

**APPENDIX G1:
GEOTECHNICAL REPORT**



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GEOTECHNICAL INVESTIGATION REPORT OF THE PROPOSED JABULANI PRECINCT, SOWETO

Prepared for: WESPLAN AND ASSOCIATES

**Report No.: 12006
Date: JANUARY 2007**

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1. INTRODUCTION

1.1 Preamble

On 11th February 2005, Mr. A. Enslin of Wesplan and Associates Town and Regional Planners appointed Africa Exposed Consulting Engineering Geologists to complete a geological evaluation of the Jabulani Precinct in Soweto as part of the Jabulani Implementation Strategy study. A report entitled "Geological Evaluation of the Jabulani Precinct, Soweto" dated 18th February 2005, was prepared by Africa Exposed.

Subsequently during October 2006 Wesplan and Associates Town and Regional Planners invited Africa Exposed Consulting Engineering Geologists to complete a detailed geotechnical investigation of the site.

1.2 Database

The following information was supplied by Wesplan;

- The site covers a surface area of some 72ha.
- Copies of annotated aerial photographs were provided.
- A locality plan was provided.

1.3 Objectives

The objectives of the investigation were:

- to identify the soil and rock conditions below the site to a depth of 3.0m or refusal.
- to recommend suitable foundation systems, and founding depths for the proposed structures.
- to comment on any perceived geotechnical problems which may affect either the design or construction of the project.
- to classify the site in terms of the National Home Builders Registration Council (NHBRC) of 1999.



2. FACTUAL REPORT

2.1 Programme of Work

2.1.1 *Literary Review*

A literature survey was completed and appropriate information was obtained from the following sources:-

- The 1: 250 000 geological map, No 2626 West Rand, published by The Government Printers, Pretoria 1986.
- The 1 : 50 000 Topo-cadastral maps 2627 BB Roodepoort and 2627 BD Lenasia, published by The Department of Survey and Mapping, Mowbray 1979.
- The 1:10 000 Orthophotos of the area, sheets 2627 BD 2 and BD 3.

2.1.2 *Field Work*

On 11th January 2007, twenty four test pits were excavated by means of a Case 580G TLB, supplied by Messrs Kosmos Plant Hire. The positions of each test pits was determined by means of a Garmin eTrex GPS and the layout of the test pits is shown on the Site Plan in Appendix 1. Each hole was profiled by an engineering geologist according to the Jennings, Brink and Williams system, sampled as necessary and backfilled. The detailed profile logs are shown in Appendix 2.

2.1.3 *Office and Laboratory Work*

From the soil samples recovered, eight were selected for Foundation Indicator Tests and three undisturbed samples were recovered to determine the collapse potential and consolidation characteristics of the soils. All the individual test results are included in Appendix 3 of this report.

2.2 Site Description

The site covers a surface area of some 72ha, and is situated on the north west of the Naledi railway line and east of Koma Road. The site is irregularly shaped and is currently used for mixed purposes that include commercial, retail, residential and communal. The police station, fire station and community hall are situated on Bolani Road which bisects the site from east to west. The area to the north incorporates large open and undeveloped land with a water tower and reservoir located on high ground in the extreme north. The high density residential Jabulani Hostel is located in the north eastern portion of the area, while the area to the south which also incorporated large open and undeveloped tracts of land is generally used for commercial and retail purposes. The Inhalanze Railway station is located on the eastern side of the site and the newly opened Jabulani Mall is located in the southwestern corner of the site.

Significant portions of the site however remain undeveloped with large tracts of open land that are vegetated with natural veld grasses.



2.3 Site Geology

From the available literature as well as from observations during site visit completed, it is evident that the site is underlain by andesite belonging to the Alberton formation of the Klipriviersberg Group of the Ventersdorp Supergroup.

The regional dip of the lithologies is some 12° to 15° to the south and south west, and the entire site is underlain by the andesite lavas that form the prominent east -west trending ridges in the area.

The contact with the geologically younger dolomite which belong to the Malmani subgroup of the Transvaal Sequence occurs some 4km to the southwest, and will have no influence on the geotechnical characteristics of the site. Similarly the geological contact with the older sedimentary rocks belonging to the Witwatersrand Supergroup is located approximately 500m to the north where the geological contact of the formations is defined by a low angle reverse fault (thrust fault).

A number of these faults are known to occur along this geological contact, which in some cases have subsequently be intruded by younger diabase dykes that are known to occur further to the east, in the vicinity of the old Orlando power station. None of these intrusions are known to occur in the vicinity of Jabulani.

2.4 Hydrology

The average annual rainfall in this area is approximately 750mm, most of which occurs as heavy, isolated thunder showers between October and March. The site slopes down towards the south and east at a gradient of some 2% to 4% and several shallow drainage features exist on the site that will concentrate stormwater runoff in that direction.

No groundwater seepage was recorded in any test pit, however seasonal fluctuations of the level of the perched water table must be anticipated.

2.5 Observations

The test pits were excavated to an average depth of 1.6m and refusal was encountered in each of the test pits on very soft to medium hard rock andesite in each case. A description of the soils that blanket the site is summarised below.

2.5.1 ***Colluvium***

Almost the entire site is blanketed by a thin horizon that ranges in thickness from 0.3 to 0.5m of transported soil that was described as being dark brown, medium dense, silty and clayey sand with scattered gravels that is of colluvial origin. The thickness of the transported material tends to become thinner towards the north as the low rise on which the water tower and reservoir are located, is approached.

The transported soils are usually ferruginised towards the base, and may range from scattered ferricrete nodules to nodular ferricrete.

2.5.2 ***Residual Andesite***

The entire site is underlain by weathered and reworked residual andesite. The soil consists of silty and gravelly clay and silt that were described as being firm to stiff or



medium dense to dense (depending on the soil texture), and the soil structure is typically relict jointed and occasionally blocky. These soils are derived from the in-situ decomposition of the underlying basic igneous rock formations and with increasing depth beyond approximately 1.5 to 1.8m becomes dense to very dense, and tending to very soft rock consistency andesite.

The weathering of these formations are highly variable and weathered soils may often be juxtaposed with shallow bedrock and boulders. This can be seen particularly well in the northern portions of the site where the variable weathering patterns of the andesite is evident by the presence of the small hill which is characterised by extensive outcrop and boulders. Scattered boulders of up to approximately 1.5m³ in volume occur throughout the site, but are more prevalent on the northern portions of the site.

2.6 Laboratory and Field Test Results

2.6.1 *Indicator testing*

For more accurate identification and classification purposes, Particle Size Distribution and Atterberg Limits Tests were carried out on representative samples of the various soil horizons present within the site. The results are shown in Appendix 3 of this report and are summarised in Table 1 below.

TP No.	Depth (m)	Material	PI (%)	PI (ws)	LS	Clay (%)	Activity
5	1.0-1.2	Gravel and sandy silt. Rew. Res. Andesite	19	11	8	14	low/med
8	0.5-0.6	Gravel and silty clayey sand. Colluvium	24	18	10	13	med
12	0.8-1.0	Blocky and fractured, highly weathered. Andesite	21	11	10	10	low/med
14	0.8-0.9	Gravel and sandy silt. Rew. Res. Andesite	22	12	10	14	med
18	0.9-1.0	Gravel with silty sand and ferricrete. Rew. Res. Andesite	23	16	11	14	med
21	1.5-1.6	Gravel and sandy silt. Rew. Res. Andesite	25	19	11	26	med
22	1.1-1.2	Gravel with silty sand and ferricrete. Rew. Res. Andesite	32	28	15	39	high
23	2.1-2.2	Gravel and sandy silt. Rew. Res. Andesite	32	26	14	30	high

2.6.2 *Collapse Potential Testing*

In order to establish the consolidation characteristics and collapse potential of the residual andesite, undisturbed samples were retrieved from TP 12, 18 and 22 and were subjected to Collapse Potential tests. The results are summarised in table 2 below, and show that the residual andesite retrieved is marginally collapsible and compressible, with a degree of severity of less than 1% to 3.4% being recorded. According to Jennings and Knight (1975), this represents "No trouble" to "Moderate trouble".



TP 14	10 to 15
TP 18	15 to 20
TP 22	35 to 40
TP 23	50 to 55

3.3 Classification of Site

In order to classify the geotechnical characteristics of the underlying soils, the geotechnical classification method proposed in the National Home Builders Registration Council (NHBC) of 1999 has been applied to this site. Table 5 shown below indicates the various geotechnical characteristics and the criteria used to evaluate the soils.

TABLE 5. Residential Site Class Designations National Home Builders Registration Council (NHBC) of 1999.				
Typical Founding Material	Character of Founding Material	Expected Range of Total Soil Movements (mm)	Assumed Differential Movement (%of Total)	Site Class
Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	EXPANSIVE SOILS	<7,5 7,5-15 15-30 >30	50% 50% 50% 50%	H H1 H2 H3
Silty sands, sands, sandy and gravelly soils	COMPRESSIBLE AND POTENTIALLY COLLAPSIBLE SOILS	<5,0 5,0-10 >10	75% 75% 75%	C C1 C2
Rock (excluding mud rocks which may exhibit swelling to some depth)	STABLE	Negligible	-	R

In terms of the National Home Builders Registration Council (NHBC) of 1999 site classification system, the site has been classified as shown below.

- R** Area underlain by shallow rock, negligible settlement anticipated
- R/H2** Area underlain by shallow rock and 15 to 30mm heave movement predicted.
- C2/H3** Greater than 10mm collapse and consolidation settlement and greater than 30mm heave movement predicted.
- P/H3** Area underlain by uncontrolled fill and greater than 30mm heave predicted

3.4 Design Solutions

3.4.1 **Structures**

3.4.1.1 Site Classified as R (Area underlain by shallow rock, negligible settlement anticipated)

The northern portion of the site is characterised by extensive outcrop of andesite bedrock and abundant spheroidal andesite boulders. All single storey residential structures constructed within Geotechnical Zone *R* can be placed on



conventional foundation. Foundation options may include strip footings or concrete slabs placed on the ground, with thickening for internal and external walls. Good site drainage must be adopted.

The routing of underground services will have to take cognisance of the presence of shallow bedrock. It must also be anticipated that excavations for service trenches and foundation within the upper 1.5m will be classified as "intermediate" and "hard" in terms of SABS 1200: Earthworks. The presence of boulders must also be anticipated.

3.4.1.2.

Site Classified as R/H1

(Area underlain by shallow rock and 7.5 to 15mm heave movement predicted)

A portion of the central and northern portions of the site has been classified as an **R/H1** and is characterised by a thick surface horizon of transported colluvial soils of silty sand and gravel which is underlain by sandy and clayey silt, residual andesite within 1.5m of the surface.

Potential founding solutions for all of the houses to be constructed on this portion of the site are presented below.

i. **Modified Normal Strip Footings.**

It is recommended that the external and internal walls of the house are founded on reinforced strip footings placed at an average depth of 0.5m below current ground level. The foundations must be reinforced and construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses. Articulation joints must be included at all external and internal doors and openings.

Particular attention must be placed on drainage precautions as well as ensuring the competence of all water bearing services.

The maximum allowable bearing pressures must not exceed 100kPa.

It is good practice to adopt sound stormwater drainage around the proposed structures, and excess moisture should not be allowed to accumulate adjacent to foundations (see section. 3.3.4).

3.4.1.3.

Site Classified as R/H2

(Area underlain by shallow rock and 15 to 30mm heave movement predicted)

A portion of the central parts of the site has been classified as an **R/H2** and is characterised by a thin surface horizon of transported colluvial soils of silty sand and gravel which is underlain by a thick horizon of sandy and clayey silt, reworked residual andesite within 2.0m of the surface.

Potential founding solutions for all of the houses to be constructed on this portion of the site are presented below.



i. *Modified Normal Strip Footings.*

It is recommended that the external and internal walls of the house are founded on reinforced strip footings placed at an average depth of 0.5m below current ground level. The foundations must be reinforced and construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses. Articulation joints must be included at all external and internal doors and openings.

Particular attention must be placed on drainage precautions as well as ensuring the competence of all water bearing services.

The maximum allowable bearing pressures must not exceed 100kPa.

ii. *Soil raft.*

Remove in situ materials to 1.0m beyond perimeter of building (ie. the foot print of the structure) to a depth of 1.5 times the widest foundation, measured from the underside of the footings. Replace with imported G7 or better quality soil in compacted layers of 150mm thick to 93% Mod AASHTO density at -1% to +2% of OMC. Bearing capacity of the soil raft will be 100kPa. Foundations must be placed at a depth of 600mm below the top of the mattress and normal construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses.

ii. *Concrete raft.*

A concrete raft designed by a competent structural engineer to tolerate the anticipated settlement.

It is good practice to adopt sound stormwater drainage around the proposed structures, and excess moisture should not be allowed to accumulate adjacent to foundations (see section. 3.3.4).

3.4.1.3.

Site Classified as C2/H3

(Greater than 10mm collapse and consolidation settlement and greater than 30mm heave movement predicted.)

The southern portions of the site been classified as an **C2/H3** and is characterised by a thin surface horizon of transported colluvial soils of silty sand and gravel which is underlain by a thick horizon of sandy and silty clay, reworked residual andesite that is up to 2.5m thick.

Potential founding solutions for all of the houses to be constructed on this portion of the site are presented below.

i. *Soil raft.*

Remove in situ materials to 1.0m beyond perimeter of building (ie. the foot print of the structure) to a depth of 1.5 times the widest foundation, measured from the underside of the footings. Replace with imported G7 or better quality soil in compacted layers of 150mm thick to 93% Mod AASHTO density at -1% to +2% of OMC.



Bearing capacity of the soil raft will be 100kPa. Foundations must be placed at a depth of 600mm below the top of the mattress and normal construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses.

- ii. **Concrete raft.**
A concrete raft designed by a competent structural engineer to tolerate the anticipated settlement.

It is good practice to adopt sound stormwater drainage around the proposed structures, and excess moisture should not be allowed to accumulate adjacent to foundations (see section. 3.4.4).

3.4.1.4.

Site Classified as P/H3

(Area underlain by uncontrolled fill and greater than 30mm heave movement predicted.)

A limited portion of the south western side of the site is blanketed by uncontrolled fill that overlies potentially expansive residual andesite. The fill consists of building rubble spoiled soil and other waste that appears to be up to 2.0m thick in places.

The area has been classified as **P/H3** and potential founding solutions for all of the houses to be constructed on this portion of the site are presented below.

- i. **Soil raft.**
Remove in situ fill materials to 1.0m beyond perimeter of building (ie. the foot print of the structure) to a depth of 1.5 times the widest foundation, measured from the underside of the footings. Replace with imported G7 or better quality soil in compacted layers of 150mm thick to 93% Mod AASHTO density at -1% to +2% of OMC. Bearing capacity of the soil raft will be 100kPa. Foundations must be placed at a depth of 600mm below the top of the mattress and normal construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses.
- ii. **Concrete raft.**
A concrete raft designed by a competent structural engineer to tolerate the anticipated settlement.

It is good practice to adopt sound stormwater drainage around the proposed structures, and excess moisture should not be allowed to accumulate adjacent to foundations (see section. 3.4.4).

3.4.2

Roads and Terraces

The results of the Foundation Indicator Tests have been used to classify the material and to determine the suitability of soil for the construction of terraces and pavement layers. The results of the tests are presented in Appendix 3, and the samples are classified as a G10+ materials and are therefore not suitable for the construction of the selected layers and sub-base layers in the proposed roads.



Suitable materials for use in the sub-base and base course layers must be imported from a commercial source.

3.4.3 **Excavation Classification**

Excavation class will be "soft" with possible boulders according to SABS 1200 D: Earthworks, up to a depth of 2.0m in the areas of the site classified as **C2/H3**. Excavation class will be "intermediate" with "boulder" in areas **R/H1** and **R/H2**.

It must be expected that some blasting will be required to remove the rock shown in zone R, and boulders and core stones may be encountered throughout the site, and more particularly within the northern and central portions.

It must be stressed that the test pit sidewalls were described as unstable in all cases, with collapse occurring as well as extensive overbreak. This must be taken into consideration in all excavations with particular emphasis being placed on the safety of personnel working in trenches deeper than 1.5m.

3.4.4 **Stormwater Management**

Although perched water was not noted during the field work it must be anticipated that localised ground water seepage could be encountered in all zones. It is therefore recommended that standard damp proofing of structures is required, and all down pipes and surface stormwater drainage measures should be carefully considered.

Due to the potentially expansive properties of the soils encountered on the site, it is recommended that the following precautions are implemented when designing the buried water bearing services:

- i. No plumbing and drainage should be placed under floor slabs as far as practicable.
- ii. The fall of all trenches should be directed away from buildings.
- iii. All service trenches should be located at least 1.5m away from buildings and should be backfilled with in situ materials to not less than 88% Mod AASHTO density.
- iv. Sewer and drain pipes and fittings should be provided with flexible joints.
- v. Water pipe entries into buildings should be provided with flexible piping to allow for movement.
- vi. Pipes through walls should be provided with sleeves to permit relative movement.

3.5 **General**

3.5.1 **Ground Water**

No ground water seepage was encountered on the site, however it must be anticipated that shallow ground water may occur in isolated areas throughout the site after periods of sustained rainfall. Appropriate precautions should therefore be implemented beneath all the structures and paved areas, as well as on any exposed excavated surfaces in the terraces.



TP No	Depth (m)	Material	Dry Density (kg/m ³)	Moisture Content (%)	Collapse Potential (%)	Jennings et.al Classification
12	0.8-1.0	Blocky and fractured, highly weathered. Andesite	1807	4.74	0.5	No trouble
18	0.9-1.0	Gravel with silty sand and ferricrete. Rew. Res. Andesite	1980	9.61	0.9	No trouble
22	1.1-1.2	Gravel with silty sand and ferricrete. Rew. Res. Andesite	1529	14.91	3.4	Moderate trouble

3. INTERPRETIVE REPORT

3.1 Discussion of Results

The Consolidation test completed on the residual andesite indicated that these soils are compressible and slightly collapsible. The magnitudes of the anticipated settlements are shown in table 3 below. These values have been calculated by assuming that 700mm wide strip footings will be placed at an average depth of 0.7m below natural ground surface and the foundations would apply a bearing pressure of 100kPa.

Position	Total Settlement (mm)
TP 12	5 to 10
TP 18	20 to 25
TP 22	50 to 55

3.2 Heave Potential

The Foundation Indicator Tests have also shown that the underlying soils are potentially active. Estimations of the total heave potential have been determined by means of the Van Der Merwe (1964) and Weston (1980) method. The Van Der Merwe method assumes that the soils are wetted up from a desiccated state and therefore tends to over estimate the severity, while the Weston method takes into consideration the current and potential fluctuations in the soil moisture conditions. Using the same footing geometry assumed above, estimated total heave movement at the base of the foundations are presented in Table 4 below.

Position	Anticipated Heave (mm)
TP 5	15 to 20
TP 8	10 to 15
TP 12	5 to 10



3.5.2 Insecticides

Termite activity was noted on the site and it is therefore recommended that a recognised, environmentally acceptable pesticide/insecticide be used to combat the threat of ants/termites and rodents to the integrity of the foundations.

3.6 Construction Problems

It must be anticipated that corestones and boulders may be encountered in the excavations.

3.7 Additional Investigations

This investigation was completed for the purposes of township proclamation, and whilst the site has been zoned and generalised foundation recommendations have been presented for typical residential structures, the results contained in this report should not be used for site specific foundation design purposes. Additional detailed geotechnical investigations would be required for structures other than single and double storey residential units.

4. CONSTRUCTION MONITORING

4.1 Excavation Inspection

In order to identify any changes or variation to the soils that may not have been identified in the test pits, it is recommended that all foundation excavations be inspected by Africa Exposed prior to placing any concrete and/or commencing any backfilling.

4.2 Control Testing

Regular checks on the quality and compaction of the backfill to the terraces should be made.



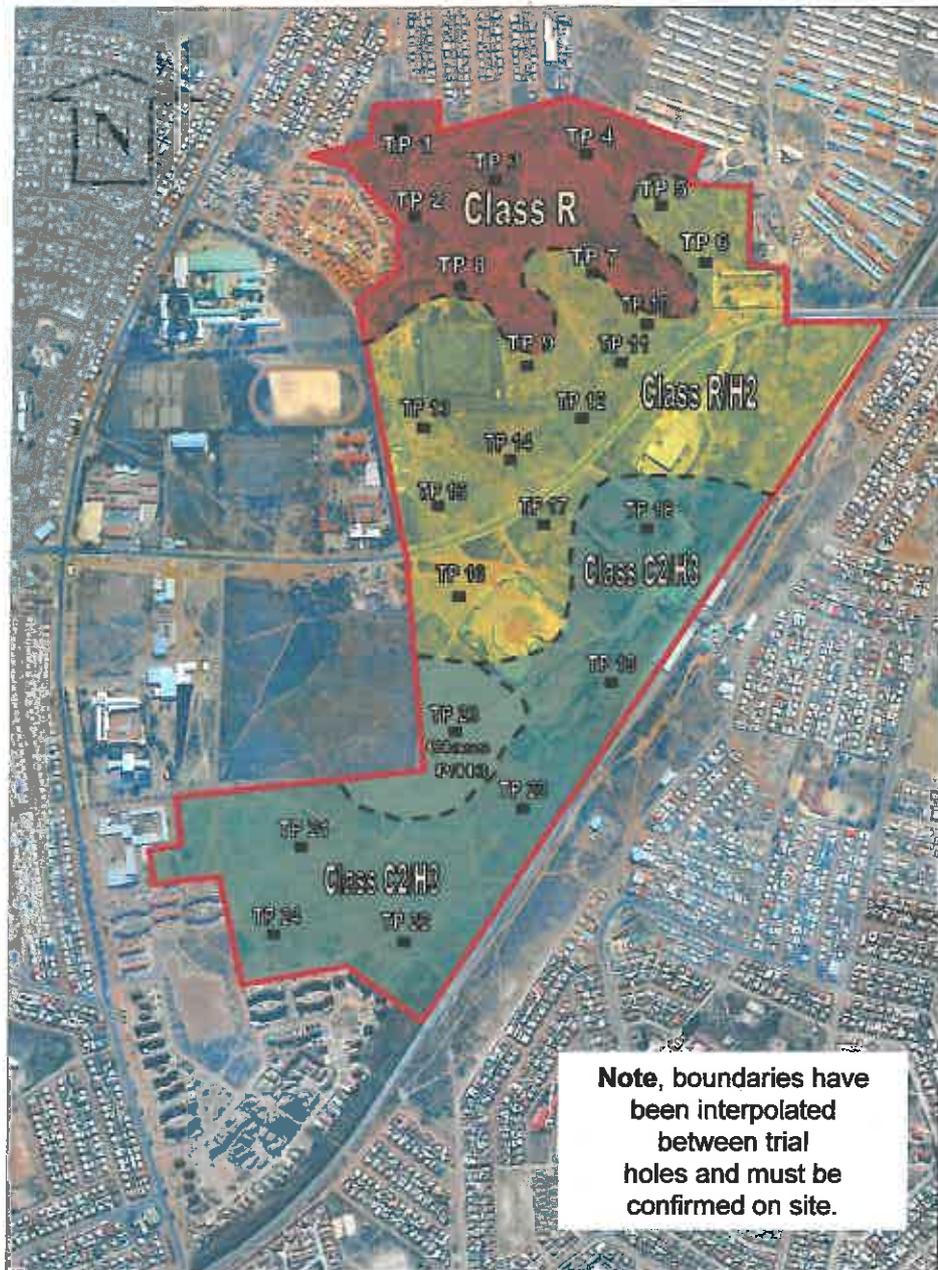
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APPENDIX 1

**SITE PLAN
AND
GEOLOGY MAP**



- Site Class R** Underlain by outcropping bedrock
- Site Class R/H2** Shallow bedrock and 15 to 30mm heave predicted
- Site Class C2/H3** Greater than 10mm consolidation and collapse settlement and greater than 30mm heave predicted
- Site Class P/H3** Underlain by uncontrolled fill and greater than 30mm heave predicted



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CONSULTING ENGINEERING GEOLOGISTS

WESPLAN AND ASSOCIATES

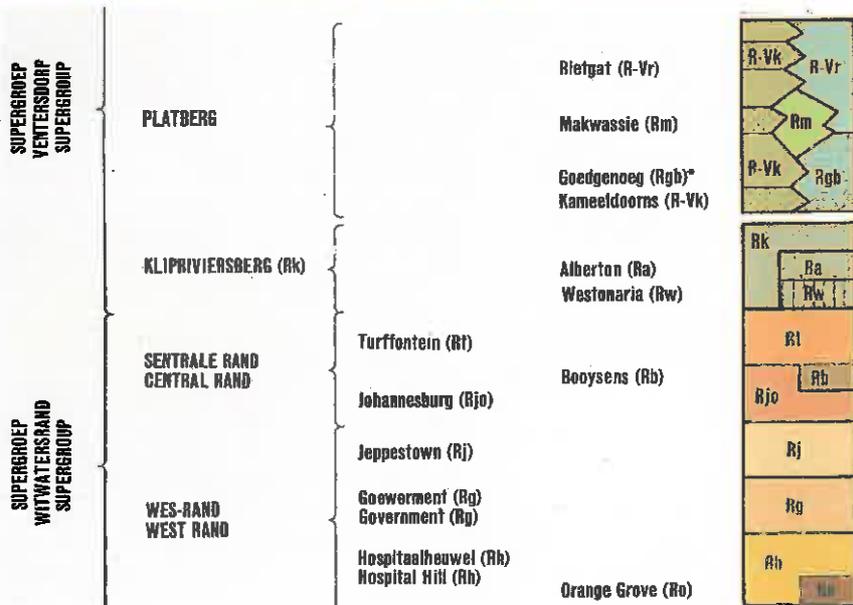
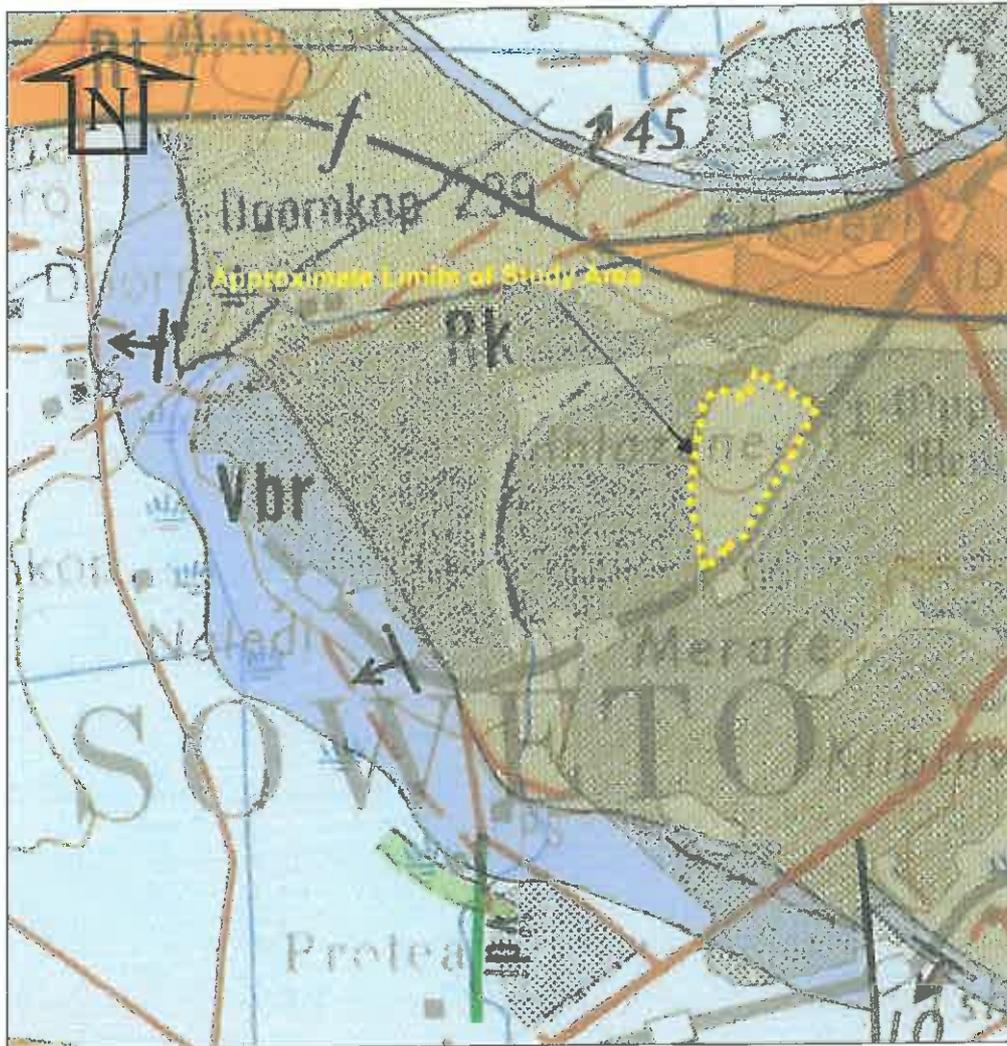
**JABULANI PRECINCT
SOWETO**

SITE PLAN

Job No: 12006

Date: JANUARY 2007

Figure: 1



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**JABULANI PRECINCT
SOWETO**

GEOLOGY MAP

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Date: JANUARY 2007

Figure: 2

APPENDIX 2

TRIAL HOLE PROFILES



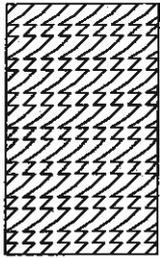
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P.O. Box 68 Honeydew 2040
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Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 1

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0 0.2			(0.0, 0.3) ANDESITE: Abundant andesite boulders and medium weathered MEDIUM HARD ROCK bedrock

NOTES
1. TEST PIT COULD NOT BE EXCAVATED DUE TO ROCK AND BOULDERS.

HOLE No.: TP 1

JOB No.: 12006	MACHINE: Case 580G
DATE: 11 January 2007	CONTRACTOR: Kosmos Plant Hire
PROFILED BY: J.A	DIAMETER: Trench



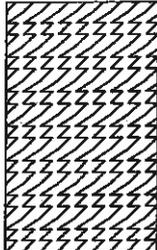
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Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 2

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0 0.2			(0.0, 0.3) ANDESITE: Abundant andesite boulders and medium weathered MEDIUM HARD ROCK bedrock

NOTES

1. TEST PIT COULD NOT BE EXCAVATED DUE TO ROCK AND BOULDERS.

HOLE No.: TP 2

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



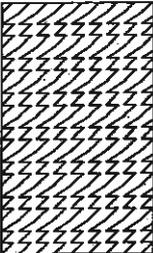
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Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 3

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0 0.2			(0.0, 0.3) ANDESITE: Abundant andesite boulders and medium weathered MEDIUM HARD ROCK bedrock

NOTES
1. TEST PIT COULD NOT BE EXCAVATED DUE TO ROCK AND BOULDERS.

HOLE No.: TP 3

JOB No.: 12006	MACHINE: Case 580G
DATE: 11 January 2007	CONTRACTOR: Kosmos Plant Hire
PROFILED BY: J.A	DIAMETER: Trench



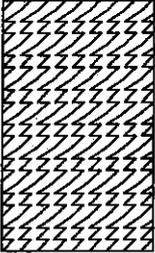
AFRICA EXPOSED
CONSULTING ENGINEERING GEOLOGISTS CC

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 4

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0 0.2			(0.0, 0.3) ANDESITE: Abundant andesite boulders and medium weathered MEDIUM HARD ROCK bedrock

NOTES

1. TEST PIT COULD NOT BE EXCAVATED DUE TO ROCK AND BOULDERS.

HOLE No.: TP 4

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



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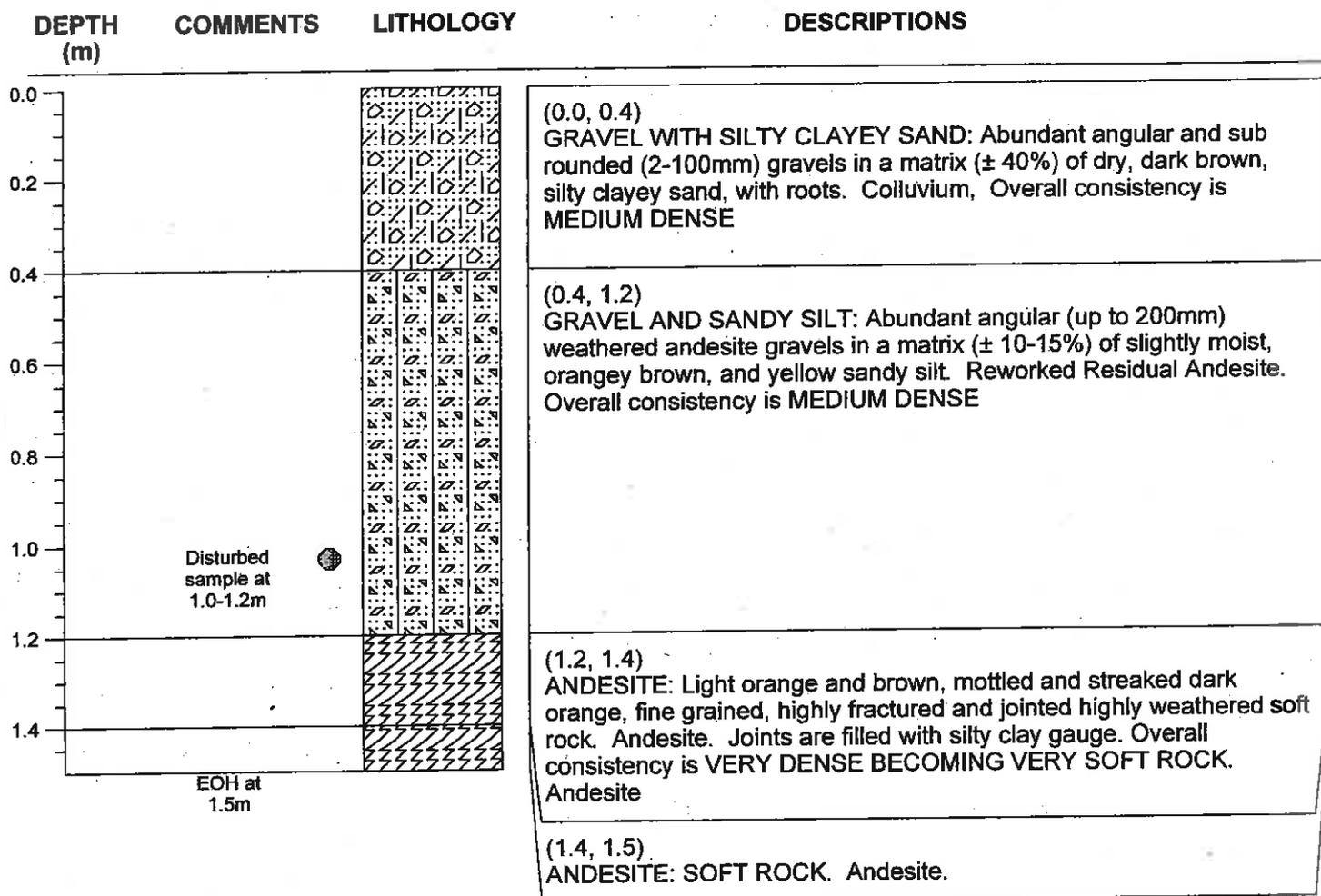
CONSULTING ENGINEERING GEOLOGISTS CC

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Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 5



NOTES

1. EOH refusal
2. No groundwater seepage
3. Disturbed sample taken at 1.0 to 1.2m

HOLE No.: TP 5

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



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P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 6

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0			(0.0, 0.5) GRAVEL WITH SILTY CLAYEY SAND: Abundant angular and sub rounded (2-100mm) gravels in a matrix (\pm 40%) of dry, dark brown, silty clayey sand, with roots. Colluvium, Overall consistency is MEDIUM DENSE
0.2			
0.4			
0.6			(0.5, 1.4) GRAVEL AND SANDY SILT: Abundant angular (up to 200mm) weathered andesite gravels in a matrix (\pm 10-15%) of slightly moist, orangey brown, and yellow sandy silt. Reworked Residual Andesite. Overall consistency is MEDIUM DENSE
0.8			
1.0			
1.2			
1.4			(1.4, 1.7) ANDESITE: Light orange and brown, mottled and streaked dark orange, fine grained, highly fractured and jointed highly weathered soft rock. Andesite. Joints are filled with silty clay gauge. Overall consistency is VERY DENSE BECOMING VERY SOFT ROCK. Andesite
1.6			
1.8	EOH at 1.8m		(1.7, 1.8) ANDESITE: SOFT ROCK. Andesite.

NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 6

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



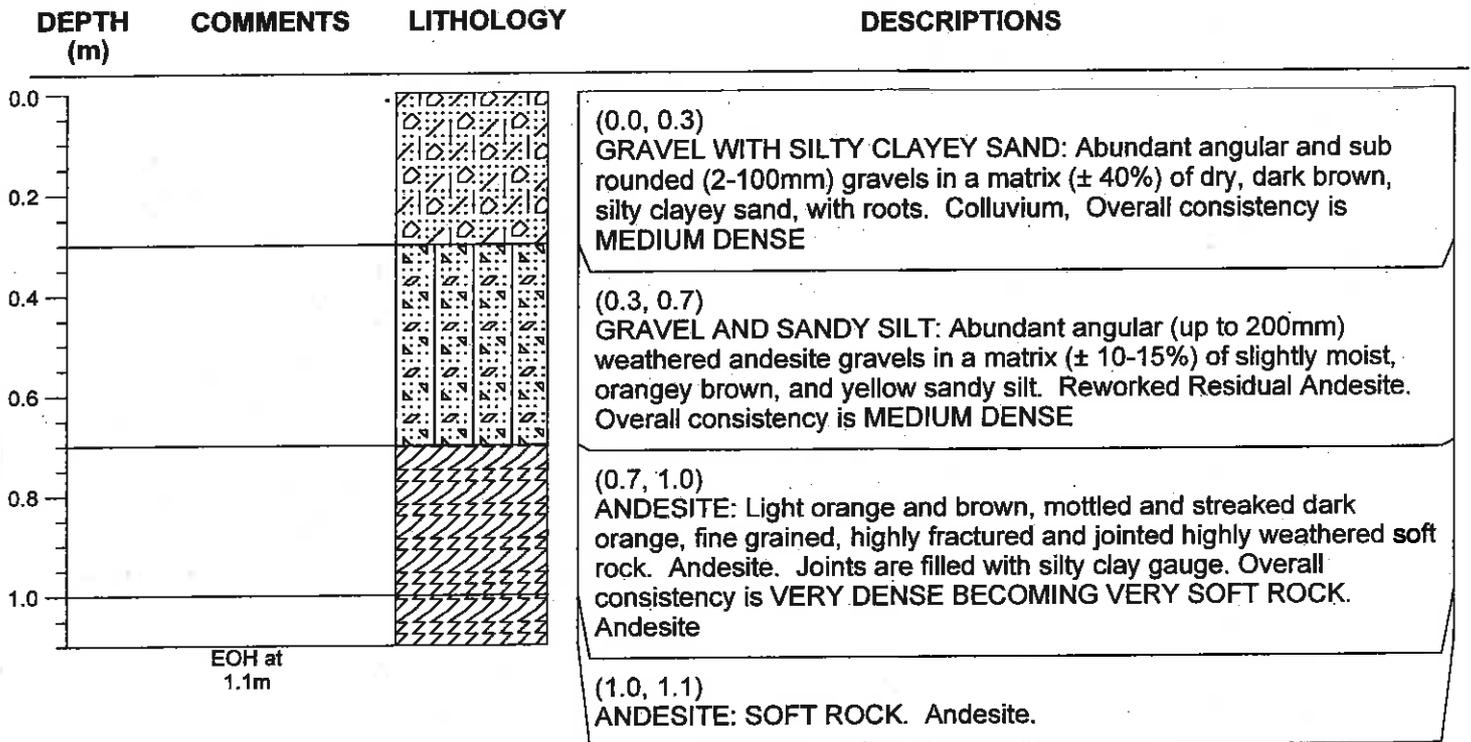
AFRICA EXPOSED
CONSULTING ENGINEERING GEOLOGISTS CC

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Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 7



NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 7

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



AFRICA EXPOSED

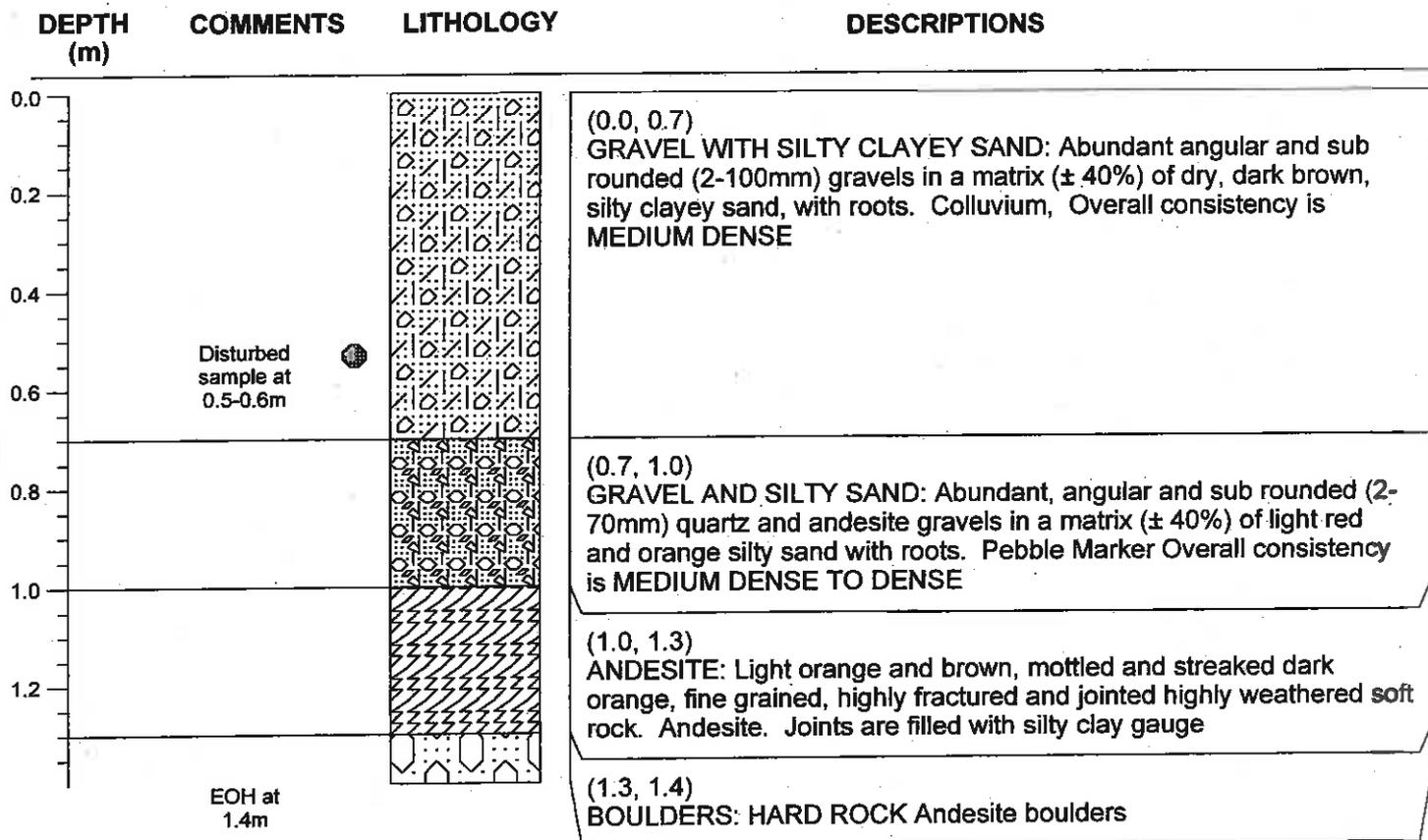
CONSULTING ENGINEERING GEOLOGISTS CC

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 8



NOTES

1. EOH refusal on boulders
2. No groundwater seepage
3. Disturbed sample taken at 0.5 to 0.6m

HOLE No.: TP 8

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



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P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 9

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0			(0.0, 0.4) GRAVEL WITH SILTY CLAYEY SAND: Abundant angular and sub rounded (2-100mm) gravels in a matrix ($\pm 40\%$) of dry, dark brown, silty clayey sand, with roots. Colluvium, Overall consistency is MEDIUM DENSE
0.2			
0.4			(0.4, 0.5) GRAVEL AND SILTY SAND: Abundant, angular and sub rounded (2-70mm) quartz and andesite gravels in a matrix ($\pm 40\%$) of light red and orange silty sand with roots. Pebble Marker Overall consistency is MEDIUM DENSE
0.6			
0.8			
1.0			(0.5, 1.3) GRAVEL AND SANDY SILT: Abundant angular (up to 200mm) weathered andesite gravels in a matrix ($\pm 10-15\%$) of slightly moist, orangey brown, and yellow sandy silt. Reworked Residual Andesite. Overall consistency is DENSE
1.2			
1.4			(1.3, 1.6) ANDESITE: Light orange and brown, mottled and streaked dark orange, fine grained, highly fractured and jointed highly weathered soft rock. Andesite. Joints are filled with silty clay gauge. Overall consistency is VERY DENSE TO VERY SOFT ROCK. Andesite
1.6			(1.6, 1.7) BOULDERS: Unweathered, HARD ROCK. Andesite. Boulder

EOH at
1.7m

NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken
4. Abundant spheroidal boulders (up to 2m in diameter) in vicinity of the Test Pit

HOLE No.: TP 9

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



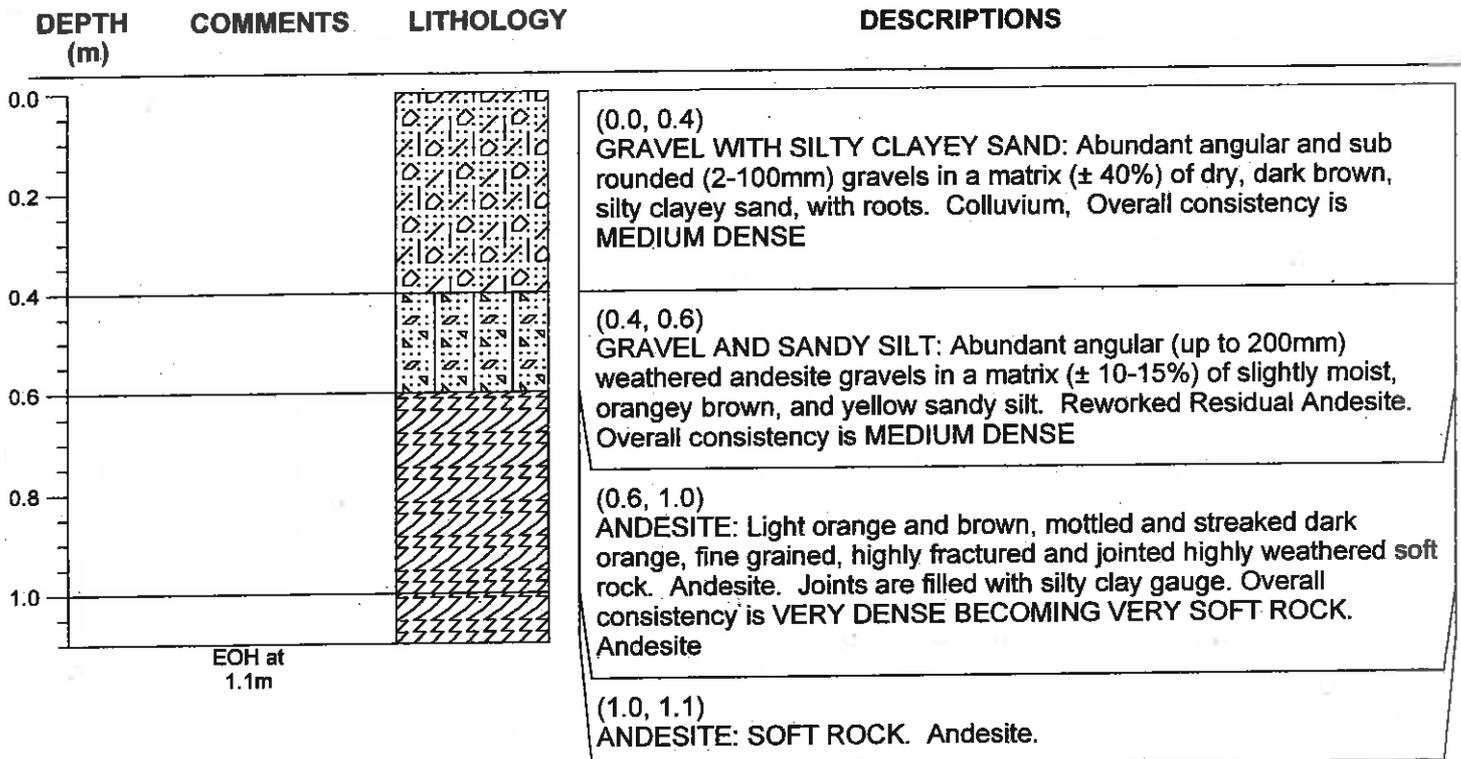
AFRICA EXPOSED
CONSULTING ENGINEERING GEOLOGISTS (PTY) LTD

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 10



NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 10

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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CONSULTING ENGINEERING GEOLOGISTS CC

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 11

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0			(0.0, 0.4) GRAVEL WITH SILTY CLAYEY SAND: Abundant angular and sub rounded (2-100mm) gravels in a matrix ($\pm 40\%$) of dry, dark brown, silty clayey sand, with roots. Colluvium, Overall consistency is MEDIUM DENSE
0.2			(0.4, 0.6) GRAVEL AND SILTY SAND: Abundant, angular and sub rounded (2-70mm) quartz and andesite gravels in a matrix ($\pm 40\%$) of light red and orange silty sand with roots. Pebble Marker Overall consistency is MEDIUM DENSE
0.4			(0.6, 1.0) GRAVEL AND SANDY SILT: Abundant angular (up to 200mm) weathered andesite gravels in a matrix ($\pm 10-15\%$) of slightly moist, orangey brown, and yellow sandy silt. Reworked Residual Andesite. Overall consistency is DENSE
0.6			(1.0, 1.3) ANDESITE: Light orange and brown, mottled and streaked dark orange, fine grained, highly fractured and jointed highly weathered soft rock. Andesite. Joints are filled with silty clay gauge
0.8			(1.3, 1.4) ANDESITE: VERY SOFT ROCK. Andesite.
1.0			
1.2			

EOH at 1.4m

NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 11

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



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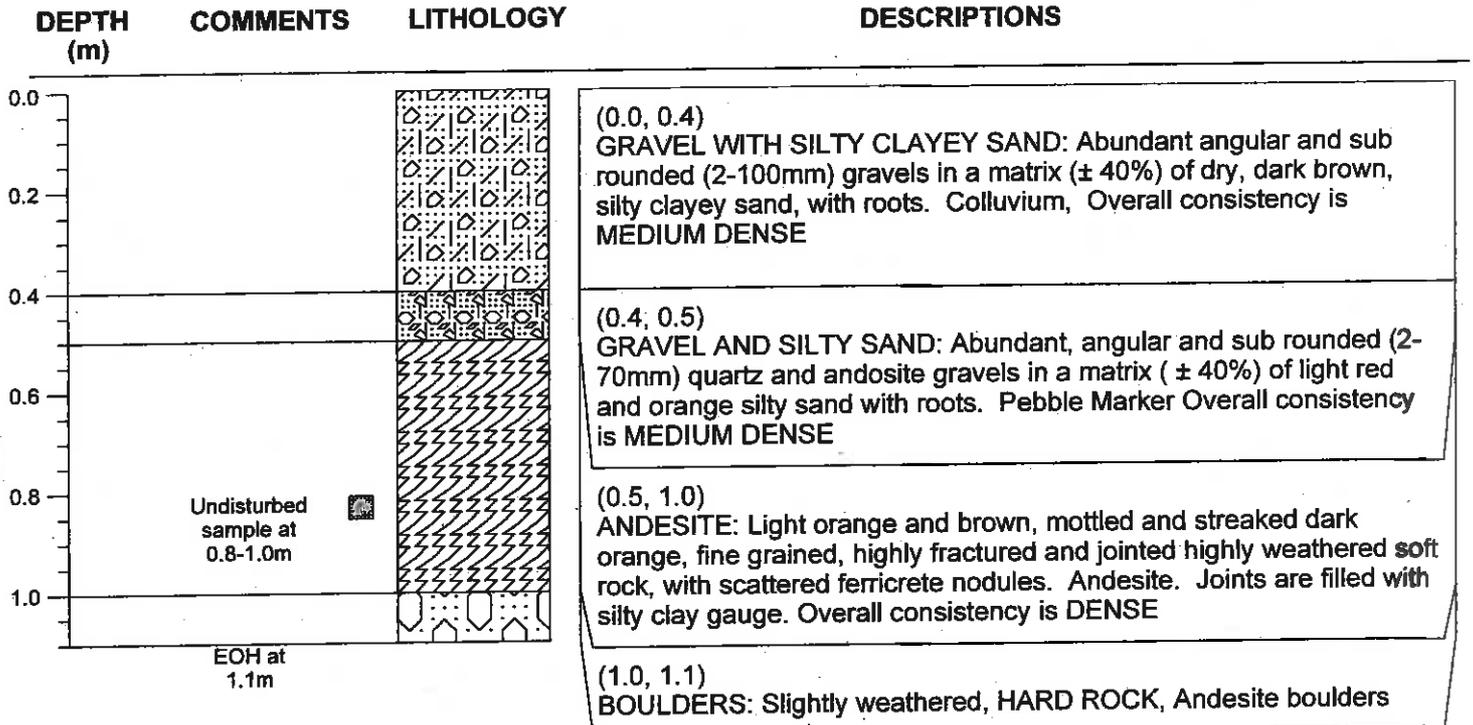
Tel: (083) 656-0900

Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 12



NOTES

1. EOH refusal
2. No groundwater seepage
3. Undisturbed sample taken at 0.8 to 1.0m

HOLE No.: TP 12

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A.

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 13

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0			(0.0, 0.5) GRAVEL WITH SILTY CLAYEY SAND: Abundant angular and sub rounded (2-100mm) gravels in a matrix ($\pm 40\%$) of dry, dark brown, silty clayey sand, with roots. Colluvium, Overall consistency is MEDIUM DENSE
0.2			
0.4			
0.5			(0.5, 0.7) GRAVEL AND SILTY SAND: Abundant, angular and sub rounded (2-70mm) quartz and andesite gravels in a matrix ($\pm 40\%$) of light red and orange silty sand with roots. Pebble Marker Overall consistency is MEDIUM DENSE
0.6			
0.8			
1.0			(0.7, 1.3) GRAVEL AND SANDY SILT: Abundant angular (up to 200mm) weathered andesite gravels in a matrix ($\pm 10-15\%$) of slightly moist, orangey brown, and yellow sandy silt. Reworked Residual Andesite. Overall consistency is DENSE
1.2			
1.3			(1.3, 1.4) ANDESITE: VERY SOFT ROCK. Andesite
1.4	EOH at 1.4m		

NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 13

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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CLIENT: Wesplan and Associates

SITE: Jabulani

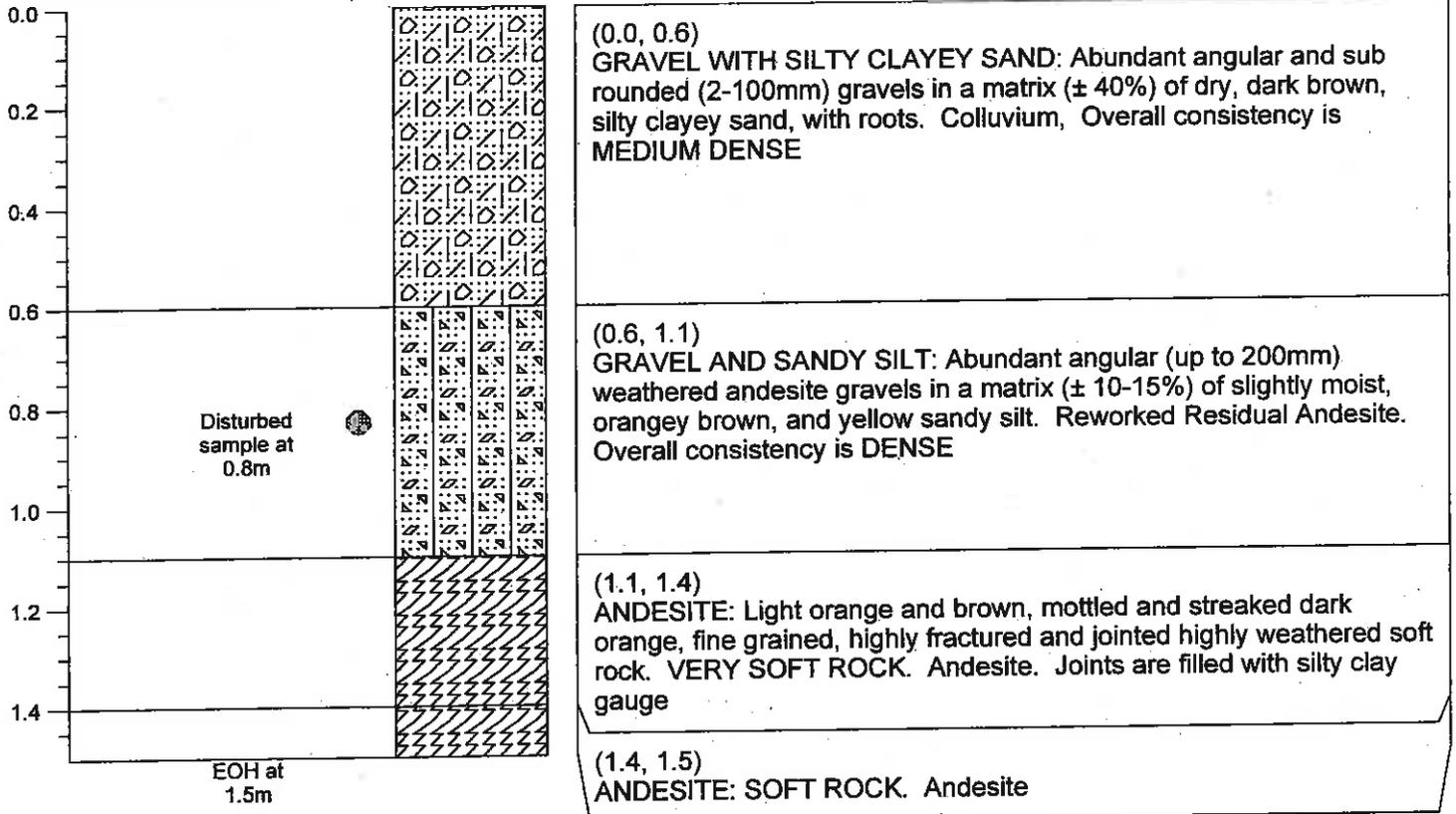
HOLE No.: TP 14

DEPTH
(m)

COMMENTS

LITHOLOGY

DESCRIPTIONS



NOTES

1. EOH refusal
2. No groundwater seepage
3. Disturbed sample taken at 0.8 to 0.9m

HOLE No.: TP 14

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A.

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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P.O. Box 68 Honeydew 2040

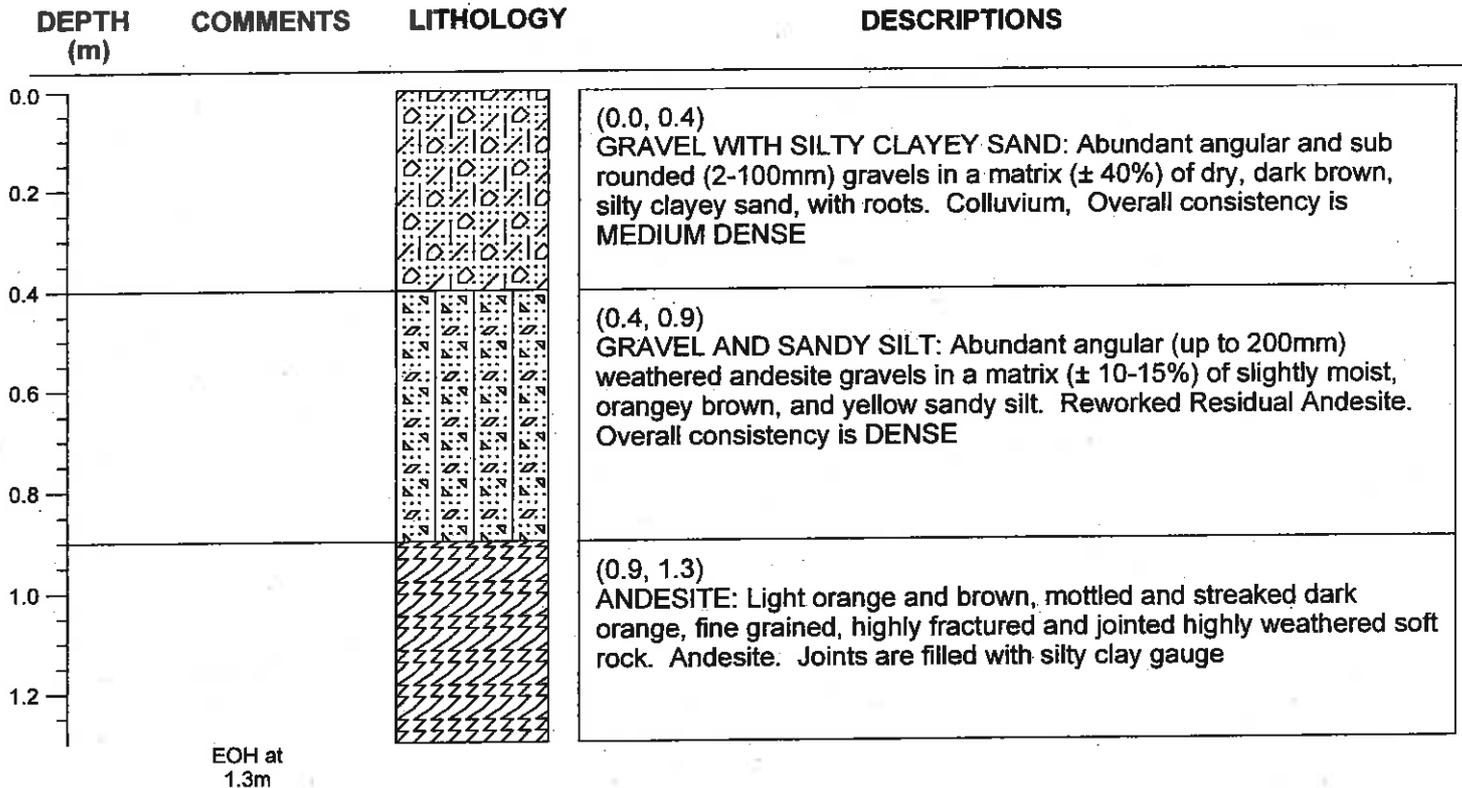
Tel: (083) 656-0900

Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 16



NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 16

JOB No.: 12006

MACHINE: Case 580G

DATE: 11 January 2007

CONTRACTOR: Kosmos Plant Hire

PROFILED BY: J.A

DIAMETER: Trench



AFRICA EXPOSED

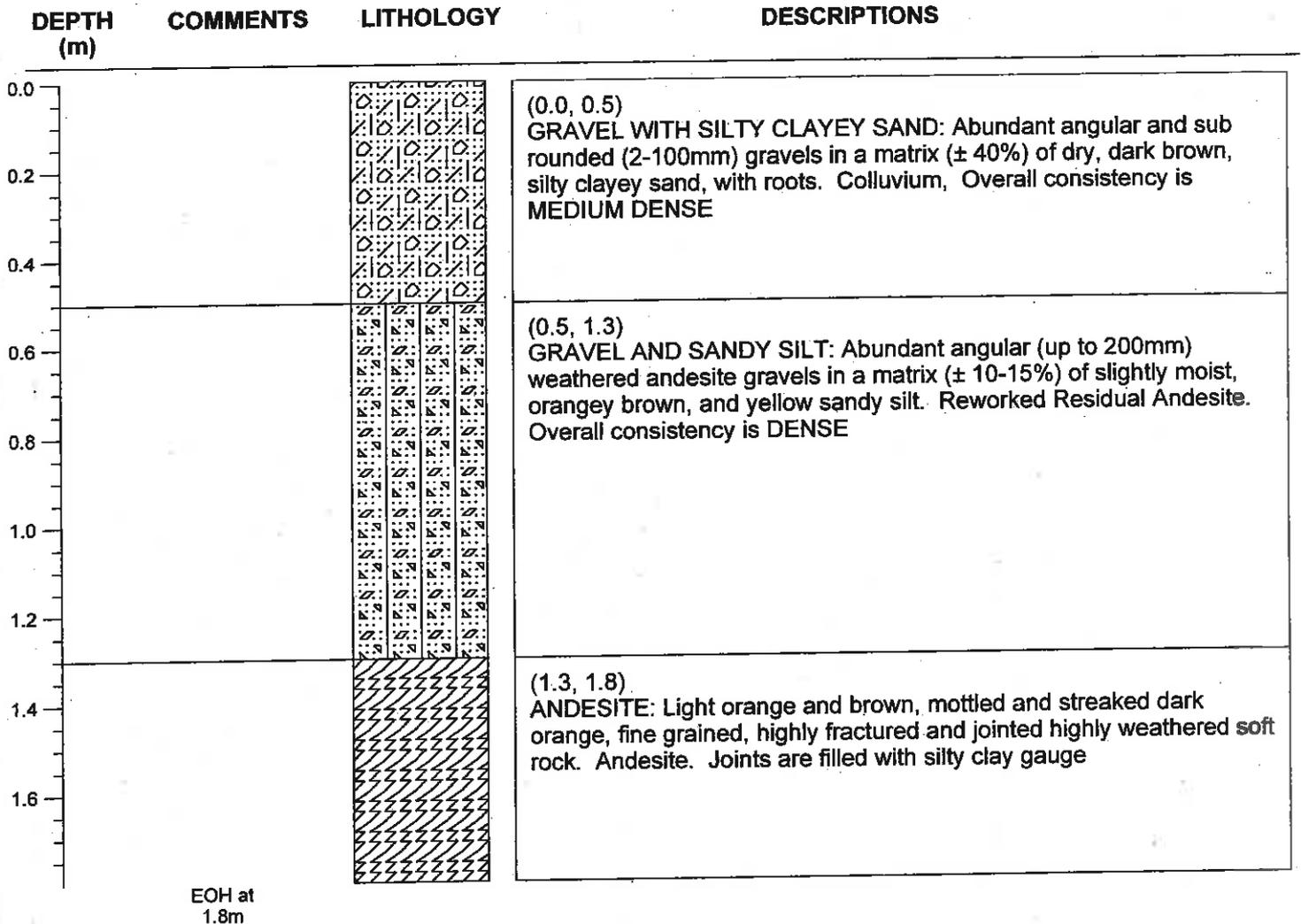
CONSULTING ENGINEERING GEOLOGISTS CC

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 15



NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 15

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 17

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0			(0.0, 0.6) GRAVEL WITH SILTY CLAYEY SAND: Abundant angular and sub rounded (2-100mm) gravels in a matrix (\pm 40%) of dry, dark brown, silty clayey sand, with roots. Colluvium, Overall consistency is MEDIUM DENSE .
0.2			
0.4			
0.6			(0.6, 1.7) GRAVEL AND SANDY SILT: Abundant angular (up to 200mm) weathered andesite gravels in a matrix (\pm 10-15%) of slightly moist, orangey brown, and yellow sandy silt. Reworked Residual Andesite. Overall consistency is DENSE .
0.8			
1.0			
1.2			
1.4			
1.6			
1.7			(1.7, 1.8) ANDESITE: Light orange and brown, mottled and streaked dark orange, fine grained, highly fractured and jointed highly weathered soft rock. Andesite. Joints are filled with silty clay gauge
1.8			(1.8, 1.9) ANDESITE: SOFT ROCK. Andesite

EOH at
1.9m

NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 17

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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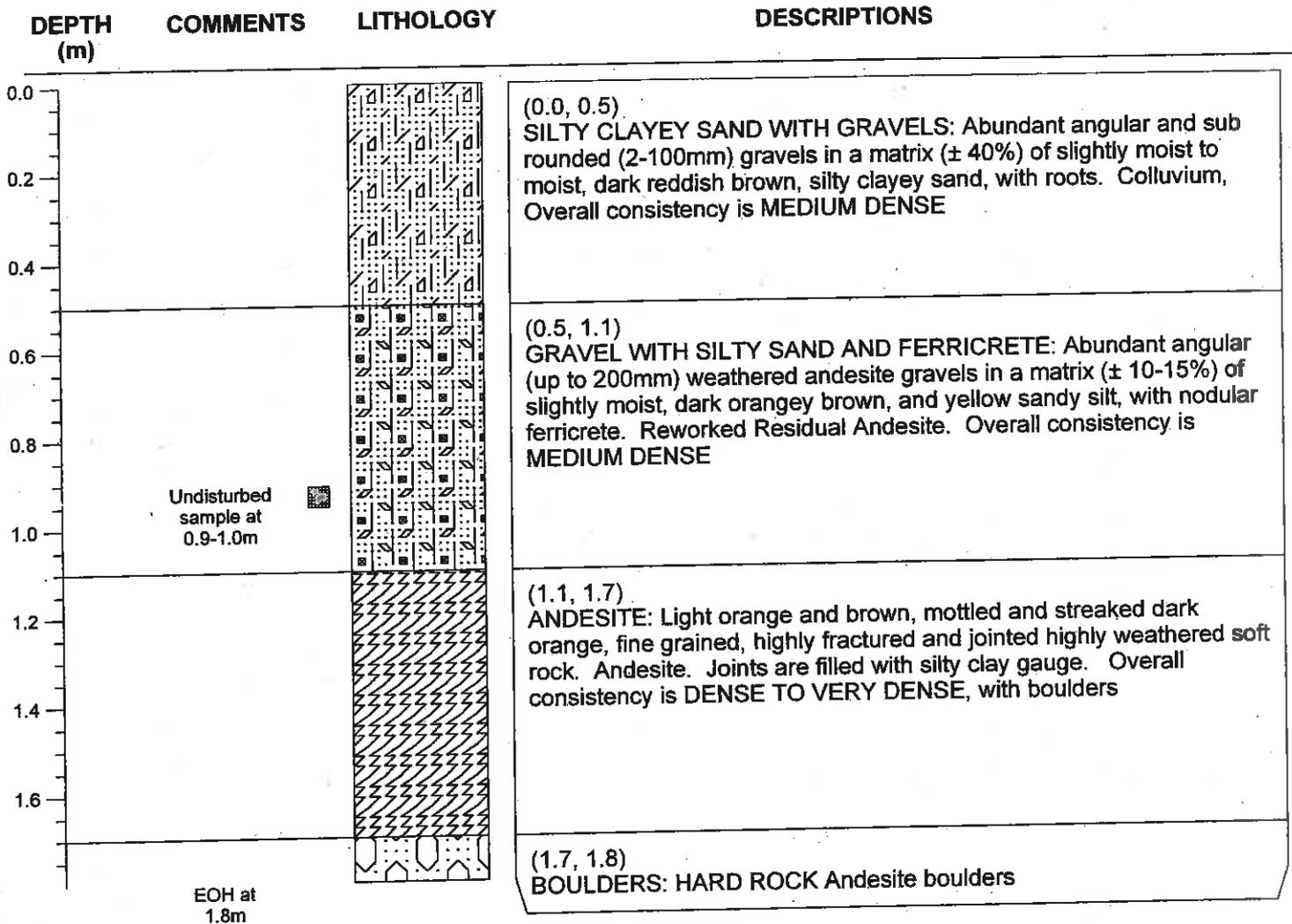
CONSULTING ENGINEERING GEOSTRUCTURAL CC

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 18



NOTES

1. EOH refusal on boulders
2. No groundwater seepage
3. Undisturbed sample taken at 0.9 to 1.0m
4. Extensive termite activity

HOLE No.: TP 18

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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Tel: (083) 656-0900
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CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 19

DEPTH (m)	COMMENTS	LITHOLOGY	DESCRIPTIONS
0.0			(0.0, 0.5) GRAVEL WITH SILTY CLAYEY SAND: Abundant angular and sub rounded (2-100mm) gravels in a matrix ($\pm 40\%$) of dry, dark brown, silty clayey sand, with roots. Colluvium, Overall consistency is MEDIUM DENSE
0.2			
0.4			
0.5			(0.5, 1.3) GRAVEL AND SANDY SILT: Abundant angular (up to 200mm) weathered andesite gravels in a matrix ($\pm 10-15\%$) of slightly moist, orangey brown, and yellow sandy silt. Reworked Residual Andesite. Overall consistency is DENSE
0.6			
0.8			
1.0			
1.2			
1.3			(1.3, 1.6) ANDESITE: Light orange and brown, mottled and streaked dark orange, fine grained, highly fractured and jointed highly weathered soft rock. Andesite. Joints are filled with silty clay gauge
1.4			
1.6			(1.6, 1.7) ANDESITE: SOFT ROCK, Andesite

EOH at 1.7m

NOTES

1. EOH refusal
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 19

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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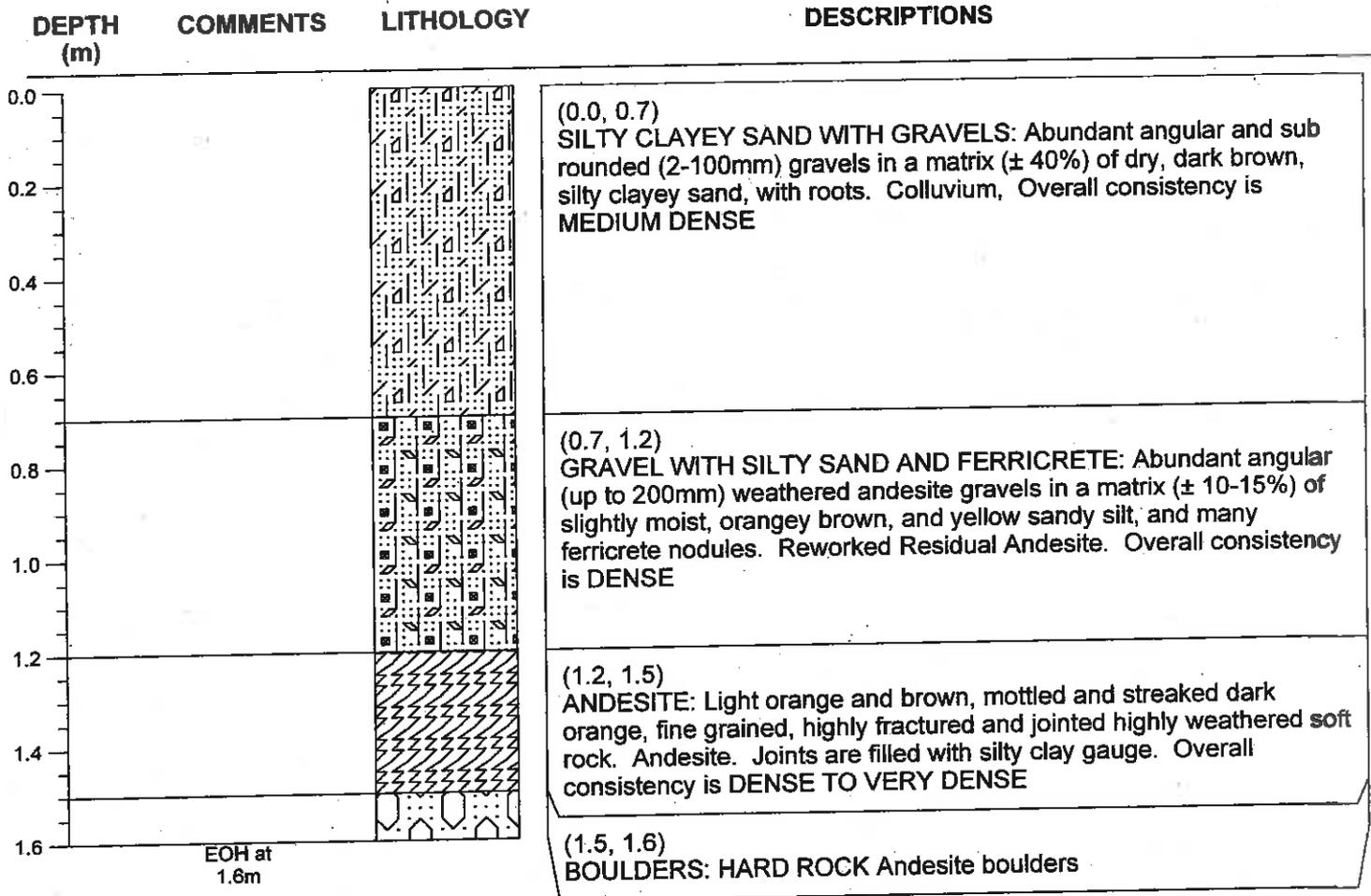
CONSULTING ENGINEERING GEOLOGISTS P.L.C.

P.O. Box 68 Honeydew 2040
Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 20



NOTES

1. EOH refusal on boulders
2. No groundwater seepage
3. No samples taken

HOLE No.: TP 20

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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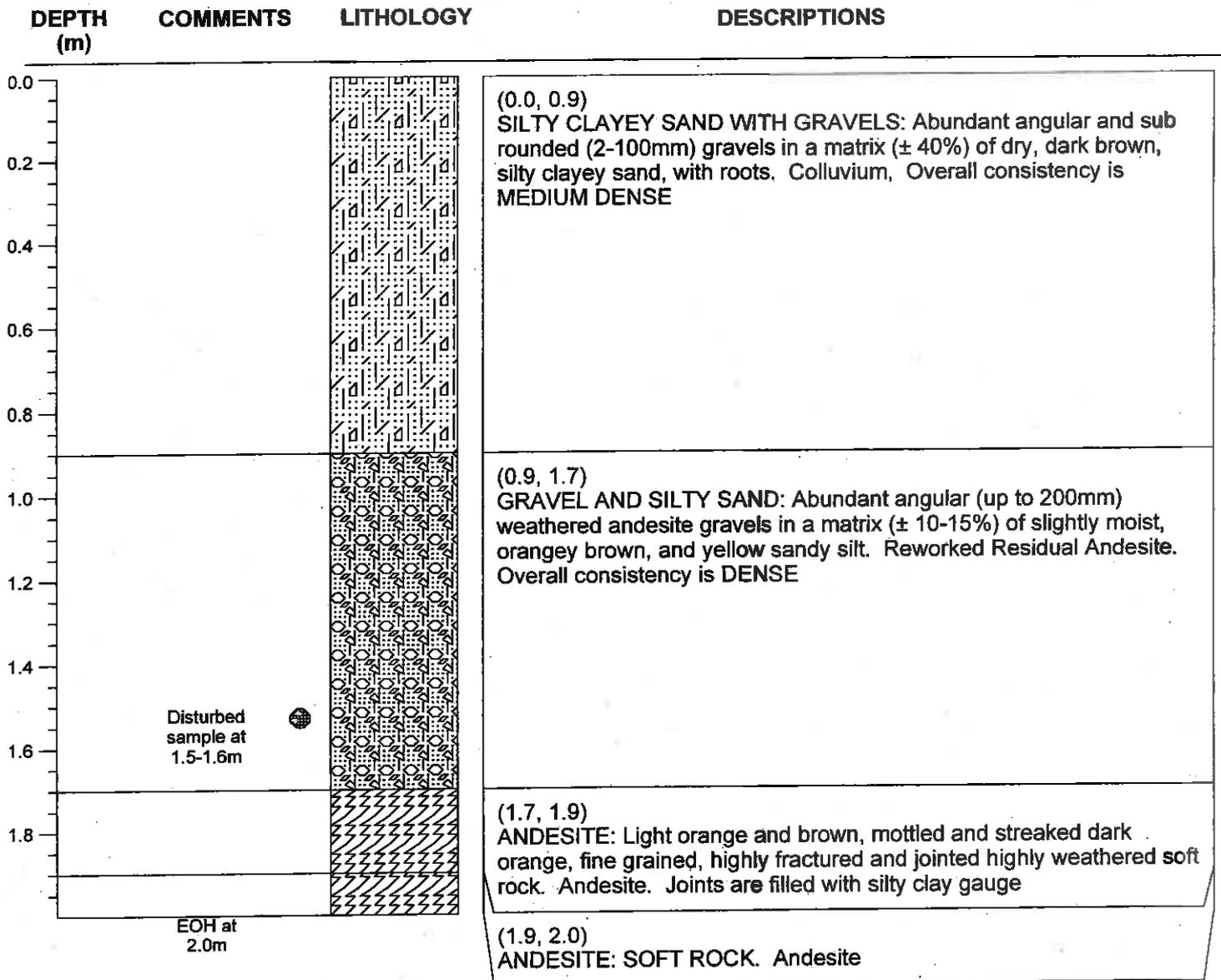
Tel: (083) 656-0900

Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 21



NOTES

1. EOH refusal
2. No groundwater seepage
3. Disturbed sample taken at 1.5 to 1.6m

HOLE No.: TP 21

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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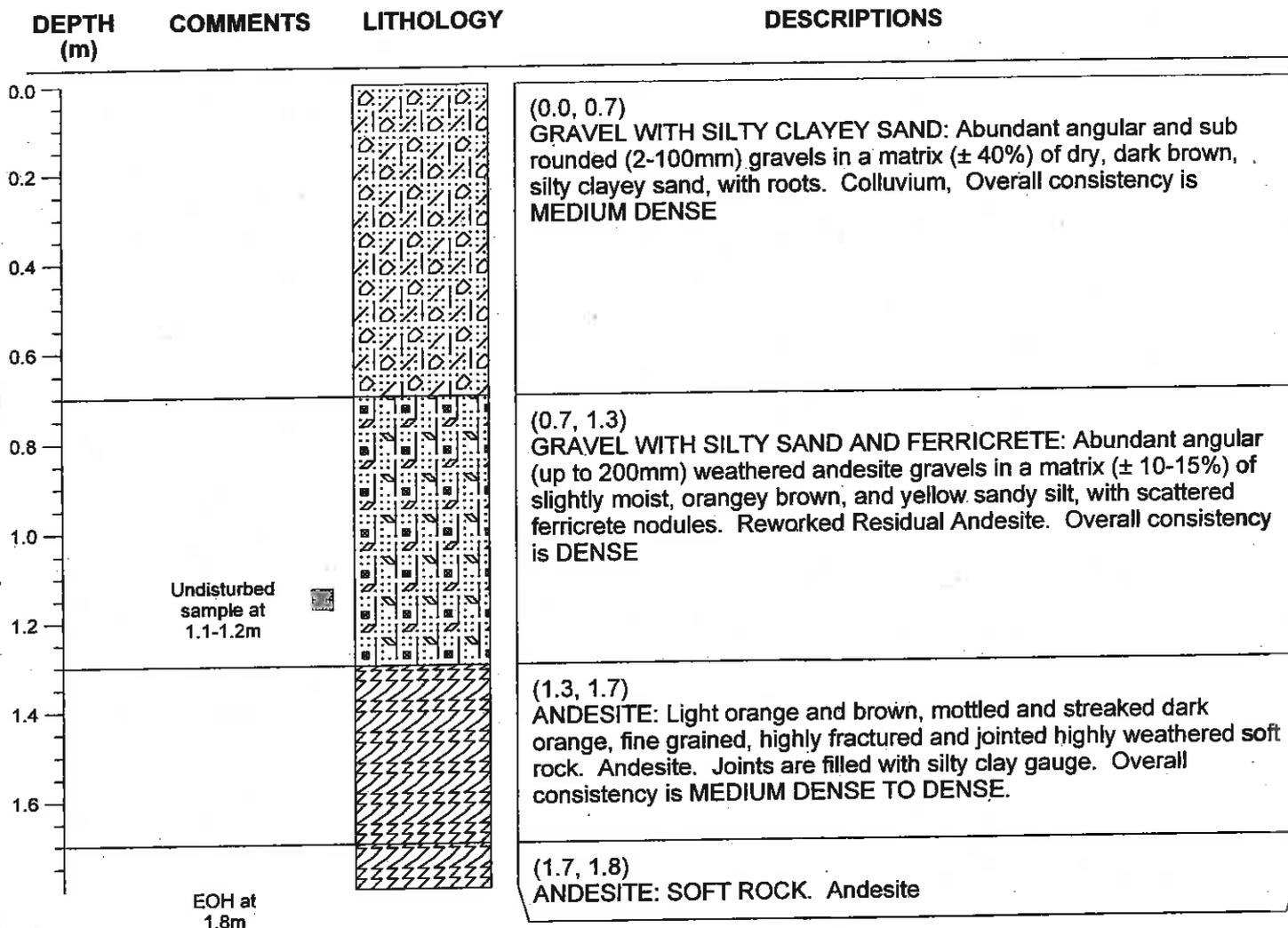
CONSULTING ENGINEERING GEOLOGISTS CC

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Tel: (083) 656-0900
Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

HOLE No.: TP 22



NOTES

1. EOH hard dig
2. No groundwater seepage
3. Undisturbed sample taken at 1.1 to 1.2m

HOLE No.: TP 22

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench



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Fax: (086) 633-7332

CLIENT: Wesplan and Associates

SITE: Jabulani

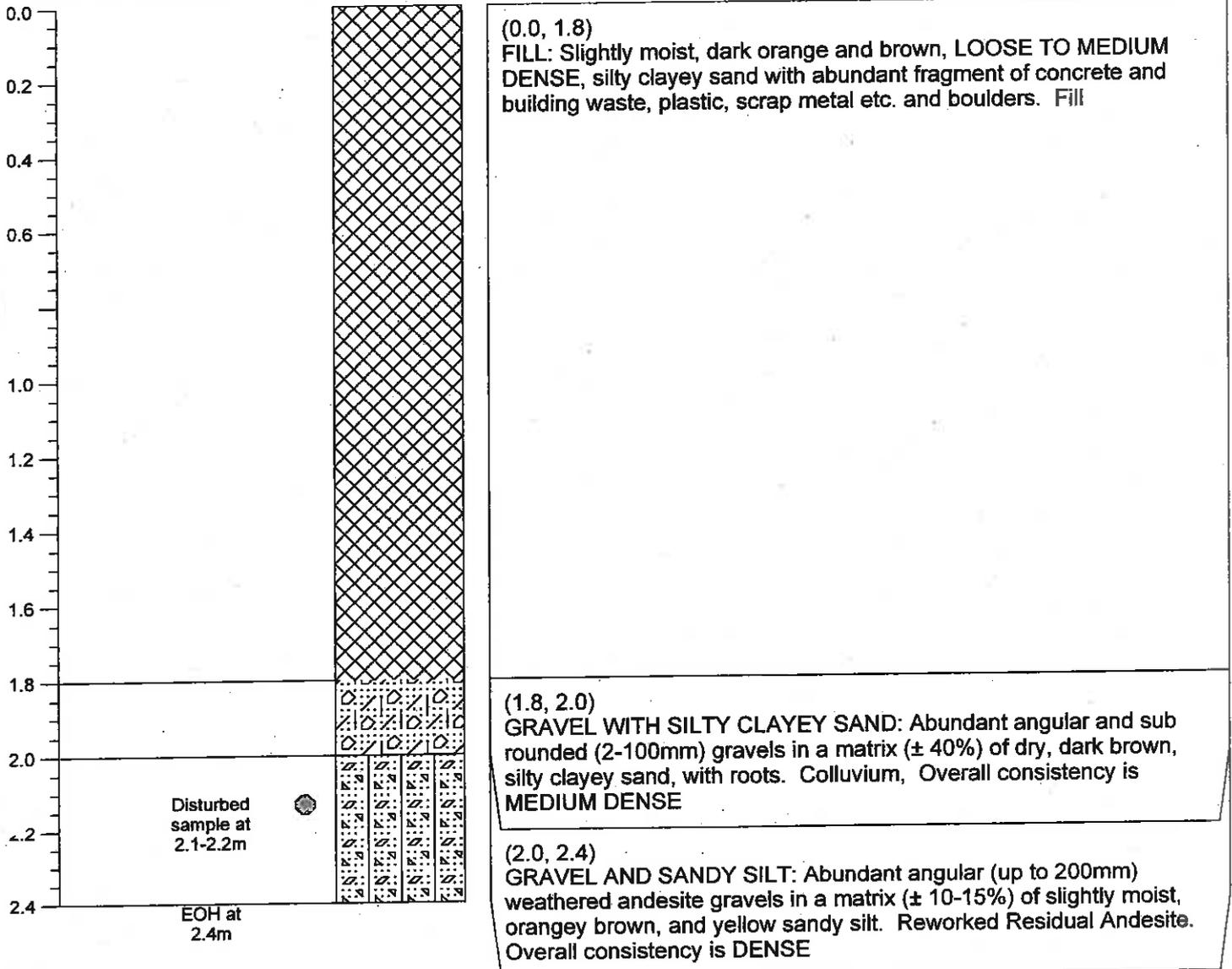
HOLE No.: TP 23

DEPTH
(m)

COMMENTS

LITHOLOGY

DESCRIPTIONS



NOTES

1. EOH very hard dig
2. No groundwater seepage
3. Disturbed sample taken at 2.1 to 2.2m

HOLE No.: TP 23

JOB No.: 12006

DATE: 11 January 2007

PROFILED BY: J.A

MACHINE: Case 580G

CONTRACTOR: Kosmos Plant Hire

DIAMETER: Trench

APPENDIX 3

LABORATORY TEST RESULTS

AFRICA EXPOSED

CONSULTING ENGINEERING GEOLOGISTS

e-mail: jan@africaexposed.co.za

P.O.Box 68, Honeydew 2040

Tel: (083) 656-0900

Fax: (086) 633-7332

FOUNDATION INDICATOR

Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 5 @ 1.0-1.2m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	99.00
4.75	94.00
2.00	78.00
0.425	60.00

HYDROMETER ANALYSIS

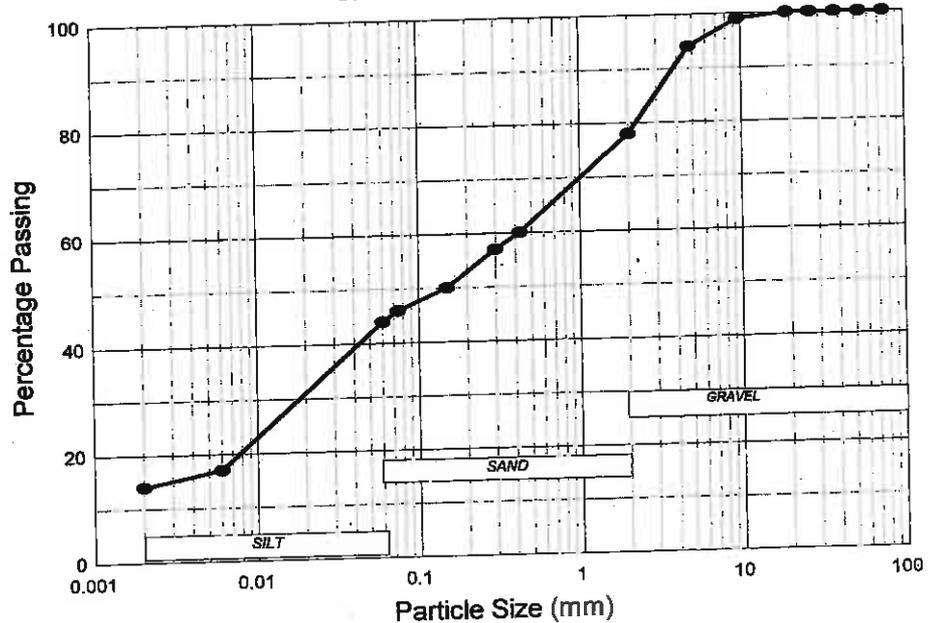
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	57.00
0.1500	50.00
0.0750	46.00
0.0600	44.00
0.0060	17.00
0.0020	14.00

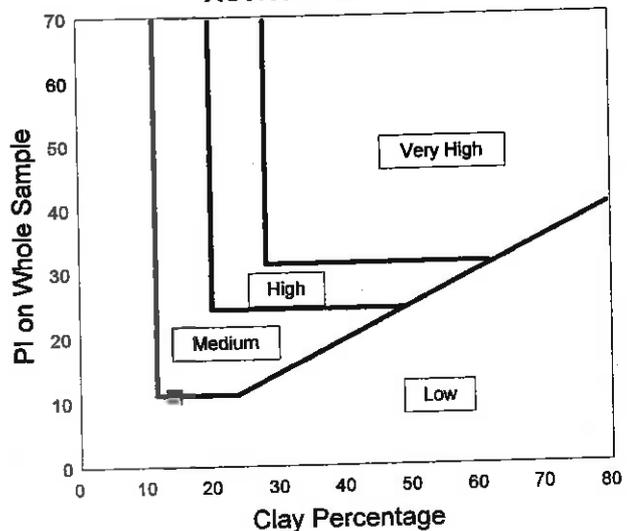
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	36
Plastic Limit	17
Plastic Index	19
Linear Shrinkage	8
Grading Modulus	1.05
PI on Whole Sample	11

GRADING ANALYSIS



ACTIVITY CHART



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CONSULTING ENGINEERING GEOLOGISTS

e-mail: jan@africaexposed.co.za
P.O.Box 68, Honeydew 2040

Tel: (083) 656-0900
Fax: (086) 633-7332

FOUNDATION INDICATOR

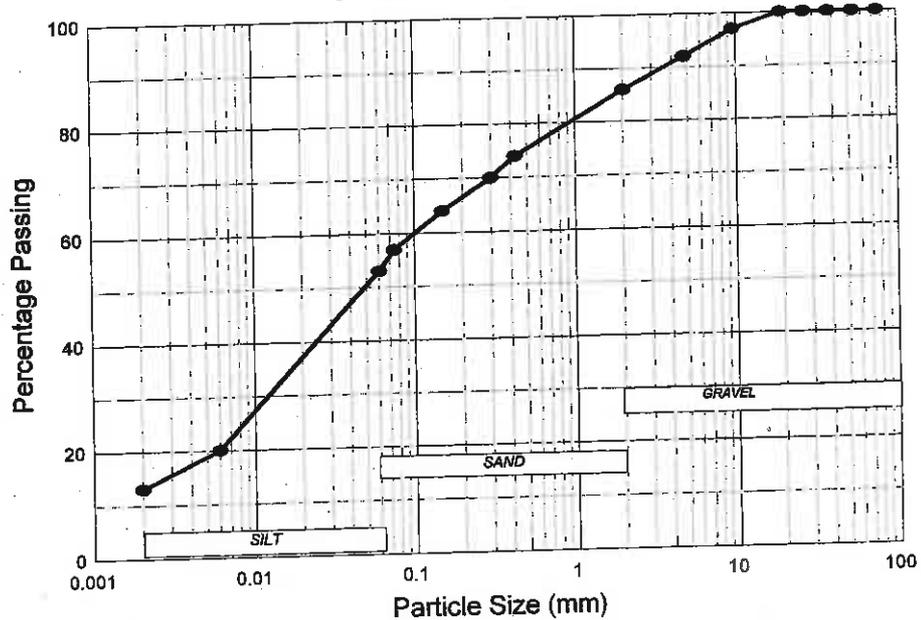
Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 8 @ 0.5-0.6m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	97.00
4.75	92.00
2.00	86.00
0.425	74.00

GRADING ANALYSIS



HYDROMETER ANALYSIS

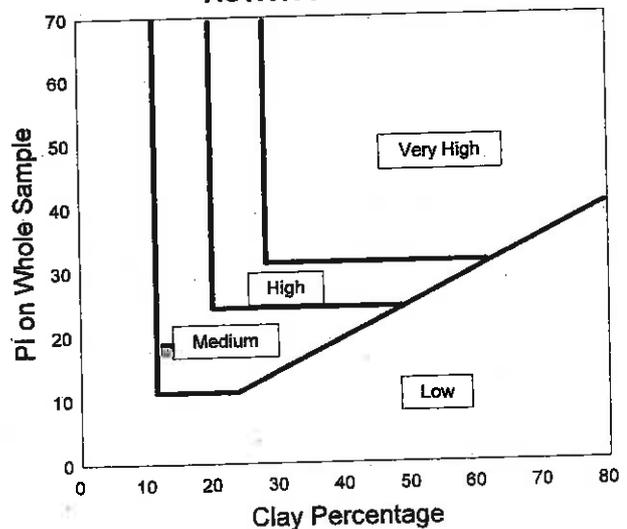
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	70.00
0.1500	64.00
0.0750	57.00
0.0600	53.00
0.0060	20.00
0.0020	13.00

ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	41
Plastic Limit	17
Plastic Index	24
Linear Shrinkage	10
Grading Modulus	0.70
PI on Whole Sample	18

ACTIVITY CHART



AFRICA EXPOSED

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FOUNDATION INDICATOR

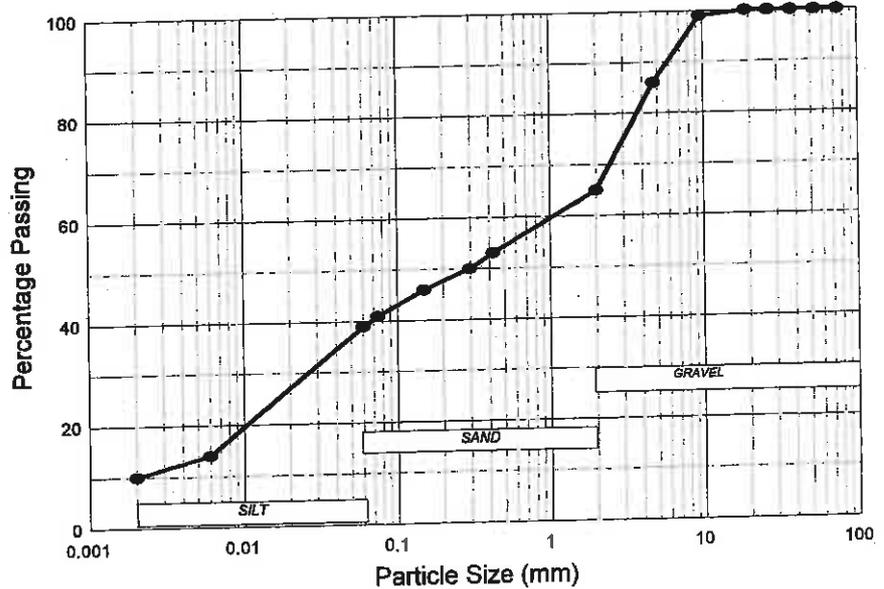
Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 12 @ 0.8-1.0m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	99.00
4.75	86.00
2.00	65.00
0.425	53.00

GRADING ANALYSIS



HYDROMETER ANALYSIS

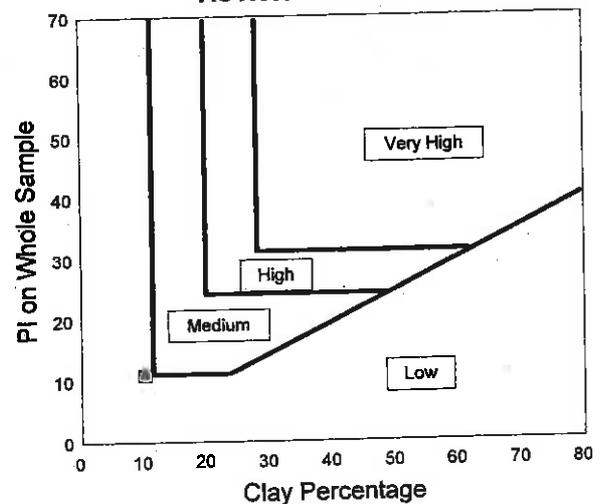
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	50.00
0.1500	46.00
0.0750	41.00
0.0600	39.00
0.0060	14.00
0.0020	10.00

ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	41
Plastic Limit	20
Plastic Index	21
Linear Shrinkage	10
Grading Modulus	1.32
PI on Whole Sample	11

ACTIVITY CHART



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FOUNDATION INDICATOR

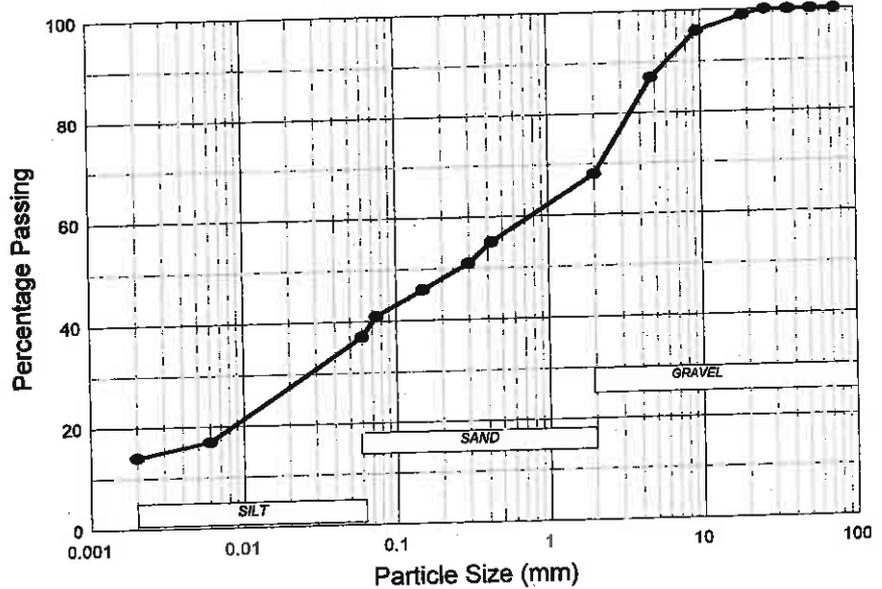
Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 14 @ 0.8-0.9m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	99.00
9.50	96.00
4.75	87.00
2.00	68.00
0.425	55.00

GRADING ANALYSIS



HYDROMETER ANALYSIS

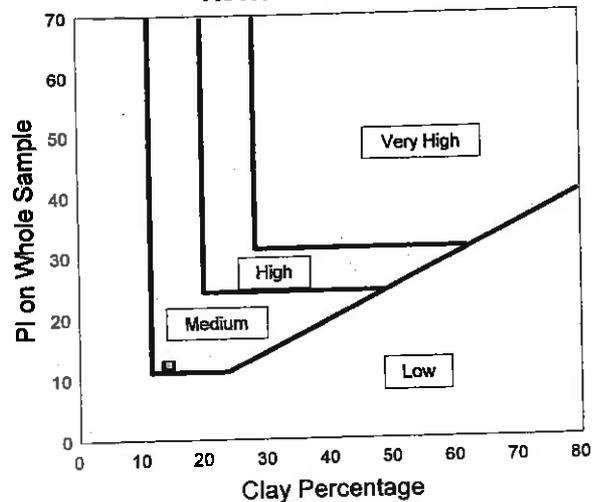
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	51.00
0.1500	46.00
0.0750	41.00
0.0600	37.00
0.0060	17.00
0.0020	14.00

ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	40
Plastic Limit	18
Plastic Index	22
Linear Shrinkage	10
Grading Modulus	1.26
PI on Whole Sample	12

ACTIVITY CHART



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FOUNDATION INDICATOR

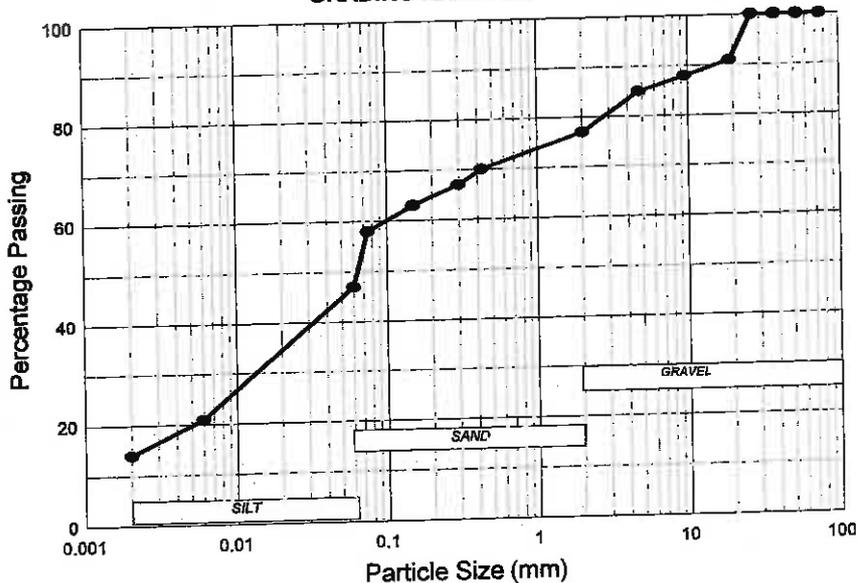
Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 18 @ 0.9-1.0m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	91.00
9.50	88.00
4.75	85.00
2.00	77.00
0.425	70.00

GRADING ANALYSIS



HYDROMETER ANALYSIS

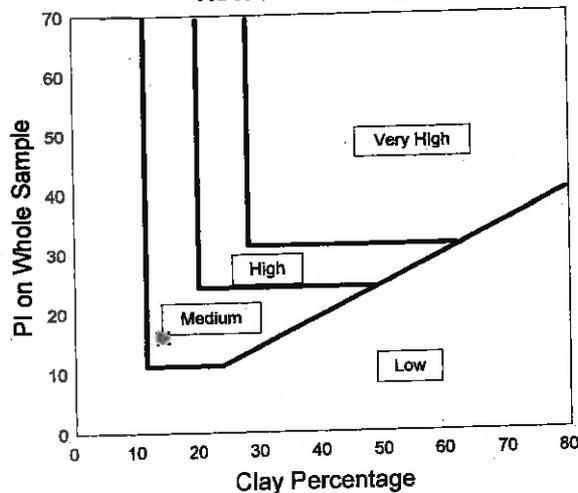
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	67.00
0.1500	63.00
0.0750	58.00
0.0600	47.00
0.0060	21.00
0.0020	14.00

ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	41
Plastic Limit	18
Plastic Index	23
Linear Shrinkage	11
Grading Modulus	0.86
PI on Whole Sample	16

ACTIVITY CHART



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FOUNDATION INDICATOR

Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 21 @ 1.5-1.6m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total size.

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	99.00
2.00	91.00
0.425	76.00

HYDROMETER ANALYSIS

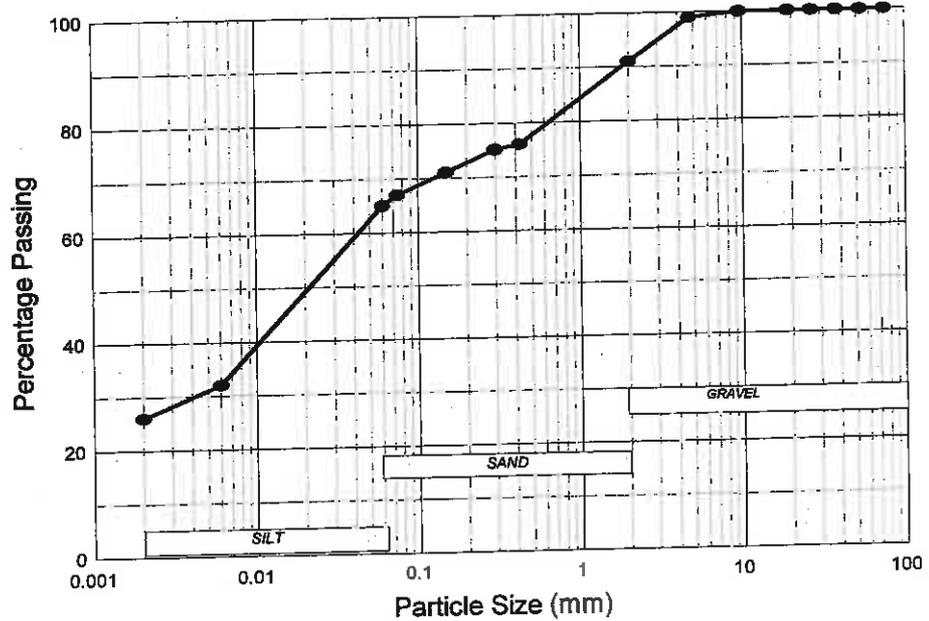
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	75.00
0.1500	71.00
0.0750	67.00
0.0600	65.00
0.0060	32.00
0.0020	26.00

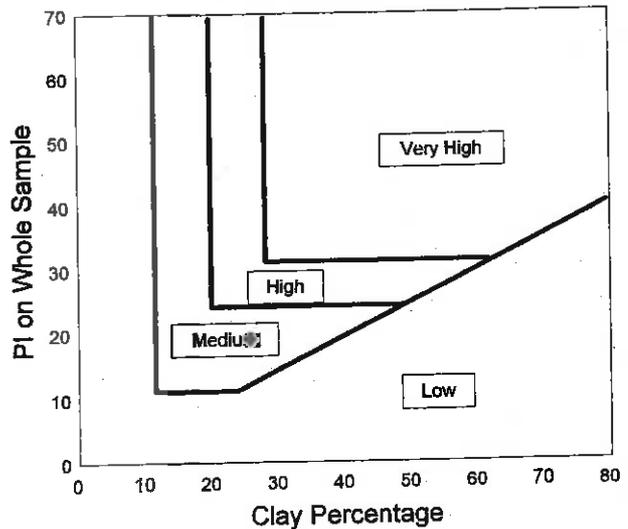
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	46
Plastic Limit	21
Plastic Index	25
Linear Shrinkage	11
Grading Modulus	0.58
PI on Whole Sample	19

GRADING ANALYSIS



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FOUNDATION INDICATOR

Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 22 @ 1.1-1.2m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	100.00
2.00	95.00
0.425	86.00

HYDROMETER ANALYSIS

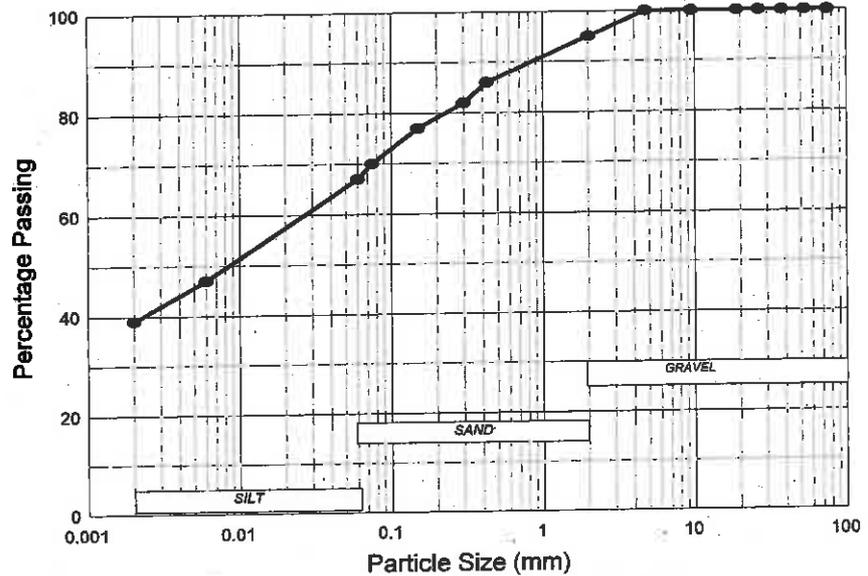
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	82.00
0.1500	77.00
0.0750	70.00
0.0600	67.00
0.0060	47.00
0.0020	39.00

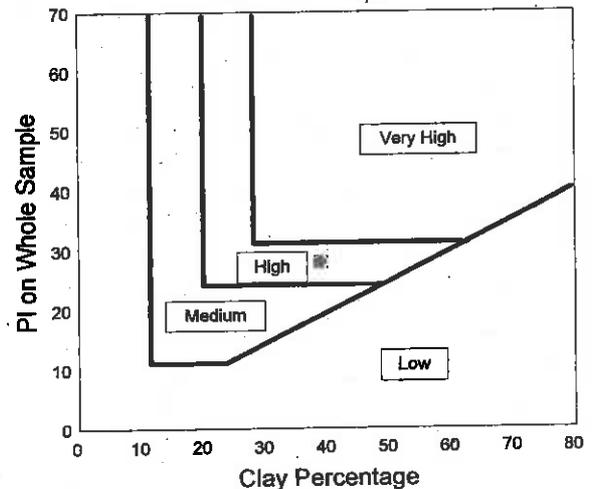
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	52
Plastic Limit	20
Plastic Index	32
Linear Shrinkage	15
Grading Modulus	0.37
PI on Whole Sample	28

GRADING ANALYSIS



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FOUNDATION INDICATOR

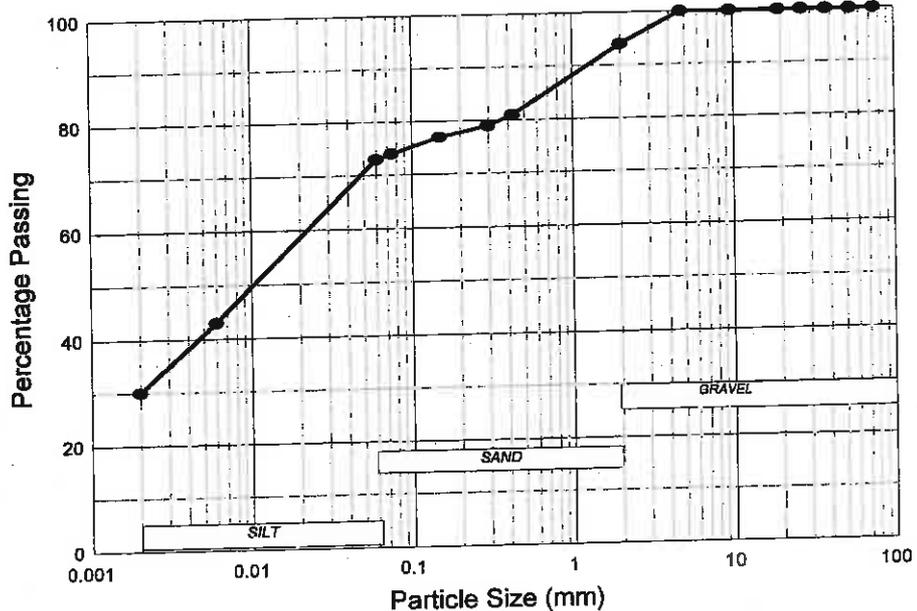
Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 23 @ 2.1-2.2m
Job No	12006	Checked By	JA

SIEVE ANALYSIS

Values are expressed as a percentage of total sz.

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	100.00
2.00	94.00
0.425	81.00

GRADING ANALYSIS



HYDROMETER ANALYSIS

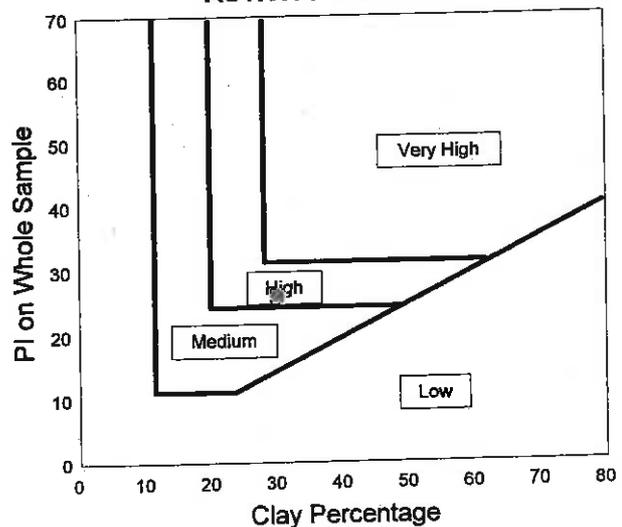
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	79.00
0.1500	77.00
0.0750	74.00
0.0600	73.00
0.0060	43.00
0.0020	30.00

ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	58
Plastic Limit	26
Plastic Index	32
Linear Shrinkage	14
Grading Modulus	0.46
PI on Whole Sample	26

ACTIVITY CHART



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COLLAPSE POTENTIAL at 100 kPa

Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 12 @ 0.8-1.0m
Job No	12006	Checked By	JA

Sample Height (mm)	19.03	Sample Diameter (mm)	75	Sample Specific Gravity	2.71
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Sample Preparation	NMC
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Effective Stress (kPa)	Consolidation Reading	Voids Ratio	Strain (%)
1	1000	0.497	0.000
10	9964	0.494	0.190
20	9930	0.492	0.370
50	9880	0.488	0.630
100	9826	0.483	0.910
100	9732	0.476	1.410
200	9552	0.462	2.350
400	9304	0.442	3.660
200	9366	0.447	3.330
100	9412	0.451	3.090
50	9474	0.456	2.760
20	9540	0.461	2.420
10	9600	0.466	2.100

Moisture Content Calculations

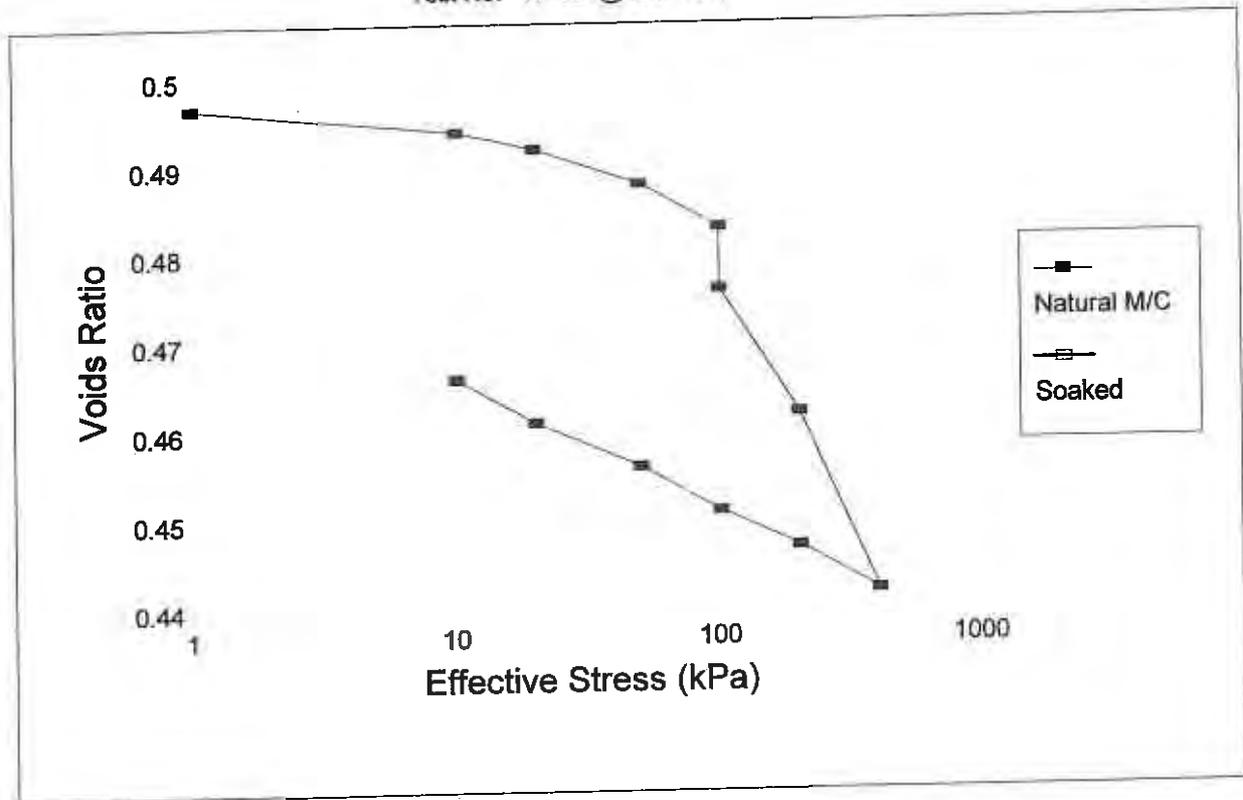
Mass wet sample plus ring before test (gms)	278.80
Mass wet sample plus ring after test (gms)	296.00
Mass dry sample plus ring (gms)	271.60
Mass ring (gms)	119.70
Moisture content before test (%)	4.74
Moisture content after test (%)	16.06

Other Data

Initial Dry Density (kg/m ³)	1807
Initial Void Ratio	0.50
Collapse Potential (%)	0.5

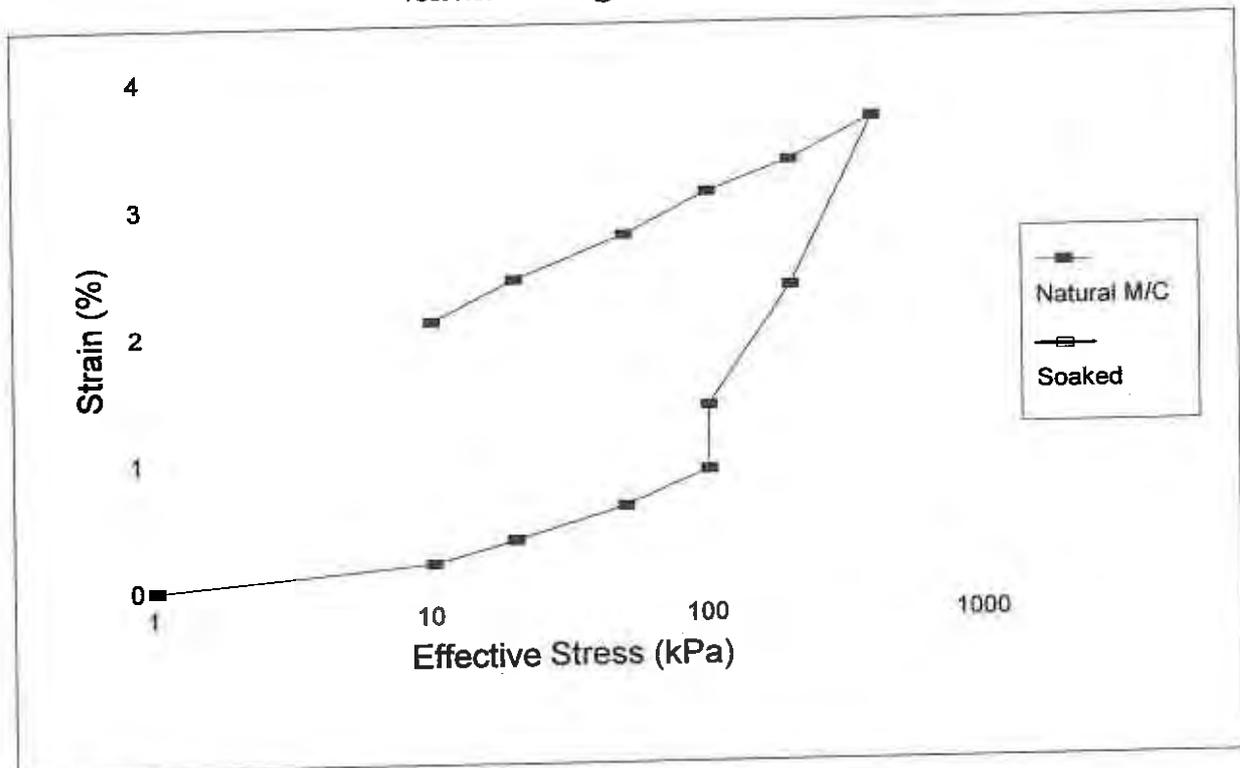
VOIDS RATIO v EFFECTIVE STRESS

Test No: TP 12 @ 0.8-1.0m



STRAIN v EFFECTIVE STRESS

Test No: TP 12 @ 0.8-1.0m



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COLLAPSE POTENTIAL at 100 kPa

Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 18 @ 0.9-1.0m
Job No	12006	Checked By	JA

Sample Height (mm)	19.03	Sample Diameter (mm)	75	Sample Specific Gravity	2.71
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Sample Preparation	NMC
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Effective Stress (kPa)	Consolidation Reading	Voids Ratio	Strain (%)
1	1000	0.359	0.000
10	9950	0.355	0.260
20	9872	0.349	0.670
50	9710	0.338	1.520
100	9532	0.325	2.460
100	9364	0.313	3.340
200	9205	0.302	4.180
400	8938	0.283	5.560
200	8965	0.285	5.440
100	9005	0.288	5.230
50	9039	0.290	5.050
20	9087	0.293	4.800
10	9123	0.296	4.610

Moisture Content Calculations

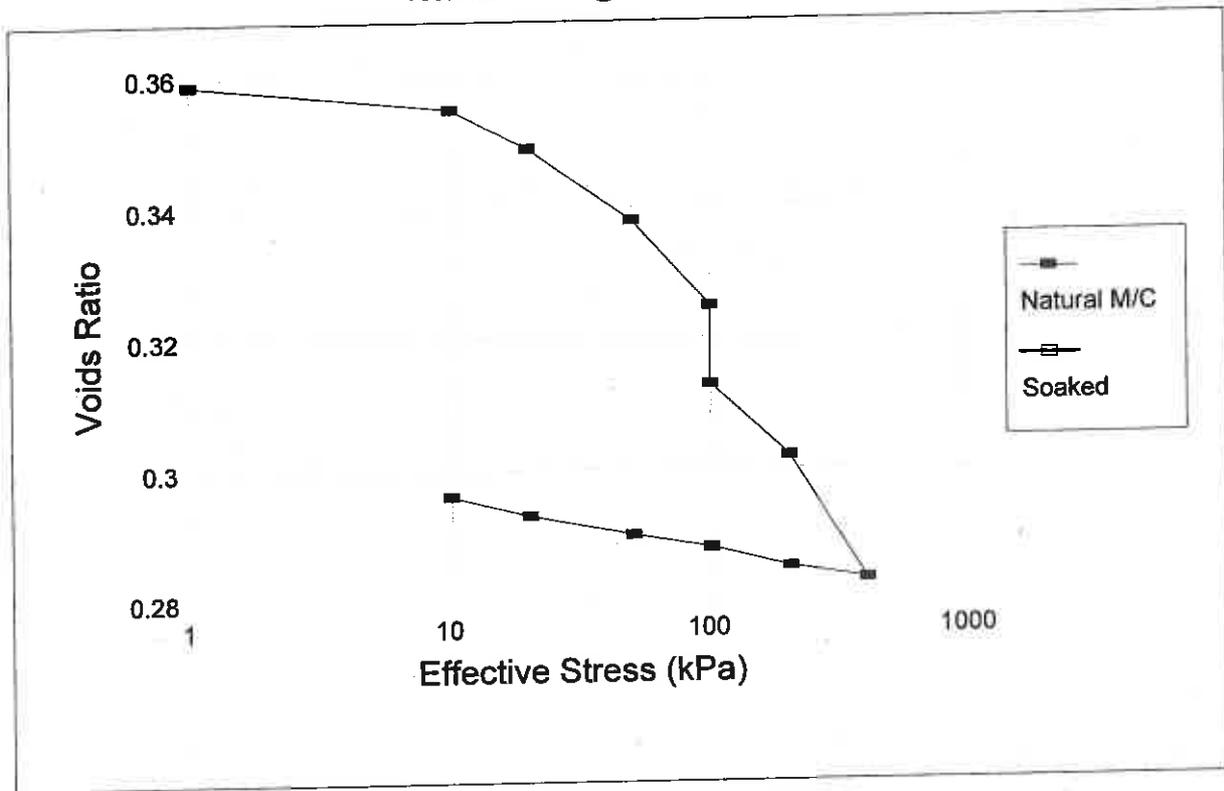
Mass wet sample plus ring before test (gms)	298.60
Mass wet sample plus ring after test (gms)	301.10
Mass dry sample plus ring (gms)	282.60
Mass ring (gms)	116.10
Moisture content before test (%)	9.61
Moisture content after test (%)	11.11

Other Data

Initial Dry Density (kg/m ³)	1980
Initial Void Ratio	0.37
Collapse Potential (%)	0.9

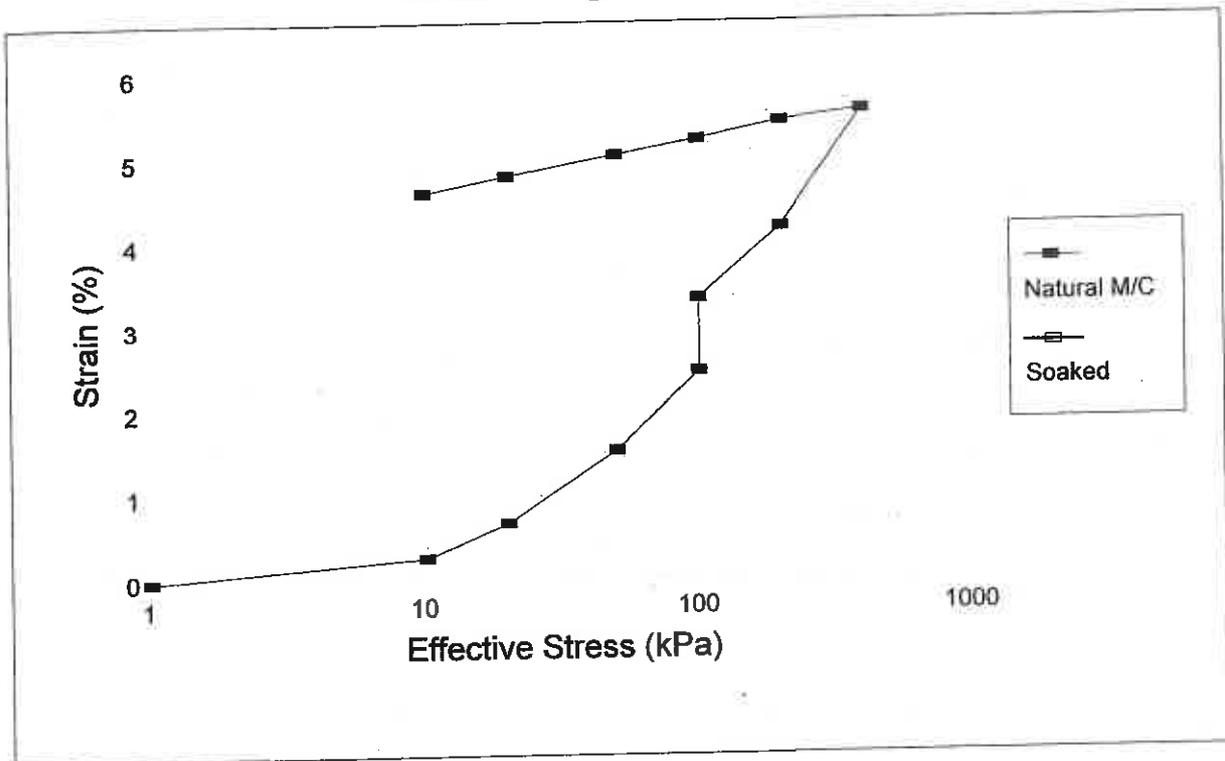
VOIDS RATIO v EFFECTIVE STRESS

Test No: TP 18 @ 0.9-1.0m



STRAIN v EFFECTIVE STRESS

Test No: TP 18 @ 0.9-1.0m



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COLLAPSE POTENTIAL at 100 kPa

Client	WESPLAN AND ASSOCIATES TOWN PLANNERS		
Location	JABULANI PRECINCT		
Date	2007/01/19	Test No	TP 22 @ 1.1-1.2m
Job No	12006	Checked By	JA

Sample Height (mm)	19.03	Sample Diameter (mm)	75	Sample Specific Gravity	2.092
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Sample Preparation	NMC
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Effective Stress (kPa)	Consolidation Reading	Voids Ratio	Strain (%)
1	10000	0.754	0.000
10	9948	0.749	0.270
20	9878	0.743	0.640
50	9704	0.727	1.550
100	9410	0.700	3.100
100	8776	0.641	6.430
200	8212	0.589	9.390
400	756	0.530	12.790
200	7570	0.530	12.760
100	7614	0.534	12.530
50	7646	0.537	12.360
20	7692	0.542	12.120
10	7720	0.544	11.970

Moisture Content Calculations

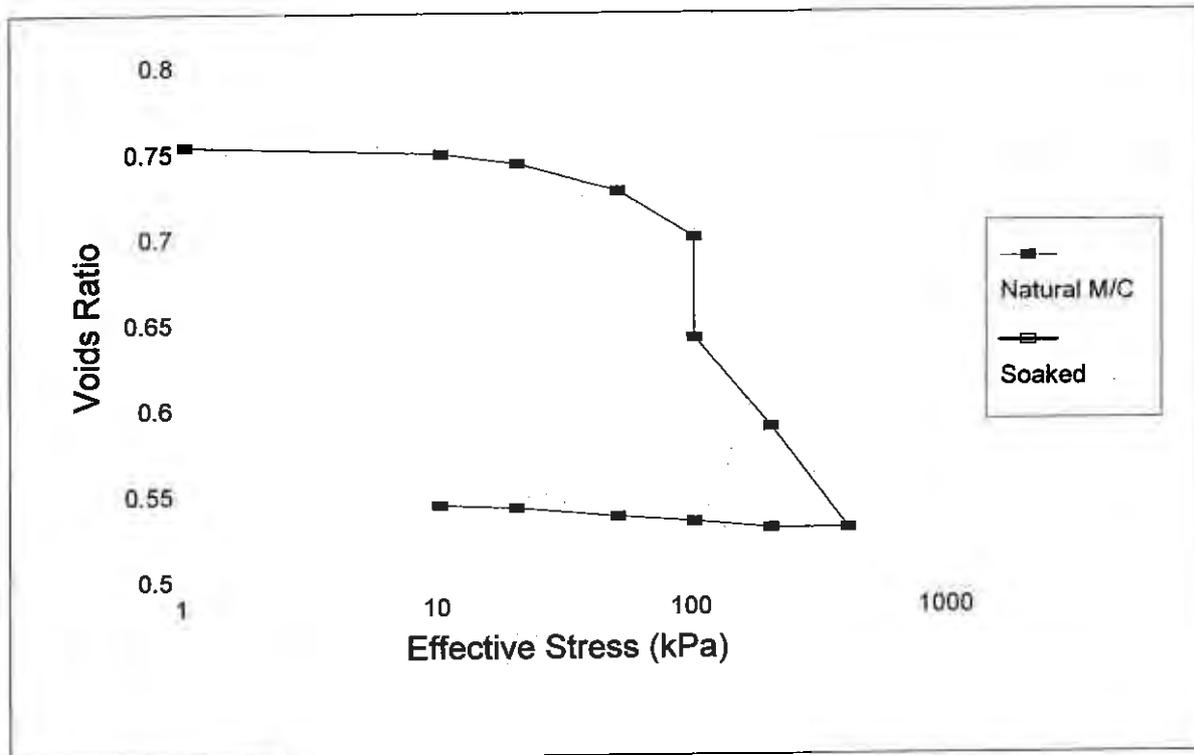
Mass wet sample plus ring before test (gms)	221.40
Mass wet sample plus ring after test (gms)	227.50
Mass dry sample plus ring (gms)	204.70
Mass ring (gms)	92.70
Moisture content before test (%)	14.91
Moisture content after test (%)	20.36

Other Data

Initial Dry Density (kg/m ³)	1529
Initial Void Ratio	0.75
Collapse Potential (%)	3.4

VOIDS RATIO v EFFECTIVE STRESS

Test No: TP 22 @ 1.1-1.2m



STRAIN v EFFECTIVE STRESS

Test No: TP 22 @ 1.1-1.2m

