

UR1987-12

1987/12. Test pits at a proposed wool store at Western Junction

W. L. Matthews

Abstract

High plasticity clay up to about two metres thick overlies deeply weathered basalt at the proposed wool store site. X-ray analysis and linear shrinkage measurements from a selection of samples show that much of the near-surface material has significant expansive properties, a factor which will influence foundation design.

INTRODUCTION

Webster Limited are proposing to build a store covering some two hectares at Western Junction [EQ180990]. The site is near the railway line, the airport, and a main road so that good transport and ready access is available.

Test pits were dug by consulting engineers from Sydney and from the samples obtained, it was thought some foundation problems were possible. Webster Ltd requested that the Department of Mines examine further test pits to determine properties of the material underlying the site.

The area is relatively flat lying with a very gentle slope towards the south where there is a shallow valley. The land rises a little towards the railway line again.

The geological map of the area shows the area to be near the margin of Tertiary basalt and later sediments (either Quaternary or Tertiary).

TEST PITS

Fifteen test pits have been dug at the locations shown on Figure 1. The test pits extended into deeply weathered basalt, which was located at depths ranging from 0.7 - 2.15 m from the surface. The weathered basalt is a little shallower than average in pits 1, 2, 13 and 14, while it is deeper in the region of pits 9, 10 and 11.

The material overlying the basalt consists of a surface layer of soil, often silty, which in turn is underlain by usually brown, dark brown to blackish (organic material?) clay which may be fissured (fine slip surfaces) or fractured (irregular cracks through it). This second layer is usually moist and in some locations can be quite soft. Between this second layer and the weathered basalt there is usually a brown plastic clay layer. This is sometimes fissured, sometimes has widely spaced and more extensive slip surfaces, and is variable in stiffness. Some localised zones are quite soft although no free water entered any of the pits. The presence of quartz (fine and occasional pebbles) suggests that the clay is sedimentary but probably is largely derived from the weathering of the surrounding basalt.

MATERIAL PROPERTIES

Samples from all pits have been subjected to X-ray diffraction analysis to determine the clay mineralogy and to give an indication of the approximate percentages of each mineral. The samples were sedimented onto glass plates and this method tends to emphasise the peaks associated with

montmorillonite a little. However from the enclosed table, it is obvious that montmorillonite is a dominant constituent of most samples. It is also apparent that as montmorillonite is an expansive (or reactive) clay, difficulties with foundations are likely to arise unless special design provisions are made.

Atterberg limit tests have been undertaken on a range of samples. Plasticity indices range up to very high values and linear shrinkages are also quite high. These values confirm that reactive soils are likely to be a major consideration in design of foundations or in determining how much of the plastic clay will have to be removed to minimise the problem. Piling to the weathered basalt is a possible solution.

Strength factors determined in a shear box for a sample from pit 8 at depth 0.7 - 1.6 m (fig. 2) were $C_p = 11$ kPa and $\phi_p = 20^\circ$. These results were determined rather rapidly from three samples with only a few hours of adjustment to the applied load.

CONCLUSIONS

Dominantly plastic clay of Tertiary to Quaternary age and up to 2.15 m thick overlies deeply weathered basalt at the proposed wool store site.

Linear shrinkage measurements and clay mineral determinations indicate that much of the material overlying the weathered basalt has significant expansive properties (or is reactive) and foundation design will have to take this into account.

[23 February 1987]

12-4

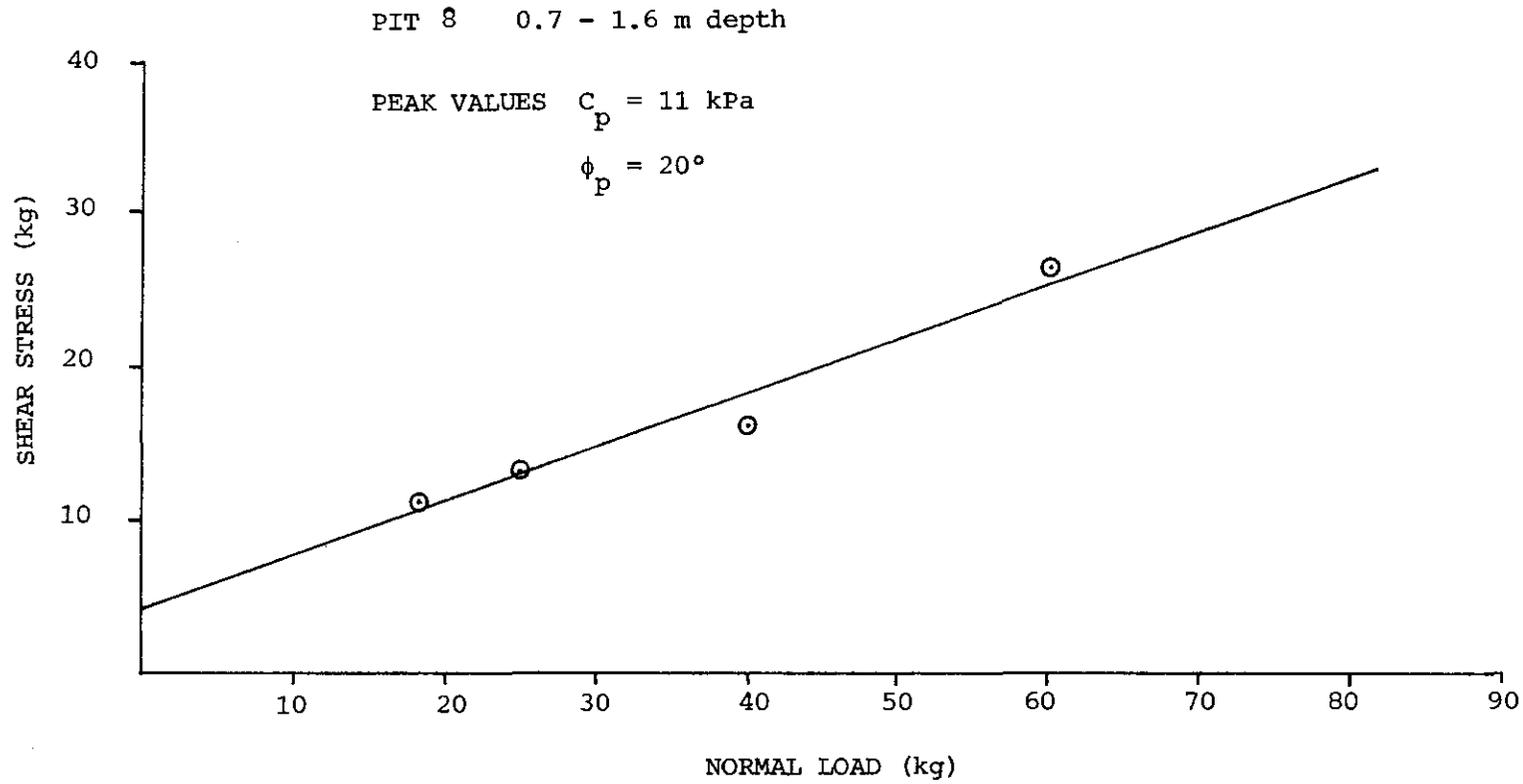


Figure 2. Shear box strength test - Western Junction

5 cm

Table 1. X-RAY DIFFRACTION ANALYSES

Pit no.	Depth (m)	Peak strength		
		Montmorillonite	Kaolinite	Quartz
1	0.15-0.4	S	M	M
1	0.4-1.3	VS	L	L
1	1.3-2.1	S	VL	-
2	0.4-0.6	S	L	L
2	0.6-1.1	VS	M	L
3	0.2-0.5	S	M	M
3	0.5-1.0	S	M	M
3	1.2-1.4	VS	L-M	L-M
4	0.3-0.6	S	L	L
4	0.6-1.5	VS	M	M
4	2	VS	VL	-
5	0.3-0.6	VS	M	M
5	0.6-1.5	VS	L-M	L-M
5	1.5-2.25	VS	VL	-
6	0.4-1.0	S	M	M
6	1-1.6	VS	M-L	L
7	0.3-0.6	S	L	M
7	0.9-1.6	VS	M	M
8	0.3-0.6	S	M-S	M
8	0.7-1.6	S	M	L
8	1.6-2.2	VS	VL	-
9	0.3-0.6	M	M	M
9(or 11?)	0.6-2.0	VS	S	M
9	0.5-2.1	VS	L	L-M
10	0.3-0.6	M-S	M	M-S
10	0.6-2.1	VS	S	M-S
11	0.3-0.5	M	M	S
12	0.3-0.6	S	M	M
12	0.6-1.7	VS	M	L
13	0.5	VS	VL	M-S
14	0.4-0.6	S	L	VS
14	0.7-1.0	VS	-	L
15	0.3	S	-	VS
15	0.5	VS	L	S
15	0.7-1.4	VS	M	M

VS = very strong; S = strong; M = moderate; L = low; VL = very low

MATERIAL PROPERTIES

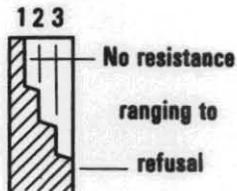
Pit no.	Depth (m)	LL	PL	PI	LS(%)
2	0.6-1.1	175	28	147	28
4	0.3-0.6	145	36	109	19
4	0.6-1.5	167	34	133	27
6	0.4-1.0	155	32	123	17
6	1-1.6	184	35	149	24
7	0.9-1.6	183	30	153	26
8	0.3-0.6	143	39	104	28
8	0.7-1.6	118	32	86	17?
9	0.5-2.1	145	30	115	23
10	0.3-0.6	167	31	136	28
10	0.6-2.1	147	32	115	29
12	0.3-0.6	135	31	104	30
12	0.6-1.7	163	30	133	31
13	0.5	138	37	101	27
15	0.5	97	22	75	21
15	0.7-1.4	122	28	94	19

Determinations by P. Terry - Department of Mines

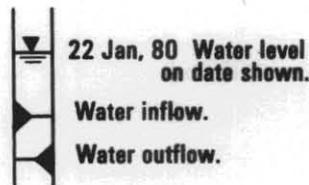
EXPLANATION SHEET FOR ENGINEERING LOGS

Borehole and excavation log

Penetration



Water



Notes - samples and tests

- U50 Undistributed sample 50mm diameter.
- D Disturbed sample.
- N Standard penetrometer blow count for 300mm.
- N* SPT + sample.

Material classification

Based on Unified Soil Classification System. In Graphic Log materials are represented by clear contrasting symbols consistent for each project.

Moisture content

- D Dry, looks and feel dry.
 - M Moist, no free water on hand when remoulding.
 - W Wet, free water on hand when remoulding.
 - LL Liquid limit.
 - PL Plastic limit.
 - PI Plasticity Index.
- eg. M > PL - Moist, moisture content greater than the plastic limit.

Consistency

- | | | hand penetrometer (kPa) |
|-----|-------------|-------------------------|
| VS | Very soft. | < 25 |
| S | Soft. | 25 - 50 |
| F | Firm. | 50 - 100 |
| St | Stiff. | 100 - 200 |
| VSt | Very stiff. | 200 - 400 |
| H | Hard. | > 400 |
| Fb | Friable. | |

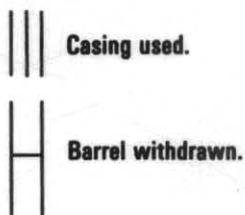
Notes: X on log is test result
— is range of results.

Density index

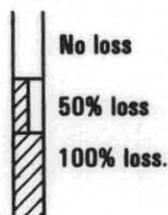
- | | | % |
|----|---------------|----------|
| VL | Very loose. | 0 - 15 |
| L | Loose. | 15 - 35 |
| MD | Medium dense. | 35 - 65 |
| D | Dense. | 65 - 85 |
| VD | Very Dense | 85 - 100 |

Cored borehole log

Case - lift



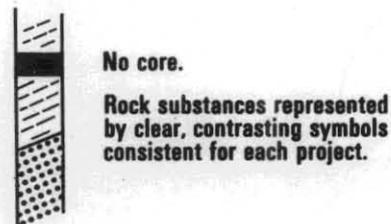
Fluid loss



Lugeons

Lugeon units (pL) are a measure of rock mass permeability. For a 48 to 74mm diameter borehole 1 Lugeon is defined as a rate of loss of 1 litre per metre per minute. 1 Lugeon is roughly equivalent to a permeability of 1×10^{-4} mm/sec.

Graphic log



Weathering

- Fr Fresh.
- SW Slightly weathered.
- HW Highly weathered.
- EW Extremely weathered.

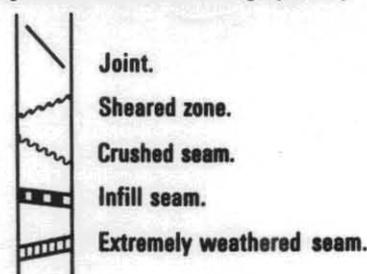
Strength

- | | | point load strength index $I_{5(50)}$ (MPa) |
|----|-----------------|---|
| EL | Extremely low. | < 0.03 |
| VL | Very low. | 0.03 - 0.1 |
| L | Low. | 0.1 - 0.3 |
| M | Medium. | 0.3 - 1 |
| H | High | 1 - 3 |
| VH | Very high. | 3 - 10 |
| EH | Extremely high. | > 10 |

Note: X on log is test result.

Significant defects

Significant defects shown graphically.



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ENGINEERING LOG - EXCAVATION

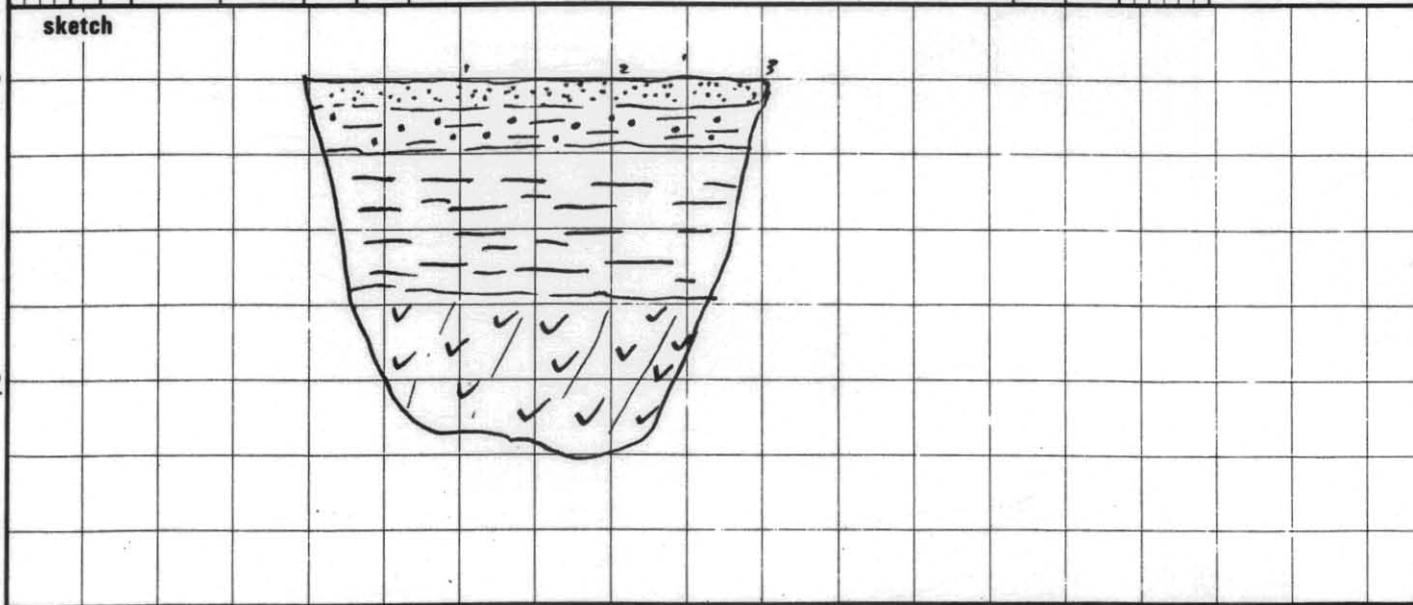
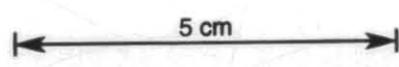
excavation no. 1
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER** location **WESTERN JUNCTION**

co-ordinates exposure type pit commenced **16/12/86**
equipment **BACKHOE** pit completed **16/12/86**
R.L. logged by **L. Matthews**
excavation dimensions operator checked by

3 x 0.5 x 2.4 m deep

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
				ML	SOIL - brown, silty					
		XAD		CH	CLAY - dark grey to black, plastic, iron oxide pisolites	M F-S				Tertiary sediments
		XAD	1	CH	CLAY - brown plastic, slip surfaces widely spaced	M-W S-F				Tertiary sediments
		XAD	2		CLAY - friable, dry, igneous texture visible	D-M FB				Deeply Weathered basalt.
			3		END - to required depth					
			4							



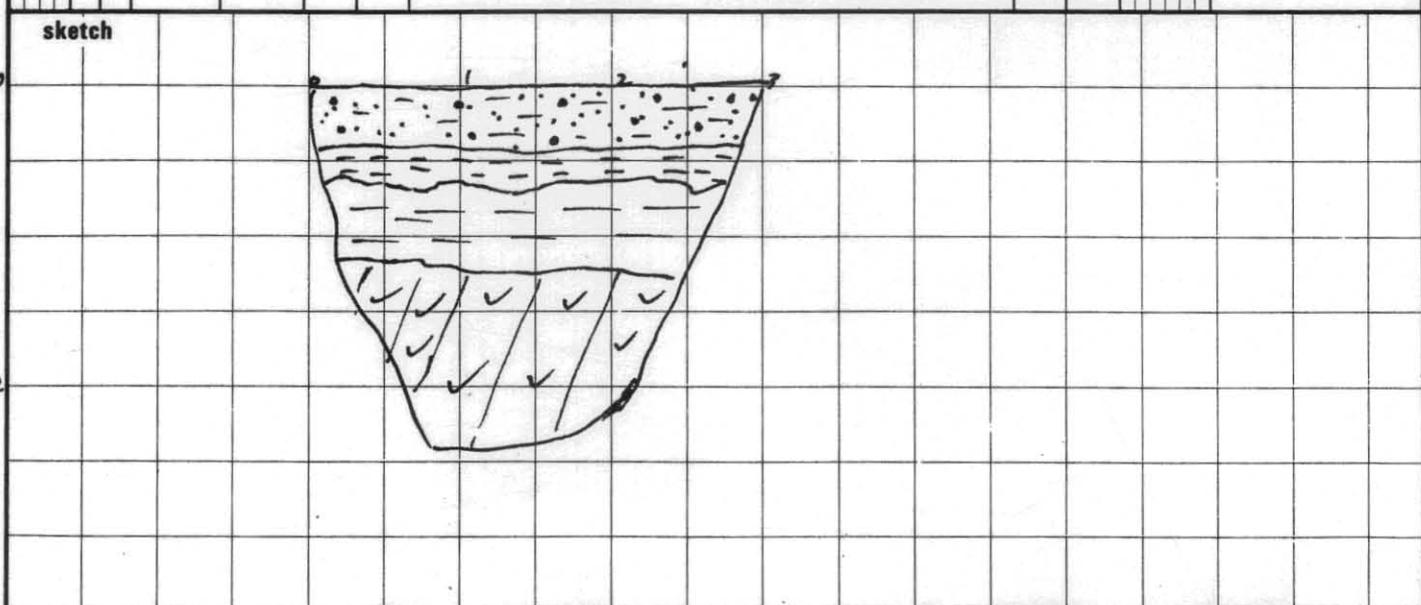
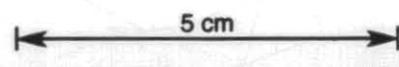
ENGINEERING LOG - EXCAVATION

excavation no. 2
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type **BACKHOE** pit commenced **16/12/86**
 R.L. equipment **BACKHOE** pit completed **16/12/86**
 excavation dimensions **3 x 0.5 x 2.4 m deep** operator logged by **L. Matthews**
 checked by

penetration 1 2 3	support	water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
						CL	SOIL - silty clay, grass roots iron oxide nodules	D-M			
			XRD			CH	CLAY - dark brown and light brown mottled, plastic, fairly soft	M F			Tertiary sediments
			XRD, A	1		CH	CLAY - light brown, plastic, soft	M-F-S			Tertiary sediments
	NONE	NONE		2			CLAY - light brown friable with igneous texture, some brown iron oxide staining.	D-M F _s			Deeply weathered basalt
				3			END - to required depth				



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ENGINEERING LOG - EXCAVATION

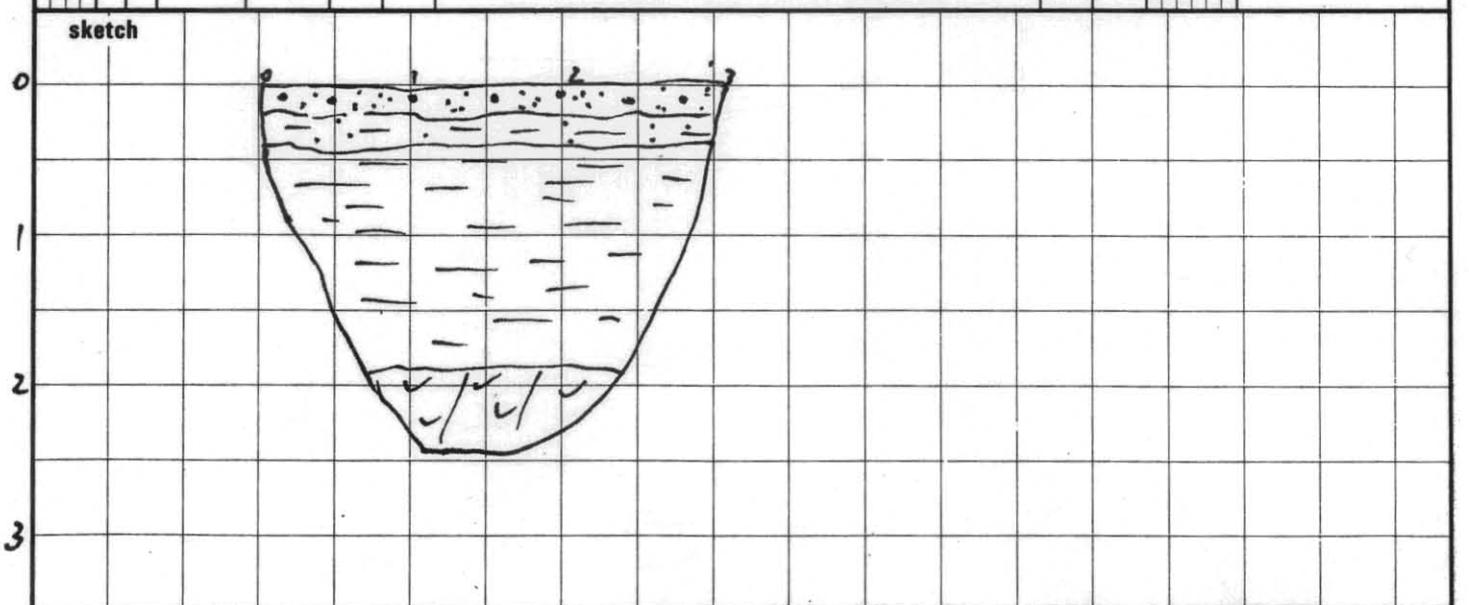
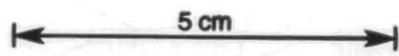
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sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type pit commenced **16/12/86**
equipment **BACK HOE** pit completed **16/12/86**
R.L. logged by **L Matthews**
excavation dimensions operator checked by

3 x 0.5 x 2.4 m deep

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
				ML	SOIL - brown, silty, roots, iron oxide pisolites				
	XAD			CL	CLAY - brown, silty, fractured	D-M	ST-M		Tertiary sediments
	XAD		1	CH	CLAY - plastic, soft at base, stiffer towards top, isolated zone of iron oxide pisolites on one side of pit.	M	F-S		Tertiary sediments
	XAD		2 1/4		CLAY - light brown friable, irregular texture visible	W	S		Deeply weathered basalt
			2 1/2			D-M	Fb		
			3		END - to required depth				



ENGINEERING LOG - EXCAVATION

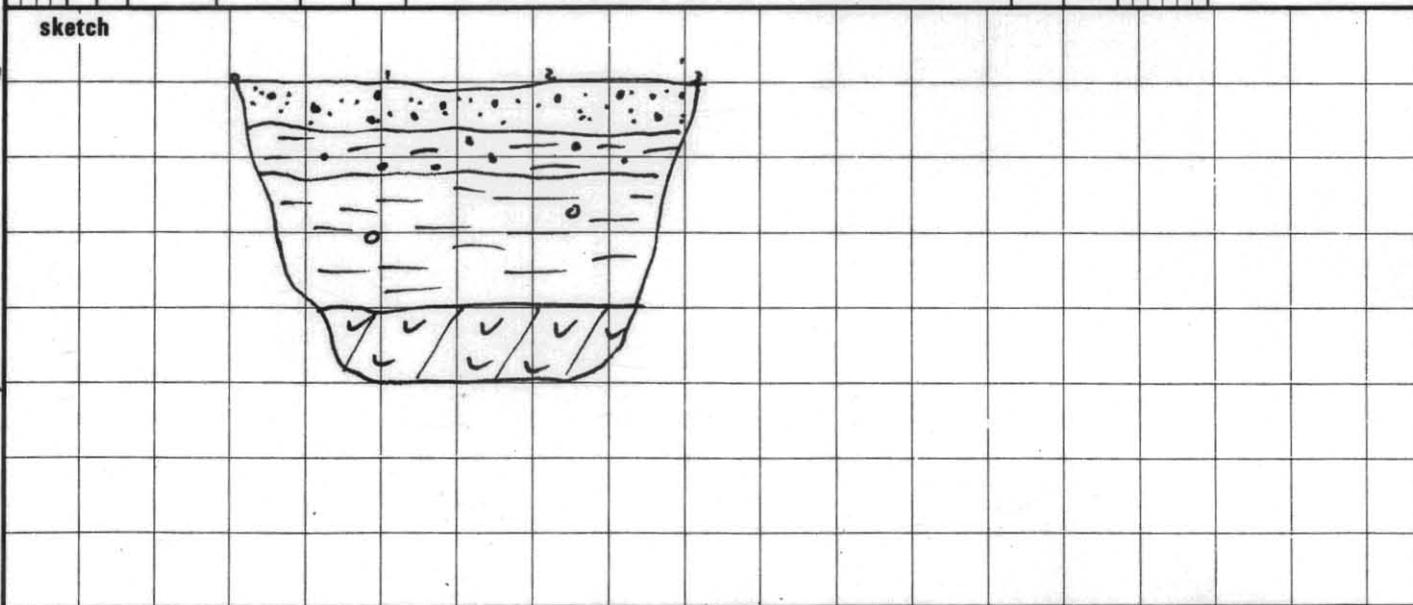
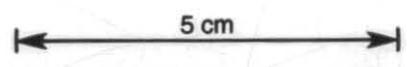
excavation no. 4
sheet 1 of 1

project **PROPOSED WOOL STORE - LOBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type pit commenced **16/12/86**
equipment **Bathloc** pit completed **16/12/86**
R.L. logged by **L. Matthews**
excavation dimensions operator checked by

3 x 0.5 x 2 m deep

penetration 1 2 3	support water	notes samples, tests	metres		classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
			R.L.	depth						
					ML	SOIL - silty brown, friable, iron oxide pseudite				
		XAD			CH	CLAY - dark and light brown mottled, plastic some fracturing, some iron oxide pseudite	B-M			
	NONE	XAD	1		CH	CLAY - brown plastic, soft at 0.9 m fractured, slip surfaces, occasional quartz pebbles	M W M	F S F		Tertiary sediments
	NONE	XAD	2	1/1		CLAY - light brown friable with an igneous texture	B-M	PB		Deeply weathered basalt
						END - to required depth				



ENGINEERING LOG - EXCAVATION

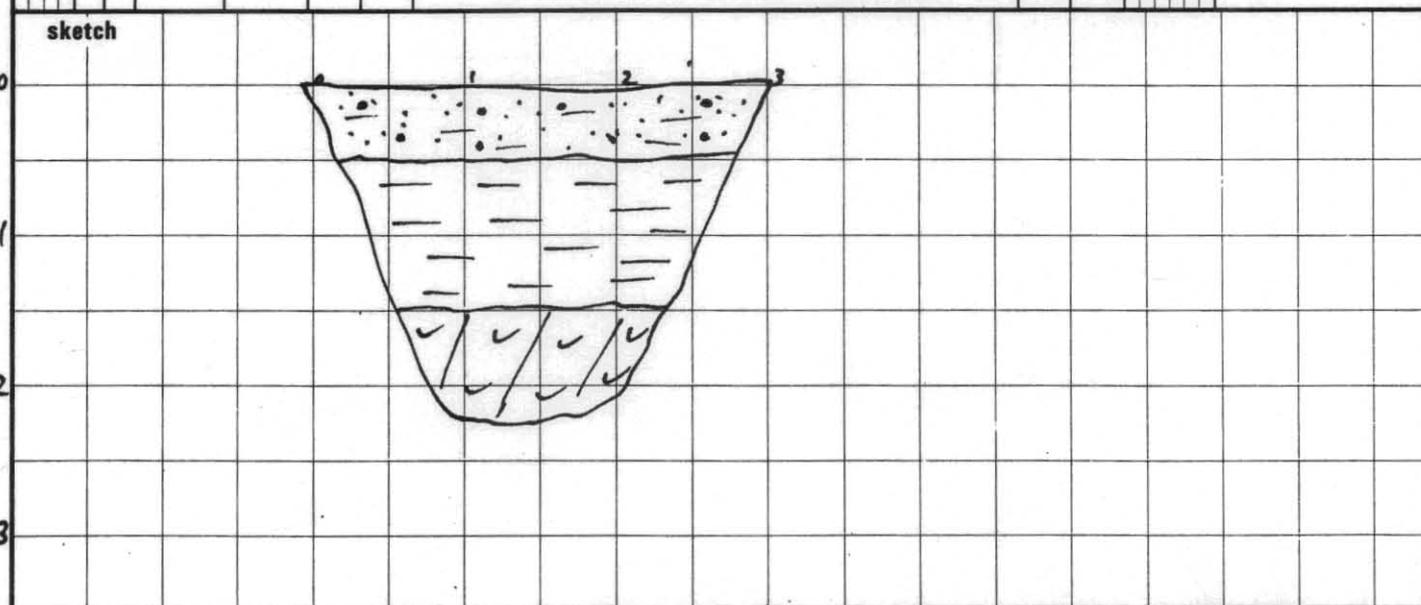
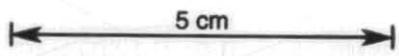
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sheet **1** of **1**

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type **pit commenced 16/12/86**
equipment **backhoe** pit completed **16/12/86**
R.L. logged by **L. Matthews**
excavation dimensions operator checked by

3 x 0.5 x 2.25

penetration 1 2 3	support	water	notes samples, tests	metres		graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency	density index	hand penetr- ometer kPa	structure, geology
				R.L.	depth								
			XRD			ML CL	SOIL - silty and CLAY - fractured plastic dark brown and mid brown mottled, iron oxide particles	D					
	NONE	NONE	XRD	1		CH	CLAY - brown and dark grey mottled plastic, soft zone at 0.9m	M W M	F S F				Testing sediments
			XRD	2			CLAY - Light brown friable with irregular texture	D-M		Fb			Deeply weathered basalt
							END - to required depth.						

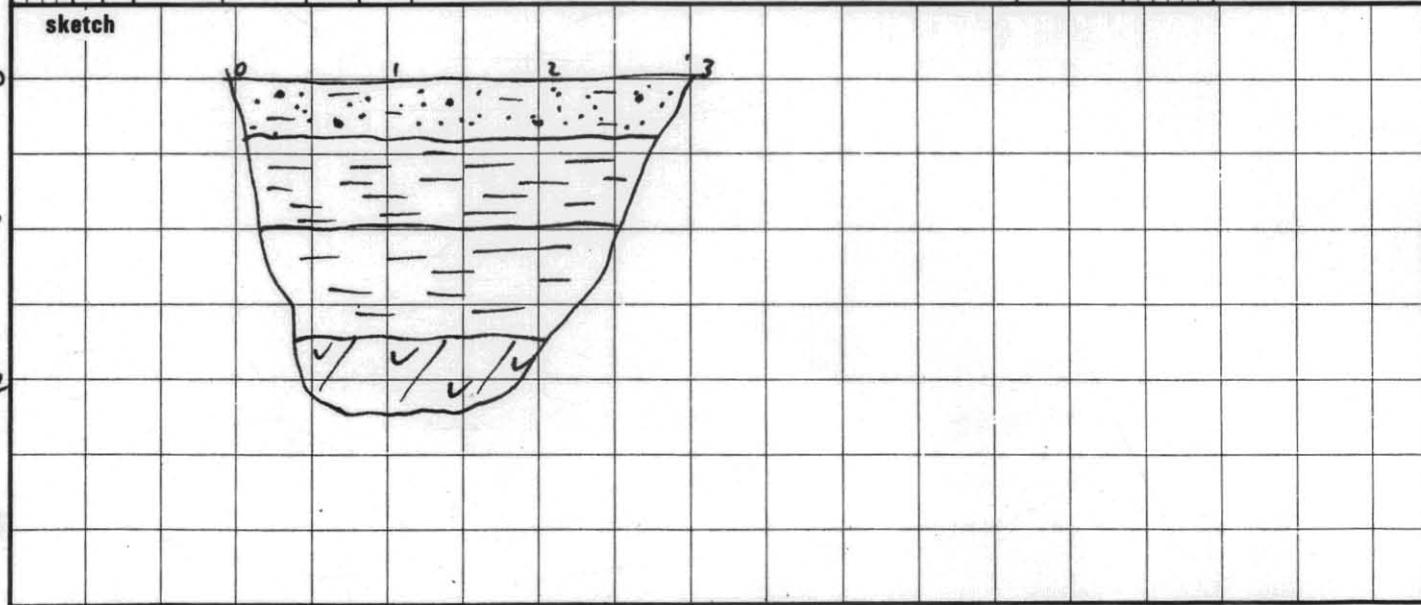
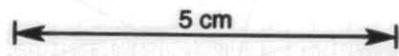


ENGINEERING LOG - EXCAVATION

excavation no. 6
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**
 co-ordinates _____ exposure type _____ pit commenced **16/12/88**
 R.L. _____ equipment **backhoe** pit completed **16/12/88**
 excavation dimensions **3 x 0.5 x 2.1m deep** operator _____ logged by **Ledwith**
 checked by _____

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa				structure, geology
								25	50	100	200	
				ML	SOIL - brown silty, grass vegetation oxide pisolites	D-M						
		XAD, A		CH	CLAY - mottled brown, slip surfaces and fractures	M-W	SF					Tertiary sediments
		XAD A		CH	CLAY - brown, plastic, some slip surfaces	M-W	F					Tertiary sediments
			2 1/2		CLAY - light brown friable with an igneous texture	D-M	Fb					Deeply weathered basalt
					END - to required depth							



ENGINEERING LOG - EXCAVATION

excavation no. 7
sheet 1 of 1

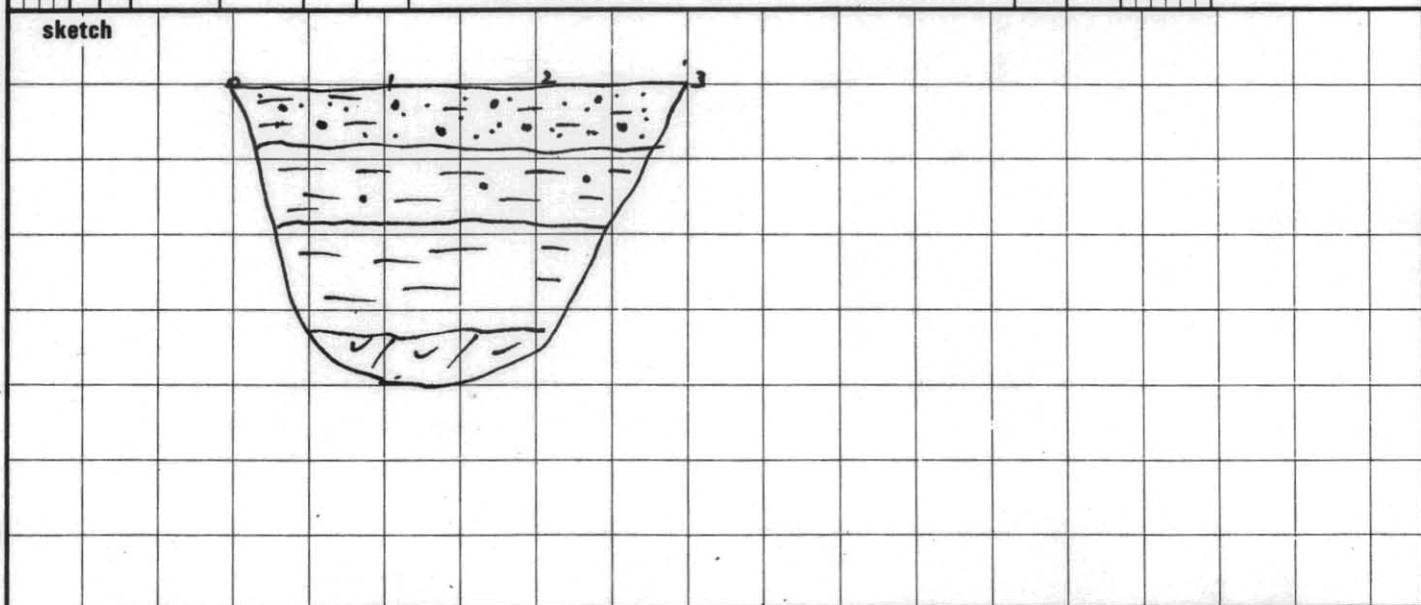
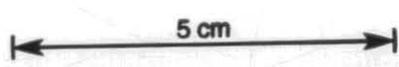
project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates
R.L.
excavation dimensions **3 x 0.5 x 2**

exposure type
equipment **backhoe**
operator

pit commenced **16/12/86**
pit completed **16/12/86**
logged by **L Matthews**
checked by

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
	NONE NONE				CL	SOIL - silty with some clay, iron oxide pisolites	D-M			
		XAD			CH	CLAY - dark brown, soft, fissured, some iron oxide pisolites	M-W	S		Tertiary Sediments
		XAD			CA	CLAY - brown, plastic, some slip surfaces (widely spaced)	M	F		Tertiary Sediments
				2			CLAY - light brown friable with an irregular texture	D-M	Fb	
						END - to required depth				



ENGINEERING LOG - EXCAVATION

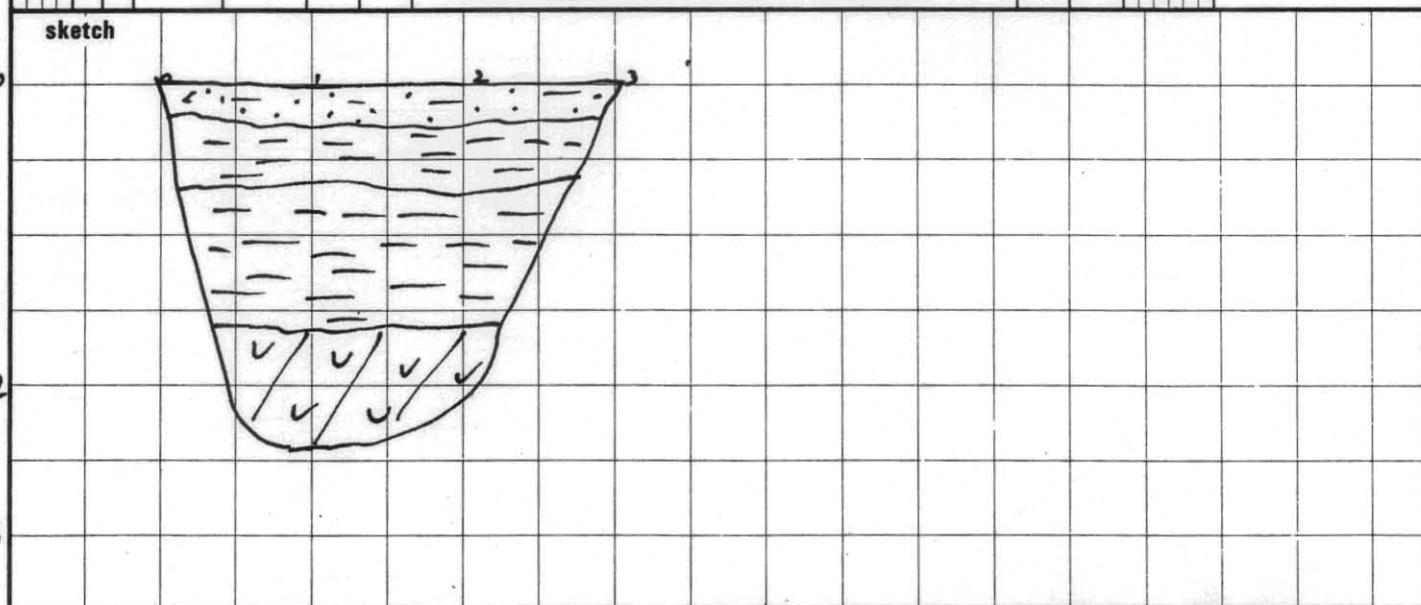
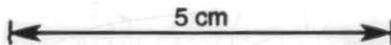
excavation no. 8
sheet 1 of 1

project **DROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type **Bachluc** pit commenced **16/12/86**
 equipment **Bachluc** pit completed **16/12/86**
 R.L. logged by **Kedathluc**
 excavation dimensions operator checked by

3x0.5x2.2

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition consistency density index	hand penetr- ometer kPa	structure, geology
				CL	SOIL - silty clay, grass roots	D		
		XRD A		CH	CLAY - mottled dark and mid brown friable to plastic	M	F	parting sediments
		XRD A	1	CH	CLAY - brown, plastic	M-V	F-S	parting sediments
		XRD	2		CLAY - light brown friable with an igneous texture	D-A	FB	deeply weathered basalt
			3		END - to required depth			



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ENGINEERING LOG - EXCAVATION

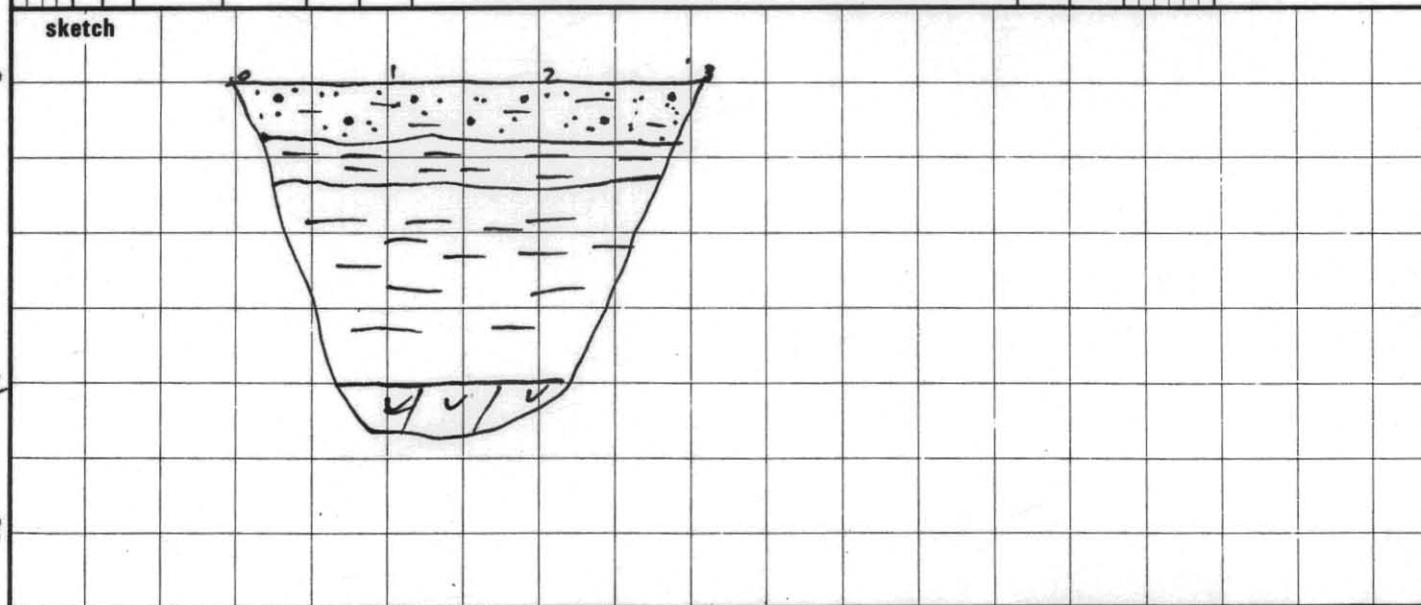
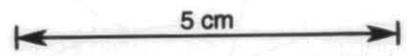
excavation no. 9
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type **backhoe** pit commenced **16/12/86**
 R.L. equipment **backhoe** pit completed **16/12/86**
 excavation dimensions operator **Delatours** logged by **Delatours**
 checked by

3 x 0.5 x 2.3 m deep

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
					CL	SOIL - brown silty clay, iron oxide pisolites plant roots				
		XRD			CH	CLAY - black and brown, silt, fissured some roots	M	F		
	NONE	XRD A	1		CH	CLAY - brown and ferruginous plastic, slip surfaces, silt at top	M-W	S		7 actives sediments
			2			CLAY - light brown fines, igneous texture	D-M	FB		deeply weathered basalt
						END - to required depth				
			3							



ENGINEERING LOG - EXCAVATION

excavation no. 10

sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

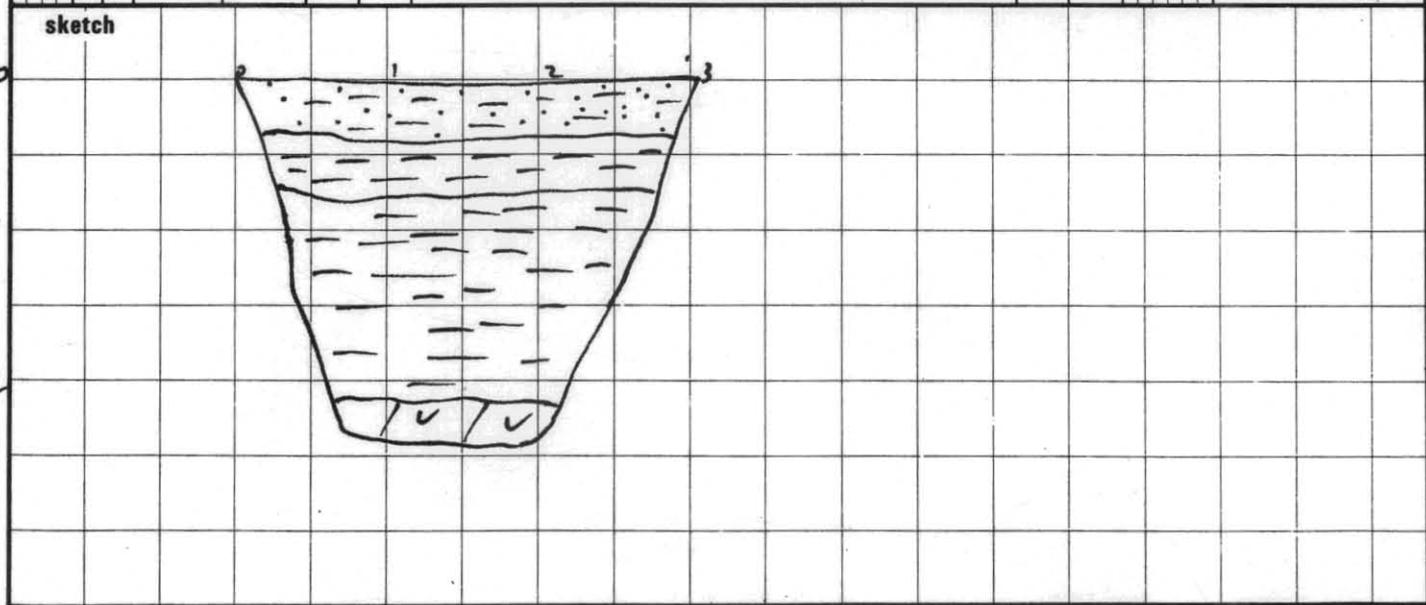
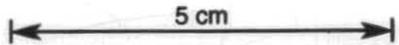
co-ordinates _____ exposure type _____ pit commenced **16/12/86**

R.L. _____ equipment **backhoe** pit completed **16/12/86**

excavation dimensions **3 x 0.5 x 2.4 m deep** operator _____ logged by **Lee Atkinson**

checked by _____

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
					ML	SOIL - brown, silty, grass roots				
		XRD A			CH	CLAY - mottled brown (dark and mid) plastic, fissured, some fracturing	D-M	F		
	NONE	XRD A	1		CH	CLAY - brownish and light greyish mottled, soft for first 0.6 m	M	S		Tertiary sediments
	NONE		2			CLAY - light brown fissile, igneous nature		F		deeply weathered basalt
			3			END - to required depth				



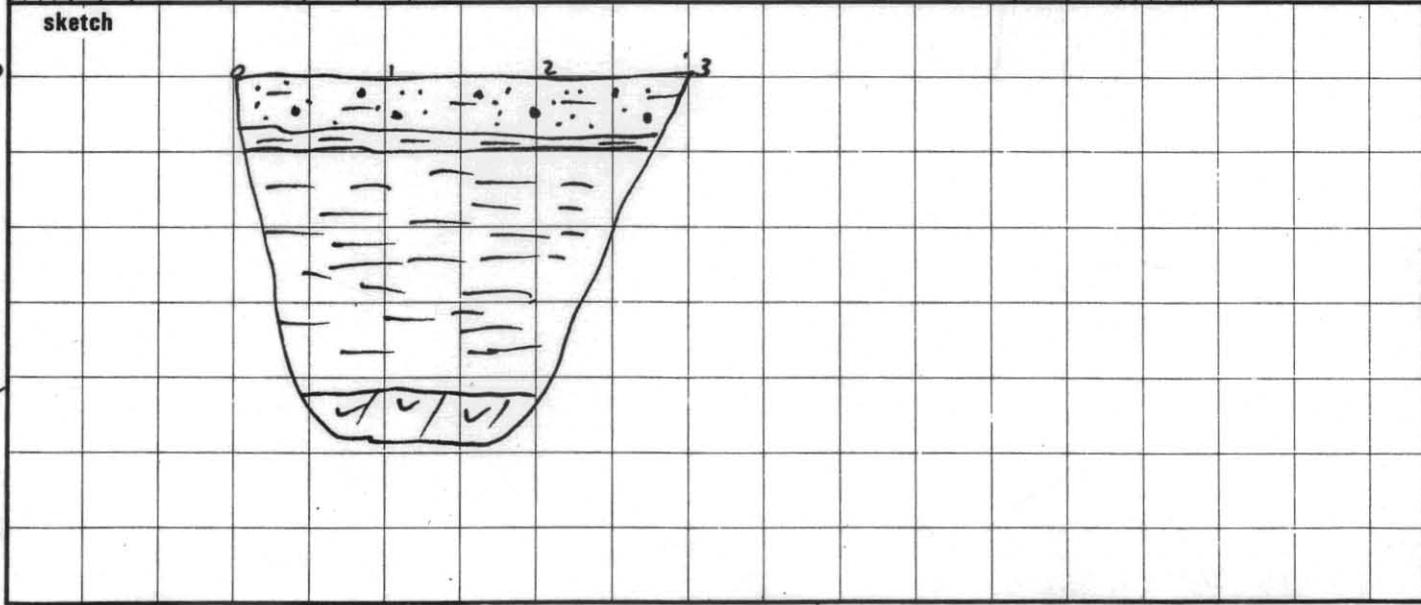
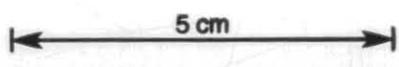
ENGINEERING LOG - EXCAVATION

excavation no. 11
sheet 1 of 1

project **PROPOSED WOOD STORE - WEBSTER LTD** location **WESTERN JUNCTION**
 co-ordinates exposure type pit commenced **16/12/86**
 equipment **backhoe** pit completed **16/12/86**
 R.L. logged by **L. Lattin**
 excavation dimensions operator checked by

3 x 0.5 x 2.45 m deep

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
					MC	SOIL - silty with iron oxide particles				
		XRD			CA	CLAY - brown mottled fissured	M			
		XRD?	1		CH	CLAY - brown plastic fissured	M	F		Terrestrial sediments
			2			CLAY - light brown friable igneous texture	D-A	Fb		Deeply weathered basalt
			3			END - to required depth				



ENGINEERING LOG - EXCAVATION

excavation no. 12
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

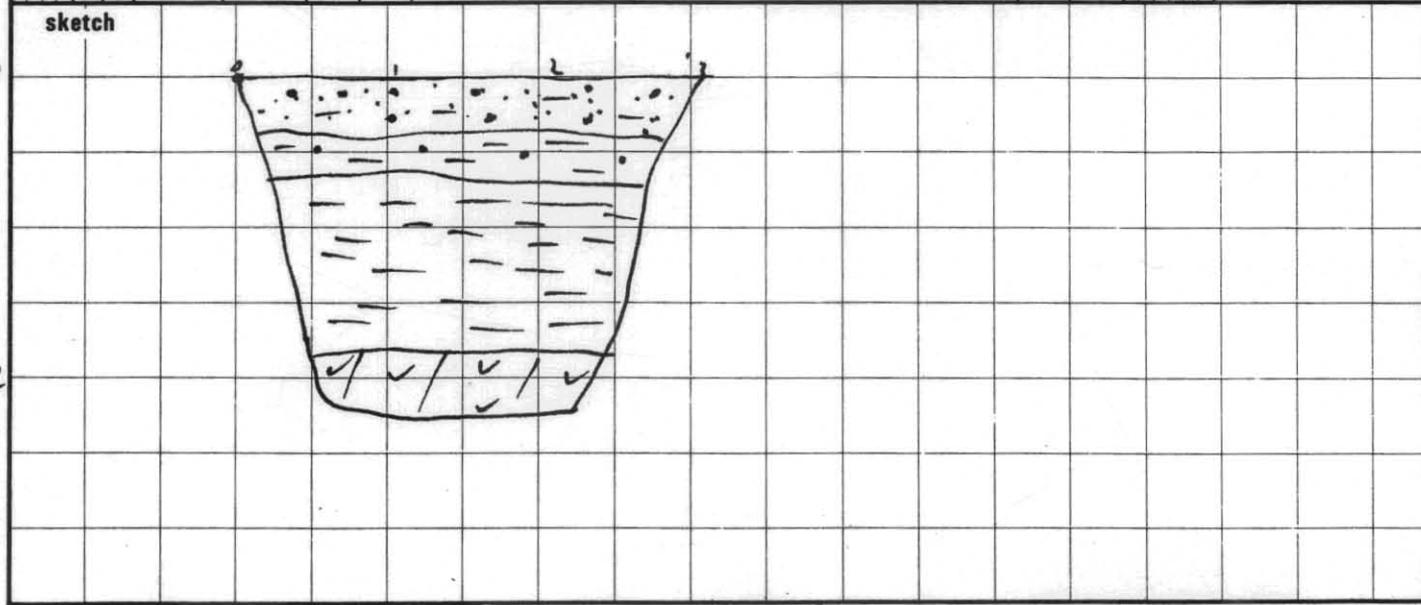
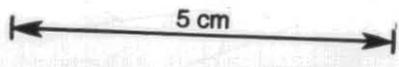
co-ordinates _____ exposure type _____ pit commenced **16/12/86**

R.L. _____ equipment **backhoe** pit completed **16/12/86**

excavation dimensions **3 x 0.5 x 2.2** operator _____ logged by **S. Lattimore**

checked by _____

penetration 1 2 3	support water	notes samples, tests	metres		graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
			R.L.	depth							
	NONE NONE					ML	SOIL - silty, iron oxide pisolites				
		XLD A				CH	CLAY - dark grey and black mottled some iron oxide pisolites	M			
		XRD A				CH	CLAY - brown, plastic	M	F		Parting sediments
							CLAY - light brown, friable with igneous texture	M	Fb		Deeply weathered basalt
							END - to required depth				



ENGINEERING LOG - EXCAVATION

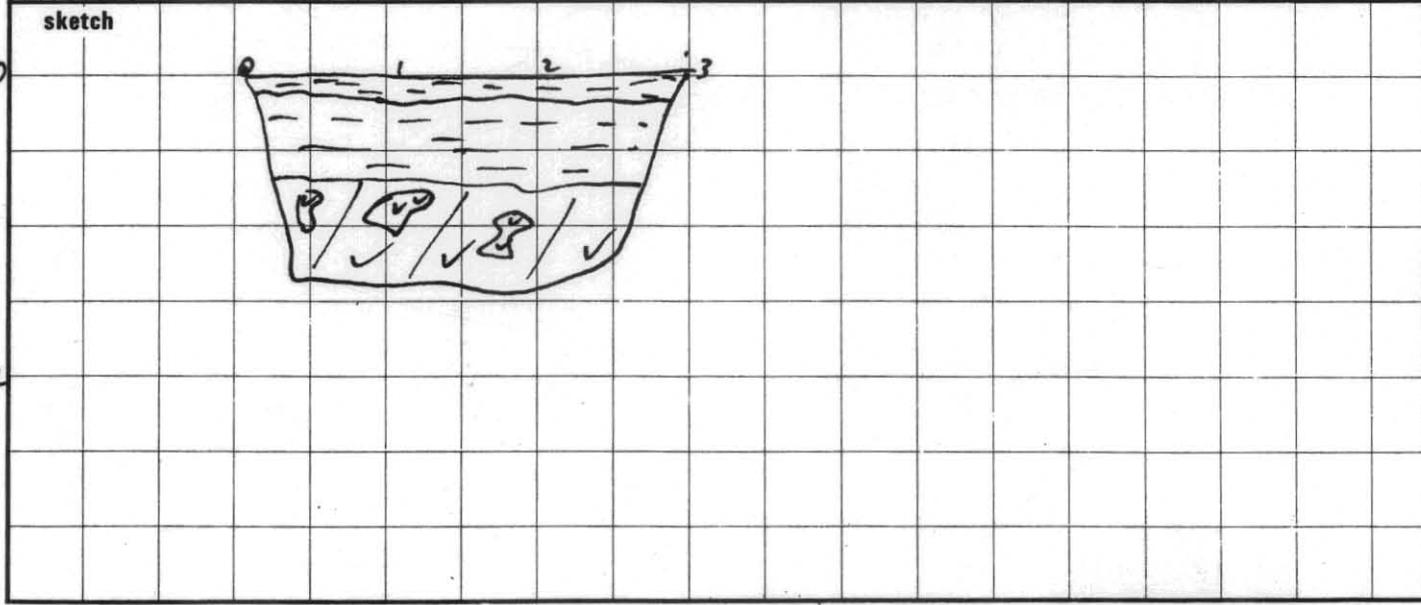
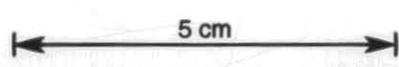
excavation no. 13
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates exposure type pit commenced **16/12/86**
equipment **backhoe** pit completed **16/12/86**
R.L. logged by **S. Lattimore**
excavation dimensions operator checked by

3 x 0.5 x 1.4 m deep

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
				OH	OH	SOIL - black, clayey				
		XRD		CH	CH	CLAY - dark grey, plastic	M	FS		Tertiary sediments
			1			CLAY AND ROCK - light brown friable clay with igneous texture, hard boulders	D-M	Fb		Weathered basalt with unweathered boulders
			2			END - to required depth				



ENGINEERING LOG - EXCAVATION

excavation no. 14
sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

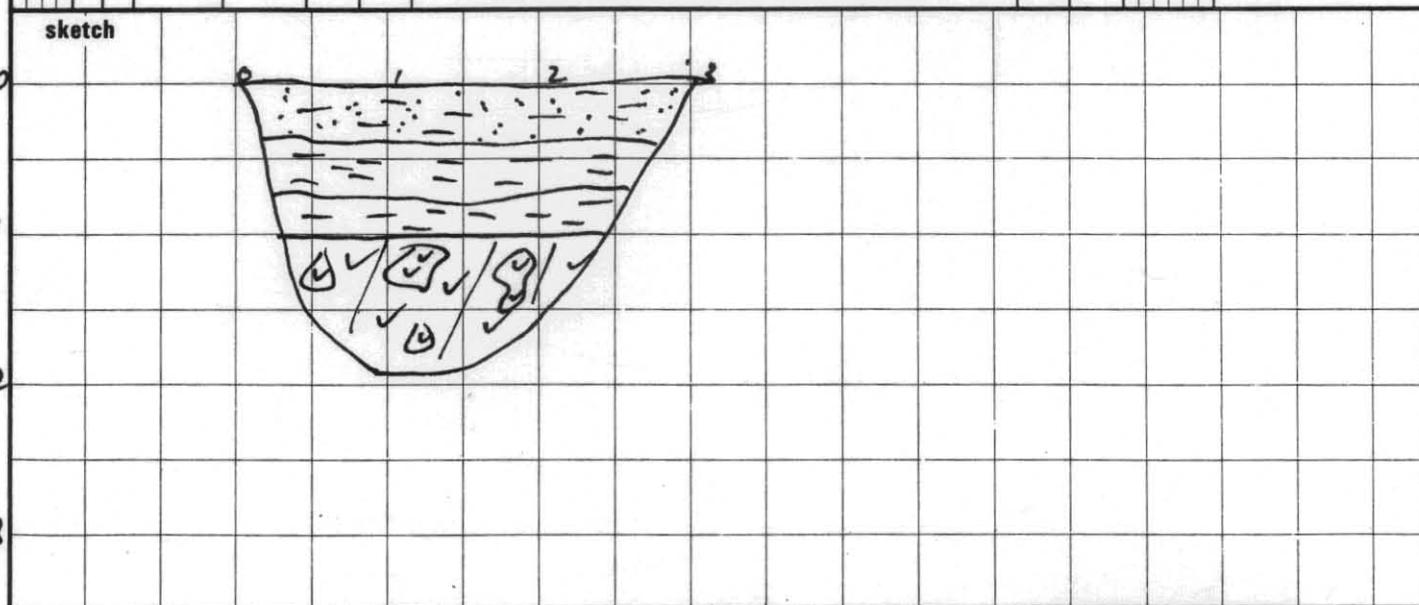
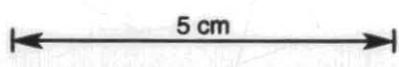
co-ordinates _____ exposure type _____ pit commenced **16/12/86**

R.L. _____ equipment **backhoe** pit completed **16/12/86**

excavation dimensions **3 x 0.5 x 1.8** operator _____ logged by **Redathines**

checked by _____

penetration 1 2 3	support	water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency	density index	hand penetr- ometer kPa 25 50 100 200 400	structure, geology
						CL	SOIL - silty fine, clay					
			XRD			CH	CLAY - flash and brown mottled plastic, fissures.	M	S-F			
			XRD			CH	CLAY - fine brown, plastic	M	F			
						CR	CLAY AND ROCK - light brown friable clay and boulders of rock					Weathered basalt with unweathered boulders
				2			END - to required depth					
				3								



ENGINEERING LOG - EXCAVATION

excavation no. 15

sheet 1 of 1

project **PROPOSED WOOL STORE - WEBSTER LTD** location **WESTERN JUNCTION**

co-ordinates _____ exposure type _____ pit commenced **16/12/86**

R.L. _____ equipment **backhoe** pit completed **16/12/86**

excavation dimensions **3 x 0.5 x 1.8** operator _____ logged by **Sellatitens**

checked by _____

penetration 1 2 3	support water	notes samples, tests	metres R.L. depth	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour secondary and minor components	moisture condition	consistency density index	hand penetr- ometer kPa	structure, geology
	NONE NONE			CL	SOIL - silty clay, grass roots					
		XAD A		CH	CLAY - black, plastic, fractious and fissured		F			
		XAD A		CH	CLAY - brown, becoming lighter with depth, plastic, soft zones	M	F			Testing sediments
		XAD A					S			
						CLAY AND ROCK - light brown friable clay and boulders of rock		F		
					END - to required depth					

