

'v/e are the same'

PUBLIC WORKS AND INFRASTRUCTURE **DEVELOPMENT DEPARTMENT**

ROADS AND STORMWATER DIVISION

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PRETORIA

0001

Room C306, 3rd Floor, Noordvaal Building, 225 Vermeulen Street, Pretoria, 0001

Your ref:

My ref:

10/1/2/1-D12/77

Hannes Claassen

Enquiries: Section: Infrastructure Planning and Management

Date: 30 January 2008

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c/o Basden & Rabie Streets, Lyttelton Agr. Holdings

The Manager: Land Use Legislation and Application

City Planning

PRETORIA REGION

Attention: Naomi Malahlela

TOWNSHIP ESTABLISHMENT: GEOLOGICAL REPORT: DIE WILGERS X77

- The Geotechnical investigation done for this development on a portion 124 of 1. Wonderboom H/A, has reference. The report compiled by Johann vd Merwe dated July 2007 is in order.
- 2. The following condition must be included in the Scheme:
- An engineer must be appointed before the approval of building plans, who must 2.1 design, specify and supervise structural measures for the foundations of all structures, according to the soil classification for each zone as described in the geological report. On completion of the structures, he must certify that all his specifications have been met.
- The report is accepted for proclamation purposes. 3.

Yours faithfulk

For: ACTING EXECUTIVE DIRECTOR: ROADS AND STORMWATER

TE-Die Wilgers X77

Die Wilgers X 77 JOHANN van der MERWE (Pry) Ud

CONSULTING APPLIED EARTH AND ENVIRONMENTAL SCIENTISTS

289 Polaris Avenue Waterkloof Ridge 0181 Pretoria, GAUTENG SOUTH AFRICA

TEL: 012: 347 8467 M OBILE: 082 570 2222 FAX: 012: 347 9064

P.O. Box 95562 WATERKLOOF 0145 Pretoria, GAUTENG

10/1/2/1- 8/2/11

PROJECT No:

McCARTAN S

P.O. Box 1253

PRETORIA 000

REF NO: V.10/1/2/1D12/77

TOWNSHIP: DIE WILGERS

EXT 77

Attention: Mr. .

REPORT NO: M07/2877

DATED: JULY 2007

ROADS & STORMWATER

GEOLOGY REPORTS

CONSULTANT: JOHANN VD MERWE

TEL NO: 012 347 8467 / FAX NO: 012 347 9064

Dear Sir,

REPORT ON A GEOTECHNICAL INVESTIGATION CARRIED OUT FOR THE PROPOSED NEW: TUCKER OFFICE PARK DEVELOPMENT ON: REMAINDER OF PORTION 161 OF THE WILLOWS 340-JR, PRETORIA DISTRICT, GAUTENG **PROVINCE**

1. INTRODUCTION

This report presents results and observations on a foundation investigation carried out during May 2007 for the proposed Tucker Office Park development in the eastern part of Pretoria, to be known as Die Wilgers Extension 77. The investigation was carried out at the request of Mr. John Shaw of McCartan Shaw & Robinson, Consulting Engineers, Pretoria, who is acting on behalf of his clients, Messrs Rocklea Realty (Pty) Ltd, the registered owner of the property who proposes to establish an office complex on the property.

2. TERMS OF REFERENCE

The objectives of the desk study were to: -

- Determine the engineering properties of the site soils and bedrock including potentially expansive material, low bearing capacity soils and areas difficult to excavate.
- Present appropriate recommendations for commercial township design and precautionary measures in accordance with the requirements of the Tshwane Local Municipality and of the National Home Builders Registration Council's guidelines.

The investigation was carried out in terms of written instructions received from Mr. Des Brand of Bild Architects in his faxed letter of appointment dated 3 May 2007.

INFORMATION CONSULTED 3.

The following information was available and was consulted: -

- The 1: 50 000 scale Topographical and Geological Maps 2528CD Rietvleidam.
- A site contour diagram prepared to a scale of 1: 250 by Buckley and Strydom, Land Surveyors, showing existing roads, the boundaries of the site and surface contours at 0,25m intervals.

PRINCIPAL: J van der Merwe MSc /Fnd Gool) Durham 11K, Dr. Sai, Mat., MAECO

- A site layout plan prepared to a scale of 1: 100 by Bild Architects, showing the site boundaries and the layout of the proposed development.
- The publication "National Home Builders Registration Council's Home Building Manual, Part 1 & 2, February 1999.

4. SITE DESCRIPTION

The site for the proposed development is situated due north-east of Pretoria CBD as shown on the attached 1: 50 000 scale Locality Map at the back of the report. The study area is roughly rectangular in shape and covers a surface area of some 1,7 hectares. The property is bounded to the north by Lynnwood Road, to the east by east by Wattle Crescent and on the remaining sides by the remainder of Holding 161, The Willows agricultural holdings. The site is devoid of any structures and is covered by large Eucalyptus spp. trees. Surface drainage takes place via sheetwash towards the north-east at an average gradient of some 8%.

5. SITE INVESTIGATION

Ten test pits were excavated across the site for the proposed development using a Bell 315SG backactor supplied by SNA Lab from Waltloo. The test pits were entered by a registered professional engineering geologist, who described the soil and bedrock formations in terms of the methods advocated by Jennings <u>et al</u> (1973) namely, moisture condition, colour, soil consistency, soil structure, soil type and origin (MCCSSO).

During the test pit profiling, disturbed and undisturbed representative soil samples were recovered from the test pits and submitted to SNA's commercial soils laboratory in Waltloo for testing and identification. The detailed descriptions of the test pit profiles are provided on the Soil Profile Sheets in Appendix 1 of the report whilst the laboratory test results appear in Appendix 2. The location of the test pits is shown on the "Site Plan", Drawing Number M07/2877 at the back of the report.

6. OBSERVATIONS

The property is blanketed by a moderate horizon of transported soil that is underlain by shale bedrock belonging to the Silverton Formation, Pretoria Group, Transvaal Supergroup. A very generalized description of the typical soil profile that can be encountered over the site is as follows:-

0,0 - 0,4: Dry, light grey, <u>loose</u>, voided, silty SAND containing tree roots; colluvium.

0,4-0,6: Abundant coarse, hard, yellow blotched red and orange, ferruginised SHALE FRAGMENTS and scattered QUARTZITE GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.

0,6-1,0: Abundant coarse, flaky SHALE FRAGMENTS, clast supported in a matrix of dry, dark yellow, silty SAND; reworked residual shale. Overall consistency is <u>loose</u>

containing vertical runnels of dense material.

1,0+: Light purple thinly banded yellow and orange, highly weathered, very closely bedded and jointed, very soft rock SHALE. The shale bedrock horizon was encountered at depths ranging from 0,6m to 1,4m below ground surface and the bedrock grades to soft rock SHALE with increasing depth.

Gradual refusal to refusal of the backactor was experienced at depths ranging from 1,0m to 1,8m below surface in the shale bedrock. The water table, whether perched or permanent, was not encountered during the investigation that was carried out during the dry season.

7. GEOTECHNICAL CONSIDERATIONS

7.1 Expansive Soils

The site soils are generally sandy and gravelly and are potentially "low" in the degree of expansiveness based on the results of the laboratory tests and according to the Van der Merwe (1964) method. A total surface heave of less than 5mm, is predicted across the site, depending on the locality on site and should the moisture condition of the soils change from a dry to a saturated state.

7.2 Collapsible and Compressible Soils

The upper sandy and gravelly horizons that extend down to some 0,6m to 1,4m below surface, are considered to be potentially compressible, based on a visual appraisal of the soil structure i.e. a loose consistency and a voided texture. These soils were unfortunately too friable in order to take undisturbed soil samples. The thickness of potentially compressible material is shown at each test pit position on the "Site Plan".

7.3 Foundations

Conventional spread or strip footings, placed onto the shale bedrock at depths ranging from 0,6m to 1,4m below surface, are envisaged for proposed multi-storey structures. A safe allowable bearing pressure not exceeding 300 kPa is applicable at this depth. Removal of the large Eucalyptus (bluegum) and other trees which covers portions of the site will probably result in a fair amount of ground disturbance which should be reinstated prior to construction of services and structures. A rebound of the soil moisture is also bound to occur after removal of the trees with settlement induced problems of structures not founded onto bedrock that may result thereof.

7.4 Earthworks

The transported and residual soils and weathered shale bedrock that blanket the site, were tested to determine their compaction characteristics and a summary of the test results appear below in Table 7.1: -

TABLE 7.1: SUMMARY OF COMPACTION TEST RESULTS

HOLE NO	DEPTH (m)	SOIL TYPE	PI	GM	CBR	TRH 14	SWELL
TO/1	0,0-0,4	Silty SAND	7	2,18	45	G5	(%)
TO/1	0,4-1,0	Clayey SAND	5	0,87	22	G7	0,01
TO/1	1,0-1,4	Reworked SHALE	4	0,99	33	G7	0,02
TO/9	0,5-1,0	Reworked SHALE	7	1,71	52	G5	0,02
TO/9	1,0-1,5	SHALE bedrock	7	1,77	35	G5	0,12

Note:

PI = Plasticity Index

GM = Grading Modulus

CBR = California Bearing Ration at 95% Mod AASHTO compaction

Based on the results of the compaction tests, it is apparent that the site soils should be suitable for use as backfill underneath surface beds, as lower selected layers and as sub-base layers (G5/G7 quality) in road-works. The potentially collapsible nature of the upper site soils should be taken into consideration in the design and construction of roads and paved areas.

7.5 Ground Water and Soil Chemistry

Although no seepages of ground water were encountered during the investigation, proper damp-proofing precautions should be taken underneath structures. Removal of the hydrophilic Eucalyptus trees across the site may result in a rebound of the soil moisture regime thereby exacerbating the potentially problematic soil conditions.

The site soils are considered to be potentially chemically aggressive with regards to underground ferrous metal pipes (pH values ranging from 3,79 to 6,62 and electrical conductivity values ranging from 0,004 to 0,014 S/m) and non-ferrous metal pipes or plastic pipes are therefore recommended for wet services and the foundation soils should be treated with an environmentally friendly insecticide to combat termites.

7.6 Excavation Characteristics

No problems should be experienced in excavating any the transported soils over the entire site down to an average depth of at least 1,5m below surface using conventional earth-moving machines. The sidewalls of deep excavations along the southern, western and eastern portions of the site may tend to become unstable if left unsupported for some time, due to the presence of unfavourably dipping bedding and joint planes in the shale rock mass.

8. GENERAL

While every effort has been made to ensure that representative test pitting and sampling has been undertaken to probe the soils on-site, guaranteeing that isolated zones of either poor foundation material or hard rock excavation have not been identified, is impossible under the constraints of an investigation of this nature. The investigation has sought to highlight general areas of potential foundation and excavation problems, and to provide early warning to the design engineers and town planners. In view of the variability inherent in soils, a competent person must inspect all foundation excavations.

It is recommended that the excavations for foundations be inspected by a competent person during construction in order to verify that the materials thus exposed are not at variance with those described in the report. The placement of the fill must be controlled with suitable field tests to confirm that the required densities are achieved during compaction and that the quality of fill material is within specification.

We trust that the above information will meet with your immediate requirements, please do not hesitate to call for any further information.

Yours faithfully

JOHANN VAN DER MERWE (Pr. Sci. Nat.)

Engineering Geologist

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9. APPENDICES

Test Pit Profiles

Laboratory Test Results

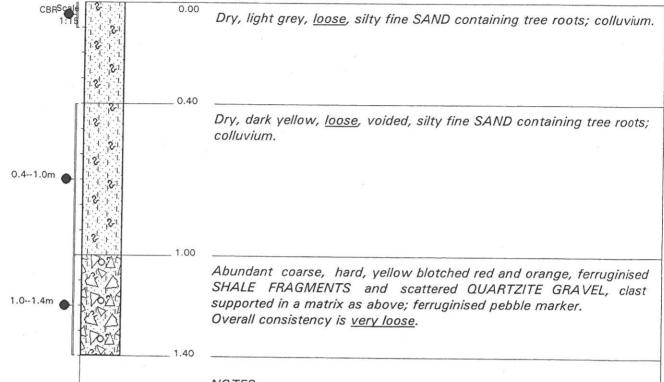
Locality Map

Site Plan

APPENDIX 1 : TEST PIT PROFILES

HOLE No: TO/1
Sheet 1 of 1

JOB NUMBER: MO7/2877



NOTES

- 1) No refusal of bakactor at 1,4m.
- 2) No water seepage encountered.
- 3) Disturbed bulk CBR samples taken from 0,1m--0-,4m; 0,4--1,0m; 1,0--1,4m.

CONTRACTOR : SNA Lab

MACHINE : Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE : STANDARD.SET

INCLINATION : Vertical

DIAM : Trench

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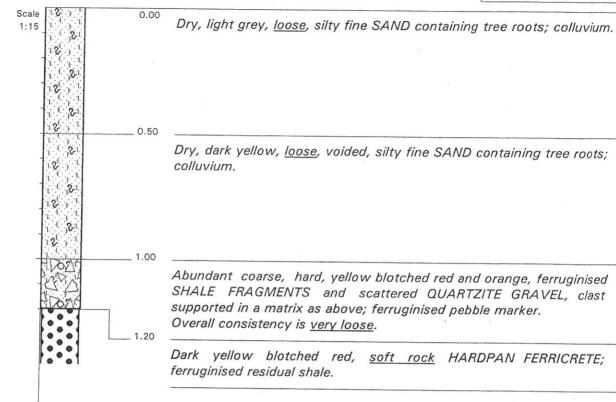
ELEVATION :

X-COORD:

Y-COORD:

HOLE No: **TO/2** Sheet 1 of 1

JOB NUMBER: MO7/2877



NOTES

- 1) No refusal of backactor at 1,2m.
- 2) No water seepage encountered.

CONTRACTOR: SNA Lab

MACHINE: Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : Trench

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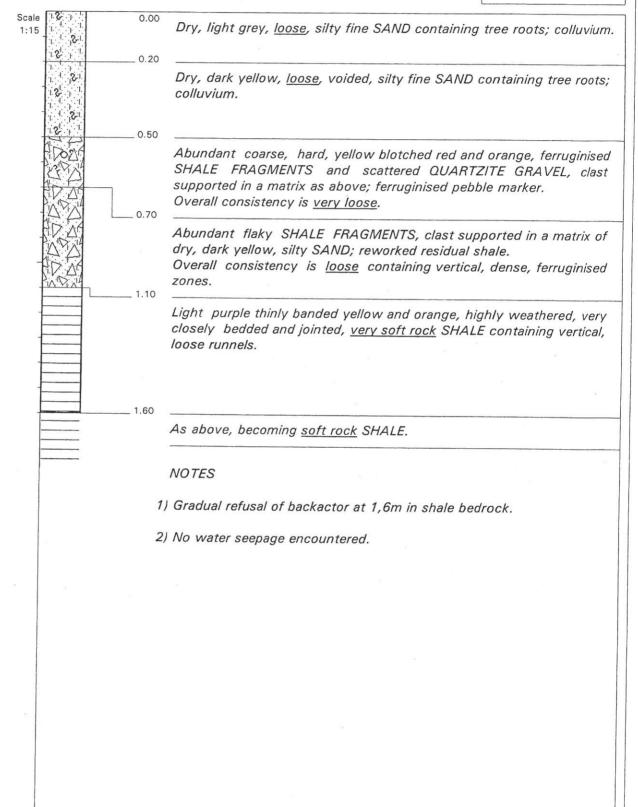
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Y-COORD :

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Sheet 1 of 1

JOB NUMBER: MO7/2877



CONTRACTOR : SNA Lab

MACHINE : Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE : STANDARD.SET

INCLINATION:

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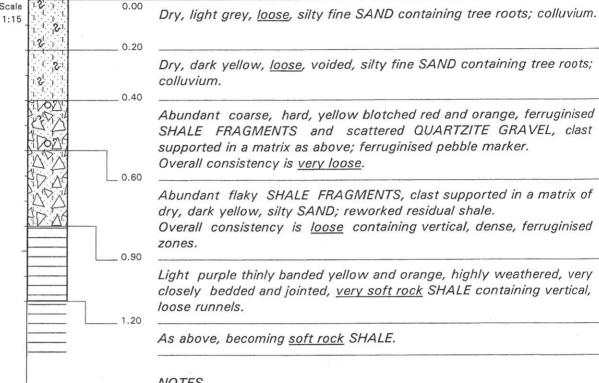
Y-COORD :

McCARTAN, SHAW & ROBINSON, Consulting Engineers Remainder of Portion 161 of The Willows 340-JR GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:

HOLE No: TO/4 Sheet 1 of 1

JOB NUMBER: MO7/2877





NOTES

- 1) Gradual refusal of backactor at 1,2m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR: SNA Lab

MACHINE: Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE: STANDARD.SET

INCLINATION:

DIAM : Trench

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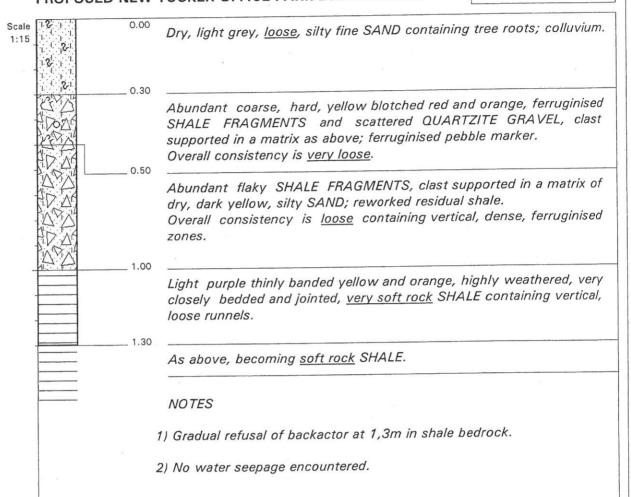
ELEVATION:

X-COORD:

Y-COORD :

HOLE No: TO/5 Sheet 1 of 1

JOB NUMBER: MO7/2877



CONTRACTOR : SNA Lab

MACHINE: Bell 315SG backactor

DRILLED BY : profiled by : jvdm

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SETUP FILE: STANDARD.SET

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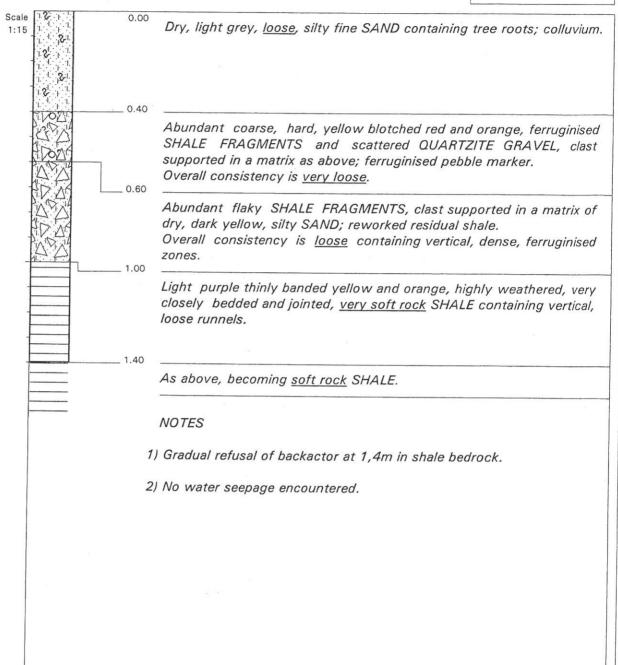
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ELEVATION: X-COORD:

Y-COORD :

HOLE No: TO/6Sheet 1 of 1

JOB NUMBER: MO7/2877



CONTRACTOR : SNA Lab

MACHINE: Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE : STANDARD.SET

INCLINATION:

DIAM: *Trench*DATE: 14/05/2007

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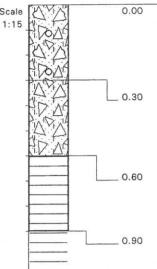
ELEVATION:

X-COORD :

Y-COORD :

HOLE No: *TO*/7 Sheet 1 of 1

JOB NUMBER: MO7/2877



Abundant coarse, hard, yellow blotched red and orange, ferruginised SHALE FRAGMENTS and scattered QUARTZITE GRAVEL, clast supported in a matrix of grey, loose, voided, silty fine SAND; ferruginised pebble marker.

Overall consistency is very loose.

Abundant flaky SHALE FRAGMENTS, clast supported in a matrix of dry, dark yellow, silty SAND; reworked residual shale.

Overall consistency is <u>loose</u> containing vertical, dense, ferruginised zones.

Light purple thinly banded yellow and orange, highly weathered, very closely bedded and jointed, very soft rock SHALE containing vertical, loose runnels.

As above, becoming soft rock SHALE.

NOTES

- 1) Gradual refusal of backactor at 0,9m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : SNA Lab

MACHINE : Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE: STANDARD.SET

INCLINATION :

DIAM : Trench

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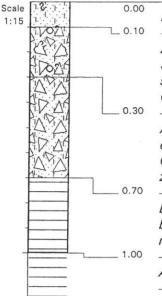
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Y-COORD :

McCARTAN, SHAW & ROBINSON, Consulting Engineers Remainder of Portion 161 of The Willows 340-JR GEOTECHNICAL INVESTIGATION CARRIED OUT FOR: HOLE No: **TO/8** Sheet 1 of 1

JOB NUMBER: MO7/2877

PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT



Dry, light grey, loose, silty fine SAND containing tree roots; colluvium.

Abundant coarse, hard, yellow blotched red and orange, ferruginised SHALE FRAGMENTS and scattered QUARTZITE GRAVEL, clast supported in a matrix as above; ferruginised pebble marker. Overall consistency is <u>very loose</u>.

Abundant flaky SHALE FRAGMENTS, clast supported in a matrix of dry, dark yellow, silty SAND; reworked residual shale.

Overall consistency is <u>loose</u> containing vertical, dense, ferruginised zones.

Light purple thinly banded light grey, highly weathered, very closely bedded and jointed, <u>very soft rock</u> SHALE containing vertical, loose runnels.

As above, becoming soft rock SHALE.

NOTES

- 1) Gradual refusal of backactor at 1,0m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR: SNA Lab

MACHINE: Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE: STANDARD.SET

INCLINATION :

DIAM : Trench

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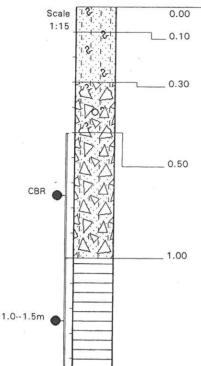
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Y-COORD :

HOLE No: *TO/9*

Sheet 1 of 1

JOB NUMBER: M07/2877



Dry, light grey, loose, silty fine SAND containing tree roots; colluvium.

Dry, dark yellow, <u>loose</u>, voided, silty fine SAND containing tree roots; colluvium.

Abundant coarse, hard, yellow blotched red and orange, ferruginised SHALE FRAGMENTS and scattered QUARTZITE GRAVEL, clast supported in a matrix as above; ferruginised pebble marker. Overall consistency is <u>very loose</u>.

Abundant flaky SHALE FRAGMENTS, clast supported in a matrix of dry, dark yellow, silty SAND; reworked residual shale.

Overall consistency is <u>loose</u> containing vertical, dense, ferruginised zones.

Light purple thinly banded yellow and orange, highly weathered, very closely bedded and jointed, <u>very soft rock</u> SHALE containing vertical, loose runnels.

NOTES

- 1) No refusal of backactor at 1,5m.
- 2) No water seepage encountered.
- 3) Disturbed CBR samples taken from 0,5--1,0m and from 1,0--1,5m.

CONTRACTOR : SNA Lab

MACHINE: Bell 315SG backactor

DRILLED BY :

PROFILED BY : jvdm

TYPE SET BY :

SETUP FILE : STANDARD.SET

INCLINATION:

DIAM : *Trench*DATE : 14/05/2007

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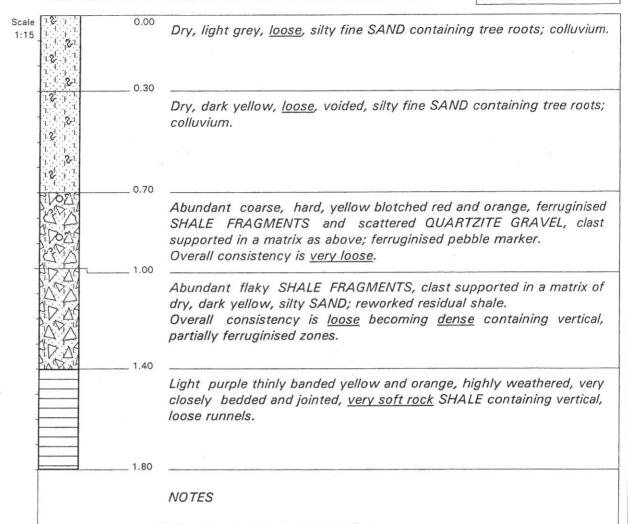
ELEVATION :

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Y-COORD :

HOLE No: *TO/10*Sheet 1 of 1

JOB NUMBER: MO7/2877



- 1) No refusal of backactor at 1,8m.
- 2) No water seepage encountered.

CONTRACTOR : SNA Lab

MACHINE: Bell 315SG backactor

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PROFILED BY : jvdm

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SETUP FILE : STANDARD.SET

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APPENDIX 2: LABORATORY SOIL TEST RESULTS

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HOLE & / SAMPLE No.	рертн			SIEVE	ANAL	SIEVE ANALYSIS PASSING	ASSIN	#	(%) ww	(%			SOIL	MORTAR ANAL (% vs # mm)	AR A	NAL	GM		ATTERBERG LIMITS (%)	ERG (%)		FIECTRIC	REMARK	S
MATERIALS DESCRIPTION	NOIL	75.0	63.0	53.0	37.5	26.5	19.0	13.2	4.75	2.0	0.075	2.0 - 0.075	0.425 - 0.425	0.150 0.250 - 0.250	0.075 0.150 - 0.150	<0.075	GM	=	LS	<u>a</u>	풘	CONDUC. (S/m)	TRB CLASS. & GROUP INDEX. CSRA TRH 4 & 14 CLASSIFICATION	8 EX. 14 ION
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	MDD		N O	0			TMH 1:	METHOD	A7	S B	2		S	\ S		ဟ	TMH	TMH 1: METHODS A14, A16	FHODS 4. A16T	A8 / A9, T	,	
SAMPLE No.				MDD / OMC	~	MOD.AASHTO.)	1TO.)				COMPACTION	CTION		CBR %		SUI	SUMMARY		11	STABILISATION		
TEST		MC		DENSITY							<u>_</u>	DRY	REL.	ncs	REL		STRENGTHS	SF.	SOIL (SOIL CONSTANTS	s	
STAB.AGENT. PERCENTAGE		%	WET kg/m³	DRY kg/m³	. _E 1		WC %	,º		SWELL %	S S S	DENS.	COMP		COMP	CBR %	UCS	ITS KPa	1%	S"%	E %	
TO/1		5.3	2330	2213	0000				2	MOD					100	90					Γ	
1.0-1.4		6.3	2390	2248	2300					0.01	7.3	2268	100.8	100	86	71					Γ	
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7.3	2413	2249	2200			1		NRB					97	63				GS		
		8.3	2423	2237	2150					0.01	7.2	2178	8.96	62	92	45						
		9.3	2359	2158	2100	-	-	-	111	PROC					93	32						
					7001		1		ا ا	0.01	7.9	2021	89.9	19	90	19						
	OMC	7.4	MDD	2249	.,	5.5		0.0	رن د.	AV.MC	7.5	CBR(1	CBR(1), UCS(2) or ITS(3)	TS(3) ⇔	-	CURING	REGIME					
TO/1		9.7	2168	1976	2050				=	MOD					100	33						
0.4-1.0		10.7	2237	2021	2000					0.01	9.7	2067	102.3	40	86	27						
		11.7	2196	1966	1950	<u></u>	1	1		NRB					97	25				G7		
		12.7	2161	1917	1850			/	7	0.01	9.3	1951	9.96	24	92	22						
		13.7	2129	1872	1800	-	-	-		PROC					93	20						
					06/	707 407		10.1	7 7	0.01	9.7	1876	92.9	20	90	17	,					
	OMC	10.8	MDD	2020					\ \ 'S	AV.MC	9.6	CBR(1	CBR(1), UCS(2) or ITS(3) ⇔	TS(3) 🗢	+	CURING	CURING REGIME	ш				
1/01		7.9	2110	1956	2050				_	MOD					100	42						
0.0-0.4		8.9	2178	2000	2000		•			0.02	9.1	2033	100.7	42	86	40						
		10.9	2219	2001	1050		}	*		NRB					97	40				G7		
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	8	12.9	2171	1923	200					PROC					93	25						
					000	70 80	100	110	130	0.04	9.1	1843	91.3	19	80	16						
	OMC	6.6	MDD	2019		·	2	?	5.3	AV.MC	9.0	CBR(CBR(1), UCS(2) or ITS(3)	ITS(3) ⇔	-	CURING	G REGIME	Е				
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	OMC		MDD		0.0	0.0	0.0	0:0	0.0	AV.MC		CBR(CBR(1), UCS(2) or ITS(3) ⇔	ITS(3) ⇔		CURIN	CURING REGIME	E		0		
REMARKS:	UCS: -19.0mm	Jmm				ITS: -19	-19.0mm				Press No:	No:				2			ТЕСН	SE SE		
JUSTIN	UCS: -37.5mm	5mm				ITS: -37.5mm	.5mm												DATE	18/06/07	70	
																			0	7	*	

historical Communical Continued Communication Communicatio	3345-3346-3346-3346-3346-3346-3346-3346-	TMH 1: MET A14 A14 AA14 AA14 AA14 AA14 AA14 AA14	CUR		CBR CBR	ACTIC AC	D	MC% 9.2 10.2 11.2 12.2 14.3 15.3 16.3 17.3 18.3
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