DYNAMIC CONE PENETRATION TEST

REPORT

TEMPORARY OFFICE SHED

MFMRD

Prepared by:

ENGR. KAIEA COLLINS
MYLANTA SERVICES
Nei Kaue, Bikenibeu, Tarawa, KI

04 JANUARY 2024

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1.0 Introduction

This report represents the result of a Dynamic Cone Penetration Test (DCPT) undertaken for a proposed Temporary Office Shed for the Ministry of Fisheries & Marine Resource Development (MFMRD). The investigation was commissioned in an email dated 19th December 2023 by the MFMRD and was undertaken in accordance with the Australian Standard AS-1289 Methods of Testing Soils for Engineering Purposes by qualified engineers from Mylanta Service.

The aim of the investigation was to assess the subsurface soil and groundwater condition across the site in order to provide comments and recommendation on:

- The geotechnical suitability of the site for the proposed office.
- The depth of groundwater, if encountered.
- Site preparation, compaction, earthworks, and remediation, if required, so as to allow the proposed development.
- Appropriate foundation system(s) for the proposed structure.
- Foundation design parameters including an indicative California Bearing Ratio, (CBR) value based on field testing, including the allowable bearing pressure, (ABP) of the site at foundation depth.

2.0 Investigation

2.1 Methodology

The investigation includes a site walkover to observe the topographic setting within which the site is located, 32 identified spots of dynamic cone penetration test, (DCPT) to determine the allowable bearing capacity of the proposed site. 9 of which, spot 21-29, was not tested due to the obstruction of an existing old building

The purpose of the DCPT was to measure the equivalent penetration index values in the subsoil units in order to determine the penetration resistance of the subsoil, so as to calculate the CBR and the ABP. In this test, a 1000mm length of 16mm diameter steel rod with a 20mm diameter cone tip is driven into the ground using a 9kg hammer with a drop height of 510mm. Blow counts were recorded as the whole number of blows for successive 100mm penetrations in accordance with AS 1289 method 6.3.2.

The investigation was undertaken on the 30th of December 2023 and 2nd of January 2024 by Mr Kaiea Collins and associates from Mylanta Services.

2.2 Result

2.2.1 Site Description

The proposed site is located at Ambo Village, Tarawa. The site is an open field with few vegetation adjacent to a telecommunication tower and an existing old building situated within the proposed structure footprints.

Groundwater depth was not found during the test and is however identified to be lower than 1m.

The site's topography is flat surfaced with low field grasses, shrubs and coconut trees. Ground penetration resistance generally vary and are described in section 2.2.2.

2.2.2 Ground Penetration Resistance

The ground penetration resistance is given in DCPT results the as in Appendix 2. The table illustrations are depths with blows/100mm and their corresponding correlation to CBR, and ABP.

The allowable bearing pressure of the identified weak layers range from 40-80 kilopascal, (kPa), whilst the strongest layers can come up to and estimated ABP of 180 kPa. But our concern are the underlying weak layers of soil which will support the building.

3.0 Comments & Recommendations

3.1 Site Suitability

The minority of the ground conditions are generally considered suitable for the proposed design, which will not impose any significant geotechnical constraints. However, the weak subsoil layers encountered at Spot # 3-6, 11-15, 19 and 30 will required densification to form suitable subgrade material for the proposed design.

Therefore, from a geotechnical standpoint, the land is physically capable of development for the proposed Temporary Office Shed provided that the provisions outlined in the subsequent subsections of the report are taken into consideration, and the recommendations implemented.

3.2 Groundwater Level

The depth of ground water at the time of investigations was lower than 1m. The time and date of testing was ~2.00pm, 30th of December 2023 and 2nd of January 2024. And 2:00pm is low tide on the Island according to the Tide Calendar from the MET. Thus, the groundwater pressure/ hydro-static uplift has no significant impact on the proposed foundation design.

3.3 Site Preparation

All deleterious material, including topsoil and vegetation should be stripped from building envelopes. Up to 7 numbers of coconut trees were identified to be stripped. Topsoil could be re-used for landscaping purposes only.

Tree roots remaining from any clearing operations within the proposed building envelopes should be completely removed and the excavation backfilled with material of similar geotechnical properties to the surrounding ground and compacted to achieve a penetration index equal to or greater than three (≥3) blow/100 mm.

3.5 Subsoil Densification

Densification of subsoil at Spot # 3-6, 11-15, 19 and 30 is crucial. It is recommended that the sites are proof rolled using a heavy (minimum of 14 tonne deadweight) vibrating smooth drum roller (if available), alternatively uses vibro-compacting plates. Any areas that show signs of excessive deformation during compaction should be continually compacted until deformation ceases, or

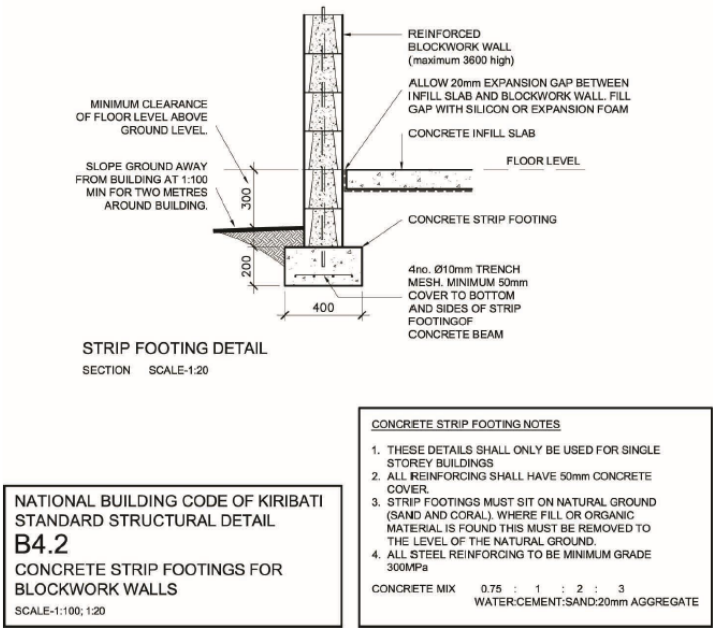
alternatively, the weak materials be removed and replaced with suitable structural filling, compacted at every 100-150 mm layer using a plate compactor until footing depth is reached.

3.4 Foundation Design

Unless the current proposed raft footing system has been analysed and designed according to AS 2870-2011, the footing shall be maintained. Otherwise, the following foundation design standard from the Kiribati National Building Code 2016, (KNBC) shall be adopted, Figure 1. This is one of the minimum shallow footing standards designed in accordance to AS 2870-201, which applies to double storey residential and small sized offices and the like classified as Class 2 under the Building Code of Kiribati.

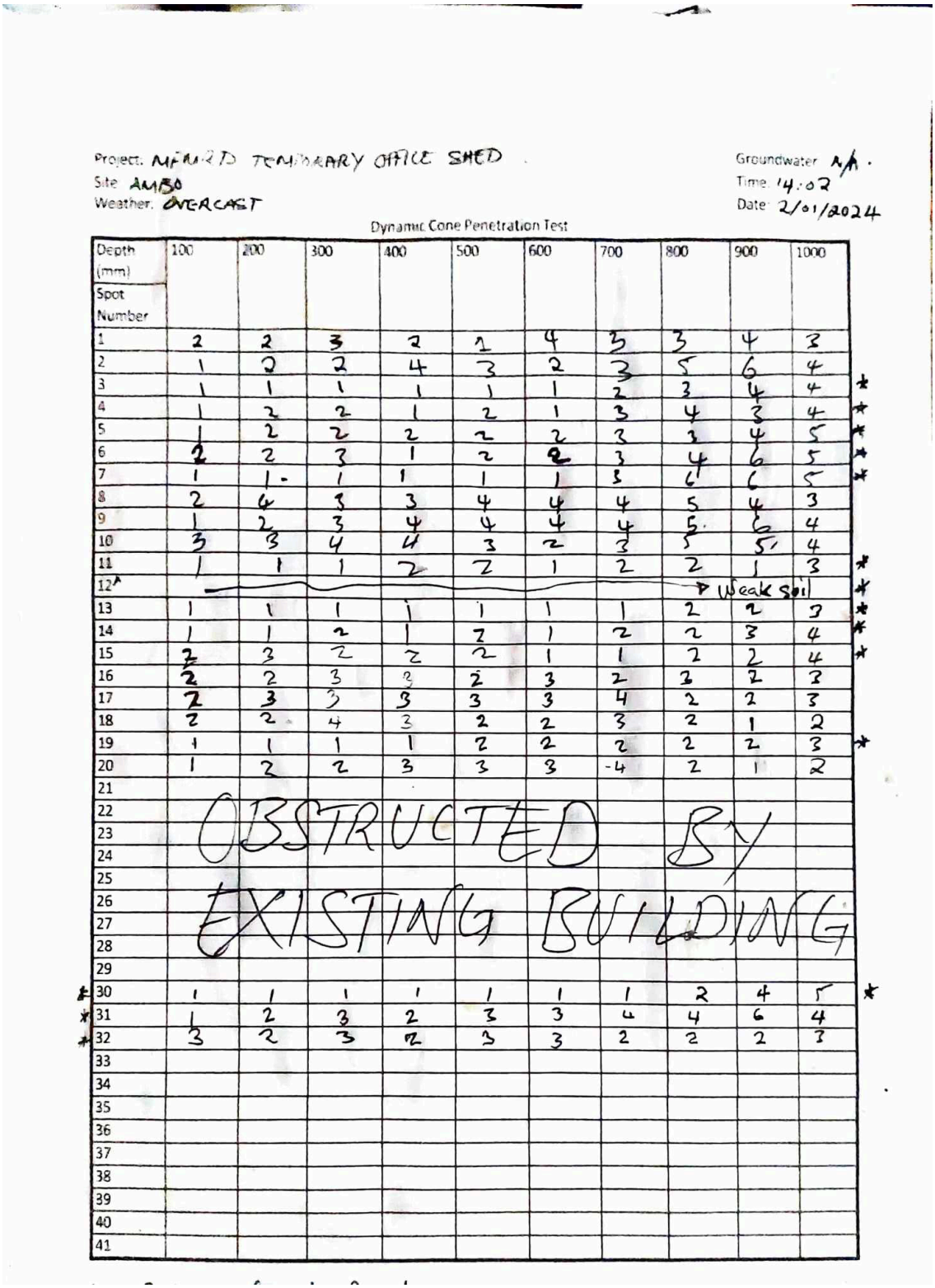
Conversely, the pier footing is 1.5 meters below the surface. In this case, it is strongly advised that a competent engineer perform a proper structural analysis and design so that the pier footing can be modified in accordance with the site's specifications.

FIGURE 1: STRIP FOOTING STANDARD STRUCTURAL DETAIL (KNBC, 2016)



APPENDIX

4.1 Appendix 1: Field Test Notes



Project: MFMRD TEMPORARY OFFICE SHED
Site: AMBO
Weather: OVERCAST

Groundwater: N/A
Time: 14:02
Date: 2/01/2024

Dynamic Cone Penetration Test

Depth (mm) / Spot Number	100	200	300	400	500	600	700	800	900	1000	
1	2	2	3	2	1	4	3	3	4	3	
2	1	2	2	4	3	2	3	5	6	4	
3	1	1	1	1	1	1	2	3	4	4	*
4	1	2	2	1	2	1	3	4	3	4	*
5	1	2	2	2	2	2	3	3	4	5	*
6	2	2	3	1	2	2	3	4	6	5	*
7	1	1	1	1	1	1	3	6	6	5	*
8	2	4	3	3	4	4	4	5	4	3	
9	1	2	3	4	4	4	4	5	6	4	
10	3	3	4	4	3	2	3	5	5	4	
11	1	1	1	2	2	1	2	2	1	3	*
12								→ Weak soil			*
13	1	1	1	1	1	1	1	2	2	3	*
14	1	1	2	1	2	1	2	2	3	4	*
15	2	3	2	2	2	1	1	2	2	4	*
16	2	2	3	3	2	3	2	3	2	3	
17	2	3	3	3	3	3	4	2	2	3	
18	2	2	4	3	2	2	3	2	1	2	
19	1	1	1	1	2	2	2	2	2	3	*
20	1	2	2	3	3	3	-4	2	1	2	
21											
22	OBSTRUCTED BY										
23											
24											
25											
26	EXISTING BUILDING										
27											
28											
29											
30	1	1	1	1	1	1	1	2	4	5	*
31	1	2	3	2	3	3	4	4	6	4	*
32	3	2	3	2	3	3	2	2	2	3	*
33											
34											
35											
36											
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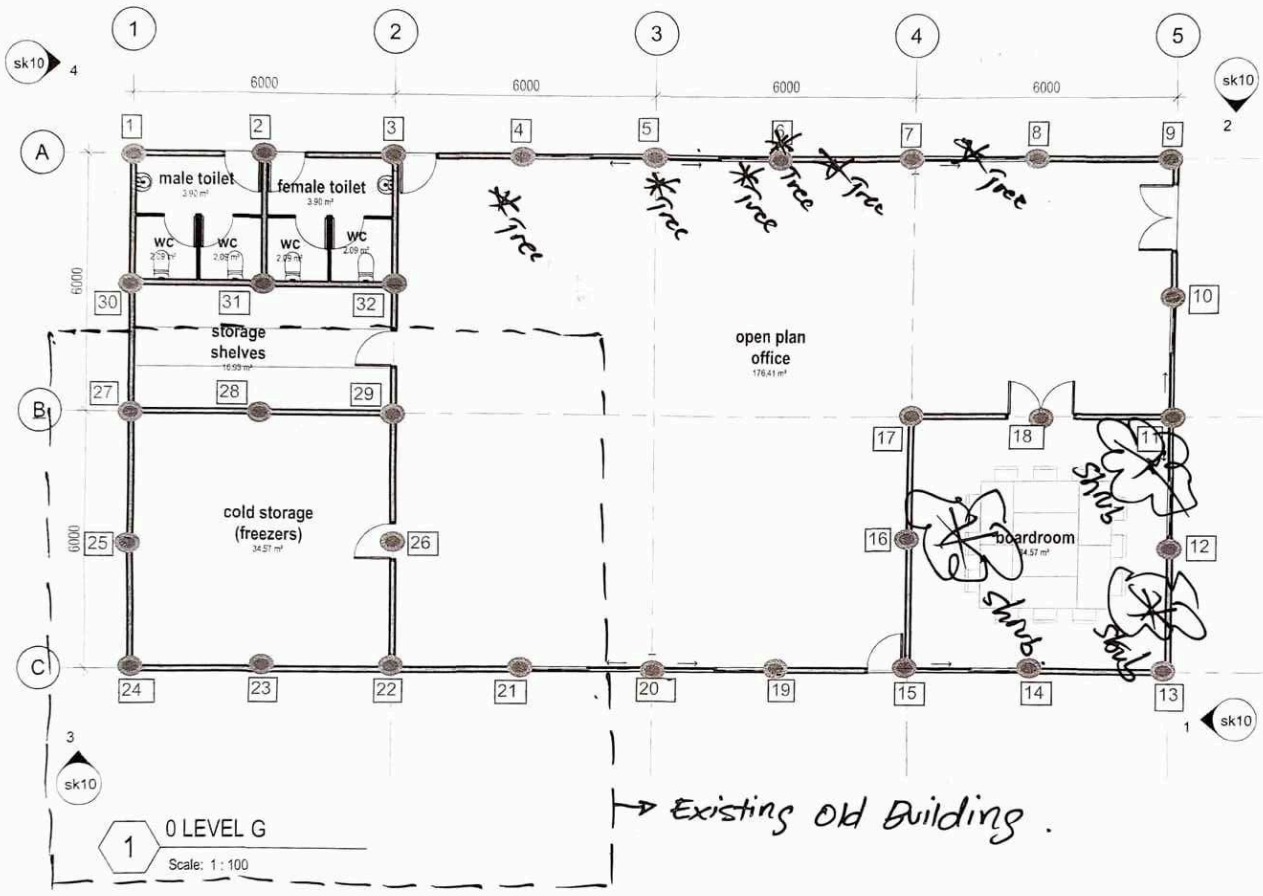
39											
40											
41											



DCP Test Spots

Temporary Office Shed

CLIENT: MFMRD
PROJECT NO: GB2309

DWG TITLE:
FLOOR LAYOUT

ARCHITECT: tteb
ENGINEER: tteb
DATE: 17/11/2023
SCALE: 1 : 100

DRAWING NUMBER: sk01
ISSUE: for tender

4.2 Appendix 2: Test Results with CBR & ABP

DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	MFMRD
Project	Temporary Office Shed
Location	Ambo
Operator	Kaiea Collins + Mylantas' Crew
Date	23/12/2023
Job #	#23-010

CBR = California Bearing Ratio
q(all) = Allowable Bearing Preassure (kPa)

Spot #	1
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70
200	2	3.5	70
300	3	6	80
400	2	3.5	70
500	1	2	40
600	4	8	115
700	3	6	80
800	3	6	80
900	4	8	115
1000	3	6	80

Spot #	2
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	2	3.5	70
300	2	3.5	70
400	4	8	115
500	3	6	80
600	2	3.5	70
700	3	6	80
800	5	10	150
900	6	12	180
1000	4	8	115

Spot #	3
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	1	2	40
300	1	2	40
400	1	2	40
500	1	2	40
600	1	2	40
700	2	3.5	70
800	3	6	80
900	4	8	115
1000	4	8	115

Spot #	4
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	2	3.5	70
300	2	3.5	70
400	1	2	40
500	2	3.5	70
600	1	2	40
700	3	6	80
800	4	8	115
900	3	6	80
1000	4	8	115

Spot #	5
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	2	3.5	70
300	2	3.5	70
400	2	3.5	70
500	2	3.5	70
600	2	3.5	70
700	3	6	80
800	3	6	80
900	4	8	115
1000	5	10	150

Spot #	6
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70
200	2	3.5	70
300	3	6	80
400	1	2	40
500	2	3.5	70
600	2	3.5	70
700	3	6	80
800	4	8	115
900	6	12	180
1000	5	10	150

Spot #	7
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	1	2	40
300	1	2	40
400	1	2	40
500	1	2	40
600	1	2	40
700	3	6	80
800	6	12	180
900	6	12	180
1000	5	10	150

Spot #	8
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70
200	4	8	115
300	3	6	80
400	3	6	80
500	4	8	115
600	4	8	115
700	4	8	115
800	5	10	150
900	4	8	115
1000	3	6	80

Spot #	9
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	2	3.5	70
300	3	6	80
400	4	8	115
500	4	8	115
600	4	8	115
700	4	8	115
800	5	10	150
900	6	12	180
1000	4	8	115

Spot #	10
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	3	6	80
200	3	6	80
300	4	8	115
400	4	8	115
500	3	6	80
600	2	3.5	70
700	3	6	80
800	5	10	150
900	5	10	150
1000	4	8	115

Spot #	11
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	1	2	40
300	2	3.5	70
400	2	3.5	70
500	1	2	40
600	2	3.5	70
700	2	3.5	70
800	1	2	40
900	3	6	80
1000	2	3.5	70

Spot #	12
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	1	2	40
300	1	2	40
400	1	2	40
500	1	2	40
600	1	2	40
700	1	2	40
800	1	2	40
900	1	2	40
1000	1	2	40

Spot #	13
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40

Spot #	14
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40

Spot #	15
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70

Spot #	16
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70

200	1	2	40
300	1	2	40
400	1	2	40
500	1	2	40
600	1	2	40
700	1	2	40
800	2	3.5	70
900	2	3.5	70
1000	3	6	80

200	1	2	40
300	2	3.5	70
400	1	2	40
500	2	3.5	70
600	1	2	40
700	2	3.5	70
800	2	3.5	70
900	3	6	80
1000	4	8	115

200	3	6	80
300	2	3.5	70
400	2	3.5	70
500	2	3.5	70
600	1	2	40
700	1	2	40
800	2	3.5	70
900	2	3.5	70
1000	4	8	115

200	2	3.5	70
300	3	6	80
400	3	6	80
500	2	3.5	70
600	3	6	80
700	2	3.5	70
800	3	6	80
900	2	3.5	70
1000	3	6	80

Spot #	17
Location	

Spot #	18
Location	

Spot #	19
Location	

Spot #	20
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70
200	3	6	80
300	3	6	80
400	3	6	80
500	3	6	80
600	3	6	80
700	4	8	115
800	2	3.5	70
900	2	3.5	70
1000	3	6	80

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	2	3.5	70
200	2	3.5	70
300	4	8	115
400	3	6	80
500	2	3.5	70
600	2	3.5	70
700	3	6	80
800	2	3.5	70
900	1	2	40
1000	2	3.5	70

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	1	2	40
300	1	2	40
400	1	2	40
500	2	3.5	70
600	2	3.5	70
700	2	3.5	70
800	2	3.5	70
900	2	3.5	70
1000	3	6	80

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	2	3.5	70
300	2	3.5	70
400	3	6	80
500	3	6	80
600	3	6	80
700	4	8	115
800	2	3.5	70
900	1	2	40
1000	2	3.5	70

Spot #	30
Location	

Spot #	31
Location	

Spot #	32
Location	

Spot #	33
Location	

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	1	2	40
300	1	2	40
400	1	2	40
500	1	2	40
600	1	2	40
700	1	2	40
800	2	3.5	70
900	4	8	115
1000	5	10	150

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	1	2	40
200	2	3.5	70
300	3	6	80
400	2	3.5	70
500	3	6	80
600	3	6	80
700	4	8	115
800	4	8	115
900	6	12	180
1000	4	8	115

Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100	3	6	80
200	2	3.5	70
300	3	6	80
400	2	3.5	70
500	3	6	80
600	3	6	80
700	2	3.5	70
800	2	3.5	70
900	2	3.5	70
1000	3	6	80

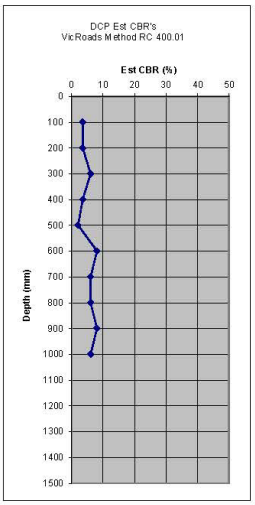
Depth mm	Blows / 100 mm	Est CBR	Est q(all)
100		#N/A	#N/A
200		#N/A	#N/A
300		#N/A	#N/A
400		#N/A	#N/A
500		#N/A	#N/A
600		#N/A	#N/A
700		#N/A	#N/A
800		#N/A	#N/A
900		#N/A	#N/A
1000		#N/A	#N/A

4.3 Appendix 3: CBR & ABP Graphs

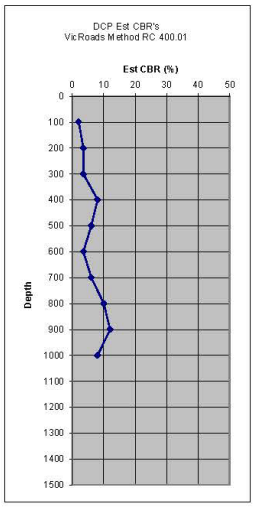
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	MFMRD
Project	Temporary Office Shed
Location	Ambo
Operator	Kaiea Collins + Mylantas' (
Date	23/12/2023
Job #	=Input!C10

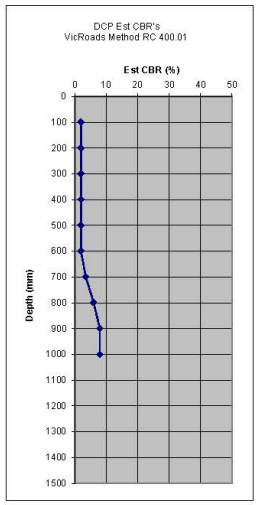
Spot #	1
Location	



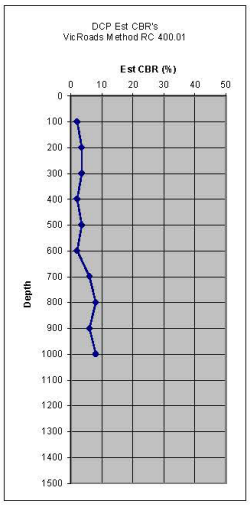
Spot #	2
Location	



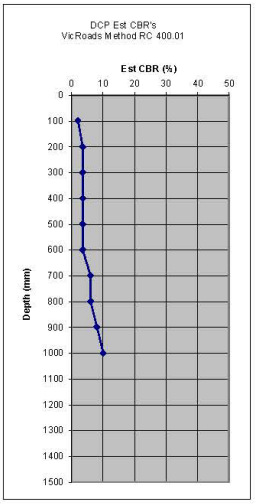
Spot #	3
Location	



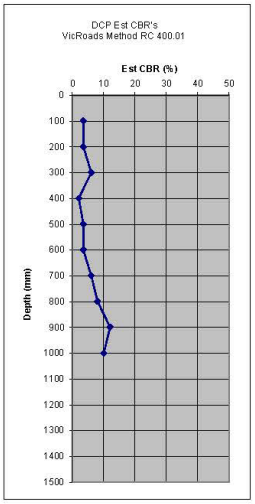
Spot #	4
Location	



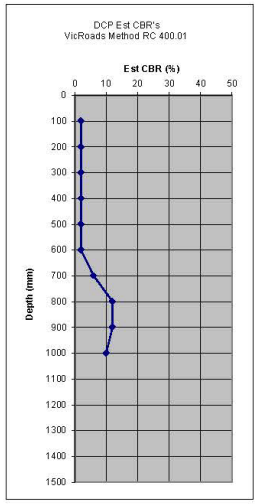
Spot #	5
Location	



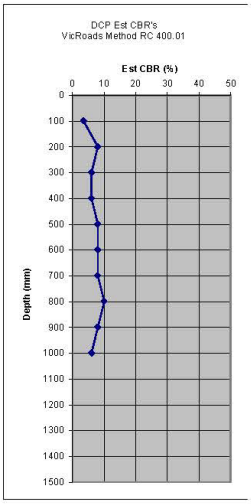
Spot #	6
Location	



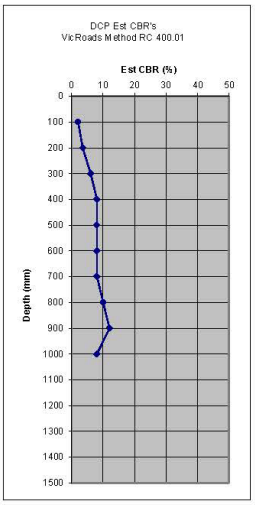
Spot #	7
Location	



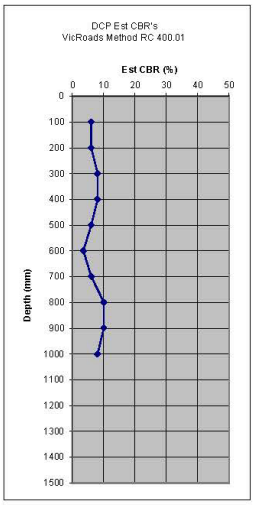
Spot #	8
Location	



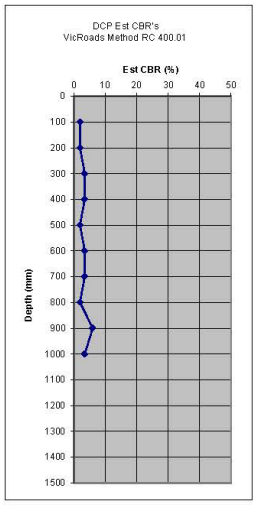
Spot #	9
Location	



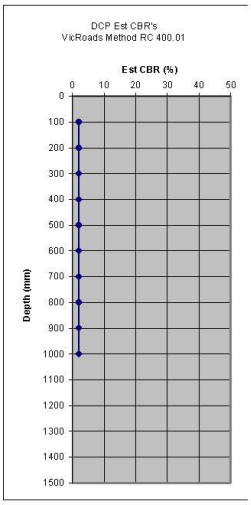
Spot #	10
Location	



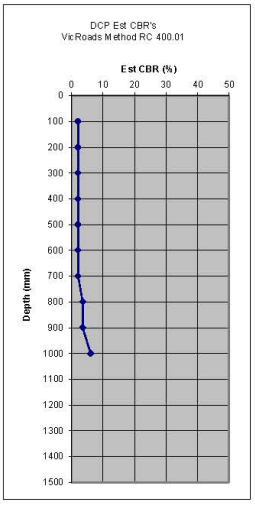
Spot #	11
Location	



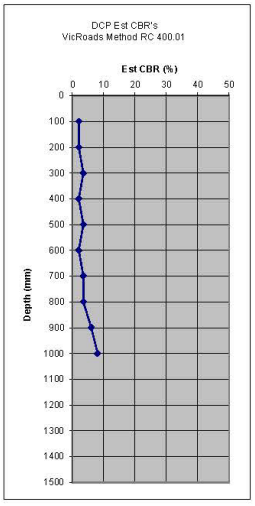
Spot #	12
Location	



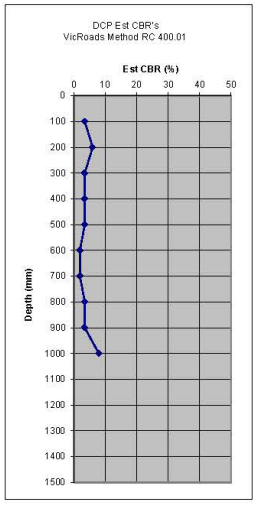
Spot #	13
Location	



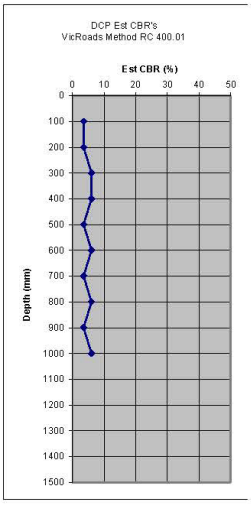
Spot #	14
Location	



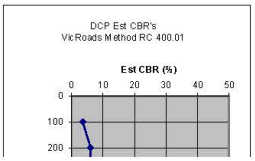
Spot #	15
Location	



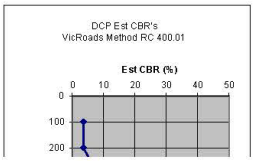
Spot #	16
Location	



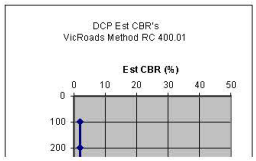
Spot #	17
Location	



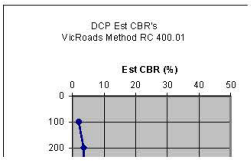
Spot #	18
Location	

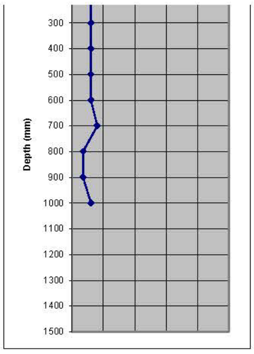


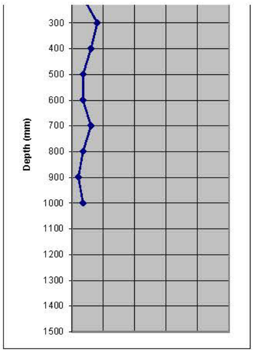
Spot #	19
Location	

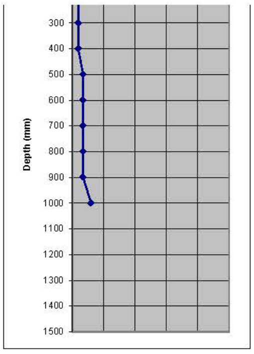


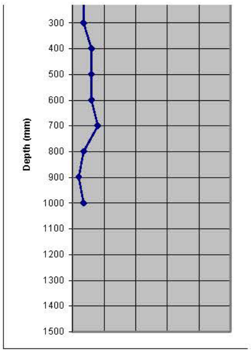
Spot #	20
Location	









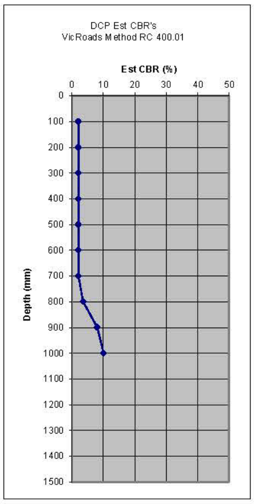


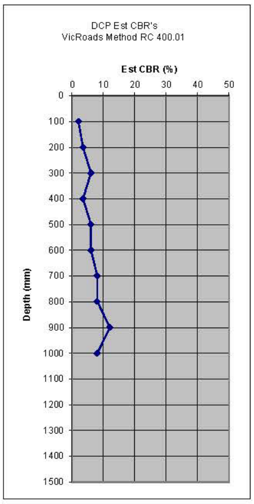
Spot #	30
Location	

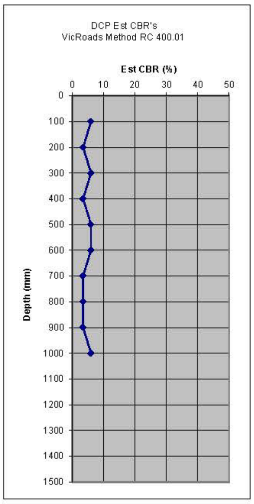
Spot #	31
Location	

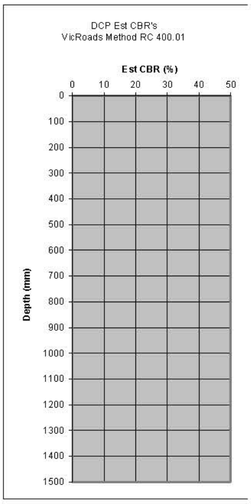
Spot #	32
Location	

Spot #	33
Location	





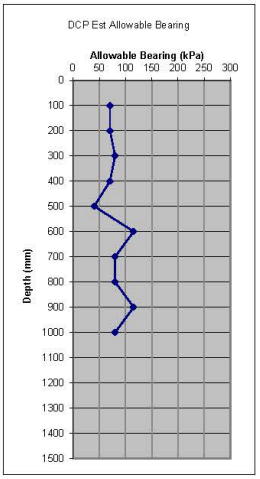




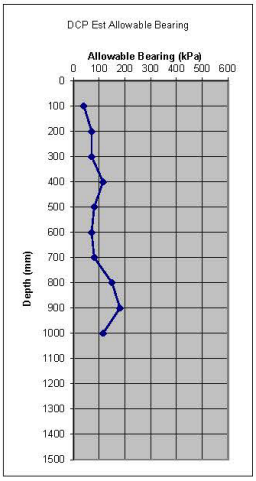
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	MFMRD
Project	Temporary Office Shed
Location	Ambo
Operator	Kaiea Collins + Mylantas'
Date	23/12/2023
Job #	=Input!C10

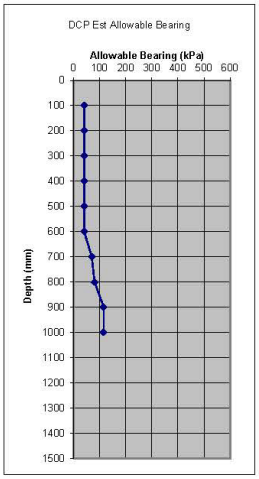
Spot #	1
Location	



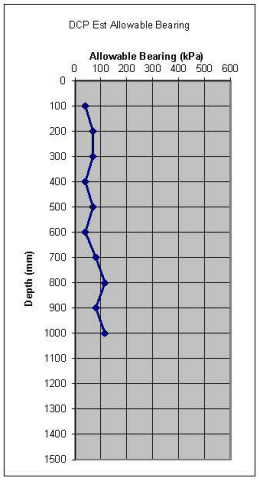
Spot #	2
Location	



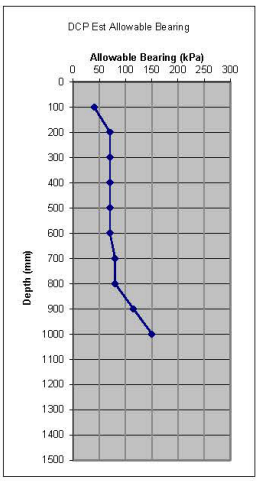
Spot #	3
Location	



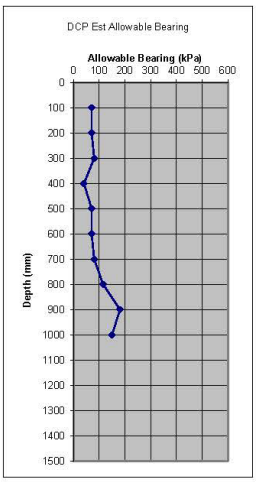
Spot #	4
Location	



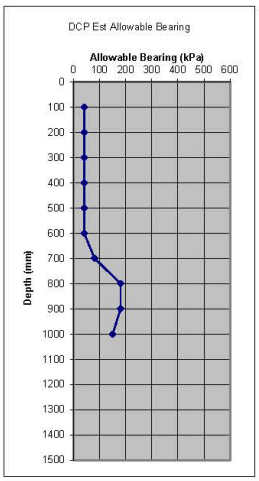
Spot #	5
Location	



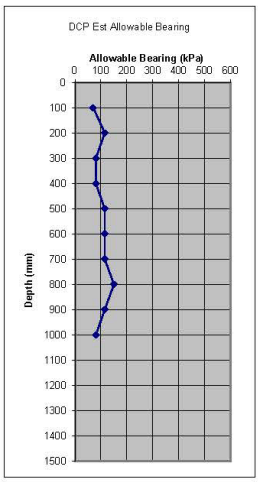
Spot #	6
Location	



Spot #	7
Location	



Spot #	8
Location	



Spot #	9

Spot #	10

Spot #	11

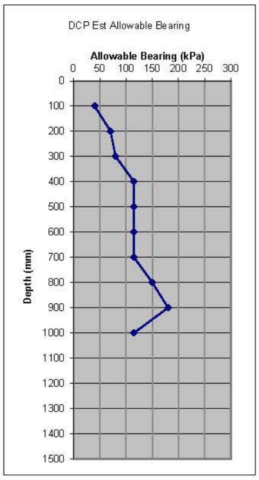
Spot #	12

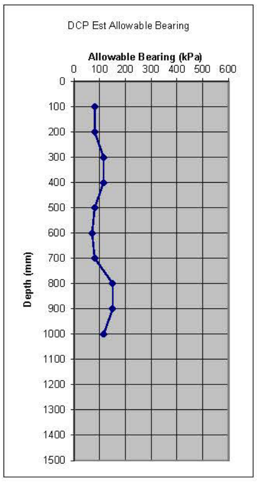
Location	

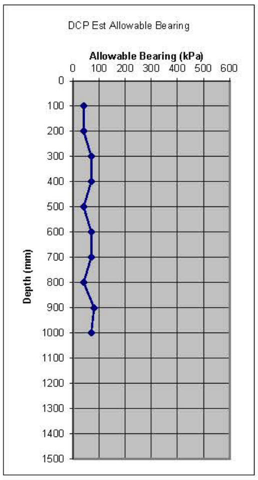
Location	

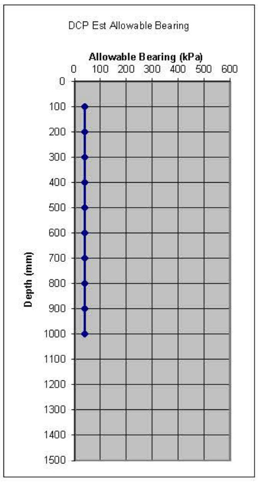
Location	

Location	







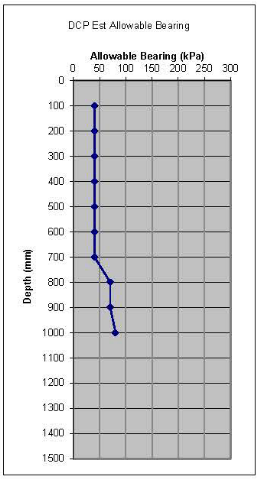


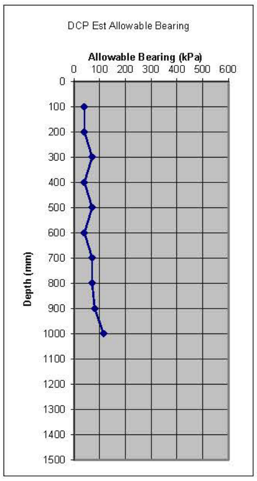
Spot #	13
Location	

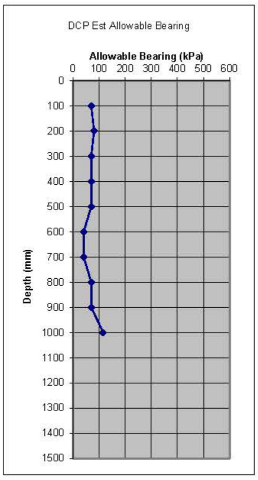
Spot #	14
Location	

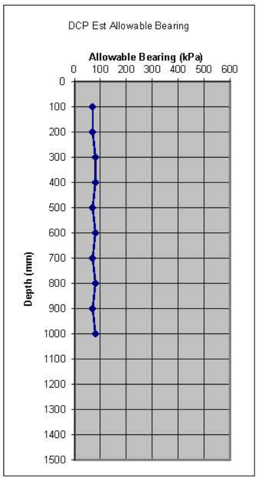
Spot #	15
Location	

Spot #	16
Location	







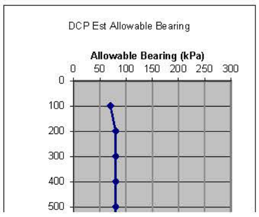


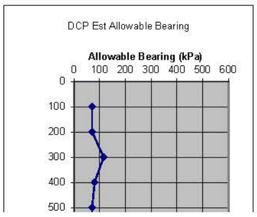
Spot #	17
Location	

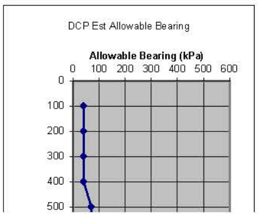
Spot #	18
Location	

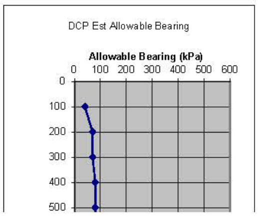
Spot #	19
Location	

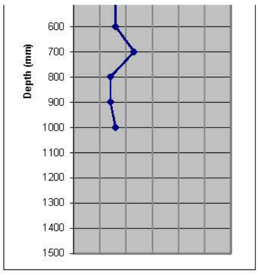
Spot #	20
Location	

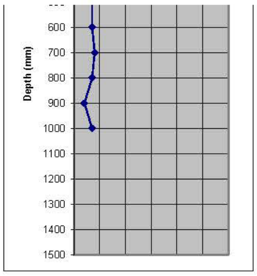


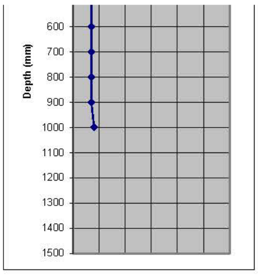


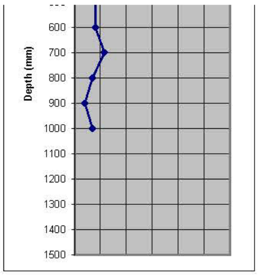










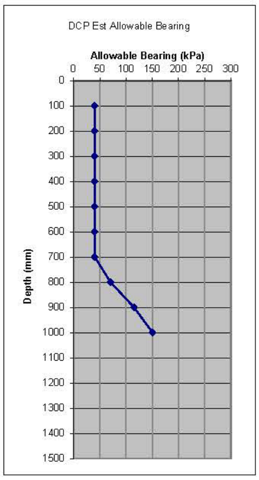


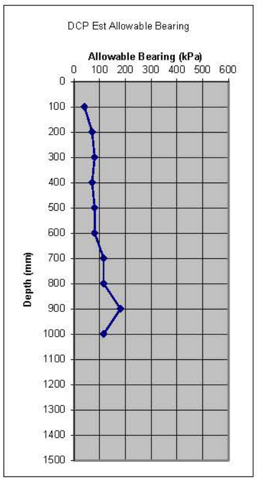
Spot #	30
Location	

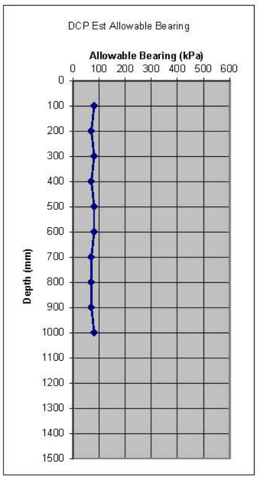
Spot #	31
Location	

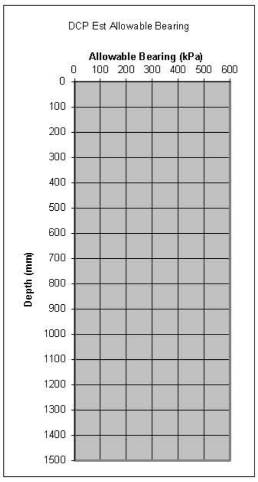
Spot #	32
Location	

Spot #	33
Location	









4.4 Appendix 4: Site Photographs