



- Site Investigations
- Slope Stability
- Rock Mechanics
- Soil Mechanics
- Foundations
- Borrow Pits and Materials
- Roads
- Groundwater
- NHBRC
- Geotechnical Instrumentation

***Rapid Land Release Program: NHBRC Phase 1  
Geotechnical Investigation for Ennerdale Extension 9,  
Gauteng: Final Report***

***Client: Glad Africa & GDHS***

***Reference: 19-0866.02R03***

***Dated: 7 November 2019***

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# *Rapid Land Release Program: NHBRC Phase 1 Geotechnical Investigation for Ennerdale Extension 9, Gauteng: Final Report*

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## ***EXECUTIVE SUMMARY***

*This report presents the findings of a NHBRC Phase 1 geotechnical investigation for the proposed housing development to be located at Ennerdale Extension 9, Ennerdale, and provides the conclusions and recommendations for excavations, foundations and earthworks.*

*Based on the 1:250 000 Geological Map titled “2626 West Rand (1986)”, the site can be seen to be underlain by Andesite lava and conglomerate of the Pretoria Group, Transvaal Supergroup.*

*The site was confirmed to be underlain by conglomerate in the south western portion of the site which is underlain by Andesite lava and across the remainder of the site during the site investigation.*

*All materials on site classify as SOFT excavation (SABS 1200 D) to depths ranging between 1.2 m and 3.1 m with an average depth of around 2.6 m. Below this depth, intermediate excavation is to be anticipated due to weathered saprolitic Andesite lava bedrock which has been identified across the site.*

*The site has been classified as H1-H2 (with an isolated zone of H) according to NHBRC guidelines. The following foundation recommendations are proposed for the site:*

- *Modified normal (for H1 only)*
- *Soil raft (for H1 and H2)*
- *Stiffened RC raft (for H2 only)*
- *Split construction (for H2 only)*
- *Piled construction (for H2 only)*

*Finally, the ground conditions described in this report refer specifically to those encountered at the test positions advanced on site. It is therefore possible that conditions at variance with those discussed above may be encountered elsewhere on the site. In this regard it is critical that the NHBRC Phase 2 investigation be commissioned and completed to assist the subsidy variation process.*

# *Rapid Land Release Program: NHBRC Phase 1 Geotechnical Investigation for Ennerdale Extension 9, Gauteng: Final Report*

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## Definitions and Abbreviations

### Commercial:

**GCS Geotechnical** GCS Geotechnical (Pty.) Ltd.

### Technical:

CH	Chainage (metres)
mbgl	metres below ground level
masl	metres above sea level
NGL	Natural Ground Level
FL	Foundation Level
BH	Borehole
SPT	Standard Penetration Test
N	SPT N value (blows per 300 mm)
TLB	Tractor-mounted Loader Backhoe
TP	Test Pit
DCP	Dynamic Cone Penetrometer
EABC	Estimated Allowable Bearing Capacity
G1-G10	Standard classification of natural road building materials (TRH 14)
CBR	California Bearing Ratio
MDD	Maximum Dry Density (kg/m <sup>3</sup> )
MADD	Modified AASHTO Dry Density
OMC	Optimum moisture Content (%)
PI	Plasticity Index
LL	Liquid Limit
LS	Linear Shrinkage
RMR	Rock Mass Rating
GSI	Geological Strength Index
mi	Hoek-Brown Constant (origin & texture dependent)
RQD	Rock Quality Designation (%)
FF	Fracture frequency
UCS	Unconfined Compressive Strength (MPa)
C (c')	Cohesion (kPa) – total stress and (effective stress)
Φ (Φ')	Friction Angle (degrees) – total stress and (effective stress)
K <sub>v</sub>	Modulus of Subgrade Reaction (MN/mm or kPa/mm)
CFA	Continuous Flight Auger (pile type)
DCI	Driven Cast In situ (pile type)
C <sub>v</sub>	Coefficient of Consolidation (m <sup>2</sup> /yr)
M <sub>v</sub>	Modulus of Compressibility (m <sup>2</sup> /MN)
MC1	Moisture Content Before Test (%)
MC2	Moisture Content After Test (%)
ρ	Dry Density (kg/m <sup>3</sup> )
VSR	Very soft rock
SR	Soft rock
MHR	Medium hard rock
HR	Hard rock
VHR	Very hard rock

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# ***Rapid Land Release Program: NHBRC Phase 1 Geotechnical Investigation for Ennerdale Extension 9, Gauteng: Final Report***

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## **1. INTRODUCTION & TERMS OF REFERENCE**

At the request of Nivendra Moodley of Glad Africa (and on behalf of the Gauteng Department of Human Settlements), **GCS Geotechnical** (hereafter referred to as GCS) was asked to provide a proposal and cost estimate quotation for the undertaking of a Phase 1 NHBRC geotechnical investigation for the proposed housing development to be located at Ennerdale Extension 9, Ennerdale, Gauteng.

## **2. AVAILABLE INFORMATION**

The following information was drawn upon for the purposes of the investigation:

- The 1:250 000 Geological Map titled “2626 West Rand” as compiled by the South African Geological Survey, 1986,
- Google Earth Imagery,
- The 1:500 000 Hydrogeological Map titled “2628 Johannesburg” as compiled by DWAF, 1998,
- Anhaesseur, 1973: Geology of Johannesburg,
- SABS 1200 D – Earthworks, and
- Report titled “*RLRP: Desk Study Geotechnical Report for Ennerdale Ext 9*”, referenced 19-0866.02R01, written by GCS in 2019.

Table 2 below shows the available published physiographical information on the site.

**Table 2: Summary of Available Physiographical Information**

Parameter	Value	Reference
Development	Rapid Land Release Project	Glad Africa
Site coordinates	26°24'20.98"S/ 27°49'39.78"E	Google Earth and Garmaps
Weinerts N-value	2-5	Weinert (1974)
Climatic Region	Moderate	TRH 2 (1978)
Rainfall	850-900 mm	
Temperature	5.8-26.2°C	After DWAF (1986)
Evaporation	1200 mm	Barnard (2000)
Water Balance	Deficit	Schulze (1985)
Weathering Type	Moderate decomposition with frost	Fookes et al (1971) & Embleton et al (1979)
General geology	Andesite Lava	1:250 000 Geological Map titled "2526 – <i>West Rand</i> (1981)
Soil cover	Clayey residual soils	Brink (1985)
Topography	Gently sloping towards the east.	Google Earth
Drainage region	C22	DWAF (1999)
Hydrogeology	Intergranular & Fractured 0.5 to 2.0 l/s	Hydrogeological Map – Johannesburg (1998)
Groundwater	5 to 40 mbgl	Barnard (2000)
Harvest potential	-	DWAF (2003)
Erodibility Index	9-15 (medium)	WRC (1992)
Seismic Intensity	VI (MMS)	Fernandez et al (1972)
Liquefaction	Likely (100-200 m2/s) <0.2g	Welland (2002)

### 3. SITE DESCRIPTION

The site is located on a vacant plot of land in the western portion of the town of Ennerdale. The northern portion of site is bounded by Katz Road, with Street B/ Smith Street along the eastern boundary, Samuel Road along the southern boundary, and an unnamed blacktop road along the western boundary.

The total site area is approximately 35.2 Ha in size.

Topographically, the site is fairly flat at 1:30 or 4% towards the south and drains into an unnamed tributary 1 km to the south. The site is sparsely vegetated with small trees, shrubs and scattered grasses.

No drainage paths were noted on site.

Portions of the site have been used as a dumping site with piles of domestic waste and builder's rubble.

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## 4. GEOLOGY

Based on the 1:250 000 Geological Map titled “2626 *Wes Rand* (1986)”, the site can be seen to be underlain by Andesite lava and conglomerate of the Pretoria Group, Transvaal Supergroup.

The site was confirmed to be underlain by conglomerate in the south western portion of the site which is underlain by Andesite lava and across the remainder of the site during the site investigation.

## 5. FIELDWORK

TLB-excavated test pits were conducted on site, in order to ascertain and better understand the general engineering properties and parameters of the subsurface materials.

### 5.1 TLB-Excavated Trial Pits

Twenty-nine test pits were excavated over the 35.2 Ha site (according to guidelines of GFSH-2 of 2002), in order to better understand the engineering properties of the subsurface soil / rock conditions.

The results of the test pits indicated refusal depths ranging between 1.1 m and 3.1 m below existing ground level, refusing at an average depth of 2.4 m. Typically the ground conditions comprised a thin veneer of fill, underlain by residual conglomerate that is underlain by residual andesite or hardpan ferricrete in the south western portion of site. The remainder of the site is underlain by fill, which is underlain by colluvium, which in turn is underlain by colluvium, residual ferriginised andesite, and residual andesite.

Detailed test pit profiles are given in appendix A of this report with a summary of the soil profiles across the site below in Table 5.1a to 5.1b.



Table 5.1a: Summary of Soil Layers in Test Pits

TP No.	Fill	Colluvium	Residual Conglomerate	Hardpan Ferricrete	Residual Ferriginised Andesite	Residual Andesite	Saprolitic Andesite
1		0.0-0.3	0.3-1.1	1.1-1.2			
2		0.0-0.5	0.5-0.9			0.9-1.9	1.9-2.8
3		0.0-0.3	0.3-1.0			1.0-2.8	
4		0.0-0.2	0.2-0.7			0.7-2.3	
5		0.0-0.2	0.2-1.1			1.1-2.8	
6		0.0-0.4	0.4-1.0			1.0-2.3	2.3-2.7
7		0.0-0.3			0.3-1.5	1.5-2.3	2.3-2.8
8		0.0-0.3			0.3-1.5	1.5-2.0	2.0-2.5
9		0.0-0.4	0.4-1.0	1.0-1.1			
10		0.0-0.4	0.4-1.1			1.1-3.1	
11		0.0-0.2	0.2-0.8		0.8-2.7		
12		0.0-0.3			0.3-1.0	1.0-2.0	2.0-2.7
13		0.0-0.3			0.3-0.8	0.8-2.2	2.2-2.8
14	0.0-0.4				0.4-1.0	1.0-1.8	1.8-2.5
15		0.0-0.4			0.4-1.5	1.5-2.2	2.2-2.7
16		0.0-0.4			0.4-1.2		1.2-1.6
17		0.0-0.4				0.4-1.3	1.3-2.1
18		0.0-0.4			0.4-1.0	1.0-1.6	1.6-2.0
19		0.0-0.4			0.4-1.0	1.0-2.0	2.0-2.8
20		0.0-0.3			0.3-0.9	0.9-1.7	1.7-2.6
21		0.0-0.4			0.4-1.3		1.3-2.1
22		0.0-0.7			0.7-1.2	1.2-1.6	1.6-2.0
23		0.0-0.6			0.6-1.2	1.2-2.0	2.0-2.7
24		0.0-0.4			0.4-1.1	1.1-1.7	1.7-2.5
25	0.0-0.7				0.7-1.4	1.4-1.8	1.8-2.5
26		0.0-0.3				0.3-1.1	1.1-1.2
27		0.0-0.5			0.5-1.0	1.0-1.7	1.7-2.5
28		0.0-0.4				0.4-2.2	2.2-2.7
29		0.0-0.3				0.3-2.0	2.0-2.5
<b>Ave Depth</b>	<b>0.6</b>	<b>0.4</b>	<b>0.6</b>	<b>0.1</b>	<b>0.8</b>	<b>1.0</b>	<b>1.8+</b>

Table 5.1b: Summary of Soil Profile

Depth		Description	EABC (kPa)	Kv (kPa/mm)	E (MPa)	c (kPa)
From (m)	To (m)					
<i>Fill</i>						
0.0	0.4	Dry to slightly moist, medium brown, MEDIUM DENSE, clayey <b>GRAVEL</b> .	N/A	N/A	N/A	N/A
<i>Colluvium</i>						
0.0	0.4	Dry to slightly moist, medium brown, FIRM/MEDIUM DENSE, slightly sandy gravelly <b>CLAY</b> to clayey sandy <b>GRAVEL</b> .	150-300	55-100	15-25	36-72
<i>Residual Conglomerate</i>						
0.4	1.0	Slightly moist, yellowish brown mottled dark grey & red to light red brown mottled dark grey and red, MEDIUM DENSE to DENSE/FIRM, slightly sandy clayey <b>GRAVEL</b> to gravelly <b>CLAY</b> .	150-500	55-180	15-35	36-72
<i>Hardpan Ferricrete</i>						
1.2+		Dry to slightly moist, yellowish brown mottled red and dark grey, DENSE to VERY DENSE, <b>GRAVEL</b> .	500+	180+	25-35+	-
<i>Residual Ferriginised Andesite</i>						
0.4	1.3	Slightly moist, yellowish brown mottled red and dark grey, STIFF, gravelly <b>CLAY</b> .	200-300	70-100	-	36-72
<i>Residual Andesite</i>						
1.3	2.0	Slightly moist, red brown mottled dark grey and yellow and medium grey streaked dark grey, STIFF, clayey <b>SILT</b> to slightly gravelly silty <b>CLAY</b> .	200-300	70-100	-	72-144
<i>Weathered Saprolitic Andesite</i>						
2.4+		Light red brown mottled light brown and light red brown streaked dark grey stained dark red, completely weathered, highly fractured, very fine to medium grained, very soft rock.	500+	180+	-	-

EABC = estimated allowable bearing capacity (ignoring collapse potential)

Kv = modulus of subgrade reaction

E = elastic modulus

## 6. GROUNDWATER

No groundwater seepage occurred on site in any of the test pits, although during summer months and during times of prolonged or heavy rainfall, it may be assumed that a perched groundwater table may be present at relatively shallow depths over the site.

## 7. LABORATORY TESTING

Laboratory tests were scheduled on soil samples recovered from the site. The following tests were carried out:

- Ten foundation indicator tests (particle size distribution, hydrometer, moisture content, and Atterberg Limits);
- Five Mod AASHTO compaction tests; and
- Five chemical tests (pH and conductivity).

The detailed laboratory test results are provided in Appendix B, while summaries of these results are presented below as in Tables 7a to 7d:

**Table 7a: Summary of Foundation Indicators**

TP	Depth (m-m)	LL	PI	GM	PE*	CBR*	Classifications		
							TRH14	PRA	USCS
<i>Colluvium</i>									
7	0.0-0.3	NP	NP	0.92	Low	16	G7	A.4	SM
17	0.0-0.4	24	10	1.55	Low	27*	G5-G6	A.2.4	SC
<i>Residual Conglomerate</i>									
1	0.3-1.1	29	11	1.45	Low	46	G6	A.2.6	SC
<i>Residual Ferriginised Andesite</i>									
24	0.4-1.1	38	17	0.75	Med	17	G8	A.6	CL/OL
25	0.7-1.4	36	18	1.09	Med	12-15*	G8	A.6	SC
<i>Residual Andesite</i>									
4	0.7-2.3	42	18	0.27	Med	4-5*	G10	A.7.6	CL/OL
6	1.0-2.3	46	16	0.22	Med	4-5*	G10	A.7.6	ML/O
10	1.1-3.1	49	24	0.21	Med	2	G10	A.7.6	CL/OL
28	0.4-1.1	39	15	1.14	Low	15-16*	G7-G8	A.6	SC
<i>Weathered Saprolitic Andesite</i>									
2	1.9-2.8	NP	NP	0.51	Low	4	G8	A.2.4	SM

\*CBR estimated from PI-GM relationship.

\*PE – Potential Expansiveness

**Table 7b: Summary of Corrosivity Tests**

TP No.	Depth (m-m)	pH	EC (µS/cm)	Resistivity (Ohm/cm)	Degree of Corrosivity
<i>Colluvium</i>					
7	0.0-0.3	4.9	309	3236	Very
<i>Residual Conglomerate</i>					
1	0.3-1.1	5.5	157	6382	Mildly
<i>Residual Ferriginised Andesite</i>					
24	0.4-1.1	4.7	189	5291	Mildly
<i>Residual Andesite</i>					
10	1.1-3.1	5.6	313	3195	Very
<i>Weathered Saprolitic Andesite</i>					
2	1.9-2.8	5.0	219	4566	Corrosive

**Table 7c: Summary of Compaction Test Result**

TP No.	Depth (m-m)	MDD (kg/m <sup>3</sup> )	OMC (%)	Swell (%)	CBR (%)				
					90	93	95	98	100
<b>Colluvium</b>									
7	0.0-0.3	2049	10.6	0.35	8	12	16	24	32
<b>Residual Conglomerate</b>									
1	0.3-1.1	2026	9.7	0.13	23	35	46	68	88
<b>Residual Ferriginised Andesite</b>									
24	0.4-1.1	1740	17.6	0.13	8	12	17	27	37
<b>Residual Andesite</b>									
10	1.1-3.1	1730	16.4	0.44	1	1	2	3	4
<b>Weathered Saprolitic Andesite</b>									
2	1.9-2.8	1709	17.5	0.79	2	3	4	7	9

**Table 7d: Materials Classification and Recommended Usage**

Material Description	Classification	Anticipated Recommended Usage
<b>Fill</b>	PI = - GM = - Classification: -	Assumed G10->G10 (cart to spoil)
<b>Colluvium</b>	PI = NP-10 GM = 0.93-1.55 Classification: A.4; SM; G5-G7	G5-G7 (select layers and general fill)
<b>Residual Conglomerate</b>	PI = 11 GM = 1.45 Classification: A.2.6; SC; G6	G6(lower subbase layers and select layers)
<b>Hardpan Ferricrete</b>	PI = - GM = - Classification: -	Assumed G5-G8 (upper to lower subbase layers and select layers)
<b>Residual Ferriginised Andesite</b>	PI = 17-18 GM = 0.75-1.09 Classification: A.6; SC-CL; G8	G8 (general fill and select layers)
<b>Residual Andesite</b>	PI = 15-24 GM = 0.21-1.14 Classification: A.7.6; CL; G10	G10 (cart to spoil)
<b>Weathered Saprolitic Andesite</b>	PI = NP GM = 0.51 Classification: A.2.4; SM; G8	G8 (select layers and general fill)

## 8. DEVELOPMENT RECOMMENDATIONS

### 8.1 Materials Usage

The soils in the south western corner of the site include a thin fill layer underlain by colluvium, underlain by residual conglomerate, underlain by hardpan ferricrete, underlain by residual ferriginised andesite and residual andesite, underlain by weathered saprolitic andesite. The soils over the remainder of the site include a thin fill layer underlain by colluvium, underlain by residual ferriginised andesite and residual andesite, underlain by weathered saprolitic andesite.

Based on visual and tactile means with limited laboratory results, the materials on site may be assumed to be used as follows:

- **Fill**

This layer is assumed to qualify as between G10- >G10 and is to be cut and carted off site.

- **Colluvium**

This layer is assumed to qualify as between G5-G7 (select layers and general fill) and can potentially be used in select layers and as select and general fill across the site.

- **Residual Conglomerate**

This layer qualifies as G6 and can potentially be used as lower subbase layers and may thus be re-used as such.

- **Hardpan Ferricrete**

This layer qualifies as G5-G8 and can potentially be used as upper to lower subbase layers and may thus be re-used as such, although this material is sparse on site and may not be available in practical volumes.

- **Residual Ferriginised Andesite**

This layer may qualify as G8 and should be carted to spoil

- **Residual Andesite**

This layer is assumed to qualify as G10 and should be carted to spoil.

- **Weathered Saprolitic Andesite**

This layer is assumed to qualify as between G8 (general fill) and can potentially be used as general fill across the site, although this material is quite deep on site and may be impractical to obtain.

## 8.2 NHBRC Classification (Provisional)

Prior to obtaining laboratory results in order to quantify the effects of soil movement beneath the site, **GCS Geotechnical** has classified the site based on general experience in similar geological environments.

The site is underlain by transported and residual soils with a low to medium potential expansiveness. These assumptions coupled with the layer thickness have led to the suggestion that this site can be represented by NHBRC classification: **H1-H2**. This signifies a cumulative potential heave of between 7.5 mm and 30 mm and possible boulder excavation within 1.5 m depth in the south western corner. A summary of the NHBRC classification can be seen in Table 8.2 below:

**Table 8.2: Residential Site Class Designations (from NHBRC, Part 1, Section 2, Table 1)**

Typical founding material	Character of founding material	Expected range of total soil movements	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	7.5-30mm	50%	<b><u>H1-H2</u></b>
Contaminated soils, controlled fill, dolomite land, landfill, uncontrolled fill	VARIABLE	VARIABLE	-	<b><u>P</u></b>

### 8.3 Foundations

The NHBRC Site Classification based on test pit logs excavated over the site can be mitigated by the following foundation options:

- Modified normal (for H1 only)
- Soil raft (for H1 and H2)
- Stiffened RC raft (for H2 only)
- Split construction (for H2 only)
- Piled construction (for H2 only)

### 8.4 Excavatability & Earthworks

All materials on site classify as SOFT excavation (SABS 1200 D) to depths ranging between 1.2 m and 3.1 m with an average depth of around 2.6 m. Below this depth, intermediate excavation is to be anticipated due to weathered saprolitic andesite bedrock which has been identified across the site. Restricted boulder excavation may also be encountered in the south western corner in the vicinity of TP 1, 2 and 3.

### 8.5 Drainage

For the promotion of a stable site, with no soil movement-related issues (settlement and/or heave), it is extremely important that adequate drainage, both surface and subsurface, be constructed so that no water ingress into the subsurface soils in and around foundation bases is possible. Drainage should be such that any rainfall is diverted to the nearest stormwater drainage system. Areas of potential pooling or damming of rainfall on site should be carefully designed and sloped so as to remove this water away from the foundations.

## 9. CONCLUSIONS & RECOMMENDATIONS

### General

- This report presents the findings of a NHBRC Phase 1 geotechnical investigation for the proposed housing development to be located at Ennerdale Extension 9, Ennerdale, and provides the conclusions and recommendations for excavations, foundations and earthworks.

### Geology & Ground Conditions

- Based on the 1:250 000 Geological Map titled “2626 West Rand (1986)”, the site can be seen to be underlain by Andesite lava and conglomerate of the Pretoria Group, Transvaal Supergroup.

The site was confirmed to be underlain by conglomerate in the south western portion of the site which is underlain by Andesite lava and across the remainder of the site during the site investigation.

### Excavatability

- All materials on site classify as SOFT excavation (SABS 1200 D) to depths ranging between 1.2 m and 3.1 m with an average depth of around 2.6 m. Below this depth, intermediate excavation is to be anticipated due to weathered saprolitic andesite bedrock which has been identified across the site. Restricted boulder excavation may also be encountered in the south western corner in the vicinity of TP 1, 2 and 3.

### Foundations

- The site has provisionally been classified as H1-H2 according to NHBRC guidelines. The following foundation recommendations are proposed for the site:
  - Modified normal (for H1 only)
  - Soil raft (for H1 and H2)
  - Stiffened RC raft (for H2 only)
  - Split construction (for H2 only)
  - Piled construction (for H2 only)

### Further Investigations

- Finally, the ground conditions described in this report refer specifically to those encountered at the test positions advanced on site. It is therefore possible that conditions at variance with those discussed above may be encountered elsewhere on the site. In this regard it is critical that the NHBRC Phase 2 investigation be commissioned and completed to assist in the subsidy variation process.



N Welland: Pr.Eng. / Pr.Sci.Nat

***For GCS Geotechnical (Pty) Ltd***



Dale Franklin  
7 November 2019

[ninow@gcs-sa.biz](mailto:ninow@gcs-sa.biz)

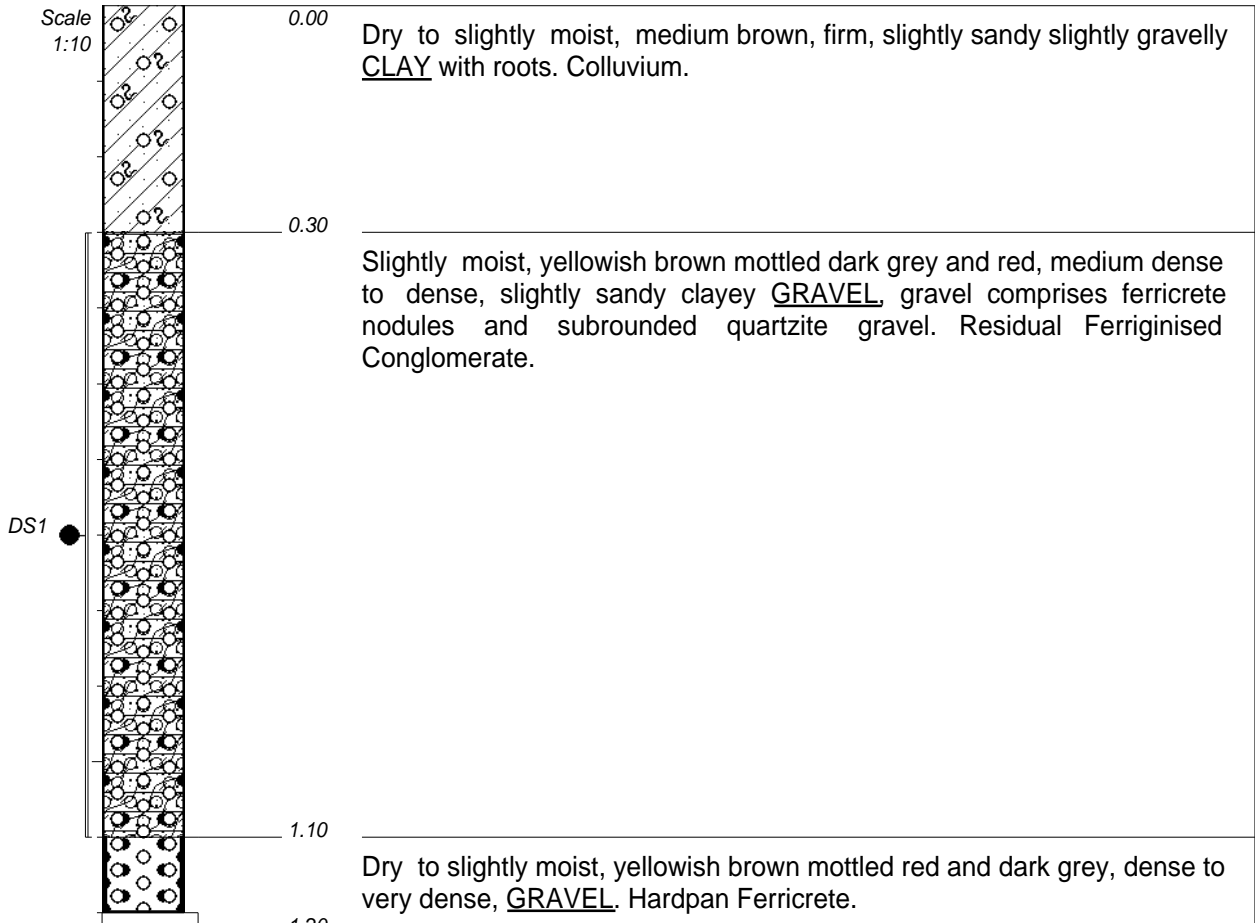
[www.gcs-sa.biz](http://www.gcs-sa.biz)

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# **APPENDIX A**

## **TLB-Excavated Trial Pit Profiles**





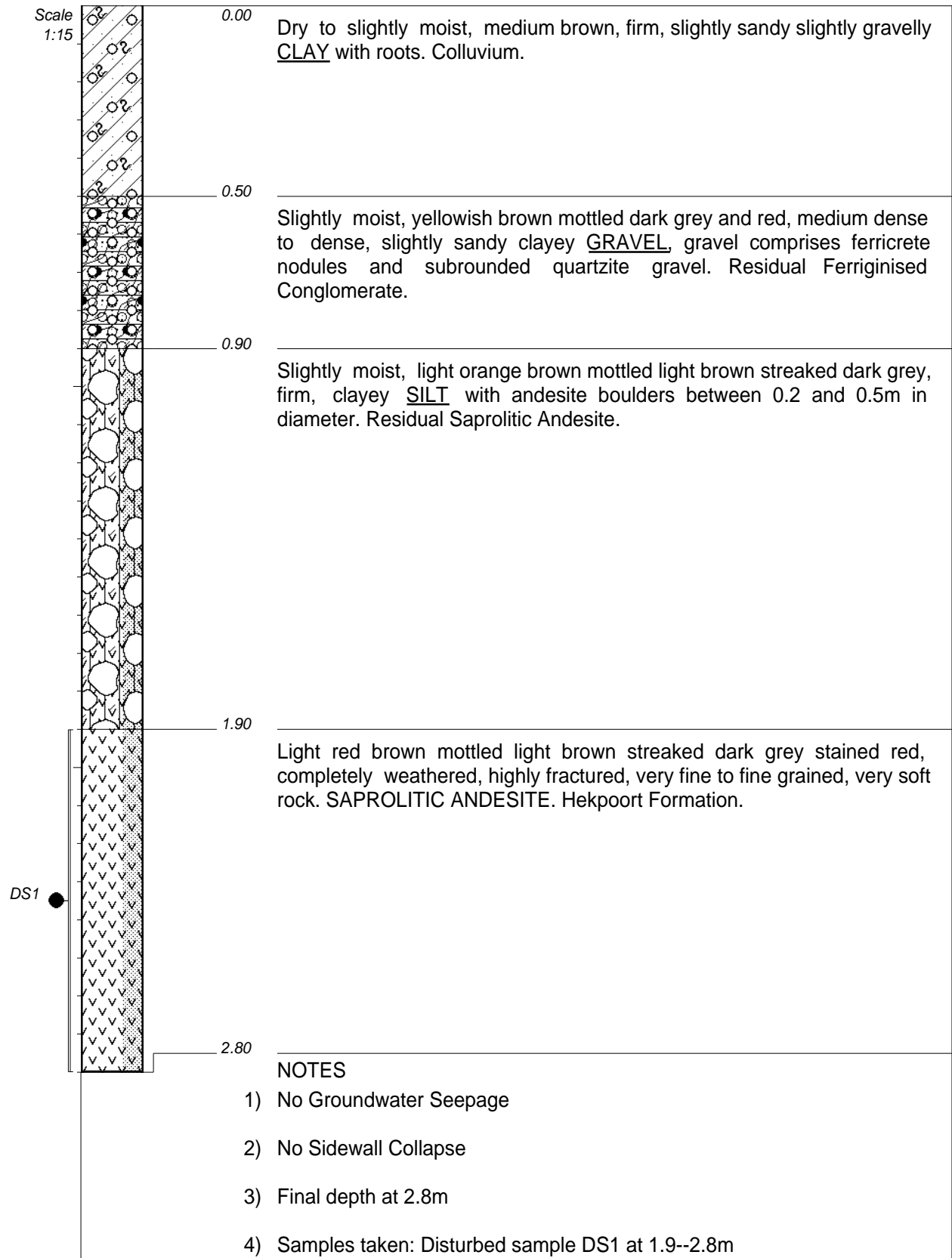
NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 1.2m
- 4) Samples taken: Disturbed sample DS1 at 0.3--1.1m

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 29.0"E  
Y-COORD : 26 24 22.0"S



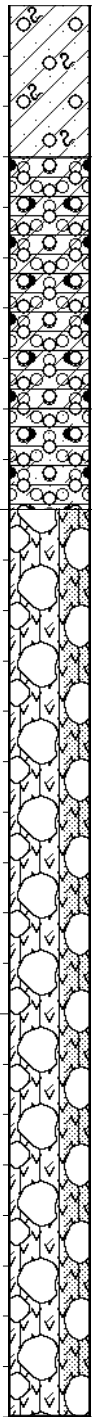
CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 32.1"E  
Y-COORD : 26 24 19.3"S



Scale  
1:15



0.00 Dry to slightly moist, medium brown, firm, slightly sandy slightly gravelly CLAY with roots. Colluvium.

0.30 Slightly moist, light reddish brown mottled dark grey and red and yellowish brown, firm, gravelly CLAY, gravel comprises ferricrete nodules. Residual Ferriginised Conglomerate.

0.80 Slightly moist, yellowish brown mottled dark grey and red, medium dense to dense, slightly sandy clayey GRAVEL, gravel comprises ferricrete nodules. Residual Ferriginised Conglomerate.

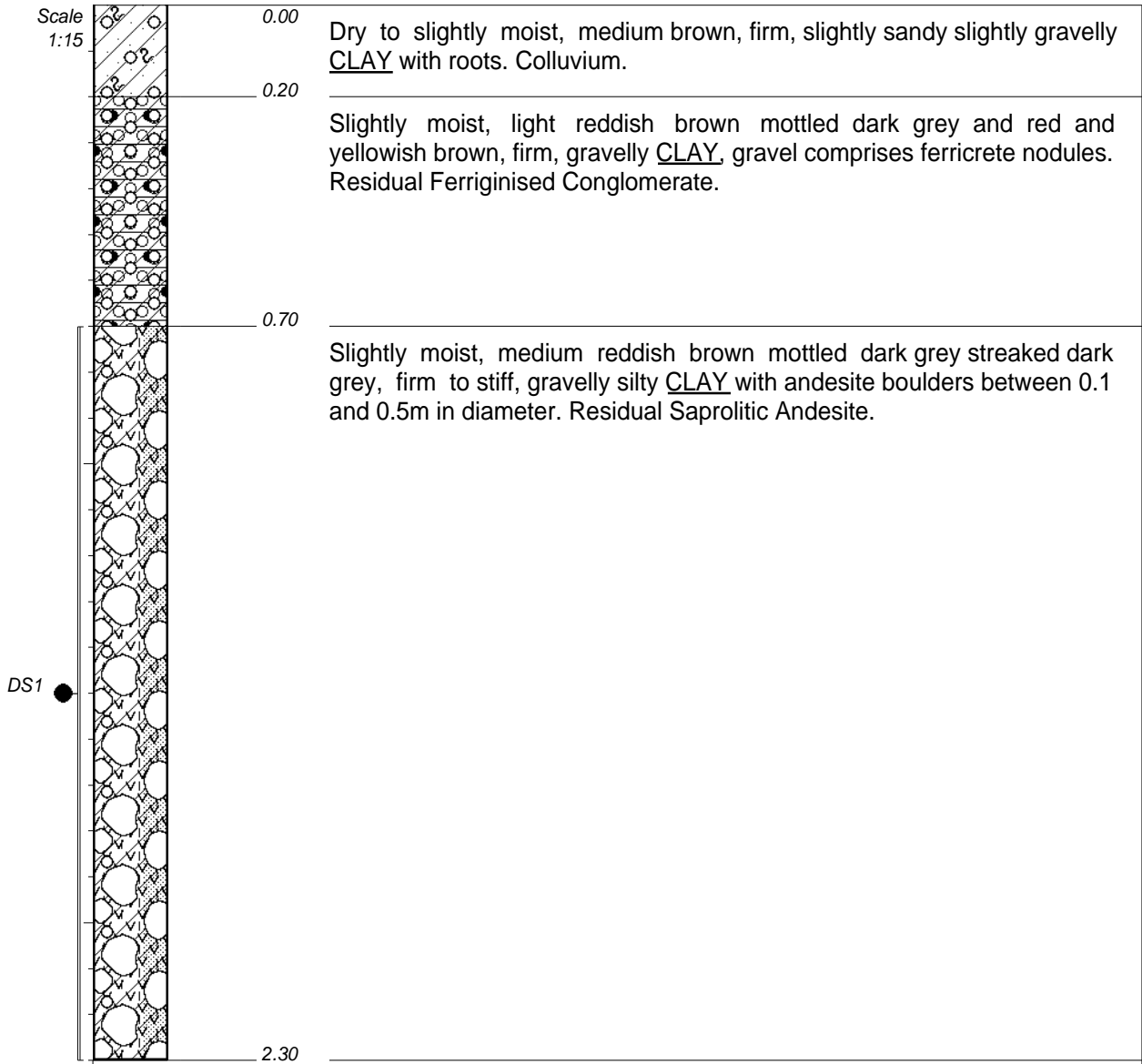
1.00 Slightly moist, medium reddish brown mottled dark grey streaked dark grey, firm to stiff, clayey SILT with andesite boulders between 0.2 and 0.5m in diameter. Residual Saprolitic Andesite.

- 2.80
- NOTES**
- 1) No Groundwater Seepage
  - 2) No Sidewall Collapse
  - 3) Final depth at 2.8m
  - 4) No Samples taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 31.7"E  
Y-COORD : 26 24 22.2"S



**NOTES**

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 2.3m on boulders
- 4) Samples taken: Disturbed sample DS1 at 0.7--2.3m

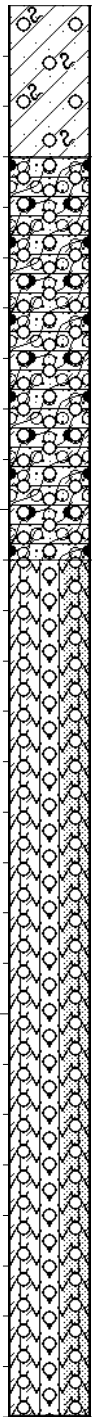
CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 29.2"E  
 Y-COORD : 26 24 24.7"S



Scale  
1:15



0.00

Dry to slightly moist, medium brown, firm, slightly sandy slightly gravelly CLAY with roots. Colluvium.

0.30

Slightly moist, yellowish brown mottled dark grey and red, medium dense to dense, slightly sandy clayey GRAVEL, gravel comprises ferricrete nodules and subrounded quartzite gravel. Residual Ferriginised Conglomerate.

1.10

Slightly moist, reddish brown mottled dark grey and yellowish brown streaked dark grey, stiff, clayey SILT with occasional gravel. Residual Saprolitic Andesite.

2.80

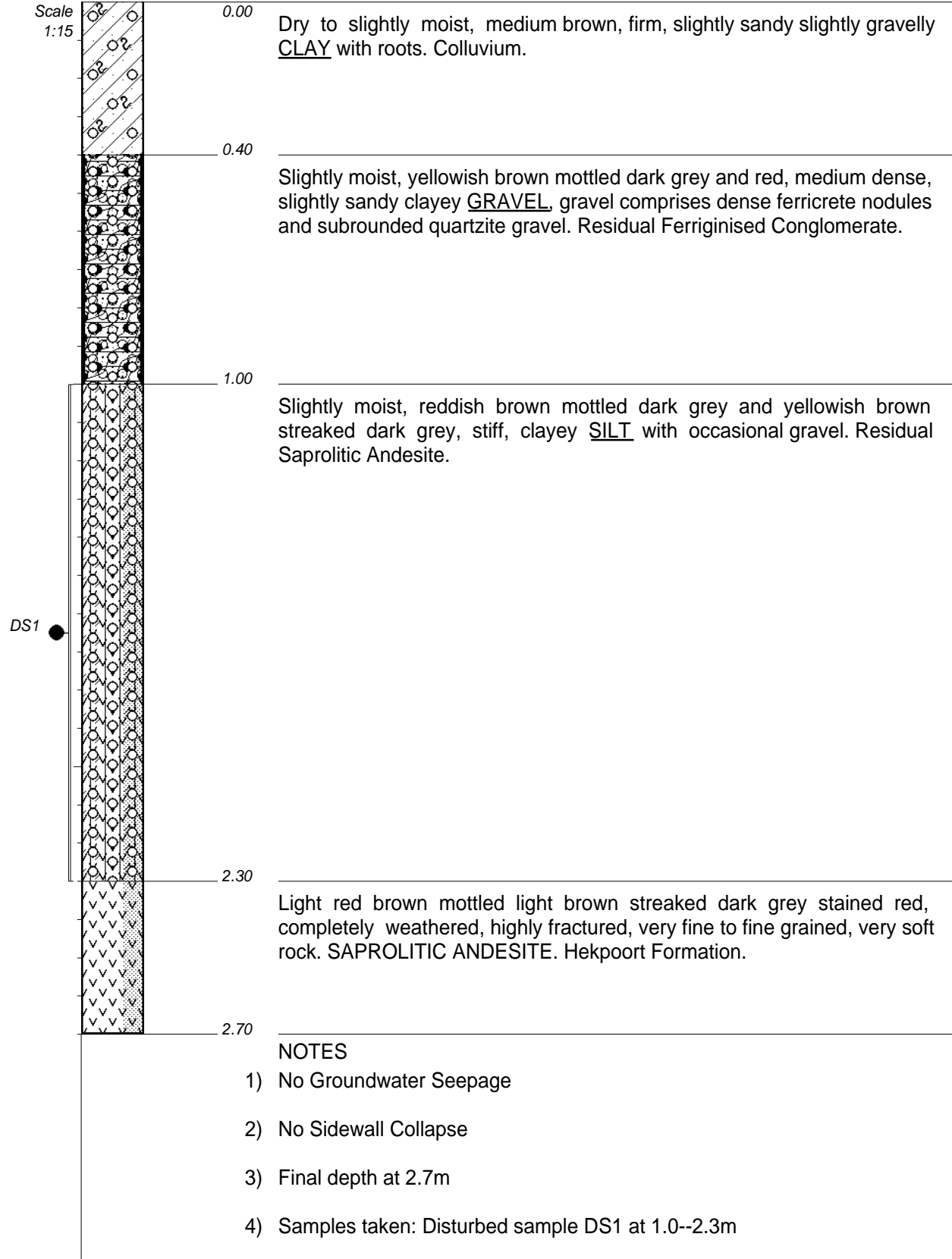
NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.8m
- 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 31.8"E  
Y-COORD : 26 24 26.9"S



CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
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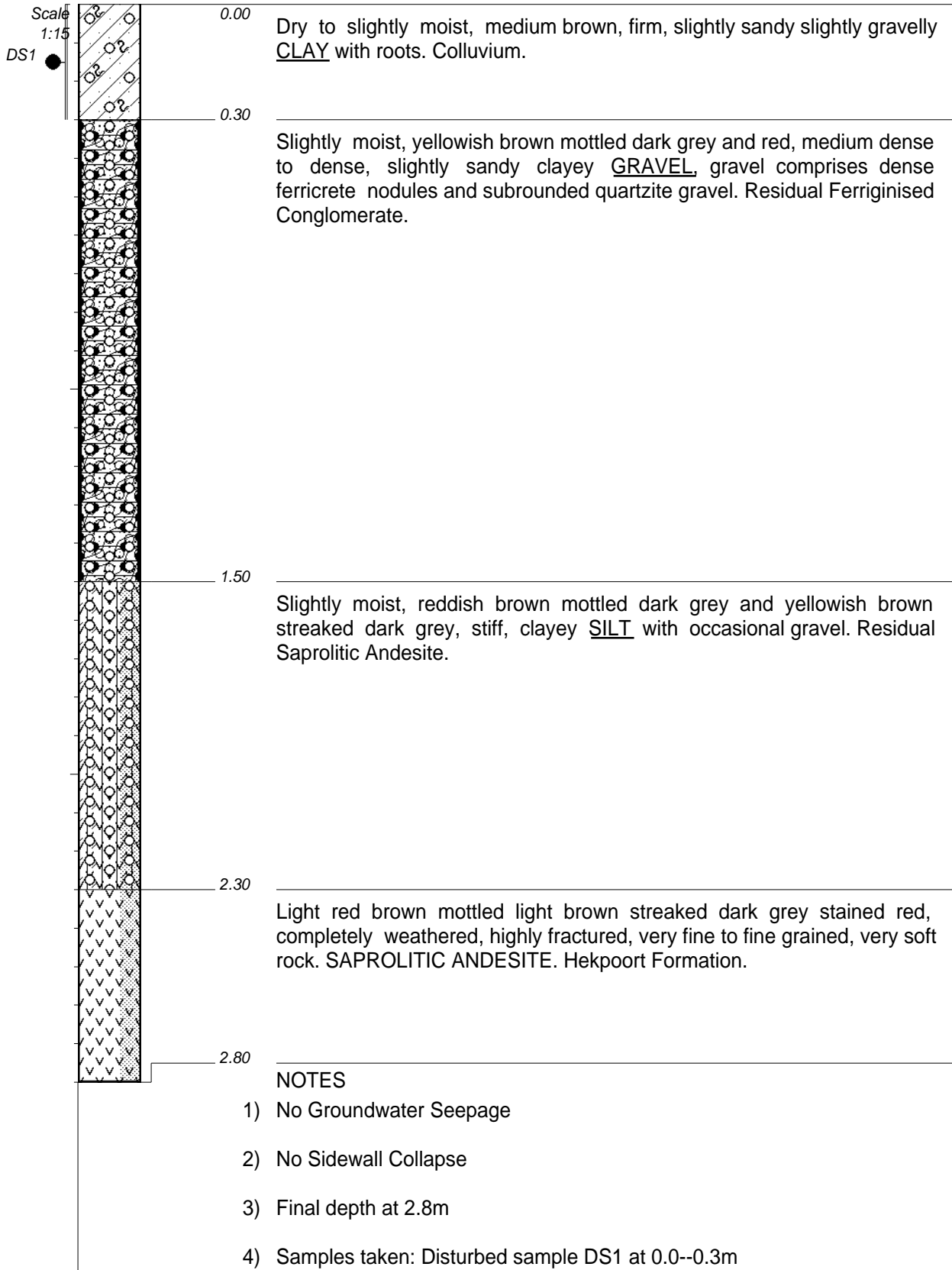
ELEVATION : N/A  
 X-COORD : 27 49 34.7"E  
 Y-COORD : 26 24 24.4"S



Glad Africa  
Ennerdale Ext 9

**HOLE No: TP07**  
Sheet 1 of 1

**JOB NUMBER: 19.0866.02**



CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 34.9"E  
Y-COORD : 26 24 20.8"S

**HOLE No: TP07**

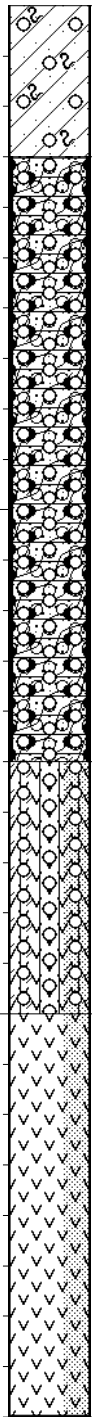


Glad Africa  
Ennerdale Ext 9

**HOLE No: TP08**  
Sheet 1 of 1

**JOB NUMBER: 19.0866.02**

Scale  
1:15



0.00

Dry to slightly moist, medium brown, firm, slightly sandy slightly gravelly CLAY with roots. Colluvium.

0.30

Slightly moist, yellowish brown mottled dark grey and red, medium dense to dense, slightly sandy clayey GRAVEL, gravel comprises dense ferricrete nodules and subrounded quartzite gravel. Residual Ferriginised Conglomerate.

1.50

Slightly moist, reddish brown mottled dark grey and yellowish brown streaked dark grey, stiff, clayey SILT with occasional gravel. Residual Saprolitic Andesite.

2.00

Red brown streaked and stained dark grey, completely weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.80

**NOTES**

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.8m
- 4) No Samples Taken

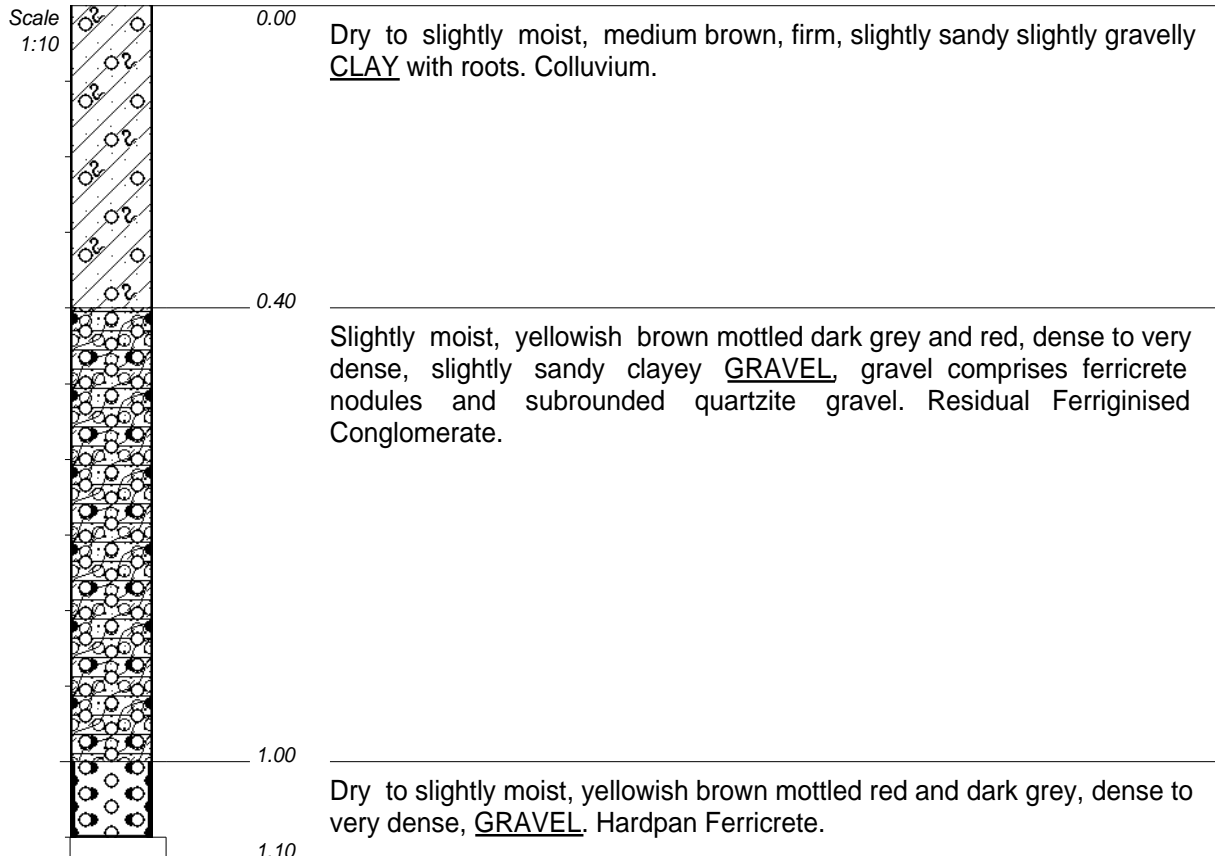
CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 38.7"E  
Y-COORD : 26 24 21.6"S

**HOLE No: TP08**





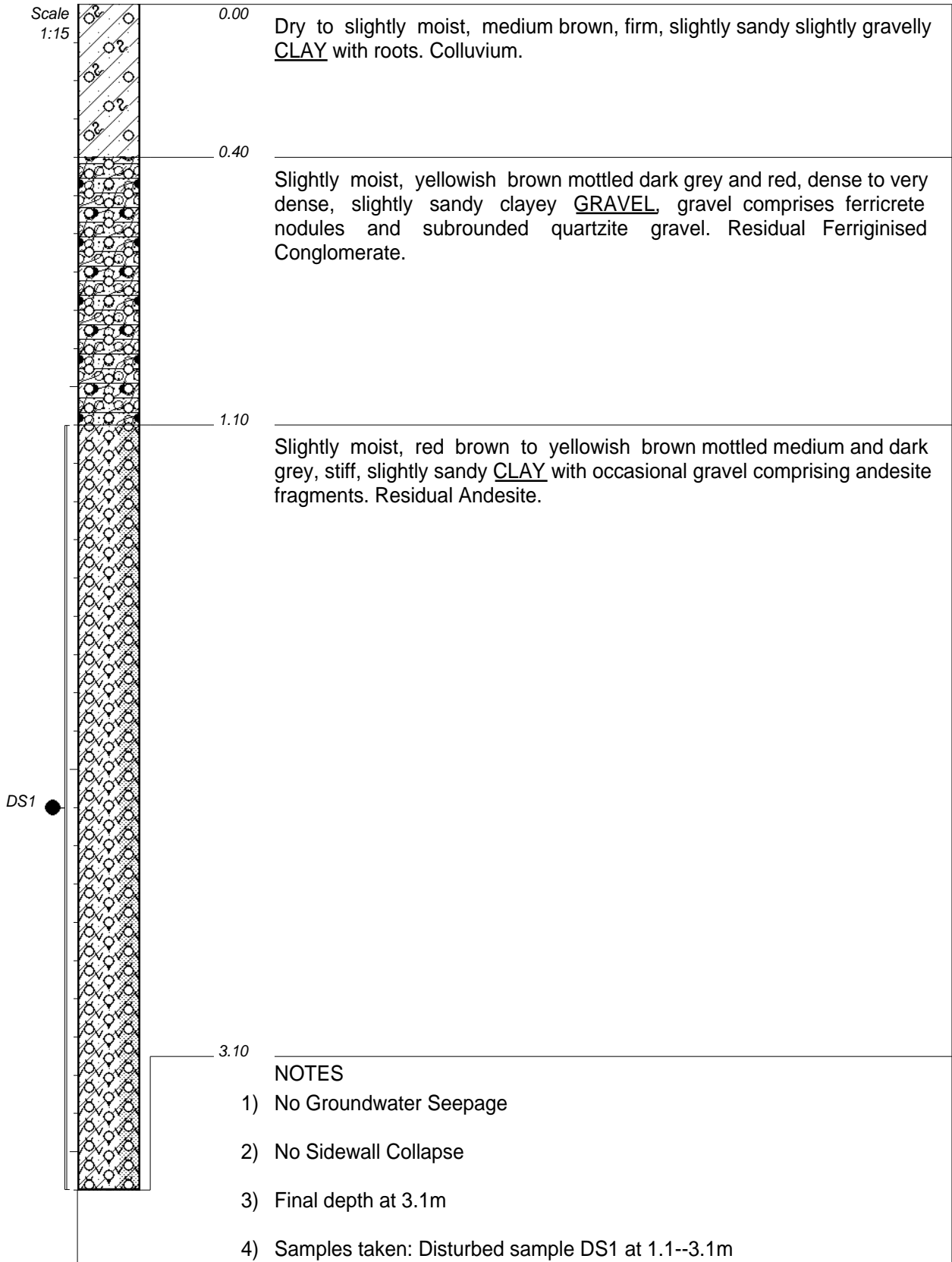
NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 1.1m
- 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

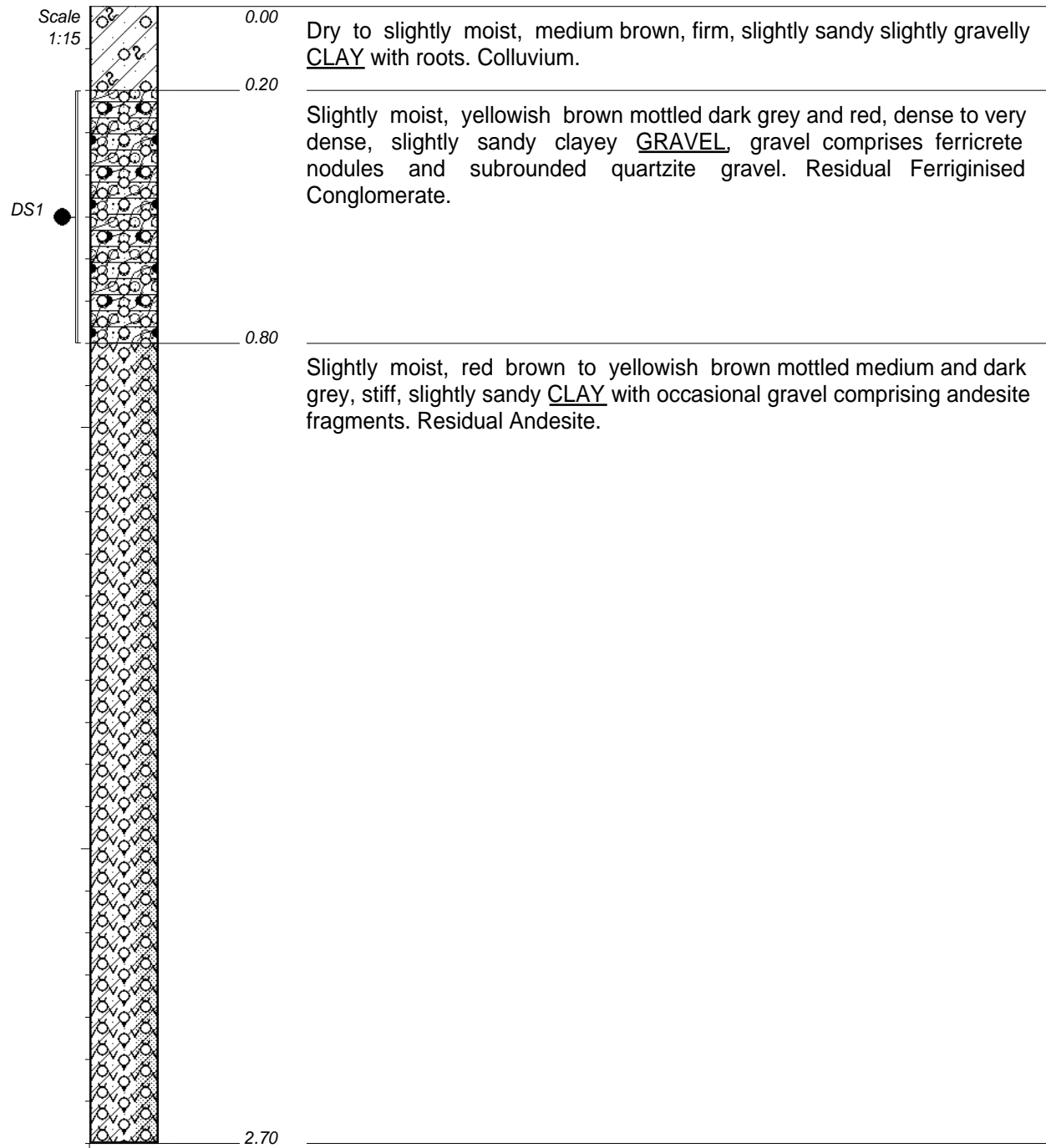
ELEVATION : N/A  
X-COORD : 27 49 37.8"E  
Y-COORD : 26 24 26.4"S



CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 35.2"E  
 Y-COORD : 26 24 28.8"S



NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.7m
- 4) Samples taken: Disturbed sample DS1 at 0.2--0.8m

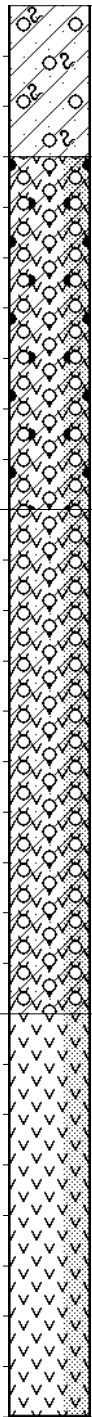
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 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 38.3"E  
 Y-COORD : 26 24 31.1"S



Scale  
1:15



0.00 Dry to slightly moist, medium brown, firm, slightly sandy slightly gravelly CLAY with roots. Colluvium.

0.30 Slightly moist, yellowish brown mottled dark grey and red, stiff, gravelly CLAY, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.00 Slightly moist, red brown to yellowish brown mottled medium and dark grey, stiff, slightly sandy CLAY with occasional gravel comprising andesite fragments. Residual Andesite.

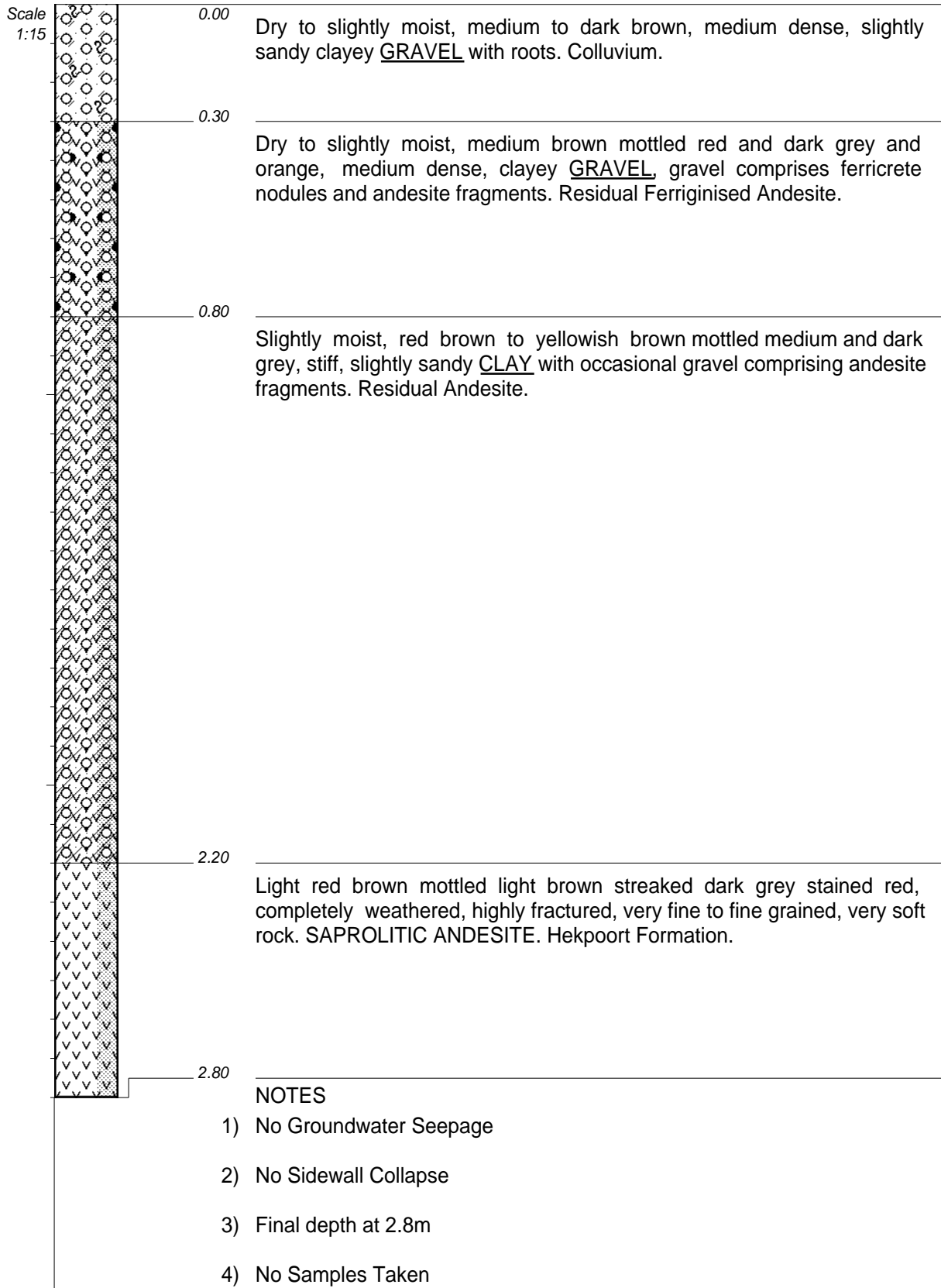
2.00 Light red brown mottled light brown streaked dark grey stained red, completely weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

- 2.80
- NOTES**
- 1) No Groundwater Seepage
  - 2) No Sidewall Collapse
  - 3) Final depth at 2.8m
  - 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 42.9"E  
Y-COORD : 26 24 28.1"S



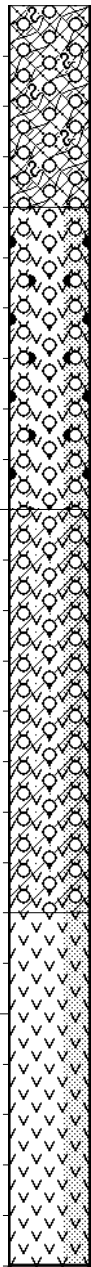
CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 46.4"E  
Y-COORD : 26 24 28.1"S



Scale  
1:15



0.00

Dry to slightly moist, medium brown, medium dense to dense, clayey GRAVEL with roots, gravel comprises quartzite fragments. Fill.

0.40

Dry to slightly moist, medium brown mottled red and dark grey and orange, medium dense, clayey GRAVEL, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.00

Slightly moist, red brown to yellowish brown mottled medium and dark grey, stiff, slightly sandy CLAY with occasional gravel comprising andesite fragments. Residual Andesite.

1.80

Red brown streaked and stained dark grey, completely weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.50

NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.5m
- 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

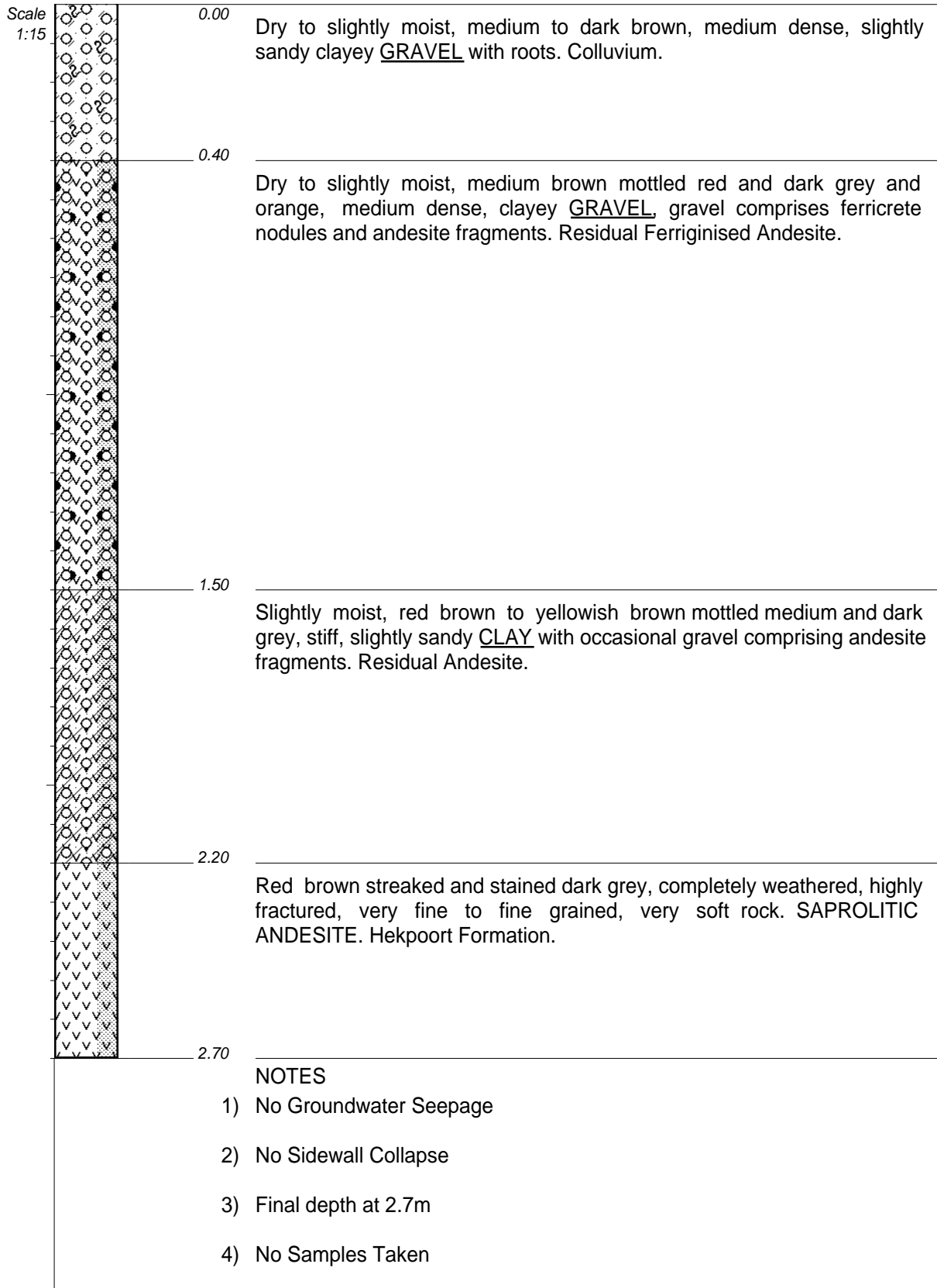
ELEVATION : N/A  
X-COORD : 27 49 45.5"E  
Y-COORD : 26 24 25.0"S



Glad Africa  
Ennerdale Ext 9

**HOLE No: TP15**  
Sheet 1 of 1

**JOB NUMBER: 19.0866.02**



CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 42.7"E  
Y-COORD : 26 24 23.8"S

**HOLE No: TP15**

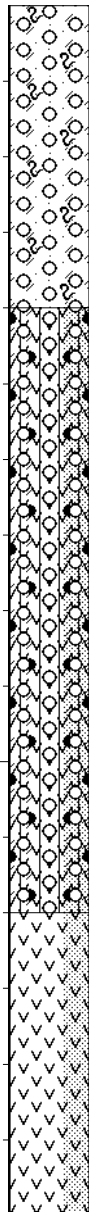


Glad Africa  
Ennerdale Ext 9

**HOLE No: TP16**  
Sheet 1 of 1

**JOB NUMBER: 19.0866.02**

Scale  
1:10



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.40

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.20

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

1.60

**NOTES**

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 1.6m
- 4) No Samples Taken

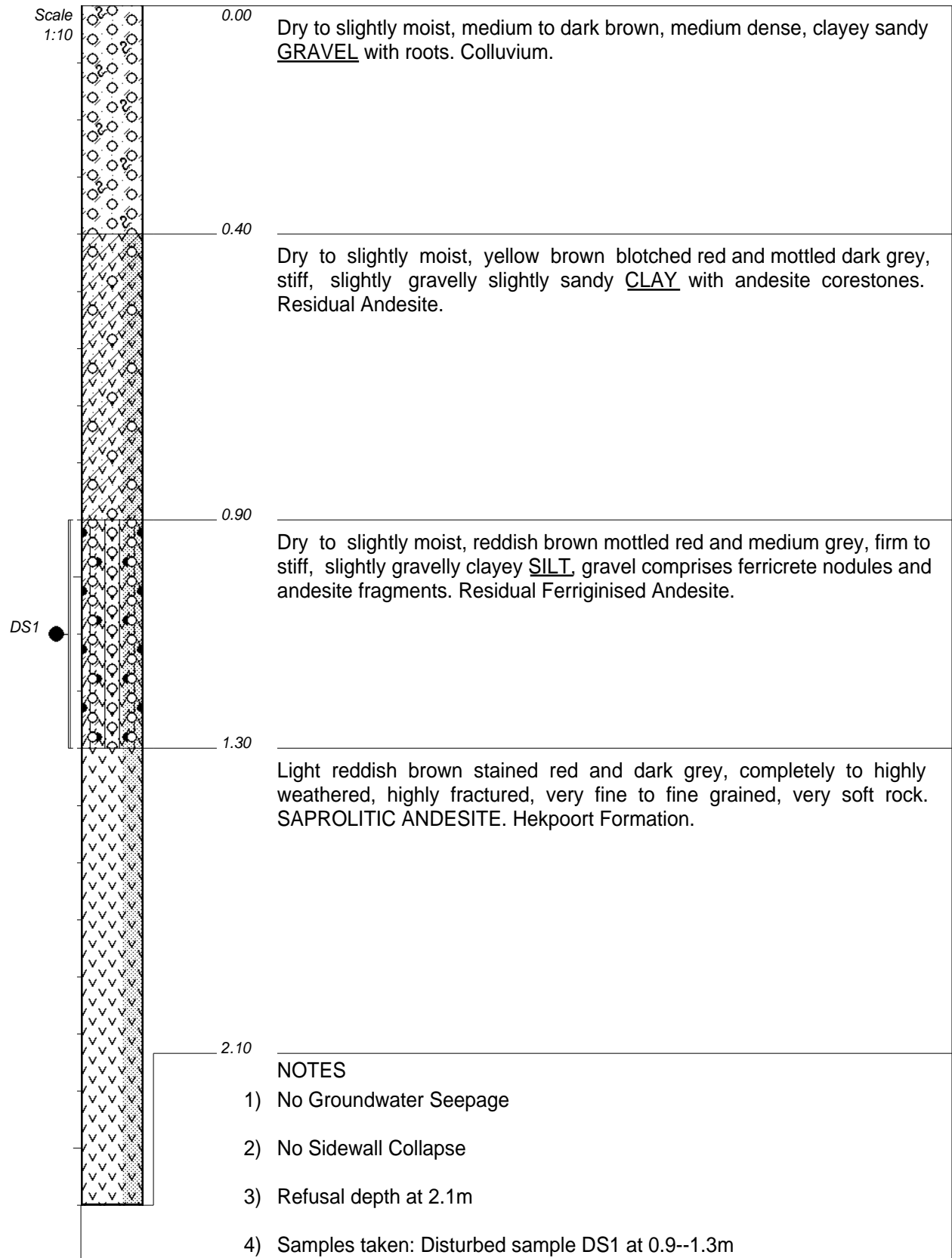
CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 33.2"E  
 Y-COORD : 26 24 16.0"S

**HOLE No: TP16**





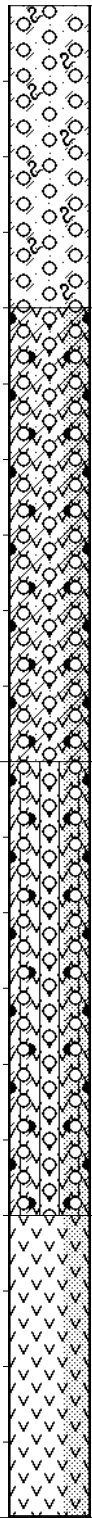
CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 37.1"E  
Y-COORD : 26 24 17.7"S



Scale  
1:10



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.40

Dry to slightly moist, yellow brown mottled red and dark grey, stiff, slightly sandy gravelly CLAY, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.00

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.60

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.00

NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 2.0m
- 4) No Samples Taken

CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 41.2"E  
 Y-COORD : 26 24 19.7"S

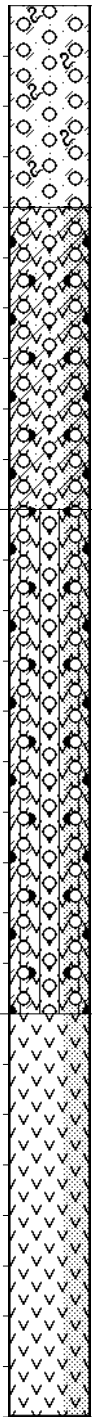


Glad Africa  
Ennerdale Ext 9

**HOLE No: TP19**  
Sheet 1 of 1

**JOB NUMBER: 19.0866.02**

Scale  
1:15



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.40

Dry to slightly moist, yellow brown mottled red and dark grey, stiff, slightly sandy gravelly CLAY, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.00

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

2.00

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.80

**NOTES**

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.8m
- 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

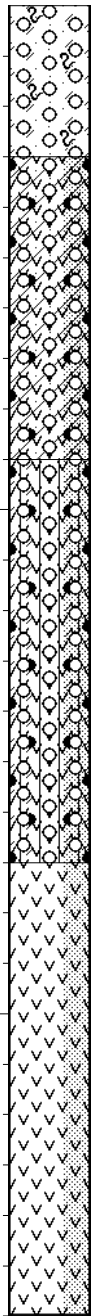
INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 43.8"E  
Y-COORD : 26 24 19.1"S

**HOLE No: TP19**



Scale  
1:15



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.30

Dry to slightly moist, yellow brown mottled red and dark grey, stiff, slightly sandy gravelly CLAY, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

0.90

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.70

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.60

NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.6m
- 4) No Samples Taken

CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 44.3"E  
 Y-COORD : 26 24 15.6"S

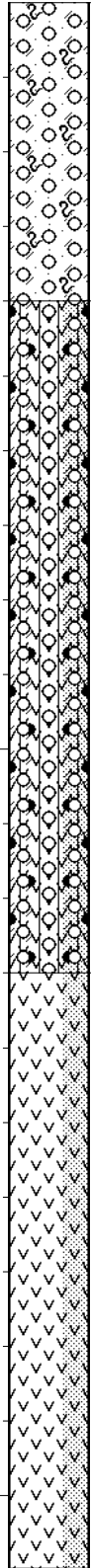


Glad Africa  
Ennerdale Ext 9

HOLE No: TP21  
Sheet 1 of 1

JOB NUMBER: 19.0866.02

Scale  
1:10



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.40

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.30

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.10

NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 2.1m
- 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

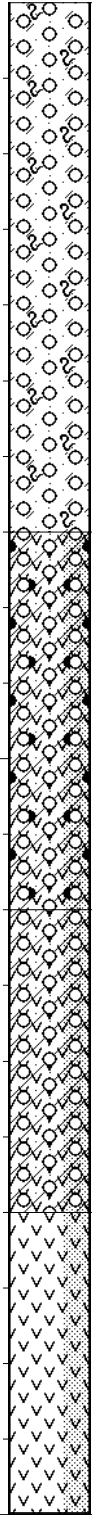
INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 40.6"E  
Y-COORD : 26 24 15.8"S

HOLE No: TP21



Scale  
1:10



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.70

Dry to slightly moist, yellow brown mottled red and dark grey, stiff, slightly sandy gravelly CLAY, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.20

Slightly moist, yellowish brown to reddish brown mottled dark grey, stiff, slightly sandy gravelly CLAY, gravel comprises andesite fragments. Residual Andesite.

1.60

Yellowish brown stained black, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.00

NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Refusal depth at 2.0m
- 4) No Samples Taken

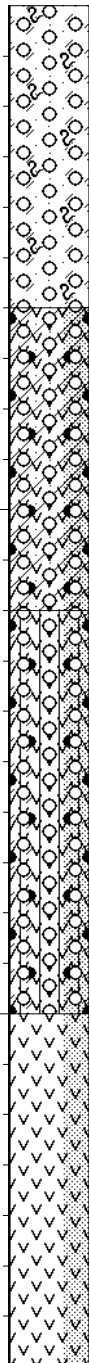
CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 35.9"E  
 Y-COORD : 26 24 13.4"S



Scale  
1:15



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.60

Dry to slightly moist, yellow brown mottled red and dark grey, stiff, slightly sandy gravelly CLAY, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

1.20

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

2.00

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.70

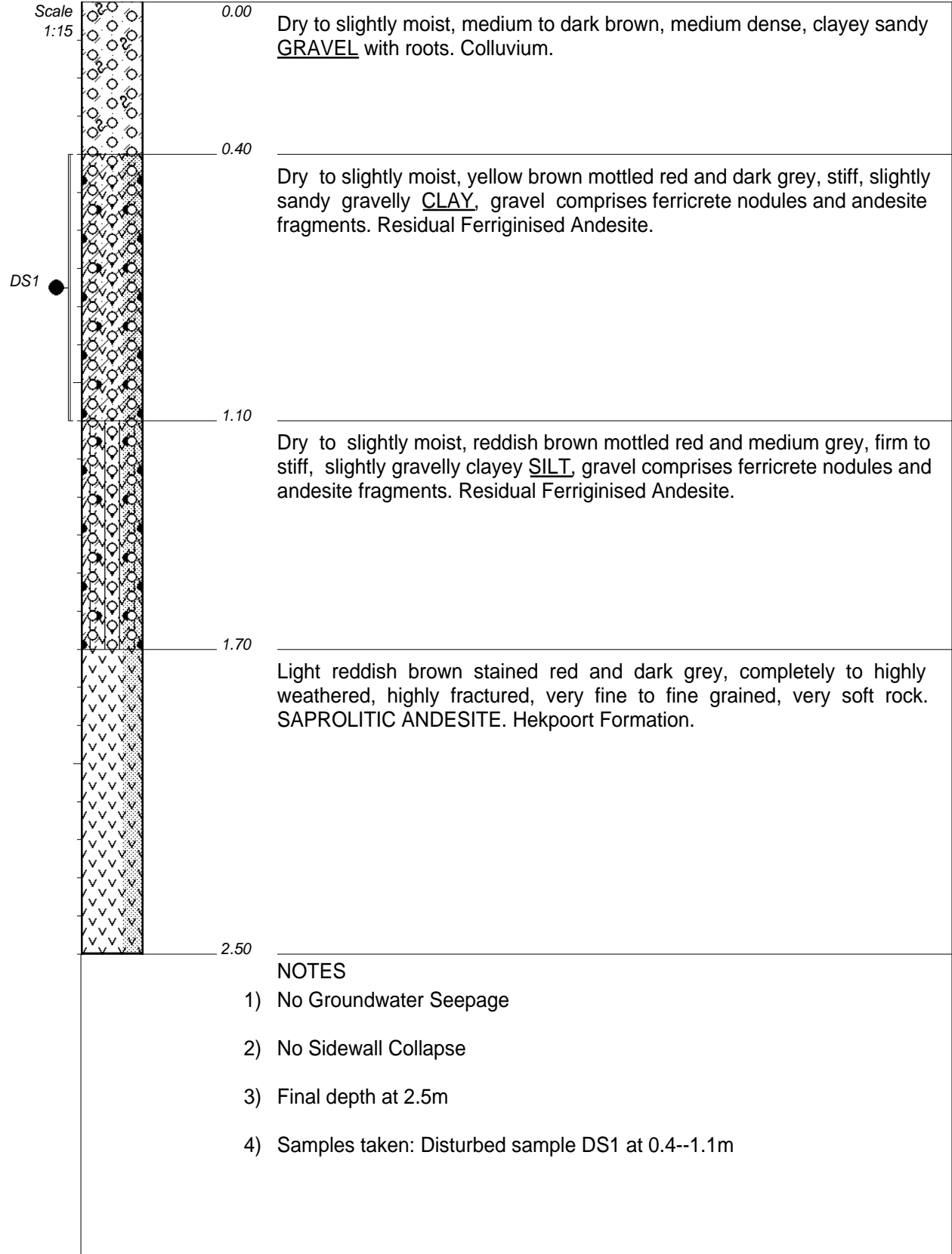
**NOTES**

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.7m
- 4) No Samples Taken

CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 34.8"E  
 Y-COORD : 26 24 11.0"S

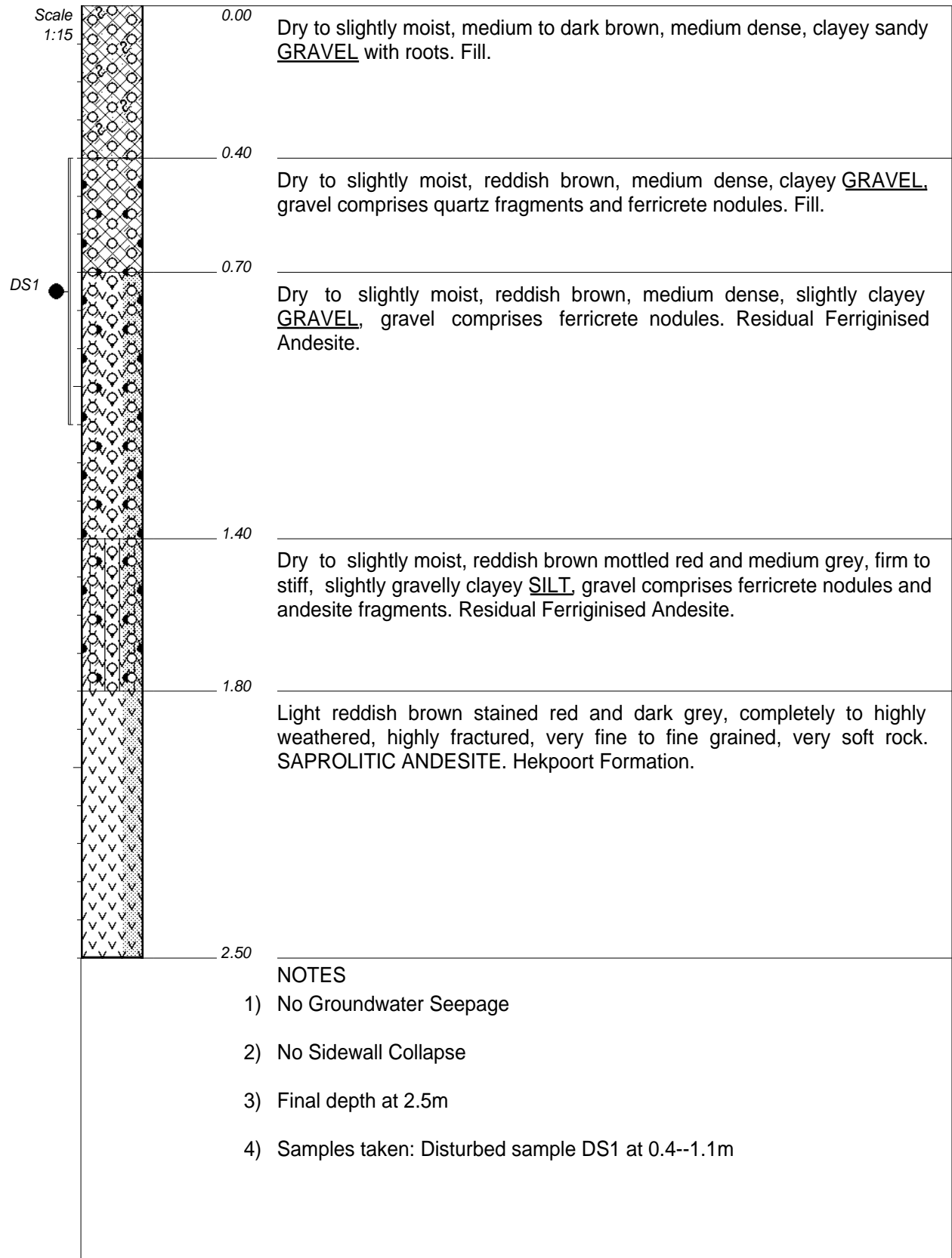


CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
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 Y-COORD : 26 24 12.0"S

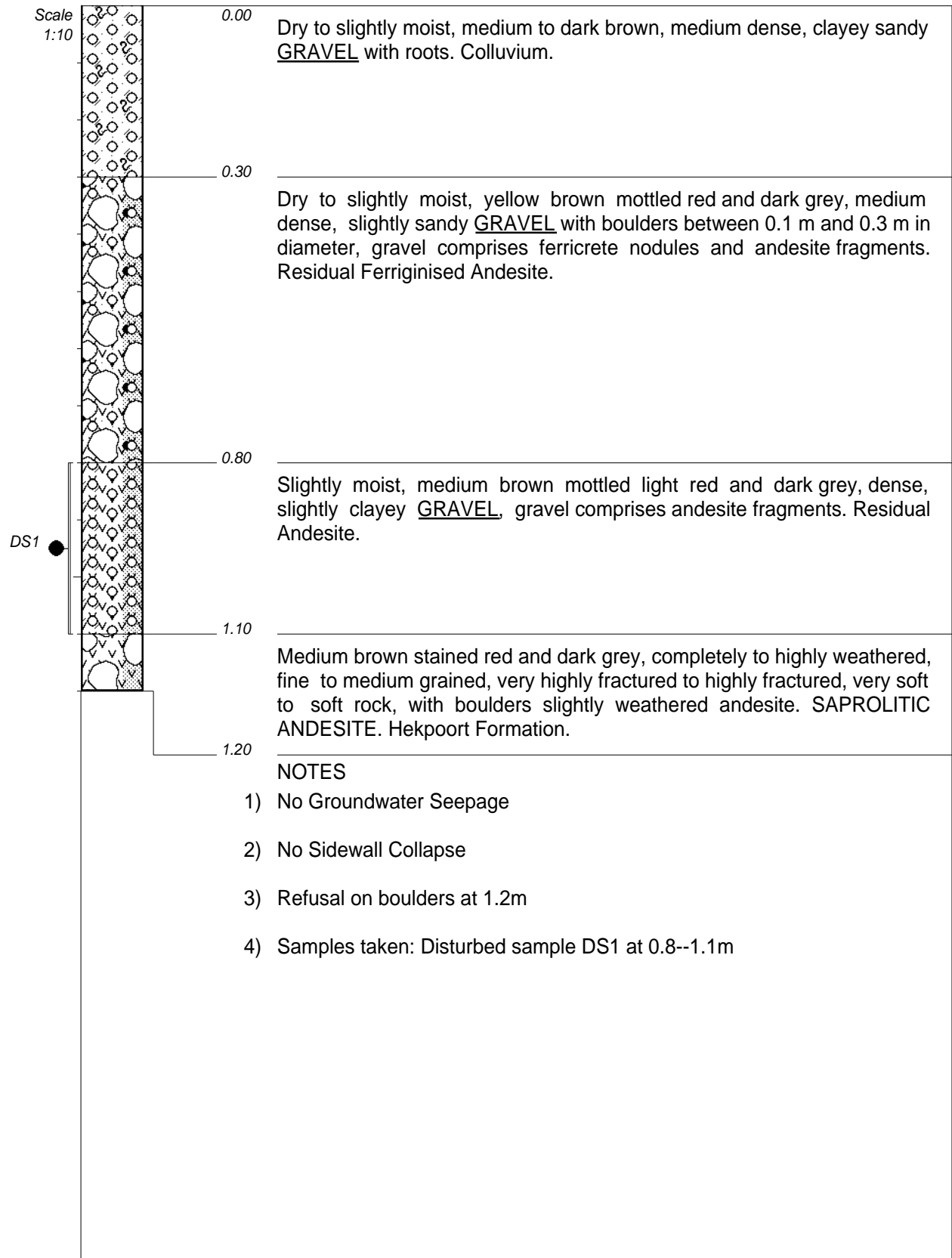




CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
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DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

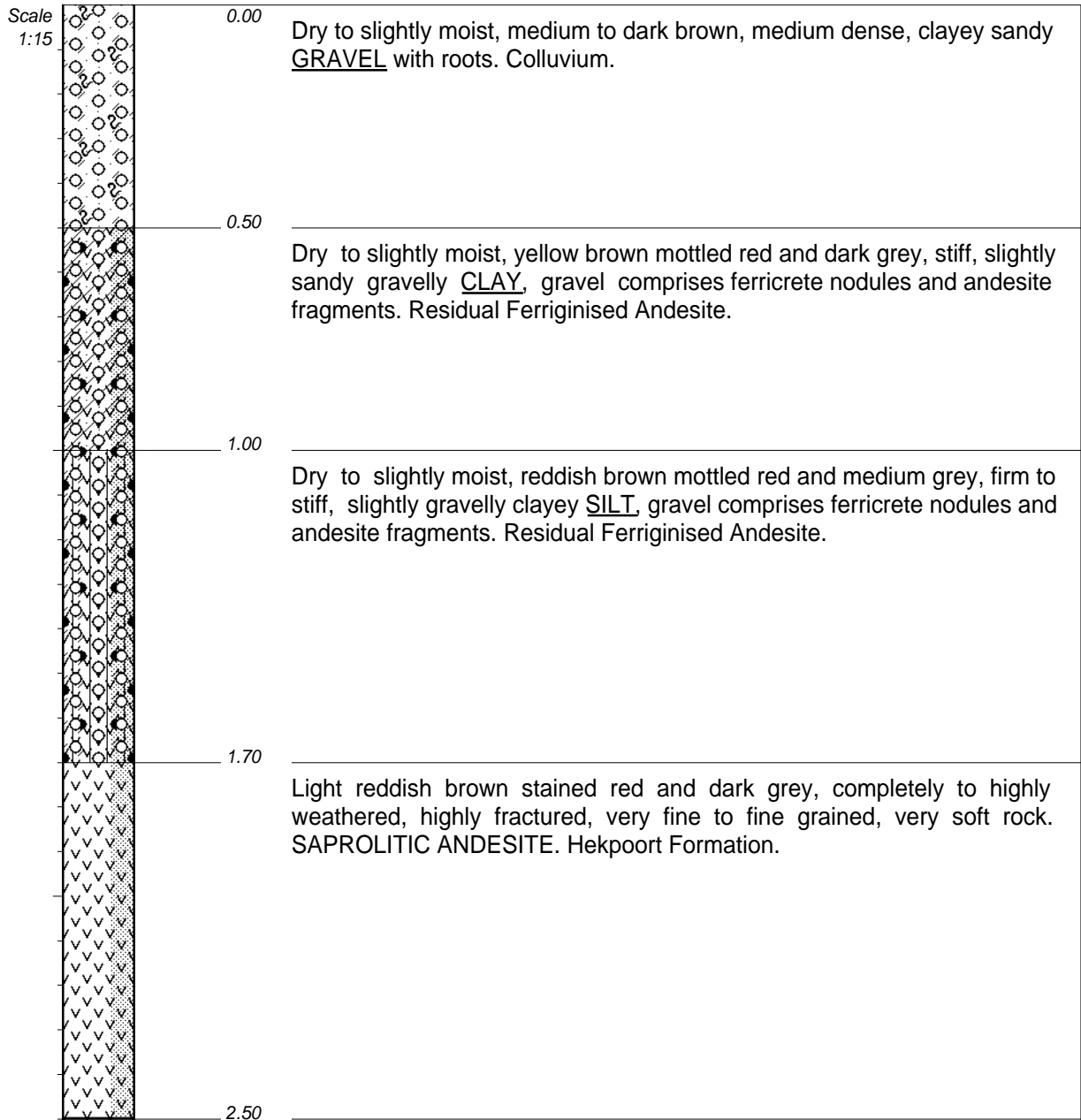
ELEVATION : N/A  
X-COORD : 27 49 43.1"E  
Y-COORD : 26 24 11.5"S



CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 46.2"E  
 Y-COORD : 26 24 09.6"S

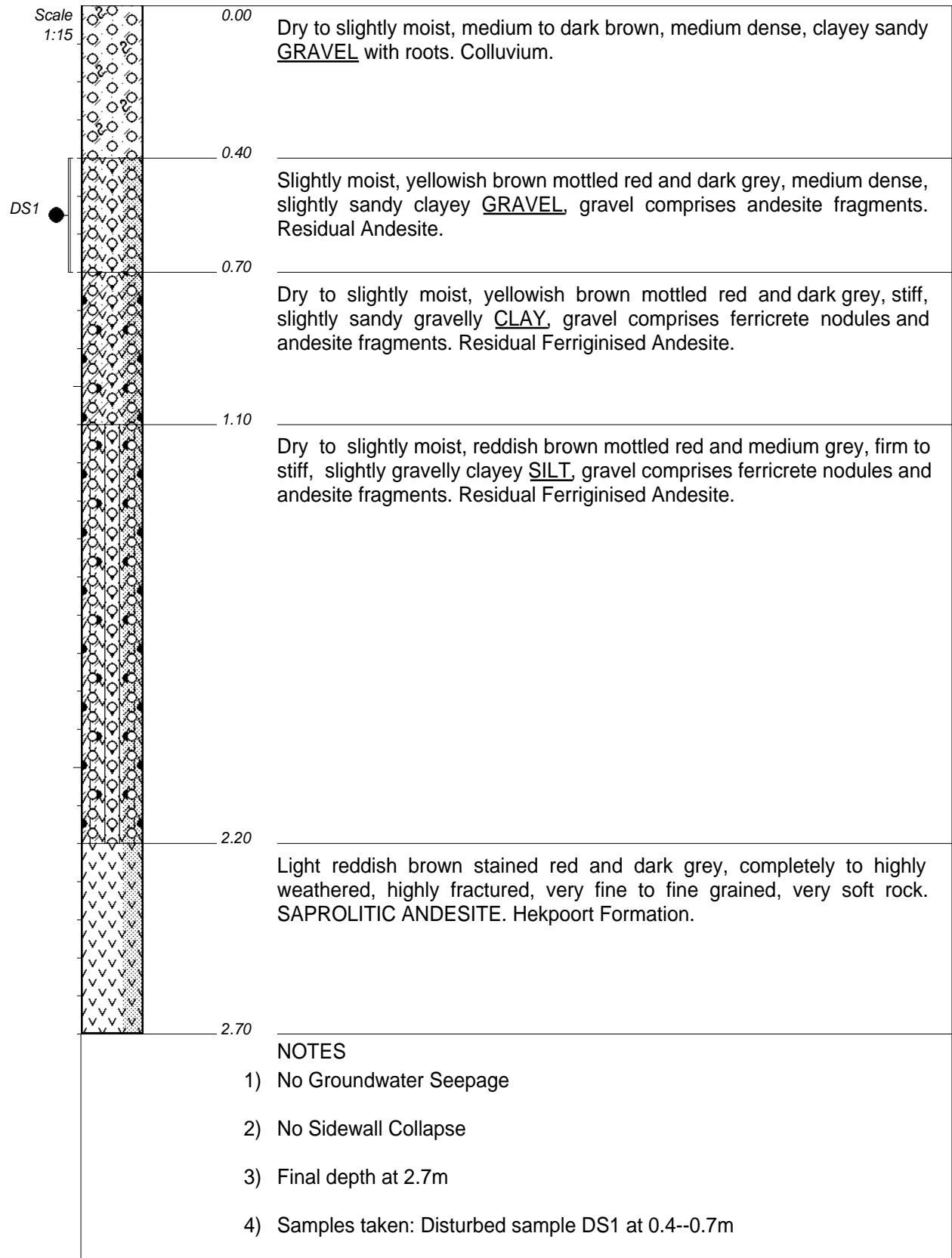


- NOTES
- 1) No Groundwater Seepage
  - 2) No Sidewall Collapse
  - 3) Final depth at 2.5m
  - 4) No Samples Taken

CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 43.6"E  
Y-COORD : 26 24 07.4"S



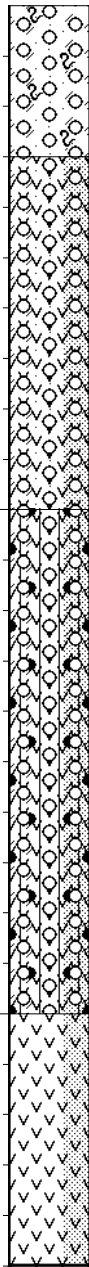
CONTRACTOR : N/A  
MACHINE : Cukorova  
DRILLED BY : -  
PROFILED BY : Dale Franklin  
TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

INCLINATION : -  
DIAM : N/A  
DATE : -  
DATE : 18/09/2019  
DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
X-COORD : 27 49 39.8"E  
Y-COORD : 26 24 08.4"S



Scale  
1:15



0.00

Dry to slightly moist, medium to dark brown, medium dense, clayey sandy GRAVEL with roots. Colluvium.

0.30

Slightly moist, yellowish brown mottled red and dark grey, medium dense, slightly sandy clayey GRAVEL, gravel comprises andesite fragments. Residual Andesite.

1.00

Dry to slightly moist, reddish brown mottled red and medium grey, firm to stiff, slightly gravelly clayey SILT, gravel comprises ferricrete nodules and andesite fragments. Residual Ferriginised Andesite.

2.00

Light reddish brown stained red and dark grey, completely to highly weathered, highly fractured, very fine to fine grained, very soft rock. SAPROLITIC ANDESITE. Hekpoort Formation.

2.50

NOTES

- 1) No Groundwater Seepage
- 2) No Sidewall Collapse
- 3) Final depth at 2.5m
- 4) No Samples Taken

CONTRACTOR : N/A  
 MACHINE : Cukorova  
 DRILLED BY : -  
 PROFILED BY : Dale Franklin  
 TYPE SET BY : Dale Franklin  
 SETUP FILE : STANDARD.SET

INCLINATION : -  
 DIAM : N/A  
 DATE : -  
 DATE : 18/09/2019  
 DATE : 26/09/2019 17:50  
 TEXT : ..66.02EnnerdaleTPLogs.TXT

ELEVATION : N/A  
 X-COORD : 27 49 35.3"E  
 Y-COORD : 26 24 08.9"S



	BOULDERS	{SA01}
	GRAVEL	{SA02}
	GRAVELLY	{SA03}
	SANDY	{SA05}
	SILT	{SA06}
	SILTY	{SA07}
	CLAY	{SA08}
	CLAYEY	{SA09}
	CONGLOMERATE	{SA10}
	QUARTZITE	{SA15}
	ANDESITE	{SA19}{SA41}
	HARDPAN FERRICRETE/dense ferricrete	{SA23}{SA29}
	FERRICRETE NODULES	{SA24}
	FILL	{SA32}
	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}

Name ●

CONTRACTOR :  
MACHINE :  
DRILLED BY :  
PROFILED BY :

INCLINATION :  
DIAM :  
DATE :  
DATE :

ELEVATION :  
X-COORD :  
Y-COORD :

TYPE SET BY : Dale Franklin  
SETUP FILE : STANDARD.SET

DATE : 26/09/2019 17:50  
TEXT : ..66.02EnnerdaleTPLogs.TXT

---

# **APPENDIX B**

## **Laboratory Test Results**

## FOUNDATION INDICATOR

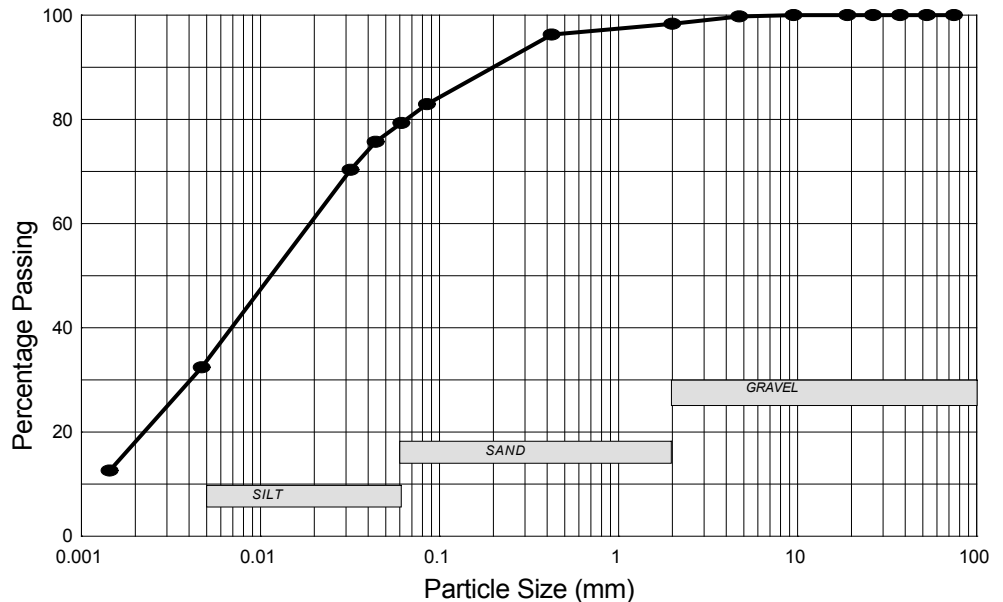
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 6 @ 1,0 - 2,3m	
Date	18 OCTOBER 2019	Test No	3116
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	99.77
2.00	98.40
0.425	96.31



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0854	82.97
0.0613	79.36
0.0441	75.75
0.0319	70.34
0.0047	32.47
0.0014	12.63

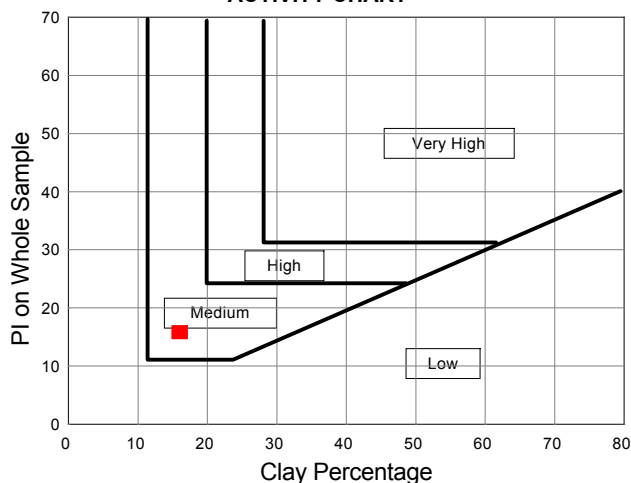
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	46
Plastic Limit	29
Plastic Index	16
Linear Shrinkage	8
Grading Modulus	0.22
Moisture Content	26.95
PI on Whole Sample	16
PRA Classification	A.7.6
Unified Classification	See Plasticity Chart

#### ESTIMATED COMPOSITION (As BS 1377)

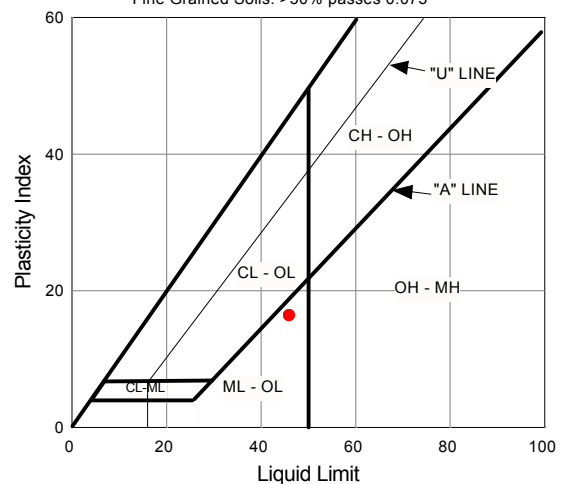
Clay (<0.002)	16.03
0.002 < Silt < 0.06	63.05
0.06 < Sand < 2.0	19.32
Gravel > 2.0	1.60
% less than 0.075	81.41

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075





## FOUNDATION INDICATOR

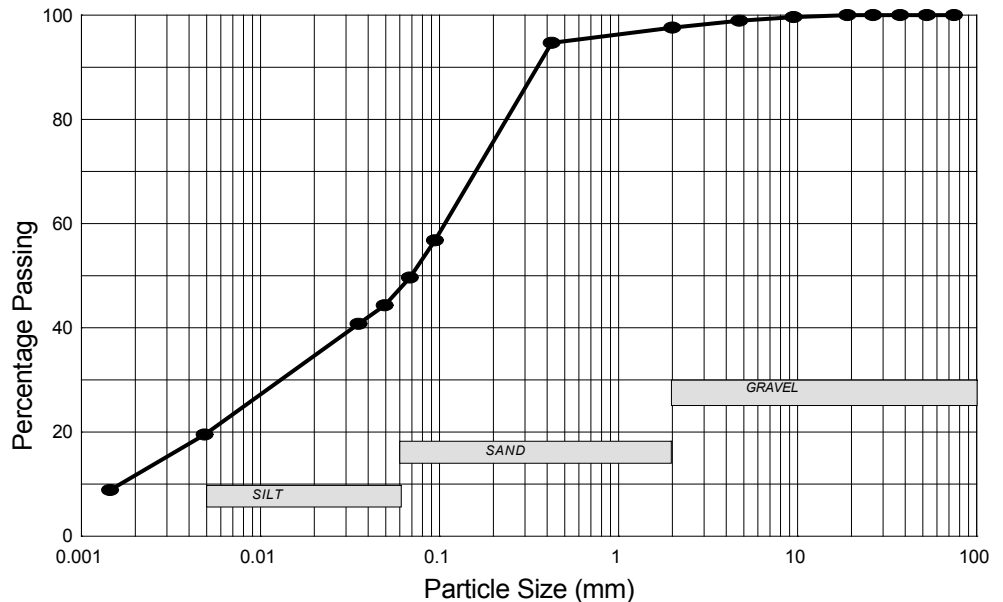
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 2 @ 1,9 - 2,8m	
Date	18 OCTOBER 2019	Test No	3113
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	99.67
4.75	98.98
2.00	97.62
0.425	94.75



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0946	56.78
0.0687	49.68
0.0495	44.36
0.0354	40.81
0.0049	19.52
0.0015	8.87

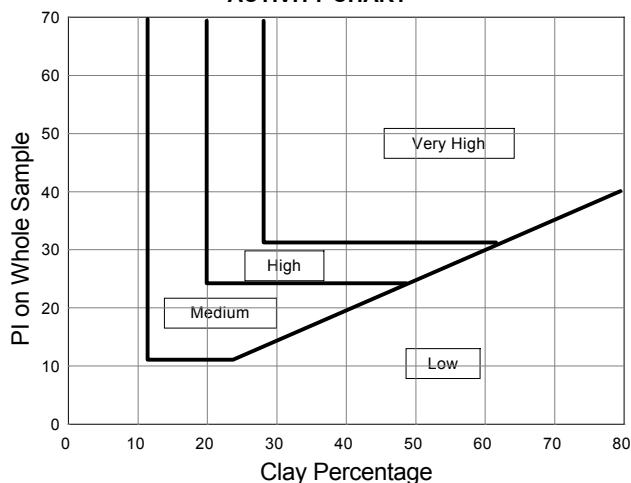
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	Non Plastic
Plastic Limit	Non Plastic
Plastic Index	Non Plastic
Linear Shrinkage	0
Grading Modulus	0.51
Moisture Content	8.46
PI on Whole Sample	Non Plastic
PRA Classification	A.2.4
Unified Classification	SM

#### ESTIMATED COMPOSITION (As BS 1377)

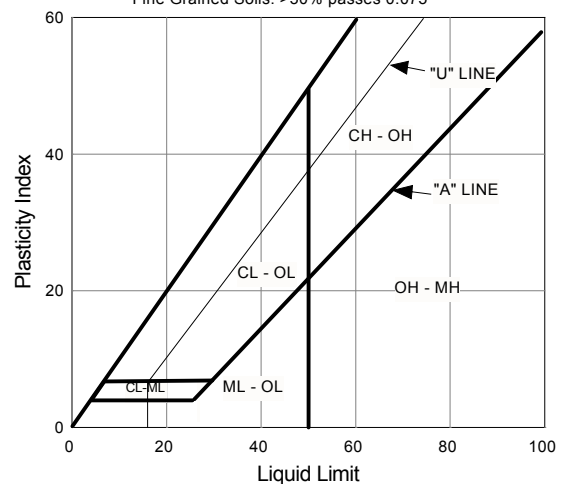
Clay (<0.002)	10.57
0.002 < Silt < 0.06	36.70
0.06 < Sand < 2.0	50.34
Gravel > 2.0	2.38
% less than 0.075	51.41

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



## FOUNDATION INDICATOR

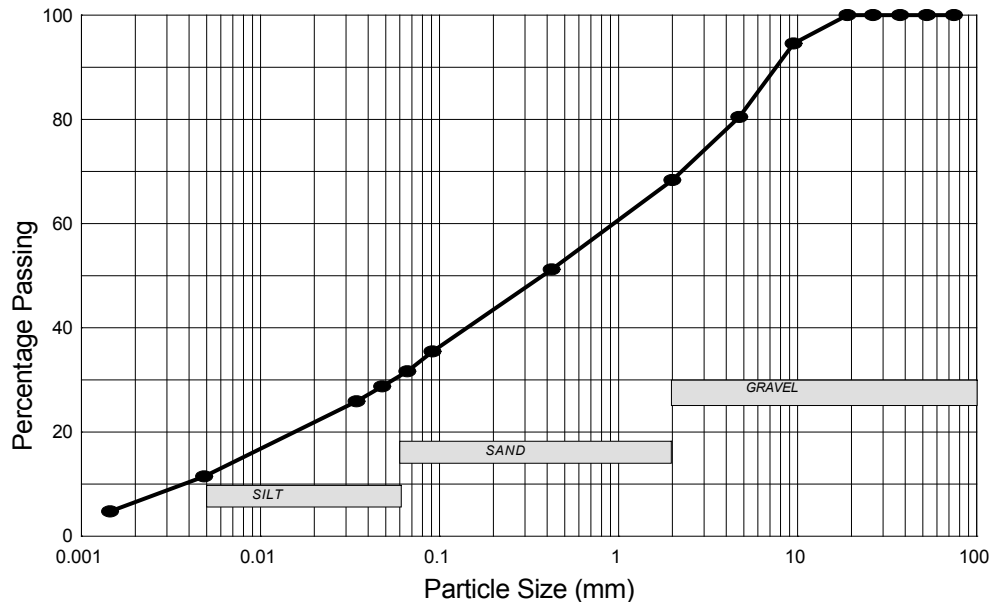
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.	TP 1 @ 0,3 - 1,1m	
Date	18 OCTOBER 2019	Test No	3111
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	94.56
4.75	80.45
2.00	68.38
0.425	51.23



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0914	35.50
0.0665	31.66
0.0479	28.78
0.0346	25.90
0.0049	11.51
0.0015	4.80

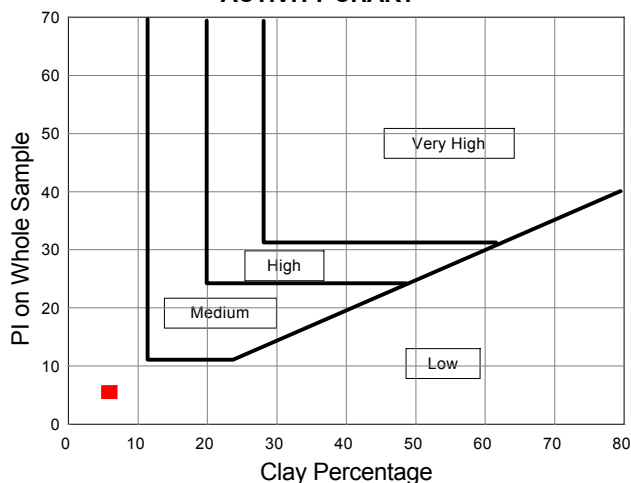
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	29
Plastic Limit	18
Plastic Index	11
Linear Shrinkage	5
Grading Modulus	1.45
Moisture Content	3.91
PI on Whole Sample	6
PRA Classification	A.2.6
Unified Classification	SC

#### ESTIMATED COMPOSITION (As BS 1377)

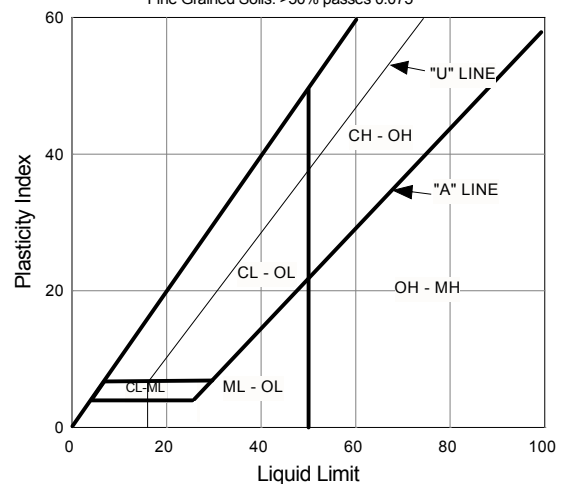
Clay (<0.002)	5.88
0.002 < Silt < 0.06	24.77
0.06 < Sand < 2.0	37.72
Gravel > 2.0	31.62
% less than 0.075	32.97

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075





### C.B.R. DETERMINATION

Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 1 @ 0,3 - 1,1m	
Date	18 OCTOBER 2019	Test No	3112
Job No	19287	Checked By	EB
Calibration Date	15 May 2018	Calibration Certificate	9475

#### Direct Results from Test Procedure

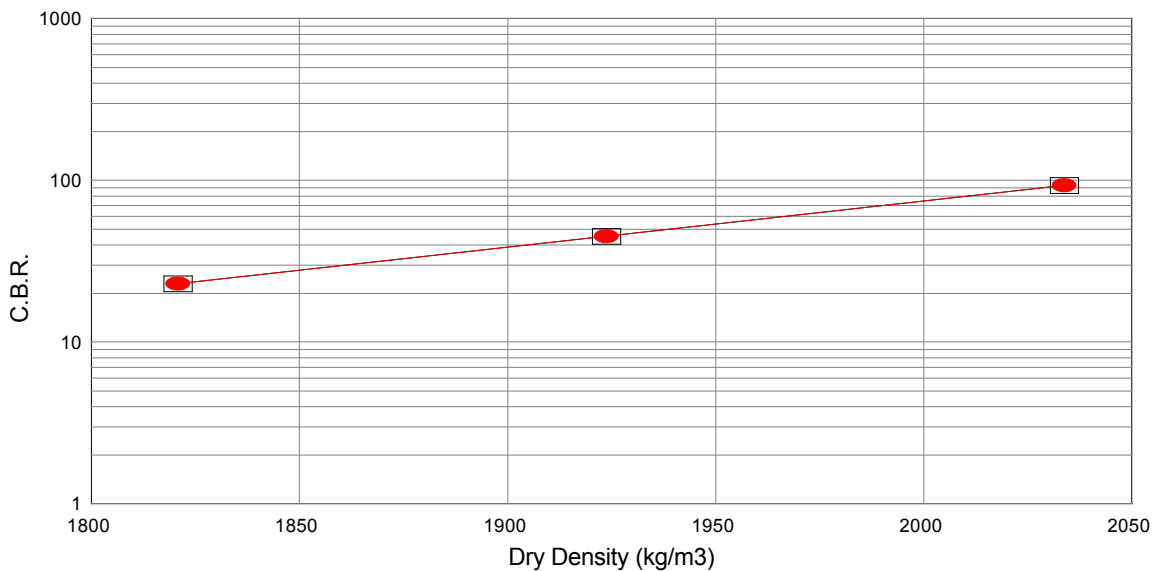
Maximum Dry Density (kg/m3)	2026
-----------------------------	------

Optimum Moisture Content (%)	9.7
------------------------------	-----

Percentage Mod AASHTO	100.4	94.9	89.9
CBR @ 2.54mm	93	45	23
CBR @ 5.08mm	10	44	22
CBR@ 7.62mm	89	43	21
Average Moisture Content (%)	83	9.6	
Percentage Swell	0.13	0.17	0.20

#### Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	23	35	46	68	88



□ Direct CBR Values      ● Interpolated CBR Values



### C.B.R. DETERMINATION

Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.	TP 2 @ 1,9 - 2,8m	
Date	18 OCTOBER 2019	Test No	3114
Job No	19287	Checked By	EB
Calibration Date	15 May 2018	Calibration Certificate	9475

#### Direct Results from Test Procedure

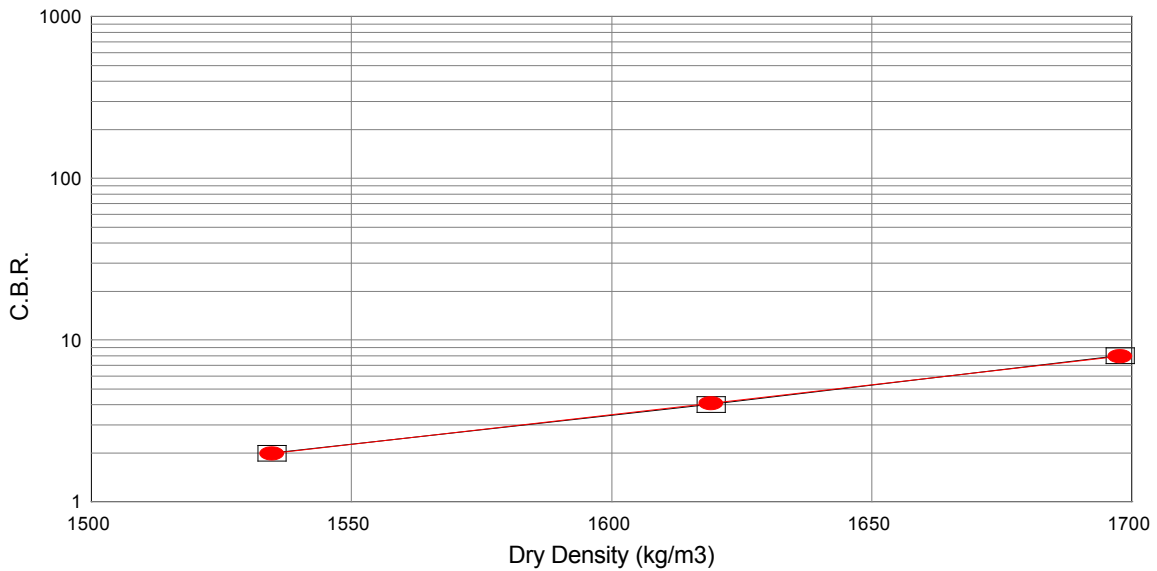
Maximum Dry Density (kg/m3)	1709
-----------------------------	------

Optimum Moisture Content (%)	17.5
------------------------------	------

Percentage Mod AASHTO	99.4	94.8	89.8
CBR @ 2.54mm	8	4	2
CBR @ 5.08mm	10	5	3
CBR@ 7.62mm	12	7	4
Average Moisture Content (%)	17.6		
Percentage Swell	0.79	0.88	0.98

#### Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	2	3	4	7	9



□ Direct CBR Values      ● Interpolated CBR Values

## FOUNDATION INDICATOR

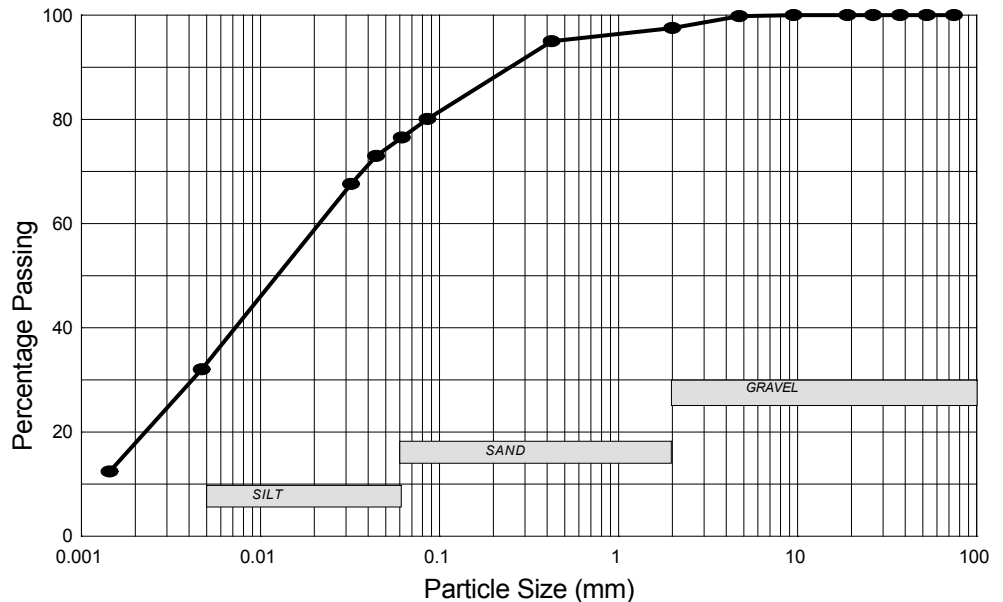
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 4 @ 0,7 - 2,3m	
Date	18 OCTOBER 2019	Test No	3115
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	99.86
2.00	97.59
0.425	95.05



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0861	80.10
0.0618	76.54
0.0444	72.98
0.0321	67.64
0.0047	32.04
0.0014	12.46

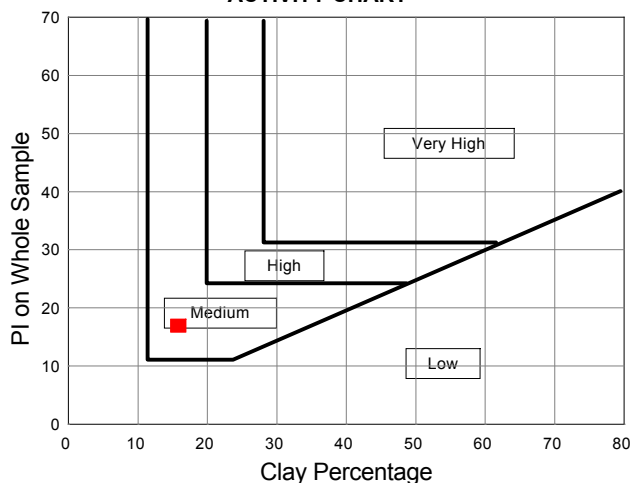
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	42
Plastic Limit	24
Plastic Index	18
Linear Shrinkage	9
Grading Modulus	0.27
Moisture Content	23.93
PI on Whole Sample	17
PRA Classification	A.7.6
Unified Classification	See Plasticity Chart

#### ESTIMATED COMPOSITION (As BS 1377)

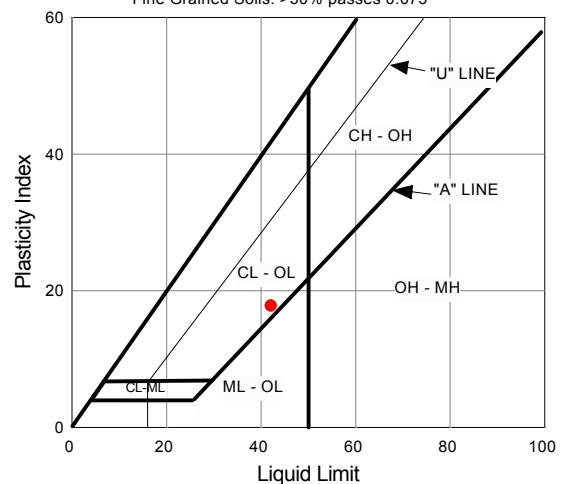
Clay (<0.002)	15.82
0.002 < Silt < 0.06	60.35
0.06 < Sand < 2.0	21.42
Gravel > 2.0	2.41
% less than 0.075	78.48

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



## FOUNDATION INDICATOR

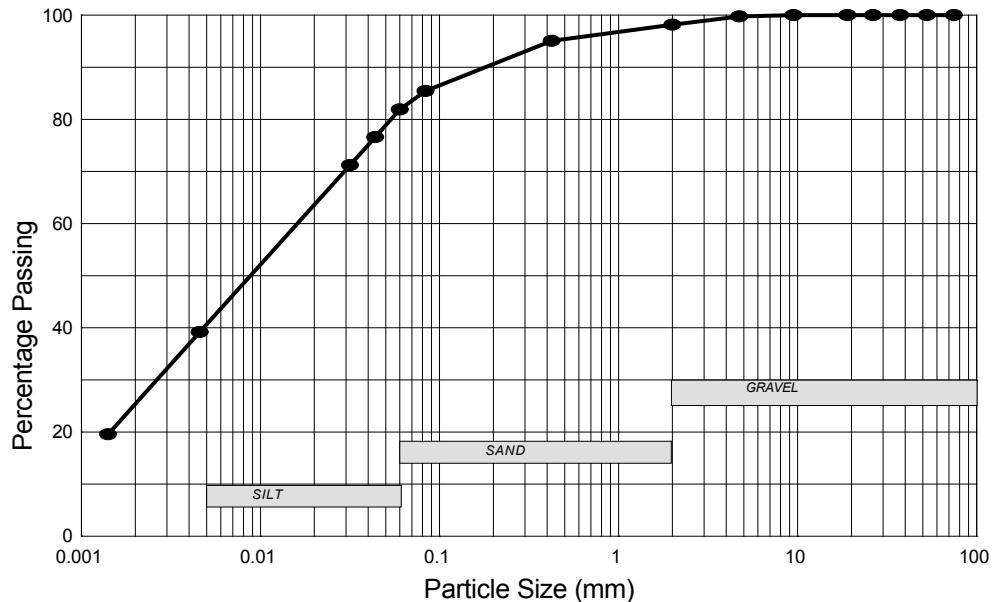
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 10 @ 1,1 - 3,1m	
Date	18 OCTOBER 2019	Test No	3119
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	99.79
2.00	98.17
0.425	95.10



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0840	85.49
0.0604	81.93
0.0437	76.59
0.0316	71.24
0.0046	39.18
0.0014	19.59

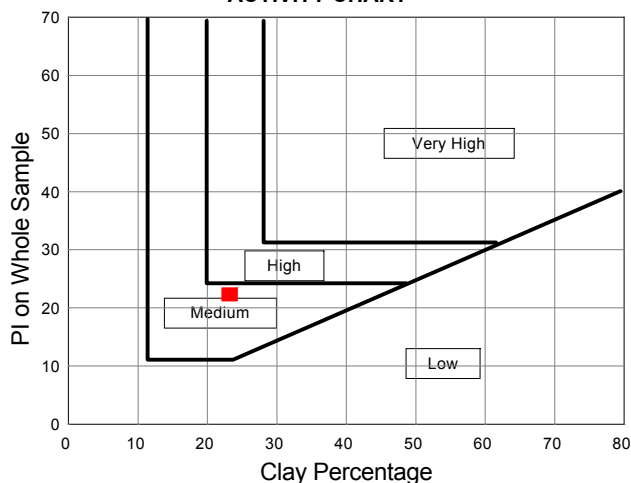
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	49
Plastic Limit	26
Plastic Index	24
Linear Shrinkage	12
Grading Modulus	0.21
Moisture Content	6.35
PI on Whole Sample	22
PRA Classification	A.7.6
Unified Classification	See Plasticity Chart

#### ESTIMATED COMPOSITION (As BS 1377)

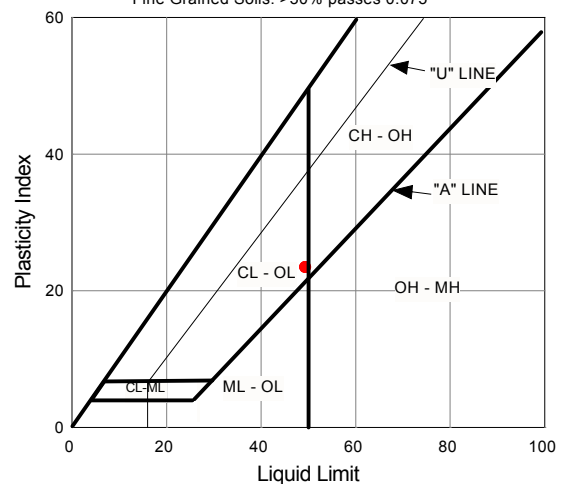
Clay (<0.002)	23.22
0.002 < Silt < 0.06	58.60
0.06 < Sand < 2.0	16.36
Gravel > 2.0	1.83
% less than 0.075	84.14

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



## FOUNDATION INDICATOR

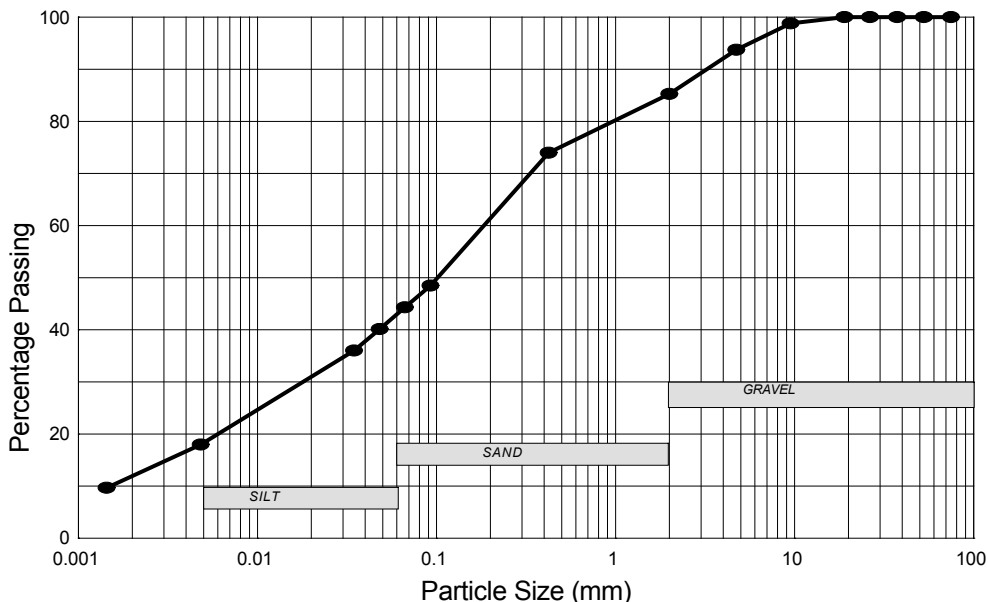
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.	TP 7 @ 0,0 - 0,3m	
Date	18 OCTOBER 2019	Test No	3117
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	98.82
4.75	93.74
2.00	85.25
0.425	73.99



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0927	48.50
0.0669	44.34
0.0482	40.19
0.0348	36.03
0.0048	18.01
0.0014	9.70

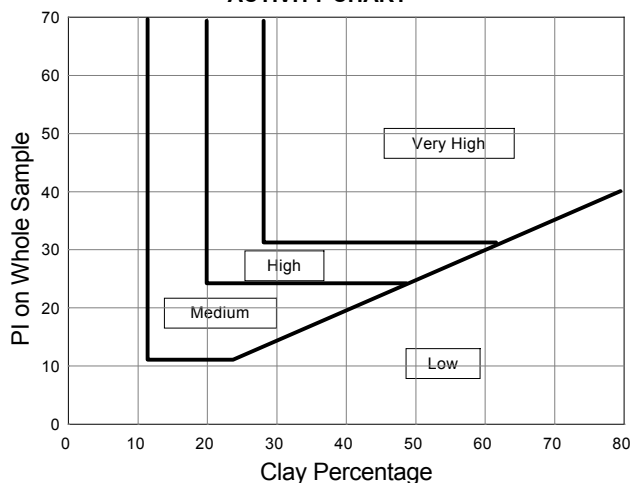
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	Non Plastic
Plastic Limit	Non Plastic
Plastic Index	Non Plastic
Linear Shrinkage	0
Grading Modulus	0.92
Moisture Content	3.03
PI on Whole Sample	Non Plastic
PRA Classification	A.4
Unified Classification	SM

#### ESTIMATED COMPOSITION (As BS 1377)

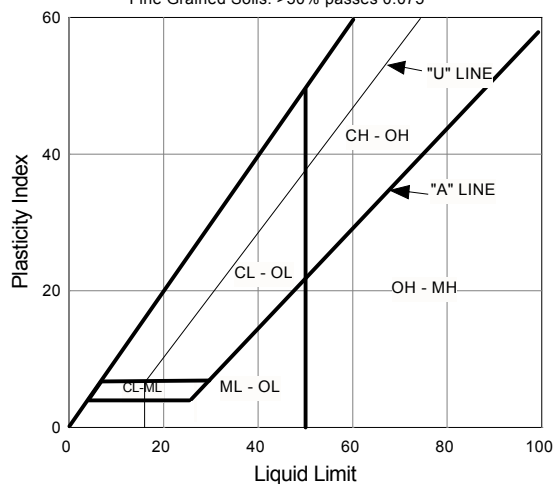
Clay (<0.002)	11.07
0.002 < Silt < 0.06	31.73
0.06 < Sand < 2.0	42.45
Gravel > 2.0	14.75
% less than 0.075	45.65

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075





### C.B.R. DETERMINATION

Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.	TP 7 @ 0,0 - 0,3m	
Date	18 OCTOBER 2019	Test No	3118
Job No	19287	Checked By	EB
Calibration Date	15 May 2018	Calibration Certificate	9475

#### Direct Results from Test Procedure

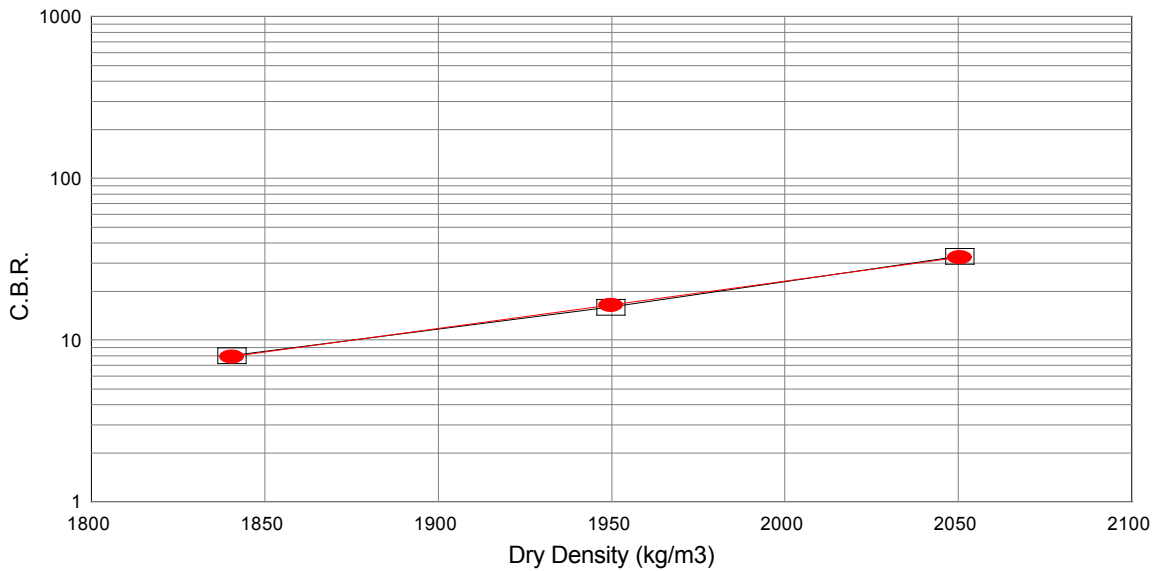
Maximum Dry Density (kg/m3)	2049
-----------------------------	------

Optimum Moisture Content (%)	10.6
------------------------------	------

Percentage Mod AASHTO	100.1	95.1	89.8
CBR @ 2.54mm	33	16	8
CBR @ 5.08mm	43	20	11
CBR@ 7.62mm	45	23	13
Average Moisture Content (%)	10.6		
Percentage Swell	0.35	0.44	0.54

#### Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	8	12	16	24	32



□ Direct CBR Values      ● Interpolated CBR Values





### C.B.R. DETERMINATION

Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.	TP 10 @ 1,1 - 3,1m	
Date	18 OCTOBER 2019	Test No	3120
Job No	19287	Checked By	EB
Calibration Date	15 May 2018	Calibration Certificate	9475

#### Direct Results from Test Procedure

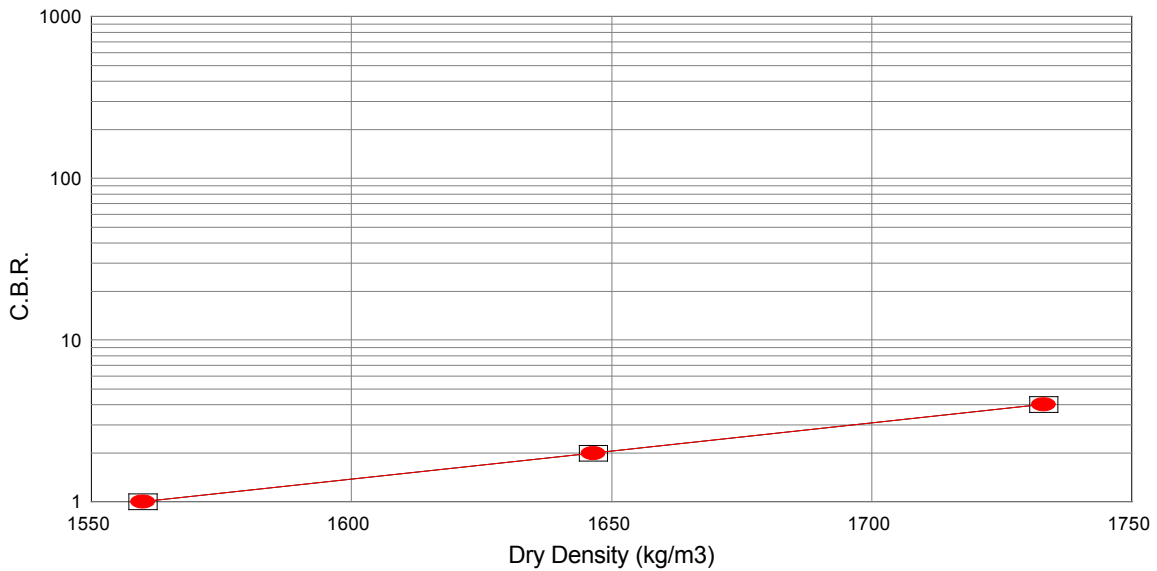
Maximum Dry Density (kg/m3)	1730
-----------------------------	------

Optimum Moisture Content (%)	16.4
------------------------------	------

Percentage Mod AASHTO	100.2	95.2	90.2
CBR @ 2.54mm	4	2	1
CBR @ 5.08mm	4	2	1
CBR@ 7.62mm	4	2	1
Average Moisture Content (%)	16.3		
Percentage Swell	0.44	0.56	0.70

#### Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	1	1	2	3	4



□ Direct CBR Values      ● Interpolated CBR Values

## FOUNDATION INDICATOR

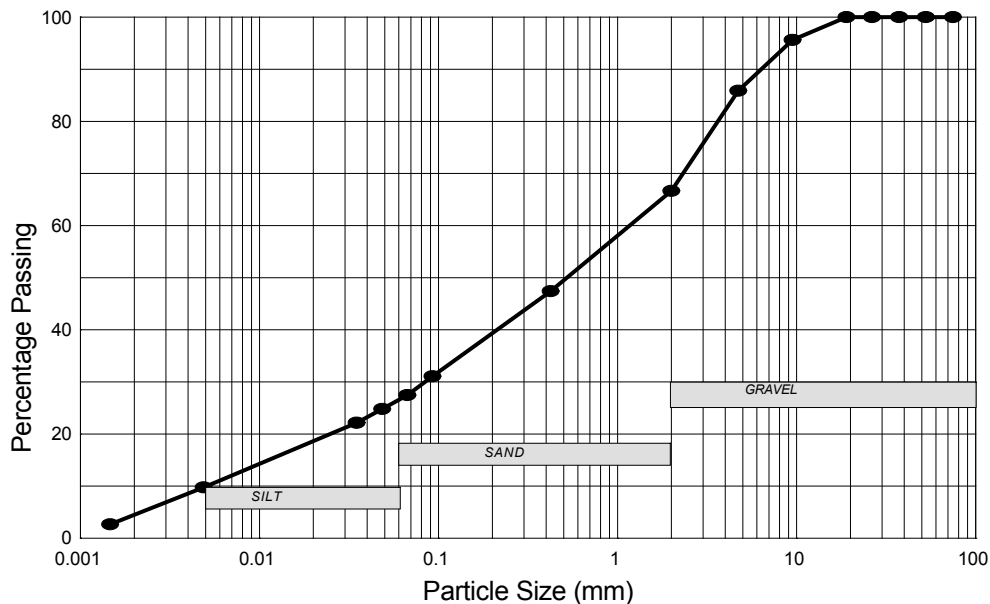
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 17 @ 0,0 - 0,4m	
Date	18 OCTOBER 2019	Test No	3121
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	95.68
4.75	85.93
2.00	66.70
0.425	47.42



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0927	31.08
0.0674	27.53
0.0486	24.86
0.0350	22.20
0.0049	9.77
0.0015	2.66

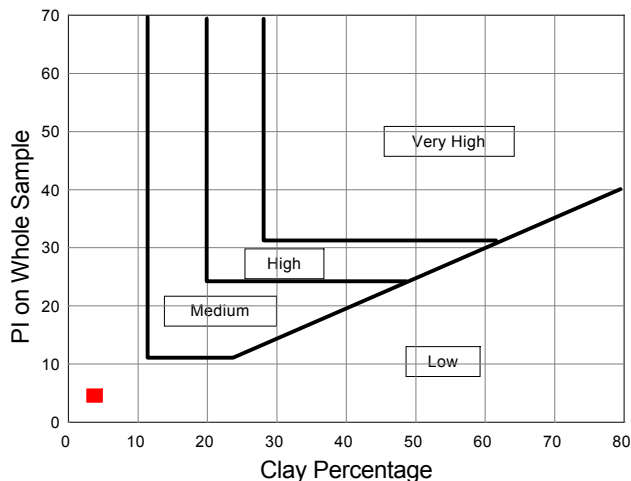
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	24
Plastic Limit	14
Plastic Index	10
Linear Shrinkage	5
Grading Modulus	1.55
Moisture Content	7.16
PI on Whole Sample	5
PRA Classification	A.2.4
Unified Classification	SC

#### ESTIMATED COMPOSITION (As BS 1377)

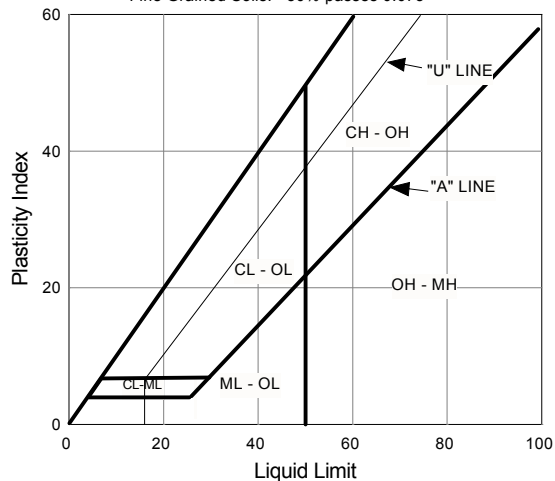
Clay (<0.002)	3.76
0.002 < Silt < 0.06	22.72
0.06 < Sand < 2.0	40.22
Gravel > 2.0	33.30
% less than 0.075	28.60

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



## FOUNDATION INDICATOR

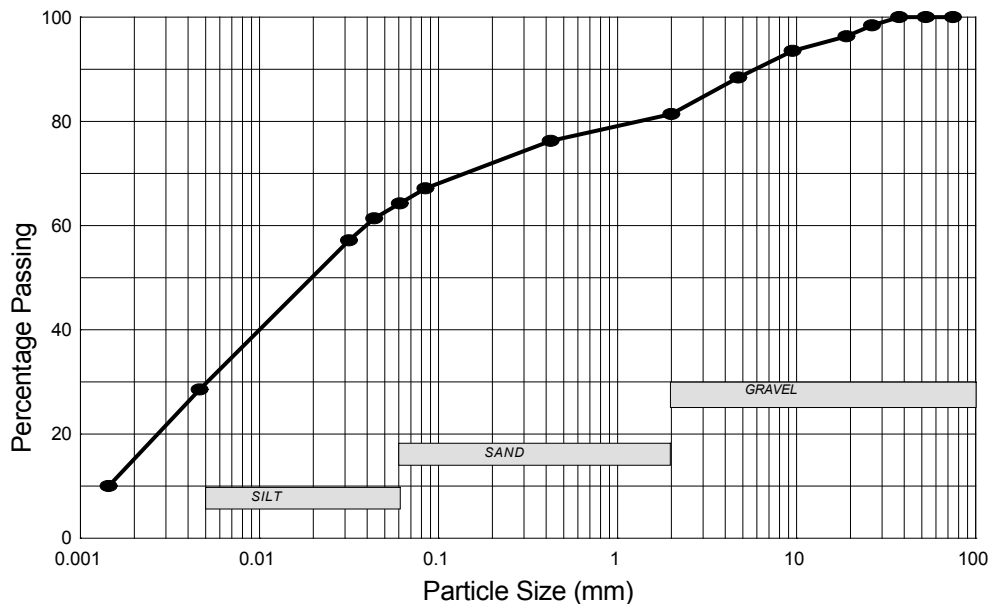
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 24 @ 0,4 - 1,1m	
Date	18 OCTOBER 2019	Test No	3122
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	98.43
19.00	96.38
9.50	93.58
4.75	88.44
2.00	81.40
0.425	76.30



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0847	67.16
0.0609	64.30
0.0437	61.44
0.0316	57.16
0.0047	28.58
0.0014	10.00

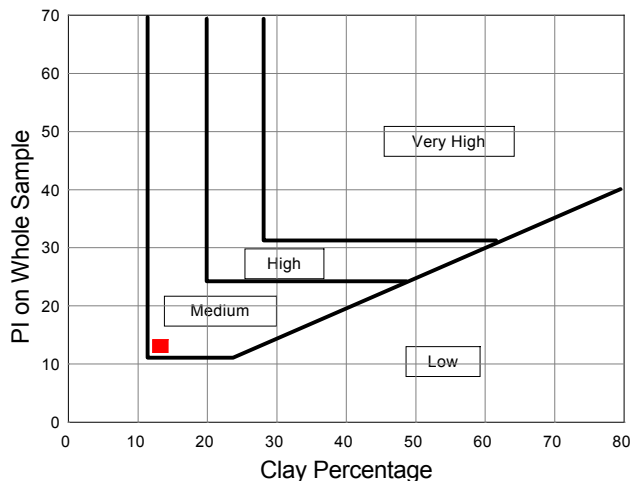
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	38
Plastic Limit	20
Plastic Index	17
Linear Shrinkage	9
Grading Modulus	0.75
Moisture Content	3.42
PI on Whole Sample	13
PRA Classification	A.6
Unified Classification	See Plasticity Chart

#### ESTIMATED COMPOSITION (As BS 1377)

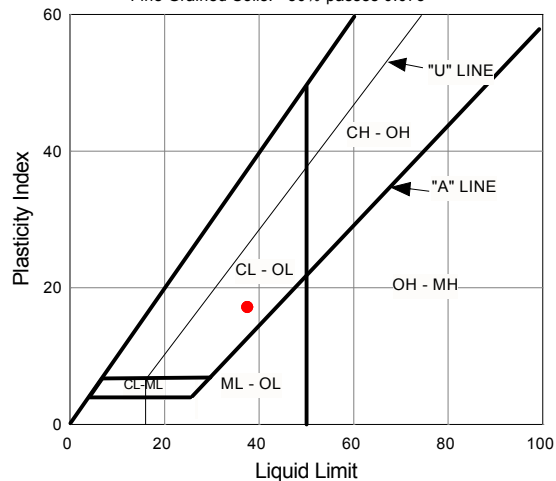
Clay (<0.002)	13.24
0.002 < Silt < 0.06	50.92
0.06 < Sand < 2.0	17.24
Gravel > 2.0	18.60
% less than 0.075	66.00

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075





### C.B.R. DETERMINATION

Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 24 @ 0,4 - 1,1m	
Date	18 OCTOBER 2019	Test No	3123
Job No	19287	Checked By	EB
Calibration Date	15 May 2018	Calibration Certificate	9475

#### Direct Results from Test Procedure

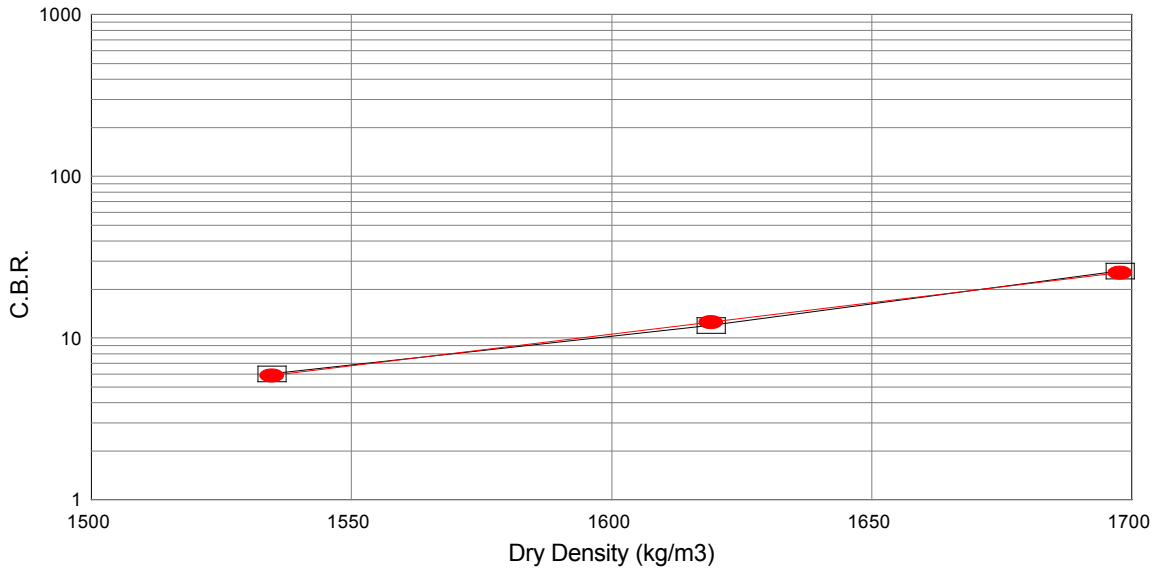
Maximum Dry Density (kg/m3)	1740
-----------------------------	------

Optimum Moisture Content (%)	17.6
------------------------------	------

Percentage Mod AASHTO	97.6	93.1	88.2
CBR @ 2.54mm	26	12	6
CBR @ 5.08mm	22	12	6
CBR@ 7.62mm	19	12	5
Average Moisture Content (%)	17.6		
Percentage Swell	0.13	0.16	0.31

#### Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	8	12	17	27	37



□ Direct CBR Values      ● Interpolated CBR Values

## FOUNDATION INDICATOR

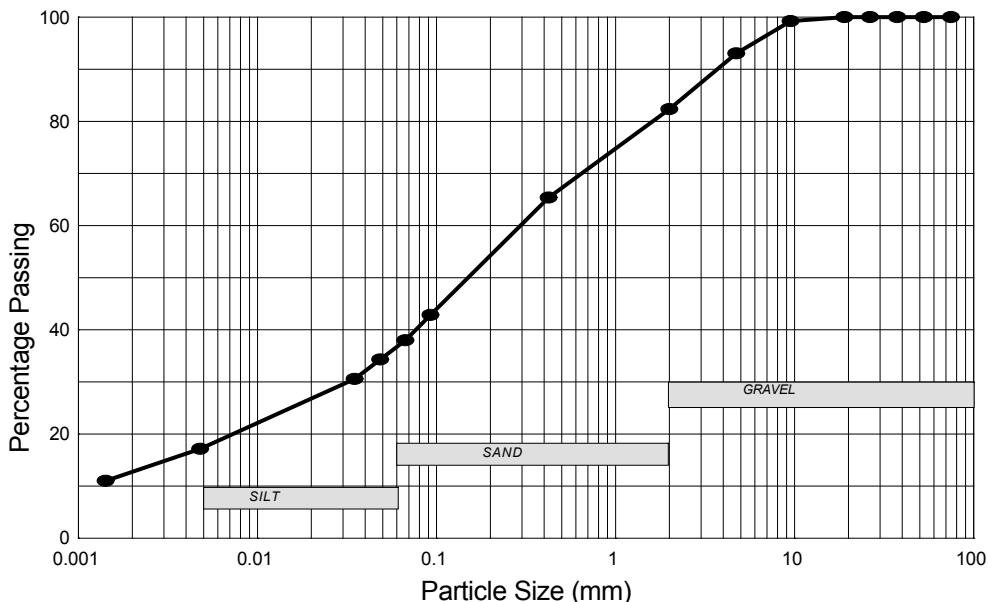
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE	TP 25 @ 0,7 - 1,4m	
Date	18 OCTOBER 2019	Test No	3124
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	99.25
4.75	93.06
2.00	82.37
0.425	65.43



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0927	42.88
0.0674	37.98
0.0486	34.31
0.0350	30.63
0.0048	17.15
0.0014	11.03

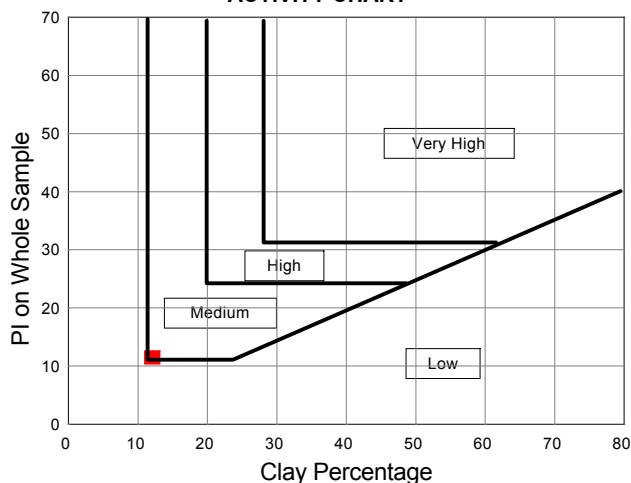
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	36
Plastic Limit	19
Plastic Index	18
Linear Shrinkage	9
Grading Modulus	1.09
Moisture Content	15.68
PI on Whole Sample	12
PRA Classification	A.6
Unified Classification	SC

#### ESTIMATED COMPOSITION (As BS 1377)

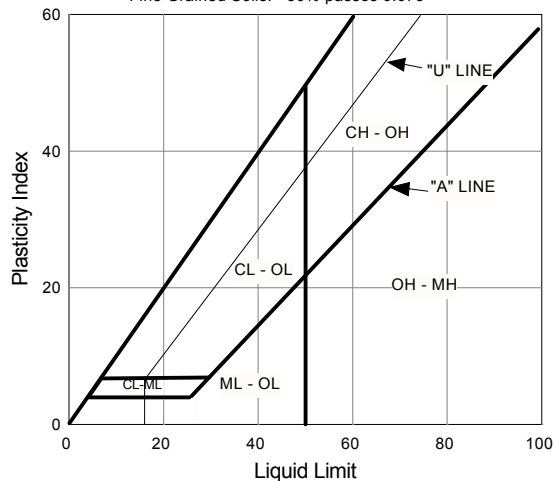
Clay (<0.002)	12.08
0.002 < Silt < 0.06	24.47
0.06 < Sand < 2.0	45.82
Gravel > 2.0	17.63
% less than 0.075	39.46

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



## FOUNDATION INDICATOR

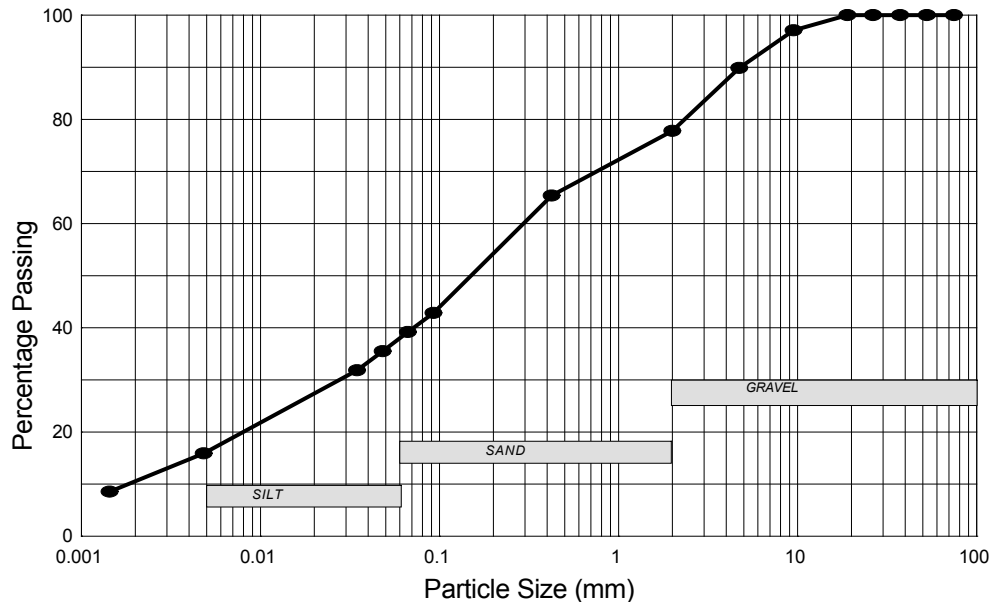
Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.	TP 28 @ 0,4 - 0,7m	
Date	18 OCTOBER 2019	Test No	3125
Job No	19286	Checked By	EB

### GRADING ANALYSIS

#### 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	97.14
4.75	89.90
2.00	77.83
0.425	65.40



#### HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0927	42.87
0.0669	39.19
0.0482	35.52
0.0348	31.84
0.0048	15.92
0.0014	8.57

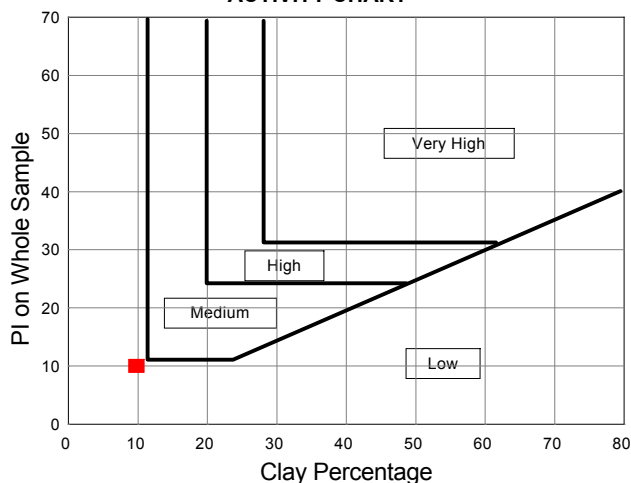
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	39
Plastic Limit	23
Plastic Index	15
Linear Shrinkage	7
Grading Modulus	1.14
Moisture Content	16.85
PI on Whole Sample	10
PRA Classification	A.6
Unified Classification	SC

#### ESTIMATED COMPOSITION (As BS 1377)

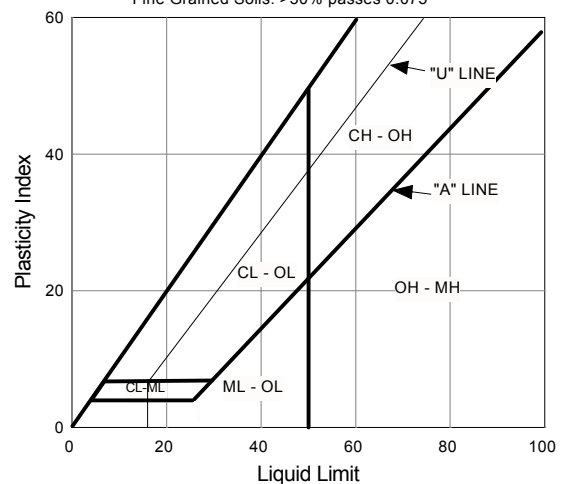
Clay (<0.002)	9.79
0.002 < Silt < 0.06	28.04
0.06 < Sand < 2.0	40.00
Gravel > 2.0	22.17
% less than 0.075	40.34

#### ACTIVITY CHART



#### PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075





SOIL and MATERIAL TESTING  
 P.O. BOX 227  
 MARAISBURG 1700

TEL: (011) 674 1325  
 FAX: (011) 674 4513  
 e mail: satisfied@geopractica.co.za

## SOIL pH and CONDUCTIVITY TEST RESULT

Client	GCS GEOTECHNICAL ENGINEERING		
Location	ENNERDALE.		
Date	18 OCTOBER 2019	Test No	
Job No	19287	Checked By	MM

Sample Description	pH	Electrical Conductivity EC (µS/cm)	Total Dissolved Salts TDS (ppm)	Resistivity R (Ohms/cm)
TP 1 @ 0.3 - 1.1	5.5	157	78	6382
TP 2 @ 1.9 - 2.8	5.0	219	110	4566
TP 7 @ 0.0 - 0.3	4.9	309	155	3236
TP 10 @ 1.1 - 3.1	5.6	313	157	3195
TP 24 @ 0.4 - 1.1	4.7	189	94	5291
				ERR
				ERR
				ERR
				ERR
				ERR

pH	Degree of Acidity
<4	Extremely Acidic
4.0 - 5.4	Strongly Acidic
5.5 - 6.4	Moderately Acidic
6.5 - 7.0	Slightly Acidic
7.1 - 7.4	Slightly Alkaline
7.5 - 8.4	Moderately Alkaline
>8.4	Strongly Alkaline

Resistivity (Ohm/cm)	Degree of Corrosivity
0 - 2 000	Extremely Corrosive
2 000 - 4 000	Very Corrosive
4 000 - 5 000	Corrosive
5 000 - 6 000	Mildly Corrosive
>10 000	Not Generally Corrosive

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**FIGURE 1**  
**Site Plan**



# RAPID LAND RELEASE PROGRAM - ENNERDALE EXT 9 TEST PIT PLAN AND NHBRC CLASSIFICATIONS

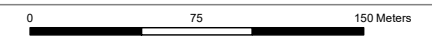


## LEGEND

- Test Pits
- Ennerdale Ext 9
- NHBRC**
- H - Heave < 7.5 mm
- H1 - Heave 7.5 - 15 mm
- H2 - Heave 15 - 30 mm



Data Sources:  
ESRI Basemap



SCALE: 1:3 400

FIGURE NO.:	-	MAP NUMBER:	19-0866-18
DRAWN BY:	A LOVE GIS CONSULTANT	REVIEWED BY:	C BOTHA GIS SPECIALIST
DATUM:	WGS84	DATE:	11 NOVEMBER 2019
PROJECTION:	GEOGRAPHIC		
PROJECT:	RAPID LAND RELEASE PROGRAM		
CLIENT:	GLAD AFRICA		

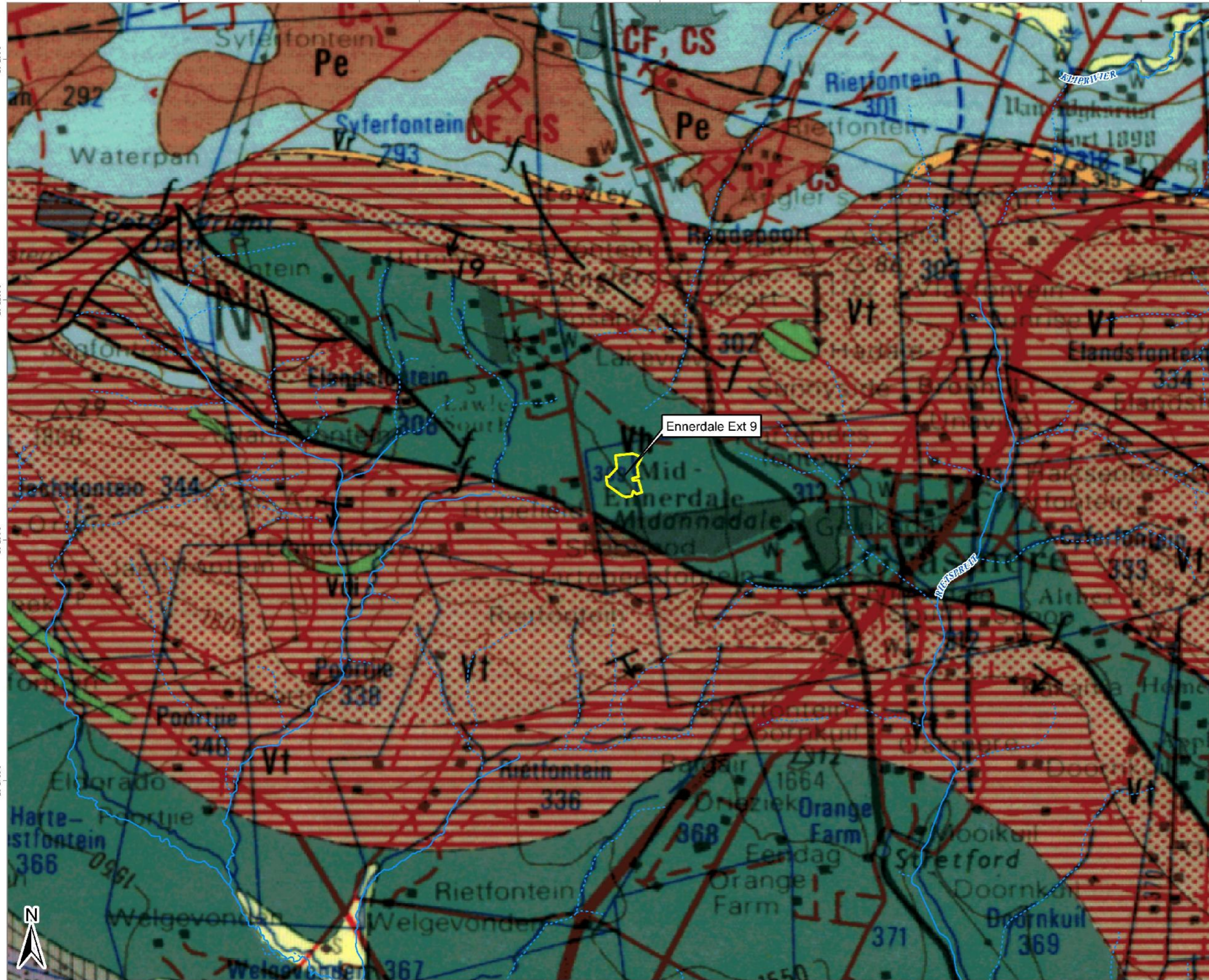


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Fax: +27 (0) 11 803 5745  
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www.gcs-sa.biz

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**FIGURE 2**  
**Geological Plan**

# RAPID LAND RELEASE PROGRAM - ENNERDALE EXT 9: GEOLOGY



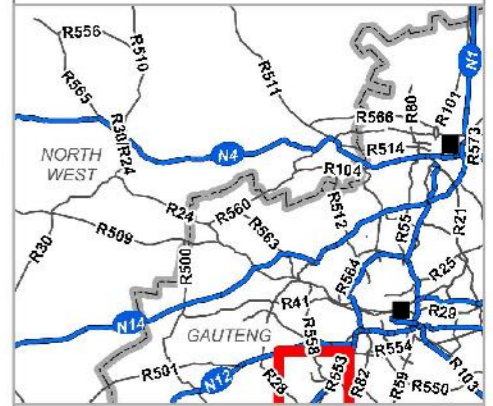
**LEGEND**

**Rivers and Streams**

- Non-Perennial
- Perennial
- Ennerdale Ext 9

**Lithology**

- Alluvium
- Pe Shale, sandstone, coal
- Vdi Diabase
- Vh Andesite, agglomerate, tuff
- VI Ferruginous shale, hornfels
- VI Ferruginous quartzite
- Vr Shale
- Vmd Dolomite, chert and remnants of chert breccia of the Rooihogte Formation



Data Sources:  
Council for Geoscience  
1:250 000 Geological Series: 2626

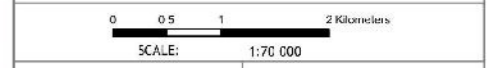


FIGURE NO.:	MAP NUMBR: 19-0666-06
DRAWN BY: N NAIDOO GIS CONSULTANT	REVIEWED BY: C BOTHA GIS SPECIALIST
DATUM: WGS84 PROJECTION: GEOGRAPHIC	DATE: 12 SEPTEMBER 2019

PROJECT: RAPID LAND RELEASE PROGRAM  
CLIENT: GLAD AFRICA

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26 200'S  
26 220'S  
26 240'S  
26 260'S  
26 270'S

27°45'E 27°47'30"E 27°50'E 27°52'30"E 27°55'E