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ANVIL RANGE MINING CORPORATION
INTERIM RECEIVERSHIP
PHASE 1 BORROW SOURCE SURVEY

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1. INTRODUCTION

1.1 Work Scope and Objectives

The Anvil Range Mining Complex, which comprises the Faro and Vangorda Plateau mines, is located in the central Yukon Territory, as shown on Figure 1. The owner, Anvil Range Mining Corporation, is currently in receivership and the mining facilities are being managed by Deloitte & Touche, LLP (Deloitte). This Phase 1 Borrow Source report addresses Task 2.3 of the work plan presented in the report on the Closure Alternatives Workshop (Deloitte, April 2002). The task description provided in the workshop report comprised the following activities:

- Compile material requirements (type and amount) for various granular, construction and erosion protection needs.
- Compile baseline summary of borrow quarry site presently existing on-site with a summary of expected material quantities available.
- Undertake terrain mapping to identify other potential sources of material existing on the current mine leases.
- Undertake reconnaissance site visit to inspect and confirm existing borrow/quarry sites and inspect and sample (likely shallow drilling and/or test pitting) new identified sites.
- Provide an assessment report outlining expected material types, quantities and location with recommendations for follow-up work.

The material types that were targeted in this Phase 1 study included:

- *Low permeability soils* for construction of covers over waste materials,
- *Granular soils* for use as erosion protection, drain material and concrete aggregate,
- *Coarse rock fill* for erosion protection in channels,

- *Organic soils* for establishing vegetative covers, and
- *General fills* for covers, slope stabilization and other potential needs.

1.2 Background

The Anvil Range Mining Complex consists of two mine sites, Faro and Vangorda Plateau, which are approximately 15 km apart. The original open pit mining and all milling and tailings deposition took place on the Faro mine site. Two additional open pits (Vangorda and Grum) are located on the Vangorda Plateau mine site but no milling or tailings deposition took place there. The two mine sites are connected by a haul road, which was used to truck ore from the Vangorda Plateau to the Faro mill. Lead and zinc concentrate and small quantities of silver and gold were the minerals of economic importance. Mining operations ceased in January 1998 when Anvil Range Mining Corporation filed for creditor protection. Deloitte & Touche Inc. was appointed Interim Receiver of Anvil Range in April 1998 and has overseen the management of the property under the terms of the water licences since that time. In addition, the Interim Receiver is responsible for:

- The identification and definition of remediation projects that can be proposed as part of the Water Licence renewal, i.e., to be completed 2003-2008; and
- The identification of critical information needs for the Water Licence renewal and the Integrated Comprehensive Abandonment Plan (ICAP) that will need to be finalized by 2008.

ICAP activities are likely to involve relatively large volumes of materials for purposes such as covers and channel protection. The development of closure plans and related cost estimations require an understanding of the available volume, quality and location of potential borrow sources. Borrow source surveys are often split into two or more phases, of which the first phase usually concentrates on a review of maps and aerial photos, followed by a limited period of field verification. This report addresses the first phase and provides conclusions and recommendations for more detailed Phase 2 investigation as defined in Task 2.4 of the work plan. This report presents the results of the Phase 1 borrow source survey, which is essentially a baseline summary of borrow materials existing on site.

The types and approximate volumes of materials required for various granular, construction and erosion protection needs will be determined based, in part, on the results of scoping studies (Tasks 3.1, 4.1 and 5.1) currently underway.

1.3 Previous Work

Previous related studies of the Faro-Vangorda area include:

- Klohn Leonoff, 1981. Faro Tailings Abandonment Plan.
- Jackson, L.E., Jr. 1993. Surficial Geology, Magundy River, Yukon Territory: Geological Survey of Canada, Map 1821A, scale 1:100,000.
- Bond, Jeffrey D., 2001. Quaternary Geology and Till Geochemistry of the Anvil District (parts 105K/2, 3, 5, 6 and 7) central Yukon Territory.

The Klohn Leonoff report refers to previous surficial geology mapping studies by Tempelman-Kluit (1972, 1980), bedrock maps by CAMC and other reports by Golder Associates, including air photo studies and borehole drilling.

The Quaternary geological mapping work by Bond forms the basis of the surficial geology maps and prospective borrow areas presented in this report. This study also includes interpretation of air photos (dating from around 1990) for the tailings dam complex and freshwater dam areas at the Faro mine site.

2. SITE CONDITIONS

The following description of the conditions at the Anvil Range Mining Complex is largely taken from Bond (2001).

2.1 Location and Physiography

Faro mine is located within the Anvil District, which is located within the Yukon Plateau physiographic subdivision. The Anvil Range lies at the core of the district, with summits rising above 1800m and intermediate surfaces, such as Vangorda Plateau, that flank the uplands.

2.2 Bedrock Geology

The stratigraphic sequence comprising the Anvil District extends from the Precambrian to the Ordovician and includes the Mount Mye, Vangorda and Menzie Creek Formations. The Mount Mye and Vangorda Formations comprise deep marine schist and phyllite sequences with other minor lithologies. The mid Cretaceous Anvil Range plutonic suite (batholith) intrudes these rocks and is comprised of granite, granodiorite and quartz monzanite lithologies. Regional dips of the metasediments are to the southwest and northeast away from the batholith. Target materials for coarse and durable riprap material generally include the coarse-grained igneous rocks (granite, diorite and granodiorite) and more competent (weakly foliated) schists and phyllites.

2.3 Surficial Geology

The Anvil District has been subject to repeated glaciation. The last glaciation occurred between 25,000 and 10,000 years ago late (Wisconsinan McConnell glaciation). Significant surficial materials were deposited during this period including morainal till veneers (<1m thick) and till blankets (>1m thick). Glaciofluvial and glaciolacustrine deposits are generally located on lower range slopes flanking active drainage channels. Recent alluvium and organic (sporadic) deposits are found throughout the area with veneers of colluvium blanketing upland slopes.

The surficial geology of the Faro mine site area is shown on Figure 2 and the Vangorda-Grum area on Figure 3, both taken from Bond (2001). The most significant surficial geologic units with respect to this study are described below. The abbreviated material descriptions which normally appear as two letters in brackets

(one upper case and one lower case), are explained in the legend provided on Figures 2 and 3.

Alluvial Deposits

The alluvial materials comprise alluvial plain (Ap), terrace (At), fan (Af) and complex (Ax) deposits and generally consist of sand, silt, pebble, cobble and boulder mixtures. They may be up to 10m thick and the fan deposits may be greater than 10m thick. These deposits occur within the main drainages and are up to 600m wide in the Rose Creek valley and 50m wide in the North Fork Rose Creek and Next Creek valleys (Figure 2). The alluvial fan deposits consist of coarse sand, pebbles cobbles and mudflow deposits up to or greater than 10m thick. The alluvial plain deposits consist of silt, sand and pebbles with reworked cobbles and boulders and are up to 10m thick. These materials mostly consist of 'clean' granular materials (sand to boulder size) and form important existing and future target borrow materials.

Colluvial Deposits

The colluvial deposits generally consist of gravels with lenses of sand and silt and are found on slopes and at the base of slopes. They generally occur as thin veneers (Cv) less than 1m thick, or as aprons (Ca) which have coalesced at the base of slopes. Colluvial deposits most commonly overlie bedrock above the treeline, but also overlie older morainal till deposits on lower slopes.

Glaciofluvial Deposits

The glaciofluvial deposits consist of stratified to massive, poorly to well sorted, gravel and sand with minor silt and cobbles, deposited by meltwater originating from glacial ice. These deposits are common in Rose Creek and the major northeast tributaries. Important derivatives include the glaciofluvial plain (Gp) deposits from 3m to 10m thick and glaciofluvial complex (Gx) deposits up to 40m thick.

Glacial Till

Till deposits generally consist of unsorted clay, silt, sand, pebbles and cobbles with minor boulders, deposited by or from glacial ice. Till is common as a veneer (Tv, <1m thick) over much of the Faro and Vangorda-Grum areas and grades into blanket deposits (Tb, >1m thick) on more gentle slopes and valley bottoms.

Organic Deposits

Organic deposits ("O") mostly consist of peat and woody material and overlie lacustrine, till or poorly drained glaciofluvial and alluvial deposits, but rarely occur as a significant geologic deposit.

3. BORROW SITES

3.1 Required Materials

Required borrow materials for future mine maintenance and closure are described below:

- low permeability soils for construction of covers over waste materials,
- granular soils for use as erosion protection, drain material and concrete aggregate,
- coarse rock fill for erosion protection in channels,
- organic soils for establishing vegetative covers, and
- general fills for covers, slope stabilization and other potential needs.

A summary of required borrow materials and corresponding target geological units is presented in Table 3.1. Soil classification symbols used to describe the soils, where possible, are summarized in Table 3.2.

Table 3.1
Required Borrow Materials and Target Geological Units

Required Borrow Material	Target Geological Units
Low Permeability Soils	• Glacial till deposits (Tv, & Tb)
Granular Soils	• Alluvial deposits (Af, Ap, At & Ax), and • Glaciofluvial deposits (Gp, Gx, Gc & Gt)
Organic Soils	• Organics (O)
General Fills	• Glacial till, glaciofluvium and alluvium
Coarse Rock Fill	• Screened material from alluvium & glaciofluvium • Quarry bedrock material

Table 3.2
Unified Soil Classification Symbols

Description			Soil Classification Symbols
Coarse grained (more than 50% larger than 63µm No. 200 US sieve size)	Gravels (more than 50% of coarse fraction of gravel size)	Well graded gravels, sandy gravels, with little or no fines	GW
		Poorly graded gravels, sandy gravels, with little or no fines	GP
		Silty gravels, silty sandy gravels	GM
		Clayey gravels, clayey sandy gravels	GC
	Sands (more than 50% of coarse fraction of sand size)	Well graded sands gravelly sands, with little or no fines	SW
		Poorly graded sands, gravelly sands, with little or no fines	SP
		Silty sands	SM
		Clayey sands	SC
Fine grained (more than 50% smaller than 63µm No. 200 US sieve size)	Silts and clays (liquid limit less than 50)	Organic silts, silty or clayey fine sands, with light plasticity	ML
		Inorganic clays, silty clays, sandy clays of low plasticity	CL
		Organic silts and organic silty clays of low plasticity	OL
	Silts and clays (liquid limit greater than 50)	Inorganic silts of high plasticity	MH
		Inorganic clays, silty clays, sandy clays of low plasticity	CH
		Organic clays of high plasticity	OH
Highly organic soils		Peat and other highly organic soils	Pt

3.2 Existing Faro Borrow Sites

Several existing borrow sites were visited during the recent reconnaissance field trip for the Phase 1 borrow source investigation. The characteristics and uses of these sites were noted and samples taken at selected locations for laboratory testing work.

3.2.1 Haul Road Borrow Site

The haul road borrow site is located just off the Vangorda-to-Faro haul road, near the North Fork Rose Creek rock drain outlet (Photo 1, Figure 2). Bond (2001) mapped the site as glaciofluvial complex (Gx). Local contractors are currently screening 10,000m^3 of cobbles and boulders (20, 40 and 60cm gradations) for lining of the Faro Creek diversion around the north side of the Faro open pit.

According to laboratory gradation tests, the material is greenish brown, poorly graded sand with gravel (SP). The cobble and boulder component was not sampled and tested in the laboratory. The deposit has been worked over a wide area (80,000m^2) and there appears to be substantial remaining reserves, possibly between 150,000m^3 to 300,000m^3. This material can be processed for both coarse grained riprap material as well as fine-grained granular fills.

3.2.2 Rose Creek Borrow Site

The Rose Creek borrow site is located approximately 1km downstream of the Cross Valley Dam (most westerly dam at the Rose Creek tailings storage facility) on the right bank of Rose Creek (Photo 4, Figure 2). The borrow site includes three existing borrow areas located within alluvial fan (Af) and glaciofluvial plain (Gp) deposits. The materials, excluding the cobble and boulder fraction, consist of poorly graded gravel with sand (GP) and silty gravel with sand (GM). There are frequent cobble-sized clasts and occasional boulders.

The three existing borrow sites cover a combined area of approximately 120,000m^2. Assuming an average depth of 3m over an available reserve area of 500,000m^2, there may be up to 1.5 million (M) m^3 of general granular fill available at the site. Much of the area appears to be mined out and, therefore, underlying and adjoining reserves will need to proved by more detailed site investigation, test pitting and laboratory testing.

3.2.3 Tailings Borrow Site

Granular material has been taken from three main borrow sites located between the North Wall Interceptor Ditch and north bank of the Intermediate Tailings Dam (Figure 2). These materials are mapped by Bond (2001) as a complex of colluvium veneer (Cv) and till blanket (Tb). The total area disturbed by borrow activity is approximately 250,000m^2. Scattered rock outcrops (closely fractured schist) were noted throughout the area. Both granular and low permeability (till) soil materials exist within these areas and probably both were borrowed for construction of the tailings facilities.

A sample taken from the uppermost borrow was rated as poorly graded sand with silt and gravel (SP-SM), which is probably indicative of the surficial colluvium (Cv) material. Typical till blanket (Tb) materials exposed in the lower middle borrow site are shown in Photo 3. There appears to be an abundance of till materials remaining at these borrow sites, but not much clean granular material.

3.2.4 Rose Creek Diversion Quarry

The Rose Creek diversion quarry is located on the south side of the Rose Creek Diversion Channel, opposite the Intermediate Tailings Dam (Photo 2, Figure 2). Approximately 30,000m^3 of phyllite schist riprap has been quarried from the site to line the Rose Creek Diversion Channel. The schist is variably strong to very strong, slightly weathered (some moderately weathered) with closely to moderately widely spaced joints which produce cobble to boulder-sized blocks. This rock is of variable quality (fair to good) but the quarry could clearly be expanded with further outcrops noted upslope of the quarry face. The Rose Creek Diversion Channel currently cuts off access to the quarry.

3.3 Potential Faro Borrow Materials

3.3.1 Organic Soils

Organic soil deposits were mapped by Bond (2001) on the south facing slope west of the Faro mine complex (Figure 2). These were not visited during the recent Phase 1 site investigation. Assuming an average 1m thickness and variable composition, there may be 50,000 to 75,000m^3 of material available for use in establishing vegetative covers.

3.3.2 Low Permeable Soils

Low permeability till soils occur on the north bank of the Faro Creek diversion (Figure 2). They were rated in the laboratory as silty sand with gravel (SM) and are mapped by Bond as till and colluvium veneer (<1m) overlying bedrock (phyllite schist). There may be a reserve of around 50,000m^3 in this area.

3.4 Existing Vangorda-Grum Borrow Sites

3.4.1 AEX Creek Schist Quarry

The AEX Creek schist quarry is located in AEX Creek approximately 650m west of the ore haul shop. The old rock quarry site, which is now infilled with water (Photo 5, Figure 4), is mapped as till veneer overlying bedrock (Tv-R). The rock quality is variable and compromises approximately 70% slightly to moderately weathered, closely jointed, strongly foliated, strong schist and 30% slightly weathered, widely jointed, weakly foliated, very strong schist. Approximately 10,000m^3 of material appears to have been extracted from this quarry with a minor stockpile of the stronger rock remaining. Another 10,000m^3 of good rock may not be obtainable by drill and blast methods but the occurrence of good rock is patchy.

3.4.2 Grum Dump Quarry

The Grum Dump quarry is located on the south side of the Grum Dump (Figure 3), which is in an area mapped as till veneer (<1m) overlying bedrock (Tv-R). The existing reserve was pre-blasted back in 1997 and a total of 10,000m^3 is currently being processed as graded riprap for the Freshwater Supply Dam spillway lowering project. The pre-blasted material has a relatively high fines content (approximately 20%) because the source, a diorite dyke, was originally 'sub-cropping' with some till cover (Photo 6). The material is high quality dioritic rock, which is dark grayish green (with brown iron stained surfaces), slightly weathered, and very strong. The angular clasts range from gravel to large boulder (2m) size and are currently being screened as required for the Freshwater Supply Dam work (Photo 6). It is difficult to estimate the available reserve but there may be a further 30,000m^3 of useable riprap-grade rock (excluding the currently required 10,000m^3).

3.4.3 Moose Pond Borrow Site

The Moose Pond borrow site is located on the north bank of Vangorda Creek, opposite Little Creek Dam (Figure 3), in an area that is mapped as a complex glaciofluvial (Gx)

deposit. The deposit consists of gravelly coarse sand and some sandy gravel with silt. A lab sample was rated as well graded sand with gravel (SW). These materials have a dominant schist bedrock origin of which outcrops are scattered throughout the area. The deposit extends over an area of approximately 300m by 100m and is probably 2m thick on average. There may be a further reserve of between 30,000m^3 to 60,000m^3 useable material. These materials may be suitable for use as granular soils and/or general fills.

3.4.4 Grum Creek Borrow Site

The Grum Creek borrow site is located within the Grum Creek catchment on the eastern margin of the Grum waste rock dump (Photo 7, Figure 3). This area is mapped as complex glaciofluvial deposit (Gx). Lab results show that the material consists of well graded sand with gravel and silt (SW-SM). This deposit extends over an approximate area of 50,000m^2. With a probable average thickness of 1 to 2m, there may be further available reserves of between 50,000m^3 to 100,000m^3 in this area. These materials may be suitable for use as granular soils and/or general fills.

3.5 Potential Vangorda-Grum Borrow Materials

3.5.1 Organic Soils

Two areas of organic soil have been mapped by Bond (2001) approximately 0.5km (North Fork Shrimp Creek) and 1.0km east of the Vangorda waste dump, respectively (Figure 3). These areas were not visited during the recent Phase 1 site visit. According to Bond (2001), they are likely to consist of fine-grained ash and peat deposits, which may be suitable for establishing vegetative covers.

3.5.2 Low Permeability Soils

Low permeability soil deposits in the Vangorda-Grum area include the Grum overburden dump stockpile (mostly till material) and two extensively mapped areas of till blanket (Tb), referenced as East Vangorda and North Grum, as shown on Figure 3. These materials generally consist of gravelly silt and silty gravel with minor clay and are probably suitable for use as construction covers over waste materials. The Grum overburden dump contains in excess of 1Mm^3 of stockpiled till material.

3.5.3 Granular Soils

Complex glaciofluvial materials are mapped in upper Vangorda Creek, approximately 300m up from the Vangorda flume headworks (Figure 3). This area was not visited during the recent Phase 1 site visit, but may contain a significant reserve (500,000m^3+) of material suitable for use as granular soils and general fills.

3.6 Off-site Borrow Locations

An existing sand and gravel borrow and a potential rock quarry site were visited on the access road between Faro townsite and the Faro mine site. Both sites are located near the old Vangorda-Grum access road turn-off and were sampled for laboratory testing work.

3.6.1 Faro Mine Road Borrow Site

This deposit is located on the Faro Mine Road, approximately 1.5km back from the old Vangorda-Grum turn-off (Figure 4). This is an active Transport Maintenance gravel pit called Drury Creek 105-K-06. Bond (2001) mapped this deposit as complex glaciofluvium (Gx), which rated in the lab as well graded gravel with sand (GW). The available reserve may be up to 200,000m^3 but its potential utilization will depend on ownership and availability.

3.6.2 Faro Mine Road Granitic Outcrop

Extensive outcrop of granitic bedrock was visited on the Faro Mine Road at the old Vangorda-Grum turnoff (Figure 4). Outcrop ridges can be seen scattered over a wide area approximately 500m by 500m. The rock is generally slightly weathered and strong to very strong with moderately widely to widely spaced joints (Photo 8). Joint surfaces are planar-rough and moderately persistent (2-3m+) with iron staining and no infill. This appears to be a very good potential rock quarry site, which is reasonably close to both mine areas.

4. BORROW DATA

4.1 Soil Laboratory Testing Data

Soil samples were taken from six existing granular soil borrow sites and one prospective low permeability borrow soil site. Summary gradation data are presented in Table 4.1 and detailed results data are presented in Appendix A. These results do not include the cobbles and boulder size fraction that occur within the granular deposits in the field.

Table 4.1
Grain Size Testing Results and Soil Classification data

Material Type	Site	Sample ID	Gradation (%)			USC	Description
			Gravel	Sand	Fines		
Granular Soils [Glaciofluvial & Alluvial Deposits]	Faro: Haul Road	Haul	48	48	5	SP	Poorly graded sand with gravel
	Faro: Rose Creek	Brrw-10	50	39	11	GP-GM	Poorly graded gravel with sand, silty gravel with sand
	Faro: Tailings	Brrw-3	36	58	7	SP-SM	Poorly graded sand with silt and gravel
	VanG: Moose Pond	Gvb-4	41	56	3	SW	Well graded sand with gravel
	VanG: Grum Ck	Gvb-3	39	54	7	SW-SM	Well graded sand with gravel and silt
	Faro Mine Road	Road	57	42	1	GW	Well graded gravel with sand
Low Perm Soil (Till)	Faro: Faro Diversion	FDD-1	13	46	42	SM	Silty sand (with gravel)

USC: Unified Soil Classification symbol
Faro: Faro borrow site
VanG: Vangorda -Grum borrow site

The results show that granular soils from existing borrow sources in the Faro area generally contain poorly graded sand and gravel with some silt (SP-SM and GP-GM). Granular materials from existing borrow sources in the Vangorda-Grum area and along the Faro Mine Road generally contain well-graded sand and gravel with some silt (SW-SM and GW). The material from the Faro Creek diversion area, generally representative of low permeability till blanket materials, contain silty sand with gravel (SM).

4.2 Estimated Material Reserves

The estimated soil borrow and rock quarry reserves are presented, by site, in Table 4.2 below. These are very approximate estimations that will require verification as part of the Phase 2 borrow investigation.

There is an abundance of low permeability soils for construction of covers overlying waste materials in the Faro and Vangorda-Plateau area. Of particular note, careful consideration should be given to utilization of stockpiled till within the overburden dumps. For example, the Grum overburden dump, where there is probably more 1Mm^3 of suitable material, should be sampled and tested.

Organic soil deposits for establishing vegetative covers are identified on the surficial geological maps but have not been visited. They should be investigated and sampled during the Phase 2 investigations.

Granular soils for use as erosion protection, drain material and concrete aggregate, are abundant within the glaciofluvial and alluvial deposits located throughout the mine site. There are between 80,000 and 160,000m^3 of inferred reserves in the Vangorda Plateau area, at the Moose Pond and Grum Creek sites, and in the order of 500,000m^3+ in upper Vangorda Creek, although this site was not visited. In addition, up to 1.8Mm^3 are available in the Faro area at the haul road and Rose Creek sites. Another 200,000m^3 may be available at the Faro Mine Road site.

Coarse rock fill for erosion protection in channels is currently being borrowed from the Grum Dump quarry in the Vangorda-Grum area and the haul road borrow site in the Faro area. There are an estimated 40,000m^3 in the Vangorda-Grum area and 80,000m^3 in the Faro area. In addition, there is a prospective quarry along the Faro Mine Road.

General fills for use as covers, slope stabilization and other potential needs can be obtained from the various identified granular soil, low permeability soil or rock sites, as required, depending on the required quantities and specifications.

Table 4.2
Summary Quarry and Borrow Locations and Estimated Material Reserves

Material Type	Area	Sites	Inferred Volumes	Comments
Low Permeability Soils	Vangorda	Grum Overburden Dump	1Mm^3+	Stockpiled material – mostly low perm till blanket material
		East Vangorda	Unknown	Till blanket materials
		North Grum	Unknown	
	Faro	Faro Creek Diversion	50,000m^3	Till blanket materials
		Tailings	100,000m^3	
Organic Soils	Vangorda	East of Vangorda Dump	Unknown	Organic deposits Two unexplored areas
	Faro	Faro West	50-75,000m^3	Organic deposits
Granular Soils	Vangorda	Moose Pond	30-60,000m^3	Glaciofluvial Deposits
		Grum Creek	50-100,000m^3	
		U. Vangorda Ck	500,000m^3+	
	Faro	Haul Road	150-300,000m^3	Glaciofluvial and alluvial deposits
		Rose Creek	1.5Mm^3	
	Road	Faro Mine Road	200,000m^3	Glaciofluvial deposits
Coarse Rock Fill	Vangorda	Grum Dump	30,000m^3	Pre-blasted diorite dyke v. good quality rock
		AEX Creek	10,000m^3	Phyllite schist - variable quality
	Faro	Haul Road	50,000m^3	Screened cobbles & boulders
		Rose Creek Diversion	30,000m^3	Phyllite schist - variable quality
	Road	Faro Mine Road	Unknown	Road-side granite outcrop

5. CONCLUSIONS

1. A summary of the required borrow materials and respective target geological units is presented below.

Required Borrow Material	Target Geological Units
Low Permeability Soils	Glacial till deposits (Tv, & Tb)
Granular Soils	Alluvial deposits (Af, Ap, At & Ax), and Glaciofluvial deposits (Gp, Gx, Gc & Gt)
Organic Soils	Organics (O)
General Fills	Till, glaciofluvial and alluvial deposits
Coarse Rock Fill	Screened cobbles/boulders from alluvial & glaciofluvial deposits Quarry bedrock material

2. The Phase 1 borrow source survey, which is largely a desk-top study of previous work indicates there are viable occurrences of all the required borrow materials within target geological units in the vicinity of the Faro and Vangorda Plateau areas.
3. Laboratory testing results show that granular soils from existing borrow sources in the Faro area generally contain poorly-graded sand and gravel with some silt (SP-SM and GP-GM). Granular materials from existing borrow sources in the Vangorda-to-Faro haul road area generally contain well-graded sand and gravel with some silt (SW-SM and GW).
4. There is an abundance of low permeability soils for construction of covers over waste materials in the Faro and Vangorda Plateau areas. Stockpiled till material within the overburden dumps should be sampled and tested for potential use.
5. There are between 80 and 160,000m^3 inferred reserves of granular soil material in the Vangorda area at the Moose Pond and Grum Creek sites, and up to 1.8Mm^3 in the Faro area at the haul road and Rose Creek sites. Another 200,000m^3 may be available at the Faro Mine Road site.
6. Organic soil deposits for establishing vegetative covers have been identified on the surficial geological maps but have not been visited. They should be investigated and sampled during the Phase 2 investigations.
7. General fills for use as covers, slope stabilization and other potential needs can be obtained from the various identified granular soil, low permeability soil or rock sites as required depending on the required quantities and specifications.

6. RECOMMENDATIONS

The objectives and work scope for the Phase 2 borrow investigation, to provide further detailed assessment of potential borrow sources, is based on this Phase 1 report, and revised quantity requirements.

6.1 Field Program

The recommended Phase 2 field program is presented in Table 4 below.

Table 6.1
Recommended Phase 2 Borrow Investigation Field Program

Material Type	Area	Sites	Test Pits	Comments
Low Permeability Soils	Vangorda	Grum Overburden Dump	4	Stockpiled material – mostly low perm till blanket material
		East Vangorda	1	Till blanket materials
		North Grum	1	1 field day
	Faro	Faro Creek Diversion	2 probably	Need access across diversion
		Tailings	4-6	1 field day
Organic Soils	Vangorda	East of Vangorda Dump	2	Depending on access (1 field day with Van & low perm)
	Faro	Faro West	None	Hand sample and map
Granular Soils	Vangorda	Moose Pond	4	I field day
		Grum Creek	4	
		U. Vangorda Ck	2	
	Faro	Haul Road	8-10	3 field days
		Rose Creek	16-20	
	Road	Faro Mine Road	None	Ownership issues to be explored
Coarse Rock Fill	Vangorda	Grum Dump	None (1-2)	Detailed mapping
		AEX	Map and Sample	Variable quality Phyllite schist
	Faro	Haul Road	As above	Screened cobbles & boulders
		Rose Creek Diversion	Map and Sample	Variable quality 1 day with Faro organics
	Road	Faro Mine Road	Map and Sample	Road-side granite outcrop 1 day with AEX & Grum Dump
Totals			46-56	8 field days (6 with excavator)

The recommended Phase 2 field program includes 8 days in the field, six of which require an excavator to dig approximately 50 test pits. The bulk of the pits will be excavated within and adjacent to the existing granular soil borrow sites. Some test pits

may be dug at the organic soil sites depending on access, otherwise they may be hand sampled.

We do not recommend any drilling at the rock quarry site at this stage but they should be revisited and mapped and sampled in more detail. Drilling work should be performed when detailed quantity requirements and specifications are known.

6.2 Laboratory Testing Program

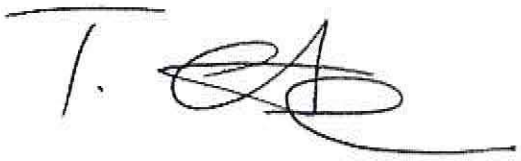
Supporting quality control testing will be required to validate material conditions versus expected material specifications.

Soil samples collected during the field program will be sent to a laboratory in Whitehorse for routine classification testing, such as moisture content determination, gradation analyses, Atterberg Limit determinations and compaction tests. It is likely that the laboratory of EBA Engineering will be used for this work.

Selected rock samples for laboratory testing will also be obtained from the detailed outcrop mapping work. These should be subject a range of physical tests including point load strength index, slake durability, cyclic abrasion, freeze-thaw and geochemical assay tests for determining the presence of sulphides and other deleterious minerals.

This report, **1CD003.12 - Anvil Range Mining Corporation Interim Receivership Phase 1 Borrow Source Survey**, has been prepared by:

STEFFEN, ROBERTSON AND KIRSTEN (CANADA) INC.



Tim Coote
Senior Engineering Geologist

Cameron Scott, P.Eng.
Principal Engineer (Review)

7. REFERENCES

Bond, Jeffrey D., 2001: Quaternary Geology and Till Geochemistry of the Anvil District (parts 105K/2, 3, 5, 6 and 7) Central Yukon Territory. Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, Bulletin 1139 p.

Jackson, L.E., Jr., 1993: Surficial Geology, Magundy River, Yukon Territory: Geological Survey of Canada, Map 1821A, scale 1:100,000.

Klohn Leonoff, 1981: Faro Tailings Abandonment Plan.

PHOTOS

Photo 1: Haul Road Borrow Site

Photo 2: Rose Creek Diversion Quarry

Photo 3: Till blanket (Tb) material exposed at the Tailings Borrow Site

Photo 4: Rose Creek Granular Borrow Site

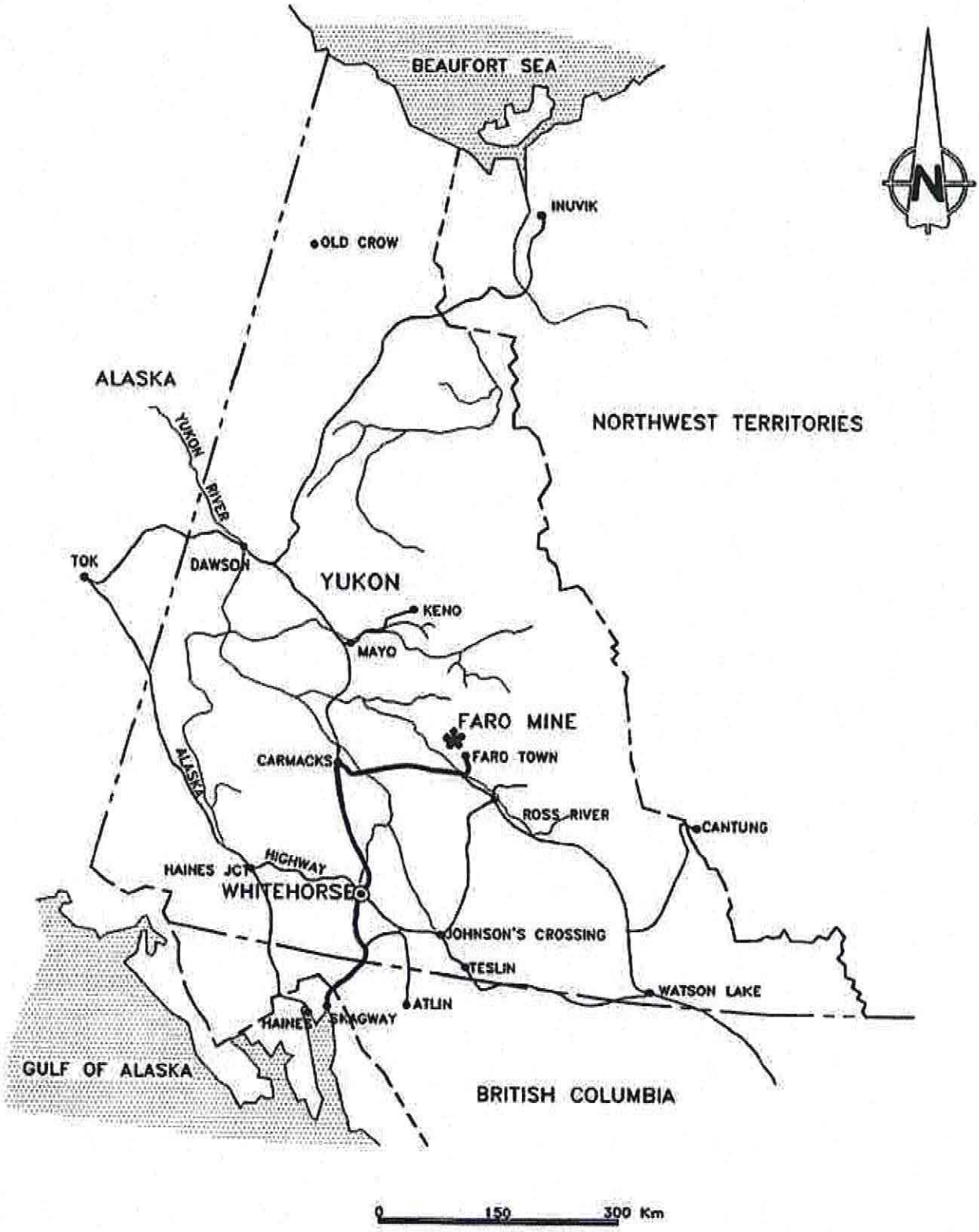
Photo 5: AEX Creek Schist Quarry

Photo 6: Grum Dump quarry material and screens

Photo 7: Grum Creek Borrow Site

Photo 8: Faro Mine Road Outcrop

FIGURES



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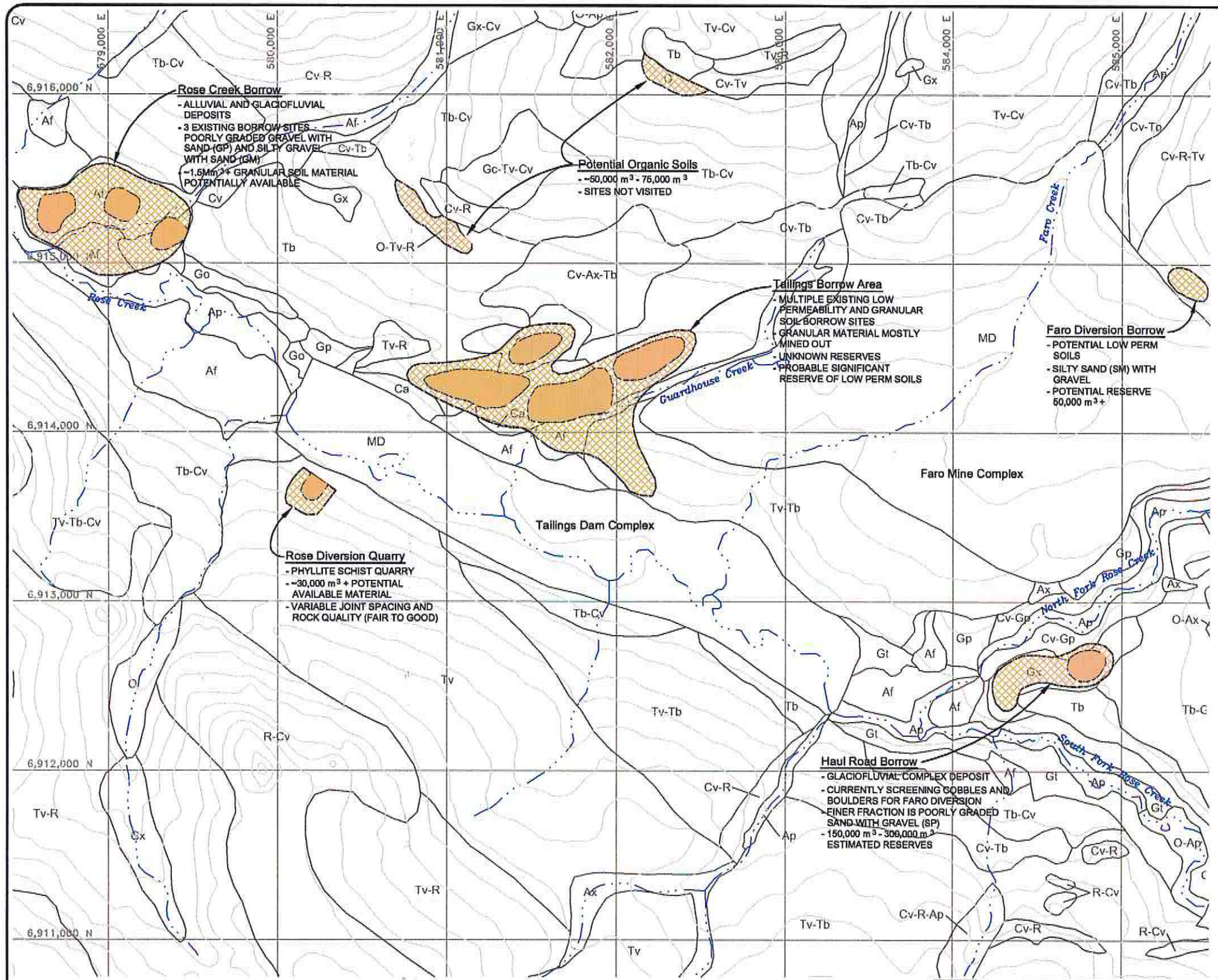
1CD003	08/02	A

FIGURE 1

LOCATION MAP



LEGEND (from Bond, 1999)

QUATERNARY

HOLOCENE

MINE DISTURBANCE

MD- mine disturbance; consisting of an open-pit and stripped till and bedrock accumulations. Bedrock and surficial sediments exposed in open-pit.

ORGANIC DEPOSITS

O - organics; consisting of woody sedge peat, variable thickness. White River ash accumulations are commonly associated with poorly drained peaty areas.

ALLUVIAL DEPOSITS

Ap - alluvial plain; silt, sand and pebbles with reworked cobbles and boulders occurring as bars, overbank floodplain deposits, 0 - 10 m thick; floodplain subject to periodic floods. Small valley alluvial plains may not be mapped at this scale.

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At - alluvial terrace; silt, sand, and pebbles with reworked cobbles and boulders occurring as low terrace deposits, 0 - 10 m thick.

Af - alluvial fan; coarse sand, pebbles, cobbles and mudflow deposits, up to or >10 m thick. Appear as vegetated, often peat covered, landforms developed during post-glacial sedimentation.

Ax - complexes of Ap and Af undivided. Common when a stream is unconfined and also in narrow valleys where side-entry alluvial fans cannot be differentiated from an alluvial plain.

PLEISTOCENE AND HOLOCENE (UNDIVIDED)

COLLUVIAL DEPOSITS

Cv - colluvium veneer; conforms to bedrock topography, <1 m thick.

Ca - colluvium apron; coalescing colluvial fans at the base of a slope, >1 m thick.

Cz - mass wasting; includes slumping, debris slides and rockfalls. Slumping and rockfalls are Common on Mt. Mye.

LATE PLEISTOCENE (WISCONSINAN) - McCONNELL GLACIATION

GLACIOLACUSTRINE DEPOSITS

Lb - glaciolacustrine blanket; 1- 40 m thick.

GLACIOFLUVIAL DEPOSITS

Gp - glaciofluvial plain; 3 - 10 m thick.

Gt - glaciofluvial terrace; <10 m thick.

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GLACIAL DEPOSITS

Tv - till veneer; conforms to underlying topography, <1 m thick.

Tb - till blanket; gently to moderately sloping plain controlled by bedrock or underlying surficial deposits, >1 m thick.

Tx - till complex; till blanket or veneer composed of meltout till and minor ice contact glaciofluvial deposits.

LOWER CAMBRIAN TO CRETACEOUS

BEDROCK

R - bedrock; common on plateau summits and ridges on Mt. Mye and Sheep Mountain.

EXISTING QUARRY OR BORROW

POTENTIAL QUARRY OR BORROW

N

0 500 1000

SCALE IN METERS
1:25,000

REFERENCE

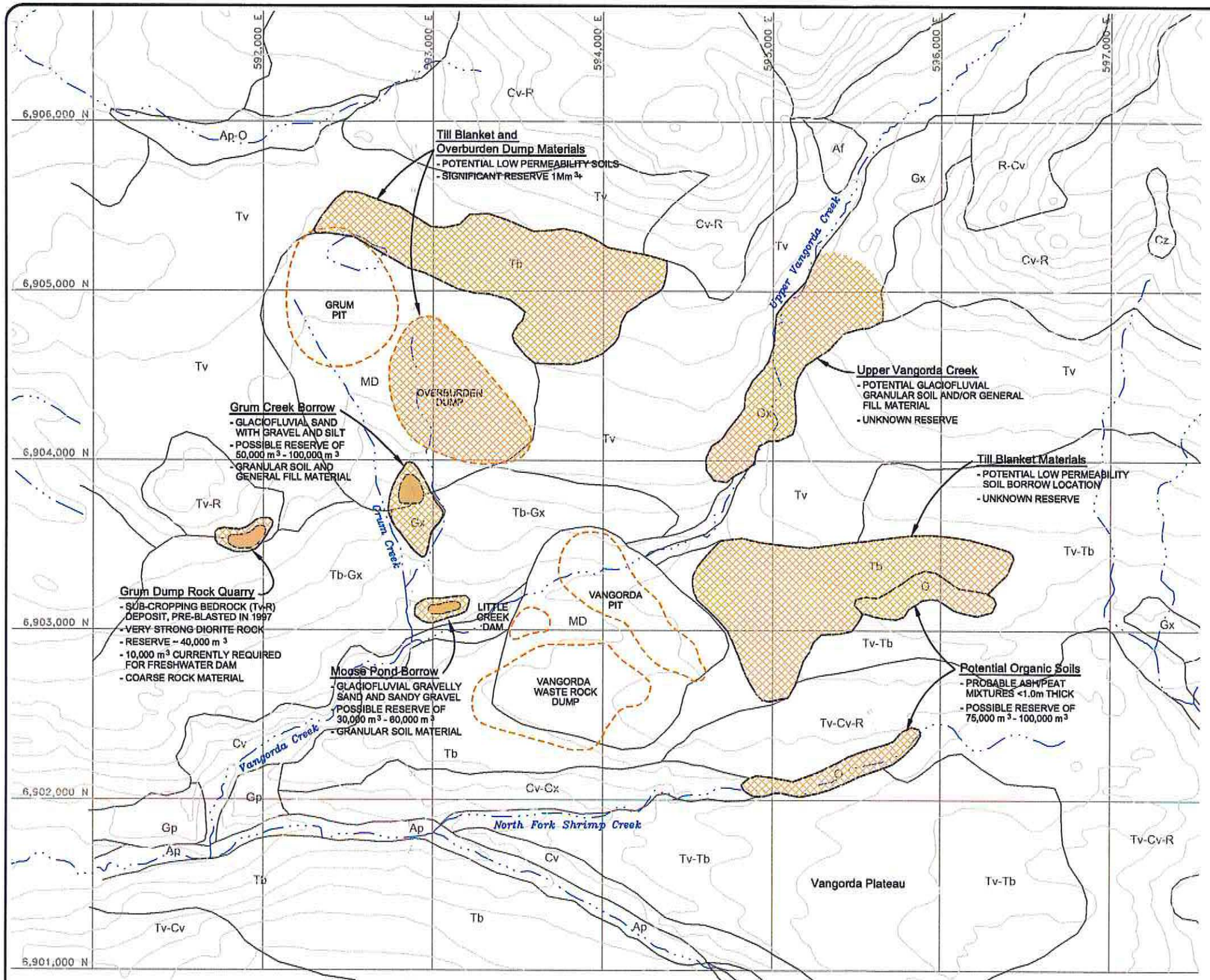
BOND, J.D. (OPEN FILE 1999-10)
SURFICIAL GEOLOGY MAP AND TILL GEOCHEMISTRY OF MOUNT MYE (105K/3&6 W), CENTRAL YUKON TERRITORY

SRK Consulting
Engineers and Scientists

PROJECT NO.	DATE	REVISION
1CD003	08/02	A

FIGURE 2

FARO MINE SITE
Surficial Geology and
Soil and Rock Borrow Locations



LEGEND (from Bond, 1999)

QUATERNARY

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EXISTING QUARRY OR BORROW

POTENTIAL QUARRY OR BORROW

N

0 500 1000

SCALE IN METERS
1:25,000

REFERENCE

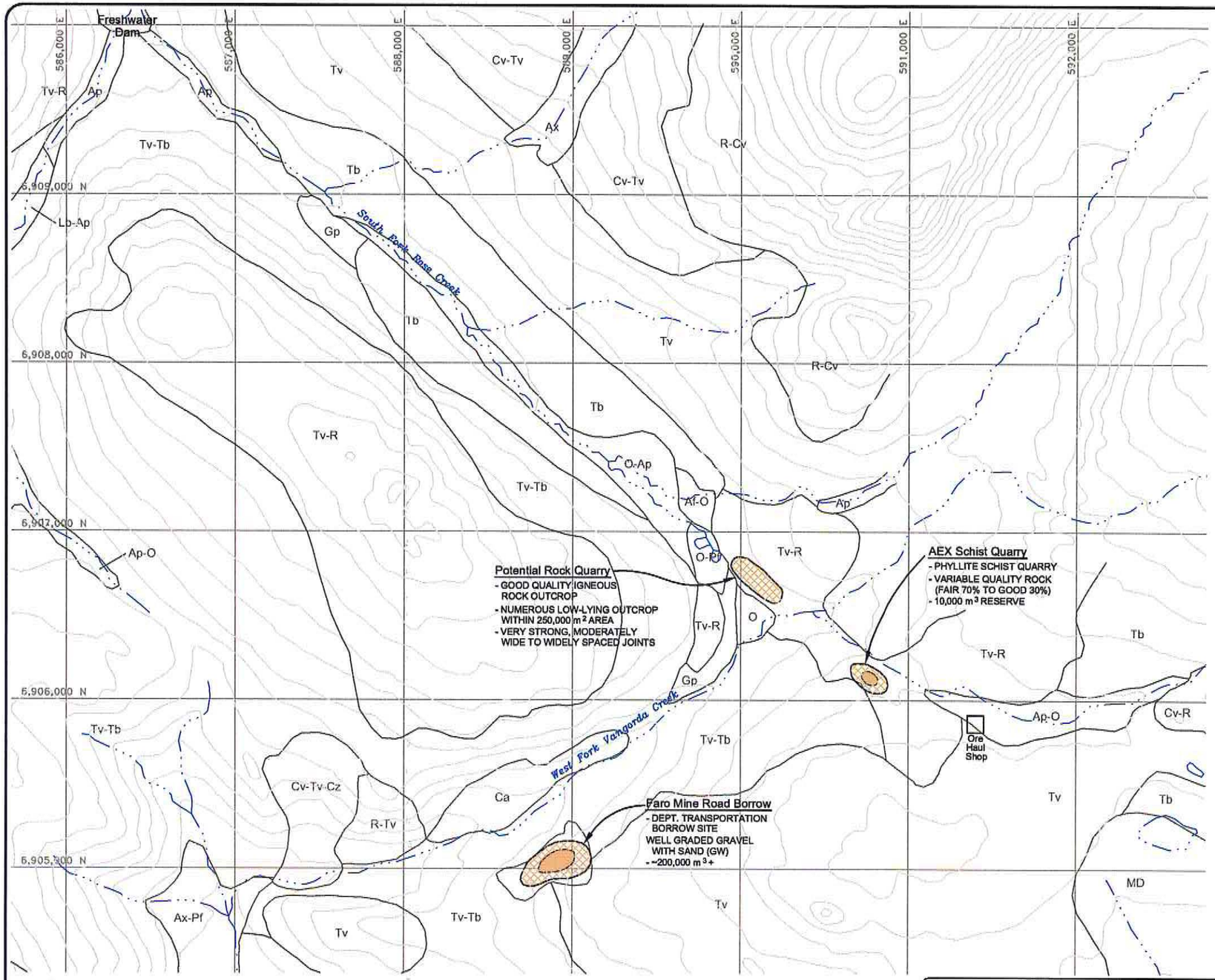
BOND, J.D. (OPEN FILE 1999-7)
SURFICIAL GEOLOGY MAP AND TILL GEOCHEMISTRY OF MOUNT MYE AND FARO (105K/3&6 E), CENTRAL YUKON TERRITORY

SRK Consulting
Engineers and Scientists

PROJECT NO.	DATE	REVISION
1CD003	08/02	A

FIGURE 3

VANGORDA - GRUM AREA
Surficial Geology and Rock and Soil Borrow Locations



LEGEND (from Bond, 1999)

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EXISTING QUARRY OR BORROW

POTENTIAL QUARRY OR BORROW

N

0 500 1000

SCALE IN METERS
1:25,000

REFERENCE

BOND, J.D. (OPEN FILE 1999-8)
SURFICIAL GEOLOGY MAP OF MOUNT MYE AND FARO (105K/3&6 W), CENTRAL YUKON TERRITORY

SRK Consulting
Engineers and Scientists

PROJECT NO.	DATE	REVISION
1CD003	08/02	A

FIGURE 4

FARO-VANGORDA ACCESS ROAD
Surficial Geology and
Soil and Rock Borrow Locations

APPENDIX A
Laboratory Testing Data

EBA Engineering Consultants Ltd.

FACSIMILE COVER SHEET

Calcite Business Centre, Unit 6
151 Industrial Road, Whitehorse, Yukon Y1A 2V3 CANADA
Telephone: (867) 668-3068 Facsimile: (867) 668-4349
Internet: whitehorse@eba.ca

Date: Sept. 11/02 Time Sent: 4:15 pm.

Attention: Cam Scott

Company: SRK Canada

Fax No.: (604) 687-5532 Telephone: (604) 601-8425

From: Myles Plaunt File No.: 0201-12.80081.023

Subject: Lab Results - Faro Samples

MESSAGE:

Cam: Nice to see that you are still alive (and well I presume).

Attached are all lab test results from the Faro samples.

The grain size testing was performed in Whitehorse and all testing on sample BRRW-1 was completed in Edmonton

Regards,

Myles Plaunt

TOTAL NUMBER OF PAGES (including this page): 12
Please circle as appropriate

Original to follow	YES/NO
By Mail/other	YES/NO

eba

EBA Engineering Consultants Ltd.

MOISTURE - DENSITY RELATIONSHIP

ASTM D698, D1557, or D2049

PROJECT: Soil Testing - Faro, Yukon

SAMPLE NUMBER:

PROJECT NO.: 0201-1280001.023

DATE TESTED: 02/09/04

CLIENT: SRK Consulting (Lakewood Colorado)

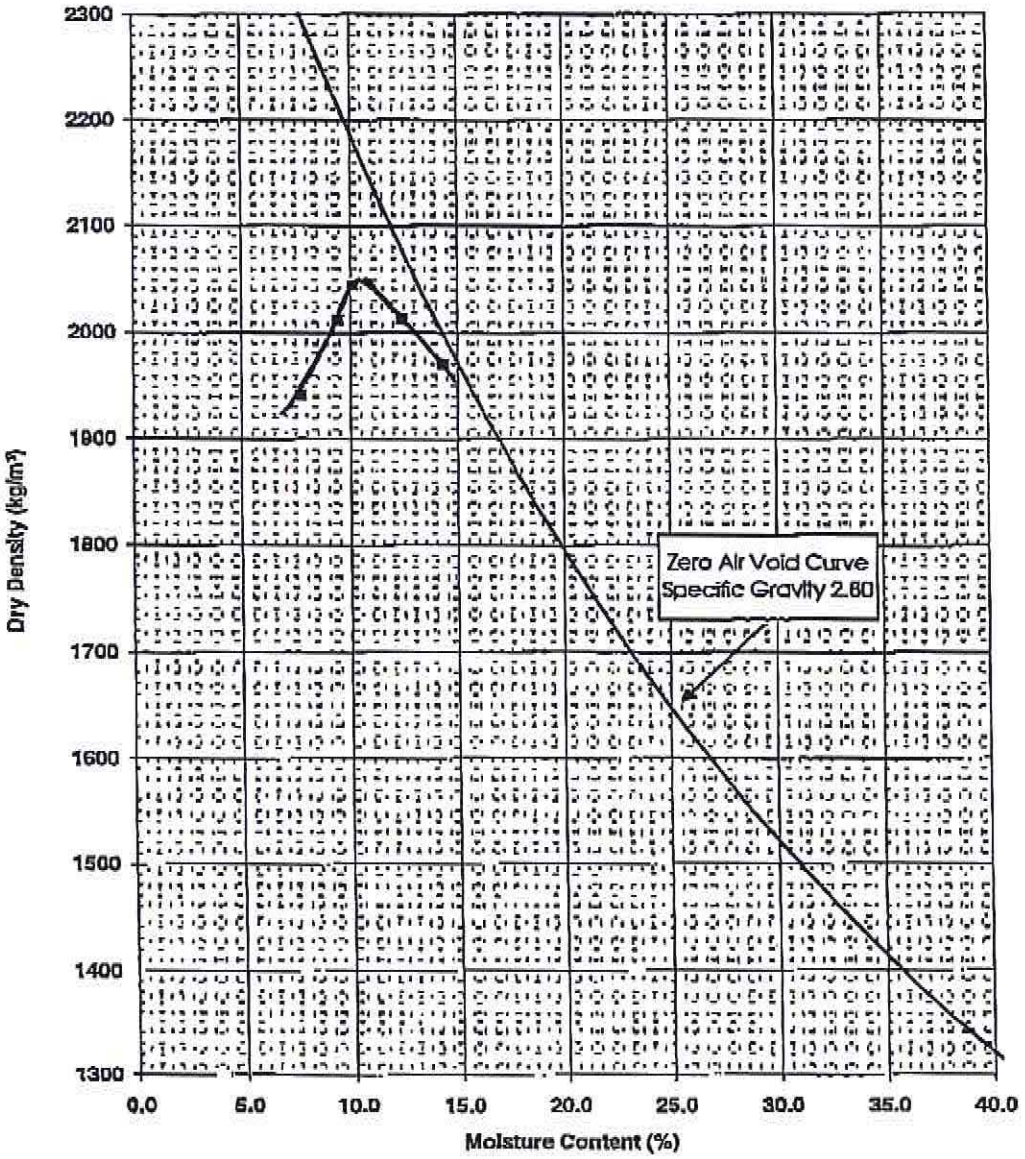
MOISTURE CONTENT (as received): 12.4%

DESCRIPTION: SILT, clay, tr. sand, tr. gravel (16mm max) - dark brown

MAXIMUM DRY DENSITY: 2050 kg/m^3

SAMPLE LOCATION: BRRW-1

OPTIMUM MOISTURE CONTENT: 10.8%



STANDARD PROCTOR
ASTM D698

Hammer Mass: 2.494 kg

Hammer Drop: 304.8 mm

Number of Layers: 3

Number of Blows/Layer: 25

Diameter of Mould: 101.4 mm

Height of Mould: 116.3 mm

Mould Volume: 0.000938 m3

Compactive Effort: 593.5 kJ/m3

REVIEWED BY:

P.Eng.

REMARKS:

EBA Engineering Consultants Ltd.

CONSTANT HEAD PERMEABILITY TEST

Job Number: 0201-1280001.023
Sample No.: BRRW-1 Depth:

Date: 02-09-10
Test No: P-1

Time	Buret (cc)	Elap. (min)	Outflow (cc)
6:46	16.2	0	0.0
7:13	16.6	27	0.4
8:06	17.1	80	0.9
9:05	17.6	139	1.4
9:54	18.0	188	1.8
10:41	18.4	235	2.2
11:35	18.8	289	2.6
12:40	19.3	354	3.1
13:31	19.7	405	3.5
14:09	20.0	443	3.8
14:59	20.4	493	4.2
15:35	20.7	529	4.5

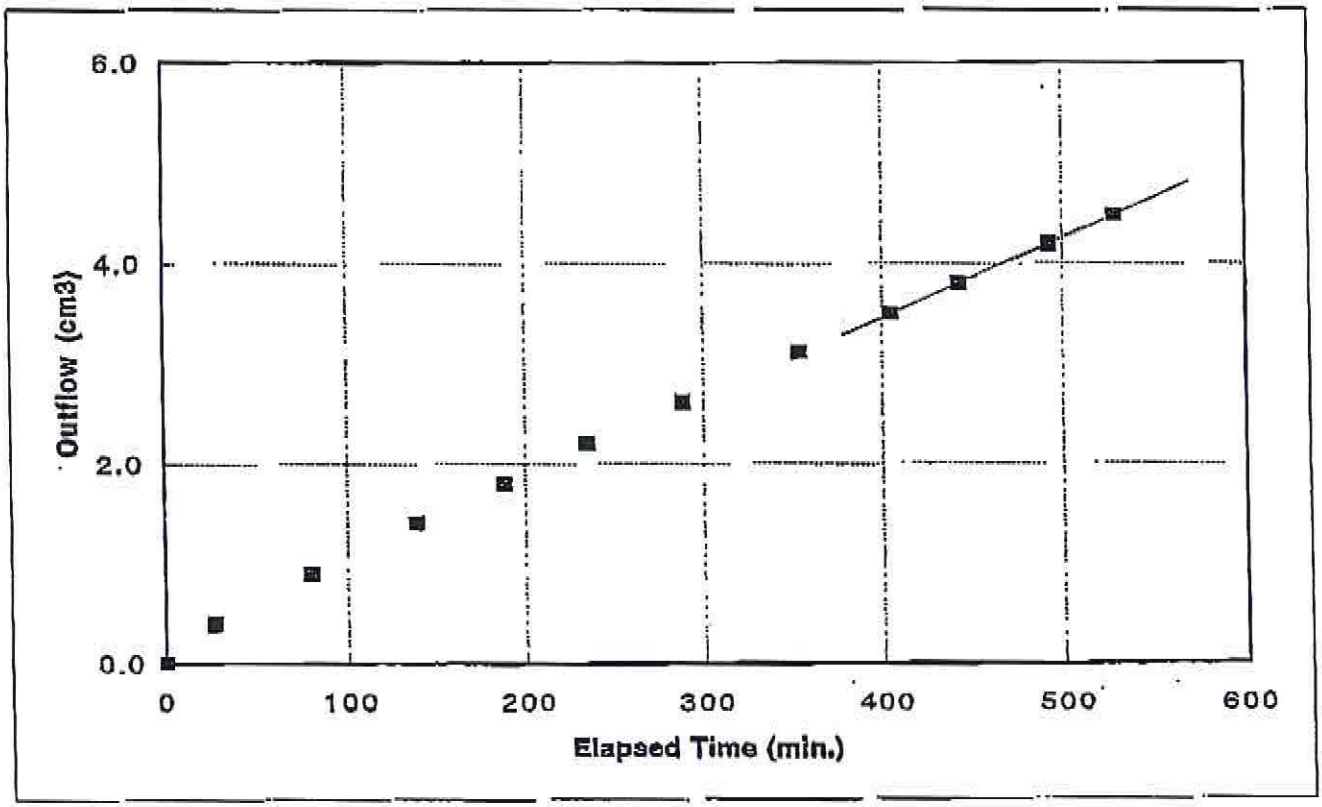
Diameter= 71.08 mm
Height= 50.52 mm

Volume= 200.47 cm3

Head Diff.= 1.42 psi

Q= 0.00013 cm3/sec
i= 19.77
A= 39.68 cm2

K= 1.71E-07 cm/sec



SAMPLE INFORMATION

Project: Soil Testing
Address: Faro, Yukon
Project Number: 0201-1280001.023
Date Tested: 02.09.06 By: S.K.
Test Apparatus: Permeability
Machine Number: "BLUE"
Rate of Strain: _____ mm%/minute
Normal Stress: _____ kPa
Cell Pressure: _____ kPa
Back Pressure: _____ kPa
Head Differential: _____ kPa
Swelling Pressure: _____ kPa

Borehole Number: BRRW-1
Depth: _____
Test Number: P-1
Sample Description: SILT, clayey, some sand & gravel, dark grayish brown.

Sample Description	Diameter (mm)	Height mm
1		
2		
3		
4		
Mean	71.08	50.56

$\gamma_{max.}$ = 2.050 Mg/m³ @ 10.8 % Opt. m.c. V = 200.63 cm³

	Trimmings	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		448.86	459.26
Mass of Dry Soil & Tare g			410.79
Mass of Tare g			6.47
Mass of Dry Soil g		404.32	404.32
Mass of Moisture g			
Moisture Content %		11.02	11.99
Wet Density Mg/m³		2.237	2.259
Dry Density Mg/m³		2.015	2.017
		98.3 % SPD	98.4 % SPD

Sketch and Remarks:

Final Dia. = 71.08 mm
Ht. = 50.52 mm
A = 39.68 cm²
V = 200.47 cm³

Angle of Shear: _____

ATTERBERG LIMIT TEST RESULTS
(LABORATORY DATA REPORT)

Project: Soil Testing
Address: Faro, Yukon
Project Number: 0201-128000 1.023
Date Tested: 02.09.10 By: S.K.

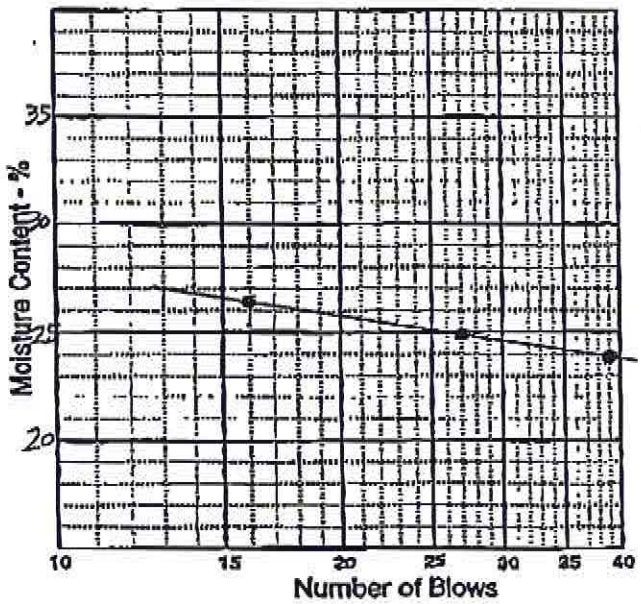
Borehole Number: BRRW-1
Depth:
Sample Number:
Sample Description

LIQUID LIMIT
(ASTM Designation D 423)

Trial Number	1	2	3
Tare Number	N40	L010	I16
Number of Blows	39	27	16
Mass of Wet Soil & Tare g	35.16	37.21	37.29
Mass of Dry Soil & Tare g	29.06	30.52	30.27
Mass of Tare g	3.57	3.66	3.57
Mass of Dry Soil g	25.49	26.86	26.70
Mass of Moisture g	6.10	6.69	7.02
MOISTURE CONTENT %	23.9	24.9	26.3

PLASTIC LIMIT
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	D051	D046
Mass of Wet Soil & Tare g	12.12	11.73
Mass of Dry Soil & Tare g	11.02	10.68
Mass of Tare g	3.62	3.60
Mass of Dry Soil g	7.40	7.08
Mass of Moisture g	1.10	1.05
MOISTURE CONTENT %	14.9	14.8



SHRINKAGE LIMIT
(ASTM Designation D 427)

(14.8)

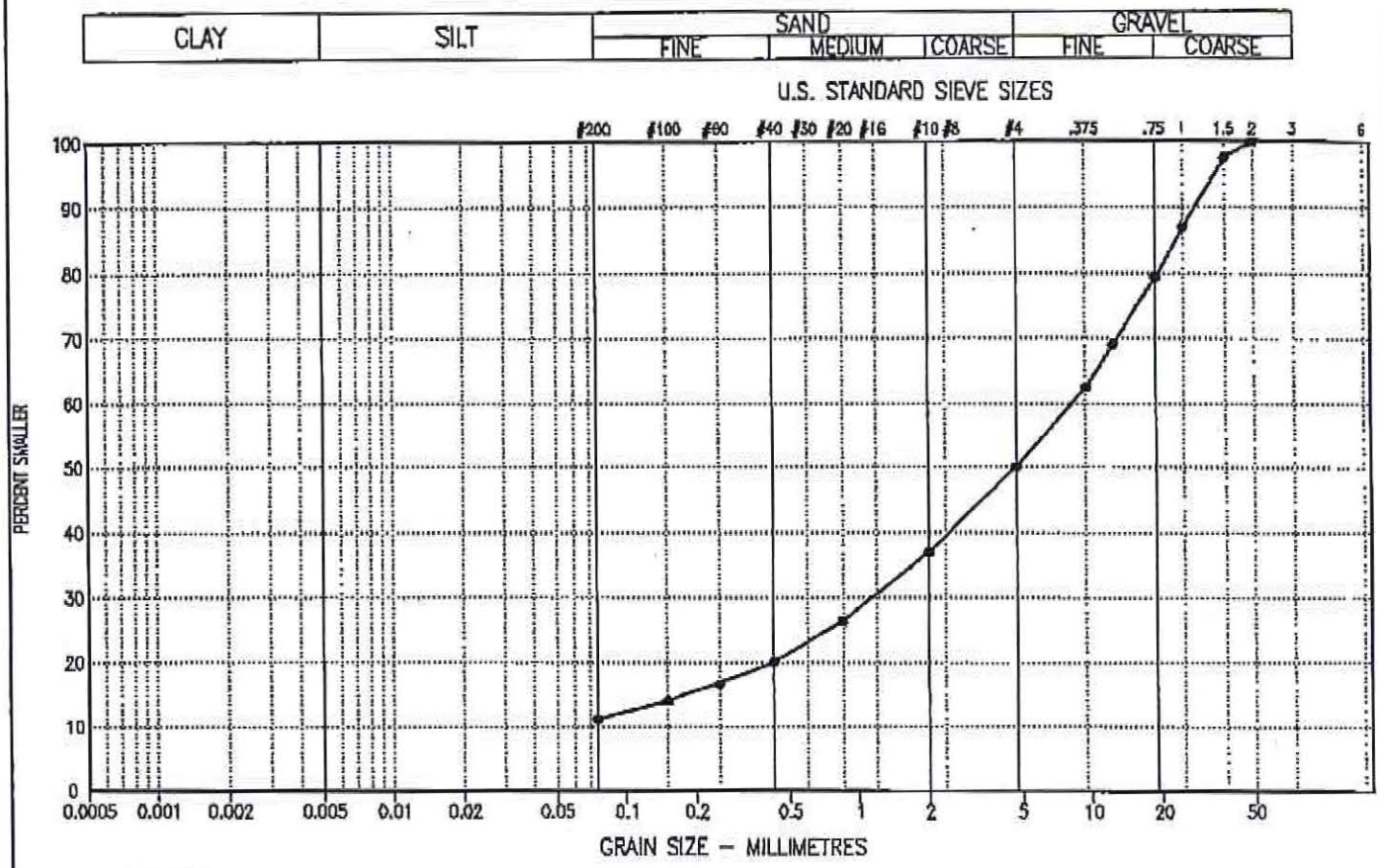
Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V.			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric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

Remarks:

Liquid Limit: 25
Plastic Limit: 15
Plasticity Index: 10 (CL)

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



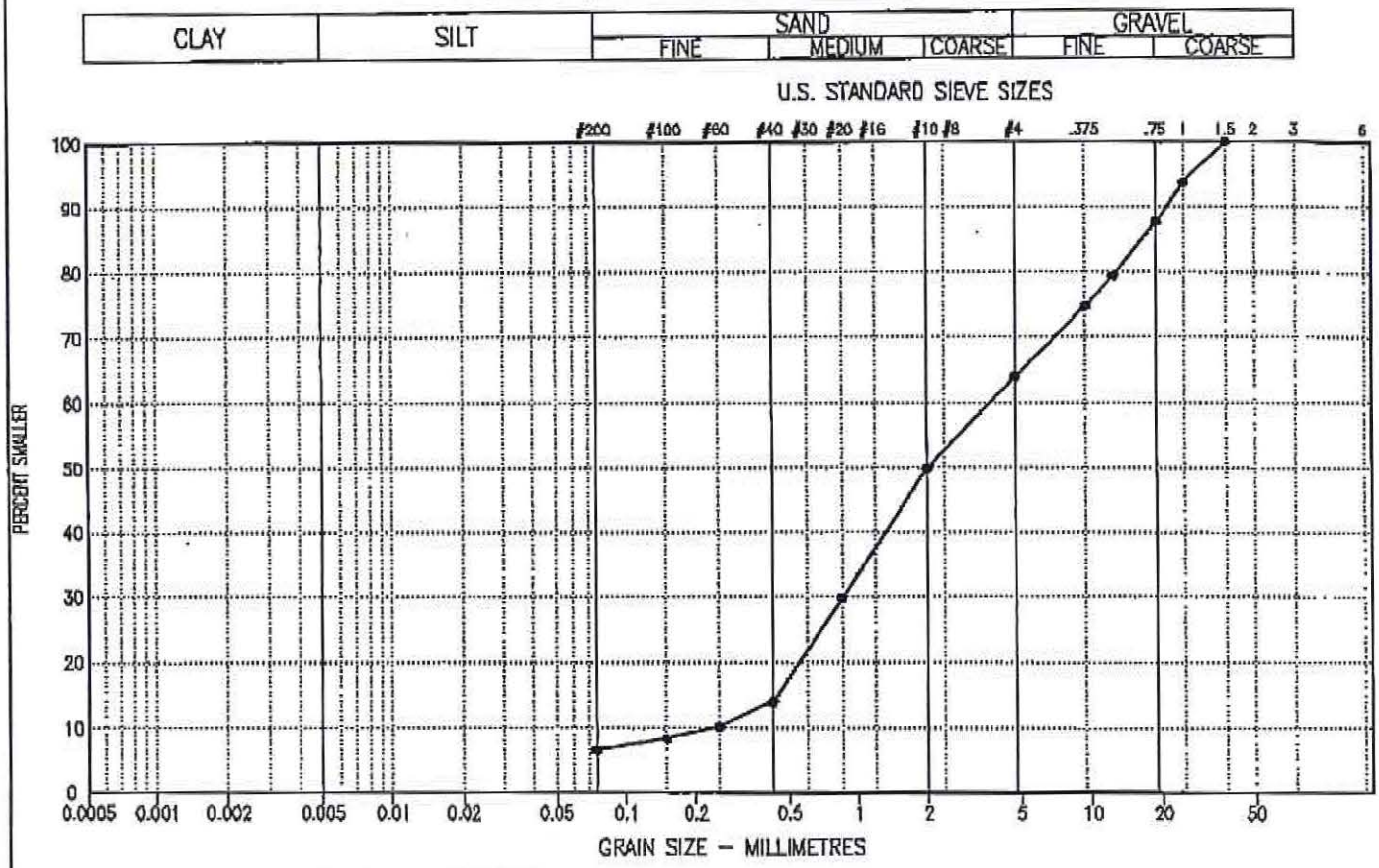
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●—●	BRRW–10	0.00	11	39	50	–	4.2	GP–GM

Project: 0201–1280001023 Date Tested: 23/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●——	BRRW–3	0.00	7	58	36	16.8	0.8	SP–SM

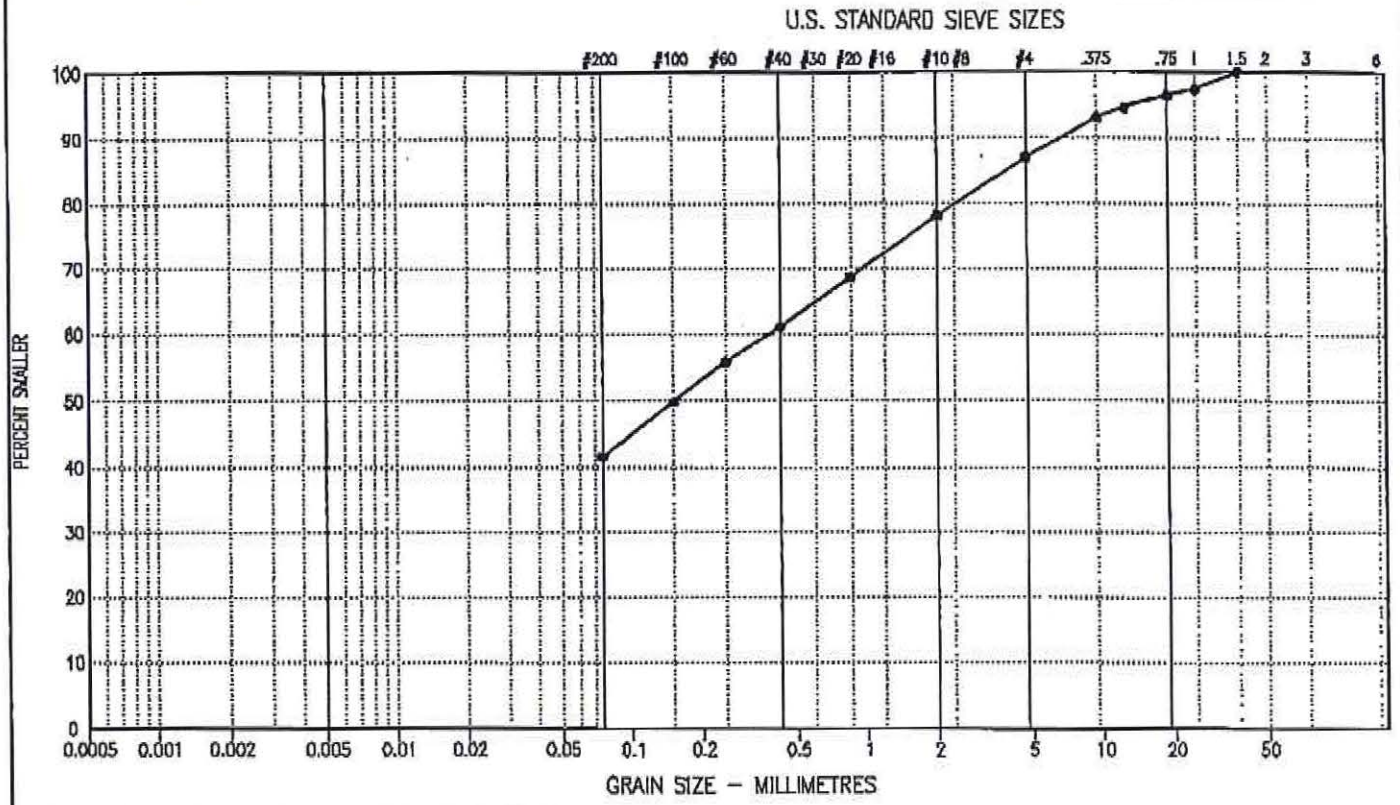
Project: 0201–1280001023 Date Tested: 24/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



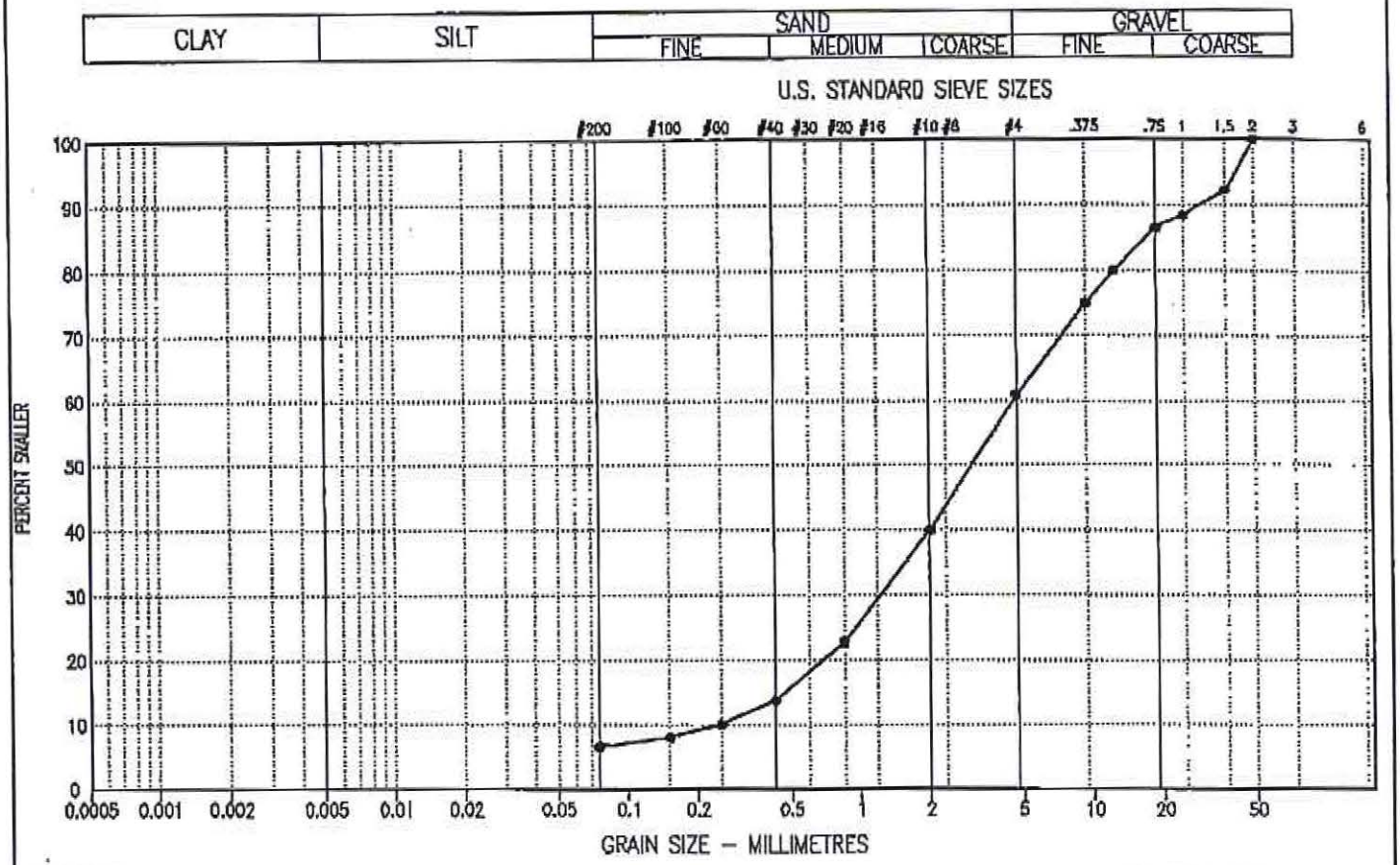
SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●	FDD–1	0.00	42	46	13	–	–	SM

Project: 0201–1280001023 Date Tested: 23/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●	GVB–3	0.00	7	54	39	18.9	1.6	SW–SM

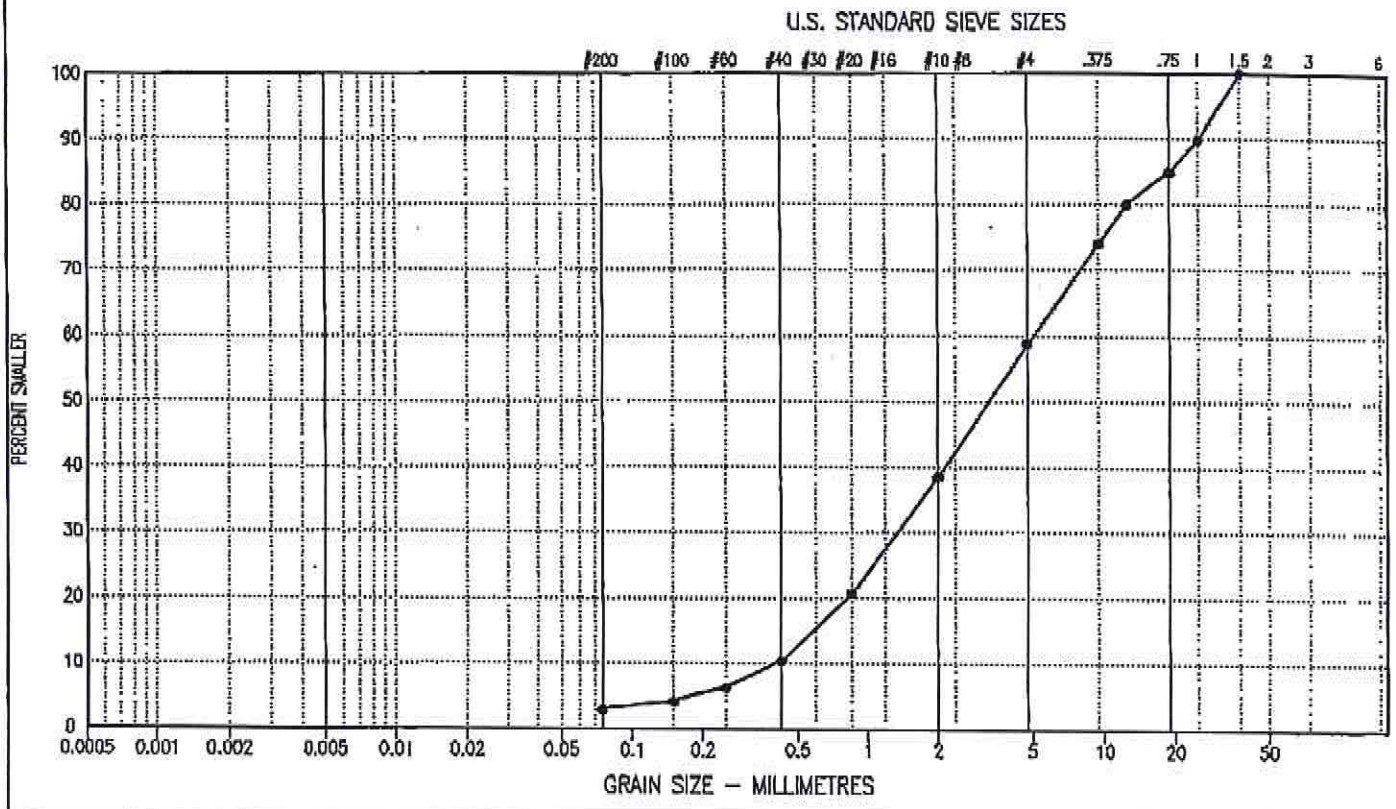
Project: 0201–1280001023 Date Tested: 23/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●—●	GVB-4	0.00	3	56	41	12.7	1.0	SW

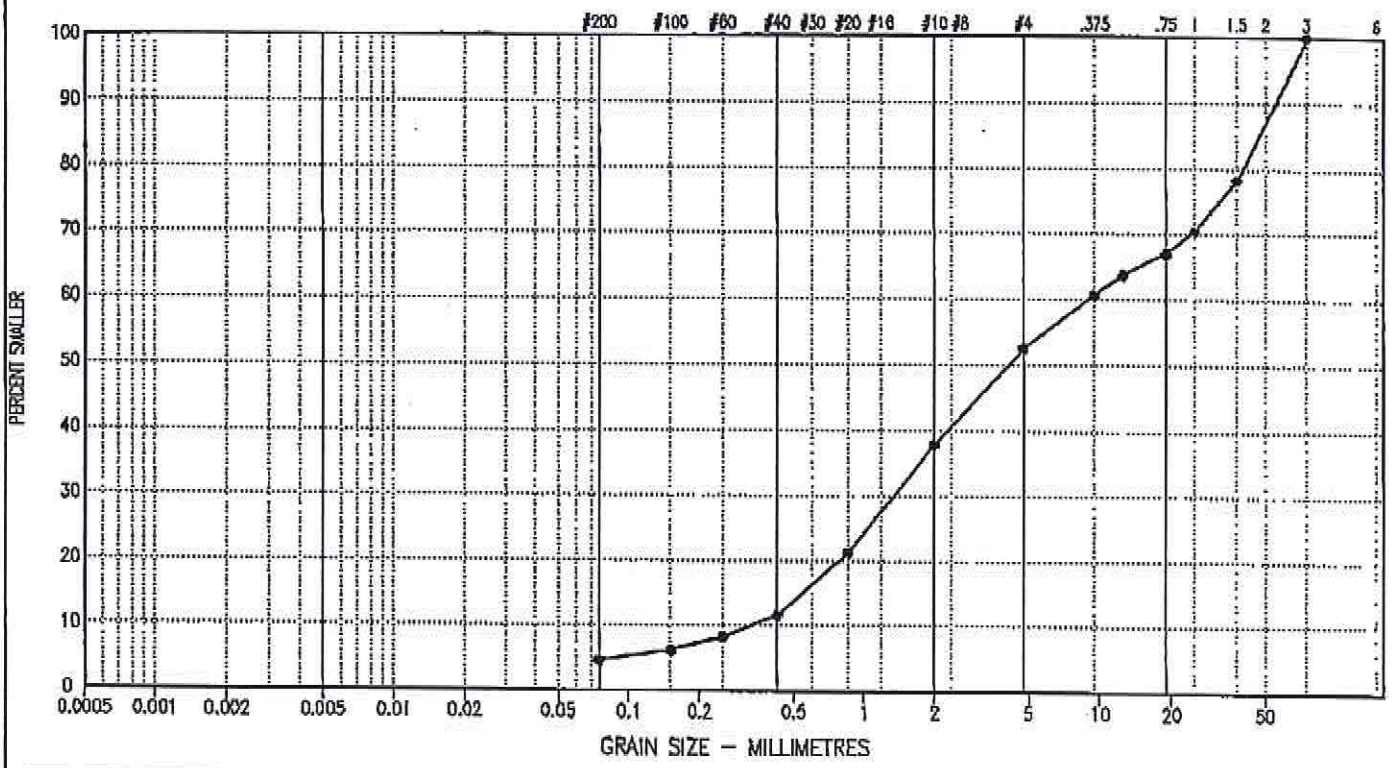
Project: 0201-1280001023 Date Tested: 24/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●—●	HAUL–BRRW	0.00	5	48	48	26.7	0.7	SP

Project: 0201–1280001023 Date Tested: 23/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.

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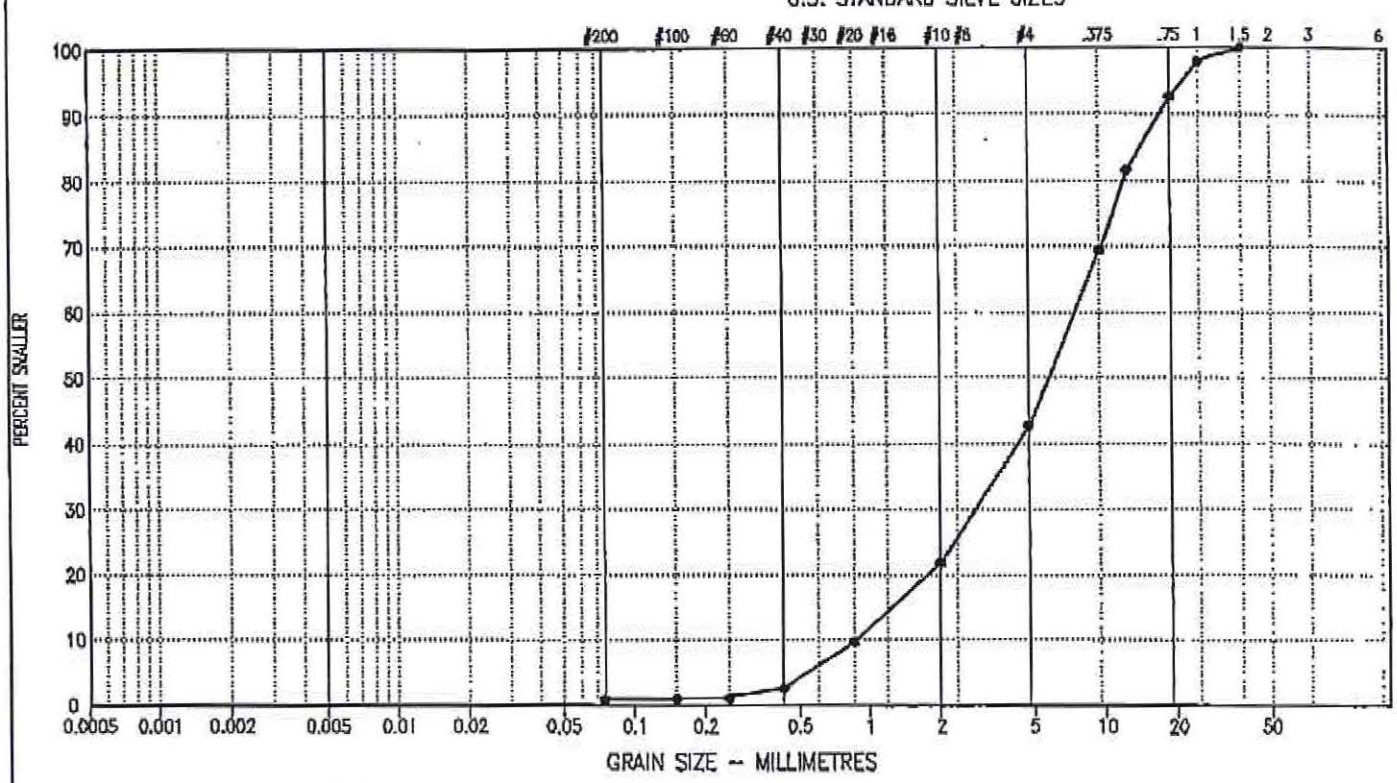
PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●——●	ROAD-BRRW	0.00	1	42	57	9.0	1.4	GW

Project: 0201-1280001023 Date Tested: 23/08/02 BY: MF

Tested in accordance with ASTM D422 unless otherwise noted.