Knight Piésold

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION DATA REPORT

PREPARED FOR

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VA101-176/35-1
Rev 0
March 30, 2011

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ISO 9001, ISO 14001
OHSAS 18001

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Rev	Description	Date	Approved
0	Issued in Final	March 30, 2011	KJB

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(REF. NO. VA101-00176/35-1)

EXECUTIVE SUMMARY

Knight Piésold Ltd. was retained by the Pebble Limited Partnership in 2010 to undertake geotechnical investigations at the Pebble Project. This data report presents the findings of the 2010 site investigation program. The Pebble Project area has been subdivided into general regions based on physiography and several of these areas were investigated during the 2010 site investigation program including: the Open Pit Area, East Deposit Area, Upper Talarik Creek Area, Area A, Area E, Area J, Area G and Area L. The key objectives of the program were to assess and/or update the geotechnical conditions in these areas to support future design phases for the Pebble Project. The 2010 geotechnical site investigation program included:

- The excavation and logging of test pits
- The drilling and logging of vertical and oriented drillholes
- Laboratory testing of select samples from the geotechnical drillholes and test pits
- Installation of a WestBay™ system
- Packer hydraulic conductivity (Lugeon method) testing and pressure transducer response tests in the bedrock
- The installation of standpipe piezometers or vibrating wire piezometers
- Piezometer maintenance and response testing (falling/rising head tests), and
- Reduction/compilation of the collected data.

The site investigation program was conducted between August and October in 2010. A total of 18 geotechnical drillholes (GH10-211 to GH10-228) were completed using helicopter portable diamond drill rigs. There were 20 drillholes planned for the site investigation program but due to permit and weather constraints they were not all completed Knight Piésold logged the overburden, completed detailed geotechnical logging of the core, performed geotechnical and hydrogeological tests, and installed hydrogeological testing equipment in the drillholes, where possible. A select set of overburden and bedrock samples were collected for laboratory analysis. The site investigation program also included the excavation of 106 test pits (TP10-319 to TP10-424). The test pits were logged by Knight Piésold and select samples were collected for laboratory analysis. A seismic investigation program was also completed by Frontier Geosciences Inc. to fill in the gaps between drillholes where no geotechnical or hydrogeological information is available.

The information in this report is a compilation of the geotechnical site work completed to date for the project. Knight Piésold has completed geotechnical site investigation programs annually from 2004 to 2008. The Pebble Project has continually evolved and additional site work was required to provide sufficient information to support the revised mine plans. The geological sections presented in this report supersede the geological sections issued in previous site investigation reports. Data collected by other consultants has also been referenced in this report.

The mine plan continues to be revised and additional geotechnical site investigation requirements will be required to provide information for areas where insufficient geotechnical/hydrogeological information is currently available. A summary of the additional geotechnical requirements for the 2011 pre-feasibility study for the preliminary mine plan and recommendations for future studies include the following:

- The proposed Tailings Storage Facility embankments may include low permeability zones constructed using glacial till materials sourced from the Open Pit Area. The quality and quantity of the glacial till material has not been well defined to date and additional investigation work is required. Additional sonic drilling, sampling and laboratory testing will be required to delineate and characterize potential construction materials during the next phases of design. The gradations, Atterberg limits, natural moisture contents and moisture-density characteristics should be evaluated in these future study programs.
- The storm water runoff and seepage control measures down gradient of the proposed waste dumps are required to control and collect surface water and seepage from the dump areas. Minimal geotechnical information is currently available to support the design of these systems, especially down gradient of potential waste dumps or other facilities that would be situated in the Upper Talarik Creek Area.
- Glaciolacustrine silts and clays are present in the foundation of waste rock dumps situated adjacent to the proposed open pit. These glaciolacustrine deposits typically have lower shear strengths than the glacial drift and alluvial overburden materials and must be considered for the stability of the proposed waste dumps. Minimal information is currently available on the nature, extent and strength of these lacustrine materials, as limited geotechnical sampling has been conducted to date. Additional sampling and laboratory shear strength testing is recommended.
- Site investigations completed in the Area L valley indicate that a zone of highly fractured/weathered rock may be present along the northern divide of the valley. Area G is being considered as a potential option for tailings management for the pre-feasibility study program. Additional investigations are required during future studies to better define the geotechnical and hydrogeological characteristics in order to develop requirements for seepage control measures and for environmental permitting.
- Sediment control ponds, seepage collection ponds and process water ponds will constitute essential components of the water management plan for the pre-feasibility mine plan and some of the water management facilities will incorporate significant water retaining structures. Limited geotechnical information is currently available for many of these facilities and they should be investigated in future studies once the mine plan is finalized as most of these structures will be classified as State jurisdictional dams.

The continued use of a specialist geotechnical drilling contractor with helicopter portable equipment is appropriate for future investigations. Maximizing drilling recovery of overburden materials is an important goal of the future geotechnical investigation programs. Knight Piésold recommends that a sonic drill rig be considered for drilling overburden as helicopter portable sonic drilling rigs are now available, and the sonic drilling method allows for significantly improved overburden recovery and provide better samples of the overburden materials for laboratory analysis when compared to conventional mud rotary drilling methods.

A significant amount of geotechnical and hydrogeological data has been collected during the various site investigation programs for the Pebble Project over the years and it would be prudent to consider the use

of an integrated data management such as the web-based FULCRUM system that has been developed by Knight Piésold Ltd. The geotechnical data management aspects of this system provide a central location for optimal data storage in one location allowing for ease of access and use by multiple consultants for ongoing design studies in support of future design and project permitting.

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SECTION 1.0 - INTRODUCTION

1.1 PROJECT DESCRIPTION AND BACKGROUND

The Pebble Project is a potential mining development for a large copper-gold-molybdenum deposit, located in the Bristol Bay region of southwestern Alaska. The project site is situated approximately 238 miles southwest of Anchorage and 17 miles northwest of the village of Iliamna, as illustrated on Figure 1.1. The mineral deposit is located on a drainage divide. The Upper Talarik Creek drains to the east and south, the North Fork Koktuli River drains to the west, and the South Fork Koktuli River drains to the southwest.

Pebble Limited Partnership (PLP) has completed extensive exploration drilling in the mineral deposit area and retained outside consultants to conduct comprehensive baseline environmental and engineering studies, which have been on-going since 2004. Knight Piésold Ltd. (KP) has been actively involved in these studies, specifically as they relate to the advancement of potential Mine Development Concepts (MDCs) and mine plans for the Pebble Project. Each MDC or mine plan is composed of different combinations of options for the mill site, crusher, waste rock and Tailings Storage Facilities (TSFs), along with associated mine infrastructure, roads and pipelines. The 2010 geotechnical investigation program was designed to provide geotechnical information to support the 2011 pre-feasibility engineering study.

The Pebble Project has been divided into ten areas on a geographical basis. The area locations and boundaries are shown on Figure 1.2, and include the Open Pit Area, the East Deposit Area, the Upper Talarik Creek Area, Area E, the North Fork Koktuli River Area, Area G, Area L, the South Fork Koktuli River Area, Area J and Area A. Area names and geographical boundaries have been updated from those described in prior reports. The 2010 site investigation program was primarily completed in eight of these geographical areas: the Open Pit Area, East Deposit Area, Upper Talarik Creek Area, Area A, Area E, Area J, Area G and Area L.

1.2 SCOPE OF REPORT

The scope of this data report is to present the results of the KP 2010 geotechnical site investigation program for the Pebble Project. This report expands on and updates previous geotechnical and hydrogeological information collected by KP for the project from 2004 to 2008. Details of the previous investigations (drillhole logs, test pit logs, hydrogeological information, seismic survey information and an interpretation of the surficial geology completed by Thomas Hamilton) are available in the following KP reports.

- 2004 Geotechnical Site Investigation Data Report (Reference No. – VA101-176/8-3, Volumes I & II)
- 2005 Geotechnical Site Investigation Data Report (Reference No. – VA101-176/8-6)
- 2006 Geotechnical Site Investigation Data Report (Reference No. – VA101-176/8-9, Volumes I & II)
- 2007 Geotechnical Site Investigation Data Report (Reference No. – VA101-176/20-4)

- 2008 Geotechnical Site Investigation Data Report (Reference No. – VA101-176/23-4 Volumes I, II & III)

The 2010 site investigation program included:

- The advancement and logging of geotechnical drillholes
- Installation of a WestBay™ system
- Hydraulic conductivity testing
- Standpipe and vibrating wire piezometer installation
- Excavation and logging of test pits, and
- Laboratory testing of select samples from the geotechnical drillholes and test pits.

A concurrent seismic investigation program was completed by Frontier Geosciences Inc. (Frontier) in 2010 and this investigation program is included in the appendices of this report.

SECTION 2.0 - PREVIOUS SITE WORK

Knight Piésold has conducted previous geotechnical site investigation programs at the Pebble Project from 2004 through 2008. These programs included the excavation and logging of 317 test pits, the advancement and logging of 211 geotechnical drillholes, hydraulic conductivity testing, piezometer installations, and laboratory testing of core and soil samples. A discussion and the complete findings of the prior geotechnical site investigation programs are included in the Knight Piésold Geotechnical Site Investigation Data Report for the corresponding year.

Steffen, Robertson and Kirsten (B.C.) Inc. (SRK) also carried out an earlier site investigation program at the Pebble site in 1991. The drillhole logs from the SRK 1991 site investigation program are appended to the Knight Piésold 2004 Geotechnical Site Investigation Data Report. SRK also completed supplemental drillholes in the deposit area in 2004. The logs for the 2004 drillholes are also appended to the Knight Piésold 2004 Geotechnical Site Investigation Data Report. SRK have also conducted open pit geotechnical site investigation programs from 2006 to 2008, but the results of these studies are not included in the scope of this document.

Schlumberger Water Services (SWS), formerly known as Water Management Consultants (WMC), conducted hydrogeological site investigations in 2004 through 2008 in conjunction with SLR Consulting (SLR). The hydrogeological site investigation programs included the advancement and logging of 235 drillholes and the installation of piezometers, monitoring and pumping wells. WMC/SLR also completed response tests, collected water levels and conducted pumping tests during these investigations. A summary of the hydrogeological site investigations completed by WMC/SLR for the corresponding year is included in the appendices of the corresponding Knight Piésold Geotechnical Site Investigation Data Report.

Frontier Geosciences Inc. (Frontier) completed geophysical surveys at site in 2004, 2005 and 2006. A total of 36 seismic refraction lines were completed by Frontier up to the end of 2006. The seismic survey reports from Frontier are included in the appendices of the corresponding Knight Piésold Geotechnical Site Investigation Data Report. A seismic geophysical survey was also completed in 1991 by Cooksley Geophysics. Details of the 1991 seismic survey are included in the Knight Piésold 2004 Geotechnical Site Investigation Data Report.

The data collected by the various consultants was shared, and where appropriate, used by Knight Piésold to assist with the characterization of the geotechnical conditions at the site.

SECTION 3.0 - 2010 GEOTECHNICAL SITE INVESTIGATION PROGRAM

3.1 GENERAL DESCRIPTION

Fieldwork for the 2010 geotechnical site investigation program was carried out from August to October of 2010. The fieldwork included:

- The excavation and logging of test pits
- The drilling and logging of vertical and oriented drillholes
- Laboratory testing of select samples
- Installation of the second WestBay™ system
- Packer hydraulic conductivity (Lugeon method) testing and pressure transducer response tests in the bedrock
- The installation of standpipe piezometers or vibrating wire piezometers, and
- Piezometer maintenance and response testing (falling/rising head tests).

Moving equipment and personnel between drilling and test pit sites was completed with the assistance of helicopters operated by independent contractors to PLP. The drillhole and test pit locations were selected by Knight Piésold based on the preliminary arrangement of the mine facilities for the 2010 engineering study program and existing knowledge of ground conditions, as well as to assist in the development of a more comprehensive understanding of site geotechnical conditions.

3.2 TEST PIT INVESTIGATIONS

A total of 106 test pits (TP10-319 to TP10-424) were excavated during August to September 2010. The purpose of the test pits was to examine the in-situ overburden materials and to provide samples for laboratory testing. The test pits were excavated using a helicopter portable Kubota BX25 excavator. Test pit depths generally ranged between approximately 5 and 6 ft, the maximum effective depth of the excavator without benching. The test pit sites were accessed using helicopters, and care was taken to minimize environmental disturbance. Wherever possible, the surface organic material and vegetation was stripped prior to excavating the test pit and stockpiled separately. The exposed soils in the pit walls and spoil piles were logged and photographed, and samples were collected and sealed in heavy duty plastic bags for laboratory testing to assess the geotechnical characteristics. All of the test pits were backfilled and the surface was re-contoured upon completion. The final activity at each site involved the replacement of the surface organic material and vegetation to recreate, as much as possible, the pre-investigation conditions.

Frozen ground was encountered in some of the test pits in the Upper Talarik Creek Area and Area A but the frozen material was thought to be part of the active layer of seasonal freezing as the test pits with frozen material generally had a thicker layer of organic deposits overlying the soil. Frozen material was encountered in one test pit that did not extend across the whole excavation. A summary of the test pits, including their locations and depths, is presented in Table 3.1. The locations of the test pits are shown on Figures 3.1 and 3.2 and detailed logs of each test pit are presented in Appendix A1.

Representative samples were selected from the test pits and sent to the Knight Piésold geotechnical laboratory in Denver, Colorado for analysis. The samples were analyzed for the following:

- Natural moisture content (ASTM D2216-90)
- Particle size distributions (ASTM D422-63)
- Hydrometer analysis (ASTM D422-63)
- Atterberg limits (ASTM D4318-84)
- Specific gravity – Coarse aggregate (ASTM C127)
- Specific gravity – Soil (ASTM D854), and
- Standard proctor analysis (ASTM D698).

The laboratory analyses are summarized in Table 3.2 and the detailed results are included in Appendix A2. Photographs of the test pit excavations are included in Appendix A3.

3.3 DRILLING INVESTIGATIONS

3.3.1 General

A total of 18 Knight Piésold geotechnical drillholes (GH10-211 to GH10-228) were advanced in 2010. The drilling was completed using an HT-700 or HT-750 Mud Rotary Drill capable of coring both overburden and bedrock. Standard Penetration Tests (SPTs) (ASTM D1586-84) were conducted at regular intervals in the overburden. Shelby tubes (ASTM D1587-94), which collect undisturbed samples of fine grained materials, were collected in the overburden of selected drillholes. Packer hydraulic conductivity (Lugeon) tests and pressure transducer response tests were conducted at selected intervals in the bedrock of the drillholes. Drilling, in-situ testing and the installation of standpipe or vibrating wire piezometers were completed by Foundex Pacific Inc. (Foundex) with the assistance of, and under the technical supervision and direction of, Knight Piésold field personnel.

The ground conditions encountered in the drillholes were monitored, logged and recorded in the field during the drilling process. Field observations included the classification of the materials encountered in the drill core and the materials recovered in the SPT split spoons and Shelby tubes. Information was also collected on the drilling conditions and hydrogeological characteristics such as piezometric levels and flow rates. Selected SPTs, Shelby tubes and overburden and bedrock core samples were sent to the Knight Piésold geotechnical laboratory in Denver, Colorado for analysis. The geological logging of the bedrock core was conducted in Iliamna, Alaska by PLP geologists.

The drillholes were advanced far enough into the bedrock to provide reasonable zones for packer hydraulic conductivity (Lugeon method) testing or confirm bedrock in drillholes where the classification of overburden materials was the primary focus. Each drillhole site was reclaimed by PLP personnel after completion of the drilling operations.

A summary of the geotechnical drillhole locations, drillhole size, depth, piezometer installation, hydraulic conductivity test results and geology is presented in Table 3.3. The

locations of these drillholes are shown on Figures 3.3 and 3.4. The depths to bedrock for Knight Piésold geotechnical holes drilled on the Pebble Property are shown on Figures 3.5 and 3.6.

The findings of the 2010 geotechnical drilling program are discussed in Section 4 and the corresponding geotechnical and hydrogeological drillhole data is found in Appendix B and Appendix C of this report, respectively. Details of the geotechnical drilling program methodology are discussed below.

3.3.2 Overburden Drilling

The overburden portion of each drillhole was cored utilizing PQ or HWT casing and PQ3 or HQ3 core, respectively. Drillholes that were completed in areas with expected artesian conditions also had permanent six inch casing installed to approximately 22 ft and were initially triconed with a 7.75 inch diameter bit. Biodegradable drilling mud additives, Pure-Vis, 133X Poly-drill or Bentonite Quik-Gel were added to the drilling water to assist in keeping the drillholes open in the overburden. The recovery length and soil descriptions were recorded for each drill run. Core recovery was generally better when drilling with PQ3, as compared to HQ3; although, in sandier materials, the fines still tended to be washed away during drilling. Disturbed soil samples were collected from the core barrel, logged, put into core boxes and photographed.

SPTs were completed to estimate the density and strength of the soil and to collect soil samples in areas of poor overburden drilling recovery. The number of required blows by a cathead hammer to advance the SPT split spoon sampler was recorded for every 6 inch increment until the sampler was driven to a total of 18 inches. The SPT ‘N’ value is the number of blows required to advance the sampler from 6 to 18 inches. SPTs were generally conducted at 5 ft intervals for the first 50 ft and then every 10 ft thereafter, where ground conditions permitted. SPTs are usually conducted in overburden materials, but are also sometimes completed in weathered bedrock materials. Most of the soil units within the Pebble Project area contain a high proportion of gravel and cobbles, which may result in some artificially high SPT ‘N’ values.

The following information was routinely recorded for each SPT sample prior to double bagging the samples for subsequent laboratory analysis:

- SPT number
- Depth of test interval
- Date taken
- Blow counts for each 6 inch interval
- ‘N’ value
- Recovery length
- Soil description, and
- Photographs.

Shelby tube samples were collected in fine grained overburden materials in some of the drillholes to provide information on the density and shear strength of finer grained materials. A thin walled sampling tube was pushed into the formation at the bottom of the drillhole and carefully removed by the driller. The field engineer then measured the amount of sample collected in the tube and sealed the Shelby tube at both ends. The Shelby tubes were kept upright during transport and storage.

Representative samples were selected from the cored overburden, SPTs and Shelby tubes, and sent to the Knight Piésold geotechnical laboratory in Denver, Colorado for analysis. The cored overburden samples were analyzed for natural moisture content (ASTM D2216-90) and bulk density. The SPT samples were analyzed for the following:

- Natural moisture content (ASTM D2216-90)
- Particle size distributions (ASTM D422-63)
- Hydrometer analysis (ASTM D422-63)
- Atterberg Limits (ASTM D4318-84), and
- Specific gravity – Soil (ASTM D854).

The Shelby tube samples were analyzed for the following:

- Natural moisture content (ASTM D2216-90)
- Particle size distributions (ASTM D422-63)
- Hydrometer analysis (ASTM D422-63)
- Atterberg Limits (ASTM D4318-84)
- Specific gravity – Soil (ASTM D854), and
- Triaxial compression testing (ASTM D4767 – Method A).

The overburden geotechnical drillhole logs are presented in Appendix B1. The laboratory results are summarized in Table 3.4, with the individual test results included in Appendix B3.

3.3.3 Bedrock Drilling

The geotechnical drillholes were advanced into the bedrock at varying depths depending on the purpose of the drillhole and the ground conditions encountered. PQ3, HQ3 and NQ3 sizes were utilized for drilling the bedrock. The drill return was observed for indications of material change and loss of fluid return during drilling of the bedrock. The assessment of geotechnical characteristics of the drill core included the following activities:

Geotechnical Logging

The geotechnical logging of the drill core was conducted to characterize rock mass quality. The following information was routinely collected:

- Depth interval
- Run length
- Core recovery length

- Rock Quality Designation (RQD)
- Lithological description
- Number of discontinuities
- Discontinuity/joint condition (roughness, aperture, alteration, infilling, etc.)
- Rock material weathering, and
- Estimate of Unconfined Compressive Strength (UCS) and collection of core samples for UCS laboratory testing.

Rock Mass Classification

The Rock Mass Rating (RMR) system, developed by Bieniawski (1989), has been used to classify the bedrock conditions. RMR is frequently employed in geotechnical engineering to describe general rock mass conditions and identify potential zones of weakness where further investigation may be required. The RMR system is based on determining values for the following five key rock mass parameters:

- Intact rock hardness and Unconfined Compressive Strength (UCS) - The rock hardness and intact rock strength were estimated in the field and measured in the laboratory for selected samples from some of the drillholes.
- RQD - The RQD value was determined for each core run by summing up the lengths of all core pieces greater than 4 inches long and presenting this as a percentage of the drill run length.
- Fracture spacing - An estimate of fracture spacing was determined by counting the number of natural fractures encountered per length of drill run.
- Fracture condition - The fracture condition is based on an evaluation of fracture persistence, roughness, infilling, aperture and weathering. The persistence has been conservatively assumed to have an RMR rating of 0, indicating high persistence. The roughness, infilling, aperture and weathering were evaluated by examining the drill core.
- Groundwater condition - A constant groundwater rating of 15, which corresponds to dry conditions, was used to calculate the RMR. This allows the RMR values to be consistent with Geological Strength Index (GSI) values (Hoek et al, 1995) that can be used to estimate rock mass strengths at the Pebble Project.

The potential RMR values range from near 0 to 100 and are broken into five major rock mass classes summarized as:

I. VERY GOOD rock. RMR: 81 – 100
II. GOOD rock. RMR: 61 – 80
III. FAIR rock. RMR: 41 – 60
IV. POOR rock. RMR: 21 – 40
V. VERY POOR rock. RMR <20

The overburden geotechnical logs included in Appendix B1 contain summaries of the bedrock geology and RMR values. The detailed geotechnical drillhole logging data sheets included in Appendix B2 contain additional information regarding the specific drillhole core characteristics per drill run. The RMR rock mass classification system is included in Table B2.1 along with a legend of the PLP bedrock lithology codes in Table B2.2. The UCS

laboratory results are included in the report in Appendix B4. All bedrock core was geologically logged and photographed by PLP personnel.

A bedrock contour plan of the inner mine area is provided on Figure 3.7; bedrock elevations between drillholes have been extrapolated. This figure is based on bedrock depths in KP geotechnical drillholes. PLP exploration drillhole depths were not utilized because tricone drilling methods, which often extended into weathered or fractured bedrock, may have overestimated the overburden thickness in some areas.

3.3.4 Piezometer Installation

A total of 16 standpipe piezometers were installed during the 2010 field season in the KP geotechnical drillholes at intervals specified by Knight Piésold. There was no piezometer installed into one of the drillholes (GH10-226) because it was abandoned due to collapse. Two piezometers were installed into different completion zones within the same drillhole (GH10-227). Four vibrating wire piezometers were installed into a deeper inclined drillhole (GH10-225). A WestBayTM system was installed in a deeper vertical drillhole (GH10-220) by Foundex, Knight Piésold and SWS personnel.

The standpipe piezometer installation procedure involved selecting the completion zone or zones and installing a Van Ruth plug, if required, to seat the bottom bentonite seal. Bentonite chips/pellets or sand were used when Van Ruth plugs were unable to be used or the completion zone was near the bottom of the drillhole. A bottom bentonite seal, typically 5 ft thick, was installed immediately above the bottom plug or backfilled material. A layer of coarse filter sand, approximately 3 to 5 ft thick, was then placed above the bottom bentonite seal to isolate the well screen from the lower bentonite seal. The bottom end cap of the slotted PVC screen and PVC riser pipe assembly was placed upon the coarse filter sand layer. A sufficient volume of filter sand was then poured down the drillhole to fully encompass the screened section plus approximately 3 to 5 ft of the riser pipe above the well screen. A bentonite seal was then placed on the top of the filter sand to form the top of the completion zone. The depth of each zone during the piezometer installation was monitored by continuous depth measurements using a weighted tape. The open annulus above this was backfilled with cement grout or slough or another piezometer was installed. All standpipe piezometers were completed by installing PVC top caps and a steel protective casing over the exposed pipes. A surface mound was constructed using cement to seat the steel protective cover and prevent surface water from percolating down the piezometer installation. Piezometers were not developed subsequent to installation.

The depth of the piezometer installations and the completion zones were governed by several factors. Usually, a zone of interest was identified in the overburden, bedrock or at the overburden/bedrock interface during drilling, and this was used as a target for the completion zone. The static depth to groundwater was also taken into consideration to make sure that the completion zone was installed below the observed water table.

Installation depths of the vibrating wires were predetermined by the KP field personnel. The vibrating wire piezometers were soaked in water for 24 hours prior to installation. The probe was affixed to a PVC riser pipe in an upright position and the wires were taped to the riser pipe as it was lowered to the bottom of the hole. Once the pipe was installed to the bottom of the drillhole, the PVC was grouted in place. Initial measurements were taken prior to soaking the vibrating wires, prior to installing them, and during the grouting and grout curing process using a RST vibrating wire readout box provided by PLP. The initial calibration records for each of the vibrating wires installed in 2010 are included in Appendix C4. The installation procedure for the WestBayTM system is described in greater detail in the SWS report included in Appendix D.

A summary of the geotechnical drillhole, piezometer and WestBayTM system information is provided in Table 3.3. Well completion details are included in Appendix C1.

3.3.5 Hydraulic Conductivity Testing

Hydraulic conductivity tests using the Lugeon method were completed at selected depths in some of the geotechnical drillholes to estimate the hydraulic conductivity of the bedrock. These tests are frequently referred to as 'packer tests' and consist of seating an inflatable bladder (packer) in competent bedrock to seal off a zone, then pumping water (under a controlled test pressure) down the drill rods into the isolated test zone, while measuring the flow. Three ascending and two descending test pressure stages were applied for each packer test. Hydraulic inflated and pneumatic packer systems were used on site during the 2010 site investigation program. The packer test results are shown in Table 3.3 and the individual test calculation sheets are included in Appendix C2.

Hydraulic conductivity tests were conducted in conjunction with the hydraulic inflated packer tests using a specially designed pressure transducer housing unit that was affixed to the packer system. Hydraulic conductivity tests were also conducted in the standpipe piezometers installed in the drillholes using either the rising or falling head test method. All of these hydraulic conductivity tests were analyzed using the Hvorslev method. An advantage of testing in standpipe piezometers is the completion zone can be installed in broken ground or overburden, where completing a Lugeon type test is usually not possible. The falling/rising head tests involved the addition or removal of water to the piezometer or drill pipe, and then recording the subsequent recovery in water levels. The results of the falling/rising head hydraulic conductivity tests are presented in Table 3.3. The individual test calculation sheets are included in Appendix C3.

3.3.6 Artesian Conditions

The piezometric level is above the ground surface in many locations throughout the Pebble Project site. Many of the piezometers installed in these drillholes are artesian with the piezometric level within approximately 3 ft (within the piezometer stickup) of the ground surface. Some drillholes have higher piezometric levels and flowing conditions. Most of these were located on the western side of Koktuli Mountain. Some of these

piezometers are intermittently artesian as there is seasonal variation in the groundwater table.

3.4 KEY GEOMORPHIC PROCESSES

The Pebble Project is situated in an area that has been extensively modified by glacial and freeze-thaw processes such as frost wedging and frost shattering. Surficial deposits identified on the Pebble Project site include extensive glacial deposits of drift, glaciofluvial, glaciolacustrine, organic soils and zones of frost modified bedrock. The Pebble Project site is located within a zone of sporadic permafrost based on the permafrost map of Alaska (Ferrians, 1965). No permafrost has been identified during the site investigation programs completed to date; however, frozen overburden materials have been encountered in the active layer in some locations.

The glacial deposits on the Pebble Project have been extensively reworked and transported downstream from the source areas. The four major glacial advances from the Alaska Range to the northeast have extensively modified the majority of the lower lying surficial deposits in this area. Vast amounts of debris were flushed rapidly down the valleys during periods of glaciation, and the lower lying surficial deposits were comprised mainly of glacial drift or till (ground moraine, terminal moraine and ablation), outwash plains and modified moraine (terraces). Glacier dammed lakes have created broad expanses of poorly drained material, glaciofluvial sediments and glaciolacustrine sediments. Other low lying soil deposits that occur in the region include swamp, landslide and solifluction deposits.

Higher elevation areas have not been heavily modified by glacial processes. However, extensive surface exposure of frost shattered bedrock (felsenmeer) was observed at higher elevations where bedrock tends to be coincident or very near surface. Felsenmeer is translated as ‘sea of rocks’ and consists of angular clasts of fractured bedrock that typically extend from the surface to a depth of up to approximately 15 ft. Felsenmeer is formed by frost shattering and frost wedging of the bedrock from the repeated freeze-thaw cycles in the active layer. This zone of highly fractured material is encountered extensively over the site, frequently exposed on the surface and at depth in drillholes underlying the overburden. Colluvium and solifluction deposits are also characteristic of overburden deposit types encountered in the higher elevation areas.

SECTION 4.0 - GEOTECHNICAL CONDITIONS

4.1 GENERAL

This section provides an overview of the geotechnical conditions encountered at the Pebble Project. The Pebble Project has been divided into ten geographical areas, as shown on Figure 1.2. Geotechnical information was collected by Knight Piésold in the following eight areas during the 2010 site investigation program:

- Open Pit Area
- East Deposit Area
- Upper Talarik Creek Area
- Area E
- Area G
- Area L
- Area J, and
- Area A.

No geotechnical investigation work was completed by Knight Piésold during 2010 in the South Fork Koktuli River area or the North Fork Koktuli River area, the other two geographic areas on Figure 1.2.

A selection of site photographs, SPT photographs and core photographs are included in Appendix F. Geotechnical data gathered in previous Knight Piésold site investigation programs can be found in the 2004, 2005, 2006, 2007 and 2008 Knight Piésold Reports (Ref Nos. VA101-00176/8-3, VA101-00176/8-6, VA101-176/8-9, VA101-176/20-4 and VA101-176/23-4). Data from previous reports has been updated as additional data becomes available.

Geologic sections for the different areas of the Pebble Project were updated with the results of the 2010 geotechnical site investigation program. These sections include the results of the seismic investigations completed by Frontier. The Frontier 2010 Seismic Refraction Investigation Report is included in Appendix E. Figures 4.1a and 4.1b show the locations of the section lines, with the individual geologic section lines illustrated on Figures 4.2a to 4.48b. Drillholes completed in previous years appear on the sections and the drillhole logs of these prior drillholes are included in Appendix B5.

4.2 OPEN PIT AREA

The Open Pit Area is located on the drainage divide between the South Fork Koktuli River and Upper Talarik Creek. The 2010 site investigation program included six geotechnical drillholes (GH10-217, GH10-218, and GH10-221 to GH10-224), drilled in the western side of the Open Pit Area, and the excavation of 14 test pits (TP10-353, TP10-354, TP10-372, TP10-377, TP10-380 to 388 and TP10-424). Four seismic lines (SL-39 to SL-42) were completed in the Open Pit Area in 2010.

Four geotechnical drillholes (GH06-80, GH08-107, GH08-112 and GH08-125) were drilled on the eastern side of the Open Pit Area in prior investigations. There were also 35 test pits (TP04-76 to 80, TP05-133 to 137, TP05-139 to 152, TP08-187 to 196, and TP08-202) excavated in the Open Pit Area during prior

investigations. Two seismic lines (SL-1 and SL-12) were completed in 2004. Geologic sections through seismic lines the seismic lines in the Open Pit Area (SL-39, SL-40, SL-41, SL-42, SL-1 and SL-12) are shown on Figures 4.39 to 4.42, 4.48a and 4.48b. A geologic section bisecting the eastern region of the Open Pit Area is shown on Figure 4.2a. The following paragraphs provide an overview of the subsurface conditions encountered in the Open Pit Area to date.

The Open Pit Area is terraced with many small ponds or kettled moraine resulting from the Brooks Lake glaciation (Detterman and Reed, 1973). A 2 to 12 inch layer of topsoil was encountered at surface over most of the Open Pit Area. The topsoil was typically dark brown, moist and contained varying quantities of silt, sand and gravel. The overburden in the Open Pit Area ranges in thickness from 10 to 250 ft and is generally composed of glaciofluvial, glaciolacustrine and glacial drift deposits.

The Open Pit Area has been roughly subdivided into western, central and eastern portions. The western portion of the Open Pit Area lies west of the 1100 ft contour elevation. The geotechnical interpretation of the western Open Pit Area was solely based on test pit information in prior reports. Two geotechnical drillholes (GH10-217 and GH10-218) completed in this area contribute to a better understanding of the overburden in this portion of the open pit, though the lateral and vertical extents of the materials remains unknown. The western, upslope portion of the Open Pit Area is primarily composed of glacial drift, colluvium and minor glaciolacustrine deposits, predominantly silty sand with varying amounts of gravel and clay, along the gently sloping hills and ridges.

The central portion of the Open Pit Area generally lies between the 1100 and 1000 ft elevation contours with moderate slopes. This area was also solely characterized by test pits in the past and two geotechnical drillholes (GH10-223 and GH10-224) were completed in this part of the Open Pit Area in 2010. The overburden is generally characterized by well-drained glaciofluvial and colluvium deposits overlying glacial drift deposits. Test pit samples in the central portion of the Open Pit Area had maximum dry densities ranging from 114 to 130 lb/ft^3 and a range of optimum moisture contents from 8 to 13% (ASTM D698). The natural moisture contents of these materials ranged from 2% dry to 10% wet of the Standard Proctor optimum moisture contents. The dry density of a glacial drift core sample was approximately 113 lb/ft^3 with a natural moisture content of 12%.

The eastern portion of the Open Pit Area covers a portion of the wide valley to the north of Frying Pan Valley and generally consists of glacial drift, glaciolacustrine and glaciofluvial deposits. The topography in the eastern area varies from 900 ft at the easternmost boundary of the Open Pit Area to approximately 1075 ft. Overburden materials observed in the drillholes in the eastern Open Pit Area contain varying amounts of gravel, sand, silt and clay. The SPT ‘N’ values typically ranged from 9 to 95 with some lower values near the top of the drillholes and some refusals due to cobble size material. The Atterberg Limit test work for the fine portion of the soils had Liquid Limits ranging from 23 to 44 and Plastic Limits ranging from 15 to 26. Some of the materials tested were non-plastic. Test pit samples in the western portion of the Open Pit Area had Standard Proctor maximum dry densities ranging from 117 to 128 lb/ft^3 and a range of optimum moisture contents from 8 to 13% (ASTM D698). The natural moisture contents of these materials were 2% dry to 5% wet of the Standard Proctor optimum moisture contents. The dry density of a glacial drift core sample was 112 lb/ft^3 with a natural moisture content of 13%.

The Cretaceous bedrock encountered in the Open Pit Area is comprised of diorite, monzodiorite and granodiorite. The average field estimated UCS values of these Cretaceous units ranged from 26 to 111 MPa and average RMR values ranged from 32 to 53 indicating POOR to FAIR rock quality (Bieniawski, 1989). The Tertiary bedrock in this area is comprised of basalt, basalt breccia, volcaniclastic matrix-supported breccia/conglomerate and mudstone/siltstone/wackes. The average field estimated UCS values of these Tertiary units ranged from 48 to 138 MPa and average RMR values ranged from 43 to 67 indicating FAIR to GOOD rock quality (Bieniawski, 1989). The bedrock conditions of the Open Pit Area have also been generally described in the Knight Piésold 2004 and 2005 Open Pit Geotechnical Investigation Reports (Ref. Nos. VA101-00176/8-2 and 8-5).

Hydrogeological investigations of the Open Pit Area have been conducted by WMC/SLR. The depths to the groundwater table were variable throughout the Open Pit Area, ranging from artesian conditions to a water level approximately 80 ft below existing grade. Some of the drillholes were advanced 300 ft into bedrock in order to provide additional information on the hydraulic conductivity of the bedrock in this area. The packer hydraulic conductivity testing in the bedrock of the Open Pit Area was in the order of 10^{-4} to 10^{-6} cm/s and generally decreases with depth. Falling/rising head hydraulic conductivity testing in the overburden and the bedrock of this area was also in the order of 10^{-3} to 10^{-5} cm/s.

4.3 EAST DEPOSIT AREA

The East Deposit Area is located immediately east of the Open Pit Area, as illustrated on Figure 1.2. One test pit (TP10-408) was completed in this area on the western side of Koktuli Mountain during the 2010 site investigation. Knight Piésold previously completed 21 geotechnical drillholes (GH05-64, GH06-78, GH06-79, GH07-104 to GH07-106, GH08-108 to GH08-111, and GH08-113 to GH08-123) and 17 test pits (TP05-116, TP05-126 to 132, TP08-179 to TP08-183, TP08-185, and TP08-197 to TP08-199) in this area. Six seismic lines (SL-25, SL-26, SL-34, SL37, and SL-38) were completed in 2006 to delineate a potential paleochannel northwest of Koktuli Mountain. Figures 4.19, 4.20, 4.28 and 4.29 represent cross sections along SL-25, SL-26, SL-34 and SL-38, respectively.

The drillholes completed in this area indicate that the overburden materials consist of glaciofluvial, glaciolacustrine and glacial drift deposits composed of sand and silt with varying amounts of gravel, and varying amounts of silt and clay. Core recovery was generally good in the glaciolacustrine and units with higher silt content. Several of the SPT samples in these units had fines contents ranging from 55 to 98%. The SPT ‘N’ values ranged from 10 to 89 in these drillholes. Lower ‘N’ values found near the surface were anomalous and have been attributed to peat or heaving sand or slough down the hole. Several of the SPTs were refused in these drillholes, which was attributed to the abundant cobbles found in the materials in the area. The Atterberg Limit test work showed that the cohesive materials have Liquid Limits ranging from 23 to 54 and the Plastic Limits ranging from 13 to 24. Some of the materials from these drillholes were determined to be non-plastic.

The bedrock encountered in the drillholes in this area was weathered Tertiary Rhyolite, Tertiary Basalt and Tertiary Volcaniclastic Breccia/Conglomerate. Some of the drillholes ended in weathered bedrock as their primary objective was for overburden characterization. The bedrock had average field estimated UCS values ranging from 8 to 106 MPa, corresponding to weak to strong rock. The average RMR value

range in these drillholes was 32 to 55, indicating a rock mass quality designation of POOR to FAIR rock (Bieniawski, 1989).

GH07-106, GH08-108, GH08-110 and GH08-122 encountered flowing conditions of approximately 1 to 13 gpm. These drillholes intersect a confined aquifer where a more recent till deposit overlies higher permeability zones such as fractured bedrock and sandy materials. The groundwater in this area ranged from 63 ft below ground surface to a piezometric surface above ground level but most water levels were within 10 ft below the surface. Falling head response tests completed in the overburden materials indicated hydraulic conductivities in the order of 10^{-6} cm/s to 10^{-4} cm/s. Falling head response tests completed at the overburden/bedrock contact had hydraulic conductivities in the order of 10^{-6} to 10^{-3} cm/s, indicative of the higher permeability material that is often encountered at the bedrock contact.

4.4 UPPER TALARIK CREEK AREA GEOTECHNICAL CONDITIONS

The Upper Talarik Creek Area is located to the north of the Open Pit Area, as shown on Figure 1.2. The 2010 site investigation program included three geotechnical drillholes (GH10-219, GH10-227 and GH10-228) and the excavation of 35 test pits (TP10-319 to 334, TP10-338, TP10-342 to 352, TP10-373 to TP10-379 and TP10-405). One seismic line (SL-50) was completed by Frontier in 2010 northeast of Koktuli Mountain. The geotechnical drillholes completed in 2010 were much farther to the east (on the eastern side of Koktuli Mountain) than previous drilling completed in the central and western portions of the Upper Talarik Creek Area.

There were 11 geotechnical drillholes (GH04-02, GH08-124, GH08-126, GH08-127, GH08-130 to GH08-132, GH08-134 and GH08-200 to GH08-202) and 29 test pits (TP04-37 to TP04-41, TP05-153 to 155, TP08-200, TP08-201, TP08-203 to TP08-220 and TP08-222) completed in this area during prior investigation programs. Seismic line (SL-22) was completed in 2006. Geologic sections through SL-22 and SL-50 are shown on Figures 4.48b and 4.43. Figure 4.37 presents a geological cross section in the western portion of the Upper Talarik Creek Area.

A layer of topsoil up to approximately 4 ft thick was typically encountered at surface in this region. The topsoil is typically dark brown, moist to wet, consisting of silt, sand, gravel and/or peat. Glacial drift, glaciolacustrine, glaciofluvial and colluvium deposits were encountered in this area. Some of the near surface materials in the eastern portion were frozen but were thought to be part of the active layer as they were usually in areas were frozen ground would persist longer. The overburden of the Upper Talarik Creek Area is predominantly composed of sand, gravel or silt with varying amounts of sand, silt, clay and gravel. Fine-grained deposits predominantly of sand, silt and clay were encountered in some of the lower-lying topographic areas in the center of the valley, to the north of the Open Pit Area and north to northeast of Koktuli Mountain. These units are typically found in low energy depositional environments, such as glaciolacustrine or very low-gradient stream reaches such as oxbows. The glaciolacustrine materials are often at surface in the eastern portion of the Upper Talarik Creek Area and overlie deeper glacial drift deposits. Sand and gravel deposits are generally found at surface in the western portion of the Upper Talarik Creek Area. These coarser grained gravel and sand combinations, indicative of glacial drift deposits, are likely a continuation of the glaciofluvial deposits encountered in the central portion of the Open Pit Area. These deposits were likely deposited in streams adjacent to the glaciers or by

meltwater channels during glacial wasting. Glaciolacustrine materials are sometimes encountered below the glacial drift materials in the western portion of the Upper Talarik Creek Area.

The overburden materials of the Upper Talarik Creek Area typically consist of glaciofluvial, glaciolacustrine and glacial drift deposits composed of sand and silt with varying amounts of gravel and varying amounts of silt and clay. Core recovery was generally good in the glaciolacustrine and silty glacial drift units. Some of the SPT samples in these units had fines contents up to 96%. The SPT 'N' values ranged from 9 to 89 in these drillholes. Lower 'N' values were encountered near the surface have been attributed to peat or heaving sand or slough down the hole. Several of the SPTs were refused in these drillholes, which was attributed to the abundant gravel and cobbles found in the glacial drift materials in the area. The Atterberg Limit test work showed that the cohesive materials have Liquid Limits ranging from 16 to 62 and the Plastic Limits ranging from 12 to 54. Some of the materials from these drillholes were determined to be non-plastic. Laboratory analyses of Shelby tube samples taken in GH10-227 and GH10-228 yielded a dry density range of 86 and 127 lb/ft^3 for the glaciolacustrine materials. The total cohesion for these samples ranged from approximately 0 to 1156 lb/ft^2 with an effective cohesion ranging from approximately 195 to 602 lb/ft^2. The total friction angle varied from 16 to 25° and the effective friction angle varied from approximately 30 to 37°. Test pit samples in the Upper Talarik Creek Area had maximum dry densities ranging from 117 to 131 lb/ft^3 and a range of optimum moisture contents from 8 to 13% (ASTM D698). The natural moisture contents ranged from 1 to 5% wet of the Standard Proctor optimum moisture content.

The bedrock encountered in this area consists of Tertiary Sandstone/Wacke/Conglomerate, Tertiary Volcaniclastic Breccia/Conglomerate, Tertiary Conglomerate, Tertiary Basalt, Tertiary/Cretaceous Monzonite, Cretaceous Siltstone (bedded andesite), Granodiorite and Diorite. Bedrock in this area has an average field estimated UCS value range of 15 to 130 MPa, the lower values corresponding to weathered rock or fault zones. Laboratory UCS results for the Tertiary Conglomerate were 14 MPa and ranged from 20 to 131 MPa for the Tertiary Volcaniclastic/Breccia Conglomerate. The average RMR value ranged from 29 to 61, corresponding with POOR to GOOD rock (Bieniawski, 1989).

GH07-134 and GH08-201 exhibited artesian conditions of approximately 2 to 5 gpm, as these drillholes intersected a confined aquifer. One of the piezometers installed into GH10-227 was artesian. A piezometer was installed into GH08-201, but had to be pressure grouted to stop the flow of approximately 5 gpm. The groundwater levels in this area ranged from artesian conditions to approximately 40 ft below ground surface, respectively, as measured shortly after drilling was completed. Packer hydraulic conductivity test results in the bedrock ranged in the order of 10^{-5} to 10^{-4} cm/s Falling head tests completed at the overburden/bedrock contact and in the bedrock showed hydraulic conductivities in the order of 10^{-6} to 10^{-4} cm/s.

4.5 AREA E GEOTECHNICAL CONDITIONS

Area E is situated immediately west of the Open Pit Area and includes the broad valley between the Open Pit Area and Area G as shown on Figure 1.2. The 2010 site investigation program in this area included four geotechnical drillholes (GH10-211 to GH10-214) and 14 test pits (TP10-355, TP10-357 to 360, TP10-363 to 369, TP10-371, and TP10-389). Four seismic lines (SL-43 to SL-46) were also

completed in this area in 2010. The purpose of the 2010 drillholes was to investigate the foundation conditions for a newly proposed mill site.

Past site investigation work completed in Area E included 19 geotechnical drillholes (GH04-26, GH04-27, GH05-57 to 58, GH08-128, GH08-129, GH08-165, GH08-177 to GH08-183, GH08-189, GH08-192, GH08-194, GH08-196, and GH08-198) and 65 test pits (TP04-43, TP04-46,TP04-67 to TP04-75, TP05-156 to 177, TP08-221 to TP08-231 and TP08-238 to TP08-259). Ten seismic lines (SL-13 to 15 and SL-27 to 33) were completed on a knoll in the eastern portion of Area E in 2006 to provide additional information on the foundation conditions. Geologic sections corresponding to seismic lines SL-13 (which also extends into Area A) to SL-15 (2004) are shown on Figures 4.10 to 4.12, geologic sections through SL-27 to SL-33 (2006) are shown on Figures 4.21 to 4.27, and geologic sections through SL-45 and SL-44 are shown on Figures 4.45 and 4.46, respectively. Figure 4.36 depicts a geologic section through the northwestern portion of Area E.

A 0 to 1 ft thick layer of topsoil was encountered at surface over most of Area E. The topsoil was typically medium to dark brown, moist and contained varying quantities of organic material, silt, sand and gravel. The test pits and drillholes show that the bedrock in this area was overlain by a veneer of glacial drift, predominantly sands and gravels with varying amounts of silt, with colluvium and frost shattered rock or felsenmeer on the ridges. Test pit samples on the knoll in east Area E had maximum dry densities ranging from 110 to 130 lb/ft^3 and a range of optimum moisture contents from 7 to 15% (ASTM D698). Some of the natural moisture contents of these materials were approximately equivalent to the Standard Proctor optimum moisture contents; however, some were 9 to 10% wet of optimum.

Bedrock was encountered at depths of 0 to 21 ft in the drillholes on the tops of the knolls in the eastern portion bordering the Open Pit Area. Thicker overburden deposits ranging from 6 to 111 ft deep encountered in the drillholes in the valleys and on the valley side slopes. The underlying bedrock varied from Cretaceous Monzonite/Granodiorite, Diorite, Wacke/Siltstone/Mudstone and Andesitic Siltstone to Tertiary sediments and intrusives. Tertiary rocks found in this area include Tertiary Volcaniclastic Breccia/Conglomerate, Tertiary Basalt, Brecciated Basalt and Tertiary Siltstone. The rock was relatively strong with an average field estimated UCS values ranging from 27 to 156 MPa. Laboratory UCS values for Cretaceous Wacke/Siltstone/Mudstone ranged from 127 to 176 MPa, 65 MPa for Diorite, and 39 to 133 MPa for the Cretaceous Andesitic Siltstone/Wacke unit. The lower values are likely attributed to weathered or veined bedrock. The average RMR values ranged from 30 to 58, as the average RQD of the rock in this area was typically lower due to the more fractured characteristics.

The water table ranged from artesian to a depth of 84 ft below surface and was usually coincident with, or close to the top of the fractured bedrock unit. Packer hydraulic conductivity tests were conducted in the bedrock of each of the drillholes and were in the order of 10^{-7} to 10^{-4} cm/s. Hydraulic conductivities obtained for the piezometer completion zones using rising/falling head tests were in the order of 10^{-6} cm/s to 10^{-4} cm/s.

4.6 NORTH FORK KOKTULI RIVER AREA GEOTECHNICAL CONDITIONS

The North Fork Koktuli River Area is a wide, relatively flat valley located in the northwestern region of the Pebble Property, as shown on Figure 1.2. The area has many streams and small, seasonal lakes that

feed into the upper reaches of the North Fork Koktuli River, which meanders through the area. No site investigation activities were completed in this area in 2010. Four geotechnical drillholes (GH04-01, GH07-101 to 103) were previously completed in this area to evaluate the subsurface overburden materials as a source for borrow materials. Prior geotechnical data collection also included the excavation of 10 test pits (TP04-42, 44 to 45, TP04-47, TP04-54 to TP04-57 and TP04-107 to 108).

A 6 inch to 2 ft layer of organic topsoil was encountered in the test pits and drillholes in the area. The topsoil is typically dark brown and consists of silt, sand and gravel. The overburden thickness in GH04-01 was 148 ft, which is significantly greater than the overburden thickness measured in the 2007 drillholes, located much further to the south, where the overburden thickness ranged from 22 to 40 ft. The materials encountered in the test pits range from well-graded gravel with some sand, to silt and sand. These materials are generally compact with cobbles and gravel. These variations are the result of the numerous glaciations and localized depositional environments.

Drillhole GH04-01 encountered sand, gravel and silt layers to approximately 23 ft deep with an increase in fines below this depth. The overburden in the 2007 drillholes encountered glacial drift deposits consisting of sand and gravel with varying amounts of silt and clay. The SPT 'N' values for the materials ranged from 10 to 93. Some of the SPTs were refused when cobbles were encountered. The Atterberg Limit test work of soil samples taken in GH07-102 had Liquid Limits that varied from 21 to 45 and Plastic Limits ranging from 13 to 19, some of the samples were non-plastic.

The bedrock encountered in GH07-101 and GH07-103 was Tertiary Basalt while Tertiary Mudstone/Siltstone/Wacke was encountered in GH07-102. The Tertiary Basalt had an average field estimated UCS values of 100 MPa, though the rock was weaker in GH07-103 and fractured to 130 ft. The average RMR value for the Tertiary Basalt in these drillholes was 44 indicating FAIR rock (Bieniawski, 1989). The Tertiary Mudstone/Siltstone/Wacke encountered in GH07-102 was highly fractured to the depth of the drillhole (133 ft), and had an average field estimated UCS value of 49 MPa and an average RMR value of 36 indicating POOR rock (Bieniawski, 1989). The bedrock in GH04-01 in the northern portion of the area is comprised of andesite. The core was highly fractured, weak to medium strong rock, with UCS values ranging from 2 to 30 MPa, and an average RMR rating of 41, which is characterized as POOR to FAIR rock (Bieniawski, 1989).

The ground was generally frozen near the surface in this area during the excavation of the test pits in 2004 as they were excavated in the early months of the summer. Aside from this frozen moisture, there was no other noted groundwater present in any of the test pits. Site reconnaissance conducted in late August 2004 encountered a number of dry rocky depressions (several feet deep) that had high water lines from earlier in the season, which indicates that the area is fairly well drained from spring to fall. The groundwater level was measured in a piezometer installed into the overburden in GH04-01 with a water level of approximately 14 ft below ground surface.

The 2007 drillhole water levels in this area varied from 20 to 31 ft below ground surface in the five piezometers installed into these drillholes (GH07-102 and GH07-103 both had two piezometers installed into different completion zones). A falling head test was completed in the overburden materials of GH07-101 with a hydraulic conductivity in the order of 10^{-5} cm/s. Falling head tests completed at the overburden/bedrock contact in GH07-102 and GH07-103 had hydraulic conductivity in the order of

10^{-6} cm/s. Falling head tests were also completed in the bedrock of these two drillholes and the hydraulic conductivity was in the order of 10^{-7} cm/s. Hydraulic conductivity based on packer tests in GH07-101 and GH07-103 was in the order of 10^{-6} cm/s. No packer testing was conducted in GH07-102 due the highly fractured nature of the bedrock.

4.7 AREA L GEOTECHNICAL CONDITIONS

Area L is located in the southwest region of the Pebble Property, as shown on Figure 1.2. Two geotechnical drillholes, one vertical (GH10-220) and one inclined (GH10-225) and one seismic line (SL-49) were completed in the northern portion of Area L in 2010. An additional inclined hole with nested vibrating wire piezometers was proposed for this area but was not completed due to time and weather constraints.

There were 28 geotechnical drillholes (GH04-09, GH04-19 to 22, GH06-65, GH08-140, GH08-143, GH08-150, GH08-152, GH08-155, GH08-159 to GH08-162, GH08-170 to GH08-176, GH08-193, GH08-195, GH08-197A, GH08-197B, GH08-199, and GH08-203), 42 test pits (TP04-35 to 36, TP04-91 to 100, and TP08-287 to 316) and one seismic line (SL-24) completed in Area L in prior site investigation programs. Geologic sections through SL-24, SL-47 (which continue into Area L from Area G), SL-49, (northern Area L), and across the valley in Area L are shown on Figures 4.18, 4.32a, 4.47, 4.33, 4.34a and 4.34b, respectively.

A 0 to 5 ft layer of topsoil covers most of the area, which is typically dark brown, and consists of silt, sand, gravel and cobbles. The overburden depth varies from 0 to 105 ft with most of the overburden within 30 ft of surface. Thicker overburden deposits are found in the valley bottom. The overburden deposits consist of sand and/or gravel with varying amounts of fine materials. Glacial drift, colluvium, felsenmeer and bedrock are encountered at surface in this area. The SPT 'N' values ranged from 7 to 82 in the overburden units, with the values generally increasing with depth. Many of the SPTs were refused as there is a significant amount of gravel and/or cobble size material in the overburden of this area.

The bedrock encountered in Area L is of igneous and volcanosedimentary origin. The rock types encountered include Granodiorite of the Kaskanak Batholith, Monzodiorite, Tertiary Volcaniclastic Breccia, and Tertiary Basalt/Brecciated Basalt. Field estimated UCS values were indicative of strong rock, ranging from 60 to 180 MPa, with RMR values ranging from 39 to 66 and a rock mass quality designation of POOR to GOOD rock (Bieniawski, 1989).

Groundwater was observed to be seeping into many of the test pits excavated in the northern and eastern regions of the valley. Numerous groundwater seeps were noted in these same areas during site reconnaissance in late August 2004. The groundwater level in Area L ranges from artesian to approximately 290 ft below ground with the deeper water level measured using a vibrating wire in GH08-170. Two drillholes were installed in this area to try to verify the depth to the water table in GH08-170. The water levels measured in the WestBay™ installation in GH10-220 and in the vibrating wire piezometers installed in GH10-225 were within approximately 25 ft of ground surface. The deeper water level in GH08-170 is inconsistent with the water levels observed in other drillholes and may be due to a malfunction in the vibrating wire piezometer. The hydraulic conductivity of the bedrock from packer

tests taken in this area ranged from 10^{-4} to 10^{-7} (no take) cm/s. Response test hydraulic conductivity values were in the order of 10^{-6} to 10^{-2} cm/s.

4.8 AREA G GEOTECHNICAL CONDITIONS

4.8.1 Introduction

Area G is located in a broad valley in the northwestern region of the Pebble Property, as shown on Figure 1.2. Previous work in Area G was completed during the 2004, 2006, 2007 and 2008 site investigation programs. The location of all site investigation work completed in Area G is shown on Figure 3.3 and summarized below:

- 2010: Two geotechnical drillholes (GH10-215 and GH10-216), nine test pits (TP10-335 to 337, TP10-339 to 341, TP10-356, TP10-361, and TP10-370) and two seismic lines (SL-47 and SL-48) were completed during the site investigation program.
- 2008: The site investigation program consisted of 20 geotechnical drillholes (GH08-136, GH08-138, GH08-141, GH08-144, GH08-146, GH08-148, GH08-151, GH08-156, GH08-158, GH08-163, GH08-164, GH08-166 to GH08-169, and GH08-184 to GH08-188) and 28 test pits (TP08-237 and TP08-260 to TP08-286).
- 2007: The site investigation program consisted of 20 geotechnical drillholes (GH07-81
- to GH07-90 and GH07-95 to GH07-100).
- 2006: Four geotechnical drillholes (GH06-66 to GH06-69) and one seismic line (SL-23) were completed during the site investigation program.
- 2005: No work was completed in this area in 2005.
- 2004: The site investigation program consisted of five geotechnical drillholes (GH04-07 to 08, GH04-23 to 25) and 15 test pits (TP04-58 to 66 and TP04-101 to 106).

The geotechnical drillholes are generally aligned on five section lines around the perimeter of Area G with additional holes to investigate potential borrow areas, sediment control ponds and hydrogeological conditions. The sections are shown in plan on Figure 4.1a and the cross sections are shown as:

- North Area G – Geologic section along SL-23, (Figure 4.17)
- Upstream North Area G – Geologic section along SL-48, (Figure 4.31b)
- Northwest Area G – Geologic section along SL-48, (Figure 4.31a)
- Southwest Area G/North Area L- Geologic section along SL-47, (Figures 4.32a and 4.32b)
- South Area G/North Area L – Geologic sections along SL-24 and SL-49, (Figures 4.18 and 4.47), and
- East Area G - East geologic section, (Figure 4.30).

The geotechnical conditions encountered are described in the following sections.

4.8.2 North Area G

A layer of topsoil, at times intermixed with felsenmeer, varying from a thin veneer at higher elevations to 4 ft thick was encountered over most of the area. A peat layer approximately 10 ft thick was encountered in the base of the valley. The topsoil is typically dark brown, moist, and comprised of silt, sand and gravel. The lower lying areas were found to contain a higher amount of fines, mostly silty sand.

The thickness of overburden in the drillholes along the alignment varied from approximately 2 to 35 ft. The deepest overburden was encountered on the western mid-valley slopes. Core recovery in the overburden was generally poor as most of the drillholes in this area were HQ3 size. A shallow 2 ft layer of sand and gravel overburden, most likely weathered felsenmeer, was observed at the northwest limit of the section line. The overburden encountered in the valley bottom is up to 15 ft of combined peat, sands and gravels. The inorganic overburden is of glacial origin, largely consisting of glacial drift and colluvium deposits. The overburden is comprised of sand and gravel with varying amounts of silt, and the deposits are complex with rapidly changing composition and numerous layers that are not easily extrapolated between drillholes.

The bedrock encountered along the section is primarily of volcanic origin. A bedrock lithology divide exists approximately coincident with the valley bottom with Cretaceous Siltstone/Mudstone/Wacke, Cretaceous Basalt and Tertiary Basalt to the northwest and Cretaceous Granodiorite/Monzonite, Gabbro and Basalt to the southeast. The average field estimated UCS values of the bedrock along this section ranged from 45 to 100 MPa and the average RMR values ranged from 44 to 55 indicating a rock mass quality designation of FAIR rock (Bieniawski, 1989).

The hydraulic conductivity of the bedrock is low with all test values ranging between 10-6 and 10-4 cm/s. Fault zones exhibited hydraulic conductivities in the same order of magnitude as that of the host bedrock. A fractured/weathered bedrock zone is generally observed at the contact of the overburden and the bedrock, which can have a relatively high hydraulic conductivity in the order of 10-4 to 10-2 cm/s. The groundwater conditions are variable with drillholes to the southeast having piezometric surfaces above ground level up to 1500 ft in elevation. GH08-188 has a piezometric water level of 41 ft below surface but is located on the eastern slope of the valley at an elevation of approximately 1700 ft. The groundwater in drillholes along the section to the northwest is more depressed with a piezometric surface that is within 12 ft of the ground surface.

Geotechnical drillhole GH10-215 was drilled to the north of the section line to provide information on the foundation conditions for a potential seepage control pond. It was deemed too far from the section line to be included on it. The overburden at this location consisted of glacial drift deposits to 12 ft depth and bedrock of Cretaceous Basalt. The rock had average field estimated UCS value of 205 MPa and average RMR values of 53. Packer hydraulic conductivity results ranged from 10-4 and 10-3 cm/s. Groundwater was encountered 8 ft below ground surface after drilling completion.

4.8.3 Upstream North Area G

An uppermost layer of topsoil, with a thickness that generally varies from 0 to 1 ft thick, was encountered across the valley in this area. A surface peat layer was encountered near the base of the valley and is approximately 2 ft thick. The topsoil is typically dark brown, moist, and comprised of silt, sand and gravel. The lower lying areas were found to contain a higher amount of fines, mostly silt and sand with some clay.

The thickness of overburden in the drillholes along the upstream north section varied from approximately 2 to 51 ft. The deepest overburden was encountered on the eastern mid-valley slopes. Core recovery in the overburden was generally poor. The overburden materials are composed of weathered bedrock, felsenmeer, colluvium and glacial drift deposits. The materials are mostly composed of silt and sand with some gravel of varying proportions.

The bedrock encountered along this portion of SL-48 is primarily of volcanic origin and comprised mostly of granodiorite, basalt and gabbro. The average field estimated UCS values for the rock range from 80 to 117 MPa. There are some lower strength values associated with weathered bedrock. The average RMR values range from 42 to 50, indicative of a rock mass quality designation of FAIR rock (Bieniawski, 1989).

The hydraulic conductivity of the bedrock is variable with hydraulic conductivity values ranging between 10-5 and 10-4 cm/s. One piezometer at the overburden/weathered bedrock contact resulted in an estimated hydraulic conductivity of between 10-3 and 10-2 cm/s as the response was too fast to be accurately measured without a transducer. The piezometric surface varies from 7 ft below ground surface on the western side of the valley to artesian conditions near the valley bottom to 24 ft below ground level on the eastern side of the valley.

4.8.4 Northwest Area G

There is very limited topsoil and overburden along the northwest portion of SL-48. The topsoil layer occurs as a thin veneer, and is not present in all locations. Felsenmeer is visible on the higher elevation slopes in this area. The overburden is up to 15 ft thick in some locations, but is generally less than 10 ft thick and is generally comprised of silty sand and gravel.

Bedrock in the southwest is mostly comprised of granodiorite/monzonite and basalt with some pyroxenite, gabbro and siltstone/sandstone to the northeast, near the end of the ridge line. The bedrock lithology was observed to abruptly change in the drillholes (basalt intrusions) with some extensively altered zones, a number of fault zones and heavily fractured zones observed. The bedrock had average field estimated UCS values ranging from 26 to 134 MPa. The lower values are associated with weathered bedrock. The RMR values for the bedrock ranged from 35 to 66, corresponding with a rock mass quality

designation of POOR to GOOD rock with most drillholes in the FAIR rock range (Bieniawski, 1989).

The bedrock has low hydraulic conductivity in the order of 10-7 (no take) to 10-4 cm/s. A number of fault zones and zones of heavily fractured rock with clay in the joints were encountered; these zones have low hydraulic conductivity in the same order of magnitude as the surrounding bedrock. The groundwater level is either at or close to the ground surface in most drillholes in this area but is as deep as 12 ft. GH07-86 and GH07-83 had piezometric levels above the ground surface, but the water levels vary seasonally so other locations may exhibit artesian conditions at certain times of the year. The hydraulic conductivity at the bedrock/overburden contact is variable with a felsenmeer or frost shattered fractured rock zone generally observed, this zone can have a relatively higher hydraulic conductivity in the order of 10-6 to 10-3 cm/s.

4.8.5 Southwest Area G/North Area L

The section along SL-47 is located along the southwest ridge of the Area G at the watershed divide between Area G and the North Fork Koktuli River and continues into Area L to the south. There were six geotechnical drillholes completed along this section: GH10-225, GH08-170, GH10-220, GH07-90, GH08-89 and GH08-169.

There is limited topsoil present along the section with up to 1 ft of organic soils on the valley slopes and on the valley bottom. The overburden along this section line is generally thin with less than 5 ft of overburden and topsoil present in the saddles. The overburden encountered in these drillholes is largely composed of sand with varying amounts of gravel and fines. Felsenmeer exists over most of this area with many large boulder size fragments at surface.

The rock types encountered in this area include Cretaceous Granodiorite/Monzonite and Tertiary Basalt. The average field estimated UCS values ranged from 72 to 136 MPa with average RMR values indicating a rock mass quality designation of FAIR rock, ranging from 44 to 60 (Bieniawski, 1989).

The hydraulic conductivity of the bedrock is generally low and ranges from 10-7 (no take) to 10-4 cm/s with occasional intervals of higher hydraulic conductivity ranging from 10-3 to 10-2 cm/s. The groundwater table was observed to be within 25 ft below surface in five of the six drillholes. The depth to groundwater in drillhole GH08-170 was measured at approximately 290 ft below the ground surface. This was measured using a vibrating wire piezometer and is inconsistent with that being observed in other drillholes in this area. Instrumentation (WestBayTM and vibrating wires) installed during the 2010 site investigation program indicate water levels within 25 ft below ground surface.

4.8.6 South Area G/North Area L

These sections along SL-24 and SL-49 are located in Area L at the head of the Area G valley at the watershed divide between Areas G and L. There is up to 1 ft of topsoil/organics encountered in this area. Overburden along these section lines is generally thin with less than 5 ft of overburden present on the valley slopes, ranging in composition from silty sand to sandy gravel. The majority of the surficial material on the slopes is felsenmeer.

Two drillholes in the valley bottom encountered very different depths to bedrock, ranging from 17 ft in GH07-93 to 90 ft in GH04-08. GH10-216 was drilled to the north of GH04-08 and the depth to bedrock in this drillhole was 59 ft, lending credence to the deeper overburden depth in GH04-08. The overburden encountered in these two drillholes is sandy gravel to gravelly sand with some fines.

The bedrock along these sections is comprised of brecciated Tertiary sediments and volcanics in the valley bottom with granodiorite/monzonite in drillholes higher up the valley slopes. Average field estimated UCS values for the bedrock in this area ranged from 36 to 93 MPa. The average RMR values ranged from 44 to 52, coinciding with a rock mass quality designation in the FAIR rock range (Bieniawski, 1989).

The hydraulic conductivity of the bedrock is generally low and ranged from 10-6 to 10-3 cm/s. The higher hydraulic conductivity is found in the valley bottom, with generally lower hydraulic conductivity encountered higher on the valley slopes. The hydraulic conductivity at the bedrock/overburden contact is relatively higher than for deeper, more competent rock. This fractured zone has a hydraulic conductivity in the order of 10-6 to 10-3 cm/s. The piezometric surface is generally less than 25 ft below surface to artesian. A piezometric surface of 85 ft below ground level is encountered in a single drillhole (GH06-65) on the western valley side slope; however, some piezometers exhibited artesian conditions further up the slope.

4.8.7 East Area G

The section on Figure 4.30 is located across a saddle and ridges at the drainage divide between Area G and Area J. A thin layer of topsoil is present along this section with felsenmeer outcropping at surface on the ridges. The overburden on the saddle side slopes and the hilltop is typically less than 10 ft thick and comprised of weathered bedrock material, which has eroded to sand and gravel with some silt and clay. The overburden at the base of the saddle was approximately 50 ft deep and consists of sandy gravel with trace amounts of clay and silt. The Standard Proctor maximum dry density of the material from test pit TP10-361 was determined to be 123 lb/ft^3 (ASTM D698). The natural moisture content of the material was 5% wet of the Standard Proctor optimum moisture content of 10%.

Bedrock in the northeast consists of Cretaceous Granodiorite/Monzonite. Tertiary Volcaniclastic Breccia overlying Cretaceous Granodiorite/Monzonite was encountered in the center of the saddle and on the slope of Kaskanak Mountain. Average field estimated UCS values for the drillholes along this section ranged from 57 to 144 MPa. The average RMR values ranged from 43 to 60, indicating a rock mass quality designation of FAIR rock (Bieniawski, 1989).

The hydraulic conductivity of the bedrock is generally low in the order of 10-6 to 10-4 cm/s. Intervals with higher estimated hydraulic conductivity in the order of 10-3 to 10-2 cm/s were identified in the drillholes on the saddle slopes.

4.8.8 Potential Borrow Sources in Area G

Seven drillholes (GH07-95, GH07-96, GH07-97, GH08-184, GH08-185, GH08-186, GH08-187) were drilled within the Area G valley and were sited to investigate potential sources of borrow material.

Drillholes GH07-95 to GH07-97 were completed on the east side of Area G, these drillholes revealed a layer of overburden composed of sand with silt and gravel between 12 and 15 ft thick. These materials were also encountered in test pits excavated in this area. Weathered bedrock between 10 and 80 ft thick was encountered below the overburden. The bedrock in all three drillholes is a Tertiary Volcaniclastic Breccia with a siltstone matrix. The total depth to competent bedrock is variable between 20 and 90 ft. The average RMR values for the bedrock in this area ranged from 38 to 47, in the POOR to FAIR rock range (Bieniawski, 1989). Average field estimated UCS values ranged from 49 to 77 MPa for these three drillholes. No elevated groundwater conditions were encountered and the hydraulic conductivity in competent rock was low in the order of 10-5 to 10-3 cm/s. Two faulted zones were identified in the drillholes with higher hydraulic conductivity in the order of 10-3 cm/s.

The potential borrow sources in the northern portion of the valley, where GH08-184 to 187 were drilled, revealed little to no overburden available for use as borrow material since the overburden ranged from 1 to 4 ft deep in this area. Bedrock types in the area consist of granodiorite, gabbro and basalt. The average field estimated UCS values for the bedrock in these four drillholes ranged from 61 to 105 MPa. The average RMR values coincided with FAIR rock as they ranged from 42 to 47 (Bieniawski, 1989). The depth to groundwater in this area ranged from approximately 1 ft to 17 ft in this area. The hydraulic conductivity of the weathered bedrock encountered in this area was in the order of 10-4 cm/s. Falling head tests completed in the holes in this area had hydraulic conductivities that ranged from 10-7 to 10-2 cm/s, all of the piezometers in this area were completed in bedrock.

4.9 SOUTH FORK KOKTULI RIVER AREA GEOTECHNICAL CONDITIONS

The South Fork Koktuli River Area lies in the southernmost extent of the Pebble property. There was no site investigation activity completed in this area in 2006, 2007, 2008 or 2010. Previous site investigation work in this area included 23 geotechnical drillholes (GH04-03 to 05, GH04-10 to 18, GH04-33 to 40A, and GH05-65), 22 test pits (TP04-01 to 15, TP04-26, TP04-33, TP04-49 to 53), and seven seismic lines (SL-6 to SL-11, and SL-19) completed in this area in 2004 and 2005. Figures 4.7a to 4.9 represent geologic sections along seismic lines SL-6, SL-7, SL-8 and 11. A cross section through SL-19 is shown on Figure 4.13.

A 0 to 4 ft layer of organic topsoil (typically dark brown and consisting of silt, sand, gravel and cobbles) covers most of the area. There were also some areas of peat encountered. The overburden thickness is highly variable, with recorded thickness ranging from 12 ft to greater than 390 ft. The shallower overburden tends to occur in elevated areas along the sides of the valley, as illustrated on Figure 3.7. The advance and retreat of multiple glaciations have resulted in a very complex and heterogeneous stratigraphy both vertically and horizontally. The surficial geology of the region is predominantly sand and gravel, with greater proportions of sand, interbedded with sand and gravel, in the east, and greater quantities of silt in the west. The soils consist of glacial drift, alluvial and colluvial deposits.

Multiple glaciations, with ice sheets of varying thickness covering the area for varying lengths of time, have resulted in a complex depositional history. The numerous glacial advances and retreats resulted in the reworking of the glacially derived sediments along with the burial of old stream channels and ponds. The drillholes in the western region of the South Fork Koktuli River Area encountered sand and gravel, with varying amounts of silt. SPT ‘N’ values in the South Fork Koktuli River Area ranged from 7 to over 100, though some of these values are artificially high due to the high cobble content of the overburden.

Drillholes GH04-15, GH04-16, GH04-37 and GH04-40 were drilled in highly permeable material, and were dry holes. The drilling of these four holes was difficult and required more drilling fluid than the other holes to maintain circulation. The SPT samples consisted largely of silts and sands with some varying amounts of gravel and layers of sand and gravel. The natural moisture content ranged from 13 to 31%, though higher moisture content values may be anomalous due to drilling disturbance and saturation with drilling fluid. A selected number of samples were tested for Atterberg Limits. The Liquid Limit on the selected samples tested varied between 34 to 39 and the Plastic Limit from non-plastic to 27.

The bedrock composition is highly variable in the South Fork Koktuli River Area. The bedrock types encountered in this area were granodiorite, monzonite, basalt, sandstone, siltstone/mudstone and andesite. The rock strength was highly variable between drillholes, as were the RMR values. The depth to bedrock in GH05-65 was 392 ft, considerably greater than in any of the other drillholes in this area. The bedrock was granodiorite with an estimated UCS value of 100 MPa, a strong to very strong rock. The average RMR value for this drillhole was 64 with a rock mass classification of GOOD rock (Bieniawski, 1989).

The presence of groundwater was not noted in any of the test pits excavated in the South Fork Koktuli River Area; however, the ground was frozen for the most part during March and April when these test pits were excavated. The groundwater table measured in the piezometers ranged from 5 to 136 ft. This area

is underlain by predominantly sand and gravel with high hydraulic conductivity. Portions of the South Fork Koktuli River flow subsurface through the more permeable strata during the drier summer months.

A limited number of hydraulic conductivity packer (Lugeon) tests were conducted in the bedrock of the area and hydraulic conductivity is in the order of 10^{-4} cm/s. Rising head hydraulic conductivity tests were conducted in some of the piezometers with completion zones located in the overburden material; however, the groundwater recovery was too rapid to obtain accurate results. This overburden zone has a very high hydraulic conductivity.

4.10 AREA J GEOTECHNICAL CONDITIONS

Area J is a long, narrow, steeply incised valley, immediately west of Area A, as shown on Figure 1.2. One test pit (TP10-362) was completed in this area during the 2010 site investigation. Past site investigation work in Area J included 14 drillholes (GH08-135, GH08-139, GH08-142, GH08-145, GH08-147, GH08-149, GH08-153, GH08-154, GH08-157, GH08-190, GH08-191, GH08-205, GH08-206 and GH08-208) and 13 test pits (TP04-24, 25, 27, 28, 31 and 32, TP05-109 and 178, and TP08-232 to 236). No work was completed during the 2006 and 2007 site investigation programs. Three seismic survey lines (SL-16 to SL-18) were completed in this area during the 2005 site investigation program. A geologic section through Area J is shown on Figure 4.35.

Organic soils ranging in thickness from 0 to 4 ft, comprised of silt, sand and gravel, cover much of the surface of the valley. Felsenmeer is prevalent at higher elevations and ranges from 0 to 15 ft depth in the drillholes throughout the area. The overburden thickness ranges from approximately 0 to 70 ft in Area J. The overburden was characterized using information gathered from the test pits and drillholes, and is composed predominantly of sand, grading to sandy gravel, with varying proportions of silt. Gradational layering and particle orientation, consistent with fluvial deposition, were noted in some coarser-grained deposits. The sand and gravel material from TP10-362 had a Standard Proctor maximum dry density of 127 lb/ft^3 with an optimum moisture content of 9% (ASTM D698). The natural moisture content of this material was approximately 3% wet of the Standard Proctor optimum moisture content.

The bedrock type most encountered in this area was the Cretaceous Granodiorite of the Kaskanak Batholith, Tertiary Basalt and minor Cretaceous Siltstone. A fault zone was intersected in GH08-205. Field estimated UCS values were indicative of strong rock, ranging from 42 to 135 MPa, with RMR values range of 40 to 65 and a rock mass quality designation of FAIR to GOOD rock (Bieniawski, 1989).

Groundwater was encountered at depths ranging from artesian to 41 ft below the ground surface, but was mostly less than 25 ft below ground surface. The hydraulic conductivity of the bedrock ranged from 10^{-7} (no take) to 10^{-4} cm/s.

4.11 AREA A GEOTECHNICAL CONDITIONS

Area A is located to the south of the Open Pit Area. A geological cross section (north to south) through the valley in Area A is shown on Figures 4.2a and 4.2b. Area A is characterized by four different geomorphologic domains as shown on Figure 1.3.

4.11.1 Valley Bottom

The Valley Bottom consists of the valley south of the Pebble Deposit Area extending to the southern end of Frying Pan Lake; the eastern and western extents are governed by the elevation rise on the side slopes as shown on Figure 1.3. One geotechnical drillhole (GH10-226) and13 test pits (TP10-401 to TP10-404, TP10-406, TP10-407, TP10-409 to TP10-412, TP10-414, TP10-422 and TP10-423) were completed in this area in 2010. Frontier also completed one seismic line (SL-51) through this area in 2010. Two geotechnical drillholes were proposed in this area but only one was completed due to time and weather constraints on the program. The drillhole (GH10-226) that was completed collapsed before reaching bedrock and no piezometer could be installed. The overburden information from the test pits and drillhole GH10-226 has been incorporated into the following discussion.

Eight geotechnical drillholes (GH04-06 and GH04-47, GH05-61 and 62, GH06-71 to GH06-73, including GH06-71A) and eight test pits (TP04-19 to 20, TP04-86, TP05-115, 117 and 125 TP08-184 and TP08-186) were completed in this area to provide additional information about the subsurface conditions. One seismic line (SL-2) was completed in this area in 2004. Geologic sections along seismic line SL-2, SL-51 and across the north valley are shown on Figures 4.3, 4.44a, 4.44b and 4.15, respectively.

The Valley Bottom is characterized by relatively flat topography with extensive swamp/wetlands present. Glaciofluvial and glacial drift deposits underlie the surface organic deposits and in turn are underlain by glaciolacustrine deposits. The glaciolacustrine layer is thought to be continuous throughout the Valley Bottom but of variable thickness. Based on relict beaches evident along the valley sides, the water elevation of the glacial lake in this area was approximately 1000 ft. Glacial drift deposits were generally encountered beneath the glaciolacustrine deposits.

The thickness of the overburden across the Valley Bottom was found to vary between approximately 100 and 185 ft, with the thickest deposits found along the western side of the valley. The peat thickness varied between 1 and 15 ft and some of the test pits excavated during 2010 were refused on frozen organic material. Gravel and sand material in TP10-402 had a Standard Proctor maximum dry density of 119 lb/ft^3 and an optimum moisture content of 12%, the natural moisture content was 18%. A glacial drift core sample from GH10-226 yielded a dry density of 115 lb/ft^3. The thickness of more recent glaciofluvial deposits varied between 15 and 30 ft. A glaciolacustrine silt layer with variable thickness was encountered approximately 15 to 40 ft below the existing ground elevation. Glacial drift, including some relatively thin, discontinuous glaciolacustrine and glaciofluvial layers, extend from the bottom of the glaciolacustrine silt to the top of bedrock. Laboratory analyses of Shelby tube samples taken in GH10-226 yielded a dry density range of 112 and 113 lb/ft^3 for the glaciolacustrine materials. The total cohesion for these samples ranged from approximately 480 to 920 lb/ft^2 with an effective cohesion ranging from approximately 370 to 590 lb/ft^2. The total friction angle varied from 17 to 18° and the effective friction angle was approximately 31°.

The materials encountered in the drillholes in the Valley Bottom consist primarily of sand and gravel with varying amounts of silt and clay, and some finer grained silts and clays, with varying amounts of sand and gravel. SPT samples in this area had moisture contents ranging from approximately 7 to 32%, and had SPT 'N' values ranging from 8 to greater than 63 (refusal) as there were many samples that encountered cobbles. The Atterberg test results for the SPT samples had Liquid Limits up to 46 and Plastic Limits ranging between non-plastic to 29.

The bedrock in the Valley Bottom of Area A was primarily igneous in origin. Granodiorite was encountered in drillhole GH06-71A; Tertiary Rhyolite was encountered in drillhole GH06-72; and Tertiary Dacite/Latite was encountered in drillhole GH06-73. The average field estimated UCS values of the bedrock in this area were indicative of medium to very strong rock. The average RMR indicated rock mass quality of generally FAIR rock (Bieniawski, 1989) with some POOR rock (Bieniawski, 1989) in the bedded andesites.

The groundwater within the Valley Bottom was encountered at, or very near (0 to 10 ft) the ground surface as evidenced by the numerous swamp/wetland areas. The overall wet, boggy composition of this area is indicative of a groundwater discharge zone. Artesian conditions are encountered in some piezometers (GH05-60, GH06-71A, and GH06-72) in this area. A piezometer was not installed in drillhole GH06-73 due to artesian flow rates estimated at 50 gpm. A packer was inflated down the drillhole and grouted in place to stop the artesian flow conditions. GH10-226 collapsed before a piezometer could be installed and the hole was abandoned before reaching bedrock.

4.11.2 Southern Upland Area

This area lies to the south of Frying Pan Lake and is distinguished from the Valley Bottom by elevated topography as shown on Figure 1.3. No site investigation work was completed in this area in 2010. Eighteen geotechnical drillholes (GH04-28 to 32, including GH04-29A, and GH04-41 to GH04-45A, GH05-51 and 52, GH06-75, GH06-76 and GH06-77, and GH08-137) and 10 test pits (TP04-16, TP04-17, TP04-29, TP04-30, TP04-34, TP04-48, and TP05-110 to 113) were completed in this area in prior investigation programs. Three seismic lines (SL-3 to SL-5) were completed in this area in 2004. Geologic sections along seismic lines SL-3, SL-4, SL-5 and a transverse section through this area are shown on Figures 4.4, 4.5, 4.6 and 4.38, respectively.

The Southern Upland Area (south of Frying Pan Lake and west of the South Fork Koktuli River) is kettled and characterized by deep deposits of moraine and outwash of the Brooks Lake glaciation (Detterman and Reed, 1973). The overburden depth ranged between approximately 7 and 389 ft below existing grade in the Southern Upland Area. The depth of overburden increases southward. The overburden was predominantly composed of glacial drift and glaciofluvial deposits, with some sorting consistent with reworking by water. The material was predominantly sand and gravel, with varying cobble and silt content. Some thin, discontinuous silt and/or clay layers were also encountered.

The SPT 'N' values ranged from 8 to refusal. There was a substantial amount of SPTs with an 'N' value over 50, indicative of the increased amount of gravel and cobbles in this area. The recovered SPT soil samples had a natural moisture content of between 9 to 34%. Atterberg Limits were determined for selected samples, the Liquid Limit varied between non-plastic to 27 and the Plastic Limit varied between non-plastic to 24. This material is anticipated to be moderately to highly permeable based on results of grain size analyses and observed difficulties in maintaining circulation of the drilling fluid during drilling.

The bedrock encountered in the Southern Upland Area was comprised of both sedimentary and volcanic units. The sedimentary units varied from mudstone/siltstone to breccia, while andesite, monzodiorite, latites, dacites, granodiorite, diorite and basalt were the volcanic units encountered in this part of Area A. The average field estimated UCS values for the bedrock, in drillholes advanced in the southern portion of Area A, ranged from 18 to 152 MPa. This indicates weak to very strong rock, though most of the drillholes encountered medium to strong rock. The drillholes in this area had average RMR values of 41 to 63, indicating a rock mass quality of FAIR to GOOD rock (Bieniawski, 1989), with most bedrock in the FAIR rock range.

The groundwater levels in the piezometers installed in this area ranged from approximately 30 to 140 ft. This area is likely a groundwater recharge zone given the nature of the surrounding deposits. Hydraulic conductivity (Lugeon) tests were conducted in the bedrock and the hydraulic conductivity for the bedrock is in the order of 10-7 to 10-4 cm/s. Falling head tests (Hvorslev method) were also conducted and the hydraulic conductivity values for the overburden ranged from 10-4 to 10-5 cm/s. Some of the overburden materials have high hydraulic conductivities as the recovery was so fast that measurements could not be made with the water level tape measure.

4.11.3 Lower/Mid Side slopes

The Lower/Mid Side slopes refer to the lower and middle elevations of the side slopes of the valley in the northern half of Area A as shown on Figure 1.3. Eighteen test pits (TP10-390 to 393, TP10-395 to 400, TP10-413, and TP10-415 to 421) were excavated in this area during the 2010 geotechnical site investigation.

Nine geotechnical drillholes GH04-46, GH04-48, GH05-56, GH05-59 to 60, GH05-63, GH06-70, GH06-74, and GH08-210), 19 test pits (TP04-18, TP04-21 to 23, TP04-81 to 85, TP04-87 to 90 and TP05-118 to 124), and one seismic line (SL-20) were completed in prior investigations. Geologic sections through seismic line SL-20 and through the north valley of Area A are shown on Figures 4.14 and 4.15, respectively.

The thickness of the overburden on the Lower/Mid Side slopes varied from 18 to 91 ft. Overburden materials encountered in the drillholes were up to 50 ft thick and typically consisted of sand and gravel with varying amounts of silt up to 50 ft. The SPT 'N' value in these drillholes varied from 9 to refusal due to cobble content. The Atterberg Liquid Limit

ranged from 29 to 42 with some non-plastic materials. The Plastic Limit ranged from 14 to 27 with some materials being non-plastic. Natural moisture content of test pit samples in this area ranged from 7 to 22%. The Standard Proctor maximum dry density of some of the test pit materials in this area ranged from 106 to 125 lb/ft^3, with optimum moisture contents ranging from 9 to 18% (ASTM D698). The natural moisture contents of these test pit samples were 3 to 13% wet of the Standard Proctor optimum moisture contents.

The bedrock of the Lower/Mid Side slopes in the northern portion of Area A was primarily diorite and granodiorite. However, andesites, Tertiary Basalt, Tertiary Volcaniclastic Breccia, and Tertiary Siltstones/Mudstone and Wackes were also encountered. The average field estimated UCS values of the bedrock ranged from approximately 50 to 100 MPa, a medium strong to strong rock. These values include lower field estimated UCS values associated with altered, highly fractured rock near the top of the drillholes. The average RMR values for the bedrock in this area ranged from 39 to 57, indicating FAIR rock mass quality (Bieniawski, 1989).

Groundwater levels in the piezometers of this area were variable, ranging from artesian conditions to depths of approximately 38 ft below existing grade. Finer-grained glacial deposits may act as aquitards, resulting in artesian conditions, if the groundwater is flowing through the underlying fractured bedrock or in springs and ponds when the groundwater level is near surface. The piezometers installed into GH06-70 exhibited flowing conditions; although, the flowing conditions were not present during the drilling and installation of the piezometers. The piezometers in GH06-70 were pressure grouted during the 2008 field season to stop artesian flow that was coming up around the monument. The piezometer installed into GH05-63 initially had flowing conditions which have since ceased.

Packer hydraulic conductivity (Lugeon) tests were conducted in the bedrock and the hydraulic conductivity values determined for the bedrock were in the order of 10-6 to 10-4 cm/s. Falling head tests (Hvorslev method) were conducted in some of the piezometers and the hydraulic conductivity values were in the order of 10-6 to 10-3 cm/s for tests conducted in completion zones at the overburden/bedrock contact and in the bedrock.

4.11.4 Upper Side slopes

The Upper Side slopes are along the upper part of the valley in the northern half of Area A and are at a higher elevation than the Lower/Mid Side slopes as shown on Figure 1.3. One test pit (TP10-394) was excavated on the upper side slopes of Area A in 2010.

Seven drillholes (GH05-53 to 55, GH08-133, GH08-204, GH08-207 and GH08-209) and three test pits (TP05-114, TP08-317 and TP08-318) were completed in these areas in prior investigations. One seismic line (SL-21) was completed in this area in 2005. A cross section through seismic line SL-21 is shown on Figures 4.16.

The subsurface conditions in this area can be summarized as a veneer of colluvium or glacial drift over shattered bedrock (felsenmeer). Overburden thickness varied between 10 and 130 ft, but mostly within 50 ft of ground surface. Minor frost sorting of the loose colluvium on the surface has produced thin solifluction lobes across much of this area.

The bedrock along the Upper Side slopes consisted of granodiorite/monzonite, bedded andesites and diorite. The average field estimated UCS values of the bedrock ranged from 50 to 150 MPa, indicating strong to very strong rock. The average RMR values ranged from 44 to 68, indicating FAIR to GOOD rock mass quality (Bieniawski, 1989).

The groundwater levels were typically found within the weathered bedrock in the Upper Side slopes, approximately 0 to 92 ft below the ground surface. The packer hydraulic conductivity values ranged in the order of no take to 10-3 cm/s. The hydraulic conductivity results of the falling head tests were often higher than those from the packer testing because falling head tests are able to be completed in more fractured zones than packer tests. Both types of testing are in the bedrock as there was little overburden in this area. The hydraulic conductivity for bedrock from falling head tests is in the order of 10-6 to 10-2 cm/s.

SECTION 5.0 - CONSTRUCTION MATERIALS

Overburden materials and non-reactive waste rock that will be stripped from within the proposed open pit footprint can potentially be used as construction material during the development of mine facilities such as roads, embankments, concrete foundations, etc.

The Open Pit Area has been roughly divided into three zones (West, Central and East) based on material types encountered in these areas. Materials that will be suitable for use as a low permeability fill (core zone/low permeability blanket) are found in the eastern and western extents of the Open Pit Area in the form of finer-grained glacial drift deposits. These materials consist of silt to sand with varying amounts of gravel and silt.

Glaciofluvial deposits of sand and gravel have been identified in the central portion of the Open Pit Area, extending into the Upper Talarik Creek Area to the north and Area A to the south. Some of these deposits have lower fines contents and can provide the materials required for the filter and drainage zones of the embankments. These materials will require processing to meet the gradation requirements. The material in the central portion of the Open Pit Area is also a potential source of concrete aggregate. Test pit samples in the central portion of the Open Pit Area had Standard Proctor maximum dry densities ranging from 114 to 130 lb/ft^3 and a range of optimum moisture contents from 8 to 13% (ASTM D698). The natural moisture contents of these materials ranged from 2% below optimum to 10% wet of optimum. However, near surface test pit materials could have higher moisture contents due to freeze-thaw processes which tend to loosen the in-situ soils and results in higher moisture content as compared to similar materials at a greater depth. Proctor density testing and determinations of natural moisture content should be completed on deeper glacial materials to determine the moisture-density characteristics of the overburden materials. Deeper glacial materials have been consolidated by self weight loading and from glacial advanced which densify the subgrade due to the weight of the overlying ice. Numerous samples of deeper dense materials have been recovered in the Open Pit Area as these dense overburden materials have been successfully cored using HQ3 and PQ3 diamond drilling methods. Examples of cored dense overburden in the Open Pit Area and East Deposit Area are shown on Figures 5.1 through 5.5.

Glacial drift and glaciofluvial materials may also be suitable as structural fill for embankments, roads and foundations provided that the natural moisture content is sufficiently low. Tertiary waste rock may also be considered for use as a construction material.

The vertical and lateral continuity of materials in the Open Pit Area will need to be verified in future investigations to provide a better estimate of material types and volumes available. Additional laboratory testing of the various overburden materials will also be required to define material strength, permeability, compaction characteristics, etc. Sonic drilling and subsequent laboratory testing will greatly increase the understanding of the materials, material properties and volumes available for construction.

SECTION 6.0 - SUMMARY AND RECOMMENDATIONS

6.1 SUMMARY OF 2010 PROGRAM

The Pebble Project is a large copper-gold-molybdenum deposit, in southwestern Alaska. Knight Piésold Ltd. was retained by Pebble Limited Partnership to conduct a geotechnical site investigation to support the 2010 updated engineering study. Knight Piésold has completed geotechnical site investigation programs annually since 2004. A number of different consulting firms have also conducted previous site investigation work at the Pebble Project. Previous site investigation programs were developed to support various mine development concepts that have progressively evolved over the last several years. Data has been shared by the various firms involved.

The field work for the geotechnical site investigation program was performed between August and October 2010 and incorporated the collection of geotechnical data in Areas G, L, J and E, along with investigations for possible mine facilities that could be situated in the Upper Talarik Creek Area, Open Pit Area and Area A. The site investigation program incorporated geotechnical drillholes, hydraulic conductivity testing, standpipe and vibrating wire piezometer installations, WestBay™ system installation, test pits, and sample collection for laboratory analyses. A total of 18 geotechnical drillholes and 106 test pits were completed during this program. Geological logging of all drill core was conducted by PLP geologists.

New drilling results have updated and confirmed the site conditions previously reported in site investigation reports from prior years, especially in areas where little to no data was available from prior studies.

The overburden at the project site generally ranges in thickness from approximately 0 to 250 ft, with depths to bedrock up to approximately 390 ft in the Southern Upland Area of Area A and in the South Fork Koktuli Area. The overburden materials are comprised of a sequence of glaciolacustrine, glaciofluvial, glacial drift and colluvium deposits of varying compositions. Areas located at higher elevation tend to have shallower overburden, usually ranging from very shallow up to 105 ft deep.

Frost wedged and frost shattered bedrock (felsenmeer) is exposed on the surface at higher elevations. A broken rock layer with highly fractured and weathered rock is generally found at the contact between the overburden and the underlying bedrock. This fractured rock at the overburden/bedrock contact may be pre-glacial felsenmeer. The competency of the bedrock generally increases with depth. The major bedrock types at the Pebble Project comprise Tertiary and Cretaceous sediments and volcanics.

Piezometric groundwater levels vary from artesian to 200 ft below ground surface. Water levels in the mountainous areas are generally lower due to higher elevations, though some perched water tables exist. A groundwater level 292 ft deep was recorded on a ridge in Area L, but this value is possibly anomalous as the 2010 WestBay™ installation and the vibrating wires installed adjacent to this drillhole in 2010 had groundwater levels ranging from 6 to approximately 25 ft deep. Artesian conditions are frequently present where the fractured bedrock zone is overlain by lower hydraulic conductivity materials. Artesian flows were encountered in the East Deposit Area on the western side of Koktuli Mountain.

Packer hydraulic conductivity testing in the bedrock of the project area provided measurements in the order of 10^{-7} (no take) to 10^{-4} cm/s, with most values in the order of 10^{-5} cm/s. Falling/rising head hydraulic conductivity testing in the overburden and the bedrock also indicate hydraulic conductivity values in the order of 10^{-7} to10^{-2} cm/s, with most values in the order of 10^{-5} cm/s.

Suitable overburden materials and non-reactive waste rock that will be stripped from within the proposed Open Pit Area can potentially be used as construction materials during the development of mine facilities such as roads, embankments, concrete foundations, etc. The vertical and lateral continuity of materials in the Open Pit Area will need to be verified in future investigations to provide a better estimate of the material types and volumes available. The natural moisture contents of test pit samples in this area ranged from 2% dry to 10% wet of the Standard Proctor optimum moisture contents. However, the natural moisture contents of near surface test pit materials (active layer) are generally expected to have higher moisture contents as these materials are loosened by freeze-thaw processes. Additional laboratory testing of the various overburden materials is recommended to define material strength, permeability, compaction characteristics, etc., particularly for dense overburden samples collected from depths below the active layer.

6.2 RECOMMENDATIONS FOR FUTURE WORK

The mine plan continues to be revised, though preliminary concepts that are being contemplated for the pre-feasibility mine plan include tailings management in Area G, and potential waste rock dumps adjacent to a proposed pit situated within the Open Pit and East Deposit Areas. Additional geotechnical site investigation requirements should be reviewed and adjusted once the pre-feasibility mine plan is confirmed. Anticipated priorities for the 2011 geotechnical investigation program and for future studies include the following:

- The proposed Tailings Storage Facility embankments may include low permeability zones constructed using glacial till materials sourced from the Open Pit Area. The quality and quantity of the glacial till material has not been well defined to date and additional investigation work is recommended. Additional sonic drilling, sampling and laboratory testing will be required to delineate and characterize potential construction materials during the next phases of design. The gradations, Atterberg limits, natural moisture contents and moisture-density characteristics should be evaluated in these future study programs.
- The storm water runoff and seepage control measures down gradient of the proposed waste dumps are required to control and collect surface water and seepage from the dump areas. Minimal geotechnical information is currently available to support the design of these systems, especially down gradient of potential waste dumps or other facilities that would be situated in the Upper Talarik Creek Area.
- Glaciolacustrine silts and clays are present in the foundation of waste rock dumps situated adjacent to the proposed open pit. These glaciolacustrine deposits typically have lower shear strengths than the glacial drift and alluvial overburden materials and must be considered for the stability of the proposed waste dumps. Minimal information is currently available on the nature, extent and strength of these lacustrine materials, as limited geotechnical sampling has been conducted to date. Additional sampling and laboratory shear strength testing is recommended.
- Site investigations completed in the Area L valley indicate that a zone of highly fractured/weathered rock may be present along the northern divide of the valley. Area G is being considered as a

potential option for tailings management for the pre-feasibility study program. Additional investigations are required during future studies to better define the geotechnical and hydrogeological characteristics in order to develop requirements for seepage control measures and for environmental permitting.

- Sediment control ponds, seepage collection ponds and process water ponds will constitute essential components of the water management plan for the pre-feasibility mine plan and some of the water management facilities will incorporate significant water retaining structures. Limited geotechnical information is currently available for many of these facilities and they should be investigated in future studies once the mine plan is finalized as most of these structures will be classified as State jurisdictional dams.

The continued use of a specialist geotechnical drilling contractor with helicopter portable equipment is appropriate for future investigations. Maximizing drilling recovery of overburden materials is an important goal of the future geotechnical investigation programs. Knight Piésold recommends that a sonic drill rig be considered for drilling overburden as helicopter portable sonic drilling rigs are now available and the sonic drilling method allows for significantly improved overburden recovery and provide better samples of the overburden materials for laboratory analysis when compared to conventional mud rotary drilling methods.

A significant amount of geotechnical and hydrogeological data has been collected during the various site investigation programs for the Pebble Project over the years and it would be prudent to consider the use of an integrated data management such as the web-based FULCRUM system that has been developed by Knight Piésold Ltd. The geotechnical data management aspects of this system provide a central location for optimal data storage in one location allowing for ease of access and use by multiple consultants for ongoing design studies in support of future design and project permitting.

SECTION 7.0 - REFERENCES

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SECTION 8.0 - CERTIFICATION

This report was prepared and approved by the undersigned.

PROFESSIONAL PROVINCE OF L. SHANNON # 34901 BRITISH COLUMBIA ENGINEER Mar 29, 2011

Prepared by: _____
Louise Shannon, P.Eng.
Project Engineer

Reviewed by: _____
Les Galbraith, P.Eng.
Senior Engineer

STATE OF ALASKA 49TH KEN J. BROUWER No. 10963 CE REGISTERED PROFESSIONAL ENGINEER 29, 2011

Approved by: _____
Ken J. Brouwer, P.E.
Managing Director

Knight Piésold
CONSULTING

TABLE 3.1

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION DATA REPORT
TEST PIT SUMMARY

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-319	2158292.5	1418952.5	891	Upper Talarik Creek Area	3.3	4.2	0	0.5	Topsoil with Tundra vegetation.	Topsoil
							0.5	2.5	SILT/CLAY, some sand, trace gravel, trace cobbles, subangular to subrounded, poorly graded, low to medium plasticity, brown, organics present, moist to wet.	Glaciolacustrine
							2.5	3.3	Silty/clayey GRAVEL and SAND, trace cobbles, subrounded, well graded, low to no plasticity, light brown, moist.	Glacial Drift
							3.3	3.9	SILT/CLAY, trace sand, trace gravel, poorly graded, low to medium plasticity, grey, moist.	Glaciolacustrine
							3.9	4.2	Silty SAND and GRAVEL, trace clay, subrounded, well graded, low plasticity, light brown, moist.	Glacial Drift
TP10-320	2156216.4	1421761.4	783	Upper Talarik Creek Area	-	5.2	0	0.5	Topsoil with Tundra vegetation.	Topsoil
							0.5	1.3	PEAT	Peat
							1.3	4.1	SILT/CLAY, some sand, trace gravel, poorly graded, low to medium plasticity, grey brown, no visible structure, some organics, moist.	Glaciolacustrine
							4.1	4.3	PEAT, decomposed organics.	Peat
							4.3	5.2	SILT/CLAY, some sand, trace gravel, poorly graded, low to medium plasticity, grey, no visible structure, no organics, moist.	Glaciolacustrine
TP10-321	2156936.0	1423017.7	742	Upper Talarik Creek Area	-	5.1	0	0.5	Topsoil with Tundra Vegetation.	Topsoil
							0.5	1.8	PEAT, intermixed with sandy SILT, trace to some clay, trace gravel, poorly graded, non plastic, grey with brown peat, moist. Finer layers, low to medium plasticity, grey, at 1.2' and 1.5'.	Peat
							1.8	4.5	Sandy SILT, some clay, trace gravel, poorly graded, low plasticity; grey-brown, no visible structure, moist.	Glaciolacustrine
							4.5	5.1	Sandy SILT, some clay, trace gravel, trace cobbles, subangular to subrounded, poorly graded, low plasticity, grey brown, no visible structure, moist.	Glaciolacustrine
TP10-322	2158836.4	1423044.3	793	Upper Talarik Creek Area	-	2.1	0	0.8	Topsoil with Tundra vegetation.	Topsoil
							0.8	2.1	SILT, some sand, trace clay, trace gravel, poorly graded, low plasticity, brown, some organics, moist to wet.	Glaciolacustrine
TP10-323	2159423	1422140	782	Upper Talarik Creek Area	0	2.7	0	1.3	Topsoil with Tundra vegetation.	Topsoil
							1.3	1.7	SILT/CLAY some sand, trace gravel, subrounded, poorly graded, low plasticity, brown, saturated.	Glaciolacustrine
							1.7	2	PEAT, frozen organics.	Peat
							2	2.7	SILT/CLAY, some sand, trace gravel, subangular to subrounded, poorly graded, low plasticity, brown, no visible structure, ice crystals visible.	Glaciolacustrine
TP10-324	2160862	1421983	805	Upper Talarik Creek Area	-	5.2	0	0.3	Topsoil with Tundra Vegetation.	Topsoil
							0.3	2	Sandy SILT, trace gravel, trace clay, subangular to subrounded, well graded, non plastic, brown, some organics/roots that diminish with depth, moist.	Glaciolacustrine
							2	3	Silty SAND, trace gravel, trace clay, subangular to subrounded, well graded, non plastic, brown, trace organics, moist.	Glaciolacustrine
							3	5.2	SAND and GRAVEL, some silt, trace clay, subangular to subrounded, well graded, non plastic, brown, stratified, gravel lenses at 3.9' and 5.0', brown, moist.	Glacial Drift
TP10-325	2161314	1420037	789	Upper Talarik Creek Area	-	1.5	0	1.5	Topsoil with Peat.	Peat

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TP10-326	2159584	1420506	791	Upper Talarik Creek Area	-	2.4	0	1.5	Topsoil with Tundra Vegetation.	Topsoil
							1.5	2.4	SILT/CLAY, trace sand, trace gravel, subangular, poorly graded, low plasticity, grey, moist.	Glaciolacustrine
TP10-327	2160100	1418870	790	Upper Talarik Creek Area	-	1.9	0	1.5	Topsoil with Tundra Vegetation.	Topsoil
							1.5	1.9	SILT, some sand, trace clay, poorly graded, no to low plasticity, brown, organic inclusions, moist to wet.	Glaciolacustrine
TP10-328	2163659	1420563	1015	Upper Talarik Creek Area	-	2.6	0	2.6	SILT, some sand, some gravel, trace clay, trace cobbles, trace boulders from 2' depth onwards, subangular to subrounded, well graded, non plastic, brown, massive, dense, moist.	Colluvium
TP10-329	2164827	1418046	979	Upper Talarik Creek Area	-	6.1	0	1.6	SAND and GRAVEL trace silt/clay, subrounded, well graded, non plastic, brown, loose, moist.	Glaciofluvial
							1.6	4.5	SILT/CLAY, some sand, some gravel, rounded to subrounded, well graded, no to low plasticity, brown, firm, moist, some cobbles below 3.9'.	Glacial Drift
							4.5	6.1	SILT, some sand, some gravel, trace clay, some cobbles, round to subrounded, well graded, non plastic, brown, moist.	Glacial Drift
TP10-330	2161363	1417977	809	Upper Talarik Creek Area	-	2.2	0	1.2	Topsoil with Tundra Vegetation	Topsoil
							1.2	2.2	SILT, some sand, some gravel, trace clay, some cobbles, round to subrounded, well graded, low to no plasticity, ice crystals present in soil matrix.	Glaciolacustrine
TP08-331	2161659	1416357	839	Upper Talarik Creek Area	-	6.3	0	1.2	Topsoil with Tundra Vegetation.	Topsoil
							1.2	2	SILT, trace sand, trace gravel, trace clay, round to subrounded, poorly graded, low plasticity, grey, thin seams of brown silt and sand, saturated.	Glaciolacustrine
							2	4.5	SAND and SILT, some gravel, trace clay, round to subrounded, poorly graded, no to low plasticity, grey, firm, massive, moist.	Glaciolacustrine
							4.5	6.3	SAND and SILT, some clay, trace gravel, round to subrounded, poorly graded, low plasticity, brown, firm, massive, moist.	Glaciolacustrine
TP10-332	2160420	1417164	816	Upper Talarik Creek Area	-	6.2	0	0.5	Topsoil with Tundra Vegetation.	Topsoil
							0.5	3.4	Sandy SILT, some clay, trace gravel, poorly graded, low plasticity, brown, layers of decayed organics, saturated near surface, then moist.	Glaciolacustrine
							3.4	5.3	SILT, some sand, some gravel, trace clay, round to subrounded, well graded, low plasticity, brown, massive, firm, moist.	Glaciolacustrine
							5.3	6.2	SILT, some sand, trace clay, no clasts, poorly graded, non-plastic, brown, moist.	Glaciolacustrine
TP10-333	2159059	1415019	835	Upper Talarik Creek Area	2.4	4	0	0.2	Topsoil with Tundra Vegetation.	Topsoil
							0.2	1.1	SILT, trace sand, trace clay, no clasts, poorly graded, no to low plasticity, brown, trace organics, moist.	Glaciolacustrine
							1.1	1.6	GRAVEL, some sand, some silt, trace clay, round to subrounded, well graded, non plastic, black, loose, moist.	Glaciofluvial
							1.6	2	SAND, some gravel, some silt, trace clay, subrounded to subangular, well graded, non plastic, brown, moist.	Glaciolacustrine
							2	2.5	Silty SAND, trace gravel, trace clay, round to subrounded, poorly graded, non plastic, brown, saturated.	Glaciolacustrine
							2.5	3	SILT, trace sand, trace gravel, trace clay, poorly graded, no to low plasticity, brown, moist.	Glaciolacustrine
							3	3.5	SAND, trace gravel, trace silt, trace clay, round to subrounded, non plastic, red-brown, saturated.	Glaciolacustrine
							3.5	4	GRAVEL, some sand, some silt, trace clay, round to subrounded, well graded, non plastic, red-brown, saturated.	Glacial Drift

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TP10-334	2161101	1413529	824	Upper Talarik Creek Area	3.6	5.2	0	0.5	Topsoil with Tundra Vegetation.	Topsoil
							0.5	1.5	SILT, trace sand, trace gravel, trace clay, poorly graded, non plastic, brown, trace organics, moist.	Glaciolacustrine
							1.5	3.5	SILT, some sand, trace gravel, trace clay, poorly graded, no to low plasticity, grey, firm, moist.	Glaciolacustrine
							3.5	5.2	SAND and GRAVEL, some cobbles, some silt, trace clay, subangular to subrounded, well graded, non plastic, grey brown, loose, moist to wet.	Glacial Drift
TP10-335	2158167	1380107	1310	Area G	-	5.2	0	0.2	Topsoil with Tundra Vegetation.	Topsoil
							0.2	5.2	GRAVEL and SAND, some silt/clay, trace cobbles, subangular to subrounded, well graded, non plastic, brown, irregular dark brown staining in first 2', compact, massive, moist.	Glacial Drift
TP10-336	2156519	1380215	1390	Area G	4.3	6.3	0	0.9	Topsoil with Tundra Vegetation.	Topsoil
							0.9	1.5	Sandy SILT, trace gravel, trace clay, subrounded, well graded, non plastic, brown, loose, massive, moist.	Glacial Drift
							1.5	2.9	Gravelly, silty SAND, trace clay, round to subrounded, well graded, non plastic, brown, massive, loose, moist.	Glacial Drift
							2.9	4.1	Silty, gravelly SAND, trace clay, subrounded, well graded, non plastic, brown, massive, compact, moist.	Glacial Drift
							4.1	6.3	Gravelly, sandy SILT, trace clay, trace cobbles, subangular, well graded, non plastic, massive, compact, saturated.	Glacial Drift
TP10-337	2157476	1380421	1356	Area G	2	6.1	0	0.7	Topsoil with Tundra Vegetation.	Topsoil
							0.7	2.3	Sandy, silty GRAVEL, trace clay, trace cobbles, subangular to subrounded, well graded, non plastic, yellow-brown, loose, massive, saturated.	Glacial Drift
							2.3	6.1	Sandy, silty GRAVEL, trace clay, trace cobbles, subrounded, well graded, non plastic, yellow-brown, compact, massive, wet becoming moist with increasing depth.	Glacial Drift
TP10-338	2167005	1415327	1203	Upper Talarik Creek Area	-	5.9	0	0.4	Topsoil with Tundra Vegetation.	Topsoil
							0.4	5.9	Gravelly, silty/clayey SAND, some cobbles, angular to subangular, well graded, low plasticity, dark brown, becoming light brown with depth, loose, massive, trace organics at top of interval, moist.	Glacial Drift
TP10-339	2162330	1372412	1606	Area G	-	3.9	0	0.5	Topsoil with Tundra Vegetation, saturated.	Topsoil
							0.5	2.6	SILT, trace sand, trace clay, trace gravel, poorly graded, non plastic, dark brown, smell of organic decay, stratified, organics, saturated.	Colluvium
							2.6	3.5	SILT, trace sand, trace clay, trace gravel, poorly graded, non plastic, brown, firm, moist.	Colluvium
							3.5	3.9	Silty, GRAVEL, some sand, trace clay, round to subrounded, gap graded, non plastic, yellow brown, compact, moist.	Colluvium
TP10-340	2165192	1375278	1399	Area G	-	4.3	0	0.4	Topsoil with Tundra Vegetation.	Topsoil
							0.4	4.3	Sandy SILT, some gravel, some cobbles, trace boulders, angular to subangular, well graded, non plastic, light brown, massive, vegetation roots present in first 3', moist.	Colluvium
TP10-341	2165540	1378286	1364	Area G	-	5.1	0	0.3	Topsoil with Tundra Vegetation.	Topsoil
							0.3	3.3	Silty SAND, some gravel, trace clay, trace cobbles, angular to subrounded, non plastic, brown, compact, becoming dense with depth, massive, trace roots throughout, moist.	Colluvium
							3.3	5.1	Silty SAND and GRAVEL, trace clay, subangular, non plastic, yellow, compact, massive, wet.	Colluvium
TP10-342	2165450	1416365	1133	Upper Talarik Creek Area	-	2.3	0	0.4	Topsoil with Tundra Vegetation.	Topsoil
							0.4	2.3	Silty SAND, trace gravel, trace clay, trace cobbles, subangular to subrounded, poorly graded, non plastic, loose, massive, organics, wet.	Colluvium

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TP10-343	2163101	1414886	860	Upper Talarik Creek Area	3.2	4.3	0	0.4	Topsoil with Tundra Vegetation.	Topsoil
							0.4	1.9	SILT, trace sand, trace clay, trace gravel, poorly graded, non plastic, brown, soft, organics, saturated.	Glaciolacustrine
							1.9	2.9	Sandy SILT, some gravel, trace clay, some cobbles, subangular to subrounded, low to no plasticity, firm, massive, trace organics, moist, frozen material at 2.5', 0.3' thick.	Glaciolacustrine
							2.9	4.3	Sandy SILT, some gravel, trace clay, some cobbles, subangular to subrounded, low to no plasticity, grey, firm, massive, moist.	Glaciolacustrine
TP10-344	2163326	1411684	926	Upper Talarik Creek Area	3.6	4.3	0	0.5	Topsoil with Tundra Vegetation.	Topsoil
							0.5	1.2	PEAT, black.	Peat
							1.2	2.4	PEAT and SILT/CLAY, poorly graded, low to medium plasticity, brown, soft, massive, wet.	Peat
							2.4	4.3	GRAVEL and SAND, some silt, trace clay, angular to subrounded, medium plasticity, well graded, grey and brown intermixed, compact, moist, appears frozen at 3'.	Glacial Drift
TP10-345	2160488	1411913	857	Upper Talarik Creek Area	-	3.4	0	2.2	PEAT, loose, brown.	Peat
							2.2	3.4	SILT/CLAY, trace sand, trace gravel, low plasticity, poorly graded, grey intermixed with brown, firm, massive, frozen, moist, becoming wet as water melting, ice formed into distinct irregular clear lenses.	Glaciolacustrine
TP10-346	2163391	1409183	943	Upper Talarik Creek Area	-	5.6	0	0.2	Topsoil with Tundra Vegetation.	Topsoil
							0.2	1.3	PEAT	Peat
							1.3	3.5	Sandy SILT, trace gravel, trace clay, fine grained, poorly graded, low to no plasticity, light brown, soft, massive, wet.	Glaciolacustrine
							3.5	5.6	SILT/CLAY, some fine sand, trace gravel, poorly graded, low plasticity, reddish brown, massive, wet.	Glaciolacustrine
TP10-347	2165407	1411214	1058	Upper Talarik Creek Area	-	6.1	0	2.8	Sandy GRAVEL, trace cobbles, trace silt/clay, angular to subangular, well graded, non plastic, brown, compact, stratified layers with increasing sand fraction interbedded with coarser layers, moist.	Glacial Drift
							2.8	6.1	Sandy GRAVEL, trace silt/clay, subangular to subrounded, well graded, non plastic, brown, compact, massive, moist.	Glacial Drift
TP10-348	2167455	1409240	1102	Upper Talarik Creek Area	-	5	0	0.2	Topsoil with Tundra Vegetation.	Topsoil
							0.2	0.8	COBBLES, some gravel, some sand, trace silt/clay, subangular to subrounded, poorly graded, non plastic, brown, loose, dry.	Glaciofluvial
							0.8	2.8	Silty SAND, trace gravel, trace cobbles, trace clay, round to subrounded, poorly graded, non plastic, brown, massive, compact, moist.	Glaciofluvial
							2.8	5	SAND and GRAVEL, some silt/clay, some cobbles, subrounded, well graded, non plastic, brown, compact, massive, moist.	Glaciofluvial
TP10-349	2163988	1404192	1092	Upper Talarik Creek Area	-	6.5	0	0.4	Topsoil with Tundra Vegetation.	Topsoil
							0.4	2	Silty SAND, trace gravel, trace clay, subrounded, poorly graded, non plastic, light brown, dense, massive, moist.	Colluvium
							2	2.2	SILT seam, trace sand, trace clay, poorly graded, low plasticity, grey, firm, moist.	Colluvium
							2.2	5.4	Silty SAND, trace gravel, trace clay, poorly graded, non plastic, light brown, firm, massive, moist.	Colluvium
							5.4	6.5	Silty SAND, some gravel, trace clay, subangular, well graded, light brown, compact, moist.	Colluvium
TP10-350	2163277	1402049	1298	Upper Talarik Creek Area	-	4.8	0	0.3	Topsoil with Tundra Vegetation.	Topsoil
							0.3	4.1	Silty/clayey SAND and GRAVEL, some cobbles, subrounded to subangular, well graded, non plastic, brown, massive, compact, moist.	Glacial Drift
							4.1	4.8	Sandy, silty GRAVEL, some cobbles, subrounded to subangular, well graded, non plastic, brown, massive, compact, moist.	Glacial Drift

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-351	2164086	1402942	1211	Upper Talarik Creek Area	-	6	0	0.2	Topsoil with Tundra Vegetation.	Topsoil
							0.2	1.3	Sandy GRAVEL, some cobbles, trace silt, trace clay, subangular to subrounded, well graded, non plastic, brown, massive, compact.	Glacial Drift
							1.3	6	Sandy SILT, some gravel and cobbles, trace clay, subangular to subrounded, well graded, low to medium plasticity, brown, massive, compact, moist.	Glacial Drift
TP10-352	2162363	1403157	1158	Upper Talarik Creek Area	-	6.5	0	0.5	Topsoil with Tundra Vegetation.	Topsoil
							0.5	6.5	Sandy, silty GRAVEL, some clay, trace cobbles, round to subrounded, well graded, low to medium plasticity, grey brown, massive, firm, trace roots 0.5 - 3', moist.	Colluvium
TP10-353	2159781	1403595	1061	Open Pit Area	-	2.8	0	1	Topsoil with Tundra Vegetation.	Topsoil
							1	1.4	GRAVEL, trace sand, trace silt, trace clay, platy, poorly graded, non plastic, black, loose, stratified, saturated.	Colluvium
							1.4	2.3	GRAVEL, some sand, some silt, trace clay, platy, well graded, non plastic, black brown, loose stratified, saturated.	Colluvium
							2.3	2.8	SILT, some sand, trace gravel, trace clay, subangular, poorly graded, low to medium plasticity, grey, soft, wet.	Colluvium
TP10-354	2159268	1399216	1417	Open Pit Area	-	5.9	0	0.4	Topsoil with Tundra Vegetation.	Topsoil
							0.4	5.9	Gravelly, silty SAND, trace clay, trace cobbles, subrounded to subangular, well graded, non plastic, brown, compact, massive, moist.	Glacial Drift
TP10-355	2158666	1397498	1345	Area E	-	4	0	0.6	Topsoil with Tundra Vegetation.	Topsoil
							0.6	4	SILT, trace gravel, trace sand, trace clay, trace cobbles, poorly graded, non plastic, brown, soft, massive, wet.	Glacial Drift
TP10-356	2164634	1384251	1237	Area G	3.3	3.6	0	0.17	Topsoil with Tundra Vegetation. Gravelly SAND, trace silt, trace clay, subangular to subrounded, clasts up to 0.75" diameter, poorly graded (gap graded), low plasticity, dark brown, loose, roots of lichens and shrubs, moist to damp.	Topsoil
							0.17	3.6	Sandy, silty GRAVEL, trace clay, subangular to subrounded clasts up to boulder size (1.5' wide), most clasts 1.5 - 2" diameter, cobbles mostly 6" diameter, some angular, well graded, low plasticity, medium brown, loose, moist.	Glacial Drift
TP10-357	2164618	1389895	1222	Area E	1.6	1.6	0	0.1	Topsoil with Tundra Vegetation. SAND, some silt, some gravel, trace clay, angular to subangular, few subrounded clasts up to 0.75" diameter, well graded, low to no plasticity, loose, some roots, dark brown, moist.	Topsoil
							0.1	1.6	Sandy GRAVEL, coarse sand, some silt, trace clay, angular to subangular, few boulders up to 1.5' diameter, most clasts angular, between 2 - 4" diameter, few clasts rounded and subrounded, well graded, low to no plasticity, loose, dark brown to medium brown, moist.	Glacial Drift
TP10-358	2162902	1391741	1314	Area E	-	5	0	0.17	Topsoil with Tundra Vegetation. Gravelly SILT and SAND, subrounded to subangular, most clasts up to 0.75" diameter, gap graded, low plasticity, dark brown, loose, moist to damp.	Topsoil
							0.17	2	Sandy GRAVEL, some silt/clay, subrounded to rounded, clasts up to 4" diameter, well graded, low plasticity, light brown, roots for the first 2' from surface, moist.	Glacial Drift
							2	5	GRAVEL, some sand, trace silt/clay, subangular and subrounded, clasts up to large cobbles (6" wide) most clasts 2 to 4" diameter, poorly graded, low to no plasticity, light brown, loose, moist.	Glacial Drift

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TP10-359	2163765	1390858	1277	Area E	2	5	0	0.1	Topsoil with Tundra Vegetation. Sandy SILT, trace gravel, trace clay, subangular to rounded, clasts up to 0.5" diameter, poorly graded, low plasticity, dark brown, root vegetation, moist.	Topsoil
							0.1	2	Silty SAND AND GRAVEL, trace clay, coarse grained, subangular to rounded, clasts up to cobble size (8") most clasts up to 4", well graded, low plasticity, light brown, loose, moist.	Glacial Drift
							2	5	Silty SAND, some clay, some gravel, subangular to subrounded clasts, mostly gravel size up to 2", some cobbles, up to 4", poorly graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-360	2161699	1396661	1422	Area E	2.6	2.1	0	0.5	Topsoil with Tundra Vegetation. SILT and PEAT, no clasts, poorly graded, no to low plasticity, dark brown/black, very fibrous, moist.	Topsoil
							0.5	1.5	SAND and GRAVEL, coarse grained sand, some silt, trace clay, subangular to subrounded clasts, with some angular boulders, up to 12" diameter, most clasts gravel sized, well graded, low plasticity, brown, loose, moist to wet.	Glacial Drift
							1.5	2.1	GRAVEL and SAND, coarse grained sand, some silt, some clay, subangular to subrounded, clasts up to boulder size up to 12" diameter, most clasts gravel size, low plasticity, light brown, compact, moist to wet.	Glacial Drift
TP10-361	2152866	1385091	1758	Area G	-	4	0	1	Topsoil with Tundra Vegetation. SILT, some sand, trace gravel, trace clay, trace cobbles, angular up to 8" diameter, likely from freeze/thaw, gap graded, low plasticity, dark brown/black, roots, fibrous, loose, moist.	Topsoil
							1	4	Sandy, gravelly SILT, trace clay, subangular to angular, some subrounded, clasts up to cobble size 6" diameter, gravel size 0.75 - 2" diameter, gap graded, no plasticity, light brown with orange oxidized zones, compact, moist.	Colluvium
TP10-362	2151245	1385483	1729	Area J	-	3	0	1	Topsoil with Tundra Vegetation. SILT, some sand, some gravel, some cobbles, clasts up to 8", subangular to subrounded granodiorite clasts, gap graded, no to low plasticity, dark black/brown, moist.	Topsoil
							1	3	SAND and GRAVEL, some silt/clay, trace cobbles, angular to subangular, some subrounded, clasts up to cobble size (8"), well graded, low plasticity, light brown, compact, moist.	Colluvium
TP10-363	2162042	1397224	1501	Area E	-	4	0	0.17	Topsoil with Tundra Vegetation. SILT, some gravel, trace sand, trace clay, trace cobbles, angular to subangular, clasts up to cobble size (6"), gap graded, low plasticity, loose, dark brown/black, moist to damp.	Topsoil
							0.17	4	Silty, gravelly SAND, trace clay, coarse sand, angular to subangular to subrounded clasts, mostly angular, up to cobble size (8"), mostly cobbles and gravel size up to 4", well graded, low plasticity, light brown, moist to damp.	Glacial Drift
TP10-364	2162203	1398683	1585	Area E	-	5.4	0	1.1	Topsoil with Tundra Vegetation. SAND, some silt, trace clay, trace gravel, trace cobbles, trace boulders, subrounded to angular, clasts up to boulder size (12" diameter), gap graded, low to medium plasticity, dark brown/black, loose, roots, moist to damp.	Topsoil
							1.1	2.8	Sandy SILT, some gravel, trace clay, subrounded clasts up to cobble size (8"), mostly gravel size, gap graded, low to medium plasticity, light orange brown, compact, stratified horizontal layers, moist.	Glacial Drift
							2.8	5.4	Sandy SILT, some gravel, trace clay, subrounded clasts up to cobble size (8"), gap graded, low plasticity, light brown, compact, moist.	Glacial Drift

Knight Piésold
CONSULTING

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TP10-365	2163865	1398011	1632	Area E	5.2	5.2	0	1.6	Topsoil with Tundra Vegetation. Gravelly SILT, trace clay, trace sand, boulders at surface, angular to subangular, gap graded, low plasticity, dark brown, roots, fibrous, loose, moist.	Topsoil
							1.6	5.2	Silty SAND, some clay, some gravel, clasts up to cobble size (10"), mostly gravel and cobble size up to 4", subangular to angular, poorly graded, low plasticity, light brown, with some orange brown zones, loose to compact, moist.	Colluvium
TP10-366	2164020	1394325	1420	Area E	-	5.3	0	0.3	Topsoil with Tundra Vegetation. SILT and organics, some sand, some gravel, subrounded to rounded clasts up to large cobble size (6"), poorly graded, low plasticity, dark brown, fibrous, roots, loose, moist.	Topsoil
							0.3	1	Silty, sandy GRAVEL, trace clay, subangular to subrounded, some angular, mostly gravel size clasts, some cobbles, well graded, low plasticity, brown, loose, stratified, moist.	Glacial Drift
							1	5.3	Gravelly, silty SAND, trace clay, subangular to subrounded, some angular clasts up to boulder size but mostly cobbles and gravel, cobbles up to 6" diameter, gravel ranges from 0.4 - 3", well graded, medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-367	2163969	1392685	1321	Area E	-	6	0	0.7	Topsoil with Tundra Vegetation. SILT, trace gravel, some sand, trace clay, subrounded clasts up to cobbles size, mostly gravel size, poorly graded, low plasticity, dark brown/black, loose, fibrous roots, moist.	Topsoil
							0.7	6	GRAVEL and SAND, some silt, trace clay, occasional boulders, coarse sand, subrounded to rounded, clasts up to large boulders size (20") usually cobbles and gravel (0.4 - 4") some 6", well graded, low to no plasticity, light brown, somewhat stratified, compact, roots down to 2' depth, moist.	Glacial Drift
TP10-368	2161738	1393976	1347	Area E	-	5.3	0	5.3	Silty, sandy GRAVEL, trace clay, rounded to subrounded clasts, some subangular to angular, up to large cobbles size (6" diameter) clasts usually <4" gravel and cobble size, well graded, no to low plasticity, light brown, compact, stratified, roots present for 1.3' from surface, moist to damp.	Glacial Drift
TP10-369	2160477	1397040	1398	Area E	-	6	0	0.17	Topsoil with Tundra Vegetation. SILT, trace sand, trace clay, no clasts, poorly graded, low plasticity, dark black/brown, loose, fibrous vegetation roots, moist.	Topsoil
							0.17	5.9	Gravelly SAND, some silt, trace clay, subangular to subrounded clasts up to cobble size, occasional boulders (up to 8"), gap graded, medium plasticity, light brown, compact, moist.	Glaciofluvial
TP10-370	2165472	1382659	1176	Area G	-	3.3	0	0.7	Topsoil with Tundra Vegetation. SILT, some sand, trace clay, some gravel, subrounded clasts, mostly gravel size (1.5") occasional boulders and cobbles, gap graded, low to medium plasticity, dark brown, loose to compact, moist.	Topsoil
							0.7	3.3	Silty, gravelly SAND, trace clay, subrounded to subangular, clasts up to large cobble size (6"), most clasts gravel size, well graded, low plasticity, light brown, loose, moist.	Glacial Drift
TP10-371	2161355	1398139	1524	Area E	-	5.6	0	0.17	Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subangular to subrounded (up to 0.75"), poorly graded, low to no plasticity, dark brown, root vegetation, moist to damp.	Topsoil
							0.17	5.6	SAND and SILT, trace gravel, trace clay, subrounded to subangular, clasts up to small cobble size (4" diameter), mostly gravel size, poorly graded, low plasticity, light brown, loose, moist.	Colluvium
TP10-372	2157032	1397456	1363	Open Pit Area	3.6	4	0	0.5	Topsoil with Tundra Vegetation. SILT, no clasts, poorly graded, low plasticity, dark brown, fibrous, vegetation roots, moist.	Topsoil
							0.5	4	Gravelly, silty SAND, trace clay, subangular to subrounded, clasts up to large cobble size, mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist to wet.	Glacial Drift

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TP10-373	2165039	1403526	1219	Upper Talarik Creek Area	-	5.6	0	0.5	Topsoil with Tundra Vegetation. SILT, no clasts, poorly graded, low plasticity, dark brown, loose, moist.	Topsoil
							0.5	5.6	Silty SAND, some gravel, trace clay, subangular to subrounded clasts up to cobble size, mostly gravel size (1 - 1.5"), well graded, low plasticity, light brown, compact, moist to wet.	Glacial Drift
TP10-374	2167500	1404655	1120	Upper Talarik Creek Area	-	5.3	0	1.3	Topsoil with Peat. SILT, some gravel, some sand, trace clay, subangular to subrounded clasts up to gravel size (0.75"), low plasticity, poorly graded, dark brown/black, compact, root vegetation, moist to wet.	Topsoil
							1.3	5.3	Sandy, silty GRAVEL, some cobbles, trace clay, angular gravel sized clasts up to 0.75 - 1.25", large cobble size 8", subrounded to subangular, well graded, low to medium plasticity, light brown, compact, moist to wet.	Colluvium
TP10-375	2165091	1404640	1053	Upper Talarik Creek Area	-	3.6	0	0.17	Topsoil with Tundra Vegetation. Sandy SILT, trace gravel, trace clay, subrounded up to cobble size, low plasticity, poorly graded, dark brown/black, compact to loose, vegetation roots, moist.	Topsoil
							0.17	3.6	Silty, gravelly SAND, trace clay, subrounded to rounded, clasts up to boulder size, mostly gravel and cobble size, well graded, low plasticity, light brown, loose to compact, moist.	Colluvium
TP10-376	2166266	1405116	1064	Upper Talarik Creek Area	3.3	5.9	0	0.6	Topsoil with Peat. PEAT, no clasts, poorly graded, no plasticity, dark brown/black, plant roots, fibrous, organic smell, loose, moist to wet.	Topsoil
							0.6	2	SAND, coarse grained, no clasts, poorly graded, low plasticity, light brown and grey, loose, moist to wet.	Glaciolacustrine
							2	5.9	SAND, fine sand, some silt, trace clay, trace gravel, poorly graded, non plastic, grey, compact, when broken has small bits of brown organic matter throughout, moist to wet.	Glaciolacustrine
TP10-377	2157862	1403021	1056	Open Pit Area	-	5	0	0.8	Topsoil with Tundra Vegetation. SAND, some silt, trace gravel, trace clay, fine grained, subrounded clasts up to gravel size, poorly graded, low to no plasticity, dark brown, loose, damp.	Topsoil
							0.8	3.3	SAND, some silt, some gravel, subangular to subrounded, clasts up to gravel size, poorly, graded, low to no plasticity, light brown, loose, damp.	Colluvium
							3.3	5	SAND and GRAVEL, some silt/clay, clasts up to cobble size, medium grained, subrounded to subangular, well graded, low to medium plasticity, light greyish brown, loose to compact, moist.	Glacial Drift
TP10-378	2162175	1402479	1275	Upper Talarik Creek Area	-	3	0	0.7	Topsoil with Peat. Sandy SILT, fine sand, some gravel, trace clay, subangular to subrounded clasts up to cobble size, poorly graded, low to medium plasticity, dark brown, cold, compact, vegetation roots, moist.	Topsoil
							0.7	3	Gravelly SAND, some silt, trace clay, subrounded to subangular clasts up to boulder size up to 20" diameter, but boulder on surface nearby is 3.3' diameter, most clasts are gravel size up to 2", gap graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-379	2161912	1405501	1042	Upper Talarik Creek Area	-	5.3	0	0.17	Topsoil with Tundra Vegetation. SILT, some sand, trace clay, no clasts, fine grained, poorly graded, low to no plasticity, dark brown, organics, fibrous plant roots, compact, moist to damp.	Topsoil
							0.17	5.3	Silty, gravelly SAND, trace clay, subrounded to subangular, clasts up to boulder size, mostly gravel and cobbles, well graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift

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TP10-380	2156543	1404106	1034	Open Pit Area	-	4	0	0.17	Topsoil with Tundra Vegetation. Silt, some sand, trace gravel, trace clay, subangular to subrounded, clasts up to gravel size, poorly graded, low plasticity, dark black/brown, loose, roots, organics, moist.	Topsoil
							0.17	4	Gravelly, sandy SILT, trace clay, subrounded to subangular clasts up to large cobble size (6"), mostly gravel size, well graded, low to medium plasticity, light brown, compact, roots up to 1' depth, moist.	Glaciofluvial
TP10-381	2160290	1400186	1528	Open Pit Area	-	5	0	0.3	Topsoil with Tundra Vegetation. Gravelly SILT, trace sand, trace clay, subrounded to subangular, clasts up to cobble size, gap graded, low plasticity, dark brown/black, organics, loose to compact, moist.	Topsoil
							0.3	5	Silty GRAVEL and SAND, trace clay, subrounded to subangular, clasts up to large cobble, mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-382	2156242	1399314	1242	Open Pit Area	-	4.3	0	1	Topsoil with Tundra Vegetation. Silty SAND in organics, subrounded to subangular, clasts up to large cobble size (10"), seems to be a large cobble/boulder layer just below surface on one side of the test pit, gap graded, low plasticity, dark brown to medium brown, loose to compact, moist to damp.	Topsoil
							1	4.3	Silty SAND, some gravel, trace clay, subrounded to subangular, clasts up to cobble size (8"), mostly cobbles and gravel, poorly graded, low to no plasticity, light brown, loose, roots up to 3' depth, moist.	Glacial Drift
TP10-383	2155380	1399290	1210	Open Pit Area	4.7	5.4	0	0.8	Topsoil with Tundra Vegetation. Gravelly, silty SAND, trace clay, fine to coarse grained, subrounded to subangular, clasts up to cobble size (10"), mostly cobbles and gravel, poorly graded, low plasticity, dark brown/black, organics, fibrous roots to 1' in depth, compact, moist to damp.	Topsoil
							0.8	5.4	Silty GRAVEL and SAND, trace clay, subrounded to subangular clasts up to boulder size, some angular clasts, most clasts cobble and gravel sized, well graded, low to medium plasticity, light brown, loose to compact, moist to wet.	Glacial Drift
TP10-384	2155482	1398384	1246	Open Pit Area	-	6.2	0	1	Topsoil with Tundra Vegetation. Silty SAND, some gravel, subrounded, clasts to gravel size, poorly graded, low to no plasticity, medium brown, loose, vegetation roots, moist to damp.	Topsoil
							1	2.6	Gravelly SAND, some silt, trace clay, subrounded to subangular, clasts up to cobble size (4"), mostly gravel size, well graded, low to no plasticity, light brown, loose, moist.	Glacial Drift
							2.6	6.2	Clayey SILT, no clasts, poorly graded, medium plasticity, grey and orange brown, compact to dense, moist.	Glaciolacustrine
TP10-385	2157061	1398395	1275	Open Pit Area	-	5.2	0	0.6	Topsoil with Peat. SILT, trace gravel, some sand, trace clay, subrounded, clasts up to boulder size but mostly cobbles and gravel, poorly graded, low plasticity, dark black/brown, fibrous, organics, compact, vegetation roots, moist to wet.	Topsoil
							0.6	1.6	SAND, some silt, some gravel, trace clay, subrounded, clasts up to boulder size, mostly gravel, coarse grained, low plasticity, light brown, loose to compact, some root inclusions, moist.	Glacial Drift
							1.6	5.2	Sandy SILT, some clay, some gravel, subrounded to subangular clasts up to cobble size, mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-386	2156954	1400693	1169	Open Pit Area	-	4.6	0	0.8	Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, poorly graded, low plasticity, dark brown/black, loose, root inclusions, moist to damp.	Topsoil
							0.8	4.6	Silty, gravelly SAND, trace clay, subrounded to subangular, clasts up to boulder size but mostly cobbles and gravel, well graded, low plasticity, light brown, loose, moist.	Glacial Drift

TABLE 3.1

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION DATA REPORT
TEST PIT SUMMARY

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-387	2156423	1400541	1140	Open Pit Area	4.3	5.6	0	0.6	Topsoil with Tundra Vegetation. Silty SAND, trace clay, no clasts, poorly graded, low plasticity, dark brown black, fibrous, roots, peat, loose to compact, moist.	Topsoil
							0.6	5.6	Sandy SILT, some clay, some gravel, clasts up to cobble size but mostly small gravel size, coarse grained sand, well graded, low to medium plasticity, light brown, remnants of weathered bedrock, compact, moist.	Glacial Drift
TP10-388	2155724	1397248	1311	Open Pit Area	-	6.9	0	0.17	Topsoil with Tundra Vegetation. SAND, some silt, some gravel, trace clay, angular, clasts up to cobble size, gap graded, low to no plasticity, dark brown, loose to compact, organics, moist to damp.	Topsoil
							0.17	5.2	Silty, gravelly SAND, trace clay, subangular to angular, clasts up to large cobble size, mostly gravel size, some iron oxide weathering, low to medium plasticity, well graded, orange brown, roots up to 1' depth, moist.	Glacial Drift
							5.2	6.9	Silty, gravelly, clayey SAND, subangular to angular, clasts up to large cobble size, mostly gravel size, some iron oxide alteration, well graded, low to medium plasticity, orange brown, moist.	Glacial Drift
TP10-389	2155326	1396313	1326	Area E	-	6.2	0	0.17	Topsoil with Peat. SILT, trace sand, trace clay, no clasts, poorly graded, low plasticity, dark brown/black, roots, loose, damp.	Peat
							0.17	6.2	Silty SAND and GRAVEL, trace clay, subrounded to subangular clasts up to cobble size, mostly gravel and smaller cobbles, well graded, low plasticity, light brown, loose to compact, moist.	Glacial Drift
TP10-390	2153969	1396548	1349	Area A, Lower/Mid Side Slopes	-	4.6	0	0.1	Topsoil with Tundra Vegetation. Gravelly SAND, some silt, trace clay, subrounded, clasts up to cobble size (6"), gap graded, low plasticity, dark brown/black, loose, damp.	Topsoil
							0.1	4.6	Silty SAND and GRAVEL, trace clay, clay content increasing with depth to some clay, subrounded clasts up to large cobble size, mostly gravel size, well graded, low plasticity, light brown, loose to compact, moist.	Glacial Drift
TP10-391	2154371	1398006	1241	Area A, Lower/Mid Side Slopes	-	5.9	0	0.6	Topsoil with Tundra Vegetation. Silty SAND, some gravel, subrounded clasts up to large cobble size, mostly gravel size, gap graded, low plasticity, dark brown, loose, roots, moist to damp.	Topsoil
							0.6	1.3	SAND and GRAVEL, some silt, trace clay, subrounded clasts up to cobble size, mostly gravel size, well graded, low to no plasticity, medium brown, loose, roots, moist to damp.	Glacial Drift
							1.3	5.9	Sandy, silty GRAVEL, trace clay, subrounded to subangular, clasts up to boulder size (12"), mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-392	2152867	1396796	1333	Area A, Lower/Mid Side Slopes	-	5.6	0	1	Topsoil with Tundra Vegetation. Silty SAND, some gravel, trace clay, trace cobbles, trace boulders, subrounded to subangular, clasts mostly up to large cobble size, boulder (2.6' diameter) encountered just below surface, well graded, low plasticity, dark brown, loose, root inclusions, moist.	Topsoil
							1	5.6	Sandy, gravelly SILT, trace to some clay, subrounded to subangular, clasts up to boulder size (12" diameter), mostly gravel and cobble size clasts, well graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-393	2153535	1397598	1254	Area A, Lower/Mid Side Slopes	3.6	6	0	3.6	Topsoil with Peat. Some sand and silt, no clasts, low plasticity, poorly graded, dark brown up to 2' then black, fibrous, roots, compact, wet, ground visibly shaking as excavator operates up to ~15' away.	Peat
							3.6	6	Clayey SILT, some sand, no clasts, poorly graded, medium plasticity, blue grey, organic smell, compact, moist, flaky bits of wood-like material and organics mixed in, moist.	Glaciolacustrine

TABLE 3.1

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION DATA REPORT
TEST PIT SUMMARY

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-394	2151793	1396936	1407	Area A, Upper Side Slopes	-	6.4	0	0.6	Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subrounded, poorly graded, low plasticity, dark brown, loose, root inclusions, moist.	Topsoil
							0.6	6.4	Gravelly SAND, some silt, trace clay, subrounded to subangular clasts up to boulder size (16"), some angular clasts, mostly cobbles and gravel, silt content slightly increasing with depth, well graded, low plasticity, light brown, loose, root inclusions up to 1.3' from surface, moist.	Glacial Drift
TP10-395	2152231	1397891	1275	Area A, Lower/Mid Side Slopes	-	5.2	0	0.6	Topsoil with Tundra Vegetation. Silty GRAVEL, some sand, trace clay, subrounded to subangular clasts, clasts up to large cobbles size (8"), mostly gravel size, layer of gravel at surface, gap graded, low plasticity, dark brown/black, organics, fibrous roots, loose, moist.	Topsoil
							0.6	5.2	SAND and GRAVEL, some silt, trace clay, clasts subrounded to subangular, some angular, up to large cobble size (10"), mostly gravel size, well graded, low plasticity, colour change at 1.6' from surface, lighter brown yellow below this depth, slightly dark brown above this depth, root inclusions to 2' depth, moist.	Glacial Drift
TP10-396	2150790	1397921	1280	Area A, Lower/Mid Side Slopes	-	6.6	0	1	Topsoil with Tundra Vegetation. Silty, sandy GRAVEL, subrounded to subangular, clasts some angular up to large cobble size, mostly gravel and cobble size, gap graded, low plasticity, dark brown, roots, loose, moist.	Topsoil
							1	6.6	Silty, gravelly SAND, trace clay, clay content increasing with depth to some, subrounded to subangular, clasts up to large cobble size, mostly gravel and cobble size, well graded, low to medium plasticity, light brown, loose to compact, moist.	Glacial Drift
TP10-397	2152409	1399398	1179	Area A, Lower/Mid Side Slopes	-	6.6	0	0.1	Topsoil with Tundra Vegetation. SAND and GRAVEL, trace silt, trace clay, coarse grained sand, subrounded to angular clasts up to gravel size, well graded, low to no plasticity, dark brown, some roots, loose, damp to dry.	Topsoil
							0.1	6.6	Gravelly SAND, trace silt, trace clay, subrounded to subangular, clasts up to boulder size but mostly gravel to large cobbles, well graded, low to no plasticity, light brown, loose, root inclusions up to 1' from surface, damp to moist.	Glacial Drift
TP10-398	2153289	1400205	1111	Area A, Lower/Mid Side Slopes	4.6	5	0	1.3	Topsoil with Tundra Vegetation. SILT, some sand, some gravel, trace clay, rounded to angular, clasts up to large cobble size, rare boulders, gap graded, low plasticity, dark brown, loose to compact, root inclusions up to 1', moist.	Topsoil
							1.3	5	Sandy GRAVEL, some silt/clay, subrounded to angular clasts, large cobbles to gravel size, well graded, low to medium plasticity, medium brown, compact, some small root inclusions, wet.	Glacial Drift
TP10-399	2151320	1399400	1170	Area A, Lower/Mid Side Slopes	-	5.2	0	0.5	Topsoil with Tundra Vegetation. SILT, trace sand, some gravel, trace clay, subrounded to subangular with some angular clasts, up to large cobble size but mostly gravel size, poorly graded, low plasticity, dark brown, compact to loose, roots, organics, moist.	Topsoil
							0.5	5.2	Sandy GRAVEL, some silt, trace clay, subrounded to subangular with some angular fragments, up to large cobble (6"), mostly gravel size, gap graded, medium plasticity, compact, moist.	Glacial Drift
TP10-400	2149246	1399449	1141	Area A, Lower/Mid Side Slopes	-	5.9	0	0.7	Topsoil with Tundra Vegetation. Gravelly SAND, some silt, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, coarse grained, poorly graded, low to no plasticity, dark brown, loose, root inclusions, damp.	Topsoil
							0.7	5.9	Gravelly SAND, some silt, some clay, fines content increasing with depth, subrounded to subangular, some angular clasts, clasts up to cobble size, occasional boulder (16"), mostly gravel size, well graded, low plasticity, light brown, compact, roots up to 1' from surface, moist.	Glacial Drift

TABLE 3.1

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION DATA REPORT
TEST PIT SUMMARY

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-401	2150044	1402729	984	Area A, Valley Bottom	-	5.9	0	0.3	SAND, some silt, some gravel, trace clay, coarse grained, subrounded to subangular clasts, some angular, up to large cobble size, mostly gravel size, poorly graded, low plasticity, dark brown, loose, root inclusions, moist.	Topsoil
							0.3	5.9	Silty, gravelly SAND, trace clay, some boulders, subrounded to subangular to platy clasts, some angular, up to cobble size but mostly gravel size, well graded, low plasticity, light brown, compact, moist.	Glacial Drift
TP10-402	2151597	1402776	980	Area A, Valley Bottom	-	4.9	0	3	PEAT, organics, fibrous, brown, root inclusions, poorly graded, low plasticity, brown, wet, woodish fragments throughout.	Peat
							3	4.9	GRAVEL and SAND, trace silt, trace clay, subrounded clasts up to gravel size, well graded, non plastic, grey, compact, wet.	Glacial Drift
TP10-403	2149836	1403877	985	Area A, Valley Bottom	0.3	1.6	0	1.6	PEAT, brown, fibrous, roots.	Peat
TP10-404	2146984	1401809	985	Area A, Valley Bottom	-	4.6	0	1.3	Topsoil with Tundra Vegetation. Silty SAND, some gravel, trace clay, subrounded to subangular clasts, mostly gravel size, coarse grained sand, poorly graded, low plasticity, medium brown, loose, root inclusions, moist to damp.	Topsoil
							1.3	4.6	Silty SAND, some gravel, trace clay, fine grained sand, subrounded to subangular clasts up to cobble size, mostly gravel size, no to low plasticity, light brown, loose to compact, moist to damp.	Glaciofluvial
TP10-405	2160653	1405192	999	Upper Talarik Creek Area	-	3	0	0.3	Topsoil with Tundra Vegetation. Silty SAND, coarse grained, subrounded to subangular, clasts up to large cobble size, mostly gravel size, well graded, low to no plasticity, dark brown, loose, root inclusions, moist to damp.	Topsoil
							0.3	3	Silty, gravelly SAND, some clay, subrounded to subangular clasts, gravel layer from surface to 8", clasts up to large cobble size, mostly gravel size, well graded, low plasticity, light brown with some areas of iron oxidation (orange brown), compact, root inclusions up to 0.4m from bottom of test pit, moist.	Glacial Drift
TP10-406	2148184	1403087	969	Area A, Valley Bottom	1.6	1.6	0	1.6	PEAT, fibrous, brown, organic, wet, root inclusions, no clasts, frozen at 1.6', poorly graded, low plasticity, compact, wet to frozen.	Peat
TP10-407	2148946	1405622	970	Area A, Valley Bottom	3	3.6	0	2.6	PEAT, fibrous, brown to dark, organic, poorly graded, plasticity, compact, root inclusions, wet to saturated.	Peat
							2.6	3.6	SAND, some gravel, some silt, trace clay, coarse grained, subrounded to subangular, clasts up to cobble size, mostly gravel size, well graded, no to low plasticity, grey, loose, wet to saturated.	Glaciofluvial
TP10-408	2149806	1407293	985	East Deposit Area	2.3	3	0	1.6	PEAT and Silty SAND, some gravel, trace clay, subrounded to subangular clasts up to large cobble size, mostly gravel size, poorly graded, low plasticity, dark brown, compact, fibrous, root inclusions, wet.	Peat
							1.6	3	SAND and SILT, trace gravel, trace clay, fine grained, subrounded to subangular clasts up to gravel size, rare cobbles, gap graded, low to no plasticity, grey brown, compact to loose, some root inclusions, moist to wet.	Glaciolacustrine
TP10-409	2147740	1404492	971	Area A, Valley Bottom	0.8	1.3	0	1.3	PEAT, fibrous, roots, no clasts, brown, compact to loose, wet.	Peat
TP10-410	2147053	1402951	976	Area A, Valley Bottom	1.3	1.6	0	1.6	PEAT, dark brown, organics, fibrous, compact, wet.	Peat
TP10-411	2147075	1404266	939	Area A, Valley Bottom	2.9	3.6	0	1.3	PEAT, fibrous, vegetation roots, brown organics, saturated to wet, compact, small fragments of frozen material.	Peat
							1.3	3.6	Gravelly SAND, some silt, trace clay, fine grained to coarse grained, clasts subangular to subrounded, mostly small gravel size, poorly graded, no to low plasticity, grey brown, compact to loose, root inclusions and woody debris, organics, wet to saturated.	Glaciofluvial

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-412	2148314	1406161	977	Area A, Valley Bottom	-	5	0	1.3	Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subrounded, clasts up to gravel size, poorly graded, low plasticity, dark brown, loose, root inclusions, moist.	Topsoil
							1.3	5	Sandy GRAVEL, some silt, trace clay, subrounded to angular to platy, clasts up to boulder size, mostly gravel and cobble size, well graded, low to no plasticity, light brown, loose, stratified, moist.	Glaciofluvial
TP10-413	2147785	1406871	1027	Area A, Lower/Mid Side Slopes	4.4	4.6	0	2	PEAT, organic, fibrous, compact, roots, dark brown, wet to saturated.	Peat
							2	4.6	Sandy GRAVEL, some silt/clay, subrounded to angular, clasts up to boulder size, mostly cobble and gravel size clasts, well graded, low to no plasticity, grey brown, loose to compact, organics, wood fragment inclusions, moist to wet.	Glaciofluvial
TP10-414	2146851	1405466	956	Area A, Valley Bottom	-	5	0	0.7	Topsoil with Tundra Vegetation. SAND AND GRAVEL, trace silt, trace clay, subangular to angular, clasts up to large cobble size, mostly gravel size, poorly graded, low to no plasticity, dark brown, root inclusions, loose, moist to damp.	Topsoil
							0.7	5	large cobbles, mostly gravel size, poorly graded, low to no plasticity, brown, loose to compact, stratified, moist.	Glaciofluvial
TP10-415	2140927	1402534	1036	Area A, Lower/Mid Side Slopes	-	5.2	0	0.17	Topsoil with Tundra Vegetation. SAND, some gravel, some silt, trace clay, angular to subrounded, clasts up to large cobble size, mostly gravel size, poorly graded, low to no plasticity, loose, root inclusions, moist to damp.	Topsoil
							0.17	5.2	Gravelly SILT, some sand, trace clay, subrounded to angular, clasts up to large cobble size, mostly gravel size, gap graded, low plasticity, some root inclusions up to 1.5' deep, compact, moist.	Glacial Drift
TP10-416	2140734	1403426	1040	Area A, Lower/Mid Side Slopes	-	5.4	0	0.3	Topsoil with Tundra Vegetation. Sandy GRAVEL, trace silt, trace clay, angular to subrounded, clasts up to gravel and small cobble size, poorly graded, no to low plasticity, dark brown, loose, moist.	Topsoil
							0.3	5.4	Gravelly SAND, some silt, trace clay, silt content increasing with depth to silty, subrounded to angular, clasts up to cobble size, mostly gravel size, some large boulders (16"), well graded, low to medium plasticity, light brown, compact, moist.	Glacial Drift
TP10-417	2143661	1401804	1027	Area A, Lower/Mid Side Slopes	5.9	6.2	0	0.5	Topsoil with Tundra Vegetation. SAND, some gravel, some silt, trace clay, subrounded to subangular, clasts up to large cobble size, mostly gravel size, poorly graded, low to no plasticity, dark brown, loose, root inclusions, moist to damp.	Topsoil
							0.5	6.2	Silty, SAND AND GRAVEL, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, well graded, low plasticity, light brown, compact to loose, some root inclusions to 2' from surface, moist.	Glacial Drift
TP10-418	2141731	1402346	1052	Area A, Lower/Mid Side Slopes	-	6.1	0	0.5	Topsoil with Tundra Vegetation. SILT, some sand, no clasts, poorly graded, low plasticity, dark brown, loose to compact, root inclusions, moist to damp.	Topsoil
							0.5	6.1	Silty SAND, some gravel, trace to some clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, low to medium plasticity, light brown with some orange brown zones, compact, some root inclusions to 1' from surface, moist.	Glacial Drift

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TABLE 3.1

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PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION DATA REPORT
TEST PIT SUMMARY

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Test Pit #	Coordinates Northing (ft)	Coordinates Easting (ft)	Elevation (ft)	Location of Test Pit	Depth to Water Table (ft)	Total Depth (ft)	From (ft)	To (ft)	Description	Geomorphology
TP10-419	2144710	1400906	1125	Area A, Lower/Mid Side Slopes	-	5.9	0	1.6	SAND and GRAVEL, trace silt, trace clay, subrounded to angular, clasts up to large cobble size, mostly gravel size, well graded, low to no plasticity, light brown, loose, root inclusions up to 1.5' from surface, moist.	Glacial Drift
							1.6	5.9	SAND and GRAVEL, trace silt/clay, subrounded to angular, clasts up to cobble size, mostly gravel size, poorly graded, no plasticity, grey brown, loose, moist.	Glacial Drift
TP10-420	2142641	1402189	1006	Area A, Lower/Mid Side Slopes	3.2	3.6	0	0.7	Topsoil with Tundra Vegetation. SILT, some sand, some gravel, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel, poorly graded (gap graded), low plasticity, dark brown black, organic, root inclusions, compact, moist.	Topsoil
							0.7	3.6	Silty SAND AND GRAVEL, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, well graded, low to medium plasticity, light brown, loose to compact, root inclusions up to 2' depth from surface, wet.	Glacial Drift
TP10-421	2141827	1403455	1007	Area A, Lower/Mid Side Slopes	-	4.6	0	1	Topsoil with Tundra Vegetation. SILT, some sand, some gravel, trace clay, subrounded, clasts up to coarse gravel size, poorly graded, low plasticity, medium brown, some root inclusions, loose, moist.	Topsoil
							1	4.6	Gravelly SILT, some sand, some clay, subrounded to subangular to platy, clasts up to cobble size, mostly gravel size, gap graded, low plasticity, brown, rare roots, compact, moist.	Glacial Drift
TP10-422	2146191	1401606	990	Area A, Valley Bottom	-	5.9	0	1	Topsoil with Tundra Vegetation. SILT, trace sand, trace gravel, trace clay, poorly graded, no plasticity, dark brown/black, organic, fibrous, roots, loose, damp.	Topsoil
							1	2.3	Sandy GRAVEL, trace silt, trace clay, subrounded to subangular, mostly gravel size clasts up to coarse grained gravel size, rare cobbles, well graded, no plasticity, dark brown, damp.	Glacial Drift
							2.3	5.9	SAND, fine grained, some silt, trace gravel, trace cobbles, subrounded to subangular, poorly graded, no plasticity, light brown, loose, massive, damp.	Glaciolacustrine
TP10-423	2145038	1401894	985	Area A, Valley Bottom	-	6	0	2	Topsoil with Tundra Vegetation. SILT, poorly graded, no plasticity, dark brown, organic smell, organic fibrous, roots, moist.	Topsoil
							2	4.6	SILT, trace sand, poorly graded, no plasticity, dark brown, moist.	Glaciolacustrine
							4.6	6	SAND, fine grained, trace silt/clay, some subangular to angular gravel, poorly graded, no plasticity, grey, moist.	Glaciolacustrine
TP10-424	2159173	1405555	1020	Open Pit Area	-	3.6	0	0.17	Topsoil with Tundra Vegetation. SILT, poorly graded, no plasticity, brown, root inclusions, loose, damp.	Topsoil
							0.17	3.6	Silty, gravelly SAND, some clay, trace cobbles, fines content increases with depth, subrounded to subangular, well graded, low plasticity, grey brown, compact, moist.	Glacial Drift

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NOTES:

1. COORDINATES AND ELEVATIONS OBTAINED FROM HAND HELD GARMIN GPS UNIT (NAD 83, ALASKA STATE PLANE - ZONE 5).
2. CONSULT INDIVIDUAL TEST PIT LOGS IN APPENDIX A1 FOR DETAILS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	13DEC'10	ISSUED WITH REPORT VA101-176/35-1	LS	LD	KJB

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TABLE 3.2

PEBBLE LIMITED PARTNERSHIP
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2010 GEOTECHNICAL SITE INVESTIGATION
SUMMARY OF TEST PIT LABORATORY TESTING RESULTS

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Test Pit ID	Sample ID	Depth		Specfic Gravity Coarse Aggregate[5]				Specific Gravity[10]	Moisture Content (%)	Atterberg Limits			Standard Proctor				Particle Size Distribution[2]											Classification[3]
													Uncorrected		Corrected		% Cobbles[4]	% Gravel			% Sand				% Fines			Material Description
		From (ft)	To (ft)	Apparent[6]	Bulk SSD[7]	Bulk[8]	Absorption[9] (%)			LL	PL	PI	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	+3"	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total	
TP10-319	1	2.5	3.5	2.72	2.55	2.44	4.2	2.71	20	-	-	-					6	28	19	47	5	10	18	33	20		20	Silty/clayey, Sandy GRAVEL, trace cobbles
TP10-321	1	3.5	4.0					2.61	33	32	22	10					0	0	0	0	0	1	27	28	57	15	72	Sandy SILT, some clay, trace gravel
TP10-329	1	0.5	1.0	2.66	2.48	2.37	4.6	2.63	10	-	-	-					0	14	26	40	15	32	6	53	7		7	SAND and GRAVEL, trace silt/clay
TP10-331	2	4.5	5.0					2.73	10	21	15	6					0	2	7	9	5	12	22	39	39	13	52	SAND and SILT, some clay, trace gravel
TP10-335	1	5.0	5.2	2.71	2.62	2.57	2.0	2.68	9	-	-	-					0	24	25	49	7	15	13	35	16		16	GRAVEL and SAND, some silt/clay
TP10-336	2	3.0	4.0	2.64	2.44	2.31	5.5	2.68	15	20	17	3					0	7	18	25	6	14	18	38	33	4	37	Silty, Gravelly SAND, trace clay
TP10-337	1	5.0	5.4						17	-	-	-					0	24	14	38	6	8	17	31	25	6	31	Sandy, Silty GRAVEL, trace clay
TP10-338	1	3.2	3.5	2.70 2.76	2.52 2.55	2.41 2.42	4.4 5.1	2.71	13	-	-	-					14	13	16	29	6	13	26	45	26		26	Gravelly, Silty/clayey SAND, some cobbles
TP10-344	1	3.5	3.7						17	40	24	16					0	24	17	41	15	16	7	38	16	5	21	GRAVEL and SAND, some silt, trace clay
TP10-347	1	2.0	2.5						10	-	-	-					8	38	16	54	10	14	11	35	11		11	GRAVEL and SAND, trace silt/clay, trace cobbles
TP10-348	1	4.3	4.6						11	-	-	-					0	17	23	40	8	18	20	46	14		14	SAND and GRAVEL, some silt/clay
TP10-350	1	3.7	4.0	2.79	2.59	2.50	3.8	2.64	13	-	-	-					0	14	23	37	8	15	18	41	22		22	Silty/clayey SAND and GRAVEL
TP10-352	1	3.4	3.8	2.79	2.64	2.55	3.3	2.64	18	40	16	24	113	16	119	13	0	19	16	35	4	10	13	27	26	12	38	Sandy, Silty GRAVEL, some clay
TP10-354	1	5.8	5.9						15	-	-	-					0	17	16	33	6	14	18	38	24	5	29	Gravelly, Silty SAND, trace clay
TP10-356	1	2.0	3.0						10	-	-	-					0	22	15	37	5	11	18	34	24	5	29	Sandy, Silty GRAVEL, trace clay
TP10-358	1	4.0	5.0						4	-	-	-					0	62	23	85	3	4	4	11	4		4	GRAVEL, some sand, trace silt/clay
TP10-358	2	1.0	2.0						10	-	-	-					0	24	25	49	6	11	15	32	19		19	Sandy GRAVEL, some silt/clay
TP10-360	1	1.5	2.0	2.69	2.59	2.53	2.4	2.70	9	-	-	-					0	35	14	49	10	12	14	36	15		15	GRAVEL and SAND, some silt/clay
TP10-361	1	2.0	3.0						15	18	NP	NP	116	12	123	10	0	18	9	27	6	9	17	32	37	4	41	Sandy, Gravelly SILT, trace clay
TP10-362	1	2.0	3.0						12	-	-	-	119	12	127	9	0	27	10	37	8	17	18	43	20		20	SAND and GRAVEL, some silt/clay
TP10-371	1	4.0	5.0						16	-	-	-					0	1	7	8	6	12	32	50	40	2	42	SAND and SILT, trace gravel, trace clay
TP10-373	2	1.5	1.7	2.67				2.72	17	27	17	10					0	2	17	19	8	13	21	42	30	9	39	Silty SAND, some gravel, trace clay
TP10-374	1	4.0	5.0						15	37	19	18					19	17	18	35	6	11	14	31	26	8	34	Sandy, silty GRAVEL, some cobbles, trace clay
TP10-376	1	2.0	3.0						24	18	NP	NP					0	0	2	2	6	25	51	82	13	3	16	SAND, some silt, trace clay, trace gravel
TP10-377	2	4.0	5.0	2.71	2.47	2.34	5.9	2.69	12	-	-	-					0	14	22	36	9	28	14	51	13		13	SAND and GRAVEL, some silt/clay
TP10-380	1	3.0	4.0						14	-	-	-	116	14	124	11	0	16	15	31	6	11	12	29	32	8	40	Gravelly, sandy SILT, trace clay
TP10-381	1	4.0	5.0						13	-	-	-					0	21	18	39	7	12	17	36	21	4	25	Silty GRAVEL and SAND, trace clay
TP10-383	1	4.0	5.0	2.69	2.49	2.38	5.0	2.70	14	-	-	-					0	24	14	38	6	14	15	35	21	6	27	Silty GRAVEL and SAND, trace clay
TP10-391	1	4.0	5.0	2.69	2.46	2.33	5.7	2.69	16	33	18	15	115	14	120	11	0	19	18	37	8	12	11	31	22	10	32	Sandy, silty GRAVEL, trace clay
TP10-395	1	3.5	4.5						12	-	-	-					0	13	22	35	11	16	15	42	19	4	23	SAND and GRAVEL, some silt, trace clay
TP10-398	1	4.0	5.0	2.70 2.74	2.52 2.62	2.42 2.56	4.3 2.6	2.69	15	-	-	-					0	30	22	52	8	10	10	28	20		20	Sandy GRAVEL, some silt/clay
TP10-399	1	4.0	5.0						16	39	19	20	116	13	123	11	0	23	21	44	6	11	10	27	20	9	29	Sandy GRAVEL, some silt, trace clay
TP10-402	1	3.0	4.0						18	32	NP	NP	116	13	119	12	0	9	39	48	10	15	15	40	10	2	12	GRAVEL and SAND, trace silt, trace clay
TP10-405	1	2.0	3.0	2.72	2.56	2.46	3.9	2.66	18	-	-	-	110	16	117	13	0	15	14	29	7	10	14	31	29	11	40	Silty, gravelly SAND, some clay
TP10-408	1	2.0	3.0	2.66				2.52	47	-	-	-					0	6	1	7	2	5	42	49	39	5	44	SAND and SILT, trace gravel, trace clay

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TABLE 3.2

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2010 GEOTECHNICAL SITE INVESTIGATION
SUMMARY OF TEST PIT LABORATORY TESTING RESULTS

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Test Pit ID	Sample ID	Depth		Specfic Gravity Coarse Aggregate[5]				Specific Gravity[10]	Moisture Content (%)	Atterberg Limits			Standard Proctor				Particle Size Distribution[2]											Classification[3]
													Uncorrected		Corrected		% Cobbles[4]	% Gravel			% Sand				% Fines			Material Description
		From (ft)	To (ft)	Apparent[6]	Bulk SSD[7]	Bulk[8]	Absorption[9] (%)			LL	PL	PI	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	+3"	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total	
TP08-413	1	3.0	4.0						22	-	-	-	101	19	124	9	0	46	13	59	6	11	11	28	13		13	Sandy GRAVEL, some silt/clay
TP08-415	1	4.0	5.0						21	-	-	-	107	17	115	14	0	20	8	28	2	2	10	14	50	8	58	Gravelly SILT, some sand, trace clay
TP08-419	2	4.0	5.0	2.69	2.57	2.50	2.9	2.71	7	-	-	-					0	24	20	44	8	19	20	47	9		9	SAND and GRAVEL, trace silt/clay
TP08-421	1	4.0	5.0	2.75	2.64	2.58	2.3	2.67	17	33	17	16	110	17	117	14	0	17	7	24	3	6	10	19	44	13	57	Gravelly SILT, some sand, some clay
TP10-424	1	2.0	3.0						16	28	18	10	113	15	117	13	0	6	17	23	8	11	20	39	27	11	38	Silty, gravelly SAND, some clay

M:\1\01\00176\35\A\Report\1-2010 SI Program Report\Rev 0\Tables\[Table 3.2 TP Lab Results Summary.xls]2010TPLABSUMMARY

NOTES:

1. ALL LABORATORY ANALYSES PERFORMED AT KNIGHT PIÉSOLD LTD. GEOTECHNICAL LABORATORY IN DENVER, CO.
2. PARTICLE SIZE DISTRIBUTION BY PERCENT WEIGHT.
3. MATERIAL CLASSIFICATION BASED ON CANADIAN FOUNDATION ENGINEERING MANUAL.
4. COBBLE CONTENT MAY VARY IN THE FIELD MATERIALS AS LARGE COBBLES AND BOULDERS ARE NOT USUALLY COLLECTED IN SAMPLES.
5. SPECIFIC GRAVITY - COARSE AGGREGATE (ASTM C 127).
6. APPARENT SPECIFIC GRAVITY IS THE RATIO OF THE WEIGHT IN AIR OF A UNIT VOLUME OF THE IMPERMEABLE PORTION OF AGGREGATE (DOES NOT INCLUDE THE PERMEABLE PORES IN AGGREGATE) TO THE WEIGHT IN AIR OF AN EQUAL VOLUME OF GAS-FREE DISTILLED WATER AT THE STATED TEMPERATURE.
7. BULK SSD SPECIFIC GRAVITY IS THE RATIO OF THE WEIGHT IN AIR OF A UNIT VOLUME OF AGGREGATE, INCLUDING THE WEIGHT OF WATER WITHIN THE VOIDS FILLED TO THE EXTENT ACHIEVED BY SUBMERGING IN WATER FOR APPROXIMATELY 15 HOURS, TO THE WEIGHT IN AIR OF AN EQUAL VOLUME OF GAS-FREE DISTILLED WATER AT THE STATED TEMPERATURE.
8. BULK SPECIFIC GRAVITY IS THE RATIO OF THE WEIGHT IN AIR OF A UNIT VOLUME OF AGGREGATE AT A STATED TEMPERATURE TO THE WEIGHT IN AIR OF AN EQUAL VOLUME OF GAS-FREE DISTILLED WATER AT THE STATED TEMPERATURE.
9. ABSORPTION IS THE INCREASE IN WEIGHT DUE TO WATER CONTAINED IN THE PORES OF THE AGGREGATE MATERIAL.
10. SPECIFIC GRAVITY - SOIL (ASTM D 854).

0	02DEC'10	ISSUED WITH REPORT VA101-176/35-1	LS	AL	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE 3.3

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION
GEOTECHNICAL DRILLHOLE SUMMARY INFORMATION SHEET

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Drillhole and Piezometer ID	Location	Alaska State Plane NAD 83 Coordinates			Nominal Hole Size[11]	Total Depth	Depth to Weathered Bedrock	Depth to Competent Bedrock	Hydraulic Conductivity Testing				Piezometer Information							Notes (artesian conditions, fault zones, zones with circulation loss, etc.)	Rock Type			
		Northing[1,2]	Easting[1,2]	Elevation[1,2]					Packer Test Zone		Packer Test (Lugeon)	Pressure Transducer Falling Head Test	Stickup	Size	Completion Zone		Depth to Water[6,7,8]		Hydraulic Conductivity (Rising/Falling Head)		Depth		Lithocode[3]	Bedrock Type[4]
		(ft)	(ft)	(ft)		(ft)	(ft)	(ft)	From (ft)	To (ft)	(cm/s)	(cm/s)	(ft)	(in)	From (ft)	To (ft)	(ft)	Date Measured	(cm/s)		From (ft)	To (ft)		
GH10-211	Area E	2,161,758	1,397,211	1,463	PQ to 26' HQ to 50'	50	6	16	33	50	No flow at P1, P4, P5	-	2.17	1	27	46	7.3	24-Oct-10	2.E-05	No PQ core boxes available at start of drilling, first box is PQ core in HQ size core box. No SPT's completed as overburden was very shallow. Shear/rubble zones, 43-44' and 49-50'. Drillhole was terminated as rods sheared off down hole. 5' casing stuck in hole from 21 - 26'.	6	50	G	Granodiorite
GH10-212	Area E	2,160,442	1,397,588	1,429	PQ to 60' HQ to 115'	115	58.5	58.5	75	100	No flow at P1 or P5.	-	1.97	1	44	61	42.6	24-Oct-10	6.E-07	UCS Samples collected at 64.5, 86, and 107'.	58.5	115	W-Y	Cretaceous Wacke-Siltstone/Mudstone
GH10-213	Area E	2,161,546	1,399,036	1,613	PQ to 29.5' HQ to 165'	165	20.5	115	49.3	75	1.E-05	-	4.27	1	44	66	31.8	24-Oct-10	5.E-06	Fault zone 69.5 - 90', UCS Sample collected at 155.5'.	20.5	69.5	G	Granodiorite
																					69.5	90	ZGY	FAULT
																					90	97	Y	Andesitic Siltstone
																					97	105	Q	Silicified Zone
																					105	118.9	Y	Andesitic Siltstone
																					118.9	165	D	Diorite
GH10-214	Area E	2,159,461	1,398,287	1,368	PQ to 57' HQ to 135'	135	30	105	110	135	3.E-06	-	2.95	1	40	55	28.6	24-Oct-10	1.E-05	UCS Samples collected at 107, 112, and 131', Fault zone from 101.5 - 103', ~50% clay gouge.	30	50	W	Highly Weathered Cretaceous Wacke
																					50	90	W	Cretaceous Wacke
																					90	135	Y-W	Cretaceous Siltstone/Mudstone/Wacke
GH10-215	Area G	2,165,467	1,382,647	1,154	PQ to 15' HQ to 75'	75	12	12	25 50	50 75	3.E-04 2.E-04	1.E-03 6.E-04	3.28	1	16.5	40	7.5	24-Oct-10	4.E-04	PQ Casing to 15'.	12	75	B	Cretaceous Basalt
GH10-216	Area G	2,150,793	1,373,405	1,545	7.75" Tricone to 21' PQ to 80' HQ to 130'	130	59	77	85	110	5.E-04	1.E-03	3.28	2	50	80	21.5	24-Oct-10	4.E-06	Triconed to 21' to install 6 inch permanent casing which was later pulled, encountered many large boulders in the first 21', lots of heaving sands from 25 to 60', then appear to hit weathered bedrock unit. Lost circulation at 85', 87.5 - 92, 104 - 107, 110 - 115, 115 - 117, 120 - 122'.	59	80	TW/TY	Highly Weathered Tertiary Wacke/Tertiary Siltstone/Mudstone
									103	130	-	-									80	130	TX	Tertiary Volcaniclastic Breccia Conglomerate
GH10-217	Open Pit Area	2,158,419	1,400,918	1,285	PQ to 57' HQ to 80' NQ to 144'	144	26	Not Reached	94	144	6.E-05	-	2.95	1	115	136	80.4	24-Oct-10	5.E-05	Drilled through void from 75 - 77', Lost circulation in void. Did not reach competent rock.	26	55.4	D	Highly Weathered Diorite
																					55.4	144	D	Diorite
GH10-218	Open Pit Area	2,156,964	1,400,731	1,166	PQ to 94' HQ to 144'	144	51	Not Reached	89	119	1.E-04	-	3.28	1	122	142	25.7	24-Oct-10	3.E-04	Lost circulation at 53 - 54'. Did not reach competent rock.	51	124	D	Highly Weathered Diorite
									119	144	2.E-05	-									124	144	N	Highly Weathered Monzodiorite
GH10-219	Upper Talarik Creek Area	2,160,637	1,405,153	1,012	PQ to 53' HQ to 158'	158	49	49	63	88	9.E-05	3.E-04	3.28	1	32	59	10.2	24-Oct-10	1.E-05	Healed Fault Breccia from 76.5 - 80'.	49	106	TF	Tertiary Volcaniclastic Breccia Conglomerate
									93	118	2.E-04	5.E-05												
									113	138	2.E-05	-									106	159	TC	Tertiary Conglomerate
									133	158	No flow at P1, P4, P5	-												
GH10-220	Area L	2,148,401	1,366,690	1,986	PQ to 13' HQ to 600'	600	7	15	20	45	2.E-04	3.E-04	3.41	1.5	34.5	65	25.4	24-Oct-10	N/A	PQ casing to 13', Pure-Vis utilized during drilling over intervals of this drillhole from 29 -35', 45 - 60', 70 - 225', 235 - 385', 420 - 460', and 520 - 560'. Lost circulation from 97 - 100' and 186 - 187'. Hole was flushed prior to installation and air lift was completed from 200' upward. Twenty port WestBay™ system installed by Schlumberger Water Services. Water levels supplied by SLR Consulting, See Appendix D for details.	7	600	G	Granodiorite
									45	70	4.E-04	4.E-05												
									70	95	-	-			69.5	90	25.3							
									14	120	-	2.E-04												
									95	120	2.E-04	-			94.5	135	25.2							
									120	145	3.E-04	-			139.5	155	24.9							
									145	185	3.E-05	-			159.5	177	24.8							
									185	210	7.E-05	6.E-05			181.5	210	24.6							
									210	235	2.E-04	3.E-05			214.7	245	24.4							
									235	260	-	-			249.7	270	24.3							
									235	285	-	1.E-04			274.7	295	24.2							
									285	335	-	3.E-05			299.7	325	24.1							
									335	385		1.E 04			329.7	375	24.0							
									375	420	-	5.E-05			379.8	405	23.9							
									420	470	4.E-05	1.E-04			409.8	430	23.7							
									470	520	No Take.	-			434.8	455	23.6							
									520	570	4.E-05	1.E-04			459.8	480	23.5							
									520	600	5.E-05	4.E-05			484.8	510	23.4							
									365	600	2.E-05	3.E-05			514.8	540	23.3							
									275	600	2.E-05	2.E-05			544.8	575	23.1							
									185	600	1.E-06	9.E-06			580	600	23.0							

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TABLE 3.3

PEBBLE LIMITED PARTNERSHIP
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2010 GEOTECHNICAL SITE INVESTIGATION
GEOTECHNICAL DRILLHOLE SUMMARY INFORMATION SHEET

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Drillhole and Piezometer ID	Location	Alaska State Plane NAD 83 Coordinates			Nominal Hole Size[11]	Total Depth	Depth to Weathered Bedrock	Depth to Competent Bedrock	Hydraulic Conductivity Testing				Piezometer Information							Notes (artesian conditions, fault zones, zones with circulation loss, etc.)	Rock Type			
		Northing[1,2]	Easting[1,2]	Elevation[1,2]					Packer Test Zone		Packer Test (Lugeon)	Pressure Transducer Falling Head Test	Stickup	Size	Completion Zone		Depth to Water[6,7,8]		Hydraulic Conductivity (Rising/Falling Head)		Depth		Lithocode[3]	Bedrock Type[4]
		(ft)	(ft)	(ft)		(ft)	(ft)	(ft)	From (ft)	To (ft)	(cm/s)	(cm/s)	(ft)	(in)	From (ft)	To (ft)	(ft)	Date Measured	(cm/s)		From (ft)	To (ft)		
GH10-221	Open Pit Area	2,159,171	1,405,547	1,006	PQ to 73' HQ to 139'	139	88	88.2	99 114	129 139	- -	4.E-05 -	3.94	1	116	135	12.7	24-Oct-10	4.E-05	Heaving sands and circulation problems after 65' in overburden.	88	139	TC	Tertiary Conglomerate Wacke
GH10-222	Open Pit Area	2,156,961	1,406,600	1,054	PQ to 75' HQ to 130'	130	75	86.3	100	130	5.E-05	-	2.95	1	96	125	63.2	24-Oct-10	6.E-06	Lots of cobbles and boulders encountered up to 45' depth.	75	86.3	TC	Highly Weathered Tertiary Conglomerate
																					86.3	106.2	TC	Tertiary Conglomerate
																					106.2	114.3	TY	Tertiary Siltstone/Mudstone
																					114.3	130	TX	Tertiary Volcaniclastic Breccia Conglomerate
GH10-223	Open Pit Area	2,156,284	1,404,713	1,005	PQ to 45' HQ to 110'	110	43	43	60	85	5.E-05	7.E-05	3.28	1	50	75	15.6	24-Oct-10	1.E-04	PQ Casing installed to 45'.	43.5	49.8	TB	Tertiary Basalt
																					49.8	58.3	D	Cretaceous Diorite
																					58.3	60	G	Granodiorite
																					60	64.7	D	Diorite
																					64.7	70.4	G	Granodiorite
									85	110	5.E-05	2.E-05									70.4	98	D	Diorite
																					98	104.3	G	Granodiorite
																					104.3	110	D	Diorite
GH10-224	Open Pit Area	2,154,519	1,403,806	1,009	PQ to 25' HQ to 80'	80	12	35	35	60	6.E-05	4.E-04	3.61	1	10	36	7	24-Oct-10	5.E-04	Lost circulation from 16 - 19'.	12	70	G	Granodiorite
									55	80	6.E-05	-									70	80	D?	Diorite
GH10-225	Area L	2,147,632	1,367,812	1,960	PQ to 22' HQ to 400' NQ to 600' ***Downhole depths***	600	6	17	40	90	1.E-04	4.E-04	5.5	1	241		6	26-Oct-10	N/A	Drillhole azimuth is 322° and drillhole was inclined at 66°. ***Downhole Depths***, depths are not corrected to ground surface. Lost circulation from 499 - 500' and 551.5 - 552.5'. Water level above ground surface during drilling. Artesian conditions beginning at ~270 ft, 0.5 - 1gpm at 410', 1 - 2.5gpm at 500'.	6	600	G	Granodiorite
									90	140	2.E-05	3.E-05												
									140	190	2.E-05	4.E-05												
									190	240	2.E-05	2.E-05			371		6	26-Oct-10						
									220	270	5.E-06	1.E-05												
									270	320	2.E-05	1.E-04												
									320	370	1.E-05	1.E-05			446		6	26-Oct-10						
									370	400	2.E-05	-												
									410	460	-	-												
									450	500	2.E-06	1.E-05												
									500	550	2.E-06	3.E-05			553		9	26-Oct-10						
									520	600	2.E-07	2.E-04												
									415	600	2.E-05	-												
GH10-226	Area A, Valley Bottom	2,142,009	1,403,372	998	7.75" Tricone to 5', Permanent 6" casing installed to 22' PQ to 160'	160	Did not reach bedrock.		No Packer Tests Performed				No piezometer installed.							, Lost circulation at 160', hole collapsed in from 35' to 160'.	N/A			
GH10-227	Upper Talarik Creek Area	2,155,964	1,421,653	798	PQ to 30' HQ to 200'	200	25	30	105	130	1.E-05	3.E-04	2.58	1	7	30	0.25	25-Oct-10	8.E-06	Artesian conditions encountered @ 55', ~0.05gpm during drilling process.	25	30	TKM	Highly Weathered Tertiary Monzonite
									45	130	4.E-05	-									30	52	TKM	Tertiary Monzonite
									150	180	4.E-05	1.E-04									52	70	FZ	Fault Zone
									0	200	-	5.E-06	2.58	1	40	60	-0.2	25-Oct-10	7.E-06		70	200	TF	Tertiary Volcaniclastic Conglomerate
GH10-228	Upper Talarik Creek Area	2,158,170	1,421,905	762	PQ to 45' HQ to 240'	240	84	84	165	205	-	2.E-04	3.41	1	91	116	15.7	25-Oct-10	3.E-06	Frozen overburden material from 15 - 20' depth, Lost circulation at 205'.	84	240	TX/TF	Tertiary Volcaniclastic Breccia/Conglomerate
									215	240	3.E-04	6.E-04												

M:\1\01\00176\05\A\Report\1-2010 SI Program Report\Rev 0\Tables\[Table 3.3 2010 GH Drillhole Summary.xls]Table 3.3 GH Summary

NOTES:
1. NAD 83, ALASKA STATE PLANE - ZONE 5 (ft).
2. DRILLHOLE COORDINATES PROVIDED BY PLP.
3. LITHOCODES WERE PROVIDED BY PLP.
4. DETAILED GEOTECHNICAL DRILLHOLE DATA IS INCLUDED IN APPENDIX B AND C.
5. PACKER HYDRAULIC CONDUCTIVITY TESTS (LUGEON METHOD) AND FALLING/RISING HEAD TESTS WERE COMPLETED IN THE BEDROCK. RISING/FALLING HEAD TESTS (HVORSLEV METHOD) WERE CONDUCTED IN EITHER THE BEDROCK OR OVERBURDEN DEPENDING ON THE LOCATION OF THE COMPLETION ZONE OF THE PIEZOMETER.
6. UNLESS OTHERWISE INDICATED, ALL DEPTH MEASUREMENTS ARE TAKEN WITH RESPECT TO GROUND SURFACE LEVEL. ALL WATER LEVEL MEASUREMENTS ARE WITH RESPECT TO GROUND SURFACE. POSITIVE = BELOW GROUND LEVEL, NEGATIVE = ABOVE GROUND LEVEL.
8. STATIC WATER LEVELS VARY SEASONALLY.
9. RMR89 = ROCK MASS RATING CLASSIFICATION SYSTEM (BIENIAWSKI, 1989).
10. UNCONFINED COMPRESSIVE STRENGTH (UCS) VALUES WERE ESTIMATED IN THE FIELD FOR A RELATIVE MEASUREMENT OF INTACT ROCK STRENGTH.
11. SEE INDIVIDUAL OVERBURDEN LOGS AND BEDROCK LOGS FOR CORE SIZE DETAILS.

0	20JAN'11	ISSUED WITH REPORT VA101-176/05-1	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.4

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION
SUMMARY OF OVERBURDEN DRILLING LABORATORY TESTING RESULTS

Print Mar/28/2011 10:05:21

Sample Type	Drillhole	Sample ID	Depth		Moisture Content (%)	Density		Specific Gravity	Total			Effective			Atterberg Limits			Particle Size Distribution											Classification
			From (ft)	To (ft)		Bulk Density (pcf)	Dry Density (pcf)		c (psf)	ϕ (°)	Tanϕ	c (psf)	ϕ (°)	Tanϕ	LL	PL	PI	Cobbles	% Gravel			% Sand				% Fines			Material Description
																			Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total	
STANDARD PENETRATION TESTS	GH10-212	1	12.0	13.5	22	-	-	2.76	-	-	-	-	-	-	-	-	-	0	6	12	18	9	16	20	45	25	12	37	Silty SAND, some gravel, some clay
		3	24.0	25.5	18	-	-	2.71	-	-	-	-	-	-	-	-	-	0	12	30	42	11	23	11	45	8	5	13	SAND,and GRAVEL, trace silt, trace clay
		5	34.0	35.5	14	-	-	-	-	-	-	-	-	-	-	-	-	0	13	43	56	17	15	6	38	6		6	GRAVEL and SAND, trace silt/clay
	GH10-213	1	5.0	6.5	51	-	-	2.77	-	-	-	-	-	-	28	17	11	-	-	-	-	-	-	-	-	-	-	-	-
	GH10-214	1	5.0	6.5	12	-	-	-	-	-	-	-	-	-	-	-	-	0	8	37	45	12	14	12	38	17		17	GRAVEL and SAND, some silt/clay
		3	15.0	16.5	19	-	-	2.76	-	-	-	-	-	-	-	-	-	0	19	23	42	10	13	13	36	22		22	Silty/Clayey GRAVEL and SAND
		4	20.0	21.5	14	-	-	2.70	-	-	-	-	-	-	-	-	-	0	25	27	52	9	13	10	32	16		16	Sandy GRAVEL, some silt/clay
		5	25.0	26.5	15	-	-	2.74	-	-	-	-	-	-	-	-	-	0	26	30	56	7	12	10	29	15		15	Sandy GRAVEL, some silt/clay
		7	35.0	36.5	25	-	-	-	-	-	-	-	-	-	37	27	10	0	10	11	21	15	15	12	42	31	6	37	Silty, Gravelly SAND, trace clay
	GH10-215	2	10.0	11.5	22	-	-	2.68	-	-	-	-	-	-	-	-	-	0	9	6	15	8	16	23	47	33	5	38	Silty SAND, some gravel, trace clay
	GH10-216	2	35.0	36.5	10	-	-	-	-	-	-	-	-	-	-	-	-	0	15	62	77	10	5	3	18	5		5	GRAVEL, some sand, trace silt/clay
		3	40.0	41.5	27	-	-	2.66	-	-	-	-	-	-	-	-	-	0	0	1	1	72	16	5	93	6		6	SAND, trace silt/clay, trace gravel
		4	65.0	66.5	29	-	-	-	-	-	-	-	-	-	47	26	21	0	0	8	8	2	13	32	47	34	11	45	Silty SAND, some clay, trace gravel
	GH10-217	2	9.0	10.5	26	-	-	2.74	-	-	-	-	-	-	39	15	24	0	3	16	19	7	14	16	37	28	16	44	Silty SAND, some gravel, some clay
		5	24.0	25.5	17	-	-	2.69	-	-	-	-	-	-	27	20	7	0	4	30	34	20	17	9	46	15	5	20	Gravelly SAND, some silt, trace clay
	GH10-218	3	14.0	15.5	14	-	-	-	-	-	-	-	-	-	-	-	-	0	12	33	45	25	17	6	48	7		7	SAND and GRAVEL, trace silt/clay
		5	24.0	25.5	24	-	-	2.73	-	-	-	-	-	-	-	-	-	0	9	15	24	10	15	14	39	25	12	37	Silty, gravelly SAND, some clay
	GH10-219	1	4.0	5.5	30	-	-	-	-	-	-	-	-	-	33	19	14	0	0	22	22	9	11	14	34	32	12	44	Silty, Gravelly SAND, some clay
		4	19.0	20.5	31	-	-	-	-	-	-	-	-	-	37	18	19	0	0	0	0	2	1	44	47	37	16	53	SAND and SILT, some clay
		5	24.0	25.5	32	-	-	2.71	-	-	-	-	-	-	34	18	16	0	0	0	0	1	1	48	50	34	16	50	Silty SAND, some clay
		6	29.0	30.5	31	-	-	-	-	-	-	-	-	-	35	19	16	0	0	0	0	0	1	13	14	65	21	86	Clayey SILT, some sand
		8	39.0	40.5	17	-	-	2.71	-	-	-	-	-	-	-	-	-	0	4	24	28	11	16	15	42	21	9	30	Gravelly, silty SAND, trace clay
		9	44.0	45.5	18	-	-	-	-	-	-	-	-	-	-	-	-	0	9	12	21	7	12	14	33	30	16	46	Silty, gravelly SAND, some clay
	GH10-221	2	10.0	11.5	27	-	-	-	-	-	-	-	-	-	35	22	13	0	14	14	28	11	16	17	44	18	10	28	Gravelly SAND, some silt, trace clay
		4	20.0	21.5	30	-	-	2.62	-	-	-	-	-	-	44	26	18	0	14	41	55	11	12	8	31	10	4	14	Sandy GRAVEL, trace silt, trace clay
		5	25.0	26.5	18	-	-	-	-	-	-	-	-	-	-	-	-	0	4	23	27	8	13	15	36	26	11	37	Gravelly, silty SAND, some clay
		7	45.0	46.5	26	-	-	-	-	-	-	-	-	-	-	-	-	0	0	8	8	5	4	33	42	37	13	50	SAND and SILT, some clay, trace gravel
	GH10-222	1	5.0	6.5	17	-	-	-	-	-	-	-	-	-	23	16	7	0	7	27	34	14	14	12	40	19	7	26	Gravelly SAND, some silt, trace clay
		3	15.0	16.5	16	-	-	2.67	-	-	-	-	-	-	29	15	14	0	11	29	40	6	10	11	27	23	10	33	Sandy, silty GRAVEL, trace clay
		5	25.0	26.5	16	-	-	2.71	-	-	-	-	-	-	-	-	-	0	17	15	32	9	11	11	31	23	14	37	Sandy, silty GRAVEL, some clay
		7	35.0	36.5	18	-	-	-	-	-	-	-	-	-	24	16	8	0	6	28	34	10	17	12	39	21	6	27	Gravelly, silty SAND, trace clay
		12	60.0	61.5	14	-	-	-	-	-	-	-	-	-	-	-	-	0	50	34	84	8	4	1	13	3		3	GRAVEL, some sand, trace silt/clay

Knight Piésold CONSULTING

TABLE 3.4

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION
SUMMARY OF OVERBURDEN DRILLING LABORATORY TESTING RESULTS

Print Mar/28/2011 10:05:21

Sample Type	Drillhole	Sample ID	Depth		Moisture Content (%)	Density		Specific Gravity	Total			Effective			Atterberg Limits			Particle Size Distribution											Classification
			From (ft)	To (ft)		Bulk Density (pcf)	Dry Density (pcf)		c (psf)	ϕ (°)	Tanϕ	c (psf)	ϕ (°)	Tanϕ	LL	PL	PI	Cobbles	% Gravel			% Sand				% Fines			Material Description
																			Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total	
	GH10-223	1	5.0	6.5	12	-	-	-	-	-	-	-	-	-	NP	NP	NP	0	18	45	63	15	14	4	33	4		4	Sandy GRAVEL, trace silt/clay
		2	10.0	11.5	13	-	-	-	-	-	-	-	-	-	-	-	-	0	20	30	50	14	20	9	43	6	1	7	GRAVEL and SAND, trace silt, trace clay
		5	30.0	31.5	26	-	-	-	-	-	-	-	-	-	30	19	11	0	11	2	13	1	2	28	31	40	16	56	Sandy SILT, some clay, some gravel
		7	40.0	41.5	17	-	-	2.74	-	-	-	-	-	-	36	16	20	0	10	24	34	10	21	11	42	15	9	24	Gravelly SAND, some silt, trace clay
	GH10-226	1	5.0	6.5	24	-	-	-	-	-	-	-	-	-	35	17	18	0	10	24	34	10	9	8	27	26	13	39	Sandy, silty GRAVEL, some clay
		3	30.0	31.5	12	-	-	-	-	-	-	-	-	-	-	-	-	0	24	33	57	11	12	8	31	12		12	Sandy GRAVEL, some silt/clay
		5	43.0	44.5	21	-	-	-	-	-	-	-	-	-	27	NP	NP	0	23	4	27	2	2	24	28	41	4	45	Sandy, gravelly SILT, trace clay
		7	53.0	54.5	24	-	-	2.71	-	-	-	-	-	-	44	14	30	0	0	7	7	3	7	10	20	41	32	73	Clayey SILT, some sand, trace gravel
		8	58.0	59.5	18	-	-	-	-	-	-	-	-	-	-	-	-	0	0	9	9	19	24	31	74	17		17	SAND, some silt/clay, trace gravel
		10	70.0	71.5	19	-	-	-	-	-	-	-	-	-	39	16	23	0	0	6	6	3	5	5	13	52	29	81	Clayey SILT, some sand, trace gravel
		12	95.0	96.5	10	-	-	-	-	-	-	-	-	-	26	14	12	0	15	38	53	9	10	10	29	12	6	18	Sandy GRAVEL, some silt, trace clay
		17	155.0	156.5	32	-	-	2.71	-	-	-	-	-	-	NP	NP	NP	0	0	0	0	0	43	45	88	12		12	SAND, some silt/clay
	GH10-227	1	10.0	11.5	13	-	-	-	-	-	-	-	-	-	25	13	12	0	9	46	55	8	7	11	26	13	6	19	Sandy GRAVEL, some silt, trace clay
		3	20.0	21.5	15	-	-	-	-	-	-	-	-	-	25	13	12	0	0	30	30	8	11	23	42	18	10	28	Gravelly SAND, some silt, trace clay
	GH10-228	1	7.0	8.5	30	-	-	2.72	-	-	-	-	-	-	36	19	17	0	0	0	0	1	1	2	4	58	38	96	SILT and CLAY, trace sand
		3	17.0	18.5	37	-	-	-	-	-	-	-	-	-	30	19	11	0	0	0	0	1	4	0	5	67	28	95	Clayey SILT, trace sand
SHELBY TUBES	GH10-226	2	15.0	17.0	18	-	111.8	2.71	482	18.0	0.32	369	31.1	0.60	37	17	20	0	9	10	19	3	6	11	20	38	23	61	Clayey SILT, some sand, some gravel
		3	20.0	22.0	17	-	113.4	2.74	919	16.8	0.30	591	30.7	0.59	35	17	18	0	3	10	13	5	10	14	29	37	21	58	Sandy, clayey SILT, some gravel
	GH10-227	1	5.0	7.0	13	-	127.0	2.76	0	24.8	0.46	371	37.3	0.76	24	15	9	0	15	19	34	6	11	17	34	22	10	32	Silty SAND and GRAVEL, trace clay
	GH10-228	1	5.0	7.0	25	-	98.3	2.73	400	17.2	0.31	195	30.2	0.58	37	19	18	0	0	1	1	1	1	2	4	54	41	95	SILT and CLAY, trace sand, trace gravel
		2	10.0	12.0	30	-	91.8	-	1156	15.9	0.28	602	30.0	0.58	37	19	18	0	0	1	1	1	1	2	4	60	35	95	Clayey SILT, trace sand, trace gravel
		3	15.0	17.0	34	-	86.1	-	0	17.8	0.32	334	29.2	0.56	32	20	12	0	0	0	0	1	0	1	2	66	32	98	Clayey SILT, trace sand
TILL	GH10-222	1	66.0	67.5	13	-	111.6	-	-	-	-	-	-	-	42	18	24	0	9	17	26	6	10	15	31	28	15	43	Silty, gravelly, SAND, some clay
	GH10-223	1	35.0	38.0	12	-	113.1	-	-	-	-	-	-	-	33	18	15	8	16	17	41	7	10	10	27	22	10	32	Sandy, silty GRAVEL, trace clay
	GH10-226	1	81.3	84.0	11	-	114.7	-	-	-	-	-	-	-	27	21	6	0	18	20	38	3	13	16	32	23	7	30	Sandy, silty GRAVEL, trace clay
HAND DUG SAMPLES	GH10-216	1	0.0	2.0	16	-	-	-	-	-	-	-	-	-	-	-	-	0	6	7	13	3	8	27	38	45	4	49	SILT and SAND, some gravel, trace clay
		2	2.0	4.0	12	-	-	-	-	-	-	-	-	-	-	-	-	0	6	9	15	6	14	38	58	22	6	27	Silty SAND, some gravel, trace clay
	GH10-220	1	0.0	3.0	30	-	-	-	-	-	-	-	-	-	-	-	-	0	15	7	22	7	25	25	57	17	4	21	Gravelly SAND, some silt, trace clay
	GH10-224	1	1.0	2.0	19	-	-	-	-	-	-	-	-	-	25	18	7	0	7	7	14	4	13	18	35	41	10	51	SILT and SAND, some gravel, trace clay
	GH10-225	1	SPOIL	PILE	10	-	-	-	-	-	-	-	-	-	21	NP	NP	7	34	8	49	5	12	13	30	19	2	21	Sandy GRAVEL, some silt, trace clay

M:\1\01\00176\35\A\Report\1-2010 SI Program Report\Rev 0\Tables\[Table 3.4 2010 SPT Lab Results Summary.xls]Table 3.4

NOTES:

1. ALL LABORATORY ANALYSES PERFORMED AT KNIGHT PIÉSOLD LTD. GEOTECHNICAL LABORATORY IN DENVER, CO.
2. MOISTURE CONTENTS OF THE SPT SAMPLES MAY BE ARTIFICIALLY HIGH DUE TO DRILLING MUD INFLUENCE.

0	28JAN11	ISSUED WITH REPORT VA101-176/35-1	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 5.1

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATION
SUMMARY OF TEST PIT STANDARD PROCTOR LABORATORY TESTING RESULTS

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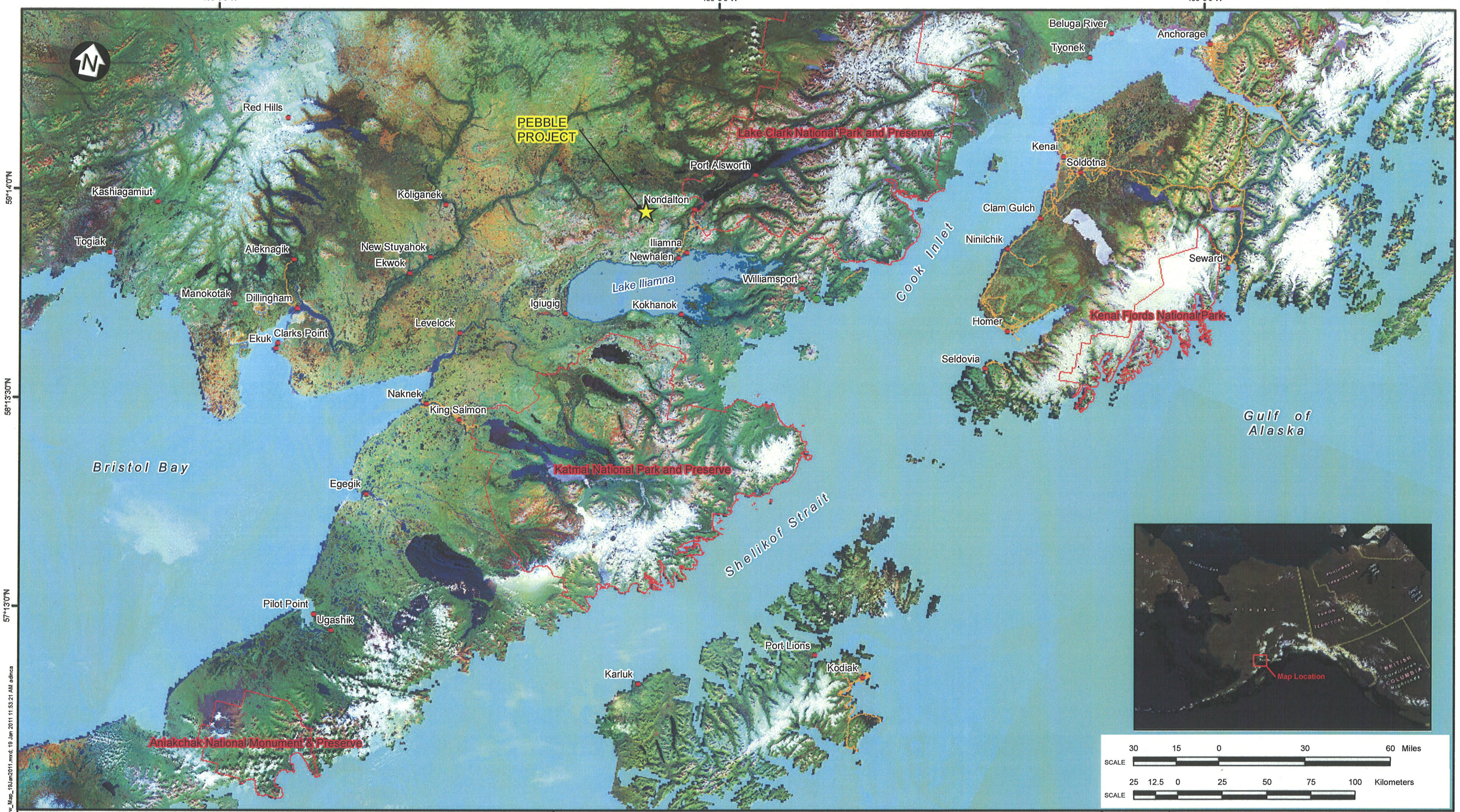
Test Pit ID	Sample ID	Area	Depth		Specfic Gravity Coarse Aggregate[5]				Specific Gravity[10]	Natural Moisture Content[11] (%)	Atterberg Limits			Standard Proctor				Particle Size Distribution[2]											Classification[3]
														Uncorrected		Corrected		% Cobbles[4]	% Gravel			% Sand				% Fines			Material Description
			From (ft)	To (ft)	Apparent[6]	Bulk SSD[7]	Bulk[8]	Absorption[9] (%)			LL	PL	PI	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	+3"	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total	
TP05-119	1	Area A, Lower Mid Side Slopes	1.0	3.0					2.70	15	29	20	9	117	14	125	10	6	-	-	29	-	-	-	35	19	16	35	Gravelly SAND, some silt, some clay
TP05-119	2	Area A, Lower Mid Side Slopes	3.0	5.0					2.70	30	41	23	18	103	20	106	18	0	-	-	11	-	-	-	19	42	29	71	Clayey SILT, some sand, some gravel
TP05-120	1	Area A, Lower Mid Side Slopes	3.0	4.6					2.70	22	34	19	15	111	16	115	14	0	-	-	15	-	-	-	39	25	21	45	Silty, clayey SAND, some gravel
TP05-124	1	Area A, Lower Mid Side Slopes	3.0	4.0					2.70	22	37	21	16	112	14	114	13	0	-	-	8	-	-	-	37	26	29	56	Clayey, silty SAND, trace gravel
TP05-133	1	Open Pit Area - East	5.0	6.0					2.70	6	NP	-	-	114	14	128	8	0	-	-	57	-	-	-	42	2		2	GRAVEL and SAND, trace silt/clay
TP05-135	1	Open Pit Area - East	2.5	3.0					2.70	15	25	19	6	121	12	125	10	0	-	-	21	-	-	-	33	27	19	46	Silty, Gravelly SAND, some clay
TP05-139	2	Open Pit Area - Central	4.0	4.6					2.70	13	21	20	1	126	9	129	8	0	-	-	22	-	-	-	61	12	6	18	Gravelly SAND, some silt, trace clay
TP05-147	1	Open Pit Area - Central	0.7	1.6					2.70	22	23	NP	-	108	15	114	13	0	-	-	21	-	-	-	49	23	8	31	Silty, gravelly SAND, trace clay
TP05-147	2	Open Pit Area - Central	3.0	4.0					2.70	7	NP	-	-	120	13	130	10	0	-	-	44	-	-	-	52	4		4	SAND and GRAVEL, trace silt/clay
TP05-155	2	Upper Talarik Creek Area	4.0	4.3					2.70	8	26	17	9	127	9	131	8	0	-	-	25	-	-	-	62	5	9	13	Gravelly SAND, trace clay, trace silt
TP05-167	2	Area E	4.6	5.6					2.70	17	33	25	8	118	13	130	8	0	-	-	43	-	-	-	22	25	10	35	Silty, sandy GRAVEL, some clay
TP05-168	2	Area E	5.0	5.6					2.70	15	NP	-	-	108	15	110	15	0	-	-	12	-	-	-	75	13		13	SAND, some silt/clay, some gravel
TP05-170	1	Area E	1.6	2.6					2.70	14	NP	-	-	108	15	110	14	0	-	-	8	-	-	-	74	13	5	18	SAND, some silt, trace gravel, trace clay
TP05-172	2	Area E	5.6	5.9					2.70	17	26	24	2	122	10	130	7	0	-	-	36	-	-	-	39	19	6	25	SAND and GRAVEL, some silt, trace clay
TP10-352	1	Upper Talarik Creek Area	3.4	3.8	2.79	2.64	2.55	3.3	2.64	18	40	16	24	113	16	119	13	0	19	16	35	4	10	13	27	26	12	38	Sandy, Silty GRAVEL, some clay
TP10-361	1	Area G	2.0	3.0						15	18	NP	NP	116	12	123	10	0	18	9	27	6	9	17	32	37	4	41	Sandy, Gravelly SILT, trace clay
TP10-362	1	Area J	2.0	3.0						12	-	-	-	119	12	127	9	0	27	10	37	8	17	18	43	20		20	SAND and GRAVEL, some silt/clay
TP10-380	1	Open Pit Area - Central	3.0	4.0						14	-	-	-	116	14	124	11	0	16	15	31	6	11	12	29	32	8	40	Gravelly, sandy SILT, trace clay
TP10-391	1	Area A, Lower Mid Side Slopes	4.0	5.0	2.69	2.46	2.33	5.7	2.69	16	33	18	15	115	14	120	11	0	19	18	37	8	12	11	31	22	10	32	Sandy, silty GRAVEL, trace clay
TP10-399	1	Area A, Lower Mid Side Slopes	4.0	5.0						16	39	19	20	116	13	123	11	0	23	21	44	6	11	10	27	20	9	29	Sandy GRAVEL, some silt, trace clay
TP10-402	1	Area A, Valley Bottom	3.0	4.0						18	32	NP	NP	116	13	119	12	0	9	39	48	10	15	15	40	10	2	12	GRAVEL and SAND, trace silt, trace clay
TP10-405	1	Upper Talarik Creek Area	2.0	3.0	2.72	2.56	2.46	3.9	2.66	18	-	-	-	110	16	117	13	0	15	14	29	7	10	14	31	29	11	40	Silty, gravelly SAND, some clay
TP08-413	1	Area A, Lower Mid Side Slopes	3.0	4.0						22	-	-	-	101	19	124	9	0	46	13	59	6	11	11	28	13		13	Sandy GRAVEL, some silt/clay
TP08-415	1	Area A, Lower Mid Side Slopes	4.0	5.0						21	-	-	-	107	17	115	14	0	20	8	28	2	2	10	14	50	8	58	Gravelly SILT, some sand, trace clay
TP08-421	1	Area A, Lower Mid Side Slopes	4.0	5.0	2.75	2.64	2.58	2.3	2.67	17	33	17	16	110	17	117	14	0	17	7	24	3	6	10	19	44	13	57	Gravelly SILT, some sand, some clay
TP10-424	1	Open Pit Area - East	2.0	3.0						16	28	18	10	113	15	117	13	0	6	17	23	8	11	20	39	27	11	38	Silty, gravelly SAND, some clay

M:\1\01\00176\35\A\Report\1-2010 SI Program Report\Rev 0\Tables\[Table 5.1 Proctor Lab Results Summary.xls]2005-2010PROCTORSUMMARY

NOTES:

1. ALL LABORATORY ANALYSES PERFORMED AT KNIGHT PIÉSOLD LTD. GEOTECHNICAL LABORATORY IN DENVER, CO.
2. PARTICLE SIZE DISTRIBUTION BY PERCENT WEIGHT.
3. MATERIAL CLASSIFICATION BASED ON CANADIAN FOUNDATION ENGINEERING MANUAL.
4. COBBLE CONTENT MAY VARY IN THE FIELD AS LARGE COBBLES AND BOULDERS ARE NOT USUALLY COLLECTED IN SAMPLES.
5. SPECIFIC GRAVITY - COARSE AGGREGATE (ASTM C 127).
6. APPARENT SPECIFIC GRAVITY IS THE RATIO OF THE WEIGHT IN AIR OF A UNIT VOLUME OF THE IMPERMEABLE PORTION OF AGGREGATE (DOES NOT INCLUDE THE PERMEABLE PORES IN AGGREGATE) TO THE WEIGHT IN AIR OF AN EQUAL VOLUME OF GAS-FREE DISTILLED WATER AT THE STATED TEMPERATURE.
7. BULK SSD SPECIFIC GRAVITY IS THE RATIO OF THE WEIGHT IN AIR OF A UNIT VOLUME OF AGGREGATE, INCLUDING THE WEIGHT OF WATER WITHIN THE VOIDS FILLED TO THE EXTENT ACHIEVED BY SUBMERGING IN WATER FOR APPROXIMATELY 15 HOURS, TO THE WEIGHT IN AIR OF AN EQUAL VOLUME OF GAS-FREE DISTILLED WATER AT THE STATED TEMPERATURE.
8. BULK SPECIFIC GRAVITY IS THE RATIO OF THE WEIGHT IN AIR OF A UNIT VOLUME OF AGGREGATE AT A STATED TEMPERATURE TO THE WEIGHT IN AIR OF AN EQUAL VOLUME OF GAS-FREE DISTILLED WATER AT THE STATED TEMPERATURE.
9. ABSORPTION IS THE INCREASE IN WEIGHT DUE TO WATER CONTAINED IN THE PORES OF THE AGGREGATE MATERIAL.
10. SPECIFIC GRAVITY - SOIL (ASTM D 854).
11. TEST PIT SAMPLES ARE COLLECTED AT SHALLOW DEPTHS AND MAY HAVE HIGH NATURAL MOISTURE CONTENTS DUE TO FREEZE-THAW DISTURBANCE.

0	11MAR'11	ISSUED WITH REPORT VA101-176/35-1	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND:

EXISTING ROAD

NATIONAL PARK/PRESERVE BOUNDARY

NOTES:

1. BASE MAP: ESRI 150M EARTHSAT IMAGERY OBTAINED AT WWW.GEOGRAPHYNETWORK.COM

2. COORDINATE GRID IS IN DEGREES.
DATUM: NAD83.
PROJECTION: ALASKA STATE PLANE ZONE 5 (FEET).

3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:2,000,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	AMD	AMD	LS	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

PROJECT LOCATION MAP

Knight Piésold CONSULTING

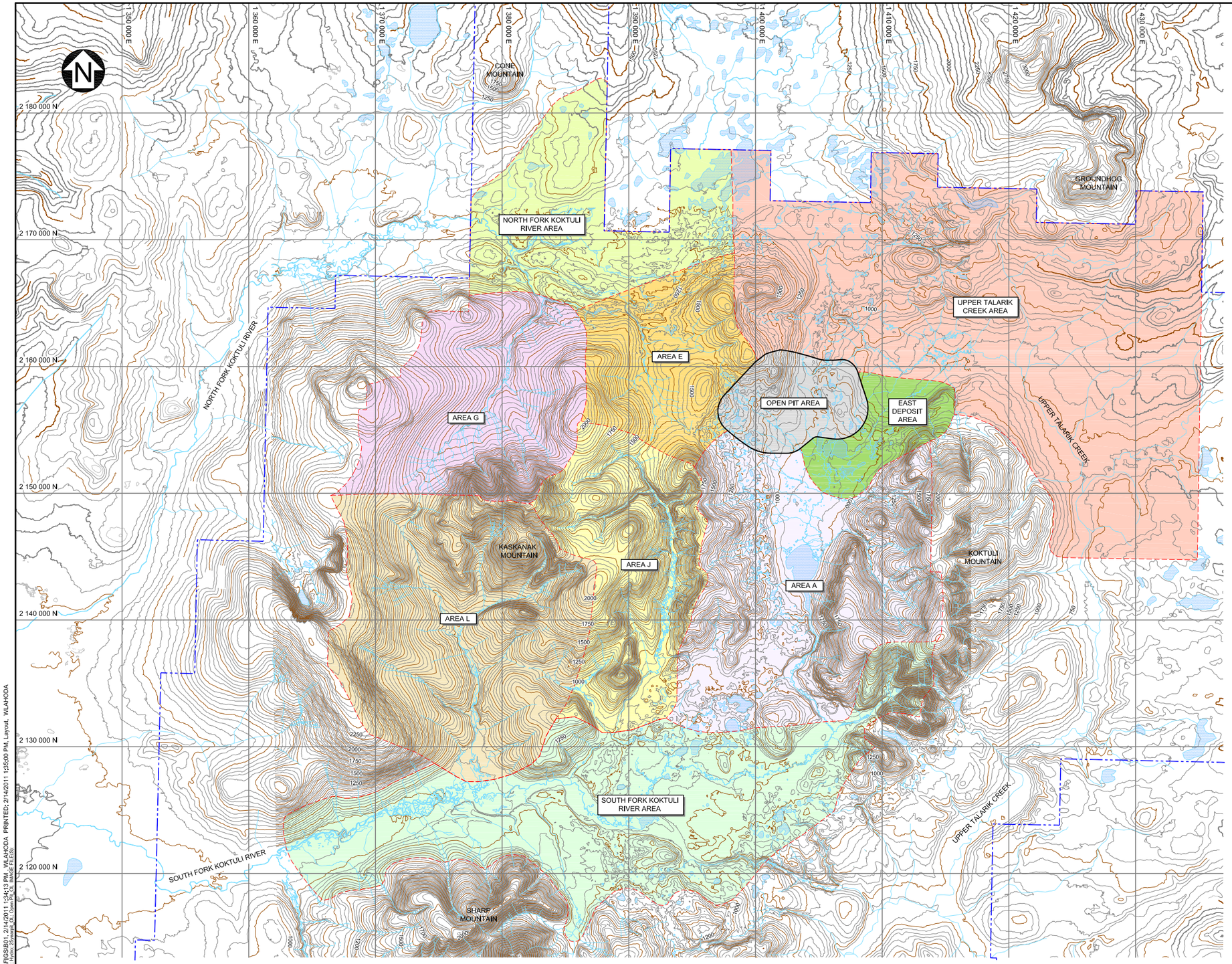
P/A NO. VA101-176/35

REF NO. 1

FIGURE 1.1

REV 0

SAVED: M:\1\01\00176\35\A\GIS\Figs\Overview_Map_18Jan2011.mxd; 19 Jan 2011 11:53:21 AM adinca



LEGEND:

- PLP MINERAL CLAIM BOUNDARY
- AREA BOUNDARIES

NOTES:

1. AREAS HAVE BEEN UPDATED AND RENAMED AND THIS FIGURE SUPERSEDES PREVIOUSLY ISSUED REPORTS.

SCALE A: 4000 0 4000 8000 12000 16000 20000 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	PP	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

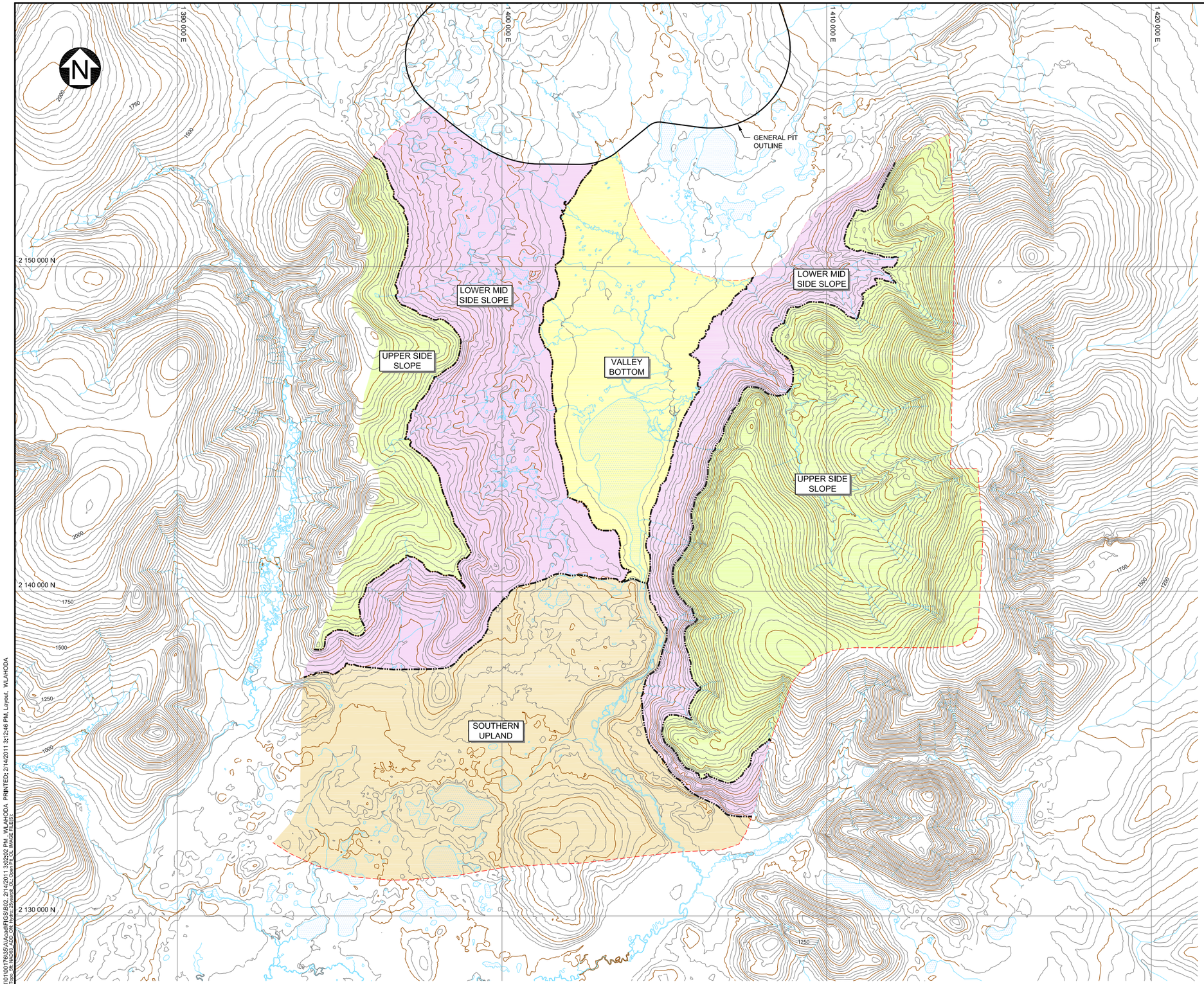
GENERAL SITE PLAN

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 1.2 REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B\01, 2/14/2011 1:34:13 PM , WILAHODA PRINTED: 2/14/2011 1:35:00 PM, Layout, WILAHODA
XREF FILE(S): Topo_Rlt; IN\265_ADD_OK; Hydro 25year; ALL Open Pit OL; IMAGE FILE(S):



LEGEND:

- AREA BOUNDARIES
- BOUNDARY OF SUBAREA WITHIN AREA A

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	WAL	LJG	KJB

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PEBBLE PROJECT

SUB-AREAS OF AREA A

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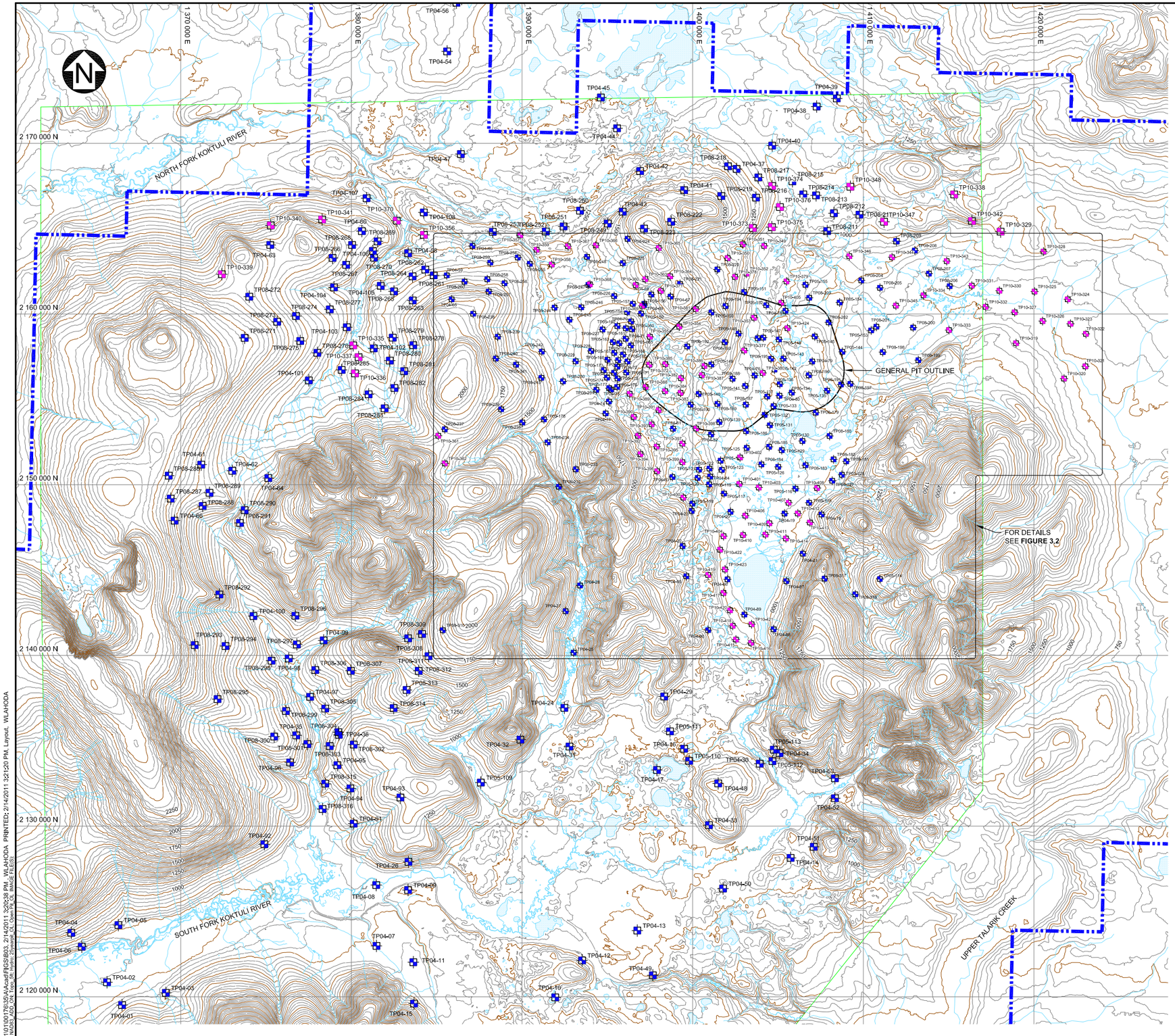
P/A NO. VA101-176/35

REF NO. 1

FIGURE 1.3

REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B02, 2/14/2011 3:02:02 PM , WLAHODA PRINTED: 2/14/2011 3:12:46 PM, Layout: WLAHODA
XREF FILE(S): 1390-JPL-NADS_ADD-DM_Hydro-Dynamic_CL Open Pit_02E; IMAGE FILE(S):



LEGEND:

- PLP MINERAL CLAIM BOUNDARY
- TP08-200 — 2004 TO 2008 TEST PITS
- TP10-333 — 2010 TEST PITS

NOTES:

1. NO TEST PITS WERE EXCAVATED IN 2006 AND 2007.

SCALE A: 3000 0 3000 6000 9000 12000 15000 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	WAL	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

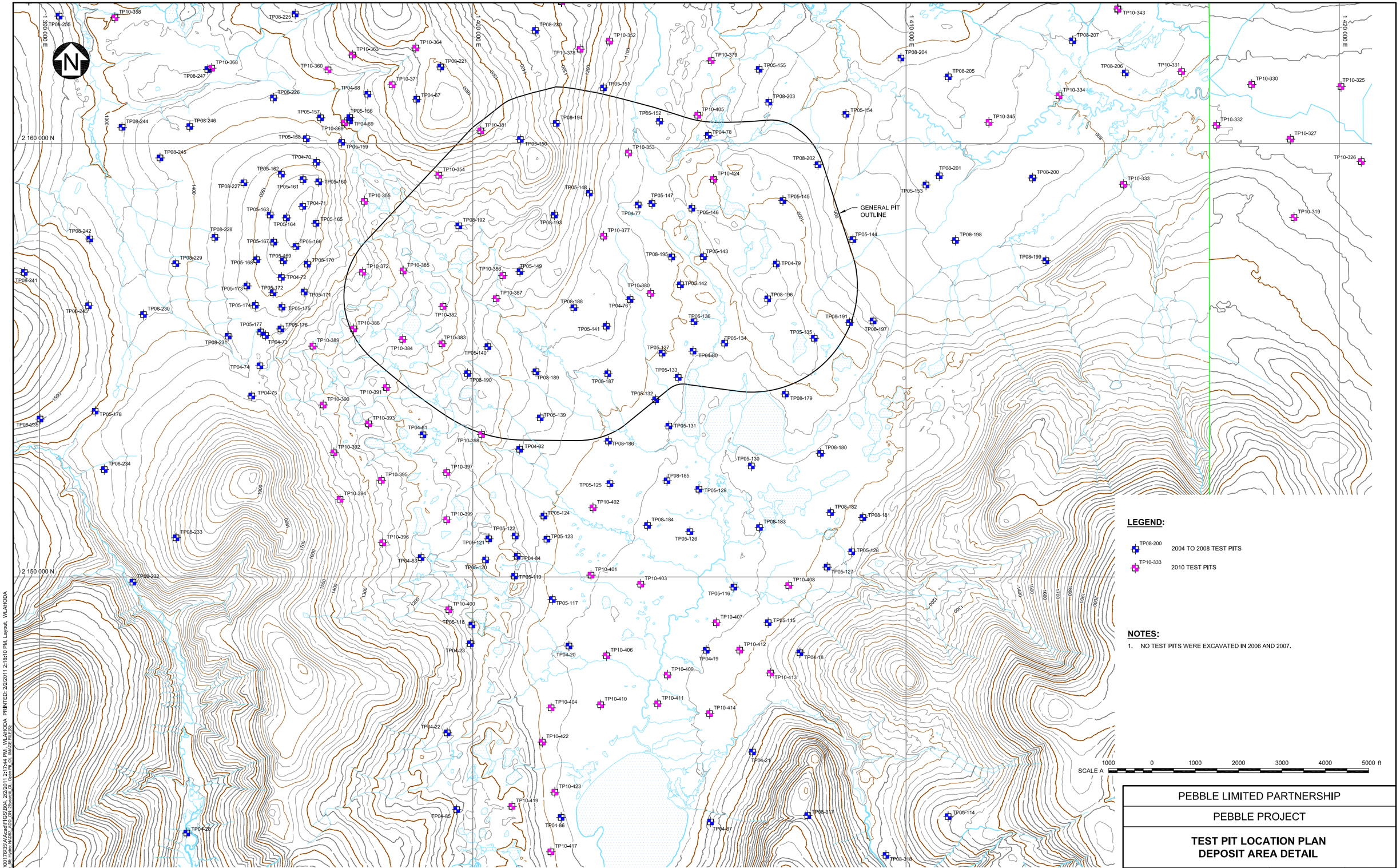
TEST PIT LOCATION PLAN

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 3.1 | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B03, 2/14/2011 3:20:38 PM , WLAHODA PRINTED: 2/14/2011 3:21:20 PM, Layout, WLAHODA
XREF FILES: MD32_ADD_04_Topo_dtm, Hydro1, Dynamic_ALL, Open Pit_OL, BAUGE FILE(S)



REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	WAL	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

TEST PIT LOCATION PLAN
DEPOSIT AREA DETAIL

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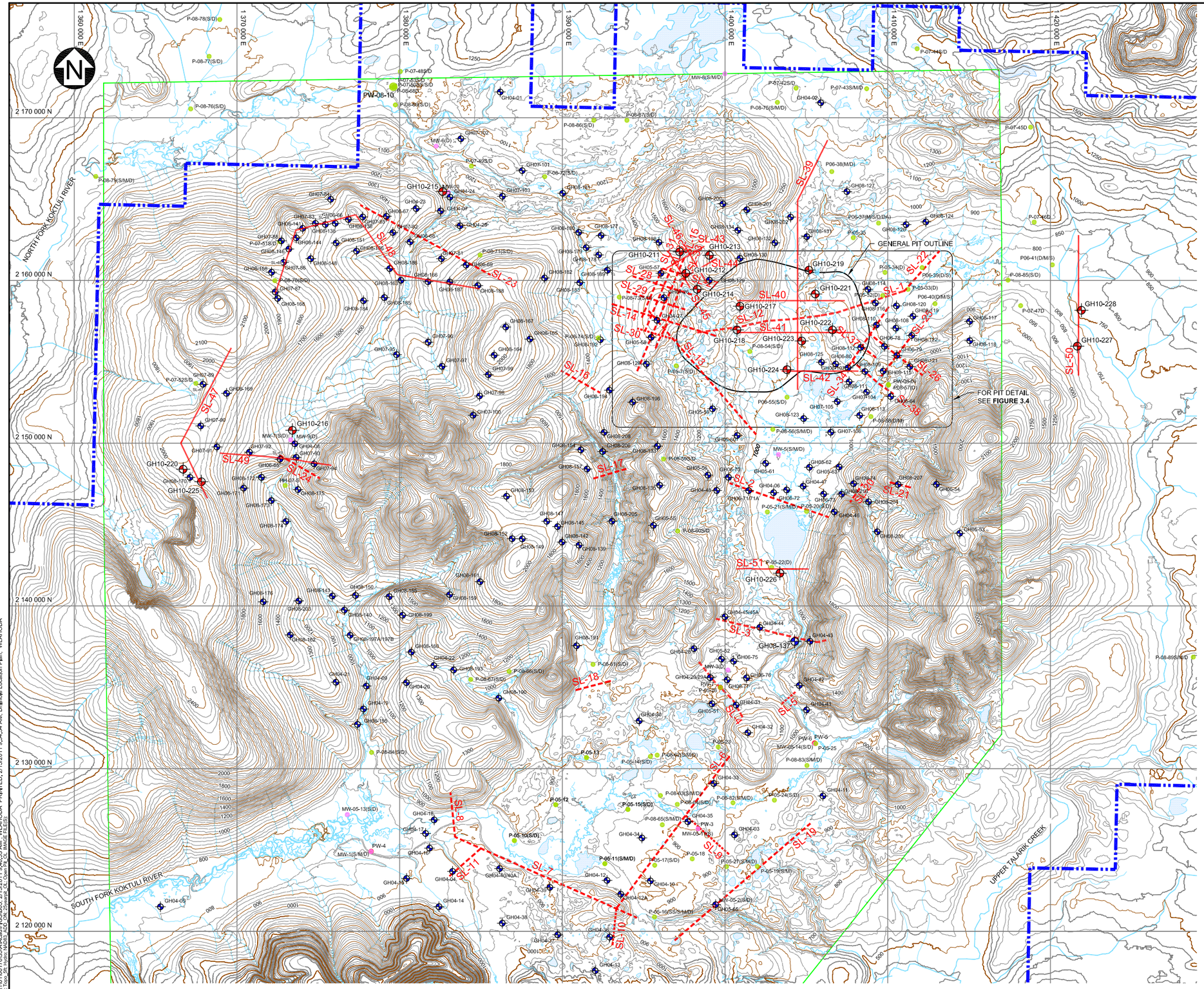
P/A NO.	REF NO.
VA101-176/35	1

FIGURE 3.2 REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B04, 2/2/2011 2:17:44 PM , WLAHODA PRINTED: 2/2/2011 2:18:10 PM, Layout, WLAHODA
XREF FILE(S): Hess_Rh_Hydro;14UM3_ADD_ON_25year;ai_QL Open Pit_QL Bridge FILE(S)



LEGEND:

PLP

PLP MINERAL CLAIM BOUNDARY

KP

GH08-153 — 2004 TO 2008 GEOTECHNICAL DRILLHOLES

GH10-217 — 2010 GEOTECHNICAL DRILLHOLES

WMC/SLR

P-1 — COMPLETED PIEZOMETER

PW-1 — COMPLETED PUMPING TEST LOCATION

MW-1 — COMPLETED BASELINE MONITORING WELLS

FRONTIER

SEISMIC LINE 2004 - 2006

SEISMIC LINE 2010

NOTES:

1. STANDPIPE PIEZOMETERS WERE INSTALLED IN ALL 2010 GEOTECHNICAL DRILLHOLES EXCEPT GH10-220, WHERE A WESTBAY (TM) SYSTEM WAS INSTALLED, GH10-225, WHERE NESTED VIBRATING WIRES WERE INSTALLED, AND GH10-226, WHICH COLLAPSED.
2. TWO DIGITS AFTER GH DENOTE THE YEAR THE DRILLHOLE WAS COMPLETED.
3. HH-07-S WAS DRILLED BY WMC/SLR, HH IS USUALLY A PROPOSED HOLE DESIGNATION.
4. NO SEISMIC LINES WERE COMPLETED IN 2007 OR 2008.

SCALE A: 3000 0 3000 6000 9000 12000 15000 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOCATION PLAN

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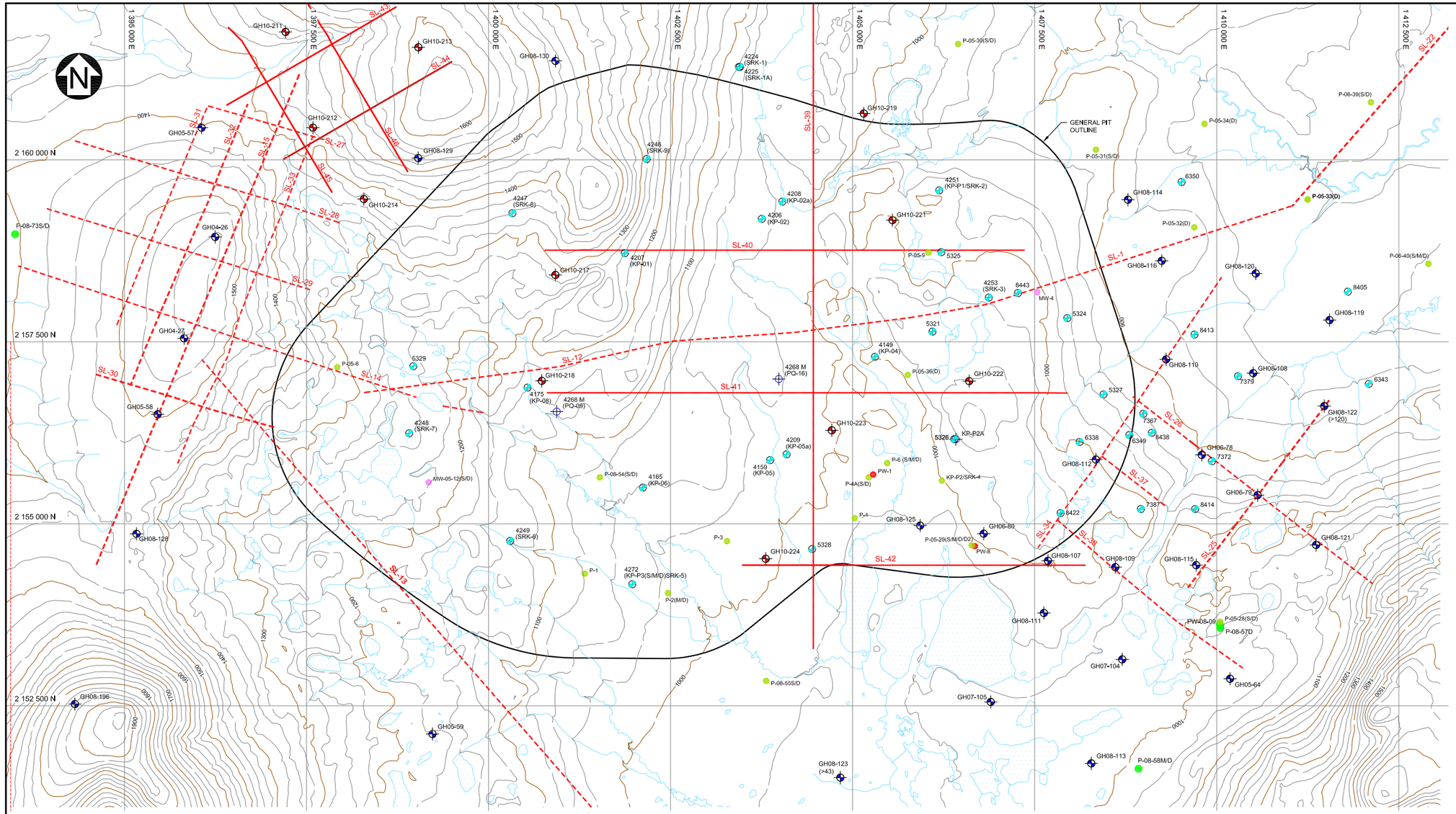
P/A NO.	REF NO.
VA101-176/35	1

FIGURE 3.3 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	PP	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B05, 2/15/2011 9:40:53 AM , WLAHODA PRINTED: 2/15/2011 9:54:34 AM, Drillhole Location Plan, WLAHODA
XREF FILE(S): 1bsrs-Bt-Hydro-MDS-ADD-ON-25sheets_ALL-Open Pit-01, MAVLE FILE(S):



LEGEND:

KP

- GH04-01 — 2004 TO 2008 GEOTECHNICAL DRILLHOLES
- 5326 — OPEN PIT GEOTECHNICAL DRILLHOLE / PLP EXPLORATION DRILLHOLE
- GH10-223 — 2010 GEOTECHNICAL DRILLHOLES
- 4278 M — PLP METALLURGICAL DRILLHOLES

WMC / SLR

- P-1 — COMPLETED PIEZOMETER
- PW-1 — COMPLETED PUMPING TEST LOCATION
- MW-1 — COMPLETED BASELINE MONITORING WELLS

FRONTIER

- SEISMIC LINE 2004 - 2006
- SEISMIC LINE 2010

SCALE A 500 0 500 1000 1500 2000 2500 3000 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOCATION PLAN DEPOSIT AREA

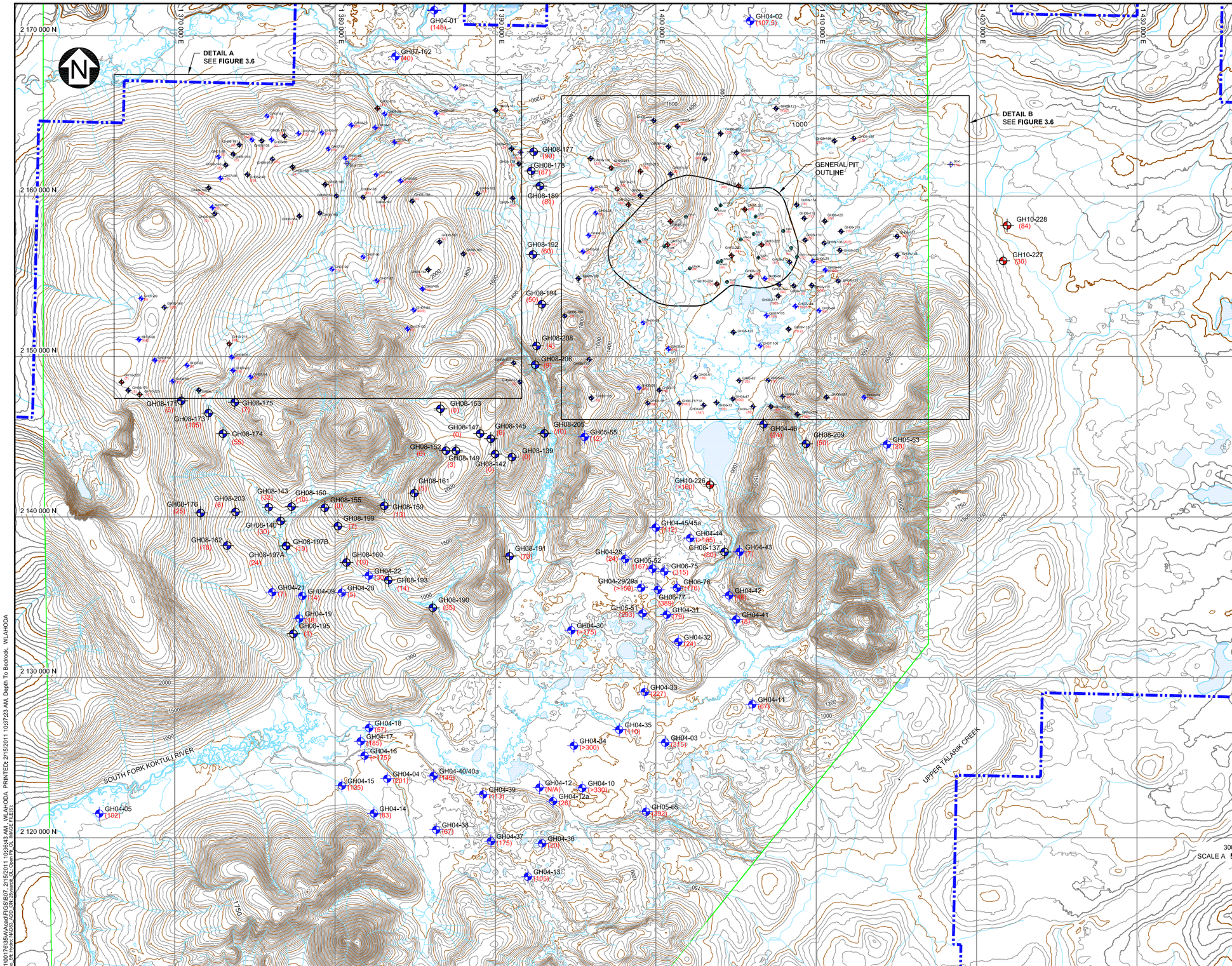
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 3.4 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	PP	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B06, 2/15/2011 1:01:31:0 AM , WLAHODA PRINTED: 2/15/2011 10:17:47 AM, Drillhole Location Plan [Close Up], WLAHODA
XREF FILES: Topo_2ft, Hybrid 2yearsft_v2, Open Pit_v2L BIMAGE FILE(S):



LEGEND:

PLP

PLP MINERAL CLAIM BOUNDARY

KP

GH04-01 (10)	2004 TO 2007 GEOTECHNICAL DRILLHOLE
4165 KP-06 (82)	OPEN PIT GEOTECHNICAL DRILLHOLE/ PLP EXPLORATION DRILLHOLE
GH08-193 (14)	2008 GEOTECHNICAL DRILLHOLE
GH10-211 (16)	2010 GEOTECHNICAL DRILLHOLES
91-1 (78)	1991 SRK DRILLHOLES

NOTES:

1. STANDPIPE PIEZOMETERS WERE INSTALLED IN ALL 2010 GEOTECHNICAL DRILLHOLES EXCEPT GH10-220, WHERE A WESTBAY (TM) SYSTEM WAS INSTALLED, GH10-225, WHERE NESTED VIBRATING WIRES WERE INSTALLED, AND GH10-226, WHICH COLLAPSED
2. RED NUMBERS IN PARENTHESES DENOTE THE DEPTH OF THE OVERBURDEN IN FEET.
3. SRK 1991 HOLE LOCATIONS ARE APPROXIMATE.

SCALE A 3000 0 3000 6000 9000 12000 15000 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	PP	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

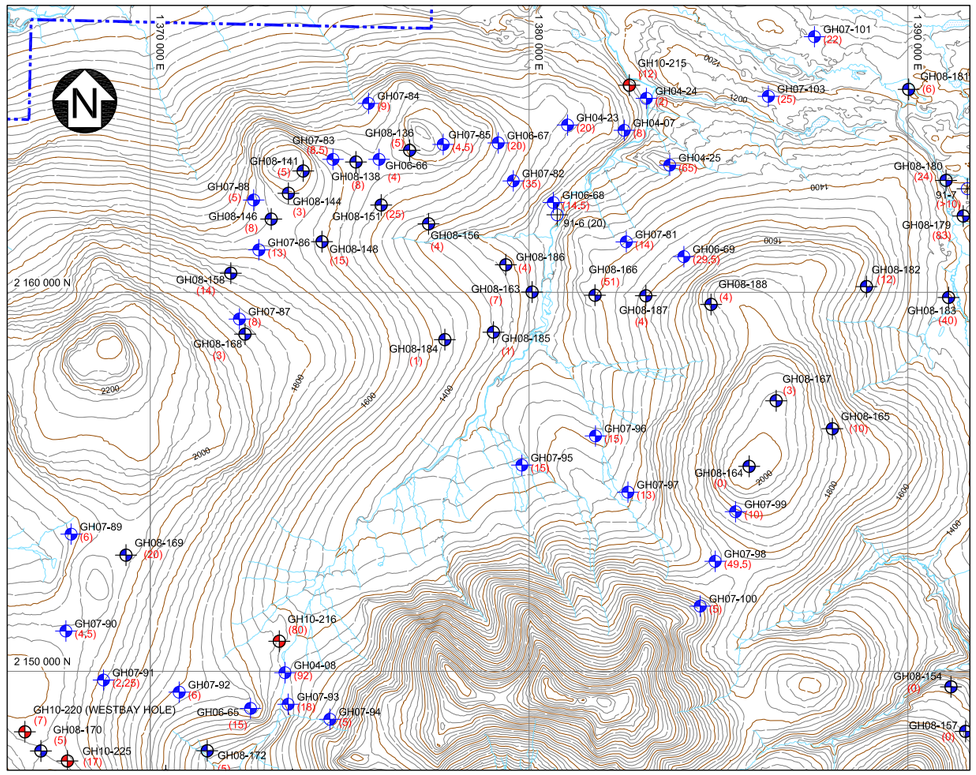
DEPTH TO BEDROCK

Knight Piésold CONSULTING

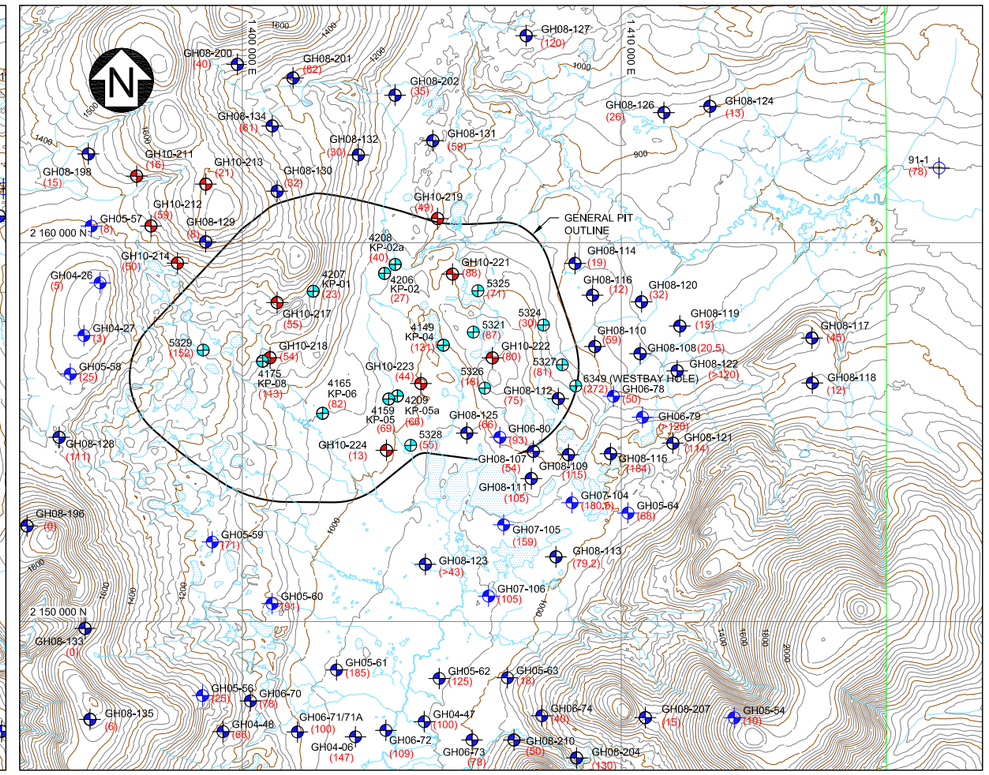
P/A NO.	REF NO.
VA101-176/35	1

FIGURE 3.5 REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B07, 2/15/2011 10:36:43 AM , WLAHODA PRINTED: 2/15/2011 10:37:23 AM, Depth To Bedrock, WLAHODA
XREF FILE(S): topo_0ft; hydro; IMDG_ADD_ON; Zoneware_Alt; Clean Plot; IMAGE FILE(S):



A 3.5 FIG **DETAIL**
SCALE A



B 3.5 FIG **DETAIL**
SCALE A

LEGEND:

PLP

PLP MINERAL CLAIM BOUNDARY

KP

GH04-41 (8)	2004 TO 2007 GEOTECHNICAL DRILLHOLE
KP-06 (82)	OPEN PIT GEOTECHNICAL DRILLHOLE / PLP EXPLORATION DRILLHOLE
GH08-115 (184)	2008 GEOTECHNICAL DRILLHOLES
GH10-211 (16)	2010 GEOTECHNICAL DRILLHOLES
91-1 (78)	1991 SRK DRILLHOLES

NOTES:

1. STANDPIPE PIEZOMETERS WERE INSTALLED IN ALL 2010 GEOTECHNICAL DRILLHOLES EXCEPT GH10-220, WHERE A WESTBAY (TM) SYSTEM WAS INSTALLED, GH10-225, WHERE NESTED VIBRATING WIRES WERE INSTALLED, AND GH10-226, WHICH COLLAPSED.
2. NUMBERS IN PARENTHESES DENOTE THE DEPTH OF THE OVERBURDEN IN FEET.
3. SRK 1991 HOLE LOCATIONS ARE APPROXIMATE.

2000 0 2000 4000 6000 8000 10000 ft
SCALE A

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	PP	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

DEPTH TO BEDROCK DETAILS

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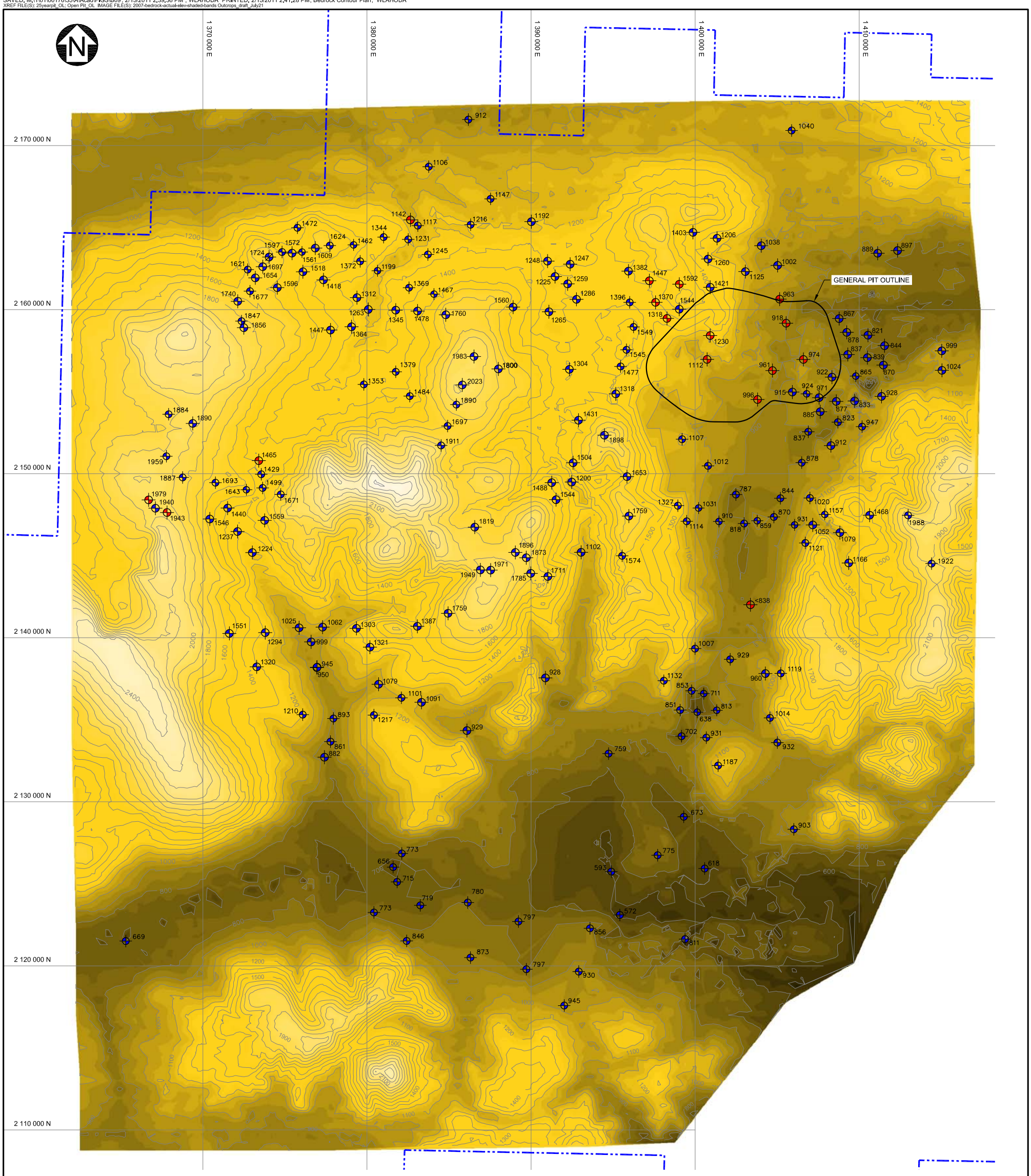
P/A NO. VA101-176/35 | REF NO. 1

FIGURE 3.6 | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B09, 2/15/2011 2:39:36 PM , WLAHODA PRINTED: 2/15/2011 2:41:28 PM, Bedrock Contour Plan, WLAHODA
XREF FILE(S): 25yearpit_OL; Open Pit_OL IMAGE FILE(S): 2007-bedrock-actual-elev-shaded-bands Outcrops_draft_July21



LEGEND:

- PLP MINERAL CLAIM BOUNDARY
- 800 — 2010 GEOTECHNICAL DRILLHOLES
- 800 — 2004 TO 2008 GEOTECHNICAL DRILLHOLES
- 1000 — BEDROCK CONTOURS (100' INTERVAL)

COLOR	ELEVATION (FT.) RANGE BEG.	ELEVATION (FT.) RANGE END
	422	550
	550	700
	700	850
	850	1000
	1000	1150
	1150	1300
	1300	1450
	1450	1600
	1600	1750
	1750	1900
	1900	2050
	2050	2200
	2200	2350
	2350	2500
	2500	2650
	2650	2718

NOTES:

1. THE BEDROCK ELEVATIONS WERE INTERPOLATED BETWEEN DRILLHOLES AND SHOULD BE CONSIDERED APPROXIMATE.
2. IMAGE BASED ON DRILLING TO THE END OF 2010.
3. BEDROCK OUTCROP GEOLOGY NOT SHOWN.
4. NUMBERS BESIDE DRILLHOLE DENOTE ELEVATION IN FEET OF THE DEPTH OF WEATHERED/FRACTURED OR COMPETENT BEDROCK.

SCALE A 3000 0 3000 6000 9000 12000 15000 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

PEBBLE SITE WIDE BEDROCK CONTOUR PLAN

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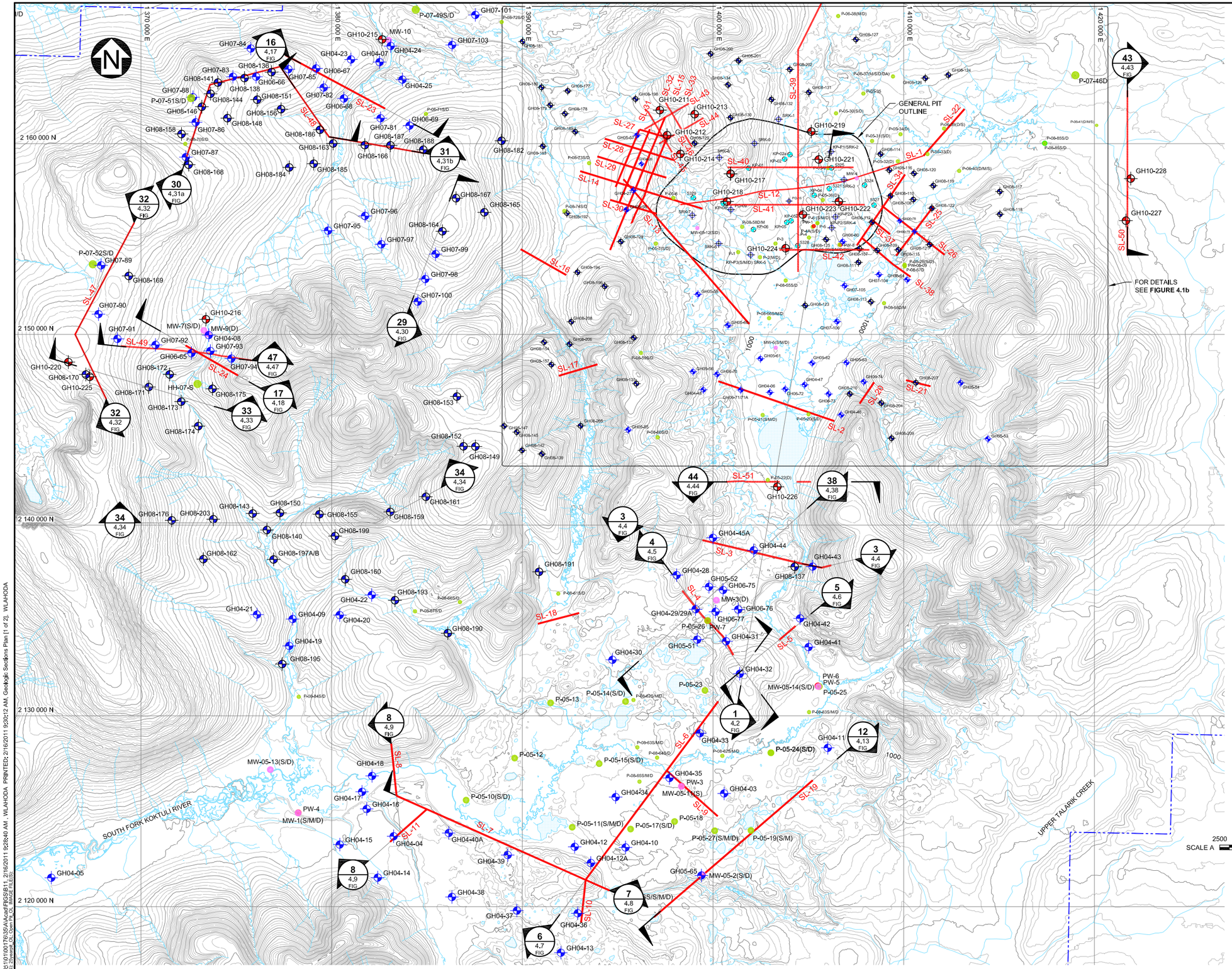
FIGURE 3.7 | REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	PP	LJG	KJB



LEGEND:

PLP MINERAL CLAIM BOUNDARY

KP

- GH10-119 — 2010 GEOTECHNICAL DRILLHOLES
- GH08-140 — 2008 GEOTECHNICAL DRILLHOLES
- GH04-1 — 2004 TO 2007 GEOTECHNICAL DRILLHOLES
- 4165 (KP-06) — OPEN PIT GEOTECHNICAL DRILLHOLE / PLP EXPLORATION DRILLHOLE

WMC / SLR

- P-1 — COMPLETED PIEZOMETER
- PW-1 — COMPLETED PUMPING TEST LOCATION
- MW-1 — COMPLETED BASELINE MONITORING WELLS

FRONTIER

- SL-1 — SEISMIC LINE

OTHER

- 4278 M (PQ-16) — PLP METALLURGICAL DRILLHOLE

NOTES:

1. STANDPIPE PIEZOMETERS WERE INSTALLED IN ALL 2010 GEOTECHNICAL DRILLHOLES EXCEPT GH10-220, WHERE A WESTBAY (TM) SYSTEM WAS INSTALLED, GH10-225, WHERE NESTED VIBRATING WIRES WERE INSTALLED, AND GH10-226, WHICH COLLAPSED.
2. HH-07-S WAS DRILLED BY WMC/SLR, HH IS USUALLY A PROPOSED HOLE DESIGNATION.
3. NO SEISMIC LINES WERE COMPLETED IN 2007 OR 2008.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	WAL	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

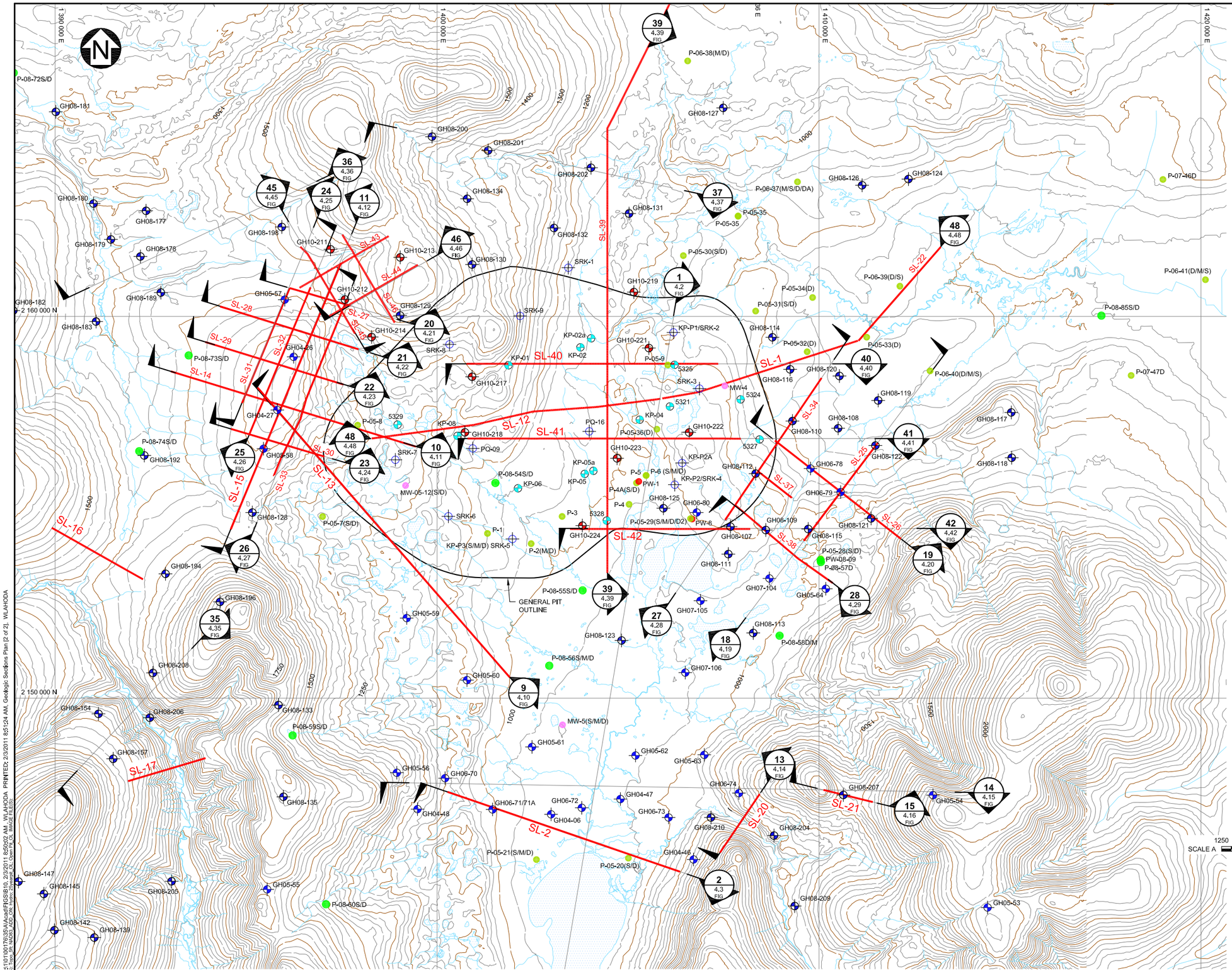
GEOLOGIC SECTIONS PLAN SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.1a | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B11, 2/16/2011 9:28:40 AM , WLAHODA PRINTED: 2/16/2011 9:30:12 AM, Geologic Sections Plan [1 of 2], WLAHODA
XREF FILES: 25years_QL, Open Pit_QL, IMAGE FILE(S):



LEGEND:

KP

GH10-219	2010 GEOTECHNICAL DRILLHOLES
GH08-117	2008 GEOTECHNICAL DRILLHOLES
GH04-1	2004 TO 2007 GEOTECHNICAL DRILLHOLES
4206 (KP-02)	OPEN PIT GEOTECHNICAL DRILLHOLES / PLP EXPLORATION DRILLHOLE

WMC / SLR

P-1	COMPLETED PIEZOMETER
PW-1	COMPLETED PUMPING TEST LOCATION
MW-1	COMPLETED BASELINE MONITORING WELLS

FRONTIER

SL-1	SEISMIC LINE

OTHER

4278 M (PQ-16)	PLP METALLURGICAL DRILLHOLE

NOTES:

1. STANDPIPE PIEZOMETERS WERE INSTALLED IN ALL 2010 GEOTECHNICAL DRILLHOLES EXCEPT GH10-220, WHERE A WESTBAY (TM) SYSTEM WAS INSTALLED, GH10-225, WHERE NESTED VIBRATING WIRES WERE INSTALLED, AND GH10-226, WHICH COLLAPSED.
2. TWO DIGITS AFTER GH DENOTE THE YEAR THE DRILLHOLE WAS COMPLETED.
3. HH-07-S WAS DRILLED BY WMC/SLR, HH IS USUALLY A PROPOSED HOLE DESIGNATION
4. NO SEISMIC LINES WERE COMPLETED IN 2007 OR 2008.

SCALE A 1250 0 1250 2500 3750 5000 6250 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	WAL	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

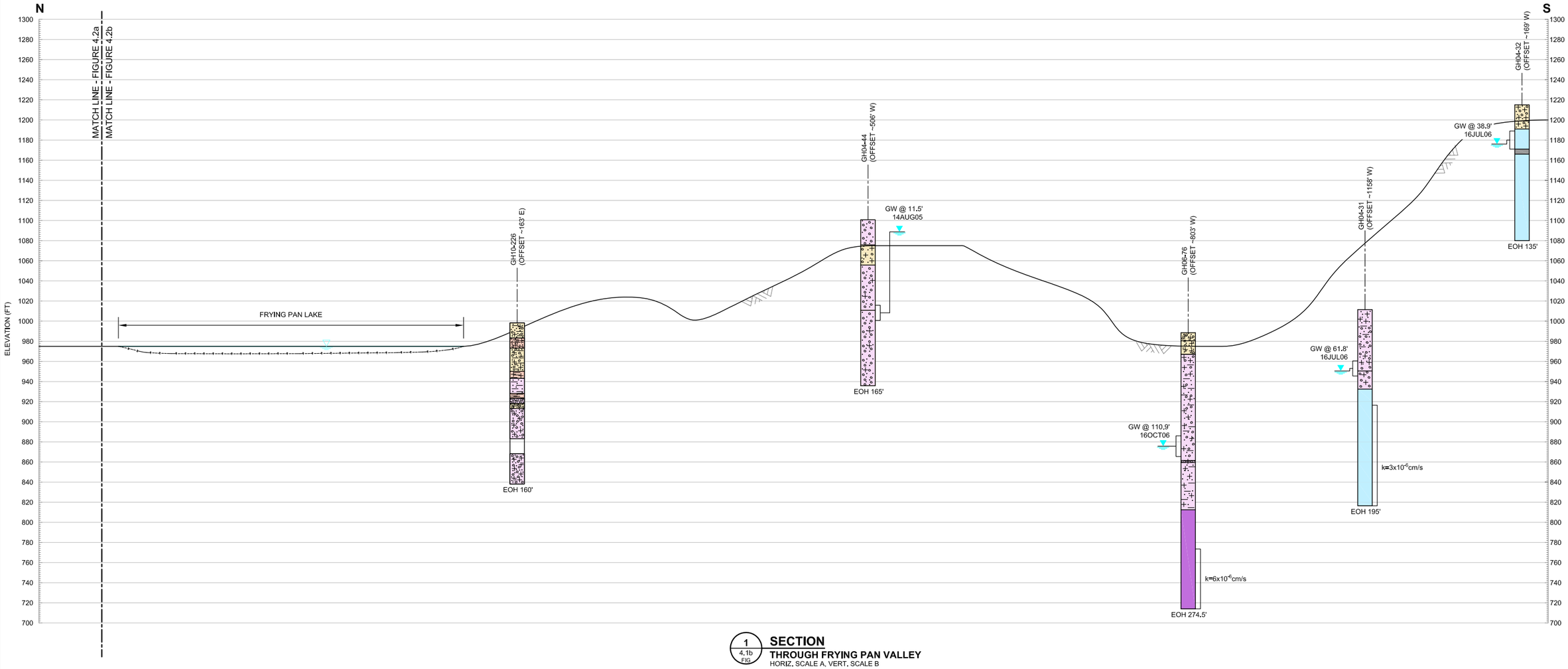
GEOLOGIC SECTIONS PLAN SHEET 2 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.1b REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B10, 2/3/2011 8:50:02 AM , WLAHODA PRINTED: 2/3/2011 8:51:24 AM, Geologic Sections Plan [2 of 2], WLAHODA
XREF FILES: Texas_2N_NAD83_ADD_ON, Hydro_Topo_DLT_Open_PLOT, IMAGE FILES:



1 / 4.1b FIG

SECTION
THROUGH FRYING PAN VALLEY
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. NO PIEZOMETER WAS INSTALLED IN GH04-40A.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

FRYING PAN VALLEY GEOLOGIC SECTION SHEET 2 OF 2

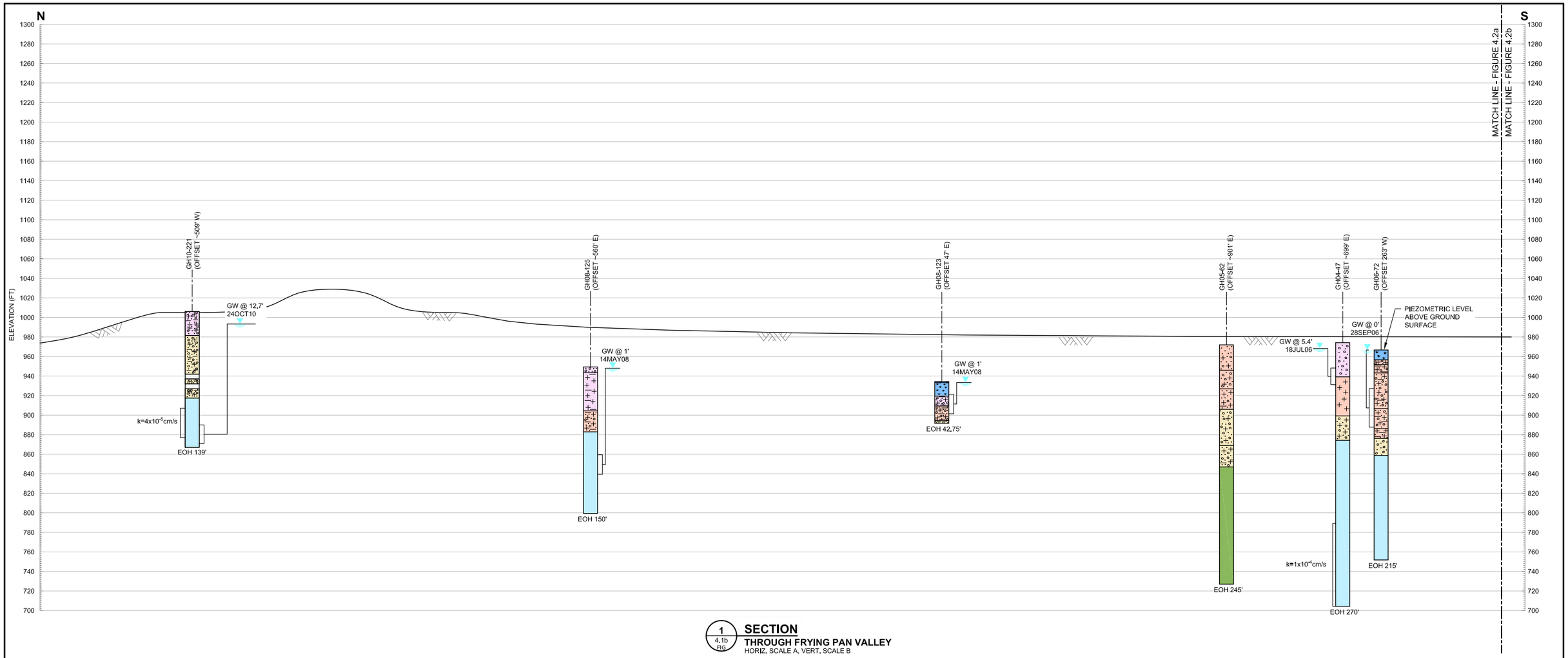
Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.2b | REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B12\s, 1/27/2011 9:15:39 AM , PPETKOVIC PRINTED: 2/15/2011 9:25:05 AM, Frying Pan Valley (2 of 2), DPETRUSE
XREF FILES: Common Mates; Legend1 ; J-300 IMAGE FILES:



1 / 4.1b FIG

SECTION
THROUGH FRYING PAN VALLEY
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

FRYING PAN VALLEY GEOLOGIC SECTION SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.2a REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B\12a, 2/14/2011 2:32:15 PM , WLAHODA PRINTED: 2/14/2011 2:35:17 PM, Frying Pan Valley (1 of 2), WLAHODA
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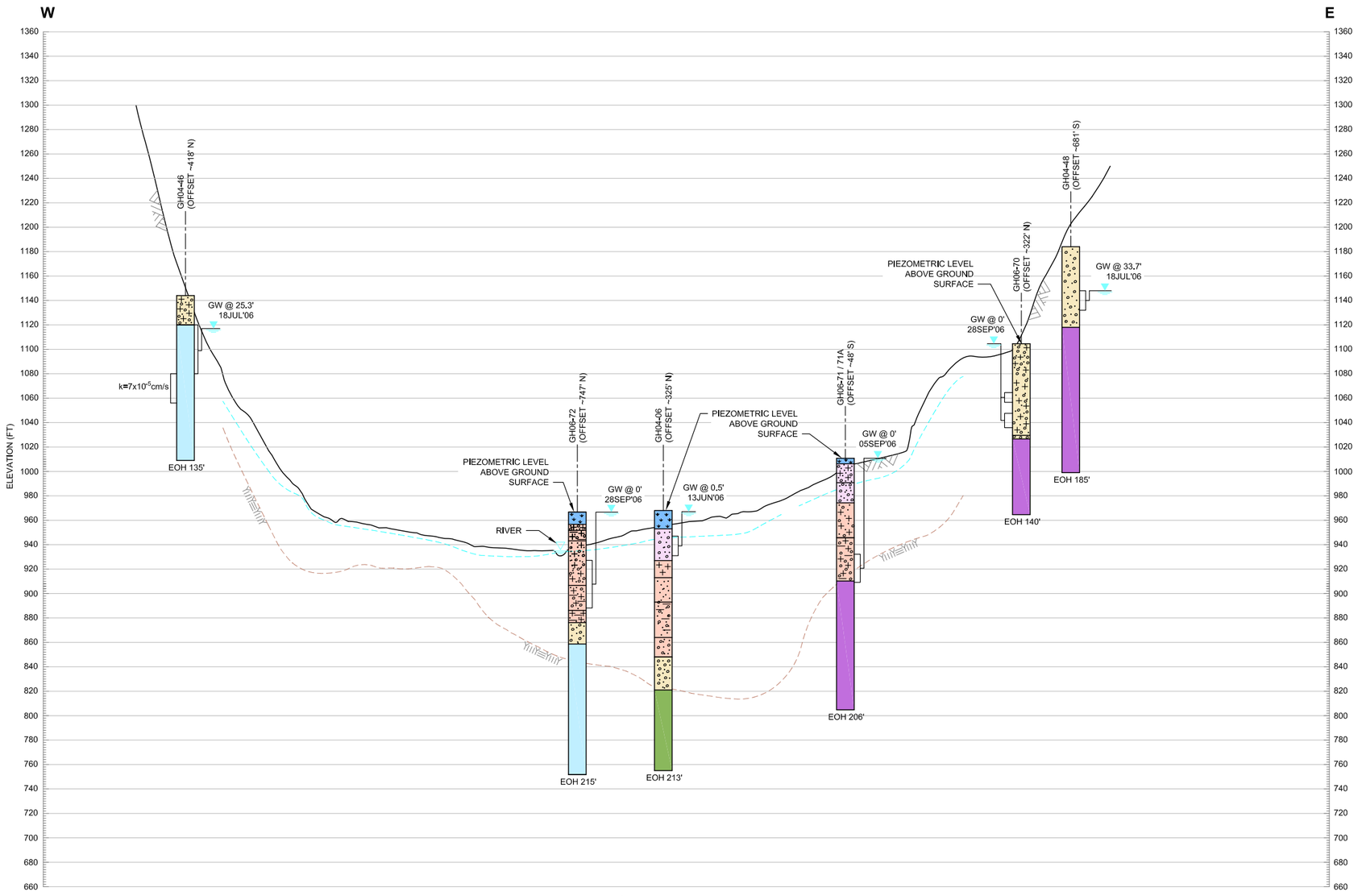

2 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-2
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS: GLACIOFLUVIAL
- GLACIAL DEPOSITS: GLACIOLACUSTRINE DEPOSIT
- GLACIAL DEPOSITS: GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

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AREA A
GEOLOGIC SECTION ALONG SEISMIC LINE-2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.3 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B13, 2/16/2011 4:12:28 PM , WLAHODA PRINTED: 2/16/2011 4:13:07 PM, SL-2, WLAHODA
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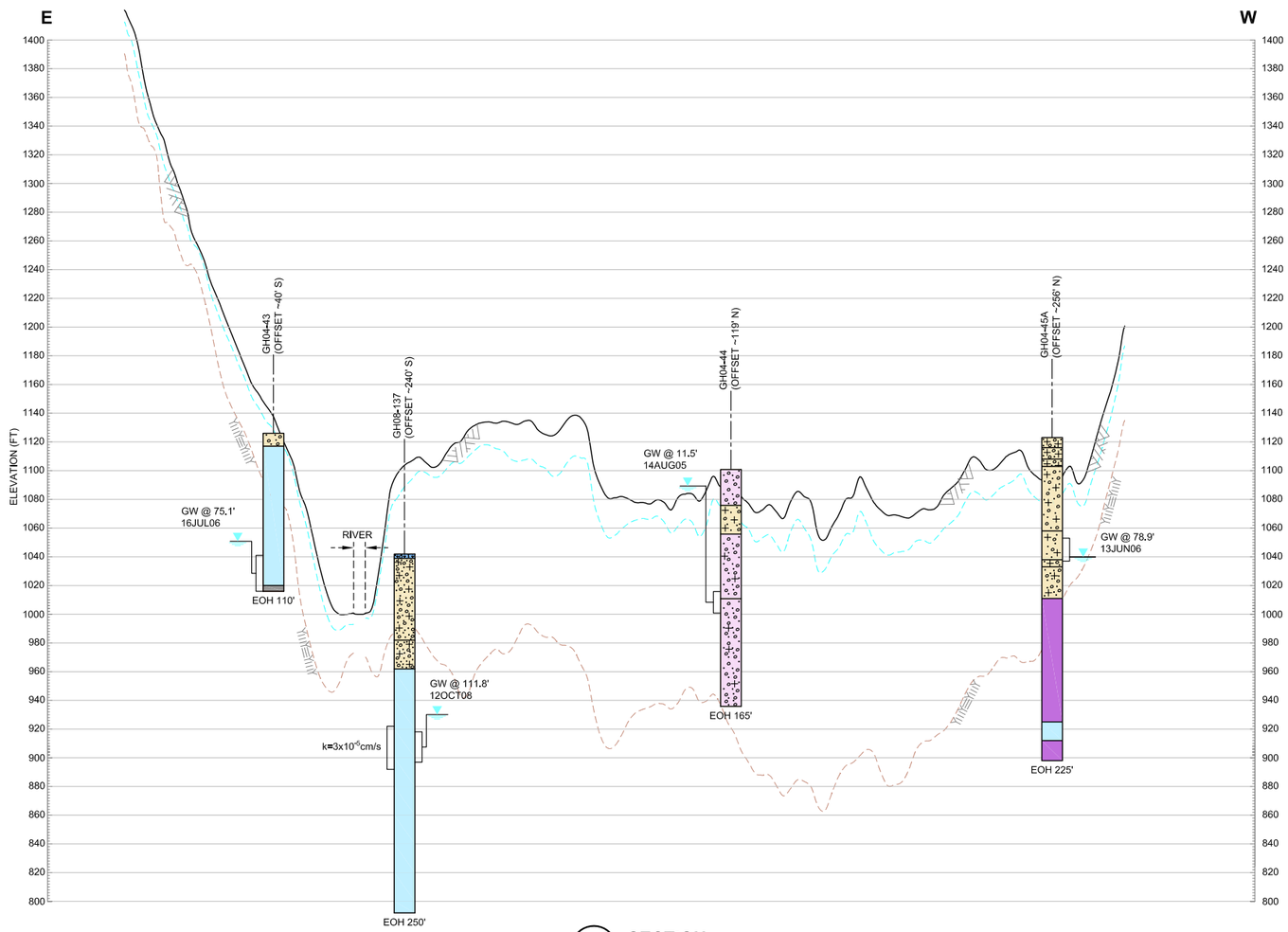

3 / 4.1a FIG

SECTION
ALONG SEISMIC LINE-3
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

GLACIAL DEPOSITS

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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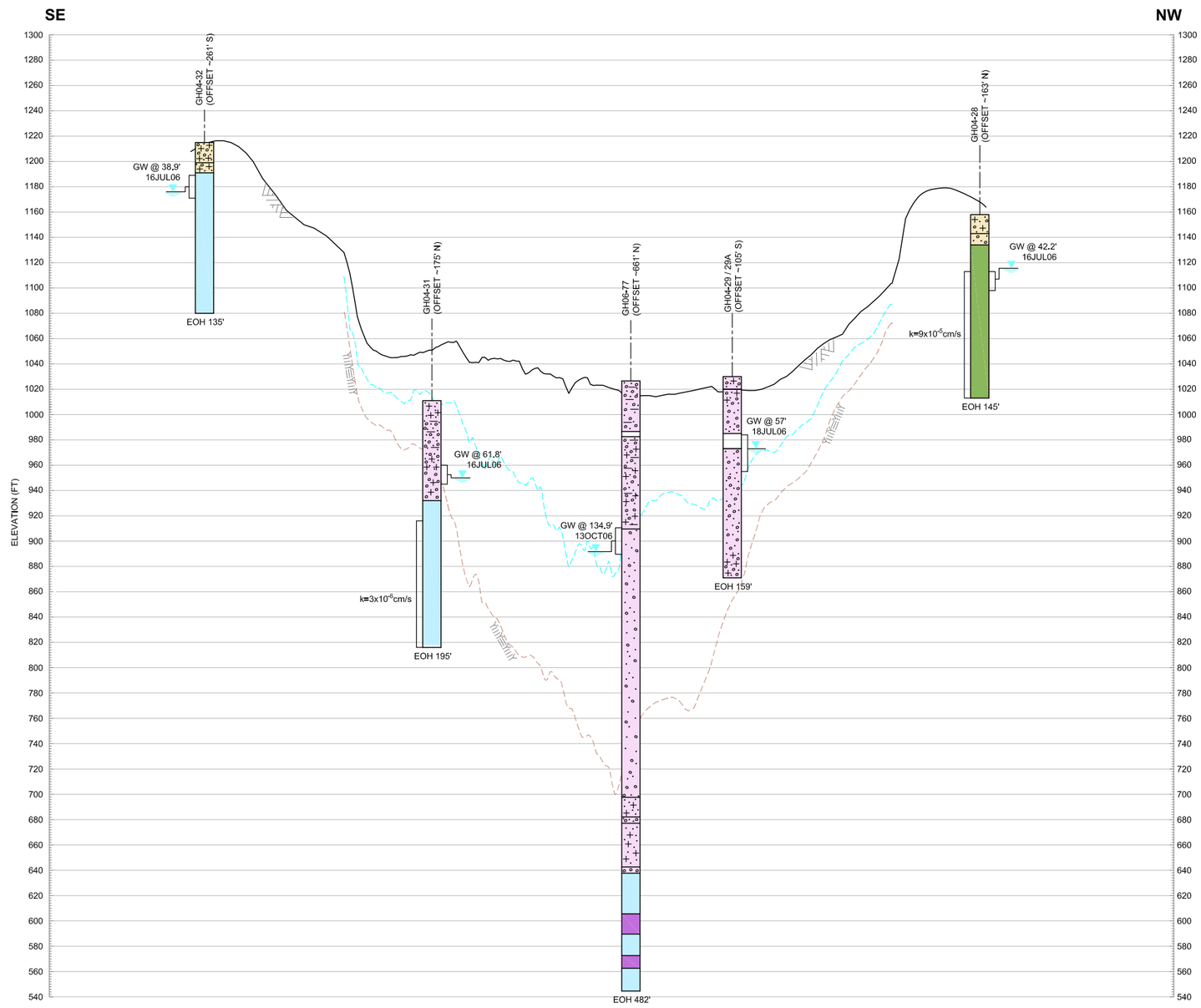
PEBBLE PROJECT

AREA A
GEOLOGIC SECTION ALONG SEISMIC LINE-3

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.4 | REV 0



4 / 4.1a FIG.

SECTION
ALONG SEISMIC LINE-4
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

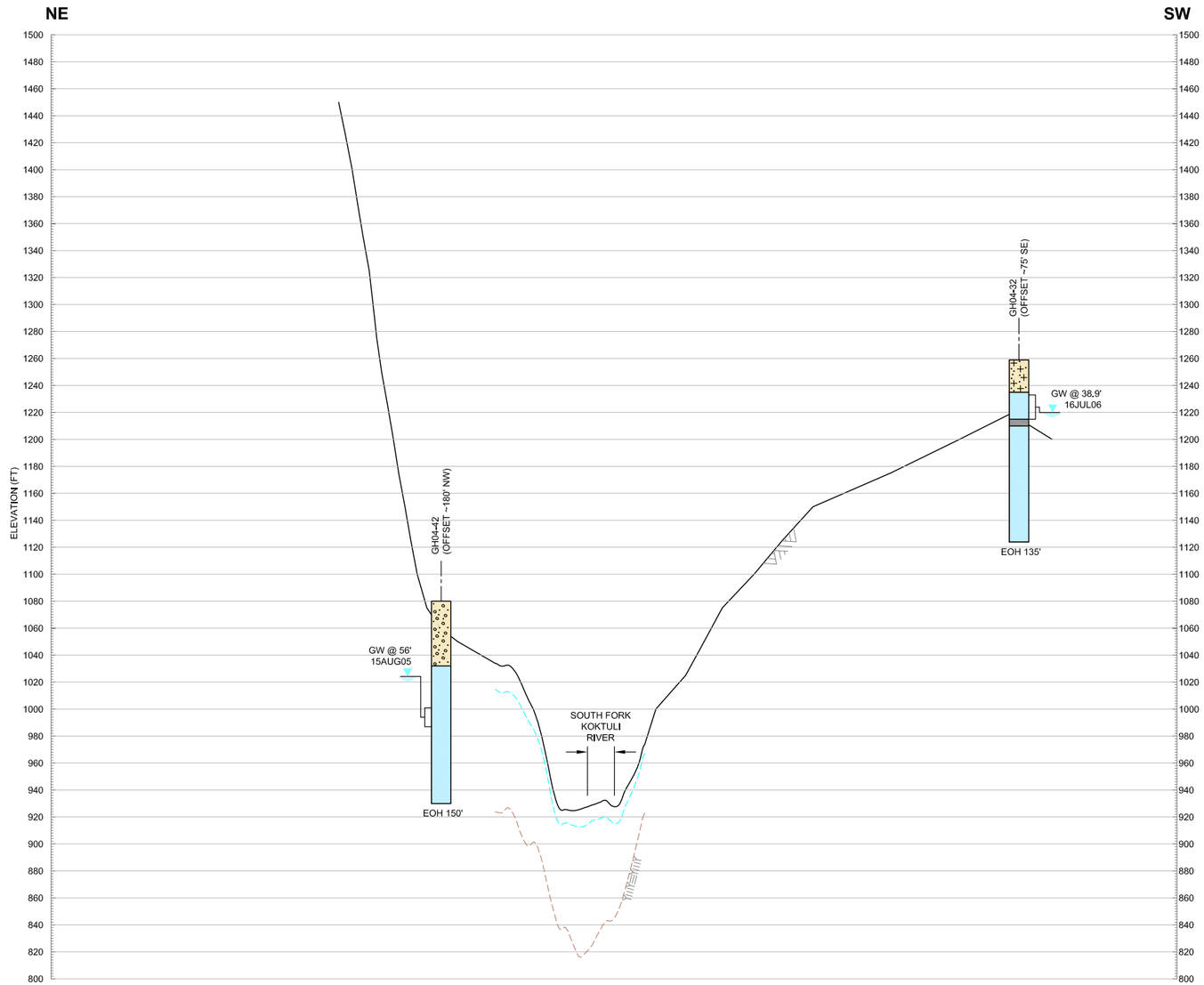
PEBBLE PROJECT

AREA A
GEOLOGIC SECTION ALONG SEISMIC LINE-4

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.5 REV 0



5
4.1a
FIG

SECTION
ALONG SEISMIC LINE-5
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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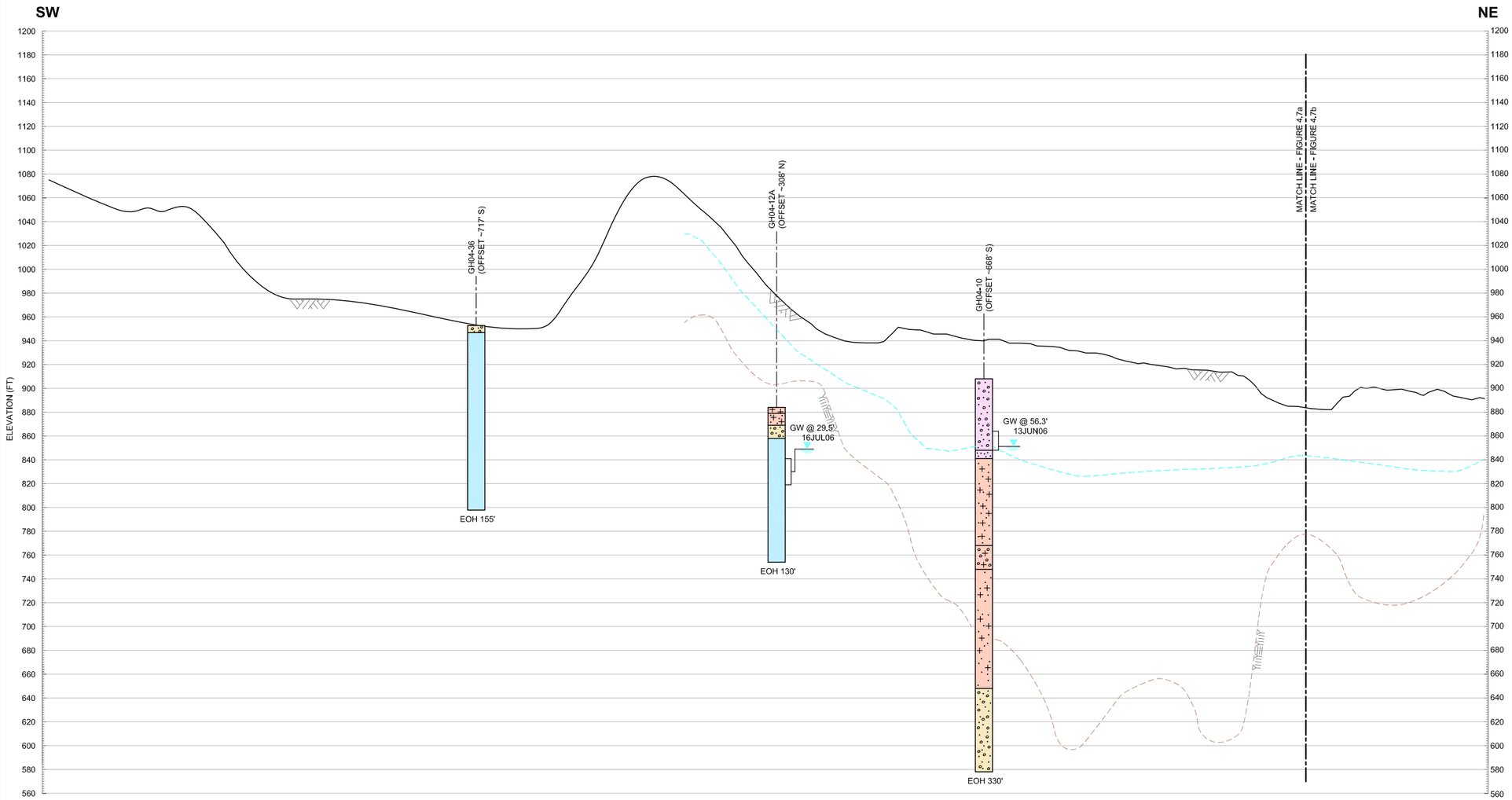
PEBBLE PROJECT

AREA A
GEOLOGIC SECTION ALONG
SEISMIC LINE-5

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.6 REV 0



6
4.1a
FIG

SECTION
ALONG SEISMIC LINE-6
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

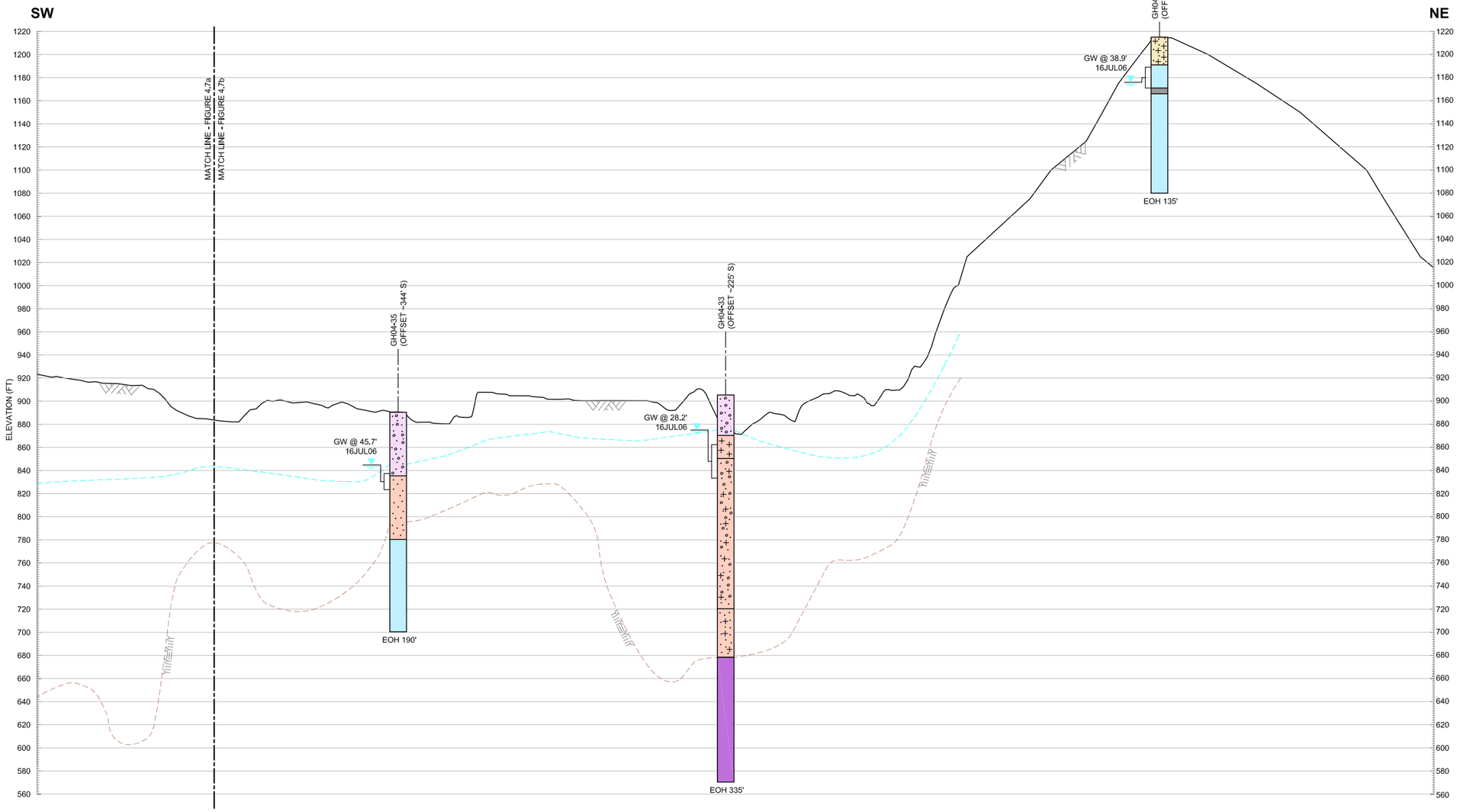
PEBBLE PROJECT

SOUTH FORK KOKTULI RIVER AREA GEOLOGIC SECTION ALONG SEISMIC LINE-6 - SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.7a | REV 0



6 / 4.1a FIG

SECTION
ALONG SEISMIC LINE-6
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS: GLACIOFLUVIAL
- GLACIAL DEPOSITS: GLACIOLACUSTRINE DEPOSIT
- GLACIAL DEPOSITS: GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

SOUTH FORK KOKTULI RIVER AREA GEOLOGIC SECTION ALONG SEISMIC LINE-6 - SHEET 2 OF 2

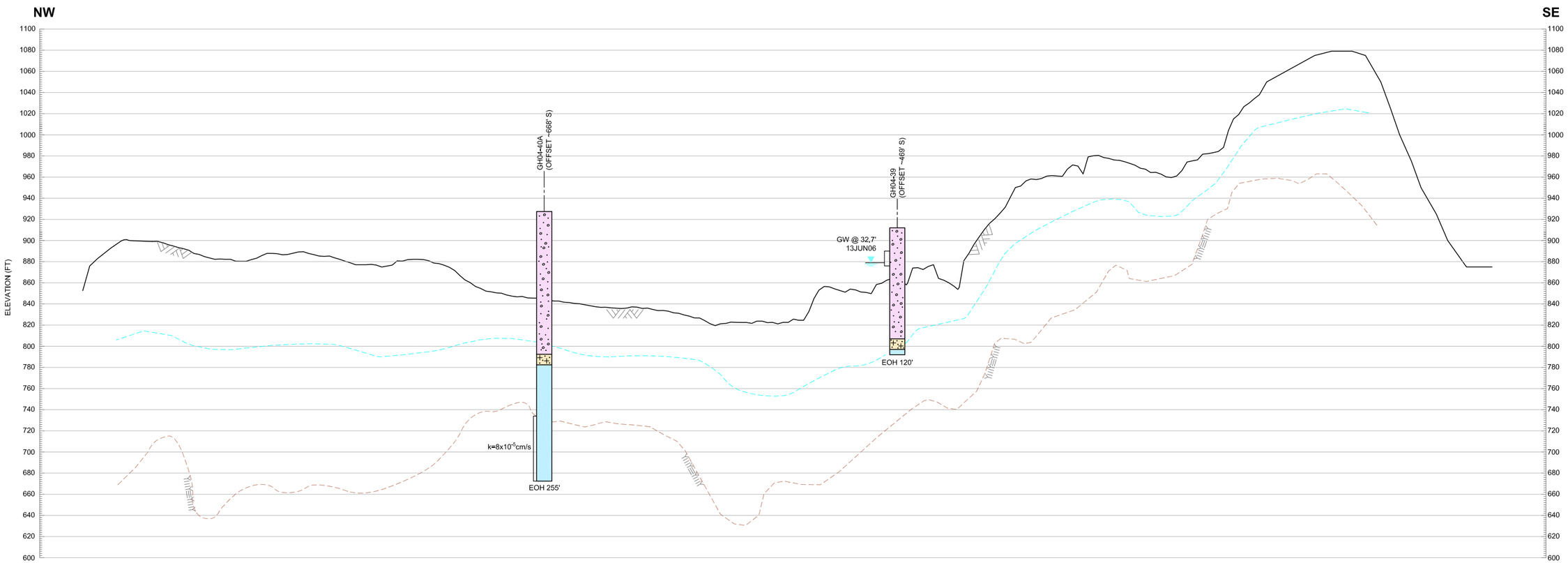
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.7b REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B17b, 2/14/2011 3:38:27 PM , DPETRUSE PRINTED: 2/14/2011 3:45:36 PM, SLs (2 of 2), DPETRUSE
XREF FILE(S): Common Notes; Legend; _L_500 BMUGE FILE(S): LINE_6_2 LINE_6_1 LINE_6_4 LINE_6_0 LINE_6_3 Seismic Report\SL_18



7 / 4.1a FIG.

SECTION
ALONG SEISMIC LINE-7
HORIZ. SCALE A, VERT.SCALE B

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. NO PIEZOMETER WAS INSTALLED IN GH04-40A.

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS:
TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS:
TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE:
TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

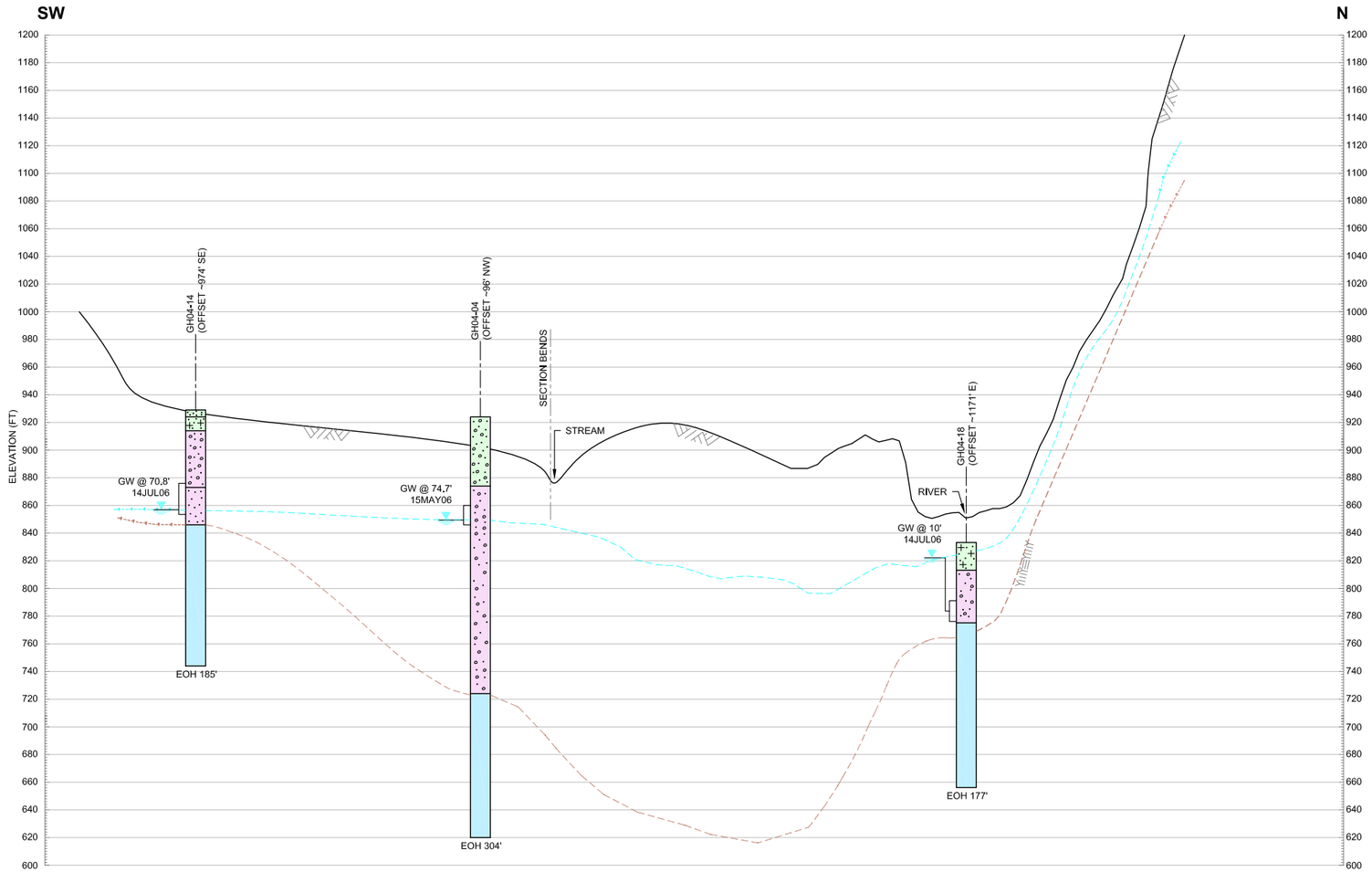
SOUTH FORK KOKTULI RIVER AREA GEOLOGIC SECTION ALONG SEISMIC LINE-7

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.8 | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B18, 2/14/2011 3:38:58 PM , DPETRUSE PRINTED: 2/14/2011 3:41:14 PM, SL-7, DPETRUSE
XREF FILES: Common Notes; Legend - 1_300; IMAGE FILES:



8
4.1a
FIG

SECTION
ALONG SEISMIC LINE-8 AND 11
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL (GLACIAL DEPOSITS)
- GLACIOLACUSTRINE DEPOSIT (GLACIAL DEPOSITS)
- GLACIAL DRIFT DEPOSIT (GLACIAL DEPOSITS)
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

SOUTH FORK KOKTULI RIVER GEOLOGIC SECTION ALONG SEISMIC LINE-8 AND 11

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.9 | REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B19, 2/17/2011 1:55:09 PM , WLAHODA PRINTED: 2/17/2011 1:55:39 PM, SLA8, WLAHODA
XREF FILES: Common Mylar, Legend1, 3000 IMAGE FILES:

9 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-13
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL (GLACIAL DEPOSITS)
- GLACIOLACUSTRINE DEPOSIT (GLACIAL DEPOSITS)
- GLACIAL DRIFT DEPOSIT (GLACIAL DEPOSITS)
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

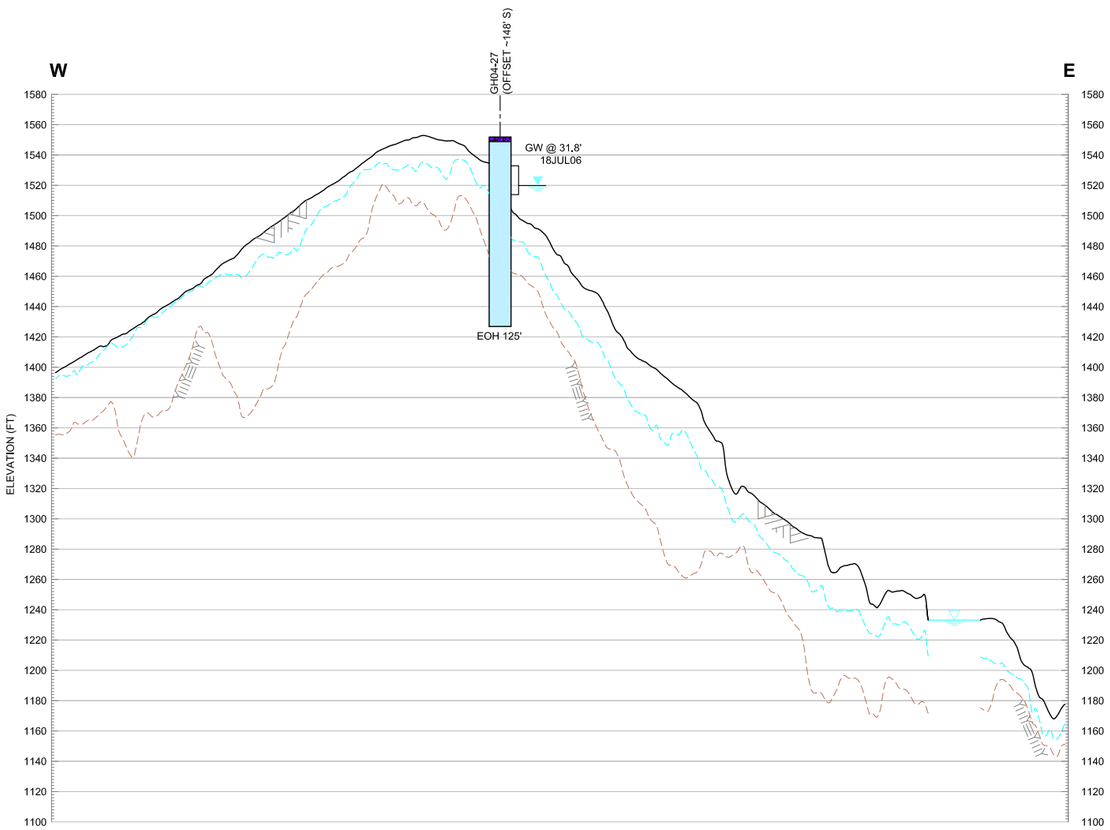
PEBBLE PROJECT

AREA E
GEOLOGIC SECTION ALONG
SEISMIC LINE-13

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.10 | REV 0



10
4.1b
FIG

SECTION
ALONG SEISMIC LINE-14
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

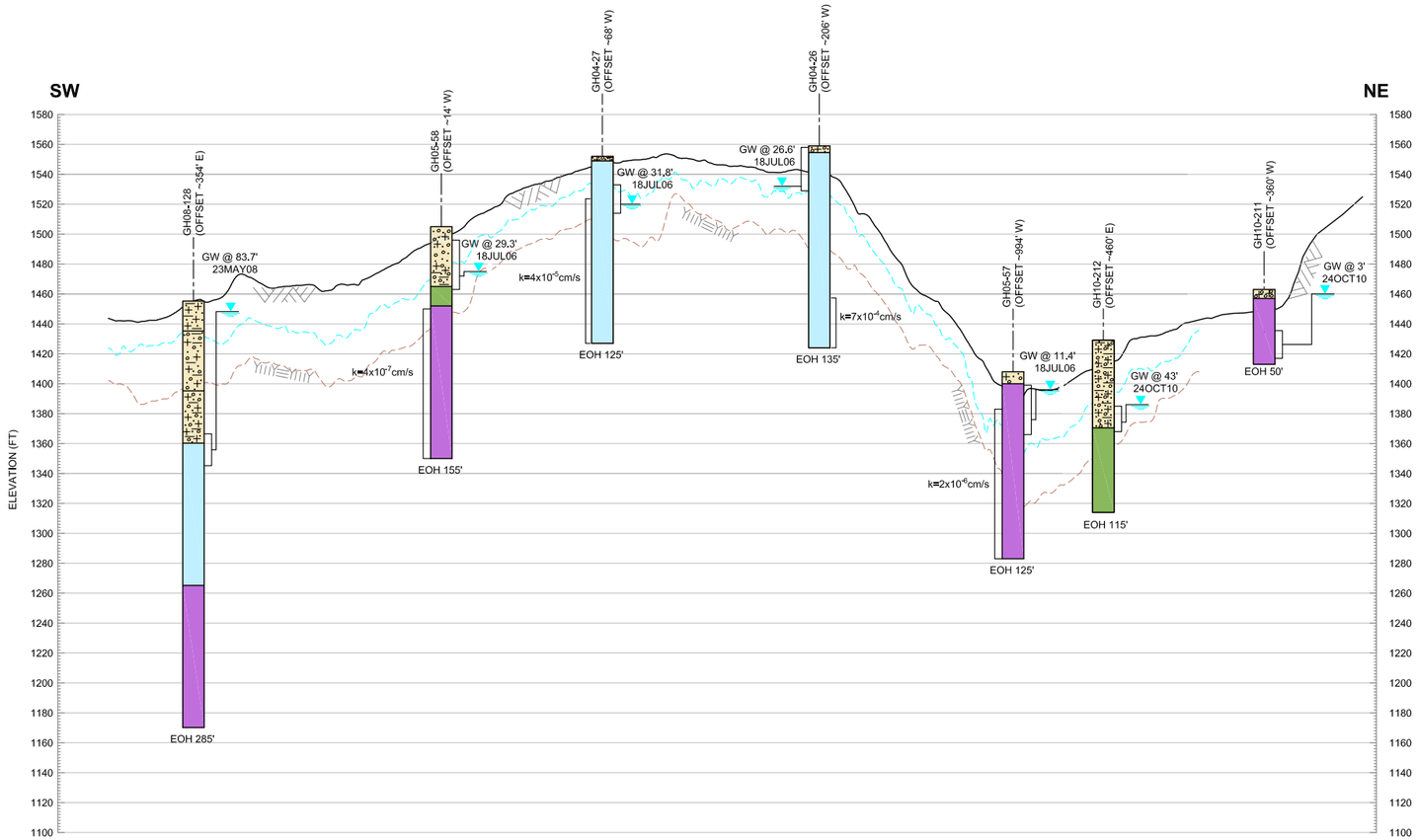
PEBBLE PROJECT

AREA E
GEOLOGIC SECTION ALONG
SEISMIC LINE-14

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.11 | REV 0



11 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-15
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-15

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.12 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B22, 2/15/2011 9:13:50 AM , WLAHODA PRINTED: 2/15/2011 9:14:33 AM, SL-15, WLAHODA
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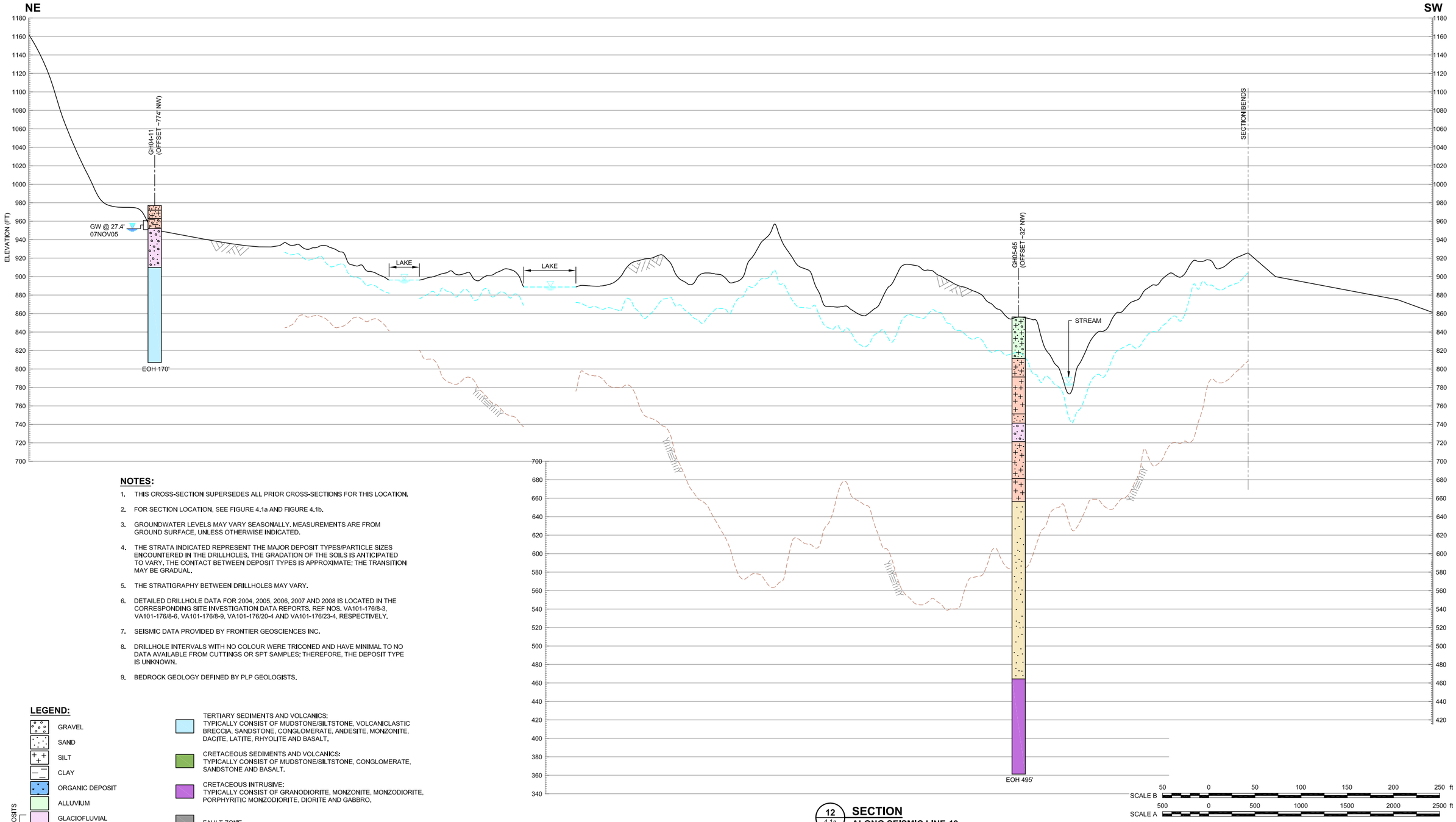


NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

12 / 4.1a FIG.

SECTION
ALONG SEISMIC LINE-19
HORIZ. SCALE A, VERT.SCALE B

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

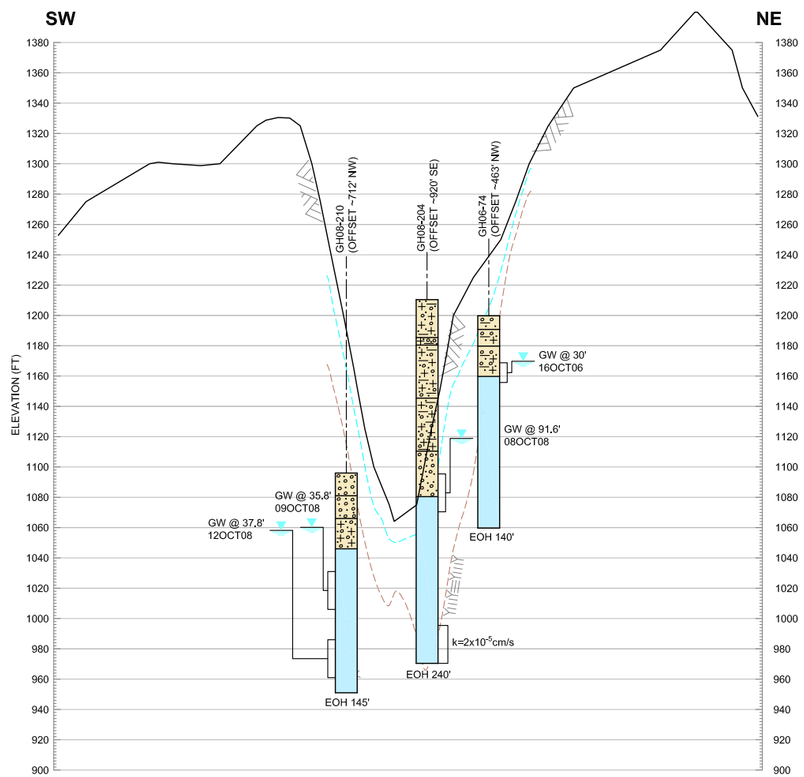
PEBBLE PROJECT

SOUTH FORK KOKTULI RIVER AREA GEOLOGIC SECTION ALONG SEISMIC LINE-19

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.13 | REV 0



13 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-20
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

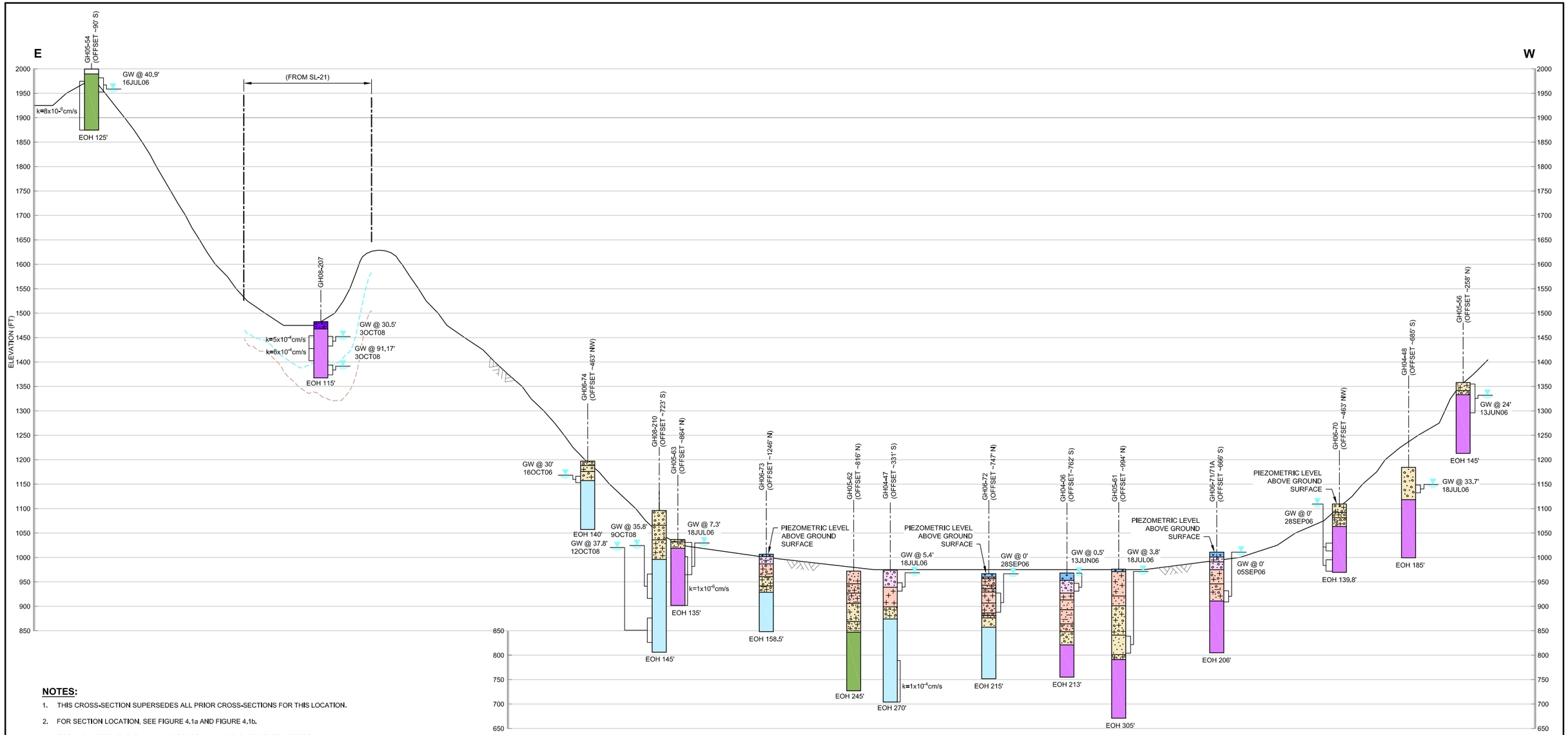
AREA A
GEOLOGIC SECTION ALONG SEISMIC LINE-20

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.14 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



14 / 4.1b FIG

SECTION

NORTH GEOLOGIC SECTION

HORIZ. SCALE A, VERT.SCALE B

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

SCALE B: 100 0 100 200 300 400 500 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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PEBBLE PROJECT

AREA A
NORTH GEOLOGIC SECTION

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.15 | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\825, 1/27/2011 10:44:16 AM , PPETKOVIC PRINTED: 2/15/2011 10:40:49 AM, North Section, DPETRUSE
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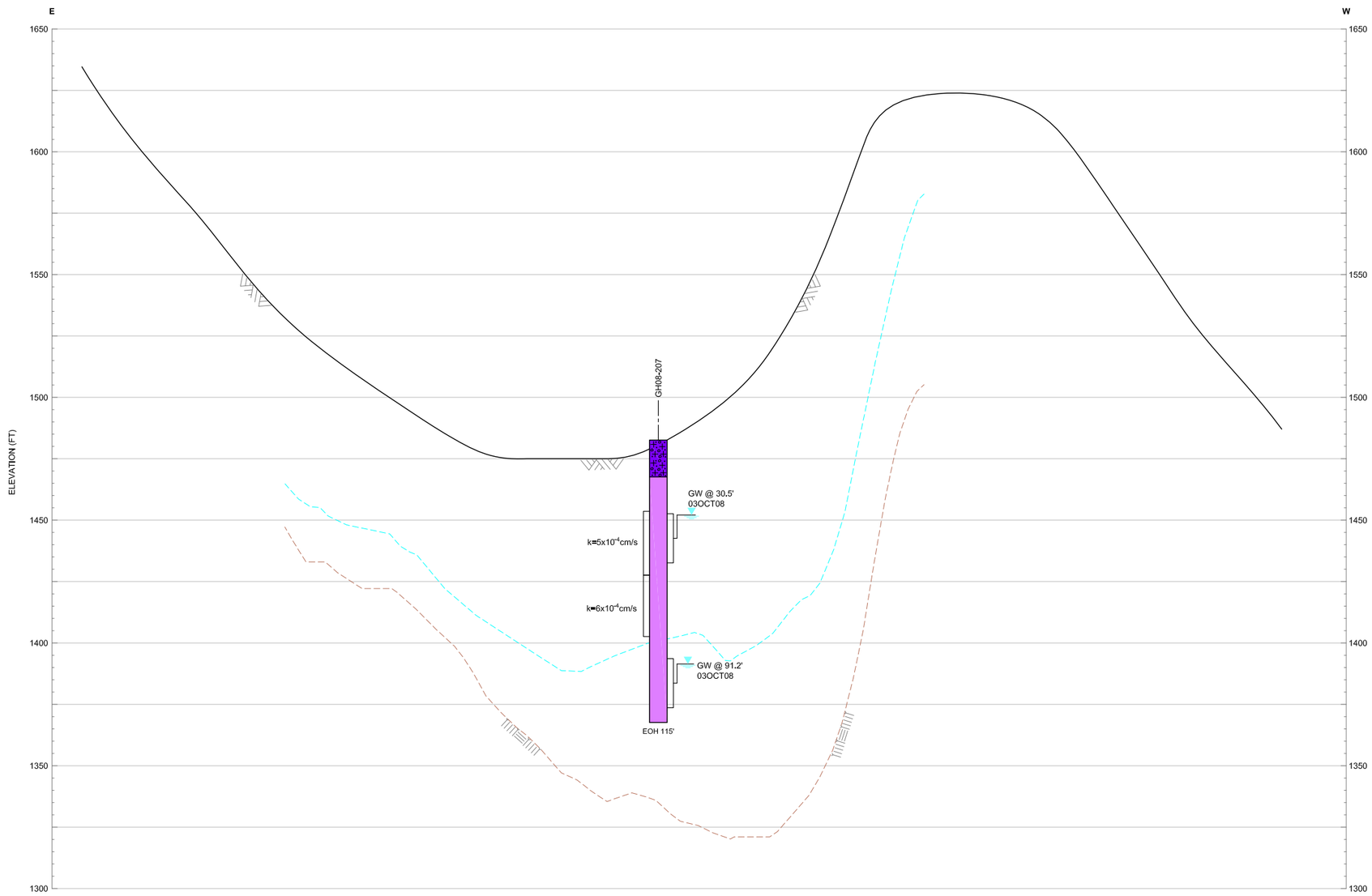


15 / 4.1b FIG.

SECTION
ALONG SEISMIC LINE-21
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 25 0 25 50 75 100 125 ft

SCALE A: 125 0 125 250 375 500 625 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

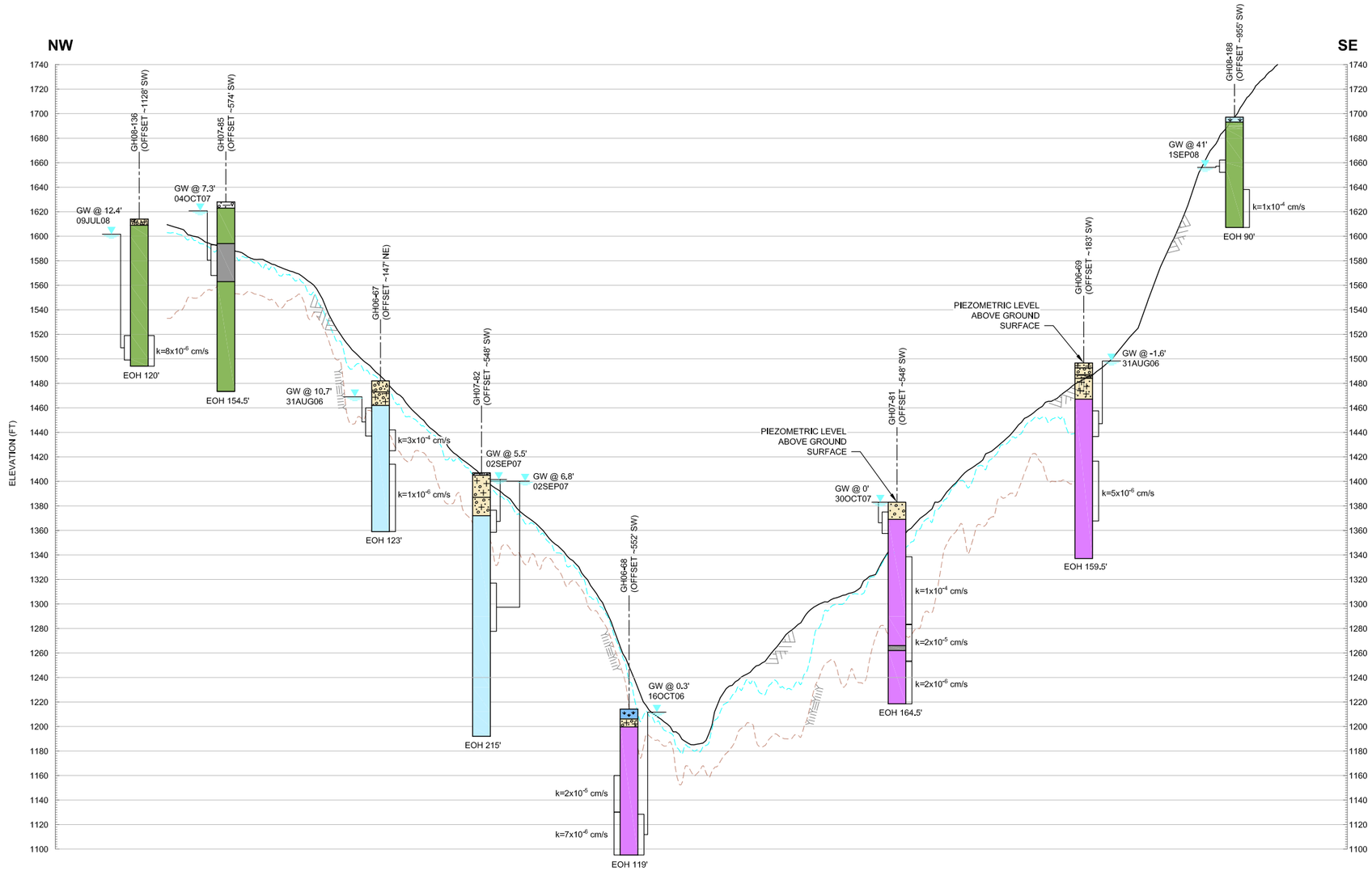
PEBBLE PROJECT

AREA A
GEOLOGIC SECTION ALONG SEISMIC LINE-21

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.16 | REV 0



16 / 4.1a FIG

SECTION
ALONG SEISMIC LINE-23
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

GLACIAL DEPOSITS

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. BASALT IS BEDROCK ENCOUNTERED IN GH08-188, GH08-36, GH06-67 AND GH07-82. THE AGE OF THIS BASALT HAS NOT BEEN DETERMINED BY CROSS CUTTING RELATIONSHIPS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

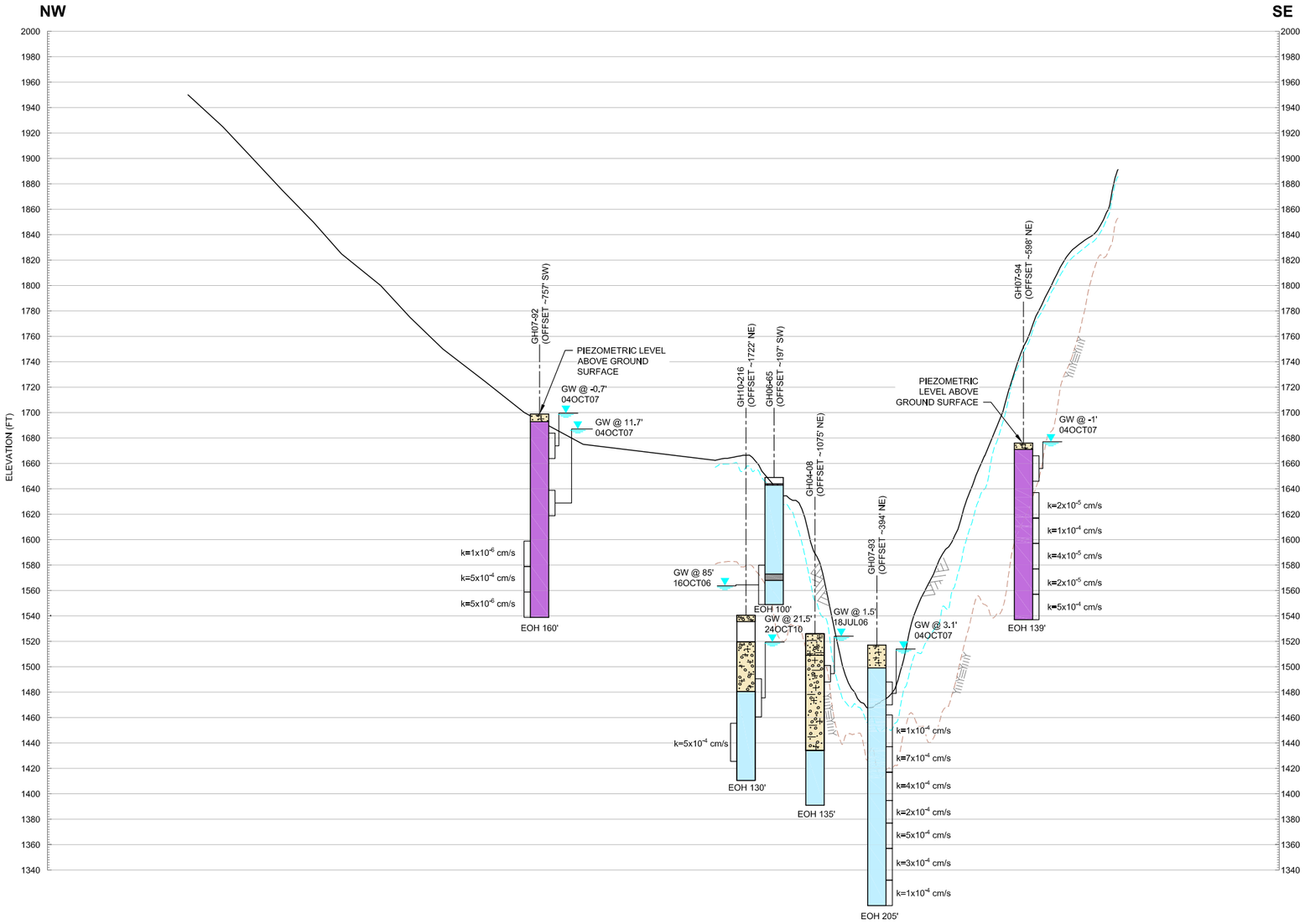
PEBBLE PROJECT

AREA G
GEOLOGIC SECTION ALONG SEISMIC LINE-23

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.17 | REV 0



17
4.1a
FIG

SECTION
ALONG SEISMIC LINE-24
HORIZ. SCALE A, VERT.SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL (GLACIAL DEPOSITS)
- GLACIOLACUSTRINE DEPOSIT (GLACIAL DEPOSITS)
- GLACIAL DRIFT DEPOSIT (GLACIAL DEPOSITS)
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. OVERBURDEN GEOLOGY OF GH04-08 HAS BEEN UPDATE.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA L
GEOLOGIC SECTION ALONG SEISMIC LINE-24

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.18 | REV 0

SAVED: M:\1\00\17\6\35\A\Acad\FIGS\B26, 2/3/2011 9:35:22 AM , DPETRUSE PRINTED: 2/15/2011 1:56:45 PM, SL-24 (South Alignment), DPETRUSE
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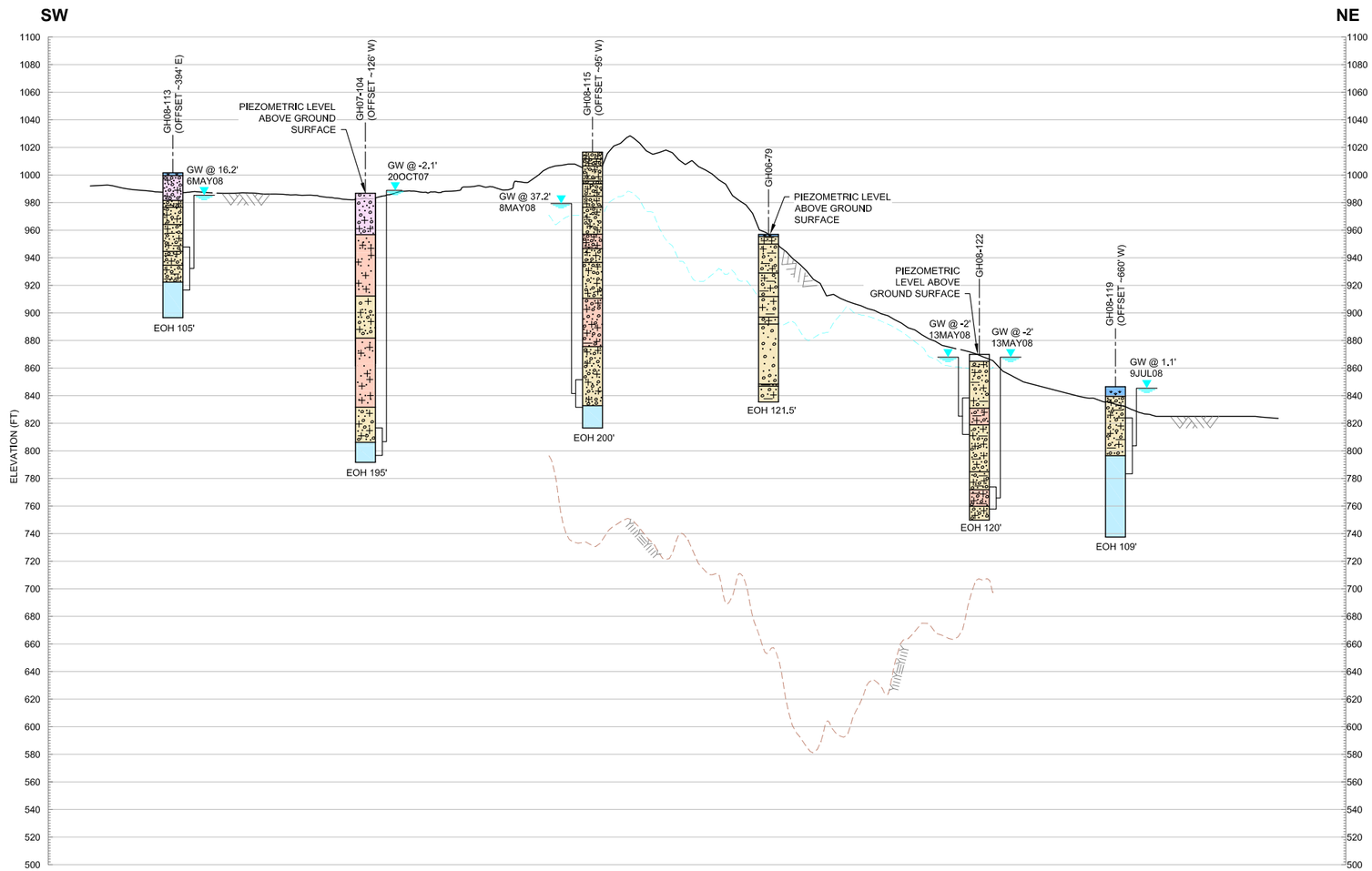


18 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-25
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS: GLACIOFLUVIAL
- GLACIAL DEPOSITS: GLACIOLACUSTRINE DEPOSIT
- GLACIAL DEPOSITS: GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. SEISMIC DATA FOR SL-25 MAY NEED TO BE REVISITED AS THE DIFFERENCE IN DRILLED DEPTH OF BEDROCK IS APPROXIMATELY 100ft FROM THE SEISMIC DEPTH.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

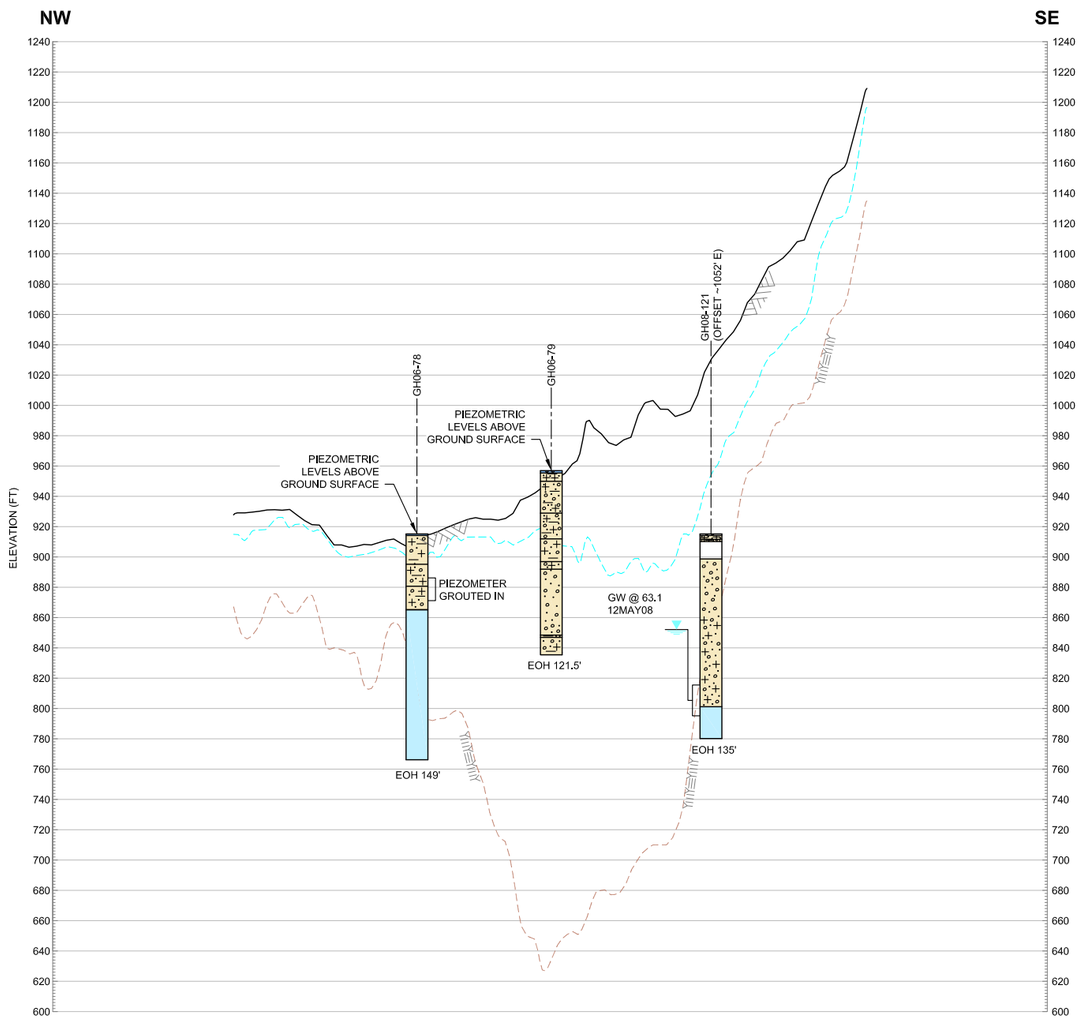
PEBBLE PROJECT

EAST DEPOSIT AREA
GEOLOGIC SECTION ALONG
SEISMIC LINE-25

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.19 | REV 0



19 4.1b FIG **SECTION**
ALONG SEISMIC LINE-26
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EAST DEPOSIT AREA
GEOLOGIC SECTION ALONG
SEISMIC LINE-26

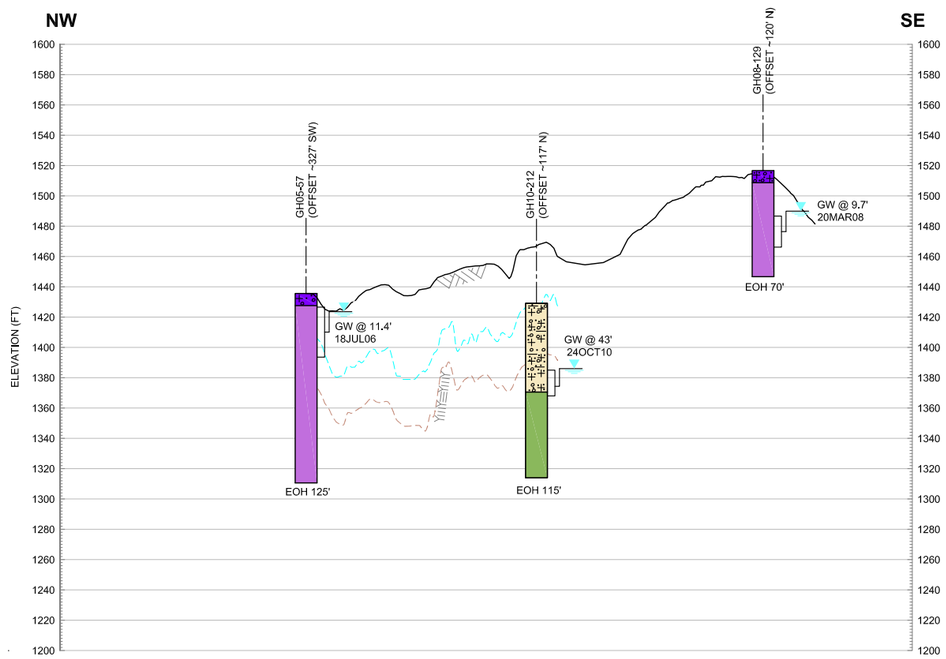
Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.20 | REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B30, 1/27/2011 11:18:15 AM , PPETKOVIC PRINTED: 2/15/2011 2:05:26 PM, SL-26, DPETRUSE
XREF FILES: Common Notes; Legend; 1_500' IMAGE FILES: SL-26



20
4.1b
FIG.

SECTION
ALONG SEISMIC LINE-27
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

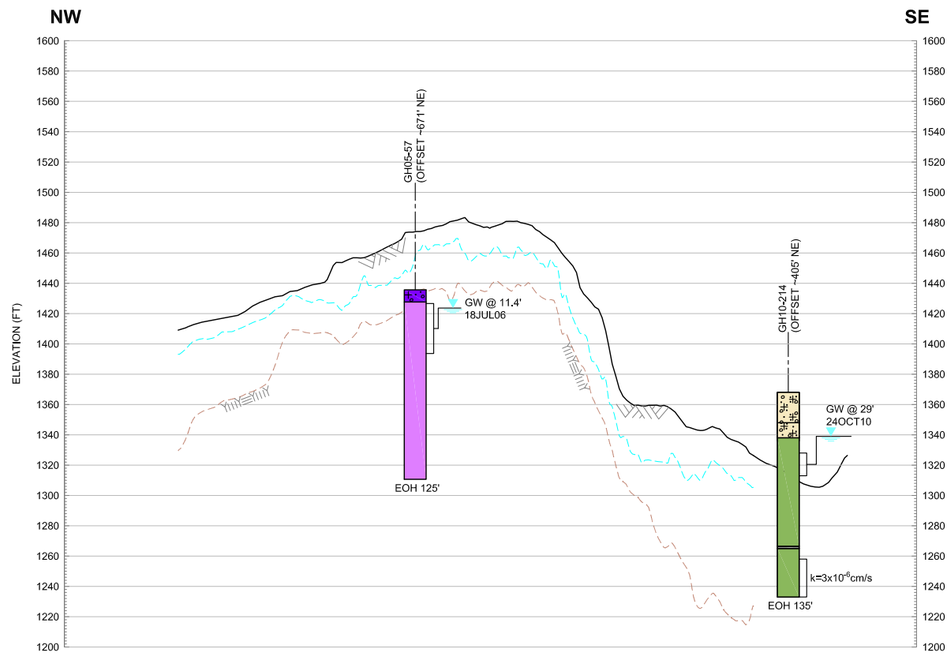
AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-27

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.21 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



21 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-28
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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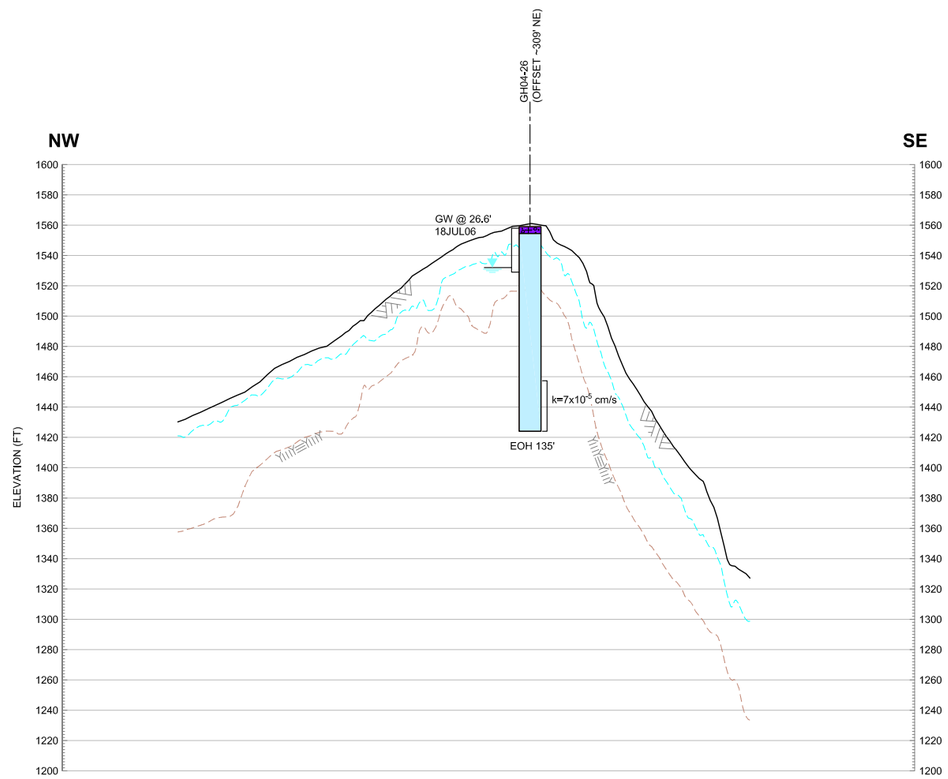
PEBBLE PROJECT

AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-28

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.22 REV 0



22 / 4.1b FIG **SECTION**
ALONG SEISMIC LINE-29
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-29

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.23 | REV 0

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XREF FILES: Common Notes; Legend; 1_500 IMAGE FILES: SL-29A SL-29B

23 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-30
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

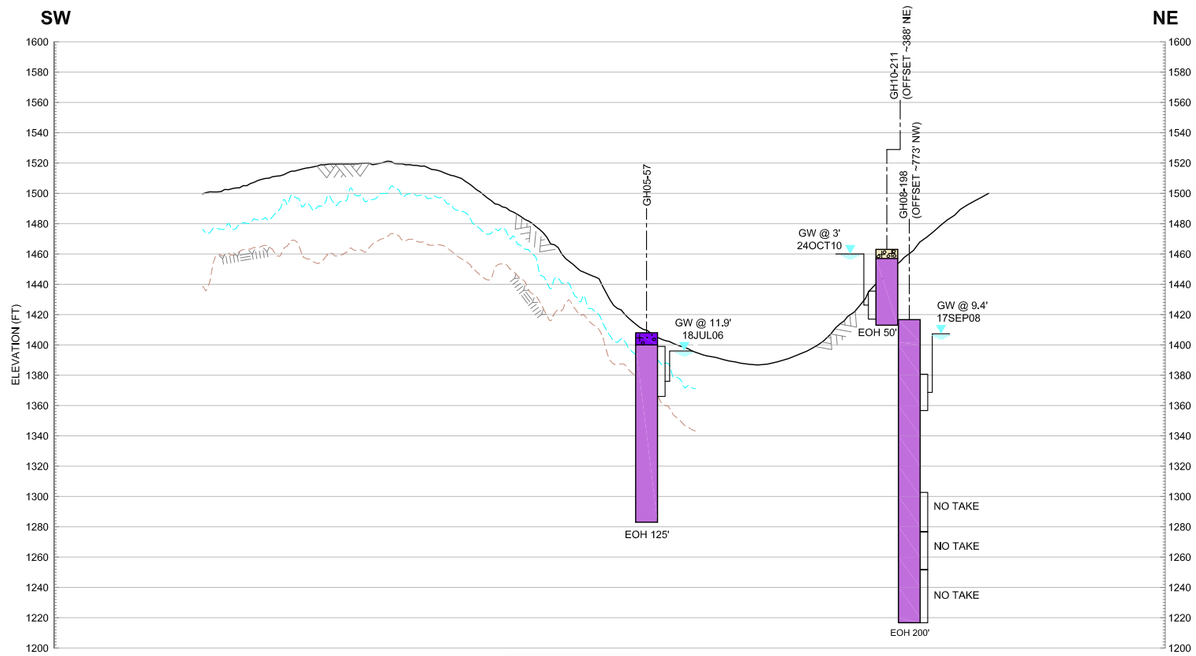
AREA E
GEOLOGIC SECTION ALONG
SEISMIC LINE-30

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.24 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



24 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-31
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-31

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.25 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B35, 2/1/2011 9:36:33 AM , WLAHODA PRINTED: 2/15/2011 2:24:02 PM, SL-31, DPETRUSE
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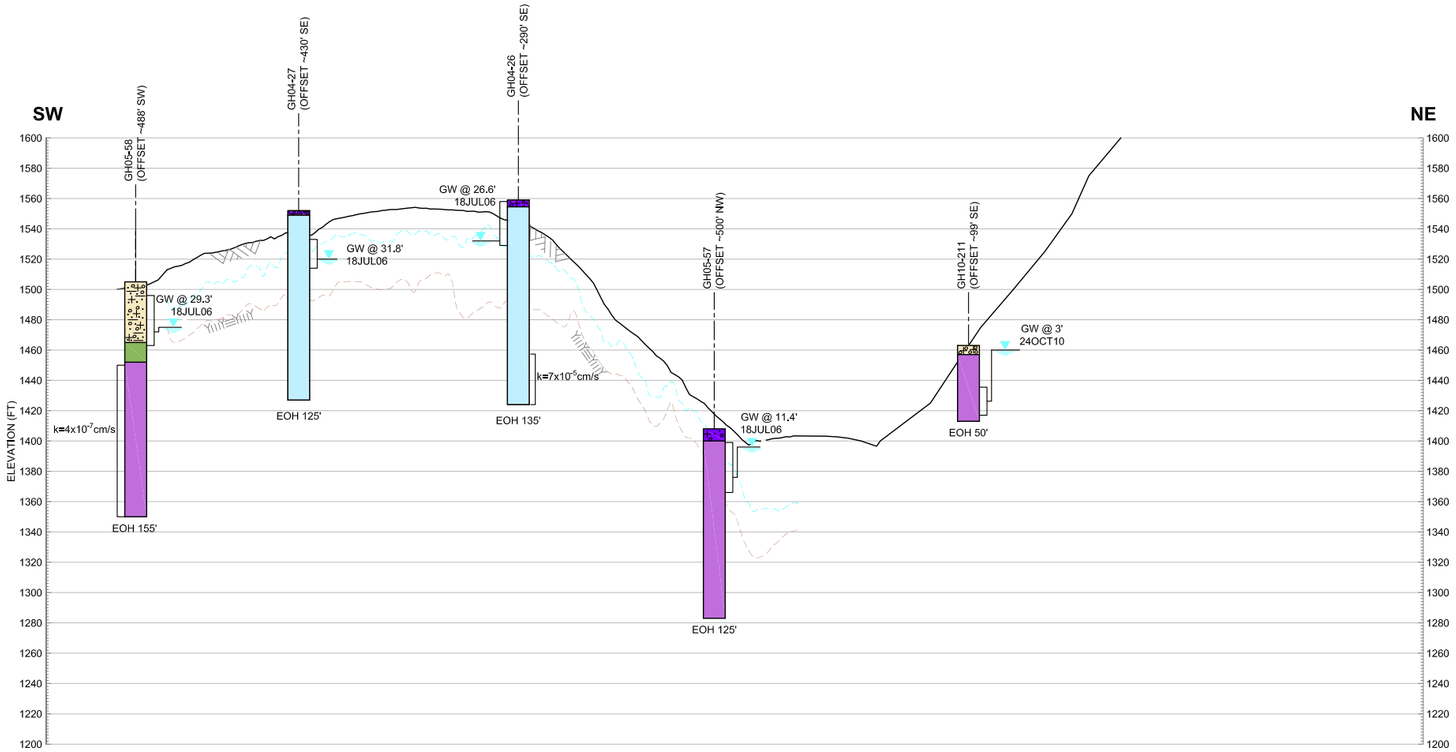


25
4.1b
FIG

SECTION
ALONG SEISMIC LINE-32
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

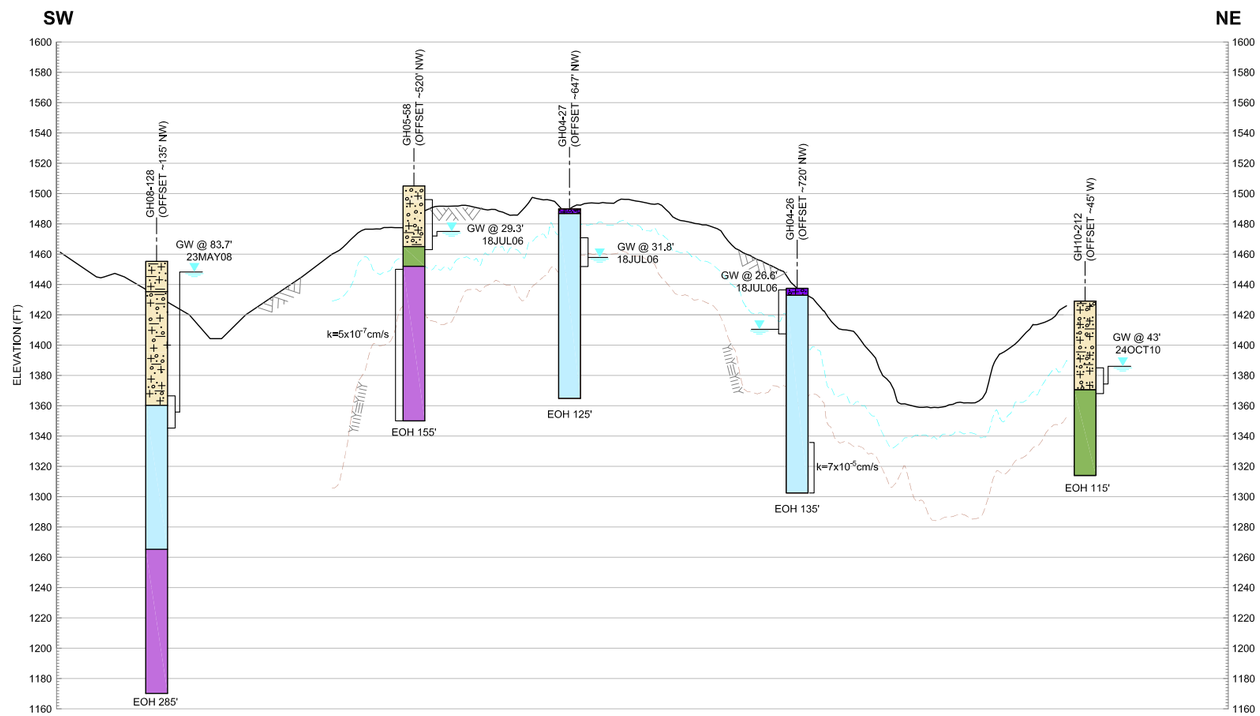
AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-32

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.26 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



26 / 4.1b FIG.

SECTION
ALONG SEISMIC LINE-33
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

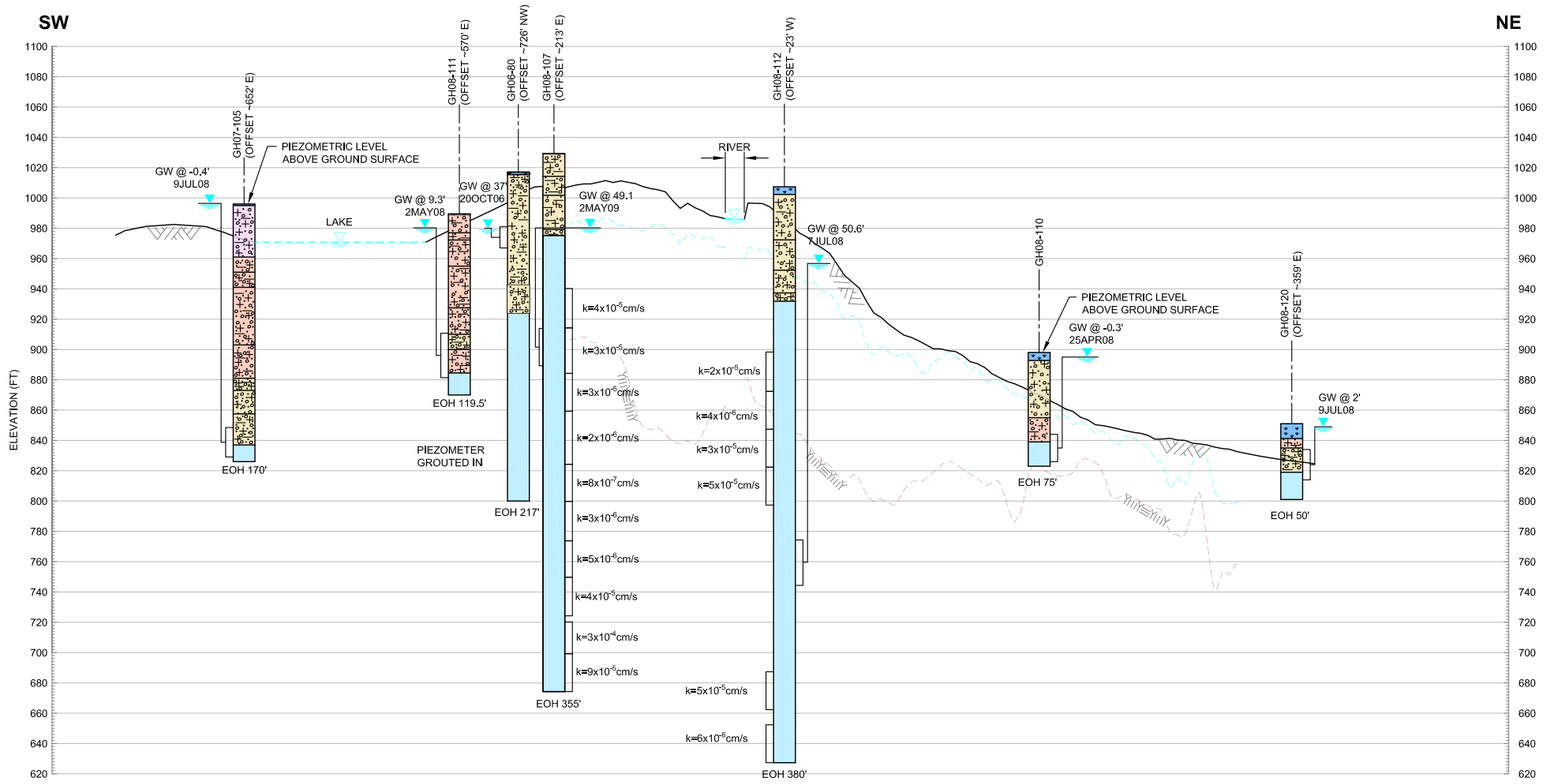
PEBBLE PROJECT

AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-33

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.27 | REV 0



27 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-34
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EAST DEPOSIT AREA
GEOLOGIC SECTION ALONG
SEISMIC LINE-34

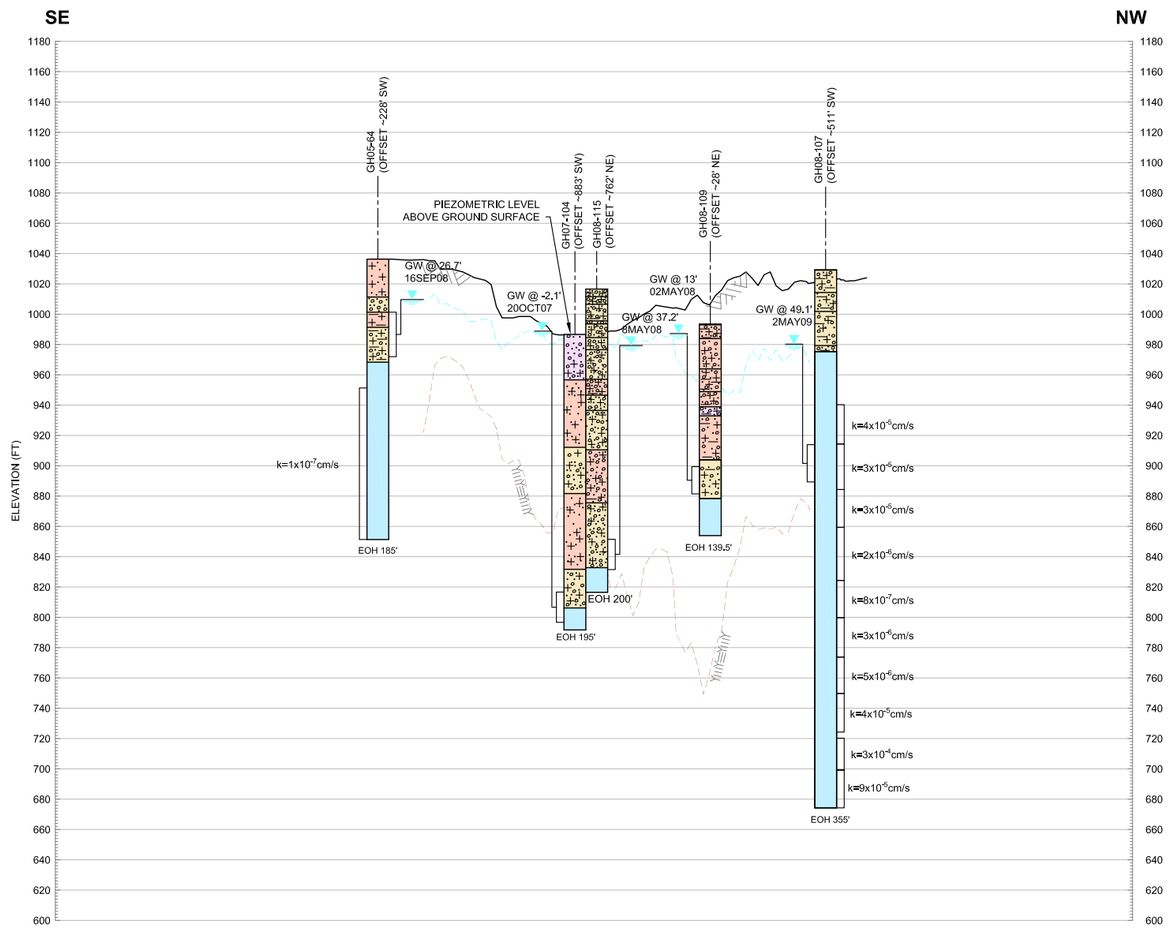
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.28 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B36, 2/15/2011 2:38:41 PM , DPETRUSE PRINTED: 2/15/2011 2:45:46 PM, SL-34 East Deposit Area, DPETRUSE
XREF FILE(S): Common Notes Legend_1_500 IMAGE FILE(S): 34



28 4.1b FIG

SECTION
ALONG SEISMIC LINE-38
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10-4 cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

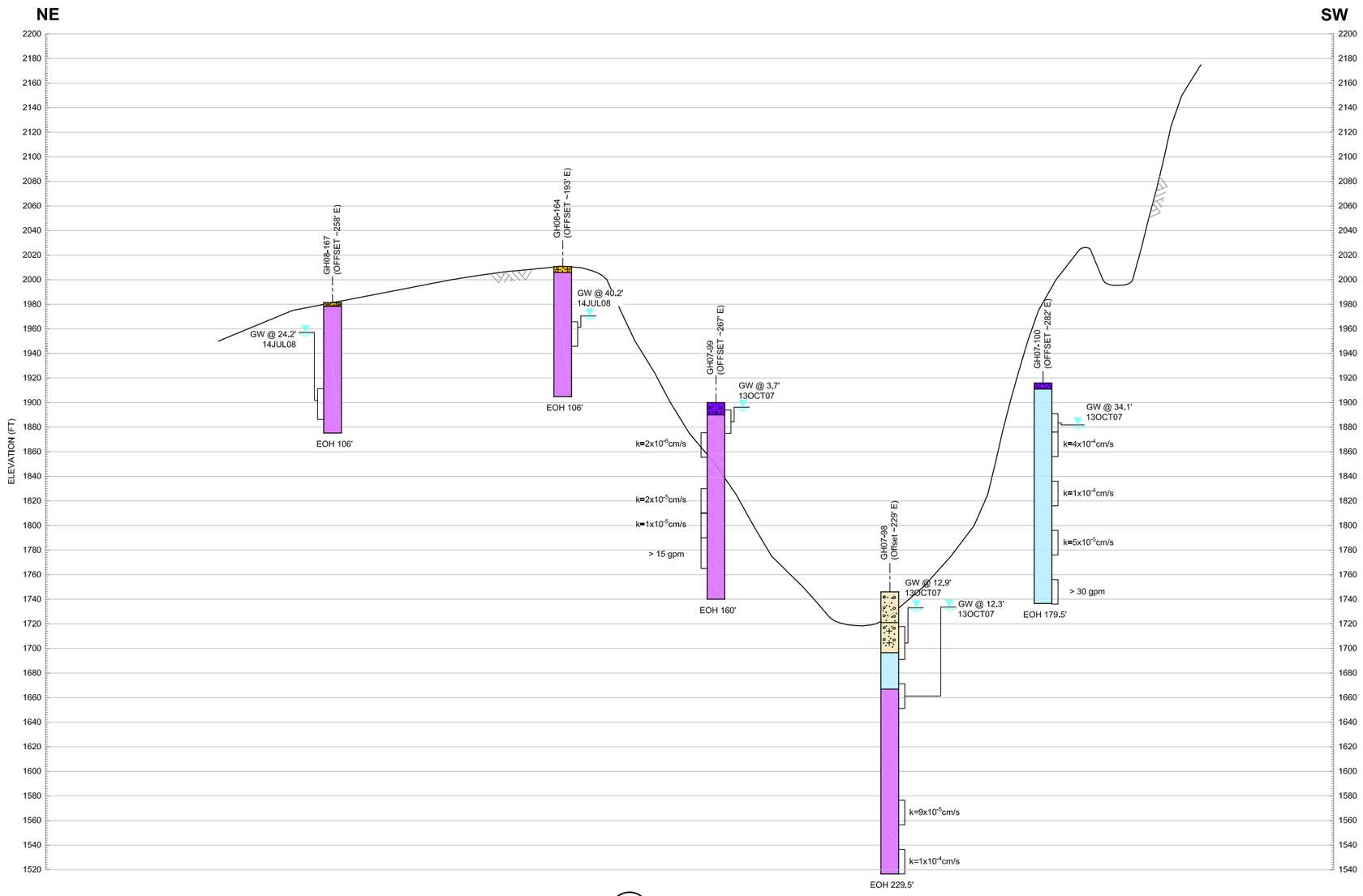
EAST DEPOSIT AREA GEOLOGIC SECTION ALONG SEISMIC LINE-38

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.29 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



29
4.1a
FIG

SECTION
EAST GEOLOGIC SECTION
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL (GLACIAL DEPOSITS)
- GLACIOLACUSTRINE DEPOSIT (GLACIAL DEPOSITS)
- GLACIAL DRIFT DEPOSIT (GLACIAL DEPOSITS)
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
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5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA G
EAST GEOLOGIC SECTION

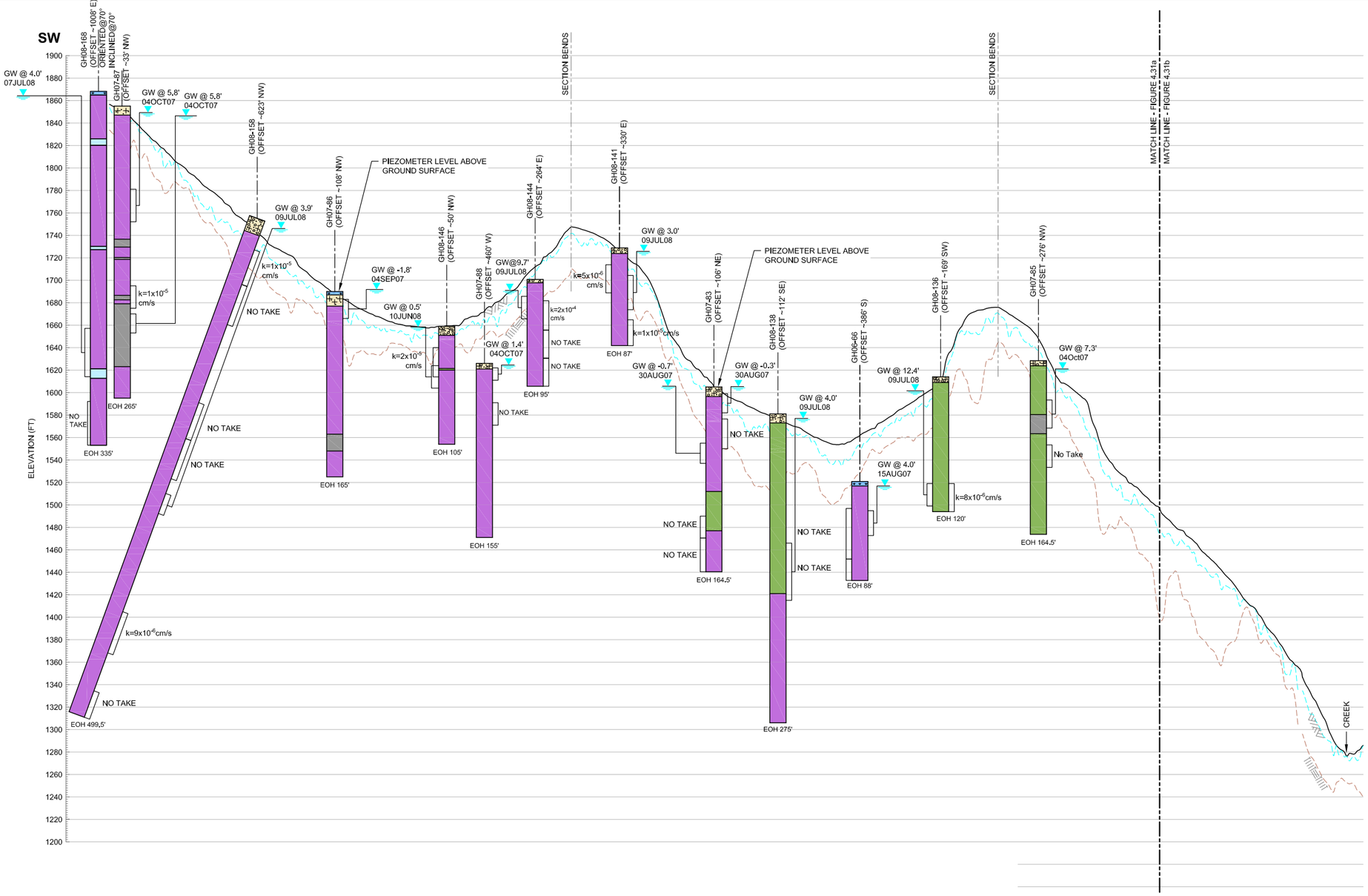
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.30 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B40, 1/27/2011 3:25:14 PM , PPETKOVIC PRINTED: 2/15/2011 2:53:33 PM, East Alignment, DPETRUSE
XREF FILE(S): Common Notes; Legend; 1_500 IMAGE FILE(S):



30 / 4.1a FIG.

SECTION
ALONG SEISMIC LINE-48
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA G
GEOLOGIC SECTION ALONG
SEISMIC LINE-48 - SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.31a REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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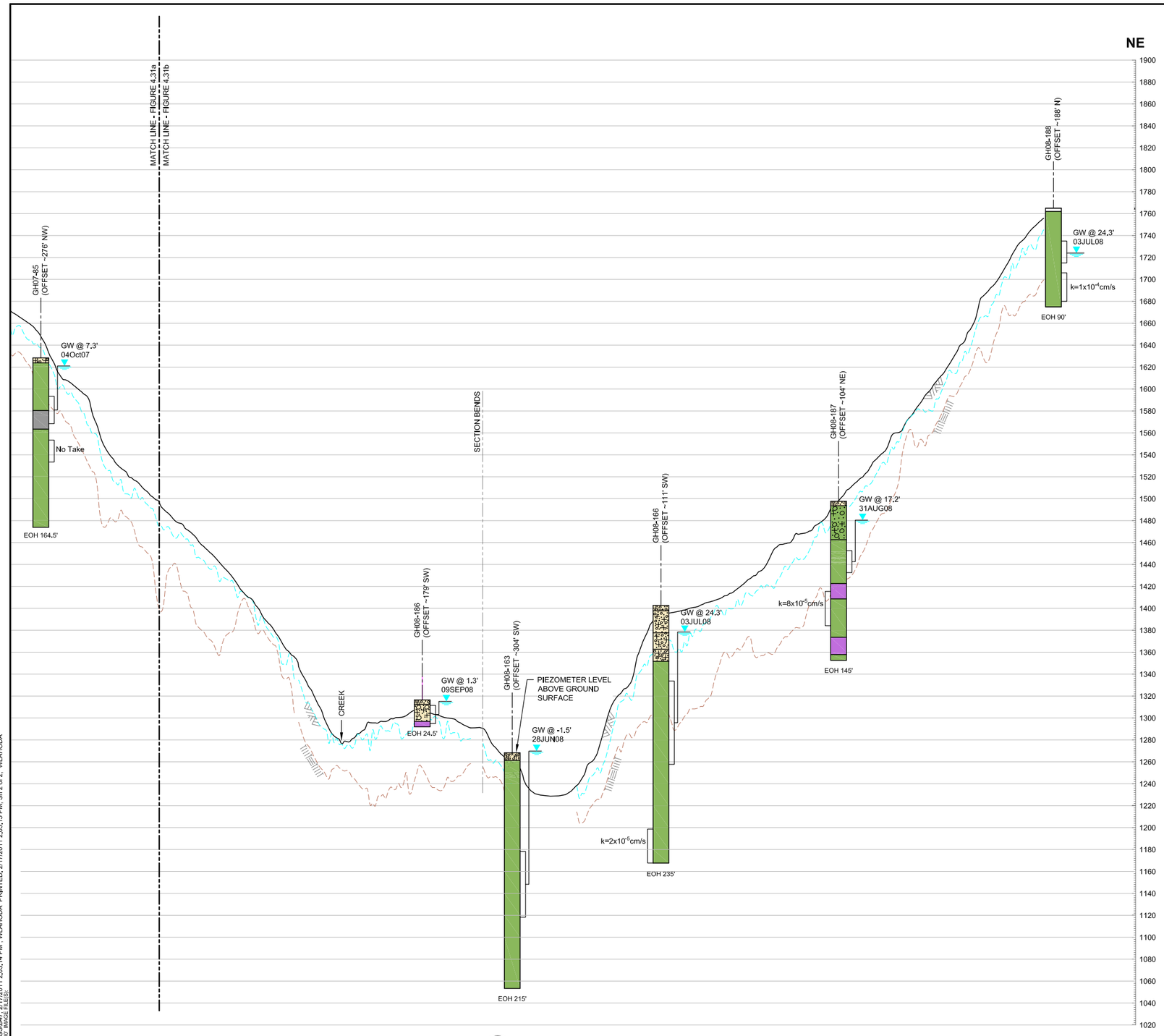

31
4.1a
FIG

SECTION
ALONG SEISMIC LINE-48
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
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7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA G
GEOLOGIC SECTION ALONG SEISMIC LINE-48 - SHEET 2 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.31b REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\BA7, 2/17/2011 2:03:14 PM , WLAHODA PRINTED: 2/17/2011 2:05:15 PM, Sh 2 of 2 , WLAHODA
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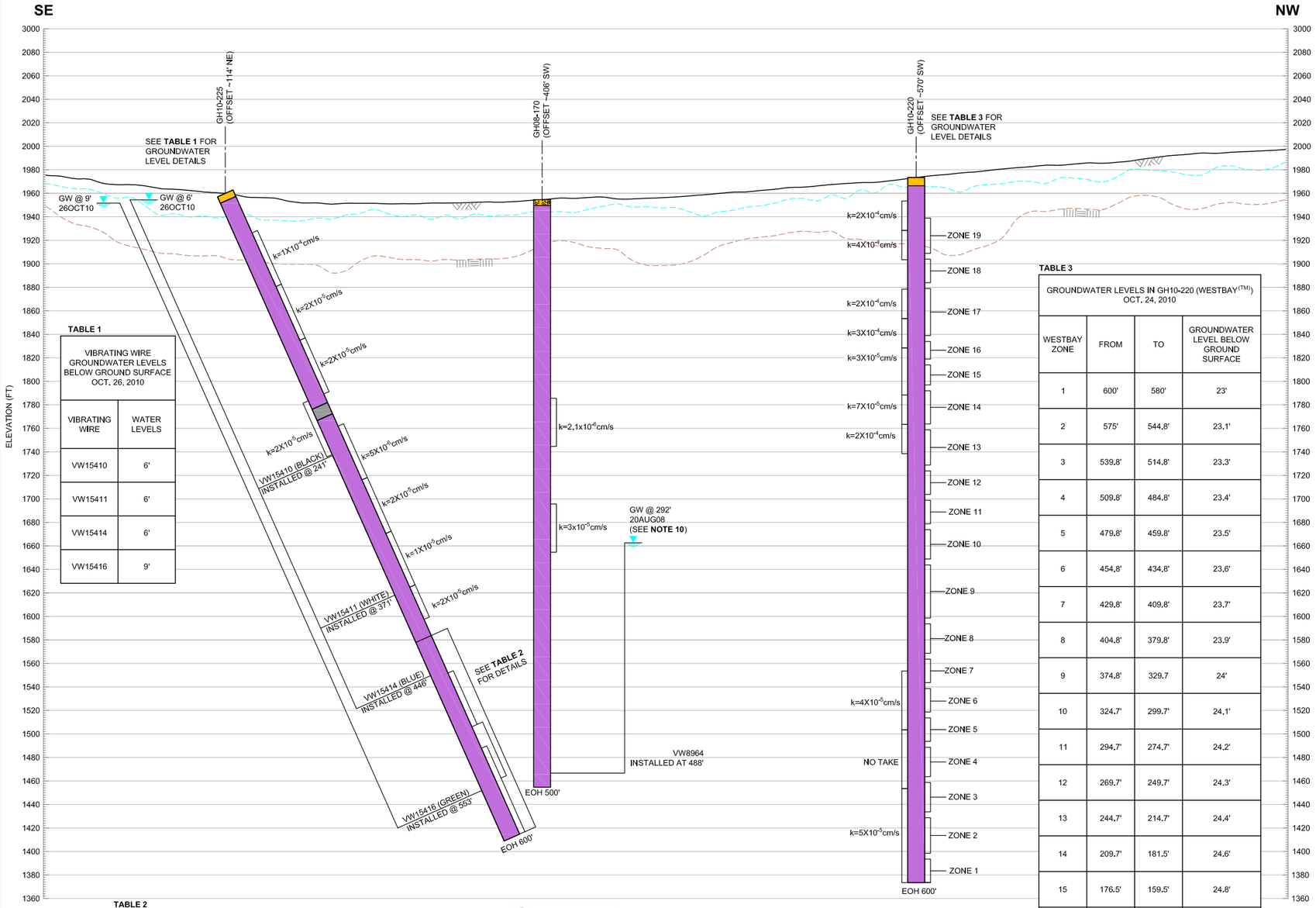

TABLE 1

VIBRATING WIRE GROUNDWATER LEVELS BELOW GROUND SURFACE OCT. 26, 2010

VIBRATING WIRE	WATER LEVELS
VW15410	6'
VW15411	6'
VW15414	6'
VW15416	9'

TABLE 2

GH10-225 PACKER HYDRAULIC CONDUCTIVITY RESULTS

FROM	TO	K
415'	600'	$K=2X10^{-5}$cm/s
520'	600'	$k=2X10^{-7}$cm/s
500'	550'	$K=2X10^{-6}$cm/s
450'	500'	$K=2X10^{-6}$cm/s

TABLE 3

GROUNDWATER LEVELS IN GH10-220 (WESTBAY(TM)) OCT. 24, 2010

WESTBAY ZONE	FROM	TO	GROUNDWATER LEVEL BELOW GROUND SURFACE
1	600'	580'	23'
2	575'	544.8'	23.1'
3	539.8'	514.8'	23.3'
4	509.8'	484.8'	23.4'
5	479.8'	459.8'	23.5'
6	454.8'	434.8'	23.6'
7	429.8'	409.8'	23.7'
8	404.8'	379.8'	23.9'
9	374.8'	329.7	24'
10	324.7'	299.7'	24.1'
11	294.7'	274.7'	24.2'
12	269.7'	249.7'	24.3'
13	244.7'	214.7'	24.4'
14	209.7'	181.5'	24.6'
15	176.5'	159.5'	24.8'
16	154.5'	139.5'	24.9'
17	134.5'	94.5'	25.2'
18	89.5'	69.5'	25.3'
19	64.5'	34.5'	25.4'

32 / 4.1a FIG

SECTION
ALONG SEISMIC LINE-47
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS: GLACIOFLUVIAL
- GLACIAL DEPOSITS: GLACIOLACUSTRINE DEPOSIT
- GLACIAL DEPOSITS: GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. STATIC WATER LEVEL IN GH08-170 MAY BE DUE TO MALFUNCTION IN VIBRATING WIRE.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 100 0 100 200 300 400 500 ft

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PEBBLE PROJECT

AREA G
GEOLOGIC SECTION ALONG SEISMIC LINE-47 - SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.32a REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B48, 2/16/2011 2:09:19 PM , WLAHODA PRINTED: 2/16/2011 2:10:45 PM, Fig 4.32a, WLAHODA
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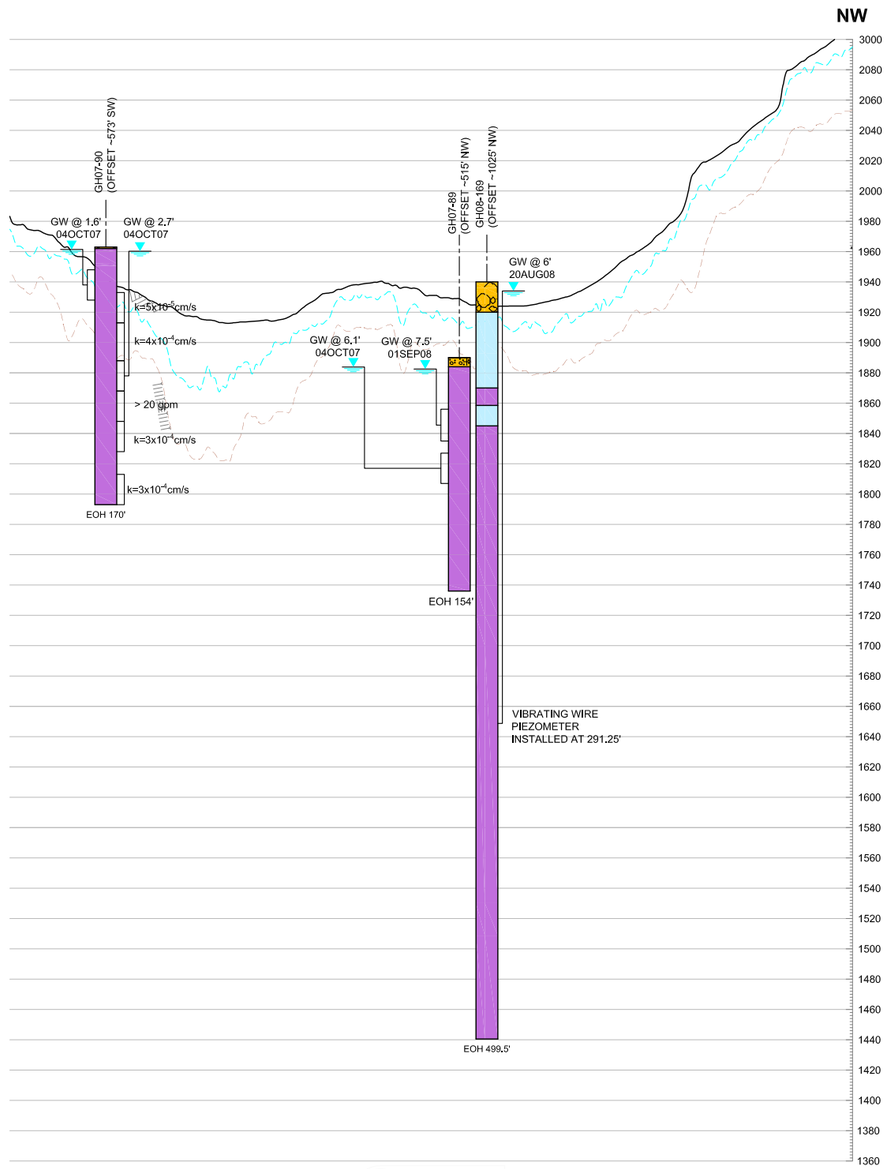

32
4.1a
FIG

SECTION
ALONG SEISMIC LINE-47
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. STATIC WATER LEVEL IN GH08-170 MAY BE DUE TO MALFUNCTION IN VIBRATING WIRE.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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PEBBLE PROJECT

AREA G
GEOLOGIC SECTION ALONG
SEISMIC LINE-47 - SHEET 2 OF 2

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.32b | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B48, 2/16/2011 11:44:25 AM , WLAHODA PRINTED: 2/16/2011 11:45:18 AM, Fig. 4.32b, WLAHODA
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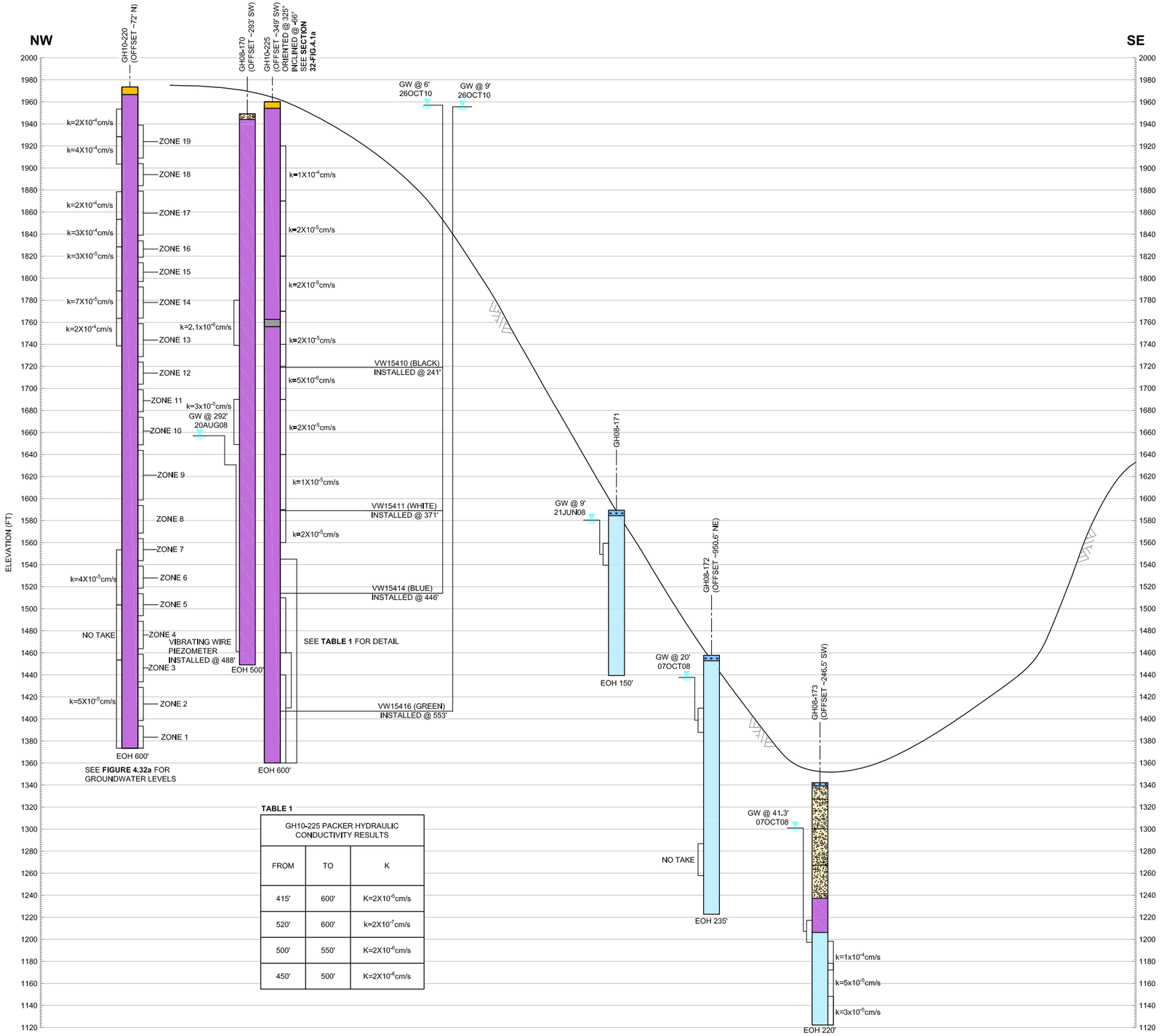

TABLE 1

GH10-225 PACKER HYDRAULIC CONDUCTIVITY RESULTS		
FROM	TO	K
415'	600'	$K=2X10^{-5}$cm/s
520'	600'	$k=2X10^{-7}$cm/s
500'	550'	$K=2X10^{-5}$cm/s
450'	500'	$K=2X10^{-6}$cm/s

33 / 4.1a FIG

SECTION
ACROSS NORTH AREA L
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS: GLACIOFLUVIAL
- GLACIAL DEPOSITS: GLACIOLACUSTRINE DEPOSIT
- GLACIAL DEPOSITS: GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. CRETACEOUS INTRUSIVE THAT OVERLIES TERTIARY UNIT IN GH08-173 IS NEITHER A LARGE BOULDER, A THRUST FAULT OR THE LITHOLOGY HAS BEEN OVERTURNED AS PROPOSED BY PLP GEOLOGISTS.
11. STATIC WATER LEVEL IN GH08-170 MAY BE DUE TO MALFUNCTION IN VIBRATING WIRE. AN INDETERMINATE AMOUNT OF MEASUREMENTS HAVE BEEN TAKEN TO DATE. WATER LEVEL NEEDS TO BE VERIFIED.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

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PEBBLE PROJECT

AREA L
NORTH GEOLOGIC SECTION

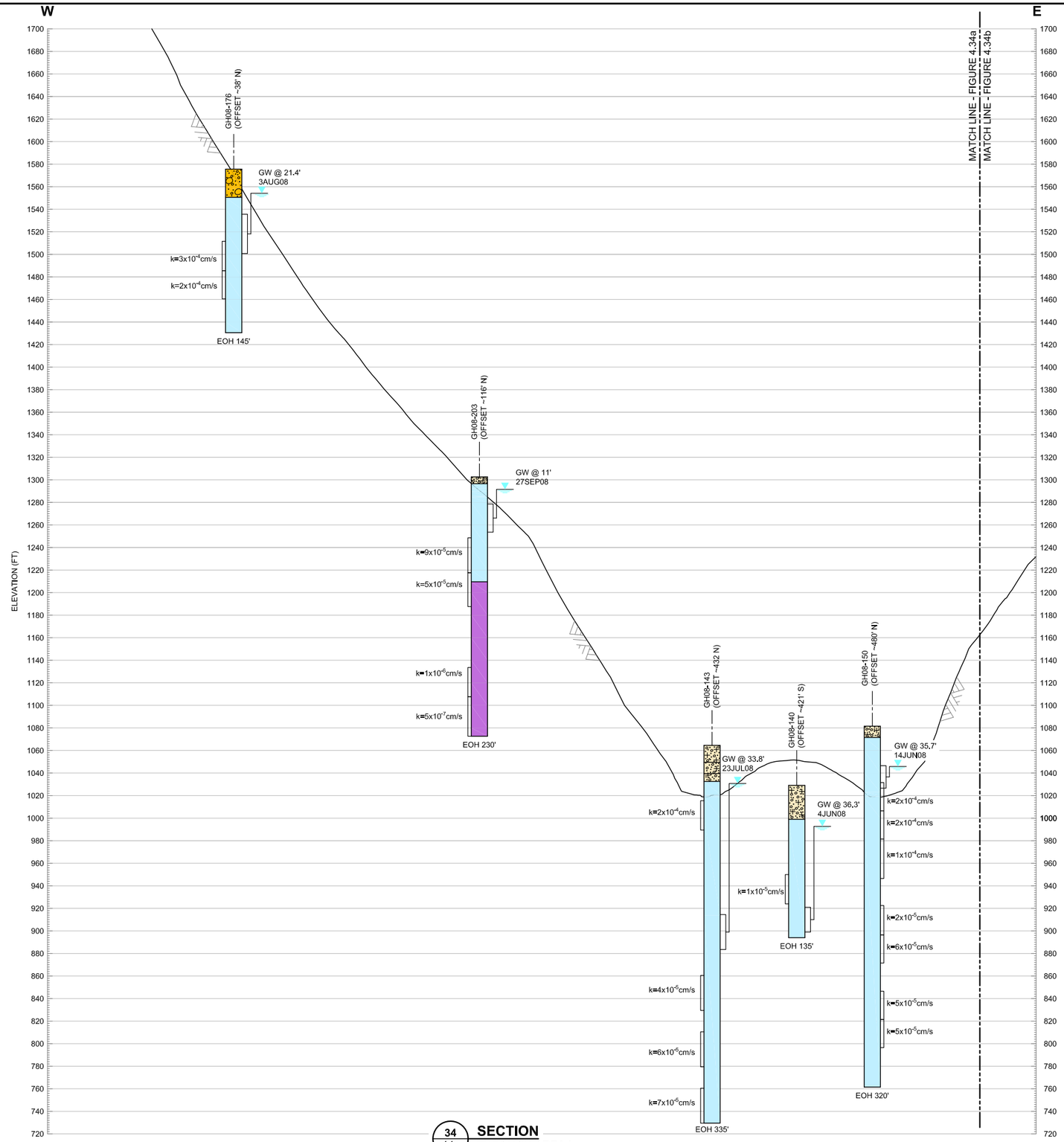
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.33 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B4-1, 2\16/2011 2:06:17 PM, WLAHODA PRINTED: 2/16/2011 2:06:37 PM, Area L - North, WLAHODA
XREF FILES: Common Notes; Legends - LJG; BMUGE FILES: 244,248



34
4.1a
FIG

SECTION
THROUGH AREA L
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

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2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

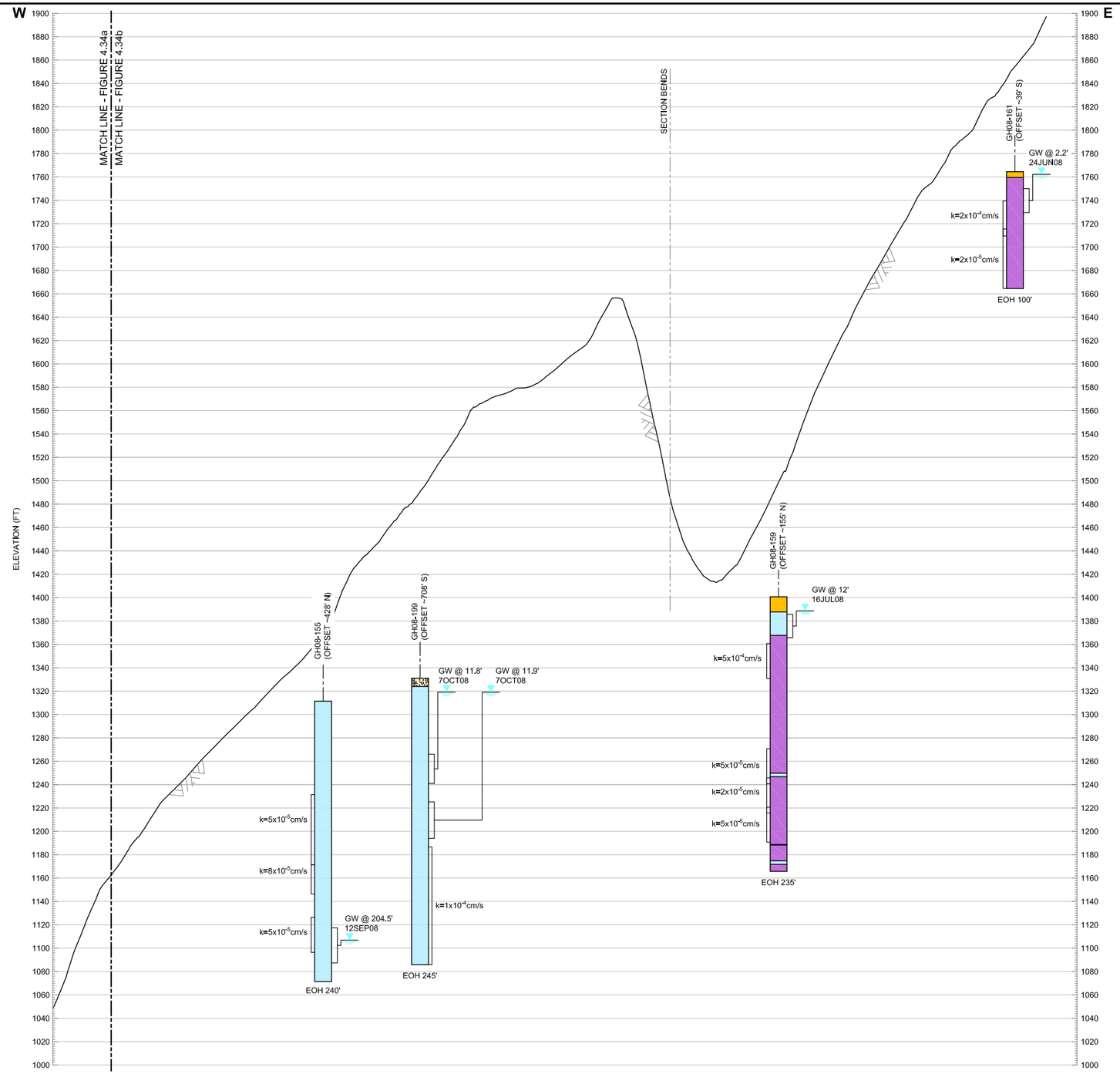
PEBBLE PROJECT

AREA L
GEOLOGIC SECTION
SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.34a | REV 0



34 / 4.1a FIG **SECTION**
THROUGH AREA L
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT (GLACIAL DEPOSITS)
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

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2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
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7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

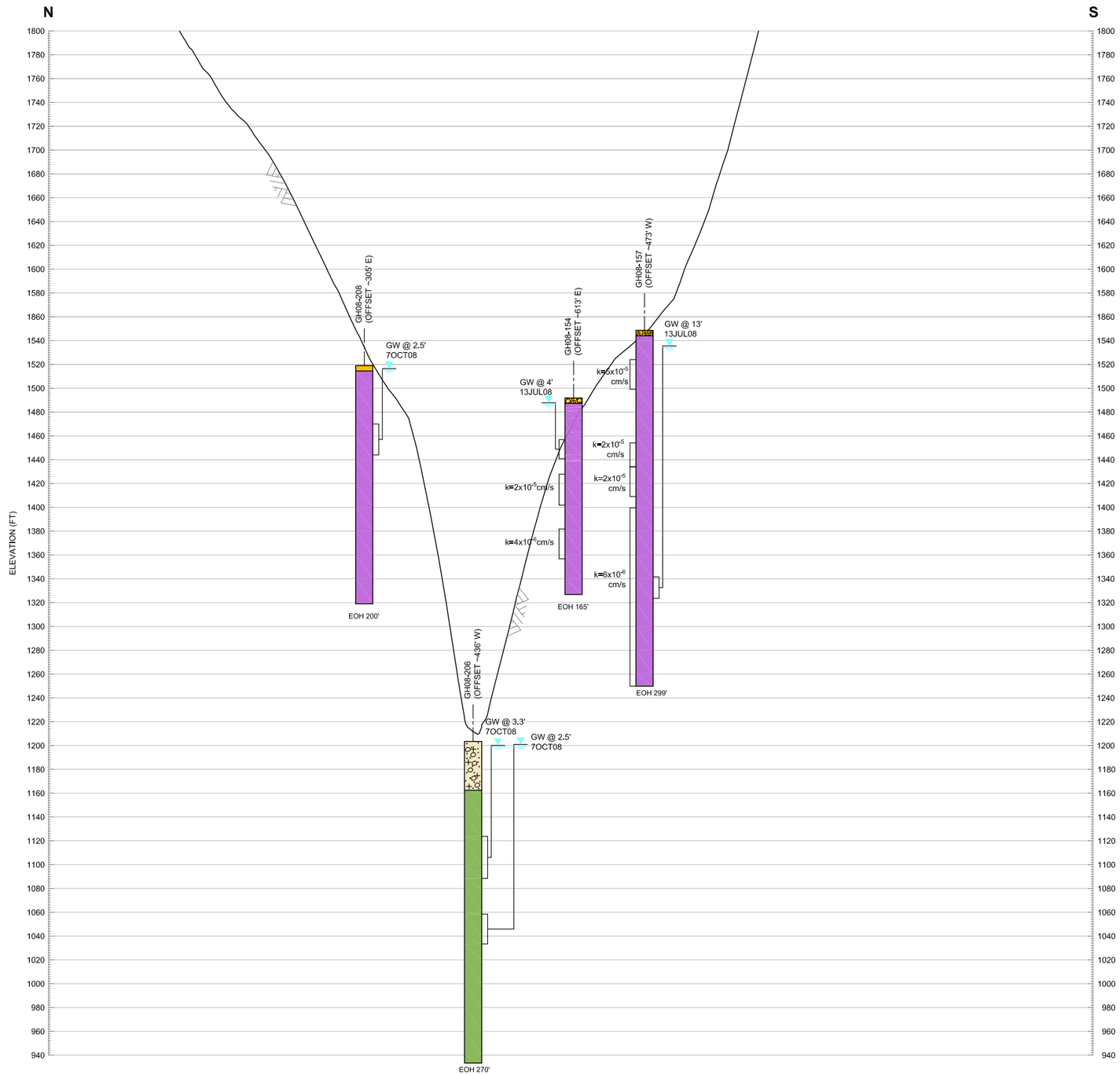
PEBBLE PROJECT

AREA L
GEOLOGIC SECTION
SHEET 2 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.34b REV 0



35 / 4.1b FIG

SECTION
ACROSS NORTH AREA J
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
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7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA J
NORTH GEOLOGIC SECTION

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.35 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B46; 2/16/2011 11:26:47 AM , PPETKOVIC PRINTED: 2/16/2011 11:29:57 AM, Section 35, PPETKOVIC
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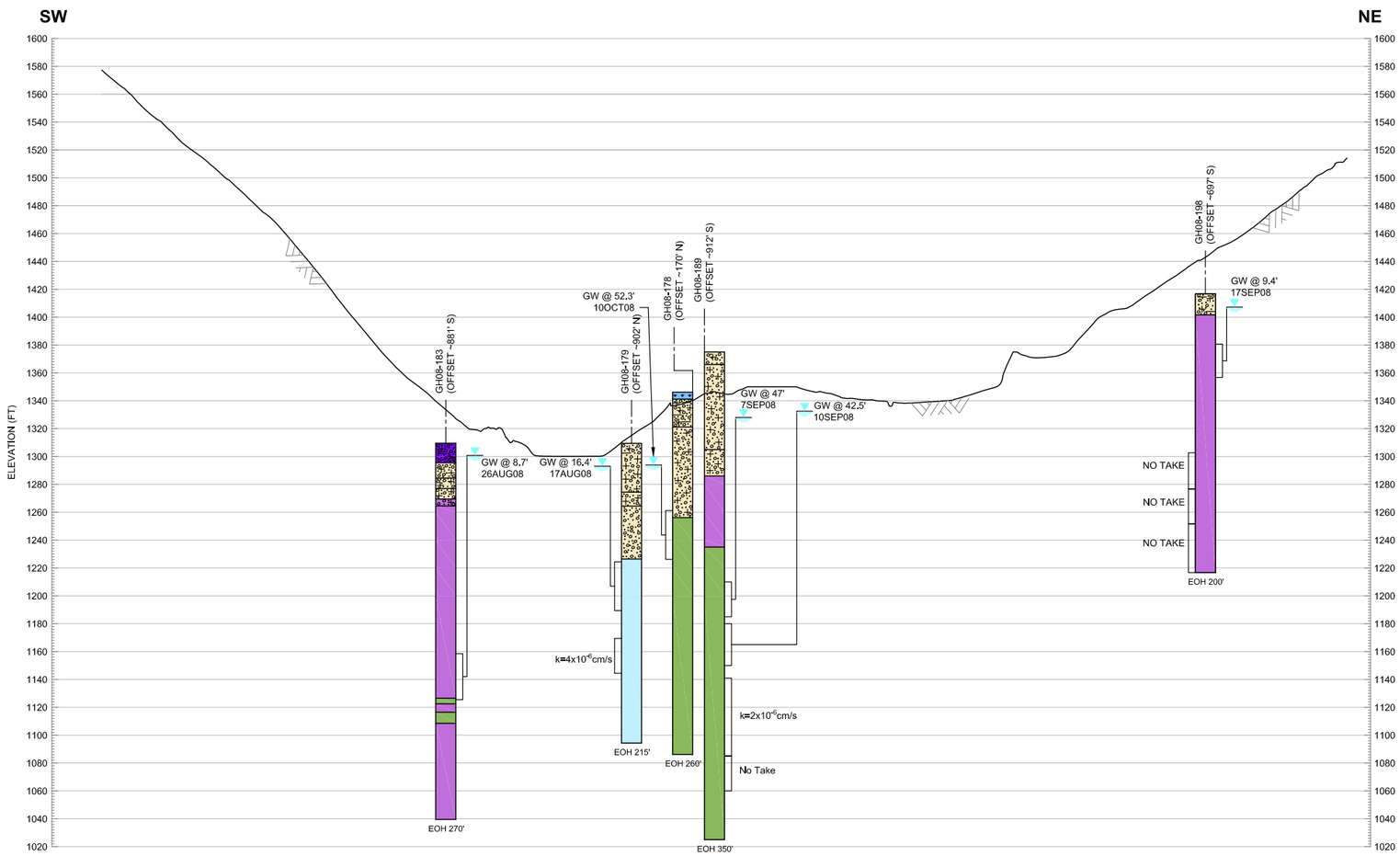

36 / 4.1b FIG.

SECTION
ACROSS NORTHWEST AREA E
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
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- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

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2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
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7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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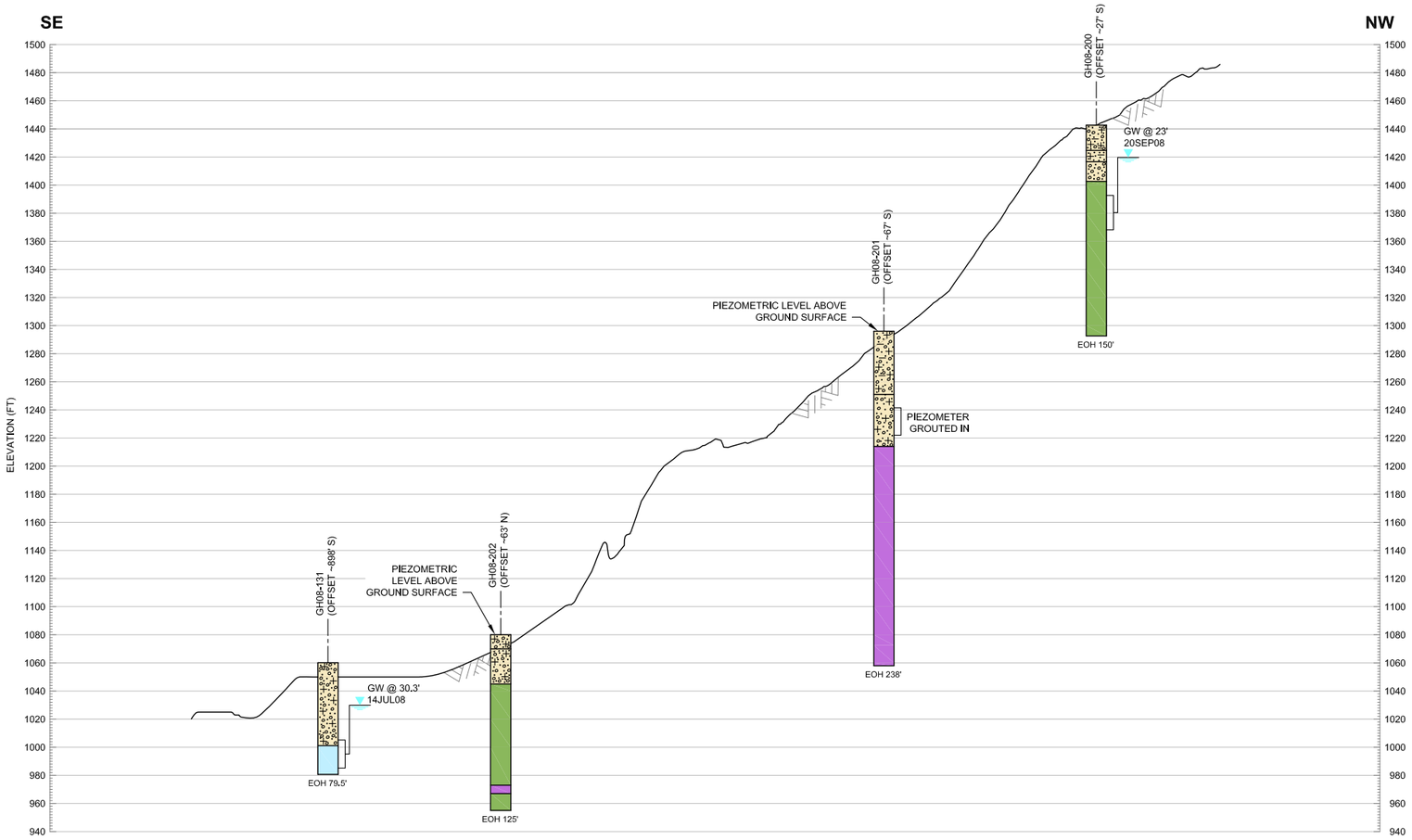
PEBBLE PROJECT

AREA E
NORTHWEST GEOLOGIC SECTION

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.36 | REV 0



37
4.1b
FIG

SECTION
NORTH OF PIT IN UPPER TALARIK
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

UPPER TALARIK CREEK AREA GEOLOGIC SECTION

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.37 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B44, 2/16/2011 11:48:34 AM , PPETKOVIC PRINTED: 2/16/2011 11:51:05 AM, Section 37, PPETKOVIC
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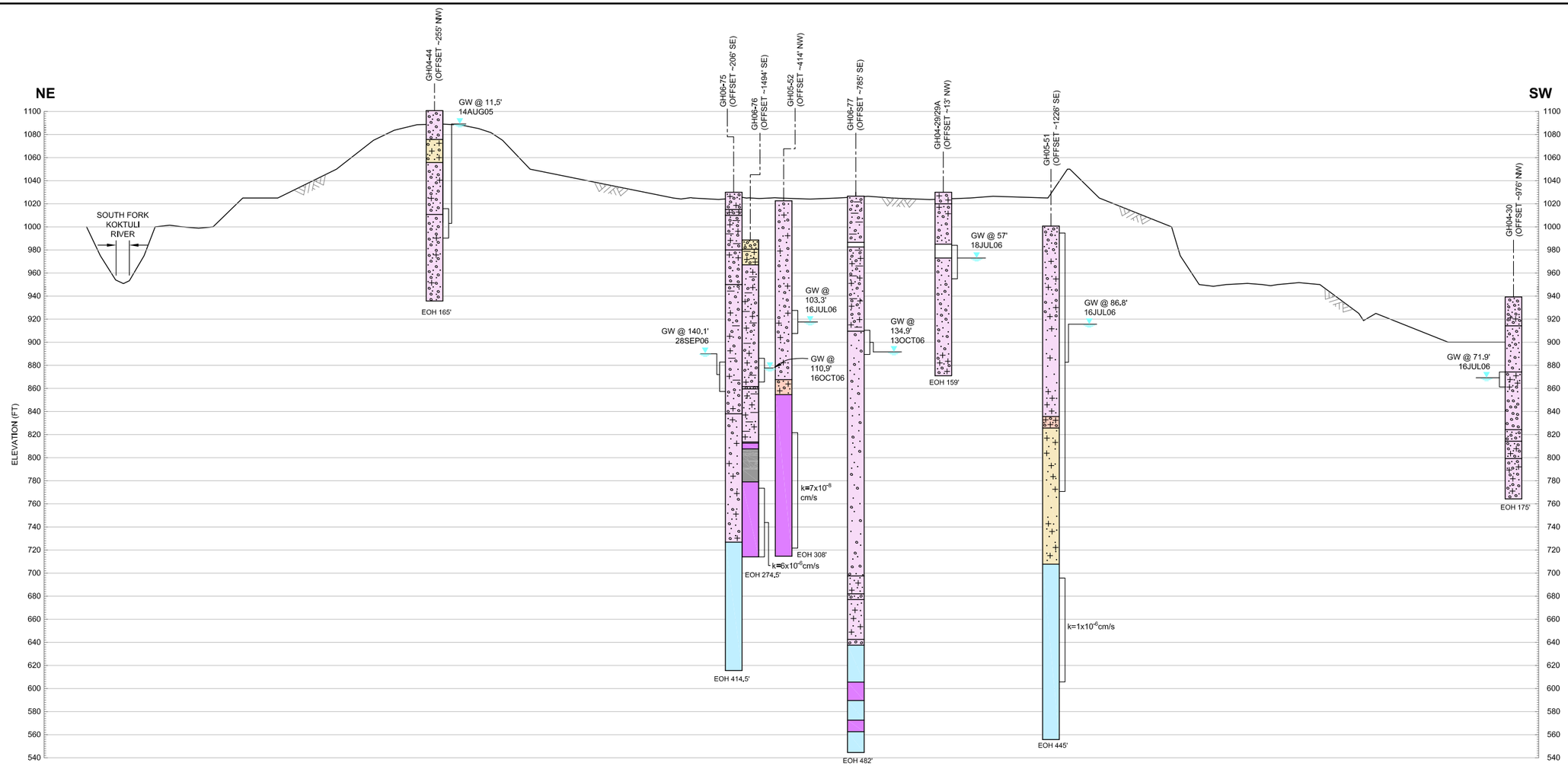

38 / 4.1a FIG

SECTION

SOUTHWEST TRANSVERSE GEOLOGIC SECTION

HORIZ. SCALE A, VERT. SCALE B

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^-4 cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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AREA A
SOUTHWEST TRANSVERSE GEOLOGIC SECTION

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.38 | REV 0

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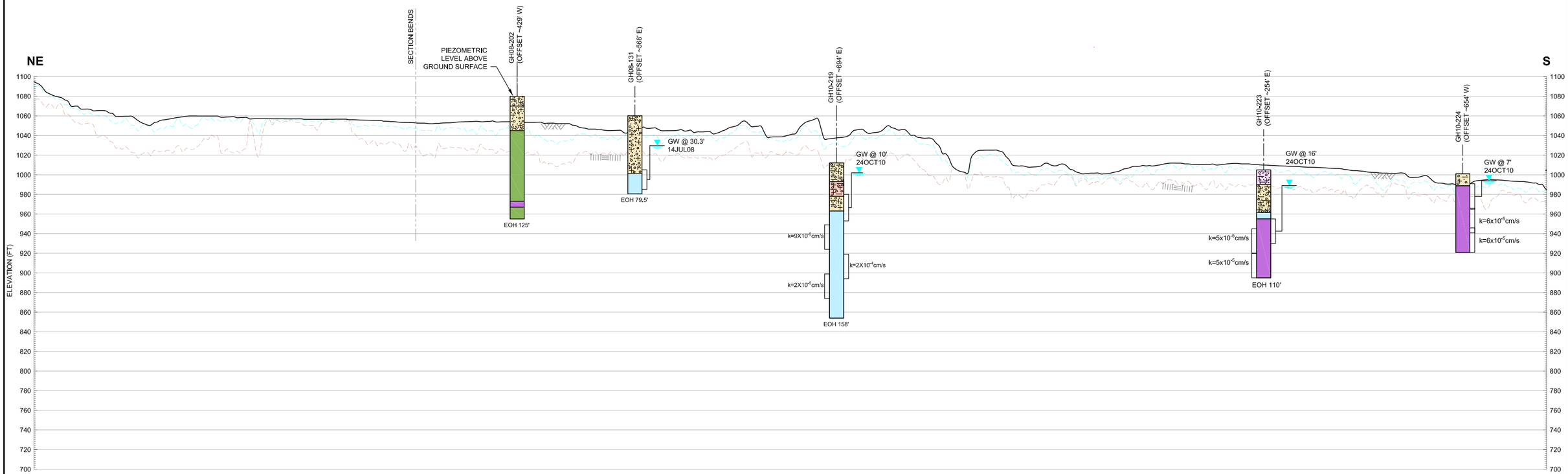

39 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-39
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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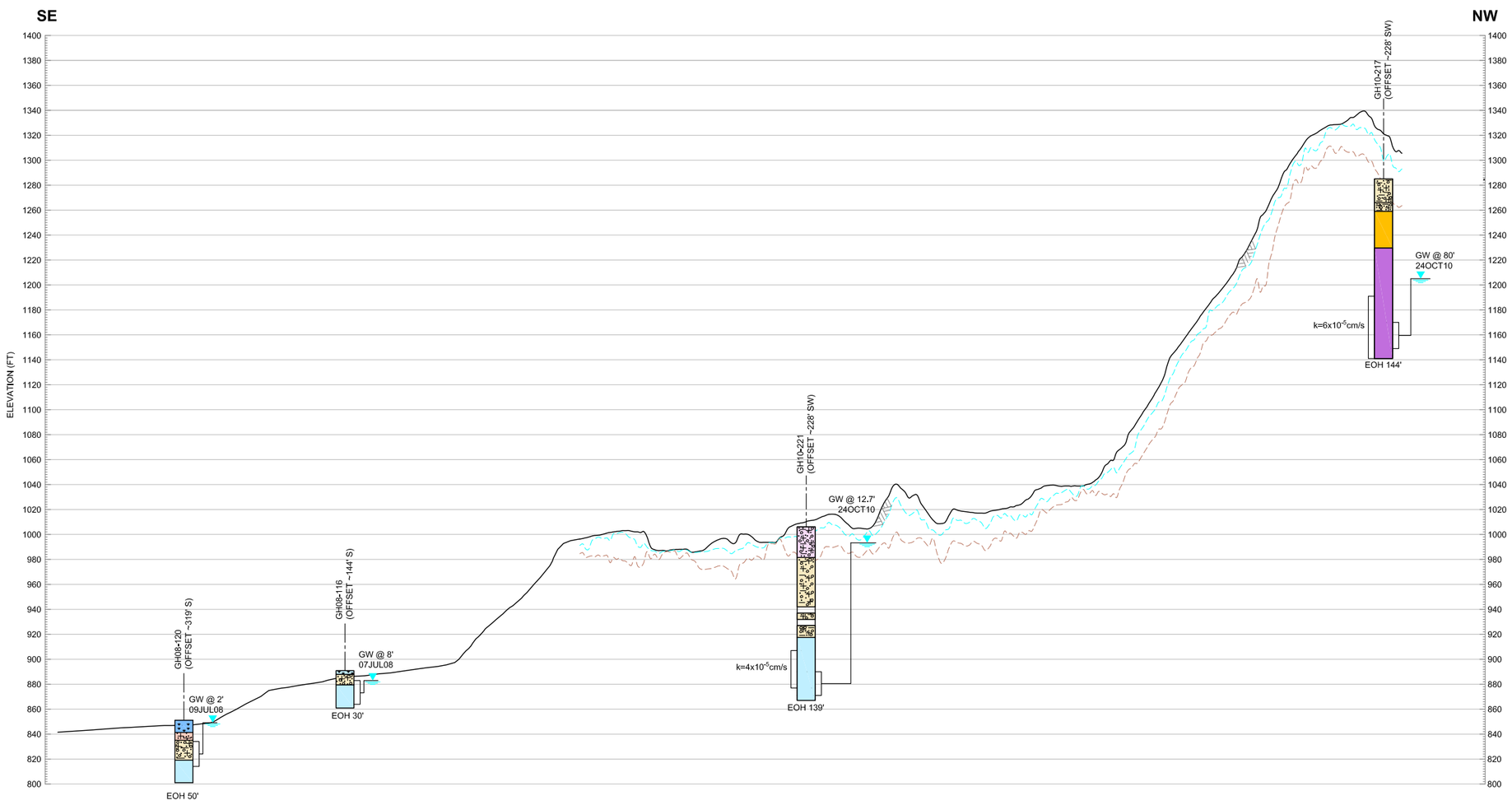
PEBBLE PROJECT

OPEN PIT AREA GEOLOGIC SECTION ALONG SEISMIC LINE-39

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.39 | REV 0



40
4.1b
FIG

SECTION
ALONG SEISMIC LINE-40
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

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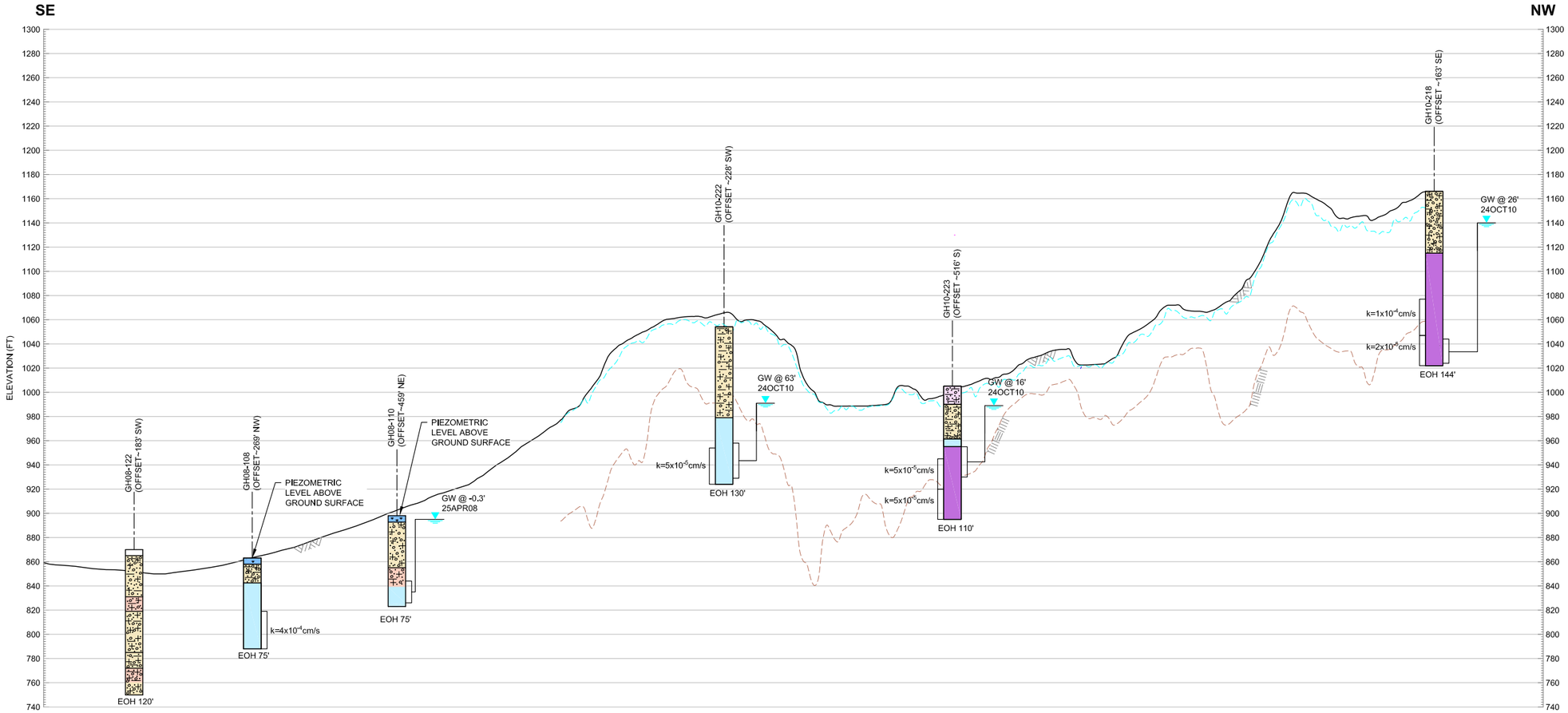
PEBBLE PROJECT

OPEN PIT AREA
GEOLOGIC SECTION ALONG
SEISMIC LINE-40

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.40 REV 0



41 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-41
HORIZ. SCALE A, VERT. SCALE B

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

OPEN PIT AREA GEOLOGIC SECTION ALONG SEISMIC LINE-41

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.41 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B55, 2/16/2011 2:52:05 PM , WLAHODA PRINTED: 2/16/2011 2:52:53 PM, Layout: WLAHODA
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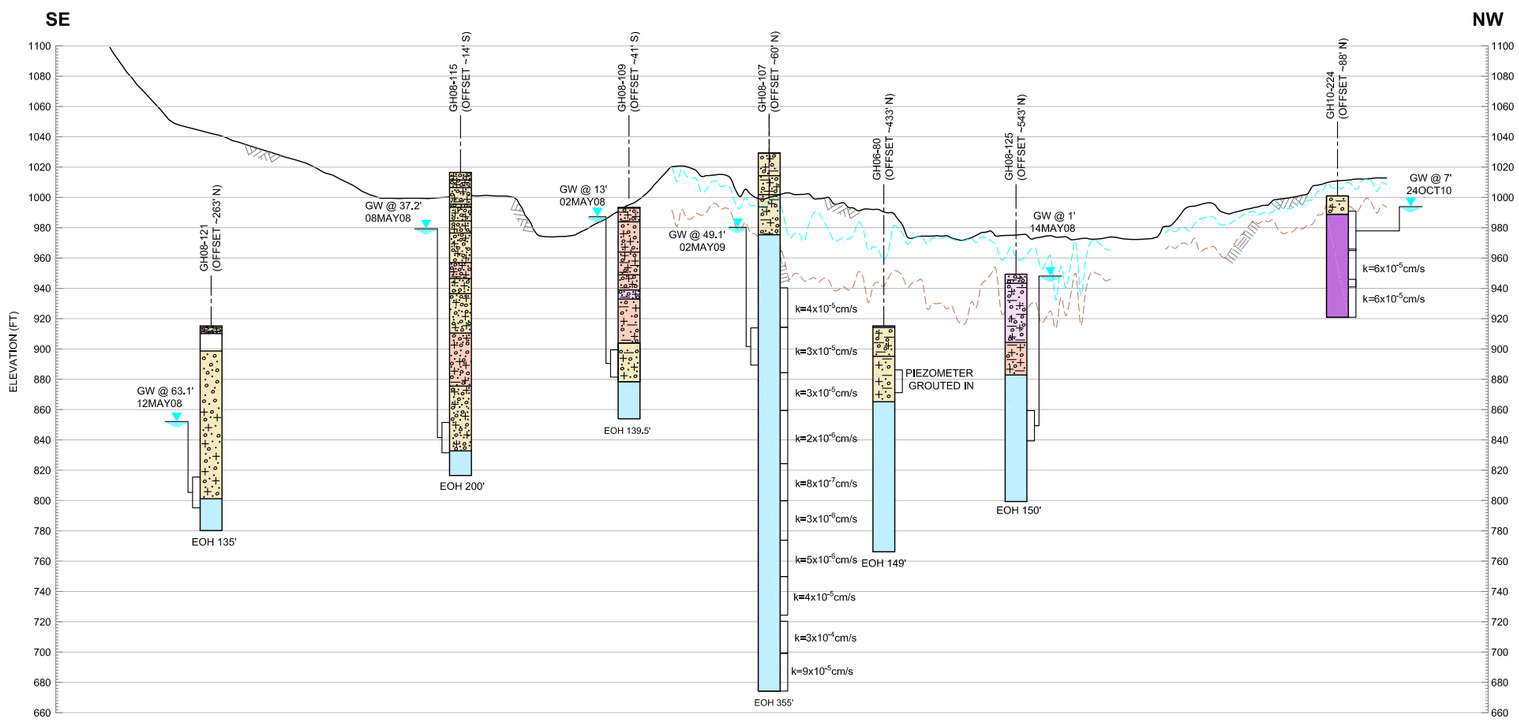

42 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-42
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS, REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

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OPEN PIT AREA GEOLOGIC SECTION ALONG SEISMIC LINE-42

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.42 | REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B56, 2/16/2011 3:09:10 PM , WLAHODA PRINTED: 2/16/2011 3:09:37 PM, Layout, WLAHODA
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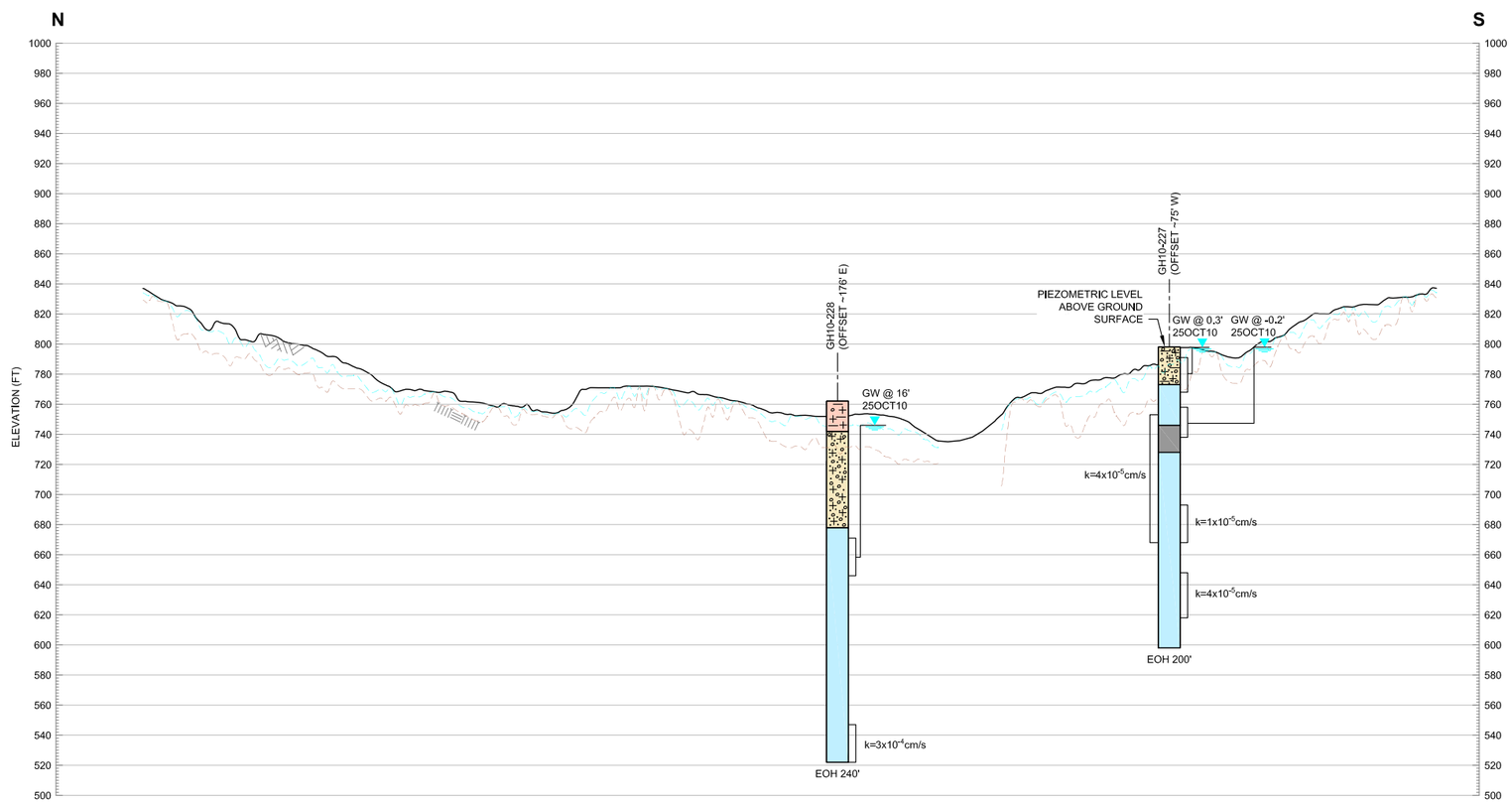


43
4.1a
FIG

SECTION
ALONG SEISMIC LINE-50
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

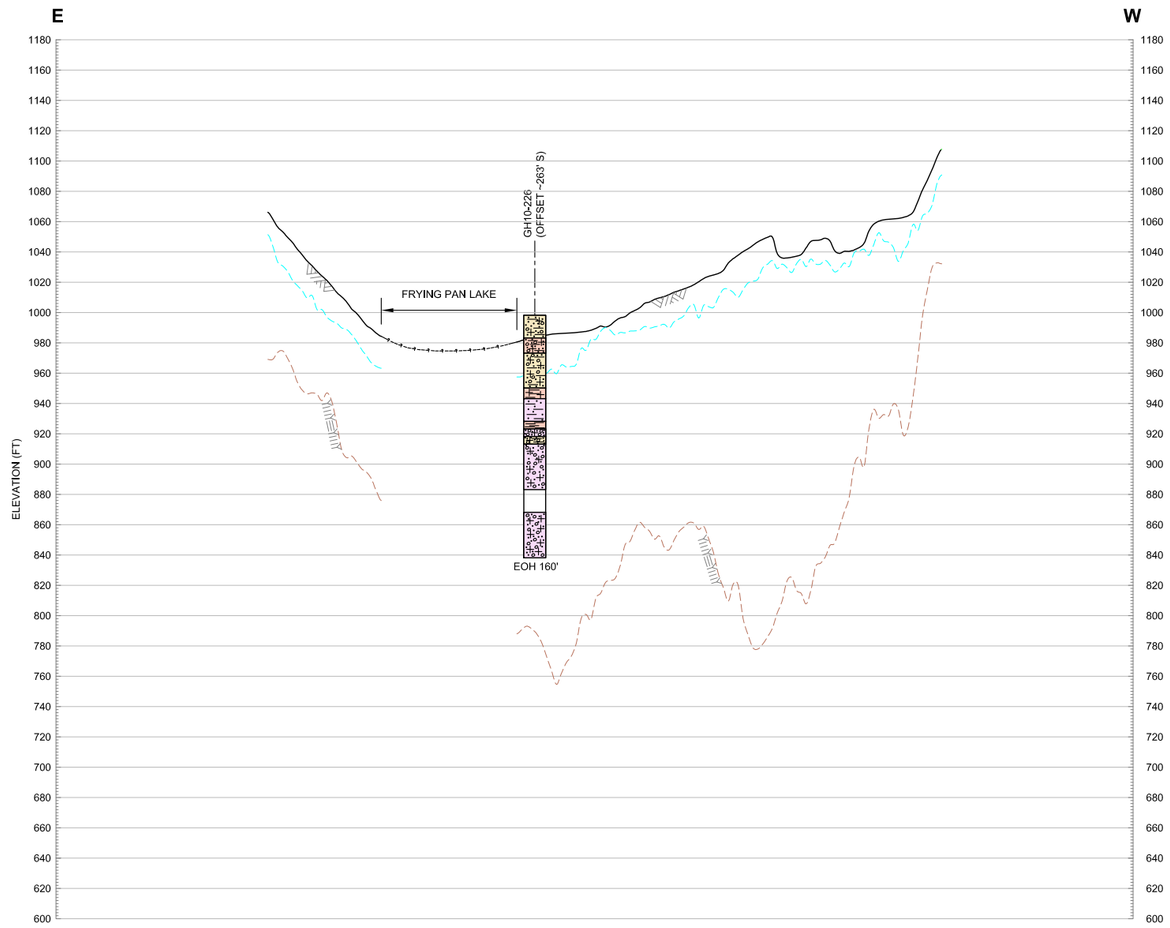
UPPER TALARIK CREEK AREA GEOLOGIC SECTION ALONG SEISMIC LINE-50

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.43 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



44
4.1a
FIG

SECTION
ALONG SEISMIC LINE-51
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

GLACIAL DEPOSITS

- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.
10. NO PIEZOMETER INSTALLED IN GH10-226

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

AREA A
GEOLOGIC SECTION ALONG
SEISMIC LINE-51

Knight Piésold CONSULTING

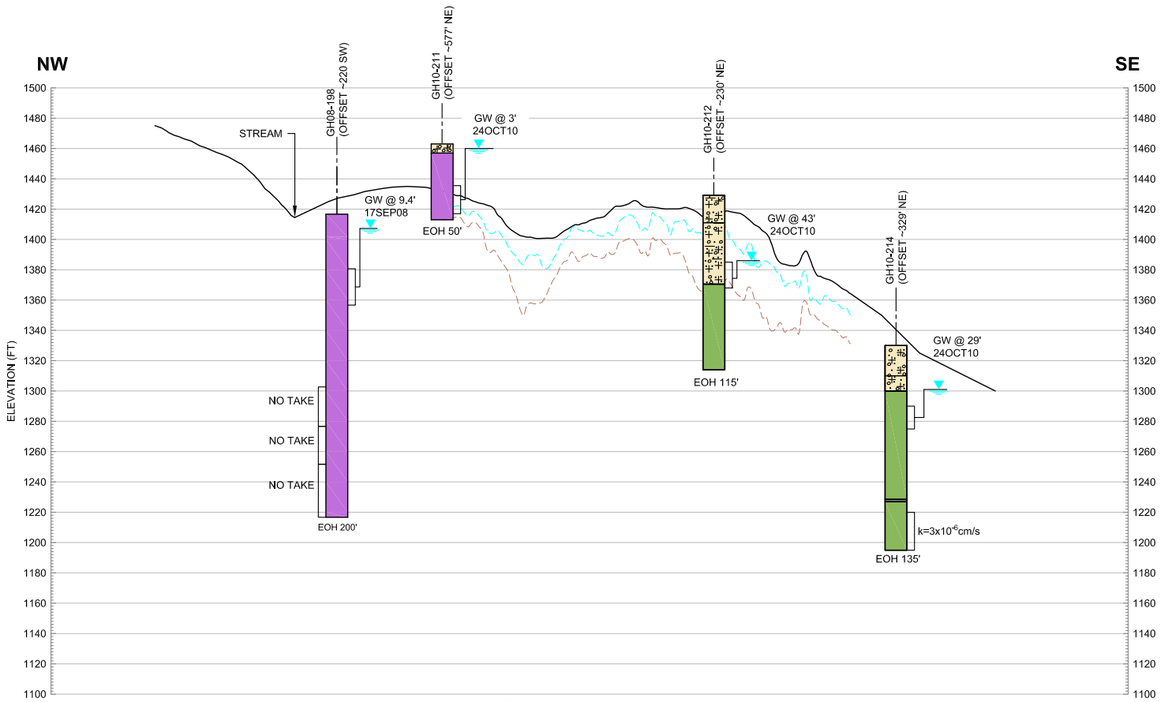
P/A NO. VA101-176/35

REF NO. 1

FIGURE 4.44

REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B52\ 2/16/2011 3:19:36 PM , WLAHODA PRINTED: 2/16/2011 3:20:27 PM, FIG4.44a, WLAHODA
XREF FILES: Tiles_Alt, Common Notes, Legend 1, 360° IMAGE FILES:



45 / 4.1b FIG

SECTION
ALONG SEISMIC LINE-45
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

GLACIAL DEPOSITS:
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIOFLUVIAL
- GLACIOLACUSTRINE DEPOSIT
- GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM

TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.

CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.

CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.

FAULT ZONE

GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT

k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS

GROUND SURFACE

INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA

INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

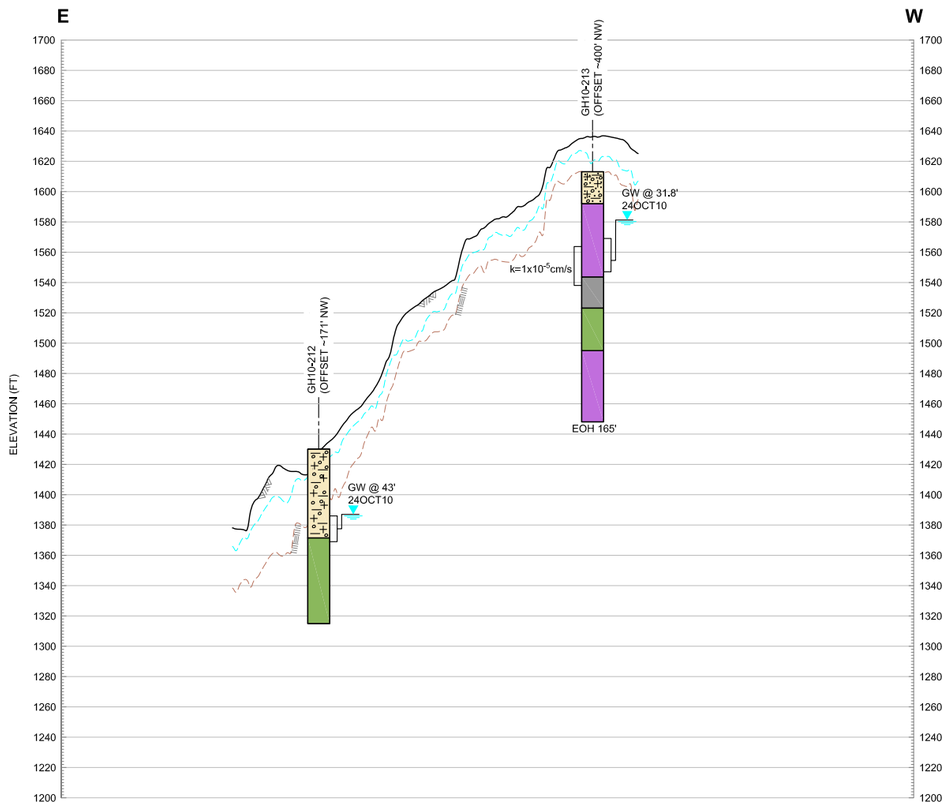
AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-45

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.45 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



46
4.1b
FIG

SECTION
ALONG SEISMIC LINE-44
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 100 0 100 200 300 400 500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

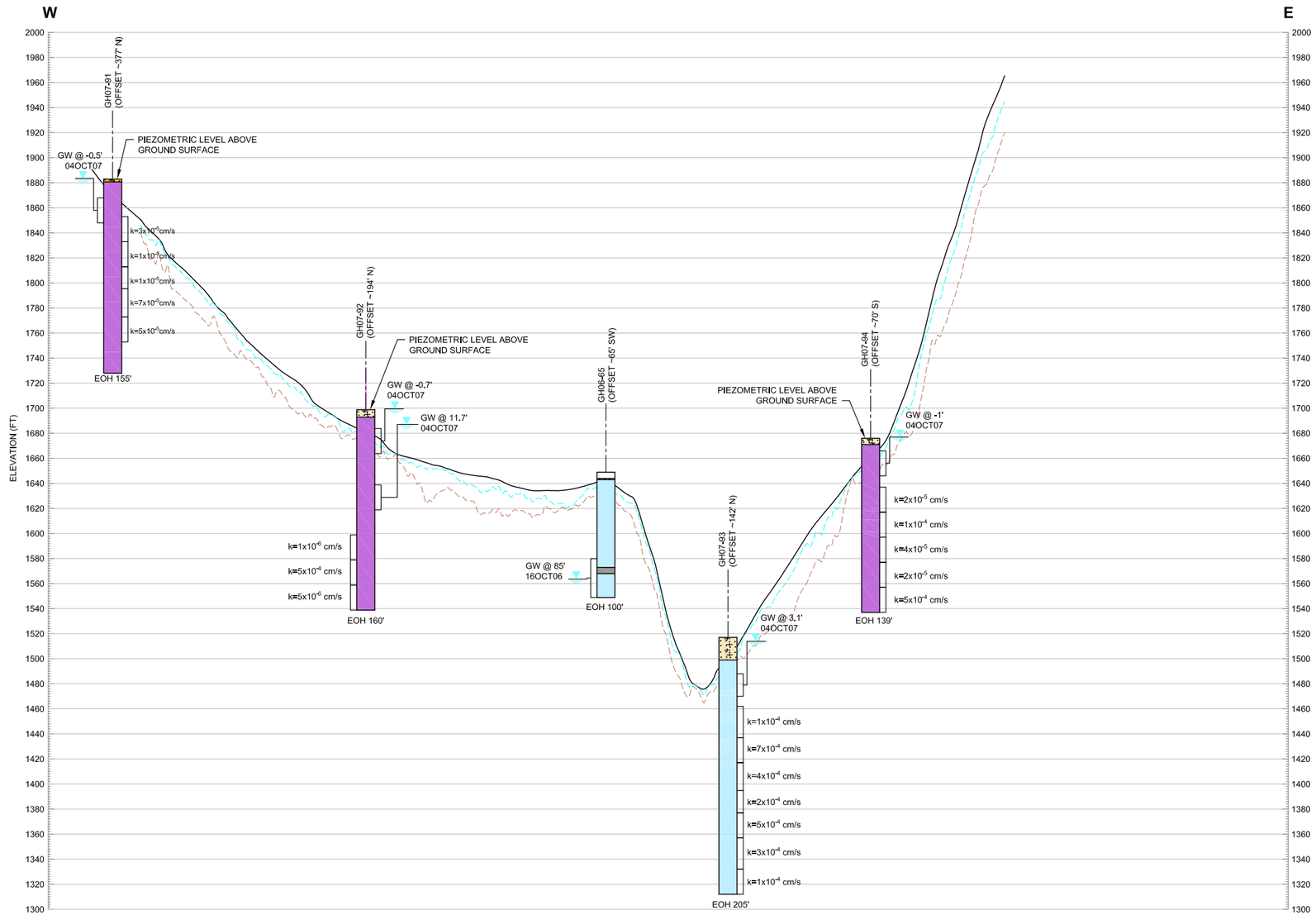
AREA E
GEOLOGIC SECTION ALONG SEISMIC LINE-44

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.46 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB



47 / 4.1a FIG

SECTION
THROUGH SOUTH AREA G
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS: GLACIOFLUVIAL
- GLACIAL DEPOSITS: GLACIOLACUSTRINE DEPOSIT
- GLACIAL DEPOSITS: GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

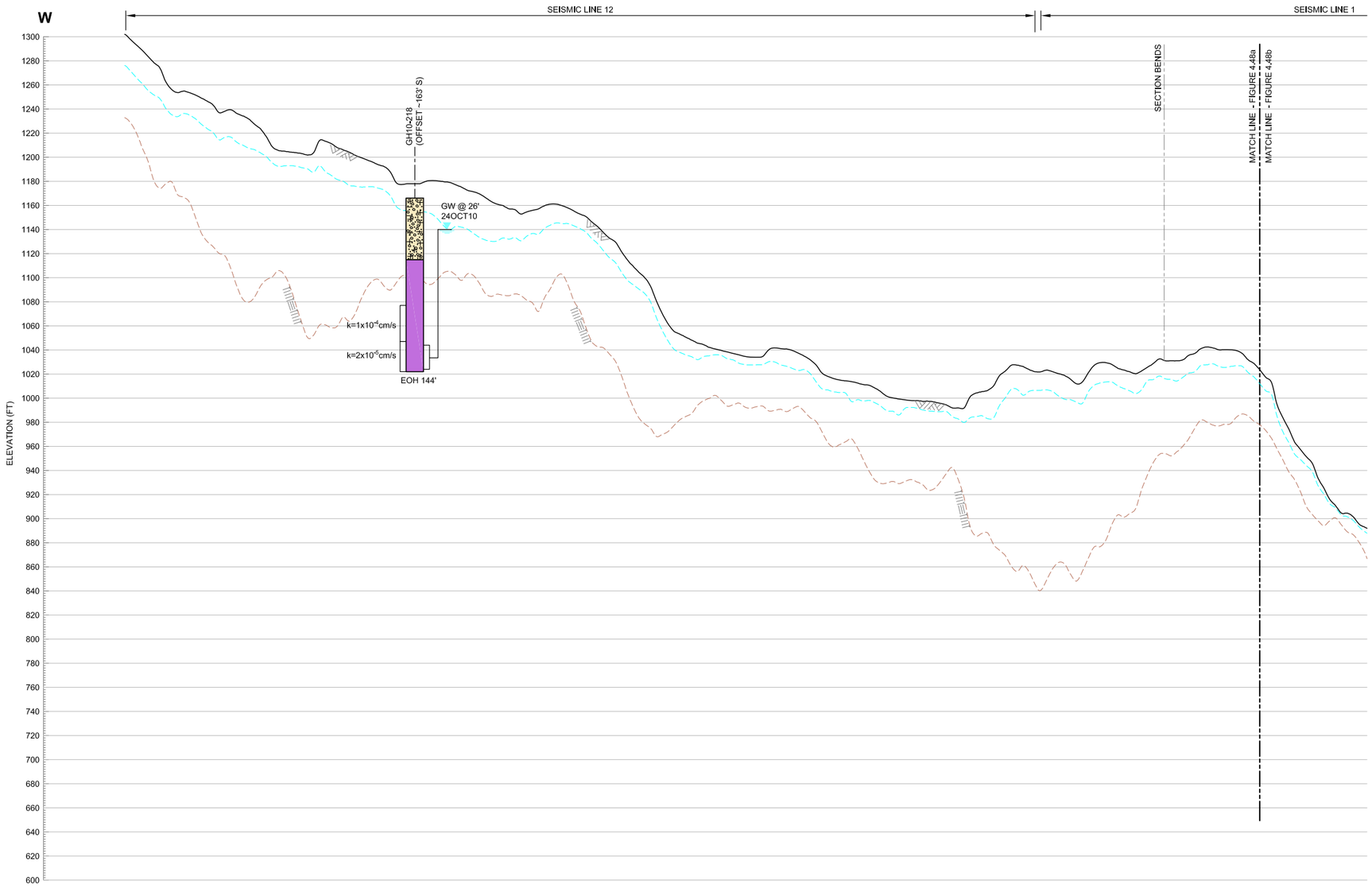
PEBBLE PROJECT

AREA L
GEOLOGIC SECTION ALONG SEISMIC LINE-49

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.47 | REV 0



48
4.1b
FIG

SECTION
ALONG SEISMIC LINES-1, 12 AND 22
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
6. DETAILED DRILLHOLE DATA FOR 2004, 2005, 2006, 2007 AND 2008 IS LOCATED IN THE CORRESPONDING SITE INVESTIGATION DATA REPORTS. REF NOS. VA101-176/8-3, VA101-176/8-6, VA101-176/8-9, VA101-176/20-4 AND VA101-176/23-4, RESPECTIVELY.
7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

OPEN PIT AREA
GEOLOGIC SECTION ALONG
SEISMIC LINES-1, 12, & 22 - SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-176/35	1

FIGURE 4.48a REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B58, 2/17/2011 1:43:24 PM , WLAHODA PRINTED: 2/17/2011 1:44:52 PM, Sh 1 of 2, WLAHODA
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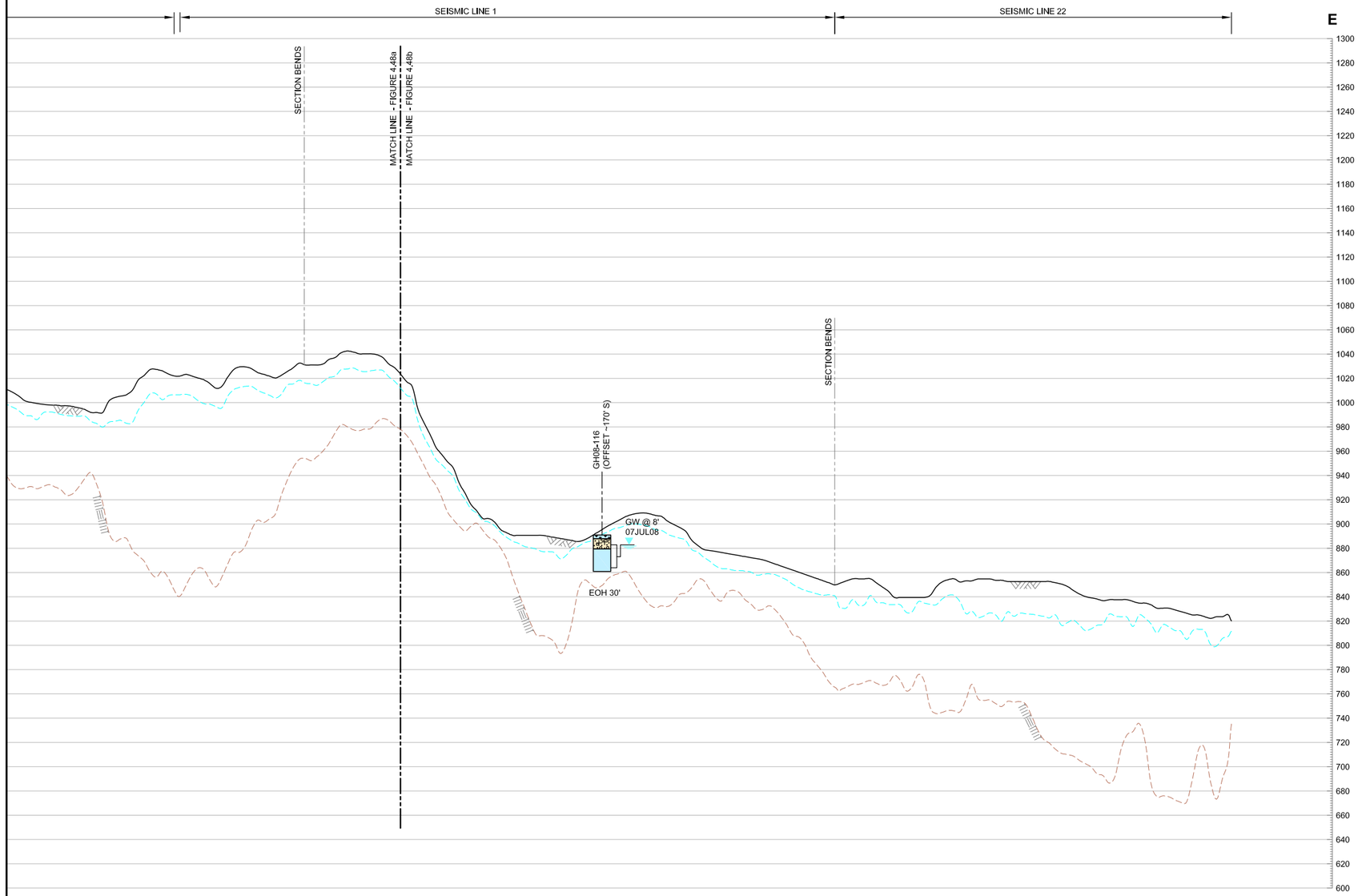

48 / 4.1b FIG

SECTION
ALONG SEISMIC LINES-1, 12 AND 22
HORIZ. SCALE A, VERT. SCALE B

LEGEND:

- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC DEPOSIT
- ALLUVIUM
- GLACIAL DEPOSITS:
  - GLACIOFLUVIAL
  - GLACIOLACUSTRINE DEPOSIT
  - GLACIAL DRIFT DEPOSIT
- FELSENMEER
- COLLUVIUM
- TERTIARY SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, VOLCANICLASTIC BRECCIA, SANDSTONE, CONGLOMERATE, ANDESITE, MONZONITE, DACITE, LATITE, RHYOLITE AND BASALT.
- CRETACEOUS SEDIMENTS AND VOLCANICS: TYPICALLY CONSIST OF MUDSTONE/SILTSTONE, CONGLOMERATE, SANDSTONE AND BASALT.
- CRETACEOUS INTRUSIVE: TYPICALLY CONSIST OF GRANODIORITE, MONZONITE, MONZODIORITE, PORPHYRITIC MONZODIORITE, DIORITE AND GABBRO.
- FAULT ZONE
- GW @ 5.4' 18JUL06 — PIEZOMETER COMPLETION ZONE, MEASURED GROUNDWATER LEVEL AND DATE OF MEASUREMENT
- k=1.2 x 10^{-4} cm/s — HYDRAULIC CONDUCTIVITY FROM PACKER TESTS
- GROUND SURFACE
- INTERPRETED GROUNDWATER LEVEL FROM SEISMIC DATA
- INTERPRETED BEDROCK SURFACE FROM SEISMIC AND DRILLHOLE DATA

NOTES:

1. THIS CROSS-SECTION SUPERSEDES ALL PRIOR CROSS-SECTIONS FOR THIS LOCATION.
2. FOR SECTION LOCATION, SEE FIGURE 4.1a AND FIGURE 4.1b.
3. GROUNDWATER LEVELS MAY VARY SEASONALLY. MEASUREMENTS ARE FROM GROUND SURFACE, UNLESS OTHERWISE INDICATED.
4. THE STRATA INDICATED REPRESENT THE MAJOR DEPOSIT TYPES/PARTICLE SIZES ENCOUNTERED IN THE DRILLHOLES. THE GRADATION OF THE SOILS IS ANTICIPATED TO VARY. THE CONTACT BETWEEN DEPOSIT TYPES IS APPROXIMATE; THE TRANSITION MAY BE GRADUAL.
5. THE STRATIGRAPHY BETWEEN DRILLHOLES MAY VARY.
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7. SEISMIC DATA PROVIDED BY FRONTIER GEOSCIENCES INC.
8. DRILLHOLE INTERVALS WITH NO COLOUR WERE TRICONED AND HAVE MINIMAL TO NO DATA AVAILABLE FROM CUTTINGS OR SPT SAMPLES; THEREFORE, THE DEPOSIT TYPE IS UNKNOWN.
9. BEDROCK GEOLOGY DEFINED BY PLP GEOLOGISTS.

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	28JAN'11	ISSUED WITH REPORT	LS	TAM	LJG	KJB

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

OPEN PIT AREA
GEOLOGIC SECTION ALONG
SEISMIC LINES-1, 12, & 22 - SHEET 2 OF 2

Knight Piésold CONSULTING

P/A NO. VA101-176/35 | REF NO. 1

FIGURE 4.48b | REV 0

SAVED: M:\1\01\00176\35\A\Acad\FIGS\B58_2\17\2011 1:43:24 PM , WLAHODA PRINTED: 2/17/2011 1:45:23 PM, Sh 2 of 2, WLAHODA
XREF FILES: Common Mases; Legend1; L300; Tess_dft (MUSE FILES):

PHOTO 1 GH07-105 120 - 141'

PHOTO 2 GH08-107 31.5 - 50'

0	11MAR'11	ISSUED WITH REPORT	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EXAMPLES OF CORED OVERBURDEN IN OPEN PIT AND EAST DEPOSIT AREAS
SHEET 1 OF 5

Knight Piésold CONSULTING

P/A NO. VA101-176/35

REF. NO. 1

FIGURE 5.1

REV 0

PHOTO 1 GH08-108 0 - 31.5'

PHOTO 2 GH08-109 69.5 - 88.2'

0	11MAR'11	ISSUED WITH REPORT	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EXAMPLES OF CORED OVERBURDEN IN OPEN PIT AND EAST DEPOSIT AREAS
SHEET 2 OF 5

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P/A NO. VA101-176/35

REF. NO. 1

FIGURE 5.2

REV 0

PHOTO 1 GH08-122 0 - 29'

PHOTO 2 GH08-110 5 - 35'

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EXAMPLES OF CORED OVERBURDEN IN OPEN PIT AND EAST DEPOSIT AREA
SHEET 3 OF 5

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P/A NO. VA101-176/35 | REF. NO. 1

FIGURE 5.3 | REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	11MAR'11	ISSUED WITH REPORT	LS	LJG	KJB

PHOTO 1 GH08-112 75.8 - 95'

PHOTO 2 GH08-117 0 - 37'

0	11MAR'11	ISSUED WITH REPORT	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EXAMPLES OF CORED OVERBURDEN IN OPEN PIT AND EAST DEPOSIT AREAS
SHEET 4 OF 5

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P/A NO. VA101-176/35

REF. NO. 1

FIGURE 5.4

REV 0

PHOTO 1 GH08-125 30 - 55'

PHOTO 2 GH08-125 55 - 72.5'

0	11MAR'11	ISSUED WITH REPORT	LS	LJG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

EXAMPLES OF CORED OVERBURDEN IN OPEN PIT AND EAST DEPOSIT AREAS
SHEET 5 OF 5

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P/A NO. VA101-176/35

REF. NO. 1

FIGURE 5.5

REV 0

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APPENDIX A

TEST PIT GEOTECHNICAL DATA

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APPENDIX A1

TEST PIT LOGS

- TP10-319 TO TP10-424

(Page A1-1 to A1-106)

Project:	**Pebble Project**	Test Pit:	**TP10-319**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 28, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**4.2 ft / 1.28 m**	Date Completed:	**Aug 28, 10**
Coordinates	**2,158,293 ft N, 1,418,953 ft E**	Surface Elev.:	**891 ft /271.58 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				SILT/CLAY, some sand, trace gravel, trace cobbles, subangular to subrounded, poorly graded, low to medium plasticity, brown, organics present, moist to wet. (Glaciolacustrine)		
1.0						
1.5	0.5					
2.0						
2.5				Silty/clayey GRAVEL and SAND, trace cobbles, subrounded, well graded, low to no plasticity, light brown, moist. (Glacial Drift)		TP10-319-1
3.0						
	1.0					
3.5				SILT/CLAY, trace sand, trace gravel, poorly graded, low to medium plasticity, grey, moist. (Glaciolacustrine)		
4.0				Silty SAND and GRAVEL, trace clay, subrounded, well graded, low plasticity, light brown, moist. (Glacial Drift)		
				End of test pit at 4.2 ft/1.28 m	Groundwater measured at 3.3' below ground surface, easy excavation, stable walls.	
4.5						
	1.5					
5.0						
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-319

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-319

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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-320**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 28, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Aug 29, 10**
Coordinates	**2,156,216 ft N, 1,421,761 ft E**	Surface Elev.:	**783 ft /238.66 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				PEAT		
1.0						
1.5	0.5			SILT/CLAY, some sand, trace gravel, poorly graded, low to medium plasticity, grey brown, no visible structure, some organics, moist. (Glaciolacustrine)		TP10-320-1
2.0						
2.5						
3.0	1.0					
3.5						
4.0				PEAT, decomposed organics.		
4.5				SILT/CLAY, some sand, trace gravel, poorly graded, low to medium plasticity, grey, no visible structure, no organics, moist. (Glaciolacustrine)		TP10-320-2
5.0	1.5					
				End of test pit at 5.2 ft/1.58 m	No groundwater present, easy excavation, stable walls.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-320

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-320

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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-321**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 29, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.1 ft / 1.55 m**	Date Completed:	**Aug 29, 10**
Coordinates	**2,156,936 ft N, 1,423,018 ft E**	Surface Elev.:	**742 ft /226.16 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				PEAT, intermixed with sandy SILT, trace to some clay, trace gravel, poorly graded, non plastic, grey with brown peat, moist. Finer layers, low to medium plasticity, grey, at 1.2' and 1.5'.		
1.0						
1.5	0.5					
2.0				Sandy SILT, some clay, trace gravel, poorly graded, low plasticity; grey-brown, no visible structure, moist. (Glaciolacustrine)		
2.5						
3.0	1.0					
3.5		X				TP10-321-1
4.0						
4.5				Sandy SILT, some clay, trace gravel, trace cobbles, subangular to subrounded, poorly graded, low plasticity, grey brown, no visible structure, moist. (Glaciolacustrine)		
5.0	1.5					
				End of test pit at 5.1 ft/1.55 m	No groundwater present, easy excavation, stable walls.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-321

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-322**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 29, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**2.1 ft / 0.64 m**	Date Completed:	**Aug 29, 10**
Coordinates	**2,158,836 ft N, 1,423,044 ft E**	Surface Elev.:	**793 ft /241.71 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.0				SILT, some sand, trace clay, trace gravel, poorly graded, low plasticity, brown, some organics, moist to wet. (Glaciolacustrine)	Soil appears frozen with ice lenses at 1.8'.	
1.5	0.5					
2.0				End of test pit at 2.1 ft/0.64 m	Refusal in frozen material. No Sample Taken.	
2.5						
3.0	1.0					
3.5						
4.0						
4.5	1.5					
5.0						
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-322

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-323**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 29, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**2.7 ft / 0.82 m**	Date Completed:	**Aug 29, 10**
Coordinates	**2,159,423 ft N, 1,422,140 ft E**	Surface Elev.:	**782 ft /238.35 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0						
1.5	0.5			SILT/CLAY some sand, trace gravel, subrounded, poorly graded, low plasticity, brown, saturated. (Glaciolacustrine)		
				PEAT, frozen organics.		
2.0, 2.5				SILT/CLAY, some sand, trace gravel, subangular to subrounded, poorly graded, low plasticity, brown, no visible structure, ice crystals visible. (Glaciolacustrine)		
				End of test pit at 2.7 ft/0.82 m	Refusal on frozen material. No Sample Taken.	
3.0	1.0					
3.5, 4.0, 4.5						
5.0	1.5					
5.5, 6.0, 6.5						
	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-323

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Project No.	Ref. No.	Rev.
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-324**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 29, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Aug 29, 10**
Coordinates	**2,160,862 ft N, 1,421,983 ft E**	Surface Elev.:	**805 ft /245.36 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0, 1.5	0.5			Sandy SILT, trace gravel, trace clay, subangular to subrounded, well graded, non plastic, brown, some organics/roots that diminish with depth, moist. (Glaciolacustrine)		
2.0, 2.5				Silty SAND, trace gravel, trace clay, subangular to subrounded, well graded, non plastic, brown, trace organics, moist. (Glaciolacustrine)		
3.0, 3.5, 4.0, 4.5, 5.0	1.0, 1.5			SAND and GRAVEL, some silt, trace clay, subangular to subrounded, well graded, non plastic, brown, stratified, gravel lenses at 3.9' and 5.0', brown, moist. (Glacial Drift)		
5.5				End of test pit at 5.2 ft/1.58 m	No groundwater present, easy excavation, stable walls.	
6.0, 6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-324

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Project No.	Ref. No.	Rev.
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-325**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 30, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**1.5 ft / 0.46 m**	Date Completed:	**Aug 30, 10**
Coordinates	**2,161,314 ft N, 1,420,037 ft E**	Surface Elev.:	**789 ft /240.49 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Peat.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5						
1.0						
1.5				End of test pit at 1.5 ft/0.46 m	Refusal on frozen organics. No Sample Taken.	
	0.5					
2.0						
2.5						
3.0						
	1.0					
3.5						
4.0						
4.5						
	1.5					
5.0						
5.5						
6.0						
6.5						
	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-325

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Project No.	Ref. No.	Rev.
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-326**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 30, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**2.4 ft / 0.73 m**	Date Completed:	**Aug 30, 10**
Coordinates	**2,159,584 ft N, 1,420,506 ft E**	Surface Elev.:	**791 ft /241.10 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0	0.5			SILT/CLAY, trace sand, trace gravel, subangular, poorly graded, low plasticity, grey, moist. (Glaciolacustrine)		TP10-326-1
2.5				End of test pit at 2.4 ft/0.73 m	Refusal on frozen material.	
3.0, 3.5	1.0					
4.0, 4.5						
5.0	1.5					
5.5, 6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-326

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-327**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 30, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**1.9 ft / 0.58 m**	Date Completed:	**Aug 30, 10**
Coordinates	**2,160,100 ft N, 1,418,870 ft E**	Surface Elev.:	**790 ft /240.79 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5						
1.0						
1.5	0.5			SILT, some sand, trace clay, poorly graded, no to low plasticity, brown, organic inclusions, moist to wet. (Glaciolacustrine)		
2.0				End of test pit at 1.9 ft/0.58 m	Refusal on frozen material.	
2.5						
3.0	1.0					
3.5						
4.0						
4.5	1.5					
5.0						
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-328**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 30, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**2.6 ft / 0.79 m**	Date Completed:	**Aug 30, 10**
Coordinates	**2,163,659 ft N, 1,420,563 ft E**	Surface Elev.:	**1015 ft /309.37 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5	0.5			SILT, some sand, some gravel, trace clay, trace cobbles, trace boulders from 2' depth onwards, subangular to subrounded, well graded, non plastic, brown, massive, dense, moist. (Colluvium)	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	TP10-328-1
3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0			End of test pit at 2.6 ft/0.79 m	Refusal due to boulders, easy excavation until boulders encountered.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-328

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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-329**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 30, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6.1 ft / 1.86 m**	Date Completed:	**Aug 30, 10**
Coordinates	**2,164,827 ft N, 1,418,046 ft E**	Surface Elev.:	**979 ft /298.40 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			SAND and GRAVEL trace silt/clay, subrounded, well graded, non plastic, brown, loose, moist. (Glaciofluvial)	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	TP10-329-1
2.0, 2.5, 3.0, 3.5, 4.0, 4.5	1.0			SILT/CLAY, some sand, some gravel, rounded to subrounded, well graded, no to low plasticity, brown, firm, moist, some cobbles below 3.9'. (Glacial Drift)		TP10-329-2
5.0, 5.5, 6.0	1.5			SILT, some sand, some gravel, trace clay, some cobbles, round to subrounded, well graded, non plastic, brown, moist. (Glacial Drift)		TP10-329-3
6.5	2.0			End of test pit at 6.1 ft/1.86 m	Increased difficulty digging below 3.9', test pit was terminated at limit of excavator.	

Pebble Limited Partnership
Pebble Project
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Date Revised: Jan 25, 11

Project:	**Pebble Project**	Test Pit:	**TP10-330**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 31, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**2.2 ft / 0.67 m**	Date Completed:	**Aug 31, 10**
Coordinates	**2,161,363 ft N, 1,417,977 ft E**	Surface Elev.:	**809 ft /246.58 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0	0.5			SILT, some sand, some gravel, trace clay, some cobbles, round to subrounded, well graded, low to no plasticity, ice crystals present in soil matrix. (Glaciolacustrine)		
2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0			End of test pit at 2.2 ft/0.67 m	Refusal on frozen material. No Sample Taken.	

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-331**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 31, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6.3 ft / 1.92 m**	Date Completed:	**Aug 31, 10**
Coordinates	**2,161,659 ft N, 1,416,357 ft E**	Surface Elev.:	**839 ft /255.73 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.5	0.5			SILT, trace sand, trace gravel, trace clay, round to subrounded, poorly graded, low plasticity, grey, thin seams of brown silt and sand, saturated. (Glaciolacustrine)		
2.0, 2.5, 3.0, 3.5, 4.0	1.0	X		SAND and SILT, some gravel, trace clay, round to subrounded, poorly graded, no to low plasticity, grey, firm, massive, moist. (Glaciolacustrine)		TP10-331-1
4.5, 5.0, 5.5, 6.0	1.5	X		SAND and SILT, some clay, trace gravel, round to subrounded, poorly graded, low plasticity, brown, firm, massive, moist. (Glaciolacustrine)		TP10-331-2
6.5	2.0			End of test pit at 6.3 ft/1.92 m	Increased difficulty digging below 2', full weight of machine required to progress bucket.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-331

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-332**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 31, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6.2 ft / 1.89 m**	Date Completed:	**Aug 31, 10**
Coordinates	**2,160,420 ft N, 1,417,164 ft E**	Surface Elev.:	**816 ft /248.72 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				Sandy SILT, some clay, trace gravel, poorly graded, low plasticity, brown, layers of decayed organics, saturated near surface, then moist. (Glaciolacustrine)		
1.0						
1.5	0.5					
2.0		X				TP10-332-1
2.5						
3.0	1.0					
3.5		X		SILT, some sand, some gravel, trace clay, round to subrounded, well graded, low plasticity, brown, massive, firm, moist. (Glaciolacustrine)		TP10-332-2
4.0						
4.5						
5.0	1.5					
5.5				SILT, some sand, trace clay, no clasts, poorly graded, non-plastic, brown, moist. (Glaciolacustrine)		
6.0						
				End of test pit at 6.2 ft/1.89 m		
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-332

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-333**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Aug 31, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**4 ft / 1.22 m**	Date Completed:	**Aug 31, 10**
Coordinates	**2,159,059 ft N, 1,415,019 ft E**	Surface Elev.:	**835 ft /254.51 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				SILT, trace sand, trace clay, no clasts, poorly graded, no to low plasticity, brown, trace organics, moist. (Glaciolacustrine)		
1.0				GRAVEL, some sand, some silt, trace clay, round to subrounded, well graded, non plastic, black, loose, moist. (Glaciofluvial)		
1.5	0.5			SAND, some gravel, some silt, trace clay, subrounded to subangular, well graded, non plastic, brown, moist. (Glaciolacustrine)		
2.0				Silty SAND, trace gravel, trace clay, round to subrounded, poorly graded, non plastic, brown, saturated. (Glaciolacustrine)	Water seeping in at 2.4 ft.	
2.5				SILT, trace sand, trace gravel, trace clay, poorly graded, no to low plasticity, brown, moist. (Glaciolacustrine)		
3.0	1.0			SAND, trace gravel, trace silt, trace clay, round to subrounded, non plastic, red-brown, saturated. (Glaciolacustrine)		
3.5				GRAVEL, some sand, some silt, trace clay, round to subrounded, well graded, non plastic, red-brown, saturated. (Glacial Drift)		
4.0				End of test pit at 4 ft/1.22 m	Strata were not uniform, test pit terminated due to sloughing caused by groundwater. No Samples Taken.	
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-333

Knight Piésold CONSULTING

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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-334**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 1, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 1, 10**
Coordinates	**2,161,101 ft N, 1,413,529 ft E**	Surface Elev.:	**824 ft /251.16 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				SILT, trace sand, trace gravel, trace clay, poorly graded, non plastic, brown, trace organics, moist. (Glaciolacustrine)		
1.0						
1.5	0.5			SILT, some sand, trace gravel, trace clay, poorly graded, no to low plasticity, grey, firm, moist. (Glaciolacustrine)		
2.0						
2.5						
3.0						TP10-334-1
	1.0					
3.5				▼SAND and GRAVEL, some cobbles, some silt, trace clay, subangular to subrounded, well graded, non plastic, grey brown, loose, moist to wet. (Glacial Drift)		
4.0						
4.5						
5.0	1.5					
				End of test pit at 5.2 ft/1.58 m	No groundwater present, easy excavation, stable walls.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-334

Knight Piésold CONSULTING

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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-335**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 1, 10**
Location:	**Area G**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 1, 10**
Coordinates	**2,158,167 ft N, 1,380,107 ft E**	Surface Elev.:	**1310 ft /399.29 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				GRAVEL and SAND, some silt/clay, trace cobbles, subangular to subrounded, well graded, non plastic, brown, irregular dark brown staining in first 2', compact, massive, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					TP10-335-1
				End of test pit at 5.2 ft/1.58 m	No groundwater present, difficult excavation, stable walls.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-335

Knight Piésold CONSULTING

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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-336**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 1, 10**
Location:	**Area G**	Total Depth:	**6.3 ft / 1.92 m**	Date Completed:	**Sep 1, 10**
Coordinates	**2,156,519 ft N, 1,380,215 ft E**	Surface Elev.:	**1390 ft /423.67 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy SILT, trace gravel, trace clay, subrounded, well graded, non plastic, brown, loose, massive, moist. (Glacial Drift)		
1.5	0.5			Gravelly, silty SAND, trace clay, round to subrounded, well graded, non plastic, brown, massive, loose, moist. (Glacial Drift)		
2.0						TP10-336-1
2.5						
3.0	1.0			Silty, gravelly SAND, trace clay, subrounded, well graded, non plastic, brown, massive, compact, moist. (Glacial Drift)		TP10-336-2
3.5						
4.0				Gravelly, sandy SILT, trace clay, trace cobbles, subangular, well graded, non plastic, massive, compact, saturated. (Glacial Drift)		
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0			End of test pit at 6.3 ft/1.92 m	Groundwater present below 4.3', easy excavation, stable walls.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-336

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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-337**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 1, 10**
Location:	**Area G**	Total Depth:	**6.1 ft / 1.86 m**	Date Completed:	**Sep 1, 10**
Coordinates	**2,157,476 ft N, 1,380,421 ft E**	Surface Elev.:	**1356 ft /413.31 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy, silty GRAVEL, trace clay, trace cobbles, subangular to subrounded, well graded, non plastic, yellow-brown, loose, massive, saturated. (Glacial Drift)	Water seeping into pit at 2'.	
1.5	0.5					
2.0						
2.5				Sandy, silty GRAVEL, trace clay, trace cobbles, subrounded, well graded, non plastic, yellow-brown, compact, massive, wet becoming moist with increasing depth. (Glacial Drift)	Cobble fraction excluded from sample.	
3.0	1.0					
3.5						
4.0						
4.5	1.5					
5.0		X				TP10-337-1
5.5						
6.0				End of test pit at 6.1 ft/1.86 m		
6.5	2.0				No groundwater present, easy excavation, stable walls.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-337

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 4, 10

Project:	**Pebble Project**	Test Pit:	**TP10-338**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 2, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 2, 10**
Coordinates	**2,167,005 ft N, 1,415,327 ft E**	Surface Elev.:	**1203 ft /366.67 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				Gravelly, silty/clayey SAND, some cobbles, angular to subangular, well graded, low plasticity, dark brown, becoming light brown with depth, loose, massive, trace organics at top of interval, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0						
	1.0	X				TP10-338-1
3.5						
4.0						
4.5						
	1.5					
5.0						
5.5						
6.0				End of test pit at 5.9 ft/1.80 m		
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-338

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-339**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 2, 10**
Location:	**Area G**	Total Depth:	**3.9 ft / 1.19 m**	Date Completed:	**Sep 2, 10**
Coordinates	**2,162,330 ft N, 1,372,412 ft E**	Surface Elev.:	**1606 ft /489.51 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation, saturated.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				SILT, trace sand, trace clay, trace gravel, poorly graded, non plastic, dark brown, smell of organic decay, stratified, organics, saturated. (Colluvium)	Test pit excavated in a pond area.	
1.0						
1.5	0.5					
2.0						
2.5				SILT, trace sand, trace clay, trace gravel, poorly graded, non plastic, brown, firm, moist. (Colluvium)		
3.0	1.0					
3.5				Silty, GRAVEL, some sand, trace clay, round to subrounded, gap graded, non plastic, yellow brown, compact, moist. (Colluvium)		
4.0				End of test pit at 3.9 ft/1.19 m	Refusal on cobbles and boulders (Felsenmeer), surrounding area was bouldered at surface with thin veneer of tundra vegetation.	
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-339

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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-340**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 2, 10**
Location:	**Area G**	Total Depth:	**4.3 ft / 1.31 m**	Date Completed:	**Sep 2, 10**
Coordinates	**2,165,192 ft N, 1,375,278 ft E**	Surface Elev.:	**1399 ft /426.42 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0	0.5, 1.0			Sandy SILT, some gravel, some cobbles, trace boulders, angular to subangular, well graded, non plastic, light brown, massive, vegetation roots present in first 3', moist. (Colluvium)		
4.5, 5.0, 5.5, 6.0, 6.5	1.5, 2.0			End of test pit at 4.3 ft/1.31 m	Refusal due to boulders (Felsenmeer).	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-340

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-341**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 2, 10**
Location:	**Area G**	Total Depth:	**5.1 ft / 1.55 m**	Date Completed:	**Sep 2, 10**
Coordinates	**2,165,540 ft N, 1,378,286 ft E**	Surface Elev.:	**1364 ft /415.75 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0, 1.5, 2.0, 2.5, 3.0	0.5			Silty SAND, some gravel, trace clay, trace cobbles, angular to subrounded, non plastic, brown, compact, becoming dense with depth, massive, trace roots throughout, moist. (Colluvium)		
3.5, 4.0, 4.5, 5.0	1.0, 1.5			Silty SAND and GRAVEL, trace clay, subangular, non plastic, yellow, compact, massive, wet. (Colluvium)		
5.5, 6.0, 6.5	2.0			End of test pit at 5.1 ft/1.55 m	Test pit terminated at limit of excavator.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-341

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-342**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 2, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**2.3 ft / 0.70 m**	Date Completed:	**Sep 2, 10**
Coordinates	**2,165,450 ft N, 1,416,365 ft E**	Surface Elev.:	**1133 ft /345.34 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0, 1.5, 2.0	0.5			Silty SAND, trace gravel, trace clay, trace cobbles, subangular to subrounded, poorly graded, non plastic, loose, massive, organics, wet. (Colluvium)		
2.5				End of test pit at 2.3 ft/0.70 m	Refusal on rock.	
3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-342

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-343**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 3, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**4.3 ft / 1.31 m**	Date Completed:	**Sep 3, 10**
Coordinates	**2,163,101 ft N, 1,414,886 ft E**	Surface Elev.:	**860 ft /262.13 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0, 1.5	0.5			SILT, trace sand, trace clay, trace gravel, poorly graded, non plastic, brown, soft, organics, saturated. (Glaciolacustrine)		
2.0, 2.5				Sandy SILT, some gravel, trace clay, some cobbles, subangular to subrounded, low to no plasticity, firm, massive, trace organics, moist, frozen material at 2.5', 0.3' thick. (Glaciolacustrine)		
3.0, 3.5, 4.0	1.0			Sandy SILT, some gravel, trace clay, some cobbles, subangular to subrounded, low to no plasticity, grey, firm, massive, moist. (Glaciolacustrine)		TP10-343-1
4.5, 5.0, 5.5, 6.0, 6.5	1.5, 2.0			End of test pit at 4.3 ft/1.31 m	Groundwater at 3.2' depth.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-343

Knight Piésold CONSULTING

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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-344**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 3, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**4.3 ft / 1.31 m**	Date Completed:	**Sep 3, 10**
Coordinates	**2,163,326 ft N, 1,411,684 ft E**	Surface Elev.:	**926 ft /282.24 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				PEAT, black.		
1.0						
				PEAT and SILT/CLAY, poorly graded, low to medium plasticity, brown, soft, massive, wet.		
1.5	0.5					
2.0						
2.5				GRAVEL and SAND, some silt, trace clay, angular to subrounded, medium plasticity, well graded, grey and brown intermixed, compact, moist, appears frozen at 3'. (Glacial Drift)		
3.0	1.0					
3.5						TP10-344-1
4.0						
				End of test pit at 4.3 ft/1.31 m	Difficult digging at 3', frozen layer, groundwater seeping into pit at 3.6'.	
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-344

Knight Piésold CONSULTING

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Project:	**Pebble Project**	Test Pit:	**TP10-345**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 3, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**3.4 ft / 1.04 m**	Date Completed:	**Sep 3, 10**
Coordinates	**2,160,488 ft N, 1,411,913 ft E**	Surface Elev.:	**857 ft /261.21 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0	0.5			PEAT, loose, brown.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
2.5, 3.0	1.0	X		SILT/CLAY, trace sand, trace gravel, low plasticity, poorly graded, grey intermixed with brown, firm, massive, frozen, moist, becoming wet as water melting, ice formed into distinct irregular clear lenses. (Glaciolacustrine)		TP10-345-1
3.5				End of test pit at 3.4 ft/1.04 m	Refusal on frozen material.	
4.0, 4.5, 5.0	1.5					
5.5, 6.0, 6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-345

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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-346**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 3, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.6 ft / 1.71 m**	Date Completed:	**Sep 3, 10**
Coordinates	**2,163,391 ft N, 1,409,183 ft E**	Surface Elev.:	**943 ft /287.43 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
				PEAT		
0.5, 1.0						
1.5	0.5			Sandy SILT, trace gravel, trace clay, fine grained, poorly graded, low to no plasticity, light brown, soft, massive, wet. (Glaciolacustrine)		
2.0, 2.5, 3.0	1.0					
3.5				SILT/CLAY, some fine sand, trace gravel, poorly graded, low plasticity, reddish brown, massive, wet. (Glaciolacustrine)		
4.0, 4.5	1.5					
5.0, 5.5				End of test pit at 5.6 ft/1.71 m	Soft upper layers sloughing into hole.	
6.0, 6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-347**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 3, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6.1 ft / 1.86 m**	Date Completed:	**Sep 3, 10**
Coordinates	**2,165,407 ft N, 1,411,214 ft E**	Surface Elev.:	**1058 ft /322.48 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5	0.5			Sandy GRAVEL, trace cobbles, trace silt/clay, angular to subangular, well graded, non plastic, brown, compact, stratified layers with increasing sand fraction interbedded with coarser layers, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	TP10-347-1
3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0	1.0, 1.5			Sandy GRAVEL, trace silt/clay, subangular to subrounded, well graded, non plastic, brown, compact, massive, moist. (Glacial Drift)		TP10-347-2
6.5	2.0			End of test pit at 6.1 ft/1.86 m		

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-348**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 3, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 3, 10**
Coordinates	**2,167,455 ft N, 1,409,240 ft E**	Surface Elev.:	**1102 ft /335.89 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				COBBLES, some gravel, some sand, trace silt/clay, subangular to subrounded, poorly graded, non plastic, brown, loose, dry. (Glaciofluvial)		
1.0				Silty SAND, trace gravel, trace cobbles, trace clay, round to subrounded, poorly graded, non plastic, brown, massive, compact, moist. (Glaciofluvial)		
1.5	0.5					
2.0						
2.5						
3.0				SAND and GRAVEL, some silt/clay, some cobbles, subrounded, well graded, non plastic, brown, compact, massive, moist. (Glaciofluvial)		
3.5	1.0					
4.0						
4.5						TP10-348-1
5.0	1.5			End of test pit at 5 ft/1.52 m	Gravel and cobbles are present at surface in the surrounding area.	
5.5						
6.0						
6.5	2.0					

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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-349**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 4, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6.5 ft / 1.98 m**	Date Completed:	**Sep 4, 10**
Coordinates	**2,163,988 ft N, 1,404,192 ft E**	Surface Elev.:	**1092 ft /332.84 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty SAND, trace gravel, trace clay, subrounded, poorly graded, non plastic, light brown, dense, massive, moist. (Colluvium)		
1.0						
1.5	0.5					
2.0				SILT seam, trace sand, trace clay, poorly graded, low plasticity, grey, firm, moist. (Colluvium)		
				Silty SAND, trace gravel, trace clay, poorly graded, non plastic, light brown, firm, massive, moist. (Colluvium)		
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5				Silty SAND, some gravel, trace clay, subangular, well graded, light brown, compact, moist. (Colluvium)		
6.0						TP10-349-1
6.5	2.0			End of test pit at 6.5 ft/1.98 m	Cobble and boulder fractions excluded from sample.	

Pebble Limited Partnership
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-350**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 4, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**4.8 ft / 1.46 m**	Date Completed:	**Sep 4, 10**
Coordinates	**2,163,277 ft N, 1,402,049 ft E**	Surface Elev.:	**1298 ft /395.63 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty/clayey SAND and GRAVEL, some cobbles, subrounded to subangular, well graded, non plastic, brown, massive, compact, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						TP10-350-1
4.0				Sandy, silty GRAVEL, some cobbles, subrounded to subangular, well graded, non plastic, brown, massive, compact, moist. (Glacial Drift)		
4.5						
5.0	1.5			End of test pit at 4.8 ft/1.46 m	Refusal due to cobbles.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-351**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 4, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6 ft / 1.83 m**	Date Completed:	**Sep 4, 10**
Coordinates	**2,164,086 ft N, 1,402,942 ft E**	Surface Elev.:	**1211 ft /369.11 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5, 1.0				Sandy GRAVEL, some cobbles, trace silt, trace clay, subangular to subrounded, well graded, non plastic, brown, massive, compact. (Glacial Drift)		
1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Sandy SILT, some gravel and cobbles, trace clay, subangular to subrounded, well graded, low to medium plasticity, brown, massive, compact, moist. (Glacial Drift)		TP10-351-1
				End of test pit at 6 ft/1.83 m	Increased difficulty digging from 1.3' onwards.	

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-352**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 5, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**6.5 ft / 1.98 m**	Date Completed:	**Sep 5, 10**
Coordinates	**2,162,363 ft N, 1,403,157 ft E**	Surface Elev.:	**1158 ft /352.96 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				Sandy, silty GRAVEL, some clay, trace cobbles, round to subrounded, well graded, low to medium plasticity, grey brown, massive, firm, trace roots 0.5 - 3', moist. (Colluvium)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5		X				TP10-352-1
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0			End of test pit at 6.5 ft/1.98 m	Easy excavation.	

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-353**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 5, 10**
Location:	**Open Pit Area**	Total Depth:	**2.8 ft / 0.85 m**	Date Completed:	**Sep 5, 10**
Coordinates	**2,159,781 ft N, 1,403,595 ft E**	Surface Elev.:	**1061 ft /323.39 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
1.0, 1.5				GRAVEL, trace sand, trace silt, trace clay, platy, poorly graded, non plastic, black, loose, stratified, saturated. (Colluvium)		
1.5, 2.0	0.5			GRAVEL, some sand, some silt, trace clay, platy, well graded, non plastic, black brown, loose stratified, saturated. (Colluvium)		
2.5				SILT, some sand, trace gravel, trace clay, subangular, poorly graded, low to medium plasticity, grey, soft, wet. (Colluvium)		
3.0				End of test pit at 2.8 ft/0.85 m	Unstable walls. No Sample Taken.	
3.5	1.0					
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-354**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 5, 10**
Location:	**Open Pit Area**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 5, 10**
Coordinates	**2,159,268 ft N, 1,399,216 ft E**	Surface Elev.:	**1417 ft /431.90 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				Gravelly, silty SAND, trace clay, trace cobbles, subrounded to subangular, well graded, non plastic, brown, compact, massive, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						
4.5	1.5					
5.0						
5.5						TP10-354-1
6.0				End of test pit at 5.9 ft/1.80 m	Increased excavation diffculty at 3.2'.	
6.5	2.0					

Pebble Limited Partnership
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-355**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 5, 10**
Location:	**Area E**	Total Depth:	**4 ft / 1.22 m**	Date Completed:	**Sep 5, 10**
Coordinates	**2,158,666 ft N, 1,397,498 ft E**	Surface Elev.:	**1345 ft /409.96 m**	Logged by:	**MACS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin etrex Legend CX (NAD 83 Alaska State Plane - Zone 5)	
0.5				SILT, trace gravel, trace sand, trace clay, trace cobbles, poorly graded, non plastic, brown, soft, massive, wet. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0				End of test pit at 4 ft/1.22 m	Easy excavation, unstable walls, wet at surface. No Sample Taken.	
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 5, 10

Project:	**Pebble Project**	Test Pit:	**TP10-356**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 9, 10**
Location:	**Area G**	Total Depth:	**3.6 ft / 1.10 m**	Date Completed:	**Sep 9, 10**
Coordinates	**2,164,634 ft N, 1,384,251 ft E**	Surface Elev.:	**1237 ft /377.04 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. Gravelly SAND, trace silt, trace clay, subangular to subrounded, clasts up to 0.75" diameter, poorly graded (gap graded), low plasticity, dark brown, loose, roots of lichens and shrubs, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Sandy, silty GRAVEL, trace clay, subangular to subrounded clasts up to boulder size (1.5' wide), most clasts 1.5 - 2" diameter, cobbles mostly 6" diameter, some angular, well graded, low plasticity, medium brown, loose, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						TP10-356-1
2.5						
3.0						
	1.0					
3.5				End of test pit at 3.6 ft/1.10 m	Water seeping into sample at 3.3' depth, stable walls, easy excavation up to large boulder that excavator could not get by.	
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-357**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 9, 10**
Location:	**Area E**	Total Depth:	**1.6 ft / 0.49 m**	Date Completed:	**Sep 9, 10**
Coordinates	**2,164,618 ft N, 1,389,895 ft E**	Surface Elev.:	**1222 ft /372.47 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SAND, some silt, some gravel, trace clay, angular to subangular, few subrounded clasts up to 0.75" diameter, well graded, low to no plasticity, loose, some roots, dark brown, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Sandy GRAVEL, coarse sand, some silt, trace clay, angular to subangular, few boulders up to 1.5' diameter, most clasts angular, between 2 - 4" diameter, few clasts rounded and subrounded, well graded, low to no plasticity, loose, dark brown to medium brown, moist. (Glacial Drift)		TP10-357-1
1.0						
1.5	0.5			End of test pit at 1.6 ft/0.49 m	Water encounter at 1.6', walls sloughing in, but somewhat stable due to boulders. Difficult excavation due to large boulders.	
2.0						
2.5						
3.0	1.0					
3.5						
4.0						
4.5	1.5					
5.0						
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-357

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-358**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 9, 10**
Location:	**Area E**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 9, 10**
Coordinates	**2,162,902 ft N, 1,391,741 ft E**	Surface Elev.:	**1314 ft /400.51 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Gravelly SILT and SAND, subrounded to subangular, most clasts up to 0.75" diameter, gap graded, low plasticity, dark brown, loose, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy GRAVEL, some silt/clay, subrounded to rounded, clasts up to 4" diameter, well graded, low plasticity, light brown, roots for the first 2' from surface, moist. (Glacial Drift)		TP10-358-2
1.5	0.5					
2.0				GRAVEL, some sand, trace silt/clay, subangular and subrounded, clasts up to large cobbles (6" wide) most clasts 2 to 4" diameter, poorly graded, low to no plasticity, light brown, loose, moist. (Glacial Drift)		
2.5						
3.0	1.0					
3.5						
4.0						TP10-358-1
4.5						
5.0	1.5			End of test pit at 5 ft/1.52 m	Stable walls, easy excavation, walls sloughing when undercut, reached extent of excavator.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-358

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-359**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 9, 10**
Location:	**Area E**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 9, 10**
Coordinates	**2,163,765 ft N, 1,390,858 ft E**	Surface Elev.:	**1277 ft /389.23 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. Sandy SILT, trace gravel, trace clay, subangular to rounded, clasts up to 0.5" diameter, poorly graded, low plasticity, dark brown, root vegetation, moist. Silty SAND AND GRAVEL, trace clay, coarse grained, subangular to rounded, clasts up to cobble size (8") most clasts up to 4", well graded, low plasticity, light brown, loose, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-359-1
				Silty SAND, some clay, some gravel, subangular to subrounded clasts, mostly gravel size up to 2", some cobbles, up to 4", poorly graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)	Brass tube collected at 3'.	TP10-359-2 TP10-359-3 (Brass Tube)
				End of test pit at 5 ft/1.52 m	Sides sloughing, especially in sand and gravel material, water seeping in at 2' but on higher slope side, easy excavation.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-359

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Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-360**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**2.1 ft / 0.64 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,161,699 ft N, 1,396,661 ft E**	Surface Elev.:	**1422 ft /433.43 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SILT and PEAT, no clasts, poorly graded, no to low plasticity, dark brown/black, very fibrous, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				SAND and GRAVEL, coarse grained sand, some silt, trace clay, subangular to subrounded clasts, with some angular boulders, up to 12" diameter, most clasts gravel sized, well graded, low plasticity, brown, loose, moist to wet. (Glacial Drift)		
1.0						
1.5	0.5			GRAVEL and SAND, coarse grained sand, some silt, some clay, subangular to subrounded, clasts up to boulder size up to 12" diameter, most clasts gravel size, low plasticity, light brown, compact, moist to wet. (Glacial Drift)		TP10-360-1
2.0				End of test pit at 2.1 ft/0.64 m	Difficult excavation, hard to break through with excavator bucket, water at 2.6', walls sloughing in	
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-360

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-361**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area G**	Total Depth:	**4 ft / 1.22 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,152,866 ft N, 1,385,091 ft E**	Surface Elev.:	**1758 ft /535.84 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, some sand, trace gravel, trace clay, trace cobbles, angular up to 8" diameter, likely from freeze/thaw, gap graded, low plasticity, dark brown/black, roots, fibrous, loose, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy, gravelly SILT, trace clay, subangular to angular, some subrounded, clasts up to cobble size 6" diameter, gravel size 0.75 - 2" diameter, gap graded, no plasticity, light brown with orange oxidized zones, compact, moist. (Colluvium)		
1.5	0.5					
2.0						TP10-361-1
2.5						
3.0						
	1.0					
3.5						
4.0				End of test pit at 4 ft/1.22 m	Hard to dig at surface because of boulders, a little easier excavation in the soil below, stable walls, dry test pit.	
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-361

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-362**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area J**	Total Depth:	**3 ft / 0.91 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,151,245 ft N, 1,385,483 ft E**	Surface Elev.:	**1729 ft /527.00 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, some sand, some gravel, some cobbles, clasts up to 8", subangular to subrounded granodiorite clasts, gap graded, no to low plasticity, dark black/brown, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND and GRAVEL, some silt/clay, trace cobbles, angular to subangular, some subrounded, clasts up to cobble size (8"), well graded, low plasticity, light brown, compact, moist. (Colluvium)		
1.5	0.5					
2.0						TP10-362-1
2.5						
3.0				End of test pit at 3 ft/0.91 m	Stable walls, difficult to dig due to flat granodiorite cobbles, likely due to freeze thaw, dry test pit.	
3.5	1.0					
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-362

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-363**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**4 ft / 1.22 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,162,042 ft N, 1,397,224 ft E**	Surface Elev.:	**1501 ft /457.50 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. SILT, some gravel, trace sand, trace clay, trace cobbles, angular to subangular, clasts up to cobble size (6"), gap graded, low plasticity, loose, dark brown/black, moist to damp. Silty, gravelly SAND, trace clay, coarse sand, angular to subangular to subrounded clasts, mostly angular, up to cobble size (8"), mostly cobbles and gravel size up to 4", well graded, low plasticity, light brown, moist to damp. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-363-1
				End of test pit at 4 ft/1.22 m	Stable walls, difficult to dig due to presence of cobbles, dry test pit.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-363

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-364**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**5.4 ft / 1.65 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,162,203 ft N, 1,398,683 ft E**	Surface Elev.:	**1585 ft /483.11 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation. SAND, some silt, trace clay, trace gravel, trace cobbles, trace boulders, subrounded to angular, clasts up to boulder size (12" diameter), gap graded, low to medium plasticity, dark brown/black, loose, roots, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5	0.5			Sandy SILT, some gravel, trace clay, subrounded clasts up to cobble size (8"), mostly gravel size, gap graded, low to medium plasticity, light orange brown, compact, stratified horizontal layers, moist. (Glacial Drift)		
3.0, 3.5, 4.0, 4.5, 5.0	1.0, 1.5	X		Sandy SILT, some gravel, trace clay, subrounded clasts up to cobble size (8"), gap graded, low plasticity, light brown, compact, moist. (Glacial Drift)		TP10-364-1
5.5, 6.0, 6.5	2.0			End of test pit at 5.4 ft/1.65 m	Stable walls, dry test pit, upper part of test pit difficult to excavate.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-364

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-365**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,163,865 ft N, 1,398,011 ft E**	Surface Elev.:	**1632 ft /497.43 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			Topsoil with Tundra Vegetation. Gravelly SILT, trace clay, trace sand, boulders at surface, angular to subangular, gap graded, low plasticity, dark brown, roots, fibrous, loose, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0	1.0, 1.5			Silty SAND, some clay, some gravel, clasts up to cobble size (10"), mostly gravel and cobble size up to 4", subangular to angular, poorly graded, low plasticity, light brown, with some orange brown zones, loose to compact, moist. (Colluvium)		TP10-365-1
5.5, 6.0, 6.5	2.0			End of test pit at 5.2 ft/1.58 m	Stable walls with occasional large cobble falling in, some water visible at 5.2', difficult to excavate due to boulders and rocky ground.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-365

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-366**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**5.3 ft / 1.62 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,164,020 ft N, 1,394,325 ft E**	Surface Elev.:	**1420 ft /432.82 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				SILT and organics, some sand, some gravel, subrounded to rounded clasts up to large cobble size (6"), poorly graded, low plasticity, dark brown, fibrous, roots, loose, moist.		
1.0				Silty, sandy GRAVEL, trace clay, subangular to subrounded, some angular, mostly gravel size clasts, some cobbles, well graded, low plasticity, brown, loose, stratified, moist. (Glacial Drift)		
1.5	0.5			Gravelly, silty SAND, trace clay, subangular to subrounded, some angular clasts up to boulder size but mostly cobbles and gravel, cobbles up to 6" diameter, gravel ranges from 0.4 - 3", well graded, medium plasticity, light brown, compact, moist. (Glacial Drift)		
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-366-1
4.5						
5.0	1.5					
5.5				End of test pit at 5.3 ft/1.62 m	Stable walls except when larger clasts fall in, dry test pit, top portion of test pit was hard to dig due to gravel and cobble material.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-366

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-367**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**6 ft / 1.83 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,163,969 ft N, 1,392,685 ft E**	Surface Elev.:	**1321 ft /402.64 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, trace gravel, some sand, trace clay, subrounded clasts up to cobbles size, mostly gravel size, poorly graded, low plasticity, dark brown/black, loose, fibrous roots, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				GRAVEL and SAND, some silt, trace clay, occasional boulders, coarse sand, subrounded to rounded, clasts up to large boulders size (20") usually cobbles and gravel (0.4 - 4") some 6", well graded, low to no plasticity, light brown, somewhat stratified, compact, roots down to 2' depth, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-367-1
4.5						
5.0	1.5					
5.5						
6.0				End of test pit at 6 ft/1.83 m	Stable walls, dry test pit, difficult to dig initially due to some large boulders but became easier with depth.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-367

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-368**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**5.3 ft / 1.62 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,161,738 ft N, 1,393,976 ft E**	Surface Elev.:	**1347 ft /410.57 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Silty, sandy GRAVEL, trace clay, rounded to subrounded clasts, some subangular to angular, up to large cobbles size (6" diameter) clasts usually <4" gravel and cobble size, well graded, no to low plasticity, light brown, compact, stratified, roots present for 1.3' from surface, moist to damp. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
						TP10-368-1
				End of test pit at 5.3 ft/1.62 m	Easy excavation, dry test pit, stable walls unless large cobble falls out.	

Pebble Limited Partnership
Pebble Project
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Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-369**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 10, 10**
Location:	**Area E**	Total Depth:	**6 ft / 1.83 m**	Date Completed:	**Sep 10, 10**
Coordinates	**2,160,477 ft N, 1,397,040 ft E**	Surface Elev.:	**1398 ft /426.11 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. SILT, trace sand, trace clay, no clasts, poorly graded, low plasticity, dark black/brown, loose, fibrous vegetation roots, moist. Gravelly SAND, some silt, trace clay, subangular to subrounded clasts up to cobble size, occasional boulders (up to 8"), gap graded, medium plasticity, light brown, compact, moist. (Glaciofluvial)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-369-1
				End of test pit at 6 ft/1.83 m	Stable walls, easy excavation, dry test pit.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-369

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-370**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 12, 10**
Location:	**Area G**	Total Depth:	**3.3 ft / 1.01 m**	Date Completed:	**Sep 12, 10**
Coordinates	**2,165,472 ft N, 1,382,659 ft E**	Surface Elev.:	**1176 ft /358.44 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, some sand, trace clay, some gravel, subrounded clasts, mostly gravel size (1.5") occasional boulders and cobbles, gap graded, low to medium plasticity, dark brown, loose to compact, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty, gravelly SAND, trace clay, subrounded to subangular, clasts up to large cobble size (6"), most clasts gravel size, well graded, low plasticity, light brown, loose, moist. (Glacial Drift)		
1.5	0.5					
2.0						TP10-370-1
2.5						
3.0						
	1.0			End of test pit at 3.3 ft/1.01 m	Stable walls, dry test pit, easy to excavate.	
3.5						
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-370

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-371**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**5.6 ft / 1.71 m**	Date Completed:	**Sep 12, 10**
Coordinates	**2,161,355 ft N, 1,398,139 ft E**	Surface Elev.:	**1524 ft /464.52 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subangular to subrounded (up to 0.75"), poorly graded, low to no plasticity, dark brown, root vegetation, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				SAND and SILT, trace gravel, trace clay, subrounded to subangular, clasts up to small cobble size (4" diameter), mostly gravel size, poorly graded, low plasticity, light brown, loose, moist. (Colluvium)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-371-1
4.5						
5.0	1.5					
5.5				End of test pit at 5.6 ft/1.71 m	Easy excavation, stable walls, dry test pit.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-372**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 12, 10**
Location:	**Open Pit Area**	Total Depth:	**4 ft / 1.22 m**	Date Completed:	**Sep 12, 10**
Coordinates	**2,157,032 ft N, 1,397,456 ft E**	Surface Elev.:	**1363 ft /415.44 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SILT, no clasts, poorly graded, low plasticity, dark brown, fibrous, vegetation roots, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Gravelly, silty SAND, trace clay, subangular to subrounded, clasts up to large cobble size, mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist to wet. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						TP10-372-1
2.5						
3.0						
	1.0					
3.5						
4.0				End of test pit at 4 ft/1.22 m	Easy to excavate, unstable walls, sections sloughing in on occasion, groundwater at 3.6' depth.	
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-372

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-373**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 12, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.6 ft / 1.71 m**	Date Completed:	**Sep 12, 10**
Coordinates	**2,165,039 ft N, 1,403,526 ft E**	Surface Elev.:	**1219 ft /371.55 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SILT, no clasts, poorly graded, low plasticity, dark brown, loose, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty SAND, some gravel, trace clay, subangular to subrounded clasts up to cobble size, mostly gravel size (1 - 1.5"), well graded, low plasticity, light brown, compact, moist to wet. (Glacial Drift)		
1.0						
1.5	0.5					TP10-373-2 (Brass Tube
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-373-1
4.5						
5.0	1.5					
5.5				End of test pit at 5.6 ft/1.71 m	Easy to excavate, dry test pit, stable walls.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-374**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 13, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.3 ft / 1.62 m**	Date Completed:	**Sep 13, 10**
Coordinates	**2,167,500 ft N, 1,404,655 ft E**	Surface Elev.:	**1120 ft /341.38 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Peat. SILT, some gravel, some sand, trace clay, subangular to subrounded clasts up to gravel size (0.75"), low plasticity, poorly graded, dark brown/black, compact, root vegetation, moist to wet.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0	0.5, 1.0, 1.5			Sandy, silty GRAVEL, some cobbles, trace clay, angular gravel sized clasts up to 0.75 - 1.25", large cobble size 8", subrounded to subangular, well graded, low to medium plasticity, light brown, compact, moist to wet. (Colluvium)		TP10-374-1
5.5, 6.0, 6.5	2.0			End of test pit at 5.3 ft/1.62 m	Easy excavation, dry test pit, unstable walls, walls are sloughing in.	

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-375**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 13, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**3.6 ft / 1.10 m**	Date Completed:	**Sep 13, 10**
Coordinates	**2,165,091 ft N, 1,404,640 ft E**	Surface Elev.:	**1053 ft /320.95 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Sandy SILT, trace gravel, trace clay, subrounded up to cobble size, low plasticity, poorly graded, dark brown/black, compact to loose, vegetation roots, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty, gravelly SAND, trace clay, subrounded to rounded, clasts up to boulder size, mostly gravel and cobble size, well graded, low plasticity, light brown, loose to compact, moist. (Colluvium)		
1.5	0.5					
2.0						
2.5						
3.0						TP10-375-1
3.5	1.0					
				End of test pit at 3.6 ft/1.10 m	Easy excavation, stable walls, dry test pit.	
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-375

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-376**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 13, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 13, 10**
Coordinates	**2,166,266 ft N, 1,405,116 ft E**	Surface Elev.:	**1064 ft /324.31 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Peat. PEAT, no clasts, poorly graded, no plasticity, dark brown/black, plant roots, fibrous, organic smell, loose, moist to wet.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND, coarse grained, no clasts, poorly graded, low plasticity, light brown and grey, loose, moist to wet. (Glaciolacustrine)		
1.5	0.5					
2.0				SAND, fine sand, some silt, trace clay, trace gravel, poorly graded, non plastic, grey, compact, when broken has small bits of brown organic matter throughout, moist to wet. (Glaciolacustrine)		TP10-376-1
2.5						
3.0						
	1.0			▼		
3.5						
4.0						
4.5						
	1.5					
5.0						
5.5						
6.0				End of test pit at 5.9 ft/1.80 m	Unstable walls in sand material, easy to excavate, water seeping in test pit at 0.3', pouring in at 3.3' causing instability in walls.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-376

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-377**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 13, 10**
Location:	**Open Pit Area**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 13, 10**
Coordinates	**2,157,862 ft N, 1,403,021 ft E**	Surface Elev.:	**1056 ft /321.87 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SAND, some silt, trace gravel, trace clay, fine grained, subrounded clasts up to gravel size, poorly graded, low to no plasticity, dark brown, loose, damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND, some silt, some gravel, subangular to subrounded, clasts up to gravel size, poorly, graded, low to no plasticity, light brown, loose, damp. (Colluvium)		
1.5	0.5					
2.0						TP10-377-1
2.5						
3.0						
	1.0					
3.5				SAND and GRAVEL, some silt/clay, clasts up to cobble size, medium grained, subrounded to subangular, well graded, low to medium plasticity, light greyish brown, loose to compact, moist. (Glacial Drift)		
4.0						TP10-377-2
4.5						
	1.5					
5.0				End of test pit at 5 ft/1.52 m	Stable walls, easy excavation, dry test pit.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-377

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-378**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 13, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**3 ft / 0.91 m**	Date Completed:	**Sep 13, 10**
Coordinates	**2,162,175 ft N, 1,402,479 ft E**	Surface Elev.:	**1275 ft /388.62 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Peat. Sandy SILT, fine sand, some gravel, trace clay, subangular to subrounded clasts up to cobble size, poorly graded, low to medium plasticity, dark brown, cold, compact, vegetation roots, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Gravelly SAND, some silt, trace clay, subrounded to subangular clasts up to boulder size up to 20" diameter, but boulder on surface nearby is 3.3' diameter, most clasts are gravel size up to 2", gap graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)		
1.5	0.5					
2.0						TP10-378-1
2.5						
3.0				End of test pit at 3 ft/0.91 m	Stable walls, easy excavation until large boulder encountered, dry test pit.	
	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-379**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 13, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**5.3 ft / 1.62 m**	Date Completed:	**Sep 13, 10**
Coordinates	**2,161,912 ft N, 1,405,501 ft E**	Surface Elev.:	**1042 ft /317.60 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. SILT, some sand, trace clay, no clasts, fine grained, poorly graded, low to no plasticity, dark brown, organics, fibrous plant roots, compact, moist to damp. Silty, gravelly SAND, trace clay, subrounded to subangular, clasts up to boulder size, mostly gravel and cobbles, well graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-379-1
				End of test pit at 5.3 ft/1.62 m	Easy excavation, stable walls, dry test pit.	

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-380**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 14, 10**
Location:	**Open Pit Area**	Total Depth:	**4 ft / 1.22 m**	Date Completed:	**Sep 14, 10**
Coordinates	**2,156,543 ft N, 1,404,106 ft E**	Surface Elev.:	**1034 ft /315.16 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5	0.5, 1.0			Topsoil with Tundra Vegetation. Silt, some sand, trace gravel, trace clay, subangular to subrounded, clasts up to gravel size, poorly graded, low plasticity, dark black/brown, loose, roots, organics, moist. Gravelly, sandy SILT, trace clay, subrounded to subangular clasts up to large cobble size (6"), mostly gravel size, well graded, low to medium plasticity, light brown, compact, roots up to 1' depth, moist. (Glaciofluvial)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-380-1
4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.5, 2.0			End of test pit at 4 ft/1.22 m	Easy excavation, stable walls, dry test pit.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-380

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-381**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 16, 10**
Location:	**Open Pit Area**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 16, 10**
Coordinates	**2,160,290 ft N, 1,400,186 ft E**	Surface Elev.:	**1528 ft /465.73 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. Gravelly SILT, trace sand, trace clay, subrounded to subangular, clasts up to cobble size, gap graded, low plasticity, dark brown/black, organics, loose to compact, moist. Silty GRAVEL and SAND, trace clay, subrounded to subangular, clasts up to large cobble, mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
						TP10-381-1
				End of test pit at 5 ft/1.52 m	Stable walls, dry test pit, easy excavation.	

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-382**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 16, 10**
Location:	**Open Pit Area**	Total Depth:	**4.3 ft / 1.31 m**	Date Completed:	**Sep 16, 10**
Coordinates	**2,156,242 ft N, 1,399,314 ft E**	Surface Elev.:	**1242 ft /378.56 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND in organics, subrounded to subangular, clasts up to large cobble size (10"), seems to be a large cobble/boulder layer just below surface on one side of the test pit, gap graded, low plasticity, dark brown to medium brown, loose to compact, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty SAND, some gravel, trace clay, subrounded to subangular, clasts up to cobble size (8"), mostly cobbles and gravel, poorly graded, low to no plasticity, light brown, loose, roots up to 3' depth, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0						TP10-382-1
	1.0					
3.5						
4.0						
4.5				End of test pit at 4.3 ft/1.31 m	Easy excavation aside from occasional boulders, stable walls, dry test pit.	
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-382

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-383**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 16, 10**
Location:	**Open Pit Area**	Total Depth:	**5.4 ft / 1.65 m**	Date Completed:	**Sep 16, 10**
Coordinates	**2,155,380 ft N, 1,399,290 ft E**	Surface Elev.:	**1210 ft /368.81 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Gravelly, silty SAND, trace clay, fine to coarse grained, subrounded to subangular, clasts up to cobble size (10"), mostly cobbles and gravel, poorly graded, low plasticity, dark brown/black, organics, fibrous roots to 1' in depth, compact, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty GRAVEL and SAND, trace clay, subrounded to subangular clasts up to boulder size, some angular clasts, most clasts cobble and gravel sized, well graded, low to medium plasticity, light brown, loose to compact, moist to wet. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-383-1
4.5						
5.0	1.5					
5.5				End of test pit at 5.4 ft/1.65 m	Easy excavation, walls unstable, water seeping in at ~3' causing sloughing, water at 4.7' depth.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-383

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-384**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 16, 10**
Location:	**Open Pit Area**	Total Depth:	**6.2 ft / 1.89 m**	Date Completed:	**Sep 16, 10**
Coordinates	**2,155,482 ft N, 1,398,384 ft E**	Surface Elev.:	**1246 ft /379.78 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND, some gravel, subrounded, clasts to gravel size, poorly graded, low to no plasticity, medium brown, loose, vegetation roots, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Gravelly SAND, some silt, trace clay, subrounded to subangular, clasts up to cobble size (4"), mostly gravel size, well graded, low to no plasticity, light brown, loose, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5				Clayey SILT, no clasts, poorly graded, medium plasticity, grey and orange brown, compact to dense, moist. (Glaciolacustrine)		
3.0						TP10-384-1
	1.0					
3.5						
4.0						
4.5						
	1.5					
5.0						TP10-384-2
5.5						
6.0						
				End of test pit at 6.2 ft/1.89 m	Easy excavation, stable walls, dry test pit.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-385**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 17, 10**
Location:	**Open Pit Area**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 17, 10**
Coordinates	**2,157,061 ft N, 1,398,395 ft E**	Surface Elev.:	**1275 ft /388.62 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Peat. SILT, trace gravel, some sand, trace clay, subrounded, clasts up to boulder size but mostly cobbles and gravel, poorly graded, low plasticity, dark black/brown, fibrous, organics, compact, vegetation roots, moist to wet.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND, some silt, some gravel, trace clay, subrounded, clasts up to boulder size, mostly gravel, coarse grained, low plasticity, light brown, loose to compact, some root inclusions, moist. (Glacial Drift)		TP10-385-1
1.5	0.5			Sandy SILT, some clay, some gravel, subrounded to subangular clasts up to cobble size, mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)		
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-385-2
4.5						
5.0	1.5					
5.5				End of test pit at 5.2 ft/1.58 m	Easy excavation, stable walls, dry test pit.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-386**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 17, 10**
Location:	**Open Pit Area**	Total Depth:	**4.6 ft / 1.40 m**	Date Completed:	**Sep 17, 10**
Coordinates	**2,156,954 ft N, 1,400,693 ft E**	Surface Elev.:	**1169 ft /356.31 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, poorly graded, low plasticity, dark brown/black, loose, root inclusions, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty, gravelly SAND, trace clay, subrounded to subangular, clasts up to boulder size but mostly cobbles and gravel, well graded, low plasticity, light brown, loose, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0						TP10-386-1
3.5	1.0					
4.0						
4.5				End of test pit at 4.6 ft/1.40 m	Easy excavation, dry test pit, stable walls.	
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-387**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 17, 10**
Location:	**Open Pit Area**	Total Depth:	**5.6 ft / 1.71 m**	Date Completed:	**Sep 17, 10**
Coordinates	**2,156,423 ft N, 1,400,541 ft E**	Surface Elev.:	**1140 ft /347.47 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND, trace clay, no clasts, poorly graded, low plasticity, dark brown black, fibrous, roots, peat, loose to compact, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy SILT, some clay, some gravel, clasts up to cobble size but mostly small gravel size, coarse grained sand, well graded, low to medium plasticity, light brown, remnants of weathered bedrock, compact, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-387-1
4.5						
5.0	1.5					
5.5				End of test pit at 5.6 ft/1.71 m	Easy excavation, stable walls, water seeping in 4.3' depth causing sloughing.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-388**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 17, 10**
Location:	**Open Pit Area**	Total Depth:	**6.9 ft / 2.10 m**	Date Completed:	**Sep 17, 10**
Coordinates	**2,155,724 ft N, 1,397,248 ft E**	Surface Elev.:	**1311 ft /399.59 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SAND, some silt, some gravel, trace clay, angular, clasts up to cobble size, gap graded, low to no plasticity, dark brown, loose to compact, organics, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty, gravelly SAND, trace clay, subangular to angular, clasts up to large cobble size, mostly gravel size, some iron oxide weathering, low to medium plasticity, well graded, orange brown, roots up to 1' depth, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						TP10-388-1
2.5						
3.0						
	1.0					
3.5						
4.0						
4.5						
	1.5					
5.0						TP10-388-2
5.5				Silty, gravelly, clayey SAND, subangular to angular, clasts up to large cobble size, mostly gravel size, some iron oxide alteration, well graded, low to medium plasticity, orange brown, moist. (Glacial Drift)		
6.0						
6.5	2.0					
				End of test pit at 6.9 ft/2.10 m	Stable walls, dry test pit, easy excavation.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-388

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-389**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 17, 10**
Location:	**Area E**	Total Depth:	**6.2 ft / 1.89 m**	Date Completed:	**Sep 17, 10**
Coordinates	**2,155,326 ft N, 1,396,313 ft E**	Surface Elev.:	**1326 ft /404.16 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Peat. SILT, trace sand, trace clay, no clasts, poorly graded, low plasticity, dark brown/black, roots, loose, damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty SAND and GRAVEL, trace clay, subrounded to subangular clasts up to cobble size, mostly gravel and smaller cobbles, well graded, low plasticity, light brown, loose to compact, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-389-1
4.5						
5.0	1.5					
5.5						
6.0						
				End of test pit at 6.2 ft/1.89 m	Stable walls, easy excavation, dry test pit.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-389

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-390**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 18, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**4.6 ft / 1.40 m**	Date Completed:	**Sep 18, 10**
Coordinates	**2,153,969 ft N, 1,396,548 ft E**	Surface Elev.:	**1349 ft /411.18 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. Gravelly SAND, some silt, trace clay, subrounded, clasts up to cobble size (6"), gap graded, low plasticity, dark brown/black, loose, damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty SAND and GRAVEL, trace clay, clay content increasing with depth to some clay, subrounded clasts up to large cobble size, mostly gravel size, well graded, low plasticity, light brown, loose to compact, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0						TP10-390-1
	1.0					
3.5						
4.0						
4.5				End of test pit at 4.6 ft/1.40 m	Stable walls, dry test pit, difficult excavtion due to cobbles.	
	1.5					
5.0						
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-391**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 18, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 18, 10**
Coordinates	**2,154,371 ft N, 1,398,006 ft E**	Surface Elev.:	**1241 ft /378.26 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND, some gravel, subrounded clasts up to large cobble size, mostly gravel size, gap graded, low plasticity, dark brown, loose, roots, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND and GRAVEL, some silt, trace clay, subrounded clasts up to cobble size, mostly gravel size, well graded, low to no plasticity, medium brown, loose, roots, moist to damp. (Glacial Drift)		
1.5	0.5			Sandy, silty GRAVEL, trace clay, subrounded to subangular, clasts up to boulder size (12"), mostly gravel size, well graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)		
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-391-1
4.5						
5.0	1.5					
5.5						
6.0				End of test pit at 5.9 ft/1.80 m	Stable walls, easy excavation, dry test pit.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-391

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-392**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 18, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.6 ft / 1.71 m**	Date Completed:	**Sep 18, 10**
Coordinates	**2,152,867 ft N, 1,396,796 ft E**	Surface Elev.:	**1333 ft /406.30 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND, some gravel, trace clay, trace cobbles, trace boulders, subrounded to subangular, clasts mostly up to large cobble size, boulder (2.6' diameter) encountered just below surface, well graded, low plasticity, dark brown, loose, root inclusions, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy, gravelly SILT, trace to some clay, subrounded to subangular, clasts up to boulder size (12" diameter), mostly gravel and cobble size clasts, well graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0						TP10-392-1
	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5				End of test pit at 5.6 ft/1.71 m	Stable walls, dry test pit, difficult excavation due to large boulder.	
6.0						
6.5	2.0					

Pebble Limited Partnership
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-393**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 18, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**6 ft / 1.83 m**	Date Completed:	**Sep 18, 10**
Coordinates	**2,153,535 ft N, 1,397,598 ft E**	Surface Elev.:	**1254 ft /382.22 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5	0.5, 1.0			Topsoil with Peat. Some sand and silt, no clasts, low plasticity, poorly graded, dark brown up to 2' then black, fibrous, roots, compact, wet, ground visibly shaking as excavator operates up to ~15' away.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
4.0, 4.5, 5.0, 5.5, 6.0	1.5	X		Clayey SILT, some sand, no clasts, poorly graded, medium plasticity, blue grey, organic smell, compact, moist, flaky bits of wood-like material and organics mixed in, moist. (Glaciolacustrine)		TP10-393-1
6.5	2.0			End of test pit at 6 ft/1.83 m	Water seeping in at 3.6', groundwater in bottom of hole, stable walls, easy excavation.	

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-394**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 18, 10**
Location:	**Area A, Upper Side Slopes**	Total Depth:	**6.4 ft / 1.95 m**	Date Completed:	**Sep 18, 10**
Coordinates	**2,151,793 ft N, 1,396,936 ft E**	Surface Elev.:	**1407 ft /428.85 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subrounded, poorly graded, low plasticity, dark brown, loose, root inclusions, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Gravelly SAND, some silt, trace clay, subrounded to subangular clasts up to boulder size (16"), some angular clasts, mostly cobbles and gravel, silt content slightly increasing with depth, well graded, low plasticity, light brown, loose, root inclusions up to 1.3' from surface, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					TP10-394-1
5.5						
6.0						
6.5	2.0			End of test pit at 6.4 ft/1.95 m	Stable walls, easy excavation, dry test pit.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-394

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-394

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-395**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 19, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 19, 10**
Coordinates	**2,152,231 ft N, 1,397,891 ft E**	Surface Elev.:	**1275 ft /388.62 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Silty GRAVEL, some sand, trace clay, subrounded to subangular clasts, clasts up to large cobbles size (8"), mostly gravel size, layer of gravel at surface, gap graded, low plasticity, dark brown/black, organics, fibrous roots, loose, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND and GRAVEL, some silt, trace clay, clasts subrounded to subangular, some angular, up to large cobble size (10"), mostly gravel size, well graded, low plasticity, colour change at 1.6' from surface, lighter brown yellow below this depth, slightly dark brown above this depth, root inclusions to 2' depth, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						TP10-395-1
4.0						
4.5						
5.0	1.5			End of test pit at 5.2 ft/1.58 m	Difficult excavation, stable walls, dry test pit.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-395

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-395

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-396**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 19, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**6.6 ft / 2.01 m**	Date Completed:	**Sep 19, 10**
Coordinates	**2,150,790 ft N, 1,397,921 ft E**	Surface Elev.:	**1280 ft /390.14 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation, Silty, sandy GRAVEL, subrounded to subangular, clasts some angular up to large cobble size, mostly gravel and cobble size, gap graded, low plasticity, dark brown, roots, loose, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Silty, gravelly SAND, trace clay, clay content increasing with depth to some, subrounded to subangular, clasts up to large cobble size, mostly gravel and cobble size, well graded, low to medium plasticity, light brown, loose to compact, moist. (Glacial Drift)		TP10-396-2 TP10-396-1
				End of test pit at 6.6 ft/2.01 m	Difficult excavation due to topsoil layer with cobbles, dry test pit, stable walls.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-396

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-397**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 19, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**6.6 ft / 2.01 m**	Date Completed:	**Sep 19, 10**
Coordinates	**2,152,409 ft N, 1,399,398 ft E**	Surface Elev.:	**1179 ft /359.36 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SAND and GRAVEL, trace silt, trace clay, coarse grained sand, subrounded to angular clasts up to gravel size, well graded, low to no plasticity, dark brown, some roots, loose, damp to dry.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Gravelly SAND, trace silt, trace clay, subrounded to subangular, clasts up to boulder size but mostly gravel to large cobbles, well graded, low to no plasticity, light brown, loose, root inclusions up to 1' from surface, damp to moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						
4.5	1.5					
5.0						TP10-397-1
5.5						
6.0						
6.5	2.0			End of test pit at 6.6 ft/2.01 m	Stable walls, easy excavation, dry test pit	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-397

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-398**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 19, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 19, 10**
Coordinates	**2,153,289 ft N, 1,400,205 ft E**	Surface Elev.:	**1111 ft /338.63 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation. SILT, some sand, some gravel, trace clay, rounded to angular, clasts up to large cobble size, rare boulders, gap graded, low plasticity, dark brown, loose to compact, root inclusions up to 1', moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0	0.5, 1.0, 1.5			Sandy GRAVEL, some silt/clay, subrounded to angular clasts, large cobbles to gravel size, well graded, low to medium plasticity, medium brown, compact, some small root inclusions, wet. (Glacial Drift)		TP10-398-1
5.0				End of test pit at 5 ft/1.52 m	Water seeping in at 1', GW at 4.6', unstable walls, difficult excavation due to large cobbles and boulders.	
5.5, 6.0, 6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-398

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-399**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 19, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 19, 10**
Coordinates	**2,151,320 ft N, 1,399,400 ft E**	Surface Elev.:	**1170 ft /356.62 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. SILT, trace sand, some gravel, trace clay, subrounded to subangular with some angular clasts, up to large cobble size but mostly gravel size, poorly graded, low plasticity, dark brown, compact to loose, roots, organics, moist. Sandy GRAVEL, some silt, trace clay, subrounded to subangular with some angular fragments, up to large cobble (6"), mostly gravel size, gap graded, medium plasticity, compact, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
						TP10-399-1
				End of test pit at 5.2 ft/1.58 m	Easy excavation, stable walls, dry test pit.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-399

Knight Piésold CONSULTING

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Date Revised: Sep 20, 10

Project:	**Pebble Project**	Test Pit:	**TP10-400**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 19, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 19, 10**
Coordinates	**2,149,246 ft N, 1,399,449 ft E**	Surface Elev.:	**1141 ft /347.78 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. Gravelly SAND, some silt, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, coarse grained, poorly graded, low to no plasticity, dark brown, loose, root inclusions, damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Gravelly SAND, some silt, some clay, fines content increasing with depth, subrounded to subangular, some angular clasts, clasts up to cobble size, occasional boulder (16"), mostly gravel size, well graded, low plasticity, light brown, compact, roots up to 1' from surface, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-400-1
4.5						
5.0	1.5					
5.5						
6.0				End of test pit at 5.9 ft/1.80 m	Difficult excavation, large boulder at bottom that excavator could not get past, stable walls, dry test pit.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-400

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-401**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,150,044 ft N, 1,402,729 ft E**	Surface Elev.:	**984 ft /299.92 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SAND, some silt, some gravel, trace clay, coarse grained, subrounded to subangular clasts, some angular, up to large cobble size, mostly gravel size, poorly graded, low plasticity, dark brown, loose, root inclusions, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty, gravelly SAND, trace clay, some boulders, subrounded to subangular to platy clasts, some angular, up to cobble size but mostly gravel size, well graded, low plasticity, light brown, compact, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-401-1
4.5						
5.0	1.5					
5.5						
6.0				End of test pit at 5.9 ft/1.80 m	Stable walls, dry test pit, easy excavation until boulders reached at bottom of test pit.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-401

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-402**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**4.9 ft / 1.49 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,151,597 ft N, 1,402,776 ft E**	Surface Elev.:	**980 ft /298.70 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			PEAT, organics, fibrous, brown, root inclusions, poorly graded, low plasticity, brown, wet, woodish fragments throughout.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
2.0, 2.5, 3.0	1.0			GRAVEL and SAND, trace silt, trace clay, subrounded clasts up to gravel size, well graded, non plastic, grey, compact, wet. (Glacial Drift)		TP10-402-1
3.5, 4.0, 4.5						
5.0	1.5			End of test pit at 4.9 ft/1.49 m	Water seeping in at 0.7', water table at 4.2', sides sloughing in, easy excavation.	
5.5, 6.0, 6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-402

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-403**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**1.6 ft / 0.49 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,149,836 ft N, 1,403,877 ft E**	Surface Elev.:	**985 ft /300.23 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5				PEAT, brown, fibrous, roots.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
	0.5			End of test pit at 1.6 ft/0.49 m	Easy excavation, tundra pad used, water pouring in 4" from surface. No Sample Taken.	
2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-403

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-404**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**4.6 ft / 1.40 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,146,984 ft N, 1,401,809 ft E**	Surface Elev.:	**985 ft /300.23 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation. Silty SAND, some gravel, trace clay, subrounded to subangular clasts, mostly gravel size, coarse grained sand, poorly graded, low plasticity, medium brown, loose, root inclusions, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5	0.5, 1.0			Silty SAND, some gravel, trace clay, fine grained sand, subrounded to subangular clasts up to cobble size, mostly gravel size, no to low plasticity, light brown, loose to compact, moist to damp. (Glaciofluvial)		TP10-404-1
4.5				End of test pit at 4.6 ft/1.40 m	Easy excavation, dry test pit, stable walls.	
5.0, 5.5, 6.0, 6.5	1.5, 2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-404

Knight Piésold CONSULTING

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-405**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**3 ft / 0.91 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,160,653 ft N, 1,405,192 ft E**	Surface Elev.:	**999 ft /304.50 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0	0.5			Topsoil with Tundra Vegetation. Silty SAND, coarse grained, subrounded to subangular, clasts up to large cobble size, mostly gravel size, well graded, low to no plasticity, dark brown, loose, root inclusions, moist to damp. Silty, gravelly SAND, some clay, subrounded to subangular clasts, gravel layer from surface to 8", clasts up to large cobble size, mostly gravel size, well graded, low plasticity, light brown with some areas of iron oxidation (orange brown), compact, root inclusions up to 0.4m from bottom of test pit, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-405-1
3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0			End of test pit at 3 ft/0.91 m	Stable walls, dry test pit, easy excavation.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-405

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-406**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**1.6 ft / 0.49 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,148,184 ft N, 1,403,087 ft E**	Surface Elev.:	**969 ft /295.35 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			PEAT, fibrous, brown, organic, wet, root inclusions, no clasts, frozen at 1.6', poorly graded, low plasticity, compact, wet to frozen.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0			End of test pit at 1.6 ft/0.49 m	No Sample Taken. Water seeping in 4" from surface. GW at 1.6' but maybe just due to frozen material, stable walls, easy excavation until refusal on frozen material at 1.6'.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-406

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-407**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 20, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**3.6 ft / 1.10 m**	Date Completed:	**Sep 20, 10**
Coordinates	**2,148,946 ft N, 1,405,622 ft E**	Surface Elev.:	**970 ft /295.66 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5	0.5			PEAT, fibrous, brown to dark, organic, poorly graded, plasticity, compact, root inclusions, wet to saturated.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
3.0, 3.5	1.0			SAND, some gravel, some silt, trace clay, coarse grained, subrounded to subangular, clasts up to cobble size, mostly gravel size, well graded, no to low plasticity, grey, loose, wet to saturated. (Glaciofluvial)		TP10-407-1
4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.5, 2.0			End of test pit at 3.6 ft/1.10 m	Easy excavation, stable walls, water seeping at 4" from surface, water table at 3', ground shakes nearby as test pit is excavated.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-407

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-408**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 21, 10**
Location:	**East Deposit Area**	Total Depth:	**3 ft / 0.91 m**	Date Completed:	**Sep 21, 10**
Coordinates	**2,149,806 ft N, 1,407,293 ft E**	Surface Elev.:	**985 ft /300.23 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5				PEAT and Silty SAND, some gravel, trace clay, subrounded to subangular clasts up to large cobble size, mostly gravel size, poorly graded, low plasticity, dark brown, compact, fibrous, root inclusions, wet.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
2.0, 2.5	0.5			SAND and SILT, trace gravel, trace clay, fine grained, subrounded to subangular clasts up to gravel size, rare cobbles, gap graded, low to no plasticity, grey brown, compact to loose, some root inclusions, moist to wet. (Glaciolacustrine)		TP10-408-1
3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.0, 1.5, 2.0			End of test pit at 3 ft/0.91 m	Water seeping into test pit at 1.3' from surface, walls sloughing in due to groundwater at 2.3', easy excavation.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-408

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-409**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Feb 27, 00**
Location:	**Area A, Valley Bottom**	Total Depth:	**1.3 ft / 0.40 m**	Date Completed:	**Jul 28, 99**
Coordinates	**2,147,740 ft N, 1,404,492 ft E**	Surface Elev.:	**971 ft /295.96 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				PEAT, fibrous, roots, no clasts, brown, compact to loose, wet.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5	0.5			End of test pit at 1.3 ft/0.40 m	Water running in at 1.3', groundwater at 0.8', but may be due to frozen material at 1.3', No Sample Taken.	
2.0, 2.5, 3.0, 3.5	1.0					
4.0, 4.5, 5.0	1.5					
5.5, 6.0, 6.5	2.0					

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-410**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 21, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**1.6 ft / 0.49 m**	Date Completed:	**Sep 21, 10**
Coordinates	**2,147,053 ft N, 1,402,951 ft E**	Surface Elev.:	**976 ft /297.48 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			PEAT, dark brown, organics, fibrous, compact, wet.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
				End of test pit at 1.6 ft/0.49 m	Water seeping in at 4" from surface, groundwater at 1.3' from surface, No Sample Taken, refusal on frozen material at 1.6'.	

2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5

1.0, 1.5, 2.0

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-411**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 21, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**3.6 ft / 1.10 m**	Date Completed:	**Sep 21, 10**
Coordinates	**2,147,075 ft N, 1,404,266 ft E**	Surface Elev.:	**939 ft /286.21 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				PEAT, fibrous, vegetation roots, brown organics, saturated to wet, compact, small fragments of frozen material.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5, 3.0, 3.5	0.5, 1.0			Gravelly SAND, some silt, trace clay, fine grained to coarse grained, clasts subangular to subrounded, mostly small gravel size, poorly graded, no to low plasticity, grey brown, compact to loose, root inclusions and woody debris, organics, wet to saturated. (Glaciofluvial)		TP10-411-1
4.0, 4.5, 5.0, 5.5, 6.0, 6.5	1.5, 2.0			End of test pit at 3.6 ft/1.10 m	Water seeping into test pit 4" from surface, groundwater at 2.9', shelf of frozen material in test pit and ice at deepest point, easy excavation except for frozen material, stable walls, sample is full of organics.	

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Pebble Project
Test Pit Log For TP10-411

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-412**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 21, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 21, 10**
Coordinates	**2,148,314 ft N, 1,406,161 ft E**	Surface Elev.:	**977 ft /297.79 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0				Topsoil with Tundra Vegetation. Silty SAND, trace gravel, trace clay, subrounded, clasts up to gravel size, poorly graded, low plasticity, dark brown, loose, root inclusions, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0	0.5, 1.0, 1.5			Sandy GRAVEL, some silt, trace clay, subrounded to angular to platy, clasts up to boulder size, mostly gravel and cobble size, well graded, low to no plasticity, light brown, loose, stratified, moist. (Glaciofluvial)		TP10-412-1
5.0				End of test pit at 5 ft/1.52 m	Stable walls, dry test pit, difficult excavation due to amount of large cobbles and boulders.	
5.5, 6.0, 6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-412

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-413**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 21, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**4.6 ft / 1.40 m**	Date Completed:	**Sep 21, 10**
Coordinates	**2,147,785 ft N, 1,406,871 ft E**	Surface Elev.:	**1027 ft /313.03 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			PEAT, organic, fibrous, compact, roots, dark brown, wet to saturated.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
2.0, 2.5, 3.0, 3.5, 4.0, 4.5	1.0			Sandy GRAVEL, some silt/clay, subrounded to angular, clasts up to boulder size, mostly cobble and gravel size clasts, well graded, low to no plasticity, grey brown, loose to compact, organics, wood fragment inclusions, moist to wet. (Glaciofluvial)		TP10-413-1
5.0, 5.5, 6.0, 6.5	1.5, 2.0			End of test pit at 4.6 ft/1.40 m	Stable walls, water seeping in 4" from surface, easy excavation, except for boulders, refusal due to boulders, groundwater at 4.4', organic material in sample.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-413

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Date Revised: Sep 22, 10

Project:	**Pebble Project**	Test Pit:	**TP10-414**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**5 ft / 1.52 m**	Date Completed:	**Sep 21, 10**
Coordinates	**2,146,851 ft N, 1,405,466 ft E**	Surface Elev.:	**956 ft /291.39 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SAND AND GRAVEL, trace silt, trace clay, subangular to angular, clasts up to large cobble size, mostly gravel size, poorly graded, low to no plasticity, dark brown, root inclusions, loose, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				SAND AND GRAVEL, trace silt, trace clay, coarse grained sand, subangular to angular, clasts up to large cobbles, mostly gravel size, poorly graded, low to no plasticity, brown, loose to compact, stratified, moist. (Glaciofluvial)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-414-1
4.5						
5.0	1.5			End of test pit at 5 ft/1.52 m	Unstable walls, dry test pit, easy excavation except for cobbles.	
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-415**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.2 ft / 1.58 m**	Date Completed:	**Sep 22, 10**
Coordinates	**2,140,927 ft N, 1,402,534 ft E**	Surface Elev.:	**1036 ft /315.77 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5	0.5, 1.0, 1.5, 2.0			Topsoil with Tundra Vegetation. SAND, some gravel, some silt, trace clay, angular to subrounded, clasts up to large cobble size, mostly gravel size, poorly graded, low to no plasticity, loose, root inclusions, moist to damp. Gravelly SILT, some sand, trace clay, subrounded to angular, clasts up to large cobble size, mostly gravel size, gap graded, low plasticity, some root inclusions up to 1.5' deep, compact, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
						TP10-415-1
				End of test pit at 5.2 ft/1.58 m	Easy excavation, dry test pit, stable walls.	

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-416**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.4 ft / 1.65 m**	Date Completed:	**Sep 22, 10**
Coordinates	**2,140,734 ft N, 1,403,426 ft E**	Surface Elev.:	**1040 ft /316.99 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Sandy GRAVEL, trace silt, trace clay, angular to subrounded, clasts up to gravel and small cobble size, poorly graded, no to low plasticity, dark brown, loose, moist.		
1.0				Gravelly SAND, some silt, trace clay, silt content increasing with depth to silty, subrounded to angular, clasts up to cobble size, mostly gravel size, some large boulders (16"), well graded, low to medium plasticity, light brown, compact, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-416-1
4.5						
5.0	1.5					
5.5				End of test pit at 5.4 ft/1.65 m	Stable walls, dry test pit, easy excavation.	
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-417**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**6.2 ft / 1.89 m**	Date Completed:	**Sep 22, 10**
Coordinates	**2,143,661 ft N, 1,401,804 ft E**	Surface Elev.:	**1027 ft /313.03 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SAND, some gravel, some silt, trace clay, subrounded to subangular, clasts up to large cobble size, mostly gravel size, poorly graded, low to no plasticity, dark brown, loose, root inclusions, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty, SAND AND GRAVEL, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, well graded, low plasticity, light brown, compact to loose, some root inclusions to 2' from surface, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-417-1
4.5						
5.0	1.5					
5.5						
6.0						
				End of test pit at 6.2 ft/1.89 m	GW at 5.9', slowly seeping in from bottom causing slumping in sides at bottom of test pit, stable walls otherwise, easy excavation.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-417

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-418**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**6.1 ft / 1.86 m**	Date Completed:	**Sep 22, 10**
Coordinates	**2,141,731 ft N, 1,402,346 ft E**	Surface Elev.:	**1052 ft /320.65 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SILT, some sand, no clasts, poorly graded, low plasticity, dark brown, loose to compact, root inclusions, moist to damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty SAND, some gravel, trace to some clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, low to medium plasticity, light brown with some orange brown zones, compact, some root inclusions to 1' from surface, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-418-1
4.5						
5.0	1.5					
5.5						
6.0				End of test pit at 6.1 ft/1.86 m	Stable walls, dry test pit, easy excavation.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-419**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 22, 10**
Coordinates	**2,144,710 ft N, 1,400,906 ft E**	Surface Elev.:	**1125 ft /342.90 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			SAND and GRAVEL, trace silt, trace clay, subrounded to angular, clasts up to large cobble size, mostly gravel size, well graded, low to no plasticity, light brown, loose, root inclusions up to 1.5' from surface, moist. (Glacial Drift)	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	TP10-419-1
2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5	1.0, 1.5			SAND and GRAVEL, trace silt/clay, subrounded to angular, clasts up to cobble size, mostly gravel size, poorly graded, no plasticity, grey brown, loose, moist. (Glacial Drift)		TP10-419-2
6.0, 6.5	2.0			End of test pit at 5.9 ft/1.80 m	No vegetation at surface, stable walls, though sloughing at bottom, dry test pit, easy excavation.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-419

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-420**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 22, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**3.6 ft / 1.10 m**	Date Completed:	**Sep 22, 10**
Coordinates	**2,142,641 ft N, 1,402,189 ft E**	Surface Elev.:	**1006 ft /306.63 m**	Logged by:	**LS**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LJG**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, some sand, some gravel, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel, poorly graded (gap graded), low plasticity, dark brown black, organic, root inclusions, compact, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Silty SAND AND GRAVEL, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, well graded, low to medium plasticity, light brown, loose to compact, root inclusions up to 2' depth from surface, wet. (Glacial Drift)		
1.5	0.5					
2.0						TP10-420-1
2.5						
3.0						
	1.0					
3.5				End of test pit at 3.6 ft/1.10 m	Water seeping in at 2.9', groundwater at 3.2', stable walls except where water seeping in, easy excavation.	
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-420

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-420

Rev. 0 - Issued for Report

TEST PIT 2010TP.GPJ FENCE TUTORIAL.GDT Feb 9, 11

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-421**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 23, 10**
Location:	**Area A, Lower/Mid Side Slopes**	Total Depth:	**4.6 ft / 1.40 m**	Date Completed:	**Sep 23, 10**
Coordinates	**2,141,827 ft N, 1,403,455 ft E**	Surface Elev.:	**1007 ft /306.93 m**	Logged by:	**BH**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, some sand, some gravel, trace clay, subrounded, clasts up to coarse gravel size, poorly graded, low plasticity, medium brown, some root inclusions, loose, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Gravelly SILT, some sand, some clay, subrounded to subangular to platy, clasts up to cobble size, mostly gravel size, gap graded, low plasticity, brown, rare roots, compact, moist. (Glacial Drift)		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0						TP10-421-1
4.5				End of test pit at 4.6 ft/1.40 m	Dry test pit, stable walls, easy excavation.	
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-421

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-421

Rev. 0 - Issued for Report

TEST PIT 2010TP.GPJ FENCE TUTORIAL.GDT Feb 9, 11

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-422**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 23, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**5.9 ft / 1.80 m**	Date Completed:	**Sep 23, 10**
Coordinates	**2,146,191 ft N, 1,401,606 ft E**	Surface Elev.:	**990 ft /301.75 m**	Logged by:	**BH**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5				Topsoil with Tundra Vegetation. SILT, trace sand, trace gravel, trace clay, poorly graded, no plasticity, dark brown/black, organic, fibrous, roots, loose, damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
1.0				Sandy GRAVEL, trace silt, trace clay, subrounded to subangular, mostly gravel size clasts up to coarse grained gravel size, rare cobbles, well graded, no plasticity, dark brown, damp. (Glacial Drift)		
1.5	0.5					
2.0						
2.5				SAND, fine grained, some silt, trace gravel, trace cobbles, subrounded to subangular, poorly graded, no plasticity, light brown, loose, massive, damp. (Glaciolacustrine)		
3.0	1.0					
3.5						
4.0						TP10-422-1
4.5						
5.0	1.5					
5.5						
6.0				End of test pit at 5.9 ft/1.80 m	Dry test pit, stable walls, easy excavation.	
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-422

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-422

Rev. 0 - Issued for Report

TEST PIT 2010TP.GPJ FENCE TUTORIAL.GDT Feb 9, 11

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-423**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 23, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**6 ft / 1.83 m**	Date Completed:	**Sep 23, 10**
Coordinates	**2,145,038 ft N, 1,401,894 ft E**	Surface Elev.:	**985 ft /300.23 m**	Logged by:	**BH**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
0.5, 1.0, 1.5	0.5			Topsoil with Tundra Vegetation. SILT, poorly graded, no plasticity, dark brown, organic smell, organic fibrous, roots, moist.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
2.0, 2.5, 3.0, 3.5, 4.0, 4.5	1.0			SILT, trace sand, poorly graded, no plasticity, dark brown, moist. (Glaciolacustrine)		
5.0, 5.5, 6.0	1.5			SAND, fine grained, trace silt/clay, some subangular to angular gravel, poorly graded, no plasticity, grey, moist. (Glaciolacustrine)		TP10-423-1
6.5	2.0			End of test pit at 6 ft/1.83 m	Water seeping in at 1' from surface, stable walls, easy excavation, ground shaking during excavation.	

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-423

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-423

Rev. 0 - Issued for Report

TEST PIT 2010TP.GPJ FENCE TUTORIAL.GDT Feb 9, 11

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Date Revised: Sep 24, 10

Project:	**Pebble Project**	Test Pit:	**TP10-424**	Page	**1** of **1**
Contractor:	**PLP/KP**	Equipment Used:	**Kubota BX25**	Date Started:	**Sep 23, 10**
Location:	**Open Pit Area**	Total Depth:	**3.6 ft / 1.10 m**	Date Completed:	**Sep 23, 10**
Coordinates	**2,159,173 ft N, 1,405,555 ft E**	Surface Elev.:	**1020 ft /310.90 m**	Logged by:	**BH**
	(NAD 83, Alaska State Plane - Zone 5)			Reviewed by:	**LS**

DEPTH - (ft)	DEPTH - (m)	SAMPLES	GRAPHIC LOG	MATERIAL DESCRIPTION	NOTES	SAMPLE ID
				Topsoil with Tundra Vegetation. SILT, poorly graded, no plasticity, brown, root inclusions, loose, damp.	Coordinates and elevation obtained from handheld Garmin GPS 76 (NAD 83 Alaska State Plane - Zone 5)	
0.5				Silty, gravelly SAND, some clay, trace cobbles, fines content increases with depth, subrounded to subangular, well graded, low plasticity, grey brown, compact, moist. (Glacial Drift)		
1.0						
1.5	0.5					
2.0						TP10-424-1
2.5						
3.0						
	1.0					
3.5				End of test pit at 3.6 ft/1.10 m	Dry test pit, stable walls, difficult excavation.	
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					

Pebble Limited Partnership
Pebble Project
Test Pit Log For TP10-424

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
101-176/35	1	0

TP10-424

Rev. 0 - Issued for Report

TEST PIT 2010TP.GPJ FENCE TUTORIAL.GDT Feb 9, 11

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Date Revised: Sep 24, 10

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APPENDIX A2

TEST PIT LABORATORY TEST RESULTS

- TP10-319
- TP10-321
- TP10-329
- TP10-331
- TP10-335 to TP10-338
- TP10-344
- TP10-347 – TP10-348
- TP10-350
- TP10-352
- TP10-354
- TP10-356
- TP10-358
- TP10-360 to TP10-362
- TP10-371
- TP10-373 to TP10-374
- TP10-376 to TP10-377
- TP10-380 to TP10-381
- TP10-383
- TP10-391
- TP10-395
- TP10-398 to TP10-399
- TP10-402
- TP10-405
- TP10-408
- TP10-413
- TP10-415
- TP10-419
- TP10-421
- TP10-424

(Page A2-1 to A2-65)

Table 1

Pebble Limited Partnership
Pebble Project

2010 Geotechnical Site Investigation - Test Pit Samples
Summary of Laboratory Test Results - Moisture Content

Sample/Boring No. (TP10-)	**319-1**	**321-1**	**329-1**	**331-2**	**335-1**	**336-2**	**337-1**	**338-1**	**344-1**	**347-1**	**348-1**
Sample Depth (ft)	**2.5-3.5'**	**3.5-4.0'**	**0.5-1.0'**	**4.5-5.0'**	**5.0-5.2'**	**3.0-4.8'**	**5.0-5.4'**	**3.2-3.5'**	**3.5-3.7'**	**2.0-2.5'**	**4.3-4.6'**
Wet sample + Tare, g	14587	9568.5	13519	10781.5	15030	13426.5	13789	16922.5	11725	14415	15314
Dry Sample + Tare, g	12469.0	7554.5	12432.5	9901.0	13915.0	11843.0	12036.0	15153.0	10249	13197	13986.5
Tare, g	1729.5	1444	1389.5	1439.5	1423.5	1421	1436	1402.5	1423.5	1441	1730
Wt. of Water, g	2118	2014	1086.5	880.5	1115	1583.5	1753	1769.5	1476	1218	1327.5
Wt. of Dry Sample, g	10739.5	6110.5	11043	8461.5	12491.5	10422	10600	13750.5	8825.5	11756	12256.5
Moisture Content, %	**19.7**	**33.0**	**9.8**	**10.4**	**8.9**	**15.2**	**16.5**	**12.9**	**16.7**	**10.4**	**10.8**

Sample/Boring No. (TP10-)	**350-1**	**352-1**	**354-1**	**356-1**	**358-1**	**358-2**	**360-1**	**361-1**	**362-1**	**371-1**	**373-2**
Sample Depth (ft)	**3.7-4.0'**	**3.4-3.8'**	**5.8-5.9'**	**2.0-3.0'**	**4.0-5.0'**	**1.0-2.0'**	**1.5-2.0'**	**2.0-3.0'**	**2.0-3.0'**	**4.0-5.0'**	**1.5'**
Wet sample + Tare, g	12750	11522	13883	17072	17375	17668	11354	14109	17943	11299	1116.9
Dry Sample + Tare, g	11454.5	9982.5	12329	15699	16797	16224	10582	12446	16209	9930	1013
Tare, g	1389.5	1445	1730	1424	1402	1626	1750	1441	1421	1436	412.4
Wt. of Water, g	1295.5	1539.5	1554	1373	578	1444	772	1663	1734	1369	103.9
Wt. of Dry Sample, g	10065	8537.5	10599	14275	15395	14598	8832	11005	14788	8494	600.6
Moisture Content, %	**12.9**	**18.0**	**14.7**	**9.6**	**3.8**	**9.9**	**8.7**	**15.1**	**11.7**	**16.1**	**17.3**

Sample/Boring No. (TP10-)	**374-1**	**376-**	**377-2**	**380-1**	**381-1**	**383-1**	**391-1**	**395-1**	**398-1**	**399-1**	**402-1**
Sample Depth (ft)	**4.0-5.0'**	**2.0-3.0'**	**4.0-5.0'**	**3.0-4.0'**	**4.0-5.0'**	**4.0-5.0'**	**4.5-5.0'**	**3.5-4.5'**	**4.5-5.0'**	**4.0-5.0'**	**3.0-4.0'**
Wet sample + Tare, g	10544.5	12123	13458	13602.5	12556	17103	14952	14871	15730	15232	17598
Dry Sample + Tare, g	9330	10067	12183	12126	11240	15186	13092	13445.5	13999	13454	14890.5
Tare, g	1436.5	1400	1802	1783.5	1400	1698.5	1424	1444.5	2146	2154	214.3
Wt. of Water, g	1214.5	2056	1275	1476.5	1316	1917	1860	1425.5	1731	1778	2707.5
Wt. of Dry Sample, g	7893.5	8667	10381	10342.5	9840	13487.5	11668	12001	11853	11300	14676.2
Moisture Content, %	**15.4**	**23.7**	**12.3**	**14.3**	**13.4**	**14.2**	**15.9**	**11.9**	**14.6**	**15.7**	**18.4**

Sample/Boring No. (TP10-)	**405-1**	**408-1**	**413-1**	**415-1**	**419-2**	**421-1**	**424-1**
Sample Depth (ft)	**2.0-3.0'**	**2.0-3.0'**	**3.0-4.0'**	**4.0-5.0'**	**4.0-5.0'**	**4.0-5.0'**	**2.0-3.0'**
Wet sample + Tare, g	13904	7895	10132	12997	12929	14655	13693
Dry Sample + Tare, g	12178.5	6072	8687.5	10966	12241	12717	12006
Tare, g	2431	2163	2150	1402	1730	1441	1423
Wt. of Water, g	1725.5	1823	1444.5	2031	688	1938	1687
Wt. of Dry Sample, g	9747.5	3909	6537.5	9564	10511	11276	10583
Moisture Content, %	**17.7**	**46.6**	**22.1**	**21.2**	**6.5**	**17.2**	**15.9**

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/10/2010	Act. Code	500
Date Completed	11/12/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	TP10-319-1 @ 2.5-3.5'		TP10-321-1 @ 3.5-4.0'		TP10-329-1 @ 0.5-1.0'		TP10-331-2 @ 4.5-5.0'		TP10-335-1 @ 5.0-5.2'	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	112	115	113	M1	116	3	13	11	44	42
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	33.29	33.65	31.86	31.23	60.89	60.62	45.19	45.09	50.13	50.74
4) Calibrated Wt. of Flask + Water	346.75	352.65	344.73	352.71	353.98	365.53	364.48	359.26	355.04	351.67
5) #3 + #4	380.04	386.30	376.59	383.94	414.87	372.22	409.67	404.35	405.17	402.41
6) Wt. of Flask + Water + Soil	367.78	373.89	364.38	372.00	392.08	403.82	393.13	387.81	386.48	383.45
7) Volume of Soil (5 - 6)	12.26	12.41	12.21	11.94	22.79	23.40	16.54	16.54	18.69	18.96
8) Test Temperature, deg. C	19.8	19.9	19.6	20.1	20.6	19.9	19.9	19.8	19.8	19.8
9) Temperature Correction, k	1.000040	1.000020	1.000080	0.999978	0.999870	1.000020	1.000020	1.000040	1.000040	1.000040
10) Specific Gravity ((3 / 7) * k)	2.715	2.712	2.610	2.616	2.671	2.591	2.732	2.726	2.682	2.676
Reported Average, G_s @ 20 deg.C	2.71		2.61		2.63		2.73		2.68	
Tare	20	11	13	12	20	3	5	6	17	2
Dry Soil + tare, g	428.68	426.6	434.87	426.98	456.24	463.66	420.38	421.02	445.31	443.88
Tare, g	395.39	392.95	403.01	395.75	395.35	403.04	375.19	375.93	395.18	393.14

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/11/2010	Act. Code	500
Date Completed	11/13/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	TP10-336-2 @ 3.0-4.8'		TP10-352-1 @ 3.4-3.8'		TP10-350-1 @ 3.7-4.0'		TP10-338-1 @ 3.2-3.5'		TP10-360-1 @ 1.5-2.0'	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	112	115	113	M1	116	3	13	11	44	42
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	45.02	45.53	34.06	33.90	33.25		34.38	34.31	33.91	34.68
4) Calibrated Wt. of Flask + Water	349.33	352.95	344.69	352.62	352.72		364.45	359.22	346.74	352.72
5) #3 + #4	394.35	398.48	378.75	386.52	385.97		398.83	393.53	380.65	387.40
6) Wt. of Flask + Water + Soil	377.68	381.39	365.85	373.71	373.38		386.13	380.85	368.20	374.42
7) Volume of Soil (5 - 6)	16.67	17.09	12.90	12.81	12.59		12.70	12.68	12.45	12.98
8) Test Temperature, deg. C	20	20.5	20.3	20.5	20.4		20.4	20.4	20	20
9) Temperature Correction, k	1.000000	0.999890	0.999934	0.999890	0.999912		0.999912	0.999912	1.000000	1.000000
10) Specific Gravity ((3 / 7) * k)	2.701	2.664	2.640	2.646	2.641		2.707	2.706	2.724	2.672
Reported Average, G_s @ 20 deg.C	2.68		2.64		2.64		2.71		2.70	
Tare	7	5	11	6	2		12	1	0	131
Dry Soil + tare, g	438.01	420.69	427	409.83	426.38		430.12	428.81	228.79	230.3
Tare, g	392.99	375.16	392.94	375.93	393.13		395.74	394.5	194.88	195.62

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/16/2010	Act. Code	500
Date Completed	11/19/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	TP10-391-1 @ 4.0-5.0'		TP10-383-1 @ 4.0-5.0'		TP10-377-2 @ 4.0-5.0'		TP10-373-2 @ 1.5'			
Sample Prep. (Wet or Dry)	dry		dry		dry		dry			
Flask No.	112	115	113	M1	116	3	13	11		
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	35.29	36.27		40.68	38.14	36.59	32.81	33.10		
4) Calibrated Wt. of Flask + Water	351.66	359.25		365.52	355.01	353.99	352.74	352.21		
5) #3 + #4	386.95	395.52		406.20	393.15	390.58	385.55	385.31		
6) Wt. of Flask + Water + Soil	373.58	382.27		391.16	378.75	377.19	373.61	373.05		
7) Volume of Soil (5 - 6)	13.37	13.25		15.04	14.40	13.39	11.94	12.26		
8) Test Temperature, deg. C	20	20		20.2	20.3	20.3	18.2	18.3		
9) Temperature Correction, k	1.000000	1.000000		0.999956	0.999934	0.999934	1.000355	1.000337		
10) Specific Gravity ((3 / 7) * k)	2.639	2.737		2.705	2.648	2.732	2.749	2.701		
Reported Average, G_s @ 20 deg.C	2.69		2.70		2.69		2.72			
Tare	3	81		6	11	16	4	88		
Dry Soil + tare, g	231.14	232.91		154.22	234.38	233.52	229.85	229.41		
Tare, g	195.85	196.64		113.54	196.24	196.93	197.04	196.31		

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

Knight Piésold
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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/23/2010	Act. Code	500
Date Completed	11/25/2010	Lab No.	
Tested By	jk	Checked By	spb

Sample No.	TP10-419-2 @ 4.0-5.0'		TP10-398-1 @ 4.0-5.0'		TP10-405-1 @ 2.0-3.0'		TP10-408-1 @ 2.0-3.0'		TP10-421-1 @ 4.0-5.0'	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	115	112	116	113	13	42	44	11	m4	m2
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	31.97	32.05	32.62	32.06	33.87	34.25	31.43	32.35	32.88	32.09
4) Calibrated Wt. of Flask + Water	352.62	346.71	365.49	352.67	352.94	352.09	354.99	359.20	352.09	352.93
5) #3 + #4	384.59	378.76	398.11	384.73	386.81	386.34	386.42	391.55	384.97	385.02
6) Wt. of Flask + Water + Soil	372.78	366.93	386.13	372.64	374.11	373.39	373.87	378.81	372.60	373.02
7) Volume of Soil (5 - 6)	11.81	11.83	11.98	12.09	12.70	12.95	12.55	12.74	12.37	12.00
8) Test Temperature, deg. C	20.5	20.6	20.8	20.8	20.6	20.6	20.7	20.8	20.7	20.8
9) Temperature Correction, k	0.999890	0.999870	0.999830	0.999830	0.999870	0.999870	0.999850	0.999830	0.999850	0.999830
10) Specific Gravity ((3 / 7) * k)	2.707	2.709	2.722	2.651	2.667	2.644	2.504	2.539	2.658	2.674
Reported Average, G_s @ 20 deg.C	2.71		2.69		2.66		2.52		2.67	
Tare	100	16	11	13	13	4	bore	31	55	88
Dry Soil + tare, g	146.47	229.08	228.71	148.06	229.05	231.21	141.46	227.81	224.74	228.21
Tare, g	114.5	197.03	196.09	116	195.18	196.96	110.03	195.46	191.86	196.12

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Coarse Aggregate
ASTM C 127

Project	Pebble Project - 2010 Geotech Investigation	Project No.	DV101-00077.11
Lab No.		Date of Test	11/13/2010
Tested By	jdb	Checked By	spb

Run by / Date	11/13/10, jdb	11/13/10, jdb	11/13/10, jdb	11/13/10, jdb	11/13/10, jdb
Sample No./ Depth	TP10-319-1 @ 2.5-3.5'	TP10-329-1 @ 0.5-1.0'	TP10-352-1 @ 3.4-3.8'	TP10-350-1 @ 3.7-4.0'	TP10-335-1 @ 5.0-5.2'
Sample Description	+No.4	+3/4 in.	+3/4 in.	+3/4 in.	+3/4 in.
No. of +3 in. pcs.					
Tare No.	rp	k	30	Possy	41
Saturated Surface Dry Aggregate + Tare	2603.6	2117.7	1868.1	1792	3526.6
Dry Aggregate + Tare	2515.9	2042.4	1812.3	1732.3	3465.8
Tare	420.5	413.1	119.7	147.2	410
Saturated Surface Dry Aggregate (B)	2183.1	1704.6	1748.4	1644.8	3116.6
Dry Aggregate (A)	2095.4	1629.3	1692.6	1585.1	3055.8
Basket Submerged	0	0	0	0	0
Saturated Aggregate Submerged (C)	1325.4	1017.6	1085.8	1010.2	1928.2
Temperature of Water	23.0	23.0	23.0	23.0	22.4
Correction Factor	0.999339	0.999339	0.999339	0.999339	0.999473
Apparent Specific Gravity (A / (A-C))	2.72	2.66	2.79	2.76	2.71
Bulk Specific Gravity , SSD (B / (B-C))	2.55	2.48	2.64	2.59	2.62
Bulk Specific Gravity (A / (B-C))	2.44	2.37	2.55	2.50	2.57
Absorption (%)	4.2%	4.6%	3.3%	3.8%	2.0%
Percent Retained #4					
Percent Passing #4					
Weight of Aggregate Passing #4					
Weighted Average Specific Gravity					

Remarks:

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Specific Gravity - Coarse Aggregate
ASTM C 127

Project	Pebble Project - 2010 Geotech Investigation	Project No.	DV101-00077.11
Lab No.		Date of Test	11/13/2010
Tested By	db	Checked By	spb

Run by / Date	11/19/10, db	11/19/10, db	11/19/10, db	11/19/10, db	11/19/10, db
Sample No./ Depth	TP10-336-2 @ 3.0-4.8'	TP10-377-2 @ 4.0-5.0'	TP10-338-1 @ 3.2-3.5'	TP10-338-1 @ 3.2-3.5'	TP10-383-1 @ 4.0-5.0'
Sample Description	+No.4	+No.4	+No.4	+No.4	+No.4
No. of +3 in. pcs.					
Tare No.	NIN	100	18	17	7
Saturated Surface Dry Aggregate + Tare	2108.2	3966.8	1770.3	1960.5	5083.9
Dry Aggregate + Tare	2016.1	3759.4	1700.6	1873	4855.4
Tare	343.4	260.9	118.3	148.6	265.3
Saturated Surface Dry Aggregate (B)	1764.8	3705.9	1652	1811.9	4818.6
Dry Aggregate (A)	1672.7	3498.5	1582.3	1724.4	4590.1
Basket Submerged	0	0	0	0	0
Saturated Aggregate Submerged (C)	1040.2	2208.2	996.3	1100.6	2886.5
Temperature of Water	21.1	24.6	24.5	24.4	23.8
Correction Factor	0.999768	0.998942	0.998968	0.998992	0.999140
Apparent Specific Gravity (A / (A-C))	2.64	2.71	2.70	2.76	2.69
Bulk Specific Gravity , SSD (B / (B-C))	2.44	2.47	2.52	2.55	2.49
Bulk Specific Gravity (A / (B-C))	2.31	2.34	2.41	2.42	2.38
Absorption (%)	5.5%	5.9%	4.4%	5.1%	5.0%
Percent Retained #4					
Percent Passing #4					
Weight of Aggregate Passing #4					
Weighted Average Specific Gravity					

Remarks:

Knight Piésold
CONSULTING

Specific Gravity - Coarse Aggregate
ASTM C 127

Project	Pebble Project - 2010 Geotech Investigation	Project No.	DV101-00077.11
Lab No.		Date of Test	11/13/2010
Tested By	db	Checked By	spb

Run by / Date	11/19/10, db	11/19/10, db	11/19/10, db	11/19/10, db	11/19/10, db
Sample No./ Depth	TP10-421-1 @ 4.0-5.0'	TP10-391-1 @ 4.0-5.0'	TP10-405-1 @ 2.0-3.0'	TP10-398-1 @ 4.0-5.0'	TP10-398-1 @ 4.0-5.0'
Sample Description	+3/8 in.	+3/8 in.	+3/4 in.	+No.4	+No.4
No. of +3 in. pcs.					
Tare No.	D	g	f	snug	BB
Saturated Surface Dry Aggregate + Tare	2432	2526.8	2203.9	3162.1	3182.3
Dry Aggregate + Tare	2380.1	2398.9	2127.5	3044.5	3109.6
Tare	143.9	147	145.9	324.4	343.3
Saturated Surface Dry Aggregate (B)	2288.1	2379.8	2058	2837.7	2839
Dry Aggregate (A)	2236.2	2251.9	1981.6	2720.1	2766.3
Basket Submerged	0	0	0	0	0
Saturated Aggregate Submerged (C)	1422.9	1413.4	1254.1	1712.8	1756.7
Temperature of Water	24.0	24.0	24.0	24.0	24.0
Correction Factor	0.999088	0.999088	0.999088	0.999088	0.999088
Apparent Specific Gravity (A / (A-C))	2.75	2.69	2.72	2.70	2.74
Bulk Specific Gravity , SSD (B / (B-C))	2.64	2.46	2.56	2.52	2.62
Bulk Specific Gravity (A / (B-C))	2.58	2.33	2.46	2.42	2.56
Absorption (%)	2.3%	5.7%	3.9%	4.3%	2.6%
Percent Retained #4					
Percent Passing #4					
Weight of Aggregate Passing #4					
Weighted Average Specific Gravity					

Remarks:

Knight Piésold
CONSULTING

Specific Gravity - Coarse Aggregate
ASTM C 127

Project	Pebble Project - 2010 Geotech Investigation	Project No.	DV101-00077.11
Lab No.		Date of Test	11/13/2010
Tested By	db	Checked By	spb

Run by / Date	11/19/10, db	11/19/10, db			
Sample No./ Depth	TP10-419-2 @ 4.0-5.0'	TP10-360-1 @ 1.5-2.0'			
Sample Description	+No.4	+No.4			
No. of +3 in. pcs.					
Tare No.	D	99			
Saturated Surface Dry Aggregate + Tare	4835.4	2264.7			
Dry Aggregate + Tare	4707	2215.8			
Tare	229.9	193.9			
Saturated Surface Dry Aggregate (B)	4605.5	2070.8			
Dry Aggregate (A)	4477.1	2021.9			
Basket Submerged	0	0			
Saturated Aggregate Submerged (C)	2814	1270.3			
Temperature of Water	23.3	23.3			
Correction Factor	0.999497	0.999497			
Apparent Specific Gravity (A / (A-C))	2.69	2.69			
Bulk Specific Gravity , SSD (B / (B-C))	2.57	2.59			
Bulk Specific Gravity (A / (B-C))	2.50	2.53			
Absorption (%)	2.9%	2.4%			
Percent Retained #4					
Percent Passing #4					
Weight of Aggregate Passing #4					
Weighted Average Specific Gravity					

Remarks:

Knight Piésold
CONSULTING

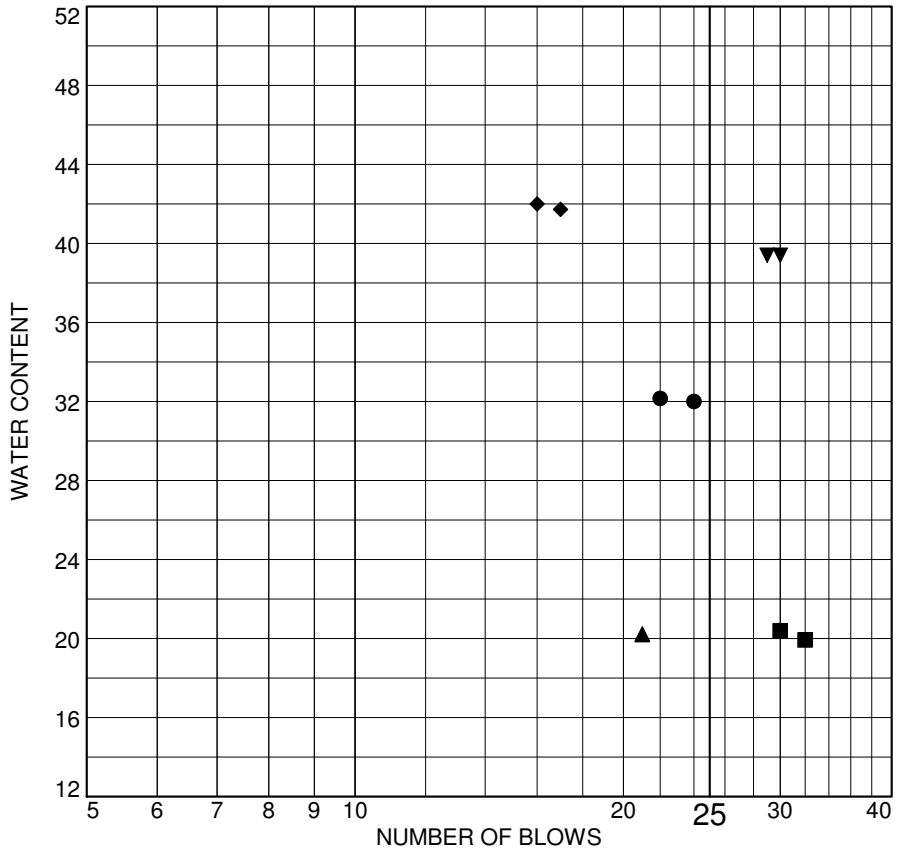
Specific Gravity - Fine Aggregate
ASTM C 128

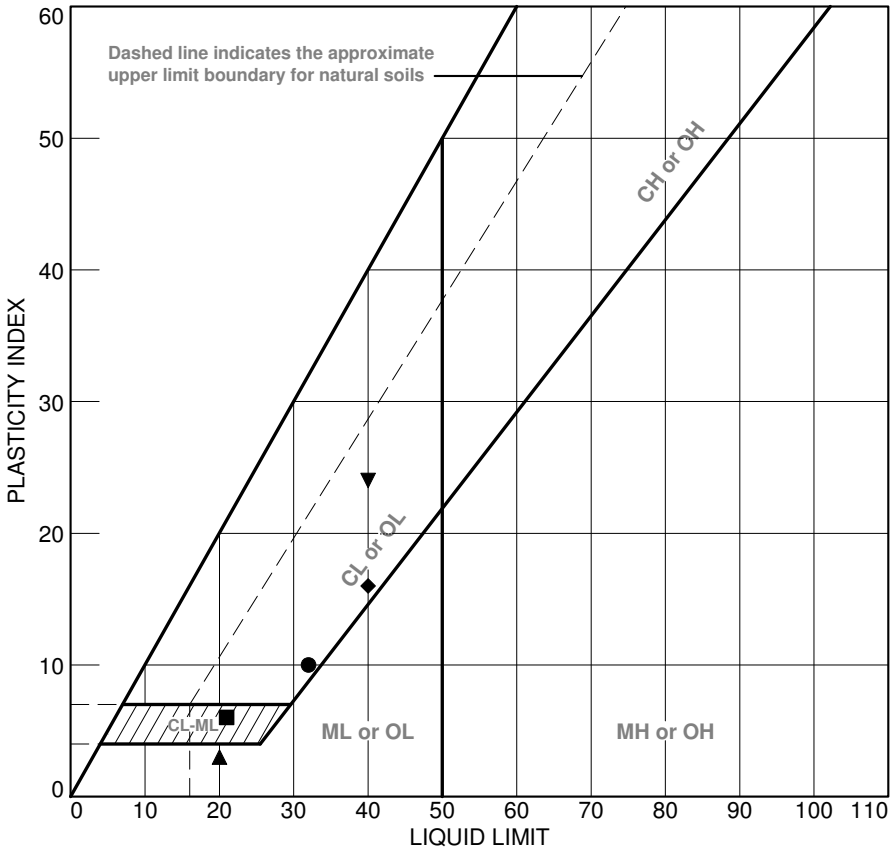
Project	Pebble Project - 2010 Geotech Investigation	Project No.	DV101-00077.11
Lab No.		Date of Test	11/23/2010
Tested By	db	Checked By	spb

Run by / Date	11/23/10, jdb	11/23/10, jdb			
Sample No./ Depth	TP10-373-2 @ 1.5'	TP10-408-1 @ 2.0-3.0'			
Sample Description	+No.4	+No.4			
No. of +3 in. pcs.					
Tare No.					
Weight of Pycnometer w/Specimen and Water ©	1537.9	1647.8			
Dry Aggregate + Tare	304.12	401.53			
Tare	195.73	116.19			
Saturated Surface Dry Aggregate					
Weight of Oven Dried Specimen (A)	108.39	285.34			
Weight of Pycnometer filled with Water (B)	1470.11	1469.54			
Saturated Aggregate Submerged					
Temperature of Water	18.3	18.0			
Correction Factor	1.000337	1.000391			
Apparent Specific Gravity (A / (A-C))	2.67	2.66			
Bulk Specific Gravity , SSD (B / (B-C))					
Bulk Specific Gravity (A / (B-C))					
Absorption (%)					
Percent Retained #4					
Percent Passing #4					
Weight of Aggregate Passing #4					
Weighted Average Specific Gravity					

Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	2010 Test Pit Samples	TP10-321-1	3.5-4.0'	11/10/10	CL	lean clay with sand		32	10
■	2010 Test Pit Samples	TP10-331-2	4.5-5.0'	11/10/10	CL-ML	sandy silty clay		21	6
▲	2010 Test Pit Samples	TP10-336-2	3.0-4.0'	11/11/10	SM	silty sand with gravel		20	3
◆	2010 Test Pit Samples	TP10-344-1	3.5-3.7'	11/11/10	GC	clayey gravel with sand		40	16
▼	2010 Test Pit Samples	TP10-352-1	3.4-3.8'	11/11/10	GC	clayey gravel with sand		40	24

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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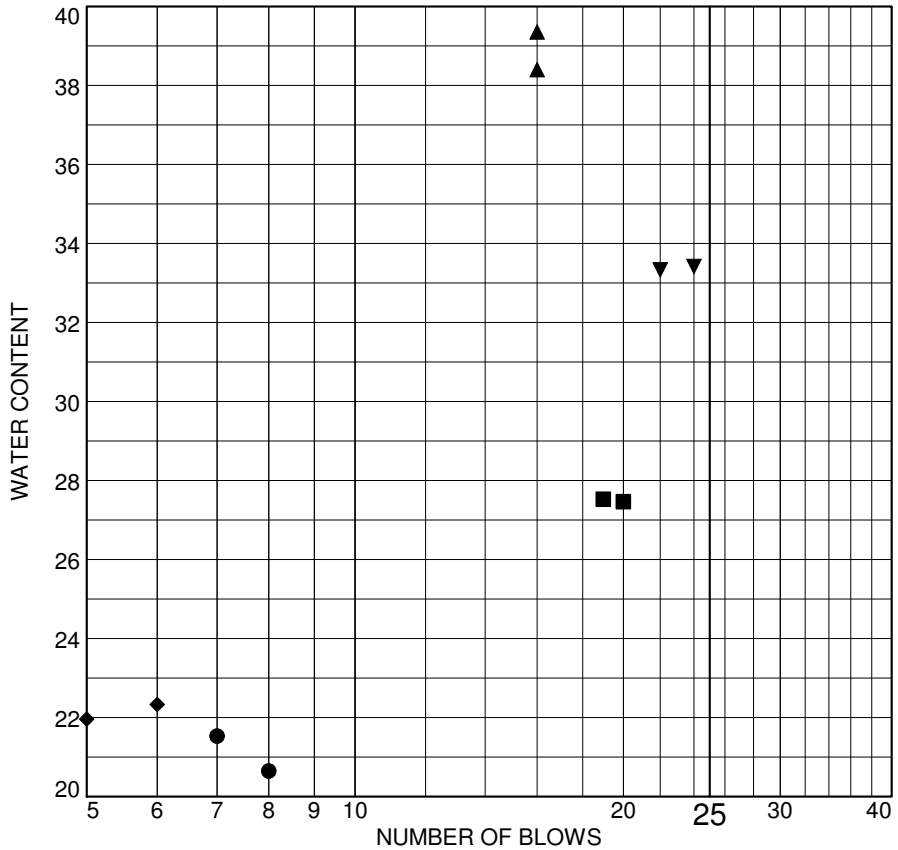
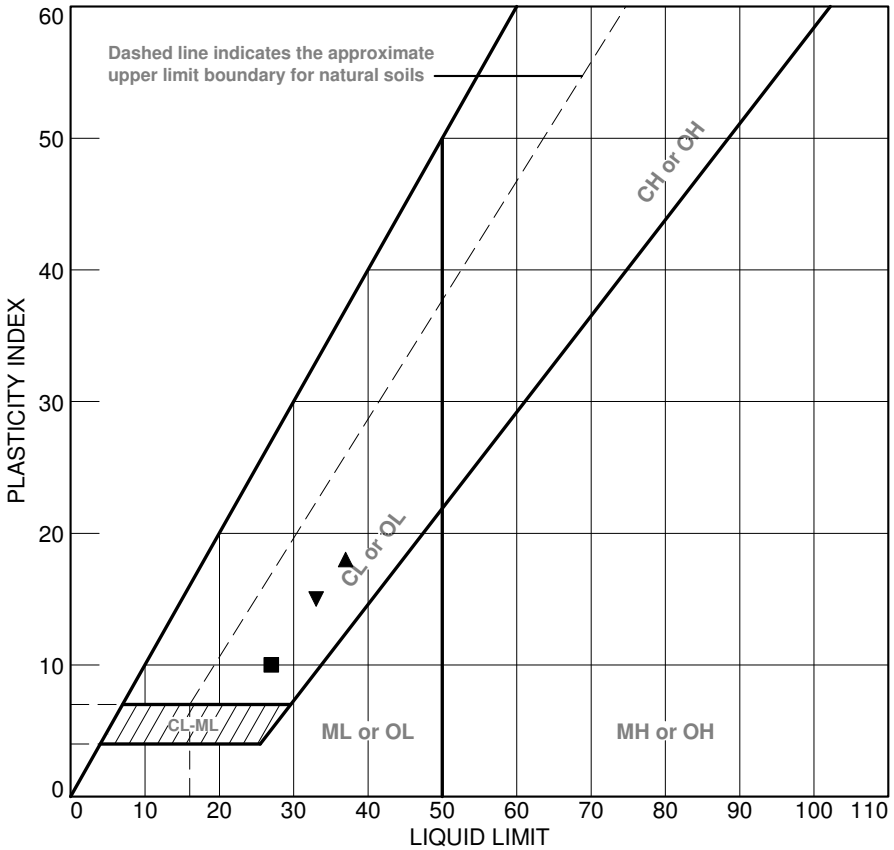
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	2010 Test Pit Samples	TP10-361-1	2.0-3.0'	11/15/10	SM	silty sand with gravel		18	NP
■	2010 Test Pit Samples	TP10-373-2	1.5'	11/17/10	SC	clayey sand with gravel		27	10
▲	2010 Test Pit Samples	TP10-374-1	4.0-5.0'	11/16/10	GC	clayey gravel with sand		37	18
◆	2010 Test Pit Samples	TP10-376-1	2.0-3.0'	11/16/10	SM	silty sand		18	NP
▼	2010 Test Pit Samples	TP10-391-1	4.0-5.0'	11/16/10	GC	clayey gravel with sand		33	15

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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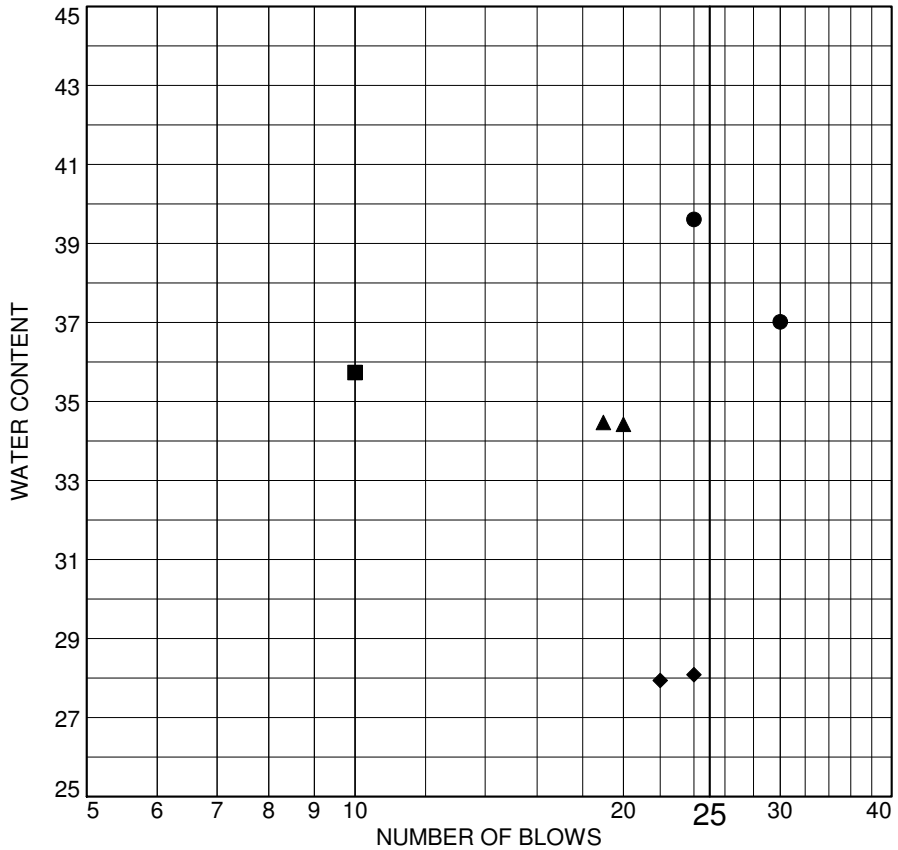
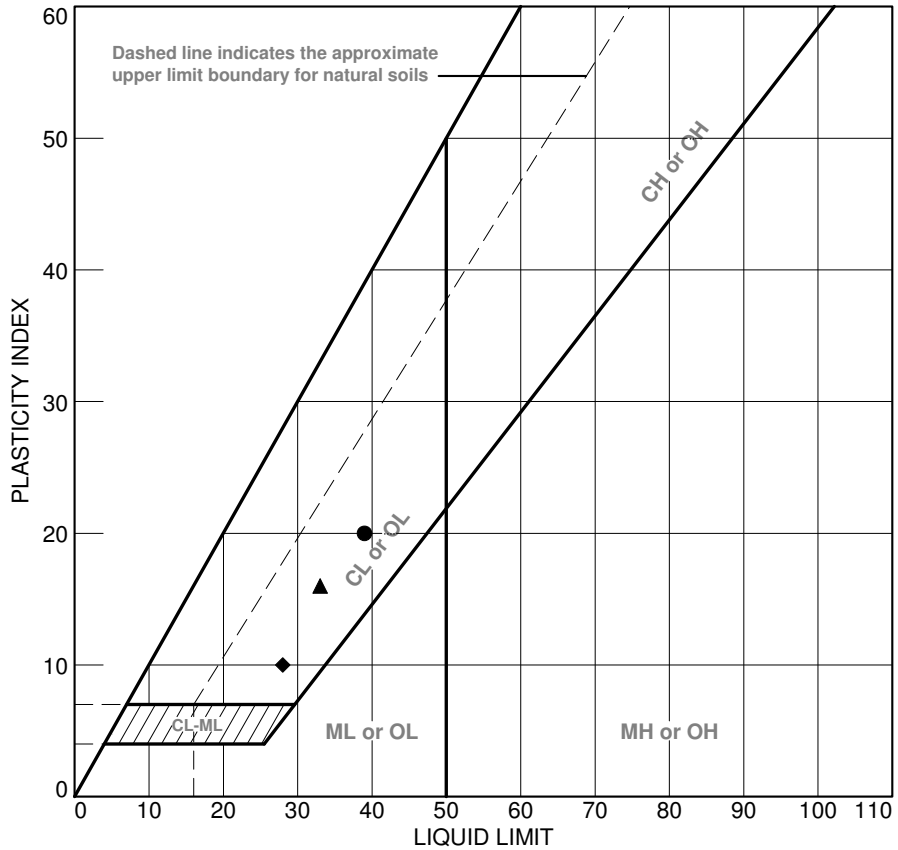
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	2010 Test Pit Samples	TP10-399-1	4.0-5.0'	11/17/10	GC	clayey gravel with sand		39	20
■	2010 Test Pit Samples	TP10-402-1	3.0-4.0'	11/17/10	GW-GM	well-graded gravel with silt and sand		32	NP
▲	2010 Test Pit Samples	TP10-421-1	4.0-5.0'	11/17/10	CL	gravelly lean clay with sand		33	16
◆	2010 Test Pit Samples	TP10-424-1	2.0-3.0'	11/17/10	SC	clayey sand with gravel		28	10

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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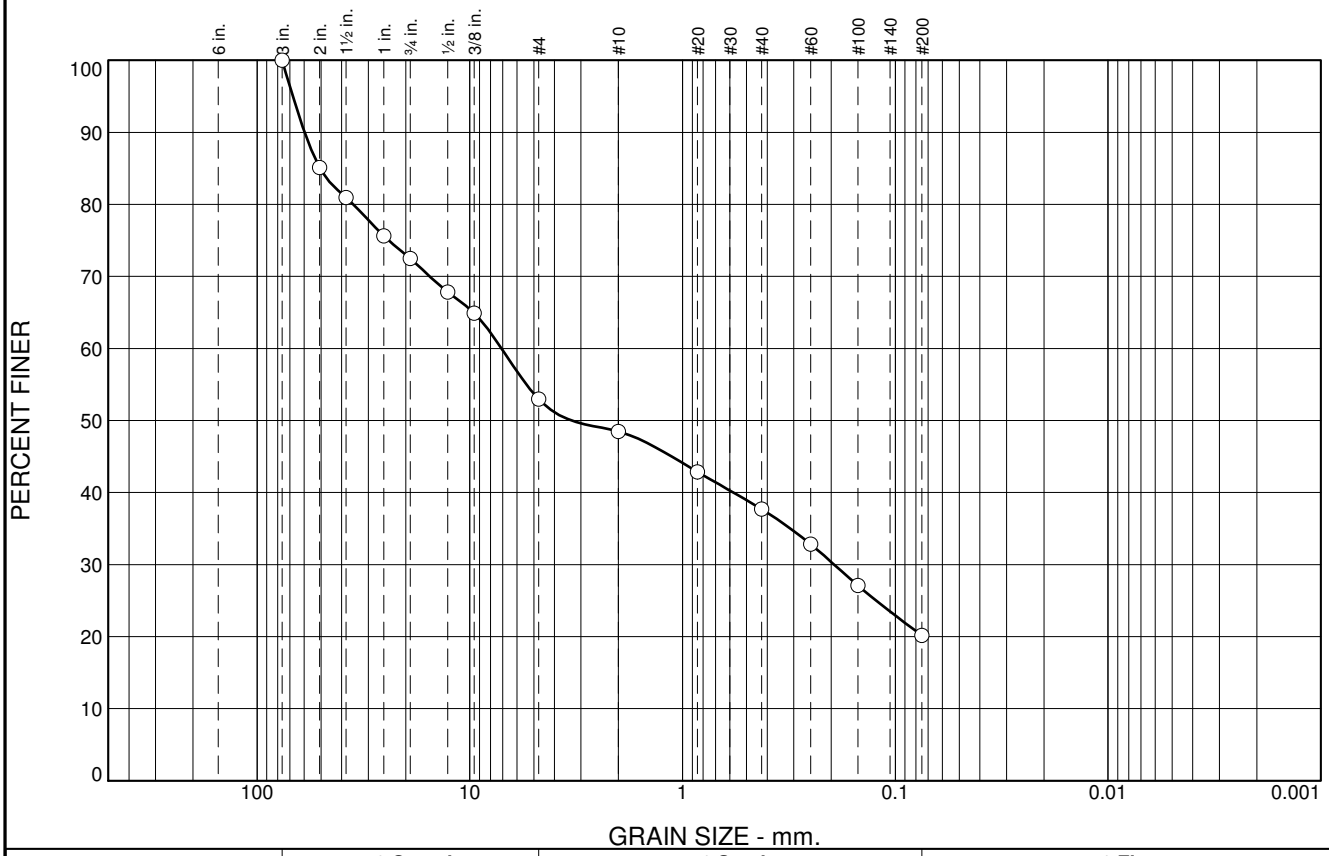
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	28	19	5	10	18	20	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	85		
1.5	81		
1	76		
.75	72		
.5	68		
0.375	65		
#4	53		
#10	48		
#20	43		
#40	38		
#60	33		
#100	27		
#200	20		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 50.5702 D_{60}= 7.0934 D_{50}= 3.3349
D_{30}= 0.1939 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 19.7%. The original sample contained 6% cobbles. These results reflect that portion of the original sample passing the 3 inch sieve.

Sample No.: TP10-319-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/10/10
Location: Upper Talarik Creek Area **Elev./Depth:** 2.5-3.5'

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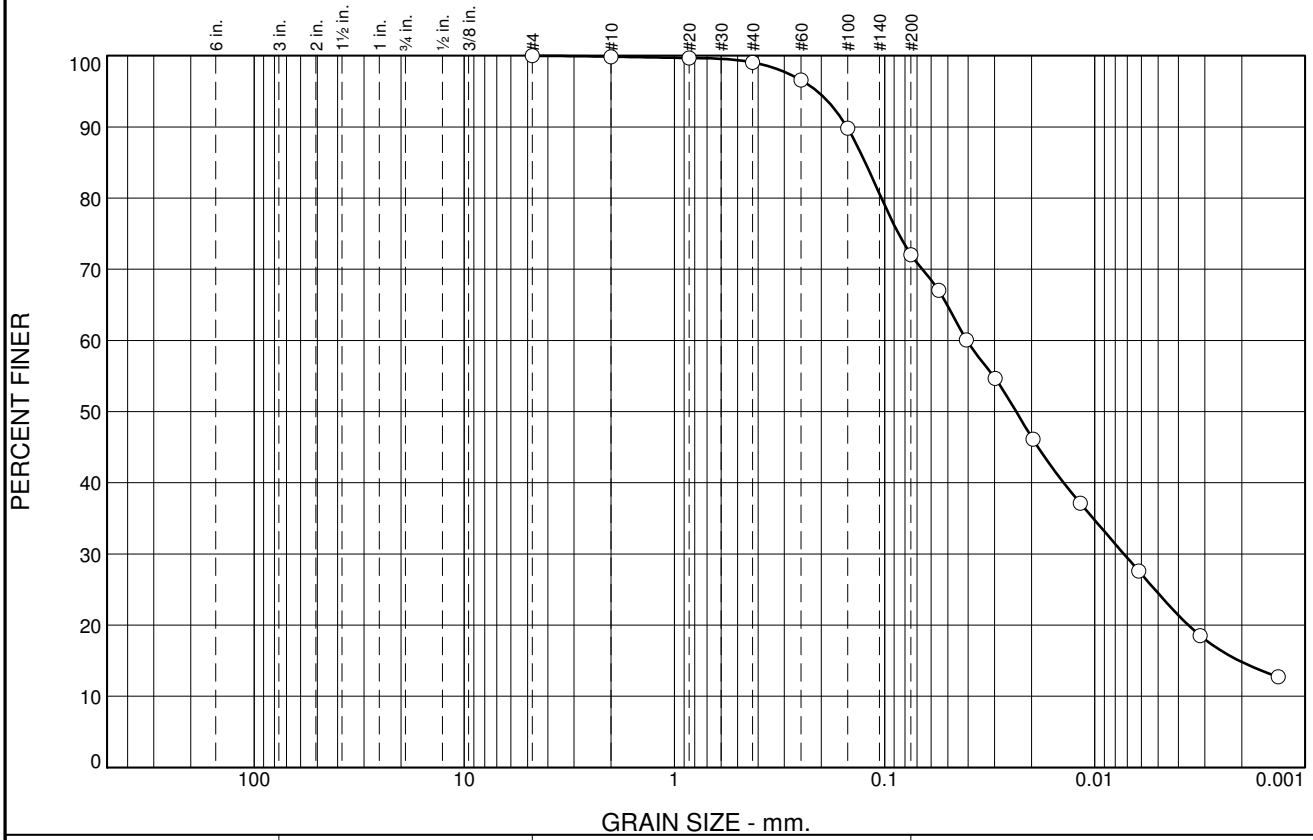
Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	27	57	15

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	100		
#20	100		
#40	99		
#60	97		
#100	90		
#200	72		
0.0553 mm.	67		
0.0408 mm.	60		
0.0298 mm.	55		
0.0197 mm.	46		
0.0117 mm.	37		
0.0062 mm.	28		
0.0032 mm.	19		
0.0013 mm.	13		

* (no specification provided)

Soil Description

lean clay with sand

Atterberg Limits

PL= 22 LL= 32 PI= 10

Coefficients

D_{85}= 0.1235 D_{60}= 0.0406 D_{50}= 0.0236
D_{30}= 0.0073 D_{15}= 0.0021 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(6)

Remarks

As received moisture 33.0%

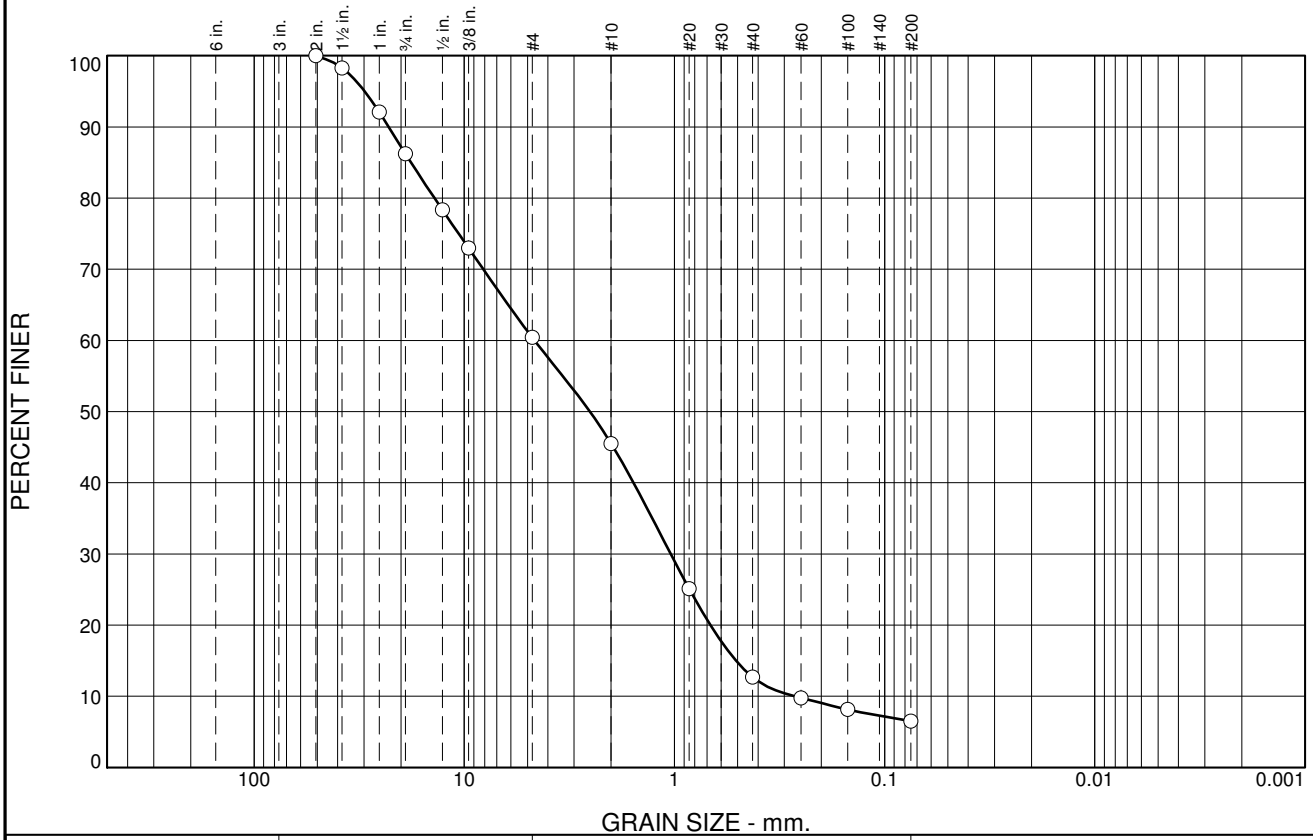
Sample No.: TP10-321-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/10/10
Location: Upper Talarik Creek Area **Elev./Depth:** 3.5-4.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	14	26	15	32	6	7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	98		
1	92		
.75	86		
.5	78		
0.375	73		
#4	60		
#10	45		
#20	25		
#40	13		
#60	10		
#100	8		
#200	6.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 17.9178 D_{60}= 4.6311 D_{50}= 2.5269
D_{30}= 1.0421 D_{15}= 0.5089 D_{10}= 0.2678
C_u= 17.30 C_c= 0.88

Classification

USCS= AASHTO=

Remarks

As received moisture 9.8%

Sample No.: TP10-329-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/10/10
Location: Upper Talarik Creek Area **Elev./Depth:** 0.5-1.0'

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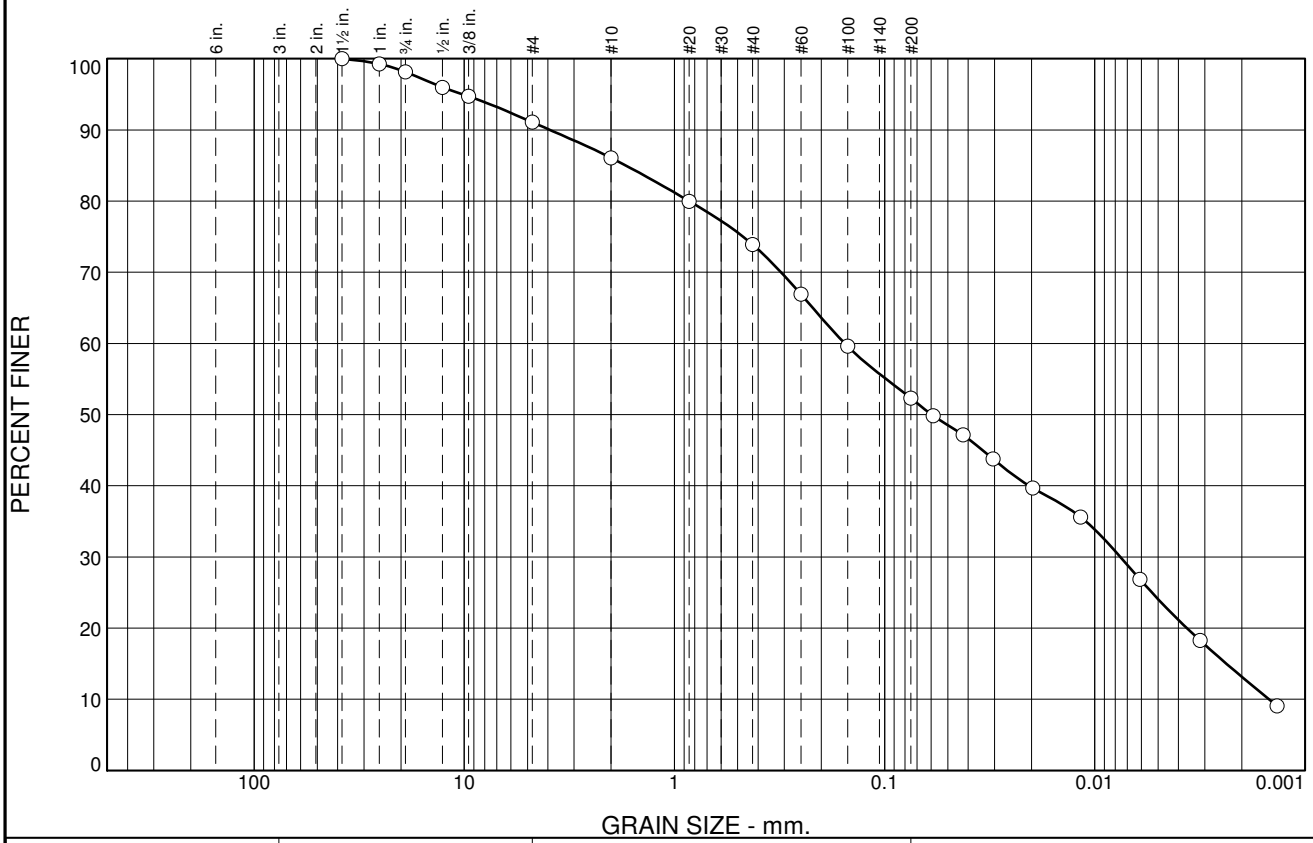
Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	7	5	12	22	39	13

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	99		
.75	98		
.5	96		
0.375	95		
#4	91		
#10	86		
#20	80		
#40	74		
#60	67		
#100	60		
#200	52		
0.0588 mm.	50		
0.0423 mm.	47		
0.0305 mm.	44		
0.0198 mm.	40		
0.0117 mm.	36		
0.0061 mm.	27		
0.0032 mm.	18		
0.0014 mm.	9.1		

* (no specification provided)

Soil Description

sandy silty clay

Atterberg Limits

PL= 15 LL= 21 PI= 6

Coefficients

D_{85}= 1.6999 D_{60}= 0.1547 D_{50}= 0.0597
D_{30}= 0.0076 D_{15}= 0.0024 D_{10}= 0.0015
C_u= 104.24 C_c= 0.25

Classification

USCS= CL-ML AASHTO= A-4(0)

Remarks

As received moisture = 10.4%

Sample No.: TP10-331-2 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/10/10
Location: Upper Talarik Creek Area **Elev./Depth:** 4.5-5.0'

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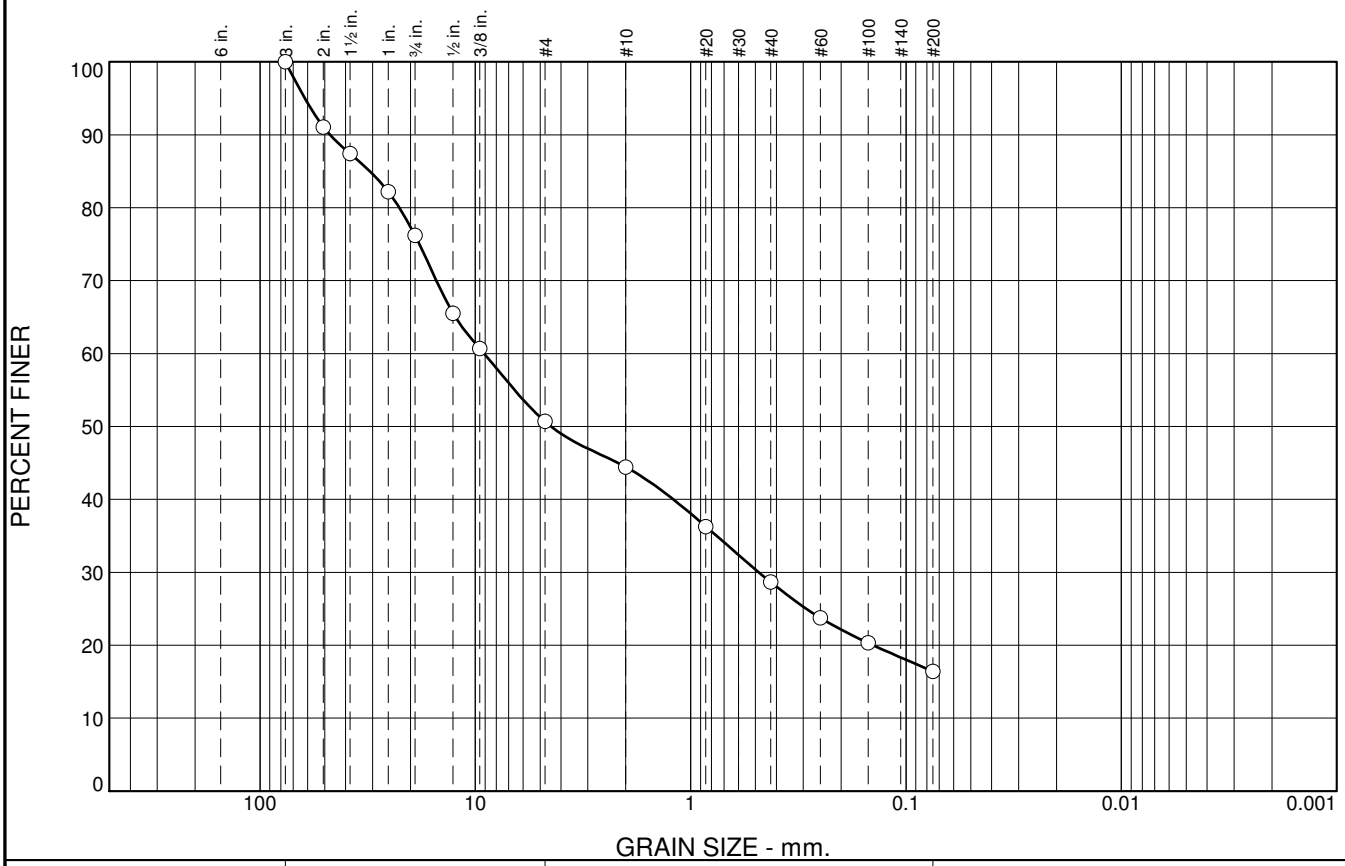
Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	25	7	15	13	16	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	91		
1.5	87		
1	82		
.75	76		
.5	66		
0.375	61		
#4	51		
#10	44		
#20	36		
#40	29		
#60	24		
#100	20		
#200	16		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 30.8648 D_{60}= 9.0956 D_{50}= 4.4501
D_{30}= 0.4824 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 8.9%

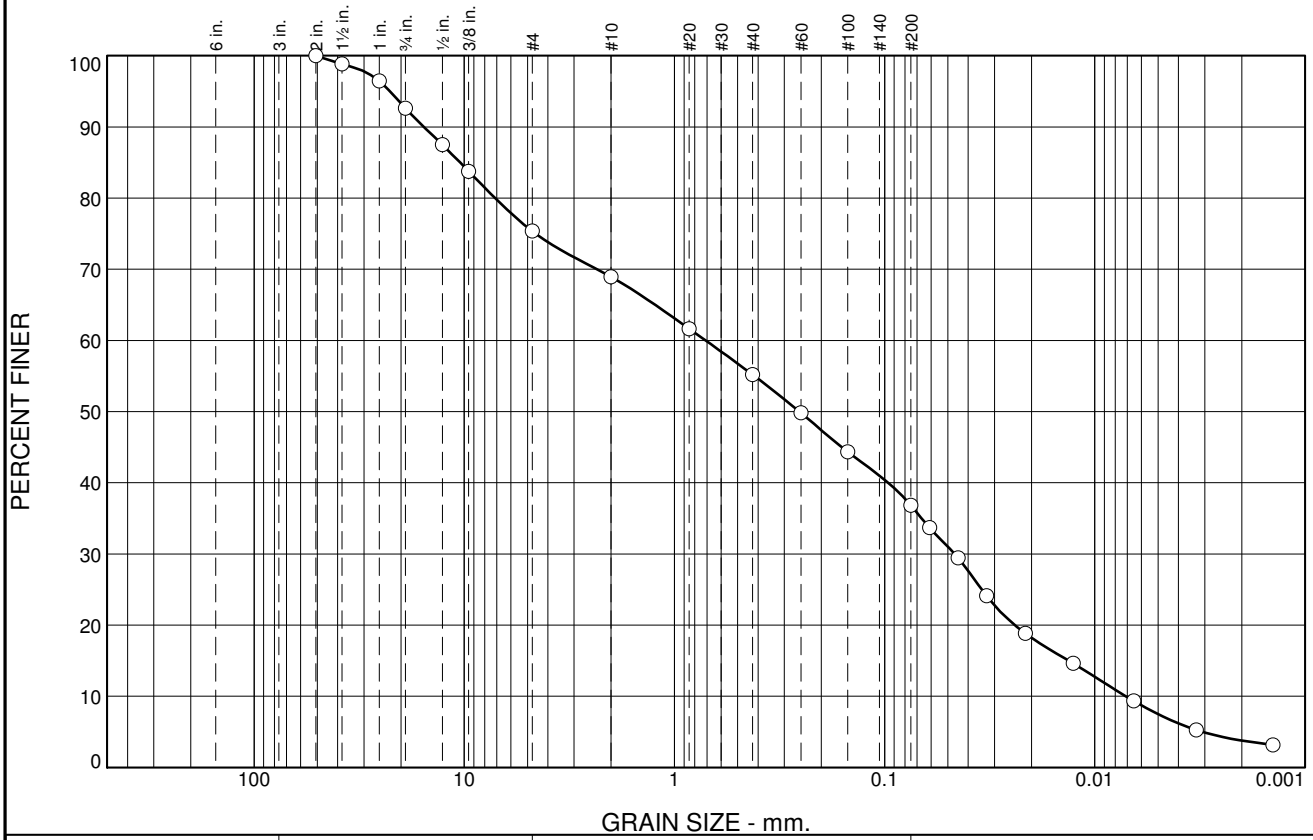
Sample No.: TP10-335-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/10/10
Location: Area G **Elev./Depth:** 5.0-5.2'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	7	18	6	14	18	33	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	99		
1	96		
.75	93		
.5	87		
0.375	84		
#4	75		
#10	69		
#20	62		
#40	55		
#60	50		
#100	44		
#200	37		
0.0611 mm.	34		
0.0446 mm.	29		
0.0327 mm.	24		
0.0214 mm.	19		
0.0127 mm.	15		
0.0065 mm.	9.3		
0.0033 mm.	5.3		
0.0014 mm.	3.2		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= 17 LL= 20 PI= 3

Coefficients

D_{85}= 10.4568 D_{60}= 0.7113 D_{50}= 0.2541
D_{30}= 0.0464 D_{15}= 0.0133 D_{10}= 0.0071
C_u= 99.94 C_c= 0.42

Classification

USCS= SM AASHTO= A-4(0)

Remarks

As received moisture = 15.2%

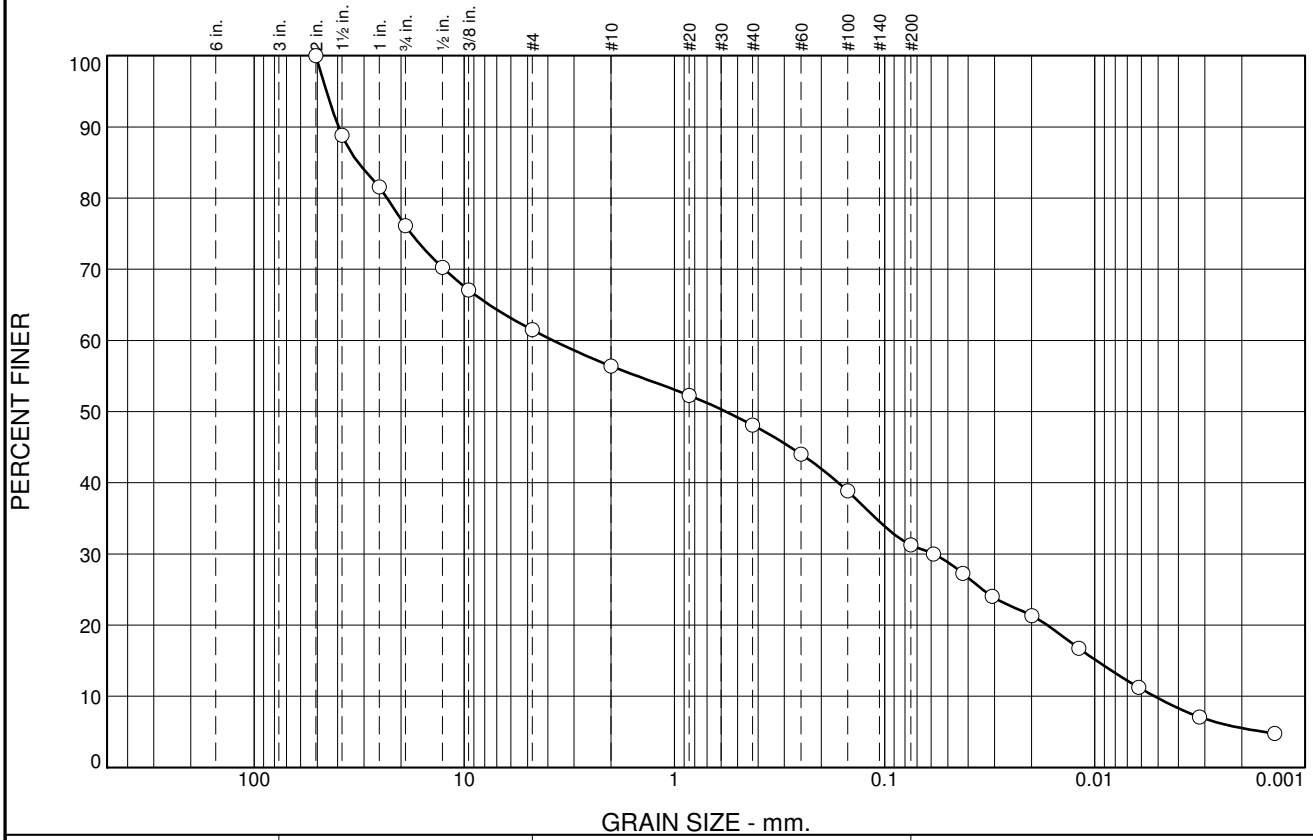
Sample No.: TP10-336-2 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Area G **Elev./Depth:** 3.0-4.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	14	6	8	17	25	6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	89		
1	82		
.75	76		
.5	70		
0.375	67		
#4	62		
#10	56		
#20	52		
#40	48		
#60	44		
#100	39		
#200	31		
0.0585 mm.	30		
0.0424 mm.	27		
0.0308 mm.	24		
0.0199 mm.	21		
0.0119 mm.	17		
0.0062 mm.	11		
0.0032 mm.	7.1		
0.0014 mm.	4.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 32.0069 D_{60}= 3.7733 D_{50}= 0.5695
D_{30}= 0.0587 D_{15}= 0.0098 D_{10}= 0.0052
C_u= 726.17 C_c= 0.18

Classification

USCS= AASHTO=

Remarks

As received moisture = 16.5%

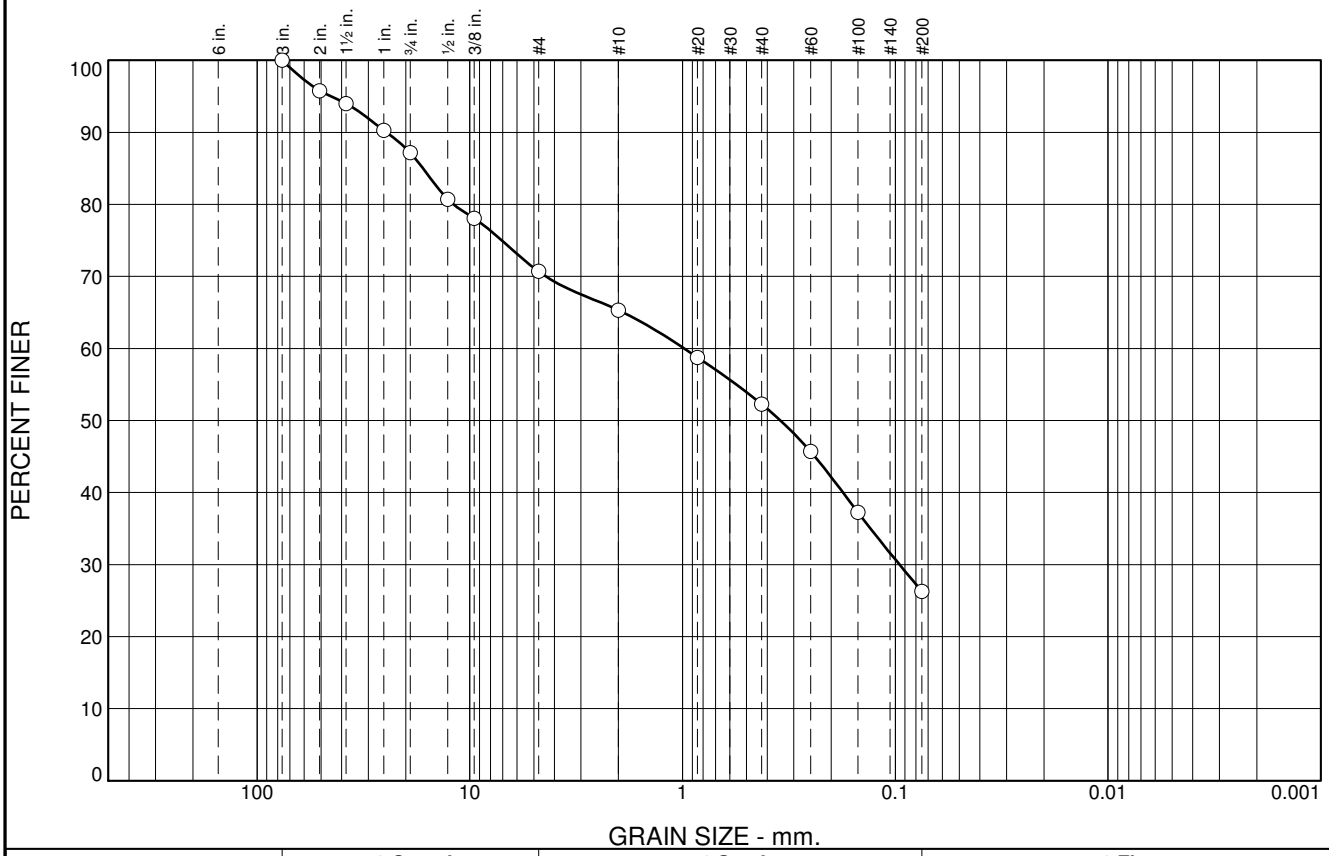
Sample No.: TP10-337-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Area G **Elev./Depth:** 5.0-5.4'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	13	16	6	13	26	26	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	96		
1.5	94		
1	90		
.75	87		
.5	81		
0.375	78		
#4	71		
#10	65		
#20	59		
#40	52		
#60	46		
#100	37		
#200	26		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.5823 D_{60}= 0.9821 D_{50}= 0.3467
D_{30}= 0.0955 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 12.9%. The original sample contained 14% cobbles. These results reflect that portion of the original sample passing the 3 inch sieve.

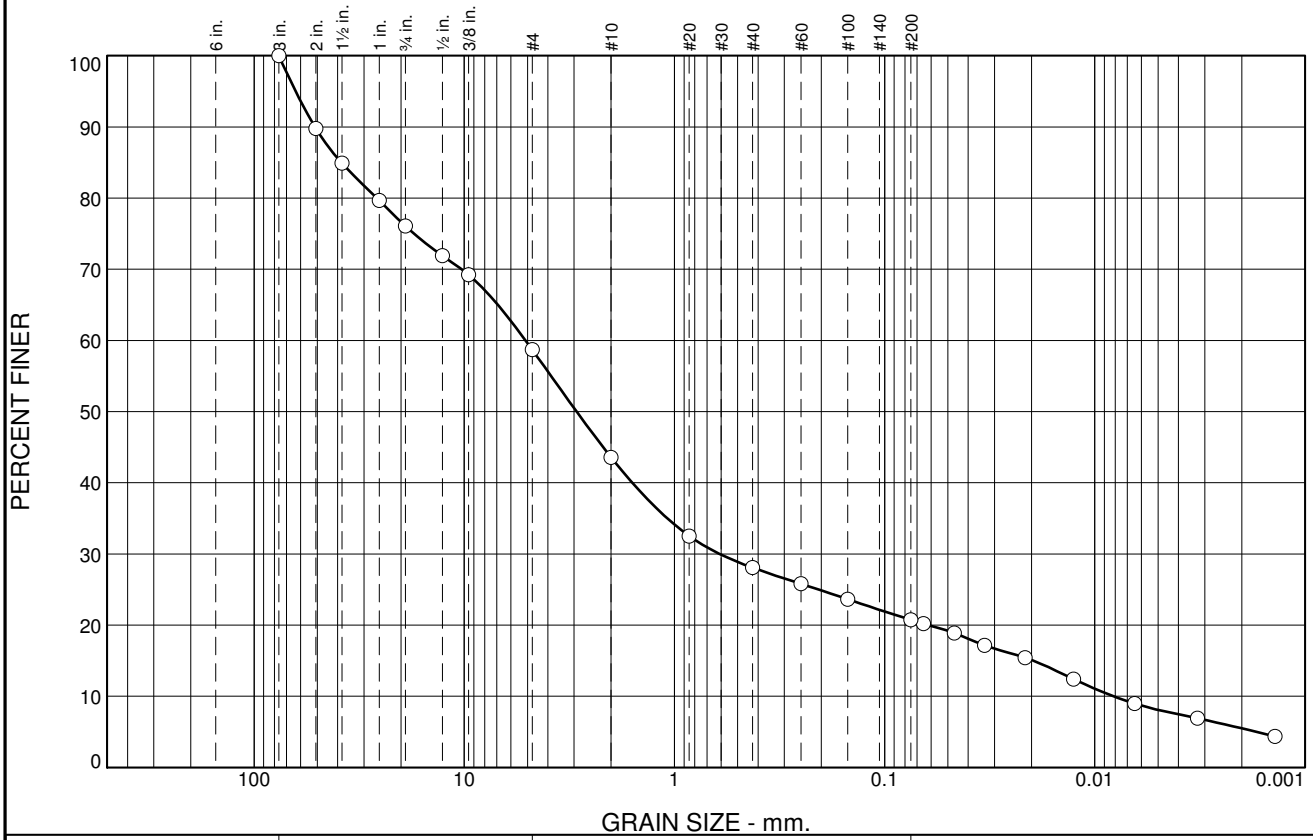
Sample No.: TP10-338-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Upper Talarik Creek Area **Elev./Depth:** 3.2-3.8'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	17	15	16	7	16	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	90		
1.5	85		
1	80		
.75	76		
.5	72		
0.375	69		
#4	59		
#10	44		
#20	33		
#40	28		
#60	26		
#100	24		
#200	21		
0.0652 mm.	20		
0.0466 mm.	19		
0.0334 mm.	17		
0.0214 mm.	15		
0.0126 mm.	12		
0.0065 mm.	9.0		
0.0033 mm.	6.9		
0.0014 mm.	4.4		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 24 LL= 40 PI= 16

Coefficients

D_{85}= 38.3767 D_{60}= 5.1132 D_{50}= 2.9188
D_{30}= 0.6099 D_{15}= 0.0196 D_{10}= 0.0082
C_u= 626.48 C_c= 8.91

Classification

USCS= GC AASHTO= A-2-6(0)

Remarks

As received moisture 16.7%

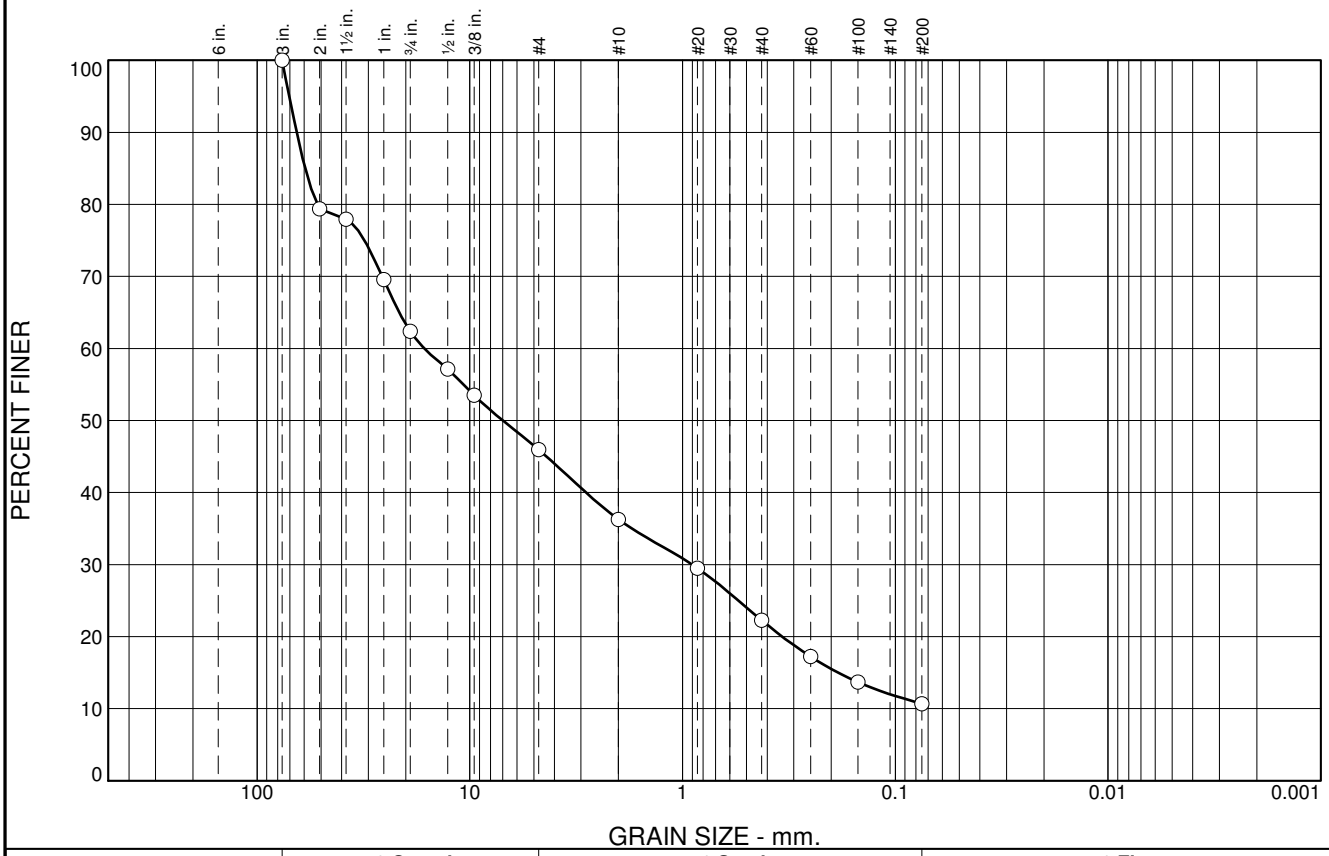
Sample No.: TP10-344-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Upper Talarik Creek Area **Elev./Depth:** 3.5-3.7'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	38	16	10	14	11	11	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	79		
1.5	78		
1	70		
.75	62		
.5	57		
0.375	53		
#4	46		
#10	36		
#20	29		
#40	22		
#60	17		
#100	14		
#200	11		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 59.3923 D_{60}= 16.3725 D_{50}= 6.9934
D_{30}= 0.9014 D_{15}= 0.1861 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As rceived moisture 10.4%. The original test sample contained 8% cobbles. These results reflect that portion of the original sample passing the 3 inch sieve.

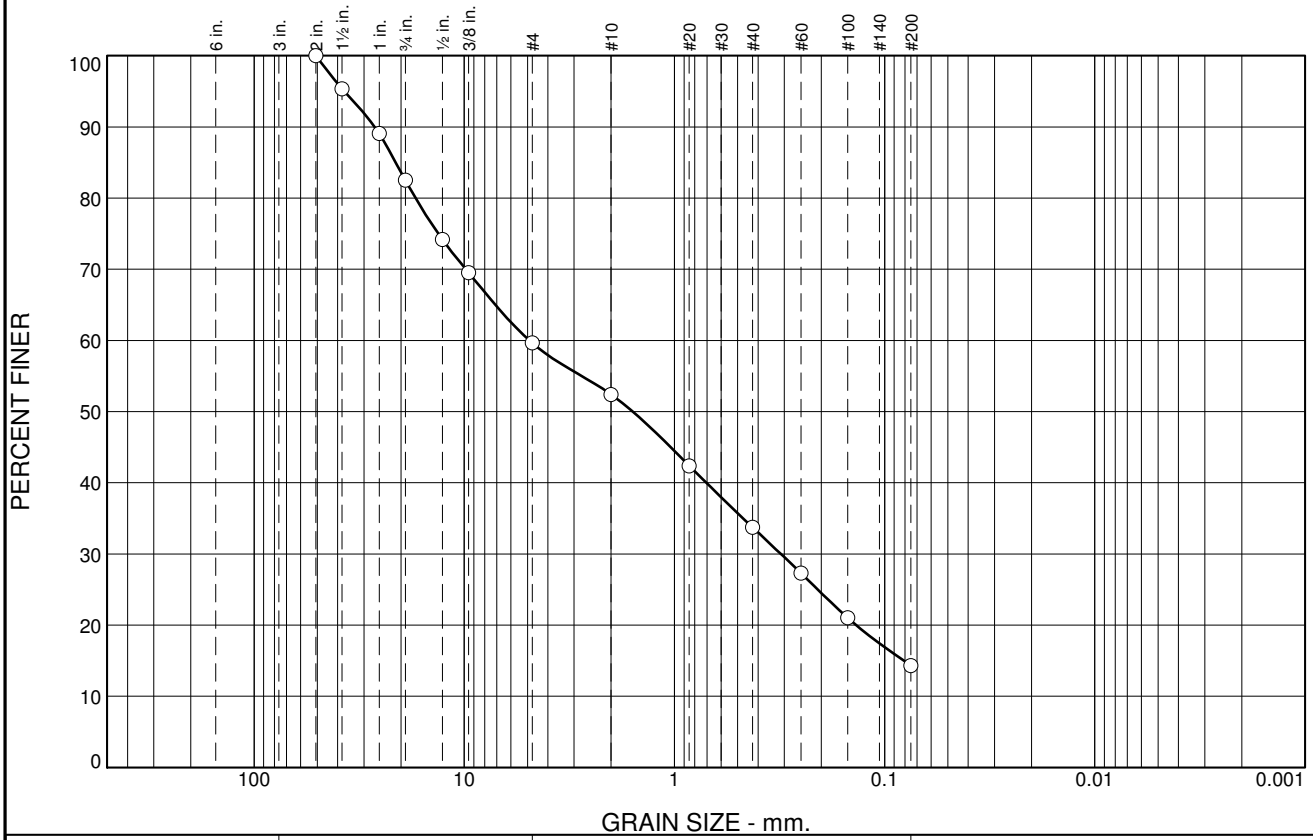
Sample No.: TP10-347-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Upper Talarik Creek Area **Elev./Depth:** 2.0-2.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	17	23	8	18	20	14	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	95		
1	89		
.75	83		
.5	74		
0.375	70		
#4	60		
#10	52		
#20	42		
#40	34		
#60	27		
#100	21		
#200	14		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.1535 D_{60}= 4.8955 D_{50}= 1.5781
D_{30}= 0.3114 D_{15}= 0.0811 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 10.8%

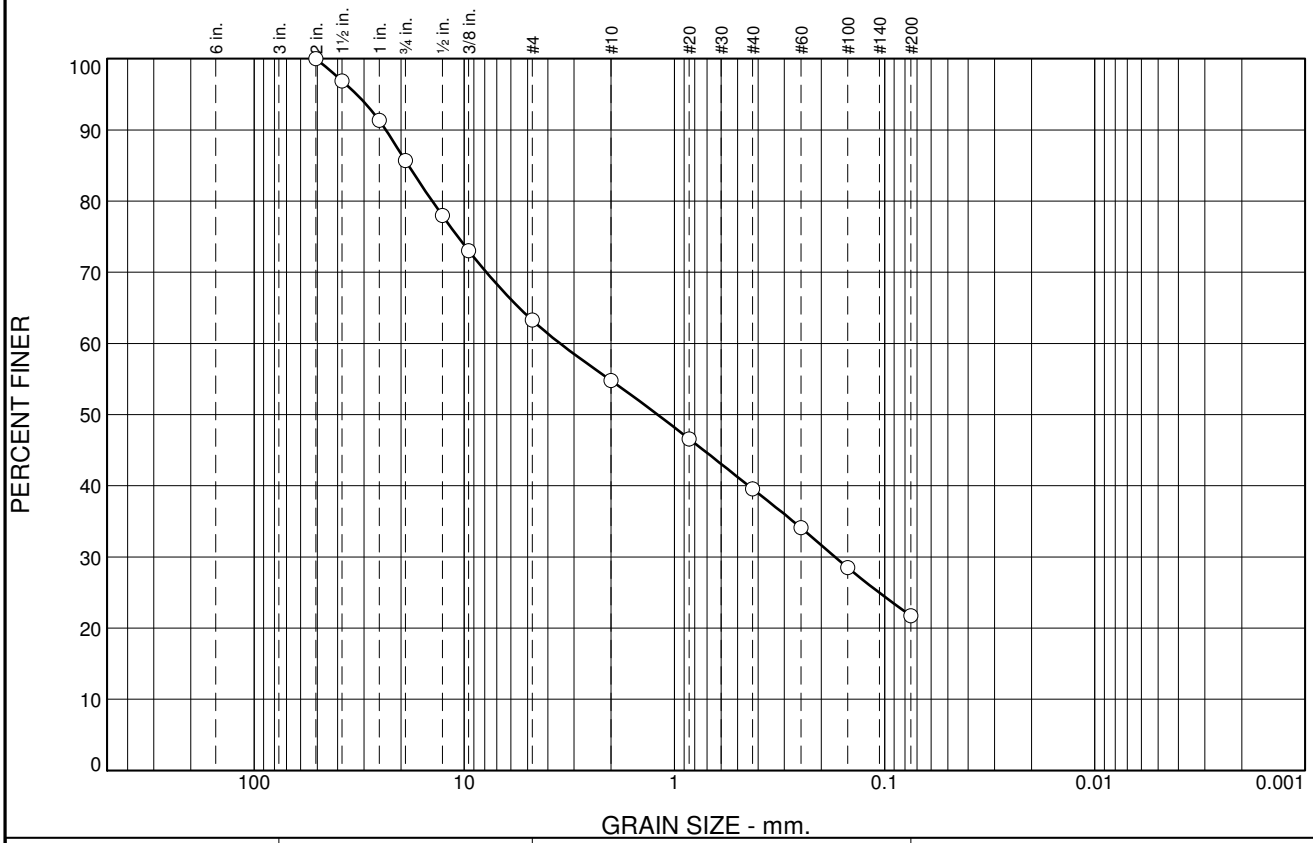
Sample No.: TP10-348-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Upper Talarik Creek Area **Elev./Depth:** 4.3-4.6'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	14	23	8	15	18	22	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	97		
1	91		
.75	86		
.5	78		
0.375	73		
#4	63		
#10	55		
#20	47		
#40	40		
#60	34		
#100	28		
#200	22		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 18.4031 D_{60}= 3.5014 D_{50}= 1.2042
D_{30}= 0.1724 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 12.9%

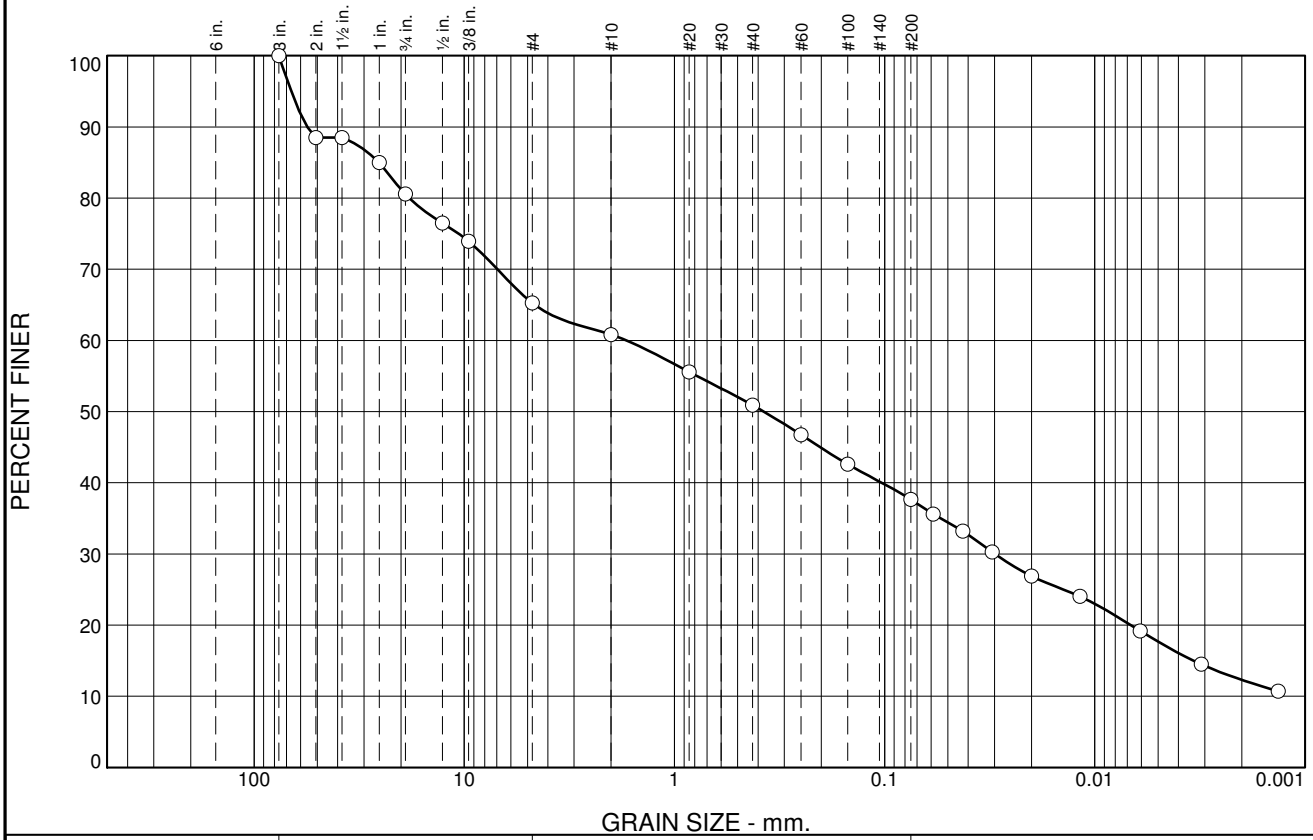
Sample No.: TP10-350-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Upper Talarik Creek Area **Elev./Depth:** 3.7-4.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	19	16	4	10	13	26	12

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	89		
1.5	89		
1	85		
.75	81		
.5	76		
0.375	74		
#4	65		
#10	61		
#20	56		
#40	51		
#60	47		
#100	43		
#200	38		
0.0588 mm.	36		
0.0425 mm.	33		
0.0308 mm.	30		
0.0200 mm.	27		
0.0118 mm.	24		
0.0061 mm.	19		
0.0031 mm.	15		
0.0013 mm.	11		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 16 LL= 40 PI= 24

Coefficients

D_{85}= 25.4287 D_{60}= 1.6900 D_{50}= 0.3759
D_{30}= 0.0299 D_{15}= 0.0034 D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO= A-6(4)

Remarks

As received moisture = 18.0%

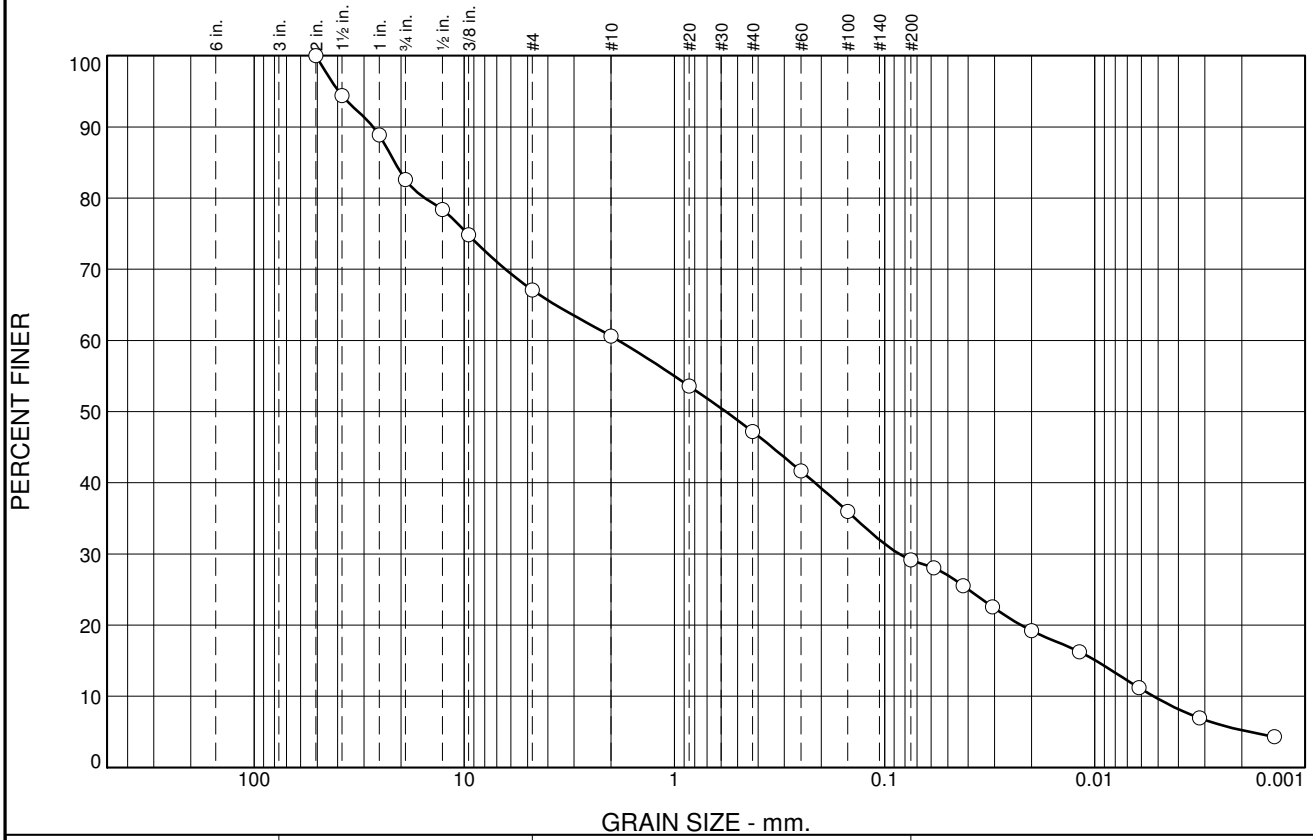
Sample No.: TP10-352-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/11/10
Location: Upper Talarik Creek Area **Elev./Depth:** 3.4-3.8'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	17	16	6	14	18	24	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	94		
1	89		
.75	83		
.5	78		
0.375	75		
#4	67		
#10	61		
#20	54		
#40	47		
#60	42		
#100	36		
#200	29		
0.0584 mm.	28		
0.0422 mm.	26		
0.0307 mm.	23		
0.0200 mm.	19		
0.0118 mm.	16		
0.0061 mm.	11		
0.0032 mm.	6.9		
0.0014 mm.	4.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.3479 D_{60}= 1.8488 D_{50}= 0.5704
D_{30}= 0.0852 D_{15}= 0.0099 D_{10}= 0.0053
C_u= 352.00 C_c= 0.75

Classification

USCS= AASHTO=

Remarks

As received moisture = 14.7%

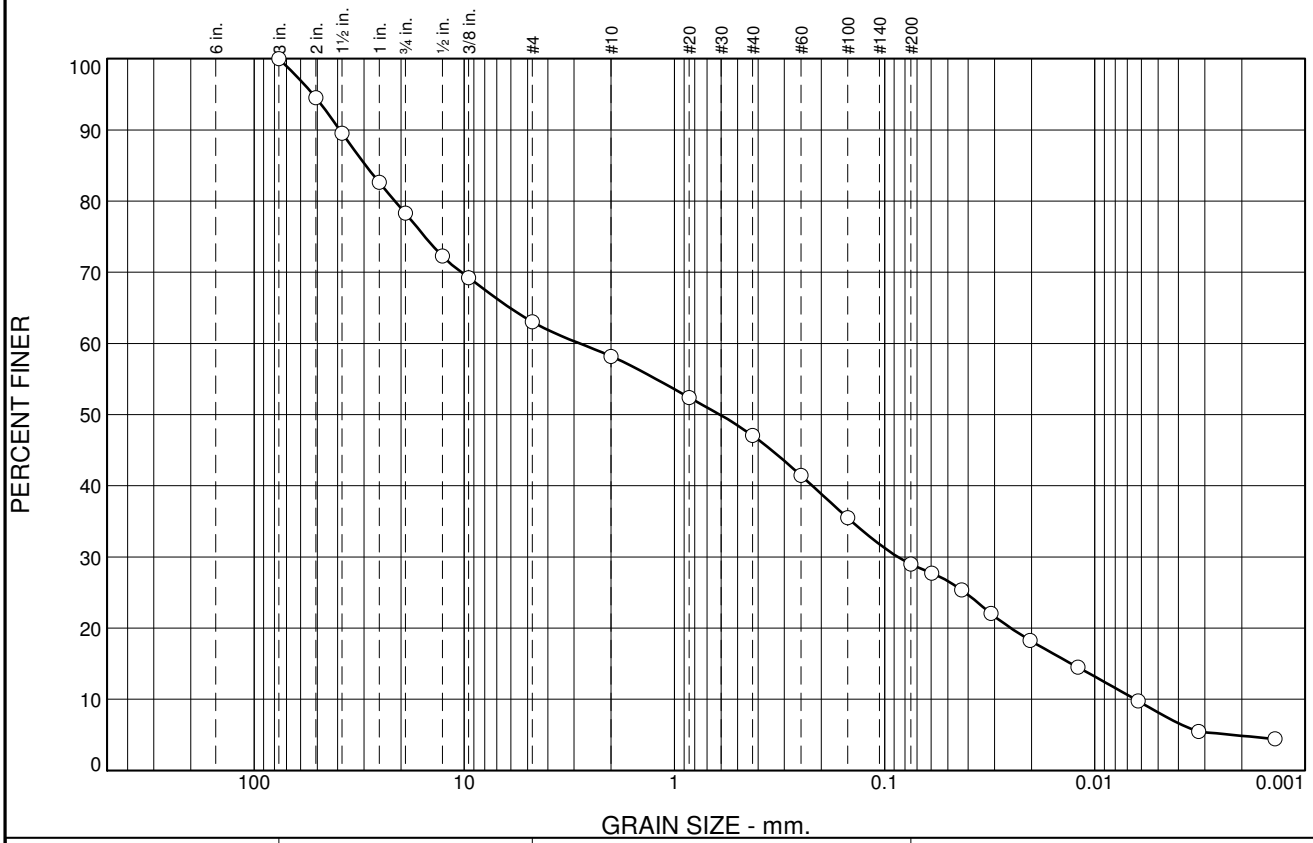
Sample No.: TP10-354-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area E **Elev./Depth:** 5.8-5.9'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	22	15	5	11	18	24	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	95		
1.5	90		
1	83		
.75	78		
.5	72		
0.375	69		
#4	63		
#10	58		
#20	52		
#40	47		
#60	41		
#100	36		
#200	29		
0.0597 mm.	28		
0.0430 mm.	25		
0.0312 mm.	22		
0.0203 mm.	18		
0.0120 mm.	14		
0.0062 mm.	9.7		
0.0032 mm.	5.5		
0.0014 mm.	4.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 29.3854 D_{60}= 2.8221 D_{50}= 0.6086
D_{30}= 0.0865 D_{15}= 0.0129 D_{10}= 0.0064
C_u= 438.71 C_c= 0.41

Classification

USCS= AASHTO=

Remarks

As received moisture = 9.6%

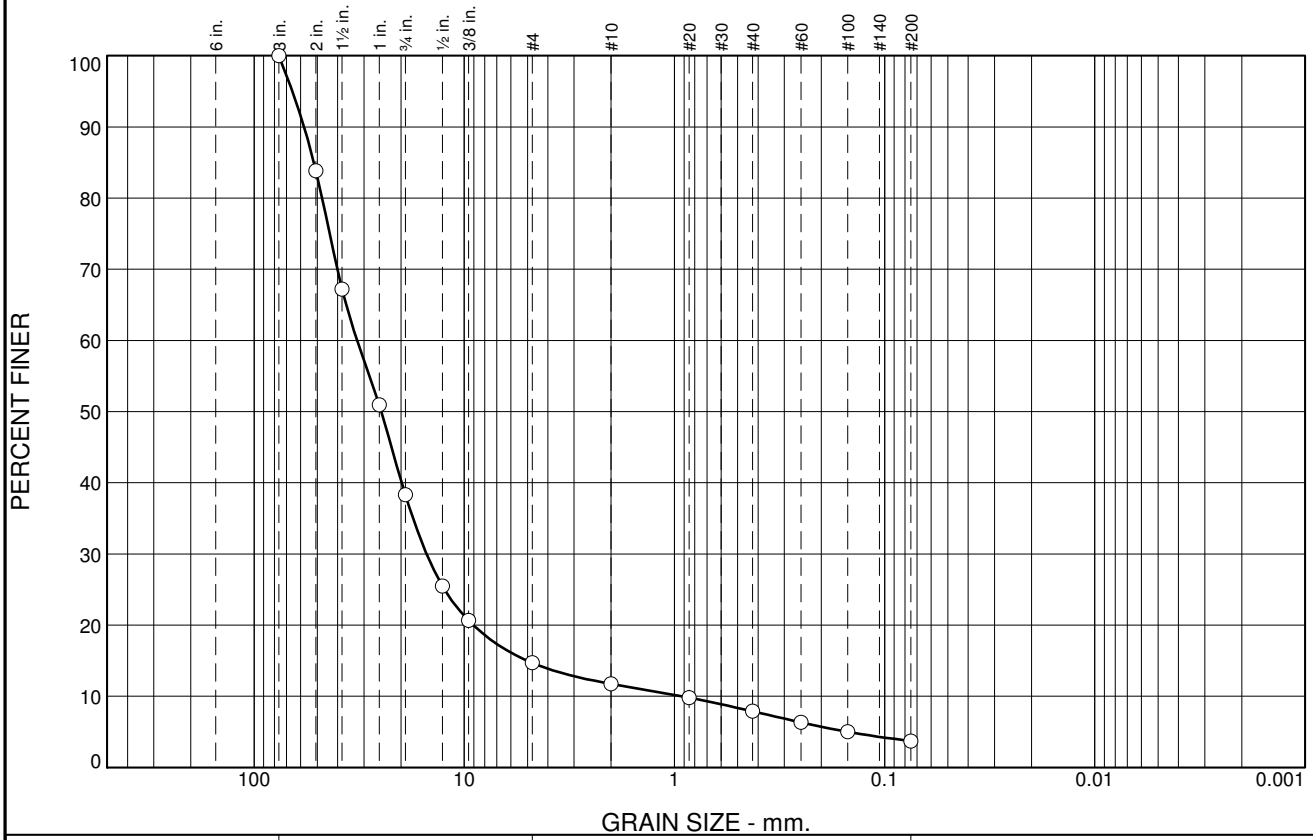
Sample No.: TP10-356-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area G **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	62	23	3	4	4	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	84		
1.5	67		
1	51		
.75	38		
.5	25		
0.375	21		
#4	15		
#10	12		
#20	10		
#40	8		
#60	6		
#100	5		
#200	3.7		

* (no specification provided)

Soil Description

poorly graded gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 51.9269 D_{60}= 32.3515 D_{50}= 24.8295
D_{30}= 15.1085 D_{15}= 5.0204 D_{10}= 0.9269
C_u= 34.90 C_c= 7.61

Classification

USCS= GP AASHTO=

Remarks

As received moisture = 3.8%

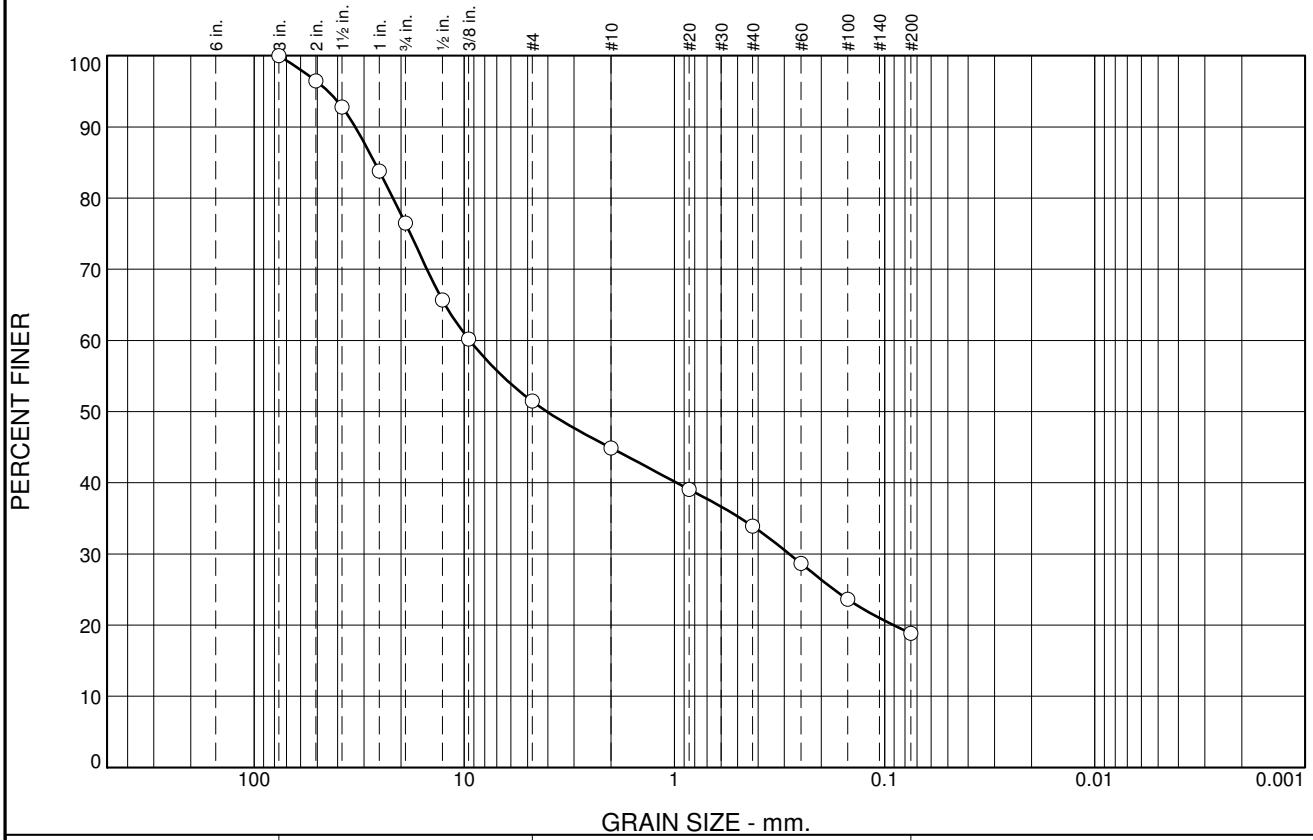
Sample No.: TP10-358-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area E **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	25	6	11	15	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	96		
1.5	93		
1	84		
.75	76		
.5	66		
0.375	60		
#4	51		
#10	45		
#20	39		
#40	34		
#60	29		
#100	24		
#200	19		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 26.6774 D_{60}= 9.3991 D_{50}= 4.0382
D_{30}= 0.2840 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 9.9%

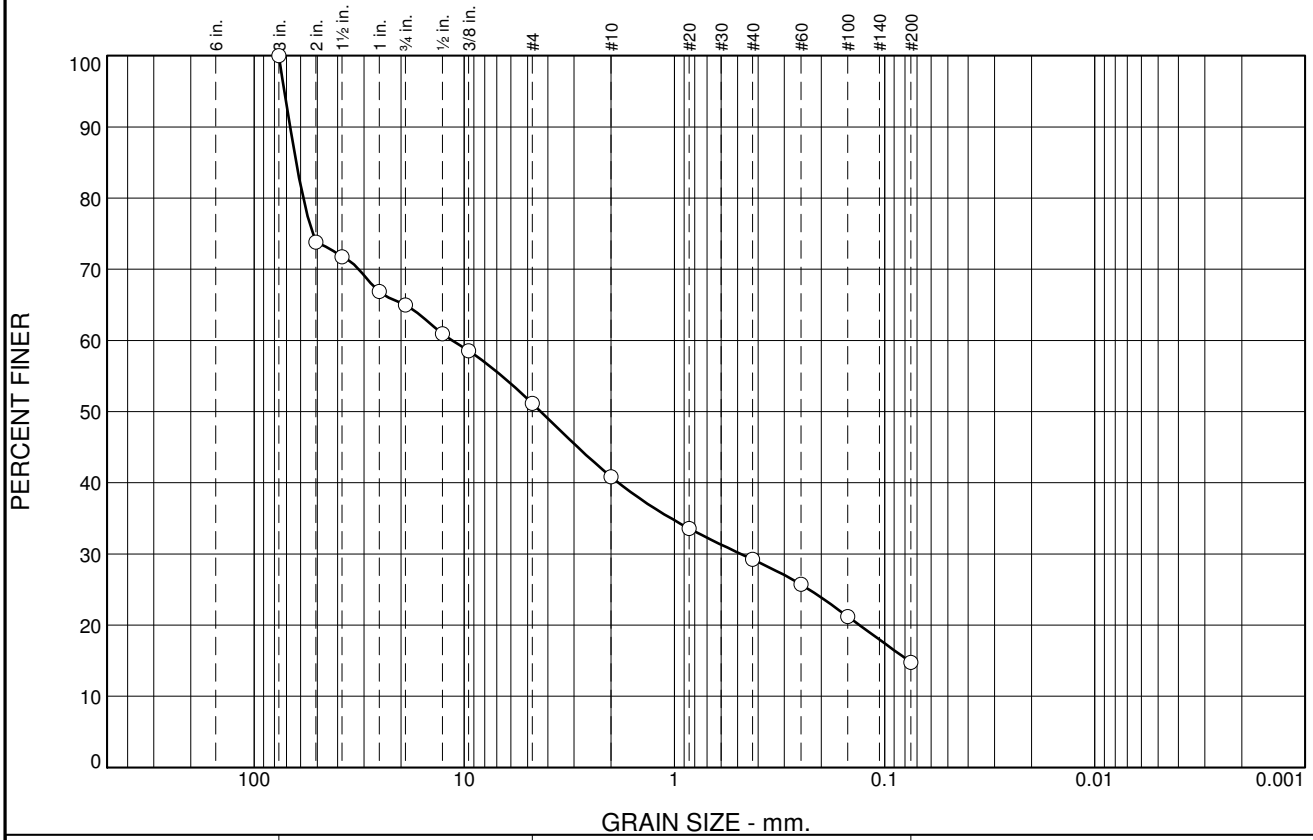
Sample No.: TP10-358-2 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area E **Elev./Depth:** 1.0-2.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	35	14	10	12	14	15	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	74		
1.5	72		
1	67		
.75	65		
.5	61		
0.375	59		
#4	51		
#10	41		
#20	34		
#40	29		
#60	26		
#100	21		
#200	15		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 62.9909 D_{60}= 11.4083 D_{50}= 4.3242
D_{30}= 0.4831 D_{15}= 0.0770 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 8.7%

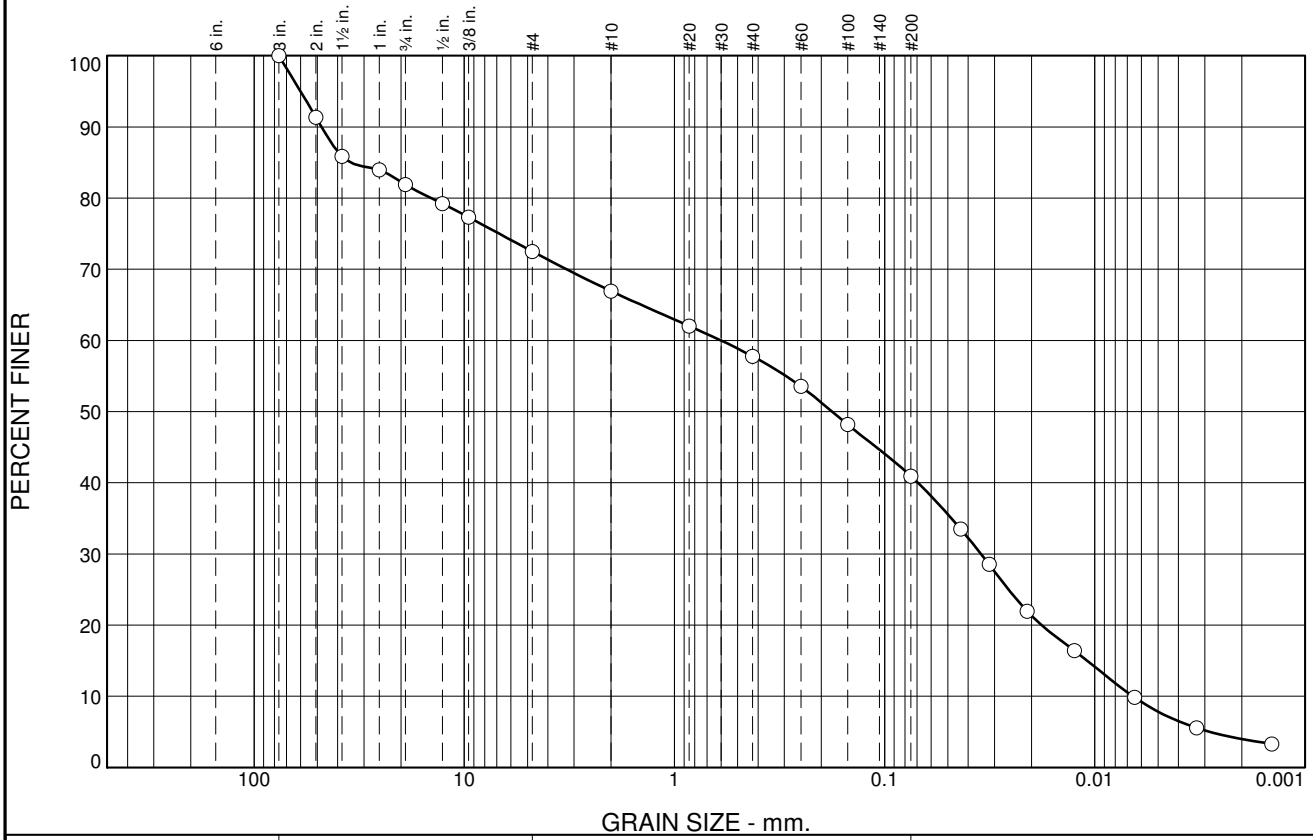
Sample No.: TP10-360-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area E **Elev./Depth:** 1.5-2.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	9	6	9	17	37	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	91		
1.5	86		
1	84		
.75	82		
.5	79		
0.375	77		
#4	73		
#10	67		
#20	62		
#40	58		
#60	54		
#100	48		
#200	41		
0.0434 mm.	33		
0.0318 mm.	29		
0.0210 mm.	22		
0.0125 mm.	16		
0.0065 mm.	9.8		
0.0033 mm.	5.5		
0.0014 mm.	3.3		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= NP LL= 18 PI= NP

Coefficients

D_{85}= 34.7583 D_{60}= 0.6012 D_{50}= 0.1778
D_{30}= 0.0348 D_{15}= 0.0109 D_{10}= 0.0066
C_u= 91.22 C_c= 0.31

Classification

USCS= SM AASHTO= A-4(0)

Remarks

As received moisture = 15.1%

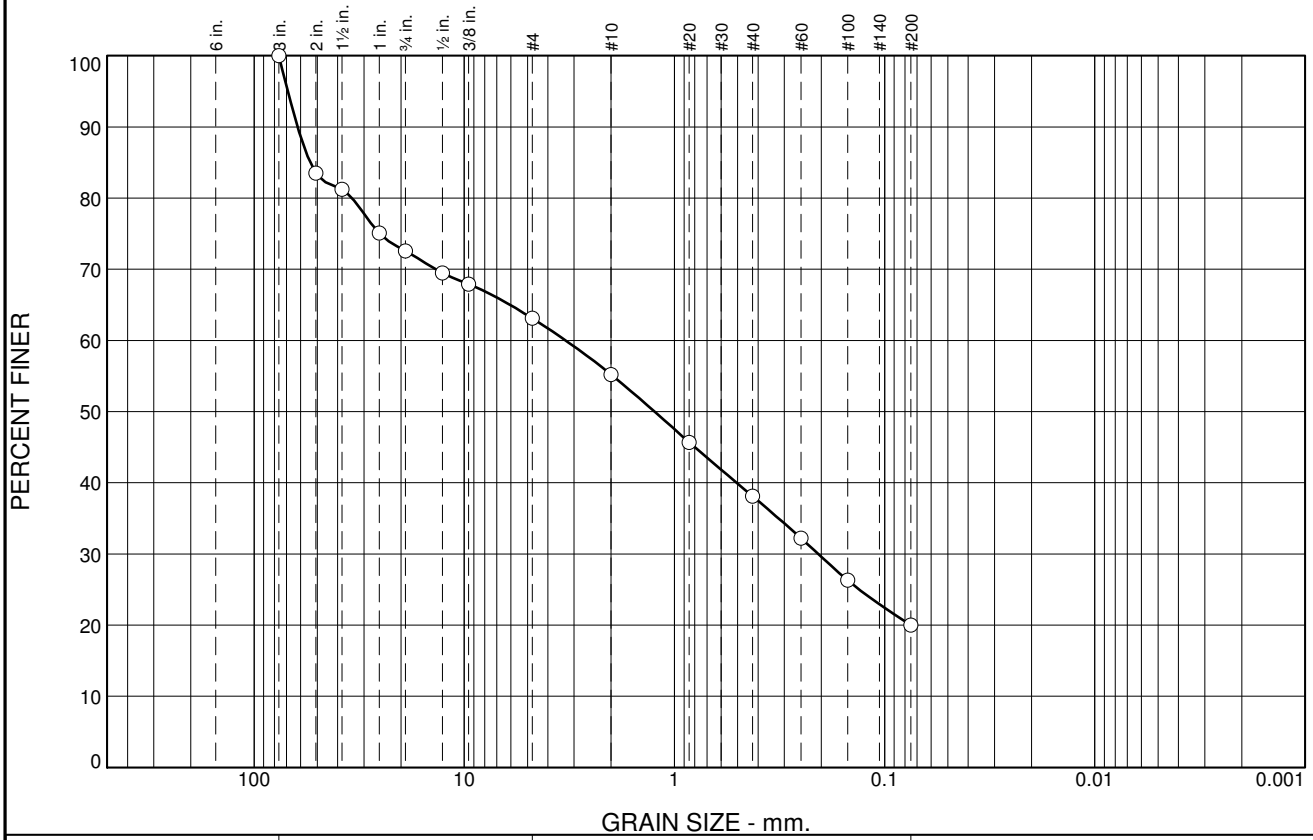
Sample No.: TP10-361-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area G **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	27	10	8	17	18	20	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	84		
1.5	81		
1	75		
.75	73		
.5	69		
0.375	68		
#4	63		
#10	55		
#20	46		
#40	38		
#60	32		
#100	26		
#200	20		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 54.0672 D_{60}= 3.2915 D_{50}= 1.2441
D_{30}= 0.2070 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 11.7%

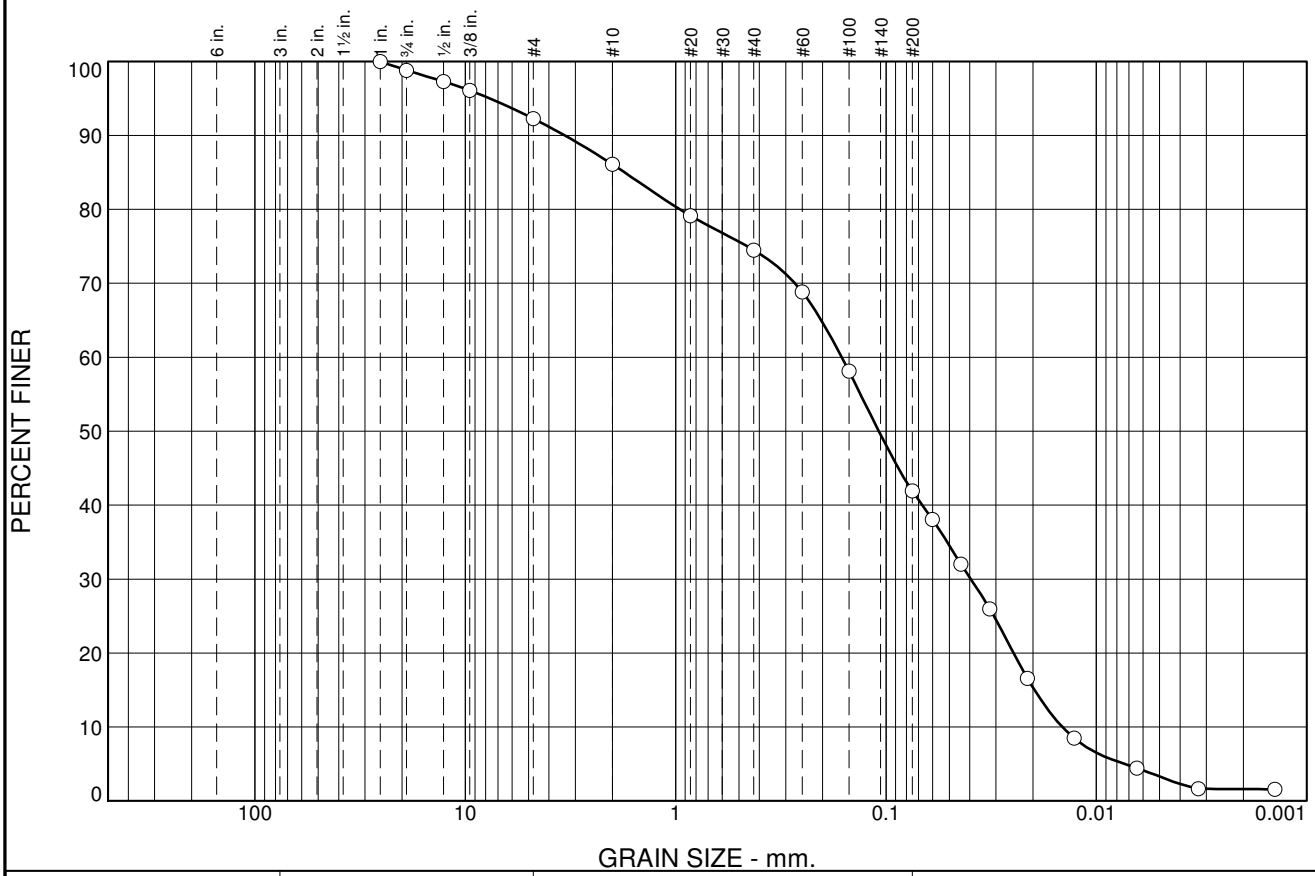
Sample No.: TP10-362-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area E **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: DB **Checked By:** SPB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	1	7	6	12	32	40	2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	99		
.5	97		
0.375	96		
#4	92		
#10	86		
#20	79		
#40	74		
#60	69		
#100	58		
#200	42		
0.0601 mm.	38		
0.0440 mm.	32		
0.0321 mm.	26		
0.0212 mm.	17		
0.0127 mm.	8.5		
0.0064 mm.	4.5		
0.0033 mm.	1.6		
0.0014 mm.	1.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.7495 D_{60}= 0.1621 D_{50}= 0.1082
D_{30}= 0.0395 D_{15}= 0.0197 D_{10}= 0.0145
C_u= 11.18 C_c= 0.66

Classification

USCS= AASHTO=

Remarks

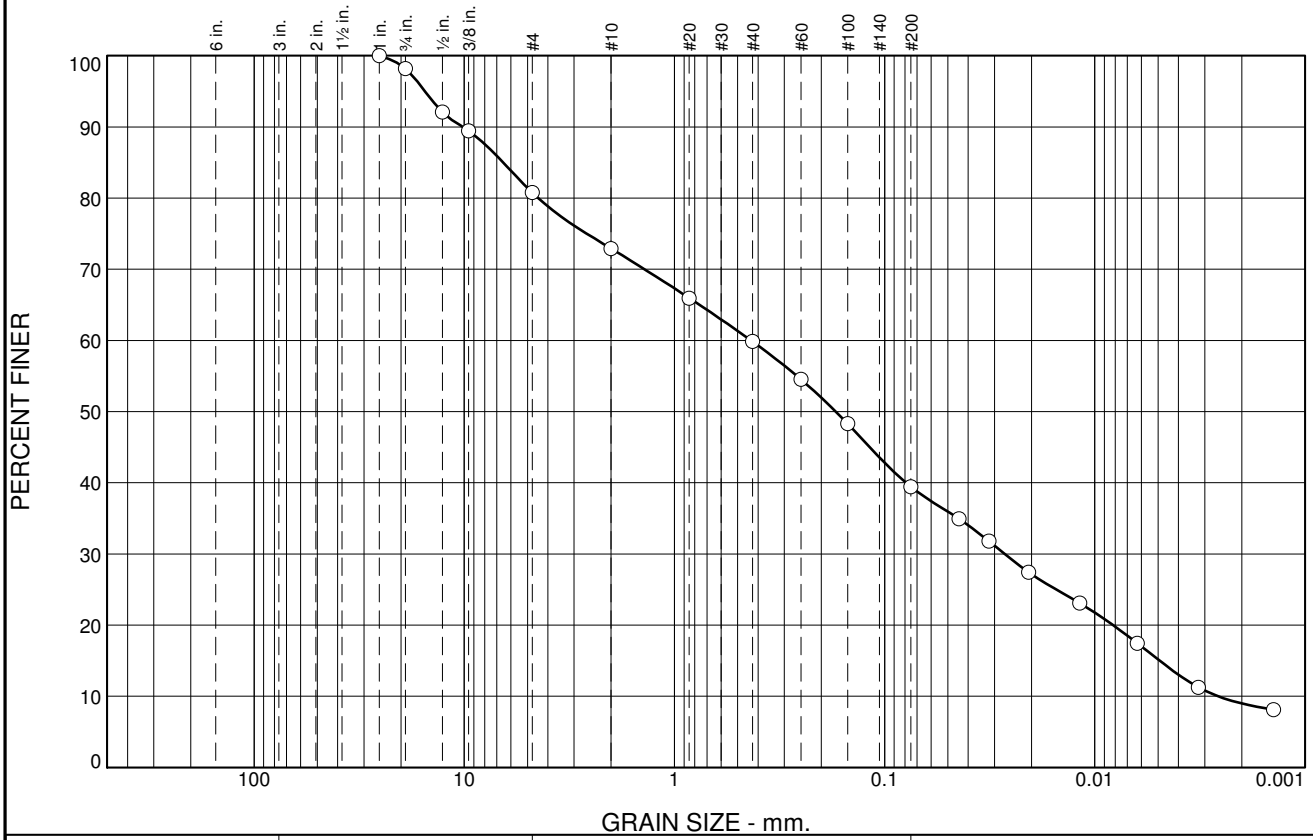
As received moisture = 16.1%

Sample No.: TP10-371-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/15/10
Location: Area E **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	17	8	13	21	30	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
0.75	98		
0.5	92		
0.375	89		
#4	81		
#10	73		
#20	66		
#40	60		
#60	55		
#100	48		
#200	39		
0.0443 mm.	35		
0.0319 mm.	32		
0.0207 mm.	27		
0.0118 mm.	23		
0.0063 mm.	17		
0.0032 mm.	11		
0.0014 mm.	8.1		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 17 LL= 27 PI= 10

Coefficients

D_{85}= 6.5278 D_{60}= 0.4318 D_{50}= 0.1708
D_{30}= 0.0268 D_{15}= 0.0049 D_{10}= 0.0026
C_u= 166.94 C_c= 0.64

Classification

USCS= SC AASHTO= A-4(1)

Remarks

As received moisture = 17.3%

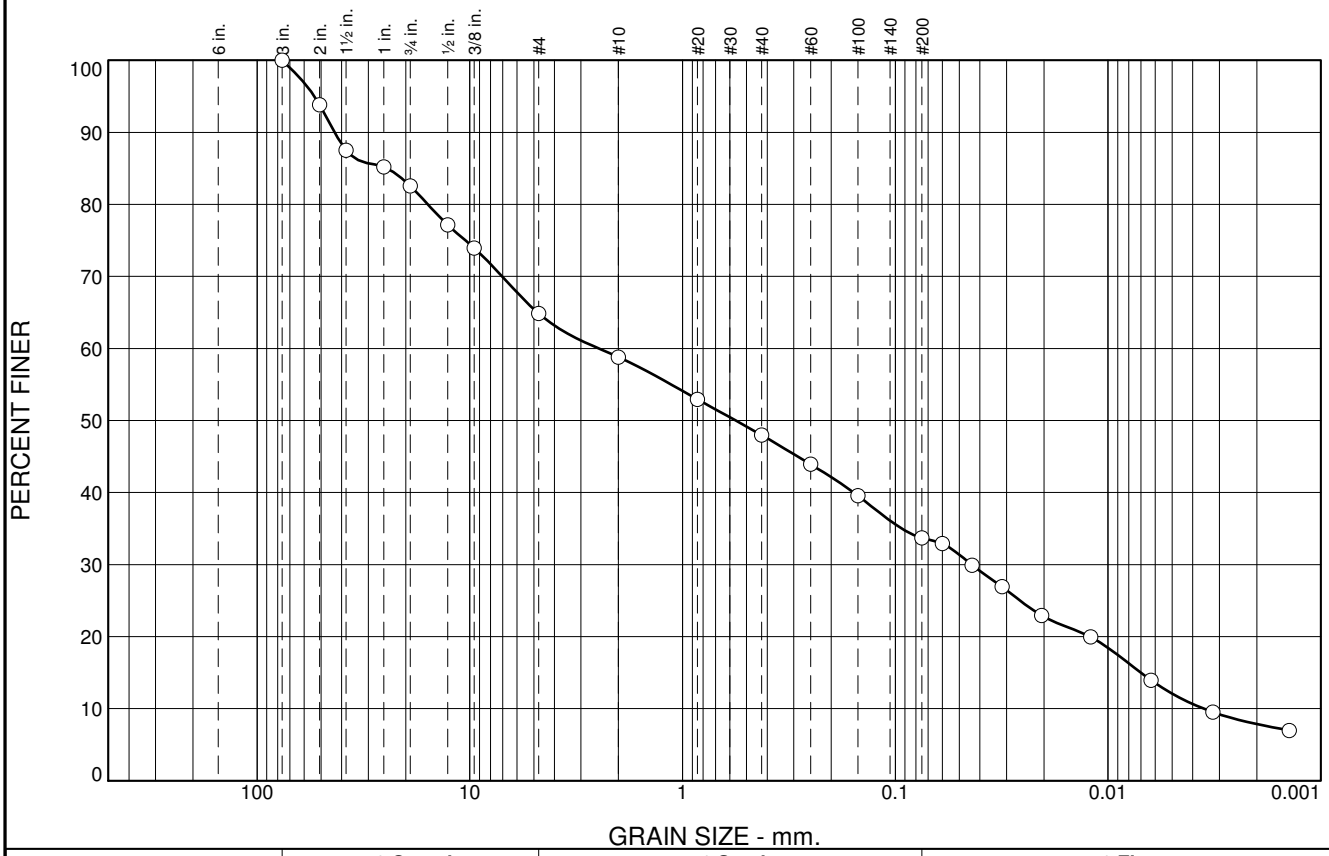
Sample No.: TP10-373-2 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Upper Talarik Creek Area **Elev./Depth:** 1.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	17	18	6	11	14	26	8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	94		
1.5	87		
1	85		
.75	83		
.5	77		
0.375	74		
#4	65		
#10	59		
#20	53		
#40	48		
#60	44		
#100	40		
#200	34		
0.0601 mm.	33		
0.0436 mm.	30		
0.0315 mm.	27		
0.0205 mm.	23		
0.0121 mm.	20		
0.0063 mm.	14		
0.0032 mm.	9.5		
0.0014 mm.	7.0		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 19 LL= 37 PI= 18

Coefficients

D_{85}= 24.4639 D_{60}= 2.4754 D_{50}= 0.5634
D_{30}= 0.0439 D_{15}= 0.0070 D_{10}= 0.0036
C_u= 696.63 C_c= 0.22

Classification

USCS= GC AASHTO= A-2-6(2)

Remarks

As received moisture = 15.4%. The original test sample contained 19% cobbles. These results reflect that portion of the original sample passing the 3 inch sieve.

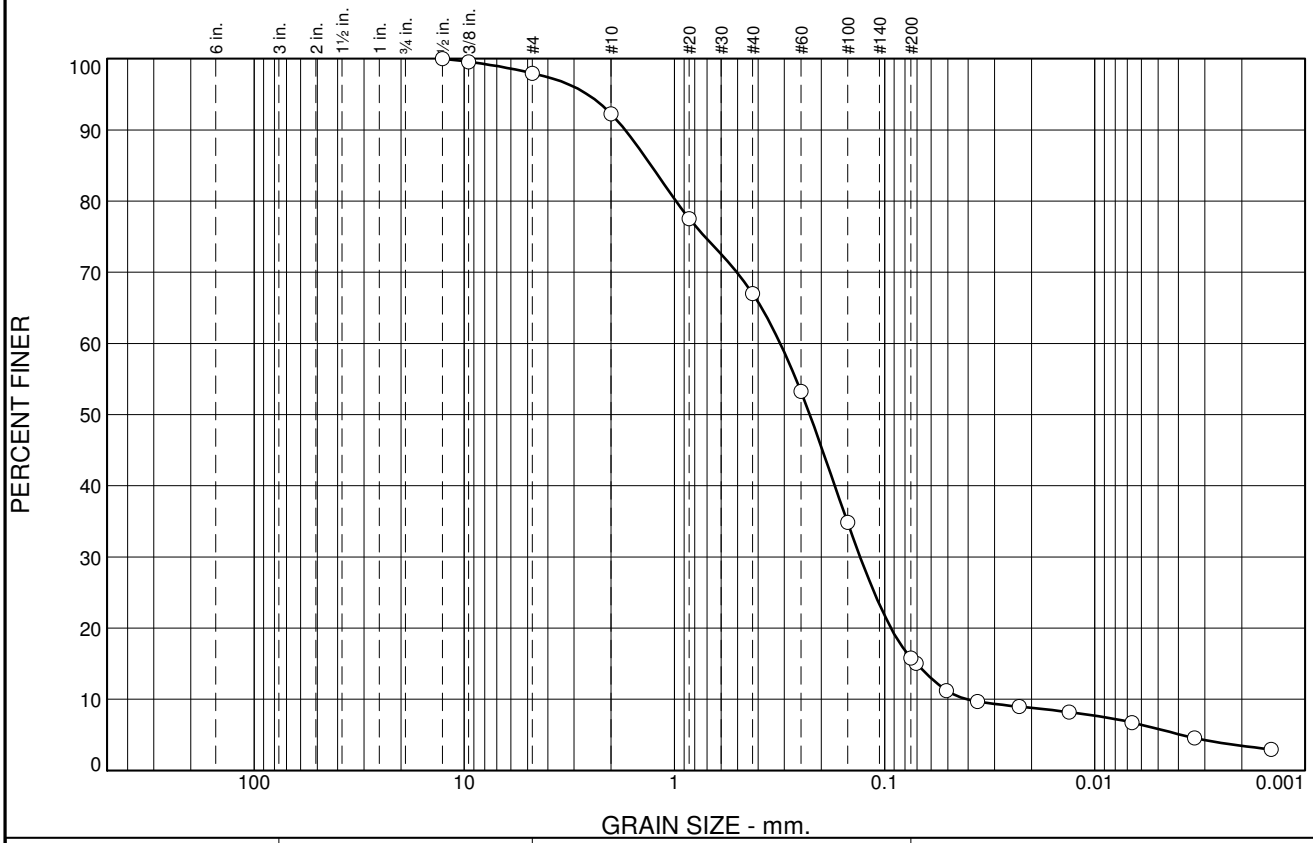
Sample No.: TP10-374-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Upper Talarik Creek Area **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	6	25	51	13	3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100		
0.375	100		
#4	98		
#10	92		
#20	78		
#40	67		
#60	53		
#100	35		
#200	16		
0.0708 mm.	15		
0.0508 mm.	11		
0.0361 mm.	9.7		
0.0229 mm.	9.0		
0.0133 mm.	8.2		
0.0067 mm.	6.7		
0.0034 mm.	4.6		
0.0014 mm.	3.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= 18 PI= NP

Coefficients

D_{85}= 1.2910 D_{60}= 0.3135 D_{50}= 0.2271
D_{30}= 0.1308 D_{15}= 0.0706 D_{10}= 0.0406
C_u= 7.72 C_c= 1.34

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

As received moisture = 23.7%

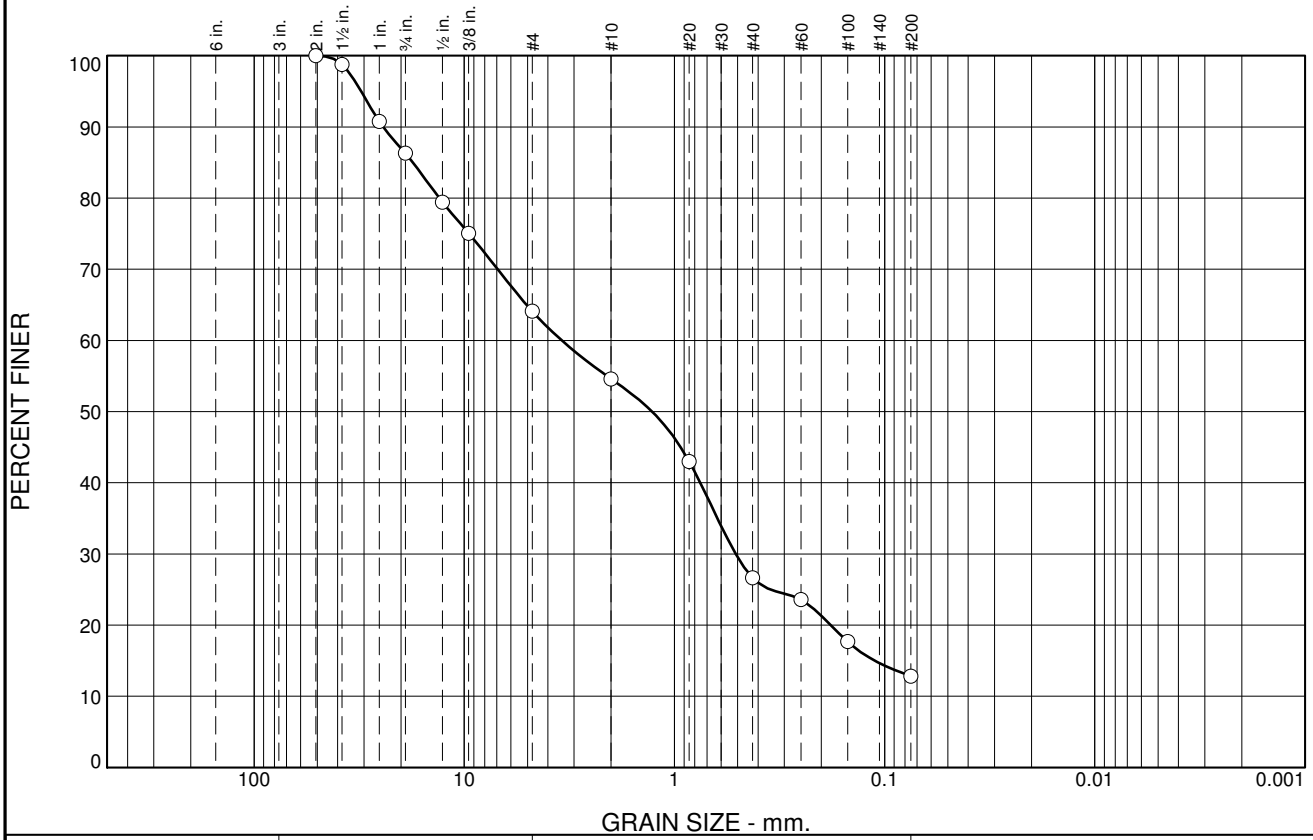
Sample No.: TP10-376-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Upper Talarik Creek Area **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	14	22	9	28	14	13	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	99		
1	91		
.75	86		
.5	79		
0.375	75		
#4	64		
#10	55		
#20	43		
#40	27		
#60	24		
#100	18		
#200	13		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 17.5523 D_{60}= 3.4361 D_{50}= 1.2791
D_{30}= 0.5109 D_{15}= 0.1114 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 12.3%

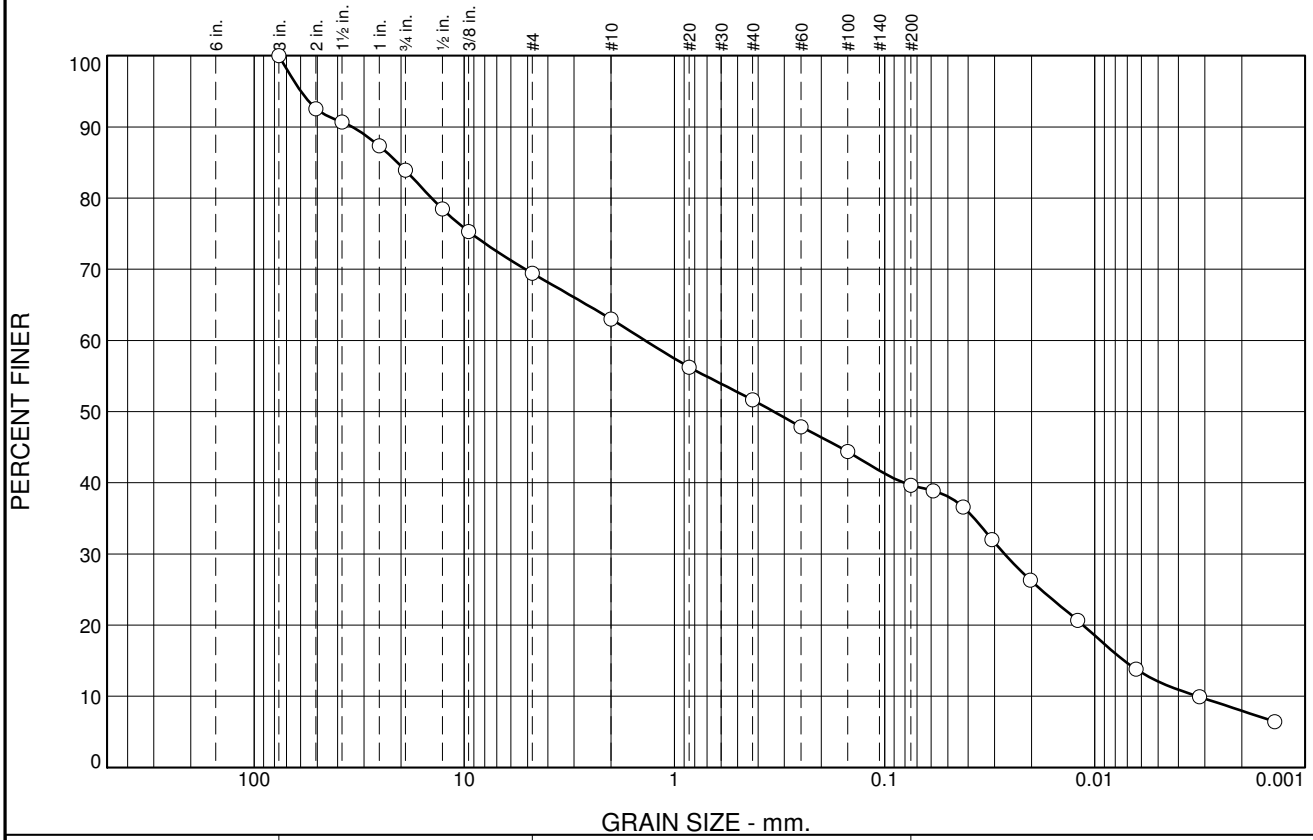
Sample No.: TP10-377-2 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Open Pit Area **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	16	15	6	11	12	32	8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	93		
1.5	91		
1	87		
.75	84		
.5	78		
0.375	75		
#4	69		
#10	63		
#20	56		
#40	52		
#60	48		
#100	44		
#200	40		
0.0588 mm.	39		
0.0422 mm.	37		
0.0308 mm.	32		
0.0202 mm.	26		
0.0121 mm.	21		
0.0064 mm.	14		
0.0032 mm.	9.9		
0.0014 mm.	6.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.7413 D_{60}= 1.3798 D_{50}= 0.3371
D_{30}= 0.0269 D_{15}= 0.0072 D_{10}= 0.0032
C_u= 425.16 C_c= 0.16

Classification

USCS= AASHTO=

Remarks

As received moisture 14.3%

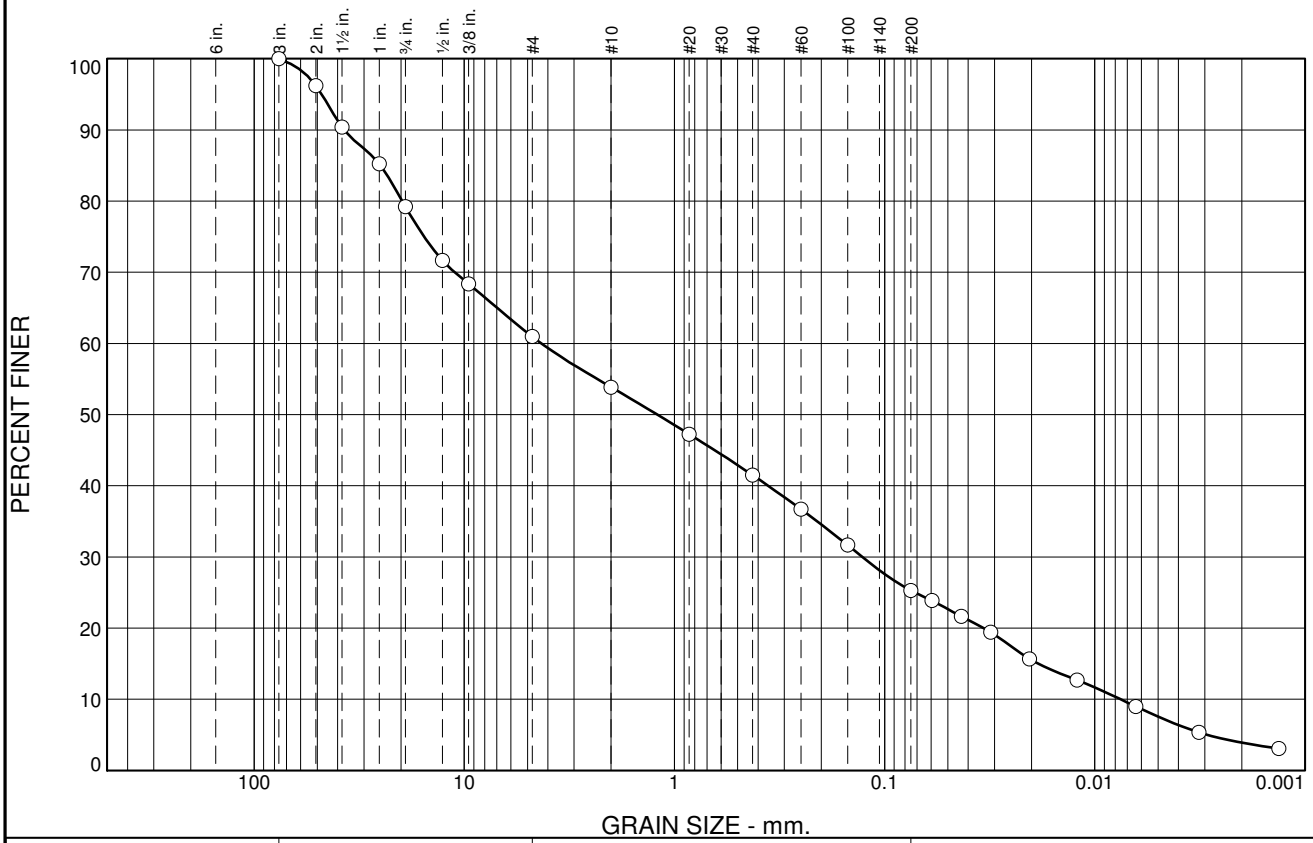
Sample No.: TP10-380-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Open Pit Area **Elev./Depth:** 3.0-4.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	21	18	7	12	17	21	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	96		
1.5	90		
1	85		
.75	79		
.5	72		
0.375	68		
#4	61		
#10	54		
#20	47		
#40	42		
#60	37		
#100	32		
#200	25		
0.0596 mm.	24		
0.0432 mm.	22		
0.0312 mm.	19		
0.0205 mm.	16		
0.0121 mm.	13		
0.0064 mm.	9.0		
0.0032 mm.	5.4		
0.0013 mm.	3.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 25.0175 D_{60}= 4.2933 D_{50}= 1.2062
D_{30}= 0.1277 D_{15}= 0.0186 D_{10}= 0.0075
C_u= 569.23 C_c= 0.50

Classification

USCS= AASHTO=

Remarks

As received moisture = 13.4%

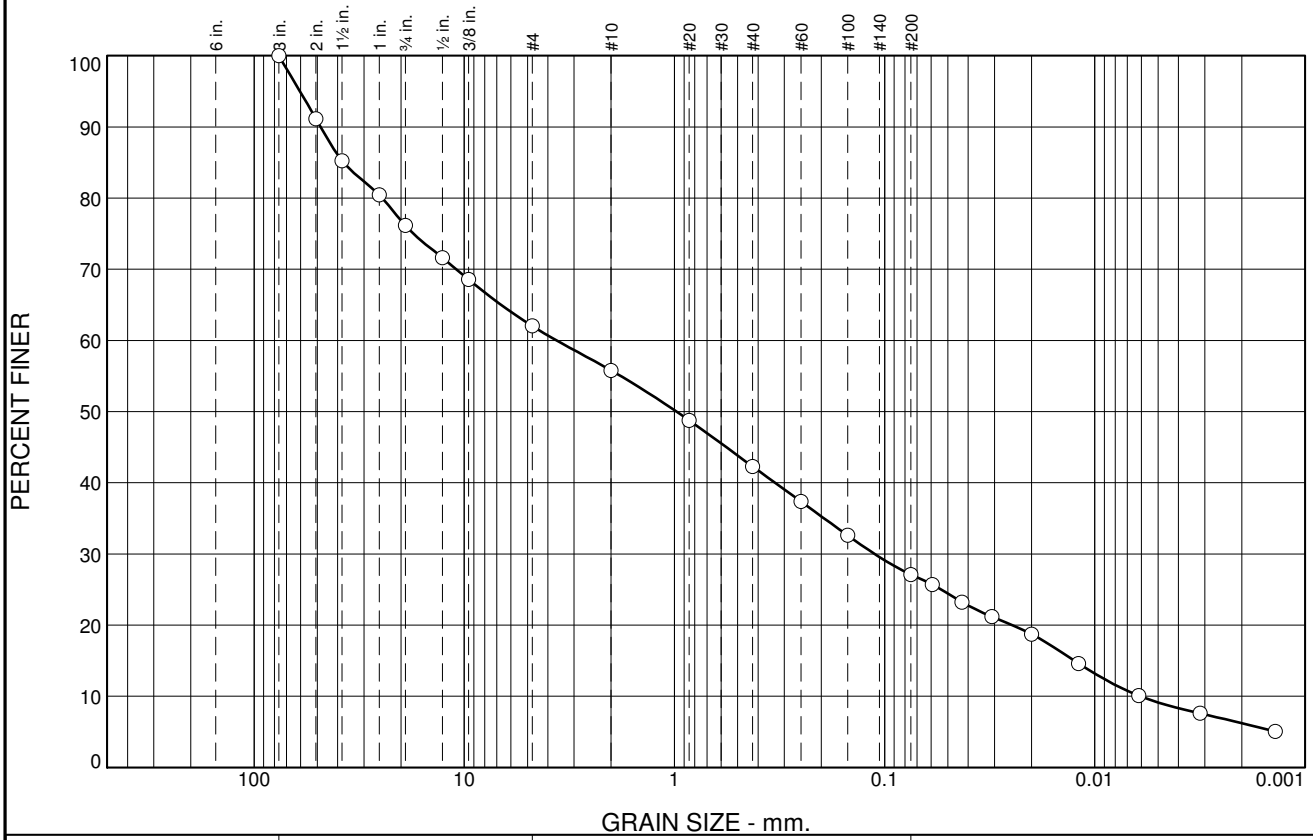
Sample No.: TP10-381-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Area E **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	14	6	14	15	21	6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	91		
1.5	85		
1	80		
.75	76		
.5	72		
0.375	69		
#4	62		
#10	56		
#20	49		
#40	42		
#60	37		
#100	33		
#200	27		
0.0593 mm.	26		
0.0429 mm.	23		
0.0309 mm.	21		
0.0200 mm.	19		
0.0119 mm.	15		
0.0062 mm.	10		
0.0032 mm.	7.6		
0.0014 mm.	5.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 37.4665 D_{60}= 3.6360 D_{50}= 0.9776
D_{30}= 0.1116 D_{15}= 0.0125 D_{10}= 0.0061
C_u= 597.85 C_c= 0.56

Classification

USCS= AASHTO=

Remarks

As received moisture 14.2%

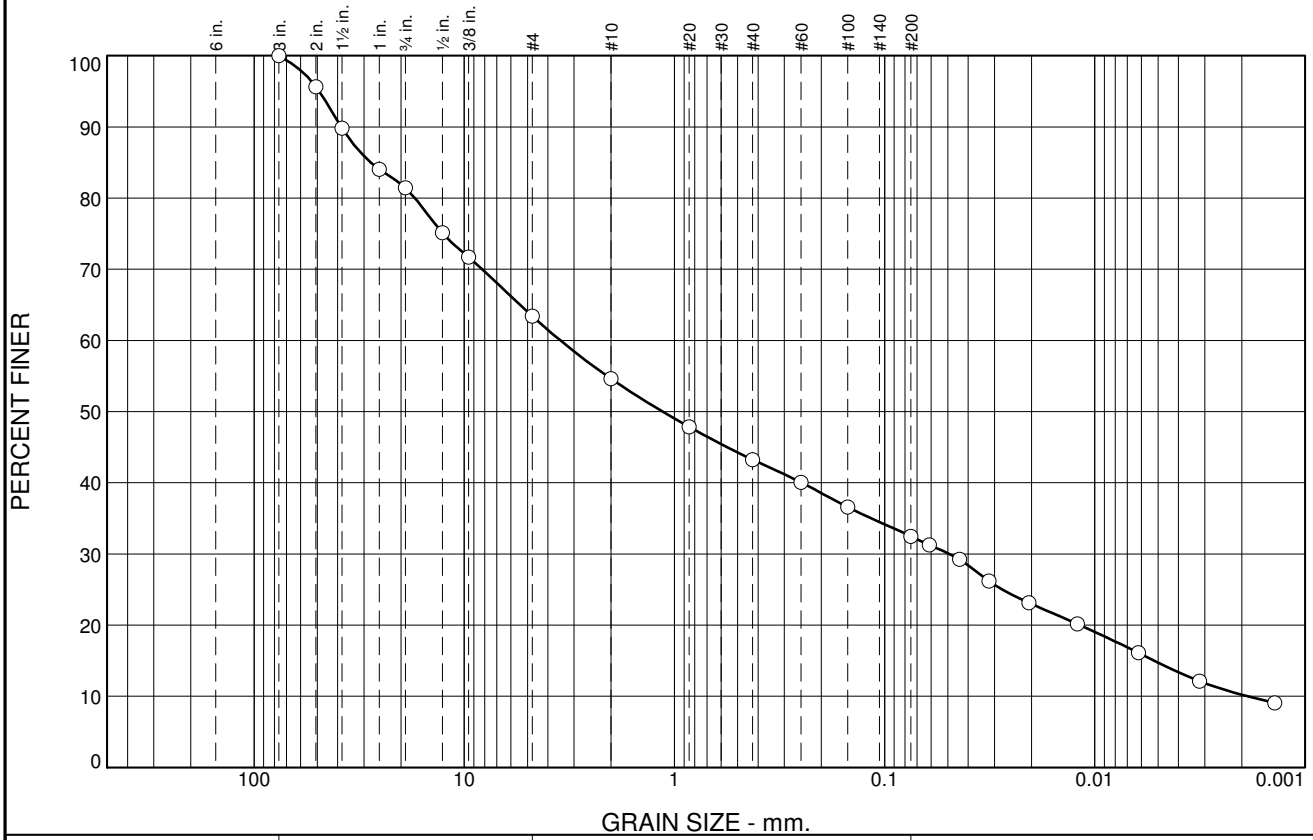
Sample No.: TP10-383-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	19	18	8	12	11	22	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	96		
1.5	90		
1	84		
.75	81		
.5	75		
0.375	72		
#4	63		
#10	55		
#20	48		
#40	43		
#60	40		
#100	37		
#200	32		
0.0613 mm.	31		
0.0440 mm.	29		
0.0318 mm.	26		
0.0206 mm.	23		
0.0121 mm.	20		
0.0062 mm.	16		
0.0032 mm.	12		
0.0014 mm.	9.1		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 18 LL= 33 PI= 15

Coefficients

D_{85}= 27.8330 D_{60}= 3.4870 D_{50}= 1.1375
D_{30}= 0.0491 D_{15}= 0.0052 D_{10}= 0.0019
C_u= 1857.85 C_c= 0.37

Classification

USCS= GC AASHTO= A-2-6(1)

Remarks

As received moisture = 15.9%

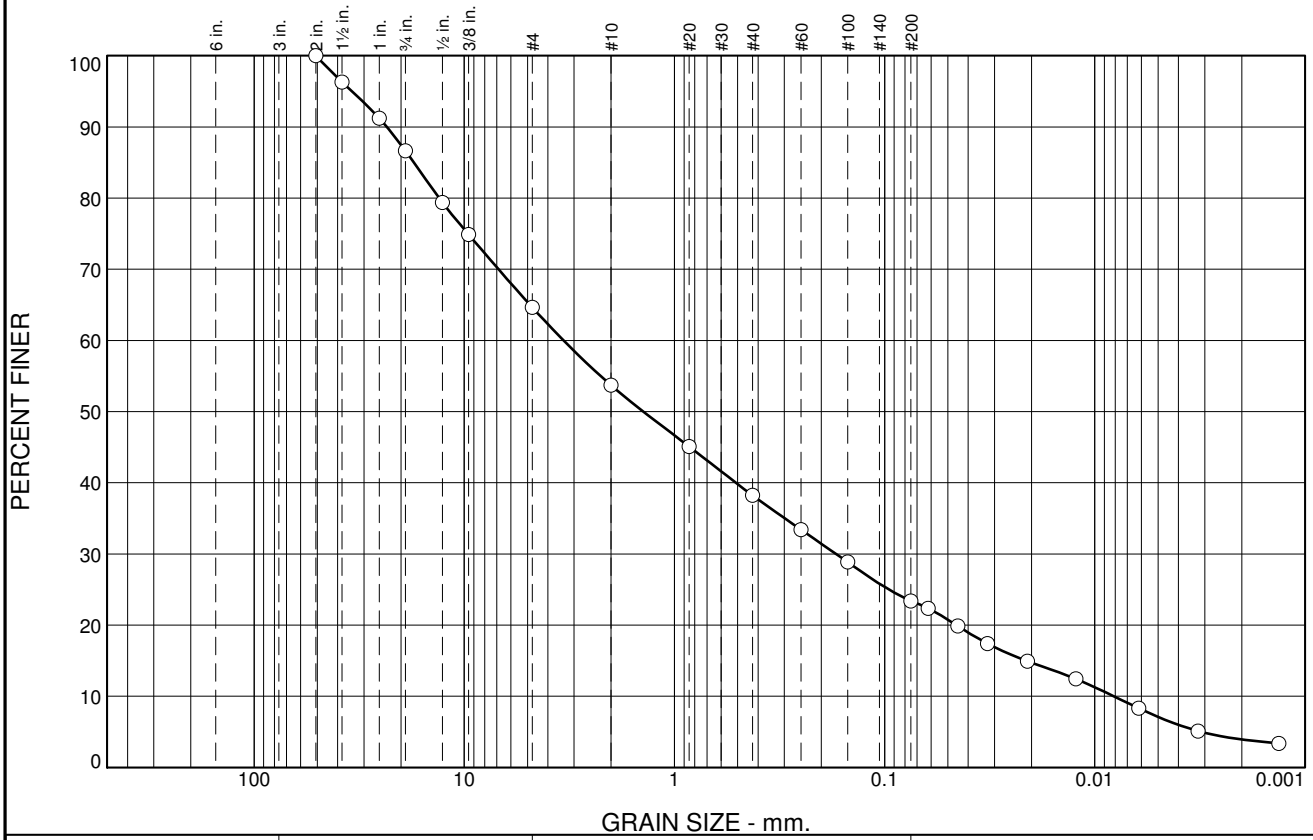
Sample No.: TP10-391-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Area A, Lower Mid/Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	13	22	11	16	15	19	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	96		
1	91		
.75	87		
.5	79		
0.375	75		
#4	65		
#10	54		
#20	45		
#40	38		
#60	33		
#100	29		
#200	23		
0.0620 mm.	22		
0.0449 mm.	20		
0.0324 mm.	17		
0.0209 mm.	15		
0.0123 mm.	12		
0.0062 mm.	8.3		
0.0032 mm.	5.1		
0.0013 mm.	3.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 17.3572 D_{60}= 3.3672 D_{50}= 1.4052
D_{30}= 0.1703 D_{15}= 0.0213 D_{10}= 0.0081
C_u= 414.64 C_c= 1.06

Classification

USCS= AASHTO=

Remarks

As received moisture = 11.9%

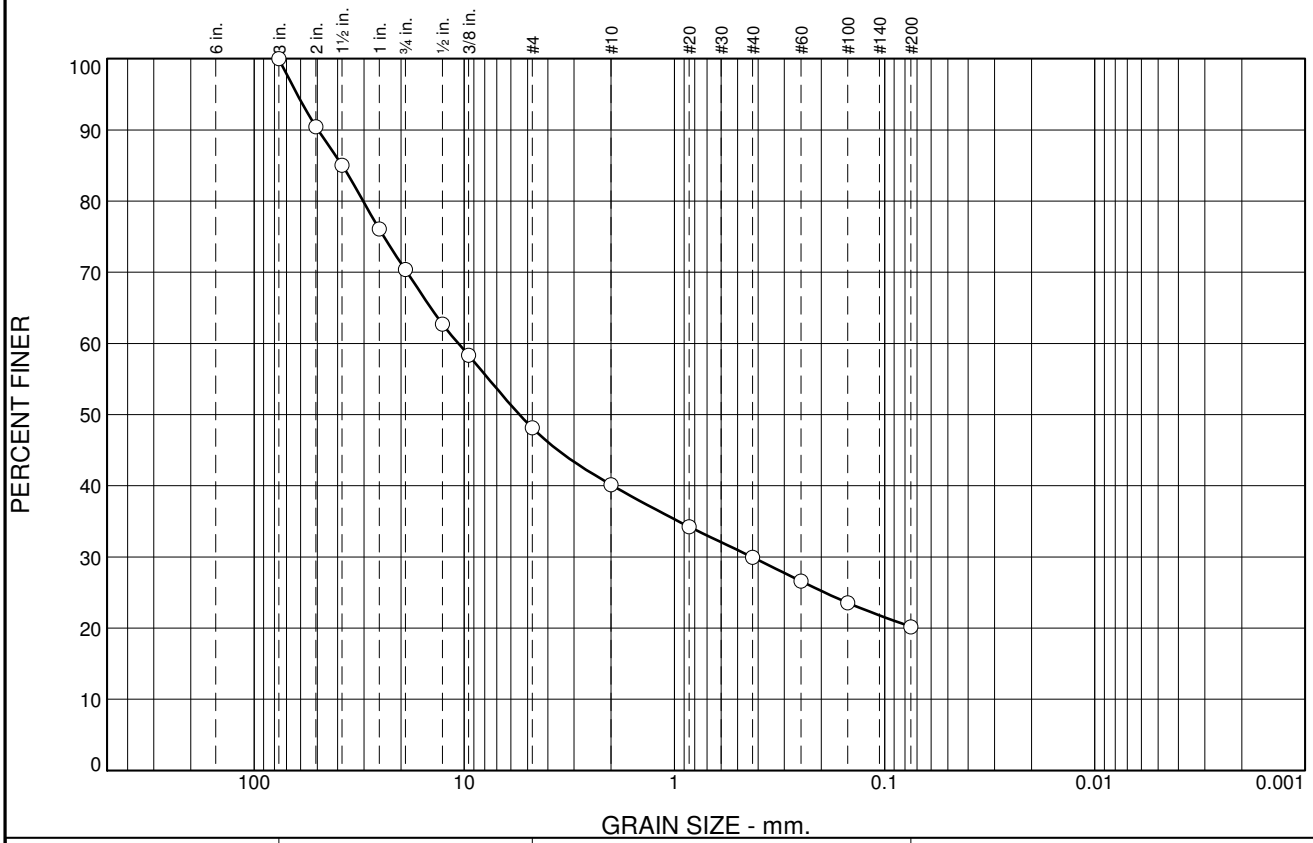
Sample No.: TP10-395-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/16/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 3.5-4.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	30	22	8	10	10	20	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	90		
1.5	85		
1	76		
.75	70		
.5	63		
0.375	58		
#4	48		
#10	40		
#20	34		
#40	30		
#60	27		
#100	24		
#200	20		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 38.0168 D_{60}= 10.6607 D_{50}= 5.4570
D_{30}= 0.4284 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 14.6%

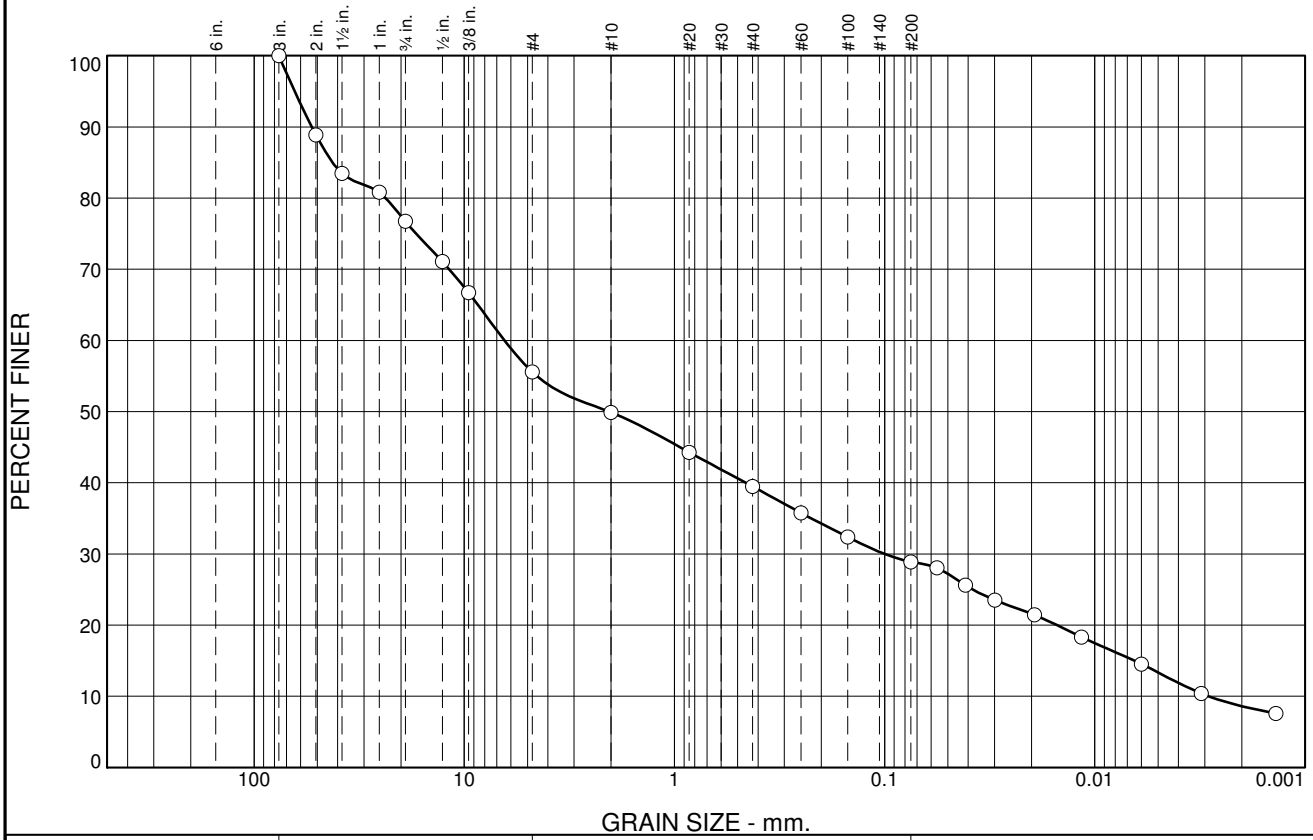
Sample No.: TP10-398-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	23	21	6	11	10	20	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	89		
1.5	83		
1	81		
.75	77		
.5	71		
0.375	67		
#4	56		
#10	50		
#20	44		
#40	39		
#60	36		
#100	32		
#200	29		
0.0564 mm.	28		
0.0412 mm.	26		
0.0299 mm.	24		
0.0194 mm.	21		
0.0116 mm.	18		
0.0060 mm.	15		
0.0031 mm.	10		
0.0014 mm.	7.6		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 19 LL= 39 PI= 20

Coefficients

D_{85}= 42.3220 D_{60}= 6.4264 D_{50}= 2.0416
D_{30}= 0.1000 D_{15}= 0.0065 D_{10}= 0.0029
C_u= 2237.60 C_c= 0.54

Classification

USCS= GC AASHTO= A-2-6(1)

Remarks

As received moisture = 15.7%

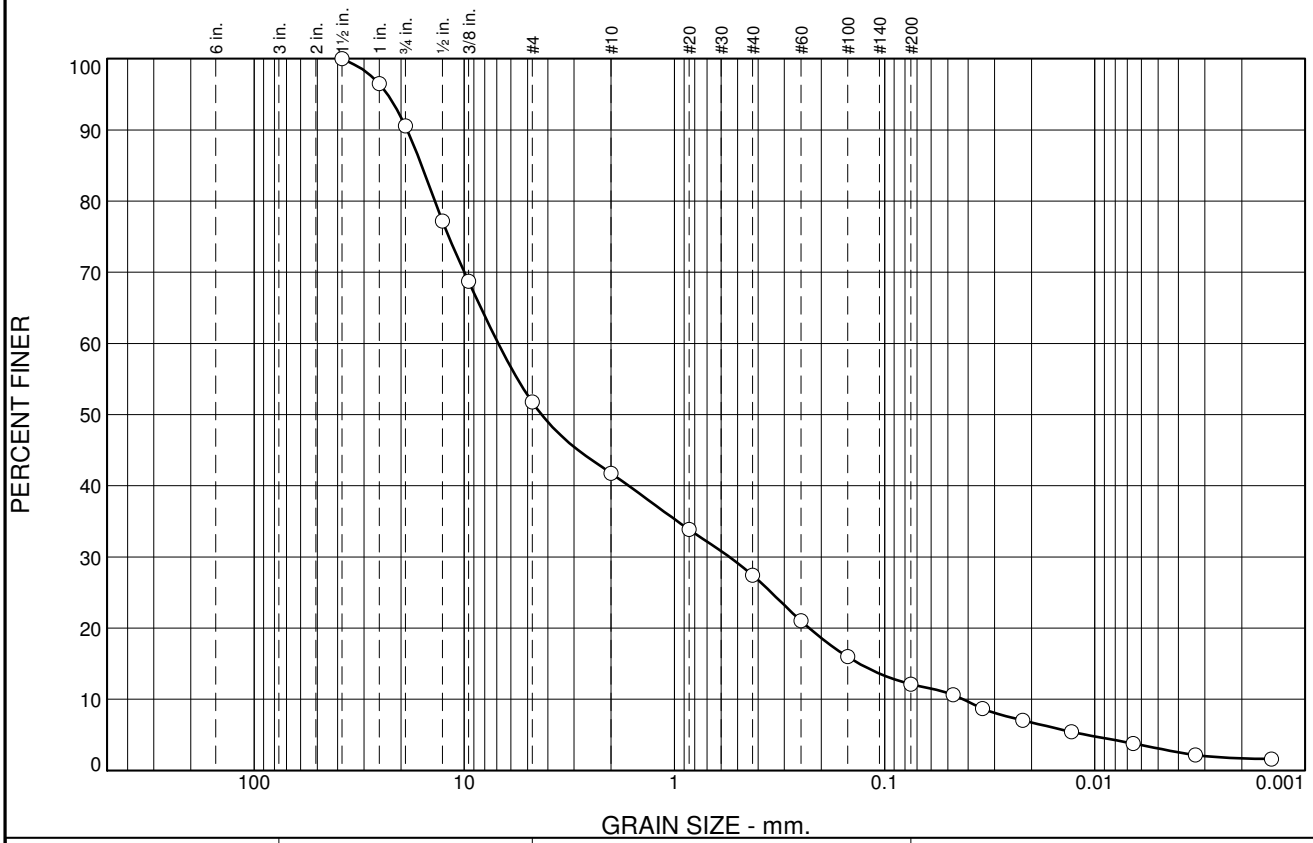
Sample No.: TP10-399-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	39	10	15	15	10	2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	97		
.75	91		
.5	77		
0.375	69		
#4	52		
#10	42		
#20	34		
#40	27		
#60	21		
#100	16		
#200	12		
0.0472 mm.	11		
0.0342 mm.	8.7		
0.0220 mm.	7.0		
0.0129 mm.	5.4		
0.0066 mm.	3.8		
0.0033 mm.	2.2		
0.0014 mm.	1.6		

* (no specification provided)

Soil Description

well-graded gravel with silt and sand

Atterberg Limits

PL= NP LL= 32 PI= NP

Coefficients

D_{85}= 15.9583 D_{60}= 6.8842 D_{50}= 4.2808
D_{30}= 0.5484 D_{15}= 0.1319 D_{10}= 0.0423
C_u= 162.63 C_c= 1.03

Classification

USCS= GW-GM AASHTO= A-1-a

Remarks

As received moisture = 18.4%

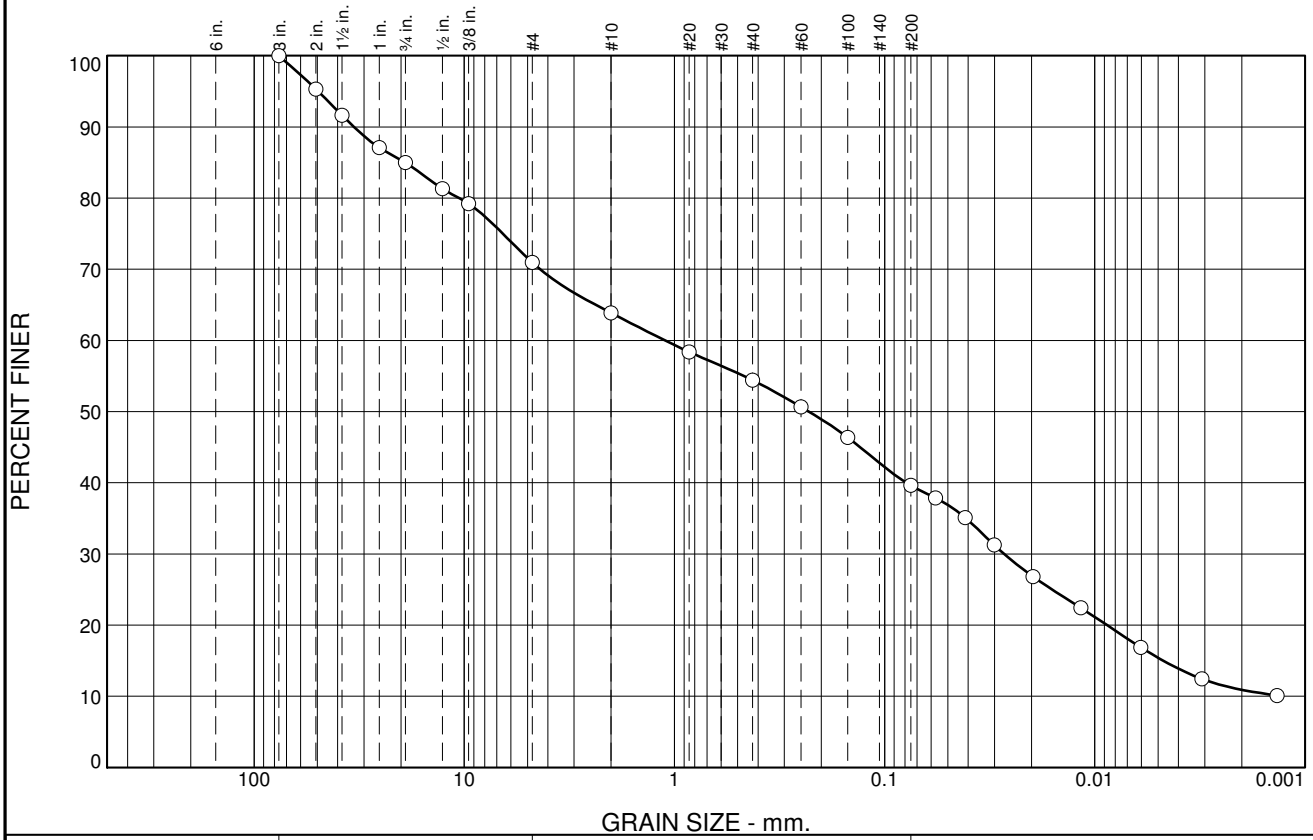
Sample No.: TP10-402-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Valley Bottom **Elev./Depth:** 3.0-4.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	14	7	10	14	29	11

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	95		
1.5	92		
1	87		
.75	85		
.5	81		
0.375	79		
#4	71		
#10	64		
#20	58		
#40	54		
#60	51		
#100	46		
#200	40		
0.0573 mm.	38		
0.0414 mm.	35		
0.0301 mm.	31		
0.0196 mm.	27		
0.0117 mm.	22		
0.0060 mm.	17		
0.0031 mm.	12		
0.0014 mm.	10		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 19.0609 D_{60}= 1.1079 D_{50}= 0.2290
D_{30}= 0.0270 D_{15}= 0.0047 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 17.7%

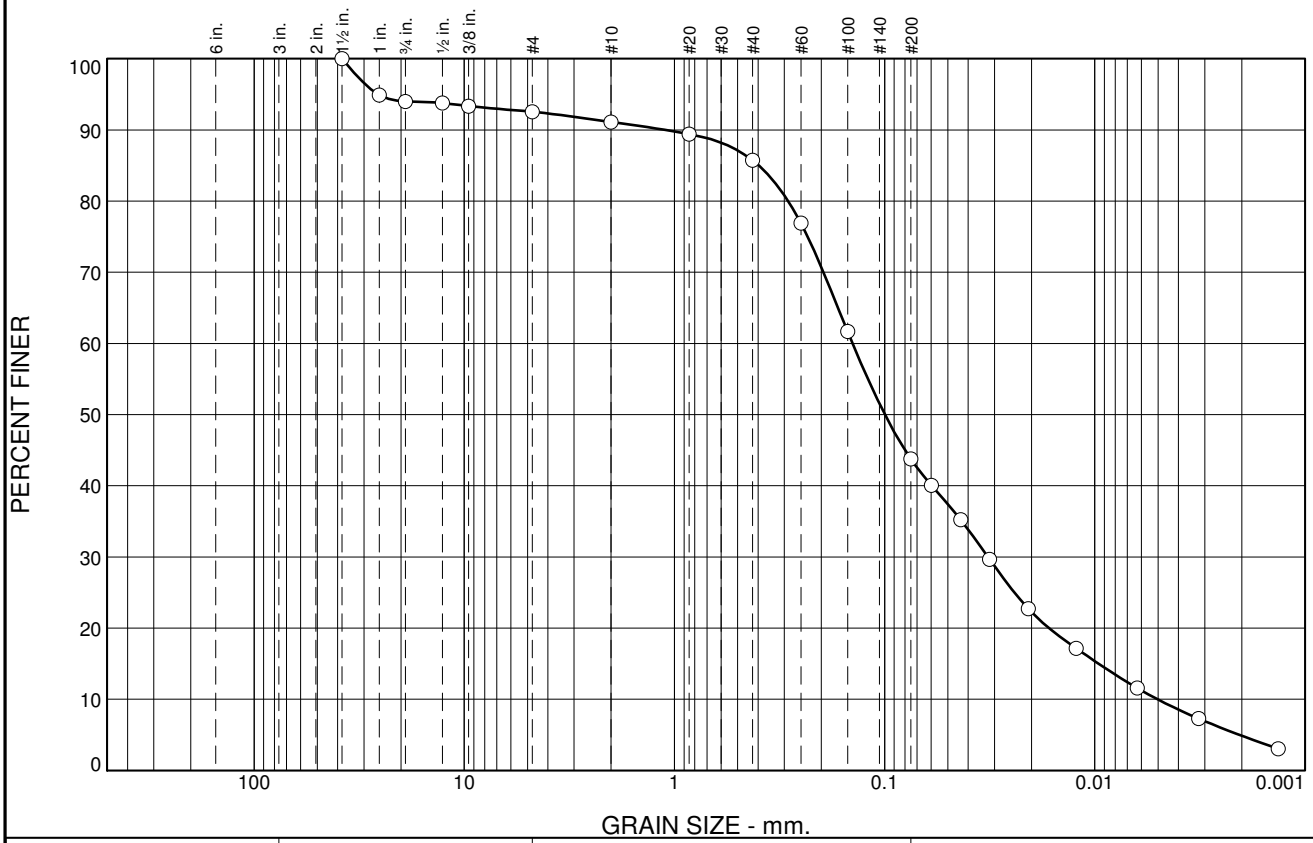
Sample No.: TP10-405-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Upper Talarik Creek Area **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	1	2	5	42	39	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	95		
.75	94		
.5	94		
0.375	93		
#4	93		
#10	91		
#20	89		
#40	86		
#60	77		
#100	62		
#200	44		
0.0598 mm.	40		
0.0434 mm.	35		
0.0316 mm.	30		
0.0207 mm.	23		
0.0123 mm.	17		
0.0063 mm.	12		
0.0032 mm.	7.3		
0.0013 mm.	3.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.3969 D_{60}= 0.1420 D_{50}= 0.0996
D_{30}= 0.0322 D_{15}= 0.0096 D_{10}= 0.0050
C_u= 28.25 C_c= 1.45

Classification

USCS= AASHTO=

Remarks

As received moisture = 46.6%

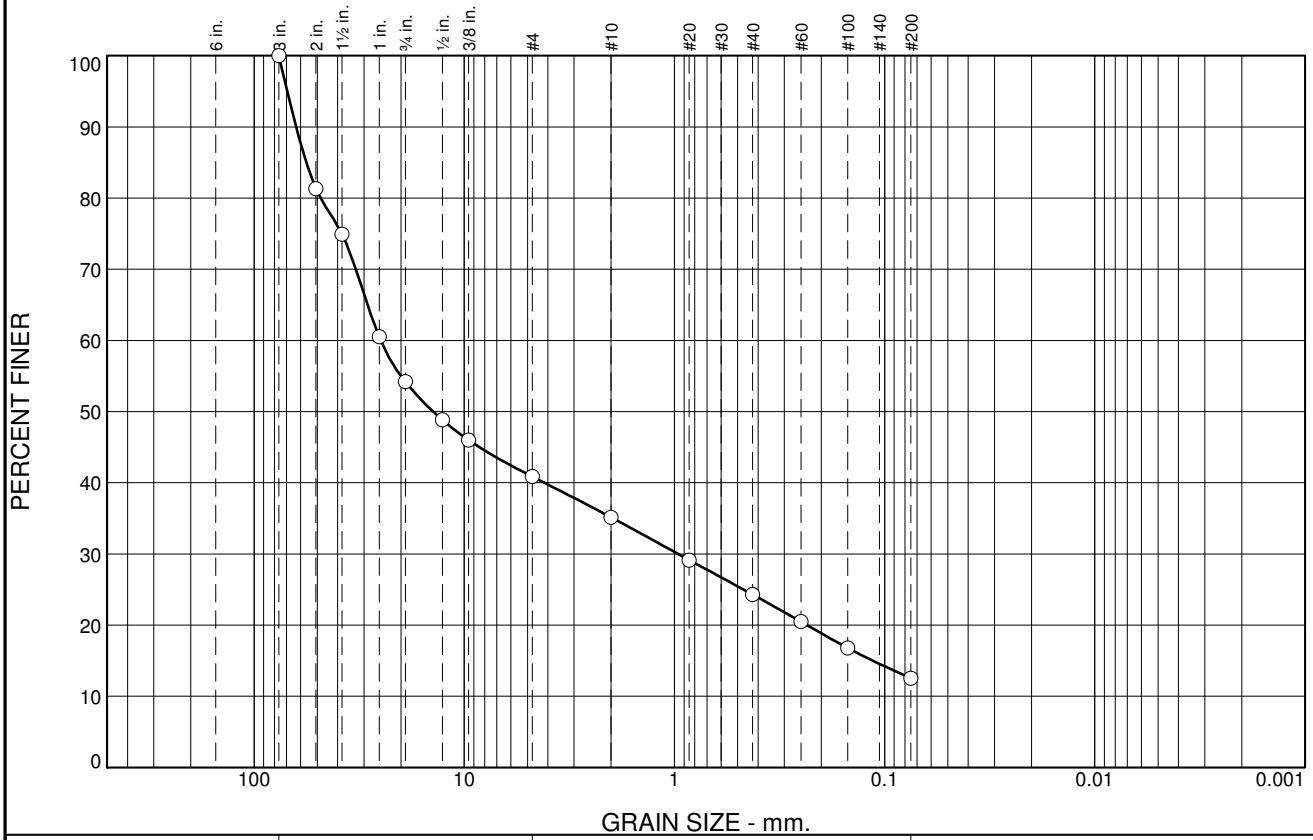
Sample No.: TP10-408-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Valley Bottom **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	46	13	6	11	11	13	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	81		
1.5	75		
1	61		
.75	54		
.5	49		
0.375	46		
#4	41		
#10	35		
#20	29		
#40	24		
#60	20		
#100	17		
#200	13		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 56.4377 D_{60}= 24.9672 D_{50}= 14.0703
D_{30}= 0.9619 D_{15}= 0.1138 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture = 22.1%

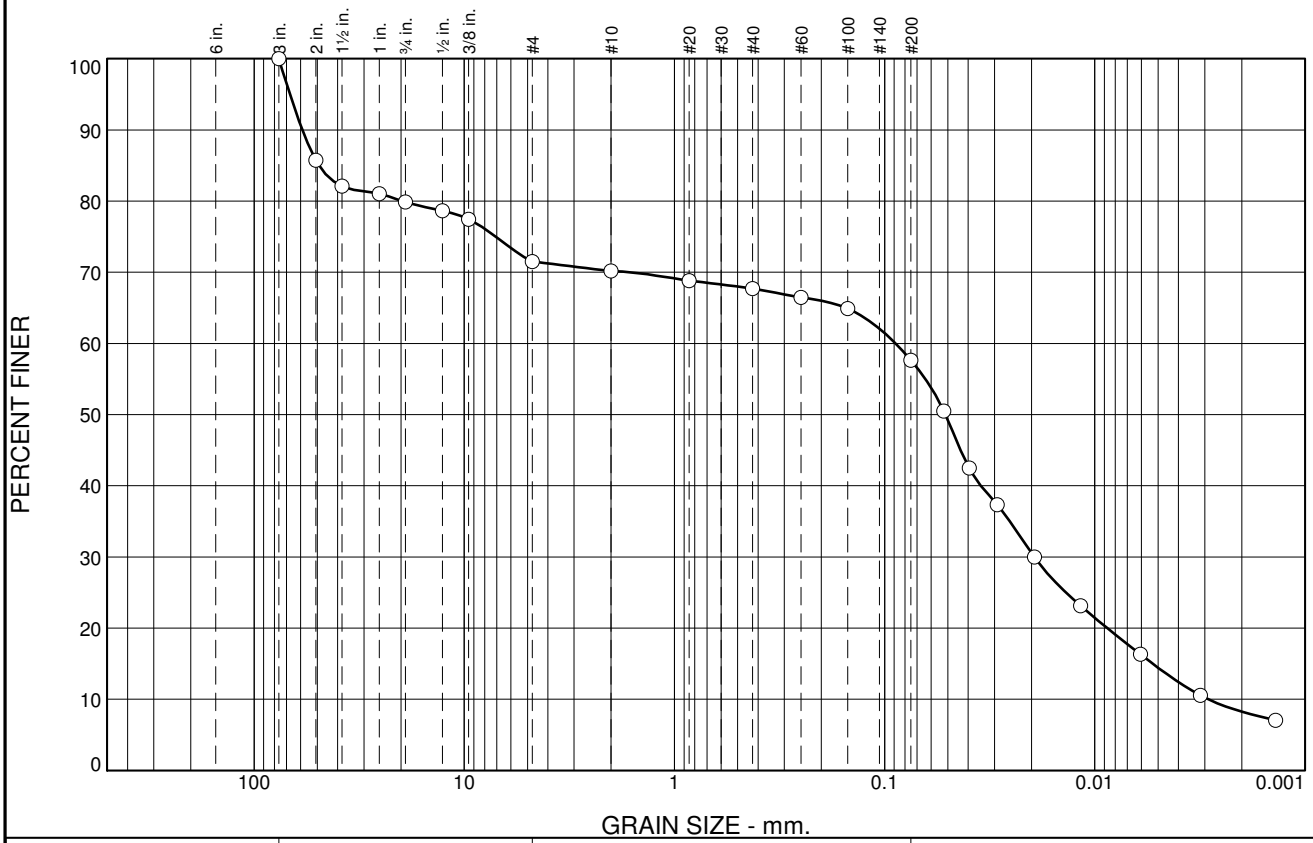
Sample No.: TP10-413-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 3.0-4.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	20	8	2	2	10	50	8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	86		
1.5	82		
1	81		
.75	80		
.5	79		
0.375	77		
#4	72		
#10	70		
#20	69		
#40	68		
#60	66		
#100	65		
#200	58		
0.0523 mm.	50		
0.0396 mm.	42		
0.0291 mm.	37		
0.0194 mm.	30		
0.0117 mm.	23		
0.0061 mm.	16		
0.0031 mm.	11		
0.0014 mm.	7.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 49.0460 D_{60}= 0.0888 D_{50}= 0.0514
D_{30}= 0.0194 D_{15}= 0.0053 D_{10}= 0.0029
C_u= 30.78 C_c= 1.47

Classification

USCS= AASHTO=

Remarks

as received moisture = 21.2%

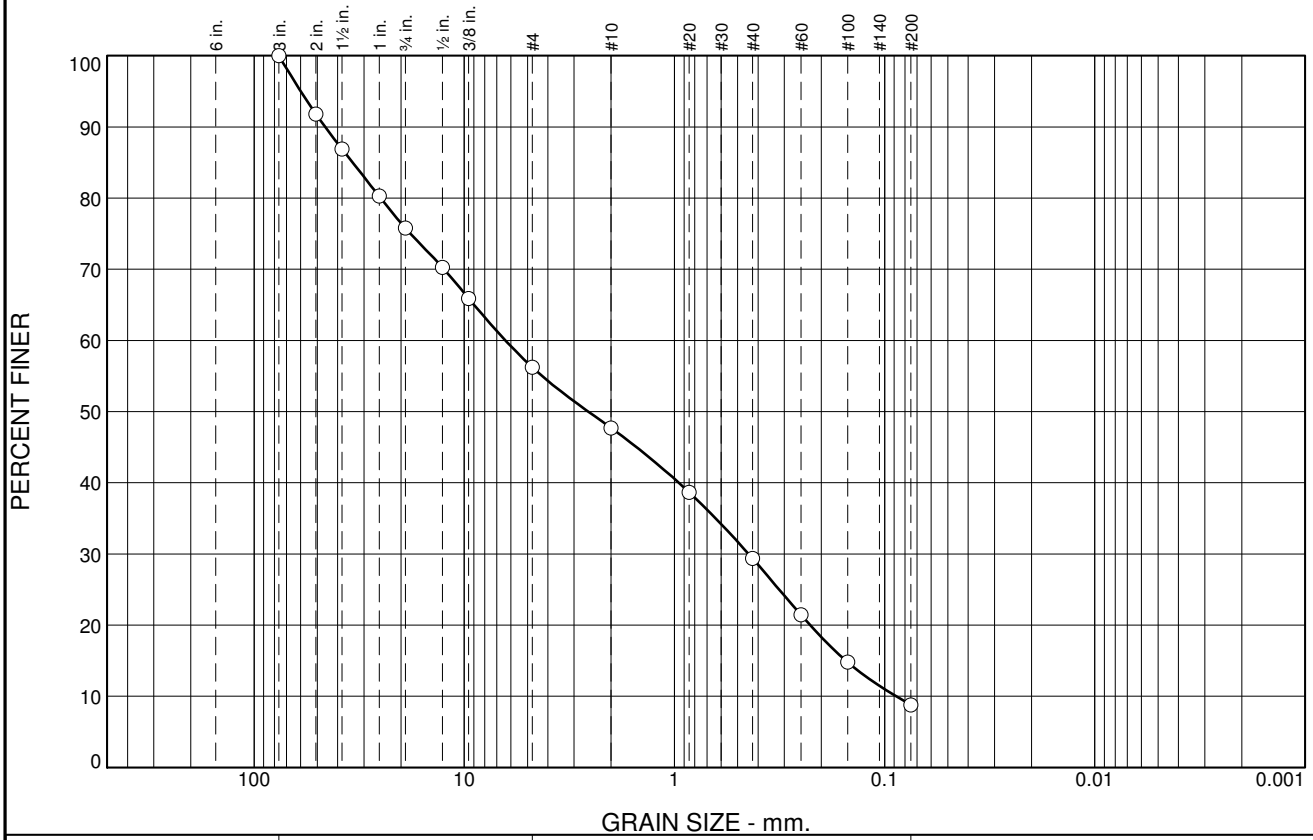
Sample No.: TP10-415-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	20	8	19	20	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	92		
1.5	87		
1	80		
.75	76		
.5	70		
0.375	66		
#4	56		
#10	48		
#20	39		
#40	29		
#60	21		
#100	15		
#200	8.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 33.9720 D_{60}= 6.3660 D_{50}= 2.5680
D_{30}= 0.4439 D_{15}= 0.1528 D_{10}= 0.0881
C_u= 72.26 C_c= 0.35

Classification

USCS= AASHTO=

Remarks

As received moisture = 6.5%

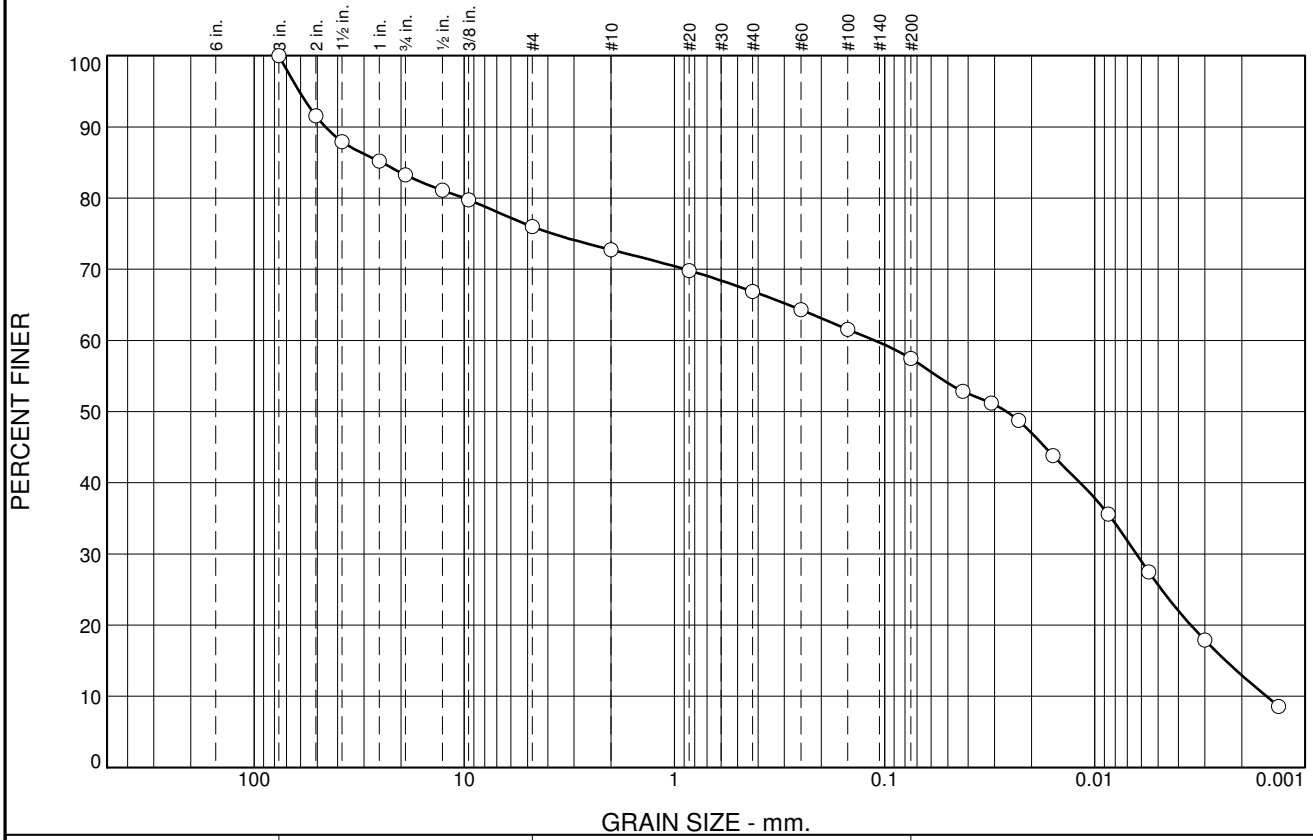
Sample No.: TP10-419-2 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	17	7	3	6	10	44	13

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	92		
1.5	88		
1	85		
.75	83		
.5	81		
0.375	80		
#4	76		
#10	73		
#20	70		
#40	67		
#60	64		
#100	62		
#200	57		
0.0425 mm.	53		
0.0311 mm.	51		
0.0231 mm.	49		
0.0158 mm.	44		
0.0086 mm.	36		
0.0055 mm.	27		
0.0030 mm.	18		
0.0013 mm.	8.6		

* (no specification provided)

Soil Description

gravelly lean clay with sand

Atterberg Limits

PL= 17 LL= 33 PI= 16

Coefficients

D_{85}= 24.6906 D_{60}= 0.1115 D_{50}= 0.0262
D_{30}= 0.0063 D_{15}= 0.0024 D_{10}= 0.0015
C_u= 73.12 C_c= 0.24

Classification

USCS= CL AASHTO= A-6(6)

Remarks

As received moisture = 17.2%

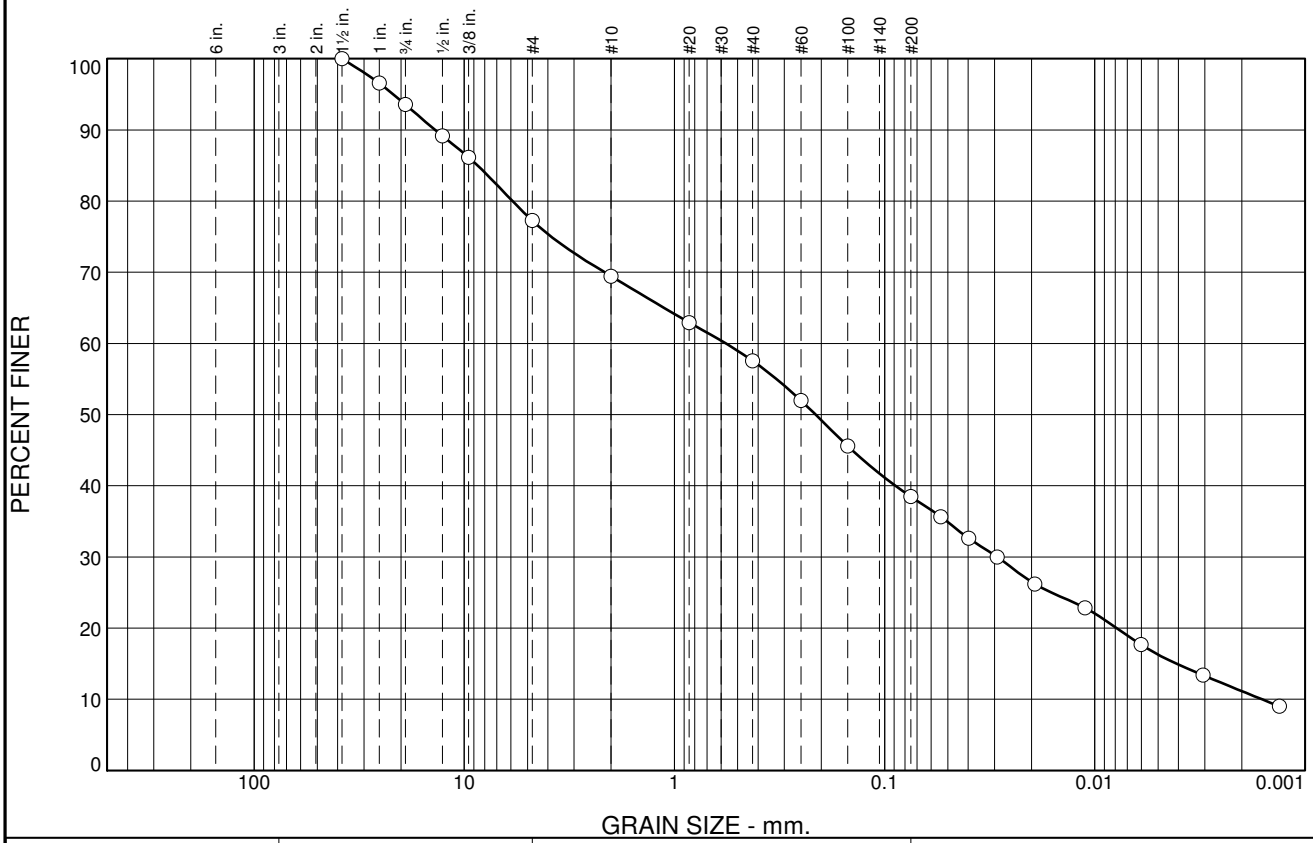
Sample No.: TP10-421-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Area A, Lower/Mid Slopes **Elev./Depth:** 4.0-5.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	17	8	11	20	27	11

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	97		
.75	94		
.5	89		
0.375	86		
#4	77		
#10	69		
#20	63		
#40	58		
#60	52		
#100	46		
#200	38		
0.0540 mm.	36		
0.0398 mm.	33		
0.0291 mm.	30		
0.0193 mm.	26		
0.0111 mm.	23		
0.0060 mm.	18		
0.0031 mm.	13		
0.0013 mm.	9.0		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 18 LL= 28 PI= 10

Coefficients

D_{85}= 8.6313 D_{60}= 0.5704 D_{50}= 0.2131
D_{30}= 0.0292 D_{15}= 0.0041 D_{10}= 0.0016
C_u= 355.98 C_c= 0.93

Classification

USCS= SC AASHTO= A-4(0)

Remarks

As received moisture = 15.9%

Sample No.: TP10-424-1 **Source of Sample:** 2010 Test Pit Samples **Date:** 11/17/10
Location: Open Pit Area **Elev./Depth:** 2.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/22/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Upper Talarik Creek Area
Sample Number: TP10-352-1 **Depth:** 3.4-3.8'
Remarks:

MATERIAL DESCRIPTION

Description: clayey gravel with sand

Classifications - **USCS:** GC **AASHTO:** A-6(4)
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 40 **Plasticity Index =** 24
% < No.200 = 38 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 118.6 pcf	113.0 pcf
Optimum moisture = 13.3 %	16.2 %

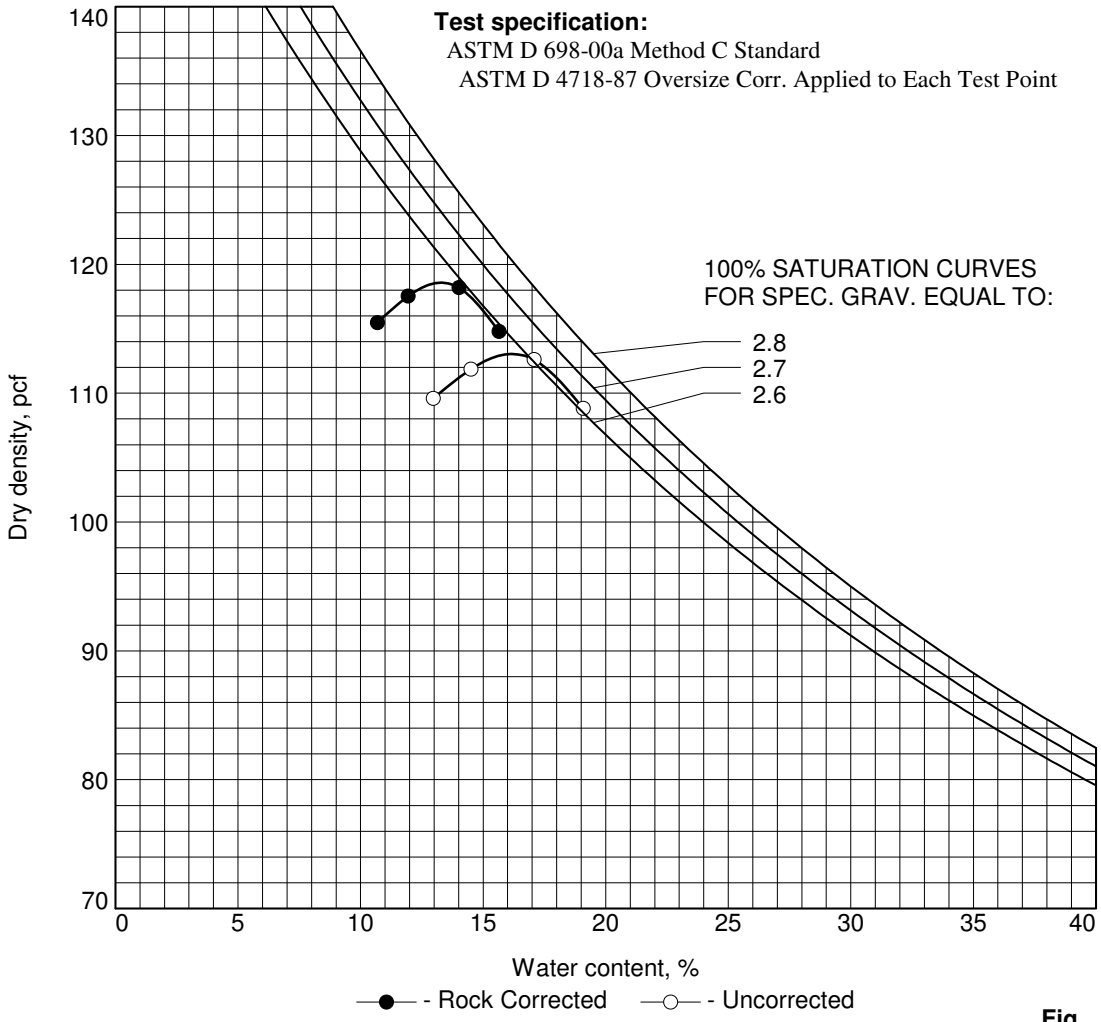


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/26/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area G
Sample Number: TP10-361-1 **Depth:** 2.0-3.0'
Remarks:

MATERIAL DESCRIPTION

Description: silty sand with gravel

Classifications - **USCS:** SM **AASHTO:** A-4(0)
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 18 **Plasticity Index =** NP
% < No.200 = 40.9 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 122.5 pcf	115.7 pcf
Optimum moisture = 9.7 %	12.3 %

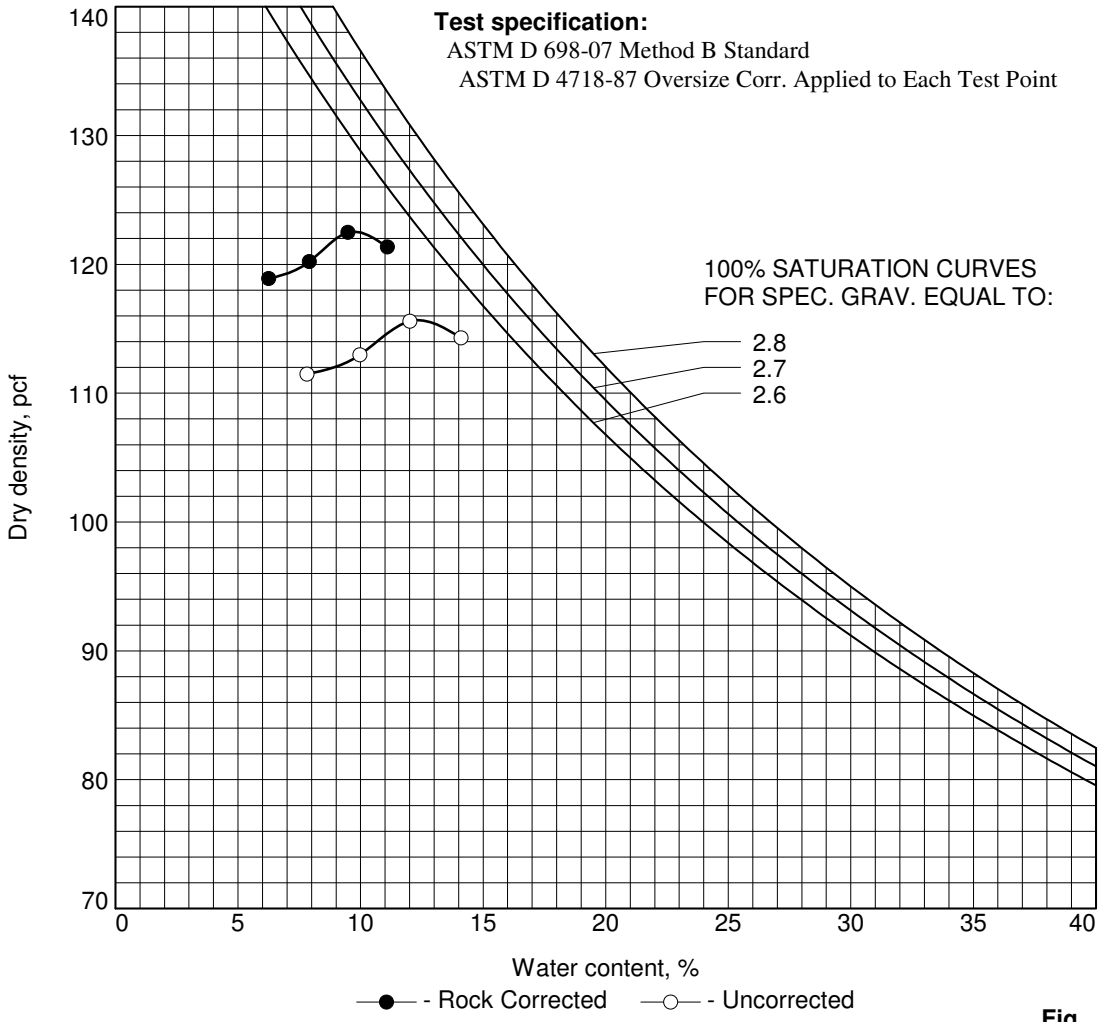


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/29/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area E
Sample Number: TP10-362-1 **Depth:** 2.0-3.0'
Remarks:

MATERIAL DESCRIPTION

Description:

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = **Plasticity Index =**
% < No.200 = 20 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 126.6 pcf	119.0 pcf
Optimum moisture = 8.8 %	11.7 %

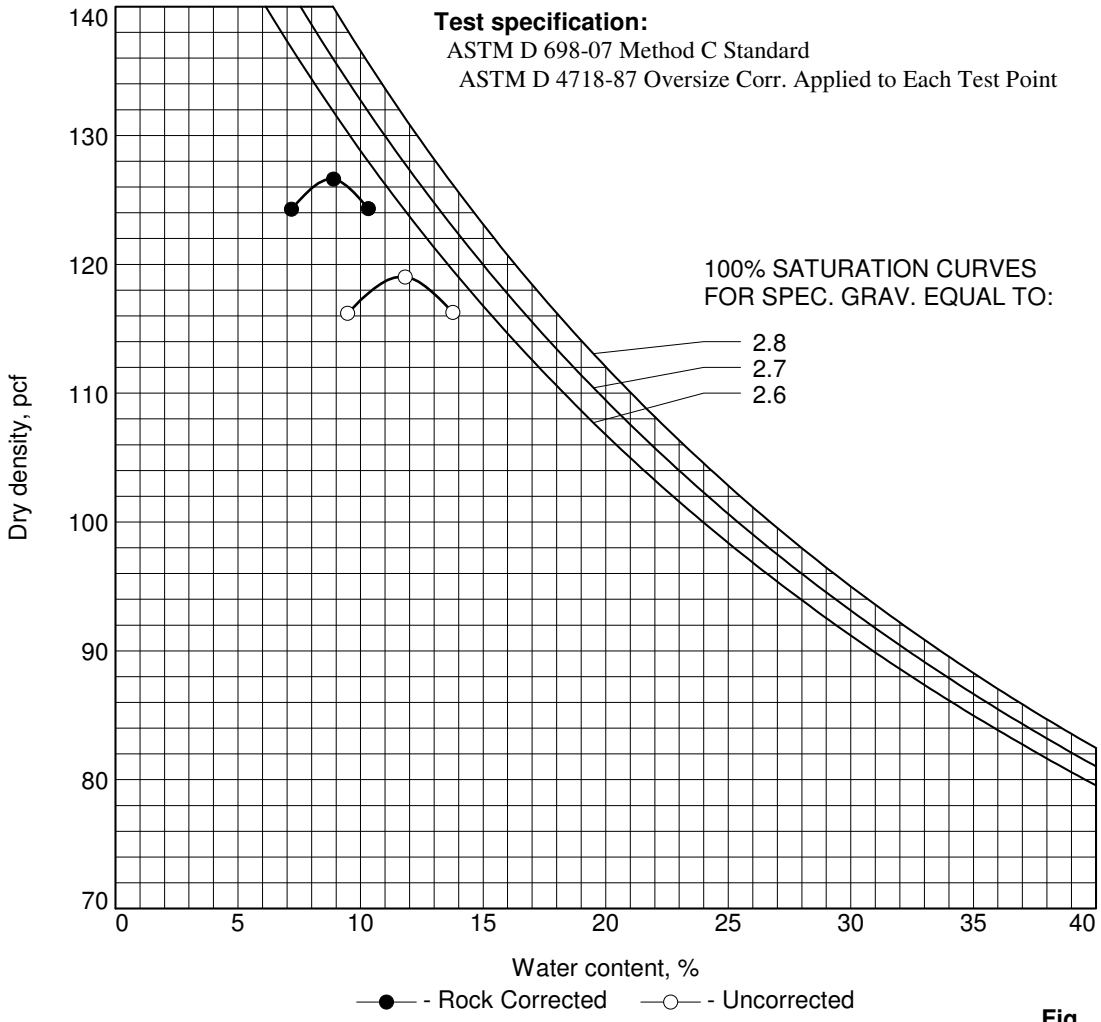


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/26/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Open Pit Area
Sample Number: TP10-380-1 **Depth:** 3.0-4.0'
Remarks:

MATERIAL DESCRIPTION

Description:

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = **Plasticity Index =**
% < No.200 = 40 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 123.6 pcf	116.2 pcf
Optimum moisture = 10.6 %	13.8 %

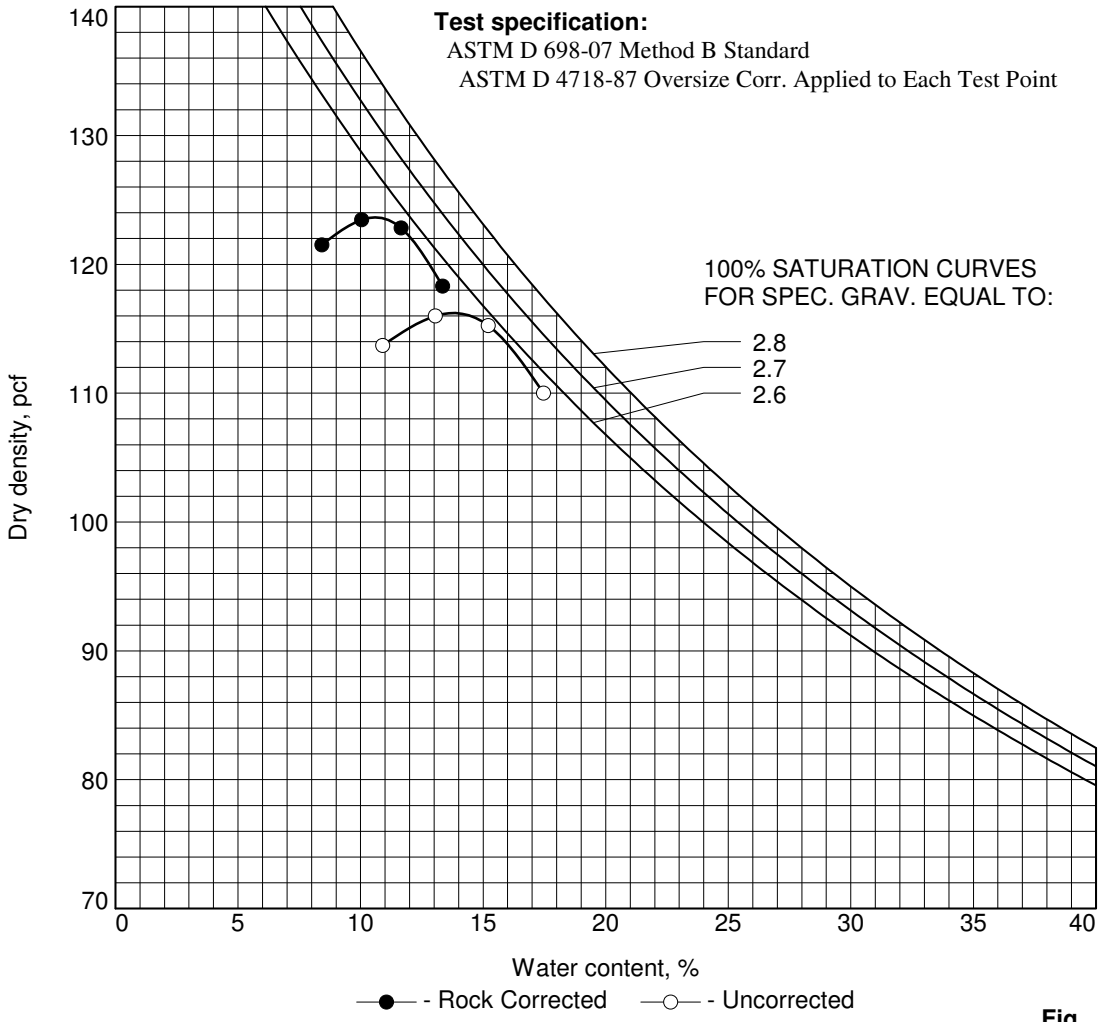


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/29/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area A, Lower Mid/Slopes
Sample Number: TP10-391-1 **Depth:** 4.0-5.0'
Remarks:

MATERIAL DESCRIPTION

Description: clayey gravel with sand

Classifications - **USCS:** GC **AASHTO:** A-2-6(1)
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 33 **Plasticity Index =** 15
% < No.200 = 32 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 120.3 pcf	114.5 pcf
Optimum moisture = 11.2 %	13.6 %

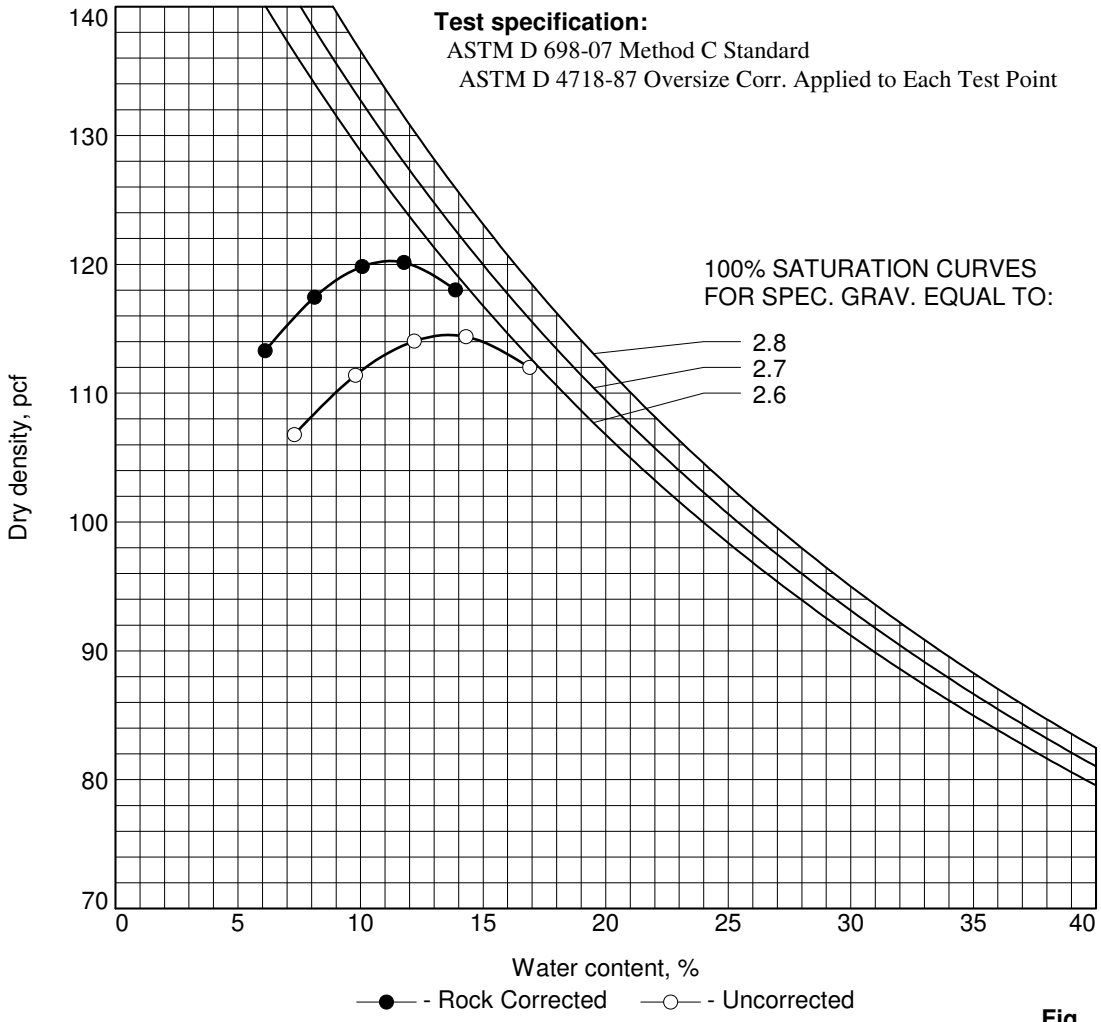


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/27/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area A, Lower/Mid Slopes
Sample Number: TP10-399-1 **Depth:** 4.0-5.0'
Remarks:

MATERIAL DESCRIPTION

Description: clayey gravel with sand

Classifications - **USCS:** GC **AASHTO:** A-2-6(1)
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 39 **Plasticity Index =** 20
% < No.200 = 29 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 123.1 pcf	116.3 pcf
Optimum moisture = 10.6 %	13.4 %

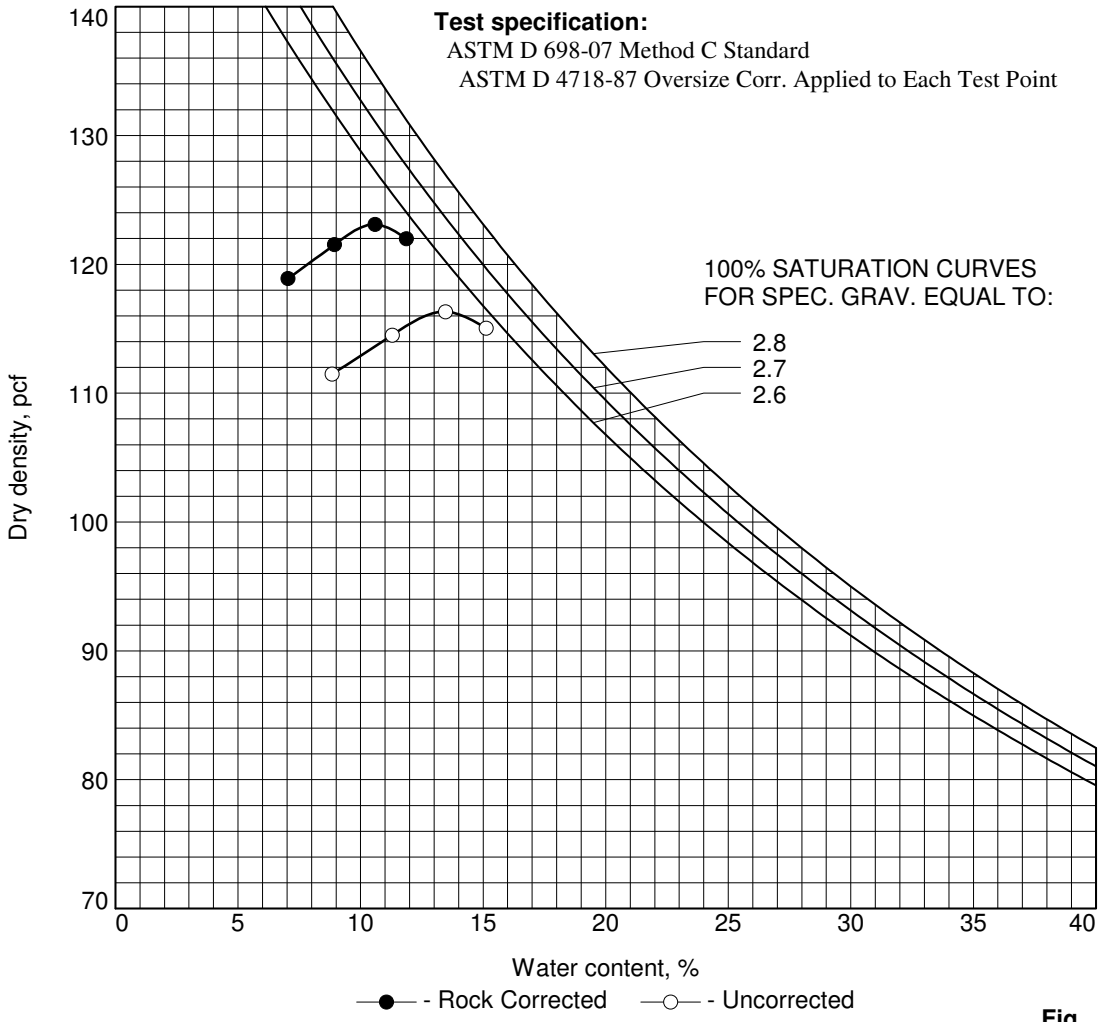


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/23/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area A, Valley Bottom
Sample Number: TP10-402-1 **Depth:** 3.0-4.0'
Remarks:

MATERIAL DESCRIPTION

Description: well-graded gravel with silt and sand

Classifications - **USCS:** GW-GM **AASHTO:** A-1-a
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 32 **Plasticity Index =** NP
% < No.200 = 12 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 118.6 pcf	116.2 pcf
Optimum moisture = 11.4 %	12.5 %

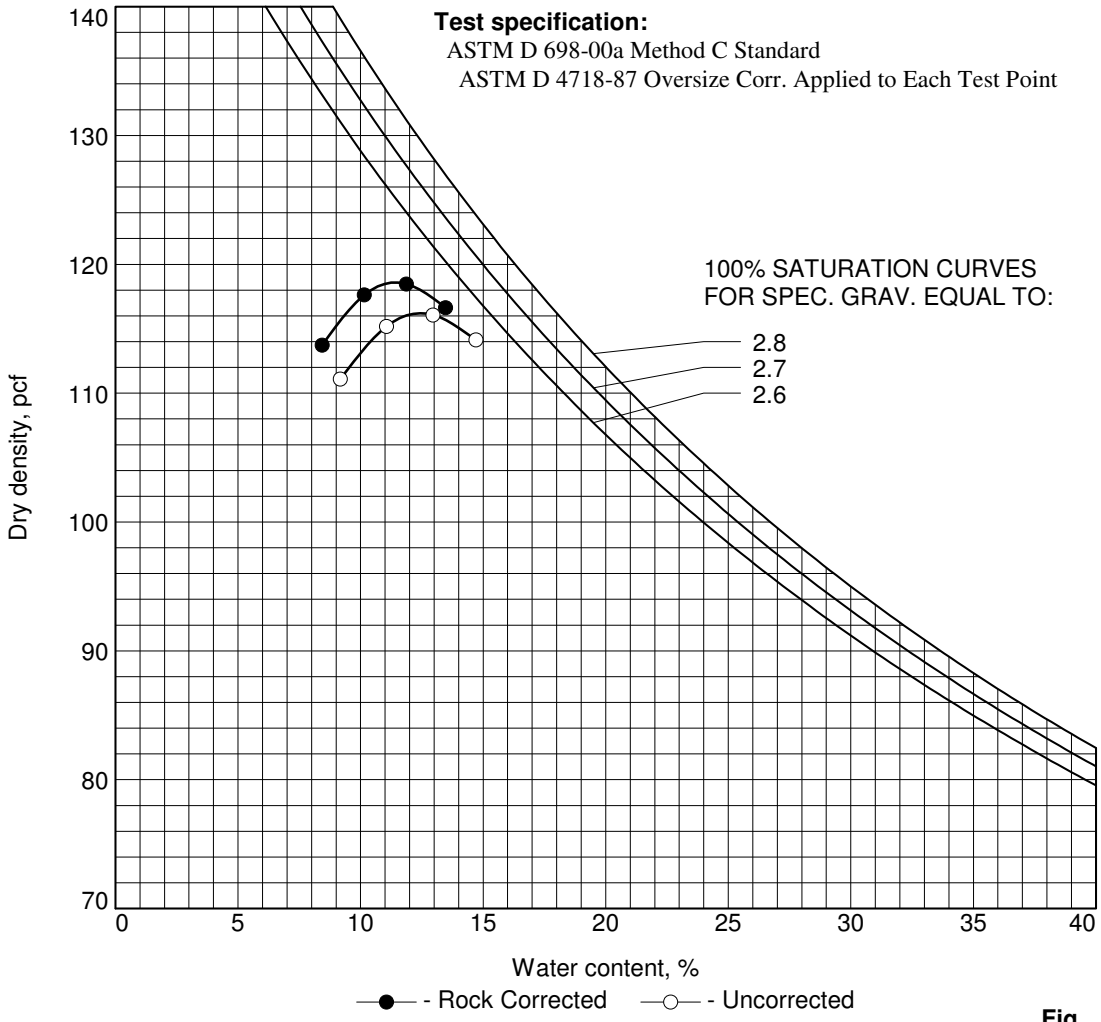


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/23/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Upper Talarik Creek Area
Sample Number: TP10-405-1 **Depth:** 2.0-3.0'
Remarks:

MATERIAL DESCRIPTION

Description:

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = **Plasticity Index =**
% < No.200 = 40 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 116.4 pcf	109.9 pcf
Optimum moisture = 12.8 %	15.9 %

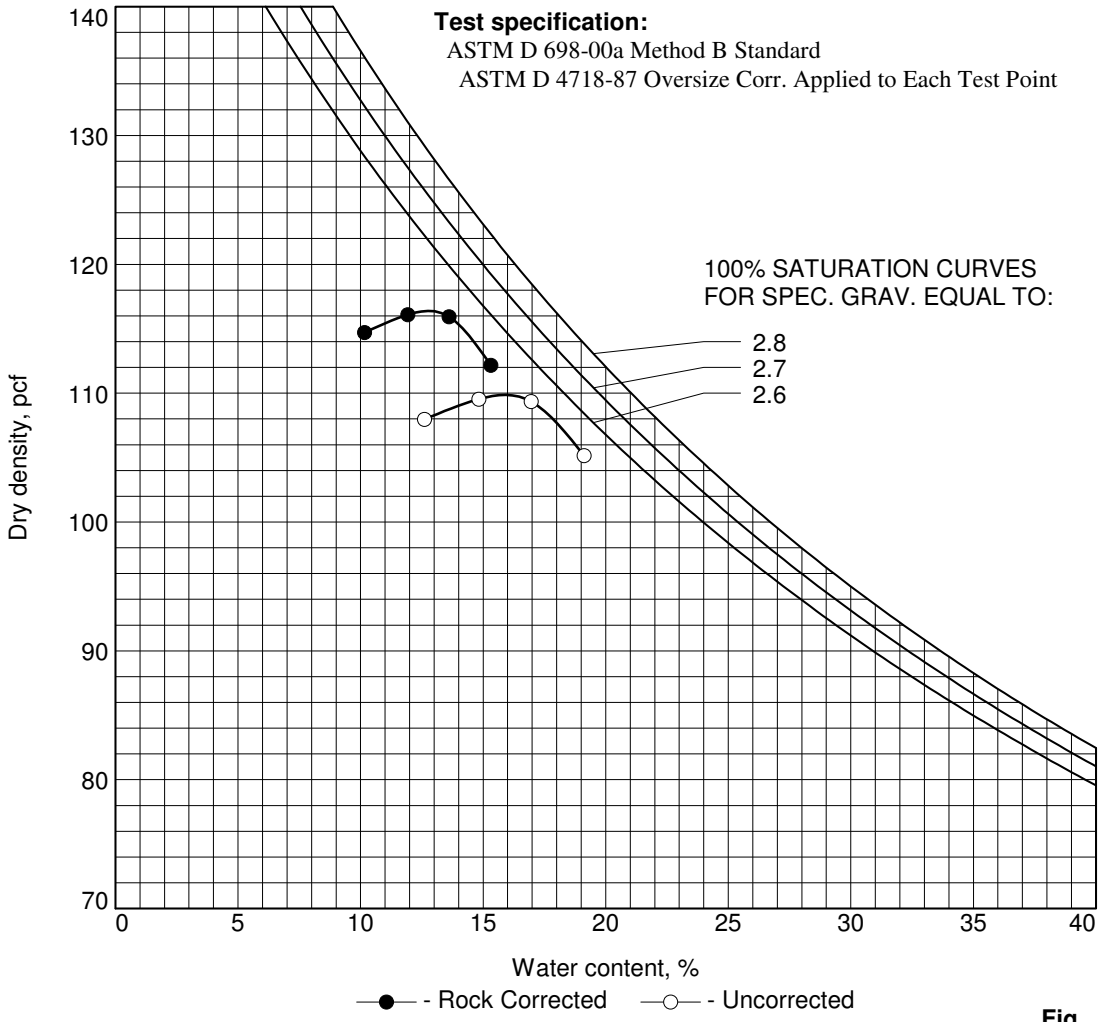


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/27/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area A, Lower/Mid Slopes
Sample Number: TP10-413-1 **Depth:** 3.0-4.0'
Remarks: Insufficient test mass to run sample in 6 inch diameter mold (Method C).

MATERIAL DESCRIPTION

Description:

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = **Plasticity Index =**
% < No.200 = 13 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 123.5 pcf	100.7 pcf
Optimum moisture = 9.4 %	19.2 %

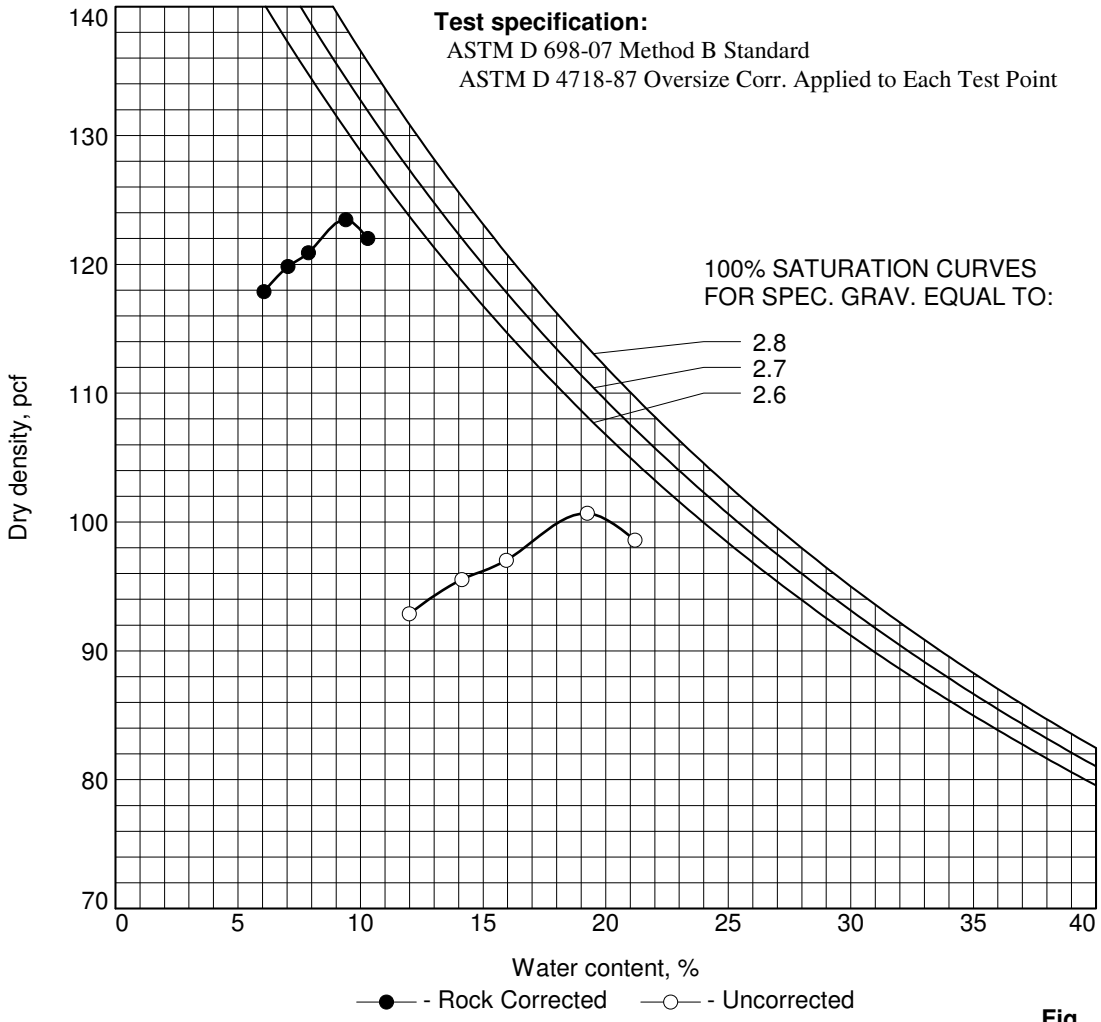


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/23/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area A, Lower/Mid Slopes
Sample Number: TP10-415-1 **Depth:** 4.0-5.0'
Remarks:

MATERIAL DESCRIPTION

Description:

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = **Plasticity Index =**
% < No.200 = 58 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 114.9 pcf	107.4 pcf
Optimum moisture = 13.6 %	17.4 %

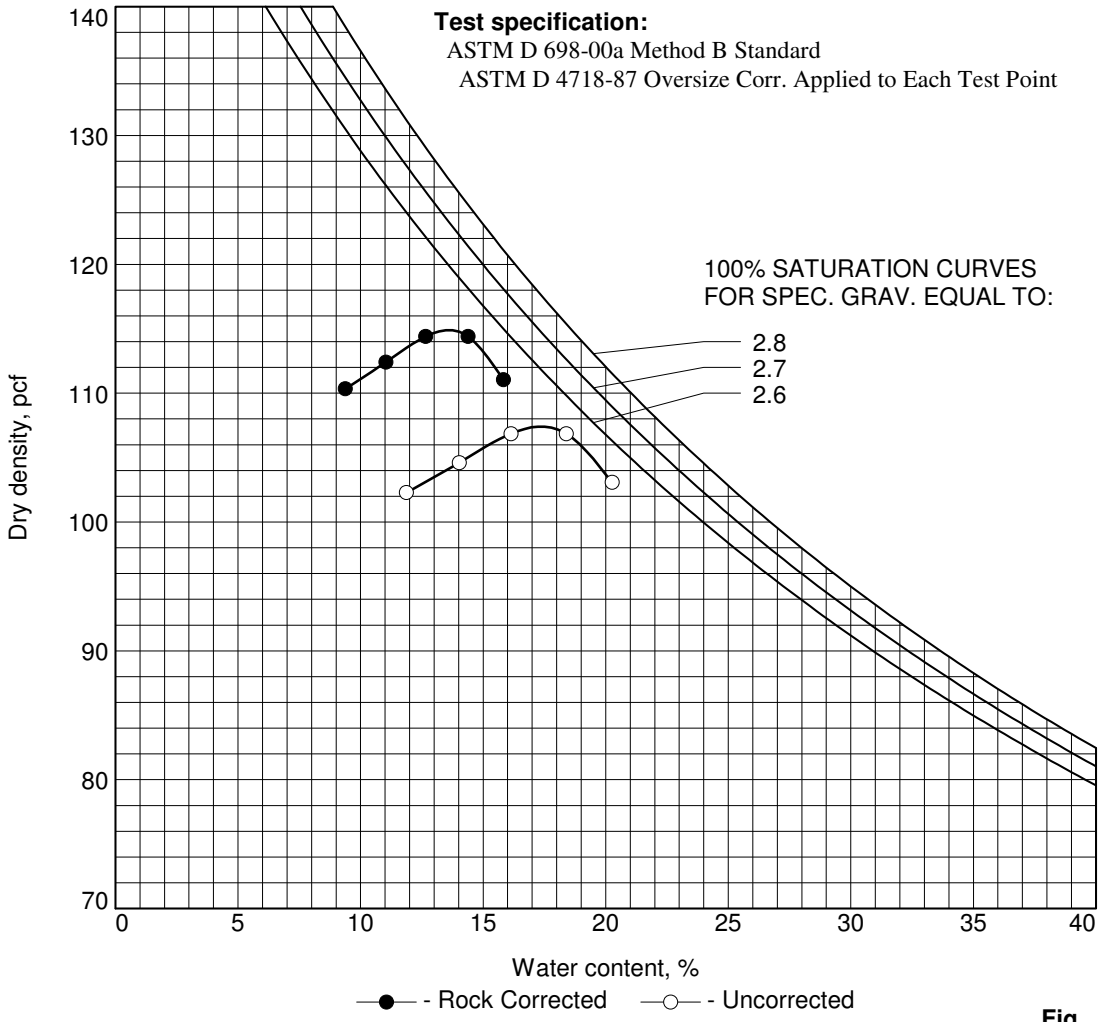


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/26/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Area A, Lower/Mid Slopes
Sample Number: TP10-421-1 **Depth:** 4.0-5.0'
Remarks:

MATERIAL DESCRIPTION

Description: gravelly lean clay with sand

Classifications - **USCS:** CL **AASHTO:** A-6(6)
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 33 **Plasticity Index =** 16
% < No.200 = 57 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 116.9 pcf	110.3 pcf
Optimum moisture = 13.6 %	16.7 %

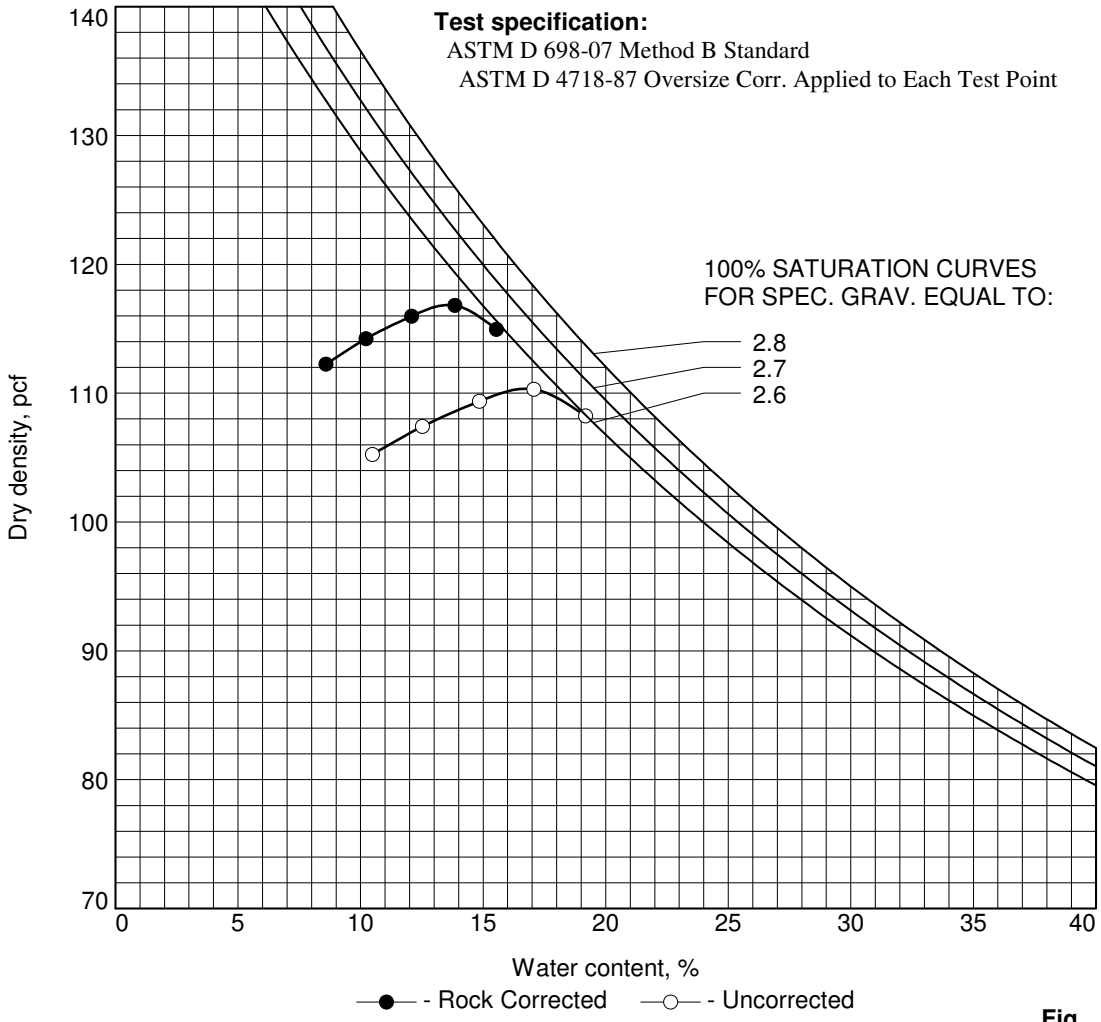


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: 101-77/11 **Date:** 11/23/10
Project: Pebble Project
Client: Pebble Limited Partnership
Location: Open Pit Area
Sample Number: TP10-424-1 **Depth:** 2.0-3.0'
Remarks:

MATERIAL DESCRIPTION

Description: clayey sand with gravel

Classifications - **USCS:** SC **AASHTO:** A-4(0)
Nat. Moist. = **Sp.G. =** 2.7
Liquid Limit = 28 **Plasticity Index =** 10
% < No.200 = 38 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 116.6 pcf	112.6 pcf
Optimum moisture = 12.9 %	14.9 %

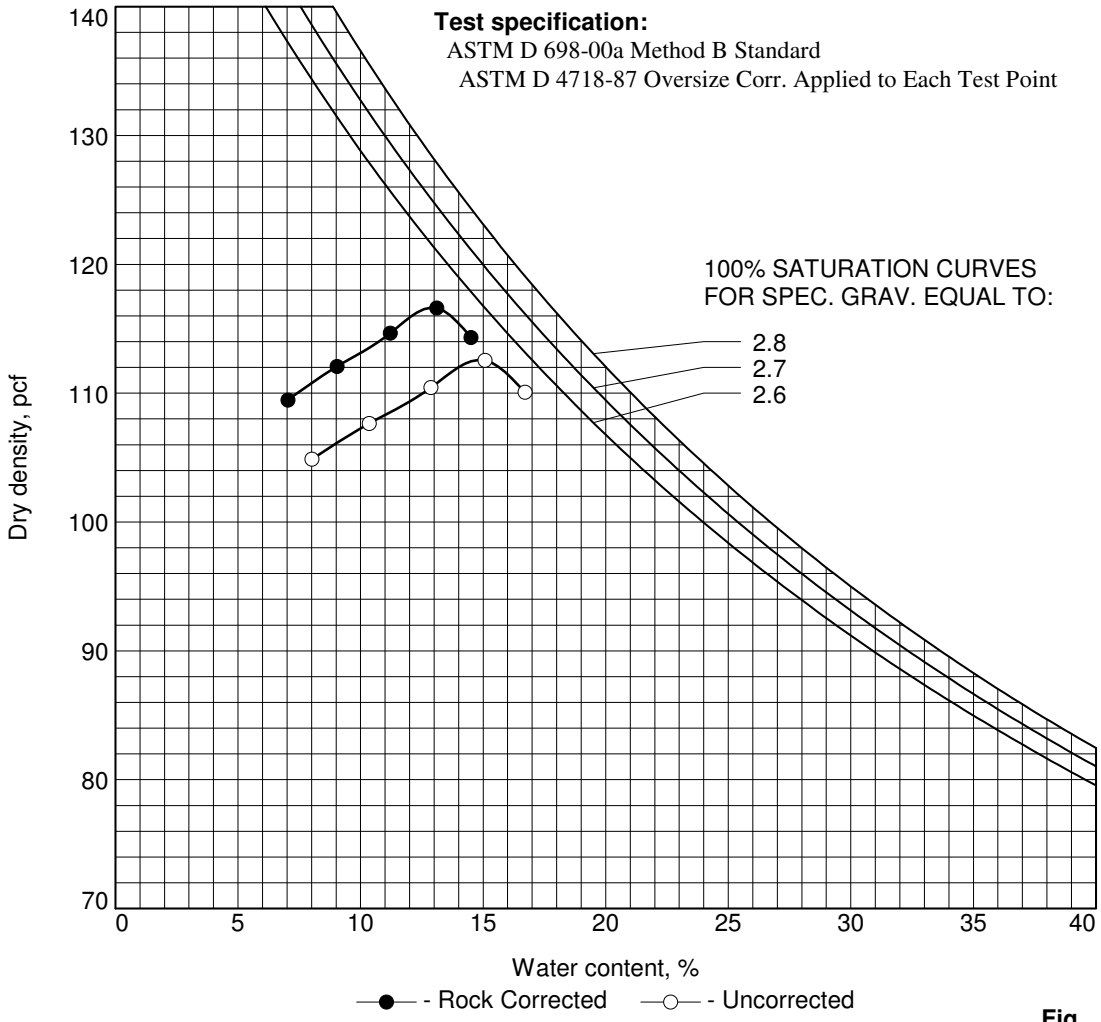


Fig.

Knight Piesold Geotechnical Lab.

Knight Piésold CONSULTING

APPENDIX A3

TEST PIT PHOTOGRAPHS

- TP10-319 to TP10-424

(Page A3-1 to A3-80)

PHOTO 1 – TP10-319 Looking South

PHOTO 2 – TP10-320 Looking North

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 3 – TP10-321 Looking East

PHOTO 4 – TP10-322 Looking North

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 5 – TP10-322 Detail Frozen Material

PHOTO 6 – TP10-322 Detail of Ice in Soil

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 7 – TP10-323 Pit

PHOTO 8 – TP10-323 Detail of Frozen Materials

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 9 – TP10-324 Looking North

PHOTO 10 – TP10-325 Looking North

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 11 – TP10-326 Pit

PHOTO 12 – TP10-327 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 13 – TP10-328 Looking East

PHOTO 14 – TP10-329 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 15 – TP10-330 Pit

PHOTO 16 – TP10-331 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 17 – TP10-332 Pit

PHOTO 18 – TP10-333 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 19 – TP10-334 Looking South

PHOTO 20 – TP10-335 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 21 – TP10-336 Pit

PHOTO 22 – TP10-337 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 23 – TP10-338 Pit

PHOTO 24 – TP10-339 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 25 – TP10-340 Pit

PHOTO 26 – TP10-341 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 27 – TP10-342 Pit

PHOTO 28 – TP10-343 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 29 – TP10-344 Pit

PHOTO 30 – TP10-345 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 31 – TP10-346 Pit

PHOTO 32 – TP10-347 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 33 – TP10-348 Top Layer Removed

PHOTO 34 – TP10-348 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 35 – TP10-349 Pit

PHOTO 36 – TP10-350 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 37 – TP10-351 Pit

PHOTO 38 – TP10-352 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 39 – TP10-353 Pit

PHOTO 40 – TP10-354 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 41 – TP10-355 Pit

PHOTO 42 – TP10-356 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 43 – TP10-356 Spoil Pile

PHOTO 44 – TP10-357 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 45 – TP10-357 Spoil Pile

PHOTO 46 – TP10-358 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 47 – TP10-359 Pit

PHOTO 48 – TP10-360 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 49 – TP10-361 Top Layer Removed

PHOTO 50 – TP10-361 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 51 – TP10-361 Spoil Pile

PHOTO 52 – TP10-362 Top Layer Removed

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 53 – TP10-362 Pit

PHOTO 54 – TP10-362 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 55 – TP10-363 Pit

PHOTO 56 – TP10-364 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 57 – TP10-365 Top Layer Removed

PHOTO 58 – TP10-365 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 59 – TP10-365 Spoil Pile

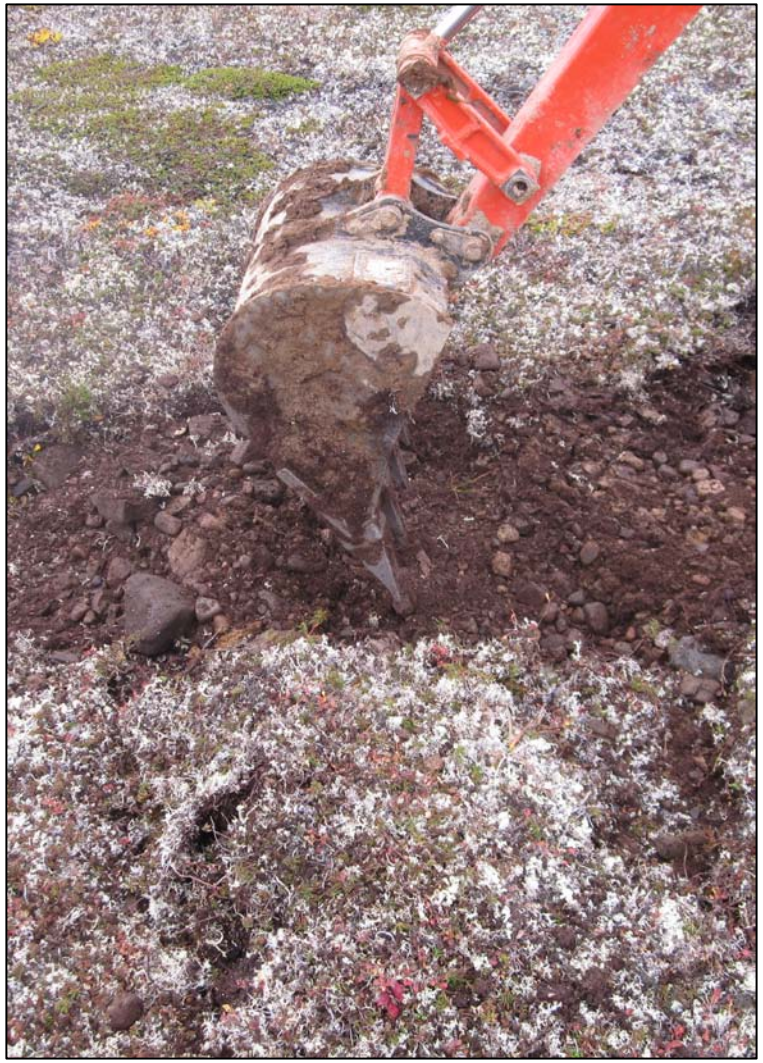


PHOTO 60 – TP10-366 Top Layer Removed

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 61 – TP10-366 Pit

PHOTO 62 – TP10-366 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 63 – TP10-367 Pit

PHOTO 64 – TP10-367 Boulder

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 65 – TP10-368 Pit

PHOTO 66 – TP10-369 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 67 – TP10-370 Pit

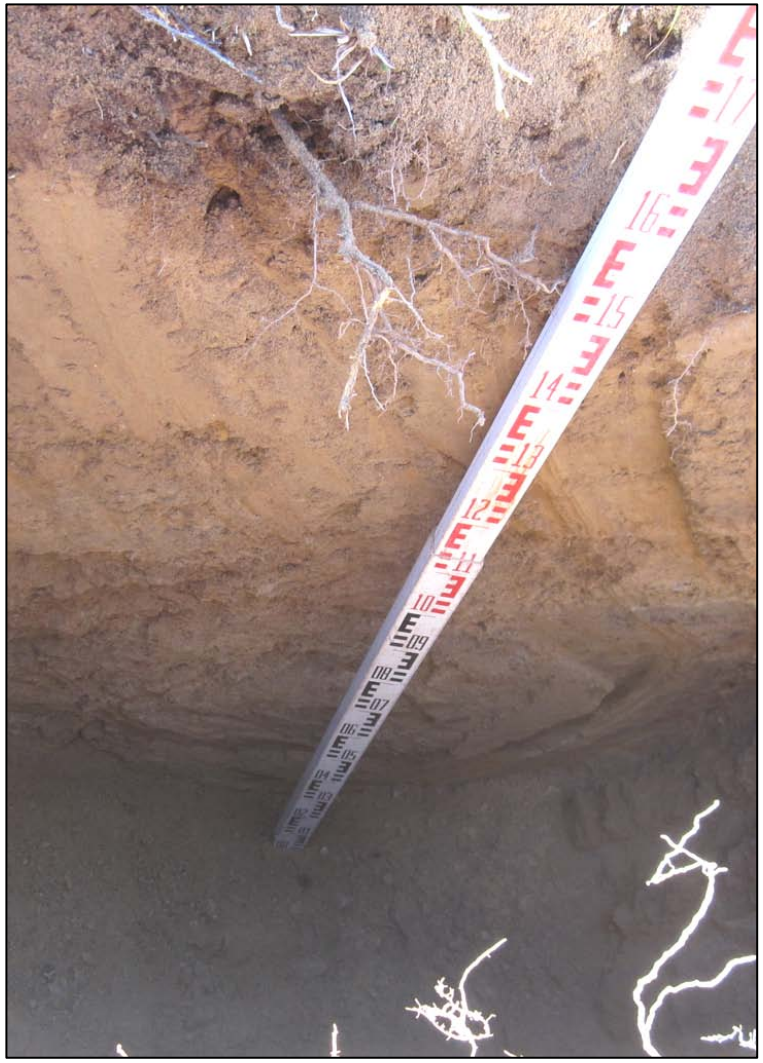


PHOTO 68 – TP10-371 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 69 – TP10-372 Pit

PHOTO 70 – TP10-372 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 71 – TP10-373 Pit

PHOTO 72 – TP10-374 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 73 – TP10-375 Pit

PHOTO 74 – TP10-375 Cobbles

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 75 – TP10-376 Pit

PHOTO 76 – TP10-377 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 77 – TP10-378 Pit

PHOTO 78 – TP10-378 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 79 – TP10-379 Pit

PHOTO 80 – TP10-380 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 81 – TP10-381 Pit

PHOTO 82 – TP10-382 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 83 – TP10-383 Pit

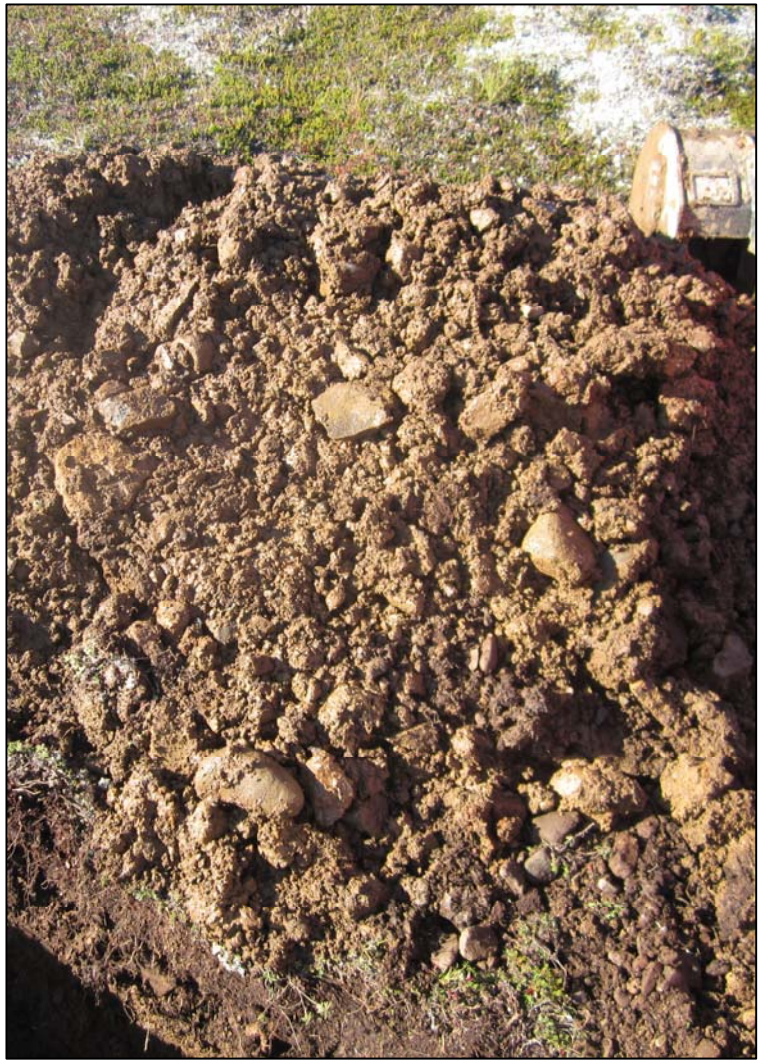


PHOTO 84 – TP10-383 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 85 – TP10-384 Pit

PHOTO 86 – TP10-384 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 87 – TP10-385 Pit

PHOTO 88 – TP10-386 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 89 – TP10-387 Pit

NO
PHOTO
AVAILABLE

PHOTO 90 – TP10-388

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 91 – TP10-389 Pit

PHOTO 92 – TP10-389 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 93 – TP10-390 Top Layer Removed

PHOTO 94 – TP10-390 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 95 – TP10-391 Pit

PHOTO 96 – TP10-391 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 97 – TP10-392 Pit

PHOTO 98 – TP10-392 Boulder

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 99 – TP10-393 Pit

PHOTO 100 – TP10-393 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 101 – TP10-394 Pit

PHOTO 102 – TP10-394 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 103 – TP10-395 Pit

PHOTO 104 – TP10-395 Cobbles

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 105 – TP10-395 Spoil Pile

PHOTO 106 – TP10-396 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 107 – TP10-396 Spoil Pile

PHOTO 108 – TP10-396 Cobbles

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 109 – TP10-397 Pit

PHOTO 110 – TP10-397 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 111 – TP10-398 Pit

PHOTO 112 – TP10-398 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 113 – TP10-398 Boulders and Cobbles

PHOTO 114 – TP10-399 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 115 – TP10-399 Spoil Pile

PHOTO 116 – TP10-400 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 117 – TP10-400 Spoil Pile

PHOTO 118 – TP10-401 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 119 – TP10-401 Spoil Pile

PHOTO 120 – TP10-402 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 121 – TP10-403 Pit

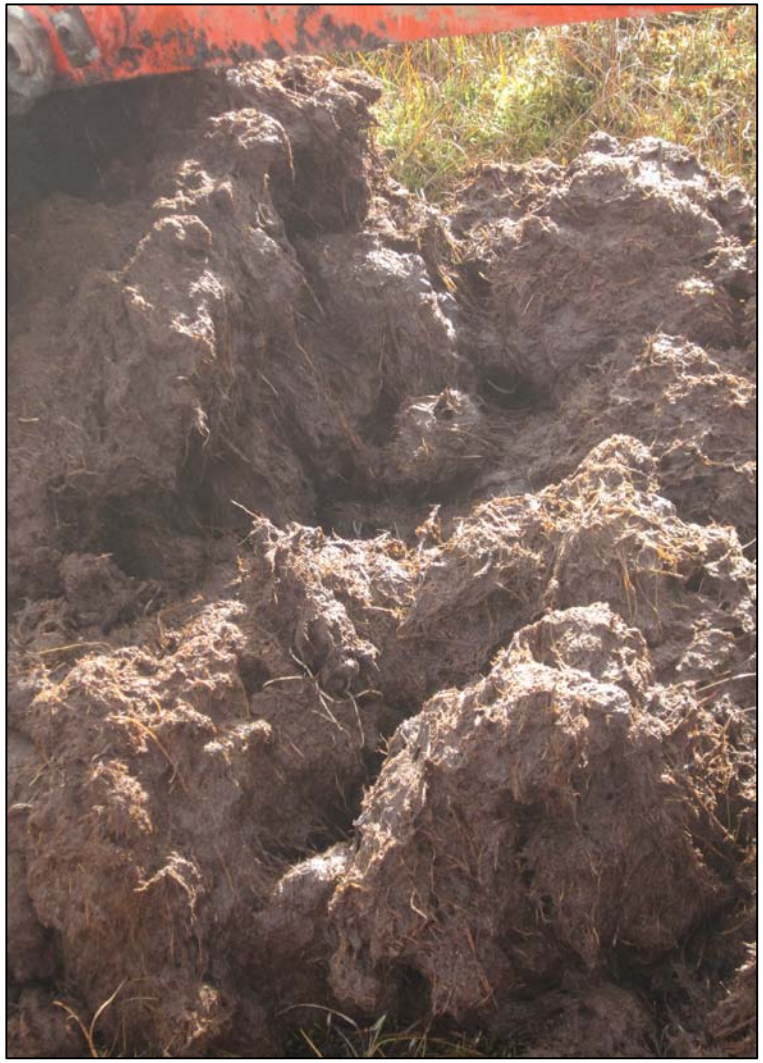


PHOTO 122 – TP10-403 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 123 – TP10-404 Pit

PHOTO 124 – TP10-404 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 125 – TP10-405 Pit

PHOTO 126 – TP10-406 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 127 – TP10-406 Detail of Spoil Pile

PHOTO 128 – TP10-407 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 129 – TP10-407 Spoil Pile

PHOTO 130 – TP10-408 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 131 – TP10-408 Spoil Pile

PHOTO 132 – TP10-409 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 133 – TP10-409 Spoil Pile

PHOTO 134 – TP10-410 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 135 – TP10-410 Spoil Pile

PHOTO 136 – TP10-411 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

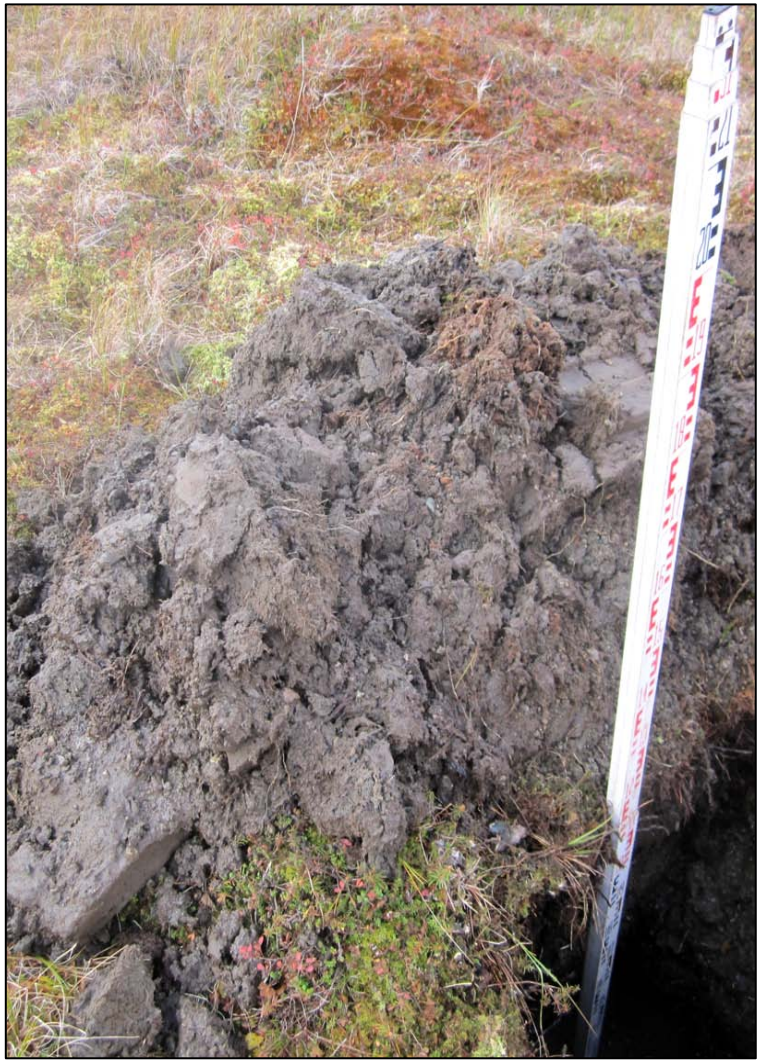


PHOTO 137 – TP10-411 Spoil Pile

PHOTO 138 – TP10-412 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 139 – TP10-412 Spoil Pile

PHOTO 140 – TP10-413 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 141 – TP10-414 Pit

PHOTO 142 – TP10-414 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 143 – TP10-415 Pit

PHOTO 144 – TP10-416 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

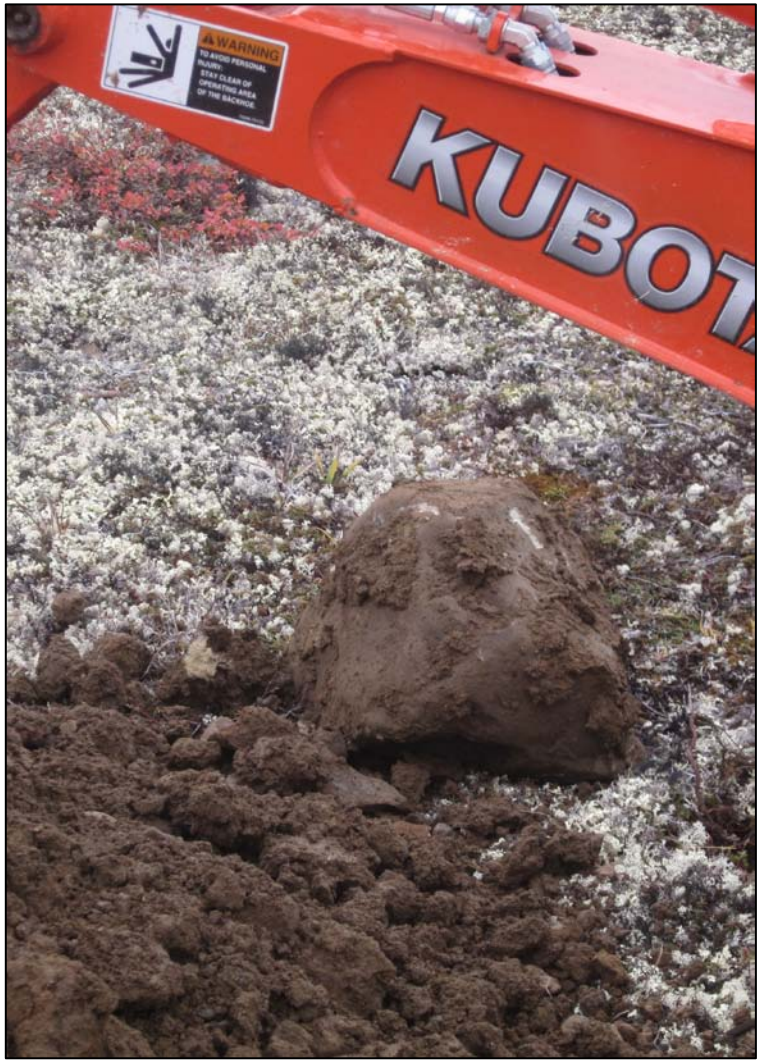


PHOTO 145 – TP10-416 Boulder

PHOTO 146 – TP10-417 Pit

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 147 – TP10-418 Pit

PHOTO 148 – TP10-418 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 149 – TP10-419 Pit

PHOTO 150 – TP10-419 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

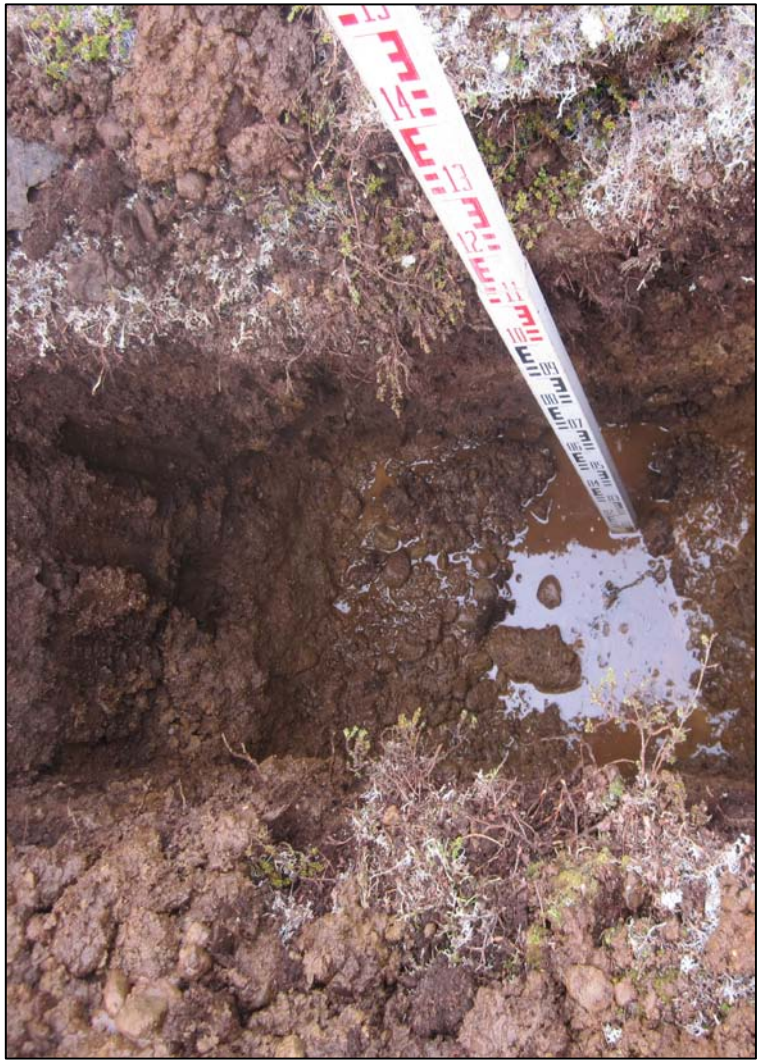


PHOTO 151 – TP10-420 Pit

PHOTO 152 – TP10-420 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 153 – TP10-421 Pit

PHOTO 154 – TP10-421 Soil Sample

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 155 – TP10-422 Pit

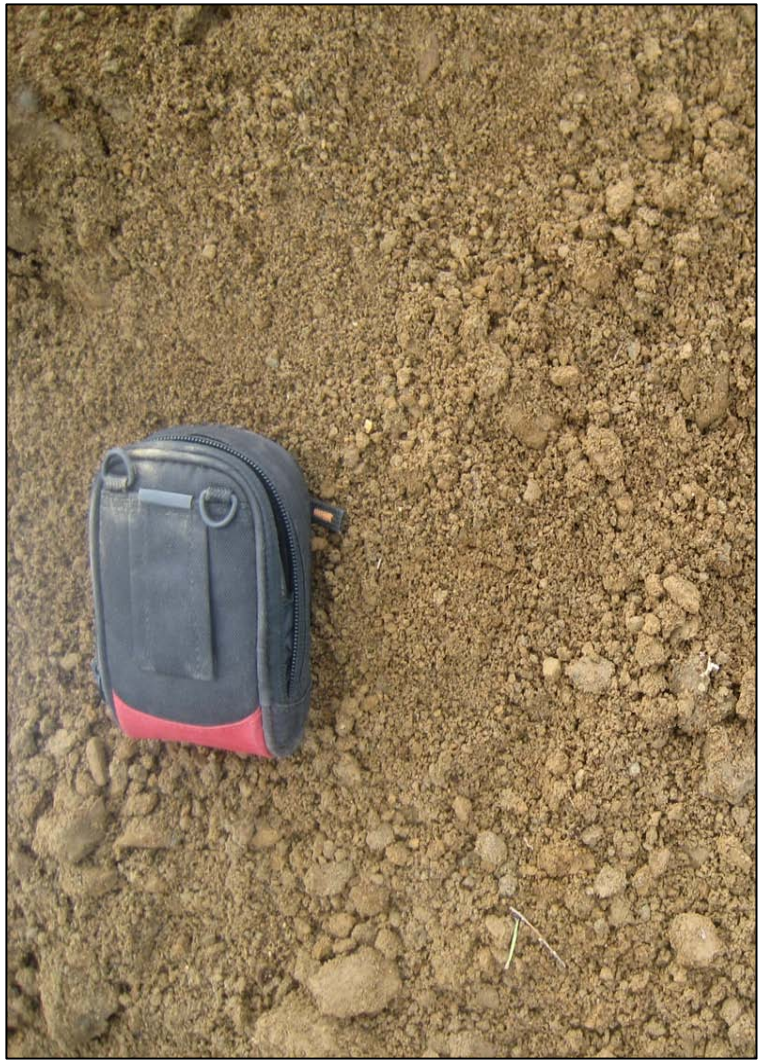


PHOTO 156 – TP10-422 Soil Sample

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 157 – TP10-423 Pit

PHOTO 158 – TP10-423 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 159 – TP10-424 Pit

PHOTO 160 – TP10-424 Spoil Pile

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

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APPENDIX B

GEOTECHNICAL DRILLHOLE DATA

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APPENDIX B1

OVERBURDEN GEOTECHNICAL DRILLHOLE LOGS

- GH10-211 to GH10-228

(Page B1-1 to B1-59)

Project:	**Pebble Project**	Drill Hole No.	**GH10-211**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Sep 6, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1463 ft**	Date Completed:	**Sep 8, 10**
Location:	**Area E**	Total Depth:	**50 ft**	Logged by:	**CG/JPN/AA**
Coordinates:	**2,161,758 N , 1,397,211 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Sandy SILT, some gravel, trace clay, subangular to subrounded, some boulders up to 17" diameter, poorly graded, low plasticity, light brown, root vegetation, moist. (Glacial Drift)	49						Core Size: PQ3 to 26' HQ3 to 50' HWT casing stuck in hole from 21-26'.
5	1									
	2		WEATHERED BEDROCK, Granodiorite, fine to medium grained, grey to dark grey with moderate to highly weathered, highly fractured, iron oxide on fracture surfaces, weak.	76						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3			73						
	4									
15										
	5		BEDROCK, Granodiorite, fine to medium grained, grey to dark grey, weak propylitic alteration, weak to moderately silicified, hematite on fracture surfaces from 15 - 26', rubble zones at 43 - 44' and 49 - 50', weakly to moderately fractured, pyrite, quartz, calcite, chalcopyrite, disseminated and in veinlets, possible trace molybdenite.	66						***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***
20	6			100						
	7									UCS Sample taken at 28.5 - 29.5'
25	8			84						
30	9									
	10			99						
35	11			100						
40	12									UCS Sample taken at 40.5 - 41.5'
	13			96						
45	14			90						
	15			95						Rods sheared off at pin at 49', hole was terminated.
50			END OF HOLE @ 50 FT							
	16									

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-211

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-211

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-212**	Page	**1 of 3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1429 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**115 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,160,442 N , 1,397,588 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Silty SAND, some gravel to gravelly, trace to some cobbles, some clay, subrounded to subangular, well graded, low plasticity, bown, moist, occasional root inclusions up to 4' depth. (Glacial Drift)	60							HWT Casing to 60'. Core Size: PQ3 to 58.5', HQ3 to 115'.	
5	1											
	2			0								
10	3											
	4			25	50		GH10-212 SPT #1	14/9/12	21			
15	5			20								
			SAND AND GRAVEL, some silt, some clay, some cobbles, some zones with less gravel, subrounded to subangular, poorly graded, no to low plasticity, light brown with some reddish brown zones, moist, zone with higher fines content from 50 - 51.5', poor recovery, fines mostly washed away, iron oxide staining on clasts throughout interval. (Glacial Drift)								
20	6			20	33		GH10-212 SPT #2	29/50+/-	50+		***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7											
25					89		GH10-212 SPT #3	30/43/38	81			
	8			20								
30	9				3		GH10-212 SPT #4	12/22/32	54			
	10			30								
35					56		GH10-212 SPT #5	21/30/27	57			
	11			20								
40	12				89		GH10-212 SPT #6	23/49/50	99			
	13			40								
45	14				0		GH10-212 SPT #7	50/50+/-	50+			
	15			5								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-212

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-212

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-212**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1429 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**115 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,160,442 N , 1,397,588 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES
				33							
	16			12							
55	17			16							
	18		BEDROCK, Cretaceous Wacke to Siltstone/Mudstone, dark grey, fine to medium grained, laminated, quartz veins, competent, hard, siliceous, trace vein and disseminated sulphide mineralization, iron oxides on fracture surfaces from 58.5 to 70'.	95							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
60	19			100							
65				98							UCS Sample taken at 64.5 - 65.5'.
	20			100							
70	21										
	22			100							
75	23			100							
	24										
80	25			100							
85	26			100							UCS Sample taken at 86 - 86.7'.
	27										
90	28			39							
95	29			100							
	30										

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-212

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-212

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-212**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1429 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**115 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,160,442 N , 1,397,588 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			98								
105	32										UCS Sample taken at 107'.	
				98								
	33											
110												
	34			97								
				92								
115	35		END OF HOLE @ 115 FT									
	36											
120												
	37											
125	38											
	39											
130												
	40											
135	41											
	42											
140												
	43											
145	44											
	45											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-212

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-212

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-213**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 9, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1613 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**165 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,161,546 N , 1,399,036 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Silty, gravelly SAND, some cobbles, trace clay, subangular to subrounded, poorly graded, low plasticity, light brown to grey brown, moist. (Glacial Drift)	10							Core Size: PQ3 to 29.5', HQ3 to 165'.	
5	1				33	X	GH10-213 SPT #1	11/18/17	35	●		
	2		GRAVEL, some silt, some sand, trace clay, subangular, well graded, low to no plasticity, light brown, loose, moist. (Glacial Drift)	12								
10	3		GRAVEL and SAND, trace silt/clay, subangular, well graded, fine to coarse gravel clasts and sand, non plastic, light brown, moist. (Glacial Drift)	13								
	4				22	X	GH10-213 SPT #2	16/26/13	39	●		
15	5			9								
20	6			39	39	X	GH10-213 SPT #3	16/30/50+	50+	●		
			BEDROCK, Granodiorite, dark grey, medium grained, slightly weathered, iron oxide alteration lessening with depth, moderately to highly fractured, weak to medium strong.								* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	7			52						■		
25	8			80						■		
	9			0							***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
30		▼										▼
	10			100						■		
35	11			89						■		
40	12											
	13			100						■		
45	14			95						■		
	15											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-213

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-213**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 9, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1613 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**165 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,161,546 N , 1,399,036 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16			72								
55	17			33								
	18											
60	19			62								
65	20			85								
	21											
70	22		BEDROCK FAULT ZONE, upper contact 15°tca, deformed and brecciated, sheared intrusion, fault gouge matrix, very soft, approximately 20% gouge, locally competent, moderately fractured, highly fractured from 80 - 90', weak.	91								
75	23			100								
	24											
80	25			90								
85	26			77								
	27											
90	28		BEDROCK, Siltstone, dark brown, hornfelsed, fine grained, locally very fractured from drilling process and fault breccia below, calcite/chlorite veins, disseminated pyrite, trace chalcopyrite, core redrill from 92 - 95.2'.	0								
				90								
95	29											
	30		BEDROCK, Unknown lithology, bleached and silicified, milky white to grey, fine grained, possible interval of siltstone or intrusive rock,	100								

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-213**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 9, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1613 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**165 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,161,546 N , 1,399,036 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		calcite veins 60°tca, pyrite, trace chalcopyrite, moderately fractured.	59								
105	32		BEDROCK, Cretaceous Siltstone, dark brown to tan, hornfelsed, fine grained, moderately fractured at ~5°tca to 110', more competent from 110 - 118.9', biotite/chlorite veins, thin pyrite veinlets with trace chalcopyrite, weakly silicified.	69								
	33											
110	34			77								
115	35			100								
	36		BEDROCK, Diorite, dark to light green to grey brown, fine grained, moderate propylitic alteration, thin pyrite veins, minor quartz veins, calcite veins 60°tca.									
120	37			100								
125	38											
	39			100								
130	40			100								
135	41											
	42			94								
140	43			100								
145	44											
	45			88								

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Pebble Project
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-213**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 9, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1613 ft**	Date Completed:	**Sep 12, 10**
Location:	**Area E**	Total Depth:	**165 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,161,546 N , 1,399,036 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	46			97								
	47											
155											UCS Sample taken at 155.5 - 156.5'.	
	48			100								
160												
	49			100								
	50											
165			END OF HOLE @ 165 FT									
	51											
170												
	52											
	53											
175												
	54											
180												
	55											
	56											
185												
	57											
190												
	58											
	59											
195												
	60											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-214**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 13, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1368 ft**	Date Completed:	**Sep 16, 10**
Location:	**Area E**	Total Depth:	**135 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,159,461 N , 1,398,287 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			GRAVEL and SAND, fine to coarse sand, some silt/clay, trace cobbles and boulders, subangular to subrounded, well graded, no to low plasticity, brown, trace organics, moist, some zones with higher fines content and better recovery. (Glacial Drift)	26							Core Size: PQ3 to 57', HQ3 to 135'.	
5	1				56	☒	GH10-214 SPT #1	32/20/28	48	●		
	2			87								
10	3				44	☒	GH10-214 SPT #2	14/11/10	21	●		
	4			20								
15	5				44	☒	GH10-214 SPT #3	4/10/11	21	●		
				46								
20	6		Sandy GRAVEL, some silt/clay, coarse gravel, trace cobbles and boulders, subrounded, poorly graded, low plasticity, brown, moist, iron oxide alteration increasing with depth. (Glacial Drift)		33	☒	GH10-214 SPT #4	15/20/26	46	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7			16								
25	8				61	☒	GH10-214 SPT #5	19/50/50+	100+	●		
				33								
30	9		HIGHLY WEATHERED BEDROCK, Cretaceous Wacke, medium grained, yellow brown, very weak, highly altered to Silty, gravelly SAND, trace clay, subrounded to subangular, poorly graded, low plasticity, moist, iron oxide staining.		56	☒	GH10-214 SPT #6	9/14/19	33	●	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	10			35						■		
35	11				72	☒	GH10-214 SPT #7	8/11/18	29	●		
				60						■		
40	12											
	13			68						■		
45	14											
				62						■		
	15											

Pebble Limited Partnership
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Project No.	Ref. No.	Rev.
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-214**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 13, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1368 ft**	Date Completed:	**Sep 16, 10**
Location:	**Area E**	Total Depth:	**135 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,159,461 N , 1,398,287 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16		BEDROCK, Cretaceous Wacke, fine grained, grey brown to dark grey, rare medium grained wacke interbeds, rusty yellow or reddish orange iron oxidized fracture surfaces, iron oxide alteration decreases at 70' depth, quartz veins, disseminated pyrite and chalcopyrite, trace sulphide mineralization, bedding is ~55°tca where present, highly fractured, overall not strong.	26								
55	17			98								
	18			33								
60	19			98								
65	20			79								
70	21											
	22			92								
75	23			51								
	24											
80	25			98								
85	26			66								
	27											
90	28		BEDROCK, Cretaceous Siltstone/Mudstone to Wacke, dark brown to grey, very fine grained, laminated siltstone with ~10% interbedded light to dark brown fine grained wacke, bedding is ~50°tca where present, no oxidation, core is rubbly in fractured zones from 90 - 101.5', rare calcite and pyrite veinlets, trace sulphide mineralization.	98								
95	29			98								
	30											

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-214**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 13, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1368 ft**	Date Completed:	**Sep 16, 10**
Location:	**Area E**	Total Depth:	**135 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,159,461 N , 1,398,287 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		FAULT ZONE, consists of ~50% clay gouge, white to light grey, weak.	96								
105	32		BEDROCK, Cretaceous Siltstone/Mudstone to Wacke, dark brown to grey, very fine grained, laminated siltstone with ~10% interbedded light to dark brown fine grained wacke, bedding is ~50°tca where present, no oxidation, core is rubbly in fractured zones from 105 - 135', rare calcite and pyrite veinlets, trace sulphide mineralization.								UCS Sample taken at 107 - 108'.	
	33			98								
110	34										UCS Sample taken at 112 - 113'.	
				100								
115	35											
	36			100								
120	37											
				100								
125	38											
				100								
	39			98								
130	40										UCS Sample taken at 131'.	
				100								
135	41		END OF HOLE @ 135 FT									
	42											
140	43											
	44											
145	45											

Pebble Limited Partnership
Pebble Project
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-215**	Page	**1 of 2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 13, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1154 ft**	Date Completed:	**Sep 15, 10**
Location:	**Area G**	Total Depth:	**75 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,165,467 N , 1,382,647 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES
			Gravelly, silty SAND, trace clay, occasional boulders and large cobbles, most clasts are gravel size, subangular to subrounded, clasts up to 6" diameter, well graded, low plasticity, light brown, loose, moist. (Glacial Drift)	9							Core Size: PQ3 to 15', HQ3 to 75'.
5	1			14	17		GH10-215 SPT #1	6/10/8	18		
	2			18							
10	3		Silty SAND, some gravel, trace clay, trace cobble, subangular to subrounded to 1.5", poorly graded, low plasticity, light brown, moist. (Glacial Drift)	49	58		GH10-215 SPT #2	8/8/13	21		
				44							
	4		BEDROCK, Cetaceous Basalt, dark grey, fine to medium grained, equigranular, massive, silicified, iron oxide on fractures, weak chloritization, fractured, calcite veinlets, sulphide bearing veinlets, some sulphides are oxidized, trace to very fine grained disseminated pyrite, trace chalcopyrite, trace pyrrhotite.	98						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
				100							
15	5			88							
20	6										***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***
	7			98							
25	8			96							
30	9			100							
	10			98							
35	11			100							
40	12										
	13			100							
45	14			100							
	15										

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH10-215**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 13, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1154 ft**	Date Completed:	**Sep 15, 10**
Location:	**Area G**	Total Depth:	**75 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,165,467 N , 1,382,647 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16		BEDROCK, Cretaceous Basalt, dark grey, fine to medium grained, massive, equigranular, silicified, chlorite and calcite veinlets, trace pyrrhotite, sphalerite, and chalcopyrite, sulphides not oxidized in this interval.	100								
55	17			100								
	18											
60	19			100								
65	20			100								
	21											
70	22			100								
75	23		END OF HOLE @ 75 FT									
	24											
80	25											
85	26											
	27											
90	28											
95	29											
	30											

Pebble Limited Partnership
Pebble Project
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Project:	**Pebble Project**	Drill Hole No.	**GH10-216**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 16, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1545 ft**	Date Completed:	**Sep 23, 10**
Location:	**Area G**	Total Depth:	**130 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,150,793 N , 1,373,405 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Silty SAND, some fine to coarse gravel, trace clay, some cobbles, subrounded, well graded, low plasticity, light brown, moist. (Glacial Drift)								6" Casing installed to 21' but later pulled. Core Size: PQ3 to 75', HQ3 to 130'.	
5	1											
			No recovery due to tricone bit being used for 6" permanent casing, some large boulders encountered.									
	2											
10	3			0								
	4											
15	5											
20	6											
			SAND, some gravel and cobbles, some silt, trace clay, subangular and subrounded gravel, clasts are of various lithology, poorly graded, no plasticity, light brown, loose, moist to wet, very poor recovery, most fine material washed away. (Glacial Drift)								Lots of heaving sand from 25 - 60', Difficult drilling, poor recovery.	▼
	7			19								
25	8				6	☒	GH10-216 SPT#1	10/10/3	13	●		
30	9			3								
	10											
35	11				50	☒	GH10-216 SPT#2	21/16/12	28	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
				13								
40	12				67	☒	GH10-216 SPT#3	2/2/7	9	●		
	13			39								
45	14											
				7								
	15											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-216

Knight Piésold CONSULTING

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GH10-216

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SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-216**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 16, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1545 ft**	Date Completed:	**Sep 23, 10**
Location:	**Area G**	Total Depth:	**130 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,150,793 N , 1,373,405 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16			26								
55	17			82								
	18		HIGHLY WEATHERED BEDROCK, Tertiary Siltstone/Mudstone weathered to Silty SAND, some clay, trace gravel, gap graded, low plasticity, grey brown, moist, mudstone boulders and cobbles found throughout, rock is greyish brown, weak, weathered, soft, fractured, zone with very poor recovery from 75 - 78'.								* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
60	19			60								
65	20				44		GH10-216 SPT#4	20/50+/-	50+			
				96								
70	21											
	22			76								
75	23											
				41								
	24											
80			BEDROCK, Tertiary Volcaniclastic Conglomerate, dark grey to rusty brown orange, fresh to slightly weathered, competent, fragmental, clast supported, clasts of various lithology, weakly fractured.									
	25			100								
85	26										Lost circulation at 85'.	
				100								
	27											
90											Lost circulation from 87.5 - 92'.	
	28			100								
95	29											
				100								
	30											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-216**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 16, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1545 ft**	Date Completed:	**Sep 23, 10**
Location:	**Area G**	Total Depth:	**130 ft**	Logged by:	**JPN/AA**
Coordinates:	**2,150,793 N , 1,373,405 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		BEDROCK, Tertiary Wacke/Siltstone/Mudstone, brown, laminated, competent.	96							Lost circulation from 104 - 107'.	
105	32											
	33		BEDROCK, Tertiary Volcaniclastic Conglomerate, dark grey to rusty brown orange, fresh to slightly weathered, competent, fragmental, clast supported, clasts of various lithology, weakly fractured.	100								
110	34			100							Lost circulation from 110 - 117'.	
115	35											
	36			96								
120	37			97							Lost circulation from 120 - 122'.	
125	38											
	39			100								
130	40		END OF HOLE @ 130 FT									
135	41											
	42											
140	43											
145	44											
	45											

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-217**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 17, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1285 ft**	Date Completed:	**Sep 19, 10**
Location:	**Open Pit Area**	Total Depth:	**144 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,158,419 N , 1,400,918 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Silty SAND, some gravel, some cobbles, some clay, subangular, well graded, low plasticity, brown, moist. (Glacial Drift)	43							PQ Casing to 57', HQ Casing to 80'. Core Size: PQ3 to 57', HQ3 to 77', NQ3 to 144'.	
5	1				0	X	GH10-217 SPT #1	5/5/11	16	●		
	2			27								
10	3				100	X	GH10-217 SPT #2	7/8/9	17	●		
	4			10								
15	5				39	X	GH10-217 SPT #3	8/8/16	24	●		
				10								
20	6		Gravelly SAND, some silt, trace clay, subangular gravel clasts, well graded, low plasticity, light brown/yellow, moist. (Glacial Drift)		39	X	GH10-217 SPT #4	1/6/6	12	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7			67								
25				100	89	X	GH10-217 SPT #5	22/40/60	100	●		
	8		HIGHLY WEATHERED BEDROCK, Diorite, grey to light yellow to orange, bedrock fragments, heavily oxidized, friable, very weak.	87						■	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
30	9			79						■		
	10											
35	11			43						■		
40	12											
	13			20						■		
45	14			93						■		
	15											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-217**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 17, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1285 ft**	Date Completed:	**Sep 19, 10**
Location:	**Open Pit Area**	Total Depth:	**144 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,158,419 N , 1,400,918 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16			96								
55				59								
	17		BEDROCK, Diorite, light grey to white with iron oxide staining and alteration throughout, brecciated and fractured, poor competency, friable, weak.	66								
	18											
60				7								
	19											
65	20			100								
	21											
70	22			85								
				98								
75	23		Drilled through void 75 - 77'.	0							Lost circulation in void.	
				33								
	24											
80		▼		33								▼
	25			11								
85	26			75								
	27											
90	28			100								
95	29			57								
	30											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-217**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 17, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1285 ft**	Date Completed:	**Sep 19, 10**
Location:	**Open Pit Area**	Total Depth:	**144 ft**	Logged by:	**BSH/BO**
Coordinates:	**2,158,419 N , 1,400,918 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			83								
105	32			66								
	33											
110	34			68								
115	35			36								
	36											
120	37			37								
125	38			81								
	39											
130	40			100								
135	41			65								
	42											
140	43			66								
145	44		END OF HOLE @ 144 FT									
	45											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-218**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 19, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1166 ft**	Date Completed:	**Sep 21, 10**
Location:	**Open Pit Area**	Total Depth:	**144 ft**	Logged by:	**BSH/BH/BO**
Coordinates:	**2,156,964 N , 1,400,731 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Silty, gravelly SAND, trace to some clay, some to trace cobbles and boulders, subangular to subrounded, clasts up to boulder size, mostly gravel size, well graded, low to no plasticity, light brown, loose, moist, zone from 11 - 21' with lower fines content. (Glacial Drift)	11							PQ Casing to 94'. Core Size: PQ3 to 64.5', HQ3 to 144.	
5	1				56	☒	GH10-218 SPT #1	11/24/14	38	●		
	2			20								
10	3				33	☒	GH10-218 SPT #2	14/23/20	43	●		
	4			33								
15	5				39	☒	GH10-218 SPT #3	8/20/17	37	●		
				43								
20	6				33	☒	GH10-218 SPT #4	15/49/20	69	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7			20								
25	8		▼		50	☒	GH10-218 SPT #5	8/12/20	32	●		▼
				25								
30	9				33	☒	GH10-218 SPT #6	17/18/22	40	●		
	10			12								
35					22	☒	GH10-218 SPT #7	12/50/50+	100+	●		
	11			22								
40	12											
	13			20								
45					28	☒	GH10-218 SPT #8	6/50/50+	100+	●		
	14			5								
50	15			59	44	☒	GH10-218 SPT #9	14/30/50+	80+	●		

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-218**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 19, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1166 ft**	Date Completed:	**Sep 21, 10**
Location:	**Open Pit Area**	Total Depth:	**144 ft**	Logged by:	**BSH/BH/BO**
Coordinates:	**2,156,964 N , 1,400,731 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16		HIGHLY WEATHERED BEDROCK, Diorite, dark grey to black with white weathered sections and yellow to reddish orange iron oxide staining, strongly oxidized, fine to medium grained, heavily fractured, not competent, mostly rubble, some solid pieces of core, breccia, quartz veins, trace sulphide mineralization.	66							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89). Lost circulation from 53 - 54'.	
55	17			76								
	18											
60				89								
	19											
65				66								
	20			60								
	21											
70				62								
	22											
75	23			47								
	24											
80				65								
	25											
85	26			46								
	27											
90				70								
	28											
95	29			23								
	30											
100												
	31			2								

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-218**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 19, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1166 ft**	Date Completed:	**Sep 21, 10**
Location:	**Open Pit Area**	Total Depth:	**144 ft**	Logged by:	**BSH/BH/BO**
Coordinates:	**2,156,964 N , 1,400,731 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
105	32											
				39								
	33		BEDROCK, Diorite, dark grey to black, fine to medium grained, some iron oxide weathering, more competent, brecciated zones, quartz veins, trace sulphide mineralization.									
110												
	34			55								
115	35											
				20								
	36											
120												
	37			100								
125	38		BEDROCK, Monzodiorite, grey brown, medium grained, iron oxide alteration on most fracture surfaces, rock is intensely altered/weathered from 124 - 130, and 139 - 144', rock is light yellow orange gouge in these zones, not competent, quartz veins, trace sulphide mineralization.									
				87								
	39											
130												
	40			100								
135	41											
				84								
	42											
140												
	43			82								
	44		END OF HOLE @ 144 FT									
145												
	45											
150	46											

Pebble Limited Partnership
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Project:	**Pebble Project**	Drill Hole No.	**GH10-219**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 21, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1012 ft**	Date Completed:	**Sep 24, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**158 ft**	Logged by:	**BH/BO**
Coordinates:	**2,160,637 N , 1,405,153 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	Silty, gravelly SAND, some clay, subrounded to subangular, clasts up to large cobble size, mostly gravel size, well graded, low to no plasticity, dark brown, loose, root inclusions, moist to damp. (Glacial Drift)	12					Core Size: PQ3 to 53', HQ3 to 158'.
5		60	39	GH10-219 SPT #1	2/1/2	3	
10		33	28	GH10-219 SPT #2	9/9/10	19	
15		40	17	GH10-219 SPT #3	7/6/10	16	
20	SAND and SILT, some clay, trace gravel, subrounded, poorly graded, low plasticity, light brown, moist. (Glaciolacustrine)	4	50	GH10-219 SPT #4	4/6/10	16	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***
25		0	67	GH10-219 SPT #5	5/5/9	14	
30	Clayey SILT, some sand, trace gravel, trace cobbles, poorly graded, low to medium plasticity, grey brown, stiff, moist. (Glaciolacustrine)	37	61	GH10-219 SPT #6	3/5/4	9	
35	Silty, gravelly SAND, some clay, trace cobbles and boulders, fine to coarse gravel, subrounded, gap graded, low to medium plasticity, grey brown, moist. (Glacial Drift)	33	0	GH10-219 SPT #7	4/5/8	13	
40		35	33	GH10-219 SPT #8	7/7/9	16	
45		67	67	GH10-219 SPT #9	8/22/50+	72+	
50	BEDROCK, Tertiary Volcaniclastic Conglomerate, matrix supported, dark green matrix, clasts are subangular to subrounded and vary from 0.75 to 2.5" in diameter, clasts are all of the same volcanic lithology.	90					* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
55		64					
							UCS Sample taken at 58 - 59'.

DEPTH (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

GRAPHIC LOG

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH10-219**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 21, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1012 ft**	Date Completed:	**Sep 24, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**158 ft**	Logged by:	**BH/BO**
Coordinates:	**2,160,637 N , 1,405,153 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	19			100								
65	20		BEDROCK, Tertiary Volcaniclastic Conglomerate, matrix supported, polylithic, medium grained, beige to tan matrix, angular to subangular clasts, clasts are all volcanic in origin, competent, slightly weathered to fresh.	100								
70	21			100								
	22											
75	23			100								
	24		BEDROCK, Fault Breccia, light grey and white, breccia fragments are subrounded, calcite - dolomite cement in matrix, upper contact is rubbly, lower contact is sharp and almost perpendicular to core axis.								UCS Sample taken at 77 - 78'.	
80				100								
	25		BEDROCK, Tertiary Volcaniclastic Conglomerate, beige to tan, matrix supported, polylithic, medium grained matrix, clasts are angular to subangular, competent, fresh to slightly weathered.									
85	26			100								
	27											
90				100								
	28											
95	29			100								
	30											
100				95								
	31		BEDROCK, Tertiary Volcaniclastic Conglomerate, purplish maroon to dark rust red fragmental basalt conglomerate, calcite cement, upper and lower contacts are rubbly, competent.								UCS Sample taken at 103 - 104'.	
105	32			95								
	33		BEDROCK, Tertiary Conglomerate, clast supported conglomerate in beige, medium grained wacke matrix, subrounded to rounded clasts are polylithic and range from 0.4 to 9" diameter, coarse grained wacke beds found throughout, some calcite, fresh to slightly weathered, competent, rubble zone at top of interval.									
110	34			66								
115	35			89								
	36											

Pebble Limited Partnership
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Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-219

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-219**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 21, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1012 ft**	Date Completed:	**Sep 24, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**158 ft**	Logged by:	**BH/BO**
Coordinates:	**2,160,637 N , 1,405,153 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	37			100								
125	38			97								
	39											
130	40			75							UCS Sample taken at 131 - 132'.	
135	41			100								
	42											
140	43			33								
145	44			89								
	45											
150	46			100								
155	47			100								
	48		END OF HOLE @ 158 FT									
160	49											
	50											
165	51											
170	52											
	53											
175	54											

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-220**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Sep 23, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1986 ft**	Date Completed:	**Oct 6, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**JPN/AA/DDF**
Coordinates:	**2,148,401 N , 1,366,690 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		BOULDERS and COBBLES, Granodiorite, Gravelly SAND, coarse grained, some silt, trace clay, subangular, frost shattered rock on surface, gap graded, light grey to dark grey rock fragments with dark brown soil, some iron oxide staining, slightly weathered, organics present in top 6". (Felsenmeer)	46							Core Size: PQ3 to 13' HQ3 to 600'.	
5	2			45								
				57							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
10	3			100								
	4											
15	5		BEDROCK, Granodiorite, light to medium grey, some intervals brown green due to alteration, weak to moderate alteration, some smaller zones are highly altered, porphyritic, minor veins of calcite, chlorite, hematite, clay, weak chloritization, weakly to moderately fractured.	100								
20	6			100								
	7											
25	8			100								
30	9			89							Hole was drilled with Pure-Vis from 29 - 35'.	
	10			93								
35	11			100								
40	12											
	13			100								
45	14			100							Hole was drilled with Pure-Vis from 45 - 60'.	
50	15											
	16			100								
55	17			100								
60	18											
	19			100								
65	20			100								
70	21											
	22			100								
75	23			100								
80	24											
	25			100								
85	26			100								
90	27											
	28			100							Hole was drilled with Pure-Vis from 90 - 225'.	
95	29			100							Lost circulation 97-100'	
100	30											
	31			100								
105	32			100								
110	33											
	34			100							***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
115	35			100								
120	36											
	37			100								

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-220**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Sep 23, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1986 ft**	Date Completed:	**Oct 6, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**JPN/AA/DDF**
Coordinates:	**2,148,401 N , 1,366,690 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	39			100								
130	40			100								
135	41											
	42			100								
140	43			100								
145	44											
	45			100								
150	46			100								
155	47											
	48			100								
160	49			100								
165	50											
	51			100								
170	52			100						>>		
	53			100								
175	54			100								
180	55											
	56			100								
185	57			100								
190	58											
	59			100							Lost circulation from 186 - 187'.	
195	60		195 - 197' Clay in fractures.	95								
200	61											
	62			92							Hole was flushed prior to WestBay installation and airlifted from 200' upward.	
205	63			100								
210	64											
	65			92								
215	66		217 - 220' very altered, very soft.	100								
220	67											
	68			100								
225	69			100								
230	70											
	71			100								
235	72		235 - 237' very weathered zone, possible small fault or cave.	100							Hole was drilled with Pure-Vis from 235 - 385'.	
240	73											
	74			100								
245	75											
	76			100								

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-220**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Sep 23, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1986 ft**	Date Completed:	**Oct 6, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**JPN/AA/DDF**
Coordinates:	**2,148,401 N , 1,366,690 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	77			96								
255	78			81								
260	79											
	80			100								
265	81			100								
270	82											
	83			100								
275	84			100								
280	85											
	86			100								
285	87			100							Pure-Vis added due to high torque from 285 - 290'	
290	88											
	89			100								
295	90			96								
300	91											
	92			100								
305	93			100								
310	94											
	95			100								
315	96			100								
320	97											
	98			100								
325	99			100								
330	100											
	101			100								
335	102			100								
340	103											
	104			100								
345	105			98								
350	106											
	107			98								
355	108			100								
360	109											
	110			100								
365	111			100								
370	112											
	113			100								
	114											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-220**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Sep 23, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1986 ft**	Date Completed:	**Oct 6, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**JPN/AA/DDF**
Coordinates:	**2,148,401 N , 1,366,690 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	115			97								
380	116											
	117			100								
385	118			98								
390	119											
	120			100								
395	121			100								
400	122											
	123			97								
405	124			98								
410	125											
	126			100								
415	127			100								
420	128											
	129			98							Hole was drilled with Pure-Vis from 420-460'.	
425	130			100								
430	131											
	132			100								
435	133			100								
440	134											
	135			100								
445	136			100								
450	137											
	138			100								
455	139			99								
460	140											
	141			100								
465	142											
	143			100								
470	144			95								
475	145											
	146			100								
480	147			100								
485	148											
	149			100								
490	150			100								
495	151											
	152			100								

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-220**	Page	**5 of 5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Sep 23, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1986 ft**	Date Completed:	**Oct 6, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**JPN/AA/DDF**
Coordinates:	**2,148,401 N , 1,366,690 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	153			96								
505	154											
	155			100								
510	156			100								
515	157											
	158			100								
520	159			100							Hole was drilled with Pure-Vis from 520 - 560'.	
525	160											
	161			100								
530	162			100								
535	163											
	164			98								
540	165			100								
545	166											
	167			100								
550	168			100								
555	169											
	170			96								
560	171			100								
565	172											
	173			94								
570	174			100								
575	175											
	176			98								
580	177			100								
585	178											
	179			100								
590	180											
	181			98								
595	182			98								
600	183		END OF HOLE @ 600 FT									
	184											
605	185											
610	186											
	187											
615	188											
620	189											
	190											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-221**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 24, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1006 ft**	Date Completed:	**Sep 30, 10**
Location:	**Open Pit Area**	Total Depth:	**139 ft**	Logged by:	**BH/BO**
Coordinates:	**2,159,171 N , 1,405,547 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Gravelly, silty SAND, trace clay, medium grained, subangular clasts up to gravel size, trace cobbles, poorly graded, low plasticity, brown, moist. (Glaciofluvial)	33							PQ Casing to 73'. Core Size: PQ3 to 55', HQ3 to 139'.	
5	1				22	X	GH10-221 SPT #1	4/5/9	14	●		
	2			10								
10	3		Gravelly SAND, some silt, trace clay, subangular to subrounded clasts up to gravel size, trace cobbles, well graded, low plasticity, grey brown, moist. (Glaciofluvial)		67	X	GH10-221 SPT #2	6/6/10	16	●		
	4			38								▼
15	5				56	X	GH10-221 SPT #3	5/21/36	57	●		
				73								
20	6				89	X	GH10-221 SPT #4	8/9/7	16	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7			81								
25	8		Silty SAND, some gravel, some clay, some gravelly zones, subrounded to subangular, clasts up to large cobble size, mostly gravel size, gap graded, low plasticty, brown, moist. (Glacial Drift)		72	X	GH10-221 SPT #5	7/11/12	23	●		
				27								
30	9				67	X	GH10-221 SPT #6	7/14/14	28	●		
	10			7								
35	11										SPT not completed due to rods not reaching testing interval due to possible heaving sands.	
				15								
40	12											
	13			45								
45	14				94	X	GH10-221 SPT #7	8/10/13	23	●		
	15											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-221**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 24, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1006 ft**	Date Completed:	**Sep 30, 10**
Location:	**Open Pit Area**	Total Depth:	**139 ft**	Logged by:	**BH/BO**
Coordinates:	**2,159,171 N , 1,405,547 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16			42								
55	17			65								
	18											
60	19			12								
65	20		No recovery 64 - 69'.	0							Heaving sands 65 - 73'.	
70	21		SAND, some gravel, trace to some silt, trace clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, poorly graded, non plastic, brown, moist, fines washed away. (Glacial Drift)	16								
75	22		No recovery 74 - 79'.	0								
80	23		Silty SAND, some gravel, trace to some clay, subrounded to subangular, clasts up to large cobble size, gap graded, low plasticity, brown, moist, most fines washed away. (Glacial Drift)	7								
85	24											
	25											
	26			27								
90	27		BEDROCK, Tertiary Conglomerate/Wacke, fine grained wacke, coarse-grained clast supported conglomerate, sedimentary and volcanic conglomerate clasts, rounded to subrounded, grey, slightly weathered, competent.	98							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	28			100								
95	29			100								
	30											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-221**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 24, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1006 ft**	Date Completed:	**Sep 30, 10**
Location:	**Open Pit Area**	Total Depth:	**139 ft**	Logged by:	**BH/BO**
Coordinates:	**2,159,171 N , 1,405,547 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32			100								
	33											
110	34			100								
115	35			100								
	36											
120	37			100								
125	38			100								
	39											
130	40			100								
135	41			100								
	42											
140			END OF HOLE @ 139 FT									
	43											
145	44											
	45											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-222**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1054 ft**	Date Completed:	**Oct 2, 10**
Location:	**Open Pit Area**	Total Depth:	**130 ft**	Logged by:	**BO/BH**
Coordinates:	**2,156,961 N , 1,406,600 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Gravelly SAND, some silt, trace clay, trace cobbles, subrounded, poorly graded, low plasticity, brown, moist. (Glacial Drift)	37							PQ casing installed to 75'. Core Size: PQ3 to 70', HQ3 to 130'.	
5	1				50	☒	GH10-222 SPT #1	6/6/6	12	●		
	2		Sandy, silty GRAVEL, trace to some clay, trace cobble and boulders, coarse gravel, subrounded to subangular, gap graded, low plasticity, brown, moist. (Glacial Drift)	20								
10	3				0	☒	GH10-222 SPT #2	6/7/5	12	●		
	4			20								
15	5				67	☒	GH10-222 SPT #3	6/6/8	14	●		
				12								
20	6				0	☒	GH10-222 SPT #4	11/9/14	23	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7			55								
25	8				61	☒	GH10-222 SPT #5	8/7/9	16	●		
				10								
30	9		Gravelly, silty SAND, trace clay, trace cobbles and boulders, gap graded, low plasticity, light brown, moist. (Glacial Drift)		39	☒	GH10-222 SPT #6	14/20/18	38	●		
	10			47								
35	11				56	☒	GH10-222 SPT #7	6/11/13	24	●		
				24								
40	12		Silty, gravelly SAND, some clay, trace cobbles and boulders, subrounded to subangular, well graded, low plasticity, light brown, moist. (Glacial Drift)		0	☒	GH10-222 SPT #8	13/14/18	32	●		
	13			33								
45	14											
				24								

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-222**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1054 ft**	Date Completed:	**Oct 2, 10**
Location:	**Open Pit Area**	Total Depth:	**130 ft**	Logged by:	**BO/BH**
Coordinates:	**2,156,961 N , 1,406,600 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
50					11		GH10-222 SPT #10	21/20/44	64			
	16			25								
55					22		GH10-222 SPT #11	2/15/25	40			
	17			33								
	18											
60					44		GH10-222 SPT #12	18/41/32	73			
	19			28								
65												
	20				100		GH10-222 TILL #1	//				
	21			92								
70			Gravelly SAND, some silt, trace clay, trace cobbles, subrounded to subangular, well graded, low plasticity, light brown, moist, fines washed away. (Glacial Drift)									
	22			46								
75	23		HIGHLY WEATHERED BEDROCK, Tertiary Conglomerate, heavily iron oxidized, highly fractured, fine grained wacke matrix, rounded to subrounded clasts up to 2" diameter, clasts are of various lithology, becoming more competent with depth.								* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	24			70								
80												
	25			91								
85	26		BEDROCK, Tertiary Conglomerate, less iron oxidation, fine grained wacke matrix, rounded to subrounded clasts up to 2" diameter, clasts are of various lithology, competent, becoming more clast supported with depth, lower contact is sharp at 75°tca.									
	27			100								
90												
	28			99								
95	29											
				100								

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-222**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1054 ft**	Date Completed:	**Oct 2, 10**
Location:	**Open Pit Area**	Total Depth:	**130 ft**	Logged by:	**BO/BH**
Coordinates:	**2,156,961 N , 1,406,600 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
100	30											
	31			100								
105	32											
			BEDROCK, Tertiary Siltstone/Mudstone, dark grey to black, finely laminated, bedding ranges from 65 - 75°tca, lower contact is gradational over 2".	91								
	33											
110	34			98								
115	35		BEDROCK, Tertiary Volcaniclastic Conglomerate, grey, polylithic clasts ranging from 0.1 - 1.2", subangular, clasts are moderately well sorted and comprise 30% of interval, matrix is soft, grey mudstone, weakly developed fabric ~65 - 70°tca, minor fine grained pyrite.									
	36			100								
120	37			99								
125	38											
	39			99								
130			END OF HOLE @ 130 FT									
	40											
135	41											
	42											
140	43											
145	44											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-223**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1005 ft**	Date Completed:	**Oct 5, 10**
Location:	**Open Pit Area**	Total Depth:	**110 ft**	Logged by:	**BO/BH/AA**
Coordinates:	**2,156,284 N , 1,404,713 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			SAND and GRAVEL, trace silt, trace clay, trace cobbles, subangular to subrounded, well graded, non plastic, brown, dry to moist, fines mostly washed away. (Glaciofluvial)	33							PQ casing installed to 45'. Core Size: PQ3 to 43', HQ3 to 110'	
5	1				39		GH10-223 SPT #1	7/23/25	48			
	2			68								
10	3				50		GH10-223 SPT #2	13/18/50+	68+			
	4			38								
15	5		Silty, gravelly SAND, trace clay, trace cobbles, trace boulders, subangular to subrounded, well graded, low plasticity, brown, moist. (Glacial Drift)	67	17		GH10-223 SPT #3	40/50+/-	50++			
20	6				72		GH10-223 SPT #4	37/41/48	89		***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
	7			55								
25	8		SAND and GRAVEL, trace silt, trace clay, trace cobbles, subangular to subrounded, poorly graded, non plastic, brown, moist, iron oxide on joint surfaces, fines mostly washed away. (Glacial Drift)	27								
30	9		Sandy SILT, some clay, some gravel, some gravelly zones, trace cobbles, subangular to subrounded, gap graded, low plasticity, grey, moist. (Glacial Drift)		50		GH10-223 SPT #5	4/8/7	15			
	10			28								
35	11		Sandy, silty GRAVEL, trace clay, trace cobbles, trace boulders, subangular to subrounded, gap graded, low plasticity, light brown, moist. (Glacial Drift)	75	89 92		GH10-223 SPT #6 GH10-223 TILL #1	8/18/26 //	44			
	12											
40	13		Gravelly SAND, some silt, trace clay, trace boulders, subangular to subrounded, gap graded, low plasticity, light brown, moist, fines washed away. (Glacial Drift)	33	56		GH10-223 SPT #7	23/48/47	95			

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Project:	**Pebble Project**	Drill Hole No.	**GH10-223**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1005 ft**	Date Completed:	**Oct 5, 10**
Location:	**Open Pit Area**	Total Depth:	**110 ft**	Logged by:	**BO/BH/AA**
Coordinates:	**2,156,284 N , 1,404,713 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
45	14		BEDROCK, Tertiary Basalt, dark grey, fine grained, weakly porphyritic, calcite veinlets, chlorite alteration, lower contact is soft and bleached, competent, moderately fractured.	105							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	15			97								
50			BEDROCK, Cretaceous Diorite, fine grained, massive, dark brown to black, moderately soft, pyrite veins, chlorite, calcite, sericite, silicification, trace disseminated chalcopyrite, highly fractured.									
	16			100								
55	17			80								
	18		BEDROCK, Cretaceous Granodiorite, light grey to tan, moderately fractured, upper and lower contacts are broken but appear sharp and planar, ~30°tca.									
60			BEDROCK, Cretaceous Diorite, fine grained, massive, dark brown to black, moderately soft, pyrite veins, chlorite, calcite, sericite, silicification, trace disseminated chalcopyrite, highly fractured, more altered zone from 62 - 64.7', core is greenish white.									
	19			70								
65	20		BEDROCK, Granodiorite, light grey to tan, upper contact is sharp and planar ~30°tca, lower contact is irregular ~35°tca, pyrite and quartz veins, silicification, sericite, relatively soft, fine disseminated pyrite, moderately fractured.									
	21			100								
70			BEDROCK, Cretaceous Diorite, dark brown to tan, fine grained, porphyritic, moderately soft, some irregular white zones brecciated with white clay cement, rare chalcopyrite, some pyrite, more competent than rock above.									
	22			100								
75	23			100								
	24											
80	25			100								
85	26											

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Project:	**Pebble Project**	Drill Hole No.	**GH10-223**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1005 ft**	Date Completed:	**Oct 5, 10**
Location:	**Open Pit Area**	Total Depth:	**110 ft**	Logged by:	**BO/BH/AA**
Coordinates:	**2,156,284 N , 1,404,713 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	27			100								
90												
	28			98								
95	29											
				100								
	30		BEDROCK, Cretaceous Granodiorite, could also be highly altered Diorite but most likely Granodiorite intrusion, light grey to tan, pyrite veins, sericite, quartz, competent, fractured.									
100												
	31			100								
			BEDROCK, Cretaceous Diorite, dark brown to tan, fine grained, porphyritic, moderately soft, rare chalcopyrite, some pyrite, slightly more competent.									
105	32											
				100								
	33											
110			END OF HOLE @ 110 FT									
	34											
115	35											
	36											
120	37											
125	38											
	39											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-224**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1009 ft**	Date Completed:	**Oct 7, 10**
Location:	**Open Pit Area**	Total Depth:	**80 ft**	Logged by:	**SC/BH**
Coordinates:	**2,154,519 N , 1,403,806 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES
			SILT and SAND, some gravel, trace clay, trace cobbles, subangular, clasts up to boulder size, well graded, medium plasticity, brown, compact, moist. (Glacial Drift)	41							Core Size: PQ3 to 25', HQ3 to 80'.
5	1		SAND, some gravel, trace silt, trace clay, fine to medium grained sand, fine grained gravel, angular to subangular, poorly graded, no to low plasticity, brown, moist, fines washed away. (Glacial Drift)	37	17		SPT 1	2/3/6	9		
10	2		Silty SAND, some gravel, some clay, trace cobbles, fine to medium grained sand, subangular, gap graded, low plasticity, dense, brown, moist. (Glacial Drift)	85	0		SPT 2	9/11/8	19		
15	3		WEATHERED BEDROCK, Granodiorite, fine grained, porphyritic, white to light grey, strong to moderate iron oxide alteration, quartz and sericite alteration, destructive clay alteration from 24 - 25', disseminated pyrite, highly fractured, soft zone from 20 - 25'.	55							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
20	4			49							Lost circulation from 16 to 19'.
25	5			94							Hole caved in at 20'.
30	6			28							
35	7		BEDROCK, Granodiorite, light grey to tan, porphyritic, core is locally very fractured, quartz and pyrite veins, some clay alteration, disseminated pyrite, trace chalcocite, trace chalcopyrite.	100							***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***
40	8			98							
45	9			97							
	10			100							
	11										
	12										
	13										
	14										
	15										

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH10-224**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1009 ft**	Date Completed:	**Oct 7, 10**
Location:	**Open Pit Area**	Total Depth:	**80 ft**	Logged by:	**SC/BH**
Coordinates:	**2,154,519 N , 1,403,806 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16			96								
55	17			95								
	18											
60	19			100								
65	20			91								
	21											
70	22		BEDROCK, Diorite? difficult to tell lithology as there is only 5', dark grey, fine to medium grained, porphyritic, local hematite, weak chlorite alteration, sericite and quartz alteration, moderately fractured, competent, trace chalcopyrite, trace disseminated pyrite, thin pyrite veins.	60								
75	23			100								
	24											
80			END OF HOLE @ 80 FT									
	25											
85	26											
	27											
90	28											
95	29											
	30											

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Project:	**Pebble Project**	Drill Hole No.	**GH10-225**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1960 ft**	Date Completed:	**Oct 27, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**DDF/CBN**
Coordinates:	**2,147,632 N , 1,367,812 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**322, -66**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		SAND and GRAVEL, some cobbles and boulders, trace silt, trace clay, subangular clasts up to boulder size, gap graded, low plasticity, brown, some organics, moist, no recovery from 1 - 3.75' as 10" boulder was pushed through ground surface while drilling. (Felsenmeer)	25							PQ Casing to 23', HQ Casing to 400'. Core Size: PQ3 to 19', HQ3 to 400', NQ3 to 600'. * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	2		No recovery.	0								
10	3		HIGHLY WEATHERED BEDROCK, Granodiorite, brown to whitish-pink, weathered to sand-size particles, soft, sugary texture, clay in groundmass, clay infilling in fractures >0.2", some more competent pieces, propylitic alteration.	100								
	4			75								
15	5			91								
20	6			25								
	7			54								
25	8			100								
30	9		BEDROCK, Granodiorite, medium grained, equigranular, competent, grey, weak propylitic alteration, overall fresh, moderate clay and iron oxide alteration from 32 - 35' and on fractures from 44 - 48', quartz veins from 63 - 64' and 114 - 132', possible aplite intrusions at 25 - 26.6' and 97 - 97.5', high angle (15°tca) structure from 76.8 - 79' with hematite striations.								
	10			90								
35	11			96								
40	12											
	13			96								
45	14			98								
50	15											
	16			97							***Depths are not corrected for hole inclination and are downhole***.	
55	17			97								
60	18											
	19			99								
65	20			100								
70	21											
	22			23								
75	23			90								
80	24											
	25			100							Four Vibrating Wire Piezometers installed in this drillhole.	
85	26											
90	27			99								
	28			100								
95	29											
	30			100								
100	31			100							***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
105	32											
	33			100								
110	34			100								
115	35											
	36			100								
120	37			100								

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Project:	**Pebble Project**	Drill Hole No.	**GH10-225**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1960 ft**	Date Completed:	**Oct 27, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**DDF/CBN**
Coordinates:	**2,147,632 N , 1,367,812 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**322, -66**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	39			100								
130	40		BEDROCK, Granodiorite, medium grained, light grey to pink, equigranular to porphyritic, local chlorite alteration, clay altered from 141.7 - 142.4', small fault zone from 203 - 204' with 20% weak iron oxide alteration, clay gouge, abrupt 35°tca contact, some clay rich veins/gouge intervals from 236 - 256' ranging from 15 - 35°tca, gouge intervals are likely due to groundwater flow, local chlorite, epidote and iron oxide alteration along quartz veins and fractures, locally vugs, aplite dykes from 293 - 297', 307 - 309' and 345 - 345.5'.	83								
135	41											
	42			100								
140	43											
	44			100								
145	45			96								
150	46											
	47			100								
155	48			100								
160	49											
	50			97								
165	51			100								
170	52											
	53			97								
175	54			100								
180	55											
	56			100								
185	57			100								
190	58											
	59			100								
195	60			100								
200	61											
	62			100								
205	63			100								
210	64											
	65			98								
215	66			100								
220	67											
	68			100								
225	69			100								
230	70											
	71			96								
235	72			100								
240	73											
	74			100							Vibrating Wire Piezometer VW15410 (Black wire) installed at 241'.	
245	75			100								
	76											

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Project:	**Pebble Project**	Drill Hole No.	**GH10-225**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1960 ft**	Date Completed:	**Oct 27, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**DDF/CBN**
Coordinates:	**2,147,632 N , 1,367,812 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**322, -66**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	77			100								
255	78			100								
260	79											
	80			83								
265	81			100								
	82											
270	83			100							Hole becomes slightly artesian.	
275	84			100								
	85											
280	86			100								
285	87			96								
	88											
290	89			96								
295	90			100								
	91											
300	92			95								
305	93			100								
	94											
310	95			100								
315	96			98								
	97											
320	98			100								
325	99			98								
	100											
330	101			100								
335	102			100								
	103											
340	104			100								
345	105			99								
	106											
350	107			99								
355	108			99								
	109											
360	110			100								
365	111			100							Vibrating Wire Piezometer VW15411 (White wire) installed at 371'.	
	112											
370	113			100								
	114											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-225

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SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-225**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1960 ft**	Date Completed:	**Oct 27, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**DDF/CBN**
Coordinates:	**2,147,632 N , 1,367,812 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**322, -66**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	115			100								
380	116			100								
	117											
385	118			100								
390	119			100								
	120											
395	121			96								
400	122			94								
	123											
405	124			96								
410	125			84							Artesian flow measured at 0.5 - 1gpm.	
	126											
415	127			100								
420	128			100								
	129											
425	130			100								
430	131			95								
	132											
435	133			100								
440	134			98								
	135											
445	136			100							Vibrating Wire Piezometer VW15414 (Blue wire) was installed at 446'.	
450	137			100								
	138											
455	139			99								
460	140			100								
	141											
465	142			100								
470	143			100								
	144											
475	145			96								
480	146			100								
	147											
485	148			98								
490	149			97								
	150											
495	151			86							Lost circulation from 499 - 500'.	
	152											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-225**	Page	**5** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**NONE**	Date Started:	**Oct 6, 10**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1960 ft**	Date Completed:	**Oct 27, 10**
Location:	**Area L**	Total Depth:	**600 ft**	Logged by:	**DDF/CBN**
Coordinates:	**2,147,632 N , 1,367,812 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**322, -66**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	153			100							Artesian flow measured at 1 - 2.5 gpm.	
505	154											
	155			100								
510	156			100								
515	157											
	158			100								
520	159			94								
525	160											
	161			100								
530	162			97								
535	163											
	164			100								
540	165			92								
545	166											
	167			92								
550	168			83							Lost circulation from 551.5 - 552.5'. Vibrating Wire Piezometer VW15416 (Green Wire) installed at 553'.	
555	169											
	170			97								
560	171											
	172			100								
565	173			100								
570	174											
	175			99								
575	176			96								
580	177											
	178			92								
585	179			99								
590	180											
	181			100								
595	182			100								
600	183		END OF HOLE @ 600 FT									
605	184											
	185											
610	186											
615	187											
	188											
620	189											
	190											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-226**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**998 ft**	Date Completed:	**Oct 14, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**160 ft**	Logged by:	**SC/BH**
Coordinates:	**2,142,009 N , 1,403,372 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Gravelly SILT, some sand, some clay, subrounded to subangular, clasts up to large cobble size, mostly gravel size, poorly graded, low plasticity, brown, some root inclusions, moist. (Glacial Drift)	0							Hole triconed with 7.75" bit to 5', Permanent 6" casing installed to 22'. Core Size: PQ3 to 160'.	
5	1		Sandy, silty GRAVEL, some clay, subangular to subrounded, clasts up to boulder size, poorly graded, low plasticity, brown, moist. (Glacial Drift)	40	67		GH10-226 SPT #1	7/5/6	11			
10	2			37	17		GH10-226 Shelby #1	//				
15	3		Clayey SILT, some gravel, some sand to sandy, subrounded, clasts up to cobble size, poorly graded, low to medium plasticity, brown, moist. (Glaciolacustrine)	24	50		GH10-226 Shelby #2	//				
20	4			49	88		GH10-226 Shelby #3	//			***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
25	5		Sandy GRAVEL, some silt/clay, subrounded to subangular, clasts up to cobble size, poorly graded, low to no plasticity, brown, moist, fine washed away. (Glacial Drift)	15	61		GH10-226 SPT #2	8/15/14	29			
30	6			14	72		GH10-226 SPT #3	10/16/22	38			
35	7			16							Hole collapsed from 35' to 160'.	
40	8		Sandy, gravelly SILT, trace clay, subangular to subrounded, clasts up to cobble size, poorly graded, low plasticity, brown, moist, fines washed away. (Glacial Drift)	10	39		GH10-226 SPT #4	21/19/24	43			

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-226**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**998 ft**	Date Completed:	**Oct 14, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**160 ft**	Logged by:	**SC/BH**
Coordinates:	**2,142,009 N , 1,403,372 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	13				44	X	GH10-226 SPT #5	30/26/21	47			
45	14			16								
			Clayey SILT, some sand, trace gravel, subrounded, clasts up to cobble size, mostly gravel size, poorly graded, low to medium plasticity, brown, moist. (Glaciolacustrine)		28	X	GH10-226 SPT #6	3/17/24	41			
50	15			18								
	16				78	X	GH10-226 SPT #7	3/8/12	20			
55	17		SAND, some silt/clay, trace gravel, subrounded to subangular, clasts up to cobble size, poorly graded, low to no plasticity, brown, moist, poor recovery. (Glaciofluvial)	23								
	18				72	X	GH10-226 SPT #8	25/29/34	63			
60				0								
	19				22	X	GH10-226 SPT #9	4/15/20	35			
				21								
65	20				111	X	GH10-226 SPT #10	10/25/31	56			
				13								
	21											
70			Clayey SILT, some sand, trace gravel, subrounded to subangular, clasts up to gravel size, poorly graded, low to medium plasticity, brown, moist. (Glaciolacustrine)									
	22			18								
75	23		Gravelly SAND, trace to some silt/clay, subrounded to subangular, clasts up to cobble size, mostly gravel size, poorly graded, low to no plasticity, brown, moist, fines washed away. (Glaciofluvial)									
	24			31								
80			Sandy, Silty GRAVEL, trace clay, subangular to subrounded, clasts up to boulder size, well graded, low plasticity, brown, moist, good recovery (Glacial Drift)		0	X	GH10-226 SPT #11	50+/-/-	N/A			
	25			100								

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-226**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**998 ft**	Date Completed:	**Oct 14, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**160 ft**	Logged by:	**SC/BH**
Coordinates:	**2,142,009 N , 1,403,372 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
85	26			43								
	27											
90			Sandy GRAVEL, some silt, trace clay, subangular to subrounded, clasts up to cobble size, poorly graded, low to no plasticity, brown, moist, gravel content decreases at 105', fines washed away. (Glaciofluvial)	15								
	28											
95	29				72	X	GH10-226 SPT #12	14/27/34	61	●		
				7								
	30											
100				16								
	31											
105	32				6	X	GH10-226 SPT #13	20/46/41	87	●		
				12								
	33											
110				10								
	34											
115	35		No Recovery									
				0								
	36											
120												
	37			0								
125	38				56	X	GH10-226 SPT #14	36/50+/-	50++			

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-226**	Page	**4 of 4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 8, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**998 ft**	Date Completed:	**Oct 14, 10**
Location:	**Area A, Valley Bottom**	Total Depth:	**160 ft**	Logged by:	**SC/BH**
Coordinates:	**2,142,009 N , 1,403,372 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	39			0								
130	40		Gravelly SAND, some silt, some clay, subrounded to subangular, mostly subrounded, clasts up to cobble size, poorly graded, low to no plasticity, brown, moist, fines washed away. (Glaciofluvial)	18								
135	41				17		GH10-226 SPT #15	12/40/50+	50+			
	42			22								
140	43			12								
145	44				28		GH10-226 SPT #16	50+/-/-	N/A			
	45			27								
150	46			33								
155	47				17		GH10-226 SPT #17	4/7/9	16		Lost circulation at 160'.	
	48			30								
160	49		END OF HOLE @ 160 FT									
165	50											
	51											

Pebble Limited Partnership
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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-227**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 16, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**798 ft**	Date Completed:	**Oct 20, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**200 ft**	Logged by:	**SC/AL**
Coordinates:	**2,155,964 N , 1,421,653 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Silty SAND and GRAVEL, trace clay, subrounded to subangular, clasts up to fine gravel size, poorly graded, low plasticity, light brown, loose, root inclusions to 5' depth, moist. (Glacial Drift)	27							PQ casing installed to 10'. Core Size: PQ3 to 30', HQ3 to 200'.	
5	1				79		GH10-227 Shelby #1	//				
	2		Gravelly SAND, some silt, trace clay, fine to coarse grained sand, fine grained gravel, subangular and angular, well graded, low plasticity, brown, moist, fines washed away in drill return. (Glacial Drift)	5								
10	3				56		GH10-227 SPT #1	7/8/10	18	●		
	4			22								
15	5				0		GH10-227 SPT #2	17/21/15	36	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
				24								
20	6				28		GH10-227 SPT #3	6/8/10	18	●		
	7			22								
25	8		HIGHLY WEATHERED BEDROCK, Tertiary Monzonite, light green to dark grey-green, highly fractured, chlorite alteration, minor veins of calcite in some of the pieces, weak.	40						■	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
30	9		BEDROCK, Tertiary Monzonite, light green to dark grey-green, moderately fractured, becoming more competent with depth, white phenocrysts, chlorite alteration, vugs of calcite, minor veins of calcite at 70°tca, pseudobreccia.									
	10			80						■		
35	11			93						■		
40	12											
	13			100						■		
45	14			100						■		
50	15											

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-227**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 16, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**798 ft**	Date Completed:	**Oct 20, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**200 ft**	Logged by:	**SC/AL**
Coordinates:	**2,155,964 N , 1,421,653 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16		FAULT ZONE, white clay gouge, poor recovery, weak.	80								
55	17			12							Artesian conditions encountered @ 55', ~0.05gpm during drilling process.	
60	18											
	19			17								
65	20			28								
	21											
70	22		BEDROCK, Tertiary Volcaniclastic Conglomerate, matrix supported fragmental rock, fragments are 0.4 - 1.2", matrix is light olive green to grey green, moderately to highly altered, some pyrite nodules, very weathered zones from 100 - 115' and 164 - 165', moderately to highly fractured, some zones near bottom look like TX unit.	100								
75	23			100								
	24											
80	25			81								
85	26			100								
	27											
90	28			77								
95	29			90								
	30											
100	31			87								

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Project:	**Pebble Project**	Drill Hole No.	**GH10-227**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 16, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**798 ft**	Date Completed:	**Oct 20, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**200 ft**	Logged by:	**SC/AL**
Coordinates:	**2,155,964 N , 1,421,653 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
105	32											
	33			92								
110												
	34			100								
115	35											
	36			100								
120												
	37			89								
125	38											
	39			98								
130												
	40			89								
135	41											
	42			100								
140												
	43			93								
145	44											
	45			91								
150												
	46			100								
155	47											

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Project:	**Pebble Project**	Drill Hole No.	**GH10-227**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 16, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**798 ft**	Date Completed:	**Oct 20, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**200 ft**	Logged by:	**SC/AL**
Coordinates:	**2,155,964 N , 1,421,653 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	48			64								
160	49			68								
	50											
165	51			90								
170	52			91								
	53											
175	54			100								
180	55			88								
	56											
185	57			94								
190	58			96								
	59											
195	60			100								
200	61		END OF HOLE @ 200 FT									
	62											
205	63											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-227

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-227

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-228**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 20, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**762 ft**	Date Completed:	**Oct 23, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**240 ft**	Logged by:	**AL/CBN**
Coordinates:	**2,158,170 N , 1,421,905 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			SILT and CLAY, trace sand, trace gravel, trace cobbles, subrounded, clasts up to gravel size, poorly graded, medium plasticity, firm, brown, root inclusions up to 5' depth, moist. (Glaciolacustrine)	20							PQ casing installed to 45'. Core Size: PQ3 to 45', HQ3 to 240'.	
5	1				42		GH10-228 Shelby #1	//				
	2			25	78		GH10-228 SPT #1	2/3/4	7	●		
10	3				71		GH10-228 Shelby #2	//				
	4			49	72		GH10-228 SPT #2	2/11/11	22	●		
15	5		Clayey SILT, trace sand, trace gravel, subrounded, poorly graded, medium plasticity, firm, brown, moist, possible frozen soil material encountered in this zone. (Glaciolacustrine)	38	33		GH10-228 Shelby #3	//				
					94		GH10-228 SPT #3	11/15/18	33	●		
20	6		Gravelly SAND, some silt, trace clay, some zones with higher silt content but fines are mostly washed away, trace cobbles and boulders, subangular to subrounded, clasts up to boulder size but mostly gravel size, poorly, low to no plasticity, brown, moist. (Glacial Drift)	42	89		GH10-228 SPT #4	6/9/25	34	●	***Drillhole logs represent an interpretation of field logs and laboratory testing results combined with PLP Lithology Logs***	
25	7				56		GH10-228 SPT #5	15/40/50+	90+	●		
	8			15								
30	9											
	10			28								
35	11			15								
40	12		Silty, gravelly SAND, some clay, trace cobbles and boulders, subangular to subrounded, clasts up to boulder size but mostly gravel size, well graded, low plasticity, grey brown, dense, moist. (Glacial Drift)	93								
45	13											
	14			27								
	15											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-228

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-228

Rev. 0 - Issued for Report

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Date Revised: Jan 28, 11

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-228**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 20, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**762 ft**	Date Completed:	**Oct 23, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**240 ft**	Logged by:	**AL/CBN**
Coordinates:	**2,158,170 N , 1,421,905 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	16			53								
55	17			93								
	18											
60	19			72								
65	20			100								
	21											
70	22			96								
75	23			100								
	24											
80	25			100								
85	26		BEDROCK, Tertiary Volcaniclastic Conglomerate, light reddish brown to pale green yellow in sections, matrix supported, clasts or fragments are 0.01 - 0.5" in diameter, subrounded, and are of various lithologies, bleaching, oxidized zones, becomes more competent with depth, strong in some sections, fractured.	98						■	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	27			92						■		
90	28			100						■		
95	29			100						■		
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-228

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-228

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-228**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 20, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**762 ft**	Date Completed:	**Oct 23, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**240 ft**	Logged by:	**AL/CBN**
Coordinates:	**2,158,170 N , 1,421,905 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			87								
105	32											
	33			92								
110												
	34			97								
115	35											
	36			77								
120												
	37			100								
125	38											
	39			97								
130												
	40			100								
135	41											
	42			98								
140												
	43			96								
145	44											
	45			97								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-228

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-228

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-228**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 20, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**762 ft**	Date Completed:	**Oct 23, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**240 ft**	Logged by:	**AL/CBN**
Coordinates:	**2,158,170 N , 1,421,905 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	46			97								
	47											
155												
	48			85								
160												
	49			92								
	50											
165												
	51			100								
170												
	52			99								
	53											
175												
	54			95								
180												
	55			97								
	56											
185												
	57			96								
190												
	58			100								
	59											
195												
	60			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-228

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-228

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.	**GH10-228**	Page	**5** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 20, 10**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**762 ft**	Date Completed:	**Oct 23, 10**
Location:	**Upper Talarik Creek Area**	Total Depth:	**240 ft**	Logged by:	**AL/CBN**
Coordinates:	**2,158,170 N , 1,421,905 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			53								
205											Lost circulation at 205'.	
	63			100								
210	64											
	65			98								
215												
	66			91								
220	67											
	68			98								
225												
	69			94								
230	70											
	71			95								
235												
	72			99								
240	73		END OF HOLE @ 240 FT									
	74											
245	75											
	76											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH10-228

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

GH10-228

Rev. 0 - Issued for Report

SOILS LOG WITH WELL DETAILS 2010 WMF SI_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Feb 9, 11

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Date Revised: Jan 28, 11

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APPENDIX B2

GEOTECHNICAL DRILLHOLE BEDROCK LOGGING DATA SHEETS

- TABLE B2.1
- TABLE B2.2
- GH10-211
- GH10-212
- GH10-213
- GH10-214
- GH10-215
- GH10-216
- GH10-217
- GH10-218
- GH10-219
- GH10-220
- GH10-221
- GH10-222
- GH10-223
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- GH10-225
- GH10-227
- GH10-228

(Page B2-1 to B2-79)

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TABLE B2.1

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

2010 GEOTECHNICAL SITE INVESTIGATIONS
ROCK MASS RATING (RMR) CLASSIFICATION SYSTEM

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												VALUE	RATING
Intact Rock Strength	PLST	10	8	6.5	5.5	5	4.5	3	2	1	<1		
	UCS, MPa	250	200	160	140	125	110	75	50	25	< 25		
	Field Est.	chipped by hammer		many blows by hammer to break				single blow		pocket knife			
	RATING	15	14	13	12	11	10	8	6	4	< 3		
RQD	RQD %	100	90	80	70	60	50	40	30	20	0		
	RATING	20	18	16	14	12	10	9	5	4	3		
Joint Spacing	Js, cm	> 200	160	130	90	60	40	20	15	10	<6		
	RATING	20	18	16	14	12	10	9	8	7	5		

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

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

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

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

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NOTE:

1. REFERENCE: BIENIAWSKI, 1989.

0	03JAN'11	ISSUED WITH REPORT VA101-176//35-1	AA	DAY	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE B2.2

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

LITHOLOGY LEGEND

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Lithocode	Bedrock Type
B	Basalt
D	Diorite
FZ	Fault Zone
G	Granodiorite
N	Monzodiorite
OB	Overburden
TB	Tertiary Basalt
TC	Tertiary Conglomerate
TF	Tertiary Volcaniclastic Conglomerate
TKM	Tertiary/Cretaceous Monzonite
TW	Tertiary Wacke
TX	Tertiary Volcaniclastic Breccia/Conglomerate
TY	Tertiary Siltstone/Mudstone
W	Wacke
Y	Siltstone/Mudstone
ZGY	Andesitic Siltstone in ZG Fault

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NOTES:

1. LITHOCODES WERE PROVIDED BY PLP.

0	03JAN'11	ISSUED WITH REPORT 101-176/35-1	AA	DAY	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-211

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1397211 E, 2161757 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 446.0 m / 1,463 ft
Total Depth: 15.2 m / 50 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-750

Core Diameter	From	to	ft		
	0	24.00	ft	PQ3	3.27 "
			ft		
	24.00	50	ft	HQ3	2.41 "
			ft		
			ft		

Logged By: CG, JPN, AA
Reviewed By: LS
Date Started: 6-Sep-10
Date Completed: 8-Sep-10

Drillhole Number: GH10-211

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1462.9	0.00	446.0	6.0	1.83	1.83	0.76	42	0.00	0	OB	See Overburden Log.																
6.0	1456.9	1.83	444.2	9.0	2.74	0.91	0.91	100	0.00	0	G	Highly weathered Granodiorite, fine to medium grained, light grey with iron oxide staining, clay infilling, highly fractured.	25	25	36	0	0	1	0	1	2	15	3.4	3.0	5.5	2.0	15	29
9.0	1453.9	2.74	443.3	14.0	4.27	1.52	1.12	73	0.00	0	G	Granodiorite, fine to medium grained, light grey, mottled, moderately to highly weathered, close joints at 45 degrees, relatively smooth with iron oxide staining, clay on joints, highly fractured.	25	25	45	0	1	1	0	1	3	15	3.4	3.0	5.6	3.0	15	30
14.0	1448.9	4.27	441.7	19.0	5.79	1.52	1.00	66	0.00	0	G	As above, fine to medium grained, light grey to dark grey, surface staining infilling (iron oxide) clay infilling, highly fractured.	25	25	40	0	1	3	0	1	5	15	3.4	3.0	5.5	5.0	15	32
19.0	1443.9	5.79	440.2	24.0	7.31	1.52	1.52	100	0.73	48	G	As above, fine grained, light grey, iron oxidation, slightly weathered, infilling, joints close with fractures at 45 and 20° to core axis, moderately fractured.	100	10	152	0	1	3	2	3	9	15	9.4	9.6	7.0	9.0	15	50

Knight Piésold CONSULTING

Drillhole Number: GH10-211

Print Jan/25/11 9:23:03

DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
24.0	1438.9	7.31	438.7	30.0	9.14	1.83	1.54	84	1.22	67	G	As above, medium grained, greenish grey with black specks, pyrite veins, chlorite infilling, some joint surface oxidation, pyrite infilling, 45° to core axis angles, drilled in two runs.	150	8	193	0	4	3	2	5	14	15	12.2	13.1	7.5	14.0	15	**62**
30.0	1432.9	9.14	436.9	34.3	10.45	1.31	1.30	99	0.80	61	G	As above.	150	9	144	0	4	3	2	5	14	15	12.2	12.0	6.9	14.0	15	**60**
34.3	1428.6	10.45	435.5	39.3	11.98	1.52	1.53	100	1.16	76	G	As above.	150	13	118	0	4	3	2	5	14	15	12.2	14.9	6.6	14.0	15	**63**
39.3	1423.6	11.98	434.0	45.0	13.72	1.74	1.66	96	1.04	60	G	As above, with shear/rubble zone from 43-44 ft.	125	25	66	0	4	3	2	5	14	15	10.9	11.8	5.9	14.0	15	**58**
45.0	1417.9	13.72	432.3	49.0	14.93	1.22	1.10	90	0.46	38	G	As above, grey, medium grained with black specks, disseminated pyrite and clay infilling, 45° to core axis angles, more competent.	20	8	138	0	1	3	2	5	11	15	3.0	8.0	6.8	11.0	15	**44**
49.0	1413.9	14.93	431.1	50.0	15.24	0.30	0.29	95	0.00	0	G	As above, highly fractured, light grey clay infilling.	10	25	12	0	1	1	2	5	9	15	2.0	3.0	5.2	9.0	15	**34**
END OF HOLE																												

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	03JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-212

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1397588 E, 2160442 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 435.8 m / 1,429 ft
Total Depth: 35.0 m / 115 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-700

Core Diameter	From	to	ft		
	0	60	ft	PQ3	3.27 "
			ft		
	60	115	ft	HQ3	2.41 "
			ft		
			ft		

Logged By: BSH, BO
Reviewed By: LS
Date Started: 8-Sep-10
Date Completed: 12-Sep-10

Drillhole Number: GH10-212

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1429.3	0.00	435.8	58.5	17.83	17.83		0			OB	See Overburden Log.																
58.5	1370.8	17.83	417.9	60.5	18.44	0.61	0.58	95	0.34	56	W-Y	Slightly weathered, dark grey, fine grained, wacke siltstone, iron staining, competent, rubble zone at top of run, joints dip ranging from 30° to 70°tca.	200	6	97	0	1	3	2	5	11	15	14.1	11.0	6.3	11.0	15	57
60.5	1368.8	18.44	417.3	63.5	19.35	0.91	0.91	100	0.43	47	W-Y	As above, dark grey, fine grained, iron oxides on joints, joints dip 20° to 45°tca.	110	7	130	0	4	3	2	5	14	15	10.0	9.5	6.7	14.0	15	55
63.5	1365.8	19.35	416.4	65.5	19.96	0.61	0.60	98	0.59	96	W-Y	As above, dark grey, fine grained, iron oxide on joints, joints dip 30°tca.	110	3	200	0	1	3	2	5	11	15	10.0	19.3	7.6	11.0	15	63
65.5	1363.8	19.96	415.8	70.0	21.33	1.37	1.37	100	0.80	58	W-Y	Wacke/Siltstone/Mudstone, dark grey, fine grained, laminated, quartz veins, iron oxide on joints, joint dip ~30°tca.	125	11	125	0	1	1	2	5	9	15	10.9	11.5	6.7	9.0	15	53
70.0	1359.3	21.33	414.4	75.0	22.86	1.52	1.52	100	1.38	91	W-Y	As above, lighter grey, fine grained, laminated wacke/siltstone/mudstone, iron oxides on joints, quartz veins, pyrite infilling joint, fractures dip 45 - 70°tca.	150	7	217	0	4	3	2	5	14	15	12.2	18.0	7.8	14.0	15	67

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Drillhole Number: GH10-212

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
75.0	1354.3	22.86	412.9	80.0	24.38	1.52	1.52	100	1.09	72	W-Y	Wacke/siltstone/mudstone, light grey, fine grained, iron staining on joints, quartz veins, pyrite infilling, joints dip 45 -80°tca, one fracture is vertical to core axis.	150	10	152	0	4	1	2	5	12	15	12.2	14.0	7.0	12.0	15	**60**
80.0	1349.3	24.38	411.4	85.0	25.91	1.52	1.52	100	1.05	69	W-Y	As above, light grey, fine grained, iron staining on joints, quartz veins, pyrite and calcite infilling, joints dip 30 -70°tca.	150	9	169	0	4	1	2	5	12	15	12.2	13.5	7.2	12.0	15	**60**
85.0	1344.3	25.91	409.8	90.0	27.43	1.52	1.52	100	0.80	52	W-Y	As above, light grey, fine grained, quartz veins, pyrite and calcite infilling, joints dip 30 -80°tca.	200	12	127	0	4	1	2	5	12	15	14.1	10.4	6.7	12.0	15	**58**
90.0	1339.3	27.43	408.3	95.0	28.95	1.52	0.60	39	0.10	7	W-Y	Rock catcher didn't catch core - needed to redrilled, lost most of sample, but core that was recovered is as above.	200	5	120	0	4	1	2	5	12	15	14.1	3.7	6.6	12.0	15	**51**
95.0	1334.3	28.95	406.8	100.0	30.48	1.52	1.52	100	0.90	59	W-Y	Wacke/Siltstone/Mudstone, light grey, fine grained, quartz veins, pyrite and calcite infilling, joints dip 45°tca.	200	8	190	0	4	1	2	5	12	15	14.1	11.6	7.5	12.0	15	**60**
100.0	1329.3	30.48	405.3	105.0	32.00	1.52	1.50	98	0.61	40	W-Y	As above, light grey, fine grained, quartz veins, pyrite and calcite infilling, joints dip <70°tca.	200	16	94	0	4	1	2	5	12	15	14.1	8.4	6.3	12.0	15	**56**
105.0	1324.3	32.00	403.7	110.0	33.53	1.52	1.50	98	0.75	49	W-Y	As above, light grey, fine grained, quartz veins, pyrite and calcite infilling, joints dip <30°tca.	110	13	115	0	4	1	2	5	12	15	10.0	9.9	6.5	12.0	15	**53**
110.0	1319.3	33.53	402.2	112.5	34.29	0.76	0.74	97	0.25	33	W-Y	As above, light grey, fine grained, quartz veins, pyrite and calcite infilling, joints dip ~45°tca.	75	7	106	0	4	1	2	5	12	15	7.7	7.2	6.4	12.0	15	**48**
112.5	1316.8	34.29	401.5	115.0	35.05	0.76	0.70	92	0.45	59	W-Y	As above, light grey, fine grained, quartz veins, pyrite and calcite infilling, joints dip 20-70°tca.	200	5	140	0	4	1	2	5	12	15	14.1	11.6	6.9	12.0	15	**60**

END OF HOLE

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-212\[GH10-212.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	17JAN'10	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-213

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1399036 E 2161546 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Logged By: JPN, AA
Reviewed By: LS
Date Started: 9-Sep-10
Date Completed: 13-Sep-10

Surface Elevation: 491.8 m
1,613 ft
Total Depth: 50.3 m
165 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-750

Core Diameter: From	0	to	29.5 ft	PQ3	3.27 "
		to	ft		
Core Diameter: From	29.5	to	165 ft	HQ3	2.41 "
		to	ft		
		to	ft		

Drillhole Number: GH10-213

Print Jan/25/11 9:20:53

DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1612.9	0.00	491.8	20.5	6.25	6.25	0.00	0	0.00	0	OB	See Overburden Log.																
20.5	1592.4	6.25	485.5	24.5	7.47	1.22	0.64	52	0.21	17	G	Highly weathered granodiorite, some soft infilling, much iron oxide staining, abruptly changing to competent bedrock (fine grained) at 23.5 ft grandodiorite with iron oxide infilling.	50	25	26	0	0	3	0	1	4	15	5.7	5.1	5.4	4.0	15	**35**
24.5	1588.4	7.47	484.3	28.5	8.69	1.22	0.98	80	0.36	30	G	Medium grained granodiorite, slightly weathered, light grey with black and white phenocrysts, heavy iron oxide staining in fractures and some pyrite infilling.	150	25	39	0	0	5	2	3	10	15	12.2	6.7	5.5	10.0	15	**50**
28.5	1584.4	8.69	483.1	30.0	9.14	0.46	0.00	0				NO SAMPLE, Driller switching over to HQ3.																
30.0	1582.9	9.14	482.6	35.0	10.67	1.52	1.52	100	0.33	22	G	Medium grained granodiorite, light grey with darker and lighter phenocrysts, moderately to highly weathered with soft infilling and heavy iron oxide staining, highly fractured.	50	9	169	0	1	3	2	3	9	15	5.7	5.6	7.2	9.0	15	**43**

Knight Piésold CONSULTING

Drillhole Number: GH10-213

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
35.0	1577.9	10.67	481.1	40.0	12.19	1.52	1.36	89	0.20	13	G	As above.	40	12	113	0	1	3	2	3	9	15	4.8	4.5	6.5	9.0	15	**40**
40.0	1572.9	12.19	479.6	45.0	13.72	1.52	1.52	100	0.50	33	G	Medium grained granodiorite, light grey with darker and lighter phenocrysts, slighly to moderately weathered with soft infilling and iron oxide staining in fractures and disseminated and vein pyrite.	40	16	95	0	4	3	2	3	12	15	4.8	7.2	6.3	12.0	15	**45**
45.0	1567.9	13.72	478.0	50.0	15.24	1.52	1.45	95	0.63	41	G	As above, between 45 and 48.5 ft, then after 48.5 ft medium grained, light grey with darker and lighter phenocrysts, highly weathered with soft infilling and disseminated and vein pyrite.	60	14	104	0	4	3	2	3	12	15	6.5	8.6	6.4	12.0	15	**48**
50.0	1562.9	15.24	476.5	55.0	16.76	1.52	1.10	72	0.12	8	G	Medium grained granodiorite, light grey with darker and lighter phenocrysts, moderately to highly weathered with soft infilling and iron oxide staining, highly fractured, disseminated pyrite.	40	21	52	0	1	3	2	3	9	15	4.8	3.9	5.7	9.0	15	**38**
55.0	1557.9	16.76	475.0	60.0	18.29	1.52	0.51	33	0.00	0	G	As above, medium grained, light grey with darker and lighter phenocrysts, moderately to highly weathered with soft infilling and iron oxide staining, highly fractured, disseminated pyrite, some washed material at top of run.	35	25	20	0	1	5	2	3	11	15	4.4	3.0	5.3	11.0	15	**39**
60.0	1552.9	18.29	473.5	65.0	19.81	1.52	0.95	62	0.10	7	G	Medium grained granodiorite, grey with white phenocrysts and pyrite flakes, slightly to moderately weathered with some soft infilling, highly fractured, washed material at top of recovery, possibly fines washed away.	40	14	68	0	1	3	2	3	9	15	4.8	3.7	5.9	9.0	15	**38**
65.0	1547.9	19.81	471.9	70.0	21.33	1.52	1.29	85	0.00	0	G/ZGY	Medium grained granodiorite/siltstone, possible faulted zone, grey with white phenocrysts and pyrite flakes, moderately weathered with soft infill, highly fractured.	40	25	52	0	4	5	2	3	14	15	4.8	3.0	5.7	14.0	15	**43**
70.0	1542.9	21.33	470.4	75.0	22.86	1.52	1.38	91	0.63	41	ZGY	Possible fault zone, medium grained, light grey with white phenocrysts, moderately weathered with calcite infill and pyrite flakes.	30	25	55	0	1	3	2	3	9	15	3.9	8.6	5.8	9.0	15	**42**

Knight Piésold CONSULTING

Drillhole Number: GH10-213

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
75.0	1537.9	22.86	468.9	80.0	24.38	1.52	1.52	100	0.61	40	ZGY	As above.	40	25	61	0	4	3	2	3	12	15	4.8	8.4	5.8	12.0	15	46
80.0	1532.9	24.38	467.4	85.0	25.91	1.52	1.37	90	1.37	90	ZGY	Possible fault zone, medium grained, light grey with white phenocrysts, highly weathered, weak, decomposed, widely spaced with calcite and pyrite infilling (>5mm), light grey clay lense (>0.10m) starting at 84'.	40	25	55	0	0	3	0	1	4	15	4.8	17.9	5.7	4.0	15	47
85.0	1527.9	25.91	465.8	90.0	27.43	1.52	1.18	77	0.00	0	ZGY	Possible fault zone, light grey, dense clay gouge matrix, with many medium sized, subangular, gravel fragments, rock less clay infilled @ 90' with increasing calcite infilling.	25	25	47	0	0	3	0	1	4	15	3.4	3.0	5.6	4.0	15	31
90.0	1522.9	27.43	464.3	92.0	28.04	0.61	0.00	0				NO SAMPLE																
92.0	1520.9	28.04	463.7	95.0	28.95	0.91	0.82	90	0.00	0	Y	Siltstone, fine grained, light grey, moderately to highly weathered with slickensided light grey infilling, highly fractured with quartz veins, some washed material at top of run, subangular to subrounded about 2 cm.	30	8	103	0	1	0	0	1	2	15	3.9	3.0	6.4	2.0	15	30
95.0	1517.9		491.8	100.0	30.48	30.48	1.52	5	0.91	3	Y	Siltstone, fine grained, light grey with dark phenocrysts, pyrite flakes and quartz veins, slightly weathered with slickensided light grey infilling and close joints at 45 degree angle, some washed material at top of run, subangular to subrounded about 2 cm.	50	12	127	0	4	0	2	5	11	15	5.7	3.3	6.7	11.0	15	42
100.0	1512.9	30.48	461.3	105.0	32.00	1.52	0.90	59	0.00	0	Y	Siltstone, fine grained, light grey with dark phenocrysts, pyrite flakes and quartz veins, moderately weathered with granular quartz infilling >5 mm, highly fractured, some washed cobble at top of run, subangular 2-3 cm.	30	25	36	0	1	1	3	3	8	15	3.9	3.0	5.5	8.0	15	35
105.0	1507.9	32.00	459.7	110.0	33.53	1.52	1.05	69	0.00	0	Y	Siltstone, fine grained, light grey with dark phenocrysts, pyrite flakes and quartz veins, moderately weathered with clay and granular quartz infilling >5 mm, highly fractured, some washed cobble at top of run, subangular 2-3 cm.	25	25	42	0	4	1	2	3	10	15	3.4	3.0	5.6	10.0	15	37

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Drillhole Number: GH10-213

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
110.0	1502.9	33.53	458.2	115.0	35.05	1.52	1.18	77	0.61	40	Y	Siltstone, fine grained, light grey with white phenocrysts, pyrite flakes, slightly weathered, chlorite and pyrite infilling >5 mm, highly fractured, increasing competence with depth, medium to coarse subrounded gravel size fragments 113'-114'.	25	25	47	0	0	3	0	5	8	15	3.4	8.4	5.6	8.0	15	40
115.0	1497.9	35.05	456.7	120.0	36.57	1.52	1.52	100	0.66	43	Y/D	Siltstone, fine grained, light grey, medium strong, pyrite flakes, slightly weathered, some drill fractures 118' -119', chlorite and pyrite infilling >5 mm, contact with medium grey diorte @118'.	100	25	61	0	1	3	2	5	11	15	9.4	8.9	5.8	11.0	15	50
120.0	1492.9	36.57	455.2	125.0	38.10	1.52	1.52	100	1.30	85	D	Diorite, fine grained, medium grey, fresh, undulating, disseminated pyrite throughout, slightly weathered, chlorite, calcite, and pyrite infilling >5 mm.	150	24	63	0	4	5	2	5	16	15	12.2	16.9	5.9	16.0	15	66
125.0	1487.9	38.10	453.7	130.0	39.62	1.52	1.52	100	1.40	92	D	Diorite, fine grained, medium grey, fresh, undulating, disseminated pyrite throughout, slightly weathered, calcite and pyrite infilling >5 mm.	150	12	127	0	4	3	2	5	14	15	12.2	18.3	6.7	14.0	15	66
130.0	1482.9	39.62	452.1	135.0	41.15	1.52	1.52	100	1.38	91	D	Diorite, fine grained, medium grey, fresh, strong, undulating, disseminated pyrite throughout, slightly weathered, calcite and pyrite infilling >5 mm.	130	9	169	0	1	3	2	5	11	15	11.2	18.0	7.2	11.0	15	62
135.0	1477.9	41.15	450.6	140.0	42.67	1.52	1.44	94	0.55	36	D	Diorite, fine grained, light grey, pyrite flakes, slightly weathered, soft calcite infilling (>5mm), extremely weathered section 135' -136' with subrounded medium tocoarse gravel fragments in light grey soft matrix, heavily fractured 138'-140'.	50	25	58	0	0	3	0	5	8	15	5.7	7.7	5.8	8.0	15	42
140.0	1472.9	42.67	449.1	145.0	44.19	1.52	1.52	100	0.94	62	D	Fine grained, light grey, fresh, moderately strong, undulating, disseminated pyrite throughout, chlorite infilling >5 mm, weathered joint (>100mm)@44' with soft calcite and pyrite infilling.	110	16	95	0	0	3	2	5	10	15	10.0	12.1	6.3	10.0	15	53

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Drillhole Number: GH10-213

Print Jan/25/11 9:20:53

DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
145.0	1467.9	44.19	447.6	150.0	45.72	1.52	1.34	88	0.45	30	D	Diorite, fine grained, light grey, slightly weathered, undulating, disseminated and vein pyrite veins, joints 45-60°tca, calcite infilling (>5 mm).	90	25	54	0	1	5	0	3	9	15	8.7	6.7	5.7	9.0	15	**45**
150.0	1462.9	45.72	446.0	155.0	47.24	1.52	1.48	97	0.86	56	D	Diorite, fine grained, grey, moderately weathered from 150' 151'-6", then fresh, strong, pyrite veins 1-5mm, chlorite on joint >5mm, undulating, increasing competence with depth.	130	25	59	0	0	5	0	3	8	15	11.2	11.1	5.8	8.0	15	**51**
155.0	1457.9	47.24	444.5	160.0	48.77	1.52	1.52	100	1.52	100	D	Diorite, fine grained, grey, slighlty weathered with disseminated and vein pyrite, moderately close joints with no infilling, at 45°tca.	175	4	380	0	1	3	6	5	15	15	13.3	20.1	9.6	15.0	15	**73**
160.0	1452.9	48.77	443.0	165.0	50.29	1.52	1.52	100	1.52	100	D	As above.	250	3	507	0	1	3	6	5	15	15	15.1	20.1	10.8	15.0	15	**76**
	END OF HOLE																											

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-213\[GH10-213.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-214

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1398287 E, 2159461 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 417.0 m / 1,368 ft
Total Depth: 41.2 m / 135.0 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-700

Core Diameter	From	to	ft		
	0	17.4	ft	PQ3	3.27 "
			ft		
	17.4	41.2	ft	HQ3	2.41 "
			ft		
			ft		

Logged By: BSH, BO
Reviewed By: LS
Date Started: 13-Sep-10
Date Completed: 16-Sep-10

Drillhole Number: GH10-214

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1367.8	0.00	417.0	30.0	9.14	9.14	3.48	38			OB	See Overburden Log.																
30.0	1337.8	9.14	407.9	35.0	10.67	1.52	0.53	35	0.00	0	W	Highly weathered Cretaceous wacke, light yellow-brown and grey, very weak, rock is intensely altered, clay, pervasive iron staining.	0	10	53	0	0	1	0	1	2	15	1.0	3.0	5.7	2.0	15	**27**
35.0	1332.8	10.67	406.3	40.0	12.19	1.52	0.91	60	0.00	0	W	As above, some larger more competent pieces of rock but still more soil like.	0	10	91	0	0	1	0	1	2	15	1.0	3.0	6.2	2.0	15	**27**
40.0	1327.8	12.19	404.8	45.0	13.72	1.52	1.04	68	0.00	0	W	Highly weathered wacke, light grey-yellow with reddish brown iron oxide staining, fine grained, highly fractured, some soft infilling.	0	30	35	0	0	1	0	1	2	15	1.0	3.0	5.5	2.0	15	**26**
45.0	1322.8	13.72	403.3	50.0	15.24	1.52	0.94	62	0.00	0	W	As above, less recovery, light grey-yellow, highly weathered, yellow and red iron oxide staining, fine grained, highly fractured, some soft infilling.	0	30	31	0	0	1	0	1	2	15	1.0	3.0	5.4	2.0	15	**26**

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Drillhole Number: GH10-214

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
50.0	1317.8	15.24	401.8	55.0	16.76	1.52	0.40	26	0.00	0	W	Moderately weathered Cretaceous Wacke, light grey with reddish brown iron oxide staining, fine grained, highly fractured.	200	30	13	0	1	3	2	3	9	15	14.1	3.0	5.2	9.0	15	46
55.0	1312.8	16.76	400.2	57.0	17.37	0.61	0.60	98	0.00	0	W	As above, some larger pieces of intact rock but still highly fractured, Joints 20-70°tca.	20	30	20	0	1	3	2	3	9	15	3.0	3.0	5.3	9.0	15	35
57.0	1310.8	17.37	399.6	60.0	18.29	0.91	0.30	33	0.00	0	W	As above, very poor recovery.	50	30	10	0	1	3	2	3	9	15	5.7	3.0	5.1	9.0	15	38
60.0	1307.8	18.29	398.7	65.0	19.81	1.52	1.50	98	0.00	0	W	As above, moderately weathered Cretaceous wacke, light grey with reddish brown iron oxide staining, fine grained, highly fractured, better recovery.	25	30	50	0	1	3	2	3	9	15	3.4	3.0	5.7	9.0	15	36
65.0	1302.8	19.81	397.2	70.0	21.33	1.52	1.20	79	0.00	0	W	As above, slightly to moderately weathered, less iron oxide staining, dark grey, fine grained wacke, calcite/quartz veins, highly fractured but some more intact pieces than above runs.	25	30	40	0	1	3	2	3	9	15	3.4	3.0	5.5	9.0	15	36
70.0	1297.8	21.33	395.7	75.0	22.86	1.52	1.40	92	0.00	0	W	Slightly weathered, grey, fine grained, quartz veins, some clay and pyrite in joints, less fractured but still very broken, much less iron staining.	50	30	47	0	1	3	2	5	11	15	5.7	3.0	5.6	11.0	15	40
75.0	1292.8	22.86	394.1	80.0	24.38	1.52	0.78	51	0.00	0	W	As above, slightly weathered, grey, fine grained, some pyrite in joints, minor iron staining, highly fractured, poor recovery.	110	30	26	0	1	3	2	5	11	15	10.0	3.0	5.4	11.0	15	44
80.0	1287.8	24.38	392.6	85.0	25.91	1.52	1.50	98	0.60	39	W	As above, some clay infilling, minor iron staining, joints dip 20-45°tca, some more competent pieces.	200	11	136	0	1	3	2	5	11	15	14.1	8.2	6.8	11.0	15	55
85.0	1282.8	25.91	391.1	90.0	27.43	1.52	1.00	66	0.00	0	W	As above, highly fractured, poorly recovery, pyrite infill.	110	30	33	0	1	3	2	5	11	15	10.0	3.0	5.5	11.0	15	45
90.0	1277.8	27.43	389.6	95.0	28.95	1.52	1.50	98	0.00	0	Y-W	Cretaceous Siltstone/Mudstone, very fine grained, laminated, small amount of wacke interbeds, pyrite infilling, some staining on joints, highly fractured.	110	30	50	0	1	3	2	5	11	15	10.0	3.0	5.7	11.0	15	45

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Drillhole Number: GH10-214

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
95.0	1272.8	28.95	388.0	100.0	30.48	1.52	1.50	98	0.00	0	Y-W	As above, light grey, fine grained, pyrite infilling, calcite on joints, highly fractured.	50	30	50	0	1	3	2	5	11	15	5.7	3.0	5.7	11.0	15	40
100.0	1267.8	30.48	386.5	105.0	32.00	1.52	1.47	96	0.00	0	Y-W	As above, fine grained, pyrite infilling, some joint discoloration (calcite), highly fractured.until 101.5 - 103', then white to light grey FAULT ZONE, ~50% clay gouge.	200	30	49	0	0	1	0	1	2	15	14.1	3.0	5.7	2.0	15	40
105.0	1262.8	32.00	385.0	110.0	33.53	1.52	1.50	98	1.10	72	Y-W	As above, no fault gouge, light grey, fine grained, some pyrite infill on joints, joint dip 20-60°tca, less fractured, more competent.	110	8	188	0	4	1	2	5	12	15	10.0	14.1	7.4	12.0	15	59
110.0	1257.8	33.53	383.5	115.0	35.05	1.52	1.52	100	1.06	70	Y-W	As above, light grey, fine grained, some pyrite and calcite infill on joints, joints dip 20-60°tca, calcite/quartz veins, less fractured.	200	10	152	0	4	3	2	5	14	15	14.1	13.6	7.0	14.0	15	64
115.0	1252.8	35.05	381.9	120.0	36.57	1.52	1.52	100	0.20	13	Y-W	As above, light grey, fine grained, some pyrite infill in joints, joints dip 45°tca.	200	12	127	0	0	3	0	5	8	15	14.1	4.5	6.7	8.0	15	48
120.0	1247.8	36.57	380.4	125.0	38.10	1.52	1.52	100	0.90	59	Y-W	As above, light grey, fine grained, some chlorite and pyrite infill in joints, joints dip 45-80°tca, more competent, much less fractured.	200	10	152	0	4	1	2	5	12	15	14.1	11.6	7.0	12.0	15	60
125.0	1242.8	38.10	378.9	128.0	39.01	0.91	0.91	100	0.91	100	Y-W	As above, some chlorite, pyrite, and clay infill on joints, joints dip 45-80°tca, more fractured.	200	2	455	0	4	3	2	5	14	15	14.1	20.1	10.3	14.0	15	74
128.0	1239.8	39.01	378.0	130.0	39.62	0.61	0.60	98	0.28	46	Y-W	As above, light grey, fine grained, some pyrite infill on joints, joints dip 45-80°tca.	200	5	120	0	4	3	2	5	14	15	14.1	9.3	6.6	14.0	15	59
130.0	1237.8	39.62	377.4	135.0	41.15	1.52	1.52	100	0.70	46	Y-W	As above, light grey, fine grained, some chlorite, pyrite, and clay infill on joints, joints dip 45-80°tca.	200	10	152	0	4	3	2	5	14	15	14.1	9.3	7.0	14.0	15	59

END OF HOLE

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	17JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-215

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1382647 E, 2165467 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 351.8 m / 1,154 ft
Total Depth: 22.9 m / 75 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-750

Core Diameter	From	to	ft		
	0		15.0	PQ3	3.27 "
	15.0		75.0	HQ3	2.41 "

Logged By: JPN, AA
Reviewed By: LS
Date Started: 13-Sep-10
Date Completed: 15-Sep-10

Drillhole Number: GH10-215

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Apert- A	Rough R	Infill I	Weath W	TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1153.7	0.00	351.8	12.0	3.66	3.66	0.00	0	0.00	0	OB	See Overburden Log.																
12.0	1141.7	3.66	348.1	13.0	3.96	0.30	0.30	98	0.00	0	B	Basalt, fine grained, equigranular, massive, dark grey, extremely strong, silicified, slightly weathered, weak chlorite alteration, fractured, very close joints with iron oxide staining.	250	6	50	0	1	1	2	5	9	15	15.1	3.0	5.7	9.0	15	48
13.0	1140.7	3.96	347.8	15.0	4.57	0.61	0.61	100	0.00	0	B	Basalt, equigranular, massive, fine grained, dark grey, slightly weathered, very close joints with iron oxide staining, shear zone @ 13.5'.	125	10	61	0	1	3	2	5	11	15	10.9	3.0	5.8	11.0	15	46
15.0	1138.7	4.57	347.2	20.0	6.10	1.52	1.34	88	0.59	39	B	Basalt, fine grained, dark grey, silicified, extremely strong, very close joints with iron oxide staining, undulating, soft red infill (>5mm).	250	22	61	0	1	3	0	5	9	15	15.1	8.1	5.8	9.0	15	53

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Drillhole Number: GH10-215

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
20.0	1133.7	6.10	345.7	25.0	7.62	1.52	1.50	98	0.52	34	B	Basalt, fine grained, dark grey, fresh, silicified, extremely strong, very close joints with iron oxide staining, undulating, soft red infill (>5mm), 16 cm fractured zone @ 21.5 ft.	250	24	63	0	1	3	2	5	11	15	15.1	7.4	5.9	11.0	15	**54**
25.0	1128.7	7.62	344.1	30.0	9.14	1.52	1.47	96	0.36	24	B	Basalt, fine grained, dark grey, fresh, silicified, extremely strong, very close joints with iron oxide staining, undulating, soft red infill (>5mm), 7 cm fractured zone @ 26.5 ft.	250	22	67	0	1	3	2	5	11	15	15.1	5.9	5.9	11.0	15	**53**
30.0	32.0	9.14	342.6	32.0	9.75	0.61	0.61	100	0.00	0	B	Basalt, fine grained, dark grey, strong, slightly weathered, very close joints with iron oxide staining, joints at 45 to 90°tca.	200	13	47	0	4	1	2	5	12	15	14.1	3.0	5.6	12.0	15	**50**
32.0	1121.7	9.75	342.0	35.0	10.67	0.91	0.90	98	0.13	14	B	Basalt, fine grained, dark grey, strong, slightly weathered, very close joints with iron oxide staining, joints at 45 to 90°tca.	200	13	69	0	1	1	2	5	9	15	14.1	4.7	5.9	9.0	15	**49**
35.0	1118.7	10.67	341.1	40.0	12.19	1.52	1.52	100	0.88	58	B	Basalt, fine grained, dark grey, slightly weathered, very close joints with iron oxide staining, at 45 to 90°tca.	100	21	72	0	4	3	2	5	14	15	9.4	11.4	6.0	14.0	15	**56**
40.0	1113.7	12.19	339.6	45.0	13.72	1.52	1.52	100	0.32	21	B	Basalt, fine grained, dark grey, slightly weathered, very close joints with iron oxide staining and calcite infill, joints at 45 to 180°tca.	100	25	61	0	1	3	2	5	11	15	9.4	5.6	5.8	11.0	15	**47**
45.0	1108.7	13.72	338.0	50.0	15.24	1.52	1.52	100	1.09	72	B	Basalt, fine grained, dark grey, slightly weathered, very close joints with some iron oxide staining, at 45 to 90°tca.	250	13	117	0	1	3	2	5	11	15	15.1	14.0	6.6	11.0	15	**62**
50.0	1103.7	15.24	336.5	55.0	16.76	1.52	1.52	100	0.66	43	B	Basalt, fine grained, dark grey, slightly weathered with close joints, pyrite and white calcite, some iron oxide staining and calcite at 45 to 90°tca.	150	22	69	0	4	1	3	5	13	15	12.2	8.9	5.9	13.0	15	**55**
55.0	1098.7	16.76	335.0	60.0	18.29	1.52	1.52	100	0.67	44	B	Basalt, fine grained, dark grey, slightly weathered with close joints, pyrite and green alteration mineral, slippery grey green infilling at 45 to 90°tca.	250	19	80	0	1	3	2	5	11	15	15.1	9.0	6.1	11.0	15	**56**
60.0	1093.7	18.29	333.5	65.0	19.81	1.52	1.52	100	0.62	41	B	As above.	250	21	72	0	1	1	2	5	9	15	15.1	8.5	6.0	9.0	15	**54**

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Drillhole Number: GH10-215

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
65.0	1088.7	19.81	331.9	70.0	21.33	1.52	1.52	100	1.23	81	B	Basalt, fine grained, dark grey, slightly weathered with close joints, pyrite, calcite veins at 45 to 90°tca.	250	10	152	0	4	3	2	5	14	15	15.1	15.9	7.0	14.0	15	**67**
70.0	1083.7	21.33	330.4	75.0	22.86	1.52	1.52	100	0.62	41	B	Basalt, fine grained, dark grey, slightly weathered with close joints, pyrite , slippery grey green infilling at 45 to 90°tca.	200	16	95	0	1	1	2	5	9	15	14.1	8.5	6.3	9.0	15	**53**
END OF HOLE																												

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	14JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-216

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1373405 E 2150793 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 471.0 m / 1,545 ft
Total Depth: 39.6 m / 130 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-750

	From		To			
Core Diameter:	20	to	80.0 m	PQ3	3.27 "
		to	m		
Core Diameter:	80.0	to	130.0 m	HQ3	2.41 "
		to	m		
		to	m		

Logged By: JPN, AA
Reviewed By: LS
Date Started: 16-Sep-10
Date Completed: 22-Sep-10

Drillhole Number: GH10-216

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1544.9	0.00	471.0	59.0	17.98	17.98	2.63	15			OB	OVERBURDEN																
59.0	1485.9	17.98	453.0	65.0	19.81	1.83	1.10	60	0.00	0	TW/TY	Highly weathered Tertiary Wacke to Siltstone/Mudstone, medium to coarse grained, greyish brown, silty sand, some clay, trace gravel in matrix with competent boulder fragments throughout, very fractured.	25	30	37	0	0	1	0	1	2	15	3.4	3.0	5.5	2.0	15	**29**
65.0	1479.9	19.81	451.2	70.0	21.33	1.52	1.46	96	0.00	0	TW/TY	Highly weathered Tertiary Wacke to Siltstone/Mudstone, medium to coarse grained, greyish brown, extremely weak, highly weathered, soft greyish brown silty sand, some clay, trace gravel matrix, very fractured, firm lenses of finer material >50mm.	25	25	58	0	0	1	0	1	2	15	3.4	3.0	5.8	2.0	15	**29**

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Drillhole Number: GH10-216

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
70.0	1474.9	21.33	449.7	75.0	22.86	1.52	1.16	76	0.34	22	TW/TY	Highly weathered Tertiary Wacke to Siltstone/Mudstone, medium to coarse grained, greyish brown, strong, very fractured from 70 to 73 ft with silty sand infilling with some clay and gravel. From 73 to 75 ft, much more competent, medium to coarse grained, greyish brown, strong, slightly weathered with soft infilling.	75	25	46	0	0	3	0	3	6	15	7.7	5.7	5.6	6.0	15	**40**
75.0	1469.9	22.86	448.1	80.0	24.38	1.52	0.62	41	0.00	0	TW/TY/TX	Highly weathered Tertiary Wacke, grey with black and white clasts, coarse grained, very strong, moderately weathered from 78 to 80 ft. From 75 to 78 ft washed sands and gravels with some cobble and a firm silt lense > 50 mm, highly weathered rock interval.	150	25	25	0	0	3	0	3	6	15	12.2	3.0	5.3	6.0	15	**42**
80.0	1464.9	24.38	446.6	85.0	25.91	1.52	1.52	100	1.34	88	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, grey matrix, varied colour clasts, transition to grey, medium grained wacke @ 81', then back to volcaniclastic conglomerate @ 82', brownish grey, extremely strong, fresh.	250	4	380	0	4	3	4	6	17	15	15.1	17.5	9.6	17.0	15	**74**
85.0	1459.9	25.91	445.1	90.0	27.43	1.52	1.52	100	1.45	95	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, grey brown matrix, varied colour clasts, strong, slightly weathered with soft infilling.	75	4	380	0	1	3	2	5	11	15	7.7	19.1	9.6	11.0	15	**62**
90.0	1454.9	27.43	443.6	95.0	28.95	1.52	1.52	100	1.34	88	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, grey brown matrix, varied colour clasts, strong, slightly weathered with soft infilling.	75	8	190	0	1	3	2	5	11	15	7.7	17.5	7.5	11.0	15	**59**
95.0	1449.9	28.95	442.0	100.0	30.48	1.52	1.52	100	1.21	79	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, grey brown matrix, varied colour clasts, strong, slightly weathered with clay infilling, large lenses of dark grey Tertiary andesite and granitic rock.	75	4	380	0	1	1	2	5	9	15	7.7	15.6	9.6	9.0	15	**57**

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Drillhole Number: GH10-216

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
100.0	1444.9	30.48	440.5	105.0	32.00	1.52	1.47	96	0.56	37	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, grey brown matrix, varied colour clasts, strong, slightly weathered with clay infilling, large lenses of Tertiary andesite and granitic rock then lithology changes at 102 ft to Tertiary Wacke/Siltstone/Mudstone, coarse grained, greyish brown, very strong, moderately weathered, thickly laminated to very thinly bedded with soft infilling.	175	17	86	0	4	1	2	3	10	15	13.3	7.8	6.2	10.0	15	52
105.0	1439.9	32.00	439.0	110.0	33.53	1.52	1.52	100	0.73	48	TX	Laminated Tertiary Wacke/Siltstone/Mudtone, weathered to clay from 105 to 106', brown, weak, then more competant at 106 ft, coarse grained, greyish brown, very strong, moderately weathered, thickly laminated to very thinly bedded Wacke/Siltstone/Mudstone with soft infilling then at 107 ft Tertiary Volcaniclastic Conglomerate, medium grained, brown matrix with smaller size varied colour clasts, strong, slightly weathered with clay infilling.	50	25	61	0	4	1	0	1	6	15	5.7	9.6	5.8	6.0	15	42
110.0	1434.9	33.53	437.5	115.0	35.05	1.52	1.52	100	0.90	59	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, brown matrix with varied colour clasts, strong, slightly weathered with soft infilling with a lense at 112.5 to 114 ft of Tertiary Wacke/Siltstone/Mudstone, coarse grained, greyish brown, very strong, weathered, thickly laminated to very thinly bedded with soft infilling.	150	14	109	0	1	3	2	5	11	15	12.2	11.6	6.5	11.0	15	56
115.0	1429.9	35.05	435.9	120.0	36.57	1.52	1.46	96	1.46	96	TX	Drill cuttings at beginning of run, not part of core, Tertiary Volcaniclastic Conglomerate, coarse grained, grey matrix with varied colour clasts, strong, slightly weathered with clay infilling . At 119 the matrix of the Tertiary Volcaniclastic Conglomerate becomes brown abruptly with a soft infilling.	50	2	730	0	1	1	2	6	10	15	5.7	19.2	12.7	10.0	15	63

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Drillhole Number: GH10-216

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
120.0	1424.9	36.57	434.4	125.0	38.10	1.52	1.48	97	1.48	97	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, brown matrix with varied colour clasts, strong, slightly weathered with soft infilling with a grey matrix from 121.5 to 124 ft.	50	4	370	0	1	3	2	5	11	15	5.7	19.5	9.5	11.0	15	**61**
125.0	1419.9	38.10	432.9	130.0	39.62	1.52	1.52	100	1.52	100	TX	Tertiary Volcaniclastic Conglomerate, coarse grained, brown matrix with varied colour clasts, strong, slightly weathered with a soft infilling changing to a grey matrix at 126 ft and a red grey matrix at 129 ft.	75	2	760	0	1	3	2	5	11	15	7.7	20.1	12.9	11.0	15	**67**
END OF HOLE																												

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-216\[GH10-216.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-217

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1400918 E, 2158419 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 391.8 m / 1,285 ft
Total Depth: 43.9 m / 144 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-700

Core Diameter	From	to		ft		
	0	to	54	ft	PQ3	3.27 "
		to		ft		
	54	to	77	ft	HQ3	2.41 "
		to		ft		
	77	to	144	ft	NQ3	1.78 "

Logged By: BSH, BH, BO
Reviewed By: LS
Date Started: 17-Sep-10
Date Completed: 19-Sep-10

Drillhole Number: GH10-217

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1284.9	0.00	391.8	26.0	7.92	7.92		0		0	OB	See Overburden Log.																
26.0	1258.9	7.92	383.8	29.0	8.84	0.91	0.80	87	0.00	0	D	Highly weathered Diorite, yellow to grey, fine grained, quartz veins, limonite alteration, very fractured, friable, weak.	0	50	16	0	0	1	0	1	2	15	1.0	3.0	5.2	2.0	15	26
29.0	1255.9	8.84	382.9	34.0	10.36	1.52	1.20	79	0.00	0	D	As above, better recovery.	0	50	24	0	0	1	0	1	2	15	1.0	3.0	5.3	2.0	15	26
34.0	1250.9	10.36	381.4	39.0	11.89	1.52	0.66	43	0.00	0	D	Highly weathered Diorite, light grey with red and yellow iron staining , fine grained, more competent but poorer recovery than interval above, fractured, joints dip at 75-80°tca, hematite and limonite on fracture surfaces, weak.	50	30	22	0	1	1	2	1	5	15	5.7	3.0	5.3	5.0	15	34
39.0	1245.9	11.89	379.9	44.0	13.41	1.52	0.30	20	0.00	0	D	Highly weathered Diorite, fine grained, yellow to grey, friable, soft, highly fractured, poor recovery, weak.	25	30	10	0	1	1	0	1	3	15	3.4	3.0	5.1	3.0	15	30
44.0	1240.9	13.41	378.3	49.0	14.93	1.52	1.42	93	0.00	0	D	Highly weathered Diorite, fine grained, grey to yellow, soft, very fractured, limonite and hematite alteration, weak.	25	30	47	0	1	1	0	1	3	15	3.4	3.0	5.6	3.0	15	30

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Drillhole Number: GH10-217

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
49.0	1235.9	14.93	376.8	54.0	16.46	1.52	1.47	96	0.20	13	D	Highly weathered Diorite, fine grained, grey to yellow, soft, very fractured, limonite alteration, weak, very poor recovery.	25	30	49	0	0	1	0	1	2	15	3.4	4.5	5.7	2.0	15	**31**
54.0	1230.9	16.46	375.3	55.0	16.76	0.30	0.18	59	0.05	16	D	Highly weathered Diorite, fine grained, grey to yellow, soft, very fractured, limonite alteration, weak, very poor recovery.	50	30	6	0	0	1	0	1	2	15	5.7	4.9	5.1	2.0	15	**33**
55.0	1229.9	16.76	375.0	59.0	17.98	1.22	0.80	66	0.00	0	D	Highly to completely weathered Diorite, fine grained, yellow to grey, soft, dense clay (17 cm) at top of run, limonite alteration, very fractured, weak.	25	6	133	0	0	1	0	0	1	15	3.4	3.0	6.8	1.0	15	**29**
59.0	1225.9	17.98	373.8	64.0	19.51	1.52	0.10	7	0.00	0	D	Highly weathered Diorite, fine grained, yellow to grey, soft, limonite alteration, very fractured, weak.	25	30	3	0	0	1	0	1	2	15	3.4	3.0	5.0	2.0	15	**28**
64.0	1220.9	19.51	372.2	69.0	21.03	1.52	1.52	100	0.15	10		Moderately weathered Diorite, fine grained, grey to yellow, brecciated and fractured, iron oxide alteration.	25	30	51	0	1	1	0	3	5	15	3.4	4.1	5.7	5.0	15	**33**
69.0	1215.9	21.03	370.7	74.0	22.55	1.52	1.30	85	0.30	20	D	Moderately weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, joints @ 45 to 70°tca, fractured and brecciated, weak.	25	13	100	0	1	3	2	3	9	15	3.4	5.4	6.3	9.0	15	**39**
74.0	1210.9	22.55	369.2	75.0	22.86	0.30	0.30	98	0.00	0	D	As above,highly weathered, very fractured.	25	30	10	0	1	1	0	1	3	15	3.4	3.0	5.1	3.0	15	**30**
75.0	1209.9	22.86	368.9	77.0	23.47	0.61	0.00	0				VOID, Lost circulation.																
77.0	1207.9	23.47	368.3	79.0	24.08	0.61	0.20	33	0.00	0	D	Highly weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, very fractured and brecciated, weak.	25	30	7	0	0	1	0	1	2	15	3.4	3.0	5.1	2.0	15	**29**
79.0	1205.9	24.08	367.7	81.0	24.69	0.61	0.20	33	0.00	0	D	Highly weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, very fractured and brecciated, weak.	25	30	7	0	0	1	0	1	2	15	3.4	3.0	5.1	2.0	15	**29**
81.0	1203.9	24.69	367.1	84.0	25.60	0.91	0.10	11	0.00	0	D	Highly weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, very fractured and brecciated, weak.	0	30	3	0	0	1	0	1	2	15	1.0	3.0	5.0	2.0	15	**26**

Knight Piésold CONSULTING

Drillhole Number: GH10-217

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
84.0	1200.9	25.60	366.1	89.0	27.13	1.52	1.15	75	0.50	33	D	Moderately to highly weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, fractured and brecciated, weak.	50	30	38	0	0	3	0	1	4	15	5.7	7.2	5.5	4.0	15	37
89.0	1195.9	27.13	364.6	94.0	28.65	1.52	1.52	100	0.60	39	D	Moderately weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, fractured and brecciated, weak.	50	30	51	0	1	3	0	3	7	15	5.7	8.2	5.7	7.0	15	42
94.0	1190.9	28.65	363.1	99.0	30.17	1.52	0.87	57	0.22	14	D	Moderately weathered Diorite, light grey to yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, fractured and brecciated, weak, fractures @90°tca.	25	12	73	0	1	3	0	3	7	15	3.4	4.7	6.0	7.0	15	36
99.0	1185.9	30.17	361.6	104.0	31.70	1.52	1.27	83	0.42	28	D	Moderately weathered Diorite, light grey to white, yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, fractured and brecciated, weak, fractures @45 to 70°tca.	25	13	98	0	1	3	0	3	7	15	3.4	6.5	6.3	7.0	15	38
104.0	1180.9	31.70	360.1	109.0	33.22	1.52	1.00	66	0.10	7	D	As above.	25	11	91	0	1	3	0	3	7	15	3.4	3.7	6.2	7.0	15	35
109.0	1175.9	33.22	358.5	114.0	34.75	1.52	1.04	68	0.00	0	D	Moderately weathered Diorite, light grey to white, yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, fractured and brecciated, weak, fractures @70 to 90°tca.	25	5	208	0	1	3	0	3	7	15	3.4	3.0	7.7	7.0	15	36
114.0	1170.9	34.75	357.0	119.0	36.27	1.52	0.55	36	0.15	10	D	Moderately to highly weathered Diorite, light grey to white, yellow, fine grained, quartz veins, iron oxide alteration, clay infilling, fractured and brecciated, weak, fractures @70 to 90°tca.	25	5	110	0	1	3	0	1	5	15	3.4	4.1	6.5	5.0	15	34
119.0	1165.9	36.27	355.5	124.0	37.79	1.52	0.56	37	0.56	37	D	Moderately to highly weathered Diorite, light grey to yellow, fine grained, iron oxide alteration, soft infilling, fractured and brecciated, weak.	25	5	112	0	1	3	0	1	5	15	3.4	7.8	6.5	5.0	15	38
124.0	1160.9	37.79	354.0	129.0	39.32	1.52	1.24	81	0.32	21	D	Moderately to highly weathered Diorite, light grey to yellow, fine grained, iron oxide alteration, soft infilling, fractured and brecciated, weak.	25	5	248	0	1	3	0	1	5	15	3.4	5.6	8.1	5.0	15	37
129.0	1155.9	39.32	352.4	134.0	40.84	1.52	1.52	100	0.76	50	D	Moderately weathered Diorite, light grey to white, yellow, fine grained, iron oxide alteration, clay infilling, fractured and brecciated, weak, fractures @70 to 90°tca.	25	11	138	0	1	3	0	3	7	15	3.4	10.0	6.8	7.0	15	42

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Drillhole Number: GH10-217

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
134.0	1150.9	40.84	350.9	139.0	42.37	1.52	0.99	65	0.44	29	D	Moderately weathered Diorite, light grey to white, yellow, fine grained, iron oxide alteration, clay infilling, fractured and brecciated, weak.	25	7	141	0	1	3	0	3	7	15	3.4	6.7	6.9	7.0	15	**39**
139.0	1145.9	42.37	349.4	144.0	43.89	1.52	1.00	66	0.68	45	D	Moderately weathered Diorite, light grey to white, yellow, fine grained, iron oxide alteration, clay infilling, fractured and brecciated, weak, fractures @30 to 80°tca.	25	6	167	0	1	3	0	3	7	15	3.4	9.1	7.2	7.0	15	**42**
END OF HOLE																												

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-217\[GH10-217.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	08JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-218

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1400731 E, 2156964 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 355.5 m
1,166 ft
Total Depth: 44.0 m
144 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-700

Core Diameter:	From 0	to 64.5 ft	PQ3	3.27 "
PQ		to ft		
Core Diameter:	From 64.5	to 144 ft	HQ3	2.41 "
HQ		to ft		
		to ft		

Logged By: BO, BH
Reviewed By: LS
Date Started: 19-Sep-10
Date Completed: 21-Sep-10

Drillhole Number: GH10-218

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1166.0	0.00	355.5	51.0	15.54	15.54	3.53	23		0	OB	See Overburden Log.																
51.0	1115.0	15.54	340.0	54.0	16.46	0.91	0.60	66	0.00	0	D	Diorite, dark grey to black, iron oxide staining on fracture surfaces, heavily fractured, highly weathered, weak.	25	100	6	0	0	1	0	1	2	15	3.4	3.0	5.1	2.0	15	**29**
54.0	1112.0	16.46	339.0	59.0	17.98	1.52	1.16	76	0.00	0	D	Diorite, yellowish -white for first foot, highly weathered to clay, then dark grey to black, iron oxide staining on fracture surfaces, heavily fractured, moderately weathered, weak.	25	100	12	0	0	1	0	1	2	15	3.4	3.0	5.2	2.0	15	**29**
59.0	1107.0	17.98	337.5	64.0	19.51	1.52	1.35	89	0.22	14	D	Diorite, light to dark grey, highly weathered soft clay and sandy material at top of run, more competent rock with steep iron stained joints in middle of run, highly weathered rock disintegrated to clay at end of run, quartz veins, heavily fractured, weak.	25	50	27	0	0	1	0	1	2	15	3.4	4.7	5.4	2.0	15	**31**

Knight Piésold CONSULTING

Drillhole Number: GH10-218

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
64.0	1102.0	19.51	336.0	64.5	19.66	0.15	0.10	66	0.00	0	D	As above, Diorite, highly to completely weathered to light yellow grey clay with some rock fragments, weak.	15	20	5	0	0	1	0	0	1	15	2.5	3.0	5.1	1.0	15	27
64.5	1101.5	19.66	335.8	69.0	21.03	1.37	0.82	60	0.00	0	D	Switch to HQ3, run blocked at 68', bit plugged up during drilling remaining foot, highly weathered Diorite, brecciated, clay material in some zones, highly fractured, weak, iron oxide staining.	30	50	16	0	0	1	0	1	2	15	3.9	3.0	5.2	2.0	15	29
69.0	1097.0	21.03	334.5	74.0	22.55	1.52	0.94	62	0.00	0	D	Highly to completely weathered Diorite, disintegrated rock with iron staining, clay zones, very weak, highly fractured.	30	50	19	0	0	1	0	0	0	15	3.9	3.0	5.3	0.0	15	27
74.0	1092.0	22.55	332.9	79.0	24.08	1.52	0.72	47	0.00	0	D	Highly weathered Diorite, iron staining, brecciated, some clay, weak, highly fractured.	30	50	14	0	0	1	0	1	2	15	3.9	3.0	5.2	2.0	15	29
79.0	1087.0	24.08	331.4	84.0	25.60	1.52	0.99	65	0.00	0	D	Moderately weathered Diorite, iron staining and clay in joints, more competent than material above, highly fractured, brecciated.	50	30	33	0	1	1	2	3	7	15	5.7	3.0	5.5	7.0	15	36
84.0	1082.0	25.60	329.9	89.0	27.13	1.52	0.70	46	0.00	0	D	Highly weathered diorite, brecciated, highly fractured, some mineralization, soft infill, iron oxide staining, weak.	30	40	18	0	0	1	0	1	2	15	3.9	3.0	5.2	2.0	15	29
89.0	1077.0	27.13	328.4	94.0	28.65	1.52	1.06	70	0.15	10	D	As above, some slightly more competent pieces, brecciated, no mineralization.	40	40	27	0	0	1	2	1	4	15	4.8	4.1	5.4	4.0	15	33
94.0	1072.0	28.65	326.9	99.0	30.17	1.52	0.35	23	0.00	0	D	As above, dark grey, fine grained, highly fractured, soft, very poor recovery, only rubble.	25	30	12	0	0	1	0	1	2	15	3.4	3.0	5.2	2.0	15	29
99.0	1067.0	30.17	325.3	104.0	31.70	1.52	0.03	2	0.00	0	D	As above, dark grey, fine grained, highly fractured, soft, very poor recovery.	25	30	1	0	0	1	0	1	2	15	3.4	3.0	5.0	2.0	15	28
104.0	1062.0	31.70	323.8	109.0	33.22	1.52	0.60	39	0.33	22	D	Moderately to highly weathered Diorite, dark grey, fine grained, highly fractured, soft, some iron staining, joints dip at 70-90°tca, more competent, some solid pieces.	25	30	20	0	1	3	2	1	7	15	3.4	5.6	5.3	7.0	15	36

Knight Piésold CONSULTING

Drillhole Number: GH10-218

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
109.0	1057.0	33.22	322.3	114.0	34.75	1.52	0.84	55	0.56	37	D	Moderately weathered Diorite, fine grained, dark grey, joints dip at 45-90°tca, some iron oxide staining, more competent.	50	30	28	0	4	3	2	3	12	15	5.7	7.8	5.4	12.0	15	**46**
114.0	1052.0	34.75	320.8	119.0	36.27	1.52	0.30	20	0.00	0	D	As above, dark grey, fine grained Diorite, only rubble recovered, more competent, moderately weathered, iron oxide staining.	25	30	10	0	1	1	2	3	7	15	3.4	3.0	5.1	7.0	15	**34**
119.0	1047.0	36.27	319.2	124.0	37.79	1.52	1.52	100	0.75	49	D	Moderately weathered Diorite, dark grey, fine grained, iron staining and clay in fairly tight shallow dipping joints, brecciated zones, highly fractured at end of run, more competent at beginning of run.	80	17	89	0	1	3	2	3	9	15	8.0	9.9	6.2	9.0	15	**48**
124.0	1042.0	37.79	317.7	129.0	39.32	1.52	1.33	87	1.00	66	N	Highly weathered Monzodiorite, light blue/green rock with high clay content, weak, some evidence of brecciation, last two feet only slightly weathered, highly fractured.	60	3	443	0	4	1	0	1	6	15	6.5	12.8	10.2	6.0	15	**51**
129.0	1037.0	39.32	316.2	134.0	40.84	1.52	1.52	100	0.14	9	N	As above, first foot is continuation from above run, highly weathered to clay, then dark grey, medium grained, monzodiorite, tan clay infill on moderately steep dipping joints, fractured, more competent.	80	15	101	0	1	1	2	1	5	15	8.0	4.0	6.4	5.0	15	**38**
134.0	1032.0	40.84	314.7	139.0	42.37	1.52	1.28	84	0.00	0	N	As above, slightly weathered, dark grey, medium grained monzodiorite, highly fractured, some clay and iron stains on joints, end of run moderately weathered.	60	25	51	0	1	1	2	3	7	15	6.5	3.0	5.7	7.0	15	**37**
139.0	1027.0	42.37	313.1	144.0	43.89	1.52	1.25	82	0.58	38	N	Highly weathered monzodiorite, upper contact at ~45°tca, weathered to clay, iron oxide staining, blue green alteration.	60	3	417	0	0	1	0	1	2	15	6.5	8.0	10.0	2.0	15	**41**

END OF HOLE

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-218\[GH10-218.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	16JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-219

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1405153 E, 2160637 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 308.5 m
1,012 ft
Total Depth: 48.2 m
158 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-700

	From		to			
Core Diameter:	0	to	53	ft	PQ3	3.27 "
		to		ft		
Core Diameter:	53	to	158	ft	HQ3	2.41 "
		to		ft		
		to		ft		

Logged By: BH, BO
Reviewed By: LS
Date Started: 21-Sep-10
Date Completed: 24-Sep-10

Drillhole Number: GH10-219

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1011.9	0.00	308.5	49.0	14.93	14.93	4.87	33			OB	See Overburden Log.																
49.0	962.9	14.93	293.6	53.0	16.15	1.22	1.10	90	0.70	57	TF	Tertiary matrix supported, volcaniclastic conglomerate, slightly weathered to unweathered, competent, dark greenish grey, fine grained matrix, some calcite infilling, some iron oxide staining, joints and breaks dip 20-90°tca.	250	5	220	0	1	3	2	5	11		15.1	11.3	7.8	11.0	0	**45**
53.0	958.9	16.15	292.3	58.0	17.68	1.52	0.98	64	0.55	36	TF	Reduce to HQ3, redrilled at top of run, run blocked twice. Rock is as above, except dark grey, steep joints, some clay, minor iron oxide.	100	11	89	0	4	3	2	3	12	15	9.4	7.7	6.2	12.0	15	**50**
58.0	953.9	17.68	290.8	63.0	19.20	1.52	1.52	100	0.90	59	TF	Tertiary matrix supported volcaniclastic conglomerate, slightly weathered, 30-50°tca, fractures with some clay and calcite infill, conglomerate at bottom of run	120	6	253	0	4	3	2	5	14	15	10.6	11.6	8.2	14.0	15	**59**

Knight Piésold CONSULTING

Drillhole Number: GH10-219

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
63.0	948.9	19.20	289.3	68.0	20.73	1.52	1.52	100	0.33	22	TF	As above, thick clay seam blocked run 1ft down, fractured, chlorite alteration.	100	16	95	0	0	1	0	5	6	15	9.4	5.6	6.3	6.0	15	**42**
68.0	943.9	20.73	287.8	73.0	22.25	1.52	1.52	100	0.37	24	TF	As above, matrix is light brown, 30-90°tca fractures with calcite on surfaces, some wacke zones.	100	16	95	0	4	3	2	5	14	15	9.4	6.0	6.3	14.0	15	**51**
73.0	938.9	22.25	286.3	78.0	23.77	1.52	1.52	100	0.64	42	TF	As above, clay seam at 75ft, conglomerate, some red conglomerate clasts, healed fault breccia at 76.5'.	100	15	101	0	0	1	0	5	6	15	9.4	8.7	6.4	6.0	15	**45**
78.0	933.9	23.77	284.7	83.0	25.30	1.52	1.52	100	0.99	65	TF	As above, fault breccia continues to 80.25', then back to conglomerate, joints at 30-60°tca with calcite infill.	120	8	190	0	1	3	2	5	11	15	10.6	12.7	7.5	11.0	15	**57**
83.0	928.9	25.30	283.2	88.0	26.82	1.52	1.52	100	0.54	35	TF	As above, matrix supported volcaniclastic conglomerate, 20-50°tca joints, polylithic clasts, calcite and clay in one joint.	100	9	169	0	4	3	2	5	14	15	9.4	7.6	7.2	14.0	15	**53**
88.0	923.9	26.82	281.7	93.0	28.35	1.52	1.52	100	1.40	92	TF	As above, light brown, very competent conglomerate, broken at top of run, no joint infill.	140	4	380	0	4	5	6	5	20	15	11.7	18.3	9.6	20.0	15	**75**
93.0	918.9	28.35	280.2	98.0	29.87	1.52	1.52	100	0.90	59	TF	As above, dark grey, fined grained, joints dip 45-70°tca.	200	9	169	0	4	5	6	5	20	15	14.1	11.6	7.2	20.0	15	**68**
98.0	913.9	29.87	278.6	103.0	31.39	1.52	1.45	95	1.02	67	TF	As above, dark grey to light grey, reddish fragmental basalt starts at 101', fine grained, some calcite infilling, joints dip 50-90°tca.	160	8	181	0	4	3	2	5	14	15	12.7	13.1	7.4	14.0	15	**62**
103.0	908.9	31.39	277.1	108.0	32.92	1.52	1.45	95	0.74	49	TF/TC	As above at end of run to 106', fragmental basalt, maroon, fractured, healed breccia, then Tertiary conglomerate, dark grey to light grey, fine grained, some calcite infilling, joints dip 50-90°tca.	110	8	181	0	1	5	2	5	13	15	10.0	9.8	7.4	13.0	15	**55**
108.0	903.9	32.92	275.6	113.0	34.44	1.52	1.00	66	0.00	0	TC	Tertiary conglomerate, rubble, light grey, fine grained, some iron oxide, rounded to subrounded clasts.	110	30	33	0	1	5	6	5	17	15	10.0	3.0	5.5	17.0	15	**51**

Knight Piésold CONSULTING

Drillhole Number: GH10-219

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
113.0	898.9	34.44	274.1	118.0	35.96	1.52	1.35	89	1.11	73	TC	Coarse grained wacke, light grey-brown, competent, joints dip 80-90°tca.	160	4	338	0	4	5	6	5	20	15	12.7	14.3	9.1	20.0	15	**71**
118.0	893.9	35.96	272.5	123.0	37.49	1.52	1.52	100	0.94	62	TC	Tertiary Conglomerate, light grey to dark grey, fine-medium grained matrix, clasts up to boulder size, some calcite infill, joints dip 30-90°tca.	200	9	169	0	6	6	6	5	23	15	14.1	12.1	7.2	23.0	15	**71**
123.0	888.9	37.49	271.0	128.0	39.01	1.52	1.48	97	0.76	50	TC	As above, fine to medium grained, conglomerate with coarse gravel, some calcite infill, joint dip 45-90°.	75	11	135	0	5	3	4	5	17	15	7.7	10.0	6.8	17.0	15	**56**
128.0	883.9	39.01	269.5	133.0	40.54	1.52	1.14	75	1.02	67	TC	Coarse grained wacke to fine grained Tertiary Conglomerate, light grey-brown.	110	3	380	0	6	6	6	5	23	15	10.0	13.1	9.6	23.0	15	**71**
133.0	878.9	40.54	268.0	138.0	42.06	1.52	1.52	100	1.36	89	TC	As above, no joints.	120	4	380	0	6	6	6	5	23	15	10.6	17.7	9.6	23.0	15	**76**
138.0	873.9	42.06	266.4	143.0	43.58	1.52	0.50	33	0.38	25	TC	As above, blocked 2ft down with no recovery, broken, redrilled rock at top of run, no joints.	120	3	167	0	6	6	6	5	23	15	10.6	6.1	7.2	23.0	15	**62**
143.0	868.9	43.58	264.9	148.0	45.11	1.52	1.35	89	1.29	85	TC	As above, no blocking, no joints.	120	3	450	0	6	6	6	5	23	15	10.6	16.7	10.3	23.0	15	**76**
148.0	863.9	45.11	263.4	153.0	46.63	1.52	1.52	100	1.48	97	TC	As above, some clay in one joint.	120	2	760	0	4	5	2	6	17	15	10.6	19.5	12.9	17.0	15	**75**
153.0	858.9	46.63	261.9	158.0	48.16	1.52	1.52	100	1.29	85	TC	As above, crushed rock in top joint.	120	4	380	0	1	3	6	6	16	15	10.6	16.7	9.6	16.0	15	**68**
												END OF HOLE																

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	05JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-220

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1366690 E, 2148401 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 605.4 m / 1,986 ft
Total Depth: 182.9 m / 600 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-750

Core Diameter	From	to				
	0	6.1	ft	PQ3	3.27 "
		182.9	ft	HQ3	2.41 "

Logged By: JPN, AA, DDF
Reviewed By: LS
Date Started: 23-Sep-10
Date Completed: 6-Oct-10

Drillhole Number: GH10-220

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1985.7	0.00	605.4	7.0	2.13	2.13	0.97	45	0.00	0	OB	See Overburden Log																
7.0	1978.7	2.13	603.3	9.0	2.74	0.61	0.35	57	0.20	33	G	Granodiorite, light grey, medium-grained, porphyritic, iron oxide staining.	100	10	35	0	1	3	2	3	9	15	9.4	7.2	5.5	9.0	15	46
9.0	1976.7	2.74	602.7	14.0	4.27	1.52	1.52	100	1.00	66	G	Granodiorite, medium grained, light grey, porphyritic, medium strong, moderately weathered, widely spaced joints, undulating, iron oxide staining and soft calcite infill on fractures (>5mm).	140	23	66	0	1	3	0	3	7	15	11.7	12.8	5.9	7.0	15	52
14.0	1971.7	4.27	601.1	19.0	5.79	1.52	1.52	100	0.94	62	G	Granodiorite, medium grained, light grey, porphyritic, medium strong, moderately weathered, widely spaced joints, undulating, iron oxide staining and soft calcite infill on fractures (>5mm).	140	22	69	0	1	3	0	3	7	15	11.7	12.1	5.9	7.0	15	52
19.0	1966.7	5.79	599.6	24.0	7.31	1.52	1.52	100	0.86	56	G	Granodiorite, medium grained, with black phenocrysts, light grey, porphyritic, medium strong, moderately weathered, widely spaced joints, undulating, iron oxide staining on fractures.	160	18	84	0	1	3	2	3	9	15	12.7	11.1	6.1	9.0	15	54

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
24.0	1961.7	7.31	598.1	29.0	8.84	1.52	1.52	100	0.67	44	G	Granodiorite, medium grained, with black phenocrysts, light grey, porphyritic, medium strong, moderately weathered, widely spaced joints, undulating, iron oxide staining and soft calcite infill on fractures (>5mm).	120	23	66	0	0	3	0	3	6	15		9.0	5.9	6.0	15	36
29.0	1956.7	8.84	596.6	30.0	9.14	0.30	0.27	89	0.27	89	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, iron oxide staining on fractures.	50	1	270	0	1	3	2	5	11	15	5.7	17.6	8.4	11.0	15	58
30.0	1955.7	9.14	596.3	35.0	10.67	1.52	1.42	93	0.47	31	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, iron oxide staining on fractures.	75	21	68	0	1	1	2	5	9	15	7.7	6.9	5.9	9.0	15	45
35.0	1950.7	10.67	594.7	40.0	12.19	1.52	1.52	100	1.11	73	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, moderately weathered, pinky red staining on fractures, clay seam at 35 ft for 6 inches.	50	14	109	0	0	3	0	3	6	15	5.7	14.3	6.5	6.0	15	47
40.0	1945.7	12.19	593.2	45.0	13.72	1.52	1.52	100	0.75	49	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, iron oxide staining on fractures.	75	25	61	0	4	1	2	5	12	15	7.7	9.9	5.8	12.0	15	50
45.0	1940.7	13.72	591.7	50.0	15.24	1.52	1.52	100	0.97	64	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly to moderately weathered, close joints at 45 to 90° tca, smooth with iron oxide staining on fractures.	100	16	95	0	1	1	2	3	7	15		12.5	6.3	7.0	15	41
50.0	1935.7	15.24	590.2	55.0	16.76	1.52	1.52	100	0.25	16	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately weathered, very close joints, smooth with iron oxide staining on fractures.	100	25	61	0	0	1	0	3	4	15	9.4	4.9	5.8	4.0	15	39
55.0	1930.7	16.76	588.6	60.0	18.29	1.52	1.52	100	0.23	15	G	Granodiorite, medium grained, light grey with black phenocrysts, weak, moderately weathered, very close joints at 45 to 90° tca, smooth with pinky red staining on fractures.	25	25	61	0	1	1	2	3	7	15	3.4	4.8	5.8	7.0	15	36
60.0	1925.7	18.29	587.1	65.0	19.81	1.52	1.52	100	0.80	52	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately to highly weathered, close joints, smooth with iron oxide staining on fractures.	75	19	80	0	1	1	2	3	7	15	7.7	10.4	6.1	7.0	15	46

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
65.0	1920.7	19.81	585.6	70.0	21.33	1.52	1.52	100	1.39	91	G	Granodiorite, medium grained, light grey with black phenocrysts, very strong, moderately weathered, close joints, smooth with iron oxide staining on fractures.	100	8	190	0	1	1	2	3	7	15	9.4	18.2	7.5	7.0	15	57
70.0	1915.7	21.33	584.1	75.0	22.86	1.52	1.52	100	1.10	72	G	Granodiorite, medium grained, light grey with black phenocrysts, very strong, moderately weathered, close joints, smooth with iron oxide staining on fractures.	100	11	138	0	1	1	2	3	7	15		14.1	6.8	7.0	15	43
75.0	1910.7	22.86	582.5	80.0	24.38	1.52	1.52	100	1.00	66	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately weathered, close joints, smooth with iron oxide staining on fractures.	50	14	109	0	1	1	2	3	7	15	5.7	12.8	6.5	7.0	15	47
80.0	1905.7	24.38	581.0	85.0	25.91	1.52	1.52	100	0.88	58	G	Granodiorite, medium grained, light grey with black phenocrysts, very strong, slightly weathered, close joints, smooth with iron oxide staining on fractures.	100	20	76	0	4	1	2	5	12	15	9.4	11.4	6.0	12.0	15	54
85.0	1900.7	25.91	579.5	90.0	27.43	1.52	1.52	100	1.26	83	G	Granodiorite, medium grained, light grey with black phenocrysts, very strong, slightly weathered, close joints, smooth with iron oxide staining on fractures.	150	4	380	0	1	1	2	5	9	15	12.2	16.3	9.6	9.0	15	62
90.0	1895.7	27.43	578.0	95.0	28.95	1.52	1.52	100	1.12	73	G	Granodiorite, medium grained, light grey with black phenocrysts, very strong, slightly weathered, close joints, smooth with iron oxide staining on fractures.	100	9	169	0	1	1	2	5	9	15	9.4	14.4	7.2	9.0	15	55
95.0	1890.7	28.95	576.4	100.0	30.48	1.52	1.52	100	1.32	87	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly weathered, widely spaced joints, undulating, ~10cm joint @97' (lost circulation 97' - 100').	160	5	304	0	1	3	4	5	13	15		17.2	8.8	13.0	15	54
100.0	1885.7	30.48	574.9	105.0	32.00	1.52	1.52	100	1.30	85	G	Granodiorite, medium grained, light grey with black and white phenocrysts (1-5mm), strong, slightly weathered, widely spaced joints, slightly rough, ~5cm zone of soft weathered infill @ 104'-10".	140	8	190	0	1	3	0	5	9	15	11.7	16.9	7.5	9.0	15	60
105.0	1880.7	32.00	573.4	110.0	33.53	1.52	1.52	100	1.21	79	G	Granodiorite, medium grained, light grey with black and white phenocrysts (1-5mm), strong, slightly weathered, widely spaced joints, slightly rough, 3 x ~5cm long voids in core.	160	5	304	0	1	1	4	5	11	15	12.7	15.6	8.8	11.0	15	63

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
110.0	1875.7	33.53	571.9	115.0	35.05	1.52	1.52	100	1.30	85	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, closely spaced joints, zone of soft calcite infill @ 114.5'.	80	20	76	0	1	2	0	5	8	15	8.0	16.9	6.0	8.0	15	54
115.0	1870.7	35.05	570.3	120.0	36.57	1.52	1.52	100	1.22	80	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, closely spaced joints, soft calcite infill.	100	10	152	0	1	1	0	5	7	15	9.4	15.8	7.0	7.0	15	54
120.0	1865.7	36.57	568.8	125.0	38.10	1.52	1.52	100	1.26	83	G	Granodiorite, medium grained, light grey matrix with black and white phenocrysts, slightly weathered, very strong.	140	9	169	0	1	3	3	5	12	15	11.7	16.3	7.2	12.0	15	62
125.0	1860.7	38.10	567.3	130.0	39.62	1.52	1.52	100	1.51	99	G	Granodiorite, medium grained, light grey matrix with black and white phenocrysts, slightly weathered, very strong.	200	3	507	0	4	3	4	5	16	15	14.1	20.0	10.8	16.0	15	76
130.0	1855.7	39.62	565.8	135.0	41.15	1.52	1.52	100	1.36	89	G	Granodiorite, medium grained, light grey matrix with black and white phenocrysts, slightly weathered, very strong, 5mm lense of soft grey clay infill @ 131'-10".	160	4	380	0	0	1	0	5	6	15	12.7	17.7	9.6	6.0	15	61
135.0	1850.7	41.15	564.3	140.0	42.67	1.52	1.52	100	1.45	95	G	Granodiorite, medium grained, light grey matrix with black and white phenocrysts, slightly weathered, very strong.	250	4	380	0	4	1	4	5	14	15	15.1	19.1	9.6	14.0	15	73
140.0	1845.7	42.67	562.7	145.0	44.19	1.52	1.52	100	1.35	89	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, near vertical joints, calcite infill (<5mm).	125	9	169	0	1	3	2	5	11	15	10.9	17.6	7.2	11.0	15	62
145.0	1840.7	44.19	561.2	150.0	45.72	1.52	1.52	100	0.64	42	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, near vertical joints.	100	3	507	0	4	3	6	5	18	15	9.4	8.7	10.8	18.0	15	62
150.0	1835.7	45.72	559.7	155.0	47.24	1.52	1.52	100	1.26	83	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, near vertical joints, calcite infill (<5mm).	100	7	217	0	1	1	2	5	9	15	9.4	16.3	7.8	9.0	15	58
155.0	1830.7	47.24	558.2	160.0	48.77	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, calcite infill (<5mm).	200	10	152	0	1	1	2	5	9	15	14.1	20.1	7.0	9.0	15	65
160.0	1825.7	48.77	556.6	165.0	50.29	1.52	1.52	100	0.80	52	G	Granodiorite, medium grained, light grey with black phenocrysts, moderately weathered, near vertical and horizontal joints, calcite infill (<5mm).	100	15	101	0	1	1	2	3	7	15	9.4	10.4	6.4	7.0	15	48

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
165.0	1820.7	50.29	555.1	168.0	51.20	0.91	0.91	100	0.63	69	G	Granodiorite, medium grained, light grey with black phenocrysts, moderately weathered, near vertical and horizontal joints, calcite infill (<5mm).	100	9	101	0	1	1	2	3	7	15	9.4	13.5	6.4	7.0	15	51
168.0	1817.7	51.20	554.2	170.0	51.81	0.61	0.61	100	0.61	100	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, some iron oxide staining, calcite infill (<5mm).	100	3	203	0	4	3	2	5	14	15	9.4	20.2	7.6	14.0	15	66
170.0	1815.7	51.81	553.6	175.0	53.34	1.52	1.52	100	0.84	55	G	Granodiorite, medium grained, light grey with black phenocrysts, moderately weathered, near vertical and horizontal joints, calcite infill (<5mm).	100	11	138	0	4	3	2	3	12	15	9.4	10.9	6.8	12.0	15	54
175.0	1810.7	53.34	552.1	180.0	54.86	1.52	1.52	100	1.37	90	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, near vertical and horizontal joints, calcite infill (<5mm), 70mm shear zone of fine-medium subangular rock fragments @176.5'.	150	9	169	0	1	3	2	5	11	15	12.2	17.9	7.2	11.0	15	63
180.0	1805.7	54.86	550.5	185.0	56.39	1.52	1.52	100	0.96	63	G	Granodiorite, medium grained, light grey with black phenocrysts (1-5mm), slightly weathered, near vertical and horizontal joints, calcite infill (<5mm), brown and green crystals @182'.	100	14	109	0	1	3	2	5	11	15	9.4	12.3	6.5	11.0	15	54
185.0	1800.7	56.39	549.0	190.0	57.91	1.52	1.52	100	1.44	94	G	Granodiorite, medium grained, light grey with black phenocrysts (1-5mm), slightly weathered, calcite infill (<5mm), LOST CIRCULATION @ 186'-187'.	175	6	253	0	4	3	2	5	14	15	13.3	18.9	8.2	14.0	15	69
190.0	1795.7	57.91	547.5	195.0	59.43	1.52	1.52	100	1.20	79	G	Granodiorite, medium grained, light grey with black phenocrysts (1-5mm), strong, slightly weathered, hard calcite and soft grey infill @193' (~10mm thick).	140	11	138	0	1	3	0	5	9	15	11.7	15.5	6.8	9.0	15	58
195.0	1790.7	59.43	546.0	200.0	60.96	1.52	1.45	95	0.70	46	G	Granodiorite, moderately weathered, heavily fractured, light greyish brown to bluish grey (soft), iron oxide, soft grey clay infill, 196'-197' light brown clay filling angled joints (5-10mm).	50	25	58	0	0	1	0	3	4	15	5.7	9.3	5.8	4.0	15	40
200.0	1785.7	60.96	544.4	205.0	62.48	1.52	1.40	92	1.14	75	G	Granodiorite, moderately weathered, light greyish brown to bluish grey (soft), iron oxide, soft grey clay infill.	100	11	127	0	0	3	2	3	8	15	9.4	14.7	6.7	8.0	15	54
205.0	1780.7	62.48	542.9	210.0	64.00	1.52	1.52	100	1.10	72	G	Granodiorite, medium grained light grey with black phenocrysts (1-5mm), slightly weathered, iron oxide infilling @ 209'.	85	18	84	0	4	3	2	5	14	15	8.4	14.1	6.1	14.0	15	58

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
210.0	1775.7	64.00	541.4	215.0	65.53	1.52	1.40	92	0.72	47	G	Granodiorite, medium grained, light grey with black phenocrysts, light brown and orangey veins, moderately weathered with close joints and greasy black infilling.	50	11	127	0	1	1	2	3	7	15	5.7	9.5	6.7	7.0	15	44
215.0	1770.7	65.53	539.9	220.0	67.05	1.52	1.52	100	0.74	49	G	Fine grained, black, medium strong, highly weathered with close joints at 45°tca until 217.5 ft then fine grained, black, extremely weak, highly weathered zone with iron oxide staining.	50	4	380	0	4	3	2	1	10	15	5.7	9.8	9.6	10.0	15	50
220.0	1765.7	67.05	538.3	225.0	68.58	1.52	1.52	100	0.91	60	G	Fine grained, black, weak, moderately weathered with iron oxide staining until 221 ft then slightly weathered, medium strong with greasy black inflling until 224 ft, then as above Granodiorite.	50	10	152	0	1	1	2	3	7	15	5.7	11.7	7.0	7.0	15	46
225.0	1760.7	68.58	536.8	230.0	70.10	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, very strong, close joints at 90 to 45° tca with calcite infilling.	250	8	190	0	1	1	0	5	7	15	15.1	18.3	7.5	7.0	15	63
230.0	1755.7	70.10	535.3	235.0	71.62	1.52	1.52	100	0.84	55	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, extremely strong, close joints at 90 to 45° tca with calcite infilling.	250	11	138	0	1	1	2	5	9	15	15.1	10.9	6.8	9.0	15	57
235.0	1750.7	71.62	533.8	240.0	73.15	1.52	1.52	100	1.06	70	G	Granodiorite, medium grained, light grey with black phenocrysts, moderately weathered, very strong, close joints at 90 to 45° tca with sandy gravelly infilling, FAULT at 235 to 236 ft completely weathered rock with clay, clay seam at 238.5 ft (10 cm wide).	150	10	152	0	0	1	0	3	4	15	12.2	13.6	7.0	4.0	15	52
240.0	1745.7	73.15	532.3	245.0	74.67	1.52	1.52	100	0.84	55	G	Granodiorite, medium grained, light grey with black phenocrysts, highly weathered, medium strong, very close joints at 90 to 45° tca with thick calcite infilling with some clay at 240 ft (5 cm wide).	50	17	89	0	0	1	0	3	4	15	5.7	10.9	6.2	4.0	15	42
245.0	1740.7	74.67	530.7	250.0	76.20	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, very strong, close joints at 90 to 45°tca with calcite infilling.	250	6	253	0	1	1	2	5	9	15	15.1	18.3	8.2	9.0	15	66
250.0	1735.7	76.20	529.2	255.0	77.72	1.52	1.47	96	0.81	53	G	Granodiorite, medium grained, light grey with black phenocrysts, moderately weathered, strong, very close joints at 90 to 45° tca with calcite infilling.	100	13	113	0	4	1	2	3	10	15	9.4	10.6	6.5	10.0	15	51

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
255.0	1730.7	77.72	527.7	260.0	79.24	1.52	1.23	81	1.23	81	G	Granodiorite, medium grained, light grey with black phenocrysts, moderately weathered, strong, very close joints at 90 to 45° tca with calcite infilling.	100	14	88	0	4	1	2	3	10	15	9.4	15.9	6.2	10.0	15	56
260.0	1725.7	79.24	526.2	265.0	80.77	1.52	1.52	100	1.12	73	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, calcite infill to 262', then abrupt change to decomposed rock, with soft pinkish and green infill (>5mm), near vertical fractures, iron oxide staining, back to competent rock @264'.	50	3	507	0	2	2	0	3	7	15	5.7	14.4	10.8	7.0	15	53
265.0	1720.7	80.77	524.6	270.0	82.29	1.52	1.52	100	0.94	62	G	0.40m of cuttings at start of run, Granodiorite, moderately weathered, medium grained, black and white phenocrysts, pink soft infill (10mm)@267'.	100	9	169	0	0	3	0	3	6	15	9.4	12.1	7.2	6.0	15	50
270.0	1715.7	82.29	523.1	275.0	83.82	1.52	1.52	100	1.44	94	G	Granodiorite, medium grained, light grey with black phenocrysts, slightly weathered, very strong, no infill.	150	5	304	0	4	3	4	5	16	15	12.2	18.9	8.8	16.0	15	71
275.0	1710.7	83.82	521.6	280.0	85.34	1.52	1.52	100	1.46	96	G	Granodiorite, medium grained, light grey matrix with black and white phenocrysts <5mm, slightly weathered, very strong, no infill.	200	5	304	0	4	3	6	5	18	15	14.1	19.2	8.8	18.0	15	75
280.0	1705.7	85.34	520.1	285.0	86.86	1.52	1.52	100	1.16	76	G	0.15m slough, Granodiorite, medium grained, light grey matrix with black and white phenocrysts (<5mm), trace pyrite, slightly weathered, strong, no infill.			1524	0				5	5	15	1.0	14.9	17.6	5.0	15	53
285.0	1700.7	86.86	518.5	290.0	88.39	1.52	1.52	100	0.71	47	G	Granodiorite, medium grained, light grey with black phenocrysts, very strong, moderately weathered, close joints from 90° to near vertical to core axis, rough with calcite infilling.	250	12	127	0	1	5	3	5	14	15	9.4	9.4	6.7	14.0	15	55
290.0	1695.7	88.39	517.0	295.0	89.91	1.52	1.52	100	1.38	91	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly weathered, close joints from 90° to near vertical to core axis, rough with calcite infilling.	100	6	253	0	1	5	3	5	14	15	9.4	18.0	8.2	14.0	15	65
295.0	1690.7	89.91	515.5	300.0	91.44	1.52	1.46	96	1.24	81	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately weathered, close joints 45°tca with thick calcite infilling.	100	5	292	0	4	3	3	3	13	15	9.4	16.0	8.6	13.0	15	62

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
300.0	1685.7	91.44	514.0	305.0	92.96	1.52	1.52	100	1.22	80	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly weathered, close joints at 45°tca with no infilling.	100	7	217	0	4	3	6	5	18	15	9.4	15.8	7.8	18.0	15	66
305.0	1680.7	92.96	512.4	310.0	94.48	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately weathered, close joints 45°tca with calcite infilling and red staining.	100	5	304	0	4	3	2	3	12	15	9.4	20.1	8.8	12.0	15	65
310.0	1675.7	94.48	510.9	315.0	96.01	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly weathered, close joints 45°tca with calcite infilling.	100	2	760	0	4	1	2	5	12	15	5.7	20.1	12.9	12.0	15	66
315.0	1670.7	96.01	509.4	320.0	97.53	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, close joints 45°tca with calcite infilling.	50	5	304	0	4	1	2	5	12	15	9.4	20.1	8.8	12.0	15	65
320.0	1665.7	97.53	507.9	325.0	99.06	1.52	1.52	100	1.32	87	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, moderately weathered, close joints 45°tca to vertical joint with calcite infilling and iron oxide staining.	100	5	304	0	4	1	2	3	10	15	9.4	17.2	8.8	10.0	15	60
325.0	1660.7	99.06	506.3	330.0	100.58	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, close joints 45°tca with calcite infilling and iron oxide staining.	100	2	760	0	4	3	2	5	14	15	9.4	20.1	12.9	14.0	15	72
330.0	1655.7	100.58	504.8	335.0	102.10	1.52	1.52	100	1.43	94	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, close joints 45° tca with no infilling and iron oxide staining.	100	5	304	0	4	3	2	5	14	15	9.4	18.8	8.8	14.0	15	66
335.0	1650.7	102.10	503.3	340.0	103.63	1.52	1.52	100	1.25	82	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, close joints 45° tca with soft infilling.	100	7	217	0	1	3	2	5	11	15	9.4	16.2	7.8	11.0	15	59
340.0	1645.7	103.63	501.8	345.0	105.15	1.52	1.52	100	1.03	68	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, slightly weathered, close joints 45° tca with no infilling and iron oxide staining.	100	5	304	0	4	1	2	5	12	15	9.4	13.2	8.8	12.0	15	58
345.0	1640.7	105.15	500.2	350.0	106.67	1.52	1.50	98	1.31	86	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly weathered, close joints 45° tca with no infilling and iron oxide staining.	100	6	250	0	4	3	2	5	14	15	9.4	17.0	8.2	14.0	15	64

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
350.0	1635.7	106.67	498.7	355.0	108.20	1.52	1.50	98	1.50	98	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, slightly weathered, no joints until broken to put into core box, then moderately close joints 45°tca with calcite infilling and iron oxide staining.	100	0	1524	0	6	6	6	5	23	15	9.4	19.8	17.6	23.0	15	85
355.0	1630.7	108.20	497.2	360.0	109.72	1.52	1.52	100	1.41	93	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately weathered, slickensides, close joints 45° tca with calcite infilling and iron oxide staining.	100	4	380	0	4	0	2	3	9	15	9.4	18.5	9.6	9.0	15	61
360.0	1625.7	109.72	495.7	365.0	111.25	1.52	1.52	100	1.47	96	G	Granodiorite, medium grained, light grey with black phenocrysts, strong, moderately weathered, slickensides, close joints 45°tca with calcite infilling and iron oxide staining.	100	4	380	0	4	0	2	5	11	15	9.4	19.4	9.6	11.0	15	64
365.0	1620.7	111.25	494.2	370.0	112.77	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, highly weathered, with veins of calcite, gradually becoming ribboned with calcite, close joints, rough, 45° tca with calcite infilling.	25	2	760	0	4	3	2	3	12	15	3.4	20.1	12.9	12.0	15	64
370.0	1615.7	112.77	492.6	375.0	114.29	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey with black phenocrysts, medium strong, highly weathered, with veins of calcite, gradually becoming ribboned with calcite, close joints, rough, 45° tca with calcite infilling .	25	2	760	0	1	3	2	3	9	15	3.4	20.1	12.9	9.0	15	61
375.0	1610.7	114.29	491.1	380.0	115.82	1.52	1.48	97	1.43	94	G	Granodiorite, medium grained, light grey matrix, black and white phenocrysts, medium strong, slightly weathered, increased weathering to moderate at 379', pinkish red infilling on near vertical closed joints.	80	3	493	0	4	3	2	3	12	15	8.0	18.8	10.7	12.0	15	64
380.0	1605.7	115.82	489.6	385.0	117.34	1.52	1.52	100	1.38	91	G	Granodiorite, medium grained, light grey matrix, black and white phenocrysts, medium strong, moderately weathered, deep fractures with alteration, near vertical seam 0.5" wide with pinkish red clayey infill from 382'-383.5'.	75	1	1520	0	4	3	4	3	14	15	7.7	18.0	17.5	14.0	15	72
385.0	1600.7	117.34	488.1	390.0	118.87	1.52	1.50	98	1.48	97	G	Granodiorite, medium grained, medium to light grey matrix, black and white phenocrysts, medium strong, moderately weathered, pinkish infill on closed joints, intact open voids without staining approximately 1-10 cm long by 3 mm wide.	80	3	500	0	1	3	2	3	9	15	8.0	19.5	10.8	9.0	15	62

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
390.0	1595.7	118.87	486.5	395.0	120.39	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, two near vertical closed joints with reddish infill, open void 1-2 cm long and 5 mm wide.	100	2	760	0	4	3	2	5	14	15	9.4	20.1	12.9	14.0	15	72
395.0	1590.7	120.39	485.0	400.0	121.91	1.52	1.52	100	1.36	89	G	Granodiorite, medium grained, medium to light grey matrix, black and white phenocrysts, medium strong, slightly weathered, near vertical closed joints with reddish slickensided stain.	80	8	190	0	1	0	2	5	8	15	8.0	17.7	7.5	8.0	15	56
400.0	1585.7	121.91	483.5	405.0	123.44	1.52	1.48	97	1.36	89	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, intact joint opening 1-2 mm wide and 8 cm long at 404.5' with no infill.	125	5	296	0	1	3	4	5	13	15	10.9	17.7	8.7	13.0	15	65
405.0	1580.7	123.44	482.0	410.0	124.96	1.52	1.50	98	1.50	98	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered.	100	4	375	0	4	3	4	5	16	15	9.4	19.8	9.5	16.0	15	70
410.0	1575.7	124.96	480.4	415.0	126.49	1.52	1.52	100	1.34	88	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, slightly weathered, calcite infill with pinkish discoloration.	125	8	190	0	1	3	2	5	11	15	10.9	17.5	7.5	11.0	15	62
415.0	1570.7	126.49	478.9	420.0	128.01	1.52	1.52	100	1.48	97	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, slightly weathered, calcite infilling on near vertical joint at 415', white discoloration on closed joint at 419'.	125	7	217	0	4	1	2	5	12	15	10.9	19.5	7.8	12.0	15	65
420.0	1565.7	128.01	477.4	425.0	129.53	1.52	1.50	98	0.97	64	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 45 and 90° tca, slightly rough, with hard infill.	100	7	214	0	4	3	4	5	16	15	9.4	12.5	7.8	16.0	15	61
425.0	1560.7	129.53	475.9	430.0	131.06	1.52	1.52	100	0.94	62	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 45 and 90° tca, slightly rough, with hard infill and some iron oxide staining.	100	10	152	0	1	3	2	5	11	15	9.4	12.1	7.0	11.0	15	55
430.0	1555.7	131.06	474.3	435.0	132.58	1.52	1.52	100	1.34	88	G	Granodiorite, medium grained, light grey matrix, porphyritic strong, slightly weathered, close joints at 45 and 90° tca, slightly rough, with hard infill in some joints, others have no infill.	100	7	217	0	1	3	4	5	13	15	9.4	17.5	7.8	13.0	15	63

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
435.0	1550.7	132.58	472.8	440.0	134.11	1.52	1.52	100	1.20	79	G	Granodiorite, medium grained, light grey matrix, porphyritic strong, slightly weathered, close joints at 45°tca, slightly rough, with hard infill and some iron oxide staining.	100	6	253	0	4	3	2	5	14	15	9.4	15.5	8.2	14.0	15	**62**
440.0	1545.7	134.11	471.3	445.0	135.63	1.52	1.52	100	1.26	83	G	Granodiorite, medium grained, light grey matrix, porphyritic strong, slightly weathered, close joints at 90 to 20° tca, slightly rough, with calcite infill.	100	3	507	0	1	1	2	5	9	15	9.4	16.3	10.8	9.0	15	**61**
445.0	1540.7	135.63	469.8	450.0	137.15	1.52	1.52	100	1.49	98	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close to moderately close joints at 90° tca, slightly rough, with no infill.	75	5	304	0	1	3	6	5	15	15	7.7	19.7	8.8	15.0	15	**66**
450.0	1535.7	137.15	468.2	455.0	138.68	1.52	1.52	100	1.25	82	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 45 and 90° tca, slightly rough, with quartz infill in 45° joints, no infill in 90° joints.	100	8	190	0	4	3	4	5	16	15	9.4	16.2	7.5	16.0	15	**64**
455.0	1530.7	138.68	466.7	460.0	140.20	1.52	1.51	99	1.51	99	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 45 and 90° tca, slightly rough, with iron oxide staining in 45° joints, no infill in 90° joints.	100	5	302	0	4	3	2	5	14	15	9.4	20.0	8.7	14.0	15	**67**
460.0	1525.7	140.20	465.2	465.0	141.73	1.52	1.52	100	1.50	98	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90° tca, slightly rough, with no infill.	100	7	217	0	1	3	6	5	15	15	9.4	19.8	7.8	15.0	15	**67**
465.0	1520.7	141.73	463.7	470.0	143.25	1.52	1.52	100	1.46	96	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90° tca, slightly rough, with no infill.	100	7	217	0	1	3	6	5	15	15	9.4	19.2	7.8	15.0	15	**66**
470.0	1515.7	143.25	462.2	475.0	144.77	1.52	1.45	95	1.45	95	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, flat joint surfaces roughly 90° to core axis, slightly rough, no infill.	100	5	290	0	4	3	6	5	18	15	9.4	19.1	8.6	18.0	15	**70**
475.0	1510.7	144.77	460.6	480.0	146.30	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, flat joint surfaces roughly 90° to core axis, slightly rough, no infill.	125	2	760	0	4	3	6	5	18	15	10.9	20.1	12.9	18.0	15	**77**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
480.0	1505.7	146.30	459.1	485.0	147.82	1.52	1.52	100	1.46	96	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, flat joint surfaces roughly 90° tca, slightly rough, calcite infill 1-2 mm in joints.	125	5	304	0	1	3	2	5	11	15	10.9	19.2	8.8	11.0	15	65
485.0	1500.7	147.82	457.6	490.0	149.34	1.52	1.52	100	1.43	94	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, joints slightly rough and infilled with calcite.	100	4	380	0	1	3	2	5	11	15	9.4	18.8	9.6	11.0	15	64
490.0	1495.7	149.34	456.1	495.0	150.87	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, porphyritic, medium strong, slightly to moderately weathered, zone of heavy weathering from 493'-495' with black discoloration on several fractures, affecting rock strength.	50	3	507	0	4	1	2	3	10	15	5.7	20.1	10.8	10.0	15	62
495.0	1490.7	150.87	454.5	500.0	152.39	1.52	1.52	100	1.48	97	G	Granodiorite, medium grained, light grey matrix, porphyritic, medium strong to strong, moderately weathered from 495'-499', calcite infill in joints approx. 1-3 mm.	50	10	152	0	1	3	2	3	9	15	5.7	19.5	7.0	9.0	15	56
500.0	1485.7	152.39	453.0	505.0	153.92	1.52	1.46	96	1.46	96	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, joints reddish colored, slickensided, some calcite 1-2 mm observed in joints.	80	2	730	0	4	0	2	5	11	15	8.0	19.2	12.7	11.0	15	66
505.0	1480.7	153.92	451.5	510.0	155.44	1.52	1.52	100	1.48	97	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, closed fractures, reddish colored, slickensided, some calcite 1-2 mm observed in joints.	100	4	380	0	4	0	2	5	11	15	9.4	19.5	9.6	11.0	15	65
510.0	1475.7	155.44	450.0	515.0	156.96	1.52	1.52	100	1.24	81	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, near vertical fracture continues to 511', < 1 mm calcite infill in joints, planar to slickensided joints.	75	8	190	0	4	0	2	5	11	15	7.7	16.0	7.5	11.0	15	57
515.0	1470.7	156.96	448.4	520.0	158.49	1.52	1.52	100	1.32	87	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, calcite infill in some joints <1mm, slickensides.	100	7	217	0	4	0	2	5	11	15	9.4	17.2	7.8	11.0	15	60
520.0	1465.7	158.49	446.9	525.0	160.01	1.52	1.52	100	1.39	91	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 degrees with no infill. Driller's helper dropped the core tube when transferring the core and it was rebuilt, the direction and order of the core in the box is possibly incorrect.	100	9	169		1	3	6	5	15	15	9.4	18.2	7.2	15.0	15	65

Knight Piésold CONSULTING

Drillhole Number: GH10-220

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
525.0	1460.7	160.01	445.4	530.0	161.54	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90° with no infill.	100	3	507	0	4	3	6	5	18	15	9.4	20.1	10.8	18.0	15	73
530.0	1455.7	161.54	443.9	535.0	163.06	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 and 45° with no infill except in one 45 degree joint that has red staining, slickensides.	100	6	253		1	0	2	5	8	15	9.4	18.3	8.2	8.0	15	59
535.0	1450.7	163.06	442.3	540.0	164.58	1.52	1.50	98	1.34	88	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 and 45° with no infill except in one 45 degree joint that has thick soft calcite infill (<20 mm), slickensides.	100	7	214	0	1	0	0	5	6	15	9.4	17.5	7.8	6.0	15	56
540.0	1445.7	164.58	440.8	545.0	166.11	1.52	1.52	100	1.49	98	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 and 45° with no infill.	100	7	217		4	3	6	5	18	15	9.4	19.7	7.8	18.0	15	70
545.0	1440.7	166.11	439.3	550.0	167.63	1.52	1.52	100	1.36	89	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 and 45° with no infill.	100	5	304	0	4	3	6	5	18	15	9.4	17.7	8.8	18.0	15	69
550.0	1435.7	167.63	437.8	555.0	169.16	1.52	1.52	100	1.20	79	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 and 45° with no infill.	100	12	127		1	3	6	5	15	15	9.4	15.5	6.7	15.0	15	62
555.0	1430.7	169.16	436.2	560.0	170.68	1.52	1.47	96	1.40	92	G	Granodiorite, medium grained, light grey matrix, porphyritic, strong, slightly weathered, close joints at 90 and 45° with no infill except hard infill in one 45° joint.	100	6	245	0	1	3	4	5	13	15	9.4	18.3	8.1	13.0	15	64
560.0	1425.7	170.68	434.7	565.0	172.20	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, porphyritic, very strong, slightly weathered, intersecting joints at 45 and 90° between 563-564', infill with 1-2 mm of calcite.	125	6	253	0	4	3	2	5	14	15	10.9	20.1	8.2	14.0	15	68
565.0	1420.7	172.20	433.2	570.0	173.73	1.52	1.44	94	0.97	64	G	Granodiorite, medium grained, grey matrix, porphyritic, very strong, slightly weathered, joints at 30 to 45° and 90° with some calcite infill, transition to fine grained Granodiorite at 568.5', slickensided joint surfaces.	150	12	120	0	4	0	2	5	11	15	12.2	12.5	6.6	11.0	15	57
570.0	1415.7	173.73	431.7	575.0	175.25	1.52	1.52	100	1.41	93	G	Granodiorite, medium grained, grey matrix, very strong, slightly weathered, some weathering in joints with 1-2 mm calcite infill on 50% of joint surfaces with brownish-orange discoloration in the near vertical joint surface, some slickensides.	150	5	304	0	4	0	2	5	11	15	12.2	18.5	8.8	11.0	15	65

Knight Piésold CONSULTING

Drillhole Number: GH10-220

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis-P	Joint Condition Apert-A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
575.0	1410.7	175.25	430.1	580.0	176.78	1.52	1.49	98	1.44	94	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slighlty weathered, calcite infill in some joints < 1 mm thick.	125	4	373	0	4	3	2	5	14	15	10.9	18.9	9.5	14.0	15	**68**
580.0	1405.7	176.78	428.6	585.0	178.30	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered joint surfaces with brownish staining.	125	4	380	0	4	3	2	5	14	15	10.9	20.1	9.6	14.0	15	**70**
585.0	1400.7	178.30	427.1	590.0	179.82	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly altered, calcium infill at joint surface at start of run at 585'	125	2	760	0	4	3	2	5	14	15	10.9	20.1	12.9	14.0	15	**73**
590.0	1395.7	179.82	425.6	595.0	181.35	1.52	1.50	98	1.13	74	G	Granodiorite, medium grained, grey matrix, porphyritic, strong, slightly weathered, < 1 mm thick calcite infill in some joints, several healed fractures at 45°tca.	100	9	167	0	4	3	2	5	14	15	9.4	14.5	7.2	14.0	15	**60**
595.0	1390.7	181.35	424.1	600.0	182.87	1.52	1.50	98	1.27	83	G	As above.	125	9	167	0	4	3	2	5	14	15	10.9	16.5	7.2	14.0	15	**64**
												END OF HOLE																

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0	05JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB
REV	DATE	DESCRIPTION	PREPD	CHKD	APPD

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-221

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1405547 E, 2159171 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 306.8 m
1,006 ft
Total Depth: 42.4 m
139 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-700

Core Diameter: From	0	to	55	ft	PQ3	3.27 "
		to		ft		
Core Diameter: From	55	to	139	ft	HQ3	2.41 "
		to		ft		
		to		ft		

Logged By: BO, BH
Reviewed By: LS
Date Started: 24-Sep-10
Date Completed: 30-Sep-10

Drillhole Number: GH10-221

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1006.1	0.00	306.8	88.2	26.88	26.88						See Overburden Log.																
88.2	917.9	26.88	279.9	89.0	27.13	0.24	0.24	98	0.10	41	TC	Tertiary conglomerate with wacke, clast supported, rounded sedimentary and volcanic clasts, shallow dipping joints.	50	7	34	0	1	3	2	5	11	15	5.7	8.5	5.5	11.0	15	**46**
89.0	917.1	27.13	279.6	94.0	28.65	1.52	1.52	100	1.25	82	TC	Tertiary conglomerate with wacke, clast supported, rounded sedimentary and volcanic clasts, shallow dipping joints, one shear zone.	140	6	253	0	1	1	2	5	9	15	11.7	16.2	8.2	9.0	15	**60**
94.0	912.1	28.65	278.1	99.0	30.17	1.52	1.52	100	1.20	79	TC	As above, all joints tight.	140	4	380	0	4	5	6	5	20	15	11.7	15.5	9.6	20.0	15	**72**
99.0	907.1	30.17	276.6	104.0	31.70	1.52	1.52	100	1.03	68	TC	As above.	140	3	507	0	4	5	6	5	20	15	11.7	13.2	10.8	20.0	15	**71**
104.0	902.1	31.70	275.1	109.0	33.22	1.52	1.52	100	1.25	82	TC	As above, 1 steeper joint and one shear zone at beginning of run.	140	4	380	0	4	5	4	5	18	15	11.7	16.2	9.6	18.0	15	**70**
109.0	897.1	33.22	273.5	114.0	34.75	1.52	1.52	100	1.46	96	TC	As above, light grey, joints dip 80-90°tca.	110	4	380	0	4	3	4	5	16	15	10.0	19.2	9.6	16.0	15	**70**

Knight Piésold CONSULTING

Drillhole Number: GH10-221

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
114.0	892.1	34.75	272.0	119.0	36.27	1.52	1.52	100	1.36	89	TC	As above, light grey, joints dip 70-90°tca.	110	3	507	0	4	3	4	5	16	15	10.0	17.7	10.8	16.0	15	**70**
119.0	887.1	36.27	270.5	124.0	37.79	1.52	1.52	100	1.42	93	TC	As above, light grey, joints dip 70-90°tca.	110	4	380	0	4	5	6	5	20	15	10.0	18.6	9.6	20.0	15	**73**
124.0	882.1	37.79	269.0	129.0	39.32	1.52	1.52	100	1.42	93	TC	As above, light grey, joints dip 80-90°tca.	110	3	507	0	4	5	6	5	20	15	10.0	18.6	10.8	20.0	15	**74**
129.0	877.1	39.32	267.4	134.0	40.84	1.52	1.52	100	1.02	67	TC	As above, light grey, joints dip 50-90°tca.	110	7	217	0	4	5	4	5	18	15	10.0	13.1	7.8	18.0	15	**64**
134.0	872.1	40.84	265.9	139.0	42.37	1.52	1.52	100	1.02	67	TC	As above, light grey, joints dip 45-90°tca.	110	9	169	0	4	5	4	5	18	15	10.0	13.1	7.2	18.0	15	**63**
END OF HOLE																												

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	08JAN11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-222

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1406600 E, 2156961 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 321.3 m
1,054 ft
Total Depth: 39.6 m
130 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-700

Core Diameter: From	0	to	70	ft	PQ3	3.27 "
		to		ft		
Core Diameter: From	70	to	130	ft	HQ3	2.41 "
		to		ft		
		to		ft		

Logged By: BO, BH
Reviewed By: LS
Date Started: 30-Sep-10
Date Completed: 2-Oct-10

Drillhole Number: GH10-222

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
																Joint Condition												
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	1053.7	0.00	321.3	75.0	22.86	22.86	7.69	34			OB	See Overburden Log.																
75.0	978.7	22.86	298.4	80.0	24.38	1.52	1.06	70	0.00	0	TC	Highly weathered Tertiary Conglomerate with lots of clay, pervasive iron oxide alteration, fractured, weak.	20	50	21	0	0	1	0	1	2	15	3.0	3.0	5.3	2.0	15	**28**
80.0	973.7	24.38	296.9	85.0	25.91	1.52	1.38	91	0.11	7	TC	As above, moderately weathered, frequent broken zones, clay infill, more competent than last run due to less intense weathering.	60	25	55	0	0	1	0	3	4	15	6.5	3.8	5.8	4.0	15	**35**
85.0	968.7	25.91	295.3	90.0	27.43	1.52	1.52	100	0.16	10	TC	Moderately weathered to 86.3', pervasive iron oxide staining to 86.3', grey rock with small to large conglomerate clasts, thin black lenses.	80	18	84	0	1	1	2	3	7	15	8.0	4.2	6.1	7.0	15	**40**
90.0	963.7	27.43	293.8	95.0	28.95	1.52	1.51	99	0.82	54	TC	As above, grey Tertiary Wacke, joints at 30-50°tca, clay, broken zones, oxidation on joints.	120	10	151	0	1	1	2	5	9	15	10.6	10.7	7.0	9.0	15	**52**

Knight Piésold CONSULTING

Drillhole Number: GH10-222

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
95.0	958.7	28.95	292.3	100.0	30.48	1.52	1.52	100	1.18	77	TC	Tertary Conglomerate, large rounded to subrounded clasts of various lithology, some iron oxidation, limited joint infill.	140	9	169	0	4	5	2	5	16	15	11.7	15.2	7.2	16.0	15	**65**
100.0	953.7	30.48	290.8	105.0	32.00	1.52	1.52	100	0.45	30	TC	As above, similar to previous run but with more fractures and clay in joints.	140	13	117	0	4	5	2	5	16	15	11.7	6.7	6.6	16.0	15	**56**
105.0	948.7	32.00	289.2	110.0	33.53	1.52	1.39	91	0.12	8	TC/TY	As above Tertiary conglomerate for first foot, then Tertiary Siltstone/Mudstone, light and dark laminations, iron oxidation and grey clay on joints, moderately fractured.	120	14	99	0	1	1	2	5	9	15	10.6	3.9	6.3	9.0	15	**45**
110.0	943.7	33.53	287.7	115.0	35.05	1.52	1.50	98	0.11	7	TY	As above, Tertiary Siltstone/Mudstone, laminations, thick layers of grey clay between shallow dipping joints, end of run is transitioning to Tertiary Volcaniclastic Breccia Conglomerate unit.	120	18	83	0	0	1	0	5	6	15	10.6	3.8	6.1	6.0	15	**42**
115.0	938.7	35.05	286.2	120.0	36.57	1.52	1.52	100	1.47	96	TX	Tertiary Volcaniclastic Breccia Conglomerate, competent, grey rock, joints at 20°tca with thin clay infill.	160	3	507	0	4	3	2	5	14	15	12.7	19.4	10.8	14.0	15	**72**
120.0	933.7	36.57	284.7	125.0	38.10	1.52	1.51	99	1.45	95	TX	As above.	160	3	503	0	4	1	2	5	12	15	12.7	19.1	10.8	12.0	15	**70**
125.0	928.7	38.10	283.2	130.0	39.62	1.52	1.51	99	0.90	59	TX	As above, thick joint with broken rock and clay at bottom of run.	160	6	252	0	1	3	2	5	11	15	12.7	11.6	8.2	11.0	15	**58**
												END OF HOLE																

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	18JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-223

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1404713 E, 2156284 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 306.3 m
1,005 ft
Total Depth: 33.5 m
110 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-700

	From	to			
Core Diameter:	0 ft	43 ft	PQ3	3.27 "
		ft		
Core Diameter:	43 ft	110 ft	HQ3	2.41 "
		ft		
		ft		

Logged By: BO, BH, AA
Reviewed By: LS
Date Started: 3-Oct-10
Date Completed: 5-Oct-10

Drillhole Number: GH10-223

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type.	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1004.5	0.00	306.3	43.0	13.11	13.11	6.27	48			OB	See Overburden Log.																
43.0	961.5	13.11	293.1	45.0	13.72	0.61	0.61	100	0.00	0	TB	Tertiary Basalt, dark grey, fine grained, soft clay infill, fractured, calcite veins.	200	30	20	0	0	3	0	5	8	15	14.1	3.0	5.3	8.0	15	45
45.0	959.5	13.72	292.5	50.0	15.24	1.52	1.48	97	0.28	18	TB/D	Tertiary Basalt to 49.8', dark grey, fine grained, soft clay infill, joints dip at 50-90°tca, then Diorite, dark brown to black.	75	15	99	0	0	3	0	3	6	15	7.7	5.2	6.3	6.0	15	40
50.0	954.5	15.24	291.0	55.0	16.76	1.52	1.52	100	0.00	0	D	Diorite, dark brown to black, fine grained, massive, calcite infill with pyrite, fractured.	110	15	101	0	1	3	2	5	11	15	10.0	3.0	6.4	11.0	15	45
55.0	949.5	16.76	289.5	60.0	18.29	1.52	1.22	80	0.18	12	D/G	As above, Diorite to 58.3', then either strongly clay altered, bleached Diorite or Granodiorite, most likely thin granodiorite intrusion, light grey to tan.	75	30	41	0	1	3	2	5	11	15	7.7	4.4	5.6	11.0	15	44
60.0	944.5	18.29	288.0	65.0	19.81	1.52	1.06	70	0.45	30	D	As above Diorite, dark brown to black, fine grained, calcite infill with pyrite, fractured, altered zones from 62 to 64.7', then light grey Granodiorite.	25	30	35	0	1	3	2	3	9	15	3.4	6.7	5.5	9.0	15	40

Knight Piésold CONSULTING

Drillhole Number: GH10-223

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type.	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
65.0	939.5	19.81	286.4	70.0	21.33	1.52	1.52	100	0.53	35	G	Granodiorite, fine grained, light grey, very strong, very close joints, rough undulating with soft infill and pyrite veins.	150	30	51	0	1	3	2	5	11	15	12.2	7.5	5.7	11.0	15	**51**
70.0	934.5	21.33	284.9	75.0	22.86	1.52	1.52	100	0.86	56	G/D	As above, Granodiorite continues to 70.4', then back to dark brown to tan Diorite, fine grained, porphyritic, close joints, smooth undulating with calcite infill and pyrite veins.	75	13	117	0	4	1	2	5	12	15	7.7	11.1	6.6	12.0	15	**52**
75.0	929.5	22.86	283.4	80.0	24.38	1.52	1.52	100	0.78	51	D	As above, Diorite, fine grained, dark grey, strong, moderately weathered, close joints, smooth undulating with calcite infill and pyrite veins.	150	15	101	0	4	1	2	5	12	15	12.2	10.2	6.4	12.0	15	**56**
80.0	924.5	24.38	281.9	85.0	25.91	1.52	1.52	100	1.30	85	D	Diorite, fine grained, dark grey, very strong, moderately weathered, close joints, smooth undulating with calcite infill and pyrite veins, thick pyrite vein at 80 ft (>10 mm).	200	10	152	0	1	3	2	5	11	15	14.1	16.9	7.0	11.0	15	**64**
85.0	919.5	25.91	280.3	90.0	27.43	1.52	1.52	100	1.07	70	D	As above.	75	15	101	0	1	3	2	5	11	15	7.7	13.7	6.4	11.0	15	**54**
90.0	914.5	27.43	278.8	95.0	28.95	1.52	1.50	98	0.85	56	D	As above, Diorite, fine grained, dark grey with pyrite veins, very strong, slightly weathered with close joints and calcite infill.	150	13	115	0	4	3	2	5	14	15	12.2	11.0	6.5	14.0	15	**59**
95.0	909.5	28.95	277.3	100.0	30.48	1.52	1.52	100	0.45	30	D//G	As above Diorite, some irregular white zones, brecciated with clay cement, close joints and hard calcite infill until 98 ft then Granodiorite, fine grained, light grey with pyrite veins, very close joints, weathered.	150	30	51	0	4	3	2	5	14	15	12.2	6.7	5.7	14.0	15	**54**
100.0	904.5	30.48	275.8	105.0	32.00	1.52	1.52	100	1.14	75	G/D	Granodiorite up to 104.3', fine grained, light grey with pyrite veins, very close joints, slightly weathered, calcite infill, then back to Diorite.	75	10	152	0	1	3	2	5	11	15	7.7	14.7	7.0	11.0	15	**55**
105.0	899.5	32.00	274.2	110.0	33.53	1.52	1.52	100	1.27	83	D	Diorite, fine grained, dark grey with pyrite veins, very strong, slightly weathered with close joints and calcite infill, alternating zones of rock that looks like granodiorite, fine grained, light grey with pyrite veins, very close joints, slightly weathered, calcite infill.	100	11	138	0	4	1	2	5	12	15	9.4	16.5	6.8	12.0	15	**60**

END OF HOLE

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-223\[GH10-223.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	18JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-224

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1403806 E, 2154519 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 307.5 m
1,009 ft
Total Depth: 24.4 m
80 ft
Azimuth: 0 deg
Inclination: 90 deg (down is positive)

Drill Type: HT-700

Core Diameter: From	0	to	25	ft	PQ3	3.27 "
		to		ft		
Core Diameter: From	25	to	80	ft	HQ3	2.41 "
		to		ft		
		to		ft		

Logged By: SC, BH
Reviewed By: LS
Date Started: 6-Oct-10
Date Completed: 7-Oct-10

Drillhole Number: GH10-224

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1008.6	0.00	307.5	12.0	3.66	3.66	0.00	0	0.00	0	OB	See Overburden Log.																
12.0	996.6	3.66	303.8	15.0	4.57	0.91	0.50	55	0.00	0	G	Weathered Granodiorite, fine grained, moderately weathered, iron oxide staining, grey to white, fine grained, veins 25°tca, competent.	100	11	45	0	4	3	2	3	12	15	9.4	3.0	5.6	12.0	15	45
15.0	993.6	4.57	302.9	20.0	6.10	1.52	0.75	49	0.16	10	G	Granodiorite, moderately weathered, abundant iron staining/oxidation, fractures in multiple directions.	100	14	54	0	4	3	2	3	12	15	9.4	4.2	5.7	12.0	15	46
20.0	988.6	6.10	301.4	25.0	7.62	1.52	1.44	94	0.15	10	G	Highly weathered granodiorite, lots of iron oxidation, thick clay seams, disseminated pyrite, very soft.	50	15	96	0	0	1	0	1	2	15	5.7	4.1	6.3	2.0	15	33
25.0	983.6	7.62	299.9	30.0	9.14	1.52	0.42	28	0.00	0	G	Switch to HQ3, weathered granodiorite, poor recovery, iron oxide staining, fractured, some mineralization.	100	20	21	0	1	1	2	3	7	15	9.4	3.0	5.3	7.0	15	40
30.0	978.6	9.14	298.4	35.0	10.67	1.52	1.52	100	0.00	0	G	Granodiorite, light grey, highly fractured, less oxidation, some small shear zones.	100	50	30	0	1	3	2	3	9	15	9.4	3.0	5.4	9.0	15	42

Knight Piésold CONSULTING

Drillhole Number: GH10-224

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
35.0	973.6	10.67	296.8	40.0	12.19	1.52	1.50	98	0.00	0	G	Light grey granodiorite, fractured but more competent than above, slight iron oxide alteration.	100	40	38	0	4	3	2	5	14	15	9.4	3.0	5.5	14.0	15	**47**
40.0	968.6	12.19	295.3	45.0	13.72	1.52	1.48	97	0.41	27	G	Granodiorite, light grey, pyrite veins @45°tca, slightly weathered, broken/shear zone at top of run.	100	23	64	0	1	3	2	5	11	15	9.4	6.4	5.9	11.0	15	**48**
45.0	963.6	13.72	293.8	50.0	15.24	1.52	1.52	100	0.21	14	G	Light grey granodiorite, vertical joint, more competent.	120	20	76	0	4	5	4	5	18	15	10.6	4.6	6.0	18.0	15	**54**
50.0	958.6	15.24	292.3	55.0	16.76	1.52	1.46	96	0.64	42	G	As above, steep joints, highly broken at bottom of run, thin shear zones.	120	12	122	0	4	5	4	5	18	15	10.6	8.7	6.6	18.0	15	**59**
55.0	953.6	16.76	290.7	60.0	18.29	1.52	1.45	95	0.00	0	G	As above, more fractured, pyrite mineralization, steep fractures.	100	29	50	0	4	3	4	5	16	15	9.4	3.0	5.7	16.0	15	**49**
60.0	948.6	18.29	289.2	65.0	19.81	1.52	1.52	100	0.72	47	G	Granodiorite, light grey, jointing up to 45°tca, heavy mineralization with pyrite veins as wide as 7mm.	100	30	51	0	4	3	4	5	16	15	9.4	9.5	5.7	16.0	15	**56**
65.0	943.6	19.81	287.7	70.0	21.33	1.52	1.38	91	0.15	10	G	Light grey granodiorite, heavily jointed and slightly more weathered than previous run, less pyrite than above, some small shear zones.	100	30	46	0	1	3	2	5	11	15	9.4	4.1	5.6	11.0	15	**45**
70.0	938.6	21.33	286.2	75.0	22.86	1.52	0.92	60	0.11	7	G	Light grey granodiorite, highly fractured, some infilling greater than 10mm, top of run is more competent and less weathered.	100	30	31	0	1	3	3	5	12	15	9.4	3.8	5.4	12.0	15	**46**
75.0	933.6	22.86	284.6	80.0	24.38	1.52	1.52	100	0.42	28	D?	Dark grey, more competent rock, possibly diorite but difficult to tell as there is only 5', less infilling, some oxidized veins trace chalcopyrite, disseminated and vein pyrite.	110	30	51	0	4	3	4	5	16	15	10.0	6.5	5.7	16.0	15	**53**

END OF HOLE

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-224\[GH10-224.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	10JAN11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-225

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1367812 E, 2147632 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 597.5 m / 1,960 ft
Total Depth: 182.9 m / 600 ft
Azimuth: 322 deg
Inclination: 66 deg (down is positive)

Drill Type: HT-750

Core Diameter	From	to	ft		
	0	22	ft	PQ3	83 "
	22	400	ft	HQ3	61 "
	400	600	ft	NQ3	45 "
			ft		
			ft		

Logged By: DDF, CN
Reviewed By: LS
Date Started: 6-Oct-10
Date Completed: 27-Oct-10

Drillhole Number: GH10-225

Print Jan/25/11 10:09:07

DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
0.0	1959.8	0.00	597.5	6.0	1.83	1.83	0.00	0	0.00	0	OB	See Overburden Log.																
6.0	1954.3	1.83	595.8	9.0	2.74	0.91	0.91	100	0.00	0	G	Highly weathered granodiorite, brown to pinkish-white with black phenocrysts, sand sized particles, some competent rock fragments remaining, groundmass altered to clay, soft.	5	50	18	0	0	1	0	1	2	15	1.5	3.0	5.3	2.0	15	27
9.0	1951.6	2.74	595.0	14.0	4.27	1.52	1.14	75	0.00	0	G	Highly weathered granodiorite, medium grained, light grey rock with black phenocrysts, weak, pink and white calcite infilling, some competent rock fragments remaining.	10	50	23	0	0	1	0	1	2	15	2.0	3.0	5.3	2.0	15	27
14.0	1947.0	4.27	593.6	19.0	5.79	1.52	1.39	91	0.18	12	G	Granodiorite, medium grained, lightish grey with black phenocrysts, medium strong, completely weathered, joints very close to extremely close, vertical joint, soft infilling with pinkish hues.	35	30	46	0	0	3	2	1	6	15	4.4	4.4	5.6	6.0	15	35

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Drillhole Number: GH10-225

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
19.0	1942.4	5.79	592.2	22.0	6.71	0.91	0.23	25	0.00	0	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, heavily weathered, brown surface staining from oxidization, whitish discoloration on 30°tca joints, slightly rough joint surfaces.	25	7	33	0	0	3	2	5	10	15	3.4	3.0	5.5	10.0	15	37
22.0	1939.7	6.71	591.4	25.0	7.62	0.91	0.49	54	0.00	0	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong, heavily weathered, brownish discoloration, calcite infill < 1 mm in slightly rough joint surfaces.	25	8	61	0	1	3	2	5	11	15	3.4	3.0	5.8	11.0	15	38
25.0	1937.0	7.62	590.5	30.0	9.14	1.52	1.52	100	0.58	38	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, slightly rough joint surfaces with < 1 mm calcite infill, intrusive finer grained granite with feldspar and quartz particles (aplite?) observed from 24.5' to 26'.	50	11	138	0	4	3	2	5	14	15	5.7	8.0	6.8	14.0	15	50
30.0	1932.4	9.14	589.1	35.0	10.67	1.52	1.37	90	0.37	24	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong to weak, moderately to heavily weathered, slightly rough joints with < 1 mm calcite infill, heavy weathering beginning at 32.5' with brownish staining and closely spaced joints (1-2 cm) dipping at an estimated 15°tca, weak.	25	20	69	0	4	3	2	3	12	15	3.4	6.0	5.9	12.0	15	42
35.0	1927.8	10.67	587.8	40.0	12.19	1.52	1.46	96	0.98	64	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, brownish discoloration at joints, hard infilling 1-5 mm in slightly rough joint surfaces, minor calcite build up in some joints < 1 mm - heavy weathering from above continues to approximately 35.5'.	50	11	133	0	4	3	2	3	12	15	5.7	12.6	6.8	12.0	15	52
40.0	1923.3	12.19	586.4	45.0	13.72	1.52	1.46	96	0.77	51	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, weathered, slightly rough joints with < 1 mm calcite infill, pegmatite-like intrusion observed near 43' with feldspar and quartz crystals, increased weathering below 43' with brown-orange and yellow discoloration on joint surfaces.	75	13	112	0	4	3	2	5	14	15	7.7	10.1	6.5	14.0	15	53

Knight Piésold CONSULTING

Drillhole Number: GH10-225

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
45.0	1918.7	13.72	585.0	50.0	15.24	1.52	1.49	98	0.34	22	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong, moderately weathered, brown-orange and yellow discoloration on joint surfaces, joints at approximately 15, 60, and 90°tca with some calcite infill 3 mm thick in a 60°tca joint at 48'.	50	20	75	0	1	3	2	5	11	15	5.7	5.7	6.0	11.0	15	**43**
50.0	1914.1	15.24	583.6	55.0	16.76	1.52	1.48	97	0.73	48	G	Granodiorite, medium grained, grey matrix, black and white flakes, strong, weathered, slightly rough joints, no infilling, increased joint weathering 50-51' and 54.5' with minor yellow discoloration.	50	14	106	0	4	3	6	5	18	15	5.7	9.6	6.4	18.0	15	**55**
55.0	1909.6	16.76	582.2	60.0	18.29	1.52	1.48	97	0.32	21	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, weathered, slightly rough joints, < 1 mm calcite infill in some joints and brownish-yellow discoloration in other joints.	50	17	87	0	4	3	2	5	14	15	5.7	5.6	6.2	14.0	15	**46**
60.0	1905.0	18.29	580.8	65.0	19.81	1.52	1.51	99	0.70	46	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, slightly rough joints, < 1 mm calcite infill in some joints and brownish-yellow discoloration in other joints, below 64' light brown soft infill ~ 2cm thick in joint dipping approximately 45°tca, yellow-brown surface staining on rock, weak.	40	16	94	0	1	3	2	3	9	15	4.8	9.3	6.3	9.0	15	**44**
65.0	1900.4	19.81	579.4	70.0	21.33	1.52	1.52	100	0.93	61	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, joints slightly rough and dipping at ~10, 45, and 90°tca, minor brownish staining on joint surfaces.	75	11	138	0	1	3	2	5	11	15	7.7	12.0	6.8	11.0	15	**52**
70.0	1895.9	21.33	578.0	75.0	22.86	1.52	0.35	23	0.00	0	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong, moderately to heavily weathered, minor brown-orange staining and calcite accumulation in slightly rough joint surfaces, very limited recovery, driller reports no lost circulation or drilling rate changes (possible fracture/fault zone or completely weathered rock getting washed away in cuttings?).	35	9	39	0	1	3	2	3	9	15	4.4	3.0	5.5	9.0	15	**37**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
75.0	1891.3	22.86	576.6	80.0	24.38	1.52	1.37	90	0.00	0	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong to weak, moderately to completely weathered, some zones of rock easily crumbled by hand, some pinkish discoloration, joints slickensided with white and red-brown color, several joints infilled with soft weathered rock > 5 mm.	25	11	125	0	1	0	0	3	4	15	3.4	3.0	6.7	4.0	15	32
80.0	1886.7	24.38	575.2	85.0	25.91	1.52	1.52	100	1.31	86	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, smooth joints with yellow and brown discoloration, no infill.	75	6	253	0	4	1	6	5	16	15	7.7	17.0	8.2	16.0	15	64
85.0	1882.1	25.91	573.8	90.0	27.43	1.52	1.51	99	1.32	87	G	Granodiorite, medium grained, black and white phenocrysts present, slightly weathered, fairly strong, some iron staining with minimal infill.	75	8	189	0	4	1	2	5	12	15	7.7	17.2	7.4	12.0	15	59
90.0	1877.6	27.43	572.4	95.0	28.95	1.52	1.52	100	1.48	97	G	Granodiorite, medium grained, black and white phenocrysts, not very weathered and quite strong, smooth joints with iron staining, minimal infill.	75	5	304	0	4	1	2	5	12	15	7.7	19.5	8.8	12.0	15	63
95.0	1873.0	28.95	571.0	100.0	30.48	1.52	1.52	100	1.39	91	G	Granodiorite, medium grained, black and white phenocrysts, not very weathered and quite strong, smooth joints with iron staining, minimal infill.	75	10	152	0	4	1	2	5	12	15	7.7	18.2	7.0	12.0	15	60
100.0	1868.4	30.48	569.7	105.0	32.00	1.52	1.52	100	1.29	85	G	Granodiorite, medium grained, pyrite present, black and white phenocrysts, slightly weathered and medium strong, smooth joints with iron staining as well as minimal infill.	50	9	169	0	4	1	2	3	10	15	5.7	16.7	7.2	10.0	15	55
105.0	1863.9	32.00	568.3	110.0	33.53	1.52	1.52	100	1.30	85	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, medium strong, slightly weathered joints, sort of smooth, minimal infill.	40	15	101	0	4	1	4	5	14	15	4.8	16.9	6.4	14.0	15	57
110.0	1859.3	33.53	566.9	115.0	35.05	1.52	1.52	100	1.13	74	G	Granodiorite, medium grained with grey matrix, black and white phenocrysts, pyrite present, medium strong, yellow brown stained joints, slightly weathered.	50	9	169	0	4	1	2	5	12	15	5.7	14.5	7.2	12.0	15	54

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
115.0	1854.7	35.05	565.5	120.0	36.57	1.52	1.52	100	1.28	84	G	Granodiorite, medium grained with grey matrix, black and white phenocrysts, pyrite present, medium strong, yellow brown stained joints, slightly weathered.	50	9	169	0	4	1	2	5	12	15	5.7	16.6	7.2	12.0	15	56
120.0	1850.2	36.57	564.1	125.0	38.10	1.52	1.52	100	1.36	89	G	Granodiorite, medium grained, black and white phenocrysts, medium strong, slightly weathered, no infill as well as smooth joints.	50	5	304	0	4	1	6	5	16	15	5.7	17.7	8.8	16.0	15	63
125.0	1845.6	38.10	562.7	130.0	39.62	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained with grey matrix, black and white phenocrysts, medium strong, weathered in areas, slightly rough joints with small soft infilling.	40	4	380	0	1	3	2	3	9	15	4.8	20.1	9.6	9.0	15	59
130.0	1841.0	39.62	561.3	135.0	41.15	1.52	1.27	83	1.24	81	G	Granodiorite, medium grained with grey matrix, black and white phenocrysts, medium strong, weathered in areas, slightly rough joints with small soft infilling.	40	5	254	0	1	3	2	3	9	15	4.8	16.0	8.2	9.0	15	53
135.0	1836.5	41.15	559.9	140.0	42.67	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained with grey matrix, black and white phenocrysts, medium strong, almost unweathered, smooth joints and no infilling.	50	3	507	0	4	1	6	5	16	15	5.7	18.3	10.8	16.0	15	66
140.0	1831.9	42.67	558.5	145.0	44.19	1.52	1.52	100	1.30	85	G	Granodiorite, medium grained, black and white phenocrysts with a grey matrix, medium strong, slightly weathered, some infilling and roughish joints, at 43 feet, rock becomes much stronger, less weathered with smaller joints and no infilling.	30	11	138	0	4	3	2	3	12	15	3.9	16.9	6.8	12.0	15	55
145.0	1827.3	44.19	557.1	150.0	45.72	1.52	1.46	96	1.14	75	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, yellowish-green staining on slightly rough joint surfaces, three joint sets at ~15, 45, 90°tca.	100	8	183	0	1	3	2	5	11	15	9.4	14.7	7.4	11.0	15	57
150.0	1822.8	45.72	555.7	155.0	47.24	1.52	1.52	100	0.98	64	G	Granodiorite, medium grained, grey matrix, black and white flakes, strong, slightly weathered, three joint sets at ~15, 45, 90°tca, some whitish discoloration near joints, no infill.	100	13	117	0	4	3	6	5	18	15	9.4	12.6	6.6	18.0	15	62

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
155.0	1818.2	47.24	554.3	160.0	48.77	1.52	1.52	100	1.08	71	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, slightly weathered, some whitish discoloration near joints, brown discoloration in 60°tca joint at 156', no infill.	150	14	109	0	4	3	6	5	18	15	12.2	13.9	6.5	18.0	15	66
160.0	1813.6	48.77	553.0	165.0	50.29	1.52	1.48	97	0.45	30	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, slightly weathered, < 1 mm hard infill in joints, yellowish-brown, slightly rough joints, long near vertical joint from 162-165', completely weathered rock below 164.5', weak, friable by hand.	100	6	247	0	4	3	4	3	14	15	9.4	6.7	8.1	14.0	15	53
165.0	1809.1	50.29	551.6	170.0	51.81	1.52	1.52	100	0.66	43	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, discoloration along joint sufaces brown to off-white, calcite infill in smooth planar joints < 5 mm.	75	12	127	0	1	1	2	3	7	15	7.7	8.9	6.7	7.0	15	45
170.0	1804.5	51.81	550.2	175.0	53.34	1.52	1.48	97	0.60	39	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joints with < 1 mm hard infill, light brown joint discoloration.	75	11	135	0	4	3	4	5	16	15	7.7	8.2	6.8	16.0	15	54
175.0	1799.9	53.34	548.8	180.0	54.86	1.52	1.52	100	1.07	70	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joints with < 1 mm hard infill, light brown joint discoloration.	100	7	217	0	4	3	4	5	16	15	9.4	13.7	7.8	16.0	15	62
180.0	1795.4	54.86	547.4	185.0	56.39	1.52	1.52	100	0.83	54	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, slightly rough joints with < 1 mm hard infill, light brown joint discoloration.	75	14	109	0	1	3	4	5	13	15	7.7	10.8	6.5	13.0	15	53
185.0	1790.8	56.39	546.0	190.0	57.91	1.52	1.52	100	0.85	56	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, slightly to moderately weathered (at 189'), most common joint sets dip ~60°tca., slightly rough joints with < 1 mm hard infill above 189', joints below 189' < 3mm off-white calcite infill, weak, heavily fractured.	100	12	127	0	1	3	2	5	11	15	9.4	11.0	6.7	11.0	15	53

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
190.0	1786.2	57.91	544.6	195.0	59.43	1.52	1.52	100	1.29	85	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, smooth unweathered joints with no infill, can be broken with moderate hammer blow.	50	8	190	0	4	1	6	6	17	15	5.7	16.7	7.5	17.0	15	62
195.0	1781.7	59.43	543.2	200.0	60.96	1.52	1.52	100	1.01	66	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, slightly rough joints, slightly weathered with hard small infill, medium strong, iron staining in joints (yellow-brown color).	75	13	117	0	4	3	2	3	12	15	7.7	13.0	6.6	12.0	15	54
200.0	1777.1	60.96	541.8	205.0	62.48	1.52	1.52	100	0.97	64	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly to highly weathered, slightly rough joints with reddish-brown surface discoloration, soft reddish infill < 1 mm, highly weathered rock from 203-204.5' easily crumbled by hand.	50	8	190	0	4	3	2	3	12	15	5.7	12.5	7.5	12.0	15	53
205.0	1772.5	62.48	540.4	210.0	64.00	1.52	1.52	100	1.46	96	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, tight, slightly rough joint surfaces with < 1 mm hard infilling.	125	4	380	0	4	3	4	5	16	15	10.9	19.2	9.6	16.0	15	71
210.0	1768.0	64.00	539.0	215.0	65.53	1.52	1.49	98	1.30	85	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, tight, slightly rough joint surfaces with < 1 mm calcite infilling.	100	8	186	0	4	3	2	5	14	15	9.4	16.9	7.4	14.0	15	63
215.0	1763.4	65.53	537.6	220.0	67.05	1.52	1.52	100	1.33	87	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, tight, slightly rough joint surfaces, brownish discoloration, some calcite infill.	100	6	253	0	1	3	2	5	11	15	9.4	17.3	8.2	11.0	15	61
220.0	1758.8	67.05	536.2	225.0	68.58	1.52	1.52	100	1.07	70	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, weathered, white and yellow soft infill < 2 mm thick, predominantly near vertical joints.	100	6	253	0	4	3	2	5	14	15	9.4	13.7	8.2	14.0	15	60
225.0	1754.3	68.58	534.9	230.0	70.10	1.52	1.52	100	0.99	65	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, weathered, slightly rough joints, < 5 mm of calcite infill in most joints, weathered near 229.5' with soft yellow infill 5 mm thick.	75	10	152	0	1	3	0	5	9	15	7.7	12.7	7.0	9.0	15	51

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
230.0	1749.7	70.10	533.5	235.0	71.62	1.52	1.47	96	1.07	70	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly to heavily weathered, planar joints, heavily weathered below 233.5' with soft brown clay coating below 234' and weakened rock strength.	75	7	210	0	4	1	2	3	10	15	7.7	13.7	7.7	10.0	15	**54**
235.0	1745.1	71.62	532.1	240.0	73.15	1.52	1.52	100	1.06	70	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong to weak, moderately weathered, completely weathered zones comprised of soft brown and whitish-yellow disintegrated rock, core maintains general structure but can be crumbled by hand, soft brown clayey coating on joint surfaces.	25	6	253	0	4	1	0	3	8	15	3.4	13.6	8.2	8.0	15	**48**
240.0	1740.5	73.15	530.7	245.0	74.67	1.52	1.52	100	1.18	77	G	Granodiorite, medium grained with black and white phenocrysts, grey matrix, medium strong, moderately weathered, one completely weathered zone at 2 feet, minimal infill throughout, joints are moderately rough.	30	9	169	0	4	3	2	3	12	15	3.9	15.2	7.2	12.0	15	**53**
245.0	1736.0	74.67	529.3	250.0	76.20	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, black and white phenocrysts on grey matrix, medium strong, unweathered, joints are rough and stained yellow.	40	7	217	0	4	1	2	5	12	15	4.8	18.3	7.8	12.0	15	**58**
250.0	1731.4	76.20	527.9	255.0	77.72	1.52	1.52	100	1.38	91	G	Granodiorite, medium grained, grey matrix, black phenocrysts, medium strong, weathered in most areas, soft infill, joints are rough as well as stained yellow.	30	8	190	0	4	3	2	3	12	15	3.9	18.0	7.5	12.0	15	**56**
255.0	1726.8	77.72	526.5	260.0	79.24	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, medium strong, unweathered, joints are rough and stained yellow.	40	5	304	0	4	1	2	3	10	15	4.8	18.3	8.8	10.0	15	**57**
260.0	1722.3	79.24	525.1	265.0	80.77	1.52	1.26	83	1.49	98	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, strong, unweathered, smooth joints with very little infill, some joints are stained yellow.	75	6	210	0	4	1	2	5	12	15	7.7	19.7	7.7	12.0	15	**62**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
265.0	1717.7	80.77	523.7	270.0	82.29	1.52	1.52	100	1.51	99	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, strong, unweathered, smooth joints with very little infill, some joints are stained yellow.	75	8	190	0	4	1	2	5	12	15	7.7	20.0	7.5	12.0	15	62
270.0	1713.1	82.29	522.3	275.0	83.82	1.52	1.52	100	0.85	56	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joint surfaces, tight, < 1 mm calcite infill.	100	10	152	0	4	3	2	5	14	15	9.4	11.0	7.0	14.0	15	56
275.0	1708.6	83.82	520.9	280.0	85.34	1.52	1.52	100	1.32	87	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joint surfaces, tight, 1-5 mm calcite infill, increased weathering at joints, brown and green discoloration.	100	11	138	0	1	3	2	5	11	15	9.4	17.2	6.8	11.0	15	59
280.0	1704.0	85.34	519.5	285.0	86.86	1.52	1.52	100	1.27	83	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joint surfaces, tight, < 1 mm calcite infill, moderately weathered between 282.5-283.5', whitish-yellow infill < 5 mm, soft, several closely spaced joints dipping at ~ 60°tca.	100	11	138	0	4	3	2	3	12	15	9.4	16.5	6.8	12.0	15	60
285.0	1699.4	86.86	518.1	290.0	88.39	1.52	1.47	96	1.09	72	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joints with < 1 mm calcite infill, voids in rock mass below 288' with greenish discoloration.	100	8	184	0	4	3	2	5	14	15	9.4	14.0	7.4	14.0	15	60
290.0	1694.9	88.39	516.8	295.0	89.91	1.52	1.47	96	1.33	87	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong, slightly to heavily weathered, from 291-293' discoloration of rock mass greenish-yellow, zones can be crumbled by hand, 1-3 mm calcite infill in joints, some reddish discoloration in joint surfaces, red clay infill ~ 1 cm wide in joint at 293', below 293' rock transitions to strong granodiorite with pegmatite-like intrusion, quartz and feldspar crystals visible in fresh to slightly weathered rock mass.	50	5	294	0	1	3	0	3	7	15	5.7	17.3	8.7	7.0	15	54

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
295.0	1690.3	89.91	515.4	300.0	91.44	1.52	1.52	100	1.22	80	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, medium strong, slightly to heavily weathered, pegmatite-like intrusion extends to 296', at 296' significant joint present ~ 20 cm wide with yellow and red clayey infill, soft, below 297' granodiorite is slightly to moderately weathered, planar to slightly rough joint surfaces, 1-2 mm of calcite infill, greenish-yellow to reddish-brown staining on joint surfaces	35	4	380	0	0	1	0	3	4	15	4.4	15.8	9.6	4.0	15	49
300.0	1685.7	91.44	514.0	305.0	92.96	1.52	1.45	95	1.16	76	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, 1-2 mm calcite infill, pinkish-red discoloration and increased weathering in joints dipping ~60°tca, near 300' (similar to previous 20 cm joint).	50	9	161	0	4	3	2	5	14	15	5.7	14.9	7.1	14.0	15	57
305.0	1681.2	92.96	512.6	310.0	94.48	1.52	1.52	100	1.26	83	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh to slightly weathered, pegmatite-like intrusion with increased quartz and feldspar below 306.5', slightly rough joints, tight, 1 mm calcite infill.	125	6	253	0	4	3	2	5	14	15	10.9	16.3	8.2	14.0	15	64
310.0	1676.6	94.48	511.2	315.0	96.01	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, slightly rough joints, 1 mm calcite infill.	125	4	380	0	4	3	2	6	15	15	10.9	20.1	9.6	15.0	15	71
315.0	1672.0	96.01	509.8	320.0	97.53	1.52	1.49	98	1.35	89	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, slightly rough joints, 1 mm calcite infill, increased weathering in one joint at 317', <5 mm soft whitish-yellow and green infill.	125	7	213	0	1	3	2	5	11	15	10.9	17.6	7.7	11.0	15	62
320.0	1667.5	97.53	508.4	325.0	99.06	1.52	1.52	100	1.21	79	G	Granodiorite, medium grained, quartz and pyrite in grey matrix, strong, joints are weathered and have soft infill, slightly rough, some yellow staining.	75	12	127	0	4	3	2	5	14	15	7.7	15.6	6.7	14.0	15	59
325.0	1662.9	99.06	507.0	330.0	100.58	1.52	1.50	98	1.13	74	G	Granodiorite, medium grained with quartz and pyrite present among grey matrix, joints are weathered and have very soft infill, some yellow staining.	50	16	94	0	4	3	2	3	12	15	5.7	14.5	6.3	12.0	15	53

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
330.0	1658.3	100.58	505.6	335.0	102.10	1.52	1.52	100	1.22	80	G	Granodiorite, black and white phenocrysts in grey matrix, quartz, strongish with weathered joints, infill is minimal, there is a slimy yellow film on some of the joints.	50	10	152	0	4	1	2	5	12	15	5.7	15.8	7.0	12.0	15	**55**
335.0	1653.8	102.10	504.2	340.0	103.63	1.52	1.52	100	1.04	68	G	Granodiorite, quartz and pyrite in grey matrix, medium grained, joints are slightly weathered, strong with soft infill.	75	14	109	0	4	1	3	3	11	15	7.7	13.4	6.5	11.0	15	**53**
340.0	1649.2	103.63	502.8	345.0	105.15	1.52	1.52	100	0.89	58	G	Granodiorite, medium grained with quartz and pyrite present among grey matrix, joints are weathered and have very soft infill, some yellow staining.	75	16	95	0	4	3	2	5	14	15	7.7	11.5	6.3	14.0	15	**54**
345.0	1644.6	105.15	501.4	350.0	106.67	1.52	1.51	99	1.30	85	G	First 6 inches completely grey, hard and strong with no joints, then granodiorite, strong with smooth joints, light weathering, some yellow staining, hard infill, last two feet are reddish, could be clay, soft with lots of joints, the infill in these joints is also soft.		7	216	0	1	1	2	3	7	15	1.0	16.9	7.8	7.0	15	**48**
350.0	1640.1	106.67	500.0	355.0	108.20	1.52	1.51	99	1.10	72	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, medium strong, weathered joints, slightly rough, infill is moderately hard, some yellow staining (iron oxide).	50	13	116	0	4	3	3	5	15	15	5.7	14.1	6.5	15.0	15	**56**
355.0	1635.5	108.20	498.7	360.0	109.72	1.52	1.51	99	1.22	80	G	Granodiorite, black and white phenocrysts, medium strong, some hard infill, slightly weathered joints, smooth joints with yellow staining.	50	8	189	0	4	1	2	5	12	15	5.7	15.8	7.4	12.0	15	**56**
360.0	1630.9	109.72	497.3	365.0	111.25	1.52	1.52	100	1.41	93	G	Granodiorite, black and white phenocrysts in grey matrix, medium grained, hard infill, medium strong, slightly weathered joints, smooth joints with yellow staining, last foot appears to be more weathered with slightly softer infill.	75	6	253	0	4	1	2	3	10	15	7.7	18.5	8.2	10.0	15	**59**
365.0	1626.4	111.25	495.9	370.0	112.77	1.52	1.52	100	1.12	73	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, medium strong, weathered joints, slightly rough, infill is moderately hard, some yellow staining (iron oxide).	50	10	152	0	4	3	2	3	12	15	5.7	14.4	7.0	12.0	15	**54**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
370.0	1621.8	112.77	494.5	375.0	114.29	1.52	1.52	100	1.41	93	G	Granodiorite, quartz and pyrite in grey matrix, medium grained and medium strong, slightly rough with weathered joints, hard infill, yellow staining.	50	6	253	0	4	3	2	3	12	15	5.7	18.5	8.2	12.0	15	**59**
375.0	1617.2	114.29	493.1	380.0	115.82	1.52	1.52	100	1.27	83	G	Granodiorite, black and white phenocrysts in grey matrix, medium grained, slightly rough joints, slightly weathered, hard infill, core is strong.	75	10	152	0	4	1	4	5	14	15	7.7	16.5	7.0	14.0	15	**60**
380.0	1612.7	115.82	491.7	385.0	117.34	1.52	1.52	100	1.34	88	G	Granodiorite, black and white phenocrysts in grey matrix, medium grained, slightly rough joints, slightly weathered, hard infill, core is strong.	75	8	190	0	4	1	4	5	14	15	7.7	17.5	7.5	14.0	15	**62**
385.0	1608.1	117.34	490.3	390.0	118.87	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh to slightly weathered, slightly rough joints, tight, no infill, heavily weathered joint at start of run at 385'.	125	4	380	0	4	3	6	5	18	15	10.9	20.1	9.6	18.0	15	**74**
390.0	1603.5	118.87	488.9	395.0	120.39	1.52	1.52	100	0.90	59	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly to moderately weathered, soft calcite infill in joints, white, < 5 mm, rock is heavily fractured below 393', some brown discoloration on a few joint surfaces.	100	10	152	0	4	3	2	5	14	15	9.4	11.6	7.0	14.0	15	**57**
395.0	1598.9	120.39	487.5	400.0	121.91	1.52	1.47	96	1.05	69	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately weathered, white discoloration around joints, slightly rough, < 1 mm calcite infill, near vertical joint running from 397'-400'.	100	7	210	0	4	3	2	5	14	15	9.4	13.5	7.7	14.0	15	**60**
400.0	1594.4	121.91	486.1	405.0	123.44	1.52	1.43	94	1.19	78	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, slightly rough joints, traces of calcite infill, whitish discoloration around joints, some rusty staining on joint surfaces.	100	6	238	0	4	3	2	5	14	15	9.4	15.3	8.0	14.0	15	**62**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
405.0	1589.8	123.44	484.7	410.0	124.96	1.52	1.46	96	1.22	80	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, slightly weathered, slightly rough, strong and joints have hard minimal infill.	100	8	183	0	4	1	3	5	13	15	9.4	15.8	7.4	13.0	15	**61**
410.0	1585.2	124.96	483.3	415.0	126.49	1.52	1.28	84	1.22	80	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, slightly weathered, slightly rough, strong and most joints have hard minimal infill, two of the joints have some yellow/green staining.	100	5	256	0	4	1	2	5	12	15	9.4	15.8	8.2	12.0	15	**60**
415.0	1580.7	126.49	481.9	420.0	128.01	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained with black and white phenocrysts in a grey matrix, strong, slightly rough and weathered joints, no infill, joints are few and far between.	100	6	253	0	4	1	6	5	16	15	9.4	20.1	8.2	16.0	15	**69**
420.0	1576.1	128.01	480.6	425.0	129.53	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, black and white phenocrysts in a grey matrix, strong, slightly rough and weathered joints, no infill.	100	5	304	0	4	3	6	5	18	15	9.4	18.3	8.8	18.0	15	**70**
425.0	1571.5	129.53	479.2	430.0	131.06	1.52	1.52	100	1.43	94	G	Granodiorite, medium grained, black, white and silvery phenocrysts in the grey matrix, hard infill, slightly rough and unweathered.	100	7	217	0	4	3	4	6	17	15	9.4	18.8	7.8	17.0	15	**68**
430.0	1567.0	131.06	477.8	435.0	132.58	1.52	1.45	95	1.15	75	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, strong, hard, large infill, roughish and slightly weathered.	100	12	121	0	4	3	3	5	15	15	9.4	14.8	6.6	15.0	15	**61**
435.0	1562.4	132.58	476.4	440.0	134.11	1.52	1.52	100	1.36	89	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, strong, hard, large infill, roughish and slightly weathered.	100	9	169	0	4	3	3	5	15	15	9.4	17.7	7.2	15.0	15	**64**
440.0	1557.8	134.11	475.0	445.0	135.63	1.52	1.49	98	1.30	85	G	Granodiorite, medium grained, black, white and silver (pyrrhotite??) phenocrysts in grey matrix, quartz throughout sample, hard infill, slightly rough and unweathered.	100	9	166	0	4	3	4	6	17	15	9.4	16.9	7.2	17.0	15	**65**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
445.0	1553.3	135.63	473.6	450.0	137.15	1.52	1.52	100	1.04	68	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, strong, unweathered, hard infill, roughish, two joints appear to be quartz.	100	9	169	0	4	3	4	5	16	15	9.4	13.4	7.2	16.0	15	**61**
450.0	1548.7	137.15	472.2	455.0	138.68	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, strong, unweathered and smoothish, no infill, joints are few and far between.	125	3	507	0	4	1	6	6	17	15	10.9	20.1	10.8	17.0	15	**74**
455.0	1544.1	138.68	470.8	460.0	140.20	1.52	1.51	99	1.44	94	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, strong, unweathered and smoothish, no infill, joints are few and far between.	100	6	252	0	4	1	6	6	17	15	9.4	18.9	8.2	17.0	15	**69**
460.0	1539.6	140.20	469.4	465.0	141.73	1.52	1.52	100	1.48	97	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, quite strong, no infill, most joints are slightly rough and unweathered, some yellow staining is presnt in two joints.	150	5	304	0	4	3	2	5	14	15	12.2	19.5	8.8	14.0	15	**70**
465.0	1535.0	141.73	468.0	470.0	143.25	1.52	1.52	100	1.49	98	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, quite strong, joint 3 is weathered, while other joints maintain characteristics mentioned in previous runs, joints are slightly weathered and slightly rough, while this joint is crumbly and brown.	125	5	304	0	4	3	2	5	14	15	10.9	19.7	8.8	14.0	15	**68**
470.0	1530.4	143.25	466.6	475.0	144.77	1.52	1.52	100	1.40	92	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, yellow staining (iron oxide) in joints, quite strong, minimal infill, joints are slightly weathered and slightly rough.	125	5	304	0	4	3	2	5	14	15	10.9	18.3	8.8	14.0	15	**67**
475.0	1525.9	144.77	465.2	480.0	146.30	1.52	1.47	96	1.41	93	G	Granodiorite, medium grained, black and white phenocrysts in grey matrix, yellow staining (iron oxide) in joints, quite strong , minimal infill, joints are slightly weathered and slightly rough.	125	6	245	0	4	3	2	5	14	15	10.9	18.5	8.1	14.0	15	**67**

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
480.0	1521.3	146.30	463.9	485.0	147.82	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh to slightly weathered, slightly rough joints, no infill, disseminated pyrite below 484'.	125	2	760	0	4	3	6	5	18	15	10.9	20.1	12.9	18.0	15	**77**
485.0	1516.7	147.82	462.5	490.0	149.34	1.52	1.50	98	1.31	86	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, slightly weathered, slightly rough joints with < 1 mm calcite infill, brownish discoloration at the bottom of the run.	125	5	300	0	4	3	2	5	14	15	10.9	17.0	8.7	14.0	15	**66**
490.0	1512.2	149.34	461.1	495.0	150.87	1.52	1.48	97	1.48	97	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh to slightly weathered, no open joints, greenish discoloration along closed joints.	125	0	1524	0	6	6	6	5	23	15	10.9	19.5	17.6	23.0	15	**86**
495.0	1507.6	150.87	459.7	500.0	152.39	1.52	1.31	86	1.31	86	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh to slightly weathered, < 1 mm calcite infill at 496', greenish discoloration along closed joints, run cut short by 8" due to loss of circulation.	125	1	1310	0	4	3	2	5	14	15	10.9	17.0	16.4	14.0	15	**73**
500.0	1503.0	152.39	458.3	505.0	153.92	1.52	1.52	100	1.21	79	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, slightly weathered, quite strong, rough joints, no infill.	125	12	127	0	4	5	6	5	20	15	10.9	15.6	6.7	20.0	15	**68**
505.0	1498.5	153.92	456.9	510.0	155.44	1.52	1.52	100	1.39	91	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, slightly weathered, quite strong, rough joints, minimal hard infill, joint 2 has reddish discoloration.	125	5	304	0	4	5	4	5	18	15	10.9	18.2	8.8	18.0	15	**71**
510.0	1493.9	155.44	455.5	515.0	156.96	1.52	1.52	100	1.48	97	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, quite strong, no infill, joints are smooth and unweathered.	125	3	507	0	4	1	6	6	17	15	10.9	19.5	10.8	17.0	15	**73**
515.0	1489.3	156.96	454.1	520.0	158.49	1.52	1.52	100	1.34	88	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, quite strong, no infill, joints are smooth and unweathered.	125	5	304	0	4	3	6	6	19	15	10.9	17.5	8.8	19.0	15	**71**

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Drillhole Number: GH10-225

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
520.0	1484.8	158.49	452.7	525.0	160.01	1.52	1.44	94	1.44	94	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, slightly rough joints, tight to closed, 2 mm calcite infill.	125	2	720	0	4	3	2	6	15	15	10.9	18.9	12.6	15.0	15	**72**
525.0	1480.2	160.01	451.3	530.0	161.54	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, slightly rough joints, tight to closed, 2 mm calcite infill, two joints at ~ 45°tca.	125	2	760	0	4	3	2	6	15	15	10.9	20.1	12.9	15.0	15	**74**
530.0	1475.6	161.54	449.9	535.0	163.06	1.52	1.48	97	1.24	81	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, slightly rough joints, tight to closed, 2 mm calcite infill, many closely spaced fractures below 534', possible drill breaks but likely caused by local weaknesses in the rock mass, horizontal.	125	9	164	0	4	3	2	6	15	15	10.9	16.0	7.2	15.0	15	**64**
535.0	1471.1	163.06	448.5	540.0	164.58	1.52	1.52	100	0.78	51	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered and heavily fractured, brownish discoloration on some joints, slightly rough, < 1 mm calcite infill.	100	13	117	0	4	3	2	5	14	15	9.4	10.2	6.6	14.0	15	**55**
540.0	1466.5	164.58	447.1	545.0	166.11	1.52	1.40	92	0.92	60	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered and heavily fractured, brownish discoloration on some joints, slightly rough, < 1 mm calcite infill, long vertical joint from 543-545'.	100	6	233	0	4	3	2	5	14	15	9.4	11.9	8.0	14.0	15	**58**
545.0	1461.9	166.11	445.8	550.0	167.63	1.52	1.40	92	0.79	52	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, slightly weathered, long vertical fracture continues to 546.5', slightly rough joints, increased calcite infill < 5 mm, brown and yellowish-green discoloration on joint surfaces.	100	9	156	0	1	3	2	5	11	15	9.4	10.3	7.0	11.0	15	**53**

Knight Piésold CONSULTING

Drillhole Number: GH10-225

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
550.0	1457.3	167.63	444.4	555.0	169.16	1.52	1.26	83	0.62	41	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, strong, moderately to completely weathered, between 550.5'-553' rock is highly weathered, possible small fault with some rock fragments, whitish-pink, drill indicates almost no resistance to penetration, remainder of the core above and below the indicated zone is intact, moderately weathered, brown and green surface staining and calcite infill 1-2 mm.	75	20	63	0	0	3	0	1	4	15	7.7	8.5	5.9	4.0	15	**41**
555.0	1452.8	169.16	443.0	560.0	170.68	1.52	1.48	97	1.40	92	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, < 1 mm calcite infill, slightly rough joints, very tight to closed.	125	2	740	0	4	3	5	6	18	15	10.9	18.3	12.8	18.0	15	**75**
560.0	1448.2	170.68	441.6	565.0	172.20	1.52	1.52	100	1.47	96	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, very strong, fresh, < 1 mm calcite infill, slightly rough joints, very tight to closed.	125	2	760	0	4	3	2	6	15	15	10.9	19.4	12.9	15.0	15	**73**
565.0	1443.6	172.20	440.2	570.0	173.73	1.52	1.52	100	1.52	100	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, quite strong, fresh, calcite in slightly rough, very tight to closed joints.	125	2	760	0	4	3	2	6	15	15	10.9	20.1	12.9	15.0	15	**74**
570.0	1439.1	173.73	438.8	575.0	175.25	1.52	1.51	99	1.51	99	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, quite strong, fresh, calcite in slightly rough, very tight to closed joints.	125	4	378	0	4	3	2	6	15	15	10.9	20.0	9.6	15.0	15	**70**
575.0	1434.5	175.25	437.4	580.0	176.78	1.52	1.46	96	1.46	96	G	Granodiorite, medium grained, grey matrix, black and white phenocrysts, quite strong, fresh, calcite in slightly rough, very tight to closed joints, crystal patches in last foot.	125	4	365	0	4	3	2	6	15	15	10.9	19.2	9.4	15.0	15	**70**
580.0	1429.9	176.78	436.0	585.0	178.30	1.52	1.40	92	1.37	90	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, sulphides in joint #4, unweathered, no infill and slightly rough.	125	5	280	0	4	3	6	6	19	15	10.9	17.9	8.5	19.0	15	**71**
585.0	1425.4	178.30	434.6	590.0	179.82	1.52	1.51	99	1.47	96	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, sulphides in joint #4, unweathered, no infill and slightly rough.	125	7	216	0	4	3	6	6	19	15	10.9	19.4	7.8	19.0	15	**72**

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Drillhole Number: GH10-225

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
590.0	1420.8	179.82	433.2	595.0	181.35	1.52	1.52	100	0.66	43	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, medium strong, minimal infill, slightly rough and slightly weathered joints.	75	12	127	0	4	3	2	5	14	15	7.7	8.9	6.7	14.0	15	**52**
595.0	1416.2	181.35	431.8	600.0	182.87	1.52	1.52	100	1.32	87	G	Granodiorite, medium grained, grey matrix with black and white phenocrysts, strong, joints are slightly weathered and slightly rough, minimal infill, some joints are red/brown stained.	100	6	253	0	4	3	2	5	14	15	9.4	17.2	8.2	14.0	15	**64**
END OF HOLE																												

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-225\[GH10-225.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	12JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-227

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1421653 E, 2155964 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 243.3 m
798 ft
Total Depth: 60.9 m
200 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-700

Core Diameter: From 0 to 30 ft PQ3 3.27 "
to ft
Core Diameter: From 30 to 200 ft HQ3 2.41 mm
to ft
to ft

Logged By: SC, AL
Reviewed By: LS
Date Started: 16-Oct-10
Date Completed: 20-Oct-10

Drillhole Number: GH10-227

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	797.9	0.00	243.3	25.0	7.62	7.62	1.51	20			OB	See Overburden Log.																
25.0	772.9	7.62	235.6	30.0	9.14	1.52	0.61	40	0.00	0	TKM	Weathered bedrock, blue-grey, with calcite phenocrysts and veins, highly fractured.	25	30	20	0	1	1	2	3	7	15	3.4	3.0	5.3	7.0	15	**34**
30.0	767.9	9.14	234.1	35.0	10.67	1.52	1.22	80	0.00	0	TKM	As above, dark grey-black, calcite phenocrysts, slightly weathered, highly fractured, more competent than run above.	100	30	41	0	1	3	2	5	11	15	9.4	3.0	5.6	11.0	15	**44**
35.0	762.9	10.67	232.6	40.0	12.19	1.52	1.42	93	0.40	26	TKM	As above, dark grey, thick calcite veins and phenocrysts, highly fractured rubble zone, green infilling on some joints.	75	25	57	0	1	3	2	5	11	15	7.7	6.3	5.8	11.0	15	**46**
40.0	757.9	12.19	231.1	45.0	13.72	1.52	1.52	100	1.17	77	TKM	As above, much more competent, dark grey, calcite veins and phenocrysts.	110	15	101	0	4	3	2	5	14	15	10.0	15.1	6.4	14.0	15	**60**
45.0	752.9	13.72	229.5	50.0	15.24	1.52	1.52	100	1.17	77	TKM	As above, calcite veins 3-5mm thick.	110	22	69	0	1	3	2	5	11	15	10.0	15.1	5.9	11.0	15	**57**

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Drillhole Number: GH10-227

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
50.0	747.9	15.24	228.0	55.0	16.76	1.52	1.22	80	0.15	10	TKM/FZ	As above until 52', then a fault zone is encountered, rock transitions quickly to purplish/grey rock, highly fractured and weathered rock and 0.15m clay gouge zone.	25	30	41	0	0	1	0	1	2	15	3.4	4.1	5.6	2.0	15	30
55.0	742.9	16.76	226.5	60.0	18.29	1.52	0.18	12	0.00	0	FZ	Fault zone continues, some remnants of weathered rock, clay gouge, poor recovery.	0	30	6	0	0	1	0	0	1	15	1.0	3.0	5.1	1.0	15	25
60.0	737.9	18.29	225.0	65.0	19.81	1.52	0.26	17	0.00	0	FZ	Fault zone continues, highly to completely weathered rock (light blue/grey), clay gouge, breaks apart easily, poor recovery.	0	30	9	0	0	1	0	0	1	15	1.0	3.0	5.1	1.0	15	25
65.0	732.9	19.81	223.4	70.0	21.33	1.52	0.42	28	0.00	0	FZ	Fault zone continues, upper portion is highly to completely weathered clay gouge as above, lower portion becoming less weathered and stronger.	25	30	14	0	0	1	0	0	1	15	3.4	3.0	5.2	1.0	15	28
70.0	727.9	21.33	221.9	75.0	22.86	1.52	1.52	100	0.00	0	TF	Tertiary Conglomerate, matrix supported, greenish grey color, calcite veins, weathered, signs of oxidation, highly fractured.	50	30	51	0	1	5	2	3	11	15	5.7	3.0	5.7	11.0	15	40
75.0	722.9	22.86	220.4	80.0	24.38	1.52	1.52	100	0.00	0	TF	As above.	50	12	127	0	1	5	2	3	11	15	5.7	3.0	6.7	11.0	15	41
80.0	717.9	24.38	218.9	85.0	25.91	1.52	1.24	81	0.20	13	TF	As above.	50	9	138	0	1	5	2	3	11	15	5.7	4.5	6.8	11.0	15	43
85.0	712.9	25.91	217.3	90.0	27.43	1.52	1.52	100	0.65	43	TF	As above, slightly more competent, less weathered.	50	10	152	0	1	5	2	5	13	15	5.7	8.8	7.0	13.0	15	49
90.0	707.9	27.43	215.8	95.0	28.95	1.52	1.17	77	0.00	0	TF	As above, moderately weathered, highly fractured.	50	20	59	0	1	5	2	3	11	15	5.7	3.0	5.8	11.0	15	40
95.0	702.9	28.95	214.3	100.0	30.48	1.52	1.37	90	0.20	13	TF	As above.	50	20	69	0	1	5	2	3	11	15	5.7	4.5	5.9	11.0	15	42
100.0	697.9	30.48	212.8	105.0	32.00	1.52	1.32	87	0.43	28	TF	As above, highly altered, soft.	30	10	132	0	0	3	0	1	4	15	3.9	6.6	6.8	4.0	15	36
105.0	692.9	32.00	211.2	110.0	33.53	1.52	1.40	92	0.15	10	TF	As above, highly altered, greenish grey, appears brecciated, soft.	30	30	47	0	0	3	0	1	4	15	3.9	4.1	5.6	4.0	15	33
110.0	687.9	33.53	209.7	115.0	35.05	1.52	1.52	100	0.23	15	TF	As above, highly altered, greenish grey, appears brecciated, soft.	30	30	51	0	0	3	0	1	4	15	3.9	4.8	5.7	4.0	15	33
115.0	682.9	35.05	208.2	120.0	36.57	1.52	1.52	100	0.43	28	TF	As above, highly altered, greenish grey, some brecciated zones, soft.	30	30	51	0	0	1	2	1	4	15	3.9	6.6	5.7	4.0	15	35
120.0	677.9	36.57	206.7	125.0	38.10	1.52	1.36	89	0.60	39	TF	As above with more competent rock, less clay breccia zones.	30	30	45	0	1	3	2	3	9	15	3.9	8.2	5.6	9.0	15	42

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Drillhole Number: GH10-227

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
125.0	672.9	38.10	205.2	130.0	39.62	1.52	1.50	98	0.34	22	TF	Top 1.5' similar to above, then transition to tan colored volcaniclastic rock, matrix supported and more competent than above.	110	25	60	0	1	3	2	3	9	15	10.0	5.7	5.8	9.0	15	46
130.0	667.9	39.62	203.6	135.0	41.15	1.52	1.36	89	0.56	37	TF	Tan-grey moderately weathered rock with oxidized joint surfaces, some significant clay infilling/zones, some more competent zones.	110	30	45	0	1	3	0	3	7	15	10.0	7.8	5.6	7.0	15	46
135.0	662.9	41.15	202.1	140.0	42.67	1.52	1.52	100	0.67	44	TF	As above, strong, brown and reddish soft infill, weathered bedrock with rough and weathered joints.	125	22	69	0	1	5	2	3	11	15	10.9	9.0	5.9	11.0	15	52
140.0	657.9	42.67	200.6	145.0	44.19	1.52	1.42	93	0.49	32	TF	As above.	125	30	47	0	1	5	2	3	11	15	10.9	7.1	5.6	11.0	15	50
145.0	652.9	44.19	199.1	150.0	45.72	1.52	1.39	91	0.38	25	TF	As above, greyish, weathered bedrock, infill has reddish tinge, thick, soft infill, rough and weathered joints.	50	30	46	0	0	5	0	3	8	15	5.7	6.1	5.6	8.0	15	40
150.0	647.9	45.72	197.5	155.0	47.24	1.52	1.52	100	0.24	16	TF	As above, highly weathered, large, soft infill, broken zones.	50	30	51	0	0	3	0	1	4	15	5.7	4.9	5.7	4.0	15	35
155.0	642.9	47.24	196.0	160.0	48.77	1.52	0.98	64	0.12	8	TF	As above, weak.	30	30	33	0	0	3	0	1	4	15	3.9	3.9	5.5	4.0	15	32
160.0	637.9	48.77	194.5	165.0	50.29	1.52	1.04	68	0.00	0	TF	As above, highly weathered, soft grey/red clay, very weak, weathered to sand at end of run.	30	30	35	0	0	1	0	1	2	15	3.9	3.0	5.5	2.0	15	29
165.0	632.9	50.29	193.0	170.0	51.81	1.52	1.37	90	0.00	0	TF	As above, sand at beginning of run, then much more competent.	50	30	46	0	0	1	0	3	4	15	5.7	3.0	5.6	4.0	15	33
170.0	627.9	51.81	191.4	175.0	53.34	1.52	1.39	91	0.32	21	TF	As above, grey clay, areas of competent rock, highly fractured.	50	30	46	0	0	3	0	3	6	15	5.7	5.6	5.6	6.0	15	38
175.0	622.9	53.34	189.9	180.0	54.86	1.52	1.52	100	0.28	18	TF	As above.	50	30	51	0	1	3	2	3	9	15	5.7	5.2	5.7	9.0	15	41
180.0	617.9	54.86	188.4	185.0	56.39	1.52	1.34	88	0.26	17	TF	As above, much more competent, less fractured, areas of soft clay infill, weathered and rough joints.	25	30	45	0	1	5	2	3	11	15	3.4	5.0	5.6	11.0	15	40
185.0	612.9	56.39	186.9	190.0	57.91	1.52	1.44	94	0.52	34	TF	Highly weathered Tertiary Volcaniclastic Conglomerate, more clasts in matrix, areas of soft clay matrix, last half of run is reddish then back to green-grey.	30	30	48	0	0	3	0	1	4	15	3.9	7.4	5.7	4.0	15	36

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Drillhole Number: GH10-227

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition Persis- P	Joint Condition Apert- A	Joint Condition Rough R	Joint Condition Infill I	Joint Condition Weath W	Joint Condition TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
190.0	607.9	57.91	185.3	195.0	59.43	1.52	1.46	96	0.19	12	TF	As above, green-grey, highly fractured, highly weathered, last foot is purplish clast supported volcaniclastic conlgomerate, more	30	25	58	0	1	5	2	1	9	15	3.9	4.4	5.8	9.0	15	**38**
195.0	602.9	59.43	183.8	200.0	60.96	1.52	1.52	100	1.21	79	TF	As above at end of run, purplish red, clast supported volcaniclastic conlgomerate, competent, very strong, some soft infill, slightly rough and weathered joints.	150	10	152	0	4	3	2	5	14	15	12.2	15.6	7.0	14.0	15	**64**
END OF HOLE																												

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-227\[GH10-227.xls]Data - Calc Sheet

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	20JAN'10	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989

Drillhole Number: GH10-228

PROJECT: PEBBLE PROJECT
Client: PEBBLE LIMITED PARTNERSHIP
Drilling Company: FOUNDEX
Location: ILIAMNA, ALASKA
Coordinates : 1421905 E, 2158170 N
Coordinate System : ALASKA STATE PLANE ZONE 5 (ft)

Surface Elevation: 232.3 m / 762 ft
Total Depth: 73.1 m / 240 ft
Azimuth: 0 deg
Inclination: 90 deg **(down is positive)**

Drill Type: HT-700

Core Diameter:	From 0	to 45	ft	PQ3	3.27 "
		to	ft		
Core Diameter:	From 45	to 240	ft	HQ3	2.41 "
		to	ft		
		to	ft		

Logged By: AL, CBN
Reviewed By: LS
Date Started: 20-Oct-10
Date Completed: 23-Oct-10

Drillhole Number: GH10-228

Print Jan/31/11 10:57:12

DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis-P	Joint Condition: Apert-A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
0.0	761.8	0.00	232.3	84.0	25.60	25.60	14.41	56			OB	See Overburden Log.																
84.0	677.8	25.60	206.6	85.0	25.91	0.30	0.30	98	0.10	33	TX/TF	Tertiary Volcaniclastic Conglomerate, reddish brown matrix, soft, weak, contains volcanic rock fragments, broken zones.	25	4	75	0	1	3	2	1	7	15	3.4	7.2	6.0	7.0	15	**39**
85.0	676.8	25.91	206.3	90.0	27.43	1.52	1.40	92	0.90	59	TX/TF	Tertiary Volcaniclastic Conglomerate, reddish brown matrix, soft, weak, contains volcanic rock fragments, broken zones.	50	9	156	0	1	3	2	1	7	15	5.7	11.6	7.0	7.0	15	**46**
90.0	671.8	27.43	204.8	95.0	28.95	1.52	1.52	100	1.20	79	TX/TF	Tertiary Volcaniclastic Conglomerate, reddish brown matrix, soft, weak, contains volcanic rock fragments, broken zones, some more competent, less weathered zones.	50	3	507	0	4	3	2	1	10	15	5.7	15.5	10.8	10.0	15	**57**
95.0	666.8	28.95	203.3	100.0	30.48	1.52	1.52	100	1.05	69	TX/TF	Tertiary Volcaniclastic Conglomerate, reddish brown matrix, soft, weak, contains volcanic rock fragments, broken zones, highly weathered.	50	3	507	0	4	3	2	1	10	15	5.7	13.5	10.8	10.0	15	**55**

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Drillhole Number: GH10-228

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	RMR-89 Total
100.0	661.8	30.48	201.8	105.0	32.00	1.52	1.33	87	0.00	0	TX/TF	As above, highly weathered, weak, soft, falling apart, poor recovery.	25	30	44	0	1	3	2	1	7	15	3.4	3.0	5.6	7.0	15	34
105.0	656.8	32.00	200.2	110.0	33.53	1.52	1.40	92	0.61	40	TX/TF	As above, weak, soft, falling apart, highly weathered, slightly stronger, less broken.	50	26	54	0	1	3	2	1	7	15	5.7	8.4	5.7	7.0	15	42
110.0	651.8	33.53	198.7	115.0	35.05	1.52	1.48	97	0.26	17	TX/TF	As above, some grey zones, strong bedrock, moderately weathered, soft infill, broken zones.	75	17	87	0	1	3	2	3	9	15	7.7	5.0	6.2	9.0	15	43
115.0	646.8	35.05	197.2	120.0	36.57	1.52	1.18	77	0.54	35	TX/TF	As above, back to reddish colour, strong bedrock, weathered joints, soft infill, becoming more competent.	75	12	98	0	4	3	2	3	12	15	7.7	7.6	6.3	12.0	15	49
120.0	641.8	36.57	195.7	125.0	38.10	1.52	1.52	100	0.37	24	TX/TF	As above.	75	14	109	0	4	3	2	3	12	15	7.7	6.0	6.5	12.0	15	47
125.0	636.8	38.10	194.2	130.0	39.62	1.52	1.48	97	0.82	54	TX/TF	As above, some paler zones, moderately weathered.	75	8	185	0	4	3	2	3	12	15	7.7	10.7	7.4	12.0	15	53
130.0	631.8	39.62	192.6	135.0	41.15	1.52	1.52	100	1.13	74	TX/TF	As above, some paler zones, moderately weathered, broken zones.	75	11	138	0	4	3	2	3	12	15	7.7	14.5	6.8	12.0	15	56
135.0	626.8	41.15	191.1	140.0	42.67	1.52	1.50	98	1.22	80	TX/TF	As above, some paler zones, moderately weathered, broken zone, soft infill.	75	6	250	0	4	3	2	3	12	15	7.7	15.8	8.2	12.0	15	59
140.0	621.8	42.67	189.6	145.0	44.19	1.52	1.47	96	0.23	15	TX/TF	As above, pale yellow colour, highly weathered bedrock, soft infill, some broken zones.	75	23	64	0	1	3	2	1	7	15	7.7	4.8	5.9	7.0	15	40
145.0	616.8	44.19	188.1	150.0	45.72	1.52	1.48	97	0.51	33	TX/TF	As above, pale yellow colour, moderately weathered bedrock, soft infill, some broken zones, long subvertical joint.	75	9	164	0	4	3	2	3	12	15	7.7	7.3	7.2	12.0	15	49
150.0	611.8	45.72	186.5	155.0	47.24	1.52	1.48	97	1.08	71	TX/TF	As above, pale yellow colour, moderately weathered bedrock, soft infill, some broken zones.	75	8	185	0	4	3	2	3	12	15	7.7	13.9	7.4	12.0	15	56
155.0	606.8	47.24	185.0	160.0	48.77	1.52	1.30	85	0.32	21	TX/TF	As above, brownish colour, highly weathered, weak, thin soft infill, joints.	75	9	144	0	4	3	2	1	10	15	7.7	5.6	6.9	10.0	15	45

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Drillhole Number: GH10-228

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
160.0	601.8	48.77	183.5	165.0	50.29	1.52	1.40	92	0.48	31	TX/TF	As above, more competent than run above.	75	14	100	0	4	3	2	3	12	15	7.7	7.0	6.3	12.0	15	**48**
165.0	596.8	50.29	182.0	170.0	51.81	1.52	1.52	100	1.40	92	TX/TF	As above, more competent, joints are slightly rough and weathered, infill is soft, strong	150	3	507	0	4	3	2	5	14	15	12.2	18.3	10.8	14.0	15	**70**
170.0	591.8	51.81	180.4	175.0	53.34	1.52	1.51	99	0.74	49	TX/TF	As above, competent, joints are slightly rough and weathered, infill is soft, paler zone from ~171 to 172.5'.	75	10	151	0	4	3	2	5	14	15	7.7	9.8	7.0	14.0	15	**53**
175.0	586.8	53.34	178.9	180.0	54.86	1.52	1.45	95	0.81	53	TX/TF	As above, moderately weathered, joints are slightly rough and weathered, infill is soft.	75	9	161	0	4	3	2	3	12	15	7.7	10.6	7.1	12.0	15	**52**
180.0	581.8	54.86	177.4	185.0	56.39	1.52	1.48	97	1.43	94	TX/TF	As above, slightly weathered, competent, strong.	125	7	211	0	4	3	2	5	14	15	10.9	18.8	7.7	14.0	15	**66**
185.0	576.8	56.39	175.9	190.0	57.91	1.52	1.47	96	1.26	83	TX/TF	As above, slightly weathered, competent, strong, hard infill.	125	6	245	0	4	3	5	5	17	15	10.9	16.3	8.1	17.0	15	**67**
190.0	571.8	57.91	174.3	195.0	59.43	1.52	1.52	100	1.42	93	TX/TF	As above.	175	3	507	0	4	3	5	5	17	15	13.3	18.6	10.8	17.0	15	**75**
195.0	566.8	59.43	172.8	200.0	60.96	1.52	1.52	100	1.52	100	TX/TF	As above, slightly weathered, one soft zone.	175	3	507	0	4	3	2	5	14	15	13.3	20.1	10.8	14.0	15	**73**
200.0	561.8	60.96	171.3	205.0	62.48	1.52	0.81	53	0.69	45	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, drilling lost circulation at 205'.	100	2	405	0	4	3	2	5	14	15	9.4	9.2	9.8	14.0	15	**57**
205.0	556.8	62.48	169.8	210.0	64.00	1.52	1.52	100	0.68	45	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, moderately weathered at 208.5'.	100	9	169	0	4	3	2	3	12	15	9.4	9.1	7.2	12.0	15	**53**
210.0	551.8	64.00	168.2	215.0	65.53	1.52	1.50	98	1.02	67	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, broken at 213.5'.	100	5	300	0	4	3	2	5	14	15	9.4	13.1	8.7	14.0	15	**60**
215.0	546.8	65.53	166.7	220.0	67.05	1.52	1.39	91	0.78	51	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, some broken zones.	100	6	232	0	4	5	2	3	14	15	9.4	10.2	8.0	14.0	15	**57**
220.0	541.8	67.05	165.2	225.0	68.58	1.52	1.49	98	0.89	58	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported.	100	5	298	0	4	5	2	5	16	15	9.4	11.5	8.7	16.0	15	**61**

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Drillhole Number: GH10-228

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DRILL RUN DATA											GEOLOGY - COMMENTS		RMR - DATA (BY RUN)										RMR CALCULATIONS (BY RUN)					
Depth From (ft)	Elev. From (ft)	Depth From (m)	Elev. From (m)	Depth To (ft)	Depth To (m)	Run Length (m)	Recov. Length (m)	Recov. (%)	RQD Length (m)	RQD (%)	Rock Type (see Legend)	Weathered State, Structure, Color, Grain Size, Rock Material Strength, Rock Type,	UCS (Est.) (MPa)	# of Joints	Joint Set Spac. (mm)	Joint Condition: Persis- P	Joint Condition: Apert- A	Joint Condition: Rough R	Joint Condition: Infill I	Joint Condition: Weath W	Joint Condition: TOTAL	Water Rating	RMR-89 UCS Rating	RMR-89 RQD Rating	RMR-89 Joint Spac. Rating	RMR-89 Joint Condition Rating	RMR-89 Water Rating	**RMR-89 Total**
225.0	536.8	68.58	163.7	230.0	70.10	1.52	1.43	94	0.64	42	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, moderately weathered.	100	10	143	0	4	3	2	3	12	15	9.4	8.7	6.9	12.0	15	**52**
230.0	531.8	70.10	162.1	235.0	71.62	1.52	1.45	95	1.45	95	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, no joints, competent.	100	0	1524	0	6	6	6	5	23	15	9.4	19.1	17.6	23.0	15	**84**
235.0	526.8	71.62	160.6	240.0	73.15	1.52	1.51	99	1.40	92	TX/TF	As above, reddish color, soft, weak, contains rock fragments, matrix supported, competent.	100	2	755	0	4	5	2	5	16	15	9.4	18.3	12.9	16.0	15	**72**
												END OF HOLE																

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-228\[GH10-228.xls]Data - Calc Sheet

0	20JAN'11	ISSUED WITH REPORT 101-176/35-1	LS	DAY	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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APPENDIX B3

GEOTECHNICAL DRILLHOLE LABORATORY TEST RESULTS

- GH10-212
- GH10-214
- GH10-215
- GH10-216
- GH10-217
- GH10-218
- GH10-219
- GH10-220
- GH10-221
- GH10-222
- GH10-223
- GH10-224
- GH10-225
- GH10-226
- GH10-227
- GH10-228

(Page B3-1 to B3-146)

Table 1

Pebble Limited Partnership
Pebble Project

2010 Geotechnical Site Investigation - SPT Samples
Summary of Laboratory Test Results - Moisture Content

Sample/Boring No. (GH10-)	**212**	**213**	**214**	**216**	**217**	**217**	**219**	**219**	**219**	**219**	**220**
SPT Sample No.	**2**	**1**	**7**	**4**	**2**	**5**	**4**	**5**	**6**	**8**	**Sump**
Sample Depth (ft)											
Wet sample + Tare, g	944.2	405.3	852.4	546.1	1084.6	1022.6	1090.9	1057.6	1207.5	873.5	2220.9
Dry Sample + Tare, g	929.3	333.7	721.7	467.8	903.9	903.1	925.8	894.9	1014.8	802.7	1764.8
Tare, g	192.1	193.8	196.4	196.9	194	194.7	395.2	392.9	394.4	395.5	260.8
Wt. of Water, g	14.9	71.6	130.7	78.3	180.7	119.5	165.1	162.7	192.7	70.8	456.1
Wt. of Dry Sample, g	737.2	139.9	525.3	270.9	709.9	708.4	530.6	502	620.4	407.2	1504
Moisture Content, %	**2.0**	**51.2**	**24.9**	**28.9**	**25.5**	**16.9**	**31.1**	**32.4**	**31.1**	**17.4**	**30.3**

Sample/Boring No. (GH10-)	**221**	**221**	**221**	**221**	**222**	**222**	**222**	**222**	**222**	**228**	**214**
SPT Sample No.	**2**	**4**	**5**	**7**	**1**	**3**	**5**	**7**	**12**	**3**	**4**
Sample Depth (ft)											
Wet sample + Tare, g	731.9	804.2	848.7	949.9	607.0	757.5	993.7	1032.0	629.2	1199.9	823.6
Dry Sample + Tare, g	606.2	653.2	741.0	766.1	541.8	675.8	912.0	937.2	603.3	980.3	770.4
Tare, g	145.4	148.3	148.8	58.0	149.0	152.0	409.9	420.5	415.0	392.9	394.5
Wt. of Water, g	125.7	151	107.7	183.8	65.2	81.7	81.7	94.8	25.9	219.6	53.2
Wt. of Dry Sample, g	460.8	504.9	592.2	708.1	392.8	523.8	502.1	516.7	188.3	587.4	375.9
Moisture Content, %	**27.3**	**29.9**	**18.2**	**26.0**	**16.6**	**15.6**	**16.3**	**18.3**	**13.8**	**37.4**	**14.2**

Sample/Boring No. (GH10-)	**216**	**218**	**219**	**216**	**216**	**226**	**226**	**226**	**226**	**226**	**226**
SPT Sample No.	**2**	**3**	**1**	**Sump1**	**Sump 2**	**5**	**7**	**8**	**10**	**12**	**17**
Sample Depth (ft)											
Wet sample + Tare, g	666.0	762.8	406.0	3846.0	3029.3	539.9	897.2	821.1	1253.0	572.2	228.5
Dry Sample + Tare, g	642.1	692.0	339.9	3346.5	2743.6	480.0	762.6	724.6	1087.9	529.9	202.1
Tare, g	395.4	194.4	116.6	230.0	265.2	195.5	196.8	195.1	194.0	111.9	118.2
Wt. of Water, g	23.9	70.8	66.1	499.5	285.7	59.9	134.6	96.5	165.1	42.3	26.4
Wt. of Dry Sample, g	246.7	497.6	223.3	3116.5	2478.4	284.5	565.8	529.5	893.9	418	83.9
Moisture Content, %	**9.7**	**14.2**	**29.6**	**16.0**	**11.5**	**21.1**	**23.8**	**18.2**	**18.5**	**10.1**	**31.5**

Sample/Boring No. (GH10-)	**227**	**226**	**227**	**228**	**222**	**223**	**223**	**223**	**223**	**223**	**224**
SPT Sample No.	**1**	**Till**	**3**	**1**	**Till**	**1**	**2**	**5**	**7**	**Till**	**Sump**
Sample Depth (ft)											
Wet sample + Tare, g	539.5	11370.0	663.9	993.5	7145	912	877.3	862.3	1068.1	12211.5	13442
Dry Sample + Tare, g	490.3	10463.0	630.5	854.1	6574	858.7	823.9	769.9	973	11129	11658.8
Tare, g	112.8	2116.5	403.1	393.9	2145.5	413.6	412.9	412.2	409.3	2154	2429
Wt. of Water, g	49.2	907	33.4	139.4	571	53.3	53.4	92.4	95.1	1082.5	1783.2
Wt. of Dry Sample, g	377.5	8346.5	227.4	460.2	4428.5	445.1	411	357.7	563.7	8975	9229.8
Moisture Content, %	**13.0**	**10.9**	**14.7**	**30.3**	**12.9**	**12.0**	**13.0**	**25.8**	**16.9**	**12.1**	**19.3**

Sample/Boring No. (GH10-)	**225**	**226**	**226**	**212**	**219**	**216**	**218**	**214**	**214**	**214**	**212**
SPT Sample No.	**Sump**	**1**	**3**	**3**	**9**	**3**	**5**	**5**	**3**	**1**	**5**
Sample Depth (ft)											
Wet sample + Tare, g	12556	727.8	864	944.2	1039.2	645.3	1058.6	721.6	803.9	807.7	824
Dry Sample + Tare, g	11611	624.6	794.8	829.3	941.6	550.3	930.7	652.4	706.2	724.3	749.6
Tare, g	2142.5	197.4	196.6	192.1	392.8	195.5	402.7	195.7	195.5	196.5	196.5
Wt. of Water, g	945	103.2	69.2	114.9	97.6	95	127.9	69.2	97.7	83.4	74.4
Wt. of Dry Sample, g	9468.5	427.2	598.2	637.2	548.8	354.8	528	456.7	510.7	527.8	553.1
Moisture Content, %	**10.0**	**24.2**	**11.6**	**18.0**	**17.8**	**26.8**	**24.2**	**15.2**	**19.1**	**15.8**	**13.5**

Sample/Boring No. (GH10-)	**212**	**215**
SPT Sample No.	**1**	**2**
Sample Depth (ft)		
Wet sample + Tare, g	782.4	832.8
Dry Sample + Tare, g	662.3	719
Tare, g	113.4	196.1
Wt. of Water, g	120.1	113.8
Wt. of Dry Sample, g	548.9	522.9
Moisture Content, %	**21.9**	**21.8**

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/10/2010	Act. Code	500
Date Completed	11/12/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	GH10-212, SPT-1 @ 12-13.5'		GH10-214, SPT-5 @ 25-26.5'		GH10-213, SPT-1 @ 5-6.5'		GH10-215, SPT-2 @ 10-11.5'		GH10-217, SPT-5 @ 24-25.5'	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	13	112	11	1	113	2	3	42	13	115
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	39.77	40.03	40.30	39.60	32.38		33.69	33.53	32.41	32.62
4) Calibrated Wt. of Flask + Water	364.57	346.83	359.35	352.81	344.80		365.54	351.67	364.48	352.65
5) #3 + #4	404.34	386.86	399.65	392.41	377.18		399.23	385.20	396.89	385.27
6) Wt. of Flask + Water + Soil	390.04	372.27	384.85	378.07	365.48		386.84	372.50	384.99	372.99
7) Volume of Soil (5 - 6)	14.30	14.59	14.80	14.34	11.70		12.39	12.70	11.90	12.28
8) Test Temperature, deg. C	18	18.1	17.9	18	18.1		19.8	19.8	19.9	20
9) Temperature Correction, k	1.000391	1.000373	1.000409	1.000391	1.000373		1.000040	1.000040	1.000020	1.000000
10) Specific Gravity ((3 / 7) * k)	2.782	2.745	2.724	2.763	2.769		2.719	2.640	2.724	2.656
Reported Average, G_s @ 20 deg.C	2.76		2.74		2.77		2.68		2.69	
Tare	F	G	I	A	17		33	26	1	7
Dry Soil + tare, g	185.68	187.05	201.09	184.52	181.18		145.53	151.95	145.41	145.53
Tare, g	145.91	147.02	160.79	144.92	148.8		111.84	118.42	113	112.91

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/16/2010	Act. Code	500
Date Completed	11/19/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	GH10-214, SPT #3 @ 15-16.5'		GH10-219, SPT @ 24-25.5'		GH10-217, SPT #2 @ 9-10.5'		GH10-212, SPT #3 @ 24-25.5'		GH10-219, SPT #8 @ 39-40.5	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	116	44	113	M4	112		116	M2	116	113
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	29.39	30.03	32.19	32.73	33.50		33.50	32.20	31.09	31.09
4) Calibrated Wt. of Flask + Water	354.10	355.12	344.72	352.13	346.75		354.02	352.99	353.97	344.67
5) #3 + #4	383.49	385.15	376.91	384.86	380.25		387.52	385.19	385.06	375.76
6) Wt. of Flask + Water + Soil	372.90	374.22	365.13	372.72	368.03		375.25	373.26	373.60	364.31
7) Volume of Soil (5 - 6)	10.59	10.93	11.78	12.14	12.22		12.27	11.93	11.46	11.45
8) Test Temperature, deg. C	18.1	18.2	19.7	19.8	19.7		19.7	19.8	20.8	20.8
9) Temperature Correction, k	1.000373	1.000355	1.000060	1.000040	1.000060		1.000060	1.000040	0.999830	0.999830
10) Specific Gravity ((3 / 7) * k)	2.776	2.748	2.733	2.696	2.742		2.730	2.699	2.712	2.715
Reported Average, G_s @ 20 deg.C	2.76		2.71		2.74		2.71		2.71	
Tare	58	55	8	7	15		11	3	18	1
Dry Soil + tare, g	224.94	222.03	424.47	425.72	427.02		229.64	228.02	149.30	144.06
Tare, g	195.55	192.00	392.28	392.99	393.52		196.14	195.82	118.21	112.97

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/29/2010	Act. Code	500
Date Completed	12/1/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	GH10-216, SPT #3 @ 40-41.5'		GH10-218, SPT #5 @ 24-25.5'		GH10-214, SPT #4 @ 20-21.5'		GH10-223, SPT #7 @ 40-41.5'		GH10-222, SPT #5 @ 25-26.5'	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	13	42	116	1	13	44	113	42	m3	11
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	33.46	32.43	32.77	32.26	32.50	32.94	32.73	32.68	33.20	33.02
4) Calibrated Wt. of Flask + Water	364.43	351.61	353.98	352.68	364.43	354.97	344.65	351.60	349.28	359.20
5) #3 + #4	397.89	384.04	386.75	384.94	396.93	387.91	377.38	384.28	382.48	392.22
6) Wt. of Flask + Water + Soil	385.34	371.83	374.87	373.03	385.05	375.53	365.53	372.23	370.11	380.14
7) Volume of Soil (5 - 6)	12.55	12.21	11.88	11.91	11.88	12.38	11.85	12.05	12.37	12.08
8) Test Temperature, deg. C	20.8	20.8	20.6	20.6	20.9	21	21.1	21	20.9	20.9
9) Temperature Correction, k	0.999830	0.999830	0.999870	0.999870	0.999810	0.999790	0.999768	0.999790	0.999810	0.999810
10) Specific Gravity ((3 / 7) * k)	2.666	2.656	2.758	2.708	2.735	2.660	2.761	2.711	2.683	2.733
Reported Average, G_s @ 20 deg.C	2.66		2.73		2.70		2.74		2.71	
Tare	100	3	58	48	1	10	12	13	44	23
Dry Soil + tare, g	147.93	228.23	228.27	228.5	145.42	149.07	146.16	148.52	228.98	229.84
Tare, g	114.47	195.80	195.5	196.24	112.92	116.13	113.43	115.84	195.78	196.82

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Soil
ASTM D 854

Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	11/29/2010	Act. Code	500
Date Completed	12/1/2010	Lab No.	
Tested By	db	Checked By	spb

Sample No.	GH10-221, SPT #4 @ 20-21.5'		GH10-222, SPT #3 @ 15-16.5'		GH10-226, SPT #17 @ 155-156.5		GH10-226, SPT #7 @ 53-54.5'		GH10-228, SPT #1 @ 7-8.5'	
Sample Prep. (Wet or Dry)	dry		dry		dry		dry		dry	
Flask No.	115	112	m2	m1	m4	116	13	42	44	11
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	32.63	33.08	34.78	35.08	31.75	32.16	32.88	32.92	33.21	33.30
4) Calibrated Wt. of Flask + Water	352.62	346.71	352.94	352.68	352.10	353.98	364.46	351.63	355.00	359.21
5) #3 + #4	385.25	379.79	387.72	387.76	383.85	386.14	397.34	384.55	388.21	392.51
6) Wt. of Flask + Water + Soil	372.79	367.22	374.65	374.68	372.04	374.41	385.40	372.24	375.84	380.41
7) Volume of Soil (5 - 6)	12.46	12.57	13.07	13.08	11.81	11.73	11.94	12.31	12.37	12.10
8) Test Temperature, deg. C	20.5	20.5	20.7	20.7	20.5	20.6	20.3	20.5	20.5	20.6
9) Temperature Correction, k	0.999890	0.999890	0.999850	0.999850	0.999890	0.999870	0.999934	0.999890	0.999890	0.999870
10) Specific Gravity ((3 / 7) * k)	2.618	2.631	2.661	2.682	2.688	2.741	2.754	2.674	2.684	2.752
Reported Average, G_s @ 20 deg.C	2.62		2.67		2.71		2.71		2.72	
Tare	6	10	1	16	11	13	13	12	0	26
Dry Soil + tare, g	408.60	405.19	429.28	429.03	424.75	435.15	148.76	146.37	228.43	151.49
Tare, g	375.97	372.11	394.5	393.95	393	402.99	115.88	113.45	195.22	118.19

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

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Specific Gravity - Soil
ASTM D 854

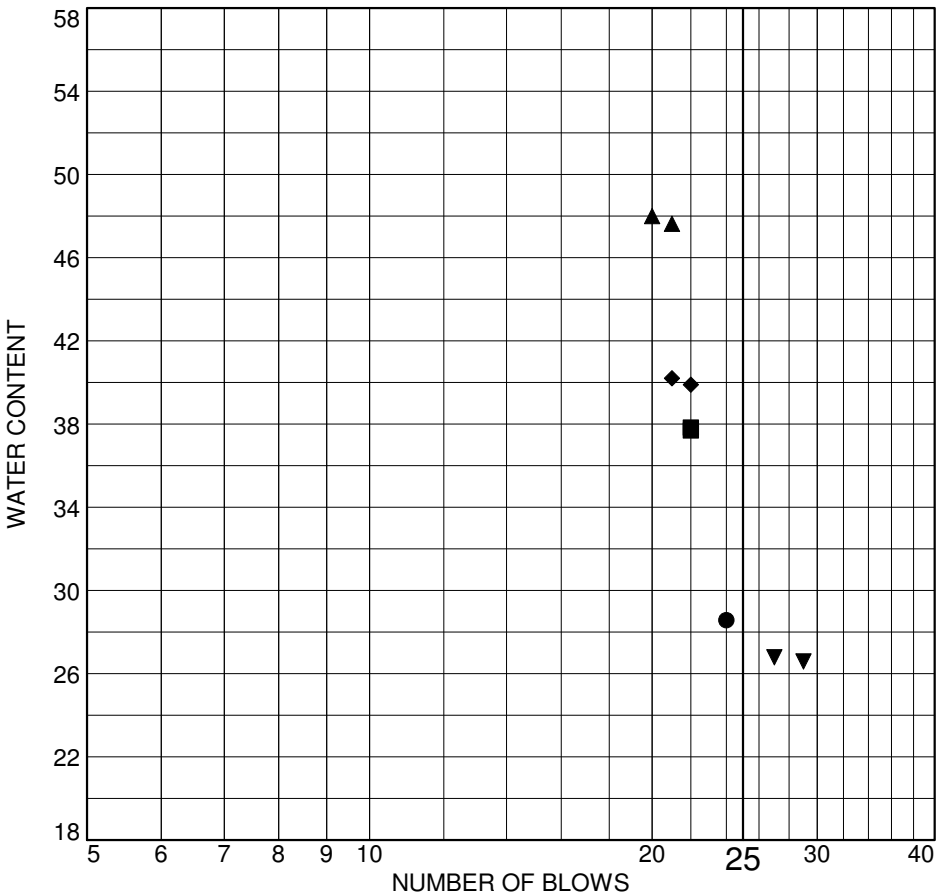
Project	Pebble Project	Project No.	DV101-00077.11
Date Staged	12/22/2010	Act. Code	500
Date Completed	12/24/2010	Lab No.	
Tested By	db	Checked By	spb

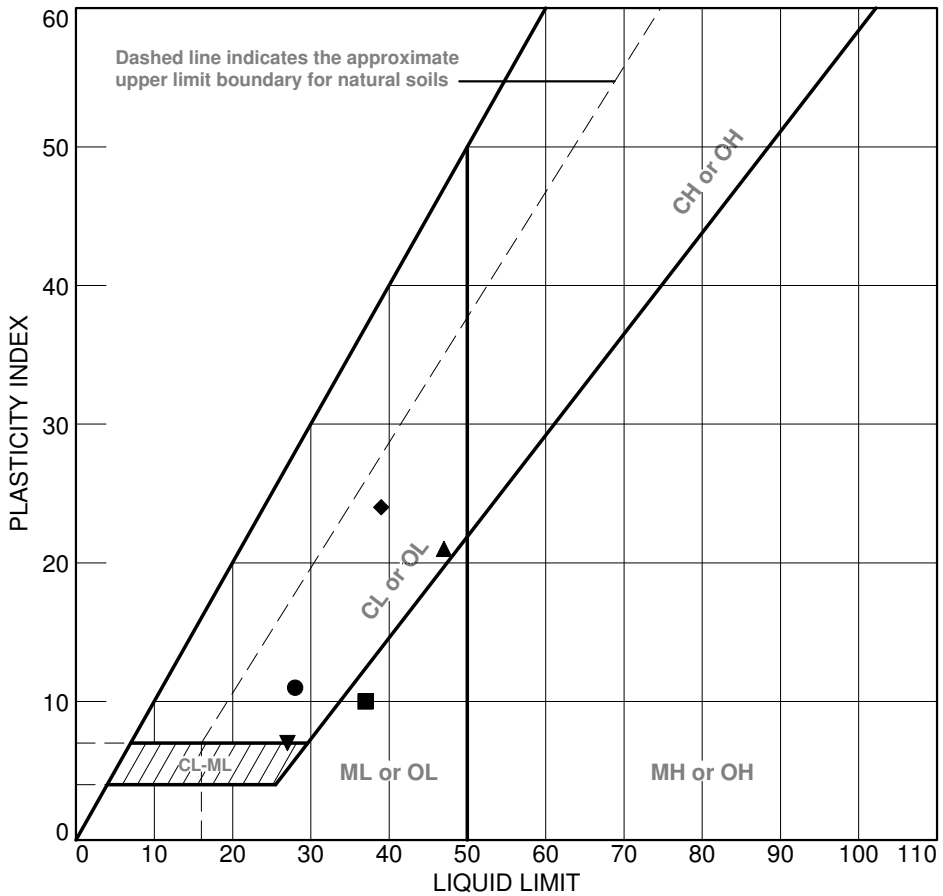
Sample No.	GH10-226, Shelby 2 @ 15-17'		GH10-226, Shelby @ 20-22'		GH10-228, Shelby 1 @ 5-7'		GH10-227, Shelby 1 @ 5-7'			
Sample Prep. (Wet or Dry)	dry		dry		dry		dry			
Flask No.	2	112	115	11	2	112	4	13		
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	32.41	32.46	33.35	32.15	39.83	39.82	39.17	39.86		
4) Calibrated Wt. of Flask + Water	352.94	346.71	352.62	359.22	352.94	346.70	352.09	364.45		
5) #3 + #4	385.35	379.17	385.97	391.37	392.77	386.52	391.26	404.31		
6) Wt. of Flask + Water + Soil	373.35	367.21	373.72	379.68	378.13	372.02	377.09	389.84		
7) Volume of Soil (5 - 6)	12.00	11.96	12.25	11.69	14.64	14.50	14.17	14.47		
8) Test Temperature, deg. C	20.6	20.6	20.6	20.5	20.6	20.7	20.6	20.5		
9) Temperature Correction, k	0.999870	0.999870	0.999870	0.999890	0.999870	0.999850	0.999870	0.999890		
10) Specific Gravity ((3 / 7) * k)	2.700	2.714	2.722	2.750	2.720	2.746	2.764	2.754		
Reported Average, G_s @ 20 deg.C	2.71		2.74		2.73		2.76			
Tare	18	33	12	7	1	26	39	18		
Dry Soil + tare, g	150.58	144.26	146.77	144.95	152.75	157.97	150.16	158.1		
Tare, g	118.17	111.80	113.42	112.80	112.92	118.15	110.99	118.24		

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded by the density of water at 20 deg. C.

Wet prep samples soaked overnight prior to application of vacuum.

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-213	SPT 1	5.0-6.5'					28	11
■	GH10-214	SPT 7	35.0-36.5'	11/17/10	SM	silty sand with gravel		37	10
▲	GH10-216	SPT 4	65-66.5'	11/17/10	SC	clayey sand		47	21
◆	GH10-217	SPT 2	9-10.5'	11/18/10	SC	clayey sand with gravel		39	24
▼	GH10-217	SPT 5	24-25.5'	11/18/10	SC-SM	silty, clayey sand with gravel		27	7

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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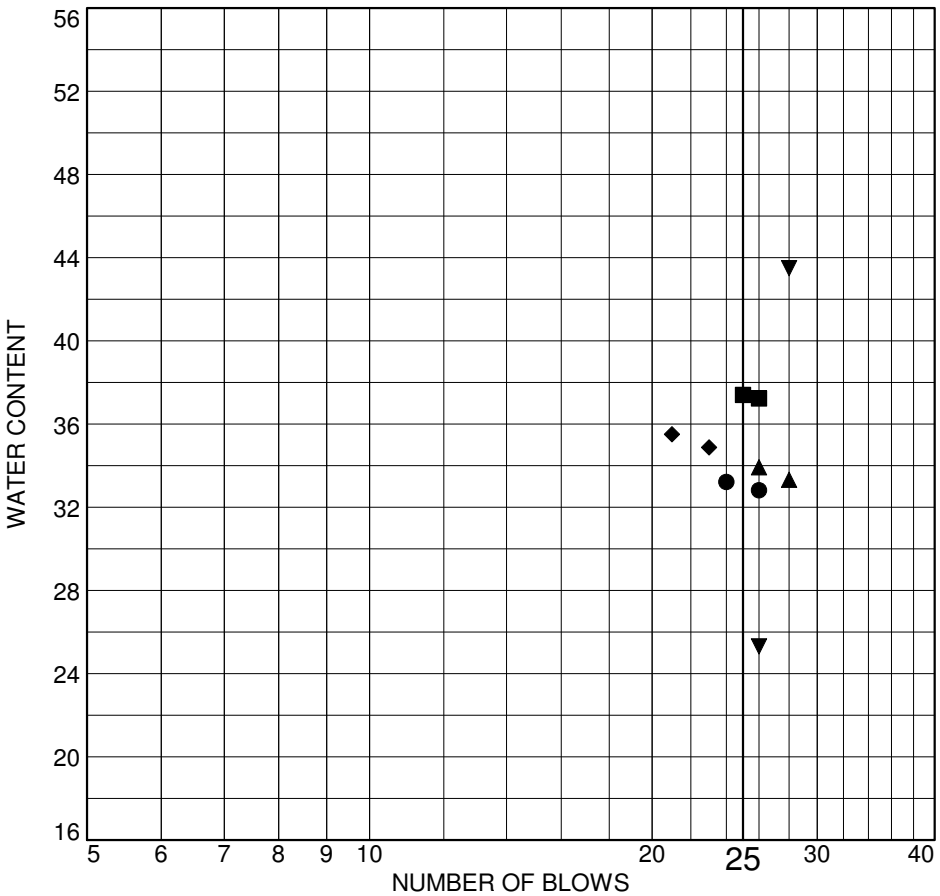
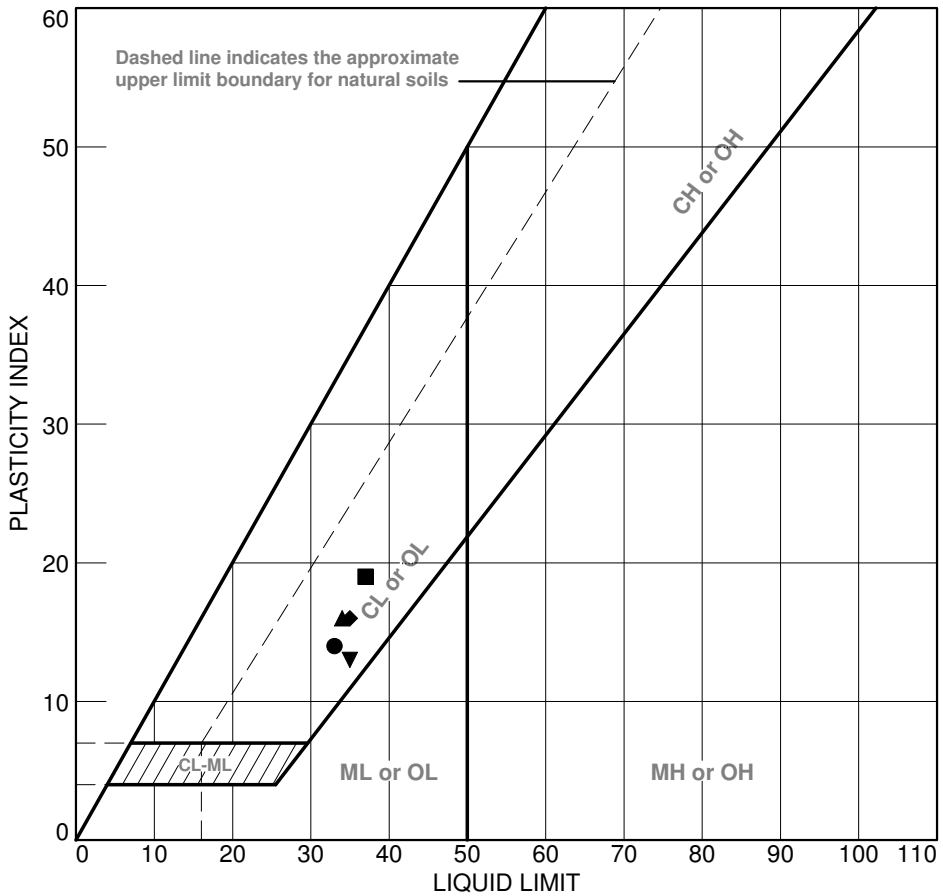
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-219	SPT 1	4.0-5.5'	11/30/10	SC	clayey sand with gravel		33	14
■	GH10-219	SPT 4	19.0-20.5'	11/17/10	CL	sandy lean clay		37	19
▲	GH10-219	SPT 5	24.0-25.5'	11/17/10	CL	sandy lean clay		34	16
◆	GH10-219	SPT 6	29.0-30.5'	11/17/10	CL	lean clay		35	16
▼	GH10-221	SPT 2	10-11.5'	11/30/10	SC	clayey sand with gravel		35	13

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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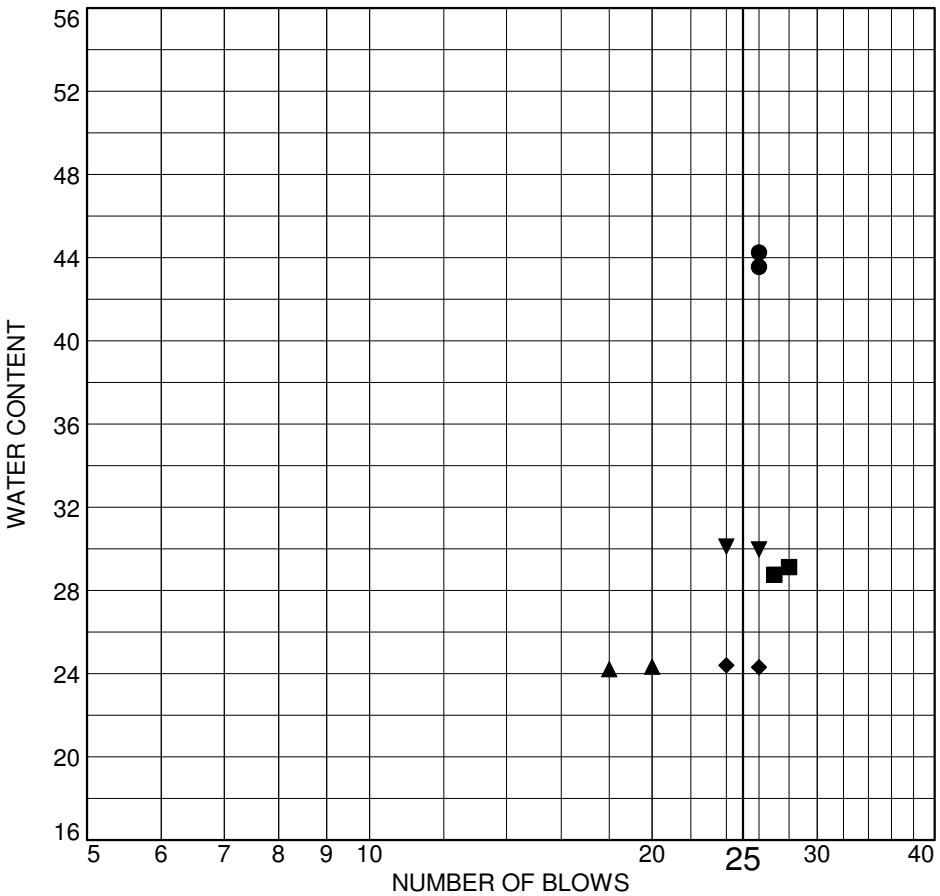
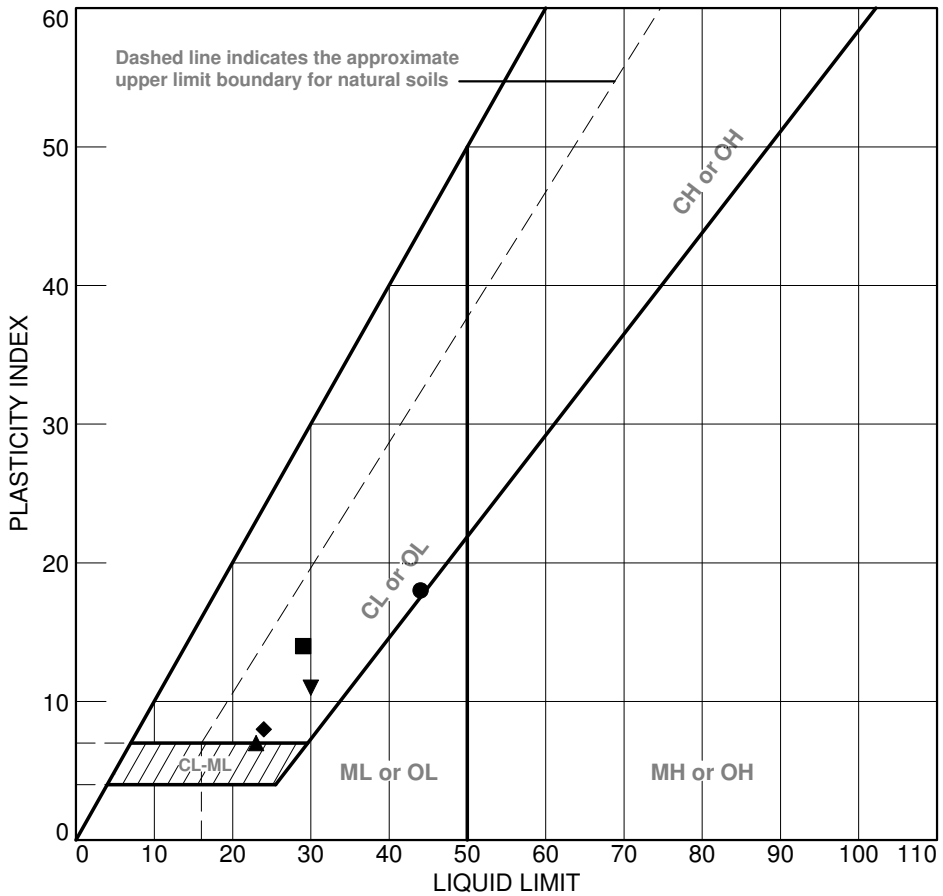
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-221	SPT 4	20-21.5'	11/30/10	GC	clayey gravel with sand		44	18
■	GH10-222	SPT 3	15-16.5'	11/30/10	GC	clayey gravel with sand		29	14
▲	GH10-222	SPT 1	5-6.5'	11/30/10	SC-SM	silty, clayey sand with gravel		23	7
◆	GH10-222	SPT 7	35-36.5'	11/30/10	SC	clayey sand with gravel		24	8
▼	GH10-223	SPT 5	30-31.5'	11/30/10	CL	sandy lean clay		30	11

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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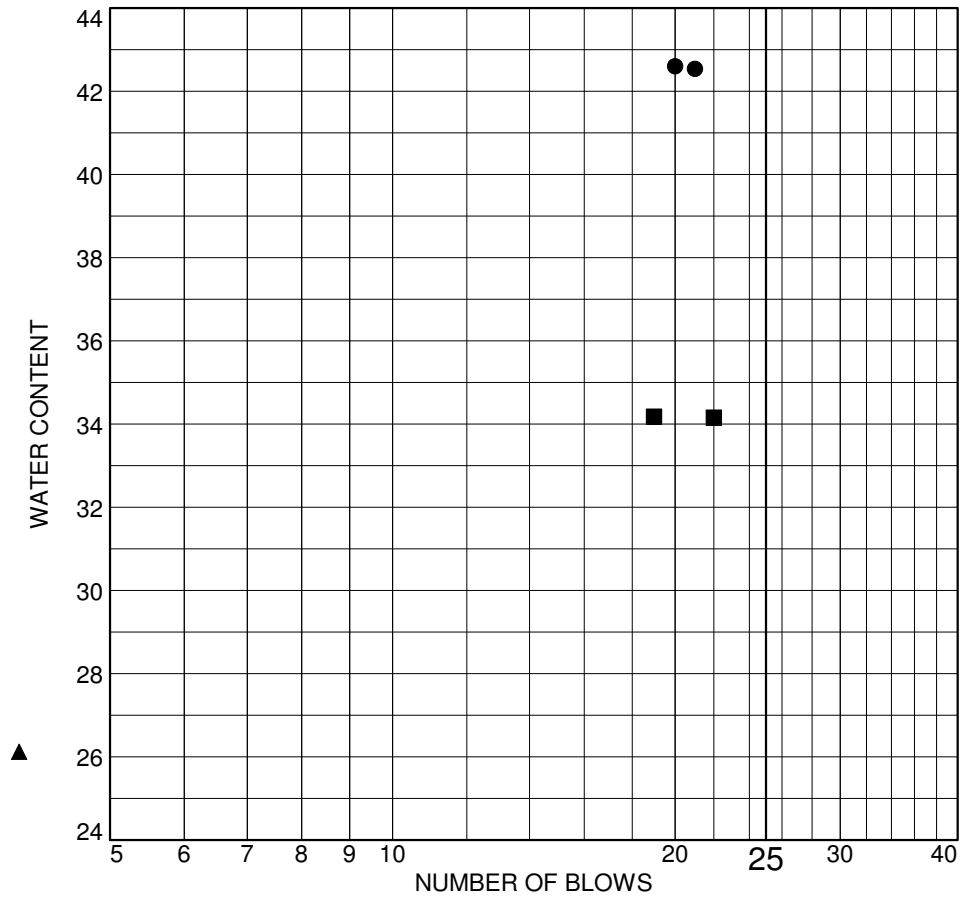
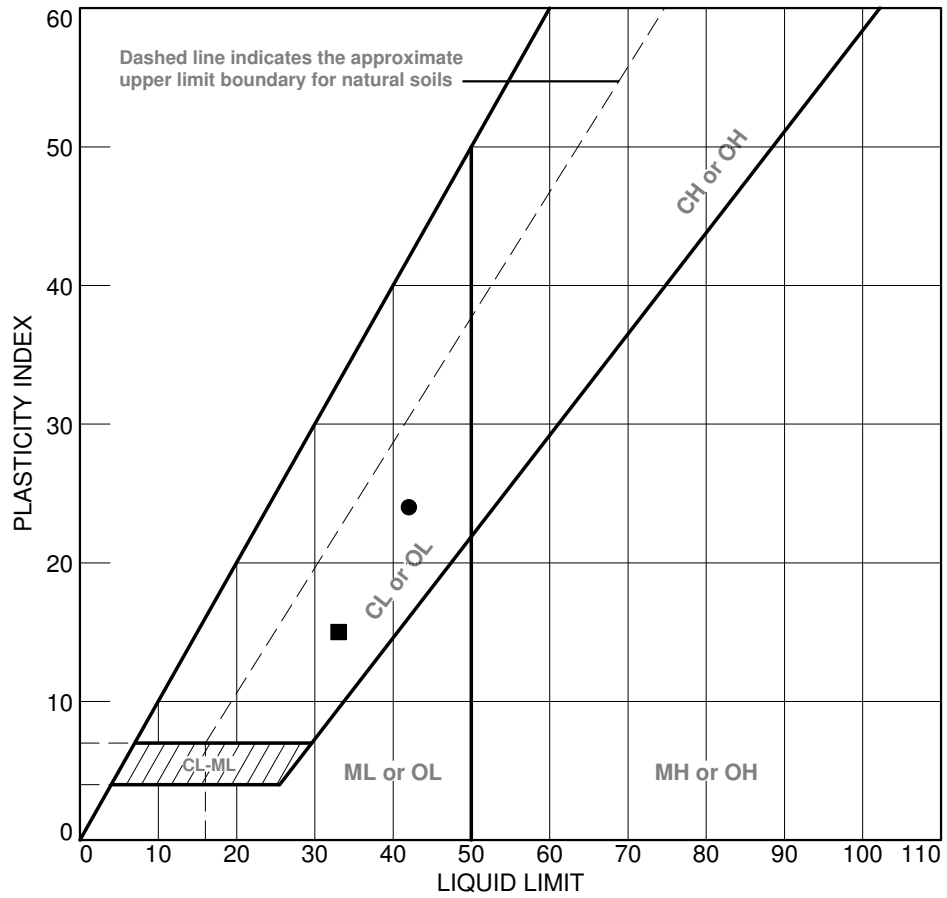
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-222	Till	66.0-67.5'	1/12/11	SC	clayey sand with gravel		42	24
■	GH10-223	Till	35.0-38.0'	1/12/11	GC	clayey gravel with sand		33	15
▲	GH10-225	SUMP	Spoil Pile	12/1/10	GM	silty gravel with sand		21	NP

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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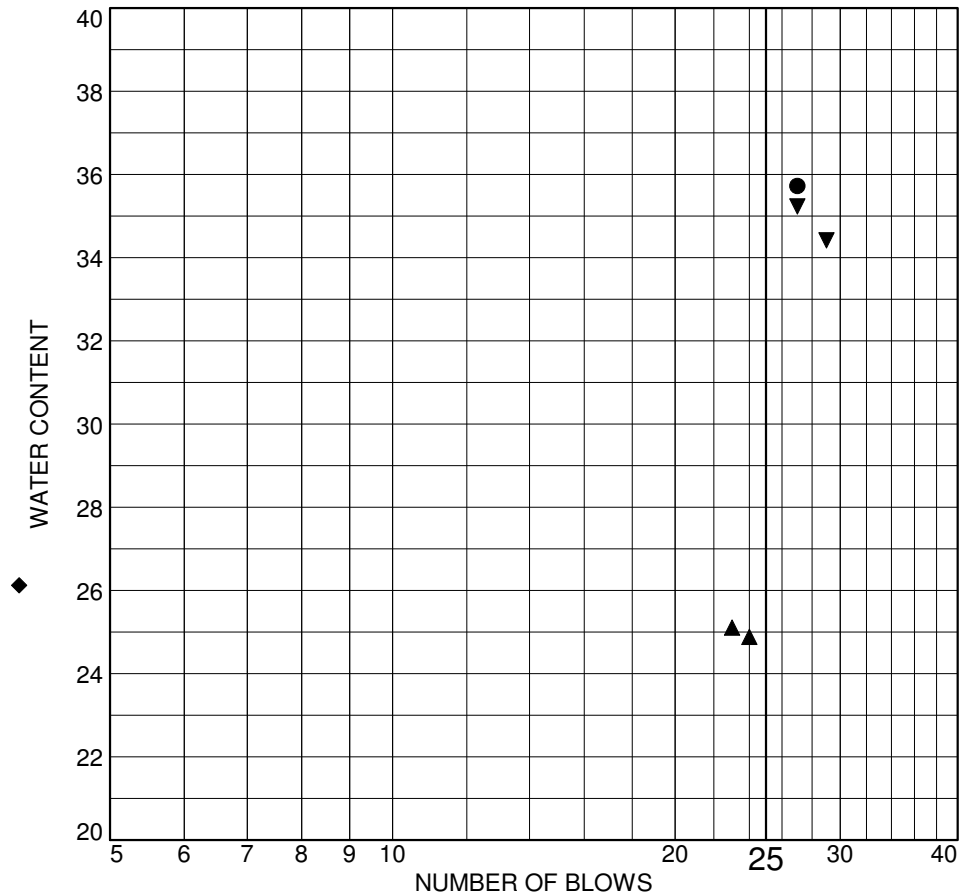
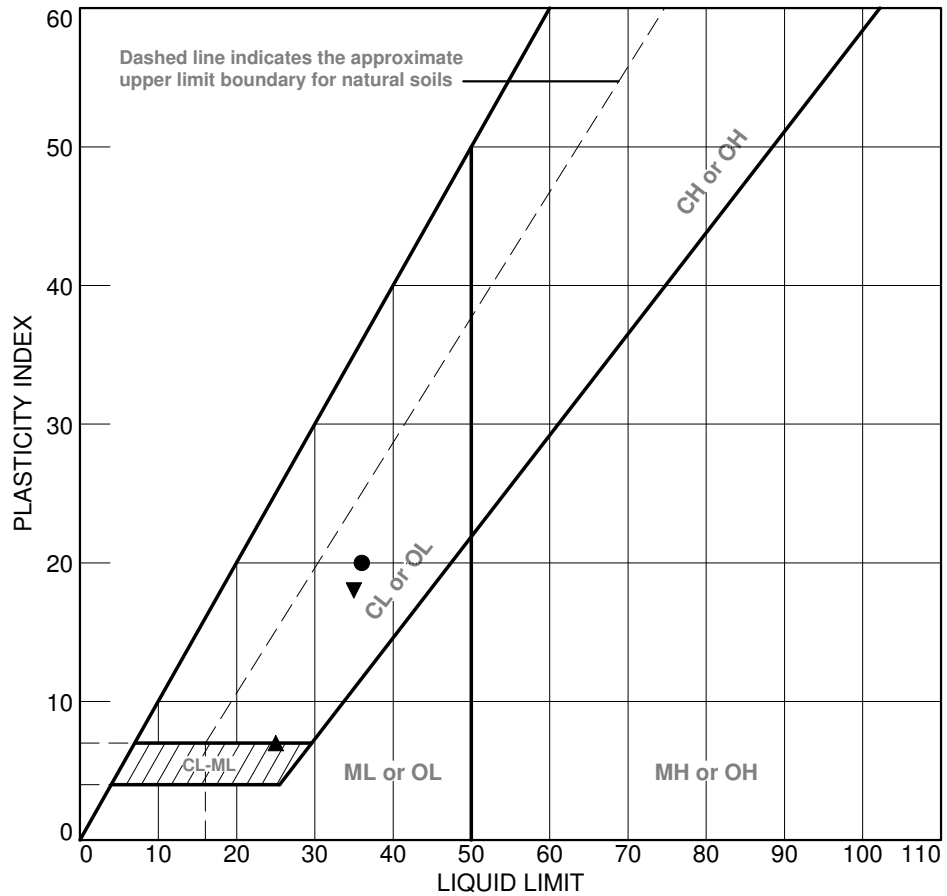
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-223	SPT 7	40-41.5'	11/30/10	SC	clayey sand with gravel		36	20
■	GH10-223	SPT 1	5-6.5'	11/30/10	GW	well-graded gravel with sand		NP	NP
▲	GH10-224	Sump	1-2'	12/1/10	CL-ML	sandy silty clay		25	7
◆	GH10-225	SUMP	Spoil Pile	12/1/10	GM	silty gravel with sand		21	NP
▼	GH10-226	SPT 1	5-6.5'	11/30/10	GC	clayey gravel with sand		35	18

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Project Pebble Project

Project No. 101-77/11 Fig.

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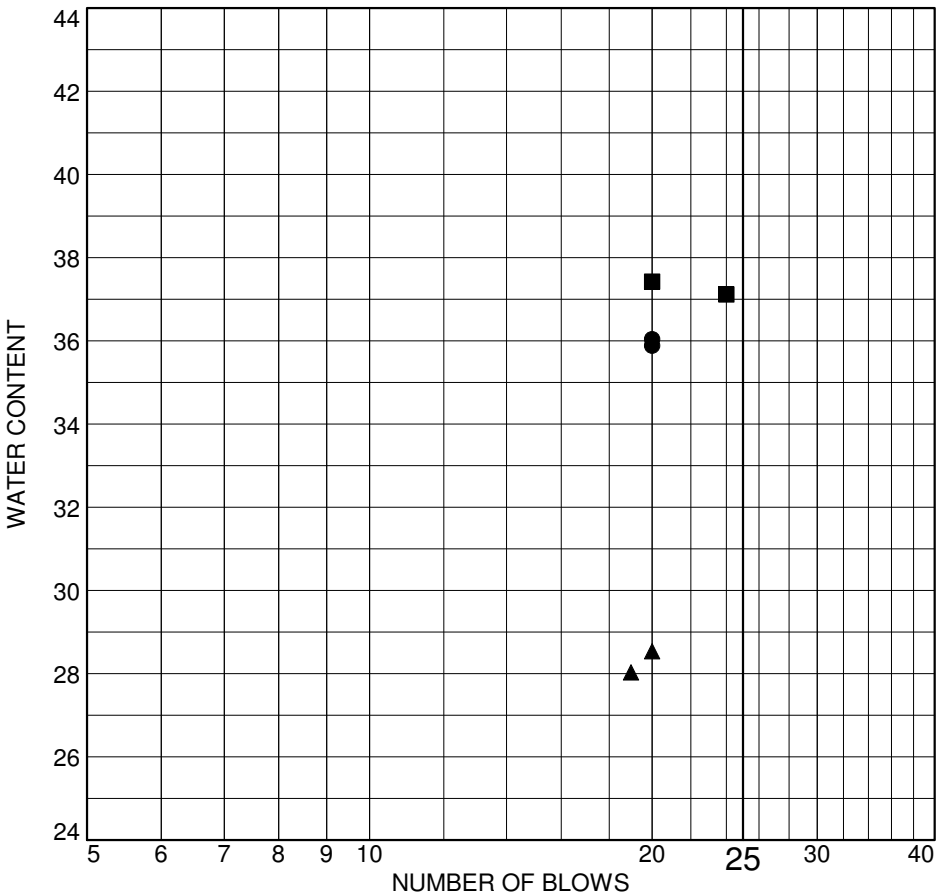
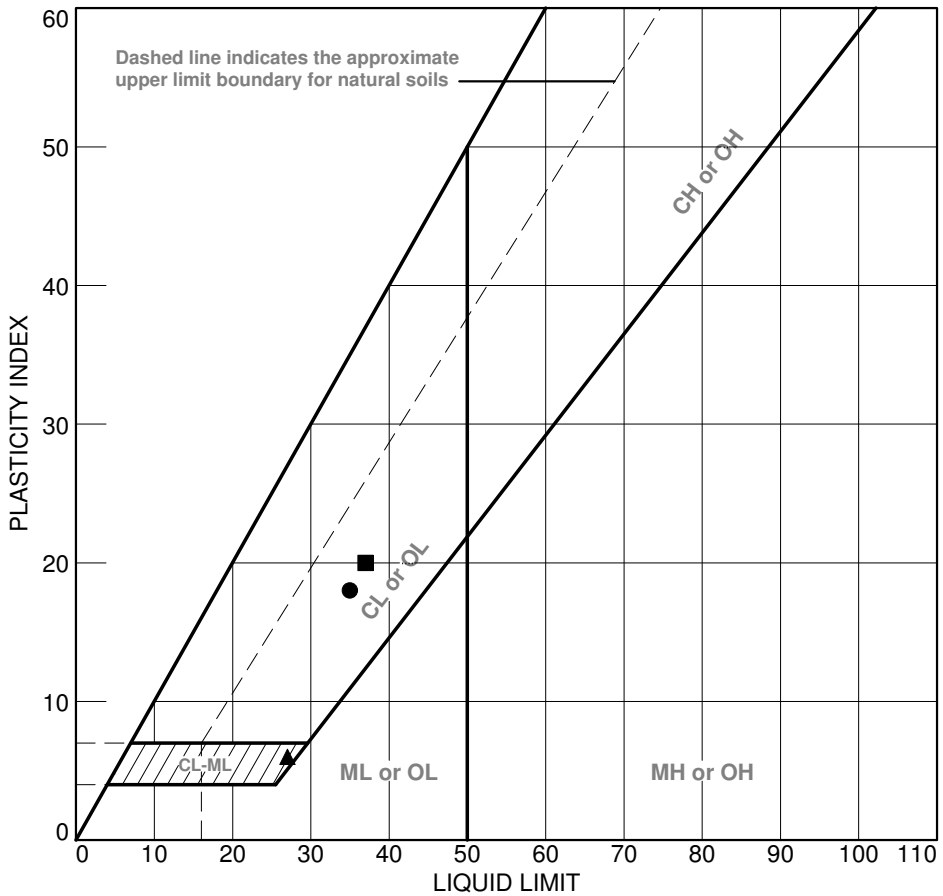
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-226	3 (Shelby)	20-22'	12/13/10	CL	sandy lean clay		35	18
■	GH10-226	2 (Shelby)	15-17'	12/10/10	CL	sandy lean clay with gravel		37	20
▲	GH10-226	Till	81.75-84.5'	1/12/11	GC-GM	silty clayey gravel with sand		27	6

Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

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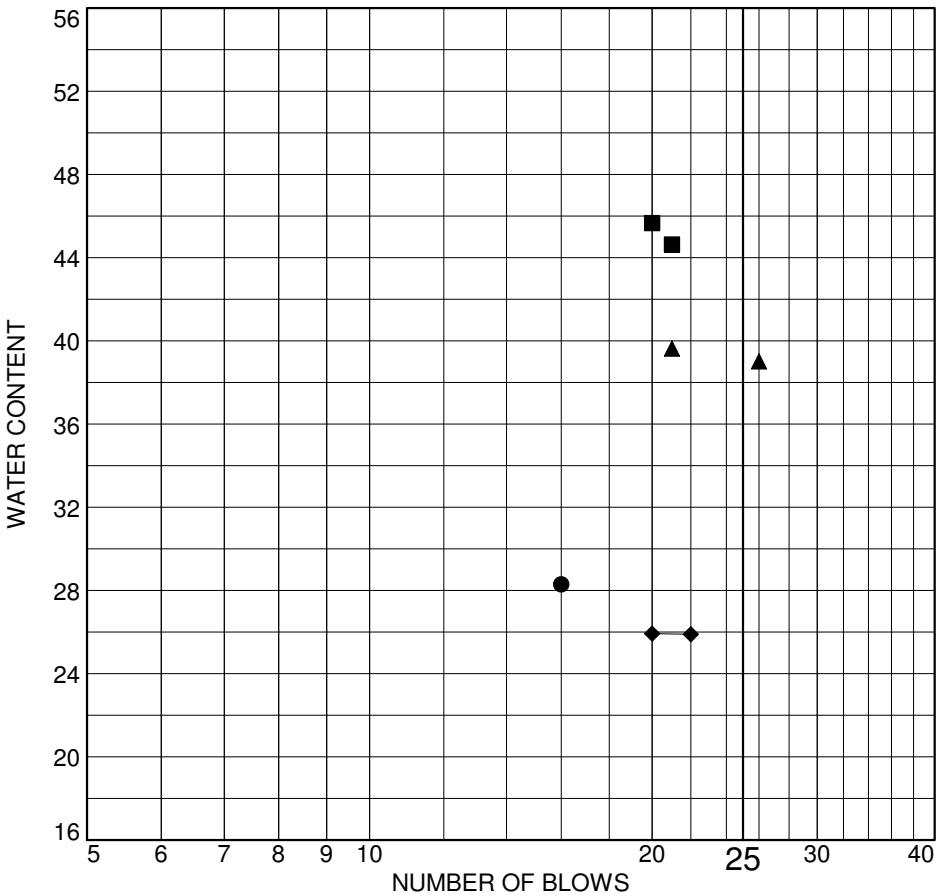
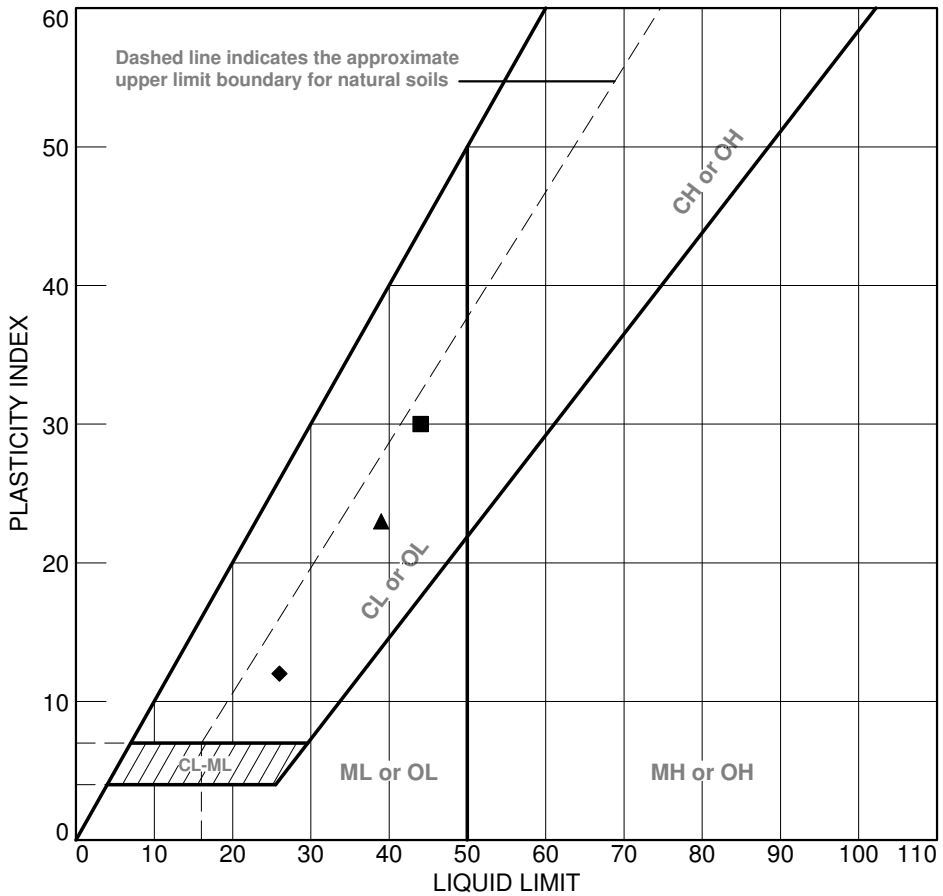
LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-226	SPT 5	43-44.5'	11/30/10	SM	silty sand with gravel		27	NP
■	GH10-226	SPT 7	53-54.5'	11/30/10	CL	lean clay with sand		44	30
▲	GH10-226	SPT 10	70-71.5'	12/1/10	CL	lean clay with sand		39	23
◆	GH10-226	SPT 12	95-96.5'	12/1/10	GC	clayey gravel with sand		26	12
▼	GH10-226	SPT 17	155-156.5'	12/1/10	SP-SM	poorly graded sand with silt		NP	NP

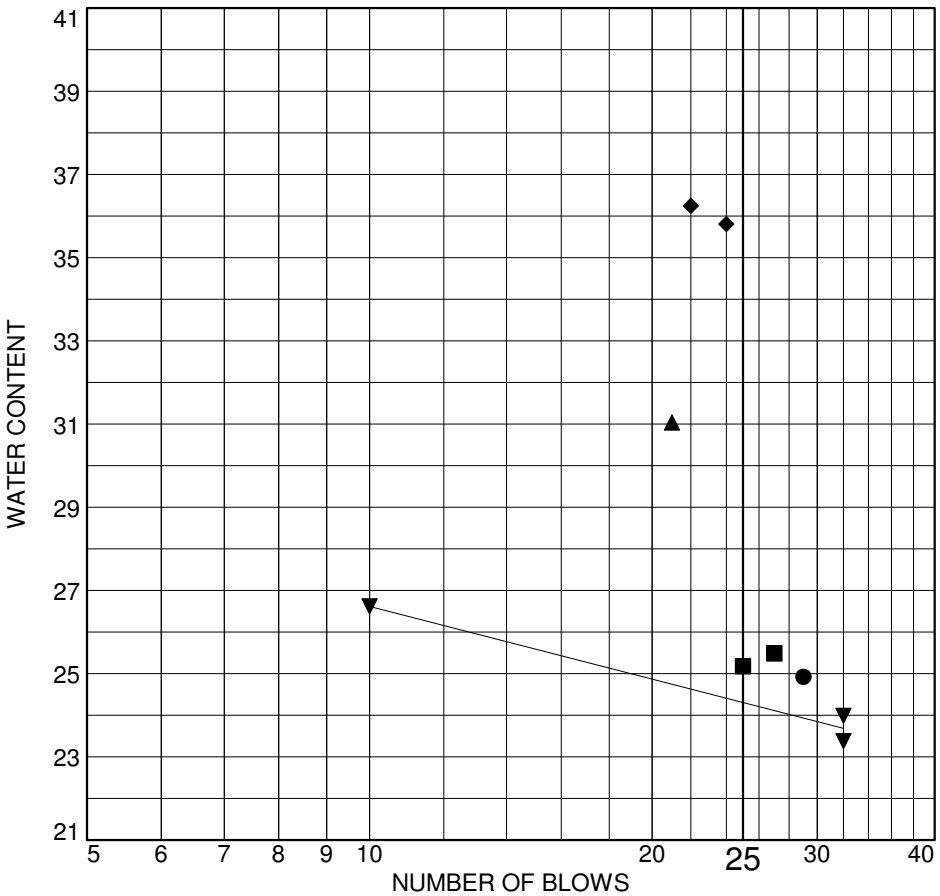
Client Pebble Limited Partnership

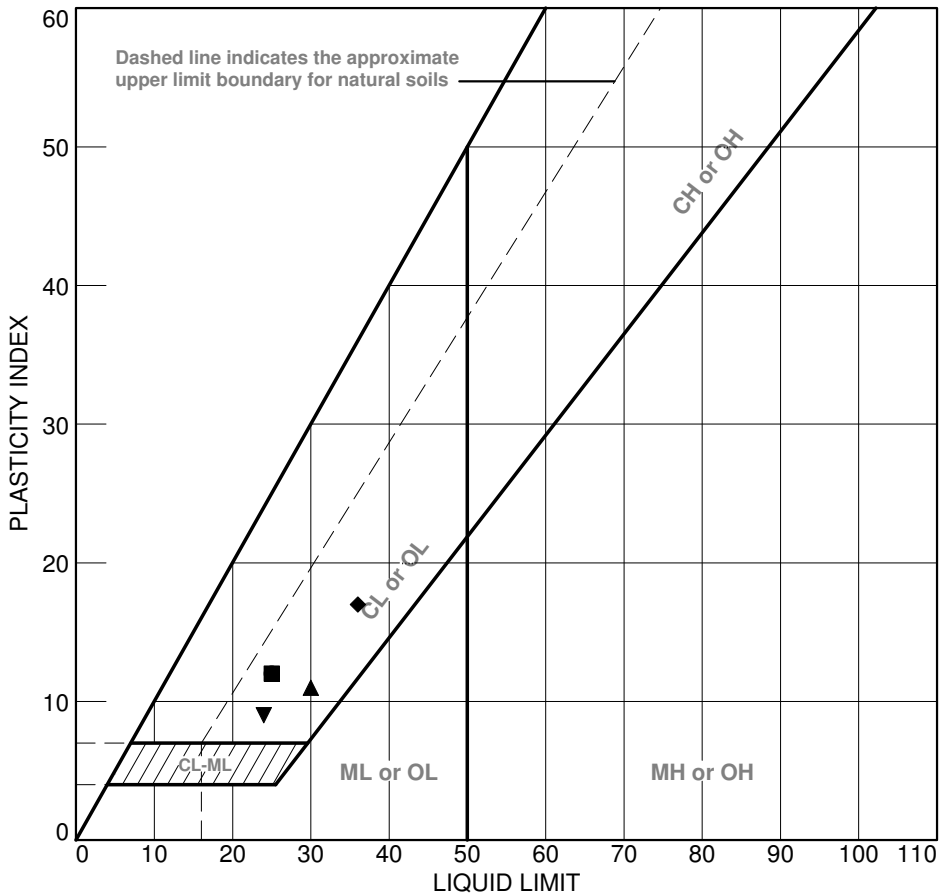
Project Pebble Project

Project No. 101-77/11 Fig.

Knight Piésold CONSULTING

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-227	SPT 1	10-11.5'	12/1/10	GC	clayey gravel with sand		25	12
■	GH10-227	SPT 3	20-21.5'	12/1/10	SC	clayey sand with gravel		25	12
▲	GH10-228	SPT 3	17-18.5'	11/30/10	CL	lean clay		30	11
◆	GH10-228	SPT 1	7-8.5'	12/1/10	CL	lean clay		36	17
▼	GH10-227	ST 1	5-7'	12/23/10	SC	clayey gravel with sand		24	9

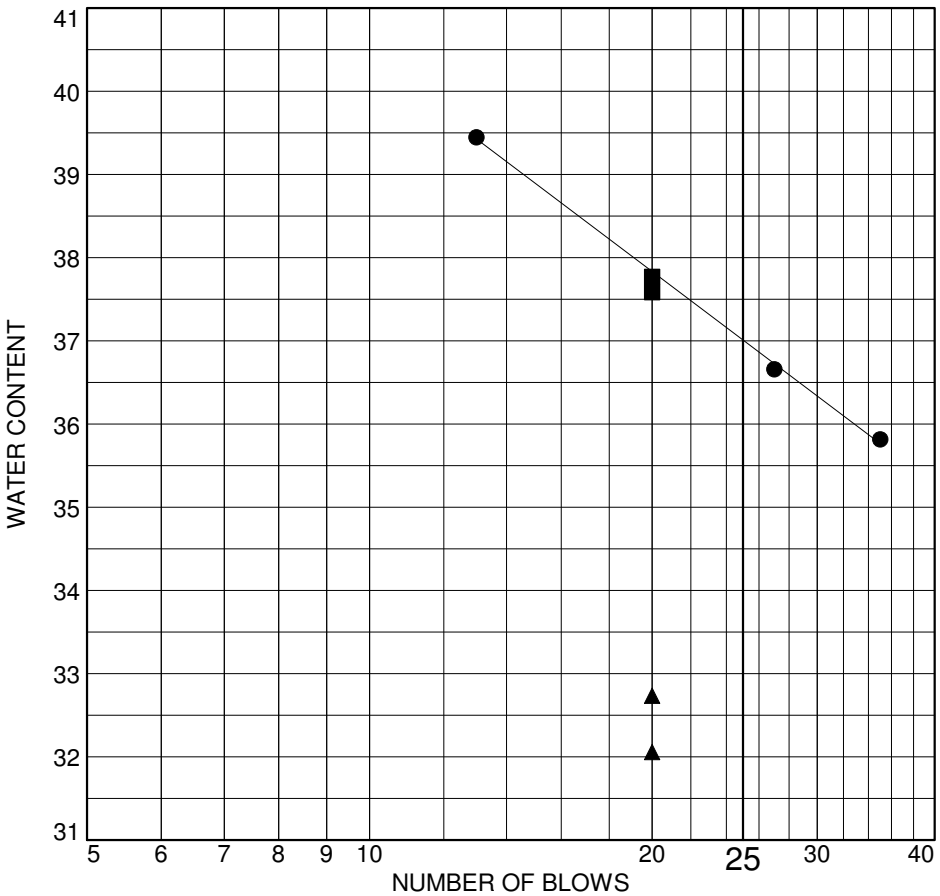
Client Pebble Limited Partnership

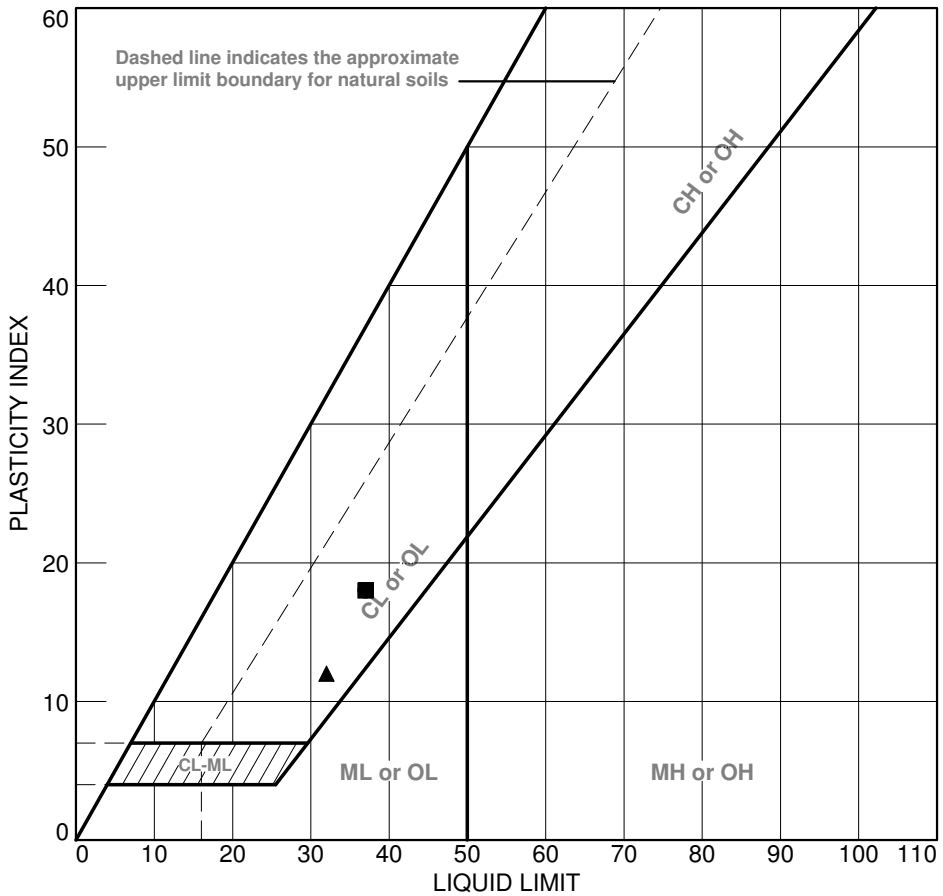
Project Pebble Project

Project No. 101-77/11 Fig.

Knight Piésold CONSULTING

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	GH10-228	ST 1	5-7'	12/23/10	CL	lean clay		37	18
■	GH10-228	ST 2	10-12'	1/13/11	CL	lean clay		37	18
▲	GH10-228	ST 3	15-17'	1/24/11	CL	lean clay		32	12

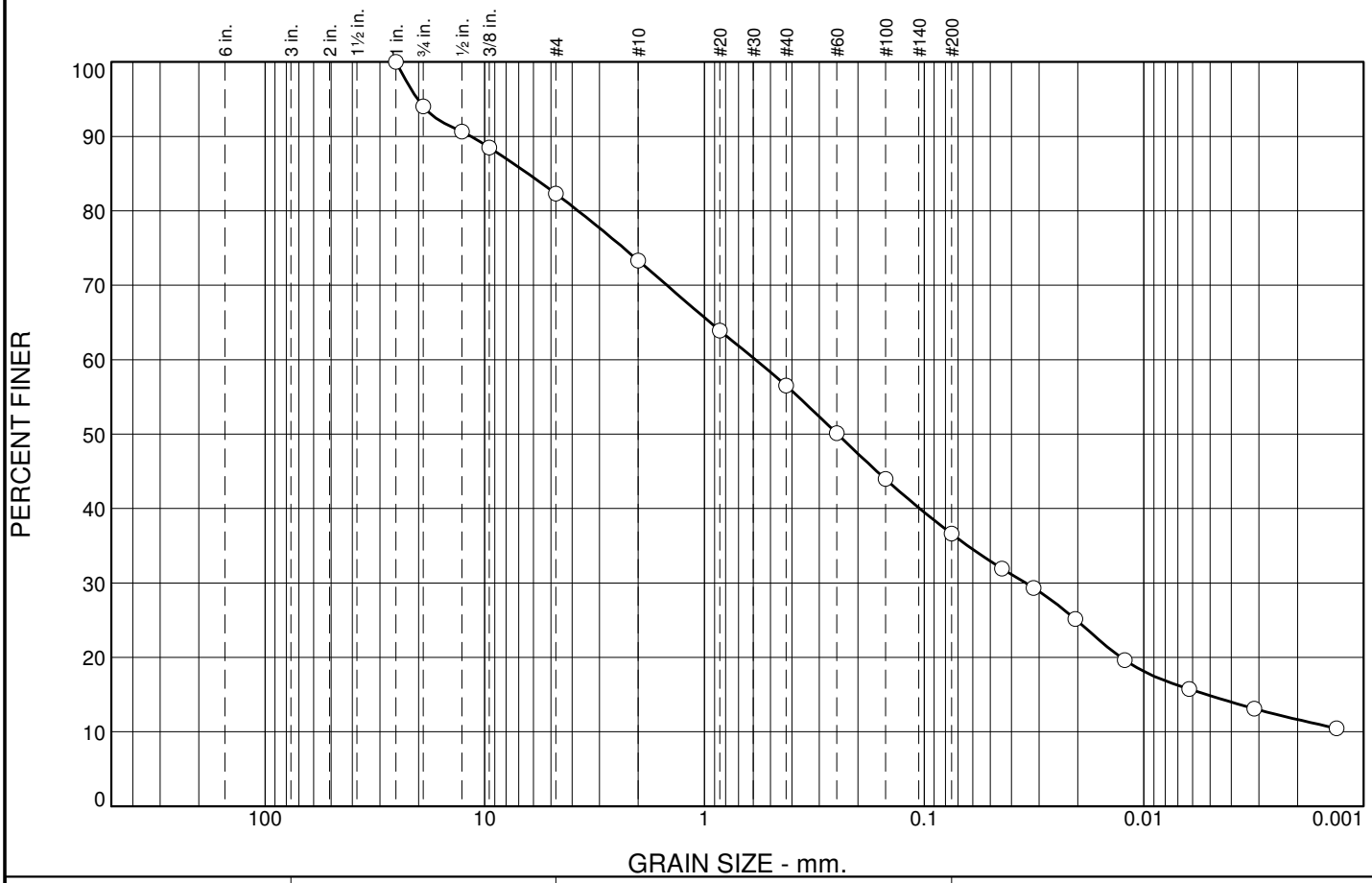
Client Pebble Limited Partnership

Project Pebble Project

Project No. 101-77/11 Fig.

Knight Piésold CONSULTING

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	12	9	16	20	25	12

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100		
0.75	94		
0.5	91		
0.375	88		
#4	82		
#10	73		
#20	64		
#40	57		
#60	50		
#100	44		
#200	37		
0.0443 mm.	32		
0.0317 mm.	29		
0.0205 mm.	25		
0.0122 mm.	20		
0.0062 mm.	16		
0.0031 mm.	13		
0.0013 mm.	10		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.3540 D_{60}= 0.5859 D_{50}= 0.2478
D_{30}= 0.0345 D_{15}= 0.0052 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 21.9%

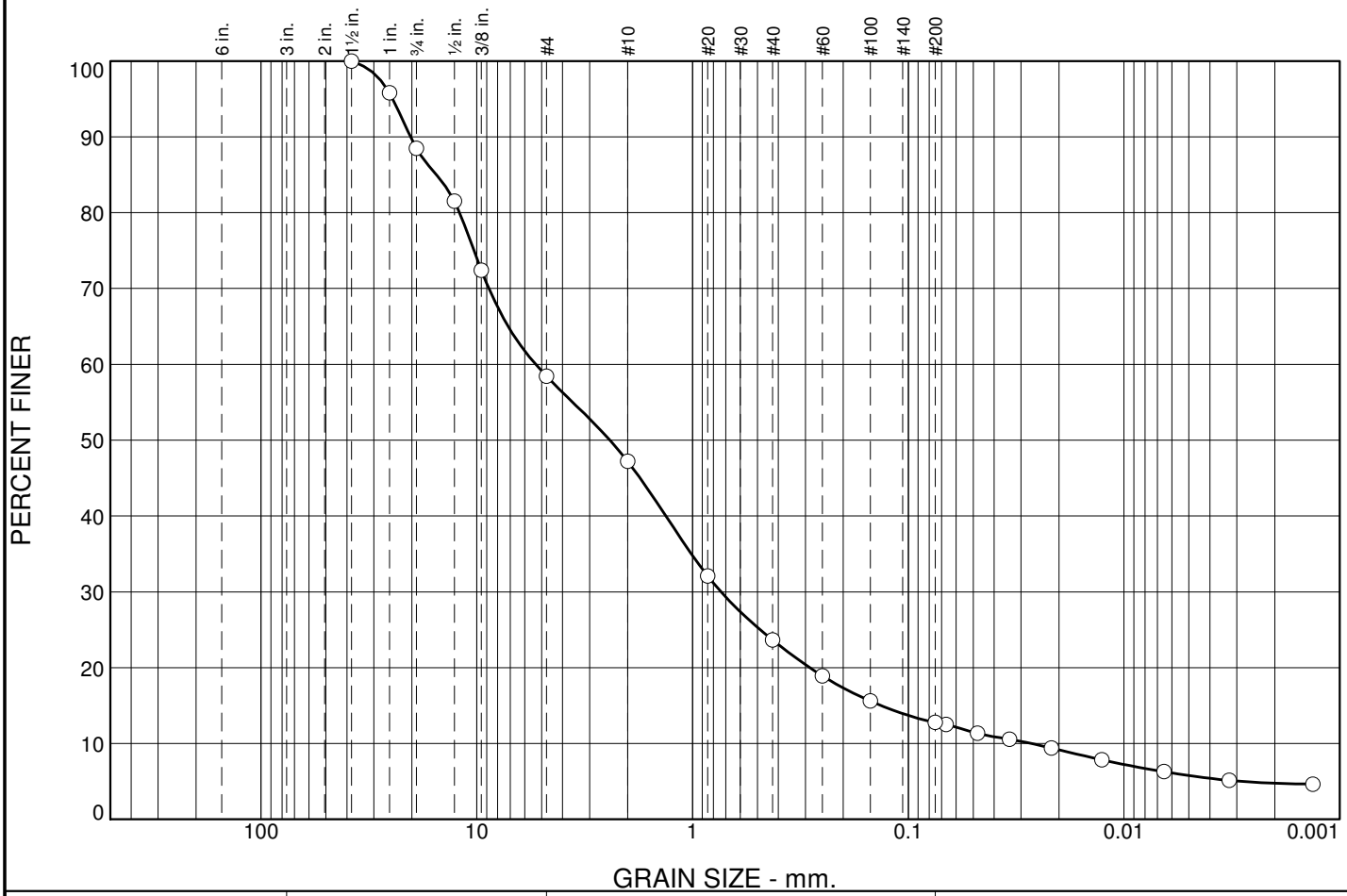
Sample No.: SPT 1 **Source of Sample:** GH10-212 **Date:** 11/17/10
Location: AREA E **Elev./Depth:** 12.0-13.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	12	30	11	23	11	8	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	96		
.75	88		
.5	82		
0.375	72		
#4	58		
#10	47		
#20	32		
#40	24		
#60	19		
#100	16		
#200	13		
0.0668 mm.	13		
0.0477 mm.	11		
0.0339 mm.	11		
0.0217 mm.	9.4		
0.0127 mm.	7.8		
0.0065 mm.	6.3		
0.0032 mm.	5.1		
0.0013 mm.	4.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.3854 D_{60}= 5.3296 D_{50}= 2.4148
D_{30}= 0.7375 D_{15}= 0.1335 D_{10}= 0.0268
C_u= 198.52 C_c= 3.80

Classification

USCS= AASHTO=

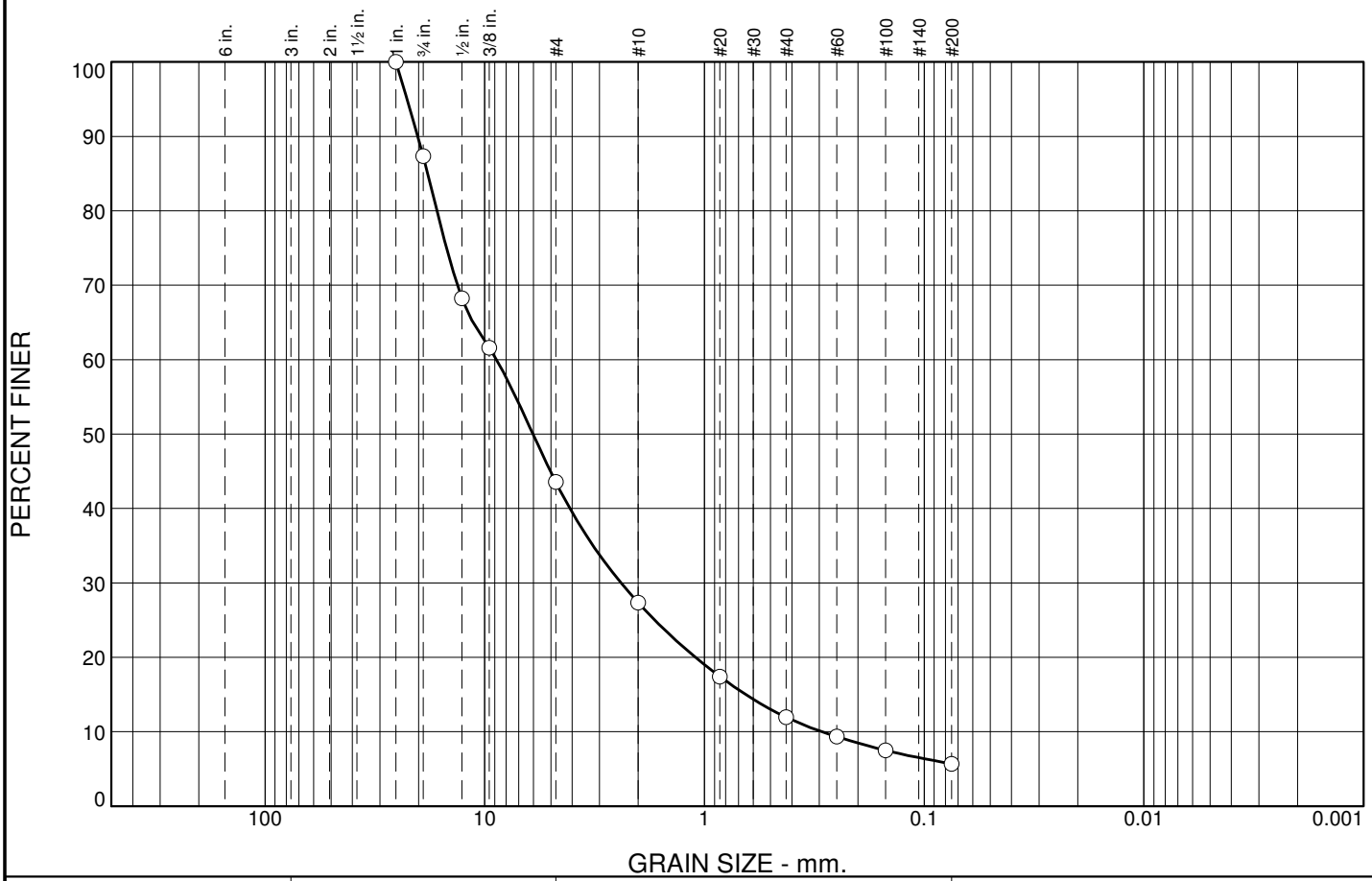
Remarks

Sample No.: SPT 3 **Source of Sample:** GH10-212 **Date:** 1/21/11
Location: AREA E **Elev./Depth:** 24.0-25.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	13	43	17	15	6	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100		
0.75	87		
0.5	68		
0.375	62		
#4	44		
#10	27		
#20	17		
#40	12		
#60	9		
#100	7		
#200	5.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 18.1798 D_{60}= 8.8359 D_{50}= 6.0300
D_{30}= 2.3960 D_{15}= 0.6484 D_{10}= 0.2914
C_u= 30.32 C_c= 2.23

Classification

USCS= AASHTO=

Remarks

As received moisture 13.5%

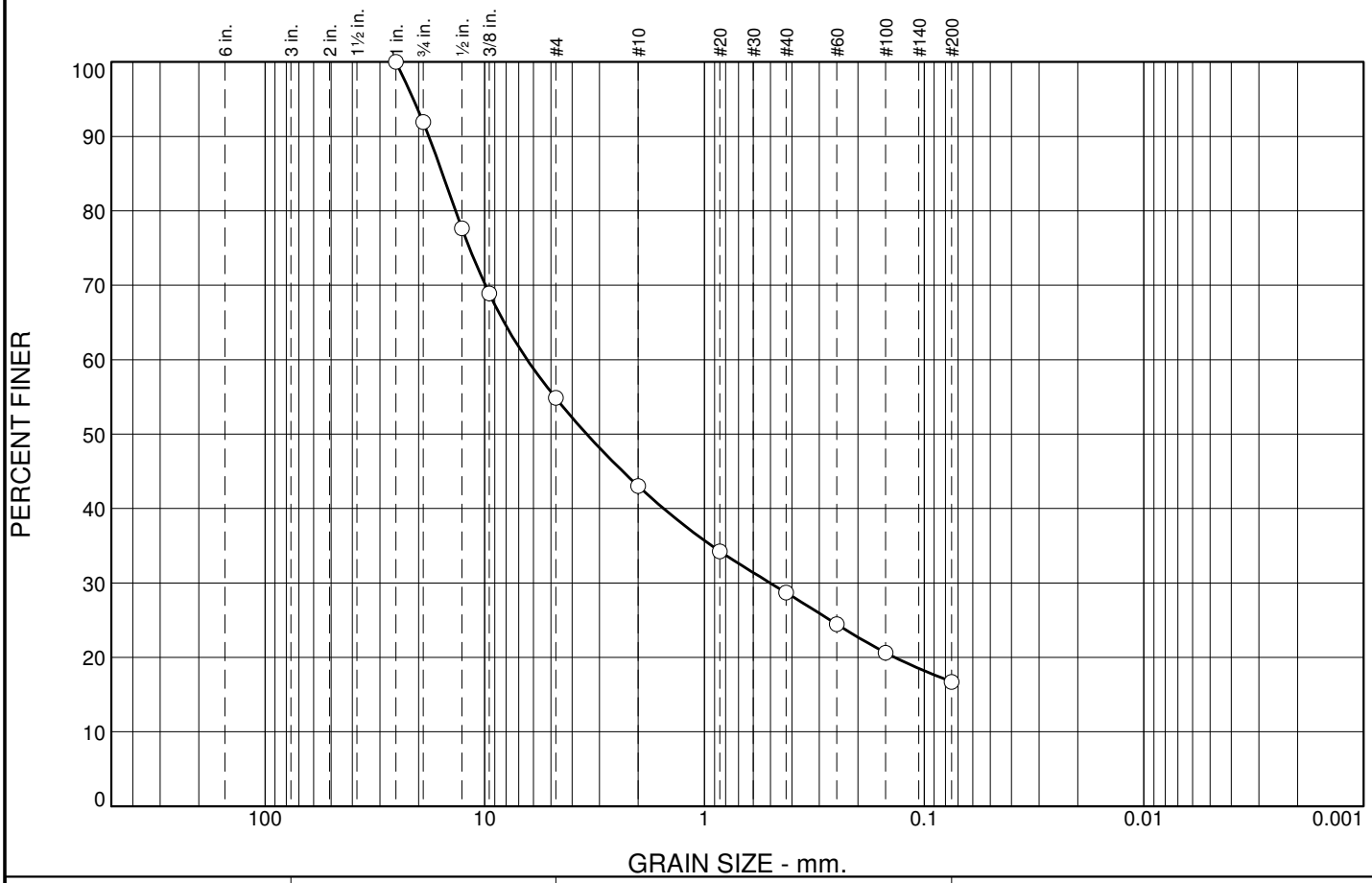
Sample No.: SPT 5 **Source of Sample:** GH10-212 **Date:** 11/17/10
Location: AREA E **Elev./Depth:** 34.0-35.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	8	37	12	14	12	17	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100		
0.75	92		
0.5	78		
0.375	69		
#4	55		
#10	43		
#20	34		
#40	29		
#60	24		
#100	21		
#200	17		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.5887 D_{60}= 6.4079 D_{50}= 3.4342
D_{30}= 0.5022 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As recieved moisture 11.8%

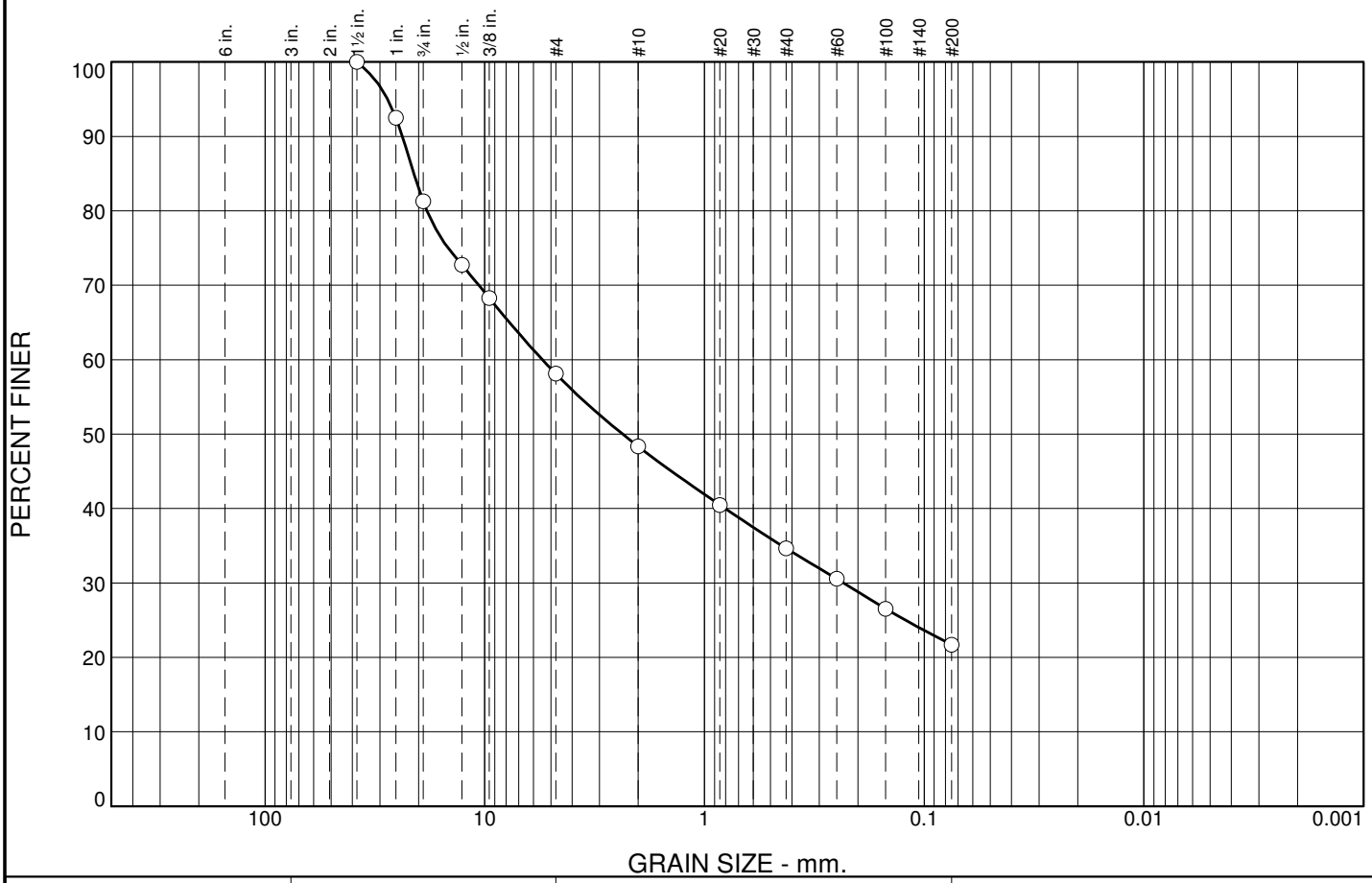
Sample No.: SPT 1 **Source of Sample:** GH10-214 **Date:** 11/17/10
Location: AREA E **Elev./Depth:** 5.0-6.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	19	23	10	13	13	22	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1.0	93		
0.75	81		
0.5	73		
0.375	68		
#4	58		
#10	48		
#20	40		
#40	35		
#60	31		
#100	27		
#200	22		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.9857 D_{60}= 5.4634 D_{50}= 2.3588
D_{30}= 0.2326 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 19.1%

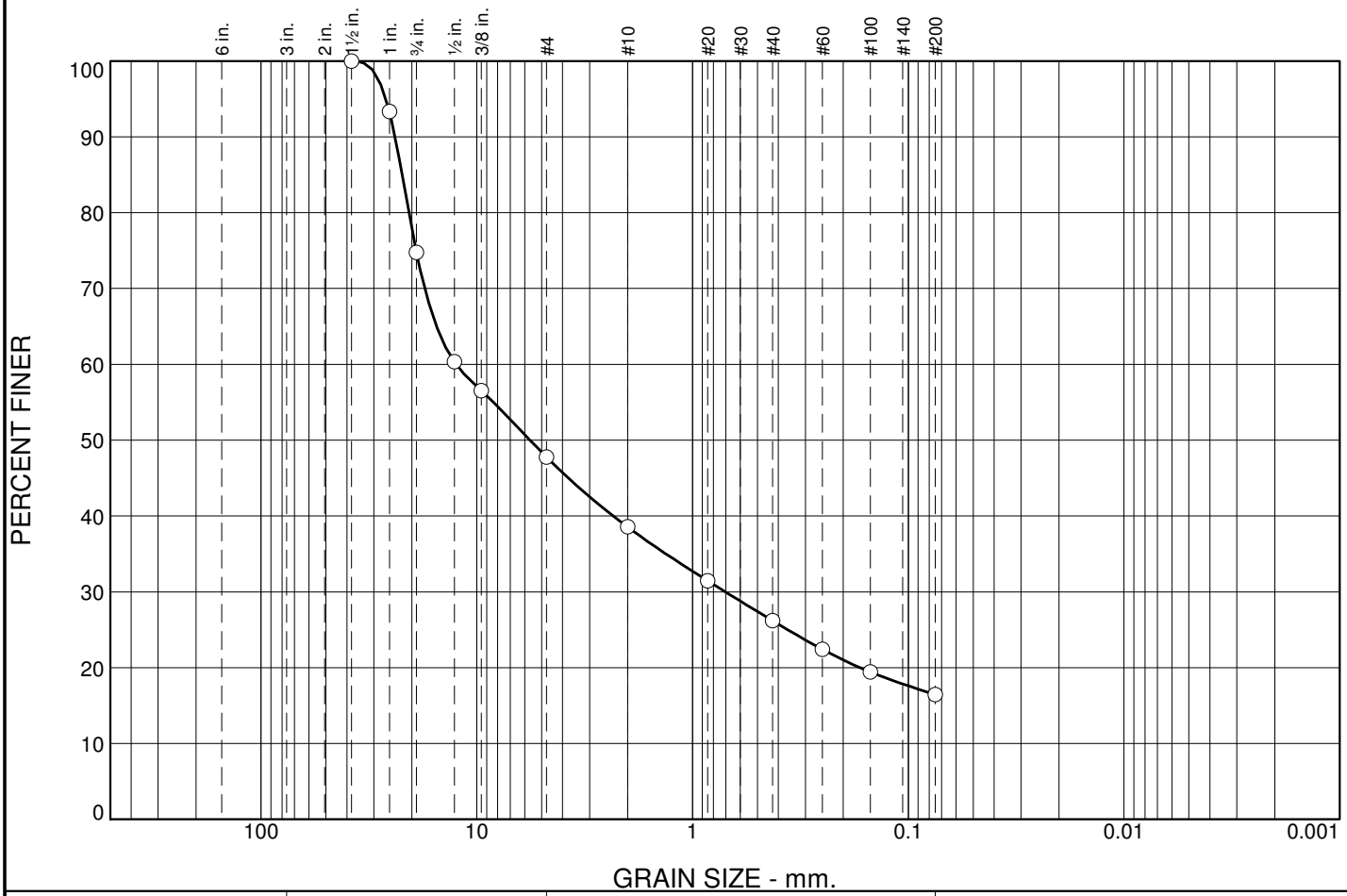
Sample No.: SPT 3 **Source of Sample:** GH10-214 **Date:** 11/17/10
Location: AREA E **Elev./Depth:** 15.0-16.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	25	27	9	13	10	16	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	93		
.75	75		
.5	60		
0.375	57		
#4	48		
#10	39		
#20	31		
#40	26		
#60	22		
#100	19		
#200	16		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.1653 D_{60}= 12.4419 D_{50}= 5.6651
D_{30}= 0.7043 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

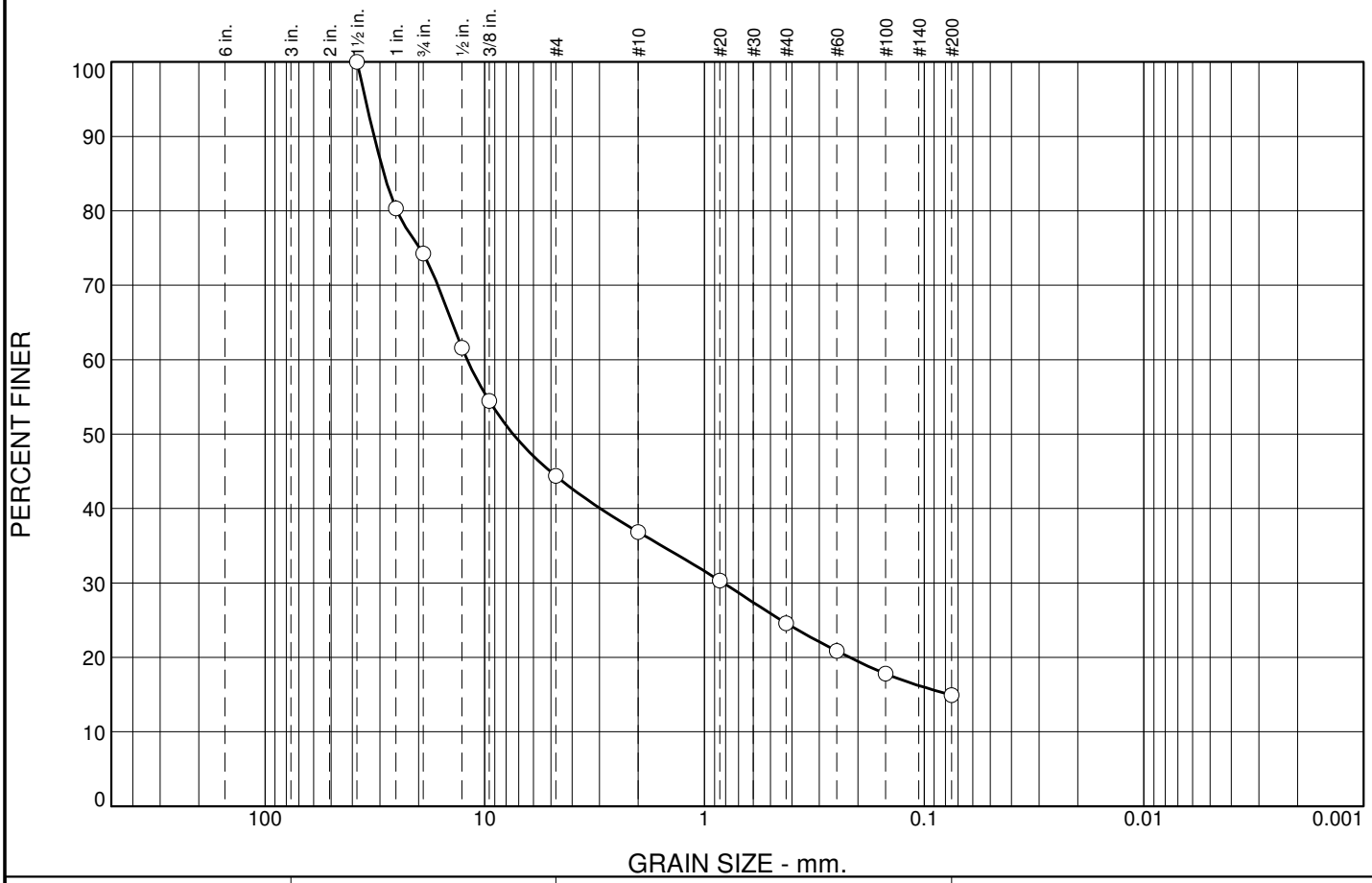
As received moisture 14.2%

Sample No.: SPT 4 **Source of Sample:** GH10-214 **Date:** 11/30/10
Location: AREA E **Elev./Depth:** 20-21.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	26	30	7	12	10	15	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1.0	80		
0.75	74		
0.5	62		
0.375	54		
#4	44		
#10	37		
#20	30		
#40	25		
#60	21		
#100	18		
#200	15		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 28.7608 D_{60}= 12.0179 D_{50}= 7.4190
D_{30}= 0.8196 D_{15}= 0.0767 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As reveived moisture 15.2%

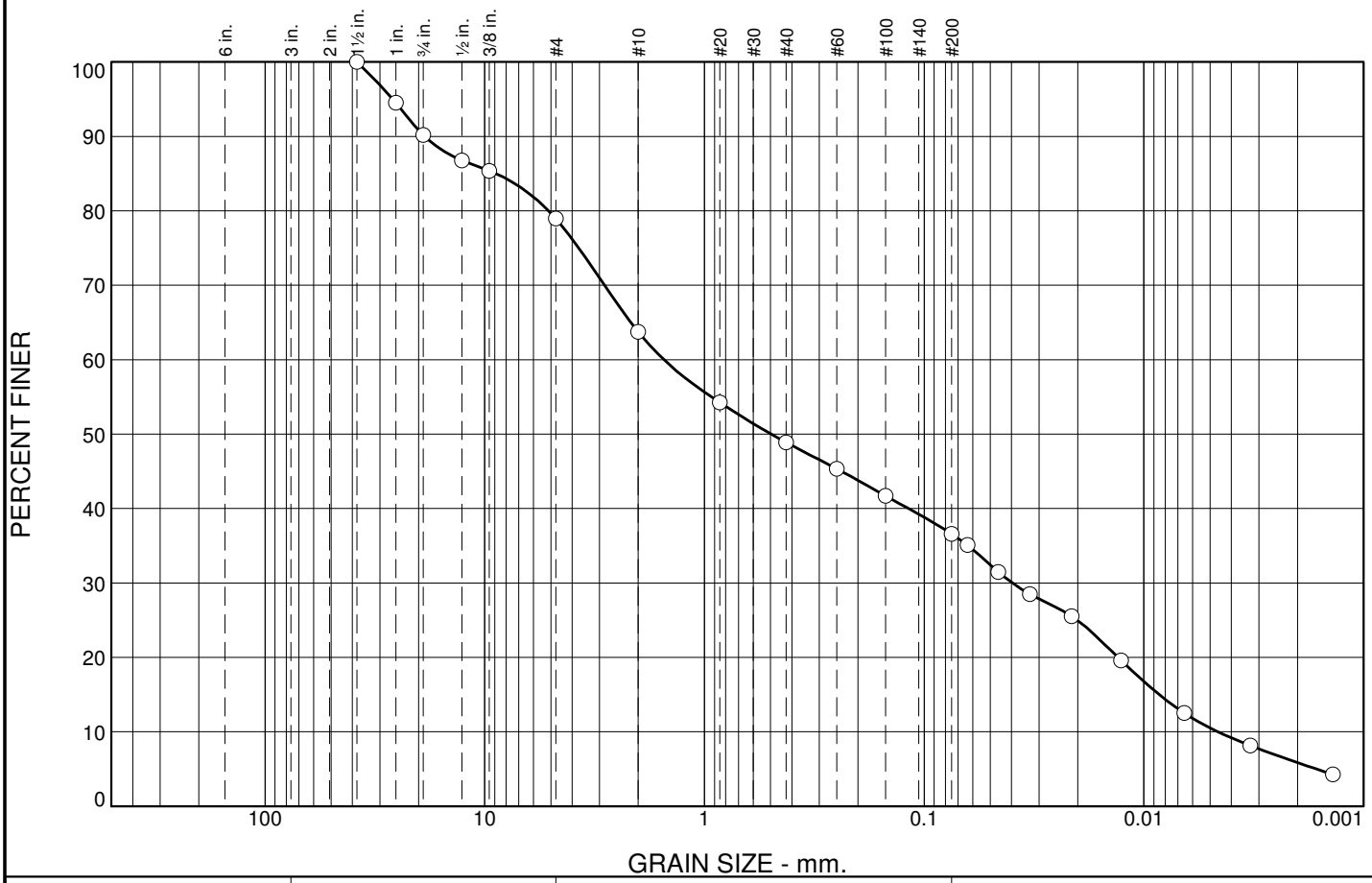
Sample No.: SPT 5 **Source of Sample:** GH10-214 **Date:** 11/17/10
Location: AREA E **Elev./Depth:** 25.0-26.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	10	11	15	15	12	31	6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	95		
.75	90		
.5	87		
0.375	85		
#4	79		
#10	64		
#20	54		
#40	49		
#60	45		
#100	42		
#200	37		
0.0635 mm.	35		
0.0460 mm.	31		
0.0331 mm.	29		
0.0213 mm.	26		
0.0127 mm.	20		
0.0065 mm.	13		
0.0033 mm.	8.1		
0.0014 mm.	4.3		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= 27 LL= 37 PI= 10

Coefficients

D_{85}= 8.8779 D_{60}= 1.5279 D_{50}= 0.4973
D_{30}= 0.0396 D_{15}= 0.0085 D_{10}= 0.0046
C_u= 331.67 C_c= 0.22

Classification

USCS= SM AASHTO= A-4(0)

Remarks

As received moisture 24.9%

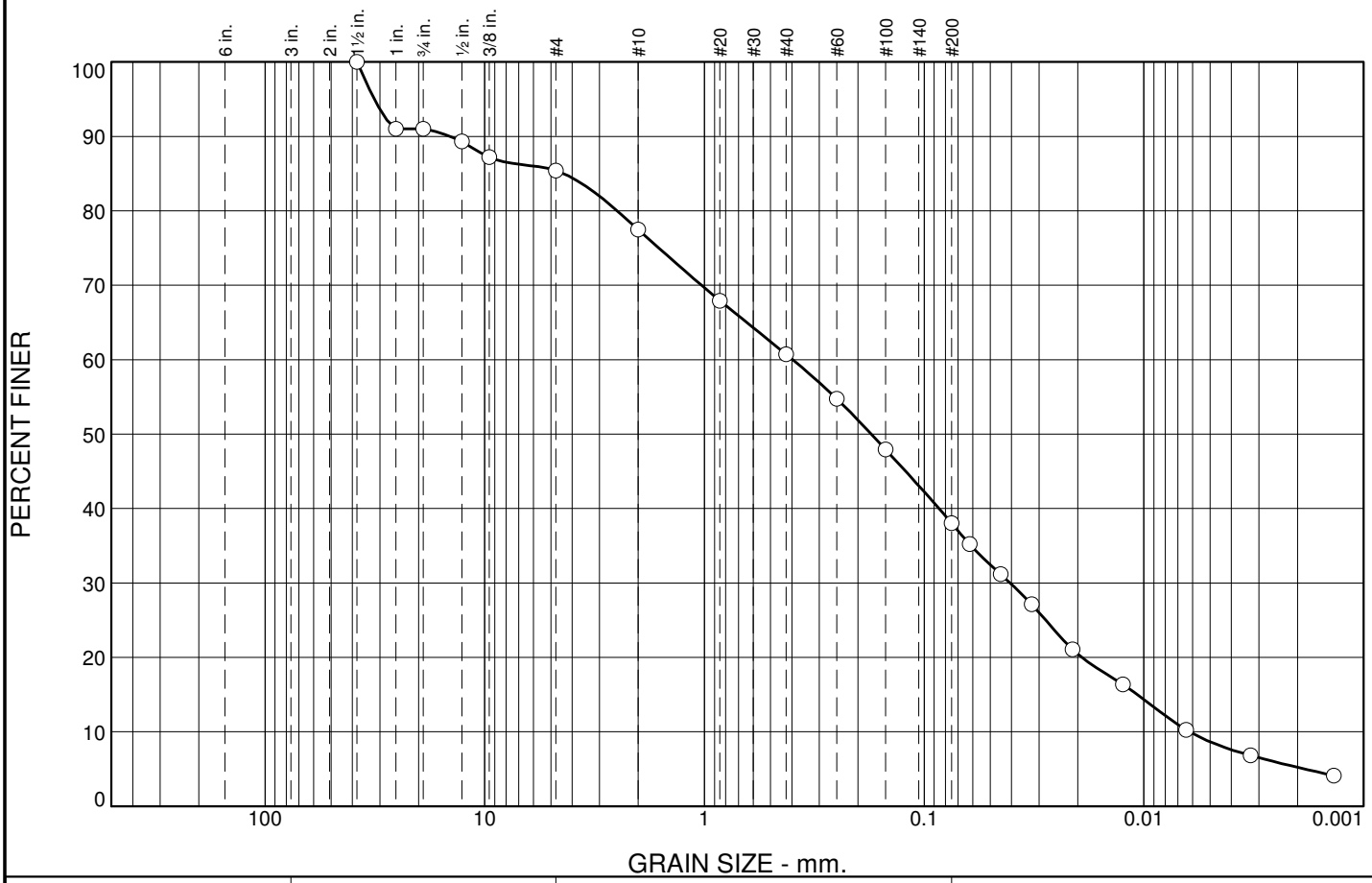
Sample No.: SPT 7 **Source of Sample:** GH10-214 **Date:** 11/17/10
Location: AREA E **Elev./Depth:** 35.0-36.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: jk **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	6	8	16	23	33	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1.0	91		
0.75	91		
0.5	89		
0.375	87		
#4	85		
#10	77		
#20	68		
#40	61		
#60	55		
#100	48		
#200	38		
0.0621 mm.	35		
0.0449 mm.	31		
0.0324 mm.	27		
0.0211 mm.	21		
0.0125 mm.	16		
0.0064 mm.	10		
0.0033 mm.	6.8		
0.0014 mm.	4.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.3723 D_{60}= 0.3965 D_{50}= 0.1742
D_{30}= 0.0406 D_{15}= 0.0107 D_{10}= 0.0062
C_u= 64.15 C_c= 0.67

Classification

USCS= AASHTO=

Remarks

As received moisture 21.8%

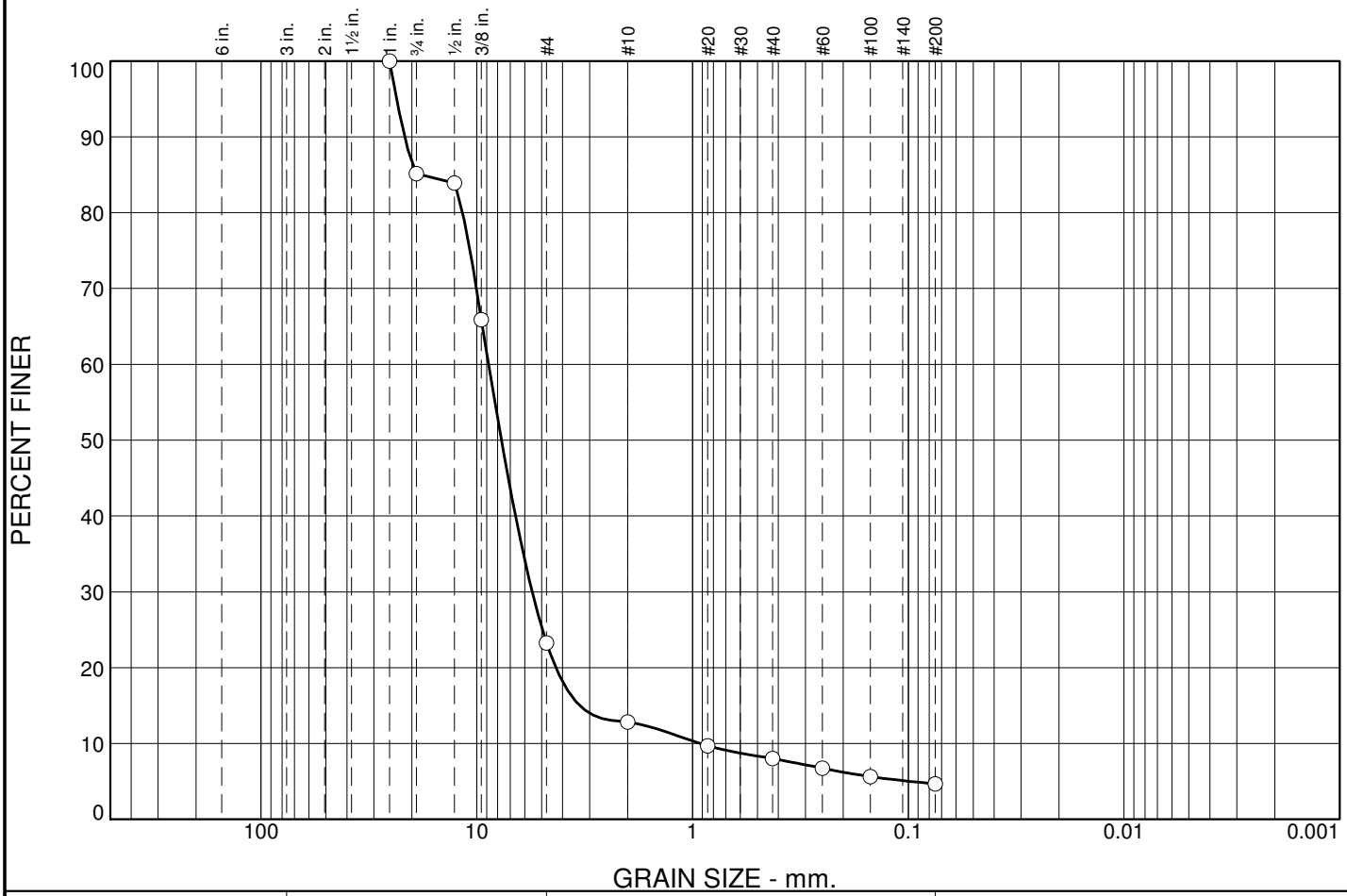
Sample No.: SPT 2 **Source of Sample:** GH10-215 **Date:** 11/17/10
Location: AREA G **Elev./Depth:** 10.0-11.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	62	10	5	3	5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	85		
.5	84		
0.375	66		
#4	23		
#10	13		
#20	10		
#40	8		
#60	7		
#100	6		
#200	4.7		

* (no specification provided)

Soil Description

poorly graded gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 18.1026 D_{60}= 8.8169 D_{50}= 7.6853
D_{30}= 5.5367 D_{15}= 3.3326 D_{10}= 0.9192
C_u= 9.59 C_c= 3.78

Classification

USCS= GP AASHTO=

Remarks

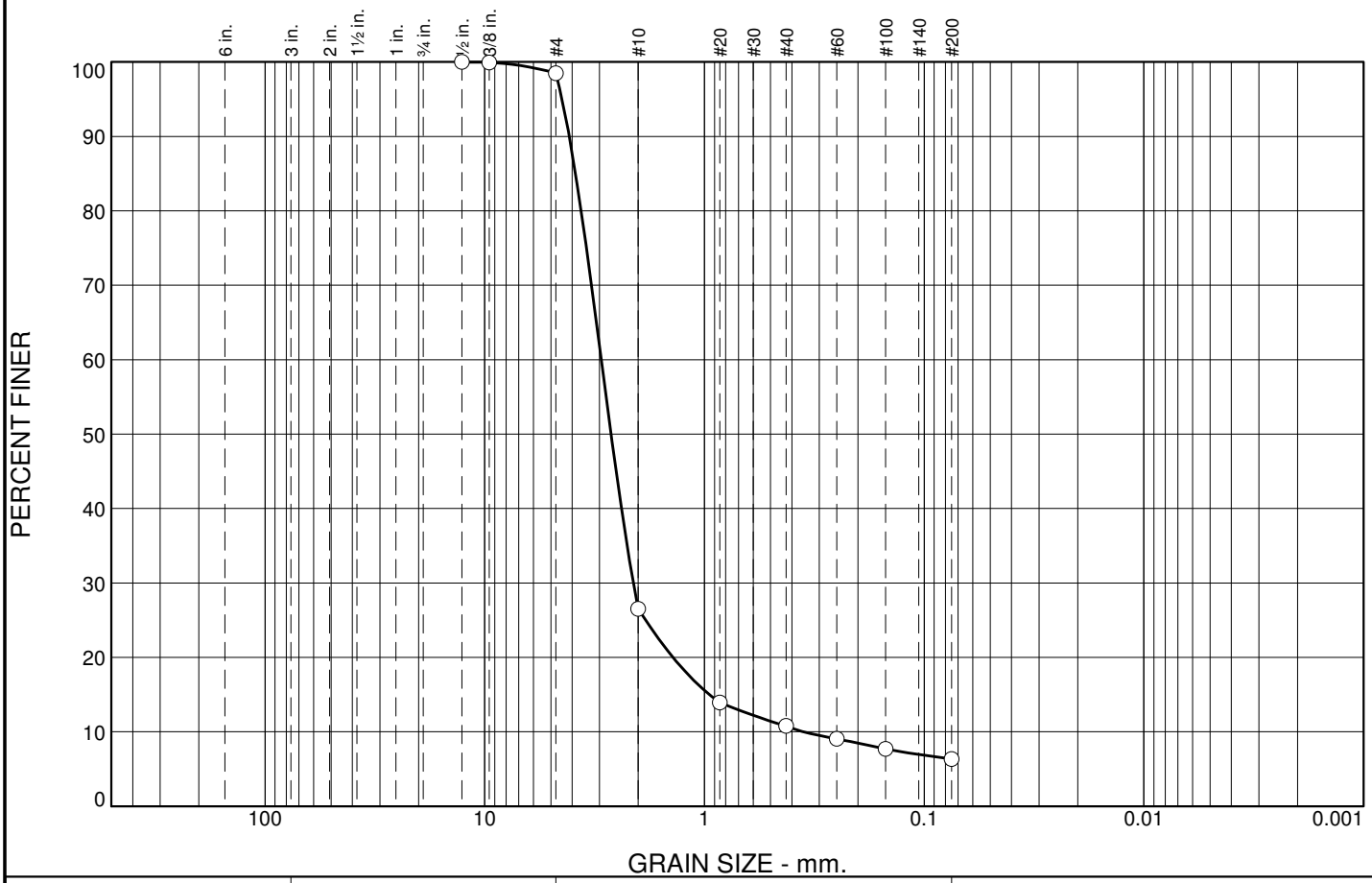
As received moisture 9.7%

Sample No.: SPT 2 **Source of Sample:** GH10-216 **Date:** 11/30/10
Location: AREA G **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	72	16	5	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100		
0.375	100		
#4	99		
#10	27		
#20	14		
#40	11		
#60	9		
#100	8		
#200	6.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.8604 D_{60}= 2.9484 D_{50}= 2.6607
D_{30}= 2.1063 D_{15}= 0.9493 D_{10}= 0.3561
C_u= 8.28 C_c= 4.23

Classification

USCS= AASHTO=

Remarks

As received moisture 26.8%

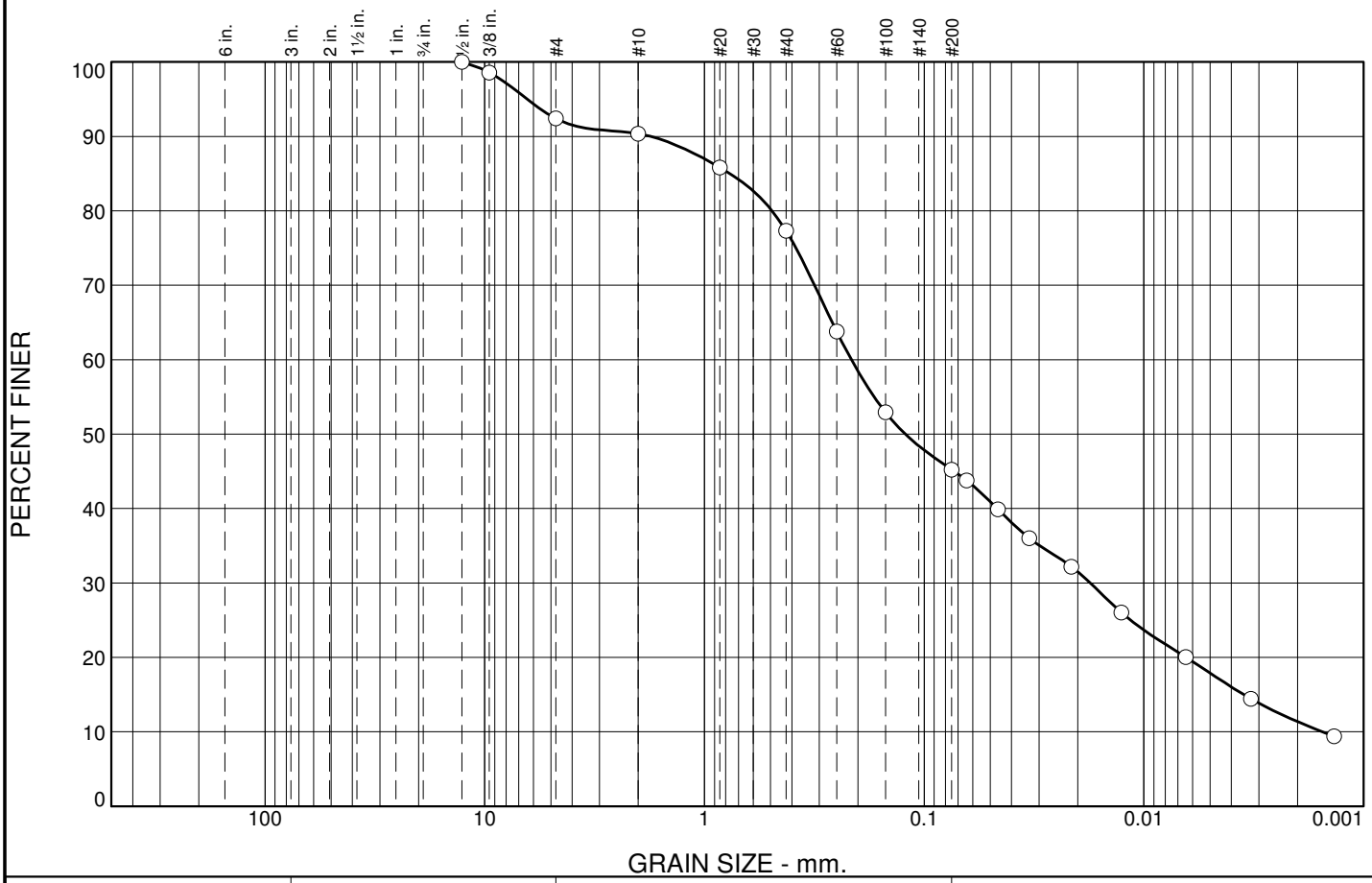
Sample No.: SPT 3 **Source of Sample:** GH10-216 **Date:** 11/17/10
Location: AREA G **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	2	13	32	34	11

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100		
0.375	99		
#4	92		
#10	90		
#20	86		
#40	77		
#60	64		
#100	53		
#200	45		
0.0640 mm.	44		
0.0461 mm.	40		
0.0332 mm.	36		
0.0214 mm.	32		
0.0127 mm.	26		
0.0064 mm.	20		
0.0033 mm.	14		
0.0014 mm.	9.4		

* (no specification provided)

Soil Description

clayey sand

Atterberg Limits

PL= 26 LL= 47 PI= 21

Coefficients

D_{85}= 0.7659 D_{60}= 0.2142 D_{50}= 0.1217
D_{30}= 0.0176 D_{15}= 0.0035 D_{10}= 0.0015
C_u= 139.26 C_c= 0.94

Classification

USCS= SC AASHTO= A-7-6(6)

Remarks

As received moisture 28.9%

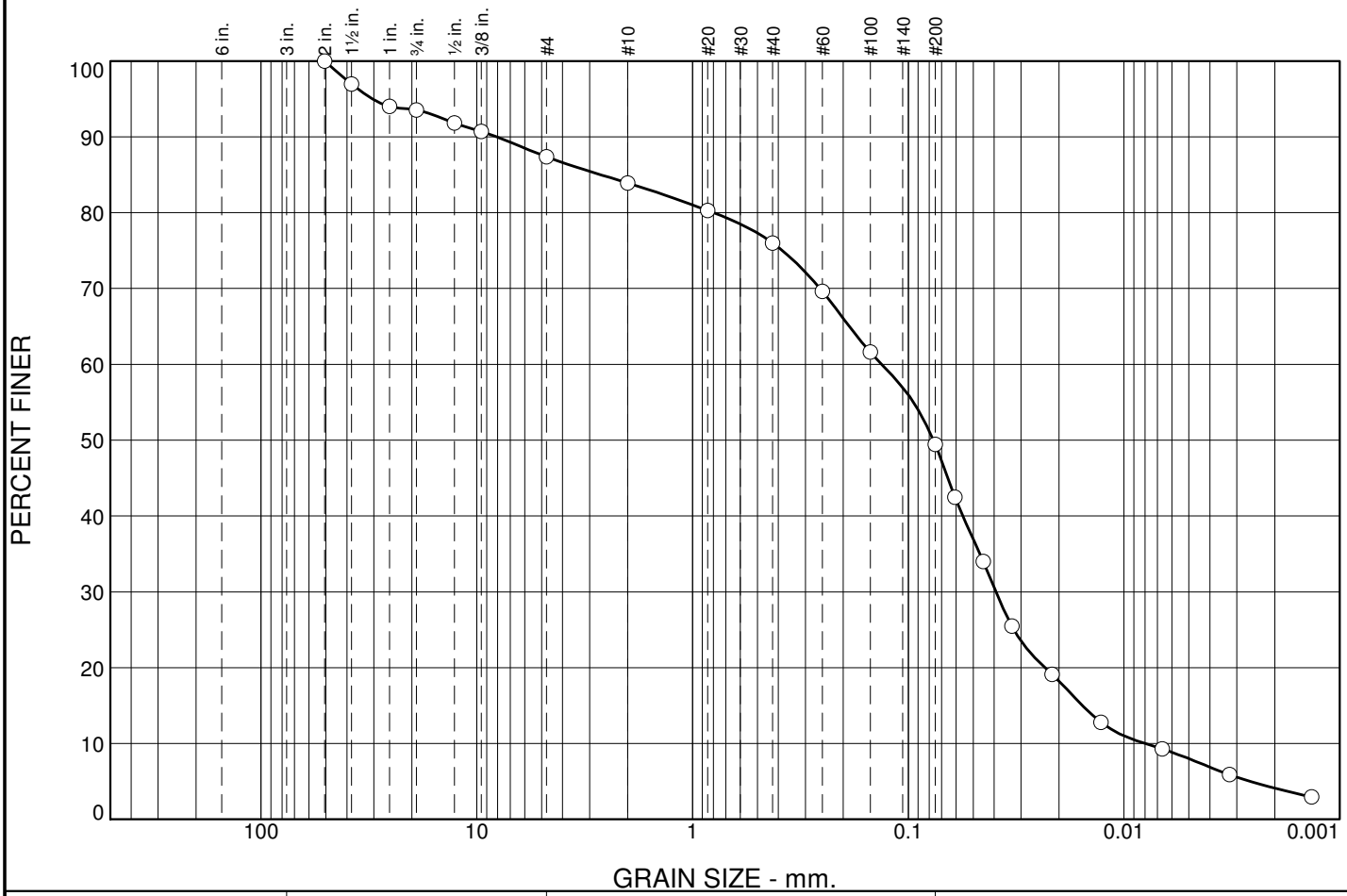
Sample No.: SPT 4 **Source of Sample:** GH10-216 **Date:** 11/17/10
Location: AREA G **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	7	3	8	27	45	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	97		
1	94		
.75	94		
.5	92		
0.375	91		
#4	87		
#10	84		
#20	80		
#40	76		
#60	70		
#100	62		
#200	49		
0.0607 mm.	42		
0.0449 mm.	34		
0.0331 mm.	26		
0.0216 mm.	19		
0.0128 mm.	13		
0.0066 mm.	9.3		
0.0032 mm.	5.9		
0.0014 mm.	3.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.6663 D_{60}= 0.1329 D_{50}= 0.0764
D_{30}= 0.0392 D_{15}= 0.0156 D_{10}= 0.0080
C_u= 16.66 C_c= 1.45

Classification

USCS= AASHTO=

Remarks

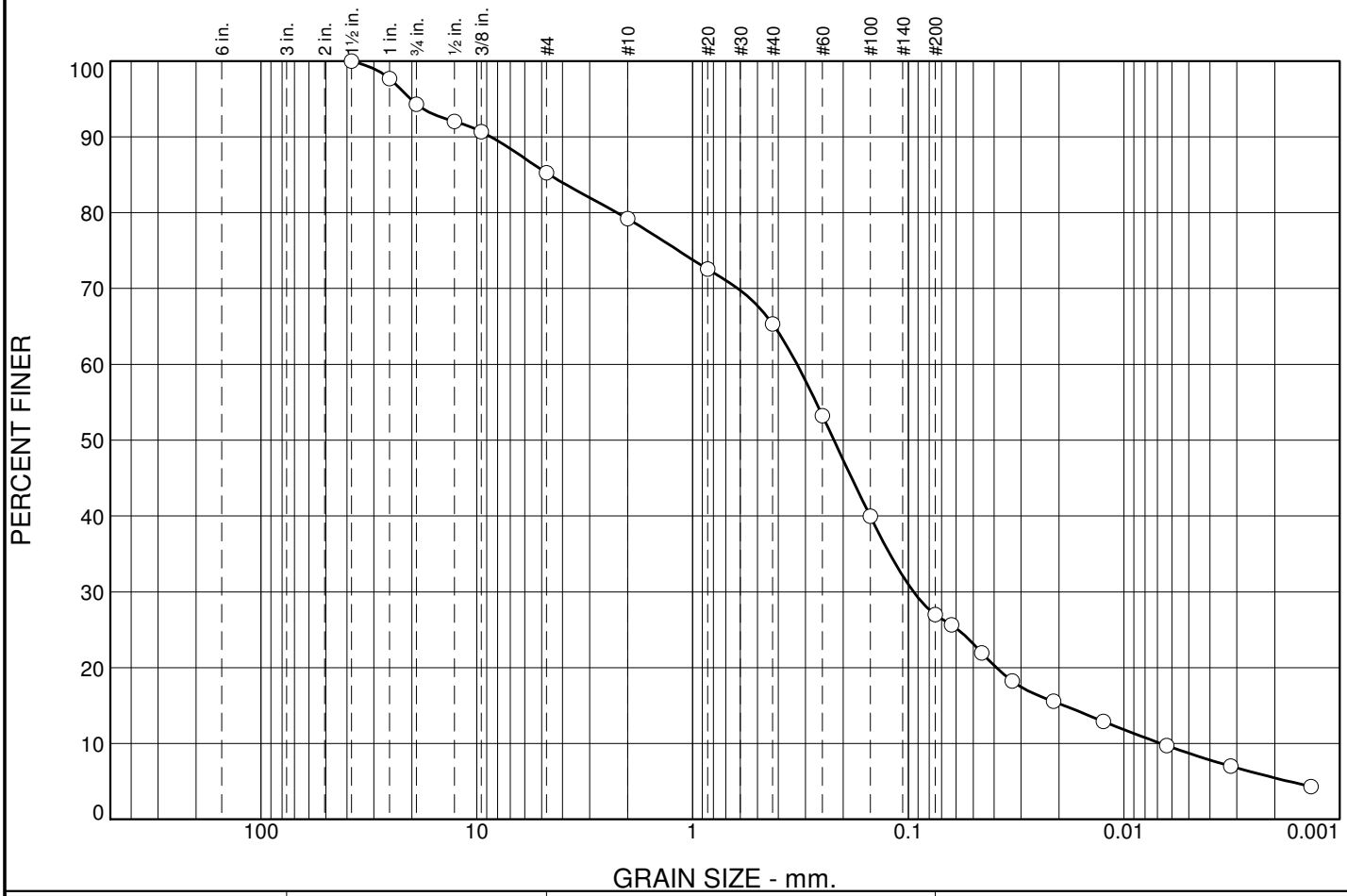
As received moisture 16.0%

Sample No.: Sump 1 **Source of Sample:** GH10-216 **Date:** 12/1/10
Location: AREA G **Elev./Depth:** 0-2'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	9	6	14	38	22	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	98		
.75	94		
.5	92		
0.375	91		
#4	85		
#10	79		
#20	73		
#40	65		
#60	53		
#100	40		
#200	27		
0.0629 mm.	26		
0.0456 mm.	22		
0.0330 mm.	18		
0.0212 mm.	16		
0.0125 mm.	13		
0.0063 mm.	9.7		
0.0032 mm.	7.0		
0.0014 mm.	4.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.6032 D_{60}= 0.3277 D_{50}= 0.2210
D_{30}= 0.0944 D_{15}= 0.0189 D_{10}= 0.0067
C_u= 48.61 C_c= 4.04

Classification

USCS= AASHTO=

Remarks

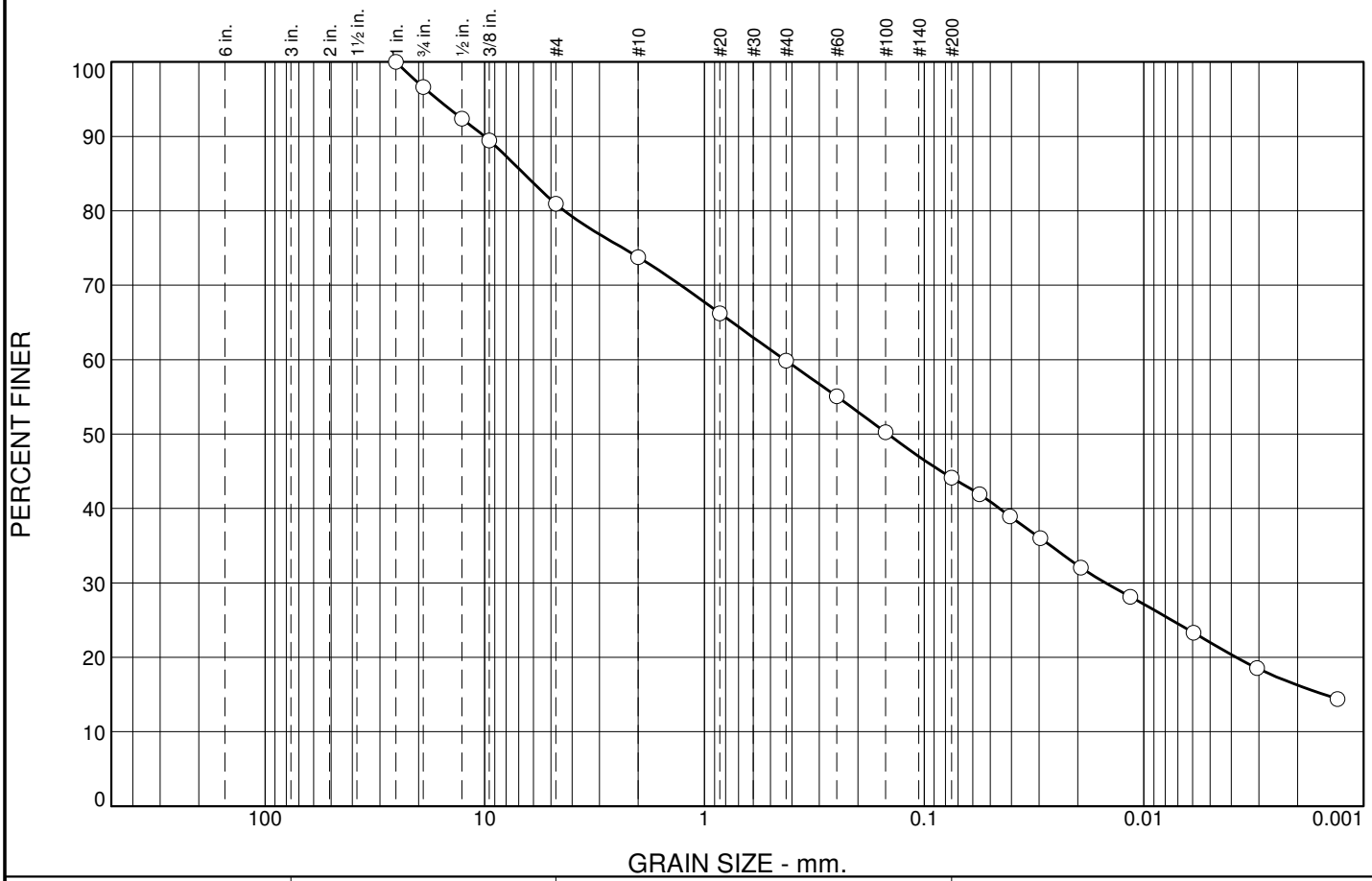
As received moisture 11.5%

Sample No.: Sump 2 **Source of Sample:** GH10-216 **Date:** 12/1/10
Location: AREA G **Elev./Depth:** 2-4'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	16	7	14	16	28	16

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	97		
.5	92		
0.375	89		
#4	81		
#10	74		
#20	66		
#40	60		
#60	55		
#100	50		
#200	44		
0.0560 mm.	42		
0.0408 mm.	39		
0.0296 mm.	36		
0.0194 mm.	32		
0.0115 mm.	28		
0.0059 mm.	23		
0.0031 mm.	19		
0.0013 mm.	14		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 15 LL= 39 PI= 24

Coefficients

D_{85}= 6.6371 D_{60}= 0.4324 D_{50}= 0.1464
D_{30}= 0.0149 D_{15}= 0.0015 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(6)

Remarks

As received moisture 25.5%

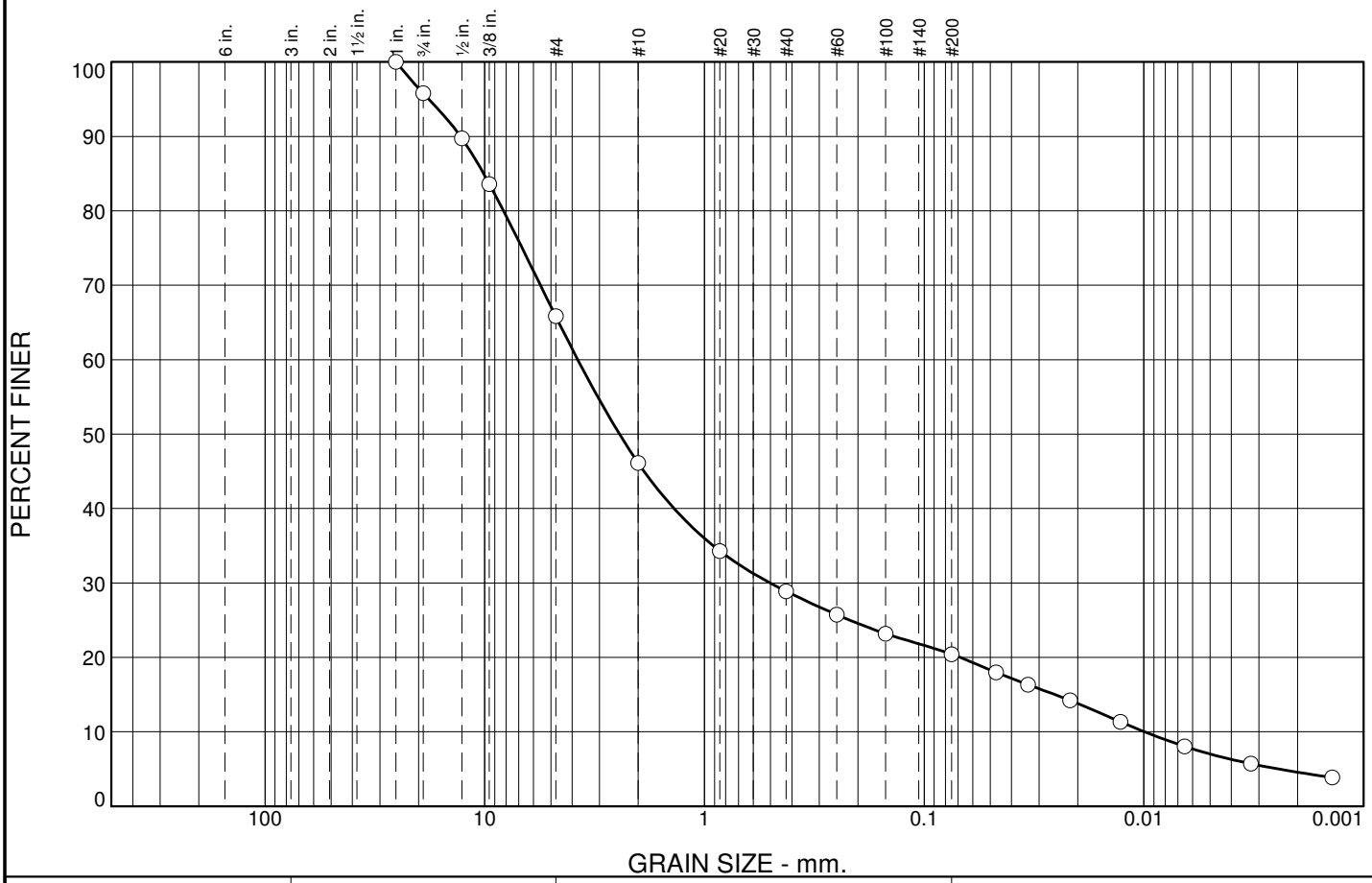
Sample No.: SPT 2 **Source of Sample:** GH10-217 **Date:** 11/18/10
Location: Open Pit Area **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: jk **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	4	30	20	17	9	15	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	96		
.5	90		
0.375	84		
#4	66		
#10	46		
#20	34		
#40	29		
#60	26		
#100	23		
#200	20		
0.0471 mm.	18		
0.0337 mm.	16		
0.0217 mm.	14		
0.0128 mm.	11		
0.0065 mm.	8.0		
0.0033 mm.	5.7		
0.0014 mm.	3.9		

* (no specification provided)

Soil Description

silty, clayey sand with gravel

Atterberg Limits

PL= 20 LL= 27 PI= 7

Coefficients

D_{85}= 10.1097 D_{60}= 3.7713 D_{50}= 2.4368
D_{30}= 0.5030 D_{15}= 0.0253 D_{10}= 0.0099
C_u= 380.26 C_c= 6.77

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

As received moisture 16.9%

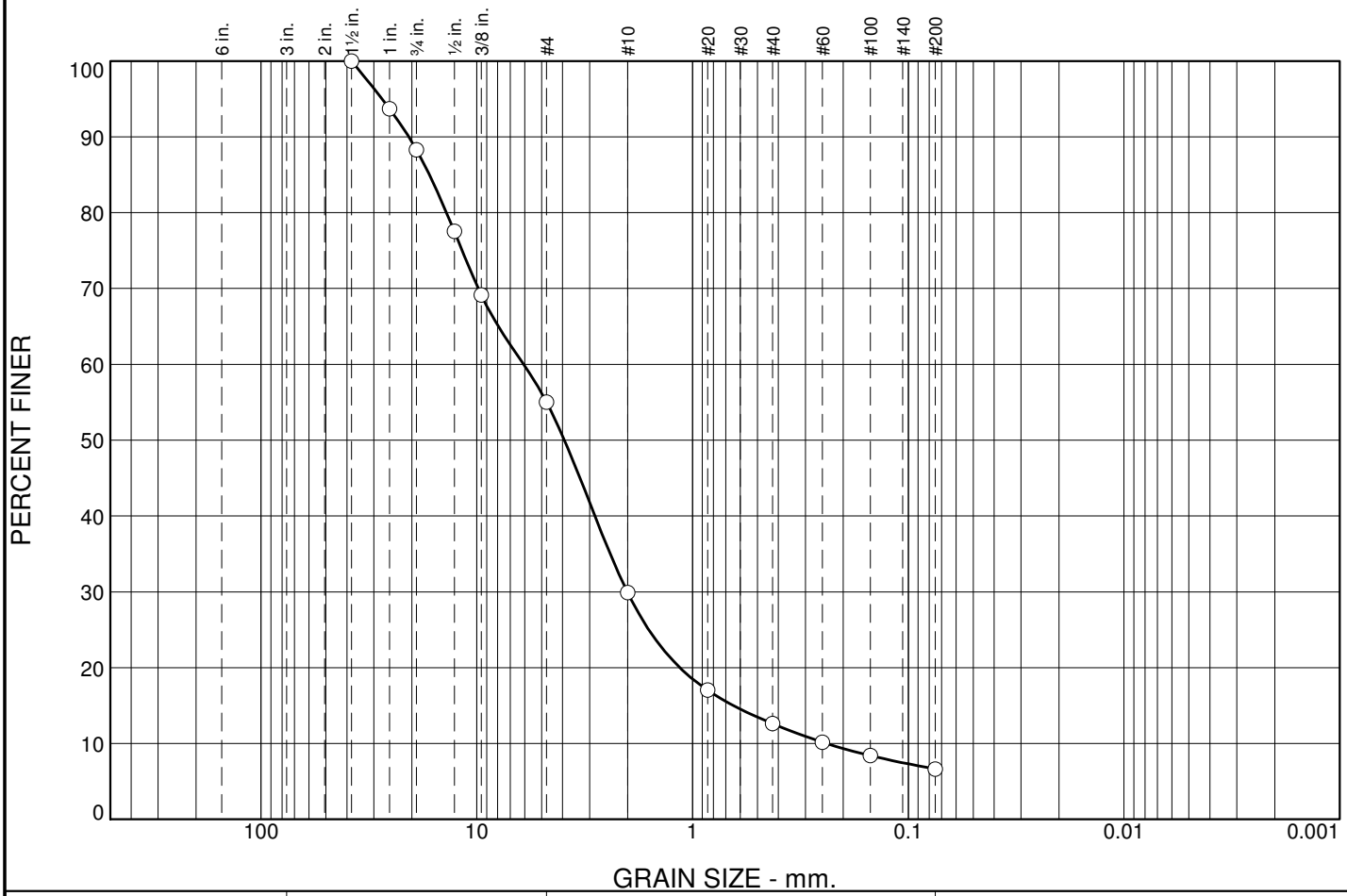
Sample No.: SPT 5 **Source of Sample:** GH10-217 **Date:** 11/18/10
Location: Open Pit Area **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: jk **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	12	33	25	17	6	7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	94		
.75	88		
.5	78		
0.375	69		
#4	55		
#10	30		
#20	17		
#40	13		
#60	10		
#100	8		
#200	6.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.5931 D_{60}= 6.0640 D_{50}= 3.9255
D_{30}= 2.0062 D_{15}= 0.6455 D_{10}= 0.2388
C_u= 25.39 C_c= 2.78

Classification

USCS= AASHTO=

Remarks

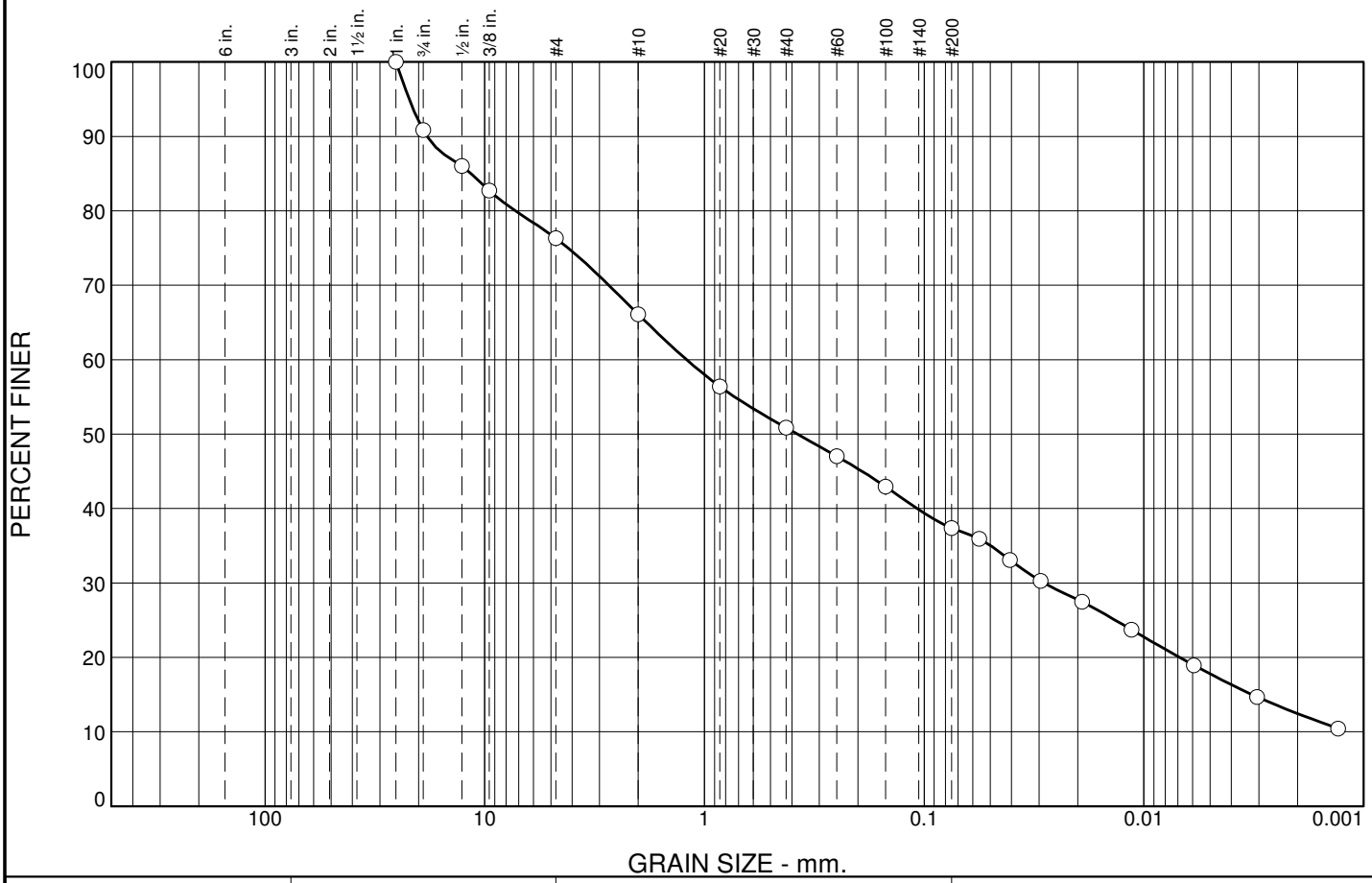
As received moisture 14.2%

Sample No.: SPT 3 **Source of Sample:** GH10-218 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	15	10	15	14	25	12

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100		
0.75	91		
0.5	86		
0.375	83		
#4	76		
#10	66		
#20	56		
#40	51		
#60	47		
#100	43		
#200	37		
0.0561 mm.	36		
0.0407 mm.	33		
0.0295 mm.	30		
0.0191 mm.	27		
0.0114 mm.	24		
0.0059 mm.	19		
0.0031 mm.	15		
0.0013 mm.	10		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.5333 D_{60}= 1.2051 D_{50}= 0.3768
D_{30}= 0.0284 D_{15}= 0.0032 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 24.2%

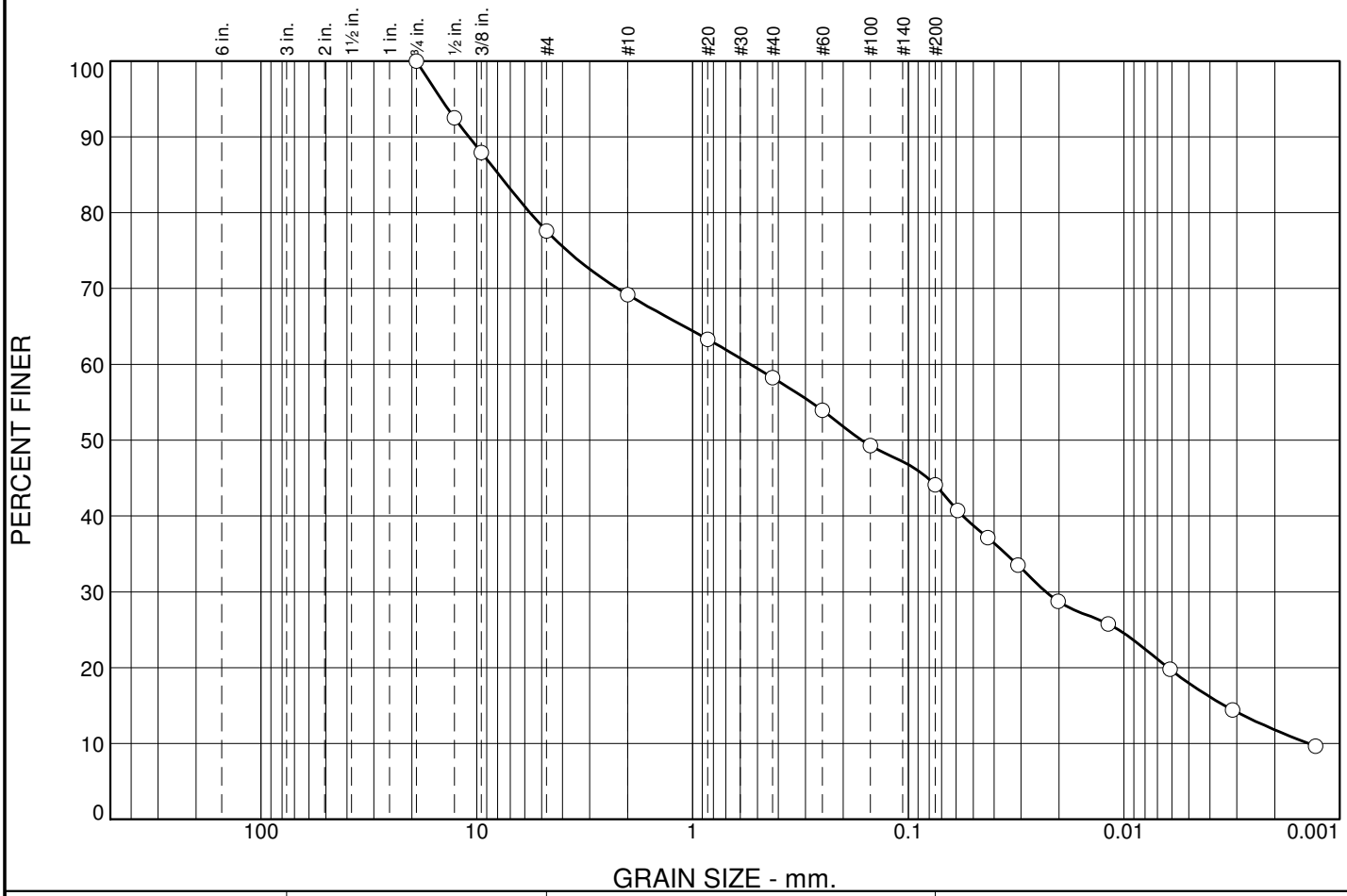
Sample No.: SPT 5 **Source of Sample:** GH10-218 **Date:** 11/17/10
Location: Open Pit Area **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	22	9	11	14	32	12

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100		
.5	93		
0.375	88		
#4	78		
#10	69		
#20	63		
#40	58		
#60	54		
#100	49		
#200	44		
0.0591 mm.	41		
0.0428 mm.	37		
0.0310 mm.	34		
0.0202 mm.	29		
0.0118 mm.	26		
0.0061 mm.	20		
0.0031 mm.	14		
0.0013 mm.	9.6		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 19 LL= 33 PI= 14

Coefficients

D_{85}= 7.8877 D_{60}= 0.5387 D_{50}= 0.1642
D_{30}= 0.0230 D_{15}= 0.0034 D_{10}= 0.0014
C_u= 386.70 C_c= 0.70

Classification

USCS= SC AASHTO= A-6(3)

Remarks

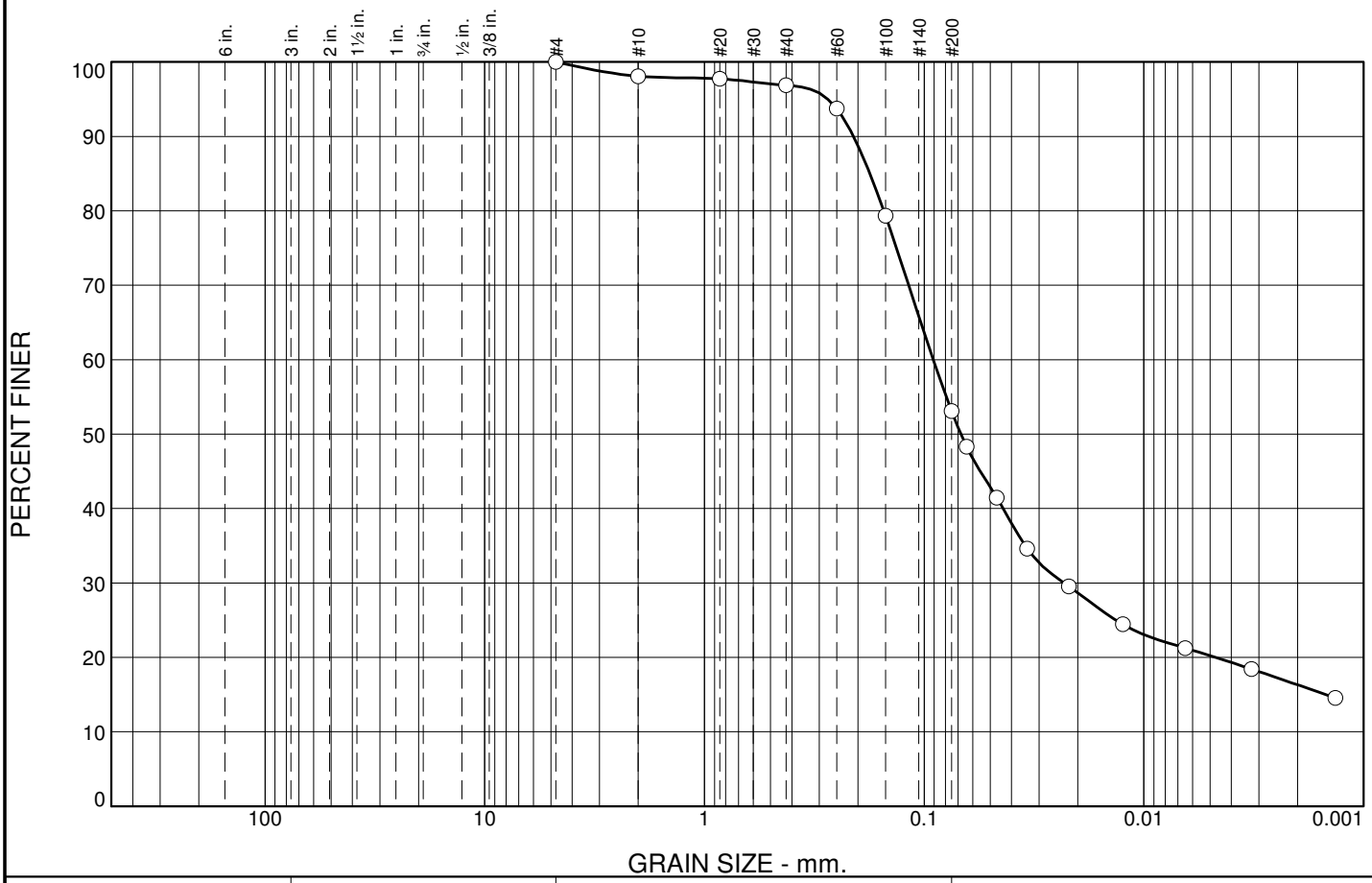
As received moisture 29.6%

Sample No.: SPT 1 **Source of Sample:** GH10-219 **Date:** 11/30/10
Location: Upper Talarik Creek Area **Elev./Depth:** 4.0-5.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	1	44	37	16

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	98		
#20	98		
#40	97		
#60	94		
#100	79		
#200	53		
0.0641 mm.	48		
0.0467 mm.	41		
0.0340 mm.	35		
0.0219 mm.	30		
0.0125 mm.	24		
0.0065 mm.	21		
0.0032 mm.	18		
0.0013 mm.	15		

* (no specification provided)

Soil Description

sandy lean clay

Atterberg Limits

PL= 18 LL= 37 PI= 19

Coefficients

D_{85}= 0.1766 D_{60}= 0.0909 D_{50}= 0.0681
D_{30}= 0.0231 D_{15}= 0.0015 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

As received moisture 31.1%

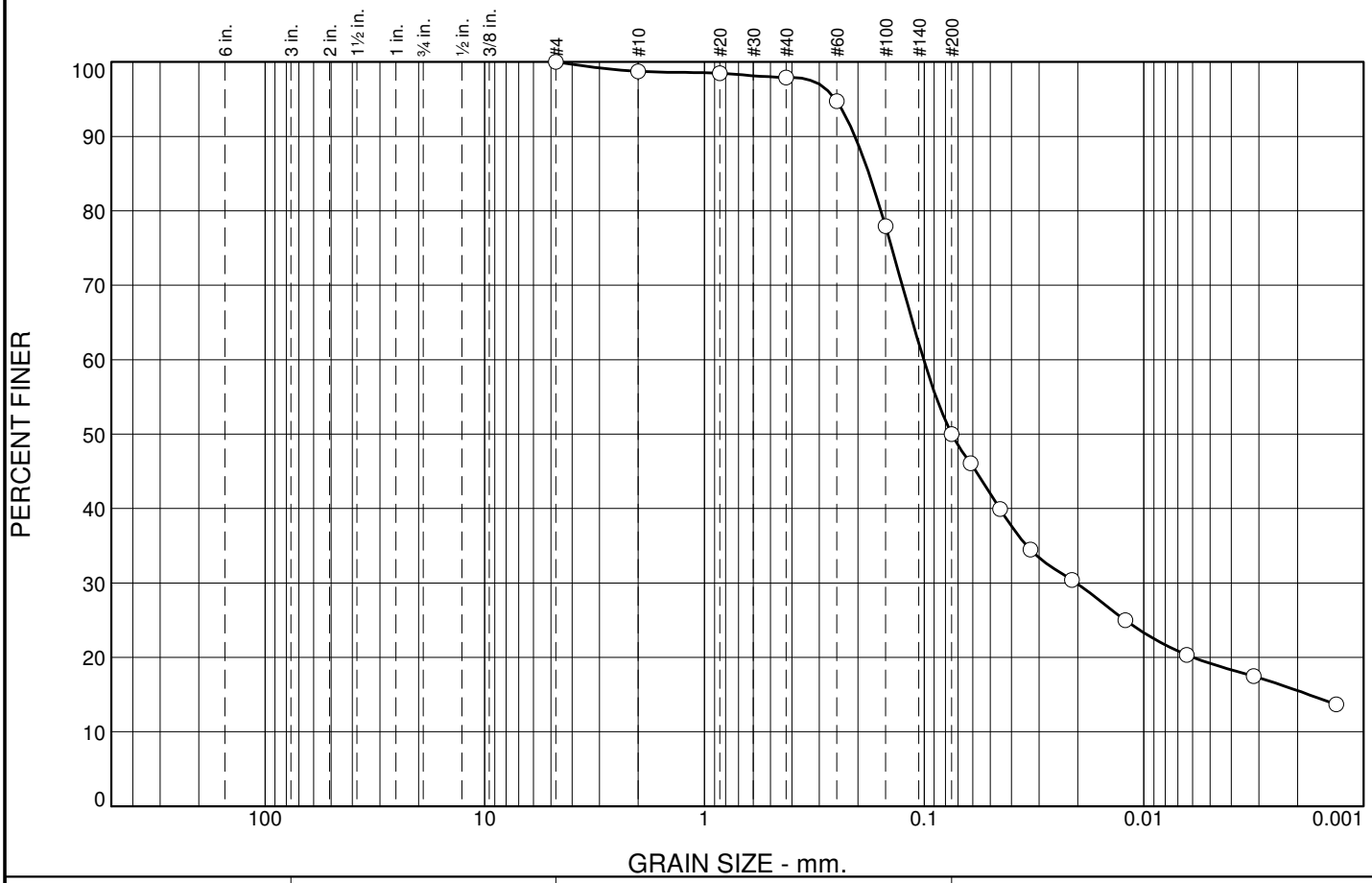
Sample No.: SPT 4 **Source of Sample:** GH10-219 **Date:** 11/17/10
Location: Upper Talarik Creek Area **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	1	48	34	16

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	99		
#20	98		
#40	98		
#60	95		
#100	78		
#200	50		
0.0615 mm.	46		
0.0451 mm.	40		
0.0328 mm.	34		
0.0212 mm.	30		
0.0122 mm.	25		
0.0064 mm.	20		
0.0032 mm.	17		
0.0013 mm.	14		

* (no specification provided)

Soil Description

sandy lean clay

Atterberg Limits

PL= 18 LL= 34 PI= 16

Coefficients

D_{85}= 0.1784 D_{60}= 0.1004 D_{50}= 0.0750
D_{30}= 0.0203 D_{15}= 0.0018 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

As received moisture 32.4%

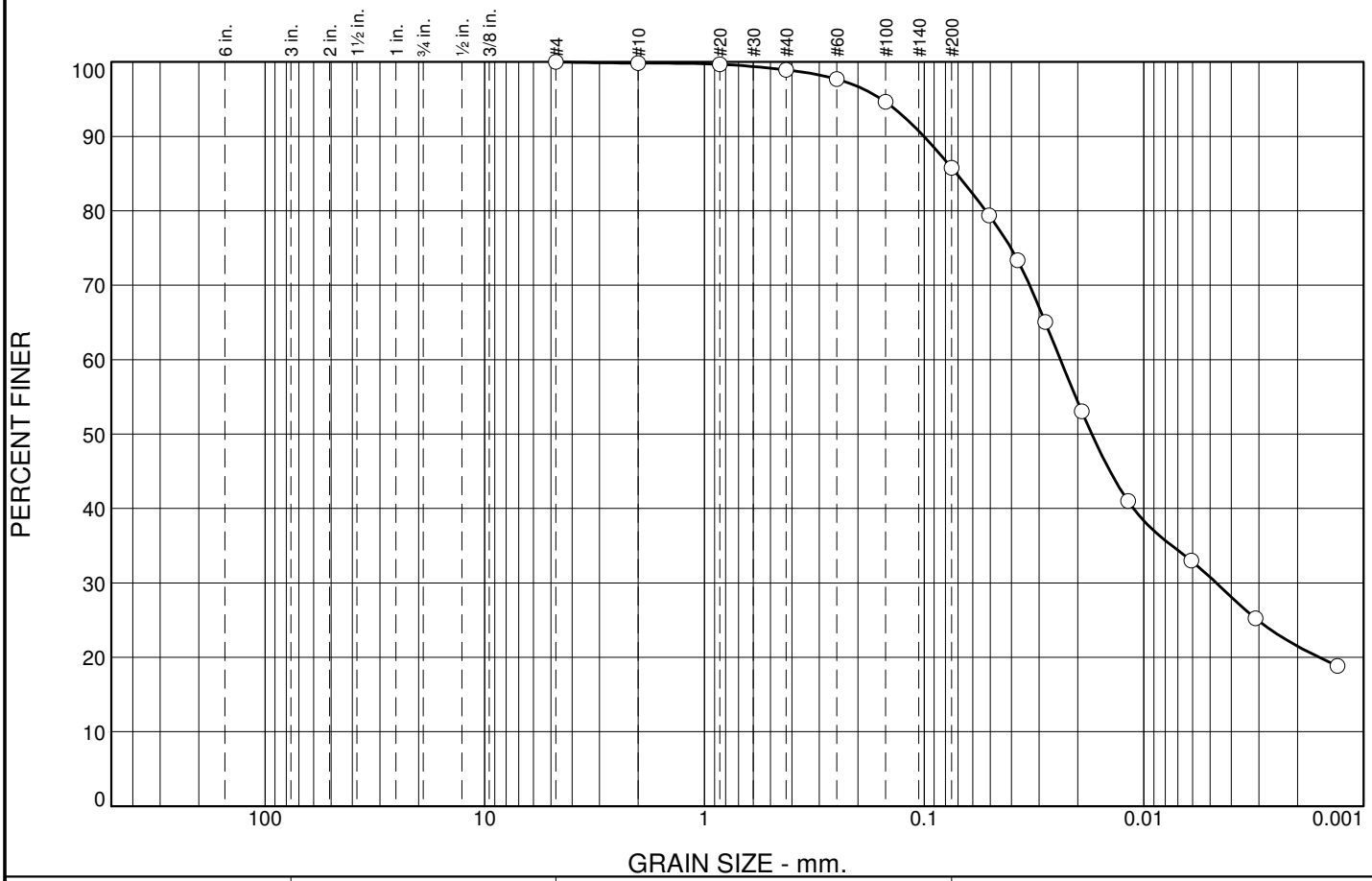
Sample No.: SPT 5 **Source of Sample:** GH10-219 **Date:** 11/17/10
Location: Upper Talarik Creek Area **Elev./Depth:** 24.0-25.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: jk **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	13	65	21

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	100		
#20	100		
#40	99		
#60	98		
#100	95		
#200	86		
0.0506 mm.	79		
0.0375 mm.	73		
0.0281 mm.	65		
0.0192 mm.	53		
0.0118 mm.	41		
0.0061 mm.	33		
0.0031 mm.	25		
0.0013 mm.	19		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.0713 D_{60}= 0.0240 D_{50}= 0.0173
D_{30}= 0.0047 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

As received moisture 31.1%

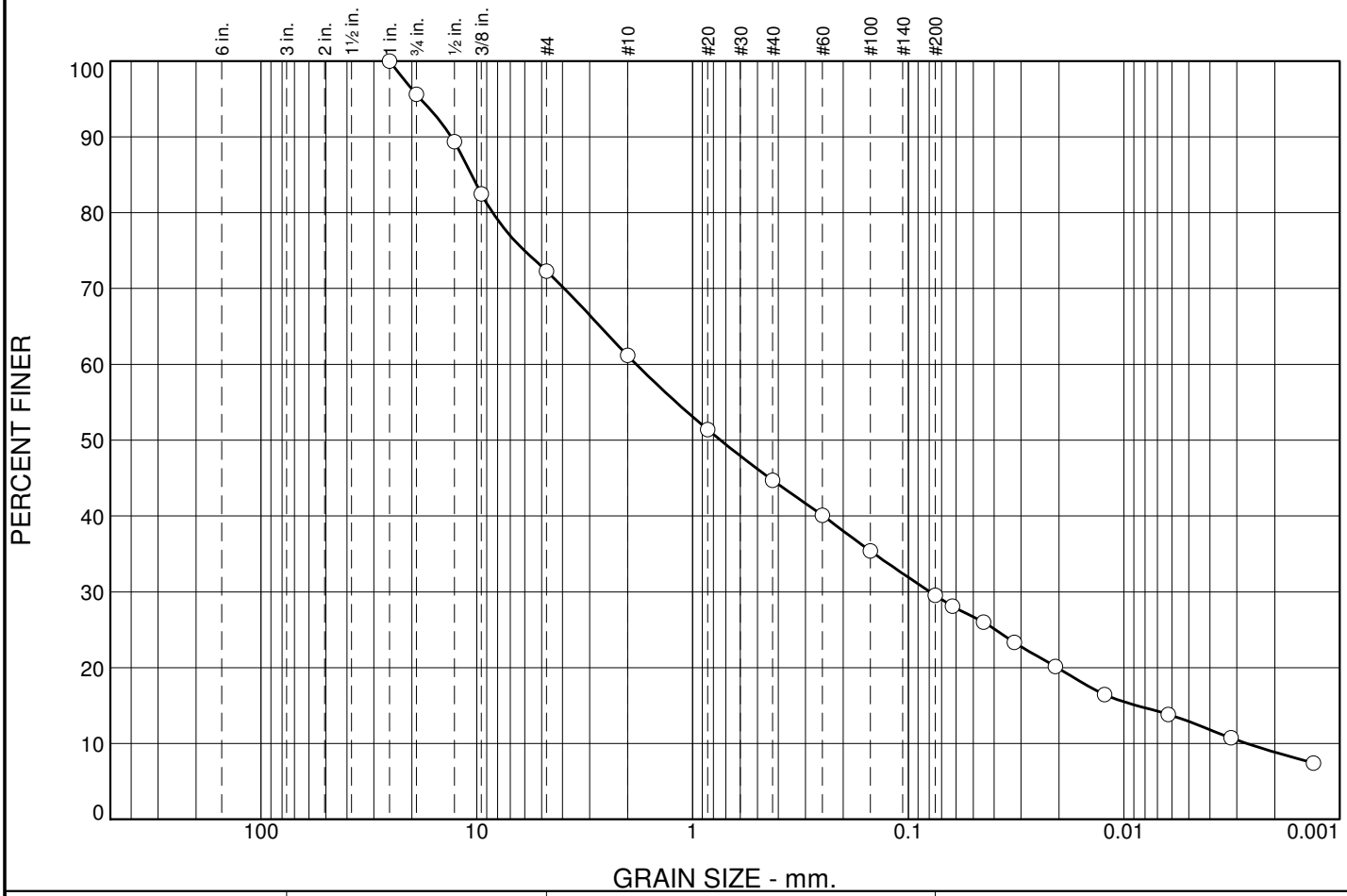
Sample No.: SPT 6 **Source of Sample:** GH10-219 **Date:** 11/17/10
Location: Upper Talarik Creek Area **Elev./Depth:**

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: db **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	4	24	11	16	15	21	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	96		
.5	89		
0.375	82		
#4	72		
#10	61		
#20	51		
#40	45		
#60	40		
#100	35		
#200	30		
0.0624 mm.	28		
0.0448 mm.	26		
0.0322 mm.	23		
0.0208 mm.	20		
0.0123 mm.	16		
0.0062 mm.	14		
0.0032 mm.	11		
0.0013 mm.	7.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 10.5837 D_{60}= 1.8225 D_{50}= 0.7411
D_{30}= 0.0791 D_{15}= 0.0087 D_{10}= 0.0027
C_u= 678.59 C_c= 1.28

Classification

USCS= AASHTO=

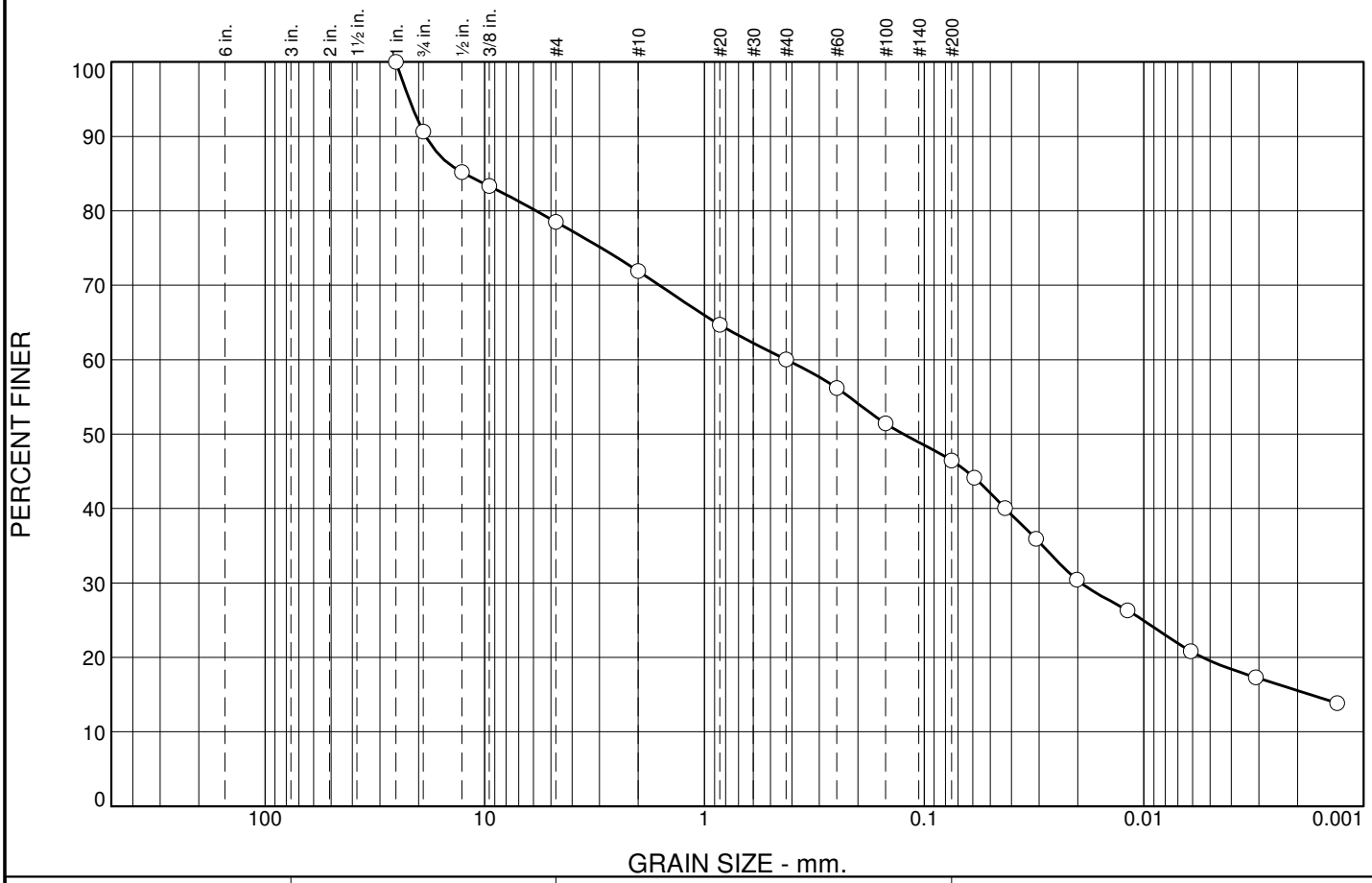
Remarks

Sample No.: SPT 8 **Source of Sample:** GH10-219 **Date:** 1/21/11
Location: Upper Talarik Creek Area **Elev./Depth:** 39.0-40.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	12	7	12	14	30	16

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100		
0.75	91		
0.5	85		
0.375	83		
#4	79		
#10	72		
#20	65		
#40	60		
#60	56		
#100	51		
#200	46		
0.0591 mm.	44		
0.0428 mm.	40		
0.0310 mm.	36		
0.0202 mm.	30		
0.0119 mm.	26		
0.0061 mm.	21		
0.0031 mm.	17		
0.0013 mm.	14		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.3599 D_{60}= 0.4239 D_{50}= 0.1242
D_{30}= 0.0193 D_{15}= 0.0017 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As received moisture 17.8%

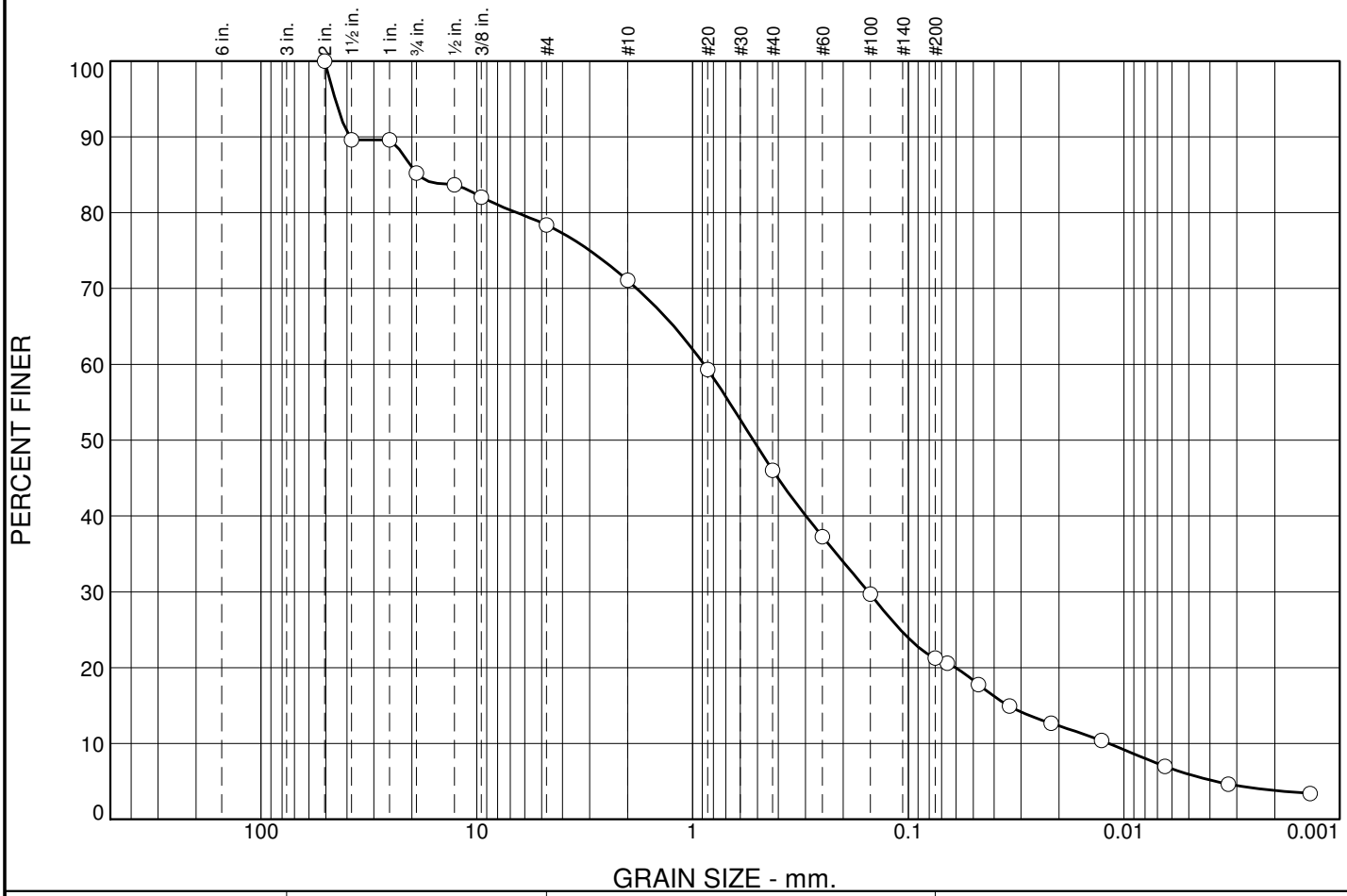
Sample No.: SPT 9 **Source of Sample:** GH10-219 **Date:** 11/17/10
Location: Upper Talarik Creek Area **Elev./Depth:** 44.0-45.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Tested By: rsh **Checked By:** spb

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	7	7	25	25	17	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	90		
1	90		
.75	85		
.5	84		
0.375	82		
#4	78		
#10	71		
#20	59		
#40	46		
#60	37		
#100	30		
#200	21		
0.0659 mm.	21		
0.0473 mm.	18		
0.0340 mm.	15		
0.0217 mm.	13		
0.0127 mm.	10		
0.0065 mm.	7.0		
0.0033 mm.	4.7		
0.0014 mm.	3.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 18.7333 D_{60}= 0.8847 D_{50}= 0.5231
D_{30}= 0.1531 D_{15}= 0.0343 D_{10}= 0.0117
C_u= 75.47 C_c= 2.26

Classification

USCS= AASHTO=

Remarks

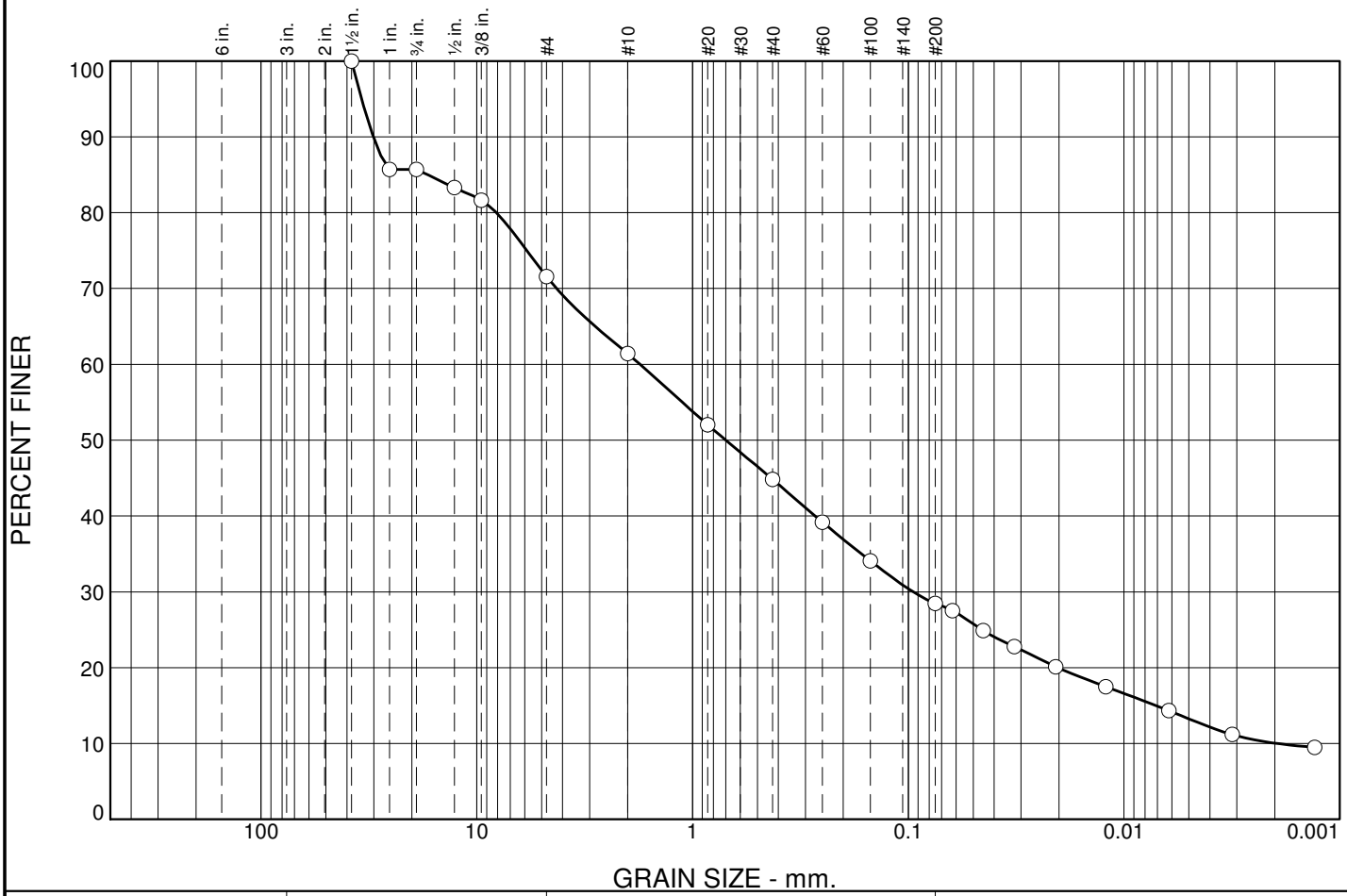
As received moisture 30.3%

Sample No.: Sump 1 **Source of Sample:** GH10-220 **Date:** 12/1/10
Location: AREA L **Elev./Depth:** 0.0-3.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	14	14	11	16	17	18	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	86		
.75	86		
.5	83		
0.375	82		
#4	72		
#10	61		
#20	52		
#40	45		
#60	39		
#100	34		
#200	28		
0.0624 mm.	28		
0.0449 mm.	25		
0.0322 mm.	23		
0.0207 mm.	20		
0.0122 mm.	17		
0.0062 mm.	14		
0.0032 mm.	11		
0.0013 mm.	9.5		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 22 LL= 35 PI= 13

Coefficients

D_{85}= 16.9249 D_{60}= 1.7524 D_{50}= 0.7008
D_{30}= 0.0948 D_{15}= 0.0071 D_{10}= 0.0019
C_u= 903.03 C_c= 2.64

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

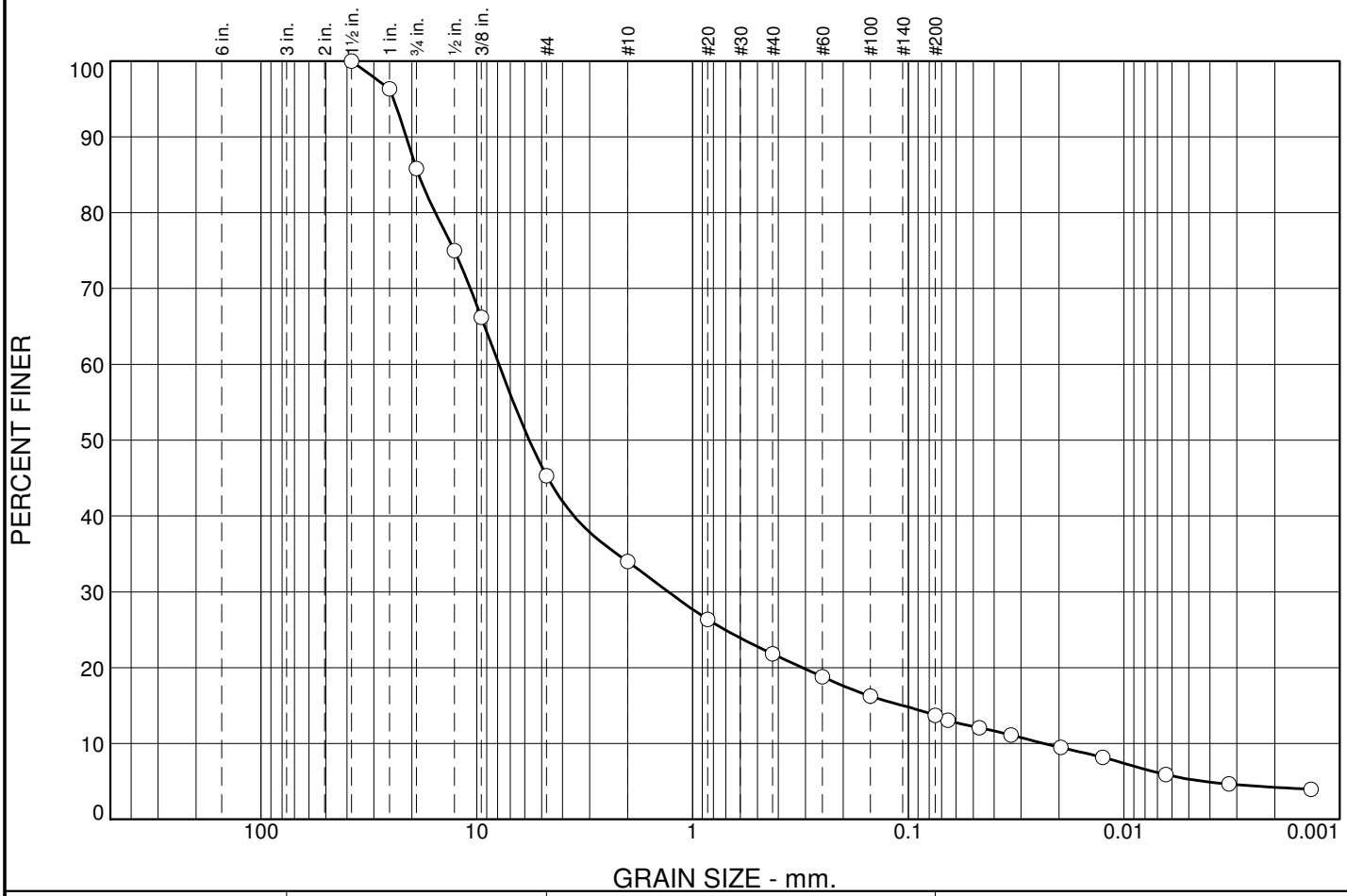
As received moisture 27.3%

Sample No.: SPT 2 **Source of Sample:** GH10-221 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 10-11.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	14	41	11	12	8	10	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	96		
.75	86		
.5	75		
0.375	66		
#4	45		
#10	34		
#20	26		
#40	22		
#60	19		
#100	16		
#200	14		
0.0656 mm.	13		
0.0468 mm.	12		
0.0334 mm.	11		
0.0196 mm.	9.5		
0.0126 mm.	8.2		
0.0064 mm.	5.9		
0.0033 mm.	4.7		
0.0014 mm.	4.0		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 26 LL= 44 PI= 18

Coefficients

D_{85}= 18.5994 D_{60}= 7.8961 D_{50}= 5.7115
D_{30}= 1.2946 D_{15}= 0.1057 D_{10}= 0.0234
C_u= 337.28 C_c= 9.07

Classification

USCS= GC AASHTO= A-2-7(0)

Remarks

As received moisture 29.9%

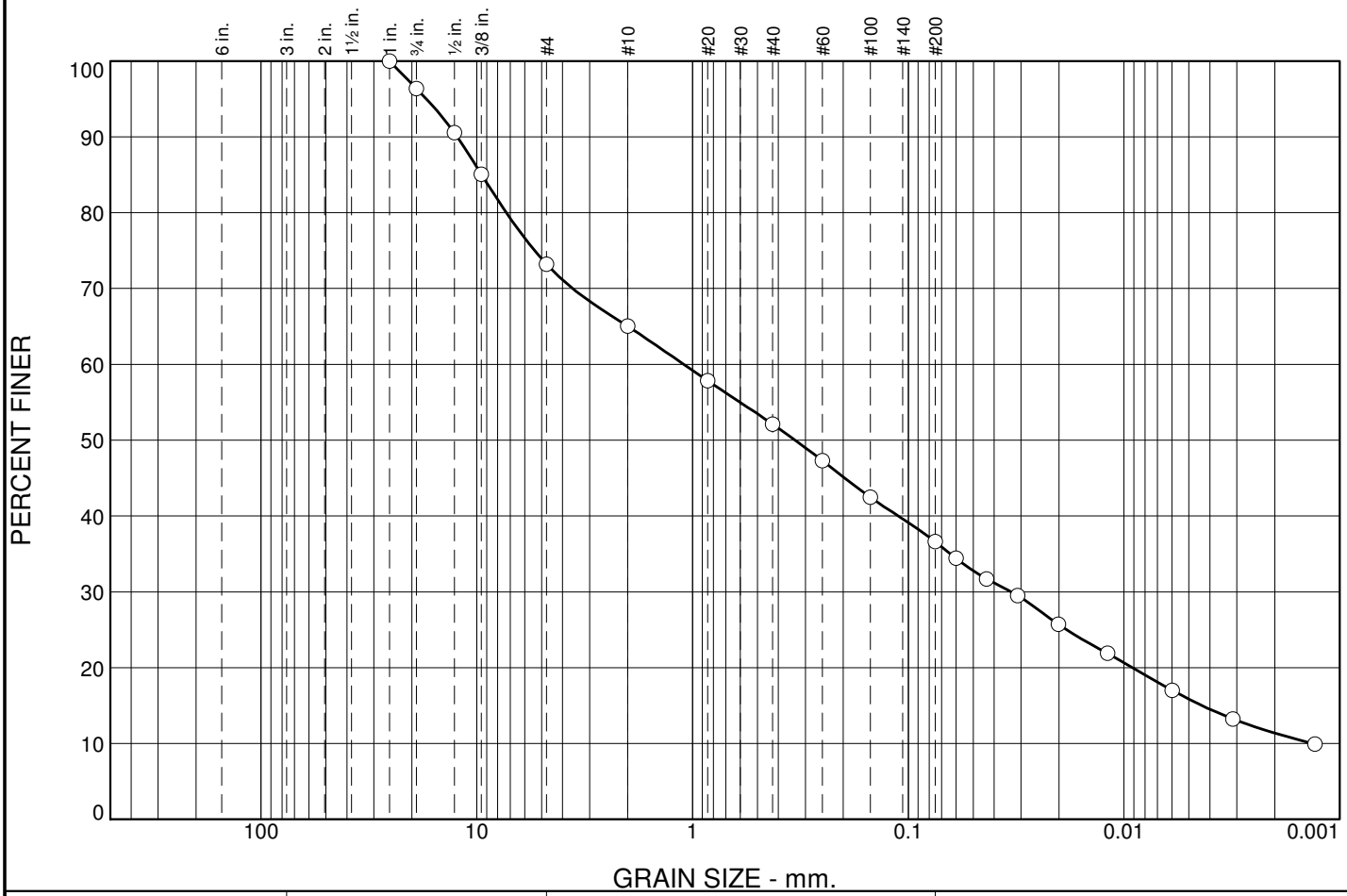
Sample No.: SPT 4 **Source of Sample:** GH10-221 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 20-21.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project

Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	4	23	8	13	15	26	11

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	96		
.5	91		
0.375	85		
#4	73		
#10	65		
#20	58		
#40	52		
#60	47		
#100	42		
#200	37		
0.0601 mm.	34		
0.0433 mm.	32		
0.0311 mm.	30		
0.0202 mm.	26		
0.0119 mm.	22		
0.0060 mm.	17		
0.0031 mm.	13		
0.0013 mm.	9.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.5024 D_{60}= 1.0984 D_{50}= 0.3342
D_{30}= 0.0333 D_{15}= 0.0043 D_{10}= 0.0013
C_u= 820.71 C_c= 0.75

Classification

USCS= AASHTO=

Remarks

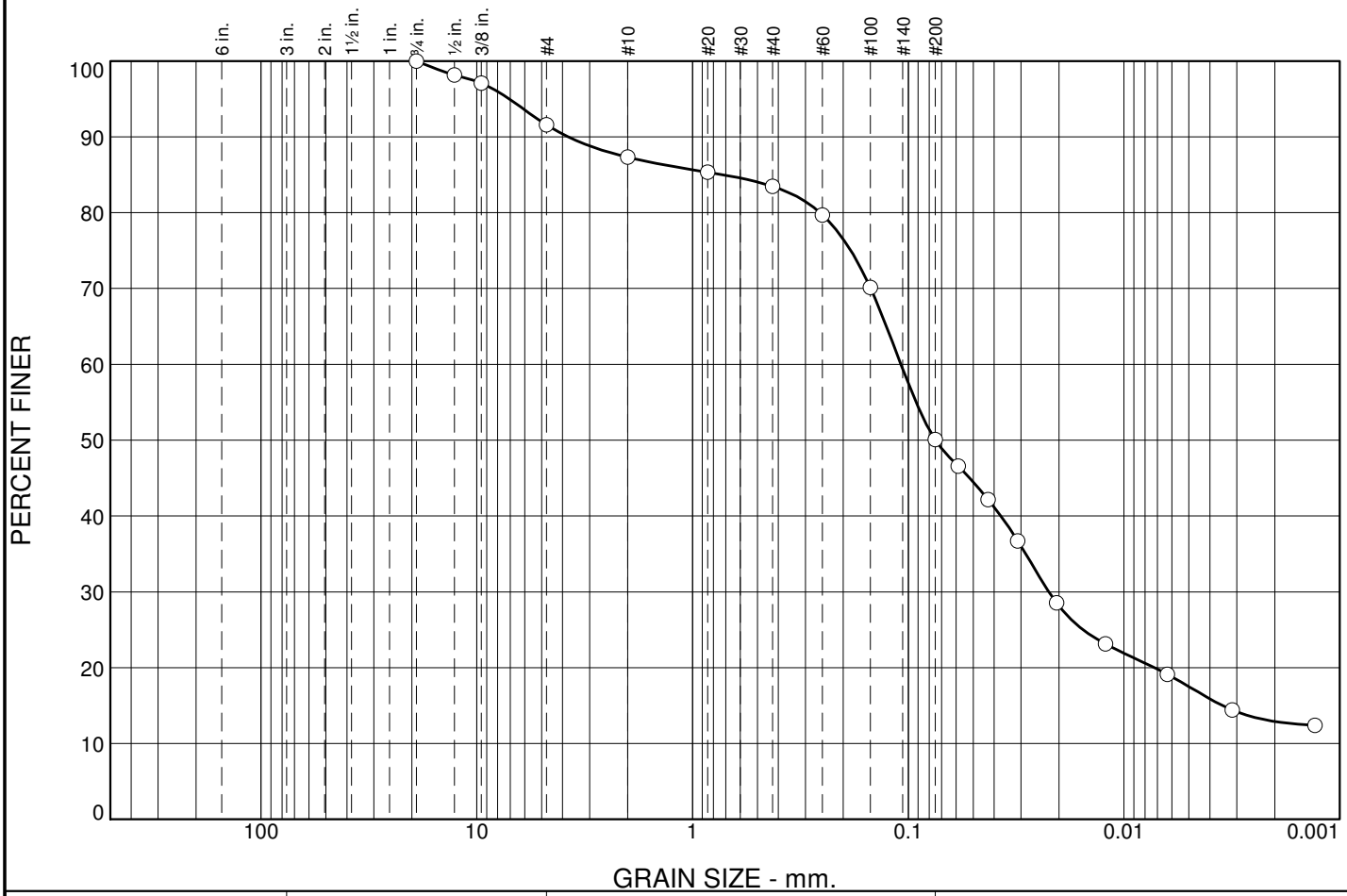
As received moisture 18.2%

Sample No.: SPT 5 **Source of Sample:** GH10-221 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 25-26.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	5	4	33	37	13

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100		
.5	98		
0.375	97		
#4	92		
#10	87		
#20	85		
#40	83		
#60	80		
#100	70		
#200	50		
0.0587 mm.	47		
0.0426 mm.	42		
0.0311 mm.	37		
0.0205 mm.	29		
0.0122 mm.	23		
0.0063 mm.	19		
0.0031 mm.	14		
0.0013 mm.	12		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.7237 D_{60}= 0.1082 D_{50}= 0.0747
D_{30}= 0.0223 D_{15}= 0.0035 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

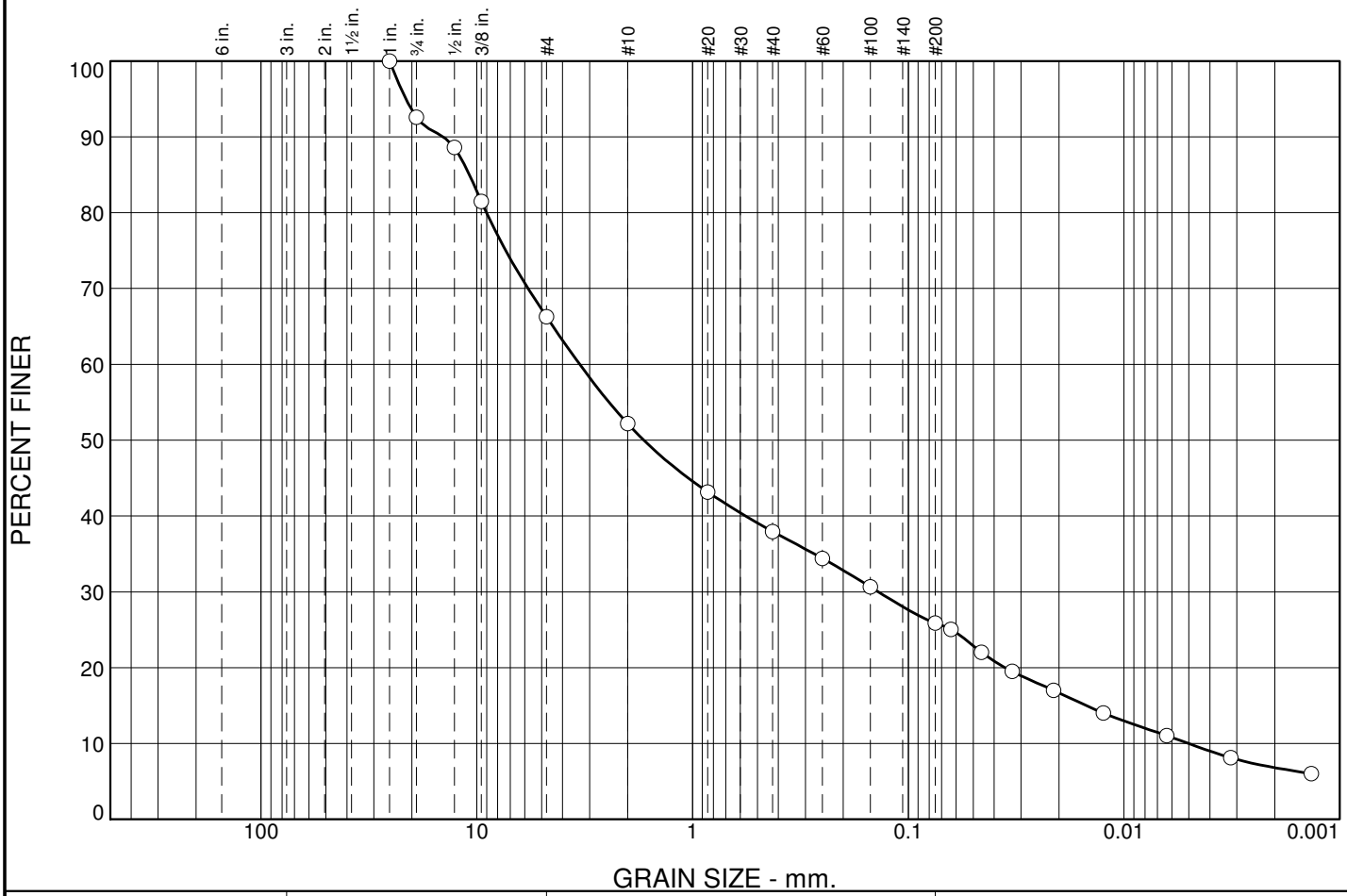
As received moisture 26.0%

Sample No.: SPT 7 **Source of Sample:** GH10-221 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 45-46.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	7	27	14	14	12	19	7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	93		
.5	89		
0.375	81		
#4	66		
#10	52		
#20	43		
#40	38		
#60	34		
#100	31		
#200	26		
0.0634 mm.	25		
0.0458 mm.	22		
0.0330 mm.	20		
0.0212 mm.	17		
0.0125 mm.	14		
0.0063 mm.	11		
0.0032 mm.	8.1		
0.0014 mm.	6.0		

* (no specification provided)

Soil Description

silty, clayey sand with gravel

Atterberg Limits

PL= 16 LL= 23 PI= 7

Coefficients

D_{85}= 10.8204 D_{60}= 3.3334 D_{50}= 1.6812
D_{30}= 0.1375 D_{15}= 0.0150 D_{10}= 0.0050
C_u= 665.19 C_c= 1.13

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

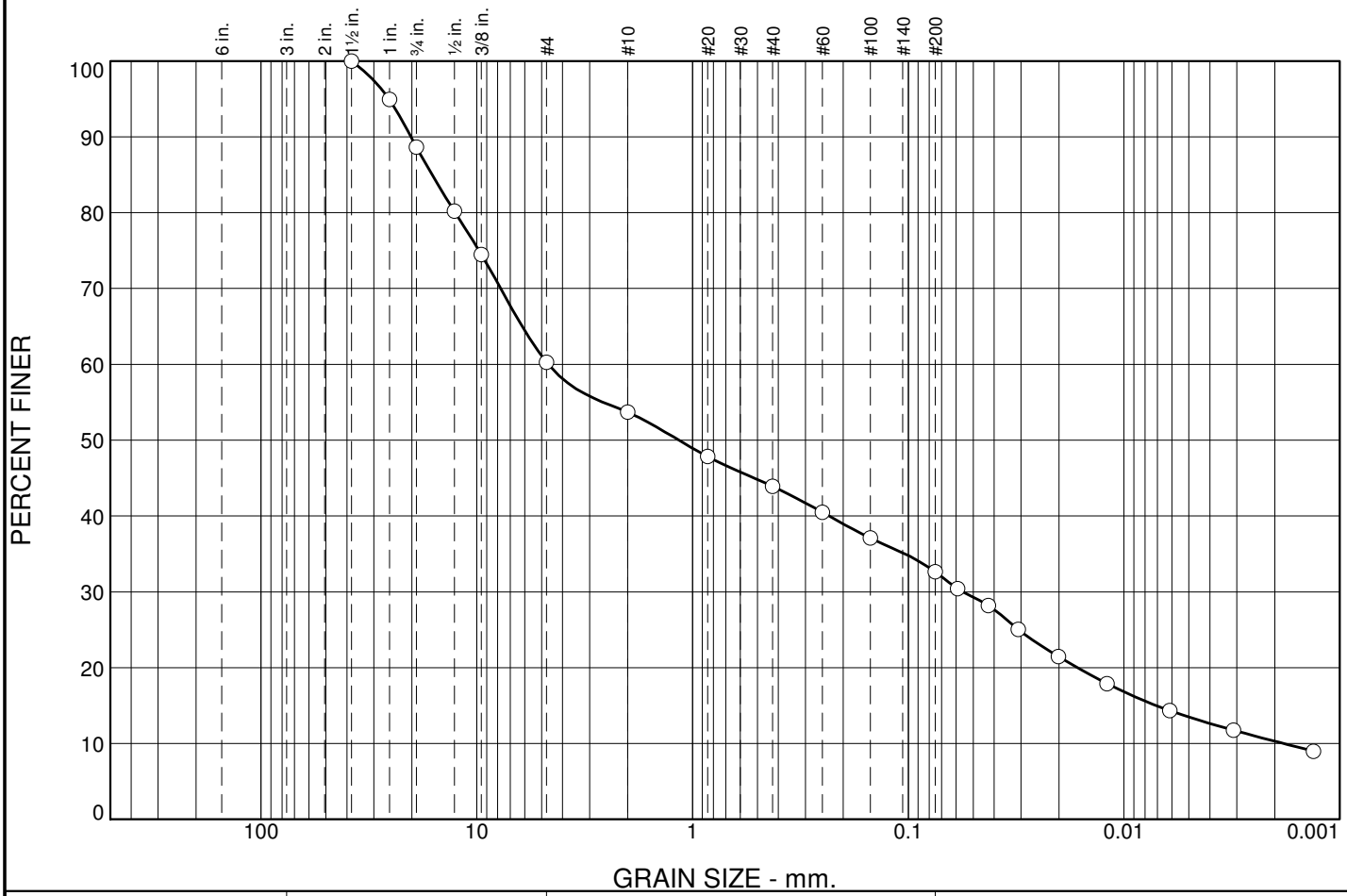
As received moisture 16.6%

Sample No.: SPT 1 **Source of Sample:** GH10-222 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 5-6.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	11	29	6	10	11	23	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	95		
.75	89		
.5	80		
0.375	74		
#4	60		
#10	54		
#20	48		
#40	44		
#60	41		
#100	37		
#200	33		
0.0590 mm.	30		
0.0426 mm.	28		
0.0309 mm.	25		
0.0202 mm.	21		
0.0120 mm.	18		
0.0061 mm.	14		
0.0031 mm.	12		
0.0013 mm.	9.0		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 15 LL= 29 PI= 14

Coefficients

D_{85}= 16.1099 D_{60}= 4.6584 D_{50}= 1.1565
D_{30}= 0.0558 D_{15}= 0.0071 D_{10}= 0.0018
C_u= 2559.75 C_c= 0.37

Classification

USCS= GC AASHTO= A-2-6(1)

Remarks

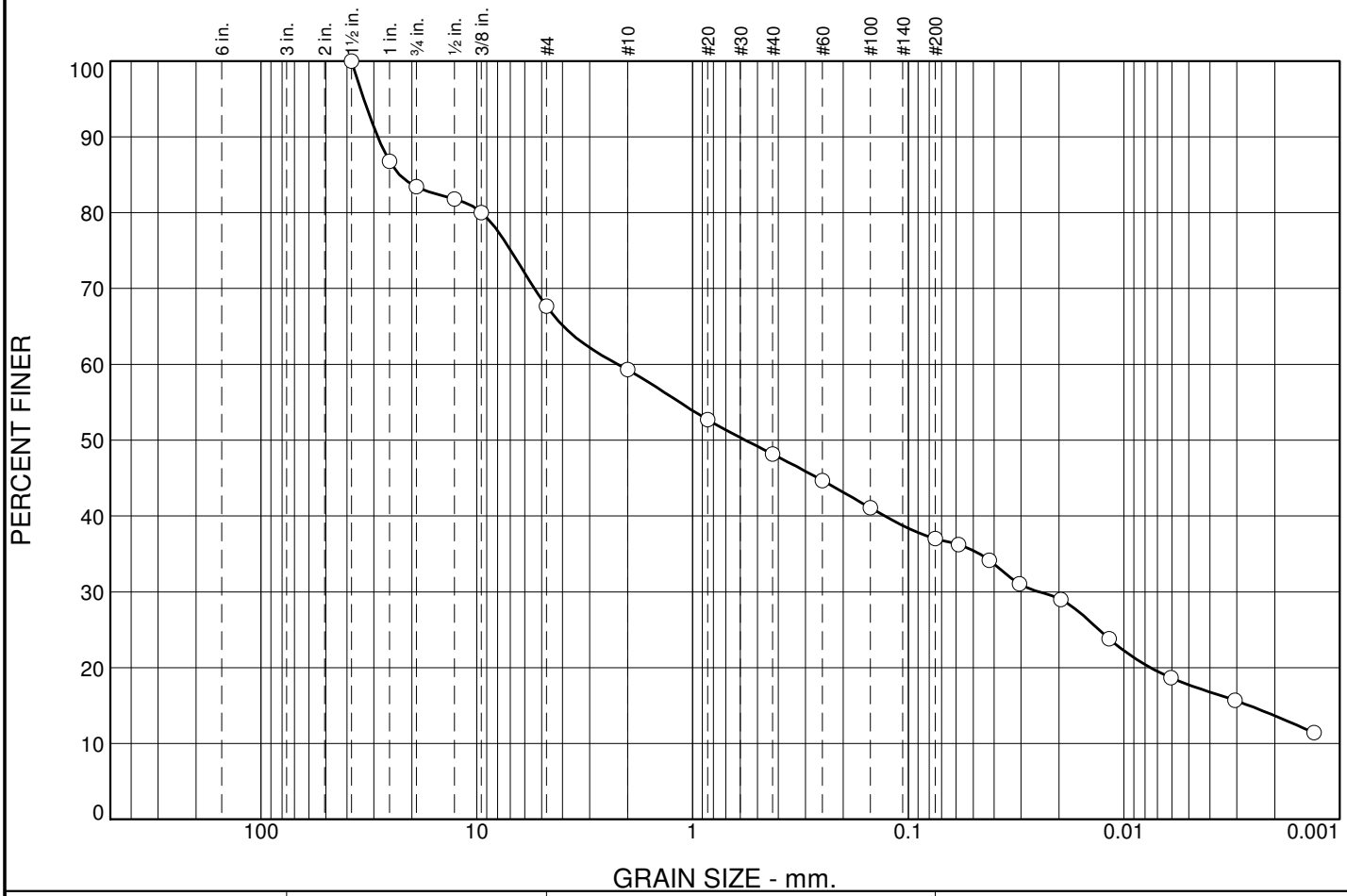
As received moisture 15.6%

Sample No.: SPT 3 **Source of Sample:** GH10-222 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 15-16.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	17	15	9	11	11	23	14

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	87		
.75	83		
.5	82		
0.375	80		
#4	68		
#10	59		
#20	53		
#40	48		
#60	45		
#100	41		
#200	37		
0.0585 mm.	36		
0.0421 mm.	34		
0.0305 mm.	31		
0.0196 mm.	29		
0.0117 mm.	24		
0.0061 mm.	19		
0.0031 mm.	16		
0.0013 mm.	11		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.8157 D_{60}= 2.2142 D_{50}= 0.5691
D_{30}= 0.0247 D_{15}= 0.0026 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

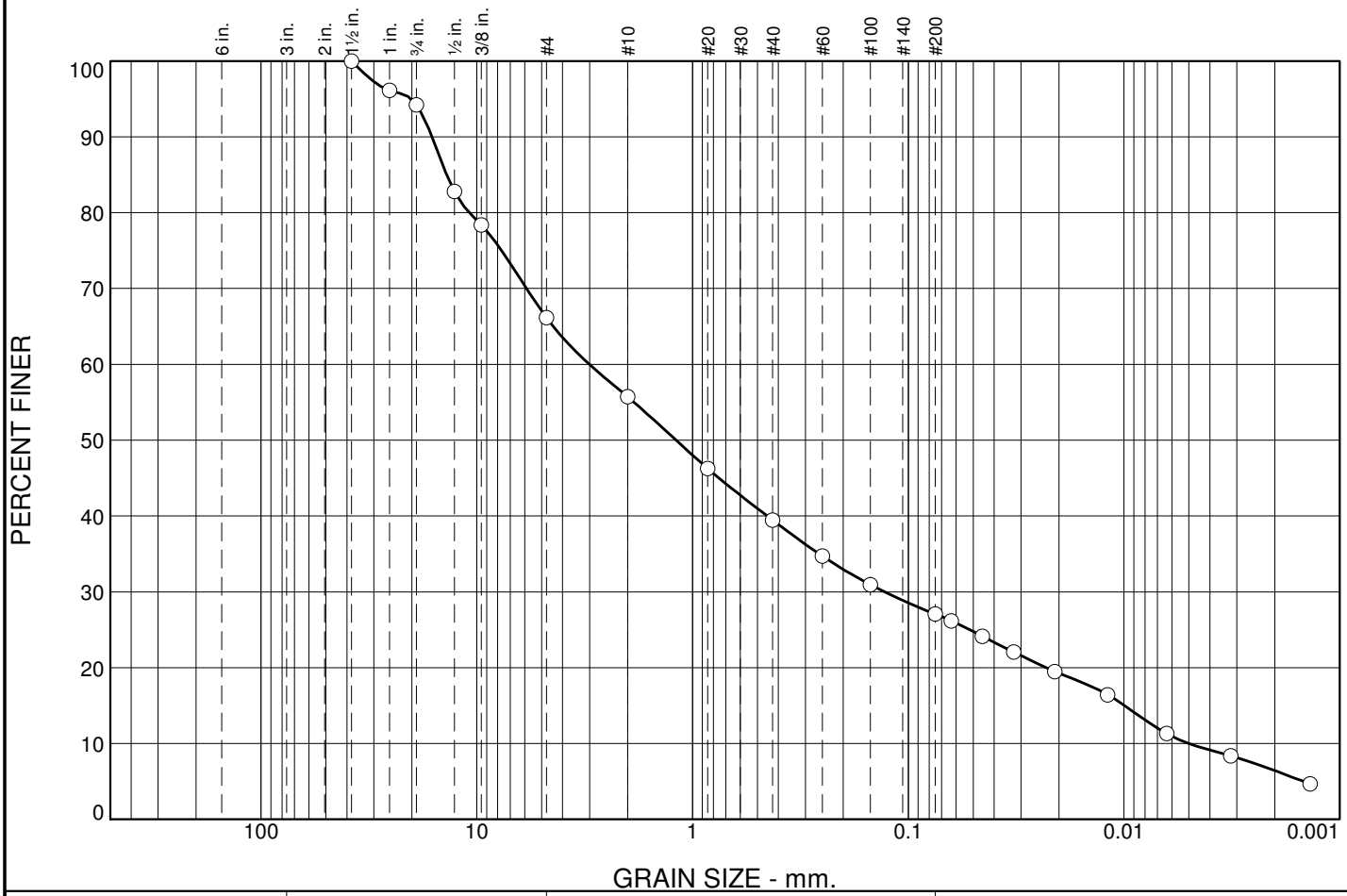
As received moisture 16.3%

Sample No.: SPT 5 **Source of Sample:** GH10-222 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 25-26.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	6	28	10	17	12	21	6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	96		
.75	94		
.5	83		
0.375	78		
#4	66		
#10	56		
#20	46		
#40	39		
#60	35		
#100	31		
#200	27		
0.0631 mm.	26		
0.0453 mm.	24		
0.0325 mm.	22		
0.0209 mm.	19		
0.0119 mm.	16		
0.0063 mm.	11		
0.0032 mm.	8.4		
0.0014 mm.	4.7		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 16 LL= 24 PI= 8

Coefficients

D_{85}= 13.7777 D_{60}= 3.0081 D_{50}= 1.1923
D_{30}= 0.1288 D_{15}= 0.0099 D_{10}= 0.0050
C_u= 602.05 C_c= 1.10

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

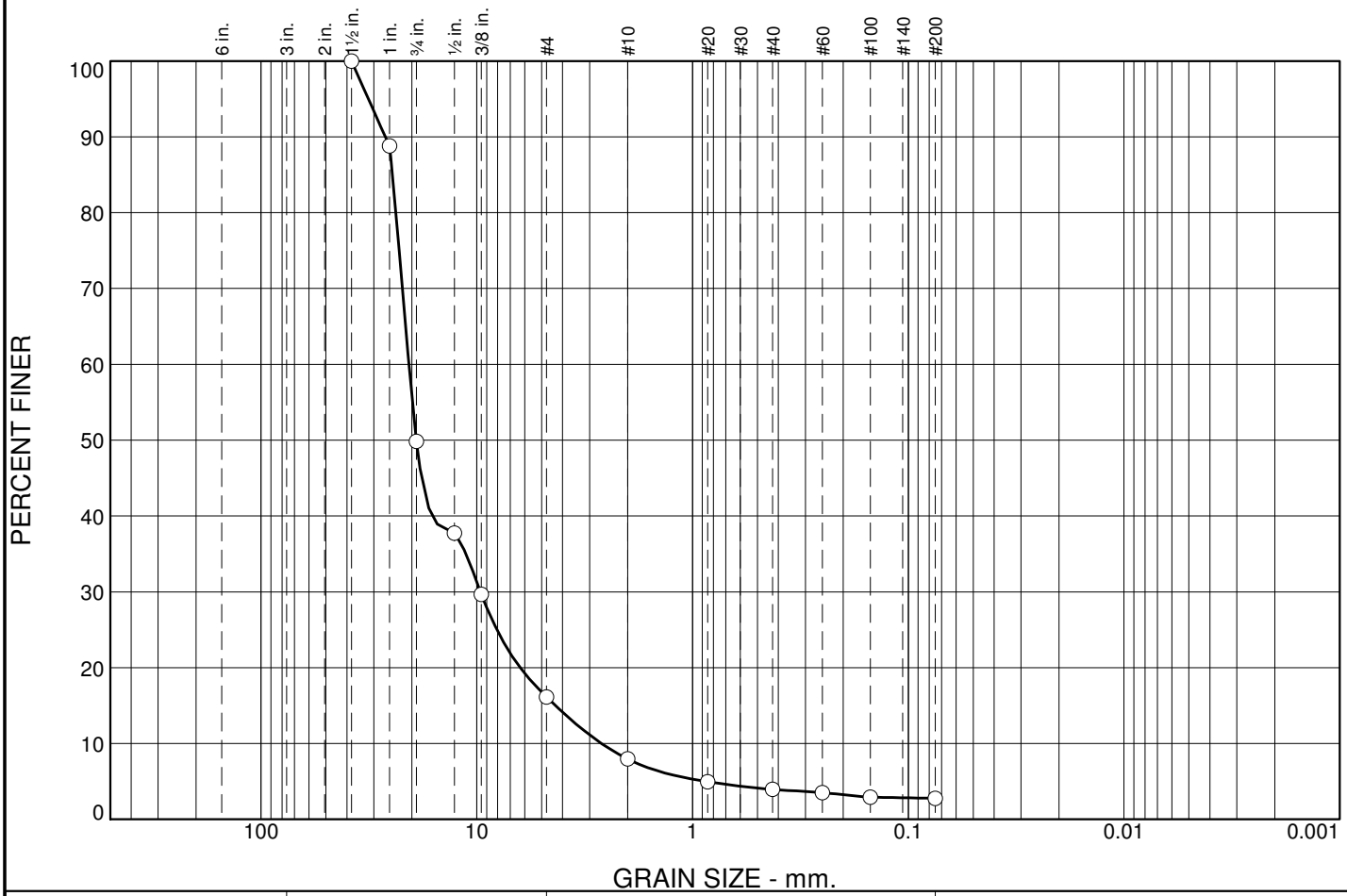
As received moisture 18.3%

Sample No.: SPT 7 **Source of Sample:** GH10-222 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 35-36.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	50	34	8	4	1	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	89		
.75	50		
.5	38		
0.375	30		
#4	16		
#10	8		
#20	5		
#40	4		
#60	4		
#100	3		
#200	2.8		

* (no specification provided)

Soil Description

well-graded gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 24.5914 D_{60}= 20.6721 D_{50}= 19.0793
D_{30}= 9.6223 D_{15}= 4.3193 D_{10}= 2.6377
C_u= 7.84 C_c= 1.70

Classification

USCS= GW AASHTO=

Remarks

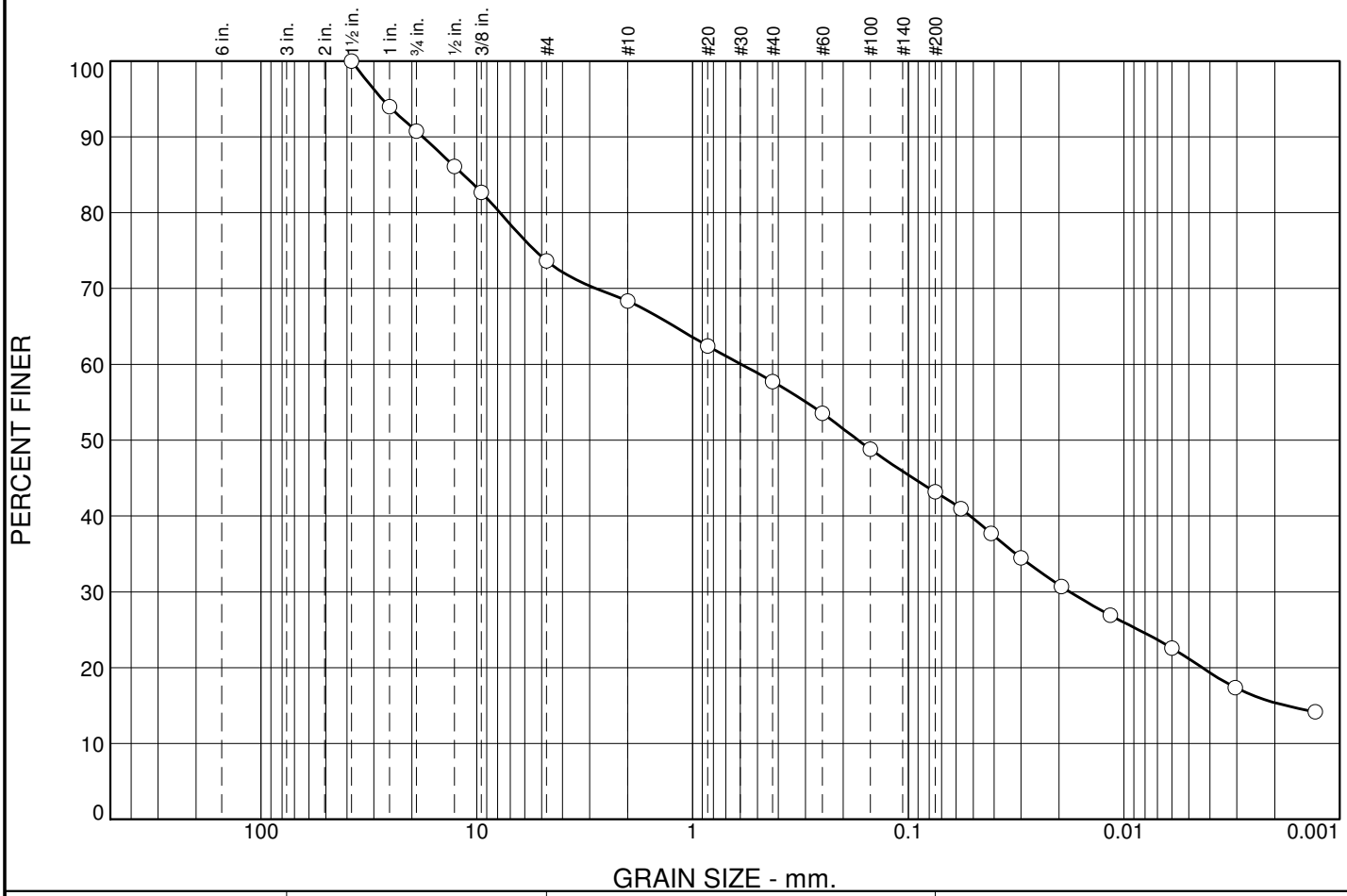
As received moisture 13.8%

Sample No.: SPT 12 **Source of Sample:** GH10-222 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 60-61.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	17	6	10	15	28	15

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	94		
.75	91		
.5	86		
0.375	83		
#4	74		
#10	68		
#20	62		
#40	58		
#60	54		
#100	49		
#200	43		
0.0570 mm.	41		
0.0413 mm.	38		
0.0300 mm.	34		
0.0195 mm.	31		
0.0116 mm.	27		
0.0060 mm.	23		
0.0030 mm.	17		
0.0013 mm.	14		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 18 LL= 42 PI= 24

Coefficients

D_{85}= 11.5328 D_{60}= 0.5943 D_{50}= 0.1706
D_{30}= 0.0178 D_{15}= 0.0018 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(6)

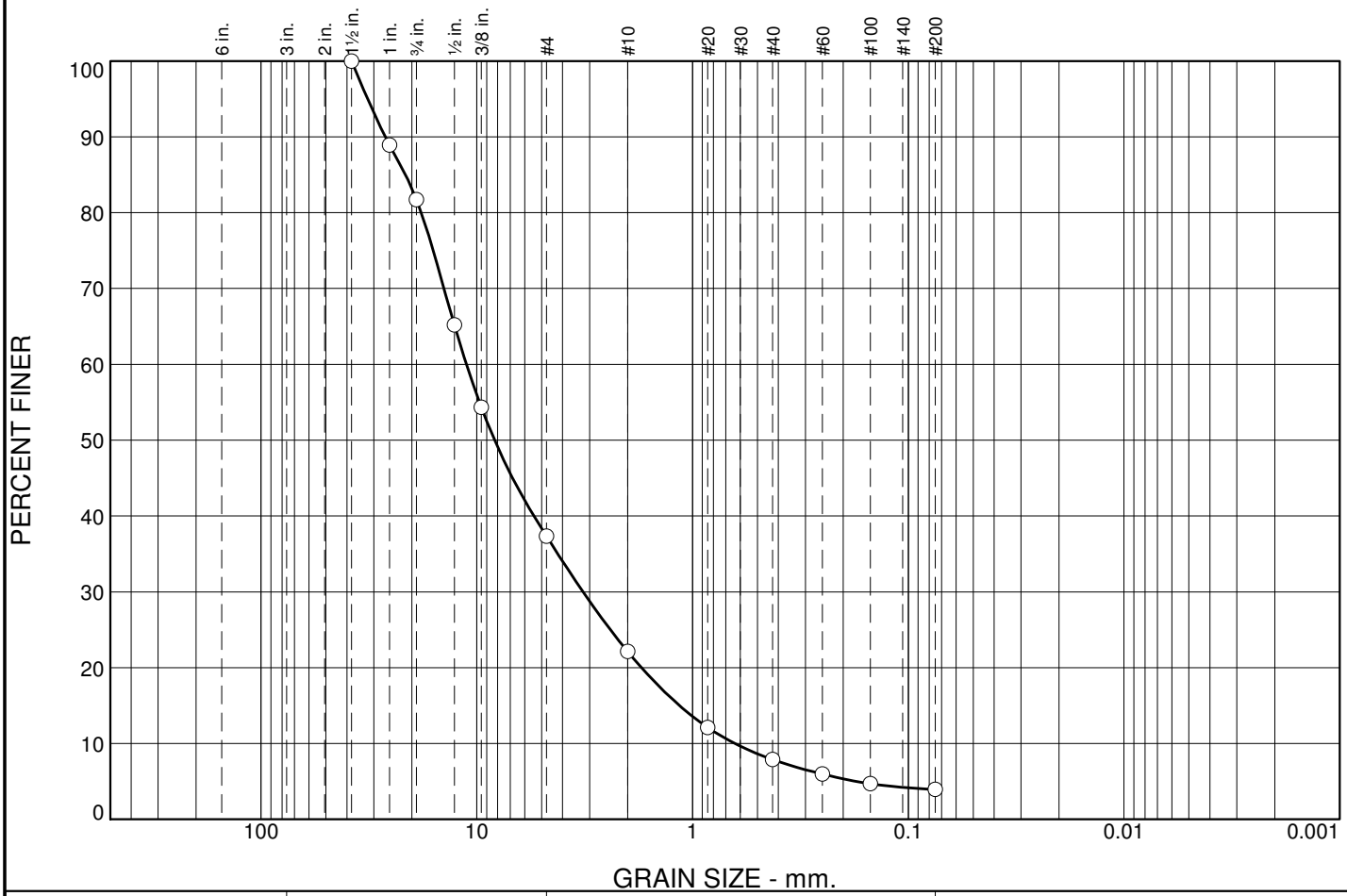
Remarks

Sample No.: Till **Source of Sample:** GH10-222 **Date:** 1/12/11
Location: Open Pit Area **Elev./Depth:** 66.0-67.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	45	15	14	4	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	89		
.75	82		
.5	65		
0.375	54		
#4	37		
#10	22		
#20	12		
#40	8		
#60	6		
#100	5		
#200	3.9		

* (no specification provided)

Soil Description

well-graded gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 21.4440 D_{60}= 11.1644 D_{50}= 8.2651
D_{30}= 3.2173 D_{15}= 1.1485 D_{10}= 0.6364
C_u= 17.54 C_c= 1.46

Classification

USCS= GW AASHTO= A-1-a

Remarks

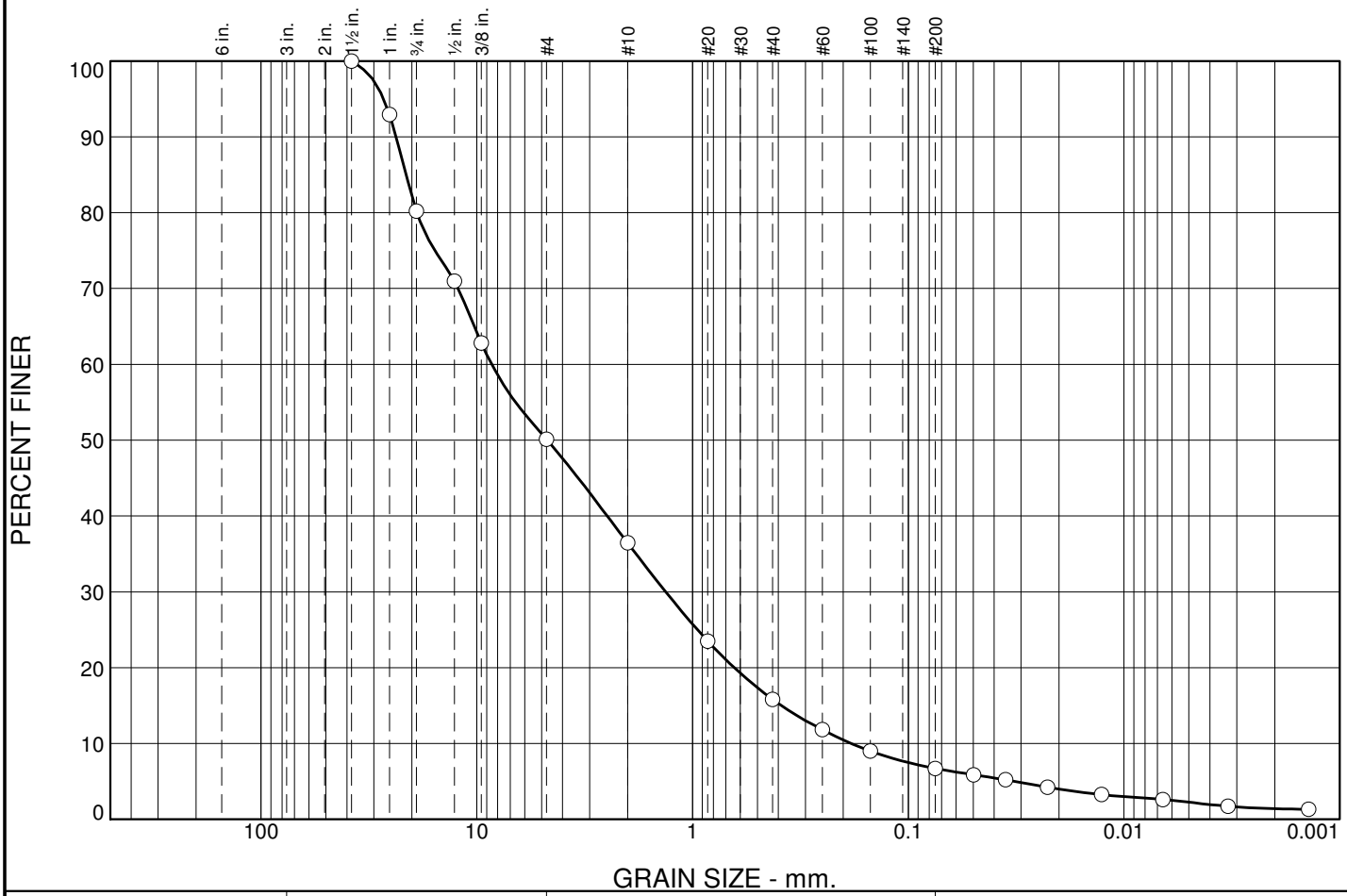
As received moisture 12.0%

Sample No.: SPT 1 **Source of Sample:** GH10-223 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 5-6.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	20	30	14	20	9	6	1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	93		
.75	80		
.5	71		
0.375	63		
#4	50		
#10	36		
#20	24		
#40	16		
#60	12		
#100	9		
#200	6.7		
0.0498 mm.	5.9		
0.0354 mm.	5.2		
0.0226 mm.	4.2		
0.0127 mm.	3.3		
0.0066 mm.	2.6		
0.0033 mm.	1.7		
0.0014 mm.	1.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.2740 D_{60}= 8.5300 D_{50}= 4.7141
D_{30}= 1.3321 D_{15}= 0.3868 D_{10}= 0.1835
C_u= 46.49 C_c= 1.13

Classification

USCS= AASHTO=

Remarks

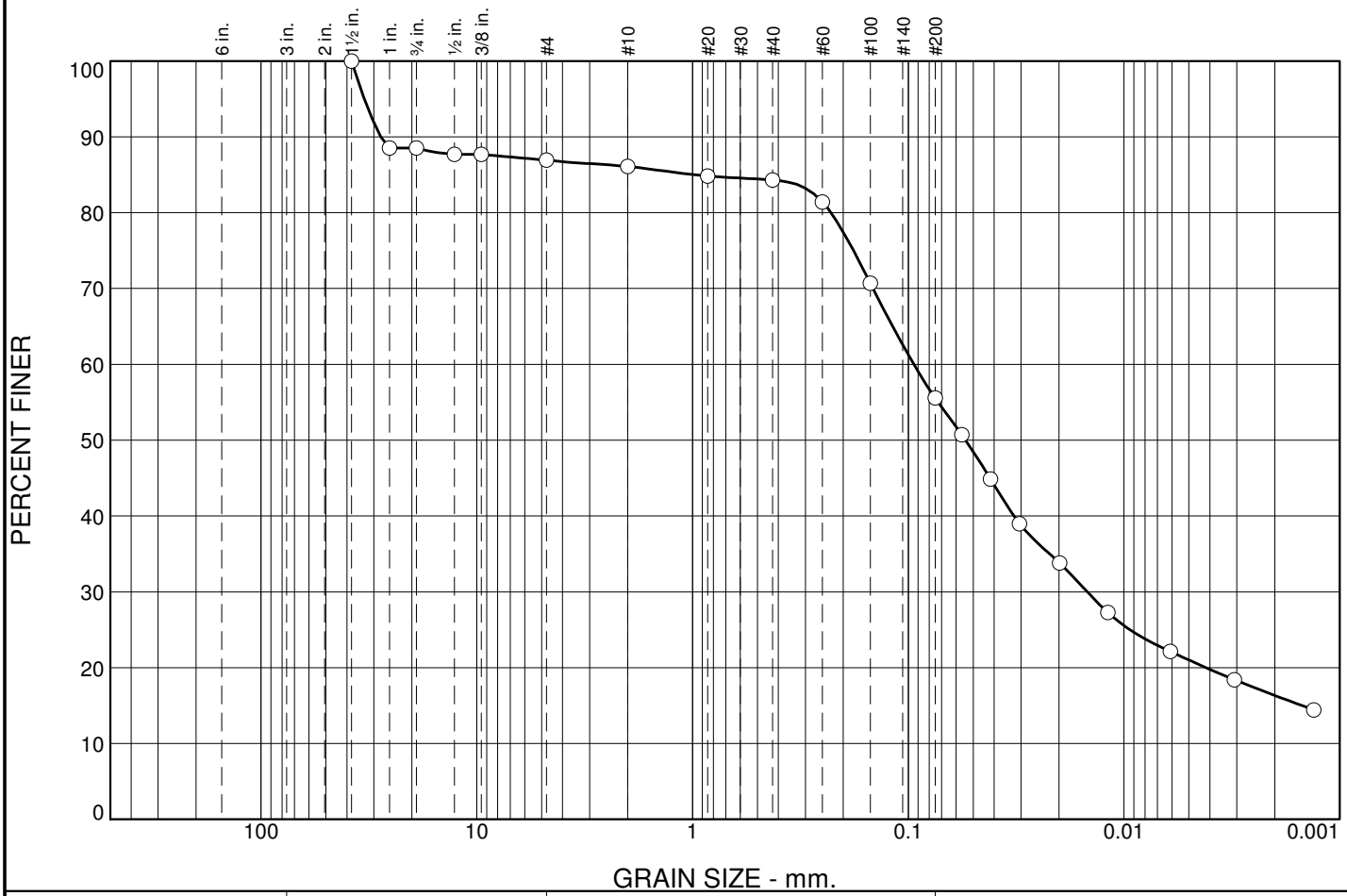
As received moisture 13.0%

Sample No.: SPT 2 **Source of Sample:** GH10-223 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 10-11.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	11	2	1	2	28	40	16

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	89		
.75	89		
.5	88		
0.375	88		
#4	87		
#10	86		
#20	85		
#40	84		
#60	81		
#100	71		
#200	56		
0.0564 mm.	51		
0.0415 mm.	45		
0.0305 mm.	39		
0.0199 mm.	34		
0.0119 mm.	27		
0.0061 mm.	22		
0.0031 mm.	18		
0.0013 mm.	14		

* (no specification provided)

Soil Description

sandy lean clay

Atterberg Limits

PL= 19 LL= 30 PI= 11

Coefficients

D_{85}= 0.9784 D_{60}= 0.0942 D_{50}= 0.0542
D_{30}= 0.0148 D_{15}= 0.0015 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(4)

Remarks

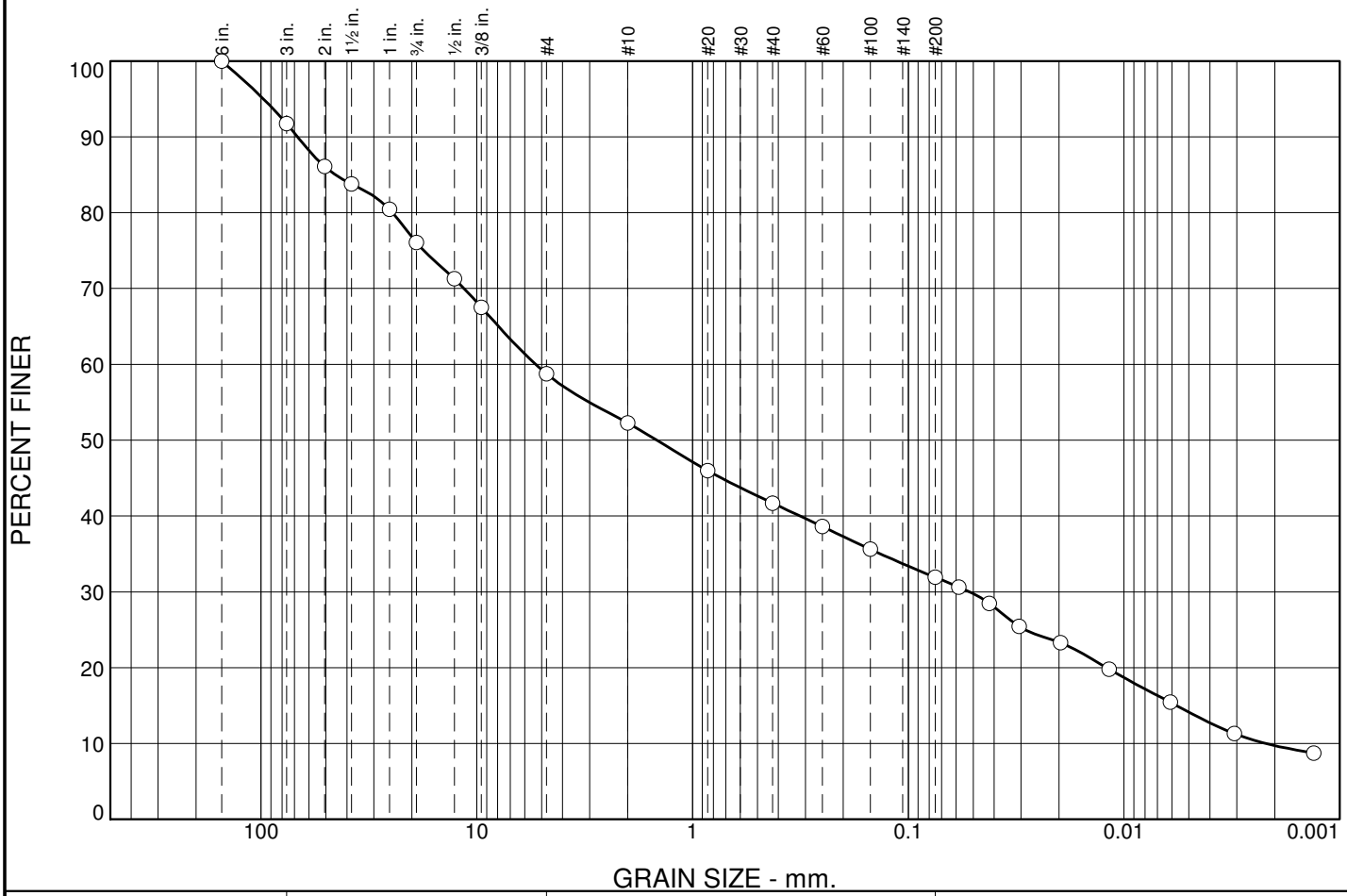
As received moisture 25.8%

Sample No.: SPT 5 **Source of Sample:** GH10-223 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 30-31.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
8	16	17	7	10	10	22	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6	100		
3	92		
2	86		
1.5	84		
1	80		
.75	76		
.5	71		
0.375	68		
#4	59		
#10	52		
#20	46		
#40	42		
#60	39		
#100	36		
#200	32		
0.0582 mm.	31		
0.0420 mm.	28		
0.0306 mm.	25		
0.0197 mm.	23		
0.0117 mm.	20		
0.0061 mm.	15		
0.0031 mm.	11		
0.0013 mm.	8.7		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 18 LL= 33 PI= 15

Coefficients

D_{85}= 45.2512 D_{60}= 5.3355 D_{50}= 1.4625
D_{30}= 0.0520 D_{15}= 0.0057 D_{10}= 0.0022
C_u= 2430.82 C_c= 0.23

Classification

USCS= GC AASHTO= A-2-6(1)

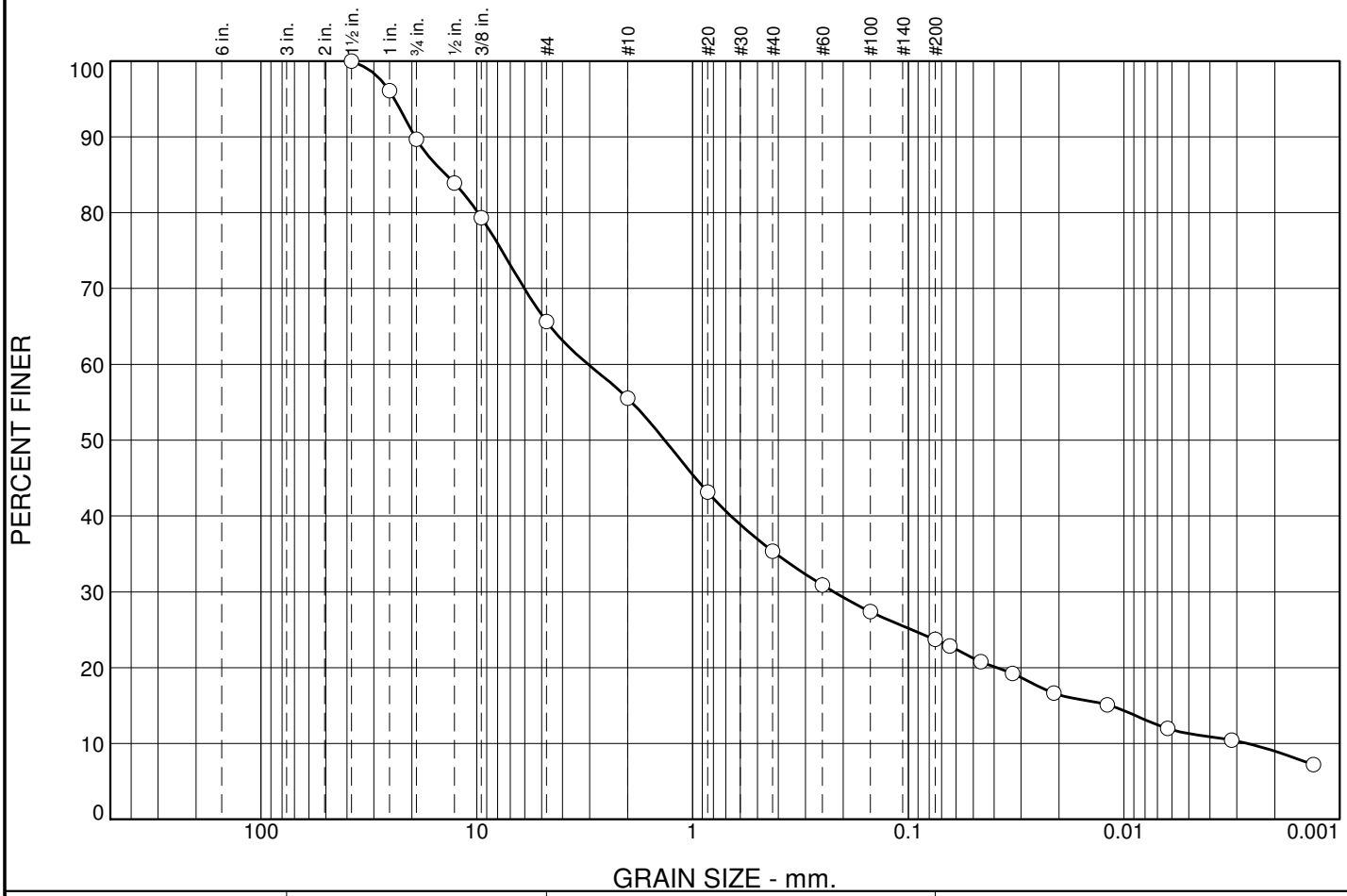
Remarks

Sample No.: Till **Source of Sample:** GH10-223 **Date:** 1/12/11
Location: Open Pit Area **Elev./Depth:** 35.0-38.0'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	10	24	10	21	11	15	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	96		
.75	90		
.5	84		
0.375	79		
#4	66		
#10	56		
#20	43		
#40	35		
#60	31		
#100	27		
#200	24		
0.0643 mm.	23		
0.0461 mm.	21		
0.0329 mm.	19		
0.0212 mm.	17		
0.0119 mm.	15		
0.0063 mm.	12		
0.0032 mm.	10		
0.0013 mm.	7.2		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 16 LL= 36 PI= 20

Coefficients

D_{85}= 13.8605 D_{60}= 3.0456 D_{50}= 1.3453
D_{30}= 0.2214 D_{15}= 0.0116 D_{10}= 0.0027
C_u= 1141.88 C_c= 6.03

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

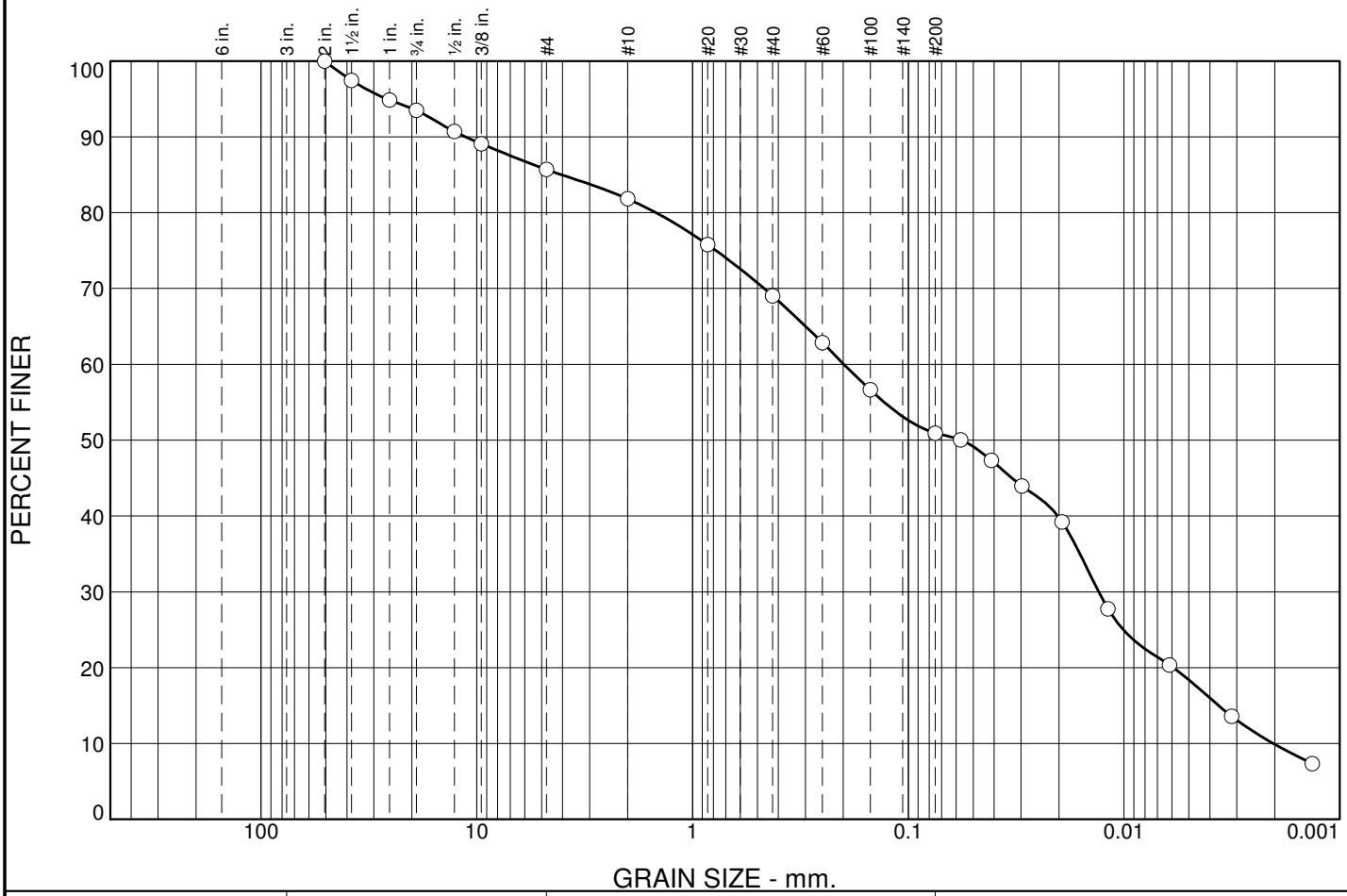
As received moisture 16.9%

Sample No.: SPT 7 **Source of Sample:** GH10-223 **Date:** 11/30/10
Location: Open Pit Area **Elev./Depth:** 40-41.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	7	7	4	13	18	41	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	97		
1	95		
.75	93		
.5	91		
0.375	89		
#4	86		
#10	82		
#20	76		
#40	69		
#60	63		
#100	57		
#200	51		
0.0572 mm.	50		
0.0412 mm.	47		
0.0297 mm.	44		
0.0193 mm.	39		
0.0119 mm.	28		
0.0061 mm.	20		
0.0032 mm.	14		
0.0013 mm.	7.4		

* (no specification provided)

Soil Description

sandy silty clay

Atterberg Limits

PL= 18 LL= 25 PI= 7

Coefficients

D_{85}= 4.0486 D_{60}= 0.1986 D_{50}= 0.0567
D_{30}= 0.0131 D_{15}= 0.0036 D_{10}= 0.0020
C_u= 97.71 C_c= 0.43

Classification

USCS= CL-ML AASHTO= A-4(1)

Remarks

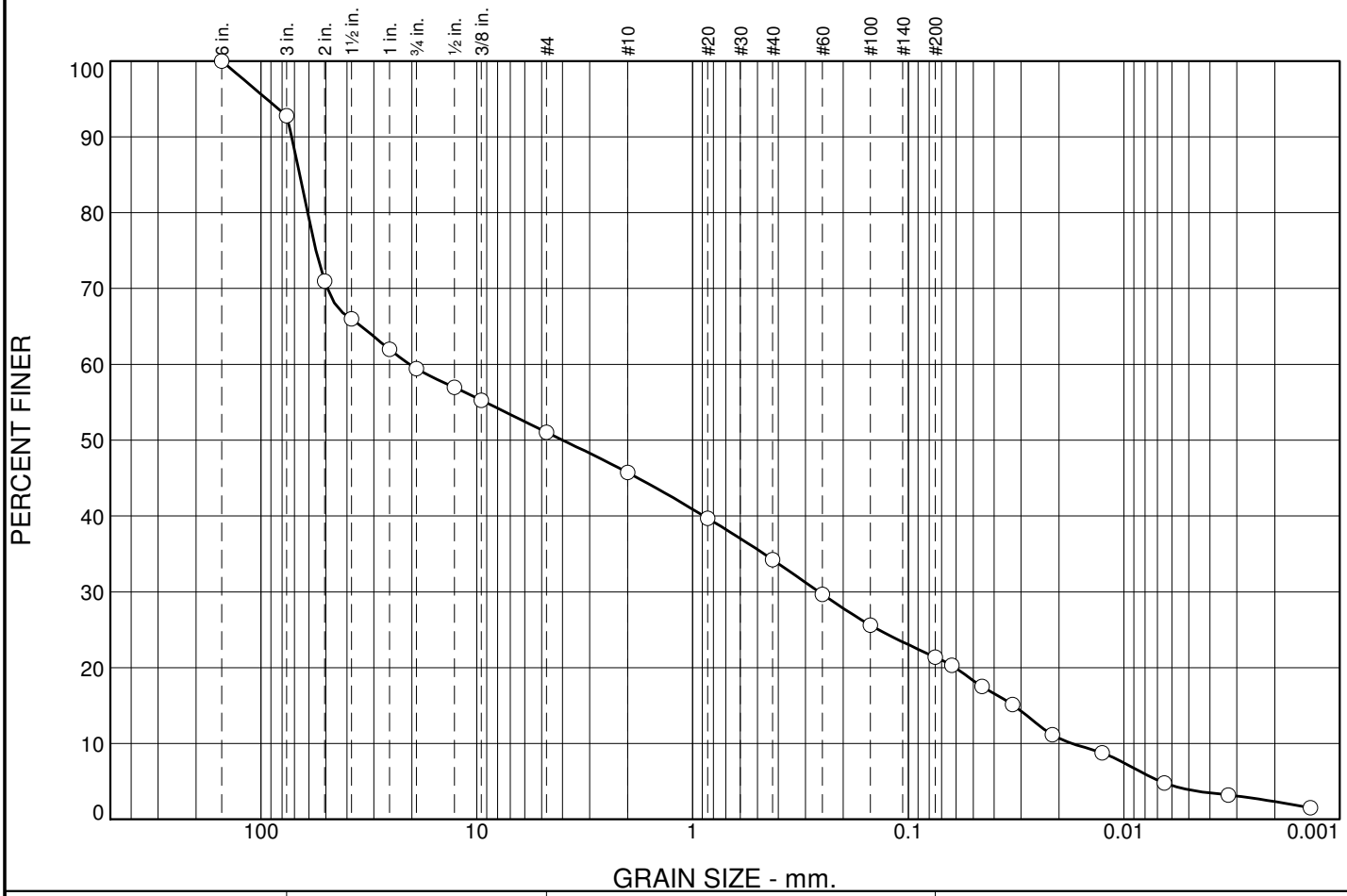
As received moisture 19.3%

Sample No.: Sump **Source of Sample:** GH10-224 **Date:** 12/1/10
Location: Open Pit Area **Elev./Depth:** 1-2'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
7	34	8	5	12	13	19	2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
6	100		
3	93		
2	71		
1.5	66		
1	62		
.75	59		
.5	57		
0.375	55		
#4	51		
#10	46		
#20	40		
#40	34		
#60	30		
#100	26		
#200	21		
0.0628 mm.	20		
0.0456 mm.	18		
0.0329 mm.	15		
0.0215 mm.	11		
0.0126 mm.	8.8		
0.0065 mm.	4.8		
0.0033 mm.	3.2		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

silty gravel with sand

Atterberg Limits

PL= NP LL= 21 PI= NP

Coefficients

D_{85}= 66.1075 D_{60}= 20.4680 D_{50}= 3.9978
D_{30}= 0.2594 D_{15}= 0.0324 D_{10}= 0.0175
C_u= 1172.53 C_c= 0.19

Classification

USCS= GM AASHTO= A-1-b

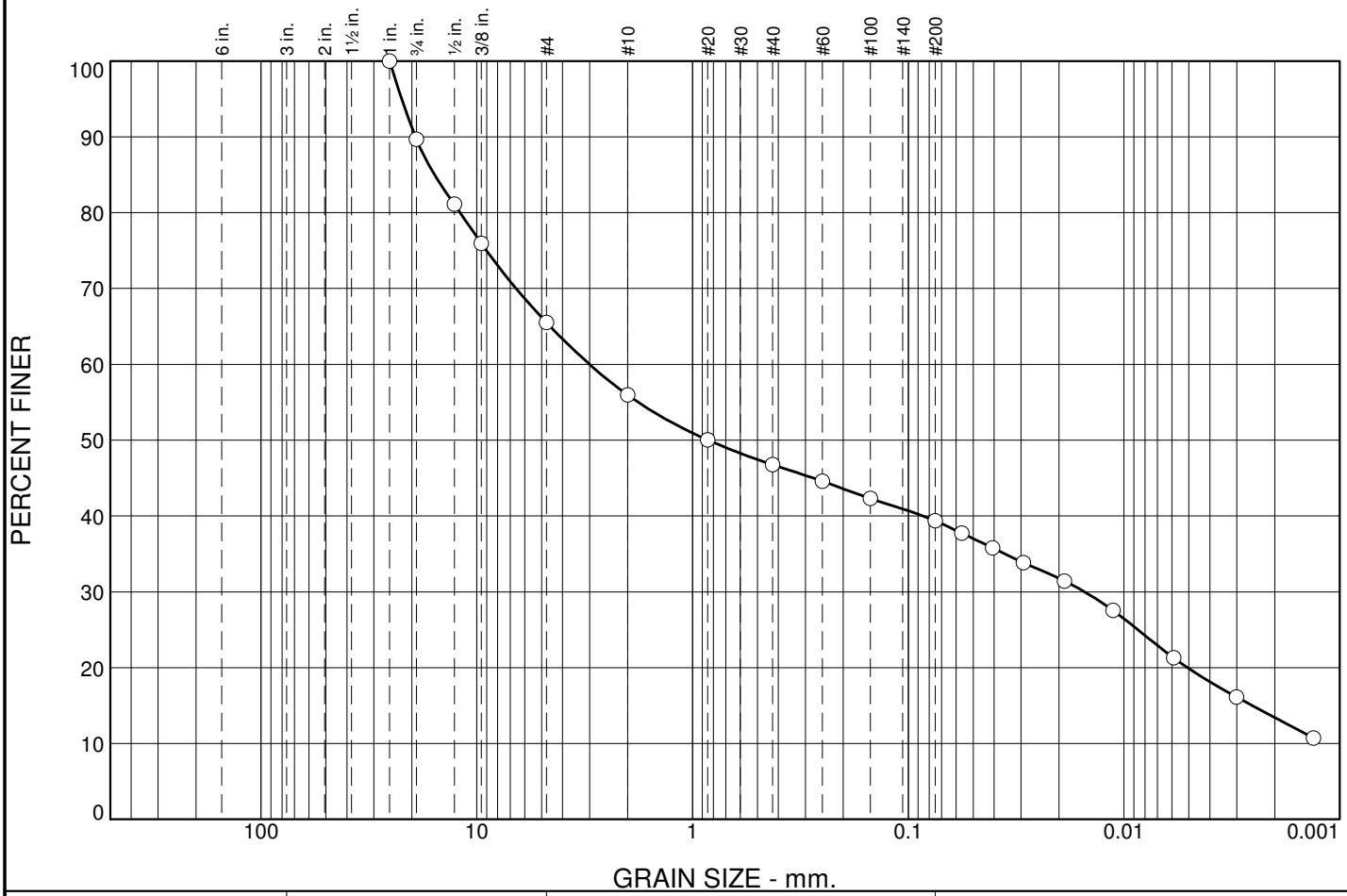
Remarks

Sample No.: SUMP **Source of Sample:** GH10-225 **Date:** 12/1/10
Location: AREA L **Elev./Depth:** Spoil Pile

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	10	24	10	9	8	26	13

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	90		
.5	81		
0.375	76		
#4	66		
#10	56		
#20	50		
#40	47		
#60	45		
#100	42		
#200	39		
0.0564 mm.	38		
0.0406 mm.	36		
0.0292 mm.	34		
0.0189 mm.	31		
0.0113 mm.	28		
0.0059 mm.	21		
0.0030 mm.	16		
0.0013 mm.	11		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 17 LL= 35 PI= 18

Coefficients

D_{85}= 15.7166 D_{60}= 3.0021 D_{50}= 0.8455
D_{30}= 0.0152 D_{15}= 0.0025 D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO= A-6(3)

Remarks

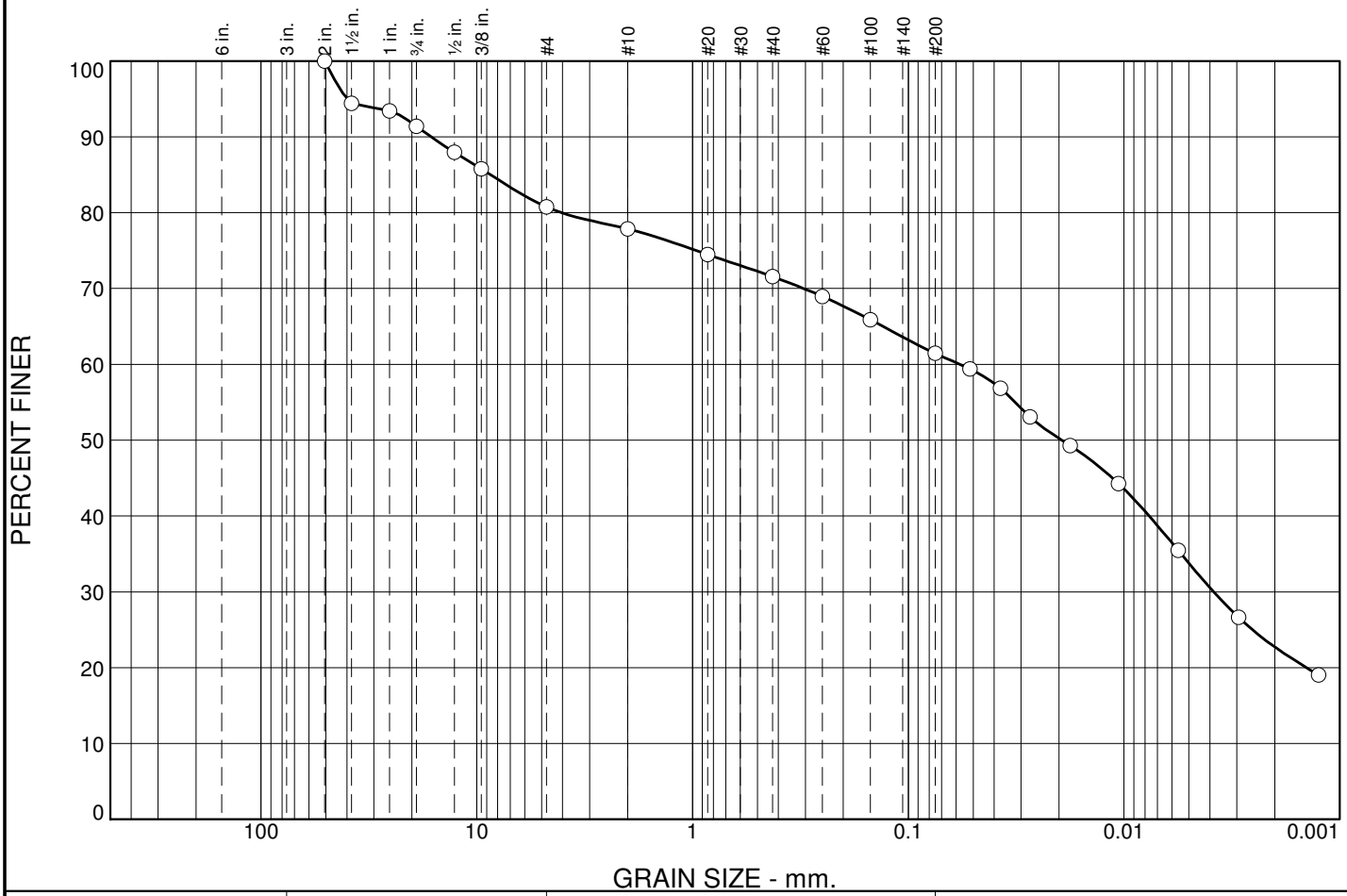
As received moisture 24.2%

Sample No.: SPT 1 **Source of Sample:** GH10-226 **Date:** 11/30/10
Location: Area A, Valley Bottom **Elev./Depth:** 5-6.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	10	3	6	11	38	23

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100		
1.5	94		
1	93		
.75	91		
.5	88		
0.375	86		
#4	81		
#10	78		
#20	74		
#40	72		
#60	69		
#100	66		
#200	61		
0.0518 mm.	59		
0.0374 mm.	57		
0.0273 mm.	53		
0.0177 mm.	49		
0.0106 mm.	44		
0.0056 mm.	35		
0.0029 mm.	27		
0.0013 mm.	19		

* (no specification provided)

Soil Description

sandy lean clay with gravel

Atterberg Limits

PL= 17 LL= 37 PI= 20

Coefficients

D_{85}= 8.6290 D_{60}= 0.0577 D_{50}= 0.0194
D_{30}= 0.0038 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

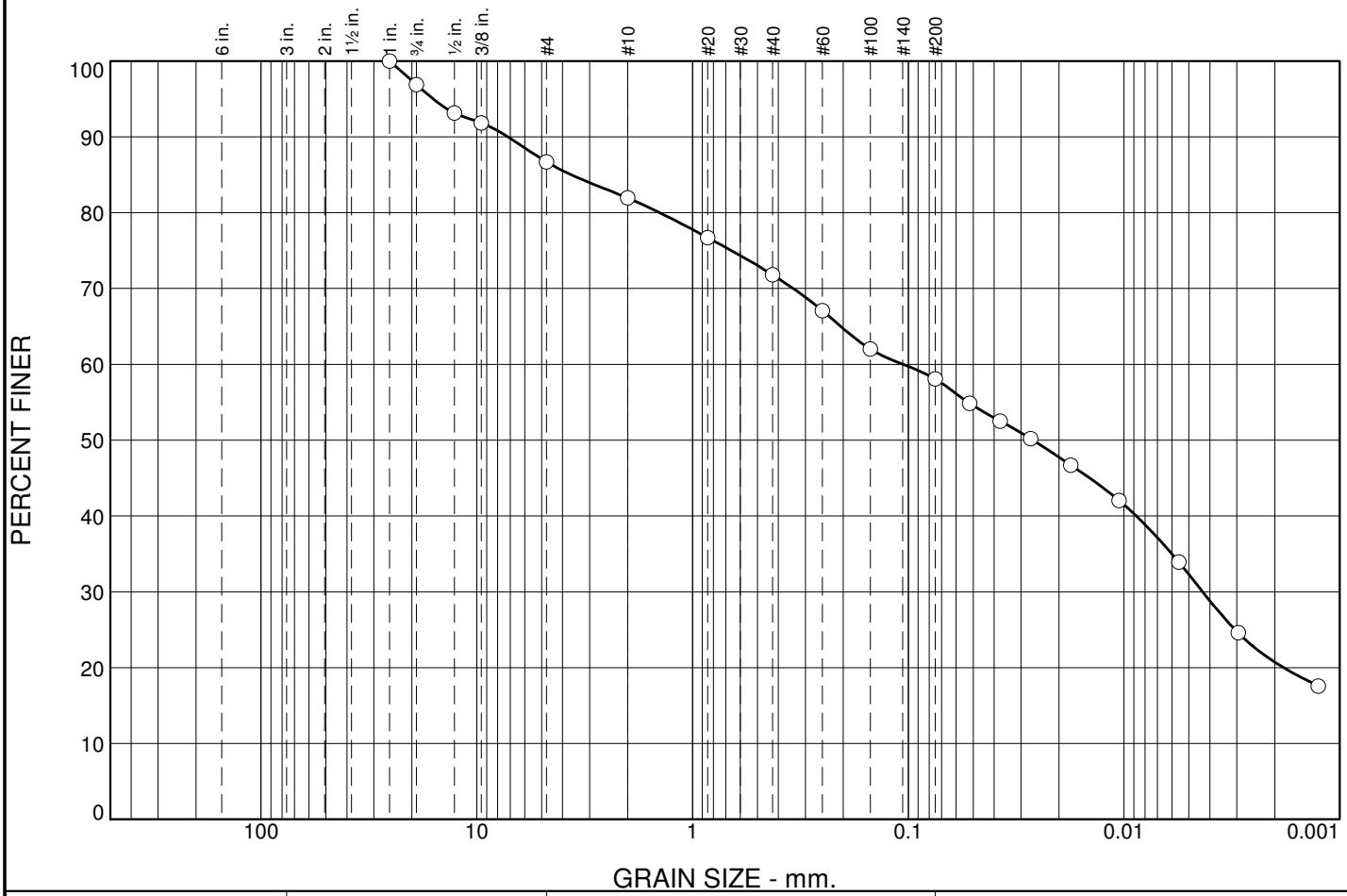
Composite of the entire shelby tube contents. As received moisture = 18.1%

Sample No.: 2 (Shelby) **Source of Sample:** GH10-226 **Date:** 12/10/10
Location: Area A, Valley Bottom **Elev./Depth:** 15-17'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	3	10	5	10	14	37	21

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	97		
.5	93		
0.375	92		
#4	87		
#10	82		
#20	77		
#40	72		
#60	67		
#100	62		
#200	58		
0.0519 mm.	55		
0.0375 mm.	53		
0.0271 mm.	50		
0.0176 mm.	47		
0.0105 mm.	42		
0.0056 mm.	34		
0.0030 mm.	25		
0.0013 mm.	18		

* (no specification provided)

Soil Description

sandy lean clay

Atterberg Limits

PL= 17 LL= 35 PI= 18

Coefficients

D_{85}= 3.6443 D_{60}= 0.1056 D_{50}= 0.0264
D_{30}= 0.0043 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

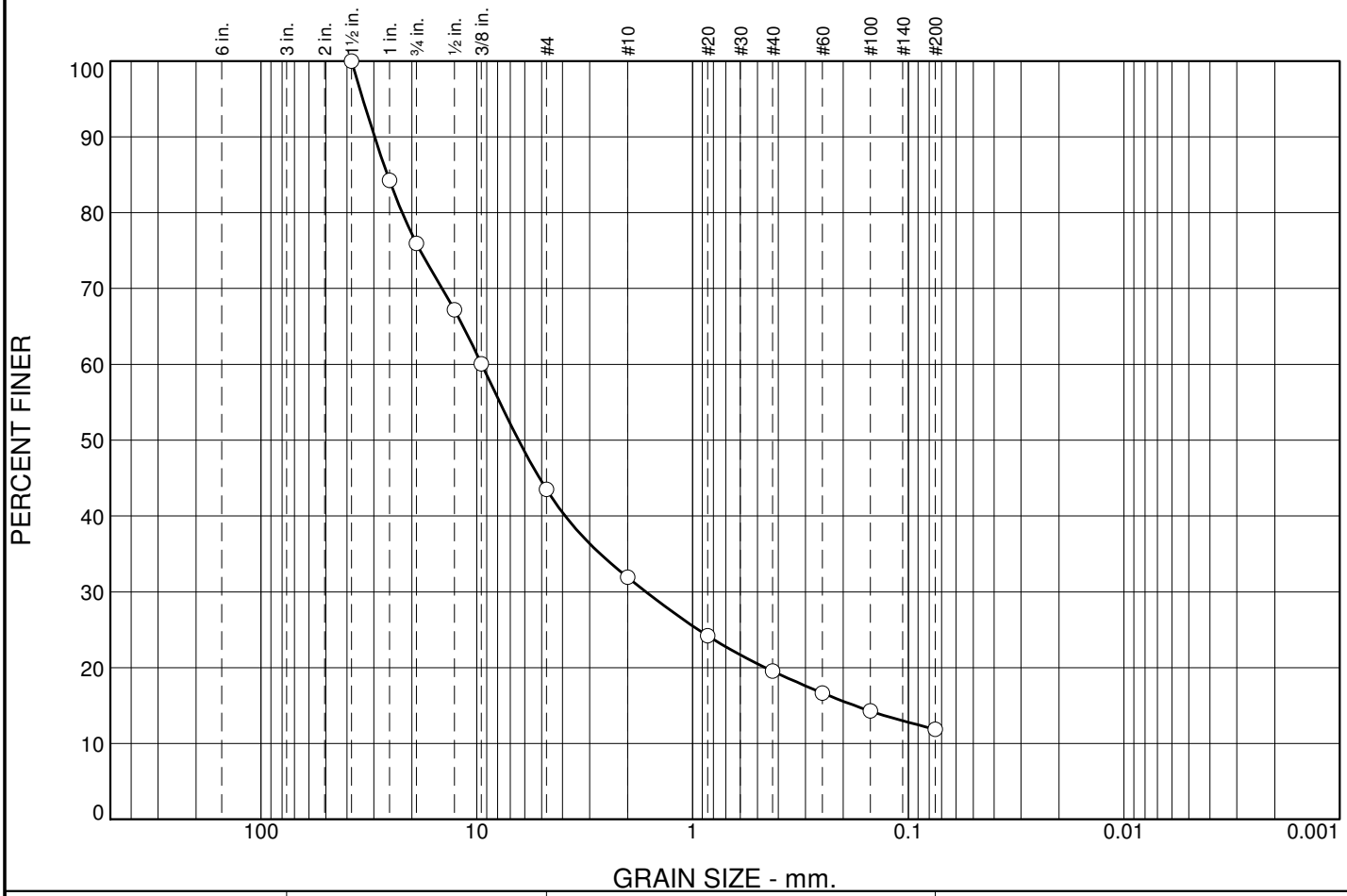
Composite of the entire shelby tube contents. As received moisture = 17.4%

Sample No.: 3 (Shelby) **Source of Sample:** GH10-226 **Date:** 12/13/10
Location: Area A, Valley Bottom **Elev./Depth:** 20-22'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	24	33	11	12	8	12	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	84		
.75	76		
.5	67		
0.375	60		
#4	43		
#10	32		
#20	24		
#40	20		
#60	17		
#100	14		
#200	12		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 25.9607 D_{60}= 9.4942 D_{50}= 6.3968
D_{30}= 1.6435 D_{15}= 0.1769 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

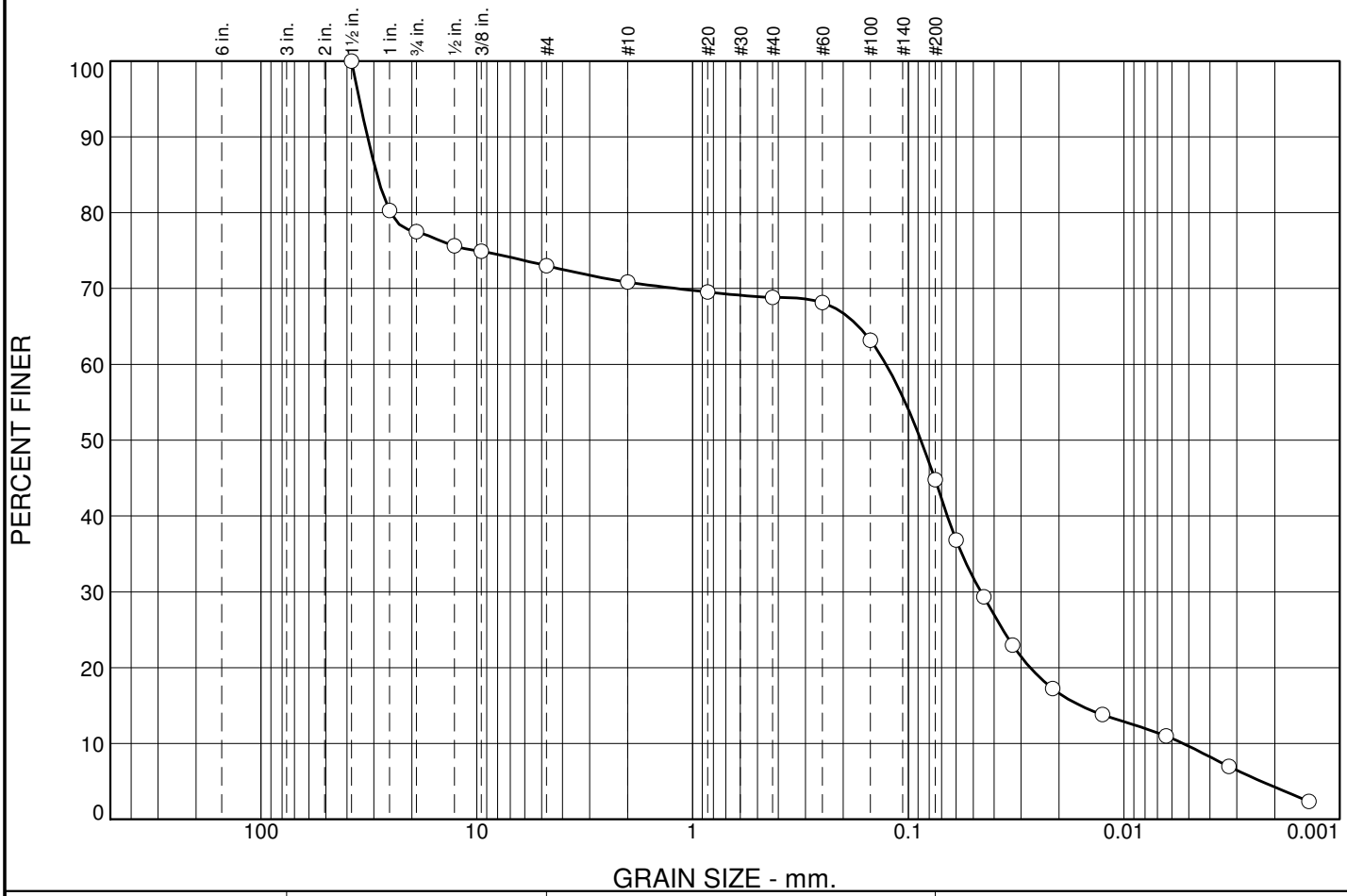
As received moisture 11.6%

Sample No.: SPT 3 **Source of Sample:** GH10-226 **Date:** 11/30/10
Location: Area A, Valley Bottom **Elev./Depth:** 30-31.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	23	4	2	2	24	41	4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	80		
.75	77		
.5	76		
0.375	75		
#4	73		
#10	71		
#20	70		
#40	69		
#60	68		
#100	63		
#200	45		
0.0600 mm.	37		
0.0446 mm.	29		
0.0328 mm.	23		
0.0214 mm.	17		
0.0126 mm.	14		
0.0064 mm.	11		
0.0033 mm.	7.0		
0.0014 mm.	2.4		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= NP LL= 27 PI= NP

Coefficients

D_{85}= 29.0053 D_{60}= 0.1268 D_{50}= 0.0874
D_{30}= 0.0460 D_{15}= 0.0159 D_{10}= 0.0053
C_u= 23.84 C_c= 3.14

Classification

USCS= SM AASHTO= A-4(0)

Remarks

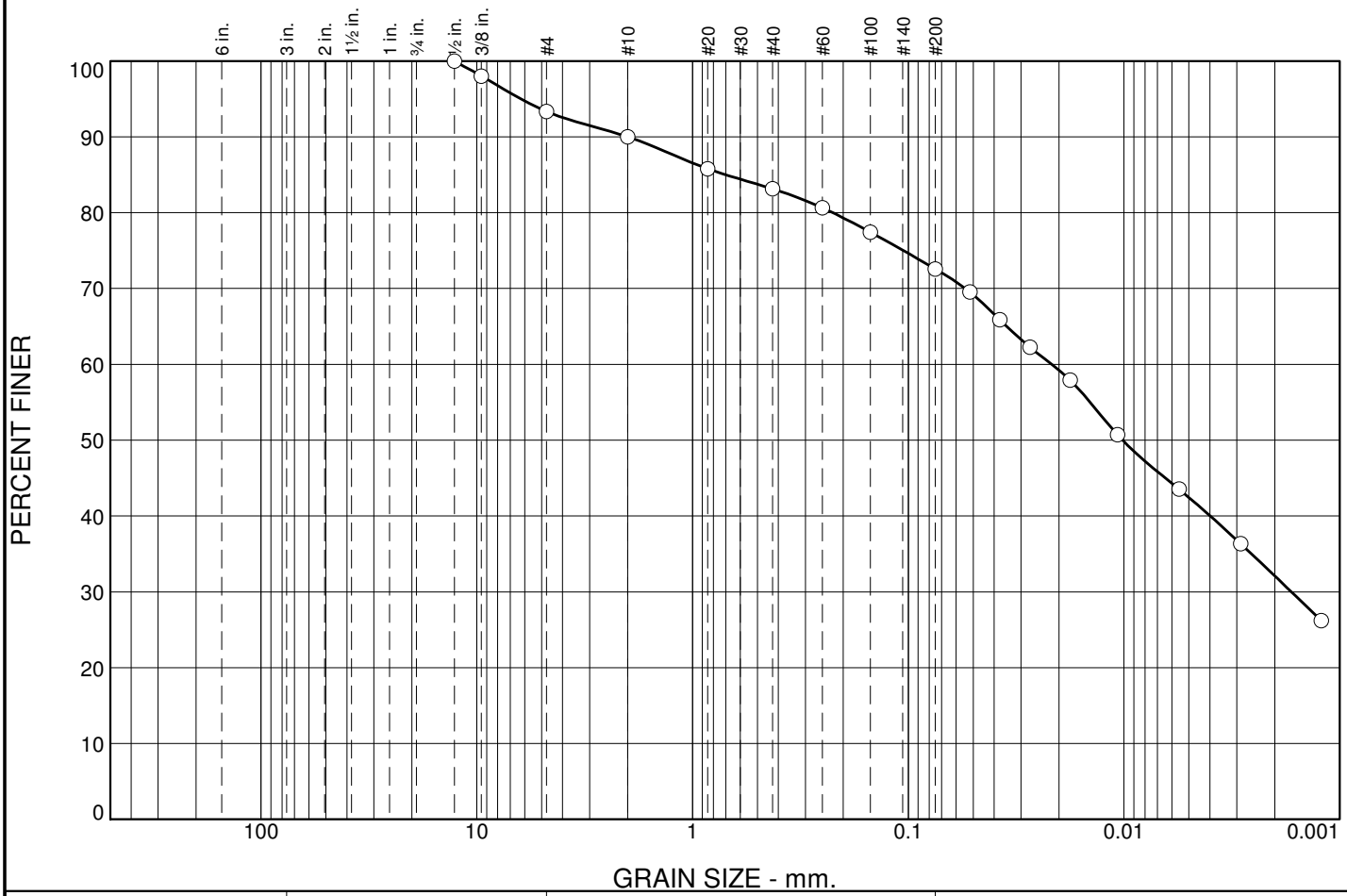
As received moisture 21.1%

Sample No.: SPT 5 **Source of Sample:** GH10-226 **Date:** 11/30/10
Location: Area A, Valley Bottom **Elev./Depth:** 43-44.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	7	3	7	10	41	32

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100		
0.375	98		
#4	93		
#10	90		
#20	86		
#40	83		
#60	81		
#100	77		
#200	73		
0.0518 mm.	70		
0.0376 mm.	66		
0.0273 mm.	62		
0.0178 mm.	58		
0.0107 mm.	51		
0.0056 mm.	44		
0.0029 mm.	36		
0.0012 mm.	26		

* (no specification provided)

Soil Description

lean clay with sand

Atterberg Limits

PL= 14 LL= 44 PI= 30

Coefficients

D_{85}= 0.7022 D_{60}= 0.0216 D_{50}= 0.0101
D_{30}= 0.0017 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

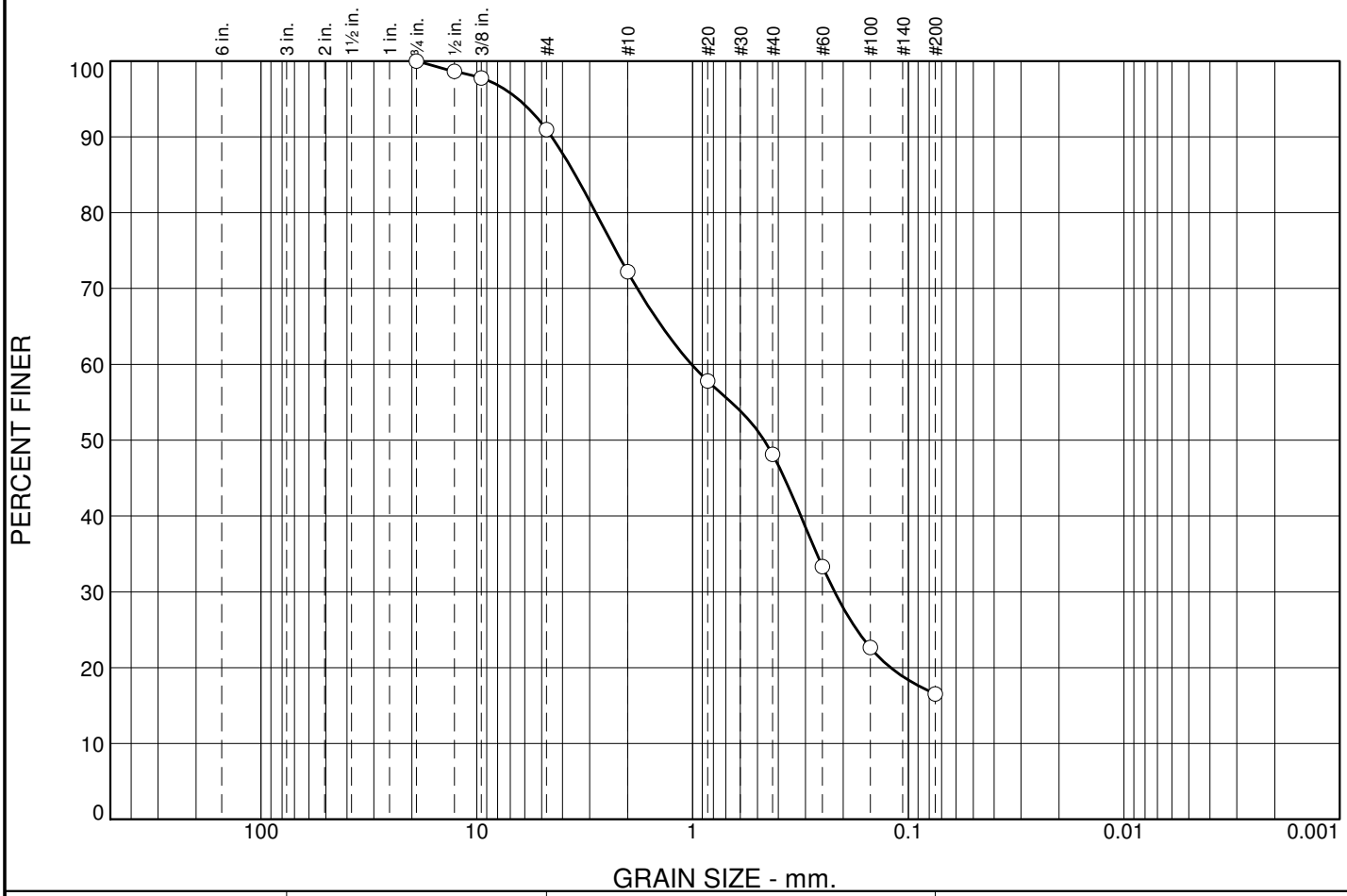
As received moisture 23.8%

Sample No.: SPT 7 **Source of Sample:** GH10-226 **Date:** 11/30/10
Location: Area A, Valley Bottom **Elev./Depth:** 53-54.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	9	19	24	31	17	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100		
.5	99		
0.375	98		
#4	91		
#10	72		
#20	58		
#40	48		
#60	33		
#100	23		
#200	17		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.5010 D_{60}= 1.0099 D_{50}= 0.4656
D_{30}= 0.2195 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

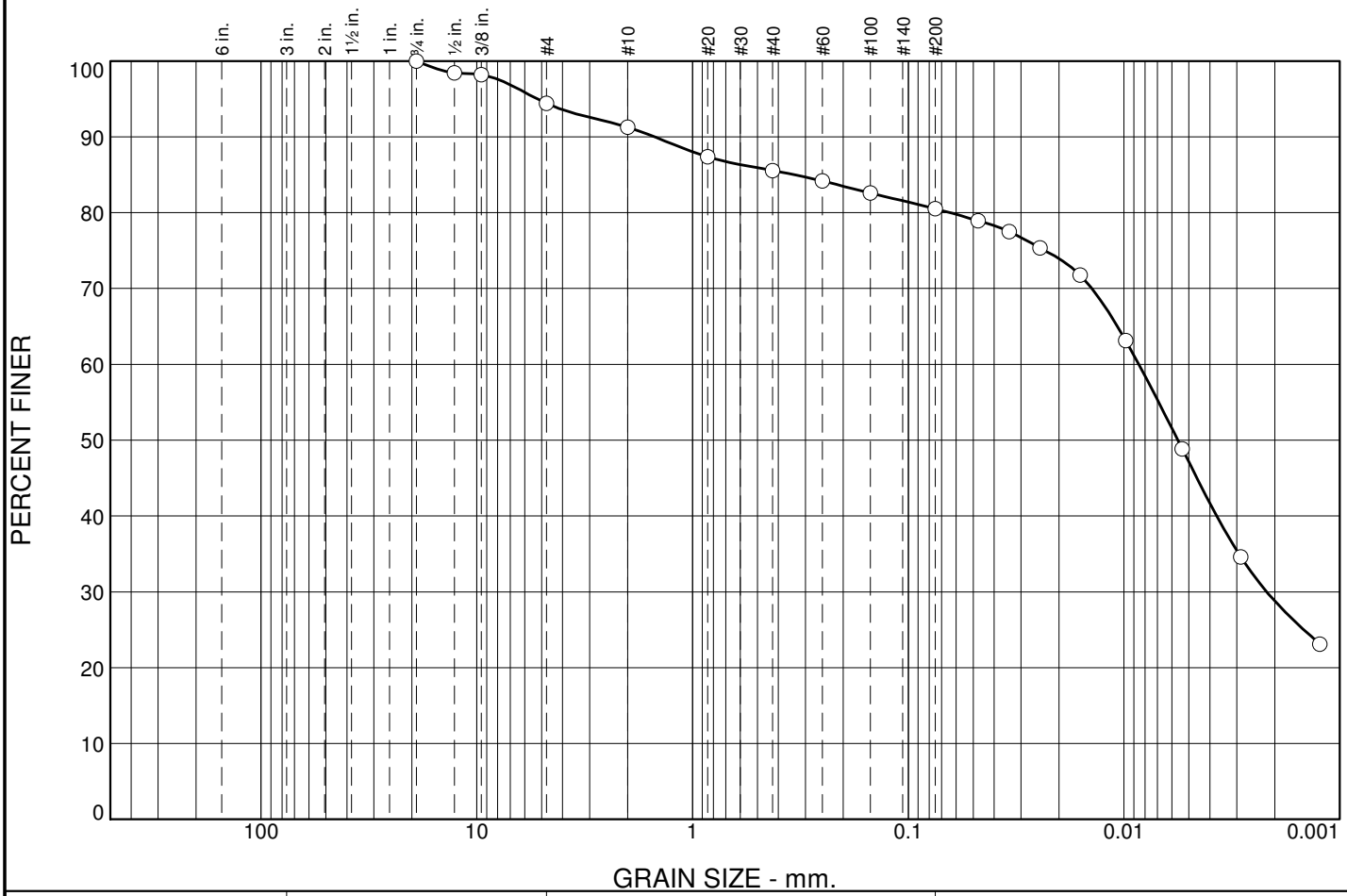
As received moisture 18.2%

Sample No.: SPT 8 **Source of Sample:** GH10-226 **Date:** 11/30/10
Location: Area A, Valley Bottom **Elev./Depth:** 58-59.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	6	3	5	5	52	29

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100		
.5	98		
0.375	98		
#4	94		
#10	91		
#20	87		
#40	86		
#60	84		
#100	83		
#200	81		
0.0475 mm.	79		
0.0340 mm.	78		
0.0245 mm.	75		
0.0160 mm.	72		
0.0098 mm.	63		
0.0054 mm.	49		
0.0029 mm.	35		
0.0012 mm.	23		

* (no specification provided)

Soil Description

lean clay with sand

Atterberg Limits

PL= 16 LL= 39 PI= 23

Coefficients

D_{85}= 0.3372 D_{60}= 0.0085 D_{50}= 0.0056
D_{30}= 0.0022 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

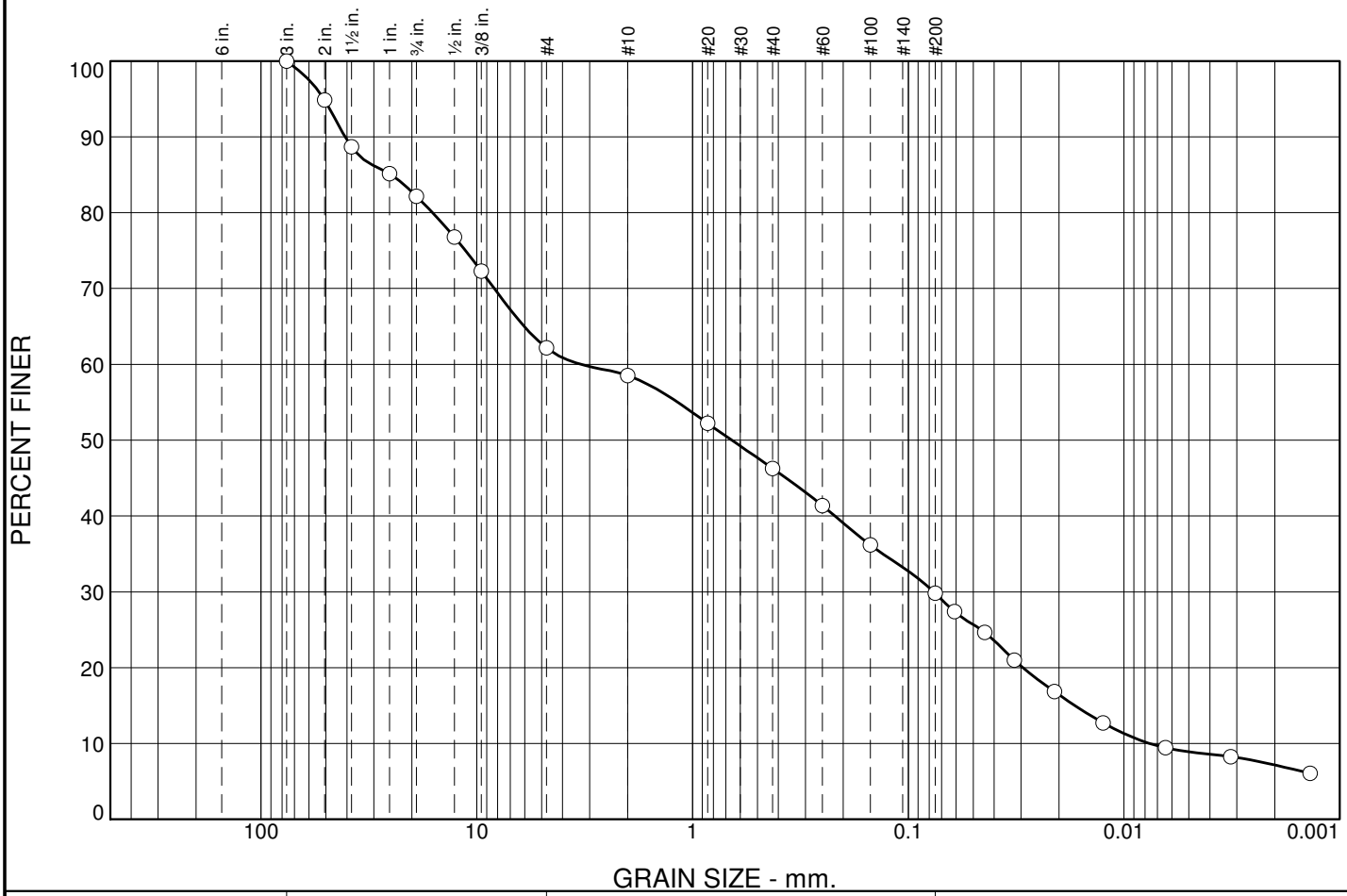
As received moisture 18.5%

Sample No.: SPT 10 **Source of Sample:** GH10-226 **Date:** 12/1/10
Location: Area A, Valley Bottom **Elev./Depth:** 70-71.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	18	20	3	13	16	23	7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	95		
1.5	89		
1	85		
.75	82		
.5	77		
0.375	72		
#4	62		
#10	59		
#20	52		
#40	46		
#60	41		
#100	36		
#200	30		
0.0611 mm.	27		
0.0442 mm.	25		
0.0322 mm.	21		
0.0210 mm.	17		
0.0125 mm.	13		
0.0064 mm.	9.4		
0.0032 mm.	8.3		
0.0014 mm.	6.0		

* (no specification provided)

Soil Description

silty clayey gravel with sand

Atterberg Limits

PL= 21 LL= 27 PI= 6

Coefficients

D_{85}= 24.9620 D_{60}= 3.2979 D_{50}= 0.6574
D_{30}= 0.0761 D_{15}= 0.0169 D_{10}= 0.0076
C_u= 435.28 C_c= 0.23

Classification

USCS= GC-GM AASHTO= A-2-4(0)

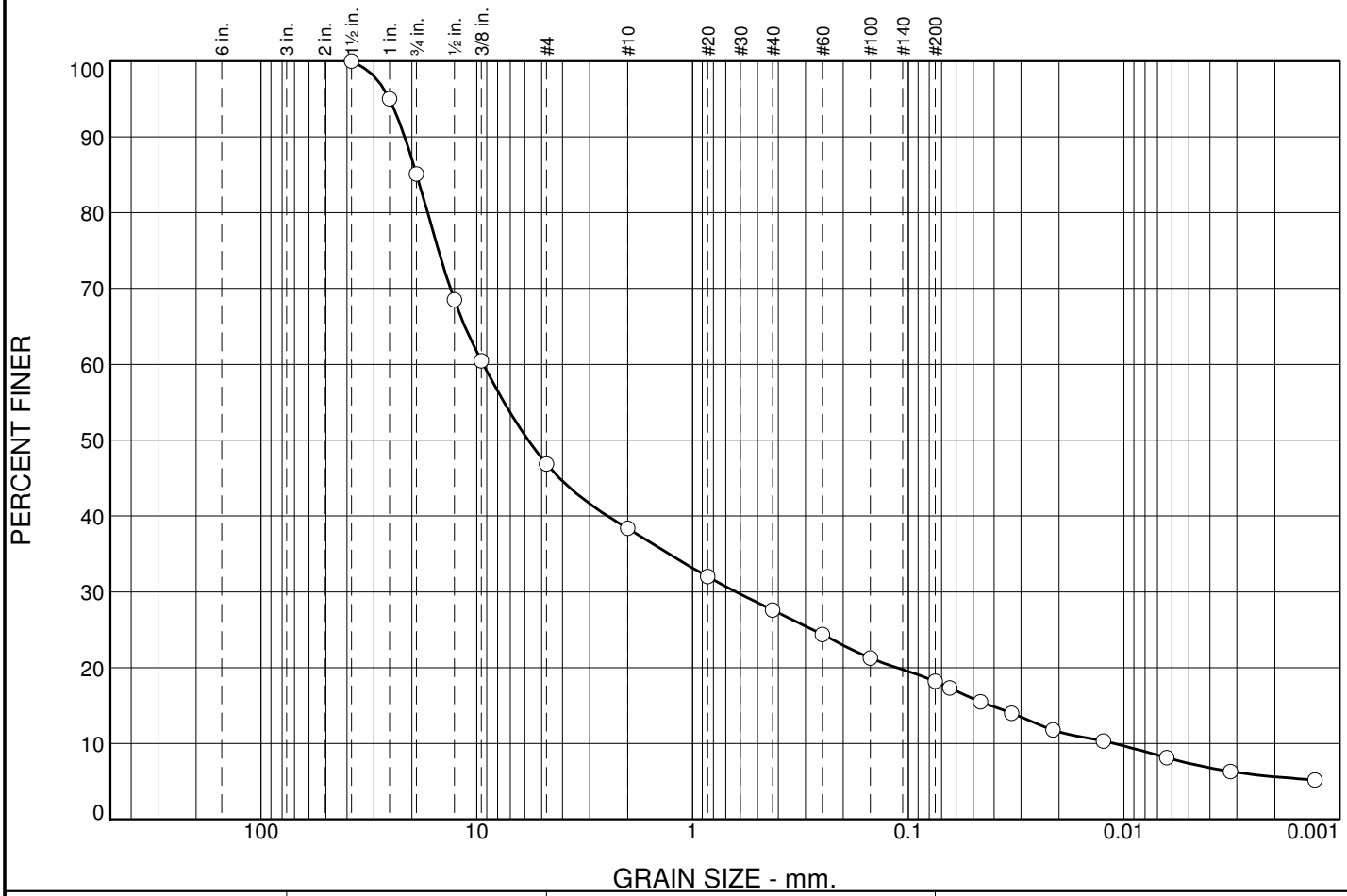
Remarks

Sample No.: Till **Source of Sample:** GH10-226 **Date:** 1/12/11
Location: Area A, Valley Bottom **Elev./Depth:** 81.75-84.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	38	9	10	10	12	6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	95		
.75	85		
.5	69		
0.375	60		
#4	47		
#10	38		
#20	32		
#40	28		
#60	24		
#100	21		
#200	18		
0.0642 mm.	17		
0.0462 mm.	15		
0.0331 mm.	14		
0.0213 mm.	12		
0.0125 mm.	10		
0.0063 mm.	8.1		
0.0032 mm.	6.3		
0.0013 mm.	5.2		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 14 LL= 26 PI= 12

Coefficients

D_{85}= 19.0120 D_{60}= 9.3329 D_{50}= 5.7727
D_{30}= 0.6286 D_{15}= 0.0416 D_{10}= 0.0111
C_u= 842.94 C_c= 3.82

Classification

USCS= GC AASHTO= A-2-6(0)

Remarks

As received moisture 10.1%

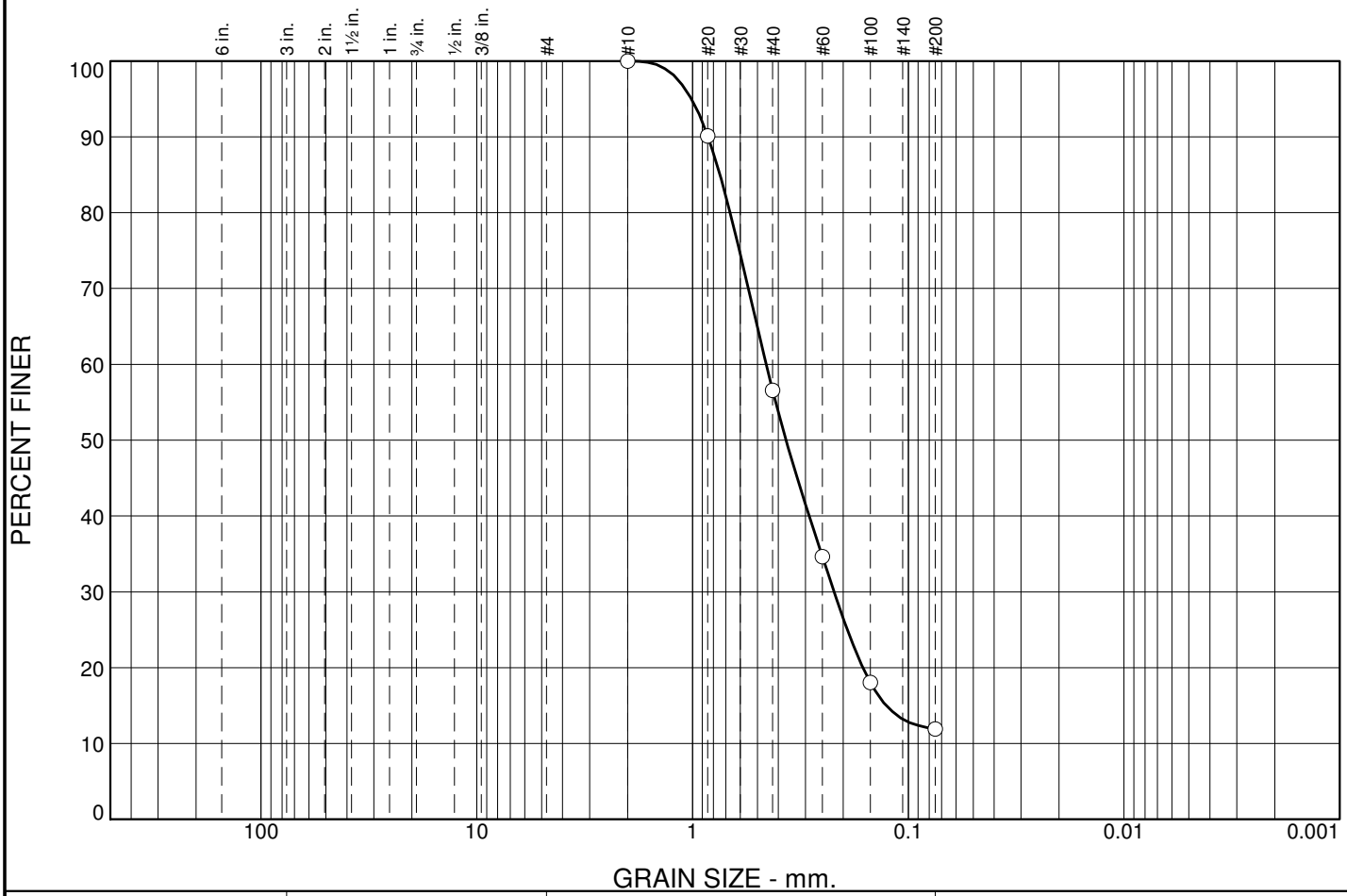
Sample No.: SPT 12 **Source of Sample:** GH10-226 **Date:** 12/1/10
Location: Area A, Valley Bottom **Elev./Depth:** 95-96.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project

Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	43	45	12	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	90		
#40	57		
#60	35		
#100	18		
#200	12		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.7458 D_{60}= 0.4555 D_{50}= 0.3683
D_{30}= 0.2206 D_{15}= 0.1264 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

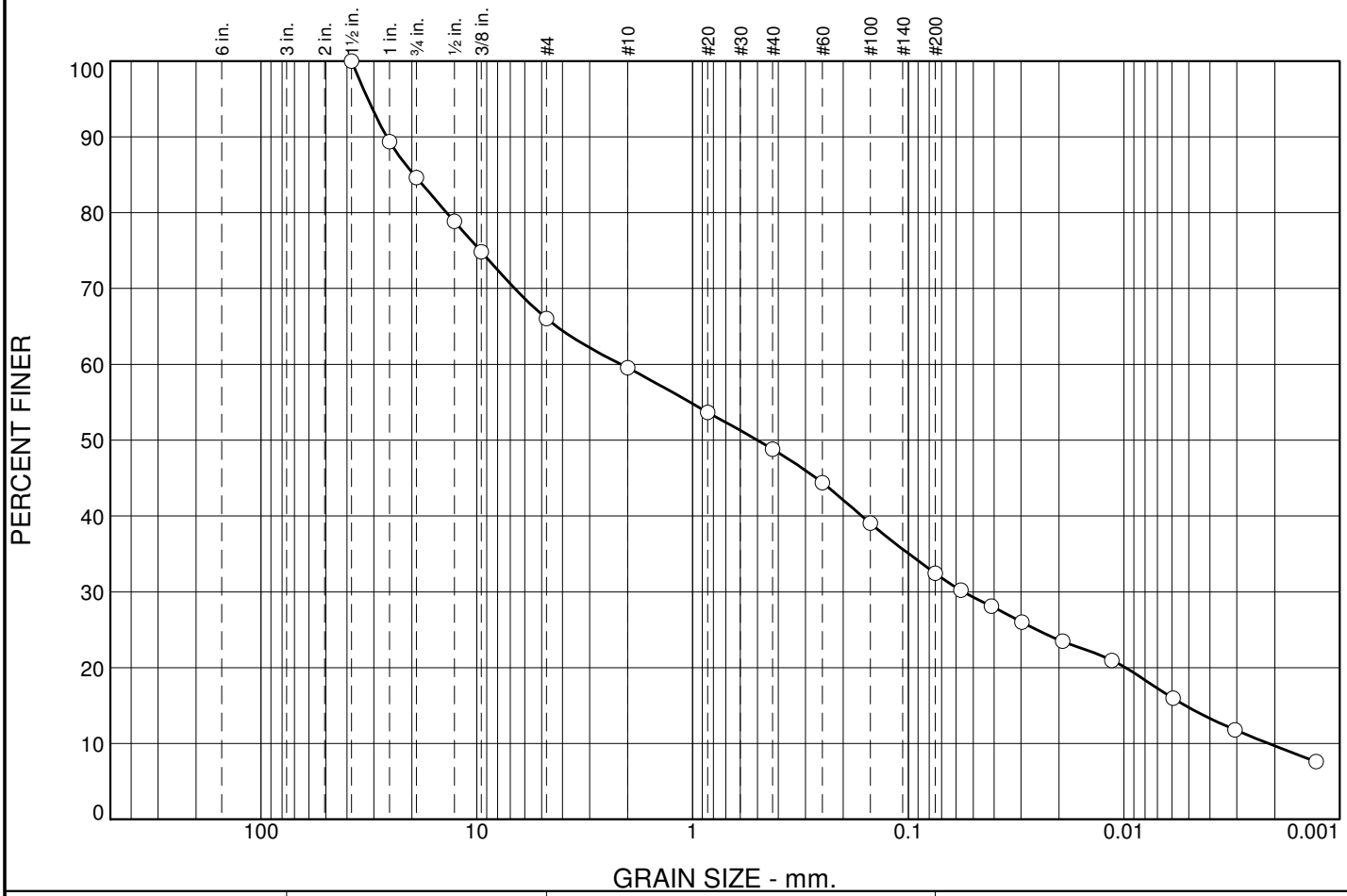
As received moisture 31.5%

Sample No.: SPT 17 **Source of Sample:** GH10-226 **Date:** 12/1/10
Location: Area A, Valley Bottom **Elev./Depth:** 155-156.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	15	19	6	11	17	22	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	89		
.75	85		
.5	79		
0.375	75		
#4	66		
#10	60		
#20	54		
#40	49		
#60	44		
#100	39		
#200	32		
0.0570 mm.	30		
0.0412 mm.	28		
0.0297 mm.	26		
0.0193 mm.	23		
0.0114 mm.	21		
0.0059 mm.	16		
0.0031 mm.	12		
0.0013 mm.	7.6		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 15 LL= 24 PI= 9

Coefficients

D_{85}= 19.5380 D_{60}= 2.1445 D_{50}= 0.5012
D_{30}= 0.0554 D_{15}= 0.0052 D_{10}= 0.0021
C_u= 1003.08 C_c= 0.67

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

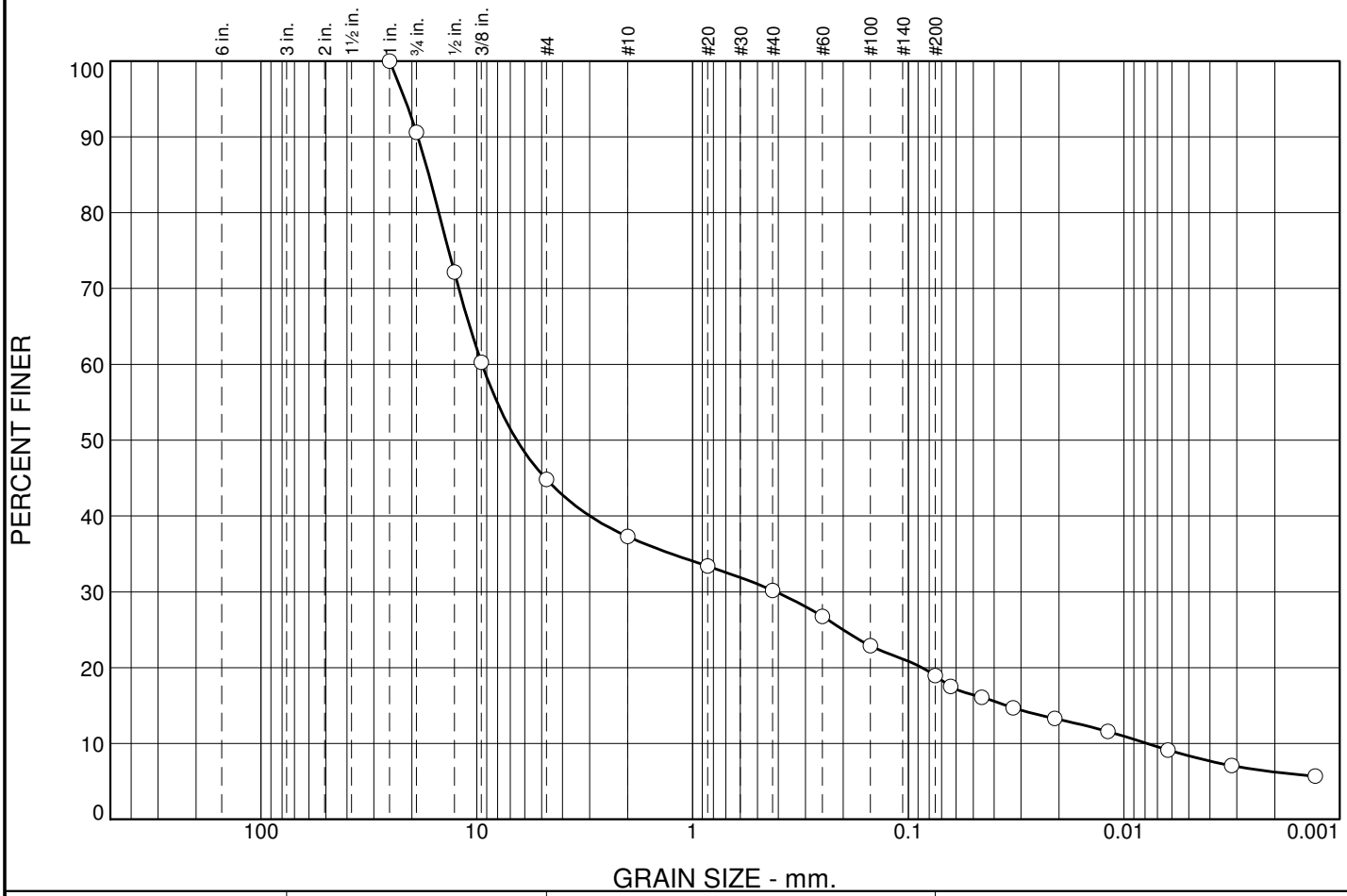
Composite of the entire shelby tube contents. As received moisture = 12.9%

Sample No.: 1 (Shelby) **Source of Sample:** GH10-227 **Date:** 12/23/10
Location: Upper Talarik Creek Area **Elev./Depth:** 5-7'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	46	8	7	11	13	6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100		
.75	91		
.5	72		
0.375	60		
#4	45		
#10	37		
#20	33		
#40	30		
#60	27		
#100	23		
#200	19		
0.0635 mm.	18		
0.0456 mm.	16		
0.0327 mm.	15		
0.0210 mm.	13		
0.0119 mm.	12		
0.0062 mm.	9.2		
0.0032 mm.	7.1		
0.0013 mm.	5.7		

* (no specification provided)

Soil Description

clayey gravel with sand

Atterberg Limits

PL= 13 LL= 25 PI= 12

Coefficients

D_{85}= 16.6933 D_{60}= 9.4521 D_{50}= 6.5233
D_{30}= 0.4108 D_{15}= 0.0350 D_{10}= 0.0078
C_u= 1211.48 C_c= 2.29

Classification

USCS= GC AASHTO= A-2-6(0)

Remarks

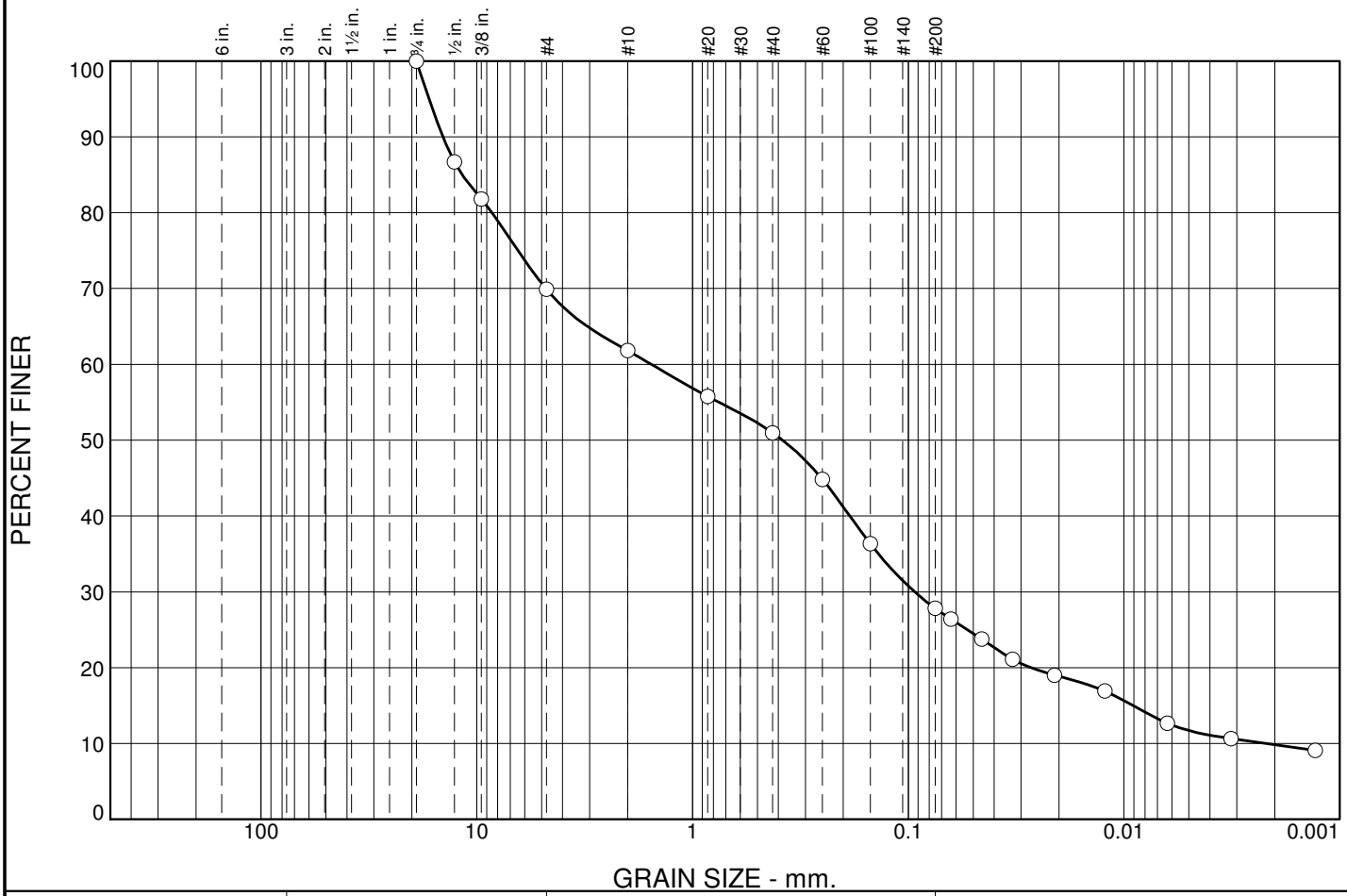
As received moisture 13.0%

Sample No.: SPT 1 **Source of Sample:** GH10-227 **Date:** 12/1/10
Location: Upper Talarik Creek Area **Elev./Depth:** 10-11.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	30	8	11	23	18	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100		
.5	87		
0.375	82		
#4	70		
#10	62		
#20	56		
#40	51		
#60	45		
#100	36		
#200	28		
0.0634 mm.	26		
0.0456 mm.	24		
0.0328 mm.	21		
0.0210 mm.	19		
0.0123 mm.	17		
0.0063 mm.	13		
0.0032 mm.	11		
0.0013 mm.	9.1		

* (no specification provided)

Soil Description

clayey sand with gravel

Atterberg Limits

PL= 13 LL= 25 PI= 12

Coefficients

D_{85}= 11.6798 D_{60}= 1.5526 D_{50}= 0.3822
D_{30}= 0.0934 D_{15}= 0.0091 D_{10}= 0.0022
C_u= 704.84 C_c= 2.55

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

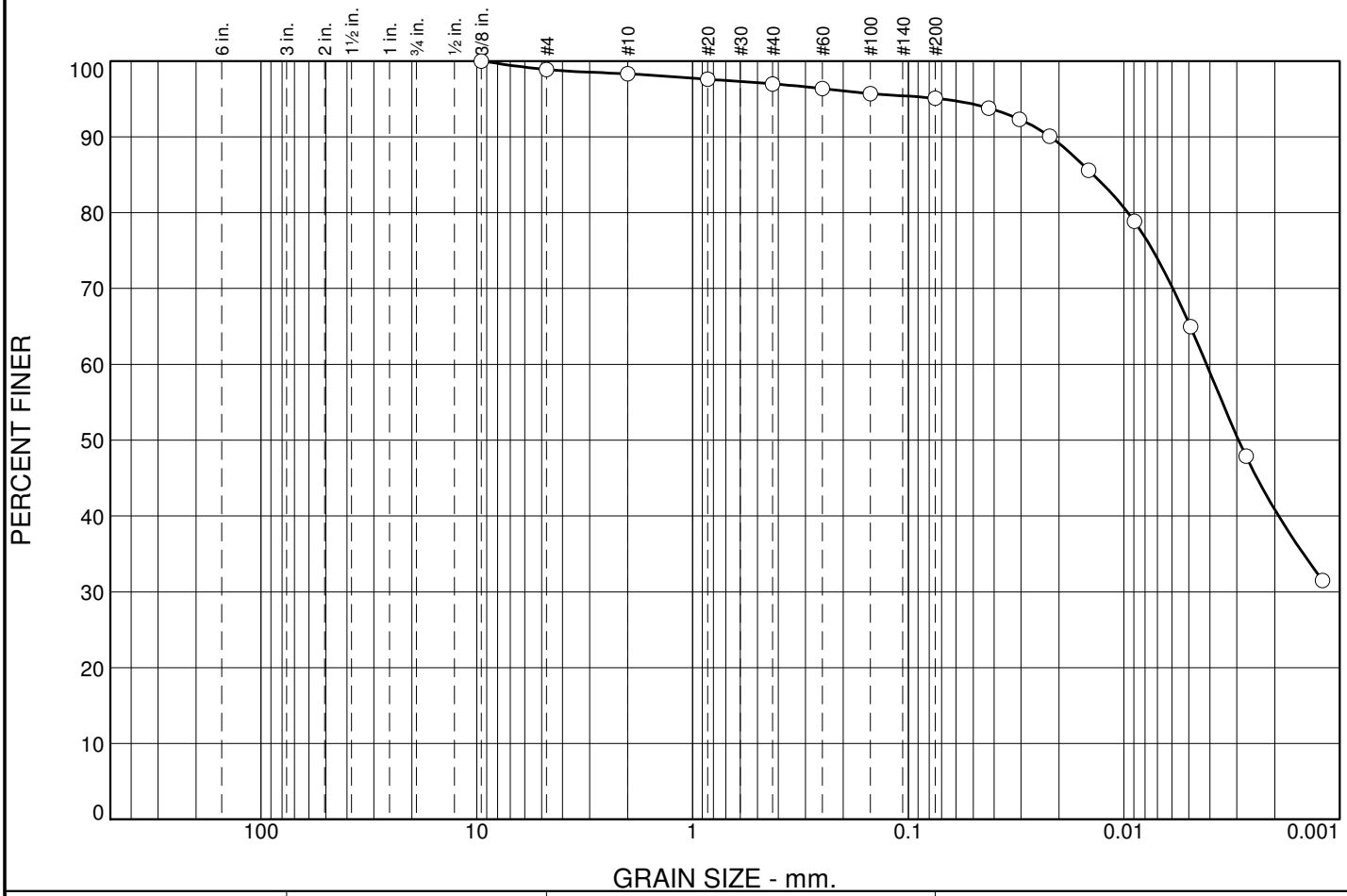
As received moisture 14.7%

Sample No.: SPT 3 **Source of Sample:** GH10-227 **Date:** 12/1/10
Location: Upper Talarik Creek Area **Elev./Depth:** 20-21.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	1	1	2	54	41

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100		
#4	99		
#10	98		
#20	98		
#40	97		
#60	96		
#100	96		
#200	95		
0.0424 mm.	94		
0.0305 mm.	92		
0.0221 mm.	90		
0.0146 mm.	86		
0.0089 mm.	79		
0.0049 mm.	65		
0.0027 mm.	48		
0.0012 mm.	32		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 19 LL= 37 PI= 18

Coefficients

D_{85}= 0.0139 D_{60}= 0.0041 D_{50}= 0.0029
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

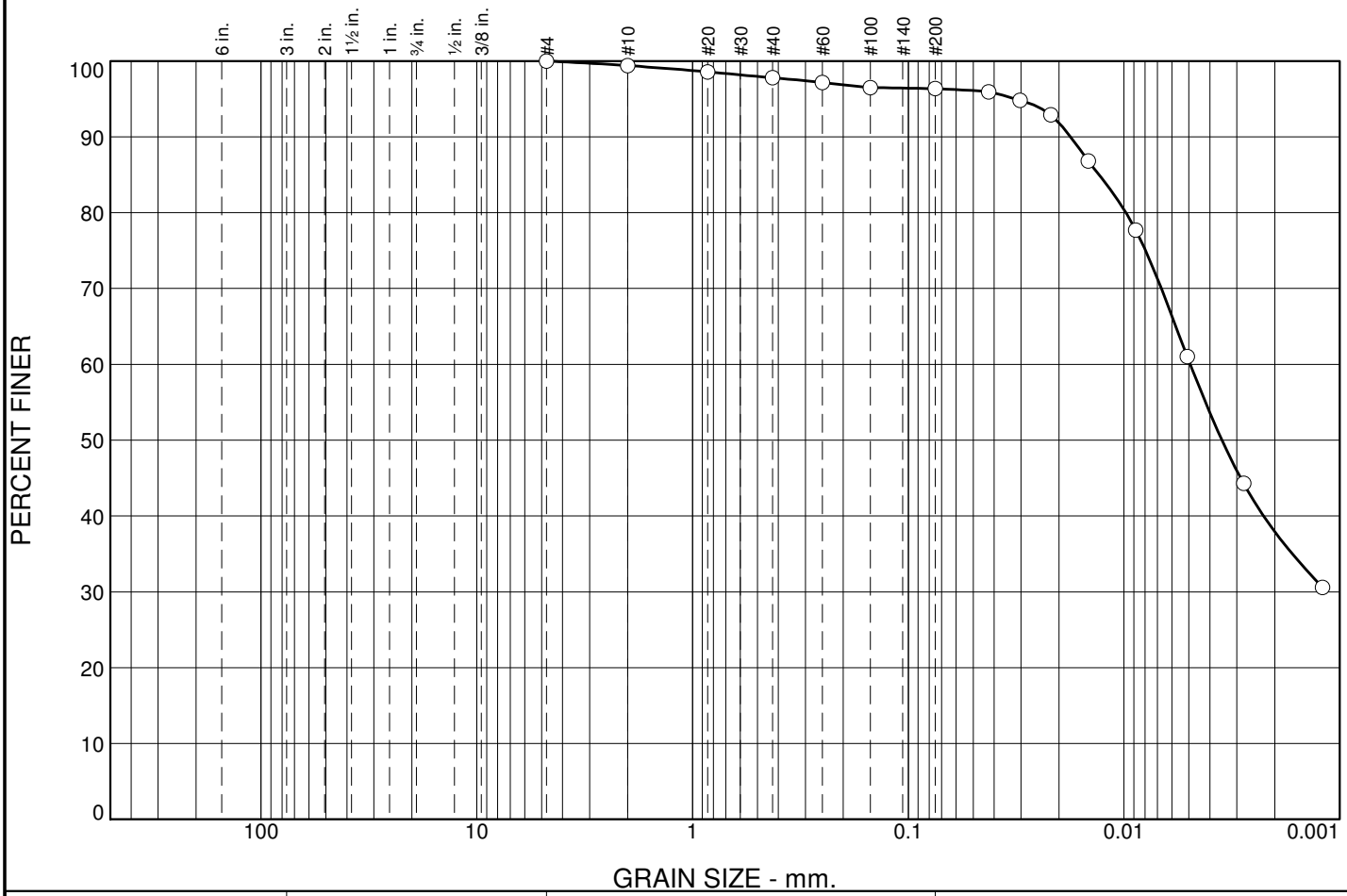
Composite of the entire shelby tube contents. As received moisture = 24.7%

Sample No.: 1 (Shelby) **Source of Sample:** GH10-228 **Date:** 12/23/10
Location: Upper Talarik Creek Area **Elev./Depth:** 5-7'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	1	2	58	38

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	99		
#20	99		
#40	98		
#60	97		
#100	96		
#200	96		
0.0423 mm.	96		
0.0303 mm.	95		
0.0219 mm.	93		
0.0146 mm.	87		
0.0088 mm.	78		
0.0051 mm.	61		
0.0028 mm.	44		
0.0012 mm.	31		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 19 LL= 36 PI= 17

Coefficients

D_{85}= 0.0131 D_{60}= 0.0049 D_{50}= 0.0035
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(17)

Remarks

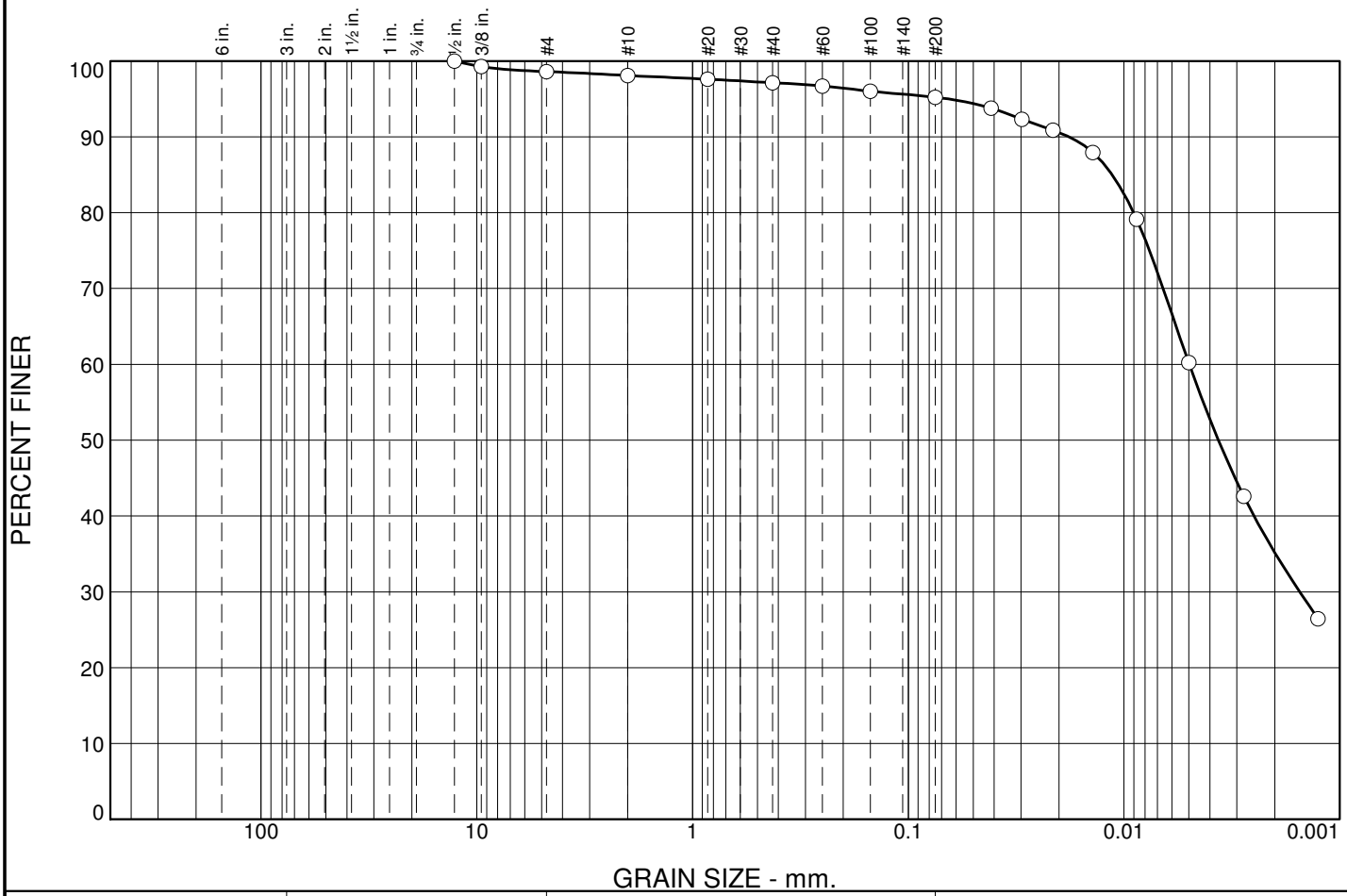
As received moisture 30.3%

Sample No.: SPT 1 **Source of Sample:** GH10-228 **Date:** 12/1/10
Location: Upper Talarik Creek Area **Elev./Depth:** 7-8.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	1	1	2	60	35

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100		
0.375	99		
#4	99		
#10	98		
#20	98		
#40	97		
#60	97		
#100	96		
#200	95		
0.0413 mm.	94		
0.0297 mm.	92		
0.0214 mm.	91		
0.0139 mm.	88		
0.0087 mm.	79		
0.0050 mm.	60		
0.0028 mm.	43		
0.0013 mm.	26		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 19 LL= 37 PI= 18

Coefficients

D_{85}= 0.0113 D_{60}= 0.0050 D_{50}= 0.0036
D_{30}= 0.0015 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

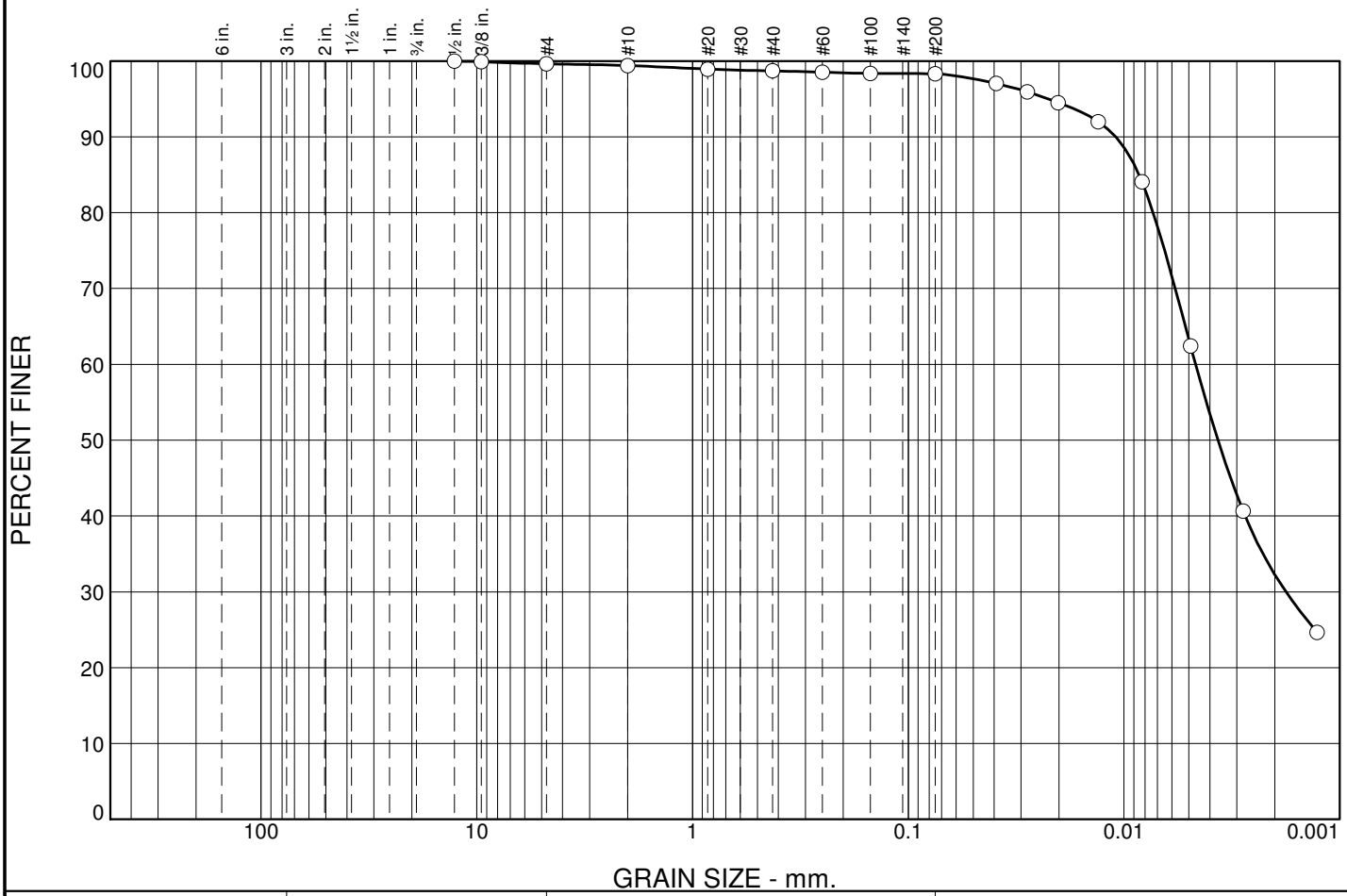
Remarks

Sample No.: ST 2 **Source of Sample:** GH10-228 **Date:** 1/13/11
Location: Upper Talarik Creek Area **Elev./Depth:** 10-12'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	0	1	66	32

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5	100		
0.375	100		
#4	100		
#10	99		
#20	99		
#40	99		
#60	99		
#100	98		
#200	98		
0.0391 mm.	97		
0.0280 mm.	96		
0.0202 mm.	94		
0.0131 mm.	92		
0.0082 mm.	84		
0.0049 mm.	62		
0.0028 mm.	41		
0.0013 mm.	25		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 20 LL= 32 PI= 12

Coefficients

D_{85}= 0.0085 D_{60}= 0.0047 D_{50}= 0.0037
D_{30}= 0.0018 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

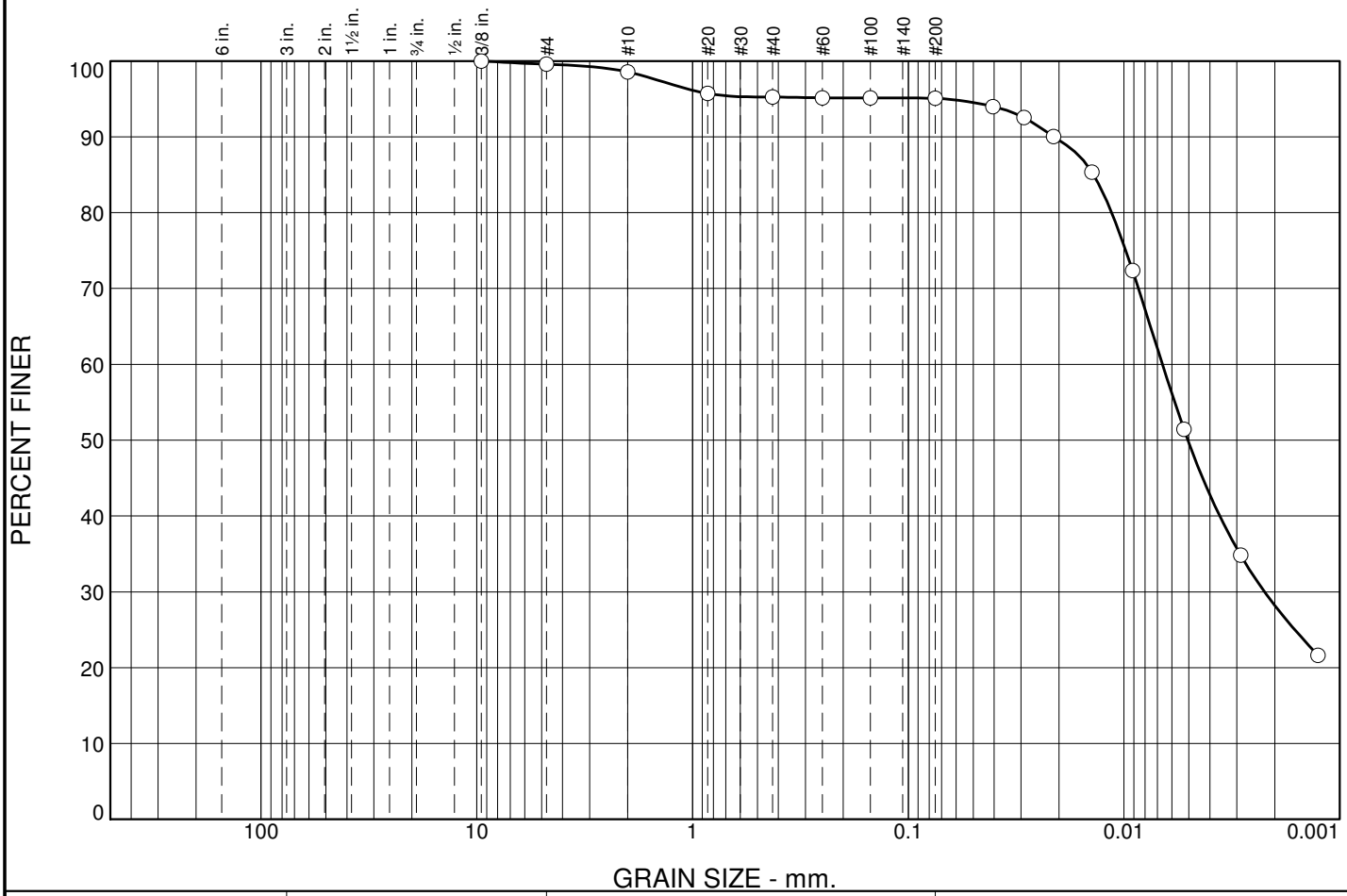
Remarks

Sample No.: ST 3 **Source of Sample:** GH10-228 **Date:** 1/24/11
Location: Upper Talarik Creek Area **Elev./Depth:** 15-17'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	4	0	67	28

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100		
#4	100		
#10	99		
#20	96		
#40	95		
#60	95		
#100	95		
#200	95		
0.0405 mm.	94		
0.0291 mm.	93		
0.0212 mm.	90		
0.0141 mm.	85		
0.0091 mm.	72		
0.0053 mm.	51		
0.0029 mm.	35		
0.0013 mm.	22		

* (no specification provided)

Soil Description

lean clay

Atterberg Limits

PL= 19 LL= 30 PI= 11

Coefficients

D_{85}= 0.0139 D_{60}= 0.0066 D_{50}= 0.0051
D_{30}= 0.0022 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

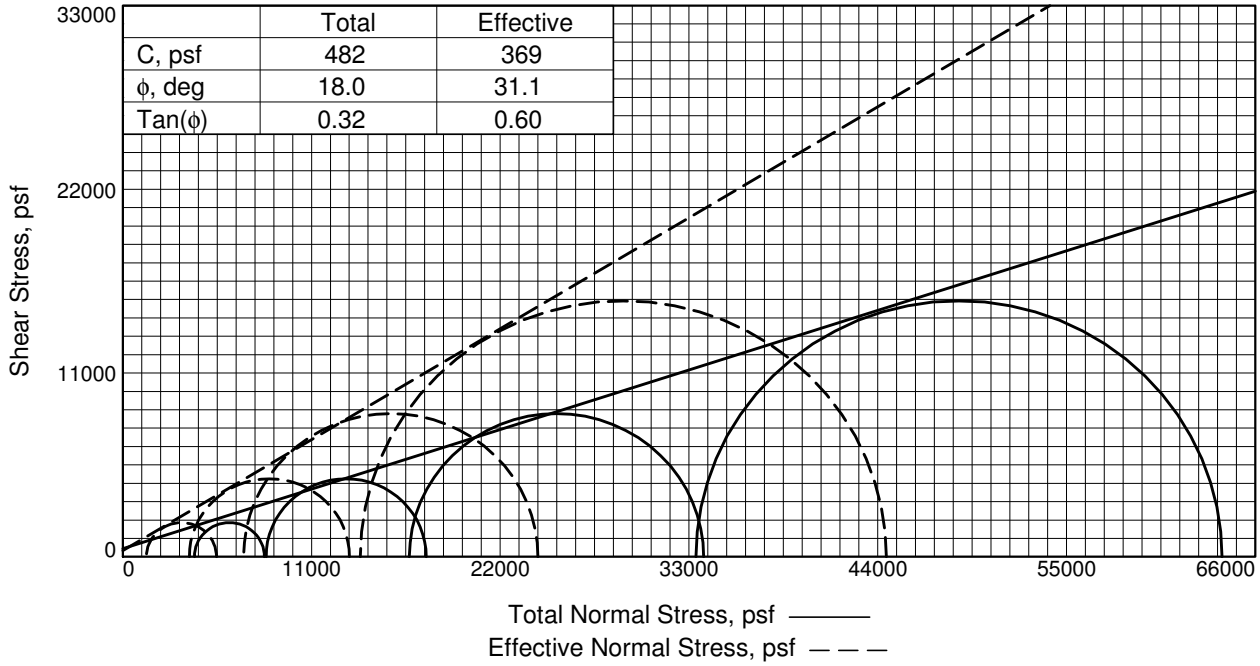
Remarks

As received moisture 37.4%

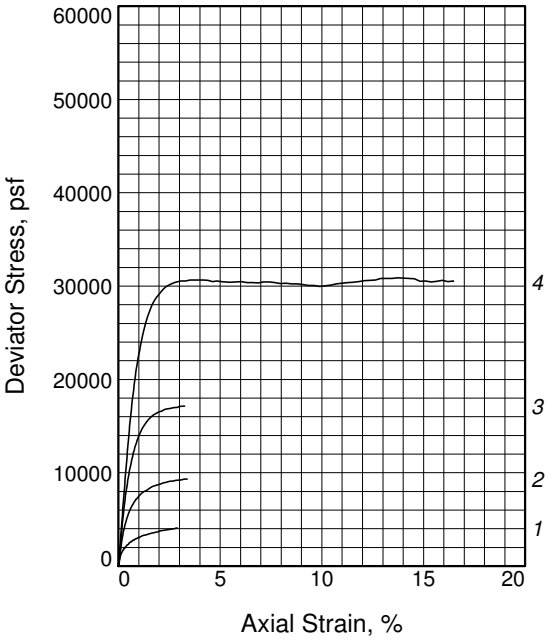
Sample No.: SPT 3 **Source of Sample:** GH10-228 **Date:** 11/30/10
Location: Upper Talarik Creek Area **Elev./Depth:** 17-18.5'

Knight Piésold CONSULTING

Client: Pebble Limited Partnership
Project: Pebble Project
Project No: 101-77/11 **Fig.**



	Total	Effective
C, psf	482	369
ϕ, deg	18.0	31.1
Tan(ϕ)	0.32	0.60



Sample No.		1	2	3	4
Initial	Water Content, %	18.1	18.1	18.1	18.1
	Dry Density, pcf	111.8	111.8	111.8	111.8
	Saturation, %	96.1	96.1	96.1	96.1
	Void Ratio	0.5074	0.5074	0.5074	0.5074
	Diameter, in.	2.85	2.85	2.85	2.85
	Height, in.	5.79	5.79	5.79	5.79
At Test	Water Content, %	15.0	13.6	12.9	12.0
	Dry Density, pcf	120.0	123.3	124.9	127.3
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.4042	0.3668	0.3494	0.3245
	Diameter, in.	2.78	2.77	2.79	2.80
	Height, in.	5.69	5.54	5.39	5.26
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, psf		4176	8352	16704	33408
Fail. Stress, psf		4080	9335	17149	30642
Excess Pore Pr., psf		2794	4475	9659	19560
Strain, %		2.9	3.3	3.2	3.5
Ult. Stress, psf					
Excess Pore Pr., psf					
Strain, %					
$\bar{\sigma}_1$ Failure, psf		5462	13213	24194	44491
$\bar{\sigma}_3$ Failure, psf		1382	3877	7045	13848

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description:

Assumed Specific Gravity= 2.7

Remarks:

Fig. _____

Client: Pebble Limited Partnership

Project: Pebble Project

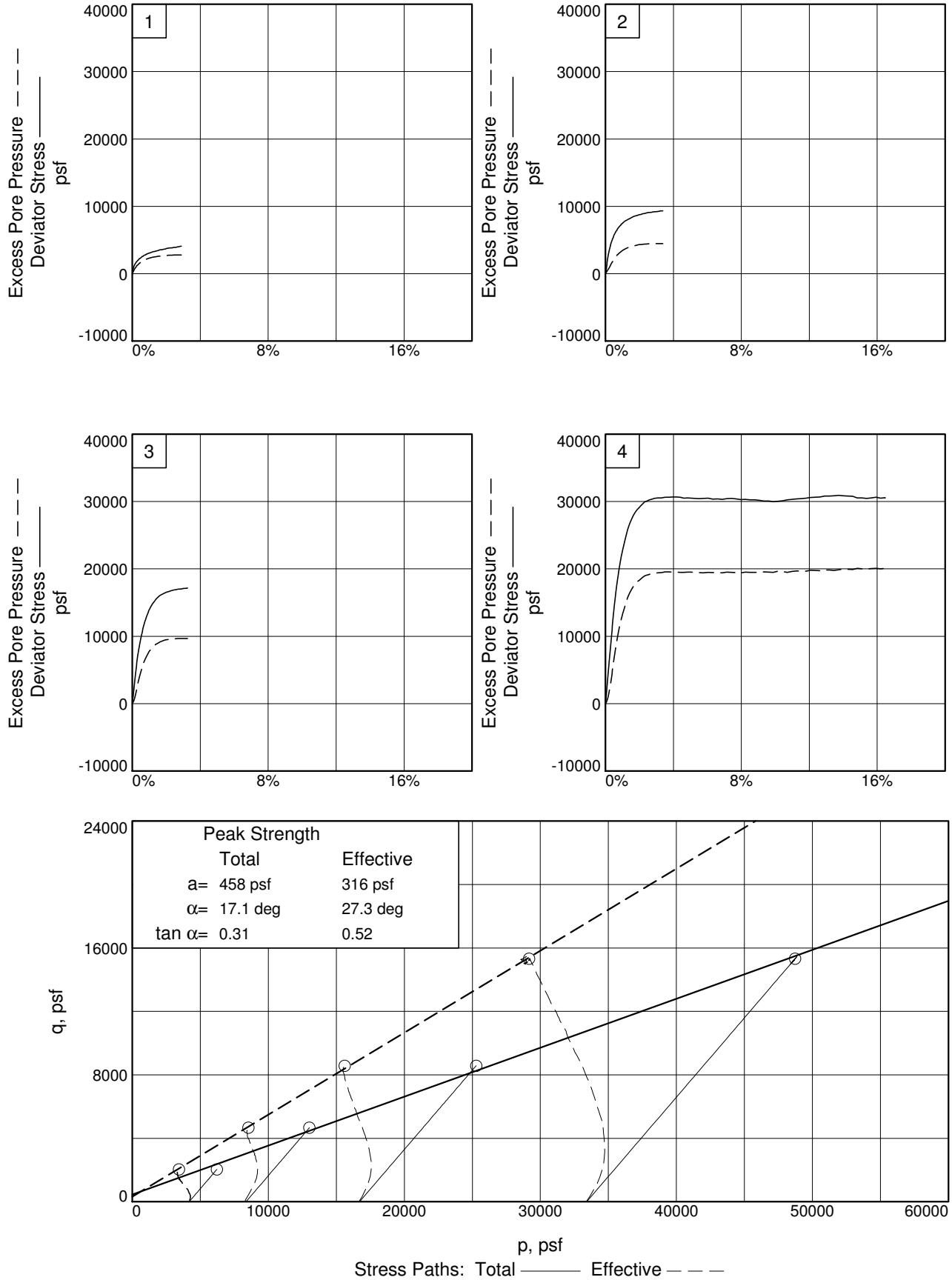
Source of Sample: GH10-226 **Depth:** 15-17'

Sample Number: ST 2

Proj. No.: 101-77/11 **Date Sampled:** 12/10/10

Knight Piésold CONSULTING

Tested By: jdb **Checked By:** spb



Client: Pebble Limited Partnership

Project: Pebble Project

Source of Sample: GH10-226 **Depth:** 15-17' **Sample Number:** ST 2

Project No.: 101-77/11 **Fig.** 1:3

Knight Piesold Geotechnical Lab.

Tested By: jdb **Checked By:** spb

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

12/23/2010
7:08 AM

Date: 12/10/10
Client: Pebble Limited Partnership
Project: Pebble Project
Project No.: 101-77/11
Location: GH10-226
Depth: 15-17' **Sample Number:** ST 2
Description:
Remarks: Failure tangents drawn at peak principal stress ratio. Multi-staged test specimen.
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.7 **LL=** **PL=** **PI=**
Test Method: ASTM D 4767 Method A (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1280.800			1409.300
Moisture content: Dry soil+tare, gms.	1084.900			1278.900
Moisture content: Tare, gms.	0.000			194.000
Moisture, %	18.1	18.8	15.0	12.0
Moist specimen weight, gms.	1280.8			
Diameter, in.	2.85	2.85	2.78	
Area, in.²	6.38	6.38	6.05	
Height, in.	5.79	5.79	5.69	
Net decrease in height, in.		0.00	0.10	
Net decrease in water volume, cc.			41.50	
Wet Density, pcf	132.0	132.8	138.0	
Dry density, pcf	111.8	111.8	120.0	
Void ratio	0.5074	0.5074	0.4042	
Saturation, %	96.1	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 69.00 psi (9936 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 4176 psf
Strain rate, %/min. = 0.03
Fail. Stress = 4080 psf **at reading no.** 58

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.4229	4.208	0.0	0.0	0	4191	4191	1.00	39.90	4191	0
1	-3.4214	25.412	21.2	0.0	504	4011	4516	1.13	41.14	4264	252
2	-3.4200	36.248	32.0	0.1	762	3879	4641	1.20	42.06	4260	381
3	-3.4185	44.666	40.5	0.1	962	3749	4711	1.26	42.97	4230	481
4	-3.4171	51.296	47.1	0.1	1119	3627	4746	1.31	43.82	4186	560
5	-3.4156	56.891	52.7	0.1	1252	3511	4764	1.36	44.61	4138	626
6	-3.4142	63.658	59.5	0.2	1413	3404	4817	1.41	45.36	4111	706
7	-3.4127	68.573	64.4	0.2	1529	3304	4833	1.46	46.05	4069	765
8	-3.4113	72.664	68.5	0.2	1626	3208	4834	1.51	46.72	4021	813
9	-3.4098	76.987	72.8	0.2	1728	3121	4849	1.55	47.33	3985	864
10	-3.4084	80.441	76.2	0.3	1810	3040	4850	1.60	47.89	3945	905
11	-3.4069	82.185	78.0	0.3	1850	2952	4802	1.63	48.50	3877	925
12	-3.4055	85.787	81.6	0.3	1935	2890	4826	1.67	48.93	3858	968
13	-3.4040	89.202	85.0	0.3	2016	2830	4846	1.71	49.35	3838	1008
14	-3.4026	91.208	87.0	0.4	2063	2767	4830	1.75	49.79	3798	1032
15	-3.4011	94.728	90.5	0.4	2146	2704	4850	1.79	50.22	3777	1073
16	-3.3997	98.557	94.3	0.4	2236	2647	4883	1.84	50.62	3765	1118
17	-3.3982	100.050	95.8	0.4	2271	2596	4867	1.87	50.97	3732	1135
18	-3.3968	101.712	97.5	0.5	2310	2548	4857	1.91	51.31	3702	1155
19	-3.3953	103.075	98.9	0.5	2341	2495	4837	1.94	51.67	3666	1171
20	-3.3939	106.205	102.0	0.5	2415	2445	4860	1.99	52.02	3652	1207
21	-3.3924	109.192	105.0	0.5	2485	2399	4884	2.04	52.34	3641	1243
22	-3.3910	110.733	106.5	0.6	2521	2356	4877	2.07	52.64	3616	1260
23	-3.3895	112.417	108.2	0.6	2560	2313	4873	2.11	52.94	3593	1280
24	-3.3881	113.773	109.6	0.6	2591	2276	4868	2.14	53.19	3572	1296
25	-3.3866	114.835	110.6	0.6	2616	2237	4852	2.17	53.47	3544	1308
26	-3.3852	117.735	113.5	0.7	2684	2200	4883	2.22	53.73	3541	1342
27	-3.3837	119.561	115.4	0.7	2726	2169	4895	2.26	53.94	3532	1363
28	-3.3823	120.622	116.4	0.7	2751	2136	4886	2.29	54.17	3511	1375
29	-3.3809	121.774	117.6	0.7	2777	2084	4861	2.33	54.53	3473	1389
30	-3.3794	122.354	118.1	0.8	2790	2080	4870	2.34	54.56	3475	1395
31	-3.3780	123.999	119.8	0.8	2828	2050	4879	2.38	54.76	3465	1414
32	-3.3765	126.555	122.3	0.8	2888	2029	4917	2.42	54.91	3473	1444
33	-3.3751	127.733	123.5	0.8	2915	2004	4919	2.45	55.08	3462	1457
34	-3.3736	128.846	124.6	0.9	2940	1979	4919	2.49	55.26	3449	1470
35	-3.3722	129.542	125.3	0.9	2956	1951	4907	2.51	55.45	3429	1478
36	-3.3707	131.325	127.1	0.9	2997	1928	4925	2.55	55.61	3427	1499
37	-3.3678	133.937	129.7	1.0	3057	1885	4943	2.62	55.91	3414	1529
38	-3.3664	134.801	130.6	1.0	3077	1864	4941	2.65	56.06	3403	1538
39	-3.3649	134.346	130.1	1.0	3065	1840	4906	2.67	56.22	3373	1533
40	-3.3591	139.697	135.5	1.1	3188	1775	4963	2.80	56.68	3369	1594
41	-3.3533	143.544	139.3	1.2	3275	1721	4996	2.90	57.05	3359	1638
42	-3.3475	145.509	141.3	1.3	3318	1665	4983	2.99	57.44	3324	1659
43	-3.3418	148.966	144.8	1.4	3396	1620	5016	3.10	57.75	3318	1698
44	-3.3360	151.416	147.2	1.5	3450	1578	5028	3.19	58.04	3303	1725
45	-3.3302	155.668	151.5	1.6	3546	1555	5100	3.28	58.20	3328	1773
46	-3.3244	156.862	152.7	1.7	3570	1517	5087	3.35	58.46	3302	1785

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
47	-3.3186	159.568	155.4	1.8	3629	1493	5123	3.43	58.63	3308	1815
48	-3.3128	161.961	157.8	1.9	3682	1468	5149	3.51	58.81	3309	1841
49	-3.3070	165.219	161.0	2.0	3754	1456	5210	3.58	58.89	3333	1877
50	-3.3012	167.070	162.9	2.1	3793	1436	5229	3.64	59.03	3332	1896
51	-3.2954	168.558	164.3	2.2	3824	1420	5244	3.69	59.14	3332	1912
52	-3.2896	170.229	166.0	2.3	3858	1412	5270	3.73	59.20	3341	1929
53	-3.2838	172.831	168.6	2.4	3915	1407	5322	3.78	59.23	3365	1957
54	-3.2781	173.524	169.3	2.5	3927	1394	5320	3.82	59.32	3357	1963
55	-3.2723	176.349	172.1	2.6	3988	1387	5375	3.88	59.37	3381	1994
56	-3.2665	177.196	173.0	2.7	4004	1384	5388	3.89	59.39	3386	2002
57	-3.2607	180.249	176.0	2.9	4070	1381	5451	3.95	59.41	3416	2035
58	-3.2583	180.763	176.6	2.9	4080	1382	5462	3.95	59.41	3422	2040

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1280.800			1409.300
Moisture content: Dry soil+tare, gms.	1084.900			1278.900
Moisture content: Tare, gms.	0.000			194.000
Moisture, %	18.1		13.6	12.0
Moist specimen weight, gms.	1280.8			
Diameter, in.	2.85		2.77	
Area, in.²	6.38		6.05	
Height, in.	5.79		5.54	
Net decrease in height, in.		0.26	-0.02	
Net decrease in water volume, cc.			15.00	
Wet Density, pcf	132.0		140.1	
Dry density, pcf	111.8		123.3	
Void ratio	0.5074		0.3668	
Saturation, %	96.1		100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 98.00 psi (14112 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 8352 psf
Strain rate, %/min. = 0.03
Fail. Stress = 9335 psf **at reading no.** 59

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.0226	2.166	0.0	0.0	0	8317	8317	1.00	40.24	8317	0
1	-0.0211	35.395	33.2	0.0	229	8194	8423	1.03	41.09	8309	114
2	-0.0197	58.043	55.9	0.1	767	8119	8886	1.09	41.62	8503	384
3	-0.0182	80.416	78.3	0.1	1299	8025	9324	1.16	42.27	8675	650
4	-0.0168	99.093	96.9	0.1	1743	7932	9675	1.22	42.91	8804	871
5	-0.0153	119.817	117.7	0.1	2235	7849	10084	1.28	43.49	8967	1117
6	-0.0139	136.074	133.9	0.2	2621	7728	10348	1.34	44.34	9038	1310
7	-0.0124	151.286	149.1	0.2	2981	7635	10616	1.39	44.98	9126	1491

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
8	-0.0110	165.116	162.9	0.2	3309	7504	10813	1.44	45.89	9159	1654
9	-0.0095	178.132	176.0	0.2	3617	7387	11004	1.49	46.70	9195	1808
10	-0.0081	188.835	186.7	0.3	3870	7263	11133	1.53	47.56	9198	1935
11	-0.0067	200.388	198.2	0.3	4143	7152	11295	1.58	48.33	9223	2071
12	-0.0052	209.385	207.2	0.3	4355	7015	11370	1.62	49.29	9192	2177
13	-0.0038	218.226	216.1	0.3	4563	6891	11454	1.66	50.15	9173	2282
14	-0.0023	227.918	225.8	0.4	4791	6776	11568	1.71	50.94	9172	2396
15	-0.0009	234.788	232.6	0.4	4953	6662	11615	1.74	51.74	9138	2476
16	0.0006	243.864	241.7	0.4	5166	6542	11709	1.79	52.57	9126	2583
17	0.0020	251.003	248.8	0.4	5334	6435	11769	1.83	53.31	9102	2667
18	0.0035	257.746	255.6	0.5	5492	6315	11807	1.87	54.14	9061	2746
19	0.0049	265.064	262.9	0.5	5664	6221	11885	1.91	54.80	9053	2832
20	0.0064	271.709	269.5	0.5	5819	6136	11955	1.95	55.39	9045	2910
21	0.0078	275.804	273.6	0.5	5914	6024	11938	1.98	56.17	8981	2957
22	0.0093	282.370	280.2	0.6	6068	5967	12035	2.02	56.56	9001	3034
23	0.0107	287.254	285.1	0.6	6181	5864	12045	2.05	57.28	8955	3091
24	0.0122	291.743	289.6	0.6	6286	5769	12055	2.09	57.94	8912	3143
25	0.0136	297.662	295.5	0.7	6424	5684	12108	2.13	58.52	8896	3212
26	0.0151	301.629	299.5	0.7	6515	5598	12113	2.16	59.13	8855	3258
27	0.0165	304.985	302.8	0.7	6593	5533	12126	2.19	59.57	8830	3296
28	0.0180	310.615	308.4	0.7	6724	5486	12210	2.23	59.90	8848	3362
29	0.0194	314.117	312.0	0.8	6804	5409	12213	2.26	60.44	8811	3402
30	0.0209	317.927	315.8	0.8	6892	5345	12237	2.29	60.88	8791	3446
31	0.0223	321.940	319.8	0.8	6985	5289	12274	2.32	61.27	8782	3492
32	0.0238	324.209	322.0	0.8	7036	5231	12267	2.35	61.67	8749	3518
33	0.0252	329.180	327.0	0.9	7151	5193	12344	2.38	61.94	8768	3576
34	0.0267	331.338	329.2	0.9	7200	5133	12333	2.40	62.35	8733	3600
35	0.0281	333.453	331.3	0.9	7248	5080	12327	2.43	62.72	8704	3624
36	0.0296	337.672	335.5	0.9	7345	5032	12377	2.46	63.05	8705	3672
37	0.0310	339.449	337.3	1.0	7384	4970	12354	2.49	63.49	8662	3692
38	0.0325	342.918	340.8	1.0	7464	4918	12382	2.52	63.84	8650	3732
39	0.0339	346.270	344.1	1.0	7541	4848	12389	2.56	64.33	8619	3770
40	0.0411	357.986	355.8	1.1	7805	4686	12490	2.67	65.46	8588	3902
41	0.0469	365.490	363.3	1.3	7971	4553	12525	2.75	66.38	8539	3986
42	0.0527	371.325	369.2	1.4	8098	4429	12527	2.83	67.24	8478	4049
43	0.0585	377.663	375.5	1.5	8237	4355	12592	2.89	67.75	8474	4118
44	0.0643	384.633	382.5	1.6	8390	4262	12652	2.97	68.41	8457	4195
45	0.0701	390.628	388.5	1.7	8520	4215	12735	3.02	68.73	8475	4260
46	0.0758	394.222	392.1	1.8	8593	4152	12745	3.07	69.17	8448	4297
47	0.0816	398.018	395.9	1.9	8671	4087	12758	3.12	69.62	8423	4336
48	0.0874	401.854	399.7	2.0	8750	4035	12786	3.17	69.98	8410	4375
49	0.0932	404.973	402.8	2.1	8812	4005	12817	3.20	70.19	8411	4406
50	0.0990	409.477	407.3	2.2	8906	3985	12891	3.23	70.32	8438	4453
51	0.1048	411.515	409.3	2.3	8942	3949	12892	3.26	70.57	8421	4471
52	0.1105	414.969	412.8	2.4	9012	3944	12955	3.29	70.61	8449	4506
53	0.1163	418.325	416.2	2.5	9078	3929	13008	3.31	70.71	8468	4539
54	0.1279	421.051	418.9	2.7	9119	3888	13007	3.35	71.00	8448	4559

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
55	0.1337	423.963	421.8	2.8	9175	3894	13069	3.36	70.96	8481	4587
56	0.1452	427.165	425.0	3.0	9226	3873	13099	3.38	71.10	8486	4613
57	0.1510	429.611	427.4	3.1	9271	3871	13142	3.39	71.12	8507	4635
58	0.1568	432.150	430.0	3.2	9318	3884	13202	3.40	71.02	8543	4659
59	0.1626	433.413	431.2	3.3	9335	3877	13213	3.41	71.07	8545	4668
60	0.1650	433.114	430.9	3.4	9324	3875	13199	3.41	71.09	8537	4662

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1280.800			1409.300
Moisture content: Dry soil+tare, gms.	1084.900			1278.900
Moisture content: Tare, gms.	0.000			194.000
Moisture, %	18.1		12.9	12.0
Moist specimen weight, gms.	1280.8			
Diameter, in.	2.85		2.79	
Area, in.²	6.38		6.14	
Height, in.	5.79		5.39	
Net decrease in height, in.		0.43	-0.04	
Net decrease in water volume, cc.			7.00	
Wet Density, pcf	132.0		141.1	
Dry density, pcf	111.8		124.9	
Void ratio	0.5074		0.3494	
Saturation, %	96.1		100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 156.00 psi (22464 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 16704 psf
Strain rate, %/min. = 0.03
Fail. Stress = 17149 psf **at reading no.** 59

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.6607	1.910	0.0	0.0	0	16659	16659	1.00	40.31	16659	0
1	-3.6593	28.170	26.3	0.0	616	16584	17201	1.04	40.83	16893	308
2	-3.6578	51.588	49.7	0.1	1165	16462	17627	1.07	41.68	17045	583
3	-3.6564	81.149	79.2	0.1	1858	16310	18168	1.11	42.74	17239	929
4	-3.6550	109.436	107.5	0.1	2521	16118	18639	1.16	44.07	17378	1260
5	-3.6535	139.521	137.6	0.1	3225	15887	19112	1.20	45.68	17499	1613
6	-3.6521	167.056	165.1	0.2	3870	15619	19489	1.25	47.53	17554	1935
7	-3.6506	193.469	191.6	0.2	4488	15333	19821	1.29	49.52	17577	2244
8	-3.6492	218.102	216.2	0.2	5063	15029	20092	1.34	51.63	17561	2532
9	-3.6477	241.410	239.5	0.2	5608	14718	20325	1.38	53.79	17521	2804
10	-3.6463	263.146	261.2	0.3	6115	14405	20520	1.42	55.97	17462	3057
11	-3.6448	285.493	283.6	0.3	6636	14090	20726	1.47	58.15	17408	3318
12	-3.6434	306.415	304.5	0.3	7124	13786	20909	1.52	60.27	17348	3562
13	-3.6419	325.636	323.7	0.3	7571	13487	21058	1.56	62.34	17272	3786

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
14	-3.6405	342.978	341.1	0.4	7975	13198	21173	1.60	64.35	17186	3987
15	-3.6390	360.411	358.5	0.4	8380	12915	21295	1.65	66.31	17105	4190
16	-3.6376	377.069	375.2	0.4	8767	12641	21409	1.69	68.21	17025	4384
17	-3.6361	393.212	391.3	0.5	9142	12380	21522	1.74	70.02	16951	4571
18	-3.6347	408.909	407.0	0.5	9506	12124	21630	1.78	71.80	16877	4753
19	-3.6332	422.931	421.0	0.5	9831	11887	21718	1.83	73.45	16803	4916
20	-3.6318	437.014	435.1	0.5	10157	11656	21813	1.87	75.06	16735	5079
21	-3.6303	449.373	447.5	0.6	10443	11429	21872	1.91	76.63	16650	5221
22	-3.6289	461.682	459.8	0.6	10727	11215	21943	1.96	78.12	16579	5364
23	-3.6274	474.768	472.9	0.6	11030	11013	22043	2.00	79.52	16528	5515
24	-3.6260	486.301	484.4	0.6	11296	10820	22115	2.04	80.86	16468	5648
25	-3.6245	498.102	496.2	0.7	11568	10640	22208	2.09	82.11	16424	5784
26	-3.6231	507.559	505.6	0.7	11785	10458	22243	2.13	83.37	16351	5892
27	-3.6216	519.355	517.4	0.7	12057	10291	22347	2.17	84.54	16319	6028
28	-3.6202	528.286	526.4	0.8	12261	10129	22391	2.21	85.66	16260	6131
29	-3.6187	536.867	535.0	0.8	12458	9976	22434	2.25	86.72	16205	6229
30	-3.6173	546.695	544.8	0.8	12683	9837	22521	2.29	87.68	16179	6342
31	-3.6159	556.312	554.4	0.8	12904	9698	22602	2.33	88.65	16150	6452
32	-3.6144	563.327	561.4	0.9	13063	9560	22624	2.37	89.61	16092	6532
33	-3.6130	572.109	570.2	0.9	13264	9430	22694	2.41	90.51	16062	6632
34	-3.6115	578.977	577.1	0.9	13420	9304	22724	2.44	91.39	16014	6710
35	-3.6101	586.873	585.0	0.9	13600	9180	22780	2.48	92.25	15980	6800
36	-3.6086	594.520	592.6	1.0	13774	9081	22856	2.52	92.93	15969	6887
37	-3.6072	599.426	597.5	1.0	13885	8973	22858	2.55	93.69	15915	6942
38	-3.6057	606.017	604.1	1.0	14034	8876	22910	2.58	94.36	15893	7017
39	-3.6043	612.662	610.8	1.0	14184	8783	22967	2.62	95.01	15875	7092
40	-3.6028	618.751	616.8	1.1	14322	8692	23014	2.65	95.64	15853	7161
41	-3.5970	639.626	637.7	1.2	14791	8371	23162	2.77	97.87	15766	7395
42	-3.5913	656.269	654.4	1.3	15160	8107	23268	2.87	99.70	15688	7580
43	-3.5855	671.195	669.3	1.4	15489	7891	23380	2.96	101.20	15635	7745
44	-3.5797	684.153	682.2	1.5	15772	7725	23497	3.04	102.36	15611	7886
45	-3.5739	695.986	694.1	1.6	16028	7566	23594	3.12	103.46	15580	8014
46	-3.5681	703.339	701.4	1.7	16180	7454	23634	3.17	104.24	15544	8090
47	-3.5624	710.309	708.4	1.8	16323	7339	23662	3.22	105.03	15501	8162
48	-3.5566	717.353	715.4	1.9	16467	7258	23725	3.27	105.60	15492	8234
49	-3.5508	722.075	720.2	2.0	16558	7204	23762	3.30	105.97	15483	8279
50	-3.5450	726.660	724.8	2.1	16645	7172	23817	3.32	106.20	15494	8323
51	-3.5392	732.231	730.3	2.3	16755	7126	23880	3.35	106.52	15503	8377
52	-3.5335	735.988	734.1	2.4	16822	7098	23921	3.37	106.70	15510	8411
53	-3.5277	738.571	736.7	2.5	16863	7078	23941	3.38	106.85	15509	8432
54	-3.5219	741.763	739.9	2.6	16918	7066	23983	3.39	106.93	15525	8459
55	-3.5161	745.349	743.4	2.7	16981	7053	24034	3.41	107.02	15543	8490
56	-3.5045	748.870	747.0	2.9	17024	7050	24074	3.41	107.04	15562	8512
57	-3.4988	752.769	750.9	3.0	17094	7038	24132	3.43	107.12	15585	8547
58	-3.4872	756.170	754.3	3.2	17133	7046	24179	3.43	107.07	15612	8567
59	-3.4855	757.113	755.2	3.2	17149	7045	24194	3.43	107.08	15620	8575

Parameters for Specimen No. 4

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1280.800			1409.300
Moisture content: Dry soil+tare, gms.	1084.900			1278.900
Moisture content: Tare, gms.	0.000			194.000
Moisture, %	18.1		12.0	12.0
Moist specimen weight, gms.	1280.8			
Diameter, in.	2.85		2.80	
Area, in.²	6.38		6.17	
Height, in.	5.79		5.26	
Net decrease in height, in.		0.57	-0.05	
Net decrease in water volume, cc.			10.00	
Wet Density, pcf	132.0		142.6	
Dry density, pcf	111.8		127.3	
Void ratio	0.5074		0.3245	
Saturation, %	96.1		100.0	

Test Readings for Specimen No. 4

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 272.00 psi (39168 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 33408 psf
Strain rate, %/min. = 0.03
Fail. Stress = 30642 psf **at reading no.** 59

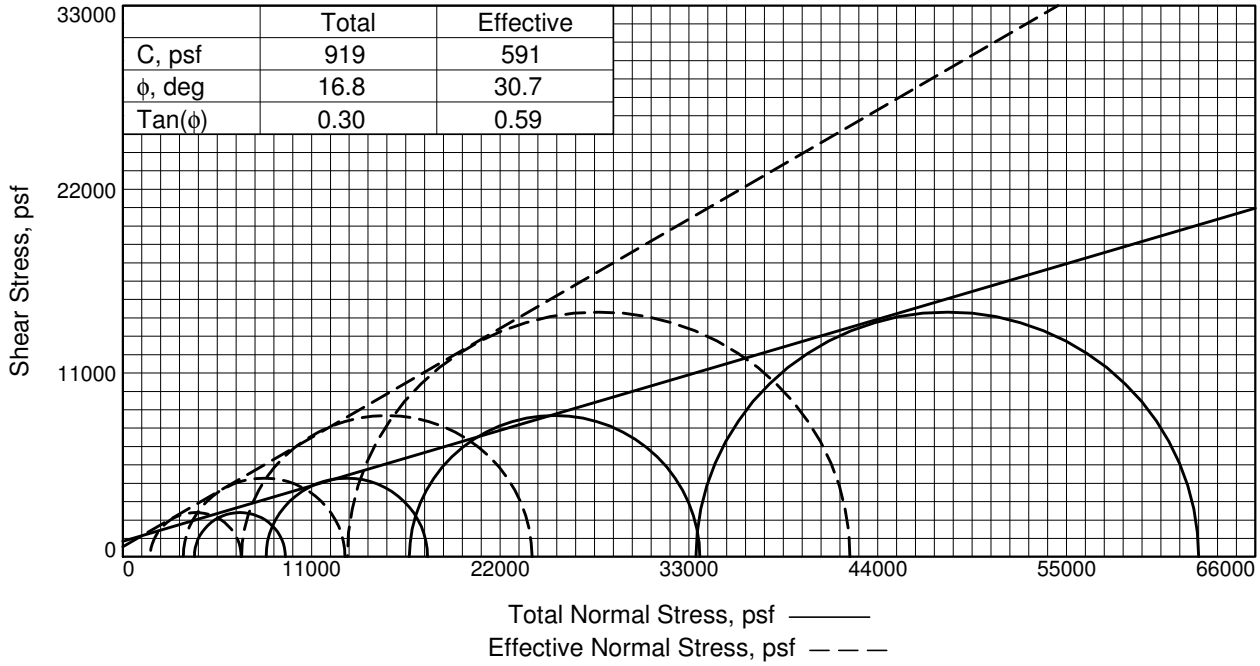
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.6194	7.407	0.0	0.0	0	33382	33382	1.00	40.18	33382	0
1	-3.6180	36.047	28.6	0.0	668	33299	33968	1.02	40.76	33633	334
2	-3.6165	69.299	61.9	0.1	1444	33173	34617	1.04	41.63	33895	722
3	-3.6151	105.007	97.6	0.1	2276	33043	35320	1.07	42.53	34181	1138
4	-3.6136	139.500	132.1	0.1	3080	32827	35907	1.09	44.03	34367	1540
5	-3.6122	175.787	168.4	0.1	3925	32565	36490	1.12	45.85	34528	1963
6	-3.6107	210.538	203.1	0.2	4734	32273	37006	1.15	47.88	34640	2367
7	-3.6093	245.604	238.2	0.2	5549	31923	37473	1.17	50.31	34698	2775
8	-3.6078	279.935	272.5	0.2	6348	31553	37900	1.20	52.88	34727	3174
9	-3.6064	311.729	304.3	0.2	7086	31174	38260	1.23	55.52	34717	3543
10	-3.6049	345.823	338.4	0.3	7878	30764	38642	1.26	58.36	34703	3939
11	-3.6035	378.153	370.7	0.3	8628	30337	38965	1.28	61.32	34651	4314
12	-3.6020	410.954	403.5	0.3	9389	29919	39308	1.31	64.23	34613	4694
13	-3.6006	443.729	436.3	0.4	10149	29459	39608	1.34	67.42	34534	5074
14	-3.5991	474.680	467.3	0.4	10865	28973	39839	1.38	70.80	34406	5433
15	-3.5977	506.805	499.4	0.4	11609	28461	40070	1.41	74.35	34266	5805
16	-3.5962	536.958	529.6	0.4	12307	27955	40262	1.44	77.87	34109	6153
17	-3.5948	568.493	561.1	0.5	13036	27477	40513	1.47	81.19	33995	6518
18	-3.5933	598.397	591.0	0.5	13727	27007	40734	1.51	84.45	33871	6864
19	-3.5919	627.602	620.2	0.5	14401	26531	40932	1.54	87.76	33732	7201
20	-3.5904	656.235	648.8	0.6	15062	26069	41132	1.58	90.96	33600	7531
21	-3.5890	681.270	673.9	0.6	15639	25612	41251	1.61	94.14	33432	7820
22	-3.5875	707.610	700.2	0.6	16246	25161	41406	1.65	97.27	33284	8123
23	-3.5861	734.417	727.0	0.6	16863	24720	41583	1.68	100.33	33152	8432

Test Readings for Specimen No. 4

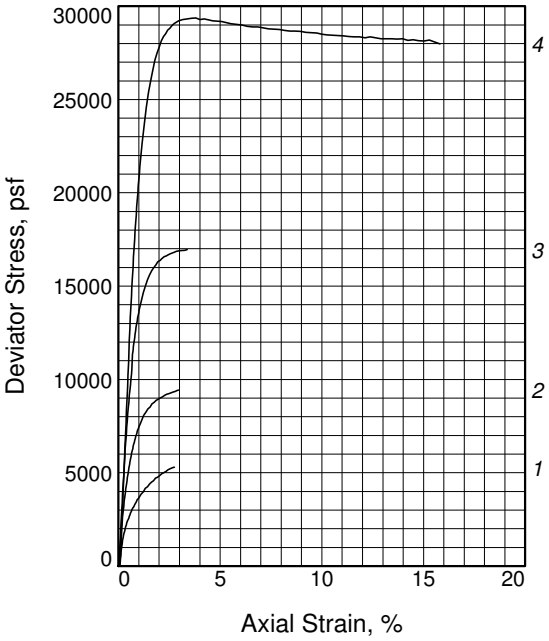
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	-3.5846	757.434	750.0	0.7	17392	24292	41684	1.72	103.31	32988	8696
25	-3.5832	780.712	773.3	0.7	17927	23882	41809	1.75	106.15	32845	8964
26	-3.5817	802.479	795.1	0.7	18427	23485	41912	1.78	108.91	32698	9213
27	-3.5803	822.456	815.0	0.7	18884	23099	41983	1.82	111.59	32541	9442
28	-3.5788	844.054	836.6	0.8	19379	22734	42113	1.85	114.13	32424	9690
29	-3.5774	865.249	857.8	0.8	19865	22370	42235	1.89	116.65	32302	9932
30	-3.5760	883.810	876.4	0.8	20289	22015	42304	1.92	119.12	32160	10144
31	-3.5745	901.827	894.4	0.9	20700	21687	42387	1.95	121.40	32037	10350
32	-3.5731	921.200	913.8	0.9	21143	21365	42508	1.99	123.63	31937	10571
33	-3.5716	937.430	930.0	0.9	21512	21139	42651	2.02	125.20	31895	10756
34	-3.5702	954.167	946.8	0.9	21893	20830	42723	2.05	127.35	31776	10947
35	-3.5687	968.523	961.1	1.0	22219	20565	42785	2.08	129.18	31675	11110
36	-3.5673	982.151	974.7	1.0	22528	20276	42804	2.11	131.19	31540	11264
37	-3.5658	996.543	989.1	1.0	22854	20007	42861	2.14	133.06	31434	11427
38	-3.5644	1010.119	1002.7	1.0	23162	19796	42958	2.17	134.53	31377	11581
39	-3.5629	1023.636	1016.2	1.1	23467	19538	43005	2.20	136.32	31271	11734
40	-3.5615	1037.686	1030.3	1.1	23785	19326	43111	2.23	137.79	31218	11893
41	-3.5557	1088.434	1081.0	1.2	24929	18353	43282	2.36	144.55	30818	12464
42	-3.5499	1131.319	1123.9	1.3	25889	17616	43505	2.47	149.67	30561	12945
43	-3.5441	1167.654	1160.2	1.4	26696	16975	43671	2.57	154.12	30323	13348
44	-3.5383	1198.427	1191.0	1.5	27374	16447	43820	2.66	157.79	30134	13687
45	-3.5326	1225.469	1218.1	1.6	27964	15986	43950	2.75	160.98	29968	13982
46	-3.5268	1246.819	1239.4	1.8	28423	15612	44035	2.82	163.58	29823	14211
47	-3.5210	1264.776	1257.4	1.9	28802	15305	44107	2.88	165.72	29706	14401
48	-3.5152	1278.802	1271.4	2.0	29091	15116	44207	2.92	167.02	29662	14545
49	-3.5094	1293.339	1285.9	2.1	29390	14887	44278	2.97	168.61	29583	14695
50	-3.5037	1306.218	1298.8	2.2	29651	14673	44324	3.02	170.11	29498	14826
51	-3.4979	1319.123	1311.7	2.3	29912	14472	44384	3.07	171.50	29428	14956
52	-3.4921	1326.210	1318.8	2.4	30040	14364	44404	3.09	172.25	29384	15020
53	-3.4863	1333.026	1325.6	2.5	30162	14261	44423	3.11	172.96	29342	15081
54	-3.4805	1339.404	1332.0	2.6	30273	14176	44448	3.14	173.56	29312	15136
55	-3.4747	1344.947	1337.5	2.7	30364	14108	44472	3.15	174.03	29290	15182
56	-3.4690	1350.449	1343.0	2.9	30455	14057	44512	3.17	174.38	29285	15227
57	-3.4574	1357.237	1349.8	3.1	30539	13993	44532	3.18	174.83	29262	15270
58	-3.4458	1360.471	1353.1	3.3	30543	13974	44517	3.19	174.96	29245	15272
59	-3.4343	1367.953	1360.5	3.5	30642	13848	44491	3.21	175.83	29169	15321
60	-3.4227	1371.246	1363.8	3.7	30647	13872	44518	3.21	175.67	29195	15323
61	-3.4112	1375.449	1368.0	4.0	30671	13875	44546	3.21	175.64	29211	15335
62	-3.3996	1378.485	1371.1	4.2	30669	13885	44554	3.21	175.58	29219	15334
63	-3.3880	1379.374	1372.0	4.4	30618	13926	44544	3.20	175.29	29235	15309
64	-3.3765	1377.180	1369.8	4.6	30499	13934	44433	3.19	175.23	29184	15250
65	-3.3649	1382.052	1374.6	4.8	30537	13880	44417	3.20	175.61	29149	15269
66	-3.3533	1382.926	1375.5	5.1	30486	13905	44391	3.19	175.43	29148	15243
67	-3.3418	1384.730	1377.3	5.3	30455	13929	44384	3.19	175.27	29156	15228
68	-3.3302	1386.362	1379.0	5.5	30421	13956	44377	3.18	175.08	29166	15210
69	-3.3157	1391.635	1384.2	5.8	30448	14006	44454	3.17	174.74	29230	15224
70	-3.3013	1397.820	1390.4	6.0	30495	13914	44409	3.19	175.37	29162	15248

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
71	-3.28681	396.054	1388.6	6.3	30367	13949	44317	3.18	175.13	29133	15184
72	-3.27241	400.755	1393.3	6.6	30381	13970	44351	3.17	174.98	29161	15190
73	-3.25791	402.547	1395.1	6.9	30331	14005	44336	3.17	174.74	29171	15165
74	-3.24351	411.584	1404.2	7.1	30437	13875	44312	3.19	175.65	29094	15219
75	-3.22901	416.859	1409.5	7.4	30461	13937	44398	3.19	175.22	29167	15231
76	-3.21461	416.754	1409.3	7.7	30369	13958	44326	3.18	175.07	29142	15184
77	-3.20011	416.875	1409.5	8.0	30281	14007	44288	3.16	174.73	29147	15140
78	-3.18571	422.521	1415.1	8.2	30312	13881	44193	3.18	175.60	29037	15156
79	-3.17121	423.894	1416.5	8.5	30250	13929	44179	3.17	175.27	29054	15125
80	-3.15681	428.033	1420.6	8.8	30248	13944	44191	3.17	175.17	29067	15124
81	-3.14231	428.655	1421.2	9.1	30170	13941	44111	3.16	175.19	29026	15085
82	-3.12791	427.718	1420.3	9.3	30059	13872	43930	3.17	175.67	28901	15029
83	-3.11341	432.361	1425.0	9.6	30066	13881	43947	3.17	175.60	28914	15033
84	-3.09901	431.677	1424.3	9.9	29960	13935	43895	3.15	175.23	28915	14980
85	-3.08451	440.043	1432.6	10.2	30044	13743	43787	3.19	176.57	28765	15022
86	-3.07011	447.768	1440.4	10.4	30114	13811	43925	3.18	176.09	28868	15057
87	-3.05561	458.009	1450.6	10.7	30235	13919	44154	3.17	175.34	29036	15118
88	-3.04121	466.331	1458.9	11.0	30315	13786	44101	3.20	176.26	28944	15158
89	-3.02671	473.442	1466.0	11.3	30369	13730	44099	3.21	176.65	28915	15184
90	-3.01231	479.673	1472.3	11.5	30404	13738	44142	3.21	176.60	28940	15202
91	-2.99781	487.765	1480.4	11.8	30476	13755	44231	3.22	176.48	28993	15238
92	-2.98341	497.948	1490.5	12.1	30590	13619	44209	3.25	177.42	28914	15295
93	-2.96891	504.304	1496.9	12.4	30625	13660	44285	3.24	177.14	28972	15312
94	-2.95451	510.711	1503.3	12.6	30659	13673	44332	3.24	177.05	29003	15330
95	-2.94001	523.381	1516.0	12.9	30821	13577	44398	3.27	177.72	28987	15410
96	-2.92561	528.262	1520.9	13.2	30822	13558	44380	3.27	177.85	28969	15411
97	-2.91111	533.342	1525.9	13.5	30828	13659	44487	3.26	177.14	29073	15414
98	-2.89661	541.750	1534.3	13.7	30899	13550	44450	3.28	177.90	29000	15450
99	-2.88221	544.186	1536.8	14.0	30850	13450	44300	3.29	178.60	28875	15425
100	-2.86771	547.264	1539.9	14.3	30813	13477	44290	3.29	178.41	28883	15406
101	-2.85331	550.927	1543.5	14.6	30787	13493	44281	3.28	178.30	28887	15394
102	-2.83881	542.384	1535.0	14.8	30518	13338	43857	3.29	179.37	28598	15259
103	-2.82441	548.320	1540.9	15.1	30538	13405	43942	3.28	178.91	28673	15269
104	-2.80991	548.976	1541.6	15.4	30452	13443	43895	3.27	178.64	28669	15226
105	-2.79551	557.294	1549.9	15.6	30517	13359	43876	3.28	179.23	28617	15259
106	-2.78101	567.427	1560.0	15.9	30617	13318	43934	3.30	179.52	28626	15308
107	-2.76661	565.271	1557.9	16.2	30474	13390	43864	3.28	179.01	28627	15237
108	-2.75211	574.362	1567.0	16.5	30552	13316	43868	3.29	179.53	28592	15276
109	-2.75191	573.409	1566.0	16.5	30532	13287	43819	3.30	179.73	28553	15266



	Total	Effective
C, psf	919	591
ϕ, deg	16.8	30.7
Tan(ϕ)	0.30	0.59



Sample No.		1	2	3	4
Initial	Water Content, %	17.4	17.4	17.4	17.4
	Dry Density, pcf	113.4	113.4	113.4	113.4
	Saturation, %	95.3	95.3	95.3	95.3
	Void Ratio	0.4971	0.4971	0.4971	0.4971
	Diameter, in.	2.88	2.88	2.88	2.88
	Height, in.	6.01	6.01	6.01	6.01
At Test	Water Content, %	15.9	15.3	14.7	14.7
	Dry Density, pcf	118.6	119.8	121.4	121.4
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.4316	0.4176	0.3989	0.3989
	Diameter, in.	2.83	2.84	2.86	2.91
	Height, in.	5.93	5.83	5.70	5.51
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, psf		4176	8352	16704	33408
Fail. Stress, psf		5301	9408	16923	29291
Excess Pore Pr., psf		2570	4817	9778	20318
Strain, %		2.7	2.9	3.3	4.0
Ult. Stress, psf					
Excess Pore Pr., psf					
Strain, %					
$\bar{\sigma}_1$ Failure, psf		6907	12944	23848	42380
$\bar{\sigma}_3$ Failure, psf		1606	3535	6926	13090

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description:

Assumed Specific Gravity= 2.72

Remarks: Failure tangents drawn through peak principal stress. Multi-staged test specimen.

Client: Pebble Limited Partnership

Project: Pebble Project

Source of Sample: GH10-226 **Depth:** 20'

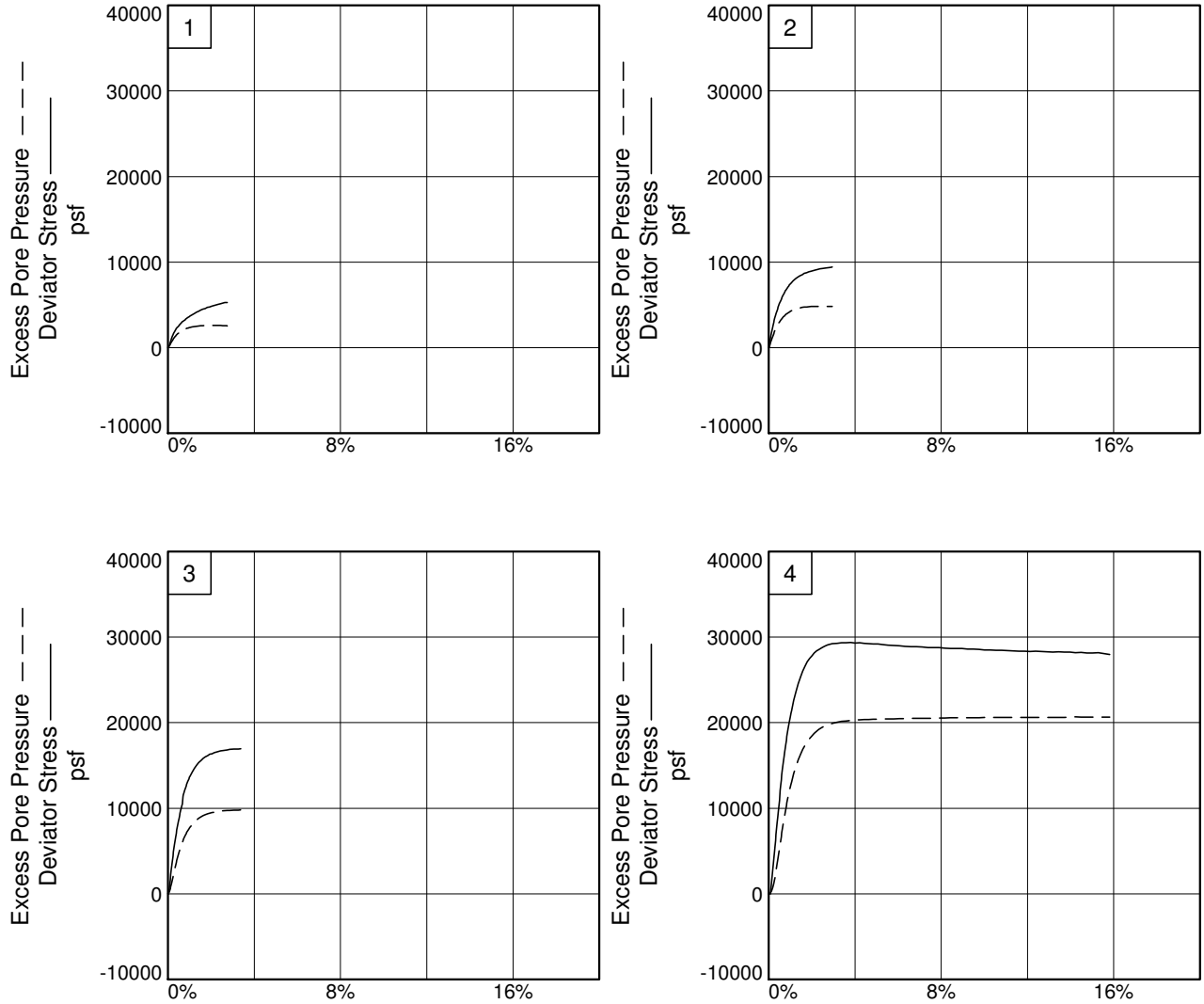
Sample Number: ST 3

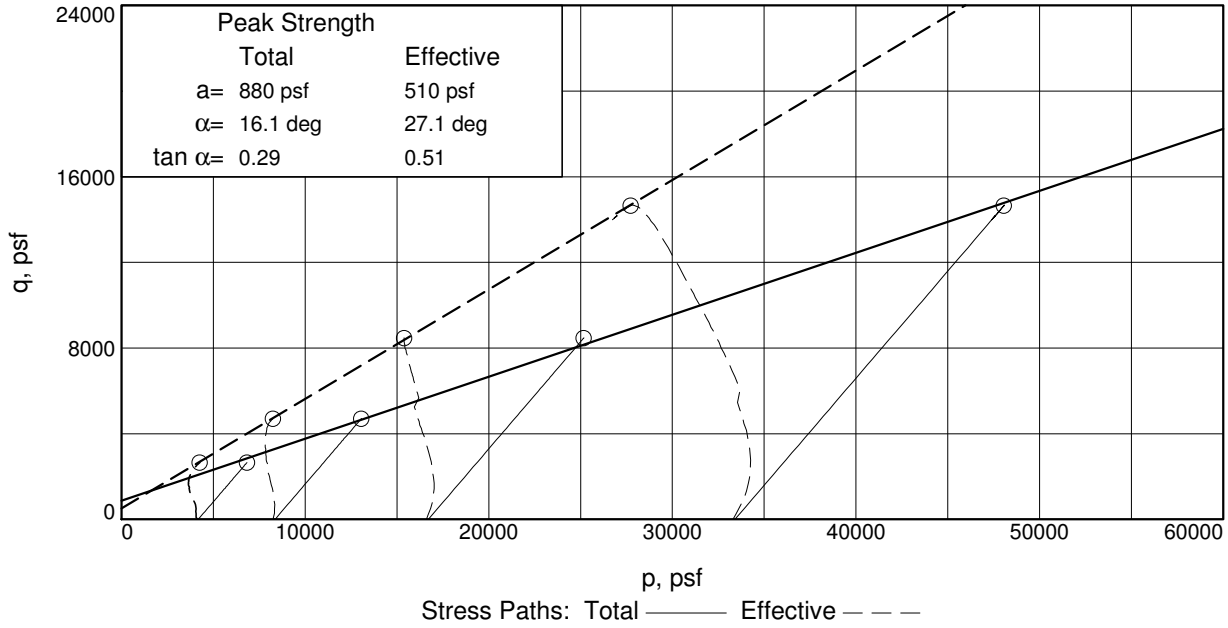
Proj. No.: 101-77/11 **Date Sampled:** 12/13/10

Knight Piésold CONSULTING

Fig. _____

Tested By: jdb **Checked By:** spb





Client: Pebble Limited Partnership

Project: Pebble Project

Source of Sample: GH10-226 **Depth:** 20' **Sample Number:** ST 3

Project No.: 101-77/11 **Fig.** _____

Knight Piesold Geotechnical Lab.

Tested By: jdb **Checked By:** spb

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

12/22/2010
1:58 PM

Date: 12/13/10
Client: Pebble Limited Partnership
Project: Pebble Project
Project No.: 101-77/11
Location: GH10-226
Depth: 20' **Sample Number:** ST 3
Description:
Remarks: Failure tangents drawn through peak principal stress. Multi-staged test specimen.
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.72 **LL=** **PL=** **PI=**
Test Method: ASTM D 4767 Method A (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1365.600			1454.300
Moisture content: Dry soil+tare, gms.	1163.000			1283.800
Moisture content: Tare, gms.	0.000			120.800
Moisture, %	17.4	18.3	15.9	14.7
Moist specimen weight, gms.	1365.6			
Diameter, in.	2.88	2.88	2.83	
Area, in.²	6.50	6.50	6.30	
Height, in.	6.01	6.01	5.93	
Net decrease in height, in.		0.00	0.08	
Net decrease in water volume, cc.			28.00	
Wet Density, pcf	133.2	134.1	137.4	
Dry density, pcf	113.4	113.4	118.6	
Void ratio	0.4971	0.4971	0.4316	
Saturation, %	95.3	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 69.00 psi (9936 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 4176 psf
Strain rate, %/min. = 0.03
Fail. Stress = 5301 psf **at reading no.** 57

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.4477	3.604	0.0	0.0	0	4143	4143	1.00	40.23	4143	0
1	-3.4462	7.648	4.0	0.0	92	4040	4132	1.02	40.95	4086	46
2	-3.4447	11.704	8.1	0.1	185	3962	4147	1.05	41.49	4054	93
3	-3.4432	19.425	15.8	0.1	362	3871	4232	1.09	42.12	4052	181
4	-3.4417	27.188	23.6	0.1	539	3783	4322	1.14	42.73	4052	269
5	-3.4402	36.006	32.4	0.1	740	3677	4417	1.20	43.46	4047	370
6	-3.4387	47.250	43.6	0.2	997	3553	4550	1.28	44.33	4052	498
7	-3.4372	56.301	52.7	0.2	1203	3435	4638	1.35	45.15	4037	602
8	-3.4357	64.478	60.9	0.2	1389	3329	4719	1.42	45.88	4024	695
9	-3.4342	70.670	67.1	0.2	1530	3221	4751	1.48	46.63	3986	765
10	-3.4327	75.565	72.0	0.3	1642	3127	4769	1.52	47.28	3948	821
11	-3.4312	81.434	77.8	0.3	1775	3035	4810	1.58	47.92	3923	888
12	-3.4297	86.258	82.7	0.3	1885	2949	4834	1.64	48.52	3892	942
13	-3.4282	91.137	87.5	0.3	1995	2864	4859	1.70	49.11	3862	998
14	-3.4266	96.642	93.0	0.4	2120	2789	4909	1.76	49.63	3849	1060
15	-3.4251	100.414	96.8	0.4	2206	2710	4916	1.81	50.18	3813	1103
16	-3.4236	104.850	101.2	0.4	2306	2650	4957	1.87	50.60	3803	1153
17	-3.4221	108.647	105.0	0.4	2392	2585	4977	1.93	51.05	3781	1196
18	-3.4206	111.187	107.6	0.5	2449	2524	4973	1.97	51.47	3749	1225
19	-3.4191	113.875	110.3	0.5	2510	2469	4979	2.02	51.85	3724	1255
20	-3.4176	117.523	113.9	0.5	2592	2417	5009	2.07	52.22	3713	1296
21	-3.4161	120.867	117.3	0.5	2668	2371	5039	2.13	52.54	3705	1334
22	-3.4146	123.578	120.0	0.6	2729	2319	5048	2.18	52.89	3684	1364
23	-3.4131	127.225	123.6	0.6	2811	2278	5089	2.23	53.18	3684	1405
24	-3.4116	130.450	126.8	0.6	2884	2241	5124	2.29	53.44	3682	1442
25	-3.4101	133.671	130.1	0.6	2956	2207	5163	2.34	53.68	3685	1478
26	-3.4086	136.534	132.9	0.7	3020	2173	5193	2.39	53.91	3683	1510
27	-3.4071	138.931	135.3	0.7	3074	2135	5209	2.44	54.18	3672	1537
28	-3.4056	140.924	137.3	0.7	3118	2101	5220	2.48	54.41	3661	1559
29	-3.4041	142.897	139.3	0.7	3162	2068	5231	2.53	54.64	3650	1581
30	-3.4026	144.473	140.9	0.8	3197	2037	5235	2.57	54.85	3636	1599
31	-3.4011	147.018	143.4	0.8	3254	2010	5265	2.62	55.04	3638	1627
32	-3.3996	150.005	146.4	0.8	3321	1976	5298	2.68	55.28	3637	1661
33	-3.3981	152.369	148.8	0.8	3374	1963	5337	2.72	55.37	3650	1687
34	-3.3965	154.386	150.8	0.9	3419	1932	5351	2.77	55.58	3641	1709
35	-3.3950	156.783	153.2	0.9	3472	1897	5370	2.83	55.83	3633	1736
36	-3.3935	159.280	155.7	0.9	3528	1888	5416	2.87	55.89	3652	1764
37	-3.3920	161.429	157.8	0.9	3576	1866	5441	2.92	56.04	3654	1788
38	-3.3905	162.875	159.3	1.0	3608	1845	5453	2.96	56.19	3649	1804
39	-3.3890	163.759	160.2	1.0	3627	1829	5456	2.98	56.30	3643	1813
40	-3.3875	166.480	162.9	1.0	3687	1815	5503	3.03	56.40	3659	1844
41	-3.3815	174.181	170.6	1.1	3858	1756	5614	3.20	56.80	3685	1929
42	-3.3755	179.979	176.4	1.2	3985	1701	5686	3.34	57.19	3694	1992
43	-3.3695	188.032	184.4	1.3	4163	1665	5828	3.50	57.44	3746	2081
44	-3.3635	192.365	188.8	1.4	4256	1644	5900	3.59	57.59	3772	2128
45	-3.3574	198.586	195.0	1.5	4392	1614	6005	3.72	57.79	3810	2196
46	-3.3514	203.276	199.7	1.6	4493	1592	6085	3.82	57.95	3838	2246

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
47	-3.3454	207.178	203.6	1.7	4576	1579	6155	3.90	58.03	3867	2288
48	-3.3394	213.299	209.7	1.8	4709	1578	6286	3.98	58.04	3932	2354
49	-3.3334	216.266	212.7	1.9	4770	1567	6337	4.04	58.12	3952	2385
50	-3.3274	220.196	216.6	2.0	4853	1562	6415	4.11	58.15	3989	2427
51	-3.3214	224.647	221.0	2.1	4948	1573	6521	4.15	58.08	4047	2474
52	-3.3154	227.149	223.5	2.2	4999	1569	6568	4.19	58.10	4069	2499
53	-3.3093	230.975	227.4	2.3	5079	1571	6650	4.23	58.09	4110	2540
54	-3.3033	234.636	231.0	2.4	5156	1579	6735	4.26	58.03	4157	2578
55	-3.2973	237.181	233.6	2.5	5207	1597	6804	4.26	57.91	4200	2603
56	-3.2913	240.064	236.5	2.6	5266	1602	6868	4.29	57.87	4235	2633
57	-3.2853	241.876	238.3	2.7	5301	1606	6907	4.30	57.85	4256	2650
58	-3.2851	241.376	237.8	2.7	5289	1628	6917	4.25	57.69	4273	2645

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1365.600			1454.300
Moisture content: Dry soil+tare, gms.	1163.000			1283.800
Moisture content: Tare, gms.	0.000			120.800
Moisture, %	17.4		15.3	14.7
Moist specimen weight, gms.	1365.6			
Diameter, in.	2.88		2.84	
Area, in.²	6.50		6.35	
Height, in.	6.01		5.83	
Net decrease in height, in.		0.24	-0.06	
Net decrease in water volume, cc.			6.00	
Wet Density, pcf	133.2		138.2	
Dry density, pcf	113.4		119.8	
Void ratio	0.4971		0.4176	
Saturation, %	95.3		100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 98.00 psi (14112 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 8352 psf
Strain rate, %/min. = 0.03
Fail. Stress = 9408 psf **at reading no.** 57

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.0543	1.706	0.0	0.0	0	8352	8352	1.00	40.00	8352	0
1	-0.0528	29.887	28.2	0.0	111	8208	8319	1.01	41.00	8263	55
2	-0.0513	50.242	48.5	0.1	572	8041	8613	1.07	42.16	8327	286
3	-0.0497	68.031	66.3	0.1	975	7835	8810	1.12	43.59	8322	487
4	-0.0482	86.131	84.4	0.1	1384	7654	9038	1.18	44.84	8346	692
5	-0.0467	100.760	99.1	0.1	1715	7451	9166	1.23	46.26	8308	857
6	-0.0452	115.592	113.9	0.2	2050	7262	9311	1.28	47.57	8287	1025
7	-0.0437	129.099	127.4	0.2	2355	7074	9428	1.33	48.88	8251	1177

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
8	-0.0422	143.433	141.7	0.2	2678	6903	9581	1.39	50.06	8242	1339
9	-0.0407	155.658	154.0	0.2	2954	6721	9675	1.44	51.33	8198	1477
10	-0.0392	166.810	165.1	0.3	3205	6549	9753	1.49	52.52	8151	1602
11	-0.0377	178.683	177.0	0.3	3472	6390	9862	1.54	53.63	8126	1736
12	-0.0362	189.157	187.5	0.3	3707	6236	9943	1.59	54.70	8089	1854
13	-0.0347	199.584	197.9	0.3	3942	6100	10042	1.65	55.64	8071	1971
14	-0.0332	208.745	207.0	0.4	4147	5962	10109	1.70	56.60	8036	2074
15	-0.0317	216.977	215.3	0.4	4332	5821	10153	1.74	57.58	7987	2166
16	-0.0302	226.995	225.3	0.4	4557	5697	10253	1.80	58.44	7975	2278
17	-0.0287	235.559	233.9	0.4	4749	5583	10332	1.85	59.23	7957	2374
18	-0.0272	243.465	241.8	0.5	4925	5476	10401	1.90	59.97	7939	2463
19	-0.0256	253.154	251.4	0.5	5142	5393	10535	1.95	60.55	7964	2571
20	-0.0241	259.043	257.3	0.5	5274	5289	10563	2.00	61.27	7926	2637
21	-0.0226	266.104	264.4	0.5	5431	5171	10602	2.05	62.09	7886	2716
22	-0.0211	272.749	271.0	0.6	5579	5083	10662	2.10	62.70	7872	2790
23	-0.0196	280.142	278.4	0.6	5744	5002	10746	2.15	63.26	7874	2872
24	-0.0181	286.970	285.3	0.6	5896	4931	10827	2.20	63.76	7879	2948
25	-0.0166	292.987	291.3	0.6	6030	4847	10877	2.24	64.34	7862	3015
26	-0.0151	299.103	297.4	0.7	6166	4771	10936	2.29	64.87	7853	3083
27	-0.0136	304.226	302.5	0.7	6279	4699	10978	2.34	65.37	7838	3139
28	-0.0121	310.333	308.6	0.7	6414	4640	11054	2.38	65.78	7847	3207
29	-0.0106	316.715	315.0	0.7	6556	4575	11131	2.43	66.23	7853	3278
30	-0.0091	320.542	318.8	0.8	6640	4514	11154	2.47	66.65	7834	3320
31	-0.0076	325.163	323.5	0.8	6742	4455	11197	2.51	67.06	7826	3371
32	-0.0061	329.935	328.2	0.8	6847	4407	11255	2.55	67.39	7831	3424
33	-0.0046	334.124	332.4	0.9	6939	4355	11294	2.59	67.76	7825	3470
34	-0.0031	338.211	336.5	0.9	7029	4301	11330	2.63	68.13	7815	3514
35	-0.0016	342.799	341.1	0.9	7130	4255	11384	2.68	68.45	7820	3565
36	-0.0001	347.482	345.8	0.9	7233	4216	11449	2.72	68.72	7832	3616
37	0.0014	351.558	349.9	1.0	7322	4187	11509	2.75	68.93	7848	3661
38	0.0029	354.905	353.2	1.0	7395	4158	11553	2.78	69.13	7855	3697
39	0.0044	357.867	356.2	1.0	7459	4102	11561	2.82	69.52	7831	3730
40	0.0059	361.216	359.5	1.0	7532	4062	11594	2.85	69.79	7828	3766
41	0.0120	374.624	372.9	1.1	7823	3935	11759	2.99	70.67	7847	3912
42	0.0180	386.075	384.4	1.2	8070	3837	11907	3.10	71.36	7872	4035
43	0.0240	394.200	392.5	1.3	8242	3771	12013	3.19	71.81	7892	4121
44	0.0300	402.322	400.6	1.4	8413	3707	12120	3.27	72.26	7913	4207
45	0.0360	407.917	406.2	1.5	8528	3649	12177	3.34	72.66	7913	4264
46	0.0420	415.931	414.2	1.7	8696	3611	12308	3.41	72.92	7960	4348
47	0.0480	420.228	418.5	1.8	8781	3582	12364	3.45	73.12	7973	4391
48	0.0540	425.075	423.4	1.9	8879	3562	12440	3.49	73.27	8001	4439
49	0.0601	428.545	426.8	2.0	8945	3535	12480	3.53	73.45	8008	4472
50	0.0661	432.270	430.6	2.1	9017	3523	12539	3.56	73.54	8031	4508
51	0.0721	435.385	433.7	2.2	9075	3515	12590	3.58	73.59	8052	4537
52	0.0781	439.651	437.9	2.3	9158	3533	12691	3.59	73.46	8112	4579
53	0.0841	442.519	440.8	2.4	9211	3523	12733	3.61	73.53	8128	4605
54	0.0901	444.471	442.8	2.5	9242	3520	12762	3.63	73.56	8141	4621

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
55	0.1022	449.221	447.5	2.7	9325	3535	12859	3.64	73.45	8197	4662
56	0.1082	451.525	449.8	2.8	9364	3532	12897	3.65	73.47	8215	4682
57	0.1142	454.060	452.4	2.9	9408	3535	12944	3.66	73.45	8239	4704
58	0.1174	454.992	453.3	2.9	9423	3532	12954	3.67	73.47	8243	4711

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1365.600			1454.300
Moisture content: Dry soil+tare, gms.	1163.000			1283.800
Moisture content: Tare, gms.	0.000			120.800
Moisture, %	17.4		14.7	14.7
Moist specimen weight, gms.	1365.6			
Diameter, in.	2.88		2.86	
Area, in.²	6.50		6.41	
Height, in.	6.01		5.70	
Net decrease in height, in.		0.36	-0.04	
Net decrease in water volume, cc.			8.00	
Wet Density, pcf	133.2		139.2	
Dry density, pcf	113.4		121.4	
Void ratio	0.4971		0.3989	
Saturation, %	95.3		100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 156.00 psi (22464 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 16704 psf
Strain rate, %/min. = 0.03
Fail. Stress = 16923 psf **at reading no.** 59

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	0.1268	5.131	0.0	0.0	0	16691	16691	1.00	40.09	16691	0
1	0.1282	22.974	17.8	0.0	0	16604	16604	1.00	40.69	16604	0
2	0.1297	48.422	43.3	0.1	416	16483	16899	1.03	41.53	16691	208
3	0.1312	76.289	71.2	0.1	1042	16311	17353	1.06	42.73	16832	521
4	0.1326	103.442	98.3	0.1	1651	16105	17756	1.10	44.16	16930	825
5	0.1341	129.432	124.3	0.1	2234	15862	18095	1.14	45.85	16979	1117
6	0.1355	156.477	151.3	0.2	2840	15609	18448	1.18	47.61	17029	1420
7	0.1370	180.578	175.4	0.2	3379	15331	18710	1.22	49.54	17020	1690
8	0.1384	203.917	198.8	0.2	3902	15038	18940	1.26	51.57	16989	1951
9	0.1399	226.306	221.2	0.2	4402	14743	19145	1.30	53.62	16944	2201
10	0.1413	248.770	243.6	0.3	4905	14458	19362	1.34	55.60	16910	2452
11	0.1428	269.903	264.8	0.3	5377	14178	19555	1.38	57.54	16866	2688
12	0.1442	289.887	284.8	0.3	5823	13881	19704	1.42	59.60	16793	2911
13	0.1457	309.495	304.4	0.3	6260	13604	19864	1.46	61.53	16734	3130
14	0.1471	327.572	322.4	0.4	6663	13323	19986	1.50	63.48	16655	3332
15	0.1486	345.526	340.4	0.4	7063	13055	20118	1.54	65.34	16586	3532

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
16	0.1500	363.087	358.0	0.4	7454	12804	20258	1.58	67.08	16531	3727
17	0.1515	379.317	374.2	0.4	7815	12557	20372	1.62	68.80	16464	3908
18	0.1529	394.182	389.1	0.5	8145	12316	20461	1.66	70.47	16388	4073
19	0.1544	410.400	405.3	0.5	8506	12083	20588	1.70	72.09	16335	4253
20	0.1559	423.725	418.6	0.5	8801	11837	20638	1.74	73.80	16238	4401
21	0.1573	439.547	434.4	0.5	9152	11624	20777	1.79	75.28	16200	4576
22	0.1588	451.584	446.5	0.6	9419	11433	20852	1.82	76.60	16142	4709
23	0.1602	465.421	460.3	0.6	9725	11235	20960	1.87	77.98	16098	4863
24	0.1617	477.099	472.0	0.6	9983	11043	21026	1.90	79.31	16035	4992
25	0.1631	490.267	485.1	0.6	10274	10860	21134	1.95	80.58	15997	5137
26	0.1646	501.030	495.9	0.7	10512	10685	21197	1.98	81.80	15941	5256
27	0.1660	513.684	508.6	0.7	11353	10519	21872	2.08	82.95	16195	5676
28	0.1675	523.026	517.9	0.7	11559	10370	21928	2.11	83.99	16149	5779
29	0.1689	533.601	528.5	0.7	11792	10216	22008	2.15	85.06	16112	5896
30	0.1704	543.557	538.4	0.8	12011	10069	22079	2.19	86.08	16074	6005
31	0.1718	553.458	548.3	0.8	12228	9927	22156	2.23	87.06	16042	6114
32	0.1733	561.809	556.7	0.8	12411	9792	22203	2.27	88.00	15997	6206
33	0.1747	571.432	566.3	0.8	12623	9673	22295	2.30	88.83	15984	6311
34	0.1762	579.157	574.0	0.9	12792	9543	22335	2.34	89.73	15939	6396
35	0.1777	587.318	582.2	0.9	12970	9433	22403	2.37	90.49	15918	6485
36	0.1791	595.099	590.0	0.9	13140	9321	22462	2.41	91.27	15892	6570
37	0.1806	602.332	597.2	0.9	13298	9229	22527	2.44	91.91	15878	6649
38	0.1820	608.965	603.8	1.0	13442	9116	22558	2.47	92.69	15837	6721
39	0.1835	616.138	611.0	1.0	13598	9028	22626	2.51	93.31	15827	6799
40	0.1849	621.983	616.9	1.0	13725	8928	22653	2.54	94.00	15791	6862
41	0.1907	645.606	640.5	1.1	14236	8606	22841	2.65	96.24	15723	7118
42	0.1965	664.978	659.8	1.2	14651	8305	22956	2.76	98.33	15630	7326
43	0.2023	682.756	677.6	1.3	15030	8082	23113	2.86	99.87	15597	7515
44	0.2081	697.396	692.3	1.4	15339	7883	23222	2.95	101.26	15553	7670
45	0.2139	709.280	704.1	1.5	15586	7716	23303	3.02	102.42	15509	7793
46	0.2197	721.052	715.9	1.6	15831	7576	23406	3.09	103.39	15491	7915
47	0.2255	728.802	723.7	1.7	15985	7454	23439	3.14	104.24	15447	7993
48	0.2313	736.569	731.4	1.8	16140	7355	23496	3.19	104.92	15426	8070
49	0.2372	744.516	739.4	1.9	16299	7281	23580	3.24	105.44	15431	8149
50	0.2430	748.449	743.3	2.0	16368	7217	23585	3.27	105.88	15401	8184
51	0.2488	754.286	749.2	2.1	16480	7161	23640	3.30	106.27	15401	8240
52	0.2546	759.391	754.3	2.2	16575	7105	23680	3.33	106.66	15392	8287
53	0.2604	762.181	757.0	2.3	16619	7069	23688	3.35	106.91	15378	8309
54	0.2662	766.092	761.0	2.4	16687	7037	23724	3.37	107.14	15380	8344
55	0.2720	769.178	764.0	2.5	16737	7010	23748	3.39	107.32	15379	8369
56	0.2836	774.758	769.6	2.8	16824	6967	23791	3.41	107.62	15379	8412
57	0.2894	777.390	772.3	2.9	16864	6953	23817	3.43	107.72	15385	8432
58	0.3010	781.205	776.1	3.1	16912	6929	23841	3.44	107.88	15385	8456
59	0.3126	783.329	778.2	3.3	16923	6926	23848	3.44	107.91	15387	8461
60	0.3191	785.655	780.5	3.4	16953	6913	23866	3.45	107.99	15389	8477

Parameters for Specimen No. 4

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1365.600			1454.300
Moisture content: Dry soil+tare, gms.	1163.000			1283.800
Moisture content: Tare, gms.	0.000			120.800
Moisture, %	17.4		14.7	14.7
Moist specimen weight, gms.	1365.6			
Diameter, in.	2.88		2.91	
Area, in.²	6.50		6.63	
Height, in.	6.01		5.51	
Net decrease in height, in.		0.51	0.00	
Net decrease in water volume, cc.			0.00	
Wet Density, pcf	133.2		139.2	
Dry density, pcf	113.4		121.4	
Void ratio	0.4971		0.3989	
Saturation, %	95.3		100.0	

Test Readings for Specimen No. 4

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 272.00 psi (39168 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 33408 psf
Strain rate, %/min. = 0.03
Fail. Stress = 29291 psf **at reading no.** 62

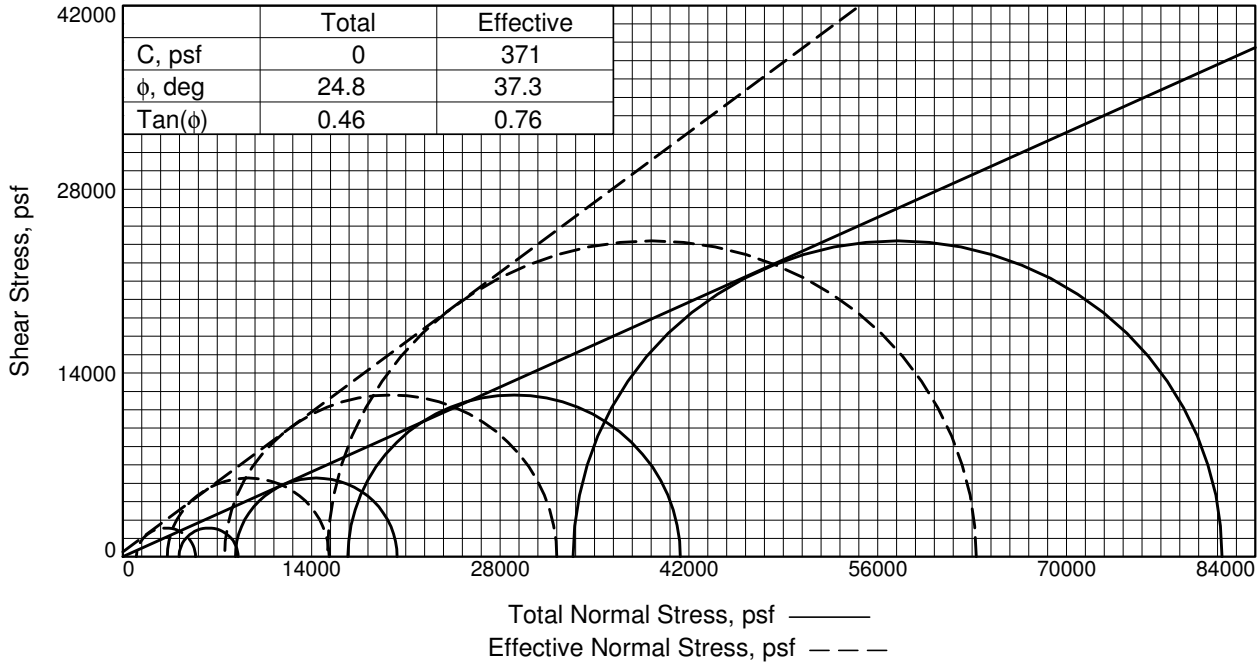
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	0.2702	2.198	0.0	0.0	0	33408	33408	1.00	40.00	33408	0
1	0.2717	3.218	1.0	0.0	0	33378	33378	1.00	40.21	33378	0
2	0.2731	7.862	5.7	0.1	0	33359	33359	1.00	40.34	33359	0
3	0.2746	24.164	22.0	0.1	0	33308	33308	1.00	40.69	33308	0
4	0.2760	51.900	49.7	0.1	499	33219	33719	1.02	41.31	33469	250
5	0.2775	83.391	81.2	0.1	1182	33086	34267	1.04	42.24	33677	591
6	0.2789	117.762	115.6	0.2	1927	32928	34854	1.06	43.33	33891	963
7	0.2804	151.397	149.2	0.2	2655	32709	35363	1.08	44.86	34036	1327
8	0.2819	184.689	182.5	0.2	3375	32456	35831	1.10	46.61	34143	1688
9	0.2833	218.357	216.2	0.2	4104	32167	36271	1.13	48.61	34219	2052
10	0.2848	251.192	249.0	0.3	4813	31846	36660	1.15	50.84	34253	2407
11	0.2862	285.064	282.9	0.3	5545	31498	37044	1.18	53.26	34271	2773
12	0.2877	316.185	314.0	0.3	6217	31125	37342	1.20	55.86	34233	3109
13	0.2891	348.922	346.7	0.3	6924	30730	37654	1.23	58.59	34192	3462
14	0.2906	380.817	378.6	0.4	7612	30303	37914	1.25	61.57	34108	3806
15	0.2920	413.625	411.4	0.4	8319	29876	38195	1.28	64.53	34036	4160
16	0.2935	442.748	440.6	0.4	8947	29431	38378	1.30	67.62	33904	4473
17	0.2949	474.438	472.2	0.4	9629	28994	38623	1.33	70.65	33808	4815
18	0.2964	504.143	501.9	0.5	10268	28538	38806	1.36	73.82	33672	5134
19	0.2978	533.887	531.7	0.5	10908	28093	39001	1.39	76.91	33547	5454
20	0.2993	562.402	560.2	0.5	12103	27639	39743	1.44	80.06	33691	6052
21	0.3007	590.777	588.6	0.6	12713	27200	39913	1.47	83.11	33557	6357
22	0.3022	618.117	615.9	0.6	13300	26756	40057	1.50	86.19	33406	6650
23	0.3036	644.509	642.3	0.6	13866	26321	40188	1.53	89.21	33255	6933

Test Readings for Specimen No. 4

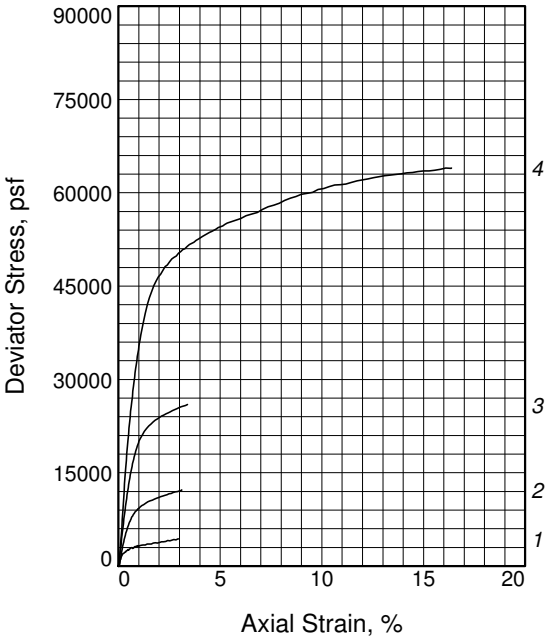
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	0.3051	671.377	669.2	0.6	14443	25890	40333	1.56	92.21	33111	7221
25	0.3066	696.200	694.0	0.7	14974	25471	40445	1.59	95.12	32958	7487
26	0.3080	721.652	719.5	0.7	15519	25058	40577	1.62	97.99	32818	7760
27	0.3095	744.139	741.9	0.7	16000	24651	40651	1.65	100.81	32651	8000
28	0.3109	770.050	767.9	0.7	16555	24258	40812	1.68	103.54	32535	8277
29	0.3124	791.687	789.5	0.8	17017	23867	40884	1.71	106.26	32375	8508
30	0.3138	815.203	813.0	0.8	17519	23497	41016	1.75	108.83	32256	8759
31	0.3153	835.490	833.3	0.8	17951	23133	41084	1.78	111.35	32109	8976
32	0.3167	856.619	854.4	0.8	18401	22791	41192	1.81	113.73	31991	9201
33	0.3182	875.788	873.6	0.9	18809	22448	41257	1.84	116.11	31852	9405
34	0.3196	895.586	893.4	0.9	19230	22126	41356	1.87	118.35	31741	9615
35	0.3211	914.381	912.2	0.9	19630	21831	41461	1.90	120.40	31646	9815
36	0.3225	932.308	930.1	1.0	20010	21484	41494	1.93	122.81	31489	10005
37	0.3240	949.601	947.4	1.0	20377	21184	41561	1.96	124.89	31372	10188
38	0.3254	966.140	963.9	1.0	20727	20892	41619	1.99	126.92	31255	10363
39	0.3269	983.275	981.1	1.0	21090	20621	41710	2.02	128.80	31165	10545
40	0.3283	997.509	995.3	1.1	21390	20355	41745	2.05	130.64	31050	10695
41	0.33411056.007		1053.8	1.2	22623	19347	41970	2.17	137.64	30659	11312
42	0.33991106.114		1103.9	1.3	23673	18503	42176	2.28	143.51	30340	11837
43	0.34571148.315		1146.1	1.4	24552	17745	42298	2.38	148.77	30021	12276
44	0.35161187.622		1185.4	1.5	25367	17096	42464	2.48	153.27	29780	12684
45	0.35741219.054		1216.9	1.6	26012	16528	42540	2.57	157.22	29534	13006
46	0.36321248.499		1246.3	1.7	26613	16026	42639	2.66	160.71	29332	13306
47	0.36901272.780		1270.6	1.8	27102	15620	42722	2.74	163.53	29171	13551
48	0.37481292.970		1290.8	1.9	27503	15260	42764	2.80	166.03	29012	13752
49	0.38061309.275		1307.1	2.0	27821	14937	42758	2.86	168.27	28848	13910
50	0.38641325.839		1323.6	2.1	28143	14671	42814	2.92	170.12	28743	14072
51	0.39221337.809		1335.6	2.2	28367	14436	42803	2.96	171.75	28620	14183
52	0.39801347.292		1345.1	2.3	28538	14224	42761	3.01	173.23	28492	14269
53	0.40381356.918		1354.7	2.4	28711	14046	42757	3.04	174.46	28401	14355
54	0.40961363.886		1361.7	2.5	28827	13903	42730	3.07	175.45	28317	14414
55	0.41541372.134		1369.9	2.6	28971	13776	42746	3.10	176.33	28261	14485
56	0.42121378.794		1376.6	2.7	29080	13667	42746	3.13	177.09	28206	14540
57	0.43281388.087		1385.9	3.0	29213	13495	42708	3.16	178.29	28101	14606
58	0.44441394.082		1391.9	3.2	29275	13353	42629	3.19	179.27	27991	14638
59	0.45601399.550		1397.4	3.4	29326	13261	42588	3.21	179.91	27924	14663
60	0.46761403.432		1401.2	3.6	29344	13207	42550	3.22	180.29	27878	14672
61	0.47921407.612		1405.4	3.8	29367	13152	42519	3.23	180.67	27836	14683
62	0.49081407.040		1404.8	4.0	29291	13090	42380	3.24	181.10	27735	14645
63	0.50241411.382		1409.2	4.2	29317	13073	42389	3.24	181.22	27731	14658
64	0.51401412.096		1409.9	4.4	29267	13064	42331	3.24	181.28	27697	14633
65	0.52561412.458		1410.3	4.6	29210	13040	42250	3.24	181.44	27645	14605
66	0.53721414.960		1412.8	4.9	29197	13019	42216	3.24	181.59	27617	14598
67	0.54891417.589		1415.4	5.1	29187	13007	42193	3.24	181.67	27600	14593
68	0.56051417.619		1415.4	5.3	29122	12982	42104	3.24	181.85	27543	14561
69	0.57501418.763		1416.6	5.5	29065	12976	42041	3.24	181.89	27508	14532
70	0.58951421.056		1418.9	5.8	29031	12969	42000	3.24	181.94	27484	14515

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
71	0.60401	422.975	1420.8	6.1	28989	12947	41936	3.24	182.09	27441	14494
72	0.61851	423.636	1421.4	6.3	28921	12936	41857	3.24	182.17	27396	14460
73	0.63301	426.138	1423.9	6.6	28890	12918	41809	3.24	182.29	27363	14445
74	0.64751	430.177	1428.0	6.9	28890	12898	41789	3.24	182.43	27344	14445
75	0.66201	431.610	1429.4	7.1	28838	12892	41730	3.24	182.47	27311	14419
76	0.67651	433.060	1430.9	7.4	28785	12895	41680	3.23	182.45	27287	14393
77	0.69101	436.546	1434.3	7.6	28773	12890	41663	3.23	182.49	27276	14387
78	0.70551	439.799	1437.6	7.9	28756	12879	41635	3.23	182.57	27257	14378
79	0.72001	440.918	1438.7	8.2	28696	12870	41566	3.23	182.62	27218	14348
80	0.73451	443.381	1441.2	8.4	28663	12853	41516	3.23	182.74	27185	14331
81	0.74901	447.305	1445.1	8.7	28658	12846	41504	3.23	182.79	27175	14329
82	0.76351	451.174	1449.0	9.0	28652	12850	41502	3.23	182.77	27176	14326
83	0.77801	452.517	1450.3	9.2	28596	12837	41432	3.23	182.85	27135	14298
84	0.79251	456.047	1453.8	9.5	28582	12826	41408	3.23	182.93	27117	14291
85	0.80701	459.170	1457.0	9.8	28560	12819	41379	3.23	182.98	27099	14280
86	0.82151	460.437	1458.2	10.0	28501	12815	41317	3.22	183.01	27066	14251
87	0.83601	463.049	1460.9	10.3	28469	12808	41277	3.22	183.05	27043	14234
88	0.85051	465.610	1463.4	10.5	28435	12808	41243	3.22	183.06	27025	14217
89	0.86501	469.895	1467.7	10.8	28434	12811	41245	3.22	183.04	27028	14217
90	0.87951	473.025	1470.8	11.1	28411	12807	41217	3.22	183.06	27012	14205
91	0.89401	475.913	1473.7	11.3	28382	12804	41186	3.22	183.08	26995	14191
92	0.90861	478.619	1476.4	11.6	28350	12808	41158	3.21	183.06	26983	14175
93	0.92311	483.320	1481.1	11.9	28355	12811	41167	3.21	183.03	26989	14178
94	0.93761	485.206	1483.0	12.1	28307	12795	41101	3.21	183.15	26948	14153
95	0.95211	492.325	1490.1	12.4	28357	12796	41153	3.22	183.14	26974	14179
96	0.96661	494.244	1492.0	12.6	28308	12796	41105	3.21	183.14	26950	14154
97	0.98111	496.189	1494.0	12.9	28260	12818	41078	3.20	182.99	26948	14130
98	0.99561	500.377	1498.2	13.2	28253	12796	41050	3.21	183.14	26923	14127
99	1.01011	505.246	1503.0	13.4	28259	12784	41043	3.21	183.22	26913	14130
100	1.02461	508.268	1506.1	13.7	28230	12794	41024	3.21	183.15	26909	14115
101	1.03911	514.143	1511.9	14.0	28253	12766	41020	3.21	183.35	26893	14127
102	1.05361	514.427	1512.2	14.2	28172	12745	40917	3.21	183.49	26831	14086
103	1.06811	520.428	1518.2	14.5	28197	12782	40979	3.21	183.23	26881	14098
104	1.08261	522.358	1520.2	14.8	28146	12773	40919	3.20	183.30	26846	14073
105	1.09711	526.719	1524.5	15.0	28139	12763	40903	3.20	183.37	26833	14070
106	1.11161	533.847	1531.6	15.3	28183	12765	40949	3.21	183.35	26857	14092
107	1.12611	532.789	1530.6	15.5	28076	12757	40833	3.20	183.41	26795	14038
108	1.14061	531.906	1529.7	15.8	27973	12752	40724	3.19	183.45	26738	13986



	Total	Effective
C, psf	0	371
ϕ, deg	24.8	37.3
Tan(ϕ)	0.46	0.76



Sample No.		1	2	3	4
Initial	Water Content, %	12.9	12.9	12.9	12.9
	Dry Density, pcf	127.0	127.0	127.0	127.0
	Saturation, %	99.9	99.9	99.9	99.9
	Void Ratio	0.3564	0.3564	0.3564	0.3564
	Diameter, in.	2.90	2.90	2.90	2.90
	Height, in.	5.99	5.99	5.99	5.99
At Test	Water Content, %	8.6	8.0	7.9	7.8
	Dry Density, pcf	139.1	141.1	141.4	141.9
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.2386	0.2209	0.2188	0.2146
	Diameter, in.	2.80	2.82	2.85	2.89
	Height, in.	5.85	5.70	5.56	5.41
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, psf		4176	8352	16704	33408
Fail. Stress, psf		4379	11994	24654	48124
Excess Pore Pr., psf		3159	5039	9158	18226
Strain, %		3.0	2.9	2.4	2.3
Ult. Stress, psf					
Excess Pore Pr., psf					
Strain, %					
$\bar{\sigma}_1$ Failure, psf		5396	15308	32200	63305
$\bar{\sigma}_3$ Failure, psf		1017	3313	7546	15182

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: clayey gravel with sand

LL= 24 **PL=** 15 **PI=** 9

Assumed Specific Gravity= 2.76

Remarks: Failure tangents drawn through peak pricipal stress ratio.

Fig. _____

Client: Pebble Limited Partnership

Project: Pebble Project

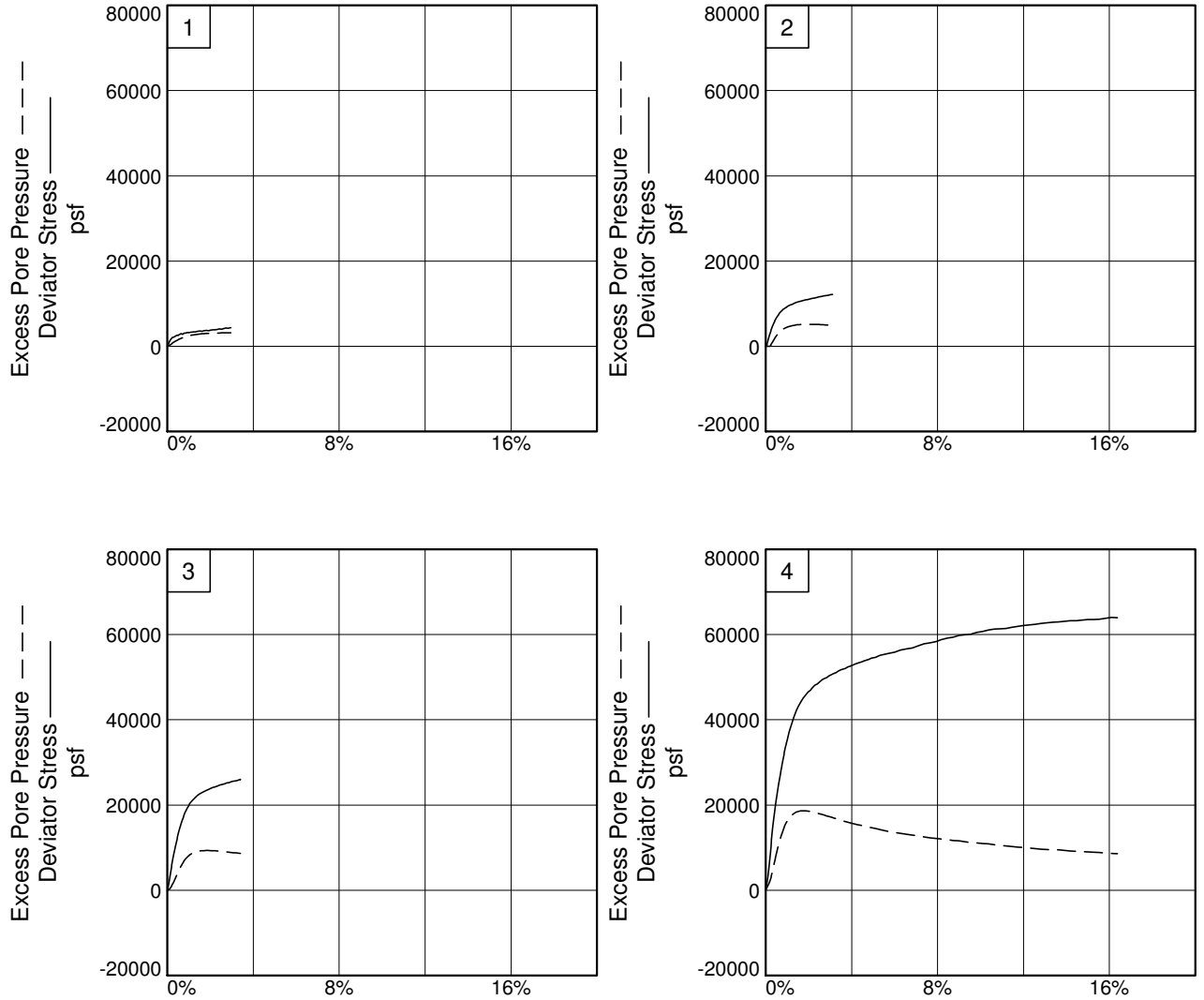
Location: GH10-227

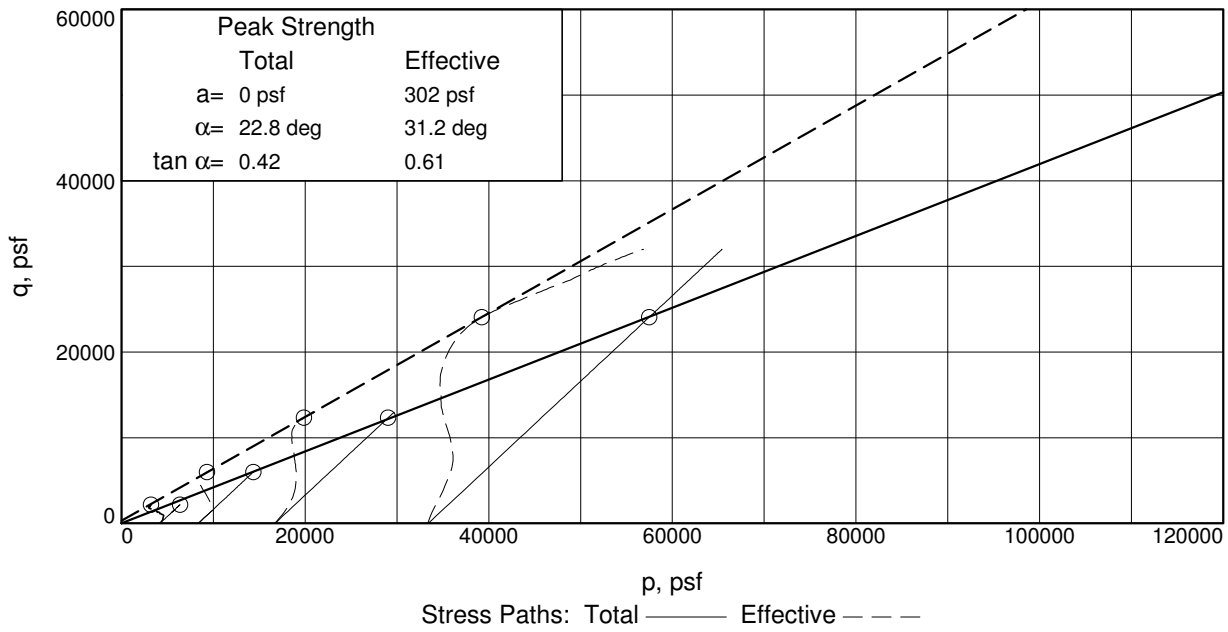
Sample Number: ST 1 **Depth:** 5-7'

Proj. No.: 101-77/11 **Date Sampled:** 12/23/10

Knight Piésold CONSULTING

Tested By: spb **Checked By:** jdb





Client: Pebble Limited Partnership
Project: Pebble Project
Location: GH10-227 **Depth:** 5-7' **Sample Number:** ST 1
Project No.: 101-77/11 **Fig.** 1:3

Knight Piesold Geotechnical Lab.

Tested By: spb **Checked By:** jdb

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/25/2011
5:21 PM

Date: 12/23/10
Client: Pebble Limited Partnership
Project: Pebble Project
Project No.: 101-77/11
Location: GH10-227
Depth: 5-7' **Sample Number:** ST 1
Description: clayey gravel with sand
Remarks: Failure tangents drawn through peak pricipal stress ratio.
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.76 **LL=**24 **PL=**15 **PI=**9
Test Method: ASTM D 4767 Method A (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	2035.150			1549.800
Moisture content: Dry soil+tare, gms.	1833.100			1446.200
Moisture content: Tare, gms.	266.500			113.100
Moisture, %	12.9	12.9	8.6	7.8
Moist specimen weight, gms.	1489.4			
Diameter, in.	2.90	2.90	2.80	
Area, in.²	6.61	6.61	6.17	
Height, in.	5.99	5.99	5.85	
Net decrease in height, in.		0.00	0.14	
Net decrease in water volume, cc.			56.30	
Wet Density, pcf	143.4	143.4	151.1	
Dry density, pcf	127.0	127.0	139.1	
Void ratio	0.3564	0.3564	0.2386	
Saturation, %	99.9	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 69.00 psi (9936 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 4176 psf
Strain rate, %/min. = 0.03
Fail. Stress = 4379 psf **at reading no.** 57

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	0.0612	-1.120	0.0	0.0	0	4152	4152	1.00	40.17	4152	0
1	0.0626	8.544	9.7	0.0	225	4158	4384	1.05	40.12	4271	113
2	0.0641	21.087	22.2	0.1	518	4110	4628	1.13	40.46	4369	259
3	0.0656	38.037	39.2	0.1	913	4067	4980	1.22	40.76	4524	456
4	0.0671	45.302	46.4	0.1	1082	3957	5038	1.27	41.52	4498	541
5	0.0685	56.419	57.5	0.1	1341	3852	5192	1.35	42.25	4522	670
6	0.0700	66.767	67.9	0.2	1581	3774	5355	1.42	42.79	4564	791
7	0.0715	75.927	77.0	0.2	1794	3689	5483	1.49	43.38	4586	897
8	0.0730	81.700	82.8	0.2	1928	3593	5521	1.54	44.05	4557	964
9	0.0744	85.819	86.9	0.2	2024	3479	5503	1.58	44.84	4491	1012
10	0.0774	90.364	91.5	0.3	2128	3282	5410	1.65	46.21	4346	1064
11	0.0789	94.220	95.3	0.3	2217	3197	5414	1.69	46.80	4305	1109
12	0.0803	95.566	96.7	0.3	2248	3119	5367	1.72	47.34	4243	1124
13	0.0818	96.649	97.8	0.4	2273	3039	5312	1.75	47.89	4176	1136
14	0.0833	103.449	104.6	0.4	2430	2955	5386	1.82	48.48	4171	1215
15	0.0848	104.914	106.0	0.4	2464	2879	5342	1.86	49.01	4110	1232
16	0.0862	108.265	109.4	0.4	2541	2794	5335	1.91	49.60	4064	1270
17	0.0877	112.321	113.4	0.5	2634	2740	5374	1.96	49.97	4057	1317
18	0.0892	113.097	114.2	0.5	2652	2665	5317	2.00	50.49	3991	1326
19	0.0907	110.034	111.2	0.5	2580	2596	5175	1.99	50.98	3886	1290
20	0.0922	114.985	116.1	0.5	2694	2528	5222	2.07	51.44	3875	1347
21	0.0936	117.837	119.0	0.6	2760	2467	5226	2.12	51.87	3846	1380
22	0.0951	119.834	121.0	0.6	2805	2423	5228	2.16	52.17	3826	1403
23	0.0966	124.442	125.6	0.6	2911	2380	5292	2.22	52.47	3836	1456
24	0.0981	125.680	126.8	0.6	2939	2319	5258	2.27	52.90	3788	1470
25	0.0995	127.214	128.3	0.7	2974	2267	5241	2.31	53.26	3754	1487
26	0.1010	124.240	125.4	0.7	2904	2216	5121	2.31	53.61	3668	1452
27	0.1025	121.732	122.9	0.7	2846	2161	5007	2.32	53.99	3584	1423
28	0.1040	124.864	126.0	0.7	2917	2126	5044	2.37	54.23	3585	1459
29	0.1055	125.630	126.8	0.8	2934	2081	5016	2.41	54.55	3549	1467
30	0.1069	131.951	133.1	0.8	3080	2053	5133	2.50	54.74	3593	1540
31	0.1084	134.658	135.8	0.8	3142	1999	5140	2.57	55.12	3570	1571
32	0.1099	133.866	135.0	0.8	3123	1953	5075	2.60	55.44	3514	1561
33	0.1114	133.258	134.4	0.9	3108	1886	4994	2.65	55.90	3440	1554
34	0.1128	137.549	138.7	0.9	3206	1861	5067	2.72	56.08	3464	1603
35	0.1173	140.338	141.5	1.0	3268	1757	5026	2.86	56.80	3391	1634
36	0.1187	135.331	136.5	1.0	3152	1714	4866	2.84	57.10	3290	1576
37	0.1202	138.949	140.1	1.0	3235	1706	4941	2.90	57.15	3324	1617
38	0.1261	144.058	145.2	1.1	3349	1594	4943	3.10	57.93	3268	1675
39	0.1320	145.752	146.9	1.2	3385	1494	4878	3.27	58.63	3186	1692
40	0.1379	146.976	148.1	1.3	3409	1398	4808	3.44	59.29	3103	1705
41	0.1438	152.654	153.8	1.4	3537	1344	4881	3.63	59.67	3112	1768
42	0.1497	154.291	155.4	1.5	3571	1296	4866	3.76	60.00	3081	1785
43	0.1557	153.436	154.6	1.6	3547	1222	4769	3.90	60.51	2996	1774
44	0.1615	160.090	161.2	1.7	3696	1190	4887	4.10	60.73	3039	1848
45	0.1675	162.780	163.9	1.8	3754	1166	4920	4.22	60.90	3043	1877
46	0.1734	159.655	160.8	1.9	3679	1120	4799	4.28	61.22	2959	1839

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
47	0.1793	165.570	166.7	2.0	3810	1098	4908	4.47	61.37	3003	1905
48	0.1852	169.871	171.0	2.1	3904	1089	4994	4.58	61.43	3042	1952
49	0.1911	169.286	170.4	2.2	3887	1045	4932	4.72	61.74	2989	1944
50	0.1970	172.472	173.6	2.3	3956	1046	5002	4.78	61.73	3024	1978
51	0.2029	178.822	179.9	2.4	4096	1049	5145	4.90	61.71	3097	2048
52	0.2088	177.320	178.4	2.5	4058	1014	5072	5.00	61.96	3043	2029
53	0.2147	182.321	183.4	2.6	4167	1031	5198	5.04	61.84	3115	2084
54	0.2206	187.566	188.7	2.7	4282	1028	5310	5.17	61.86	3169	2141
55	0.2265	185.688	186.8	2.8	4235	1000	5235	5.23	62.06	3117	2117
56	0.2324	192.210	193.3	2.9	4378	1022	5400	5.28	61.90	3211	2189
57	0.2340	192.326	193.4	3.0	4379	1017	5396	5.31	61.94	3207	2190

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	2035.150			1549.800
Moisture content: Dry soil+tare, gms.	1833.100			1446.200
Moisture content: Tare, gms.	266.500			113.100
Moisture, %	12.9		8.0	7.8
Moist specimen weight, gms.	1489.4			
Diameter, in.	2.90		2.82	
Area, in.²	6.61		6.25	
Height, in.	5.99		5.70	
Net decrease in height, in.		0.31	-0.02	
Net decrease in water volume, cc.			8.50	
Wet Density, pcf	143.4		152.4	
Dry density, pcf	127.0		141.1	
Void ratio	0.3564		0.2209	
Saturation, %	99.9		100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 98.00 psi (14112 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 8352 psf
Strain rate, %/min. = 0.03
Fail. Stress = 11994 psf **at reading no.** 58

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	0.2368	0.924	0.0	0.0	0	8351	8351	1.00	40.01	8351	0
1	0.2383	5.286	4.4	0.0	72	8370	8442	1.01	39.88	8406	36
2	0.2398	13.154	12.2	0.1	253	8359	8612	1.03	39.95	8486	127
3	0.2413	33.328	32.4	0.1	746	8356	9102	1.09	39.97	8729	373
4	0.2427	56.586	55.7	0.1	1282	8363	9645	1.15	39.93	9004	641
5	0.2442	78.178	77.3	0.1	1779	8351	10130	1.21	40.00	9241	889
6	0.2457	100.240	99.3	0.2	2286	8361	10647	1.27	39.94	9504	1143
7	0.2472	119.870	118.9	0.2	2737	8359	11097	1.33	39.95	9728	1369
8	0.2487	136.782	135.9	0.2	3126	8362	11488	1.37	39.93	9925	1563

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
9	0.2501	154.930	154.0	0.2	3542	8140	11682	1.44	41.47	9911	1771
10	0.2516	170.255	169.3	0.3	3894	7879	11772	1.49	43.29	9826	1947
11	0.2531	186.194	185.3	0.3	4259	7641	11900	1.56	44.94	9770	2130
12	0.2546	203.140	202.2	0.3	4648	7414	12062	1.63	46.51	9738	2324
13	0.2560	217.181	216.3	0.3	4969	7178	12147	1.69	48.15	9662	2484
14	0.2575	230.458	229.5	0.4	5273	6944	12217	1.76	49.78	9581	2636
15	0.2590	243.088	242.2	0.4	5561	6719	12280	1.83	51.34	9499	2781
16	0.2605	255.437	254.5	0.4	5843	6510	12353	1.90	52.79	9432	2922
17	0.2619	267.450	266.5	0.4	6118	6310	12428	1.97	54.18	9369	3059
18	0.2634	278.122	277.2	0.5	6361	6123	12484	2.04	55.48	9304	3180
19	0.2649	289.292	288.4	0.5	6615	5939	12554	2.11	56.76	9247	3308
20	0.2664	300.099	299.2	0.5	6862	5754	12616	2.19	58.04	9185	3431
21	0.2679	309.566	308.6	0.5	7077	5584	12661	2.27	59.22	9123	3538
22	0.2693	317.246	316.3	0.6	7251	5420	12671	2.34	60.36	9045	3626
23	0.2708	325.103	324.2	0.6	7429	5280	12709	2.41	61.34	8994	3715
24	0.2723	332.425	331.5	0.6	7595	5141	12736	2.48	62.30	8938	3798
25	0.2738	341.162	340.2	0.6	7793	4997	12790	2.56	63.30	8894	3897
26	0.2752	348.235	347.3	0.7	7953	4886	12839	2.63	64.07	8862	3977
27	0.2767	354.034	353.1	0.7	8084	4763	12847	2.70	64.92	8805	4042
28	0.2782	359.952	359.0	0.7	8217	4648	12865	2.77	65.72	8756	4109
29	0.2797	366.753	365.8	0.8	8371	4561	12932	2.84	66.33	8746	4185
30	0.2811	372.831	371.9	0.8	8508	4460	12967	2.91	67.03	8713	4254
31	0.2826	378.009	377.1	0.8	8624	4364	12988	2.98	67.69	8676	4312
32	0.2841	383.186	382.3	0.8	8740	4267	13007	3.05	68.37	8637	4370
33	0.2856	387.109	386.2	0.9	8827	4188	13015	3.11	68.92	8602	4414
34	0.2870	390.561	389.6	0.9	8904	4116	13020	3.16	69.42	8568	4452
35	0.2885	395.573	394.6	0.9	9016	4041	13057	3.23	69.94	8549	4508
36	0.2900	399.534	398.6	0.9	9104	3984	13088	3.28	70.33	8536	4552
37	0.2915	403.028	402.1	1.0	9181	3920	13102	3.34	70.78	8511	4591
38	0.2929	407.355	406.4	1.0	9278	3875	13153	3.39	71.09	8514	4639
39	0.2944	409.839	408.9	1.0	9332	3815	13147	3.45	71.51	8481	4666
40	0.2959	414.006	413.1	1.0	9425	3769	13193	3.50	71.83	8481	4712
41	0.3018	427.094	426.2	1.1	9713	3605	13318	3.69	72.96	8462	4857
42	0.3077	435.427	434.5	1.2	9893	3492	13384	3.83	73.75	8438	4946
43	0.3136	445.426	444.5	1.3	10110	3390	13500	3.98	74.46	8445	5055
44	0.3195	455.575	454.7	1.5	10330	3308	13637	4.12	75.03	8473	5165
45	0.3254	462.373	461.4	1.6	10473	3277	13750	4.20	75.25	8513	5237
46	0.3313	468.741	467.8	1.7	10607	3222	13829	4.29	75.62	8525	5303
47	0.3372	476.572	475.6	1.8	10773	3203	13976	4.36	75.76	8589	5386
48	0.3432	483.935	483.0	1.9	10928	3202	14130	4.41	75.76	8666	5464
49	0.3491	488.159	487.2	2.0	11012	3190	14202	4.45	75.85	8696	5506
50	0.3550	494.615	493.7	2.1	11146	3183	14329	4.50	75.90	8756	5573
51	0.3609	499.182	498.3	2.2	11237	3191	14429	4.52	75.84	8810	5619
52	0.3668	504.607	503.7	2.3	11348	3189	14537	4.56	75.85	8863	5674
53	0.3727	511.327	510.4	2.4	11487	3213	14700	4.58	75.69	8956	5743
54	0.3786	517.092	516.2	2.5	11604	3231	14835	4.59	75.56	9033	5802
55	0.3845	520.936	520.0	2.6	11678	3242	14920	4.60	75.48	9081	5839

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
56	0.3904	527.887	527.0	2.7	11822	3274	15096	4.61	75.26	9185	5911
57	0.3963	532.343	531.4	2.8	11909	3321	15230	4.59	74.94	9276	5955
58	0.4022	536.719	535.8	2.9	11994	3313	15308	4.62	74.99	9310	5997
59	0.4081	541.298	540.4	3.0	12084	3341	15425	4.62	74.80	9383	6042
60	0.4140	547.417	546.5	3.1	12208	3380	15587	4.61	74.53	9484	6104
61	0.4143	547.803	546.9	3.1	12216	3389	15605	4.60	74.46	9497	6108

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	2035.150			1549.800
Moisture content: Dry soil+tare, gms.	1833.100			1446.200
Moisture content: Tare, gms.	266.500			113.100
Moisture, %	12.9		7.9	7.8
Moist specimen weight, gms.	1489.4			
Diameter, in.	2.90		2.85	
Area, in.²	6.61		6.40	
Height, in.	5.99		5.56	
Net decrease in height, in.		0.47	-0.04	
Net decrease in water volume, cc.			1.00	
Wet Density, pcf	143.4		152.6	
Dry density, pcf	127.0		141.4	
Void ratio	0.3564		0.2188	
Saturation, %	99.9		100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.064 cm

Consolidation cell pressure = 156.00 psi (22464 psf)

Consolidation back pressure = 40.00 psi (5760 psf)

Consolidation effective confining stress = 16704 psf

Strain rate, %/min. = 0.03

Fail. Stress = 24654 psf **at reading no.** 53

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	0.3794	2.332	0.0	0.0	0	16704	16704	1.00	40.00	16704	0
1	0.3809	23.782	21.4	0.0	432	16644	17076	1.03	40.42	16860	216
2	0.3824	55.390	53.1	0.1	1194	16589	17783	1.07	40.80	17186	597
3	0.3838	89.107	86.8	0.1	1952	16504	18456	1.12	41.39	17480	976
4	0.3853	127.293	125.0	0.1	2811	16349	19160	1.17	42.46	17754	1405
5	0.3868	165.164	162.8	0.1	3662	16212	19874	1.23	43.41	18043	1831
6	0.3883	202.178	199.8	0.2	4493	16015	20508	1.28	44.78	18262	2246
7	0.3898	236.864	234.5	0.2	5271	15812	21083	1.33	46.19	18448	2636
8	0.3912	272.510	270.2	0.2	6071	15598	21669	1.39	47.68	18633	3035
9	0.3927	306.288	304.0	0.2	6828	15338	22165	1.45	49.49	18752	3414
10	0.3942	340.252	337.9	0.3	7589	15067	22656	1.50	51.37	18861	3794
11	0.3957	370.613	368.3	0.3	8268	14791	23059	1.56	53.28	18925	4134
12	0.3971	400.238	397.9	0.3	8931	14501	23432	1.62	55.30	18967	4466
13	0.3986	429.547	427.2	0.3	9586	14197	23784	1.68	57.41	18990	4793

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
14	0.4001	458.988	456.7	0.4	10244	13884	24128	1.74	59.58	19006	5122
15	0.4016	485.721	483.4	0.4	10841	13564	24405	1.80	61.81	18984	5421
16	0.4030	512.759	510.4	0.4	11444	13298	24742	1.86	63.65	19020	5722
17	0.4045	539.928	537.6	0.5	12050	12995	25046	1.93	65.76	19020	6025
18	0.4060	564.469	562.1	0.5	12597	12689	25287	1.99	67.88	18988	6299
19	0.4075	588.830	586.5	0.5	13140	12393	25533	2.06	69.94	18963	6570
20	0.4090	613.723	611.4	0.5	13694	12109	25803	2.13	71.91	18956	6847
21	0.4104	635.483	633.2	0.6	14177	11802	25979	2.20	74.04	18890	7089
22	0.4119	657.961	655.6	0.6	14676	11558	26234	2.27	75.74	18896	7338
23	0.4134	677.747	675.4	0.6	15115	11268	26383	2.34	77.75	18826	7558
24	0.4149	698.893	696.6	0.6	15584	11030	26615	2.41	79.40	18822	7792
25	0.4164	719.008	716.7	0.7	16030	10777	26807	2.49	81.16	18792	8015
26	0.4178	737.503	735.2	0.7	16439	10551	26991	2.56	82.73	18771	8220
27	0.4193	753.484	751.2	0.7	16792	10314	27106	2.63	84.38	18710	8396
28	0.4208	770.642	768.3	0.7	17171	10087	27259	2.70	85.95	18673	8586
29	0.4223	785.752	783.4	0.8	17504	9876	27381	2.77	87.41	18629	8752
30	0.4237	801.274	798.9	0.8	17846	9688	27535	2.84	88.72	18611	8923
31	0.4252	816.575	814.2	0.8	18183	9506	27689	2.91	89.99	18598	9092
32	0.4267	830.302	828.0	0.9	18485	9335	27820	2.98	91.18	18577	9242
33	0.4282	843.449	841.1	0.9	18773	9184	27958	3.04	92.22	18571	9387
34	0.4296	857.023	854.7	0.9	19071	9031	28102	3.11	93.29	18566	9536
35	0.4311	867.533	865.2	0.9	19301	8893	28194	3.17	94.24	18544	9650
36	0.4326	878.914	876.6	1.0	19549	8761	28310	3.23	95.16	18535	9775
37	0.4341	889.857	887.5	1.0	19788	8652	28440	3.29	95.92	18546	9894
38	0.4355	901.816	899.5	1.0	20049	8541	28591	3.35	96.69	18566	10025
39	0.4370	911.910	909.6	1.0	20269	8439	28708	3.40	97.40	18573	10134
40	0.4385	920.409	918.1	1.1	20453	8322	28775	3.46	98.21	18548	10226
41	0.4444	950.246	947.9	1.2	21095	7993	29088	3.64	100.49	18541	10547
42	0.4503	976.559	974.2	1.3	21657	7754	29411	3.79	102.15	18583	10828
43	0.4562	999.353	997.0	1.4	22140	7607	29747	3.91	103.17	18677	11070
44	0.4621	1018.346	1016.0	1.5	22537	7503	30040	4.00	103.90	18772	11269
45	0.4680	1032.880	1030.5	1.6	22835	7424	30259	4.08	104.44	18842	11418
46	0.4739	1048.798	1046.5	1.7	23163	7403	30566	4.13	104.59	18984	11581
47	0.4798	1062.134	1059.8	1.8	23433	7390	30823	4.17	104.68	19106	11716
48	0.4857	1072.981	1070.6	1.9	23647	7376	31023	4.21	104.78	19199	11823
49	0.4916	1085.589	1083.3	2.0	23899	7410	31309	4.23	104.54	19360	11950
50	0.4975	1096.027	1093.7	2.1	24103	7444	31547	4.24	104.31	19495	12052
51	0.5034	1104.045	1101.7	2.2	24254	7461	31714	4.25	104.19	19587	12127
52	0.5093	1114.937	1112.6	2.3	24467	7513	31980	4.26	103.82	19747	12234
53	0.5152	1124.660	1122.3	2.4	24654	7546	32200	4.27	103.60	19873	12327
54	0.5211	1132.829	1130.5	2.5	24806	7604	32410	4.26	103.20	20007	12403
55	0.5271	1142.135	1139.8	2.7	24983	7659	32642	4.26	102.81	20151	12492
56	0.5330	1150.710	1148.4	2.8	25144	7704	32848	4.26	102.50	20276	12572
57	0.5389	1158.177	1155.8	2.9	25280	7765	33045	4.26	102.07	20405	12640
58	0.5448	1166.856	1164.5	3.0	25442	7825	33266	4.25	101.66	20546	12721
59	0.5507	1174.987	1172.7	3.1	25591	7887	33478	4.24	101.23	20683	12796
60	0.5566	1180.960	1178.6	3.2	25693	7927	33621	4.24	100.95	20774	12847

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
61	0.56251	187.818	1185.5	3.3	25815	7977	33792	4.24	100.60	20885	12907
62	0.56841	196.958	1194.6	3.4	25985	8042	34027	4.23	100.15	21034	12993
63	0.56851	195.873	1193.5	3.4	25961	8046	34007	4.23	100.12	21027	12980

Parameters for Specimen No. 4

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	2035.150			1549.800
Moisture content: Dry soil+tare, gms.	1833.100			1446.200
Moisture content: Tare, gms.	266.500			113.100
Moisture, %	12.9		7.8	7.8
Moist specimen weight, gms.	1489.4			
Diameter, in.	2.90		2.89	
Area, in.²	6.61		6.55	
Height, in.	5.99		5.41	
Net decrease in height, in.		0.62	-0.04	
Net decrease in water volume, cc.			2.00	
Wet Density, pcf	143.4		152.9	
Dry density, pcf	127.0		141.9	
Void ratio	0.3564		0.2146	
Saturation, %	99.9		100.0	

Test Readings for Specimen No. 4

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.064 cm

Consolidation cell pressure = 272.00 psi (39168 psf)

Consolidation back pressure = 40.00 psi (5760 psf)

Consolidation effective confining stress = 33408 psf

Strain rate, %/min. = 0.03

Fail. Stress = 48124 psf **at reading no.** 51

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.1330	4.203	0.0	0.0	0	33340	33340	1.00	40.47	33340	0
1	-0.1315	42.056	37.9	0.0	832	33070	33902	1.03	42.35	33486	416
2	-0.1301	79.210	75.0	0.1	1648	32816	34464	1.05	44.11	33640	824
3	-0.1286	120.747	116.5	0.1	2561	32534	35095	1.08	46.07	33814	1280
4	-0.1271	168.480	164.3	0.1	3608	32243	35851	1.11	48.09	34047	1804
5	-0.1256	226.323	222.1	0.1	4877	31942	36819	1.15	50.18	34380	2439
6	-0.1242	285.790	281.6	0.2	6182	31589	37770	1.20	52.63	34680	3091
7	-0.1227	347.353	343.2	0.2	7531	31221	38752	1.24	55.19	34986	3766
8	-0.1212	407.708	403.5	0.2	8853	30804	39658	1.29	58.08	35231	4427
9	-0.1197	478.146	473.9	0.2	10396	30366	40762	1.34	61.13	35564	5198
10	-0.1182	545.001	540.8	0.3	11859	29899	41758	1.40	64.37	35829	5929
11	-0.1168	610.056	605.9	0.3	13282	29376	42658	1.45	68.00	36017	6641
12	-0.1153	671.530	667.3	0.3	14626	28805	43430	1.51	71.97	36117	7313
13	-0.1138	727.062	722.9	0.4	15838	28203	44042	1.56	76.14	36122	7919
14	-0.1123	778.885	774.7	0.4	16969	27561	44531	1.62	80.60	36046	8485
15	-0.1109	827.542	823.3	0.4	18030	26910	44940	1.67	85.13	35925	9015
16	-0.1094	879.021	874.8	0.4	19152	26282	45434	1.73	89.49	35858	9576

Test Readings for Specimen No. 4

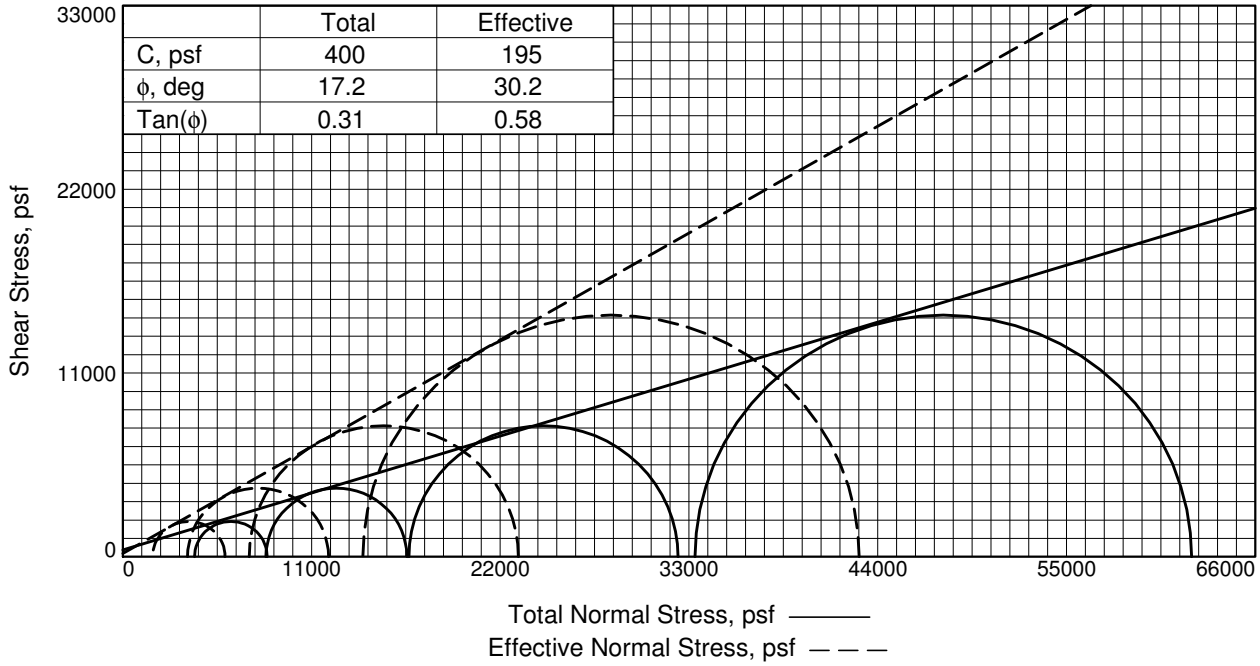
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
17	-0.1079	929.285	925.1	0.5	20247	25632	45879	1.79	94.00	35755	10123
18	-0.1064	973.186	969.0	0.5	21202	25004	46206	1.85	98.36	35605	10601
19	-0.10501	017.456	1013.3	0.5	22165	24409	46573	1.91	102.50	35491	11082
20	-0.10351	057.910	1053.7	0.5	23043	23810	46853	1.97	106.65	35331	11522
21	-0.10201	099.375	1095.2	0.6	23943	23234	47178	2.03	110.65	35206	11972
22	-0.10051	142.619	1138.4	0.6	24882	22704	47586	2.10	114.33	35145	12441
23	-0.09901	177.412	1173.2	0.6	25635	22174	47809	2.16	118.02	34991	12818
24	-0.09761	215.566	1211.4	0.7	26462	21691	48153	2.22	121.37	34922	13231
25	-0.09611	250.320	1246.1	0.7	27213	21215	48428	2.28	124.67	34822	13607
26	-0.09461	291.738	1287.5	0.7	28110	20774	48884	2.35	127.73	34829	14055
27	-0.09311	325.654	1321.5	0.7	28843	20345	49188	2.42	130.72	34766	14421
28	-0.09171	363.164	1359.0	0.8	29653	19979	49633	2.48	133.25	34806	14827
29	-0.09021	397.954	1393.8	0.8	30404	19553	49957	2.55	136.22	34755	15202
30	-0.08871	428.731	1424.5	0.8	31067	19164	50231	2.62	138.92	34698	15533
31	-0.08721	461.056	1456.9	0.8	31763	18815	50578	2.69	141.34	34697	15882
32	-0.08581	490.221	1486.0	0.9	32390	18478	50868	2.75	143.68	34673	16195
33	-0.08431	520.925	1516.7	0.9	33050	18172	51223	2.82	145.80	34697	16525
34	-0.08281	549.619	1545.4	0.9	33666	17873	51539	2.88	147.88	34706	16833
35	-0.08131	573.556	1569.4	1.0	34178	17608	51787	2.94	149.72	34698	17089
36	-0.07991	601.811	1597.6	1.0	34784	17371	52155	3.00	151.37	34763	17392
37	-0.07841	627.742	1623.5	1.0	35339	17132	52471	3.06	153.03	34801	17669
38	-0.07691	655.284	1651.1	1.0	35928	16912	52840	3.12	154.56	34876	17964
39	-0.07541	681.070	1676.9	1.1	36480	16705	53185	3.18	155.99	34945	18240
40	-0.07391	711.595	1707.4	1.1	37133	16529	53662	3.25	157.22	35095	18567
41	-0.06801	795.686	1791.5	1.2	38919	15865	54785	3.45	161.82	35325	19460
42	-0.06211	875.938	1871.7	1.3	40618	15410	56028	3.64	164.98	35719	20309
43	-0.05621	946.641	1942.4	1.4	42105	15088	57193	3.79	167.22	36141	21053
44	-0.05031	998.276	1994.1	1.5	43177	14886	58063	3.90	168.62	36475	21588
45	-0.04442	045.467	2041.3	1.6	44150	14785	58935	3.99	169.32	36860	22075
46	-0.03852	091.903	2087.7	1.7	45104	14768	59872	4.05	169.44	37320	22552
47	-0.03262	126.891	2122.7	1.9	45809	14761	60570	4.10	169.49	37666	22904
48	-0.02672	160.625	2156.4	2.0	46485	14829	61314	4.13	169.02	38072	23243
49	-0.02082	183.397	2179.2	2.1	46924	14927	61851	4.14	168.34	38389	23462
50	-0.01492	214.309	2210.1	2.2	47536	15051	62587	4.16	167.48	38819	23768
51	-0.00902	244.109	2239.9	2.3	48124	15182	63305	4.17	166.57	39244	24062
52	-0.00312	260.279	2256.1	2.4	48417	15325	63742	4.16	165.58	39533	24208
53	0.00282	285.590	2281.4	2.5	48905	15477	64382	4.16	164.52	39929	24453
54	0.00872	310.111	2305.9	2.6	49376	15649	65024	4.16	163.33	40336	24688
55	0.01462	324.460	2320.3	2.7	49627	15796	65423	4.14	162.31	40610	24814
56	0.02052	337.518	2333.3	2.8	49851	15960	65810	4.12	161.17	40885	24925
57	0.02642	360.706	2356.5	2.9	50289	16112	66402	4.12	160.11	41257	25145
58	0.03232	376.906	2372.7	3.1	50578	16259	66837	4.11	159.09	41548	25289
59	0.03822	393.142	2388.9	3.2	50867	16456	67323	4.09	157.72	41889	25434
60	0.04412	403.731	2399.5	3.3	51035	16635	67669	4.07	156.48	42152	25517
61	0.05002	423.381	2419.2	3.4	51395	16808	68203	4.06	155.27	42506	25697
62	0.05592	439.908	2435.7	3.5	51687	16964	68651	4.05	154.20	42807	25844
63	0.06772	462.542	2458.3	3.7	52050	17286	69336	4.01	151.96	43311	26025

Test Readings for Specimen No. 4

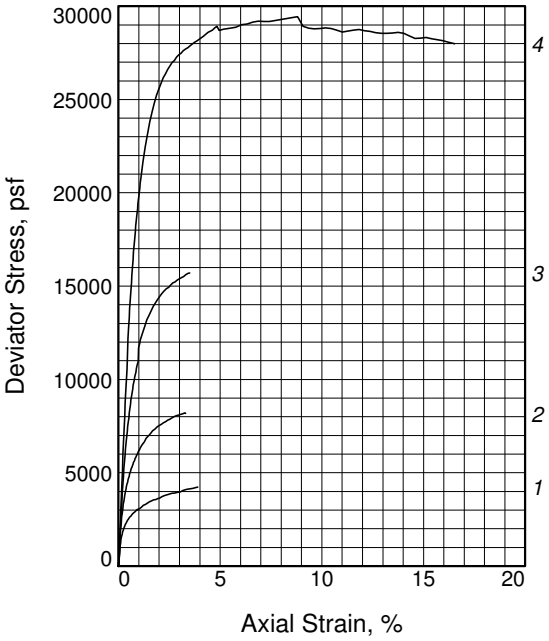
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
64	0.07362	480.353	2476.2	3.8	52367	17436	69804	4.00	150.92	43620	26184
65	0.07952	492.711	2488.5	3.9	52569	17569	70138	3.99	149.99	43853	26285
66	0.09132	519.035	2514.8	4.1	53005	17842	70847	3.97	148.09	44345	26502
67	0.09722	533.254	2529.1	4.3	53244	17978	71222	3.96	147.15	44600	26622
68	0.10902	557.192	2553.0	4.5	53625	18242	71867	3.94	145.32	45055	26812
69	0.11492	568.546	2564.3	4.6	53802	18369	72171	3.93	144.44	45270	26901
70	0.12672	591.299	2587.1	4.8	54155	18628	72783	3.91	142.64	45706	27078
71	0.13272	607.443	2603.2	4.9	54431	18749	73180	3.90	141.80	45965	27215
72	0.14452	624.726	2620.5	5.1	54666	18953	73619	3.88	140.38	46286	27333
73	0.15042	639.434	2635.2	5.2	54910	19090	74000	3.88	139.43	46545	27455
74	0.15632	654.591	2650.4	5.3	55162	19225	74387	3.87	138.49	46806	27581
75	0.17692	684.183	2680.0	5.7	55553	19603	75156	3.83	135.87	47379	27776
76	0.19172	707.381	2703.2	6.0	55872	19819	75691	3.82	134.37	47755	27936
77	0.20642	737.286	2733.1	6.3	56326	20037	76363	3.81	132.86	48200	28163
78	0.22122	758.289	2754.1	6.5	56594	20252	76846	3.79	131.36	48549	28297
79	0.23592	778.718	2774.5	6.8	56847	20473	77320	3.78	129.82	48897	28424
80	0.25072	810.260	2806.1	7.1	57325	20640	77965	3.78	128.67	49303	28663
81	0.26552	841.089	2836.9	7.4	57785	20890	78675	3.77	126.93	49783	28892
82	0.28022	860.772	2856.6	7.6	58014	21080	79095	3.75	125.61	50087	29007
83	0.29502	884.353	2880.2	7.9	58320	21226	79547	3.75	124.59	50387	29160
84	0.30972	916.265	2912.1	8.2	58792	21381	80173	3.75	123.52	50777	29396
85	0.32452	943.678	2939.5	8.5	59169	21543	80712	3.75	122.40	51127	29585
86	0.33922	963.351	2959.1	8.7	59388	21706	81094	3.74	121.26	51400	29694
87	0.35402	992.371	2988.2	9.0	59791	21832	81623	3.74	120.39	51728	29895
88	0.36873	007.278	3003.1	9.3	59909	22008	81917	3.72	119.17	51963	29955
89	0.38353	025.841	3021.6	9.5	60098	22214	82312	3.71	117.74	52263	30049
90	0.39823	056.337	3052.1	9.8	60522	22302	82823	3.71	117.13	52562	30261
91	0.41303	074.571	3070.4	10.1	60699	22418	83117	3.71	116.32	52768	30349
92	0.42783	100.092	3095.9	10.4	61018	22504	83522	3.71	115.72	53013	30509
93	0.44253	121.049	3116.8	10.6	61244	22725	83969	3.70	114.19	53347	30622
94	0.45733	133.856	3129.7	10.9	61308	22869	84177	3.68	113.19	53523	30654
95	0.47203	149.657	3145.5	11.2	61429	22988	84417	3.67	112.36	53703	30714
96	0.48683	171.852	3167.6	11.5	61672	23115	84787	3.67	111.48	53951	30836
97	0.50153	194.485	3190.3	11.7	61921	23263	85185	3.66	110.45	54224	30961
98	0.51633	212.719	3208.5	12.0	62083	23355	85438	3.66	109.81	54396	31041
99	0.53113	231.071	3226.9	12.3	62245	23511	85755	3.65	108.73	54633	31122
100	0.54583	250.084	3245.9	12.5	62417	23647	86063	3.64	107.79	54855	31208
101	0.56063	270.826	3266.6	12.8	62619	23755	86375	3.64	107.03	55065	31310
102	0.57533	287.247	3283.0	13.1	62737	23819	86556	3.63	106.59	55187	31369
103	0.59013	304.586	3300.4	13.4	62871	23920	86791	3.63	105.89	55355	31435
104	0.60483	319.902	3315.7	13.6	62964	23942	86905	3.63	105.74	55424	31482
105	0.61963	336.716	3332.5	13.9	63083	24094	87177	3.62	104.68	55636	31542
106	0.63433	353.847	3349.6	14.2	63207	24219	87425	3.61	103.81	55822	31603
107	0.64913	367.681	3363.5	14.5	63266	24283	87549	3.61	103.37	55916	31633
108	0.66393	386.020	3381.8	14.7	63408	24377	87785	3.60	102.72	56081	31704
109	0.67863	403.867	3399.7	15.0	63539	24444	87983	3.60	102.25	56213	31769
110	0.69343	413.473	3409.3	15.3	63514	24519	88033	3.59	101.73	56276	31757

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
111	0.70813	429.858	3425.7	15.5	63614	24536	88150	3.59	101.61	56343	31807
112	0.72293	450.884	3446.7	15.8	63797	24666	88463	3.59	100.71	56564	31899
113	0.73763	471.933	3467.7	16.1	63979	24769	88748	3.58	100.00	56758	31990
114	0.75243	479.581	3475.4	16.4	63912	24867	88779	3.57	99.31	56823	31956
115	0.75273	482.746	3478.5	16.4	63965	24869	88834	3.57	99.30	56851	31983



	Total	Effective
C, psf	400	195
ϕ, deg	17.2	30.2
Tan(ϕ)	0.31	0.58



Sample No.		1	2	3	4
Initial	Water Content, %	24.7	24.7	24.7	24.7
	Dry Density, pcf	98.3	98.3	98.3	98.3
	Saturation, %	92.4	92.4	92.4	92.4
	Void Ratio	0.7269	0.7269	0.7269	0.7269
	Diameter, in.	2.86	2.86	2.86	2.86
	Height, in.	5.95	5.95	5.95	5.95
At Test	Water Content, %	21.4	20.1	18.6	18.5
	Dry Density, pcf	107.2	109.8	112.7	112.9
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.5833	0.5460	0.5070	0.5043
	Diameter, in.	2.76	2.77	2.77	2.81
	Height, in.	5.85	5.66	5.52	5.36
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, psf		4188	8348	16682	33357
Fail. Stress, psf		4227	8211	15680	28924
Excess Pore Pr., psf		2452	4567	9311	19368
Strain, %		3.9	3.3	3.4	4.8
Ult. Stress, psf					
Excess Pore Pr., psf					
Strain, %					
$\bar{\sigma}_1$ Failure, psf		5964	11992	23051	42913
$\bar{\sigma}_3$ Failure, psf		1737	3781	7371	13989

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: lean clay

LL= 37 **PL=** 19 **PI=** 18

Assumed Specific Gravity= 2.72

Remarks: Failure tangents drawn through peak principal stress ratio.

Fig. _____

Client: Pebble Limited Partnership

Project: Pebble Project

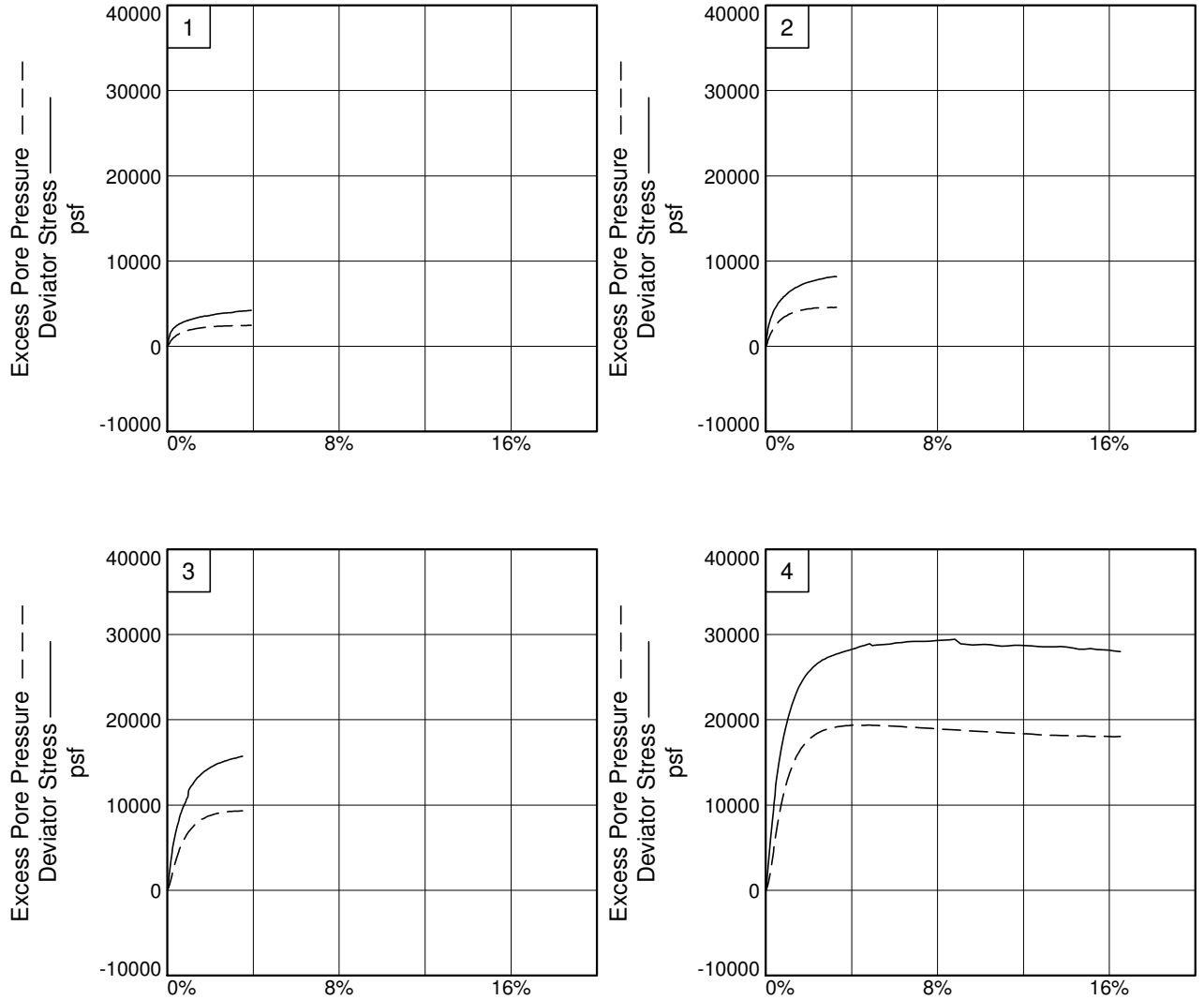
Location: GH10-228

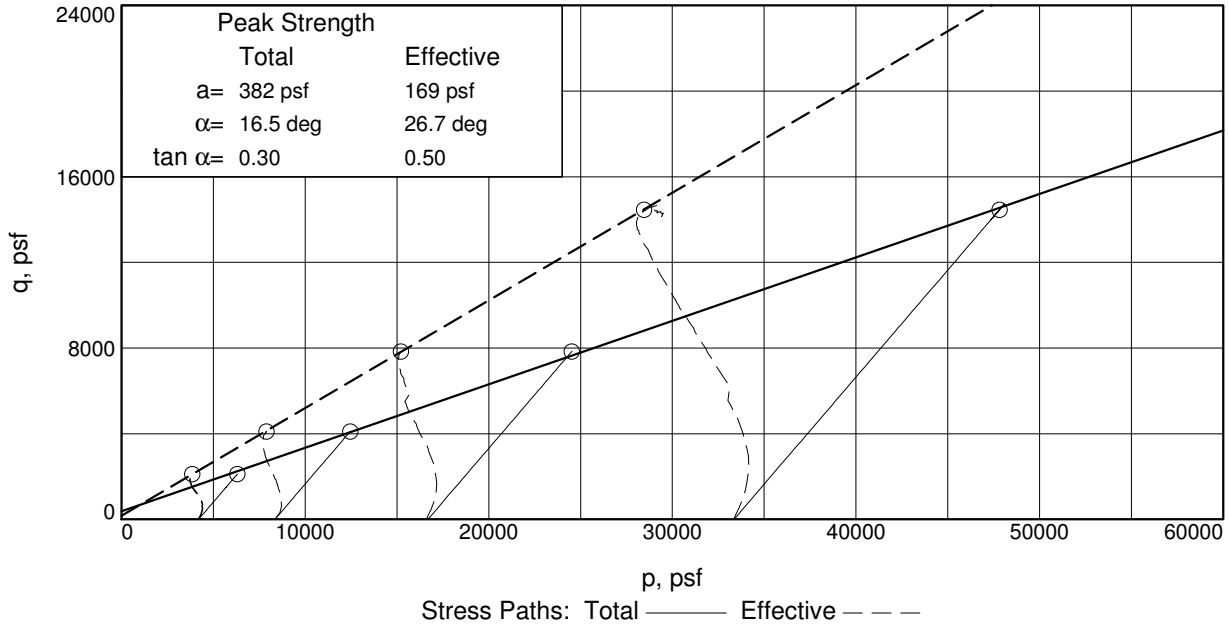
Sample Number: ST 1 **Depth:** 5-7'

Proj. No.: 101-77/11 **Date Sampled:** 12/23/10

Knight Piésold CONSULTING

Tested By: SPB **Checked By:** JDB





Client: Pebble Limited Partnership
Project: Pebble Project
Location: GH10-228 **Depth:** 5-7' **Sample Number:** ST 1
Project No.: 101-77/11 **Fig.** 1:3

Knight Piesold Geotechnical Lab.

Tested By: SPB **Checked By:** JDB

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/25/2011
5:22 PM

Date: 12/23/10
Client: Pebble Limited Partnership
Project: Pebble Project
Project No.: 101-77/11
Location: GH10-228
Depth: 5-7' **Sample Number:** ST 1
Description: lean clay
Remarks: Failure tangents drawn through peak principal stress ratio.
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.72 **LL=**37 **PL=**19 **PI=**18
Test Method: ASTM D 4767 Method A (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	819.700			1281.600
Moisture content: Dry soil+tare, gms.	696.500			1098.500
Moisture content: Tare, gms.	197.340			111.100
Moisture, %	24.7	26.7	21.4	18.5
Moist specimen weight, gms.	1227.5			
Diameter, in.	2.86	2.86	2.76	
Area, in.²	6.41	6.41	5.98	
Height, in.	5.95	5.95	5.85	
Net decrease in height, in.		0.00	0.10	
Net decrease in water volume, cc.			52.00	
Wet Density, pcf	122.6	124.6	130.3	
Dry density, pcf	98.3	98.3	107.2	
Void ratio	0.7269	0.7269	0.5833	
Saturation, %	92.4	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 69.08 psi (9948 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 4188 psf
Strain rate, %/min. = 0.03
Fail. Stress = 4227 psf **at reading no.** 61

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.6189	5.151	0.0	0.0	0	4188	4188	1.00	40.00	4188	0
1	-3.6174	20.510	15.4	0.0	370	4117	4487	1.09	40.49	4302	185
2	-3.6159	35.973	30.8	0.1	742	4002	4744	1.19	41.29	4373	371
3	-3.6144	47.894	42.7	0.1	1029	3886	4915	1.26	42.10	4400	514
4	-3.6129	56.488	51.3	0.1	1235	3777	5013	1.33	42.85	4395	618
5	-3.6114	65.102	60.0	0.1	1442	3677	5119	1.39	43.55	4398	721
6	-3.6100	71.066	65.9	0.2	1585	3582	5167	1.44	44.21	4374	793
7	-3.6085	76.385	71.2	0.2	1713	3495	5208	1.49	44.81	4351	856
8	-3.6070	81.423	76.3	0.2	1834	3416	5250	1.54	45.36	4333	917
9	-3.6055	84.162	79.0	0.2	1899	3339	5238	1.57	45.90	4288	949
10	-3.6040	89.350	84.2	0.3	2023	3272	5295	1.62	46.36	4283	1012
11	-3.6025	91.139	86.0	0.3	2066	3210	5276	1.64	46.79	4243	1033
12	-3.6010	94.303	89.2	0.3	2141	3148	5289	1.68	47.22	4219	1070
13	-3.5995	97.151	92.0	0.3	2209	3093	5301	1.71	47.61	4197	1104
14	-3.5980	99.131	94.0	0.4	2256	3043	5299	1.74	47.95	4171	1128
15	-3.5965	102.093	96.9	0.4	2326	2991	5317	1.78	48.32	4154	1163
16	-3.5950	103.392	98.2	0.4	2357	2939	5296	1.80	48.68	4117	1178
17	-3.5935	106.580	101.4	0.4	2433	2895	5327	1.84	48.98	4111	1216
18	-3.5920	108.191	103.0	0.5	2471	2853	5324	1.87	49.27	4088	1235
19	-3.5906	109.470	104.3	0.5	2501	2813	5314	1.89	49.55	4063	1250
20	-3.5891	112.220	107.1	0.5	2566	2775	5341	1.92	49.82	4058	1283
21	-3.5876	112.895	107.7	0.5	2582	2734	5315	1.94	50.10	4025	1291
22	-3.5861	115.593	110.4	0.6	2645	2701	5346	1.98	50.33	4024	1323
23	-3.5831	116.987	111.8	0.6	2677	2634	5311	2.02	50.79	3973	1339
24	-3.5816	119.331	114.2	0.6	2733	2605	5338	2.05	51.00	3971	1366
25	-3.5786	121.890	116.7	0.7	2793	2547	5340	2.10	51.40	3943	1396
26	-3.5756	124.397	119.2	0.7	2851	2496	5347	2.14	51.75	3922	1426
27	-3.5727	126.199	121.0	0.8	2893	2446	5338	2.18	52.10	3892	1446
28	-3.5712	126.909	121.8	0.8	2909	2423	5332	2.20	52.26	3878	1455
29	-3.5682	129.390	124.2	0.9	2967	2381	5348	2.25	52.55	3864	1483
30	-3.5652	132.312	127.2	0.9	3035	2347	5382	2.29	52.79	3865	1518
31	-3.5637	131.242	126.1	0.9	3009	2329	5338	2.29	52.91	3833	1504
32	-3.5622	133.373	128.2	1.0	3059	2313	5372	2.32	53.02	3843	1529
33	-3.5607	133.253	128.1	1.0	3055	2298	5353	2.33	53.13	3825	1528
34	-3.5533	137.863	132.7	1.1	3161	2226	5387	2.42	53.63	3806	1580
35	-3.5473	141.814	136.7	1.2	3252	2178	5430	2.49	53.96	3804	1626
36	-3.5414	144.612	139.5	1.3	3315	2116	5431	2.57	54.39	3773	1657
37	-3.5354	147.674	142.5	1.4	3384	2071	5455	2.63	54.70	3763	1692
38	-3.5295	150.428	145.3	1.5	3446	2034	5480	2.69	54.96	3757	1723
39	-3.5235	152.413	147.3	1.6	3489	1995	5485	2.75	55.23	3740	1745
40	-3.5176	154.801	149.6	1.7	3542	1966	5508	2.80	55.44	3737	1771
41	-3.5116	156.193	151.0	1.8	3572	1938	5509	2.84	55.63	3724	1786
42	-3.5057	157.925	152.8	1.9	3609	1911	5519	2.89	55.82	3715	1804
43	-3.4997	160.100	154.9	2.0	3656	1892	5548	2.93	55.95	3720	1828
44	-3.4938	162.620	157.5	2.1	3712	1866	5578	2.99	56.12	3722	1856
45	-3.4878	165.036	159.9	2.2	3765	1850	5615	3.04	56.24	3732	1883
46	-3.4819	167.128	162.0	2.3	3810	1833	5644	3.08	56.35	3739	1905

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
47	-3.4759	168.861	163.7	2.4	3847	1817	5665	3.12	56.46	3741	1924
48	-3.4699	170.539	165.4	2.5	3883	1807	5690	3.15	56.54	3748	1941
49	-3.4640	171.501	166.3	2.6	3901	1794	5696	3.17	56.62	3745	1951
50	-3.4580	172.105	167.0	2.7	3911	1791	5702	3.18	56.65	3746	1956
51	-3.4521	173.279	168.1	2.9	3934	1790	5724	3.20	56.66	3757	1967
52	-3.4461	174.577	169.4	3.0	3961	1788	5748	3.22	56.67	3768	1980
53	-3.4402	175.387	170.2	3.1	3975	1770	5745	3.25	56.80	3757	1988
54	-3.4342	178.631	173.5	3.2	4047	1763	5810	3.30	56.84	3786	2023
55	-3.4283	180.357	175.2	3.3	4083	1757	5840	3.32	56.88	3799	2041
56	-3.4223	181.973	176.8	3.4	4116	1751	5867	3.35	56.92	3809	2058
57	-3.4164	183.069	177.9	3.5	4137	1744	5881	3.37	56.98	3813	2069
58	-3.4104	183.857	178.7	3.6	4151	1742	5893	3.38	56.99	3817	2076
59	-3.4045	184.881	179.7	3.7	4171	1739	5909	3.40	57.01	3824	2085
60	-3.3985	186.387	181.2	3.8	4201	1736	5938	3.42	57.03	3837	2101
61	-3.3908	187.740	182.6	3.9	4227	1737	5964	3.43	57.02	3850	2113

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	819.700			1281.600
Moisture content: Dry soil+tare, gms.	696.500			1098.500
Moisture content: Tare, gms.	197.340			111.100
Moisture, %	24.7		20.1	18.5
Moist specimen weight, gms.	1227.5			
Diameter, in.	2.86		2.77	
Area, in.²	6.41		6.03	
Height, in.	5.95		5.66	
Net decrease in height, in.		0.33	-0.04	
Net decrease in water volume, cc.			13.50	
Wet Density, pcf	122.6		131.9	
Dry density, pcf	98.3		109.8	
Void ratio	0.7269		0.5460	
Saturation, %	92.4		100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 97.97 psi (14108 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 8348 psf
Strain rate, %/min. = 0.03
Fail. Stress = 8211 psf **at reading no.** 61

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.4915	9.270	0.0	0.0	0	8359	8359	1.00	39.92	8359	0
1	-3.4900	36.519	27.2	0.0	651	8299	8949	1.08	40.34	8624	325
2	-3.4885	61.362	52.1	0.1	1244	8081	9324	1.15	41.85	8703	622
3	-3.4870	77.454	68.2	0.1	1627	7872	9500	1.21	43.30	8686	814
4	-3.4855	93.354	84.1	0.1	2006	7678	9684	1.26	44.65	8681	1003
5	-3.4840	105.741	96.5	0.1	2301	7488	9789	1.31	45.97	8638	1151
6	-3.4825	118.582	109.3	0.2	2607	7310	9917	1.36	47.21	8613	1303
7	-3.4810	127.925	118.7	0.2	2829	7139	9968	1.40	48.39	8553	1414
8	-3.4795	137.681	128.4	0.2	3061	6982	10042	1.44	49.49	8512	1530
9	-3.4780	147.793	138.5	0.2	3301	6835	10135	1.48	50.51	8485	1650
10	-3.4765	154.956	145.7	0.3	3471	6695	10165	1.52	51.48	8430	1735
11	-3.4750	163.861	154.6	0.3	3682	6568	10249	1.56	52.36	8409	1841
12	-3.4736	169.329	160.1	0.3	3811	6447	10258	1.59	53.20	8353	1905
13	-3.4721	176.759	167.5	0.3	3987	6319	10306	1.63	54.09	8313	1993
14	-3.4706	182.538	173.3	0.4	4123	6216	10339	1.66	54.81	8277	2062
15	-3.4691	188.817	179.5	0.4	4272	6111	10383	1.70	55.53	8247	2136
16	-3.4676	194.354	185.1	0.4	4402	6013	10415	1.73	56.21	8214	2201
17	-3.4661	197.849	188.6	0.4	4484	5921	10405	1.76	56.85	8163	2242
18	-3.4646	202.934	193.7	0.5	4604	5832	10435	1.79	57.47	8133	2302
19	-3.4631	208.467	199.2	0.5	4734	5747	10481	1.82	58.06	8114	2367
20	-3.4616	211.744	202.5	0.5	4811	5666	10477	1.85	58.62	8072	2405
21	-3.4601	217.655	208.4	0.6	4950	5592	10541	1.89	59.14	8066	2475
22	-3.4586	221.010	211.7	0.6	5028	5515	10543	1.91	59.67	8029	2514
23	-3.4571	225.766	216.5	0.6	5140	5446	10586	1.94	60.15	8016	2570

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	-3.4557	229.348	220.1	0.6	5223	5378	10601	1.97	60.62	7990	2612
25	-3.4542	231.991	222.7	0.7	5285	5315	10600	1.99	61.06	7958	2642
26	-3.4527	236.277	227.0	0.7	5385	5253	10638	2.03	61.49	7946	2692
27	-3.4512	239.922	230.7	0.7	5470	5193	10663	2.05	61.91	7928	2735
28	-3.4497	243.830	234.6	0.7	5561	5139	10700	2.08	62.28	7919	2781
29	-3.4482	245.547	236.3	0.8	5600	5087	10687	2.10	62.65	7887	2800
30	-3.4467	248.834	239.6	0.8	5677	5035	10712	2.13	63.00	7873	2838
31	-3.4452	252.483	243.2	0.8	5762	4984	10746	2.16	63.36	7865	2881
32	-3.4437	254.594	245.3	0.8	5810	4941	10751	2.18	63.66	7846	2905
33	-3.4422	258.085	248.8	0.9	5891	4896	10787	2.20	63.97	7841	2946
34	-3.4407	259.722	250.5	0.9	5928	4855	10784	2.22	64.25	7820	2964
35	-3.4392	261.943	252.7	0.9	5979	4817	10796	2.24	64.52	7807	2990
36	-3.4378	265.973	256.7	0.9	6073	4778	10851	2.27	64.79	7815	3037
37	-3.4363	267.822	258.6	1.0	6115	4742	10857	2.29	65.04	7799	3058
38	-3.4348	271.167	261.9	1.0	6193	4708	10901	2.32	65.27	7805	3096
39	-3.4333	272.732	263.5	1.0	6228	4671	10899	2.33	65.53	7785	3114
40	-3.4318	275.695	266.4	1.1	6296	4627	10924	2.36	65.84	7775	3148
41	-3.4258	284.650	275.4	1.2	6501	4499	11000	2.45	66.73	7750	3251
42	-3.4199	291.657	282.4	1.3	6660	4389	11049	2.52	67.49	7719	3330
43	-3.4139	300.162	290.9	1.4	6853	4294	11147	2.60	68.15	7721	3426
44	-3.4080	305.789	296.5	1.5	6978	4210	11188	2.66	68.73	7699	3489
45	-3.4020	311.721	302.5	1.6	7110	4141	11251	2.72	69.21	7696	3555
46	-3.3961	318.350	309.1	1.7	7258	4096	11354	2.77	69.53	7725	3629
47	-3.3901	322.356	313.1	1.8	7344	4039	11383	2.82	69.92	7711	3672
48	-3.3842	327.188	317.9	1.9	7450	3994	11443	2.87	70.24	7718	3725
49	-3.3782	330.923	321.7	2.0	7529	3953	11482	2.90	70.52	7717	3765
50	-3.3723	334.284	325.0	2.1	7600	3935	11535	2.93	70.64	7735	3800
51	-3.3663	337.786	328.5	2.2	7673	3884	11557	2.98	71.00	7720	3837
52	-3.3604	340.692	331.4	2.3	7733	3846	11579	3.01	71.26	7712	3866
53	-3.3544	344.688	335.4	2.4	7818	3829	11646	3.04	71.38	7738	3909
54	-3.3485	347.431	338.2	2.5	7873	3807	11680	3.07	71.54	7743	3936
55	-3.3425	350.342	341.1	2.6	7932	3814	11746	3.08	71.49	7780	3966
56	-3.3365	353.868	344.6	2.7	8006	3810	11816	3.10	71.51	7813	4003
57	-3.3306	356.241	347.0	2.8	8052	3801	11853	3.12	71.58	7827	4026
58	-3.3246	358.115	348.8	2.9	8087	3789	11875	3.13	71.66	7832	4043
59	-3.3187	360.264	351.0	3.1	8128	3786	11913	3.15	71.68	7850	4064
60	-3.3127	361.796	352.5	3.2	8154	3797	11952	3.15	71.60	7874	4077
61	-3.3068	364.622	355.4	3.3	8211	3781	11992	3.17	71.71	7886	4105
62	-3.3049	363.200	353.9	3.3	8175	3778	11953	3.16	71.73	7866	4088

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	819.700			1281.600
Moisture content: Dry soil+tare, gms.	696.500			1098.500
Moisture content: Tare, gms.	197.340			111.100
Moisture, %	24.7		18.6	18.5
Moist specimen weight, gms.	1227.5			
Diameter, in.	2.86		2.77	
Area, in.²	6.41		6.03	
Height, in.	5.95		5.52	
Net decrease in height, in.		0.47	-0.04	
Net decrease in water volume, cc.			14.10	
Wet Density, pcf	122.6		133.7	
Dry density, pcf	98.3		112.7	
Void ratio	0.7269		0.5070	
Saturation, %	92.4		100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 155.85 psi (22442 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 16682 psf
Strain rate, %/min. = 0.03
Fail. Stress = 15680 psf **at reading no.** 62

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.0990	7.856	0.0	0.0	0	16675	16675	1.00	40.05	16675	0
1	-0.0975	39.575	31.7	0.0	187	16542	16729	1.01	40.97	16636	93
2	-0.0961	70.385	62.5	0.1	921	16398	17319	1.06	41.97	16858	461
3	-0.0946	100.551	92.7	0.1	1640	16194	17834	1.10	43.39	17014	820
4	-0.0931	127.049	119.2	0.1	2271	15971	18242	1.14	44.94	17107	1136
5	-0.0916	151.493	143.6	0.1	2853	15714	18567	1.18	46.72	17141	1426
6	-0.0901	175.704	167.8	0.2	3429	15455	18884	1.22	48.52	17169	1714
7	-0.0887	195.318	187.5	0.2	3895	15178	19073	1.26	50.44	17125	1947
8	-0.0872	215.554	207.7	0.2	4375	14892	19267	1.29	52.43	17080	2188
9	-0.0857	233.869	226.0	0.2	4810	14654	19463	1.33	54.09	17059	2405
10	-0.0842	251.354	243.5	0.3	5224	14381	19605	1.36	55.98	16993	2612
11	-0.0828	266.747	258.9	0.3	5589	14108	19697	1.40	57.87	16902	2794
12	-0.0813	281.976	274.1	0.3	5949	13843	19793	1.43	59.71	16818	2975
13	-0.0798	294.845	287.0	0.3	6253	13612	19865	1.46	61.32	16738	3127
14	-0.0783	309.579	301.7	0.4	6601	13394	19995	1.49	62.84	16694	3301
15	-0.0768	323.578	315.7	0.4	6932	13152	20084	1.53	64.51	16618	3466
16	-0.0754	335.360	327.5	0.4	7210	12920	20130	1.56	66.12	16525	3605
17	-0.0739	347.367	339.5	0.5	7493	12706	20199	1.59	67.61	16452	3746
18	-0.0724	357.228	349.4	0.5	7725	12490	20214	1.62	69.11	16352	3862
19	-0.0709	367.120	359.3	0.5	7957	12286	20243	1.65	70.53	16265	3979
20	-0.0695	377.951	370.1	0.5	8212	12093	20305	1.68	71.87	16199	4106
21	-0.0680	387.886	380.0	0.6	8445	11913	20358	1.71	73.12	16135	4222
22	-0.0665	397.779	389.9	0.6	8677	11748	20425	1.74	74.26	16087	4338
23	-0.0650	407.948	400.1	0.6	8915	11589	20504	1.77	75.37	16046	4458

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	-0.0636	415.234	407.4	0.6	9085	11426	20511	1.80	76.50	15968	4543
25	-0.0621	423.899	416.0	0.7	9288	11267	20555	1.82	77.60	15911	4644
26	-0.0606	432.533	424.7	0.7	9490	11128	20618	1.85	78.57	15873	4745
27	-0.0591	440.625	432.8	0.7	9679	10977	20656	1.88	79.62	15817	4839
28	-0.0577	447.569	439.7	0.7	9840	10838	20678	1.91	80.58	15758	4920
29	-0.0562	454.480	446.6	0.8	10001	10696	20697	1.93	81.57	15696	5000
30	-0.0547	460.066	452.2	0.8	10130	10586	20716	1.96	82.33	15651	5065
31	-0.0532	466.363	458.5	0.8	10276	10459	20735	1.98	83.21	15597	5138
32	-0.0518	472.061	464.2	0.9	10407	10372	20779	2.00	83.82	15576	5204
33	-0.0503	478.942	471.1	0.9	10567	10250	20817	2.03	84.67	15533	5284
34	-0.0488	485.908	478.1	0.9	10729	10145	20873	2.06	85.40	15509	5364
35	-0.0473	491.592	483.7	0.9	10860	10042	20901	2.08	86.11	15472	5430
36	-0.0459	496.706	488.8	1.0	10977	9936	20913	2.10	86.85	15425	5489
37	-0.0444	501.560	493.7	1.0	11667	9837	21505	2.19	87.53	15671	5834
38	-0.0429	508.679	500.8	1.0	11832	9747	21579	2.21	88.16	15663	5916
39	-0.0414	514.069	506.2	1.0	11956	9672	21629	2.24	88.68	15651	5978
40	-0.0400	519.481	511.6	1.1	12081	9580	21661	2.26	89.32	15621	6040
41	-0.0340	535.936	528.1	1.2	12456	9249	21705	2.35	91.62	15477	6228
42	-0.0281	552.229	544.4	1.3	12826	8971	21797	2.43	93.55	15384	6413
43	-0.0222	568.413	560.6	1.4	13193	8767	21960	2.50	94.96	15364	6597
44	-0.0163	579.404	571.5	1.5	13437	8547	21984	2.57	96.49	15266	6719
45	-0.0104	589.765	581.9	1.6	13666	8360	22026	2.63	97.79	15193	6833
46	-0.0045	601.321	593.5	1.7	13922	8230	22152	2.69	98.69	15191	6961
47	0.0014	610.238	602.4	1.8	14116	8083	22199	2.75	99.71	15141	7058
48	0.0073	618.393	610.5	1.9	14292	7961	22253	2.80	100.56	15107	7146
49	0.0132	626.382	618.5	2.0	14463	7890	22353	2.83	101.06	15121	7231
50	0.0191	633.047	625.2	2.1	14603	7799	22402	2.87	101.69	15100	7301
51	0.0250	639.811	632.0	2.2	14745	7727	22472	2.91	102.19	15100	7372
52	0.0309	645.803	637.9	2.4	14868	7642	22510	2.95	102.78	15076	7434
53	0.0368	649.163	641.3	2.5	14930	7605	22535	2.96	103.03	15070	7465
54	0.0427	655.705	647.8	2.6	15066	7562	22628	2.99	103.33	15095	7533
55	0.0486	660.861	653.0	2.7	15169	7526	22695	3.02	103.58	15110	7585
56	0.0545	663.657	655.8	2.8	15217	7482	22699	3.03	103.89	15090	7609
57	0.0604	669.292	661.4	2.9	15331	7450	22781	3.06	104.11	15115	7666
58	0.0663	672.969	665.1	3.0	15399	7430	22830	3.07	104.25	15130	7700
59	0.0722	676.411	668.6	3.1	15462	7414	22876	3.09	104.36	15145	7731
60	0.0781	679.607	671.8	3.2	15519	7395	22913	3.10	104.50	15154	7759
61	0.0840	684.845	677.0	3.3	15622	7391	23014	3.11	104.52	15203	7811
62	0.0899	688.086	680.2	3.4	15680	7371	23051	3.13	104.66	15211	7840
63	0.0939	689.640	681.8	3.5	15704	7371	23074	3.13	104.66	15222	7852

Parameters for Specimen No. 4

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	819.700			1281.600
Moisture content: Dry soil+tare, gms.	696.500			1098.500
Moisture content: Tare, gms.	197.340			111.100
Moisture, %	24.7		18.5	18.5
Moist specimen weight, gms.	1227.5			
Diameter, in.	2.86		2.81	
Area, in.²	6.41		6.19	
Height, in.	5.95		5.36	
Net decrease in height, in.		0.63	-0.04	
Net decrease in water volume, cc.			1.00	
Wet Density, pcf	122.6		133.8	
Dry density, pcf	98.3		112.9	
Void ratio	0.7269		0.5043	
Saturation, %	92.4		100.0	

Test Readings for Specimen No. 4

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 271.64 psi (39117 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 33357 psf
Strain rate, %/min. = 0.03
Fail. Stress = 28924 psf **at reading no.** 71

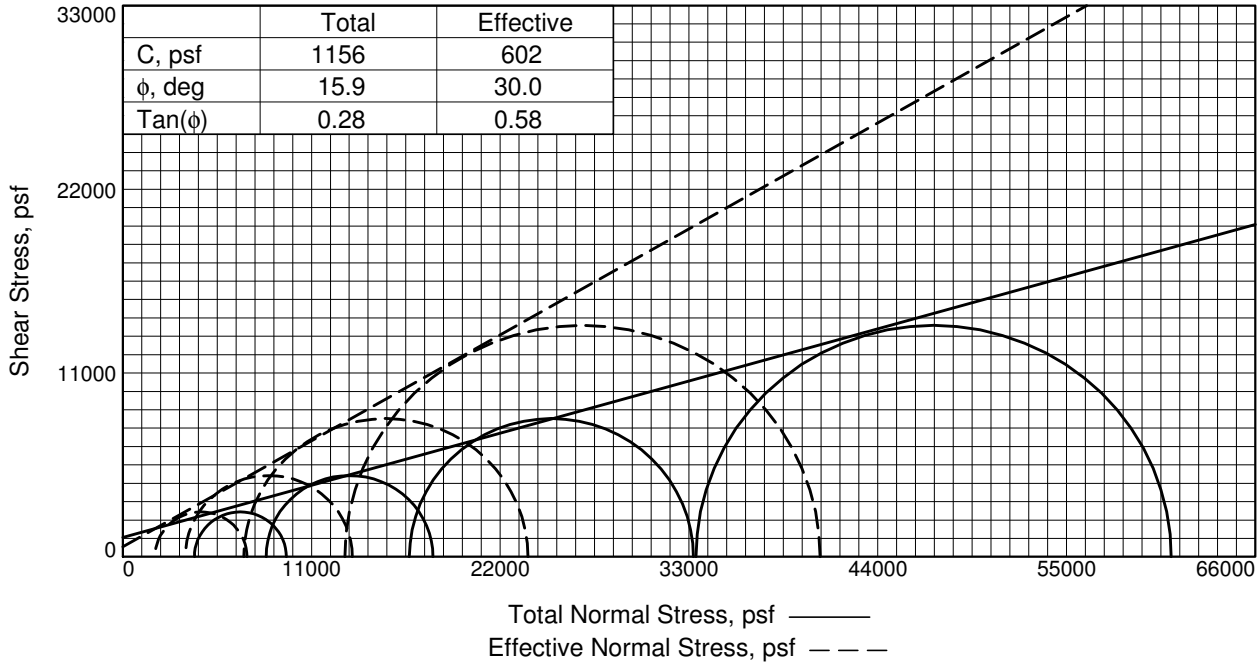
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.0068	3.256	0.0	0.0	0	33427	33427	1.00	39.52	33427	0
1	-0.0053	35.260	32.0	0.0	159	33291	33450	1.00	40.46	33370	79
2	-0.0038	75.148	71.9	0.1	1085	33097	34182	1.03	41.81	33639	543
3	-0.0024	113.658	110.4	0.1	1979	32857	34836	1.06	43.47	33847	990
4	-0.0009	149.127	145.9	0.1	2802	32587	35389	1.09	45.35	33988	1401
5	0.0006	183.291	180.0	0.1	3594	32271	35865	1.11	47.54	34068	1797
6	0.0021	218.160	214.9	0.2	4402	31935	36337	1.14	49.87	34136	2201
7	0.0035	251.328	248.1	0.2	5170	31570	36740	1.16	52.41	34155	2585
8	0.0050	285.883	282.6	0.2	5970	31157	37127	1.19	55.28	34142	2985
9	0.0065	316.258	313.0	0.2	6672	30711	37383	1.22	58.37	34047	3336
10	0.0080	345.456	342.2	0.3	7347	30265	37612	1.24	61.47	33938	3673
11	0.0094	375.706	372.5	0.3	8046	29815	37860	1.27	64.60	33837	4023
12	0.0109	404.699	401.4	0.3	8715	29351	38066	1.30	67.82	33708	4357
13	0.0124	432.775	429.5	0.4	9362	28893	38255	1.32	71.00	33574	4681
14	0.0139	457.789	454.5	0.4	9939	28391	38330	1.35	74.48	33361	4969
15	0.0153	484.116	480.9	0.4	10545	27946	38491	1.38	77.58	33219	5273
16	0.0168	508.244	505.0	0.4	11100	27467	38567	1.40	80.90	33017	5550
17	0.0183	531.533	528.3	0.5	12225	26992	39217	1.45	84.20	33105	6112
18	0.0198	556.541	553.3	0.5	12800	26576	39375	1.48	87.09	32976	6400
19	0.0212	577.951	574.7	0.5	13291	26131	39423	1.51	90.18	32777	6646
20	0.0227	599.313	596.1	0.6	13782	25706	39487	1.54	93.13	32597	6891
21	0.0242	619.754	616.5	0.6	14250	25282	39532	1.56	96.08	32407	7125
22	0.0257	640.447	637.2	0.6	14724	24893	39618	1.59	98.78	32255	7362
23	0.0271	659.264	656.0	0.6	15155	24502	39657	1.62	101.49	32079	7578

Test Readings for Specimen No. 4

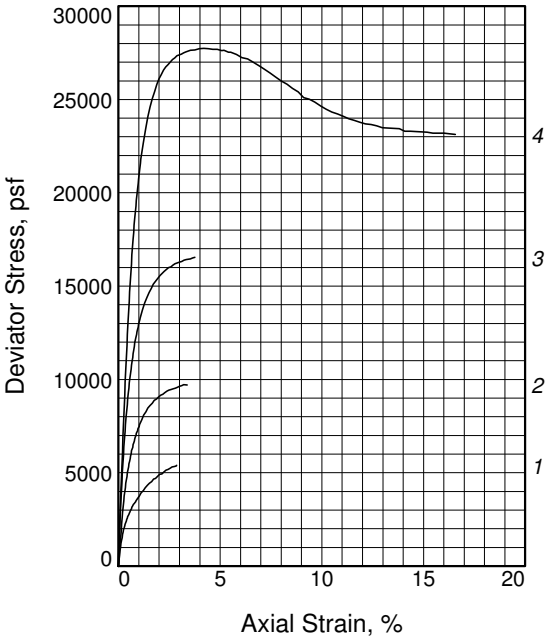
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	0.0286	677.047	673.8	0.7	15562	24144	39706	1.64	103.98	31925	7781
25	0.0301	696.497	693.2	0.7	16006	23798	39804	1.67	106.38	31801	8003
26	0.0316	714.162	710.9	0.7	16410	23434	39844	1.70	108.91	31639	8205
27	0.0330	731.856	728.6	0.7	16814	23119	39932	1.73	111.10	31525	8407
28	0.0345	747.360	744.1	0.8	17167	22769	39936	1.75	113.52	31353	8583
29	0.0360	762.853	759.6	0.8	17519	22469	39988	1.78	115.61	31229	8760
30	0.0375	779.542	776.3	0.8	17899	22189	40088	1.81	117.55	31139	8950
31	0.0389	793.708	790.5	0.9	18221	21895	40116	1.83	119.59	31006	9110
32	0.0404	807.540	804.3	0.9	18534	21606	40141	1.86	121.60	30873	9267
33	0.0419	821.839	818.6	0.9	18859	21331	40189	1.88	123.52	30760	9429
34	0.0434	833.332	830.1	0.9	19118	21059	40177	1.91	125.40	30618	9559
35	0.0449	846.860	843.6	1.0	19424	20823	40247	1.93	127.04	30535	9712
36	0.0463	858.895	855.6	1.0	19696	20561	40257	1.96	128.86	30409	9848
37	0.0478	871.079	867.8	1.0	19971	20354	40325	1.98	130.30	30339	9985
38	0.0493	883.037	879.8	1.0	20240	20123	40363	2.01	131.90	30243	10120
39	0.0508	895.111	891.9	1.1	20512	19910	40422	2.03	133.38	30166	10256
40	0.0522	905.716	902.5	1.1	20751	19693	40444	2.05	134.89	30069	10375
41	0.0581	947.615	944.4	1.2	21690	18938	40627	2.15	140.13	29783	10845
42	0.0640	982.653	979.4	1.3	22469	18259	40729	2.23	144.84	29494	11235
43	0.0699	1013.330	1010.1	1.4	23147	17675	40822	2.31	148.90	29249	11574
44	0.0758	1042.833	1039.6	1.5	23797	17204	41001	2.38	152.17	29102	11898
45	0.0818	1066.630	1063.4	1.7	24314	16736	41050	2.45	155.42	28893	12157
46	0.0877	1088.576	1085.3	1.8	24788	16371	41160	2.51	157.95	28766	12394
47	0.0936	1108.920	1105.7	1.9	25225	16049	41273	2.57	160.20	28661	12612
48	0.0995	1124.494	1121.2	2.0	25551	15744	41295	2.62	162.31	28519	12776
49	0.1054	1138.935	1135.7	2.1	25851	15478	41329	2.67	164.16	28404	12926
50	0.1113	1153.863	1150.6	2.2	26162	15287	41449	2.71	165.49	28368	13081
51	0.1172	1164.577	1161.3	2.3	26376	15090	41466	2.75	166.85	28278	13188
52	0.1231	1176.240	1173.0	2.4	26611	14920	41530	2.78	168.03	28225	13305
53	0.1290	1185.816	1182.6	2.5	26798	14783	41581	2.81	168.98	28182	13399
54	0.1349	1195.778	1192.5	2.6	26993	14662	41655	2.84	169.82	28159	13496
55	0.1408	1201.751	1198.5	2.8	27097	14532	41629	2.86	170.73	28081	13549
56	0.1467	1210.984	1207.7	2.9	27275	14463	41738	2.89	171.21	28100	13638
57	0.1526	1217.749	1214.5	3.0	27397	14363	41760	2.91	171.90	28062	13698
58	0.1585	1223.031	1219.8	3.1	27485	14290	41775	2.92	172.41	28032	13742
59	0.1644	1230.476	1227.2	3.2	27621	14250	41871	2.94	172.69	28061	13811
60	0.1703	1235.391	1232.1	3.3	27700	14186	41886	2.95	173.13	28036	13850
61	0.1762	1239.818	1236.6	3.4	27768	14152	41920	2.96	173.37	28036	13884
62	0.1821	1246.223	1243.0	3.5	27880	14119	42000	2.97	173.59	28059	13940
63	0.1939	1257.190	1253.9	3.7	28062	14057	42119	3.00	174.03	28088	14031
64	0.1998	1261.709	1258.5	3.9	28131	14038	42169	3.00	174.16	28103	14065
65	0.2116	1272.346	1269.1	4.1	28304	13994	42298	3.02	174.46	28146	14152
66	0.2175	1277.899	1274.6	4.2	28395	14003	42398	3.03	174.40	28200	14198
67	0.2234	1284.003	1280.7	4.3	28498	13994	42492	3.04	174.46	28243	14249
68	0.2294	1289.850	1286.6	4.4	28595	14006	42601	3.04	174.38	28304	14298
69	0.2412	1298.374	1295.1	4.6	28719	14012	42730	3.05	174.34	28371	14359
70	0.2471	1305.075	1301.8	4.7	28834	13995	42829	3.06	174.45	28412	14417

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
71	0.25301	310.663	1307.4	4.8	28924	13989	42913	3.07	174.50	28451	14462
72	0.25891	302.426	1299.2	5.0	28709	14009	42718	3.05	174.36	28363	14354
73	0.27071	308.510	1305.3	5.2	28776	14033	42809	3.05	174.20	28421	14388
74	0.28251	312.403	1309.1	5.4	28795	14042	42838	3.05	174.13	28440	14398
75	0.30311	320.997	1317.7	5.8	28866	14082	42949	3.05	173.85	28516	14433
76	0.31791	331.483	1328.2	6.1	29011	14135	43146	3.05	173.48	28641	14506
77	0.33261	337.195	1333.9	6.3	29051	14158	43208	3.05	173.33	28683	14525
78	0.34741	345.625	1342.4	6.6	29148	14210	43359	3.05	172.96	28784	14574
79	0.36211	352.167	1348.9	6.9	29204	14240	43444	3.05	172.76	28842	14602
80	0.37691	355.373	1352.1	7.2	29187	14293	43480	3.04	172.39	28887	14594
81	0.39161	359.450	1356.2	7.4	29188	14329	43517	3.04	172.14	28923	14594
82	0.40641	365.623	1362.4	7.7	29234	14368	43602	3.03	171.87	28985	14617
83	0.42121	371.806	1368.6	8.0	29279	14427	43706	3.03	171.46	29067	14640
84	0.43591	378.735	1375.5	8.3	29340	14473	43813	3.03	171.14	29143	14670
85	0.45071	384.822	1381.6	8.5	29381	14516	43897	3.02	170.84	29206	14691
86	0.46541	391.952	1388.7	8.8	29444	14537	43981	3.03	170.70	29259	14722
87	0.48021	371.501	1368.2	9.1	28923	14569	43492	2.99	170.47	29031	14461
88	0.49491	370.939	1367.7	9.4	28823	14645	43468	2.97	169.95	29056	14412
89	0.50971	373.247	1370.0	9.6	28784	14672	43456	2.96	169.76	29064	14392
90	0.52441	378.582	1375.3	9.9	28809	14706	43515	2.96	169.52	29110	14404
91	0.53921	384.136	1380.9	10.2	28837	14748	43585	2.96	169.23	29166	14418
92	0.55391	386.934	1383.7	10.5	28807	14792	43598	2.95	168.92	29195	14403
93	0.56871	386.756	1383.5	10.7	28714	14791	43505	2.94	168.93	29148	14357
94	0.58351	386.406	1383.2	11.0	28619	14869	43487	2.92	168.39	29178	14309
95	0.59821	392.704	1389.4	11.3	28660	14886	43546	2.93	168.27	29216	14330
96	0.61301	400.149	1396.9	11.6	28724	14927	43651	2.92	167.99	29289	14362
97	0.62771	405.516	1402.3	11.8	28745	14986	43731	2.92	167.57	29359	14373
98	0.64251	407.069	1403.8	12.1	28687	14998	43685	2.91	167.49	29342	14344
99	0.65721	409.787	1406.5	12.4	28653	15049	43702	2.90	167.14	29376	14326
100	0.67201	410.802	1407.5	12.7	28583	15101	43685	2.89	166.77	29393	14292
101	0.68671	413.252	1410.0	12.9	28543	15127	43671	2.89	166.59	29399	14272
102	0.70151	418.079	1414.8	13.2	28550	15174	43724	2.88	166.27	29449	14275
103	0.71631	423.495	1420.2	13.5	28569	15185	43754	2.88	166.19	29469	14284
104	0.73101	429.513	1426.3	13.8	28599	15203	43802	2.88	166.07	29502	14299
105	0.74581	431.049	1427.8	14.0	28538	15225	43763	2.87	165.92	29494	14269
106	0.76051	429.499	1426.2	14.3	28416	15243	43659	2.86	165.79	29451	14208
107	0.77531	426.968	1423.7	14.6	28274	15271	43545	2.85	165.60	29408	14137
108	0.79001	432.000	1428.7	14.9	28283	15256	43539	2.85	165.70	29397	14141
109	0.80481	439.015	1435.8	15.1	28330	15314	43645	2.85	165.29	29480	14165
110	0.81951	439.837	1436.6	15.4	28254	15324	43578	2.84	165.23	29451	14127
111	0.83431	442.108	1438.9	15.7	28207	15290	43497	2.84	165.46	29393	14104
112	0.84911	444.223	1441.0	16.0	28156	15325	43481	2.84	165.22	29403	14078
113	0.86381	443.937	1440.7	16.2	28059	15345	43404	2.83	165.08	29374	14029
114	0.87861	445.665	1442.4	16.5	28000	15312	43312	2.83	165.31	29312	14000
115	0.87891	445.041	1441.8	16.5	27986	15329	43315	2.83	165.19	29322	13993



	Total	Effective
C, psf	1156	602
ϕ, deg	15.9	30.0
Tan(ϕ)	0.28	0.58



Sample No.		1	2	3	4
Initial	Water Content, %	29.9	29.9	29.9	29.9
	Dry Density, pcf	91.8	91.8	91.8	91.8
	Saturation, %	95.7	95.7	95.7	95.7
	Void Ratio	0.8501	0.8501	0.8501	0.8501
	Diameter, in.	2.88	2.88	2.88	2.88
	Height, in.	5.80	5.80	5.80	5.80
At Test	Water Content, %	26.0	24.9	24.9	23.8
	Dry Density, pcf	99.4	101.2	101.2	103.0
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.7084	0.6786	0.6786	0.6487
	Diameter, in.	2.79	2.79	2.84	2.86
	Height, in.	5.72	5.60	5.42	5.25
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, psf		4176	8352	16704	33408
Fail. Stress, psf		5359	9725	16548	27694
Excess Pore Pr., psf		2297	4704	9642	20463
Strain, %		2.8	3.2	3.8	4.9
Ult. Stress, psf					
Excess Pore Pr., psf					
Strain, %					
$\bar{\sigma}_1$ Failure, psf		7238	13373	23609	40638
$\bar{\sigma}_3$ Failure, psf		1879	3648	7062	12945

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: lean clay

LL= 37 **PL=** 19 **PI=** 18

Assumed Specific Gravity= 2.72

Remarks: Failure tangents drawn at peak principal stress ratio.

Fig. _____

Client: Pebble Limited Partnership

Project: Pebble Project

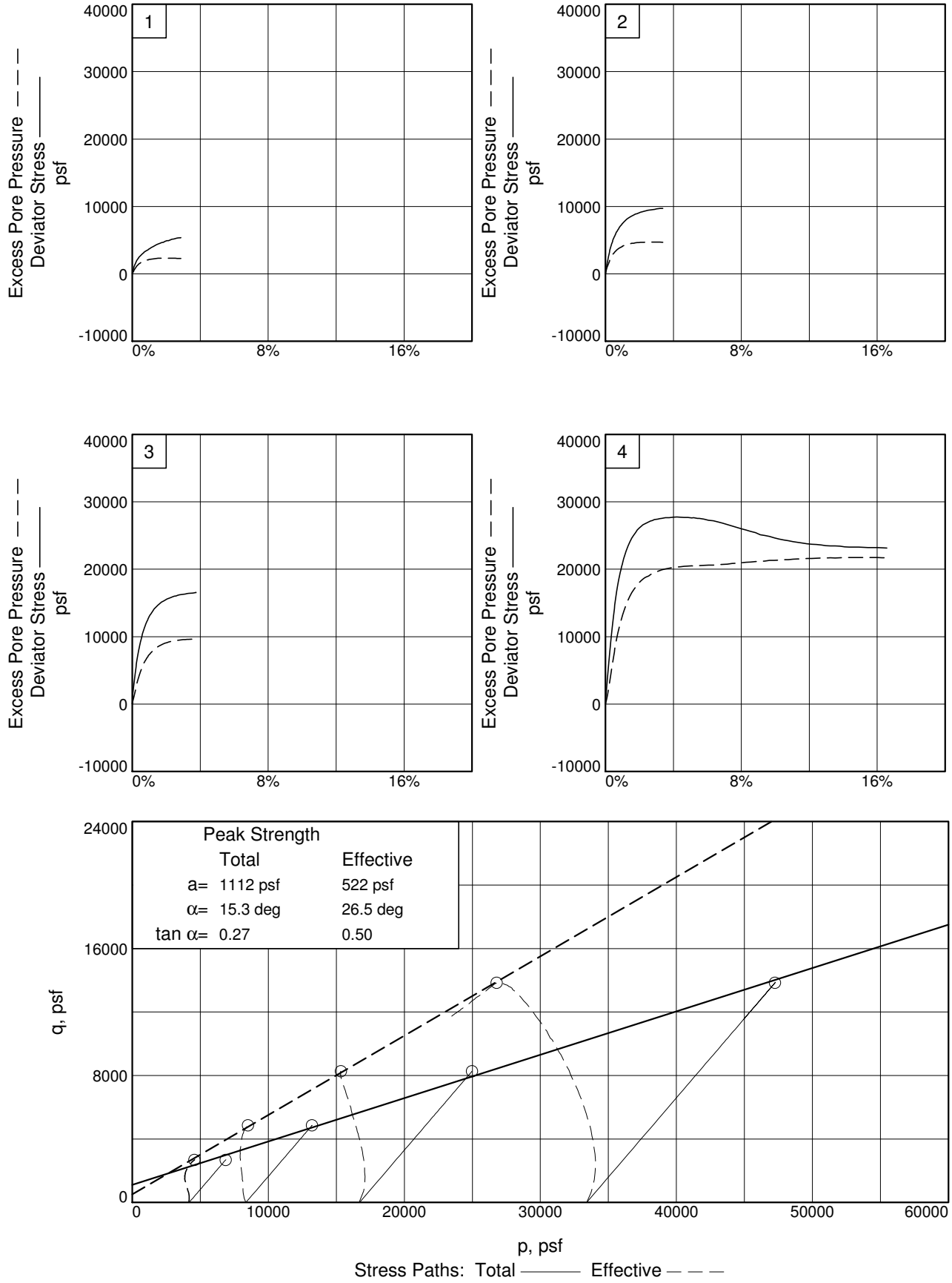
Location: GH10-228

Sample Number: ST 2 **Depth:** 10-12'

Proj. No.: 101-77/11 **Date Sampled:** 1/13/11

Knight Piésold CONSULTING

Tested By: rsh **Checked By:** spb



Client: Pebble Limited Partnership
Project: Pebble Project
Location: GH10-228 **Depth:** 10-12' **Sample Number:** ST 2
Project No.: 101-77/11 **Fig.** 1:3

Knight Piesold Geotechnical Lab.

Tested By: rsh **Checked By:** spb

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/25/2011
5:23 PM

Date: 1/13/11
Client: Pebble Limited Partnership
Project: Pebble Project
Project No.: 101-77/11
Location: GH10-228
Depth: 10-12' **Sample Number:** ST 2
Description: lean clay
Remarks: Failure tangents drawn at peak principal stress ratio.
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.72 **LL=**37 **PL=**19 **PI=**18
Test Method: ASTM D 4767 Method A (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1182.500			1272.300
Moisture content: Dry soil+tare, gms.	910.300			1055.200
Moisture content: Tare, gms.	0.000			144.880
Moisture, %	29.9	31.3	26.0	23.8
Moist specimen weight, gms.	1182.5			
Diameter, in.	2.88	2.88	2.79	
Area, in.²	6.51	6.51	6.10	
Height, in.	5.80	5.80	5.72	
Net decrease in height, in.		0.00	0.08	
Net decrease in water volume, cc.			47.40	
Wet Density, pcf	119.2	120.5	125.3	
Dry density, pcf	91.8	91.8	99.4	
Void ratio	0.8501	0.8501	0.7084	
Saturation, %	95.7	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 79.00 psi (11376 psf)
Consolidation back pressure = 50.00 psi (7200 psf)
Consolidation effective confining stress = 4176 psf
Strain rate, %/min. = 0.03
Fail. Stress = 5359 psf **at reading no.** 58

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.8287	3.560	0.0	0.0	0	4149	4149	1.00	50.19	4149	0
1	-3.8272	17.396	13.8	0.0	326	4013	4339	1.08	51.13	4176	163
2	-3.8257	28.632	25.1	0.1	591	3889	4480	1.15	51.99	4185	296
3	-3.8243	38.373	34.8	0.1	821	3769	4590	1.22	52.83	4179	411
4	-3.8228	47.059	43.5	0.1	1026	3652	4677	1.28	53.64	4165	513
5	-3.8214	54.954	51.4	0.1	1212	3535	4747	1.34	54.45	4141	606
6	-3.8199	62.284	58.7	0.2	1384	3424	4808	1.40	55.22	4116	692
7	-3.8185	68.344	64.8	0.2	1526	3311	4837	1.46	56.01	4074	763
8	-3.8170	75.431	71.9	0.2	1693	3211	4904	1.53	56.70	4058	846
9	-3.8156	81.752	78.2	0.2	1841	3126	4967	1.59	57.29	4047	921
10	-3.8141	86.298	82.7	0.3	1948	3043	4991	1.64	57.87	4017	974
11	-3.8127	90.442	86.9	0.3	2045	2967	5011	1.69	58.40	3989	1022
12	-3.8112	95.380	91.8	0.3	2161	2899	5060	1.75	58.87	3980	1080
13	-3.8098	99.022	95.5	0.3	2246	2836	5082	1.79	59.30	3959	1123
14	-3.8083	103.017	99.5	0.4	2339	2777	5116	1.84	59.72	3946	1170
15	-3.8069	106.580	103.0	0.4	2422	2721	5143	1.89	60.11	3932	1211
16	-3.8054	109.692	106.1	0.4	2495	2667	5162	1.94	60.48	3914	1247
17	-3.8040	113.277	109.7	0.4	2578	2621	5199	1.98	60.80	3910	1289
18	-3.8025	116.351	112.8	0.5	2650	2575	5225	2.03	61.12	3900	1325
19	-3.8011	118.709	115.1	0.5	2705	2532	5236	2.07	61.42	3884	1352
20	-3.7996	121.702	118.1	0.5	2774	2492	5266	2.11	61.70	3879	1387
21	-3.7982	124.350	120.8	0.5	2836	2453	5288	2.16	61.97	3870	1418
22	-3.7967	126.629	123.1	0.6	2889	2415	5303	2.20	62.23	3859	1444
23	-3.7952	129.406	125.8	0.6	2953	2380	5333	2.24	62.48	3856	1477
24	-3.7938	132.451	128.9	0.6	3024	2351	5374	2.29	62.68	3862	1512
25	-3.7923	134.587	131.0	0.6	3073	2318	5391	2.33	62.90	3855	1537
26	-3.7909	138.017	134.5	0.7	3153	2290	5442	2.38	63.10	3866	1576
27	-3.7894	139.986	136.4	0.7	3198	2266	5464	2.41	63.26	3865	1599
28	-3.7880	141.711	138.2	0.7	3238	2233	5471	2.45	63.49	3852	1619
29	-3.7865	144.418	140.9	0.7	3300	2216	5516	2.49	63.61	3866	1650
30	-3.7851	146.441	142.9	0.8	3347	2195	5542	2.52	63.75	3869	1673
31	-3.7836	147.335	143.8	0.8	3367	2174	5540	2.55	63.91	3857	1683
32	-3.7822	149.575	146.0	0.8	3418	2155	5573	2.59	64.04	3864	1709
33	-3.7807	151.086	147.5	0.8	3453	2137	5590	2.62	64.16	3863	1726
34	-3.7793	153.252	149.7	0.9	3503	2123	5626	2.65	64.25	3875	1751
35	-3.7778	154.954	151.4	0.9	3542	2108	5650	2.68	64.36	3879	1771
36	-3.7764	156.376	152.8	0.9	3574	2095	5669	2.71	64.45	3882	1787
37	-3.7749	158.998	155.4	0.9	3634	2081	5715	2.75	64.55	3898	1817
38	-3.7735	159.997	156.4	1.0	3657	2067	5724	2.77	64.64	3896	1828
39	-3.7720	161.831	158.3	1.0	3699	2040	5738	2.81	64.84	3889	1849
40	-3.7706	163.472	159.9	1.0	3736	2024	5760	2.85	64.94	3892	1868
41	-3.7648	171.507	167.9	1.1	3920	1979	5899	2.98	65.26	3939	1960
42	-3.7590	176.930	173.4	1.2	4042	1941	5983	3.08	65.52	3962	2021
43	-3.7531	183.511	180.0	1.3	4191	1907	6098	3.20	65.76	4003	2096
44	-3.7473	190.318	186.8	1.4	4345	1883	6229	3.31	65.92	4056	2173
45	-3.7415	194.942	191.4	1.5	4448	1865	6314	3.38	66.05	4089	2224
46	-3.7357	198.605	195.0	1.6	4529	1852	6381	3.45	66.14	4116	2264

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
47	-3.7299	204.555	201.0	1.7	4662	1858	6521	3.51	66.09	4189	2331
48	-3.7241	206.315	202.8	1.8	4698	1839	6537	3.56	66.23	4188	2349
49	-3.7183	211.461	207.9	1.9	4812	1835	6647	3.62	66.26	4241	2406
50	-3.7125	216.637	213.1	2.0	4927	1837	6764	3.68	66.24	4301	2464
51	-3.7067	217.492	213.9	2.1	4942	1833	6775	3.70	66.27	4304	2471
52	-3.7009	221.953	218.4	2.2	5040	1836	6875	3.75	66.25	4355	2520
53	-3.6951	226.497	222.9	2.3	5139	1841	6980	3.79	66.22	4410	2570
54	-3.6893	228.470	224.9	2.4	5179	1849	7028	3.80	66.16	4439	2590
55	-3.6835	231.267	227.7	2.5	5238	1865	7103	3.81	66.05	4484	2619
56	-3.6777	234.878	231.3	2.6	5316	1872	7188	3.84	66.00	4530	2658
57	-3.6719	236.029	232.5	2.7	5337	1872	7209	3.85	66.00	4541	2668
58	-3.6661	237.256	233.7	2.8	5359	1879	7238	3.85	65.95	4559	2680
59	-3.6649	239.316	235.8	2.9	5405	1870	7275	3.89	66.02	4572	2703

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1182.500			1272.300
Moisture content: Dry soil+tare, gms.	910.300			1055.200
Moisture content: Tare, gms.	0.000			144.880
Moisture, %	29.9		24.9	23.8
Moist specimen weight, gms.	1182.5			
Diameter, in.	2.88		2.79	
Area, in.²	6.51		6.12	
Height, in.	5.80		5.60	
Net decrease in height, in.		0.24	-0.05	
Net decrease in water volume, cc.			10.00	
Wet Density, pcf	119.2		126.4	
Dry density, pcf	91.8		101.2	
Void ratio	0.8501		0.6786	
Saturation, %	95.7		100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 98.00 psi (14112 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 8352 psf
Strain rate, %/min. = 0.03
Fail. Stress = 9725 psf **at reading no.** 61

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.8176	3.460	0.0	0.0	0	8338	8338	1.00	40.10	8338	0
1	-3.8161	26.866	23.4	0.0	551	7951	8502	1.07	42.79	8226	275
2	-3.8146	40.511	37.1	0.1	872	7748	8620	1.11	44.20	8184	436
3	-3.8132	53.450	50.0	0.1	1176	7561	8736	1.16	45.50	8148	588
4	-3.8118	68.019	64.6	0.1	1518	7377	8895	1.21	46.77	8136	759
5	-3.8103	82.996	79.5	0.1	1870	7202	9072	1.26	47.99	8137	935
6	-3.8088	98.761	95.3	0.2	2240	7009	9249	1.32	49.33	8129	1120

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
7	-3.8074	114.779	111.3	0.2	2616	6820	9436	1.38	50.64	8128	1308
8	-3.8059	126.177	122.7	0.2	2883	6645	9528	1.43	51.86	8086	1441
9	-3.8045	139.351	135.9	0.2	3192	6480	9671	1.49	53.00	8075	1596
10	-3.8030	152.132	148.7	0.3	3491	6322	9813	1.55	54.10	8068	1745
11	-3.8016	163.311	159.9	0.3	3752	6177	9930	1.61	55.10	8054	1876
12	-3.8001	172.638	169.2	0.3	3970	6044	10014	1.66	56.03	8029	1985
13	-3.7987	182.830	179.4	0.3	4208	5918	10126	1.71	56.90	8022	2104
14	-3.7972	192.576	189.1	0.4	4436	5787	10222	1.77	57.82	8005	2218
15	-3.7958	200.488	197.0	0.4	4620	5672	10293	1.81	58.61	7982	2310
16	-3.7943	208.006	204.5	0.4	4795	5565	10360	1.86	59.35	7963	2398
17	-3.7929	216.953	213.5	0.4	5004	5464	10468	1.92	60.05	7966	2502
18	-3.7914	223.803	220.3	0.5	5163	5369	10532	1.96	60.72	7950	2581
19	-3.7900	230.572	227.1	0.5	5320	5278	10598	2.01	61.35	7938	2660
20	-3.7885	237.507	234.0	0.5	5481	5198	10679	2.05	61.90	7938	2741
21	-3.7871	242.768	239.3	0.5	5603	5125	10728	2.09	62.41	7926	2801
22	-3.7856	249.627	246.2	0.6	5762	5052	10814	2.14	62.91	7933	2881
23	-3.7842	255.748	252.3	0.6	5904	4980	10884	2.19	63.42	7932	2952
24	-3.7827	260.491	257.0	0.6	6013	4917	10930	2.22	63.86	7923	3007
25	-3.7813	268.410	265.0	0.6	6197	4854	11051	2.28	64.29	7952	3098
26	-3.7798	271.469	268.0	0.7	6267	4797	11064	2.31	64.69	7930	3133
27	-3.7784	275.745	272.3	0.7	6365	4739	11104	2.34	65.09	7922	3183
28	-3.7769	282.551	279.1	0.7	6522	4681	11204	2.39	65.49	7942	3261
29	-3.7755	286.157	282.7	0.8	6605	4630	11235	2.43	65.85	7932	3303
30	-3.7740	290.474	287.0	0.8	6704	4583	11287	2.46	66.17	7935	3352
31	-3.7725	294.865	291.4	0.8	6805	4538	11343	2.50	66.49	7940	3402
32	-3.7711	299.859	296.4	0.8	6920	4496	11416	2.54	66.78	7956	3460
33	-3.7696	302.974	299.5	0.9	6991	4461	11451	2.57	67.02	7956	3495
34	-3.7682	308.016	304.6	0.9	7106	4423	11529	2.61	67.29	7976	3553
35	-3.7667	311.528	308.1	0.9	7187	4396	11583	2.63	67.47	7990	3593
36	-3.7653	314.652	311.2	0.9	7257	4362	11619	2.66	67.71	7990	3629
37	-3.7638	318.552	315.1	1.0	7347	4319	11665	2.70	68.01	7992	3673
38	-3.7624	321.607	318.1	1.0	7416	4282	11698	2.73	68.26	7990	3708
39	-3.7609	324.393	320.9	1.0	7479	4248	11727	2.76	68.50	7988	3739
40	-3.7595	328.356	324.9	1.0	7569	4211	11780	2.80	68.76	7995	3785
41	-3.7537	340.305	336.8	1.1	7839	4104	11943	2.91	69.50	8024	3920
42	-3.7479	351.486	348.0	1.2	8091	4010	12101	3.02	70.16	8055	4046
43	-3.7421	359.630	356.2	1.3	8272	3933	12205	3.10	70.69	8069	4136
44	-3.7363	368.143	364.7	1.5	8461	3866	12327	3.19	71.15	8096	4230
45	-3.7305	374.764	371.3	1.6	8605	3821	12427	3.25	71.46	8124	4303
46	-3.7247	380.226	376.8	1.7	8722	3794	12516	3.30	71.65	8155	4361
47	-3.7189	387.256	383.8	1.8	8876	3742	12618	3.37	72.02	8180	4438
48	-3.7130	390.861	387.4	1.9	8950	3710	12660	3.41	72.24	8185	4475
49	-3.7072	395.521	392.1	2.0	9048	3685	12733	3.46	72.41	8209	4524
50	-3.7014	400.874	397.4	2.1	9162	3669	12830	3.50	72.52	8250	4581
51	-3.6956	403.257	399.8	2.2	9207	3662	12869	3.51	72.57	8266	4603
52	-3.6898	407.552	404.1	2.3	9296	3668	12964	3.53	72.53	8316	4648
53	-3.6840	411.519	408.1	2.4	9377	3645	13022	3.57	72.69	8334	4689

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
54	-3.6782	414.329	410.9	2.5	9432	3640	13072	3.59	72.72	8356	4716
55	-3.6724	416.099	412.6	2.6	9462	3634	13096	3.60	72.76	8365	4731
56	-3.6666	417.831	414.4	2.7	9492	3633	13125	3.61	72.77	8379	4746
57	-3.6608	419.790	416.3	2.8	9527	3634	13161	3.62	72.77	8397	4763
58	-3.6550	422.677	419.2	2.9	9583	3646	13228	3.63	72.68	8437	4791
59	-3.6492	425.132	421.7	3.0	9629	3642	13271	3.64	72.71	8457	4814
60	-3.6434	427.162	423.7	3.1	9665	3643	13307	3.65	72.70	8475	4832
61	-3.6376	430.253	426.8	3.2	9725	3648	13373	3.67	72.66	8511	4862
62	-3.6284	430.220	426.8	3.4	9707	3661	13368	3.65	72.58	8514	4854

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1182.500			1272.300
Moisture content: Dry soil+tare, gms.	910.300			1055.200
Moisture content: Tare, gms.	0.000			144.880
Moisture, %	29.9		24.9	23.8
Moist specimen weight, gms.	1182.5			
Diameter, in.	2.88		2.84	
Area, in.²	6.51		6.33	
Height, in.	5.80		5.42	
Net decrease in height, in.		0.38	0.00	
Net decrease in water volume, cc.			0.00	
Wet Density, pcf	119.2		126.4	
Dry density, pcf	91.8		101.2	
Void ratio	0.8501		0.6786	
Saturation, %	95.7		100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 156.00 psi (22464 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 16704 psf
Strain rate, %/min. = 0.03
Fail. Stress = 16548 psf **at reading no.** 63

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.8033	4.016	0.0	0.0	0	16680	16680	1.00	40.17	16680	0
1	-3.8019	67.971	64.0	0.0	1454	16285	17740	1.09	42.91	17013	727
2	-3.8004	94.790	90.8	0.1	2064	16040	18104	1.13	44.61	17072	1032
3	-3.7990	122.310	118.3	0.1	2689	15756	18445	1.17	46.58	17101	1344
4	-3.7975	148.456	144.4	0.1	3282	15463	18745	1.21	48.62	17104	1641
5	-3.7961	173.351	169.3	0.1	3847	15162	19009	1.25	50.71	17086	1923
6	-3.7946	199.141	195.1	0.2	4431	14864	19296	1.30	52.78	17080	2216
7	-3.7932	222.514	218.5	0.2	4961	14565	19526	1.34	54.85	17045	2480
8	-3.7917	244.898	240.9	0.2	5468	14272	19739	1.38	56.89	17005	2734
9	-3.7902	265.684	261.7	0.2	5938	13987	19925	1.42	58.86	16956	2969
10	-3.7888	286.047	282.0	0.3	6398	13714	20112	1.47	60.77	16913	3199

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
11	-3.7873	304.726	300.7	0.3	6820	13452	20271	1.51	62.59	16861	3410
12	-3.7859	321.506	317.5	0.3	7199	13195	20394	1.55	64.37	16794	3599
13	-3.7844	338.422	334.4	0.3	7580	12951	20531	1.59	66.06	16741	3790
14	-3.7830	356.710	352.7	0.4	7993	12719	20712	1.63	67.67	16715	3996
15	-3.7815	370.661	366.6	0.4	8306	12489	20795	1.67	69.27	16642	4153
16	-3.7801	385.730	381.7	0.4	8645	12276	20922	1.70	70.75	16599	4323
17	-3.7786	399.723	395.7	0.5	8960	12058	21018	1.74	72.26	16538	4480
18	-3.7772	413.826	409.8	0.5	9277	11859	21136	1.78	73.65	16497	4638
19	-3.7757	425.712	421.7	0.5	9543	11671	21214	1.82	74.95	16442	4772
20	-3.7743	438.250	434.2	0.5	9824	11488	21312	1.86	76.22	16400	4912
21	-3.7728	449.527	445.5	0.6	10077	11314	21391	1.89	77.43	16352	5038
22	-3.7714	460.302	456.3	0.6	10318	11150	21467	1.93	78.57	16308	5159
23	-3.7699	470.819	466.8	0.6	10553	10995	21548	1.96	79.65	16271	5276
24	-3.7685	480.283	476.3	0.6	10764	10847	21610	1.99	80.68	16229	5382
25	-3.7670	490.125	486.1	0.7	10983	10705	21688	2.03	81.66	16197	5492
26	-3.7656	499.029	495.0	0.7	11181	10568	21749	2.06	82.61	16159	5591
27	-3.7641	507.838	503.8	0.7	11377	10440	21817	2.09	83.50	16128	5689
28	-3.7627	516.560	512.5	0.8	11571	10311	21882	2.12	84.39	16097	5786
29	-3.7612	525.770	521.8	0.8	11776	10192	21968	2.16	85.22	16080	5888
30	-3.7598	534.161	530.1	0.8	11962	10079	22041	2.19	86.01	16060	5981
31	-3.7583	541.291	537.3	0.8	12120	9967	22087	2.22	86.78	16027	6060
32	-3.7569	548.230	544.2	0.9	12273	9860	22132	2.24	87.53	15996	6136
33	-3.7554	554.836	550.8	0.9	12418	9758	22176	2.27	88.24	15967	6209
34	-3.7539	560.710	556.7	0.9	12547	9659	22207	2.30	88.92	15933	6274
35	-3.7525	566.947	562.9	0.9	12685	9566	22251	2.33	89.57	15908	6342
36	-3.7510	572.697	568.7	1.0	12811	9479	22290	2.35	90.17	15885	6405
37	-3.7496	579.365	575.3	1.0	12957	9395	22353	2.38	90.76	15874	6479
38	-3.7481	584.721	580.7	1.0	13074	9318	22392	2.40	91.29	15855	6537
39	-3.7467	590.658	586.6	1.0	13205	9245	22449	2.43	91.80	15847	6602
40	-3.7452	594.121	590.1	1.1	13279	9157	22436	2.45	92.41	15797	6639
41	-3.7394	614.244	610.2	1.2	13717	8868	22585	2.55	94.42	15726	6858
42	-3.7336	631.287	627.3	1.3	14085	8619	22704	2.63	96.15	15661	7042
43	-3.7278	645.366	641.4	1.4	14385	8400	22786	2.71	97.66	15593	7193
44	-3.7220	658.156	654.1	1.5	14656	8211	22867	2.79	98.98	15539	7328
45	-3.7162	669.111	665.1	1.6	14885	8047	22933	2.85	100.11	15490	7443
46	-3.7104	679.660	675.6	1.7	15105	7907	23012	2.91	101.09	15459	7552
47	-3.7046	687.505	683.5	1.8	15264	7784	23048	2.96	101.94	15416	7632
48	-3.6988	694.821	690.8	1.9	15410	7674	23084	3.01	102.71	15379	7705
49	-3.6930	702.306	698.3	2.0	15560	7589	23149	3.05	103.30	15369	7780
50	-3.6872	708.880	704.9	2.1	15689	7507	23197	3.09	103.87	15352	7845
51	-3.6814	713.837	709.8	2.3	15783	7437	23220	3.12	104.35	15329	7891
52	-3.6756	719.217	715.2	2.4	15885	7385	23270	3.15	104.72	15327	7942
53	-3.6698	724.967	721.0	2.5	15995	7329	23323	3.18	105.11	15326	7997
54	-3.6640	727.411	723.4	2.6	16031	7281	23312	3.20	105.44	15296	8016
55	-3.6582	733.167	729.2	2.7	16141	7248	23390	3.23	105.66	15319	8071
56	-3.6524	737.033	733.0	2.8	16209	7213	23422	3.25	105.91	15317	8104
57	-3.6408	742.008	738.0	3.0	16283	7157	23440	3.28	106.30	15298	8141

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
58	-3.6350	744.768	740.8	3.1	16326	7134	23459	3.29	106.46	15297	8163
59	-3.6292	748.412	744.4	3.2	16388	7116	23504	3.30	106.58	15310	8194
60	-3.6234	750.889	746.9	3.3	16424	7097	23521	3.31	106.72	15309	8212
61	-3.6118	754.191	750.2	3.5	16460	7072	23533	3.33	106.89	15302	8230
62	-3.6059	757.039	753.0	3.6	16504	7064	23569	3.34	106.94	15316	8252
63	-3.6001	759.856	755.8	3.8	16548	7062	23609	3.34	106.96	15336	8274
64	-3.6000	759.607	755.6	3.8	16542	7058	23599	3.34	106.99	15328	8271

Parameters for Specimen No. 4

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1182.500			1272.300
Moisture content: Dry soil+tare, gms.	910.300			1055.200
Moisture content: Tare, gms.	0.000			144.880
Moisture, %	29.9		23.8	23.8
Moist specimen weight, gms.	1182.5			
Diameter, in.	2.88		2.86	
Area, in.²	6.51		6.41	
Height, in.	5.80		5.25	
Net decrease in height, in.		0.59	-0.04	
Net decrease in water volume, cc.			10.00	
Wet Density, pcf	119.2		127.6	
Dry density, pcf	91.8		103.0	
Void ratio	0.8501		0.6487	
Saturation, %	95.7		100.0	

Test Readings for Specimen No. 4

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 272.00 psi (39168 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 33408 psf
Strain rate, %/min. = 0.03
Fail. Stress = 27694 psf **at reading no.** 66

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-3.7884	3.867	0.0	0.0	0	33409	33409	1.00	40.00	33409	0
1	-3.7869	58.502	54.6	0.0	1227	33105	34333	1.04	42.10	33719	614
2	-3.7855	92.715	88.8	0.1	1996	32847	34843	1.06	43.89	33845	998
3	-3.7840	131.860	128.0	0.1	2874	32528	35402	1.09	46.11	33965	1437
4	-3.7826	168.957	165.1	0.1	3706	32172	35878	1.12	48.58	34025	1853
5	-3.7811	204.616	200.7	0.1	4505	31803	36308	1.14	51.15	34056	2253
6	-3.7797	240.817	236.9	0.2	5316	31390	36706	1.17	54.01	34048	2658
7	-3.7782	276.081	272.2	0.2	6106	30964	37069	1.20	56.97	34017	3053
8	-3.7768	310.091	306.2	0.2	6867	30519	37386	1.22	60.06	33952	3433
9	-3.7753	345.160	341.3	0.2	7651	30069	37720	1.25	63.19	33894	3825
10	-3.7739	377.586	373.7	0.3	8375	29612	37987	1.28	66.36	33799	4188
11	-3.7724	411.793	407.9	0.3	9139	29148	38287	1.31	69.58	33718	4570
12	-3.7710	443.720	439.9	0.3	9852	28690	38542	1.34	72.76	33616	4926

Test Readings for Specimen No. 4

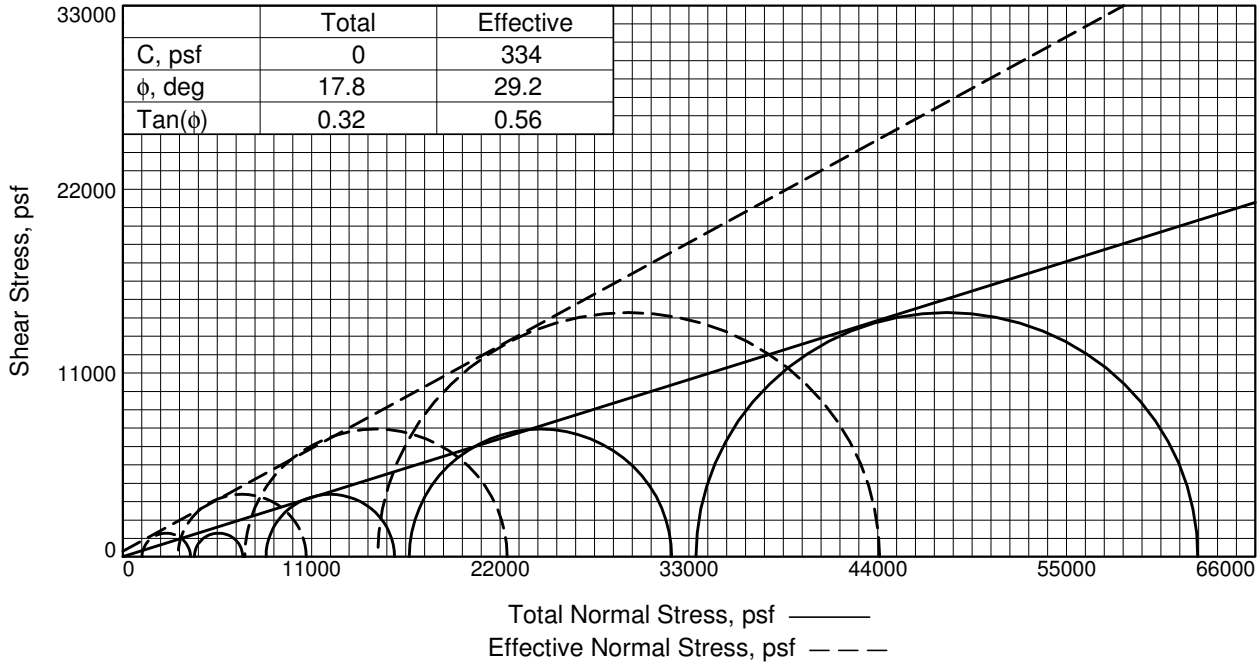
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
13	-3.7695	473.846	470.0	0.4	10524	28223	38747	1.37	76.01	33485	5262
14	-3.7681	503.561	499.7	0.4	11186	27782	38968	1.40	79.07	33375	5593
15	-3.7666	531.863	528.0	0.4	11817	27342	39158	1.43	82.13	33250	5908
16	-3.7652	559.216	555.3	0.4	12425	26913	39338	1.46	85.10	33126	6213
17	-3.7637	586.995	583.1	0.5	13043	26487	39531	1.49	88.06	33009	6522
18	-3.7623	612.403	608.5	0.5	13608	26069	39676	1.52	90.97	32872	6804
19	-3.7608	637.975	634.1	0.5	14176	25662	39837	1.55	93.79	32749	7088
20	-3.7594	661.233	657.4	0.6	14691	25264	39956	1.58	96.55	32610	7346
21	-3.7579	683.866	680.0	0.6	15193	24867	40060	1.61	99.31	32463	7597
22	-3.7565	706.378	702.5	0.6	15692	24487	40179	1.64	101.95	32333	7846
23	-3.7550	728.110	724.2	0.6	16173	24119	40292	1.67	104.51	32206	8086
24	-3.7536	751.118	747.3	0.7	16682	23757	40439	1.70	107.02	32098	8341
25	-3.7521	769.443	765.6	0.7	17086	23416	40502	1.73	109.39	31959	8543
26	-3.7507	788.932	785.1	0.7	17516	23083	40599	1.76	111.70	31841	8758
27	-3.7492	805.797	801.9	0.7	17887	22767	40654	1.79	113.90	31710	8944
28	-3.7478	823.383	819.5	0.8	18275	22473	40748	1.81	115.94	31610	9137
29	-3.7463	839.802	835.9	0.8	18636	22195	40831	1.84	117.87	31513	9318
30	-3.7449	854.823	851.0	0.8	18965	21892	40857	1.87	119.98	31374	9483
31	-3.7434	869.910	866.0	0.9	19296	21620	40916	1.89	121.86	31268	9648
32	-3.7420	884.374	880.5	0.9	19613	21362	40974	1.92	123.66	31168	9806
33	-3.7405	896.714	892.8	0.9	19882	21111	40993	1.94	125.39	31052	9941
34	-3.7391	912.028	908.2	0.9	20218	20854	41071	1.97	127.18	30962	10109
35	-3.7376	925.075	921.2	1.0	20502	20606	41108	1.99	128.91	30857	10251
36	-3.7362	935.554	931.7	1.0	20730	20367	41097	2.02	130.56	30732	10365
37	-3.7347	948.844	945.0	1.0	21020	20121	41141	2.04	132.27	30631	10510
38	-3.7333	962.191	958.3	1.0	21311	19901	41211	2.07	133.80	30556	10655
39	-3.7318	974.624	970.8	1.1	21581	19683	41264	2.10	135.32	30473	10790
40	-3.7304	985.008	981.1	1.1	21806	19467	41273	2.12	136.81	30370	10903
41	-3.7246	1025.729	1021.9	1.2	22685	18688	41374	2.21	142.22	30031	11343
42	-3.7188	1059.386	1055.5	1.3	23406	17998	41404	2.30	147.01	29701	11703
43	-3.7130	1090.498	1086.6	1.4	24069	17400	41470	2.38	151.16	29435	12035
44	-3.7072	1115.802	1111.9	1.5	24602	16891	41493	2.46	154.70	29192	12301
45	-3.7014	1137.591	1133.7	1.7	25056	16462	41518	2.52	157.68	28990	12528
46	-3.6956	1154.914	1151.0	1.8	25410	16061	41471	2.58	160.47	28766	12705
47	-3.6897	1173.997	1170.1	1.9	25803	15698	41501	2.64	162.99	28599	12901
48	-3.6839	1189.013	1185.1	2.0	26104	15394	41498	2.70	165.10	28446	13052
49	-3.6781	1201.042	1197.2	2.1	26340	15116	41456	2.74	167.03	28286	13170
50	-3.6723	1212.934	1209.1	2.2	26571	14878	41449	2.79	168.68	28163	13286
51	-3.6665	1222.076	1218.2	2.3	26742	14677	41419	2.82	170.08	28048	13371
52	-3.6607	1228.782	1224.9	2.4	26859	14524	41383	2.85	171.14	27954	13429
53	-3.6549	1236.540	1232.7	2.5	26998	14416	41414	2.87	171.89	27915	13499
54	-3.6491	1244.427	1240.6	2.7	27140	14221	41361	2.91	173.25	27791	13570
55	-3.6433	1250.030	1246.2	2.8	27232	14045	41277	2.94	174.47	27661	13616
56	-3.6375	1256.932	1253.1	2.9	27352	13924	41276	2.96	175.30	27600	13676
57	-3.6259	1263.553	1259.7	3.1	27434	13722	41156	3.00	176.71	27439	13717
58	-3.6201	1267.758	1263.9	3.2	27494	13596	41090	3.02	177.58	27343	13747
59	-3.6143	1271.943	1268.1	3.3	27553	13517	41070	3.04	178.13	27293	13777

Test Readings for Specimen No. 4

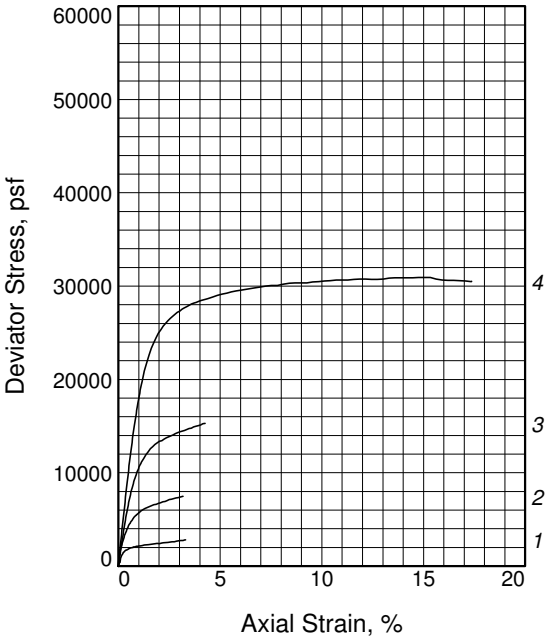
No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
60	-3.60271	278.374	1274.5	3.5	27630	13359	40989	3.07	179.23	27174	13815
61	-3.59111	282.669	1278.8	3.8	27659	13261	40921	3.09	179.91	27091	13830
62	-3.57951	288.858	1285.0	4.0	27730	13147	40877	3.11	180.70	27012	13865
63	-3.56791	292.016	1288.1	4.2	27734	13084	40817	3.12	181.14	26950	13867
64	-3.55631	294.551	1290.7	4.4	27724	13031	40756	3.13	181.50	26894	13862
65	-3.54471	296.021	1292.2	4.6	27692	12991	40682	3.13	181.79	26836	13846
66	-3.53311	299.108	1295.2	4.9	27694	12945	40638	3.14	182.11	26792	13847
67	-3.52151	298.808	1294.9	5.1	27623	12921	40544	3.14	182.27	26733	13811
68	-3.51571	300.958	1297.1	5.2	27637	12940	40576	3.14	182.14	26758	13818
69	-3.50411	299.117	1295.2	5.4	27533	12850	40383	3.14	182.76	26617	13767
70	-3.49821	300.734	1296.9	5.5	27535	12864	40399	3.14	182.67	26631	13768
71	-3.48371	299.122	1295.3	5.8	27421	12852	40273	3.13	182.75	26562	13710
72	-3.46921	294.616	1290.7	6.1	27245	12785	40030	3.13	183.21	26408	13623
73	-3.45471	294.765	1290.9	6.3	27168	12802	39970	3.12	183.10	26386	13584
74	-3.44021	290.551	1286.7	6.6	27000	12732	39731	3.12	183.59	26232	13500
75	-3.42571	285.780	1281.9	6.9	26820	12702	39522	3.11	183.79	26112	13410
76	-3.41121	280.271	1276.4	7.2	26626	12662	39288	3.10	184.07	25975	13313
77	-3.39671	274.192	1270.3	7.5	26420	12571	38991	3.10	184.70	25781	13210
78	-3.38221	267.391	1263.5	7.7	26200	12528	38728	3.09	185.00	25628	13100
79	-3.36771	261.159	1257.3	8.0	25993	12439	38432	3.09	185.62	25435	12997
80	-3.35321	256.494	1252.6	8.3	25819	12371	38190	3.09	186.09	25280	12910
81	-3.33871	249.436	1245.6	8.6	25596	12348	37944	3.07	186.25	25146	12798
82	-3.32421	244.327	1240.5	8.8	25414	12273	37687	3.07	186.77	24980	12707
83	-3.30971	232.478	1228.6	9.1	25095	12236	37331	3.05	187.03	24784	12548
84	-3.29521	231.908	1228.0	9.4	25008	12190	37198	3.05	187.35	24694	12504
85	-3.28071	228.477	1224.6	9.7	24862	12106	36967	3.05	187.93	24536	12431
86	-3.26621	221.862	1218.0	9.9	24652	12093	36744	3.04	188.02	24418	12326
87	-3.25171	217.300	1213.4	10.2	24484	12047	36531	3.03	188.34	24289	12242
88	-3.23721	213.509	1209.6	10.5	24333	11988	36321	3.03	188.75	24154	12166
89	-3.22271	211.550	1207.7	10.8	24218	11984	36202	3.02	188.78	24093	12109
90	-3.20821	209.353	1205.5	11.0	24100	11925	36024	3.02	189.19	23974	12050
91	-3.19371	206.612	1202.7	11.3	23970	11901	35871	3.01	189.35	23886	11985
92	-3.17921	205.694	1201.8	11.6	23877	11882	35759	3.01	189.48	23821	11939
93	-3.16471	204.620	1200.8	11.9	23781	11813	35595	3.01	189.96	23704	11891
94	-3.15021	204.287	1200.4	12.1	23700	11813	35514	3.01	189.96	23663	11850
95	-3.13571	206.252	1202.4	12.4	23665	11781	35446	3.01	190.19	23613	11832
96	-3.12111	206.293	1202.4	12.7	23591	11759	35349	3.01	190.34	23554	11795
97	-3.10661	205.291	1201.4	13.0	23497	11754	35250	3.00	190.38	23502	11748
98	-3.09211	207.588	1203.7	13.3	23467	11715	35182	3.00	190.64	23449	11733
99	-3.07761	210.912	1207.0	13.5	23457	11732	35189	3.00	190.53	23460	11728
100	-3.06311	213.439	1209.6	13.8	23431	11698	35129	3.00	190.76	23414	11715
101	-3.04861	210.831	1207.0	14.1	23306	11693	34998	2.99	190.80	23345	11653
102	-3.03411	213.980	1210.1	14.4	23291	11687	34978	2.99	190.84	23332	11646
103	-3.01961	217.777	1213.9	14.6	23289	11664	34953	3.00	191.00	23309	11645
104	-3.00511	220.626	1216.8	14.9	23268	11690	34958	2.99	190.82	23324	11634
105	-2.99061	223.331	1219.5	15.2	23244	11665	34909	2.99	191.00	23287	11622
106	-2.97611	225.067	1221.2	15.5	23202	11686	34887	2.99	190.85	23286	11601

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
107	-2.96161	229.211	1225.3	15.7	23204	11681	34885	2.99	190.88	23283	11602
108	-2.94711	232.982	1229.1	16.0	23200	11690	34890	2.98	190.82	23290	11600
109	-2.93261	234.823	1231.0	16.3	23158	11695	34853	2.98	190.78	23274	11579
110	-2.91811	237.159	1233.3	16.6	23125	11696	34822	2.98	190.77	23259	11563



	Total	Effective
C, psf	0	334
ϕ, deg	17.8	29.2
Tan(ϕ)	0.32	0.56



Sample No.		1	2	3	4
Initial	Water Content, %	33.9	33.9	33.9	33.9
	Dry Density, pcf	86.1	86.1	86.1	86.1
	Saturation, %	95.4	95.4	95.4	95.4
	Void Ratio	0.9583	0.9583	0.9583	0.9583
	Diameter, in.	2.88	2.88	2.88	2.88
	Height, in.	5.75	5.75	5.75	5.75
At Test	Water Content, %	28.1	27.4	26.1	25.3
	Dry Density, pcf	95.9	96.8	98.8	100.2
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.7580	0.7404	0.7053	0.6830
	Diameter, in.	2.80	2.83	2.84	2.87
	Height, in.	5.45	5.29	5.14	4.97
Strain rate, %/min.		0.02	0.02	0.02	0.02
Eff. Cell Pressure, psf		4176	8352	16704	33408
Fail. Stress, psf		2819	7478	15283	29242
Excess Pore Pr., psf		3051	5141	9587	18551
Strain, %		3.3	3.2	4.3	5.3
Ult. Stress, psf					
Excess Pore Pr., psf					
Strain, %					
$\bar{\sigma}_1$ Failure, psf		3943	10689	22400	44099
$\bar{\sigma}_3$ Failure, psf		1125	3211	7117	14857

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: lean clay

LL= 32 **PL=** 20 **PI=** 12

Assumed Specific Gravity= 2.7

Remarks: Failure tangents drawn at peak principal stress ratio.

Fig. _____

Client: Pebble Limited Partnership

Project: Pebble Project

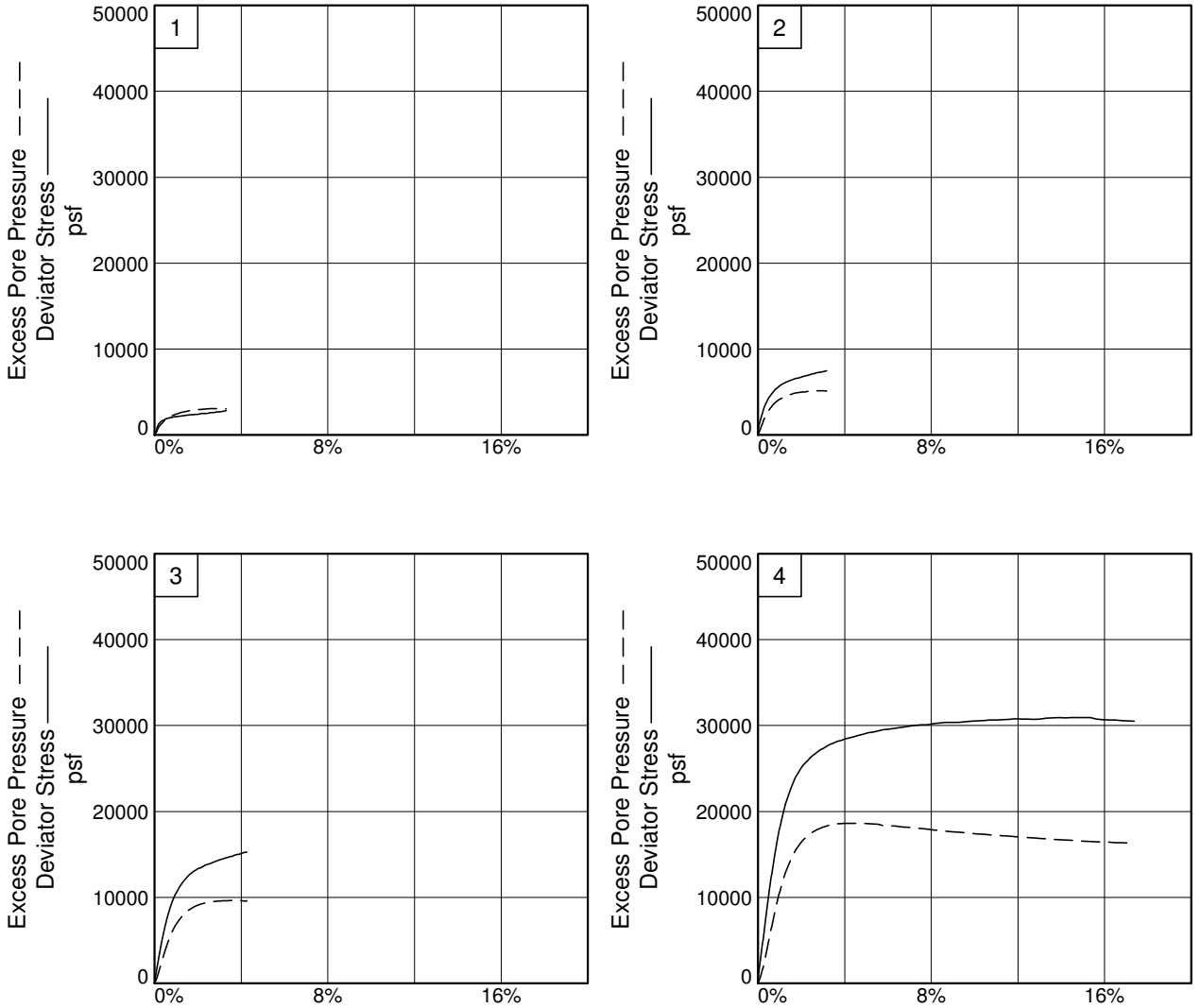
Location: GH10-228

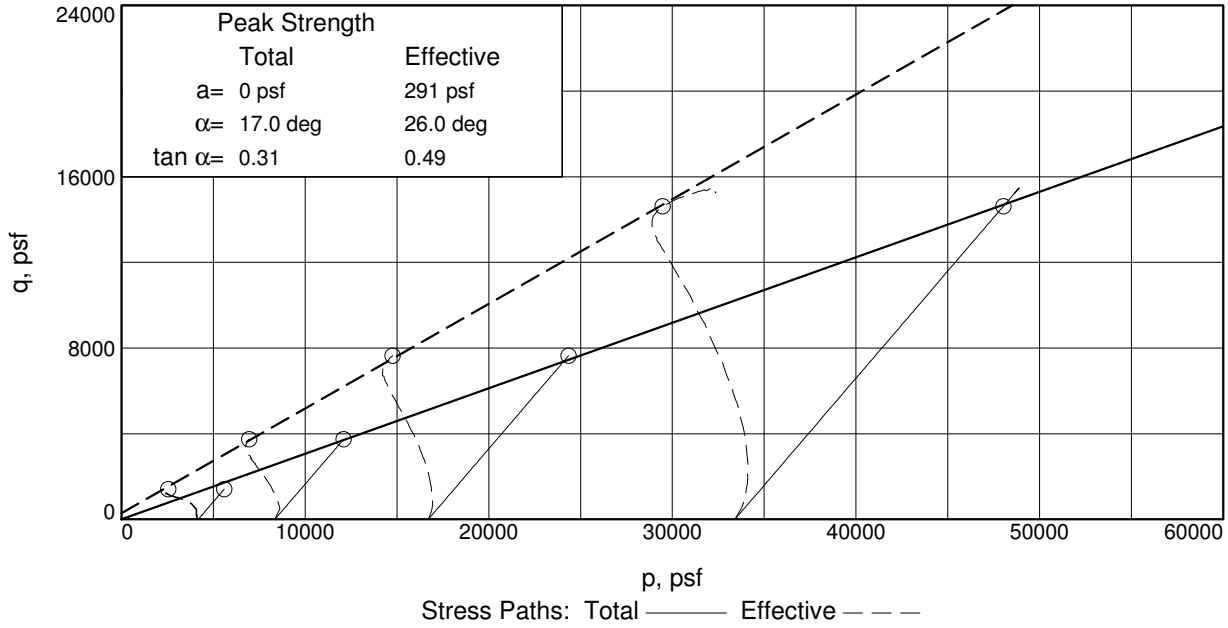
Sample Number: ST 3 **Depth:** 15-17'

Proj. No.: 101-77/11 **Date Sampled:** 1/24/11

Knight Piésold CONSULTING

Tested By: rsh **Checked By:** spb





Client: Pebble Limited Partnership

Project: Pebble Project

Location: GH10-228 **Depth:** 15-17' **Sample Number:** ST 3

Project No.: 101-77/11 **Fig.** 1:3

Knight Piesold Geotechnical Lab.

Tested By: rsh **Checked By:** spb

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

1/25/2011
5:22 PM

Date: 1/24/11
Client: Pebble Limited Partnership
Project: Pebble Project
Project No.: 101-77/11
Location: GH10-228
Depth: 15-17' **Sample Number:** ST 3
Description: lean clay
Remarks: Failure tangents drawn at peak principal stress ratio.
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.7 **LL=**32 **PL=**20 **PI=**12
Test Method: ASTM D 4767 Method A (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1132.900			1256.100
Moisture content: Dry soil+tare, gms.	846.300			1042.100
Moisture content: Tare, gms.	0.000			195.800
Moisture, %	33.9	35.5	28.1	25.3
Moist specimen weight, gms.	1132.9			
Diameter, in.	2.88	2.88	2.80	
Area, in.²	6.51	6.51	6.17	
Height, in.	5.75	5.75	5.45	
Net decrease in height, in.		0.00	0.30	
Net decrease in water volume, cc.			62.80	
Wet Density, pcf	115.2	116.6	122.8	
Dry density, pcf	86.1	86.1	95.9	
Void ratio	0.9583	0.9583	0.7580	
Saturation, %	95.4	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 69.00 psi (9936 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 4176 psf
Strain rate, %/min. = 0.02
Fail. Stress = 2819 psf **at reading no.** 51

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.4107	2.289	0.0	0.0	0	4116	4116	1.00	40.42	4116	0
1	-0.4093	18.943	16.7	0.0	388	3901	4290	1.10	41.91	4095	194
2	-0.4078	18.336	16.0	0.1	374	3895	4270	1.10	41.95	4083	187
3	-0.4064	18.827	16.5	0.1	385	3884	4270	1.10	42.03	4077	193
4	-0.4050	38.439	36.1	0.1	842	3646	4488	1.23	43.68	4067	421
5	-0.4035	45.821	43.5	0.1	1014	3533	4547	1.29	44.47	4040	507
6	-0.4021	50.403	48.1	0.2	1121	3407	4527	1.33	45.34	3967	560
7	-0.4006	55.675	53.4	0.2	1243	3290	4533	1.38	46.15	3912	622
8	-0.3992	60.091	57.8	0.2	1345	3188	4533	1.42	46.86	3861	673
9	-0.3978	63.963	61.7	0.2	1435	3090	4525	1.46	47.54	3808	718
10	-0.3963	66.737	64.4	0.3	1499	3004	4503	1.50	48.14	3754	750
11	-0.3949	69.298	67.0	0.3	1559	2914	4473	1.53	48.76	3693	779
12	-0.3934	71.908	69.6	0.3	1619	2844	4463	1.57	49.25	3653	809
13	-0.3920	74.435	72.1	0.3	1677	2775	4452	1.60	49.73	3614	839
14	-0.3906	75.910	73.6	0.4	1711	2703	4414	1.63	50.23	3558	855
15	-0.3891	76.386	74.1	0.4	1722	2619	4340	1.66	50.82	3479	861
16	-0.3877	77.914	75.6	0.4	1757	2565	4322	1.68	51.19	3443	878
17	-0.3862	79.159	76.9	0.4	1785	2490	4275	1.72	51.71	3383	893
18	-0.3848	80.497	78.2	0.5	1816	2439	4254	1.74	52.06	3347	908
19	-0.3834	82.627	80.3	0.5	1865	2395	4260	1.78	52.37	3328	932
20	-0.3819	83.608	81.3	0.5	1887	2344	4231	1.81	52.72	3287	943
21	-0.3805	84.846	82.6	0.6	1915	2307	4222	1.83	52.98	3264	958
22	-0.3790	86.479	84.2	0.6	1952	2271	4223	1.86	53.23	3247	976
23	-0.3776	86.932	84.6	0.6	1962	2234	4196	1.88	53.49	3215	981
24	-0.3733	87.929	85.6	0.7	1984	2080	4064	1.95	54.56	3072	992
25	-0.3718	88.490	86.2	0.7	1996	2043	4039	1.98	54.81	3041	998
26	-0.3704	90.951	88.7	0.7	2053	2016	4069	2.02	55.00	3043	1026
27	-0.3661	91.646	89.4	0.8	2067	1904	3971	2.09	55.78	2937	1034
28	-0.3646	92.415	90.1	0.8	2085	1877	3962	2.11	55.96	2920	1042
29	-0.3617	93.653	91.4	0.9	2112	1829	3941	2.15	56.30	2885	1056
30	-0.3589	94.198	91.9	1.0	2124	1766	3889	2.20	56.74	2828	1062
31	-0.3560	95.492	93.2	1.0	2152	1735	3887	2.24	56.95	2811	1076
32	-0.3531	96.325	94.0	1.1	2170	1680	3851	2.29	57.33	2765	1085
33	-0.3474	97.047	94.8	1.2	2185	1591	3776	2.37	57.95	2683	1092
34	-0.3416	99.972	97.7	1.3	2250	1523	3772	2.48	58.43	2647	1125
35	-0.3301	102.480	100.2	1.5	2303	1411	3713	2.63	59.20	2562	1151
36	-0.3186	105.466	103.2	1.7	2366	1315	3681	2.80	59.87	2498	1183
37	-0.3128	106.514	104.2	1.8	2388	1290	3678	2.85	60.04	2484	1194
38	-0.3071	108.122	105.8	1.9	2422	1238	3660	2.96	60.40	2449	1211
39	-0.3013	107.752	105.5	2.0	2411	1205	3616	3.00	60.63	2410	1205
40	-0.2956	110.324	108.0	2.1	2467	1205	3672	3.05	60.63	2439	1233
41	-0.2898	112.416	110.1	2.2	2512	1169	3681	3.15	60.88	2425	1256
42	-0.2783	113.417	111.1	2.4	2529	1129	3658	3.24	61.16	2394	1265
43	-0.2726	115.800	113.5	2.5	2581	1110	3690	3.33	61.29	2400	1290
44	-0.2668	117.075	114.8	2.6	2607	1101	3708	3.37	61.35	2405	1303
45	-0.2611	117.643	115.4	2.7	2617	1083	3700	3.42	61.48	2391	1308
46	-0.2553	120.345	118.1	2.9	2675	1114	3789	3.40	61.26	2452	1338

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
47	-0.2496	121.401	119.1	3.0	2696	1098	3794	3.46	61.37	2446	1348
48	-0.2438	123.119	120.8	3.1	2732	1109	3841	3.46	61.30	2475	1366
49	-0.2381	124.308	122.0	3.2	2756	1107	3863	3.49	61.31	2485	1378
50	-0.2323	127.010	124.7	3.3	2814	1136	3950	3.48	61.11	2543	1407
51	-0.2308	127.252	125.0	3.3	2819	1125	3943	3.51	61.19	2534	1409

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1132.900			1256.100
Moisture content: Dry soil+tare, gms.	846.300			1042.100
Moisture content: Tare, gms.	0.000			195.800
Moisture, %	33.9		27.4	25.3
Moist specimen weight, gms.	1132.9			
Diameter, in.	2.88		2.83	
Area, in.²	6.51		6.30	
Height, in.	5.75		5.29	
Net decrease in height, in.		0.48	-0.02	
Net decrease in water volume, cc.			5.50	
Wet Density, pcf	115.2		123.4	
Dry density, pcf	86.1		96.8	
Void ratio	0.9583		0.7404	
Saturation, %	95.4		100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.064 cm

Consolidation cell pressure = 98.00 psi (14112 psf)

Consolidation back pressure = 40.00 psi (5760 psf)

Consolidation effective confining stress = 8352 psf

Strain rate, %/min. = 0.02

Fail. Stress = 7478 psf **at reading no.** 60

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.4292	3.029	0.0	0.0	0	8348	8348	1.00	40.03	8348	0
1	-0.4278	46.902	43.9	0.0	1003	8131	9134	1.12	41.54	8632	501
2	-0.4263	57.496	54.5	0.1	1245	7970	9214	1.16	42.66	8592	622
3	-0.4249	68.737	65.7	0.1	1501	7791	9293	1.19	43.89	8542	751
4	-0.4234	80.274	77.2	0.1	1764	7616	9380	1.23	45.11	8498	882
5	-0.4220	91.360	88.3	0.1	2017	7431	9448	1.27	46.40	8440	1009
6	-0.4206	101.916	98.9	0.2	2257	7258	9516	1.31	47.60	8387	1129
7	-0.4191	111.703	108.7	0.2	2480	7073	9553	1.35	48.88	8313	1240
8	-0.4177	120.212	117.2	0.2	2674	6912	9586	1.39	50.00	8249	1337
9	-0.4162	129.375	126.3	0.2	2882	6748	9630	1.43	51.14	8189	1441
10	-0.4148	138.350	135.3	0.3	3086	6588	9674	1.47	52.25	8131	1543
11	-0.4134	146.611	143.6	0.3	3273	6433	9706	1.51	53.33	8070	1637
12	-0.4119	153.677	150.6	0.3	3433	6276	9709	1.55	54.42	7993	1717
13	-0.4105	161.032	158.0	0.4	3600	6142	9742	1.59	55.35	7942	1800
14	-0.4090	167.470	164.4	0.4	3746	6000	9746	1.62	56.33	7873	1873

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
15	-0.4076	173.782	170.8	0.4	3888	5883	9772	1.66	57.14	7827	1944
16	-0.4062	179.955	176.9	0.4	4028	5753	9780	1.70	58.05	7766	2014
17	-0.4047	185.625	182.6	0.5	4156	5628	9784	1.74	58.91	7706	2078
18	-0.4033	191.650	188.6	0.5	4292	5520	9811	1.78	59.67	7665	2146
19	-0.4018	197.070	194.0	0.5	4414	5413	9827	1.82	60.41	7620	2207
20	-0.4004	201.767	198.7	0.5	4520	5318	9837	1.85	61.07	7577	2260
21	-0.3990	205.166	202.1	0.6	4596	5218	9813	1.88	61.77	7516	2298
22	-0.3975	209.880	206.9	0.6	4701	5129	9831	1.92	62.38	7480	2351
23	-0.3961	213.608	210.6	0.6	4785	5051	9836	1.95	62.92	7444	2392
24	-0.3946	217.325	214.3	0.7	4868	4935	9803	1.99	63.73	7369	2434
25	-0.3932	221.680	218.7	0.7	4966	4869	9835	2.02	64.19	7352	2483
26	-0.3918	225.643	222.6	0.7	5054	4790	9844	2.06	64.74	7317	2527
27	-0.3903	229.015	226.0	0.7	5129	4716	9845	2.09	65.25	7281	2565
28	-0.3889	233.524	230.5	0.8	5230	4663	9893	2.12	65.62	7278	2615
29	-0.3875	235.981	233.0	0.8	5285	4590	9875	2.15	66.12	7232	2642
30	-0.3860	238.757	235.7	0.8	5346	4519	9866	2.18	66.61	7193	2673
31	-0.3846	241.427	238.4	0.8	5405	4468	9873	2.21	66.97	7171	2703
32	-0.3831	243.426	240.4	0.9	5449	4414	9863	2.23	67.35	7139	2724
33	-0.3817	246.315	243.3	0.9	5513	4352	9865	2.27	67.78	7108	2756
34	-0.3803	248.464	245.4	0.9	5560	4308	9868	2.29	68.09	7088	2780
35	-0.3788	250.548	247.5	1.0	5606	4249	9855	2.32	68.49	7052	2803
36	-0.3774	253.285	250.3	1.0	5666	4208	9875	2.35	68.77	7042	2833
37	-0.3759	257.043	254.0	1.0	5750	4190	9940	2.37	68.90	7065	2875
38	-0.3745	258.184	255.2	1.0	5774	4140	9914	2.39	69.25	7027	2887
39	-0.3731	260.644	257.6	1.1	5828	4105	9933	2.42	69.49	7019	2914
40	-0.3716	263.848	260.8	1.1	5899	4066	9965	2.45	69.76	7016	2949
41	-0.3659	269.402	266.4	1.2	6018	3914	9932	2.54	70.82	6923	3009
42	-0.3601	276.677	273.6	1.3	6175	3803	9978	2.62	71.59	6891	3088
43	-0.3544	281.924	278.9	1.4	6287	3697	9984	2.70	72.32	6841	3143
44	-0.3486	286.724	283.7	1.5	6388	3608	9996	2.77	72.94	6802	3194
45	-0.3429	291.225	288.2	1.6	6482	3533	10015	2.83	73.47	6774	3241
46	-0.3371	295.809	292.8	1.7	6578	3459	10037	2.90	73.98	6748	3289
47	-0.3314	298.392	295.4	1.9	6629	3399	10027	2.95	74.40	6713	3314
48	-0.3256	302.313	299.3	2.0	6709	3367	10076	2.99	74.62	6722	3355
49	-0.3199	306.197	303.2	2.1	6789	3351	10139	3.03	74.73	6745	3394
50	-0.3141	310.710	307.7	2.2	6882	3342	10224	3.06	74.79	6783	3441
51	-0.3084	313.719	310.7	2.3	6942	3285	10227	3.11	75.19	6756	3471
52	-0.3026	317.843	314.8	2.4	7026	3275	10301	3.15	75.26	6788	3513
53	-0.2968	322.140	319.1	2.5	7114	3249	10363	3.19	75.44	6806	3557
54	-0.2911	324.709	321.7	2.6	7163	3221	10384	3.22	75.63	6803	3582
55	-0.2853	328.962	325.9	2.7	7250	3213	10463	3.26	75.69	6838	3625
56	-0.2796	332.236	329.2	2.8	7315	3207	10522	3.28	75.73	6864	3657
57	-0.2738	333.487	330.5	2.9	7334	3207	10541	3.29	75.73	6874	3667
58	-0.2681	337.284	334.3	3.0	7410	3213	10624	3.31	75.68	6919	3705
59	-0.2623	340.447	337.4	3.2	7472	3222	10694	3.32	75.62	6958	3736
60	-0.2617	340.759	337.7	3.2	7478	3211	10689	3.33	75.70	6950	3739

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1132.900			1256.100
Moisture content: Dry soil+tare, gms.	846.300			1042.100
Moisture content: Tare, gms.	0.000			195.800
Moisture, %	33.9		26.1	25.3
Moist specimen weight, gms.	1132.9			
Diameter, in.	2.88		2.84	
Area, in.²	6.51		6.35	
Height, in.	5.75		5.14	
Net decrease in height, in.		0.63	-0.02	
Net decrease in water volume, cc.			11.00	
Wet Density, pcf	115.2		124.7	
Dry density, pcf	86.1		98.8	
Void ratio	0.9583		0.7053	
Saturation, %	95.4		100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 156.00 psi (22464 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 16704 psf
Strain rate, %/min. = 0.02
Fail. Stress = 15283 psf **at reading no.** 68

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.3355	4.753	0.0	0.0	0	16702	16702	1.00	40.01	16702	0
1	-0.3341	28.973	24.2	0.0	549	16561	17110	1.03	41.00	16835	275
2	-0.3326	47.348	42.6	0.1	965	16416	17381	1.06	42.00	16899	483
3	-0.3312	64.892	60.1	0.1	1363	16251	17614	1.08	43.14	16933	681
4	-0.3297	83.600	78.8	0.1	1786	16052	17838	1.11	44.52	16945	893
5	-0.3283	101.338	96.6	0.1	2187	15828	18015	1.14	46.08	16922	1094
6	-0.3269	119.106	114.4	0.2	2589	15594	18183	1.17	47.71	16888	1294
7	-0.3254	137.313	132.6	0.2	3000	15364	18364	1.20	49.31	16864	1500
8	-0.3240	154.366	149.6	0.2	3385	15122	18508	1.22	50.98	16815	1693
9	-0.3225	171.871	167.1	0.3	3780	14887	18667	1.25	52.62	16777	1890
10	-0.3211	188.866	184.1	0.3	4163	14653	18816	1.28	54.24	16735	2082
11	-0.3197	205.600	200.8	0.3	4540	14419	18960	1.31	55.87	16689	2270
12	-0.3182	221.772	217.0	0.3	4905	14185	19090	1.35	57.49	16637	2452
13	-0.3168	236.095	231.3	0.4	5227	13934	19161	1.38	59.24	16547	2613
14	-0.3153	251.212	246.5	0.4	5567	13694	19261	1.41	60.90	16477	2783
15	-0.3139	264.405	259.7	0.4	5863	13462	19325	1.44	62.52	16393	2932
16	-0.3125	279.221	274.5	0.4	6196	13241	19437	1.47	64.05	16339	3098
17	-0.3110	293.026	288.3	0.5	6506	12997	19503	1.50	65.74	16250	3253
18	-0.3096	306.933	302.2	0.5	6818	12791	19609	1.53	67.17	16200	3409
19	-0.3081	319.024	314.3	0.5	7089	12574	19663	1.56	68.68	16118	3544
20	-0.3067	331.841	327.1	0.6	7376	12363	19739	1.60	70.14	16051	3688
21	-0.3053	344.178	339.4	0.6	7652	12159	19811	1.63	71.56	15985	3826
22	-0.3038	355.805	351.1	0.6	7912	11963	19874	1.66	72.92	15919	3956
23	-0.3024	366.316	361.6	0.6	8146	11766	19912	1.69	74.29	15839	4073

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	-0.3009	376.372	371.6	0.7	8370	11566	19936	1.72	75.68	15751	4185
25	-0.2995	387.028	382.3	0.7	8608	11383	19991	1.76	76.95	15687	4304
26	-0.2981	397.128	392.4	0.7	8833	11218	20051	1.79	78.09	15635	4416
27	-0.2966	407.417	402.7	0.8	9062	11045	20107	1.82	79.30	15576	4531
28	-0.2952	416.200	411.4	0.8	9257	10872	20129	1.85	80.50	15501	4628
29	-0.2937	423.813	419.1	0.8	9426	10712	20138	1.88	81.61	15425	4713
30	-0.2923	432.880	428.1	0.8	9627	10568	20194	1.91	82.61	15381	4813
31	-0.2909	440.599	435.8	0.9	9798	10420	20218	1.94	83.64	15319	4899
32	-0.2894	449.137	444.4	0.9	9987	10292	20279	1.97	84.53	15285	4993
33	-0.2880	456.543	451.8	0.9	10150	10156	20307	2.00	85.47	15232	5075
34	-0.2865	463.189	458.4	1.0	10297	10025	20322	2.03	86.38	15173	5148
35	-0.2851	469.259	464.5	1.0	10430	9898	20328	2.05	87.27	15113	5215
36	-0.2837	475.964	471.2	1.0	10578	9779	20357	2.08	88.09	15068	5289
37	-0.2822	482.864	478.1	1.0	10729	9661	20390	2.11	88.91	15025	5365
38	-0.2808	488.638	483.9	1.1	10856	9558	20414	2.14	89.62	14986	5428
39	-0.2793	494.185	489.4	1.1	10977	9456	20433	2.16	90.33	14945	5489
40	-0.2779	501.260	496.5	1.1	11133	9355	20488	2.19	91.04	14921	5566
41	-0.2721	519.786	515.0	1.2	11535	8988	20523	2.28	93.58	14756	5768
42	-0.2664	537.476	532.7	1.3	11918	8670	20588	2.37	95.79	14629	5959
43	-0.2606	553.005	548.3	1.5	12251	8408	20659	2.46	97.61	14534	6126
44	-0.2549	568.166	563.4	1.6	12576	8200	20776	2.53	99.05	14488	6288
45	-0.2491	578.843	574.1	1.7	12799	7997	20796	2.60	100.47	14396	6400
46	-0.2434	589.236	584.5	1.8	13016	7839	20855	2.66	101.56	14347	6508
47	-0.2376	597.919	593.2	1.9	13195	7704	20899	2.71	102.50	14302	6597
48	-0.2319	606.059	601.3	2.0	13360	7604	20964	2.76	103.20	14284	6680
49	-0.2261	610.361	605.6	2.1	13441	7489	20930	2.79	103.99	14210	6720
50	-0.2204	618.394	613.6	2.2	13603	7417	21020	2.83	104.50	14218	6802
51	-0.2146	625.505	620.8	2.4	13745	7339	21084	2.87	105.03	14212	6873
52	-0.2089	631.182	626.4	2.5	13855	7286	21141	2.90	105.40	14214	6928
53	-0.2031	635.987	631.2	2.6	13945	7242	21187	2.93	105.71	14215	6973
54	-0.1974	641.904	637.2	2.7	14060	7199	21259	2.95	106.01	14229	7030
55	-0.1916	648.510	643.8	2.8	14189	7152	21341	2.98	106.33	14246	7095
56	-0.1859	654.335	649.6	2.9	14301	7141	21442	3.00	106.41	14292	7151
57	-0.1801	659.668	654.9	3.0	14402	7115	21517	3.02	106.59	14316	7201
58	-0.1744	663.809	659.1	3.1	14476	7101	21578	3.04	106.68	14340	7238
59	-0.1686	668.121	663.4	3.2	14554	7095	21650	3.05	106.73	14373	7277
60	-0.1628	673.071	668.3	3.4	14646	7084	21730	3.07	106.80	14407	7323
61	-0.1571	677.596	672.8	3.5	14728	7075	21803	3.08	106.87	14439	7364
62	-0.1513	681.428	676.7	3.6	14794	7075	21870	3.09	106.87	14473	7397
63	-0.1456	687.837	683.1	3.7	14917	7092	22009	3.10	106.75	14550	7459
64	-0.1398	691.561	686.8	3.8	14981	7070	22051	3.12	106.90	14561	7491
65	-0.1341	694.995	690.2	3.9	15039	7075	22114	3.13	106.87	14595	7519
66	-0.1283	699.485	694.7	4.0	15119	7083	22202	3.13	106.81	14643	7559
67	-0.1226	706.158	701.4	4.1	15246	7122	22368	3.14	106.54	14745	7623
68	-0.1168	708.659	703.9	4.3	15283	7117	22400	3.15	106.57	14759	7641
69	-0.1166	708.805	704.1	4.3	15285	7114	22399	3.15	106.60	14756	7643

Parameters for Specimen No. 4

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1132.900			1256.100
Moisture content: Dry soil+tare, gms.	846.300			1042.100
Moisture content: Tare, gms.	0.000			195.800
Moisture, %	33.9		25.3	25.3
Moist specimen weight, gms.	1132.9			
Diameter, in.	2.88		2.87	
Area, in.²	6.51		6.48	
Height, in.	5.75		4.97	
Net decrease in height, in.		0.83	-0.05	
Net decrease in water volume, cc.			7.00	
Wet Density, pcf	115.2		125.5	
Dry density, pcf	86.1		100.2	
Void ratio	0.9583		0.6830	
Saturation, %	95.4		100.0	

Test Readings for Specimen No. 4

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.064 cm
Consolidation cell pressure = 272.00 psi (39168 psf)
Consolidation back pressure = 40.00 psi (5760 psf)
Consolidation effective confining stress = 33408 psf
Strain rate, %/min. = 0.02
Fail. Stress = 29242 psf **at reading no.** 71

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
0	-0.3451	1.883	0.0	0.0	0	33406	33406	1.00	40.01	33406	0
1	-0.3437	50.944	49.1	0.0	1091	33230	34320	1.03	41.24	33775	545
2	-0.3422	76.083	74.2	0.1	1649	33067	34716	1.05	42.37	33892	824
3	-0.3408	101.222	99.3	0.1	2207	32880	35087	1.07	43.67	33984	1103
4	-0.3393	126.731	124.8	0.1	2773	32640	35413	1.08	45.33	34027	1386
5	-0.3379	153.235	151.4	0.1	3361	32403	35763	1.10	46.98	34083	1680
6	-0.3365	178.778	176.9	0.2	3927	32141	36068	1.12	48.80	34104	1963
7	-0.3350	203.065	201.2	0.2	4464	31856	36321	1.14	50.77	34089	2232
8	-0.3336	230.591	228.7	0.2	5074	31582	36656	1.16	52.68	34119	2537
9	-0.3321	256.646	254.8	0.3	5650	31261	36911	1.18	54.91	34086	2825
10	-0.3307	282.188	280.3	0.3	6215	30938	37153	1.20	57.15	34046	3107
11	-0.3293	309.652	307.8	0.3	6822	30614	37436	1.22	59.40	34025	3411
12	-0.3278	336.418	334.5	0.3	7413	30289	37702	1.24	61.66	33996	3706
13	-0.3264	362.290	360.4	0.4	7984	29937	37921	1.27	64.11	33929	3992
14	-0.3249	388.390	386.5	0.4	8560	29589	38148	1.29	66.52	33869	4280
15	-0.3235	413.850	412.0	0.4	9121	29221	38342	1.31	69.07	33782	4560
16	-0.3221	437.253	435.4	0.5	9636	28870	38506	1.33	71.52	33688	4818
17	-0.3206	462.406	460.5	0.5	10190	28524	38714	1.36	73.92	33619	5095
18	-0.3192	488.010	486.1	0.5	10753	28167	38920	1.38	76.40	33543	5377
19	-0.3177	510.959	509.1	0.6	11258	27799	39057	1.40	78.95	33428	5629
20	-0.3163	533.994	532.1	0.6	11764	27434	39198	1.43	81.49	33316	5882
21	-0.3149	557.557	555.7	0.6	12281	27099	39380	1.45	83.81	33240	6140
22	-0.3134	579.807	577.9	0.6	12769	26748	39517	1.48	86.25	33133	6385
23	-0.3120	601.675	599.8	0.7	13248	26384	39633	1.50	88.78	33009	6624

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
24	-0.3105	623.142	621.3	0.7	13718	26050	39769	1.53	91.10	32909	6859
25	-0.3091	644.423	642.5	0.7	14184	25716	39900	1.55	93.42	32808	7092
26	-0.3077	665.870	664.0	0.8	14653	25398	40051	1.58	95.63	32724	7327
27	-0.3062	685.355	683.5	0.8	15079	25053	40132	1.60	98.02	32592	7540
28	-0.3048	704.332	702.4	0.8	15493	24724	40217	1.63	100.31	32471	7747
29	-0.3033	723.080	721.2	0.8	15902	24417	40319	1.65	102.44	32368	7951
30	-0.3019	741.807	739.9	0.9	16310	24105	40415	1.68	104.61	32260	8155
31	-0.3005	759.631	757.7	0.9	16698	23802	40500	1.70	106.71	32151	8349
32	-0.2990	777.592	775.7	0.9	17089	23508	40597	1.73	108.75	32053	8545
33	-0.2976	795.723	793.8	1.0	17483	23219	40702	1.75	110.76	31960	8742
34	-0.2961	812.001	810.1	1.0	17837	22944	40781	1.78	112.67	31862	8918
35	-0.2947	829.122	827.2	1.0	18208	22676	40884	1.80	114.53	31780	9104
36	-0.2933	844.103	842.2	1.0	18533	22403	40936	1.83	116.42	31670	9266
37	-0.2918	858.714	856.8	1.1	18849	22131	40980	1.85	118.31	31556	9424
38	-0.2904	873.474	871.6	1.1	19168	21867	41035	1.88	120.14	31451	9584
39	-0.2889	887.649	885.8	1.1	19474	21622	41095	1.90	121.85	31359	9737
40	-0.2875	901.012	899.1	1.2	19762	21379	41140	1.92	123.54	31260	9881
41	-0.2817	953.918	952.0	1.3	20900	20511	41411	2.02	129.56	30961	10450
42	-0.2760	997.310	995.4	1.4	21827	19717	41544	2.11	135.08	30631	10913
43	-0.2702	1034.783	1032.9	1.5	22622	19040	41662	2.19	139.78	30351	11311
44	-0.2645	1068.753	1066.9	1.6	23339	18445	41784	2.27	143.91	30115	11669
45	-0.2587	1099.453	1097.6	1.7	23982	17938	41920	2.34	147.43	29929	11991
46	-0.2530	1124.009	1122.1	1.9	24490	17466	41956	2.40	150.71	29711	12245
47	-0.2472	1147.488	1145.6	2.0	24973	17094	42066	2.46	153.29	29580	12486
48	-0.2415	1166.120	1164.2	2.1	25349	16747	42096	2.51	155.70	29422	12674
49	-0.2357	1183.829	1181.9	2.2	25704	16456	42160	2.56	157.72	29308	12852
50	-0.2300	1197.969	1196.1	2.3	25981	16185	42166	2.61	159.60	29176	12990
51	-0.2242	1214.662	1212.8	2.4	26312	15975	42287	2.65	161.06	29131	13156
52	-0.2185	1226.717	1224.8	2.5	26542	15772	42314	2.68	162.47	29043	13271
53	-0.2127	1239.021	1237.1	2.7	26777	15610	42387	2.72	163.60	28998	13388
54	-0.2070	1249.521	1247.6	2.8	26972	15458	42430	2.74	164.65	28944	13486
55	-0.2012	1260.914	1259.0	2.9	27186	15349	42535	2.77	165.41	28942	13593
56	-0.1955	1269.025	1267.1	3.0	27328	15224	42552	2.80	166.28	28888	13664
57	-0.1897	1279.529	1277.6	3.1	27522	15140	42662	2.82	166.86	28901	13761
58	-0.1840	1288.213	1286.3	3.2	27676	15058	42734	2.84	167.43	28896	13838
59	-0.1782	1296.193	1294.3	3.4	27814	14984	42798	2.86	167.94	28891	13907
60	-0.1725	1303.583	1301.7	3.5	27940	14931	42871	2.87	168.31	28901	13970
61	-0.1667	1311.642	1309.8	3.6	28079	14885	42964	2.89	168.63	28924	14040
62	-0.1609	1317.937	1316.1	3.7	28180	14845	43025	2.90	168.91	28935	14090
63	-0.1552	1323.053	1321.2	3.8	28256	14818	43074	2.91	169.09	28946	14128
64	-0.1494	1329.715	1327.8	3.9	28364	14800	43164	2.92	169.22	28982	14182
65	-0.1437	1336.409	1334.5	4.1	28473	14782	43255	2.93	169.34	29019	14236
66	-0.1322	1345.163	1343.3	4.3	28590	14783	43374	2.93	169.34	29079	14295
67	-0.1264	1350.716	1348.8	4.4	28674	14781	43454	2.94	169.36	29117	14337
68	-0.1149	1361.711	1359.8	4.6	28837	14781	43619	2.95	169.35	29200	14419
69	-0.1034	1372.784	1370.9	4.9	29002	14800	43801	2.96	169.23	29300	14501
70	-0.0919	1383.431	1381.5	5.1	29156	14848	44004	2.96	168.89	29426	14578

Test Readings for Specimen No. 4

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress psf	Minor Eff. Stress psf	Major Eff. Stress psf	1:3 Ratio	Pore Press. psi	P psf	Q psf
71	-0.08041	390.916	1389.0	5.3	29242	14857	44099	2.97	168.83	29478	14621
72	-0.06891	400.834	1399.0	5.6	29379	14900	44279	2.97	168.53	29590	14690
73	-0.05741	410.078	1408.2	5.8	29501	15076	44577	2.96	167.30	29827	14750
74	-0.04301	419.059	1417.2	6.1	29598	15064	44662	2.96	167.39	29863	14799
75	-0.02861	427.672	1425.8	6.4	29686	15115	44801	2.96	167.04	29958	14843
76	-0.01431	437.347	1435.5	6.7	29795	15205	45001	2.96	166.41	30103	14898
77	0.00011	446.977	1445.1	6.9	29902	15266	45168	2.96	165.98	30217	14951
78	0.01451	455.887	1454.0	7.2	29993	15332	45324	2.96	165.53	30328	14996
79	0.02891	464.679	1462.8	7.5	30080	15401	45481	2.95	165.05	30441	15040
80	0.04331	469.203	1467.3	7.8	30079	15478	45556	2.94	164.52	30517	15039
81	0.05761	479.938	1478.1	8.1	30204	15556	45760	2.94	163.97	30658	15102
82	0.07201	489.272	1487.4	8.4	30299	15616	45915	2.94	163.55	30766	15149
83	0.08641	496.679	1494.8	8.7	30354	15720	46073	2.93	162.83	30897	15177
84	0.10081	501.289	1499.4	9.0	30351	15769	46119	2.92	162.49	30944	15175
85	0.11521	506.649	1504.8	9.3	30362	15828	46191	2.92	162.08	31009	15181
86	0.12951	515.536	1513.7	9.5	30444	15900	46344	2.91	161.58	31122	15222
87	0.14391	522.904	1521.0	9.8	30495	15969	46464	2.91	161.11	31216	15247
88	0.15831	529.826	1527.9	10.1	30535	16010	46545	2.91	160.82	31277	15268
89	0.17271	537.018	1535.1	10.4	30580	16061	46641	2.90	160.46	31351	15290
90	0.18701	544.905	1543.0	10.7	30638	16119	46757	2.90	160.06	31438	15319
91	0.20141	550.136	1548.3	11.0	30642	16180	46822	2.89	159.64	31501	15321
92	0.21581	556.320	1554.4	11.3	30665	16234	46898	2.89	159.27	31566	15332
93	0.23021	564.235	1562.4	11.6	30720	16280	47001	2.89	158.94	31640	15360
94	0.24461	571.843	1570.0	11.9	30769	16354	47123	2.88	158.43	31738	15385
95	0.25891	575.658	1573.8	12.2	30743	16394	47136	2.88	158.16	31765	15371
96	0.27331	580.493	1578.6	12.4	30736	16462	47198	2.87	157.68	31830	15368
97	0.28771	584.504	1582.6	12.7	30712	16497	47209	2.86	157.44	31853	15356
98	0.30211	592.467	1590.6	13.0	30764	16544	47308	2.86	157.11	31926	15382
99	0.31641	602.175	1600.3	13.3	30849	16606	47455	2.86	156.68	32030	15424
100	0.33081	610.216	1608.3	13.6	30900	16650	47550	2.86	156.38	32100	15450
101	0.34521	616.091	1614.2	13.9	30910	16695	47605	2.85	156.06	32150	15455
102	0.35961	620.564	1618.7	14.2	30891	16738	47629	2.85	155.77	32183	15446
103	0.37401	626.920	1625.0	14.5	30908	16777	47685	2.84	155.49	32231	15454
104	0.38831	633.120	1631.2	14.8	30921	16833	47753	2.84	155.11	32293	15460
105	0.40271	639.669	1637.8	15.0	30940	16861	47800	2.83	154.91	32331	15470
106	0.41711	644.021	1642.1	15.3	30916	16895	47811	2.83	154.68	32353	15458
107	0.43151	641.477	1639.6	15.6	30763	16942	47705	2.82	154.35	32324	15381
108	0.44591	642.083	1640.2	15.9	30669	16959	47628	2.81	154.23	32293	15334
109	0.46021	646.047	1644.2	16.2	30637	16992	47629	2.80	154.00	32311	15319
110	0.47461	651.227	1649.3	16.5	30627	17032	47659	2.80	153.72	32346	15314
111	0.48901	653.859	1652.0	16.8	30570	17050	47620	2.79	153.59	32335	15285
112	0.50341	658.285	1656.4	17.1	30545	17080	47626	2.79	153.39	32353	15273
113	0.51781	661.340	1659.5	17.4	30495	17117	47612	2.78	153.13	32364	15248
114	0.51791	661.865	1660.0	17.4	30504	17127	47631	2.78	153.06	32379	15252

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Moisture-Density Worksheet

Identification				Test Results (Summary)				Density Determination					Moisture Determination				
Hole	Depth (ft)	Sample No.	Sample Type	% Moisture	Dry Density (pcf)	USCS	Component, Color, Consistency, Structure ...	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Run By
GH10-222	66.0-67.5		SD	12.9	111.6			18.00	3.270	7145.0	2145.5	4999.5		7145.0	6574.0	2145.5	db
GH10-223	35.0-38.0		SD	12.1	113.1			36.00	3.270	12211.5	2154.0	10057.5		12211.5	11129.0	2154.0	db
GH10-226	81.25-84.0		SD	10.9	114.7			33.00	3.270	11370.0	2116.5	9253.5		11370.0	10463.0	2116.5	db

Project	**Pebble Project**	**Sheet Prep. By**	**db**	**Lab No.**	
Project No.	**DV101-00077/11**	**Checked By**	**spb**	**Date**	**12/3/2010**

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APPENDIX B4

UNCONFINED COMPRESSIVE STRENGTH LABORATORY REPORT

- GH10-212
- GH10-213
- GH10-214
- GH10-219

(Page B4-1 to B4-14)

NORMAN B. KEEVIL
INSTITUTE OF MINING ENGINEERING

Knight Piésold Ltd.

Pebble Project
Laboratory Rock Strength Testing Report

February 16, 2011

LABORATORY TESTING

Testing Date:	October 12- 22, 2010
Tested by:	Paul Hughes & Cristian Caceres
Tested at:	Norman B Keevil Institute of Mining Engineering, University of British Columbia
Testing Program:	In total six UCS with Elastic Modulus tests and five UCS tests were completed.
Equipment:	MTS Electro-Hydraulic Testing Machine
Method:	UCS and Elastic Modulus: ISRM-1979
Procedure:	UCS Samples identified as competent were wet cut and polished and tested per ISRM specifications.
Comments:	Sample GH10-213 Sample #1 was observed to be damaged upon arrival and was not tested. Samples were disposed of after testing at the University of British Columbia.

Summary

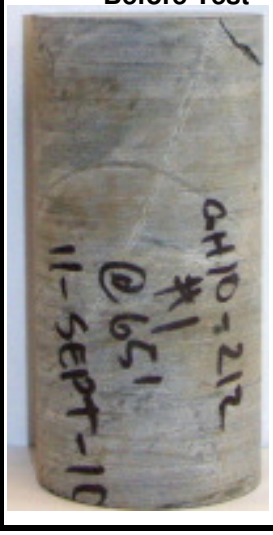
Unconfined Compressive Strength and Elastic Modulus Test Results

Borehole #	Sample #	Depth (m)	Location	Diameter d	Height H	Ratio H/d	UCS (MPa)	UCS (psi)	Young Modulus E (GPa)	Poisson Ratio ν ( )
GH10-212	1	19.81	Area E	60.75	136.93	2.3	175.9	25501	55.04	0.32
GH10-212	2	26.21	Area E	60.94	139.13	2.3	126.9	18405	63.90	0.31
GH10-212	3	32.92	Area E	60.63	139.64	2.3	128.8	18680	N/A	N/A
GH10-213	2	47.40	Area E	60.88	139.62	2.3	65.2	9449	68.81	0.34
GH10-214	1	32.61	Area E	60.75	115.65	1.9	132.8	19253	63.59	0.30
GH10-214	2	34.14	Area E	60.79	149.89	2.5	39.1	5663	N/A	N/A
GH10-214	3	39.93	Area E	60.84	122.55	2.0	101.2	14668	N/A	N/A
GH10-219	1	17.68	Upper Talarik Creek Area	60.70	152.48	2.5	45.8	6648	15.30	0.36
GH10-219	2	23.47	Upper Talarik Creek Area	60.74	153.64	2.5	131.4	19048	49.77	0.24
GH10-219	3	31.39	Upper Talarik Creek Area	60.65	148.50	2.4	20.0	2907	N/A	N/A
GH10-219	4	39.93	Upper Talarik Creek Area	60.60	147.54	2.4	13.9	2013	N/A	N/A

ELASTIC MODULUS AND UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

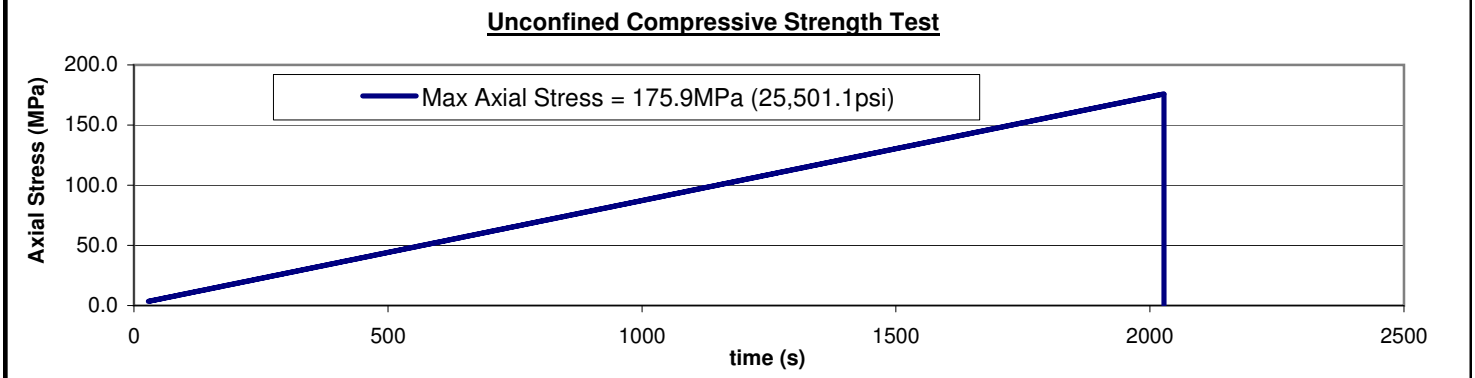
Borehole ID:	GH10-212
Sample #:	1
Depth (m):	19.81
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**55.04**
Poisson Ratio, ν	**0.32**
Failure Mode:	**Shear**

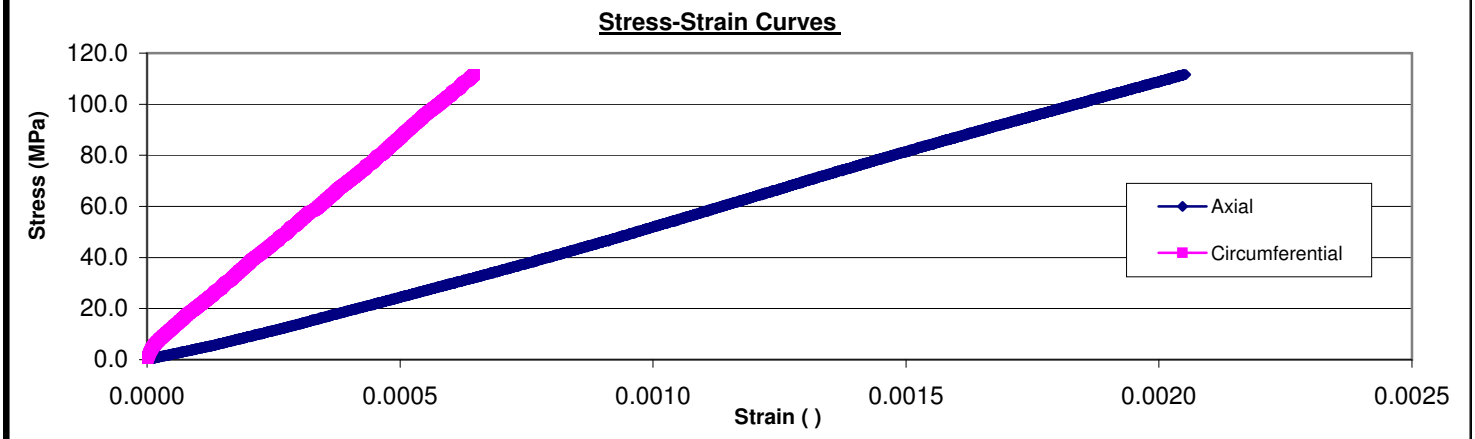
Before Test



After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.75	2898.6	136.93	2.3	509.8	175.9	25,501.1





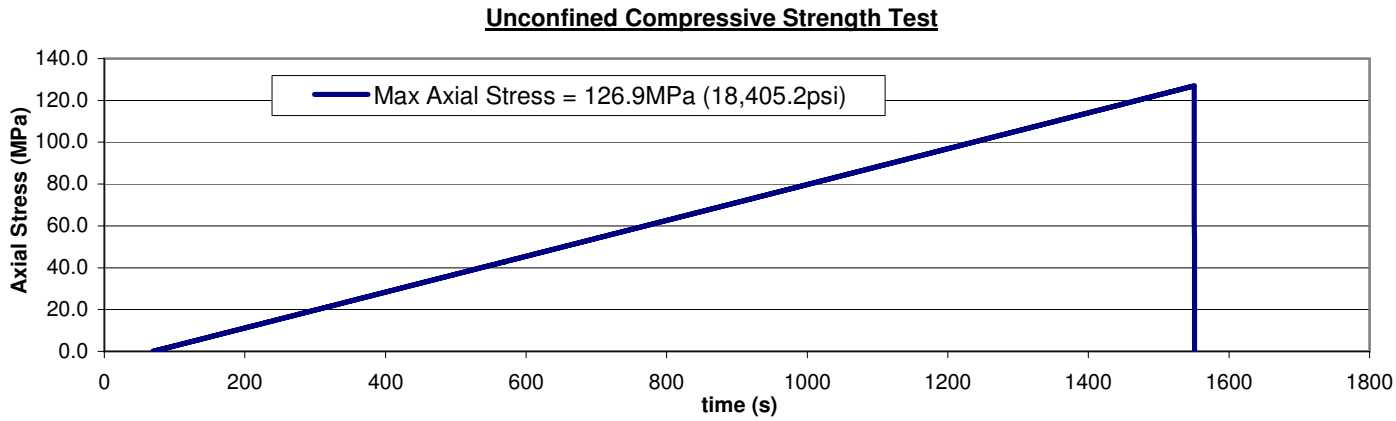
ELASTIC MODULUS AND UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

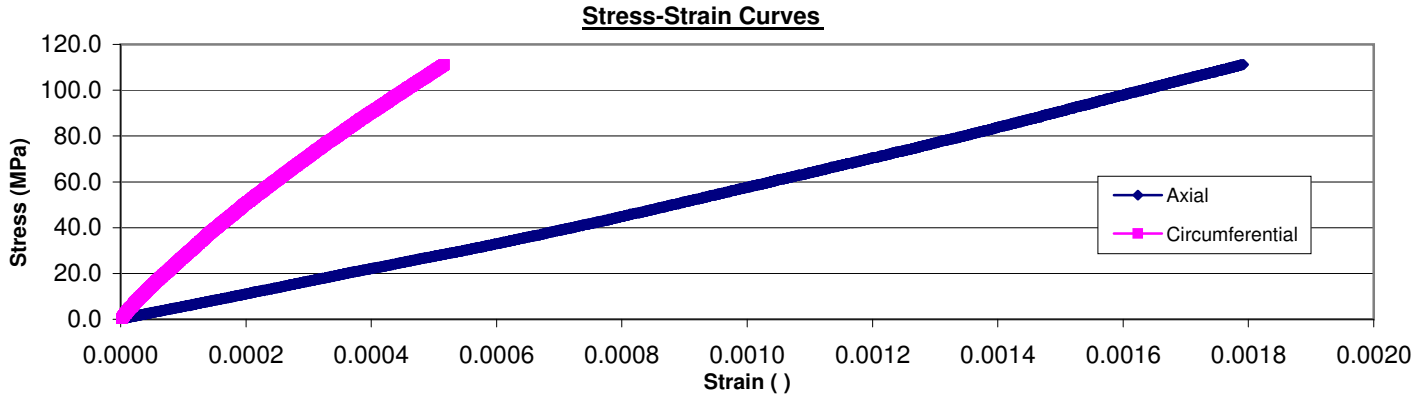
Borehole ID:	GH10-212
Sample #:	2
Depth (m):	26.21
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**63.90**
Poisson Ratio, ν	**0.31**
Failure Mode:	**Shear**

Before Test

After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.94	2916.7	139.13	2.3	311.6	126.9	18,405.2

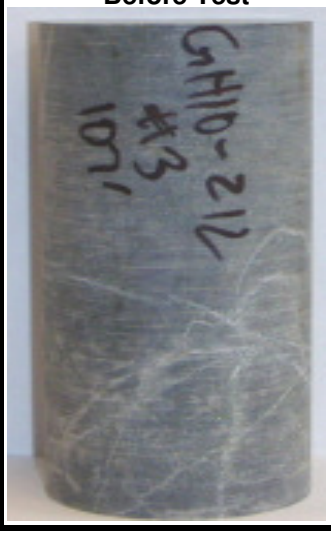




UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

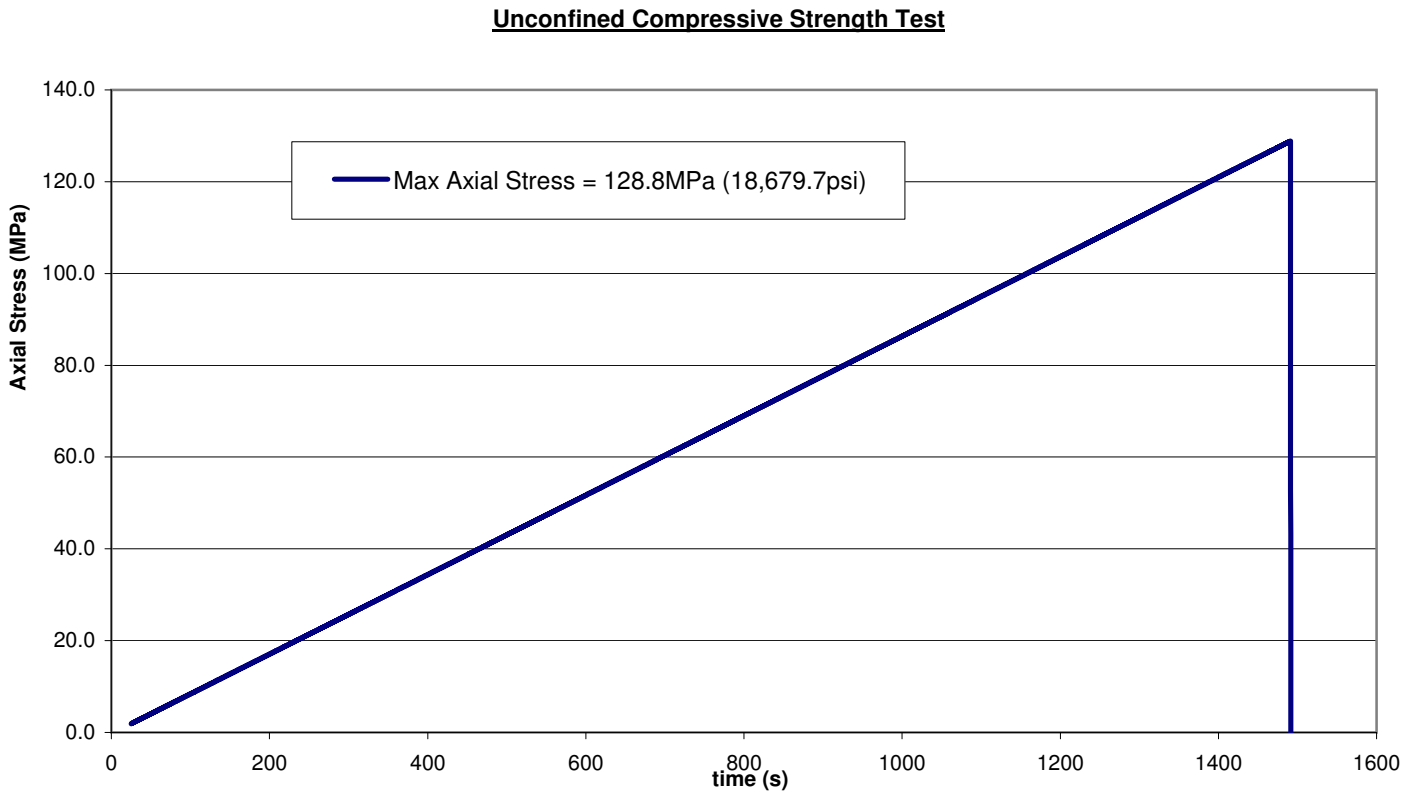
Borehole ID:	GH10-212
Sample #:	3
Depth (m):	32.92
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**N/A**
Poisson Ratio, ν	**N/A**
Failure Mode:	**Shear**

Before Test



After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.63	2887.1	139.64	2.3	317.2	128.8	18,679.7

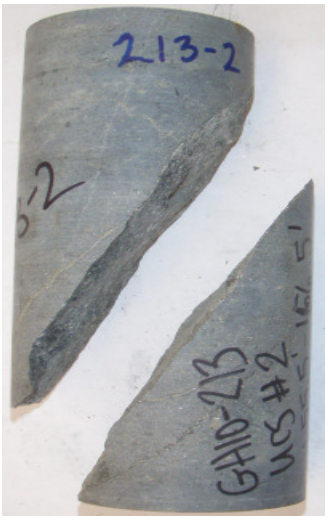


ELASTIC MODULUS AND UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

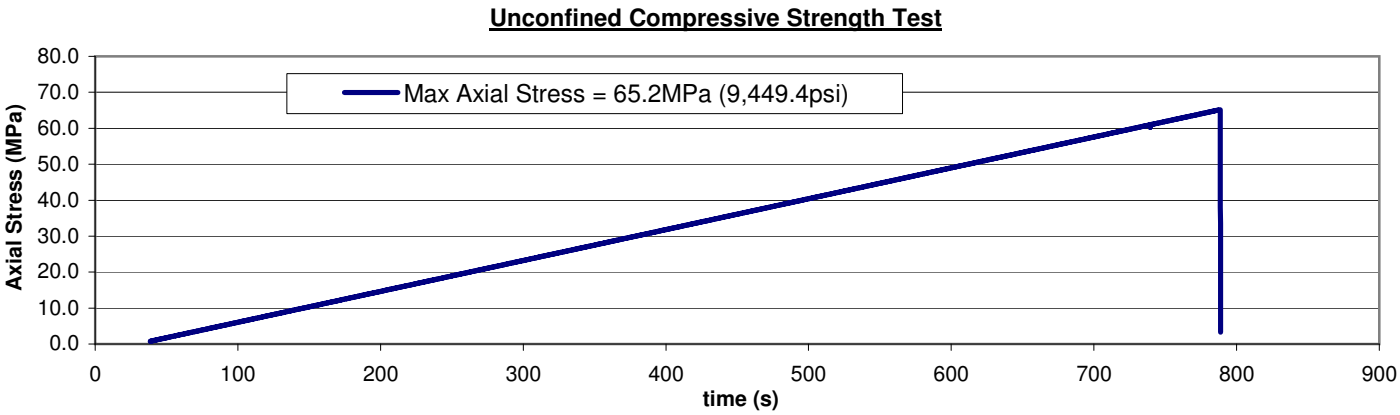
Borehole ID:	GH10-213
Sample #:	2
Depth (m):	47.40
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**68.81**
Poisson Ratio, ν	**0.34**
Failure Mode:	**Shear**

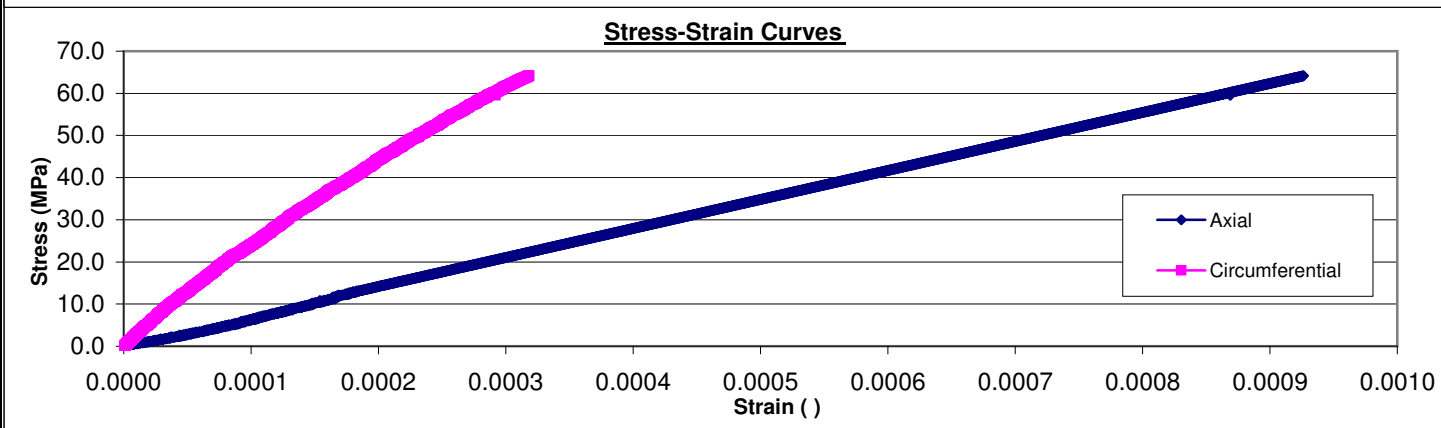
Before Test

After Test



Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.88	2911.0	139.62	2.3	189.7	65.2	9,449.4





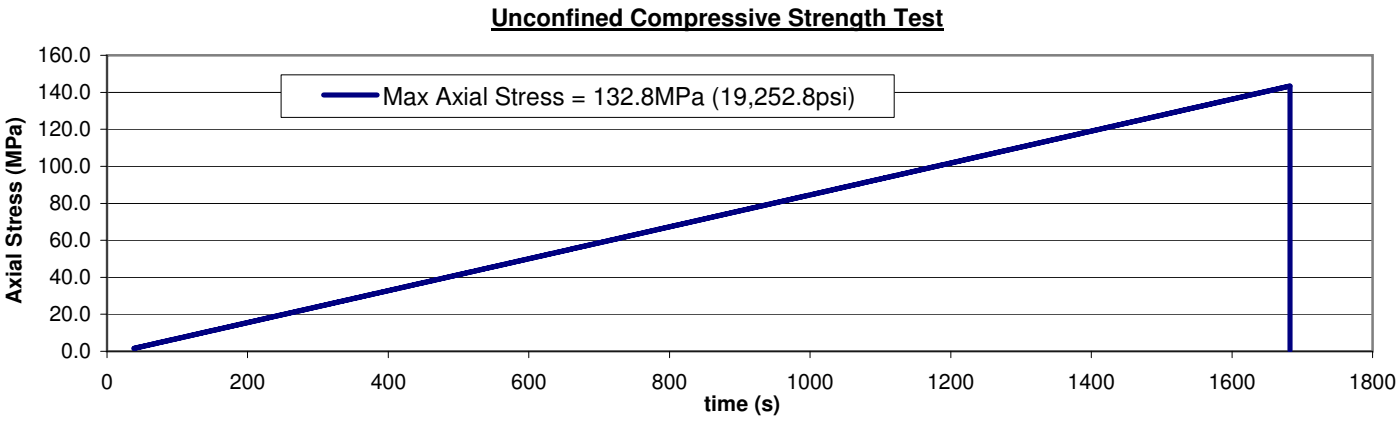
ELASTIC MODULUS AND UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

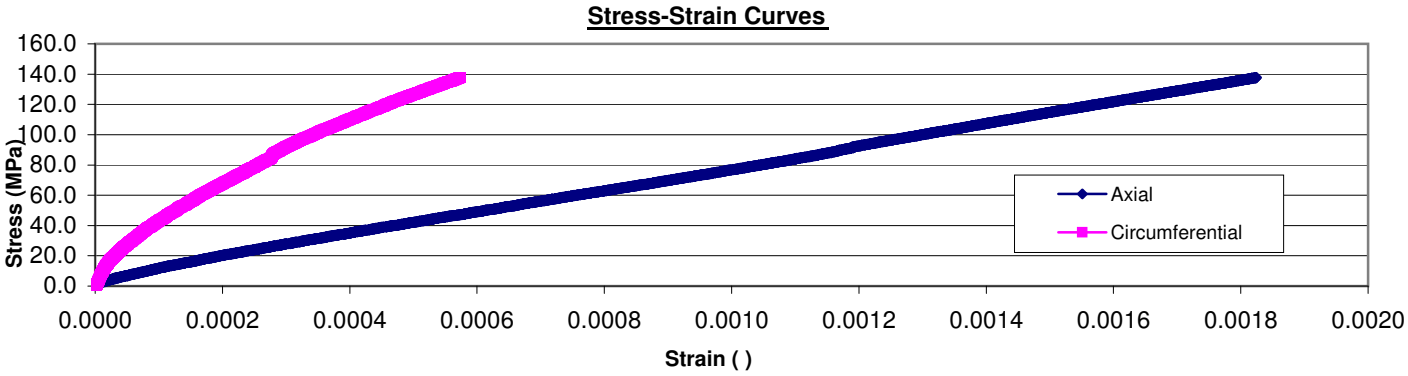
Borehole ID:	GH10-214
Sample #:	1
Depth (m):	32.61
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**63.59**
Poisson Ratio, ν	**0.30**
Failure Mode:	**Shear**

Before Test

After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.75	2898.6	115.65	1.9	316.2	132.8	19,252.8





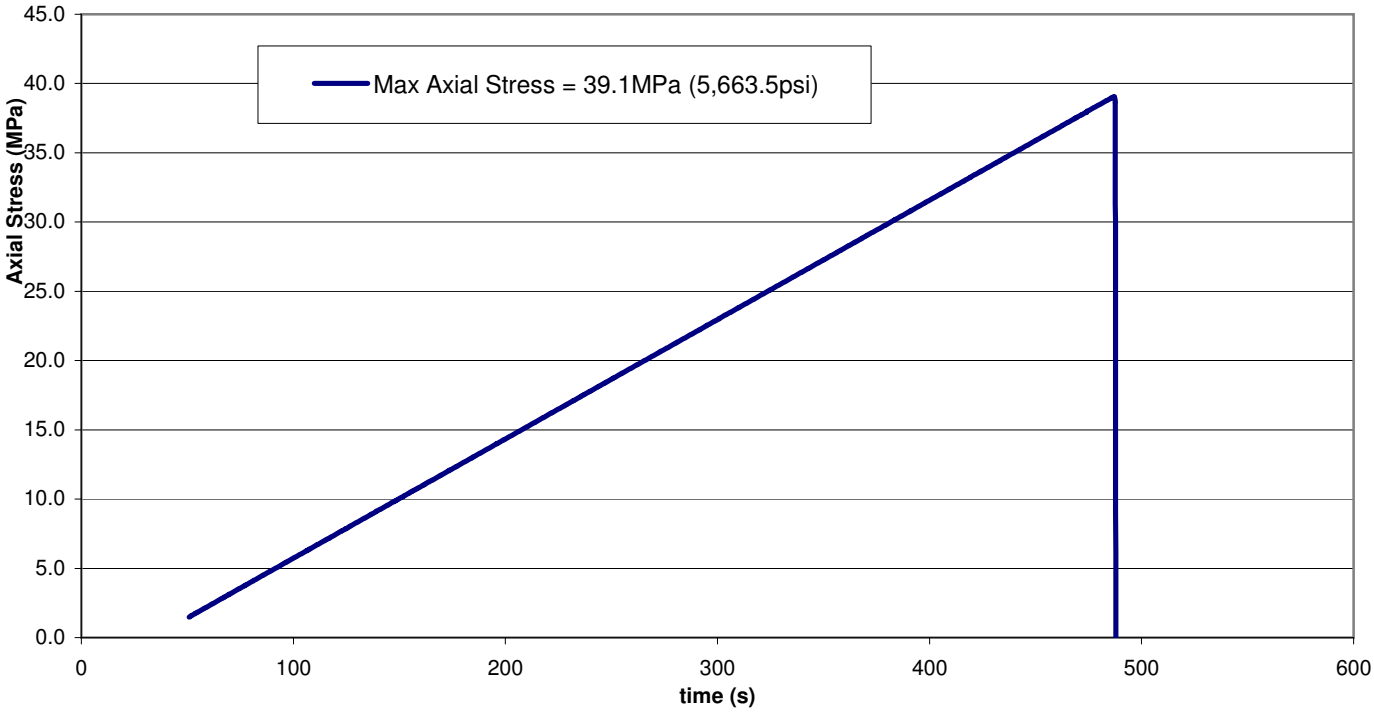
UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

Borehole ID:	GH10-214
Sample #:	2
Depth (m):	34.14
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**N/A**
Poisson Ratio, ν	**N/A**
Failure Mode:	**Shear**

Before Test

After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.79	2902.4	149.89	2.5	113.4	39.1	5,663.5



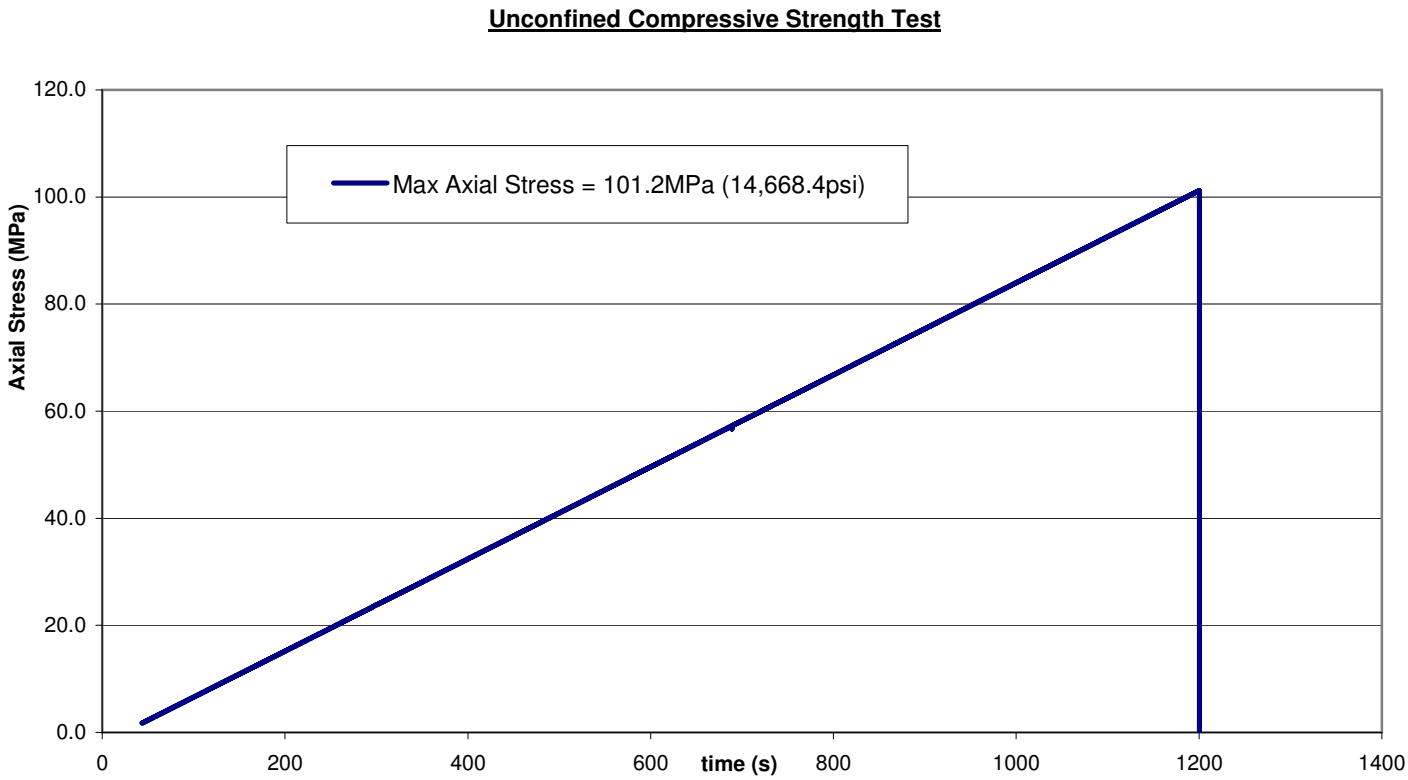
UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

Borehole ID:	GH10-214
Sample #:	3
Depth (m):	39.93
Location:	Area E
Test Date:	October, 2010
Young Modulus, E (GPa)	**N/A**
Poisson Ratio, ν	**N/A**
Failure Mode:	**Shear**

Before Test

After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.84	2907.2	122.55	2.0	294.1	101.2	14,668.4



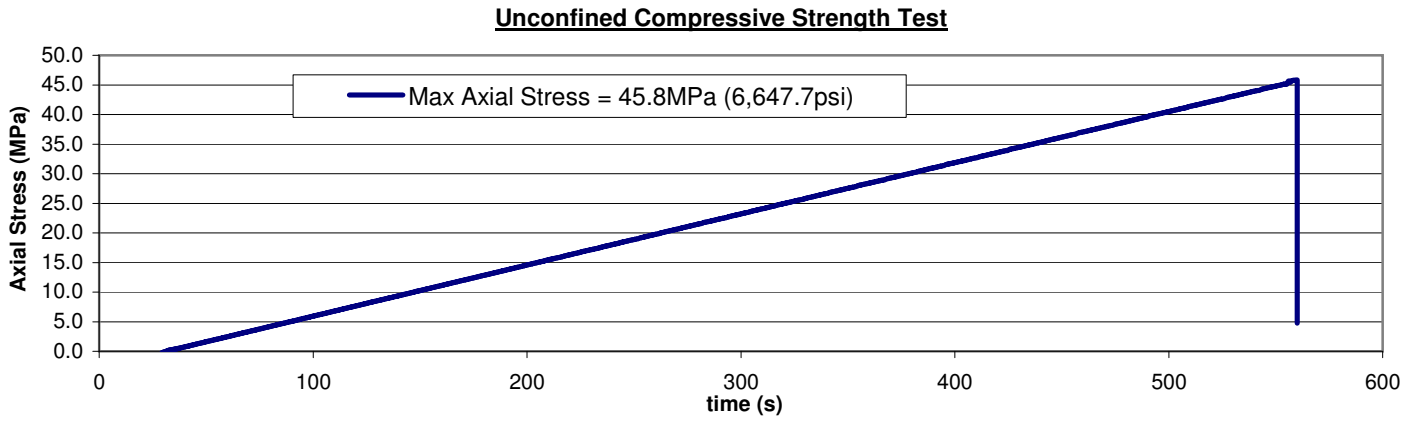
ELASTIC MODULUS AND UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

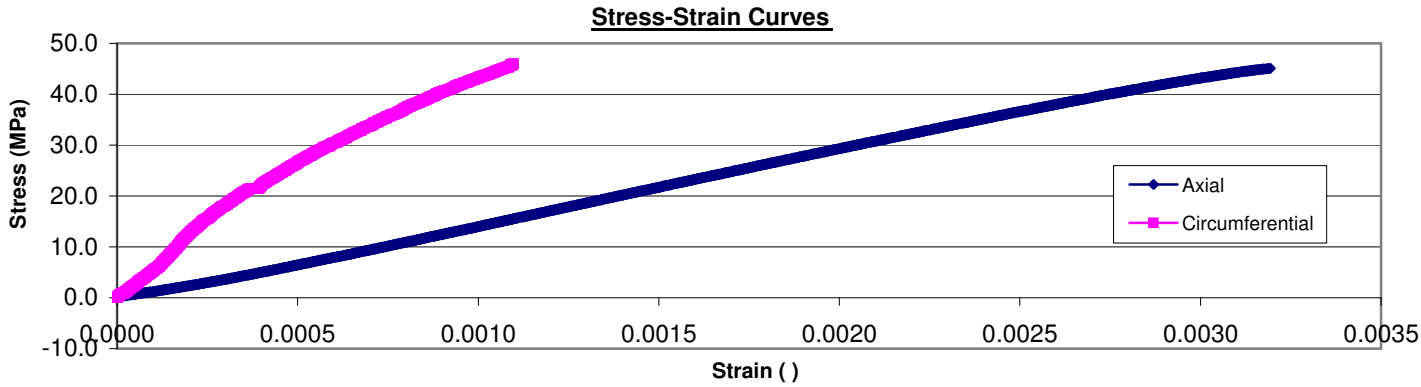
Borehole ID:	GH10-219
Sample #:	1
Depth (m):	17.68
Location:	Upper Talarik Creek Area
Test Date:	October, 2010
Young Modulus, E (GPa)	**15.30**
Poisson Ratio, ν	**0.36**
Failure Mode:	**Shear**

Before Test

After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.70	2893.8	152.48	2.5	132.7	45.8	6,647.7

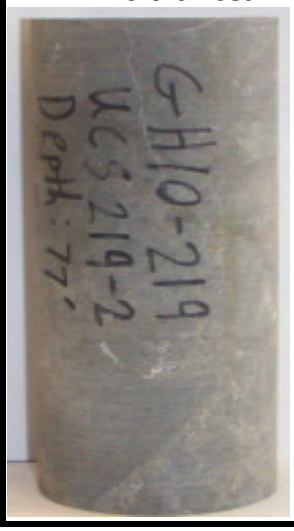




ELASTIC MODULUS AND UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

Borehole ID:	GH10-219
Sample #:	2
Depth (m):	23.47
Location:	Upper Talarik Creek Area
Test Date:	October, 2010
Young Modulus, E (GPa)	**49.77**
Poisson Ratio, ν	**0.24**
Failure Mode:	**Shear**

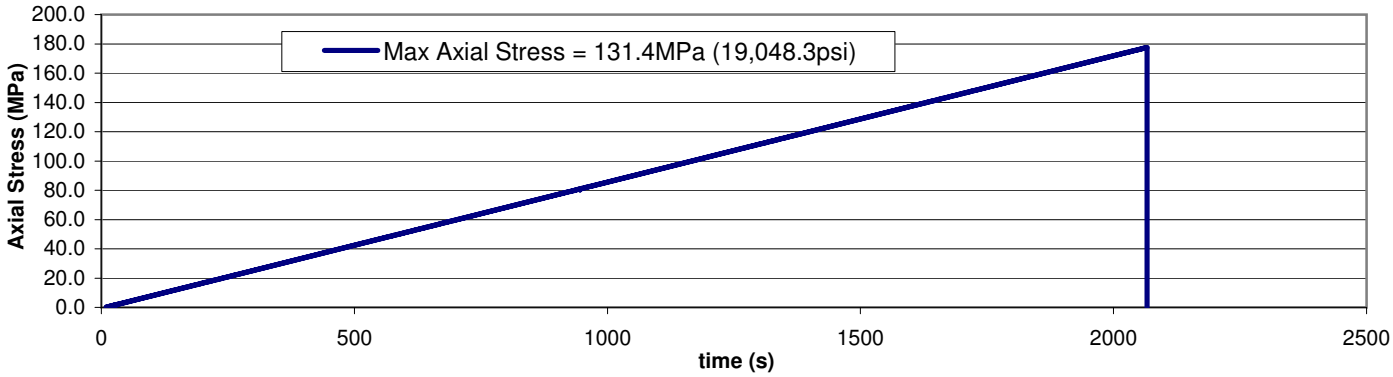
Before Test



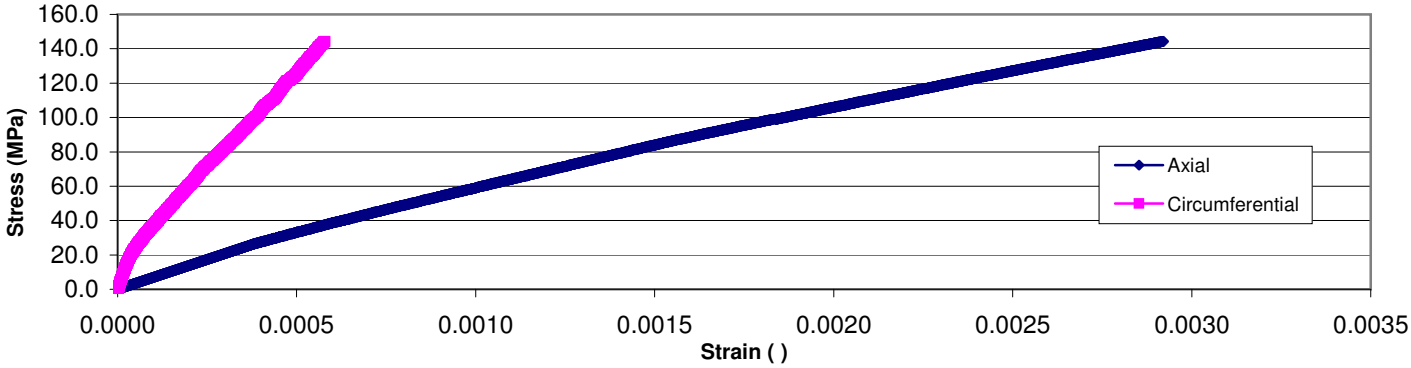
After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.74	2897.6	153.64	2.5	312.0	131.4	19,048.3

Unconfined Compressive Strength Test



Stress-Strain Curves



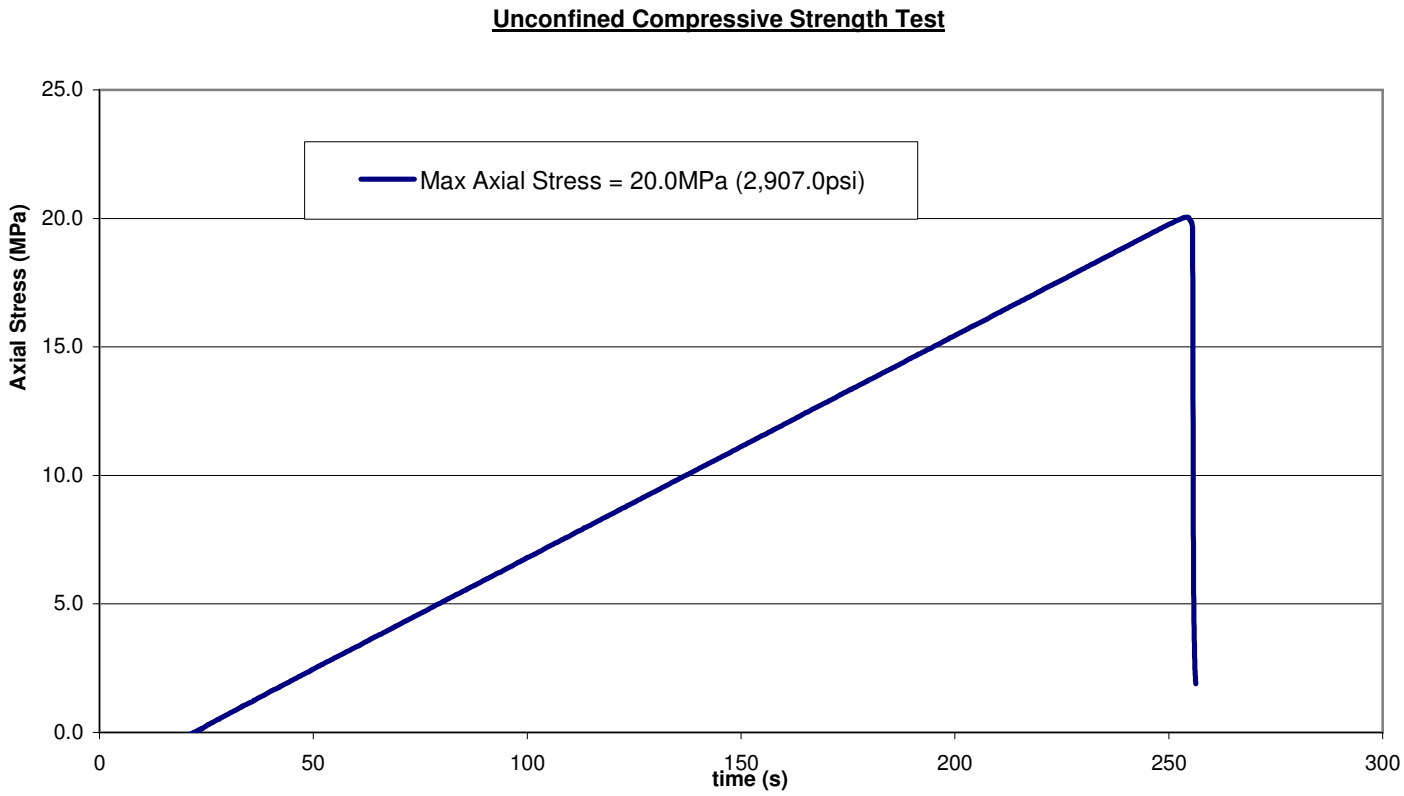
UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

Borehole ID:	GH10-219
Sample #:	3
Depth (m):	31.39
Location:	Upper Talarik Creek Area
Test Date:	October, 2010
Young Modulus, E (GPa)	**N/A**
Poisson Ratio, ν	**N/A**
Failure Mode:	**Shear**

Before Test

After Test

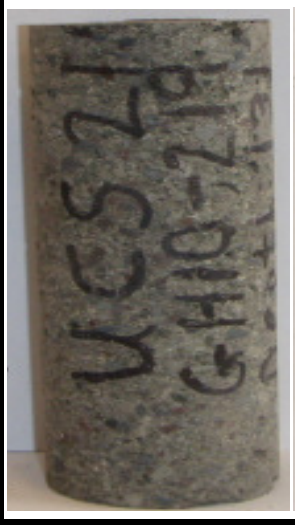
Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.65	2889.0	148.50	2.4	57.9	20.0	2,907.0



UNCONFINED COMPRESSIVE STRENGTH TEST
(ISRM-1979)

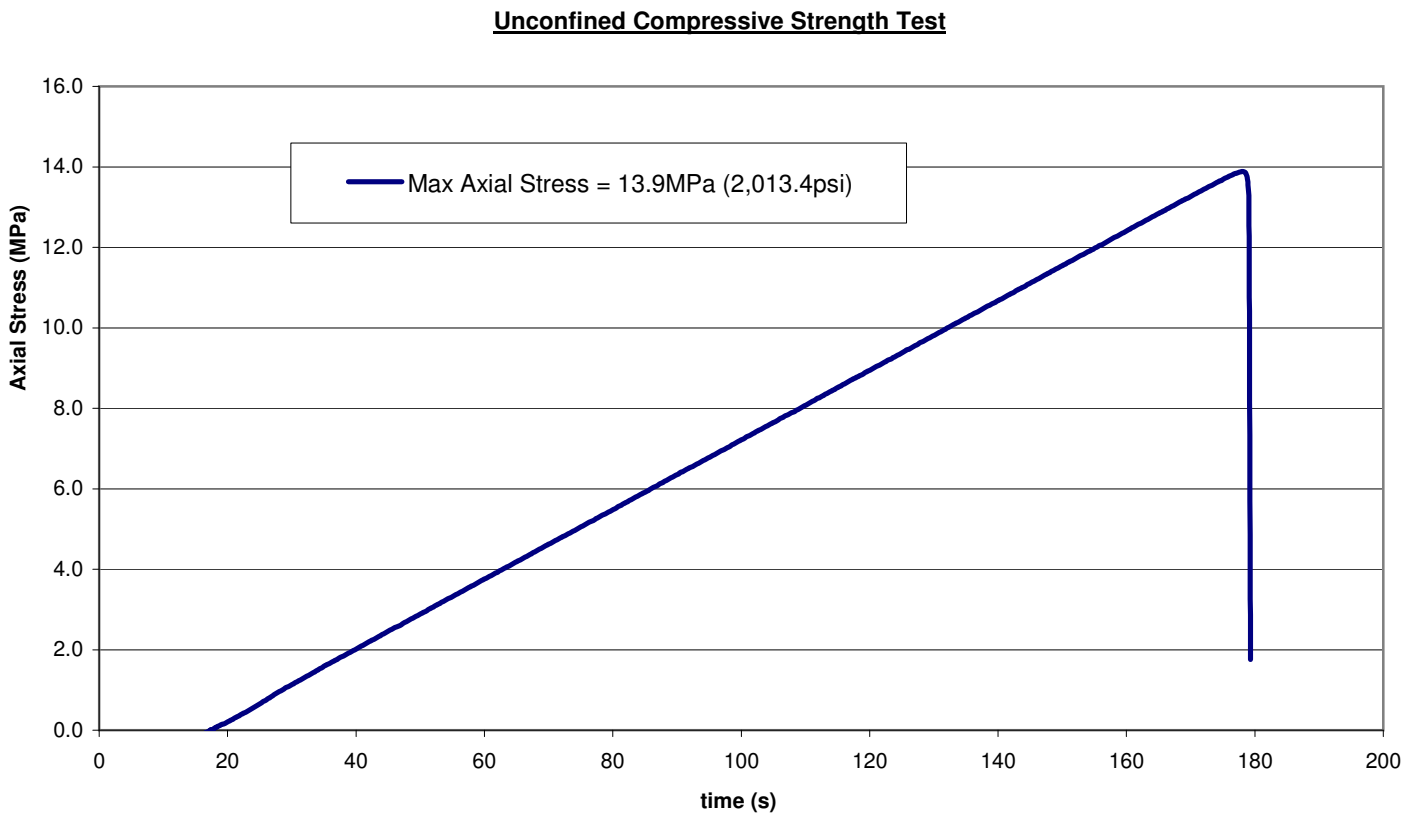
Borehole ID:	GH10-219
Sample #:	4
Depth (m):	39.93
Location:	Upper Talarik Creek Area
Test Date:	October, 2010
Young Modulus, E (GPa)	**N/A**
Poisson Ratio, ν	**N/A**
Failure Mode:	**Shear**

Before Test



After Test

Diameter, (ϕ)	Area, (A)	Height, (h)	Ratio	Peak Load	σ_{UCS}	
(mm)	(mm^2)	(mm)	h/ϕ	(kN)	(MPa)	(psi)
60.60	2884.3	147.54	2.4	40.0	13.9	2,013.4



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APPENDIX B5

PREVIOUS GEOTECHNICAL DRILLHOLE LOGS ON SECTIONS

- GH04-04, GH04-06, GH04-08, GH04-10 to GH04-11
- GH04-12A, GH04-14, GH04-18
- GH04-26 to GH04-33, GH04-35 to GH04-36
- GH04-39 to GH04-40A, GH04-42 to GH04-48
- GH05-51 to GH05-52, GH05-54
- GH05-56 to GH05-65
- GH06-65 to GH06-80
- GH07-81 to GH07-83, GH07-85 to GH07-94
- GH07-98 to GH07-100, GH07-104 to GH07-105
- GH08-107 to GH08-113, GH08-115 to GH08-116
- GH08-119 to GH08-123, GH08-125
- GH08-128 to GH08-129, GH08-131
- GH08-136 to GH08-138, GH08-140 to GH08-141
- GH08-143 to GH08-144, GH08-146, GH08-150
- GH08-154 to GH08-155, GH08-157 to GH08-159
- GH08-161, GH08-163 to GH08-164
- GH08-166 to GH08-173, GH08-176
- GH08-178 to GH08-179, GH08-183
- GH08-186 to GH08-189, GH08-198 to GH08-204
- GH08-206 to GH08-208, GH08-210

(Page B5-1 to B5-390)

Project:	**Pebble Project**	Drill Hole No.	**GH04-04**	Page	**1** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**11 May 04**
Drilling Method:	**DDH**	Elevation:	**924 ft / 281.6m**	Date Completed:	**15 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**304 ft / 92.7m**	Logged by:	**CNH/NDE**
Coordinates:	**2,123,686 ft N , 1,383,250 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND and GRAVEL - trace silt, occasional cobbles, poorly graded, angular to subrounded particles, compact to dense, brown, damp to moist							Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 5'.
					72		GH04-04 #1	10/16/23	39	
					61		GH04-04 #2	5/9/18	27	
					53		GH04-04 #3	1/2/7	9	
					67		GH04-04 #4	2/3/15	18	HW casing advanced to 29' with tri-cone.
					67		GH04-04 #5	18/24/36	60	
					61		GH04-04 #6	3/15/23	38	
					83		GH04-04 #7	11/22/27	49	
										No SPT due to heaving.
			SAND and GRAVEL - frequent cobbles, trace to some silt, well graded, angular to subrounded particles, dense, grey/brown, wet		92		GH04-04 #8	28/61/0	100+	
										No SPT.
			SAND and GRAVEL - trace to some silt, poorly graded, angular to subrounded particles, dense to very dense, brown, wet		72		GH04-04 #9	26/26/23	49	
					39		GH04-04 #10	0/0/0	n/a	SPT - disturbed sample.
					78		GH04-04 #11	23/31/31	62	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-04

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH04-04

SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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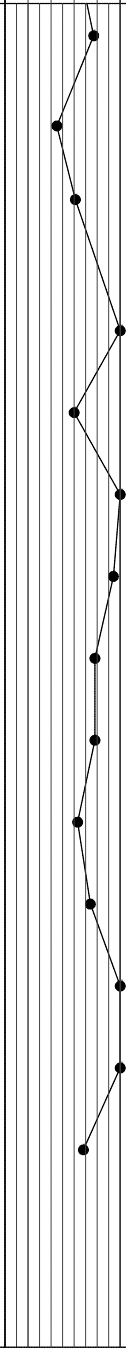
Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-04**	Page	**2** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**11 May 04**
Drilling Method:	**DDH**	Elevation:	**924 ft / 281.6m**	Date Completed:	**15 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**304 ft / 92.7m**	Logged by:	**CNH/NDE**
Coordinates:	**2,123,686 ft N , 1,383,250 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
85	26				83		GH04-04 #12	27/38/39	77		
90	27				78		GH04-04 #13	19/25/20	45		
95	28				72		GH04-04 #14	10/33/28	61		
100	29				100		GH04-04 #15	40/77/82	100+		
105	30				61		GH04-04 #16	34/35/25	60		
110	31		SAND and GRAVEL - trace fines, occasional cobbles, angular to subrounded particles, well graded, very dense, brown and grey, wet		67		GH04-04 #17	19/52/60	100+		
115	32				50		GH04-04 #18	29/50/44	94		
120	33				78		GH04-04 #19	39/42/36	78		
125	34				89		GH04-04 #20	18/38/40	78		
130	35				89		GH04-04 #21	38/39/24	63		
135	36				86		GH04-04 #22	28/40/34	74		
140	37				89		GH04-04 #23	19/52/62	100+		
145	38				62		GH04-04 #24	54/50/0	100+		
150	39				78		GH04-04 #25	30/33/35	68		
155	40										
160	41										
	42										
	43										
	44										
	45										
	46										
	47										
	48										
	49										



Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-04

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-04**	Page	**3** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**11 May 04**
Drilling Method:	**DDH**	Elevation:	**924 ft / 281.6m**	Date Completed:	**15 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**304 ft / 92.7m**	Logged by:	**CNH/NDE**
Coordinates:	**2,123,686 ft N , 1,383,250 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165			gravelly SAND - some silt and clay, occasional cobbles, very dense, brown, wet		81	X	GH04-04 #26	//				
	51											
170	52										No SPT. Reduced to NQ2.	
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61		BEDROCK - Tertiary Siltstone - fine grained, grey, carbonates and chlorite on joint surfaces, joints suface highly oxidized near top of bedrock and decreases with depth, some core section highly fractured.								* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)	
	62											
205	63											
210	64		RMR89 - 44.1, UCS - 24MPa, RQD - 37.3% (average/estimated values)									
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
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Project:	**Pebble Project**	Drill Hole No.	**GH04-04**	Page	**4 of 4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**11 May 04**
Drilling Method:	**DDH**	Elevation:	**924 ft / 281.6m**	Date Completed:	**15 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**304 ft / 92.7m**	Logged by:	**CNH/NDE**
Coordinates:	**2,123,686 ft N , 1,383,250 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
250	76											
	77											
255	78											
	79											
260	80											
265	81											
	82											
270	83											
275	84											
	85											
280	86											
285	87											
	88											
290	89											
295	90											
	91											
300	92											
305	93		End of hole at 304' (92.6m)									
	94											
310	95											
315	96											
	97											
320	98											
325	99											

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-06**	Page	**1 of 3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**18 May 04**
Drilling Method:	**DDH**	Elevation:	**968 ft / 295.0m**	Date Completed:	**21 May 04**
Location:	**Frying Pan Lake**	Total Depth:	**213 ft / 64.9m**	Logged by:	**GEM/NDE**
Coordinates:	**2,146,959 ft N , 1,402,986 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
PEAT - very soft, saturated, frozen 1 ft below surface	0	61	GH04-06-1	1/2/2	4	Triconed to 5'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. 5' - No recovery, peat washed out of core tube.
GRAVEL and SAND - some fines and organics (peat), well graded, angular to subangular, compact, dark grey/brown, saturated.	0	106	GH04-06-2	1/2/2	4	14' - Very soft unconsolidated soil.
	0	75	GH04-06-3	4/16/25	41	
SAND - very fine sand changing at depth to fine gravel and coarse sand, sub-angular to subround, loose to compact, brown, saturated.	32	67	GH04-06-4	11/17/18	35	
GRAVEL - some sand, some silt, poorly graded, sub-rounded, loose to compact, brown, saturated	26	61	GH04-06-5	2/4/5	9	
	0	11	GH04-06-6	1/4/12	16	
silty/clayey SAND - fine grained, poorly graded, very soft to soft, brown, saturated.	0	111	GH04-06-7	2/4/8	12	
SILT and CLAY - some fine sand, some gravel, poorly graded, subrounded, brown to grey, saturated.	200 / 0	53	GH04-06-8	0.5/0.5/7	7.5	
SAND - medium grained, trace fines, poorly graded, loose, gray, saturated	20	139	GH04-06-9	4/4/7	11	
CLAY - some silt, trace fine sand, poorly graded, grey, wet	139					
SAND - fine to medium grained, some to trace silt/clay with depth, trace to some gravel with depth, poorly graded, loose, grey/brown, wet.	0	161	GH04-06-10	3/4/6	10	
	20 / 0	67	GH04-06-11	10/10/10	20	60' - Core barrel plugged by medium grained sand. Unplugged and drilled to 65'.
	0	44	GH04-06-12	9/7/7	14	SPT#11 sampled from core barrel. 65' - Hole caved to 65.5ft, SPT#12 sampled anyways.
	50					
GRAVEL and SAND - some silt, some clay, well graded, subround to angular, loose to compact, grey, moist to wet.	0	44	GH04-06-13	3/5/24	29	
	30	28	GH04-06-14	10/13/17	30	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-06

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-06**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**18 May 04**
Drilling Method:	**DDH**	Elevation:	**968 ft / 295.0m**	Date Completed:	**21 May 04**
Location:	**Frying Pan Lake**	Total Depth:	**213 ft / 64.9m**	Logged by:	**GEM/NDE**
Coordinates:	**2,146,959 ft N , 1,402,986 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26									
	27			86	100		GH04-06-15	70/-/-	n/a	SPT - hit a rock.
90	28			60	100		GH04-06-16	32/50/-	n/a	SPT - hit a rock.
95	29									
	30		Silt and Clay decreasing with depth.	40	88		GH04-06-17	21/51/70+	n/a	
100	31			0	56		GH04-06-18	2/18/49	67	No recovery, tight ground, coarse sand in cuttings.
105	32		SAND and CLAY - some gravel, poorly graded, stiff to hard, moist to wet.	0	89		GH04-06-19	20/32/40	72	104' - Core barrel plugged with sand. Attempted to tri-cone, plugged with sand and gravel at 70ft.
	33									
110	34		sandy CLAY - some gravel, some silt, well graded, subround, very stiff to hard, wet.	11						
115	35			67	94		GH04-06-20	23/60+/-	n/a	SPT - refusal @3". Hole under artesian pressure with 4ft stickup on drill rods, 1 - 2 gal/min @ 120ft.
	36									
120	37		SAND and GRAVEL - trace silt, well graded, subround, dense, brown, wet.	57	71		GH04-06-21	6/30/20	50	SPT - shorter test interval due to rock.
125	38			70	96		GH04-06-22	39/58/-	n/a	SPT - hit cobble.
	39									
130	40			52	72		GH04-06-23	9/25/42	67	
			SAND - medium grained, some gravel, trace clay, well graded, dense, wet.	53	91		GH04-06-24	29/75+/-	n/a	SPT - cobbley substrate. Hole making significant water, 5 - 7 gpm @ surface.
135	41									
	42		GRAVEL - fine grained, some sand, trace silt, well graded, dense, wet.	60	78		GH04-06-25	39/54/81	135	
140	43									
	44		SAND and GRAVEL - all grade sizes, trace silt, well graded, sub-angular to subround, dense, wet	40	133		GH04-06-26	70/-/-	n/a	SPT - rock stuck in tip.
145	45		BEDROCK - Diorite - pyrite in joints, highly weathered, grey, calcite infilling, some red staining, joints mostly degraded near surface with no infill, less weathered with depth.	0	60		GH04-06-27	60+/-/-	n/a	
150	46									*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
155	47		RMR89 - 46.0, RQD - 31.3%, UCS - 75MPa (average/estimated values)							
	48									
160	49									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-06

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Project:	**Pebble Project**	Drill Hole No.	**GH04-06**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**18 May 04**
Drilling Method:	**DDH**	Elevation:	**968 ft / 295.0m**	Date Completed:	**21 May 04**
Location:	**Frying Pan Lake**	Total Depth:	**213 ft / 64.9m**	Logged by:	**GEM/NDE**
Coordinates:	**2,146,959 ft N , 1,402,986 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54											
180												
	55											
	56											
185												
	57											
190												
	58											
	59											
195												
	60											
200												
	61											
	62											
205												
	63											
210												
	64											
	65		End Of Hole @ 213 ft (64.9 m)									
215												
	66											
220												
	67											
	68											
225												
	69											
230												
	70											
	71											
235												
	72											
240												
	73											
	74											
245												

Northern Dynasty Mines Inc.
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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-08**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**22 May 04**
Drilling Method:	**DDH**	Elevation:	**1526 ft / 465.1m**	Date Completed:	**24 May 04**
Location:	**Saddle Area**	Total Depth:	**135 ft / 41.1m**	Logged by:	**GEM/NDE**
Coordinates:	**2,149,963 ft N , 1,373,556 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND - fine to medium, some gravel, some silt, well graded, sub-angular to subround, loose.							Drillhole advanced using HW casing with HQ2 core. HW Casing advanced as far as necessary to keep circulation and avoid hole collapse. HW casing initially advanced to 5'.
5	1–2			0	61		GH04-08-1	3/3/5	8	
			SAND - fine to medium grained, some gravel, some silt, well graded, sub-angular to subround, loose.	25	39		GH04-08-2	4/6/8	14	
10	3									
			clayey SAND - fine to medium grained, some gravel, some silt, poorly graded, subangular to subrounded, soft, grey.	33	72		GH04-08-3	7/8/10	18	
15	4–5									
			GRAVEL - coarse to medium grained, some clay, some sand, sub-angular to subround.	28	78		GH04-08-4	12/27/18	45	
20	6									
	7			59	8		GH04-08-5	7/10/11	21	
25	8									
30	9		GRAVEL and SAND - well graded, subround to sub-angular, compact to dense, brown, wet.	0	50		GH04-08-6	3/5/7	12	
35	10–11			37	156		GH04-08-7	-/-/-	n/a	SPT#7 done in core barrel. Blow count ignored.
40	12			0						
45	13–14			56	69		GH04-08-8	10/31/21	52	
50	15			26	94		GH04-08-9	17/26/40	66	
55	16–17			50	67		GH04-08-10	18/22/23	45	
60	18–19			58	67		GH04-08-11	2/7/16	23	
65	20			42	61		GH04-08-12	11/18/28	46	
70	21–22			71	67		GH04-08-13	9/12/17	29	
75	23			45	156		GH04-08-14	8/3/10	13	No recovery, sand heaved into core barrel, core tube stuck. Pulled HQ rods to clean out. SPT#14 done inside core
80	24									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
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Knight Piésold CONSULTING

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Project:	**Pebble Project**	Drill Hole No.	**GH04-08**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**22 May 04**
Drilling Method:	**DDH**	Elevation:	**1526 ft / 465.1m**	Date Completed:	**24 May 04**
Location:	**Saddle Area**	Total Depth:	**135 ft / 41.1m**	Logged by:	**GEM/NDE**
Coordinates:	**2,149,963 ft N , 1,373,556 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26			0							barrel. Advanced HW casing to 77ft.	
	27				100	☒	GH04-08-15	5/5/16	21	●		
90	28											
			BEDROCK - Layers of Sandstone, Siltstone and Siltstone Conglomerate/Breccia, some angular clasts, soft clay and carbonate infilling. UCS - 30MPa, RQD - 0%, RMR-89 - 35.6 (average/estimated values)	73							* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)	
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
			End of Hole @ 135 feet (41.15m)									
140	42											
	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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Project:	**Pebble Project**	Drill Hole No.	**GH04-10**	Page	**1 of 4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**26 May 04**
Drilling Method:	**DDH**	Elevation:	**908 ft / 276.8m**	Date Completed:	**28 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**330 ft / 100.6m**	Logged by:	**GEM/SM/NE**
Coordinates:	**2,123,101 ft N , 1,395,412 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Surface tundra vegetation. SAND and GRAVEL - coarse sand, some cobbles, well graded, subrounded to round, compact.							Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
5	1			0	67		GH04-10-1	14/24/18	42	
	2		SAND and GRAVEL - trace silt, occasional cobble, well graded, subrounded to angular, compact to dense at depth, grey, damp to moist.	30	72		GH04-10-2	13/18/18	36	
10	3			67	53		GH04-10-3	14/12/19	31	
15	4									
	5			20	11		GH04-10-4	12/25/33	58	
20	6									
	7			40	56		GH04-10-5	10/37/34	71	
25	8									
30	9			25	78		GH04-10-6	26/34/34	68	
	10									
35	11			57	58		GH04-10-7	1/7/20	27	
				72	47		GH04-10-8	4/9/10	19	
40	12									
	13			56						
45	14									
50	15			50	61		GH04-10-9	4/8/8	16	
	16									
55	17			40	81		GH04-10-10	12/33/30	66	
60	18		SAND - medium to fine grained, trace silt, dense to very dense, over consolidated, brown, wet.	0	79		GH04-10-11	12/20/	40	SPT - interval shortened due to refusal @12". Fluvial deposit, likely intra glacial deposit, grades to sandy silt, moderate dilatency.
	19			0						
65	20									
	21		CLAY and SILT - trace to some sand with depth, some gravel with depth, very dense, brown to grey to tan, damp to wet.	0	33		GH04-10-12	5/50+/50+	100+	SPT - high 'N'value due to overconsolidated, fine grained substrate. Glacio-lacustrine.
70	22			0	89		GH04-10-13	20/21/22	43	
75	23									
	24			0	44		GH04-10-14	9/13/16	29	
80	25			0						

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-10

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8		0

Rev. 0 - Issued for Report

GH04-10

SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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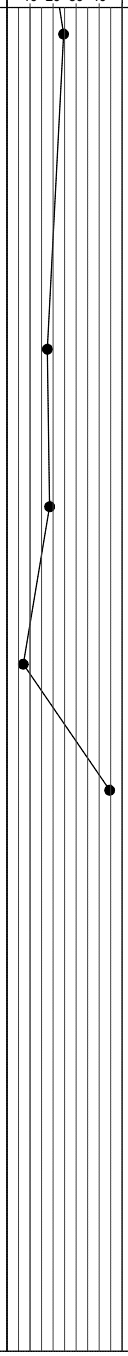
Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-10**	Page	**2** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**26 May 04**
Drilling Method:	**DDH**	Elevation:	**908 ft / 276.8m**	Date Completed:	**28 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**330 ft / 100.6m**	Logged by:	**GEM/SM/NE**
Coordinates:	**2,123,101 ft N , 1,395,412 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
90	27		clayey, gravelly SAND - trace silt, poorly graded, hard, tan, wet.	13	0	X	GH04-10-15	16/22/27	49	
	28		SILT and CLAY - some gravel, trace cobble, stiff, brown, wet.	0						
95	29									
	30				0	X	GH04-10-16	40/50+/	n/a	SPT - pushing gravel.
100	31		SILT - trace fine sand, high dilatency.	0						
105	32									
	33		silty SAND - fine grained, trace clay, poorly graded, dense, stratified, gray-brown, damp to wet.	0	0	X	GH04-10-17	15/15/20	35	
110	34									
115	35									
	36			0	0	X	GH04-10-18	17/17/20	37	
120	37		SAND - medium grained, trace silt, trace gravel, poorly graded, compact to dense, grey, wet.	0						
125	38									
	39			0	100	X	GH04-10-19	3/7/7	14	Sanded rods and barrel together from heaved sand. Lost return at 87 ft, used G-STOP, dry hole. Triconed down to 135 ft--lost 3 ft. Cased with HQ to 140 ft.
130	40			0						
135	41				50	X	GH04-10-20	24/50/39	89	
	42									
140	43		GRAVEL - some silt, trace pockets of sand and gravel, well graded, sub-angular to rounded.	0						Reduced to NQ2 core barrel.
145	44									
	45									
150	46			15						
155	47									
	48									
160	49		SILT - some gravel, trace to some sand, trace clay, stiff, grey, moist.	1						
165	50									
	51									
170										



WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-10

Knight Piésold CONSULTING

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-10**	Page	**3** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**26 May 04**
Drilling Method:	**DDH**	Elevation:	**908 ft / 276.8m**	Date Completed:	**28 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**330 ft / 100.6m**	Logged by:	**GEM/SM/NE**
Coordinates:	**2,123,101 ft N , 1,395,412 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
				20								
175	53											
	54											
180	55			50								
	56											
185	57											
190	58		silty SAND - very fine grained, poorly graded, stiff to very stiff, grey to brown, moist to wet.	45								
	59											
195	60											
200	61		GRAVEL - some silt, trace, blue/green sedimentary.	35								
	62											
205	63											
210	64			1								
	65											
215	66											
220	67		silty SAND - some gravel, angular to rounded, compact to dense, brown.	0								
	68											
225	69											
230	70			4								
	71											
235	72											
240	73			10								
	74											
245	75											
250	76			25								
	77											
255												

Northern Dynasty Mines Inc.
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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-10**	Page	**4 of 4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**26 May 04**
Drilling Method:	**DDH**	Elevation:	**908 ft / 276.8m**	Date Completed:	**28 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**330 ft / 100.6m**	Logged by:	**GEM/SM/NE**
Coordinates:	**2,123,101 ft N , 1,395,412 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
260	79		SAND and GRAVEL - fine grading to coarse with depth, trace to some silt, isolated cobbles, sub-angular to sub-rounded, dense to compact, brown, moist to damp.	33								
265	80, 81											
270	82			37							Lost return at 280 ft. Close to being sanded in.	
275	83, 84											
280	85			38								
285	86, 87											
290	88			0								
295	89, 90											
300	91			50							Fluvial deposit.	
305	92, 93											
310	94			55							Fluvial deposit.	
315	95, 96											
320	97			38							S. Martin spoke with R. Moses and decided to shut down the hole.	
325	98, 99											
330	100		End of hole @ 330 ft (100.6m)	10							*Bedrock is undetermined.	
335	101, 102											
340	103											

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-11**	Page	**1 of 3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**28 May 04**
Drilling Method:	**DDH**	Elevation:	**977 ft / 297.8m**	Date Completed:	**31 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**170 ft / 51.8m**	Logged by:	**SM/NE**
Coordinates:	**2,128,321 ft N , 1,406,017 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		SAND - mostly coarse, well graded, trace silt, trace to some gravel, dense, wet, brown, angular to sub-angular.							Triconed to 5'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
5	2		SAND and SILT - some coarse sand, some gravel (increasing quantity with depth), well graded, subrounded to subangular, dense to compact with depth, brown, damp to wet.	0	106		GH04-11-1	24/26/28	54	
10	3									
	4									
15	5		SAND, GRAVEL and CLAY - some silt, well graded, subrounded to subangular, compact, brown, damp to wet.	49	86		GH04-11-2	15/17/18	35	
20	6				72		GH04-11-3	12/12/13	25	
	7									
25	8		SAND and GRAVEL - some to trace silt with depth, isolated cobbles, well graded, subangular to subrounded, loose to very dense with depth, brown, wet to damp.	33	53		GH04-11-4	12/15/11	26	Potential for getting sanded in. PERMEABLE ZONE - lost return from surface to 30ft and @ 42 - 67ft. Used G-STOP at 54.5 - 60 ft interval.
30	9			50						
	10									
35	11			54	56		GH04-11-5	4/7/9	16	
40	12									
	13									Lost return @ 42 ft.
45	14			42	22		GH04-11-6	6/6/6	12	Lost return until 52 ft depth.
50	15									
	16									
55	17			37	53		GH04-11-7	14/20/19	39	Dry hole, used G_STOP.
60	18			65						
	19									
65	20				53		GH04-11-8	23/47/34	81	
70	21		BEDROCK - Tertiary Sediments - breccia, grey/green, clay, sand and gravel infilling on joints >10mm (soft), factured zones at each joint.	6						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
	22		UCS - 43.5MPa, RQD - 48.1%, RMR89 - 41.9. (averge/estimated values)							
75	23									
	24									
80										

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80; Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
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Knight Piésold CONSULTING

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-11**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**28 May 04**
Drilling Method:	**DDH**	Elevation:	**977 ft / 297.8m**	Date Completed:	**31 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**170 ft / 51.8m**	Logged by:	**SM/NE**
Coordinates:	**2,128,321 ft N , 1,406,017 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-11

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Project:	**Pebble Project**	Drill Hole No.	**GH04-11**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**28 May 04**
Drilling Method:	**DDH**	Elevation:	**977 ft / 297.8m**	Date Completed:	**31 May 04**
Location:	**South Fork Koktuli River**	Total Depth:	**170 ft / 51.8m**	Logged by:	**SM/NE**
Coordinates:	**2,128,321 ft N , 1,406,017 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170	52		End of hole @ 170 ft (51.8 m)									
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
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Project:	**Pebble Project**	Drill Hole No.	**GH04-12A**	Page	**1 of 2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**1 Jun 04**
Drilling Method:	**DDH**	Elevation:	**884 ft / 269.4m**	Date Completed:	**2 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**130 ft / 39.6m**	Logged by:	**CK/NDE**
Coordinates:	**2,122,286 ft N , 1,393,590 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SILT - some fine sand, poorly graded, compact, low plasticity, light to medium brown.							Tri-coned to 5 ft. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
			silty SAND - some gravel, isolated cobbles, well graded, angular to subangular, compact to dense, low plasticity, light to medium brown.	0	67		GH04-12A-1	1/5/13	18	
			sandy GRAVEL - fine gravel, trace silt, well graded, subangular, very dense, dark brown.	45	50		GH04-12A-2	16/16/13	29	
			BEDROCK - ANDESITE - dark grey, aphanitic, purplish in fracture zones, brecciated, friable rock, clayey/sandy infilling, thin carbonate veins. UCS - 100MPa, RQD - 44.6%, RMR89 - 51.4. (average/estimated values)	55	33		GH04-12A-3	50+//	n/a	SPT - hit bedrock *See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-12A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-12A**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**1 Jun 04**
Drilling Method:	**DDH**	Elevation:	**884 ft / 269.4m**	Date Completed:	**2 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**130 ft / 39.6m**	Logged by:	**CK/NDE**
Coordinates:	**2,122,286 ft N , 1,393,590 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40		End of hole @ 130 ft (40 m)									
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-14**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**4 Jun 04**
Drilling Method:	**DDH**	Elevation:	**929 ft / 283.2m**	Date Completed:	**6 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**199 ft / 60.7m**	Logged by:	**CK/NDE**
Coordinates:	**2,121,520 ft N , 1,382,419 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
SAND - fine grained, poorly graded, low plasticity, light to medium brown, damp.						Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud addditive used.
silty SAND - fine grained, some gravel, trace cobbles, well graded, subangular, loose, coarsens with depth, light to medium brown, moist.	0	78	GH04-14-1	2/4/7	11	
SAND and GRAVEL - trace silt, isolated cobbles, well graded, angular to subrounded, dense to very dense, low plasticity, brown, moist to wet.	26	67	GH04-14-2	19/23/24	47	
	87	39	GH04-14-3	12/38/35	73	
	47					
	0	56	GH04-14-4	7/35/50+	n/a	SPT stopped - bouncing on boulder for 25 blows at 10 inches.
Fines increasing with depth.	26	39	GH04-14-5	7/16/15	31	Rods under high torque @ 50ft.
SAND - some clay, trace gravel, trace silt, subangular to subrounded, medium brown, trace cobbles, well graded.	59	100	GH04-14-6	30/38/60	98	
	0					SPT stopped - bouncing on boulder. Extended HW casing 58ft. Triconed to next interval. Leak in rods due to sand abrasion.
	83	0	GH04-14-7	50+/50+/-	n/a	
	50	81	GH04-14-8	16/38/53	91	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80; Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
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Project:	**Pebble Project**	Drill Hole No.	**GH04-14**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**4 Jun 04**
Drilling Method:	**DDH**	Elevation:	**929 ft / 283.2m**	Date Completed:	**6 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**199 ft / 60.7m**	Logged by:	**CK/NDE**
Coordinates:	**2,121,520 ft N , 1,382,419 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26		BEDROCK - ANDESITIC MUD/SILTSTONE - highly fractured, friable, light green gouge which reacts with HCl, chlorite alterations.	26							*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)	
	27		UCS - 15MPa, RQD - 0%, RMR89 - 27.1. (average/estimated values)									
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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Project:	**Pebble Project**	Drill Hole No.	**GH04-14**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**4 Jun 04**
Drilling Method:	**DDH**	Elevation:	**929 ft / 283.2m**	Date Completed:	**6 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**199 ft / 60.7m**	Logged by:	**CK/NDE**
Coordinates:	**2,121,520 ft N , 1,382,419 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54											
180												
	55											
	56											
185			End of hole @ 185 ft (56.4 m)									
	57											
190												
	58											
	59											
195												
	60											
200												
	61											
	62											
205												
	63											
210												
	64											
	65											
215												
	66											
220												
	67											
	68											
225												
	69											
230												
	70											
	71											
235												
	72											
240												
	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-14

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-18**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**16 Jun 04**
Drilling Method:	**DDH**	Elevation:	**833.3 ft / 254.0m**	Date Completed:	**18 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**177 ft / 53.9m**	Logged by:	**CK**
Coordinates:	**2,126,850 ft N , 1,382,120 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
silty SAND - trace clay, trace gravel, poorly graded, low plasticity, tan to rusty brown, moist to wet.	0	83	GH04-18-1	2/1/1	2
	0	94	GH04-18-2	26/15/15	30
	50				
SAND and GRAVEL - trace silt, isolated boulders, well graded, subangular to subrounded, dense to very dense, light brown/ reddish, moist to wet. Some to trace silt with depth.	80	72	GH04-18-3	7/28/31	59
	60				
	75	89	GH04-18-4	7/19/18	37
	80	61	GH04-18-5	19/26/14	40
SAND and GRAVEL - fine to medium grained sand, trace silt, trace clay, isolated cobbles and boulders, well graded, subangular to subrounded, compact to dense, light to medium brown, moist to wet.	25	33	GH04-18-6	1/3/5	8
	75				
	100	0	GH04-18-7	12/15/9	24
	70	61	GH04-18-8	11/20/24	44
BEDROCK - Andesitic Siltstone - grey, very tighly annealed veins, trace calcite, clay gouge and pyrite found in joints, joints dip 30 - 45 degrees. UCS - 30MPa, RQD - 14.9%, RMR89 - 40.9. (average/estimated values)	150				

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

NOTES

Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. Geographic Location appears to be remnants of river channel. Note: Located 8m from existing creek.
NO SPT - hit boulder @ 14ft.

*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-18

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-18**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**16 Jun 04**
Drilling Method:	**DDH**	Elevation:	**833.3 ft / 254.0m**	Date Completed:	**18 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**177 ft / 53.9m**	Logged by:	**CK**
Coordinates:	**2,126,850 ft N , 1,382,120 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-18**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT & Core**	Date Started:	**16 Jun 04**
Drilling Method:	**DDH**	Elevation:	**833.3 ft / 254.0m**	Date Completed:	**18 Jun 04**
Location:	**South Fork Koktuli River**	Total Depth:	**177 ft / 53.9m**	Logged by:	**CK**
Coordinates:	**2,126,850 ft N , 1,382,120 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54		End of hole at 177' (53.9m)									
180												
	55											
	56											
185												
	57											
190												
	58											
	59											
195												
	60											
200												
	61											
	62											
205												
	63											
210												
	64											
	65											
215												
	66											
220												
	67											
	68											
225												
	69											
230												
	70											
	71											
235												
	72											
240												
	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-18

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-26**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**2 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1558.4 ft / 475.0m**	Date Completed:	**3 Jul 04**
Location:	**Mill Site**	Total Depth:	**135 ft / 41.1m**	Logged by:	**CK**
Coordinates:	**2,158,941 ft N , 1,396,246 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
	1		silty SAND - some gravel, isolated cobbles, trace inclusions (roots), well graded, angular, low plasticity, damp.								Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 4.5'.	
5	2		BEDROCK - Siltstone - medium to dark brown-grey, with narrow bands of wacke, early pervasive potassic alterations, quartz, epidote and pyrite veins, hematite and limonite alterations, highly fractured.	0							*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)	
10	3		UCS - 115MPa, RQD - 27.9%, RMR89 - 48.8. (average/estimated values)									
15	4											
	5											
20	6											
	7											
25	8											
30	9											
	10											
35	11											
40	12											
	13											
45	14											
50	15											
	16											
55	17											
60	18											
	19											
65	20											
70	21											
	22											
75	23											
80	24											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-26

Knight Piésold CONSULTING

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Project:	**Pebble Project**	Drill Hole No.	**GH04-26**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**2 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1558.4 ft / 475.0m**	Date Completed:	**3 Jul 04**
Location:	**Mill Site**	Total Depth:	**135 ft / 41.1m**	Logged by:	**CK**
Coordinates:	**2,158,941 ft N , 1,396,246 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41		End of hole at 135' (41.1m).									
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-26

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-27**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**4 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1551.84 ft / 473.0m**	Date Completed:	**4 Jul 04**
Location:	**Mill Site**	Total Depth:	**125 ft / 38.1m**	Logged by:	**CK**
Coordinates:	**2,157,549 ft N , 1,395,818 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
			silty SAND - some gravels, trace cobbles, trace inclusions (roots), well graded, angular, low plasticity, damp.								Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. *See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)	
	1		BEDROCK - Siltstone - greenish-blue w/ Wacke layers, limonite alt on fracture surfaces, illite/chlorite alterations pervasive (green tint), quartz/ dolomite/ pyrite veining, heavily fractured, healed by silty sand infill.	0								
5	2		UCS - 61MPa, RQD - 27.9%, RMR89 - 46.7. (average/estimated values)									
10	3											
	4											
15	5											
20	6											
	7											
25	8											
30	9											
	10											
35	11											
40	12											
	13											
45	14											
50	15											
	16											
55	17											
60	18											
	19											
65	20											
70	21											
	22											
75	23											
80	24											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-27

Knight Piésold CONSULTING

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-27**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**4 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1551.84 ft / 473.0m**	Date Completed:	**4 Jul 04**
Location:	**Mill Site**	Total Depth:	**125 ft / 38.1m**	Logged by:	**CK**
Coordinates:	**2,157,549 ft N , 1,395,818 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38		End of hole at 125' (38.1m).									
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-27

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-28**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**5 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1158.14 ft / 353.0m**	Date Completed:	**6 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**145 ft / 44.2m**	Logged by:	**CK**
Coordinates:	**2,137,379 ft N , 1,398,091 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND - some gravel, some silt, well graded, angular, compact to dense, medium brown, moist.							Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 4'.
5	1			0	78		GH04-28-1	10/10/12	22	
	2									
10	3			0	67		GH04-28-2	9/12/9	21	
	4									
15	5		GRAVEL and SAND - trace silt, isolated cobble/boulders - surface heavily oxidized from 15-19ft, well graded, angular, medium brown, wet.	0	61		GH04-28-3	3/9/17	26	Sanded in - extend HW casing to 22ft.
20	6			100						
	7									
25	8		BEDROCK - Monzodiorite - fine grained, green w/ light green patches(sericite alt), calcite and clay filled amygdules and joint infill, limonite/ epidote/ quartz/ magnetite alterations, quartz/ dolomite/ pyrite/ calcite veining.	50						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
30	9									
	10		UCS - 152MPa, RQD - 62.7%, RMR89 - 62.8. (average/estimated values)							
35	11									
40	12									
	13									
45	14									
50	15									
	16									
55	17									
60	18									
	19									
65	20									
70	21									
	22									
75	23									
80	24									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-28

Knight Piésold CONSULTING

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-28**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**5 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1158.14 ft / 353.0m**	Date Completed:	**6 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**145 ft / 44.2m**	Logged by:	**CK**
Coordinates:	**2,137,379 ft N , 1,398,091 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44		End of hole at 145' (44.2m).									
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-28

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-29**	Page	**1** of **1**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**9 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1072.83 ft / 327.0m**	Date Completed:	**10 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**45 ft / 13.7m**	Logged by:	**CK/KA**
Coordinates:	**2,135,591 ft N , 1,399,085 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND - some gravel, some silt, isolated cobbles and boulders, well graded, rounded to subrounded, loose to compact, light to medium brown, moist.	0						Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
			GRAVEL and SAND - trace silt, isolated cobbles and boulders, well graded, rounded to subrounded, loose to compact, light to medium brown, moist.	20						
				40	50	X	GH04-29-1	8/10/11	21	
				20						
				50						
				42	39	X	GH04-29-1	3/3/6	9	
				35						
				60	44	X	GH04-29-4	12/17/11	28	
			gravelly SAND - occasional cobbles, isolated boulders, well graded, rounded to sub-rounded, loose to compact, medium brown, moist.	25						
			HOLE ABANDONNED - REFER TO GH04-29A.	40	50	X	GH04-29-5	9/9/8	17	Lost 5ft of HW casing in hole. Attempt to hook up but ended up splitting 4ft of casing. See Photo #1-GH04-29 folder.

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-29

Knight Piésold CONSULTING

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Date Revised: 8 Nov 04

Project:	**Pebble Project**	Drill Hole No.	**GH04-29A**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**13 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1030.1 ft / 314.0m**	Date Completed:	**14 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**159 ft / 48.5m**	Logged by:	**CK/KA**
Coordinates:	**2,135,590 ft N , 1,399,086 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Triconed down to 57' and advanced HW casing. Refer to GH04-29 Overburden Log for upper 55'.							Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
			SAND and GRAVEL - increasing sand with depth, occasional cobbles and boulders, poorly graded, angular to sub-rounded, compact, moist.		6		GH04-29A - 1	6/5/4	9	
				57	56		GH04-29A - 2	21/28/49	77	
				40						
				87	78		GH04-29A - 3	10/27/41	68	
				30						

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-29A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8		0

GH04-29A

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SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-29A**	Page	**2 of 2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**13 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1030.1 ft / 314.0m**	Date Completed:	**14 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**159 ft / 48.5m**	Logged by:	**CK/KA**
Coordinates:	**2,135,590 ft N , 1,399,086 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26			70	83		GH04-29A - 4	20/31/22	53	
	27									
90	28		sandy GRAVEL - some cobbles, some boulders, rounded to subrounded, well graded, light to medium brown.	50						
95	29			70						No SPT
	30									
100	31			50						
105	32			85						SPT - hit boulder.
	33									
110	34			75						
115	35			30	75		GH04-29A - 6	18/45/-	n/a	SPT-6 aborted after 12", blow count too high.
	36									
120	37			40						
				92						
125	38			12	1371		GH04-29A - 7	24/50+/-	n/a	SPT-7 aborted after 7", blow count too high.
	39									
130	40			60						
135	41		GRAVEL and SAND - trace silt, isolated cobbles, well graded, rounded to subrounded, loose to compact, medium brown, moist.	0	6		GH04-29A - 8	6/8/15	23	SPT8,9 --material fell out of the tube-stuck in core barrel -poor test.
	42									
140	43			75						
145	44			40						
				17	117		GH04-29A - 9	21/-/-	n/a	
	45									
150	46			40						
			WEATHERED BEDROCK- mafic, silty infill and on surface, RMR~15, RQD=0, UCS~50.	41						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
155	47			80						
	48									
160	49		End of hole @159' (48.5m).							

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-29A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-30**	Page	**1 of 3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**31 Jul 04**
Drilling Method:	**DDH**	Elevation:	**939.3 ft / 286.3m**	Date Completed:	**3 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**175 ft / 53.3m**	Logged by:	**KA/RV**
Coordinates:	**2,132,937 ft N , 1,394,724 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
		GRAVEL and SAND - trace silt, occasional to frequent cobbles with depth, well graded, subangular to subrounded, medium brown, moist.						Triconed down to 5'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
5	1–2			67	GH04-30-1	17/27/40	67	
10	3–4		60					
15	5		0	50	GH04-30-2	50+//	n/a	SPTs are problematic due to cobbley substrate.
20	6	sandy GRAVEL- trace silt, occasional cobbles, well graded, subangular to subrounded, compact to dense, light brown to light grey with depth, moist.	60	33	GH04-30-3	7/9/25	34	
25	7–8	silty, gravelly SAND - trace clay, well graded, subangular to subrounded, compact to dense, light brown to light grey with depth, moist.	90	94	GH04-30-4	19/16/19	35	
30	9–10		50					SPT - hit a boulder.
35	11	GRAVEL and SAND - some silt, trace clay, occasional cobbles, well graded, subangular to subrounded, dense, light grey, moist.	80	92	GH04-30-5	20/50+/	n/a	Triconed - no recovery. SPT - hit a boulder.
40	12–13							
45	14			61	GH04-30-6	23/23/19	46	
50	15–16		30					
55	17		67	67	GH04-30-7	32/50+/	n/a	SPT - hit a boulder.
60	18–19		30					
65	20	sandy GRAVEL- trace silt, isolated cobbles, poorly graded, subangular to subrounded, dense, light grey, moist to wet.	50	58	GH04-30-8	23/50+/	n/a	SPT - hit a boulder.
70	21–22		25					
75	23		40	58	GH04-30-9	41/50+/	n/a	SPT - hit a boulder.
80	24		13					

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80; Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-30

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH04-30

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-30**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**31 Jul 04**
Drilling Method:	**DDH**	Elevation:	**939.3 ft / 286.3m**	Date Completed:	**3 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**175 ft / 53.3m**	Logged by:	**KA/RV**
Coordinates:	**2,132,937 ft N , 1,394,724 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26		GRAVEL - well graded, subangular to subrounded, moist to wet.	40	83	X	GH04-30-10	45/38+/	n/a	SPT - hammer broke.
90	27, 28			47						Drill time unknown.
95	29, 30			110						
100	31		Increasing cobbles and boulders.	60						No SPT.
105	32, 33			80						Drill time unknown - lots of problems.
110	34			110						Drill time unkown - lots of problems.
115	35, 36		SAND- some gravel, frequent cobbles, well graded, rounded to subrounded.	100						Assuming 4.75ft was sand as the core barrel sanded in twice on this run.
120	37			5						
125	38, 39		SILT- some sand, some clay, trace gravel, isolated cobbles, poorly graded, rounded to subrounded, compact to very dense, medium brown, moist.	5	44	X	GH04-30-11	19/16/7	35	
130	40									
135	41, 42			50	100	X	GH04-30-12	25/50+/	n/a	SPT - hit a boulder.
140	43		gravelly SAND- trace silt on cobbles, some gravel, well graded, rounded to subrounded.	15						
145	44, 45			40	50	X	GH04-30-13	20/49/32	81	
150	46		sandy GRAVEL- trace silt, isolated cobbles, well graded, subrounded to rounded, light brown.	0						No SPT.
155	47, 48			100						
160	49			70						No SPT.

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-30**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**31 Jul 04**
Drilling Method:	**DDH**	Elevation:	**939.3 ft / 286.3m**	Date Completed:	**3 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**175 ft / 53.3m**	Logged by:	**KA/RV**
Coordinates:	**2,132,937 ft N , 1,394,724 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165				90							Due to a series of mislatches on the core barrel the actual recovery for this run is unknown.	
	51											
170	52											
	53											
175			END OF HOLE @ 175ft.	40							Bedrock was never reached. This hole was closed off due to the frequency at which the rods had to be pulled.	
	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-30

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-31**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**7 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1011.5 ft / 308.3m**	Date Completed:	**9 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**195 ft / 59.4m**	Logged by:	**CK/KA**
Coordinates:	**2,133,911 ft N , 1,400,682 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
gravelly SAND - trace cobbles, trace silt, well graded, rounded ot subrounded, light brown, moist to wet.	0	100	GH04-31-1	50+/-/-	n/a	Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 4'.
		56	GH04-31-2	11/50+/-	n/a	
silty SAND and GRAVEL - trace clay, isolated cobble, well graded, rounded to subrounded, dense to very dense, medium to light brown, moist.	27	83	GH04-31-3	17/31/40	71	
silty SAND - some gravel, trace clay, isolated cobbles (increasing with depth), well graded, subrounded to subangular, dense to very dense, light brown, moist.	0	83	GH04-31-4	8/22/30	52	
Decreasing fines. Some cobbles.	40		GH04-31-5	50+/-/-	n/a	
	60	72	GH04-31-6	14/26/27	53	Tricone down to 45ft-extend HW casing.
SAND and GRAVEL - some silt, trace clay, poorly graded, subangular to subrounded, dense, light brown, moist.	0	72	GH04-31-7	15/24/28	52	
gravelly SILT - trace sand, trace cobbles, well graded, subrounded, very dense, light brown, moist.	12					
sandy GRAVEL - some silt, trace clay, isolated cobbles, poorly graded, subrounded to rounded, dense, light brown, moist to damp.	40	56	GH04-31-8	11/18/26	44	
	57					
	8	78	GH04-31-9	23/48/43	91	
	15	56	GH04-31-10	11/29/35	64	
BEDROCK- Latite - green, fine grained, flow banding, sericite infilling, quartz/dolomite/pyrite	18 11					*See GEOTECHNICAL BEDROCK DATA

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-31

Knight Piésold CONSULTING

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-31**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**7 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1011.5 ft / 308.3m**	Date Completed:	**9 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**195 ft / 59.4m**	Logged by:	**CK/KA**
Coordinates:	**2,133,911 ft N , 1,400,682 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26		veining mostly oxidized to limonite on fracture surfaces, irregular calcite stringers, moderately jointed.	70							LOGGING SHEET for additional information (RMR89)	
90	27		100 to 170' - coarse grained latite, same as GH04-32.									
	28		Shear zone from 85' to 89' - partially healed.									
95	29		Shear zone from 130' to 135' - partially healed with calcite rich clay.									
100	30		UCS - 50MPa, RQD - 49.6%, RMR89 - 50.6. (average/estimated values)									
105	31											
110	32											
115	33											
120	34											
125	35											
130	36											
135	37											
140	38											
145	39											
150	40											
155	41											
160	42											
	43											
	44											
	45											
	46											
	47											
	48											
	49											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-31

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-31**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**7 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1011.5 ft / 308.3m**	Date Completed:	**9 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**195 ft / 59.4m**	Logged by:	**CK/KA**
Coordinates:	**2,133,911 ft N , 1,400,682 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54											
180												
	55											
	56											
185												
	57											
190												
	58											
	59											
195			End of hole at 195' (59.4m).									
	60											
200												
	61											
	62											
205												
	63											
210												
	64											
	65											
215												
	66											
220												
	67											
	68											
225												
	69											
230												
	70											
	71											
235												
	72											
240												
	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-31

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-32**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**6 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1214.6 ft / 370.2m**	Date Completed:	**7 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**135 ft / 41.1m**	Logged by:	**CK/KA**
Coordinates:	**2,132,207 ft N , 1,401,402 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24		sandy SILT - trace gravel, isolated boulders, well graded, subrounded to rounded, loose to compact, medium brown, moist.	0 17						Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 7'.
			sandy GRAVEL - some silt, poorly graded, subangular to subrounded, sandy-silt layer above and below the 3" gravel layer, moist.	8	75		GH-04-32-1	5/15/50+	n/a	
			SILT - some sand, trace gravel, trace cobbles, trace boulders, well graded, subrounded to subangular, loose to compact, medium brown, moist.	30						
			BEDROCK - Latite - light green with plagioclase phenocrysts altering to illite, higly fractured with calcite and clay infilling.	33 80						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
			Andesite - 32.5' to 42', 65' to 68', 85' to 90', olive green, with calcite and pyrite veins and vesicles which are mostly alterred to limonite.							
			FAULT ZONE @44' - fault breccia in a fine grained calcite rich clay matrix.							
			Fracture zone from 106' to 130'.							
			UCS - 80MPa, RQD - 31.2%, RMR89 - 48.8. (average/estimated values)							

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-32**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**6 Jul 04**
Drilling Method:	**DDH**	Elevation:	**1214.6 ft / 370.2m**	Date Completed:	**7 Jul 04**
Location:	**Frying Pan Lake**	Total Depth:	**135 ft / 41.1m**	Logged by:	**CK/KA**
Coordinates:	**2,132,207 ft N , 1,401,402 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41		End of hole at 135' (41.1m).									
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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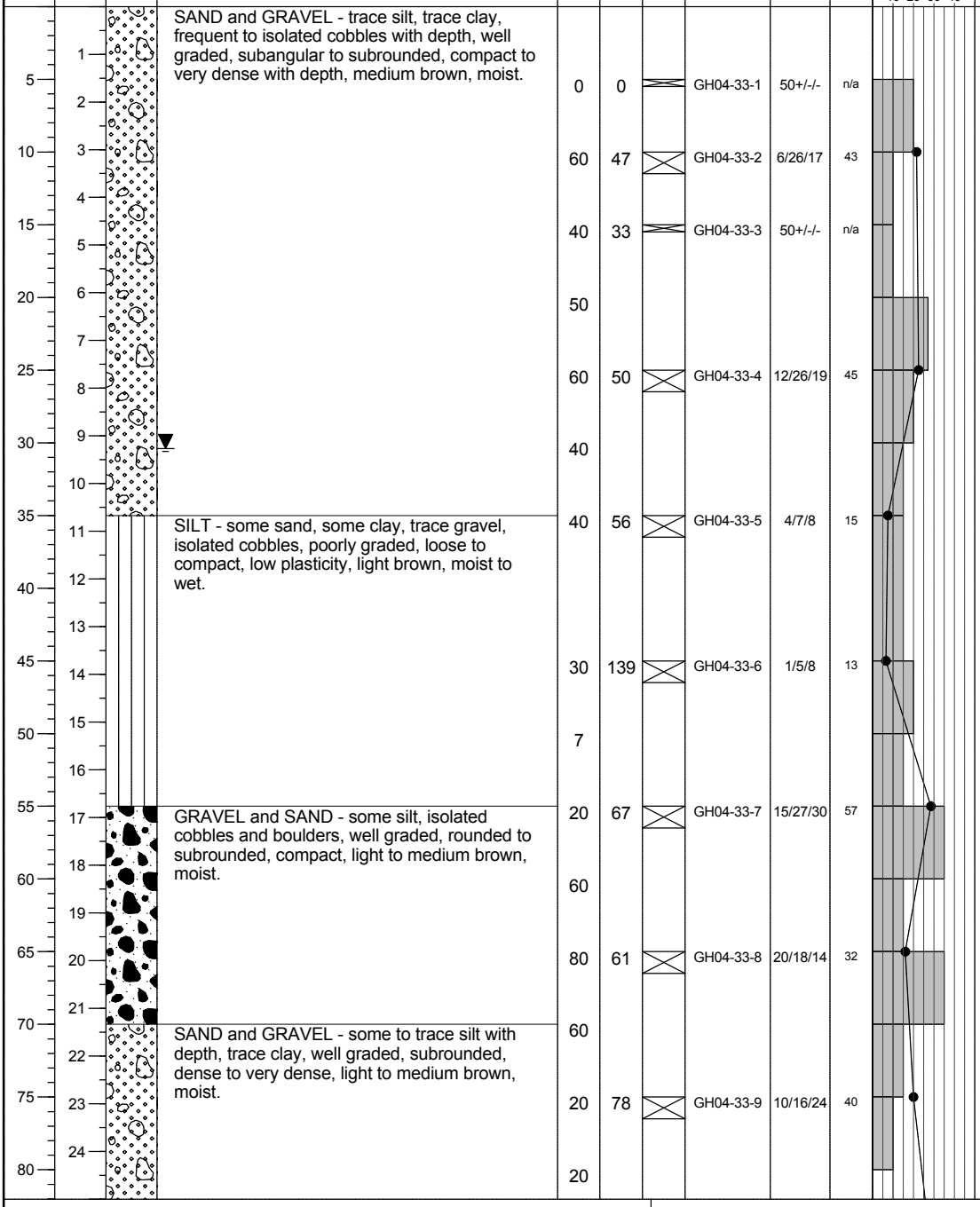
Project:	**Pebble Project**	Drill Hole No.	**GH04-33**	Page	**1** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**10 Jul 04**
Drilling Method:	**DDH**	Elevation:	**905.4 ft / 276.0m**	Date Completed:	**13 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**335 ft / 102.1m**	Logged by:	**CK/KA**
Coordinates:	**2,129,087 ft N , 1,399,309 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
SAND and GRAVEL - trace silt, trace clay, frequent to isolated cobbles with depth, well graded, subangular to subrounded, compact to very dense with depth, medium brown, moist.	0	0	GH04-33-1	50+/-/-	n/a	Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 5'.
	60	47	GH04-33-2	6/26/17	43	
	40	33	GH04-33-3	50+/-/-	n/a	
	50					
	60	50	GH04-33-4	12/26/19	45	
	40					
SILT - some sand, some clay, trace gravel, isolated cobbles, poorly graded, loose to compact, low plasticity, light brown, moist to wet.	40	56	GH04-33-5	4/7/8	15	Note: Drill rig has zero water head pressure at the drill bit.
	30	139	GH04-33-6	1/5/8	13	
	7					
GRAVEL and SAND - some silt, isolated cobbles and boulders, well graded, rounded to subrounded, compact, light to medium brown, moist.	20	67	GH04-33-7	15/27/30	57	
	60					
	80	61	GH04-33-8	20/18/14	32	
SAND and GRAVEL - some to trace silt with depth, trace clay, well graded, subrounded, dense to very dense, light to medium brown, moist.	60					
	20	78	GH04-33-9	10/16/24	40	
	20					Tricone - extend HW



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Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-33**	Page	**2** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**10 Jul 04**
Drilling Method:	**DDH**	Elevation:	**905.4 ft / 276.0m**	Date Completed:	**13 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**335 ft / 102.1m**	Logged by:	**CK/KA**
Coordinates:	**2,129,087 ft N , 1,399,309 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
										casing to 85ft.
85	26			0	72		GH04-33-10	17/30/26	56	
90	27									
	28									
95	29			20	67		GH04-33-11	13/23/30	53	
	30									
100	31			80						
105	32			80	67		GH04-33-12	24/50+/-	n/a	
	33									
110	34			40						
115	35			50	72		GH04-33-13	30/50/38	88	
	36									
120	37			40						
125	38			40	39		GH04-33-14	14/42/44	86	
	39									
130	40									
135	41			40						Tricone - Extend HW casing to 145ft.
	42									
140	43									
145	44		gravelly SAND - some silt, some cobbles and boulders, rounded to subrounded, medium brown, well graded, moist, very dense.	0	50		GH04-33-16	35/50+/-	n/a	
	45									
150	46			87						
155	47			70	0		GH04-33-17	50+/-/-	n/a	
	48									
160	49			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-33**	Page	**3** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**10 Jul 04**
Drilling Method:	**DDH**	Elevation:	**905.4 ft / 276.0m**	Date Completed:	**13 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**335 ft / 102.1m**	Logged by:	**CK/KA**
Coordinates:	**2,129,087 ft N , 1,399,309 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
165	51			100						
170	52			47						
175	53			40						
180	54			0						
185	55			40						
190	56		SAND - some silt, trace clay, trace gravel, well graded, subrounded, very dense, rusty brown, moist to wet.	0						
195	57			80	94		GH04-33-18	21/41/55	96	
200	58			80						
205	59			50	83		GH04-33-19	18/42/50+	92+	
210	60			50						
215	61			45	50		GH04-33-20	14/47/50+	97+	
220	62			80						
225	63			50						
	64		CLAY - some silt, trace sand, trace gravel, poorly graded, very dense, high plasticity.	100						
	65		BEDROCK - Monzonite - greyish green, plagioclase porphorytic, pyrite veins primarily oxidized to hematite, limonite and clay alterations pervasive, clacite veining, present, initally highly weathered and friable with red clay infilling.	100						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
230	66									
235	67									
240	68		UCS - 56MPa, RQD - 31.5%, RMR89 - 45.0. (average/estimated values)							
245	69									
	70									
	71									
	72									
	73									
	74									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-33**	Page	**4** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**10 Jul 04**
Drilling Method:	**DDH**	Elevation:	**905.4 ft / 276.0m**	Date Completed:	**13 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**335 ft / 102.1m**	Logged by:	**CK/KA**
Coordinates:	**2,129,087 ft N , 1,399,309 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
250	76											
	77											
255	78											
	79											
260	80											
265	81											
	82											
270	83											
275	84											
	85											
280	86											
285	87											
	88											
290	89											
295	90											
	91											
300	92											
305	93											
	94											
310	95											
315	96											
	97											
320	98											
325	99											

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Project:	**Pebble Project**	Drill Hole No.	**GH04-33**	Page	**5** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**10 Jul 04**
Drilling Method:	**DDH**	Elevation:	**905.4 ft / 276.0m**	Date Completed:	**13 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**335 ft / 102.1m**	Logged by:	**CK/KA**
Coordinates:	**2,129,087 ft N , 1,399,309 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
330	101											
335	102		End of hole at 335' (102.1m).									
340	103											
	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
395	120											
	121											
400	122											
	123											
405	124											

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Project:	**Pebble Project**	Drill Hole No.	**GH04-35**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**28 Jul 04**
Drilling Method:	**DDH**	Elevation:	**890.4 ft / 271.4m**	Date Completed:	**30 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**190 ft / 57.9m**	Logged by:	**KA**
Coordinates:	**2,126,742 ft N , 1,397,715 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
GRAVEL and SAND- some silt, poorly graded, subangular to subrounded, compact, medium brown, dry to moist.		100	GH04-35-1	25/-/-	n/a	Triconed through to 25'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
		94	GH04-35-2	28/46/31	77	
		67	GH04-35-3	20/21/27	48	
		56	GH04-35-4	7/16/16	32	
SAND- some gravel, isolated cobbles, well graded, rounded to subrounded, loose, moist.		44	GH04-35-5	21/41/21	62	
SAND and GRAVEL - trace silt, isolated cobbles, poorly graded, rounded to subrounded, medium brown, moist.	60					
	70	78	GH04-35-6	19/22/25	47	
	20	67	GH04-35-7	6/30/50+	80+	
SAND- some silt, trace to some gravel with depth, poorly graded, subrounded to subangular, loose, medium brown, moist to wet.	15	100	GH04-35-8	5/10/10	20	
	30					
	0	161	GH04-35-9	2/4/3	7	May be slough or heave in bottom of hole (SPT'N'value of 7 and sample recovery of 161%).
	0	78	GH04-35-10	15/12/17	29	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80; Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-35**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**28 Jul 04**
Drilling Method:	**DDH**	Elevation:	**890.4 ft / 271.4m**	Date Completed:	**30 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**190 ft / 57.9m**	Logged by:	**KA**
Coordinates:	**2,126,742 ft N , 1,397,715 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26			20	11		GH04-35-11	9/9/8	17	
90	27									
	28									
95	29		sandy GRAVEL- some silt, occasional cobbles, well graded, rounded to subrounded, compact, light brown, moist.	0	22		GH04-35-12	19/50+/-	50+	SPT - hit a boulder.
100	30									
	31		Large boulder sized chunks of brecciated rock held together with silty material with gravel. Cobbles of varying nature were also present.	60						
105	32		SAND- some silt some cobbles/boulders (comprised of breccia from last run) poorly graded, medium brown, dense.	80						
	33									
110	34		BEDROCK - Breccia - light grey to white matrix surrounding angular clasts of varied colour and size, cobble to pebble size predominant, soft and fractured throughout depth of core.	120						* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89).
115	35		UCS - 60.9 MPa, RQD - 33.4%, RMR89 - 39.5. (average/approximate values)							
	36									
120	37									
125	38									
	39									
130	40									
135	41									
	42									
140	43									
145	44									
	45									
150	46									
155	47									
	48									
160	49									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-35**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**28 Jul 04**
Drilling Method:	**DDH**	Elevation:	**890.4 ft / 271.4m**	Date Completed:	**30 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**190 ft / 57.9m**	Logged by:	**KA**
Coordinates:	**2,126,742 ft N , 1,397,715 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54											
180												
	55											
	56											
185												
	57											
190	58		END OF HOLE @190ft.									
	59											
195												
	60											
200	61											
	62											
205												
	63											
210	64											
	65											
215												
	66											
220	67											
	68											
225												
	69											
230	70											
	71											
235												
	72											
240	73											
	74											
245												

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Project:	**Pebble Project**	Drill Hole No.	**GH04-36**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**24 Jul 04**
Drilling Method:	**DDH**	Elevation:	**952.8 ft / 290.4m**	Date Completed:	**25 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**155 ft / 47.2m**	Logged by:	**KA/RV**
Coordinates:	**2,119,650 ft N , 1,392,907 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			GRAVEL and SAND - fine grained sand, gravel content decreasing with depth, some silt, poorly graded, sub-angular to sub-rounded, compact, light brown, dry to moist.							Triconed to 10'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.	
					67	X	GH04-36-2	20/21/25	45	* No well/piezometer installed at this location.	
			sandy GRAVEL - some silt, trace clay, isolated boulders, well graded, very dense, light brown, moist.	40	67	X	GH04-36-3	10/13/17	30		
			BEDROCK - Dacite - Igneous - highly weathered and unrecognizable to 36' depth. Light greyish green becoming dark purple (87'), alternating fine to coarse grained, visible flow banding, pervasive illite and sericite alterations (thick clay seems throughout), calcite veining and iron oxide staining pervasive below 108'. UCS - 52.8 MPa, RQD - 36.7%, RMR89 - 41.3. (average/approximate values)	90						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

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Project:	**Pebble Project**	Drill Hole No.	**GH04-36**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**24 Jul 04**
Drilling Method:	**DDH**	Elevation:	**952.8 ft / 290.4m**	Date Completed:	**25 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**155 ft / 47.2m**	Logged by:	**KA/RV**
Coordinates:	**2,119,650 ft N , 1,392,907 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
	47											
155			END OF HOLE @155ft.									
	48											
160	49											

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Project:	**Pebble Project**	Drill Hole No.	**GH04-39**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Jul 04**
Drilling Method:	**DDH**	Elevation:	**911.7 ft / 277.9m**	Date Completed:	**18 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**120 ft / 36.6m**	Logged by:	**CK/KA**
Coordinates:	**2,122,703 ft N , 1,389,233 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			sandy GRAVEL - trace silt, isolated cobbles, well graded, subangular to subrounded, compact to dense, light brown, moist.							Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used. HW casing initially advanced to 4'. Tricone to 10ft - extend HW casing--low torque on rods at 1000rpm.
5	1			0	56	X	GH04-39-1	10/17/21	38	
10	2			0	28	X	GH04-39-2	12/12/12	24	
15	3			38						
20	4			50	11	X	GH04-39-3	6/5/10	15	
25	5									
30	6			35	50	X	GH04-39-4	5/6/6	12	
35	7									
40	8			40	22	X	GH04-39-5	8/8/14	22	
45	9									
50	10			30	67	X	GH04-39-6	12/16/18	34	
55	11		SAND and GRAVEL - trace silt, isolated cobbles, poorly graded, rounded to subrounded, compact to very dense with depth, light brown, moist.							
60	12			35	56	X	GH04-39-7	18/17/15	32	Tricone and extend HW casing to 60ft.
65	13			0						
70	14			30	67	X	GH04-39-8	15/26/19	45	Very dense material stuck to core bit and cannot penetrate. Lost return at 67'. High permeability.
75	15									
80	16			0	56	X	GH04-39-9	17/21/40	61	
	17									
	18									
	19									
	20									
	21									
	22									
	23									
	24									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-39**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Jul 04**
Drilling Method:	**DDH**	Elevation:	**911.7 ft / 277.9m**	Date Completed:	**18 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**120 ft / 36.6m**	Logged by:	**CK/KA**
Coordinates:	**2,122,703 ft N , 1,389,233 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26			50	50	☒	GH04-39-10	21/48/43	91	
90	27, 28									
95	29		GRAVEL and SAND - trace silt, isolated cobbles, well graded, rounded to subrounded, compact, light brown, moist to wet.	40	56	☒	GH04-39-11	41/42/38	80	DELAY: Sanded in - pull 20' of HQ rods then ream back down.
100	30, 31									
105	32		sandy SILT - some gravel, isolated cobbles, well graded, subrounded to rounded, medium brown, moist.	30	28	☒	GH04-39-12	20/12/10	22	LOST 100% OF RETURN AT BEDROCK CONTACT.
110	33, 34									
115	35		BEDROCK - ANDESITE - dark purple, highly fractured, very brittle, magnetite and hematite alterations, limonite, chlorite and calcite scattered throughout. UCS - 50MPa, RQD - 10.8%, RMR89 - 39.7.	38						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
120	36, 37			71						
125	38									
130	39, 40									
135	41									
140	42, 43									
145	44									
150	45, 46									
155	47									
160	48, 49									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-39

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8		0

GH04-39

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SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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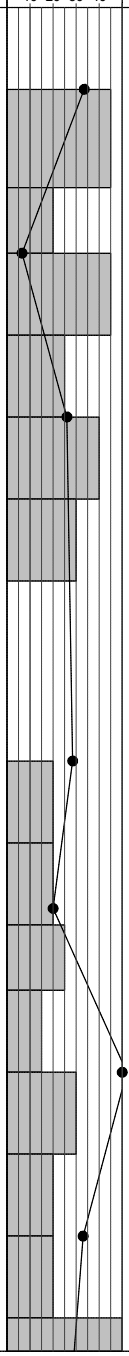
Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-40**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**14 Jul 04**
Drilling Method:	**DDH**	Elevation:	**928.8 ft / 283.1m**	Date Completed:	**16 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**105 ft / 32.0m**	Logged by:	**CK/KA**
Coordinates:	**2,123,808 ft N , 1,386,101 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			GRAVEL and SAND - some silt, isolated cobbles and boulders, poorly graded, subangular to rounded with depth, compact, light brown, moist.							Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
5	1			0	89	X	GH04-40-1	16/27/40	67	
	2									
10	3			75						
	4									
15	5		Cobbles and boulders content increasing and becoming more rounded.	25	44	X	GH04-40-2	6/5/8	13	
20	6			60						
	7									
25	8			80	50	X	GH04-40-3	10/29/23	52	
30	9			70						
	10									
35	11			80						DRY HOLE. Pull HQ rods, tricone and extend casing to 46ft.
40	12									
	13									
45	14		SAND and GRAVEL - trace silt, isolated cobbles, well graded, rounded to subrounded, dense to very dense, medium brown, moist.	0	61	X	GH04-40-4	9/24/33	57	DRY HOLE.
50	15			30						
	16									
55	17			30	28	X	GH04-40-5	7/5/35	40	
60	18			25						
	19									
65	20			0	83	X	GH04-40-6	26/55/49	104	DRY HOLE - LOST 100% OF RETURN.
70	21		sandy GRAVEL - trace silt, isolated cobbles, well graded, rounded to subrounded, dense to very dense, light brown, moist.	20						
75	22									
	23			80	61	X	GH04-40-7	33/34/32	66	
80	24			40						



WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-40

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8		0

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-40**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**14 Jul 04**
Drilling Method:	**DDH**	Elevation:	**928.8 ft / 283.1m**	Date Completed:	**16 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**105 ft / 32.0m**	Logged by:	**CK/KA**
Coordinates:	**2,123,808 ft N , 1,386,101 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26			60	100		GH04-40-8	18/31/24	55	
90	27									
	28									
95	29			40	100		GH04-40-9	29/24/25	49	Tricone and extend HW casing to 105ft.
100	30									Lost 45ft HW casing in the hole.
	31									
105	32		HOLE ABANDONNED - REFER TO GH04-40A	0						
110	33									
	34									
115	35									
120	36									
	37									
125	38									
130	39									
	40									
135	41									
140	42									
	43									
145	44									
150	45									
	46									
155	47									
160	48									
	49									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

Drill Run Time (min) 10 20 30 40

55

WELL DETAILS

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Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-40

Knight Piésold CONSULTING

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-40A**	Page	**1** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**18 Jul 04**
Drilling Method:	**DDH**	Elevation:	**927.4 ft / 282.7m**	Date Completed:	**20 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**255 ft / 77.7m**	Logged by:	**CK/KA**
Coordinates:	**2,123,858 ft N , 1,386,142 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
			Refer to GH04-40 Overburden Log for the upper 105' of GH04-40A Drill Hole.								Triconed down to 105'. Drillhole advanced using HW casing and HQ2 core. WDS-120 drilling mud additive used.	

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-40A

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-40A**	Page	**2** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**18 Jul 04**
Drilling Method:	**DDH**	Elevation:	**927.4 ft / 282.7m**	Date Completed:	**20 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**255 ft / 77.7m**	Logged by:	**CK/KA**
Coordinates:	**2,123,858 ft N , 1,386,142 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26									
	27									
90	28									
95	29									
	30									
100	31									
105	32		GRAVEL and SAND - trace silt, trace cobbles, well graded, subrounded to subangular, dense, light brown, moist.		56		GH04-40A-1	19/19/40	59	
	33									
110	34			70						DELAY: Bit burnt out. Rods are pulled and reset.
115	35			90						
	36									
120	37									
125	38			30	28		GH04-40A-2	43/15/12	27	
	39									
130	40									
135	41			20	72		GH04-40A-3	24/28/35	63	
	42		silty SAND - trace clay, trace gravel, isolated cobbles, poorly graded, subrounded, dense to very dense, low plasticity, light brown, moist to wet.							Sanded in - pull rods, replace core bit- tricone and extend HW casing to 136ft.
140	43		silty GRAVEL - some sand, trace cobbles, well graded, subrounded, very dense, light brown, moist to wet.	25						
145	44		BEDROCK - Tertiary Andesite - dark grey to forrest green, highly weathered, fine grained, heavily oxidized, abundant hematite on joint surfaces, calcite veins, silty sand infill.	30						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)
	45									
150	46		RMR89 - 44.6, RQD - 27.1%, UCS - 53MPa (average/estimated values)							
155	47									
	48									
160	49									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-40A

Knight Piésold CONSULTING

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-40A**	Page	**3** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**18 Jul 04**
Drilling Method:	**DDH**	Elevation:	**927.4 ft / 282.7m**	Date Completed:	**20 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**255 ft / 77.7m**	Logged by:	**CK/KA**
Coordinates:	**2,123,858 ft N , 1,386,142 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-40A

Knight Piésold CONSULTING

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Project:	**Pebble Project**	Drill Hole No.	**GH04-40A**	Page	**4 of 4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**18 Jul 04**
Drilling Method:	**DDH**	Elevation:	**927.4 ft / 282.7m**	Date Completed:	**20 Jul 04**
Location:	**South Fork Koktuli River**	Total Depth:	**255 ft / 77.7m**	Logged by:	**CK/KA**
Coordinates:	**2,123,858 ft N , 1,386,142 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
250	76											
	77											
255	78		End of hole @255' (77.7m).									
260	79											
	80											
265	81											
	82											
270	83											
275	84											
	85											
280	86											
285	87											
	88											
290	89											
295	90											
	91											
300	92											
305	93											
	94											
310	95											
315	96											
	97											
320	98											
325	99											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-40A

Knight Piésold CONSULTING

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-42**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**5 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1066.5 ft / 325.1m**	Date Completed:	**6 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**150 ft / 45.7m**	Logged by:	**KA/RV**
Coordinates:	**2,135,111 ft N , 1,404,563 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			sandy GRAVEL- some silt, frequent cobbles, well graded, compact to dense, med. brown, dry to moist.							Triconed to 5ft. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
				100	83		GH04-42-1	19/33/40	73	
			gravelly SAND- frequent cobbles, trace silt, well graded, subrounded to angular, medium brown.	38	6		GH04-42-2	6/5/6	11	
			sandy GRAVEL- frequent cobbles, well graded, subangular to subrounded.	50	11		GH04-42-3	3/4/4	8	SPT - rock stuck in tube.
				90	53		GH04-42-4	11/20/30	50	SPT - rock stuck in tube.
				70						
				70	20		GH04-42-5	40+//	n/a	SPT - rock stuck in tube.
				33						Triconed from 38-45 in order to extend casing to this depth. No recovery for this interval.
					8		GHO4-42-6	45/50+/	n/a	SPT - encountered chunks of bedrock.
			BEDROCK - Mudstone - green to blue-grey, with brown and black sequences, cancite and pyrite veins, very fractured, initially highly weathered.	17						* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89).
			Fracture zone - 66' to 73'.							
			Basalt Dyke - 113' to 115' - black, fine grained, calcite filled vesicles.							
			UCS - 35.7 MPa, RQD - 17.1%, RMR89 - 42.3. (average/estimated values)							

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-42

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Project:	**Pebble Project**	Drill Hole No.	**GH04-42**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**5 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1066.5 ft / 325.1m**	Date Completed:	**6 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**150 ft / 45.7m**	Logged by:	**KA/RV**
Coordinates:	**2,135,111 ft N , 1,404,563 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46		END OF HOLE @ 150ft.									
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-43**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**11 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1122.9 ft / 342.3m**	Date Completed:	**12 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**110 ft / 33.5m**	Logged by:	**KA/JEM**
Coordinates:	**2,137,825 ft N , 1,405,221 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
			sandy GRAVEL - some silt, some organics, poorly graded, subangular to subrounded, reddish brown, moist to wet.								Triconed down 5ft. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.	
					22		GH04-43-1	5/5/6	11			
			BEDROCK - Dacite - light to medium grey with dark grey to black specks, fine grained becoming more coarse with depth, 2-5mm pockets of very fine powdery substance (no rxn with HCl), sandy-silt infill, magnetite staining on joint surfaces.	50	67		GH04-43-2	10/18/18	36		*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89)	
			Highly fractured zone healed with clay from 45' to 63'.									
			Fracture zone healed with clay @104-105'.									
			Possible open fault @ 106' - 110'.									
			UCS - 28.8 MPa, RQD - 7.4%, RMR89 - 40.7. (average/estimated values)									

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Northern Dynasty Mines Inc.
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Project:	**Pebble Project**	Drill Hole No.	**GH04-43**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**11 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1122.9 ft / 342.3m**	Date Completed:	**12 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**110 ft / 33.5m**	Logged by:	**KA/JEM**
Coordinates:	**2,137,825 ft N , 1,405,221 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34		END OF HOLE @ 110 ft.									
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

Northern Dynasty Mines Inc.
Pebble Project
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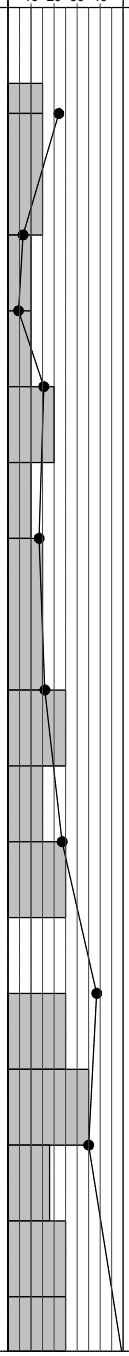
Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-44**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**7 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1100.1 ft / 335.3m**	Date Completed:	**9 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**165 ft / 50.3m**	Logged by:	**KA/RV**
Coordinates:	**2,138,681 ft N , 1,402,137 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
sandy GRAVEL- some silt, occasional cobbles, well graded, subangular to subrounded, med. brown, dry to moist.		50	GH04-44-1	20/50+/-	n/a	Triconed to 5'->no core sample. Drilling with WDS-120 drilling additive.
	75	83	GH04-44-2	14/24/20	44	SPT - hit boulder. SPT performed at 7' had no recovery.
	31	0	GH04-44-3	5/6/7	13	
	40	61	GH04-44-4	7/5/4	9	
silty GRAVEL and SAND - some clay, isolated cobbles, well graded, subangular to subrounded, dense, dark brown, moist.	70	17	GH04-44-5	7/16/15	31	
	0					
	50	56	GH04-44-6	13/13/14	27	
sandy GRAVEL- gravel content increasing with depth, sand content decreasing with depth, trace silt, isolated cobbles, well graded, rounded to subrounded, medium brown, moist.	55	72	GH04-44-7	15/17/37	32	
	60					
	20	61	GH04-44-8	14/23/24	47	
	30					No recovery-> Triconed to 65'-> Sanded in at 60'.
	0	44	GH04-44-9	38/37/39	77	
	35					
	60	17	GH04-44-10	32/38/30	70	No recovery.
	0					
	47	67	GH04-44-11	36/50+/-	n/a	SPT - hit boulder.



Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-44

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Rev. 0 - Issued for Report

GH04-44

SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-44**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**7 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1100.1 ft / 335.3m**	Date Completed:	**9 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**165 ft / 50.3m**	Logged by:	**KA/RV**
Coordinates:	**2,138,681 ft N , 1,402,137 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
90	28		GRAVEL and SAND - trace silt, isolated cobbles, poorly graded, rounded to subrounded, medium brown, moist.	0						
95	29			45	67		GH04-44-12	42/49/63	112	
	30									
100	31			40						
105	32			30	72		GH04-44-13	12/37/40	77	
	33									
110	34			50						
115	35			40	44		GH04-44-14	9/40+/-	n/a	
	36									
120	37			13						
125	38			55	72		GHO4-44-15	46/29/37	66	Drill time undisclosed due to problems. Night shift pulled rods to extend casing to 125'. Dayshift had to pull rods and found bit burnt out. Replaced the bit and went down once again. Had to wait for HQ tap and then replace rod. Trouble with pump-> no pressure in rods.
	39									
130	40			50						
135	41			60	56		GH04-44-16	27/29/30	59	
	42									
140	43			70						
145	44									No SPT
	45									
150	46			70						No SPT done at 155' due to frequency of cobbles & large gravel.
155	47			80						
	48									
160	49			60						
	50									
165	51		END OF HOLE @ 165 ft. Hole called at 165' due to difficulties in drilling.	60	0		GH04-44-17	8/50+/-	n/a	
170	52									
175	53									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-45**	Page	**1 of 1**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**10 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1122.5 ft / 342.1m**	Date Completed:	**11 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**40 ft / 12.2m**	Logged by:	**KA/RV**
Coordinates:	**2,139,335 ft N , 1,399,997 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			silty SAND- trace gravel, trace clay, poorly graded, subround to subangular, compact, medium to dark brown, moist.							Triconed to 5' and advanced HW casing with HQ2 core. WDS-120 drilling mud additive used.
					78		GH04-45-1	6/6/10	16	
			GRAVEL and SAND- some silt, frequent cobbles, well graded, subangular to subrounded, compact to dense, medium to dark brown, moist.	150	67		GH04-45-2	33/21/14	35	Casing fell into hole and needed to be fished out. Extended casing to 15ft.
			SAND- trace silt, some gravel, well graded, subangular to subround, compact, medium brown.	50	61		GH04-45-3	11/32/24	56	Cobbly substrate may effect SPT results.
			sandy GRAVEL- trace silt, frequent cobbles, well graded, subangular to subrounded, compact, medium brown, moist.	30	50		GH04-45-4	4/7/19	26	No SPT.
				80						
				40						
				40	22		GHO4-45-5	18/22/22	44	
			END OF HOLE @ 40 ft. REFER TO GH04-45A. Lost part of core barrel and bit in hole. Attempted to tricone past to no avail. End of GH04-45. Will return and redrill GH04-45A.	40						

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
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Project:	**Pebble Project**	Drill Hole No.	**GH04-45A**	Page	**1 of 3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**12 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1123.5 ft / 342.4m**	Date Completed:	**14 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**225 ft / 68.6m**	Logged by:	**KA/JEM**
Coordinates:	**2,139,335 ft N , 1,399,997 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Refer to GH04-45 for first 40 feet of overburden.							Triconed to 45'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
45	14		GRAVEL and SAND - trace silt, well graded, angular to subangular, light brown to light reddish brown, wet.							
55	17			20	56		GH04-45A-1	35/51/36	87	No SPT
60	19			50						
65	20		gravelly-SAND- some silt, frequent cobbles, well graded, subangular to subrounded, loose to compact with depth, light reddish brown, wet.	80	0		GH04-45A-2	20+//	n/a	SPT - hit a boulder.
70	21			30						
75	23			50	72		GH04-45A-3	4/16/26	42	
80	24			40						

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80; Drill Run Time (min) 10 20 30 40

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Project:	**Pebble Project**	Drill Hole No.	**GH04-45A**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**12 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1123.5 ft / 342.4m**	Date Completed:	**14 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**225 ft / 68.6m**	Logged by:	**KA/JEM**
Coordinates:	**2,139,335 ft N , 1,399,997 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
85	26		silty SAND- some gravel, round to subround, well graded, med. brown, moist compact to dense, frequent cobbles.	40	11		GH04-45A-4	15/17/22	39	Had to ream rods down last 40 feet.
	27			92						Had to ream rods back down once again.
90	28		sandy GRAVEL- some silt, frequent cobbles, well graded, moist, compact, silt is med. brown and sand is black.	38						
95	29			80	0		GH04-45A-5	20+//	n/a	SPT - hit a boulder.
	30									
100	31			60						
105	32		Encountered large chunks of weathered bedrock.	35						
	33									
110	34			120						
115	35		BEDROCK - DIORITE - medium grey with green irregular splotches throughout, medium grained, magnetite, chalcopyrite, pyrite and calcite pervasive, soft clay-like infilling, limonite staining on joint surfaces.	133						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89).
	36									
120	37		UCS - 70.0 MPa, RQD - 58.7%, RMR89 - 56.3. (average/estimated values)							
125	38									
	39									
130	40									
135	41									
	42									
140	43									
145	44									
	45									
150	46									
155	47									
	48									
160	49									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-45A**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**12 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1123.5 ft / 342.4m**	Date Completed:	**14 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**225 ft / 68.6m**	Logged by:	**KA/JEM**
Coordinates:	**2,139,335 ft N , 1,399,997 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54											
180												
	55											
	56											
185												
	57											
190												
	58											
	59											
195												
	60											
200												
	61											
	62											
205												
	63											
210												
	64											
	65											
215												
	66											
220												
	67											
	68											
225			END OF HOLE @ 225ft.									
	69											
230												
	70											
	71											
235												
	72											
240												
	73											
	74											
245												

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Project:	**Pebble Project**	Drill Hole No.	**GH04-46**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**14 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1143.8 ft / 348.6m**	Date Completed:	**15 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**135 ft / 41.1m**	Logged by:	**KA/JEM**
Coordinates:	**2,145,777 ft N , 1,406,716 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		silty SAND- trace gravel, subangular to angular, loose to compact with depth, med. brown to dark brown, moist.							Triconed to 5ft. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
5	2		sandy GRAVEL - some silt, subangular to angular, loose to compact with depth, med. brown to dark brown, moist. Frequent cobbles - increasing density with depth.		33		GH04-46-1	5/7/3	10	
				4	11		GH04-46-2	4/13/23	36	
10	3									
	4									
15	5			38						No SPT.
20	6		silty SAND and GRAVEL - frequent cobbles, well graded, subangular to subrounded, compact, medium brown, moist.	80						No SPT.
	7									
25	8		BEDROCK	50						* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89).
30	9		Dacite/Andesite (24' to 65') - medium to dark greenish grey, very fine grained rock, chlorite and calcite alterations, little to no veining.							
	10		Andesitic Mudstone (65' to 86') - greenish grey to dark green, oxidation, carbonate pockets.							
35	11		Andesite (86' to end of hole) - medium to dark green with white flecks, carbonate veins, soft sandy silt infilling in some joints.							
40	12									
	13		Tertiary Basalt Dykes (100-106' and 127-135') - dark grey.							
45	14		UCS - 80.2 MPa, RQD - 57.4%, RMR89 - 57.2. (average/estimated values)							
50	15									
	16									
55	17									
60	18									
	19									
65	20									
70	21									
	22									
75	23									
80	24									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-46**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**14 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1143.8 ft / 348.6m**	Date Completed:	**15 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**135 ft / 41.1m**	Logged by:	**KA/JEM**
Coordinates:	**2,145,777 ft N , 1,406,716 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41		END OF HOLE @135ft.									
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-47**	Page	**1** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**15 Aug 04**
Drilling Method:	**DDH**	Elevation:	**974.2 ft / 296.9m**	Date Completed:	**16 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**270 ft / 82.3m**	Logged by:	**KA/JEM**
Coordinates:	**2,147,359 ft N , 1,404,802 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1–2	sandy GRAVEL - some silt, shells and organic mat'l, well graded, angular to subrounded, primarily grey in colour, moist.		56	GH04-47-1	4/8/10	18	Triconed to 25ft. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
	3–4	silty, sandy GRAVEL - trace clay, shells and organic mat'l, some gravel, well graded, angular to subrounded, primarily grey in colour, wet.		33	GH04-47-2	1/1/1	2	
	5	SAND and GRAVEL - some silt, well graded, rounded to subrounded, loose, medium brown, moist.		78	GH04-47-3	8/15/9	24	
	6–7			111	GH04-47-4	1/2/2	4	
	8	SAND- some gravel, trace silt, occasional cobbles, well graded, rounded to subrounded, loose, medium brown, moist.		89	GH04-47-5	4/7/13	20	
	9–10	gravelly SAND- trace silt, occasional cobbles and boulders, well graded, subangular to subround, loose, medium brown, moist.	40					
	11–12	SILT and CLAY- trace sand, isolated cobbles, poorly graded, high plasticity, stiff to very stiff, visible layers in colouration, med. grey to light brown, moist to wet.	75 30	94	GH04-47-6	9/9/8	17	
	13–14		0	150	GH04-47-7	2/5/4	9	
	15–16							
	17	SILT- some clay, trace to some sand, poorly graded, stiff to very stiff, medium grey, moist.	0	144	GH04-47-8	3/5/7	12	
	18–19		40					
	20	As above - becoming reddish brown with 1-5mm clay lenses.	65	156	GH04-47-9	2/6/8	14	
	21–22							
	23–24	sandy, gravelly SILT - medium grained angular sand, some clay, frequent cobbles, poorly graded, angular to subrounded, hard, reddish-brown, moist.	55	67	GH04-47-10	18/46/50	96	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH04-47**	Page	**2** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**15 Aug 04**
Drilling Method:	**DDH**	Elevation:	**974.2 ft / 296.9m**	Date Completed:	**16 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**270 ft / 82.3m**	Logged by:	**KA/JEM**
Coordinates:	**2,147,359 ft N , 1,404,802 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
				81	0	☒	GH04-47-11	12/50+/-	n/a			
85	26			100							No SPT	
	27		SAND- medium grained, some silt, trace clay, trace gravel, occassional to frequent cobbles with depth, poorly graded, brown, moist.									
90	28			79								
95	29			50							Drill time unknown, had to change bit.	
	30			150								
100	31		BEDROCK - Latite or Dacite Pyroclastic Flow - white to pinkish red, some flow banding, with ferric oxide and manganese oxide staining along fracture surfaces, soft CaCO3 clay-like infilling.								* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89).	
105	32		UCS - 56.6 MPa, RQD - 44.1%, RMR89 - 48.3. (average/estimated values)									
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

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Project:	**Pebble Project**	Drill Hole No.	**GH04-47**	Page	**3** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**15 Aug 04**
Drilling Method:	**DDH**	Elevation:	**974.2 ft / 296.9m**	Date Completed:	**16 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**270 ft / 82.3m**	Logged by:	**KA/JEM**
Coordinates:	**2,147,359 ft N , 1,404,802 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170												
	52											
	53											
175												
	54											
180	55											
	56											
185												
	57											
190	58											
	59											
195												
	60											
200	61											
	62											
205												
	63											
210	64											
	65											
215												
	66											
220	67											
	68											
225												
	69											
230	70											
	71											
235												
	72											
240	73											
	74											
245												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-47

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH04-47

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SOILS LOG WITH DRILL TIME NEWDRILL.GPJ DRILL.GDT 22 Mar 05

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-47**	Page	**4 of 4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**15 Aug 04**
Drilling Method:	**DDH**	Elevation:	**974.2 ft / 296.9m**	Date Completed:	**16 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**270 ft / 82.3m**	Logged by:	**KA/JEM**
Coordinates:	**2,147,359 ft N , 1,404,802 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
250	76											
	77											
255	78											
	79											
260	80											
265	81											
	82											
270			End of hole @ 270 ft.									
	83											
275	84											
	85											
280	86											
285	87											
	88											
290	89											
295	90											
	91											
300	92											
305	93											
	94											
310	95											
315	96											
	97											
320	98											
325	99											

Northern Dynasty Mines Inc.
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-48**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1184.7 ft / 361.1m**	Date Completed:	**17 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**185 ft / 56.4m**	Logged by:	**JEM/DF**
Coordinates:	**2,147,095 ft N , 1,399,489 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND and GRAVEL - some silt (increasing with depth), occassional to frequent cobbles, well graded, subangular to subrounded, loose to compact with depth, reddish brown, dry to damp with depth.							Triconed to 25'. Drillhole advanced using HW casing with HQ2 core. WDS-120 drilling mud additive used.
					50		GH04-48-1	8/16/15	31	
					78		GHO4-48-2	13/16/21	37	
					83		GH04-48-3	10/14/17	31	
					67		GH04-48-4	18/24/24	48	
					50		GH04-48-5	16/22/20	42	
			Increasing cobble.	80						No SPT.
			5-10mm siltly clay lenses.	100	83		GH04-48-6	18/27/41	68	
				100						No SPT.
			gravelly, silty, SAND and CLAY - poorly graded, subangular, compact to very dense, reddish brown, damp.	90	83		GH04-48-7	11/50+/-	50+	SPT 7 - clay layer.
			SAND and GRAVEL - some silt, some clay, frequent cobbles, well graded, subangular to subrounded, compact, reddish brown, damp.	171						
				80						No SPT.
				100						
				80						
			BEDROCK - Granodiorite - lots of pyrite and carbonate minerals, yellow staining (oxidation) on fracture surfaces, initially highly weathered. UCS - 77.1MPa, RQD - 30.7%, RMR89 - 44.5. (average/estimated values)	200						* See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information (RMR89).

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 — Drill Run Time (min) 10 20 30 40

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH04-48

Knight Piésold CONSULTING

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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-48**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1184.7 ft / 361.1m**	Date Completed:	**17 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**185 ft / 56.4m**	Logged by:	**JEM/DF**
Coordinates:	**2,147,095 ft N , 1,399,489 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
85	26											
	27											
90	28											
95	29											
	30											
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											

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Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH04-48**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Aug 04**
Drilling Method:	**DDH**	Elevation:	**1184.7 ft / 361.1m**	Date Completed:	**17 Aug 04**
Location:	**Frying Pan Lake**	Total Depth:	**185 ft / 56.4m**	Logged by:	**JEM/DF**
Coordinates:	**2,147,095 ft N , 1,399,489 ft E (NAD 83, Alaska State Planes - Zone 5)**			Reviewed by:	**SM**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80 / Drill Run Time (min) 10 20 30 40	NOTES	WELL DETAILS
165												
	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245												

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Pebble Project
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Date Revised: 20 Jan 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-51**	Page	**1** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**20 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1001 ft / 305.1m**	Date Completed:	**26 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**445 ft / 135.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,165 N , 370,579 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND and GRAVEL, subrounded to subangular, brown, moist							Drillhole advanced using a Tricone 5' to install casing. EZ MUD kwik gel used. Groundwater depth measured on Sept. 22/05, 55.5'
			silty SAND, some gravel, well graded, subangular to subrounded, brown, moist.	3						
					61		GH05-51-1	39/50/60	110	SPT#1 Recovered-11"/18" Photo 100-1090
			SAND and GRAVEL, some silt, isolated cobbles, well graded, subagular to subrounded, brown, moist	5	56		GH05-51-2	30/52/36	88	SPT#2 Recovered 10"/18" Photo 100-1093
					33		GH05-51-3	5/11/28	39	SPT#3 Recovered 6"/18" Photo 100-1095
					78		GH05-51-4	32/40/46	86	SPT#4 Recovered 14"/18" Photo 100-1096
			Increasing silt content (silty)							
			gravelly SAND, trace silt, isolated cobbles, well graded, subangular, brown, moist		67		GH05-51-5	11/36/50	86	SPT#5 recovered 14"/18" Photo 100-1098
			Increasing sand, frequent boulders		61		GH05-51-6	4/29/39	68	SPT#6 recovered

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-51

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-51**	Page	**2** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**20 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1001 ft / 305.1m**	Date Completed:	**26 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**445 ft / 135.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,165 N , 370,579 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
100	31									11"/18" Photo 100-1099
105	32				33		GH05-51-7	70/-/-	70+	SPT#7 recovered 6"/18" Photo 100-1100 (Incomplete test)
110	33									
115	34				83		GH05-51-8	25/52/73	125	SPT#8 recovered 15"/18" Photo 100-1101
120	35									
125	36				83		GH05-51-9	9/16/26	42	SPT #9 recovered 15"/18" Photo 100-1103
130	37									
135	38				50		GH05-51-10	7/35/68	103	SPT #10 recovered 9"/18" Photo 100-1104
140	39									
145	40				56		GH05-51-11	21/44/50	94	SPT #11 recovered 10"/18" Photo 100-1105
150	41									
155	42		Increasing gravel and decreasing silt content		61		GH05-51-12	31/32/62	94	SPT #12 recovered 11"/18" Photo 100-1106
160	43									
165	44		SILT, some gravel, trace sand, isolated cobbles, poorly graded, grey, moist to wet.	2						
170	45									
175	46		Gravelly SAND, some silt, isolated cobbles, well graded, subangular, brown, moist.	40						
180	47									
185	48									
190	49									
195	50									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-51

Knight Piésold CONSULTING

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-51**	Page	**3** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**20 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1001 ft / 305.1m**	Date Completed:	**26 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**445 ft / 135.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,165 N , 370,579 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
			BEDROCK, Tertiary Andesite, dark grey-green	38							*See GEOTECHNICAL	

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-51**	Page	**4** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**20 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1001 ft / 305.1m**	Date Completed:	**26 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**445 ft / 135.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,165 N , 370,579 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
			to red, fine to medium grained, plagioclase phenocrysts, abundant clay minerals, gypsum veining, chlorite on joint surfaces, highly fractured, weak rock. RMR89 - 41.2, UCS - 18MPa, RQD - 45.9%. (average/estimated values)								BEDROCK DATA LOGGING SHEET for additional information	

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Pebble Project
Overburden Log For GH05-51

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Project:	**Pebble Project**	Drill Hole No.	**GH05-51**	Page	**5** of **5**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**20 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1001 ft / 305.1m**	Date Completed:	**26 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**445 ft / 135.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,165 N , 370,579 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
395	121											
400	122											
	123											
405	124											
410	125											
	126											
415	127											
420	128											
	129											
425	130											
430	131											
	132											
435	133											
440	134											
	135											
445	136		End of Hole at 445'									
450	137											
	138											
455	139											
460	140											
	141											
465	142											
470	143											
	144											
475	145											
480	146											
	147											
485	148											
490	149											

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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-52**	Page	**1** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**26 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1023 ft / 311.8m**	Date Completed:	**30 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**307 ft / 93.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,999 N , 370,766 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
		SAND and GRAVEL, some silt, well graded, subangular, dense, brown, moist						Groundwater depth measured on Sept 22, 2006, 105'
5	1							
	2							
10	3		87					
	4							
15	5	Decreasing fines content (trace silt)	87	72	GH05-52-1	27/18/17	35	SPT#1 Recovered-13"/18" Photo 100-1107
20	6		0					
	7							
25	8		73	78	GH05-52-2	26/23/15	48	SPT#2 Recovered-14"/18" Photo 100-1108
30	9		40					
	10							
35	11		63	50	GH05-52-3	20/33/30	63	SPT#3 Recovered-9"/14" Photo 100-1113, Hit Cobble
40	12	Decreasing fines content (some silt)						
	13							
45	14		45	56	GH05-52-4	25/36/24	60	SPT#4 Recovered-10"/18" Photo 100-1114
50	15							
	16							
55	17		50	28	GH05-52-5	15/14/14	28	SPT#5 Recovered-5"/18" Photo 100-1115
60	18		40					
	19							
65	20		40	61	GH05-52-6	36/34/27	61	SPT#6 Recovered-11"/18" Photo 100-1117
70	21	Decreasing fines content (trace silt)	40					
	22							
75	23		40	72	GH05-52-7	13/20/26	46	SPT#7 Recovered-13"/18" Photo 100-1118
80	24		40					
	25							
85	26		80	61	GH05-52-8	6/17/17	34	No recovery SPT#8 Recovered-11"/18" Photo 100-1119
90	27	Decreasing gravel and increasing fine (some silt)						
	28							
95	29	Decreasing fines content (trace silt)	40	72	GH05-52-9	37/48/36	84	SPT#9 Recovered-

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-52**	Page	**2** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**26 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1023 ft / 311.8m**	Date Completed:	**30 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**307 ft / 93.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,999 N , 370,766 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
100	31							13"/18" Photo 100-1120
105	32		30	100	GH05-52-10	38/56/60	116	SPT#10 Recovered- 14"/18" Photo 100-1121
110	33, 34							
115	35		50	83	GH05-52-11	35/61/-	61+	SPT#11 Recovered- 10"/12" Photo 100-1122, Hit Boulder
120	36, 37							
125	38		25	67	GH05-52-12	12/32/62	94	SPT#12 Recovered- 12"/18" Photo 100-1123
130	39, 40							
135	41		50	72	GH05-52-13	28/24/23	47	SPT#13 Recovered- 13"/18" Photo 100-1124
140	42, 43							
145	44		25					
150	45, 46							
155	47	Silty SAND and GRAVEL, isolated cobbles, well graded, subangular, rusty brown, moist	25	33	GH05-52-14	29/44/43	87	SPT#14 Recovered- 6"/18" Photo 100-1125, Hit Cobble
160	48, 49							
165	50			28	GH05-52-15	60/-/-	60+	SPT#15 Recovered- 5"/16" No Photo *See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information
170	51, 52	BEDROCK Y type rock, weathered, dark grey, fine grained, trace pyrite, limonite stains on joints, (UCS~5-150 Mpa), (RMR~25-70)	42					
175	53, 54							
180	55							
185	56, 57							
190	58							
195	59							

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
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Knight Piésold CONSULTING

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-52**	Page	**3** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**26 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1023 ft / 311.8m**	Date Completed:	**30 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**307 ft / 93.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,999 N , 370,766 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											

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Pebble Project
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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-52**	Page	**4** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**26 Aug 05**
Drilling Method:	**DDH**	Elevation:	**1023 ft / 311.8m**	Date Completed:	**30 Aug 05**
Location:	**Southwest Embankment**	Total Depth:	**307 ft / 93.6m**	Logged by:	**CK/BH**
Coordinates:	**6,635,999 N , 370,766 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
300	91											
	92											
305	93											
	94		End of Hole at 308'									
310	95											
315	96											
	97											
320	98											
325	99											
	100											
330	101											
335	102											
	103											
340	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											

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Date Revised: 24 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-54**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**31 Aug 05**
Drilling Method:	**DDH**	Elevation:	**2000 ft / 609.6m**	Date Completed:	**31 Aug 05**
Location:	**North Saddle**	Total Depth:	**125 ft / 38.1m**	Logged by:	**CK/BH**
Coordinates:	**6,639,209 N , 374,843 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
			Tricone and casing to Bedrock.								Groundwater depth measured on Sept 22, 2005, Dry Well'	
			BEDROCK Y type rock, dark grey, fine grained, clay infill, weathered joints, trace calcite nodules, (UCS~ 50-100 Mpa), (RMR~ 25-65)								*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information	

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Date Revised: 25 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-54**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**31 Aug 05**
Drilling Method:	**DDH**	Elevation:	**2000 ft / 609.6m**	Date Completed:	**31 Aug 05**
Location:	**North Saddle**	Total Depth:	**125 ft / 38.1m**	Logged by:	**CK/BH**
Coordinates:	**6,639,209 N , 374,843 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38		End of Hole at 125'									
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											

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Date Revised: 25 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-56**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**2 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1358 ft / 413.9m**	Date Completed:	**2 Sep 05**
Location:	**North Embankment**	Total Depth:	**145 ft / 44.2m**	Logged by:	**CK/BH**
Coordinates:	**6,639,448 N , 370,566 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND, some gravel, some clay, isolated cobbles, well graded, subangular, brown, moist							Groundwater depth measured on Sept 22, 2005, Dry Well
					0		GH05-56-1	7/6/4	10	SPT#1 Recovered- 0"/18" No Photo, Loose, back end of split tube blocked with gravel
				35	44		GH05-56-2	8/12/9	21	
			gravelly SAND, some clay, isolated cobbles, well graded, subangular, brown, moist	12						SPT#2 Recovered- 8"/18" Photo 100-1143
			BEDROCK Diorite/Granodiorite, light grey, quartz phenocrysts, weathered joints, limonite, clay infill, (UCS~25-100 Mpa), (RMR~ 25-65)							*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

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Pebble Project
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Date Revised: 25 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-56**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**2 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1358 ft / 413.9m**	Date Completed:	**2 Sep 05**
Location:	**North Embankment**	Total Depth:	**145 ft / 44.2m**	Logged by:	**CK/BH**
Coordinates:	**6,639,448 N , 370,566 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44		End of Hole at 145'									
	45											
150	46											
	47											
155	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
195	59											

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Pebble Project
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Date Revised: 25 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-57**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**3 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1408 ft / 429.2m**	Date Completed:	**4 Sep 05**
Location:	**Mill Site**	Total Depth:	**125 ft / 38.1m**	Logged by:	**CK/BH**
Coordinates:	**6,643,241 N , 369,743 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
	1		Silty SAND and GRAVEL, Tricone and casing to 10'								Groundwater depth measured on Sept 22, 2005, 10.5'	
5	2											
10	3		BEDROCK Granodiorite, (UCS~ 25-100 Mpa), (RMR~ 25-60)								*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information	
15	4											
20	5											
25	6											
30	7											
35	8											
40	9											
45	10											
50	11											
55	12											
60	13											
65	14											
70	15											
75	16											
80	17											
85	18											
90	19											
95	20											
	21											
	22											
	23											
	24											
	25											
	26											
	27											
	28											
	29											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-57

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-57**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**3 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1408 ft / 429.2m**	Date Completed:	**4 Sep 05**
Location:	**Mill Site**	Total Depth:	**125 ft / 38.1m**	Logged by:	**CK/BH**
Coordinates:	**6,643,241 N , 369,743 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38		End of Hole at 125'									
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-58**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**4 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1505 ft / 458.7m**	Date Completed:	**5 Sep 05**
Location:	**Mill Site**	Total Depth:	**155 ft / 47.2m**	Logged by:	**CK/BH**
Coordinates:	**6,642,044 N , 369,541 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND and GRAVEL, well graded, subrounded to subangular, rusty brown, moist Tricone and case top 20'							Groundwater depth measured on Sept 22, 2005, 17.5' Esker just west of site
20	6		silty SAND and GRAVEL, trace clay, well graded, subrounded to subangular, rusty brown, moist	0						Clay seam at 20-30', extremely weathered bedrock
25	8				67		GH05-58-1	16/34/38	72	SPT#1 Recovered-12"/18" Photo 100-1152
40	12		BEDROCK Y/G type rock, light grey, fine grained, competent bedrock at 38ft, (UCS~ 5-100 Mpa), (RMR~ 25-50)							*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-58**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**4 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1505 ft / 458.7m**	Date Completed:	**5 Sep 05**
Location:	**Mill Site**	Total Depth:	**155 ft / 47.2m**	Logged by:	**CK/BH**
Coordinates:	**6,642,044 N , 369,541 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47		End of Hole at 155'									
	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
195	59											

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-59**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**5 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1184 ft / 360.9m**	Date Completed:	**6 Sep 05**
Location:	**Crusher Site**	Total Depth:	**175 ft / 53.3m**	Logged by:	**CK/BH**
Coordinates:	**6,640,688 N , 370,671 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND and GRAVEL, some clay, isolated cobbles, well graded, subangular, rusty brown, moist.							Groundwater depth measured on Sept 22, 2005, 72'
					17		GH05-50-1	7/4/5	9	SPT#1 Recovered- 3"/18" Photo 100-1157
			Decreasing fines	21	50		GH05-50-2	6/7/11	18	SPT#2 Recovered- 9"/18" Photo 100-1158
				10	39		GH05-50-3	6/16/13	29	SPT#3 Recovered- 7"/18" Photo 100-1159
			Decreasing gravel	25	61		GH05-50-4	4/12/12	24	SPT#4 Recovered- 11"/18" Photo 100-1160
				45	0		GH05-50-5	6/10/11	21	SPT#5 Recovered- 0"/18" No Photo
			Decreasing sand		61		GH05-50-6	3/7/8	15	SPT#6 Recovered- 11"/18" Photo 100-1161
			BEDROCK Granodiorite, light grey, stained discolouration in quartz veins, heavy deposit of clay 76'-78', (UCS~ 25-100 Mpa), (RMR~ 25-50)	0 3						SPT#7 Recovered- ?"/18" No Photo, Hit Cobble or Boulder *See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH05-59**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**5 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1184 ft / 360.9m**	Date Completed:	**6 Sep 05**
Location:	**Crusher Site**	Total Depth:	**175 ft / 53.3m**	Logged by:	**CK/BH**
Coordinates:	**6,640,688 N , 370,671 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
	53											
175	54		End of Hole at 175'									
180	55											
	56											
185	57											
190	58											
195	59											

SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-59

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	6	0

GH05-59

Rev. 0 - Issued for Report

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-60**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**6 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1107 ft / 337.4m**	Date Completed:	**8 Sep 05**
Location:	**Crusher Site**	Total Depth:	**245 ft / 74.7m**	Logged by:	**CK/BH**
Coordinates:	**6,640,182 N , 371,125 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
TOPSOIL, silty SAND and GRAVEL, trace inclusions (roots), well graded, subangular, rusty brown, moist						Groundwater at surface on Sept 22, 2005
SAND and GRAVEL, some silt, trace clay, trace inclusions (roots), well graded, subangular, brown, moist	20	0	GH05-60-1	1/4/3	7	SPT#1 Recovered- 0"/18" No Photo, Sample fell out of tube
	15	0	GH05-60-2	2/4/4	8	SPT#2 Recovered- 0"/18" No Photo, Sample fell out of tube
	30	33	GH05-60-3	4/9/8	17	SPT#3 Recovered- 6"/18" Photo 100-1166
	25	44	GH05-60-4	6/13/20	33	SPT#4 Recovered- 8"/18" Photo 100-1167, Hit Cobble
	38	61	GH05-60-5	16/20/21	41	SPT#5 Recovered- 11"/18" Photo 100-1168, Hit Cobble
		61	GH05-60-6	18/26/27	53	SPT#6 Recovered- 11"/18" Photo 100-1169
Tricone and case to 75'		44	GH05-60-7	30/35/30	65	SPT#7 Recovered- 8"/14" Photo 100-1170, Hit Cobble/Boulder
		61	GH05-60-8	6/7/7	14	SPT#8 Recovered- 11"/18" Photo 100-1171
silty gravelly SAND, trace clay, subangular, brown, moist	42	78	GH05-60-9	12/18/23	41	SPT#9 Recovered- 14"/18" Photo 100-1172
BEDROCK Granodiorite, weathered, rusty brown/orange, (UCS~ 5-100 Mpa),(RMR~ 25-50)						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-60

Knight Piésold CONSULTING

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VA101-176/8	6	0

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-60**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**6 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1107 ft / 337.4m**	Date Completed:	**8 Sep 05**
Location:	**Crusher Site**	Total Depth:	**245 ft / 74.7m**	Logged by:	**CK/BH**
Coordinates:	**6,640,182 N , 371,125 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-60

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-60**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**6 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1107 ft / 337.4m**	Date Completed:	**8 Sep 05**
Location:	**Crusher Site**	Total Depth:	**245 ft / 74.7m**	Logged by:	**CK/BH**
Coordinates:	**6,640,182 N , 371,125 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75		End of Hole at 245'									
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											

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Pebble Project
Overburden Log For GH05-60

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-61**	Page	**1** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**8 Sep 05**
Drilling Method:	**DDH**	Elevation:	**976 ft / 297.5m**	Date Completed:	**10 Sep 05**
Location:	**North Embankment**	Total Depth:	**305 ft / 93.0m**	Logged by:	**CK/BH**
Coordinates:	**6,639,653 N , 371,651 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND (Topsoil), trace inclusions (roots), poorly graded, loose, dark brown, moist							Groundwater depth measured on Sept 22, 2005, 1.5'
5	1, 2		SILT and SAND, trace gravel, trace clay, poorly graded, dark grey, wet		39		GH05-61-1	1/2/2	4	No recovery SPT#1 Recovered- 7"/18" Photo 100-1177
10, 15	3, 4, 5		Trace gravel and isolated cobbles	0	22		GH05-61-2	4/4/5	9	SPT#2 Recovered- 4"/18" Photo 100-1178
20, 25	6, 7, 8				111		GH05-61-3	3/5/5	10	SPT#3 Recovered- 20"/18" Photo 100-1180
30, 35	9, 10, 11		Decreasing fines (silty), isolated cobbles, trace gravel	25	144		GH05-61-4	6/8/11	19	SPT#4 Recovered- 26"/18" Photo 100-1182
40, 45	12, 13, 14				117		GH05-61-5	41/33/50	83	No SPT due to cave in.
50, 55	15, 16, 17		SAND, trace gravel, trace silt, trace clay, occasional boulder, poorly graded, dense, light brown, moist	20						SPT#5 Recovered- 21"/18" Photo 100-1183
60, 65	18, 19, 20				94		GH05-61-6	11/23/19	42	SPT#6 Recovered- 17"/18" Photo 100-1184
70, 75	21, 22, 23		Silty SAND and GRAVEL, trace clay, frequent cobbles, well graded, subangular, light brown, moist		0		GH05-61-7	60/-/-	60+	SPT#7 Recovered- 0"/6" No Photo, Hit Boulder
80, 85	24, 25, 26			100	100		GH05-61-8	60/-/-	60+	SPT#8 Recovered- 6"/6" Photo 100-1185
90, 95	27, 28, 29			60	33		GH05-61-9	37/60/-	60+	SPT#9 Recovered-

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
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Overburden Log For GH05-61

Knight Piésold CONSULTING

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-61**	Page	**2** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**8 Sep 05**
Drilling Method:	**DDH**	Elevation:	**976 ft / 297.5m**	Date Completed:	**10 Sep 05**
Location:	**North Embankment**	Total Depth:	**305 ft / 93.0m**	Logged by:	**CK/BH**
Coordinates:	**6,639,653 N , 371,651 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
100	31							4"/12" Photo 100-1186, Hit Boulder
105	32		60					No recovery
	33			0	GH05-61-10	60/-/-	60+	SPT#10 Recovered- 0"/6" No Photo, Hit Boulder
110	34		0					No recovery
115	35							
	36							
120	37							
125	38			0	GH05-61-11	60/-/-	60+	
	39							SPT#11 Recovered- 0"/6" No Photo, Hit Boulder
130	40							
	41			133	GH05-61-12	10/18/20	38	
135		SAND, trace silt, poorly graded	8					SPT#12 Recovered- 24"/18" Photo 100-1187, 2' of cave in
140	42							
	43							
145	44		45	0	GH05-61-13	58/50/	50+	
	45							SPT#13 Recovered- 0"/6" No Photo, Hit Boulder
150	46							
155	47		40	67	GH05-61-14	60/-/-	60+	
	48							SPT#14 Recovered- 4"/6" Photo 100-1188, Hit Boulder
160	49							
165	50		60					
	51							
170	52							
175	53	Silty SAND, isolated cobbles, trace gravel, poorly graded, subangular to subrounded, loose, dark grey, moist	45	83	GH05-61-15	60/-/-	60+	
	54							SPT#15 Recovered- 5"/6" Photo 100-1189, Hit Boulder
180	55							
	56							
185	57	BEDROCK Granodiorite, clay filled joints, (UCS~5-35 Mpa), (RMR~ 40-55)	50	83	GH05-61-16	60/-/-	60+	*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information
190	58							SPT#16 Recovered- 5"/6" No Photo, Hit Boulder
195	59							

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-61**	Page	**3** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**8 Sep 05**
Drilling Method:	**DDH**	Elevation:	**976 ft / 297.5m**	Date Completed:	**10 Sep 05**
Location:	**North Embankment**	Total Depth:	**305 ft / 93.0m**	Logged by:	**CK/BH**
Coordinates:	**6,639,653 N , 371,651 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-61

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-61**	Page	**4** of **4**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**8 Sep 05**
Drilling Method:	**DDH**	Elevation:	**976 ft / 297.5m**	Date Completed:	**10 Sep 05**
Location:	**North Embankment**	Total Depth:	**305 ft / 93.0m**	Logged by:	**CK/BH**
Coordinates:	**6,639,653 N , 371,651 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
300	91											
	92											
305	93		End of Hole at 305'									
310	94											
	95											
315	96											
	97											
320	98											
325	99											
	100											
330	101											
335	102											
	103											
340	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											

Northern Dynasty Mines Inc.
Pebble Project
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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-62**	Page	**1** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**11 Sep 05**
Drilling Method:	**DDH**	Elevation:	**972 ft / 296.3m**	Date Completed:	**13 Sep 05**
Location:	**North Embankment**	Total Depth:	**245 ft / 74.7m**	Logged by:	**CK/BH**
Coordinates:	**6,639,566 N , 372,470 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			SAND, some silt, trace gravel, poorly graded, subangular, brown, moist.							Well was lost due to bridging to rods	
					39		GH05-62-1	7/6/34	40	SPT#1 Recovered- 7"/18" Photo 100-1194	
			gravelly SILT and SAND, well graded	15	67		GH05-62-2	8/9/13	22	SPT#2 Recovered- 12"/18" Photo 100-1195	
				20	100		GH05-62-3	8/14/19	33	SPT#3 Recovered- 18"/18" Photo 100-1196	
			sandy SILT, trace gravel, trace clay, , subangular, poorly graded, moist	27	0		GH05-62-4	9/11/22	33	No SPT, Boulder	
				50						SPT#4 Recovered- 18"/18" Photo 100-1197	
			SAND and GRAVEL, trace silt, occasional cobbles, well graded, subangular, chocolate brown, moist	50	83		GH05-62-5	40/60/-	60+	SPT#5 Recovered- 5"/6" Photo 100-1198, Hit Boulder	
				33							
					39		GH05-62-6	9/37/36	73	SPT#6 Recovered- 7"/18" Photo 100-1199, Likely hit cobble	
			Silty SAND and GRAVEL, occasional cobble, well graded, subangular, light brown, moist		0		GH05-62-7	30/60/	60+	SPT#7 Recovered- 0"/6" No Photo, Hit Boulder	
					0		GH05-62-8	40/60/-	60+	SPT#8 Recovered-	

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-62**	Page	**2** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**11 Sep 05**
Drilling Method:	**DDH**	Elevation:	**972 ft / 296.3m**	Date Completed:	**13 Sep 05**
Location:	**North Embankment**	Total Depth:	**245 ft / 74.7m**	Logged by:	**CK/BH**
Coordinates:	**6,639,566 N , 372,470 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31										0"/18" No Photo, Hit Boulder	
105	32		sandy, gravelly SILT, some clay, well graded, subangular, pinkish white, well graded, moist (Completely decomposed bedrock)	39								
110	33											
	34											
115	35				83	☒	GH05-62-9	21/60/-	60+	●		
120	36										SPT#9 Recovered-10"/12" Photo 100-1200, Hit Boulder	
	37											
125	38		BEDROCK Y unit, Pinkish white, completely decomposed bedrock, soft, silty, (UCS~5-50 Mpa), (RMR~25-60)								*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information	
130	39											
	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-62**	Page	**3** of **3**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**11 Sep 05**
Drilling Method:	**DDH**	Elevation:	**972 ft / 296.3m**	Date Completed:	**13 Sep 05**
Location:	**North Embankment**	Total Depth:	**245 ft / 74.7m**	Logged by:	**CK/BH**
Coordinates:	**6,639,566 N , 372,470 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75		End of Hole at 245'									
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-62

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-63**	Page	**1** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**13 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1041 ft / 317.3m**	Date Completed:	**14 Sep 05**
Location:	**North Embankment**	Total Depth:	**135 ft / 41.1m**	Logged by:	**LS/BH**
Coordinates:	**6,639,564 N , 373,025 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		SILT, some sand, trace gravel, trace organics, poorly graded, dark brown, moist							Groundwater was at surface on Sept 22, 2005
5	2		Clayey SAND, some gravel, well graded, subangular, brown, moist.	10						
10	3									
	4									
15	5				33		GH05-63-1	21/70/-	70+	SPT#1 Recovered- 6"/6" Photo 100-1205, Hit Boulder
20	6		BEDROCK Diorite, dark grey, quartz veins, rusty brown discolouration, (UCS~5-100 Mpa), (RMR~25-60)							*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information
25	7									
	8									
30	9									
	10									
35	11									
40	12									
	13									
45	14									
50	15									
	16									
55	17									
60	18									
	19									
65	20									
70	21									
	22									
75	23									
80	24									
	25									
85	26									
90	27									
	28									
95	29									

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-63

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	6	0

Rev. 0 - Issued for Report

GH05-63

SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 26 Oct 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-63**	Page	**2** of **2**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**13 Sep 05**
Drilling Method:	**DDH**	Elevation:	**1041 ft / 317.3m**	Date Completed:	**14 Sep 05**
Location:	**North Embankment**	Total Depth:	**135 ft / 41.1m**	Logged by:	**LS/BH**
Coordinates:	**6,639,564 N , 373,025 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41		End of Hole at 135'									
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-63

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	6	0

Rev. 0 - Issued for Report

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 26 Oct 05

Project: Pebble Project | Drill Hole No. GH05-64 | Page 1 of 2

Drilling Co: Quest America Drilling Inc. | In-Situ Sampler: SPT Split Spoon | Date Started: 14 Sep 05

Drilling Method: DDH | Elevation: 1020 ft / 310.9m | Date Completed: 15 Sep 05

Location: Topsoil Stockpile | Total Depth: 185 ft / 56.4m | Logged by: LS/BH

Coordinates: 6,640,869 N , 374,012 E | Azimuth,Inclination 0, -90 | Reviewed by: TT

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND, trace organics, well graded, subangular fragments, brown, moist.							
					28		GH05-64-1	8/5/7	12	SPT#1 Recovered- 5"/18" Photo 100-1210
					61		GH05-64-2	16/26/21	47	SPT#2 Recovered- 11"/18" Photo 100-1211, Pebble stuck in end
			SAND and GRAVEL, fine grained, well graded, brown, moist.	20	61		GH05-64-3	7/16/25	41	SPT#3 Recovered- 11"/18" Photo 100-1212
			CLAY and SILT, trace sand, poorly graded, brown, moist.	10	67		GH05-64-4	14/11/17	18	SPT#4 Recovered- 12"/18" Photo 100-1213, advanced 3" on last hit of 2nd 6"
			Silty SAND, trace gravel, well graded, subangular, brown, moist.	8	133		GH05-64-5	7/10/14	24	SPT#5 Recovered- 24"/18" Photo 100-1214
			BEDROCK Y rock type, fairly weathered, soft, rusty brown discolouration in joints, quartz veins, (UCS~5-100 Mpa), (RMR~25-65)	17						*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information

SPT TEST DATA Uncorrected 'N' values vs. depth 20 40 60 80

WELL DETAILS

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-64

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: 27 Nov 06

SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 27 Nov 06

Project: Pebble Project | Drill Hole No. GH05-64 | Page 2 of 2

Drilling Co: Quest America Drilling Inc. | In-Situ Sampler: SPT Split Spoon | Date Started: 14 Sep 05

Drilling Method: DDH | Elevation: 1020 ft / 310.9m | Date Completed: 15 Sep 05

Location: Topsoil Stockpile | Total Depth: 185 ft / 56.4m | Logged by: LS/BH

Coordinates: 6,640,869 N , 374,012 E | Azimuth,Inclination 0, -90 | Reviewed by: TT

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
100	31											
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
	56											
185	57		End of Hole at 185'									
190	58											
195	59											

SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 27 Nov 06

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-64

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: 27 Nov 06

Project:	**Pebble Project**	Drill Hole No.	**GH05-65**	Page	**1** of **6**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Sep 05**
Drilling Method:	**DDH**	Elevation:	**835 ft / 254.5m**	Date Completed:	**20 Sep 05**
Location:	**UT1.190**	Total Depth:	**495 ft / 150.9m**	Logged by:	**LS/BH**
Coordinates:	**6,631,402 N , 370,590 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			sandy, gravelly SILT, trace clay, subrounded, clasts up to cobble size, well graded, light brown, moist							Well was lost due to sand cavern	
5	1, 2				78	☒	GH05-65-1	7/7/14	21	SPT#1 Recovered-14"/18" Photo GH05-65 SPT#1	
10	3, 4										
15	5		Gravelly sandy SILT, some cobbles, subangular to subrounded clasts, gap-graded, light brown, moist.		3	☒	GH05-65-2	11/8/11	19	SPT#2 Recovered-0"/18" Photo GH05-65 SPT#2, Few Pebbles	
20	6, 7										
25	8		Increasing sand and gravel content		61	☒	GH05-65-3	4/16/27	43	SPT#3 Recovered-11"/18" Photo GH05-65 SPT#3	
30	9, 10										
35	11		Increasing silt content		50	☒	GH05-65-4	22/27/73	100	SPT#4 Recovered-9"/18" Photo GH05-65 SPT#4	
40	12, 13										
45	14		SILT and fine SAND, trace gravel, trace clay, poorly graded		89	☒	GH05-65-5	19/32/36	68	SPT#5 Recovered-16"/18" Photo GH05-65 SPT#5	
50	15, 16										
55	17		Some clay, very fine, absence of pebbles		89	☒	GH05-65-6	9/18/25	43	SPT#6 Recovered-16"/18" Photo GH05-65 SPT#6	
60	18, 19										
65	20		SILT, trace sand, trace clay, poorly graded		139	☒	GH05-65-7	5/8/16	24	Tricone to 105', Cased to 60' SPT#7 Recovered-25"/18" Photo GH05-65 SPT#7 & 7(2)	
70	21, 22										
75	23										
80	24, 25										
85	26										
90	27, 28										
95	29										

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-65

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**6**	**0**

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GH05-65

SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 3 Nov 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-65**	Page	**2** of **6**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Sep 05**
Drilling Method:	**DDH**	Elevation:	**835 ft / 254.5m**	Date Completed:	**20 Sep 05**
Location:	**UT1.190**	Total Depth:	**495 ft / 150.9m**	Logged by:	**LS/BH**
Coordinates:	**6,631,402 N , 370,590 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
100	31										
105	32		SAND, trace silt, trace gravel, poorly graded, subrounded clasts up to cobble size, light brown, moist.	0	100		GH05-65-8	14/28/25	53	SPT#8 Recovered-18"/18" Photo 100-1217	
110	33, 34										
115	35		SAND and GRAVEL, trace silt, well graded, subrounded to subangular, light brown, moist		61		GH05-65-9	45/30/13	43	SPT#9 Recovered-11"/18" Photo 100-1218	
120	36, 37										
125	38		Some clay		33		GH05-65-10	47/25/15	40	SPT#10 Recovered-6"/18" Photo 100-1219, Hit Cobble	
130	39, 40										
135	41		SILT, some clay, trace sand, trace gravel, subrounded to cobble size, poorly graded		111		GH05-65-11	27/54/60	114	SPT#11 Recovered-20"/18" Photo 100-1220	
140	42, 43										
145	44		SILT and SAND, trace clay, poorly graded, light brown, moist.		100		GH05-65-12	14/30/34	64	SPT#12 Recovered-18"/18" Photo 100-1221	
150	45, 46										
155	47		Increasing fines (clayey SILT)		133		GH05-65-13	16/20/26	46	SPT#13 Recovered-24"/18" Photo 100-1222	
160	48, 49										
165	50		gravelly SILT, some sand, trace clay, well graded, subangular to subrounded, light brown, moist.		78		GH05-65-14	27/60/	60+	SPT#14 Recovered-14"/18" Photo 100-1223	
170	51, 52										
175	53		SILT, some clay, trace sand, poorly graded		56		GH05-65-15	36/65/	65+	SPT#15 Recovered-10"/18" Photo 100-1224	
180	54, 55										
185	56				67		GH05-65-16	42/60/	60+	SPT#16 Recovered-12"/10" Photo 100-1225, Hit Cobble	
190	57, 58										
195	59										

SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-65

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	6	0

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GH05-65

SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 3 Nov 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-65**	Page	**3** of **6**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Sep 05**
Drilling Method:	**DDH**	Elevation:	**835 ft / 254.5m**	Date Completed:	**20 Sep 05**
Location:	**UT1.190**	Total Depth:	**495 ft / 150.9m**	Logged by:	**LS/BH**
Coordinates:	**6,631,402 N , 370,590 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
200	61		SAND, trace gravel, some silt, poorly graded, subangular, brown, moist									
	62											
205	63		Increasing fines									
210	64											
	65											
215	66										Tricone to 237', due to tight hole, sand heaved up 20' in rods, core tube sanded in core barrel, reaming shell replaced	
220	67											
	68											
225	69											
230	70											
	71											
235	72			0								
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81										Sand taken from cuttings and added to core box	
270	82											
	83											
275	84										Tricone to 340' after tube was sanded in twice more and rods pulled to free it each time.	
280	85											
	86											
285	87											
290	88											
	89											

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-65

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 3 Nov 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-65**	Page	**4** of **6**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Sep 05**
Drilling Method:	**DDH**	Elevation:	**835 ft / 254.5m**	Date Completed:	**20 Sep 05**
Location:	**UT1.190**	Total Depth:	**495 ft / 150.9m**	Logged by:	**LS/BH**
Coordinates:	**6,631,402 N , 370,590 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
300	91											
	92											
305	93											
	94											
310	95											
315	96											
	97											
320	98											
325	99											
	100											
330	101											
335	102											
	103											
340	104		Increasing fines	0								
345	105											
	106											
350	107											
355	108										Triconed to 395', Bedrock at 392'	
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119			0								

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-65

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 3 Nov 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-65**	Page	**5** of **6**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Sep 05**
Drilling Method:	**DDH**	Elevation:	**835 ft / 254.5m**	Date Completed:	**20 Sep 05**
Location:	**UT1.190**	Total Depth:	**495 ft / 150.9m**	Logged by:	**LS/BH**
Coordinates:	**6,631,402 N , 370,590 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
395			BEDROCK G type rock, quartz veins, competent rock, none weathered, (UCS~100 Mpa), (RMR~25-70)								*See GEOTECHNICAL BEDROCK DATA LOGGING SHEET for additional information	
	121											
400	122											
	123											
405	124											
410	125											
	126											
415	127											
420	128											
	129											
425	130											
430	131											
	132											
435	133											
440	134											
	135											
445	136											
450	137											
	138											
455	139											
460	140											
	141											
465	142											
470	143											
	144											
475	145											
	146											
480	147											
485	148											
	149											
490												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-65

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 3 Nov 05

Project:	**Pebble Project**	Drill Hole No.	**GH05-65**	Page	**6** of **6**
Drilling Co:	**Quest America Drilling Inc.**	In-Situ Sampler:	**SPT Split Spoon**	Date Started:	**16 Sep 05**
Drilling Method:	**DDH**	Elevation:	**835 ft / 254.5m**	Date Completed:	**20 Sep 05**
Location:	**UT1.190**	Total Depth:	**495 ft / 150.9m**	Logged by:	**LS/BH**
Coordinates:	**6,631,402 N , 370,590 E**	Azimuth,Inclination	**0, -90**	Reviewed by:	**TT**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) 20 40 60 80	NOTES	WELL DETAILS
495	151		End of Hole at 495'									
500	152											
	153											
505	154											
	155											
510	156											
515	157											
	158											
520	159											
525	160											
	161											
530	162											
535	163											
	164											
540	165											
545	166											
	167											
550	168											
555	169											
	170											
560	171											
565	172											
	173											
570	174											
575	175											
	176											
580	177											
	178											
585	179											
590												

Northern Dynasty Mines Inc.
Pebble Project
Overburden Log For GH05-65

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SOILS LOG WITH WELL DETAILS GH05-51.GPJ DRILL.GDT 5 Jun 06

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Date Revised: 3 Nov 05

Project:	**Pebble Project**	Drill Hole No.	**GH06-65**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 28, 06**
Drilling Method:	**DDH**	Elevation:	**1649 ft**	Date Completed:	**Aug 30, 06**
Location:	**Area G**	Total Depth:	**100 ft**	Logged by:	**DAY/MW**
Coordinates:	**2,149,020 N , 1,372,647 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Triconed							Triconed to 5'
5	1									
	2		SAND, fine to coarse grained, some silt, some fine gravel, dense, angular, well graded, dry to moist, brown	0 100	75		GH06-65-1	21/50/-	50+	Water level measured at 85' below ground surface Aug 31/06
10	3		WEATHERED BEDROCK, Highly weathered Sandstone?, dark green, coarse grained, silty sand infill, friable	94						***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	4									
15	5		BEDROCK, Rhyolite, slightly weathered, clastic, pinkish, coarse to fine grain, moderate to strong, some quartz, calcite veins	80						
20	6			100						*See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	7			100						
25	8									
				77						
30	9			66						
	10			37						
35	11			100 96						
				100						
40	12			94						
	13			13						
45	14			100						
50	15			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-65

Knight Piésold CONSULTING

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-65**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 28, 06**
Drilling Method:	**DDH**	Elevation:	**1649 ft**	Date Completed:	**Aug 30, 06**
Location:	**Area G**	Total Depth:	**100 ft**	Logged by:	**DAY/MW**
Coordinates:	**2,149,020 N , 1,372,647 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	16			94						
				98						
55	17			82						
	18									
60				100						
	19			98						
65	20			98						
	21			98						
70										
	22			98						
75	23			98						
	24									
80				100						
	25									
				98						
85	26			98						
	27			98						
90				98						
	28									
				99						
95	29			100						
	30									
100			END OF HOLE @100FT	100						
	31									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-65

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-66**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 25, 06**
Drilling Method:	**DDH**	Elevation:	**1565 ft**	Date Completed:	**Aug 26, 06**
Location:	**Area G**	Total Depth:	**88 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,163,510 N , 1,376,039 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND mixed with roots of tundra vegetation 0 - 3', brown, wet.							Casing installed to 6' No SPT's performed as bedrock was encountered at shallow depth.
5	1		WEATHERED/FRACTURED BEDROCK, Gabbro/Tertiary Basalt?, hematite on fractures, fine to coarse grained, dark grey, broken	25						
	2			98						
				98						Water level measured at 1' above ground surface Oct 16/06
10	3			98						
				99						
	4									
15				100						***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	5									
20	6			98						
	7			99						
25	8									
				98						
30	9		BEDROCK, Gabbro/Tertiary Basalt?, slightly weathered, fine to coarse grained, dark grey, competent	98						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	10			98						
35	11			98						
40	12			98						
	13			82						
45	14									
	15			98						
50										

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-66

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-66**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 25, 06**
Drilling Method:	**DDH**	Elevation:	**1565 ft**	Date Completed:	**Aug 26, 06**
Location:	**Area G**	Total Depth:	**88 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,163,510 N , 1,376,039 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
55	16			98							
	17			98							
60	18										
	19			98							
65	20										
	21			98							
70	22			98							
75	23										
	24			98							
80	25			98							
85	26										
	27		END OF HOLE @88FT	98							
90	28										
95	29										
	30										
100	31										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-66

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-67**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 22, 06**
Drilling Method:	**DDH**	Elevation:	**1482 ft**	Date Completed:	**Aug 24, 06**
Location:	**Area G**	Total Depth:	**123 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,163,945 N , 1,379,185 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Tundra Vegetation, organics							Drillhole advanced with HQ3 core, HW casing until 35 ft
	1		gravelly SAND							
5	2		SAND and GRAVEL, isolated cobbles	0						Water level measured at 11' below ground surface Aug 31/06
10	3		Silty SAND, some gravel, poorly graded, subangular, brown, moist	25 98	70		GH06-67-1	36/44/46	50+	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	4			50 17						
15	5			98	98		GH06-67-2	50/-/-	50+	
20	6		WEATHERED BEDROCK, Tertiary basalt, highly weathered, soil like, very broken, iron oxides, gouge	25 82						
25	7									
	8		BEDROCK, moderately weathered Tertiary basalt, fine grained, broken, iron oxides, brown	60 67						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
30	9									
	10			50						
35	11			83						
				100						
40	12									
	13			100						
45	14			75 10						
				100						
50	15									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-67

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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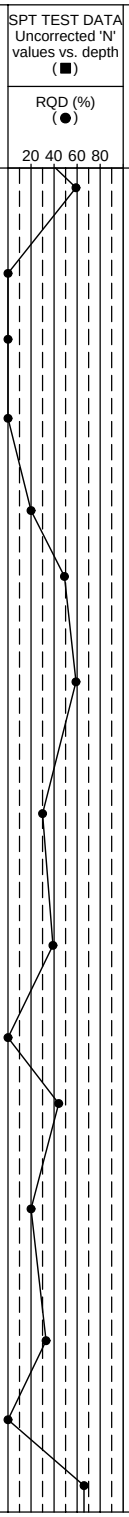
Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-67**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 22, 06**
Drilling Method:	**DDH**	Elevation:	**1482 ft**	Date Completed:	**Aug 24, 06**
Location:	**Area G**	Total Depth:	**123 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,163,945 N , 1,379,185 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	16			80							
				80							
55	17										
				38							
	18			0							
60											
	19			100							
65	20			100							
	21			100							
70											
	22			100							
75	23										
	24			100							
80											
	25			100							
85	26			100							
	27			100							
90											
	28			100							
95	29										
	30			100							
100				98							
	31										



Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-67

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-67**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 22, 06**
Drilling Method:	**DDH**	Elevation:	**1482 ft**	Date Completed:	**Aug 24, 06**
Location:	**Area G**	Total Depth:	**123 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,163,945 N , 1,379,185 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
105	32			100							
				100							
	33			100							
110				100							
	34										
				100							
115	35										
				100							
	36			100							
120											
	37			100							
			END OF HOLE @123FT	100							
125	38										
	39										
130											
	40										
	41										
135											
	42										
140											
	43										
	44										
145											
	45										
150											
	46										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-67

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-68**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 20, 06**
Drilling Method:	**DDH**	Elevation:	**1214 ft**	Date Completed:	**Aug 22, 06**
Location:	**Area G**	Total Depth:	**119 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,162,370 N , 1,380,641 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			PEAT, silty clay, very soft, contains roots, brown.							Water level measured at 0.25' below ground surface Oct 16/06
			Gravelly SAND, some silt, subangular, loose to compact, poorly graded, grey, wet	20	33		GH06-68-1	4/9/15	24	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
			WEATHERED BEDROCK, Gabbro, fine grained, grey-green, broken, weathered, clay seam at 16-16.5'	60 98						
			BEDROCK, Gabbro, grey, fine-grained, highly fractured, weathered, clay seams, becomes less weathered at 38', calcite veins, becomes more competent with depth	100 80 100 100 98 100 98 100 100 75 24						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-68

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-68**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 20, 06**
Drilling Method:	**DDH**	Elevation:	**1214 ft**	Date Completed:	**Aug 22, 06**
Location:	**Area G**	Total Depth:	**119 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,162,370 N , 1,380,641 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
55	16–17			100						
60	17–18			100						
65	18–19			100						
70	19–20			90						
75	20–21			100						
80	21–22			100						
85	22–23			100						
90	23–24			100						
95	24–25			100						
100	25–26			100						
	26–27									
	27–28									
	28–29									
	29–30									
	30–31									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-68

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-68**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 20, 06**
Drilling Method:	**DDH**	Elevation:	**1214 ft**	Date Completed:	**Aug 22, 06**
Location:	**Area G**	Total Depth:	**119 ft**	Logged by:	**DAY/BH**
Coordinates:	**2,162,370 N , 1,380,641 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
105	32			100						
	33									
110				100						
	34									
115	35			100						
	36									
120			END OF HOLE @119FT	100						
	37									
125	38									
	39									
130	40									
135	41									
	42									
140	43									
145	44									
	45									
150	46									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-68

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-69**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 26, 06**
Drilling Method:	**DDH**	Elevation:	**1497 ft**	Date Completed:	**Aug 27, 06**
Location:	**Area G**	Total Depth:	**159.5 ft**	Logged by:	**DAY/MW**
Coordinates:	**2,160,944 N , 1,384,085 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND, fine grained, subrounded, contains roots, brown, saturated							Casing set to 4'
	1		SAND, trace gravel, saturated, poorly graded							Water level measured at 1.5' above ground surface Aug 31/06
5			SAND and GRAVEL	40						
	2			28						
10	3		Silty SAND, trace gravel, medium grained, subrounded, compact, grey, wet to damp	49	83		GH06-69-1	15/14/14	28	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	4		SAND and SILT/CLAY, varying amounts of clay, trace gravel, subrounded, dense to compact, damp, grey-yellow	71						
15	5				100		GH06-69-2	8/16/17	33	
20	6			75	72		GH06-69-3	12/13/18	31	
	7									
25	8			18	100		GH06-69-4	2/6/8	14	
				39						
	9			61						
30			WEATHERED BEDROCK, highly to completely weathered, coarse grained Gabbro, grey yellow, damp to wet, iron oxide staining.	100						
	10			76						
				94						
35	11									
	12			0						
40										
	13			78						
45	14			100						
				98						
				98						
				100						
	15									
50			BEDROCK, moderately weathered, coarse	100						* See GEOTECHNICAL

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-69

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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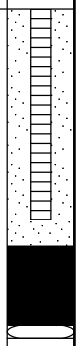
Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-69**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 26, 06**
Drilling Method:	**DDH**	Elevation:	**1497 ft**	Date Completed:	**Aug 27, 06**
Location:	**Area G**	Total Depth:	**159.5 ft**	Logged by:	**DAY/MW**
Coordinates:	**2,160,944 N , 1,384,085 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	16		grained Gabbro, highly fractured, iron oxide staining, grey to brown							BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
55	17			100						
60	18			100						
	19			99						
65	20			99						
70	21			50						
	22			28						
75	23			100						
	24									
80	25			100						
85	26			100						
	27			100						
90	28									
95	29			100						
100	30			100						
	31									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS



Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-69

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-69**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 26, 06**
Drilling Method:	**DDH**	Elevation:	**1497 ft**	Date Completed:	**Aug 27, 06**
Location:	**Area G**	Total Depth:	**159.5 ft**	Logged by:	**DAY/MW**
Coordinates:	**2,160,944 N , 1,384,085 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
105	32			100							
	33										
110				100							
	34										
115	35			100							
	36										
120				100							
	37										
125	38			100							
	39										
130				100							
	40										
135	41			100							
	42										
140				100							
	43										
145	44			100							
	45										
150				100							
	46										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-69

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-13

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-69**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 26, 06**
Drilling Method:	**DDH**	Elevation:	**1497 ft**	Date Completed:	**Aug 27, 06**
Location:	**Area G**	Total Depth:	**159.5 ft**	Logged by:	**DAY/MW**
Coordinates:	**2,160,944 N , 1,384,085 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
155	47			100								
	48											
160			END OF HOLE @159.5FT	100								
	49											
	50											
165												
	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-69

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-14

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-70**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 31, 06**
Drilling Method:	**DDH**	Elevation:	**1109 ft**	Date Completed:	**Sep 2, 06**
Location:	**Area A Northeast Abutment**	Total Depth:	**139.8 ft**	Logged by:	**DAY/LS/MW**
Coordinates:	**2,147,906 N , 1,400,211 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Silty SAND and GRAVEL, subangular to subrounded, up to cobble size, well graded, light brown, dense, moist							NOTE: **Flowing Conditions.
5	1			10	56		GH06-70-1	2/13/26	39	Water levels measured at 2.25' above ground surface and flowing Sep 28/06
	2			33						
10	3		Gravelly SILT, clasts up to boulder size, subrounded, light brown, compact, moist, gap graded	9	0		GH06-70-2	2/4/10	14	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	4		Silty SAND and GRAVEL, fine to coarse grained, subangular to subrounded, well graded, moist, brown, compact to very dense, some layers of increasing and decreasing silt content	33						
15	5			41	33		GH06-70-3	10/12/23	35	
20	6			70	42		GH06-70-4	13/25/28	50+	
	7									
25	8			27	22		GH06-70-5	25/29/20	49	
				50						
30	9			20	58		GH06-70-6	14/21/14	35	
	10			17						
35	11			25	44		GH06-70-7	15/14/16	30	
				40						
				100						
40	12			25	28		GH06-70-8	19/16/41	50+	
	13			25						
				22						
45	14			91	83		GH06-70-9	6/10/11	21	
50	15			30	89		GH06-70-10	10/15/25	40	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)

RQD (%) (●)

20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-70

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-15

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-70**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 31, 06**
Drilling Method:	**DDH**	Elevation:	**1109 ft**	Date Completed:	**Sep 2, 06**
Location:	**Area A Northeast Abutment**	Total Depth:	**139.8 ft**	Logged by:	**DAY/LS/MW**
Coordinates:	**2,147,906 N , 1,400,211 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	16			33						
55	17			100 57						
	18									
60				99	94		GH06-70-11	18/35/61	50+	
	19			33						
65	20			70						
			No recovery	23						
	21									
70			Silty SAND and GRAVEL, fine to coarse grained, subangular to subrounded, well graded, moist, brown, very dense, some layers of increasing and decreasing silt content	0	100		GH06-70-12	15/21/31	50+	
	22									
75	23		GRAVEL, fine to coarse grained, subrounded to subangular	5						
	24		WEATHERED BEDROCK, completely to highly weathered angular fragments of Granodiorite, clay infilling fractures, some hematite and limonite staining, some pyrite.	17						
80				100						
	25									
				9						
85	26			100						
	27			17 60						
90			BEDROCK, highly to moderately weathered Granodiorite, fine grained grey rock, pyrite, chlorite, hematite, and clay gouges throughout	66 0						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	28			12						
95	29			18 62						
	30			100						
100				53						
	31			93						

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-70

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-16

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-70**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Aug 31, 06**
Drilling Method:	**DDH**	Elevation:	**1109 ft**	Date Completed:	**Sep 2, 06**
Location:	**Area A Northeast Abutment**	Total Depth:	**139.8 ft**	Logged by:	**DAY/LS/MW**
Coordinates:	**2,147,906 N , 1,400,211 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE (SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80)	NOTES	WELL DETAILS
105	32			100							
				100							
	33			100							
110				22							
	34										
				82							
115	35										
	36			11							
120				59							
	37			86							
				100							
				33							
125	38			41							
				80							
	39			33							
130				96							
	40										
	41			3							
135				100							
				66							
	42			100							
				100							
140			END OF HOLE @139.8FT	96						Too difficult to continue drilling without grouting	
	43										
	44										
145											
	45										
150	46										

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-70

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-17

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-71**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 5, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 6, 06**
Location:	**Area A North Embankment**	Total Depth:	**90 ft**	Logged by:	**LS/MW**
Coordinates:	**2,147,080 N , 1,401,484 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
			PEAT, boulders, fines washed away, subangular to subrounded								NOTE: **Flowing Conditions, ~20gpm.	
5	1		Silty SAND and GRAVEL, subrounded, clasts up to pebble size, light brown, compact to dense, moist, well graded	25	78	☒	GH06-71-1	14/17/23	40		No piezometer installed.	
	2			33								
10	3			13	61	☒	GH06-71-2	8/7/15	22		***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***	
	4											
15	5			9	33	☒	GH06-71-3	5/9/8	17			
				16								
20	6		SAND and GRAVEL, fine to coarse grained, well graded, subangular to subrounded, moist, brown, compact to very dense	14	72	☒	GH06-71-4	24/43/-	50+			
	7											
25	8			33	50	☒	GH06-71-5	27/50/36	50+			
				47								
30	9			37	22	☒	GH06-71-6	23/50/-	50+			
	10											
35	11			22	11	☒	GH06-71-7	6/6/16	22			
			Sandy SILT, trace fine to coarse gravel, poorly graded, subrounded to subangular, moist to wet, brown, compact	20								
				24								
40	12			50	67	☒	GH06-71-8	6/5/6	11			
	13											
45	14			30	50	☒	GH06-71-9	6/6/10	16			
				20								
50	15			55								

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-18

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-71**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 5, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 6, 06**
Location:	**Area A North Embankment**	Total Depth:	**90 ft**	Logged by:	**LS/MW**
Coordinates:	**2,147,080 N , 1,401,484 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
55	16–17			10	39		GH06-71-10	5/8/12	20		
60	18–19			5	0		GH06-71-11	7/8/9	17		
65	20		Silty, clayey GRAVEL, clasts up to pebble size, subrounded, light grey, dense to very dense, moist	3	0		GH06-71-12	5/8/24	32		
70	21–22			7 33 98	39		GH06-71-13	50/-/-	50+		
75	23–24			27							
80	25			93	39		GH06-71-14	11/50/-	50+		
85	26–27		Sand seam present at 89'	55 62 36 43						Flowing conditions encountered (20 gpm), casing was advanced and hole was capped, no monitoring well was installed.	
90	28		END OF HOLE @90FT	49							
95	29										
100	30–31										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-19

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-71A**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 7, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 10, 06**
Location:	**Area A North Embankment**	Total Depth:	**206 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,087 N , 1,401,454 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
			Triconed to below depth of GH06-71 No Recovery								Cemented in casing until 50'. Hit flowing conditions at 90', similar to GH06-71.	
5	1											
10	2											
15	3											
20	4											
25	5											
30	6											
35	7											
40	8											
45	9											
50	10											
	11											
	12											
	13											
	14											
	15											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-20

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-71A**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 7, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 10, 06**
Location:	**Area A North Embankment**	Total Depth:	**206 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,087 N , 1,401,454 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	16											
55	17											
	18											
60	19											
65	20											
	21											
70	22											
75	23											
	24											
80	25											
85	26											
	27											
90	28		Silty, clayey GRAVEL, clasts up to pebble size, subrounded, light grey, moist, no recovery, based on drill cuttings and observations of flowing conditions and GH06-71.	0							Water level measured at 1.4' above ground surface, flowing Sep 5/06	
95	29										***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***	
	30											
100	31		BEDROCK, Granodiorite, highly weathered,								* See GEOTECHNICAL	

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-21

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-71A**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 7, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 10, 06**
Location:	**Area A North Embankment**	Total Depth:	**206 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,087 N , 1,401,454 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			fractured from 100.5' to 105.5' with hematite and limonite alteration. More competent starting at 105.5', light grey, clay in fractures, some pyrite.							BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
105	32			50							
	33										
110				100							
	34										
115	35			95							
	36										
120	37			100							
125	38			100							
	39			100							
130	40			63							
135	41			98							
	42										
140	43			22							
145	44			47							
	45										
150	46			90							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-22

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-71A**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 7, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 10, 06**
Location:	**Area A North Embankment**	Total Depth:	**206 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,087 N , 1,401,454 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
155	47			64							
	48			100							
160	49			63							
				105							
	50										
165				43							
	51										
				100							
170	52			68							
	53			100							
175											
	54			100							
180	55			92							
				58							
	56										
185				0							
	57			10							
190	58			80							
	59										
195				73							
	60										
200	61			89							
	62										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-23

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-71A**	Page	**5** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 7, 06**
Drilling Method:	**DDH**	Elevation:	**1011 ft**	Date Completed:	**Sep 10, 06**
Location:	**Area A North Embankment**	Total Depth:	**206 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,087 N , 1,401,454 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
205												
	63		END OF HOLE @206FT	100								
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-71A

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-24

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-72**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 11, 06**
Drilling Method:	**DDH**	Elevation:	**967 ft**	Date Completed:	**Sep 16, 06**
Location:	**Area A North Embankment**	Total Depth:	**215 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,129 N , 1,403,789 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
		PEAT, organic material						NOTE: **Flowing Conditions, ~3gpm
5	1, 2			100	GH06-72-1	1/-/-	0	
10	3, 4	Silty SAND, some clay, very fine sand, light brown to dark brown, poorly graded, loose, moist	5	72	GH06-72-2	5/2/2	4	Triconed from 5' to 10', description based on SPT sample.
15	5	Silty GRAVEL, some clay, subrounded clasts up to cobble size, isolated boulders, well graded, light brown, dense, moist to wet	18	100	SHELBY-1	//		Water level measured at 1.7' above ground surface and flowing Sep 28/06
20	6		15	61	GH06-72-3	7/21/26	47	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	7		22					
25	8	Silty SAND, poorly graded, no clasts, compact, light brown, moist, small subrounded gravel clasts with depth	99	122	GH06-72-4	3/4/8	12	
30	9	SILT and SAND, some clay, trace gravel, gap graded, light grey, moist, up to gravel size clasts, loose to compact, subrounded	66	94	GH06-72-5	2/4/5	9	
	10		16					
35	11		13 100	89	GH06-72-6	7/14/17	31	
40	12	SILT and SAND, trace clay, poorly graded to gap graded, some gravel, small number of clasts, up to boulder size, light brown, compact to very dense, moist	85	117	GH06-72-7	3/5/9	14	
	13							
45	14		54	28	GH06-72-8	8/14/19	33	
50	15		30	28	GH06-72-9	32/50+/-	50+	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-72

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-25

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-72**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 11, 06**
Drilling Method:	**DDH**	Elevation:	**967 ft**	Date Completed:	**Sep 16, 06**
Location:	**Area A North Embankment**	Total Depth:	**215 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,129 N , 1,403,789 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
55	16, 17		58					
60	18, 19	SAND and GRAVEL, some silt/clay, fine to coarse grained, well graded, occasional cobbles, greyish brown, dense to very dense	25	56	GH06-72-10	19/18/17	35	Between 65 - 75', driller noted flow confined by silts and clays, low flow
65	20		25					
	21		61					
70	22		46	53	GH06-72-11	21/20/29	49	
			42					
75	23		64	61	GH06-72-12	9/16/50+	50+	
	24		24					
80	25	Silty GRAVEL, some clay, some sand, well graded, clasts up to cobble size, subrounded	15 25					
85	26	SILT and CLAY, some sand, poorly graded, light brown, moist, no clasts, very stiff	87	111	GH06-72-13	9/23/38	50+	
	27							
90	28	SAND and GRAVEL, well graded, some silt/clay, clasts up to boulder size, subrounded, light brown, moist, very dense	52					
95	29		20	39	GH06-72-14	31/25/47	50+	
	30							
100	31		37					

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-72

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-26

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-72**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 11, 06**
Drilling Method:	**DDH**	Elevation:	**967 ft**	Date Completed:	**Sep 16, 06**
Location:	**Area A North Embankment**	Total Depth:	**215 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,129 N , 1,403,789 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
				39							
105	32			54							
	33		WEATHERED BEDROCK, yellow-brown, silt/clay, some gravel, poorly graded, clasts up to cobble size, subangular	20							
110	34			63							
				41							
115	35		BEDROCK, Rhyolite, highly weathered, highly fractured, cream to white, dendritic pyrolusite, hematite	64 89						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	36										
120	37			85							
125	38			100							
	39										
130	40			100							
135	41			84							
	42			93							
140	43			92							
145	44										
	45			72							
150	46			93							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-72

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-27

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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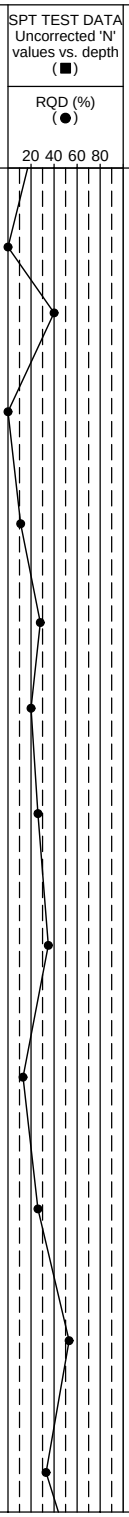
Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-72**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 11, 06**
Drilling Method:	**DDH**	Elevation:	**967 ft**	Date Completed:	**Sep 16, 06**
Location:	**Area A North Embankment**	Total Depth:	**215 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,129 N , 1,403,789 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
155	47			73							
	48			62							
160	49			100							
	50										
165	51			60							
				66							
170	52										
	53			56							
175	54			90							
180	55			79							
	56										
185	57			92							
190	58			95							
	59										
195	60			98							
200	61			100							
	62										



Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-72

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-28

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-72**	Page	**5** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 11, 06**
Drilling Method:	**DDH**	Elevation:	**967 ft**	Date Completed:	**Sep 16, 06**
Location:	**Area A North Embankment**	Total Depth:	**215 ft**	Logged by:	**MW/LS**
Coordinates:	**2,147,129 N , 1,403,789 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
205	63			92								
210	64			100								
	65											
215			END OF HOLE @215FT	96								
	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-72

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-29

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-73**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 16, 06**
Drilling Method:	**DDH**	Elevation:	**1007 ft**	Date Completed:	**Sep 19, 06**
Location:	**Area A North Embankment**	Total Depth:	**158.5 ft**	Logged by:	**MW/LS**
Coordinates:	**2,146,876 N , 1,406,063 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			Tundra vegetation, roots, organic soils, dark brown, silty sandy GRAVEL, clasts up to boulder size, subrounded							Triconed to 5'	
5	1		Sandy GRAVEL, trace silt, trace clay, well graded, clasts up to boulder size, subrounded, light brown, dense to very dense, moist	0	61	X	GH06-73-1	11/21/38	50+	NOTE: **Artesian Conditions encountered at 115' with flow increasing to 65 gpm at 130', not possible to drill any further, had to cap hole, no piezometer was installed	
10	2			24	33	X	GH06-73-2	12/18/34	50+		
15	3			15	44	X	GH06-73-3	6/14/23	37	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***	
20	4			34							
25	5		SAND and GRAVEL, trace silt, trace clay, fine to coarse grained, subangular to subrounded, moist to wet, light brown, compact to very dense	38	89	X	GH06-73-4	8/36/21	50+		
30	6			24	56	X	GH06-73-5	16/7/14	21		
35	7			25	72	X	GH06-73-6	16/24/27	50+		
40	8			34 66 33 22	56	X	GH06-73-7	9/32/50	50+		
45	9			26	78	X	GH06-73-8	34/43/18	50+		
50	10			6 33	83	X	GH06-73-9	41/50/-	50+		
	11		Silty, gravelly SAND, some clay, subangular to subrounded, poorly graded, very dense, moist, brown to purplish grey	23 52							
	12			22	81	X	GH06-73-10	20/34/33	50+		
	13										
	14										
	15										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-73

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-30

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-73**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 16, 06**
Drilling Method:	**DDH**	Elevation:	**1007 ft**	Date Completed:	**Sep 19, 06**
Location:	**Area A North Embankment**	Total Depth:	**158.5 ft**	Logged by:	**MW/LS**
Coordinates:	**2,146,876 N , 1,406,063 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	16			20							
				30							
55	17			69							
				30							
	18										
60				34	0		GH06-73-11	9/37/50	50+		
	19										
65	20		GRAVEL, some sand, trace silt/clay, gap graded, light brown, moist, clasts up to large cobbles, subrounded	17							
	21										
70				17	17		GH06-73-12	50/-/-	50+		
	22										
75	23		BEDROCK, Tertiary Dacite, fine grained, light coloured, hematite, limonite	66						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	24										
80				84							
	25										
85	26			91							
	27										
90				66							
	28										
				100							
95	29			100							
	30										
100				95							
	31										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-73

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-31

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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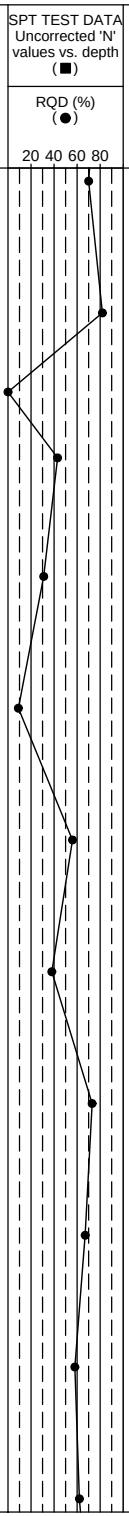
Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-73**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 16, 06**
Drilling Method:	**DDH**	Elevation:	**1007 ft**	Date Completed:	**Sep 19, 06**
Location:	**Area A North Embankment**	Total Depth:	**158.5 ft**	Logged by:	**MW/LS**
Coordinates:	**2,146,876 N , 1,406,063 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
105	32			100							
	33										
110				100							
	34			36							
115	35			94							
	36										
120	37			95							
125	38			69							
	39										
130	40			100							
135	41			97							
	42										
140	43			94							
145	44			94							
	45										
150	46			93							



Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-73

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-32

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-73**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 16, 06**
Drilling Method:	**DDH**	Elevation:	**1007 ft**	Date Completed:	**Sep 19, 06**
Location:	**Area A North Embankment**	Total Depth:	**158.5 ft**	Logged by:	**MW/LS**
Coordinates:	**2,146,876 N , 1,406,063 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
155	47			100								
	48											
			END OF HOLE @158.5FT	100								
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-73

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-33

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-74**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 19, 06**
Drilling Method:	**DDH**	Elevation:	**1197 ft**	Date Completed:	**Sep 20, 06**
Location:	**Area A Northwest Abutment**	Total Depth:	**140 ft**	Logged by:	**LS/AG**
Coordinates:	**2,147,514 N , 1,407,904 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Sandy GRAVEL, trace clay, well graded, subangular, dense, light brown (based on SPT sample).							Triconed, casing down to 9 ft
5	1, 2				58	X	GH06-74-1	13/19/11	30	
10	3, 4		SAND and GRAVEL, trace to some clay and silt, subangular to subrounded, some fines washed away, up to boulder size clasts, well graded, light brown, compact to very dense, moist to wet	0 33	50	X	GH06-74-2	14/20/21	41	Water level measured at 30' below ground surface Oct 16/06
15	5			18 0	0	X	GH06-74-3	13/25/19	44	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
20	6, 7		Gravelly SAND, trace silt/clay, well graded, subangular to subrounded, clasts up to gravel size, light brown, compact, moist to wet	22	50	X	GH06-74-4	14/15/13	28	
25	8			45						
30	9, 10			90	11	X	GH06-74-5	50+/-/-	50+	
35	11			8						
40	12, 13		BEDROCK, Tertiary Basalt, fine grained, dark green rock, chlorite and calcite veins, hematite on fractures	20 16	11	X	GH06-74-6	50+/-/-	50+	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
45	14			95						RMR89-56, UCS-73MPa (average/estimated values for rock mass)
50	15			100 46						

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-74

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-34

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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-74**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 19, 06**
Drilling Method:	**DDH**	Elevation:	**1197 ft**	Date Completed:	**Sep 20, 06**
Location:	**Area A Northwest Abutment**	Total Depth:	**140 ft**	Logged by:	**LS/AG**
Coordinates:	**2,147,514 N , 1,407,904 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
55	16										
	17			92							
60	18			91							
	19										
65	20			100 100							
	21										
70	22			100							
75	23			100							
	24										
80	25			99							
85	26			100							
	27										
90	28			100							
95	29			100							
	30										
100	31			100							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-74

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-35

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-74**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 19, 06**
Drilling Method:	**DDH**	Elevation:	**1197 ft**	Date Completed:	**Sep 20, 06**
Location:	**Area A Northwest Abutment**	Total Depth:	**140 ft**	Logged by:	**LS/AG**
Coordinates:	**2,147,514 N , 1,407,904 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
105	32			100							
	33										
110				100							
	34										
115	35			100							
	36										
120				100							
	37										
125	38			99							
	39										
130				98							
	40										
135	41			100							
	42			99							
140			END OF HOLE @140FT	100							
	43										
145	44										
	45										
150	46										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-74

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-36

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**1** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND and GRAVEL, trace to some silt and clay, well graded, clasts up to cobble size, subrounded to angular, compact to very dense, light brown, moist to wet (first 9' based on SPT sample).							Triconed and set casing to 9 ft
5	1				39		GH06-75-1	21/33/30	50+	
	2									
10	3			0 22	94		GH06-75-2	18/26/34	50+	Water level measured at 140' below ground surface Sep 28/06
	4									
15	5		Silt and Sand w/ some gravel, trace to some clay, poorly to gap graded, clasts up to cobble size, light brown, moist	17	61		GH06-75-3	11/14/15	29	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
20	6		GRAVEL and SAND, trace silt/clay, light brown, subrounded to subangluar, clasts up to boulder size, well graded, compact to very dense	4	17		GH06-75-4	7/12/8	20	Fines washed away
	7			22						
25	8			22	50		GH06-75-5	26/25/28	50+	Lost circulation at 24', regained after a foot
30	9			25 79 22 98	33		GH06-75-6	50+/-/-	50+	
35	10			57 98						
	11			16	56		GH06-75-7	12/14/13	27	
40	12			17	61		GH06-75-8	42/25/24	49	
45	13			9 11 66	50		GH06-75-9	14/17/13	30	Lost circulation just before 45', all fines washed away, poor recovery
50	14									
	15		Sandy GRAVEL, trace silt/clay, fine to coarse	23	28		GH06-75-10	3/6/25	31	Lost circulation at 50',

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-37

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**2** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
		gravel, well graded, most fines washed away, clasts up to cobble size, isolated boulders, subangular to subrounded clasts, dense to very dense						water lost into formation. Note: Drill run recovery was low and multiple drill runs from 45' to 75' due to blocking and lost water circulation.
	16		10					
			73					
			28					
55			49					
	17		47					
			41					
			61					
	18		28					
			61					
60			62	11	GH06-75-11	50+/-/-	50+	
			55					
	19		41					
			47					
			66					
			66					
65	20		8					Lost circulation at approximately 69.5'
	21							
70			7	50	GH06-75-12	14/23/25	48	Lost circulation at 75'
	22							
75	23		7					
	24							
80		SAND and GRAVEL, trace silt/clay, well graded, subrounded, clasts up to boulder size, but mostly gravel to cobble size, compact to very dense, light brown (based on SPT samples as most fine material being washed away during drilling).	20	33	GH06-75-13	15/16/13	29	Driller had to tricone and set casing to 85.5'; all drilling water was being lost into formation
	25							
85	26		3					
			82					
			13					
	27							
90			18	100	GH06-75-14	31/47/49	50+	
	28							
			14					
			49					
			82					
95	29		51					
			31					
			33					
	30		33					
			33					
100			44	78	GH06-75-15	44/50/50+	50+	
	31							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-38

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**3** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
				25								
				61								
105	32			30								
				33								
	33											
110				29	39		GH06-75-16	48/50+/-	50+			
	34											
115	35			16							Lost circulation @115'	
	36			21								
120				33	33		GH06-75-17	27/50+/-	50+			
	37											
125	38			16								
	39											
130				13	33		GH06-75-18	38/50+/-	50+			
	40											
135	41			9								
	42											
140				16	33		GH06-75-19	17/50+/-	50+			
	43			25								
145	44			8								
	45			22								
150	46			34	33		GH06-75-20	45/38/50+	50+			

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-39

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**4** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	47			34								
155				7								
	48			49								
				82								
				51								
				73								
160	49			55	0		GH06-75-21	50+/-/-	50+			
				16								
				66								
	50			19								
165				16								
				66								
	51			25								
				52	72		GH06-75-22	26/32/37	50+			
170	52			98								
				15								
	53											
175				4								
	54			82								
180	55			14	17		GH06-75-23	50+/-/-	50+			
	56			25								
185				10								
	57											
190	58			13	44		GH06-75-24	24/23/23	46			
	59		Well graded SAND and GRAVEL, trace silt/clay, angular to subounded clasts up to boulder size, mostly gravel size, light brown, moist, (based on observations of cuttings and prior materials encountered)								Triconed from 192' to 315'.	
195												
	60											
200	61											
	62											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-40

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**5** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
205											Triconed. Lost circulation at 204 ft.	
	63											
210	64										Triconed. Lost circulation at 209 ft.	
	65											
215											Triconed. Lost circulation at 214 ft.	
	66											
220	67											
	68											
225	69											
230	70		Increase in cobbles (based on cuttings)									
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-41

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**6** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	78										Triconed from 192' to 315'.	
	79											
260												
	80											
265												
	81											
	82											
270												
	83											
275												
	84											
	85											
280												
	86											
285												
	87											
	88											
290												
	89											
295												
	90											
	91										Triconed. Lost circulation at 299 ft.	
300												
	92											
305	93											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-42

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**7** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
310	94, 95									Triconed from 192' to 315'.	
315	96		BEDROCK, Tertiary Basalt grey green, chloritized, pyrite present along veins, intercalations of Tertiary Mudstone/Siltstone starting at 327'	0						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
320	97			89							
	98			99							
325	99			99							
330	100			92							
335	101, 102			100							
340	103		BEDROCK, Tertiary Mudstone/siltstone and Tertiary andesite dykes, fine grained, calcite/quartz veins, dark grey green to black, pyrite	100							
345	104, 105			92							
350	106			100							
355	107, 108			100							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-43

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**8** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
360	109			99							
	110										
365	111			100							
				75							
	112										
370	113			100							
	114										
375	115			100							
380	116			100							
	117										
385	118			100							
390	119			99							
	120										
395	121			99							
400	122			99							
				100							
	123										
405	124			77							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

Rev. 0 - Issued for Report

A1-44

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-75**	Page	**9** of **9**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 21, 06**
Drilling Method:	**DDH**	Elevation:	**1026 ft**	Date Completed:	**Sep 27, 06**
Location:	**Area A**	Total Depth:	**414.5 ft**	Logged by:	**LS/AG/TT/KW**
Coordinates:	**2,136,598 N , 1,400,526 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
410	125			98								
	126											
415			END OF HOLE @414.5FT	98								
	127											
420	128											
	129											
425	130											
430	131											
	132											
435	133											
440	134											
	135											
445	136											
450	137											
	138											
455	139											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-75

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-45

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-76**	Page	**1** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 4, 06**
Drilling Method:	**DDH**	Elevation:	**989 ft**	Date Completed:	**Oct 9, 06**
Location:	**Area A**	Total Depth:	**274.5 ft**	Logged by:	**JV/TT/AG**
Coordinates:	**2,135,578 N , 1,401,319 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			SAND and GRAVEL, fine sand, trace silt, subrounded to subangular, compact, saturated, light brown (interpretation based on SPT sample).	0	44		GH06-76-1	4/7/12	19	Triconed down to 6'.
5	1									
	2			0	67		GH06-76-2	9/18/30	48	Water level measured at 111' below ground surface Oct 16/06
			silty/clayey SAND and GRAVEL, clasts up to cobble size, subrounded to subangular, well graded, compact to very dense	60	89		GH06-76-3	23/20/28	48	
10	3			26						
	4			52						***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
				44	44		GH06-76-4	16/36/50	50+	
15	5			44						
				85						
				98						
				98						
				92	39		GH06-76-5	16/16/15	31	
20	6			98						
			Sandy GRAVEL, trace silt/clay, clasts up to cobble size, mostly gravel size, subrounded to subangular, well graded, compact to dense, (based on SPT samples)	20						Triconed from 46.5' to 127'. Cobbles damaging drill bits
	7									
25				59	17		GH06-76-6	22/36/50	50+	
	8			39						
				75						
	9									
30				12	61		GH06-76-7	26/28/32	50+	
	10			21						
				33						
35				30	50		GH06-76-8	16/18/21	39	
	11			44						
	12									
40				22	39		GH06-76-9	13/13/21	34	
				44						
	13									
45				17	72		GH06-76-10	16/36/34	50+	
	14			25						
				66						
	15									
50										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-76

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-46

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-76**	Page	**2** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 4, 06**
Drilling Method:	**DDH**	Elevation:	**989 ft**	Date Completed:	**Oct 9, 06**
Location:	**Area A**	Total Depth:	**274.5 ft**	Logged by:	**JV/TT/AG**
Coordinates:	**2,135,578 N , 1,401,319 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
				0	67		GH06-76-11	28/28/42	50+			
55	16											
	17											
60	18											
	19										Lost circulation from 62 - 65'.	
65	20											
70	21											
	22											
75	23											
	24											
80	25											
85	26											
	27											
90	28											
95	29											
	30			0	67		GH06-76-12	50+/-/-	50+			
100	31											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-76

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-47

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-76**	Page	**3** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 4, 06**
Drilling Method:	**DDH**	Elevation:	**989 ft**	Date Completed:	**Oct 9, 06**
Location:	**Area A**	Total Depth:	**274.5 ft**	Logged by:	**JV/TT/AG**
Coordinates:	**2,135,578 N , 1,401,319 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES
105	32										
	33										
110	34										
115	35										
	36										
120	37										Lost circulation at 119'.
125	38										
	39		GRAVEL, some sand, some silt, trace clay, coarse, well graded, subangular to subrounded.	0							
130	40		SAND, trace clay and silt, grey (based on cuttings), potentially weathered bedrock	55 98	67		GH06-76-13	50+/-/-	50+		Triconed from 129' to 176'.
135	41										
	42										Lost circulation at 137.5-139'. Poor circulation from 139'-157.
140	43										
145	44										
	45										
150	46										

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-76

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-48

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-76**	Page	**4** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 4, 06**
Drilling Method:	**DDH**	Elevation:	**989 ft**	Date Completed:	**Oct 9, 06**
Location:	**Area A**	Total Depth:	**274.5 ft**	Logged by:	**JV/TT/AG**
Coordinates:	**2,135,578 N , 1,401,319 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
155	47										
	48										
160	49										
	50										
165	51										
170	52										
	53										
175	54		BEDROCK, Granodiorite, weak, becoming more competent with depth, light grey, fractured, calcite veins, fine to medium grained, pyrite infilling, zones of Tertiary Andesite	0						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
				77							
180	55			98							
				95							
	56			66							
185				87							
	57										
				98							
190	58			44							
	59			93							
195				98							
	60										
200	61			87							
				92							
	62										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-76

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-49

Rev. 0 - Issued for Report

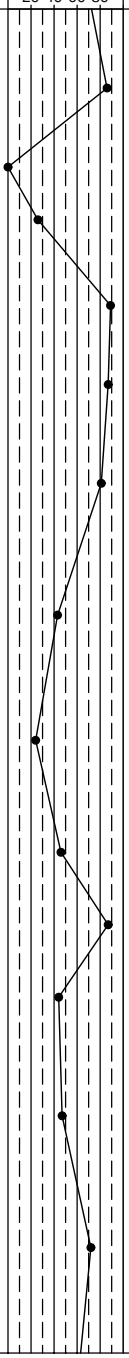
Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-76**	Page	**5** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 4, 06**
Drilling Method:	**DDH**	Elevation:	**989 ft**	Date Completed:	**Oct 9, 06**
Location:	**Area A**	Total Depth:	**274.5 ft**	Logged by:	**JV/TT/AG**
Coordinates:	**2,135,578 N , 1,401,319 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
205				98							
	63										
210	64			100							
				69							
	65			98							
215											
	66			96							
220	67			98							
	68										
225				98							
	69										
230	70			95							
	71										
235				100							
	72										
				94							
240	73			98							
	74										
				95							
245	75										
	76			100							
250											
	77										
				99							



Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-76

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-50

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-76**	Page	**6** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 4, 06**
Drilling Method:	**DDH**	Elevation:	**989 ft**	Date Completed:	**Oct 9, 06**
Location:	**Area A**	Total Depth:	**274.5 ft**	Logged by:	**JV/TT/AG**
Coordinates:	**2,135,578 N , 1,401,319 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
260	78			96							
	79			98							
265	80			100							
	81										
270	82			100							
	83										
275	84		END OF HOLE @274.5FT	100							
280	85										
	86										
285	87										
	88										
290	89										
295	90										
	91										
300	92										
305	93										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-76

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-51

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**1** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Sandy GRAVEL, subrounded to subangular, trace clay, well graded, clasts up to boulder size, mostly up to cobble size, compact to very dense							Water level measured at 135' below ground surface Oct 13/06
5	1									
	2									
10	3			5 16	22		GH06-77-1	15/18/16	34	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	4									
15	5			5	33		GH06-77-2	13/19/18	37	
				43 33						
20	6			35	33		GH06-77-3	10/15/19	34	
	7									
25	8			5	0		GH06-77-4	26/26/29	50+	
				7						
30	9			35	22		GH06-77-5	22/23/18	41	
	10			24						
35	11			21	33		GH06-77-6	15/14/13	27	
	12			29						
40			No recovery from SPT sampler	89	0		GH06-77-7	15/17/17	34	Triconed from 40' to 44', no recovery
	13									
45	14		SAND and GRAVEL, some silt and clay, fine to coarse gravel clasts, rounded to subangular, dense to very dense	0	61		GH06-77-8	30/17/24	41	
50	15			28	50		GH06-77-9	38/50+/-	50+	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-52

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**2** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	16											
55	17			13								
	18											
60				20	50		GH06-77-10	28/25/16	41			
				37								
	19		SAND and GRAVEL (based on cuttings)	23							Triconed from 62.5' to 326'. Lost circulation at 63'.	
65	20											
	21											
70												
	22											
75	23											
	24											
80											Lost circulation at 80'.	
	25											
85	26											
	27											
90												
	28											
95	29											
	30											
100												
	31											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-53

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**3** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
105	32										Dry Well.	
	33											
110												
	34											
115	35											
	36		SAND and GRAVEL, medium sand, very dense, subangular to angular, dark brown sand and grey gravel (based on SPT sample)	0	56		GH06-77-11	25/50+/-	50+			
120	37											
125	38											
	39											
130	40										Lost ciculation from 130' to 132'.	
135	41											
	42											
140	43											
	44											
145	45											
150	46											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-54

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**4** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
155	47											
	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57										Lost circulation at 185'.	
190	58											
	59											
195	60										Lost circulation at 197'.	
200	61											
	62											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-55

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**5** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
205	63											
210	64											
	65											
215	66										Lost circulation at 214'.	
220	67										Lost circulation at 220'.	
	68											
225	69										Lost circulation at 226'.	
230	70											
	71											
235	72											
240	73										Lost circulation at 238'.	
	74											
245	75											
250	76										Lost circulation at 248'.	
	77											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-56

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**6** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	78											
	79											
260												
	80											
265	81											
	82											
270												
	83											
275	84											
	85											
280												
	86											
285	87											
	88											
290												
	89											
295	90											
	91											
300												
	92											
305	93											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-57

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**7** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
310	94											
	95											
315	96											
	97											
320	98											
325	99											
			GRAVEL, some sand, fine to coarse gravel clasts, rounded to subangular	0							Reduced to NQ.	
	100											
330			Silty SAND, trace clay, poorly graded, fine, very dense, dark to medium grey	33								
	101											
335	102			39								
	103			82								
340				98								
	104											
345	105		GRAVEL, poorly graded, rounded to subrounded	36							Fines washed away	
				41								
	106			39								
350			Silty SAND, trace clay, poorly graded, fine, dark to medium grey	44								
	107											
	108											
355				39								

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-58

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**8** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
360	109			97							
	110										
365	111			89							
	112										
370	113			100							
375	114			95							
	115										
380	116			100							
385	117		GRAVEL, fine to coarse clasts, gap graded, subangular	100 49						Fines washed away	
	118										
390	119		BEDROCK, Tertiary Mudstone, fine grained, dark grey, pyrite present, white calcite veins, fractured.	22						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	120			100							
395	121			94 93							
400	122										
405	123		BEDROCK, Tertiary amygdaloidal Andesite/Basalt, zones of Porphyritic Monzodiorite, fine grained, grey to green-grey, pyrite present, white calcite veins, fractured.	100							
	124			97							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-59

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**9** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
410	125			100							
	126			100							
415	127										
420	128			100							
	129										
425	130			100							
430	131			100							
	132										
435	133			98							
440	134			100							
	135										
445	136			98							
450	137			100							
	138										
455	139			100							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-60

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-77**	Page	**10** of **10**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Sep 28, 06**
Drilling Method:	**DDH**	Elevation:	**1027 ft**	Date Completed:	**Oct 3, 06**
Location:	**Area A**	Total Depth:	**482 ft**	Logged by:	**TT/AG**
Coordinates:	**2,135,459 N , 1,400,130 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
460	140			100							
	141										
465				99							
	142										
470	143			99							
	144										
475				100							
	145										
	146			86							
480				87							
				79							
	147		END OF HOLE @482FT	71							
485	148										
	149										
490	150										
495	151										
	152										
500	153										
505	154										
	155										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-77

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-61

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-78**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 10, 06**
Drilling Method:	**DDH**	Elevation:	**915 ft**	Date Completed:	**Oct 12, 06**
Location:	**East Deposit Area**	Total Depth:	**149 ft**	Logged by:	**TT/JV**
Coordinates:	**2,155,947 N , 1,409,794 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Peaty, organic TOPSOIL, saturated.							Piezometer installed but permanently sealed with grout due to artesian conditions of >65 gpm.
			Sandy SILT, some gravel, some clay (glacial till), fine to coarse gravel subangular, well graded, trace cobbles, trace boulders, stiff to very stiff, brown.	0						
5	1									
	2			0	56	X	GH06-78-1	2/5/7	12	Pushed four Shelby tubes (#1 to #4), but they were heavily disturbed with bentonite from the collar seal deteriorating, samples not useable
10	3			0	0	X	GH06-78-2	4/5/8	13	
	4									
15				15						***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	5			49						
20	6		Sandy, gravelly SILT/CLAY, clasts up to cobble size, mostly gravel, brown, moist, stiff to very stiff	48						
				66	44	X	GH06-78-3	17/21/40	50+	
	7			30						
25				80	83	X	GH06-78-4	15/20/45	50+	
	8			44						
				87						
30	9			90	78	X	GH06-78-5	21/22/33	55	
				33						
	10			82						
				87						
35			Gravelly Sand, some silt, trace to some clay, subangular clasts, up to boulder size, mostly gravel size, brown, moist	59	50	X	GH06-78-6	12/34/34	50+	Flowing condition encountered.
	11			66						
				82						
				98						
	12			98						
40				66	0	X	GH06-78-7	13/50+/-	50+	
				55						
	13			75						
45				13	50	X	GH06-78-8	36/24/27	51	Dramatic increase in flow to more than 65gpm at bedrock contact
	14									
	15									
50			BEDROCK, Volcaniclastic Tertiary	72						* See GEOTECHNICAL

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-78

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-62

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-78**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 10, 06**
Drilling Method:	**DDH**	Elevation:	**915 ft**	Date Completed:	**Oct 12, 06**
Location:	**East Deposit Area**	Total Depth:	**149 ft**	Logged by:	**TT/JV**
Coordinates:	**2,155,947 N , 1,409,794 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	16		fragmental rock, heterolithic matrix supported, fine angular clasts, white grey, brittle with up to 1cm infilling of clay. Fragments are predominantly 0.1 cm to 0.8 cm in size.							BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
55	17			64							
	18										
60				100							
	19										
65	20			100							
	21										
70				89							
	22										
75	23			100							
	24										
80				100							
	25										
85	26			100							
	27										
90				97							
	28										
95	29			100							
	30										
100	31			100							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-78

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-63

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-78**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 10, 06**
Drilling Method:	**DDH**	Elevation:	**915 ft**	Date Completed:	**Oct 12, 06**
Location:	**East Deposit Area**	Total Depth:	**149 ft**	Logged by:	**TT/JV**
Coordinates:	**2,155,947 N , 1,409,794 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
105	32			92						Increased fractures.	
	33										
110				100							
	34										
115	35			100							
	36										
120				100							
	37										
125	38			96							
	39										
130				100							
	40										
135	41			100							
	42										
140				100							
	43										
145	44			100							
	45		BEDROCK, Bottom 1 foot is dark purple, iron stained TX unit, highly fractured, clast supported	98							
150	46		END OF HOLE @149FT								

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-78

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-64

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-79**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 13, 06**
Drilling Method:	**DDH**	Elevation:	**957 ft**	Date Completed:	**Oct 16, 06**
Location:	**East Deposit Area**	Total Depth:	**120 ft**	Logged by:	**TT/JV**
Coordinates:	**2,155,394 N , 1,410,562 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			organic TOPSOIL, peat, root layer.							Artesian flow exceeds 300 gpm, hole plugged due to artesian flow	
			Silty SAND, trace clay, some organics, wet, soft, brown	0 94	94		GH06-79-1	1/1/3	4		
5	1				67		GH06-79-2	2/4/5	9	No piezometer installed.	
	2		SAND, trace to some silt, clay and gravel, subangular to subrounded, fine grained sand, moist, loose to compact	66							
10	3			66	67		GH06-79-3	3/10/14	24		
	4										
15	5				94		GH06-79-4	2/4/7	11	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***	
				35	89		GH06-79-5	1/8/9	17		
20	6			90							
	7			98							
25	8			69	89		GH06-79-6	11/12/8	20		
			SAND and GRAVEL, trace to some silt/clay, subangular to subrounded, well graded, some cobbles, very dense	33 98							
30	9			66 43	72		GH06-79-7	36/39/50	50+		
	10			39 66 59 79							
35	11			44 82	0		GH06-79-8	50+/-/-	50+		
40	12			92 72 98							
	13			98 49							
45	14		Silty, gravelly SAND, trace clay, some coarse gravel, subangular, trace cobbles, very dense	98 44 66	78		GH06-79-9	32/49/50+	50+		
50	15			66 66 98	67		GH06-79-10	37/50+/-	50+		

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-79

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

Rev. 0 - Issued for Report

A1-65

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-79**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 13, 06**
Drilling Method:	**DDH**	Elevation:	**957 ft**	Date Completed:	**Oct 16, 06**
Location:	**East Deposit Area**	Total Depth:	**120 ft**	Logged by:	**TT/JV**
Coordinates:	**2,155,394 N , 1,410,562 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	16		44					
			98					
55	17		98					
			98					
			98					
	18							
60		SILT, some sand, trace to some gravel and cobbles, some clay, subangular to subrounded, compact to very dense, moist	98	100	GH06-79-11	18/26/43	50+	
	19							
65	20	SAND and GRAVEL, well graded, subrounded to subangular clasts, compact to very dense, brown, moist	85					
			33					
	21							
70			14	72	GH06-79-12	50+/-/-	50+	
	22		33					
75	23		22					
	24							
80			52	89	GH06-79-13	11/13/15	28	
	25							
85	26		13					
			39					
	27		66					Fines washed away
90			87	67	GH06-79-14	47/50+/-	50+	
	28		98					
95	29		15					
			26					
	30							
100			33	44	GH06-79-15	43/50+/-	50+	
	31							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-79

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-66

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-79**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 13, 06**
Drilling Method:	**DDH**	Elevation:	**957 ft**	Date Completed:	**Oct 16, 06**
Location:	**East Deposit Area**	Total Depth:	**120 ft**	Logged by:	**TT/JV**
Coordinates:	**2,155,394 N , 1,410,562 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) / RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
				25								
105	32			27							Significant increase in flow, conditions now artesian	
				33								
				66								
	33		Silty SAND, trace clay, poorly graded, dense, moist.	66								
110			SAND and GRAVEL, trace silt/clay, dense, well graded, subangular clasts.	98	100	X	GH06-79-16	15/17/28	45			
	34											
115	35			75								
	36											
120				69	67	X	GH06-79-17	20/22/14	36			
	37		END OF HOLE @121.5FT, PLUGGED @120FT DUE TO ARTESIAN FLOW OF 300gpm	68								
125	38											
	39											
130	40											
135	41											
	42											
140	43											
	44											
145	45											
150	46											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-79

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-67

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-80**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 17, 06**
Drilling Method:	**DDH**	Elevation:	**1017 ft**	Date Completed:	**Oct 20, 06**
Location:	**Open Pit Area**	Total Depth:	**217 ft**	Logged by:	**TT/JV**
Coordinates:	**2,154,864 N , 1,406,799 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
		TOPSOIL, clay with organics, root mat.						
		Sandy SILT, trace to some gravel, trace clay, angular clasts, moist, dense, medium plasticity, brown.	0	33	GH06-80-1	2/3/3	6	Water level measured at 37' below ground surface Oct 20/06
5	1		33					
				0	GH06-80-2	2/3/5	8	
	2		0					Spoon blocked by gravel clast.
				6	GH06-80-3	6/12/9	21	
10	3		7					
	4							
15			15	89	GH06-80-4	4/5/6	11	***Drillhole logs represent an interpretation of field logs combined with laboratory test results.***
	5							
20	6		20	94	GH06-80-5	6/9/15	24	
	7							
25			20	0	GH06-80-6	11/14/21	35	
	8							
30	9		60	78	GH06-80-7	8/17/17	34	
	10	Gravelly SAND, fine to coarse gravel, trace to some silt/clay, well graded, subangular to subrounded sediment, moist, brown, compact to dense						
35			49	67	GH06-80-8	9/10/11	21	Lost circulation at 36 ft.
	11		27					
40	12		33	50	GH06-80-9	8/8/8	16	
	13		41					
45			66	67	GH06-80-10	16/17/17	34	Tricone to advance 4" casing due to heaving in loose gravelly sand zone.
	14							
	15		13					
50								

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-80

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-68

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-80**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 17, 06**
Drilling Method:	**DDH**	Elevation:	**1017 ft**	Date Completed:	**Oct 20, 06**
Location:	**Open Pit Area**	Total Depth:	**217 ft**	Logged by:	**TT/JV**
Coordinates:	**2,154,864 N , 1,406,799 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
55	16, 17			0, 66	56		GH06-80-11	9/15/18	33	
60	18, 19			13	33		GH06-80-12	12/14/13	27	
65	20			13, 26						
70	21, 22			33	28		GH06-80-13	14/15/18	33	
75	23		Sandy SILT, some gravel, trace cobbles, some clay, angular clasts, moist, very dense, grey brown.	13						Loss Circulation at 75 ft.
80	24, 25			58	117		GH06-80-14	4/11/13	24	
85	26, 27			57						
90	28		SAND and GRAVEL, some silt, trace clay, subangular clasts, very dense, moist, brown	59	83		GH06-80-15	23/31/50+	50+	
95	29, 30		BEDROCK, completely to highly weathered, hematitic basalt. Some brecciated, flow-banded and amygdaloidal basalt, stained red by hematite alteration. 4% calcite overall as amygdules and fracture infill. Moderate to strong fracturing.	37, 100						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
100	31			69						

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-80

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	9	0

A1-69

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

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Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-80**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 17, 06**
Drilling Method:	**DDH**	Elevation:	**1017 ft**	Date Completed:	**Oct 20, 06**
Location:	**Open Pit Area**	Total Depth:	**217 ft**	Logged by:	**TT/JV**
Coordinates:	**2,154,864 N , 1,406,799 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
105	32			89							
				44							
	33										
110				70							
	34										
115	35			100							
	36										
120				100							
	37										
125	38		BEDROCK, fragmental Tertiary conglomerate from 124' to 129'. Poorly consolidated. Very soft.	98							
	39										
130			BEDROCK, completely to highly weathered, hematitic basalt. Some brecciated, flow-banded and amygdaloidal basalt, stained red by hematite alteration. 4% calcite overall as amygdules and fracture infill. Moderate to strong fracturing.	98							
	40			66							
135	41			93							
	42										
140				101							
	43										
				102							
145	44			90							
				82							
	45										
150				100						Change to NQ	
	46										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-80

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-70

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH06-80**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 17, 06**
Drilling Method:	**DDH**	Elevation:	**1017 ft**	Date Completed:	**Oct 20, 06**
Location:	**Open Pit Area**	Total Depth:	**217 ft**	Logged by:	**TT/JV**
Coordinates:	**2,154,864 N , 1,406,799 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
155	47			98							
	48			80						Changed bit to enhance recovery	
160	49			33							
165	50			95							
	51			33							
170	52			71							
175	53			75							
	54										
180	55			100							
	56			92							
185	57			98							
190	58			100							
195	59			97							
	60										
200	61			98							
	62		BEDROCK, dark grey rock with quartz veins,	100							

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-80

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-71

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH06-80**	Page	**5** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT/Shelby**	Date Started:	**Oct 17, 06**
Drilling Method:	**DDH**	Elevation:	**1017 ft**	Date Completed:	**Oct 20, 06**
Location:	**Open Pit Area**	Total Depth:	**217 ft**	Logged by:	**TT/JV**
Coordinates:	**2,154,864 N , 1,406,799 E**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
205			clay infilling and reddish spots. Less mottled than above.									
	63											
				100								
210	64											
	65			100								
215												
	66											
			END OF HOLE @217FT	90								
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
	76											
250	77											

Northern Dynasty Minerals Inc.
Pebble Project
Overburden Log For GH06-80

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/8	**9**	**0**

A1-72

Rev. 0 - Issued for Report

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\LIBRARY1.GLB Printed: Mar 5, 08

M:\1\01\00176\08\A\DATA\2006 WMF SI\GINT\WMF2006 REVISED.GPJ

Date Revised: Nov 26, 07

Project:	**Pebble Project**	Drill Hole No.	**GH07-81**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 18, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1383 ft**	Date Completed:	**Aug 21, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**164.5 ft**	Logged by:	**LS/EC/AM**
Coordinates:	**2,161,333 N , 1,382,565 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
			Tundra Vegetation, numerous roots, dark brown, wet.	0						Casing advanced 0 - 14 ft, no core recovery.
5	1		Gravelly SAND, well graded, trace cobbles, subangular, light brown, moist.							Flowing conditions encountered from 9 to 14 feet below ground. Flow measured at ~3.5 gpm.
10	2			0						
	3									
	4									
15	5		BEDROCK, Monzonite, light grey, fine to medium grained, hematite, chlorite, pyrite and clay on fracture surfaces, Shear zone 117-121 ft, Possibly Tertiary Basalt below 121 ft.	98					0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
20	6			91					21	
25	7			100					65	
	8									
30	9			100					82	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
35	10			100					81	
	11			100					100	
40	12			95					30	
45	13			100					69	
50	14			100					88	
55	15			99					16	
60	16			99					62	
65	17			97					0	
70	18			100					63	
75	19			98					43	
80	20			100					43	
85	21			100					93	
90	22			99					64	
95	23			98					45	
	24			100					50	
	25			100					92	
	26			98					83	
	27									
	28									
	29									
	30									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-81

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

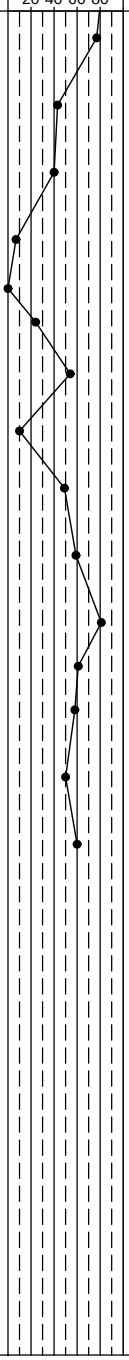
A1-1

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-81**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 18, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1383 ft**	Date Completed:	**Aug 21, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**164.5 ft**	Logged by:	**LS/EC/AM**
Coordinates:	**2,161,333 N , 1,382,565 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			95					77		
105	32										
	33			100					43		
110	34			100					40		
115	35										
	36			100					7		
120	37			94					0		
				100					24		
125	38										
	39			92					54		
130	40			89					10		
135	41			100					49		
	42										
140	43			91					59		
145	44			100					81		
	45			100					61		
150	46			100					58		
155	47										
	48			96					50		
160	49										
				100					60		
165	50		END OF HOLE @ 164.5 FT								
	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										



Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-81

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-2

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

M:\1\01\00176\20\A\DATA\2007 WMF SI\GINT\WMF2007.GPJ

Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-82**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 22, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1407 ft**	Date Completed:	**Aug 25, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**215 ft**	Logged by:	**LS/EC/AM**
Coordinates:	**2,162,943 N , 1,379,583 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)
Tundra Vegetation, organics, dark brown moss, roots.	0				
SILT/CLAY, some sand, some subangular to subrounded gravel, trace cobbles, gap graded, light brown, moist.	0				
	53	53	GH07-82-1	12/30/16	46
Sandy GRAVEL, some silt, trace to some clay, varying amounts of sand, well graded, trace subrounded to subangular cobbles and boulders; light brown, moist.	0				
	53	53	GH07-82-2	28/27/27	54
	0				
	0				
	47	47	GH07-82-3	24/29/50+	79+
Gravelly SAND, some silt, trace clay, few subangular cobbles, well graded, light brown, moist.	0				
	93	93	GH07-82-4	50+/+/+	50+++
	0				
	93	93	GH07-82-5	50+/+/+	50+++
	0				
	10				
BEDROCK, Tertiary Basalt, weathered to grey, calcite/chlorite on fracture surfaces, hematite only on shallow fractures, calcite veins.	100	100	GH07-82-6	50+/+/+	50+++
	31				0
	28				0
	39				0
	66				0
	90				30
	92				0
	39				0
	39				0
	100				11
	91				7
	100				0
	100				7
	98				33
	99				38
	39				0
	49				0
	80				14
	83				8

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

NOTES

Casing advanced 0 - 30 ft, no core recovery.

Water levels in 82S and 82D measured at 5.5 ft and 6.8 ft below ground surface, respectively on Sept 2/07.

Drillhole logs represent an interpretation of field logs combined with laboratory test results

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-82

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-3

Rev. 0 - Issued for Report VA101-00176/20-4

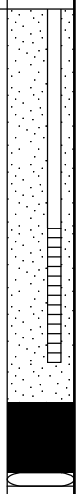
Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-82**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 22, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1407 ft**	Date Completed:	**Aug 25, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**215 ft**	Logged by:	**LS/EC/AM**
Coordinates:	**2,162,943 N , 1,379,583 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
	31			59					0	
105	32			100					0	
				66					25	
	33			94					25	
110	34			62					0	
115	35			98					49	
				63					0	
	36			87					21	
120	37			56					16	
125	38									
	39			100					40	
130	40			100					59	
135	41									
	42			93					34	
140				99					23	
	43			96					0	
145	44			98					25	
	45			100					21	
150	46									
155	47			87					7	
	48			100					49	
160	49									
	50			100					28	
165	51			100					7	
170	52									
	53			98					0	
175	54			100					36	
180	55									
	56			97					41	
185	57			100					20	
190	58									
	59			96					0	
195	60			100					13	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-82

Rev. 0 - Issued for Report VA101-00176/20-4

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

M:\1\01\00176\20\A\DATA\2007 WMF SI\GINT\WMF2007.GPJ

Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-82**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 22, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1407 ft**	Date Completed:	**Aug 25, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**215 ft**	Logged by:	**LS/EC/AM**
Coordinates:	**2,162,943 N , 1,379,583 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	62			100					31		
205	63			100					49		
210	64										
	65			93					27		
215	66		END OF HOLE @ 215FT								
220	67										
	68										
225	69										
230	70										
	71										
235	72										
240	73										
	74										
245	75										
250	76										
	77										
255	78										
260	79										
	80										
265	81										
270	82										
	83										
275	84										
280	85										
	86										
285	87										
290	88										
	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-82

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-5

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-83**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 26, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1605 ft**	Date Completed:	**Aug 27, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**164.5 ft**	Logged by:	**EC/AM**
Coordinates:	**2,163,510 N , 1,374,824 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
TOPSOIL, organic, sandy, gravelly SILT, trace clay, angular to subangular gravel, some angular to subangular cobbles and boulders. numerous roots (Tundra vegetation).	0						Casing advanced 0 - 8.5 ft, no core recovery.
	0						
	47	47	☒	GH07-83-1	9/9/9	18	
	0						
Silty, gravelly SAND, trace clay, some angular to subrounded gravel and cobbles, gravel content decreasing with depth, well graded, brown, moist.	49					0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	89					0	
	77					0	
WEATHERED BEDROCK, Monzonite, fine to medium-grained, grey-green, hematite, chlorite, and clay alteration on fracture surfaces, minor disseminated pyrite.	100					31	
	87					23	
	77					43	Water levels in 83S and 83D measured at 0.3 ft and 0.7 ft above ground surface, respectively on Oct 4/07.
BEDROCK, Monzonite, fine to medium-grained, grey-green, hematite, chlorite, pyrite and clay alteration on fracture surfaces.	95					43	
	88					76	
	100					16	
	100					10	
	100					22	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
	100					75	
	25					0	
	99					39	
	98					0	
	100					33	
	98					63	
	98					26	
	100					86	
	98					27	
	100					26	
BEDROCK, Siltstone and minor sandstone, dark grey-brown-green, minor alteration.	99					37	
	100					83	

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-83

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-6

Rev. 0 - Issued for Report VA101-00176/20-4

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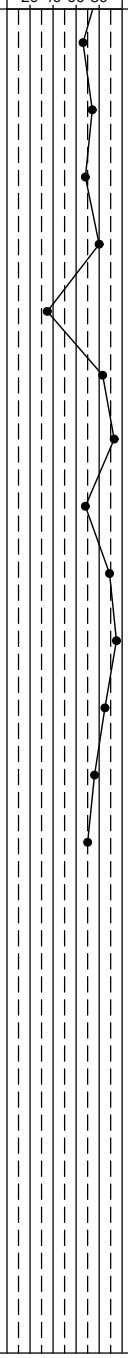
Date Revised: Sep 15, 08

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-83**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 26, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1605 ft**	Date Completed:	**Aug 27, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**164.5 ft**	Logged by:	**EC/AM**
Coordinates:	**2,163,510 N , 1,374,824 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					66		
105	32										
	33			100					74		
110	34										
				100					68		
115	35										
	36			100					80		
120	37										
				100					35		
125	38										
	39		BEDROCK, Granodiorite, light grey to white, fine-medium grained, calcite, chlorite, hematite, pyrite, minor chalcopyrite.	100					83		
130	40			100					93		
135	41										
	42			100					68		
140	43										
				100					89		
145	44										
	45			100					95		
150	46										
				100					85		
155	47										
	48			100					76		
160	49										
				96					70		
165	50		END OF HOLE @ 164.5FT								
	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										



Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-83

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-7

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-85**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 30, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1628 ft**	Date Completed:	**Sep 2, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**154.5 ft**	Logged by:	**LS/EC**
Coordinates:	**2,163,904 N , 1,377,732 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
			Sandy, silty GRAVEL, trace clay, poorly graded, clasts subangular up to boulder size, brown, moist, tundra vegetation veneer.	0	57		GH07-85-1	3/4/45	49	Casing advanced 0 - 21.5 ft, no core recovery.
5	1			6						
			BEDROCK, Siltstone/Wacke, Fine-grained grey rock, propylitically altered, possibly sediments or basalt?, epidote, hematite, calcite and chlorite on fracture surfaces throughout. Many steeply dipping fractures. Occasional pyrite and chalcopyrite inclusions, Fault Zone, 48 to 65'.	70					0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	2			98						
10	3			98					21	
	4			98					43	
15	5			98					98	
				100					55	
20	6									Water level measured at 7.3' below ground surface, Oct 4/07
	7			100					54	
25	8			98					78	
30	9									***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
	10			98					39	
35	11			66					0	
				78					0	
				46					0	
40	12			98					0	
				86					33	
	13			85					68	
45	14									
				89					0	
50	15									
				68					0	
	16			16					0	
55				31					0	
	17			0					0	
				59					0	
60	18									
	19			20					0	
65	20									
				92					45	
70	21									
	22			99					79	
75	23			99					62	
				95					43	
80	24									
	25			100					88	
85	26			100					91	
90	27									
	28			99					91	
95	29			92					92	
	30			96					58	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-85

Rev. 0 - Issued for Report VA101-00176/20-4

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-10

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-85**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 30, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1628 ft**	Date Completed:	**Sep 2, 07**
Location:	**Area G, NE Alignment**	Total Depth:	**154.5 ft**	Logged by:	**LS/EC**
Coordinates:	**2,163,904 N , 1,377,732 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			98					87		
105	32										
	33			98					98		
110	34										
				100					58		
115	35										
	36			100					77		
120	37										
				92					18		
125	38										
	39			100					61		
130	40										
				100					41		
135	41										
	42			100					72		
140	43										
				98					62		
145	44										
	45			99					34		
150	46										
				100					21		
155	47		END OF HOLE @ 154.5 FT								
	48										
160	49										
	50										
165	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-85

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-11

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-86**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 2, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1690 ft**	Date Completed:	**Sep 4, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**165 ft**	Logged by:	**LS/EC**
Coordinates:	**2,161,121 N , 1,372,867 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
		Tundra vegetation, peat, numerous roots.	0	0	GH07-86-1	1/27/6	33	Casing advanced 0 - 13 ft, no core recovery.
5	1	Silty/clayey SAND, some gravel, occasional cobbles, gap graded, clasts subrounded, boulder from 11 to 13', light brown, moist.		0	GH07-86-2	7/6/5	11	
	2			3	GH07-86-3	22/21/18	39	Sandy light brown drill return, 5 - 10 ft.
10	3		0	80	GH07-86-4	14/16/50+	66+	
	4	BEDROCK, light grey, relatively unaltered, medium grained Monzonite, calcite and hematite/limonite on fracture surfaces, Fault Zone at 127 to 142 ft, ~25 degrees tca.	77				24	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
15	5		100				63	
20	6		98				98	
	7		100				92	
25	8		100				100	Water level measured at 1.8' above ground surface, Sept 4/07.
30	9		98				82	
	10		100				94	
35	11		100				91	
40	12							
	13		100				95	
45	14		100				100	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
50	15							
	16		94				94	
55	17		74				74	
	18		98				66	
60	19		100				30	
65	20							
	21		100				43	
70	22		100				70	
75	23							
	24		100				41	
80	25		100				57	
85	26							
	27		34				0	
90	28		88				58	
95	29							
	30		100				69	

GRAPHIC LOG

SAMPLES

SPT TEST DATA Uncorrected 'N' values vs. depth (■)

RQD (%) (●)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-86

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-12

Rev. 0 - Issued for Report VA101-00176/20-4

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Date Revised: Sep 15, 08

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-86**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 2, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1690 ft**	Date Completed:	**Sep 4, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**165 ft**	Logged by:	**LS/EC**
Coordinates:	**2,161,121 N , 1,372,867 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					75		
105	32										
	33			100					85		
110	34			100					53		
115	35										
	36			98					86		
120	37			100					86		
125	38										
	39			70					10		
130	40			100					0		
135	41			66					0		
	42			96					11		
140	43			72 100					0 0		
145	44			92					22		
	45			100					25		
150	46										
155	47			97					50		
	48			92					0		
160	49			93 89					0 29		
165	50			97					14		
	51		END OF HOLE @ 165 FT								
170	52										
175	53										
	54										
180	55										
185	56										
	57										
190	58										
195	59										
	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-86

Rev. 0 - Issued for Report VA101-00176/20-4

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-13

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

M:\1\01\00176\20\A\DATA\2007 WMF SI\GINT\WMF2007.GPJ

Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-87**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 4, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1855 ft**	Date Completed:	**Sep 7, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**260 ft**	Logged by:	**EC/LS**
Coordinates:	**2,159,296 N , 1,372,353 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
			Tundra Vegetation, Organic silt and clay, numerous roots, dark brown.	0						Casing advanced 0 - 15 ft, no core recovery. Drill return light brown, sand-rich 3 - 8 ft.
5	1		Silty clayey SAND, trace gravel, up to cobble size, occasional boulders, well graded, clasts subangular, light brown, moist.	0	77		GH08-87-1	6/8/2	10	
	2				61		GH08-87-2	18/24/26	50	
10	3		WEATHERED BEDROCK, granodiorite, highly weathered to coarse-grained sand, some hematite staining, poorly graded sand, light brown, moist.	0	66		GH08-87-3	15/18/31	49	
15	4									
	5		BEDROCK. Light grey, relatively unaltered, medium to coarse-grained Granodiorite, calcite and hematite on fracture surfaces, Major Fault Zone 176 to 232 ft, Minor Fault Zones at 118.5 to 125.5 ft, 134.75 to 136.5, 168.5 to 172.5 ft.	93					0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
20	6									
	7			79					0	
25	8			0					0	Water levels in 87S and 87D measured at 5.8 ft and 8.7 ft below ground surface, respectively on Oct 4/07.
30	9			0					0	
	10			45	98		GH08-87-4	23/50+/+	50++	
35	11			30					0	
	12			18					0	
40	13			69					0	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
45	14			85					0	
	15			85					0	
50	16			56					0	
55	17			83					26	
60	18									
	19			92					10	
65	20			71					18	
70	21			95					0	
	22			94					52	
75	23			95					18	
	24			59					0	
80	25			100					0	
85	26									
	27			100					42	
90	28			98					18	
95	29									
	30			100					50	

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-87

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-14

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-87**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 4, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1855 ft**	Date Completed:	**Sep 7, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**260 ft**	Logged by:	**EC/LS**
Coordinates:	**2,159,296 N , 1,372,353 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					51		
105	32										
	33			100					14		
110											
	34			90					12		
115	35			87					0		
	36			60					7		
120											
	37			55					0		
125	38										
	39			86					0		
130				94					19		
	40			100					29		
135	41										
	42			100					58		
140	43										
				100					26		
145	44										
	45			100					70		
150	46										
				100					63		
155	47										
	48			100					59		
160	49										
	50			95					50		
165	51			98					47		
170	52			84					0		
	53			98					33		
175	54			82					0		
180	55										
	56			100					0		
185	57			69					16		
190	58			98					0		
	59			67					0		
195	60			82					0		
				93					33		

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-87

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-15

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-87**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 4, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1855 ft**	Date Completed:	**Sep 7, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**260 ft**	Logged by:	**EC/LS**
Coordinates:	**2,159,296 N , 1,372,353 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	62			98					0		
205				94					0		
	63			98					0		
210	64										
	65			78					0		
215	66			98					0		
220	67			98					0		
	68			100					0		
225	69			100					0		
230	70			100					0		
	71			91					13		
235	72			100					79		
240	73										
	74			100					100		
245	75			100					75		
250	76										
	77			97					43		
255	78			100					80		
260	79		END OF HOLE @ 260 FT								
	80										
265	81										
270	82										
	83										
275	84										
280	85										
	86										
285	87										
	88										
290	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-87

Rev. 0 - Issued for Report VA101-00176/20-4

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-16

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-88**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 7, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1626 ft**	Date Completed:	**Sep 9, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**155 ft**	Logged by:	**JN/TB/LS/EC**
Coordinates:	**2,162,438 N , 1,372,730 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
			Tundra Vegetation, organic silt and clay, numerous roots, brown.	0						Casing advanced, no core sample 0 - 5 ft.
	1		Silty SAND, trace gravel, frequent cobbles and boulders, (frost heaved bedrock), Well graded, clasts subangular, brown, moist to wet.	0	22		GH07-88-1	43/50+/+	50++	
5	2			90					35	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3		BEDROCK, Gabbro, dark grey to green, coarse-grained, calcite, hematite and clay on fracture surfaces, pyrite veins, chalcopyrite increases downhole.	98					89	
15	4			100					91	Water level measured at 1.4' below ground surface, Oct 4/07.
20	5			99					96	
25	6			92					0	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
30	7			100					58	
35	8			94					68	
40	9			99					84	
45	10			100					91	
50	11			100					42	
55	12			99					85	
60	13			100					42	
65	14			97					40	
70	15			97					90	
75	16			97					84	
80	17			89					58	
85	18			100					75	
90	19			94					54	
95	20			96					86	
	21			100					90	
	22			96					96	
	23									
	24									
	25									
	26									
	27									
	28									
	29									
	30									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-88

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-17

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-88**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 7, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1626 ft**	Date Completed:	**Sep 9, 07**
Location:	**Area G, NW Alignment**	Total Depth:	**155 ft**	Logged by:	**JN/TB/LS/EC**
Coordinates:	**2,162,438 N , 1,372,730 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					88		
105	32										
	33			100					92		
110	34										
				100					94		
115	35										
	36			100					100		
120	37										
				98					94		
125	38										
	39			91					89		
130	40										
				100					100		
135	41										
	42			97					88		
140	43										
				100					100		
145	44										
	45			100					90		
150	46										
				100					92		
155	47		END OF HOLE @ 155 FT								
	48										
160	49										
	50										
165	51										
	52										
170	53										
	54										
175	55										
	56										
180	57										
	58										
185	59										
	60										
190											
195											

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-88

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-18

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-89**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 10, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1890 ft**	Date Completed:	**Sep 11, 07**
Location:	**Area G, SW Alignment**	Total Depth:	**154.1 ft**	Logged by:	**TB/JN/EC**
Coordinates:	**2,153,620 N , 1,367,910 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)
Tundra Vegetation, organics silt and clay, numerous roots, brown.	0					
Silty SAND, some gravel, frequent boulders, well graded, clasts subangular to subrounded of variable composition, boulder 5 - 5.5 ft, moist, brown.	0	14		GH07-89-1	3/6/2	8
WEATHERED BEDROCK, Granodiorite/Monzonite, weathered to sand size material.	98	75		GH07-89-2	50/+/+	50+++
BEDROCK, Granodiorite/Monzonite, grey to greenish-grey, coarse grained. Hematite and calcite on fracture surfaces.	0					0
	0					
	100					28
	94					14
	98					31
	100					43
	98					35
	96					53
	100					0
	100					23
	100					0
	69					0
	99					28
	100					0
	94					0
	86					0
	96					0
	98					47
	97					0
	94					0
	97					55
	100					24
	100					21
	100					78
	100					100
	93					0
	98					0
	69					0

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

NOTES

Casing advanced, no core sample 2 - 7.5 ft. Drill return orange-tan brown, changes to tan-brown to grey at 7.5 ft.
* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

Water levels in 89S and 89D measured at 7.5 ft and 6.4 ft below ground surface on Sept 1/08 and Oct 4/07, respectively.

Drillhole logs represent an interpretation of field logs combined with laboratory test results

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-89

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-19

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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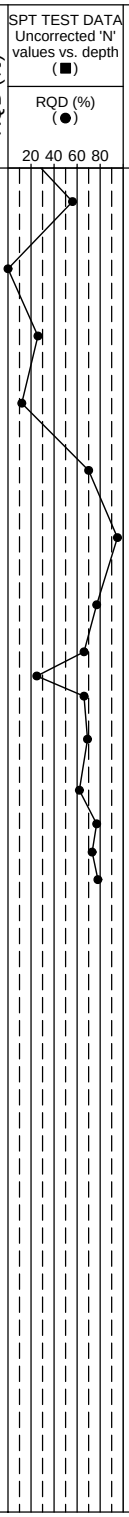
Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-89**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 10, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1890 ft**	Date Completed:	**Sep 11, 07**
Location:	**Area G, SW Alignment**	Total Depth:	**154.1 ft**	Logged by:	**TB/JN/EC**
Coordinates:	**2,153,620 N , 1,367,910 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			98					56		
105	32										
	33			100					0		
110	34										
				98					26		
115	35										
	36			100					12		
120	37										
				99					70		
125	38										
	39			100					95		
130	40										
				96					77		
135	41										
				100					66		
	42			94					25		
140				96					66		
	43										
				98					69		
145	44										
	45			100					62		
				100					77		
150	46			100					73		
	47			100					78		
155			END OF HOLE @ 154.1 FT								
	48										
160	49										
	50										
165	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										



Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-89

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

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Rev. 0 - Issued for Report VA101-00176/20-4

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Date Revised: Sep 15, 08

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-90**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 12, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1963 ft**	Date Completed:	**Sep 13, 07**
Location:	**Area G, SW Alignment**	Total Depth:	**170 ft**	Logged by:	**TB/JN**
Coordinates:	**2,151,062 N , 1,367,772 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)
Tundra Vegetation, thin veneer, dark brown, moist, organic odor. numerous roots and organic debris.	0				
	0	17	GH07-90-1	3/7/8	15
	0	33	GH07-90-2	12/23/22	45
WEATHERED BEDROCK, Monzonite, frost heaved, medium to coarse grained, boulders, subangular, some sand, some silt.	0				0
	0				0
BEDROCK, Monzonite, light grey and pink, medium-grained. Some calcite veinlets, calcite and hematite on fracture surfaces, clay fracture infilling.	26				0
	83				0
	89				26
	98				67
	98				66
	99				60
	100				39
	83				37
	100				62
	95				51
	91				0
	91				41
	98				59
	100				26
	96				59
	100				68
	100				32
	100				54
	100				83

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

NOTES

Casing advanced 0 - 10 ft, no core recovery. Drill return tan brown, sand-rich 4.5 - 10 ft.
* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

Water levels in 90S and 90D measured at 1.6 ft and 2.7 ft below ground surface, respectively on Oct 4/07.

Drillhole logs represent an interpretation of field logs combined with laboratory test results

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-90

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-21

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-90**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 12, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1963 ft**	Date Completed:	**Sep 13, 07**
Location:	**Area G, SW Alignment**	Total Depth:	**170 ft**	Logged by:	**TB/JN**
Coordinates:	**2,151,062 N , 1,367,772 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					79		
105	32										
	33			97					79		
110	34										
				100					65		
115	35										
	36			100					79		
120	37										
				97					85		
125	38										
	39			100					72		
130	40										
				100					15		
135	41										
	42			100					7		
140	43										
				98					89		
145	44										
	45			100					54		
150	46										
				100					62		
155	47										
	48			98					28		
160	49										
				100					92		
165	50										
	51			98					98		
170	52		END OF HOLE @ 170 FT								
175	53										
	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-90

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-22

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-91**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 14, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1889 ft**	Date Completed:	**Sep 15, 07**
Location:	**Area G, S Alignment**	Total Depth:	**155 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,768 N , 1,368,765 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
			Tundra vegetation, silty sand matrix and frequent roots and organic debris. Trace grey-blue organic clay near surface, poorly graded, clasts angular to subangular up to boulder size, damp.	0						Casing advanced 0 - 5.5 ft, no core recovery. Drill return tan brown, sand-rich.
	1			0	66		GH07-91-1	3/8/13	21 / 0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
5	2			0					0	
			WEATHERED BEDROCK, Silty SAND, some gravel, poorly graded, clasts subangular to angular, light brown.	20					43	
10	3									
	4		BEDROCK, Monzonite, light grey and pink, medium-grained, hematite, calcite and chlorite on fracture surfaces, some calcite veinlets, basalt intercalations from 87 to 108'.	95					24	
15	5									Water level measured at 0.5' above ground surface, Oct 4/07.
				90					49	
20	6									
	7			95					49	
25	8									
				95					100	
30	9									
	10			100					68	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
35	11									
				100					52	
40	12									
	13			95					60	
45	14									
				96					53	
50	15									
	16			100					43	
55	17									
				100					65	
60	18									
	19			98					52	
65	20									
				100					37	
70	21									
	22			100					38	
75	23									
				100					49	
80	24									
	25			100					50	
85	26									
	27			97					25	
90	28									
				100					27	
95	29									
	30			100					10	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-91

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-23

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-91**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 14, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1889 ft**	Date Completed:	**Sep 15, 07**
Location:	**Area G, S Alignment**	Total Depth:	**155 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,768 N , 1,368,765 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			92					20		
105	32										
	33			100					30		
110	34										
				100					62		
115	35										
	36			98					77		
120	37										
				100					85		
125	38										
	39			100					52		
130	40										
				97					80		
135	41										
	42			100					89		
140	43										
				94					94		
145	44										
	45			100					85		
150	46										
				100					91		
155	47		END OF HOLE @ 155 FT								
	48										
160	49										
	50										
165	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-91

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-92**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 15, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1699 ft**	Date Completed:	**Sep 18, 07**
Location:	**Area G, S Alignment**	Total Depth:	**160 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,448 N , 1,370,764 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
	1		Tundra Vegetation, SAND, some silt, some gravel, frequent roots and organic debris, well graded, clasts subrounded up to cobble size, light brown, moist.	0						Casing advanced, no core recovery 0 - 6 ft.
5	2		WEATHERED BEDROCK, Monzonite, brecciated, weathered to sand size particles with angular more competent fragments, light brown, poorly sorted, light brown.	0	56		GH07-92-1	2/4/11	15	
				0					0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3			0	83		GH07-92-2	14/48/49	0	
									97	
	4			23					0	
15	5		BEDROCK, Monzonite, brecciated, angular monzonite clasts ranging from gravel to boulder size, matrix consists of a ploymictic wacke to gravel conglomerate, fractures contain mainly hard infilling, strong weathering of matrix.	62					7	Water levels in 92S and 92D measured at 0.7 ft above ground surface and 11.7 ft below ground surface, respectively on Oct 4/07.
20	6									
	7			98					26	
25	8									
				92					7	
30	9									
	10			100					26	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
35	11									
				100					36	
40	12									
	13			100					38	
45	14									
				91					0	
50	15									
	16			100					69	
55	17									
				98					49	
60	18									
	19			100					13	
65	20									
				100					7	
70	21									
	22			100					49	
75	23									
				100					43	
80	24									
	25			100					69	
85	26									
				100					59	
90	27									
	28			98					81	
95	29									
	30			100					62	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-92

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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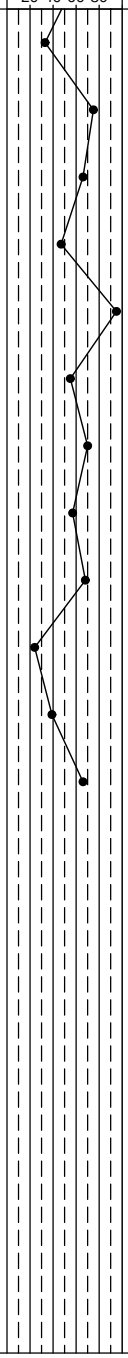
Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-92**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 15, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1699 ft**	Date Completed:	**Sep 18, 07**
Location:	**Area G, S Alignment**	Total Depth:	**160 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,448 N , 1,370,764 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					33		
105	32										
	33			100					75		
110	34										
				100					66		
115	35										
	36			100					47		
120	37										
				100					95		
125	38										
	39			100					55		
130	40										
				98					70		
135	41										
	42			100					57		
140	43										
				100					68		
145	44										
	45			100					24		
150	46										
	47			100					39		
155	48										
				100					66		
160	49		END OF HOLE @ 160 FT								
	50										
165	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										



Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-92

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-26

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-93**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 18, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1517 ft**	Date Completed:	**Sep 21, 07**
Location:	**Area G, S Alignment**	Total Depth:	**205 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,129 N , 1,373,640 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
Tundra Vegetation, SILT and SAND, trace gravel, isolated cobbles, well graded, clasts angular to subrounded, brown, moist, numerous roots and organic debris.	0						Casing advanced 0 - 16.5 ft, no core recovery.
		61		GH07-93-1	11/11/12	23	
Sandy GRAVEL, some silt, trace clay, isolated cobbles, well graded, clasts angular to subrounded, light brown, moist, sand and silt content increasing with depth.	0	72		GH07-93-2	20/31/37	68	Water level measured at 3.1' below ground surface, Oct 4/07.
		33		GH07-93-3	27/11/6	17	
WEATHERED BEDROCK, Tertiary Andesite, dark grey, white phenocrysts, hematite on fracture surfaces, soft infill material washed away.	74					0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	50					0	
	98					0	
	56					26	
BEDROCK, Tertiary clast-supported breccia, mix of subrounded and angular basaltic clasts ranging from gravel to cobble size, matrix ranging from mudstone to sandstone, hematite, limonite and calcite on fracture surfaces.		67		GH07-93-4	9/13/12	25	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
	75					20	
	100					28	
	100					36	
	98					0	
	100					40	
	100					63	
	100					52	
	97					30	
	100					32	
	100					7	
	100					56	
	100					29	
	100					48	Loss of circulation between 82 to 85 ft.
	100					69	
	100					65	

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-93

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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A1-27

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

M:\1\01\00176\20\A\DATA\2007 WMF SI\GINT\WMF2007.GPJ

Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-93**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 18, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1517 ft**	Date Completed:	**Sep 21, 07**
Location:	**Area G, S Alignment**	Total Depth:	**205 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,129 N , 1,373,640 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					31		
105	32										
	33			100					39		
110	34										
				98					10		
115	35										
	36			100					31		
120	37										
				100					47		
125	38		BEDROCK, Tertiary Dacite, grey-green, flow banding, vesicular portions, weathered to pale brown in portions.								
	39			100					82		
130	40										
				100					70		
135	41			98					0		
	42			100					60		
140	43										
				100					92		
145	44										
	45			99					52		
150	46										
				100					51		
155	47										
	48			98					64		
160	49									Total loss of circulation at 160 ft.	
				100					75		
165	50										
	51			98					82		
170	52										
				100					66		
175	53										
	54			100					74		
180	55										
				100					54		
185	56										
	57			94					84		
190	58										
				100					69		
195	59										
	60			100					72		

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-93

Rev. 0 - Issued for Report VA101-00176/20-4

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-28

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

M:\1\01\00176\20\A\DATA\2007 WMF SI\GINT\WMF2007.GPJ

Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-93**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 18, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1517 ft**	Date Completed:	**Sep 21, 07**
Location:	**Area G, S Alignment**	Total Depth:	**205 ft**	Logged by:	**TB/JN**
Coordinates:	**2,149,129 N , 1,373,640 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	62			100					82			
205	63		END OF HOLE @ 205 FT									
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-93

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-29

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-94**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 21, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1676 ft**	Date Completed:	**Sep 22, 07**
Location:	**Area G, S Alignment**	Total Depth:	**139 ft**	Logged by:	**TB/JN**
Coordinates:	**2,148,734 N , 1,374,743 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)
Tundra Vegetation, Silty sand, trace gravel, isolated cobbles, numerous roots and organic debris, well graded, clasts angular to subangular, dark brown, moist.	0					
	0					
	0	100		GH07-94-1	50+/+/+	50
Silty SAND, some gravel, occasional cobbles, well graded, clasts angular to subangular, orangey-brown, moist.	91					21
	85					12
BEDROCK. Porphyritic with a fine-grained matrix and white sand to gravel sized phenocrysts. Hematite and clay on fracture surfaces.	70					0
	51					13
	92					21
	95					0
	84					18
	100					29
	100					45
	100					16
	100					39
	100					79
	100					83
	100					97
	100					73
	100					99
	100					100
	100					59
	99					67
	100					90
	100					96

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

NOTES

Casing advanced 0 - 5.5 ft, no core recovery. Drill return tan brown, sand-rich 1 - 5.5 ft.
* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

Water level measured at 1' above ground surface, Oct 4/07.

Drillhole logs represent an interpretation of field logs combined with laboratory test results

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-94

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-30

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-94**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 21, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1676 ft**	Date Completed:	**Sep 22, 07**
Location:	**Area G, S Alignment**	Total Depth:	**139 ft**	Logged by:	**TB/JN**
Coordinates:	**2,148,734 N , 1,374,743 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					77		
105	32			100					62		
	33										
110	34			100					76		
115	35			100					85		
	36										
120	37			100					66		
125	38			99					60		
	39										
130	40			100					47		
135	41			100					66	Loss of circulation at 137 ft	
	42										
140	43		END OF HOLE @ 139 FT								
145	44										
	45										
150	46										
155	47										
	48										
160	49										
165	50										
	51										
170	52										
175	53										
	54										
180	55										
185	56										
	57										
190	58										
195	59										
	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-94

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-31

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-98**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 28, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1746 ft**	Date Completed:	**Sep 30, 07**
Location:	**Area G, E Alignment**	Total Depth:	**229.5 ft**	Logged by:	**TB/JN**
Coordinates:	**2,152,902 N , 1,384,912 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
Tundra Vegetation, fine sand and gravel (colluvium), some cobbles, numerous roots and organic debris, gap graded, clasts angular to subangular, dark brown, damp.	0	8	GH07-98-1	4/4/4	8	Casing advanced 0 - 49.5 ft, no core recovery.
Sandy GRAVEL, trace to some silt/clay, fines increasing with depth, occasional cobbles, well graded, clasts subangular to subrounded, tan brown, moist to damp.		50	GH07-98-2	22/23/30	53	Drill return changed from dark reddish-brown to greyish brown at 5 ft, gravel encountered.
		100	GH07-98-3	3/2/5	7	
	0	89	GH07-98-4	7/8/13	21	
		81	GH07-98-5	9/13/12	25	
		100	GH07-98-6	10/14/14	28	
COMPLETELY WEATHERED BEDROCK, Silty, gravelly SAND, trace clay, silt content decreasing with depth, gravel content increasing with depth, well graded, clasts subangular, greyish brown, moist.		94	GH07-98-7	23/34/46	80	Water levels in 98S and 98D measured at 12.9 ft and 12.3 ft below ground surface, respectively on Oct 13/07.
		89	GH07-98-8	10/12/34	46	
	0	78	GH07-98-9	14/13/16	29	
		100	GH07-98-10	15/18/16	34	
		100	GH07-98-11	19/44/49	93	
WEATHERED BEDROCK, Tertiary matrix supported breccia/conglomerate, silty, gravelly SAND, occasional cobbles, well graded, clasts subangular, mottled orange, brown, and grey, moist, hematite and limonite alteration, more competent.	85				0	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	85				0	
	95				45	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
	89				28	
	72				16	
	93				48	
BEDROCK, Monzonite, light grey and pink, medium-grained, calcite, hematite/limonite on fracture surfaces, vugs, weak to moderately fractured.	98				16	
	79				20	
	96				0	
	100				25	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-98

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

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Rev. 0 - Issued for Report VA101-00176/20-4

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Date Revised: Sep 15, 08

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-98**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 28, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1746 ft**	Date Completed:	**Sep 30, 07**
Location:	**Area G, E Alignment**	Total Depth:	**229.5 ft**	Logged by:	**TB/JN**
Coordinates:	**2,152,902 N , 1,384,912 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					41		
105	32			98					0		
	33			100					53		
110	34			100					41		
115	35										
	36			100					0		
120	37			98					23		
125	38										
	39			98					64		
130	40			100					75		
135	41										
	42			100					36		
140	43			100					45		
145	44										
	45			100					89		
150	46			100					56		
155	47										
	48			100					46		
160	49			100					79		
165	50										
	51			100					51		
170	52			100					85		
175	53										
	54			95					66		
180	55										
	56			100					92		
185	57			100					85		
190	58										
	59			100					58		
195	60			100					74		

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-98

Rev. 0 - Issued for Report VA101-00176/20-4

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-39

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-98**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 28, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1746 ft**	Date Completed:	**Sep 30, 07**
Location:	**Area G, E Alignment**	Total Depth:	**229.5 ft**	Logged by:	**TB/JN**
Coordinates:	**2,152,902 N , 1,384,912 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	62			100					92			
205	63			100					66			
210	64											
	65			100					79			
215	66			98					66			
220	67											
	68			100					82			
225	69			97					64			
230	70		END OF HOLE @ 229.5 FT									
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-98

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-40

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-99**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1900 ft**	Date Completed:	**Oct 3, 07**
Location:	**Area G, E Alignment**	Total Depth:	**160 ft**	Logged by:	**TB/JN**
Coordinates:	**2,154,211 N , 1,385,450 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
			Tundra Vegetation, frost heaved bedrock at surface, silty SAND, some gravel, well graded, dark reddish-brown, moist to wet.	0	28		GH07-99-1	3/4/4	8	Casing advanced 0 - 10 ft, no core recovery.
			WEATHERED BEDROCK, Monzonite, weathered to SAND, some silt, trace clay, trace gravel, poorly graded, subangular coarse sand, light brown, moist.	0	67		GH07-99-2	26/13/17	30	Drill return greyish brown between 7 - 10 ft.
					100		GH07-99-3	14/20/41	61	
			Frequent boulders 7 - 10 ft.	100					23	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
			BEDROCK, Monzonite, light grey and pink, medium-grained, biotite-hornblende-quartz, calcite veinlets, weak to moderate fracturing, hematite and calcite on fracture surfaces throughout, some pyrite and chlorite staining.	100					58	
				35					60	
				98					87	Water level measured at 3.7' below ground surface, Oct 13/07.
				99					66	
				100					87	
				100					100	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
				100					94	
				100					80	
				100					89	
				97					87	
				100					79	
				100					79	
				98					70	
				100					82	
				100					79	
				100					83	
				100					92	
				97					85	

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-99

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

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Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-99**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1900 ft**	Date Completed:	**Oct 3, 07**
Location:	**Area G, E Alignment**	Total Depth:	**160 ft**	Logged by:	**TB/JN**
Coordinates:	**2,154,211 N , 1,385,450 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					89		
105	32										
	33			100					85		
110	34										
				100					82		
115	35										
	36			95					82		
120	37										
				100					84		
125	38									Lost circulation between 125 to 130 ft. (15gpm)	
	39			100					82		
130	40										
				100					62		
135	41										
	42			100					97		
140	43										
				100					100		
145	44										
	45			96					94		
150	46										
				100					95		
155	47										
	48			100					83		
160	49		END OF HOLE @ 160 FT								
165	50										
	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-99

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

Rev. 0 - Issued for Report VA101-00176/20-4

A1-42

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-100**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1916 ft**	Date Completed:	**Oct 5, 07**
Location:	**Area G, E Alignment**	Total Depth:	**180 ft**	Logged by:	**TB/JN/LS/TG**
Coordinates:	**2,151,719 N , 1,384,518 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
Tundra Vegetation veneer, frost heaved bedrock, organic silt and clay, frequent roots, dark brown, poorly sorted, moist.	0	56		GH07-100-1	3/4/7	11	Casing advanced 0 - 5 ft, no core recovery.
	0						
Sandy GRAVEL, angular to subangular clasts, isolated cobbles and boulders, well graded, moist, likely weathered bedrock.		100		GH07-100-2	50+/+/+	50+++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	0					0	
BEDROCK, Tertiary breccia/conglomerate, mainly clast supported, clasts are volcanic and angular to subrounded, matrix consists of wacke, chlorite and hematite on fracture surfaces, occasional dacitic intrusions.	33					0	
							Lost circulation 15-20 ft.
	98					29	
	100					73	
	100					53	
	100					67	Water level measured at 34.1' below ground surface, Oct 13/07.
	98					46	
	100					30	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
	100					90	
	100					68	
	94					71	
	100					71	
	100					67	
	100					58	
	100					88	
	100					68	
	100					40	
	100					79	
	100					91	

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-100

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-43

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-100**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1916 ft**	Date Completed:	**Oct 5, 07**
Location:	**Area G, E Alignment**	Total Depth:	**180 ft**	Logged by:	**TB/JN/LS/TG**
Coordinates:	**2,151,719 N , 1,384,518 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES	WELL DETAILS
	31			100					51		
105	32										
	33			96					56		
110	34										
				93					60		
115	35										
	36			93					60		
120	37										
				100					100		
125	38										
	39			100					64		
130	40										
				100					95		
135	41										
	42			100					75		
140	43										
				100					100		
145	44										
	45			98					87		
150	46										
				100					44		
155	47										
	48			82					66		
160	49										
				100					100		
165	50										
	51			100					62		
170	52										
				100					49		
175	53										
	54			98					16		
180	55		END OF HOLE @ 179.5 FT								
185	56										
	57										
190	58										
	59										
195	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-100

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-44

Rev. 0 - Issued for Report VA101-00176/20-4

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-104**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 15, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1003 ft**	Date Completed:	**Oct 20, 07**
Location:	**East Deposit Area**	Total Depth:	**195 ft**	Logged by:	**TG/LS**
Coordinates:	**2,153,137 N , 1,408,702 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
Tundra vegetation, Gravelly SAND, some silt and clay, numerous organic roots, well graded, clasts subrounded to subangular, brown, moist.	20	56	GH07-104-1	18/15/29	44	Casing advanced to 17.5 ft. No core recovery from 7.5-17.5 ft. Finer materials mostly washed away 0 - 9 ft.
GRAVEL and SAND, trace silt, trace clay, well graded, clasts subrounded to angular, light brown, moist.	60	44	GH07-104-2	18/22/21	43	
	40	50	GH07-104-3	14/16/24	40	
		50	GH07-104-4	15/17/17	34	
	0	64	GH07-104-5	9/9/15	24	
		61	GH07-104-6	15/20/40	60	Circulation lost @15'
						Boulder 17' to 19.5'
SILT, some sand, some clay, trace gravel, poorly graded, grey, moist.	92	100	GH07-104-7	4/7/12	19	
Silty, gravelly SAND, trace clay, well graded, clasts rounded to subangular, light brown, moist to wet.	62	50	GH07-104-8	10/13/13	26	Finer materials mostly washed away in core recoveries 24 - 30 ft.
	20	44	GH07-104-9	5/5/9	14	
	40	36	GH07-104-10	6/7/12	19	Water level measured at 2.1' above ground surface, Oct 20/07.
SILT, some sand, some clay, areas where sand and clay content is higher, trace gravel, poorly graded, clasts rounded to subangular, grey, moist to wet.	40	100	GH07-104-11	3/3/3	6	
	13	100	GH07-104-12	2/4/6	10	
	25	33	GH07-104-13	6/9/15	24	
	23	47	GH07-104-14	6/8/11	19	
	28	64	GH07-104-15	3/6/8	14	
	67	83	GH07-104-16	8/10/12	22	
	40	94	GH07-104-17	5/8/10	18	
	23	114	GH07-104-18	4/5/5	10	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
	25	119	GH07-104-19	3/5/6	11	
	71	94	GH07-104-20	3/7/12	19	
	25	78	GH07-104-21	5/6/9	15	
	72	117	GH07-104-22	7/9/16	25	
	75	33	GH07-104-23	4/6/7	13	
	67					

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-104

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

Rev. 0 - Issued for Report VA101-00176/20-4

A1-51

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-104**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 15, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1003 ft**	Date Completed:	**Oct 20, 07**
Location:	**East Deposit Area**	Total Depth:	**195 ft**	Logged by:	**TG/LS**
Coordinates:	**2,153,137 N , 1,408,702 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
SAND and GRAVEL, some silt/clay, poorly to well graded due to varying amounts of gravel, subrounded clasts up to cobble size, light brown to light grey, moist.	42	100	GH07-104-24	9/26/36	61	Some heaving sand during drilling at 75 ft, sand in drill return from 77 to 105 ft.
	22	67	GH07-104-25	26/24/18	42	Trace hematite on cobbles, Trace iron oxide in soil 80 - 81.5 ft.
	7					
	0					
	10					
		83	GH07-104-26	10/19/22	41	
	20					
		22	GH07-104-27	19/32/47	79	
	10					
Clayey SILT, trace sand, trace gravel, poorly graded, clasts subrounded to subangular, up to gravel size, light grey, moist.		22	GH07-104-28	21/47/50+	97+	Gravel does not appear in SPT samples for this material - only observed in core recovery.
	86					
		100	GH07-104-29	8/13/29	42	
	85					
		97	GH07-104-30	5/7/11	18	
	55					
Sandy SILT, some clay, trace gravel, subrounded clasts, poorly graded, grey, moist.		106	GH07-104-31	22/30/35	65	Heaving sands at 125 to 134 ft. 1 ft boulder at 139 ft.
	43					
			GH07-104-32	50+/+/+	50+++	
	30					
	50					
		22	GH07-104-33	17/50+/+	50++	
	18					
		100	GH07-104-34	17/22/40	62	
	65					
		106	GH07-104-35	15/30/50+	83+	
	82					

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-104

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

Rev. 0 - Issued for Report VA101-00176/20-4

A1-52

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-104**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 15, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**1003 ft**	Date Completed:	**Oct 20, 07**
Location:	**East Deposit Area**	Total Depth:	**195 ft**	Logged by:	**TG/LS**
Coordinates:	**2,153,137 N , 1,408,702 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
	46				6		GH07-104-36	30/42/50+	92+	
	47			17						
155			SAND and GRAVEL, some silt/clay, frequent cobbles and boulders, well graded, clasts rounded to subrounded, light brown, moist to wet.		33		GH07-104-37	12/38/50+	88+	Heaving sand at 165 ft associated with flowing conditions, very low, casing set to 175 ft.
	48			95						
160	49				89		GH07-104-38	34/49/50+	99+	
				67						
	50			100						
165										
	51			33						
170	52				22		GH07-104-39	24/35/50+	85+	
				75						
	53			27						
175					60		GH07-104-40	16/46/50+	96+	
	54			0						
180	55		BEDROCK, Weathered Tertiary Rhyolite, cream white-green, heavily weathered, clay, chlorite and calcite fracture infilling.	0	40		GH07-104-41	11/35/50+	85+	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	56			100					0	
185									27	
	57			100					53	
190	58			92					18	
	59			62					0	
195			END OF HOLE @ 195 FT							
	60									
200	61									
	62									
205	63									
210	64									
	65									
215	66									
220	67									
	68									

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-104

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

Rev. 0 - Issued for Report VA101-00176/20-4

A1-53

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-105**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 20, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**996 ft**	Date Completed:	**Oct 25, 07**
Location:	**East Deposit Area**	Total Depth:	**170 ft**	Logged by:	**TG/LS**
Coordinates:	**2,152,553 N , 1,406,897 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
Tundra vegetation., silty SAND, some gravel, round to subrounded clastsup to coarse gravel size, dry, numerous roots up to 1 ft depth.	0					Tricone drilled 0 - 20 ft to install 6" casing, no core recovery to 22.5 ft. Light brown drill return with brown/black sand content 0 - 21 ft. 1 ft boulder at 5.5 ft
GRAVEL and SAND, trace silt, trace clay, well graded, clasts subangular to rounded, occasional cobbles and boulders, light brown, dry to moist, gravel content varying with depth.		50	GH07-105-1	17/24/30	54	
		53	GH07-105-2	22/27/29	56	
		56	GH07-105-3	16/25/24	49	
		39	GH07-105-4	14/19/32	51	Water level measured at 0.7' below ground surface, Oct 26/07.
	0	56	GH07-105-5	21/20/23	43	
		56	GH07-105-6	22/19/23	42	
		58	GH07-105-7	11/9/9	18	
		69	GH07-105-8	9/15/19	34	Finer materials mostly washed away from core recoveries 20 - 37 ft.
		50	GH07-105-9	12/18/12	30	
	10	50	GH07-105-10	4/10/8	18	Circulation lost occasionally between 25 and 35 ft.
	5	56	GH07-105-11	4/6/7	13	
	0	67	GH07-105-12	7/7/6	13	
	5	64	GH07-105-13	9/7/7	14	
	5	58	GH07-105-14	7/5/9	14	Finer materials washed away.
SAND, some silt/clay, trace gravel, silt content increases with depth, poorly graded, sand size clasts, subrounded, light brown, moist.	20	78	GH07-105-15	5/7/8	15	
	40	106	GH07-105-16	4/5/8	13	Orangey brown, sandy drill return 37 - 75 ft.
	43	97	GH07-105-17	4/7/8	15	
	63	111	GH07-105-18	4/7/8	15	***Drillhole logs represent an interpretation of field logs combined with laboratory test results***
SILT, some sand, some clay, trace to some gravel, gravel content increasing with depth, subrounded clasts up to gravel size, poorly graded to gap graded, light brown, moist	80	117	GH07-105-19	4/8/17	25	
	20	67	GH07-105-20	11/11/14	25	
	7					
SAND, some silt/clay, trace to some gravel, poorly graded to gap graded, subangular clasts, grey-brown, moist.		22	GH07-105-21	6/11/9	20	Heaving sand at 60 to 75 ft.
	30					
		56	GH07-105-22	10/12/11	23	
	79					
		17	GH07-105-23	7/7/8	15	
	0					
	62					

SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-105

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

Rev. 0 - Issued for Report VA101-00176/20-4

A1-54

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-105**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 20, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**996 ft**	Date Completed:	**Oct 25, 07**
Location:	**East Deposit Area**	Total Depth:	**170 ft**	Logged by:	**TG/LS**
Coordinates:	**2,152,553 N , 1,406,897 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	NOTES
	23				100		GH07-105-24	50+/+/+	50+++	
				22						
80	24				89		GH07-105-25	8/13/22	35	
	25			9						
85	26				139		GH07-105-26	8/12/19	31	
	27			58						
90	28				133		GH07-105-27	2/11/15	26	
				77						
95	29		Sandy, clayey SILT, some gravel, gap graded, clasts subrounded up to cobble size, light grey-brown, moist.	23						
	30			33						
100	31				14		GH07-105-28	15/14/17	31	
				13						
105	32									No core recovery 105 - 110 ft
	33			0						
110	34				125		GH07-105-29	6/9/11	20	
				60						
115	35		SAND and GRAVEL, some silt/clay, frequent cobbles and boulders, well graded, clasts subrounded to subangular, light brown-grey, moist.		39		GH07-105-30	15/50+/+	50++	Boulder 120 to 123 ft
				50						
	36			100						
120	37				58		GH07-105-31	50+/+/+	50+++	
			Gravelly SILT, some sand, trace clay, gap graded, clasts subrounded up to medium gravel size, light brown, moist.	97						
125	38				0		GH07-105-32	22/28/50+	78+	
	39			43						
			GRAVEL and SAND, trace silt/clay, numerous cobbles, well graded, clasts rounded to subrounded, light brown, moist.	100	43		GH07-105-33	20/50+/+	50++	Boulder 128.5 - 130 ft
130	40			65						
135	41				33		GH07-105-34	50+/+/+	50+++	
	42			90						
140	43				50		GH07-105-35	50+/+/+	50+++	
				43						
145	44				58		GH07-105-36	50+/+/+	50+++	Finer materials washed away in core recoveries 145 - 159 ft.
				27						
	45			50						

SPT TEST DATA Uncorrected 'N' values vs. depth (■)
RQD (%) (●)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-105

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

Rev. 0 - Issued for Report VA101-00176/20-4

A1-55

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

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Date Revised: Sep 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH07-105**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 20, 07**
Drilling Method:	**HT-700 Mud Rotary Diamond Drill**	Elevation:	**996 ft**	Date Completed:	**Oct 25, 07**
Location:	**East Deposit Area**	Total Depth:	**170 ft**	Logged by:	**TG/LS**
Coordinates:	**2,152,553 N , 1,406,897 E, NAD83 AK State Plane (ft)**	Azimuth, Inclination:	**0 degs, -90 degs**	Reviewed by:	**LJG**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE RQD (%)	SPT TEST DATA Uncorrected 'N' values vs. depth (■) RQD (%) (●) 20 40 60 80	NOTES	WELL DETAILS
	46				56		GH07-105-37	42/50+/+	50++			
				40								
155	47											
				43	67		GH07-105-38	50+/+/+	50+++			
	48			0								
				53								
160	49		BEDROCK. Rhyolite, coarse grained, mainly cream pink with banded texture, calcite and hematite on fracture surfaces, clay infilling, trace pyrite, moderately to heavily weathered, very fractured.	100					0		* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
				84					11			
165	50			98					0			
	51			94					0			
170	52		END OF HOLE @ 190 FT									
175	53											
	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											
200	61											
	62											
205	63											
210	64											
	65											
215	66											
220	67											
	68											

Pebble Limited Partnership
Pebble Project
Overburden Geotechnical Log For GH07-105

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/20	4	0

A1-56

Rev. 0 - Issued for Report VA101-00176/20-4

M:\1\01\00176\20\A\DATA\2007 WMF SI\GINT\WMF2007.GPJ

Date Revised: Sep 15, 08

Log Type: SOILS LOG WITH ROCK DATA Library Filepath: M:\1\01\00176\23\A\DATA\2008 WMF SI\2008 GINT\LIBRARY1.GLB Printed: Sep 21, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-107**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 12, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1029.3 ft**	Date Completed:	**Apr 21, 08**
Location:	**Open Pit Area**	Total Depth:	**355 ft**	Logged by:	**LS/EC/SR**
Coordinates:	**2,154,630 N , 1,407,556 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, dark brown, root inclusions, moist. (Topsoil)	77					
Gravelly silty SAND, some clay, trace cobbles, subangular to subrounded, up to cobble size (2"), well graded, low plasticity, loose to compact, light brown, moist. (Glacial Drift)	81	89		GH08-107-1	13/50+/+	50++
	20	65		GH08-107-2	5/5/5	10
Gravelly SAND, some silt, some clay, subrounded, up to cobble size, up to 2", well graded, low plasticity, loose, light brown, moist. (Glacial Drift)	20	67		GH08-107-3	6/11/10	21
	46	56		GH08-107-4	11/15/14	29
	55					
Gravelly, silty SAND, some clay, subangular to subrounded, trace cobbles up to 10" diameter, well graded, medium to high plasticity, dense to very dense, brown, moist. (Glacial Drift)	79	42		GH08-107-5	9/37/34	71
	87	100		GH08-107-6	36/50+/+	50++
	88	94		GH08-107-7	10/17/47	64
	100	83		GH08-107-8	40/34/29	63
	93	67		GH08-107-9	10/32/45	77
SAND and GRAVEL, some silt, some clay, subrounded to subangular, trace cobbles up to 2" diameter, poorly graded, low plasticity, very dense, brown, moist. (Glaciofluvial)	68					
BEDROCK, Tertiary Basalt, fine grained, grey, moderately weathered, calcite, hematite, chlorite, some clay infilling of discontinuities, intervals of brecciated basalt, competent.	98					
	99					
	100					
	100					
	100					
	79					
	100					
	96					
	89					
	96					

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

NOTES

HQ3 to 355'
PW casing to 15.3'
PQ3 to 59'
HWT to 205', 61' stuck in hole.

Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-107

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-107

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: May 2, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-107**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 12, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1029.3 ft**	Date Completed:	**Apr 21, 08**
Location:	**Open Pit Area**	Total Depth:	**355 ft**	Logged by:	**LS/EC/SR**
Coordinates:	**2,154,630 N , 1,407,556 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			63						
105	32									Core pump was left on for 15 mins after the run, possible shear zone 103-105ft, material suspected to be washed away.
	33			96						
110	34			100						
115	35									
	36			96						
120	37			99						
125	38			100						Lost circulation, 124.7 to 127'
	39			100						
130	40			98						
				62						Increased circulation to ~12gpm
				100						
135	41			94						
	42			96						
140	43			100						
145	44									
	45			91						
150	46			98						
155	47									
	48			85						
160	49			98						
165	50									
	51			98						
170	52			92						
175	53									
	54			100						
180	55			100						
	56									
185	57			64						
190	58			92						
	59			97						
195	60		BEDROCK, Tertiary volcaniclastic breccia/conglomerate, brown to grey, ranges	78						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
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Date Revised: May 2, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-107**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 12, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1029.3 ft**	Date Completed:	**Apr 21, 08**
Location:	**Open Pit Area**	Total Depth:	**355 ft**	Logged by:	**LS/EC/SR**
Coordinates:	**2,154,630 N , 1,407,556 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62		from clast to matrix supported, angular to subrounded poorly sorted, polymicitic breccia-fragmental rock. Clasts range from sand to boulder sized (1 cm to 60 cm) with most clasts between 1-5 cm.	100								
205	63			100								
210	64											
	65			100								
215	66			99								
220	67											
	68			93								
225	69			100								
230	70											
	71			100								
235	72			100								
240	73											
	74			98								
245	75			97								
250	76		BEDROCK, Tertiary Basalt, dark green to black, some reddish, fine grained, moderately weathered, carbonate and calcite veins, minor chlorite and hematite.									
	77			100								
255	78			100								
260	79											
	80			100								
265	81			100								
270	82											
	83			100								
275	84			94								
280	85											
	86			100								
285	87			100								
290	88											
	89			94								
295	90											
	91			96								

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Project:	**Pebble Project**	Drill Hole No.	**GH08-107**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 12, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1029.3 ft**	Date Completed:	**Apr 21, 08**
Location:	**Open Pit Area**	Total Depth:	**355 ft**	Logged by:	**LS/EC/SR**
Coordinates:	**2,154,630 N , 1,407,556 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			100								
305	93											
	94			100								
310	95			98								
315	96											
	97			94								
320	98			100								
325	99											
	100			88								
330	101			100								
335	102											
	103			98								
340	104			100								
345	105											
	106			100								
350	107			100								
	108											
355			END OF HOLE @ 355 FT									
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
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Date Revised: May 2, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-108**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 21, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**863.42 ft**	Date Completed:	**Apr 23, 08**
Location:	**East Deposit Area**	Total Depth:	**75 ft**	Logged by:	**CG/LS/MS**
Coordinates:	**2,157,070 N , 1,410,500 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
			PEAT, very soft, dark brown, organic. Top 4 inches frozen, some greyish-brown sand, trace silt/clay, trace subangular gravel, poorly graded, high plasticity, very loose, moist to wet. (Topsoil)	20						Permanent 6" casing installed to 20' PQ3 to 37' HQ3 to 75'	
			Silty, gravelly SAND, some clay, trace cobbles/boulders, subangular to subrounded, well graded, medium to high plasticity, light greyish-brown, very dense, moist. (Glacial Drift)	24	50		GH08-108-1	1/1/3	4		
				47	74		GH08-108-2	4/6/9	15		
				67							
				87	100		GH08-108-3	50+/+/+	50+++		
			BEDROCK, Tertiary Basalt, fine grained, porphyritic, with thin white calcite and dark red hematite veins, some disseminated pyrite, dark black to grey-brown, some clay infilling of discontinuities.	50	17		GH08-108-4	9/17/20	37	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89). Artesian/Flowing conditions of approximately 5 gpm at 25 ft depth,	
				79							
				87							
				65							
				90						No Piezometer installed because the casing became stuck at 37 ft depth and an HQ Van Ruth plug had already been installed at 45 ft. The hole was grouted in.	
				85							
				100							
				94							
				100							
				97						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
				100							
			END OF HOLE @ 75 FT								

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

Pebble Limited Partnership
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Date Revised: May 2, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-109**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 21, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**993.44 ft**	Date Completed:	**Apr 25, 08**
Location:	**East Deposit Area**	Total Depth:	**139.5 ft**	Logged by:	**SR/EC**
Coordinates:	**2,154,404 N , 1,408,606 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Tundra Vegetation, dark brown, organics, root inclusions, moist. (Topsoil)	95						PW to 10' PQ to 139.5'
Sandy SILT, some clay, trace gravel, trace cobbles, subrounded to subangular, poorly graded, medium to high plasticity, brown, compact, moist. (Glaciolacustrine)	52	28		GH08-109-1	4/4/7	11	
	10	42		GH08-109-2	6/5/7	12	
Gravelly, Sandy SILT, some clay, trace cobbles, trace boulders up to 30 cm diameter, subrounded to subangular, gap graded, medium to high plasticity, brown, dense, moist. (Glaciolacustrine)	30	22		GH08-109-3	19/19/10	29	
	98						
	59	67		GH08-109-5	16/50+/+	50++	
SILT, some clay, some sand, trace gravel, trace cobbles, subrounded to subangular, poorly graded, medium to high plasticity, grey, compact, moist. (Glaciolacustrine)	20	0		GH08-109-6	7/7/11	18	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	23	33		GH08-109-7	5/10/15	25	
	77	78		GH08-109-8	5/8/9	17	
Silty SAND, trace gravel, trace clay, subangular to subrounded, clasts less than 4 cm diameter, large amount of fines washed away, poorly graded, low plasticity, brown, compact, moist to wet. (Glaciolacustrine)	13						
	13	72		GH08-109-9	13/11/16	27	
SAND and GRAVEL, trace silt/clay, subrounded to subangular, clasts up to cobble size, most fines washed away, well graded, low to no plasticity, brown, dense, moist. (Glaciofluvial)	46	50		GH08-109-10	17/20/26	46	
	55						
Clayey SILT, some sand, trace gravel, trace cobbles, subangular to subrounded, poorly graded, low to medium plasticity, grey/brown, compact to dense, moist. (Glaciolacustrine)	99						
	100	94		GH08-109-11	6/10/15	25	
	98						
	100	100		GH08-109-12	12/19/19	38	
	97						
	100	83		GH08-109-13	14/25/37	62	
Gravelly SAND, some silt, trace clay, trace cobbles, some fines washed away in sections with less fines, more fines from 92 to 94.5 ft depth, subangular to subrounded, well graded, low to medium plasticity, brown, firm to dense, moist.	53						
	10	61		GH08-109-14	2/50+/+	50++	

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
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Date Revised: May 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-109**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 21, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**993.44 ft**	Date Completed:	**Apr 25, 08**
Location:	**East Deposit Area**	Total Depth:	**139.5 ft**	Logged by:	**SR/EC**
Coordinates:	**2,154,404 N , 1,408,606 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		(Glaciofluvial)	11								
105	32				59		GH08-109-15	43/50+/+	50++			
	33			18								
110	34			34								
115	35			98								
	36		WEATHERED BEDROCK, Tertiary volcaniclastic breccia, highly oxidized, weak, gravelly SAND, some silt, trace clay, trace cobbles, subangular to subrounded clasts, poorly graded, medium plasticity, reddish-brown, dense, moist.	56	64		GH08-109-16	36/31/50+	50+			
120	37			57							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
125	38		BEDROCK, Tertiary volcaniclastic breccia with fine grained matrix and subangular multicoloured clasts, mostly gravel size, trace cobbles, oxidized, poorly sorted, heterolithic clasts largely of basalt, up to 10cm diameter, reddish-purple.	100								
	39			96								
130	40			100								
135	41											
	42			97								
140	43		END OF HOLE @ 139.5 FT									
145	44											
	45											
150	46											
	47											
155	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											

Pebble Limited Partnership
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Date Revised: May 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-110**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**898.01 ft**	Date Completed:	**Apr 26, 08**
Location:	**East Deposit Area**	Total Depth:	**75 ft**	Logged by:	**CG/LS/MS**
Coordinates:	**2,157,260 N , 1,409,305 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
PEAT, tundra vegetation, dark brown, frozen, organics, spongy, fibrous, no recovery. (Topsoil)	0	56	GH08-110-1	2/1/1	2	PQ3 to 75'
Gravelly Silty SAND, trace to some clay, some cobbles and boulders (increased cobbles from 10 to 15 ft depth), increased sand from 25 to 27 ft depth, subangular to subrounded, well graded, medium to high plasticity, grey, dense, moist. (Glacial Drift)	33	44	GH08-110-2	1/1/2	3	
	25	50	GH08-110-3	4/7/10	17	Driller noticed reddish return at 12' which turned back to grey.
	100	86	GH08-110-4	11/14/20	34	
	64	97	GH08-110-5	11/14/31	45	
Silty SAND, some gravel, some clay, trace cobbles, subangular to subrounded, clasts up to boulder size, gap graded, medium plasticity, brown, very dense, moist. (Glacial Drift)	89	97	GH08-110-6	15/24/30	54	
Gravelly Silty SAND, trace cobbles and boulders, subangular to subrounded, clasts up to boulder size, well graded, medium plasticity, brown, dense, moist. (Glacial Drift)	72	86	GH08-110-7	21/42/50+	50+	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	100	67	GH08-110-8	30/41/38	79	
	89	33	GH08-110-9	18/34/50	84	Artesian/ flowing conditions at 40', measured at ~0.5gpm.
Sandy SILT, some clay, trace gravel, increased silt from 45 to 50 ft depth, subangular to subrounded, clasts up to cobble size, poorly graded, medium to high plasticity, light brown to brown, moist. (Glaciolacustrine)	60	100	GH08-110-10	17/34/50+	50+	
		100	GH08-110-11	15/50+/+	50++	
Silty SAND, some clay, trace gravel, trace cobbles, subangular to subrounded, clasts up to cobble size, well graded, medium to high plasticity, brown, moist, silt and clay content increases with depth. (Glaciolacustrine)	62					
	95					
	100					
WEATHERED BEDROCK, Tertiary volcaniclastic breccia/conglomerate, weathered, very soft material in fractures, matrix supported, polymictic, angular to subrounded clasts, up to 5cm, moderately to well sorted, hematite/limonite on fractures.	52	100	GH08-110-12	25/50+/+	50++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	93					
BEDROCK, Tertiary volcaniclastic breccia/conglomerate, highly weathered, highly fractured, light grey, matrix supported breccia, with clay infilling, some vertical fractures, limonite/hematite on fractures, some quartz.	98					
END OF HOLE @ 75 FT						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-110

Knight Piésold CONSULTING

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Date Revised: Apr 24, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-111**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 25, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**989.55 ft**	Date Completed:	**Apr 29, 08**
Location:	**East Deposit Area**	Total Depth:	**119.5 ft**	Logged by:	**EC/SR/CK(SLR)/SD**
Coordinates:	**2,153,775 N , 1,407,626 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Tundra vegetation, SAND, trace silt, gravelly, brown, frozen. (Topsoil)	94						PW casing to 9.5' PQ3 to 119.5' Driller comments that this zone is very rocky.
Silty SAND, some clay, trace gravel, trace cobbles, trace boulders, subangular to subrounded, well graded, low to medium plasticity, light brown, compact, damp to moist, clay content increases from 5.7 to 9.25 ft depth, fines washed away between 9.25 to 14.5 ft. (Glaciolacustrine)	98, 68, 55	67		GH08-111-1	21/19/9	28	
	16	100		GH08-111-2	9/4/9	13	
	82	78		GH08-111-3	4/5/6	11	
Clayey SILT, some sand, no gravel, subrounded, up to coarse sand, sand seems to be in isolated seams, poorly graded, low to medium plasticity, brown, firm to dense, moist. (Glaciolacustrine)	89	72		GH08-111-4	4/10/9	19	
	85	78		GH08-111-5	11/12/13	25	
Sandy SILT, fine-grained, sand decreasing with depth, trace to some clay, trace gravel, subangular, clasts up to gravel size, poorly graded, low plasticity, grey-brown, density increases with depth, moist. (Glaciolacustrine)	19	92		GH08-111-6	10/11/15	26	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
SILT, some sand to sandy, some clay to clayey, some to no gravel, trace cobbles from 35.5 to 54.5 ft depth, subangular to subrounded, clasts up to cobble size, poorly graded, low to medium plasticity, grey-brown, firm to dense, damp to moist. (Glaciolacustrine)	100	92		GH08-111-7	7/12/14	26	
	46	94		GH08-111-8	11/24/10	34	
	100	100		GH08-111-9	4/6/10	16	
	33	92		GH08-111-10	3/6/9	15	
	43						
	92	100		GH08-111-11	4/4/7	11	
Silty SAND, fine to medium grained, trace to some clay, trace gravel, subrounded, clasts up to gravel size, poorly graded, low to medium plasticity, ranging to high plasticity with increased clay content from 74.5 to 79.5 ft depth, light brown, firm to dense, moist to damp. (Glaciolacustrine)	100						
	89						
	66	83		GH08-111-12	4/8/10	18	
	100						
Silty SAND and GRAVEL, with lenses of high plasticity clay, trace boulders of conglomerate composition, subangular to subrounded, poorly graded, low to medium plasticity, light brown, dense, moist. (Glacial Drift)	100						
	100						No SPT, run ended on boulder.
Sandy SILT, some clay, trace gravel, trace cobbles, increased sand from 102.5 to 105 ft depth, decreased sand with depth, gravel lense at 89.5 to 90 ft depth, subangular, poorly graded, medium to high plasticity light brown to grey, stiff, damp.	100						
	28	0		GH08-111-13	5/10/15	25	Low recovery due to cored boulder jammed into lifter.

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-111

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Date Revised: May 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-111**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 25, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**989.55 ft**	Date Completed:	**Apr 29, 08**
Location:	**East Deposit Area**	Total Depth:	**119.5 ft**	Logged by:	**EC/SR/CK(SLR)/SD**
Coordinates:	**2,153,775 N , 1,407,626 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		(Glaciolacustrine)	100								
105	32		BEDROCK, Tertiary Basalt, brecciated, angular fragments/clasts up to 15cm, clast supported, fine grained brown matrix, soft infilling in joints, oxidized, competent, pink-brown.	98	100		GH08-111-14	50+/+/+	50+++		* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	33			75								
110	34			100								
115	35			88								
	36											
120	37		END OF HOLE @ 119.5 FT									
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-111

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: May 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-112**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1007.33 ft**	Date Completed:	**May 3, 08**
Location:	**Open Pit Area**	Total Depth:	**380 ft**	Logged by:	**CG/MS**
Coordinates:	**2,155,883 N , 1,408,340 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Tundra Vegetation, peat, organics, roots, spongy, bown. (Topsoil)	0					PQ3 to 103.5' HQ3 to 380'
Gravelly SAND, some silt/clay, trace cobbles, subangular to subrounded, well graded, low plasticity silt/clay, brown, compact, moist. (Glacial Drift)	7	19	GH08-112-1	1/2/2	4	
		50	GH08-112-2	5/5/8	13	
	50	44	GH08-112-3	10/4/7	11	
	27	44	GH08-112-4	7/8/10	18	
	14	50	GH08-112-5	5/10/12	22	
	17	80	GH08-112-6	24/15/50+	50+	
	7	72	GH08-112-7	14/19/22	41	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
SAND, some silt/clay, trace gravel, trace cobbles, subangular to subrounded, poorly graded, low to no plasticity, brown, compact to dense, moist, fines washed out with the drill water circulation, minimal recovery, no recovery from 40 to 45 ft depth. (Glacial Drift)	33	78	GH08-112-8	21/35/49	84	
	0	117	GH08-112-9	13/15/15	30	No recovery
	13	67	GH08-112-10	9/10/16	26	
	50	100	GH08-112-11	18/21/20	41	
Gravelly SAND, coarse grained, some silt/clay, subrounded to subangular, clasts up to cobble size, increased to silt/clay from 65 to 70 ft depth, gap graded, medium plasticity, brown, moist. (Glacial Drift)	17					
	30	100	GH08-112-12	23/31/50+	50+	
	42					
Silty SAND, becoming coarser with depth, trace cobbles and boulders, subrounded to subangular, poorly graded, medium plasticity, grey, becoming brown with depth, dense, moist. (Glacial Drift)	28	111	GH08-112-13	11/19/22	41	
	95					
WEATHERED BEDROCK, highly to completely weathered to SAND and GRAVEL, some silt, trace clay, trace cobbles and boulders, subrounded to subangular, well graded, medium plasticity, brown, dense, moist.	90	100	GH08-112-14	25/50+/+	50++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	50					
BEDROCK, Tertiary Volcaniclastic Breccia Felsite Conglomerate, heterolithic clast supported breccia, clasts range from 0.1 to 4cm diameter, subangular to subrounded, mottled, hard, fractures at fragment/clast boundaries, calcite, rare hematized pyrite.	84	78	GH08-112-15	50+/+/+	50+++	
	92					

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

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Date Revised: Apr 27, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-112**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1007.33 ft**	Date Completed:	**May 3, 08**
Location:	**Open Pit Area**	Total Depth:	**380 ft**	Logged by:	**CG/MS**
Coordinates:	**2,155,883 N , 1,408,340 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	31			84							
105	32			100							
	33			94							
110	34			90							
115	35		BEDROCK, Tertiary Basalt, dark grey-green, minor xenoliths of volcaniclastic breccia, weak to moderately brecciated zones, moderately hard and competent except weak to moderately oxidized and fractured zone from 133 to 138, some larger zones of volcaniclastic breccia from 159.5 to 184, mainly calcite infilling in joints as well as veins throughout, rare fine disseminated pyrite.	91							
120	36										
	37			91							
125	38										
	39			100							
130	40			100							
135	41			100							
	42			100							
140	43			100							
145	44										
	45			100							
150	46			100							
155	47										
	48			100							
160	49			88							
165	50										
	51			89							
170	52			100							
175	53										
	54			98							
180	55			94							
185	56										
	57			98							
190	58		BEDROCK, Tertiary Volcaniclastic Breccia, medium to coarse grained, clast supported, various shades of green and cream, clasts tend to be smaller than 1 cm, but up to 3cm, angular to subangular, generally highly weathered, moderately hard, not competent, minor fracturing, localized bedding at 30°tca,	100							
195	59										
	60			97							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

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Project:	**Pebble Project**	Drill Hole No.	**GH08-112**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1007.33 ft**	Date Completed:	**May 3, 08**
Location:	**Open Pit Area**	Total Depth:	**380 ft**	Logged by:	**CG/MS**
Coordinates:	**2,155,883 N , 1,408,340 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			weak rubbly zones with some clay gouge from 210 to 220' and 236 to 254'.									
205	62			96								
	63			100								
210	64											
	65			98								
215	66			89								
220	67											
	68			94								
225	69			100								
230	70											
	71			100								
235	72			92								
240	73											
	74			92								
245	75			100								
250	76											
	77			92								
255	78		BEDROCK, Tertiary Basalt, dark grey with some maroon zones, weak to moderately brecciated zones, moderately hard, competent, minor fracturing, calcite veins and infilling, some clay infilling, rare to trace pyrite blebs, carbonate.	100								
260	79											
	80			95								
265	81											
	82			98								
270	83			95								
275	84											
	85			89								
280	86			97								
285	87											
	88			100								
290	89			100								
295	90											
	91			91								

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Date Revised: Apr 27, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-112**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1007.33 ft**	Date Completed:	**May 3, 08**
Location:	**Open Pit Area**	Total Depth:	**380 ft**	Logged by:	**CG/MS**
Coordinates:	**2,155,883 N , 1,408,340 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			97								
305	93											
	94			93								
310	95			98								
315	96											
	97			100								
320	98			100								
325	99											
	100			100								
330	101			98								
335	102											
	103			95								
340	104			97								
345	105											
	106			95								
350	107			97								
355	108											
	109			100								
360	110			100								
365	111											
	112			100								
370	113			100								
375	114											
	115			98								
380	116		END OF HOLE @ 380 FT									
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
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Date Revised: Apr 27, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-113**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1001.54 ft**	Date Completed:	**May 2, 08**
Location:	**East Deposit Area**	Total Depth:	**105 ft**	Logged by:	**SR/CK(SLR)/SD/AS**
Coordinates:	**2,151,709 N , 1,408,277 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
		Tundra vegetation, SILT, some sand, angular, clasts up to cobble size, poorly graded, no to low plasticity, organics, dark brown, damp to moist. (Topsoil)	79						Permanent 6" casing installed to 20' PQ3 to 105'
5	1		59	82		GH08-113-1	16/20/26	46	
10	2	SAND and GRAVEL, some cobbles and boulders, some silt, trace clay, varying amounts of sand and gravel, subrounded to subangular, clasts up to boulder size, poorly graded, non plastic, brown, moist, low recovery, fines washed out. (Glaciofluvial)	65	94		GH08-113-2	33/50+/+	50++	
15	3		60	78		GH08-113-3	36/32/48	80	
20	4		41	83		GH08-113-4	22/10/14	24	
25	5	Gravelly Sandy SILT, some clay, some cobbles, subangular, clasts up to cobble size, poorly graded, low plasticity, brown, damp to moist. (Glacial Drift)	49	72		GH08-113-5	16/26/27	53	
30	6	Gravelly SAND, some silt/clay, decreases in gravel content from 30 to 37.5 ft depth, trace cobbles from 29 to 30 ft depth, subrounded to subangular, clasts up to cobble size, well graded, non plastic, brown, moist, some fines washed away. (Glacial Drift)	30	58		GH08-113-6	18/22/25	47	
35	7		20	100		GH08-113-7	15/24/32	56	
40	8	Silty SAND, trace gravel, trace clay, clay content increases at 52,5', few cobbles increasing towards the bottom, subangular to subrounded, clasts up to cobble size, poorly graded, non plastic, very dense from 55 to 60 ft depth, grey-brown, moist. (Glacial Drift)	72	97		GH08-113-8	16/34/43	77	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
45	9		95	50		GH08-113-9	12/22/39	61	
50	10		13	89		GH08-113-10	11/23/36	59	
55	11		76						
60	12	Silty SAND, trace gravel, trace cobbles, trace clay, subangular to subrounded, clasts up to cobble size, poorly graded, non plastic, grey/brown, moist. (Glacial Drift)	88	100		GH08-113-11	20/19/21	40	Most of the sand and fines are assumed to have washed away.
65	13		98						
70	14	Sandy SILT, some gravel, some clay, trace cobbles, trace boulders, subrounded to subangular, clasts up to boulder size, gap graded, low plasticity, brown, moist. (Glacial Drift)	86	88		GH08-113-12	15/24/50+	50+	
75	15		25						
80	16		33						
85	17		84						
90	18		56						
95	19		31						
	20		91						
	21		64						
	22	WEATHERED BEDROCK, Rhyolite, light pink, grey-green, weathered to sandy GRAVEL, clasts are fragments of rhyolite, angular to subangular up to 4cm diameter.	34						
	23	BEDROCK, Rhyolite, banded pale green and pink, fine-medium grained matric with moderate biotite content, highly to completely weathered, thin clay infilling in joints.	100						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	24		95						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-113

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: May 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-113**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Apr 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1001.54 ft**	Date Completed:	**May 2, 08**
Location:	**East Deposit Area**	Total Depth:	**105 ft**	Logged by:	**SR/CK(SLR)/SD/AS**
Coordinates:	**2,151,709 N , 1,408,277 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32		END OF HOLE @ 105 FT									
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
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Date Revised: May 5, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-115**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1016.53 ft**	Date Completed:	**May 8, 08**
Location:	**East Deposit Area**	Total Depth:	**200 ft**	Logged by:	**SR/SD**
Coordinates:	**2,154,432 N , 1,409,718 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Tundra vegetation at surface, Silty SAND, some gravel, subrounded, clasts up to gravel size, poorly graded, non plastic, brown, damp. (Topsoil)	100							Permanent 6" casing to 20' PQ3 to 115' HWT casing to 140' HQ3 to 200'	
5	1		Sandy GRAVEL, trace silt, trace clay, trace cobbles, subangular to subrounded, clasts up to cobble size, poorly graded, non plastic, brown, moist. (Glacial Drift)	85	71		GH08-115-1	17/21/40	61			
	2			98								
				92								
10	3		SAND and GRAVEL, trace silt/clay, trace cobbles/boulders, subangular to subrounded, clasts up to boulder size, poorly graded, non plastic, brown/grey, damp. (Glacial Drift)		56		GH08-115-2	9/13/13	26			
	4			76								
15					0		GH08-115-3	13/10/12	22			
	5			88								
				81								
20	6			98	47		GH08-115-4	12/7/6	13			
			Silty SAND, trace gravel, trace clay, subangular to subrounded, clasts up to gravel size, poorly graded, non plastic, light brown, moist. (Glacial Drift)	98								
	7			68								
				75								
				35							Fines are assumed to have washed away.	
25					53		GH08-115-5	13/17/14	31			
	8		GRAVEL and SAND, some silt, trace clay, subangular to subrounded, clasts up to cobble size, poorly graded, low plasticity, brown and grey, moist. (Glacial Drift)	69								
				11								
30	9				72		GH08-115-6	8/12/9	21			
			Silty SAND, some gravel, some clay, some gravel, trace cobbles, subangular to subrounded, clasts up to cobble size, poorly graded, low plasticity, brown, moist, fines washed away. (Glacial Drift)	20								
35	10				61		GH08-115-7	7/11/15	26			
	11			20								
	12											
40			SAND and GRAVEL, some silt, trace clay, trace cobbles, subrounded to subangular, clasts up to cobble size, poorly graded, non plastic, brown, moist. (Glacial Drift)		58		GH08-115-8	8/14/27	41			
	13			56								
45					56		GH08-115-9	10/17/23	40			
	14			23								
	15											
50					56		GH08-115-10	9/11/11	22		***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	16			28								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-115

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-115**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1016.53 ft**	Date Completed:	**May 8, 08**
Location:	**East Deposit Area**	Total Depth:	**200 ft**	Logged by:	**SR/SD**
Coordinates:	**2,154,432 N , 1,409,718 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	17			46								
	18											
60			SILT, some clay, some sand, trace gravel, only gravel recovered from 65 to 65.5 ft depth (fines washed out), subangular to subrounded, clasts up to gravel size, poorly graded, low plasticity, brown, moist. (Glaciolacustrine)		83	☒	GH08-115-11	11/22/38	60	●		
	19			46								
65	20			82								
	21											
70			GRAVEL and SAND, trace clay, trace silt, silt content increasing with depth, trace cobbles, subangular to subrounded, clasts up to cobble size, poorly graded, non plastic, brown and grey, moist, fines washed out. (Glacial Drift)		53	☒	GH08-115-12	9/23/25	48	●		
	22			33								
75	23			57								
	24			98								
80			Sandy SILT, some clay, some gravel, subangular to subrounded, clasts up to cobble size, poorly graded, low plasticity, brown, moist. (Glacial Drift)									
	25			49								
85	26				83	☒	GH08-115-13	17/34/50+	50+	●		
				52								
	27											
90	28			13								
95	29				82	☒	GH08-115-14	27/50+/+	50++			
	30			43								
100	31			79								
105	32				79	☒	GH08-115-15	12/33/50+	50+	●		
	33		SILT and CLAY, trace sand, trace gravel, trace cobbles, trace boulders, subangular to subrounded, clasts up to boulder size, poorly graded, medium plasticity, plasticity	85								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-115

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-115

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-115**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1016.53 ft**	Date Completed:	**May 8, 08**
Location:	**East Deposit Area**	Total Depth:	**200 ft**	Logged by:	**SR/SD**
Coordinates:	**2,154,432 N , 1,409,718 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	34		decreases with depth, brown grey, dense to very dense, moist. (Glaciolacustrine)	100								
115	35				100		GH08-115-16	10/35/40	75			
	36			95								
120	37			100								
125	38				11		GH08-115-17	9/19/39	58			
	39			56								
130	40			19								
135	41			94								
	42			100								
140	43				94		GH08-115-18	22/50+/+	50++			
	44		Gravelly, silty SAND, trace to some clay, trace cobbles, trace boulders, subrounded to subangular, clasts up to boulder size, poorly graded, non plastic, firm, brown grey, moist. (Glacial Drift)	100								
145	45			100								
150	46				95		GH08-115-19	19/50+/+	50++			
	47			57								
155	48			100								
160	49				50		GH08-115-20	27/50+/+	50++			
	50			91								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-115

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-115

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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-115**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1016.53 ft**	Date Completed:	**May 8, 08**
Location:	**East Deposit Area**	Total Depth:	**200 ft**	Logged by:	**SR/SD**
Coordinates:	**2,154,432 N , 1,409,718 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	51			100								
170	52				100		GH08-115-21	20/50+/+	50++			
				79								
	53											
175												
	54			93								
180	55			98								
				68								
	56											
185			BEDROCK, Tertiary Volcaniclastic Rhyolite Breccia, fine to medium grained, highly weathered, highly fractured, fine grained light pink grey, clast supported, fragments from 0.2 to 2 cm with rare clasts up to 10cm diameter, soft, weak.	97							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	57			100								
190	58											
				100								
	59											
195												
	60			94								
200	61		END OF HOLE @ 200 FT									
	62											
205												
	63											
210	64											
	65											
215	66											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-115

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-116**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 4, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**890.45 ft**	Date Completed:	**May 5, 08**
Location:	**East Deposit Area**	Total Depth:	**30 ft**	Logged by:	**CG/AM(SLR)/MS**
Coordinates:	**2,158,613 N , 1,409,244 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			PEAT, fibrous, spongy, dark brown, organic, frozen. (Topsoil)	52						PW to 6.5' HWT to 17.5' PQ3 to 15' HQ3 to 30'
5	1		Silty SAND and GRAVEL, some clay, trace cobbles and boulders, subangular to subrounded, clasts up to boulder size, gap graded, low plasticity, brown, moist to wet. (Glacial Drift)	88	19		GH-08-116-1	34/13/25	38	
10	2				83		GH-08-116-2	3/42/50+	50+	
15	3		BEDROCK, Tertiary Volcaniclastic Breccia, clast supported, heterolithic clasts, most are felsic, less than 0.1 to 5cm diameter, angular to subrounded fragments, moderately soft, competent, rare carbonate.	100						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
20	4			84						
25	5			100						
30	6			97						
35	7		END OF HOLE @ 30 FT							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
40	8									
45	9									
50	10									
	11									
	12									
	13									
	14									
	15									
	16									

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-116

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: May 4, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-119**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**846.51 ft**	Date Completed:	**May 8, 08**
Location:	**East Deposit Area**	Total Depth:	**105 ft**	Logged by:	**CG/AM(SLR)/MS**
Coordinates:	**2,157,799 N , 1,411,549 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			PEAT, Silty, spongy, fibrous, dark brown, organic, moist. (Topsoil)	0						PQ3 to 28.5' HQ3 to 105' No recovery from 0-5'
5	1				72	X	GH08-119-1	5/4/9	13	
	2		Silty SAND, some gravel, some clay, some cobbles and boulders, subangular to subrounded, clasts up to boulder size, well graded, low plasticity, brown, moist, some fines washed out. (Glacial Drift)	29						
10	3				61	X	GH08-119-2	5/5/7	12	
	4			46						
15			BEDROCK, Tertiary Basalt, dark green to black, fracture infillings of quartz and calcite, some clay infilling, competent.		0	X	GH08-119-3	25/28/13	41	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	5			63						
20	6									
	7			98						
25	8			96						
	9			98						
30				98						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	10			84						
35	11			100						
40	12									
	13			100						
45	14			100						
50	15									
	16			100						
55	17			100						
60	18									
	19			100						
65	20			100						
70	21									
	22			95						
75	23			100						
	24									

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-119

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: May 8, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-119**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**846.51 ft**	Date Completed:	**May 8, 08**
Location:	**East Deposit Area**	Total Depth:	**105 ft**	Logged by:	**CG/AM(SLR)/MS**
Coordinates:	**2,157,799 N , 1,411,549 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	25			97								
85	26											
	27			98								
90	28			97								
95	29											
	30			100								
100	31			100								
105	32		END OF HOLE @ 105 FT									
110	33											
	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-119

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: May 8, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-120**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 8, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**851.05 ft**	Date Completed:	**May 9, 08**
Location:	**East Deposit Area**	Total Depth:	**50 ft**	Logged by:	**CG/MS**
Coordinates:	**2,158,439 N , 1,410,536 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Tundra Vegetation and PEAT for top 0.2 m, material then washed away, possibly more peat or sandy material, bottom 0.1 m is SILT/CLAY material with medium to high plasticity, poorly graded, grey, wet. (Topsoil)	10						PW casing to 20' PQ3 to 50'
			SILT and CLAY, trace sand, no clasts, poorly graded, high plasticity, grey, moist. (Glaciolacustrine)	40	67		GH08-120-1	0/1/2	3	
					78		GH08-120-2	0/1/2	3	
			Sandy, gravelly SILT and CLAY, trace cobbles and boulders, subangular to subrounded, clasts up to boulder size, gap graded, low to medium plasticity, grey brown, moist. (Glacial Drift)	75						
				55	61		GH08-120-3	9/22/28	50	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
				66						
				49						
			BEDROCK, Tertiary Rhyolite Breccia, green-grey, weak banding, some felsic subangular fragments, some clay infilling, highly weathered, possible lower contact with basalt at 49.5', rare calcite.	98						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
				92						
				95						
				89						
			END OF HOLE @ 50 FT							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-120

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-120

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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-121**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1041.78 ft**	Date Completed:	**May 12, 08**
Location:	**East Deposit Area**	Total Depth:	**135 ft**	Logged by:	**SR/SD**
Coordinates:	**2,154,709 N , 1,411,364 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Silty SAND, trace gravel, subangular, clasts up to gravel size, poorly graded, non plastic, brown, organics, moist, very soft. (Topsoil)	69					PW casing installed to 16.5' PQ3 to 90' HQ3 to 135' Fines washed away.
		100	GH08-121-1	31/50+/+	50++	
Silty SAND, trace gravel increasing in content with depth, subangular, poorly graded, non plastic, soft, brown, moist. (Glacial Drift)	0					
GRAVEL and SAND, trace silt/clay, subangular to subrounded, clasts up to gravel size, well graded, non plastic, brown, moist. (Glacial Drift)	84					Installed PW after coring to 5', so no recovery and no SPTs due to triconing to 16.5'.
No recovery						
Gravelly SAND, trace cobbles and boulders present, generally well graded, varying silt/clay content that increased with depth, subrounded to subangular, well graded, non plastic, dark grey to brown, moist. (Glacial Drift)	73					***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	20					
		54	GH08-121-2	13/29/17	46	
	60					
GRAVEL and SAND, trace cobbles, trace boulders, trace silt, subangular to subrounded, poorly graded, non plastic, brown to dark grey, moist. Fewer cobbles with depth, and decreasing average size of gravel. Significant sand content between 50 to 55 ft depth. (Glacial Drift)		75	GH08-121-3	17/50/26	76	Fines washed away.
	59					
		67	GH08-121-4	14/22/23	45	
	63					
		44	GH08-121-5	12/13/14	27	
	26					
		40	GH08-121-6	14/8/13	21	
	36					
	52					Lost circulation at 55', causes PW casing to be spun.
		0	GH08-121-7	9/30/17	47	
	25					
	20					
	22					
Silty Gravelly SAND, trace cobbles and clay, sand coarsening with depth, silt content increases from 108 to 110', subangular to subrounded, clasts up to cobble size, well graded, no to low plasticity, brown, moist. (Glacial Drift)	68					
		67	GH08-121-9	15/14/18	32	
	37					
	30					
		96	GH08-121-10	22/18/38	56	
	64					
	51					

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-121

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

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Date Revised: May 28, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-121**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1041.78 ft**	Date Completed:	**May 12, 08**
Location:	**East Deposit Area**	Total Depth:	**135 ft**	Logged by:	**SR/SD**
Coordinates:	**2,154,709 N , 1,411,364 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			69	67		GH08-121-11	30/42/42	84			
105	32											
	33			93								
110	34			50	67		GH08-121-12	50+/+/+	50+++			
115	35		WEATHERED BEDROCK, highly weathered Tertiary Basalt, green brown, with angular fragments of bedrock.	100						■		
	36			98						■	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
120	37		BEDROCK, Tertiary Basalt, brecciated, dark grey to black, fine grained, calcite veins.	100						■		
125	38											
	39			100						■		
130	40			100						■		
135	41		END OF HOLE @ 135 FT									
	42											
140	43											
	44											
145	45											
150	46											
	47											
155	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-121

Knight Piésold CONSULTING

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Date Revised: May 28, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-122**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**869.86 ft**	Date Completed:	**May 13, 08**
Location:	**East Deposit Area**	Total Depth:	**115 ft**	Logged by:	**CG/AM(SLR)/MS**
Coordinates:	**2,156,617 N , 1,411,477 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
No recovery	0						Permanent 6" casing to 20' PQ3 to 115' Artesian conditions would not allow drilling to bedrock.
Silty, gravelly SAND, some clay, subangular to subrounded, clasts up to cobble size, gap graded, low plasticity, brown, moist. (Glacial Drift)	38						
	20	17	☒	GH08-122-1	19/37/36	73	
	89	92	☒	GH08-122-2	15/27/50+	50+	No SPT taken for 20-21.5ft, as boulder present.
	92						
	86						
	96	97	☒	GH08-122-3	19/32/50+	50+	
	92	56	☒	GH08-122-4	5/18/28	51	
	93	56	☒	GH08-122-5	3/18/40	58	Sample collected in 2 runs- pulled up rods at 37.5 ft.
Clayey SILT, some sand, trace gravel, subrounded, clasts up to gravel size, poorly graded, low plasticity, dark brown to light grey, moist. (Glaciolacustrine)	86	114	☒	GH08-122-6	9/16/21	37	
	39	78	☒	GH08-122-7	9/19/31	50	First noticed Artesian flow (<0.5 gpm).
	49	83	☒	GH08-122-8	9/14/16	30	
Sandy SILT, some clay, some gravel, trace cobbles, sand content decreasing with depth, subangular to subrounded, clast up to cobble size, poorly graded, low plasticity, brown, moist, more clay present between 70 to 73 ft and 84 to 85 ft depth. (Glacial Drift)	10						
	11	124	☒	GH08-122-9	36/50+/+	50++	
	16						63' switched from polymer to bentonite.
	13						
	57	89	☒	GH08-122-10	19/50+/+	50++	
	49						
	91						
	86	31	☒	GH08-122-11	10/18/44	62	Artesian flow increased significantly, to ~6 gpm.
Sandy SILT, some clay, some gravel, trace cobbles, subangular to subrounded, clast up to cobble size, poorly graded, low plasticity, brown, moist, fines washed away. (Glacial Drift)	13						
	18	67	☒	GH08-122-12	10/23/50	73	
Sandy Clayey SILT, trace gravel, some seams	44						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-122

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-122

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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-122**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**869.86 ft**	Date Completed:	**May 13, 08**
Location:	**East Deposit Area**	Total Depth:	**115 ft**	Logged by:	**CG/AM(SLR)/MS**
Coordinates:	**2,156,617 N , 1,411,477 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		with increased clay content, subangular, clasts up to gravel size, poorly graded, low plasticity, grey to brown, moist. (Glaciolacustrine)	49	0		GH08-122-13	12/21/38	59			
105	32			46								
	33			91								
110	34		SAND, some gravel, some silt, trace clay, subrounded, clasts up to gravel size, poorly graded, non plastic, light brown, moist, heaving sands, core barrel is sanded in several times. (Glacial Drift)	5	103		GH08-122-14	10/31/19	50		Artesian flow increased to 10 gpm.	
115	35											
	36			20								
120	37		END OF HOLE @ 120 FT									
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-122

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-123**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 12, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**972.94 ft**	Date Completed:	**May 13, 08**
Location:	**East Deposit Area**	Total Depth:	**42.75 ft**	Logged by:	**LB/SD/AM(SLR)**
Coordinates:	**2,151,513 N , 1,404,831 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
PEAT, dark brown, organic, moist. (Topsoil)	52					PQ3 to 42.7' First 25" frozen.
	22	0	GH08-123-1	//	1	
	25	0	GH08-123-2	5/4/3	7	
SAND and GRAVEL, trace silt, trace clay, subangular to subrounded, well graded, low plasticity, grey, moist. (Glaciofluvial)	56	53	GH08-123-3	3/6/5	11	
	100					
	61	33	GH08-123-4	7/4/5	9	
Silty SAND, some gravel, trace cobbles, some clay, subrounded, clasts up to cobble size, poorly graded, no to low plasticity, gravel content increases with depth, grey, moist. (Glaciolacustrine)	23	56	GH08-123-5	3/7/10	17	
	25	50	GH08-123-6	11/19/17	36	
	28	72	GH08-123-7	11/16/30	46	
SAND and GRAVEL, some cobble, trace silt, subangular to subrounded, clasts up to cobble size, well graded, no to low plasticity, changing brown to dark grey toward bottom, moist. (Glacial Drift)	69	50	GH08-123-8	11/28/23	51	Hole abandoned due to rising meltwater, Bedrock not reached.
END OF HOLE @ 42.67 FT						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-125**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**980.56 ft**	Date Completed:	**May 17, 08**
Location:	**Open Pit Area**	Total Depth:	**150 ft**	Logged by:	**LB/AM(SLR)/SD**
Coordinates:	**2,154,975 N , 1,405,927 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
PEAT Top 10 cm, organics and sand, some silt, fibrous, frozen, brown. (Topsoil)	83				
SAND, trace gravel, trace cobbles, subrounded, clasts up to cobble size, poorly graded, no plasticity, brown, moist. (Glaciofluvial)	64	67	GH08-125-1	10/13/14	27
SAND and GRAVEL, some silt, trace clay, trace cobbles, subangular to subrounded, clasts up to cobble size, well graded, non plastic, brown, moist. (Glaciofluvial)	37	64	GH08-125-2	16/8/6	14
	20	69	GH08-125-3	12/18/17	35
GRAVEL and SAND, varying amounts of sand and gravel, trace silt/clay, trace cobbles, subrounded to subangular, clasts up to cobble size, poorly graded, non plastic, light brown to dark grey, moist. (Glaciofluvial)	54	67	GH08-125-4	8/14/13	27
	74				
	90	53	GH08-125-5	4/1/5	6
	73				
	89	58	GH08-125-6	8/12/11	23
SAND and SILT, trace clay, trace gravel, trace cobbles and boulders, subrounded, clasts up to boulder size, poorly graded, non plastic, brown, moist. (Glaciolacustrine)	24				
	94	53	GH08-125-7	13/16/17	33
	68				
Gravelly, silty SAND, some cobbles, trace boulders up to 30cm, subrounded, clasts up to boulder size, clasts various colour and composition, well graded, medium to low plasticity, brown, moist. (Glacial Drift)	37				
	91				
	100				
	94	0	GH08-125-8	26/50+/+	50++
WEATHERED BEDROCK, highly weathered to Silty SAND, some gravel, trace clay, subangular, clasts up to gravel size, gravel content increases with depth, poorly graded, low plasticity, dark grey to dark brown, moist.	65				
	89	92	GH08-125-9	39/50+/+	50++
BEDROCK, Tertiary Siltstone, fine grained, no visible laminae or bedding, black to dark grey-green, moderately to highly fractured, highly weathered from 90' onward, iron staining from 109 to 117.	96				
	98				
	100				
	91				
	100				
	16				

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

NOTES

PQ3 to 100'
HQ3 to 150'

Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-125

Knight Piésold CONSULTING

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Date Revised: Jun 1, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-125**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**980.56 ft**	Date Completed:	**May 17, 08**
Location:	**Open Pit Area**	Total Depth:	**150 ft**	Logged by:	**LB/AM(SLR)/SD**
Coordinates:	**2,154,975 N , 1,405,927 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33			100								
110	34			95								
115	35											
	36		BEDROCK, Tertiary Basalt, some breccia zones, hematite staining on fractures, calcite veins and white phenocrysts, red to brown, less fractured than siltstone.	100								
120	37			98								
				96								
				97								
125	38											
	39			97								
130	40											
				99								
135	41											
	42			100								
140	43											
				100								
145	44											
	45			98								
150	46		End of Hole at 150 ft									
155	47											
	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-125

Knight Piésold CONSULTING

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Project:	**Pebble Project**	Drill Hole No.	**GH08-128**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 17, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1462.7 ft**	Date Completed:	**May 23, 08**
Location:	**Area E**	Total Depth:	**285 ft**	Logged by:	**LB/SD**
Coordinates:	**2,154,863 N , 1,395,164 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES
			Tundra Vegetation, organic, some gravel, dark brown. (Topsoil)	96							PQ3 to 120' HQ3 to 285'
5	1		Sandy SILT, some clay, trace gravel, poorly graded, low to medium plasticity, brown, moist. (Glacial Drift)	61	78	☒	GH08-128-1	1/9/9	18	●	
10	2		Gravelly SAND, some silt/clay, trace cobbles, sub-angular, well graded, brown, moist. (Glacial Drift)	64							
15	3			51	33	☒	GH08-128-2	7/7/8	15	●	
20	4		Sandy GRAVEL, some silt/clay, trace cobbles, sub-angular to sub-rounded, brown, dense, moist. (Glacial Drift)	44	33	☒	GH08-128-3	5/8/10	18	●	
25	5			100	67	☒	GH08-128-4	12/40/25	65	●	
30	6		Sandy GRAVEL, some silt, trace clay, trace cobbles, sub-angular to sub-rounded, well graded, medium plasticity, light brown, compact, moist. (Glacial Drift)	72	56	☒	GH08-128-5	12/19/16	35	●	
35	7			33	28	☒	GH08-128-6	8/12/27	39	●	
40	8			17	0	☒	GH08-128-7	14/24/22	46	●	
45	9			25	0	☒	GH08-128-8	10/13/13	26	●	
50	10			21	14	☒	GH08-128-9	8/9/11	20	●	
55	11			36							
60	12		SILT, trace clay, trace sand, poorly graded, medium plasticity, brown, moist. (Glacial Drift)	90	0	☒	GH08-128-10	5/7/9	16	●	
65	13		Sandy, silty GRAVEL, trace cobbles, sub-rounded to sub-angular, well graded, brown, moist. (Glacial Drift)	98							
70	14		SILT, trace sand, trace clay, poorly graded, medium plasticity, brown, moist. 30 cm sand lens at 69 ft depth, 5 cm sand lens at 72 ft depth, 20 cm sand and gravel lens at 73.5 ft depth, and 5 cm sand and gravel lens at 74.5 ft depth. (Glacial Drift)	100	0	☒	GH08-128-11	8/6/11	17	●	
75	15			83							
80	16			60	100	☒	GH08-128-12	12/39/27	66	●	
85	17		Gravelly SAND, some silt, trace clay, subangular to subrounded, well graded, brown, dense, moist. (Glacial Drift)	0							
90	18			49							
95	19		SILT, some sand, trace gravel, very soft, poorly graded, light brown, moist. (Glacial Drift)	72	75	☒	GH08-128-13	8/15/19	34	●	
	20		CLAY, high plasticity, light brown, stiff. (Glacial Drift)	80							
	21			77							

WELL DETAILS

Pebble Limited Partnership
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Date Revised: May 28, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-128**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 17, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1462.7 ft**	Date Completed:	**May 23, 08**
Location:	**Area E**	Total Depth:	**285 ft**	Logged by:	**LB/SD**
Coordinates:	**2,154,863 N , 1,395,164 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		SAND and SILT, some clay, trace gravel, trace cobbles from 95 to 111 ft depth, poorly graded, brown, dense, moist. (Glacial Drift)	79	41		GH08-128-14	32/54/50+	50++			
105	32											
	33			94								
110				75	100		GH08-128-15	50+/+/+	50+++			
	34		BEDROCK, Tertiary Breccia, reddish brown to grey, highly fractured, very soft, often sandy or silty surfaces on fractures.	93							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89). ***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
115	35											
	36			81								
120	37			70								
				79								
125	38			93								
	39			83								
130	40			100								
135	41			98								
	42			100								
140	43			100								
145	44											
	45			100								
150	46			100								
155	47											
	48			94								
160	49			98								
165	50											
	51			100								
170	52			100								
175	53											
	54			99								
180	55			98								
	56											
185	57			99								
190	58		BEDROCK, Granodiorite, pale green to grey, medium grained, veins of pyrite and calcite, competent.	97								
195	59											
	60			96								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-128

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Date Revised: May 28, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-128**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 17, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1462.7 ft**	Date Completed:	**May 23, 08**
Location:	**Area E**	Total Depth:	**285 ft**	Logged by:	**LB/SD**
Coordinates:	**2,154,863 N , 1,395,164 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	62			100							
205	63			100							
				100							
210	64			98							
	65										
215	66			100							
220	67										
	68			97							
225	69			99							
230	70										
	71			100							
235	72			100							
240	73										
	74			98							
245	75			99							
250	76										
	77			100							
255	78			100							
260	79										
	80			100							
265	81			100							
270	82										
	83			100							
275	84			100							
280	85										
	86			100							
285	87		END OF HOLE @ 285 FT								
290	88										
	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

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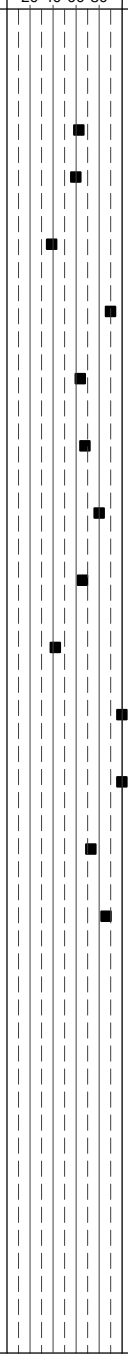
Date Revised: May 28, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-129**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 19, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1548.8 ft**	Date Completed:	**May 20, 08**
Location:	**Area E**	Total Depth:	**70 ft**	Logged by:	**MS/CG**
Coordinates:	**2,160,024 N , 1,399,033 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

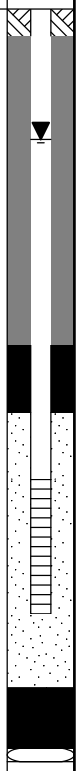
DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Sandy, silty GRAVEL, trace clay, trace cobbles, subangular to subrounded, clasts up to cobbles, well graded, low plasticity, grey brown, moist. (Glacial Drift)	28						PQ3 to 15' HQ3 to 70'
				66						
			BEDROCK, Basalt, propylitic altered, dark green to black, epidote and pyrite in fractures.	100						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
				90						
				92						
				100						
				100						
				100						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
				100						
				100						
				100						
				100						
				100						
				100						
			END OF HOLE @ 70 FT							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)



WELL DETAILS



Pebble Limited Partnership
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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: May 27, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-131**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 21, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1060.1 ft**	Date Completed:	**Jun 1, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**79.5 ft**	Logged by:	**JR(SLR)/DM/LS**
Coordinates:	**2,162,693 N , 1,405,027 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			SAND and GRAVEL, trace silt, trace clay, trace cobbles, angular to subrounded, clasts up to cobble size, well graded, no to low plasticity, brown, moist, silt/clay seam between 40 and 45 ft depth approximately 1.5 ft thick. (Glacial Drift)	23							HWT casing to 14.5' HQ3 to 79.5'	
5	1				56		GH08-131-1	8/21/36	57			
	2			10								
10	3				44		GH08-131-2	3/6/8	14			
	4			13								
15	5				33		GH08-131-3	10/11/15	26			
				14								
20	6				33		GH08-131-4	12/10/12	22			
	7			33								
25	8				47		GH08-131-5	19/29/31	60			
				16								
30	9				44		GH08-131-6	16/42/29	71		***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	10			30								
35	11				39		GH08-131-7	34/32/31	63			
				26								
40	12				53		GH08-131-8	14/22/20	42			
	13			26								
45	14				31		GH08-131-9	5/18/25	43			
				23								
50	15				75		GH08-131-10	14/32/29	61			
	16			11								
55	17			70								
60	18		BEDROCK, Tertiary Basalt, fine-grained, calcite and chlorite in fractures, dark green-grey, competent.								* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	19			98								
65	20											
	21			97								
70	22		BEDROCK, Tertiary Volcaniclastic Breccia, poorly sorted, matrix supported, very angular clasts, matrix is fine wacke, calcite.	94								
75	23			100								
80	24		END OF HOLE @ 79.5 FT									
	25											
85	26											
90	27											
	28											
95	29											
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-131

Knight Piésold CONSULTING

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Date Revised: Jul 3, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-136**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 27, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1614 ft**	Date Completed:	**May 29, 08**
Location:	**Area G**	Total Depth:	**120 ft**	Logged by:	**MS/CG/JB/LS**
Coordinates:	**2,163,750 N , 1,376,848 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Sandy SILT, some gravel, trace fractured boulders, angular to subangular, gap graded, non plastic, , brown, trace organics, moist. (Topsoil/Felsenmeer)	81							HWT to 12.5' PQ3 to 12' HQ3 to 120' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	2		BEDROCK, Cretaceous Basalt, dark green and purple aphanitic chlorite, calcite and chlorite infilling in fractures, some calcite veins, trace pyrite and chalcopyrite, competent, hard, slightly fractured.	85								
10	3			97								
	4			98								
15	5			100								
20	6											
	7			99								
25	8			100								
30	9											
	10			100							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
35	11			100								
40	12											
	13			91								
45	14			100								
50	15											
	16			100								
55	17			100								
60	18											
	19			100								
65	20			100								
70	21											
	22			98								
75	23			100								
80	24											
	25			100								
85	26			100								
90	27											
	28			100								
95	29											
	30			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-136

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-136**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 27, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1614 ft**	Date Completed:	**May 29, 08**
Location:	**Area G**	Total Depth:	**120 ft**	Logged by:	**MS/CG/JB/LS**
Coordinates:	**2,163,750 N , 1,376,848 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			95								
105	32											
	33			100								
110	34											
				96								
115	35											
	36			100								
120	37		END OF HOLE @ 120 FT									
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
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Overburden Log For GH08-136

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-137**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 28, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1041.9 ft**	Date Completed:	**Jun 1, 08**
Location:	**Area A**	Total Depth:	**250 ft**	Logged by:	**LB/JC**
Coordinates:	**2,137,818 N , 1,404,282 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Tundra Vegetation, some sand, some gravel, subangular, clasts up to gravel size, poorly graded, non plastic, brown, organics, moist. (Topsoil)	73						PW casing to 17' PQ3 to 92.5' HWT casing to 98' HQ3 to 250'
SAND and GRAVEL, trace to some silt, trace clay, trace cobbles, sand and gravel content varies throughout interval, subangular to subrounded, clasts up to cobble size, poorly graded, no to low plasticity, brown, moist, most fines washed away. (Glacial Drift)	56	61	☒	GH08-137-1	7/11/11	22	
	63	36	☒	GH08-137-2	8/13/20	33	
	54	22	☒	GH08-137-3	11/17/13	30	
	63	47	☒	GH08-137-4	14/10/10	20	
	72	56	☒	GH08-137-5	12/16/17	33	
	37	39	☒	GH08-137-6	11/9/10	19	
	49	50	☒	GH08-137-7	11/11/13	24	
	79						
	49	56	☒	GH08-137-8	11/12/13	25	
	21						
	72	31	☒	GH08-137-9	9/11/14	25	
	55						
	59						
	52	0	☒	GH08-137-10	9/13/12	25	
	66						
	52						
	30						
	56						
	59						
	49						
Gravelly, silty SAND, some clay, trace cobbles, subangular to subrounded, clasts up to cobble size, poorly graded, low plasticity, brown, moist, better recovery. (Glacial Drift)	98	0	☒	GH08-137-11	7/8/11	19	Lost circulation at 60', regained from 82' to 86'.
	30						
	66						
	92						
	49						
	44						
	33	56	☒	GH08-137-12	13/27/47	74	
	57						
	100						
	50						
BEDROCK, Tertiary Basalt, dark to medium green and purple, moderately magnetic, pidote and minor chlorite alteration in fractures, calcite infilling in joints.	89	94	☒	GH08-137-13	35/40+/+	50++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	88						
	84						
	100						Lost circulation at 98', regained from 110 to 115'.

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

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Overburden Log For GH08-137

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-137**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 28, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1041.9 ft**	Date Completed:	**Jun 1, 08**
Location:	**Area A**	Total Depth:	**250 ft**	Logged by:	**LB/JC**
Coordinates:	**2,137,818 N , 1,404,282 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			98						
105	32									
	33			100						
110	34			100						
115	35									
	36			100						
120	37			90						
125	38									
	39			96						
130	40			99						
135	41									
	42			100						
140	43			100						
145	44									
	45			98						
150	46			100						
155	47									
	48			99						
160	49			100						
165	50									
	51			100						
170	52			100						
175	53									
	54			100						
180	55									
	56			100						
185	57			99						Lost circulation at 188'
190	58									
	59			100						
195	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-137**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 28, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1041.9 ft**	Date Completed:	**Jun 1, 08**
Location:	**Area A**	Total Depth:	**250 ft**	Logged by:	**LB/JC**
Coordinates:	**2,137,818 N , 1,404,282 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
205	62			100								
	63			100								
210	64											
	65			97								
215	66			100								
220	67											
	68			100								
225	69			100								
230	70		BEDROCK, brecciated Tertiary Basalt, pale pinky-green in colour, jigsaw breccia apperance, calcite infilling in joints.								***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	71			96								
235	72											
				99								
240	73											
	74			100								
245	75			100								
250	76		END OF HOLE @ 250 FT									
255	77											
	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
	85											
280	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-137

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-138**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1581 ft**	Date Completed:	**Jun 3, 08**
Location:	**Area G**	Total Depth:	**275 ft**	Logged by:	**LB/CG/JB/DM**
Coordinates:	**2,163,442 N , 1,375,431 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		Silty, gravelly SAND, subangular, clasts up to gravel size, poorly graded, non plastic, brown, moist. (Topsoil)	0	33		GH08-138-1	1/1/1	2	HWT/PQ3 to 10' HQ3 to 275'
5	2				56		GH08-138-2	15/32/20	52	
10	3		BEDROCK, Basalt, plagioclase, pyroxene phyric (pyroxenite?), black, some brecciated zones, white phenocrysts, calcite, hematite, possible dyke.	74						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	4			83						
15	5			100						
20	6									***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	7			100						
25	8			100						
30	9									
	10			94						
35	11		BEDROCK, Basalt, light greenish-grey, pyroxene phyric (pyroxenite?), rubble zones, 33.5 to 61' strongly fractured and rubbled with several 10 cm gouge zones, weakly to moderately fractured outside this interval, calcite and chlorite infilling, calcite veins, rubbly zones.	40						
40	12									
	13			59						
45	14			68						
50	15			79						
	16			25						
55	17			98						
	18			62						
60				49						
				98						
	19			100						
65	20			98						
70	21									
	22			100						
75	23			98						
80	24									
	25			100						
85	26			100						
90	27									
	28			98						
95	29									
	30			99						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-138

Knight Piésold CONSULTING

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Date Revised: Jul 16, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-138**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1581 ft**	Date Completed:	**Jun 3, 08**
Location:	**Area G**	Total Depth:	**275 ft**	Logged by:	**LB/CG/JB/DM**
Coordinates:	**2,163,442 N , 1,375,431 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

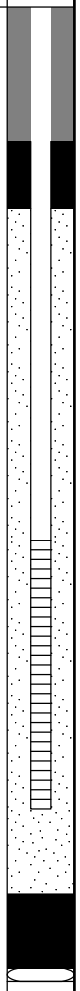
DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			35						
105	32									
	33			95						
110	34			87						
115	35									
	36			45						
120	37			54						
125	38									
	39			25						
130	40			98						
				30						
135	41									
	42			38						
140	43			66						
				100						
145	44			76						
	45			26						
150	46									
	47			51						
155	48			22						
160	49		BEDROCK, Granodiorite, dark green/grey to light grey, hornblende and feldspar phenocrysts, 166 to 264' is heavily fractured with zones of gouge making up to 5% of interval, calcite and chlorite infilling, some brecciated zones from 266 to 275'.	81						
165	50									
	51			98						
170	52									
				100						
175	53									
	54			100						
180	55									
	56			98						
185	57			100						
190	58									
	59			98						
195	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-138

Knight Piésold CONSULTING

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Date Revised: Jul 16, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-138**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**May 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1581 ft**	Date Completed:	**Jun 3, 08**
Location:	**Area G**	Total Depth:	**275 ft**	Logged by:	**LB/CG/JB/DM**
Coordinates:	**2,163,442 N , 1,375,431 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	62			97							
205	63			100							
210	64										
	65			83							
215	66			39							
220	67										
	68			95							
225	69			95							
230	70										
	71			100							
235	72			100							
240	73										
	74			100							
245	75			100							
250	76										
	77			92							
255	78			100							
260	79										
	80			87							
265	81			87							
270	82										
	83			96							
275	84		END OF HOLE @ 275 FT								
280	85										
	86										
285	87										
290	88										
	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-138

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Date Revised: Jul 16, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-140**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 2, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1029 ft**	Date Completed:	**Jun 4, 08**
Location:	**Area L**	Total Depth:	**135 ft**	Logged by:	**JC/LB**
Coordinates:	**2,139,747 N , 1,376,604 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Tundra Vegetation, brown, organics, moist. (Topsoil)	92						PW casing to 10' PQ3 to 35' HWT casing to 38' HQ3 to 135'
5	1–2		Silty, gravelly SAND, trace clay, trace cobble, silt content increases with depth, gravel and sand contents vary throughout interval, subangular to subrounded, clasts up to cobble size, rare boulder size, poorly graded, brown, moist. (Glacial Drift)	85	78		GH08-140-1	45/50+/+	50++	
10	3–4			93	183		GH08-140-2	7+/+/+	50+++	
15	5			100	83		GH08-140-3	40/50+/+	50++	
20	6–7			99	89		GH08-140-4	32/40/52	50+	
25	8			89	97		GH08-140-5	9/33/41	74	Possibly extremely weathered bedrock.
30	9		BEDROCK, Tertiary Volcaniclastic Breccia, heterolithic, clast supported, clasts are 85% volcanic in orgin and 15% sedimentary in origin, angular to subrounded, 1cm to 20cm diameter, generally less than 2cm, some blebs and cubic pyrite, some fine grained soft infilling in joints, grey to reddish brown.	89	100		GH08-140-6	50+/+/+	50+++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89). ***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
35	10–11			94						
40	12–13			79						
45	14			97						
50	15–16			100						
55	17			95						
60	18–19			100						
65	20			100						
70	21–22			100						
75	23			98						
80	24–25			100						
85	26			98						
90	27–28		BEDROCK, Tertiary Basalt, black, porphyritic, 2 ft chilled margins at contacts, oxidized, brecciated basalt layer from 96 to 100 ft, weak flow banding.	100						
95	29–30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-140

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-140

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-140**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 2, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1029 ft**	Date Completed:	**Jun 4, 08**
Location:	**Area L**	Total Depth:	**135 ft**	Logged by:	**JC/LB**
Coordinates:	**2,139,747 N , 1,376,604 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

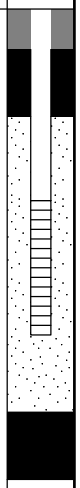
DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			100						
105	32									
	33			100						
110	34		BEDROCK, Tertiary Volcaniclastic Breccia, heterolithic, clast supported, clasts are 85% volcanic in orgin and 15% sedimentary in origin, angular to subrounded, 1cm to 20cm diameter, generally less than 2cm, some blebs and cubic pyrite, some fine grained soft infilling in joints, grey to reddish brown.	100						
115	35									
	36			100						
120	37									
				98						
125	38									
	39			100						
130	40		BEDROCK, Tertiary Basalt?, pinky green amgydule rich, amygules infilled by chlorite.	100						
135	41		END OF HOLE @ 135 FT							
140	42									
	43									
145	44									
	45									
150	46									
	47									
155	48									
160	49									
	50									
165	51									
170	52									
	53									
175	54									
180	55									
	56									
185	57									
190	58									
	59									
195	60									

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-140

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-140

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-141**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1728.8 ft**	Date Completed:	**Jun 5, 08**
Location:	**Area G**	Total Depth:	**87 ft**	Logged by:	**JB/RS**
Coordinates:	**2,163,204 N , 1,374,035 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Gravelly, Silty SAND, trace clay, subangular, clasts up to boulder size, well graded, non plastic, brown, moist. (Topsoil, Felsenmeer)	62							HWT to 11.5', 5' stuck in the ground. PQ3 to 11' HQ3 to 87' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	2		BEDROCK, Granodiorite, dark fragments of magnetite make up less than 1% of interval, quartz rich from 17-18', chlorite, epidote, calcite, pyrite and minor molybdenum, competent, few fractures.	94								
10	3			100								
	4			100								
15	5			100								
20	6											
	7			100								
25	8			98								
30	9										***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	10			99								
35	11			100								
40	12											
	13			100								
45	14			96								
50	15											
	16			99								
55	17			100								
60	18											
	19			98								
65	20			92								
	21			98								
70	22			100								
75	23			100								
	24											
80	25			90								
				100								
85	26			92								
				100								
	27		END OF HOLE @ 87 FT									
90	28											
95	29											
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-141

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 17, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-143**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 5, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1064.5 ft**	Date Completed:	**Jun 9, 08**
Location:	**Area L**	Total Depth:	**335 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,607 N , 1,375,861 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		Tundra Vegetation, dark brown, organics, moist. (Topsoil)	80						PW to 10' PQ3 to 45' HQ3 to 197' NQ3 to 335'
5	2		Silty, Sandy GRAVEL, trace cobbles, subangular to subrounded, clasts up to cobble size, gap graded, low plasticity, brown, moist. (Glacial Drift)	65	64	X	GH08-143-1	10/21/41	62	
10	3									
	4			41						
15	5		Silty SAND, trace to some gravel, trace clay, subrounded to subangular, clasts up to gravel size, poorly graded, no to low plasticity, brown, moist. (Glacial Drift)	100	69	X	GH08-143-2	6/7/12	19	
20	6				89	X	GH08-143-3	9/14/20	34	
	7			100						
25	8		Gravelly, Silty SAND, trace clay, trace cobbles, subrounded to subangular, clasts up to cobble size, gap graded, low plasticity, brown, moist. (Glacial Drift)	96	78	X	GH08-143-4	20/37/45	82	
30	9			98	90	X	GH08-143-5	30/50+/+	50++	
10			WEATHERED BEDROCK, Tertiary Volcaniclastic Breccia, highly weathered, soft clay infill keeping rock fragments together, reddish brown.	92						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89). ***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
35	11			95						
40	12		BEDROCK, Tertiary Volcaniclastic Breccia, monomictic, clast supported, clasts 2mm to 3cm, most ~1cm diameter, varies in colour from grey to red-brown to greenish-grey, gypsum infill between clasts and coating fracture surfaces, hematite staining common.							
	13			99						
45	14			100						
50	15									
	16			91						
55	17			100						
60	18									
	19			99						
65	20			100						
70	21									
	22			100						
75	23									
	24		BEDROCK, Tertiary Volcaniclastic Breccia, polymictic, clast supported, darker coloured, vesicular andesite and basalt clasts.	98						
80	25			88						
85	26									
	27			89						
90	28			98						
95	29									
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-143

Knight Piésold CONSULTING

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-143**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 5, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1064.5 ft**	Date Completed:	**Jun 9, 08**
Location:	**Area L**	Total Depth:	**335 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,607 N , 1,375,861 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			100						
105	32									
	33			99						
110	34			100						
115	35									
	36		BEDROCK, Tertiary Basalt, brecciated, dark green, aphanitic groundmass with 2% plagioclase phenocrysts over the interval, soft infilling.	100						
120	37			100						
125	38									
	39			100						
130	40		BEDROCK, Tertiary Volcaniclastic Breccia, felsic to mafic volcanic clasts as well as porphyritic intrusive granodiorite with chloritized hornblende phenocrysts, alternates between red-brown and grey in colour, some calcite veins, clast supported, hematite staining common.	100						
135	41									
	42			94						
140	43			100						
145	44									
	45			100						
150	46									
	47			98						
155	48			100						
160	49									
	50			100						
165	51			100						
170	52									Poor circulation at 170'.
	53			99						
175	54			96						
180	55									
	56			100						
185	57			100						Lost circulation 186 to192'.
190	58									
	59			100						
195	60			79						Lost circulation 195 to 200', regained at 200'.

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-143

Knight Piésold CONSULTING

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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-143**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 5, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1064.5 ft**	Date Completed:	**Jun 9, 08**
Location:	**Area L**	Total Depth:	**335 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,607 N , 1,375,861 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
205	62			98							
	63			95							
210	64										
	65			99							
215	66										
			BEDROCK, Tertiary Basalt to Andesite, pinkish brown colour, contains 10% euhedral plagioclase phenocrysts, gypsum coating on fractures.	99							
220	67										
	68			98							
225	69										
				100							
230	70										
	71			100							
235	72		BEDROCK, Tertiary Basalt Breccia, reddish brown to grey, small sections of polymictic volcaniclastic breccia.	100							
240	73										
	74			100							
245	75										
				98							
250	76										
	77			100							
255	78										
				100							
260	79										
	80			99							
265	81										
				98							
270	82										
	83			100							
275	84										
				100							
280	85										
	86			99							
285	87										
				100							
290	88										
	89			100							
295	90										
	91			98						Lost circulation due to bit clogging at 295'.	

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-143

Knight Piésold CONSULTING

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Date Revised: Jul 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-143**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 5, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1064.5 ft**	Date Completed:	**Jun 9, 08**
Location:	**Area L**	Total Depth:	**335 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,607 N , 1,375,861 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			100								
305	93											
	94			99								
310	95			100								
315	96										No circulation from 315 to 335'.	
	97			100								
320	98			99								
325	99											
	100			98								
330	101			100								
335	102		END OF HOLE @ 335 FT									
	103											
340	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-143

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Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-143

Project:	**Pebble Project**	Drill Hole No.	**GH08-144**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 5, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1700.7 ft**	Date Completed:	**Jun 6, 08**
Location:	**Area G**	Total Depth:	**95 ft**	Logged by:	**JB/RS**
Coordinates:	**2,162,615 N , 1,373,646 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			FROST HEAVED BEDROCK, Granodiorite, fines washed away in cuttings. (Topsoil/Felsenmeer)								PQ3 to 7' HQ3 to 95' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	1		BEDROCK, Granodiorite, grey, relatively unaltered, hornblende, quartz, plagioclase, k-feldspar, iron oxides in fractures, thin chlorite veinlets, minor epidote and pyrite, competent, few fractures.	100								
	2			100								
10	3			100								
	4			100								
15	5			100								
20	6										***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	7			100								
25	8			100								
30	9											
	10			100								
35	11			100								
40	12											
	13			100								
45	14			100								
50	15											
	16			100								
55	17			100								
60	18											
	19			100								
65	20			99								
70	21											
	22			100								
75	23			100								
80	24											
	25			56								
85	26			100								
90	27											
	28			100								
95	29		END OF HOLE @ 95 FT									
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-144

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

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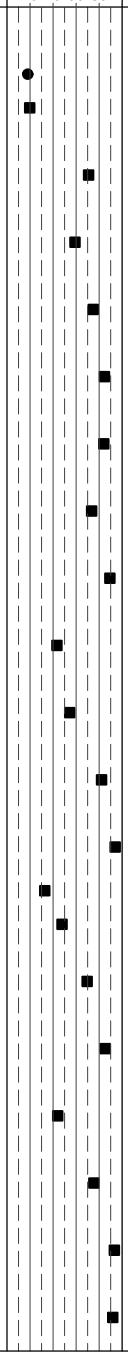
Date Revised: Jul 18, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-146**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 6, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1659 ft**	Date Completed:	**Jun 7, 08**
Location:	**Area G**	Total Depth:	**105 ft**	Logged by:	**JB/RS**
Coordinates:	**2,161,935 N , 1,373,192 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, oganic soils, peat, roots, dark black. (Topsoil)	33					
SAND and GRAVEL, some silt, trace clay, some cobbles, some boulders, subangular to subrounded, clasts up to boulder size, gap graded, non plastic, light brown, moist, frost heaved bedrock. (Felsenmeer)	20	44	☒	GH08-146-1	6/11/7	18
	94					
BEDROCK, Granodiorite, medium grained, relatively fresh, plagioclase, k-felspar, quartz, hornblende, biotite, weak chloritization, minor pyrite, trace molybdenum, trace copper minerals in last 20 ft, 37.5 to 39' is a basalt/andesite dyke with a 35° tca contact.	100					
	100					
	100					
	100					
	100					
	100					
	98					
	92					
	100					
	100					
	100					
	100					
	100					
	100					
	100					
	100					
	97					

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

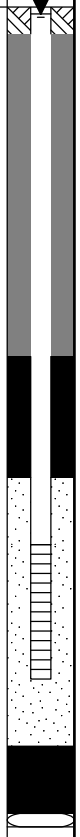
RQD DATA (%) (■)



NOTES

HWT to 15.3'
PQ3 to 15'
HQ3 to 105'
Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs
* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-146

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-146

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 18, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-146**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 6, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1659 ft**	Date Completed:	**Jun 7, 08**
Location:	**Area G**	Total Depth:	**105 ft**	Logged by:	**JB/RS**
Coordinates:	**2,161,935 N , 1,373,192 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100						■		
105	32		END OF HOLE @ 105 FT									
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-146

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 18, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-150**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 10, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1081.5 ft**	Date Completed:	**Jun 15, 08**
Location:	**Area L**	Total Depth:	**320 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,642 N , 1,377,288 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, dark brown, organics, moist. (Topsoil)	64					
Sandy GRAVEL with some silt, trace clay, trace cobbles, trace boulders, subangular to subrounded, well graded, low plasticity, brown, moist. (Glacial Drift)	72	31		GH08-150-1	5/10/15	25
		94		GH08-150-2	19/38/50+	50+
WEATHERED BEDROCK, Tertiary Volcaniclastic Breccia, highly weathered to Sandy GRAVEL, some cobbles, some silt and clay towards bottom of interval, subangular, clasts up to cobble size, poorly graded, low plasticity, brown, moist.	72	100		GH08-150-3	50+/+/+	50+++
	81					
BEDROCK, Tertiary Volcaniclastic Breccia, heterolithic, dark purple, strongly magnetic, fairly competent with sporadic zones of highly fractured rock, mostly granodiorite clasts, chlorite, oxidized volcanic clasts, homolithic from 91 to 104'.	98					
	78					
	100					
	100					
	100					
	99					
	100					
	98					
	89					
	100					
	100					
	100					
	100					
	90					
	100					
	100					

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

NOTES

PW to 10'
PQ3 to 25.5'
HQ3 to 100'
NQ3 to 320'

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-150

Knight Piésold CONSULTING

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-150**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 10, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1081.5 ft**	Date Completed:	**Jun 15, 08**
Location:	**Area L**	Total Depth:	**320 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,642 N , 1,377,288 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	31			96							
105	32										
	33			70							
110	34			97							
115	35										
	36			93							
120	37			94							
125	38										
	39		BEDROCK, Tertiary Volcaniclastic Breccia, dark brownish-grey to deep purple, mottled, volcanic crackle breccia, abundant calcite filling in fractures.	99							
130	40			98							
135	41										
	42			99							
140	43			83							
145	44										
	45			100							
150	46			100							
155	47										
	48			100							
160	49										
	50		BEDROCK, Tertiary Volcaniclastic Breccia, heterolithic, dark grey, strongly magnetic, competent, mostly granodiorite clasts, chlorite, basalt clasts, calcite veinlets.	100							
165	51			100							
170	52			100							
175	53										
	54			100							
180	55										
	56			100							
185	57			100							
190	58										
	59			100							
195	60			98							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-150

Knight Piésold CONSULTING

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-150**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 10, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1081.5 ft**	Date Completed:	**Jun 15, 08**
Location:	**Area L**	Total Depth:	**320 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,642 N , 1,377,288 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			97								
205	63			100								
210	64			100								
	65											
215	66			100								
220	67			100								
	68											
225	69			99								
230	70			99								
	71											
235	72			100								
240	73			96								
	74											
245	75			100								
250	76			95								
	77											
255	78			100								
260	79			100								
	80											
265	81			99								
270	82			100								
	83											
275	84			100								
280	85			100								
	86											
285	87			100								
290	88			100								
	89											
295	90			100								
	91											

Pebble Limited Partnership
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Project:	**Pebble Project**	Drill Hole No.	**GH08-150**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 10, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1081.5 ft**	Date Completed:	**Jun 15, 08**
Location:	**Area L**	Total Depth:	**320 ft**	Logged by:	**JC/LB**
Coordinates:	**2,140,642 N , 1,377,288 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			100								
305	93		BEDROCK, Tertiary Basalt dyke, dark green, strongly magnetic plagioclase-phyric, large calcite veins.									
	94			98								
310	95			100								
315	96											
	97			100								
320	98		END OF HOLE @ 320 FT									
325	99											
	100											
330	101											
335	102											
	103											
340	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-150

Knight Piésold CONSULTING

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-154**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 14, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1491.8 ft**	Date Completed:	**Jun 16, 08**
Location:	**Area J**	Total Depth:	**165 ft**	Logged by:	**AM(SLR)/DM**
Coordinates:	**2,149,452 N , 1,391,260 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		FROST HEAVED BEDROCK, weathered granodiorite, sand and clay infill.	36						HWT to 18.5' HQ3 to 165'
5	2		BEDROCK, Granodiorite, hornblende, quartz, plagioclase, moderately fractured, fractures increasing downhole, calcite and oxides on fractures, sulphides.	56						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3			98						
	4			54						
15	5			100						
20	6			100						
	7									
25	8			100						
30	9			83						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	10									
35	11			100						
40	12			100						
	13			100						
45	14			93						
	15			87						
50	16			98						
55	17			96						
	18									
60	19			100						
65	20			100						
	21									
70	22			100						
75	23			52						
				100						
	24			100						
80	25			100						
85	26			100						
	27									
90	28			74						
				100						
95	29									
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-154

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 14, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-154**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 14, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1491.8 ft**	Date Completed:	**Jun 16, 08**
Location:	**Area J**	Total Depth:	**165 ft**	Logged by:	**AM(SLR)/DM**
Coordinates:	**2,149,452 N , 1,391,260 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	31			100							
105	32										
	33			100							
110	34			99							
115	35										
	36			100							
120	37			87							
				53							
125	38										
	39			100							
130	40			100							
135	41									Slight artesian conditions noted.	
	42			98							
140	43										
	44			100							
145	45			100							
150	46			98							
	47			73							
155	48			100							
160	49			100							
	50										
165			END OF HOLE @ 165 FT								
	51										
170	52										
	53										
175	54										
180	55										
	56										
185	57										
190	58										
	59										
195	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-154

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Date Revised: Jul 14, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-155**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 15, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1311.4 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area L**	Total Depth:	**240 ft**	Logged by:	**SD/JC/RS**
Coordinates:	**2,140,571 N , 1,379,360 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		BEDROCK, Tertiary Volcaniclastic Breccia, polymictic, clast supported, clasts from pebble to cobble size and are angular to highly angular, matrix is usually a coarse wacke but is poorly sorted and consists of grains from silt to pebbles, colour varies throughout interval, completely weathered from 0 to 9 ft, oxidized to 21', brecciated from 21 to 29', basalt from 25 to 29', highly fractured from 117-134', calcite in matrix.	65							HWT to 8' HQ3 to 55' NQ3 to 240' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	2			90								
10	3			100								
	4			100								
15	5			100							Lose circulation at 16'	
20	6											
	7			96								
25	8			98								
30	9											
	10			99							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
35	11			100								
40	12										Lose circulation several times after 40'.	
	13			100								
45	14			100								
50	15											
	16			100								
55	17			97								
60	18											
	19			100								
65	20			98								
70	21											
	22			100								
75	23			98								
80	24											
	25			96								
85	26			100								
90	27											
	28			100								
95	29											
	30			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-155

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Project:	**Pebble Project**	Drill Hole No.	**GH08-155**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 15, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1311.4 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area L**	Total Depth:	**240 ft**	Logged by:	**SD/JC/RS**
Coordinates:	**2,140,571 N , 1,379,360 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			100						
105	32									
	33			100						
110	34			100						
115	35									
	36			100						
120	37			100						
125	38									
	39			99						
130	40			100						
135	41									
	42			100						
140	43									
	44			98						
145	45			98						
150	46									No drill return from 150 to 180.25'.
	47			99						
155	48			96						
160	49									
	50			100						
165	51			100						
170	52									
	53			91						
175	54		BEDROCK, Tertiary Volcaniclastic Breccia, monomictic, clast supported, heavily brecciated, matrix is made up mostly of clast material but 25% is calcite cement, some clay infilling, moderately fractured, heavily fractured from 210 to 217', pyrite in the matrix from 228-240'.	100						
180	55									
	56			90						
185	57			100						Very poor circulation from 180 to 210'
190	58									
	59			100						
195	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

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Project:	**Pebble Project**	Drill Hole No.	**GH08-155**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 15, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1311.4 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area L**	Total Depth:	**240 ft**	Logged by:	**SD/JC/RS**
Coordinates:	**2,140,571 N , 1,379,360 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			97								
205	63			100								
210	64										Generally poor circulation from 210 to EOH.	
	65			93								
215	66			100								
220	67											
	68			100								
225	69			100								
230	70											
	71			95								
235	72			93								
240	73		END OF HOLE @ 240 FT									
245	74											
	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-157**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1548.6 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area J**	Total Depth:	**298.75 ft**	Logged by:	**CK(SLR)/DM**
Coordinates:	**2,148,413 N , 1,391,522 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Gravelly SAND, some silt, subrounded to subangular, clasts up to gravel size, poorly graded, non plastic, light brown, damp, weathered bedrock. (Felsenmeer)	16							HWT to 12' HQ3 to 79.5' NQ3 to 298.75' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	2			67								
10	3		BEDROCK, Diorite, fine-grained, grey, thin dykelets of massive dark grey basalt?, calcite, moderate propylitic alteration, MnO and FeO staining on fracture surfaces to 24', veining, abundant pyrite with lesser chalcopyrite, rare molybdenite, finer-grained below 125', highly fractured, possibly from drilling.	100							
	4			100								
15				98								
	5			100								
20	6											
	7			100								
25	8			100								
30	9											
	10			100								
35	11			96								
40	12			100								
	13			100								
45	14			85								
50	15											
	16			100								
55	17			82								
60	18											
	19			91								
65	20			99								
70	21											
	22			79								
75	23			88								
80	24											
	25			66								
85	26			100								
90	27											
	28			98								
95	29			98								
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-157

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-157

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-157**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1548.6 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area J**	Total Depth:	**298.75 ft**	Logged by:	**CK(SLR)/DM**
Coordinates:	**2,148,413 N , 1,391,522 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			89								
105	32			98								
	33											
110	34			98								
115	35			98								
	36											
120	37			66								
125	38			43								
	39											
130	40			100								
135	41			94								
	42			82								
140	43			66								
145	44			96								
	45			98								
150	46			100								
155	47											
	48			100								
160	49			87								
	50			100								
165	51			100								
170	52			100								
175	53											
	54		BEDROCK, Granodiorite, weakly mineralized, grey-green pink, hornblende, strong propylitic alteration, some small faults with gouge, minor chalcopyrite, pyrite disseminated throughout, contact with diorite very sharp.	100							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
180	55			95								
	56											
185	57			100								
190	58			79								
	59											
195	60			93								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-157

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-157

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-157**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1548.6 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area J**	Total Depth:	**298.75 ft**	Logged by:	**CK(SLR)/DM**
Coordinates:	**2,148,413 N , 1,391,522 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			98								
205	63			79								
210	64			91								
	65											
215	66			100								
220	67			100								
	68											
225	69			100								
230	70			100								
	71											
235	72			96								
240	73			100								
	74											
245	75			100								
250	76			87								
	77											
255	78			93								
260	79			100								
	80											
265	81			94								
270	82			98								
	83											
275	84			71								
280	85			100								
	86			100								
285	87			100								
290	88			98								
	89											
295	90			89								
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-157

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-157

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-157**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1548.6 ft**	Date Completed:	**Jun 20, 08**
Location:	**Area J**	Total Depth:	**298.75 ft**	Logged by:	**CK(SLR)/DM**
Coordinates:	**2,148,413 N , 1,391,522 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92		END OF HOLE @ 298.75 FT									
305	93											
	94											
310	95											
315	96											
	97											
320	98											
325	99											
	100											
330	101											
335	102											
	103											
340	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-157

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-157

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 15, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-158**	Page	**1** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**None**	Date Started:	**Jun 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1755.1 ft**	Date Completed:	**Jun 27, 08**
Location:	**Area G**	Total Depth:	**500 ft**	Logged by:	**GD/JB/RS/LB**
Coordinates:	**2,160,506 N , 1,372,125 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**250, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Tundra vegetation, some sand and silt, dark brown, organics, moist. (Topsoil)	22							Drillhole inclined at 70 degrees. Depths are not corrected for 70 degree angle. PQ3 to 19' HQ3 to 347' NQ3 to 500' NO SPT's performed due to incline of hole.	
5	2		Silty SAND, some gravel, angular, clasts up to gravel size, poorly graded, no to low plasticity, dark brown, moist, fines washed away. (Colluvium)	11								
10	3			9								
	4		GRAVEL and COBBLES, some sand and silt, subangular, poorly graded, light brown, moist. (Colluvium)									
15	5			94								
			SAND and GRAVEL, some cobbles, medium course, poorly graded, angular to sub rounded, loose, moist. (Colluvium)	100							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
20	6			98								
	7		BEDROCK, Granodiorite, sulfide, hematite, epidote, calcite, chlorite bearing hornblende granodiorite porphyry. Greenish-grey to pinkish-grey, calcite and chlorite infilling in joints.	97								
25	8			97								
30	9											
	10			79								
35	11			100								
40	12											
	13			99							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
45	14			100								
50	15											
	16			100								
55	17			96								
60	18											
	19			98								
65	20			100								
				98								
70	21											
	22			100								
75	23											
	24			98								
80	25			85								
85	26			100								
	27			100								
90	28			98								
				94								
95	29			100								
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-158

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-158**	Page	**2** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**None**	Date Started:	**Jun 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1755.1 ft**	Date Completed:	**Jun 27, 08**
Location:	**Area G**	Total Depth:	**500 ft**	Logged by:	**GD/JB/RS/LB**
Coordinates:	**2,160,506 N , 1,372,125 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**250, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			98								
				96								
105	32											
	33			98								
110												
	34			98								
115	35											
	36			100								
120												
	37			100								
125	38											
	39			98								
130												
	40			100								
135	41											
	42			92								
140				98								
	43			100								
145	44											
	45			100								
150	46										Lost circulation at 153'	
				100								
155	47											
	48			100								
160	49			98								
				98								
	50			100								
165	51			100								
170	52											
				100								
175	53											
	54			100								
180	55											
				97								
	56											
185				96								
	57											
				100								
190	58											
				100								
	59											
195				96								
	60											
				91								

Pebble Limited Partnership
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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-158**	Page	**3** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**None**	Date Started:	**Jun 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1755.1 ft**	Date Completed:	**Jun 27, 08**
Location:	**Area G**	Total Depth:	**500 ft**	Logged by:	**GD/JB/RS/LB**
Coordinates:	**2,160,506 N , 1,372,125 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**250, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			98								
205				100								
	63			100								
210	64											
	65			100								
215	66			100								
220	67											
	68			100								
225	69			100								
230	70											
	71			100								
235	72			96								
240	73											
	74			95								
245	75			100								
250	76											
	77			96								
255	78			96								
260	79			98								
	80			98								
265	81			100								
	82			100								
270	83			98								
275	84			100								
280	85											
	86			98								
285	87			100								
	88			97								
290	89			100								
295	90			100								
	91			98								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-158

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-158**	Page	**4** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**None**	Date Started:	**Jun 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1755.1 ft**	Date Completed:	**Jun 27, 08**
Location:	**Area G**	Total Depth:	**500 ft**	Logged by:	**GD/JB/RS/LB**
Coordinates:	**2,160,506 N , 1,372,125 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**250, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			100								
305	93											
	94			100								
310	95			100								
315	96											
	97			100								
320	98			99								
325	99											
	100			98								
330	101			100								
335	102											
	103			100								
340	104			98								
345	105			100								
	106			82								
350	107			98								
355	108											
	109			99								
360	110			100								
365	111											
	112			100								
370	113			98								
375	114											
	115			100								
380	116			100								
385	117											
	118			100								
390	119			100								
395	120											
	121			92								
				100								

Pebble Limited Partnership
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Overburden Log For GH08-158

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-158**	Page	**5** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**None**	Date Started:	**Jun 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1755.1 ft**	Date Completed:	**Jun 27, 08**
Location:	**Area G**	Total Depth:	**500 ft**	Logged by:	**GD/JB/RS/LB**
Coordinates:	**2,160,506 N , 1,372,125 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**250, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	123			100								
405	124			100								
410	125			100								
	126											
415	127			100								
420	128			100								
	129											
425	130			100								
430	131			100								
	132											
435	133			100								
440	134			100								
	135											
445	136			99								
450	137			100								
	138											
455	139			100								
460	140			96								
	141											
465	142			100								
470	143			100								
	144											
475	145			100								
480	146			100								
	147											
485	148			100								
490	149			100								
	150			100								
495	151			100								
	152											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-158

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-158**	Page	**6** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**None**	Date Started:	**Jun 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1755.1 ft**	Date Completed:	**Jun 27, 08**
Location:	**Area G**	Total Depth:	**500 ft**	Logged by:	**GD/JB/RS/LB**
Coordinates:	**2,160,506 N , 1,372,125 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**250, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	153		END OF HOLE @ 500 FT									
505	154											
	155											
510	156											
515	157											
	158											
520	159											
525	160											
	161											
530	162											
535	163											
	164											
540	165											
545	166											
	167											
550	168											
555	169											
	170											
560	171											
565	172											
	173											
570	174											
575	175											
	176											
580	177											
585	178											
	179											
590	180											
595	181											
	182											

Pebble Limited Partnership
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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-159**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 20, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1400.7 ft**	Date Completed:	**Jun 23, 08**
Location:	**Area L**	Total Depth:	**235 ft**	Logged by:	**SD/RS/KB**
Coordinates:	**2,140,694 N , 1,383,070 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		SAND and GRAVEL, some silt/clay, trace cobbles, subangular, clasts up to cobble size, gap graded, non plastic, brown, moist. (Felsenmeer)	41							PQ3 to 20' HQ3 to 235'	
5	2			100								
10	3			100								
	4		BEDROCK, Tertiary Volcaniclastic Breccia, clast supported, polymictic, clasts up to cobble size, dark grey.	100							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
15	5			100								
20	6											
	7			98								
25	8		BEDROCK, Tertiary Basalt, calcite filled amygdules, fine grained, dark blue.	100							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
30	9			100								
	10		BEDROCK, Granodiorite, light grey, oxidation or chlorite alteration, chlorite and calcite infilling, some clay infilling and iron staining on joints towards top of interval, contact with above basalt is 43°tca.	100								
35	11			94								
40	12											
	13			98								
45	14			100								
50	15											
	16			98								
55	17			96								
60	18											
	19			100								
65	20			100								
70	21											
	22			100								
75	23			100								
80	24											
	25			100								
85	26			100								
90	27											
	28			100								
95	29			100								
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-159

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-159

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-159**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 20, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1400.7 ft**	Date Completed:	**Jun 23, 08**
Location:	**Area L**	Total Depth:	**235 ft**	Logged by:	**SD/RS/KB**
Coordinates:	**2,140,694 N , 1,383,070 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	31			98							
105	32										
	33			98							
110	34			100							
115	35										
	36			100							
120	37			100							
125	38										
	39			100							
130	40			100							
135	41										
	42			100							
140	43			100							
145	44										
	45			100							
150	46		BEDROCK, Basalt dyke, dark green brecciated, chloritized, calcite filling in joints and phenocrysts.	99							
155	47		BEDROCK, Granodiorite, light grey, oxidation or chlorite alteration, chlorite and calcite infilling.								
	48			100							
160	49			100							
165	50										
	51			100							
170	52			95							
175	53										
	54			98							
180	55										
	56			100							
185	57			100							
190	58										
	59			100							
195	60			98							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-159

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

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Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-159**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 20, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1400.7 ft**	Date Completed:	**Jun 23, 08**
Location:	**Area L**	Total Depth:	**235 ft**	Logged by:	**SD/RS/KB**
Coordinates:	**2,140,694 N , 1,383,070 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
205	62			100								
	63			100								
210	64											
	65		BEDROCK, dark green Basalt dyke, calcite filled phenocrysts and chlorite filled vesicles.	100								
215	66		BEDROCK, Granodiorite, light grey, oxidation or chlorite alteration, chlorite and calcite infilling.	100								
220	67											
	68			100								
225	69		BEDROCK, dark green Basalt dyke, small calcite filled phenocrysts.	100								
230	70		BEDROCK, Granodiorite, light grey, oxidation or chlorite alteration, chlorite and calcite infilling.	97								
235	71											
	72		END OF HOLE @ 235 FT									
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-159

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-159

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 2, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-161**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 23, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1764.2 ft**	Date Completed:	**Jun 24, 08**
Location:	**Area L**	Total Depth:	**101 ft**	Logged by:	**SD/KB/RS**
Coordinates:	**2,141,487 N , 1,384,942 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Tundra Vegetation, silt and sand, dark brown, moist. (Topsoil)	43							PQ3 to 15' HQ3 to 100'	
5				98								
	2		FELSENMEER, Moderately weathered/fractured Granodiorite. trace amounts of sand and fines as infilling.	99							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
10	3			90								
	4		BEDROCK, Granodiorite, light grey to green in colour, composed primarily of quartz, plagioclase, k-feldspar with moderate amounts of chlorite, weakly to moderately fractured, quartz veins with moderate pyrite, disseminated pyrite.	100								
15	5			100								
20	6											
	7			100								
25	8			100							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
30	9											
	10			100								
35	11			95								
40	12											
	13			100								
45	14			100								
50	15											
	16			97								
55	17			87								
60	18											
	19			98								
65	20			98								
70	21											
	22			100								
75	23			92								
80	24											
	25			92								
85	26			89								
90	27											
	28			100								
95	29											
	30			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-161

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-161

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Project:	**Pebble Project**	Drill Hole No.	**GH08-161**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 23, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1764.2 ft**	Date Completed:	**Jun 24, 08**
Location:	**Area L**	Total Depth:	**101 ft**	Logged by:	**SD/KB/RS**
Coordinates:	**2,141,487 N , 1,384,942 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		END OF HOLE @ 100FT									
105	32											
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-161

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-163**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1268.3 ft**	Date Completed:	**Jun 28, 08**
Location:	**Area G**	Total Depth:	**215 ft**	Logged by:	**KB/RS**
Coordinates:	**2,160,010 N , 1,380,080 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			PEAT, fibrous, dark brown, partially frozen, moist. (Topsoil)	31						HWT to 17', Stuck in hole to 15' PQ3 to 12.5' HQ3 to 215'
5	1		Silty GRAVEL, some sand, trace clay, trace cobbles, subangular to subrounded, clasts up to cobble size, gap graded, non plastic, brown to dark brown, moist. (Glacial Drift)	38	44	☒	GH08-163-1	9/17/6	32	
	2			100						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3			87						
	4		BEDROCK, Basalt, dark green to black, massive, fine grained, iron oxide staining on fracture surfaces, minor chlorite and epidote to 150', then increasing downhole, highly fractured from 100 to 150'.	100						
15	5			100						
20	6									
	7			97						
25	8			100						
30	9									
	10			97						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
35	11			100						
40	12									
	13			98						
45	14			100						
50	15									
	16			100						
55	17			98						
60	18									
	19			86						
65	20			100						
70	21									
	22			97						
75	23			100						
80	24									
	25			100						
85	26			100						
90	27									
	28			100						
95	29									
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-163

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-163

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-163**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1268.3 ft**	Date Completed:	**Jun 28, 08**
Location:	**Area G**	Total Depth:	**215 ft**	Logged by:	**KB/RS**
Coordinates:	**2,160,010 N , 1,380,080 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			100						
105	32									
	33			96						
110	34			100						
115	35									
	36			96						
120	37			100						
125	38									
	39			100						
130	40			99						
135	41									
	42			100						
140	43			96						
145	44									
	45			100						
150	46			100						
155	47									
	48			72						
160	49			100						
165	50									
	51			100						
170	52			100						
175	53									
	54			100						
180	55			100						
185	56									
	57			100						
190	58			97						
195	59									
	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-163

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH08-163

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-163**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 26, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1268.3 ft**	Date Completed:	**Jun 28, 08**
Location:	**Area G**	Total Depth:	**215 ft**	Logged by:	**KB/RS**
Coordinates:	**2,160,010 N , 1,380,080 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			85								
205	63			100								
210	64											
	65			95								
215	66		END OF HOLE @ 215 FT									
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-163

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-164**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 28, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**2026.7 ft**	Date Completed:	**Jun 30, 08**
Location:	**Area G**	Total Depth:	**106 ft**	Logged by:	**LB/GD**
Coordinates:	**2,155,408 N , 1,385,809 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES
	1		FROST HEAVED BEDROCK, some silt and sand infilling. (Felsenmeer)	52							PQ3 to 10' HQ3 to 106'
5	2		BEDROCK, Granodiorite, dark grey to green, equigranular of the Kaskanak Batholith, some chlorite alteration, quartz.	69							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3			98							
	4			98							
15				100							
	5			100							
20	6										
	7			97							
25											
	8			100							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
30	9										
	10			100							
35	11										
	12			100							
40											
	13			99							Lost circulation from 42 to 71 ft.
45	14										
	15			100							
50											
	16			93							
55	17			92							
	18			100							
60											
	19			100							
65	20										
	21			100							
70											
	22			100							
75	23										
	24			99							
80											
	25			100							
85	26										
	27			100							
90											
	28			100							
95	29										
	30			100							

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-164

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 10, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-164**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 28, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**2026.7 ft**	Date Completed:	**Jun 30, 08**
Location:	**Area G**	Total Depth:	**106 ft**	Logged by:	**LB/GD**
Coordinates:	**2,155,408 N , 1,385,809 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31											
105	32			100						■		
			END OF HOLE @ 106 FT									
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-164

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 10, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-166**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1402.7 ft**	Date Completed:	**Jul 2, 08**
Location:	**Area G**	Total Depth:	**235 ft**	Logged by:	**KB/RS**
Coordinates:	**2,159,924 N , 1,381,741 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		Tundra Vegetation, organics, dark brown, moist. (Topsoil)	26						HWT to 65, stuck at 60' PQ3 to 65' HQ3 to 235'
5	2		SILT, some sand, trace gravel, trace clay, subrounded to subangular, clasts up to cobble size, poorly graded, low plasticity, brown, moist. (Glacial Drift)	34						
10	3									
	4			47						
15	5			35	89		GH08-163-1	2/4/7	11	
20	6									
	7			35						
25	8		Gravelly SAND, some silt, trace clay, subangular, clasts up to gravel size, well graded, low plasticity, orangy brown, moist to wet. (Glacial Drift)	100	44		GH08-163-2	8/24/18	42	Heaving Sands, 25 to 40'
30	9				100		GH08-163-3	16/26/28	54	
	10			100						
35	11				100		GH08-163-4	31/50+/+	50++	
	12			100						
40	13		Sandy SILT, some clay, trace gravel, subangular to subrounded, clasts up to gravel size, poorly graded, low plasticity, brown, moist to wet. (Glacial Drift)	26	100		GH08-163-5	13/19/36	55	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
45	14			65						
50	15									
	16		BEDROCK, Basalt, dark green to black/brown, moderately weathered, upper 100 ft is weathered and highly fractured, calcite, iron staining on fractures, calcite filled vesicles.	66						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
55	17			72						
60	18									
	19			74						
65	20									
	21			91						
70	22			85						
75	23									
	24			95						
80	25			91						
85	26									
	27			91						
90	28			100						
95	29									
	30			94						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-166

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-166

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 11, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-166**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1402.7 ft**	Date Completed:	**Jul 2, 08**
Location:	**Area G**	Total Depth:	**235 ft**	Logged by:	**KB/RS**
Coordinates:	**2,159,924 N , 1,381,741 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			93						
105	32									
	33			100						
110	34			100						
115	35									
	36			99						
120	37			98						
125	38									
	39			99						
130	40			100						
135	41									
	42			99						
140	43			99						
145	44									
	45			100						
150	46			100						
155	47									
	48			99						
160	49			100						
165	50									
	51			99						
170	52			99						
175	53									
	54			98						
180	55			100						
185	56									
	57			99						
190	58			100						
195	59									
	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-166

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

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Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 11, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-166**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jun 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1402.7 ft**	Date Completed:	**Jul 2, 08**
Location:	**Area G**	Total Depth:	**235 ft**	Logged by:	**KB/RS**
Coordinates:	**2,159,924 N , 1,381,741 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
205	62			100								
	63			97								
210	64											
	65			100								
215	66			100								
220	67											
	68			100								
225	69			100								
230	70											
	71			100								
235	72		END OF HOLE @ 235 FT									
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-166

Knight Piésold CONSULTING

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Date Revised: Jul 11, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-167**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 1, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1987.2 ft**	Date Completed:	**Jul 2, 08**
Location:	**Area G**	Total Depth:	**106 ft**	Logged by:	**LB/GD**
Coordinates:	**2,157,140 N , 1,386,522 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		SILT, some clay, trace sand, trace boulders, subangular, clasts up to boulder size, poorly graded, low plasticity, brown, moist. (Felsenmeer)	100							PQ3 to 9.7' HQ3 to 106' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5				72								
	2		BEDROCK, Granodiorite, fine to medium-grained, black and white specked, weak chlorite alteration, calcite and hematite on fracture surfaces, competent.	96								
10	3			100								
	4			100								
15	5											
				98								
20	6											
	7			98								
25	8											
				100								
30	9											
	10			96							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
35	11			96								
	12			100								
40	13			100								
45	14											
				95								
50	15											
	16			100								
55	17											
				98								
60	18											
	19			100								
65	20											
				100								
70	21			96								
	22			100								
75	23											
	24			97								
80	25											
				100								
85	26											
	27			100								
90	28			90								
				100								
95	29											
	30			97								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-167

Knight Piésold CONSULTING

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Date Revised: Jul 10, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-167**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 1, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1987.2 ft**	Date Completed:	**Jul 2, 08**
Location:	**Area G**	Total Depth:	**106 ft**	Logged by:	**LB/GD**
Coordinates:	**2,157,140 N , 1,386,522 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31											
105	32			100								
			END OF HOLE @ 106 FT									
	33											
110	34											
115	35											
	36											
120	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-167

Knight Piésold CONSULTING

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Date Revised: Jul 10, 08

Project:	**Pebble Project**	Drill Hole No.	**GH08-168**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1868.2 ft**	Date Completed:	**Jul 6, 08**
Location:	**Area G**	Total Depth:	**335 ft**	Logged by:	**LB/KB/DM/GD**
Coordinates:	**2,158,898 N , 1,372,501 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**070, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Tundra Vegetation, organics, dark brown, moist. (Topsoil)	52							HWT casing installed to 283'. 5' and casing shoe left in hole. PQ3 to 34' HQ3 to 282.9' NQ3 to 335' Drillhole inclined at 70 degrees. Depths are not corrected for angle. * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
5	2		EXTREMELY WEATHERED BEDROCK, SAND and SILT, some clay, trace gravel, subangular, clasts up to gravel size, poorly graded, no to low plasticity, grey-brown to red-brown, moist.	100								
10	3			100								
	4		WEATHERED BEDROCK, Granodiorite with red-brown sand infill, very weathered with plagioclase, hornblende and quartz.									
15	5			95								
20	6		BEDROCK, Granodiorite, heavily fractured, fracture density ranges between 2 and 20 fractures/ft, fracture surfaces oxidized and contain chlorite.	54								
25	7											
	8			81								
30	9			93							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	10											
35	11			98								
				97								
40	12			78								
	13			98								
45	14		BEDROCK, Basalt dyke, dark green to black, fine grained.	91								
50	15			46								
	16		BEDROCK, Granodiorite, light grey in color, calcite chlorite and quartz veins throughout.	100								
55	17			98								
60	18											
	19			100								
65	20			100								
70	21											
	22			100								
75	23			97								
80	24											
	25			100								
85	26			100								
90	27											
	28			100								
95	29											
	30			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-168

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-168

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-168**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1868.2 ft**	Date Completed:	**Jul 6, 08**
Location:	**Area G**	Total Depth:	**335 ft**	Logged by:	**LB/KB/DM/GD**
Coordinates:	**2,158,898 N , 1,372,501 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**070, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			98								
105	32											
	33			83								
110	34			97								
115	35											
	36			100								
120	37			89								
125	38											
	39			100								
130	40			96								
135	41			100								
	42			114								
140	43			92								
145	44											
	45		BEDROCK, Basalt dyke, dark blue in colour, calcite veins present.	92								
150	46		BEDROCK, Granodiorite, grey to green in colour, highly fractured, chlorite and calcite throughout, fracture density ranges between 2 and 20 fractures per ft.	100								
155	47											
	48			98								
160	49			99								
165	50											
	51			98								
170	52			100								
175	53											
	54			99								
180	55			87								
	56			100								
185	57			100								
190	58			93								
	59			98								
195	60			97								

Pebble Limited Partnership
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Overburden Log For GH08-168

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-168**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1868.2 ft**	Date Completed:	**Jul 6, 08**
Location:	**Area G**	Total Depth:	**335 ft**	Logged by:	**LB/KB/DM/GD**
Coordinates:	**2,158,898 N , 1,372,501 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**070, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
205	62			100								
	63			91								
210	64											
	65			78								
215	66			93								
220	67											
	68			100								
225	69			100								
230	70											
	71			100								
235	72			99								
240	73											
	74			79								
245	75			100								
250	76											
	77			100								
255	78			100								
260	79											
	80			100								
265	81		BEDROCK, Basalt dyke, black in colour, calcite amygdules.	96								
270	82											
	83		BEDROCK, Granodiorite, grey to green in color, less fractured, fracture density ranges between 2 and 20 fractures per ft.	100								
275	84			98								
280	85											
	86			95								
285	87			100								
	88			97								
290	89			100								
295	90											
	91			100								

Pebble Limited Partnership
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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-168**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 3, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1868.2 ft**	Date Completed:	**Jul 6, 08**
Location:	**Area G**	Total Depth:	**335 ft**	Logged by:	**LB/KB/DM/GD**
Coordinates:	**2,158,898 N , 1,372,501 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**070, -70**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			99								
305	93											
	94			98								
310	95			100								
315	96											
	97			100								
320	98			99								
325	99											
	100			100								
330	101			98								
335	102		END OF HOLE @ 335 FT									
340	103											
	104											
345	105											
	106											
350	107											
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
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Overburden Log For GH08-168

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-169**	Page	**1** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1940.13 ft**	Date Completed:	**Jul 12, 08**
Location:	**Area G**	Total Depth:	**499.5 ft**	Logged by:	**LB/KB/DM/LS**
Coordinates:	**2,153,064 N , 1,369,359 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Granodiorite BOULDERS and COBBLES, some sand and gravel, frost shattered rocks on surface.	49							HWT to 67.5' PQ3 to 65' HQ3 to 245' NQ3 to 499.5'	
5	2		(Felsenmeer)	66								
10	3											
	4			39							Virbrating Wire Piezometer installed @291.25'.	
15	5			16								
20	6		WEATHERED BEDROCK, highly to completely weathered, possibly granodiorite or Tertiary volcaniclastic breccia, some basaltic fragments, highly oxidized, reddish brown, clay, soft, not competent, broken.									
	7			86								
25	8											
	9			94								
30	10			88								
35	11			100								
40	12											
	13			91							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
45	14			100								
50	15											
	16			83								
55	17			100								
60	18											
	19			98								
65	20			85								
70	21		BEDROCK, Granodiorite, light grey in colour, medium grained, moderately to heavily weathered, calcite and chlorite infilling, moderately oxidized.									
	22			100							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
75	23			100								
80	24											
	25		BEDROCK, Tertiary Basalt intrusion, dark brown to dark green, white phenocrysts, fine grained, moderately fractured.	98								
85	26			99								
90	27											
	28			98								
				100								
95	29		BEDROCK, Granodiorite, light grey in colour, calcite and chlorite infilling, slightly weathered and fractured, competent, becoming									
	30			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-169

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-169**	Page	**2** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1940.13 ft**	Date Completed:	**Jul 12, 08**
Location:	**Area G**	Total Depth:	**499.5 ft**	Logged by:	**LB/KB/DM/LS**
Coordinates:	**2,153,064 N , 1,369,359 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		gradually less fractured with depth, hard.	100								
105	32											
	33			100								
110	34			95								
115	35											
	36			100								
120	37			100								
125	38											
	39			96								
130	40			95								
135	41											
	42			100								
140	43			100								
145	44											
	45			100								
150	46			100								
155	47											
	48			98								
160	49			100								
165	50											
	51			87								
170	52			100								
175	53											
	54			92								
180	55											
	56			100								
185	57			100								
190	58											
	59			100								
195	60			99								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-169

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-169

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-169**	Page	**3** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1940.13 ft**	Date Completed:	**Jul 12, 08**
Location:	**Area G**	Total Depth:	**499.5 ft**	Logged by:	**LB/KB/DM/LS**
Coordinates:	**2,153,064 N , 1,369,359 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			90								
205	63			100								
210	64			100								
	65											
215	66			100								
220	67											
	68			100								
225	69			100								
230	70											
	71			100								
235	72			100								
240	73											
	74			100								
245	75			99								
250	76											
	77			100								
255	78			98								
260	79											
	80			100								
265	81			100								
270	82											
	83			100								
275	84			100								
280	85											
	86			100								
285	87			88								
290	88											
	89			98								
295	90			100								
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-169

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-169

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-169**	Page	**4** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1940.13 ft**	Date Completed:	**Jul 12, 08**
Location:	**Area G**	Total Depth:	**499.5 ft**	Logged by:	**LB/KB/DM/LS**
Coordinates:	**2,153,064 N , 1,369,359 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			100								
305	93			100								
	94											
310	95			100								
315	96			100								
	97											
320	98			100								
325	99			100								
	100											
330	101			100								
335	102			98								
	103											
340	104			100								
345	105			100								
	106											
350	107			100								
355	108			100								
	109											
360	110			100								
365	111			100								
	112											
370	113			100								
375	114			100								
	115											
380	116			100								
385	117			100								
	118											
390	119			99							Little to no drill return, 388 to 450', 399 to 450', water noted coming out of the casing, artesian conditions seem inconsistent with no drill	
395	120			100								
	121											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-169

Knight Piésold CONSULTING

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-169**	Page	**5** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1940.13 ft**	Date Completed:	**Jul 12, 08**
Location:	**Area G**	Total Depth:	**499.5 ft**	Logged by:	**LB/KB/DM/LS**
Coordinates:	**2,153,064 N , 1,369,359 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
											return.	
	123			100								
405	124			96								
410	125			100								
	126											
415	127			97								
420	128			100								
	129											
425	130			100								
430	131			100								
	132											
435	133			100								
440	134			100								
	135											
445	136			98								
450	137			97								
	138											
455	139			100								
460	140			100								
	141											
465	142			100								
470	143			100								
	144											
475	145			100								
480	146			100								
	147											
485	148			100								
490	149			100								
	150											
495	151			97								
	152											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-169

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-169**	Page	**6** of **6**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 7, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1940.13 ft**	Date Completed:	**Jul 12, 08**
Location:	**Area G**	Total Depth:	**499.5 ft**	Logged by:	**LB/KB/DM/LS**
Coordinates:	**2,153,064 N , 1,369,359 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			END OF HOLE @ 499.5 FT									
	153											
505	154											
	155											
510	156											
515	157											
	158											
520	159											
525	160											
	161											
530	162											
535	163											
	164											
540	165											
545	166											
	167											
550	168											
555	169											
	170											
560	171											
565	172											
	173											
570	174											
575	175											
	176											
580	177											
585	178											
	179											
590	180											
595	181											
	182											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-169

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

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Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 3, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-170**	Page	**1** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1949 ft**	Date Completed:	**Jul 18, 08**
Location:	**Area L**	Total Depth:	**500 ft**	Logged by:	**LB/DM**
Coordinates:	**2,147,896 N , 1,367,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	1		TOPSOIL, organics, dark brown, moist. (Topsoil)	26						PQ3 to 30' HQ3 to 135' NQ3 to 500', HWT rods stuck in hole.	
5	2		SAND, some silt, some gravel, trace to some clay, subangular to subrounded, clasts up to gravel size, poorly graded, non plastic, brown, moist. (Colluvium)	32							
10	3			98						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
	4		WEATHERED BEDROCK, Silty SAND, some gravel, trace to some clay, subangular to subrounded clasts/fragments of granodiorite, clast up to gravel size, mostly coarse sand size, poorly graded, low plasticity, soft, grey brown, moist.								
15	5			51							
				100							
20	6										
	7		BEDROCK, Granodiorite, medium grained, light grey, moderately weathered, iron oxides on fracture surfaces, heavily to moderately fractured to 45', the becomes more competent with depth, epidote vein at between 88 and 89', ~0.3 inches wide.	87							
25	8			83							
30	9										
	10			59							
35	11			100							
40	12										
	13			98							
45	14			100							
50	15										
	16			93							
55	17			100							
60	18										
	19			97							
65	20			100							
70	21										
	22			98							
75	23			100							
80	24										
	25			100							
85	26			100							
90	27										
	28			100						Virbrating Wire Piezometer installed at 488' depth.	
95	29			99							
100	30										
	31			100							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-170

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-170

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-170**	Page	**2** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1949 ft**	Date Completed:	**Jul 18, 08**
Location:	**Area L**	Total Depth:	**500 ft**	Logged by:	**LB/DM**
Coordinates:	**2,147,896 N , 1,367,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	33			100								
110	34			100								
115	35											
	36			100								
120	37			100								
125	38											
	39			100								
130	40			98								
135	41			85								
	42			94								
140	43			98								
145	44											
	45			99								
150	46			100								
155	47											
	48			87								
160	49			100								
165	50											
	51			100								
170	52			100								
175	53											
	54			100								
180	55			98								
185	56											
	57			100								
190	58			97								
195	59											
	60			100								
200	61			100								
205	62											
	63			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-170

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-170**	Page	**3** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1949 ft**	Date Completed:	**Jul 18, 08**
Location:	**Area L**	Total Depth:	**500 ft**	Logged by:	**LB/DM**
Coordinates:	**2,147,896 N , 1,367,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	65			100								
215	66			100								
220	67											
	68			98								
225	69			100								
230	70											
	71			100								
235	72			100								
240	73											
	74			100								
245	75			96								
				100								
250	76											
	77			100								
255	78			100								
260	79											
	80			100								
265	81			100								
270	82											
	83			98								
275	84			100								
280	85											
	86			100								
285	87											
	88			100								
290	89		Water level needs further verification by more data from the VW Piezometer.	100								
295	90											
	91			100								
300	92			99							Lost circulation at 302.5, little to no drill return to 500'.	
305	93											
	94			100								
310	95			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-170

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-170**	Page	**4** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1949 ft**	Date Completed:	**Jul 18, 08**
Location:	**Area L**	Total Depth:	**500 ft**	Logged by:	**LB/DM**
Coordinates:	**2,147,896 N , 1,367,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	97			100								
320	98			100								
325	99											
	100			100								
330	101			100								
335	102											
	103			98								
340	104			100								
345	105											
	106			100								
350	107			98								
355	108											
	109			99								
360	110			100								
365	111											
	112			100								
370	113			100								
375	114											
	115			98								
380	116			100								
385	117											
	118			100								
390	119			100								
395	120											
	121			100								
400	122			100								
405	123											
	124			100								
410	125			98								
415	126			98								
	127			97								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-170

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-170**	Page	**5** of **5**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 14, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1949 ft**	Date Completed:	**Jul 18, 08**
Location:	**Area L**	Total Depth:	**500 ft**	Logged by:	**LB/DM**
Coordinates:	**2,147,896 N , 1,367,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	129			100								
425	130			100								
430	131											
	132			100								
435	133			100							Slight artesian conditions at 435' observed after run, however flow stopped soon after, difficult to get seal on some packer tests.	
440	134											
	135			98								
445	136			100								
450	137											
	138			100								
455	139			98								
460	140											
	141			100								
465	142			100								
470	143											
	144			100								
475	145			100								
480	146											
	147			100								
485	148			100								
490	149											
	150			100								
495	151			100								
	152											
500	153		END OF HOLE @ 500 FT									
505	154											
	155											
510	156											
515	157											
	158											
520	159											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-170

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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-171**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 19, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1589.41 ft**	Date Completed:	**Jul 21, 08**
Location:	**Area L**	Total Depth:	**150 ft**	Logged by:	**LB/RS/DM**
Coordinates:	**2,147,241 N , 1,370,411 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		Tundra Vegetation, organics, dark brown, moist. (Topsoil)	52						PQ3 to 43' HQ3 to 150'
5	2		WEATHERED BEDROCK, Tertiary Volcaniclastic Breccia, highly weathered, silty SAND matrix, fragments sand to boulder size of various igneous composition, felsic to mafic, highly fractured, weak, limonitic clay alteration prevalent, hematite on some fracture surfaces, friable.	58	50		GH08-171-1	7/4/6	10	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3				61		GH08-171-2	6/17/35	52	
	4			85						
15	5			93						
20	6									
	7			98						
25	8			100						
30	9									
	10			93						
35	11			85						
40	12									
	13			25						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
45	14			87						
				81						
50	15									
	16			92						
55	17			100						Sands heaved to 59' after rods pulled at the end of the drillhole.
60	18									
	19			88						
65	20		BEDROCK, Tertiary Volcaniclastic Breccia, as above, only less weathered and more competent, less fractured, matrix supported, calcite in fractures, some limonite and hematite alteration, dark grey to black with multi-coloured fragments.	93						
70	21									
	22			100						
75	23			98						
	24			77						
80	25			88						
85	26									
	27			100						
90	28			100						
95	29									
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-171

Knight Piésold CONSULTING

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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-171**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 19, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1589.41 ft**	Date Completed:	**Jul 21, 08**
Location:	**Area L**	Total Depth:	**150 ft**	Logged by:	**LB/RS/DM**
Coordinates:	**2,147,241 N , 1,370,411 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	31			100							
105	32										
	33			100							
110	34			100							
115	35										
	36			100							
120	37			100							
125	38										
	39			100							
130	40			88							
135	41										
	42			100							
140	43			100						Water bubbling out of casing, 140 to 145'.	
145	44										
	45			100							
150	46		END OF HOLE @ 150 FT								
155	47										
	48										
160	49										
165	50										
	51										
170	52										
175	53										
	54										
180	55										
185	56										
	57										
190	58										
195	59										
	60										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
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Knight Piésold CONSULTING

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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-172**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 21, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1457.75 ft**	Date Completed:	**Jul 23, 08**
Location:	**Area L**	Total Depth:	**235 ft**	Logged by:	**RS/DM**
Coordinates:	**2,147,901 N , 1,371,504 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		Tundra Vegetation, organics, dark brown, moist. (Topsoil)	17						PQ3 to 20' HQ3 to 150' NQ3 to 235' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
5	2		WEATHERED BEDROCK, Tertiary Volcaniclastic Breccia, matrix highly weathered to a silty SAND, soft, light brown in colour, clast supported, monomictic, clasts are coarse grained granodiorite, iron oxides, chlorite, becomes more competent with depth, moderately to highly fractured.	68	67		GH08-172-1	12/27/28	55	
10	3			82	83		GH08-172-2	12/23/50+	50+	
	4			98						
15	5			93						
20	6									***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	7			83						
25	8			51						
30	9									Lost circulation from 30 to 40'.
	10			94						
35	11			100						
40	12									
	13			100						
45	14		BEDROCK, Teriary Volcaniclastic Breccia, slightly orange to brown in colour with frequent purple patches, polymictic, gravel to boulder sized clasts of granodiorite and felsic to mafic volcanic rocks, clasts are subangular to angular, wacke size matrix, basaltic clasts become more abundant with depth, minor carbonate, becomes more competent at 60', highly weathered from 145 to 148ft.	100						
50	15			96						
	16			98						
55	17			100						
60	18									
	19			100						Lost circulation from 62 to 90' with limited return at times.
65	20			100						
70	21									
	22			98						
75	23			100						
80	24									
	25			96						Hole suspected to have sanded in to 80' after pulling the rods when finished drilling.
85	26			100						
90	27									
	28			100						
95	29									
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-172

Knight Piésold CONSULTING

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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-172**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 21, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1457.75 ft**	Date Completed:	**Jul 23, 08**
Location:	**Area L**	Total Depth:	**235 ft**	Logged by:	**RS/DM**
Coordinates:	**2,147,901 N , 1,371,504 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32			100							Lost circulation 105 to 150' with periodic recovery	
	33											
110	34			100								
115	35											
	36			100								
120	37			100								
125	38											
	39			100								
130	40			100								
135	41											
	42			100								
140	43			100								
145	44											
	45			96							Likely heaving sand or slough, uniform loose sand from 145-147.5'	
150	46		BEDROCK, Tertiary Volcaniclastic Breccia, clast supported, monomictic, basaltic clasts, rare felsic clasts, calcite, dark purple to black, bright red patches near upper and lower contacts, competent.	97								
	47			100								
155	48			75								
160	49											
	50			94								
165	51			91								
				98								
170	52			100								
175	53											
	54			95								
180	55		BEDROCK, Tertiary Volcaniclastic Breccia, grey, matrix supported to fine clast supported, polymictic, angular clasts mostly granodiorite with some clasts of intermediate to mafic volcanic rocks, chlorite, competent.	100							Lost and regained circulation from 180 to 235'	
185	56											
	57			100								
190	58											
	59			100								
195	60			100								

Pebble Limited Partnership
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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-172**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 21, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1457.75 ft**	Date Completed:	**Jul 23, 08**
Location:	**Area L**	Total Depth:	**235 ft**	Logged by:	**RS/DM**
Coordinates:	**2,147,901 N , 1,371,504 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
205	62			100								
	63			100								
210	64											
	65			100								
215	66		BEDROCK, Tertiary Basalt, brecciated, black to red in colour, calcite veins, competent.	100								
220	67											
	68			100								
225	69											
				100								
230	70											
	71			100								
235	72		END OF HOLE @ 235 FT									
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
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Date Revised: Jun 1, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-173**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1342.22 ft**	Date Completed:	**Jul 27, 08**
Location:	**Area L**	Total Depth:	**220 ft**	Logged by:	**RS/DM**
Coordinates:	**2,146,475 N , 1,372,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Tundra Vegetation, organics, dark red brown, moist. (Topsoil)	80							PW to 38', HWT casing to 117', PQ3 to 118', HQ3 to 220', HWT casing stuck in drillhole, had to be cut, drill steel remains in the ground from 86 to 117'	
5	1		Sandy, silty GRAVEL, trace cobbles, trace clay, subangular to subrounded, clasts up to cobble size, well graded, low plasticity, brown, moist. (Colluvium)	26	0		GH08-173-1	4/3/4	7			
10	2			40	53		GH08-173-2	15/23/23	46			
15	3		Gravelly silty SAND, trace clay, trace cobbles, silt content decreases with depth, subangular to subrounded, clasts up to cobble size, poorly to well graded, non plastic, hematite on some subangular clasts, light brown, moist. (Colluvium)	5	72		GH08-173-3	16/25/29	54		Most fines washed away in drill return.	
20	4			33	56		GH08-173-4	12/10/4	14			
25	5			0	72		GH08-173-5	2/12/15	27		Lost circulation from 25-35', partial recovery from 30 to 35'. SPTs not performed past 25 ft depth due to broken cathead.	
30	6			49								
35	7			62								
40	8			60								
45	9		Gravelly SAND, some silt, trace clay, some cobbles and boulders, subangular, clasts up to boulder size, poorly graded, no to low plasticity, brown with some orange zones of iron staining, moist. (Colluvium)	69								
50	10			87							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
55	11			53								
60	12			74								
65	13			61								
70	14			82								
75	15		Gravelly SAND, some silt, trace cobbles and boulders, hematite on some clast surfaces, zones with higher silt content with better recovery, subrounded to subangular, clasts up to boulder size, non plastic, brown, moist. (Colluvium)	74							Fines washed away in drill return.	
80	16			67								
85	17			82								
90	18			66								
95	19			63							Heaving Sand.	

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Project:	**Pebble Project**	Drill Hole No.	**GH08-173**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1342.22 ft**	Date Completed:	**Jul 27, 08**
Location:	**Area L**	Total Depth:	**220 ft**	Logged by:	**RS/DM**
Coordinates:	**2,146,475 N , 1,372,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			43								
105	32		BEDROCK or possible boulder, Granodiorite, medium grained, light grey in colour, brecciated with a matrix of fine grained feldspar and epidote, thought to be a boulder as this unit overlies a younger Tertiary unit, could also possibly be a thrust fault or overturning, competent.	52							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
110	33			89								
115	34			100								
120	35			100							Lost circulation at 122'.	
125	36			100								
130	37			100								
135	38			100								
140	39		BEDROCK, Tertiary volcaniclastic breccia, contains fragments/clasts of granodiorite similar to the unit above as well as fragments of basalt and sedimentary rocks, some calcite and chlorite veins, competent, some vertical fracturing, moderately fractured.	100								
145	40			100								
150	41			100								
155	42			100								
160	43			100								
165	44			100								
170	45			100								
175	46			100								
180	47			100								
185	48			100								
190	49			100								
195	50			100								
	51			100								
	52			92								
	53			100								
	54			100								
	55			100								
	56			100								
	57			100								
	58			100								
	59			100								
	60											

Pebble Limited Partnership
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Project:	**Pebble Project**	Drill Hole No.	**GH08-173**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1342.22 ft**	Date Completed:	**Jul 27, 08**
Location:	**Area L**	Total Depth:	**220 ft**	Logged by:	**RS/DM**
Coordinates:	**2,146,475 N , 1,372,111 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			100								
205	63			100								
210	64											
	65			96								
215	66			97								
220	67		END OF HOLE @ 220 FT									
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
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Project:	**Pebble Project**	Drill Hole No.	**GH08-176**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 31, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1575.55 ft**	Date Completed:	**Aug 3, 08**
Location:	**Area L**	Total Depth:	**145 ft**	Logged by:	**RS/DM**
Coordinates:	**2,140,251 N , 1,371,615 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES
5	1		Sandy GRAVEL, some silt/clay, trace cobbles, subangular, clasts up to cobble size, gap graded, low plasticity, light brown, moist. (Felsenmeer)	20							PQ3 to 40' HWT to 42' HQ3 to 145' 300 lb boulder had to be moved at the surface to start drilling, felsenmeer on surface.
	2			82							
10	3										
	4			23							
15	5			20							
20	6										
	7			23							
25	8		BEDROCK, Tertiary Volcaniclastic Breccia, reddish-brown to grey in colour, clasts are angular to subrounded ranging in size from 5mm to > 0.5 m, clasts are mostly granodiorite from 25.5 to 70 ft, 70 to 145 ft is polymictic with some basaltic material present as both clasts and matrix.	100							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
30	9										
	10			49							
35	11			91							
40	12										
	13			98							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
45	14			100							
50	15										
	16			100							
55	17			100							
60	18										
	19			95							
65	20			100							
70	21										
	22			100							
75	23			94							
80	24										
	25			96							
85	26			100							
90	27										
	28			100							
95	29										
	30			100							

WELL DETAILS

Pebble Limited Partnership
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Project:	**Pebble Project**	Drill Hole No.	**GH08-176**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Jul 31, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1575.55 ft**	Date Completed:	**Aug 3, 08**
Location:	**Area L**	Total Depth:	**145 ft**	Logged by:	**RS/DM**
Coordinates:	**2,140,251 N , 1,371,615 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33			100								
110	34			100								
115	35											
	36			100								
120	37			100								
125	38										Lost circulation from 125 to 130'.	
	39			100								
130	40			100							Clay seam 132.5 to 135'.	
135	41											
	42			100								
140	43			100								
145	44		END OF HOLE @ 145 FT									
150	45											
	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-178**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1346.2 ft**	Date Completed:	**Aug 12, 08**
Location:	**Area E**	Total Depth:	**260 ft**	Logged by:	**RS/DM**
Coordinates:	**2,161,569 N , 1,392,234 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Tundra Vegetation, dark brown, organics, moist. (Topsoil)	30							PQ3 to 95' HQ3 to 110' NQ3 to 260'	
5	2		Silty GRAVEL, some sand, some clay, trace cobbles, subangular to rounded, clasts up to cobble size, gap graded, low plasticity, brown, moist. (Glacial Drift)	24								
10	3											
	4			43								
15	5			18	56		GH08-178-1	12/15/16	31			
20	6			23	64		GH08-178-2	7/15/26	41			
25	7											
	8		Sandy GRAVEL, trace silt, trace cobbles, subangular, clasts up to cobble size, poorly graded, no to low plasticity, grey/brown, moist, fines washed away. (Glacial Drift)	41	64		GH08-178-3	13/35/40	75			
30	9				56		GH08-178-4	13/28/39	67			
	10			39								
35	11			28	39		GH08-178-5	8/14/29	43			
40	12				38		GH08-178-6	11/50+/+	50++		***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
	13			24								
45	14			77	72		GH08-178-7	12/25/50+	50+			
50	15			76			GH08-178-8	50+/+/+	50+++			
	16			38								
55	17			45								
60	18				133		GH08-178-9	50+/+/+	50+++			
	19			48								
65	20			35								
70	21				69		GH08-178-10	26/50/50+	50+			
	22			41								
75	23			30								
80	24				42		GH08-178-11	15/50+/+	50++			
	25			24								
85	26			98 / 75								
	27		BEDROCK, Basalt, dark blue-green in colour, highly fractured, calcite and pyrite veins, chlorite, epidote.	33 / 93							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
90	28			77								
95	29											
	30			66								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-178

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-178

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-178**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1346.2 ft**	Date Completed:	**Aug 12, 08**
Location:	**Area E**	Total Depth:	**260 ft**	Logged by:	**RS/DM**
Coordinates:	**2,161,569 N , 1,392,234 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31		BEDROCK, Basalt, dark blue-green in colour, moderately fractured, calcite and pyrite veins, chlorite, epidote.	96								
105	32											
	33			100								
110	34			91								
115	35											
	36			100								
120	37			96								
125	38											
	39			92								
130	40			87								
135	41											
	42			94								
140	43			98								
145	44											
	45			93								
150	46			96								
155	47											
	48		BEDROCK, Basalt, dark blue-green in colour, heavily fractured, possible fault zone, calcite and pyrite veins, chlorite, epidote.	72								
160	49			94								
165	50											
	51			60								
170	52			87								
175	53			94								
	54			57								
180	55			87								
				89								
	56			69								
185				24								
	57			82								
				59								
190	58			31								
				73								
195	59			31								
	60			31								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-178

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-178**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 9, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1346.2 ft**	Date Completed:	**Aug 12, 08**
Location:	**Area E**	Total Depth:	**260 ft**	Logged by:	**RS/DM**
Coordinates:	**2,161,569 N , 1,392,234 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
205	62			20							
	63			37							
210	64										
	65			72							
215	66			80							
220	67		BEDROCK, Basalt, dark blue-green in colour, moderately fractured, calcite and pyrite veins, chlorite, epidote.								
	68			86							
225	69			100							
230	70										
	71			93							
235	72			100							
240	73										
	74			93							
245	75			100							
250	76										
	77			100							
255	78			100							
260	79		END OF HOLE @ 260 FT								
	80										
265	81										
270	82										
	83										
275	84										
280	85										
	86										
285	87										
	88										
290	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-178

Knight Piésold CONSULTING

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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-179**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 13, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1309.4 ft**	Date Completed:	**Aug 16, 08**
Location:	**Area E**	Total Depth:	**215 ft**	Logged by:	**LB/DM/DG**
Coordinates:	**2,162,015 N , 1,391,461 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Gravelly SAND, trace to some silt, trace to some clay, trace cobbles, varying amounts of SAND and GRAVEL, subangular, clasts up to cobble size, well graded, low plasticity, brown, moist. (Glacial Drift)	19							PW to 28.5' PQ3 to 85' HQ3 to 100' NQ3 to 215'	
5	1			22								
	2			9	61	☒	GH08-179-1	9/7/8	15	●		
10	3				36	☒	GH08-179-2	6/13/16	29	●		
	4			14								
15	5			12	69	☒	GH08-179-3	8/11/16	27	●	Heaving Sands, rods sanded in.	
20	6			36	100	═	GH08-179-4	50+/+/+	50+++			
	7			19								
25	8			12	11	☒	GH08-179-5	11/14/15	29	●		
30	9			33	67	☒	GH08-179-6	13/19/25	44	●		
35	11		SAND and SILT, some gravel, trace clay, trace cobbles, subangular, clasts up to cobble size, well graded, low plasticity, light brown, moist. (Glacial Drift)	41	39	☒	GH08-179-7	15/34/39	73	●		
40	12				47	☒	GH08-179-8	6/11/8	19	●		
	13			13								
45	14		SAND and GRAVEL, trace silt, trace cobbles, varying amounts of gravel content throughout interval but generally gravel content slightly increases with depth, subangular to subrounded, clasts up to boulder size, poorly graded, grey, moist. (Glacial Drift)	39	58	☒	GH08-179-9	17/39/?	50+	●		
	15			28								
50	16			20	44	☒	GH08-179-10	19/39/36	75	●		
55	17			35								
60	18			49	0	═	GH08-179-11	50+/+/+	50+++			
	19			18								
65	20			10								
70	21			26	56	☒	GH08-179-12	29/25/31	56	●		
75	22			19								
80	24			42								
	25			74						■		
85	26		BEDROCK, Basalt, fine grained, moderately fractured, some oxidation at shallow depths coating fracture surfaces 83 to 91 ft, calcite veins, pyrite veins, epidote, quartz, rock becomes more competent with depth.	95						■	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
				100								
90	27			96						■		
	28			100						■		
95	29											
	30			100						■		

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-179

Knight Piésold CONSULTING

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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-179**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 13, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1309.4 ft**	Date Completed:	**Aug 16, 08**
Location:	**Area E**	Total Depth:	**215 ft**	Logged by:	**LB/DM/DG**
Coordinates:	**2,162,015 N , 1,391,461 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			65							Possible Void?	
105	32			68								
	33			94								
110	34			100								
115	35											
	36			100								
120	37			100								
125	38											
	39			100								
130	40			100								
135	41											
	42			100								
140	43			100								
145	44											
	45			99								
150	46			100								
155	47											
	48			100								
160	49			99								
165	50											
	51			100								
170	52			100								
175	53											
	54			100								
180	55											
	56			100								
185	57			100								
190	58											
	59			100								
195	60			100								

Pebble Limited Partnership
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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-179**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 13, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1309.4 ft**	Date Completed:	**Aug 16, 08**
Location:	**Area E**	Total Depth:	**215 ft**	Logged by:	**LB/DM/DG**
Coordinates:	**2,162,015 N , 1,391,461 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			100						■		
205	63			100						■		
210	64			100						■		
	65											
215	66		END OF HOLE @ 215 FT								***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-179

Knight Piésold CONSULTING

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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-183**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1309.5 ft**	Date Completed:	**Aug 27, 08**
Location:	**Area E**	Total Depth:	**270 ft**	Logged by:	**DG/DB**
Coordinates:	**2,159,867 N , 1,391,073 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Tundra vegetation, dark brown, roots, organics, moist. (Topsoil)	40						PQ3 to 50' HQ3 to 180' NQ3 to 270' HWT to 180', casing stuck from 25 to 40'
SILT and SAND, some clay, trace gravel, subrounded to subangular, clasts up to gravel size, poorly graded, low plasticity, light brown, moist. (Colluvium)	52	56	☒	GH08-183-1	2/7/14	23	
	59	94	☒	GH08-183-2	3/6/9	18	
Gravelly SAND, some silt, trace clay, trace cobble, subrounded to subangular, clasts up to cobble size, well graded, non plastic, grey, moist. (Glacial Drift)	33	100	☒	GH08-183-3	9/20/50+	50+	
	38	100	☒	GH08-183-4	15/14/15	44	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	37	72	☒	GH08-183-5	4/4/6	14	
Silty SAND, some gravel, trace clay, trace cobble, subrounded to subangular, clasts up to cobble size, poorly graded, non plastic, brown, moist. (Glacial Drift)	30	72	☒	GH08-183-6	7/9/13	29	
	60						
SAND, some gravel, some silt, subrounded to subangular, clasts up to gravel size, poorly graded, non plastic, light brown, moist. (Glacial Drift)	94	100	☒	GH08-183-7	//50+	50+	Heaving sands at 35'
	66						
EXTREMELY WEATHERED BEDROCK, SAND and GRAVEL, some silt, medium to fine grained sand, subrounded to subangula, clasts up to gravel size, well graded, non plastic, light brown, moist.	40	67	☒	GH08-183-8	19/44/50+	50+	
WEATHERED BEDROCK, Granodiorite, medium to coarse grained, hornblende, quartz, feldspars, heavily fractured and oxidized.	87						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	93						
	89						
	83						
	93						
	87						
	79						
	79						
	92						
	79						
	87						
	45						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
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Knight Piésold CONSULTING

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Project:	**Pebble Project**	Drill Hole No.	**GH08-183**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1309.5 ft**	Date Completed:	**Aug 27, 08**
Location:	**Area E**	Total Depth:	**270 ft**	Logged by:	**DG/DB**
Coordinates:	**2,159,867 N , 1,391,073 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			67						
105	32									
	33			81						
110	34			66						
115	35									
	36			62						
120	37			30						
125	38									
	39			52						
130	40			89						
135	41									
	42			85						
140	43			26						
145	44									
	45			100						
150	46			92						
155	47			66						
	48			93						
160	49		BEDROCK, Granodiorite, medium to coarse grained, hornblende, quartz, feldspars, heavily fractured, chlorite, epidote, hematite alteration.	88						
165	50									
	51			100						
170	52			99						
175	53									
	54			88						
180	55			100						
				67						
	56		BEDROCK, Basalt, fine grained, black, calcite veins, more competent.	98						
185	57			87						
190	58		BEDROCK, Granodiorite, medium to coarse grained, hornblende, quartz, feldspars, heavily fractured, chlorite, epidote, hematite alteration.	87						
195	59									
	60		BEDROCK, Basalt, fine grained, black, calcite veins, more competent.	100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-183

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Project:	**Pebble Project**	Drill Hole No.	**GH08-183**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 24, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1309.5 ft**	Date Completed:	**Aug 27, 08**
Location:	**Area E**	Total Depth:	**270 ft**	Logged by:	**DG/DB**
Coordinates:	**2,159,867 N , 1,391,073 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	62		BEDROCK, Granodiorite, medium to coarse grained, hornblende, quartz, feldspars, heavily fractured, chlorite, epidote, hematite alteration.	35							
205	63			54							
210	64										
	65			44							
215	66			52							
220	67		BEDROCK, Granodiorite, medium to coarse grained, hornblende, quartz, feldspars, moderately fractured, chlorite, epidote, hematite alteration .								
	68			100							
225	69			66							
				100							
230	70										
	71			100							
235	72			75							
240	73										
	74			83							
245	75			75							
250	76										
	77			85							
255	78			100							
260	79										
	80			100						Core improperly labelled in photographs, hole continues to 270'.	
265	81			100							
270	82		END OF HOLE @ 270 FT								
	83										
275	84										
	85										
280	86										
285	87										
	88										
290	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
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Date Revised: Jul 4, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-186**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1316.4 ft**	Date Completed:	**Aug 29, 08**
Location:	**Area G**	Total Depth:	**24.5 ft**	Logged by:	**DB/WX**
Coordinates:	**2,160,728 N , 1,379,386 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Tundra Vegetation with organics, very dark brown, wet. (Topsoil)	87							PQ3 to 15' HQ3 to 24.5' * See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89). ***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
			Clayey SILT, some gravel, subangular, clasts up to gravel size, gap graded, low plasticity, light grey brown, moist. (Colluvium)	45								
			WEATHERED BEDROCK, Fragments of dark grey Gabbro, oxidation on some fragments, fine material washed away.	72								
				51								
			BEDROCK, Gabbro, dark grey, plagioclase, pyroxene, competent, moderately fractured, oxidation on fractures.	100						■		
			END OF HOLE @ 24.5 FT									

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-186

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-186

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-187**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1497.7 ft**	Date Completed:	**Aug 31, 08**
Location:	**Area G**	Total Depth:	**145 ft**	Logged by:	**DG/AW/DB/WX**
Coordinates:	**2,159,911 N , 1,383,083 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	1		Tundra Vegetation, dark brown, organics, moist. (Topsoil)	47							PQ3 to 40' HQ3 to 145'	
5	2		WEATHERED BEDROCK, Basalt, moderately to highly fractured basalt with highly to completely weathered zones, infillings of clay and silt, oxidation on fracture surfaces.	97								
10	3											
	4			100								
15	5			72								
20	6											
	7			92							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
25	8			90								
30	9											
	10			98								
35	11		BEDROCK, Basalt, dark green/black vesicular fine grained basalt, moderately fractured, oxidized zones.	100 / 78							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
40	12											
	13			100								
45	14			22								
50	15											
	16			3								
55	17			98								
60	18											
	19			100								
65	20			85								
70	21											
	22			87								
75	23		BEDROCK, Granodiorite, competent, weakly altered, oxidation on fractures.	89								
80	24											
	25			100								
85	26			100								
90	27		BEDROCK, Basalt, transitioning from granodiorite, dark green/black vesicular fine grained basalt, less fractured, oxidized zones, calcite on fractures and in veins.									
	28			100								
95	29											
	30			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-187

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-187

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-187**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 29, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond Drill**	Elevation:	**1497.7 ft**	Date Completed:	**Aug 31, 08**
Location:	**Area G**	Total Depth:	**145 ft**	Logged by:	**DG/AW/DB/WX**
Coordinates:	**2,159,911 N , 1,383,083 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33			100								
110	34			100								
115	35											
	36			100								
120	37			100								
125	38		BEDROCK, Granodiorite, competent, slightly altered, oxidation on fractures.									
	39			100								
130	40			100								
135	41											
	42			100								
140	43		BEDROCK, Basalt, transitioning from granodiorite, dark green/black vesicular fine grained basalt, competent.	100								
	44											
145			END OF HOLE @ 145 FT									
	45											
150	46											
	47											
155	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-187

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-187

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-188**	Page	**1** of **1**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Aug 31, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1764.6 ft**	Date Completed:	**Sep 1, 08**
Location:	**Area G**	Total Depth:	**90 ft**	Logged by:	**DG/AW/DB/WX**
Coordinates:	**2,159,683 N , 1,384,804 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			No recovery, washed away in drill return.	0							PQ3 to 10' HQ3 to 90'	
5	1		WEATHERED BEDROCK, SILT/CLAY, some sand, bedrock fragments up to cobble size, angular to subangular, gap graded, low plasticity, grey brown, moist.	100								
	2			87							* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
10	3		BEDROCK, Basalt, dark green, porphyritic, minor vesicles filled with pyrite, quartz, calcite, and ankerite, iron staining on joints.	96								
	4			99								
15	5			100								
20	6											
	7			100								
25	8			26							***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
30	9			73								
	10			100								
35	11			100								
40	12											
	13			100								
45	14			100								
50	15											
	16			100								
55	17			100								
60	18											
	19			100								
65	20			100								
70	21											
	22			100								
75	23			100								
80	24											
	25			100								
85	26			100								
90	27											
	28		END OF HOLE @ 90 FT									
95	29											
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-188

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-188

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: May 27, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-189**	Page	**1** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 1, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1375 ft**	Date Completed:	**Sep 7, 08**
Location:	**Area E**	Total Depth:	**350 ft**	Logged by:	**DG/DB**
Coordinates:	**2,160,625 N , 1,392,769 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, some fine grained gravel, brown, primarily organics, moist to wet. (Topsoil)	28				
SAND and SILT, trace gravel, trace clay, trace cobbles, subangular to subrounded, poorly graded, non plastic, brown, moist. (Glacial Drift)	27	67	GH08-189-1	8/14/31	45
SAND and GRAVEL, varying amounts of sand and gravel throughout interval, trace to some silt, trace cobble, trace clay, subangular to subrounded, clasts up to cobble size, poorly graded, no to low plasticity, light brown to grey, moist. (Glacial Drift)	38	72	GH08-189-2	19/27/32	59
	28	67	GH08-189-3	31/50+/+	50++
	54	88	GH08-189-4	30/50+/+	50++
	43	67	GH08-189-5	50/50/45	95
	33	28	GH08-189-6	4/7/50+	50+
	7	39	GH08-189-7	3/25/50+	50+
	46	64	GH08-189-8	20/50+/+	50++
	22	63	GH08-189-9	6/50/50+	50+
	30				
	17	111	GH08-189-10	40/50+/+	50++
	16	0	GH08-189-11	50+/+/+	50+++
	33				
Sandy, silty GRAVEL, trace clay, trace cobbles, subangular, clasts up to cobble size, well graded, medium to low plasticity, very oxidized, rust brown, moist, possible weathered bedrock, difficult to discern. (Glacial Drift)	72	88	GH08-189-12	36/50+/+	50++
	89				
	98				
	100				
	69	100	GH08-189-13	50+/+/+	50+++
EXTREMELY WEATHERED BEDROCK, weathered to Sandy, silty GRAVEL, trace clay, subangular to subrounded, clasts up to boulder size, well graded, low to medium plasticity, orange-brown, moist, seems to be oxidized, weathered Tertiary Volcaniclastic Breccia?.	90				
	46				
BEDROCK, Granodiorite, mafic rich, groundmass consists of quartz and feldspar, limonite along fractures, major fault below 105 ft extending into the lower basalt unit to 140 ft,	54				
	59				

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

NOTES

PQ3 to 85'
HQ3 to 185'
NQ3 to 350'

.

Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-189

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-189

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-189**	Page	**2** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 1, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1375 ft**	Date Completed:	**Sep 7, 08**
Location:	**Area E**	Total Depth:	**350 ft**	Logged by:	**DG/DB**
Coordinates:	**2,160,625 N , 1,392,769 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31		very gougey and clay filled.	52						
105	32									
	33			52						
110			BEDROCK, Basalt, Cretaceous?, chloritic, blackish grey to green, clasts of granodiorite entrained, calcite veins and infilling, chlorite to serpentine alteration, very broken to 140' with numerous gougey/clayey zones, contact with lower basalt unit is a healed breccia.							
	34			54						
115	35									
	36			54						
120	37			47						
125	38									
	39			72						
130	40			24						
135	41									
	42			100						
140	43			100						
145	44									
	45			100						
150	46			54						
	47			94						
155	48			100						
160	49			91						
	50									
165	51			62						
170	52			100						
175	53									
	54			100						
180	55			99						
	56			96						
185	57			78						
				100						
190	58			68						
	59									
195	60			87						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-189

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-189

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-189**	Page	**3** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 1, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1375 ft**	Date Completed:	**Sep 7, 08**
Location:	**Area E**	Total Depth:	**350 ft**	Logged by:	**DG/DB**
Coordinates:	**2,160,625 N , 1,392,769 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

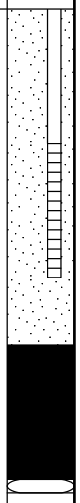
DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	62			73						
205	63			54						
210	64			66						
215	65			49						
220	66			87						
225	67			97						
230	68			100						
235	69			89						
240	70			92						
245	71			48						
250	72			100						
255	73			85						
260	74			66						
265	75			100						
270	76			75						
	77			47						
275	78		BEDROCK, Basalt, Cretaceous?, chloritic, blackish grey to green, calcite veins and infilling.	100						
280	79			98						
285	80			59						
290	81			92						
295	82			100						
	83			100						
	84			100						
	85			100						
	86									
	87									
	88									
	89									
	90									
	91									

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-189

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-189

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-189**	Page	**4** of **4**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 1, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1375 ft**	Date Completed:	**Sep 7, 08**
Location:	**Area E**	Total Depth:	**350 ft**	Logged by:	**DG/DB**
Coordinates:	**2,160,625 N , 1,392,769 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	92			100								
305	93											
	94			87								
310	95			100								
315	96											
	97			66								
320	98			50								
325	99											
	100			34								
330	101			81								
335	102											
	103											
340	104			19								
345	105											
	106			68								
350	107		END OF HOLE @ 350 FT									
355	108											
	109											
360	110											
365	111											
	112											
370	113											
375	114											
	115											
380	116											
385	117											
	118											
390	119											
	120											
395	121											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-189

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-189

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jul 5, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-198**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 16, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1416.7 ft**	Date Completed:	**Sep 17, 08**
Location:	**Area E**	Total Depth:	**200 ft**	Logged by:	**EC/DG**
Coordinates:	**2,162,343 N , 1,395,936 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, dark brown, dominated by organics, bottom portion is sandy, moist. (Topsoil)	30					
Sandy GRAVEL, some silt, trace clay, trace cobble, silt content decreases to trace towards bottom of interval, subangular, clasts up to cobble size, clasts are mostly granodiorite with iron staining, well graded transitioning to poorly graded with depth, low to no plasticity, brown, moist. (Glacial Drift)	66	67	☒	GH08-198-1	7/24/29	53
	60	44	☒	GH08-198-2	18/23/41	64
	47					
	46	53	☒	GH08-198-3	18/29/37	66
	81					
WEATHERED BEDROCK, highly to completely weathered Granodiorite, becoming less weathered with depth, gravel to cobble size fragments of granodiorite in a sandy material.	31					
	25					
	49					
	46					
BEDROCK, Granodiorite, light to medium grey, medium grained, quartz dominated matrix, moderately weathered and more fractured and rubbly from 35 to 55, moderately hard, competent, minor fracturing, trace narrow quartz-pyrite veinlets, disseminated pyrite, chalcopyrite blebs, rare molybdenite, some calcite, epidote, sericite and chlorite infilling.	81					
	91					
	92					
	96					
	98					
	100					
	100					
	100					
	100					
	100					
	100					
	100					
	97					

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

NOTES

PQ3 to 35'
HQ3 to 200'

Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-198

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-198

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-198**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 16, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1416.7 ft**	Date Completed:	**Sep 17, 08**
Location:	**Area E**	Total Depth:	**200 ft**	Logged by:	**EC/DG**
Coordinates:	**2,162,343 N , 1,395,936 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			98								
105	32											
	33			97								
110	34			100								
115	35											
	36			98								
120	37			100								
125	38											
	39			100								
130	40			100								
135	41											
	42			94								
140	43			100								
145	44											
	45			98								
150	46			100								
155	47											
	48			95								
160	49			98								
165	50											
	51			100								
170	52			99								
175	53											
	54			100								
180	55											
	56			100								
185	57			99								
190	58											
	59			100								
195	60			100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-198

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-198

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-198**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 16, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1416.7 ft**	Date Completed:	**Sep 17, 08**
Location:	**Area E**	Total Depth:	**200 ft**	Logged by:	**EC/DG**
Coordinates:	**2,162,343 N , 1,395,936 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			END OF HOLE @ 200 FT									
205	62											
	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-198

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-198

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-199**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1331 ft**	Date Completed:	**Sep 20, 08**
Location:	**Area L**	Total Depth:	**245 ft**	Logged by:	**CD/CG**
Coordinates:	**2,139,428 N , 1,380,179 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	1		Tundra Vegetation, dark brown to black, vegetation roots, moist. (Topsoil)	100						PQ3 to 15' HQ3 to 90' NQ3 to 245'
5				66						
	2		Gravelly SAND, some silt, trace clay, trace cobbles, subangular, clasts up to cobble size, well graded, low to medium plasticity, dark to light brown, moist. (Glacial Drift)	100	78	☒	GH08-199-1	7/13/24	37	
				100						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
10	3									
	4		BEDROCK, Tertiary Volcaniclastic Breccia, light brown to grey, polymictic, subangular to rounded, <1cm to >4cm diameter clasts, poorly sorted, quite oxidized, calcite veins in matrix.	92						
15	5			67						
20	6									
	7			93						
25	8			95						
30	9									
	10		BEDROCK, Tertiary Basalt Breccia, dark grey to red, brecciated, some amygdules, moderate to strong iron oxidation on fracture surfaces, some calcite veins.	100						
35	11			100						
40	12									
	13			100						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
45	14			96						
50	15									
	16			96						
55	17			95						
60	18									
	19			98						
65	20			99						
70	21									
	22			99						
75	23		BEDROCK, Tertiary Conglomerate, light to dark grey, polymictic, poorly sorted, matrix supported fragmental rock, subangular to rounded, >6cm to <2cm diameter fragments, heavily weathered and oxidized in sections, minor pyrite in granodiorite clasts, calcite.	100						
80	24									
	25			100						Shear zone 82 to 83.5', circulation lost from 85 to 90', regained after NWT casing is installed to 90'.
85	26									
	27			100						
90	28			72						
				100						
95	29									
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-199

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-199

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-199**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1331 ft**	Date Completed:	**Sep 20, 08**
Location:	**Area L**	Total Depth:	**245 ft**	Logged by:	**CD/CG**
Coordinates:	**2,139,428 N , 1,380,179 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			100						
105	32			94, 97						
	33			95						
110	34			99						
				98						
115	35			28						
	36		BEDROCK, Tertiary Basalt Breccia, dark grey to red, brecciated, some amygdules, moderate to strong iron oxidation on fracture surfaces, some calcite veins.	84						No circulation 117 to 120'
120	37			100						Minimal circulation from 120 to 130'.
125	38			100						
130	39			100						
	40			94						Circulation Lost at 130', did not return.
135	41									
	42			100						
140	43			95						
145	44									
	45			100						
150	46			100						
155	47									
	48			100						
160	49			99						
165	50									
	51			100						
170	52			97						
175	53									
	54			99						
180	55									
	56			99						
185	57			96						
190	58									
	59			100						
195	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-199

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-199**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 17, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1331 ft**	Date Completed:	**Sep 20, 08**
Location:	**Area L**	Total Depth:	**245 ft**	Logged by:	**CD/CG**
Coordinates:	**2,139,428 N , 1,380,179 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62		BEDROCK, Tertiary Conglomerate, light to dark grey, polymictic, poorly sorted, matrix supported fragmental rock, subangular to rounded, >6cm to <2cm diameter clasts, calcite and chlorite infilling in joints, minor pyrite in granodiorite clasts..	100								
205	63			100								
210	64											
	65			100								
215	66			100								
220	67											
	68			100								
225	69			100								
230	70											
	71			93								
235	72			93								
240	73											
	74			100								
245	75		END OF HOLE @ 245 FT									
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
290	88											
	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-199

Knight Piésold CONSULTING

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Project:	**Pebble Project**	Drill Hole No.	**GH08-200**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1442.7 ft**	Date Completed:	**Sep 20, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**150 ft**	Logged by:	**EC/DG**
Coordinates:	**2,164,708 N , 1,399,869 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, dark brown, organics, moist. (Topsoil)	24				
Gravelly, sandy SILT, some clay, trace cobbles, subangular, clasts up to cobble size, gap graded, medium plasticity, brown, moist. (Glacial Drift)	13	31	GH08-200-1	7/7/7	14
	13	69	GH08-200-2	7/4/6	10
	37	75	GH08-200-3	5/8/14	22
Clayey SILT, some sand, trace gravel, subangular, clasts up to gravel size, poorly graded, medium plasticity, light brown, moist. (Glacial Drift)	49	97	GH08-200-4	9/20/35	55
SAND and GRAVEL, some silt/clay, trace cobble, subangular, clasts up to cobble size, well graded, non plastic, brown, moist, fines washed away. (Glacial Drift)	35	65	GH08-200-5	12/37/50+	50+
	30		GH08-200-6	50+/+/+	50+++
	15	75	GH08-200-7	13/24/27	51
BEDROCK, Basalt, light grey to light brown, highly siliceous, wacke interbeds, moderately altered, high amounts of pyrite with minor chalcopyrite, relatively brecciated in upper 80 ft, granodiorite? between 103 and 105 ft depth and between 140 and 144.5 ft depth, calcite, chlorite and iron staining in joints, highly fractured 41 to 95 ft, more competent from 95 to 150 ft.	89	100	GH08-200-8	50+/+/+	50+++
	90				
	89				
	86				
	100				
	78				
	100				
	99				
	100				
	98				
	100				
	99				
	100				

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

NOTES

PQ3 to 50'
HQ3 to 150'

Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs

* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-200

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH08-200

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-200**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 18, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1442.7 ft**	Date Completed:	**Sep 20, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**150 ft**	Logged by:	**EC/DG**
Coordinates:	**2,164,708 N , 1,399,869 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33			100								
110	34			100								
115	35											
	36			100								
120	37			95								
125	38											
	39			100								
130	40			97								
135	41											
	42			100								
140	43			98								
145	44											
	45			100								
150	46		END OF HOLE @ 150 FT									
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-200

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-200

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-201**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 20, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1296 ft**	Date Completed:	**Sep 24, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**238 ft**	Logged by:	**EC/DG/SC**
Coordinates:	**2,164,347 N , 1,401,337 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
Gravelly SAND, some silt, some clay, trace cobble, subangular to subrounded, well graded, medium plasticity, brown, moist, silt content increases at approximately 30 ft depth. (Glacial Drift)	16						NQ3 to 153.8', HQ3 to165.5' NQ3 to 238' PW to 21.5' PQ3 to 74' HWT to 83' HQ3 to 135'
	11	17	☒	GH08-201-1	2/2/2	4	
	5	33	☒	GH08-201-2	4/4/3	7	
	20	39	☒	GH08-201-3	6/4/6	10	
	45	42	☒	GH08-201-4	20/15/18	33	
	21	94	☒	GH08-201-5	10/50+/+	50++	
	25	56	☒	GH08-201-6	11/15/25	40	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
	15	53	☒	GH08-201-7	9/19/25	44	
	24			GH08-201-8	50+/+/+	50+++	
GRAVEL and SAND, some silt, trace clay, trace cobble, subangular to subrounded, clasts up to cobble size, poorly graded, no to low plasticity, light brown, moist, silt content decreases from 60 to 70 ft depth. (Glacial Drift)	15	39	☒	GH08-201-9	5/8/11	19	Flowing conditons at 47.5', ~5gpm.
	25	67	☒	GH08-201-10	26/27/27	54	
	17						Piezometer was pressure grouted to stop artesian flow, 2.5gpm.
	18	50	☒	GH08-201-11	18/17/12	29	
	42						
	16	86	☒	GH08-201-12	10/16/15	31	
	66						
	10						
	51	85	☒	GH08-201-13	20/50+/+	50++	
BEDROCK, Basalt, dark green-grey, fine to medium grained, fairly hard and moderately fractured, fractures along veins, minor zones of shattered rock, calcite stringers and veins, epidote, weak to moderate propylitic alteration, trace to minor chlorite, limonite on fractures, moderate disseminated and vein pyrite mineralization, rare disseminated chalcopyrite, weathered to 96.5'.	19						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	31						
	90	0	☒	GH08-201-14	50+/+/+	50+++	
	100						
	95						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-201

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-201**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 20, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1296 ft**	Date Completed:	**Sep 24, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**238 ft**	Logged by:	**EC/DG/SC**
Coordinates:	**2,164,347 N , 1,401,337 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	31			91							
				100							
105	32										
	33			100							
110											
	34			96							
115	35										
	36			100							
120											
	37			96							
125	38										
	39			96							
130											
	40			97							
135	41										
	42			100							
140											
	43			100							
145	44										
	45			94							
150											
	46			26							
155	47			100							
	48			100							
160											
	49			100							
165	50										
	51			58							
170											
	52			93							
175	53										
	54			65							
180											
	55			95							
185	56										
	57			81							
190				66							
	58			100							
195	59										
	60			100							

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-201

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Project:	**Pebble Project**	Drill Hole No.	**GH08-201**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 20, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1296 ft**	Date Completed:	**Sep 24, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**238 ft**	Logged by:	**EC/DG/SC**
Coordinates:	**2,164,347 N , 1,401,337 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			100								
205	63			100								
210	64			99								
	65											
215	66			100								
				49								
220	67											
	68			99								
225	69		BEDROCK, Fault Zone?, Basalt, light to medium grey, fine to medium grained, clay gouge, likely a fault but holes ends in material so extent is unknown.	89								
				41								
230	70			54								
	71			97								
235	72			79								
240	73		END OF HOLE @ 238 FT									
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-201

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Project:	**Pebble Project**	Drill Hole No.	**GH08-202**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 25, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1073.1 ft**	Date Completed:	**Sep 26, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**125 ft**	Logged by:	**EC/SC**
Coordinates:	**2,163,894 N , 1,404,030 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			Tundra Vegetation, dark brown, organics, moist. (Topsoil)	49							PW casing to 21' PQ3 to 40' HWT casing to 41' HQ3 to 125'	
5	1			4								
	2		Silty SAND, some gravel, trace clay, trace cobble, subangular, clasts up to cobble size, poorly graded, low plasticity, brown, moist. (Glacial Drift)	13	64	☒	GH08-202-1	2/4/4	8	●		
10	3				53	☒	GH08-202-2	11/9/19	28	●		
	4		GRAVEL and SAND, some silt, trace cobble, subangular, clasts up to cobble size, poorly graded, brown to grey, moist, varying gravel content. (Glacial Drift)	25								
15	5			22	100	☒	GH08-202-3	12/34/48	82	●		
20	6				81	☒	GH08-202-4	20/49/46	95	●		
	7			28								
25	8			28	69	☒	GH08-202-5	28/27/41	68	●	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***	
30	9				64	☒	GH08-202-6	12/17/17	34	●		
	10			36								
35	11		BEDROCK, Cretaceous Andesitic Bedded Siltstone, dark brown with patches of light grey, fine grained, minor wacke beds, highly mineralized with pyrite, some chalcopyrite, mineralization is disseminated and in veins, calcite veins and infilling, bedding 70°tca.	100	81	☒	GH08-202-7	49/50+/+	50++	■	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).	
40	12			79						■		
	13			97						■		
45	14			100						■		
50	15											
	16			97						■		
55	17			98						■		
	18			97						■		
60	19			94						■		
65	20			98						■		
70	21											
	22			100						■		
75	23			100						■		
80	24											
	25			100						■		
85	26			100						■		
90	27											
	28			99						■		
95	29			95						■		
	30											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-202

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-202

Rev. 0 - Issued for Report VA101-176/23-4

SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Project:	**Pebble Project**	Drill Hole No.	**GH08-202**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 25, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1073.1 ft**	Date Completed:	**Sep 26, 08**
Location:	**Upper Talarik Creek Area**	Total Depth:	**125 ft**	Logged by:	**EC/SC**
Coordinates:	**2,163,894 N , 1,404,030 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33		BEDROCK, Granodiorite, altered, fine-grained, light brown with patches of dark brown, pyrite veins and disseminations, some chalcopyrite.	100								
110	34			100								
115	35		BEDROCK, Cretaceous Andesitic Bedded Siltstone, dark brown with patches of light grey, fine grained, minor wacke beds, highly mineralized with pyrite, some chalcopyrite, mineralization is disseminated and in veins, calcite veins and infilling, bedding 70°tca.									
	36			100								
120	37			100								
125	38		END OF HOLE @ 125 FT									
130	39											
	40											
135	41											
	42											
140	43											
	44											
145	45											
150	46											
	47											
155	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-202

Knight Piésold CONSULTING

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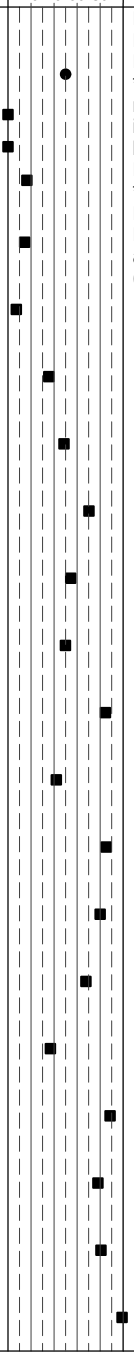
Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-203**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 25, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1302.6 ft**	Date Completed:	**Sep 27, 08**
Location:	**Area L**	Total Depth:	**230 ft**	Logged by:	**CD/CG**
Coordinates:	**2,140,309 N , 1,373,795 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE
Tundra Vegetation, dark brown black, organics, roots, moist. (Topsoil)	60					
Gravelly, silty SAND, trace clay, trace cobble, subangular, clasts up to cobble size, well graded, low plasticity, brown, moist. (Glacial Drift)	75	67	☒	GH08-203-1	9/33/50+	50+
	82					
BEDROCK, Tertiary Volcaniclastic Breccia, light to dark brown, polymictic, poorly sorted, clasts are 2mm to 5cm, angular to subrounded, 20% of granodiorite composition, some soft infilling.	85					
	86					
	96					
	97					
	96					
	100					
	100					
	97					
BEDROCK, Tertiary Basalt, dark grey-black, fine grained.	99					
BEDROCK, Tertiary Volcaniclastic Breccia, light to dark brown, polymictic, poorly sorted, clasts are 2mm to 5cm, angular to subrounded, 20% of granodiorite composition, some soft infilling.	100					
	100					
	100					
BEDROCK, Tertiary Basalt Breccia, dark greyish-green to reddish-brown, calcite and hematite veining, small massive sections.	98					
	92					
	100					
	100					
	100					
BEDROCK, subangular to subrounded fragments of Granodiorite with chlorite and hematite filling the spaces between fragments, possible healed fault zone.	100					

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

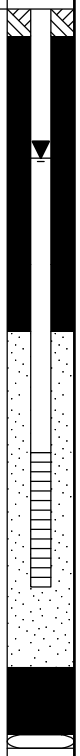
RQD DATA (%) (■)



NOTES

PQ3 to 20'
HQ3 to 140'
NQ3 to 230'
Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs
* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-203

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH08-203

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-203**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 25, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1302.6 ft**	Date Completed:	**Sep 27, 08**
Location:	**Area L**	Total Depth:	**230 ft**	Logged by:	**CD/CG**
Coordinates:	**2,140,309 N , 1,373,795 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33			100								
110	34			98								
115	35											
	36			100								
120	37			100								
125	38											
	39			85								
130	40			100								
135	41											
	42			100								
140	43			86								
145	44											
	45			100								
150	46			100								
155	47											
	48			100								
160	49			98								
165	50											
	51			100								
170	52			98								
175	53											
	54			100								
180	55		BEDROCK, Granodiorite, light grey to pink, competent, soft gougey sections between 218 and 218.5 ft and between 224.5 and 225.5 ft, chlorite and calcite infilling in joints.	100								
185	56											
	57			100								
190	58											
	59			100								
195	60			100								

Pebble Limited Partnership
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Overburden Log For GH08-203

Knight Piésold CONSULTING

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-203**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 25, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1302.6 ft**	Date Completed:	**Sep 27, 08**
Location:	**Area L**	Total Depth:	**230 ft**	Logged by:	**CD/CG**
Coordinates:	**2,140,309 N , 1,373,795 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	62			98								
205				100								
	63			99								
210	64											
	65			100								
215												
	66		BEDROCK, subangular to subrounded fragments of Granodiorite with chlorite and hematite filling the spaces between fragments, possible healed fault zone.	97								
220	67			97								
	68			100								
225	69			100								
230	70		END OF HOLE @ 230 FT									
235	71											
	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-203

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-204**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 27, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1209 ft**	Date Completed:	**Oct 1, 08**
Location:	**Area A**	Total Depth:	**240 ft**	Logged by:	**EC/SC**
Coordinates:	**2,146,402 N , 1,408,822 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
TOPSOIL, organics, dark brown, moist. (Topsoil)	20						PQ3 to 65' HQ3 to 240' HWT Casing installed to 130'. Poor Recovery, Fines washed away in Drill Return.
Sandy, silty GRAVEL, trace to some clay, trace cobble, subangular to subrounded, well graded, low to medium plasticity, dark brown to brown, stiff, moist. (Glacial Drift)	22	44		GH08-204-1	7/6/4	10	
	6						
	25	28		GH08-204-2	5/5/5	10	
	13	28		GH08-204-3	6/6/5	11	
	7	0		GH08-204-4	1/7/6	13	
Sandy, clayey SILT, some gravel, trace cobble, subangular, poorly graded, medium plasticity, stiff, moist. (Glacial Drift)	24	56		GH08-204-5	9/14/13	27	
SAND and GRAVEL, medium to coarse-grained, some silt/clay, trace cobble, subangular to subrounded, well graded, low plasticity, brown, moist, fines washed away in drill return. (Glacial Drift)	24	42		GH08-204-6	13/15/18	33	
	46	44		GH08-204-7	20/25/23	48	
	49	79		GH08-204-8	27/50+/+	50++	
	67	32		GH08-204-9	25/50+/+	50++	
	39	100		GH08-204-10	50+/+/+	50+++	Lost circulation at 54', regained at 57'.
	79						
	26	25		GH08-204-11	15/16/19	35	
Gravelly, Silty SAND, trace clay, trace cobbles and boulders, subangular to subrounded, gap graded to well graded, low plasticity, brown, stiff, moist, some lenses of mainly silt/clay. (Glacial Drift)	64						
	43	72		GH08-204-12	13/18/23	41	
	63						
	60						
	72	100		GH08-204-13	50+/+/+	50+++	
	78						
	74						
	71						
	35	0		GH08-204-14	50/41/27	68	
	50						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-204

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

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Date Revised: Apr 15, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-204**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 27, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1209 ft**	Date Completed:	**Oct 1, 08**
Location:	**Area A**	Total Depth:	**240 ft**	Logged by:	**EC/SC**
Coordinates:	**2,146,402 N , 1,408,822 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31		Sandy GRAVEL, trace silt, trace clay, trace cobbles and boulders, subangular to subrounded, well graded, low plasticity, brown, stiff, moist, fines washed away in drill return. (Glacial Drift)	51	47		GH08-204-15	27/21/22	43	
105	32									
	33			34						
110	34			57	22		GH08-204-16	28/34/25	59	
115	35									
	36			66						
120	37			52	0		GH08-204-17	10/10/24	34	Lost circulation at 120', decision is made to Tricone, no core recovered from 121 to 129'.
125	38			0						
	39									
130	40		BEDROCK, Granodiorite, grey, speckled black, fine to medium-grained, moderately competent with localized iron oxide weathered zones, minor to moderate fracturing, clay, weathered granodiorite sand and calcite in fractures, some rubble zones.	26	90		GH08-204-18	50+/+/+	50+++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
	41			85						
135	42			88						
140	43			90						
145	44									
	45			59						
150	46			91						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
155	47									
	48			95						
160	49			95						
165	50									
	51			89						
170	52			90						
175	53									
	54			96						Coring Pump at maximum flow rate to maintain circulation. No Fluid Return from 179 to 190', rods chattering occasionally.
180	55			95						
	56			100						
185	57			100						
190	58			91						
	59									
195	60			99						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-204

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Apr 15, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-204**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 27, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1209 ft**	Date Completed:	**Oct 1, 08**
Location:	**Area A**	Total Depth:	**240 ft**	Logged by:	**EC/SC**
Coordinates:	**2,146,402 N , 1,408,822 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
				92								
	62			100								
205	63			100								
210	64			100								
215	65			100								
220	66			100							Move water supply pump to deeper portion of the water source at 220'.	
225	67			100								
230	68			91							Still have not regained full circulation at 235'.	
235	69			100								
240	70			90								
	71											
	72											
	73		END OF HOLE @ 239.75 FT									
245	74											
250	75											
255	76											
260	77											
265	78											
270	79											
275	80											
280	81											
285	82											
290	83											
295	84											
	85											
	86											
	87											
	88											
	89											
	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-204

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-204

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Date Revised: Apr 15, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-206**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1203.4 ft**	Date Completed:	**Oct 3, 08**
Location:	**Area J**	Total Depth:	**270 ft**	Logged by:	**CD/MG**
Coordinates:	**2,149,489 N , 1,392,479 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Tundra Vegetation, light brown, some root vegetation, moist. (Topsoil)							PQ3 to 15' HQ3 to 155' NQ3 to 270'
	1			60						
5	2		SAND and coarse GRAVEL, some cobbles, subangular to angular, clasts up to cobble size, poorly graded, nonplastic, light brown, moist. (Felsenmeer)	79						
				98						
10	3			98						
	4		BEDROCK, Tertiary Basalt, fine grained, highly fractured at top of interval become more competent with depth, calcite, chlorite, and pyrite infilling and veins, as well as some clay infilling, calcite veins.	100						
15	5			66						
20	6			98						
	7			94						
25				98						
	8			52						
30	9			98						
	10			98						
35	11			100						Rods get stuck at 35' in highly fractured rock.
40	12									
	13			97						
45	14			94						
				99						
50	15									
	16			99						
55	17			100						
60	18									
	19			100						
65	20			95						
70	21									
	22			100						
75	23			98						
	24			100						
80				94						
	25			98						
85	26			100						
90	27									
	28			99						
95	29			100						
	30			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-206

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-206**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1203.4 ft**	Date Completed:	**Oct 3, 08**
Location:	**Area J**	Total Depth:	**270 ft**	Logged by:	**CD/MG**
Coordinates:	**2,149,489 N , 1,392,479 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

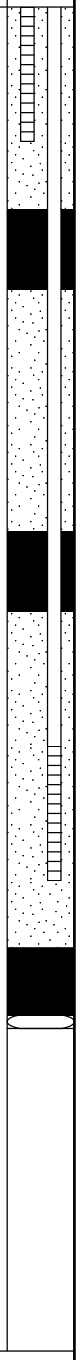
DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
	31			98						
105	32									
	33			100						
110	34			100						
115	35									
	36			100						
120	37									
	38			100						
125	39			100						
130	40									
	41			100						
135	42			97						
140	43									
	44			96						
145	45			100						
150	46									
	47			97						
155	48			94						
160	49			72						
	50			85						
165	51			98						
170	52									
	53			78						
175	54			100						Rock gets better at 175'.
180	55									
	56			100						
185	57			97						
190	58									
	59			83						
195	60			100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS



Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-206

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-206

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-206**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Sep 30, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1203.4 ft**	Date Completed:	**Oct 3, 08**
Location:	**Area J**	Total Depth:	**270 ft**	Logged by:	**CD/MG**
Coordinates:	**2,149,489 N , 1,392,479 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES	WELL DETAILS
	62			98							
205	63			100							
210	64			100							
	65										
215	66			100							
220	67										
	68			100							
225	69			100							
230	70										
	71			99							
235	72			100							
240	73										
	74			100							
245	75			100							
250	76										
	77			99							
255	78			99							
260	79			98							
	80			100							
265	81			100							
270	82		END OF HOLE @ 270 FT								
275	83										
	84										
280	85										
	86										
285	87										
	88										
290	89										
295	90										
	91										

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-206

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-206

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-207**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 2, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1482.6 ft**	Date Completed:	**Oct 3, 08**
Location:	**Area A**	Total Depth:	**115 ft**	Logged by:	**EC/SC**
Coordinates:	**2,147,466 N , 1,410,638 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Tundra Vegetation, organics, dark brown, moist. (Topsoil)	20						PQ3 to 25' HQ3 to 115', HWT casing to 26'
5	1		Gravelly, silty SAND, some clay, trace cobble, subangular, well graded, low plasticity, brown, firm, moist. (Colluvium)	42	56		GH08-207-1	3/8/15	23	
	2			16						
10	3			28	73		GH08-207-2	22/50+/+	50++	
	4		GRAVEL and SAND, trace silt/clay, subangular, poorly graded, fine to coarse gravel, grey, loose, moist. (Glacial Drift)							
15	5			74	83		GH08-207-3	35/50+/+	50++	* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
20	6		BEDROCK, Monzonite, quartz, fine to coarse grained, some soft clay and sand infilling, some calcite infilling, trace pyrite.	85						
	7			98						
25	8			98						
30	9			96						
	10									
35	11			98						Start to lose circulation at 33', complete loss of circulation at 35', did not regain.
40	12									
	13			96						
45	14			100						
50	15									
	16			100						
55	17			100						
60	18									
	19			100						
65	20			100						
70	21									
	22			100						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
75	23			100						
80	24									
	25			100						
85	26			100						
90	27									
	28			100						
95	29			100						
	30									

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-207

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-207

Rev. 0 - Issued for Report VA101-176/23-4

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Date Revised: Apr 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-207**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 2, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1482.6 ft**	Date Completed:	**Oct 3, 08**
Location:	**Area A**	Total Depth:	**115 ft**	Logged by:	**EC/SC**
Coordinates:	**2,147,466 N , 1,410,638 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			100								
105	32											
	33			100								
110	34			100								
115	35		END OF HOLE @ 115 FT									
120	36											
	37											
125	38											
	39											
130	40											
135	41											
	42											
140	43											
145	44											
	45											
150	46											
155	47											
	48											
160	49											
165	50											
	51											
170	52											
175	53											
	54											
180	55											
185	56											
	57											
190	58											
195	59											
	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-207

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
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GH08-207

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Date Revised: Apr 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-208**	Page	**1** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1519 ft**	Date Completed:	**Oct 5, 08**
Location:	**Area J**	Total Depth:	**200 ft**	Logged by:	**CD/MG**
Coordinates:	**2,150,663 N , 1,392,562 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			Tundra Vegetation, black, vegetation roots, moist. (Topsoil)	66						PQ3 to 25' HQ3 to 200'
			Gravelly SAND, trace cobbles, trace silt/clay, subangular, clasts up to cobble size, poorly graded, low plasticity, brown, moist. (Colluvium, possible Felsenmeer)	49						
				98						
			WEATHERED BEDROCK, GRAVEL, some silt, some cobbles, some sand, subangular, clasts up to cobble size, poorly graded, low plasticity, light brown, moist. (Felsenmeer)	49						
				98						
				79						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
			BEDROCK, Granodiorite, medium grained, moderately fractured and moderately competent until end of interval, calcite and chlorite veins, calcite, epidote, chlorite and clay infilling, minor disseminated pyrite, trace chalcopyrite.	100						
				33						
				100						
				100						
				93						
				85						***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
				100						
				93						
				96						
				100						
				100						
				98						
				100						
				100						
				98						
				100						
				100						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)
RQD DATA (%) (■)
20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-208

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-208

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-208**	Page	**2** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1519 ft**	Date Completed:	**Oct 5, 08**
Location:	**Area J**	Total Depth:	**200 ft**	Logged by:	**CD/MG**
Coordinates:	**2,150,663 N , 1,392,562 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			96								
105	32											
	33			100								
110	34			99								
115	35											
	36			100								
120	37			100								
125	38											
	39			100								
130	40			99								
135	41											
	42			99								
140	43			100								
145	44											
	45			100								
150	46			98								
155	47											
	48			100								
160	49			98								
165	50											
	51			100								
170	52			98								
175	53											
	54			100								
180	55			100								
185	56											
	57			100								
190	58			100								
195	59											
	60			100							Rods get stuck at 198, later freed.	
				100								

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-208

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-208

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-208**	Page	**3** of **3**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 3, 08**
Drilling Method:	**HT-700 Mud Rotary Diamond**	Elevation:	**1519 ft**	Date Completed:	**Oct 5, 08**
Location:	**Area J**	Total Depth:	**200 ft**	Logged by:	**CD/MG**
Coordinates:	**2,150,663 N , 1,392,562 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
			END OF HOLE @ 200 FT									
205	62											
	63											
210	64											
	65											
215	66											
220	67											
	68											
225	69											
230	70											
	71											
235	72											
240	73											
	74											
245	75											
250	76											
	77											
255	78											
260	79											
	80											
265	81											
270	82											
	83											
275	84											
280	85											
	86											
285	87											
	88											
290	89											
295	90											
	91											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-208

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-208

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SOILS LOG WITH WELL DETAILS WMF2008_MASTER-COPY.GPJ DRILL TEMPLATE.GDT Sep 25, 09

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Date Revised: Jun 30, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-210**	Page	**1** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 6, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1096.3 ft**	Date Completed:	**Oct 9, 08**
Location:	**Area A**	Total Depth:	**145 ft**	Logged by:	**MG/SC**
Coordinates:	**2,146,875 N , 1,407,171 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	NOTES
			TOPSOIL, root vegetation, moist. (Topsoil)	30						PQ3 to 55' HQ3 to 145'
5	1–2		Sandy GRAVEL, trace silt/clay, trace cobbles and boulders, subrounded to subangular, poorly graded, low plasticity, brown, moist. (Glacial Drift)	27	67		GH08-210-1	14/32/34	66	
10	3–4			35	56		GH08-210-2	11/21/25	46	
15				52						
20	5–7		Gravelly SAND, medium to coarse grained, trace silt/clay, trace cobbles, subangular, poorly graded, brown, moist. (Glacial Drift)	31	50		GH08-210-3	14/36/27	63	
25	8			44	44		GH08-210-4	19/31/46	77	
30	9–10		Gravelly, Silty SAND, some clay, trace cobbles and boulders, clasts up to boulder size increasing in frequency with depth, subangular, well graded, low to medium plasticity, greyish-brown, moist. (Glacial Drift)	30	50		GH08-210-5	16/20/50+	50+	***Drillhole logs represent an interpretation of field logs combined with PLP Lithology Logs***
35	11			40	55		GH08-210-6	26/50+/+	50++	
40	12–13			35	0		GH08-210-7	50+/+/+	50+++	
45	14–15			67	0		GH08-210-8	50+/+/+	50+++	
50	16–17		BEDROCK, Tertiary Basalt, black to dark grey green, fine-grained, porphyritic, weak to moderate brecciation throughout, chlorite, epidote, and calcite matrix and fracture filling, some clay infilling.	67						* See GEOTECHNICAL BEDROCK GEOLOGY LOGGING SHEET for additional information (RMR89).
55				82						
60	18			90						
65	19			100						
70	20–21			100						
				77						
				96						
75	22–23			92						
80	24			100						
85	25–26			100						
90	27			89						
95	28–29		BEDROCK, Tertiary Volcaniclastic Breccia, dark green to light grey, polymictic, coarse grained, angular fragments, fine-grained matrix, moderately fractured throughout, strongly fractured from 90-100', hematite, calcite, chlorite and clay infilling.	92						
	30			98						

SPT TEST DATA Uncorrected 'N' values vs. depth (●)

RQD DATA (%) (■)

20 40 60 80

WELL DETAILS

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-210

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	**4**	**0**

GH08-210

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Date Revised: Apr 14, 09

Project:	**Pebble Project**	Drill Hole No.	**GH08-210**	Page	**2** of **2**
Drilling Co:	**Foundex**	In-Situ Sampler:	**SPT**	Date Started:	**Oct 6, 08**
Drilling Method:	**HT-750 Mud Rotary Diamond**	Elevation:	**1096.3 ft**	Date Completed:	**Oct 9, 08**
Location:	**Area A**	Total Depth:	**145 ft**	Logged by:	**MG/SC**
Coordinates:	**2,146,875 N , 1,407,171 E, Alaska State Plane Zone 5**	Azimuth, Inclination:	**0, -90**	Reviewed by:	**LS**

DEPTH (ft)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION	DRILL RUN RECOVERY (%)	SAMPLE RECOVERY (%)	SAMPLES	SAMPLE NO.	BLOW COUNT	SPT 'N' VALUE	SPT TEST DATA Uncorrected 'N' values vs. depth (●) / RQD DATA (%) (■) 20 40 60 80	NOTES	WELL DETAILS
	31			95								
105	32											
	33			98								
110	34		BEDROCK, Tertiary Basalt, dark coloured, medium grained, weak to moderate brecciation, chlorite, epidote and calcite matrix and fracture filling.	100								
115	35											
	36			100								
120	37											
				99								
125	38			84								
	39		BEDROCK, Tertiary Siltstone/Mudstone, fine grained, black and grey, finely bedded, calcite and chlorite infilling.	98								
130	40		BEDROCK, Tertiary Volcaniclastic Breccia, grey to brown, very fractured, weathered, calcite, chlorite and thick clay infillings.	97								
135	41			100								
	42			100								
140	43											
	44		BEDROCK, Tertiary Wacke, fine to medium grained, light grey with purple/pink, black flecks, calcite and chlorite infilling.	100								
145			END OF HOLE @ 145 FT									
	45											
150	46											
	47											
155	48											
160	49											
	50											
165	51											
170	52											
	53											
175	54											
180	55											
	56											
185	57											
190	58											
	59											
195	60											

Pebble Limited Partnership
Pebble Project
Overburden Log For GH08-210

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/23	4	0

GH08-210

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Date Revised: Apr 14, 09

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APPENDIX C

HYDROGEOLOGICAL DRILLHOLE DATA

Appendix C1	Well Completion Details
Appendix C2	Packer Hydraulic Conductivity (Lugeon) Test Sheets
Appendix C3	Rising/Falling Head Hydraulic Conductivity Test Sheets
Appendix C4	Vibrating Wire Pressure Transducer Calibration Records

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APPENDIX C1

WELL COMPLETION DETAILS

- GH10-211
- GH10-212
- GH10-213
- GH10-214
- GH10-215
- GH10-216
- GH10-217
- GH10-218
- GH10-219
- GH10-220
- GH10-221
- GH10-222
- GH10-223
- GH10-224
- GH10-225
- GH10-227
- GH10-228

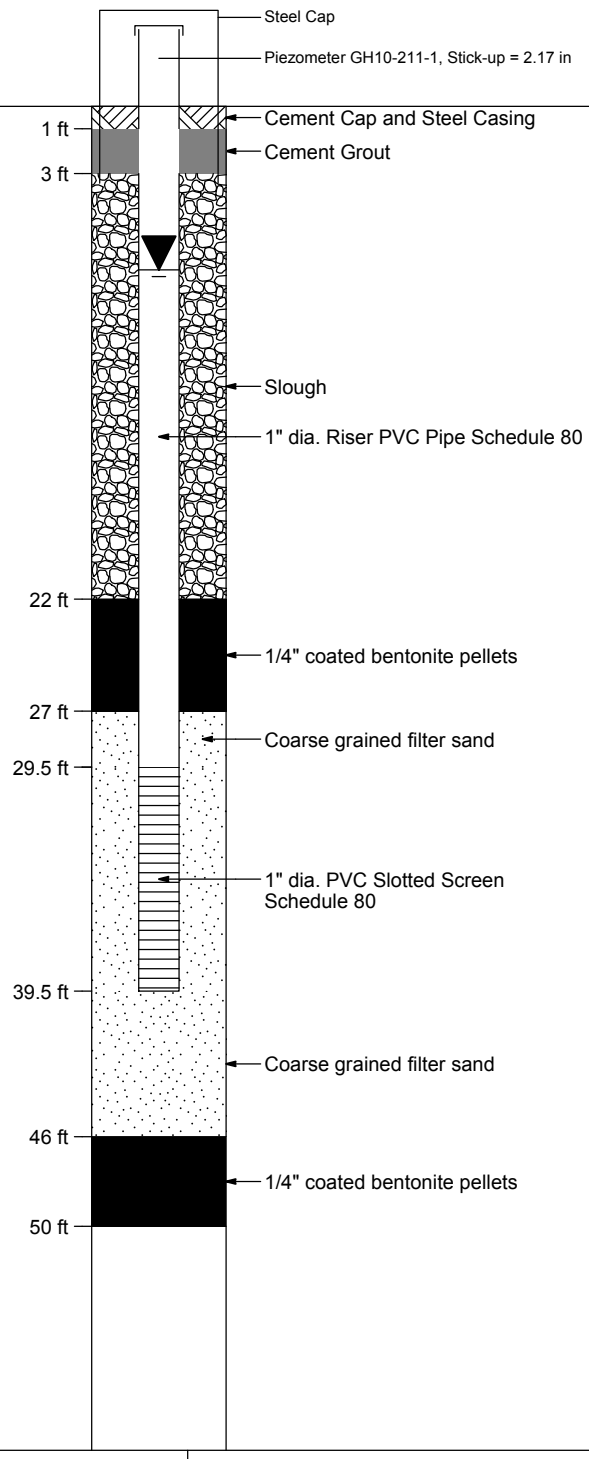
(Page C1-1 to C1-17)

Project:	**Pebble Project**	Drill Hole No.:	**GH10-211**	Page	**1** of **1**
Hole Depth:	**50 ft**	Hole Diameter: **PQ to 24', HQ to 50'**	Date Started:	**Sep 6, 10**	Date Completed: **Sep 8, 10**
Collar Elev:	**1463 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**CG/JPN/AA**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 7.3 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Sandy SILT, some gravel, trace clay.	PQ to 24', then HQ to 50', HWT casing to 26', HWT casing stuck in hole from 21 - 26'.
			WEATHERED BEDROCK, Granodiorite.	
			BEDROCK, Granodiorite.	
			END OF HOLE @ 50 FT	



1/2 bucket of bentonite pellets

2 1/2 bags of sand

1/4 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-211

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

C1-1

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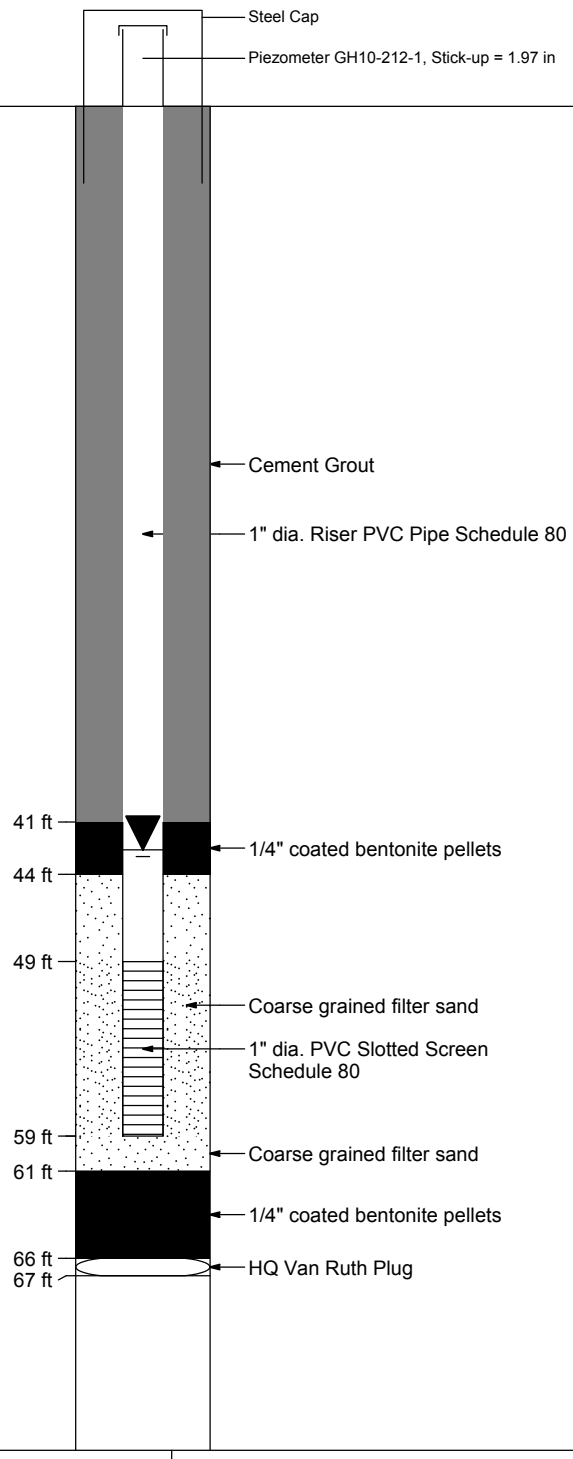
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-212**	Page	**1** of **1**
Hole Depth:	**115 ft**	Hole Diameter:	**PQ to 58.5', HQ to 115'**	Date Started:	**Sep 8, 10**
Date Completed:	**Sep 12, 10**	Collar Elev:	**1429 ft**	PVC Pipe I.D.:	**1 in**
Logged by:	**BSH/BO**	Reviewed by:	**LS**		

Water Level Readings: Depth to Water / Date Measured

Well 1: 42.6 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Silty SAND, some gravel to gravelly, trace to some cobbles, some clay.	PQ to 58.5', then HQ to 115'
10				
	5			
20			SAND AND GRAVEL, some silt, some clay, some cobbles, some zones with less gravel.	
30				
	10			
40				
50	15			
60			BEDROCK, Cretaceous Wacke to Siltstone/Mudstone.	
	20			
70				



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-212

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

C1-2

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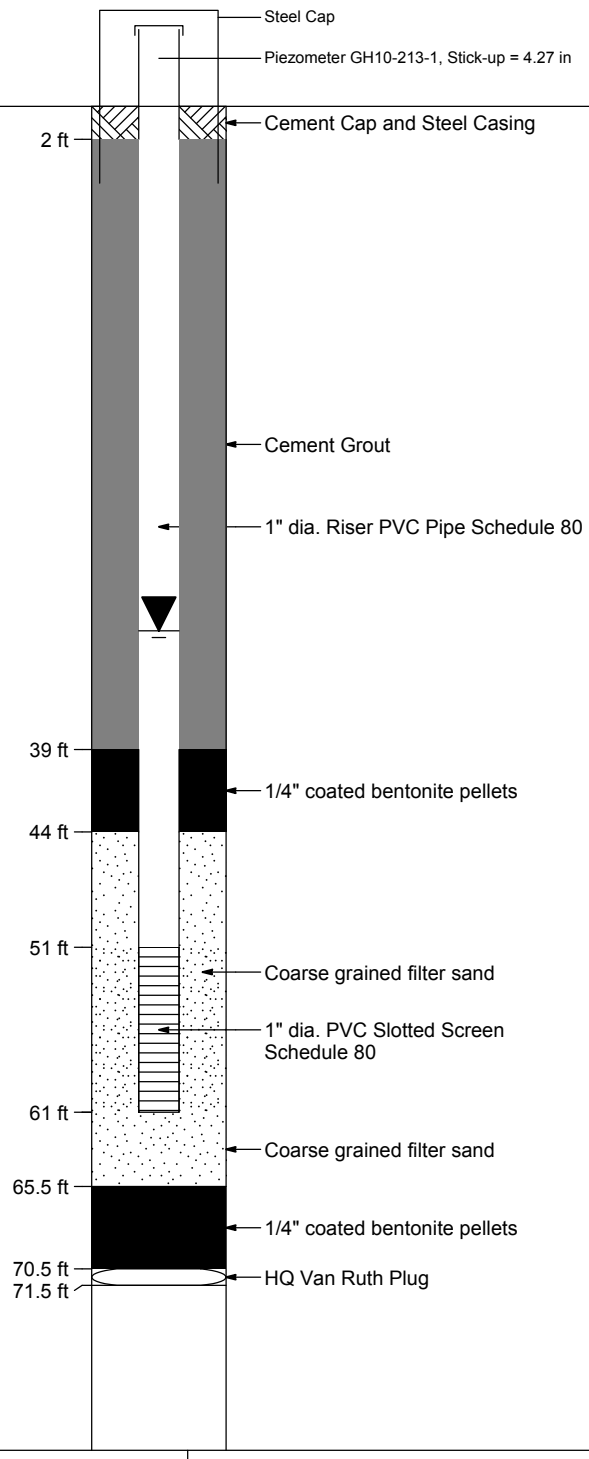
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-213**	Page	**1** of **1**
Hole Depth:	**165 ft**	Hole Diameter:	**PQ to 29.5', HQ to 165'**	Date Started:	**Sep 9, 10**
Date Completed:	**Sep 12, 10**	Collar Elev:	**1613 ft**	PVC Pipe I.D.:	**1 in**
Logged by:	**JPN/AA**	Reviewed by:	**LS**		

Water Level Readings: Depth to Water / Date Measured

Well 1: 31.8 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Silty, Gravelly SAND, some cobbles, trace clay.	PQ to 29.5', then HQ to 165'
			GRAVEL, some silt, some sand, trace clay.	
10			GRAVEL and SAND, trace silt/clay.	
	5			
20			BEDROCK, Granodiorite.	
30				
	10			
40				
50	15			
60				
	20			
70			BEDROCK FAULT ZONE.	
80				



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-213

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

C1-3

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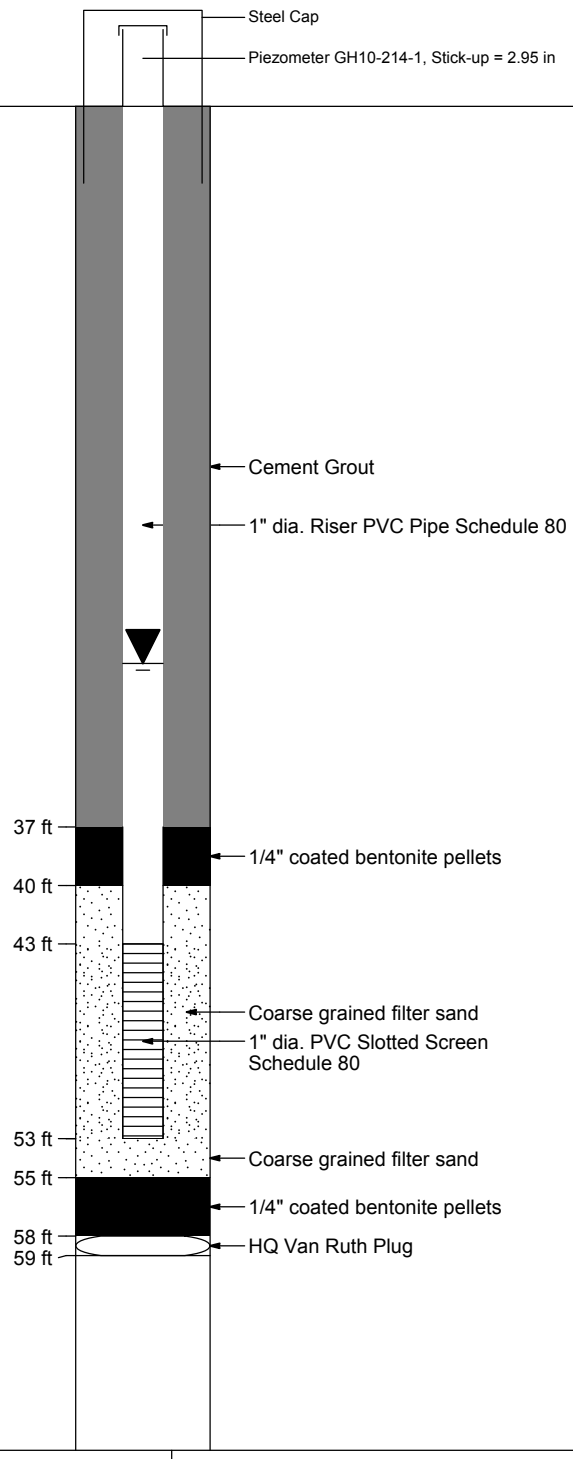
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-214**	Page	**1** of **1**
Hole Depth:	**135 ft**	Hole Diameter: **PQ to 57', HQ to 135'**	Date Started:	**Sep 13, 10**	Date Completed: **Sep 16, 10**
Collar Elev:	**1368 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**BSH/BO**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 28.6 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			GRAVEL and SAND, fine to coarse sand, some silt/clay, trace cobbles and boulders.	PQ to 57', then HQ to 135'
10				
	5			
20			Sandy GRAVEL, some silt/clay, coarse gravel, trace cobbles and boulders.	
30			HIGHLY WEATHERED BEDROCK, Cretaceous Wacke, highly altered to Silty, gravelly SAND, trace clay.	
	10			
40				
	15			
50			BEDROCK, Cretaceous Wacke.	
60				
	20			



NOTES
1/2 bucket of bentonite pellets
3 bags of sand
1 bag of sand
1/2 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-214

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

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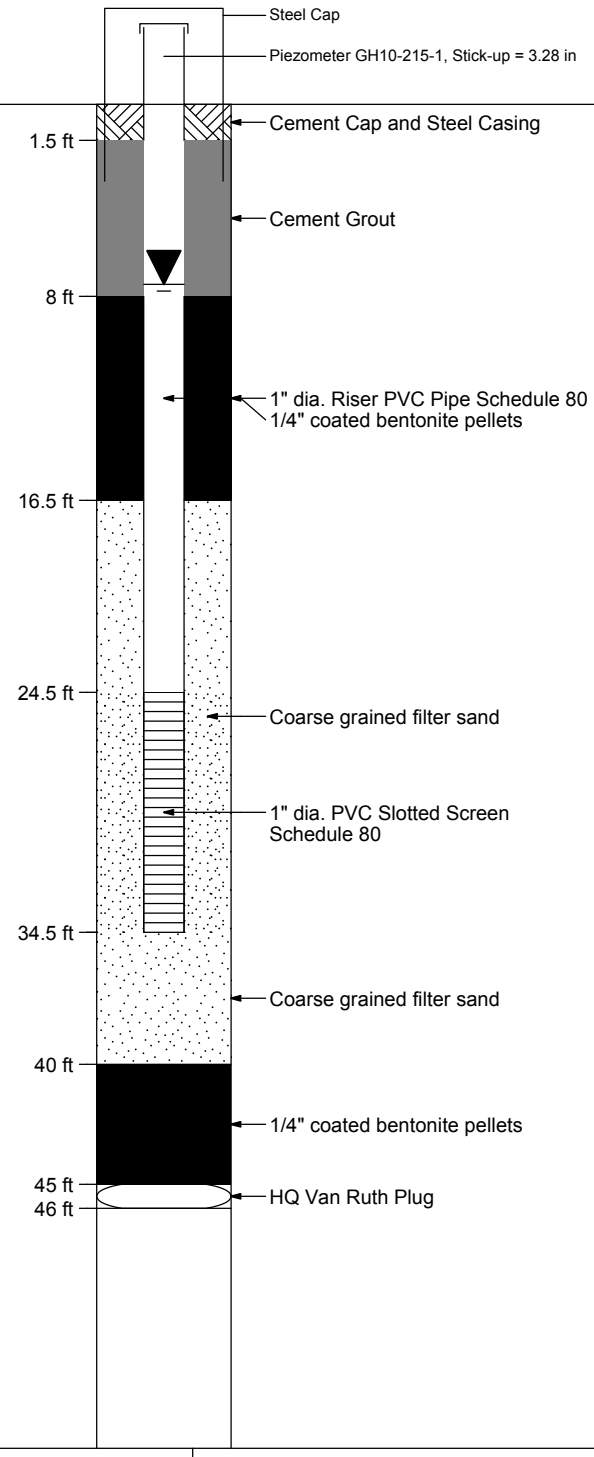
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-215**	Page	**1** of **1**
Hole Depth:	**75 ft**	Hole Diameter: **PQ to 15', HQ to 75'**	Date Started:	**Sep 13, 10**	Date Completed: **Sep 15, 10**
Collar Elev:	**1154 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**JPN/AA**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 7.5 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Gravelly, Silty SAND, trace clay, occasional boulders and large cobbles.	PQ to 15', then HQ to 75'
			Silty SAND, some gravel, trace clay, trace cobble.	
			BEDROCK, Cetaceous Basalt.	



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-215

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

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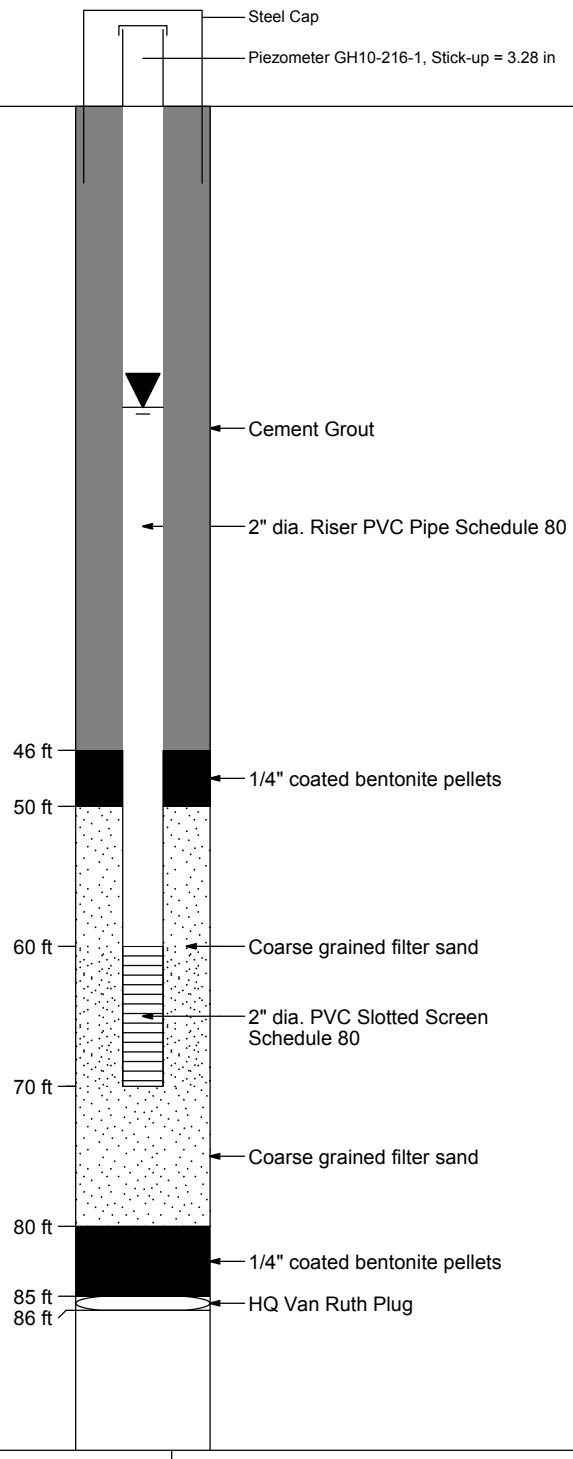
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-216**	Page	**1** of **1**
Hole Depth:	**130 ft**	Hole Diameter: **Varies, see Notes**	Date Started:	**Sep 16, 10**	Date Completed: **Sep 23, 10**
Collar Elev:	**1545 ft**	PVC Pipe I.D.: **2 in**	Logged by:	**JPN/AA**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 21.5 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Silty SAND, some fine to coarse gravel, trace clay, some cobbles.	7.75" Tricone to 20', PQ to 80', then HQ to 130'
			No recovery due to tri-cone bit being used for 6" permanent casing, some large boulders encountered.	
10				
	5			
20			SAND, some gravel and cobbles, some silt, trace clay.	
30				
	10			
40				
50	15			
60			HIGHLY WEATHERED BEDROCK, Tertiary Siltstone/Mudstone weathered to Silty SAND, some clay, trace gravel.	
	20			
70				
80	25		BEDROCK, Tertiary Volcaniclastic Conglomerate.	
90				



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-216

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

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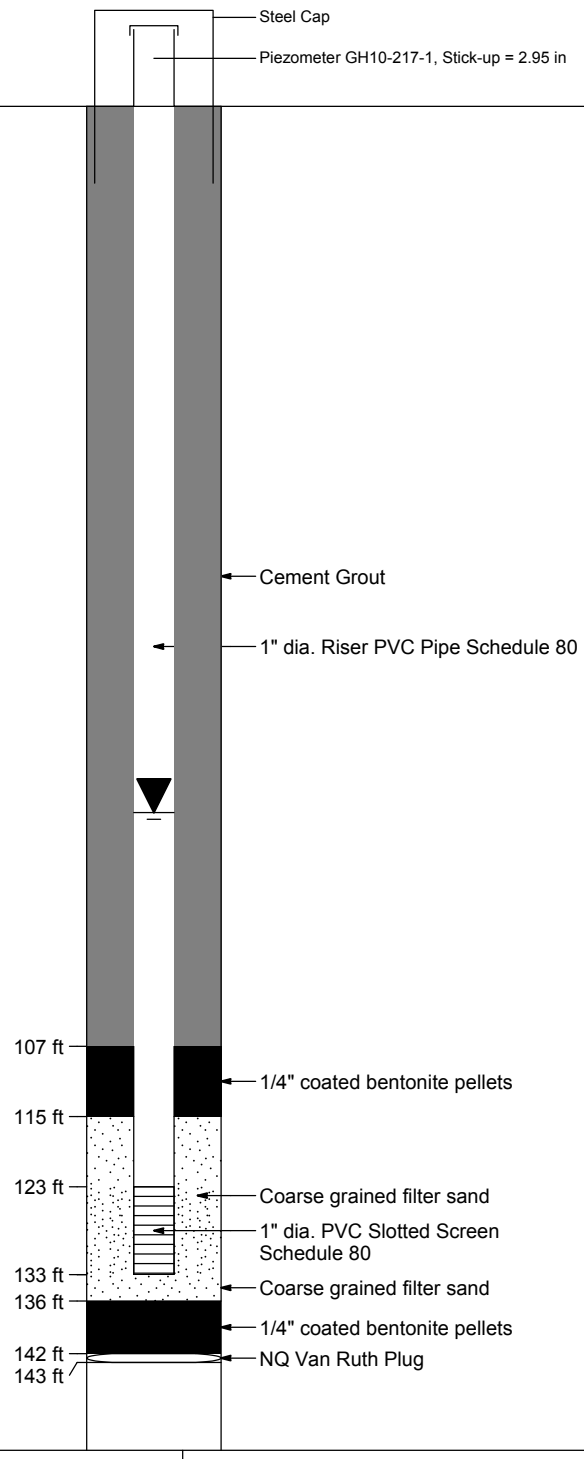
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-217**	Page	**1** of **1**
Hole Depth:	**144 ft**	Hole Diameter: **Varies, see Notes**	Date Started:	**Sep 17, 10**	Date Completed: **Sep 19, 10**
Collar Elev:	**1285 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**BSH/BO**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 80.4 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Silty SAND, some gravel, some cobbles, some clay.	PQ to 54', HQ to 144', then NQ to 144'
10, 20	5		Gravelly SAND, some silt, trace clay.	
30	10		HIGHLY WEATHERED BEDROCK, Diorite.	
40, 50	15		BEDROCK, Diorite.	
60, 70	20		Drilled through void 75 - 77'.	
80, 90	25			
100	30			
110	35			
120, 130	40			
140, 150	45		END OF HOLE @ 144 FT	



1/2 bucket of bentonite pellets

2 bags of sand

1 bag of sand

1/2 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-217

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

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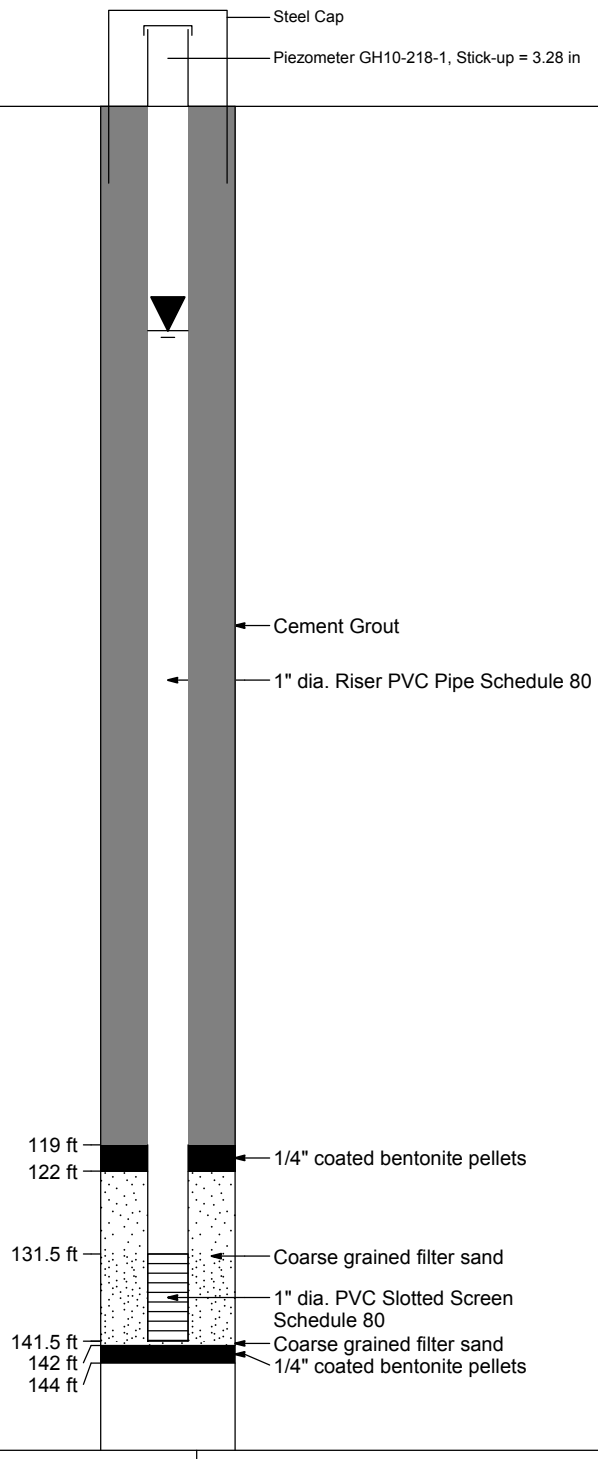
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-218**	Page	**1** of **1**
Hole Depth:	**144 ft**	Hole Diameter:	**PQ to 64.5', HQ to 144'**	Date Started:	**Sep 19, 10**
Date Completed:	**Sep 21, 10**	Collar Elev:	**1166 ft**	PVC Pipe I.D.:	**1 in**
Logged by:	**BSH/BH/BO**	Reviewed by:	**LS**		

Water Level Readings: Depth to Water / Date Measured

Well 1: 25.7 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
0–50	0–15		Silty, Gravelly SAND, trace to some clay.	PQ to 64.5', then HQ to 144'
50–120	15–35		HIGHLY WEATHERED BEDROCK, Diorite.	
120–144	35–45		BEDROCK, Diorite.	
144–150	45		BEDROCK, Monzodiorite.	
			END OF HOLE @ 144 FT	



NOTES
2.5 bags of cement, 1 bag of grout
1/2 bucket of bentonite pellets
2 1/2 bags of sand
1/2 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-218

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

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Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-219**	Page	**1** of **1**
Hole Depth:	**158 ft**	Hole Diameter: **PQ to 53', HQ to 158'**	Date Started:	**Sep 21, 10**	Date Completed: **Sep 24, 10**
Collar Elev:	**1012 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**BH/BO**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 10.2 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION		NOTES
			Silty, Gravelly SAND, some clay.	Steel Cap; Piezometer GH10-219-1, Stick-up = 3.28 in; 2 ft: Cement Cap and Steel Casing	PQ to 53', then HQ to 158'
10				Cement Grout	
	5				
20			SAND and SILT, some clay, trace gravel.	1" dia. Riser PVC Pipe Schedule 80; 26 ft: 1/4" coated bentonite pellets	1 bucket of bentonite pellets
30			Clayey SILT, some sand, trace gravel, trace cobbles.	32 ft	
	10		Silty, gravelly SAND, some clay, trace cobbles and boulders.		
40				Coarse grained filter sand; 45 ft: 1" dia. PVC Slotted Screen Schedule 80	6 bags of sand
50	15		BEDROCK, Tertiary Volcaniclastic Conglomerate.	55 ft: Coarse grained filter sand; 59 ft: 1/4" coated bentonite pellets	1 bag of sand; 1 bucket of bentonite pellets
60					
	20		BEDROCK, Tertiary Volcaniclastic Conglomerate.	65 ft: HQ Van Ruth Plug; 66 ft	
70					

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-219

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

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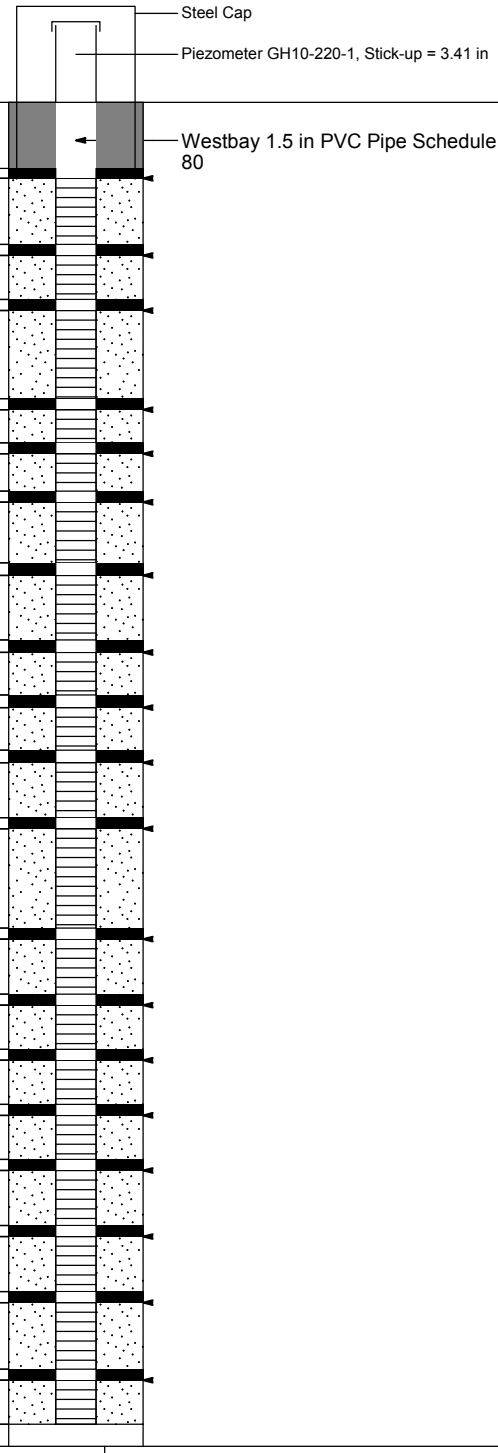
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-220**	Page	**1** of **1**
Hole Depth:	**600 ft**	Hole Diameter: **PQ to 13', HQ to 600'**	Date Started:	**Sep 23, 10**	Date Completed: **Oct 6, 10**
Collar Elev:	**1986 ft**	PVC Pipe I.D.: **1.5 in**	Logged by:	**JPN/AA/DDF**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: ft bgs /

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
10	5		Granodiorite BOULDERS and COBBLES, Gravelly SAND, some silt, trace clay.	PQ to 9', then HQ to 600'
20			BEDROCK, Granodiorite.	
30	10			
40				Water Level: 25.4' on 10/24/2010
50	15			
60				
70	20			Water Level: 25.3' on 10/24/2010
80	25			
90				
100	30			Water Level: 25.2' on 10/24/2010
110	35			
120				
130	40			
140				
150	45			Water Level: 24.9' on 10/24/2010
160	50			Water Level: 24.8' on 10/24/2010
170				
180	55			
190				Water Level: 24.6' on 10/24/2010
200	60		195 - 197' Clay in fractures.	
210	65			
220			217 - 220' very altered, very soft.	Water Level: 24.4' on 10/24/2010
230	70			
240			235 - 237' very weathered zone, possible small fault or cave.	
250	75			Water Level: 24.3' on 10/24/2010
260	80			
270				
280	85			Water Level: 24.2' on 10/24/2010
290				
300	90			Water Level: 24.1' on 10/24/2010
310	95			
320				
330	100			Water Level: 24.0' on 10/24/2010
340	105			
350				
360	110			
370				
380	115			Water Level: 23.9' on 10/24/2010
390	120			
400				
410	125			Water Level: 23.7' on 10/24/2010
420				
430	130			Water Level: 23.6' on 10/24/2010
440	135			
450				
460	140			Water Level: 23.5' on 10/24/2010
470	145			
480				Water Level: 23.4' on 10/24/2010
490	150			
500				
510	155			Water Level: 23.3' on 10/24/2010
520	160			
530				
540	165			Water Level: 23.1' on 10/24/2010
550				
560	170			
570	175			Water Level: 23.0' on 10/24/2010
580				
590	180			
600			END OF HOLE @ 600 FT	



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-220

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

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Date Revised: Jan 28, 11

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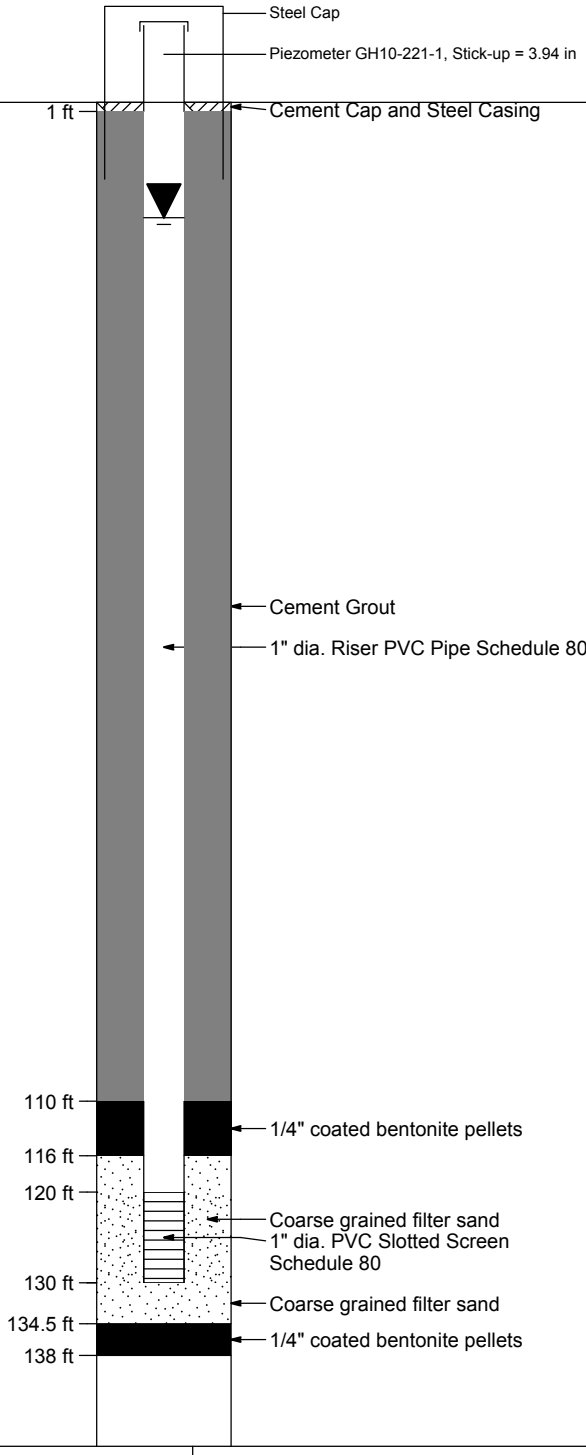
Project:	**Pebble Project**	Drill Hole No.:	**GH10-221**	Page	**1** of **1**
Hole Depth:	**139 ft**	Hole Diameter: **PQ to 55', HQ to 139'**	Date Started: **Sep 24, 10**	Date Completed:	**Sep 30, 10**
Collar Elev:	**1006 ft**	PVC Pipe I.D.: **1 in**	Logged by: **BH/BO**	Reviewed by:	**LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 12.7 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Gravelly, silty SAND, trace clay.	PQ to 55', then HQ to 139'
10			Gravelly SAND, some silt, trace clay.	
20	5		Silty SAND, some gravel, some clay.	
30	10			
40				
50	15			
60				
	20		No recovery 64 - 69'.	
70			SAND, some gravel, trace to some silt, trace clay.	
			No recovery 74 - 79', likely same as above, less gravel.	
80	25		Silty SAND, some gravel, trace to some clay.	
90			BEDROCK, Tertiary Conglomerate/Wacke.	
100	30			
110	35			
120				
130	40			
140			END OF HOLE @ 139 FT	



NOTES
3 bags of cement, 1/4 bags of bentonite, 150 gallons of water
1/2 bucket of bentonite pellets
2 3/4 bags of sand
1/2 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-221

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

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Date Revised: Jan 28, 11

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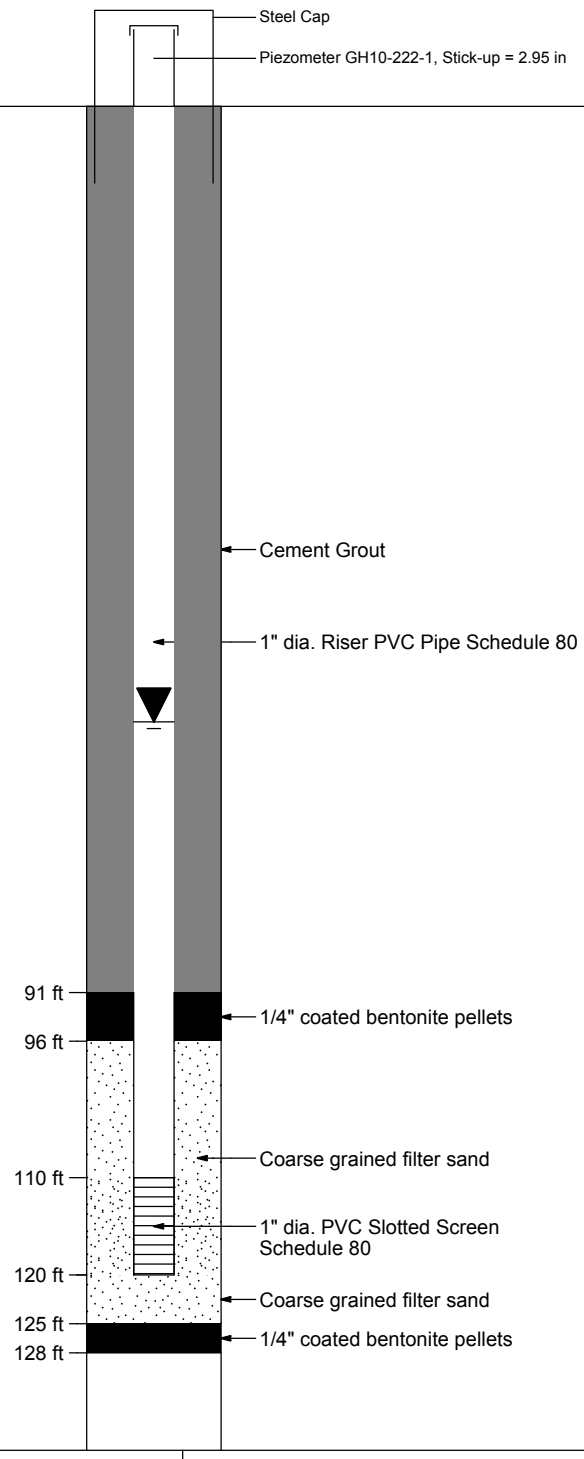
Project:	**Pebble Project**	Drill Hole No.:	**GH10-222**	Page	**1** of **1**
Hole Depth:	**130 ft**	Hole Diameter: **PQ to 70', HQ to 130'**	Date Started:	**Sep 30, 10**	Date Completed: **Oct 2, 10**
Collar Elev:	**1054 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**BO/BH**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 63.2 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Gravelly SAND, some silt, trace clay, trace cobbles.	PQ to 70', then HQ to 130'
10			Sandy, silty GRAVEL, trace to some clay, trace cobble and boulders.	
20	5			
30			Gravelly SAND, some silt, trace clay, trace cobbles and boulders.	
40	10		Silty, gravelly SAND, some clay, trace cobbles and boulders.	
50	15			
60				
70	20		Gravelly SAND, some silt, trace clay, trace cobbles.	
80			HIGHLY WEATHERED BEDROCK, Tertiary Conglomerate.	
90	25		BEDROCK, Tertiary Conglomerate.	
100	30			
110			BEDROCK, Tertiary Siltstone/Mudstone.	
120	35		BEDROCK, Tertiary Volcaniclastic Conglomerate.	
130	40			



NOTES:
- 3 bags of cement, 1/2 bags of bentonite, 150 gallons of water
- 1/2 bucket of bentonite pellets
- 3 bags of sand
- 1/2 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-222

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

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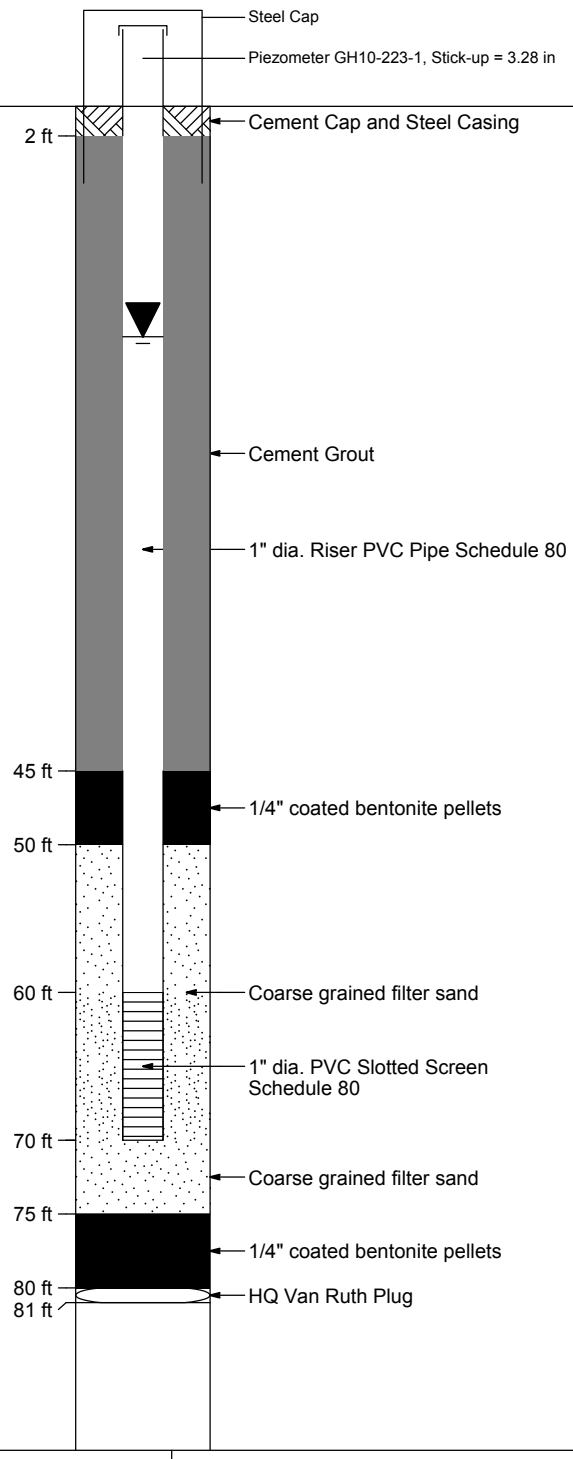
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-223**	Page	**1** of **1**
Hole Depth:	**110 ft**	Hole Diameter:	**PQ to 45', HQ to 110'**	Date Started:	**Oct 3, 10**
Date Completed:	**Oct 5, 10**	Collar Elev:	**1005 ft**	PVC Pipe I.D.:	**1 in**
Logged by:	**BO/BH/AA**	Reviewed by:	**LS**		

Water Level Readings: Depth to Water / Date Measured

Well 1: 15.6 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			SAND and GRAVEL, trace silt, trace clay, trace cobbles.	PQ to 45', then HQ to 110'
10				
	5		Silty, gravelly SAND, trace clay, trace cobbles, trace boulders. (Glacial Drift)	
20				
			SAND and GRAVEL, trace silt, trace clay, trace cobbles. (Glacial Drift)	
30			Sandy SILT, some clay, some gravel, some gravelly zones, trace cobbles. (Glacial Drift)	
	10		Sandy, silty GRAVEL, trace clay, trace cobbles, trace boulders. (Glacial Drift)	
40			Gravelly SAND, some silt, trace clay, trace boulders. (Glacial Drift)	
			BEDROCK, Tertiary Basalt.	
50	15		BEDROCK, Cretaceous Diorite.	
60			BEDROCK, Cretaceous Granodiorite.	
			BEDROCK, Cretaceous Diorite.	
	20		BEDROCK, Granodiorite.	
70			BEDROCK, Cretaceous Diorite.	
80	25			
90				



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-223

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	1	0

C1-13

Rev. 0 - Issued for Report

Log Type: WELL Library Filepath: M:\1\01\00176\35\A\DATA\FINAL 2010 WMF SI\GINT\LIBRARY2.GLB Printed: Feb 9, 11

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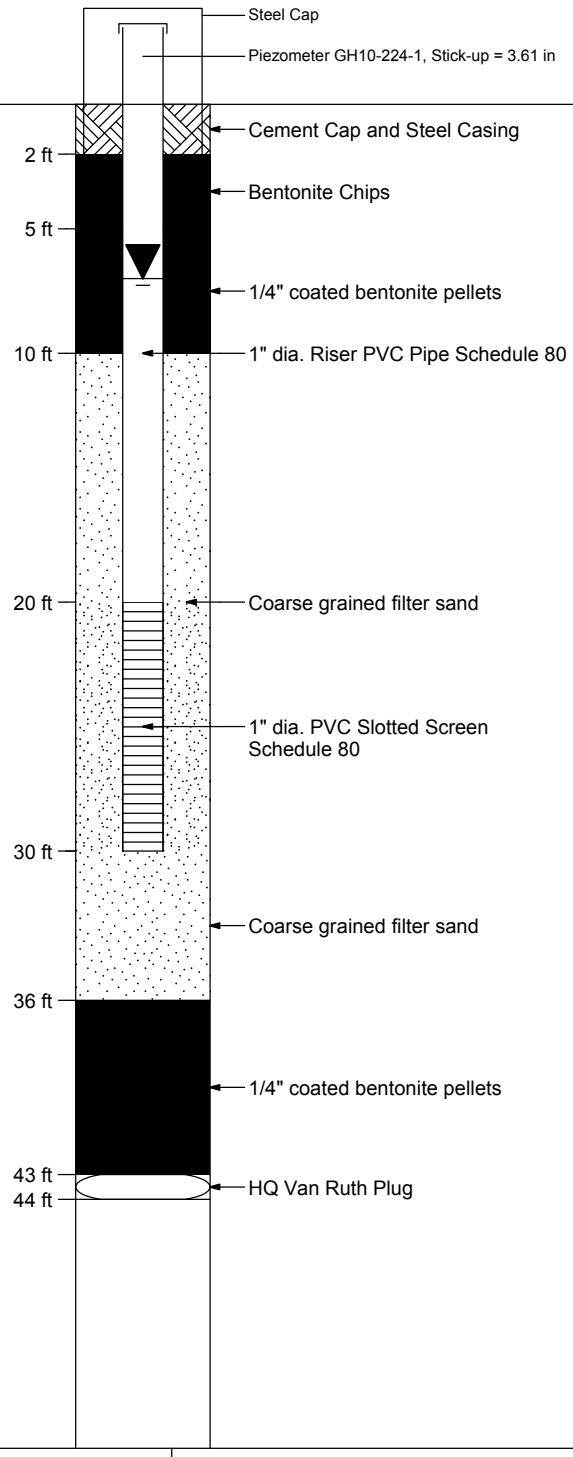
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-224**	Page	**1** of **1**
Hole Depth:	**80 ft**	Hole Diameter: **PQ to 25', HQ to 80'**	Date Started:	**Oct 6, 10**	Date Completed: **Oct 7, 10**
Collar Elev:	**1009 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**SC/BH**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 7 ft bgs / Oct 24, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			SILT and SAND, some gravel, trace clay, trace cobbles. (Glacial Drift)	PQ to 25', then HQ to 80'
	1		SAND, some gravel, trace silt, trace clay. (Glacial Drift)	
5	2			
10	3		Silty SAND, some gravel, some clay, trace cobbles. (Glacial Drift)	
	4		WEATHERED BEDROCK, Granodiorite.	
15	5			
20	6			
	7			
25	8			
30	9		BEDROCK, Granodiorite.	
	10			
35	11			
40	12			
	13			
45	14			
50	15			
	16			



NOTES
2 bags of bentonite chips
1 bucket of bentonite pellets
4 bags of sand
1 bag of sand
1 bucket of bentonite pellets

Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-224

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

C1-14

Rev. 0 - Issued for Report

Log Type: WELL Library Filepath: M:\1\01\00176\35\A\DATA\FINAL 2010 WMF SI\GINT\LIBRARY2.GLB Printed: Feb 9, 11

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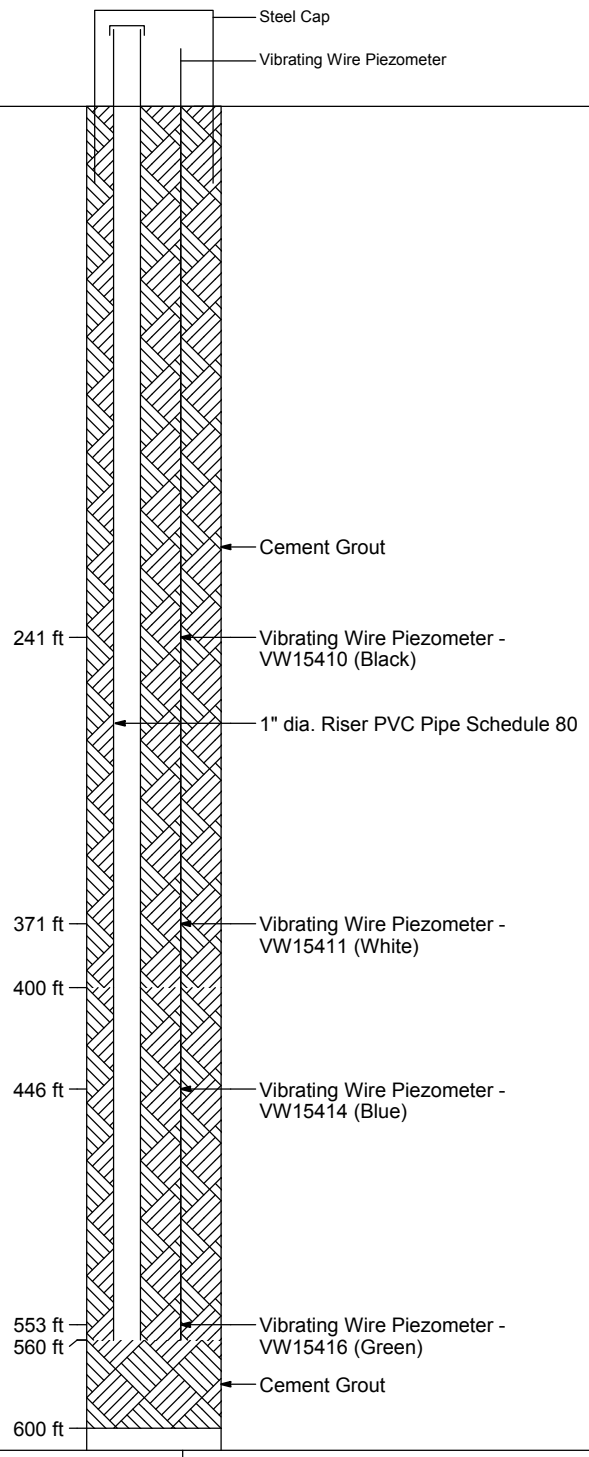
Date Revised: Jan 28, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-225**	Page	**1** of **1**
Hole Depth:	**600 ft**	Hole Diameter: **Varies, see Notes**	Date Started:	**Oct 6, 10**	Date Completed: **Oct 27, 10**
Collar Elev:	**1960 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**DDF/CBN**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 6 - 9 ft bgs / Oct 26, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, 150, 155, 160, 165, 170, 175, 180		SAND and GRAVEL, some cobbles and boulders, trace silt, trace clay. (Felsenmeer) No recovery, likely washed away during drilling process. HIGHLY WEATHERED BEDROCK, Granodiorite. BEDROCK, Granodiorite. BEDROCK, Granodiorite. END OF HOLE @ 600 FT	Drillhole inclined at 66 degrees, all depths are downhole depths PQ to 22', HQ to 400', then NQ to 600'



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-225

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

C1-15

Rev. 0 - Issued for Report

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Date Revised: Jan 28, 11

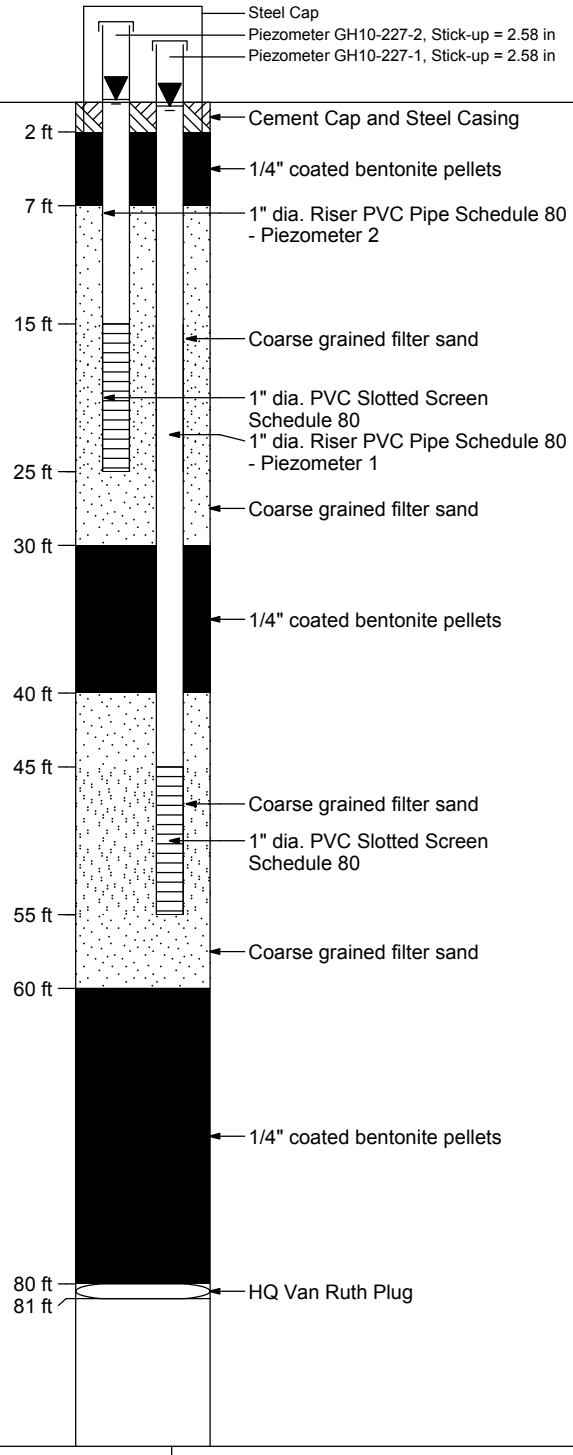
Log Type: WELL Library Filepath: M:\1\01\00176\35\A\DATA\FINAL 2010 WMF SI\GINT\LIBRARY2.GLB Printed: Feb 9, 11

Project:	**Pebble Project**	Drill Hole No.:	**GH10-227**	Page	**1** of **1**
Hole Depth:	**200 ft**	Hole Diameter: **PQ to 30', HQ to 200'**	Date Started:	**Oct 16, 10**	Date Completed: **Oct 20, 10**
Collar Elev:	**798 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**SC/AL**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 0.25 ft bgs / Oct 25, 10 **Well 2: -0.2 ft bgs / Oct 25, 10**

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			Silty SAND and GRAVEL, trace clay. (Glacial Drift)	PQ to 30', then HQ to 200'
10	5		Gravelly SAND, some silt, trace clay. (Glacial Drift)	
20			HIGHLY WEATHERED BEDROCK, Tertiary Monzonite.	
30	10		BEDROCK, Tertiary Monzonite.	
40				
50	15		FAULT ZONE, white clay gouge.	
60	20			
70			BEDROCK, Tertiary Volcaniclastic Conglomerate.	
80	25			
90				



Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-227

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

C1-16

Rev. 0 - Issued for Report

Log Type: WELL Library Filepath: M:\1\01\00176\35\A\DATA\FINAL 2010 WMF SI\GINT\LIBRARY2.GLB Printed: Feb 9, 11

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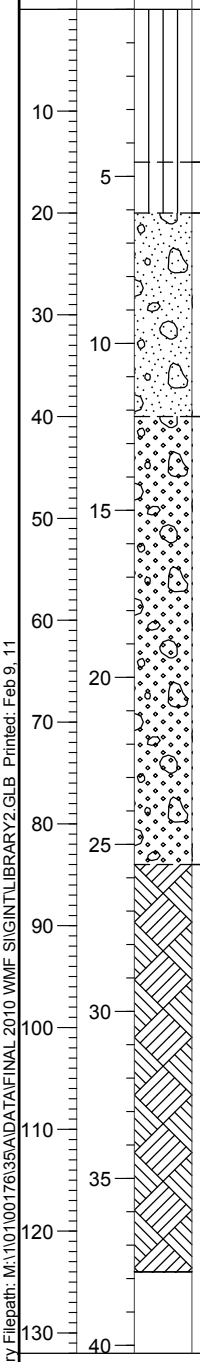
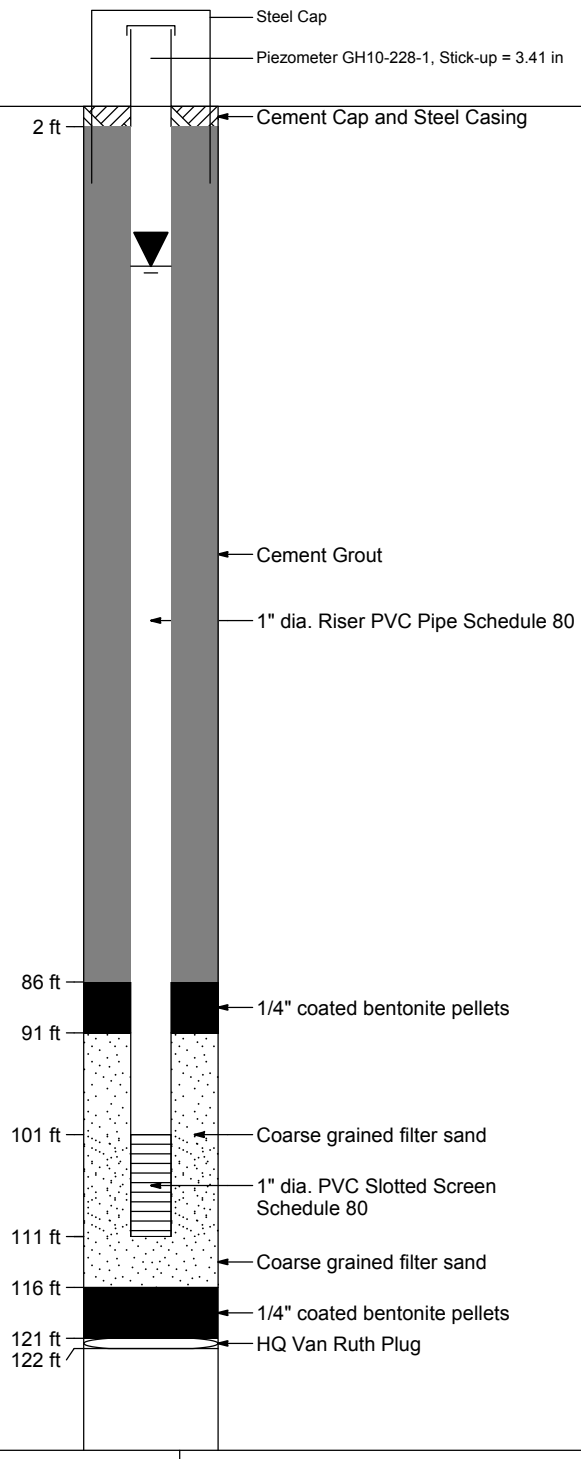
Project:	**Pebble Project**	Drill Hole No.:	**GH10-228**	Page	**1** of **1**
Hole Depth:	**240 ft**	Hole Diameter: **PQ to 45', HQ to 240'**	Date Started:	**Oct 20, 10**	Date Completed: **Oct 23, 10**
Collar Elev:	**762 ft**	PVC Pipe I.D.: **1 in**	Logged by:	**AL/CBN**	Reviewed by: **LS**

Water Level Readings: Depth to Water / Date Measured

Well 1: 15.7 ft bgs / Oct 25, 10

DEPTH - (ft)	DEPTH - (m)	GRAPHIC LOG	DESCRIPTION	NOTES
			SILT and CLAY, trace sand, trace gravel, trace cobbles. (Glaciolacustrine)	PQ to 45', then HQ to 240'
			Clayey SILT, trace sand, trace gravel. (Glaciolacustrine)	
			Gravelly SAND, some silt, trace clay, trace cobbles and boulders. (Glacial Drift)	
			Silty, gravelly SAND, some clay, trace cobbles and boulders. (Glacial Drift)	
			BEDROCK, Tertiary Volcaniclastic Conglomerate.	





Pebble Limited Partnership
Pebble Project
Well Completion Details For GH10-228

Knight Piésold CONSULTING

Project No.	Ref. No.	Rev.
VA101-176/35	**1**	**0**

C1-17

Rev. 0 - Issued for Report

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Date Revised: Jan 28, 11

Log Type: WELL Library Filepath: M:\1\01\00176\35\A\DATA\FINAL 2010 WMF SI\GINT\LIBRARY2.GLB Printed: Feb 9, 11

Knight Piésold CONSULTING

APPENDIX C2

PACKER HYDRAULIC CONDUCTIVITY (LUGEON) TEST SHEETS

- GH10-211
- GH10-212
- GH10-213
- GH10-214
- GH10-215
- GH10-216
- GH10-217
- GH10-218
- GH10-219
- GH10-220
- GH10-221
- GH10-222
- GH10-223
- GH10-224
- GH10-225
- GH10-227
- GH10-228

(Page C2-1 to C2-48)

SHEET 1 OF 1

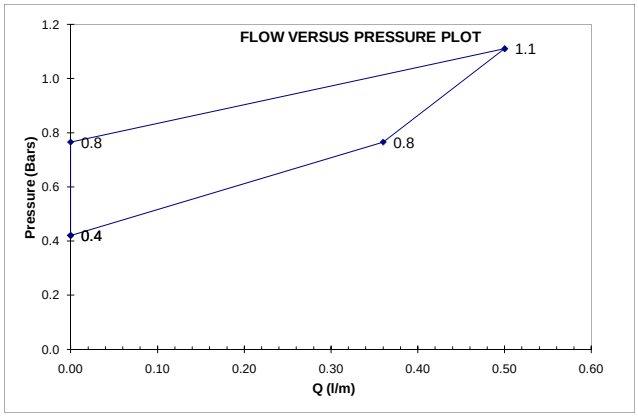
LUGEON TEST FIELD DATA SHEET

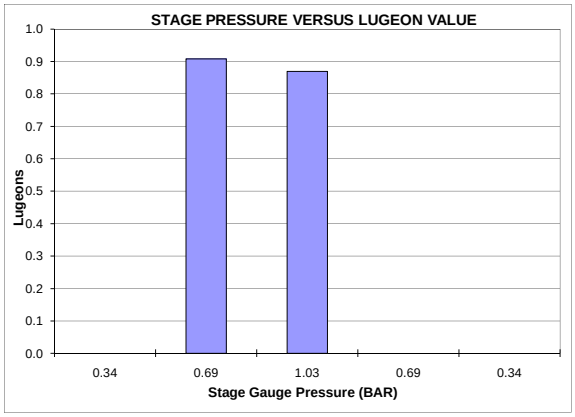
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-00176/35	DRILLHOLE:	GH10-211
AREA:	Area E			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	0.5	m	TOP OF TEST INTERVAL:	33.00 ft (DOWN HOLE) / 10.06 m (DOWN HOLE)
DATE:	7-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.3	m	BOTTOM OF TEST INTERVAL:	50.00 ft (DOWN HOLE) / 15.24 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157462.0	157462.0	157462.0	157462.0	157462.0	157462.0				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
0.34	Average Take	l/m		0.00	0.00	0.00	0.00	0.00			0.00	0.00
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157462.2	157463.0	157463.0	157463.0	157463.5	157464.0				
	Take	litres		0.80	0.00	0.00	0.50	0.50				
0.69	Average Take	l/m		0.80	0.00	0.00	0.50	0.50			0.36	0.91
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157464.5	157465.5	157465.5	157466.0	157466.5	157467.0				
	Take	litres		1.00	0.00	0.50	0.50	0.50				
1.03	Average Take	l/m		1.00	0.00	0.50	0.50	0.50			0.50	0.87
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157467.0	157467.0	157467.0	157467.0	157467.0	157467.0				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
0.69	Average Take	l/m		0.00	0.00	0.00	0.00	0.00			0.00	0.00
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157467.0	157467.0	157467.0	157467.0	157467.0	157467.0				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
0.34	Average Take	l/m		0.00	0.00	0.00	0.00	0.00			0.00	0.00





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.908	MAX k=	9.08E-06
		MIN Lu=	0.000	MIN k=	0.00E+00
INTERPRETATION REFERENCE:		AVG Lu=	0.227	AVG k=	2.27E-06

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	YES
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

Water came out casing so double checked length of rods; little bit in casing so added 5 ft of rod and reset packer; sound results after resetting.

Last two pressures were aborted as flow rate was less than 1 L/min.

TEST BY: CG, JPN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

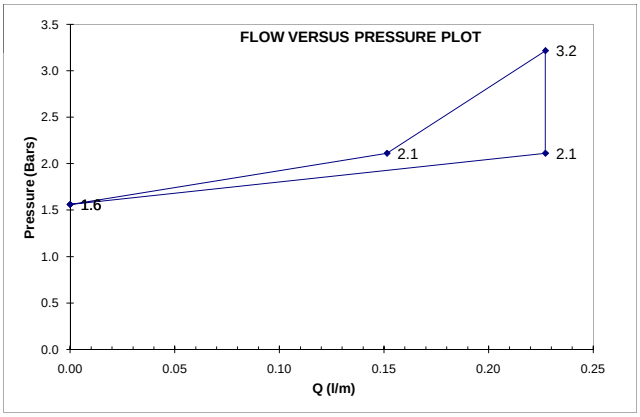
LUGEON TEST FIELD DATA SHEET

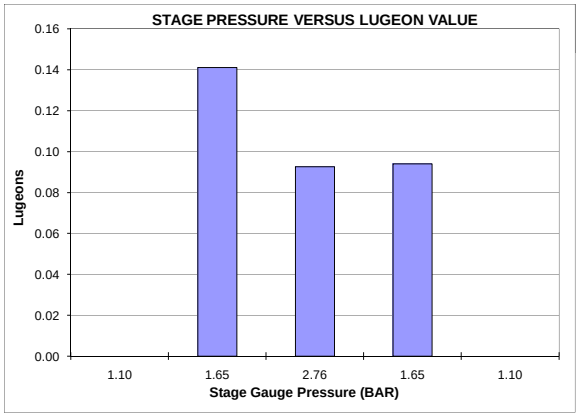
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-212
AREA:	Area E			TEST NO:	1

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	4.3 m	TOP OF TEST INTERVAL:	75.00 ft (DOWN HOLE)	22.87 m (DOWN HOLE)
DATE:	11-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	100.00 ft (DOWN HOLE)	30.49 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	32291.1	32291.1	32291.1	32291.1	32291.1	32291.1				
	Take	litres		0.0000	0.0000	0.0000	0.0000	0.0000				
1.10	Average Take	l/m		0.0000	0.0000	0.0000	0.0000	0.0000			0.00	0.00
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	32291.5	32291.8	32292.2	32292.2	32292.6	32292.6				
	Take	litres		0.38	0.38	0.00	0.38	0.00				
1.65	Average Take	l/m		0.3785	0.3785	0.0000	0.3785	0.0000			0.23	0.14
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	32293.3	32293.7	32293.7	32294.1	32294.5	32294.5				
	Take	litres		0.38	0.00	0.38	0.38	0.00				
2.76	Average Take	l/m		0.3785	0.0000	0.3785	0.3785	0.0000			0.23	0.09
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	32294.5	32294.9	32294.9	32294.9	32295.2	32295.2				
	Take	litres		0.38	0.00	0.00	0.38	0.00				
1.65	Average Take	l/m		0.3785	0.0000	0.0000	0.3785	0.0000			0.15	0.09
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	32295.2	32295.2	32295.2	32295.2	32295.2	32295.2				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
1.10	Average Take	l/m		0.0000	0.0000	0.0000	0.0000	0.0000			0.00	0.00





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.141	MAX k=	1.41E-06
		MIN Lu=	0.000	MIN k=	0.00E+00
INTERPRETATION REFERENCE:		AVG Lu=	0.093	AVG k=	9.27E-07

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons

The first pressure yielded incoherent flow values, therefore used the last flow reading for each interval.

TEST BY: BO

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06DEC'2010	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

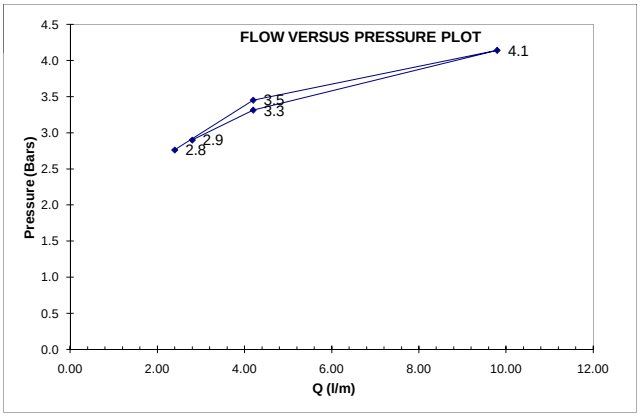
LUGEON TEST FIELD DATA SHEET

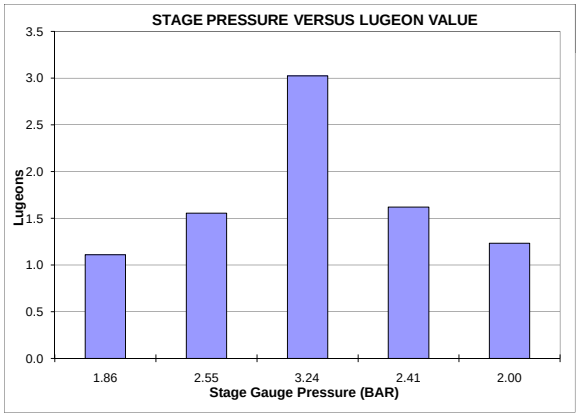
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-213
AREA:	Area E			TEST NO:	1

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	8.5 m	TOP OF TEST INTERVAL:	49.33 ft (DOWN HOLE)	15.04 m (DOWN HOLE)
DATE:	11-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.5 m	BOTTOM OF TEST INTERVAL:	75.00 ft (DOWN HOLE)	22.87 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157527.0	157528.0	157532.0	157534.0	157537.0	157539.0				
	Take	litres		1.00	4.00	2.00	3.00	2.00				
1.86	Average Take	l/m		1.00	4.00	2.00	3.00	2.00			2.40	1.11
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157548.0	157553.0	157557.0	157561.0	157565.0	157569.0				
	Take	litres		5.00	4.00	4.00	4.00	4.00				
2.55	Average Take	l/m		5.00	4.00	4.00	4.00	4.00			4.20	1.56
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157576.0	157586.0	157595.0	157606.0	157616.0	157625.0				
	Take	litres		10.00	9.00	11.00	10.00	9.00				
3.24	Average Take	l/m		10.00	9.00	11.00	10.00	9.00			9.80	3.02
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157634.0	157638.0	157642.0	157646.0	157650.0	157655.0				
	Take	litres		4.00	4.00	4.00	4.00	5.00				
2.41	Average Take	l/m		4.00	4.00	4.00	4.00	5.00			4.20	1.62
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157657.0	157659.0	157662.0	157664.0	157667.0	157671.0				
	Take	litres		2.00	3.00	2.00	3.00	4.00				
2.00	Average Take	l/m		2.00	3.00	2.00	3.00	4.00			2.80	1.23





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	3.024	MAX k=	3.02E-05
		MIN Lu=	1.110	MIN k=	1.11E-05
INTERPRETATION REFERENCE:		AVG Lu=	1.380	AVG k=	1.38E-05

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	YES
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Leakage under P_3 at a rate of approximately 1 L/min

TEST BY:	JPN	REVIEWED BY:	JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

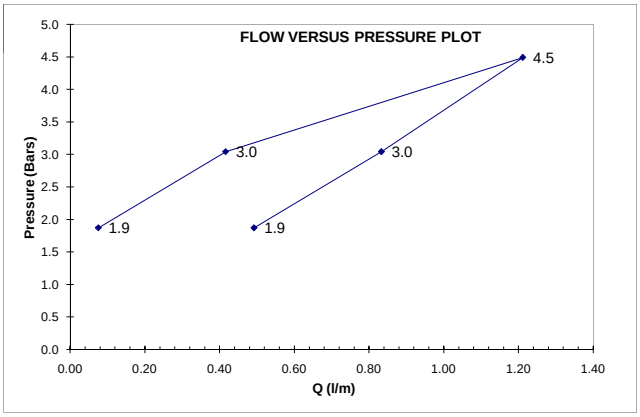
LUGEON TEST FIELD DATA SHEET

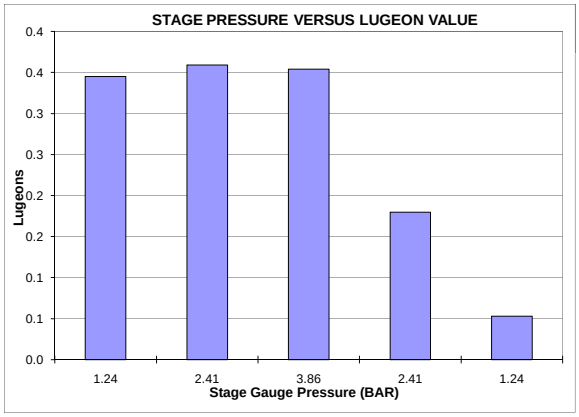
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-214
AREA:	Area E			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	6.0	m	TOP OF TEST INTERVAL:	110.00 ft (DOWN HOLE) / 33.54 m (DOWN HOLE)
DATE:	16-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.3	m	BOTTOM OF TEST INTERVAL:	135.00 ft (DOWN HOLE) / 41.16 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	25.0	25.7	26.1	26.5	27.1	27.4				
	Take	litres		0.76	0.38	0.38	0.57	0.38				
1.24	Average Take	l/m		0.76	0.38	0.38	0.57	0.38			0.49	0.35
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	28.8	29.7	30.7	31.4	32.2	32.9				
	Take	litres		0.95	0.95	0.76	0.76	0.76				
2.41	Average Take	l/m		0.95	0.95	0.76	0.76	0.76			0.83	0.36
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	34.4	35.8	37.1	38.2	39.4	40.5				
	Take	litres		1.32	1.32	1.14	1.14	1.14				
3.86	Average Take	l/m		1.32	1.32	1.14	1.14	1.14			1.21	0.35
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	2.6	3.0	3.4	3.8	4.4	4.7				
	Take	litres		0.38	0.38	0.38	0.57	0.38				
2.41	Average Take	l/m		0.38	0.38	0.38	0.57	0.38			0.42	0.18
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	4.5	4.5	4.5	4.5	4.7	4.9				
	Take	litres		0.00	0.00	0.00	0.19	0.19				
1.24	Average Take	l/m		0.00	0.00	0.00	0.19	0.19			0.08	0.05





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.359	MAX k=	3.59E-06
		MIN Lu=	0.053	MIN k=	5.31E-07
INTERPRETATION REFERENCE:		AVG Lu=	0.258	AVG k=	2.58E-06

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	YES

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons
Flushed drill hole for 30 minutes before testing
No leakage

TEST BY: BSH

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 2

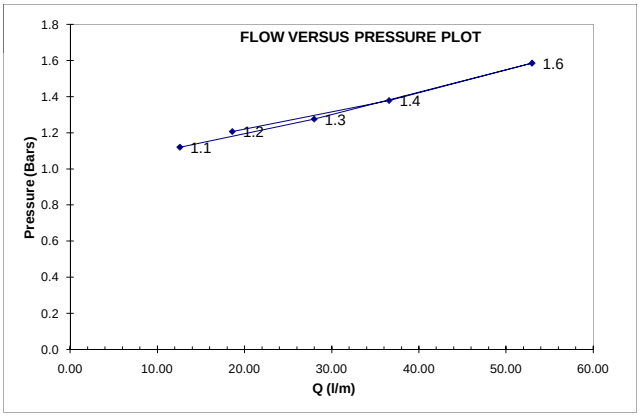
LUGEON TEST FIELD DATA SHEET

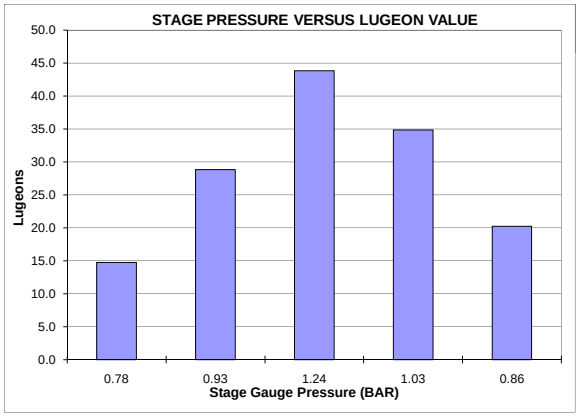
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-215
AREA:	Area G			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	3.0	m	TOP OF TEST INTERVAL:	25.00 ft (DOWN HOLE) / 7.62 m (DOWN HOLE)
DATE:	14-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	50.00 ft (DOWN HOLE) / 15.24 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157615.0	157627.0	157640.0	157652.0	157665.0	157678.0				
	Take	litres		12.00	13.00	12.00	13.00	13.00				
0.78	Average Take	l/m		12.00	13.00	12.00	13.00	13.00			12.60	14.76
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157714.0	157741.0	157771.0	157799.0	157828.0	157854.0				
	Take	litres		27.00	30.00	28.00	29.00	26.00				
0.93	Average Take	l/m		27.00	30.00	28.00	29.00	26.00			28.00	28.82
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	157890.0	157951.0	158007.0	158063.0	158117.0	158155.0				
	Take	litres		61.00	56.00	56.00	54.00	38.00				
1.24	Average Take	l/m		61.00	56.00	56.00	54.00	38.00			53.00	43.87
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	158197.0	158232.0	158268.0	158307.0	158342.0	158380.0				
	Take	litres		35.00	36.00	39.00	35.00	38.00				
1.03	Average Take	l/m		35.00	36.00	39.00	35.00	38.00			36.60	34.84
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	158399.0	158417.0	158435.0	158454.0	158478.0	158492.0				
	Take	litres		18.00	18.00	19.00	24.00	14.00				
0.86	Average Take	l/m		18.00	18.00	19.00	24.00	14.00			18.60	20.24





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	43.870	MAX k=	4.39E-04
		MIN Lu=	14.764	MIN k=	1.48E-04
INTERPRETATION REFERENCE:		AVG Lu=	28.506	AVG k=	2.85E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

At P_3, return water began to flow out of casing and continued to flow during P4 and P5 stages. The flow decreased with decreasing pressure.

Pressures entered into spreadsheet were taken from the pressure transducer readings. Static water level determined using pressure transducer.

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 2

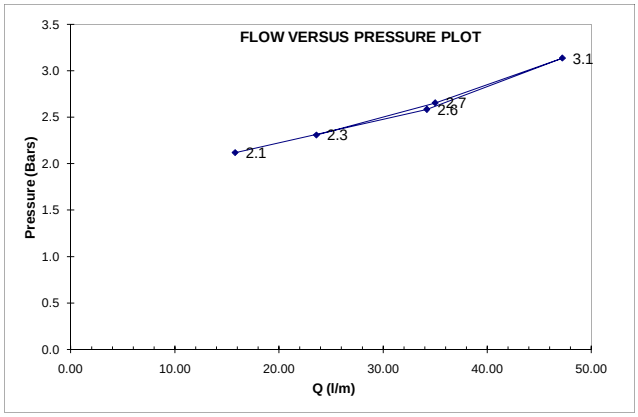
LUGEON TEST FIELD DATA SHEET

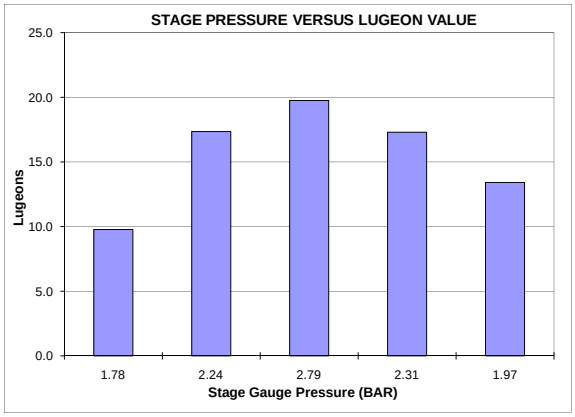
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-215
AREA:	Area G			TEST NO:	2

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	3.0	m	TOP OF TEST INTERVAL:	50.00 ft (DOWN HOLE) / 15.24 m (DOWN HOLE)
DATE:	15-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	75.00 ft (DOWN HOLE) / 22.87 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	158541.0	158552.0	158569.0	158586.0	158603.0	158620.0				
	Take	litres		11.00	17.00	17.00	17.00	17.00				
1.78	Average Take	l/m		11.00	17.00	17.00	17.00	17.00			15.80	9.78
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	158665.0	158700.0	158734.0	158767.0	158802.0	158836.0				
	Take	litres		35.00	34.00	33.00	35.00	34.00				
2.24	Average Take	l/m		35.00	34.00	33.00	35.00	34.00			34.20	17.36
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	158870.0	158916.0	158963.0	159011.0	159058.0	159106.0				
	Take	litres		46.00	47.00	48.00	47.00	48.00				
2.79	Average Take	l/m		46.00	47.00	48.00	47.00	48.00			47.20	19.74
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	159145.0	159179.0	159215.0	159249.0	159285.0	159320.0				
	Take	litres		34.00	36.00	34.00	36.00	35.00				
2.31	Average Take	l/m		34.00	36.00	34.00	36.00	35.00			35.00	17.30
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	159340.0	159363.0	159387.0	159411.0	159435.0	159458.0				
	Take	litres		23.00	24.00	24.00	24.00	23.00				
1.97	Average Take	l/m		23.00	24.00	24.00	24.00	23.00			23.60	13.41





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	19.745	MAX k=	1.97E-04
		MIN Lu=	9.781	MIN k=	9.78E-05
INTERPRETATION REFERENCE:		AVG Lu=	15.520	AVG k=	1.55E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

At P1 return water began to flow out of casing and continued to flow during all stages. The flow decreased with decreasing pressure.

Pressures entered into spreadsheet were taken from the pressure transducer readings. Static water level determined using pressure transducer.

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

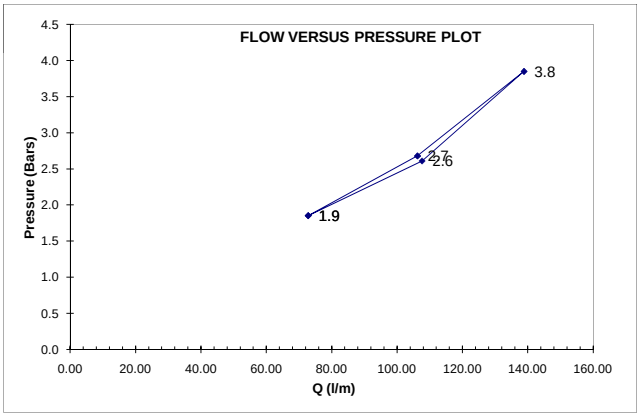
LUGEON TEST FIELD DATA SHEET

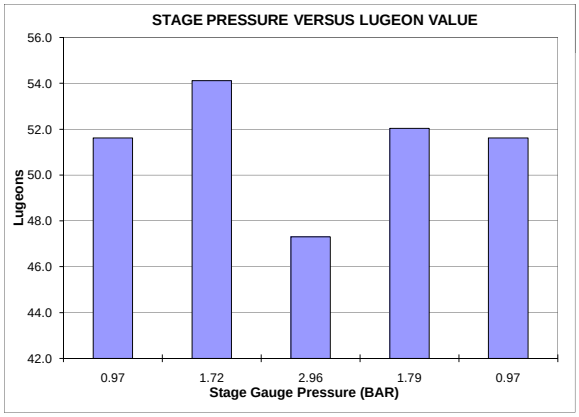
Knight Piésold CONSULTING

PROJECT:	PEBBLE PROJECT	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-216
AREA:	Area G			TEST NO:	1

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	8.4 m	TOP OF TEST INTERVAL:	85.00 ft (DOWN HOLE)	25.91 m (DOWN HOLE)
DATE:	22-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.5 m	BOTTOM OF TEST INTERVAL:	110.00 ft (DOWN HOLE)	33.54 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	159625.0	159697.0	159766.0	159847.0	159918.0	159989.0				
	Take	litres		72.00	69.00	81.00	71.00	71.00				
0.97	Average Take	l/m		72.00	69.00	81.00	71.00	71.00			72.80	51.62
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	160160.0	160269.0	160377.0	160484.0	160591.0	160698.0				
	Take	litres		109.00	108.00	107.00	107.00	107.00				
1.72	Average Take	l/m		109.00	108.00	107.00	107.00	107.00			107.60	54.12
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	160810.0	160940.0	161082.0	161224.0	161362.0	161504.0				
	Take	litres		130.00	142.00	142.00	138.00	142.00				
2.96	Average Take	l/m		130.00	142.00	142.00	138.00	142.00			138.80	47.30
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	161590.0	161693.0	161799.0	161907.0	162015.0	162121.0				
	Take	litres		103.00	106.00	108.00	108.00	106.00				
1.79	Average Take	l/m		103.00	106.00	108.00	108.00	106.00			106.20	52.04
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	162210.0	162282.0	162355.0	162429.0	162502.0	162574.0				
	Take	litres		72.00	73.00	74.00	73.00	72.00				
0.97	Average Take	l/m		72.00	73.00	74.00	73.00	72.00			72.80	51.62





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	54.116	MAX k=	5.41E-04
		MIN Lu=	47.303	MIN k=	4.73E-04
INTERPRETATION REFERENCE:		AVG Lu=	47.303	AVG k=	4.73E-04

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

At P3 return water began to flow out of casing and continued to flow during P4. The flow decreased with decreasing pressure.

During P3 the flow was approx. 5 gal/min but during P4 the flow was too low to measure accurately. Stopped the test after P4 for 3 minutes to allow water tank to refill to continue test.

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

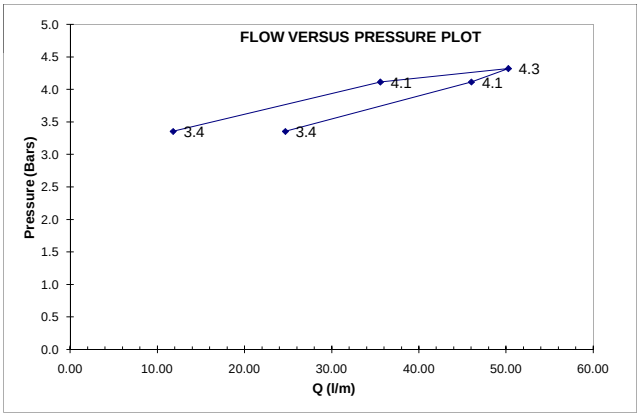
LUGEON TEST FIELD DATA SHEET

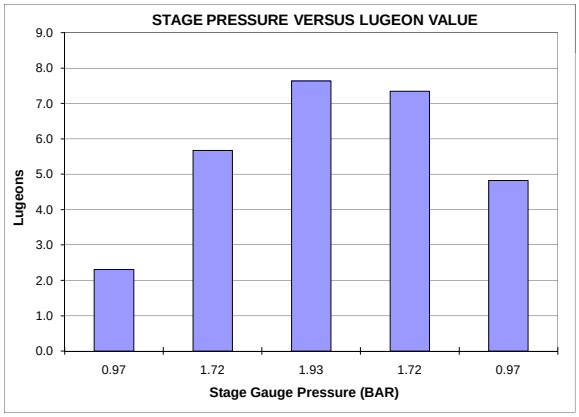
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-217
AREA:	Open Pit Area			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	23.6	m	TOP OF TEST INTERVAL:	94.00 ft (DOWN HOLE) / 28.66 m (DOWN HOLE)
DATE:	19-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.3	m	BOTTOM OF TEST INTERVAL:	144.00 ft (DOWN HOLE) / 43.90 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	19.7	34.4	46.6	58.7	68.9	78.7				
	Take	litres		14.76	12.11	12.11	10.22	9.84				
0.97	Average Take	l/m		14.76	12.11	12.11	10.22	9.84			11.81	2.31
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	26.5	62.5	96.5	133.2	170.3	204.4				
	Take	litres		35.96	34.07	36.72	37.10	34.07				
1.72	Average Take	l/m		35.96	34.07	36.72	37.10	34.07			35.58	5.67
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	14.8	65.9	113.9	164.7	215.4	266.1				
	Take	litres		51.10	48.07	50.72	50.72	50.72				
1.93	Average Take	l/m		51.10	48.07	50.72	50.72	50.72			50.27	7.63
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	22.7	68.9	114.7	160.5	206.7	252.9				
	Take	litres		46.18	45.80	45.80	46.18	46.18				
1.72	Average Take	l/m		46.18	45.80	45.80	46.18	46.18			46.03	7.34
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	11.4	36.0	60.9	87.1	110.5	134.8				
	Take	litres		24.61	24.98	26.12	23.47	24.23				
0.97	Average Take	l/m		24.61	24.98	26.12	23.47	24.23			24.68	4.83





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	7.633	MAX k=	7.63E-05
		MIN Lu=	2.309	MIN k=	2.31E-05
INTERPRETATION REFERENCE:		AVG Lu=	5.556	AVG k=	5.56E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Couldn't reach P3 due to leakage through casing - assumed to be caused by highly factured rock above test interval.
P1 - didn't leak at first but did at a rate of approx 1 L/min during second interval. P2 leaked at approx 5 gal/min. P3 leaked at approx 6.8 gal/min
Flowmeter Units: US Gallons

TEST BY: BSH

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 2

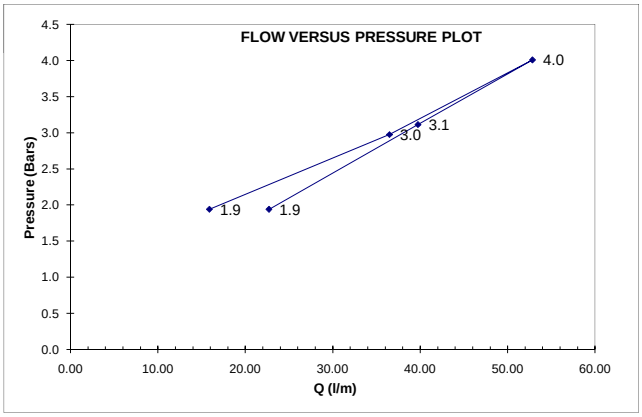
LUGEON TEST FIELD DATA SHEET

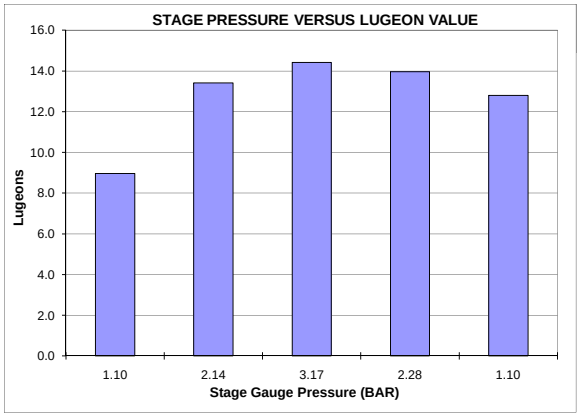
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-218
AREA:	Open Pit Area			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	7.9	m	TOP OF TEST INTERVAL:	89.00 ft (DOWN HOLE) / 27.13 m (DOWN HOLE)
DATE:	20-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	119.00 ft (DOWN HOLE) / 36.28 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	17.0	33.3	49.2	64.4	79.5				
	Take	litres		17.03	16.28	15.90	15.14	15.14				
1.10	Average Take	l/m		17.03	16.28	15.90	15.14	15.14			15.90	8.96
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	36.3	73.1	109.8	145.7	182.5				
	Take	litres		36.34	36.72	36.72	35.96	36.72				
2.14	Average Take	l/m		36.34	36.72	36.72	35.96	36.72			36.49	13.41
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	53.0	107.1	159.0	212.0	264.2				
	Take	litres		53.00	54.13	51.86	53.00	52.24				
3.17	Average Take	l/m		53.00	54.13	51.86	53.00	52.24			52.84	14.41
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	39.7	80.3	119.6	159.0	198.7				
	Take	litres		39.75	40.50	39.37	39.37	39.75				
2.28	Average Take	l/m		39.75	40.50	39.37	39.37	39.75			39.75	13.96
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	23.5	45.4	68.9	90.8	113.6				
	Take	litres		23.47	21.96	23.47	21.96	22.71				
1.10	Average Take	l/m		23.47	21.96	23.47	21.96	22.71			22.71	12.80





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	14.413	MAX k=	1.44E-04
		MIN Lu=	8.959	MIN k=	8.96E-05
INTERPRETATION REFERENCE:		AVG Lu=	12.710	AVG k=	1.27E-04

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:
Good seal, no leaks noticed during test, pressure gauge was steady.
Flowmeter Units: US Gallons

TEST BY: BH

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 2

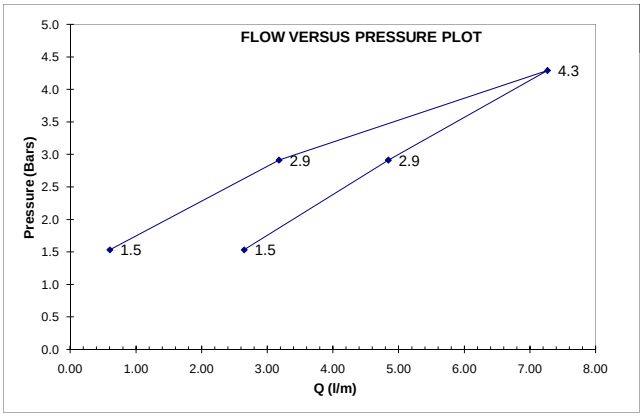
LUGEON TEST FIELD DATA SHEET

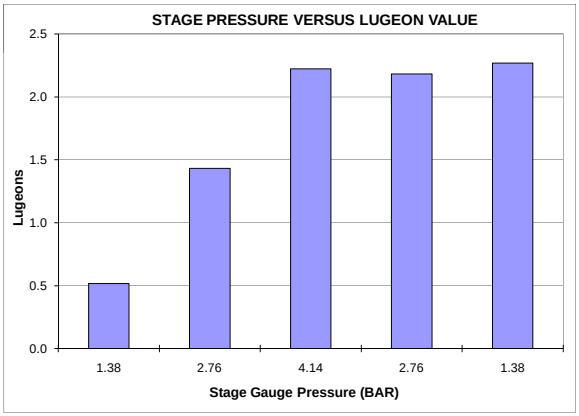
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-218
AREA:	Open Pit Area			TEST NO:	2

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.1	m	TOP OF TEST INTERVAL:	119.00 ft (DOWN HOLE) / 36.28 m (DOWN HOLE)
DATE:	21-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	144.00 ft (DOWN HOLE) / 43.90 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	4.2	4.5	5.3	6.1	6.4	7.2				
	Take	litres		0.38	0.76	0.76	0.38	0.76				
1.38	Average Take	l/m		0.38	0.76	0.76	0.38	0.76			0.61	0.52
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	9.1	11.7	14.4	16.7	18.9	25.0				
	Take	litres		2.65	2.65	2.27	2.27	6.06				
2.76	Average Take	l/m		2.65	2.65	2.27	2.27	6.06			3.18	1.43
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	28.8	37.9	44.3	51.5	58.3	65.1				
	Take	litres		9.08	6.44	7.19	6.81	6.81				
4.14	Average Take	l/m		9.08	6.44	7.19	6.81	6.81			7.27	2.22
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	67.4	72.7	77.2	82.1	87.1	91.6				
	Take	litres		5.30	4.54	4.92	4.92	4.54				
2.76	Average Take	l/m		5.30	4.54	4.92	4.92	4.54			4.85	2.18
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	18.2	20.8	23.5	26.1	28.8	31.4				
	Take	litres		2.65	2.65	2.65	2.65	2.65				
1.38	Average Take	l/m		2.65	2.65	2.65	2.65	2.65			2.65	2.27





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.268	MAX k=	2.27E-05
		MIN Lu=	0.518	MIN k=	5.18E-06
INTERPRETATION REFERENCE:		AVG Lu=	2.268	AVG k=	2.27E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	YES
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:
Good seal, no leaks noticed during test, steady gauge.
Flowmeter Units: US Gallons

TEST BY: BH

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 4

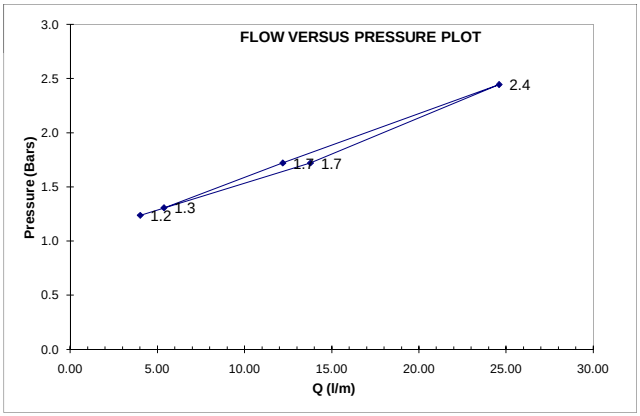
LUGEON TEST FIELD DATA SHEET

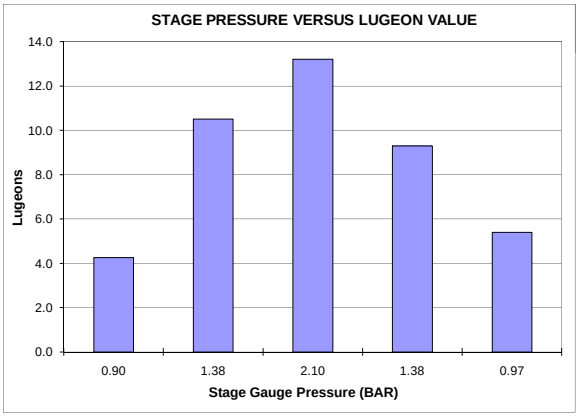
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-219
AREA:	Upper Talarik Creek Area			TEST NO:	1

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	3.0 m	TOP OF TEST INTERVAL:	63.00 ft (DOWN HOLE)	19.21 m (DOWN HOLE)
DATE:	22-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.5 m	BOTTOM OF TEST INTERVAL:	88.00 ft (DOWN HOLE)	26.83 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	34.1	38.6	42.8	46.6	50.3	54.1				
	Take	litres		4.54	4.16	3.79	3.79	3.79				
0.90	Average Take	l/m		4.54	4.16	3.79	3.79	3.79			4.01	4.25
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	14.0	27.3	41.3	55.3	68.9				
	Take	litres		14.01	13.25	14.01	14.01	13.63				
1.38	Average Take	l/m		14.01	13.25	14.01	14.01	13.63			13.78	10.51
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	18.9	44.3	70.0	96.1	118.1	142.0				
	Take	litres		25.36	25.74	26.12	21.96	23.85				
2.10	Average Take	l/m		25.36	25.74	26.12	21.96	23.85			24.61	13.21
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	12.5	24.2	36.3	48.5	60.9				
	Take	litres		12.49	11.73	12.11	12.11	12.49				
1.38	Average Take	l/m		12.49	11.73	12.11	12.11	12.49			12.19	9.30
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	28.4	33.7	39.0	44.3	50.0	55.3				
	Take	litres		5.30	5.30	5.30	5.68	5.30				
0.97	Average Take	l/m		5.30	5.30	5.30	5.68	5.30			5.38	5.40





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	Water meter	MAX Lu=	13.209	MAX k=	1.32E-04
		MIN Lu=	4.255	MIN k=	4.25E-05
INTERPRETATION REFERENCE:		AVG Lu=	8.534	AVG k=	8.53E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Good seal, no leaks noticed. Pressure gauge seems to have a lowest reading of 10psi.
Flowmeter Units: US Gallons

TEST BY: BH

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 4

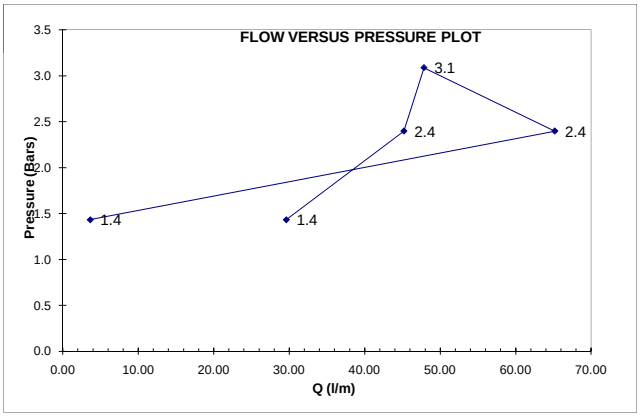
LUGEON TEST FIELD DATA SHEET

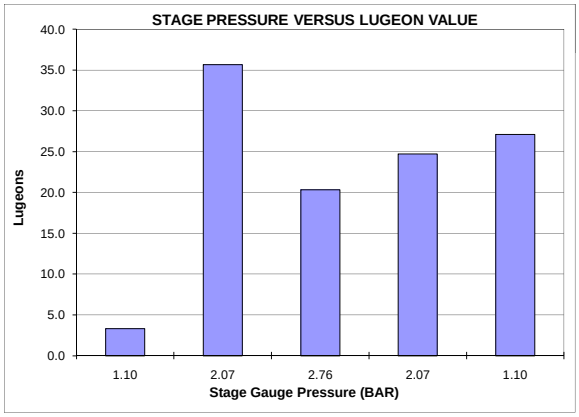
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-219
AREA:	Upper Talarik Creek Area			TEST NO:	2

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	3.0 m	TOP OF TEST INTERVAL:	93.00 ft (DOWN HOLE)	28.35 m (DOWN HOLE)
DATE:	23-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	118.00 ft (DOWN HOLE)	35.98 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	1881.4	1887.8	1890.8	1893.4	1896.2	1899.5				
	Take	litres		6.44	2.99	2.61	2.76	3.33				
1.10	Average Take	l/m		6.44	2.99	2.61	2.76	3.33			3.63	3.32
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	1903.7	2015.4	2057.4	2100.9	2123.6	2229.6				
	Take	litres		111.67	42.02	43.53	22.71	105.99				
2.07	Average Take	l/m		111.67	42.02	43.53	22.71	105.99			65.18	35.66
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	2267.5	2289.0	2382.9	2399.6	2490.4	2506.7				
	Take	litres		21.58	93.88	16.66	90.85	16.28				
2.76	Average Take	l/m		21.58	93.88	16.66	90.85	16.28			47.85	20.33
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	2540.0	2586.6	2630.9	2676.3	2759.2	2766.0				
	Take	litres		46.56	44.29	45.42	82.90	6.81				
2.07	Average Take	l/m		46.56	44.29	45.42	82.90	6.81			45.20	24.72
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	2786.1	2817.1	2844.7	2876.9	2905.3	2934.1				
	Take	litres		31.04	27.63	32.18	28.39	28.77				
1.10	Average Take	l/m		31.04	27.63	32.18	28.39	28.77			29.60	27.10





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	35.658	MAX k=	3.57E-04
		MIN Lu=	3.320	MIN k=	3.32E-05
INTERPRETATION REFERENCE:		AVG Lu=	15.210	AVG k=	1.52E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons Needle of flowmeter was reading 10 psi with no pressure.
Pin broke at 425 psi before the 5 min inflation period; No water leakage observed at casing
Driller noted that there was a void/cave-in in the test zone.

TEST BY: BO REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 3 OF 4

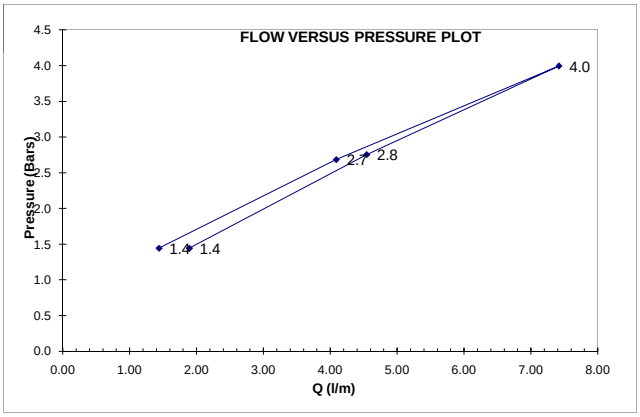
LUGEON TEST FIELD DATA SHEET

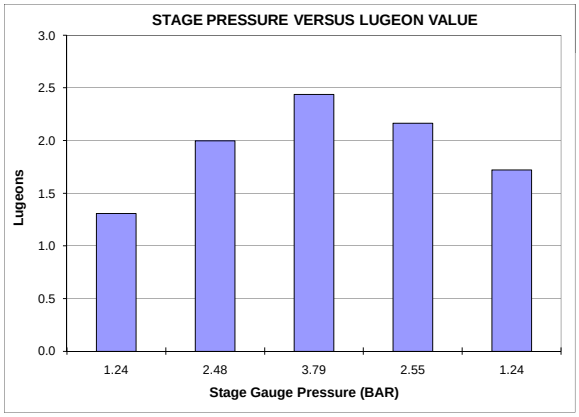
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-219
AREA:	Upper Talarik Creek Area			TEST NO:	3

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	1.7 m	TOP OF TEST INTERVAL:	113.00 ft (DOWN HOLE)	34.45 m (DOWN HOLE)
DATE:	23-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	138.00 ft (DOWN HOLE)	42.07 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	5.3	6.8	8.7	9.8	11.4	12.5				
	Take	litres		1.51	1.89	1.14	1.51	1.14				
1.24	Average Take	l/m		1.51	1.89	1.14	1.51	1.14			1.44	1.31
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	21.2	25.7	29.9	34.1	37.9	41.6				
	Take	litres		4.54	4.16	4.16	3.79	3.79				
2.48	Average Take	l/m		4.54	4.16	4.16	3.79	3.79			4.09	2.00
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	23.1	30.7	38.2	45.8	53.0	60.2				
	Take	litres		7.57	7.57	7.57	7.19	7.19				
3.79	Average Take	l/m		7.57	7.57	7.57	7.19	7.19			7.42	2.44
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	30.7	35.2	39.7	44.3	48.5	53.4				
	Take	litres		4.54	4.54	4.54	4.16	4.92				
2.55	Average Take	l/m		4.54	4.54	4.54	4.16	4.92			4.54	2.16
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	18.5	20.4	22.7	24.2	26.1	28.0				
	Take	litres		1.89	2.27	1.51	1.89	1.89				
1.24	Average Take	l/m		1.89	2.27	1.51	1.89	1.89			1.89	1.72





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.437	MAX k=	2.44E-05
		MIN Lu=	1.307	MIN k=	1.31E-05
INTERPRETATION REFERENCE:		AVG Lu=	1.925	AVG k=	1.92E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classifica.tion:

DRILLING / TEST RESULTS COMMENTS:

Good seal, no leaks noticed, pressure gauge steady.
Flowmeter Units: US Gallons
Pin sheared at 9:42 am

TEST BY: BH

REVIEWED BY: JAB

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-219\[GH10-219 Lugeon Packer Testing Sheet.xls]3

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 4 OF 4

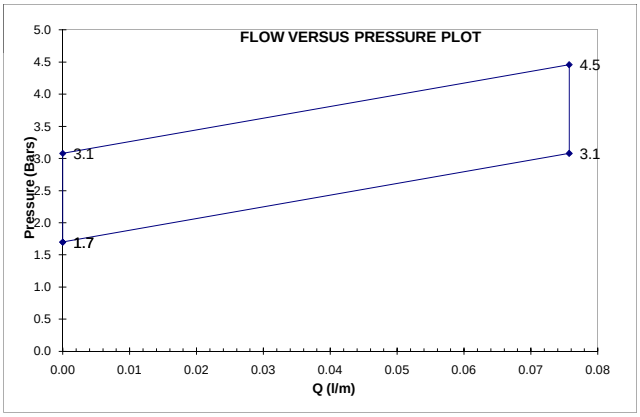
LUGEON TEST FIELD DATA SHEET

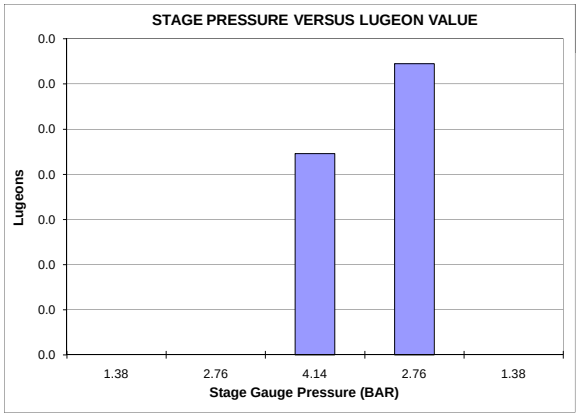
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-219
AREA:	Upper Talarik Creek Area			TEST NO:	4

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	2.9	m	TOP OF TEST INTERVAL:	133.00 ft (DOWN HOLE) / 40.55 m (DOWN HOLE)
DATE:	23-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.3	m	BOTTOM OF TEST INTERVAL:	158.00 ft (DOWN HOLE) / 48.17 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	33.3	33.3	33.3	33.3	33.3	33.3				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
1.38	Average Take	l/m		0.00	0.00	0.00	0.00	0.00			0.00	0.00
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	34.1	34.1	34.1	34.1	34.1	34.1				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
2.76	Average Take	l/m		0.00	0.00	0.00	0.00	0.00			0.00	0.00
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	34.4	34.4	34.4	34.8	34.8	34.8				
	Take	litres		0.00	0.00	0.38	0.00	0.00				
4.14	Average Take	l/m		0.00	0.00	0.38	0.00	0.00			0.08	0.02
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	34.8	34.8	34.8	34.8	35.0	35.2				
	Take	litres		0.00	0.00	0.00	0.19	0.19				
2.76	Average Take	l/m		0.00	0.00	0.00	0.19	0.19			0.08	0.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	35.2	35.2	35.2	35.2	35.2	35.2				
	Take	litres		0.00	0.00	0.00	0.00	0.00				
1.38	Average Take	l/m		0.00	0.00	0.00	0.00	0.00			0.00	0.00





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	Water meter	MAX Lu=	0.032	MAX k=	3.23E-07
		MIN Lu=	0.000	MIN k=	0.00E+00
INTERPRETATION REFERENCE:		AVG Lu=	0.022	AVG k=	2.23E-07

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons

Start of inflation at 10:37 pm, pin broke at 10:42 pm, end of falling head test at 10:57 pm, end of packer test at 11:37 pm

15-min falling head test with level troll before Packer test; no leak observed at casing

TEST BY: BH

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 13

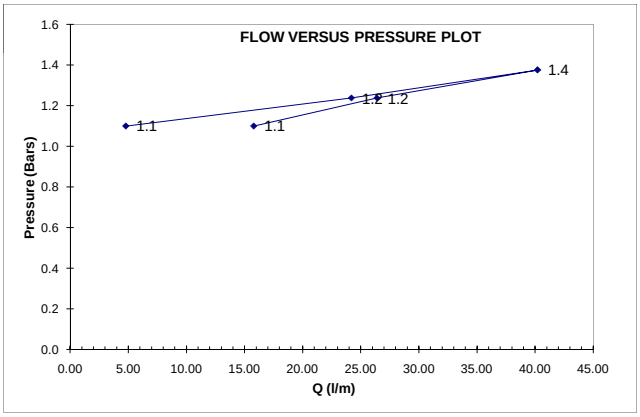
LUGEON TEST FIELD DATA SHEET

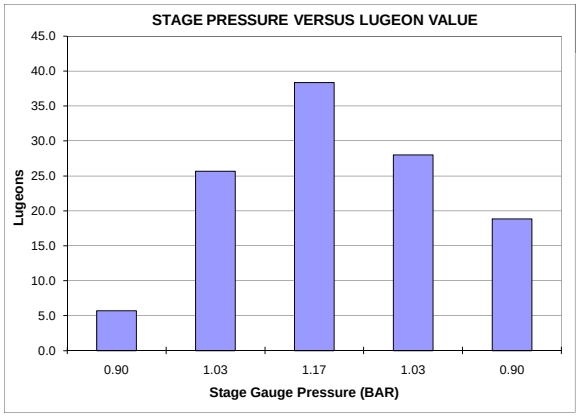
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.5	m	TOP OF TEST INTERVAL:	20.00 ft (DOWN HOLE) / 6.10 m (DOWN HOLE)
DATE:	24-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	45.00 ft (DOWN HOLE) / 13.72 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	164467.0	164472.0	164477.0	164482.0	164486.0	164491.0				
	Take	litres		5.00	5.00	5.00	4.00	5.00				
0.90	Average Take	l/m		5.00	5.00	5.00	4.00	5.00			4.80	5.73
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	164500.0	164523.0	164548.0	164572.0	164597.0	164621.0				
	Take	litres		23.00	25.00	24.00	25.00	24.00				
1.03	Average Take	l/m		23.00	25.00	24.00	25.00	24.00			24.20	25.65
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	164640.0	164679.0	164721.0	164761.0	164802.0	164841.0				
	Take	litres		39.00	42.00	40.00	41.00	39.00				
1.17	Average Take	l/m		39.00	42.00	40.00	41.00	39.00			40.20	38.34
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	164853.0	164880.0	164906.0	164933.0	164958.0	164985.0				
	Take	litres		27.00	26.00	27.00	25.00	27.00				
1.03	Average Take	l/m		27.00	26.00	27.00	25.00	27.00			26.40	27.98
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	164996.0	165009.0	165026.0	165043.0	165058.0	165075.0				
	Take	litres		13.00	17.00	17.00	15.00	17.00				
0.90	Average Take	l/m		13.00	17.00	17.00	15.00	17.00			15.80	18.85





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	38.341	MAX k=	3.83E-04
		MIN Lu=	5.726	MIN k=	5.73E-05
INTERPRETATION REFERENCE:		AVG Lu=	23.310	AVG k=	2.33E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Some leakage out of casing during P3 (~5gal/min). Flows were corrected to account for this.

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 13

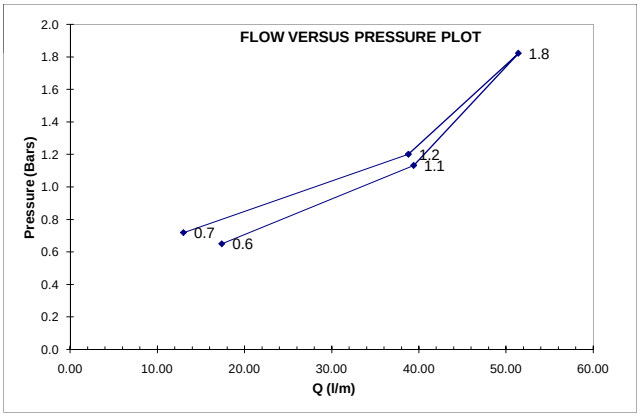
LUGEON TEST FIELD DATA SHEET

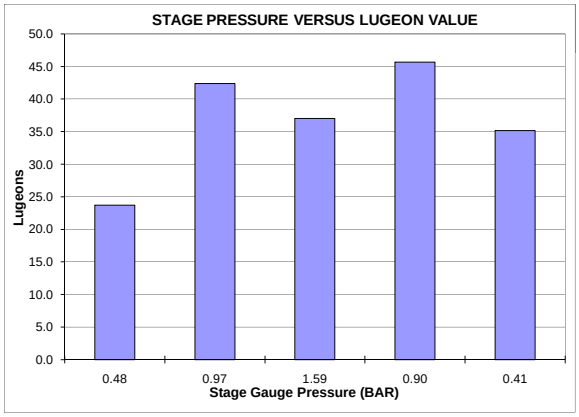
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	2

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.8	m	TOP OF TEST INTERVAL:	45.00 ft (DOWN HOLE) / 13.72 m (DOWN HOLE)
DATE:	24-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	70.00 ft (DOWN HOLE) / 21.34 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	165090.0	165103.0	165116.0	165128.0	165141.0	165155.0				
	Take	litres		13.00	13.00	12.00	13.00	14.00				
0.48	Average Take	l/m		13.00	13.00	12.00	13.00	14.00			13.00	23.73
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	165170.0	165208.0	165247.0	165287.0	165326.0	165364.0				
	Take	litres		38.00	39.00	40.00	39.00	38.00				
0.97	Average Take	l/m		38.00	39.00	40.00	39.00	38.00			38.80	42.37
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	165390.0	165444.0	165495.0	165545.0	165597.0	165647.0				
	Take	litres		54.00	51.00	50.00	52.00	50.00				
1.59	Average Take	l/m		54.00	51.00	50.00	52.00	50.00			51.40	37.02
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	165670.0	165710.0	165749.0	165788.0	165828.0	165867.0				
	Take	litres		40.00	39.00	39.00	40.00	39.00				
0.90	Average Take	l/m		40.00	39.00	39.00	40.00	39.00			39.40	45.65
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	165873.0	165889.0	165905.0	165923.0	165942.0	165960.0				
	Take	litres		16.00	16.00	18.00	19.00	18.00				
0.41	Average Take	l/m		16.00	16.00	18.00	19.00	18.00			17.40	35.13





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	45.649	MAX k=	4.56E-04
		MIN Lu=	23.731	MIN k=	2.37E-04
INTERPRETATION REFERENCE:		AVG Lu=	36.781	AVG k=	3.68E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Leakage out of casing during all stages. P1, P2: ~3.3gal/min, P3: 4gal/min, P4: 2gal/min, leakage at P5 as well (not measured).

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 3 OF 13

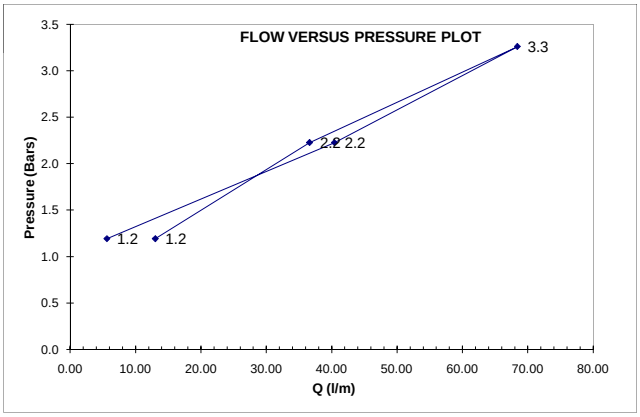
LUGEON TEST FIELD DATA SHEET

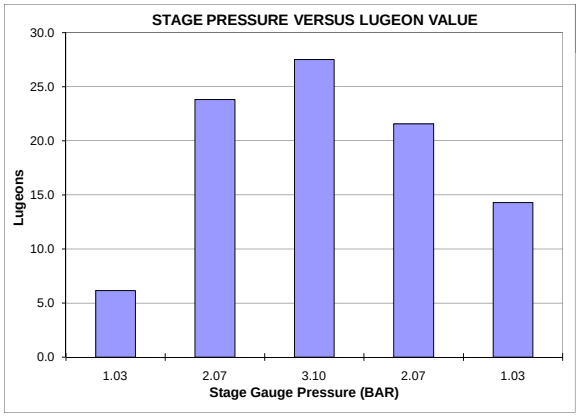
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	5

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.0	m	TOP OF TEST INTERVAL:	95.00 ft (DOWN HOLE) / 28.96 m (DOWN HOLE)
DATE:	24-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	120.00 ft (DOWN HOLE) / 36.59 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	166186.0	166190.0	166195.0	166201.0	166207.0	166214.0				
	Take	litres		4.00	5.00	6.00	6.00	7.00				
1.03	Average Take	l/m		4.00	5.00	6.00	6.00	7.00			5.60	6.16
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	166270.0	166311.0	166351.0	166391.0	166430.0	166472.0				
	Take	litres		41.00	40.00	40.00	39.00	42.00				
2.07	Average Take	l/m		41.00	40.00	40.00	39.00	42.00			40.40	23.80
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	166570.0	166640.0	166700.0	166764.0	166840.0	166912.0				
	Take	litres		70.00	60.00	64.00	76.00	72.00				
3.10	Average Take	l/m		70.00	60.00	64.00	76.00	72.00			68.40	27.52
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	166942.0	166992.0	167034.0	167068.0	167099.0	167125.0				
	Take	litres		50.00	42.00	34.00	31.00	26.00				
2.07	Average Take	l/m		50.00	42.00	34.00	31.00	26.00			36.60	21.57
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	167150.0	167163.0	167176.0	167189.0	167202.0	167215.0				
	Take	litres		13.00	13.00	13.00	13.00	13.00				
1.03	Average Take	l/m		13.00	13.00	13.00	13.00	13.00			13.00	14.30





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	27.521	MAX k=	2.75E-04
		MIN Lu=	6.162	MIN k=	6.16E-05
INTERPRETATION REFERENCE:		AVG Lu=	18.671	AVG k=	1.87E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Leakage at casing: slight flow under P_1; a flow rate of approximately 5 L/min under P_2; and a flow rate of approximately 10 L/min under P_3

TEST BY: JPN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 4 OF 13

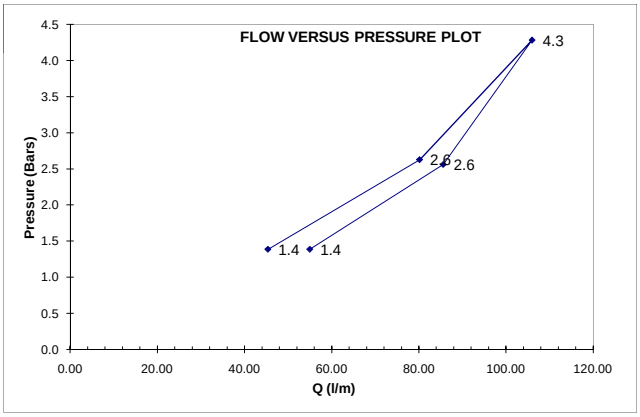
LUGEON TEST FIELD DATA SHEET

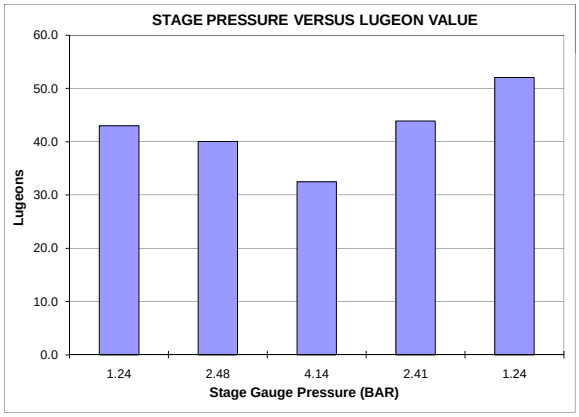
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	6

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	0.9 m	TOP OF TEST INTERVAL:	120.00 ft (DOWN HOLE)	36.59 m (DOWN HOLE)
DATE:	25-Sep-10	GAUGE HEIGHT ABOVE GROUND:	0.5 m	BOTTOM OF TEST INTERVAL:	145.00 ft (DOWN HOLE)	44.21 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	167258.0	167302.0	167347.0	167392.0	167438.0	167485.0				
	Take	litres		44.00	45.00	45.00	46.00	47.00				
1.24	Average Take	l/m		44.00	45.00	45.00	46.00	47.00			45.40	42.97
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	167540.0	167616.0	167696.0	167778.0	167861.0	167941.0				
	Take	litres		76.00	80.00	82.00	83.00	80.00				
2.48	Average Take	l/m		76.00	80.00	82.00	83.00	80.00			80.20	40.05
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	168010.0	168128.0	168246.0	168364.0	168460.0	168540.0				
	Take	litres		118.00	118.00	118.00	96.00	80.00				
4.14	Average Take	l/m		118.00	118.00	118.00	96.00	80.00			106.00	32.48
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	168538.0	168624.0	168710.0	168797.0	168882.0	168966.0				
	Take	litres		86.00	86.00	87.00	85.00	84.00				
2.41	Average Take	l/m		86.00	86.00	87.00	85.00	84.00			85.60	43.90
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	168985.0	169042.0	169107.0	169150.0	0.0	0.0				
	Take	litres		57.00	65.00	43.00						
1.24	Average Take	l/m		57.00	65.00	43.00					55.00	52.06





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	52.056	MAX k=	5.21E-04
		MIN Lu=	32.478	MIN k=	3.25E-04
INTERPRETATION REFERENCE:		AVG Lu=	32.478	AVG k=	3.25E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Slight leakage under P_1; approximately 4 gal/min under P_2; approximately 7 gal/min under P_3. Permeability of ~3.45E-04 cm/s if flows modified.

Pin sheared at 8:19 pm

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 5 OF 13

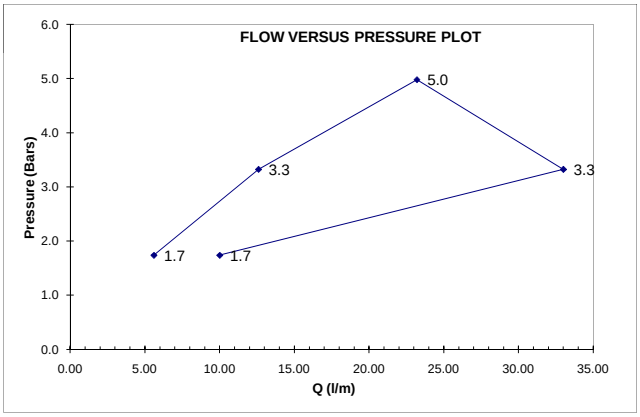
LUGEON TEST FIELD DATA SHEET

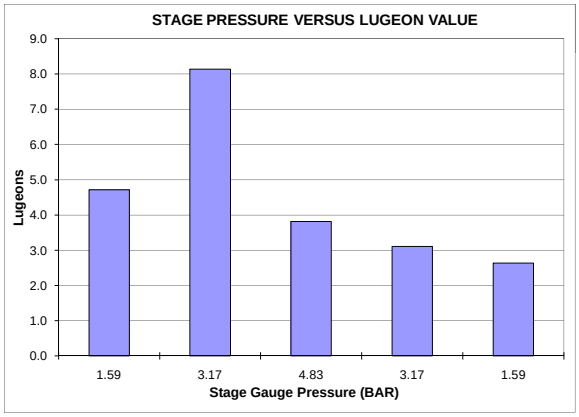
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	7

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.0	m	TOP OF TEST INTERVAL:	145.00 ft (DOWN HOLE) / 44.21 m (DOWN HOLE)
DATE:	27-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	185.00 ft (DOWN HOLE) / 56.40 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	169270.0	169281.0	169291.0	169301.0	169311.0	169320.0				
	Take	litres		11.00	10.00	10.00	10.00	9.00				
1.59	Average Take	l/m		11.00	10.00	10.00	10.00	9.00			10.00	4.71
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	169365.0	169400.0	169440.0	169466.0	169496.0	169530.0				
	Take	litres		35.00	40.00	26.00	30.00	34.00				
3.17	Average Take	l/m		35.00	40.00	26.00	30.00	34.00			33.00	8.14
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	169574.0	169598.0	169622.0	169644.0	169667.0	169690.0				
	Take	litres		24.00	24.00	22.00	23.00	23.00				
4.83	Average Take	l/m		24.00	24.00	22.00	23.00	23.00			23.20	3.82
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	169700.0	169713.0	169726.0	169738.0	169750.0	169763.0				
	Take	litres		13.00	13.00	12.00	12.00	13.00				
3.17	Average Take	l/m		13.00	13.00	12.00	12.00	13.00			12.60	3.11
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	169764.0	169769.0	169775.0	169781.0	169787.0	169792.0				
	Take	litres		5.00	6.00	6.00	6.00	5.00				
1.59	Average Take	l/m		5.00	6.00	6.00	6.00	5.00			5.60	2.64





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	8.138	MAX k=	8.14E-05
		MIN Lu=	2.640	MIN k=	2.64E-05
INTERPRETATION REFERENCE:		AVG Lu=	2.640	AVG k=	2.64E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	YES

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3 Pin sheared at 13:48.

Slight flow from casing under P_1; leakage of approximately 5 L/min under P_2; leakage of approximately 0.25 L/min under P_3; slight fluctuation of gauge pressure due to pump

Short circulating, approximately 1 L/min; Packer system was borrowed from Rig 2, with much less flow than other Packers.

TEST BY: JPN REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07/DEC'10	ISSUED WITH REPORT 101-176\35-1	AL	CG	KJB

SHEET 6 OF 13

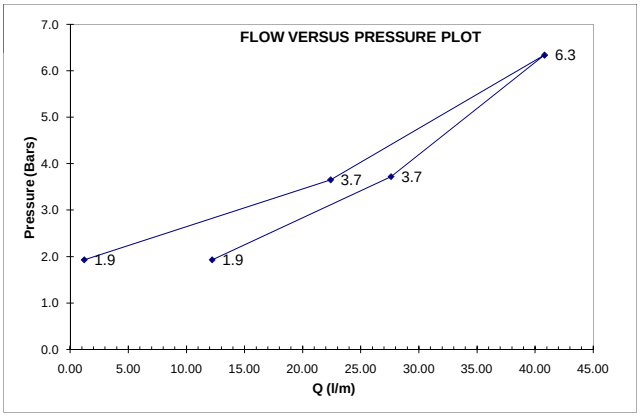
LUGEON TEST FIELD DATA SHEET

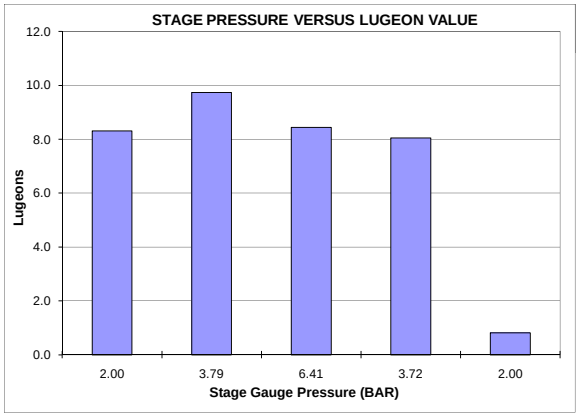
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	8

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	-1.3	m	TOP OF TEST INTERVAL:	185.00 ft (DOWN HOLE) / 56.40 m (DOWN HOLE)
DATE:	27-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	210.00 ft (DOWN HOLE) / 64.02 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	170075.0	170089.0	170097.0	170107.0	170122.0	170136.0				
	Take	litres		14.00	8.00	10.00	15.00	14.00				
2.00	Average Take	l/m		14.00	8.00	10.00	15.00	14.00			12.20	8.30
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	170160.0	170189.0	170217.0	170244.0	170271.0	170298.0				
	Take	litres		29.00	28.00	27.00	27.00	27.00				
3.79	Average Take	l/m		29.00	28.00	27.00	27.00	27.00			27.60	9.73
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	170330.0	170374.0	170415.0	170458.0	170493.0	170534.0				
	Take	litres		44.00	41.00	43.00	35.00	41.00				
6.41	Average Take	l/m		44.00	41.00	43.00	35.00	41.00			40.80	8.44
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	170540.0	170566.0	170587.0	170609.0	170630.0	170652.0				
	Take	litres		26.00	21.00	22.00	21.00	22.00				
3.72	Average Take	l/m		26.00	21.00	22.00	21.00	22.00			22.40	8.05
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	170655.0	170658.0	170659.5	170660.0	170660.5	170661.0				
	Take	litres		3.00	1.50	0.50	0.50	0.50				
2.00	Average Take	l/m		3.00	1.50	0.50	0.50	0.50			1.20	0.82





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	9.734	MAX k=	9.73E-05
		MIN Lu=	0.817	MIN k=	8.17E-06
INTERPRETATION REFERENCE:		AVG Lu=	7.070	AVG k=	7.07E-05

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Water column was full after; didn't need to fill-up

Leakage during P1, P2, P3 (~2gal/min), P4.

TEST BY:	AA	REVIEWED BY:	JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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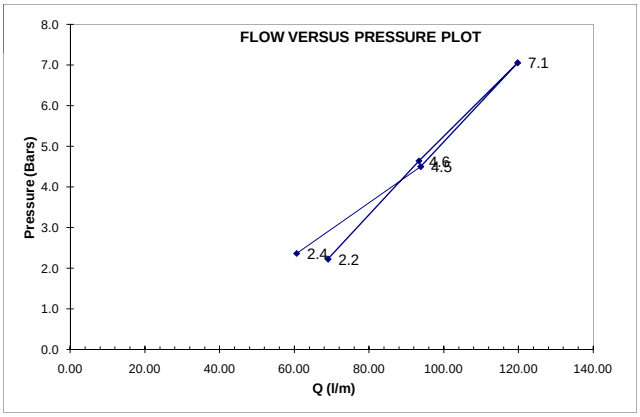
LUGEON TEST FIELD DATA SHEET

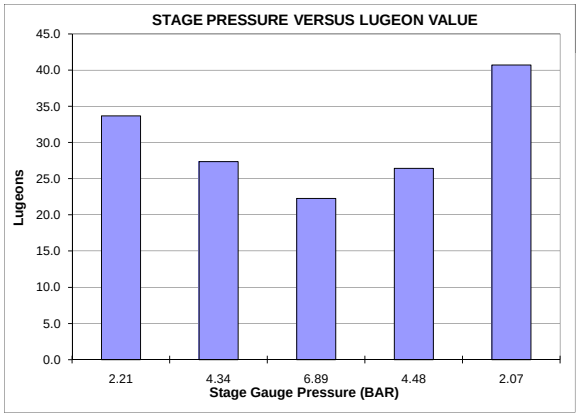
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	9

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.0	m	TOP OF TEST INTERVAL:	210.00 ft (DOWN HOLE) / 64.02 m (DOWN HOLE)
DATE:	28-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.5	m	BOTTOM OF TEST INTERVAL:	235.00 ft (DOWN HOLE) / 71.65 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	170730.0	170792.0	170851.0	170913.0	170973.0	171033.0				
	Take	litres		62.00	59.00	62.00	60.00	60.00				
2.21	Average Take	l/m		62.00	59.00	62.00	60.00	60.00			60.60	33.66
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	171110.0	171212.0	171302.0	171395.0	171487.0	171579.0				
	Take	litres		102.00	90.00	93.00	92.00	92.00				
4.34	Average Take	l/m		102.00	90.00	93.00	92.00	92.00			93.80	27.35
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	171670.0	171787.0	171909.0	172028.0	172149.0	0.0				
	Take	litres		117.00	122.00	119.00	121.00					
6.89	Average Take	l/m		117.00	122.00	119.00	121.00				119.75	22.28
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	172285.0	172390.0	172480.0	172565.0	0.0	0.0				
	Take	litres		105.00	90.00	85.00						
4.48	Average Take	l/m		105.00	90.00	85.00					93.33	26.41
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	172590.0	172654.0	172725.0	172796.0	172865.0	172935.0				
	Take	litres		64.00	71.00	71.00	69.00	70.00				
2.07	Average Take	l/m		64.00	71.00	71.00	69.00	70.00			69.00	40.70





		LUGEONS		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	40.704	MAX k=	4.07E-04
		MIN Lu=	22.284	MIN k=	2.23E-04
INTERPRETATION REFERENCE:		AVG Lu=	22.284	cm/s AVG k=	2.23E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Leakage throughout the entire test, approximately 4 gal/min.

Flows for all stages were modified to account for the leakage.

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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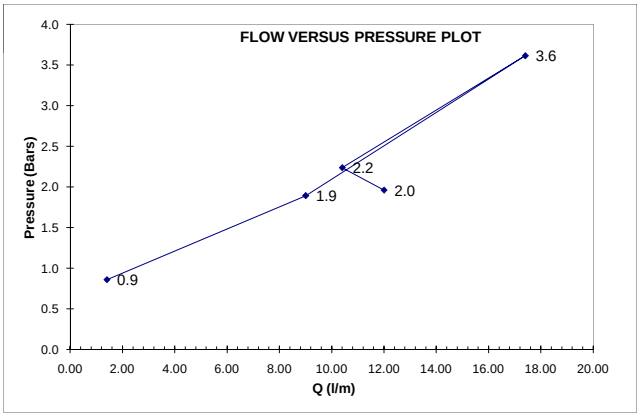
LUGEON TEST FIELD DATA SHEET

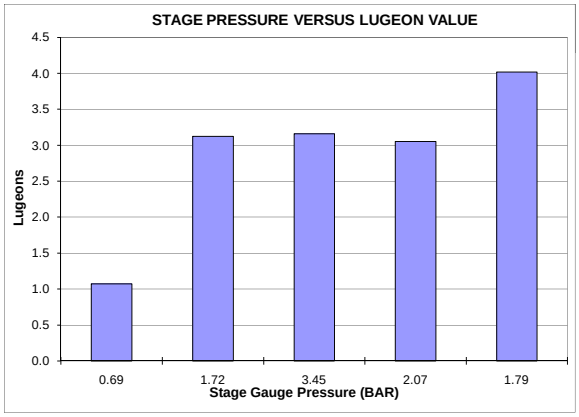
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	15

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.4	m	TOP OF TEST INTERVAL:	420.00 ft (DOWN HOLE) / 128.05 m (DOWN HOLE)
DATE:	30-Sep-10		GAUGE HEIGHT ABOVE GROUND:	0.3	m	BOTTOM OF TEST INTERVAL:	470.00 ft (DOWN HOLE) / 143.29 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173346.0	173348.0	173349.0	173350.0	173352.0	173353.0				
	Take	litres		2.00	1.00	1.00	2.00	1.00				
0.69	Average Take	l/m		2.00	1.00	1.00	2.00	1.00			1.40	1.07
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173271.0	173280.0	173289.0	173298.0	173307.0	173316.0				
	Take	litres		9.00	9.00	9.00	9.00	9.00				
1.72	Average Take	l/m		9.00	9.00	9.00	9.00	9.00			9.00	3.12
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173106.0	173124.0	173142.0	173159.0	173176.0	173193.0				
	Take	litres		18.00	18.00	17.00	17.00	17.00				
3.45	Average Take	l/m		18.00	18.00	17.00	17.00	17.00			17.40	3.16
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173363.0	173373.0	173384.0	173395.0	173406.0	173415.0				
	Take	litres		10.00	11.00	11.00	11.00	9.00				
2.07	Average Take	l/m		10.00	11.00	11.00	11.00	9.00			10.40	3.05
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173010.0	173023.0	173035.0	173047.0	173059.0	173070.0				
	Take	litres		13.00	12.00	12.00	12.00	11.00				
1.79	Average Take	l/m		13.00	12.00	12.00	12.00	11.00			12.00	4.02





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	4.016	MAX k=	4.02E-05
		MIN Lu=	1.072	MIN k=	1.07E-05
INTERPRETATION REFERENCE:		AVG Lu=	4.016	AVG k=	4.02E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	YES
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Constant Head Test Leakage at a rate of approximately 1 L/min

Pressure measurements read from gauge. Pressures originally not in order, but rearranged afterward to interpret flow.

TEST BY: DDF

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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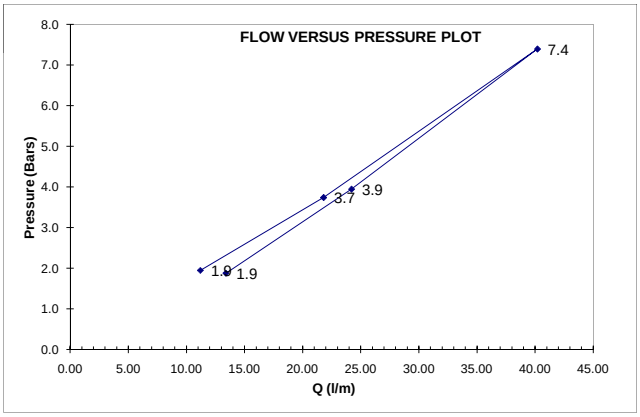
LUGEON TEST FIELD DATA SHEET

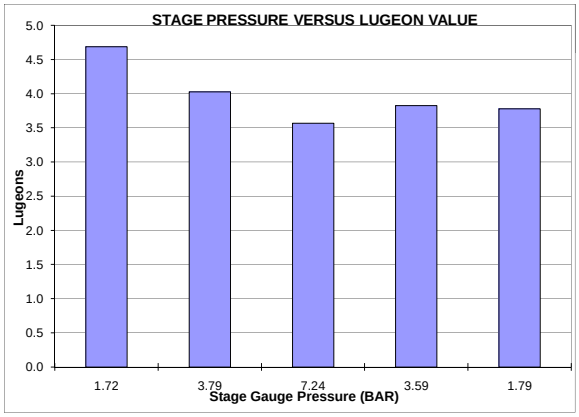
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	17

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.2	m	TOP OF TEST INTERVAL:	520.00 ft (DOWN HOLE) / 158.54 m (DOWN HOLE)
DATE:	1-Oct-10		GAUGE HEIGHT ABOVE GROUND:	0.3	m	BOTTOM OF TEST INTERVAL:	570.00 ft (DOWN HOLE) / 173.78 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173610.0	173624.0	173637.0	173650.0	173663.0	173677.0				
	Take	litres		14.00	13.00	13.00	13.00	14.00				
1.72	Average Take	l/m		14.00	13.00	13.00	13.00	14.00			13.40	4.69
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173713.0	173737.0	173761.0	173785.0	173810.0	173834.0				
	Take	litres		24.00	24.00	24.00	25.00	24.00				
3.79	Average Take	l/m		24.00	24.00	24.00	25.00	24.00			24.20	4.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	173918.0	173958.0	173999.0	174039.0	174079.0	174119.0				
	Take	litres		40.00	41.00	40.00	40.00	40.00				
7.24	Average Take	l/m		40.00	41.00	40.00	40.00	40.00			40.20	3.57
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	174210.0	174232.0	174253.0	174275.0	174296.0	174319.0				
	Take	litres		22.00	21.00	22.00	21.00	23.00				
3.59	Average Take	l/m		22.00	21.00	22.00	21.00	23.00			21.80	3.83
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	174352.0	174363.0	174374.0	174385.0	174397.0	174408.0				
	Take	litres		11.00	11.00	11.00	12.00	11.00				
1.79	Average Take	l/m		11.00	11.00	11.00	12.00	11.00			11.20	3.78





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	4.686	MAX k=	4.69E-05
		MIN Lu=	3.568	MIN k=	3.57E-05
INTERPRETATION REFERENCE:		AVG Lu=	3.977	AVG k=	3.98E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:
Flowmeter units: m3
Pressure measurements from flow meter gauge

TEST BY: DDF

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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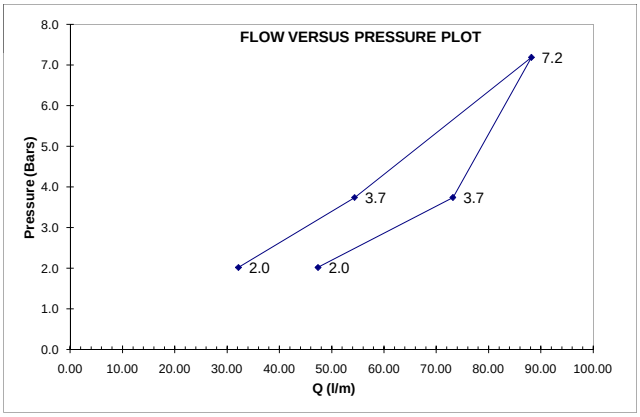
LUGEON TEST FIELD DATA SHEET

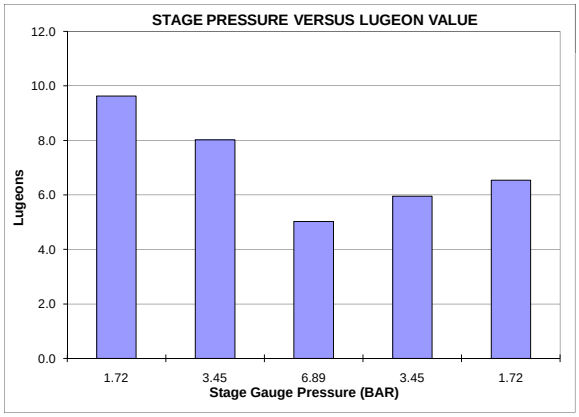
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	18

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.3	m	TOP OF TEST INTERVAL:	520.00 ft (DOWN HOLE) / 158.54 m (DOWN HOLE)
DATE:	2-Oct-10		GAUGE HEIGHT ABOVE GROUND:	1.6	m	BOTTOM OF TEST INTERVAL:	600.00 ft (DOWN HOLE) / 182.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	174480.0	174534.0	174580.0	174626.0	174671.0	174717.0				
	Take	litres		54.00	46.00	46.00	45.00	46.00				
1.72	Average Take	l/m		54.00	46.00	46.00	45.00	46.00			47.40	9.62
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	174760.0	174833.0	174906.0	174979.0	175053.0	175126.0				
	Take	litres		73.00	73.00	73.00	74.00	73.00				
3.45	Average Take	l/m		73.00	73.00	73.00	74.00	73.00			73.20	8.02
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	175205.0	175299.0	175390.0	175478.0	175562.0	175646.0				
	Take	litres		94.00	91.00	88.00	84.00	84.00				
6.89	Average Take	l/m		94.00	91.00	88.00	84.00	84.00			88.20	5.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	175670.0	175725.0	175780.0	175833.0	175880.0	175942.0				
	Take	litres		55.00	55.00	53.00	47.00	62.00				
3.45	Average Take	l/m		55.00	55.00	53.00	47.00	62.00			54.40	5.96
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	175950.0	175980.0	176014.0	176046.0	176078.0	176111.0				
	Take	litres		30.00	34.00	32.00	32.00	33.00				
1.72	Average Take	l/m		30.00	34.00	32.00	32.00	33.00			32.20	6.54





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	9.624	MAX k=	9.62E-05
		MIN Lu=	5.029	MIN k=	5.03E-05
INTERPRETATION REFERENCE:		AVG Lu=	5.029	AVG k=	5.03E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m3

Pressure measurements from flow meter gauge; new pressure gauge was installed.

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 11 OF 13

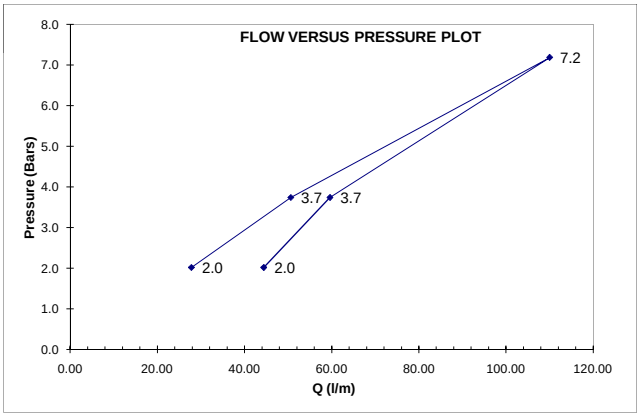
LUGEON TEST FIELD DATA SHEET

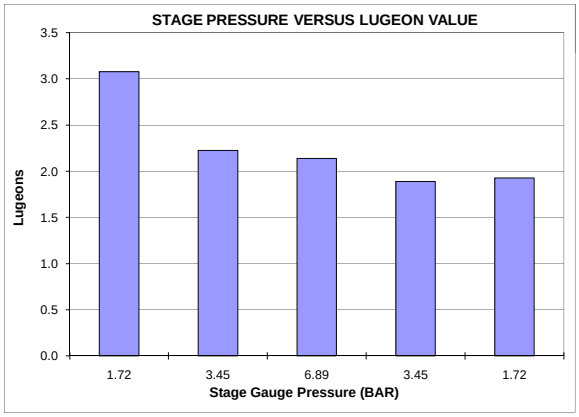
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	19

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.3	m	TOP OF TEST INTERVAL:	365.00 ft (DOWN HOLE) / 111.28 m (DOWN HOLE)
DATE:	3-Oct-10		GAUGE HEIGHT ABOVE GROUND:	1.6	m	BOTTOM OF TEST INTERVAL:	600.00 ft (DOWN HOLE) / 182.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	176132.0	176180.0	176224.0	176268.0	176311.0	176354.0				
	Take	litres		48.00	44.00	44.00	43.00	43.00				
1.72	Average Take	l/m		48.00	44.00	44.00	43.00	43.00			44.40	3.08
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	176384.0	176443.0	176502.0	176560.0	176621.0	176682.0				
	Take	litres		59.00	59.00	58.00	61.00	61.00				
3.45	Average Take	l/m		59.00	59.00	58.00	61.00	61.00			59.60	2.23
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	176740.0	176853.0	176966.0	177064.0	177177.0	177290.0				
	Take	litres		113.00	113.00	98.00	113.00	113.00				
6.89	Average Take	l/m		113.00	113.00	98.00	113.00	113.00			110.00	2.14
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	177330.0	177384.0	177436.0	177487.0	177536.0	177583.0				
	Take	litres		54.00	52.00	51.00	49.00	47.00				
3.45	Average Take	l/m		54.00	52.00	51.00	49.00	47.00			50.60	1.89
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	177595.0	177620.0	177649.0	177678.0	177706.0	177734.0				
	Take	litres		25.00	29.00	29.00	28.00	28.00				
1.72	Average Take	l/m		25.00	29.00	29.00	28.00	28.00			27.80	1.93





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	3.079	MAX k=	3.08E-05
		MIN Lu=	1.890	MIN k=	1.89E-05
INTERPRETATION REFERENCE:		AVG Lu=	2.252	AVG k=	2.25E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Pressure measurements from flow meter gauge

Water pressure issues during P_3

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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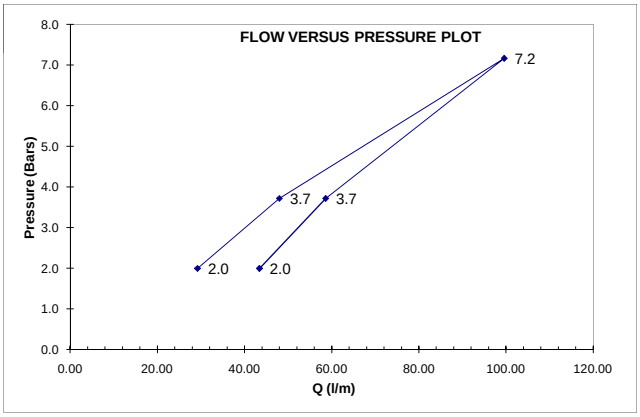
LUGEON TEST FIELD DATA SHEET

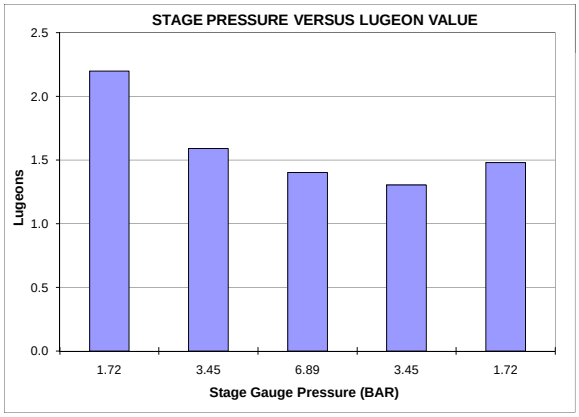
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	20

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	1.1	m	TOP OF TEST INTERVAL:	275.00 ft (DOWN HOLE) / 83.84 m (DOWN HOLE)
DATE:	3-Oct-10		GAUGE HEIGHT ABOVE GROUND:	1.6	m	BOTTOM OF TEST INTERVAL:	600.00 ft (DOWN HOLE) / 182.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	177765.0	177804.0	177857.0	177900.0	177941.0	177982.0				
	Take	litres		39.00	53.00	43.00	41.00	41.00				
1.72	Average Take	l/m		39.00	53.00	43.00	41.00	41.00			43.40	2.20
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	178020.0	178085.0	178149.0	178204.0	178259.0	178313.0				
	Take	litres		65.00	64.00	55.00	55.00	54.00				
3.45	Average Take	l/m		65.00	64.00	55.00	55.00	54.00			58.60	1.59
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	178395.0	178492.0	178594.0	178694.0	178794.0	178893.0				
	Take	litres		97.00	102.00	100.00	100.00	99.00				
6.89	Average Take	l/m		97.00	102.00	100.00	100.00	99.00			99.60	1.40
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	178923.0	178971.0	179020.0	179067.0	179116.0	179163.0				
	Take	litres		48.00	49.00	47.00	49.00	47.00				
3.45	Average Take	l/m		48.00	49.00	47.00	49.00	47.00			48.00	1.30
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	179180.0	179209.0	179238.0	179267.0	179297.0	179326.0				
	Take	litres		29.00	29.00	29.00	30.00	29.00				
1.72	Average Take	l/m		29.00	29.00	29.00	30.00	29.00			29.20	1.48





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.198	MAX k=	2.20E-05
		MIN Lu=	1.304	MIN k=	1.30E-05
INTERPRETATION REFERENCE:		AVG Lu=	1.595	AVG k=	1.60E-05

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Pressure measurements from flow meter gauge

TEST BY:	AA	REVIEWED BY:	JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 13 OF 13

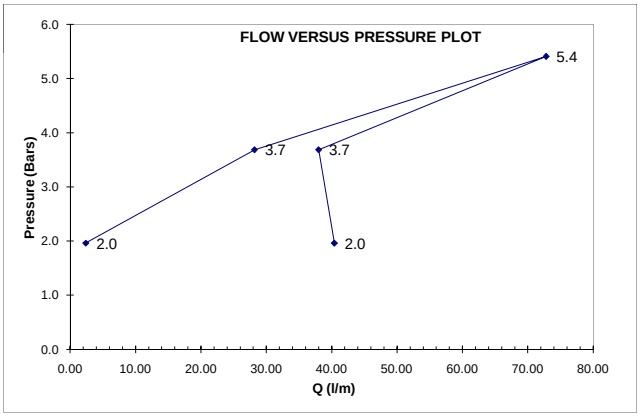
LUGEON TEST FIELD DATA SHEET

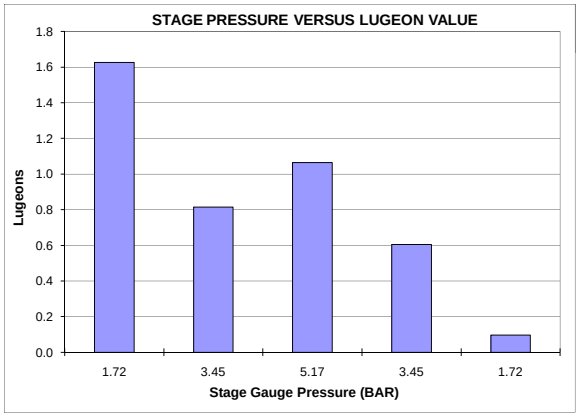
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-220
AREA:	Area L			TEST NO:	21

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	0.7	m	TOP OF TEST INTERVAL:	185.00 ft (DOWN HOLE) / 56.40 m (DOWN HOLE)
DATE:	3-Oct-10		GAUGE HEIGHT ABOVE GROUND:	1.6	m	BOTTOM OF TEST INTERVAL:	600.00 ft (DOWN HOLE) / 182.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	179350.0	179395.0	179438.0	179477.0	179520.0	179552.0				
	Take	litres		45.00	43.00	39.00	43.00	32.00				
1.72	Average Take	l/m		45.00	43.00	39.00	43.00	32.00			40.40	1.63
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	179585.0	179625.0	179664.0	179703.0	179734.0	179775.0				
	Take	litres		40.00	39.00	39.00	31.00	41.00				
3.45	Average Take	l/m		40.00	39.00	39.00	31.00	41.00			38.00	0.81
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	179790.0	179862.0	179936.0	180008.0	180082.0	180154.0				
	Take	litres		72.00	74.00	72.00	74.00	72.00				
5.17	Average Take	l/m		72.00	74.00	72.00	74.00	72.00			72.80	1.06
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	180170.0	180199.0	180226.0	180254.0	180282.0	180311.0				
	Take	litres		29.00	27.00	28.00	28.00	29.00				
3.45	Average Take	l/m		29.00	27.00	28.00	28.00	29.00			28.20	0.60
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	180315.0	180318.0	180320.0	180322.0	180325.0	180327.0				
	Take	litres		3.00	2.00	2.00	3.00	2.00				
1.72	Average Take	l/m		3.00	2.00	2.00	3.00	2.00			2.40	0.10





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	1.626	MAX k=	1.63E-05
		MIN Lu=	0.097	MIN k=	9.66E-07
INTERPRETATION REFERENCE:		AVG Lu=	0.097	AVG k=	9.66E-07

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	YES

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Pressure measurements from flow meter gauge

No last reading because ran out of water

TEST BY:	AA	REVIEWED BY:	JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

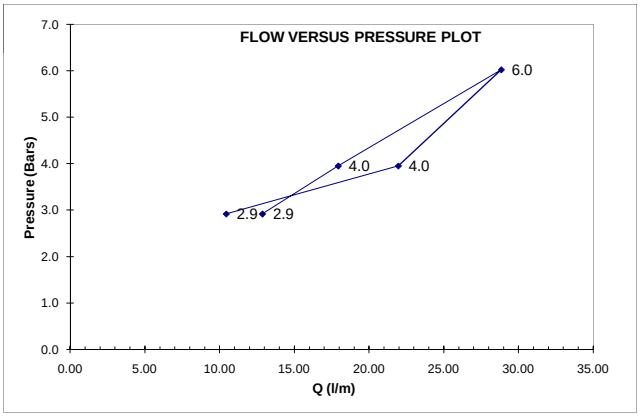
LUGEON TEST FIELD DATA SHEET

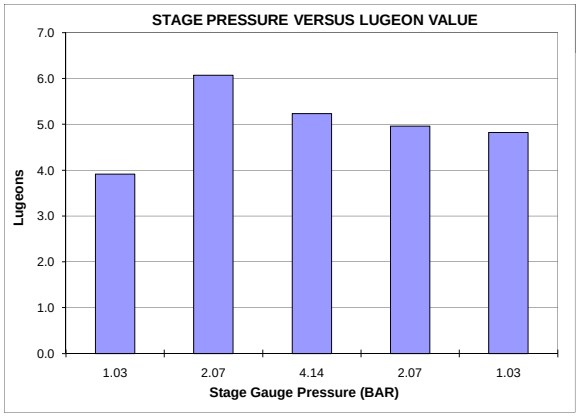
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-222
AREA:	Open Pit Area			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	18.7	m	TOP OF TEST INTERVAL:	100.00 ft (DOWN HOLE) / 30.49 m (DOWN HOLE)
DATE:	2-Oct-10		GAUGE HEIGHT ABOVE GROUND:	0.2	m	BOTTOM OF TEST INTERVAL:	130.00 ft (DOWN HOLE) / 39.63 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	41215.6	41228.8	41239.0	41248.5	41257.2	41267.8				
	Take	litres		13.25	10.22	9.46	8.71	10.60				
1.03	Average Take	l/m		13.25	10.22	9.46	8.71	10.60			10.45	3.91
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	41287.5	41305.7	41324.2	41344.6	41376.4	41397.3				
	Take	litres		18.17	18.55	20.44	31.80	20.82				
2.07	Average Take	l/m		18.17	18.55	20.44	31.80	20.82			21.96	6.07
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	41431.3	41461.2	41490.4	41519.2	41547.9	41575.6				
	Take	litres		29.90	29.15	28.77	28.77	27.63				
4.14	Average Take	l/m		29.90	29.15	28.77	28.77	27.63			28.84	5.24
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	41586.5	41605.1	41623.3	41640.7	41658.5	41676.2				
	Take	litres		18.55	18.17	17.41	17.79	17.79				
2.07	Average Take	l/m		18.55	18.17	17.41	17.79	17.79			17.94	4.96
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	41683.1	41696.3	41709.9	41722.1	41735.3	41747.4				
	Take	litres		13.25	13.63	12.11	13.25	12.11				
1.03	Average Take	l/m		13.25	13.63	12.11	13.25	12.11			12.87	4.82





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	6.072	MAX k=	6.07E-05
		MIN Lu=	3.913	MIN k=	3.91E-05
INTERPRETATION REFERENCE:		AVG Lu=	5.001	AVG k=	5.00E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons
Leakage during the 2nd pressure
Packer was inflated with Nitrogen.

TEST BY: BO

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 2

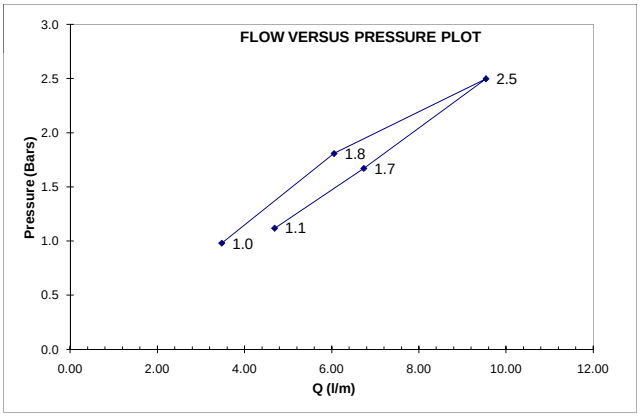
LUGEON TEST FIELD DATA SHEET

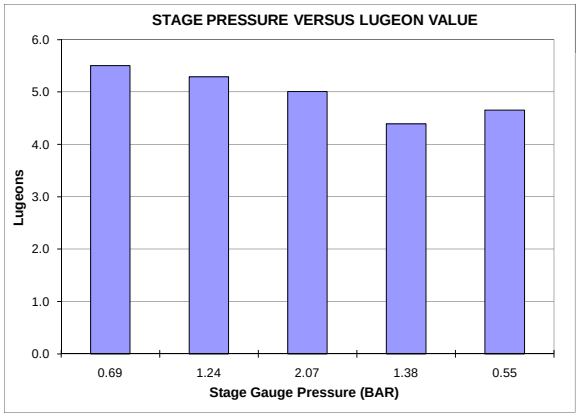
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-223
AREA:	Open Pit Area			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	2.8	m	TOP OF TEST INTERVAL:	60.00 ft (DOWN HOLE) / 18.29 m (DOWN HOLE)
DATE:	5-Oct-10		GAUGE HEIGHT ABOVE GROUND:	1.5	m	BOTTOM OF TEST INTERVAL:	85.00 ft (DOWN HOLE) / 25.91 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42184.3	42189.5	42194.5	42198.6	42203.2	42207.7				
	Take	litres		5.30	4.92	4.16	4.54	4.54				
0.69	Average Take	l/m		5.30	4.92	4.16	4.54	4.54			4.69	5.50
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42210.0	42216.4	42223.6	42230.1	42236.9	42243.7				
	Take	litres		6.44	7.19	6.44	6.81	6.81				
1.24	Average Take	l/m		6.44	7.19	6.44	6.81	6.81			6.74	5.29
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42248.6	42259.2	42267.9	42277.8	42287.2	42296.3				
	Take	litres		10.60	8.71	9.84	9.46	9.08				
2.07	Average Take	l/m		10.60	8.71	9.84	9.46	9.08			9.54	5.01
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42298.9	42304.6	42310.7	42317.1	42323.2	42329.2				
	Take	litres		5.68	6.06	6.44	6.06	6.06				
1.38	Average Take	l/m		5.68	6.06	6.44	6.06	6.06			6.06	4.39
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42331.1	42334.5	42337.9	42341.3	42345.1	42348.5				
	Take	litres		3.41	3.41	3.41	3.79	3.41				
0.55	Average Take	l/m		3.41	3.41	3.41	3.79	3.41			3.48	4.65





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	5.501	MAX k=	5.50E-05
		MIN Lu=	4.393	MIN k=	4.39E-05
INTERPRETATION REFERENCE:		AVG Lu=	4.970	AVG k=	4.97E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 2

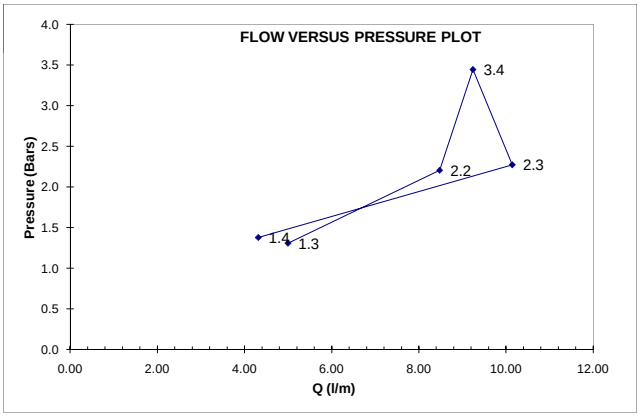
LUGEON TEST FIELD DATA SHEET

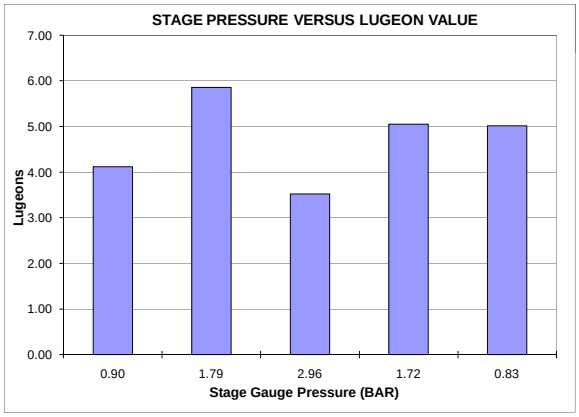
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-223
AREA:	Open Pit Area			TEST NO:	2

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	3.3 m	TOP OF TEST INTERVAL:	85.00 ft (DOWN HOLE)	25.91 m (DOWN HOLE)
DATE:	5-Oct-10	GAUGE HEIGHT ABOVE GROUND:	1.5 m	BOTTOM OF TEST INTERVAL:	110.00 ft (DOWN HOLE)	33.54 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42373.5	42378.1	42383.0	42387.1	42391.3	42395.1				
	Take	litres		4.54	4.92	4.16	4.16	3.79				
0.90	Average Take	l/m		4.54	4.92	4.16	4.16	3.79			4.32	4.11
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42398.5	42408.0	42417.8	42428.4	42438.6	42449.2				
	Take	litres		9.46	9.84	10.60	10.22	10.60				
1.79	Average Take	l/m		9.46	9.84	10.60	10.22	10.60			10.14	5.86
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42464.7	42487.5	42496.5	42510.9	42510.9	42511.0				
	Take	litres		22.71	9.08	14.38	0.02	0.01				
2.96	Average Take	l/m		22.71	9.08	14.38	0.02	0.01			9.24	3.52
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42580.2	42588.9	42597.2	42605.6	42613.9	42622.6				
	Take	litres		8.71	8.33	8.33	8.33	8.71				
1.72	Average Take	l/m		8.71	8.33	8.33	8.33	8.71			8.48	5.05
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	42626.0	42630.9	42635.9	42641.1	42646.4	42651.0				
	Take	litres		4.92	4.92	5.30	5.30	4.54				
0.83	Average Take	l/m		4.92	4.92	5.30	5.30	4.54			5.00	5.02





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	5.857	MAX k=	5.86E-05
		MIN Lu=	3.521	MIN k=	3.52E-05
INTERPRETATION REFERENCE:		AVG Lu=	5.009	AVG k=	5.01E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	YES
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons

Leakage under P2 and P3, so increased inflation pressure to minimize leakage

TEST BY: AA

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 2

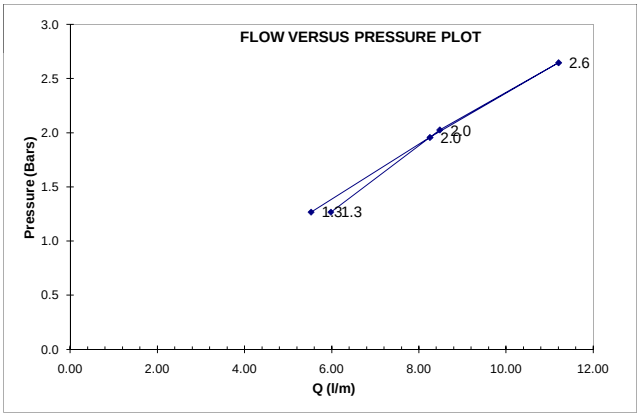
LUGEON TEST FIELD DATA SHEET

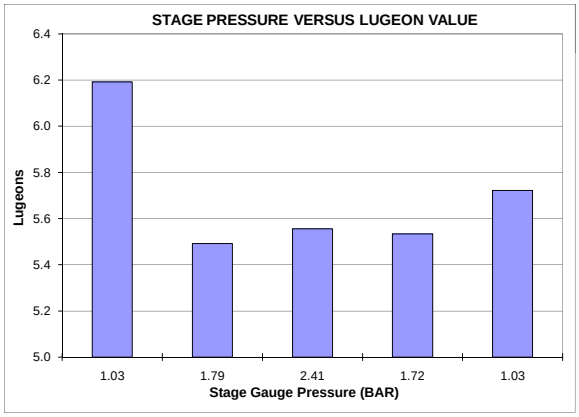
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-224
AREA:	Open Pit Area			TEST NO:	1

DIP:	90 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	2.0	m	TOP OF TEST INTERVAL:	35.00 ft (DOWN HOLE) / 10.67 m (DOWN HOLE)
DATE:	7-Oct-10		GAUGE HEIGHT ABOVE GROUND:	0.4	m	BOTTOM OF TEST INTERVAL:	60.00 ft (DOWN HOLE) / 18.29 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	7.6	13.6	19.3	25.4	31.0	37.5				
	Take	litres		6.06	5.68	6.06	5.68	6.44				
1.03	Average Take	l/m		6.06	5.68	6.06	5.68	6.44			5.98	6.19
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	13.2	21.6	30.3	39.0	47.3	55.6				
	Take	litres		8.33	8.71	8.71	8.33	8.33				
1.79	Average Take	l/m		8.33	8.71	8.71	8.33	8.33			8.48	5.49
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	34.1	45.4	56.4	67.8	78.7	90.1				
	Take	litres		11.36	10.98	11.36	10.98	11.36				
2.41	Average Take	l/m		11.36	10.98	11.36	10.98	11.36			11.20	5.56
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	30.3	38.6	46.6	54.9	63.2	71.5				
	Take	litres		8.33	7.95	8.33	8.33	8.33				
1.72	Average Take	l/m		8.33	7.95	8.33	8.33	8.33			8.25	5.53
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	3.8	9.5	14.8	20.4	25.7	31.4				
	Take	litres		5.68	5.30	5.68	5.30	5.68				
1.03	Average Take	l/m		5.68	5.30	5.68	5.30	5.68			5.53	5.72





			LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:	Water meter	MAX Lu=	6.192	MAX k=	6.19E-05
		MIN Lu=	5.492	MIN k=	5.49E-05
INTERPRETATION REFERENCE:		AVG Lu=	5.699	AVG k=	5.70E-05

INTERPRETATION TYPE OF FLOW:			
	1	LAMINAR	YES
	2	TURBULENT	NO
	3	DILATION	NO
	4	WASH-OUT	NO
	5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Small leak out of swivel head, no other leaks noticed. Water pump pulsed.
Flowmeter Units: US Gallons

TEST BY:	BH	REVIEWED BY:	JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
#0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 2

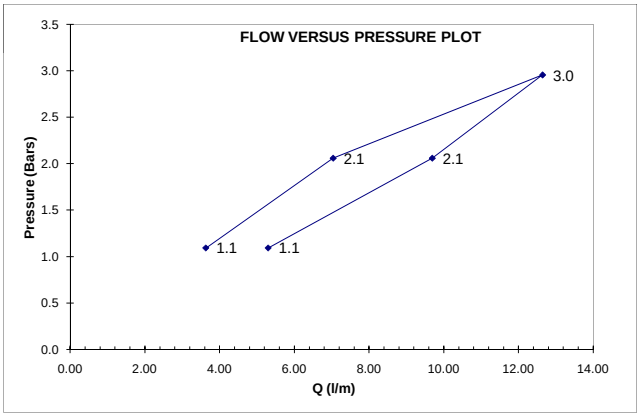
LUGEON TEST FIELD DATA SHEET

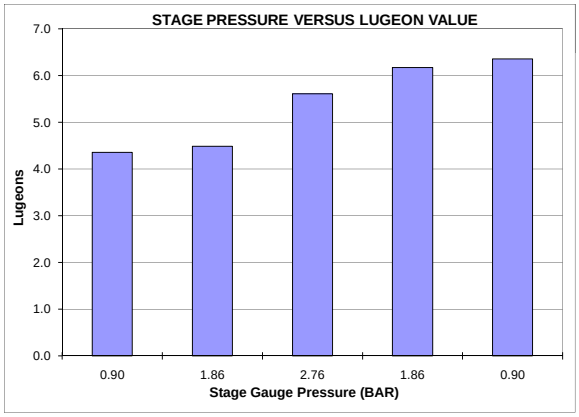
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-224
AREA:	Open Pit Area			TEST NO:	2

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	1.7 m	TOP OF TEST INTERVAL:	55.00 ft (DOWN HOLE)	16.77 m (DOWN HOLE)
DATE:	7-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	80.00 ft (DOWN HOLE)	24.39 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	4.2	7.9	11.4	14.4	18.2				
	Take	litres		4.16	3.79	3.41	3.03	3.79				
0.90	Average Take	l/m		4.16	3.79	3.41	3.03	3.79			3.63	4.36
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	7.2	14.4	21.2	28.4	35.2				
	Take	litres		7.19	7.19	6.81	7.19	6.81				
1.86	Average Take	l/m		7.19	7.19	6.81	7.19	6.81			7.04	4.49
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	12.9	25.4	37.9	50.3	63.2				
	Take	litres		12.87	12.49	12.49	12.49	12.87				
2.76	Average Take	l/m		12.87	12.49	12.49	12.49	12.87			12.64	5.61
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	9.8	19.7	29.1	39.0	48.5				
	Take	litres		9.84	9.84	9.46	9.84	9.46				
1.86	Average Take	l/m		9.84	9.84	9.46	9.84	9.46			9.69	6.18
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	4.9	10.2	15.9	21.2	26.5				
	Take	litres		4.92	5.30	5.68	5.30	5.30				
0.90	Average Take	l/m		4.92	5.30	5.68	5.30	5.30			5.30	6.36





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	6.360	MAX k=	6.36E-05
		MIN Lu=	4.361	MIN k=	4.36E-05
INTERPRETATION REFERENCE:		AVG Lu=	6.360	AVG k=	6.36E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	YES
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons

TEST BY: SHC

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 12

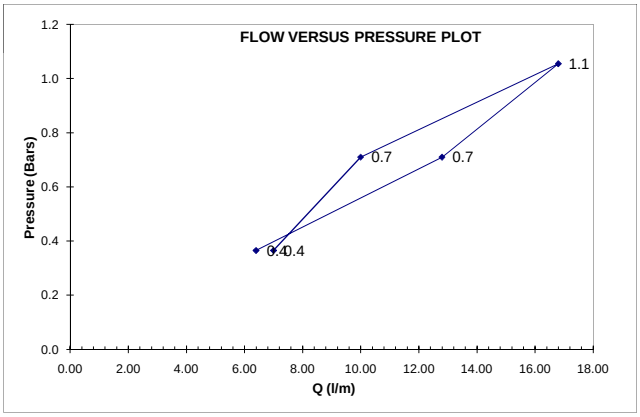
LUGEON TEST FIELD DATA SHEET

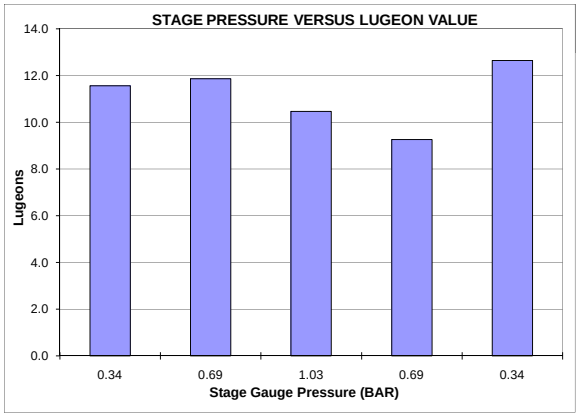
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	1

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.1 m	TOP OF TEST INTERVAL:	40.00 ft (DOWN HOLE)	12.20 m (DOWN HOLE)
DATE:	6-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	90.00 ft (DOWN HOLE)	27.44 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	180922.0	180928.5	180935.0	180941.0	180947.5	180954.0				
	Take	litres		6.50	6.50	6.00	6.50	6.50				
0.34	Average Take	l/m		6.50	6.50	6.00	6.50	6.50			6.40	11.57
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	180986.0	180999.0	181013.0	181025.0	181038.0	181050.0				
	Take	litres		13.00	14.00	12.00	13.00	12.00				
0.69	Average Take	l/m		13.00	14.00	12.00	13.00	12.00			12.80	11.87
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181095.0	181113.0	181130.0	181146.0	181162.0	181179.0				
	Take	litres		18.00	17.00	16.00	16.00	17.00				
1.03	Average Take	l/m		18.00	17.00	16.00	16.00	17.00			16.80	10.47
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181215.0	181225.0	181234.0	181245.0	181255.0	181265.0				
	Take	litres		10.00	9.00	11.00	10.00	10.00				
0.69	Average Take	l/m		10.00	9.00	11.00	10.00	10.00			10.00	9.27
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181293.0	181298.0	181307.0	181314.0	181321.0	181328.0				
	Take	litres		5.00	9.00	7.00	7.00	7.00				
0.34	Average Take	l/m		5.00	9.00	7.00	7.00	7.00			7.00	12.65





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	12.655	MAX k=	1.27E-04
		MIN Lu=	9.271	MIN k=	9.27E-05
INTERPRETATION REFERENCE:		AVG Lu=	11.167	AVG k=	1.12E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	07DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 2 OF 12

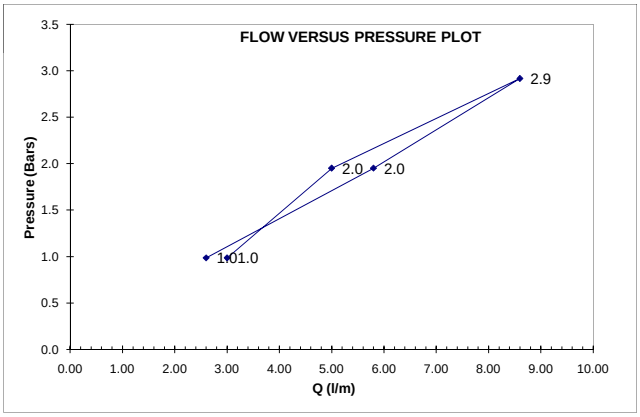
LUGEON TEST FIELD DATA SHEET

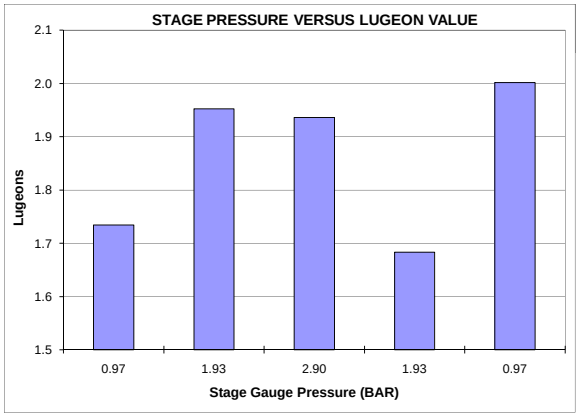
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	2

DIP:	65 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.1 m	TOP OF TEST INTERVAL:	90.00 ft (DOWN HOLE)	27.44 m (DOWN HOLE)
DATE:	8-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	140.00 ft (DOWN HOLE)	42.68 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181739.0	181742.0	181744.0	181747.0	181750.0	181752.0				
	Take	litres		3.00	2.00	3.00	3.00	2.00				
0.97	Average Take	l/m		3.00	2.00	3.00	3.00	2.00			2.60	1.73
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181761.0	181767.0	181773.0	181778.0	181784.0	181790.0				
	Take	litres		6.00	6.00	5.00	6.00	6.00				
1.93	Average Take	l/m		6.00	6.00	5.00	6.00	6.00			5.80	1.95
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181808.0	181817.0	181826.0	181834.0	181843.0	181851.0				
	Take	litres		9.00	9.00	8.00	9.00	8.00				
2.90	Average Take	l/m		9.00	9.00	8.00	9.00	8.00			8.60	1.94
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181868.0	181873.0	181878.0	181883.0	181888.0	181893.0				
	Take	litres		5.00	5.00	5.00	5.00	5.00				
1.93	Average Take	l/m		5.00	5.00	5.00	5.00	5.00			5.00	1.68
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	181901.0	181904.0	181907.0	181910.0	181913.0	181916.0				
	Take	litres		3.00	3.00	3.00	3.00	3.00				
0.97	Average Take	l/m		3.00	3.00	3.00	3.00	3.00			3.00	2.00





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.002	MAX k=	2.00E-05
		MIN Lu=	1.683	MIN k=	1.68E-05
INTERPRETATION REFERENCE:		AVG Lu=	1.862	AVG k=	1.86E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 3 OF 12

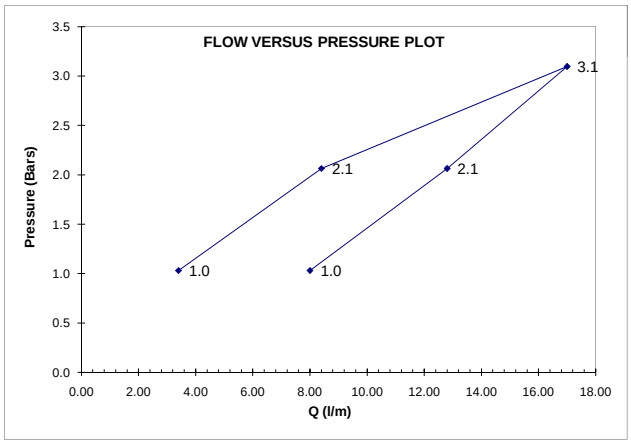
LUGEON TEST FIELD DATA SHEET

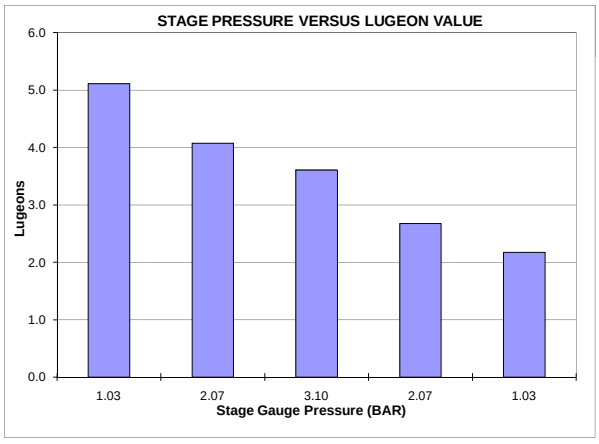
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Site G			TEST NO:	3

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.4 m	TOP OF TEST INTERVAL:	140.00 ft (DOWN HOLE)	42.68 m (DOWN HOLE)
DATE:	8-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	190.00 ft (DOWN HOLE)	57.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	182025.0	182034.0	182043.0	182051.0	182058.0	182065.0				
	Take	litres		9.00	9.00	8.00	7.00	7.00				
1.03	Average Take	l/m		9.00	9.00	8.00	7.00	7.00			8.00	5.11
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	182097.0	182111.0	182124.0	182137.0	182149.0	182161.0				
	Take	litres		14.00	13.00	13.00	12.00	12.00				
2.07	Average Take	l/m		14.00	13.00	13.00	12.00	12.00			12.80	4.07
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	182205.0	182223.0	182241.0	182258.0	182274.0	182290.0				
	Take	litres		18.00	18.00	17.00	16.00	16.00				
3.10	Average Take	l/m		18.00	18.00	17.00	16.00	16.00			17.00	3.60
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	182320.0	182328.0	182336.0	182345.0	182353.0	182362.0				
	Take	litres		8.00	8.00	9.00	8.00	9.00				
2.07	Average Take	l/m		8.00	8.00	9.00	8.00	9.00			8.40	2.67
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	182375.0	182378.0	182381.0	182385.0	182388.0	182392.0				
	Take	litres		3.00	3.00	4.00	3.00	4.00				
1.03	Average Take	l/m		3.00	3.00	4.00	3.00	4.00			3.40	2.17





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	5.111	MAX k=	5.11E-05
		MIN Lu=	2.172	MIN k=	2.17E-05
INTERPRETATION REFERENCE:		AVG Lu=	2.172	AVG k=	2.17E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	YES

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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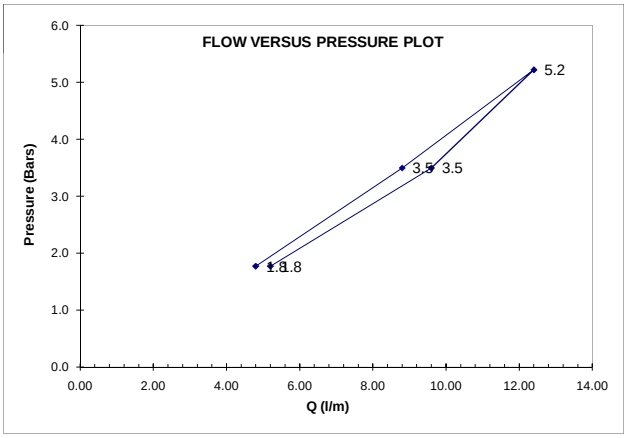
LUGEON TEST FIELD DATA SHEET

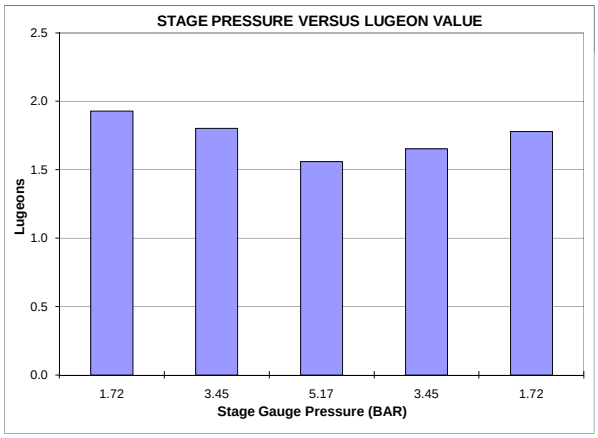
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	4

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	0.2 m	TOP OF TEST INTERVAL:	190.00 ft (DOWN HOLE)	57.93 m (DOWN HOLE)
DATE:	9-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	240.00 ft (DOWN HOLE)	73.17 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183045.0	183051.0	183056.0	183061.0	183066.0	183071.0				
	Take	litres		6.00	5.00	5.00	5.00	5.00				
1.72	Average Take	l/m		6.00	5.00	5.00	5.00	5.00			5.20	1.93
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183098.0	183108.0	183118.0	183127.0	183137.0	183146.0				
	Take	litres		10.00	10.00	9.00	10.00	9.00				
3.45	Average Take	l/m		10.00	10.00	9.00	10.00	9.00			9.60	1.80
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183180.0	183193.0	183205.0	183218.0	183230.0	183242.0				
	Take	litres		13.00	12.00	13.00	12.00	12.00				
5.17	Average Take	l/m		13.00	12.00	13.00	12.00	12.00			12.40	1.56
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183265.0	183274.0	183283.0	183292.0	183300.0	183309.0				
	Take	litres		9.00	9.00	9.00	8.00	9.00				
3.45	Average Take	l/m		9.00	9.00	9.00	8.00	9.00			8.80	1.65
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183325.0	183330.0	183334.0	183339.0	183344.0	183349.0				
	Take	litres		5.00	4.00	5.00	5.00	5.00				
1.72	Average Take	l/m		5.00	4.00	5.00	5.00	5.00			4.80	1.78





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	1.928	MAX k=	1.93E-05
		MIN Lu=	1.559	MIN k=	1.56E-05
INTERPRETATION REFERENCE:		AVG Lu=	1.744	AVG k=	1.74E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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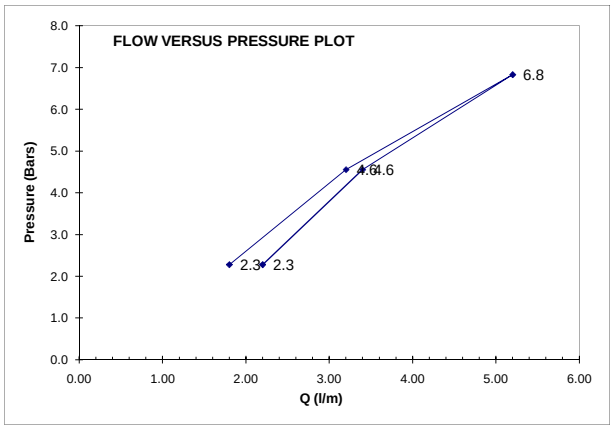
LUGEON TEST FIELD DATA SHEET

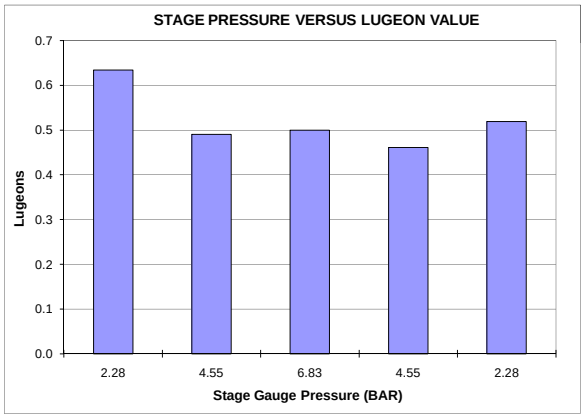
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	5

DIP:	66 ° (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.3 m	TOP OF TEST INTERVAL:	220.00 ft (DOWN HOLE)	67.07 m (DOWN HOLE)
DATE:	10-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	270.00 ft (DOWN HOLE)	82.32 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183579.0	183581.0	183584.0	183586.0	183588.0	183590.0				
	Take	litres		2.00	3.00	2.00	2.00	2.00				
2.28	Average Take	l/m		2.00	3.00	2.00	2.00	2.00			2.20	0.63
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183600.0	183604.0	183607.0	183611.0	183614.0	183617.0				
	Take	litres		4.00	3.00	4.00	3.00	3.00				
4.55	Average Take	l/m		4.00	3.00	4.00	3.00	3.00			3.40	0.49
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183634.0	183639.0	183644.0	183650.0	183655.0	183660.0				
	Take	litres		5.00	5.00	6.00	5.00	5.00				
6.83	Average Take	l/m		5.00	5.00	6.00	5.00	5.00			5.20	0.50
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183671.0	183674.0	183677.0	183681.0	183684.0	183687.0				
	Take	litres		3.00	3.00	4.00	3.00	3.00				
4.55	Average Take	l/m		3.00	3.00	4.00	3.00	3.00			3.20	0.46
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183694.0	183696.0	183697.0	183699.0	183701.0	183703.0				
	Take	litres		2.00	1.00	2.00	2.00	2.00				
2.28	Average Take	l/m		2.00	1.00	2.00	2.00	2.00			1.80	0.52





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.634	MAX k=	6.34E-06
		MIN Lu=	0.461	MIN k=	4.61E-06
INTERPRETATION REFERENCE:		AVG Lu=	0.521	AVG k=	5.21E-06

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: m^3

Leak. Leaking at 33 psi: 750 ml per minute Leaking at 66 psi: 909 ml per minute

Leaking at 99 psi: 1000 ml per minute

TEST BY: CBN REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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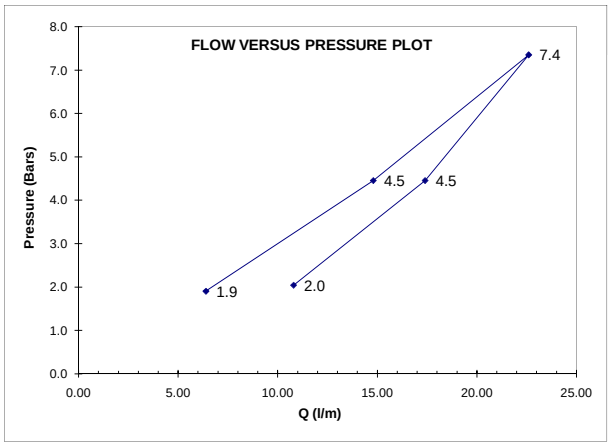
LUGEON TEST FIELD DATA SHEET

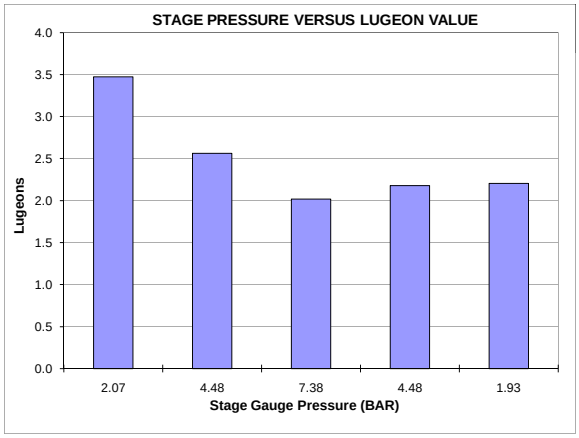
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	6

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.6 m	TOP OF TEST INTERVAL:	270.00 ft (DOWN HOLE)	82.32 m (DOWN HOLE)
DATE:	10-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	320.00 ft (DOWN HOLE)	97.56 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183740.0	183752.0	183763.0	183773.0	183784.0	183794.0				
	Take	litres		12.00	11.00	10.00	11.00	10.00				
2.07	Average Take	l/m		12.00	11.00	10.00	11.00	10.00			10.80	3.47
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183838.0	183856.0	183873.0	183891.0	183908.0	183925.0				
	Take	litres		18.00	17.00	18.00	17.00	17.00				
4.48	Average Take	l/m		18.00	17.00	18.00	17.00	17.00			17.40	2.56
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	183986.0	184009.0	184032.0	184055.0	184077.0	184099.0				
	Take	litres		23.00	23.00	23.00	22.00	22.00				
7.38	Average Take	l/m		23.00	23.00	23.00	22.00	22.00			22.60	2.02
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184118.0	184133.0	184147.0	184162.0	184177.0	184192.0				
	Take	litres		15.00	14.00	15.00	15.00	15.00				
4.48	Average Take	l/m		15.00	14.00	15.00	15.00	15.00			14.80	2.18
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184201.0	184207.0	184214.0	184220.0	184226.0	184233.0				
	Take	litres		6.00	7.00	6.00	6.00	7.00				
1.93	Average Take	l/m		6.00	7.00	6.00	6.00	7.00			6.40	2.21





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	3.471	MAX k=	3.47E-05
		MIN Lu=	2.017	MIN k=	2.02E-05
INTERPRETATION REFERENCE:		AVG Lu=	2.487	AVG k=	2.49E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

Pressure is approximate from pressure gauge readings

Loss of flow during test was approximately 500, 1500, and 1750 mL/min for P1, P2, and P3 respectively, based on measurements at the top of the casing and stuffing box.

TEST BY: DDF

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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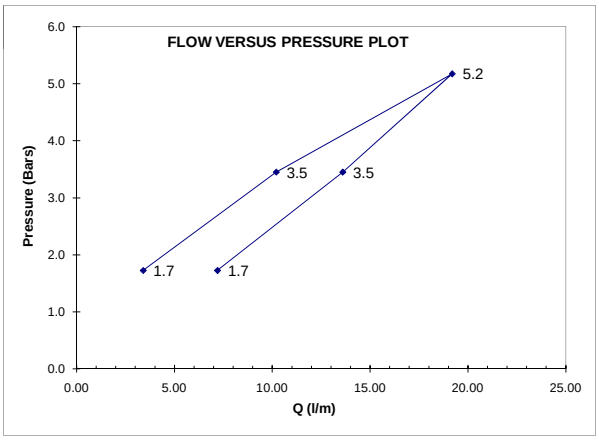
LUGEON TEST FIELD DATA SHEET

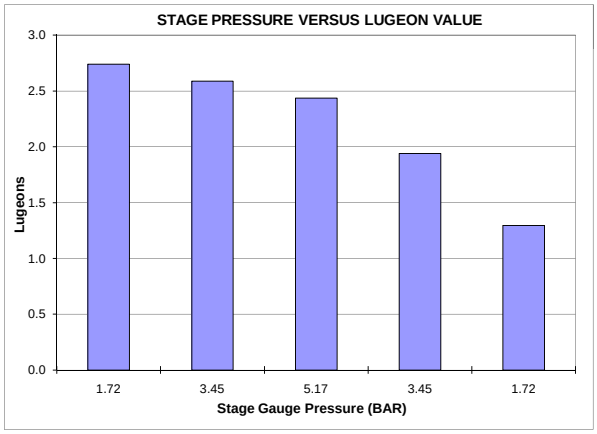
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	7

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.4 m	TOP OF TEST INTERVAL:	320.00 ft (DOWN HOLE)	97.56 m (DOWN HOLE)
DATE:	11-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.4 m	BOTTOM OF TEST INTERVAL:	370.00 ft (DOWN HOLE)	112.80 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184273.0	184281.0	184288.0	184296.0	184302.0	184309.0				
	Take	litres		8.00	7.00	8.00	6.00	7.00				
1.72	Average Take	l/m		8.00	7.00	8.00	6.00	7.00			7.20	2.74
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184341.0	184355.0	184369.0	184383.0	184396.0	184409.0				
	Take	litres		14.00	14.00	14.00	13.00	13.00				
3.45	Average Take	l/m		14.00	14.00	14.00	13.00	13.00			13.60	2.59
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184445.0	184465.0	184484.0	184503.0	184522.0	184541.0				
	Take	litres		20.00	19.00	19.00	19.00	19.00				
5.17	Average Take	l/m		20.00	19.00	19.00	19.00	19.00			19.20	2.44
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184572.0	184582.0	184593.0	184603.0	184613.0	184623.0				
	Take	litres		10.00	11.00	10.00	10.00	10.00				
3.45	Average Take	l/m		10.00	11.00	10.00	10.00	10.00			10.20	1.94
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184628.0	184631.0	184634.0	184638.0	184642.0	184645.0				
	Take	litres		3.00	3.00	4.00	4.00	3.00				
1.72	Average Take	l/m		3.00	3.00	4.00	4.00	3.00			3.40	1.29





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.740	MAX k=	2.74E-05
		MIN Lu=	1.294	MIN k=	1.29E-05
INTERPRETATION REFERENCE:		AVG Lu=	1.294	AVG k=	1.29E-05

INTERPRETATION TYPE OF FLOW:		
1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	YES

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 8 OF 12

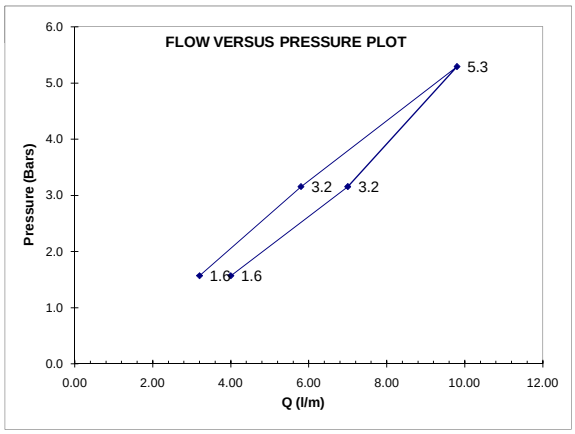
LUGEON TEST FIELD DATA SHEET

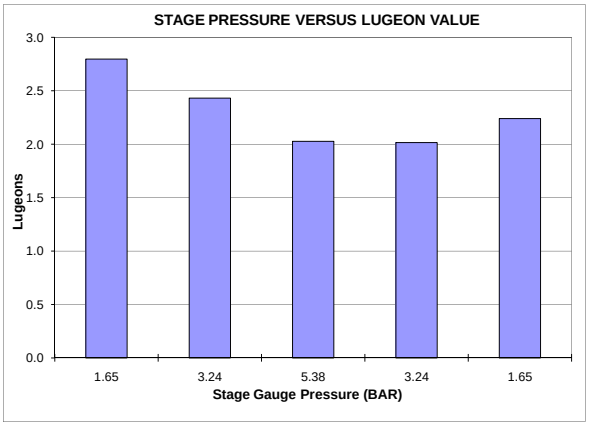
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	8

DIP:	66 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	-1.4	m	TOP OF TEST INTERVAL:	370.00 ft (DOWN HOLE) / 112.80 m (DOWN HOLE)
DATE:	11-Oct-10		GAUGE HEIGHT ABOVE GROUND:	0.4	m	BOTTOM OF TEST INTERVAL:	400.00 ft (DOWN HOLE) / 121.95 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184660.0	184664.0	184668.0	184672.0	184676.0	184680.0				
	Take	litres		4.00	4.00	4.00	4.00	4.00				
1.65	Average Take	l/m		4.00	4.00	4.00	4.00	4.00			4.00	2.80
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184694.0	184701.0	184708.0	184715.0	184722.0	184729.0				
	Take	litres		7.00	7.00	7.00	7.00	7.00				
3.24	Average Take	l/m		7.00	7.00	7.00	7.00	7.00			7.00	2.43
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184748.0	184758.0	184768.0	184778.0	184787.0	184797.0				
	Take	litres		10.00	10.00	10.00	9.00	10.00				
5.38	Average Take	l/m		10.00	10.00	10.00	9.00	10.00			9.80	2.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184813.0	184818.0	184824.0	184830.0	184836.0	184842.0				
	Take	litres		5.00	6.00	6.00	6.00	6.00				
3.24	Average Take	l/m		5.00	6.00	6.00	6.00	6.00			5.80	2.01
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184849.0	184853.0	184856.0	184859.0	184862.0	184865.0				
	Take	litres		4.00	3.00	3.00	3.00	3.00				
1.65	Average Take	l/m		4.00	3.00	3.00	3.00	3.00			3.20	2.24





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.797	MAX k=	2.80E-05
		MIN Lu=	2.014	MIN k=	2.01E-05
INTERPRETATION REFERENCE:		AVG Lu=	2.301	AVG k=	2.30E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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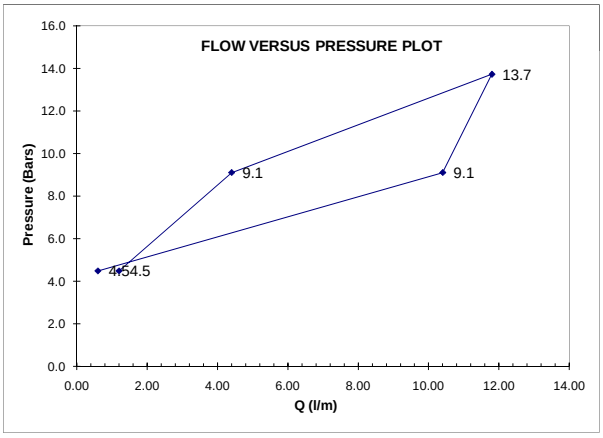
LUGEON TEST FIELD DATA SHEET

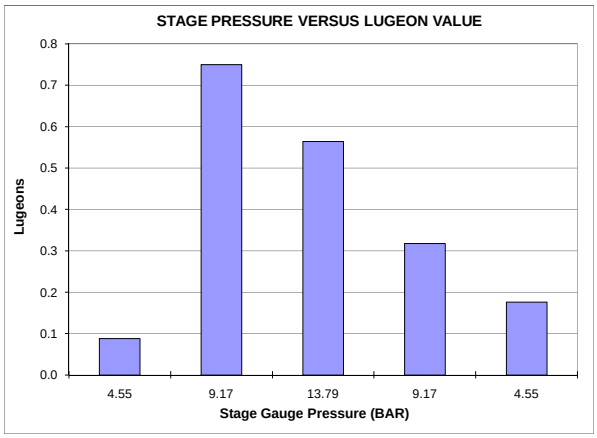
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	10

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-1.3 m	TOP OF TEST INTERVAL:	450.00 ft (DOWN HOLE)	137.20 m (DOWN HOLE)
DATE:	13-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.5 m	BOTTOM OF TEST INTERVAL:	500.00 ft (DOWN HOLE)	152.44 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	184995.0	184996.0	184996.0	184997.0	184997.0	184998.0				
	Take	litres		1.00	0.00	1.00	0.00	1.00				
4.55	Average Take	l/m		1.00	0.00	1.00	0.00	1.00			0.60	0.09
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185000.0	185009.0	185020.0	185031.0	185042.0	185052.0				
	Take	litres		9.00	11.00	11.00	11.00	10.00				
9.17	Average Take	l/m		9.00	11.00	11.00	11.00	10.00			10.40	0.75
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185078.0	185091.0	185102.0	185113.0	185125.0	185137.0				
	Take	litres		13.00	11.00	11.00	12.00	12.00				
13.79	Average Take	l/m		13.00	11.00	11.00	12.00	12.00			11.80	0.56
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185145.0	185150.0	185154.0	185159.0	185163.0	185167.0				
	Take	litres		5.00	4.00	5.00	4.00	4.00				
9.17	Average Take	l/m		5.00	4.00	5.00	4.00	4.00			4.40	0.32
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185168.0	185169.0	185170.0	185171.0	185173.0	185174.0				
	Take	litres		1.00	1.00	1.00	2.00	1.00				
4.55	Average Take	l/m		1.00	1.00	1.00	2.00	1.00			1.20	0.18





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.750	MAX k=	7.50E-06
		MIN Lu=	0.088	MIN k=	8.79E-07
INTERPRETATION REFERENCE:		AVG Lu=	0.176	AVG k=	1.76E-06

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	YES

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

Pressure is approximate from pressure gauge readings

Artesian condition

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 10 OF 12

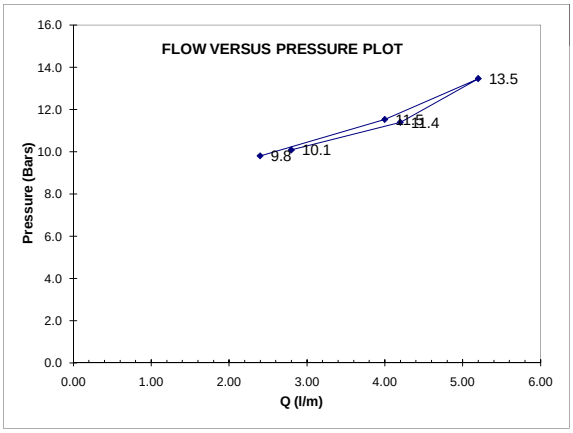
LUGEON TEST FIELD DATA SHEET

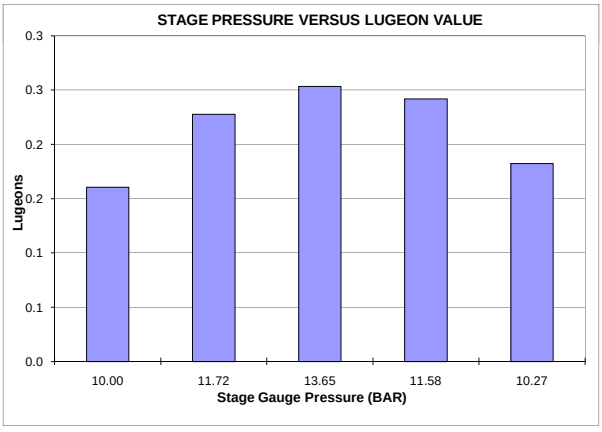
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	11

DIP:	66 (FROM HORIZONTAL)	o	DEPTH GROUNDWATER:	-2.5	m	TOP OF TEST INTERVAL:	500.00 ft (DOWN HOLE) / 152.44 m (DOWN HOLE)
DATE:	14-Oct-10		GAUGE HEIGHT ABOVE GROUND:	0.4	m	BOTTOM OF TEST INTERVAL:	550.00 ft (DOWN HOLE) / 167.68 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185217.0	185219.0	185221.0	185224.0	185226.0	185229.0				
	Take	litres		2.00	2.00	3.00	2.00	3.00				
10.00	Average Take	l/m		2.00	2.00	3.00	2.00	3.00			2.40	0.16
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185229.0	185233.0	185237.0	185242.0	185245.0	185249.0				
	Take	litres		4.00	4.00	5.00	3.00	4.00				
11.72	Average Take	l/m		4.00	4.00	5.00	3.00	4.00			4.00	0.23
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185255.0	185261.0	185265.0	185270.0	185276.0	185281.0				
	Take	litres		6.00	4.00	5.00	6.00	5.00				
13.65	Average Take	l/m		6.00	4.00	5.00	6.00	5.00			5.20	0.25
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185281.0	185285.0	185290.0	185293.0	185298.0	185302.0				
	Take	litres		4.00	5.00	3.00	5.00	4.00				
11.58	Average Take	l/m		4.00	5.00	3.00	5.00	4.00			4.20	0.24
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185302.0	185304.0	185307.0	185310.0	185313.0	185316.0				
	Take	litres		2.00	3.00	3.00	3.00	3.00				
10.27	Average Take	l/m		2.00	3.00	3.00	3.00	3.00			2.80	0.18





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.253	MAX k=	2.53E-06
		MIN Lu=	0.161	MIN k=	1.61E-06
INTERPRETATION REFERENCE:		AVG Lu=	0.213	AVG k=	2.13E-06

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: m^3

Pressure is approximate from pressure gauge readings

Static groundwater pressure is artesian for this interval.

TEST BY: DDF

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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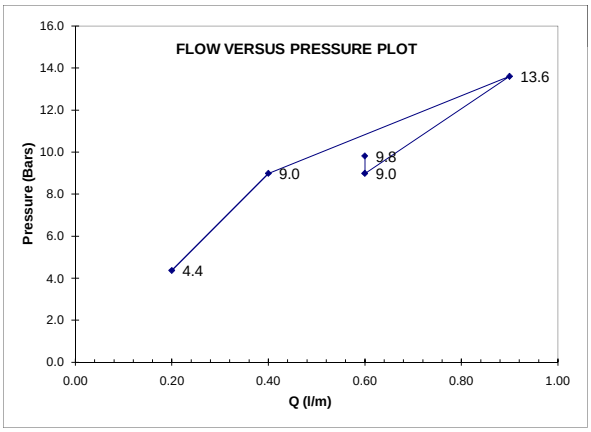
LUGEON TEST FIELD DATA SHEET

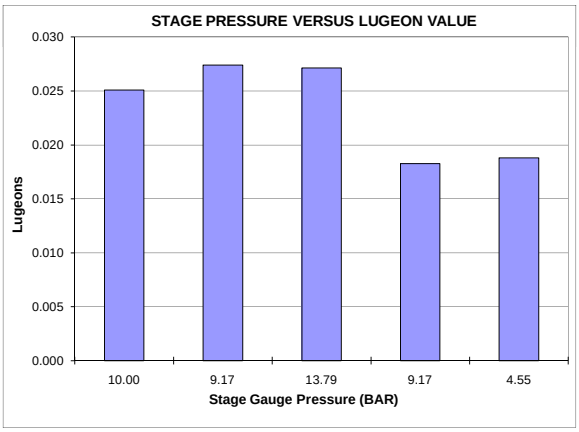
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	12

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-2.5 m	TOP OF TEST INTERVAL:	520.00 ft (DOWN HOLE)	158.54 m (DOWN HOLE)
DATE:	15-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.4 m	BOTTOM OF TEST INTERVAL:	600.00 ft (DOWN HOLE)	182.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185327.0	185327.5	185328.0	185329.0	185329.5	185330.0				
	Take	litres		0.50	0.50	1.00	0.50	0.50				
10.00	Average Take	l/m		0.50	0.50	1.00	0.50	0.50			0.60	0.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185332.0	185333.0	185333.0	185334.0	185334.0	185335.0				
	Take	litres		1.00	0.00	1.00	0.00	1.00				
9.17	Average Take	l/m		1.00	0.00	1.00	0.00	1.00			0.60	0.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185337.0	185338.0	185339.0	185340.0	185340.0	185341.5				
	Take	litres		1.00	1.00	1.00	0.00	1.50				
13.79	Average Take	l/m		1.00	1.00	1.00	0.00	1.50			0.90	0.03
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185342.0	185342.2	185343.0	185343.2	185344.0	185344.0				
	Take	litres		0.20	0.80	0.20	0.80	0.00				
9.17	Average Take	l/m		0.20	0.80	0.20	0.80	0.00			0.40	0.02
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185345.0	185345.0	185345.0	185345.0	185346.0	185346.0				
	Take	litres		0.00	0.00	0.00	1.00	0.00				
4.55	Average Take	l/m		0.00	0.00	0.00	1.00	0.00			0.20	0.02





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	0.027	MAX k=	2.74E-07
		MIN Lu=	0.018	MIN k=	1.83E-07
INTERPRETATION REFERENCE:		AVG Lu=	0.023	AVG k=	2.33E-07

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Unite: m^3

Pressure is approximate from pressure gauge readings

Static groundwater pressure is artesian for this interval.

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

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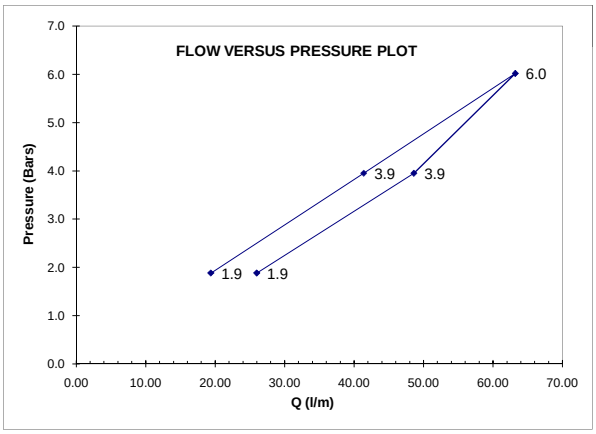
LUGEON TEST FIELD DATA SHEET

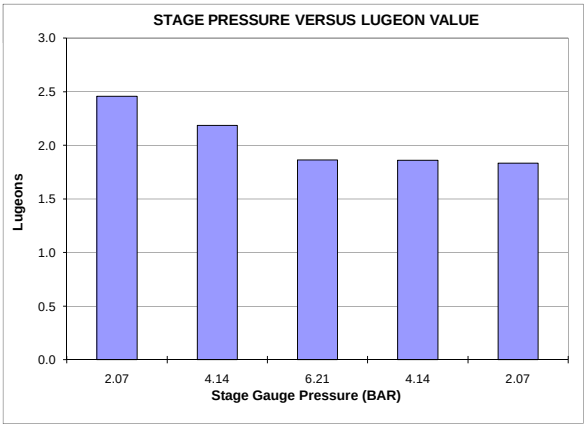
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-225
AREA:	Area L			TEST NO:	13

DIP:	66 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-2.5 m	TOP OF TEST INTERVAL:	415.00 ft (DOWN HOLE)	126.52 m (DOWN HOLE)
DATE:	15-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.4 m	BOTTOM OF TEST INTERVAL:	600.00 ft (DOWN HOLE)	182.93 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185600.0	185625.0	185652.0	185676.0	185704.0	185730.0				
	Take	litres		25.00	27.00	24.00	28.00	26.00				
2.07	Average Take	l/m		25.00	27.00	24.00	28.00	26.00			26.00	2.46
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	185780.0	185829.0	185879.0	185926.0	185974.0	186023.0				
	Take	litres		49.00	50.00	47.00	48.00	49.00				
4.14	Average Take	l/m		49.00	50.00	47.00	48.00	49.00			48.60	2.18
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	186070.0	186133.0	186196.0	186261.0	186323.0	186386.0				
	Take	litres		63.00	63.00	65.00	62.00	63.00				
6.21	Average Take	l/m		63.00	63.00	65.00	62.00	63.00			63.20	1.86
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	186440.0	186481.0	186522.0	186564.0	186605.0	186647.0				
	Take	litres		41.00	41.00	42.00	41.00	42.00				
4.14	Average Take	l/m		41.00	41.00	42.00	41.00	42.00			41.40	1.86
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	186677.0	186696.0	186714.0	186733.0	186753.0	186774.0				
	Take	litres		19.00	18.00	19.00	20.00	21.00				
2.07	Average Take	l/m		19.00	18.00	19.00	20.00	21.00			19.40	1.83





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	2.456	MAX k=	2.46E-05
		MIN Lu=	1.833	MIN k=	1.83E-05
INTERPRETATION REFERENCE:		AVG Lu=	2.039	AVG k=	2.04E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units m^3

Pressure is approximate from pressure gauge readings

Static groundwater pressure is artesian for this interval.

TEST BY: CBN, AL

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	09DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 3

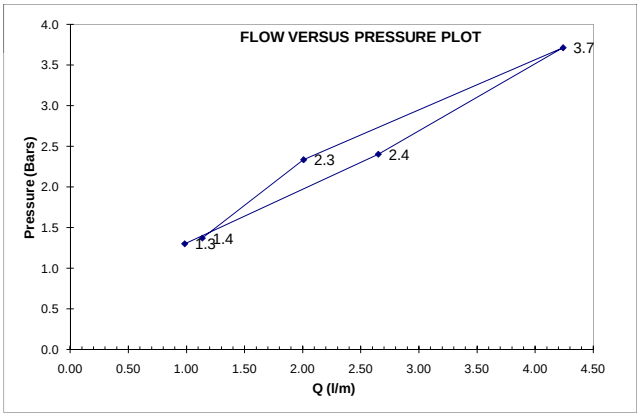
LUGEON TEST FIELD DATA SHEET

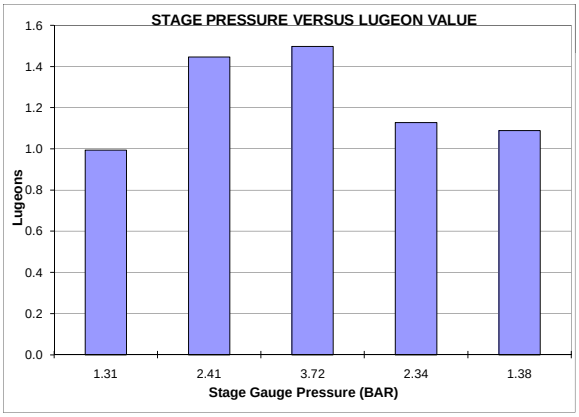
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-227
AREA:	Upper Talarik Creek Area			TEST NO:	1

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.4 m	TOP OF TEST INTERVAL:	105.00 ft (DOWN HOLE)	32.01 m (DOWN HOLE)
DATE:	18-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	130.00 ft (DOWN HOLE)	39.63 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	0.8	1.9	3.0	4.0	4.9				
	Take	litres		0.76	1.14	1.14	0.95	0.95				
1.31	Average Take	l/m		0.76	1.14	1.14	0.95	0.95			0.98	0.99
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	2.3	4.9	7.9	10.6	13.2				
	Take	litres		2.27	2.65	3.03	2.65	2.65				
2.41	Average Take	l/m		2.27	2.65	3.03	2.65	2.65			2.65	1.45
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	4.7	9.1	13.2	17.4	21.2				
	Take	litres		4.73	4.35	4.16	4.16	3.79				
3.72	Average Take	l/m		4.73	4.35	4.16	4.16	3.79			4.24	1.50
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	2.1	4.2	6.2	8.1	10.0				
	Take	litres		2.08	2.08	2.08	1.89	1.89				
2.34	Average Take	l/m		2.08	2.08	2.08	1.89	1.89			2.01	1.13
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	1.1	2.3	3.4	4.9	5.7				
	Take	litres		1.14	1.14	1.14	1.51	0.76				
1.38	Average Take	l/m		1.14	1.14	1.14	1.51	0.76			1.14	1.09





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	1.498	MAX k=	1.50E-05
		MIN Lu=	0.993	MIN k=	9.93E-06
INTERPRETATION REFERENCE:		AVG Lu=	1.231	AVG k=	1.23E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: US Gallons

No leakage during test.

TEST BY: SHC

REVIEWED BY: JAB

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0	10DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

SHEET 2 OF 3

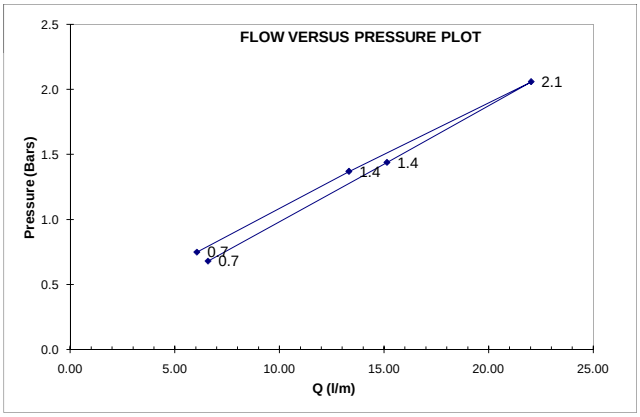
LUGEON TEST FIELD DATA SHEET

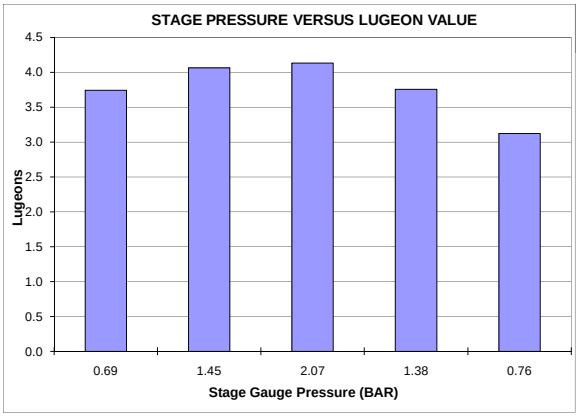
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-227
AREA:	Upper Talarik Creek Area			TEST NO:	2

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.4 m	TOP OF TEST INTERVAL:	45.00 ft (DOWN HOLE)	13.72 m (DOWN HOLE)
DATE:	18-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	130.00 ft (DOWN HOLE)	39.63 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	6.8	13.2	20.1	26.5	32.9				
	Take	litres		6.81	6.44	6.81	6.44	6.44				
0.69	Average Take	l/m		6.81	6.44	6.81	6.44	6.44			6.59	3.74
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	15.5	30.3	45.0	60.2	75.7				
	Take	litres		15.52	14.76	14.76	15.14	15.52				
1.45	Average Take	l/m		15.52	14.76	14.76	15.14	15.52			15.14	4.06
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	23.1	45.4	67.4	87.8	110.2				
	Take	litres		23.09	22.33	21.96	20.44	22.33				
2.07	Average Take	l/m		23.09	22.33	21.96	20.44	22.33			22.03	4.13
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	13.2	26.9	40.5	53.4	66.6				
	Take	litres		13.25	13.63	13.63	12.87	13.25				
1.38	Average Take	l/m		13.25	13.63	13.63	12.87	13.25			13.32	3.76
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	0.0	6.4	12.1	17.8	23.8	30.3				
	Take	litres		6.44	5.68	5.68	6.06	6.44				
0.76	Average Take	l/m		6.44	5.68	5.68	6.06	6.44			6.06	3.12





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	4.130	MAX k=	4.13E-05
		MIN Lu=	3.123	MIN k=	3.12E-05
INTERPRETATION REFERENCE:		AVG Lu=	3.763	AVG k=	3.76E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: US Gallons

Leakage measured to be approximately 1.0 gallons per minute with inflation pressure at 300 psi.

TEST BY: SHC

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	10DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 3 OF 3

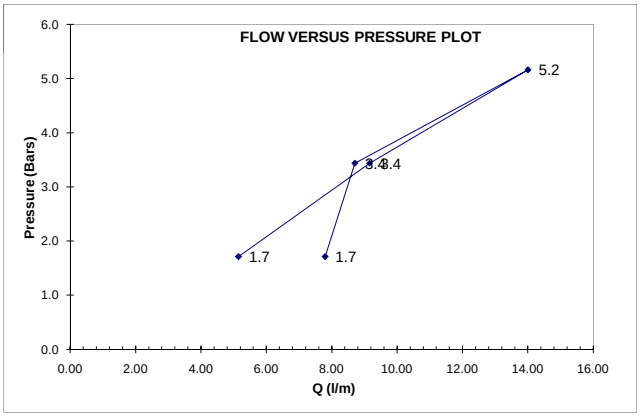
LUGEON TEST FIELD DATA SHEET

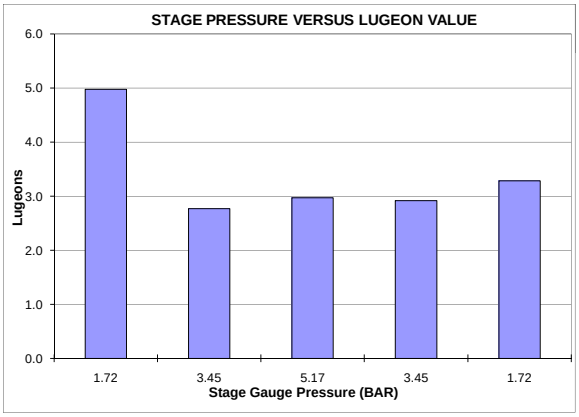
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-227
AREA:	Upper Talarik Creek Area			TEST NO:	3

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	-0.4 m	TOP OF TEST INTERVAL:	150.00 ft (DOWN HOLE)	45.73 m (DOWN HOLE)
DATE:	19-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	180.00 ft (DOWN HOLE)	54.88 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	44402.9	44412.0	44419.2	44427.5	44434.4	44441.9				
	Take	litres		9.08	7.19	8.33	6.93	7.46				
1.72	Average Take	l/m		9.08	7.19	8.33	6.93	7.46			7.80	4.98
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	44455.9	44464.6	44473.3	44481.6	44490.7	44499.4				
	Take	litres		8.71	8.71	8.33	9.08	8.71				
3.45	Average Take	l/m		8.71	8.71	8.33	9.08	8.71			8.71	2.77
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	44512.7	44526.7	44541.0	44554.7	44568.7	44582.7				
	Take	litres		14.01	14.38	13.63	14.01	14.01				
5.17	Average Take	l/m		14.01	14.38	13.63	14.01	14.01			14.01	2.97
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	44595.9	44605.4	44614.5	44623.6	44632.3	44641.7				
	Take	litres		9.46	9.08	9.08	8.71	9.46				
3.45	Average Take	l/m		9.46	9.08	9.08	8.71	9.46			9.16	2.91
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	44652.7	44658.0	44662.9	44668.2	44673.5	44678.5				
	Take	litres		5.30	4.92	5.30	5.30	4.92				
1.72	Average Take	l/m		5.30	4.92	5.30	5.30	4.92			5.15	3.28





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	4.975	MAX k=	4.98E-05
		MIN Lu=	2.769	MIN k=	2.77E-05
INTERPRETATION REFERENCE:		AVG Lu=	3.382	AVG k=	3.38E-05

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	YES
2	TURBULENT	NO
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter Units: US Gallons

While testing the first pressure, it gradually moved from 25 psi to 40 psi after 3 minutes, so last two readings were taken under 40 psi.

TEST BY: AL

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	10DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

SHEET 1 OF 1

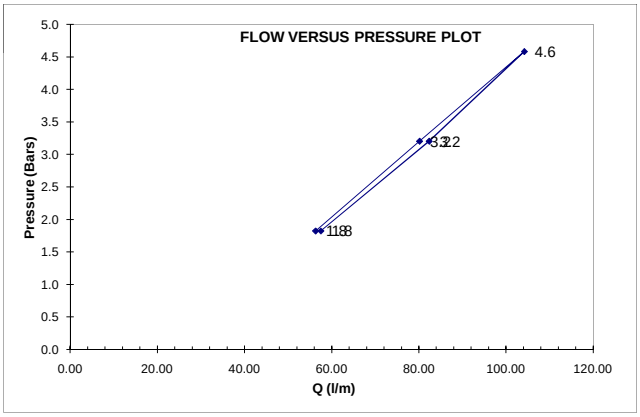
LUGEON TEST FIELD DATA SHEET

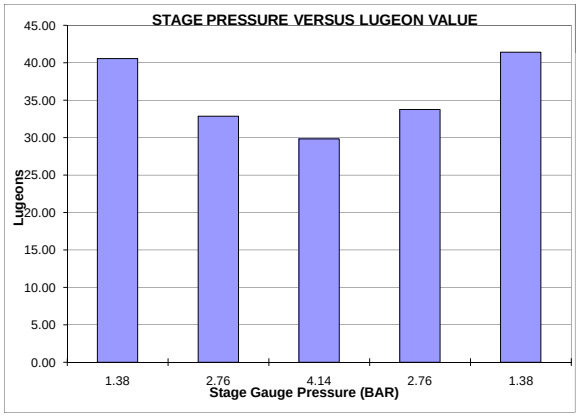
Knight Piésold CONSULTING

PROJECT:	Pebble Project	PROJECT NO:	VA101-176/35	DRILLHOLE:	GH10-228
AREA:	Upper Talarik Creek Area			TEST NO:	2

DIP:	90 o (FROM HORIZONTAL)	DEPTH GROUNDWATER:	4.1 m	TOP OF TEST INTERVAL:	215.00 ft (DOWN HOLE)	65.55 m (DOWN HOLE)
DATE:	22-Oct-10	GAUGE HEIGHT ABOVE GROUND:	0.3 m	BOTTOM OF TEST INTERVAL:	240.00 ft (DOWN HOLE)	73.17 m (DOWN HOLE)

GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	46950.5	47007.6	47064.0	47121.6	47175.7	47232.1				
	Take	litres		57.16	56.40	57.54	54.13	56.40				
1.38	Average Take	l/m		57.16	56.40	57.54	54.13	56.40			56.33	40.54
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	47612.9	47542.1	47773.8	47853.7	47933.5	48013.8				
	Take	litres		-70.79	231.67	79.87	79.87	80.25				
2.76	Average Take	l/m		-70.79	231.67	79.87	79.87	80.25			80.18	32.85
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	48241.3	48346.1	48443.1	48554.3	48658.1	48762.2				
	Take	litres		104.86	96.91	111.29	103.72	104.10				
4.14	Average Take	l/m		104.86	96.91	111.29	103.72	104.10			104.17	29.84
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	48922.7	49005.6	49088.1	49168.3	49251.6	49334.5				
	Take	litres		82.90	82.52	80.25	83.28	82.90				
2.76	Average Take	l/m		82.90	82.52	80.25	83.28	82.90			82.37	33.75
GAUGE P (BAR)											AVERAGE FLOW litres/min	LUGEON
	Time	min	0	1	2	3	4	5				
	Flowmeter	litres	49373.1	49431.0	49488.2	49546.1	49603.7	49660.8				
	Take	litres		57.92	57.16	57.92	57.54	57.16				
1.38	Average Take	l/m		57.92	57.16	57.92	57.54	57.16			57.54	41.41





		LUGEONS, cm/s		APPROXIMATE PERMEABILITY, cm/s	
STATIC WTR LEVEL DETERMINATION:		MAX Lu=	41.411	MAX k=	4.14E-04
		MIN Lu=	29.837	MIN k=	2.98E-04
INTERPRETATION REFERENCE:		AVG Lu=	29.837	AVG k=	2.98E-04

INTERPRETATION TYPE OF FLOW:

1	LAMINAR	NO
2	TURBULENT	YES
3	DILATION	NO
4	WASH-OUT	NO
5	VOID FILLING	NO

Note: Permeability calculation dependent upon flow classification:

DRILLING / TEST RESULTS COMMENTS:

Flowmeter units: US Gallons

TEST BY: CBN

REVIEWED BY: JAB

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REV	DATE	DESCRIPTION	PEP'D	CHK'D	APP'D
0	10DEC'10	ISSUED WITH REPORT 101-176/35-1	AL	CG	KJB

Knight Piésold CONSULTING

APPENDIX C3

RISING/FALLING HEAD HYDRAULIC CONDUCTIVITY TEST SHEETS

- GH10-211
- GH10-212
- GH10-213
- GH10-214
- GH10-215
- GH10-216
- GH10-217
- GH10-218
- GH10-219
- GH10-220
- GH10-221
- GH10-222
- GH10-223
- GH10-224
- GH10-225
- GH10-227
- GH10-228

(Page C3-1 to C3-55)

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

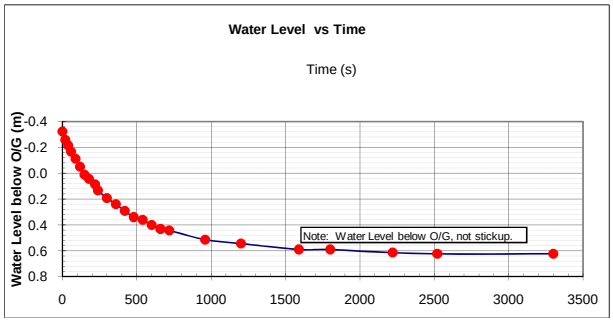
Print 01/08/10 14:19

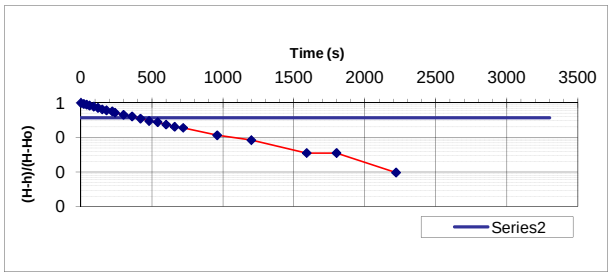
Downhole Test Interval: 8.38 m to 14.02 m

Project No.	101-176/35					
Drillhole ID.	GH10-211					
Piezometer ID.	GH10-211					
				Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)				90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods				446		m
Date				Sep/8/2010		
Test Type				FALLING		
Test No.				1		
Hole diameter, D		HQ	D =	0.096		m
Interior diameter of piezometer or drill rods, d	1.00 Inches	Sch 80	d =	0.02431		m
Top of test interval				8.38	8.38	m
Bottom of test interval				14.02	14.02	m
Length of test interval, L			L =	5.64	5.64	m
Downhole stickup of piezometer or rods above ground surface				0.66	0.66	m
Static water level, **(below ground surface)**				0.62	0.62	m
Elevation of Static Water Level **(above sea level)**			El. =	444.72	444.72	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.28	1.28	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.34	0.34	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.34	0.34	-0.32	1.00	0.37
20	0.40	0.40	-0.26	0.93	0.37
40	0.45	0.45	-0.21	0.89	0.37
60	0.49	0.49	-0.17	0.84	0.37
90	0.55	0.55	-0.11	0.78	0.37
120	0.61	0.61	-0.05	0.71	0.37
150	0.67	0.67	0.01	0.65	0.37
180	0.70	0.70	0.04	0.61	0.37
220	0.75	0.75	0.09	0.57	0.37
240	0.79	0.79	0.13	0.52	0.37
300	0.85	0.85	0.19	0.45	0.37
360	0.90	0.90	0.24	0.41	0.37
420	0.95	0.95	0.29	0.35	0.37
480	1.00	1.00	0.34	0.30	0.37
540	1.02	1.02	0.36	0.28	0.37
600	1.06	1.06	0.40	0.24	0.37
660	1.09	1.09	0.43	0.20	0.37
720	1.10	1.10	0.44	0.19	0.37
960	1.17	1.17	0.51	0.12	0.37
1200	1.20	1.20	0.54	0.08	0.37
1590	1.25	1.25	0.59	0.04	0.37
1800	1.25	1.25	0.59	0.04	0.37
2220	1.27	1.27	0.61	0.01	0.37
2520	1.28	1.28	0.62	0.00	0.37
3300	1.28	1.28	0.62	0.00	0.37





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

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

Assume sin a = 1, m = 1

T= 400 secs

Hydraulic Conductivity, K= **1.6E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted after Piezometer Installed
2. Static water level measured approximately 12 hours after test (stayed at 1.28 m below collar).

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-211\[GH10-211 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	10DEC'10	ISSUED WITH REPORT 101-176/35-1	JPN	CG	KJB

Tested By: JPN
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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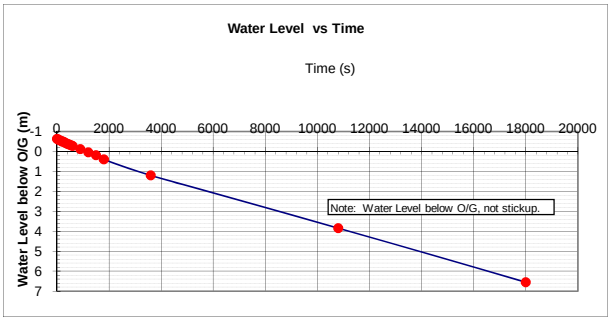
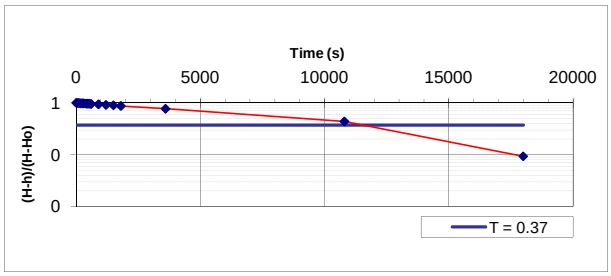
Downhole Test Interval: 13.41 m to 18.60 m

Project No.	101-176/35					
Drillhole ID.	GH10-212					
Piezometer ID.	GH10-212					
				Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)				90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods				436		m
Date				Sep/13/10		
Test Type				FALLING		
Test No.				1		
Hole diameter, D		PQ	D =	0.123		m
Interior diameter of piezometer or drill rods, d	1.00 Inches	Sch 80	d =	0.02431		m
Top of test interval				13.41	13.41	m
Bottom of test interval				18.60	18.60	m
Length of test interval, L			L =	5.18	5.18	m
Downhole stickup of piezometer or rods above ground surface				0.84	0.84	m
Static water level, **(below ground surface)**				7.30	7.30	m
Elevation of Static Water Level **(above sea level)**			El. =	427.86	427.86	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	8.14	8.14	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.21	0.21	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.21	0.21	-0.63	1.00	0.37
60	0.25	0.25	-0.59	0.99	0.37
120	0.29	0.29	-0.55	0.99	0.37
180	0.33	0.33	-0.51	0.98	0.37
240	0.36	0.36	-0.48	0.98	0.37
300	0.39	0.39	-0.45	0.98	0.37
360	0.43	0.43	-0.41	0.97	0.37
420	0.46	0.46	-0.38	0.97	0.37
480	0.50	0.50	-0.34	0.96	0.37
540	0.53	0.53	-0.31	0.96	0.37
600	0.57	0.57	-0.27	0.95	0.37
900	0.72	0.72	-0.12	0.94	0.37
1200	0.88	0.88	0.04	0.92	0.37
1500	1.03	1.03	0.19	0.90	0.37
1800	1.24	1.24	0.40	0.87	0.37
3600	2.04	2.04	1.20	0.77	0.37
10800	4.68	4.68	3.84	0.44	0.37
18000	7.40	7.40	6.56	0.09	0.37





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

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

Assume sin a = 1, m = 1

T= **11500** secs

Hydraulic Conductivity, K= **5.5E-07** cm/s

TEST COMMENTS:

1. Falling Head Test conducted 36 hours after Piezometer Installed. First attempt was conducted 24 hrs after installation however cancelled due to increased helicopter traffic and rig move.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	10DEC'10	ISSUED WITH REPORT 101-176/35-1	BSH	CG	KJB

Tested By: BSH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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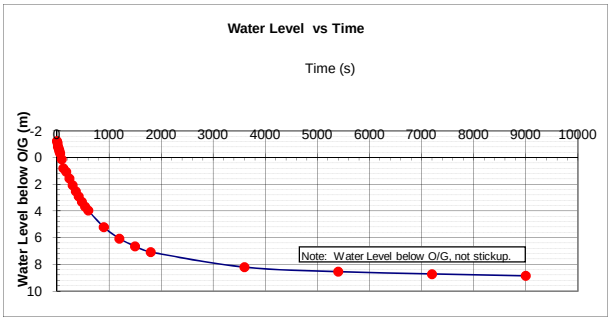
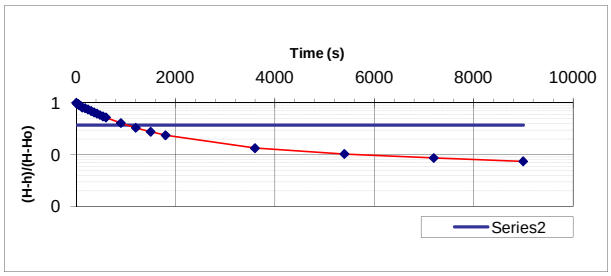
					Downhole Test Interval		
Project No.	**101-176/35**				**13.41** m to **19.96** m		
Drillhole ID.	**GH10-213**						
Piezometer ID.	**GH10-213**				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					492		m
Date					Sept 13 2010		
Test Type					**FALLING**		
Test No.					1		
Hole diameter, D			**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		**1.00 Inches**	**Sch 80**	d =	0.02431		m
Top of test interval					13.41	13.41	m
Bottom of test interval					19.96	19.96	m
Length of test interval, L				L =	6.55	6.55	m
Downhole stickup of piezometer or rods above ground surface					1.30	1.30	m
Static water level, **(below ground surface)**					9.68	9.68	m
Elevation of Static Water Level **(above sea level)**				El. =	481.02	481.02	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	10.98	10.98	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.06	0.06	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.06	0.06	-1.23	1.00	0.37
10	0.21	0.21	-1.08	0.99	0.37
20	0.47	0.47	-0.83	0.96	0.37
30	0.58	0.58	-0.72	0.95	0.37
40	0.74	0.74	-0.56	0.94	0.37
50	0.86	0.86	-0.44	0.93	0.37
60	0.98	0.98	-0.31	0.92	0.37
90	1.43	1.43	0.14	0.87	0.37
120	2.09	2.09	0.79	0.81	0.37
180	2.37	2.37	1.07	0.79	0.37
240	2.87	2.87	1.57	0.74	0.37
300	3.37	3.37	2.07	0.70	0.37
360	3.82	3.82	2.53	0.66	0.37
420	4.21	4.21	2.91	0.62	0.37
480	4.61	4.61	3.31	0.58	0.37
540	4.97	4.97	3.67	0.55	0.37
600	5.26	5.26	3.96	0.52	0.37
900	6.51	6.51	5.21	0.41	0.37
1200	7.37	7.37	6.07	0.33	0.37
1500	7.94	7.94	6.64	0.28	0.37
1800	8.38	8.38	7.08	0.24	0.37
3600	9.51	9.51	8.22	0.13	0.37
5400	9.85	9.85	8.55	0.10	0.37
7200	10.03	10.03	8.73	0.09	0.37
9000	10.16	10.16	8.87	0.07	0.37





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

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

Assume
sin a = 1
m = 1

T= **1050** secs

Hydraulic Conductivity, K= **5.3E-06** cm/s

TEST COMMENTS:

1. Example comment: Falling Head Test conducted 12 hours after Piezometer Installed
2. Static water level is an estimate.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	23DEC'10	ISSUED WITH REPORT VA101-176/35-1	JPN	CG	KJB

Tested By: JPN
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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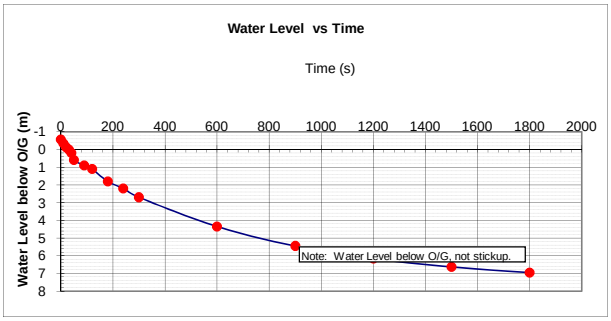
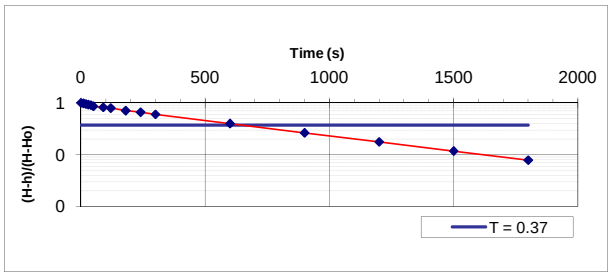
					Downhole Test Interval		
Project No.	101-176/35				12.20 m to 16.77 m		
Drillhole ID.	GH10-214						
Piezometer ID.	GH10-214				Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)					90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods					417		m
Date					Sep/17/10		
Test Type					FALLING		
Test No.					1		
Hole diameter, D		PQ		D =	0.123		m
Interior diameter of piezometer or drill rods, d	1.00 Inches	Sch 80		d =	0.02431		m
Top of test interval					12.20	12.20	m
Bottom of test interval					16.77	16.77	m
Length of test interval, L				L =	4.57	4.57	m
Downhole stickup of piezometer or rods above ground surface					0.9	0.90	m
Static water level, **(below ground surface)**					7.60	7.60	m
Elevation of Static Water Level **(above sea level)**				El. =	408.50	408.50	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	8.50	8.50	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.33	0.33	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.33	0.33	-0.57	1.00	0.37
10	0.55	0.55	-0.35	0.97	0.37
20	0.76	0.76	-0.14	0.95	0.37
30	0.90	0.90	0.00	0.93	0.37
40	1.10	1.10	0.20	0.91	0.37
50	1.50	1.50	0.60	0.86	0.37
90	1.80	1.80	0.90	0.82	0.37
120	2.00	2.00	1.10	0.80	0.37
180	2.70	2.70	1.80	0.71	0.37
240	3.10	3.10	2.20	0.66	0.37
300	3.60	3.60	2.70	0.60	0.37
600	5.25	5.25	4.35	0.40	0.37
900	6.35	6.35	5.45	0.26	0.37
1200	7.06	7.06	6.16	0.18	0.37
1500	7.54	7.54	6.64	0.12	0.37
1800	7.86	7.86	6.96	0.08	0.37





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

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

Assume sin a = 1, m = 1

T= 675 secs

Hydraulic Conductivity, K= **1.0E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted 12 hours after Piezometer Installed

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	17DEC'10	ISSUED WITH REPORT VA101-176/35-1	BSH	CG	KJB

Tested By: BSH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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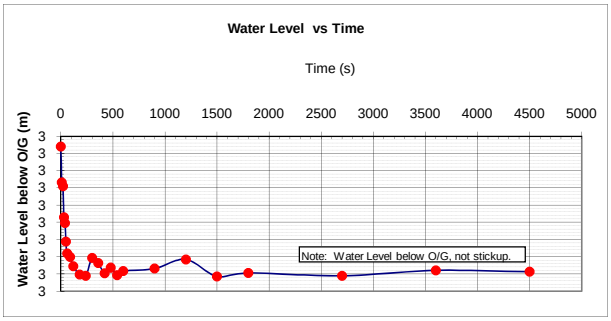
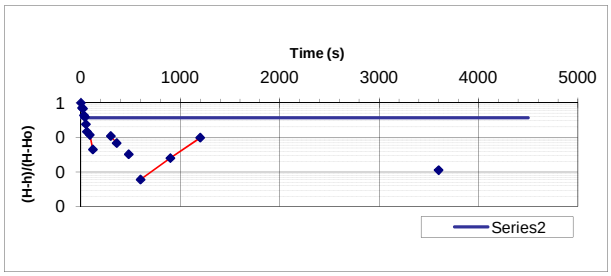
Downhole Test Interval: 7.62 m to 15.24 m

			Downhole	Vertical	
Project No.	101-176/35				
Drillhole ID.	GH10-215				
Piezometer ID.	N/A				
Drillhole Inclination (if not inclined, select 90°)			90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods			352		m
Date			SEP 14/2010		
Test Type			FALLING		
Test No.			1		
Hole diameter, D	HQ	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			7.62	7.62	m
Bottom of test interval			15.24	15.24	m
Length of test interval, L		L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface			0	0.00	m
Static water level, **(below ground surface)**			2.99	2.99	m
Elevation of Static Water Level **(above sea level)**		El. =	349.01	349.01	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	2.99	2.99	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	2.63	2.63	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	2.63	2.63	2.63	1.00	0.37
10	2.73	2.73	2.73	0.72	0.37
20	2.75	2.75	2.75	0.68	0.37
30	2.84	2.84	2.84	0.44	0.37
40	2.85	2.85	2.85	0.39	0.37
50	2.91	2.91	2.91	0.24	0.37
60	2.94	2.94	2.94	0.15	0.37
90	2.95	2.95	2.95	0.12	0.37
120	2.98	2.98	2.98	0.04	0.37
180	3.00	3.00	3.00	-0.02	0.37
240	3.01	3.01	3.01	-0.03	0.37
300	2.95	2.95	2.95	0.11	0.37
360	2.97	2.97	2.97	0.07	0.37
420	3.00	3.00	3.00	-0.01	0.37
480	2.98	2.98	2.98	0.03	0.37
540	3.00	3.00	3.00	-0.03	0.37
600	2.99	2.99	2.99	0.01	0.37
900	2.98	2.98	2.98	0.03	0.37
1200	2.96	2.96	2.96	0.10	0.37
1500	3.01	3.01	3.01	-0.04	0.37
1800	3.00	3.00	3.00	-0.01	0.37
2700	3.01	3.01	3.01	-0.03	0.37
3600	2.99	2.99	2.99	0.01	0.37
4500	2.99	2.99	2.99	0.00	0.37





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

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

Assume sin a = 1, m = 1

T= 45 secs

Hydraulic Conductivity, K= **1.1E-03** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer test #1, using the pressure transducer.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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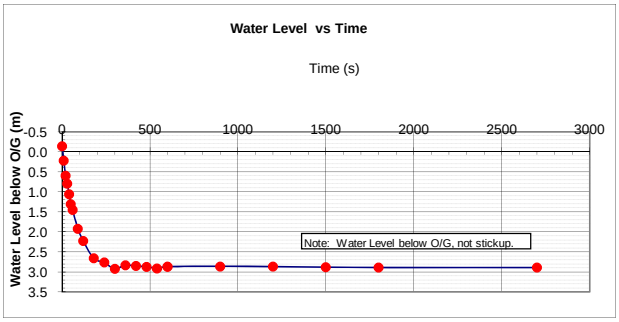
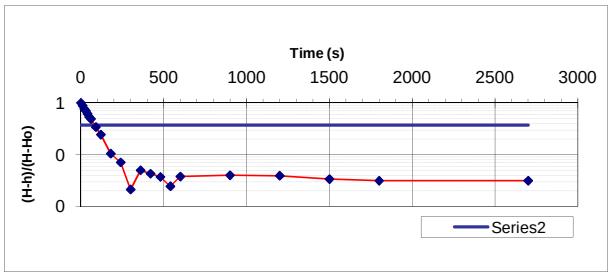
			Downhole Test Interval			
Project No.	**101-176/35**		**15.24** m to **22.86** m			
Drillhole ID.	**GH10-215**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				352		m
Date				SEP 15/2010		
Test Type				**FALLING**		
Test No.				2		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				15.24	15.24	m
Bottom of test interval				22.86	22.86	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				0	0.00	m
Static water level, **(below ground surface)**				2.99	2.99	m
Elevation of Static Water Level **(above sea level)**			El. =	349.01	349.01	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.99	2.99	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	-0.14	-0.14	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	-0.14	-0.14	-0.14	1.00	0.37
10	0.22	0.22	0.22	0.88	0.37
20	0.60	0.60	0.60	0.76	0.37
30	0.79	0.79	0.79	0.70	0.37
40	1.06	1.06	1.06	0.62	0.37
50	1.31	1.31	1.31	0.54	0.37
60	1.46	1.46	1.46	0.49	0.37
90	1.92	1.92	1.92	0.34	0.37
120	2.23	2.23	2.23	0.24	0.37
180	2.66	2.66	2.66	0.10	0.37
240	2.77	2.77	2.77	0.07	0.37
300	2.92	2.92	2.92	0.02	0.37
360	2.83	2.83	2.83	0.05	0.37
420	2.85	2.85	2.85	0.04	0.37
480	2.87	2.87	2.87	0.04	0.37
540	2.91	2.91	2.91	0.02	0.37
600	2.87	2.87	2.87	0.04	0.37
900	2.86	2.86	2.86	0.04	0.37
1200	2.87	2.87	2.87	0.04	0.37
1500	2.88	2.88	2.88	0.03	0.37
1800	2.89	2.89	2.89	0.03	0.37
2700	2.89	2.89	2.89	0.03	0.37





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

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

Assume sin a = 1, m = 1

T= **80** secs

Hydraulic Conductivity, K= **6.3E-04** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer test #2 using the pressure transducer.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15DEC'10	ISSUED FOR REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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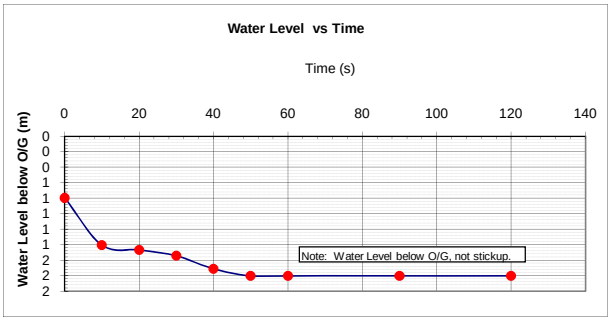
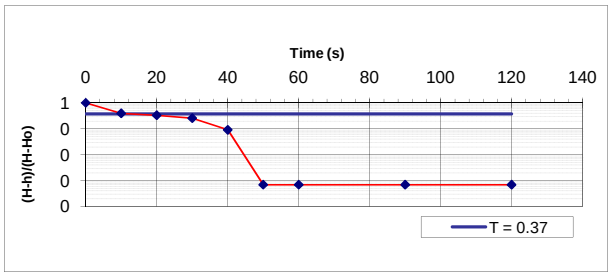
Downhole Test Interval: 5.03 m to 12.19 m

Project No.	101-176/35					
Drillhole ID.	GH10-215					
Piezometer ID.	GH10-215					
				Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)				90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods				352		m
Date				SEP 15/2010		
Test Type				FALLING		
Test No.				3		
Hole diameter, D		HQ	D =	0.096		m
Interior diameter of piezometer or drill rods, d	1.00 Inches	Sch 80	d =	0.02431		m
Top of test interval				5.03	5.03	m
Bottom of test interval				12.19	12.19	m
Length of test interval, L			L =	7.16	7.16	m
Downhole stickup of piezometer or rods above ground surface				0.94	0.94	m
Static water level, **(below ground surface)**				1.80	1.80	m
Elevation of Static Water Level **(above sea level)**			El. =	349.26	349.26	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.74	2.74	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	1.74	1.74	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	1.74	1.74	0.80	1.00	0.37
10	2.35	2.35	1.41	0.39	0.37
20	2.41	2.41	1.47	0.33	0.37
30	2.48	2.48	1.54	0.26	0.37
40	2.65	2.65	1.71	0.09	0.37
50	2.74	2.74	1.80	0.00	0.37
60	2.74	2.74	1.80	0.00	0.37
90	2.74	2.74	1.80	0.00	0.37
120	2.74	2.74	1.80	0.00	0.37





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

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

Assume
sin a = 1
m = 1

T= 12 secs

Hydraulic Conductivity, K= **4.3E-04** cm/s

TEST COMMENTS:

1. Falling Head test conducted after piezometer installed
2. Water level measured on September 15, 2010. Rose from 9.45' to 8.96' over ~45 min.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-215\[GH10-215 Hydraulic Conductivity Testing Sheet_Rev C.xlsx]FH-3

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15DEC'10	ISSUED WITH REPORT VA101-176/35-1	JPN	CG	KJB

Tested By: JPN
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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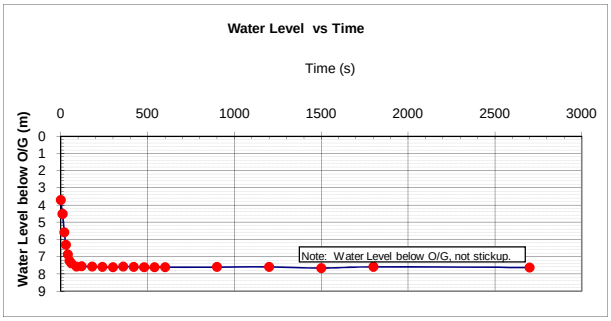
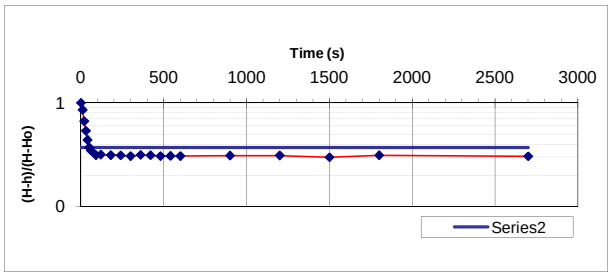
Downhole Test Interval: **25.91** m to **33.54** m

			Downhole	Vertical	
Project No.	101-176/35				
Drillhole ID.	GH10-216				
Piezometer ID.	N/A				
Drillhole Inclination (if not inclined, select 90°)			90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods			471		m
Date			SEP 22/2010		
Test Type			FALLING		
Test No.			1		
Hole diameter, D	HQ	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			25.91	25.91	m
Bottom of test interval			33.54	33.54	m
Length of test interval, L		L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface			0.8636	0.86	m
Static water level, **(below ground surface)**			8.48	8.48	m
Elevation of Static Water Level **(above sea level)**		El. =	461.65	461.65	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	9.35	9.35	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	3.70	3.70	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	3.70	3.70	3.70	1.00	0.37
10	4.52	4.52	4.52	0.86	0.37
20	5.59	5.59	5.59	0.67	0.37
30	6.32	6.32	6.32	0.54	0.37
40	6.87	6.87	6.87	0.44	0.37
50	7.25	7.25	7.25	0.37	0.37
60	7.39	7.39	7.39	0.35	0.37
90	7.58	7.58	7.58	0.31	0.37
120	7.56	7.56	7.56	0.32	0.37
180	7.58	7.58	7.58	0.31	0.37
240	7.59	7.59	7.59	0.31	0.37
300	7.62	7.62	7.62	0.31	0.37
360	7.57	7.57	7.57	0.31	0.37
420	7.59	7.59	7.59	0.31	0.37
480	7.62	7.62	7.62	0.31	0.37
540	7.61	7.61	7.61	0.31	0.37
600	7.62	7.62	7.62	0.31	0.37
900	7.60	7.60	7.60	0.31	0.37
1200	7.59	7.59	7.59	0.31	0.37
1500	7.66	7.66	7.66	0.30	0.37
1800	7.59	7.59	7.59	0.31	0.37
2700	7.63	7.63	7.63	0.30	0.37





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

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

Assume sin a = 1, m = 1

T= **50** secs

Hydraulic Conductivity, K= **1.0E-03** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer test #1, using the pressure transducer.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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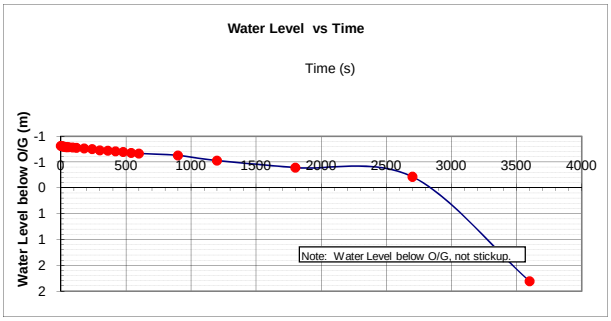
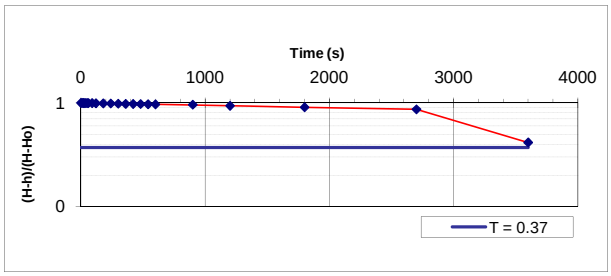
			Downhole Test Interval			
Project No.	101-176/35		15.24 m to	24.39 m		
Drillhole ID.	GH10-216					
Piezometer ID.	GH10-216			Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)				90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods				471		m
Date				SEP 22/2010		
Test Type				FALLING		
Test No.				3		
Hole diameter, D		PQ	D =	0.123		m
Interior diameter of piezometer or drill rods, d	2.00 Inches	Sch 80	d =	0.04925		m
Top of test interval				15.24	15.24	m
Bottom of test interval				24.39	24.39	m
Length of test interval, L			L =	9.15	9.15	m
Downhole stickup of piezometer or rods above ground surface				0.81	0.81	m
Static water level, **(below ground surface)**				3.67	3.67	m
Elevation of Static Water Level **(above sea level)**			El. =	466.52	466.52	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	4.48	4.48	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-0.81	1.00	0.37
10	0.01	0.01	-0.80	1.00	0.37
20	0.01	0.01	-0.80	1.00	0.37
30	0.02	0.02	-0.79	1.00	0.37
40	0.02	0.02	-0.79	1.00	0.37
50	0.02	0.02	-0.79	1.00	0.37
60	0.02	0.02	-0.79	0.99	0.37
90	0.03	0.03	-0.78	0.99	0.37
120	0.03	0.03	-0.78	0.99	0.37
180	0.05	0.05	-0.76	0.99	0.37
240	0.06	0.06	-0.75	0.99	0.37
300	0.09	0.09	-0.72	0.98	0.37
360	0.09	0.09	-0.72	0.98	0.37
420	0.11	0.11	-0.70	0.98	0.37
480	0.12	0.12	-0.69	0.97	0.37
540	0.13	0.13	-0.68	0.97	0.37
600	0.15	0.15	-0.66	0.97	0.37
900	0.18	0.18	-0.63	0.96	0.37
1200	0.28	0.28	-0.53	0.94	0.37
1800	0.42	0.42	-0.39	0.91	0.37
2700	0.60	0.60	-0.21	0.87	0.37
3600	2.62	2.62	1.81	0.42	0.37





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

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

Assume sin a = 1, m = 1

T= 3800 secs

Hydraulic Conductivity, K= **4.4E-06** cm/s

TEST COMMENTS:

1. Falling Head Test conducted after Piezometer installation

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	04JAN'11	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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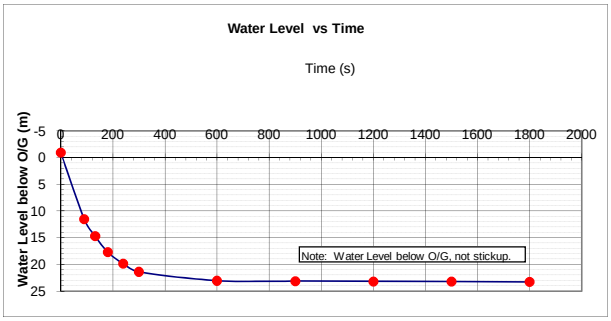
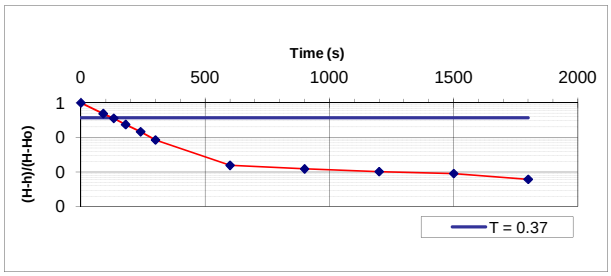
					Downhole Test Interval		
Project No.	**101-176/35**				**35.06** m to **41.46** m		
Drillhole ID.	**GH10-217**						
Piezometer ID.	**GH10-217**				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					392		m
Date					Sept/19/2010		
Test Type					**FALLING**		
Test No.					1		
Hole diameter, D			**NQ**	D =	0.076		m
Interior diameter of piezometer or drill rods, d		**1.00 Inches**	**Sch 80**	d =	0.02431		m
Top of test interval					35.06	35.06	m
Bottom of test interval					41.46	41.46	m
Length of test interval, L				L =	6.40	6.40	m
Downhole stickup of piezometer or rods above ground surface					0.94	0.94	m
Static water level, **(below ground surface)**					23.46	23.46	m
Elevation of Static Water Level **(above sea level)**				El. =	367.60	367.60	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	24.40	24.40	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-0.94	1.00	0.37
90	12.50	12.50	11.56	0.49	0.37
132	15.68	15.68	14.74	0.36	0.37
180	18.65	18.65	17.71	0.24	0.37
240	20.84	20.84	19.90	0.15	0.37
300	22.34	22.34	21.40	0.08	0.37
600	24.02	24.02	23.08	0.02	0.37
900	24.10	24.10	23.16	0.01	0.37
1200	24.15	24.15	23.21	0.01	0.37
1500	24.18	24.18	23.24	0.01	0.37
1800	24.25	24.25	23.31	0.01	0.37





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

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

Assume
sin a = 1
m = 1

T= **130** secs

Hydraulic Conductivity, K= **4.6E-05** cm/s

TEST COMMENTS:

1. Falling head test conducted 1hr after piezometer was installed.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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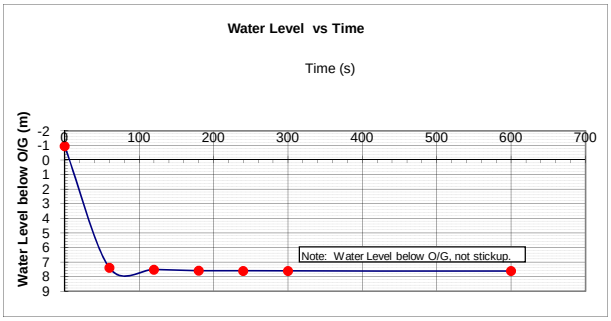
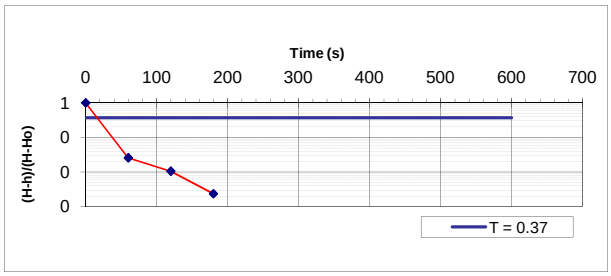
					Downhole Test Interval		
Project No.	**101-176/35**				**37.20** m to **43.30** m		
Drillhole ID.	**GH10-218**						
Piezometer ID.	**GH10-218**				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					355		m
Date					Sep/21/10		
Test Type					**FALLING**		
Test No.					1		
Hole diameter, D			**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		**1.00 Inches**	**Sch 80**	d =	0.02431		m
Top of test interval					37.20	37.20	m
Bottom of test interval					43.30	43.30	m
Length of test interval, L				L =	6.10	6.10	m
Downhole stickup of piezometer or rods above ground surface					0.95	0.95	m
Static water level, **(below ground surface)**					7.62	7.62	m
Elevation of Static Water Level **(above sea level)**				El. =	346.43	346.43	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	8.57	8.57	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-0.95	1.00	0.37
60	8.35	8.35	7.40	0.03	0.37
120	8.48	8.48	7.53	0.01	0.37
180	8.55	8.55	7.60	0.00	0.37
240	8.57	8.57	7.62	0.00	0.37
300	8.57	8.57	7.62	0.00	0.37
600	8.58	8.58	7.63	0.00	0.37





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

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

Assume sin a = 1, m = 1

T= **20** secs

Hydraulic Conductivity, K= **2.9E-04** cm/s

TEST COMMENTS:

1. Example comment: Falling Head Test conducted 12 hours after Piezometer Installed

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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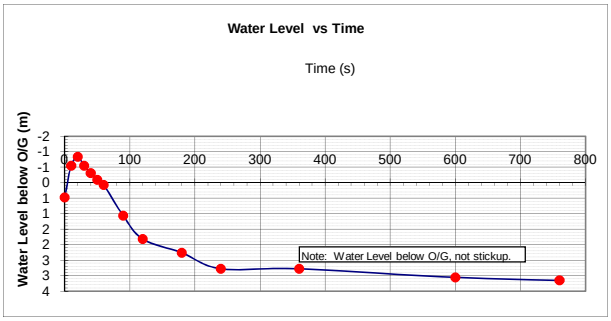
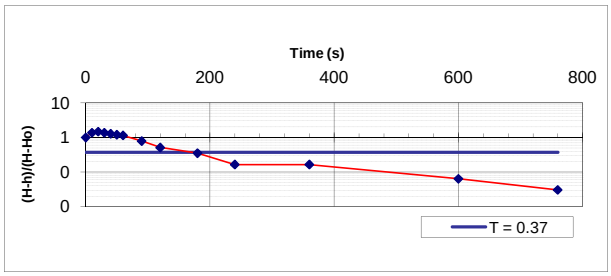
			Downhole Test Interval			
Project No.	**101-176/35**		**19.20** m to **26.80** m			
Drillhole ID.	**GH10-219**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				308		m
Date				Sep/22/2010		
Test Type				**FALLING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				19.20	19.20	m
Bottom of test interval				26.80	26.80	m
Length of test interval, L			L =	7.60	7.60	m
Downhole stickup of piezometer or rods above ground surface				0	0.00	m
Static water level, **(below ground surface)**				3.24	3.24	m
Elevation of Static Water Level **(above sea level)**			El. =	304.76	304.76	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	3.24	3.24	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.48	0.48	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.48	0.48	0.48	1.00	0.37
10	-0.55	-0.55	-0.55	1.37	0.37
20	-0.83	-0.83	-0.83	1.48	0.37
30	-0.54	-0.54	-0.54	1.37	0.37
40	-0.30	-0.30	-0.30	1.28	0.37
50	-0.09	-0.09	-0.09	1.21	0.37
60	0.07	0.07	0.07	1.15	0.37
90	1.07	1.07	1.07	0.79	0.37
120	1.83	1.83	1.83	0.51	0.37
180	2.26	2.26	2.26	0.35	0.37
240	2.78	2.78	2.78	0.17	0.37
360	2.78	2.78	2.78	0.17	0.37
600	3.06	3.06	3.06	0.06	0.37
760	3.16	3.16	3.16	0.03	0.37





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

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

Assume sin a = 1, m = 1

T= **160** secs

Hydraulic Conductivity, K= **3.2E-04** cm/s

TEST COMMENTS:

1. Data collected by the pressure transducer in conjunction with the packer test, after the pin sheared, before the lugeon test.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-219\[GH10-219 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-1 (transducer)

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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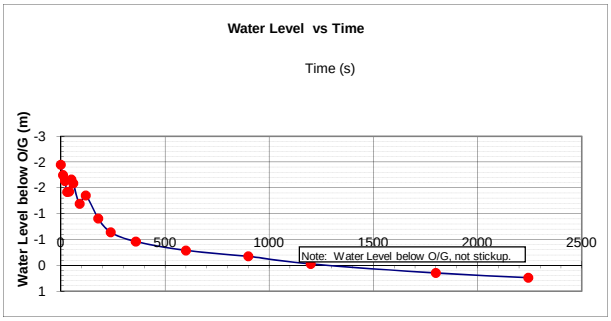
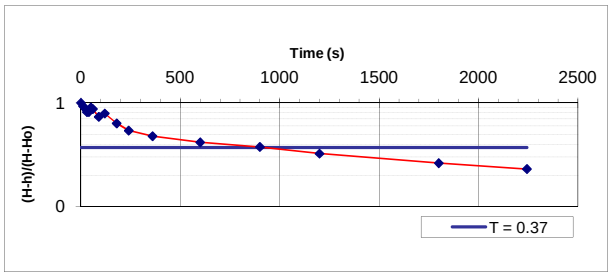
			Downhole Test Interval			
Project No.	**101-176/35**		**28.35** m to **35.98** m			
Drillhole ID.	**GH10-219**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				308		m
Date				Sep/22/2010		
Test Type				**FALLING**		
Test No.				2		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				28.35	28.35	m
Bottom of test interval				35.98	35.98	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				0	0.00	m
Static water level, **(below ground surface)**				0.90	0.90	m
Elevation of Static Water Level **(above sea level)**			El. =	307.10	307.10	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	0.90	0.90	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	-1.95	-1.95	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	-1.95	-1.95	-1.95	1.00	0.37
10	-1.74	-1.74	-1.74	0.93	0.37
20	-1.63	-1.63	-1.63	0.89	0.37
30	-1.42	-1.42	-1.42	0.81	0.37
40	-1.43	-1.43	-1.43	0.82	0.37
50	-1.66	-1.66	-1.66	0.90	0.37
60	-1.59	-1.59	-1.59	0.87	0.37
90	-1.19	-1.19	-1.19	0.73	0.37
120	-1.35	-1.35	-1.35	0.79	0.37
180	-0.90	-0.90	-0.90	0.63	0.37
240	-0.64	-0.64	-0.64	0.54	0.37
360	-0.46	-0.46	-0.46	0.48	0.37
600	-0.29	-0.29	-0.29	0.42	0.37
900	-0.17	-0.17	-0.17	0.38	0.37
1200	-0.02	-0.02	-0.02	0.32	0.37
1800	0.15	0.15	0.15	0.26	0.37
2244	0.24	0.24	0.24	0.23	0.37





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

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

Assume sin a = 1, m = 1

T= **950** secs

Hydraulic Conductivity, K= **5.3E-05** cm/s

TEST COMMENTS:

1. Data collected in conjunction with packer test #2, after the lugeon portion of the test.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-219\[GH10-219 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-2 (transducer)

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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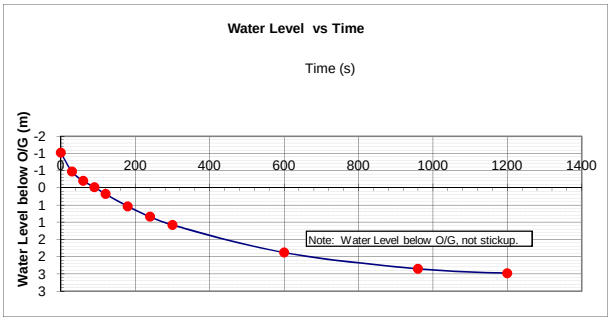
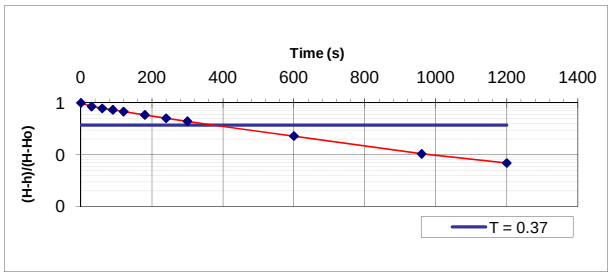
Downhole Test Interval: 9.76 m to 17.99 m

Project No.	101-176/35				
Drillhole ID.	GH10-219				
Piezometer ID.	GH10-219				
Drillhole Inclination (if not inclined, select 90°)				Downhole: 90	Vertical: 90 °
Drillhole Elevation from Top of Piezometer or Drill Rods				308	m
Date				Sep/24/2010	
Test Type				FALLING	
Test No.				4	
Hole diameter, D		HQ	D =	0.096	m
Interior diameter of piezometer or drill rods, d	1.00 Inches	Sch 80	d =	0.02431	m
Top of test interval				9.76 / 9.76	m
Bottom of test interval				17.99 / 17.99	m
Length of test interval, L			L =	8.23 / 8.23	m
Downhole stickup of piezometer or rods above ground surface				1.02 / 1.02	m
Static water level, **(below ground surface)**				2.74 / 2.74	m
Elevation of Static Water Level **(above sea level)**			El. =	304.24 / 304.24	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	3.76 / 3.76	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00 / 0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.02	1.00	0.37
30	0.55	0.55	-0.47	0.85	0.37
60	0.82	0.82	-0.20	0.78	0.37
90	1.00	1.00	-0.02	0.73	0.37
120	1.20	1.20	0.18	0.68	0.37
180	1.56	1.56	0.54	0.59	0.37
240	1.86	1.86	0.84	0.51	0.37
300	2.10	2.10	1.08	0.44	0.37
600	2.90	2.90	1.88	0.23	0.37
960	3.37	3.37	2.35	0.10	0.37
1200	3.50	3.50	2.48	0.07	0.37





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

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

Assume sin a = 1, m = 1

T= 400 secs

Hydraulic Conductivity, K= **1.2E-05** cm/s

TEST COMMENTS:

1. Done first thing in the morning after night shift piezo install.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	23DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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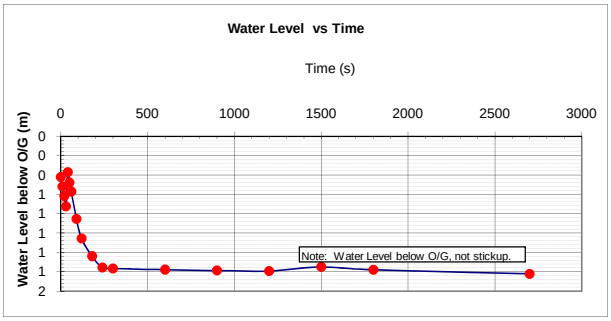
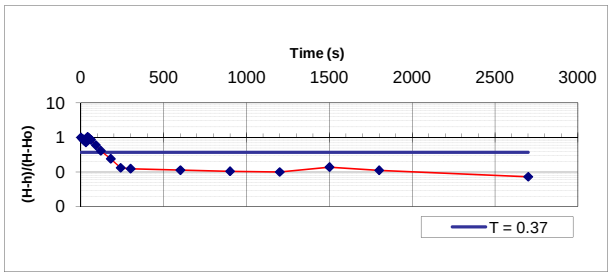
			Downhole Test Interval			
Project No.	**101-176/35**		**6.10** m to **13.72** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 24/2010		
Test Type				**FALLING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				6.10	6.10	m
Bottom of test interval				13.72	13.72	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				0.48	0.48	m
Static water level, **(below ground surface)**				1.50	1.50	m
Elevation of Static Water Level **(above sea level)**			El. =	603.02	603.02	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.98	1.98	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.90	0.90	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.90	0.90	0.42	1.00	0.37
10	1.00	1.00	0.52	0.91	0.37
20	1.10	1.10	0.62	0.82	0.37
30	1.21	1.21	0.73	0.72	0.37
40	0.85	0.85	0.37	1.05	0.37
50	0.96	0.96	0.48	0.95	0.37
60	1.05	1.05	0.57	0.86	0.37
90	1.34	1.34	0.86	0.60	0.37
120	1.54	1.54	1.06	0.41	0.37
180	1.72	1.72	1.24	0.24	0.37
240	1.84	1.84	1.36	0.13	0.37
300	1.85	1.85	1.37	0.12	0.37
600	1.86	1.86	1.38	0.11	0.37
900	1.87	1.87	1.39	0.10	0.37
1200	1.87	1.87	1.39	0.10	0.37
1500	1.83	1.83	1.35	0.14	0.37
1800	1.86	1.86	1.38	0.11	0.37
2700	1.90	1.90	1.42	0.07	0.37





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

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

Assume
sin a = 1
m = 1

T= **150** secs

Hydraulic Conductivity, K= **3.4E-04** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #1

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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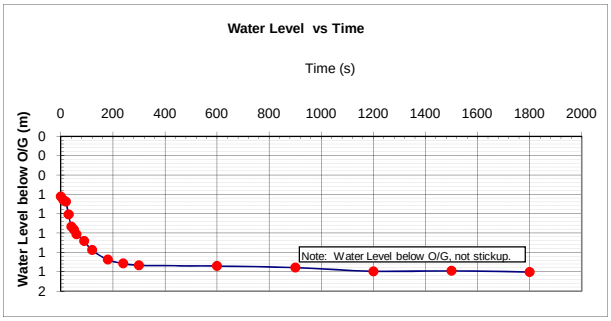
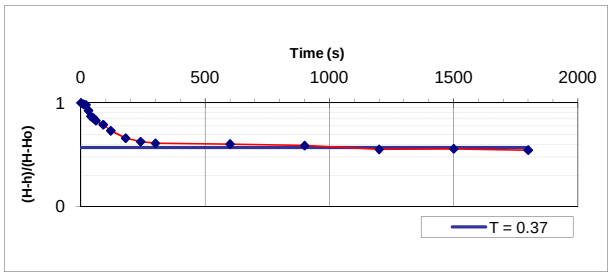
Downhole Test Interval: 13.72 m to 21.34 m

			Downhole	Vertical	
Project No.	101-176/35				
Drillhole ID.	GH10-220				
Piezometer ID.	N/A				
Drillhole Inclination (if not inclined, select 90°)			90	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m
Date			SEP 24/2010		
Test Type			FALLING		
Test No.			2		
Hole diameter, D	HQ	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			13.72	13.72	m
Bottom of test interval			21.34	21.34	m
Length of test interval, L		L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface			0.45	0.45	m
Static water level, **(below ground surface)**			1.82	1.82	m
Elevation of Static Water Level **(above sea level)**		El. =	602.73	602.73	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	2.27	2.27	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	1.07	1.07	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	1.07	1.07	0.62	1.00	0.37
10	1.11	1.11	0.66	0.97	0.37
20	1.13	1.13	0.68	0.96	0.37
30	1.26	1.26	0.81	0.85	0.37
40	1.38	1.38	0.93	0.74	0.37
50	1.42	1.42	0.97	0.72	0.37
60	1.46	1.46	1.01	0.67	0.37
90	1.53	1.53	1.08	0.62	0.37
120	1.63	1.63	1.18	0.54	0.37
180	1.72	1.72	1.27	0.46	0.37
240	1.77	1.77	1.32	0.42	0.37
300	1.78	1.78	1.33	0.41	0.37
600	1.79	1.79	1.34	0.40	0.37
900	1.81	1.81	1.36	0.39	0.37
1200	1.85	1.85	1.40	0.36	0.37
1500	1.84	1.84	1.39	0.36	0.37
1800	1.85	1.85	1.40	0.35	0.37





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

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

Assume sin a = 1, m = 1

T= **1150** secs

Hydraulic Conductivity, K= **4.4E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #2

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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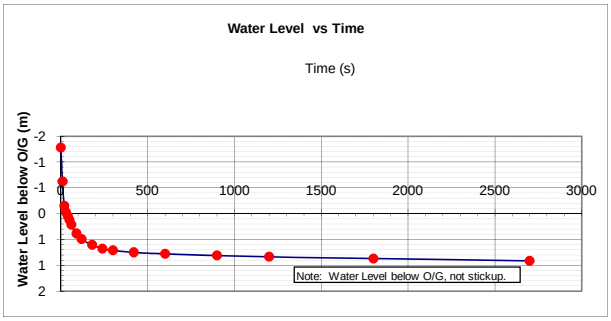
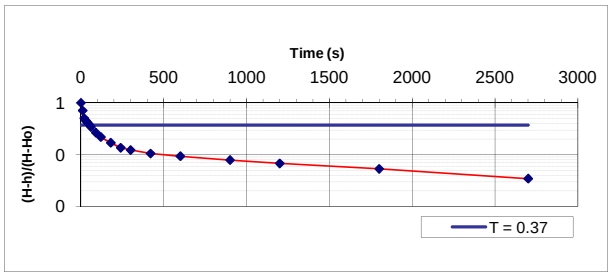
			Downhole Test Interval			
Project No.	**101-176/35**		**4.27** m to **44.21** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 25/2010		
Test Type				**FALLING**		
Test No.				4		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				4.27	4.27	m
Bottom of test interval				44.21	44.21	m
Length of test interval, L			L =	39.94	39.94	m
Downhole stickup of piezometer or rods above ground surface				1.28	1.28	m
Static water level, **(below ground surface)**				0.99	0.99	m
Elevation of Static Water Level **(above sea level)**			El. =	602.73	602.73	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.27	2.27	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.28	1.00	0.37
10	0.66	0.66	-0.62	0.71	0.37
20	1.13	1.13	-0.15	0.50	0.37
30	1.25	1.25	-0.03	0.45	0.37
40	1.33	1.33	0.05	0.42	0.37
50	1.40	1.40	0.12	0.38	0.37
60	1.49	1.49	0.21	0.34	0.37
90	1.66	1.66	0.38	0.27	0.37
120	1.77	1.77	0.49	0.22	0.37
180	1.88	1.88	0.60	0.17	0.37
240	1.96	1.96	0.68	0.14	0.37
300	1.99	1.99	0.71	0.12	0.37
420	2.03	2.03	0.75	0.11	0.37
600	2.06	2.06	0.78	0.09	0.37
900	2.09	2.09	0.81	0.08	0.37
1200	2.12	2.12	0.84	0.07	0.37
1800	2.15	2.15	0.87	0.05	0.37
2700	2.19	2.19	0.91	0.03	0.37





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

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

Assume
sin a = 1
m = 1

T= **55** secs

Hydraulic Conductivity, K= **2.3E-04** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #5, before the packer was put down the hole. Test was conducted with water level meter.
2. This tests a larger region than the packer test does.
3. Assumed a static water level.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	25SEP'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

Knight Piésold CONSULTING

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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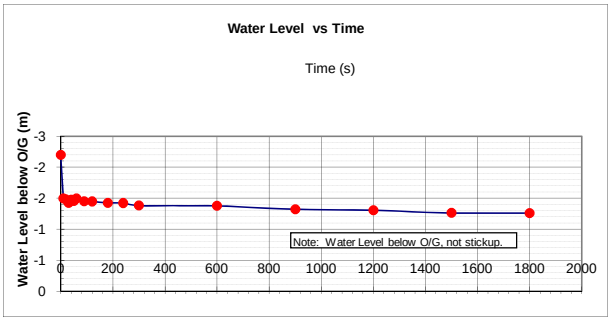
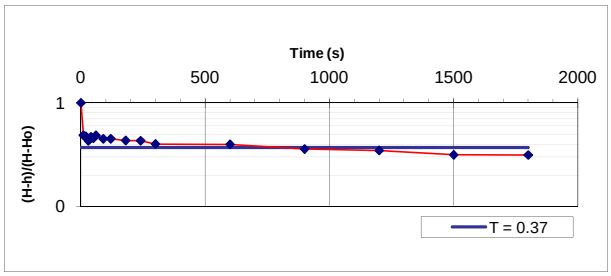
			Downhole Test Interval			
Project No.	**101-176/35**		**56.40** m to **64.02** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 27/2010		
Test Type				**FALLING**		
Test No.				8		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				56.40	56.40	m
Bottom of test interval				64.02	64.02	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				1.45	1.45	m
Static water level, **(below ground surface)**				-0.83	-0.83	m
Elevation of Static Water Level **(above sea level)**			El. =	604.38	604.38	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	0.62	0.62	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	-0.75	-0.75	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	-0.75	-0.75	-2.20	1.00	0.37
10	-0.05	-0.05	-1.50	0.49	0.37
20	-0.03	-0.03	-1.48	0.47	0.37
30	0.03	0.03	-1.42	0.43	0.37
40	-0.02	-0.02	-1.47	0.47	0.37
50	-0.01	-0.01	-1.46	0.46	0.37
60	-0.05	-0.05	-1.50	0.49	0.37
90	0.00	0.00	-1.45	0.45	0.37
120	0.00	0.00	-1.45	0.45	0.37
180	0.03	0.03	-1.42	0.43	0.37
240	0.03	0.03	-1.42	0.43	0.37
300	0.07	0.07	-1.38	0.40	0.37
600	0.07	0.07	-1.38	0.40	0.37
900	0.13	0.13	-1.32	0.36	0.37
1200	0.14	0.14	-1.31	0.35	0.37
1500	0.19	0.19	-1.26	0.32	0.37
1800	0.19	0.19	-1.26	0.31	0.37





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

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

Assume
sin a = 1
m = 1

T= **850** secs

Hydraulic Conductivity, K= **5.9E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #8

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-220\[GH10-220 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-8

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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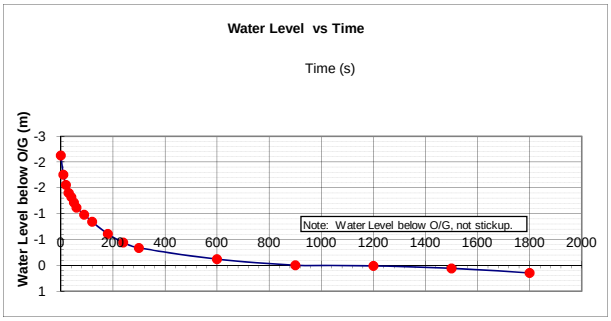
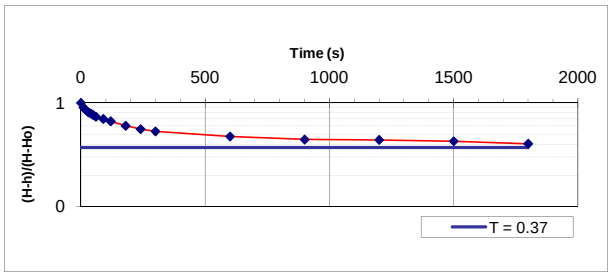
			Downhole Test Interval			
Project No.	**101-176/35**		**64.02** m to **71.65** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 28/2010		
Test Type				**FALLING**		
Test No.				9		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				64.02	64.02	m
Bottom of test interval				71.65	71.65	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				1.4	1.40	m
Static water level, **(below ground surface)**				1.69	1.69	m
Elevation of Static Water Level **(above sea level)**			El. =	601.91	601.91	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	3.09	3.09	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	-0.72	-0.72	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	-0.72	-0.72	-2.12	1.00	0.37
10	-0.35	-0.35	-1.75	0.90	0.37
20	-0.16	-0.16	-1.56	0.85	0.37
30	0.00	0.00	-1.40	0.81	0.37
40	0.08	0.08	-1.32	0.79	0.37
50	0.19	0.19	-1.21	0.76	0.37
60	0.28	0.28	-1.12	0.74	0.37
90	0.42	0.42	-0.98	0.70	0.37
120	0.56	0.56	-0.84	0.66	0.37
180	0.79	0.79	-0.61	0.60	0.37
240	0.96	0.96	-0.44	0.56	0.37
300	1.06	1.06	-0.34	0.53	0.37
600	1.28	1.28	-0.12	0.47	0.37
900	1.40	1.40	0.00	0.44	0.37
1200	1.41	1.41	0.01	0.44	0.37
1500	1.46	1.46	0.06	0.43	0.37
1800	1.55	1.55	0.15	0.40	0.37





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

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

Assume sin a = 1, m = 1

T= **1850** secs

Hydraulic Conductivity, K= **2.7E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #9 using the pressure transducer.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	28SEP'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV RISING HEAD TEST METHOD

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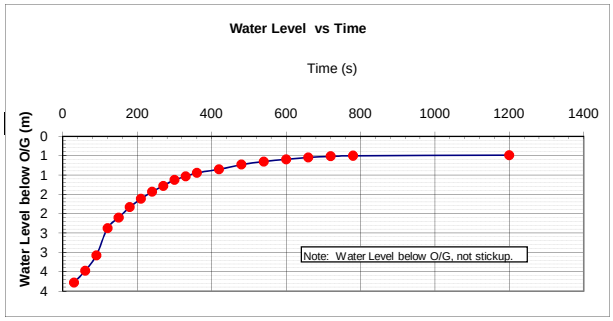
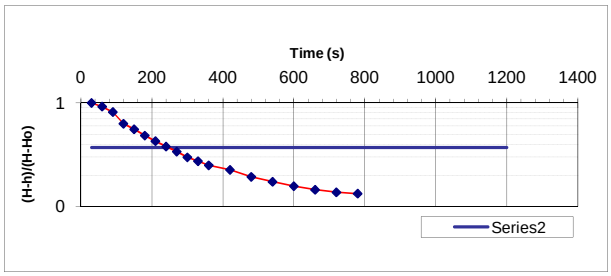
			Downhole Test Interval			
Project No.	**101-176/35**		**71.65** m to **86.87** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A		**Downhole**	**Vertical**		
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°	
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m	
Date			SEP 24/2010			
Test Type			**RISING**			
Test No.			11			
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				71.65	71.65	m
Bottom of test interval				86.87	86.87	m
Length of test interval, L			L =	15.22	15.22	m
Downhole stickup of piezometer or rods above ground surface				0.09	0.09	m
Static water level, **(below ground surface)**				0.00	0.00	m
Elevation of Static Water Level **(above sea level)**			El. =	604.91	604.91	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	0.09	0.09	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	3.87	3.87	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	3.87	3.87	3.78	1.00	0.37
30	3.57	3.57	3.48	0.92	0.37
60	3.17	3.17	3.08	0.81	0.37
90	2.47	2.47	2.38	0.63	0.37
120	2.19	2.19	2.10	0.56	0.37
150	1.92	1.92	1.83	0.48	0.37
180	1.71	1.71	1.62	0.43	0.37
210	1.52	1.52	1.43	0.38	0.37
240	1.37	1.37	1.28	0.34	0.37
270	1.22	1.22	1.13	0.30	0.37
300	1.13	1.13	1.04	0.27	0.37
330	1.04	1.04	0.95	0.25	0.37
360	0.94	0.94	0.85	0.23	0.37
420	0.82	0.82	0.73	0.19	0.37
480	0.75	0.75	0.66	0.17	0.37
540	0.69	0.69	0.60	0.16	0.37
600	0.64	0.64	0.55	0.15	0.37
660	0.61	0.61	0.52	0.14	0.37
720	0.59	0.59	0.50	0.13	0.37
780	0.58	0.58	0.49	0.13	0.37
1200	0.53	0.53	0.44	0.12	0.37





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

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

Assume
sin a = 1
m = 1

T= **220** secs

Hydraulic Conductivity, K= **1.3E-04** cm/s

TEST COMMENTS:

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-220\[GH10-220 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-11

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	JPN	CG	KJB

Tested By: JPN
Reviewed By: JAB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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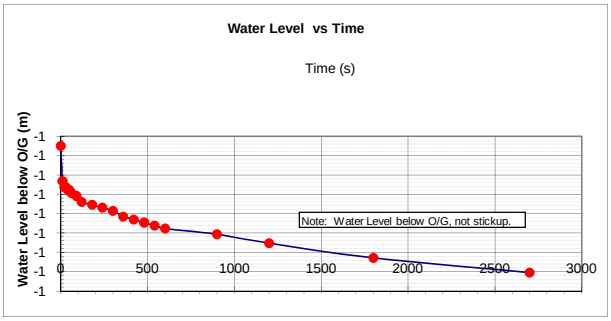
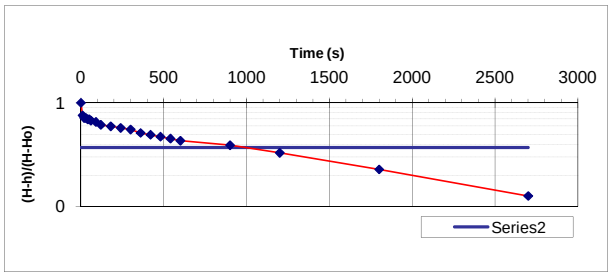
			Downhole Test Interval			
Project No.	**101-176/35**		**86.89** m to **102.11** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 29/2010		
Test Type				**FALLING**		
Test No.				12		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				86.89	86.89	m
Bottom of test interval				102.11	102.11	m
Length of test interval, L			L =	15.22	15.22	m
Downhole stickup of piezometer or rods above ground surface				1.33	1.33	m
Static water level, **(below ground surface)**				-1.18	-1.18	m
Elevation of Static Water Level **(above sea level)**			El. =	604.85	604.85	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	0.15	0.15	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.33	1.00	0.37
10	0.04	0.04	-1.29	0.76	0.37
20	0.04	0.04	-1.29	0.72	0.37
30	0.04	0.04	-1.29	0.72	0.37
40	0.05	0.05	-1.28	0.70	0.37
50	0.05	0.05	-1.28	0.70	0.37
60	0.05	0.05	-1.28	0.67	0.37
90	0.05	0.05	-1.28	0.65	0.37
120	0.06	0.06	-1.27	0.61	0.37
180	0.06	0.06	-1.27	0.59	0.37
240	0.06	0.06	-1.27	0.57	0.37
300	0.07	0.07	-1.26	0.55	0.37
360	0.07	0.07	-1.26	0.51	0.37
420	0.08	0.08	-1.25	0.49	0.37
480	0.08	0.08	-1.25	0.47	0.37
540	0.08	0.08	-1.25	0.45	0.37
600	0.09	0.09	-1.24	0.43	0.37
900	0.09	0.09	-1.24	0.39	0.37
1200	0.10	0.10	-1.23	0.33	0.37
1800	0.12	0.12	-1.21	0.23	0.37
2700	0.13	0.13	-1.20	0.13	0.37





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

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

Assume sin a = 1, m = 1

T= **1000** secs

Hydraulic Conductivity, K= **2.9E-05** cm/s

TEST COMMENTS:

1. Couldn't do a rising head test as water level was below the suction ability of the pump.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	29SEP'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV RISING HEAD TEST METHOD

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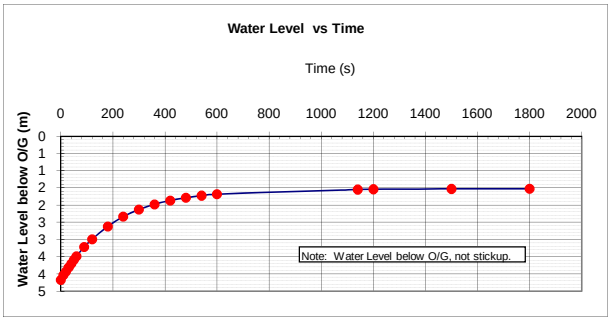
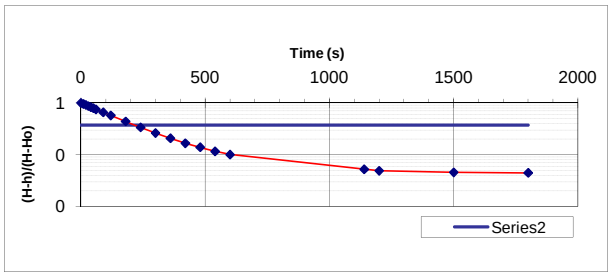
			Downhole Test Interval			
Project No.	**101-176/35**		**102.13** m to **117.35** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A		**Downhole**	**Vertical**		
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°	
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m	
Date			SEP 29/2010			
Test Type			**RISING**			
Test No.			13			
Hole diameter, D		**HQ**	D =	0.096	m	
Interior diameter of piezometer or drill rods, d			d =	0.07780	m	
Top of test interval			102.13	102.13	m	
Bottom of test interval			117.35	117.35	m	
Length of test interval, L			L =	15.21	15.21	m
Downhole stickup of piezometer or rods above ground surface			1.52	1.52	m	
Static water level, **(below ground surface)**			1.41	1.41	m	
Elevation of Static Water Level **(above sea level)**			El. =	602.07	602.07	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.93	2.93	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	5.70	5.70	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	5.70	5.70	4.18	1.00	0.37
10	5.56	5.56	4.04	0.95	0.37
20	5.46	5.46	3.94	0.91	0.37
30	5.33	5.33	3.81	0.87	0.37
40	5.22	5.22	3.70	0.83	0.37
50	5.12	5.12	3.60	0.79	0.37
60	5.01	5.01	3.49	0.75	0.37
90	4.74	4.74	3.22	0.65	0.37
120	4.52	4.52	3.00	0.57	0.37
180	4.15	4.15	2.63	0.44	0.37
240	3.86	3.86	2.34	0.34	0.37
300	3.66	3.66	2.14	0.26	0.37
360	3.50	3.50	1.98	0.21	0.37
420	3.39	3.39	1.87	0.17	0.37
480	3.31	3.31	1.79	0.14	0.37
540	3.25	3.25	1.73	0.12	0.37
600	3.21	3.21	1.69	0.10	0.37
1140	3.07	3.07	1.55	0.05	0.37
1200	3.06	3.06	1.54	0.05	0.37
1500	3.05	3.05	1.53	0.05	0.37
1800	3.05	3.05	1.53	0.04	0.37
2280	3.05	3.05	1.53	0.04	0.37





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

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

Assume
sin a = 1
m = 1

T= **200** secs

Hydraulic Conductivity, K= **1.4E-04** cm/s

TEST COMMENTS:

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	23DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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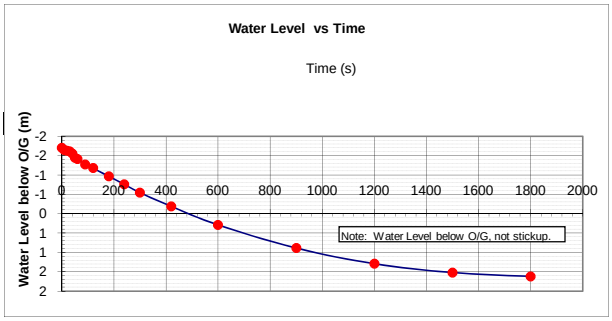
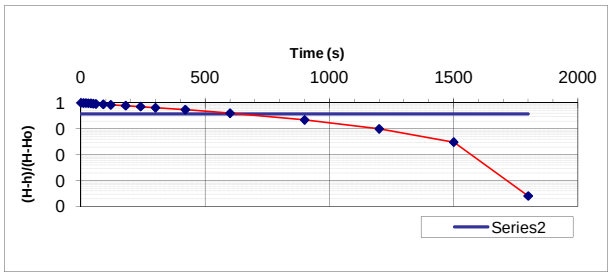
			Downhole Test Interval			
Project No.	**101-176/35**		**114.30** m to **128.02** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 29/2010		
Test Type				**FALLING**		
Test No.				14		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				114.30	114.30	m
Bottom of test interval				128.02	128.02	m
Length of test interval, L			L =	13.72	13.72	m
Downhole stickup of piezometer or rods above ground surface				1.7	1.70	m
Static water level, **(below ground surface)**				1.63	1.63	m
Elevation of Static Water Level **(above sea level)**			El. =	601.67	601.67	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	3.33	3.33	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.70	1.00	0.37
10	0.06	0.06	-1.64	0.98	0.37
20	0.08	0.08	-1.62	0.98	0.37
30	0.09	0.09	-1.61	0.97	0.37
40	0.15	0.15	-1.55	0.95	0.37
50	0.26	0.26	-1.44	0.92	0.37
60	0.29	0.29	-1.41	0.91	0.37
90	0.43	0.43	-1.27	0.87	0.37
120	0.52	0.52	-1.18	0.84	0.37
180	0.74	0.74	-0.96	0.78	0.37
240	0.94	0.94	-0.76	0.72	0.37
300	1.16	1.16	-0.54	0.65	0.37
420	1.51	1.51	-0.19	0.55	0.37
600	1.99	1.99	0.29	0.40	0.37
900	2.59	2.59	0.89	0.22	0.37
1200	3.00	3.00	1.30	0.10	0.37
1500	3.22	3.22	1.52	0.03	0.37
1800	3.33	3.33	1.63	0.00	0.37





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

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

Assume sin a = 1, m = 1

T= **650** secs

Hydraulic Conductivity, K= **4.8E-05** cm/s

TEST COMMENTS:

1. Falling Head Test completed as part of Packer Test #14 (Constant Head Test #14)

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	23DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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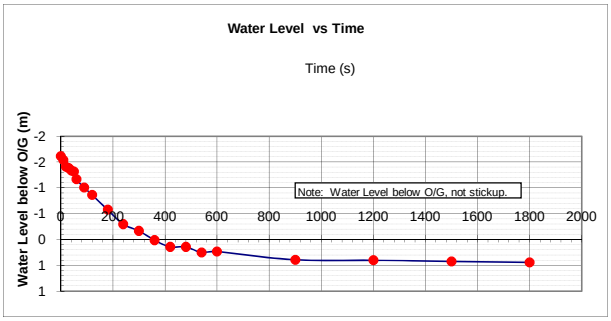
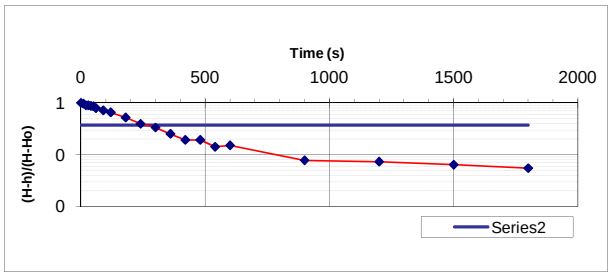
			Downhole Test Interval			
Project No.	**101-176/35**		**128.02** m to **143.26** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				SEP 30/2010		
Test Type				**FALLING**		
Test No.				15		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				128.02	128.02	m
Bottom of test interval				143.26	143.26	m
Length of test interval, L			L =	15.24	15.24	m
Downhole stickup of piezometer or rods above ground surface				1.61544	1.62	m
Static water level, **(below ground surface)**				0.56	0.56	m
Elevation of Static Water Level **(above sea level)**			El. =	602.82	602.82	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.18	2.18	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.62	1.00	0.37
10	0.08	0.08	-1.54	0.96	0.37
20	0.21	0.21	-1.41	0.90	0.37
30	0.23	0.23	-1.39	0.89	0.37
40	0.28	0.28	-1.34	0.87	0.37
50	0.30	0.30	-1.32	0.86	0.37
60	0.45	0.45	-1.17	0.79	0.37
90	0.61	0.61	-1.01	0.72	0.37
120	0.75	0.75	-0.87	0.66	0.37
180	1.04	1.04	-0.58	0.52	0.37
240	1.32	1.32	-0.30	0.39	0.37
300	1.45	1.45	-0.17	0.33	0.37
360	1.63	1.63	0.01	0.25	0.37
420	1.76	1.76	0.14	0.19	0.37
480	1.76	1.76	0.14	0.19	0.37
540	1.87	1.87	0.25	0.14	0.37
600	1.85	1.85	0.23	0.15	0.37
900	2.01	2.01	0.39	0.08	0.37
1200	2.02	2.02	0.40	0.07	0.37
1500	2.04	2.04	0.42	0.06	0.37
1800	2.06	2.06	0.44	0.06	0.37





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

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

Assume
sin a = 1
m = 1

T= **260** secs

Hydraulic Conductivity, K= **1.1E-04** cm/s

TEST COMMENTS:

1. Data from downhole troll measurements.
2. Static water level calculated as difference between static troll and completely full pipe before Falling Head Test
3. Falling Head Test after Packer Test #15

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-220\[GH10-220 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-15 (TROLL)

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	30SEP'10	ISSUED WITH REPORT VA101-176/35-1	DDF	CG	KJB

Tested By: DDF
Reviewed By: JAB

Knight Piésold CONSULTING

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

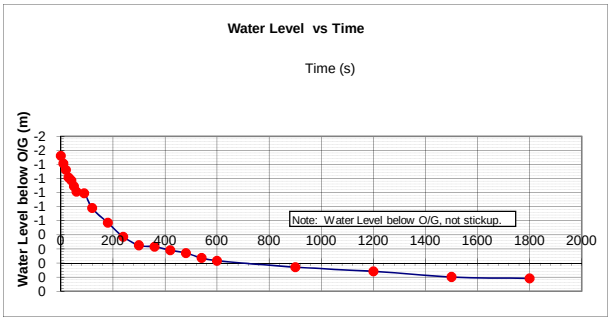
Print 01/08/10 14:19

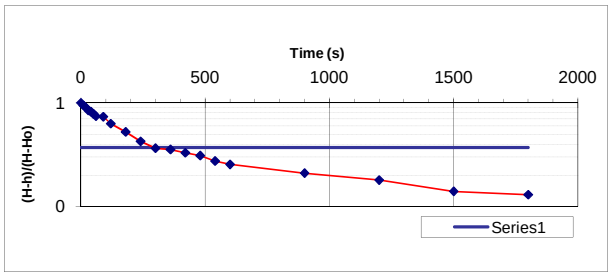
Downhole Test Interval: **158.50** m to **173.74** m

			Downhole	Vertical	
Project No.	**101-176/35**				
Drillhole ID.	**GH10-220**				
Piezometer ID.	N/A				
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m
Date			OCT 1/2010		
Test Type			**FALLING**		
Test No.			17		
Hole diameter, D	**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			158.50	158.50	m
Bottom of test interval			173.74	173.74	m
Length of test interval, L		L =	15.24	15.24	m
Downhole stickup of piezometer or rods above ground surface			1.52	1.52	m
Static water level, **(below ground surface)**			0.48	0.48	m
Elevation of Static Water Level **(above sea level)**		El. =	603.00	603.00	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	2.00	2.00	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.52	1.00	0.37
10	0.11	0.11	-1.41	0.95	0.37
20	0.20	0.20	-1.32	0.90	0.37
30	0.31	0.31	-1.21	0.85	0.37
40	0.35	0.35	-1.17	0.83	0.37
50	0.43	0.43	-1.09	0.79	0.37
60	0.51	0.51	-1.01	0.75	0.37
90	0.53	0.53	-0.99	0.74	0.37
120	0.74	0.74	-0.78	0.63	0.37
180	0.95	0.95	-0.57	0.53	0.37
240	1.15	1.15	-0.37	0.43	0.37
300	1.27	1.27	-0.25	0.37	0.37
360	1.29	1.29	-0.23	0.36	0.37
420	1.34	1.34	-0.18	0.33	0.37
480	1.38	1.38	-0.14	0.31	0.37
540	1.45	1.45	-0.07	0.28	0.37
600	1.49	1.49	-0.03	0.26	0.37
900	1.58	1.58	0.06	0.21	0.37
1200	1.64	1.64	0.12	0.18	0.37
1500	1.72	1.72	0.20	0.14	0.37
1800	1.74	1.74	0.22	0.13	0.37





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

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

Assume
sin a = 1
m = 1

T= **300** secs

Hydraulic Conductivity, K= **9.5E-05** cm/s

TEST COMMENTS:

1. Data from downhole troll measurements.
2. Static water level calculated as difference between static troll and completely full pipe before Falling Head Test
3. Falling Head Test after Packer Test #17

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-220\[GH10-220 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-17 (TROLL)

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	23DEC'10	ISSUED WITH REPORT VA101-176/35-1	DDF	CG	KJB

Tested By: DDF
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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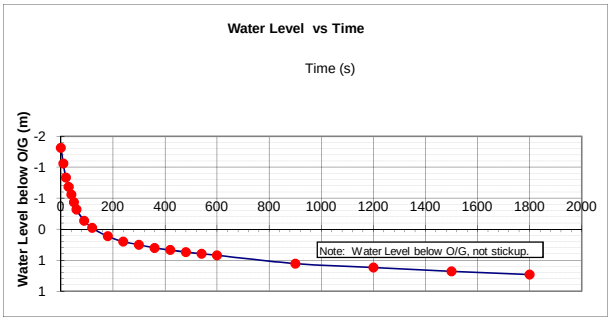
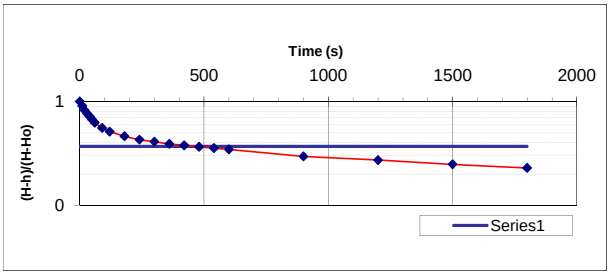
Downhole Test Interval: **158.50** m to **182.88** m

Project No.	**101-176/35**				
Drillhole ID.	**GH10-220**				
Piezometer ID.	N/A				
			Downhole	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m
Date			Oct/02/10		
Test Type			**FALLING**		
Test No.			18		
Hole diameter, D	**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			158.50	158.50	m
Bottom of test interval			182.88	182.88	m
Length of test interval, L		L =	24.38	24.38	m
Downhole stickup of piezometer or rods above ground surface			1.62	1.62	m
Static water level, **(below ground surface)**			1.34	1.34	m
Elevation of Static Water Level **(above sea level)**		El. =	602.04	602.04	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	2.96	2.96	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	0.30	0.30	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.30	0.30	-1.31	1.00	0.37
10	0.55	0.55	-1.06	0.91	0.37
20	0.79	0.79	-0.83	0.82	0.37
30	0.94	0.94	-0.68	0.76	0.37
40	1.06	1.06	-0.56	0.72	0.37
50	1.18	1.18	-0.43	0.67	0.37
60	1.30	1.30	-0.32	0.63	0.37
90	1.48	1.48	-0.13	0.56	0.37
120	1.60	1.60	-0.02	0.51	0.37
180	1.73	1.73	0.12	0.46	0.37
240	1.82	1.82	0.20	0.43	0.37
300	1.87	1.87	0.25	0.41	0.37
360	1.92	1.92	0.30	0.39	0.37
420	1.95	1.95	0.34	0.38	0.37
480	1.99	1.99	0.37	0.37	0.37
540	2.01	2.01	0.40	0.36	0.37
600	2.04	2.04	0.42	0.35	0.37
900	2.17	2.17	0.56	0.30	0.37
1200	2.23	2.23	0.62	0.27	0.37
1500	2.30	2.30	0.68	0.25	0.37
1800	2.35	2.35	0.73	0.23	0.37





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

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

Assume sin a = 1, m = 1

T= **480** secs

Hydraulic Conductivity, K= **4.0E-05** cm/s

TEST COMMENTS:

1. Data from hand measurements with water level meter.
2. Falling head test after Packer Test #18.
3. Initial water level, Ho, modified by DDF.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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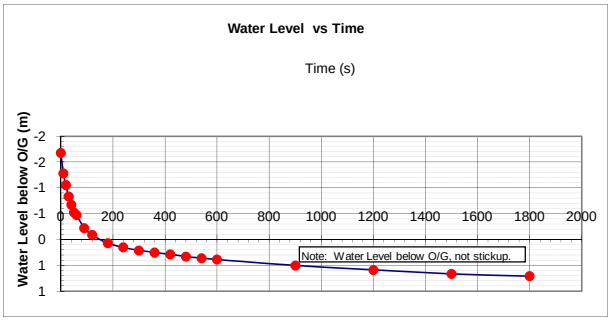
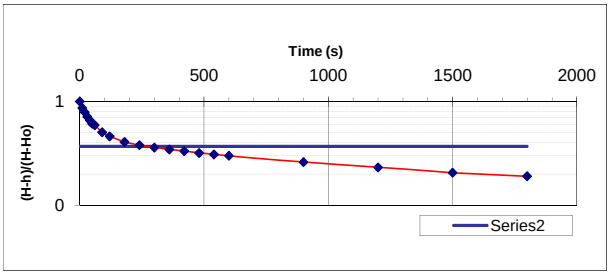
Downhole Test Interval: **111.25** m to **182.88** m

			Downhole	Vertical	
Project No.	**101-176/35**				
Drillhole ID.	**GH10-220**				
Piezometer ID.	N/A				
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m
Date			OCT 3/2010		
Test Type			**FALLING**		
Test No.			19		
Hole diameter, D	**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			111.25	111.25	m
Bottom of test interval			182.88	182.88	m
Length of test interval, L		L =	71.63	71.63	m
Downhole stickup of piezometer or rods above ground surface			1.6764	1.68	m
Static water level, **(below ground surface)**			1.28	1.28	m
Elevation of Static Water Level **(above sea level)**		El. =	602.05	602.05	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	2.95	2.95	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.68	1.00	0.37
10	0.40	0.40	-1.28	0.87	0.37
20	0.62	0.62	-1.05	0.79	0.37
30	0.84	0.84	-0.83	0.71	0.37
40	1.01	1.01	-0.67	0.66	0.37
50	1.15	1.15	-0.52	0.61	0.37
60	1.20	1.20	-0.47	0.59	0.37
90	1.46	1.46	-0.22	0.51	0.37
120	1.59	1.59	-0.09	0.46	0.37
180	1.75	1.75	0.07	0.41	0.37
240	1.83	1.83	0.16	0.38	0.37
300	1.89	1.89	0.21	0.36	0.37
360	1.93	1.93	0.26	0.35	0.37
420	1.97	1.97	0.29	0.33	0.37
480	2.01	2.01	0.33	0.32	0.37
540	2.04	2.04	0.36	0.31	0.37
600	2.07	2.07	0.39	0.30	0.37
900	2.18	2.18	0.51	0.26	0.37
1200	2.27	2.27	0.59	0.23	0.37
1500	2.34	2.34	0.67	0.21	0.37
1800	2.39	2.39	0.71	0.19	0.37





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

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

Assume sin a = 1, m = 1

T= **270** secs

Hydraulic Conductivity, K= **2.9E-05** cm/s

TEST COMMENTS:

1. Data from hand measurements with water level meter.
2. Falling Head Test after Packer Test #19.
3. Initial water level, Ho, modified by DDF.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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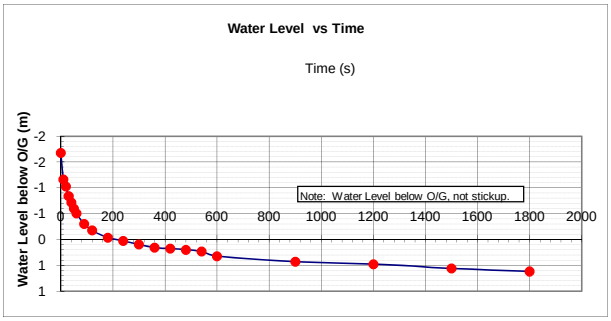
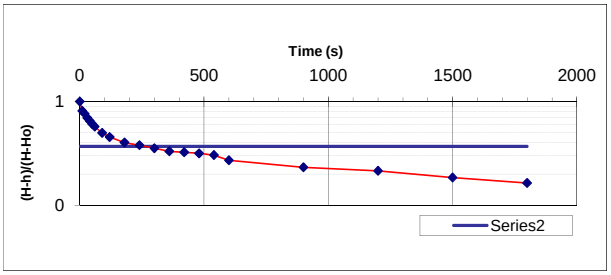
Downhole Test Interval: **83.82** m to **182.88** m

			Downhole	Vertical	
Project No.	**101-176/35**				
Drillhole ID.	**GH10-220**				
Piezometer ID.	N/A				
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods			605		m
Date			OCT 3/2010		
Test Type			**FALLING**		
Test No.			20		
Hole diameter, D	**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		d =	0.07780		m
Top of test interval			83.82	83.82	m
Bottom of test interval			182.88	182.88	m
Length of test interval, L		L =	99.06	99.06	m
Downhole stickup of piezometer or rods above ground surface			1.6764	1.68	m
Static water level, **(below ground surface)**			1.07	1.07	m
Elevation of Static Water Level **(above sea level)**		El. =	602.25	602.25	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	2.75	2.75	m
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.68	1.00	0.37
10	0.52	0.52	-1.16	0.81	0.37
20	0.66	0.66	-1.02	0.76	0.37
30	0.84	0.84	-0.84	0.70	0.37
40	0.96	0.96	-0.72	0.65	0.37
50	1.08	1.08	-0.59	0.61	0.37
60	1.17	1.17	-0.50	0.57	0.37
90	1.38	1.38	-0.30	0.50	0.37
120	1.50	1.50	-0.18	0.45	0.37
180	1.64	1.64	-0.03	0.40	0.37
240	1.71	1.71	0.03	0.38	0.37
300	1.77	1.77	0.10	0.35	0.37
360	1.84	1.84	0.16	0.33	0.37
420	1.86	1.86	0.18	0.32	0.37
480	1.88	1.88	0.20	0.32	0.37
540	1.91	1.91	0.23	0.30	0.37
600	2.00	2.00	0.33	0.27	0.37
900	2.11	2.11	0.43	0.23	0.37
1200	2.16	2.16	0.48	0.22	0.37
1500	2.24	2.24	0.56	0.19	0.37
1800	2.30	2.30	0.62	0.16	0.37





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

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

Assume
sin a = 1
m = 1

T= **260** secs

Hydraulic Conductivity, K= **2.2E-05** cm/s

TEST COMMENTS:

1. Data from hand measurements with water level meter.
2. Falling Head Test after Packer Test #20.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

Knight Piésold CONSULTING

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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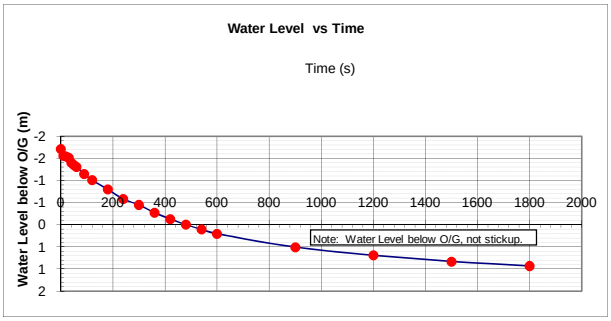
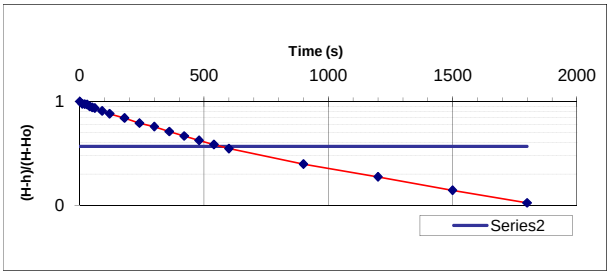
			Downhole Test Interval			
Project No.	**101-176/35**		**56.39** m to **182.88** m			
Drillhole ID.	**GH10-220**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				605		m
Date				OCT 3/2010		
Test Type				**FALLING**		
Test No.				21		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				56.39	56.39	m
Bottom of test interval				182.88	182.88	m
Length of test interval, L			L =	126.49	126.49	m
Downhole stickup of piezometer or rods above ground surface				1.71	1.71	m
Static water level, **(below ground surface)**				1.25	1.25	m
Elevation of Static Water Level **(above sea level)**			El. =	602.05	602.05	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.95	2.95	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.71	1.00	0.37
10	0.15	0.15	-1.55	0.95	0.37
20	0.17	0.17	-1.54	0.94	0.37
30	0.20	0.20	-1.51	0.93	0.37
40	0.31	0.31	-1.40	0.89	0.37
50	0.36	0.36	-1.35	0.88	0.37
60	0.40	0.40	-1.30	0.86	0.37
90	0.56	0.56	-1.15	0.81	0.37
120	0.70	0.70	-1.01	0.76	0.37
180	0.91	0.91	-0.80	0.69	0.37
240	1.13	1.13	-0.58	0.62	0.37
300	1.26	1.26	-0.45	0.57	0.37
360	1.44	1.44	-0.27	0.51	0.37
420	1.58	1.58	-0.12	0.46	0.37
480	1.71	1.71	0.00	0.42	0.37
540	1.82	1.82	0.11	0.38	0.37
600	1.91	1.91	0.21	0.35	0.37
900	2.22	2.22	0.51	0.25	0.37
1200	2.40	2.40	0.69	0.19	0.37
1500	2.54	2.54	0.84	0.14	0.37
1800	2.64	2.64	0.94	0.11	0.37





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

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

Assume sin a = 1, m = 1

T= **550** secs

Hydraulic Conductivity, K= **8.6E-06** cm/s

TEST COMMENTS:

1. Data from hand measurements with water level meter.
2. Falling Head Test after Packer Test #21.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-220\[GH10-220 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-21

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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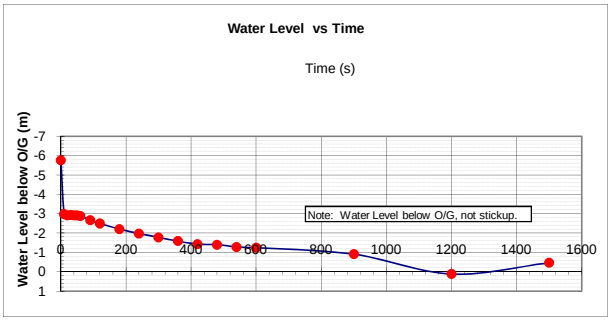
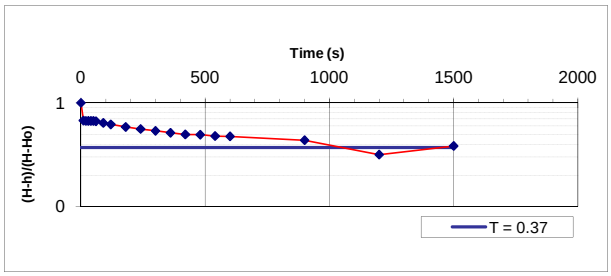
			Downhole Test Interval			
Project No.	**101-176/35**		**30.18** m to **39.33** m			
Drillhole ID.	**GH10-221**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				307		m
Date				Sep/28/10		
Test Type				**FALLING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				30.18	30.18	m
Bottom of test interval				39.33	39.33	m
Length of test interval, L			L =	9.15	9.15	m
Downhole stickup of piezometer or rods above ground surface				1.45	1.45	m
Static water level, **(below ground surface)**				1.39	1.39	m
Elevation of Static Water Level **(above sea level)**			El. =	304.16	304.16	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	2.84	2.84	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	-5.75	-5.75	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	-5.75	-5.75	-5.75	1.00	0.37
10	-2.97	-2.97	-2.97	0.68	0.37
20	-2.91	-2.91	-2.91	0.67	0.37
30	-2.93	-2.93	-2.93	0.67	0.37
40	-2.91	-2.91	-2.91	0.67	0.37
50	-2.92	-2.92	-2.92	0.67	0.37
60	-2.88	-2.88	-2.88	0.67	0.37
90	-2.66	-2.66	-2.66	0.64	0.37
120	-2.49	-2.49	-2.49	0.62	0.37
180	-2.20	-2.20	-2.20	0.59	0.37
240	-1.97	-1.97	-1.97	0.56	0.37
300	-1.77	-1.77	-1.77	0.54	0.37
360	-1.58	-1.58	-1.58	0.51	0.37
420	-1.42	-1.42	-1.42	0.50	0.37
480	-1.40	-1.40	-1.40	0.49	0.37
540	-1.27	-1.27	-1.27	0.48	0.37
600	-1.24	-1.24	-1.24	0.47	0.37
900	-0.91	-0.91	-0.91	0.44	0.37
1200	0.12	0.12	0.12	0.32	0.37
1500	-0.46	-0.46	-0.46	0.38	0.37
1800	-0.37	-0.37	-0.37	0.37	0.37
2700	-0.03	-0.03	-0.03	0.33	0.37
3600	0.21	0.21	0.21	0.31	0.37





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

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

Assume
sin a = 1
m = 1

T= **1100** secs

Hydraulic Conductivity, K= **3.9E-05** cm/s

TEST COMMENTS:

1. Tested with packer using the pressure transducer.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-221\[GH10-221 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH- Packer 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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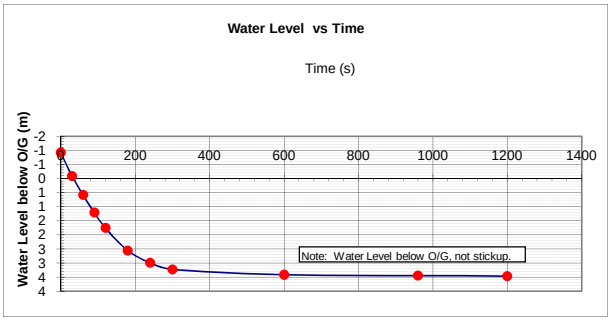
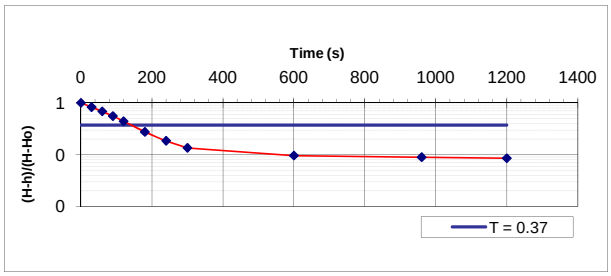
Downhole Test Interval: **35.37** m to **41.16** m

Project No.	**101-176/35**				
Drillhole ID.	**GH10-221**				
Piezometer ID.	GH10-221				
				Downhole	**Vertical**
Drillhole Inclination (if not inclined, select 90°)				**90**	**90** °
Drillhole Elevation from Top of Piezometer or Drill Rods				307	m
Date				Sep/30/2010	
Test Type				**FALLING**	
Test No.				1	
Hole diameter, D		**HQ**	D =	0.096	m
Interior diameter of piezometer or drill rods, d	**1.00 Inches**	**Sch 80**	d =	0.02431	m
Top of test interval				35.37 / 35.37	m
Bottom of test interval				41.16 / 41.16	m
Length of test interval, L			L =	5.79 / 5.79	m
Downhole stickup of piezometer or rods above ground surface				0.92 / 0.92	m
Static water level, **(below ground surface)**				3.88 / 3.88	m
Elevation of Static Water Level **(above sea level)**			El. =	302.20 / 302.20	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	4.80 / 4.80	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00 / 0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-0.92	1.00	0.37
30	0.83	0.83	-0.09	0.83	0.37
60	1.51	1.51	0.59	0.69	0.37
90	2.13	2.13	1.21	0.56	0.37
120	2.68	2.68	1.76	0.44	0.37
180	3.48	3.48	2.56	0.28	0.37
240	3.91	3.91	2.99	0.19	0.37
300	4.15	4.15	3.23	0.14	0.37
600	4.34	4.34	3.42	0.10	0.37
960	4.37	4.37	3.45	0.09	0.37
1200	4.39	4.39	3.47	0.09	0.37





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

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

Assume sin a = 1, m = 1

T= **150** secs

Hydraulic Conductivity, K= **4.1E-05** cm/s

TEST COMMENTS:

1. Tested 2 hours after piezo install.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101/176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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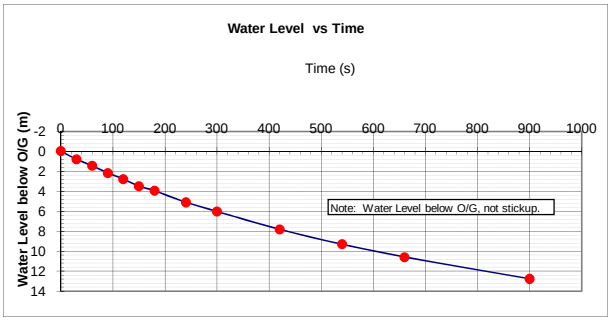
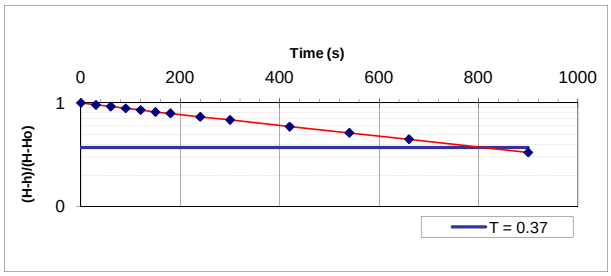
					Downhole Test Interval		
Project No.	**101-176/35**				**29.27** m to **38.11** m		
Drillhole ID.	**GH10-222**						
Piezometer ID.	GH10-222				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					321		m
Date					Oct/03/2010		
Test Type					**FALLING**		
Test No.					1		
Hole diameter, D		**HQ**		D =	0.096		m
Interior diameter of piezometer or drill rods, d	**1.00 Inches**	**Sch 80**		d =	0.02431		m
Top of test interval					29.27	29.27	m
Bottom of test interval					38.11	38.11	m
Length of test interval, L				L =	8.84	8.84	m
Downhole stickup of piezometer or rods above ground surface					0.94	0.94	m
Static water level, **(below ground surface)**					19.13	19.13	m
Elevation of Static Water Level **(above sea level)**				El. =	300.93	300.93	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	20.07	20.07	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.91	0.91	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.91	0.91	-0.03	1.00	0.37
30	1.74	1.74	0.80	0.96	0.37
60	2.38	2.38	1.44	0.92	0.37
90	3.10	3.10	2.16	0.89	0.37
120	3.71	3.71	2.77	0.85	0.37
150	4.43	4.43	3.49	0.82	0.37
180	4.89	4.89	3.95	0.79	0.37
240	6.05	6.05	5.11	0.73	0.37
300	6.97	6.97	6.03	0.68	0.37
420	8.77	8.77	7.83	0.59	0.37
540	10.25	10.25	9.31	0.51	0.37
660	11.54	11.54	10.60	0.45	0.37
900	13.72	13.72	12.78	0.33	0.37





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

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

Assume
sin a = 1
m = 1

T= **750** secs

Hydraulic Conductivity, K= **5.8E-06** cm/s

TEST COMMENTS:

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-222\[GH10-222 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-1 from piezo

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	BO	CG	KJB

Tested By: BO
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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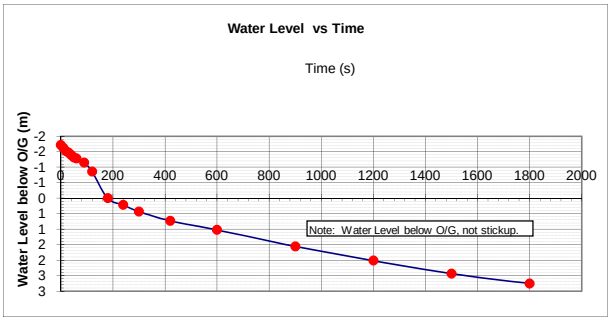
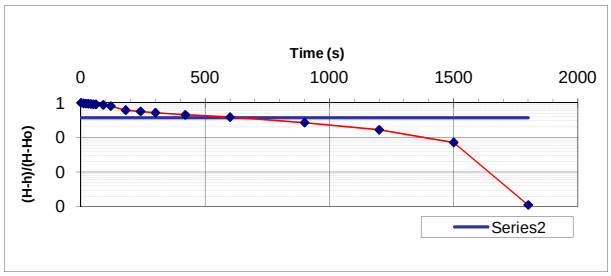
			Downhole Test Interval			
Project No.	**101-176/35**		**18.29** m to **25.91** m			
Drillhole ID.	**GH10-223**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				306		m
Date				Oct/4/2010		
Test Type				**FALLING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				18.29	18.29	m
Bottom of test interval				25.91	25.91	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				1.72	1.72	m
Static water level, **(below ground surface)**				2.76	2.76	m
Elevation of Static Water Level **(above sea level)**			El. =	301.52	301.52	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	4.48	4.48	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.72	1.00	0.37
10	0.10	0.10	-1.62	0.98	0.37
20	0.20	0.20	-1.52	0.96	0.37
30	0.25	0.25	-1.47	0.94	0.37
40	0.33	0.33	-1.39	0.93	0.37
50	0.41	0.41	-1.31	0.91	0.37
60	0.44	0.44	-1.28	0.90	0.37
90	0.57	0.57	-1.15	0.87	0.37
120	0.86	0.86	-0.86	0.81	0.37
180	1.72	1.72	0.00	0.62	0.37
240	1.94	1.94	0.22	0.57	0.37
300	2.15	2.15	0.43	0.52	0.37
420	2.45	2.45	0.73	0.45	0.37
600	2.75	2.75	1.03	0.39	0.37
900	3.28	3.28	1.56	0.27	0.37
1200	3.74	3.74	2.02	0.17	0.37
1500	4.16	4.16	2.44	0.07	0.37
1800	4.48	4.48	2.76	0.00	0.37





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

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

Assume sin a = 1, m = 1

T= **700** secs

Hydraulic Conductivity, K= **7.2E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #1

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	17DEC'10	ISSUED WITH REPORT VA101-176/35-1	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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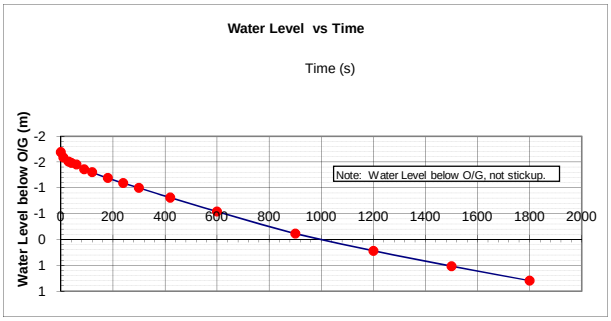
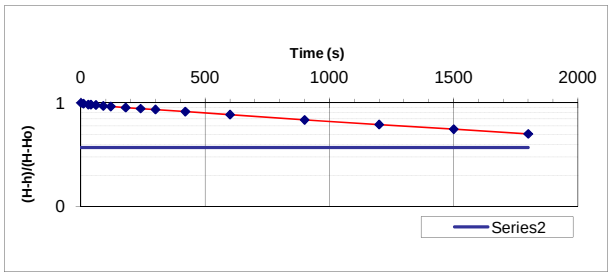
			Downhole Test Interval			
Project No.	**101-176/35**		**25.91** m to **33.53** m			
Drillhole ID.	**GH10-223**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				306		m
Date				Oct/5/2010		
Test Type				**FALLING**		
Test No.				2		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				25.91	25.91	m
Bottom of test interval				33.53	33.53	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				1.69	1.69	m
Static water level, **(below ground surface)**				3.30	3.30	m
Elevation of Static Water Level **(above sea level)**			El. =	301.01	301.01	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	4.99	4.99	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.69	1.00	0.37
10	0.10	0.10	-1.59	0.98	0.37
30	0.18	0.18	-1.51	0.96	0.37
40	0.21	0.21	-1.49	0.96	0.37
60	0.24	0.24	-1.45	0.95	0.37
90	0.33	0.33	-1.36	0.93	0.37
120	0.39	0.39	-1.30	0.92	0.37
180	0.50	0.50	-1.19	0.90	0.37
240	0.60	0.60	-1.09	0.88	0.37
300	0.69	0.69	-1.00	0.86	0.37
420	0.88	0.88	-0.81	0.82	0.37
600	1.15	1.15	-0.54	0.77	0.37
900	1.58	1.58	-0.12	0.68	0.37
1200	1.91	1.91	0.22	0.62	0.37
1500	2.21	2.21	0.52	0.56	0.37
1800	2.49	2.49	0.80	0.50	0.37





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

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

Assume
sin a = 1
m = 1

T= **2200** secs

Hydraulic Conductivity, K= **2.3E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted before Packer Test #2
2. Time when T=0.37 was extrapolated.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	17DEC'10	ISSUED WITH REPORT VA101'176/35	AA	CG	KJB

Tested By: AA
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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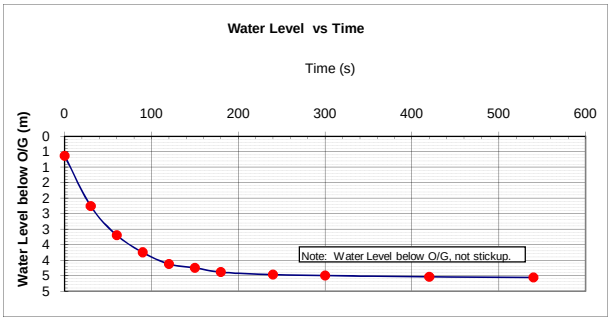
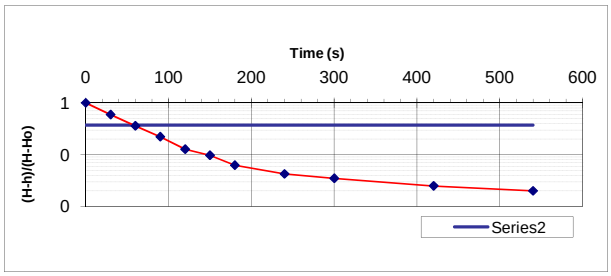
				Downhole Test Interval			
Project No.	**101-176/35**			**15.20** m to **22.90** m			
Drillhole ID.	**GH10-223**						
Piezometer ID.	GH10-223				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					306		m
Date					Oct/5/2010		
Test Type					**FALLING**		
Test No.					3		
Hole diameter, D		**HQ**		D =	0.096		m
Interior diameter of piezometer or drill rods, d	**1.00 Inches**	**Sch 80**		d =	0.02665		m
Top of test interval					15.20	15.20	m
Bottom of test interval					22.90	22.90	m
Length of test interval, L				L =	7.70	7.70	m
Downhole stickup of piezometer or rods above ground surface					0.96	0.96	m
Static water level, **(below ground surface)**					4.64	4.64	m
Elevation of Static Water Level **(above sea level)**				El. =	300.40	300.40	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	5.60	5.60	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	1.60	1.60	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	1.60	1.60	0.64	1.00	0.37
30	3.22	3.22	2.26	0.60	0.37
60	4.16	4.16	3.20	0.36	0.37
90	4.71	4.71	3.75	0.22	0.37
120	5.09	5.09	4.13	0.13	0.37
150	5.21	5.21	4.25	0.10	0.37
180	5.35	5.35	4.39	0.06	0.37
240	5.43	5.43	4.47	0.04	0.37
300	5.46	5.46	4.50	0.03	0.37
420	5.50	5.50	4.54	0.02	0.37
540	5.52	5.52	4.56	0.02	0.37





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

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

Assume
sin a = 1
m = 1

T= **60** secs

Hydraulic Conductivity, K= **9.8E-05** cm/s

TEST COMMENTS:

1. Falling Head Test conducted in piezometer.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-223\[GH10-223 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-3 (piezo)

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	22DEC'10	ISSUED WITH REPORT VA101-176/35-1	BO	CG	KJB

Tested By: BO/SC
Reviewed By: JAB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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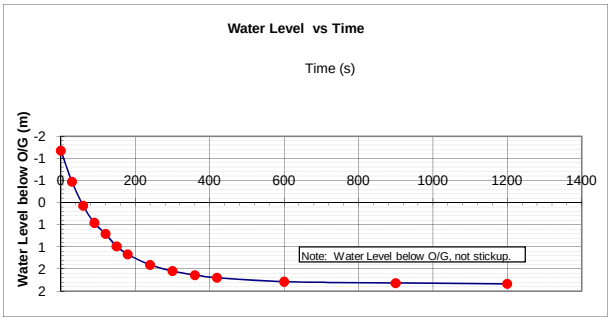
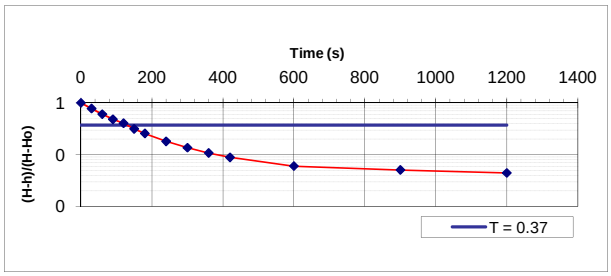
			Downhole Test Interval			
Project No.	**101-176/35**		**10.67** m to **18.29** m			
Drillhole ID.	**GH10-224**					
Piezometer ID.	N/A		**Downhole**	**Vertical**		
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°	
Drillhole Elevation from Top of Piezometer or Drill Rods			308		m	
Date			Oct/07/10			
Test Type			**FALLING**			
Test No.			1			
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				10.67	10.67	m
Bottom of test interval				18.29	18.29	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				1.17	1.17	m
Static water level, **(below ground surface)**				1.98	1.98	m
Elevation of Static Water Level **(above sea level)**			El. =	304.85	304.85	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	3.15	3.15	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.17	1.00	0.37
30	0.70	0.70	-0.47	0.78	0.37
60	1.24	1.24	0.07	0.61	0.37
90	1.63	1.63	0.46	0.48	0.37
120	1.88	1.88	0.71	0.40	0.37
150	2.16	2.16	0.99	0.31	0.37
180	2.34	2.34	1.17	0.26	0.37
240	2.58	2.58	1.41	0.18	0.37
300	2.72	2.72	1.55	0.14	0.37
360	2.81	2.81	1.64	0.11	0.37
420	2.87	2.87	1.70	0.09	0.37
600	2.96	2.96	1.79	0.06	0.37
900	2.99	2.99	1.82	0.05	0.37
1200	3.01	3.01	1.84	0.04	0.37





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

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

Assume sin a = 1, m = 1

T= **130** secs

Hydraulic Conductivity, K= **3.9E-04** cm/s

TEST COMMENTS:

1. Conducted in conjunction with Packer Test #1.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	17DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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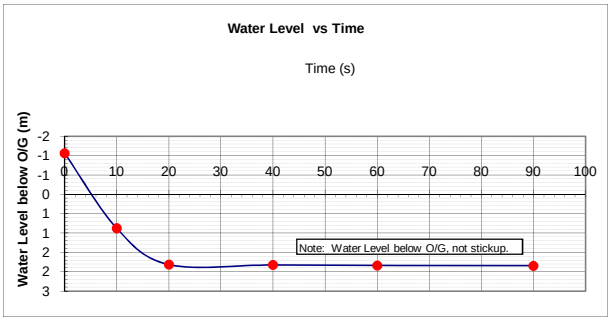
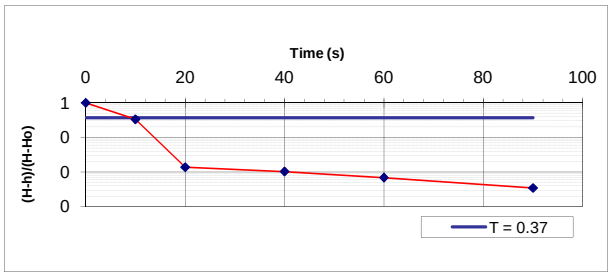
					Downhole Test Interval		
Project No.	**101-176/35**				**3.05** m to **10.98** m		
Drillhole ID.	**GH10-224**						
Piezometer ID.	GH10-224				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					308		m
Date					Oct/07/10		
Test Type					**FALLING**		
Test No.					2		
Hole diameter, D			**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		**1.00 Inches**	**Sch 80**	d =	0.02431		m
Top of test interval					3.05	3.05	m
Bottom of test interval					10.98	10.98	m
Length of test interval, L				L =	7.93	7.93	m
Downhole stickup of piezometer or rods above ground surface					1.06	1.06	m
Static water level, **(below ground surface)**					1.86	1.86	m
Elevation of Static Water Level **(above sea level)**				El. =	305.08	305.08	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	2.92	2.92	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.06	1.00	0.37
10	1.94	1.94	0.88	0.34	0.37
20	2.88	2.88	1.82	0.01	0.37
40	2.89	2.89	1.83	0.01	0.37
60	2.90	2.90	1.84	0.01	0.37
90	2.91	2.91	1.85	0.00	0.37





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

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

Assume
sin a = 1
m = 1

T= **10** secs

Hydraulic Conductivity, K= **4.8E-04** cm/s

TEST COMMENTS:

1. Example comment: Falling Head Test conducted 12 hours after Piezometer Installed

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-224\[GH10-224 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-2 (piezo)

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	BH	CG	KJB

Tested By: BH
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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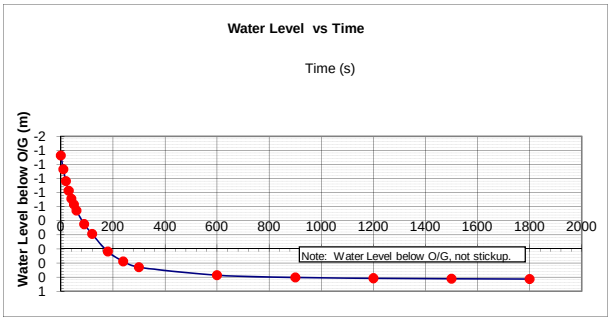
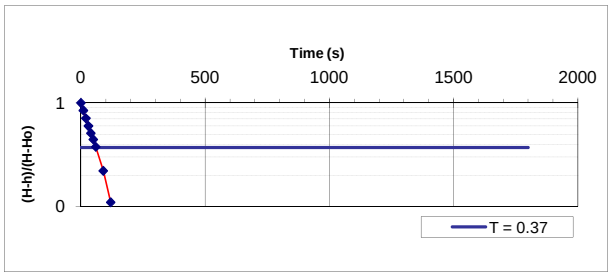
			Downhole Test Interval			
Project No.	**101-176/35**		**12.19** m to **27.43** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/07/10		
Test Type				**FALLING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				12.19	11.14	m
Bottom of test interval				27.43	25.06	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.45	1.32	m
Static water level, **(below ground surface)**				-0.08	-0.07	m
Elevation of Static Water Level **(above sea level)**			El. =	595.63	595.75	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.37	1.25	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.32	1.00	0.37
10	0.21	0.19	-1.13	0.84	0.37
20	0.40	0.36	-0.96	0.71	0.37
30	0.55	0.50	-0.82	0.60	0.37
40	0.67	0.61	-0.71	0.51	0.37
50	0.76	0.70	-0.63	0.44	0.37
60	0.85	0.78	-0.55	0.38	0.37
90	1.07	0.97	-0.35	0.22	0.37
120	1.22	1.11	-0.21	0.11	0.37
180	1.49	1.36	0.04	-0.09	0.37
240	1.65	1.50	0.18	-0.20	0.37
300	1.74	1.59	0.26	-0.27	0.37
600	1.86	1.70	0.37	-0.36	0.37
900	1.90	1.73	0.41	-0.38	0.37
1200	1.91	1.74	0.42	-0.39	0.37
1500	1.92	1.75	0.43	-0.40	0.37
1800	1.92	1.75	0.43	-0.40	0.37





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

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

Assume
sin a = 1
m = 1

T= **70** secs

Hydraulic Conductivity, K= **4.1E-04** cm/s

TEST COMMENTS:

1. Static water level not measured correctly prior to test, water level determined from final static water level at the end of the test.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORTS VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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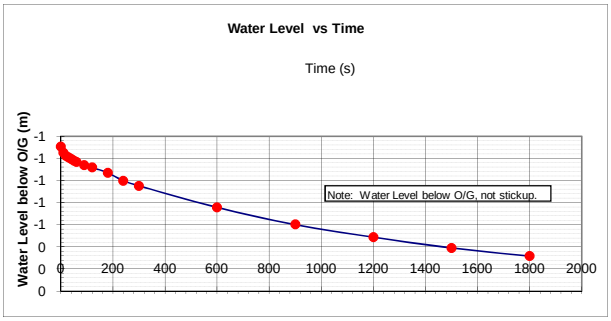
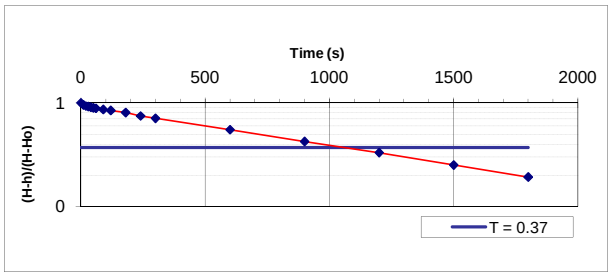
			Downhole Test Interval			
Project No.	101-176/35		27.43	m to	42.67	m
Drillhole ID.	GH10-225					
Piezometer ID.	N/A			Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)				66	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/07/10		
Test Type				FALLING		
Test No.				2		
Hole diameter, D		HQ	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				27.43	25.06	m
Bottom of test interval				42.67	38.98	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.43	1.31	m
Static water level, **(below ground surface)**				-0.09	-0.08	m
Elevation of Static Water Level **(above sea level)**			El. =	595.66	595.78	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.34	1.22	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.31	1.00	0.37
10	0.06	0.06	-1.25	0.95	0.37
20	0.09	0.08	-1.22	0.93	0.37
30	0.11	0.10	-1.21	0.92	0.37
40	0.12	0.11	-1.19	0.91	0.37
50	0.14	0.13	-1.18	0.90	0.37
60	0.15	0.14	-1.17	0.89	0.37
90	0.18	0.17	-1.14	0.86	0.37
120	0.21	0.19	-1.12	0.85	0.37
180	0.26	0.24	-1.07	0.81	0.37
240	0.34	0.31	-1.00	0.75	0.37
300	0.39	0.36	-0.95	0.71	0.37
600	0.60	0.55	-0.76	0.55	0.37
900	0.77	0.70	-0.60	0.42	0.37
1200	0.90	0.82	-0.49	0.33	0.37
1500	1.00	0.92	-0.39	0.25	0.37
1800	1.08	0.99	-0.32	0.19	0.37





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

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

Assume
sin a = 1
m = 1

T= **1050** secs

Hydraulic Conductivity, K= **2.7E-05** cm/s

TEST COMMENTS:

1. Static water level not measured correctly prior to test, water level taken from measured with drill bit 145' following one run after the falling head test.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH rREPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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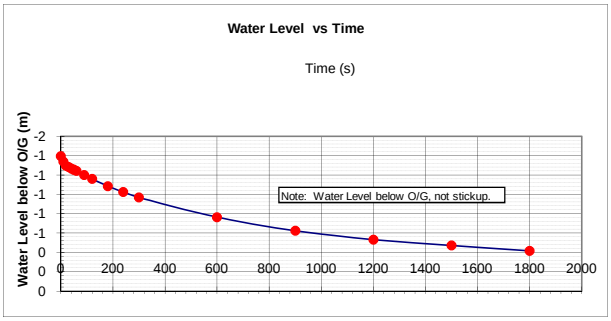
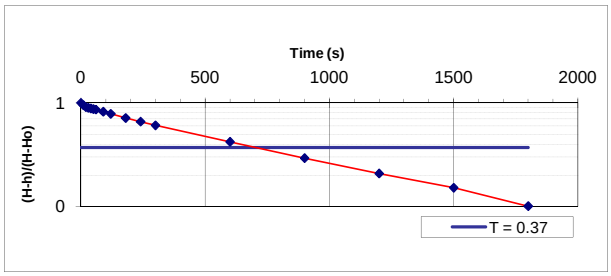
			Downhole Test Interval			
Project No.	**101-176/35**		**42.67** m to **57.91** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/08/10		
Test Type				**FALLING**		
Test No.				3		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				42.67	38.98	m
Bottom of test interval				57.91	52.90	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.524	1.39	m
Static water level, **(below ground surface)**				-0.33	-0.31	m
Elevation of Static Water Level **(above sea level)**			El. =	595.81	595.91	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.19	1.09	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.39	1.00	0.37
10	0.06	0.06	-1.34	0.95	0.37
20	0.11	0.10	-1.29	0.91	0.37
30	0.12	0.11	-1.28	0.90	0.37
40	0.14	0.13	-1.26	0.88	0.37
50	0.15	0.14	-1.25	0.87	0.37
60	0.16	0.15	-1.24	0.86	0.37
90	0.21	0.19	-1.20	0.82	0.37
120	0.26	0.23	-1.16	0.78	0.37
180	0.34	0.31	-1.08	0.72	0.37
240	0.41	0.37	-1.02	0.66	0.37
300	0.47	0.43	-0.97	0.61	0.37
600	0.69	0.63	-0.76	0.42	0.37
900	0.84	0.77	-0.62	0.29	0.37
1200	0.94	0.86	-0.53	0.21	0.37
1500	1.01	0.92	-0.47	0.15	0.37
1800	1.07	0.98	-0.41	0.10	0.37





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

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

Assume
sin a = 1
m = 1

T= **700** secs

Hydraulic Conductivity, K= **4.1E-05** cm/s

TEST COMMENTS:

1. Water level above ground. Could not do rising head test, due to lack of pump.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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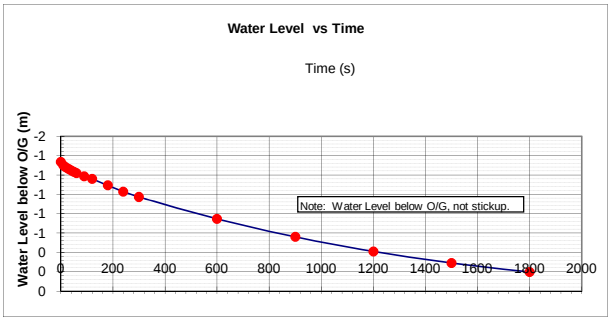
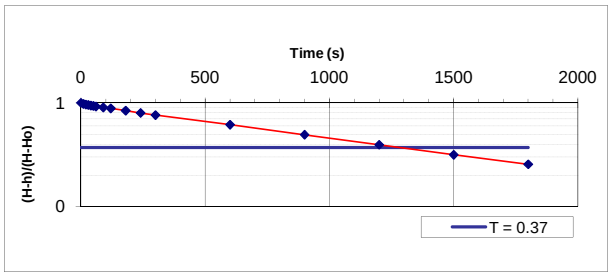
			Downhole Test Interval			
Project No.	**101-176/35**		**57.91** m to **73.15** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/09/10		
Test Type				**FALLING**		
Test No.				4		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				57.91	52.90	m
Bottom of test interval				73.15	66.83	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.46	1.33	m
Static water level, **(below ground surface)**				0.21	0.19	m
Elevation of Static Water Level **(above sea level)**			El. =	595.33	595.47	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.67	1.53	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.33	1.00	0.37
10	0.04	0.04	-1.30	0.98	0.37
20	0.06	0.06	-1.28	0.96	0.37
30	0.08	0.07	-1.26	0.95	0.37
40	0.10	0.09	-1.24	0.94	0.37
50	0.11	0.10	-1.23	0.93	0.37
60	0.13	0.12	-1.22	0.92	0.37
90	0.16	0.15	-1.19	0.90	0.37
120	0.19	0.18	-1.16	0.89	0.37
180	0.27	0.24	-1.09	0.84	0.37
240	0.34	0.31	-1.03	0.80	0.37
300	0.40	0.36	-0.97	0.76	0.37
600	0.64	0.59	-0.75	0.61	0.37
900	0.85	0.77	-0.56	0.49	0.37
1200	1.01	0.92	-0.41	0.39	0.37
1500	1.14	1.04	-0.29	0.32	0.37
1800	1.24	1.14	-0.20	0.26	0.37





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

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

Assume
sin a = 1
m = 1

T= **1250** secs

Hydraulic Conductivity, K= **2.3E-05** cm/s

TEST COMMENTS:

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-225\[GH10-225 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-4

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CNB	CG	KJB

Tested By: CBN
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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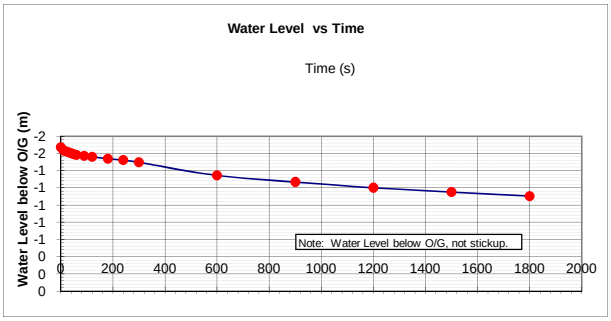
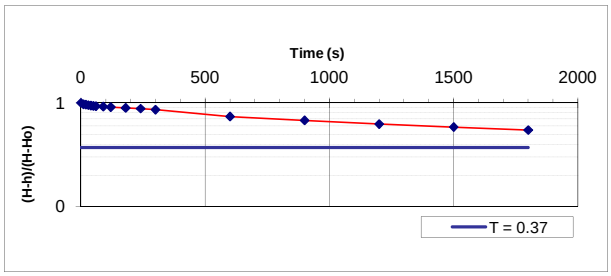
			Downhole Test Interval			
Project No.	**101-176/35**		**67.05** m to **82.29** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/10/10		
Test Type				**FALLING**		
Test No.				5		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				67.05	61.25	m
Bottom of test interval				82.29	75.18	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.83	1.67	m
Static water level, **(below ground surface)**				-0.46	-0.42	m
Elevation of Static Water Level **(above sea level)**			El. =	595.63	595.75	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.37	1.25	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.67	1.00	0.37
10	0.04	0.04	-1.64	0.97	0.37
20	0.05	0.05	-1.62	0.96	0.37
30	0.07	0.06	-1.61	0.95	0.37
40	0.08	0.07	-1.60	0.94	0.37
50	0.09	0.08	-1.59	0.93	0.37
60	0.10	0.09	-1.58	0.93	0.37
90	0.11	0.10	-1.57	0.92	0.37
120	0.12	0.11	-1.56	0.91	0.37
180	0.15	0.13	-1.54	0.89	0.37
240	0.16	0.15	-1.52	0.88	0.37
300	0.19	0.18	-1.50	0.86	0.37
600	0.36	0.33	-1.34	0.74	0.37
900	0.44	0.40	-1.27	0.68	0.37
1200	0.52	0.47	-1.20	0.62	0.37
1500	0.57	0.52	-1.15	0.58	0.37
1800	0.62	0.57	-1.10	0.55	0.37





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

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

Assume sin a = 1, m = 1

T= **3000** secs

Hydraulic Conductivity, K= **9.5E-06** cm/s

TEST COMMENTS:

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-225\[GH10-225 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-5

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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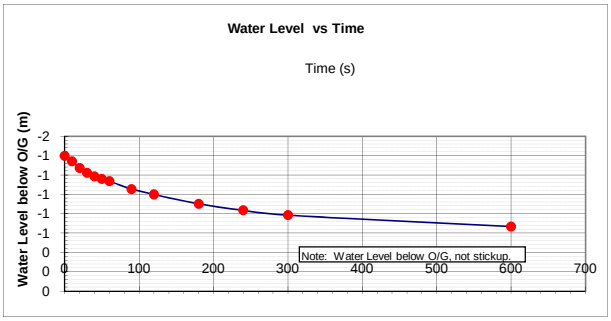
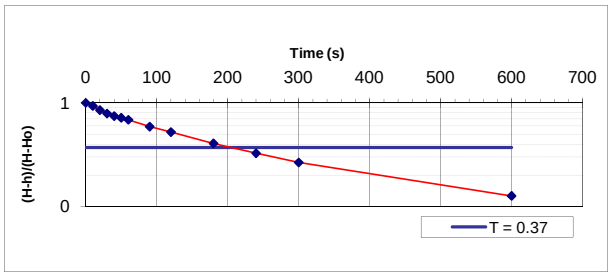
			Downhole Test Interval			
Project No.	**101-176/35**		**82.30** m to **97.54** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/10/10		
Test Type				**FALLING**		
Test No.				6		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				82.30	75.18	m
Bottom of test interval				97.54	89.10	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.62	1.48	m
Static water level, **(below ground surface)**				-0.61	-0.56	m
Elevation of Static Water Level **(above sea level)**			El. =	595.99	596.08	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.01	0.92	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.09	0.08	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.09	0.08	-1.40	1.00	0.37
10	0.15	0.14	-1.34	0.93	0.37
20	0.23	0.21	-1.27	0.85	0.37
30	0.28	0.26	-1.22	0.79	0.37
40	0.32	0.30	-1.18	0.75	0.37
50	0.35	0.32	-1.16	0.72	0.37
60	0.38	0.35	-1.13	0.69	0.37
90	0.47	0.43	-1.05	0.59	0.37
120	0.53	0.48	-1.00	0.52	0.37
180	0.63	0.58	-0.90	0.41	0.37
240	0.71	0.65	-0.83	0.33	0.37
300	0.76	0.70	-0.78	0.27	0.37
600	0.89	0.81	-0.67	0.13	0.37





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

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

Assume sin a = 1, m = 1

T= **200** secs

Hydraulic Conductivity, K= **1.4E-04** cm/s

TEST COMMENTS:

1. Static water level above ground surface, but no pump available to complete a rising head test instead of a falling head test.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH RPOERT VA101-176/35-1	DDF	CG	KJB

Tested By: DDF
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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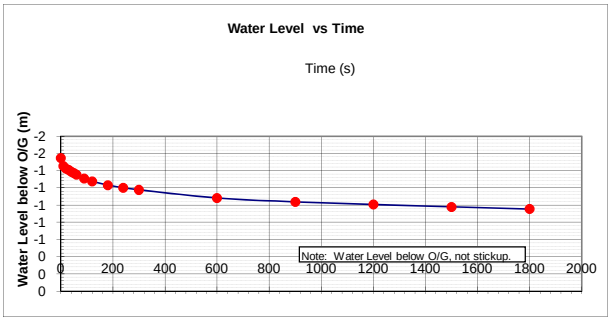
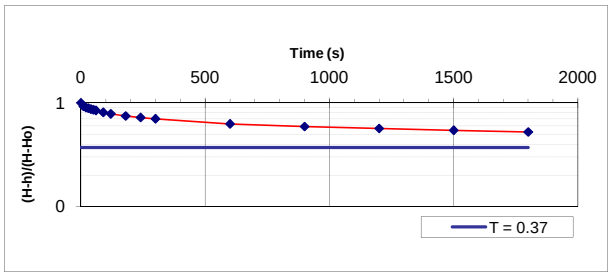
			Downhole Test Interval			
Project No.	**101-176/35**		**97.53** m to **112.77** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/11/10		
Test Type				**FALLING**		
Test No.				7		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				97.53	89.10	m
Bottom of test interval				112.77	103.02	m
Length of test interval, L			L =	15.24	13.92	m
Downhole stickup of piezometer or rods above ground surface				1.69164	1.55	m
Static water level, **(below ground surface)**				-0.33	-0.30	m
Elevation of Static Water Level **(above sea level)**			El. =	595.64	595.76	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.36	1.24	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.55	1.00	0.37
10	0.10	0.09	-1.45	0.93	0.37
20	0.13	0.12	-1.42	0.90	0.37
30	0.15	0.14	-1.41	0.89	0.37
40	0.17	0.16	-1.39	0.87	0.37
50	0.19	0.18	-1.37	0.86	0.37
60	0.21	0.19	-1.35	0.85	0.37
90	0.26	0.24	-1.31	0.81	0.37
120	0.30	0.27	-1.28	0.78	0.37
180	0.34	0.31	-1.23	0.75	0.37
240	0.38	0.35	-1.20	0.72	0.37
300	0.41	0.37	-1.18	0.70	0.37
600	0.51	0.46	-1.08	0.63	0.37
900	0.56	0.51	-1.04	0.59	0.37
1200	0.59	0.54	-1.01	0.57	0.37
1500	0.62	0.57	-0.98	0.54	0.37
1800	0.65	0.59	-0.95	0.52	0.37





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

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

Assume sin a = 1, m = 1

T= **2800** secs

Hydraulic Conductivity, K= **1.0E-05** cm/s

TEST COMMENTS:

1. Static water level above ground surface, but no pump available to complete a rising head test instead of a falling head test.
2. Time when T=0.37 was extrapolated.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV RISING HEAD TEST METHOD

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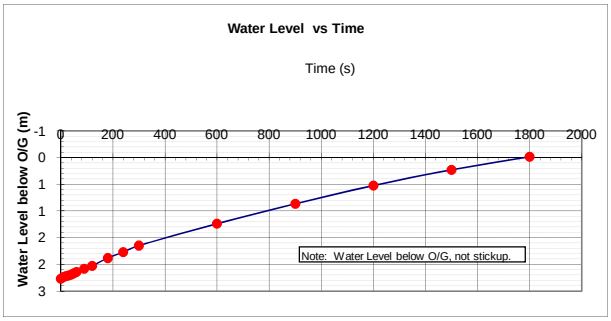
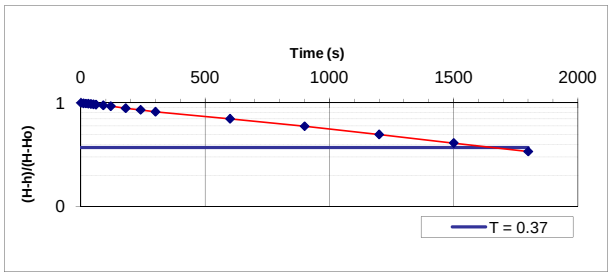
			Downhole Test Interval			
Project No.	101-176/35		137.20 m to 152.44 m			
Drillhole ID.	GH10-225					
Piezometer ID.	N/A			Downhole	Vertical	
Drillhole Inclination (if not inclined, select 90°)				66	90	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/13/10		
Test Type				RISING		
Test No.				10		
Hole diameter, D		NQ	D =	0.076		m
Interior diameter of piezometer or drill rods, d			d =	0.06030		m
Top of test interval				137.20	125.33	m
Bottom of test interval				152.44	139.26	m
Length of test interval, L			L =	15.24	13.93	m
Downhole stickup of piezometer or rods above ground surface				1.2954	1.18	m
Static water level, **(below ground surface)**				-1.30	-1.18	m
Elevation of Static Water Level **(above sea level)**			El. =	597.00	597.00	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	0.00	0.00	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	3.78	3.45	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	3.78	3.45	2.27	1.00	0.37
10	3.75	3.42	2.24	0.99	0.37
20	3.72	3.40	2.22	0.99	0.37
30	3.71	3.39	2.21	0.98	0.37
40	3.69	3.37	2.19	0.98	0.37
50	3.67	3.35	2.17	0.97	0.37
60	3.64	3.33	2.14	0.96	0.37
90	3.58	3.27	2.08	0.95	0.37
120	3.52	3.21	2.03	0.93	0.37
180	3.36	3.07	1.88	0.89	0.37
240	3.23	2.95	1.77	0.86	0.37
300	3.10	2.83	1.65	0.82	0.37
600	2.65	2.42	1.24	0.70	0.37
900	2.25	2.05	0.87	0.59	0.37
1200	1.87	1.71	0.52	0.49	0.37
1500	1.55	1.41	0.23	0.41	0.37
1800	1.28	1.17	-0.01	0.34	0.37





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

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

Assume sin a = 1, m = 1

T= 1650 secs

Hydraulic Conductivity, K= **1.1E-05** cm/s

TEST COMMENTS:

1. Rising head test completed due to artesian conditions
2. 1" Schedule 80 PVC tremie pipe downhole during response testing.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV RISING HEAD TEST METHOD

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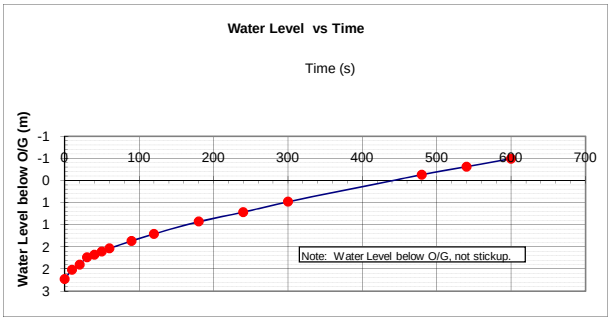
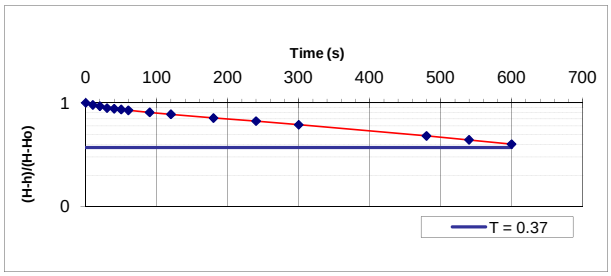
			Downhole Test Interval			
Project No.	**101-176/35**		**152.40** m to **167.64** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A		**Downhole**	**Vertical**		
Drillhole Inclination (if not inclined, select 90°)			**66**	**90**	°	
Drillhole Elevation from Top of Piezometer or Drill Rods			597		m	
Date			Oct/14/10			
Test Type			**RISING**			
Test No.			11			
Hole diameter, D	**NQ**	D =	0.076		m	
Interior diameter of piezometer or drill rods, d		d =	0.06030		m	
Top of test interval			152.40	139.22	m	
Bottom of test interval			167.64	153.15	m	
Length of test interval, L		L =	15.24	13.92	m	
Downhole stickup of piezometer or rods above ground surface			1.524	1.39	m	
Static water level, **(below ground surface)**			-2.52	-2.31	m	
Elevation of Static Water Level **(above sea level)**		El. =	598.00	597.91	m	
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**		H =	-1.00	-0.91	m	
Water level at start of test, Ho **(below top of piezo or drill rods)**		Ho =	3.96	3.62	m	

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	3.96	3.62	2.23	1.00	0.37
10	3.74	3.41	2.02	0.95	0.37
20	3.61	3.29	1.90	0.93	0.37
30	3.43	3.13	1.74	0.89	0.37
40	3.36	3.07	1.68	0.88	0.37
50	3.29	3.00	1.61	0.86	0.37
60	3.21	2.93	1.54	0.85	0.37
90	3.02	2.76	1.37	0.81	0.37
120	2.85	2.60	1.21	0.78	0.37
180	2.54	2.32	0.93	0.71	0.37
240	2.31	2.11	0.72	0.67	0.37
300	2.05	1.87	0.48	0.61	0.37
480	1.38	1.26	-0.13	0.48	0.37
540	1.18	1.08	-0.31	0.44	0.37
600	0.98	0.90	-0.49	0.40	0.37





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

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

Assume sin a = 1, m = 1

T= **650** secs

Hydraulic Conductivity, K= **2.8E-05** cm/s

TEST COMMENTS:

1. Rising head test completed due to artesian conditions
2. 1" Schedule 80 PVC tremie pipe downhole during response testing.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-225\[GH10-225 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-11

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	DDF	CG	KJB

Tested By: DDF
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

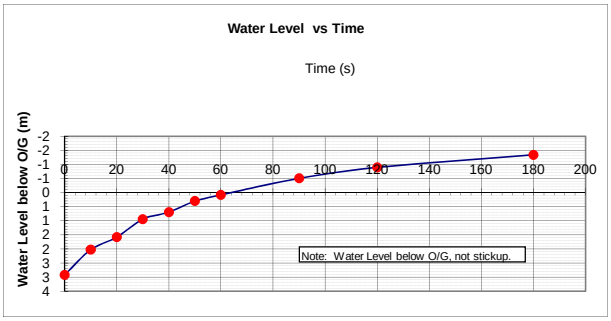
HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV RISING HEAD TEST METHOD

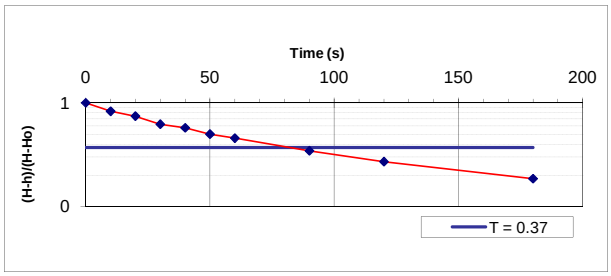
Print 01/08/10 14:19

			Downhole Test Interval			
Project No.	**101-176/35**		**158.50** m to **182.88** m			
Drillhole ID.	**GH10-225**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**66**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				597		m
Date				Oct/15/10		
Test Type				**RISING**		
Test No.				12		
Hole diameter, D		**NQ**	D =	0.076		m
Interior diameter of piezometer or drill rods, d			d =	0.06030		m
Top of test interval				158.50	144.79	m
Bottom of test interval				182.88	167.07	m
Length of test interval, L			L =	24.38	22.28	m
Downhole stickup of piezometer or rods above ground surface				1.524	1.39	m
Static water level, **(below ground surface)**				-2.52	-2.31	m
Elevation of Static Water Level **(above sea level)**			El. =	598.00	597.91	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	-1.00	-0.91	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	4.72	4.32	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	4.72	4.32	2.92	1.00	0.37
10	3.75	3.42	2.03	0.83	0.37
20	3.26	2.98	1.59	0.74	0.37
30	2.56	2.34	0.95	0.62	0.37
40	2.29	2.09	0.70	0.57	0.37
50	1.86	1.70	0.31	0.50	0.37
60	1.62	1.48	0.08	0.46	0.37
90	0.98	0.89	-0.50	0.35	0.37
120	0.55	0.50	-0.89	0.27	0.37
180	0.06	0.06	-1.34	0.19	0.37





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

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

Assume
sin a = 1
m = 1

T= **80** secs

Hydraulic Conductivity, K= **1.5E-04** cm/s

TEST COMMENTS:

1. Rising head test completed due to artesian conditions
2. 1" Schedule 80 PVC tremie pipe downhole during response testing.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

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PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV RISING HEAD TEST METHOD

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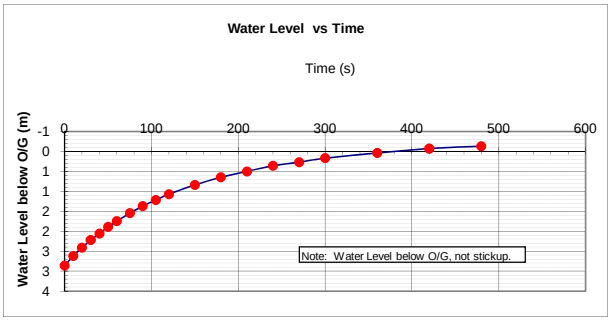
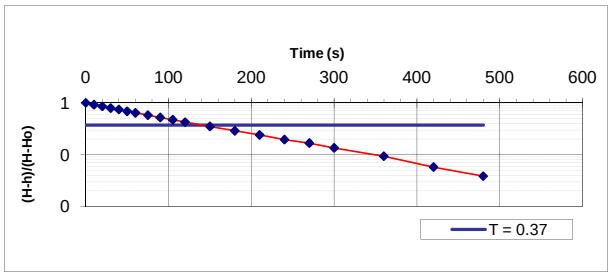
			Downhole Test Interval			
Project No.	**101-176/35**		**30.49** m to **39.63** m			
Drillhole ID.	**GH10-227**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				243		m
Date				Oct/18/2010		
Test Type				**RISING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				30.49	30.49	m
Bottom of test interval				39.63	39.63	m
Length of test interval, L			L =	9.15	9.15	m
Downhole stickup of piezometer or rods above ground surface				1.34	1.34	m
Static water level, **(below ground surface)**				-0.25	-0.25	m
Elevation of Static Water Level **(above sea level)**			El. =	241.91	241.91	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	1.09	1.09	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	4.20	4.20	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	4.20	4.20	2.86	1.00	0.37
10	3.96	3.96	2.62	0.92	0.37
20	3.75	3.75	2.41	0.86	0.37
30	3.56	3.56	2.22	0.79	0.37
40	3.40	3.40	2.06	0.74	0.37
50	3.23	3.23	1.89	0.69	0.37
60	3.09	3.09	1.75	0.64	0.37
75	2.89	2.89	1.55	0.58	0.37
90	2.71	2.71	1.37	0.52	0.37
105	2.56	2.56	1.22	0.47	0.37
120	2.41	2.41	1.07	0.42	0.37
150	2.18	2.18	0.84	0.35	0.37
180	1.99	1.99	0.65	0.29	0.37
210	1.84	1.84	0.50	0.24	0.37
240	1.70	1.70	0.36	0.20	0.37
270	1.61	1.61	0.27	0.17	0.37
300	1.51	1.51	0.17	0.14	0.37
360	1.38	1.38	0.04	0.09	0.37
420	1.27	1.27	-0.07	0.06	0.37
480	1.21	1.21	-0.13	0.04	0.37
540	1.15	1.15	-0.19	0.02	0.37
600	1.10	1.10	-0.24	0.00	0.37
660	1.08	1.08	-0.26	0.00	0.37
720	1.05	1.05	-0.29	-0.01	0.37
780	1.04	1.04	-0.30	-0.02	0.37
840	1.03	1.03	-0.31	-0.02	0.37
900	1.01	1.01	-0.33	-0.03	0.37
960	1.00	1.00	-0.34	-0.03	0.37
1020	1.00	1.00	-0.35	-0.03	0.37





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

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

Assume
sin a = 1
m = 1

T= **140** secs

Hydraulic Conductivity, K= **3.1E-04** cm/s

TEST COMMENTS:

1. Rising head test completed 45 minutes before Packer #1 completed and was over the same test interval.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	SHC	CG	KJB

Tested By: SHC
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV RISING HEAD TEST METHOD

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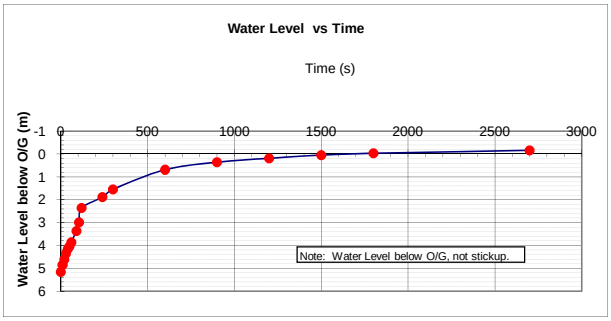
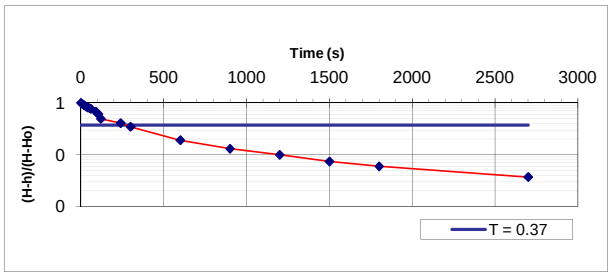
			Downhole Test Interval			
Project No.	**101-176/35**		**44.21** m to **54.88** m			
Drillhole ID.	**GH10-227**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				243		m
Date				Oct/19/2010		
Test Type				**RISING**		
Test No.				2		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				44.21	44.21	m
Bottom of test interval				54.88	54.88	m
Length of test interval, L			L =	10.67	10.67	m
Downhole stickup of piezometer or rods above ground surface				1.34	1.34	m
Static water level, **(below ground surface)**				-0.36	-0.36	m
Elevation of Static Water Level **(above sea level)**			El. =	242.02	242.02	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	0.98	0.98	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	6.50	6.50	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	6.50	6.50	5.16	1.00	0.37
10	6.20	6.20	4.86	0.95	0.37
20	5.96	5.96	4.62	0.90	0.37
30	5.70	5.70	4.36	0.86	0.37
40	5.50	5.50	4.16	0.82	0.37
50	5.38	5.38	4.04	0.80	0.37
60	5.21	5.21	3.87	0.77	0.37
90	4.71	4.71	3.37	0.68	0.37
105	4.33	4.33	2.99	0.61	0.37
120	3.70	3.70	2.36	0.49	0.37
240	3.23	3.23	1.89	0.41	0.37
300	2.89	2.89	1.55	0.35	0.37
600	2.03	2.03	0.69	0.19	0.37
900	1.70	1.70	0.36	0.13	0.37
1200	1.53	1.53	0.19	0.10	0.37
1500	1.39	1.39	0.05	0.07	0.37
1800	1.31	1.31	-0.03	0.06	0.37
2700	1.19	1.19	-0.16	0.04	0.37





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

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

Assume sin a = 1, m = 1

T= **300** secs

Hydraulic Conductivity, K= **1.3E-04** cm/s

TEST COMMENTS:

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH VA101-176/35-1	AL	CG	KJB

Tested By: AL
Reviewed By: JAB

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HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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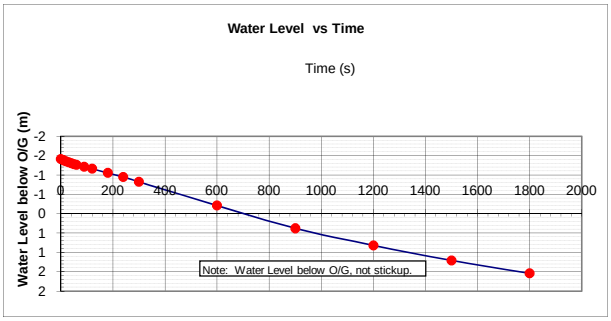
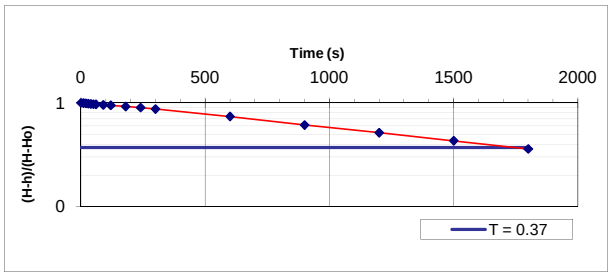
			Downhole Test Interval			
Project No.	**101-176/35**		**0.00** m to **60.96** m			
Drillhole ID.	**GH10-227**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				243		m
Date				Oct/19/2010		
Test Type				**FALLING**		
Test No.				3		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				0.00	0.00	m
Bottom of test interval				60.96	60.96	m
Length of test interval, L			L =	60.96	60.96	m
Downhole stickup of piezometer or rods above ground surface				1.41	1.41	m
Static water level, **(below ground surface)**				3.19	3.19	m
Elevation of Static Water Level **(above sea level)**			El. =	238.40	238.40	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	4.60	4.60	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.41	1.00	0.37
10	0.03	0.03	-1.38	0.99	0.37
20	0.06	0.06	-1.35	0.99	0.37
30	0.08	0.08	-1.33	0.98	0.37
40	0.11	0.11	-1.30	0.98	0.37
50	0.13	0.13	-1.28	0.97	0.37
60	0.15	0.15	-1.26	0.97	0.37
90	0.20	0.20	-1.21	0.96	0.37
120	0.25	0.25	-1.16	0.95	0.37
180	0.36	0.36	-1.05	0.92	0.37
240	0.46	0.46	-0.95	0.90	0.37
300	0.59	0.59	-0.82	0.87	0.37
600	1.20	1.20	-0.21	0.74	0.37
900	1.79	1.79	0.38	0.61	0.37
1200	2.23	2.23	0.82	0.52	0.37
1500	2.62	2.62	1.21	0.43	0.37
1800	2.95	2.95	1.54	0.36	0.37





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

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

Assume sin a = 1, m = 1

T= **1750** secs

Hydraulic Conductivity, K= **5.1E-06** cm/s

TEST COMMENTS:

1. Rock not acceptable to perform packer test on bottom of hole

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

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PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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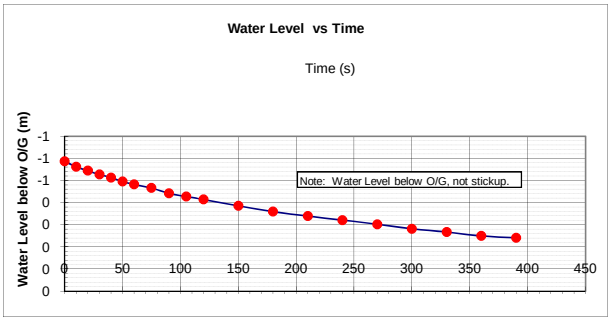
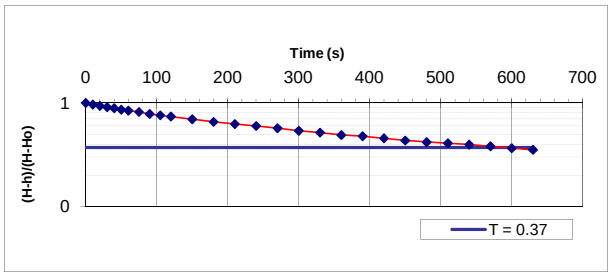
					Downhole Test Interval		
Project No.	**101-176/35**				**2.13** m to **9.15** m		
Drillhole ID.	**GH10-227**						
Piezometer ID.	GH10-227 #1 (shallow)				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					243		m
Date					Oct/25/2010		
Test Type					**FALLING**		
Test No.					4		
Hole diameter, D		**PQ**		D =	0.123		m
Interior diameter of piezometer or drill rods, d	**1.00 Inches**	**Sch 80**		d =	0.02431		m
Top of test interval					2.13	2.13	m
Bottom of test interval					9.15	9.15	m
Length of test interval, L				L =	7.02	7.02	m
Downhole stickup of piezometer or rods above ground surface					0.787	0.79	m
Static water level, **(below ground surface)**					0.08	0.08	m
Elevation of Static Water Level **(above sea level)**				El. =	242.14	242.14	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	0.86	0.86	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.20	0.20	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.20	0.20	-0.59	1.00	0.37
10	0.23	0.23	-0.56	0.96	0.37
20	0.24	0.24	-0.54	0.94	0.37
30	0.26	0.26	-0.53	0.91	0.37
40	0.27	0.27	-0.51	0.89	0.37
50	0.29	0.29	-0.50	0.86	0.37
60	0.31	0.31	-0.48	0.84	0.37
75	0.32	0.32	-0.47	0.82	0.37
90	0.35	0.35	-0.44	0.78	0.37
105	0.36	0.36	-0.43	0.76	0.37
120	0.37	0.37	-0.41	0.74	0.37
150	0.40	0.40	-0.39	0.70	0.37
180	0.43	0.43	-0.36	0.66	0.37
210	0.45	0.45	-0.34	0.63	0.37
240	0.47	0.47	-0.32	0.60	0.37
270	0.49	0.49	-0.30	0.57	0.37
300	0.51	0.51	-0.28	0.54	0.37
330	0.52	0.52	-0.27	0.52	0.37
360	0.54	0.54	-0.25	0.49	0.37
390	0.55	0.55	-0.24	0.48	0.37
420	0.56	0.56	-0.23	0.46	0.37
450	0.58	0.58	-0.21	0.43	0.37
480	0.59	0.59	-0.20	0.42	0.37
510	0.59	0.59	-0.20	0.41	0.37
540	0.60	0.60	-0.19	0.40	0.37
570	0.61	0.61	-0.18	0.38	0.37
600	0.62	0.62	-0.17	0.37	0.37
630	0.63	0.63	-0.16	0.35	0.37





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

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

Assume
sin a = 1
m = 1

T= **600** secs

Hydraulic Conductivity, K= **8.3E-06** cm/s

TEST COMMENTS:

1. Falling Head test completed 5 days after piezometer installed
2. This piezometer is labeled #1 on PVC and monument

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	SHC	CG	KJB

Tested By: SHC
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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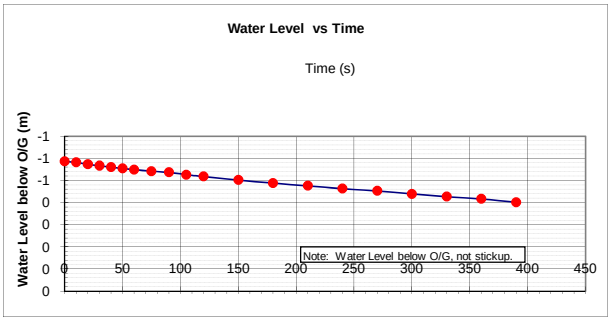
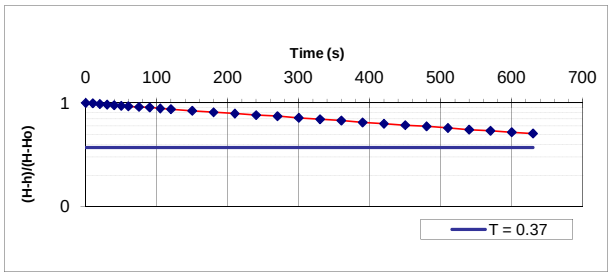
					Downhole Test Interval		
Project No.	**101-176/35**				**12.20** m to **18.29** m		
Drillhole ID.	**GH10-227**						
Piezometer ID.	GH10-227 #2 (deep)				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					243		m
Date					Oct/25/2010		
Test Type					**FALLING**		
Test No.					5		
Hole diameter, D			**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		**1.00 Inches**	**Sch 80**	d =	0.02431		m
Top of test interval					12.20	12.20	m
Bottom of test interval					18.29	18.29	m
Length of test interval, L				L =	6.09	6.09	m
Downhole stickup of piezometer or rods above ground surface					0.787	0.79	m
Static water level, **(below ground surface)**					-0.06	-0.06	m
Elevation of Static Water Level **(above sea level)**				El. =	242.28	242.28	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	0.73	0.73	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.20	0.20	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.20	0.20	-0.59	1.00	0.37
10	0.21	0.21	-0.58	0.99	0.37
20	0.21	0.21	-0.57	0.97	0.37
30	0.22	0.22	-0.57	0.96	0.37
40	0.23	0.23	-0.56	0.95	0.37
50	0.23	0.23	-0.55	0.94	0.37
60	0.24	0.24	-0.55	0.93	0.37
75	0.25	0.25	-0.54	0.91	0.37
90	0.25	0.25	-0.54	0.90	0.37
105	0.26	0.26	-0.53	0.88	0.37
120	0.27	0.27	-0.52	0.87	0.37
150	0.29	0.29	-0.50	0.84	0.37
180	0.30	0.30	-0.49	0.81	0.37
210	0.31	0.31	-0.48	0.79	0.37
240	0.32	0.32	-0.46	0.76	0.37
270	0.33	0.33	-0.45	0.74	0.37
300	0.35	0.35	-0.44	0.72	0.37
330	0.36	0.36	-0.43	0.70	0.37
360	0.37	0.37	-0.42	0.68	0.37
390	0.39	0.39	-0.40	0.65	0.37
420	0.39	0.39	-0.39	0.63	0.37
450	0.41	0.41	-0.38	0.61	0.37
480	0.41	0.41	-0.37	0.59	0.37
510	0.42	0.42	-0.36	0.57	0.37
540	0.44	0.44	-0.35	0.55	0.37
570	0.44	0.44	-0.35	0.54	0.37
600	0.45	0.45	-0.34	0.52	0.37
630	0.46	0.46	-0.33	0.51	0.37





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

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

Assume
sin a = 1
m = 1

T= **800** secs

Hydraulic Conductivity, K= **7.3E-06** cm/s

TEST COMMENTS:

1. Falling Head test completed 5 days after piezometer installed
2. This piezometer is labeled #2 on PVC and monument
3. Time when T=0.37 was extrapolated.

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-227\[GH10-227 Hydraulic Conductivity Testing Sheet_Rev B.xlsx]FH-3

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10Y	ISSUED WITH REPORT VA101-176/35-1	SHC	JCG	KJB-

Tested By: SHC
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

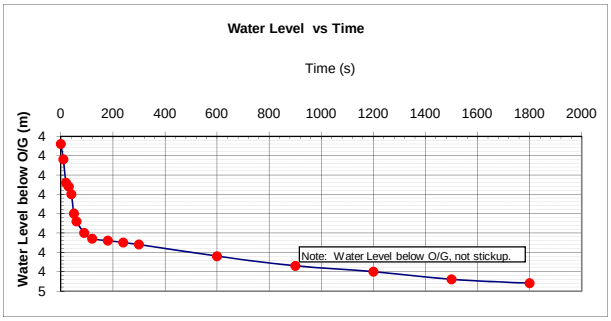
HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

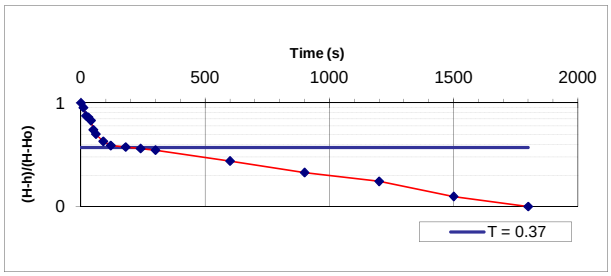
Print 01/08/10 14:19

			Downhole Test Interval			
Project No.	**101-176/35**		**50.30** m to **60.98** m			
Drillhole ID.	**GH10-228**					
Piezometer ID.	N/A			**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)				**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods				232		m
Date				Oct/22/2010		
Test Type				**FALLING**		
Test No.				1		
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				50.30	50.30	m
Bottom of test interval				60.98	60.98	m
Length of test interval, L			L =	10.67	10.67	m
Downhole stickup of piezometer or rods above ground surface				1.38	1.38	m
Static water level, **(below ground surface)**				4.52	4.52	m
Elevation of Static Water Level **(below ground surface)**			El. =	226.10	226.10	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	5.90	5.90	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	5.50	5.50	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	5.50	5.50	4.12	1.00	0.37
10	5.54	5.54	4.16	0.90	0.37
20	5.60	5.60	4.22	0.75	0.37
30	5.61	5.61	4.23	0.72	0.37
40	5.63	5.63	4.25	0.68	0.37
50	5.68	5.68	4.30	0.55	0.37
60	5.70	5.70	4.32	0.50	0.37
90	5.73	5.73	4.35	0.42	0.37
120	5.75	5.75	4.37	0.39	0.37
180	5.75	5.75	4.37	0.38	0.37
240	5.76	5.76	4.38	0.36	0.37
300	5.76	5.76	4.38	0.35	0.37
600	5.79	5.79	4.41	0.28	0.37
900	5.82	5.82	4.44	0.21	0.37
1200	5.83	5.83	4.45	0.18	0.37
1500	5.85	5.85	4.47	0.13	0.37
1800	5.86	5.86	4.48	0.10	0.37





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

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

Assume
sin a = 1
m = 1

T= **210** secs

Hydraulic Conductivity, K= **1.8E-04** cm/s

TEST COMMENTS:

1. Results inconsistent with packer test results (zero pressure during maximum pumping- possible fault zone at 205 ft).
(Possibly recorded SWL as too low- ie. pulled out core tube, and measured WL before water had a chance to regenerate)

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-228\[GH10-228 Hydraulic Conductivity Testing Sheet_Rev C.xlsx]FH-1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	AL	CG	KJB

Tested By: AL
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION USING HVORSLEV FALLING HEAD TEST METHOD

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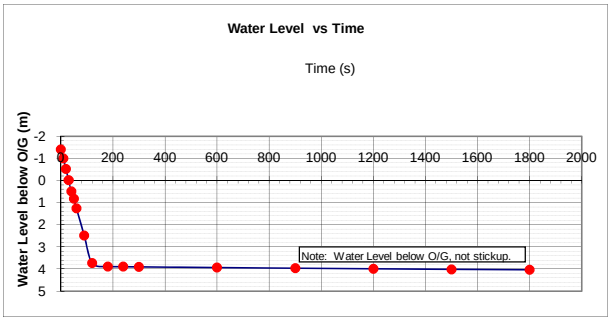
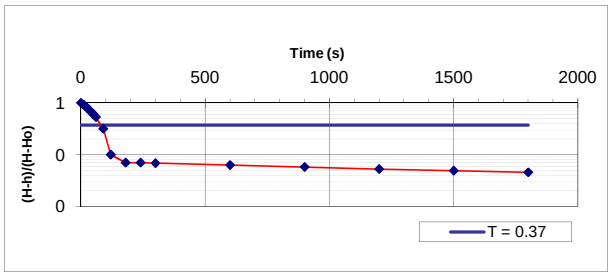
			Downhole Test Interval			
Project No.	**101-176/35**		**65.55** m to **73.17** m			
Drillhole ID.	**GH10-228**					
Piezometer ID.	N/A		**Downhole**	**Vertical**		
Drillhole Inclination (if not inclined, select 90°)			**90**	**90**	°	
Drillhole Elevation from Top of Piezometer or Drill Rods			232		m	
Date			Oct/22/2010			
Test Type			**FALLING**			
Test No.			2			
Hole diameter, D		**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d			d =	0.07780		m
Top of test interval				65.55	65.55	m
Bottom of test interval				73.17	73.17	m
Length of test interval, L			L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface				1.4	1.40	m
Static water level, **(below ground surface)**				4.30	4.30	m
Elevation of Static Water Level **(below ground surface)**			El. =	226.30	226.30	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**			H =	5.70	5.70	m
Water level at start of test, Ho **(below top of piezo or drill rods)**			Ho =	0.00	0.00	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.00	0.00	-1.40	1.00	0.37
10	0.41	0.41	-0.99	0.93	0.37
20	0.88	0.88	-0.52	0.85	0.37
30	1.39	1.39	-0.01	0.76	0.37
40	1.89	1.89	0.49	0.67	0.37
50	2.23	2.23	0.83	0.61	0.37
60	2.66	2.66	1.26	0.53	0.37
90	3.89	3.89	2.49	0.32	0.37
120	5.13	5.13	3.73	0.10	0.37
180	5.30	5.30	3.90	0.07	0.37
240	5.30	5.30	3.90	0.07	0.37
300	5.31	5.31	3.91	0.07	0.37
600	5.34	5.34	3.94	0.06	0.37
900	5.37	5.37	3.97	0.06	0.37
1200	5.40	5.40	4.00	0.05	0.37
1500	5.42	5.42	4.02	0.05	0.37
1800	5.44	5.44	4.04	0.05	0.37





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

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

Assume sin a = 1, m = 1

T= **80** secs

Hydraulic Conductivity, K= **6.3E-04** cm/s

TEST COMMENTS:

M:\1\01\00176\35\A\Data\Final 2010 WMF SI\2010 Geotech Drillholes\GH10-228\[GH10-228 Hydraulic Conductivity Testing Sheet_Rev C.xlsx]FH-2

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	AL	CG	KJB

Tested By: CBN
Reviewed By: JAB

Knight Piésold CONSULTING

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

HYDRAULIC CONDUCTIVITY CALCULATION
USING HVORSLEV FALLING HEAD TEST METHOD

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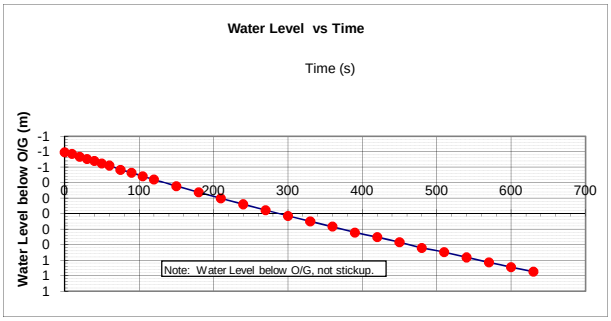
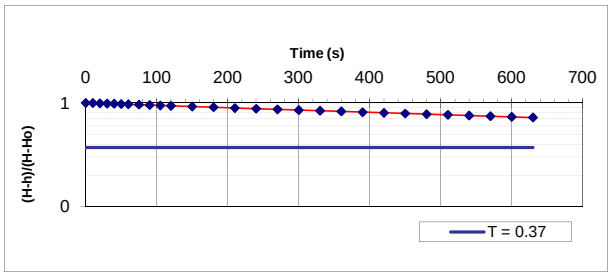
					Downhole Test Interval		
Project No.	**101/176/35**				**27.74** m to	**35.37**	m
Drillhole ID.	**GH10-228**						
Piezometer ID.	GH10-228				**Downhole**	**Vertical**	
Drillhole Inclination (if not inclined, select 90°)					**90**	**90**	°
Drillhole Elevation from Top of Piezometer or Drill Rods					232		m
Date					Oct/25/2010		
Test Type					**FALLING**		
Test No.					3		
Hole diameter, D			**HQ**	D =	0.096		m
Interior diameter of piezometer or drill rods, d		**1.00 Inches**	**Sch 80**	d =	0.02431		m
Top of test interval					27.74	27.74	m
Bottom of test interval					35.37	35.37	m
Length of test interval, L				L =	7.62	7.62	m
Downhole stickup of piezometer or rods above ground surface					1.04	1.04	m
Static water level, **(below ground surface)**					4.75	4.75	m
Elevation of Static Water Level **(below ground surface)**				El. =	226.21	226.21	m
Downhole Static water level, H **(below starting point - top of piezo or drill rods)**				H =	5.79	5.79	m
Water level at start of test, Ho **(below top of piezo or drill rods)**				Ho =	0.25	0.25	m

TEST DATA

Elapsed Time (sec)	Downhole Water Level btoc (m)	Water Level vertical depth btoc (m)	Water Level bgs (m)	(H-h)/(H-Ho)	
0	0.25	0.25	-0.79	1.00	0.37
10	0.27	0.27	-0.77	1.00	0.37
20	0.31	0.31	-0.74	0.99	0.37
30	0.34	0.34	-0.70	0.98	0.37
40	0.36	0.36	-0.68	0.98	0.37
50	0.39	0.39	-0.65	0.97	0.37
60	0.42	0.42	-0.62	0.97	0.37
75	0.48	0.48	-0.57	0.96	0.37
90	0.51	0.51	-0.53	0.95	0.37
105	0.56	0.56	-0.48	0.94	0.37
120	0.60	0.60	-0.44	0.94	0.37
150	0.69	0.69	-0.36	0.92	0.37
180	0.77	0.77	-0.28	0.91	0.37
210	0.85	0.85	-0.20	0.89	0.37
240	0.92	0.92	-0.12	0.88	0.37
270	1.00	1.00	-0.05	0.87	0.37
300	1.07	1.07	0.03	0.85	0.37
330	1.14	1.14	0.10	0.84	0.37
360	1.21	1.21	0.17	0.83	0.37
390	1.28	1.28	0.24	0.81	0.37
420	1.35	1.35	0.31	0.80	0.37
450	1.41	1.41	0.37	0.79	0.37
480	1.48	1.48	0.44	0.78	0.37
510	1.54	1.54	0.50	0.77	0.37
540	1.61	1.61	0.57	0.76	0.37
570	1.67	1.67	0.63	0.74	0.37
600	1.73	1.73	0.69	0.73	0.37
630	1.79	1.79	0.75	0.72	0.37





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

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

Assume
sin a = 1
m = 1

T= **2000** secs

Hydraulic Conductivity, K= **2.5E-06** cm/s

TEST COMMENTS:

1. Original SWL was measured to be 8.88m below top of casing (Possibly recorded SWL as too low- ie. pulled out core tube, and measured WL before water had a chance to regenerate)
2. Measured SWL on 25-Oct-10 (two days later), and was found to be 5.8 m below casing- used this value for the FHT analysis.
3. Tiime when T= 0.37 was extrapolated.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	21DEC'10	ISSUED WITH REPORT VA101-176/35-1	CBN	CG	KJB

Tested By: CBN
Reviewed By: JAB

Knight Piésold
CONSULTING

APPENDIX C4

VIBRATING WIRE PRESSURE TRANSDUCER CALIBRATION RECORDS

(Page C4-1 to C4-4)

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Knight Piesold Consulting
Model:		VW2100-2.0
Serial Number:		**VW15410** BLACK
Mfg Number:		1022503
Range:		2.0 MPa
Temperature:		24.1 °C
Barometric Pressure:		997.0 millibars
Work Order Number:		Q017737
Cable Length:		300 feet
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 Kohms

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (% FS)	Polynomial Error (% FS)
0.000	9175	9175	9175	0.005	0.23	0.01
0.400	8502	8502	8502	0.399	-0.05	-0.01
0.800	7823	7824	7824	0.796	-0.18	0.00
1.200	7141	7141	7141	1.196	-0.18	0.00
1.600	6453	6454	6454	1.599	-0.04	0.01
2.000	5762	5762	5762	2.004	0.22	0.00
				Max. Error (%):	0.23	0.01

Linear Calibration Factor:	C.F.=	0.0005859 MPa/B unit
Regression Zero:	At Calibration =	9182.8 B unit
Temperature Correction Factor:	Tk =	0.0002395 MPa/°C rise

Polynomial Gage Factors (MPa) A: -2.8850E-09 B: -0.00054284 C: 5.2235

Pressure is calculated with the following equations:

Linear: $P(MPa) = C.F.(Li-Lc) - [Tk(Ti-Tc)] + [0.00010(Bi-Bc)]$

Polynomial: $P(MPa) = A(Lc)^2 + BLc + C + Tk(Tc-Ti) - [0.00010(Bc-Bi)]$

	Date (dd/mm/yy)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Shipped Zero Readings:	10-Sep-10	9178	21.8	1019.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: J. Chung Date: 10-Sep-10

Applied Science Technologists and Technicians of British Columbia
22724
A.C.
AL CULLEY
ASCT

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Document Number: ELL0143H

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MIG0106A

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Knight Piesold Consulting
Model:		VW2100-2.0
Serial Number:		**VW15411** WHITE
Mfg Number:		1022504
Range:		2.0 MPa
Temperature:		24.1 °C
Barometric Pressure:		997.0 millibars
Work Order Number:		Q017737
Cable Length:		400 feet
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 Kohms

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (% FS)	Polynomial Error (% FS)
0.000	8825	8825	8825	0.005	0.23	0.00
0.400	8141	8142	8142	0.399	-0.04	0.01
0.800	7454	7454	7454	0.796	-0.19	-0.01
1.200	6761	6761	6761	1.196	-0.19	0.00
1.600	6064	6063	6064	1.599	-0.05	0.00
2.000	5361	5361	5361	2.005	0.23	0.00
				Max. Error (%):	0.23	0.01

Linear Calibration Factor:	**C.F.=**	**0.0005774 MPa/B unit**
Regression Zero:	**At Calibration =**	**8832.9 B unit**
Temperature Correction Factor:	**Tk =**	**0.0003530 MPa/°C rise**

Polynomial Gage Factors (MPa) **A:** -2.9001E-09 **B:** -0.00053623 **C:** 4.9581

Pressure is calculated with the following equations:

Linear: $P(MPa) = C.F.(Li-Lc) - [Tk(Ti-Tc)] + [0.00010(Bi-Bc)]$

Polynomial: $P(MPa) = A(Lc)^2 + BLc + C + Tk(Tc-Ti) - [0.00010(Bc-Bi)]$

	Date (dd/mm/yy)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Shipped Zero Readings:	10-Sep-10	8830	22.0	1019.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: J. Chung Date: 10-Sep-10

Applied Science Technologists and Technicians of British Columbia
22724
A.C
AL CULLEY
AScT

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Document Number: ELL0143H

Recycled

MIG0106A

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Knight Piesold Consulting
Model:		VW2100-2.0
Serial Number:		**VW15414** BLUE
Mfg Number:		1024109
Range:		2.0 MPa
Temperature:		23.8 °C
Barometric Pressure:		992.9 millibars
Work Order Number:		Q017737
Cable Length:		500 feet
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 Kohms

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (% FS)	Polynomial Error (% FS)
0.000	8887	8888	8888	0.004	0.20	0.00
0.400	8212	8212	8212	0.399	-0.05	-0.02
0.800	7530	7531	7531	0.797	-0.13	0.03
1.200	6848	6848	6848	1.196	-0.18	-0.02
1.600	6159	6159	6159	1.599	-0.04	0.01
2.000	5467	5467	5467	2.004	0.19	0.00
				Max. Error (%):	0.20	0.03

Linear Calibration Factor:	**C.F.=**	**0.0005847 MPa/B unit**
Regression Zero:	**At Calibration =**	**8894.3 B unit**
Temperature Correction Factor:	**Tk =**	**0.0001076 MPa/°C rise**

Polynomial Gage Factors (MPa) **A:** -2.5097E-09 **B:** -0.00054866 **C:** 5.0745

Pressure is calculated with the following equations:

Linear: $P(MPa) = C.F.(Li-Lc) - [Tk(Ti-Tc)] + [0.00010(Bi-Bc)]$

Polynomial: $P(MPa) = A(Lc)^2 + BLc + C + Tk(Tc-Ti) - [0.00010(Bc-Bi)]$

	Date (dd/mm/yy)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Shipped Zero Readings:	10-Sep-10	8889	22.1	1019.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: J. Chung Date: 10-Sep-10

Applied Science Technologists and Technicians of British Columbia
22724
A.C.
AL CULLEY
ASCT

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Document Number: ELL0143H

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MIG0106A

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Knight Piesold Consulting
Model:		VW2100-2.0
Serial Number:		**VW15416** GREEN
Mfg Number:		1024111
Range:		2.0 MPa
Temperature:		23.8 °C
Barometric Pressure:		992.9 millibars
Work Order Number:		Q017737
Cable Length:		600 feet
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 Kohms

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (% FS)	Polynomial Error (% FS)
0.000	8976	8977	8977	0.004	0.22	-0.01
0.400	8284	8284	8284	0.399	-0.06	-0.01
0.800	7584	7584	7584	0.798	-0.12	0.06
1.200	6885	6885	6885	1.196	-0.22	-0.03
1.600	6178	6178	6178	1.598	-0.08	-0.03
2.000	5464	5464	5464	2.005	0.25	0.02
				Max. Error (%):	0.25	0.06

Linear Calibration Factor:	**C.F.=**	**0.0005696 MPa/B unit**
Regression Zero:	**At Calibration =**	**8984.3 B unit**
Temperature Correction Factor:	**Tk =**	**0.0001623 MPa/°C rise**

Polynomial Gage Factors (MPa) **A:** -2.7944E-09 **B:** -0.00052921 **C:** 4.9755

Pressure is calculated with the following equations:

Linear: $P(MPa) = C.F.(Li-Lc) - [Tk(Ti-Tc)] + [0.00010(Bi-Bc)]$

Polynomial: $P(MPa) = A(Lc)^2 + BLc + C + Tk(Tc-Ti) - [0.00010(Bc-Bi)]$

	Date (dd/mm/yy)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Shipped Zero Readings:	10-Sep-10	8975	22.2	1019.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: J. Chung Date: 10-Sep-10

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Applied Science Technologists and Technicians of British Columbia
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Document Number: ELL0143H

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CONSULTING

APPENDIX D

SCHLUMBERGER WATER SERVICES – COMPLETION REPORT -
WESTBAY SYSTEM MONITORING WELL: GH10-220

(Pages D-1 to D-54)

VA101-176/35-1
Rev 0
March 30, 2011

Schlumberger Water Services

Schlumberger Canada Limited
3480 Gilmore Way, Suite 110
Burnaby, BC V5G 4Y1
Canada
Tel. (604) 430-4272
Fax (604) 430-3538

October 25, 2010
WB854

Ms. Jane Whitsett
Pebble Limited Partnership
3201 C Street, Suite 604
Anchorage, Alaska
99503

Subject: Completion Report, Monitoring Well: GH10-220, Iliamna, Alaska

Dear Ms. Whitsett,

This report summarizes the work carried out by Schlumberger Water Services related to installation of the Westbay System for groundwater monitoring in a 600-ft borehole at the Pebble site in Iliamna, Alaska.

It was a pleasure working with you and your field staff on this project. We look forward to working with you on this project in the future. Please call us if you have any questions.

Yours truly,

Mark Lessard

Encl.: Completion Report – Monitoring Well GH10-220. One digital copy.

Schlumberger Water Services

Schlumberger Canada Limited
3480 Gilmore Way, Suite 110
Burnaby, BC V5G 4Y1
Canada
Tel. +1.604.430.4272
Fax. +1.604.430.3538

COMPLETION REPORT

Westbay System Monitoring Well: GH10-220

Pebble Limited Partnership

Alaska

Prepared for:

Pebble Limited Partnership
3201 C Street – Suite 604
Anchorage, Alaska

99503
USA

Prepared by:

Schlumberger Water Services
WB854
October 25, 2010

CONTENTS:

APPENDIX

APPENDIX: GH10-220

1. Introduction

This report and the attached Appendix document the technical services carried out by Schlumberger Water Services (SWS) under Pebble Limited Partnership agreement No. SWS.2010.WB854.PLP dated on September 14, 2010. A Westbay System monitoring well was installed in borehole GH10-220 at the Pebble Limited Partnership site near Iliamna, Alaska.

SWS technical services representative Mr. Mark Lessard was on site for the installation of the Westbay System well from September 28 to October 7, 2010. This report documents the installation tasks and related QA checks. Assistance and supervision during the installation was provided by Vladimir Stastny of SWS, Dan Fontaine of Knight and Piesold and field staff of Foundex Explorations Ltd. (Foundex).

2. Previous Activities

A borehole with at a nominal 3.782-in diameter was drilled using an HQ3 wireline coring method. A polymer (Pur-Vis) was used as a drilling fluid to 200-ft and locally supplied water was used as the drilling fluid from 200 to 600-ft. Straddle packer testing was performed in the open borehole before the installation of the Westbay system. An HQ guide tube was placed in the borehole before the lowering of the Westbay casing to protect against caving of the borehole. The bottom of the guide tube was positioned such that the bottom three Westbay System packers were in the open hole.

Table 1, Summary of Westbay Well Installation

Monitoring Well No.	Installation Date	Borehole Depth (ft)	MP38 Casing Length (ft)	No. Monitoring Zones	Surface Casing (diameter/depth)
GH10-220	Oct 4 – 6, 2010	600	595.2	19	n/a

(Note: all depths are with respect to ground surface. Monitoring well reference elevations were not available at the time of writing).

The well was installed according to the procedure described below.

3. Installation

3.1 Preparation of Monitoring Well Design

Zone locations for the borehole were chosen from review of borehole cores by Mr. Vladimir Stastny of SWS. A well design was created based on the chosen zone locations. The well design was used to prepare a Casing Installation Log, which specifies the location of components in the well. Mr. Rod Smith of SWS reviewed and approved the log by phone call and e-mail prior to installation of the well. The Casing Installation Log as approved was used as an installation guide in the field. A copy of the log is located in the Appendix.

A measurement port coupling was included in each zone to provide the capability to measure fluid pressures, collect fluid samples and to permit operation of the squeeze relief venting capabilities of the Westbay Model No. 6055 packer inflation tool. A pumping port coupling was also included three zones to provide purging and hydraulic conductivity testing capabilities. All pumping ports are Westbay Model 0706 hydraulic ports. Mr. Dan Fontaine requested that optional polypropylene filters were not to be installed over measurement port couplings.

3.2 Layout of Westbay Casing Components

Prior to the installation, the Westbay System casing components were set out at the borehole according to the sequence indicated on the Casing Installation Log. Each casing length was numbered beginning with the lowermost as an aid to confirming the proper sequence of components. The appropriate Westbay System couplings were attached to the casing sections. Magnetic location collars were attached 2-ft below the top of the measurement port couplings in 11 of the 19 zones. Two measurement ports were included in Zone 9 (329.7-374.8 ft).

Each casing component was visually inspected. Serial numbers for each packer, pumping port and measurement port coupling were recorded on the Casing Installation Log. The component layout was confirmed with the log before the components were lowered into the borehole.

3.3 Lowering of Westbay Components

The open-hole water level in GH10-220 was less than 10-ft below ground level, so the Westbay casing components were lowered into the borehole by hand. Clean water supplied by Foundex was added to the Westbay casing when necessary for testing of joint seals during lowering and to counter buoyancy. Each casing joint was tested with a minimum internal hydraulic pressure of 150 psi for one minute to confirm hydraulic seals. Records of each successful joint test and the placement of each casing component are noted on the Casing Installation Log by check marks.

3.4 Hydraulic Integrity Testing

After the Westbay casing string was lowered into the borehole, the water level inside the Westbay casing was monitored at a depth different from the open borehole water level for a minimum period of thirty minutes to confirm hydraulic integrity of the casing. The data from the hydraulic integrity test are shown on Page 3 of the Casing Installation Log in the Appendix and in Table 2 below.

Table 2, Borehole and Westbay Casing Water Levels

Well number	Borehole water level (Ground Surface)	Westbay water level (top of casing)
GH10-220	6.8-ft	206.72-ft

3.5 Positioning of Westbay Components

After the components were lowered into the well, the Westbay casing string was positioned as illustrated on the Casing Installation Log. The datum for GH10-220 is with respect to ground surface. The Westbay casing string was supported in this position while packer inflation was carried out. The positioning of the Westbay casing components is based on the "nominal" lengths of Westbay casing components. The positioning calculations do not include allowances for borehole temperature or deviation effects.

The attached figure titled “MOSDAX Transducer Position” provides information to correlate the position of MOSDAX Transducer sensors to the reference position at the top of the Measurement Port. The attached figure titled “Dimensions of Packer Seals and Monitoring Zones” outlines the calculations used to determine the packer depths and zone length. A Summary Casing Log, which shows the final “as-built” locations of the components in the well, is included in the Appendix. The depths of key items in the well are shown on Table 3.

3.6 Pre-inflation Profile

A pre-inflation pressure profile was carried out at the well prior to inflating the packers to confirm the proper operation and position of measurement ports and magnetic collars. The data confirmed that the ports operated properly and were positioned correctly in the well. A plot of the Pre-Inflation Piezometric levels in all zones is shown on Figure 1 in the Appendix.

3.7 Inflation of Westbay System Packers

The Westbay packers were inflated sequentially beginning at the bottom of the well using clean water provided by Foundex. The Westbay Model No. 6055 vented inflation tool was used for packer inflation. After the three exposed bottom packers were inflated, the guide tube was removed in stages as determined by SWS. In general the stages were determined based on borehole wall quality and risk of caving. In each stage, packers were uncovered then inflated before the next stage of guide tube removal. During these steps the weight of the Westbay casing was supported by the inflated packers. All the packers appear to have inflated normally. The data for inflation of each packer are provided on the Westbay Packer Inflation Records included in the Appendix.

4. Fluid Pressure Measurements

After packer inflation was completed, fluid pressures were measured at each measurement port. At that time, the in-situ formation pressures may not have recovered from the pre-installation activities. Longer term monitoring may be required to establish representative fluid pressures.

Three complete pressure profiles were measured to document the recovery of fluid pressures after packer inflation. These profiles were measured on October 6, 0900 hr, October 6, 1500 hr and October 7, 1000 hr.

Plot of the Piezometric levels in all zones in the well are shown on Figures 2 to 4 in the Appendix. The data were examined to confirm proper operation of the measurement ports and as a check on the presence of annulus seals between monitoring zones. The calculation sheets for the pressure profiles of the Westbay System monitoring well are also enclosed in the Appendix.

Table 3, Depths of Key Items for Westbay Monitoring Well GH10-220.

Zone No.	Monitoring Interval* (ft)	MP Casing No. (from MP Log)	Packer No.	Packer Serial No.	Nominal Packer Position (ft) ***	Measurement Port Depth** (ft)	Magnetic Collar Depth (ft)	Pumping Port Depth** (ft)
Zone 1	580.0-600.0	1-2	---	---	---	580.0	582.0	---
Packer	---	3	1	15882	575.0	---	---	---
Zone 2	544.8-575.0	4-7	---	---	---	544.8	546.8	549.8
Packer	---	8	2	15881	539.8	---	---	---
Zone 3	514.8-539.8	9-11	---	---	---	514.8	516.8	---
Packer	---	12	3	15886	509.8	---	---	---
Zone 4	484.8-509.8	13-15	---	---	---	484.8	---	---
Packer	---	16	4	15880	479.8	---	---	---
Zone 5	459.8-479.8	17-18	---	---	---	459.8	---	---
Packer	---	19	5	15884	454.8	---	---	---
Zone 6	434.8-454.8	20-21	---	---	---	434.8	436.8	---
Packer	---	22	6	15879	429.8	---	---	---
Zone 7	409.8-429.8	23-24	---	---	---	409.8	---	---
Packer	---	25	7	15878	404.8	---	---	---
Zone 8	379.8-404.8	26-28	---	---	---	379.8	---	---
Packer	---	29	8	15885	374.8	---	---	---
Zone 9	329.7-374.8	30-34	---	---	---	329.7/349.7	331.7/351.7	359.7
Packer	---	35	9	15883	324.7	---	---	---
Zone 10	299.7-324.7	36-38	---	---	---	299.7	---	---

* Depths are with respect ground surface..

** Component positions are referenced to the top of the subject Westbay System coupling.

*** Packer positions are referenced to the top Westbay System coupling on the packer.

Monitoring zone dimensions are determined as described on the attached “Dimensions of Packer Seals and Monitoring Zones”.

The position of a MOSDAX Transducer in a Measurement Port is illustrated in the attached “MOSDAX Transducer Position”. This information may be used in calculating piezometric levels.

Table 3, Depths of Key Items for Westbay Monitoring Well GH10-220 (cont).

Zone No.	Monitoring Interval* (ft)	MP Casing No. (from MP Log)	Packer No.	Packer Serial No.	Nominal Packer Position (ft) ***	Measurement Port Depth** (ft)	Magnetic Collar Depth (ft)	Pumping Port Depth** (ft)
Packer	---	39	10	15883	294.7	---	---	---
Zone 11	274.7-294.7	40-41	---	---	---	274.7	276.7	---
Packer	---	42	11	15864	269.7	---	---	---
Zone 12	249.7-269.7	43-44	---	---	---	249.7	251.7	---
Packer	---	45	12	15858	244.7	---	---	---
Zone 13	214.7-244.7	46-48	---	---	---	214.7	---	---
Packer	---	49	13	15865	209.7	---	---	---
Zone 14	181.5-209.7	50-54	---	---	---	181.5	183.5	186.5
Packer	---	55	14	15860	176.5	---	---	---
Zone 15	159.5-176.5	56-58	---	---	---	159.5	---	---
Packer	---	59	15	15863	154.5	---	---	---
Zone 16	139.5-154.5	60-61	---	---	---	139.5	141.5	---
Packer	---	62	16	15866	134.5	---	---	---
Zone 17	94.5-134.5	63-66	---	---	---	94.5	---	---
Packer	---	67	17	15859	89.5	---	---	---
Zone 18	69.5-89.5	68-69	---	---	---	69.5	71.5	---
Packer	---	70	18	15862	64.5	---	---	---
Zone 19	34.5-64.5	71-73	---	---	---	34.5	36.5	---
Packer	---	74	19	15857	29.5	---	---	---
Riser	0-29.5	75-79	---	---	---	---	---	---

* Depths are with respect ground surface..

** Component positions are referenced to the top of the subject Westbay System coupling.

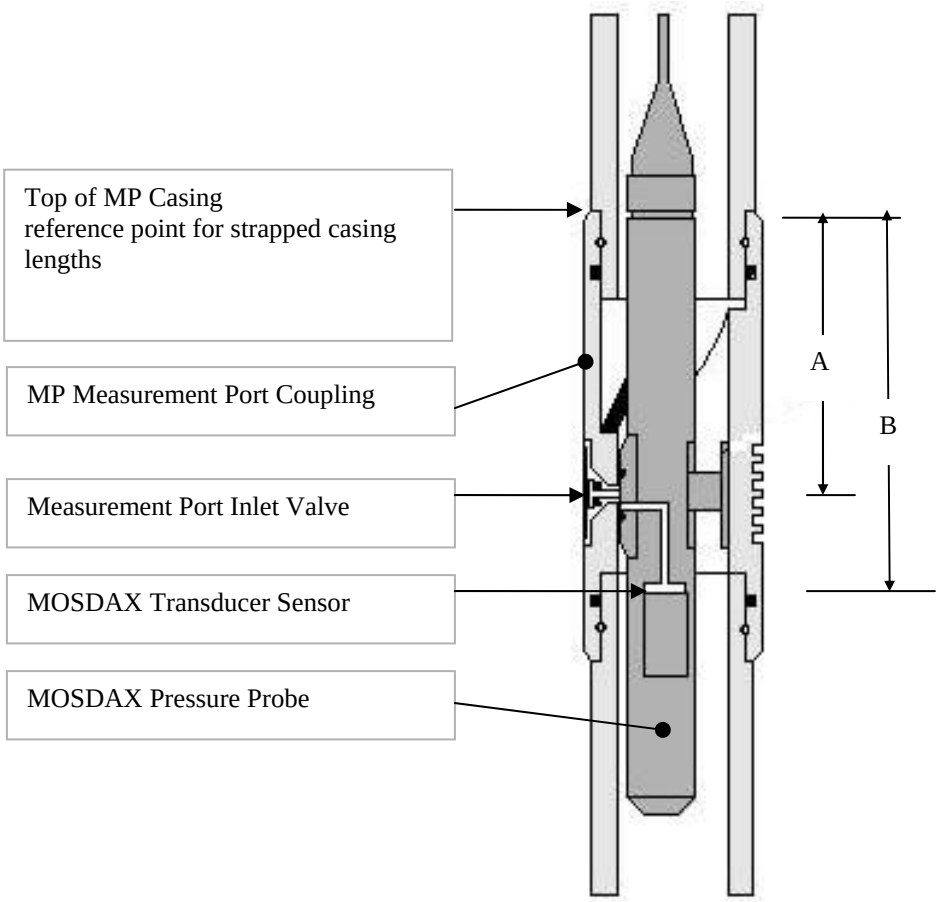
*** Packer positions are referenced to the top Westbay System coupling on the packer.

Monitoring zone dimensions are determined as described on the attached “Dimensions of Packer Seals and Monitoring Zones”.

The position of a MOSDAX Transducer in a Measurement Port is illustrated in the attached “MOSDAX Transducer Position”. This information may be used in calculating piezometric levels.

MOSDAX Transducer Position

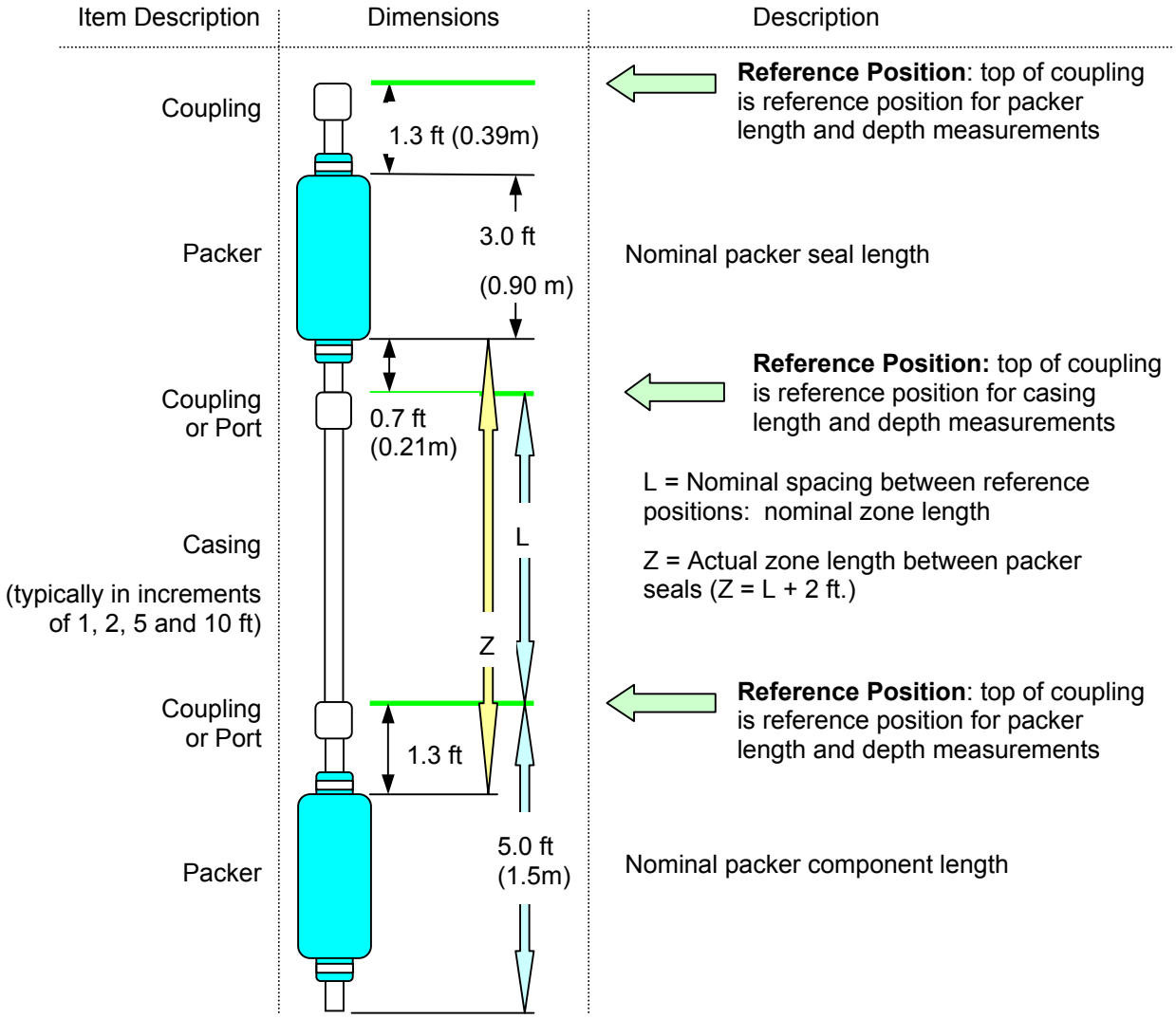
In an MP System Measurement Port Coupling



System	Measurement Port Type	A	B
Plastic MP38	0222, 0205	4.5" (114.3 mm)	6.5" (165.1 mm)

Dimensions of Packer Seals and Monitoring Zones

Westbay System – Plastic MP38



Discussion Points:

- The top of a coupling (Regular Coupling, Measurement Port or Pumping Port) is the reference point for describing nominal depths and nominal lengths. Actual positions of packer seals and zone lengths are determined with respect to the appropriate reference positions.
- Packer Position Example: A packer with a nominal depth of 50 ft (15.2m), will have a nominal packer seal position of 51.3 to 54.3 ft. (15.59 to 16.49m)
- Zone Length Example: A zone whose upper packer is at 50 ft (15.2m) and bottom packer is at 70 ft (21.3m) will have a nominal zone length of 15 ft (4.6m) and an actual zone length (between packer seals) of 15.0+1.3+0.7 = 17.0ft. (4.6 + 0.39 + 0.2 = 5.19m)
- Information on the position of Measurement Port Valve and MOSDAX Transducer sensor, used for detailed calculation of piezometric level measurements, are described separately.

APPENDIX

Monitoring Well GH10-220

Summary Casing Log

Company: Pebble Partnership
Well: GH10-220
Site: Iliamna, Alaska
Project: Pebble

Job No: WB854
Author: ML

Well Information

Reference Datum: Ground Surface
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 595.16 ft.

Borehole Depth: 600.00 ft.
Borehole Inclination: Vertical
Borehole Diameter: 4.00 in.

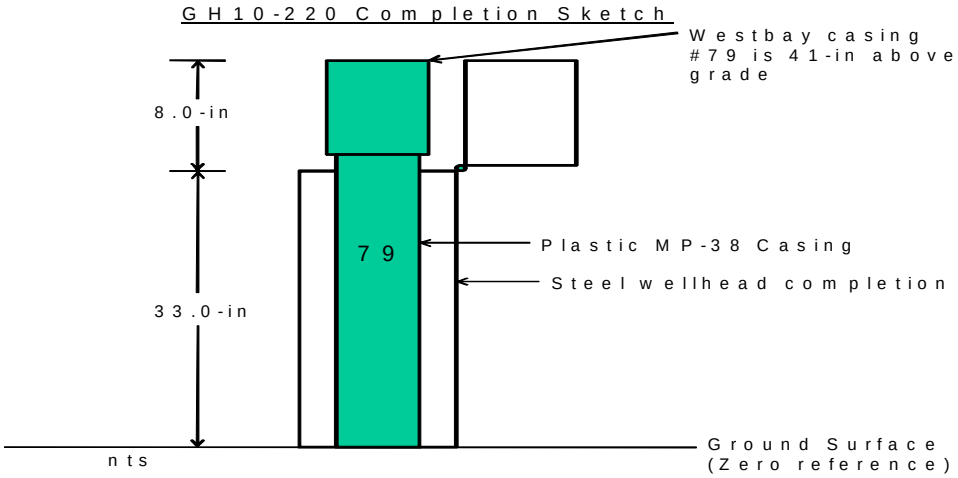
Well Description:
MP38
Other References:

File Information

File Name: G10-220.WWD
Report Date: Fri Oct 22 13:16:59 2010

File Date: Oct 13 09:16:00 2010

Sketch of Wellhead Completion

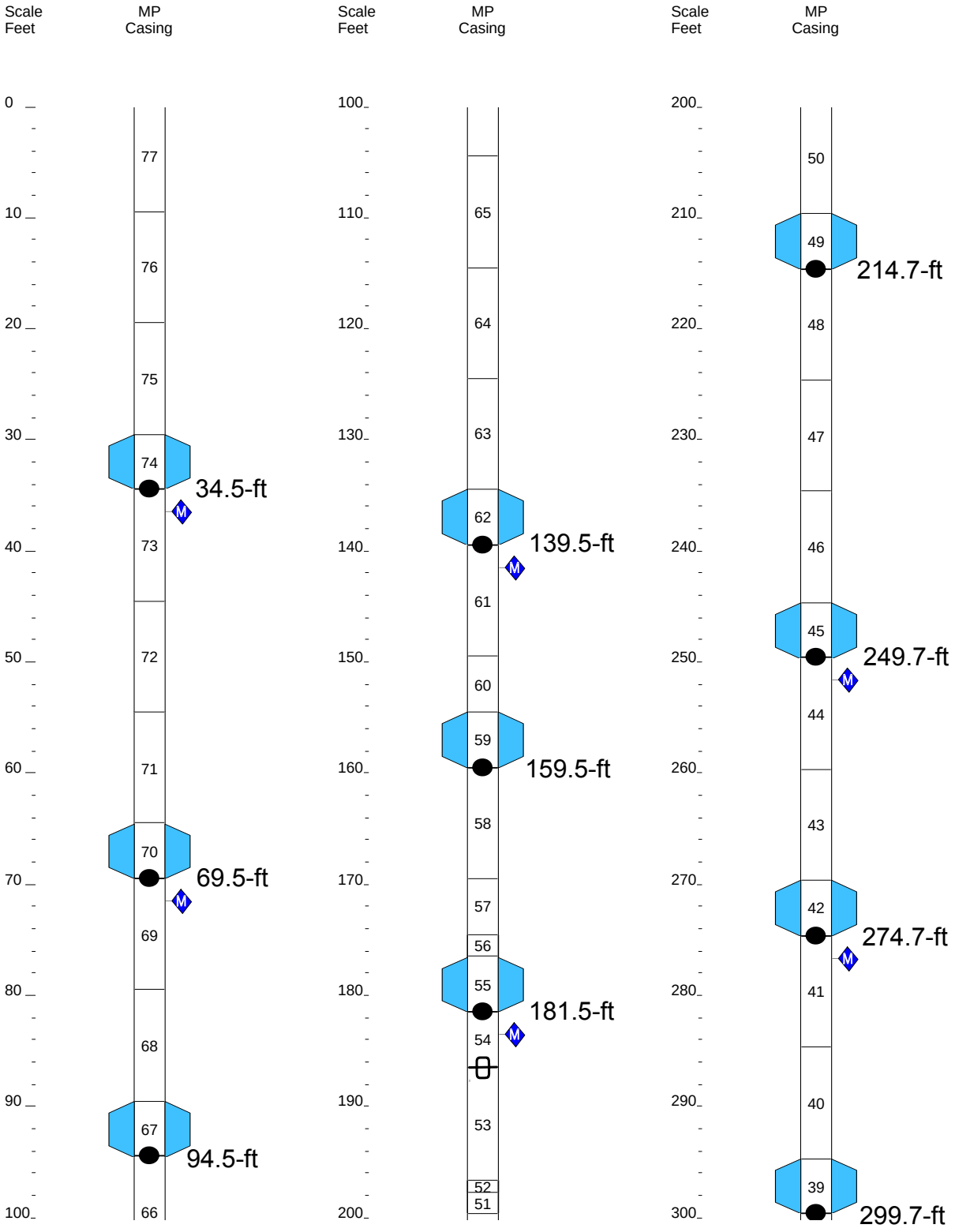


Legend

(Qty) MP Components (Library - WD Library 7/27/00)	Geology	Backfill/Casing
(4) 020102 - MP38 Casing 3 (2F/0.6M)		
(2) 020101 - MP38 Casing 4 (1F/0.3M)		
(44) 020110 - MP38 Casing 1 (10F/3M)		
(19) 0238 - MP38 Packer 74mm (5F/1.5M)		
(11) 020105 - MP38 Casing 2 (5F/1.5M)		
(1) 0203 - MP38 End Cap		
(57) 0202 - MP38 Regular Coupling		
(20) 0205 - MP38 Measurment Port		
(3) 0706 - MP38 Hydraulic Pumping Port		
(12) 0216 - Magnetic Location Collar		

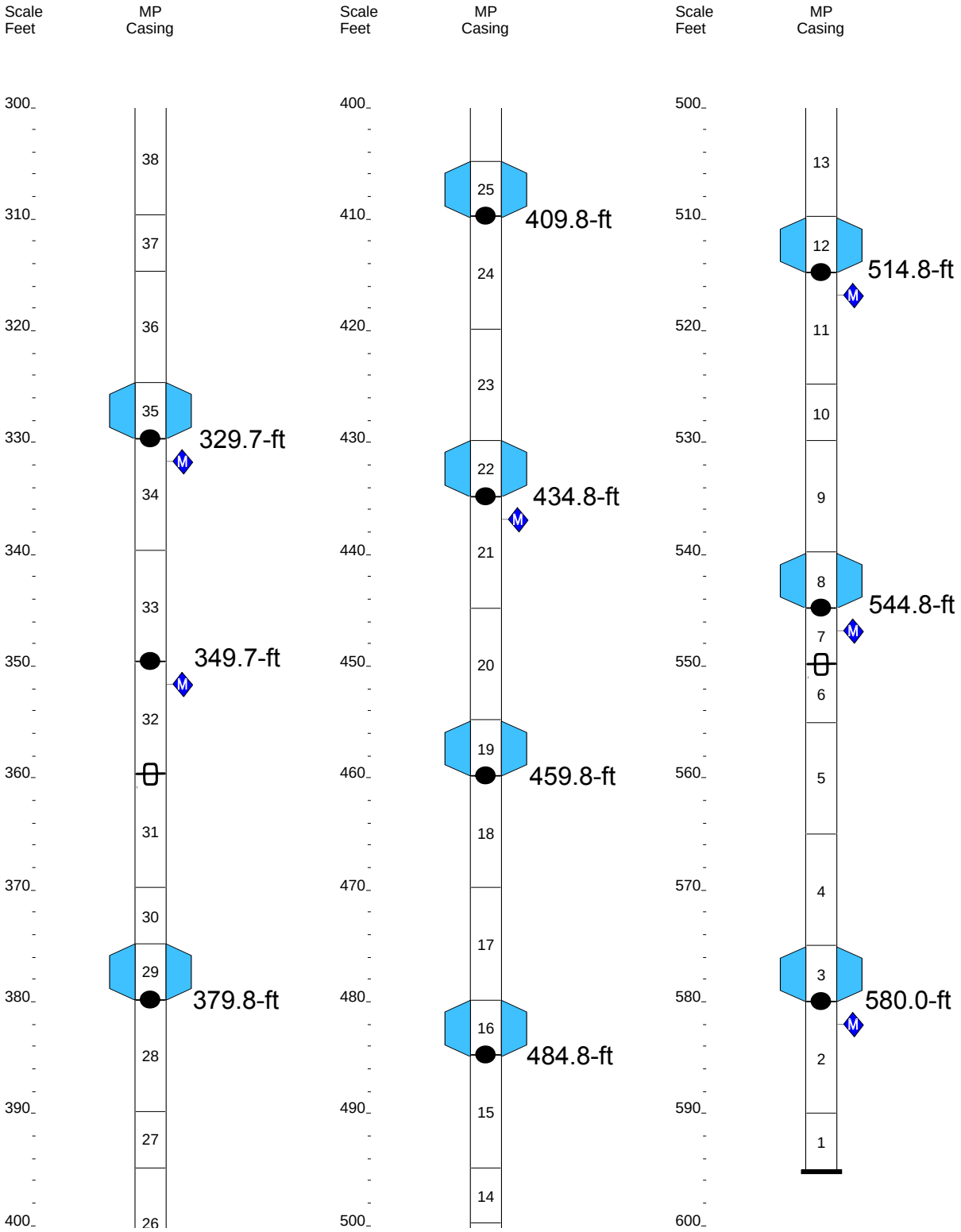
Summary Casing Log
Pebble Partnership

Job No: WB854
Well: GH10-220



Summary Casing Log
Pebble Partnership

Job No: WB854
Well: GH10-220



Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: ≈5½ ft
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 4, 10
Client: Pebble
Job No.: WB854
Location:
Weather: Cloudy, cold, windy
Operator: ML, VS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start	Finish
Pressure	12.94 psi	12.95 psi
Temp	3.63 °C	3.95 °C
Time	4:02 pm	5:18 pm

shoe out ↓ shoe in ↓ P_{atm} 12.94 psi

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Comments: Magnetic collar depth by counter (ft) (tripping down)
1	580.0	576	–	178.70	262.90	4:11	3.62	178.70	576.6	3.4	578
2	544.8	541	–	163.31	247.63	4:15	3.82	163.34	541.4	3.4	543
3	514.8	511	–	150.30	234.68	4:32	~~3.86~~ 3.61	150.20	511.5	3.3	514 shoe broke
4	484.8	481	–	137.15	221.59	4:35	3.70	137.15	481.3	3.5	
5	459.8	456	–	126.33	210.75	4:38	3.75	126.35	456.3	3.5	
6	434.8	431	–	115.40	199.93	4:40	3.82	115.40	431.3	3.5	434
7	409.8	406	–	104.50	189.15	4:42	3.84	104.60	406.5	3.3	
8	379.8	376	–	91.45	176.15	4:45	3.79	91.45	376.5	3.3	
9	349.7	346	–	78.30	162.96	4:48	3.73	78.30	~~277.~~ 346.1	3.6	349
10	329.7	326	–	69.65	154.31	4:51	3.69	69.60	326.1	3.6	330
11	299.7	296	–	56.60	141.25	4:53	3.66	56.60	296.0	3.7	
12	274.7	271	–	45.70	130.45	4:56	3.66	45.75	271.1	3.6	275 (130.45)
13	249.7	246	–	34.85	119.70	4:58	3.68	34.85	246.3	3.4	250
14	214.7	211	–	19.50	104.40	5:00	3.77	19.60	211.0	3.7	
15	181.5	178	–	13.10	80.00	5:02	3.81	13.10	177.8	3.7	182

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: 5.5-ft
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 4/10
Client: Pebble
Job No.: WB854
Location:
Weather: cloudy, cold, windy
Operator: ML / VS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 12.94 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

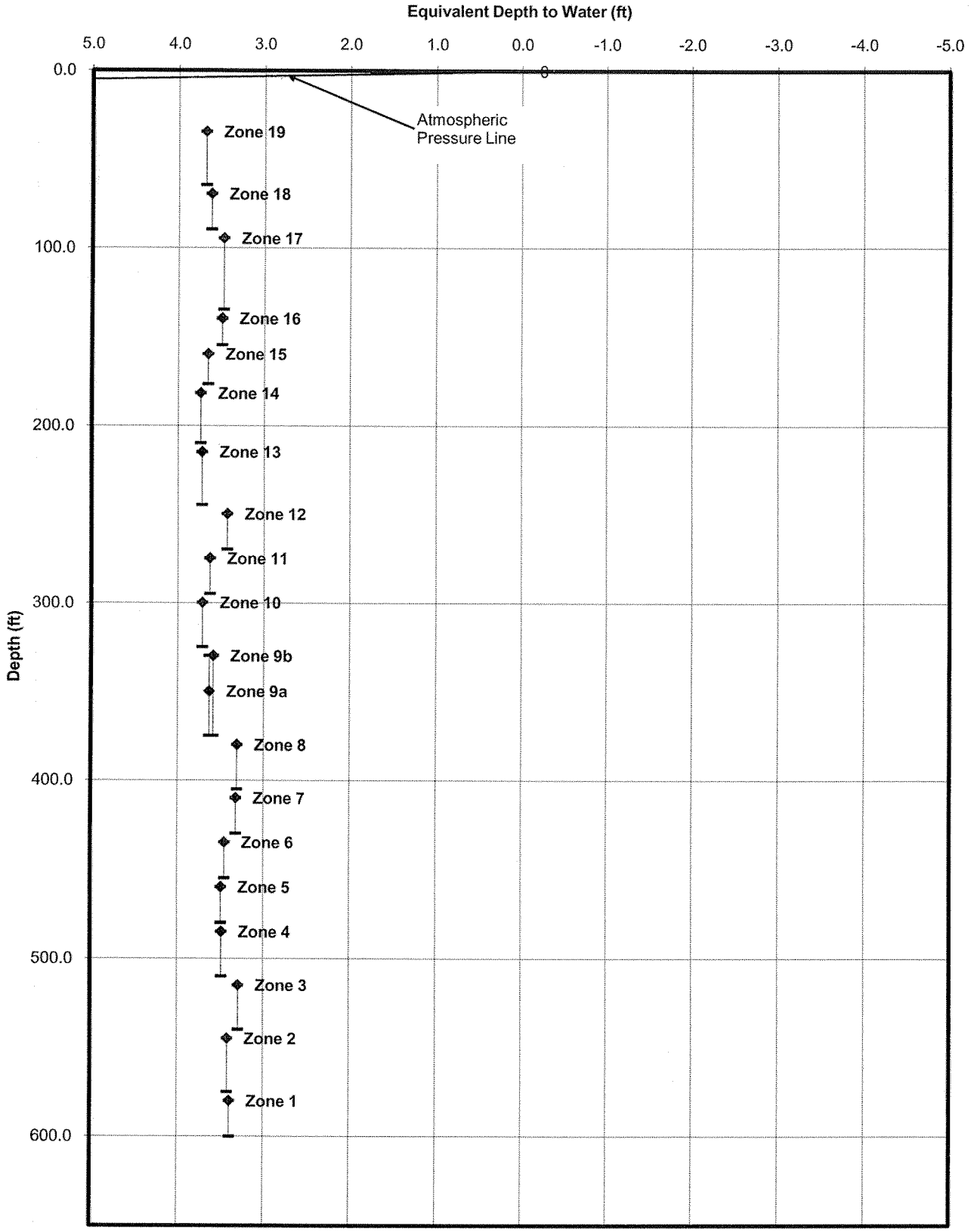
	Start	Finish
Pressure	12.94 psi	12.95 psi
Temp	3.67 °C	3.95 °C
Time	4:02 pm	5:18 pm

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Magnetic collar depth by counter (ft)	Comments
16	159.5	156	–	13.06	80.50	5:07	3.88	13.06	155.8	3.7		
17	139.5	136	–	13.06	71.90	5:09	3.88	13.10	136.0	3.5	141	
18	94.5	91	–	13.08	52.40	5:11	3.89	13.09	91.0	3.5		
19	69.5	66	–	13.08	41.50	5:13	3.91	13.06	65.9	3.6	71	
20	34.5	31	–	13.00	26.30	5:15	3.93	13.04	~~57.9~~ 30.8	3.7	36	

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Piezometric Profile
Monitoring Well: GH10-220

Profile Date: October 4, 2010
Comments: Pre-Inflation Profile



Client: Pebble Partnership
Site: Iliamna, Alaska
Datum: Ground Surface

Plot By: MC Date: Oct 13/10
Checked By: FB Date: 10/15/10
Westbay Project: WB854

Figure 1

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: 4ft-in
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 6/10
Client: Pebble
Job No.: WB 854
Location:
Weather: Clear, cold
Operator: Vlad & Mark

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 12.94 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start	Finish
Pressure	12.94 psi	12.99 psi
Temp	7.96 °C	2.95 °C
Time	9:02 am	9:55 am

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Comments: Zones	Westbay Casing water level (P1)
1	580.0	577	–	264.07	262.77	9:06	5.71	264.05	576.31	3.7	1	4.70'
2	544.8	542	–	248.71	247.50	9:08	5.01	248.73	~~543.9~~	3.7	541.1 2	
3	514.8	512	–	235.69	234.54	9:12	4.43	235.68	511.2	3.6	3	
4	484.8	482	–	222.61	221.49	9:14	4.18	222.66	481.1	3.7	4	
5	459.8	457	–	211.69	210.70	9:16	3.94	211.6	458.2	3.6	5	
6	434.8	433	–	200.80	199.81	9:18	3.85	200.89	431.1	3.7	6	
7	409.8	408	–	189.91	188.99	9:20	3.77	189.91	406.1	3.7	7	
8	379.8	378	–	176.83	175.98	9:22	3.67	176.82	376.1	3.7	8	
9	349.7	348	–	163.62	162.81	9:24	3.53	163.61	345.7	4.0	9a	5.81'
10	329.7	328	–	154.96	154.18	9:26	3.35	155.00	325.8	3.9	~~10~~ 9b	
11	299.7	298	–	141.86	144.01	9:28	3.21	141.95	302.4	-2.6	~~11~~ 10	
12	274.7	274	–	130.98	133.13	9:31	3.04	130.97	277.3	-2.6	~~12~~ 11	
13	249.7	249	–	120.16	122.32	9:34	2.99	120.09	252.3	-2.6	~~13~~ 12	
14	214.7	215	–	104.76	105.61	9:37	2.93	104.83	213.8	0.9	~~14~~ 13	
15	181.5	182	–	90.37	91.20	9:40	2.89	90.36	180.5	1.0	~~15~~ 14	

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: 48 in
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 6/10
Client: Pebble
Job No.: WB854
Location:
Weather: clear/cold
Operator: Vlad, Mark

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 12.94 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start	Finish
Pressure	12.94 psi	12.94 psi
Temp	7.96 °C	2.95 °C
Time	9:02 am	9:55 am

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Comments: Zones
16	159.5	161	-	80.72	80.73	9:43	2.85	80.72	156.4	3.1	~~16~~ 15
17	139.5	141	-	72.03	72.19	9:45	2.90	72.01	136.7	2.8	~~17~~ 16
18	94.5	96	-	52.43	52.73	9:48	2.96	52.43	91.8	2.7	~~18~~ 17
19	69.5	71	-	41.42	42.14	9:50	2.96	67.4 →		2.1	(41.42) ~~19~~ 18
20	34.5	36	-	26.27	27.41	9:52	3.00	26.26	33.4	1.1	~~20~~ 19

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: 48-in
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: closed

Date: Oct 6/10
Client: Pebble
Job No.: WB 854
Location:
Weather: overcast, cold, windy
Operator: VS/MC

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 12.90 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

		Start	Finish
	Pressure	12.90 psi	12.90 psi
	Temp	2.10 °C	3.01 °C
	Time	3:27 pm	4:15 pm

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Comments: Zones
1	580.0	578	–	263.98	262.78	3:34	5.27	264.0	576.4	3.6	1
2	544.8	543	–	248.68	247.52	3:36	4.87	248.63	541.2	3.6	2
3	514.8	513	–	235.60	234.55	3:37	4.46	235.6	511.3	3.5	3
4	484.8	483	–	222.55	221.53	3:39	4.29	222.55	481.3	3.5	4
5	459.8	458	–	211.63	210.71	3:41	4.01	211.60	456.3	3.5	5
6	434.8	433	–	200.77	199.85	3:43	3.90	200.73	431.3	3.5	6
7	409.8	408	–	189.86	188.99	3:45	3.83	189.85	406.2	3.6	7
8	379.8	378	–	176.77	176.03	3:47	3.67	176.76	376.3	3.5	8
9	349.7	348	–	163.55	162.87	3:49	3.50	163.55	346.0	3.7	9
10	329.7	328	–	154.84	154.22	3:51	3.36	154.83	326.0	3.7	10 9b
11	299.7	298	–	141.74	143.98	3:53	3.20	141.73	302.4	-2.7	~~11~~ 10
12	274.7	273	–	130.89	133.17	3:55	3.10	130.91	277.4	-2.7	~~12~~ 11
13	249.7	248	–	120.0	122.35	3:57	3.01	120.01	252.5	-2.8	~~13~~ 12
14	214.7	213	–	104.71	105.63	3:59	2.92	104.72	213.9	0.8	~~14~~ 13
15	181.5	180	–	90.18	91.17	4:01	2.88	90.18	180.6	0.9	~~15~~ 14

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: 48-in
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 6/10
Client: Pebble
Job No.: WB 854
Location:
Weather: Overcast, cold, windy
Operator: VS/ML

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 12.9 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start	Finish
Pressure	12.90 psi	12.90
Temp	7.10 °C	3.01
Time	3:27 pm	4:15

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Comments: Zones	
16	159.5	158	–	80.63	80.92	4:03	2.84	80.60	156.9	2.6	16	15
17	139.5	138	–	71.90	72.19	4:05	2.89	71.93	136.8	2.7	17	16
18	94.5	93	–	52.27	52.76	4:07	2.90	52.27	91.9	2.6	18	17
19	69.5	68	–	~~41.29~~ 41.35	~~51.65~~ ~~42.22~~	4:09	2.93	41.35	~~89.4~~ ~~67.6~~	1.9	19	18
20	34.5	33	–	26.14	27.37	4:12	2.96	26.14	33.4	1.1	20	19

Blank wall

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GH10-220
Datum: G.S.
Elev. G.S.: Ø
Height of Westbay above G.S.: 60.7m
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS 3556
Probe Range: 2000 psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 7/10
Client: P0664
Job No.: WB854
Location:
Weather: Clear/Cold
Operator: Vlad / MARK

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Ambient Reading (P_{atm}) (pressure, temperature, time)

	Start	Finish
Pressure	12.98 psi	13.02 psi
Temp	7.74 °C	2.95 °C
Time	10:01 am	11:05 am

P_{atm} 12.98 psi

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Zones	Comments
1	580.0	578	–	264.26	262.81	10:10	4.54	264.25	576.3	3.7	1	
2	544.8	543	–	248.91	247.56	10:12	4.18	248.91	541.1	3.7	2	
3	514.8	513	–	235.76	234.61	10:15	4.02	235.78	511.3	3.5	3	
4	484.8	483	–	222.71	221.54	10:17	3.83	222.71	481.1	3.7	4	
5	459.8	458	–	211.79	210.74	10:19	3.73	211.75	456.2	3.6	5	
6	434.8	433	–	200.97	199.82	10:24	3.60	200.97	431.0	3.8	6	
7	409.8	408	–	190.02	189.03	10:26	3.53	190.03	406.1	3.7	7	
8	379.8	378	–	176.94	176.04	10:28	3.42	176.93	376.1	3.7	8	
9	349.7	348	–	163.78	162.91	10:30	3.29	163.77	345.9	3.8	9a	
10	329.7	328	–	155.06	154.17	10:33	3.05	155.04	325.7	4.0	9b	
11	299.7	298	–	141.93	144.11	10:36	2.86	141.93	302.5	-2.8 ~~2.74~~	10	
12	274.7	273	–	131.12	133.22	10:42	2.70	131.11	277.4	-2.7	11	
13	249.7	248	–	120.15	122.45	10:46	2.67	120.15	252.5	-2.8	12	
14	214.7	213	–	104.97	105.72	10:48	2.64	104.91	213.9	+0.8	13	
15	181.5	180	–	90.39	91.10	10:50	2.60	90.39	180.2	1.3	14	

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Schlumberger WATER SERVICES

Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: GHO-220
Datum: GS
Elev. G.S.: Ø
Height of Westbay above G.S.: 40-m
Elev. top of Westbay Casing: Ø
Reference Elevation: Ø
Borehole angle: Vertical

Probe Type: Sampler
Serial No.: EMS3556
Probe Range: 2000psi
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: Oct 7/10
Client: Pebble
Job No.: WB 954
Location:
Weather: Clear/Cold
Operator: Vlad/Mark

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

P_{atm} 12.98 psi

Ambient Reading (P_{atm}) (pressure, temperature, time)

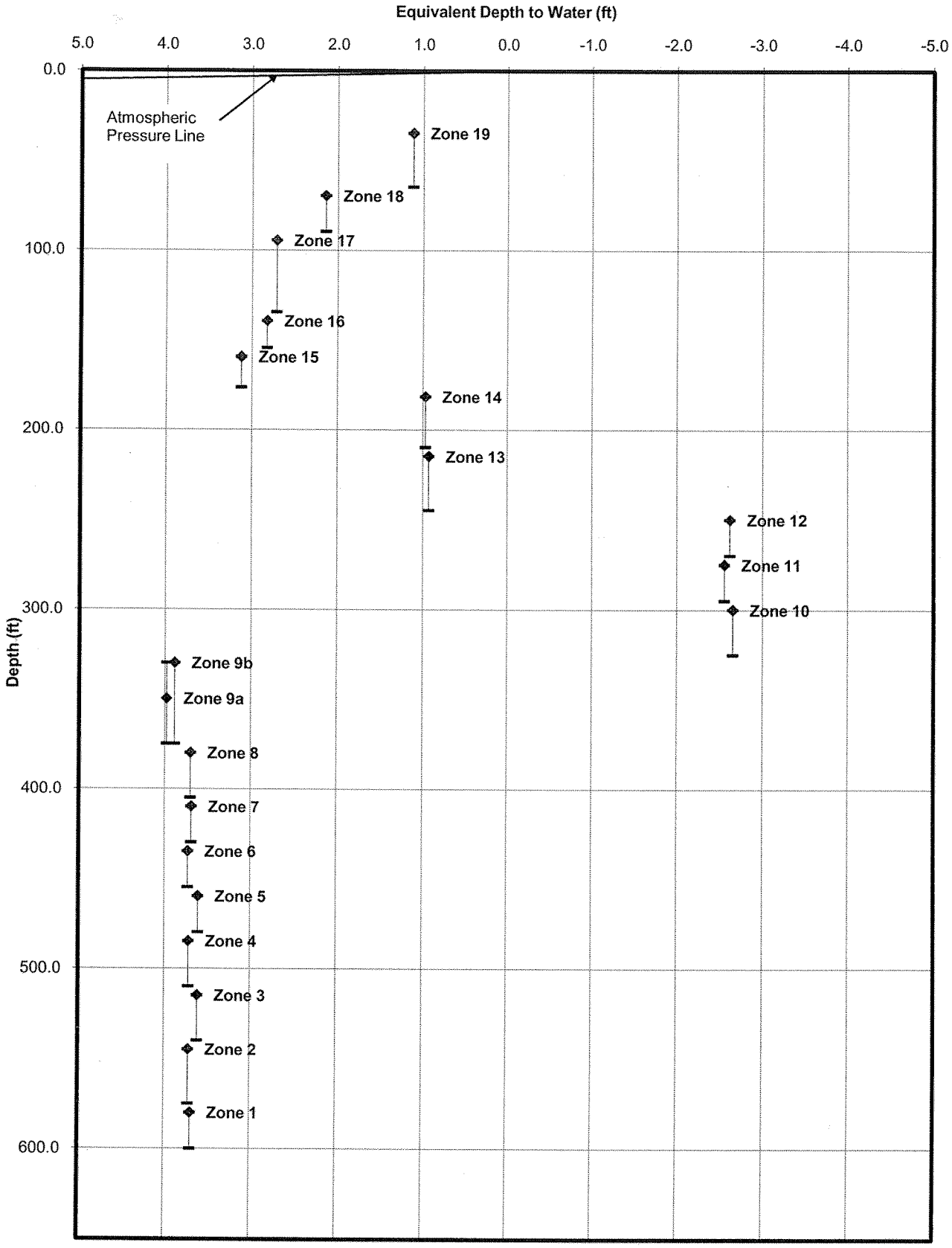
	Start	Finish
Pressure	12.98 psi	13.02 psi
Temp	7.74°C	7.95°C
Time	10:01 am	11:05 am

Port No.	Port Position From Log (ft)	Port Position From Cable (ft)	True Port Depth "Dp" (ft)	Fluid Pressure Readings: Inside Casing (P1)	Outside Casing (P2)	Time H:M:S	Probe Temp. (°C)	Inside Casing (P1)	Pressure Head Outside Port (ft) H = (P2-Patm)/w	Piez. Level Outside Port (ft) Dz = Dp - H	Zones	Comments
16	159.5	158	–	80.77	80.87	10:54	2.61	80.77	156.6	2.9	15	
17	139.5	138	–	72.15	72.22	10:56	2.64	72.14	136.7	2.8	16	
18	94.5	93	–	52.50	52.78	10:58	2.70	52.44	91.8	2.7	17	
19	69.5	68	–	41.60	42.18	11:00	2.71	41.61	67.4	2.1	18	
20	34.5	33	–	26.28	27.33	11:02	2.72	26.30	33.1	1.4	19	

Notes: w = 0.4335 psi/ft (1.422psi/m) of H_2O Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

Piezometric Profile
Monitoring Well: GH10-220

Profile Date: October 6, 2010 (0900 hr)
Comments: Post-Inflation Profile



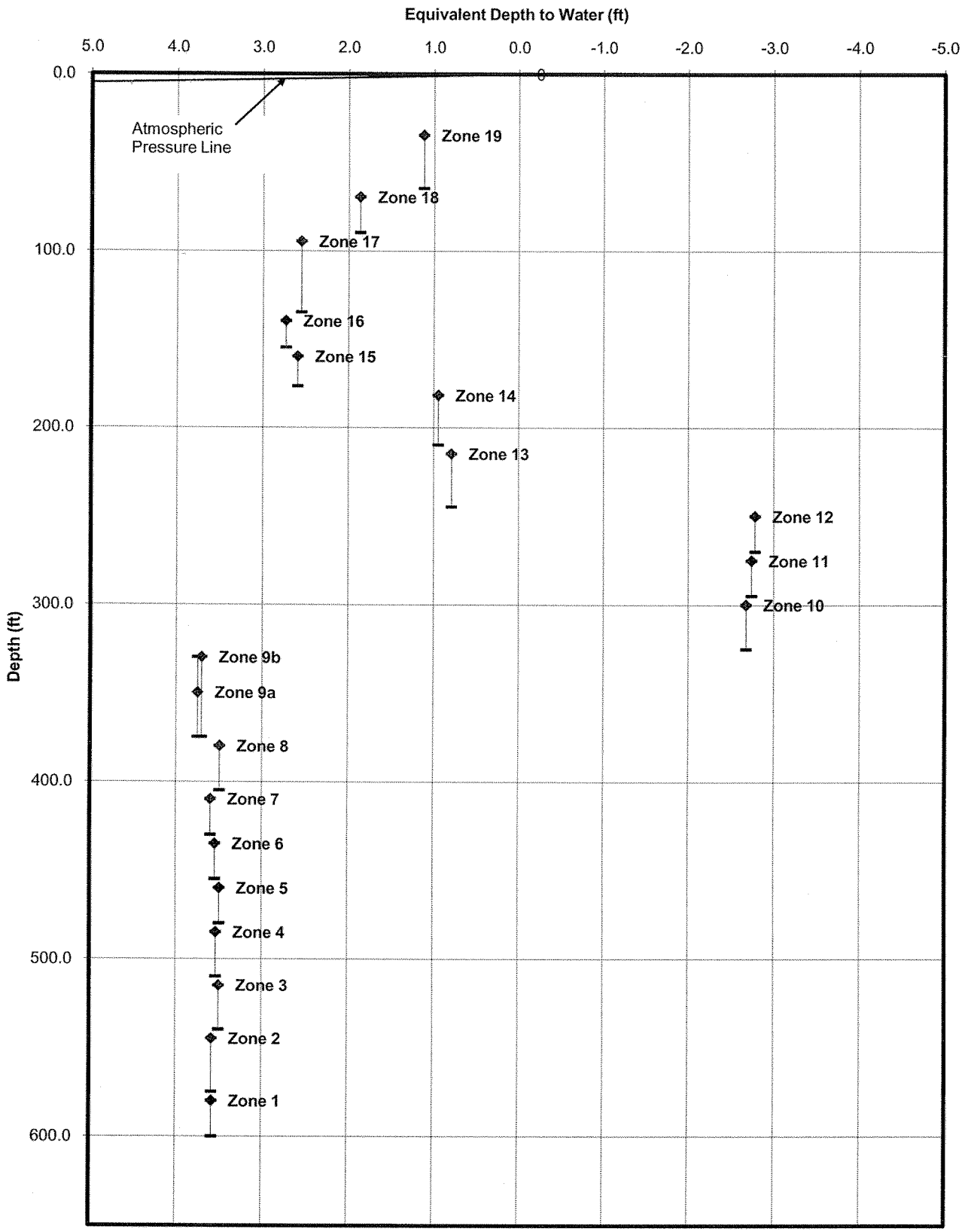
Client: Pebble Partnership
Site: Iliamna, Alaska
Datum: Ground Surface

Plot By: MJ Date: Oct 22/10
Checked By: DL Date: 25 Oct 10
Westbay Project: WB854

Figure 2

Piezometric Profile
Monitoring Well: GH10-220

Profile Date: October 6, 2010 (1500 hr)
Comments: Post-Inflation Profile



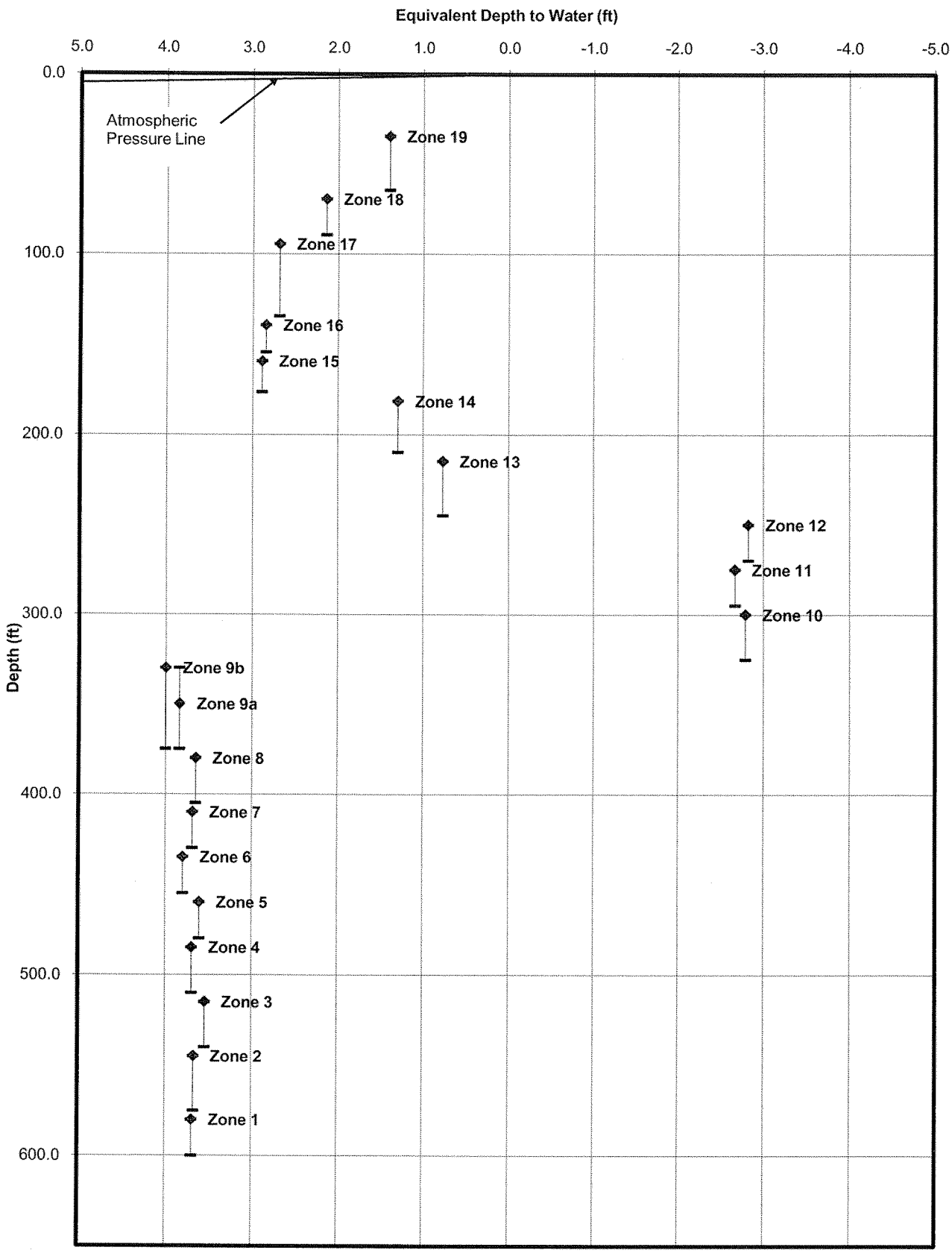
Client: Pebble Partnership
Site: Iliamna, Alaska
Datum: Ground Surface

Plot By: ML Date: Oct 22/10
Checked By: DL Date: 25 OCT 10
Westbay Project: WB854

Figure 3

Piezometric Profile
Monitoring Well: GH10-220

Profile Date: October 7, 2010 (1000 hr)
Comments: Post-Inflation Profile



Client: Pebble Partnership
Site: Iliamna, Alaska
Datum: Ground Surface

Plot By: MJ Date: Oct 22/10
Checked By: DC Date: 25 OCT 10
Westbay Project: WB854

Figure 4

Casing Installation Log

Company: Pebble Partnership
Well: GH10-220
Site: Iliamna, Alaska
Project: Pebble

Job No: WB854
Author: ML

Well Information

Reference Datum: Ground Surface
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 595.16 ft.

Borehole Depth: 600.00 ft.
Borehole Inclination: Vertical
Borehole Diameter: 4.00 in.

Well Description:
MP38
Other References:

File Information

File Name: G10-220.WWD
Report Date: Mon Oct 04 08:04:09 2010

File Date: Oct 03 20:32:26 2010

Comments

Zero reference is ground surface. DDF
Filter socks not to be used - DDF

Log Information

Borehole condition confirmed.	(method) Guide + Joe	Date: Oct 4/10
MP well design & preparation.	By: [illegible]	Date: Oct 3/10
MP well design checked.	By: [illegible]	Date: Oct 3/10
MP well and borehole approved to install.	By: Mark Leonard (for RS)	Date: Oct 3/10

- from phone conversation on Oct 3, 2010.

Casing Installation Log
Pebble Partnership

Job No: WB854
Well: GH10-220

Legend

(Qty) MP Components
(Library - WD Library 7/27/00)

Geology

Backfill/Casing

(4) 020102 - MP38 Casing 3 (2F/0.6M)

(2) 020101 - MP38 Casing 4 (1F/0.3M)

(44) 020110 - MP38 Casing 1 (10F/3M)

(19) 0238 - MP38 Packer 74mm (5F/1.5M)

(11) 020105 - MP38 Casing 2 (5F/1.5M)

(1) 0203 - MP38 End Cap

(57) 0202 - MP38 Regular Coupling

(20) 0205 - MP38 Measurment Port

(3) 0706 - MP38 Hydraulic Pumping Port

(12) 0216 - Magnetic Location Collar

Casing Installation Log
Pebble Partnership

Job No: WB854
Well: GH10-220

Scale Feet	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
	2-ft 80			
	2-ft 79			
0	1-ft 78		Finish lowering at 3:15pm, Oct 4/10	Added about 16-g of water to casing after leak test.
	77		020110 - MP38 Casing 1 (10F/3M)	
10				
	76		020110 - MP38 Casing 1 (10F/3M)	
20				
	75		020110 - MP38 Casing 1 (10F/3M)	
30				
	74		0238 - MP38 Packer 74mm (5F/1.5M)	15857-140
			0205 - MP38 Measurment Port	4501
40	73		020110 - MP38 Casing 1 (10F/3M)	
50	72		020110 - MP38 Casing 1 (10F/3M)	
60	71		020110 - MP38 Casing 1 (10F/3M)	
	70		0238 - MP38 Packer 74mm (5F/1.5M)	15862-140
70			0205 - MP38 Measurment Port	4509
	69		020110 - MP38 Casing 1 (10F/3M)	
80				
	68		020110 - MP38 Casing 1 (10F/3M)	
90				
	67		0238 - MP38 Packer 74mm (5F/1.5M)	15859-140
			0205 - MP38 Measurment Port	4519
100	66		020110 - MP38 Casing 1 (10F/3M)	

Hydraulic Integrity Test

206.74-ft at 5:35 pm
206.73-ft at 5:40 pm
206.73-ft at 5:45 pm
206.73-ft at 6:05 pm
206.72-ft at 6:30 pm
206.72-ft at 6:55 pm
Westbay casing is water tight
Mark Leonard

Added water to Westbay casing

Casing Installation Log
Pebble Partnership

Job No: WB854
Well: GH10-220

Scale Feet	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
100				
110	65	✓	020110 - MP38 Casing 1 (10F/3M)	
				Added water to Westbay Casing
120	64	✓	020110 - MP38 Casing 1 (10F/3M)	
130	63	✓	020110 - MP38 Casing 1 (10F/3M)	
	62	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15860-140
140		✓	0205 - MP38 Measurment Port	4500
	61	✓	020110 - MP38 Casing 1 (10F/3M)	
150	60	✓	020105 - MP38 Casing 2 (5F/1.5M)	
	59	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15863-155
160		✓	0205 - MP38 Measurment Port	4518
	58	✓	020110 - MP38 Casing 1 (10F/3M)	
170	57	✓	020105 - MP38 Casing 2 (5F/1.5M)	
	56	✓	020102 - MP38 Casing 3 (2F/0.6M)	
180	55	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15860-145
		✓	0205 - MP38 Measurment Port	4524
	54	✓	020105 - MP38 Casing 2 (5F/1.5M)	
		✓	0706 - MP38 Hydraulic Pumping Port	037
190	53	✓	020110 - MP38 Casing 1 (10F/3M)	Added water to Westbay Casing
	52	✓	020101 - MP38 Casing 4 (1F/0.3M)	
200	51	✓	020102 - MP38 Casing 3 (2F/0.6M)	

Mon Oct 04 08:05:46 2010

Casing Installation Log
Pebble Partnership

Job No: WB854
Well: GH10-220

Scale Feet	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
200				
	50	✓	020110 - MP38 Casing 1 (10F/3M)	
210		✓✓✓		
	49	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15865-140
		✓✓✓	0205 - MP38 Measurment Port	4504
220	48	✓	020110 - MP38 Casing 1 (10F/3M)	
		✓✓✓		
230	47	✓	020110 - MP38 Casing 1 (10F/3M)	
		✓✓✓		
240	46	✓	020110 - MP38 Casing 1 (10F/3M)	
		✓✓✓		
	45	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15858-145
250		✓✓✓	0205 - MP38 Measurment Port	4505
	44	✓	020110 - MP38 Casing 1 (10F/3M)	
260		✓✓✓		
	43	✓	020110 - MP38 Casing 1 (10F/3M)	
270		✓✓✓		
	42	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15864-145
		✓✓✓	0205 - MP38 Measurment Port	4511
280	41	✓	020110 - MP38 Casing 1 (10F/3M)	
		✓✓✓		
290	40	✓	020110 - MP38 Casing 1 (10F/3M)	Added water to Westbay Casing
		✓✓✓		
	39	✓	0238 - MP38 Packer 74mm (5F/1.5M)	15877-135
300			0205 - MP38 Measurment Port	4502

Mon Oct 04 08:05:40 2010

Casing Installation Log
Pebble Partnership

Job No: WB854
Well: GH10-220

Scale Feet	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
300				
	38		020110 - MP38 Casing 1 (10F/3M)	
310				
	37		020105 - MP38 Casing 2 (5F/1.5M)	Added water to Westbay Casing
320	36		020110 - MP38 Casing 1 (10F/3M)	
	35		0238 - MP38 Packer 74mm (5F/1.5M)	15883-140
330			0205 - MP38 Measurment Port	4536
	34		020110 - MP38 Casing 1 (10F/3M)	
340				
	33		020110 - MP38 Casing 1 (10F/3M)	
350			0205 - MP38 Measurment Port	4520
	32		020110 - MP38 Casing 1 (10F/3M)	
360			0706 - MP38 Hydraulic Pumping Port	035
	31		020110 - MP38 Casing 1 (10F/3M)	
370				
	30		020105 - MP38 Casing 2 (5F/1.5M)	
	29		0238 - MP38 Packer 74mm (5F/1.5M)	15885-155
380			0205 - MP38 Measurment Port	4327
	28		020110 - MP38 Casing 1 (10F/3M)	
390				
	27		020105 - MP38 Casing 2 (5F/1.5M)	Added water to Westbay Casing
400	26		020110 - MP38 Casing 1 (10F/3M)	

Mon Oct 04 08:06:11 2010

Casing Installation Log
Pebble Partnership

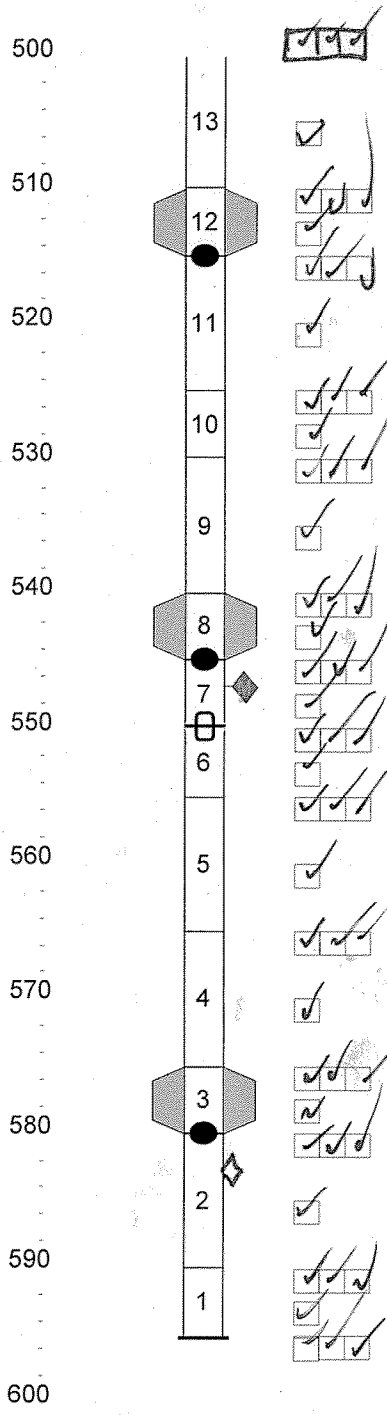
Job No: WB854
Well: GH10-220

Scale Feet	Westbay Casing	QA Tested OK	MP Casing Description	Serial Numbers
400				
	25		0238 - MP38 Packer 74mm (5F/1.5M)	15878-145
410			0205 - MP38 Measurment Port	4528
	24		020110 - MP38 Casing 1 (10F/3M)	
420				
	23		020110 - MP38 Casing 1 (10F/3M)	
430				
	22		0238 - MP38 Packer 74mm (5F/1.5M)	15879-140
			0205 - MP38 Measurment Port	4544
440	21		020110 - MP38 Casing 1 (10F/3M)	
				Added water to Westbay casing
450	20		020110 - MP38 Casing 1 (10F/3M)	
	19		0238 - MP38 Packer 74mm (5F/1.5M)	15884-140
460			0205 - MP38 Measurment Port	4545
	18		020110 - MP38 Casing 1 (10F/3M)	
470				
	17		020110 - MP38 Casing 1 (10F/3M)	
				Added water to Westbay casing
480	16		0238 - MP38 Packer 74mm (5F/1.5M)	15880-140
			0205 - MP38 Measurment Port	4549
490	15		020110 - MP38 Casing 1 (10F/3M)	
	14		020105 - MP38 Casing 2 (5F/1.5M)	Added water to Westbay casing
500				

Mon Oct 04 08:06:11 2010

Casing Installation Log
Pebble Partnership

Job No: WB854
Well: GH10-220



Mon Oct 04 08:06:11 2010

Borehole water level: 6.8-ft below ground surface.
Joint test tool: 240-psi.
Inflation tool: 460-psi.

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

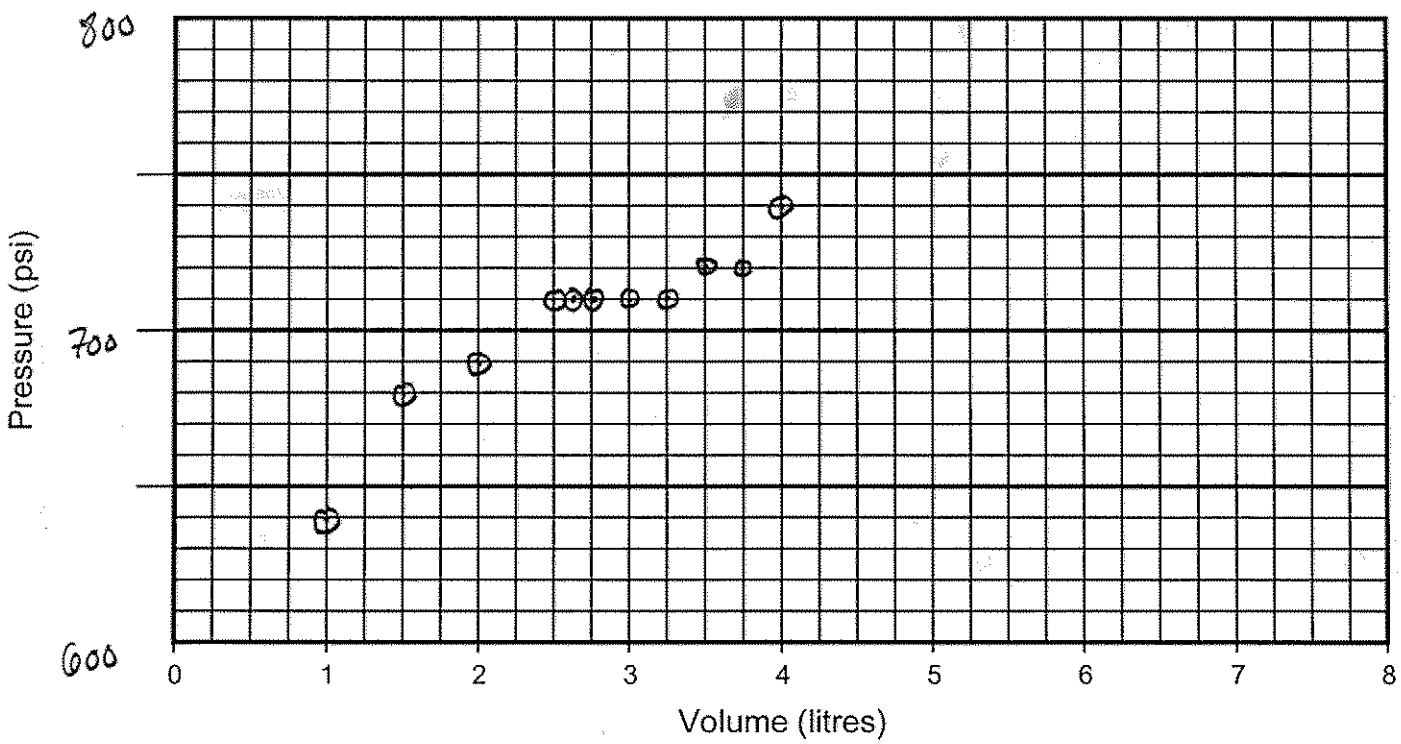
Packer No. 1, comp 3 S#15882 Depth (ft / m): 575.0 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 145 psi

Volume, litres	1.0	1.5	2.0	2.5	2.6	2.75	3.0	3.25	3.5	3.75
Pressure, psi	640	680	690	710	710	710	710	710	720	720
Volume, litres	4.0	3.65								
Pressure, psi	740	Ø								



Comments: Packer # 1 TIME - 11:00

Target ≈ 700

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

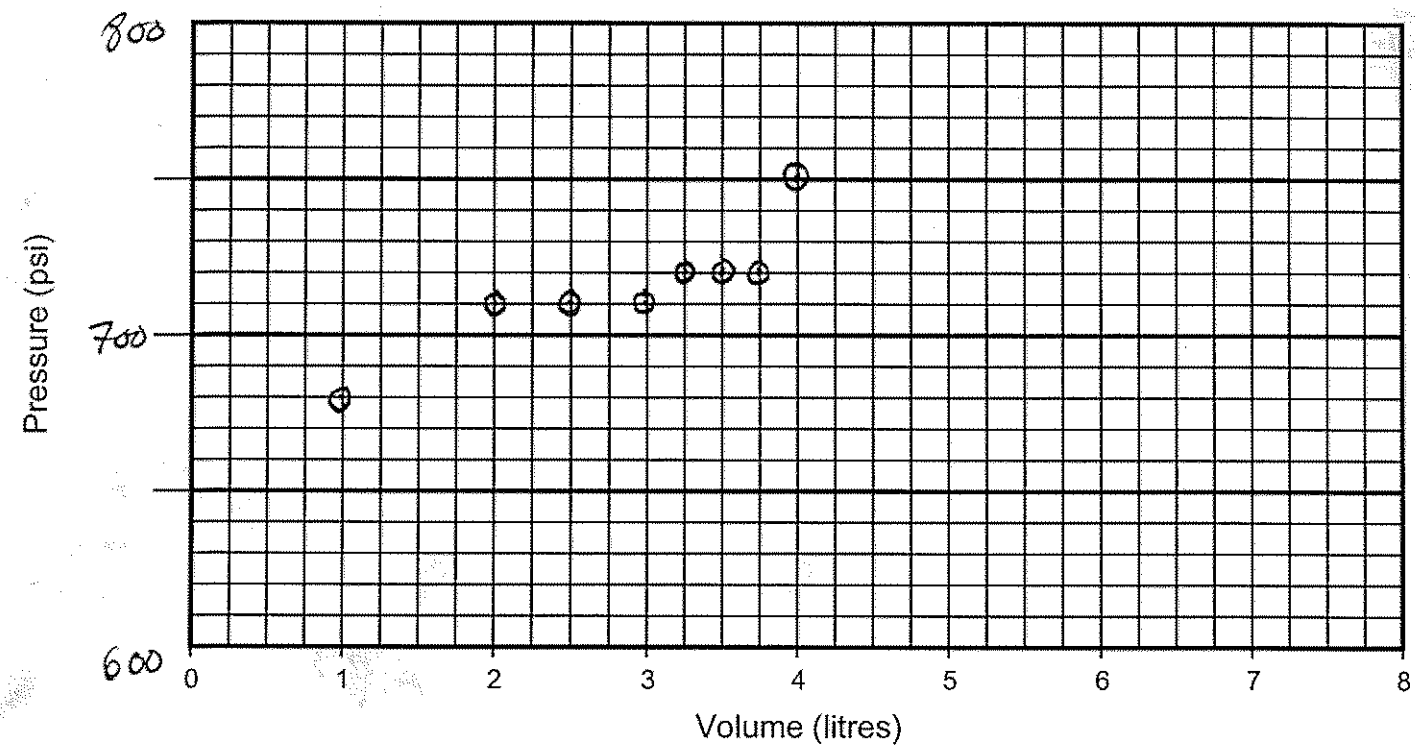
Packer No. 2, comp 8 SN# 15881 Depth (ft / m): 539.8 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 150 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 145 psi

Volume, litres	1.0	2.0	2.5	3.0	3.25	3.5	3.75	4.0	3.65	
Pressure, psi	680	710	710	710	720	720	730	750	ø	
Volume, litres										
Pressure, psi										



Comments: Packer # 2 TIME - 11:20 am

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

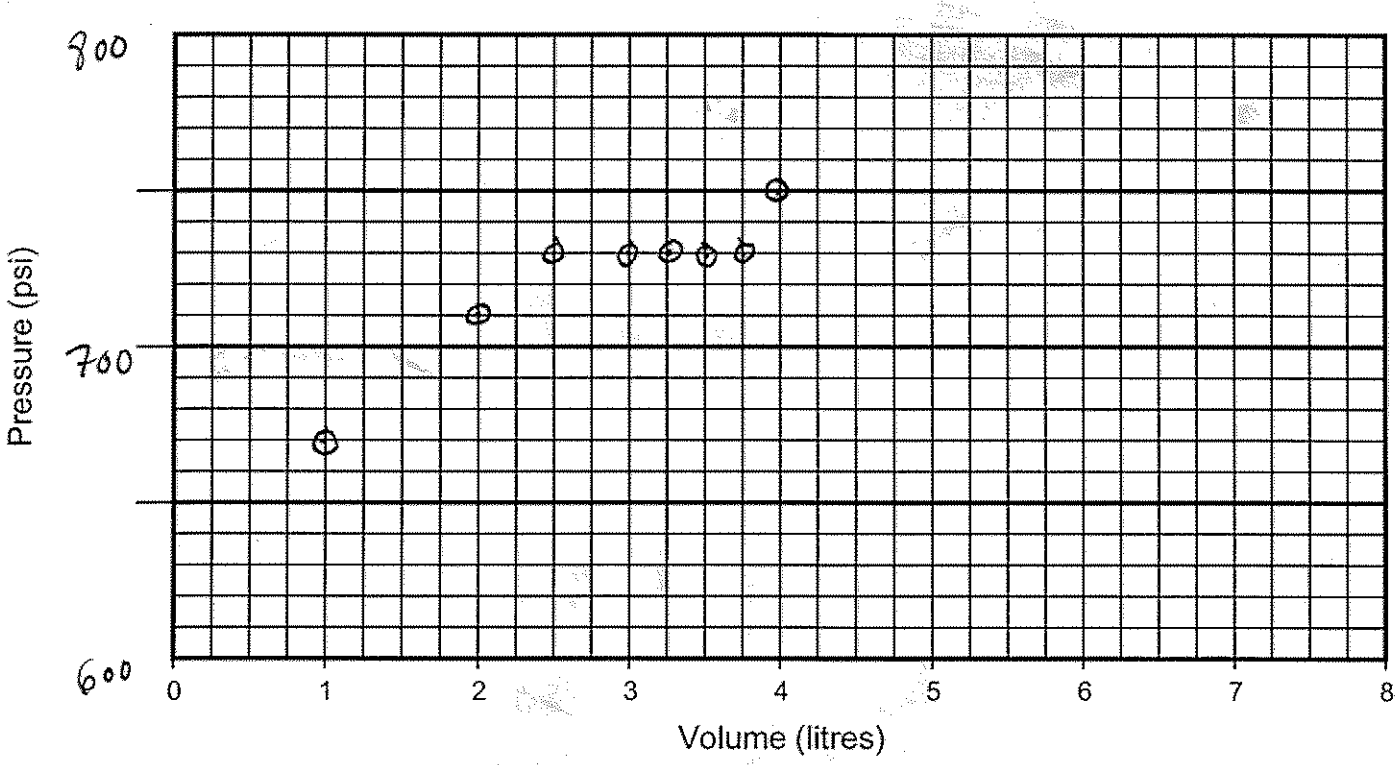
Packer No. 3 comp (2 SNH 15886 Depth (ft / m): 509.8 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 155 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 140 psi

Volume, litres	1.0	2.0	2.5	3.0	3.25	3.5	3.75	4.0	3.65	
Pressure, psi	670	710	730	730	730	730	730	750	0	
Volume, litres										
Pressure, psi										



Comments: Packer # 3 TIME - 11:40 am

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

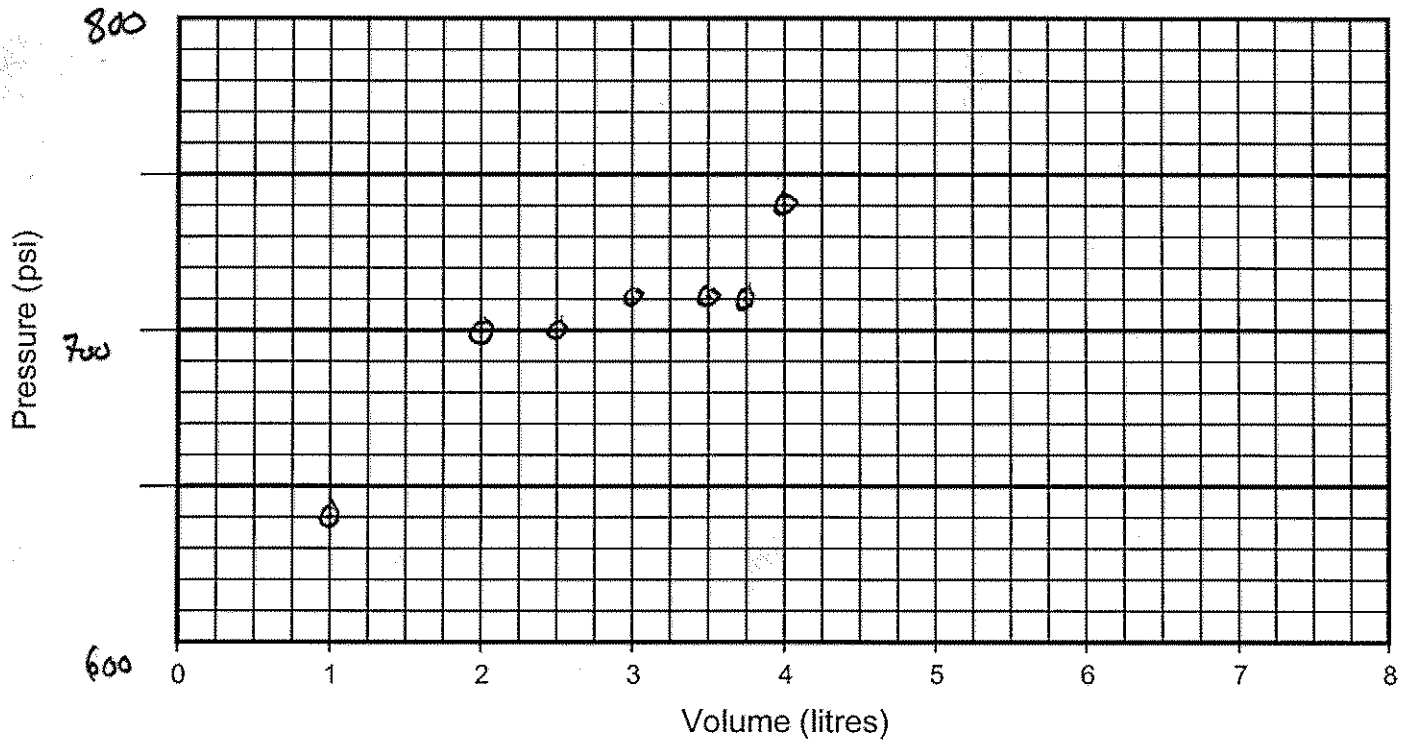
Packer No. 4, comp 16 SN# 15880 Depth (ft / m): 479.8 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 180 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 145 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.65		
Pressure, psi	640	700	700	710	710	710	740	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 4 TIME - 12:45pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership | Project No.: WB854 | Well No.: GH10-220

Location: Iliamna, Alaska | Completed by: M. Lessard | Date Inflated: Oct 5/10

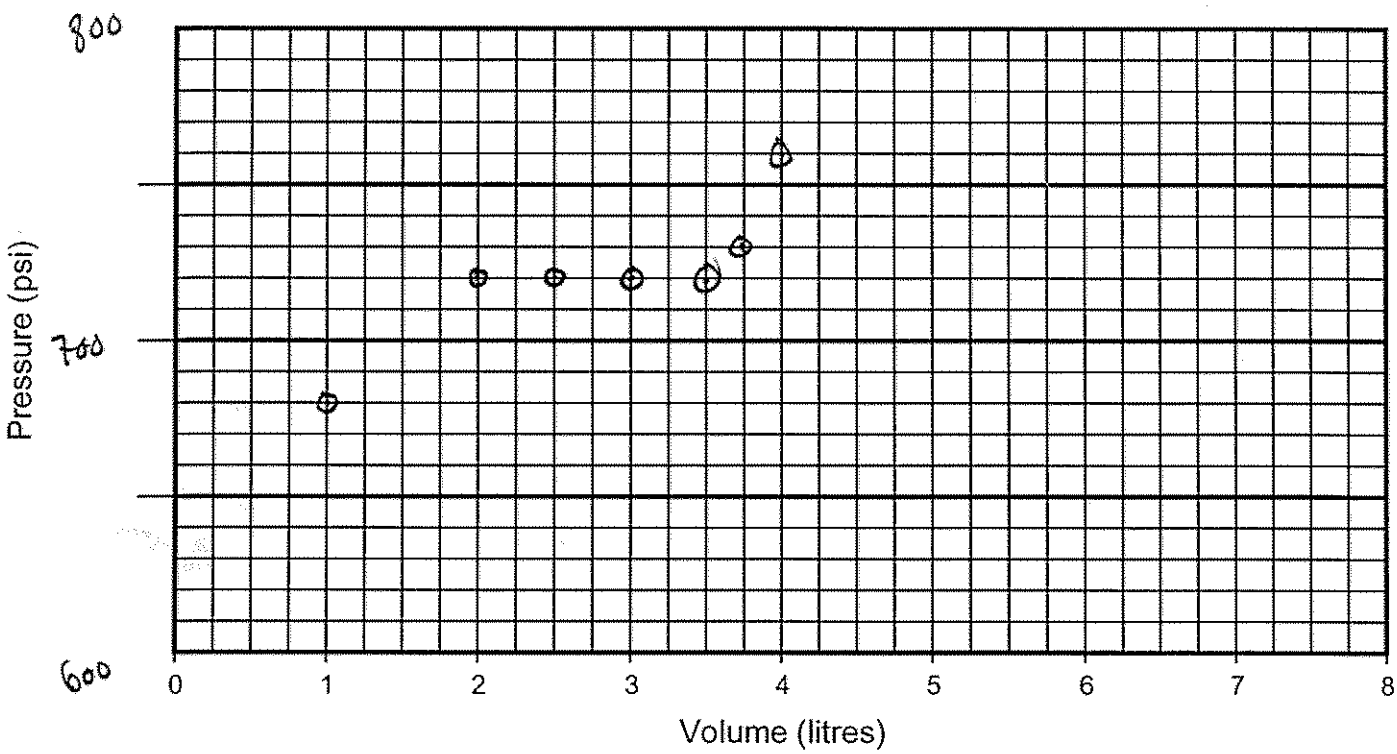
Packer No. 5, comp 19 Sn# 15884 | Depth (ft / m): 454.8 | Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi | Final Line Pressure, P_L: 760 psi | Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 165 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	680	720	720	720	720	730	760	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 5 TIME - 1:00pm

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Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M.Lessard Date Inflated: Oct 5/10

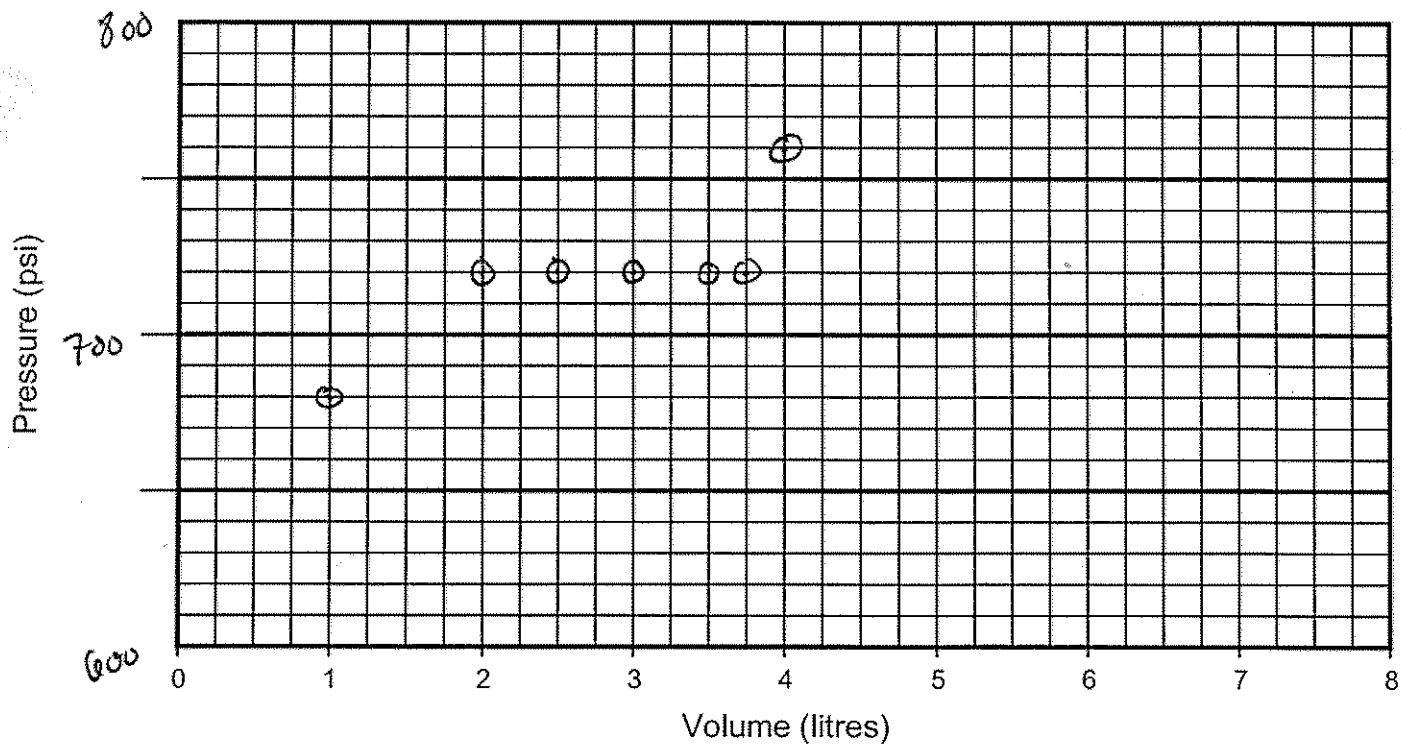
Packer No. 6, comp 22 Snl# 15879 Depth (ft / m): 429.8 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 760 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 165 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	680	720	720	720	720	720	760	0		
Volume, litres										
Pressure, psi										



Comments: Packer # 6 TIME - 1:15 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

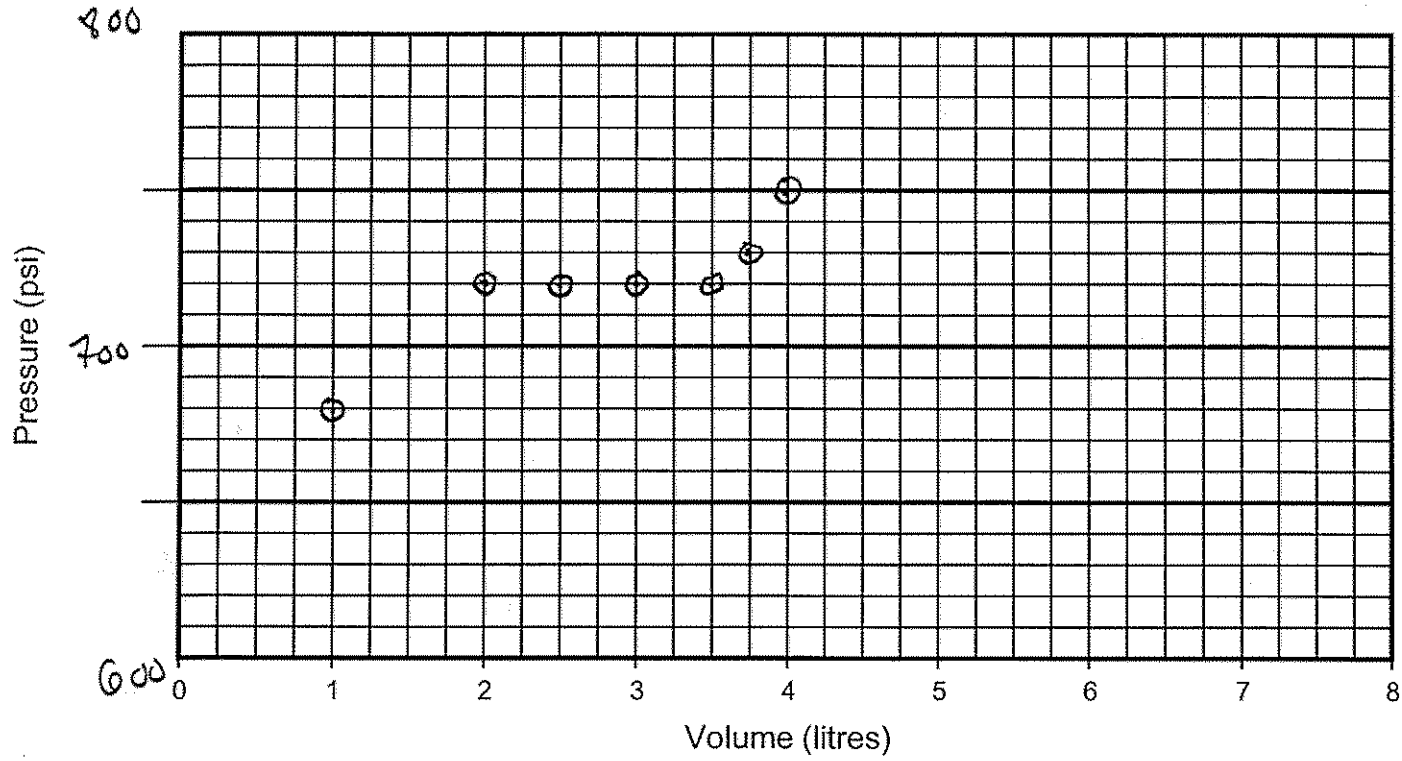
Packer No. 7, comp 25 SN#15878 Depth (ft / m): 404.8 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T =$ 150 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	680	720	720	720	720	730	750	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 7 TIME - 1:30 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M.Lessard Date Inflated: Oct 5/10

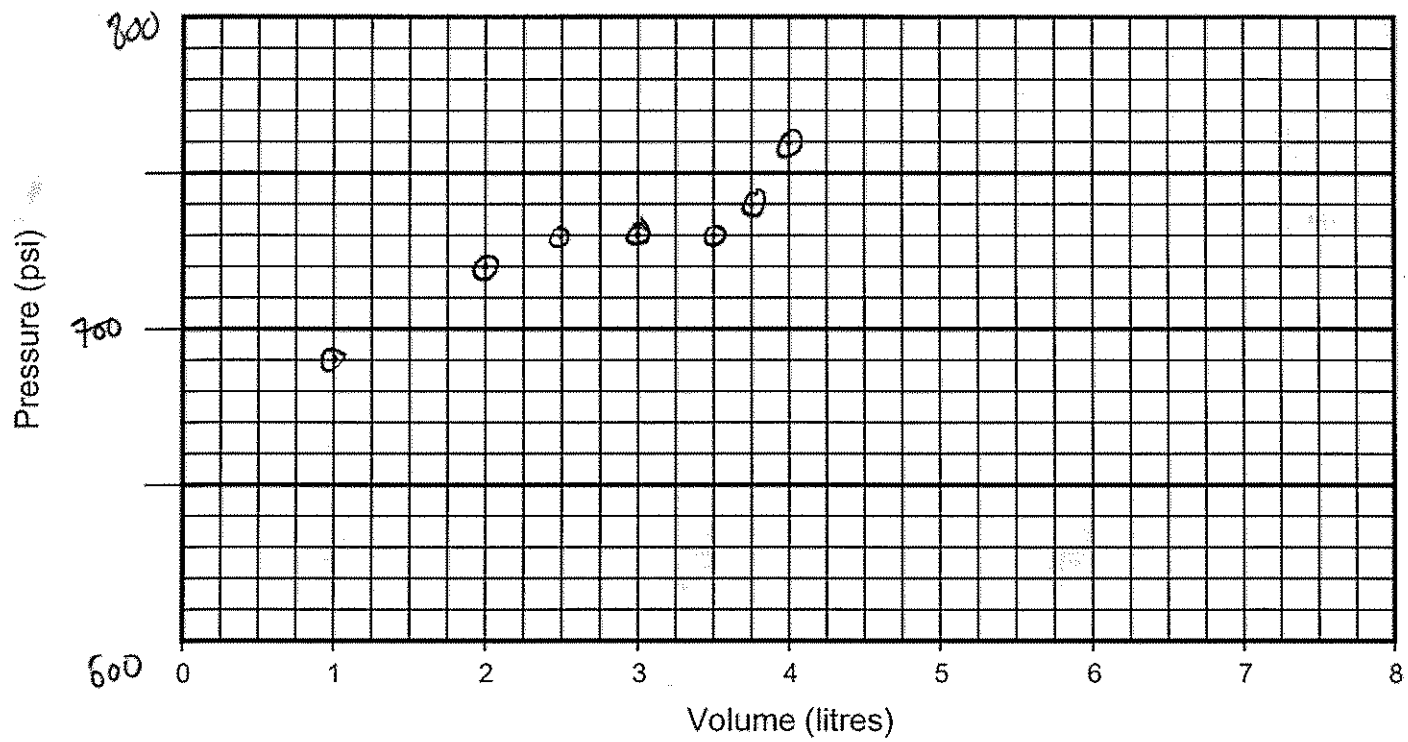
Packer No. 8 Corp 29 SN# 15885 Depth (ft / m): 379.8 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 155 psi Final Line Pressure, P_L: 760 psi Tool Pressure, P_T: 860 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T =$ 150 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	690	720	730	730	730	740	760	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 8 TIME - 1:46 pm

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Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

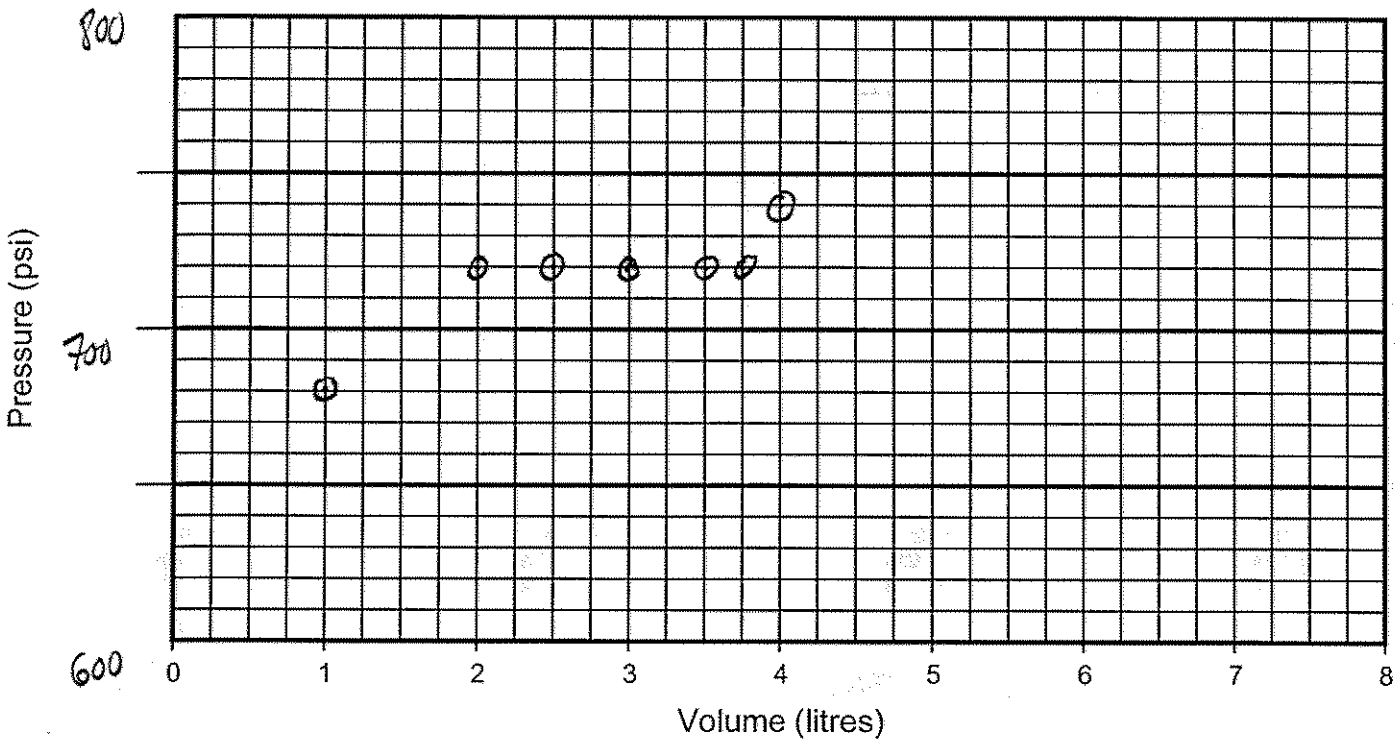
Packer No. 9, comp 35 SN# 15883 Depth (ft / m): 324.7 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 145 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	680	720	720	720	720	720	740	0		
Volume, litres										
Pressure, psi										



Comments: Packer # 9 TIME - 2:02 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

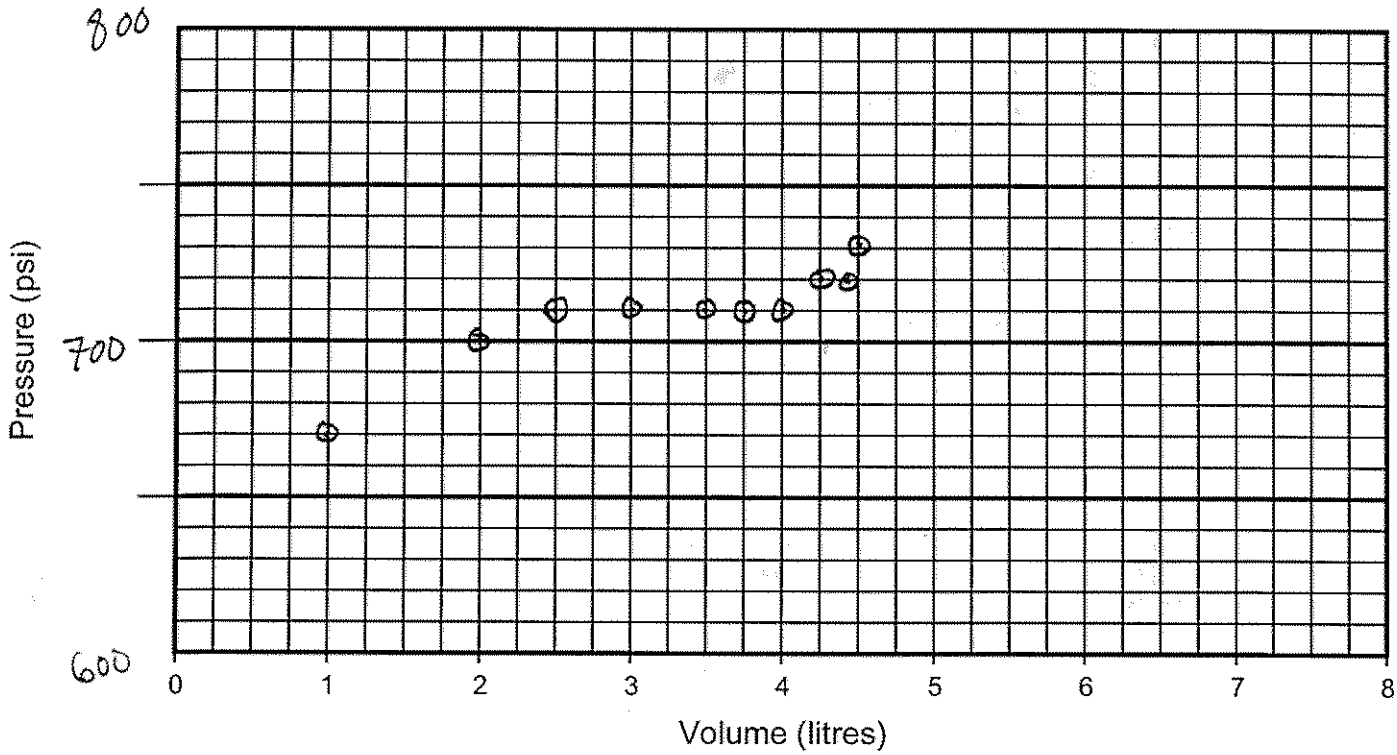
Packer No. 10, comp 39 SN# 15883 Depth (@ / m): 294.7 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 730 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (@ / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 135 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	4.25	4.4	4.5
Pressure, psi	670	700	710	710	710	710	710	720	720	730
Volume, litres	4.2									
Pressure, psi	Ø									



Comments: Packer # 10 TIME - 2:22 pm

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Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

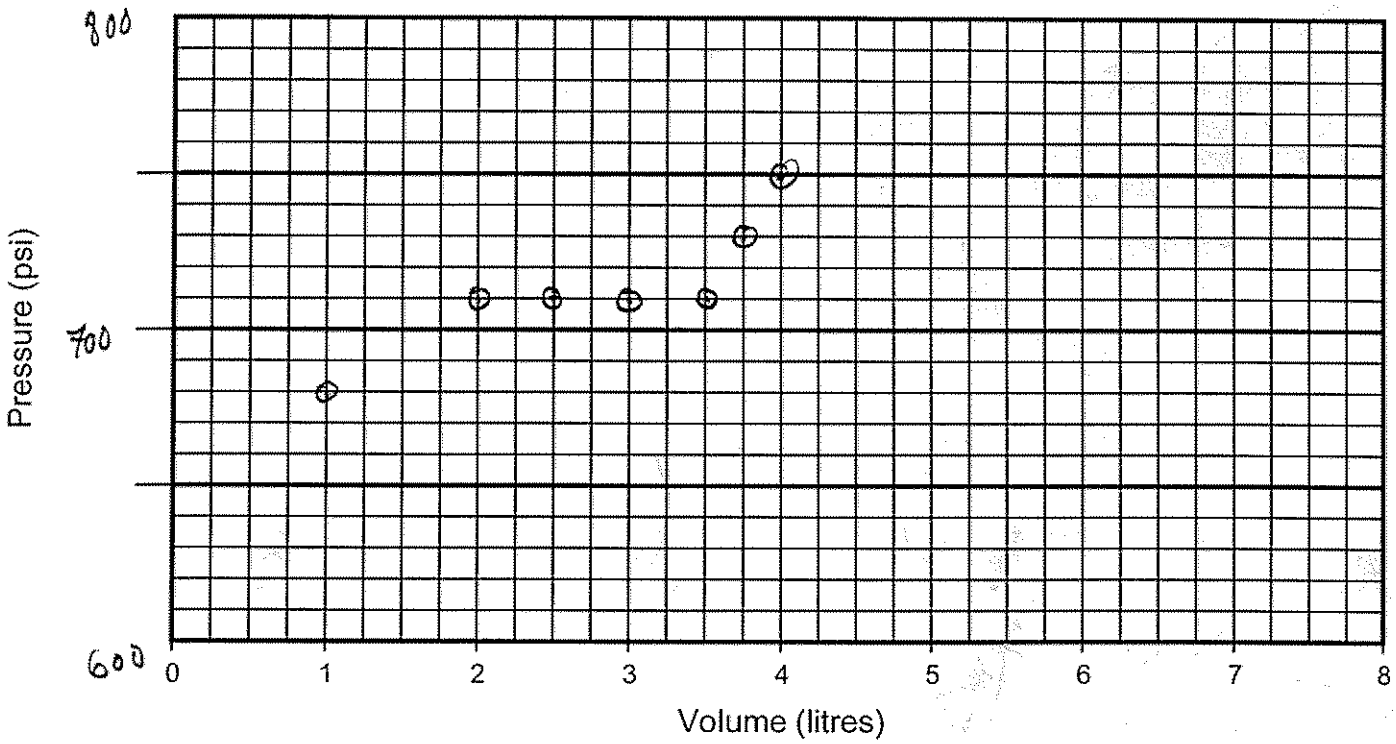
Packer No. 11 Comp ~~82~~ SN# 15864 Depth (@ / m): 269.7 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (@ / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 150 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.65		
Pressure, psi	680	710	710	710	710	730	750	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 11 TIME - 2:38pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

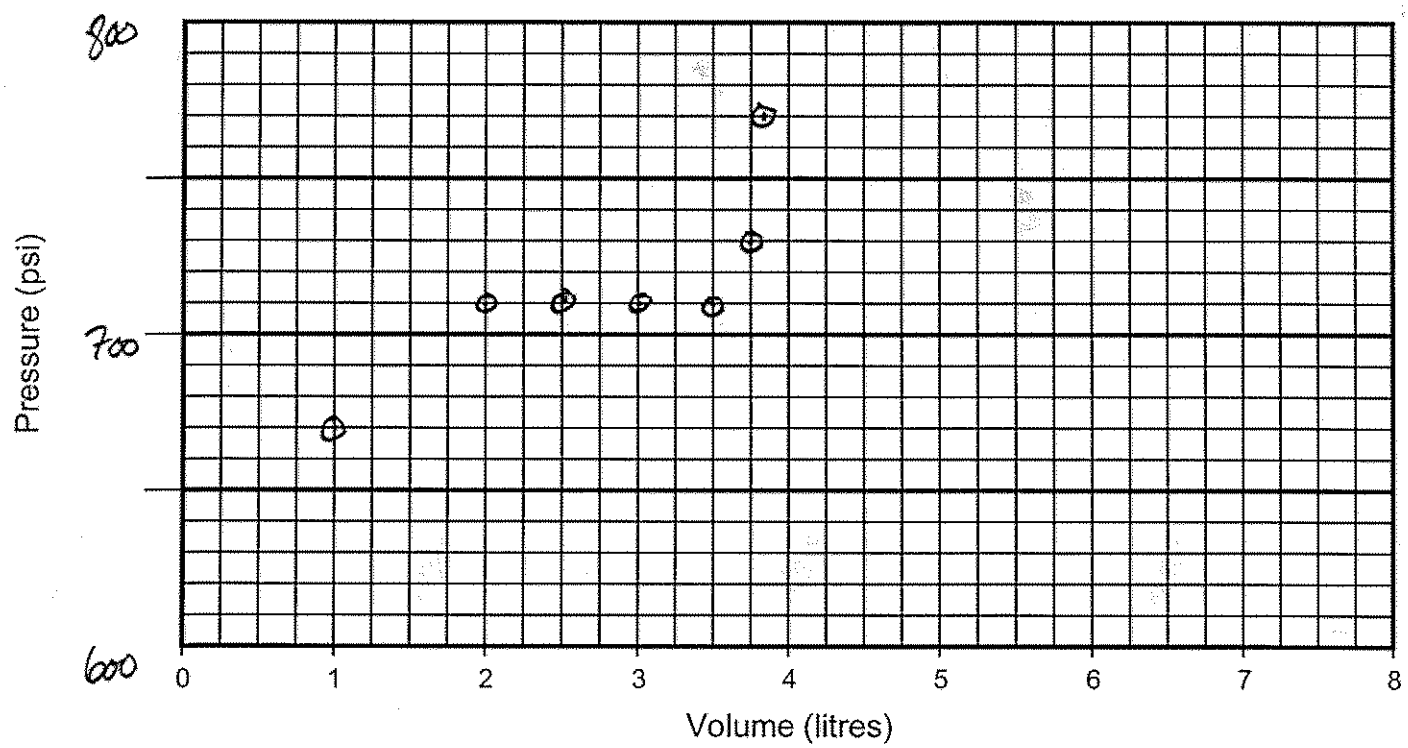
Packer No. 12/comp 45 Snd 15858 Depth (ft / m): 244.7 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 770 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T =$ 170 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	3.85	3.5		
Pressure, psi	670	710	710	710	710	730	770	ϕ		
Volume, litres										
Pressure, psi										



Comments: Packer # 12 TIME - 3:30pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

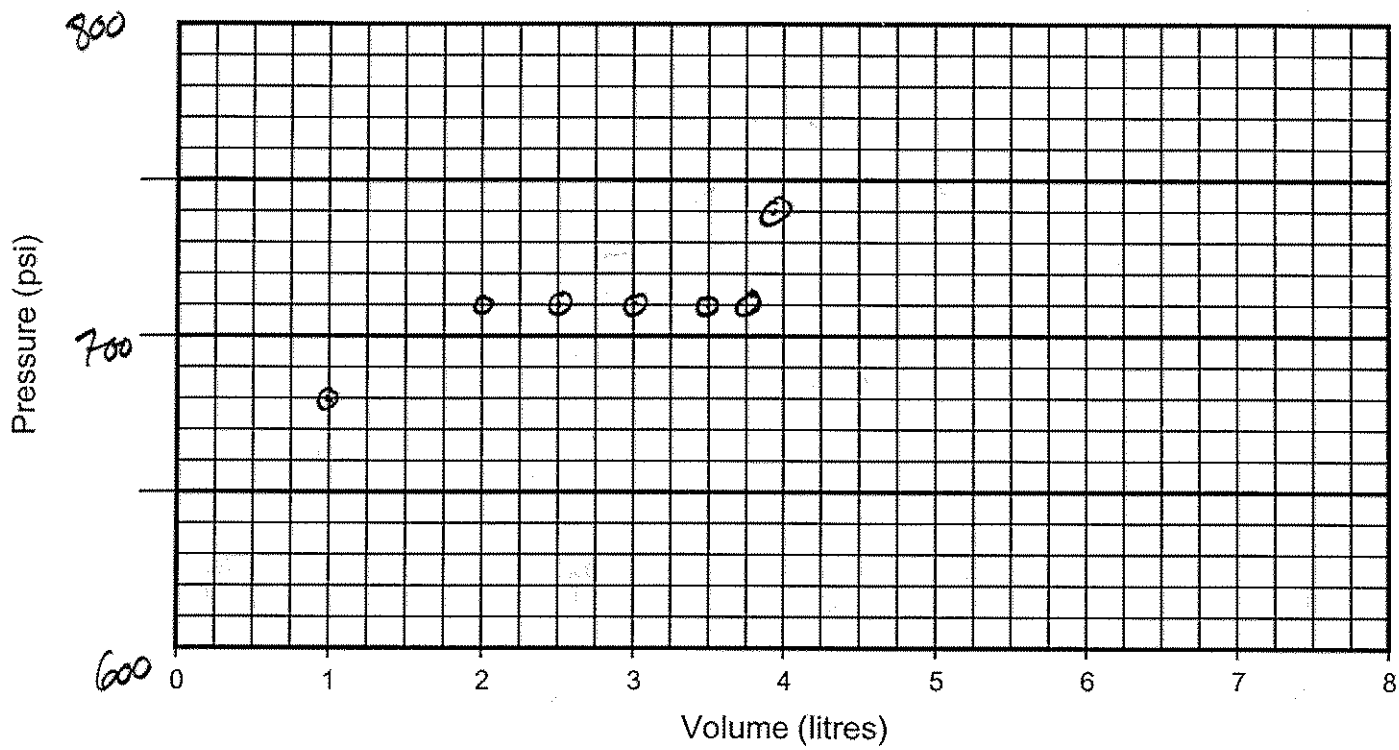
Packer No. 13 comp 49 S/N# 15865 Depth (ft / m): 209.7 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 145 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	3.9	3.6		
Pressure, psi	680	710	710	710	710	710	740	¢		
Volume, litres										
Pressure, psi										



Comments: Packer # 13 TIME - 3:43 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lersard Date Inflated: Oct 5/10

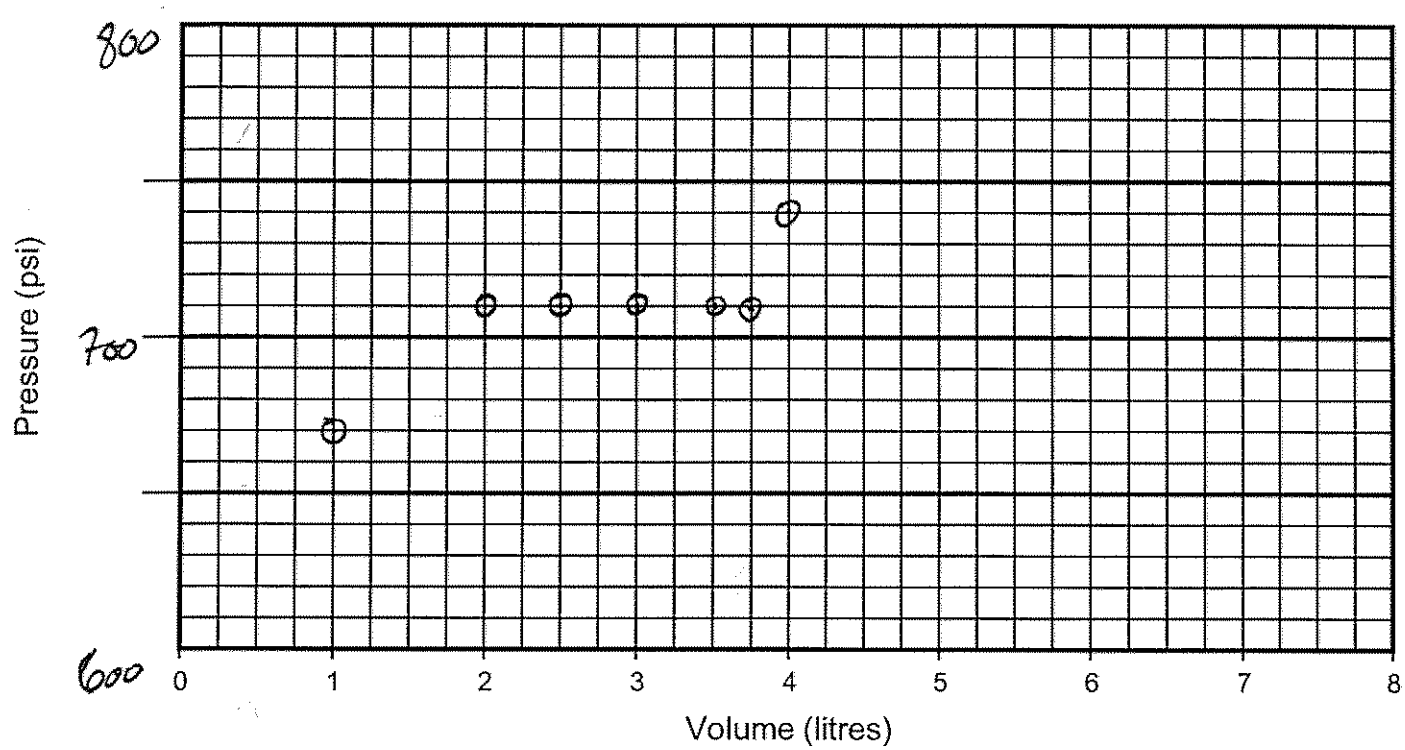
Packer No. 14, comp 55 Serial 15860 Depth (ft / m): 176.5 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 145 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 140 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	670	710	710	710	710	710	740	ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 14 TIME - 3:54 pm

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Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

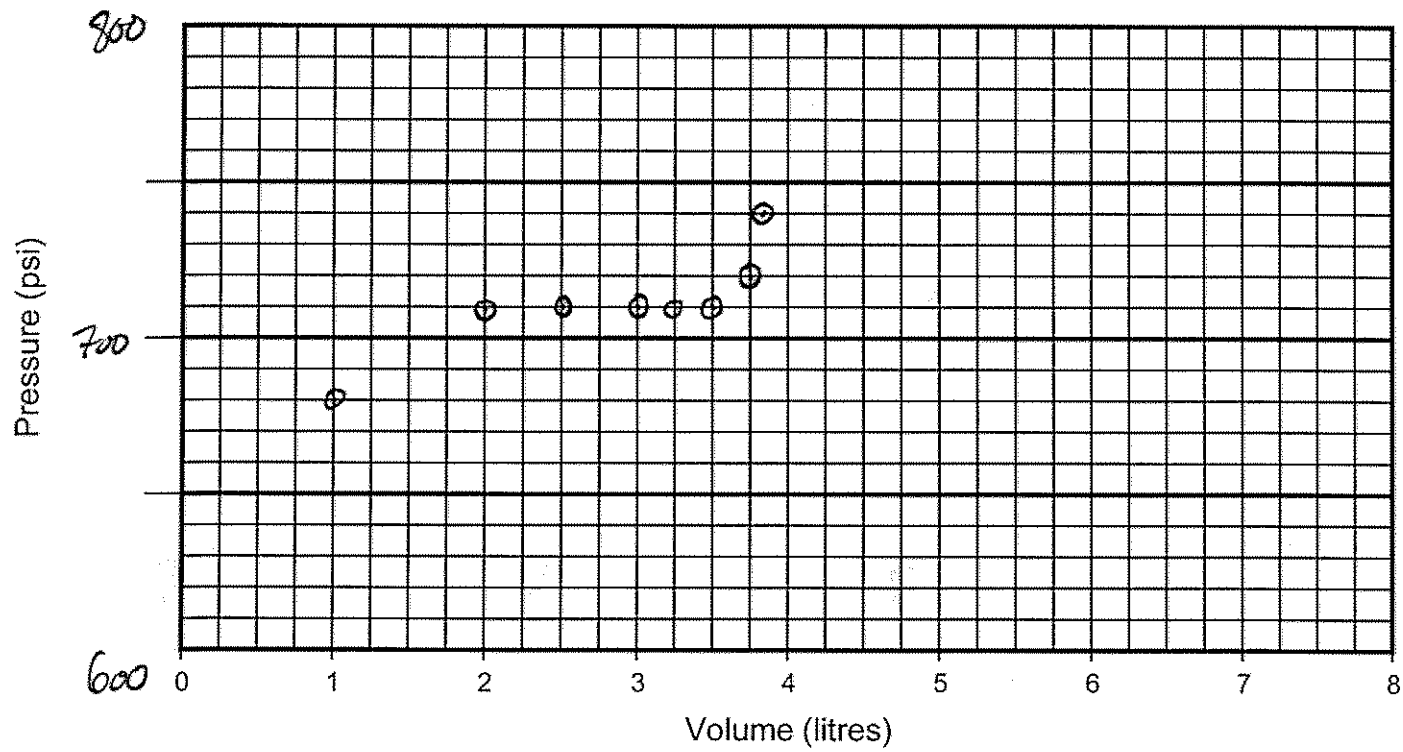
Packer No. 15, Comp 59 Ser# 15863 Depth (ft / m): 159.5 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 155 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 130 psi

Volume, litres	1.0	2.0	2.5	3.0	3.25	3.5	3.75	3.85	3.55	
Pressure, psi	680	710	710	710	710	710	720	740	0	
Volume, litres										
Pressure, psi										



Comments: Packer # 15 TIME - 4:12 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

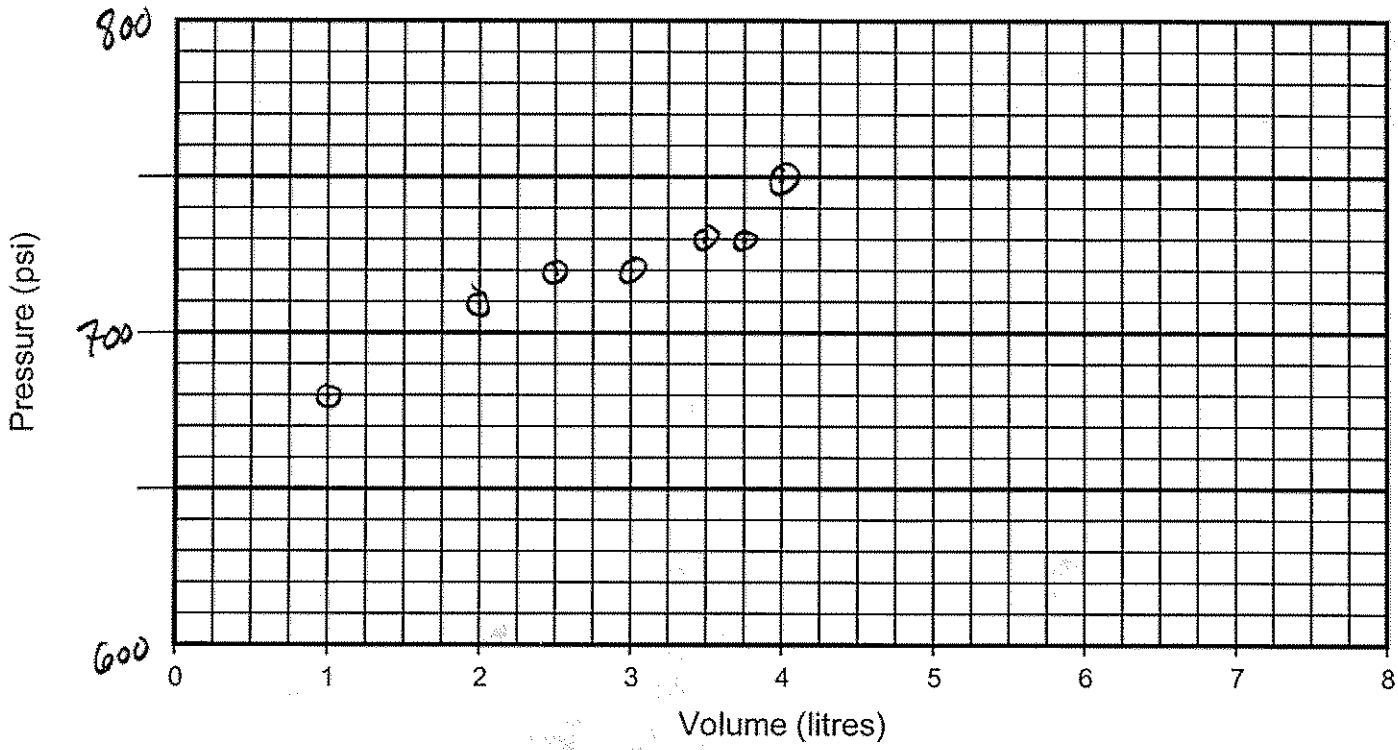
Packer No. 16 comp 62 S/N 15866 Depth (ft / m): 134.5 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 155 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	680	710	720	720	730	730	750	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 16 TIME - 4:27 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lessard Date Inflated: Oct 5/10

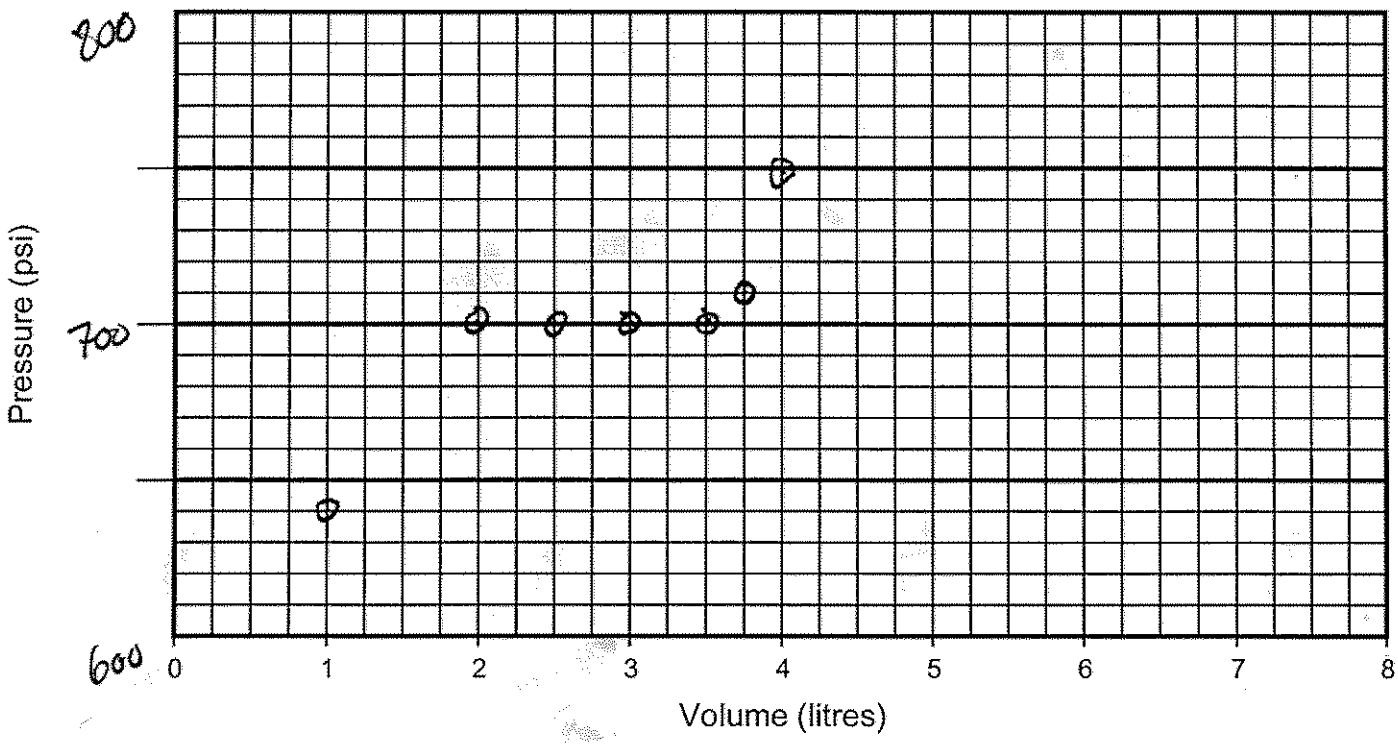
Packer No. 17 Comp 67 SN # 15859 Depth (ft / m): 89.5 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 155 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	640	700	700	700	700	710	750	6		
Volume, litres										
Pressure, psi										



Comments: Packer # 17 TIME - 4:42 pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M. Lersard Date Inflated: Oct 5/10

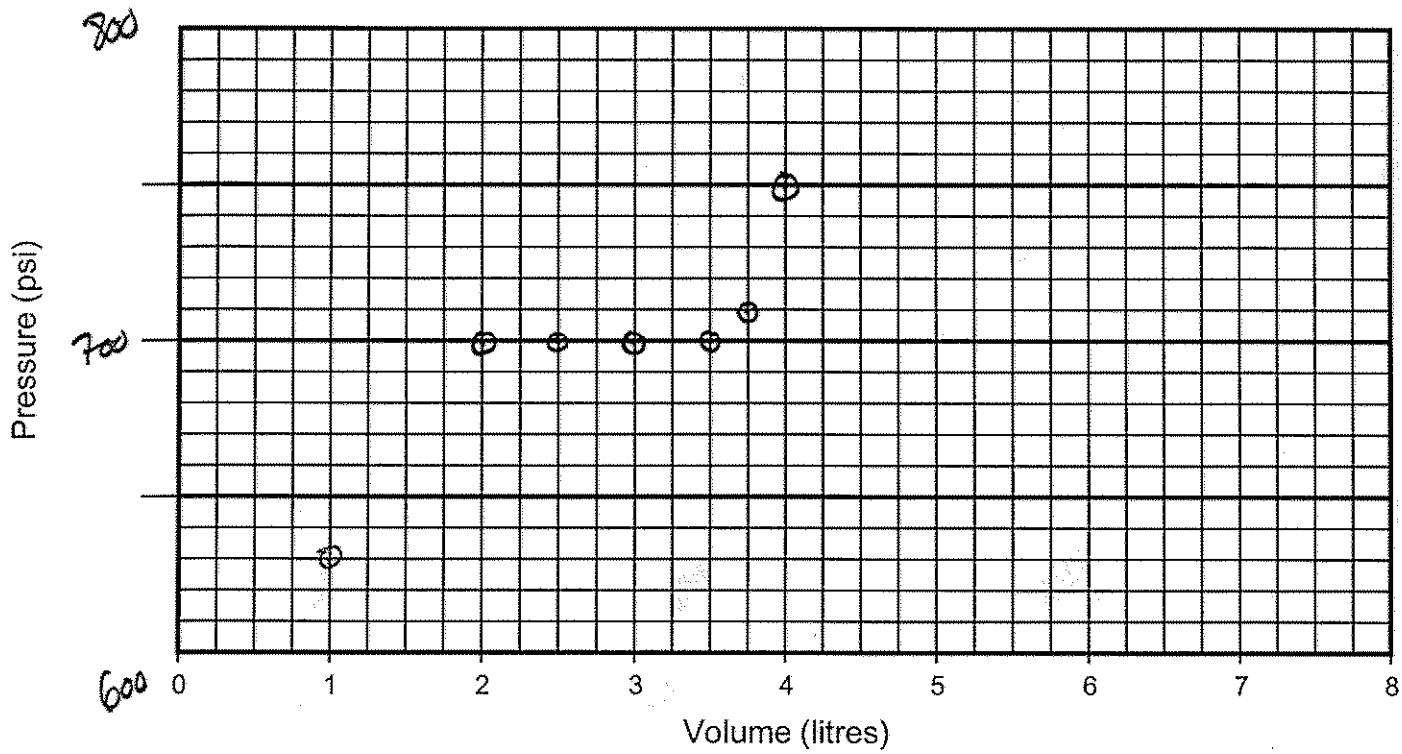
Packer No. 18, Comp 70 SN# 15862 Depth (ft / m): 64.5 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 750 psi Tool Pressure, P_T: 460 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 155 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	630	700	700	700	700	710	750	ϕ		
Volume, litres										
Pressure, psi										



Comments: Packer # 18 TIME - 5:15pm

Schlumberger WATER SERVICES

Westbay Packer Inflation Record

Project: Pebble Partnership Project No.: WB854 Well No.: GH10-220

Location: Iliamna, Alaska Completed by: M Lessard Date Inflated: Oct 5/10

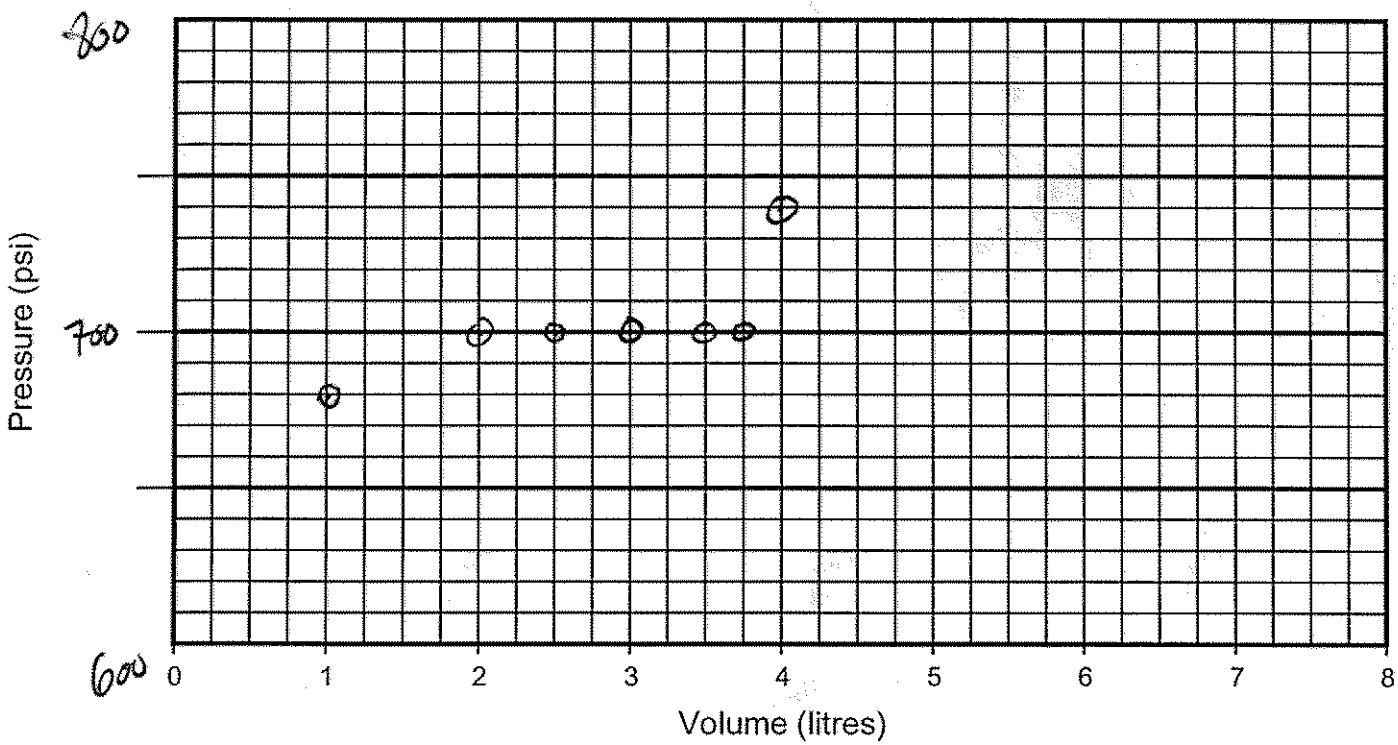
Packer No. 19, comp 74 SN# 15857 Depth (ft / m): 29.5 Inflation Tool No.: TIW852

Packer Valve Pressure, P_V: 140 psi Final Line Pressure, P_L: 740 psi Tool Pressure, P_T: 660 psi

Borehole Water Level: 7 (ft / m) = 5 psi (P_W)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T =$ 145 psi

Volume, litres	1.0	2.0	2.5	3.0	3.5	3.75	4.0	3.7		
Pressure, psi	680	700	700	700	700	700	740	Ø		
Volume, litres										
Pressure, psi										



Comments: Packer # 19 TIME - 5:31 pm

Knight Piésold
CONSULTING

APPENDIX E

FRONTIER GEOSCIENCES INC.
2010 SEISMIC REFRACTION INVESTIGATION REPORT

(Page E-1 to E-46)

VA101-176/35-1
Rev 0
March 30, 2011

PEBBLE LIMITED PARTNERSHIP

REPORT ON

SEISMIC REFRACTION INVESTIGATION

PROPOSED MINE SITE FACILITIES

PEBBLE PROJECT

ILIAMNA, ALASKA

by

J. K. Porter, B.Sc.

Russell Hillman, P.Eng.

October, 2010 **PROJECT FGI-1163**

Frontier Geosciences Inc. 237 St. Georges Avenue, North Vancouver, B.C., Canada V7L 4T4
Tel: 604.987.3037 Fax: 604.984.3074

CONTENTS

ILLUSTRATIONS

1. INTRODUCTION

In the period October 3 through October 30, 2010, Frontier Geosciences Inc. carried out a seismic refraction investigation for the Pebble Limited Partnership at the Pebble gold-copper-molybdenum porphyry project. The project area is located approximately 17 miles northwest of Iliamna, Alaska. A Survey Location Plan of the area is shown at a scale of 1 inch equals 80 miles in Figure 1.

The purpose of the seismic refraction survey was to determine geological conditions at the Deposit Area, Plant Site and Tailings Storage Facilities (TSF) areas as well as Frying Pan Lake and the Upper Talarik Creek area. The current seismic refraction program is a continuation of subsurface geophysical investigations previously completed by Frontier Geosciences Inc. for Knight Piesold Ltd. Seismic lines SL-1 through SL-12 were surveyed in September 2004[1], SL-13 through SL-21 in July 2005[2] and seismic lines SL-22 through SL-38 were completed in August 2006[3]. A Site Plan showing seismic lines completed in 2004, 2005, 2006 and 2010, is presented at scale of 1 inch equals 1 mile in Figure 2 of the Appendix.

In all, thirteen separate seismic traverses were completed in 2010 for proposed Pebble project mine site facilities. A total of approximately 17.2 miles of detailed seismic refraction surveying was carried out in the investigation, on 150 separate seismic spreads.

[1] *Report on Seismic Refraction Investigation, Proposed Mine Site Facilities, Pebble Project, Iliamna, Alaska* Frontier Geosciences Inc. Project FGI-755 September, 2004.

[2] *Report on Seismic Refraction Investigation, Proposed Mine Site Facilities, Pebble Project, Iliamna, Alaska* Frontier Geosciences Inc. Project FGI-822 July, 2005.

[3] *Report on Seismic Refraction Investigation, Proposed Mine Facilities, Pebble Project, Iliamna, Alaska* Frontier Geosciences Inc. Project FGI-983 August, 2006.

0 40 80 120 160

MILES

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

SURVEY LOCATION PLAN

FRONTIER GEOSCIENCES INC.

DATE: OCT. 2010	SCALE 1"=80 MILES	FIG. 1

2. THE SEISMIC REFRACTION SURVEY METHOD

2.1 Equipment

The seismic refraction investigation was carried out with a Geometrics, Geode, 24 channel, signal enhancement seismograph and Oyo Geo Space, 10 Hz geophones. Geophone intervals along the multicored seismic cables were maintained at 7.5 metres (24.6 feet) and 10 metres (32.8 feet) in order to produce high resolution data on subsurface layering and the bedrock surface. The zero delay or instantaneous blasting caps in the small explosive charges used for energy input, were detonated electrically with an Ideal, 5 cap, high voltage, capacitor-type blaster.

2.2 Survey Procedure

For each spread, the seismic cable was stretched out in a straight line and the geophones implanted. Six separate 'shots' were then initiated: one at either end of the geophone array, two at intermediate locations along the seismic cable, and one off each end of the line to ensure adequate coverage of the basal layer. The shots were detonated individually and arrival times for each geophone were recorded digitally in the seismograph. Data recorded during field surveying operations was generally of good to excellent quality.

Throughout the survey, notes were recorded regarding seismic line positions in relation to topographic and geological features, and survey stations in the area. Relative elevations on the seismic lines were recorded by chain and inclinometer. Absolute elevations and coordinates were recorded at 200 metre (656 foot) intervals and provided by the Pebble Limited Partnership.

2.3 Interpretive Method

The final interpretation of the seismic data was arrived at using the method of differences technique. This method utilises the time taken to travel to a geophone from shotpoints located to either side of the geophone. Using the total time, a small vertical time is computed which represents the time taken to travel from the refractor up to the ground surface. This time is then multiplied by the velocity of each overburden layer to obtain the thickness of each layer at that point.

3. GEOPHYSICAL RESULTS

3.1 General

The 2010 seismic survey lines are shown at a scale of 1 inch equals 100 ft in Figures 3 through 36, in the Appendix. Seismic line intersections are indicated on the plots, including seismic lines surveyed in previous years. Relevant drillhole locations and their respective logs are also plotted on the profiles.

The area for the 2010 Pebble project field seismic surveying was located primarily above the tree line. Low-lying areas are covered in tundra organics with occasional marsh, small lakes, streams and rare bedrock exposure. Areas of high topography contain less organics and are covered in cobbles and boulders, indicating shallow depths to bedrock and the possible site area lithology. Seismic line SL-47 was surveyed under snow cover.

3.2 Discussion

3.2.1 Deposit Area

The Deposit Area was surveyed with a grid of seismic lines SL-39, SL-40, SL-41 and SL-42. Seismic line SL-42 is divided in two by a small lake between seismic spreads two and three. These lines cover the future open pit area of the deposit and extend into the Upper Talarik Creek region. The results of the interpretations indicate this area is underlain by four distinct compressional (P) wave velocity layers. These velocities indicate the area is primarily underlain by shallow, and compositionally weak bedrock, especially in the south, along seismic line SL-42.

The surficial layer exhibits compressional wave velocities between 980 ft/s and 2300 ft/s. The majority of the surficial layer velocities vary from 980 ft/s to 1480 ft/s which is consistent with exposures of loose, unsaturated silts, sands and organics. This layer is quite thin, averaging approximately six feet in thickness. The thickest accumulations occur along the eastern portion of line SL-42, between stations 2000E through 4000E, where the surficial layer is up to 29 feet in interpreted thickness. In this area, the surficial layer has a compressional wave velocity of 2300 ft/s likely indicating denser sands and gravels or stiff silt.

A shallow intermediate layer was identified in the data with velocities ranging from 1575 ft/s to 5250 ft/s. These velocities indicate denser or coarser sands and gravels or stiffer silts. In the majority of instances, this layer is unsaturated however, between stations 1600E and 2200E on line SL-41 and stations 1820E and 4000E on line SL-42, the compressional wave velocities are indicative of more saturated conditions. These velocities are consistent with the

marsh conditions in this area and the small lake that separates spreads two and three on line SL-42.

The deeper intermediate layer shown in dark blue, has compressional wave velocities that vary between 5300 ft/s and 8530 ft/s. These velocities in the majority of cases, represent compositionally weak or weathered bedrock, such as weathered basalt, breccia, mudstone and siltstone, intersected in drillholes, GH08-107, GH08-125 and GH08-202. Velocities in the 6500 ft/s to 8000 ft/s range may also be indicative of dense, coarse, glacial drift. Velocities less than 6500 ft/s may be consistent with dense, coarse, saturated sands, gravels and boulders or saturated silts. The interpreted depths to this layer average approximately 25 feet over the Deposit Area.

The basal layer in red, is the interpreted bedrock surface. Compressional wave velocities for the bedrock range from 8140 ft/s to 18180 ft/s. Basal layer velocities are variable, reflecting the complex geology and weathering in the area. Velocities below 10,000 ft/s such as at stations 9400N and 15400NE on line SL-39, likely reflect sedimentary or weatherd crystalline bedrock. These areas may also indicate zones of higher fracture frquency in the rock. Velocities over 13200 ft/s are believed to represent competent crystalline basement. In the station interval 10000N to 11100N on line SL-39, the basal velocity of 13480 ft/s is coincident with a granodiorite intersection in drillhole GH08-202.

3.2.2 Plant Site

The Plant Site was surveyed with a grid of seismic lines SL-43, SL-44, SL-45 and SL-46. The area is underlain by four velocity layers and is generally characterised by shallow depths to bedrock. Both the surficial and shallow intermediate layers are interpreted to be unsaturated sands, silts, gravels and cobbles. The surficial layer has velocities ranging from 980 ft/s to 1740 ft/s and averages 11 feet in interpreted thickness. The shallow intermediate layer exhibits velocities between 2430 ft/s and 4200 ft/s and averages 18 feet in thickness. Sediment accumulations are greatest at lower elevations, along the entire extent of line SL-45 and in the small gully between stations 400SE and 600SE on line SL-46.

The deeper intermediate layer with velocities ranging from 5090 ft/s to 8580 ft/s, is interpreted to be dense glacial drift, sedimentary rock, or weathered crystalline rock such as the basalt intersected in drillhole GH08-129. The interpreted depths to this layer average 29 feet.

The basal velocity layer is more representative of competent bedrock. Basal velocities are quite high and exceed 12000 ft/s, which may indicate the basement is primarily crystalline granodiorite. Drillholes in the area generally intersected crystalline rock. Velocities less than

12000 ft/s may indicate basalt with varying frequencies of fractures or joints in the rock mass. The depths to the basal layer average approximately 66 feet.

3.2.3 TSF Areas

Seismic lines SL-47, SL-48 and SL-49 are included in the TSF areas. These areas are all characterised by shallow bedrock. The results of the interpretations show three or four distinct velocity layers underlie the sites. Bedrock along these lines is generally shallow, and basal velocities indicate much of the region is underlain by competent, crystalline bedrock.

The surficial layer at the TSF areas is interpreted to be thin, averaging 11 feet along the three lines. Compressional wave velocities for this layer range from 980 ft/s to 3540 ft/s, consistent with shot hole and drillhole intersections of loose to dense gravel and sands, and soft to hard silt. Along seismic line SL-49 and between stations 5550NE and 6500NE on line SL-47, the interpreted surficial materials are sufficiently thick to enable resolution of two distinct velocity layers. The shallow intermediate layer on these lines has compressional wave velocities ranging from 2050 ft/s to 3540 ft/s. This layer is interpreted to be similar in composition to the surficial layer, but denser and possibly coarser.

The deeper or basal intermediate layer exhibits velocities varying between 4760 ft/s and 10150 ft/s. This layer is interpreted to be weathered or brecciated crystalline rock, sedimentary rock or dense glacial drift. Drillhole intersections in this velocity layer correspond to andesite, weathered basalt, greywacke mudstone/siltstone, weathered gabbro, weathered granodiorite and brecciated monzonite. Regions exhibiting velocities less than 6000 ft/s, may indicate dense or hard, saturated sediments, or highly weathered and fractured rock. This layer averages 14 ft in interpreted thickness on lines SL-47 and SL-48 and 22 ft on line SL-49.

The basal layer with velocities ranging from 8430 ft/s to 19180 ft/s is the interpreted bedrock surface. These velocities correspond to drillhole intersections at depth, of granodiorite, mudstone/siltsone, monzonite and basalt. Velocities below 10000 ft/s may represent zones of higher fracture frequencies in the rock or areas of sedimentary rock. Low compressional wave velocities for the basal layer in the steep valley between stations 3750E and 4600E on line SL-49, likely indicate increased fractured frequency or jointing in the rock at this location.

3.2.4 Upper Talarik Creek Area

The Upper Talarik Creek area was surveyed with north-south seismic line, SL-50. Upper Talarik Creek crosses the seismic line between spreads 8 and 9. The interpretation of the data indicates the area is underlain by four distinct compressional wave velocity layers. The

surficial layer, exhibits low velocities of 980 ft/s to 2130 ft/s indicative of unsaturated silts, sands and gravels. This layer is quite thin, averaging approximately 5 feet. The shallow intermediate layer with velocities of 2215 ft/s to 5560 ft/s is interpreted to be similar to the surficial layer, although denser and coarser in composition. An exception is between stations 700N and 1500N, where the velocity of 5560 ft/s is more indicative of saturated sediments, consistent with the marsh at this location.

The deeper intermediate layer ranges from 5315 ft/s to 8600 ft/s in velocity. Higher velocities likely indicate bedrock such as a volcaniclastic breccia, conglomerate, weathered crystalline rock or sedimentary rock. Velocity zones greater than 6500 ft/s may also indicate the presence of dense glacial drift. Slower velocities in this layer north of station 3300N, may alternatively represent saturated sands, gravels and cobbles. Interpreted depths to this layer average 15 feet along the line.

The basal layer varying from 7220 ft/s to 14240 ft/s in velocity, represents more competent bedrock. Compressional wave velocities exceeding 12400 ft/s along the southern extent of the line, likely indicate a change in composition to either plutonic rock or competent volcanic rock. Velocities to the north of 7220 ft/s to 9630 ft/s may indicate a broad area of weak volcanic or sedimentary rock. The interpreted bedrock velocities increase again at the north end of the line likely reflecting more indurated sedimentary rock or moderately weathered crystalline rock.

3.2.5 Frying Pan Lake Area

The Frying Pan Lake area was surveyed with east-west seismic line SL-51. This line is bisected by Frying Pan Lake between spreads four and five. The western portion of the line is underlain by very thick sediments, with a maximum thickness of approximately 270 feet.

The interpretation of the data indicate there are three distinct velocity layers underlying line SL-51. The thin surficial layer which averages approximately 17 feet in interpreted thickness, corresponds to loose, unsaturated silts, sands and organics. Seismic velocities between 4480 ft/s and 6040 ft/s, indicate the intermediate layer is comprised of saturated silts, sands and gravels deposited in lacustrine conditions. Accumulations of unconsolidated sediments in this intermediate layer average 163 ft in thickness.

The basal layer is the interpreted competent bedrock surface. The seismic velocities vary between 13160 ft/s and 16060 ft/s indicating a plutonic or competent volcanic basement. The interpreted depths to bedrock average 90 ft on the eastern side of the lake and 179 ft in the west.

4. LIMITATIONS

The depths to subsurface boundaries derived from seismic refraction surveys are generally accepted as accurate to within fifteen percent of the true depths to the boundaries. In some cases, unusual geological conditions may produce false or misleading data points with the result that computed depths to subsurface boundaries may be less accurate. In seismic refraction surveying difficulties with a 'hidden layer' or a velocity inversion may produce erroneous depths. The first condition is caused by the inability to detect the existence of layers because of insufficient velocity contrasts or layer thicknesses. A velocity inversion exists when an underlying layer has a lower velocity than the layer directly above it.

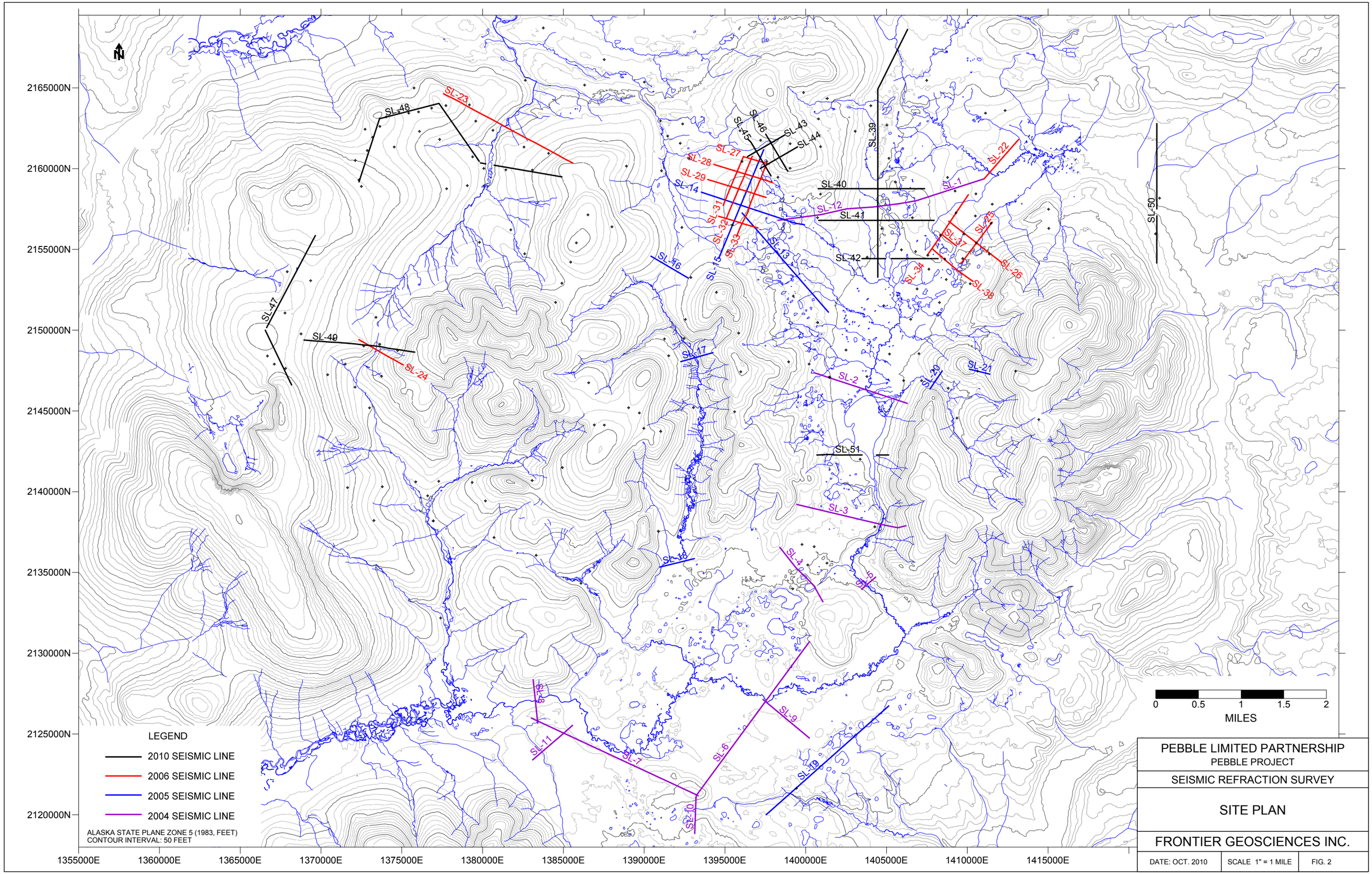
A basal layer smoothing function was utilised to remove sharp changes in the relief of the basal layer surface. The use of this smoothing operator on the basal surface may have resulted in some small errors, especially in areas of steep dip.

The results are interpretive in nature and are considered to be a reasonably accurate representation of existing subsurface conditions within the limitations of the seismic refraction method.

For: Frontier Geosciences Inc.

J.K. Porter, B.Sc.

Russell Hillman, P.Eng.



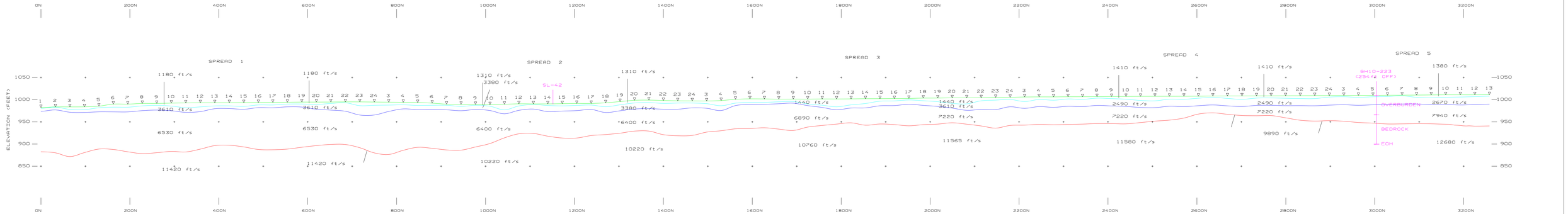
PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

SITE PLAN

FRONTIER GEOSCIENCES INC.

DATE: OCT. 2010	SCALE 1" = 1 MILE	FIG. 2



SEISMIC LINE SL-39A

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP

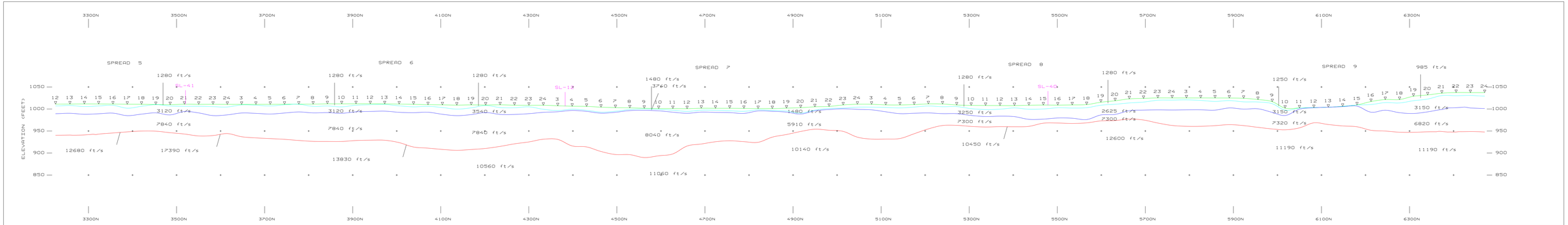
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-39A

FRONTIER GEOSCIENCES INC.

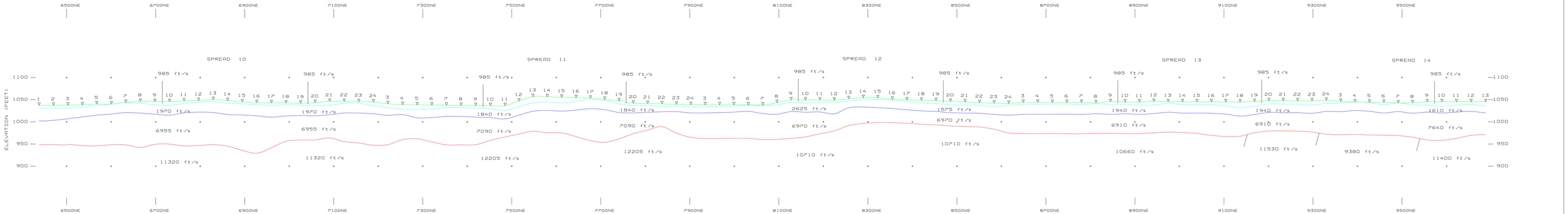
DATE: OCT. 2010	SCALE 1"=100'	FIG. 3



SEISMIC LINE SL-39B

INSTRUMENT: GEOMETRICS GEODE

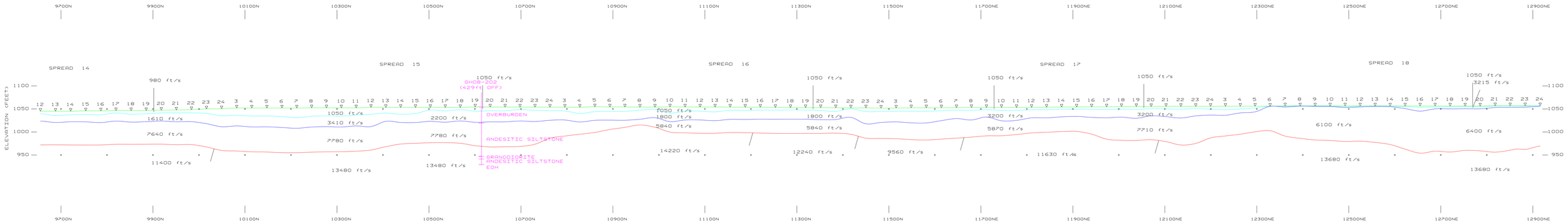
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-39B		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 4



SEISMIC LINE SL-39C

INSTRUMENT: GEOMETRICS GEODE

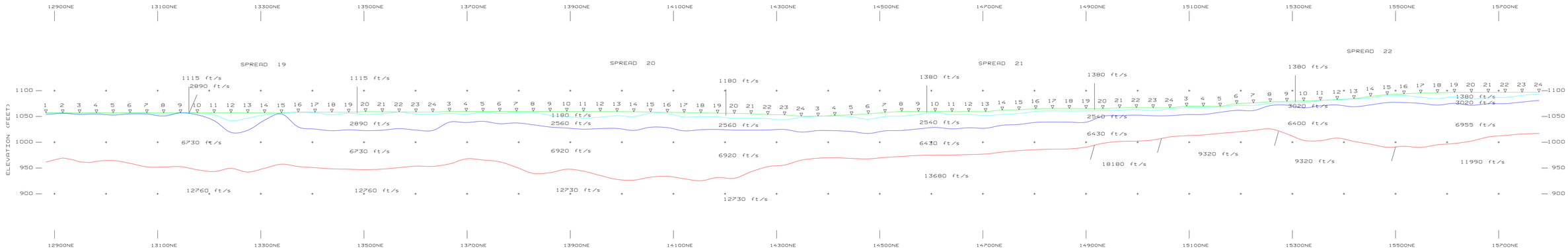
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-39C		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 5



SEISMIC LINE SL-39D

INSTRUMENT: GEOMETRICS GEODE

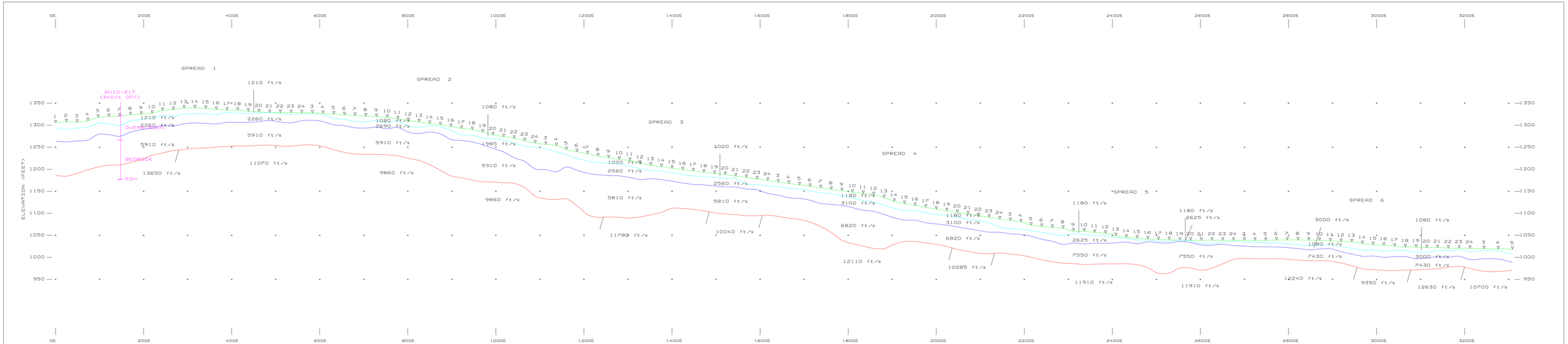
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-39D		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 6



SEISMIC LINE SL-39E

INSTRUMENT: GEOMETRICS GEODE

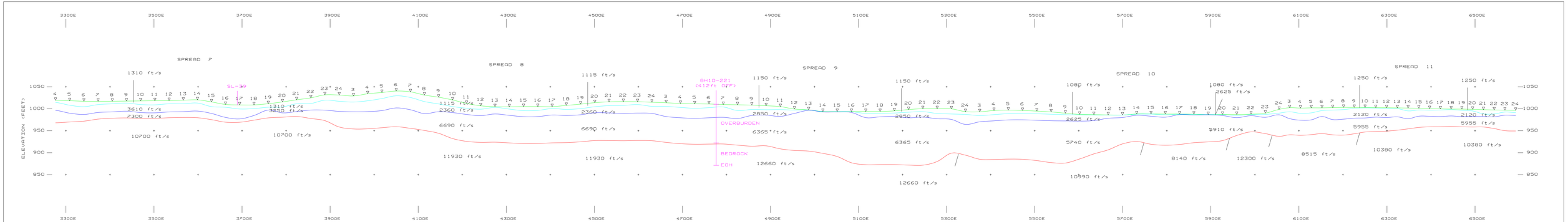
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-39E		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 7



SEISMIC LINE SL-40A

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP		
PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-40A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 8



SEISMIC LINE SL-40B

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP

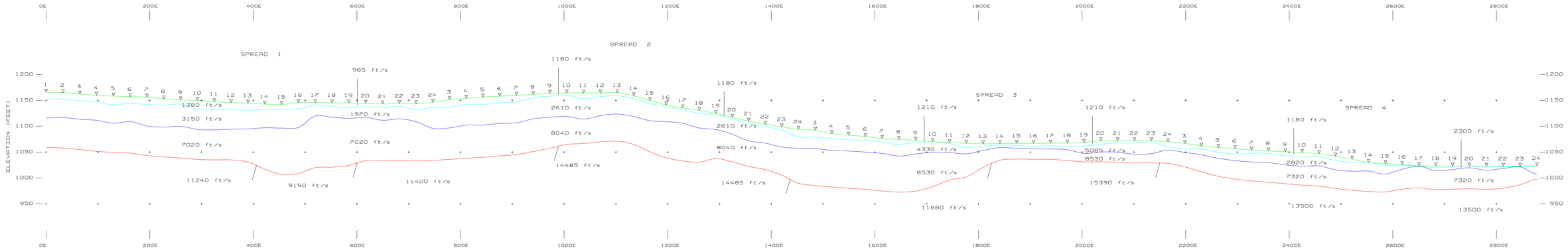
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-40B

FRONTIER GEOSCIENCES INC.

DATE: OCT. 2010	SCALE 1"=100'	FIG. 9



SEISMIC LINE SL-41A

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP

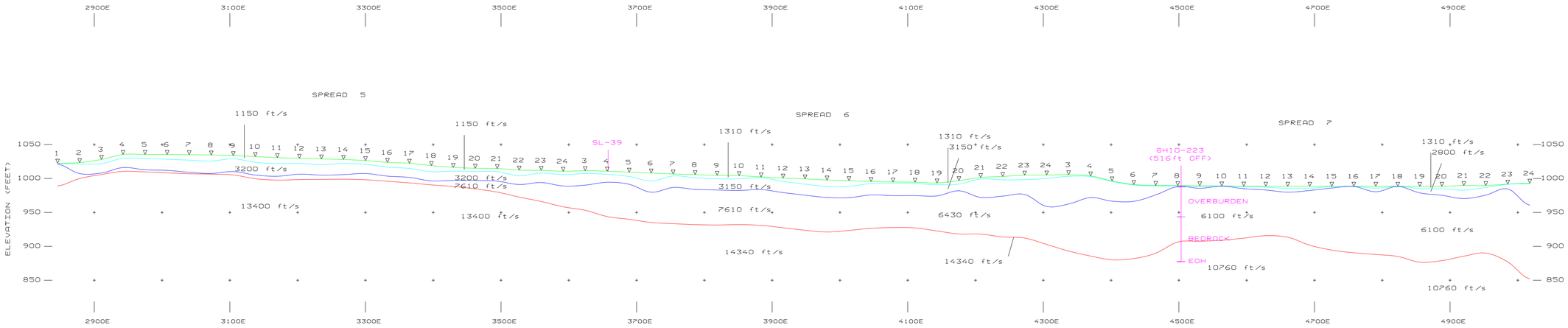
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-41A

FRONTIER GEOSCIENCES INC.

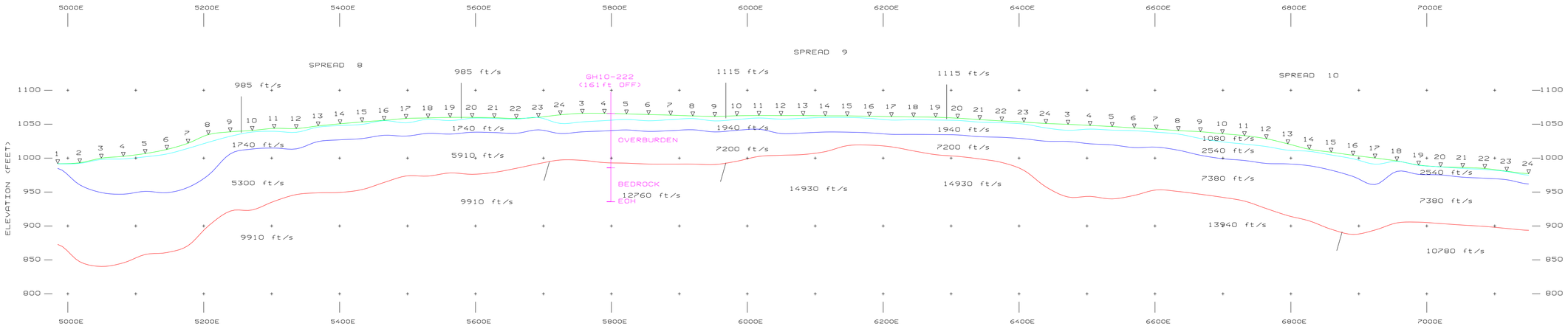
DATE: OCT. 2010	SCALE 1"=100'	FIG. 10



SEISMIC LINE SL-41B

INSTRUMENT: GEOMETRICS GEODE

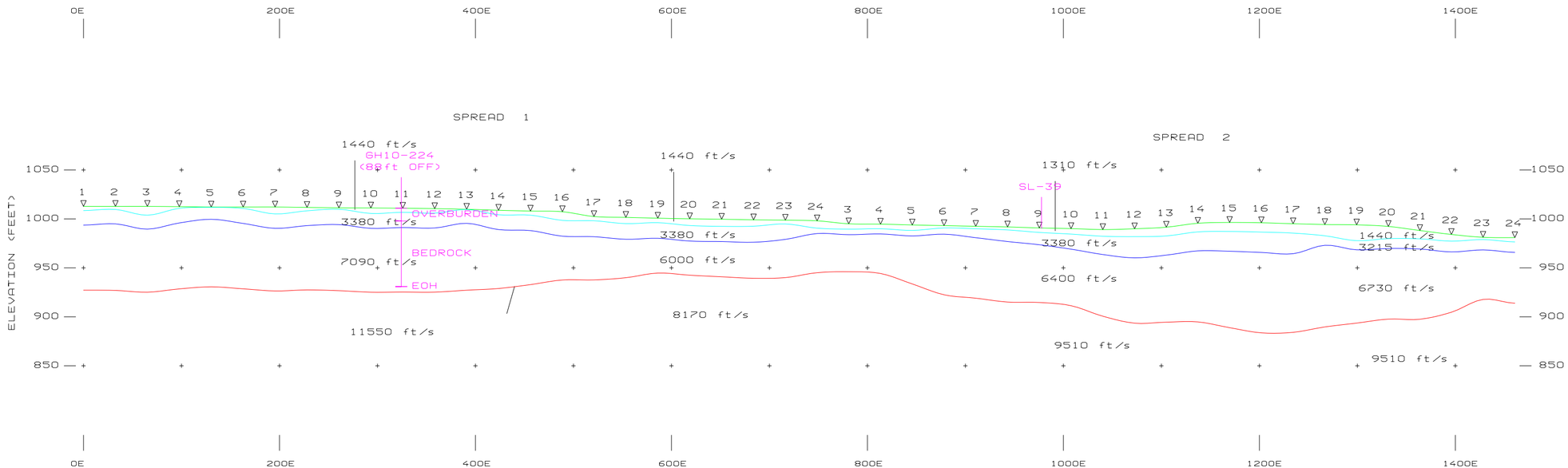
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-41B		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 11



SEISMIC LINE SL-41C

INSTRUMENT: GEOMETRICS GEODE

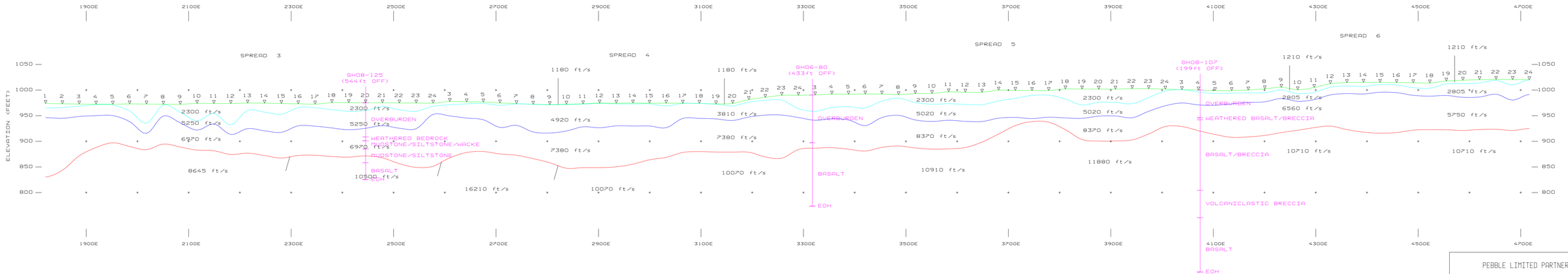
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-41C		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 12



SEISMIC LINE SL-42A

INSTRUMENT: GEOMETRICS GEODE

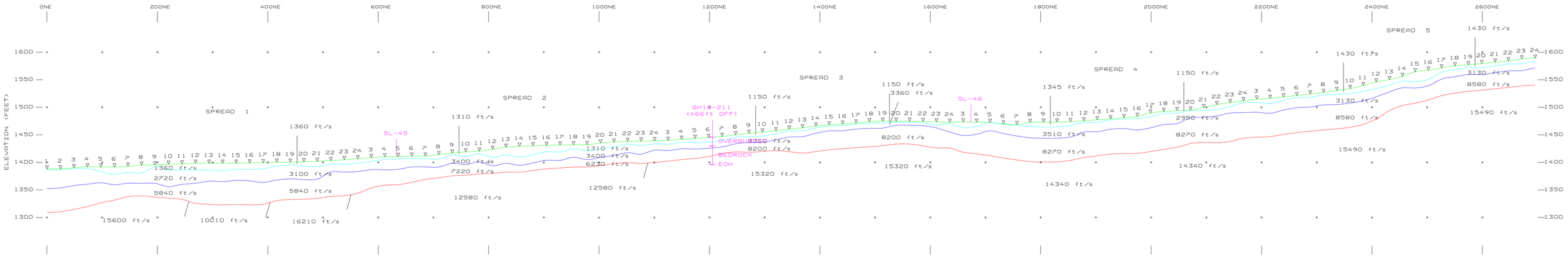
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-42A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 13



SEISMIC LINE SL-42B

INSTRUMENT: GEOMETRICS GEODE

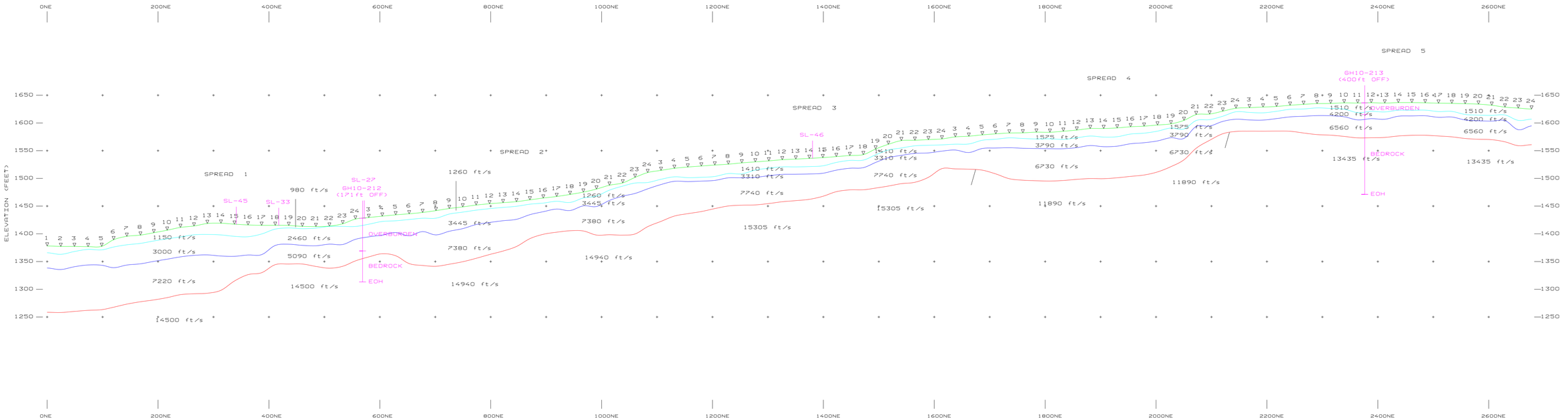
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-42B		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 14



SEISMIC LINE SL-43

INSTRUMENT: GEOMETRICS GEODE

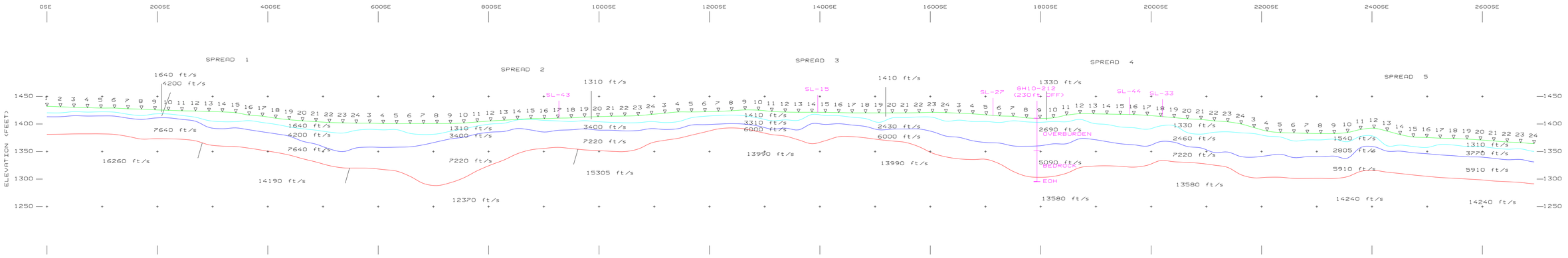
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-43		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 15



SEISMIC LINE SL-44

INSTRUMENT: GEOMETRICS GEODE

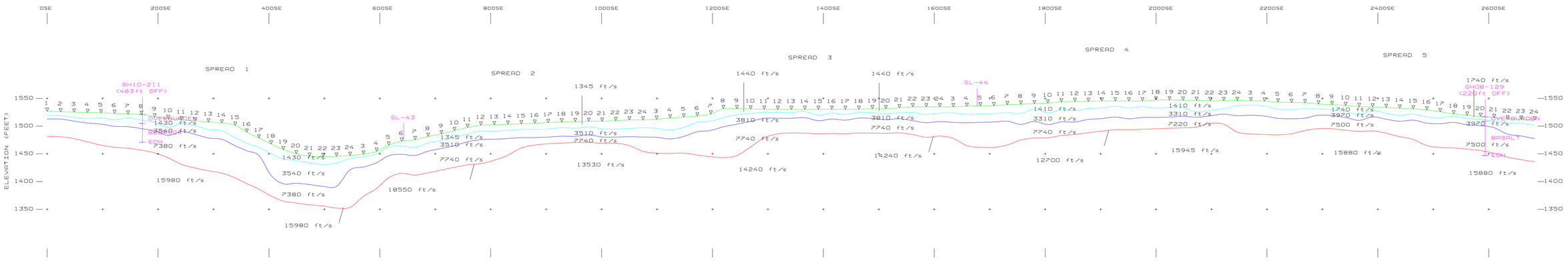
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-44		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 16



SEISMIC LINE SL-45

INSTRUMENT: GEOMETRICS GEODE

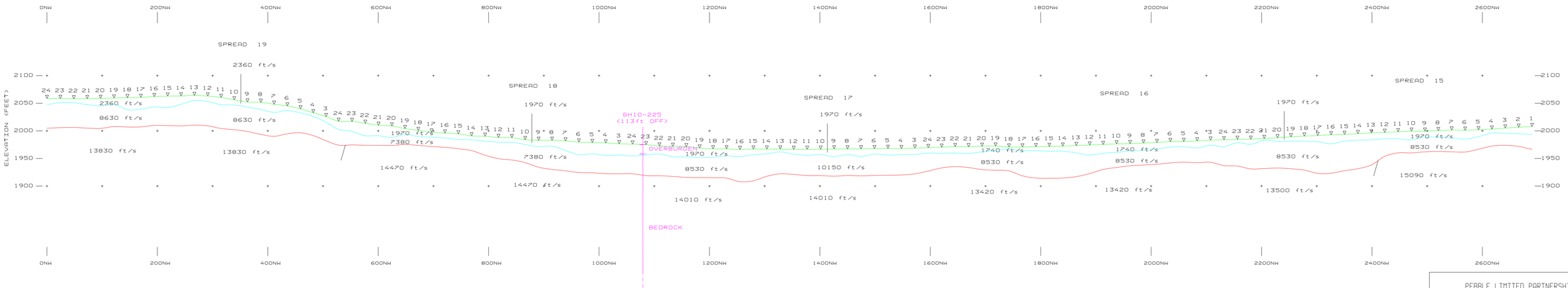
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-45		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 17



SEISMIC LINE SL-46

INSTRUMENT: GEOMETRICS GEODE

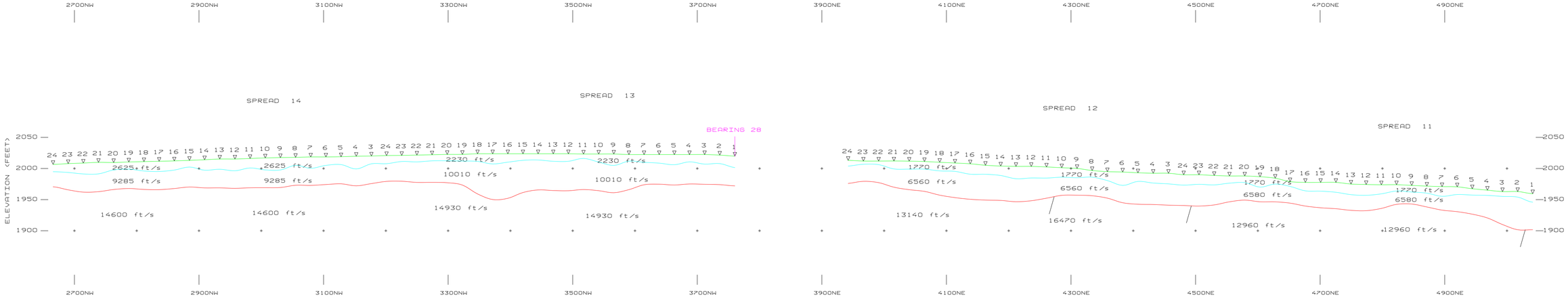
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-46		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 18



SEISMIC LINE SL-47A

INSTRUMENT: GEOMETRICS GEODE

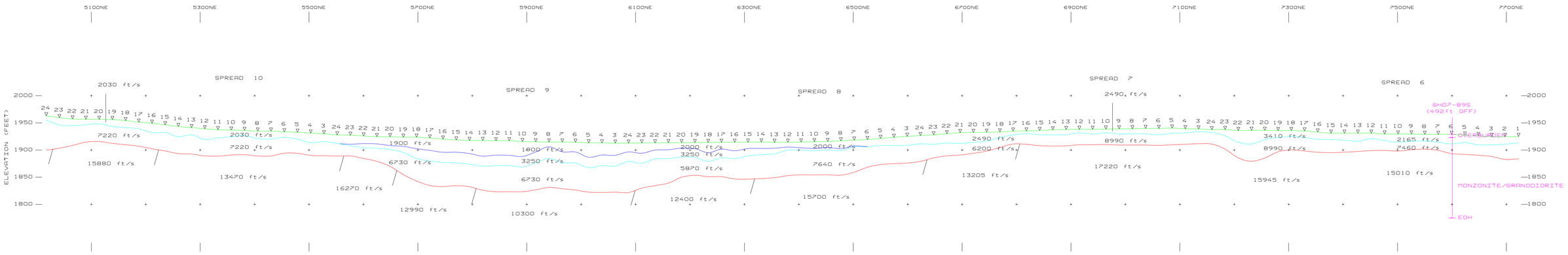
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-47A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 19



SEISMIC LINE SL-47B

INSTRUMENT: GEOMETRICS GEODE

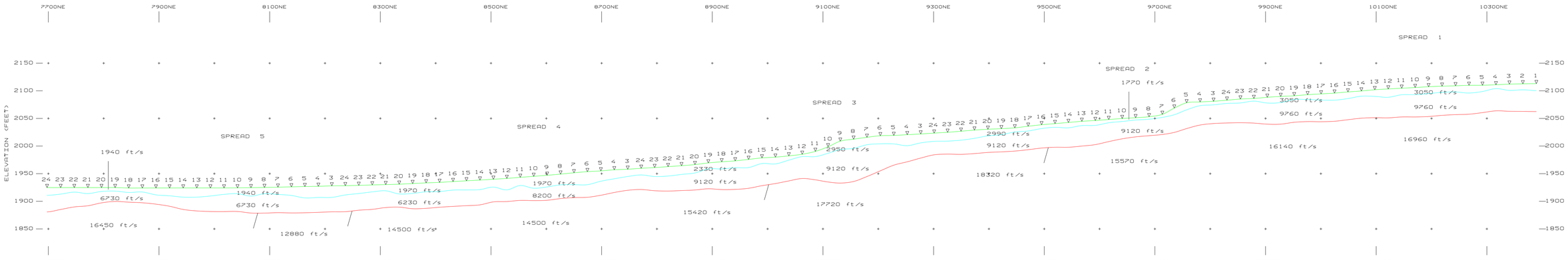
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-47B		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 20



SEISMIC LINE SL-47C

INSTRUMENT: GEOMETRICS GEODE

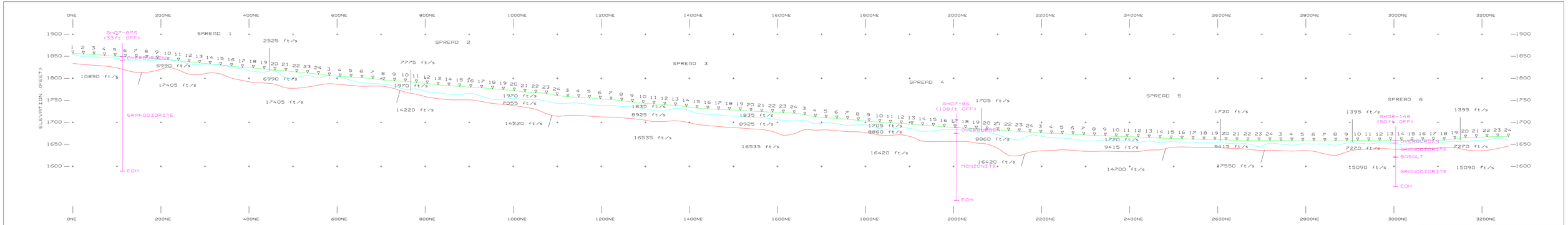
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-47C		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 21



SEISMIC LINE SL-47D

INSTRUMENT: GEOMETRICS GEODE

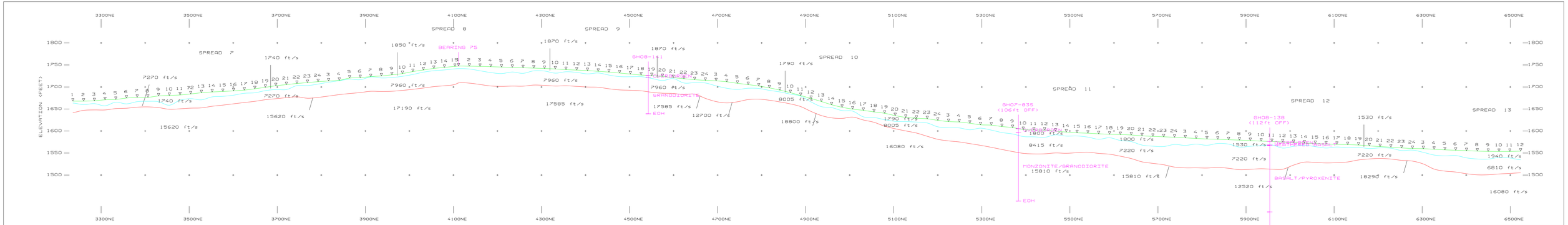
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-47D		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 22



SEISMIC LINE SL-48A

INSTRUMENT: GEOMETRICS GEODE

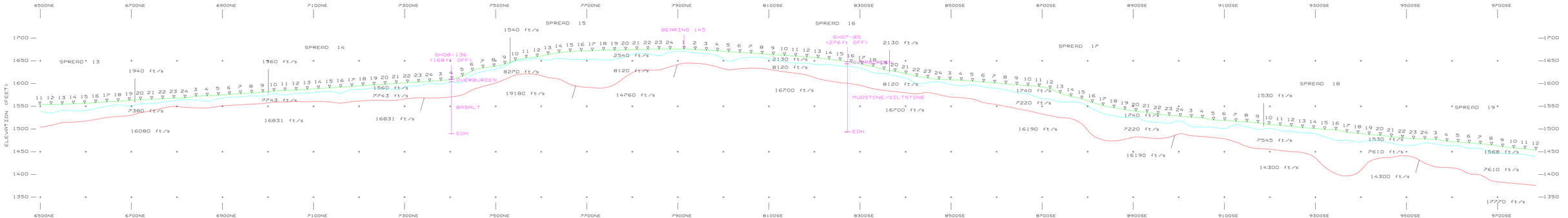
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-48A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 23



SEISMIC LINE SL-48B

INSTRUMENT: GEOMETRICS GEODE

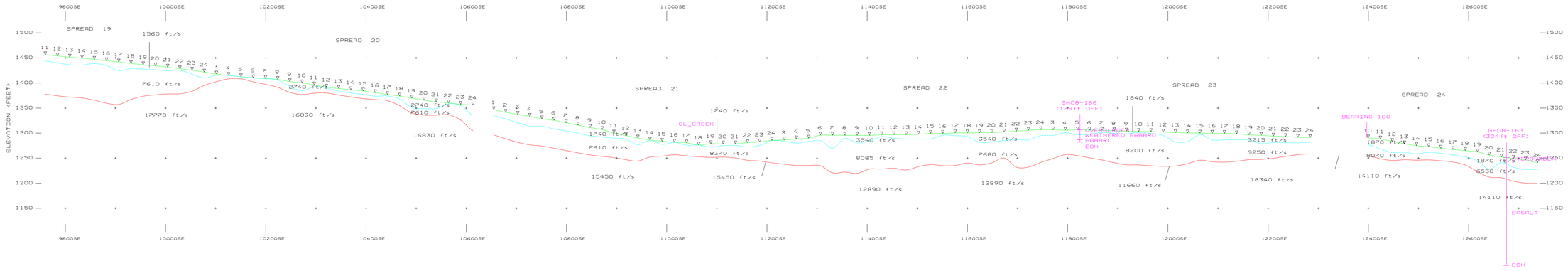
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-48B		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 24



SEISMIC LINE SL-48C

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-48C		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 25



SEISMIC LINE SL-48D

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP

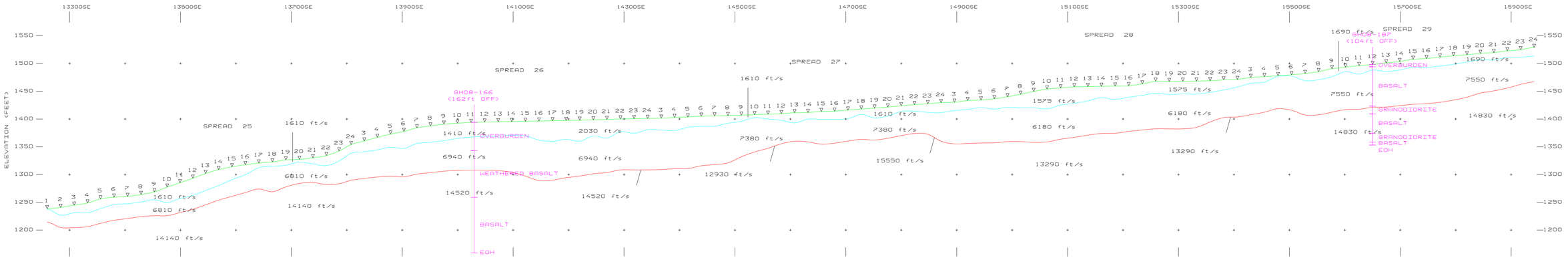
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-48D

FRONTIER GEOSCIENCES INC.

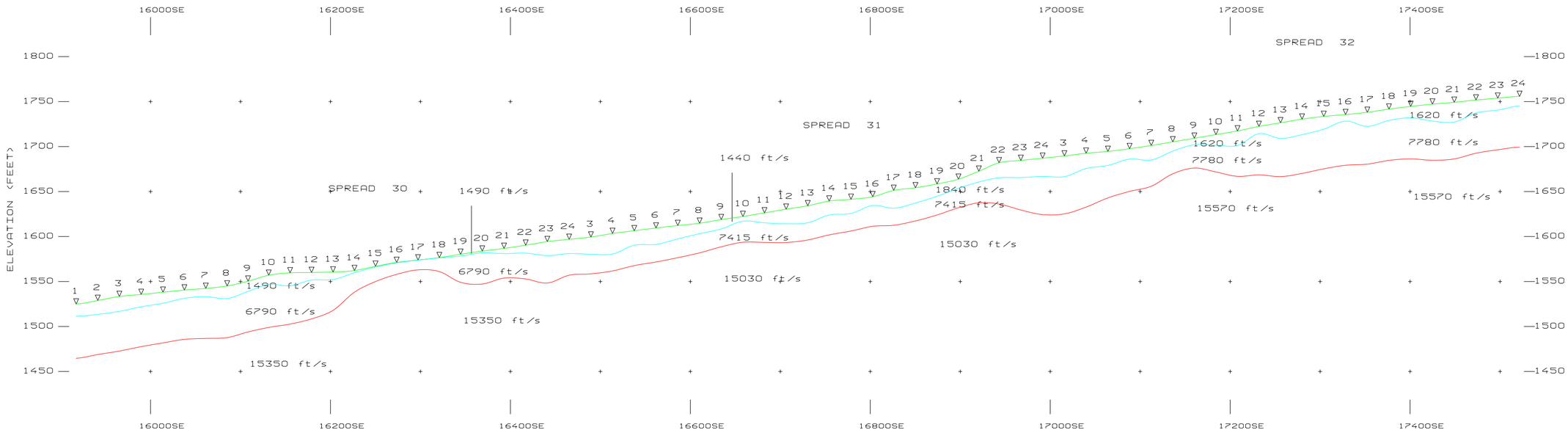
DATE: OCT. 2010	SCALE 1"=100'	FIG. 26



SEISMIC LINE SL-48E

INSTRUMENT: GEOMETRICS GEODE

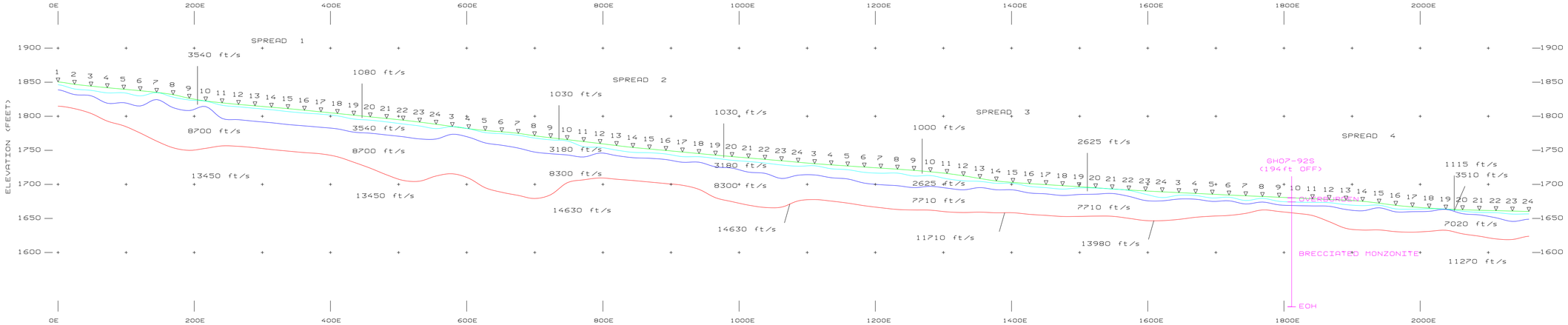
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-48E		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 27



SEISMIC LINE SL-48F

INSTRUMENT: GEOMETRICS GEODE

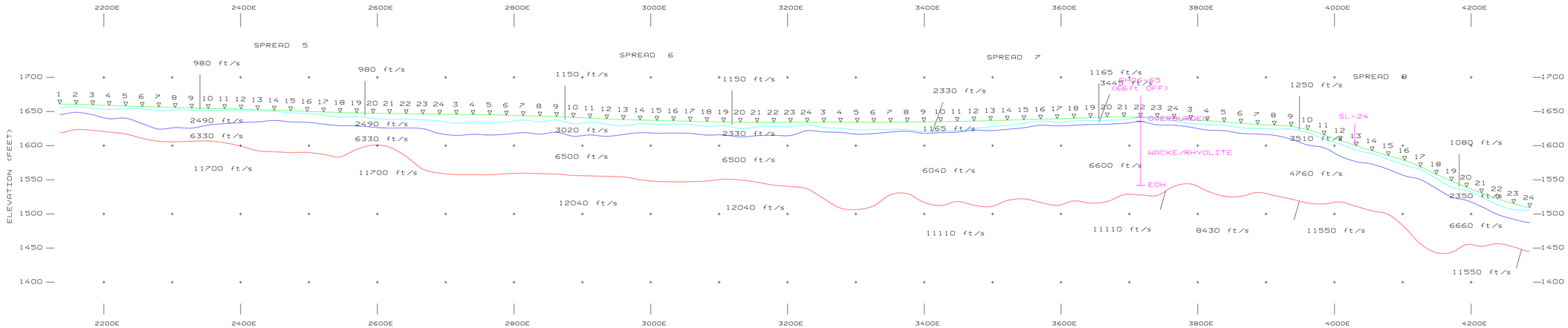
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-48F		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 28



SEISMIC LINE SL-49A

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-49A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 29



SEISMIC LINE SL-49B

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP

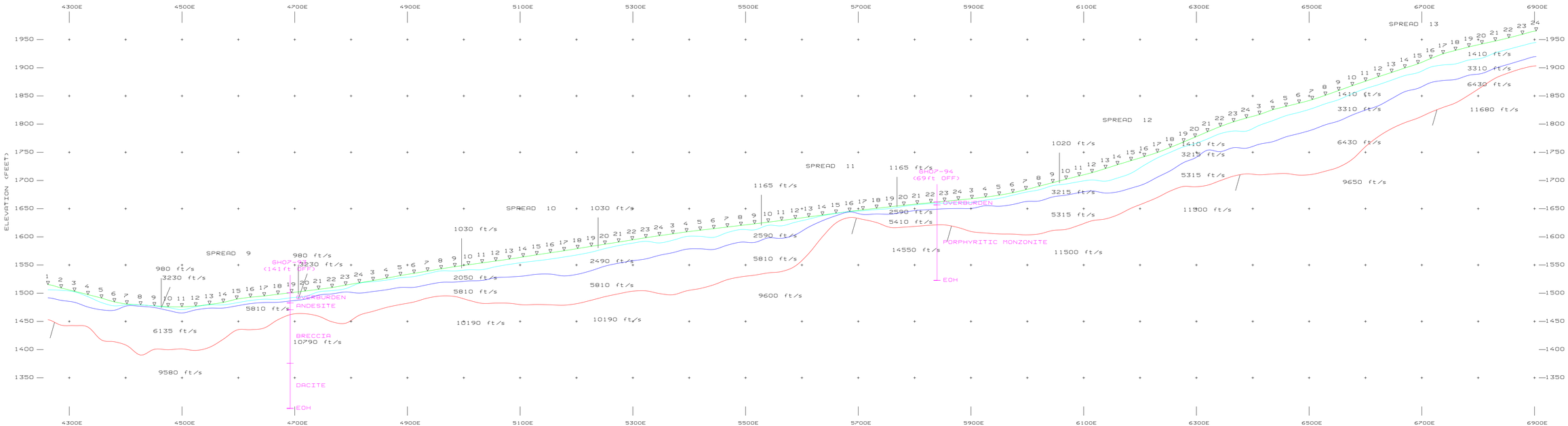
PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-49B

FRONTIER GEOSCIENCES INC.

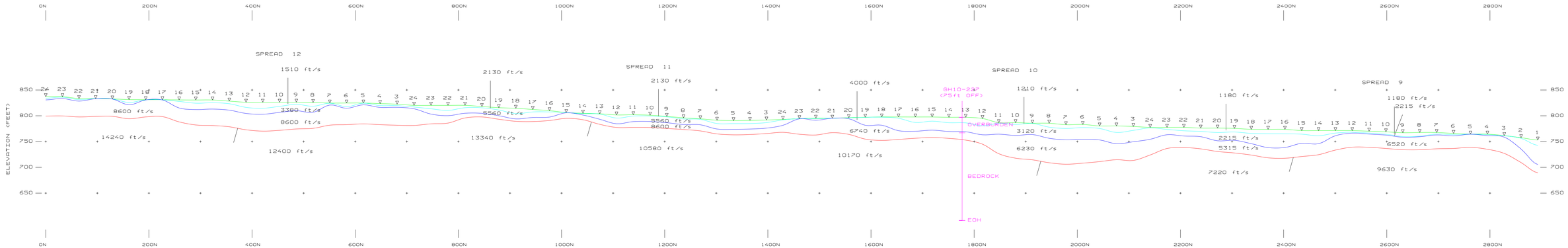
DATE: OCT. 2010	SCALE 1"=100'	FIG. 30



SEISMIC LINE SL-49C

INSTRUMENT: GEOMETRICS GEODE

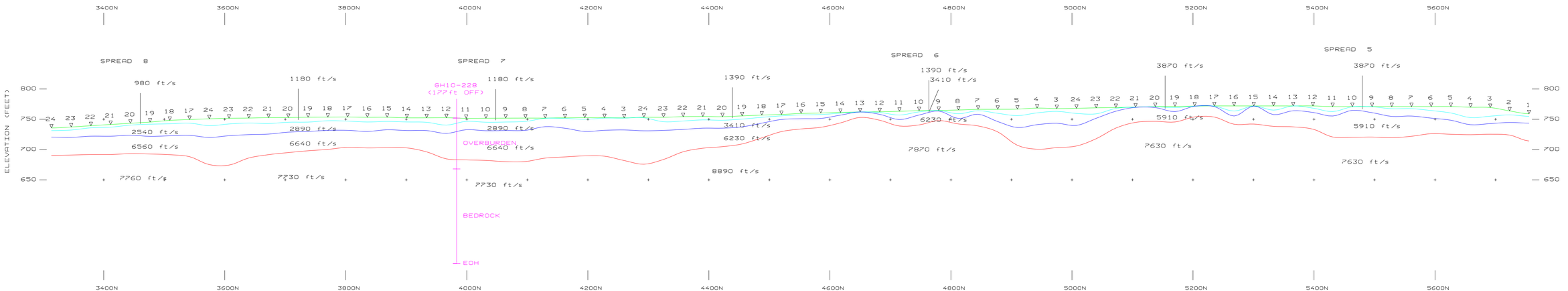
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-49C		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 31



SEISMIC LINE SL-50A

INSTRUMENT: GEOMETRICS GEODE

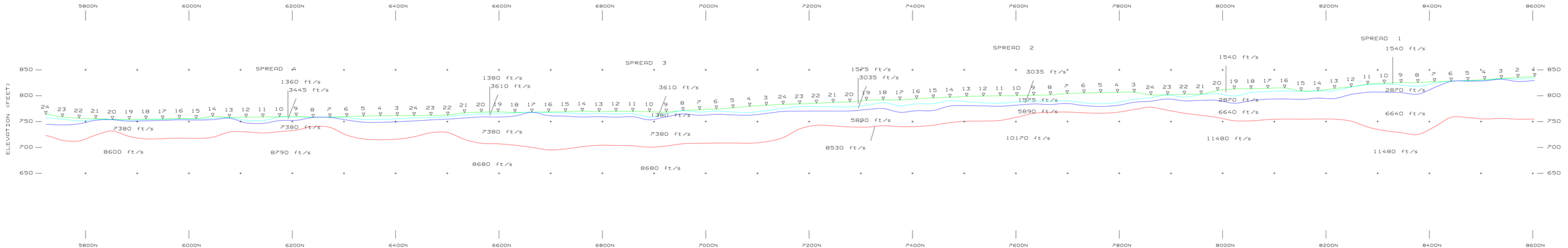
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-50A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 32



SEISMIC LINE SL-50B

INSTRUMENT: GEOMETRICS GEODE

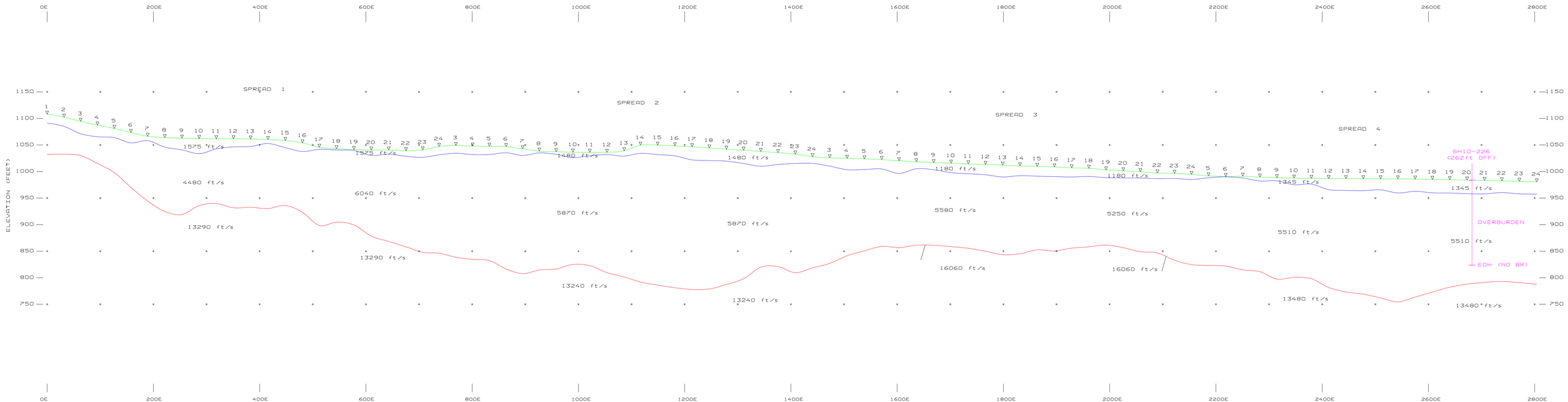
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-50B		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 33



SEISMIC LINE SL-50C

INSTRUMENT: GEOMETRICS GEODE

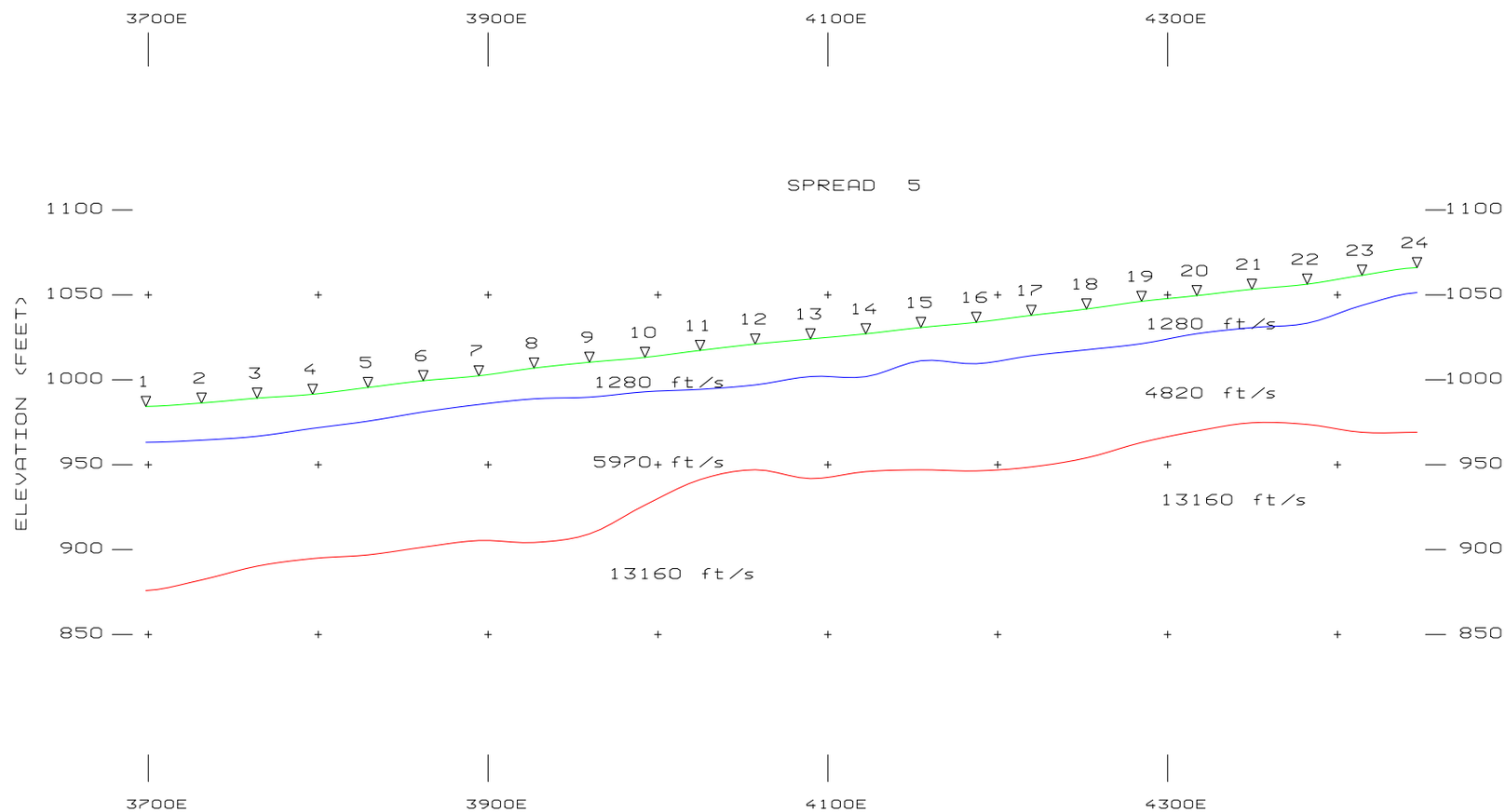
PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-50C		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 34



SEISMIC LINE SL-51A

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP PEBBLE PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-51A		
FRONTIER GEOSCIENCES INC.		
DATE: OCT. 2010	SCALE 1"=100'	FIG. 35



SEISMIC LINE SL-51B

INSTRUMENT: GEOMETRICS GEODE

PEBBLE LIMITED PARTNERSHIP

PEBBLE PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-51B

FRONTIER GEOSCIENCES INC.

DATE: OCT. 2010	SCALE 1"=100'	FIG. 36

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APPENDIX F

PHOTOGRAPHS

Knight Piésold
CONSULTING

APPENDIX F1

DRILL SITE PHOTOGRAPHS

GH10-211 to GH10-228

(Pages F1-1 to F1-9)

PHOTO 1 – GH10-211 Looking South

PHOTO 2 – GH10-212 Looking North

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

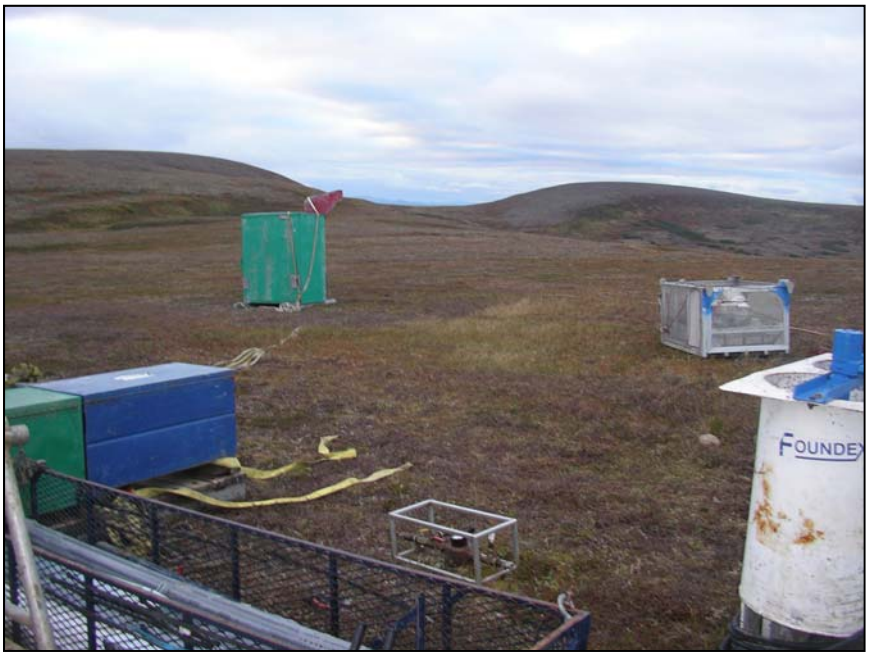

PHOTO 3 – GH10-213 Looking North

PHOTO 4 – GH10-214 Looking East

PHOTO 5 – GH10-215 Looking West

PHOTO 6 – GH10-216 Looking East

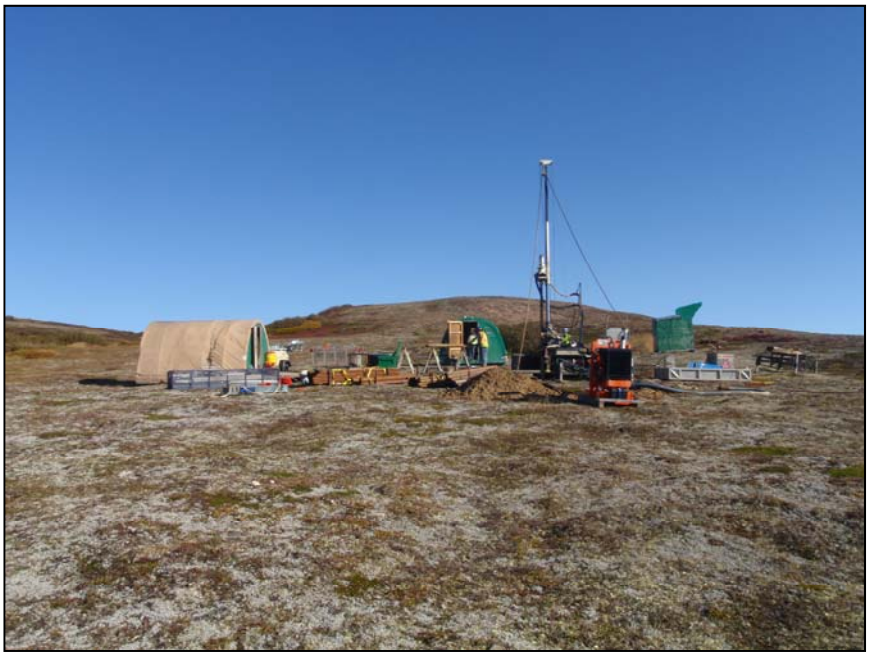

PHOTO 7 – GH10-217 Looking North

PHOTO 8 – GH10-218 Looking South

PHOTO 9 – GH10-219 Looking Northeast

PHOTO 10 – GH10-220 Looking South

PHOTO 11 – GH10-221 Looking South

PHOTO 12 – GH10-222 Looking West

PHOTO 13 – GH10-223 Looking West

PHOTO 14 – GH10-224 Looking North

PHOTO 15 – GH10-225 Looking West

PHOTO 16 – GH10-226 Looking West

PHOTO 17 – GH10-227 Looking North

PHOTO 18 – GH10-228 Looking Northeast

Knight Piésold CONSULTING

APPENDIX F2

STANDARD PENETRATION TEST PHOTOGRAPHS

- GH10-212
- GH10-213
- GH10-214
- GH10-215
- GH10-216
- GH10-217
- GH10-218
- GH10-219
- GH10-221
- GH10-222
- GH10-223
- GH10-224
- GH10-226
- GH10-227
- GH10-228

(Pages F2-1 to F2-50)

PHOTO 1 – GH10-212 SPT#1, 12 to 13.5 ft

PHOTO 2 – GH10-212 SPT#2, 19 to 20.5 ft

PHOTO 3 – GH10-212 SPT#3, 24 to 25.5 ft

PHOTO 4 – GH10-212 SPT#4, 29 to 30.5 ft

PHOTO 5 – GH10-212 SPT#5, 34 to 35.5 ft

PHOTO 6 – GH10-212 SPT#6, 39 to 40.5 ft

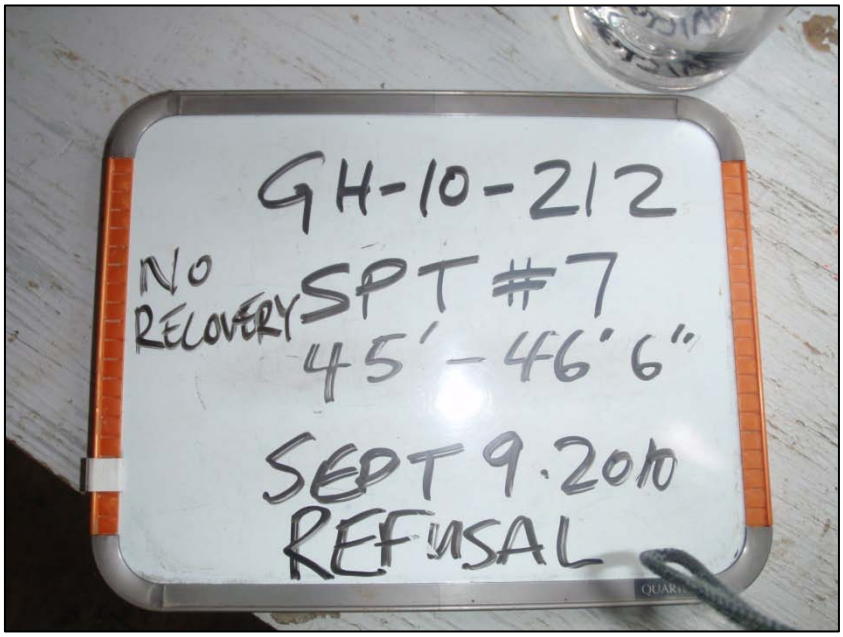

PHOTO 7 – GH10-212 SPT#7, 45 to 46.5 ft (No Recovery)

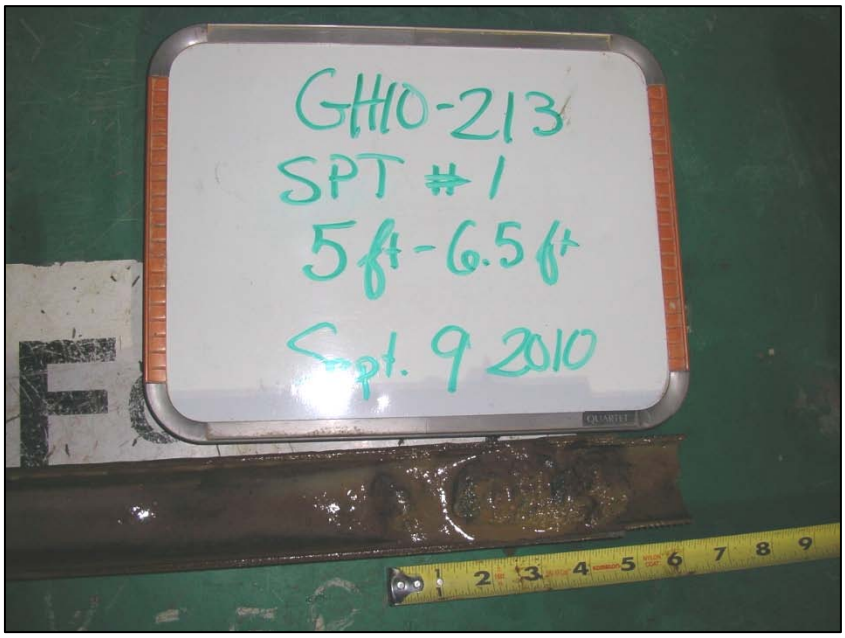

PHOTO 8 – GH10-213 SPT#1, 5 to 6.5 ft

PHOTO 9 – GH10-213 SPT#2, 14 to 15.5 ft

PHOTO 10 – GH10-213 SPT#3, 19 to 20.5 ft

PHOTO 11 – GH10-214 SPT#1, 5 to 6.5 ft

PHOTO 12 – GH10-214 SPT#2, 10 to 11.5 ft

PHOTO 13 – GH10-214 SPT#3, 15 to 16.5 ft

PHOTO 14 – GH10-214 SPT#4, 20 to 21.5 ft

PHOTO 15 – GH10-214 SPT#5, 25 to 26.5 ft

PHOTO 16 – GH10-214 SPT#6, 30 to 31.5 ft

PHOTO 17 – GH10-214 SPT#7, 35 to 36.5 ft

PHOTO 18 – GH10-215 SPT#1, 5 to 6.5 ft

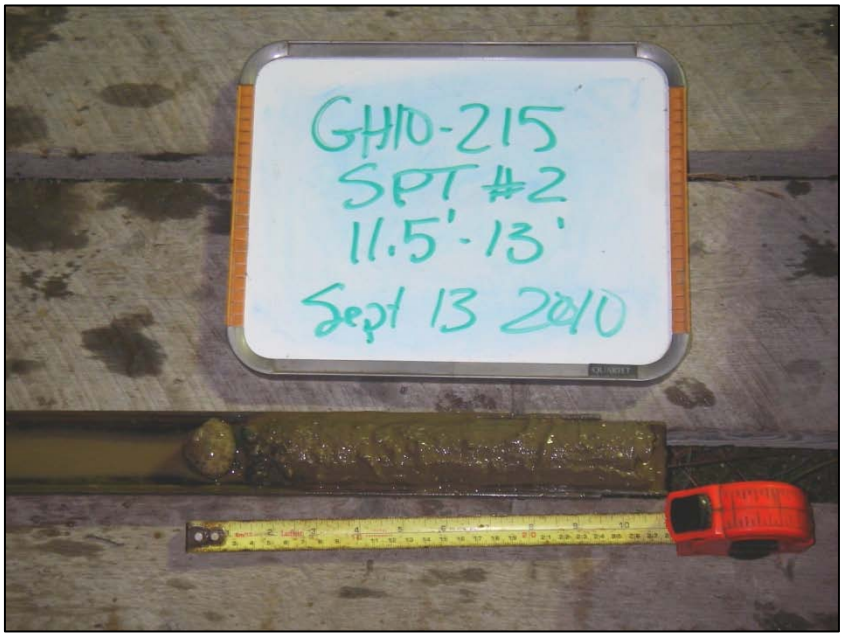

PHOTO 19 – GH10-216 SPT#2, 11.5 to 13 ft

PHOTO 20 – GH10-216 SPT#1, 25 to 26.5 ft

PHOTO 21 – GH10-216 SPT#2, 35 to 36.5 ft

PHOTO 22 – GH10-216 SPT#3, 40 to 41.5 ft

PHOTO 23 – GH10-216 SPT#4, 65 to 66.5 ft

PHOTO 24 – GH10-217 SPT#1 4 to 5.5 ft

PHOTO 25 – GH10-217 SPT#2, 9 to 10.5 ft

PHOTO 26 – GH10-217 SPT#3, 14 to 15.5 ft

PHOTO 27 – GH10-217 SPT#4, 19 to 20.5 ft

PHOTO 28 – GH10-217 SPT#5, 24 to 25.5 ft

PHOTO 29 – GH10-218 SPT#1, 4 to 5.5 ft

PHOTO 30 – GH10-218 SPT#2, 9 to 10.5 ft

PHOTO 31 – GH10-218 SPT#3, 14 to 15.5 ft

PHOTO 32 – GH10-218 SPT#4, 19 to 20.5 ft

PHOTO 33 – GH10-218 SPT#5, 24 to 25.5 ft

PHOTO 34 – GH10-218 SPT#6, 29 to 30.5 ft

PHOTO 35 – GH10-218 SPT#7, 34 to 35.5 ft

PHOTO 36 – GH10-218 SPT#8, 44 to 45.5 ft

PHOTO 37 – GH10-218 SPT#9, 49 to 50.5 ft

PHOTO 38 – GH10-219 SPT#1, 4 to 5.5 ft

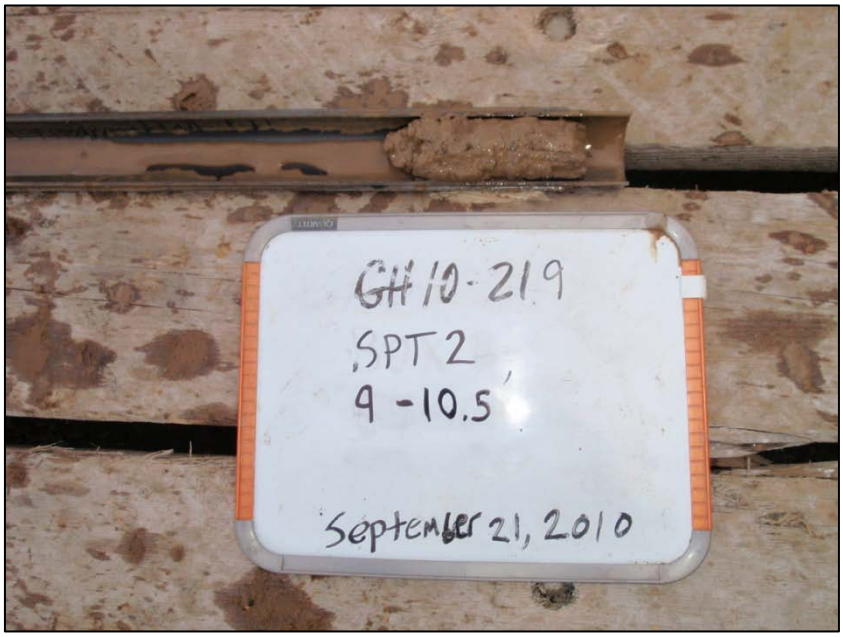

PHOTO 39 – GH10-219 SPT#2, 9 to 10.5 ft

PHOTO 40 – GH10-219 SPT#3, 14 to 15.5 ft

PHOTO 41 – GH10-219 SPT#4, 19 to 20.5 ft

PHOTO 42 – GH10-219 SPT#5, 24 to 25.5 ft

PHOTO 43 – GH10-219 SPT#6, 29 to 30.5 ft

PHOTO 44 – GH10-219 SPT#7, 34 to 35.5 ft

PHOTO 45 – GH10-219 SPT#8, 39 to 40.5 ft

PHOTO 46 – GH10-219 SPT#9, 44 to 45.5 ft

PHOTO 47 – GH10-221 SPT#1, 5 to 6.5ft

PHOTO 48 – GH10-221 SPT#2, 10 to 11.5 ft

PHOTO 49 – GH10-221 SPT#3, 15 to 16.5 ft

PHOTO 50 – GH10-221, SPT#4, 20 to 21.5 ft

PHOTO 51 – GH10-221 SPT#5, 25 to 26.5 ft

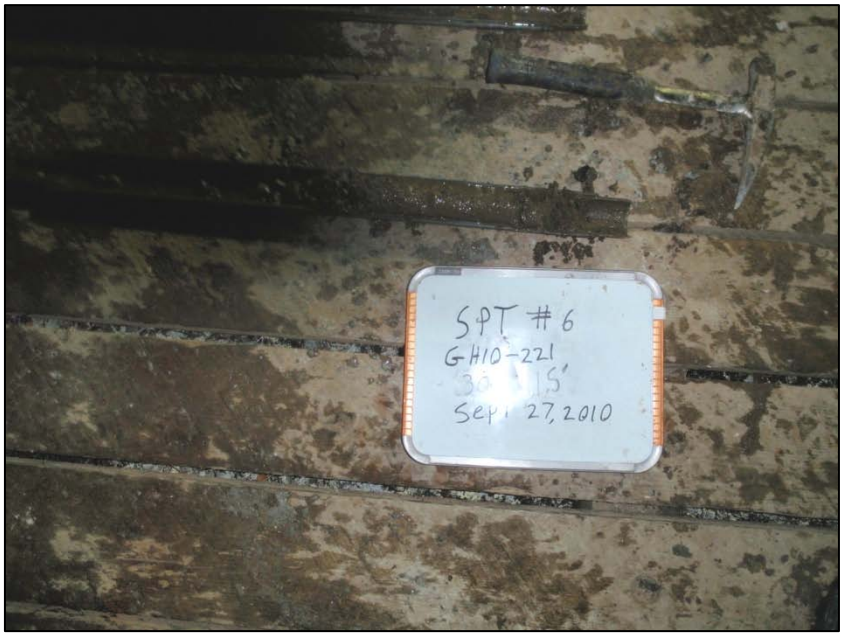

PHOTO 52 – GH10-221 SPT#6, 30 to 31.5 ft

PHOTO 53 – GH10-221 SPT#7, 45 to 46.5 ft

PHOTO 54 – GH10-222 SPT#1, 5 to 6.5 ft

Photo Missing

PHOTO 55 – GH10-222 SPT#2, 10 to 11.5 ft

PHOTO 56 – GH10-222 SPT@3, 15 to 16.5 ft

PHOTO 57 – GH10-222 SPT#4, 20 to 21.5 ft

PHOTO 58 – GH10-222 SPT#5, 25 to 26.5 ft

PHOTO 59 – GH10-222 SPT#6, 30 to 31.5 ft

PHOTO 60 – GH10-222 SPT#7, 35 to 36.5 ft

PHOTO 61 – GH10-222 SPT#8, 40 to 41.5 ft

PHOTO 62 – GH10-222 SPT#9, 45 to 46.5 ft

PHOTO 63 – GH10-222 SPT#10, 50 to 51.5 ft

PHOTO 64 – GH10-222 SPT#11, 55 to 56.5 ft

PHOTO 65 – GH10-222 SPT#12, 60 to 61.5 ft

PHOTO 66 – GH10-223 SPT#1, 5 to 6.5 ft

PHOTO 67 – GH10-223 SPT#2, 10 to 11.5 ft

PHOTO 68 – GH10-223 SPT#3, 15 to 16.5 ft

PHOTO 69 – GH10-223 SPT#4, 20 to 21.5 ft

PHOTO 70 – GH10-223 SPT#5, 30 to 31.5 ft

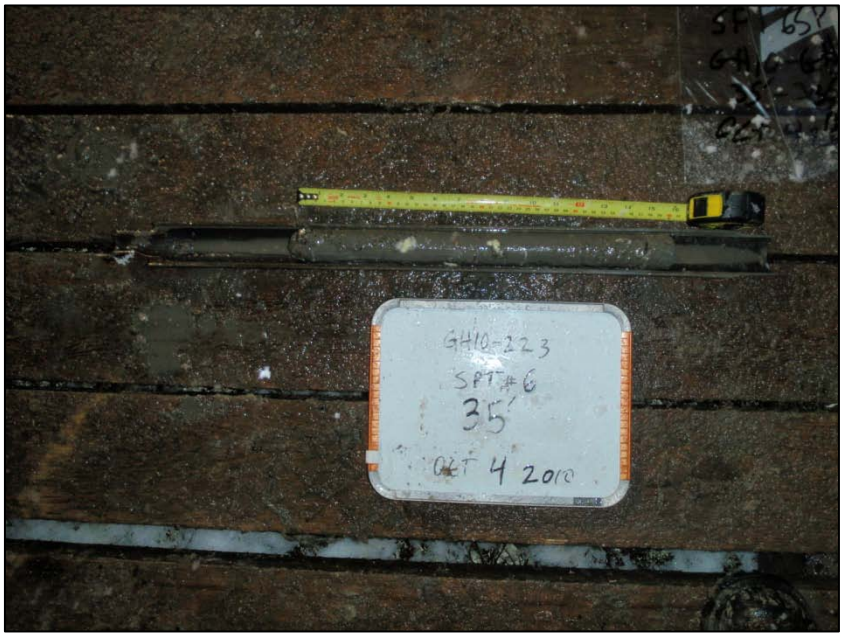

PHOTO 71 – GH10-223 SPT#6, 35 to 36.5 ft

PHOTO 72 – GH10-223 SPT#7, 40 to 41.5 ft

PHOTO 73 – GH10-224 SPT#1, 5 to 6.5 ft

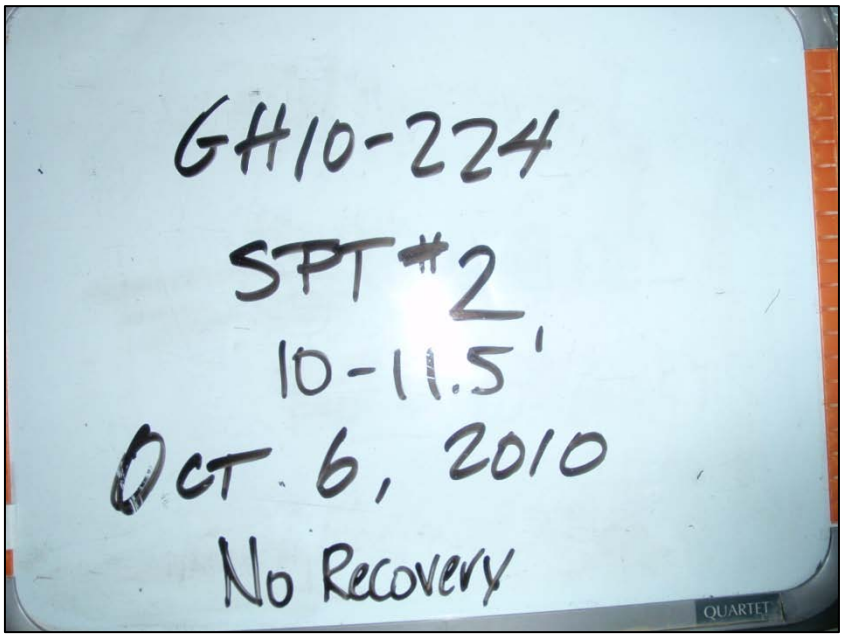

PHOTO 74 – GH10-224 SPT#2, 10 to 11.5 ft (No Recovery)

PHOTO 75 – GH10-226 SPT#1, 5 to 6.5 ft

PHOTO 76 – GH10-226 SPT#2, 25 to 26.5 ft

PHOTO 77 – GH10-226 SPT#3, 30 to 31.5 ft

PHOTO 78 – GH10-226 SPT#4, 38 to 39.5 ft

PHOTO 79 – GH10-226 SPT#5, 43 to 44.5 ft

PHOTO 80 – GH10-226 SPT#6, 48 to 49.5 ft

PHOTO 81 – GH226 SPT#7, 53 to 54.5 ft

PHOTO 82 – GH10-226 SPT#8, 58 to 59.5 ft

PHOTO 83 – GH10-226 SPT#9, 63 to 64.5 ft

PHOTO 84 – GH10-226 SPT#10, 70 to 71.5 ft

Photo Missing

PHOTO 85 – GH10-226 SPT#11

PHOTO 86 – GH10-226 SPT#12, 95 to 96.5 ft

PHOTO 87 – GH10-226 SPT#13, 105 to 106.5 ft

PHOTO 88 – GH10-226 SPT#14, 125 to 126.5 ft

PHOTO 89 – GH10-226 SPT #15, 135 to 136.5 ft

PHOTO 90 – GH10-226 SPT#16, 145 to 146.5 ft

PHOTO 91 – GH10-226 SPT#17, 155 to 156.5 ft

PHOTO 92 – GH10-227 SPT#1, 10 to 11.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

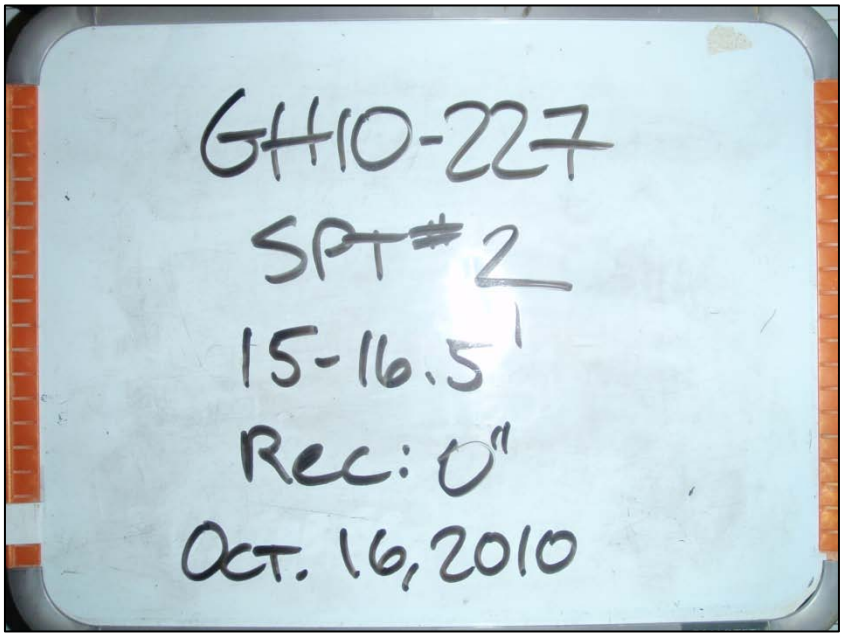

PHOTO 93 – GH10-227 SPT#2, 15 to 16.5 ft

PHOTO 94 – GH10-227 SPT#3, 20 to 21.5 ft

PHOTO 95 – GH10-227 SPT#4, 25 to 26.5 ft

PHOTO 96 – GH10-228 SPT#1, 5 to 6.5 ft

PHOTO 97 – GH10-228 SPT#2, 10 to 11.5 ft

PHOTO 98 – GH10-228 SPT#3, 15 to 16.5 ft

PHOTO 99 – GH10-228 SPT#4, 20 to 21.5 ft

PHOTO 100 – GH10-228 SPT#5, 25 to 26.5 ft

Knight Piésold
CONSULTING

APPENDIX F3

CORE PHOTOGRAPHS

GH10-211 to GH10-228

(Pages F3-1 to F3-126)

PHOTO 1 – GH10-211 Box 1 & 2, 0 to 23 ft

PHOTO 2 – GH10-211 Box 3 & 4, 23 to 42 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 3 – GH10-211 Box 5, 42 to 50 ft (EOH)

PHOTO 4 – GH10-212 Box 1 & 2, 0 to 51.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 5 – GH10-212 Box 3 & 4, 51.5 to 72.5 ft

PHOTO 6 – GH10-212 Box 5 & 6, 72.5 to 87 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 7 – GH10-212 Box 7 & 8, 87 to 109 ft

PHOTO 8 – GH10-212 Box 9, 109 to 115 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 9 – GH10-213 Box 1, 0 to 31.5 ft

PHOTO 10 – GH10-213 Box 2, 31.5 to 42 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 11 – GH10-213 Box 3, 42 to 51 ft

PHOTO 12 – GH10-213 Box 4, 51 to 66 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 13 – GH10-213 Box 5, 66 to 75.5 ft

PHOTO 14 – GH10-213 Box 6, 75.5 to 86 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 15 – GH10-213 Box 7, 86 to 97.5 ft

PHOTO 16 – GH10-213 Box 8, 97.5 to 108.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 17 – GH10-213 Box 9, 108.5 to 119 ft

PHOTO 18 – GH10-213 Box 10, 119 to 127 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 19 – GH10-213 Box 11, 127 to 136.5 ft

PHOTO 20 – GH10-213 Box 12, 136.5 to 145 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 21 – GH10-213 Box 13, 145 to 153.5 ft

PHOTO 22 – GH10-213 Box 14, 153.5 to 162 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 23 – GH10-213 Box 15, 162 to 165 ft (EOH)

PHOTO 24 – GH10-214 Box 1 & 2, 0 to 40 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 25 – GH10-214 Box 3 & 4, 40 to 66 ft

PHOTO 26 – GH10-214 Box 5 & 6, 66 to 87 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 27 – GH10-214 Box 7 & 8, 87 to 103 ft

PHOTO 28 – GH10-214 Box 9 & 10, 103 to 120 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 29 – GH10-214 Box 11, 120 to 128 ft

PHOTO 30 – GH10-214 Box 12, 128 to 135 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 31 – GH10-215 Box 1, 0 to 15 ft

PHOTO 32 – GH10-215 Box 2 & 3, 15 to 33 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 33 – GH10-215 Box 4 & 5, 33 to 49.5 ft

PHOTO 34 – GH10-215 Box 6 & 7, 49.5 to 66 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 35 – GH10-215 Box 8 & 9, 66 to 75 ft (EOH)

PHOTO 36 – GH10-216 Box 1 & 2, 20 to 65 ft

PHOTO 37 – GH10-216 Box 3 & 4, 65 to 80 ft

PHOTO 38 – GH10-216 Box 5, 80 to 88 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 39 – GH10-216 Box 6, 88 to 97.5 ft

PHOTO 40 – GH10-216 Box 7, 97.5 to 106 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 41 – GH10-216 Box 8, 106 to 113.5 ft

PHOTO 42 – GH10-216 Box 9, 113.5 to 122.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 43 – GH10-216 Box 10, 122.5 to 130 ft (EOH)

PHOTO 44 – GH10-217 Box 1 & 2, 0 to 34 ft

PHOTO 45 – GH10-217 Box 3 & 4, 34 to 64 ft

PHOTO 46 – GH10-217 Box 5 & 6, 64 to 90 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 47 – GH10-217 Box 7 & 8, 90 to 114 ft

PHOTO 48 – GH10-217 Box 9 & 10, 114 to 139 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 49 – GH10-217 Box 11, 139 to 144 ft (EOH)

PHOTO 50 – GH10-218 Box 1 & 2, 0 to 57 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 51 – GH10-218 Box 3, 57 to 64.5 ft

PHOTO 52 – GH10-218 Box 4 & 5, 64.5 to 92 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 53 – GH10-218 Box 6 & 7, 92 to 128 ft

PHOTO 54 – GH10-218 Box 8 & 9, 128 to 144 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 55 – GH10-219 Box 1 & 2, 0 to 50 ft

PHOTO 56 – GH10-219 Box 3 & 4, 50 to 63 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 57 – GH10-219 Box 5 & 6, 63 to 80 ft

PHOTO 58 – GH10-219 Box 7 & 8, 80 to 96 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 59 – GH10-219 Box 9 &10, 96 to 114 ft

PHOTO 60 – GH10-219 Box 11 & 12, 114 to 131 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 61 – GH10-219 Box 13 & 14, 131 to 151 ft

PHOTO 62 – GH10-219 Box 15, 151 to 158 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 63 – GH10-220 Box 1, 0 to 9 ft

PHOTO 64 – GH10-220 Box 2, 9 to 18 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 65 – GH10-220 Box 3, 18 to 27 ft

PHOTO 66 – GH10-220 Box 4, 27 to 37 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 67 – GH10-220 Box 5, 37 to 45 ft

PHOTO 68 – GH10-220 Box 6, 45 to 53 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 69 – GH10-220 Box 7, 53 to 61.5 ft

PHOTO 70 – GH10-220 Box 8, 61.5 to 70 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 71 – GH10-220 Box 9, 70 to 79 ft

PHOTO 72 – GH10-220 Box 10, 79 to 87.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 73 – GH10-220 Box 11, 87.5 to 97 ft

PHOTO 74 – GH10-220 Box 12, 97 to 105 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 75 – GH10-220 Box 13, 105 to 113.5 ft

PHOTO 76 – GH10-220 Box 14, 34 to 64 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 77 – GH10-220 Box 15, 122 to 130 ft

PHOTO 78 – GH10-220 Box 16, 130 to 139 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 79 – GH10-220 Box 17, 139 to 147.5 ft

PHOTO 80 – GH10-220 Box 18, 147.5 to 156 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 81 – GH10-220 Box 19, 156 to 164.5 ft

PHOTO 82 – GH10-220 Box 20, 164.5 to 172.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 83 – GH10-220 Box 21, 172.5 to 181.5 ft

PHOTO 84 – GH10-220 Box 22, 181.5 to 190 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 85 – GH10-220 Box 23, 190 to 199 ft

PHOTO 86 – GH10-220 Box 24, 199 to 207.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 87 – GH10-220 Box 25, 207.5 to 217 ft

PHOTO 88 – GH10-220 Box 26, 217 to 225 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 89 – GH10-220 Box 27, 225 to 234.5 ft

PHOTO 90 – GH10-220 Box 28, 234.5 to 240 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 91 – GH10-220 Box 29, 240 to 248.5 ft

PHOTO 92 – GH10-220 Box 30, 248.5 to 257 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 93 – GH10-220 Box 31, 257 to 264 ft

PHOTO 94 – GH10-220 Box 32, 264 to 272.5 ft

PHOTO 95 – GH10-220 Box 33, 272.5 to 281 ft

PHOTO 96 – GH10-220 Box 34, 281 to 290 ft

PHOTO 97 – GH10-220 Box 35, 290 to 299 ft

PHOTO 98 – GH10-220 Box 36, 299 to 307 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 99 – GH10-220 Box 37, 307 to 316 ft

PHOTO 100 – GH10-220 Box 38, 316 to 323.5 ft

PHOTO 101 – GH10-220 Box 39, 323.5 to 332 ft

PHOTO 102 – GH10-220 Box 40, 332 to 340 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 103 – GH10-220 Box 41, 340 to 349 ft

PHOTO 104 – GH10-220 Box 42, 349 to 356.5 ft

PHOTO 105 – GH10-220 Box 43, 356.5 to 365 ft

PHOTO 106 – GH10-220 Box 44, 365 to 374 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 107 – GH10-220 Box 45, 374 to 383 ft

PHOTO 108 – GH10-220 Box 46, 383 to 392 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 109 – GH10-220 Box 47, 392 to 400.7 ft

PHOTO 110 – GH10-220 Box 48, 400.7 to 409 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 111 – GH10-220 Box 49, 409 to 418 ft

PHOTO 112 – GH10-220 Box 50, 418 to 426 ft

PHOTO 113 – GH10-220 Box 51, 426 to 435.5 ft

PHOTO 114 – GH10-220 Box 52, 435.5 to 444 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 115 – GH10-220 Box 53, 444 to 452 ft

PHOTO 116 – GH10-220 Box 54, 452 to 461 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 117 – GH10-220 Box 55, 461 to 470 ft

PHOTO 118 – GH10-220 Box 56, 470 to 479 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 119 – GH10-220 Box 57, 479 to 487.5 ft

PHOTO 120 – GH10-220 Box 58, 487.5 to 496 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 121 – GH10-220 Box 59, 496 to 505 ft

PHOTO 122 – GH10-220 Box 60, 505 to 513 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 123 – GH10-220 Box 61, 513 to 521 ft

PHOTO 124 – GH10-220 Box 62, 521 to 530 ft

PHOTO 125 – GH10-220 Box 63, 530 to 539 ft

PHOTO 126 – GH10-220 Box 64, 539 to 547 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 127 – GH10-220 Box 65, 547 to 556.5 ft

PHOTO 128 – GH10-220 Box 66, 556.5 to 565 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 129 – GH10-220 Box 67, 565 to 573 ft

PHOTO 130 – GH10-220 Box 68, 573 to 581 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 131 – GH10-220 Box 69, 581 to 589.5 ft

PHOTO 132 – GH10-220 Box 70, 589.5 to 597.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 133 – GH10-220 Box 71, 597.5 to 600 ft (EOH)

PHOTO 134 – GH10-221 Box 1 & 2, 0 to 45 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 135 – GH10-221 Box 3 & 4, 45 to 93 ft

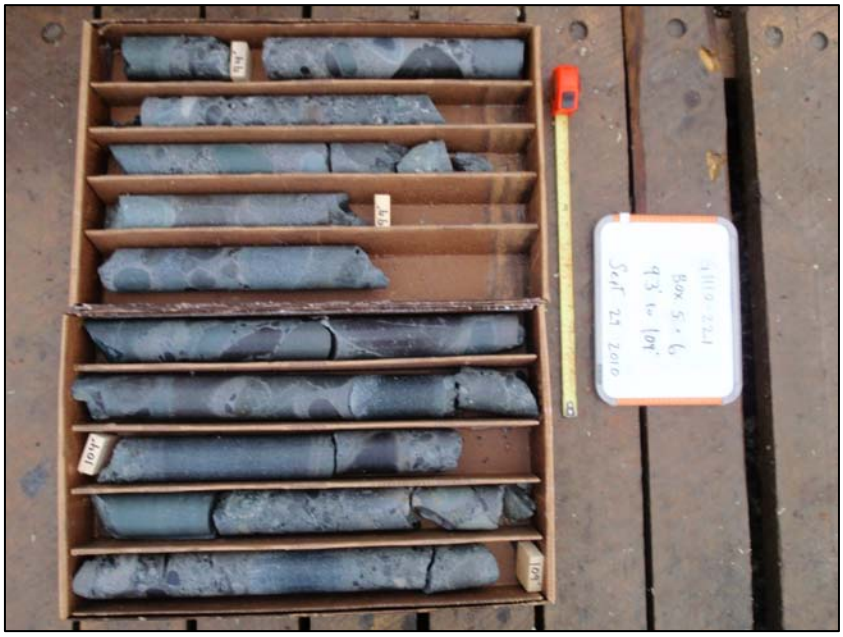

PHOTO 136 – GH10-221 Box 5 & 6, 93 to 109 ft

PHOTO 137 – GH10-221 Box 7 & 8, 109 to 126 ft

PHOTO 138 – GH10-221 Box 9 & 10, 126 to 139 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 139 – GH10-222 Box 1 & 2, 0 to 55 ft

PHOTO 140 – GH10-222 Box 3 & 4, 55 to 82 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 141 – GH10-222 Box 5 & 6, 82 to 100 ft

PHOTO 142 – GH10-222 Box 7 & 8, 100 to 118 ft

PHOTO 143 – GH10-222 Box 9 & 10, 118 to130 ft (EOH)

PHOTO 144 – GH10-223 Box 1 & 2, 0 to 35 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 145 – GH10-223 Box 3 & 4, 35 to 55 ft

PHOTO 146 – GH10-223 Box 5, 55 to 63.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 147 – GH10-223 Box 6 & 7, 63.5 to 80 ft

PHOTO 148 – GH10-223 Box 8 & 9, 80 to 97 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 149 – GH10-223 Box 10 & 11, 97 to 110 ft (EOH)

PHOTO 150 – GH10-224 Box 1 & 2, 0 to 25 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 151 – GH10-224 Box 3, 25 to 37 ft

PHOTO 152 – GH10-224 Box 4, 37 to 45 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 153 – GH10-224 Box 5, 45 to 53.5 ft

PHOTO 154 – GH10-224 Box 6, 53.5 to 61.7 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 155 – GH10-224 Box 7, 61.7 to 70 ft

PHOTO 156 – GH10-224 Box 8, 70 to 80 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 157 – GH10-225 Box 1, 0 to 9 ft

PHOTO 158 – GH10-225 Box 2, 9 to 19 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 159 – GH10-225 Box 3, 19 to 30 ft

PHOTO 160 – GH10-225 Box 4, 30 to 40 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 161 – GH10-225 Box 5, 40 to 49 ft

PHOTO 162 – GH10-225 Box 6, 49 to 57.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 163 – GH10-225 Box 7, 57.5 to 65 ft

PHOTO 164 – GH10-225 Box 8, 65 to 77 ft

PHOTO 165 – GH10-225 Box 9, 77 to 83.5 ft

PHOTO 166 – GH10-225 Box 10, 83.5 to 92 ft

PHOTO 167 – GH10-225 Box 11, 92 to 100 ft

PHOTO 168 – GH10-225 Box 12, 100 to 108 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 169 – GH10-225 Box 13, 108 to 116.5 ft

PHOTO 170 – GH10-225 Box 14, 116.5 to 125 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 171 – GH10-225 Box 15, 125 to 133.5 ft

PHOTO 172 – GH10-225 Box 16, 133.5 to 142 ft

PHOTO 173 – GH10-225 Box 17, 142 to 150 ft

PHOTO 174 – GH10-225 Box 18, 150 to 159 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 175 – GH10-225 Box 19, 159 to 166.5 ft

PHOTO 176 – GH10-225 Box 20, 166.5 to 174 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 177 – GH10-225 Box 21, 174 to 182 ft

PHOTO 178 – GH10-225 Box 22, 182 to 190 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 179 – GH10-225 Box 23, 190 to 198.5 ft

PHOTO 180 – GH10-225 Box 24, 198.5 to 207 ft

PHOTO 181 – GH10-225 Box 25, 207 to 215 ft

PHOTO 182 – GH10-225 Box 26, 215 to 222.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 183 – GH10-225 Box 27, 222.5 to 230 ft

PHOTO 184 – GH10-225 Box 28, 230 to 238.1 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 185 – GH10-225 Box 29, 238.1 to 246.7 ft

PHOTO 186 – GH10-225 Box 30, 246.7 to 255 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 187 – GH10-225 Box 31, 255 to 263.2 ft

PHOTO 188 – GH10-225 Box 32, 263.2 to 272 ft

PHOTO 189 – GH10-225 Box 33, 272 to 280 ft

PHOTO 190 – GH10-225 Box 34, 280 to 288.5 ft

PHOTO 191 – GH10-225 Box 35, 288.5 to 297 ft

PHOTO 192 – GH10-225 Box 36, 297 to 305 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 193 – GH10-225 Box 37, 305 to 313.5

PHOTO 194 – GH10-225 Box 38, 313.5 to 321.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 195 – GH10-225 Box 39, 321.5 to 330 ft

PHOTO 196 – GH10-225 Box 40, 330 to 338.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 197 – GH10-225 Box 41, 338.5 to 346.5 ft

PHOTO 198 – GH10-225 Box 42, 346.5 to 355 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 199 – GH10-225 Box 43, 355 to 363.5 ft

PHOTO 200 – GH10-225 Box 44, 363.5 to 371.5 ft

PHOTO 201 – GH10-225 Box 45, 371.5 to 380 ft

PHOTO 202 – GH10-225 Box 46, 380 to 388 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 203 – GH10-225 Box 47, 388 to 395 ft

PHOTO 204 – GH10-225 Box 48, 395 to 403 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 205 – GH10-225 Box 49, 403 to 411.5 ft

PHOTO 206 – GH10-225 Box 50, 411.5 to 420 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 207 – GH10-225 Box 51, 420 to 428.5 ft

PHOTO 208 – GH10-225 Box 52, 428.5 to 437 ft

PHOTO 209 – GH10-225 Box 53, 437 to 446 ft

PHOTO 210 – GH10-225 Box 54, 446 to 455 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 211 – GH10-225 Box 55, 455 to 464 ft

PHOTO 212 – GH10-225 Box 56, 464 to 472.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 213 – GH10-225 Box 57, 472.5 to 482 ft

PHOTO 214 – GH10-225 Box 58, 482 to 491 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 215 – GH10-225 Box 59, 491 to 500 ft

PHOTO 216 – GH10-225 Box 60, 500 to 506.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 217 – GH10-225 Box 61, 506.5 to 515.5 ft

PHOTO 218 – GH10-225 Box 62, 515.5 to 525 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 219 – GH10-225 Box 63,525 to 533.5 ft

PHOTO 220 – GH10-225 Box 64, 533.5 to 542 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 221 – GH10-225 Box 65, 542 to 550 ft

PHOTO 222 – GH10-225 Box 66, 550 to 559 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 223 – GH10-225 Box 67, 559 to 567 ft

PHOTO 224 – GH10-225 Box 68, 567 to 576.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 225 – GH10-225 Box 69, 576.5 to 586.5 ft

PHOTO 226 – GH10-225 Box 70, 586.5 to 595 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 227 – GH10-225 Box 71, 595 to 600 ft (EOH)

PHOTO 228 – GH10-226 Box 1 & 2, 5 to 70 ft

PHOTO 229 – GH10-226 Box 3 & 4, 70 to 145 ft

PHOTO 230 – GH10-226 Box 5, 145 to 160 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 231 – GH10-227 Box 1, 0 to 30 ft

PHOTO 232 – GH10-227 Box 2 & 3, 30 to 48.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 233 – GH10-227 Box 4 & 5, 48.5 to 79 ft

PHOTO 234 – GH10-227 Box 6 & 7, 79 to 98 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 235 – GH10-227 Box 8 & 9, 98 to 117 ft

PHOTO 236 – GH10-227 Box 10 & 11, 117 to 135.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 237 – GH10-227 Box 12 & 13, 135.5 to 153 ft

PHOTO 238 – GH10-227 Box 14 & 15, 153 to 171.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

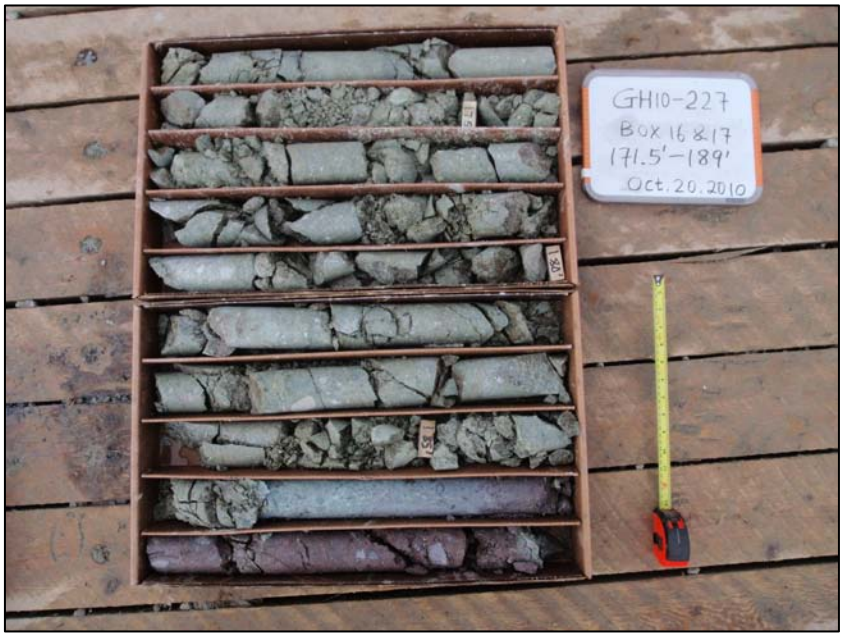

PHOTO 239 – GH10-227 Box 16 & 17, 171.5 to 189 ft

PHOTO 240 – GH10-228 Box 18 & 19, 189 to 200 ft (EOH)

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 241 – GH10-228 Box 1 & 2, 0 to 45 ft

PHOTO 242 – GH10-228 Box 3 & 4, 45 to 71.5 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

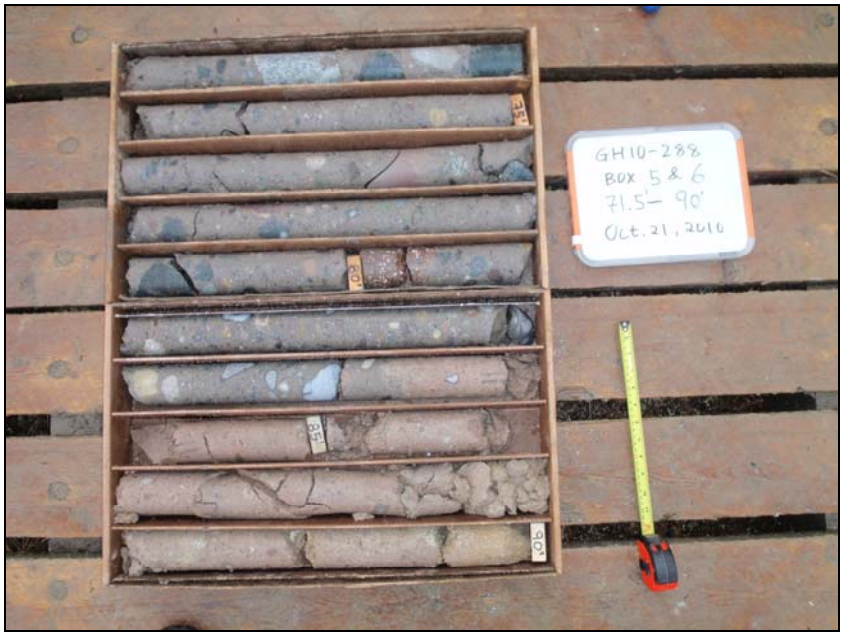

PHOTO 243 – GH10-228 Box 5 & 6, 71.5 to 90 ft

PHOTO 244 – GH10-228 Box 7 & 8, 90 to 109 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

PHOTO 245 – GH10-228 Box 9 & 10, 109 to 126.5 ft

PHOTO 246 – GH10-228 Box 11 & 12, 126.5 to 144 ft

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PEBBLE PROJECT

PHOTO 247 – GH10-228 Box 13 & 14, 144 to 162.5 ft

PHOTO 248 – GH10-228 Box 15 & 16, 162.5 to 181 ft

PEBBLE LIMITED PARTNERSHIP
PEBBLE PROJECT

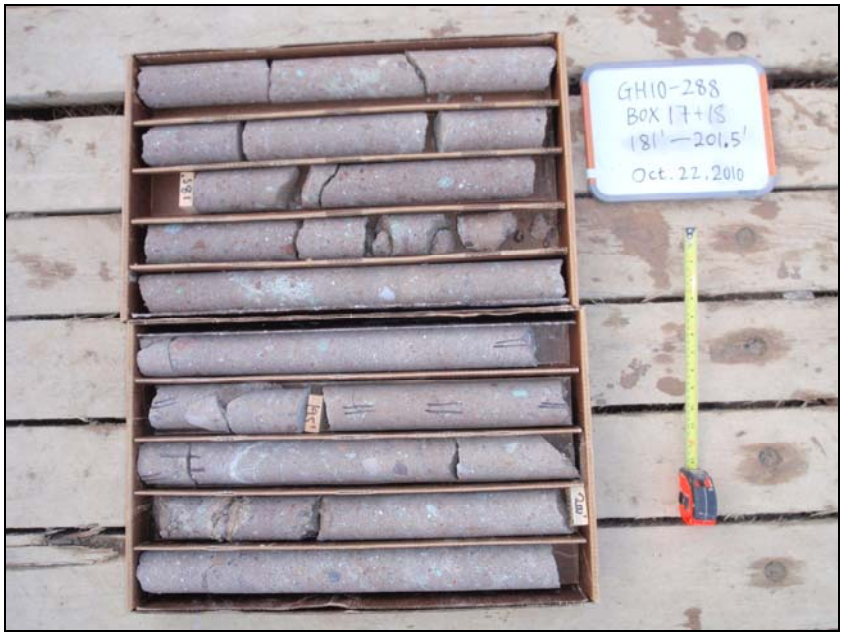

PHOTO 249 – GH10-228 Box 17 & 18, 181 to 201.5 ft

PHOTO 250 – GH10-228 Box 19 & 20, 201.5 to 221.5 ft

PHOTO 251 – GH10-228 Box 21 & 22, 221.5 to 240 ft (EOH)

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