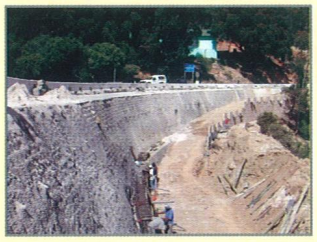
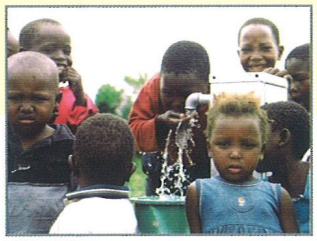
GEOTECHNICAL INVESTIGATION FOR THE EXTENSION OF MUSLIM CEMETERY IN NEWCASTLE





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GEOTECHNICAL INVESTIGATION REPORT

EXTENSION OF THE NEWCASTLE MUSLIM CEMETERY IN NEWCASTLE

TERRATEST NO. :	DATE :	REPORT STATUS :
41265	July 2012	FINAL

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CLIENT CONTACT PERSONS :
Mark Faku

SYNOPSIS: Geotechnical Investigation for the Proposed Extension of Newcastle Muslim Cemetery in Newcastle.

KEY WORDS: Geotechnical Investigation, Muslim Cemetery, Newcastle.

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882

Verification	Capacity	Name	Signature	Date
By Author	**Engineering Geologist**	**G Ndlela**		**26/07/2012**
Checked by	**Senior Engineering Geologist**	**T Speirs**		**26/07/2012**
Authorised by	**Director**	**J C Norris**		**26/07/2012**

GEOTECHNICAL INVESTIGATION FOR THE EXTENSION OF MUSLIM CEMETERY IN NEWCASTLE

CONTENTS

GEOTECHNICAL INVESTIGATION FOR THE EXTENSION OF MUSLIM CEMETERY IN NEWCASTLE

1. INTRODUCTION

1.1. Preamble

At the request of Mr Mark Faku of Udidi Environmental, Planning and Development Consultants, Terratest submitted a quote referenced 41231/geo052/2012/GN/gn for a geotechnical investigation to be conducted for the extension of the Newcastle Muslim Cemetery in Newcastle, northern KwaZulu-Natal. Mr Faku subsequently appointed Terratest in a letter dated 14 May 2012 to proceed with the investigation as proposed.

This report presents the findings of the geotechnical investigation and provides recommendations for the proposed extension of the Newcastle Muslim Cemetery. The investigation was carried out in accordance to the criteria and guidelines stipulated by the Council of Geoscience and by NP Richards and L Croukamp, entitled "Geotechnical Investigation Guidelines for Cemetery Site Selection".

1.2. Database

Information available to Terratest at the time of the investigation was the layout plans showing the boundaries for the proposed site.

Mr Phiri from Newcastle Municipality indicated to Terratest the boundaries for the proposed extension.

1.3. Objectives

The objectives of the investigation were to complete a geotechnical survey of the site giving:-

- The soil/rock profiles to determine the subsurface soil conditions.
- Comments on the excavatibility, permeability and topography of the site.
- Comments on groundwater seepage.
- Comments on any perceived geotechnical problems which may affect the site for use as cemetery site.

2. SITE DESCRIPTION

The proposed site for the extension of Newcastle Muslim Cemetery is situated in Newcastle Industrial area, northern KwaZulu Natal. Access to the site is via Falkirk Street. The proposed site is approximately 1.3 hectares in extent.

The site is bounded on the north by a railway line, on the east by Ni-Da Transport, on the west by an existing cemetery site and on the south by Falkirk Street.

There is an existing servitude along the western boundary and a sewer line along the southern boundary of the site.

The site is currently used for illegal dumping. As a result, the investigation could only be carried out on the north eastern section of the site because of the fill material dumped on site.

The layout of the site is shown in Figure 2 of Appendix A attached.

2.1. Topography

Topographically, the site gently slopes at an average declination of 1.1° in a south easterly direction, as measured on the 2729DD 1:50 000 Newcastle Topographic Map and consequently can be classified as being relatively flat.

2.2. Climate

The area experiences very hot humid conditions during summer months and cold temperatures during the winter months. The average annual rainfall for the area is approximately 850mm most of which occurs as heavy isolated falls between November and March.

2.3. Vegetation

The project area falls in the Southern KwaZulu-Natal Moist Grassland type this is dominated by *Hyparrhenia hirta* and sparsely scattered *Acacia sieberiana*. *Themeda triandra* is the dominant grass on veld.

The major portion of the site is currently covered by concrete slabs, bricks, soil material and other refuse as a result of illegal dumping in the area.

3. FACTUAL REPORT

3.1. Programme of work

3.1.1. Literary review

Prior to the commencement of field work, a literary review was conducted on the data obtained from previous investigations by both Terratest and other consultants in the area. A 1:250 000 “2728 Frankfort” Map Series was consulted to determine the local geology.

3.1.2. Field work

On the 07th of June 2012, five test holes were mechanically advanced from the ground surface to approximate depths of between 2.6 and 3.20m below existing ground level. The test hole positions were recorded in the field using a hand

held Garmin nüvi GPS and their coordinates appear on the soil profile logs that are included in Appendix B of this report.

Each test hole was profiled by an engineering geologist according to the method of Jennings, Brink and Williams, 1973. Representative disturbed subsoil samples were retrieved from the trial pits for laboratory testing. The detailed soil profile descriptions are presented in Appendix B of this report.

3.1.3. Office and Laboratory work

From the selected soil samples recovered during the field work, foundation indicator tests were conducted and the laboratory tests result sheets appear in Appendix C of this report.

A summary of the tests pits excavated, depths where samples were retrieved, the nature of tests conducted and results appear in Table 1 in Section 5. Finally the report was prepared using the data obtained from all the sources mentioned above.

4. GEOLOGY

The geological Map Series, 2728 Frankfort to scale 1:250 000 and field observations indicate the area within which the proposed extension is located to be underlain by a mantle of fill, transported and residual soils which overlie weathered shale and sandstone bedrocks of the Vryheid Formation.

4.1. Observations

The main soil types encountered in the test pits during the site investigation and their detailed descriptions are presented below:-

4.1.1. Fill Material

The site is underlain by a mantle of fill material ranging from the surface to a depth of 2.5m below existing ground level. The fill material was described as dry to slightly moist, greyish brown, black and orange brown, loose to medium dense, medium grained silty sand containing concrete slab, red bricks, bottles and other refuse.

4.1.2. Ferruginous Horizon

Ferruginous horizon / pedogenic soils which have been chemically altered as a result of fluctuations in water levels were encountered across the site. These soils occur from depths of about 0.25 to 2.5m below existing ground level with thickness ranging from 0.3 to 1.7m. They comprise slightly moist, greyish brown, reddish brown and yellowish brown, medium dense to dense, silty gravelly sand, clayey gravelly sand and sandy gravel with gravel components comprising ferruginous nodules. The occurrence of the pedogenic soils / ferruginous horizon indicates the periodic presence of groundwater at this level across the site.

4.1.3. Residual Shale

Residual soils developed from the complete in situ weathering of shale were encountered underlying ferruginous horizon at depths ranging from 2.0 and 2.80m below existing ground level. These soils comprised slightly moist, orange brown, firm, clayey micaceous silt, sandy clay.

The underlying shale bedrock was not encountered during the investigation.

4.2. Groundwater

No ground water seepage was observed in any of the test holes excavated during the investigation. However, during periods of prolonged rainfall, particularly during the summer season, a marked increase in the occurrence and magnitude of groundwater seepage flow can be anticipated. Perched groundwater flows at the transported soil / residual soil interface are likely to become more prolific in the rainy months. This is characterised by the ferruginous horizon. It is an indication of fluctuating groundwater conditions that can be expected during and after wet periods. Any cuttings that are taken below this horizon are likely to experience groundwater seepage problems during the wet summer season.

5. LABORATORY TESTING

For more accurate determination and classification purposes, particle size distribution and Atterberg limits tests were conducted on representative samples of soil present at the site. The tests results are summarised in Table 1 below and detailed results are presented in Appendix C.

Table 1
Particle Size Distribution and Atterberg Limit Determination Tests

Pit No	Depth (m)	Material Description	Particle Size %				Atterberg Limits %				Classification and Activity
			Clay	Silt	Sand	Gravel	LL	PI	LS	Equiv. PI	
TP1	0.5-1.20	Silty Sand. Ferruginous Horizon.	15	25	51	9	19	9	4	6.1	A-2-4(0), Low
TP2	2.1-2.80	Clayey Sand. Ferruginous Horizon.	29	26	37	9	36	19	7.5	16.2	A-6(2), Medium
TP4	2.5-2.80	Clayey Sand. Ferruginous Horizon.	20	29	42	8	34	14	6	12.3	A-6(5), Low
TP5	2.0-2.70	Clayey silty Sand. Residual Sandstone.	17	32	45	6	57	29	12	26.9	A-7-6(11), Medium

LL- Liquid Limit LS - Linear Shrinkage
PI - Plasticity Index
Equiv. PI – Equivalent Plasticity Index of whole sample (=PI×% <0.425mm)

6. CEMETERY SITE SELECTION CRITERIA

The Council for Geoscience have produced a document titled “Geotechnical Investigation Guidelines For Cemetery Site Selection”, which proposed a number of criteria that should be assessed in determining if a site is suitable for use as a cemetery.

6.1. Topography

The maximum slope angle of the ground should be within 6° to 9°, from the horizontal, in order to enable human and mechanical mobility across the site and to minimize erosion potential. It is estimated that the site at Newcastle Muslim Cemetery varies from relatively flat to an average of 1.1°.

6.2. Soil Excavatibility

The ease at which the soil can be excavated is an important criteria in the selection of a site. The majority of cemetery sites use labour to dig the graves sites and hence it must be possible to excavate a hole to a depth of 1.8m below ground level with a pick and shovel. Excavation of the soils at Newcastle Muslim Cemetery would be within the capabilities of manual labour.

6.3. Site Drainage

Site drainage is very important as the ingress of surface water into open graves must be minimized and storm water run-off should be controlled as far as possible for the following reasons:

- High velocity run-off increases the erosion potential.
- Excessive ponding will enhance the ingress of water into the soil, and increase the risk of groundwater pollution.
- Poor site drainage will increase the risk of flooding open grave sites
- Poor drainage results in marshy conditions, reducing mobility around gravel sites.
- Poor drainage creates the impression of a badly kept cemetery site.

Due to the gently sloping and the relatively flat nature of the ground at Newcastle Muslim Cemetery, the ingress of surface water, groundwater and storm water run-off should be controlled as far as possible.

6.4. Soil Permeability

Soil permeability is the major factor determining the rate of fluid movement through the soil. For cemetery purposes soil permeability must fall within a predetermined permeability range. From the laboratory test undertaken on samples retrieved from the trial pits put down during investigation, the soils are being classified as silty sand and clayey sand which as indicated in the Council for Geoscience Guidelines to have permeability in the range of approximately $5x10^{-4}$ to $1x10^{-8}$ cm/sec. This range is described as ideal to partially suitable for cemetery purposes. A permeability that is too low will result in anaerobic and septic conditions and permeability that is too high will result in rapid leaching and possible pollution to both surface and groundwater.

6.5. Positioning in Respect to Domestic Water Supplies

The position in relation to water sources which are utilized for human consumption is the most important consideration for the location of a cemetery site. Water borne diseases reaching water courses must be prevented at all costs. The minimum distance from the cemetery site and the nearest water source has therefore been prescribed and is based on the permeability of the soil. The Ncandu River, running through the northern section of the site which should be regarded as a domestic water source is located approximately 650m from the proposed site of Newcastle Muslim Cemetery and the distance suggested in the Guideline is less than 500m.

6.6. Position in Respect of Drainage Features

The position of a cemetery site in relation to a drainage feature of any description is of utmost importance, and pollutants emanating from a cemetery site must not contaminate the water course, conversely the cemetery must not be under threat

of flooding from the water course. A minimum prescribed distance to water courses is given, again depending upon the permeability of the subsoils. At Newcastle Muslim Cemetery there is a water course to the east of the site and is located approximately 450m from the site. The distance suggested by the Guideline is approximately 150m.

6.7. Basal Buffer Zone

A basal buffer zone refers to the vertical soil succession, which occurs between the base of the deepest grave and the water table. This buffer zone acts as an essential aeration zone which forms a barrier between the source of pollution and the water table. Through processes of filtration and absorption, the soil in the aeration (or attenuation) zone ensures that most microbiological pollutants do not come into contact with the water table. This buffer zone should ideally be a minimum of 2.5m thick. The Newcastle Muslim Cemetery site is variable with areas with a deep soil profile exceeding 3.0m with no refusal of a TLB machine.

6.8. Grave Stability

Grave stability refers to the competence of the grave sides and the grave verge or lip. Stability is required for the following reasons:

- A period of a few days usually elapses after the excavation of a grave and the actual burial.
- At the time of burial many people move around the sides of the grave causing a disturbance.
- Excessive crumbling of the excavation verge may hinder the smooth lowering of a coffin.

The subsoils encountered during the investigation at Newcastle Muslim Cemetery site were in all cases stable without any signs of side wall collapse. These subsoils were described as being loose to medium dense through to dense consistency or firm to stiff consistency. Particular care needs to be taken in fill material which is described as loose to medium dense in places. The dumped material covering the majority of the site will require some removal and an additional geotechnical investigation will be required.

6.9. Soil Workability

Another potentially important consideration is soil workability which refers to the ease at which the soil can be manipulated in and out of the grave. Soil at Newcastle Muslim Cemetery is considered to be highly to moderately workable.

6.10. Cemetery Size

Methods have been proposed by the Department of Development Planning to determine the size of a cemetery site and its expected life. Information pertaining to the demographics of the community is required before these calculations can be made. The information required will include:

- Total population of the community
- The average mortality rate per 1000 people per year
- Population growth rates
- Percentage split between child mortalities and adult mortalities
- Gross area required for a single child (usually 2,37 m^2)
- Gross area required for a single adult (usually 5,33 m^2)
- Life expectancy of the cemetery (usually 30 years).

7. CONCLUSIONS

The geotechnical investigation undertaken indicates that the site is suitable for the cemetery purposes. Due to the gently sloping and the relatively flat nature of the ground at Newcastle Muslim Cemetery, the ingress of surface water, groundwater and storm water run-off should be controlled as far as possible. Particular care needs to be exercised on the fill material which is described as loose to medium dense consistency in places. The dumped material covering the majority of the site will require some removal and an additional geotechnical investigation will be required.

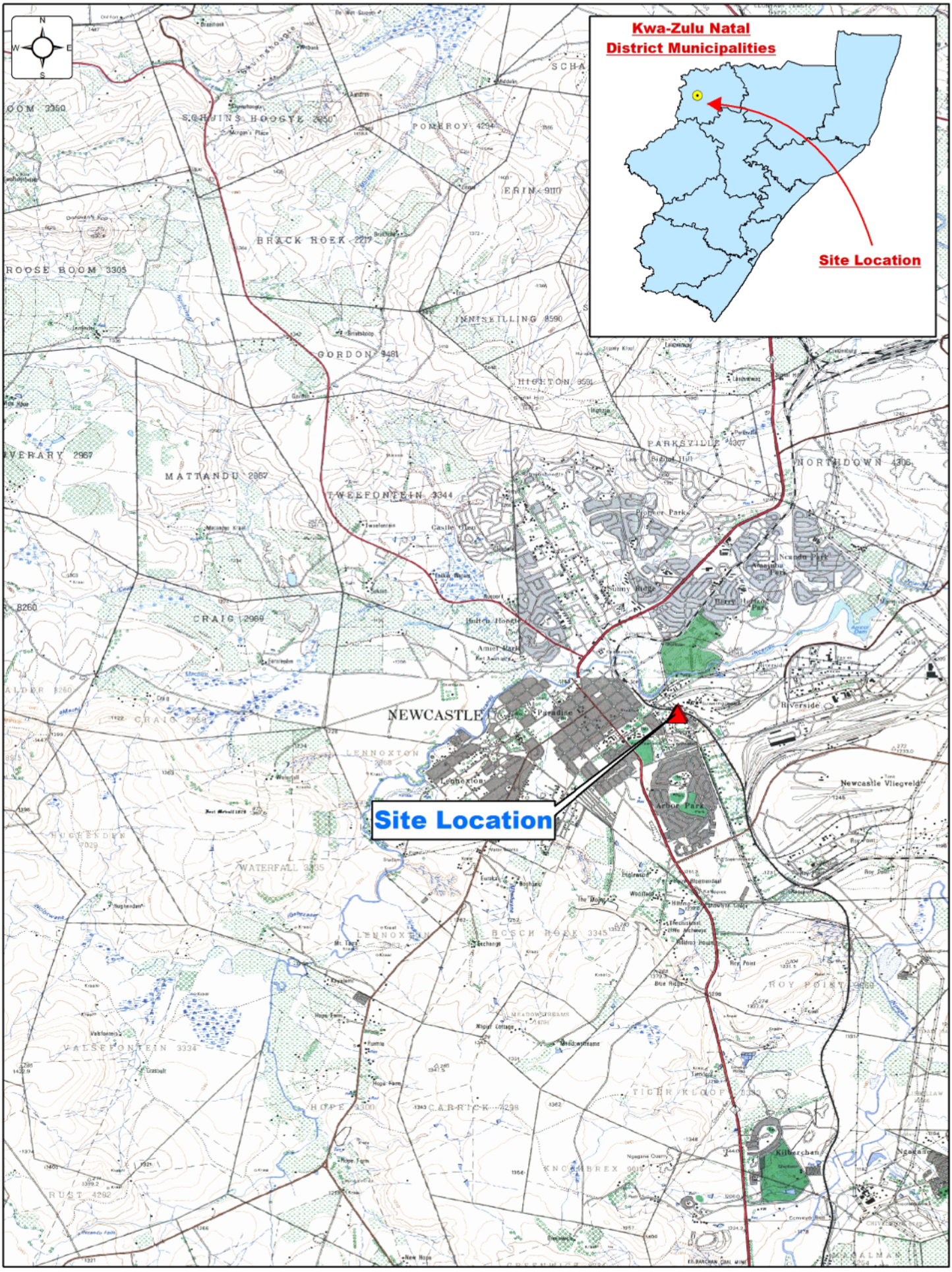
8. REFERENCES

Core Logging Committee (1976). A Guide to core logging for rock engineering, Proc Symp. On Exploration for rock engineering, Johannesburg.

Jennings, J.E., Brink, A.B.A. and Williams, A.A.B. (1973). *Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa*. Transactions of the South African Institution of Civil Engineers, Vol. 15.

NP Richards and L Croukamp (2004). *Geotechnical Investigation Guidelines for Cemetery Site Selection*. Council for Geoscience.

9. APPENDIX A: PLANS



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Fax: (033) 343 6788

Extension of the Newcastle Cemeteries - Muslim Cemetery

Locality Plan

0 1 2 4 6 8 10 Kilometers

Fig 1

Scale 1 : 100 000

T:\ACTIVE PROJECTS\41265 - Extension of the Newcastle Cemeteries\1. Muslim Cemetery\GIS\

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Fax: (033) 343 6788

Extension of the Newcastle Cemeteries - Muslim Cemetery

Site Plan

0 10 20 40 60 80 100 Meters

Fig 2

Scale 1 : 1 500

T:\ACTIVE PROJECTS\41265 - Extension of the Newcastle Cemeteries\1. Muslim Cemetery\GIS\

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Fax: (033) 343 6788

Extension of the Newcastle Cemeteries - Muslim Cemetery

Locality Plan

0 0.5 1 2 3 4 5 Kilometers

Map Reference:
2728 Frankfort
1 : 250 000

Fig 3

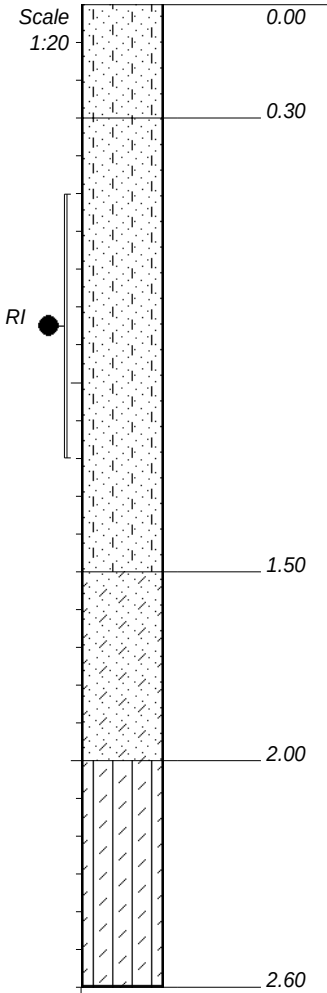
Scale
1 : 75 000

10. APPENDIX B: SOIL PROFILES

UDIDI ENVIRONMENTAL
PLANNING AND DEVELOPMENT CONSULTANTS
MUSLIM CEMETERY

HOLE No: TP1
Sheet 1 of 1

JOB NUMBER: 41265



0.00 Dry to slightly moist, loose to medium dense, silty SAND containing red bricks and ther refuse. Fill.

0.30 Slightly moist, greyish brown and orange red, medium dense to dense, silty SAND containing ferruginous nodules. Ferruginous Horizon.

1.50 Slightly moist, orange brown, light grey and black, medium dense to dense, clayey SAND. Ferruginous Horizon.

2.00 Slightly moist, orange brown, firm, clayey micaceous SILT. Residual Shale.

2.60

NOTES

1) EOH at 2.60m - No refusal of a TLB machine.

2) No water seepage observed.

3) No sidewall collapse.

4) Disturbed sample RI at 0.5--1.20m.

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DRILLED BY :
PROFILED BY : G. NDLELA
TYPE SET BY : G. NDLELA
SETUP FILE : TP-TT-A4.SET

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DIAM :
DATE :
DATE : 07/06/2012
DATE : 20/07/2012 11:47
TEXT : ..T\41265MUSLIMCEMETRY.TXT

ELEVATION :
X-COORD : 29d45'24.12"S
Y-COORD : 29d56'57.90"E

HOLE No: TP1

D06C JGI

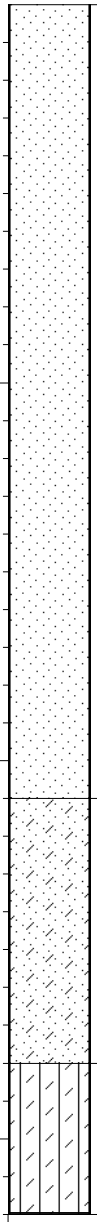
dotPLOT 7006 PBp7

UDIDI ENVIRONMENTAL
PLANNING AND DEVELOPMENT CONSULTANTS
MUSLIM CEMETERY

HOLE No: TP2
Sheet 1 of 1

JOB NUMBER: 41265

Scale 1:20



0.00 Dry to slightly moist, greyish brown, loose to medium dense, medium grained, SAND containing red bricks, concrete and other refuse. Fill.

2.10 Slightly moist, reddish brown, grey and yellowish brown, medium dense, clayey SAND. Ferruginous Horizon.

2.80 Slightly moist, orange brown, firm, clayey micaceous SILT. Residual Shale.

3.20

NOTES

1) EOH at 3.20m - No refusal of a TLB machine.

2) No water seepage observed.

3) No sidewall collapse.

4) Disturbed sample RI at 2.1--2.80m.

CONTRACTOR :
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TYPE SET BY : G. NDLELA
SETUP FILE : TP-TT-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 07/06/2012
DATE : 20/07/2012 11:47
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Y-COORD : 29d56'57.4"E

HOLE No: TP2

D06C JGI

dotPLOT 7006 PBp7

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MUSLIM CEMETERY

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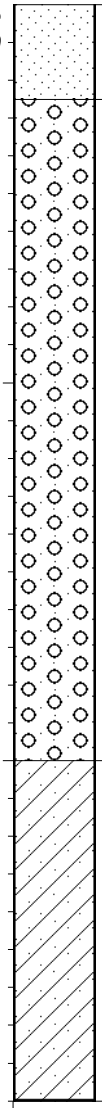
Sheet 1 of 1

JOB NUMBER: 41265

Scale 1:20



0.00

Dry to slightly moist, greyish brown, loose to medium dense, medium grained, SAND containing red bricks, concrete and other refuse. Fill.

0.25

Slightly moist, light grey, reddish brown and orange brown, medium dense to dense, sandy GRAVEL. Gravel components comprising ferruginous nodules. Ferruginous Horizon.

2.00

Slightly moist, greyish brown and yellowish brown, stiff, sandy CLAY.

2.90

NOTES

1) EOH at 2.90m - No refusal of a TLB machine.

2) No water seepage observed.

3) No sidewall collapse.

CONTRACTOR :
MACHINE : TLB EXCAVATOR
DRILLED BY :
PROFILED BY : G. NDLELA
TYPE SET BY : G. NDLELA
SETUP FILE : TP-TT-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 07/06/2012
DATE : 20/07/2012 11:47
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ELEVATION :
X-COORD : 27d45'25.4"S
Y-COORD : 29d56'57.4"E

HOLE No: TP3

D06C JGI

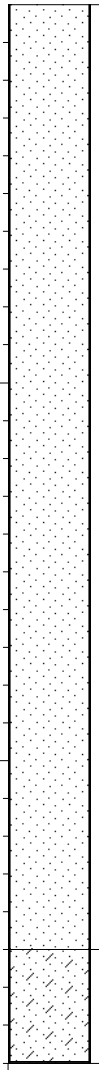
dotPLOT 7006 PBp7

UDIDI ENVIRONMENTAL
PLANNING AND DEVELOPMENT CONSULTANTS
MUSLIM CEMETERY

HOLE No: TP4
Sheet 1 of 1

JOB NUMBER: 41265

Scale 1:20



0.00

Dry to slightly moist, grey, black and orange brown, medium dense to dense SAND containing concrete, red bricks and other refuse. Fill.

2.50

RI

Slightly moist, reddish brown, grey and black, medium dense to dense, clayey SAND containing wet sand lenses and ferruginous nodules. Ferruginous Horizon.

2.80

NOTES

1) EOH at 2.80m - No refusal of a TLB machine.

2) No water seepage observed.

3) No sidewall collapse.

4) Disturbed sample RI at 2.5--2.80m.

CONTRACTOR :
MACHINE : TLB EXCAVATOR
DRILLED BY :
PROFILED BY : G. NDLELA
TYPE SET BY : G. NDLELA
SETUP FILE : TP-TT-A4.SET

INCLINATION :
DIAM :
DATE :
DATE : 07/06/2012
DATE : 20/07/2012 11:47
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ELEVATION :
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Y-COORD : 29d56'38.1"E

HOLE No: TP4

D06C JGI

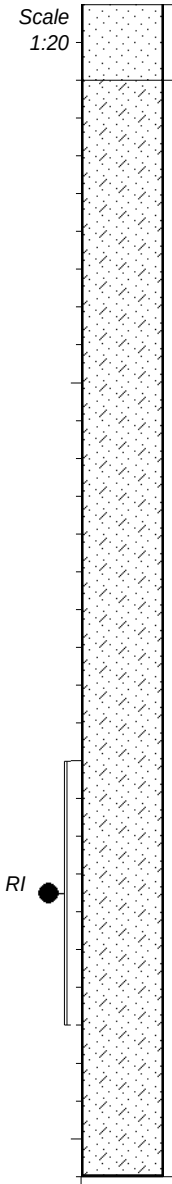
dotPLOT 7006 PBp7

UDIDI ENVIRONMENTAL
PLANNING AND DEVELOPMENT CONSULTANTS
MUSLIM CEMETERY

HOLE No: TP5
Sheet 1 of 1

JOB NUMBER: 41265

Scale 1:20



0.00 Dry to slightly moist, grey, black and orange brown, medium dense to dense SAND containing concrete, red bricks and other refuse. Fill.

0.20 Slightly moist to moist, yellowish brown and grey, dense, clayey SAND.

3.10

NOTES

1) EOH at 3.10m - No refusal of a TLB machine.

2) No water seepage observed.

3) No sidewall collapse.

4) Disturbed sample RI at 2.0--2.70m.

CONTRACTOR :
MACHINE : TLB EXCAVATOR
DRILLED BY :
PROFILED BY : G. NDLELA
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DATE : 07/06/2012
DATE : 20/07/2012 11:47
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X-COORD : 27d45'25.5"S
Y-COORD : 29d56'58.3"E

HOLE No: TP5

D06C JGI

dotPLOT 7006 PBp7

11. APPENDIX C: LABORATORY TEST RESULTS

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

11 HALSTED ROAD - 24 DAVLEN PARK • MKONDENI - P.O. BOX 846 - PIETERMARITZBURG - 3200

TELEPHONE : 033 386 9095 TELEFAX : 033 386 1878 email : scowapmb@wandata.com

ATT: GUGU

Client : TERRATEST

Project : MUSLIM CEMETERY 41265

Job Card No : 163667

Date Received : 15-6-2012

Date Tested : 19-6-2012

Date Reported : 27-6-2012

Sample delivered by : - GN

HYDROMETER ANALYSIS TEST REPORT

Laboratory No.	P11338	P11339	P11340	P11341	
Field No.	TP 1	TP 2	TP 4	TP 5	
Position in Field					
Depth (mm)	500 - 1200	2100 - 2800	2500 - 2800	2000 - 2700	
Material Description	Ly yellow or br ferricrete,silty sand	Reddish orange grey clayey sand	Reddish yellowish grey clayey sand	Yellowish grey clayey silty sand	
Stabilising Agent	Natural	Natural	Natural	Natural	

Sieve Analysis (Wet Preparation) TMH1 - Method A1 (a)

Sieve Aperture							
75.0	mm						
63.0	mm						
53.0	mm						
37.5	mm						
26.5	mm	100					
19.0	mm	96					
13.2	mm	89	100				
4.75	mm	80	97	100	100		
2.00	mm	75	93	96	99		
0.425	mm	68	85	88	93		
0.075	mm	33	54	53	52		

Hydrometer Analysis (ASTM - D422)

Sieve Aperture						
0.060	mm	30	51	48	48	
0.050	mm	27	49	44	45	
0.026	mm	23	44	39	39	
0.015	mm	20	41	35	32	
0.010	mm	18	37	32	28	
0.0074	mm	15	34	26	24	
0.005	mm	12	31	23	21	
0.0036	mm	12	29	21	19	
0.0020	mm	11	27	19	17	
0.0015	mm	11	26	18	15	

Soil Mortar Analysis

Coarse Sand	%	9	9	8	6	
Fine Sand	%	51	37	42	45	
Silt	%	25	26	29	32	
Clay	%	15	29	20	17	

Atterberg Limits TMH 1 - Methods A2, A3, A4

Liquid Limit	%	19	36	34	57	
Plasticity Index	%	9	19	14	29	
Linear Shrinkage	%	4	7.5	6	12	
Equivalent PI	%	6.1	16.2	12.3	26.9	
Classification (Group Index)		A-2-4(0)	A-6(2)	A-6(5)	A-7-6(11)	

For Soilco :

19/07/2012

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09685/07

11 HALSTED ROAD - 24 DAVLEN PARK - MKONDENI - P.O. BOX 846 - PIETERMARITZBURG - 3200

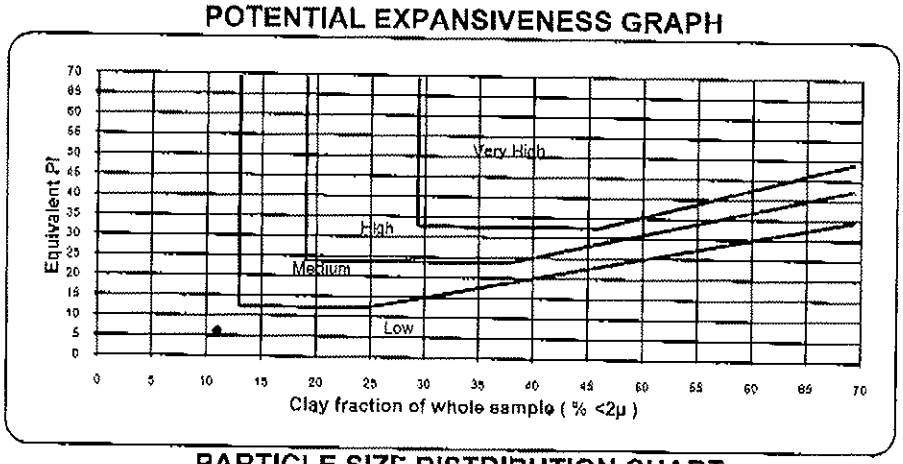
TELEPHONE : (033) 386 9095 TELEFAX : (033) 386 1878 email : scowapmb@wendata.com

Client	: TERRATEST	**Job Card No.**	: 163667
Project	: MUSLIM CEMETERY 41265	**Date Received**	: 15-6-2012
		Date Tested	: 19-6-2012
Sample Delivered by	: 0	**Date Reported**	: 27-6-2012

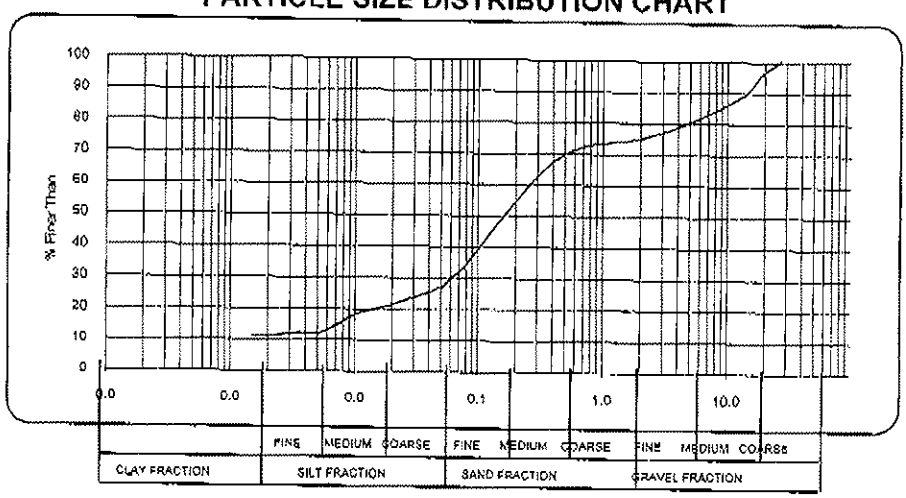
Sample Number	: P11338	**Field or Pit Number**	: TP 1
Position in field	: 0	**Depth (mm)**	: 500 - 1200
Sample Description	: Ly yellow or br ferricrete,silty sand		

Equivalent PI : 6.1 **Clay fraction of whole sample (% <2μ)** : 11

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilco: _____

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TELEPHONE : (033) 386 9095 TELEFAX : (033) 386 1878 email : scowapmb@wandata.com

Client : TERRATEST
Project : MUSLIM CEMETERY 41265

Job Card No. : 163667
Date Received : 15-6-2012
Date Tested : 19-6-2012
Date Reported : 27-6-2012

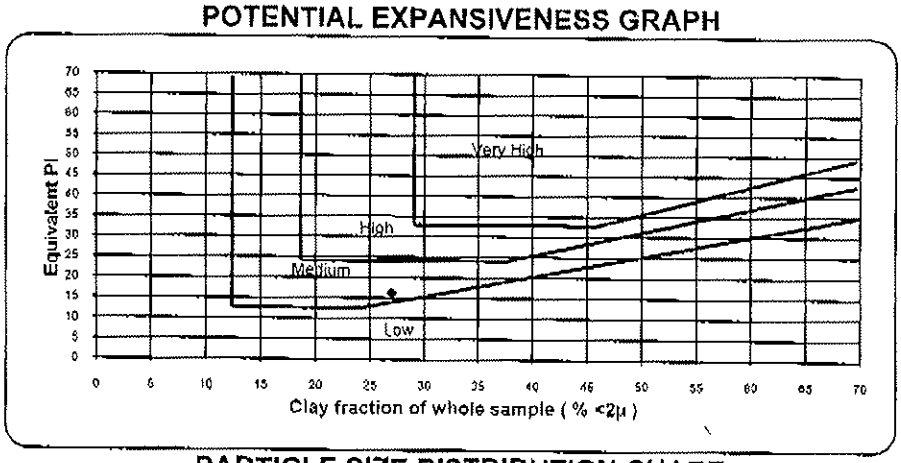
Sample Delivered by : 0

Sample Number : P11339
Position in field : 0
Sample Description : Reddish orange grey clayey sand

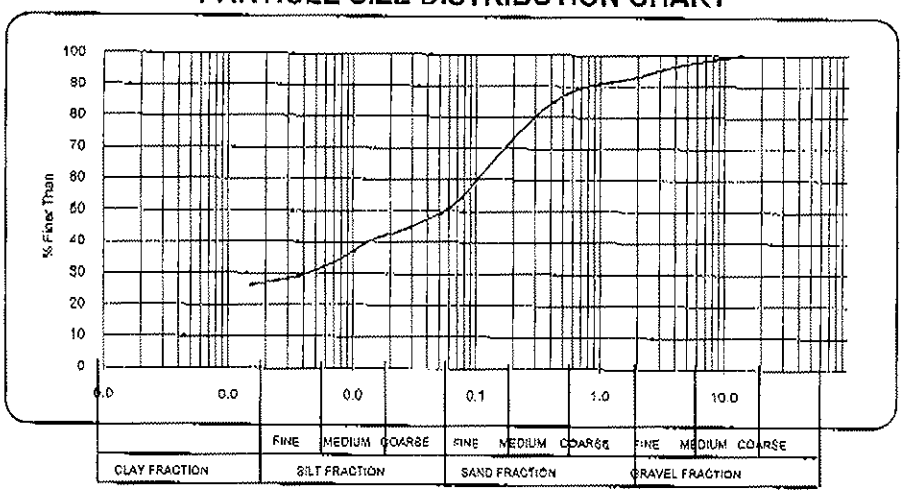
Field or Pit Number : TP 2
Depth (mm) : 2100 - 2800

Equivalent PI : 16.2 **Clay fraction of whole sample (% <2μ)** : 27

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilco: _____

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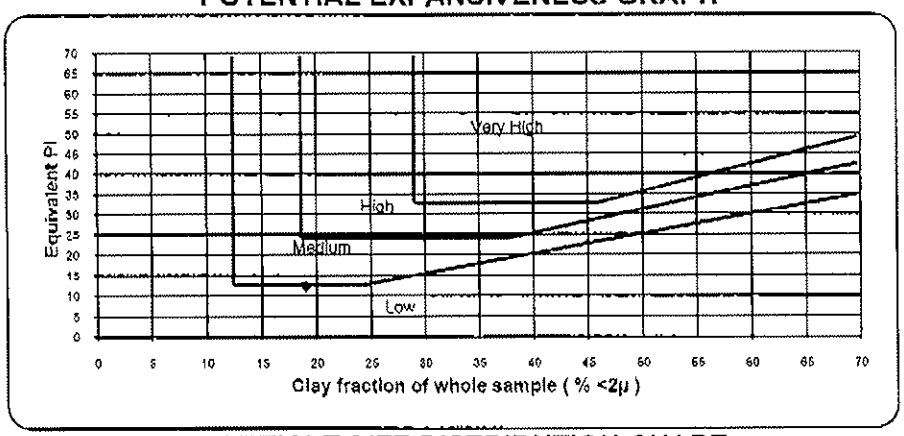
TELEPHONE : (033) 386 9095 TELEFAX : (033) 386 1878 email : scowapmb@wandate.com

Client	: TERRATEST	**Job Card No.**	: 163667
Project	: MUSLIM CEMETERY 41265	**Date Received**	: 15-6-2012
		Date Tested	: 19-6-2012
Sample Delivered by	: 0	**Date Reported**	: 27-6-2012

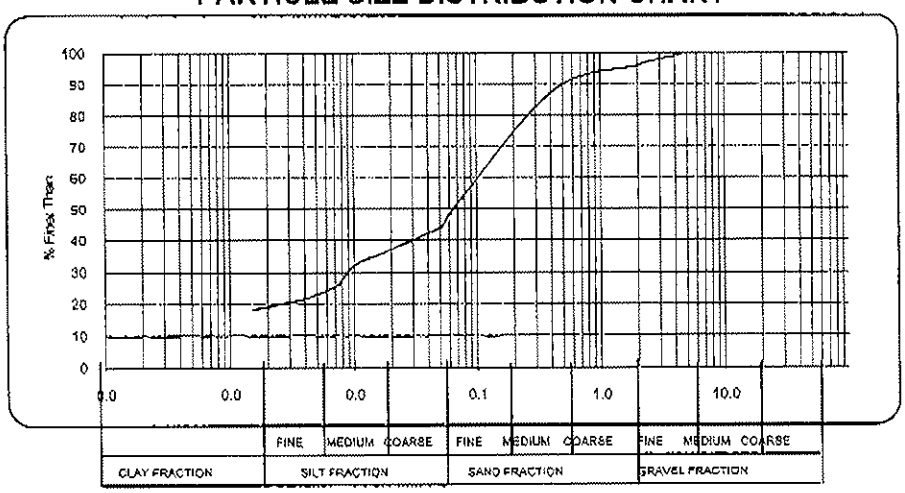
Sample Number	: P11340	**Field or Pit Number**	: TP 4
Position in field	: 0	**Depth (mm)**	: 2500 - 2800
Sample Description	: Reddish yellowish grey clayey sand		

Equivalent PI : 12.3 **Clay fraction of whole sample (% <2μ)** : 19

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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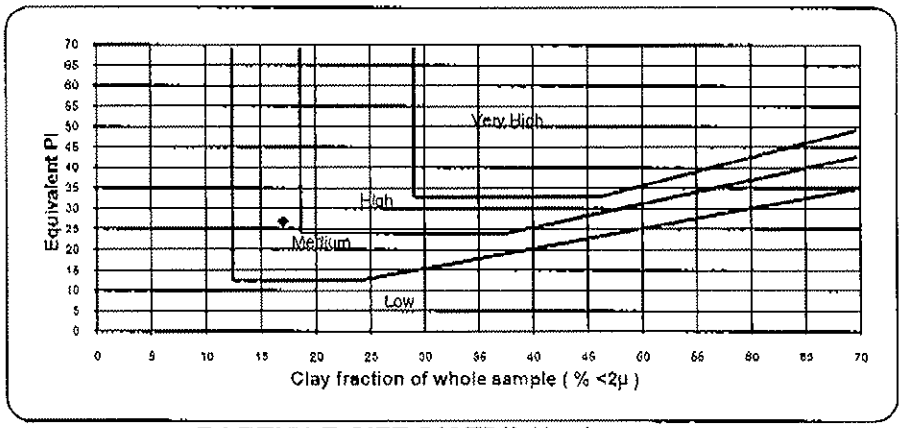
TELEPHONE : (033) 386 9095 TELEFAX : (033) 386 1878 email : scowapmb@wandata.com

Client	: TERRATEST	**Job Card No.**	: 163667
Project	: MUSLIM CEMETERY 41265	**Date Received**	: 15-6-2012
		Date Tested	: 19-6-2012
Sample Delivered by	: 0	**Date Reported**	: 27-6-2012

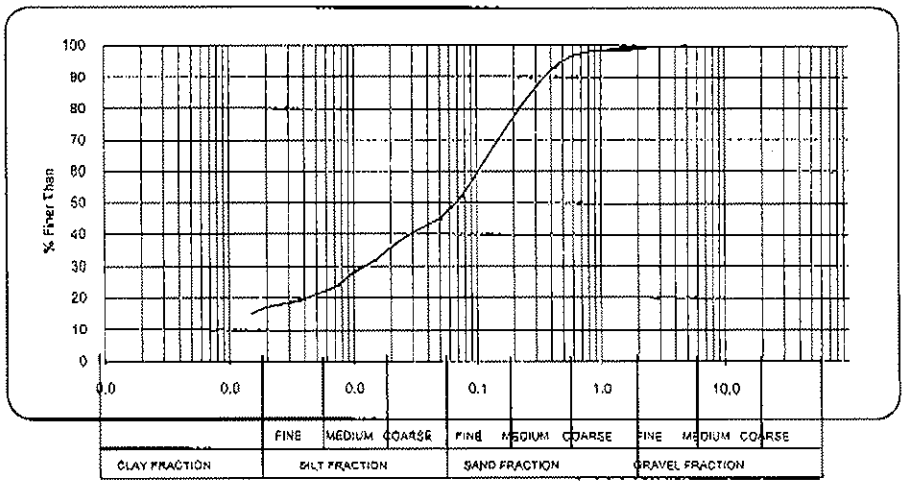
Sample Number	: P11341	**Field or Pit Number**	: TP 5
Position in field	: 0	**Depth (mm)**	: 2000 - 2700
Sample Description	: Yellowish grey clayey sil;ty sand		

Equivalent PI : 26.9 **Clay fraction of whole sample (% <2μ)** : 17

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



For Soilco: _____

19/07/2012