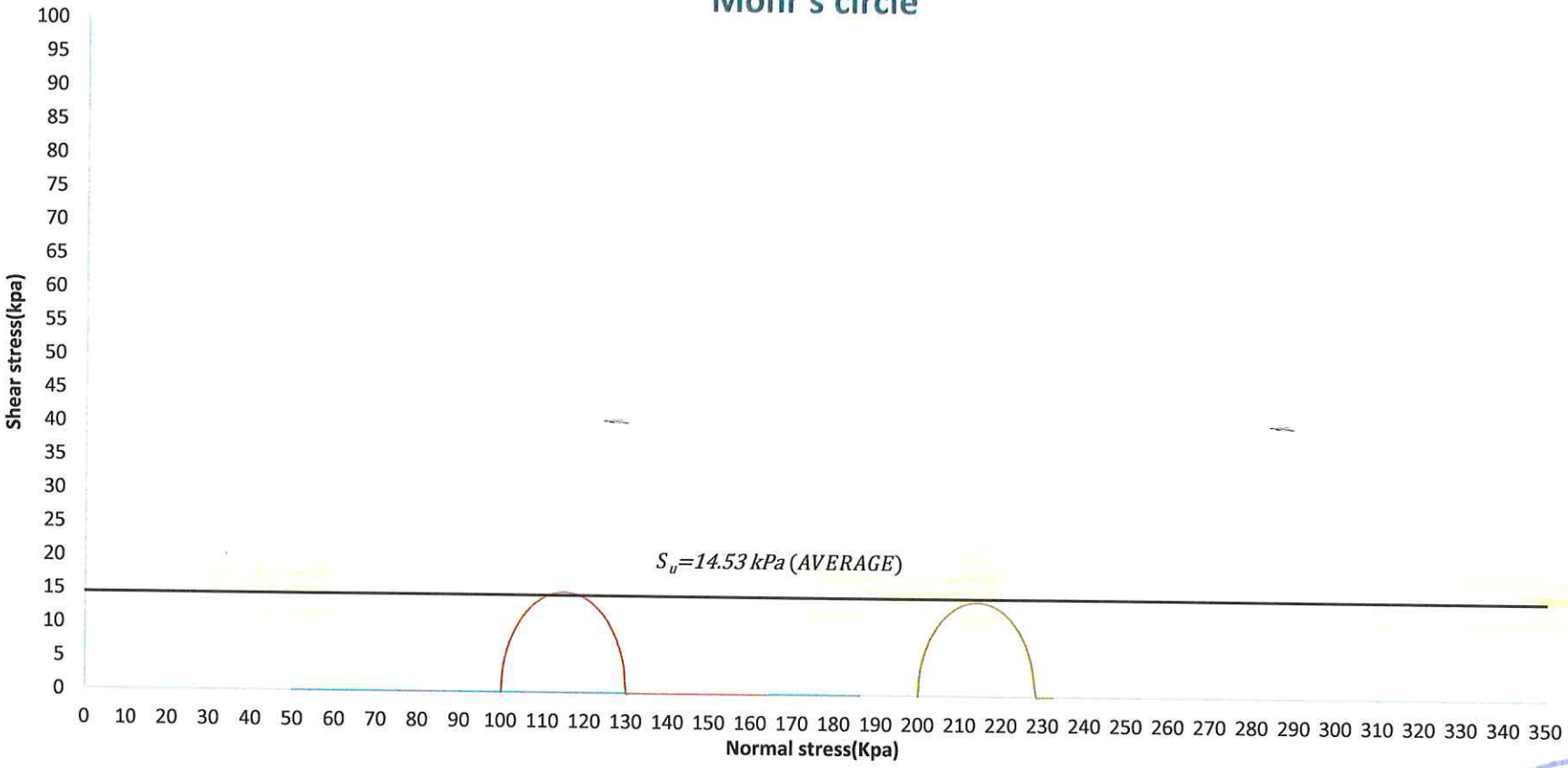
GEOTECHNICAL SERVICES LTD

Client:	Water Research Co. Ltd	**GETS Sample No:**	CM/2019/0346
Project:	G.I for PV Farm Phase 2	**Client Sample No:**	BH 8
Location:	Henrietta	**Depth (Meters):**	5.50 - 6.00

Mohr's circle



-End of Report-

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Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Quality | Excellence | On Time

Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-38
Sample:	BH 1	**Date:**	26/06/2019
Depth: (m)	14.0 - 14.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

General Test Data	
Type of Test:	Saturated, Consolidated Undrained with Pore Water Pressure Measurements
Type of Sample:	Undisturbed
Side Drains:	Yes
Drainage:	To One End
Comments:	

Initial Specimen Details				
		Specimen 1	**Specimen 2**	**Specimen 3**
Diameter	mm	50.0	50.0	
Length	mm	100.0	100.0	
Volume	cm^3	196.3	196.3	
Moisture Content	%	69.4	67.5	
Dry Density	g/cm^3	0.903	0.891	
Void Ratio	-	2.224	2.270	
Degree of Saturation	%	90.9	86.6	
Particle Density (SG)	-	2.913		

End of Saturation Phase				
Method:	Increments of Cell- and Backpressure			
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	200	200	
Back Pressure	kPa	190	190	
B Value	-	0.96	0.96	

Consolidation Phase				
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	290	340	
Back Pressure	kPa	190	190	
Pore Pressure (Initial)	kPa	278.9	325.5	
Pore Pressure (Final)	kPa	186.1	189.9	
Volumetric Strain	%	5.8	7.2	
Effective Stress *	kPa	99.4	148.5	

*: At commencement of Shear

End of Shear Phase					
Failure Criterion:		Maximum Deviator Stress			
Rate of Strain		1.0 %/hour			
			Specimen 1	**Specimen 2**	**Specimen 3**
Corrected Deviator Stress		kPa	105.0	145.8	
at Axial Strain		%	15.1	15.1	
Principal Stresses	$\sigma 1'$	kPa	146	204	
	$\sigma 3'$	kPa	41	59	

Final Specimen Details				
Moisture Content	%	63.9	61.9	
Dry Density	g/cm^3	0.959	0.960	
Void Ratio	-	2.036	2.035	

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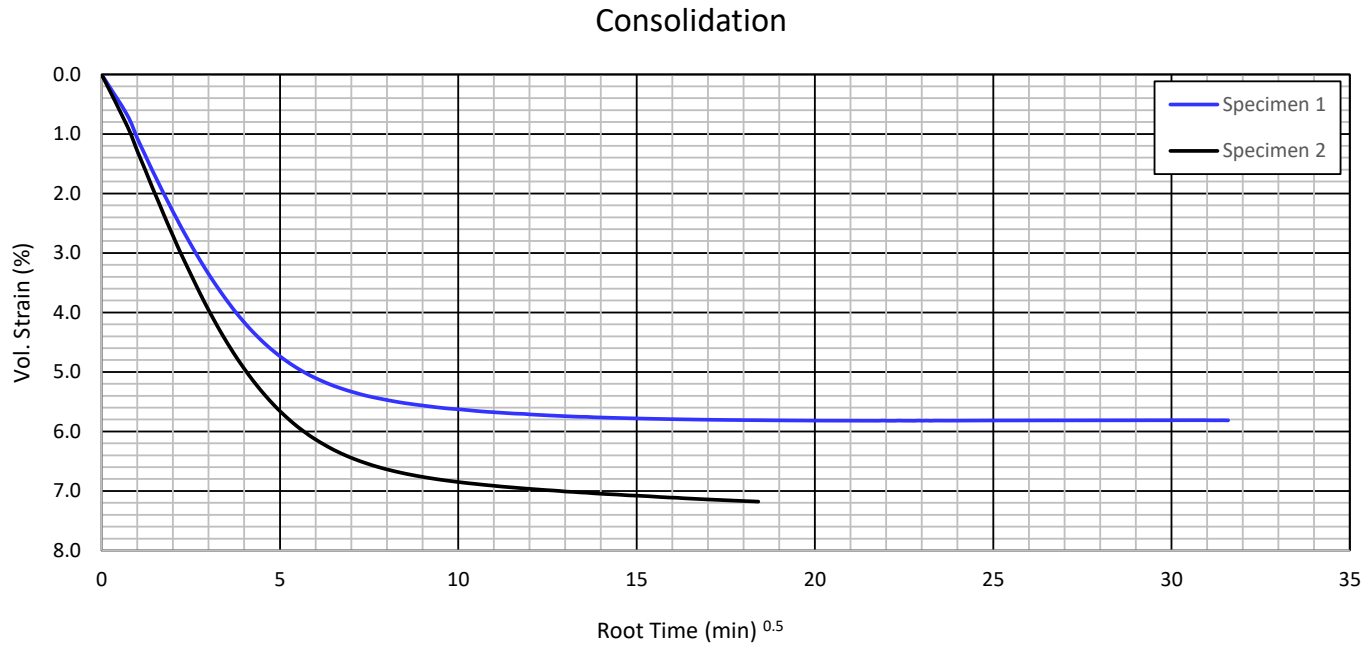
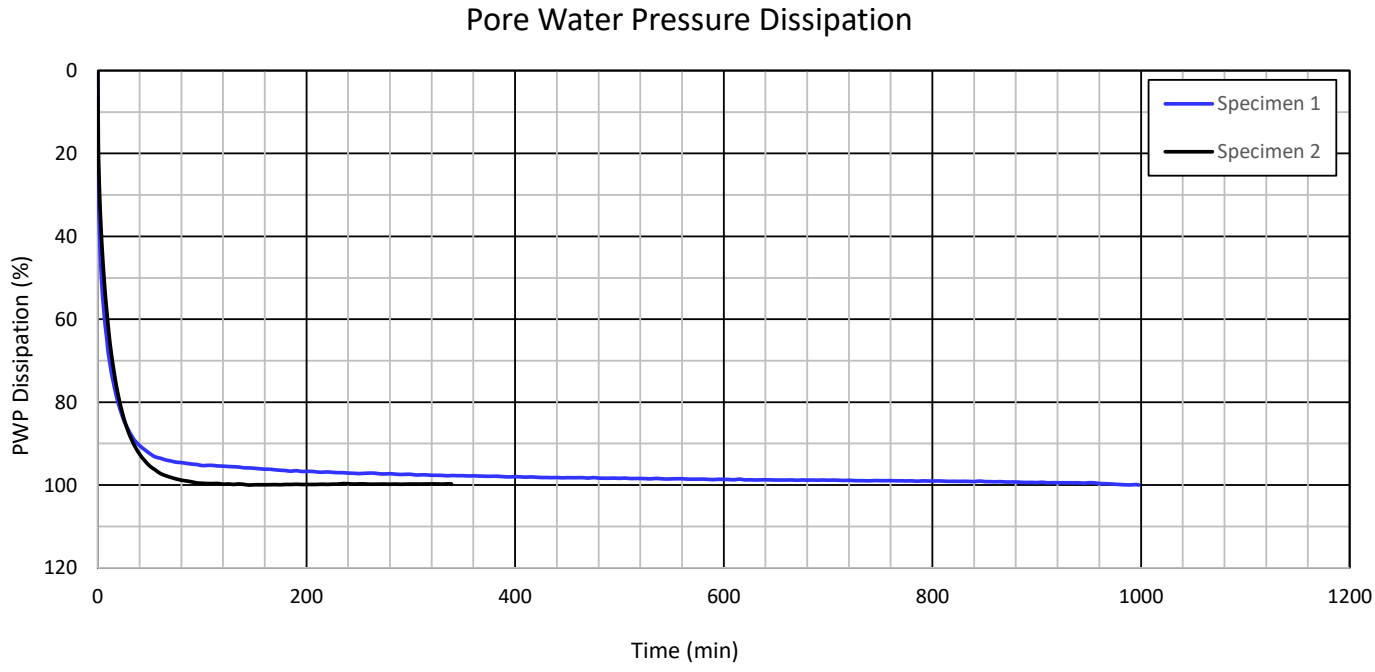
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-38
Sample:	BH 1	**Date:**	26/06/2019
Depth: (m)	14.0 - 14.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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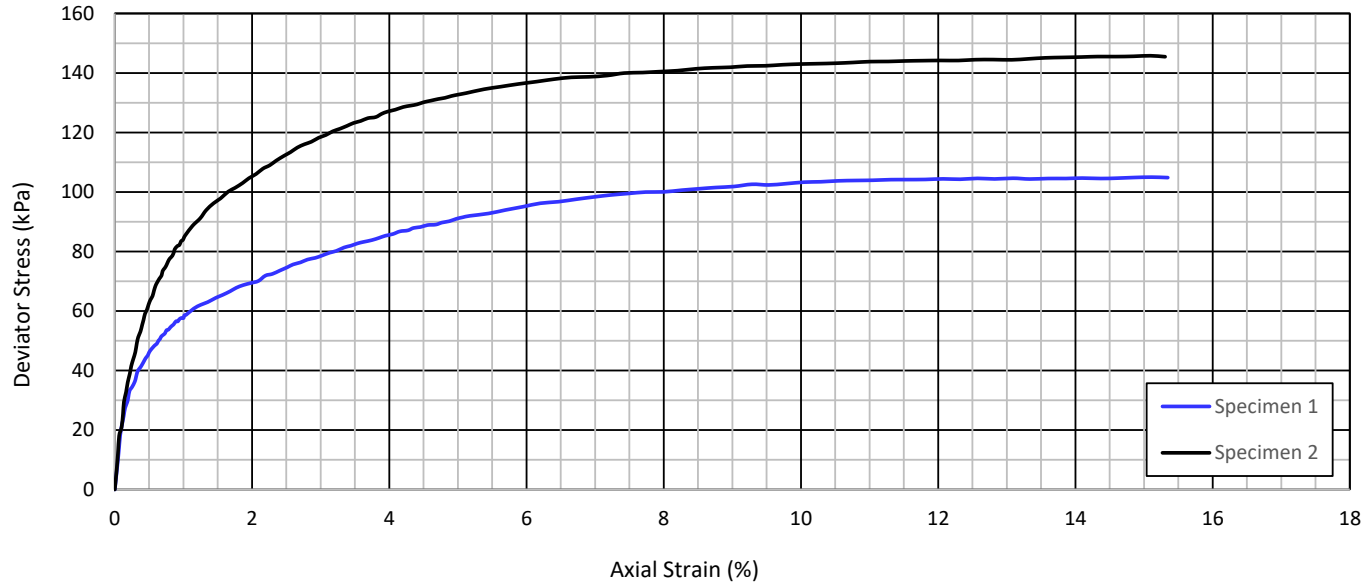
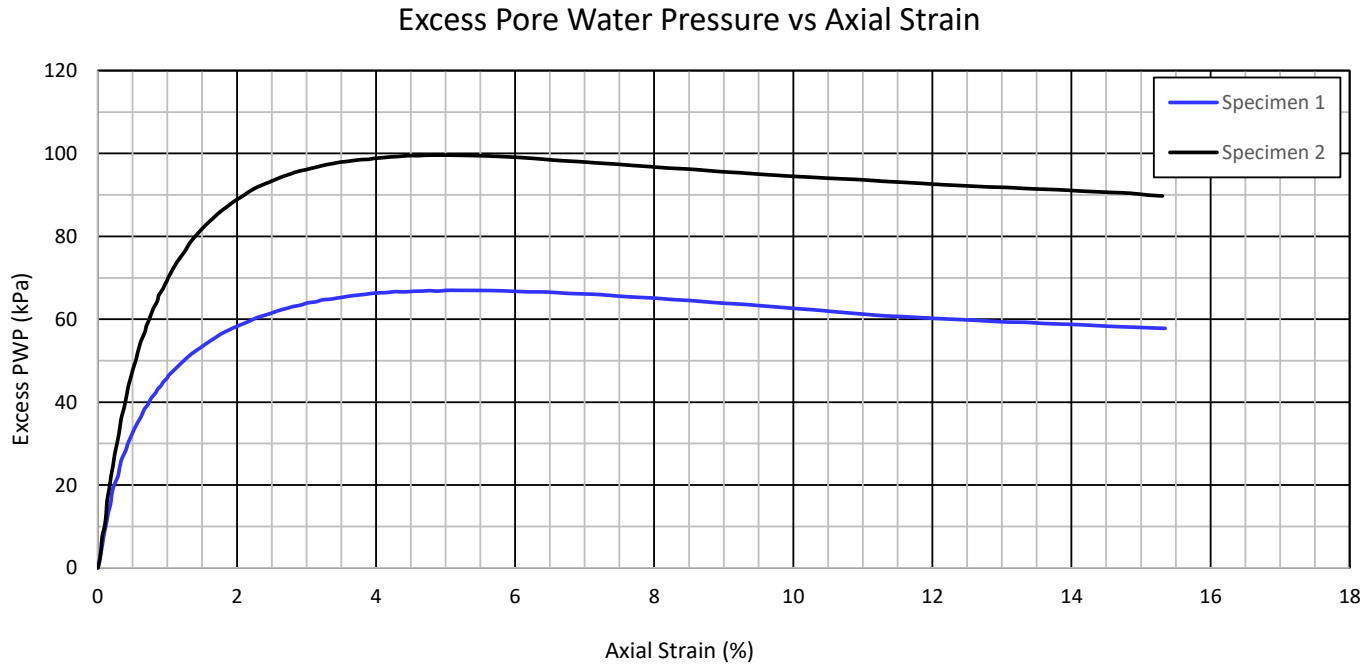
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-38
Sample:	BH 1	**Date:**	26/06/2019
Depth: (m)	14.0 - 14.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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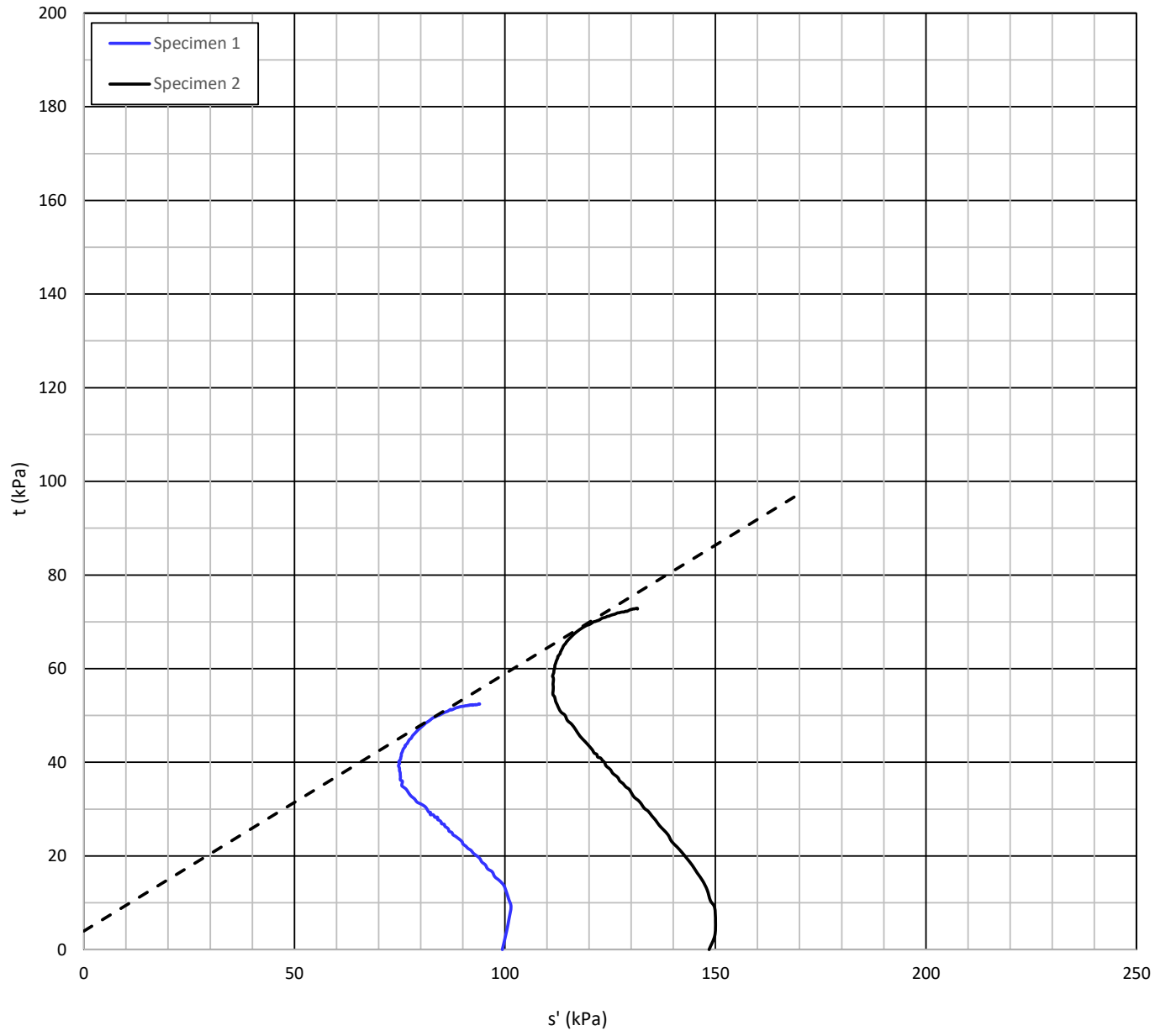
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-38
Sample:	BH 1	**Date:**	26/06/2019
Depth: (m)	14.0 - 14.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

ϕ'	Deg.	**34**
c'	kPa	**4**



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Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-39
Sample:	BH 2	**Date:**	26/06/2019
Depth: (m)	6.0 - 6.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

General Test Data	
Type of Test:	Saturated, Consolidated Undrained with Pore Water Pressure Measurements
Type of Sample:	Undisturbed
Side Drains:	No
Drainage:	To One End
Comments:	-

Initial Specimen Details				
		Specimen 1	**Specimen 2**	**Specimen 3**
Diameter	mm	50.0	50.0	50.0
Length	mm	100.0	100.0	100.0
Volume	cm^3	196.3	196.3	196.3
Moisture Content	%	62.4	61.1	61.7
Dry Density	g/cm^3	1.018	1.012	1.040
Void Ratio	-	1.788	1.803	1.729
Degree of Saturation	%	99.0	96.1	101.3
Particle Density (SG)	-	2.838		

End of Saturation Phase				
Method:		Increments of Cell- and Backpressure		
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	200	200	200
Back Pressure	kPa	190	190	190
B Value	-	0.96	0.99	0.98

Consolidation Phase				
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	240	290	390
Back Pressure	kPa	190	190	190
Pore Pressure (Initial)	kPa	228.4	278.4	372.7
Pore Pressure (Final)	kPa	189.0	190.6	185.3
Volumetric Strain	%	1.8	3.5	6.8
Effective Stress *	kPa	47.8	96.4	199.8

*: At commencement of Shear

End of Shear Phase				
Failure Criterion:		Maximum Deviator Stress		
Rate of Strain		T1: 0.5 %/hour, T2 & T3: 0.75%/hour		
		Specimen 1	**Specimen 2**	**Specimen 3**
Corrected Deviator Stress	kPa	66.9	159.0	194.3
at Axial Strain	%	14.1	14.9	15.4
Principal Stresses $\sigma 1'$	kPa	90	209	266
Principal Stresses $\sigma 3'$	kPa	23	50	72

Final Specimen Details				
Moisture Content	%	58.7	56.7	53.1
Dry Density	g/cm^3	1.037	1.049	1.116
Void Ratio	-	1.737	1.705	1.543

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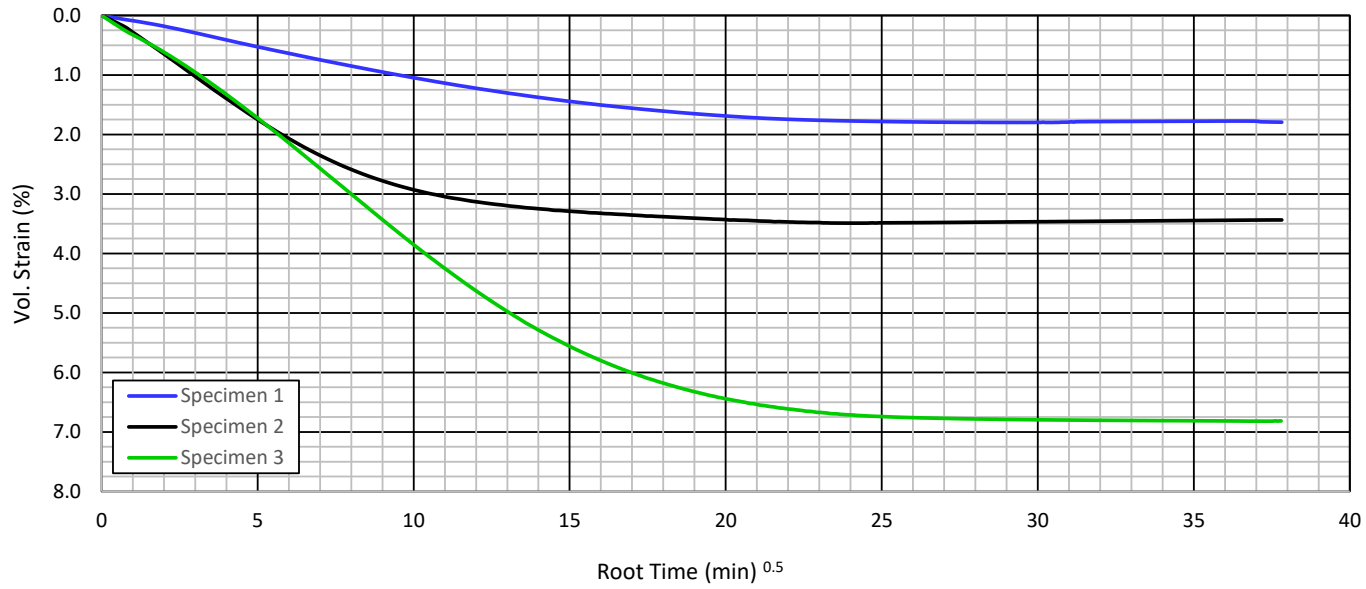
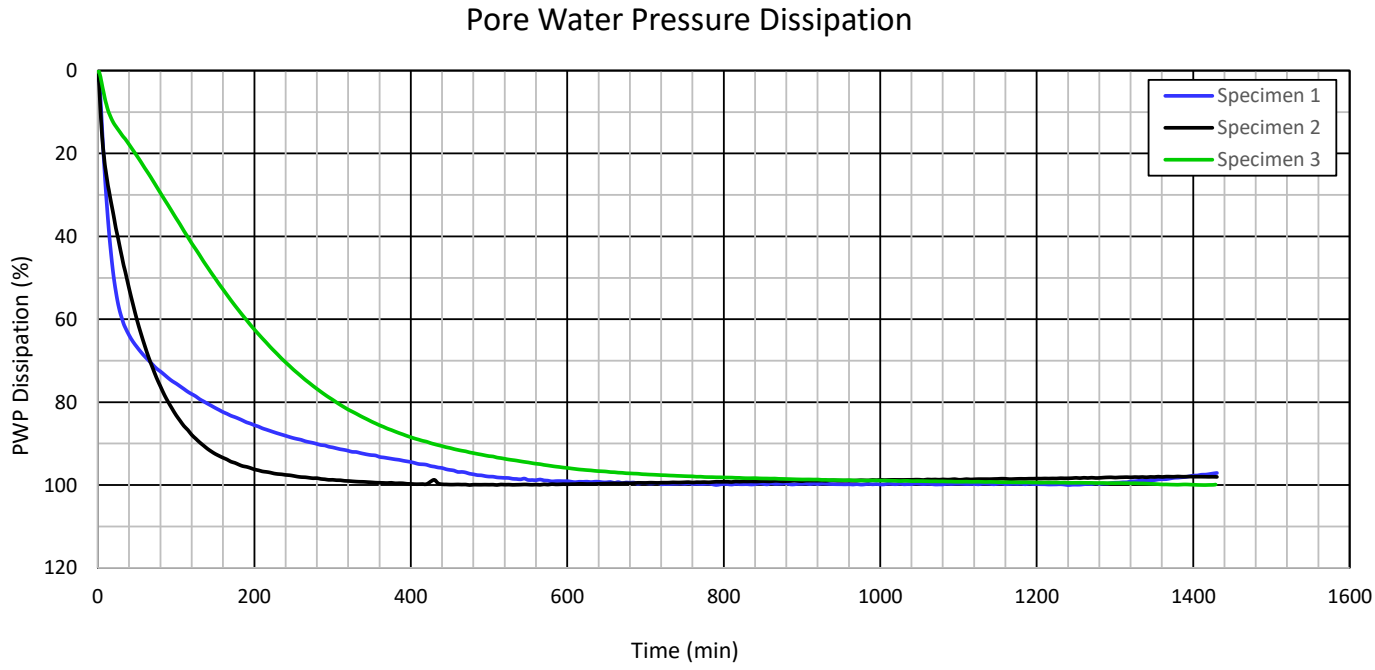
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-39
Sample:	BH 2	**Date:**	26/06/2019
Depth: (m)	6.0 - 6.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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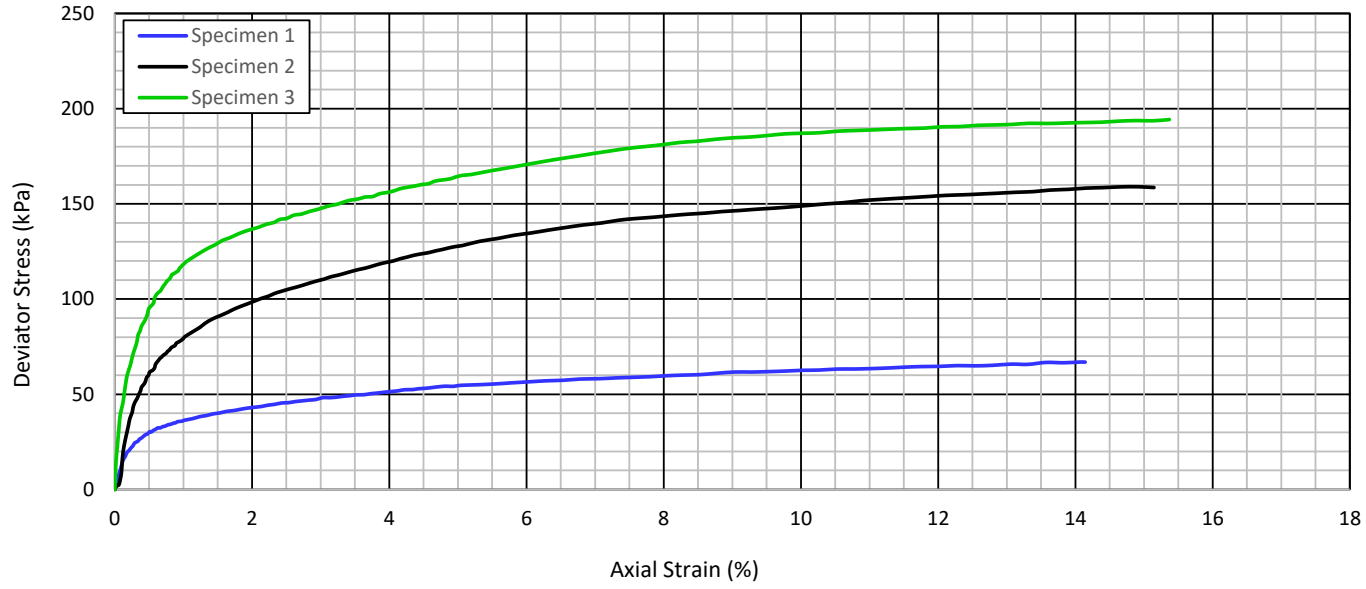
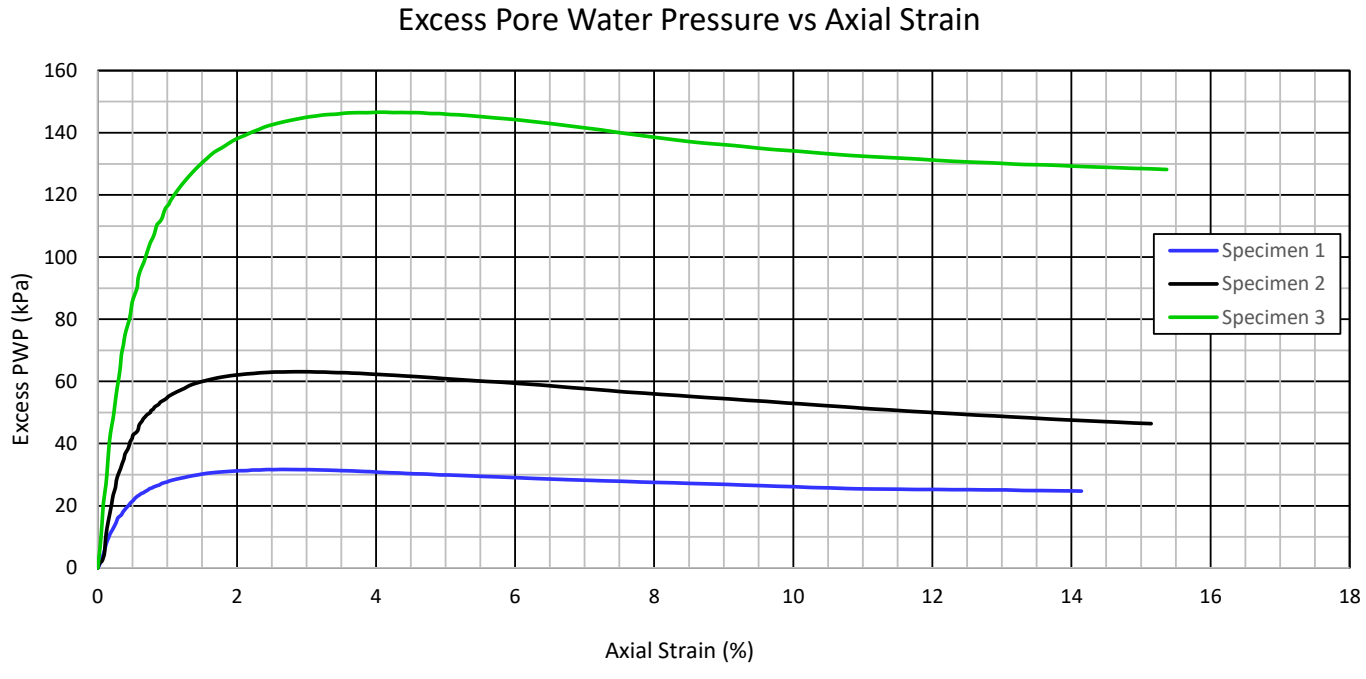
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-39
Sample:	BH 2	**Date:**	26/06/2019
Depth: (m)	6.0 - 6.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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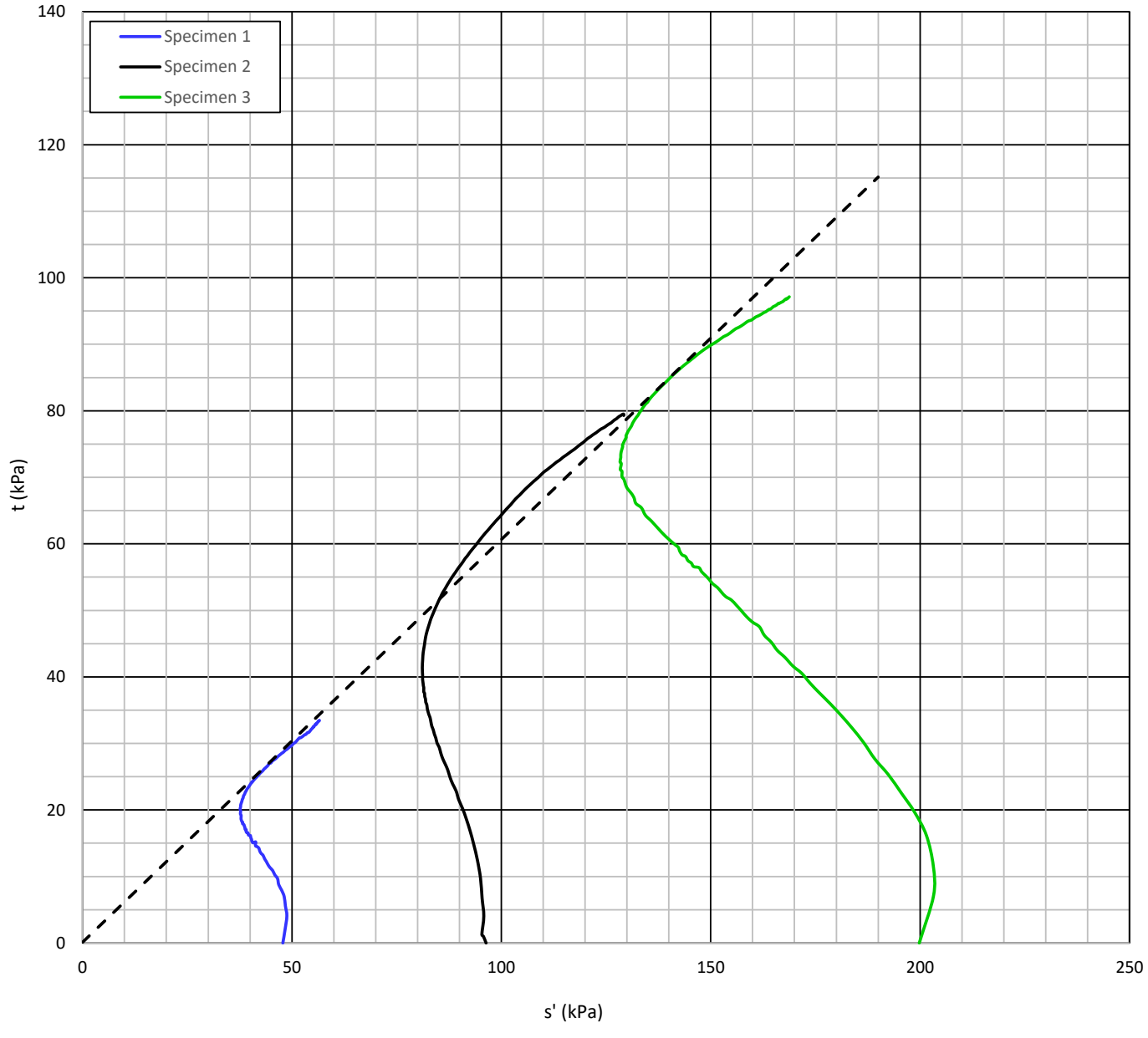
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-39
Sample:	BH 2	**Date:**	26/06/2019
Depth: (m)	6.0 - 6.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

ϕ'	Deg.	**37**
c'	kPa	**0**



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Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-40
Sample:	BH 4	**Date:**	26/06/2019
Depth: (m)	5.0 - 5.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

General Test Data	
Type of Test:	Saturated, Consolidated Undrained with Pore Water Pressure Measurements
Type of Sample:	Undisturbed
Side Drains:	No
Drainage:	To One End
Comments:	

Initial Specimen Details				
		Specimen 1	**Specimen 2**	**Specimen 3**
Diameter	mm	50.0	50.0	
Length	mm	100.0	100.0	
Volume	cm^3	196.3	196.3	
Moisture Content	%	41.9	42.3	
Dry Density	g/cm^3	1.249	1.267	
Void Ratio	-	1.442	1.408	
Degree of Saturation	%	88.7	91.7	
Particle Density (SG)	-	3.05		

End of Saturation Phase				
Method:	Increments of Cell- and Backpressure			
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	200	200	
Back Pressure	kPa	190	190	
B Value	-	0.99	0.96	

Consolidation Phase				
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	290	340	
Back Pressure	kPa	190	190	
Pore Pressure (Initial)	kPa	277.2	325.7	
Pore Pressure (Final)	kPa	190.7	192.2	
Volumetric Strain	%	2.2	3.4	
Effective Stress *	kPa	98.0	146.3	

*: At commencement of Shear

End of Shear Phase					
Failure Criterion:		Maximum Deviator Stress			
Rate of Strain		0.75 %/hour			
			Specimen 1	**Specimen 2**	**Specimen 3**
Corrected Deviator Stress		kPa	166.1	203.9	
at Axial Strain		%	13.1	15.1	
Principal Stresses	$\sigma 1'$	kPa	217	265	
	$\sigma 3'$	kPa	50	61	

Final Specimen Details				
Moisture Content	%	41.4	41.1	
Dry Density	g/cm^3	1.277	1.311	
Void Ratio	-	1.389	1.327	

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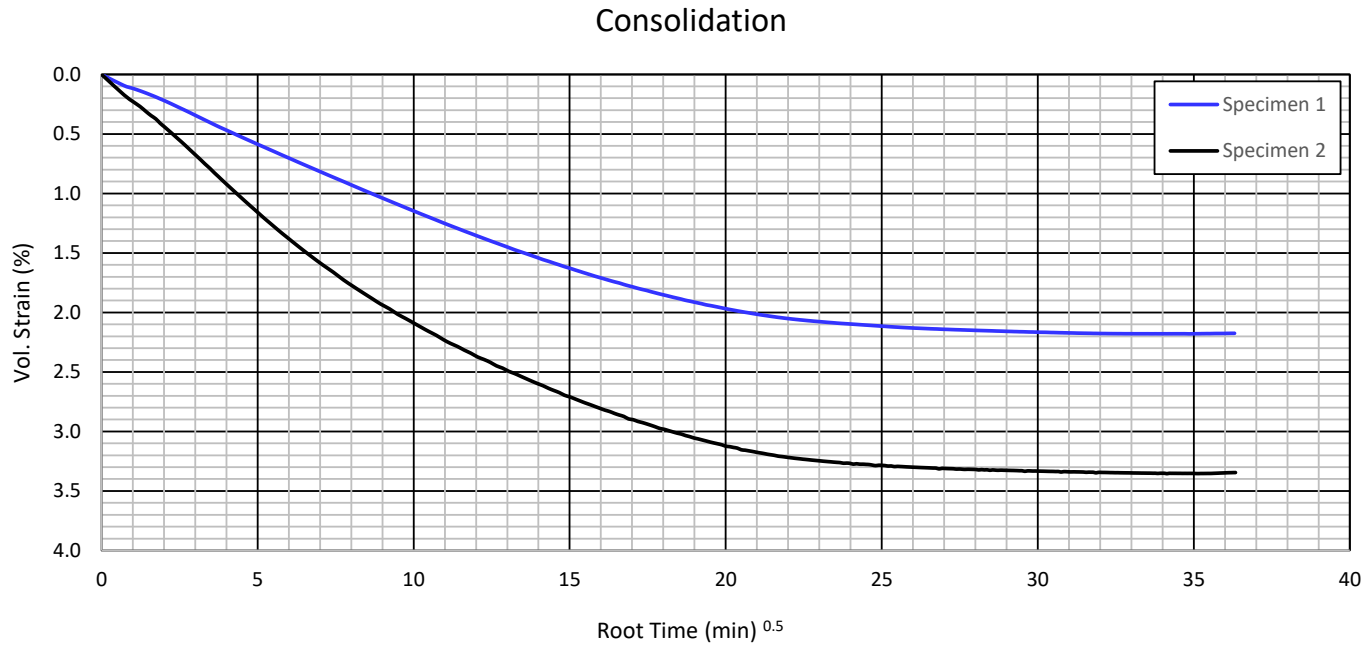
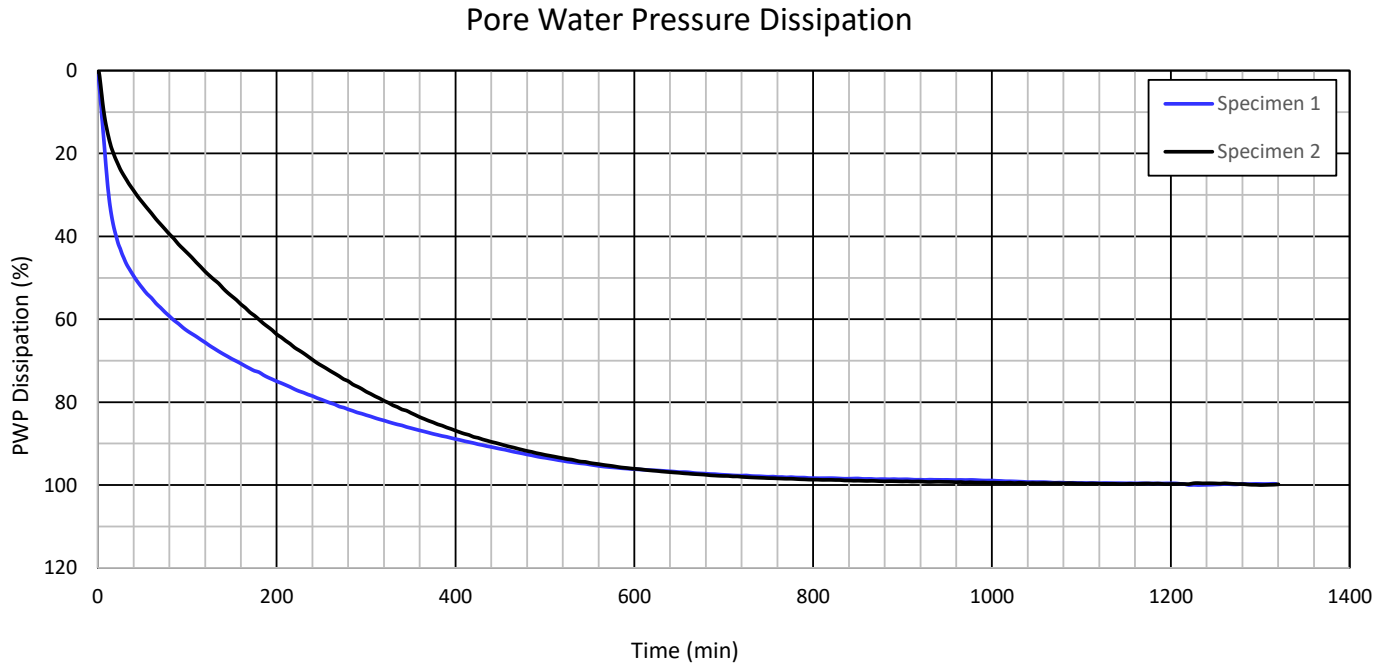
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-40
Sample:	BH 4	**Date:**	26/06/2019
Depth: (m)	5.0 - 5.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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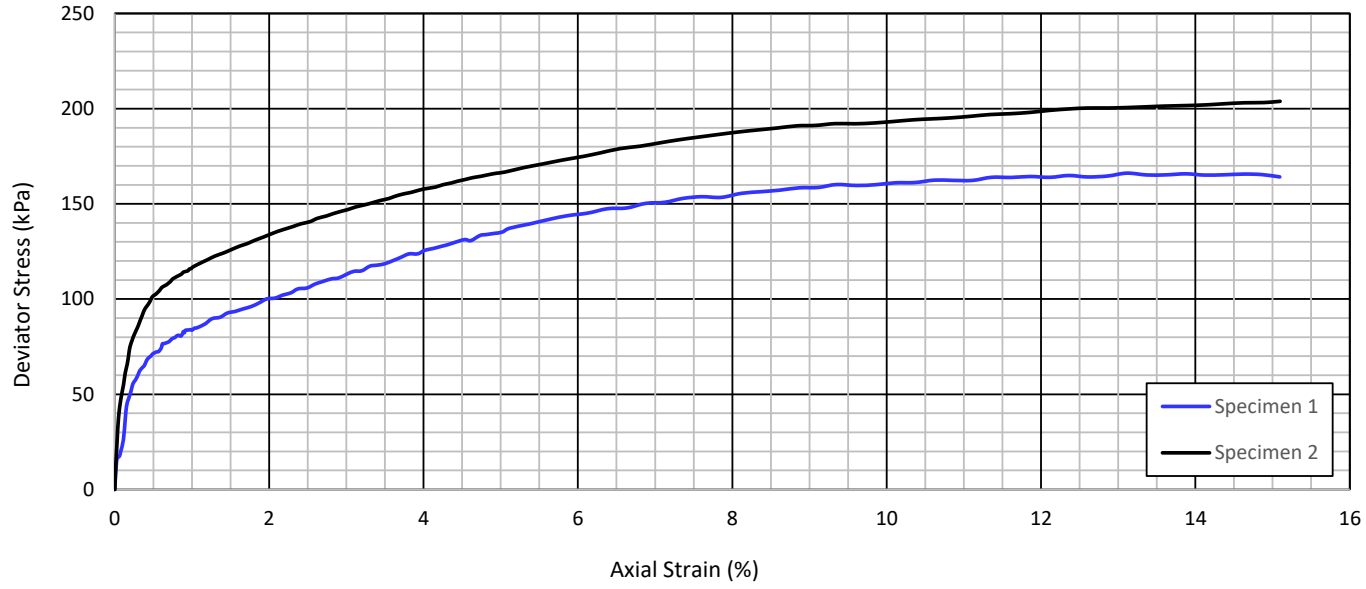
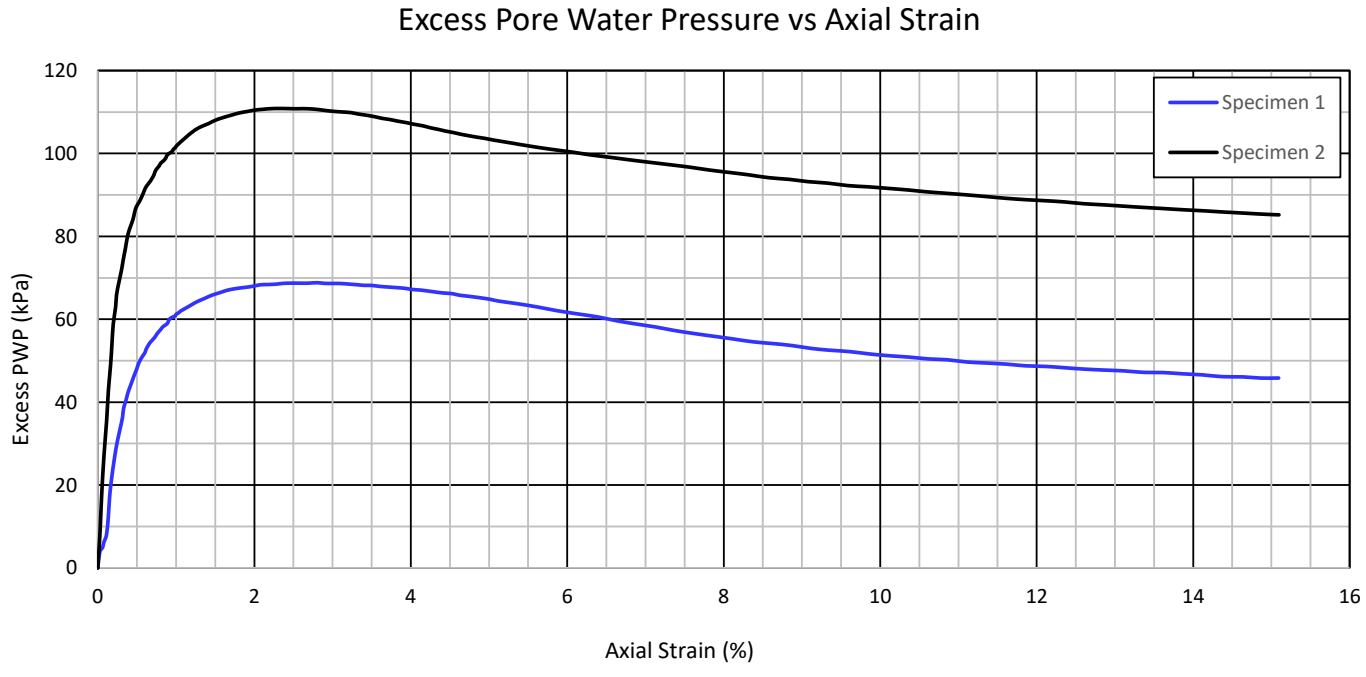
Project Name:	Henrietta	**Lab Number:**	WRC-12-40
Sample:	BH 4	**Date:**	26/06/2019
Depth: (m)	5.0 - 5.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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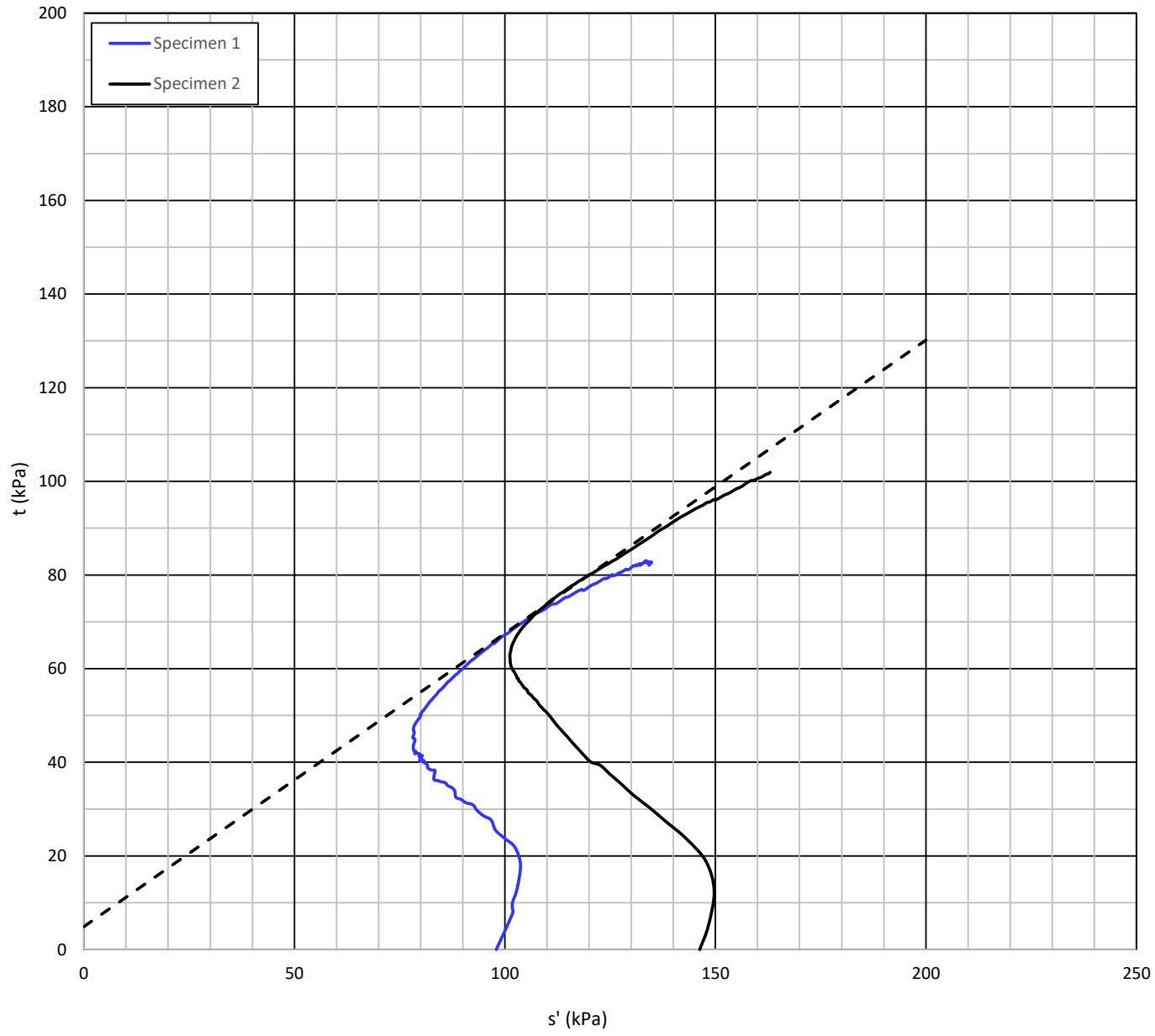
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-40
Sample:	BH 4	**Date:**	26/06/2019
Depth: (m)	5.0 - 5.5	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

ϕ'	Deg.	**39**
c'	kPa	**5**



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Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-42
Sample:	BH 7	**Date:**	26/06/2019
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

General Test Data	
Type of Test:	Saturated, Consolidated Undrained with Pore Water Pressure Measurements
Type of Sample:	Undisturbed
Side Drains:	Yes
Drainage:	To One End
Comments:	-

Initial Specimen Details				
		Specimen 1	**Specimen 2**	**Specimen 3**
Diameter	mm	50.0	50.0	50.0
Length	mm	100.0	100.0	100.0
Volume	cm^3	196.3	196.3	196.3
Moisture Content	%	47.6	52.4	54.5
Dry Density	g/cm^3	1.195	1.141	1.115
Void Ratio	-	1.495	1.614	1.675
Degree of Saturation	%	94.9	96.8	97.1
Particle Density (SG)	-	2.982		

End of Saturation Phase				
Method:		Increments of Cell- and Backpressure		
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	250	250	250
Back Pressure	kPa	240	240	240
B Value	-	0.98	0.99	0.97

Consolidation Phase				
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	290	340	440
Back Pressure	kPa	240	240	240
Pore Pressure (Initial)	kPa	328.0	328.0	328.0
Pore Pressure (Final)	kPa	287.0	287.0	287.0
Volumetric Strain	%	1.2	3.2	5.0
Effective Stress *	kPa	48.7	99.3	198.4

*: At commencement of Shear

End of Shear Phase					
Failure Criterion:		Maximum Deviator Stress			
Rate of Strain		0.5 %/hour			
			Specimen 1	**Specimen 2**	**Specimen 3**
Corrected Deviator Stress		kPa	201.0	210.2	270.4
at Axial Strain		%	12.3	15.2	10.3
Principal Stresses	$\sigma 1'$	kPa	254	276	343
	$\sigma 3'$	kPa	53	65	73

Final Specimen Details				
Moisture Content	%	46.7	49.3	49.5
Dry Density	g/cm^3	1.210	1.179	1.174
Void Ratio	-	1.464	1.530	1.540

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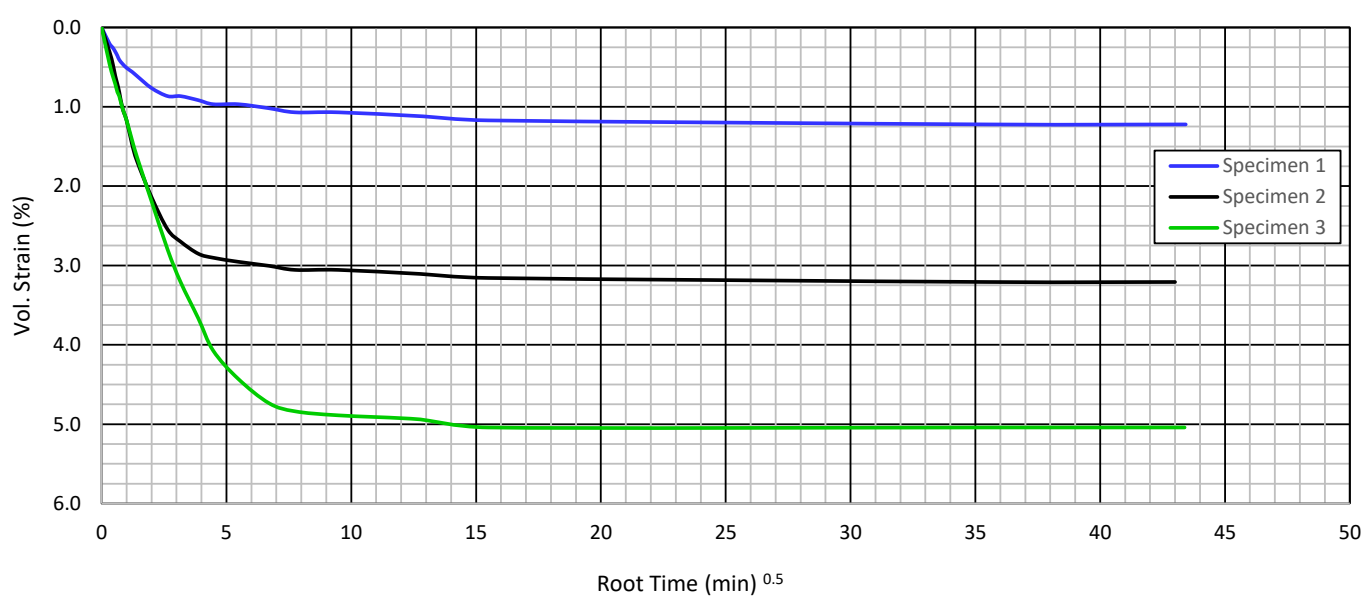
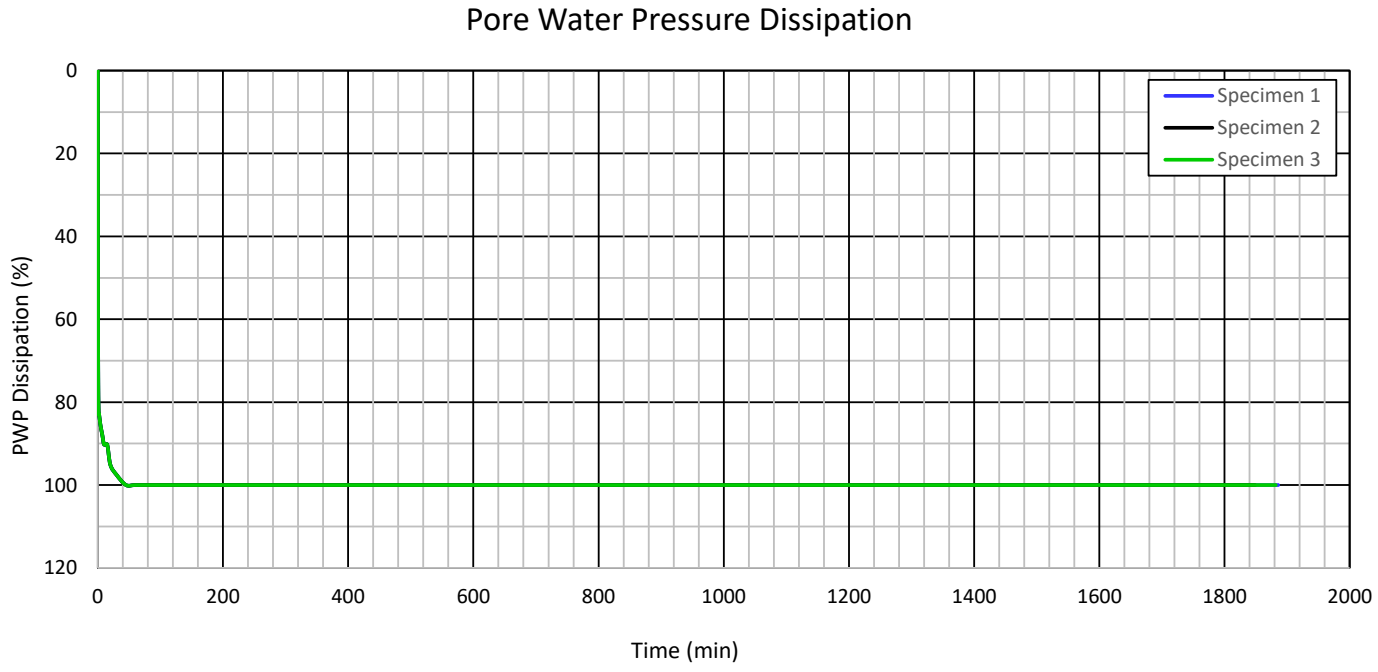
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-42
Sample:	BH 7	**Date:**	26/06/2019
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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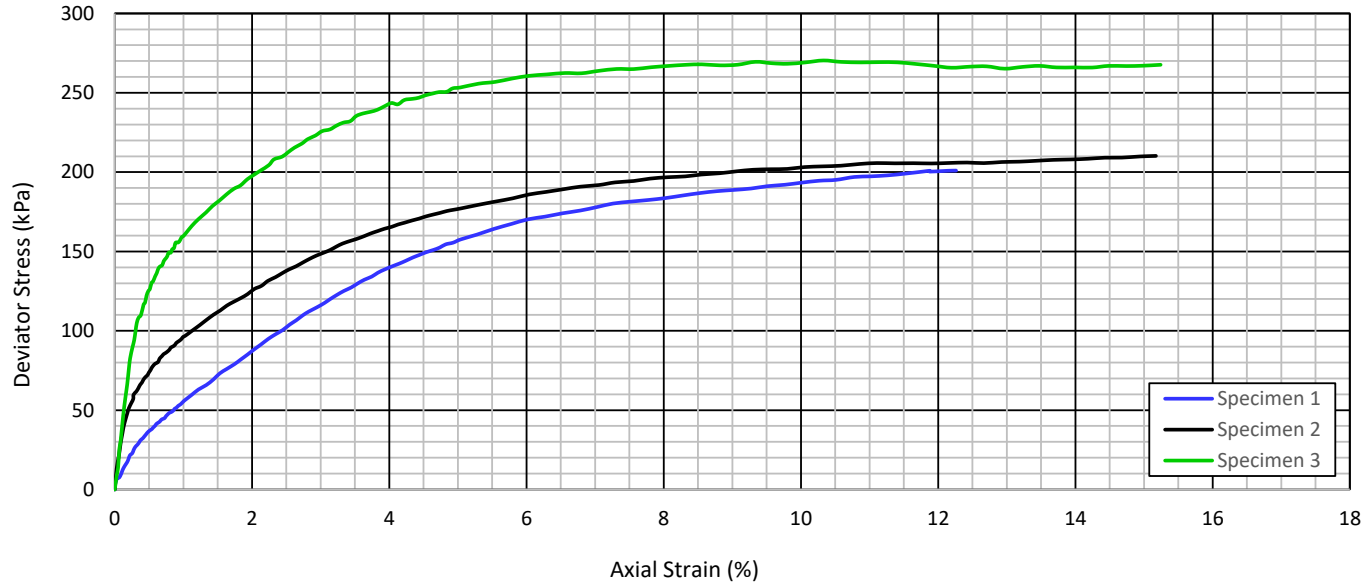
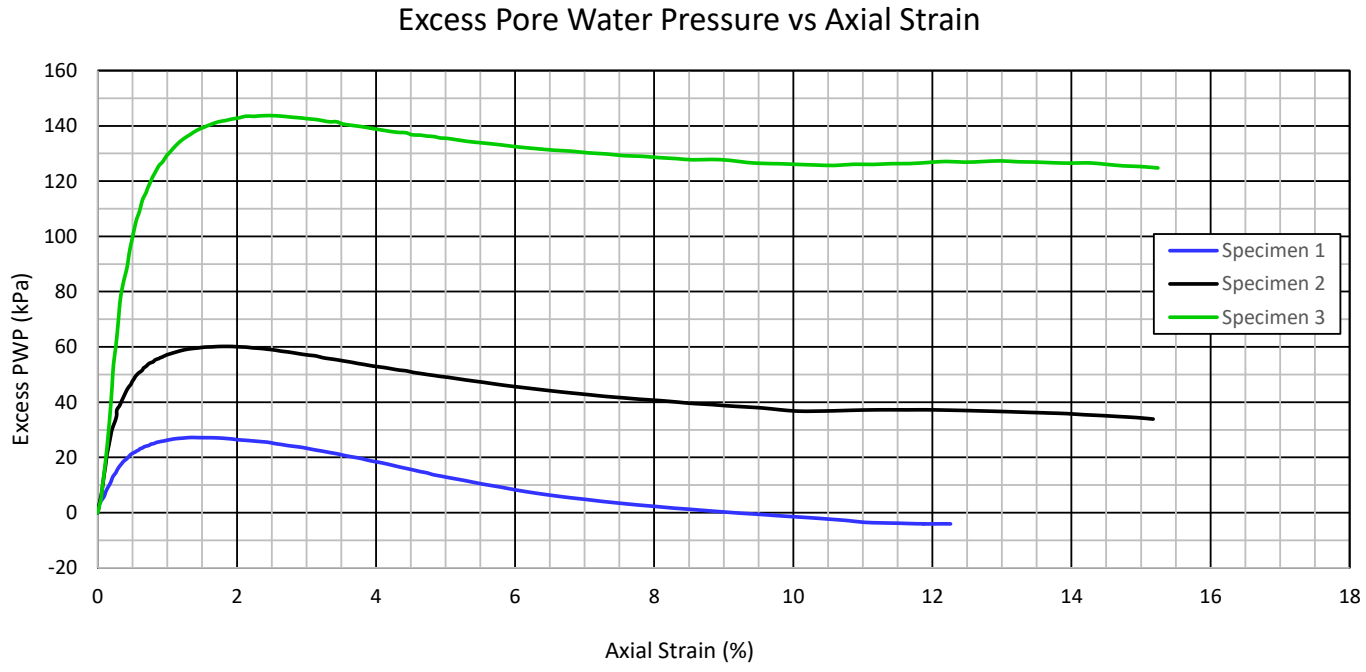
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-42
Sample:	BH 7	**Date:**	26/06/2019
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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Gerrie | 082 309 4448 | gerrie@stlab.co.za
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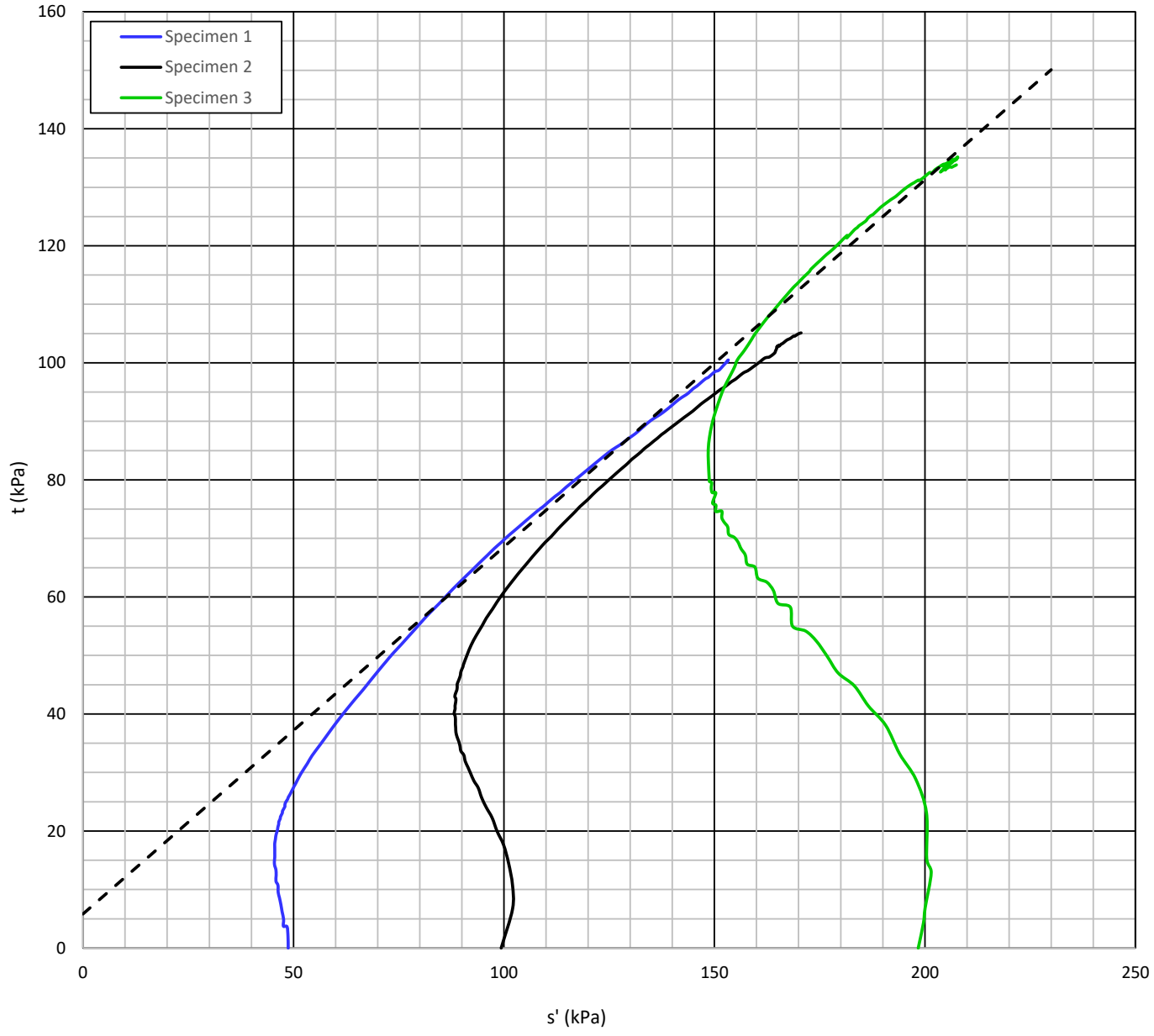
Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-42
Sample:	BH 7	**Date:**	26/06/2019
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

ϕ'	Deg.	**39**
c'	kPa	**6**



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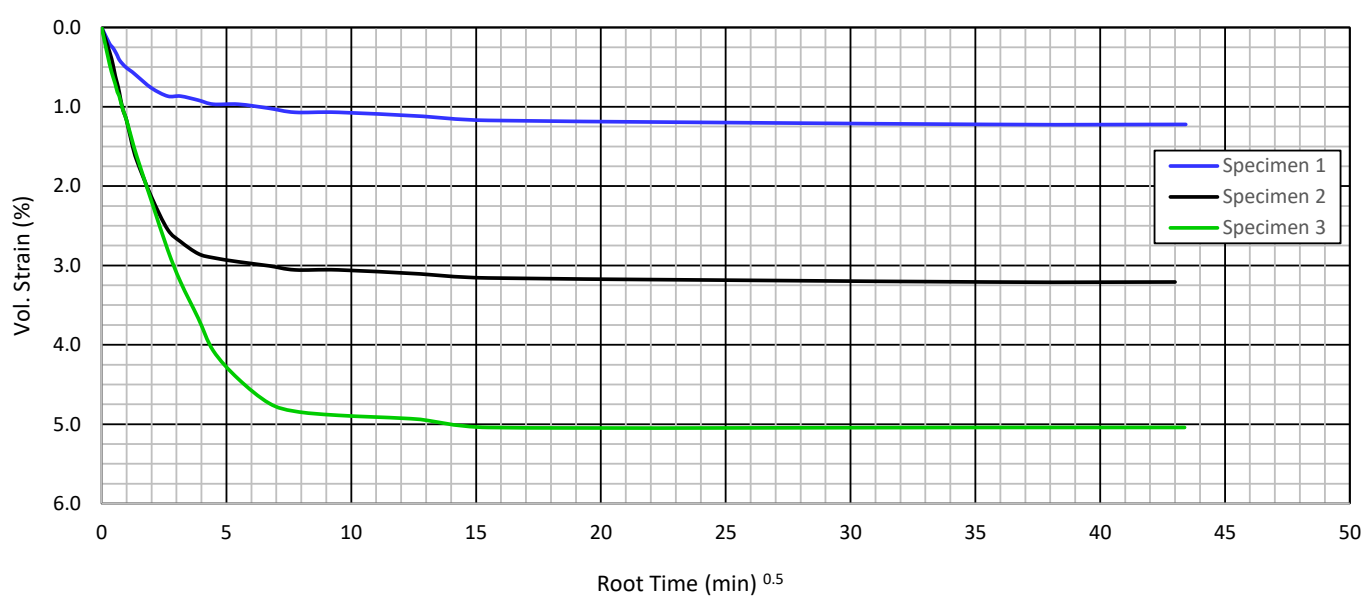

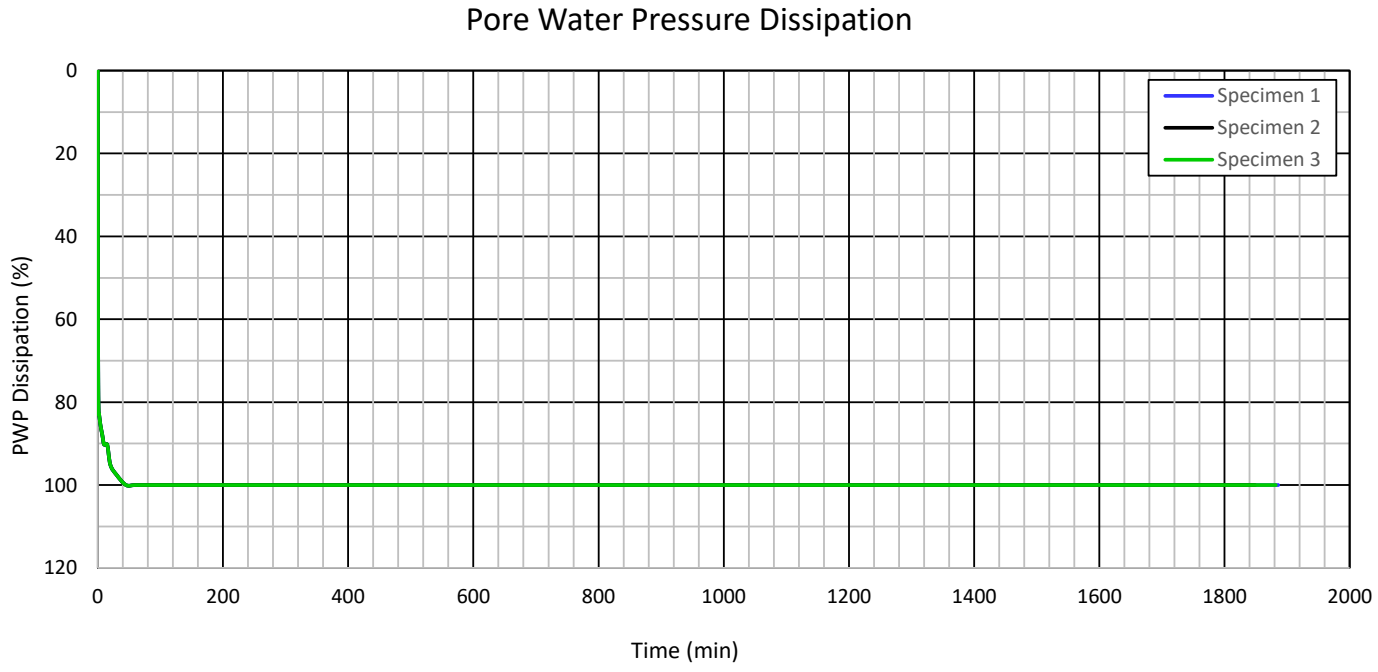

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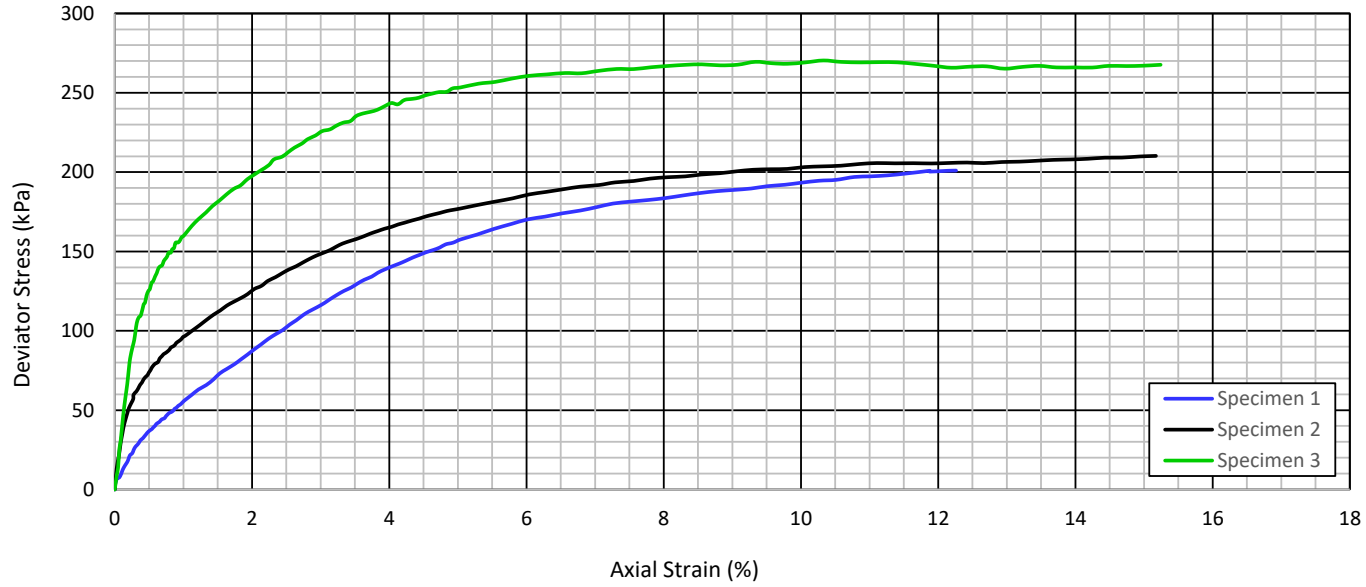

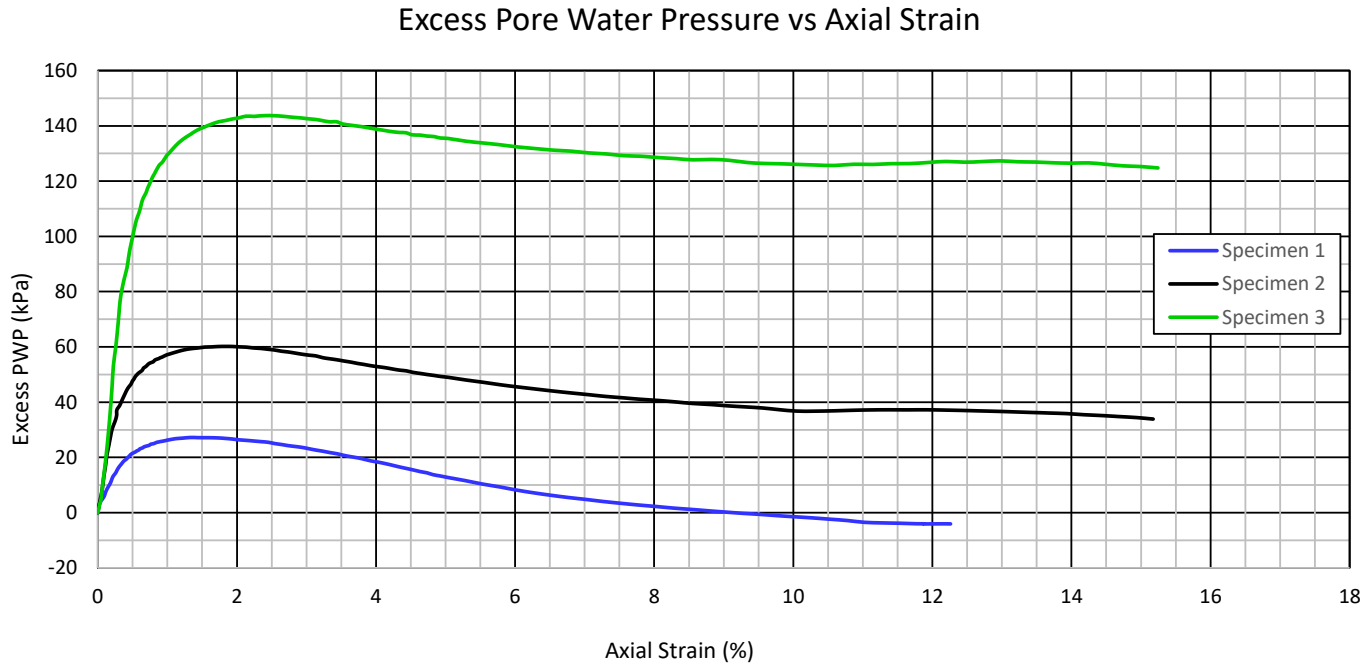

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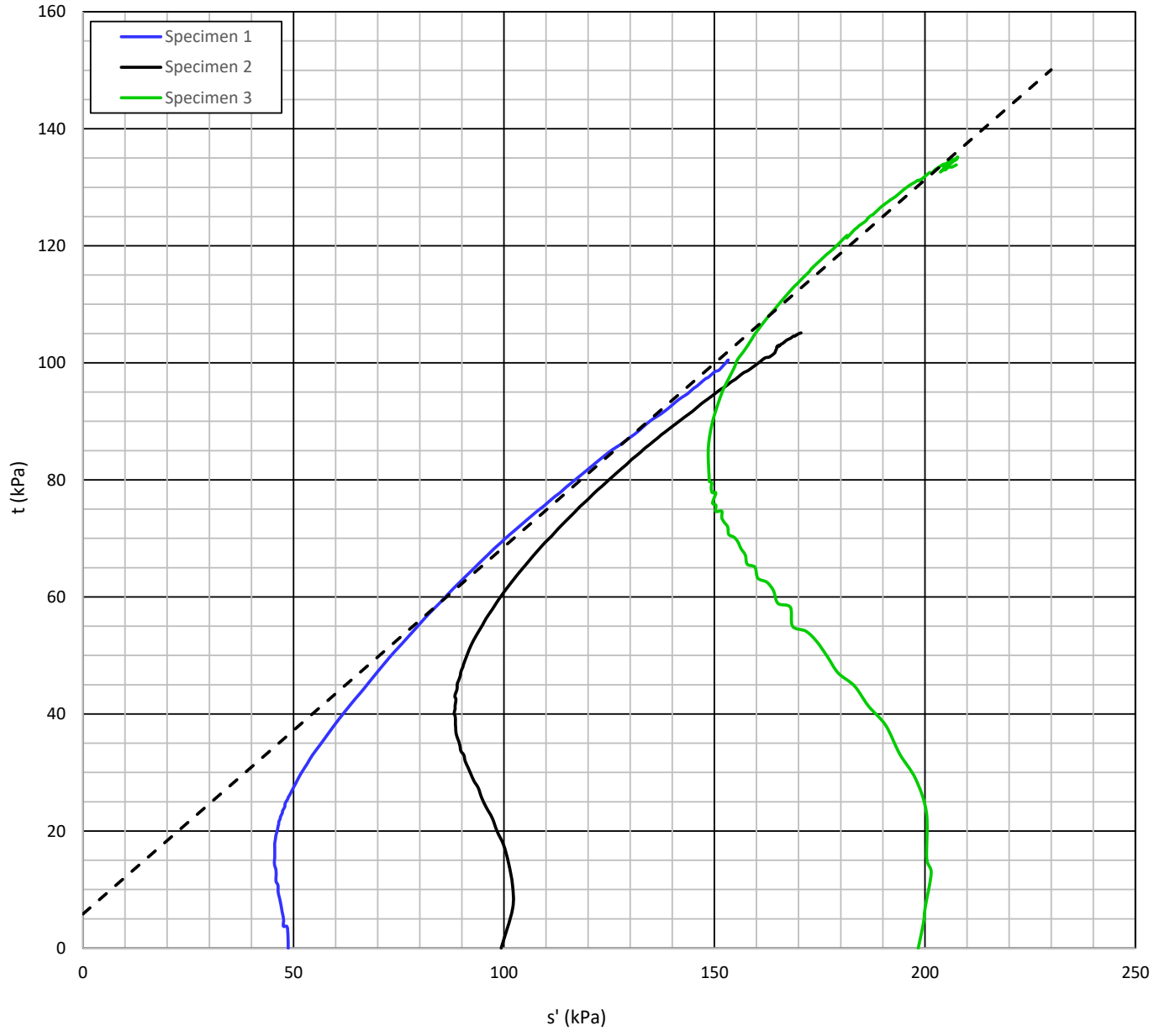
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

ϕ'	Deg.	**39**
c'	kPa	**6**



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Client Name:	Water Research Co.	**Job Number:**	WRC-12
Project Name:	Henrietta	**Lab Number:**	WRC-12-41
Sample:	BH 6	**Date:**	26/06/2019
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

General Test Data	
Type of Test:	Saturated, Consolidated Undrained with Pore Water Pressure Measurements
Type of Sample:	Undisturbed
Side Drains:	Yes
Drainage:	To One End
Comments:	-

Initial Specimen Details				
		Specimen 1	**Specimen 2**	**Specimen 3**
Diameter	mm	50.0	50.0	50.0
Length	mm	100.0	100.0	100.0
Volume	cm^3	196.3	196.3	196.3
Moisture Content	%	60.1	58.8	59.4
Dry Density	g/cm^3	1.035	1.077	1.051
Void Ratio	-	1.867	1.757	1.825
Degree of Saturation	%	95.5	99.3	96.7
Particle Density (SG)	-	2.968		

End of Saturation Phase				
Method:		Increments of Cell- and Backpressure		
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	300	250	250
Back Pressure	kPa	290	240	240
B Value	-	0.96	0.98	0.98

Consolidation Phase				
		Specimen 1	**Specimen 2**	**Specimen 3**
Cell Pressure	kPa	340	340	440
Back Pressure	kPa	290	240	240
Pore Pressure (Initial)	kPa	328.0	320.3	429.3
Pore Pressure (Final)	kPa	287.0	239.3	238.8
Volumetric Strain	%	2.0	5.9	6.2
Effective Stress *	kPa	46.1	98.5	198.7

*: At commencement of Shear

End of Shear Phase					
Failure Criterion:		Maximum Deviator Stress			
Rate of Strain		1.0 %/hour			
			Specimen 1	**Specimen 2**	**Specimen 3**
Corrected Deviator Stress		kPa	61.9	115.0	226.2
at Axial Strain		%	15.1	14.5	15.2
Principal Stresses	$\sigma 1'$	kPa	83	156	293
	$\sigma 3'$	kPa	21	41	67

Final Specimen Details				
Moisture Content	%	53.5	48.9	52.8
Dry Density	g/cm^3	1.056	1.144	1.120
Void Ratio	-	1.810	1.595	1.650

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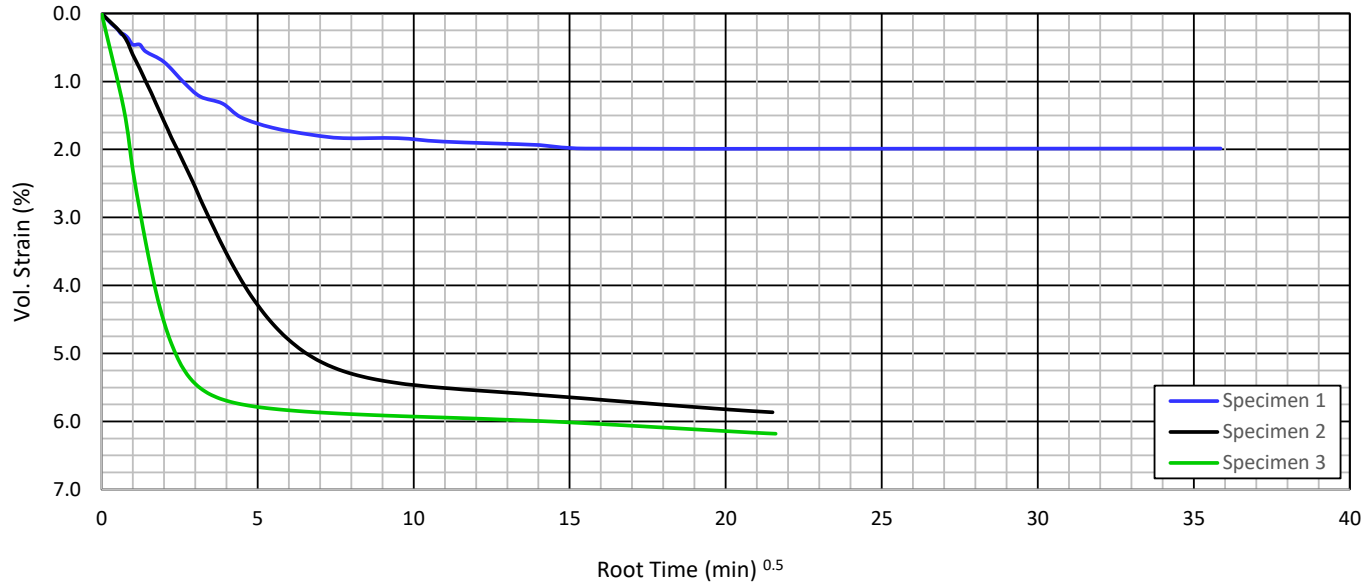
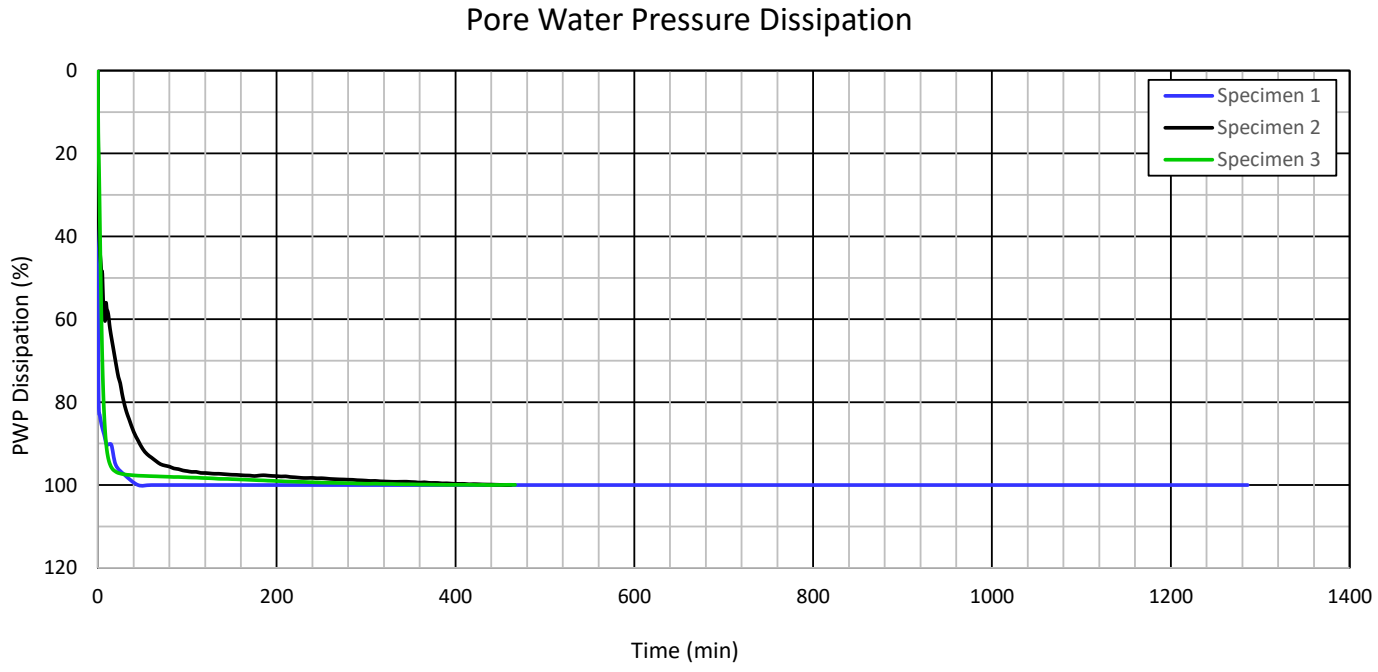
Sample:	BH 6	**Date:**	26/06/2019
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST





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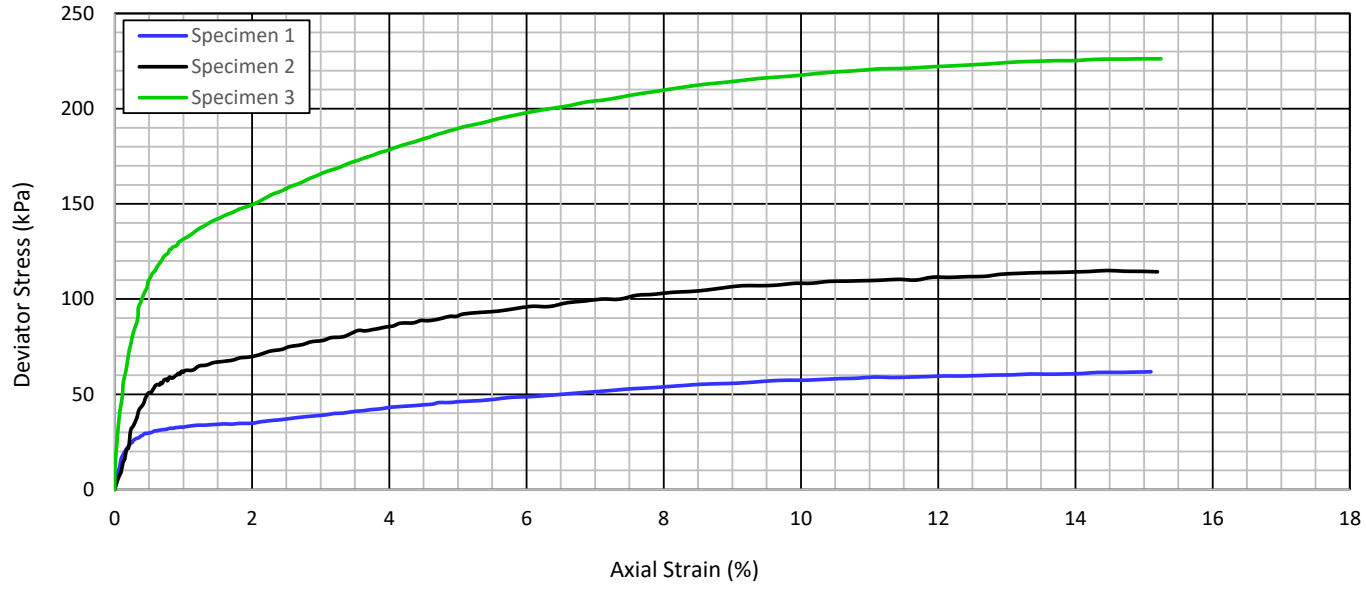

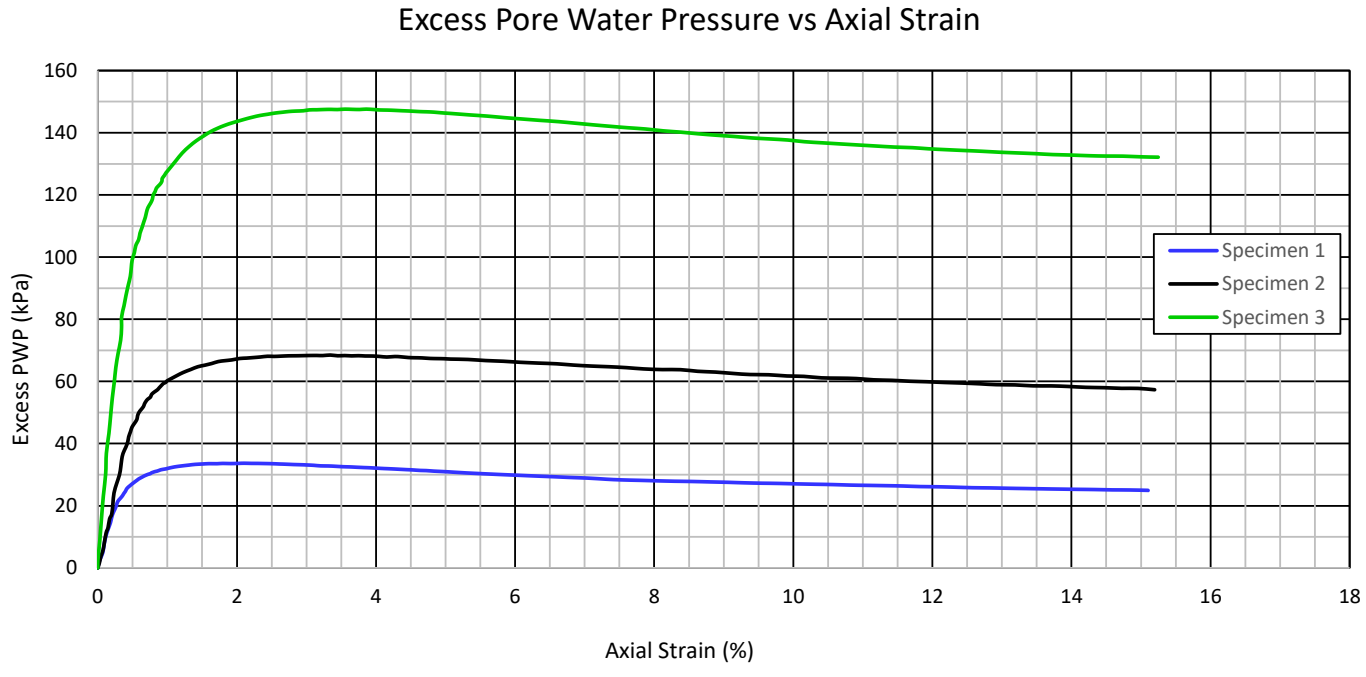

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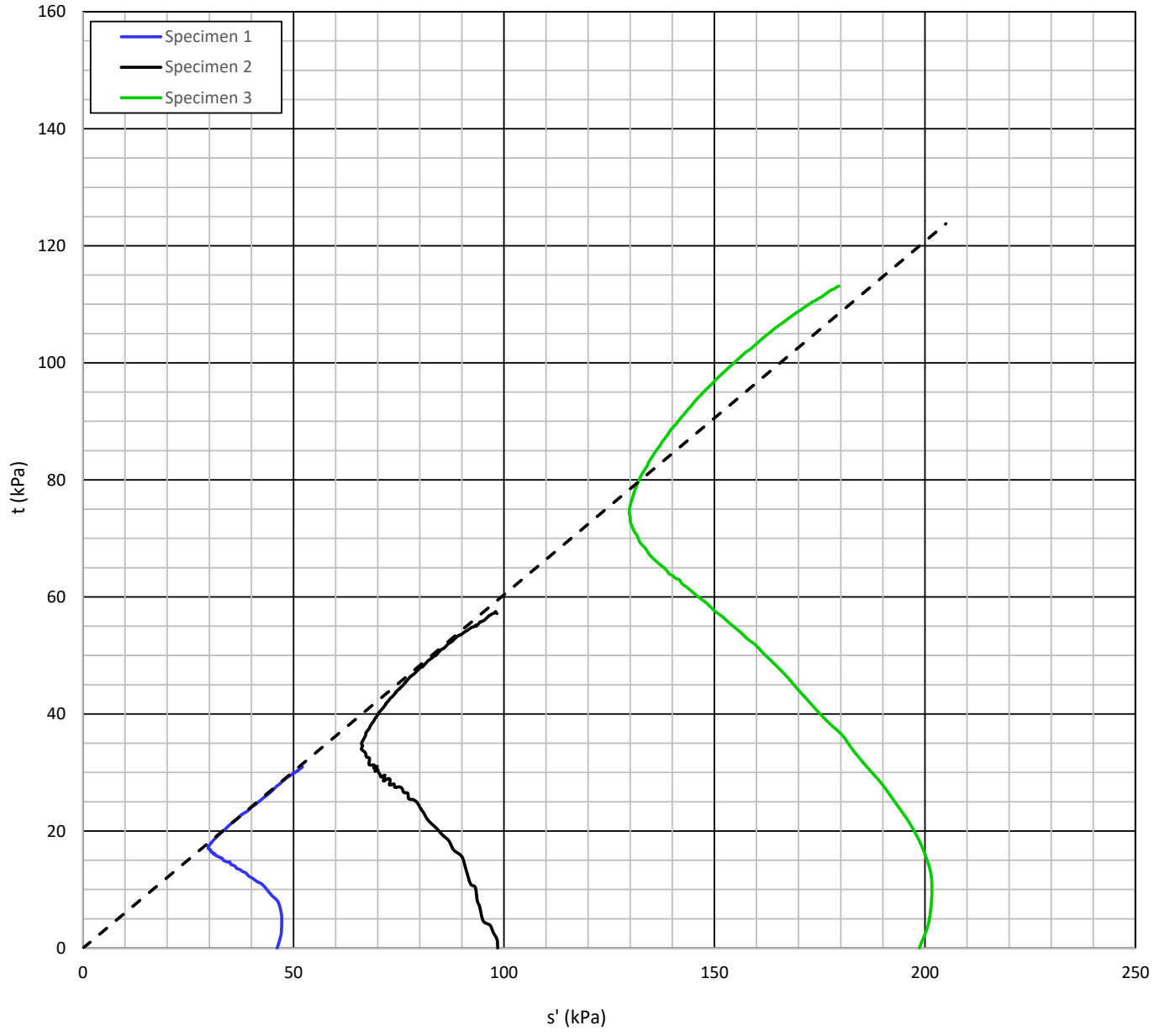
Depth: (m)	3.5 - 4.0	**Method:**	BS 1377 Part 8

CONSOLIDATED UNDRAINED TRIAXIAL TEST

ϕ'	Deg.	**37**
c'	kPa	**0**



Appendix I: Electrical Resistivity Report

Bureau d'études STRATAGEM974
62 Bd du Chaudron
97490 Sainte Clotilde
La Réunion
Tel/fax : 02 62 21 84 69
GSM: 06 92 266062 / 06 92 369650
Email: contact@stratagem974.com

Geophysical survey
Photovoltaic Farm - Henrietta
Vertical Electrical Resistivity Soundings

Final report
21/02/2019

Field data acquisition and processing

Mrs. Marie CHAPUT
Mr. M. MERALLI BALLOU

Client

Water Research Co. Ltd.
Trunk Road, St Jean Road
Quatre Bornes,
Mauritius

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1. Introduction

In the scope of the construction of a photovoltaic farm at Henrietta, close to Tamarind fall reservoir, a vertical electrical sounding (VES) survey has been required in order to determine the electrical resistivity of the subsoil in the project area.
To that end, the company Stratagem974 was commissioned by Water Research Ltd to carry out 8 electrical resistivity soundings.
The geophysical survey was performed on the 19th February 2019.

2. General context of the survey

2.1. Study area

The site is located in the southwestern half of Mauritius island, south of Vacoas, close to the village of Henrietta and to the reservoir of Tamarind falls (Figure 1).

Figure 1 – Location of the study area (in red)

2.2. Scope of the work

As required by the client on the area of the future photovoltaic farm, the Vertical Electrical Resistivity Soundings in 8 locations (IEEE Std 81-1983 part 1) and interpretation (in accordance with BS7354 or IEEE 80/81) have been performed.

2.3. Location of the geophysical soundings

Figure 2 shows the location of the eight measurements made during this survey. The soundings have been performed close to trial pits, in order to compare the results with the obtained geological logs.

Figure 2 – Location of the measurements on aerial photograph of the site

Method	Sounding name	X coordinate (WGS84 UTM40, m)	Y coordinate (WGS84 UTM40, m)	Corresponding trial pit/corehole
Vertical Electrical Sounding	VES - TP1	548946	7748742	TP1 / BH1
	VES - TP2	549043	7748780	TP2 / BH2
	VES – TP3	549095	7748666	TP3 / (BH3)
	VES – TP5	549167	7748373	TP5 / BH5
	VES – TP6	549302	7749070	TP6 / BH6
	VES – TP7	549288	7748831	TP7 / BH7
	VES – TP8	549231	7748773	TP8 / BH8
	VES – TP9	549379	7748680	TP9 / (BH9)

Table 1 – GPS coordinates of the different sounding points

3. Methodology and procedure

3.1. Vertical Electrical Sounding (VES)

a) Theoretical concepts

The techniques for measuring soil resistivity are essentially the same whatever the purpose of the measurement. However, the interpretation of the recorded data can vary considerably, especially where soils with non-uniform resistivities are encountered. The added complexity caused by non-uniform soils is common, and in only a few cases are the soil resistivities constant with increasing depth. Earth resistivity varies not only with the type of soil but also with temperature, moisture, salt content, and compactness. The literature indicates that the values of earth resistivity vary from 0.01 to 1 Ω.m for sea water and up to 10^9 Ω.m for sandstone.

Usually there are several layers, each having a different resistivity. Lateral changes may also occur, but in general, these changes are gradual and negligible at least in the vicinity of the site concerned.
In most cases, the measurement will show that the resistivity $\rho_{apparent}$, is mainly a function of depth z. For purposes of illustration, we will assume that this function may be written as: $\rho = \varphi(z)$.

The most accurate method in practice of measuring the average resistivity of large volumes of undisturbed earth is the four-point method. Small electrodes are buried in four small holes in the earth, all at depth b and spaced (in a straight line) at intervals a. A test current *I* is passed between the two outer electrodes and the potential *V* between the two inner electrodes is measured with a potentiometer or high-impedance voltmeter. Then *V/I* gives the resistance *R* in ohms.

One of the most common electrodes arrangement used is the Equally Spaced or Wenner Arrangement. With this arrangement, the electrodes are equally spaced as shown in Figure 3 (left). Let "a" be the distance between two adjacent electrodes. Then, the resistivity "*ρ*" in the terms of the length units in which "a" and "b" are measured is:

$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

It should be noted that this does not apply to ground rods driven to depth b; it applies only to small electrodes buried at depth b, with insulated connecting wires. However, in practice, four rods are usually placed in a straight line at intervals "a",

driven to a depth not exceeding 0.1*a. Then we assume b = 0 and the formula becomes:

$$\rho = 2\pi a R$$

and gives approximately the average resistivity of the soil to the depth a.

A set of readings taken with various probe spacing gives a set of resistivities which, when plotted against spacing, indicates whether there are distinct layers of different soil or rock and gives an idea of their respective resistivities and depth (Figure 3, right).

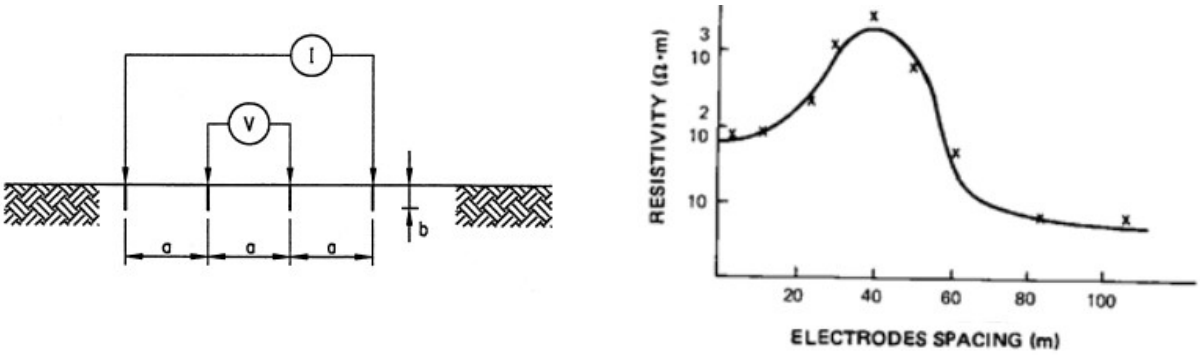


Figure 3 – Wenner arrangement (left) and typical resistivity curve (right)

b) Procedure and equipment

Electrical resistivity tests were carried out using the Wenner 4 points method, in accordance with the ASTM International Standard G57-06 and IEEE Standard 81-2012 (up to date standard).
The following pictures (Figures 4 and 5) present the equipment used for this survey.
Electrical resistivity soundings include:

- Resistivity meter ABEM *Terrameter* multichannel acquisition device
- 4 stainless steel electrodes
- 4 independent 50 m long electrical cables with a plug in system on electrodes and Terrameter
- 12V Battery
- Hammer
- Water

Figure 4 – Complete device: Terrameter, electrodes, battery and sets of cables

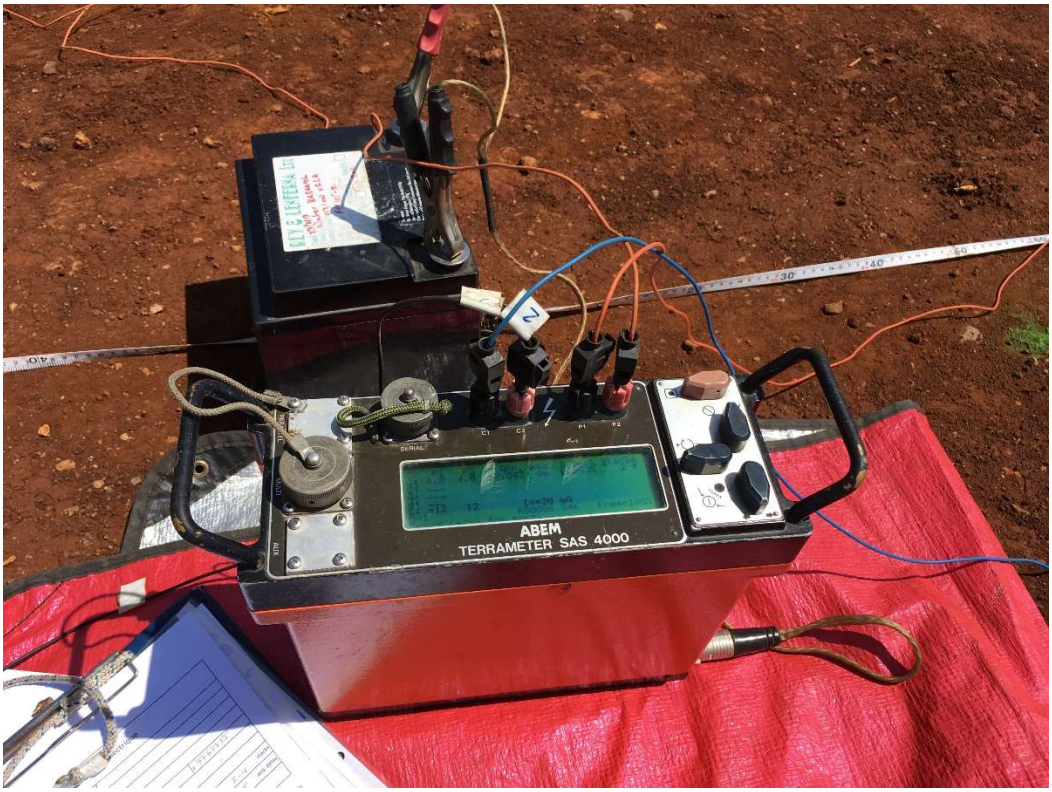


Figure 5 – Resistivity meter ABEM Terrameter SAS4000

4. Results

4.1. Vertical Electrical Soundings

Three soundings were made close to the trial pits TP1 to TP9. For each sounding, a Wenner arrangement has been used. The Wenner arrangement suppose that the spacing between "injection electrodes" A-B is always equal to three time the spacing between the "measuring electrodes" M-N (Figure 6).

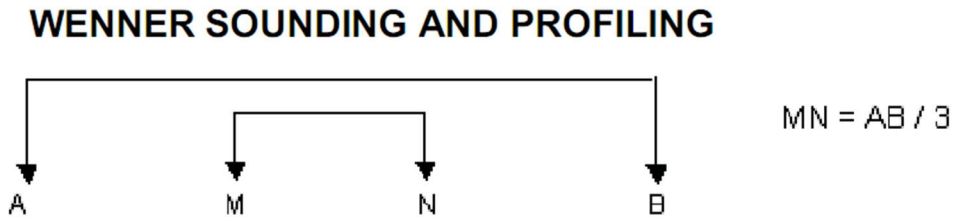


Figure 6 – Wenner arrangement

Nine measurements have been done with the following spacing between M-N electrodes: 0.5m, 1m, 1.5m, 2m, 2.5m, 3m, 4m, 6m and 8m. The maximum size of the profile (maximum distance A-B) was therefore 24 meters.

a) Electrical sounding VES TP1

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	219.10	0.040
6	233.15	0.178
4	237.36	0.097
3	234.84	0.109
2.5	227.29	0.381
2	203.08	0.107
1.5	197.29	0.124
1	202.75	0.156
0.5	242.47	0.087

Table 2 – Apparent resistivity measured for sounding VES TP1

- ***Inverted model***

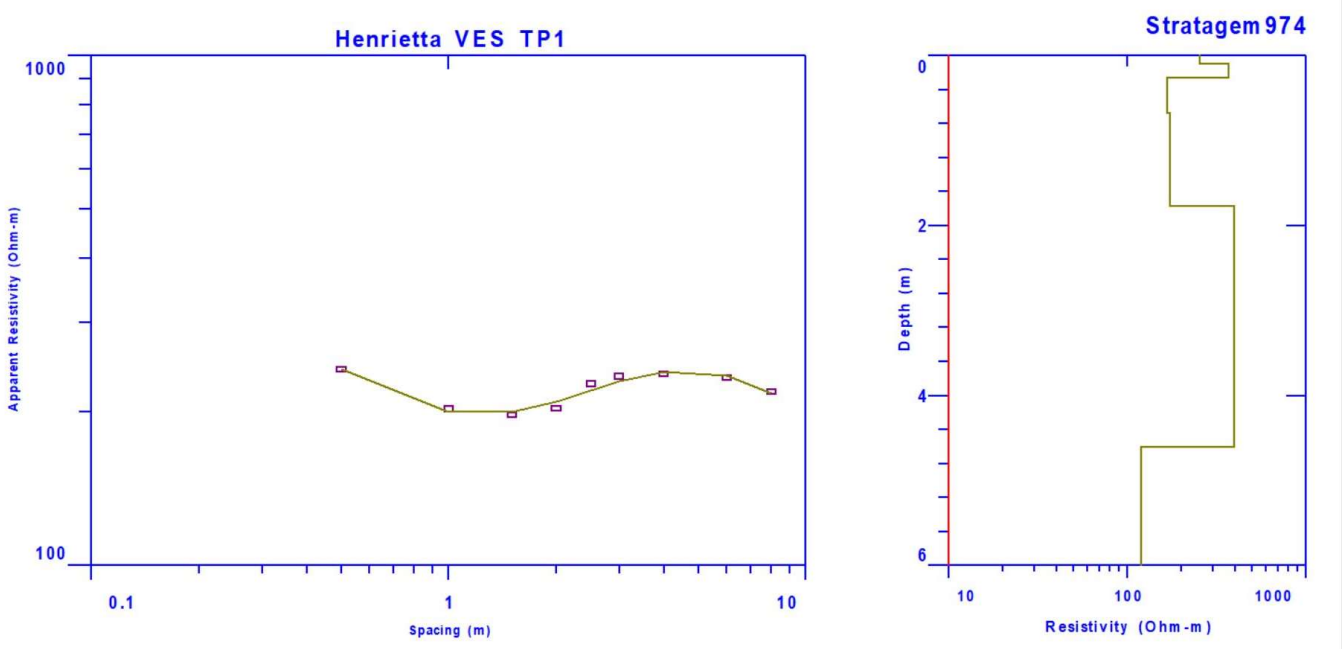


Figure 7 - Best curve fitting the measurement points and inverted model for VES TP1

Once the best fitting curve is obtained between the measured points, an inversion is done to get a model of resistivity function of depth. The Figure 7 and the Table 3 display the results of the calculated model.

VES-TP1 model (RMS error 1.85%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	254.9	0.1	0 to 0.1
2	369.2	0.2	0.1 to 0.3
3	166.9	0.4	0.3 to 0.7
4	173.1	1.1	0.7 to 1.8
5	398.7	2.8	1.8 to 4.6
6	119.3	-	> 4.6

Table 3 – Resistivity values and layers depths for the sounding VES1

From this model, we can observe 4 main units:
- From 0 to 0.3 m depth = Thin moderately resistive unit in surface (layer 1+2, 254.9 and 369.2 Ω.m)
- From 0.3 to 1.8 m depth = A decrease of resistivity to a more conductive unit formed by the layers 3 and 4 (166.9 and 173.1 Ω.m)
- From 1.8 to 4.6m depth = A re-increase of resistivity to a more resistive unit (398.7 Ω.m)

- Beyond 4.6 m depth: Again a sharp decrease to a more conductive layer (119.3 Ω.m).

Two main conductive layers are thus evidenced by this sounding:
- at 30cm deep, the unit is 1.5 m thick
- at 4.6 m deep, with unknown thickness

- ***Comparison with geological log TP1***

The geological log shows:
- 0 to 0.2 m : **Topsoil**
- 0.2 to 1.5 m : **Completely weathered basalt**/residual soil *(soft to firm, greyish to reddish brown, high plasticity clay)*
- 1.5 to 3.8 m: **Completely weathered basalt**/residual soil *(firm, reddish brown, high plasticity clay)*

No water was encountered.

The log is consistent with result of the electrical sounding. The topsoil correspond to the moderately resistive unit (layers 1+2), while the upper completely weathered basalt is characterized by a lower resistivity values (layers 3+4) and the lower completely weathered basalt is a bit more resistive. The depths are consistent within a few centimeters to a few tens centimeters.

b) Electrical sounding VES TP2

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	84.993	0.166
6	108.97	0.127
4	162.76	0.080
3	212.65	0.192
2.5	266.25	0.210
2	265.36	0.070
1.5	287.07	0.053
1	320.41	0.061
0.5	300.10	0.054

Table 4 – Apparent resistivity measured for sounding VES TP2

- ***Inverted model***

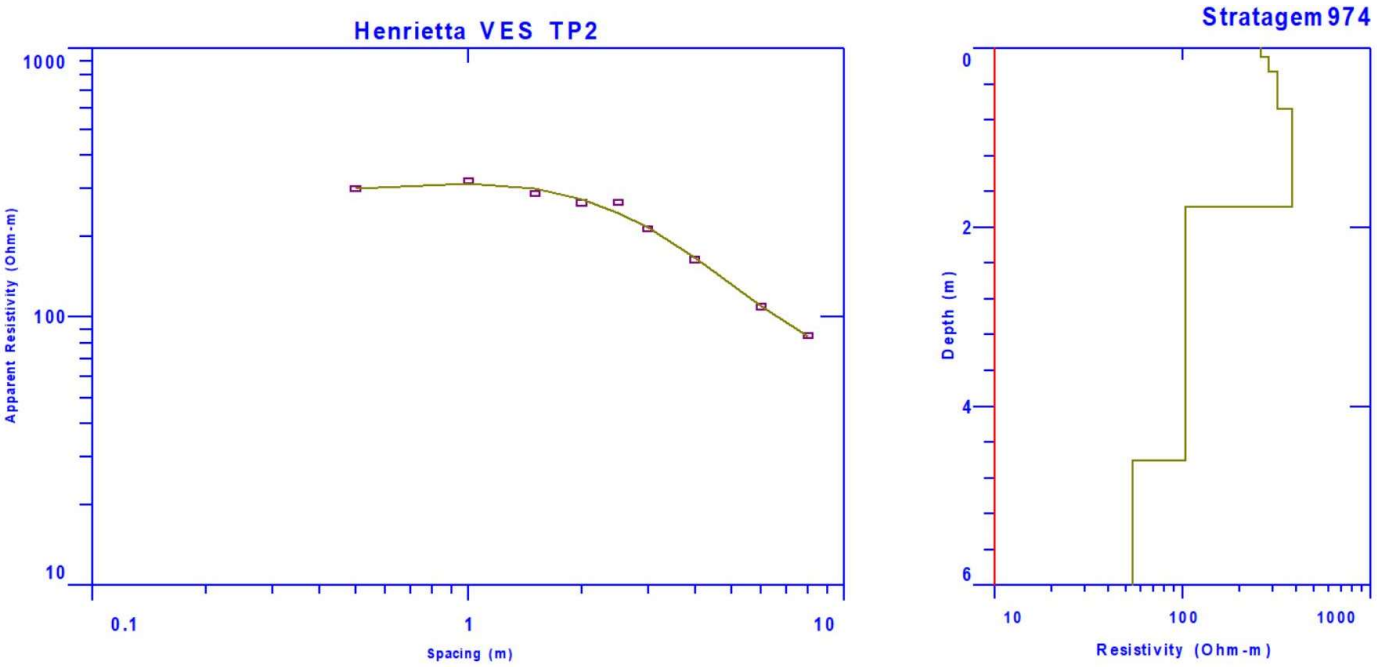


Figure 8 - Best curve fitting the measurement points and inverted model for VES TP2

The results of the data inversion are shown on Figure 8 and the Table 5:

VES-TP2 model (RMS error 3.72%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	259.3	0.1	0 to 0.1
2	286.1	0.2	0.1 to 0.3
3	320.3	0.4	0.3 to 0.7
4	384.4	1.1	0.7 to 1.8
5	103.6	2.8	1.8 to 4.6
6	54.5	-	> 4.6

Table 5 - Resistivity values and layers depths for the sounding VES TP2

From this model, we can observe 4 main units:

- From 0 to 0.3 m depth = A moderately resistive layer in surface (Layers 1+2, 259.3 and 286.1 Ω.m)
- From 0.3 to 1.8 m depth = A slight increase of resistivity to depth (Layers 3+4, 320.3 and 384.4 Ω.m)
- From 1.8 to 4.6 m depth = An sharp decrease to a more conductive unit (103.6 Ω.m)
- Beyond 4.6 m depth = An even more conductive unit (54.5 Ω.m)

Two main conductive layers are thus evidenced by this sounding:

- at 1.8 m deep, the unit is 2.8 m thick
- at 4.6 m deep, more conductive, with unknown thickness

- ***Comparison with geological log TP2***

The geological log shows:

- 0 to 0.4 m : **Topsoil**
- 0.4 to 1.5 m : **Completely weathered basalt**/residual soil *(soft to firm, brown, high plasticity silty clay)*
- 1.5 to 3.8 m: **Completely weathered basalt**/residual soil *(soft, greyish brown, high plasticity silty clay)*

Water was encountered at **1.9m depth**.

The log is consistent with result of the electrical sounding. The topsoil correspond to the moderately resistive unit (layers 1+2), while the upper completely weathered basalt is characterized by slightly higher resistivity values (layers 3+4). The sharp decrease of resistivity at 1.8m is consistent with the presence of water evidenced by the trial pit at a similar depth.

c) Electrical sounding VES TP3

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	192.27	0.147
6	209.41	0.227
4	225.76	0.145
3	249.04	0.100
2.5	251.00	0.047
2	265.78	0.070
1.5	265.74	0.142
1	235.05	0.076
0.5	223.42	0.058

Table 6 – Apparent resistivity measured for sounding VES TP3

- ***Inverted model***

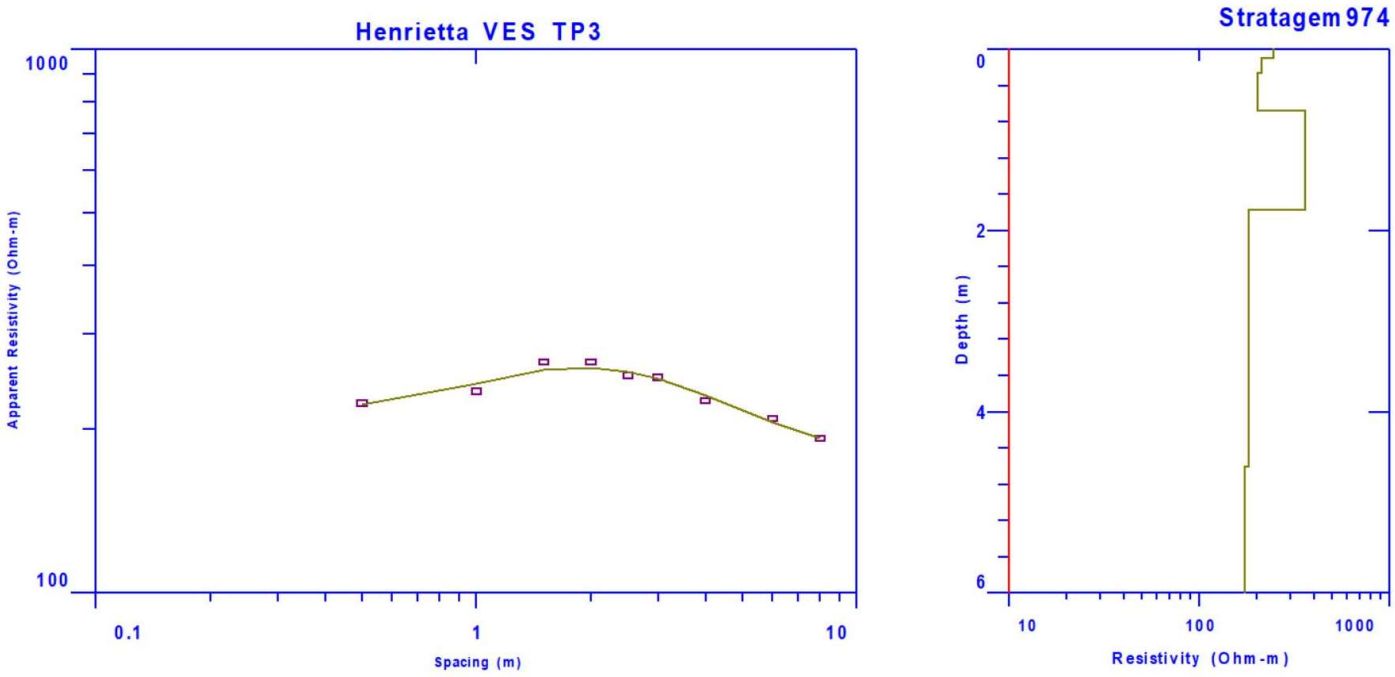


Figure 9 - Best curve fitting the measurement points and inverted model for VES TP3

The results of the data inversion are shown on Figure 9 and the Table 7:

VES-TP3 model (RMS error 2.06%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	246.9	0.1	0 to 0.1
2	213.0	0.2	0.1 to 0.3
3	202.4	0.4	0.3 to 0.7
4	361.3	1.1	0.7 to 1.8
5	181.3	2.8	1.8 to 4.6
6	172.8	-	> 4.6

Table 7 - Resistivity values and layers depths for the sounding VES TP3

From this model, we can observe 3 main units:

- From 0 to 0.7 m depth = A moderately resistive unit in surface (Layers 1+2+3, 246.9, 213 and 202.4 Ω.m)
- From 0.7 to 1.8 m depth = A slight increase of resistivity to depth (361.3 Ω.m)
- From 1.8 to > 4.6 m depth = An sharp decrease to a more conductive unit (layers 5+6, 181.3 and 172.8 Ω.m)

One main conductive layer is thus evidenced by this sounding:

- at 1.8m deep, with a thickness over 2.8 meters

- ***Comparison with geological log TP3***

The geological log shows:

- 0 to 0.4 m : **Topsoil**
- 0.4 to 1.7 m : **Completely weathered basalt**/residual soil *(soft to firm, brown, high plasticity silty clay)*
- 1.7 to 3.8 m: **Completely weathered basalt**/residual soil *(soft to firm, greyish to reddish brown, silty gravelly clay; gravels of moderately to highly weathered basalt)*

No water was encountered.

The log is rather consistent with result of the electrical sounding. The topsoil correspond to the moderately resistive unit (layers 1+2+3), even if the thickness of this unit is a bit larger in the geophysical model. The upper completely weathered basalt is characterized by a higher resistivity value (layer 4) and the lower completely weathered basalt is less resistant (layers 5+6). The transition depth between the two units of weathered basalt is consistent within a few centimeters.

d) Electrical sounding VES TP5

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	266.39	0.151
6	293.65	0.181
4	307.45	0.052
3	337.83	0.085
2.5	350.63	0.082
2	359.33	0.133
1.5	338.33	0.113
1	321.36	0.104
0.5	295.19	0.057

Table 8 – Apparent resistivity measured for sounding VES TP5

- ***Inverted model***

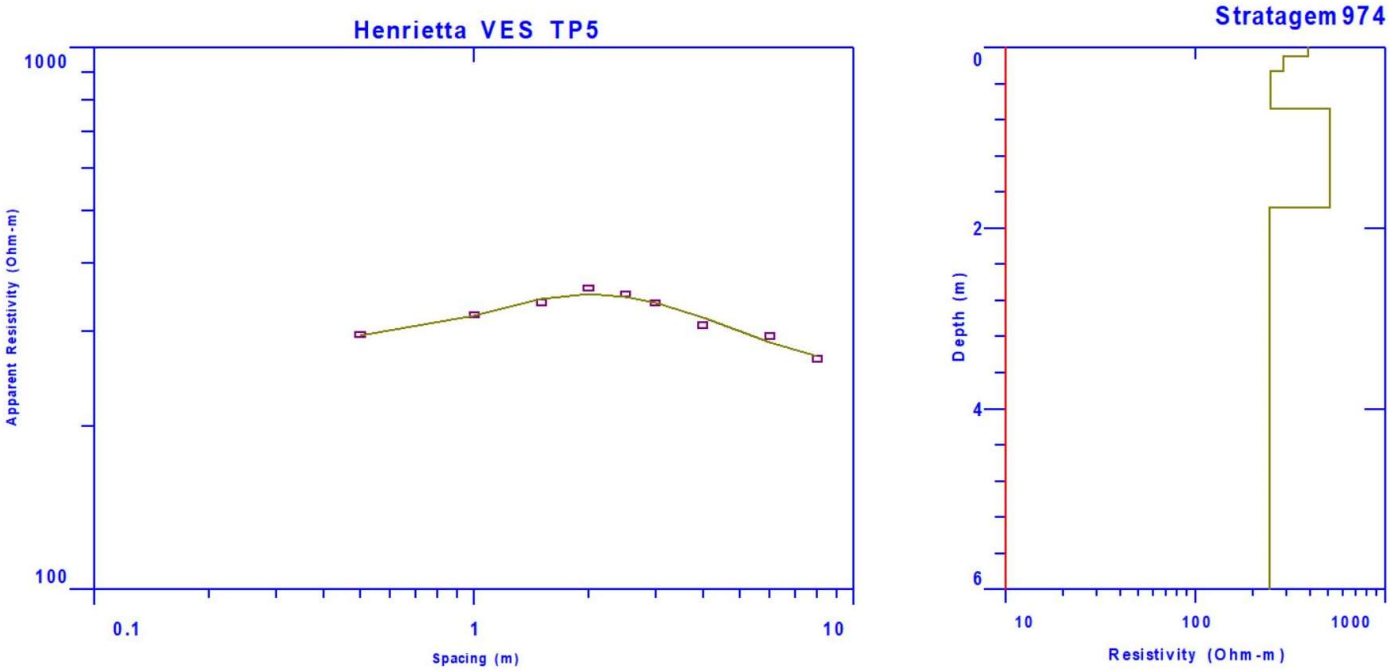


Figure 10 - Best curve fitting the measurement points and inverted model for VES TP5

The results of the data inversion are shown on Figure 10 and the Table 9:

VES-TP5 model (RMS error 1.78%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	393.9	0.1	0 to 0.1
2	292.2	0.2	0.1 to 0.3
3	247.5	0.4	0.3 to 0.7
4	510.6	1.1	0.7 to 1.8
5	244.5	2.8	1.8 to 4.6
6	246.9	-	> 4.6

Table 9 - Resistivity values and layers depths for the sounding VES TP5

From this model, we can observe 4 main units:

- From 0 to 0.1 m depth = A thin resistive unit in surface (393.9 Ω.m)
- From 0.1 to 0.7 m depth = A slight decrease of resistivity to depth (Layers 2+3, 292.2 and 247.5 Ω.m)
- From 0.7 to 1.8 m depth = An sharp increase to a more resistive unit (510.6 Ω.m)
- Beyond 1.8m depth = a sharp decrease to a more conductive unit (layers 5+6, 244.5 and 246.9 Ω.m)

One main resistive layer is thus evidenced by this sounding:

- at 0.7m deep, with a thickness of 1.1 meters

- ***Comparison with geological log TP5***

The geological log shows:

- 0 to 0.5 m : **Topsoil**
- 0.5 to 3.0 m : **Completely weathered basalt**/residual soil *(firm, reddish brown, high plasticity silty clay, cobbles and boulders of slightly weathered basalt)*

No water was encountered.

The log is rather consistent with result of the electrical sounding. The topsoil correspond to the moderately resistive unit (layers 1+2+3), while the completely weathered basalt is characterized by a higher resistivity value (layer 4). The presence of boulders of slightly altered rocks within the unit should explain the higher resistivities. The depths are consistent within a few tens centimeters. However, the decrease of resistivity measured below 1.8 m deep is not supported by a change of lithology visible in the trial pit.

e) Electrical sounding VES TP6

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	170.92	0.148
6	219.41	0.141
4	269.82	0.084
3	319.76	0.069
2.5	333.02	0.071
2	358.26	0.034
1.5	396.13	0.064
1	452.65	0.054
0.5	518.94	0.069

Table 10 – Apparent resistivity measured for sounding VES TP6

- ***Inverted model***

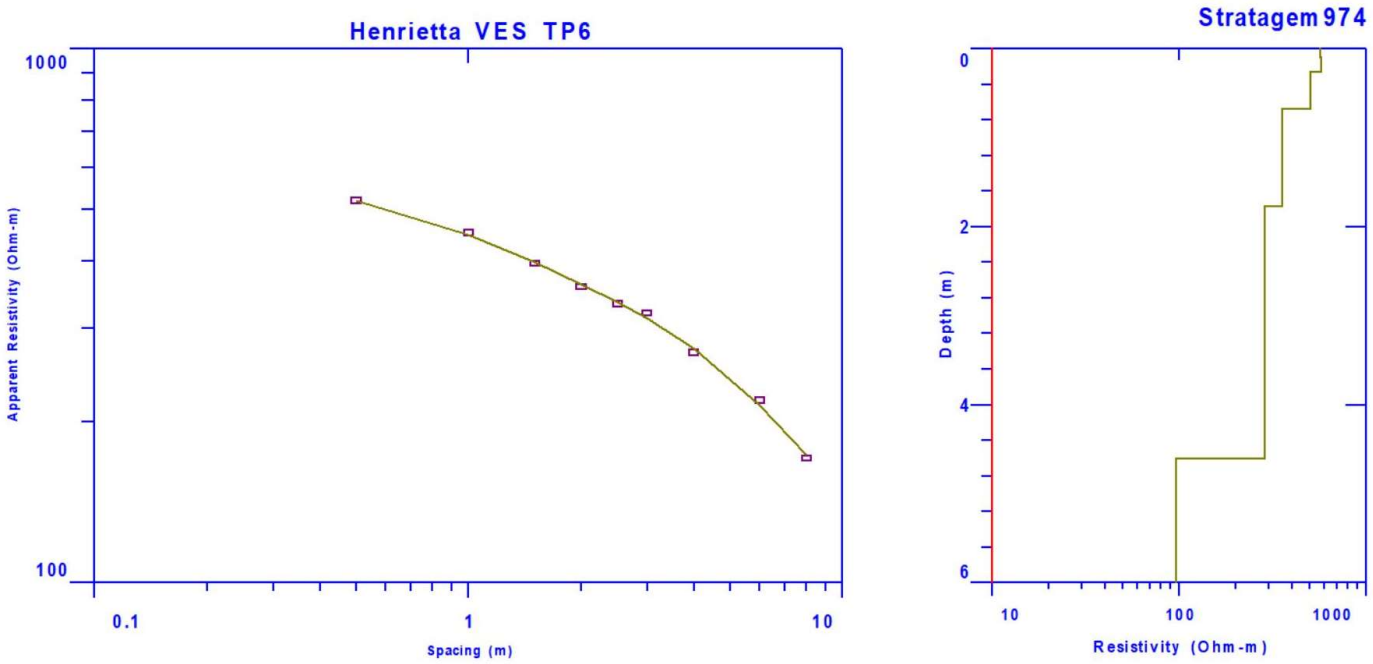


Figure 11 - Best curve fitting the measurement points and inverted model for VES TP6

The results of the data inversion are shown on Figure 11 and the Table 11:

VES-TP6 model (RMS error 1.42%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	569.2	0.1	0 to 0.1
2	573.9	0.2	0.1 to 0.3
3	507.2	0.4	0.3 to 0.7
4	355.1	1.1	0.7 to 1.8
5	287.1	2.8	1.8 to 4.6
6	96.7	-	> 4.6

Table 11 - Resistivity values and layers depths for the sounding VES TP6

From this model, we can observe 3 main units:

- From 0 to 0.7 m depth = A quite resistive unit in surface (Layers 1 to 3, 569.2, 573.9 and 507.2 Ω.m)
- From 0.7 to 4.6 m depth = A slight decrease of resistivity to depth (Layers 4+5, 355.1 and 287.1 Ω.m)
- Beyond 4.6m depth = A sharp decrease to an even more conductive unit (96.7 Ω.m)

One main conductive layer is thus evidenced by this sounding:

- at 4.6 m deep, very conductive, with an unknown thickness

- ***Comparison with geological log TP6***

The geological log shows:

- 0 to 0.3 m : **Topsoil**
- 0.3 to 2.1 m : **Completely weathered basalt**/residual soil *(soft, greyish brown, high plasticity silty clay)*
- 2.1 to 3.2 m: **Completely weathered basalt**/residual soil *(soft, dark brown, high plasticity silty clay)*

Water was encountered at **3.2 m deep**.

The log is not that consistent with result of the electrical sounding. The main resistivity contrasts are evidenced at 0.7 and 4.6 m deep, which do not fit to the lithology contrasts seen in the trial pit. The very conductive unit, which may correspond to the water table is shown at 4.6 m deep, while it was encountered at 3.2 m in the pit.
It can be explained by very local variations of rock composition (presence of boulders of less/more weathered rocks) and lithology between the trial pit area and the area where was made the geophysical test (distant of a few meters). The water level may also have evolved in this area between the two campaigns.

f) Electrical sounding VES TP7

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	243.59	0.145
6	276.46	0.107
4	301.19	0.340
3	335.52	0.071
2.5	359.44	0.088
2	*Incoherent measurement (4.8725 kOhm.m)*	*0.087*
1.5	323.12	0.059
1	573.22	0.047
0.5	450.08	0.001

Table 12 – Apparent resistivity measured for sounding VES TP7

Given its inconsistency, the measured value at spacing 2 m was not taken into account in the inversion process.

- ***Inverted model***

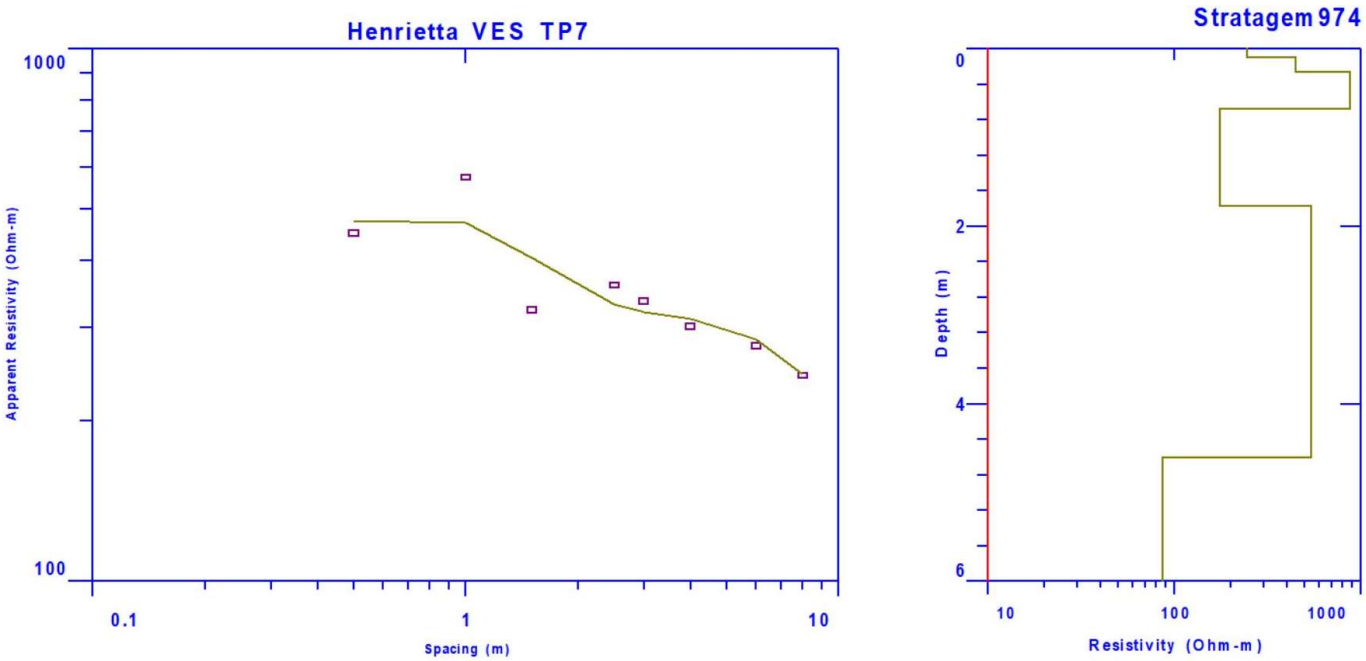


Figure 12 - Best curve fitting the measurement points and inverted model for VES TP7

The results of the data inversion are shown on Figure 12 and the Table 13:

VES-TP7 model (RMS error 11.96%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	246.3	0.1	0 to 0.1
2	448.7	0.2	0.1 to 0.3
3	875.9	0.4	0.3 to 0.7
4	174.9	1.1	0.7 to 1.8
5	543.8	2.8	1.8 to 4.6
6	86.2	-	> 4.6

Table 13 - Resistivity values and layers depths for the sounding VES TP7

From this model, we can observe 6 different units:

- From 0 to 0.1 m depth = A moderately resistive unit in surface (246.3 Ω.m)
- From 0.1 to 0.3 m depth = An increase of resistivity to depth (448.7 Ω.m)
- From 0.3 to 0.7 m depth = A sharp increase of resistivity value (875.9 Ω.m)
- From 0.7 to 1.8 m depth = A sharp decrease to a conductive unit (174.9 Ω.m)
- From 1.8 to 4.6 m depth = Again, a sharp increase to a resistive unit (543.8 Ω.m)
- Beyond 4.6m depth = Again a sharp decrease to a very conductive unit (86.2 Ω.m)

This sounding is characterized by the alternation of conductive/resistive layer from the surface to 4.6 m deep. The deepest layer is very conductive.

The bad datum at spacing 2m negatively affects the quality of the model (high RMS error). So the uncertainty for this model is higher than for the other models.

- ***Comparison with geological log TP7***

The geological log shows:

- 0 to 0.4 m : **Topsoil**
- 0.4 to 2.2 m : **Completely weathered basalt**/residual soil *(soft to firm, greyish to reddish brown, high plasticity silty clay)*
- 2.2 to 3.3 m: **Completely weathered basalt**/residual soil *(soft to firm, greyish to reddish brown, silty clay, gravels of moderately to highly weathered basalt*

No water was encountered.

The log is rather consistent with result of the electrical sounding. The topsoil correspond to the two first moderately resistive unit (layers 1+2), while the upper completely weathered basalt is characterized by a higher resistivity value (layer 3). The second unit of completely weathered basalt corresponds to the layer 5. The layer 4 evidenced by the electrical sounding is not seen in the trial pit and may be a very local lithological anomaly. The last unit with very low resistivities is not reached by the trail pit and may correspond to the saturated horizon.

g) Electrical sounding VES TP8

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	198.95	0.118
6	222.59	0.038
4	233.47	0.063
3	253.03	0.028
2.5	279.77	0.005
2	287.33	0.196
1.5	356.81	0.048
1	395.86	0.046
0.5	429.59	0.047

Table 14 – Apparent resistivity measured for sounding VES TP8

- ***Inverted model***

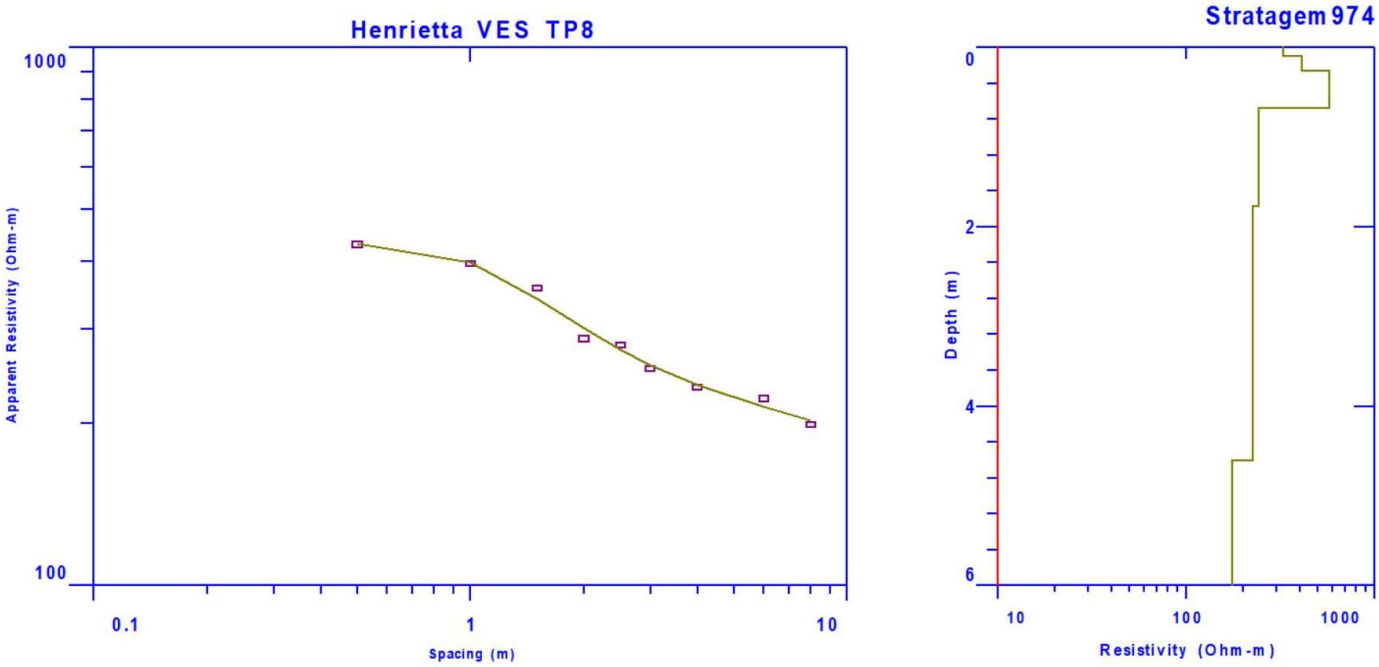


Figure 13 - Best curve fitting the measurement points and inverted model for VES TP8

The results of the data inversion are shown on Figure 13 and the Table 15:

VES-TP8 model (RMS error 2.68%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	326.5	0.1	0 to 0.1
2	410.8	0.2	0.1 to 0.3
3	575.7	0.4	0.3 to 0.7
4	243.2	1.1	0.7 to 1.8
5	224.6	2.8	1.8 to 4.6
6	174.7	-	> 4.6

Table 15 - Resistivity values and layers depths for the sounding VES TP8

From this model, we can observe:

- A progressive increase of resistivity from surface to 0.7 m deep. The unit from 0.3 to 0.7 m deep is quite resistive (575.7 Ω.m)
- At 0.7 m depth = A sharp decrease of resistivity to more conductive units (243.2 Ω.m)
- A progressive decrease of resistivity to a quite conductive unit at 4.6 deep (174.7 Ω.m)

A resistive unit is evidenced at 0.3 m deep, with a thickness of 0.4 m, and a conductive layer is seen at greater depth (> 4.6 m)

- ***Comparison with geological log TP8***

The geological log shows:

- 0 to 0.3 m : **Topsoil**
- 0.3 to 1.1 m : **Completely weathered basalt**/residual soil *(soft, greyish brown, high plasticity silty clay)*
- 1.1 to 3.2 m: **Completely weathered basalt**/residual soil *(firm to soft, greyish brown, silty clay)*

No water was encountered.

The log is rather consistent with result of the electrical sounding. The topsoil correspond to the moderately resistive unit (layers 1+2), while the completely weathered basalt is characterized by a higher resistivity value (layer 3). The layers 4 and 5 should correspond to the deeper unit of completely weathered basalt.

h) Electrical sounding VES TP9

- ***Raw data***

The following Table is a synthesis of the apparent resistivity data obtained for this profile for each electrode's spacing.

Spacing (m)	Apparent resistivity (Ω.m)	Error (%)
8	416.09	1.81
6	404.05	0.541
4	484.05	0.896
3	*Incoherent measurement (1.9425 kOhm.m)*	*2.99*
2.5	789.5	0.209
2	596.62	0.294
1.5	393.21	0.060
1	436.83	0.014
0.5	697.5	0.850

Table 16 – Apparent resistivity measured for sounding VES TP9

Given its inconsistency, probably caused by heavy rain at the moment of measurement, the measured value at spacing 3 m was not taken into account in the inversion process.

- ***Inverted model***

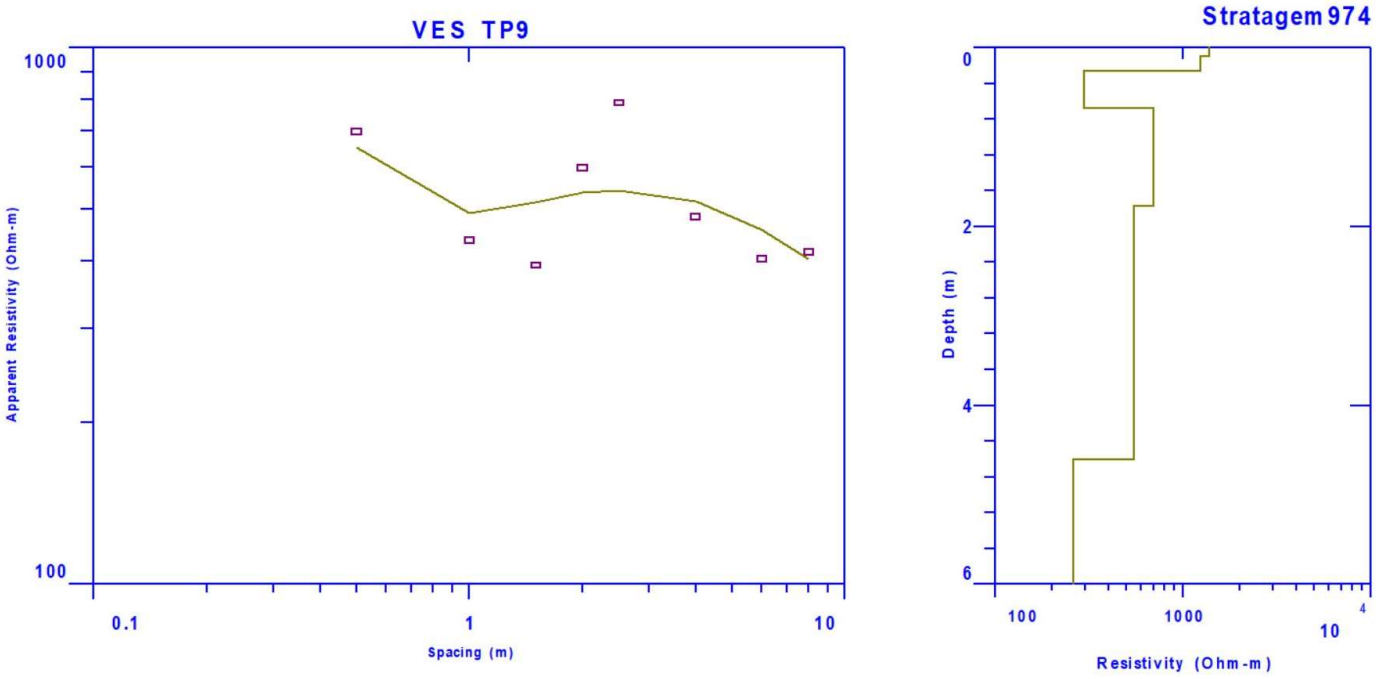


Figure 14 - Best curve fitting the measurement points and inverted model for VES TP9

The results of the data inversion are shown on Figure 14 and the Table 17:

VES-TP9 model (RMS error 20%)			
Layer	**Resistivity (Ω.m)**	**Thickness (m)**	**Depth (m)**
1	1376.6	0.1	0 to 0.1
2	1238.4	0.2	0.1 to 0.3
3	298.1	0.4	0.3 to 0.7
4	700.2	1.1	0.7 to 1.8
5	546.2	2.8	1.8 to 4.6
6	261.7	-	> 4.6

Table 17 - Resistivity values and layers depths for the sounding VES TP9

From this model, we can observe:

- A very resistant unit in surface from 0 to 0.3 m deep (layers 1+2, 1376.6 and 1238.4 Ω.m)
- At 0.3 m depth = A sharp decrease of resistivity to a conductive units (298.1 Ω.m)
- At 0.7 depth = A sharp increase of resistivity to a quite resistant unit (layers 4+5, 700.2 and 546.2 Ω.m)
- Beyond 4.6m = A sharp decrease of resistivity (261.7 Ω.m)

The bad datum at spacing 3 m negatively affects the quality of the model (high RMS error). So, as for TP7, the uncertainty for this model is higher than for the other models.

- ***Comparison with geological log TP9***

The geological log shows:

- 0 to 0.2 m : **Topsoil**
- 0.2 to 1.2 m : **Completely weathered basalt**/residual soil *(firm, brown, high plasticity silty clay with frequent cobbles and boulders of slightly weathered basalt)*
- 1.2 to 3.0 m: **Completely weathered basalt**/residual soil *(soft to firm, greyish to reddish brown, silty gravelly clay, gravels of moderately to highly weathered basalt*

No water was encountered.

The log is not that consistent with result of the electrical sounding. The topsoil may corresponds to to first very resistant layers (layers 1+2), which are surprisingly much more resistant than the other soundings. The two unit of completely weathered basalt may corresponds to the moderately resistant layers 3 and 4 but the depths are not the consistent with the electrical sounding and the lower resistivity of the layer 3 is not explained by the results of the trial pit. It may correspond to very local lithological change. Furthermore, the bad weather conditions during the electrical sounding may have altered the signal and leading to a less precise model.

5. Conclusion

A geophysical survey has been conducted on the site of the future CEB photovoltaic farm at Henrietta in order to determine the electrical resistivity of the ground, both at depth and in surface.
Electrical resistivity soundings (VES) show the presence of **moderately resistant (170-400 Ohm.m) to resistant (400-800 Ohm.m) units up to 4.6 m deep and a more conductive unit (50-120 Ohm.m) from 4.6 m to greater depths**. Sounding VES-TP9 display a similar pattern but with higher resistivities.
The trial pits show some strata mostly constituted of soil in the first tens of centimeters, and of **clayey completely weathered basalt to residual soils at depth**.

The following table summarize the results of the geophysical survey:

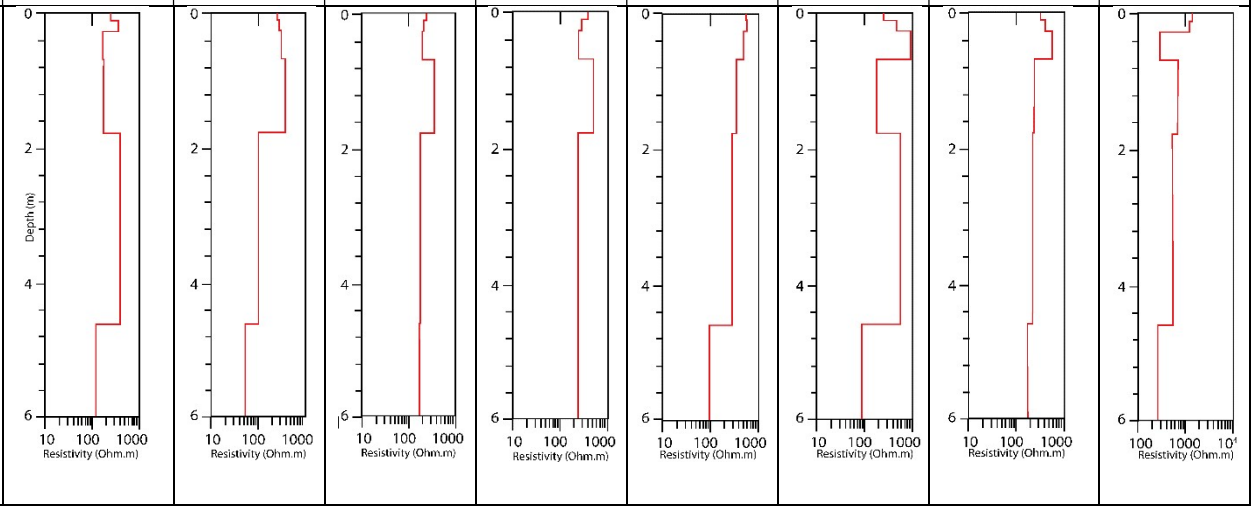
Depth	**VES1**	**VES2**	**VES3**	**VES5**	**VES6**	**VES7**	**VES8**	**VES9**
0-0.1 m	254.9	259.3	246.9	393.9	569.2	246.3	326.5	1376.6
0-0.3 m	369.2	286.1	213	292.2	573.9	448.7	410.8	1238.4
0.3-0.7 m	166.9	320.3	202.4	247.5	507.2	875.9	575.7	298.1
0.7-1.8 m	173.1	384.4	361.3	510.6	355.1	174.9	243.2	700.2
1.8-4.6 m	398.7	103.6	181.3	244.5	287.1	543.8	224.6	546.2
>4.6 m	119.3	54.5	172.8	246.9	96.7	86.2	174.7	261.7
Graph models								

Table 18 – Summary of the geophysical survey results

6. References

- IEEE Standard 81-2012: IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
- ASTM International Standard G57-06: Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method

7. Some pictures


ABEM
TERRAMETER SAS 4000

8. Geological logs

WATER RESEARCH CO. LTD

TRIALPIT No. : TP 1

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 13/02/2019
	N : 7748761.00	End Date : 13/02/2019
	E : 548944.000	Final Depth : 3.40m
	Ground Level :	Water Depth : No Ground Water Encountered

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
0	Dark brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.20				
0.5	Soft to firm greyish to reddish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.0							
1.5			1.50				
2.0	Firm reddish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
2.5							
3.0							
3.5	End of Trialpit at 3.40m		3.40				
4.0							

Remarks :

Notation

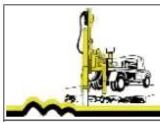
P : Percolation Test
DT : In Situ Density Test
PP : Pocket Penetrometer
SB : Small Bulk
LB : Large Bulk

Logged by : DG
Checked by : ES

Contract No. : OPG 19068 CEB

Project : Geotechnical Investigation at Proposed Henrietta PV Farm Phase 2

Sheet : 1 of 1



WATER RESEARCH CO. LTD

TRIALPIT No. : TP 2

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 13/02/2019
	N : 7748783.00	End Date : 13/02/2019
	E : 549034.000	Final Depth : 3.60m
	Ground Level :	Water Depth : 1.90m

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
	Dark brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.40				
0.5	Soft to firm brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.0							
1.5			1.50				
	Soft greyish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				SB	1.90	
2.0							
2.5							
3.0							
3.5			3.60				
	End of Trialpit at 3.60m				LB		
4.0							

Remarks :

Notation

P : Percolation Test
DT : In Situ Density Test
PP : Pocket Penetrometer
SB : Small Bulk
LB : Large Bulk

Logged by : DG
Checked by : ES

Contract No. : OPG 19068 CEB

Project : Geotechnical Investigation at Proposed Henrietta PV Farm Phase 2

Sheet : 1 of 1

WATER RESEARCH CO. LTD

TRIALPIT No. : TP 3

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 13/02/2019
	N : 7748676.00	End Date : 13/02/2019
	E : 549093.000	Final Depth : 3.70m
	Ground Level :	Water Depth : No Ground Water Encountered

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
0.5	Dark brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.40				
1.0	Soft to firm brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.5			1.70				
2.0	Soft to firm greyish to reddish brown silty slightly gravelly CLAY. Gravels are subrounded fine of very weak dark grey to black Moderately to Highly Weathered Basalt. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
2.5							
3.0							
3.5			3.70				
4.0	End of Trialpit at 3.70m						

Remarks :

Notation

P : Percolation Test
DT : In Situ Density Test
PP : Pocket Penetrometer
SB : Small Bulk
LB : Large Bulk

Logged by : DG
Checked by : ES

Contract No. : OPG 19068 CEB	Project : Geotechnical Investigation at Proposed Henrietta PV Farm Phase 2	Sheet : 1 of 1

WATER RESEARCH CO. LTD

TRIALPIT No. : TP 4

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 13/02/2019
	N : 7748649.00	End Date : 13/02/2019
	E : 548992.000	Final Depth : 3.50m
	Ground Level :	Water Depth : 3.50m

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
0	Dark greyish brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.40				
0.5	Soft greyish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.0							
1.5			1.90				
2.0	Firm reddish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
2.5							
3.0							
3.5	End of Trialpit at 3.50m		3.50			3.50	
4.0							

Remarks :

Notation
P : Percolation Test
DT : In Situ Density Test
PP : Pocket Penetrometer
SB : Small Bulk
LB : Large Bulk

Logged by : DG
Checked by : ES

Contract No. : OPG 19068 CEB

Project : Geotechnical Investigation at Proposed Henrietta PV Farm Phase 2

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WATER RESEARCH CO. LTD

TRIALPIT No. : TP 5

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 15/02/2019
	N : 7748421.00	End Date : 15/02/2019
	E : 549151.000	Final Depth : 3.00m
	Ground Level :	Water Depth : No Ground Water Encountered

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
0.5	Dark reddish brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.50				
1.0	Firm reddish brown high plasticity silty CLAY with frequent cobbles and boulders. Cobbles and Boulders are medium strong to strong grey of Slightly Weathered Basalt. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.5							
2.0							
2.5							
3.0			3.00				
	End of Trialpit at 3.00m						
3.5							
4.0							

Remarks :

Notation

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DT : In Situ Density Test
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Checked by : ES

Contract No. : OPG 19068 CEB

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WATER RESEARCH CO. LTD

TRIALPIT No. : TP 6

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 14/02/2019
	N : 7749067.00	End Date : 14/02/2019
	E : 549307.000	Final Depth : 3.20m
	Ground Level :	Water Depth : 3.20m

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
	Dark greyish brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.30				
0.5	Soft greyish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.0							
1.5							
2.0			2.10				
	Soft dark brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
2.5							
3.0			3.20			3.20	
	End of Trialpit at 3.20m						
3.5							
4.0							

Remarks :

Notation

P : Percolation Test
DT : In Situ Density Test
PP : Pocket Penetrometer
SB : Small Bulk
LB : Large Bulk

Logged by : DG
Checked by : ES

Contract No. : OPG 19068 CEB

Project : Geotechnical Investigation at Proposed Henrietta PV Farm Phase 2

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WATER RESEARCH CO. LTD

TRIALPIT No. : TP 7

SITE : Henrietta

Method : Mechanical Excavator	National Grid Coordinates	Start Date : 14/02/2019
	N : 7748859.00	End Date : 14/02/2019
	E : 549231.000	Final Depth : 3.30m
	Ground Level :	Water Depth : No Ground Water Encountered

Scale (m)	Description of Strata	Legend	Depth (m)	Elevation (m amsl)	Sample Type	Depth of Water Strikes	Insitu density/ Percolation/ Pocket Pen. kPa
	Dark greyish brown gravelly high plasticity silty CLAY with frequent rootlets. Gravels are medium strong grey sub rounded of Moderately Weathered Basalt. TOPSOIL.		0.40				
0.5	Soft to firm greyish to reddish brown high plasticity silty CLAY. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
1.0							
1.5							
2.0			2.20				
2.5	Soft to firm greyish to reddish brown silty slightly gravelly CLAY. Gravels are subrounded fine of very weak dark grey to black Moderately to Highly Weathered Basalt. COMPLETELY WEATHERED BASALT TO RESIDUAL SOIL.				LB SB		
3.0			3.30				
	End of Trialpit at 3.30m						
3.5							
4.0							

Remarks :

Notation

P : Percolation Test
DT : In Situ Density Test
PP : Pocket Penetrometer
SB : Small Bulk
LB : Large Bulk

Logged by : DG
Checked by : ES

Contract No. : OPG 19068 CEB

Project : Geotechnical Investigation at Proposed Henrietta PV Farm Phase 2

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