6. Site Soil Investigation Data

1.0 GENERAL

1.1 Introduction

This report presents the results of the soil investigation carried out for the new proposed Samoa Polytechnic Upgrade Project for the Government of Samoa. This is one of the many milestone projects funded by the Japanese Goverment to assist in the Samoan Technical Education Sector to improve on the practical training in many technical disciplines. The Samoa Polytechnic compound is located at Vaivase next to the National University of Samoa. The Project is monitored and administered by the JICA office in Apia.

The work was carried out at the request of the project consultant team, Yamashita Sekkei Inc. of Japan. The request was received by Tinai, Gordon & Associates Ltd. (TGA) of Apia on 27 November 2003. TGA submitted a fee proposal dated 27 November 2003 to provide the soil investigation service based on the Specification for Soil Investigation document submitted to our office by Yamashita Sekkei Inc. A separate fee proposal, on same date, was also submitted by TGA to Yamashita Sekkei Inc giving an alternative scope for soil investigation given the availability of the equipment required for field work. Yamashita Sekkei Inc. accepted the alternative proposal and the agreement was signed on 09 December 2003. The preliminary or draft soil report will be submitted to the Yamashita Sekkei Inc consultants on 15 December 2003. The final report will be submitted on 22 December 2003.

1.2 Locality and Site Conditions

The Samoa Polytechnic site is situated at Vaivase, south east of Apia and adjacent to the National University of Samoa. The site is located on a flat to sloping terrain. The area of the site is approximately 7.3 hectares. The land is partly covered with low to high bush and vegetation especially on the south side side of the property. Existing buildings are single storeys constructed of concrete masonry walls or timber framing on concrete slab floor. The roof framing consists of timber with metal cladding. A metal fence surrounds the property. Site drainage for stormwater and waste water disposal is lacking on the whole site. The existing site is prone to flooding due to the lack of proper drainage. This aspect requires careful design consideration. See Locality Plan in Figure 1 Appendix 1.

Public water supply, telephone and electricity are available in the area.

1.3 Field Work

Subsurface probings were carried out using the scala penetrometer. Fourty four (44) probings were put down with this equipment to depths up to 1.2 metre below the existing ground surface and or below the bottom of test pits.

There were nine (9) test pits excavated by a backhoe to determine soil profile

and water table. Three percolation tests were also carried out. This work was carried out under the supervision of a senior civil engineer from TGA office on 1st, 2nd, 3rd and 12th December 2003.

Scala penetrometer, test pits and percolation test positions are shown in Figure 1 of Appendix 2.

2.0 SUBSURFACE GROUND CONDITIONS

2.1 Geology

The published geological information shows the site is underlain by Fagaloa Volcanics formation which comprise of fine grained basalt. Test pit profiles suggest that the local geology has been formed by weathered basalt.

2.2 Field Test Information

The site generally has average top soil of 150mm to 200mm. The soil is typically sandy gravel with boulders of 100mm to 400mm in size with angular and vesicular basalt clasts. Hard basalt were encountered at shallow depths (less than 1.0m) in some test pits. Highly vesicular basalts were encountered at depths of 2.8 to 3.5m in some test pits. The vesicular basalt was not difficult to break using the bucket of the backhoe. The hard basalt was difficult to break.

The soil is relatively moist, most probably due to the high rainfall during the past weeks. Field plasticity is medium to low and the soil is slightly cohesive. There was basement rock stratum encountered in half the number of test pits. Pit excavation were stopped at depths where hard boulders and basalt outcrop layer exist. There was no water table encountered in all test pits.

Test pits logs and pictures are given in Appendix 2. Scala penetrometer results are given in Appendix 3.

3.0 ENGINEERING CONSIDERATION

3.1 General

Building foundation shall be founded below the humic layer. This humic layer shall be removed. Due to the sloping nature of the site, cut and fill of the existing ground should be considered to reduce the quantity of earthworks and concrete foundation.

Strip footings and column pad foundation with tie beams is considered appropriate for this site. There is no sign of soil contamination on this site. Step footings can be considered to suit the sloping terrain.

3.2 Engineering Fill

Seleccted material from site excavation can be used as general backfill. Structural fill should be imported from other nearby sources if the existing material is found unacceptable.

3.3 Foundation

The new proposed school buildings are mainly two storeys and strip footings or column pad footings with tie beams are considered suitable. Footings of the new building structures shall be founded at depth below the humic layer or at least 800mm below the existing ground level. Strip footings and tie beams can be stepped to match ground profile to minimise earthworks.

3.4 Bearing Capacity

The recommended allowable bearing pressures for the design of footings of the new building structures are as follows:

Loadings	q allowable
Dead + Live	100 kPa
Wind/Seismic	150 kPa

3.5 Compaction of Fill

Fill where required will be placed in layers of no more than 150mm thick per layer, and should be tested for compaction by means of scala penetrometer or a Glegg hammer equipment. All imported and selected fill material should be compacted to 90 percent maximum dry density. In-situ subgrade soil should be compacted to CBR 10% before placing the imported fill material.

3.6 Percolation Test

Three percolation tests were carried out on this site. The site provides 6 minutes for the water to percolate 25mm. The percolation test results are given in Appendix 4.

4.0 APPLICABILITY

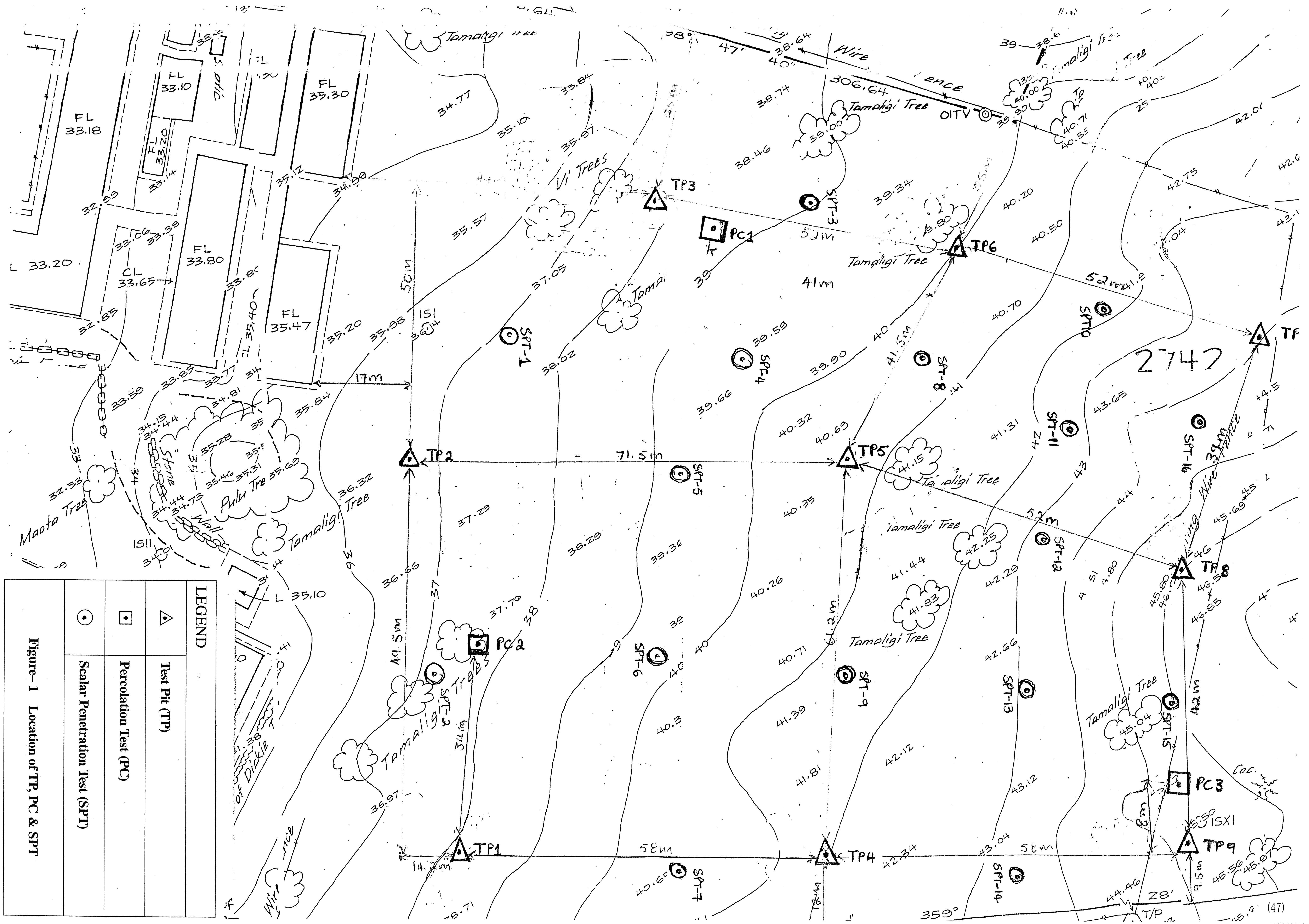
This report is prepared for the particular site in question. Data and opinions contained in it may not be used in other context or for any other purpose

without our prior review and agreement.

During excavation and construction, the site should be examined by an engineer competent to judge whether the exposed subsoils are compatible with the inferred conditions.

5.0 ACKNOWLEDGEMENT

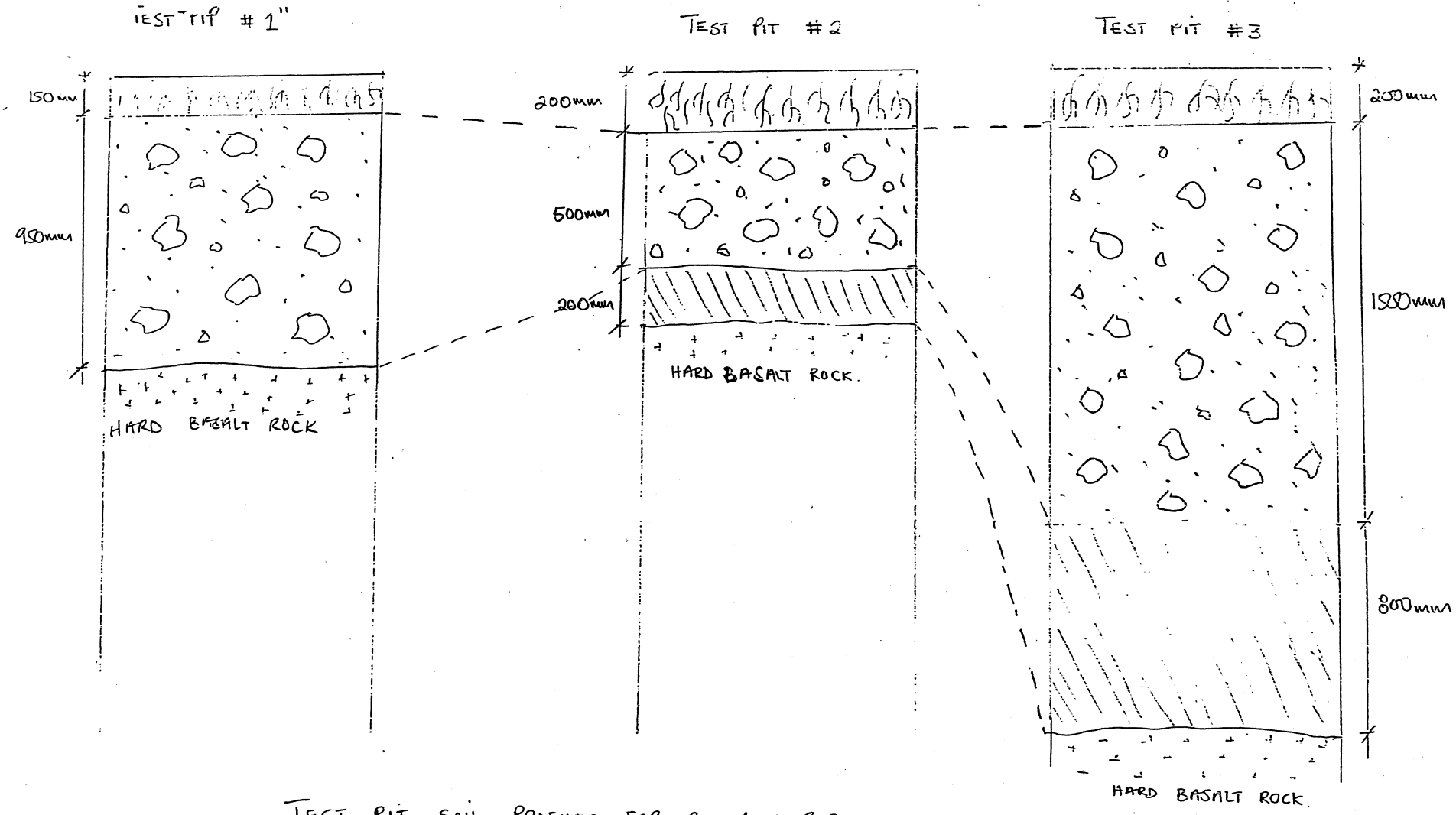
We gratefully acknowledge the assistance of the assistant CEO of the Samoa Polytechnic and local residents of Toomatagi and Vaivase who were able to provide information regarding previous flooding in the area.



LEGEND

△	Test Pit (TP)
▣	Percolation Test (PC)
⊙	Scalar Penetration Test (SPT)

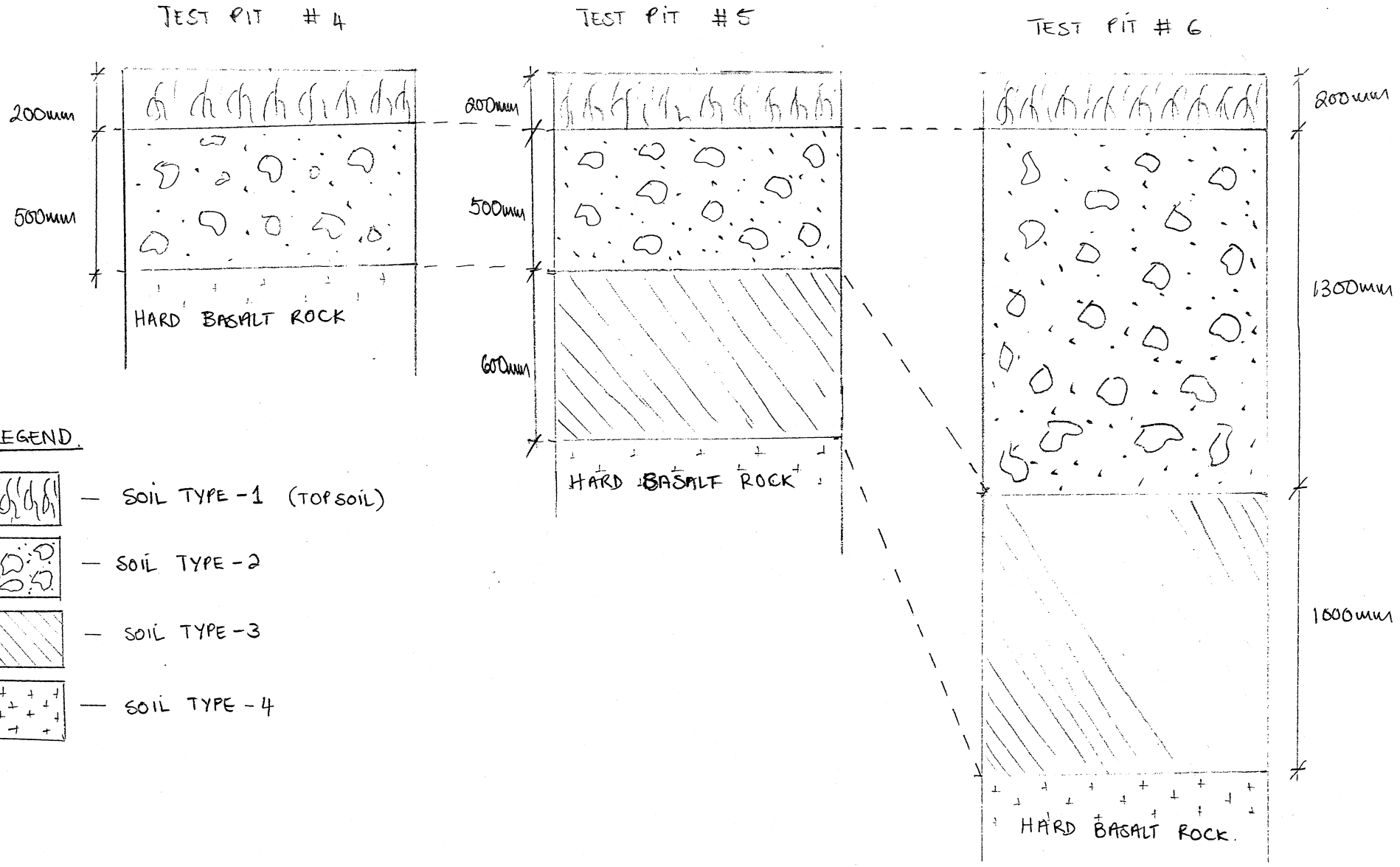
Figure–1 Location of TP, PC & SPT

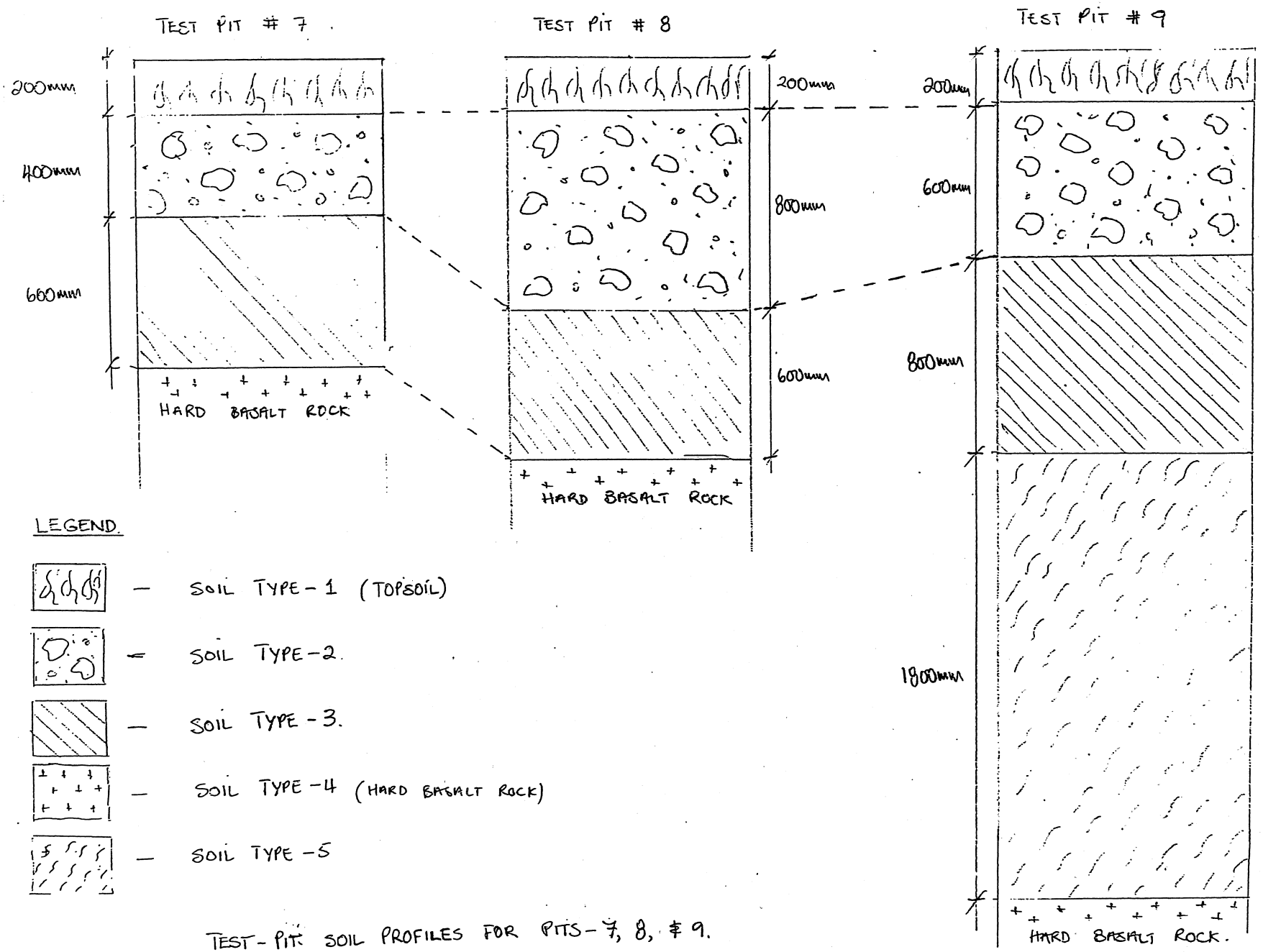


TEST PIT SOIL PROFILES FOR PITS-1, 2, & 3.

SAMOA POLYTECHNIC INSTITUTE

FIGURE - 1:


TEST PIT #4
200mm
500mm
HARD BASALT ROCK
TEST PIT #5
200mm
500mm
600mm
HARD BASALT ROCK
TEST PIT #6
200mm
1300mm
1000mm
HARD BASALT ROCK.
LEGEND.
— SOIL TYPE - 1 (TOPSOIL)
— SOIL TYPE - 2
— SOIL TYPE - 3
— SOIL TYPE - 4



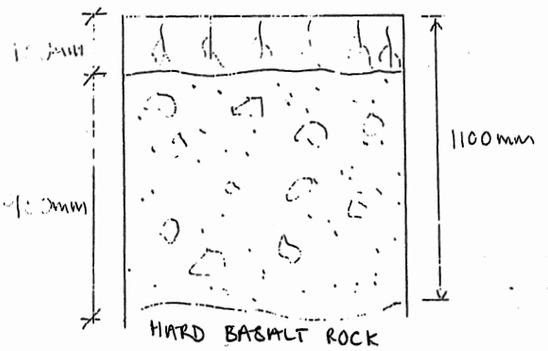
TEST - PIT SOIL PROFILES FOR PITS - 7, 8, & 9.

FIGURE - 3. SAMOA POLYTECHNIC INSTITUTE

Test Pit Investigation Sheet

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	1
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

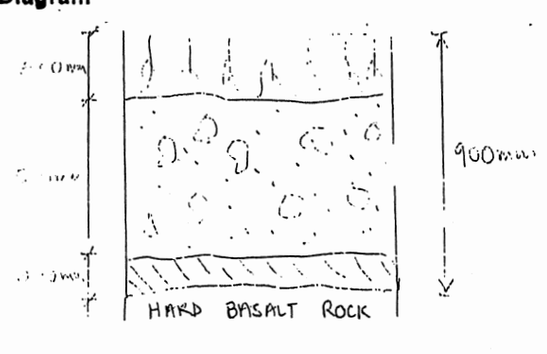
Pit Diagram



- TOPSOIL LAYER 150mm THICK WITH ROOTS + ROOT FIBRES.
- 2ND. LAYER – 950mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS RANGING FROM GRAVEL TO BOULDERS (10mm – 400mm)
- GRAVELY SOIL MATRIX
- HOLE STOPPED AT 1100mm DUE TO HARD LARGE BASALT.

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	2
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

Pit Diagram

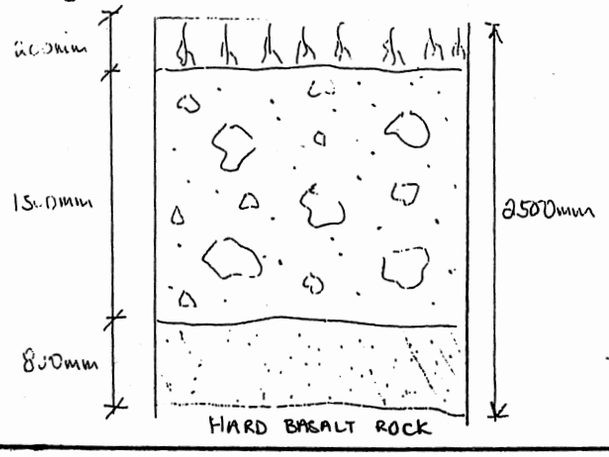


- TOPSOIL LAYER 200mm THICK WITH ROOTS + ROOT FIBRE
- 2ND LAYER – 500mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS RANGING FROM GRAVEL TO BOULDERS (100mm – 600mm)
- GRAVELY SOIL MATRIX
- HOLE STOPPED AT 900mm DUE TO HARD LARGE BASALT

Test Pit Investigation Sheet

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	3
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	VESICULAR BASALT
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

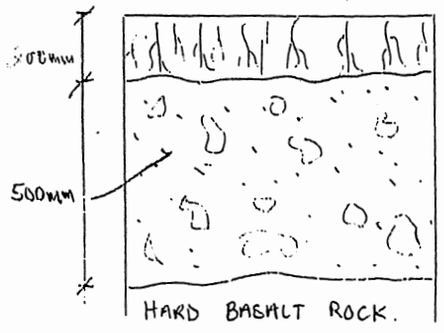
Pit Diagram



- TOPSOIL LAYER 200mm THICK WITH ROOTS & ROOT FIBRES
- 2ND LAYER - 1500mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS RANGING FROM GRAVEL TO BOULDERS (10mm – 600mm)
- GRAVELY SOIL MATRIX
- 800mm THICK LAYER OF BLACK SOFT BASALTIC TYPE ROCK BEFORE HARD LARGE BASALT.
  - POORLY WEATHERED BASALT ROCK

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	4
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

Pit Diagram

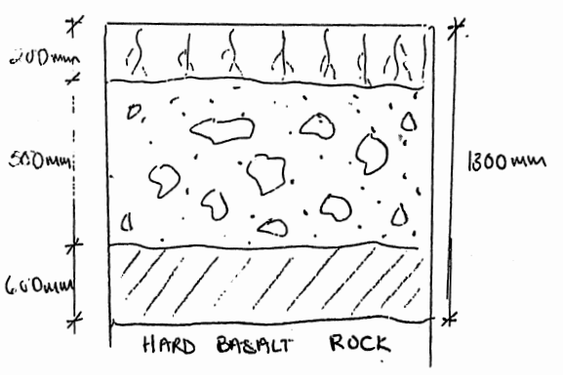


- TOPSOIL LAYER - 200mm THICK WITH ROOTS & ROOT FIBRE.
- 2ND LAYER – 500mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS (GRAVEL TO BOULDERS: 10mm – 800mm)
- GRAVELY SOIL MATRIX
- HOLE STOPPED AT 700mm DUE TO HARD BASALT ROCK.
- NO LAYER OF POORLY WEATHERED BASALT ROCK FOUND AT DEPTH < 700mm FROM SURFACE.

Test Pit Investigation Sheet

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	5
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

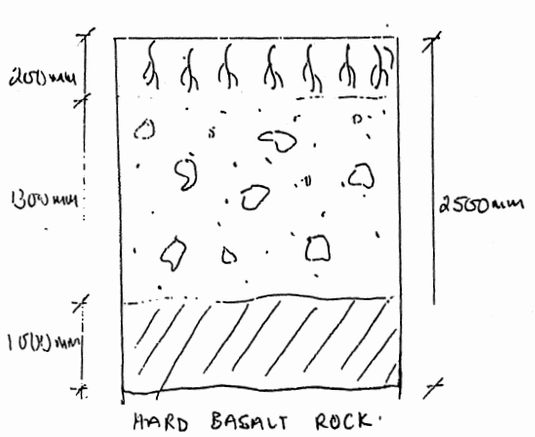
Pit Diagram



- TOPSOIL LAYER 200mm THICK WITH ROOTS & ROOT FIBRES.
- 2ND LAYER – 500mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS RANGING FROM GRAVEL TO BOULDERS (100mm – 400mm)
- GRAVELY SOIL MATRIX
- 600mm THICK LAYER OF BLACK SOFT BASALTIC TYPE ROCK BEFORE HARD LARGE BASALT.
  – POORLY WEATHERED BASALT ROCK LAYER.

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	6
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

Pit Diagram

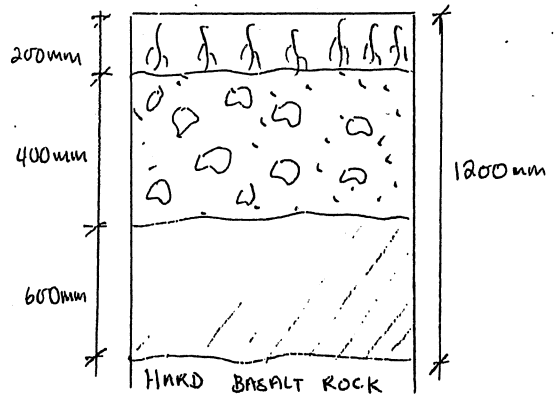


- TOPSOIL LAYER – 200mm THICK WITH ROOTS & ROOT FIBRES
- 2ND LAYER – 1300mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS (GRAVEL TO BOULDERS :- 10mm – 400mm)
- GRAVELY SOIL MATRIX
- HOLE STOPPED AT 2500mm DEEP DUE TO HARD BASALT ROCK.
- 3RD LAYER – 1000mm THICK POORLY WEATHERED BASALT ROCK LAYER (BREAKABLE)

Test Pit Investigation Sheet

Site Name	SAMOA POLYTECHNIC	Test Pit No.	7
Soil Name / Description			
Soil Origin			
Rock Formation		Rock Type	
Field Plasticity		Field Moisture	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		Soil Zonation	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

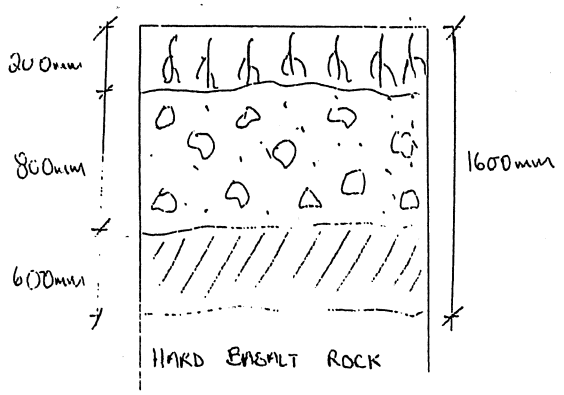
Pit Diagram



- TOPSOIL LAYER - 200mm THICK WITH ROOTS & ROOT FIBRES.
- 2ND LAYER - 400mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS. (GRAVEL TO BOULDERS - 10mm - 400mm)
- 3RD LAYER - 600mm THICK POORLY WEATHERED BASALT ROCK LAYER
- HOLE STOPPED AT 1200mm DEEP DUE TO HARD BASALT ROCK
- GRAVELY SOIL MATRIX.

Site Name	SAMOA POLYTECHNIC	Test Pit No.	8
Soil Name / Description			
Soil Origin			
Rock Formation		Rock Type	
Field Plasticity		Field Moisture	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		Soil Zonation	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

Pit Diagram

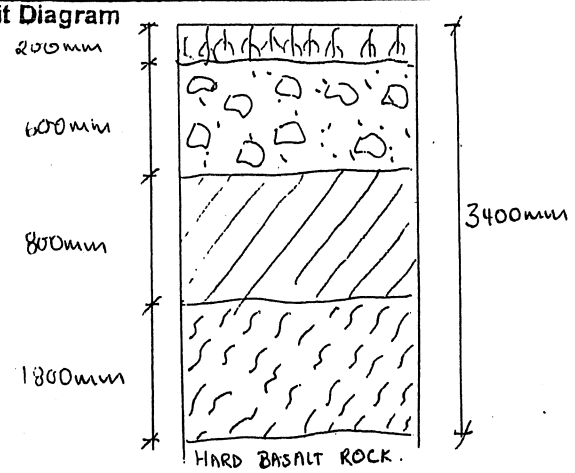


- TOPSOIL LAYER - 200mm THICK WITH ROOTS & ROOT FIBRES
- 2ND LAYER - 800mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS. (GRAVEL TO BOULDERS :- 10mm - 700mm)
- 3RD LAYER - 600mm THICK POORLY WEATHERED BASALT ROCK LAYER.
- HOLE STOPPED AT 1600mm DEEP DUE TO HARD BASALT ROCK.

Test Pit Investigation Sheet

Site Name	SAMOA POLYTECHNIC	**Test Pit No.**	9
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table			
Bedrock Description			
Comments			

Pit Diagram



- TOPSOIL LAYER – 200mm THICK WITH ROOTS & ROOT FIBRES
- 2ND LAYER - 600mm THICK CONTAINS ANGULAR VESICULAR BASALT CLASTS (GRAVEL TO BOULDERS;– 10mm – 400mm)
- 3RD LAYER - 800mm THICK POORLY WEATHERED BASALT ROCK LAYER
- 4TH LAYER - 1800mm THICK. WELL WEATHERED BASALT ROCK LAYER BEFORE THE HARD BASALT ROCK AT 3400mm DEEP.

Site Name		**Test Pit No.**	
Soil Name / Description			
Soil Origin			
Rock Formation		**Rock Type**	
Field Plasticity		**Field Moisture**	
(Low, Medium, High)		*(Dry, Moist, Wet)*	
Soil Colour / Shade			
Soil Consistancy		**Soil Zonation**	
(Cohesive, Non-Cohesive)		*(Layering, Lens, Pocket, Thickness, Defects)*	
Water Table	N/A		
Bedrock Description			
Comments			

Pit Diagram