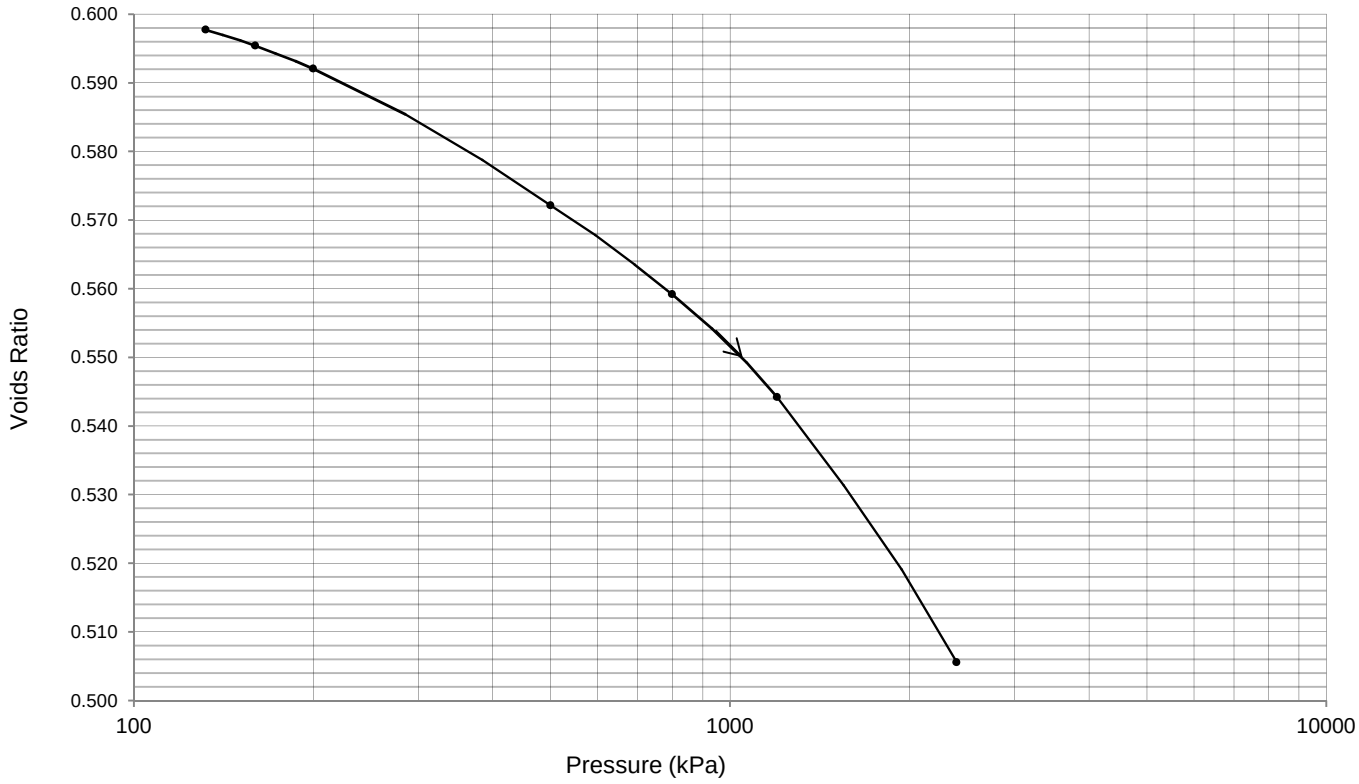
ASTM : D 4546 - 96 : Method C

Determination of One Dimensional Consolidation Properties of Soil

Borehole No.:	PB01
Sample Ref.:	C16
Depth (m):	24.15-24.45
Depth within original:	24.21
Orientation within original:	Vertical
Specimen preparation:	Undisturbed

Description:

Stiff fissured dark grey silty CLAY



Initial Conditions:

					Initial
Height	(mm)	16.7	Moisture Content	(%)	21
Diameter	(mm)	75.0	Voids Ratio		0.605
Area	(mm²)	4415.5	Bulk Density	(Mg/m³)	2.04
Volume	(cm³)	73.8	Dry Density	(Mg/m³)	1.68
Laboratory Temperature	(ºC)	20	Particle density	(Mg/m³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m²/MN)	c_v (m²/year)	Time Fitting Method	Void Ratio
0 - 132	-	Swelling Pressure	-	0.598
132 - 160	0.076	4.3	t90	0.594
160 - 200	0.066	2.8	t90	0.590
200 - 500	0.061	4.4	t90	0.561
500 - 800	0.035	2.3	t90	0.544
800 - 1200	0.029	2.9	t90	0.527
1200 - 2400	0.025	2.8	t90	0.480

Checked and Approved by

JS

J Sturges (Ops Mgr)

Date: 04/03/2015

Project Number:

GEO / 22150

Project Name:

St Giles Circus

Project Ref.: 14/2669

GEOLABS

UKAS TESTING 1982

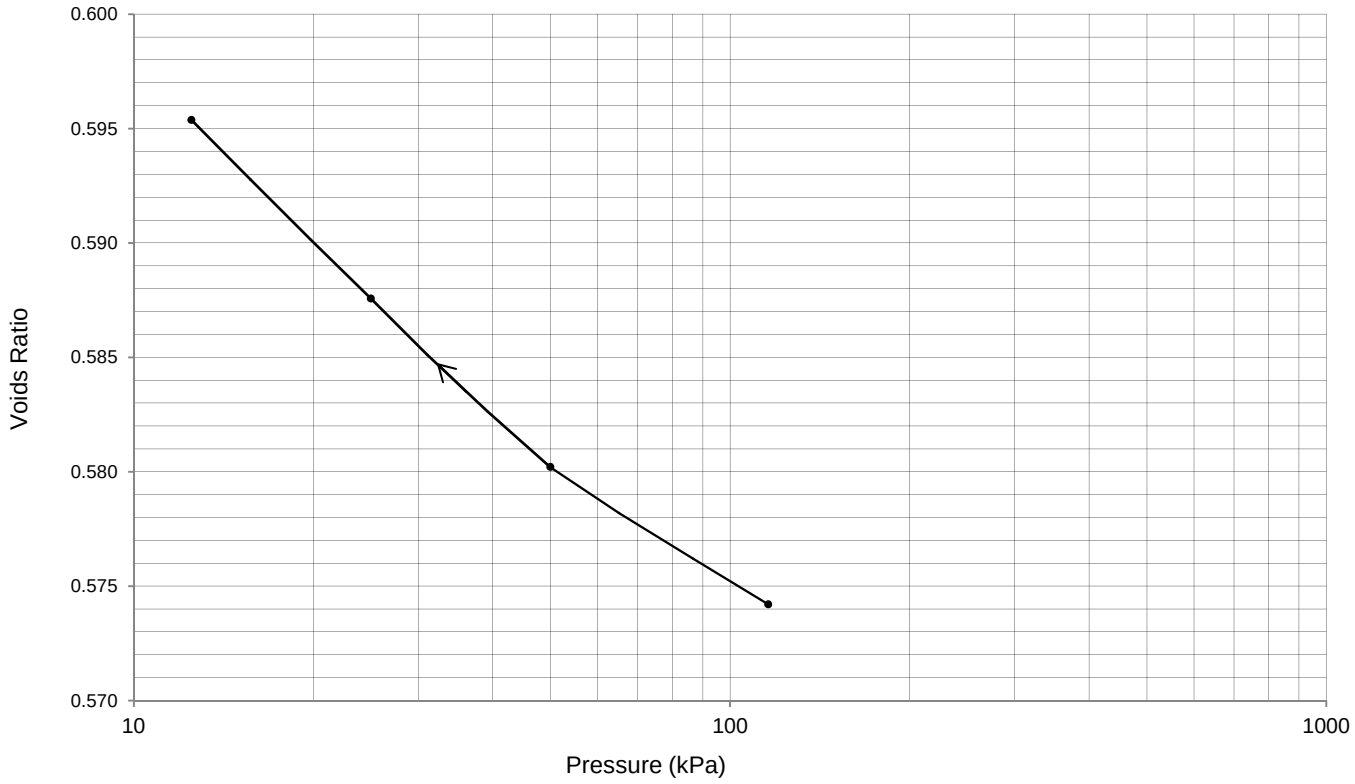
BS1377 : Part 5 : Clause 4.4 : 1990

Determination of Swelling Characteristics

Borehole No.:	PB01
Sample Ref.:	C16
Depth (m):	24.15-24.45
Depth within original:	24.18
Orientation within original:	Vertical
Specimen preparation:	Undisturbed

Description:

Stiff fissured dark grey silty CLAY



Initial Conditions:

					Initial
Height	(mm)	17.1	Moisture Content	(%)	21
Diameter	(mm)	75.0	Voids Ratio		0.590
Area	(mm²)	4414.3	Bulk Density	(Mg/m³)	2.06
Volume	(cm³)	75.5	Dry Density	(Mg/m³)	1.70
Laboratory Temperature	(ºC)	20	Particle density	(Mg/m³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m²/MN)	c_v (m²/year)	Time Fitting Method	Void Ratio
0 - 116	-	Swelling Pressure	-	0.574
116 - 50	0.061	1.2 (Sv)	t50	0.581
50 - 25	0.19	0.23 (Sv)	t50	0.588
25 - 12.5	0.40	0.17 (Sv)	t90	0.596

Checked and Approved by

JS

J Sturges (Ops Mgr)

Date: 03/03/2015

Project Number:

GEO / 22150

Project Name:

St Giles Circus

Project Ref.: 14/2669

GEOLABS

UKAS TESTING 1982

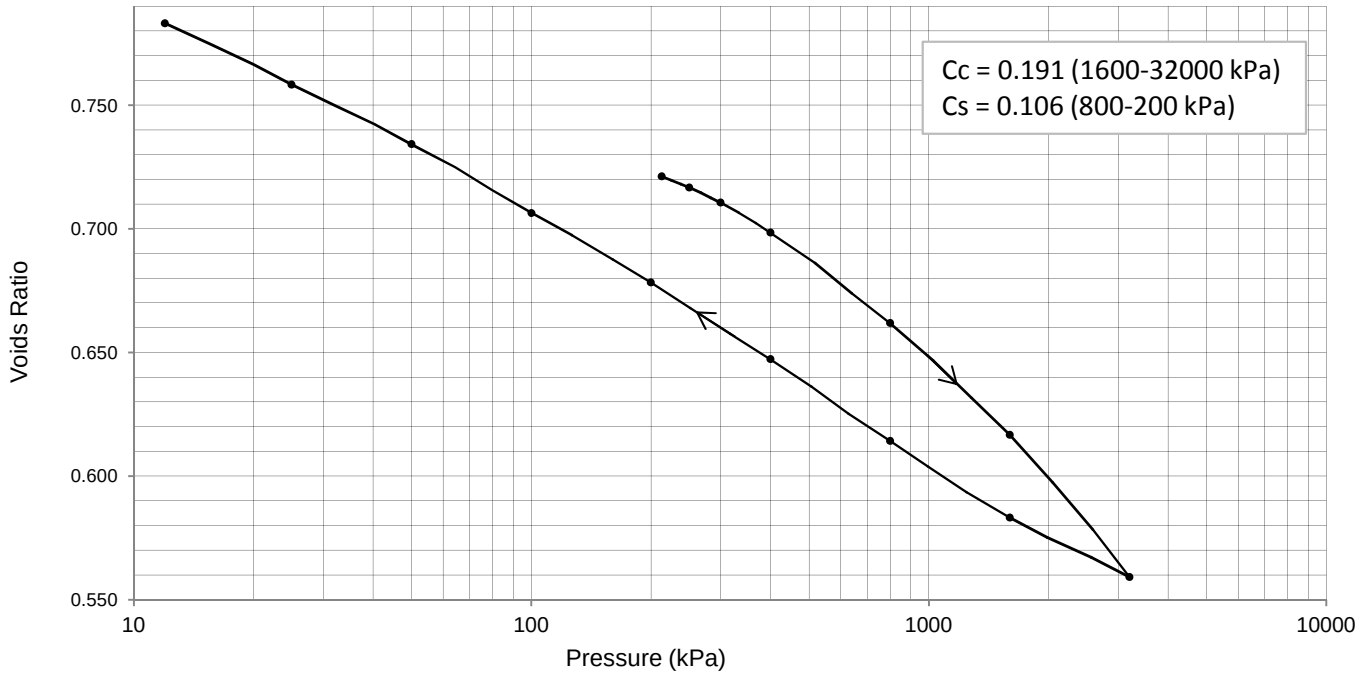
ASTM : D 4546 - 96 : Method C

Determination of One Dimensional Consolidation Properties of Soil

Borehole No.:	PB01
Sample Ref.:	C17
Depth (m):	25.56-25.86
Depth within original:	25.62
Orientation within original:	Vertical
Specimen preparation:	Undisturbed

Description:

Stiff grey fissured CLAY



Initial Conditions:

					Initial
Height	(mm)	17.0	Moisture Content	(%)	27
Diameter	(mm)	75.0	Voids Ratio		0.722
Area	(mm²)	4419.0	Bulk Density	(Mg/m³)	2.00
Volume	(cm³)	75.2	Dry Density	(Mg/m³)	1.57
Laboratory Temperature	(ºC)	20	Particle density	(Mg/m³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m²/MN)	c_v (m²/year)	Time Fitting Method	Void Ratio
0 - 213	-	Swelling Pressure	-	0.721
213 - 250	0.071	0.46	t50	0.717
250 - 300	0.072	0.22	t50	0.710
300 - 400	0.071	0.25	t50	0.698
400 - 800	0.054	0.24	t50	0.662
800 - 1600	0.034	0.26	t50	0.617
1600 - 3200	0.022	0.26	t50	0.559
3200 - 1600	0.0096	0.30 (Sv)	t50	0.583
1600 - 800	0.024	0.15 (Sv)	t50	0.614
800 - 400	0.051	0.096 (Sv)	t50	0.647
400 - 200	0.094	0.068 (Sv)	t50	0.678
200 - 100	0.17	0.054 (Sv)	t50	0.706
100 - 50	0.33	0.034 (Sv)	t50	0.734
50 - 25	0.56	0.024 (Sv)	t50	0.758
25 - 12	1.1	0.015 (Sv)	t50	0.783

Checked and Approved by

JS

J Sturges (Ops Mgr)

Date: 03/03/2015

Project Number:

GEO / 22150

Project Name:

St Giles Circus

Project Ref.: 14/2669

GEOLABS

UKAS TESTING 1982

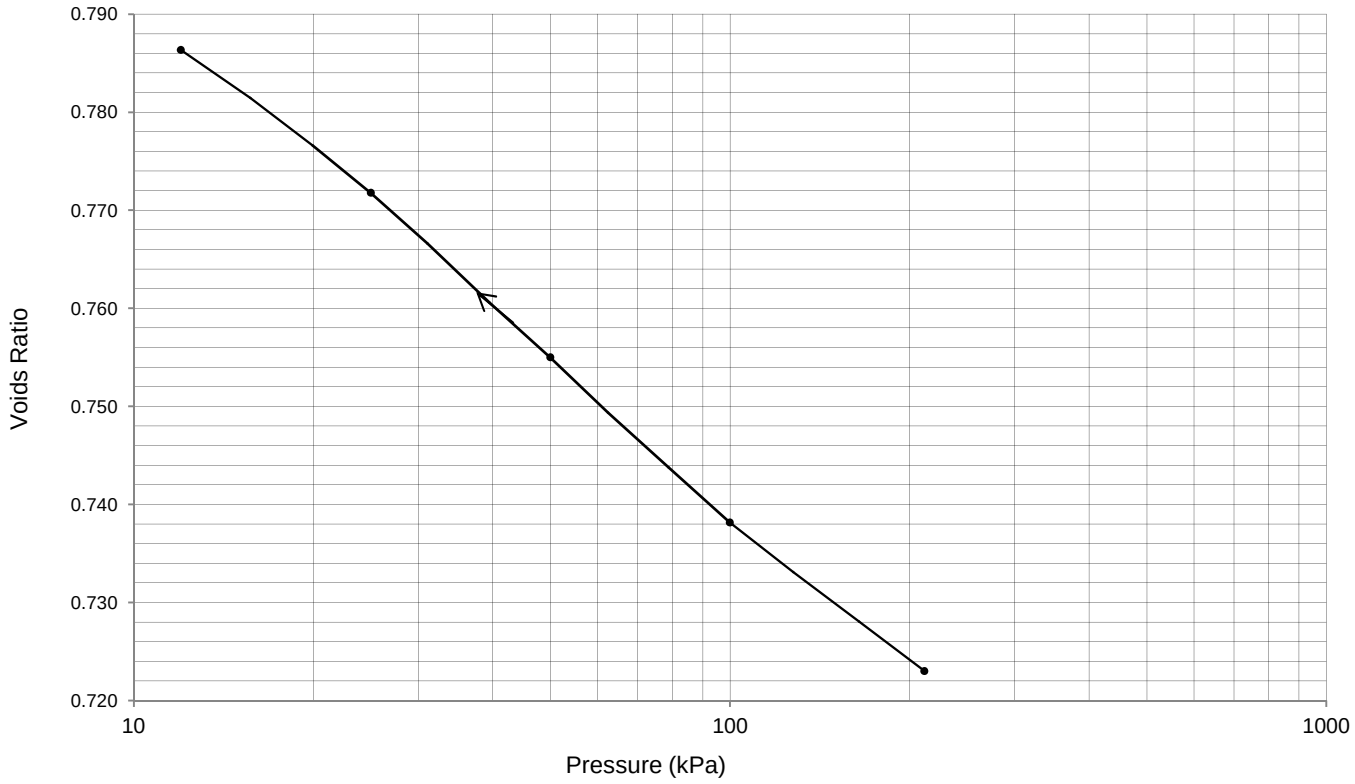
BS1377 : Part 5 : Clause 4.4 : 1990

Determination of Swelling Characteristics

Borehole No.:	PB01
Sample Ref.:	C17
Depth (m):	25.56-25.86
Depth within original:	25.58
Orientation within original:	Vertical
Specimen preparation:	Undisturbed

Description:

Stiff grey fissured CLAY



Initial Conditions:

					Initial
Height	(mm)	17.0	Moisture Content	(%)	27
Diameter	(mm)	75.0	Voids Ratio		0.727
Area	(mm²)	4416.7	Bulk Density	(Mg/m³)	1.99
Volume	(cm³)	74.9	Dry Density	(Mg/m³)	1.56
Laboratory Temperature	(ºC)	20	Particle density	(Mg/m³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m²/MN)	c_v (m²/year)	Time Fitting Method	Void Ratio
0 - 212	-	Swelling Pressure	-	0.723
212 - 100	0.078	0.19 (Sv)	t50	0.738
100 - 50	0.19	0.092 (Sv)	t50	0.755
50 - 25	0.38	0.049 (Sv)	t50	0.772
25 - 12	0.63	0.031 (Sv)	t50	0.786

Checked and Approved by

JS

J Sturges (Ops Mgr)

Date: 03/03/2015

Project Number:

GEO / 22150

Project Name:

St Giles Circus

Project Ref.: 14/2669

GEOLABS

UKAS TESTING 1982

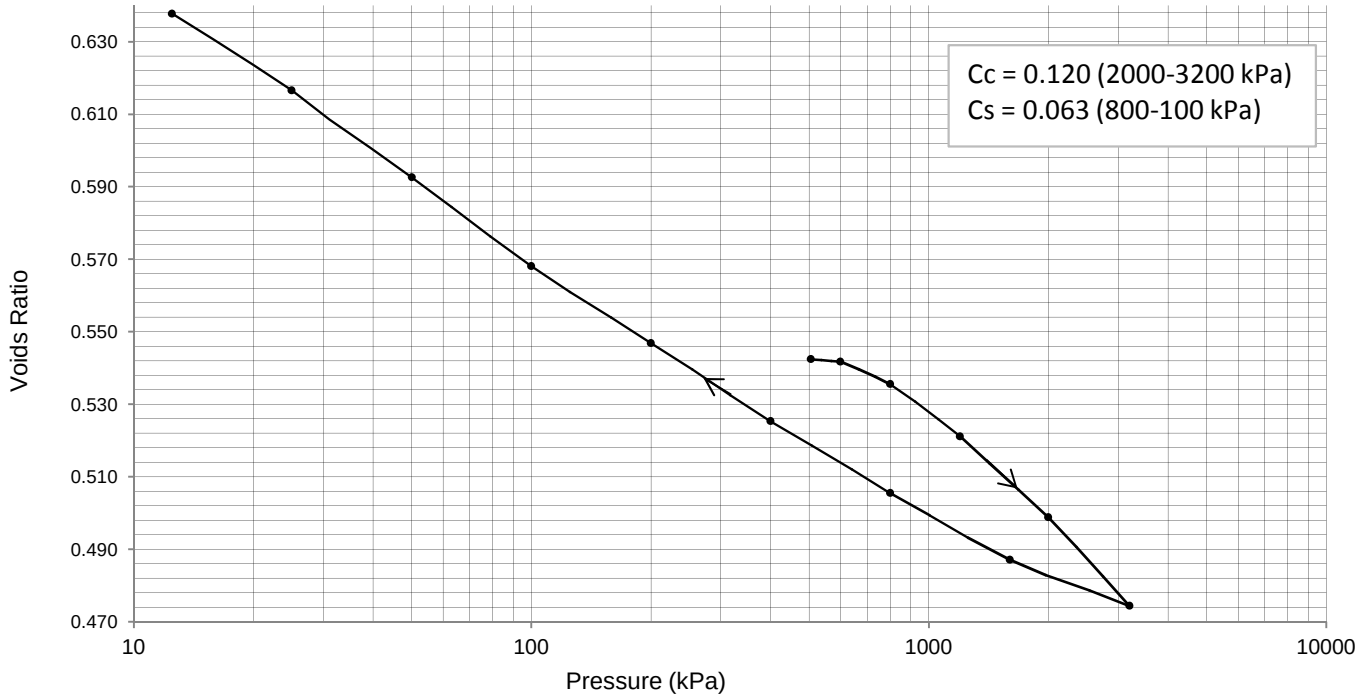
ASTM : D 4546 - 96 : Method C

Determination of One Dimensional Consolidation Properties of Soil

Borehole No.:	PB01
Sample Ref.:	C25
Depth (m):	34.35-34.65
Depth within original:	34.43
Orientation within original:	Vertical
Specimen preparation:	Undisturbed

Description:

Very stiff fissured grey and brown mottled CLAY



Initial Conditions:

					Initial
Height	(mm)	17.0	Moisture Content	(%)	22
Diameter	(mm)	74.9	Voids Ratio		0.550
Area	(mm²)	4407.3	Bulk Density	(Mg/m³)	2.12
Volume	(cm³)	75.0	Dry Density	(Mg/m³)	1.74
Laboratory Temperature	(ºC)	20	Particle density	(Mg/m³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m²/MN)	c_v (m²/year)	Time Fitting Method	Void Ratio
0 - 506	-	Swelling Pressure	-	0.542
506 - 600	0.0047	0.76	t90	0.542
600 - 800	0.020	1.8	t50	0.536
800 - 1200	0.023	0.37	t50	0.521
1200 - 2000	0.018	0.32	t50	0.499
2000 - 3200	0.014	0.34	t50	0.474
3200 - 1600	0.0054	0.46 (Sv)	t50	0.487
1600 - 800	0.015	0.25 (Sv)	t50	0.505
800 - 400	0.033	0.13 (Sv)	t50	0.525
400 - 200	0.071	0.095 (Sv)	t50	0.547
200 - 100	0.14	0.060 (Sv)	t50	0.568
100 - 50	0.31	0.042 (Sv)	t50	0.593
50 - 25	0.60	0.029 (Sv)	t50	0.617
25 - 12.5	1.0	0.026 (Sv)	t50	0.638

Checked and Approved by

JS

J Sturges (Ops Mgr)

Date: 04/03/2015

Project Number:

GEO / 22150

Project Name:

St Giles Circus

Project Ref.: 14/2669

GEOLABS

UKAS TESTING 1982

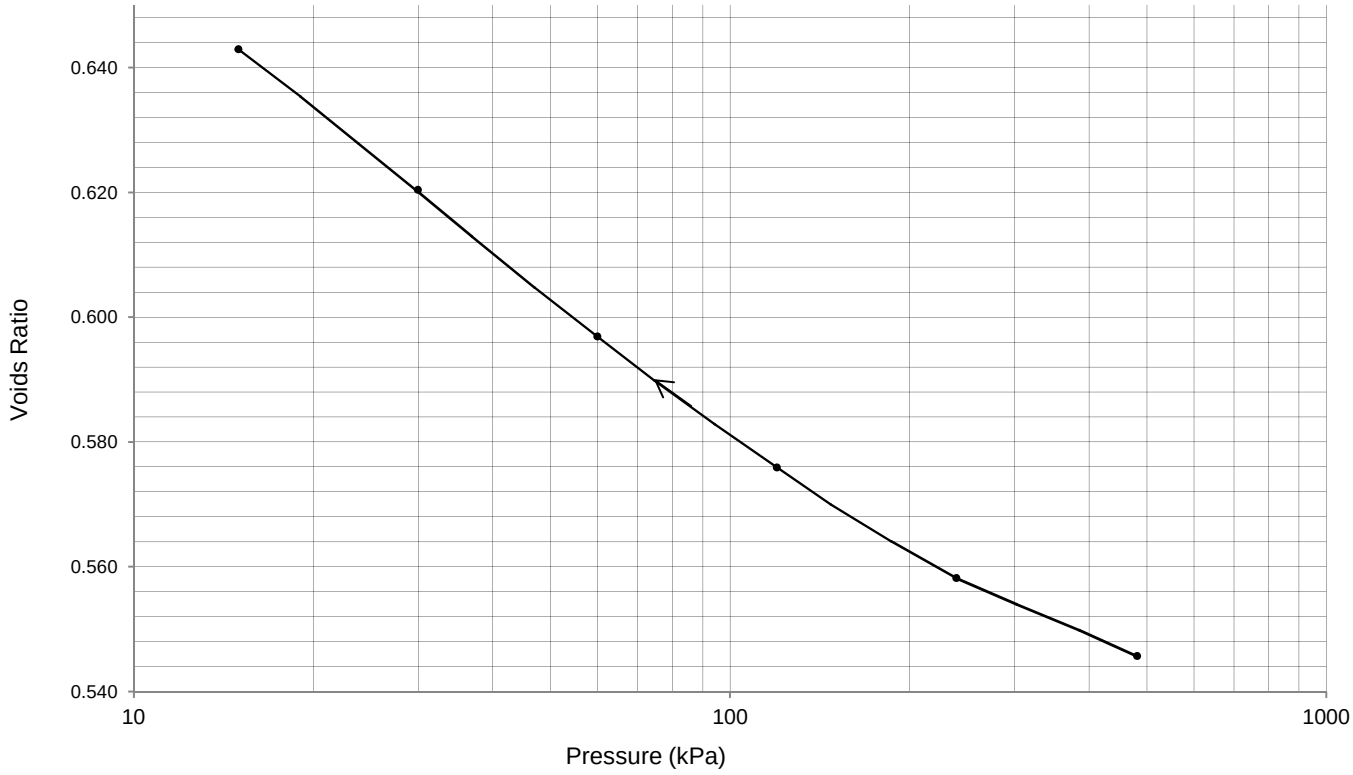
BS1377 : Part 5 : Clause 4.4 : 1990

Determination of Swelling Characteristics

Borehole No.:	PB01
Sample Ref.:	C25
Depth (m):	34.35-34.65
Depth within original:	34.40
Orientation within original:	Vertical
Specimen preparation:	Undisturbed

Description:

Very stiff fissured grey and brown mottled CLAY



Initial Conditions:

					Initial
Height	(mm)	16.7	Moisture Content	(%)	21
Diameter	(mm)	76.2	Voids Ratio		0.553
Area	(mm²)	4559.2	Bulk Density	(Mg/m³)	2.11
Volume	(cm³)	76.1	Dry Density	(Mg/m³)	1.74
Laboratory Temperature	(ºC)	20	Particle density	(Mg/m³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m²/MN)	c_v (m²/year)	Time Fitting Method	Void Ratio
0 - 482	-	Swelling Pressure	-	0.546
482 - 240	0.033	0.16 (Sv)	t50	0.558
240 - 120	0.095	0.082 (Sv)	t50	0.576
120 - 60	0.22	0.051 (Sv)	t50	0.597
60 - 30	0.49	0.034 (Sv)	t50	0.620
30 - 15	0.93	0.035 (Sv)	t50	0.643

Checked and Approved by

JS

J Sturges (Ops Mgr)

Date: 03/03/2015

Project Number:

GEO / 22150

Project Name:

St Giles Circus

Project Ref.: 14/2669

GEOLABS

UKAS TESTING 1982

CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 19/01/2015

Job No.: 14/2669

Site Location: St Giles Circus

Client: Consolidated Developments Limited

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
PB01	C	05	8.88	Firm, brownish grey slightly micaceous CLAY with white flecks	178	4.6	1.985	1.562	27	129	64	Brittle
PB01	C	10	16.70	Stiff, extremely closely to very closely fissured grey slightly micaceous CLAY with rare bioturbation	334	3.1	1.984	1.550	28	151	76	Brittle
PB01	C	12	18.90	Stiff, brownish grey slightly micaceous CLAY with rare pockets of light and dark grey fine sand (<30mm), bioturbation and foraminifera	378	3.5	1.991	1.583	26	304	152	Brittle
PB01	C	13	20.20	Very stiff, grey slightly micaceous slightly sandy CLAY with occasional pockets of light and dark grey fine sand (<50mm) and rare bioturbation	404	4.2	2.038	1.647	24	623	312	Brittle
PB01	C	19	27.50	Stiff, grey slightly micaceous slightly sandy CLAY with occasional pockets of light and dark grey fine sand (<55mm), rare bioturbation and foraminifera	550	5.9	2.049	1.673	22	512	256	Brittle with slight plastic deformation
PB01	C	20	29.90	Stiff, brown slightly mottled bluish grey CLAY with rare polished surfaces	598	3.7	2.139	1.782	20	201	100	Brittle
PB01	U	21	30.66	Stiff, brown mottled bluish grey CLAY with occasional polished surfaces	613	0.9	2.091	1.722	21	125	62	Brittle
PB01	U	24	33.10	Stiff, multi-coloured CLAY	662	12.8	2.162	1.821	19	471	235	Brittle with plastic deformation (sample locally soft)

Date - samples received: 26/11/2014

Date - samples tested: 08/01/2015

Approved Signatories: A G Bates AGB (Quality Mngr) - K Mazerant KM (Lab Mngr)

Checked by: KM Date: 16/01/2015

CONCEPT
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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING 4503

CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 19/01/2015

Job No.: 14/2669

Site Location: St Giles Circus

Client: Consolidated Developments Limited

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
PB01	U	28	38.90	Very stiff, multi-coloured slightly sandy CLAY with rare pockets (<60mm) of red fine to coarse gravel sized hematite nodules	778	5.8	2.239	1.971	14	618	309	Brittle
PB01	U	34	45.50	Very stiff, multi-coloured very sandy CLAY with occasional pockets of white fine sand (<55mm) and frequent black flecks	910	2.9	2.167	1.859	17	1378	689	Brittle

Date - samples received: 26/11/2014

Date - samples tested: 08/01/2015

Approved Signatories: A G Bates AGB (Quality Mngr) - K Mazerant KM (Lab Mngr)

Checked by: KM Date: 16/01/2015

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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

UKAS TESTING
4503

CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 19/01/2015

Job No.: 14/2669

Site Location: St Giles Circus

Client: Consolidated Developments Limited

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
PB02	C	17	10.35	Soft, grey CLAY with rare pockets of dark grey fine sand (<30mm) and a claystone fragment (60x85m) between 10.36 and 10.42m depth	207	16.8	1.861	1.378	35	44	22	Brittle with plastic deformation
PB02	C	22	17.40	Stiff, brownish grey slightly micaceous CLAY with occasional bioturbation and rare foraminifera	348	3.9	1.988	1.568	27	228	114	Brittle
PB02	C	26	24.05	Stiff, grey slightly micaceous slightly sandy CLAY with frequent pockets of light and dark grey fine sand (<50mm), occasional foraminifera and bioturbation	481	5.4	2.068	1.720	20	739	369	Brittle with slight plastic deformation
PB02	C	34	31.50	Very stiff, multi-coloured sandy CLAY	630	3.0	2.251	1.992	13	1475	737	Brittle
PB02	C	41	37.00	Very stiff, brown mottled bluish grey CLAY with frequent polished surfaces	740	1.0	2.088	1.704	23	442	221	Brittle

Date - samples received: 05/12/2014

Date - samples tested: 09/01/2015

Approved Signatories: A G Bates AGB (Quality Mngr) - K Mazerant KM (Lab Mngr)

Checked by: KM Date: 16/01/2015

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CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 23/12/2014

Job No.: 14/2669

Site Location: St Giles Circus

Client: Consolidated Developments Limited

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
PB04	UT	25	13.00	Firm, extremely closely fissured grey slightly micaceous CLAY	260	5.7	2.030	1.597	27	226	113	Brittle
PB04	UT	33	19.00	Stiff, extremely closely to very closely fissured grey slightly micaceous CLAY with rare white flecks	380	4.0	1.967	1.533	28	266	133	Brittle
PB04	UT	41	25.00	Stiff, grey slightly micaceous CLAY with occasional pockets of light and dark grey fine sand (<45mm), foraminifera, rare bioturbation and pyrite nodules (<20mm)	500	4.6	2.021	1.621	25	555	277	Brittle

Date - samples received: 21/11/2014

Date - samples tested: 16/12/2014

Approved Signatories: A G Bates AGB (Quality Mngr) - K Mazerant KM (Lab Mngr)

Checked by: KM Date: 23/12/2014

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4503

CONCEPT SITE INVESTIGATIONS

Summary Test Report - Undrained Triaxial Compression (Single-Stage)

BS 1377 : Part 7: 1990 Clause 8

Date Reported: 23/12/2014

Job No.: 14/2669

Site Location: St Giles Circus

Client: Consolidated Developments Limited

BH No.	Sample Type	Sample No	Depth top (m)	Description	Cell pressure kN/m2	Strain at failure %	Bulk Density Mg/m3	Dry Density Mg/m3	NMC %	Max Dev. Stress kPa	Shear Strength kPa	Mode of failure/Comments
PB05	UT	31	17.00	Stiff, extremely closely fissured brownish grey slightly micaceous CLAY with rare white flecks	340	5.3	1.964	1.536	28	270	135	Brittle
PB05	UT	35	20.00	Stiff, brownish grey slightly micaceous slightly sandy CLAY with occasional pockets of dark grey sand (<45mm) and rare white flecks								Sample insufficient for testing
PB05	UT	43	26.00	Stiff, grey slightly micaceous slightly sandy CLAY with occasional pockets of light grey fine sand (<35mm), rare foraminifera and lignite fragments (<6mm)	520	6.3	2.014	1.641	23	620	310	Brittle

Date - samples received: 18/11/2014

Date - samples tested: 17/12/2014

Approved Signatories: A G Bates AGB (Quality Mngr) - K Mazerant KM (Lab Mngr)

Checked by: KM Date: 23/12/2014

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AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS

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4503

BS1377 : Part 8 : Clause 7

Consolidated Undrained Triaxial Compression Test

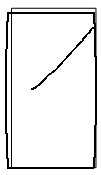
with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	09
Depth (m):	14.87 - 15.17

Description: Stiff dark brown CLAY

SPECIMEN DETAILS		
Depth within original sample		30mm from top
Orientation within original sample		Vertical
TEST DETAILS		
Specimen Preparation		Undisturbed
Cell Preparation		Checks performed in accordance with Clause 3.5
Specimen Number		**Single**
Initial Diameter	*mm*	99.2
Initial Length	*mm*	202.1
Initial Moisture Content	*%*	28
Initial Wet Density	*Mg/m³*	2.02
Drainage Conditions		One end and radial boundary
SATURATION STAGE		
Final Cell Pressure	*kPa*	850
Final Pore Pressure	*kPa*	721
Final Pore Pressure Parameter B		1.00
Duration	*day(s)*	3
CONSOLIDATION STAGE		
Cell Pressure	*kPa*	850
Back Pressure	*kPa*	650
Effective Pressure	*kPa*	200
Final Pore Pressure	*kPa*	650
Final Pore Pressure Dissipation	*%*	100
Duration	*day(s)*	5
SHEARING STAGE		
Cell Pressure	*kPa*	850
Rate of Axial Displacement	*mm/min*	0.0011
Initial Pore Pressure	*kPa*	650
Initial Effective Stress	*kPa*	200
CONDITIONS AT FAILURE	*criteria*	Maximum Principal Stress Ratio
Pore Pressure	*kPa*	737
Minor Effective Principal Stress	*kPa*	113
Deviator Stress	*kPa*	187
Major Effective Principal Stress	*kPa*	300
Effective Principal Stress Ratio		2.66
Pore Pressure Parameter A		0.47
Axial Strain	*%*	2.1
Correction applied to Deviator Stress	*kPa*	4
Duration	*day(s)*	3
Final Moisture Content	*%*	28
Final Wet Density	*Mg/m³*	2.05
EFFECTIVE STRESS PARAMETERS		
Cohesion	*kPa*	not applicable
Angle of Shear Resistance	*degrees*	

FAILURE SKETCH



Checked and Approved	Project Number:	
Initials: *RJP*	Project Name:	**GEO / 22150**
Date: 03/02/15		**ST GILES CIRCUS**
		Project Number 14/2669

UKAS TESTING 1982

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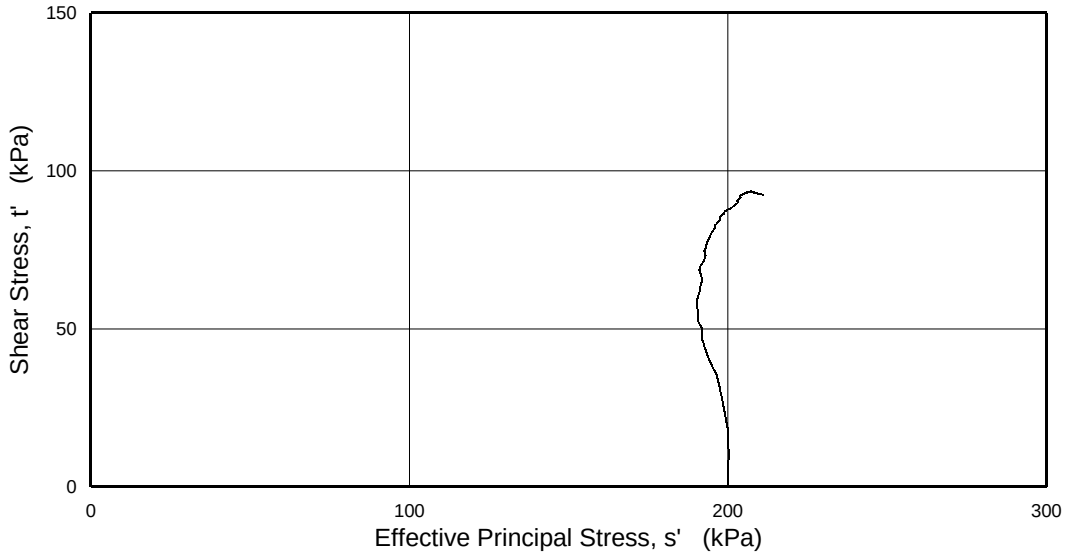
BS1377 : Part 8 : Clause 7

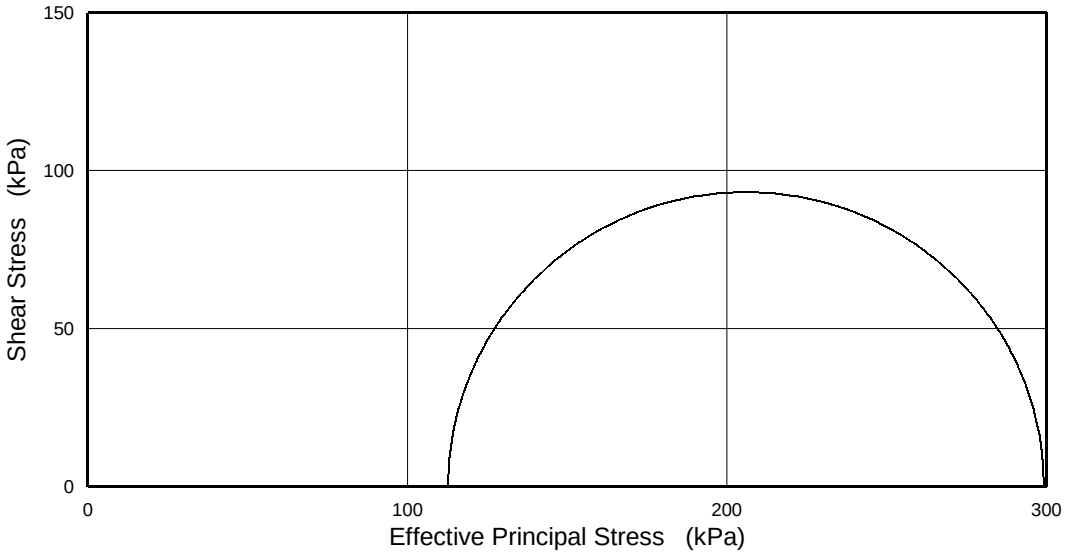
Consolidated Undrained Triaxial Compression Test

with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	09
Depth (m):	14.87 - 15.17

Description:
Stiff dark brown CLAY





Checked and Approved Initials: *RJP* Date: 03/02/15	Project Number: **GEO / 22150** Project Name: **ST GILES CIRCUS** **Project Number 14/2669**	GEOLABS ®

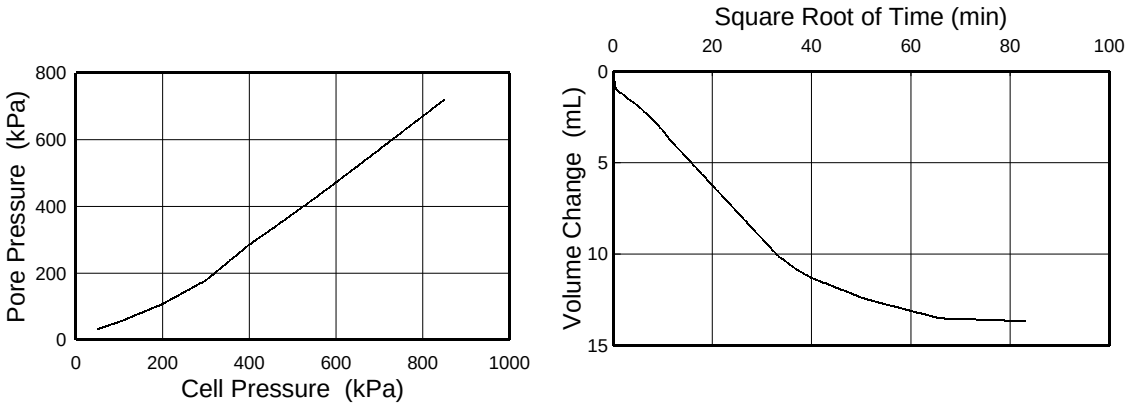
BS1377 : Part 8 : Clause 7

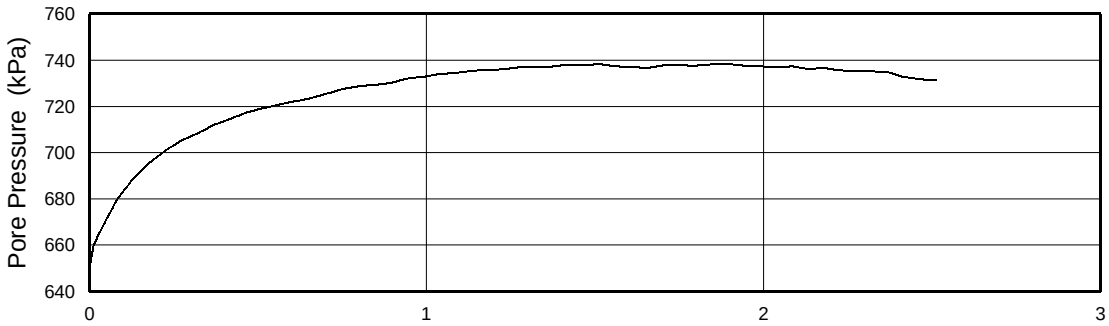
Consolidated Undrained Triaxial Compression Test

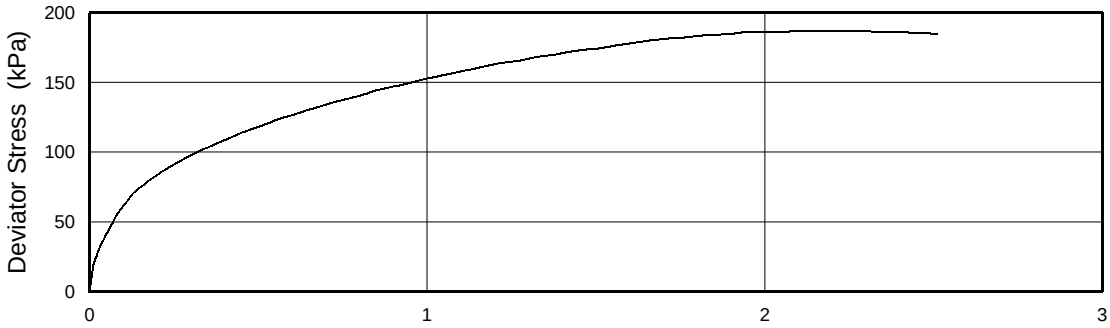
with Measurement of Pore Pressure

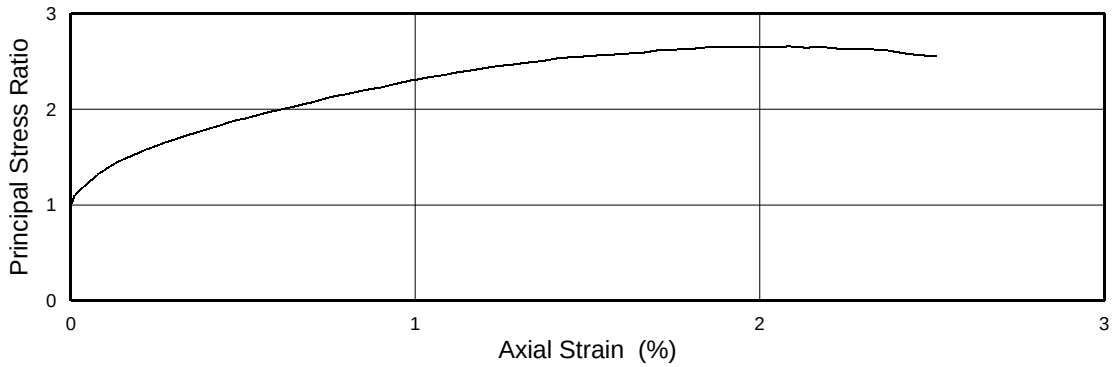
Borehole Number:	PB01
Sample Number:	09
Depth (m):	14.87 - 15.17

Specimen No 1









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BS1377 : Part 8 : Clause 7

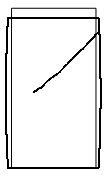
Consolidated Undrained Triaxial Compression Test

with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	14
Depth (m):	21.30 - 21.60

Description:
Stiff dark brown CLAY

SPECIMEN DETAILS		
Depth within original sample		10mm from top
Orientation within original sample		Vertical
TEST DETAILS		
Specimen Preparation		Undisturbed
Cell Preparation		Checks performed in accordance with Clause 3.5
Specimen Number		**Single**
Initial Diameter	*mm*	100.8
Initial Length	*mm*	202.5
Initial Moisture Content	*%*	23
Initial Wet Density	*Mg/m³*	2.08
Drainage Conditions		One end and radial boundary
SATURATION STAGE		
Final Cell Pressure	*kPa*	850
Final Pore Pressure	*kPa*	671
Final Pore Pressure Parameter B		0.95
Duration	*day(s)*	3
CONSOLIDATION STAGE		
Cell Pressure	*kPa*	850
Back Pressure	*kPa*	550
Effective Pressure	*kPa*	300
Final Pore Pressure	*kPa*	551
Final Pore Pressure Dissipation	*%*	99
Duration	*day(s)*	6
SHEARING STAGE		
Cell Pressure	*kPa*	850
Rate of Axial Displacement	*mm/min*	0.0012
Initial Pore Pressure	*kPa*	551
Initial Effective Stress	*kPa*	299
CONDITIONS AT FAILURE	*criteria*	Maximum Principal Stress Ratio
Pore Pressure	*kPa*	723
Minor Effective Principal Stress	*kPa*	127
Deviator Stress	*kPa*	509
Major Effective Principal Stress	*kPa*	636
Effective Principal Stress Ratio		5.01
Pore Pressure Parameter A		0.34
Axial Strain	*%*	1.8
Correction applied to Deviator Stress	*kPa*	3
Duration	*day(s)*	1
Final Moisture Content	*%*	23
Final Wet Density	*Mg/m³*	2.10
EFFECTIVE STRESS PARAMETERS		
Cohesion	*kPa*	not applicable
Angle of Shear Resistance	*degrees*	
FAILURE SKETCH		



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Initials: *RJP*

Date: 03/02/15

Project Number:

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Project Name:

ST GILES CIRCUS

Project Number 14/2669

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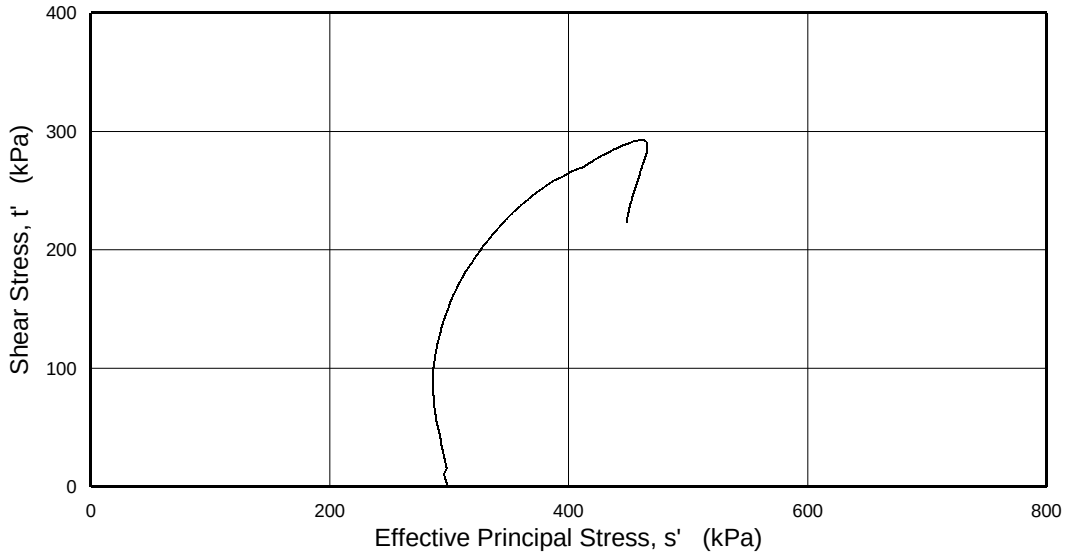
BS1377 : Part 8 : Clause 7

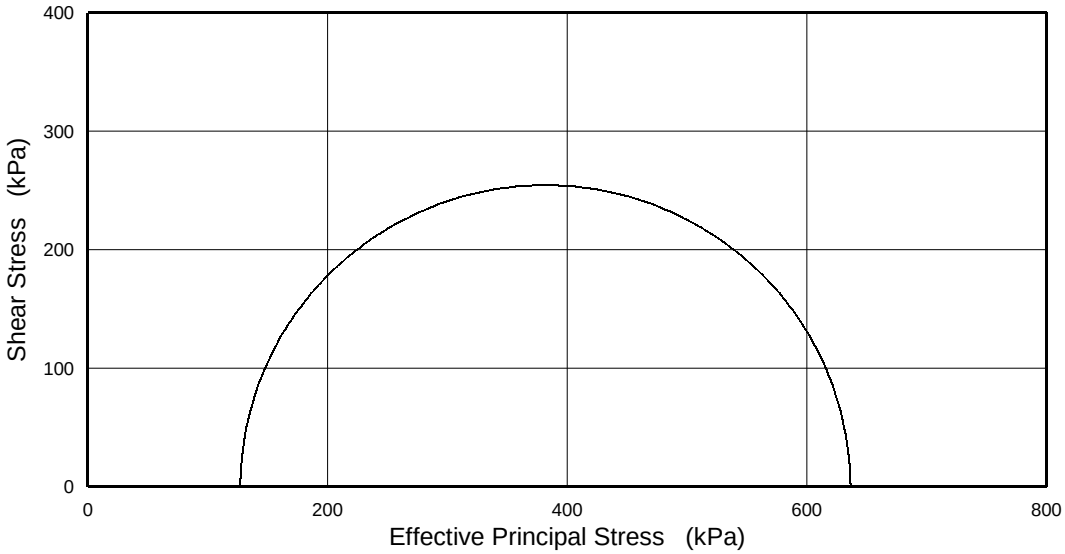
Consolidated Undrained Triaxial Compression Test

with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	14
Depth (m):	21.30 - 21.60

Description:
Stiff dark brown CLAY





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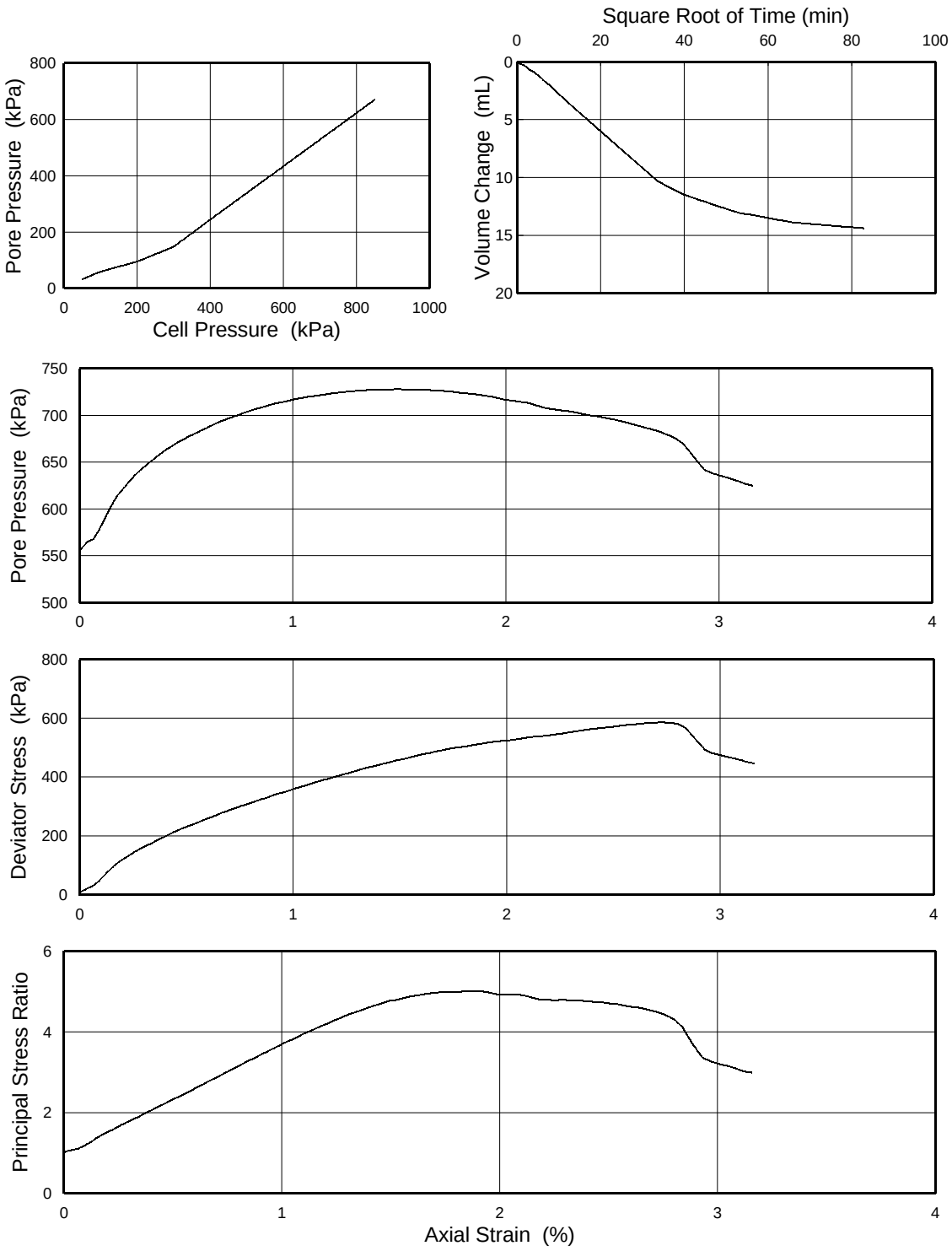
BS1377 : Part 8 : Clause 7

Consolidated Undrained Triaxial Compression Test

with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	14
Depth (m):	21.30 - 21.60

Specimen No 1



Checked and Approved	Project Number:	
Initials: *RJP*	Project Name:	**GEO / 22150**
Date: 03/02/15		**ST GILES CIRCUS**
		Project Number 14/2669

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Consolidated Undrained Triaxial Compression Test

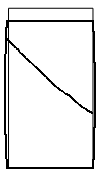
with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	18
Depth (m):	26.86 - 27.16

Description:
Stiff to very stiff dark brown silty CLAY

SPECIMEN DETAILS		
Depth within original sample		20mm from top
Orientation within original sample		Vertical
TEST DETAILS		
Specimen Preparation		Undisturbed
Cell Preparation		Checks performed in accordance with Clause 3.5
Specimen Number		**Single**
Initial Diameter	*mm*	100.8
Initial Length	*mm*	202.8
Initial Moisture Content	*%*	23
Initial Wet Density	*Mg/m³*	2.08
Drainage Conditions		One end and radial boundary
SATURATION STAGE		
Final Cell Pressure	*kPa*	850
Final Pore Pressure	*kPa*	547
Final Pore Pressure Parameter B		0.96
Duration	*day(s)*	3
CONSOLIDATION STAGE		
Cell Pressure	*kPa*	850
Back Pressure	*kPa*	450
Effective Pressure	*kPa*	400
Final Pore Pressure	*kPa*	450
Final Pore Pressure Dissipation	*%*	100
Duration	*day(s)*	4
SHEARING STAGE		
Cell Pressure	*kPa*	850
Rate of Axial Displacement	*mm/min*	0.0020
Initial Pore Pressure	*kPa*	450
Initial Effective Stress	*kPa*	400
CONDITIONS AT FAILURE	*criteria*	Maximum Principal Stress Ratio
Pore Pressure	*kPa*	627
Minor Effective Principal Stress	*kPa*	223
Deviator Stress	*kPa*	450
Major Effective Principal Stress	*kPa*	673
Effective Principal Stress Ratio		3.02
Pore Pressure Parameter A		0.39
Axial Strain	*%*	2.1
Correction applied to Deviator Stress	*kPa*	4
Duration	*day(s)*	4
Final Moisture Content	*%*	23
Final Wet Density	*Mg/m³*	2.09
EFFECTIVE STRESS PARAMETERS		
Cohesion	*kPa*	not applicable
Angle of Shear Resistance	*degrees*	

FAILURE SKETCH



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Initials: *RJP*

Date: 04/02/15

Project Number:

GEO / 22150

Project Name:

ST GILES CIRCUS

Project Number 14/2669

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BS1377 : Part 8 : Clause 7

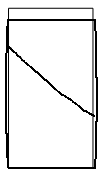
Consolidated Undrained Triaxial Compression Test

with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	18
Depth (m):	26.86 - 27.16

Description:
Stiff to very stiff dark brown CLAY

SPECIMEN DETAILS		
Depth within original sample		20mm from top
Orientation within original sample		Vertical
TEST DETAILS		
Specimen Preparation		Undisturbed
Cell Preparation		Checks performed in accordance with Clause 3.5
Specimen Number		**Single**
Initial Diameter	*mm*	100.8
Initial Length	*mm*	202.8
Initial Moisture Content	*%*	23
Initial Wet Density	*Mg/m³*	2.08
Drainage Conditions		One end and radial boundary
SATURATION STAGE		
Final Cell Pressure	*kPa*	850
Final Pore Pressure	*kPa*	547
Final Pore Pressure Parameter B		0.96
Duration	*day(s)*	3
CONSOLIDATION STAGE		
Cell Pressure	*kPa*	850
Back Pressure	*kPa*	450
Effective Pressure	*kPa*	400
Final Pore Pressure	*kPa*	450
Final Pore Pressure Dissipation	*%*	100
Duration	*day(s)*	4
SHEARING STAGE		
Cell Pressure	*kPa*	850
Rate of Axial Displacement	*mm/min*	0.0020
Initial Pore Pressure	*kPa*	450
Initial Effective Stress	*kPa*	400
CONDITIONS AT FAILURE	*criteria*	Maximum Principal Stress Ratio
Pore Pressure	*kPa*	627
Minor Effective Principal Stress	*kPa*	223
Deviator Stress	*kPa*	450
Major Effective Principal Stress	*kPa*	673
Effective Principal Stress Ratio		3.02
Pore Pressure Parameter A		0.39
Axial Strain	*%*	2.1
Correction applied to Deviator Stress	*kPa*	4
Duration	*day(s)*	4
Final Moisture Content	*%*	23
Final Wet Density	*Mg/m³*	2.09
EFFECTIVE STRESS PARAMETERS		
Cohesion	*kPa*	not applicable
Angle of Shear Resistance	*degrees*	
FAILURE SKETCH		



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Project Number: **GEO / 22150**

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Project Number 14/2669

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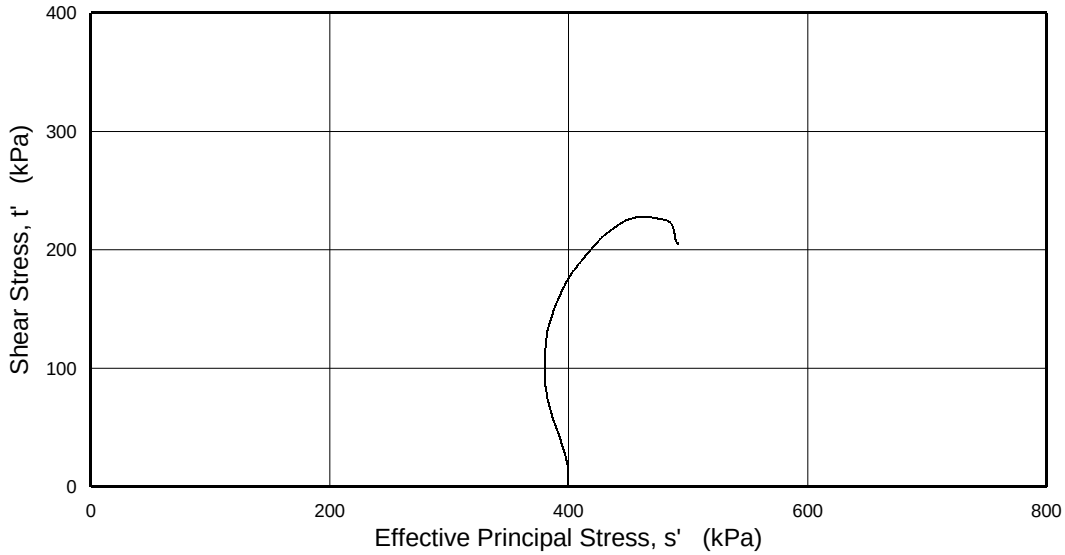
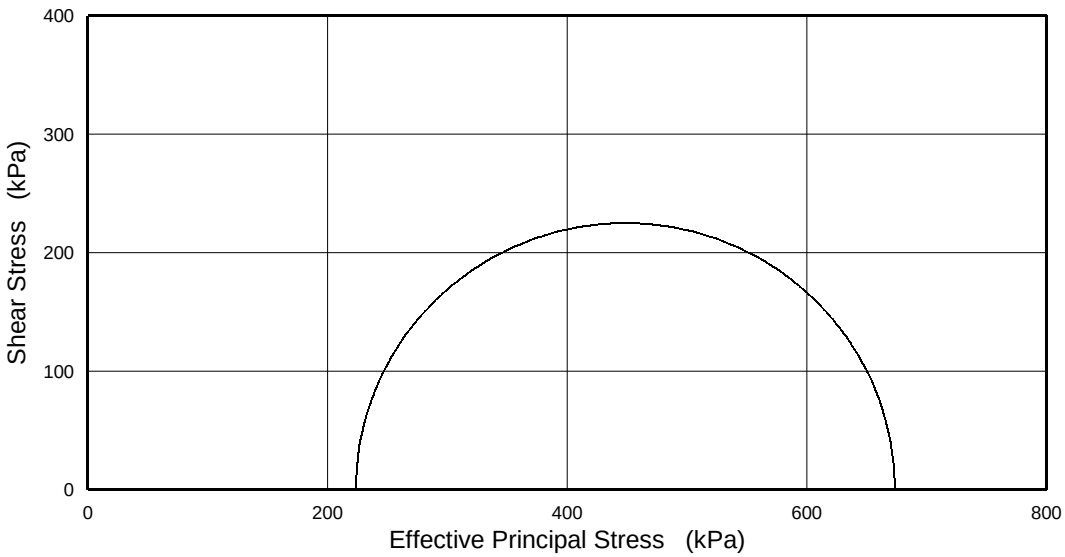
Consolidated Undrained Triaxial Compression Test

with Measurement of Pore Pressure

Borehole Number:	PB01
Sample Number:	18
Depth (m):	26.86 - 27.16

Description:
Stiff to very stiff dark brown CLAY





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Project Name:	**ST GILES CIRCUS**
	Project Number 14/2669

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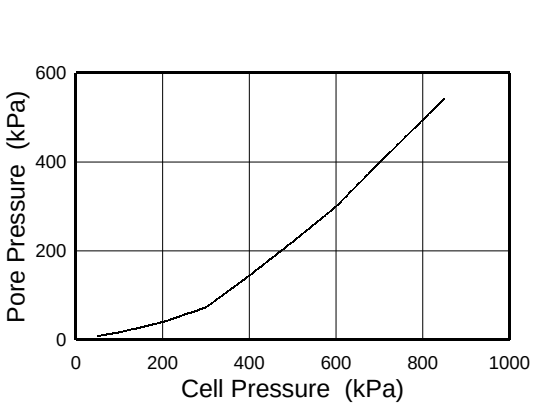
BS1377 : Part 8 : Clause 7

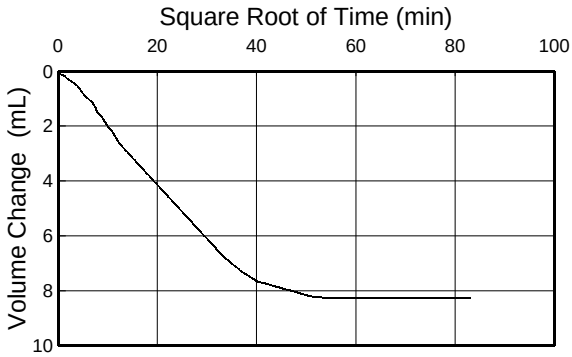
Consolidated Undrained Triaxial Compression Test

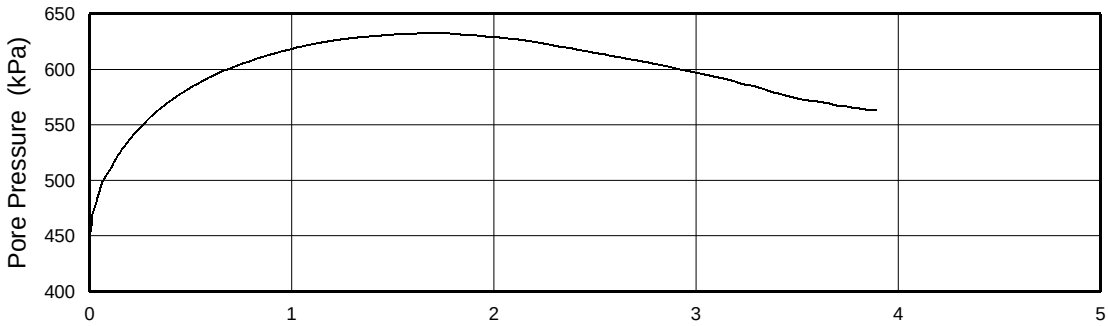
with Measurement of Pore Pressure

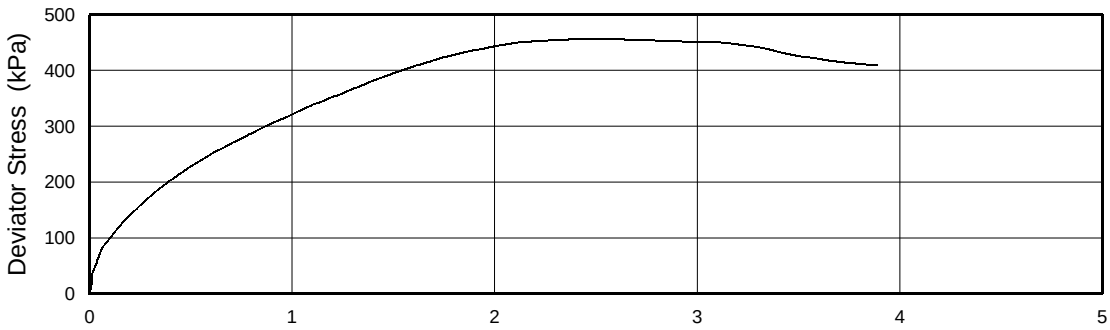
Borehole Number:	PB01
Sample Number:	18
Depth (m):	26.86 - 27.16

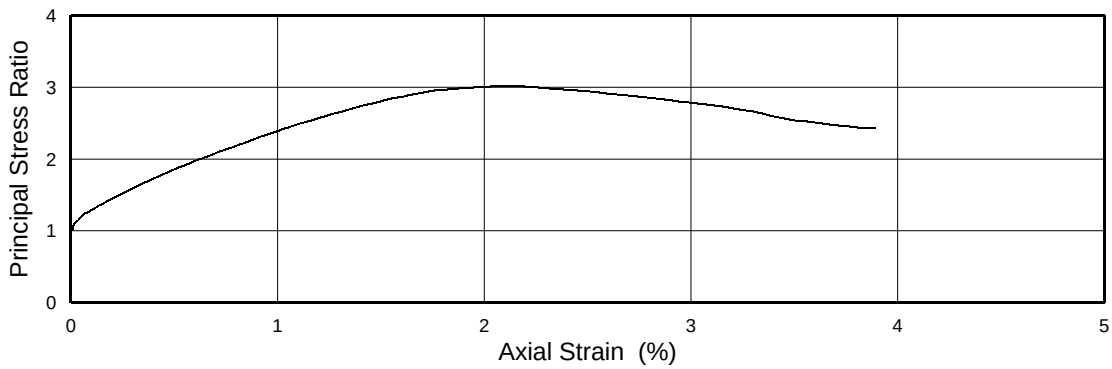
Specimen No 1











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Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Description:
Sample Ref: C11	Very stiff fissured grey CLAY.
Depth (m): 17.50 - 17.80	

Initial Specimen Conditions	**Initial**		**Final**
Location within sample	50mm from top		
Orientation	Vertical		
Condition	Undisturbed		
Diameter	97.5 mm		
Height	199.5 mm		
Moisture content	24.4 %		25.0 %
Bulk density	2.03 Mg/m³		2.03 Mg/m³
Dry density	1.63 Mg/m³		1.62 Mg/m³

At End of Saturation	**base**	**mid-plane**
Cell pressure	1206 kPa	
Pore pressure	827 kPa	827 kPa
B value	1.00	1.00
Method used	Back pressure assisted	

At End of Isotropic Consolidation	**base**	**mid-plane**
Cell pressure	1206 kPa	
Back pressure	966 kPa	
Pore pressure	966 kPa	966 kPa

At End of Anisotropic Stage		
Cell pressure	1257 kPa	
Back pressure	967 kPa	
Deviator stress	-51 kPa	
Base pore pressure	967 kPa	967 kPa
Ko	1.21	1.21

Shearing Stage (compression)	**base**	**mid-plane**
Initial conditions:		
Cell pressure	1257 kPa	
Pore pressure	967 kPa	967 kPa
Mean effective stress, p_0', $(\sigma_1'+2\sigma_3')/3$	273 kPa	273 kPa
Set rate of external axial strain	0.20 %/hr	

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Checked and Approved	Project Number:	
Initials: CFW	GEO / 22150	GEOLABS®
16/03/2015	Project Name: ST GILES CIRCUS Project Number 14/2669	

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No:	PB01	Description:
Sample Ref:	C11	Very stiff fissured grey CLAY.
Depth (m):	17.50 - 17.80	

Stiffnesses From Shear Stage

	External	Local
Secant Modulus, Eu, at **0.01%** axial strain	217.9 MPa	219.8 MPa
- normalized with respect to mean effective stress, p'o	798	805
Secant Modulus, Eu, at **0.1%** axial strain	114.8 MPa	108.5 MPa
- normalized with respect to mean effective stress, p'o	421	412
Degree of Non-Linearity, L	0.53	0.51

Local Axial Creep Rates

Immediately prior to shearing	0.0000 %/hr
Immediately prior to unloading	0.0000 %/hr
Immediately prior to reloading	-0.0090 %/hr

Conditions at failure (with filter drain strength correction)

	base	mid-plane
Failure criteria	Maximum deviator stress	
External axial strain	2.34 %	
Local axial strain	2.92 %	
Deviator stress	444.1 kPa	
Filter drain strength correction to deviator stress	3.5 kPa	
Undrained shear strength	222.1 kPa	
Pore pressure	1149.9 kPa	1136.3 kPa
Axial effective stress, σ_v'	550.2 kPa	563.8 kPa
Radial effective stress, σ_h'	106.1 kPa	119.7 kPa
s' [$(\sigma_1'+\sigma_3')/2$]	328.2 kPa	341.8 kPa
t [$(\sigma_1-\sigma_3)/2$]	222.1 kPa	
Pore pressure parameter A, $(u - u_o)/(\sigma_V - \sigma_{Vo})$	0.37	0.34
Principal stress ratio	5.19	4.71

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shear Wave Velocities
Sample Ref: C11	
Depth (m): 17.50 - 17.80	

Gmax Determination
Using First Arrival Shear Wave Velocities from Bender Elements

Note: The travel time determinations can be subjective, so the associated Gmax and Wave Velocity values should be taken as guide only

Svh Determination At End Of Stage:	Bulk Density (Mg/m³)	Travel time (s)	Travel Length (m)	Gmax (MPa)	Shear Wave Velocity **Svh** (m/s)
Saturation	2.031	0.000626	0.1961	199.2	313.2
Isotropic Consolidation	2.024	0.000680	0.1968	169.6	289.4
Anisotropic Consolidation	2.025	0.000673	0.1968	173.2	292.5
End of Unload (before reloac	2.025	0.000684	0.1966	167.3	287.5

Shh Determination At End Of Stage:	Bulk Density (Mg/m³)	Travel time (s)	Travel Length (m)	Gmax (MPa)	Velocity **Shh** (m/s)
Saturation	2.031	0.000307	0.0947	193.2	308.4
Isotropic Consolidation	2.024	0.000326	0.0948	171.2	290.8
Anisotropic Consolidation	2.025	0.000321	0.0948	176.5	295.3
End of Unload (before reloac	2.025	0.000331	0.0947	165.7	286.1

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	End of test photograph

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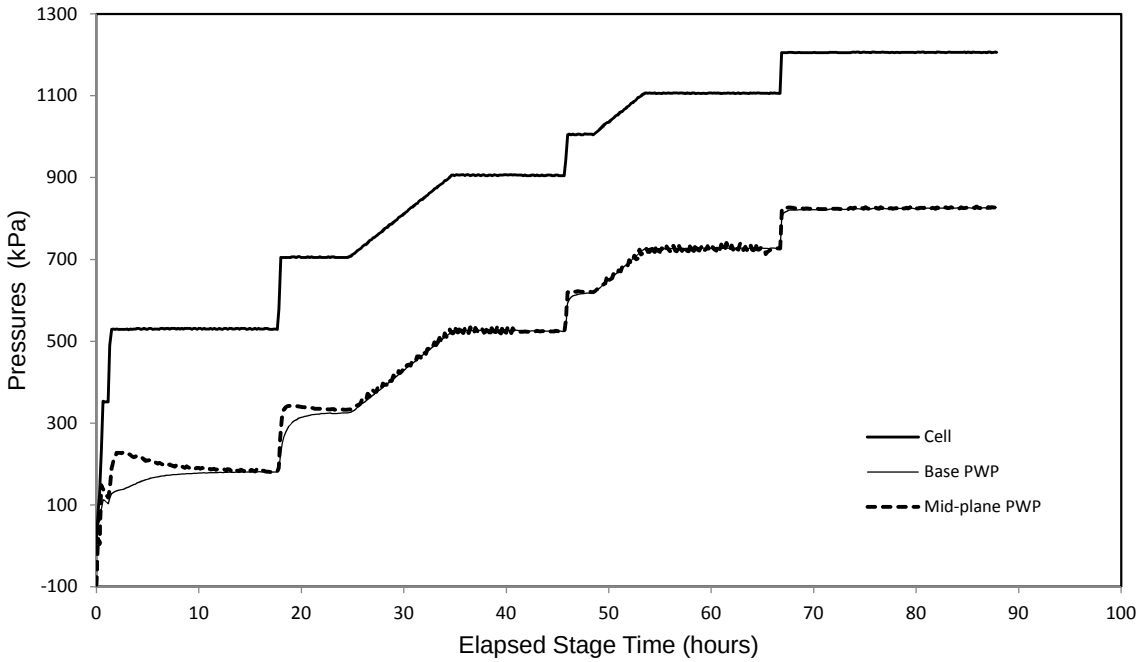
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

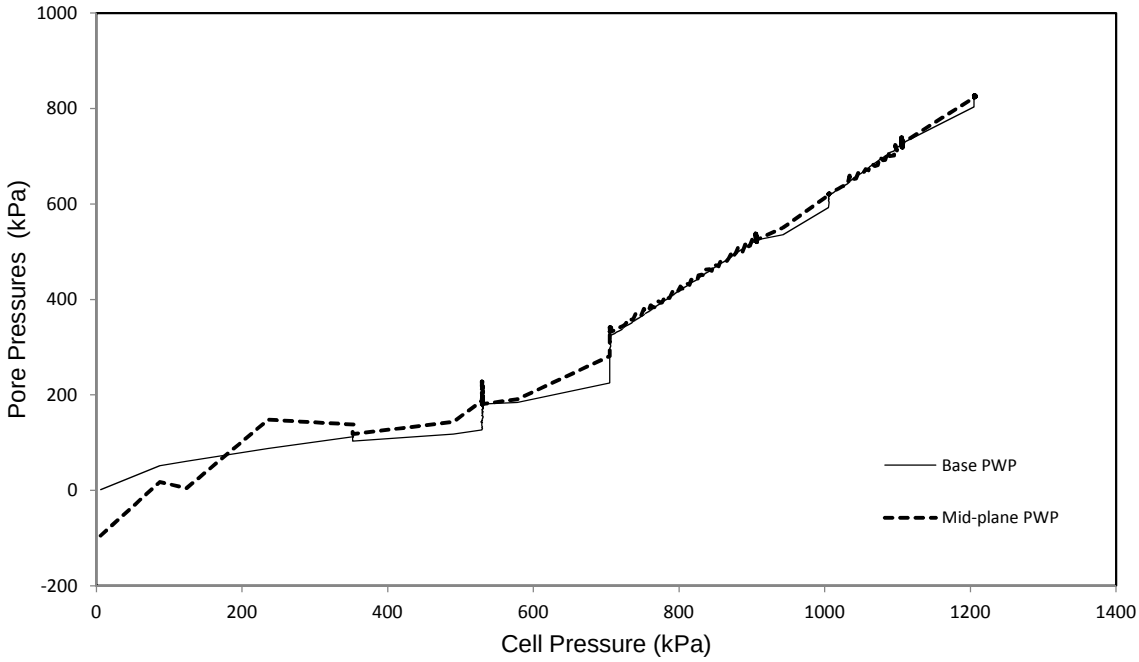
Custom Procedure Agreed By Client

Borehole No: PB01	Saturation Stage
Sample Ref: C11	
Depth (m): 17.50 - 17.80	

Cell & Pore Pressures v Time



Pore Pressures v Cell Pressure



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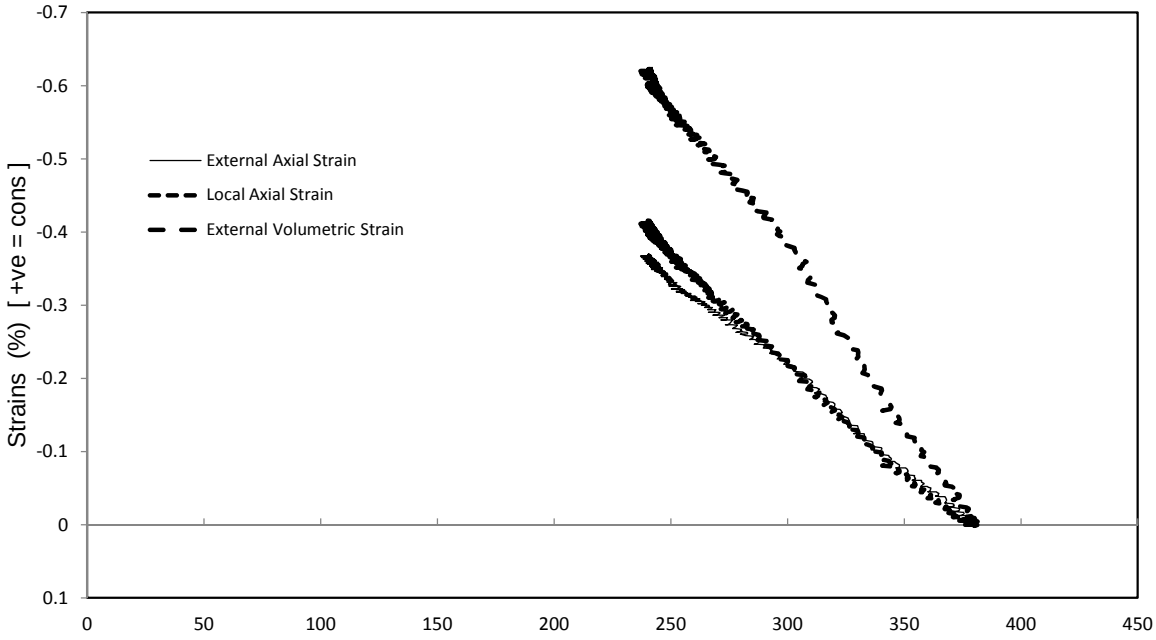
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

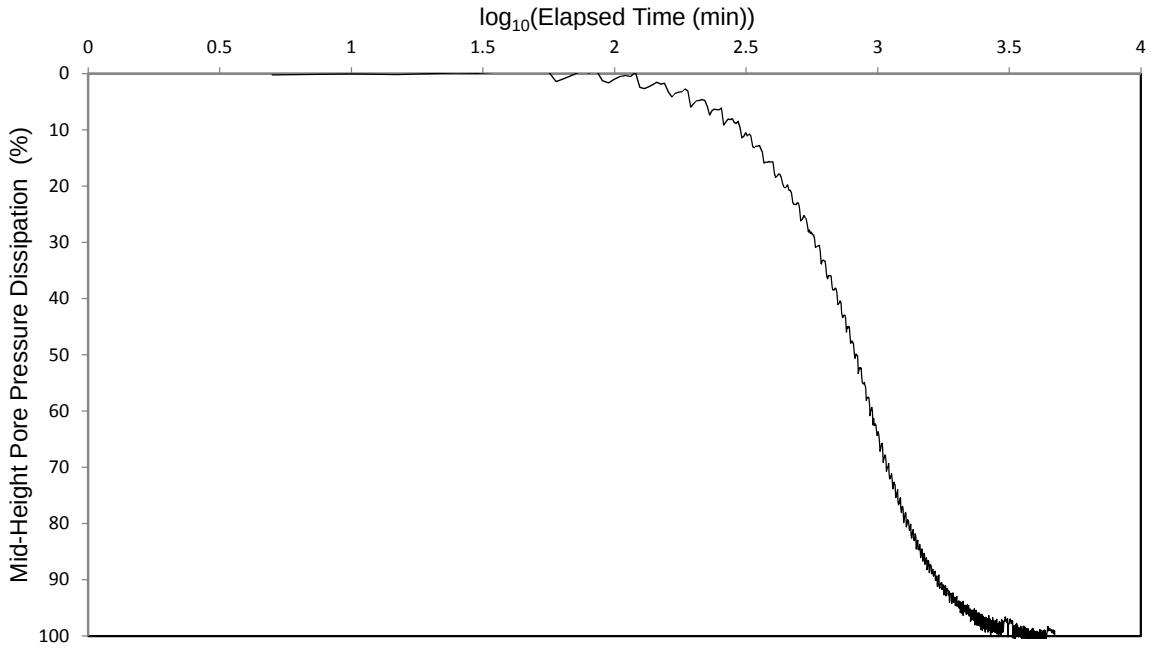
Custom Procedure Agreed By Client

Borehole No:	PB01	Isotropic Consolidation Stage
Sample Ref:	C11	
Depth (m):	17.50 - 17.80	

Axial and Volumetric Strains v Mean Effective Stress



Pore Pressure Dissipation v log Elapsed Time



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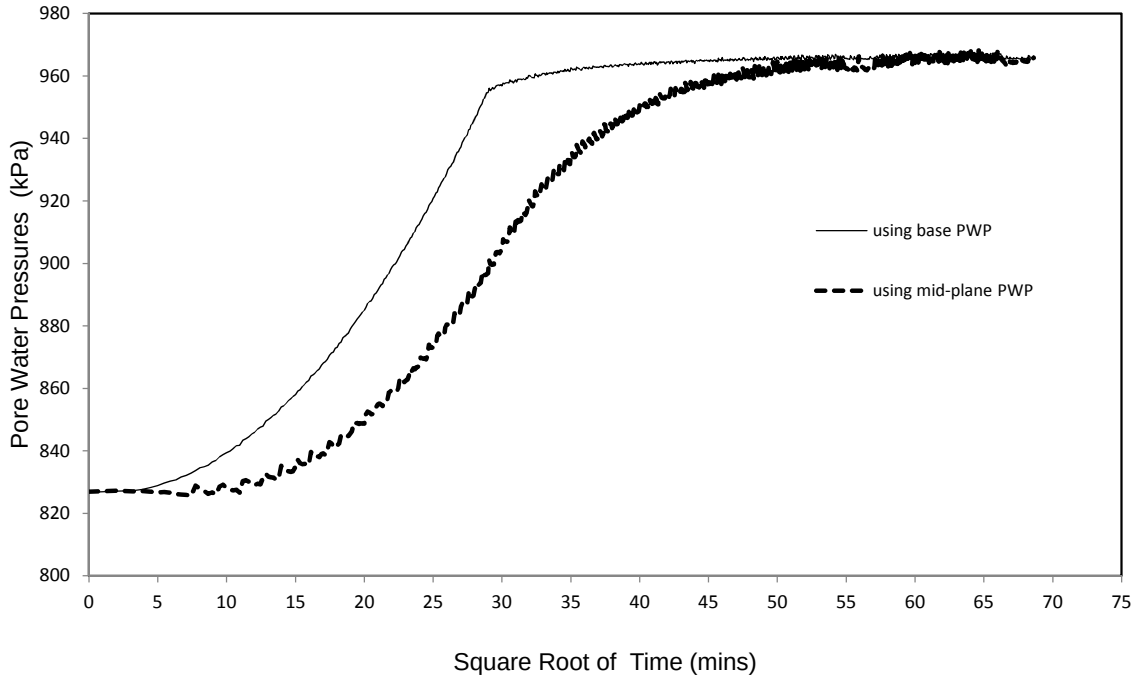
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

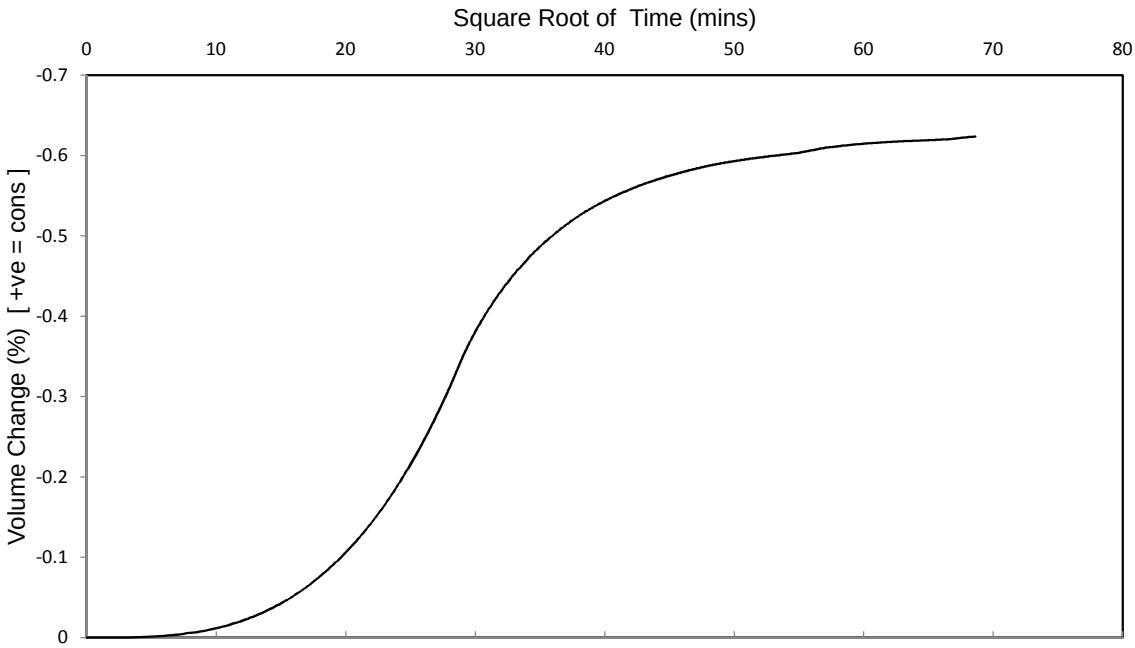
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Isotropic Consolidation Stage

Pore Water Pressures v Square Root of Time



Volume Change v Square Root of Time



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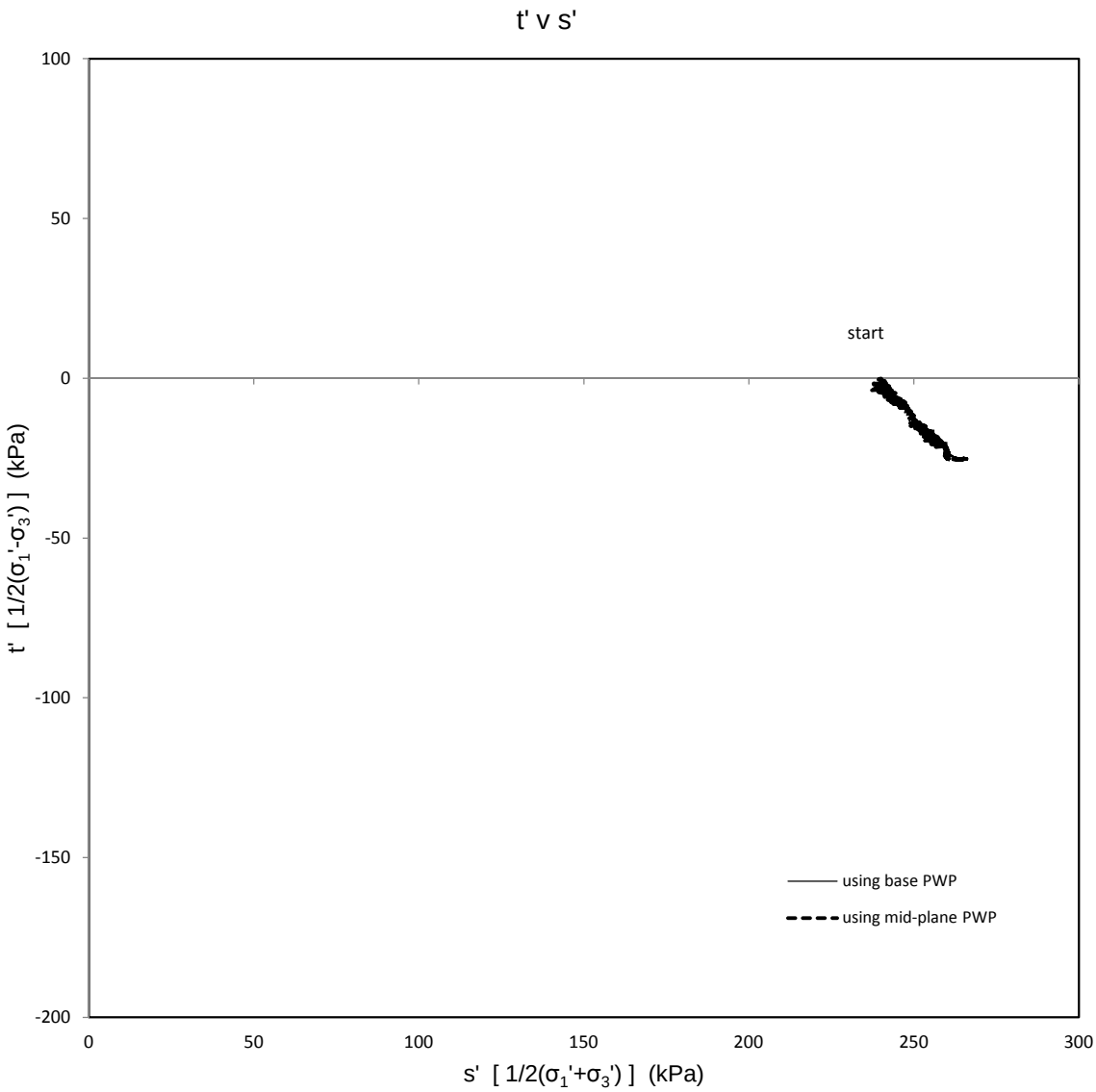
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Anisotropic Stage
Sample Ref: C11	
Depth (m): 17.50 - 17.80	

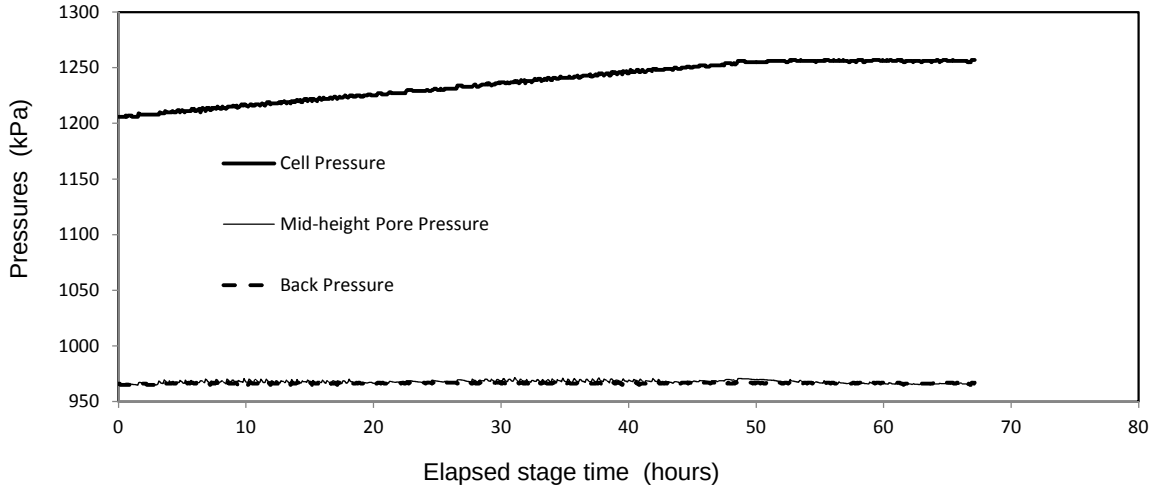


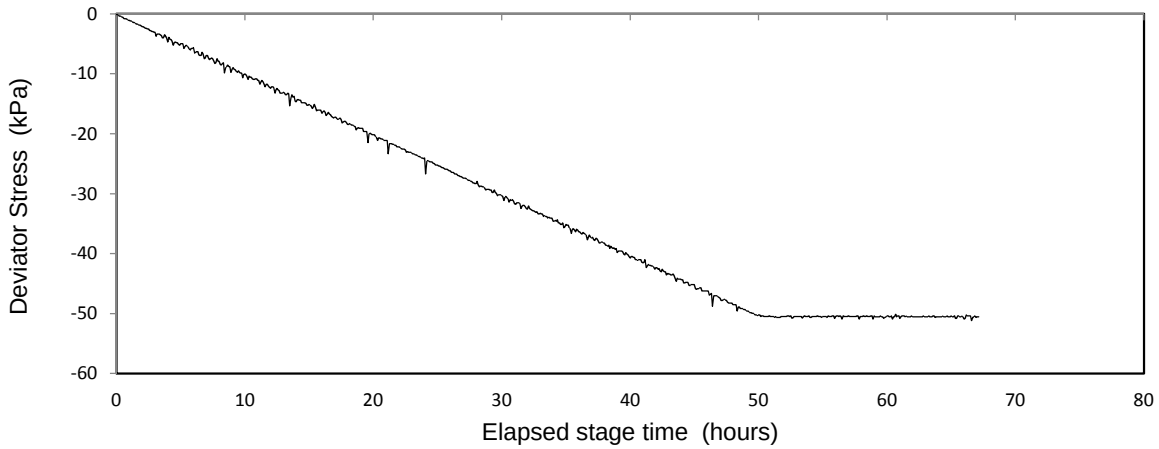
Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

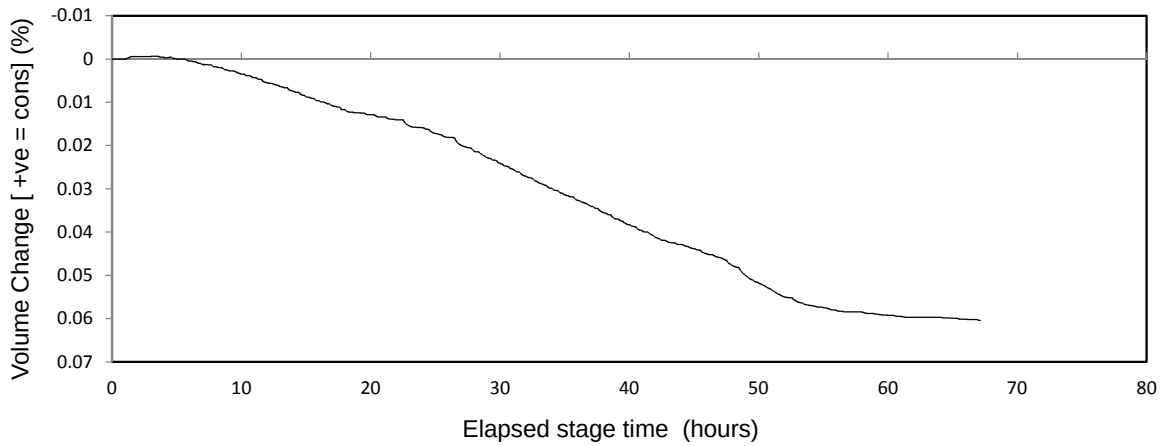
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Anisotropic Stage
Sample Ref: C11	
Depth (m): 17.50 - 17.80	







Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

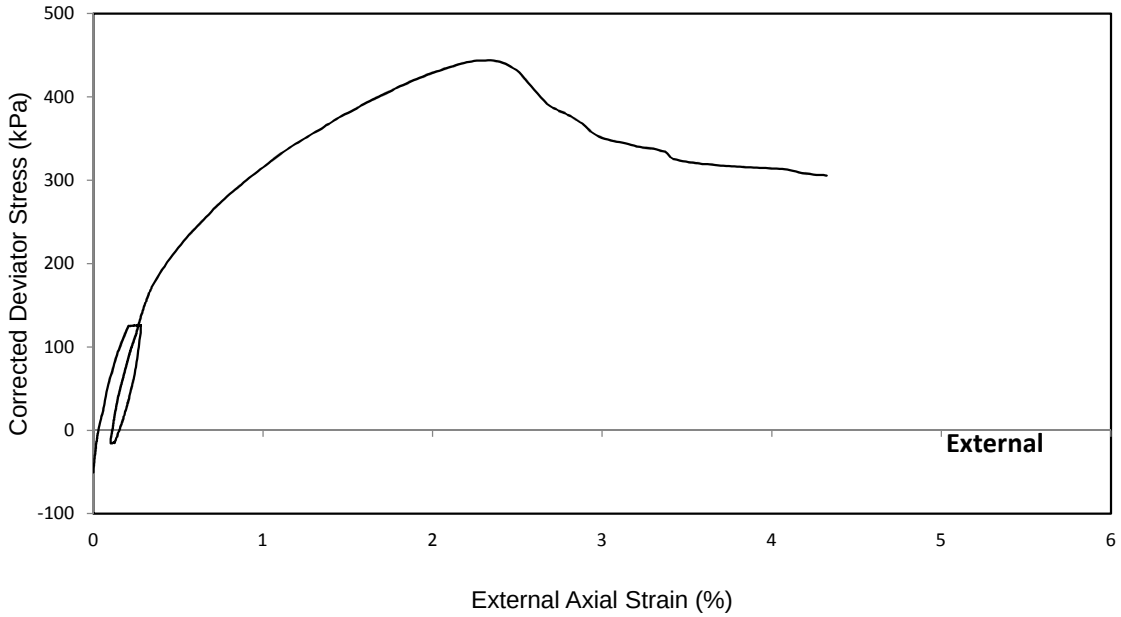
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Shearing Stage

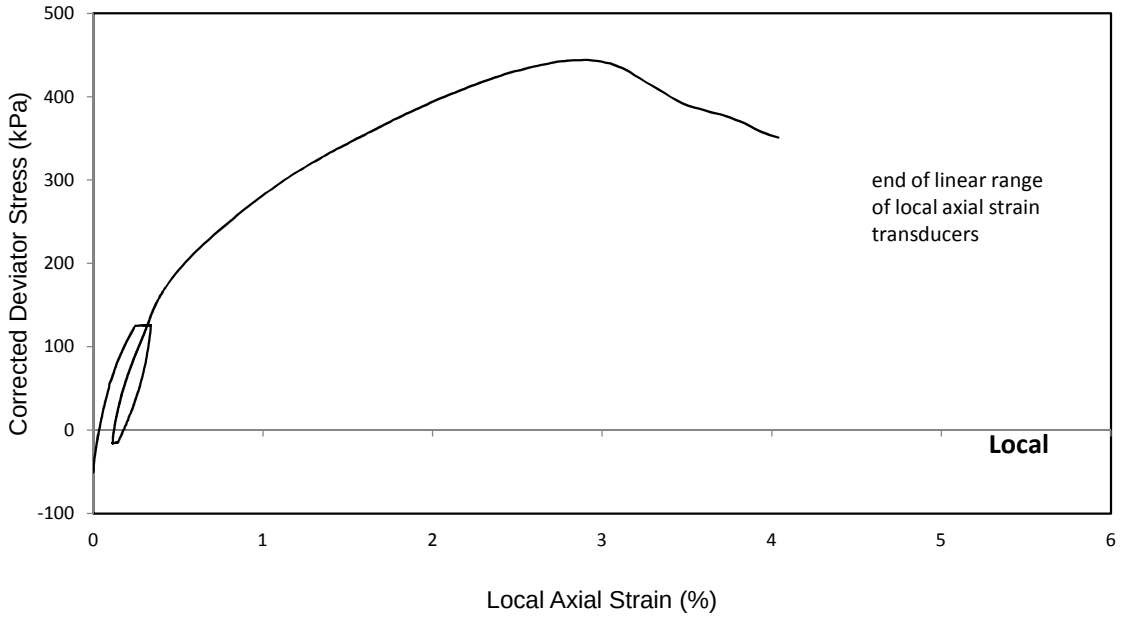
Corrected Deviator Stress v External Axial Strain

(with area change and filter drain corrections



Corrected Deviator Stress v Local Axial Strain

(with area change and filter drain corrections



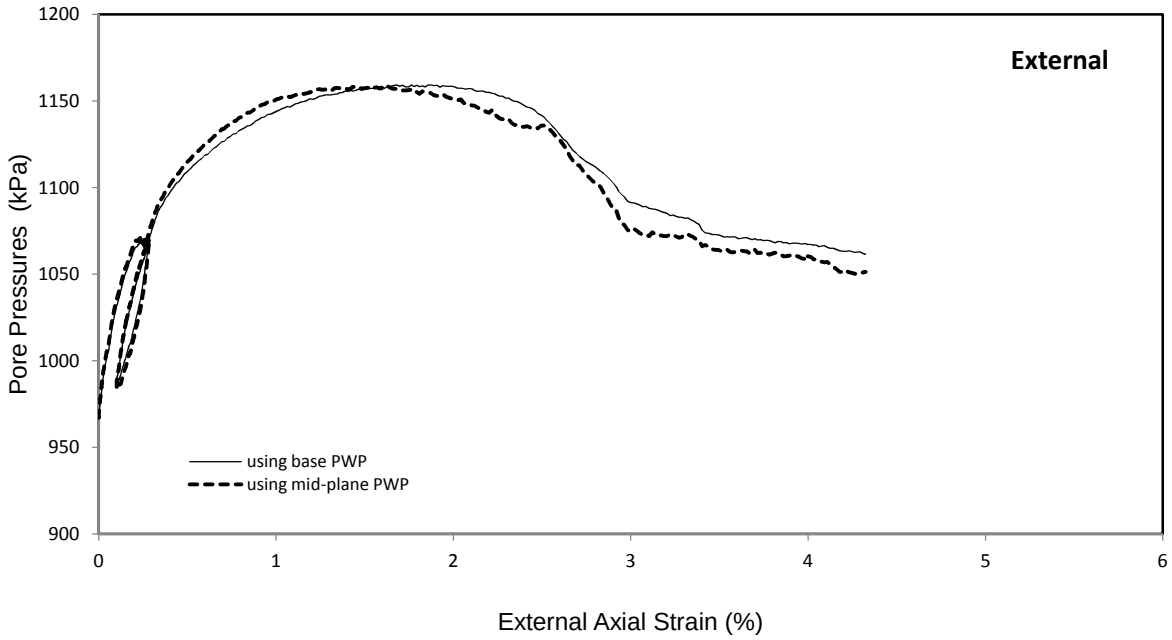
Checked and Approved Initials CW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

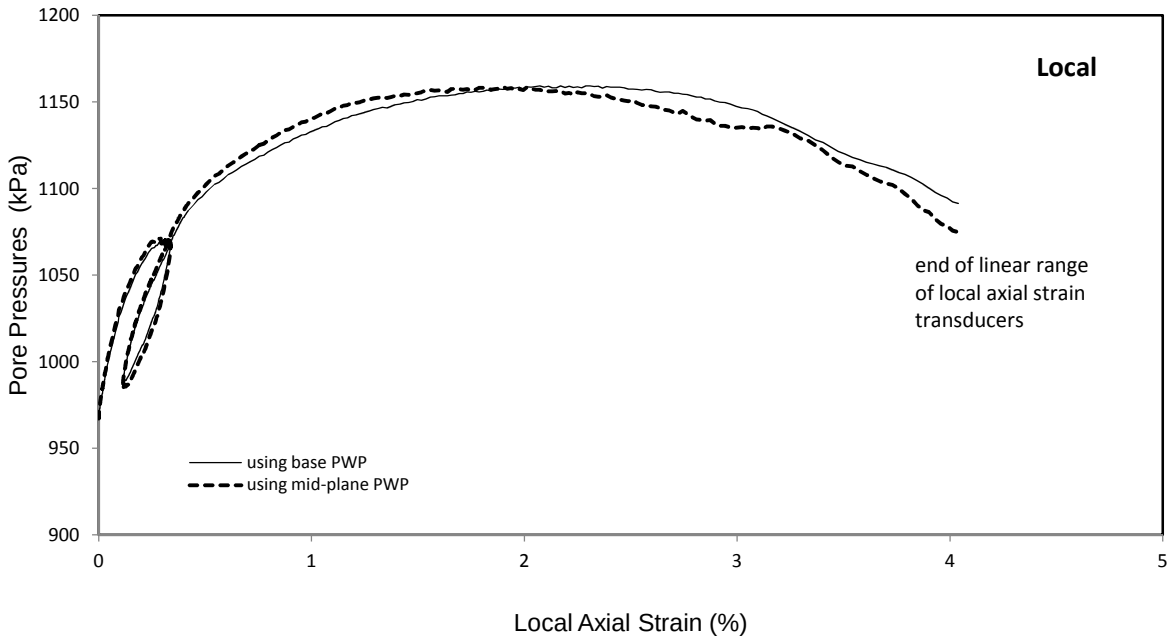
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Shearing Stage

Pore Pressures v External Axial Strain



Pore Pressures v Local Axial Strain



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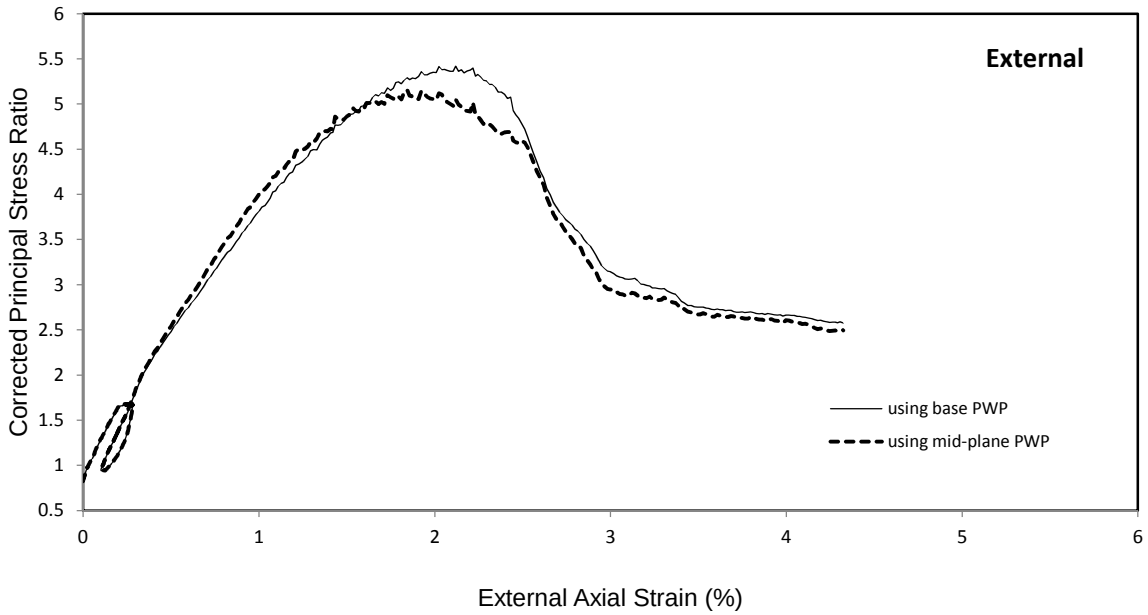
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Shearing Stage

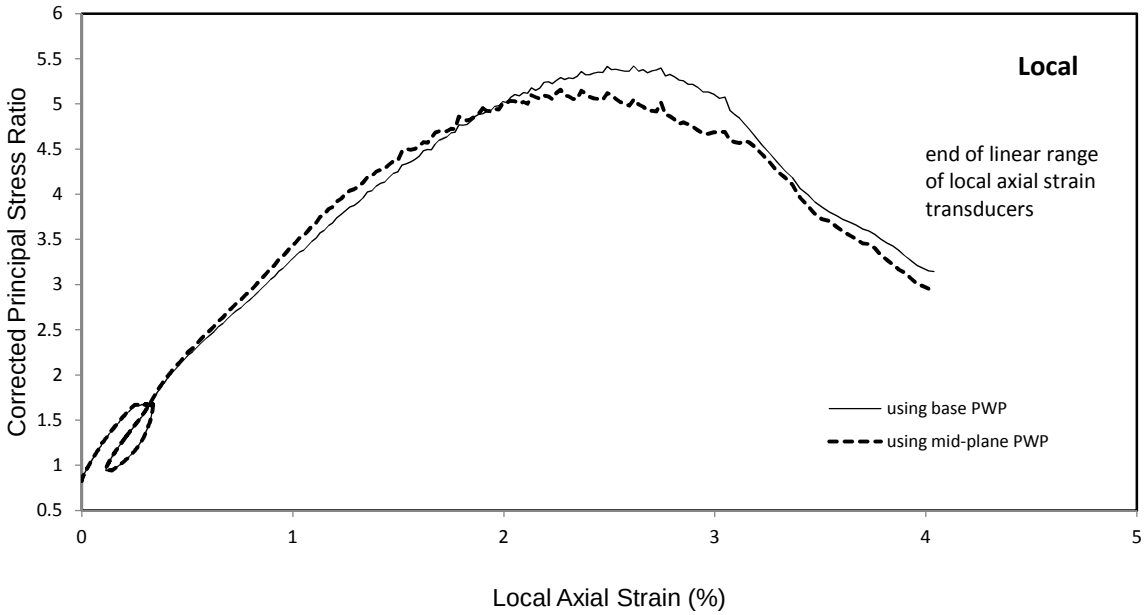
Corrected Principal Stress Ratio v External Axial Strain

(with area change and filter drain corrections)



Corrected Principal Stress Ratio v Local Axial Strain

(with area change and filter drain corrections)



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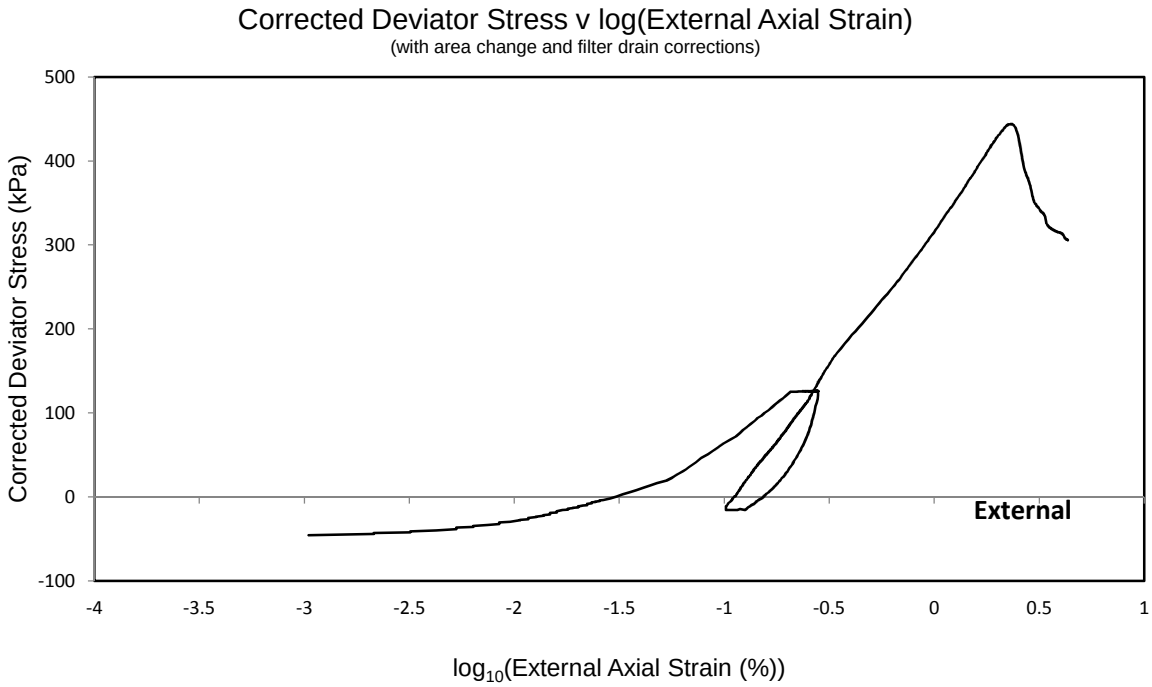
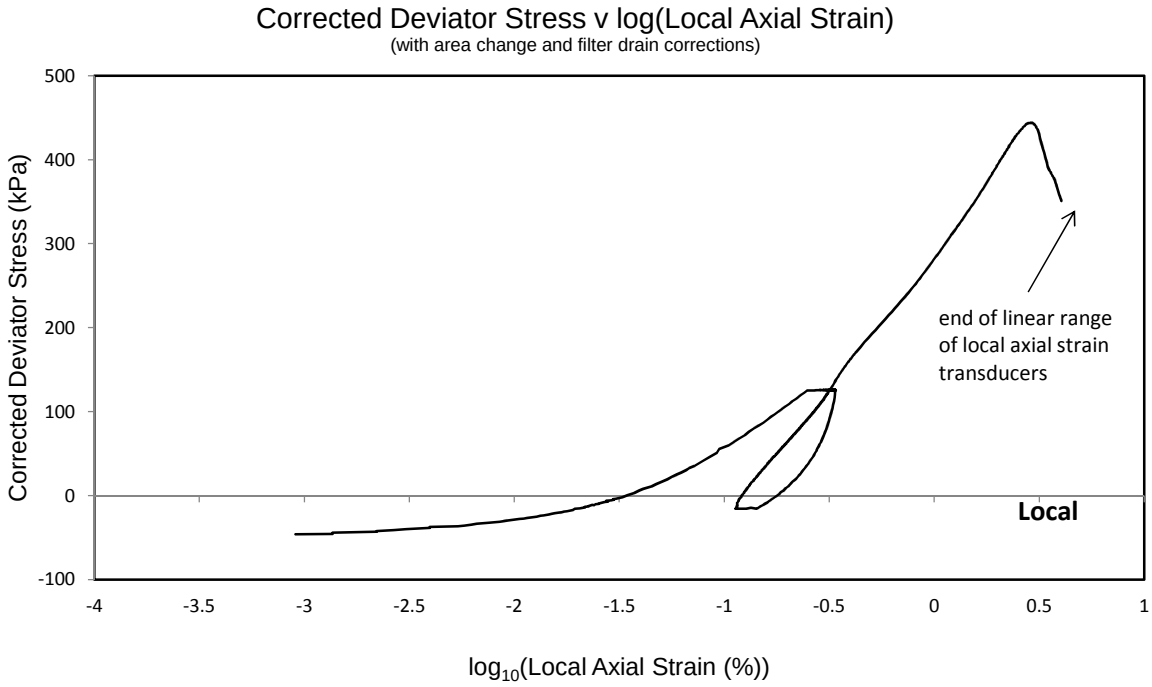
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Shearing Stage





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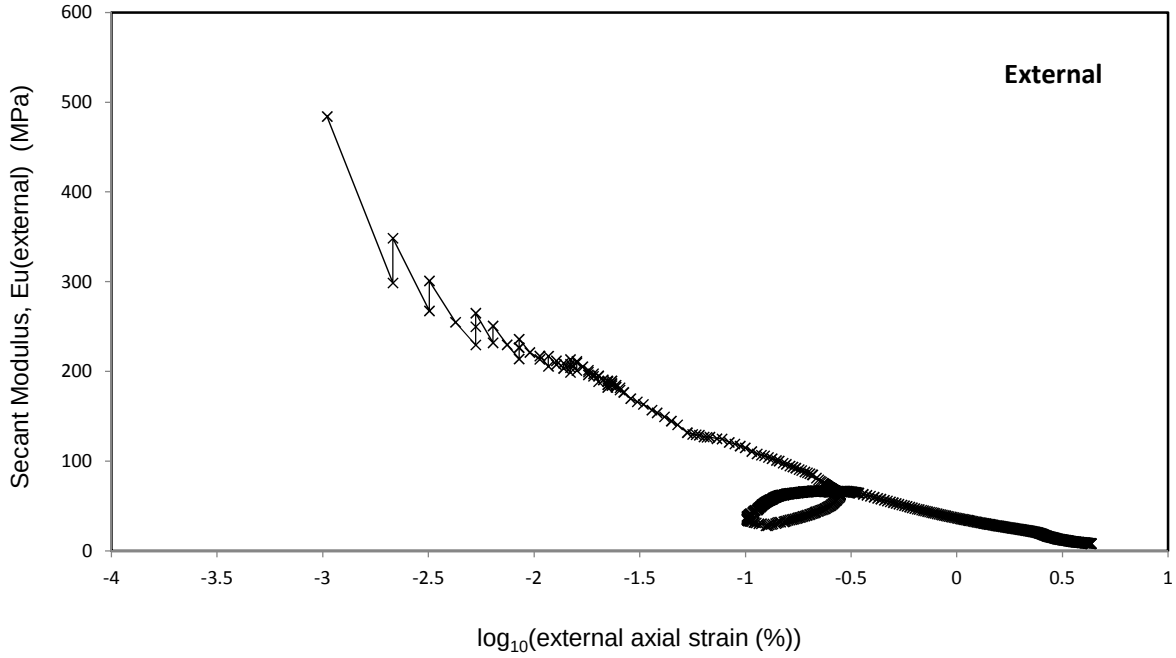
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

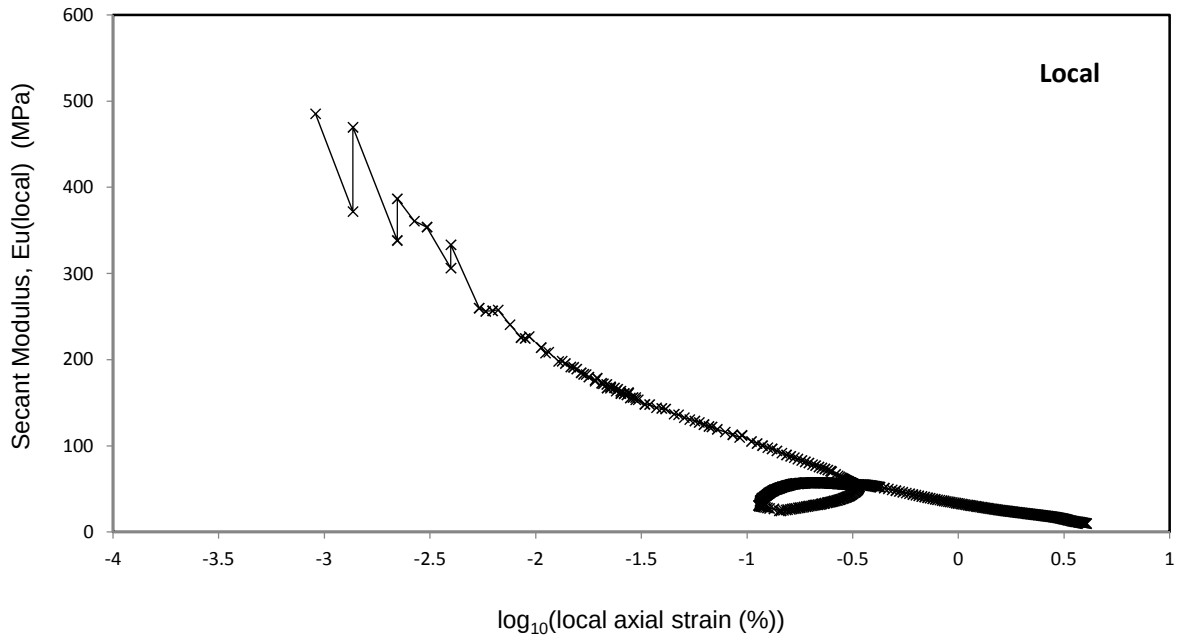
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Shearing Stage

Corrected Eu_{ext} v log(ext strain)
(with area change and filter darin corrections)



Corrected Eu_{local} v log(local strain)
(with area change and filter drain corrections)



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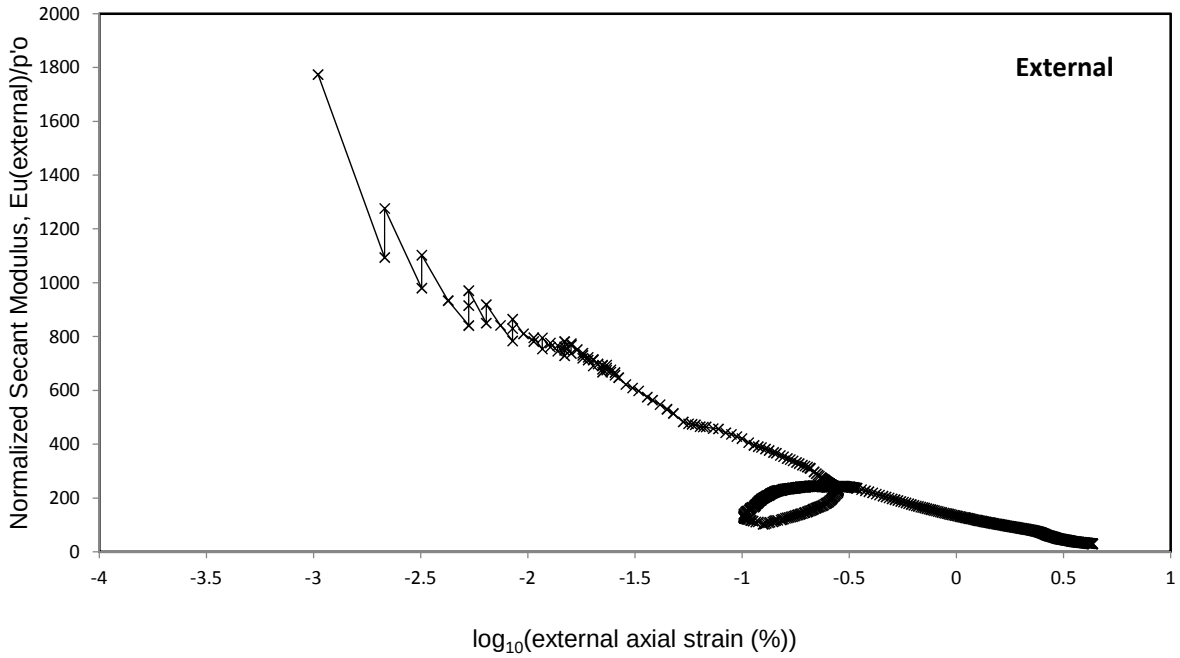
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

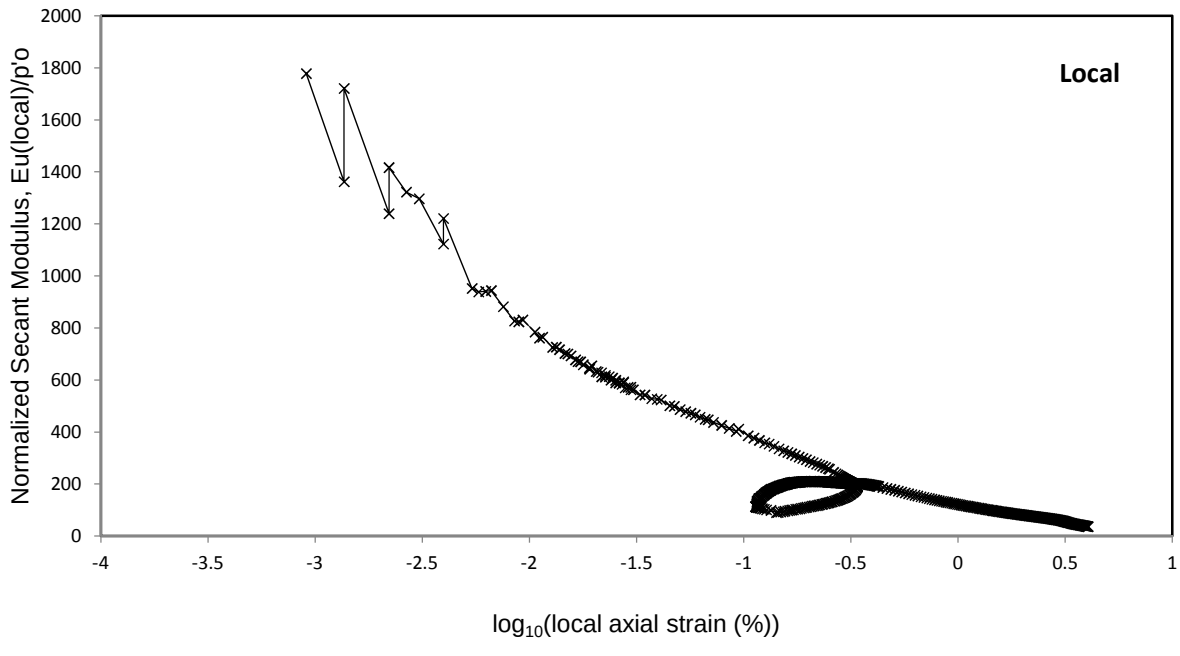
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C11 Depth (m): 17.50 - 17.80	Shearing Stage

Corrected Eu_{ext} /p'o v log(ext strain)
(with area change and filter drain corrections)



Corrected Eu_{local}/p'o v log(local strain)
(with area change and filter drain corrections)



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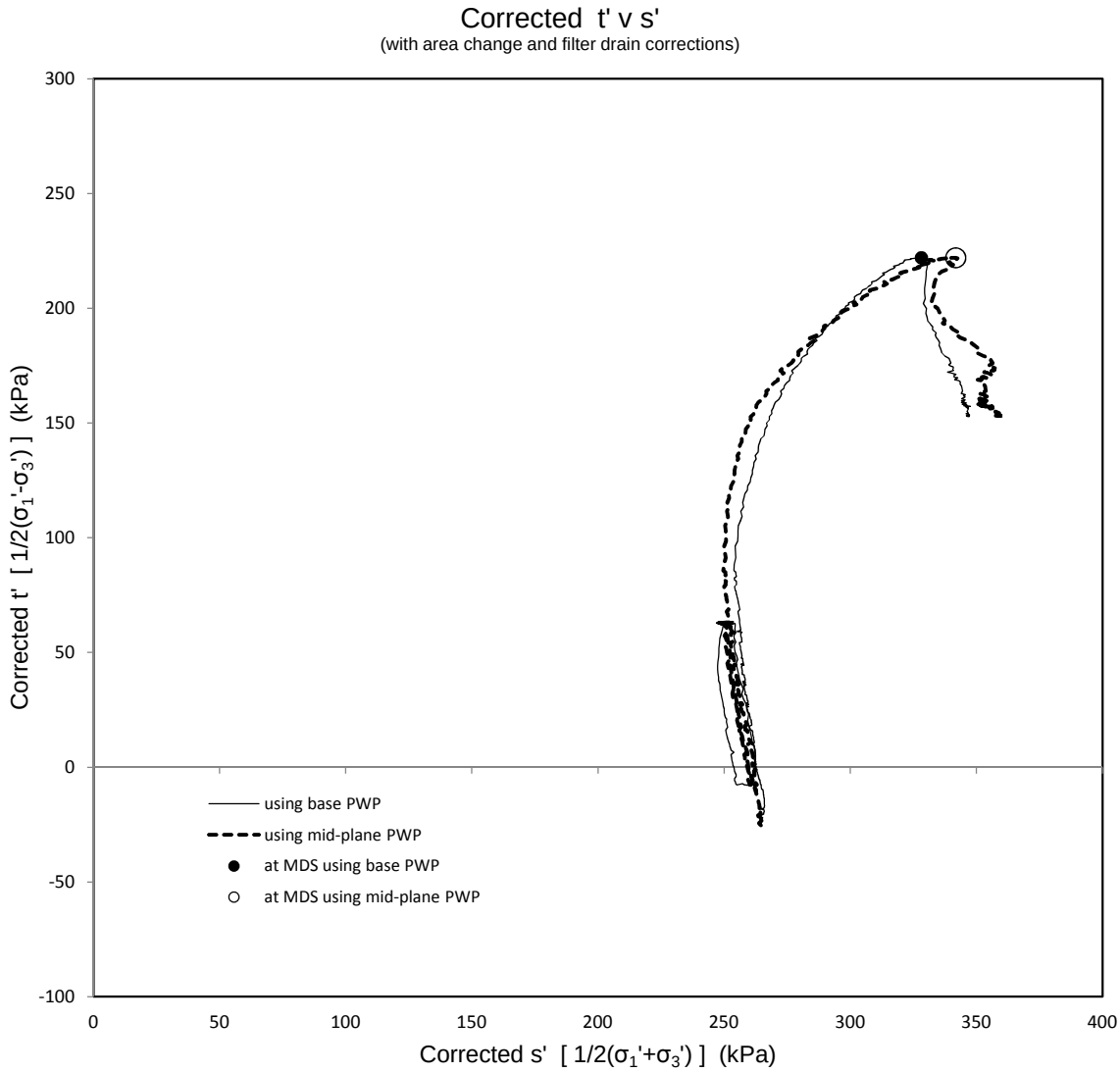
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shearing Stage
Sample Ref: C11	
Depth (m): 17.50 - 17.80	



Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Borehole No:	PB01	Shearing Stage - Calculations Notes
Sample Ref:	C11	
Depth (m):	17.50 - 17.80	

Cross-Sectional Area Calculations

a) The cross-sectional area is calculated assuming a right-cylinder deformation of the specimen.

Membrane Corrections

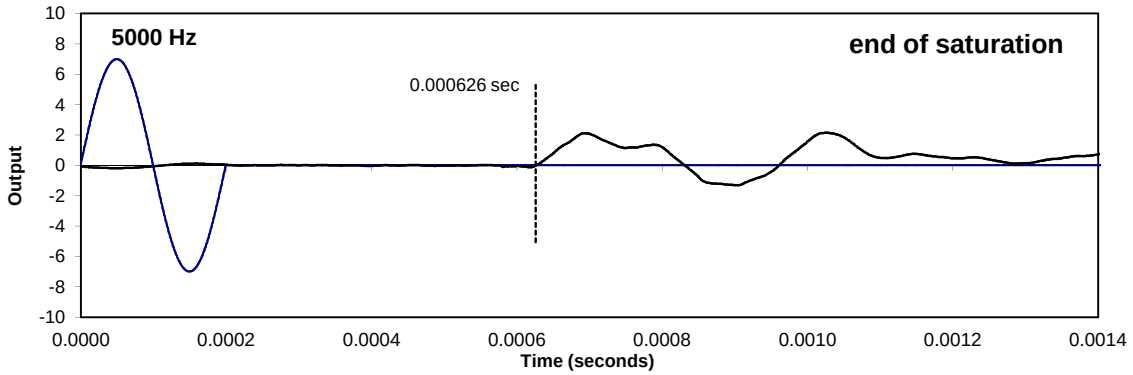
b) Corrections for membrane restraint are according to BS1377:Part 8:1990

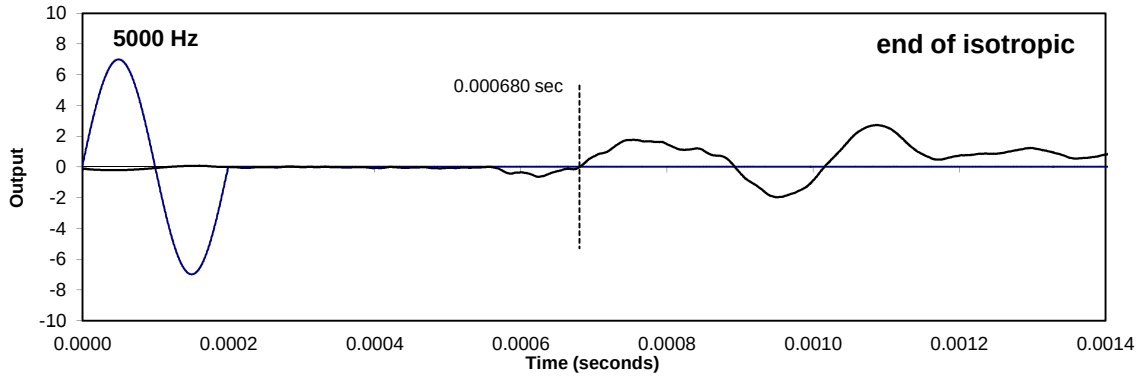
Filter Paper Corrections

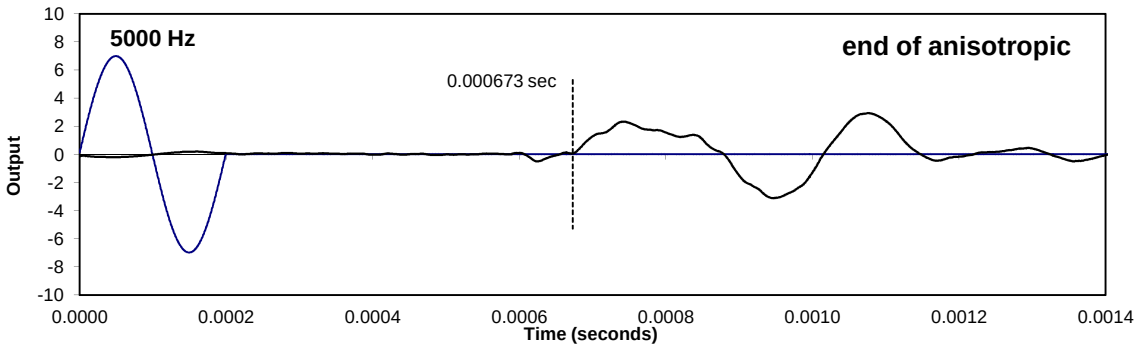
c) Corrections for strength due to peripheral filter papers are according to BS1377:Part 8:1990
but with the correction from 0 to 2% strain proportionally increasing from 0 kPa to the value calculated at 2% strain.

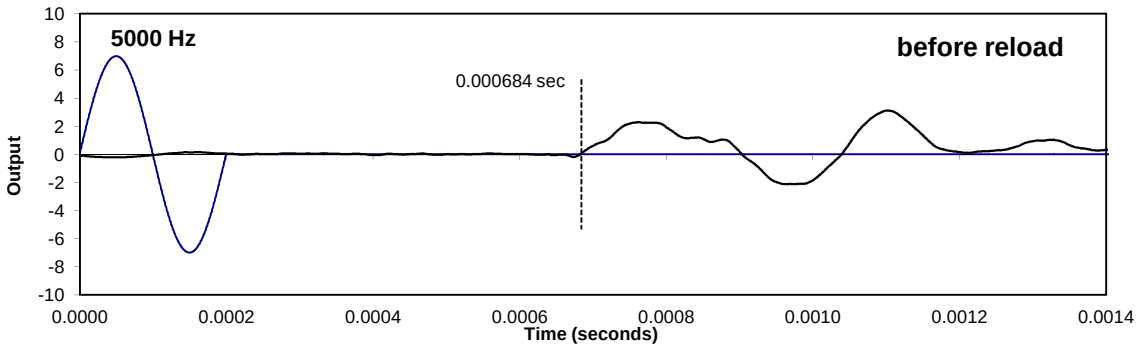
Determination of Gmax Using Bender Elements
Stage Traces

Borehole No:	PB01	**Svh**
Sample Ref:	C11	
Depth (m):	17.50 - 17.80	





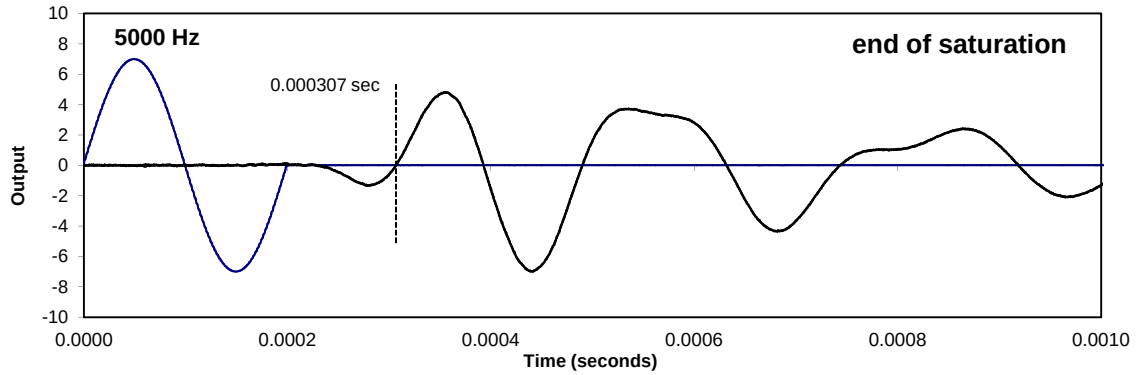


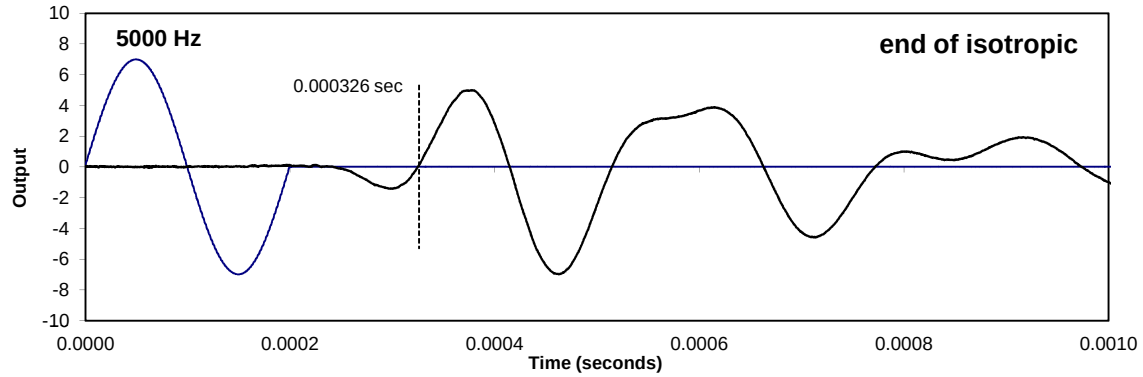


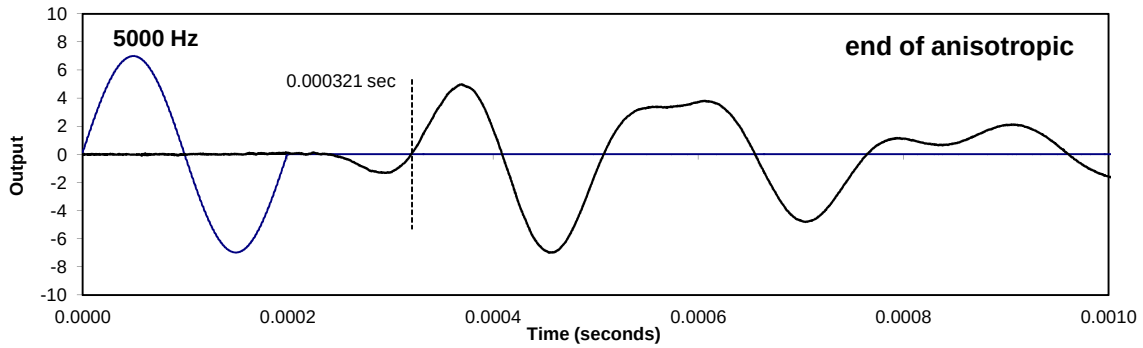
Checked and Approved Initials: CFW 16/03/2015	Project Number: **22150** Project Name: **ST GILES CIRCUS** **Project Number 14/2669**	***GEOLABS*®**

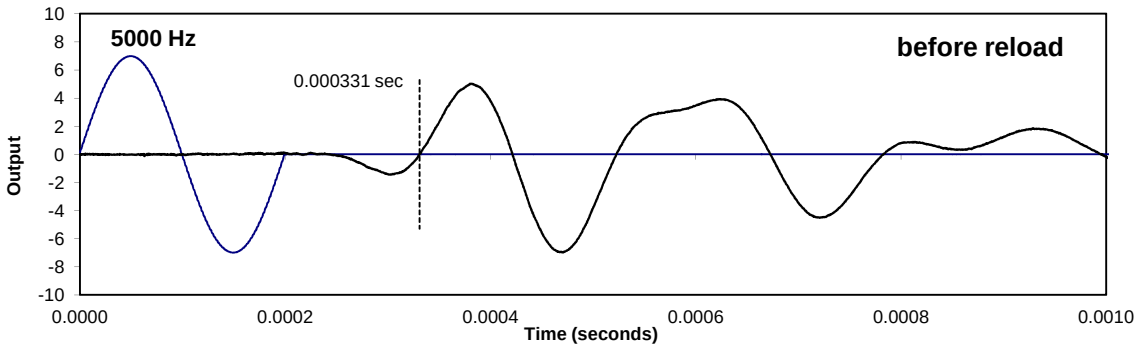
Determination of Gmax Using Bender Elements
Stage Traces

Borehole No:	PB01	**Shh**
Sample Ref:	C11	
Depth (m):	17.50 - 17.80	









Checked and Approved Initials: CFW 16/03/2015	Project Number: **22150** Project Name: **ST GILES CIRCUS** **Project Number 14/2669**	***GEOLABS*®**

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Description:
Sample Ref: C17	Very stiff fissured grey CLAY.
Depth (m): 25.56 - 25.86	

Initial Specimen Conditions	**Initial**		**Final**
Location within sample	90mm from top		
Orientation	Vertical		
Condition	Undisturbed		
Diameter	97.9 mm		
Height	198.9 mm		
Moisture content	27.0 %		26.4 %
Bulk density	2.01 Mg/m³		2.04 Mg/m³
Dry density	1.59 Mg/m³		1.61 Mg/m³

At End of Saturation	**base**	**mid-plane**
Cell pressure	1030 kPa	
Pore pressure	803 kPa	803 kPa
B value	0.98	0.99
Method used	Constant moisture content	

At End of Isotropic Consolidation	**base**	**mid-plane**
Cell pressure	1030 kPa	
Back pressure	650 kPa	
Pore pressure	650 kPa	650 kPa

At End of Anisotropic Stage		
Cell pressure	1100 kPa	
Back pressure	650 kPa	
Deviator stress	-71 kPa	
Base pore pressure	650 kPa	650 kPa
Ko	1.19	1.19

Shearing Stage (compression)	**base**	**mid-plane**
Initial conditions:		
Cell pressure	1100 kPa	
Pore pressure	650 kPa	650 kPa
Mean effective stress, p_0', $(\sigma_1'+2\sigma_3')/3$	427 kPa	426 kPa
Set rate of external axial strain	0.20 %/hr	

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No:	PB01	Description:
Sample Ref:	C17	Very stiff fissured grey CLAY.
Depth (m):	25.56 - 25.86	

Stiffnesses From Shear Stage

	External	Local
Secant Modulus, Eu, at **0.01%** axial strain	163.1 MPa	181.9 MPa
- normalized with respect to mean effective stress, p'o	383	427
Secant Modulus, Eu, at **0.1%** axial strain	104.3 MPa	95.6 MPa
- normalized with respect to mean effective stress, p'o	245	225
Degree of Non-Linearity, L	0.64	0.53

Local Axial Creep Rates

Immediately prior to shearing	0.0004 %/hr
Immediately prior to unloading	0.0123 %/hr
Immediately prior to reloading	-0.0074 %/hr

Conditions at failure (with filter drain strength correction)

	base	mid-plane	
Failure criteria	Maximum deviator stress		**SEE NOTE**
External axial strain	8.93 %		
Local axial strain	outside range		
Deviator stress	294.9 kPa		
Filter drain strength correction to deviator stress	3.9 kPa		
Undrained shear strength	147.5 kPa		
Pore pressure	810.9 kPa	789.0 kPa	
Axial effective stress, σ_v'	584.0 kPa	605.9 kPa	
Radial effective stress, σ_h'	289.1 kPa	311.0 kPa	
s' [$(\sigma_1'+\sigma_3')/2$]	436.6 kPa	458.5 kPa	
t [$(\sigma_1-\sigma_3)/2$]	147.5 kPa		
Pore pressure parameter A, $(u - u_o)/(\sigma_V - \sigma_{Vo})$	0.44	0.38	
Principal stress ratio	2.02	1.95	

Note:
Shearing stage stopped due to deformation of specimen forcing piezo bender elements against triaxial cell. Deviator stress had not peaked at this point, but was only rising very slowly.

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shear Wave Velocities
Sample Ref: C17	
Depth (m): 25.56 - 25.86	

Gmax Determination
Using First Arrival Shear Wave Velocities from Bender Elements

Note: The travel time determinations can be subjective, so the associated Gmax and Wave Velocity values should be taken as guide only

Svh Determination At End Of Stage:	Bulk Density (Mg/m³)	Travel time (s)	Travel Length (m)	Gmax (MPa)	Shear Wave Velocity **Svh** (m/s)
Saturation	2.014	0.000850	0.1958	106.8	230.3
Isotropic Consolidation	2.027	0.000755	0.1943	134.2	257.3
Anisotropic Consolidation	2.029	0.000743	0.1943	138.8	261.6
End of Unload (before reloac	2.029	0.000750	0.1942	136.0	258.9

Shh Determination At End Of Stage:	Bulk Density (Mg/m³)	Travel time (s)	Travel Length (m)	Gmax (MPa)	Velocity **Shh** (m/s)
Saturation	2.014	0.000397	0.0952	115.8	239.8
Isotropic Consolidation	2.027	0.000355	0.0949	144.9	267.4
Anisotropic Consolidation	2.029	0.000342	0.0948	155.9	277.2
End of Unload (before reloac	2.029	0.000351	0.0952	149.3	271.2

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

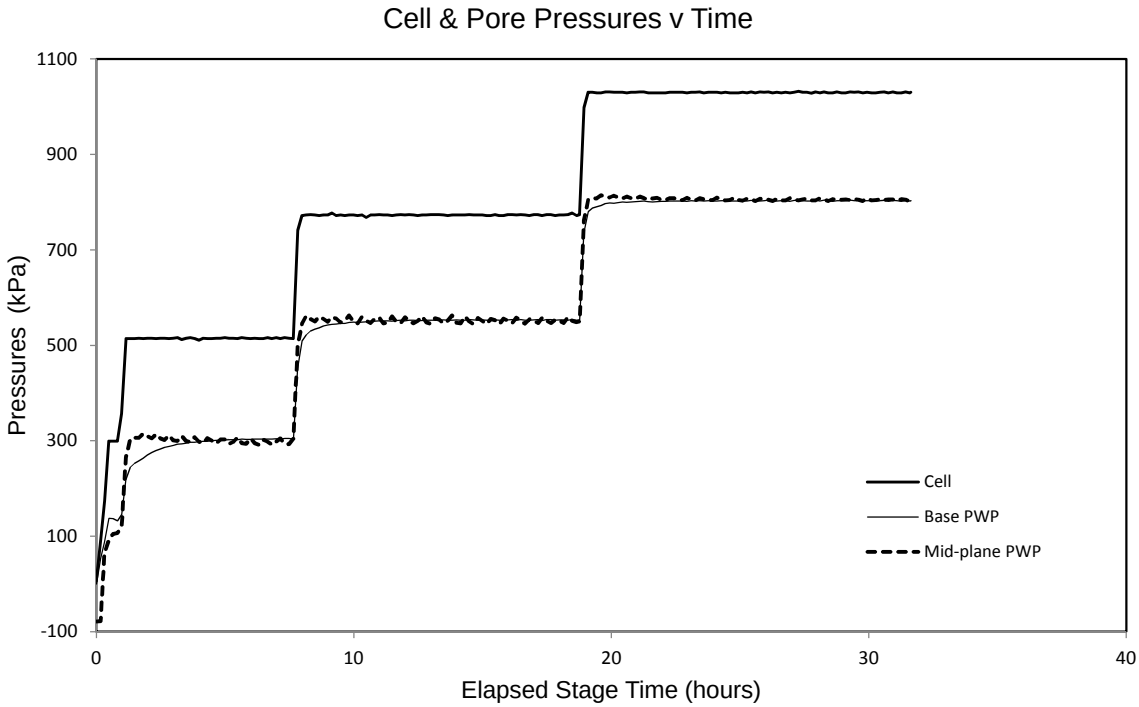
Borehole No: PB01	End of test photograph
Sample Ref: C17	
Depth (m): 25.56 - 25.86	

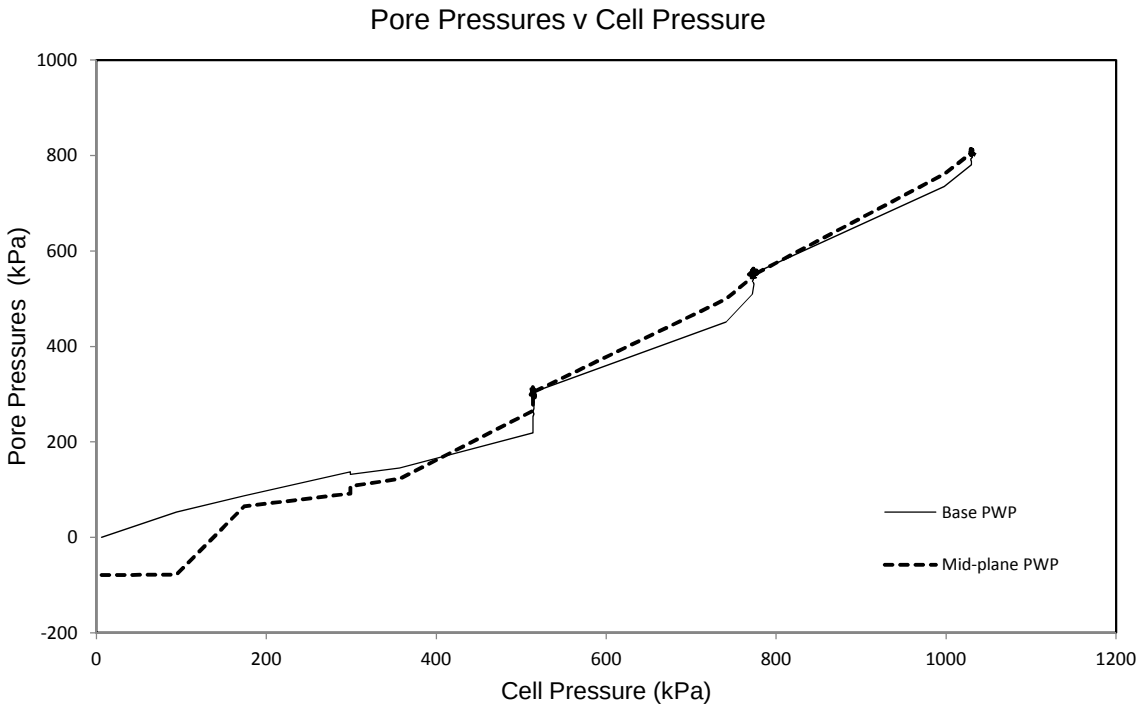
Checked and Approved Initials CW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Saturation Stage
Sample Ref: C17	
Depth (m): 25.56 - 25.86	





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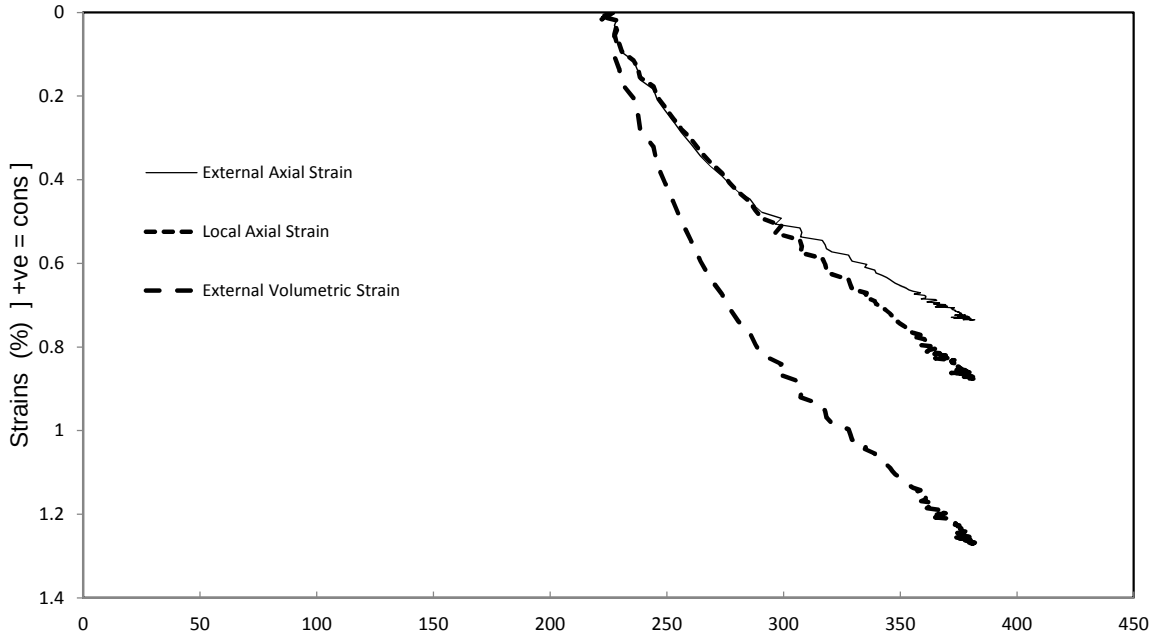
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

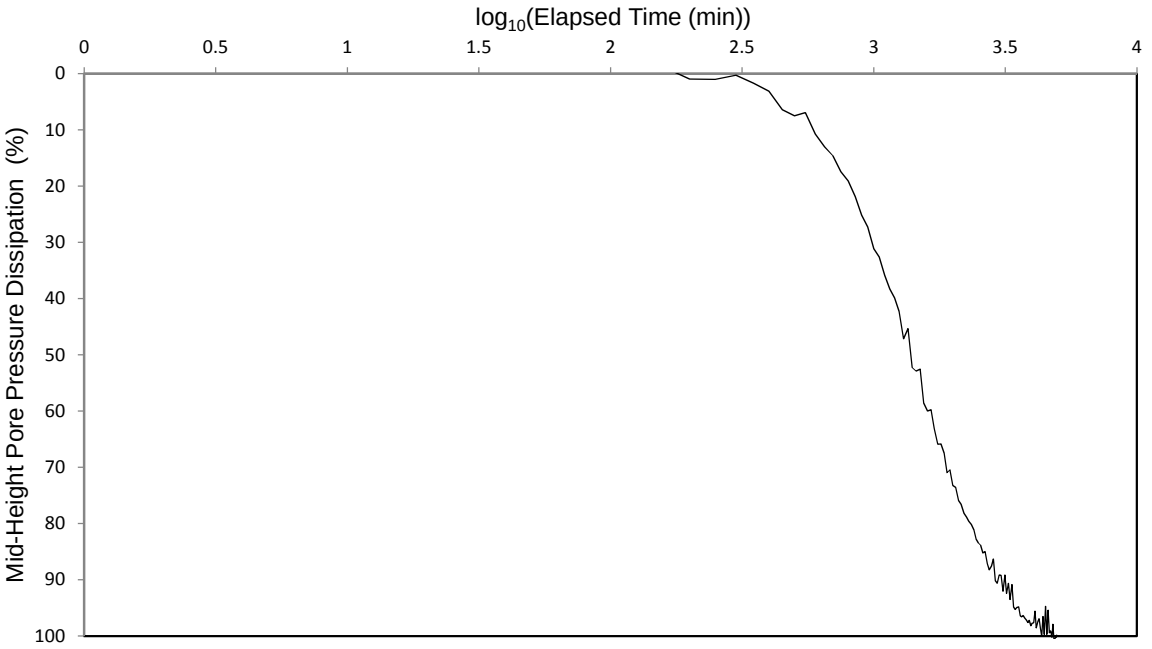
Custom Procedure Agreed By Client

Borehole No:	PB01	Isotropic Consolidation Stage
Sample Ref:	C17	
Depth (m):	25.56 - 25.86	

Axial and Volumetric Strains v Mean Effective Stress



Pore Pressure Dissipation v log Elapsed Time



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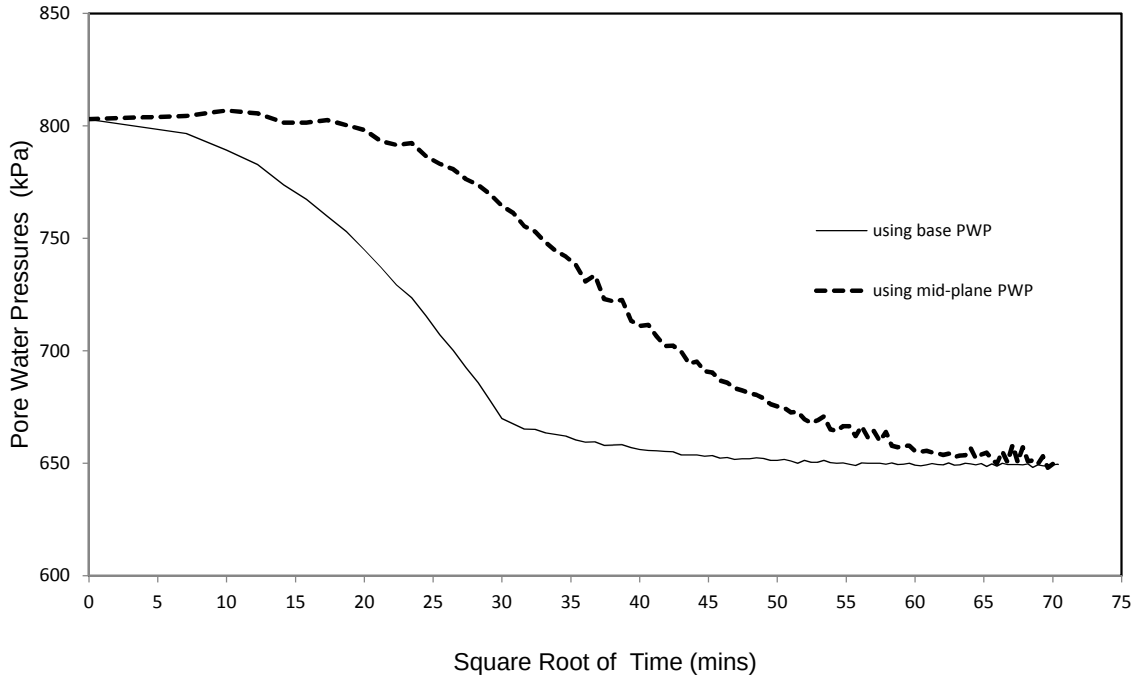
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

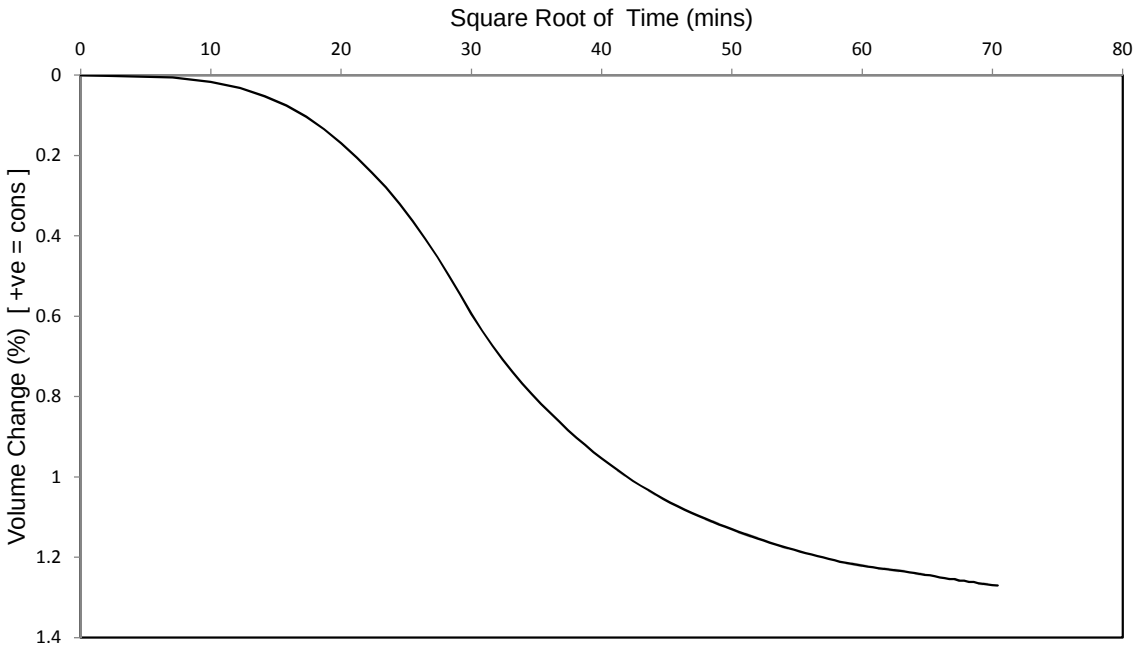
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Isotropic Consolidation Stage

Pore Water Pressures v Square Root of Time



Volume Change v Square Root of Time



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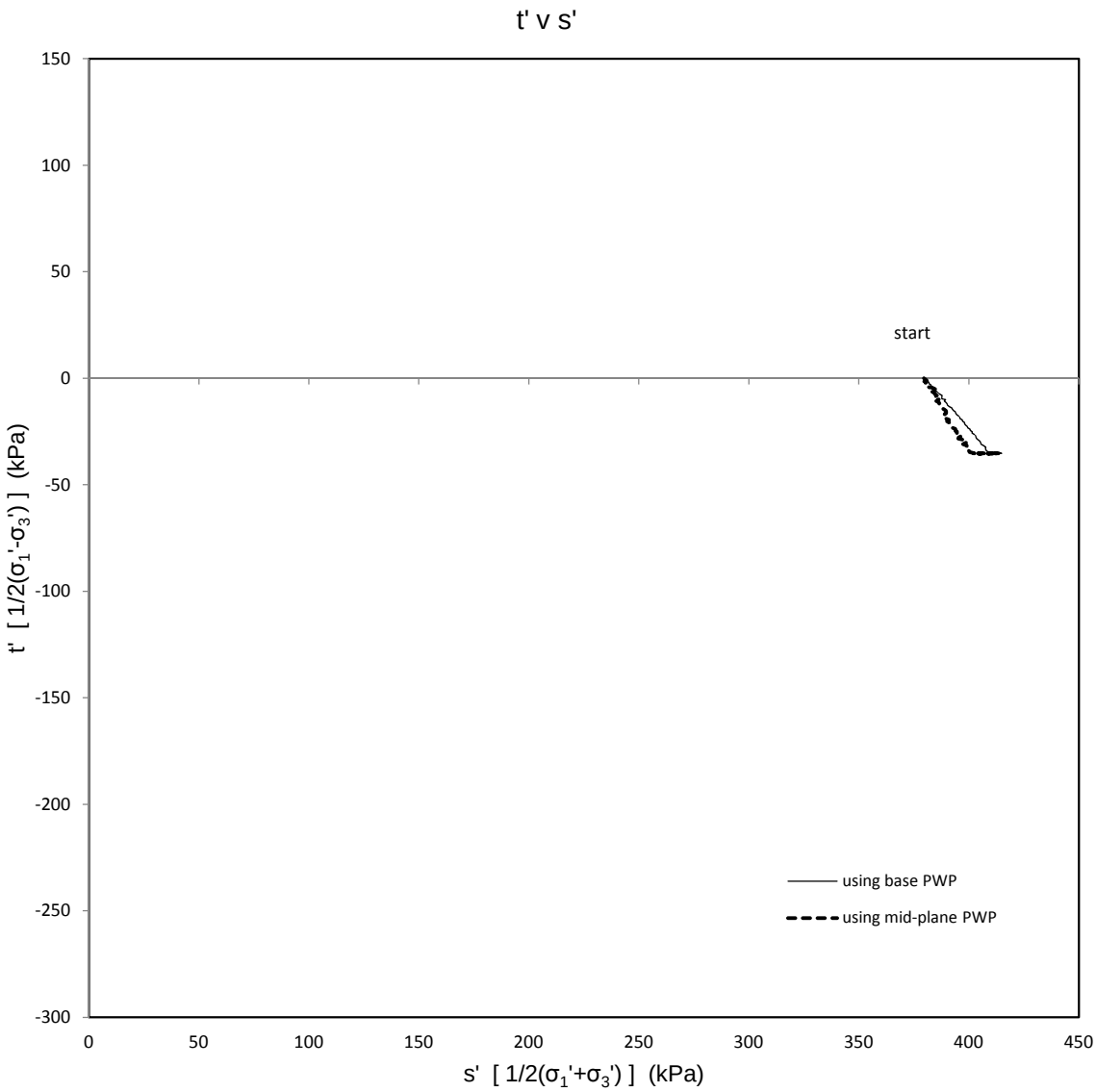
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Anisotropic Stage
Sample Ref: C17	
Depth (m): 25.56 - 25.86	



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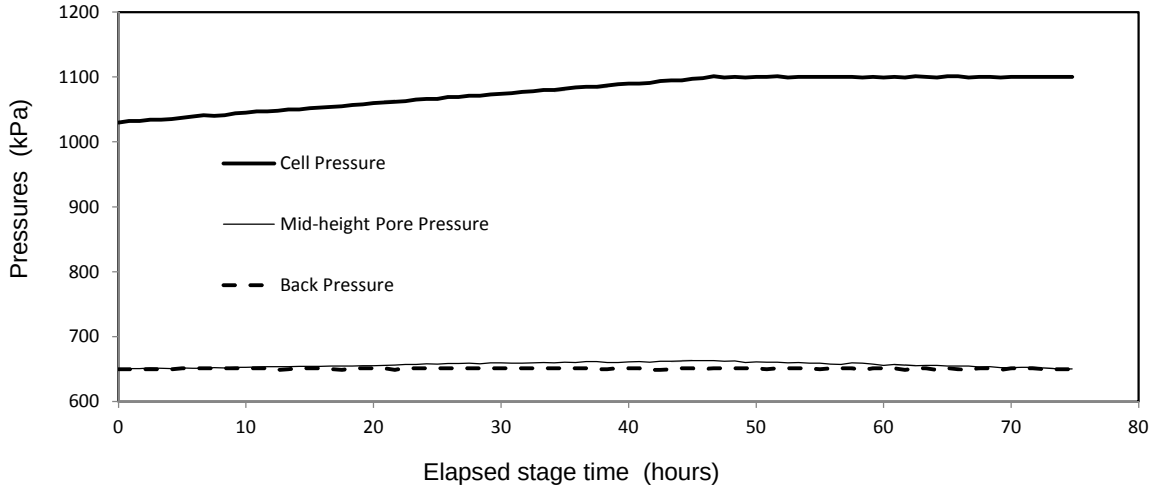
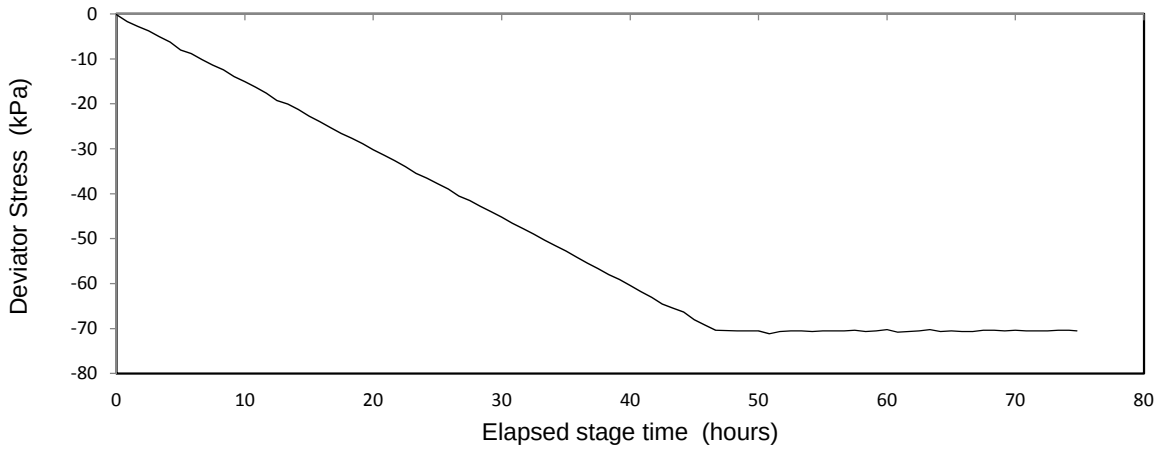
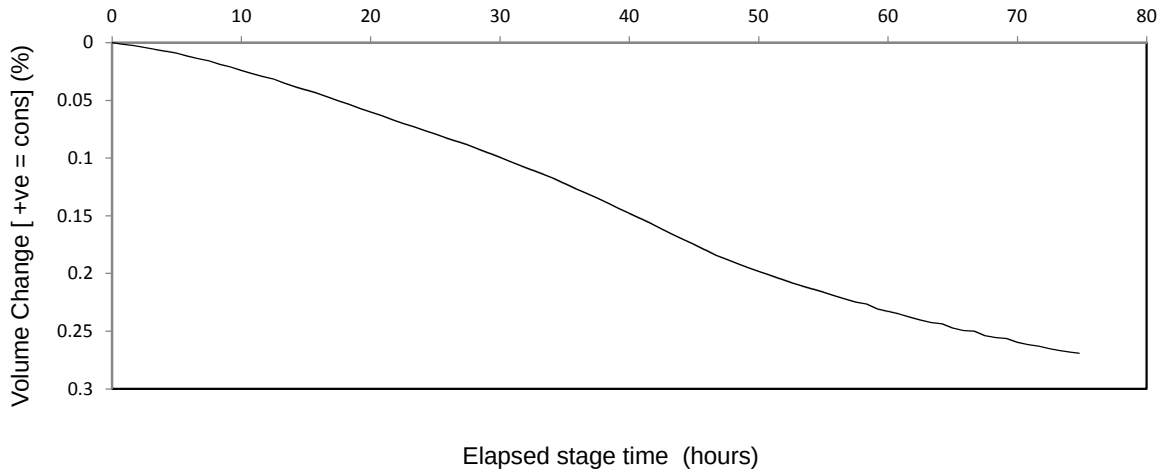
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Anisotropic Stage
Sample Ref: C17	
Depth (m): 25.56 - 25.86	







Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

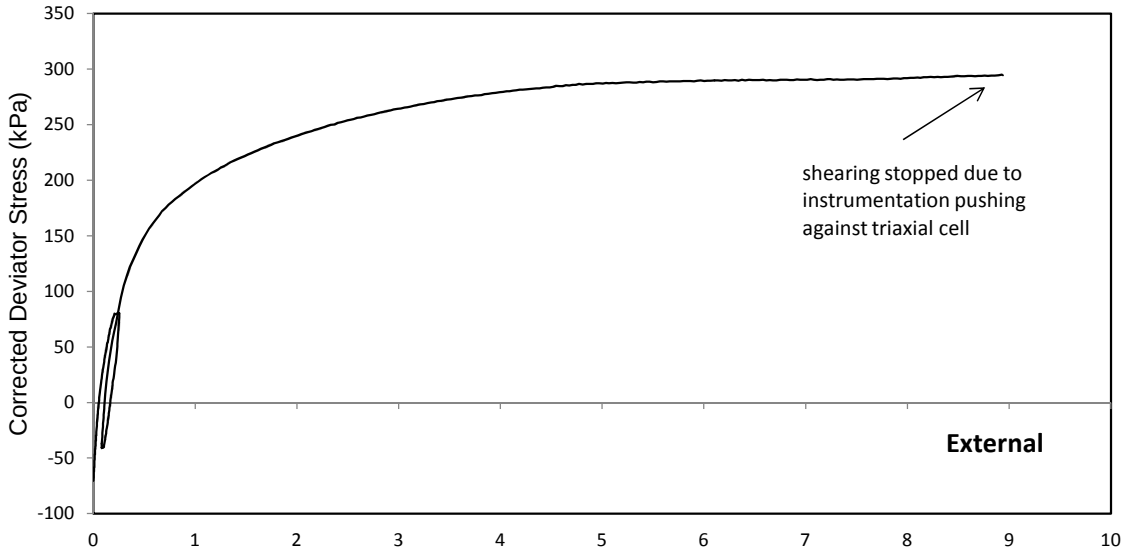
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shearing Stage
Sample Ref: C17	
Depth (m): 25.56 - 25.86	

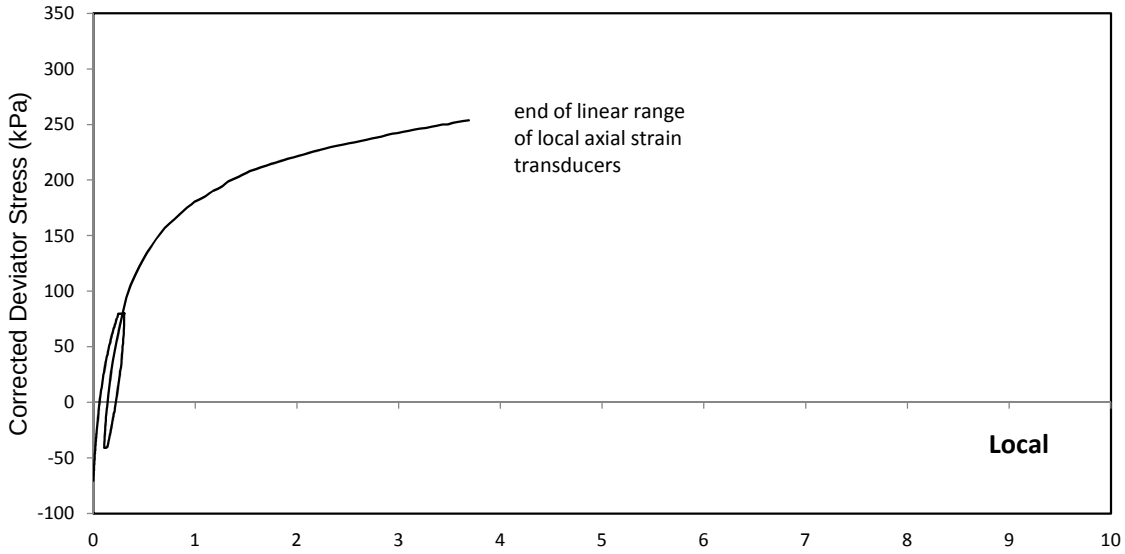
Corrected Deviator Stress v External Axial Strain

(with area change and filter drain corrections



Corrected Deviator Stress v Local Axial Strain

(with area change and filter drain corrections



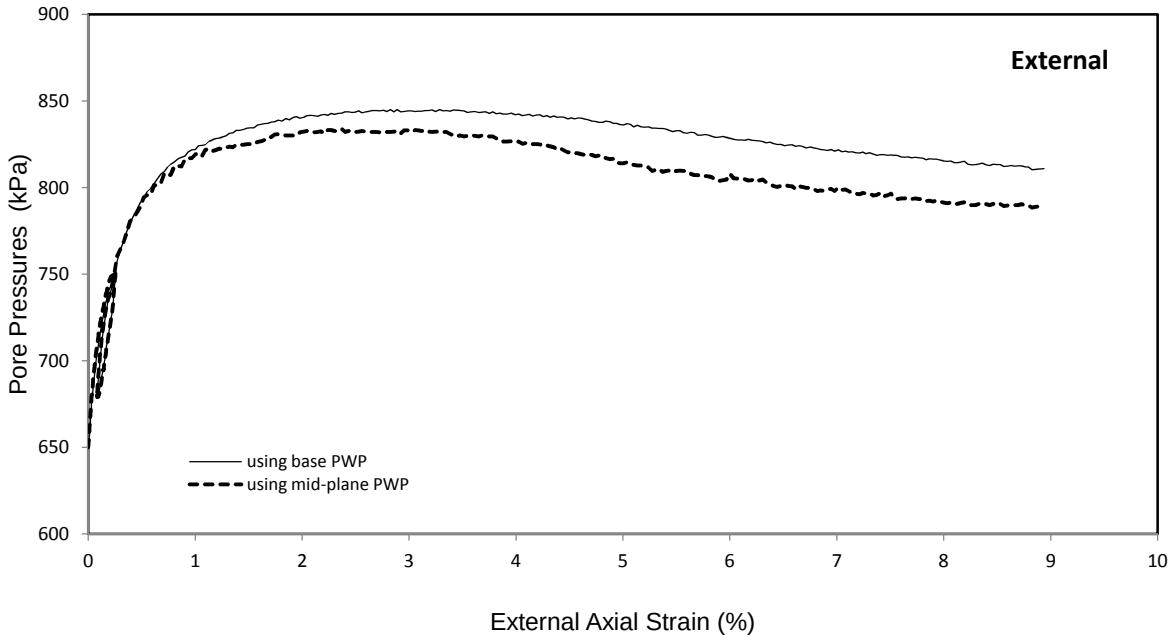
Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

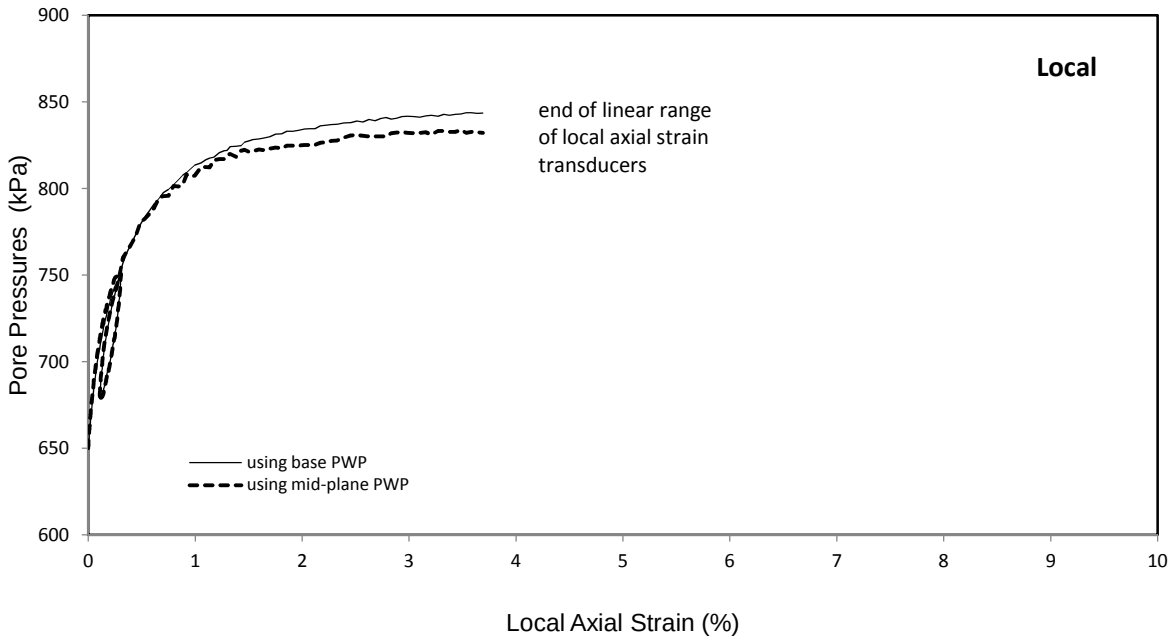
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Shearing Stage

Pore Pressures v External Axial Strain



Pore Pressures v Local Axial Strain



Checked and Approved Initials CW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

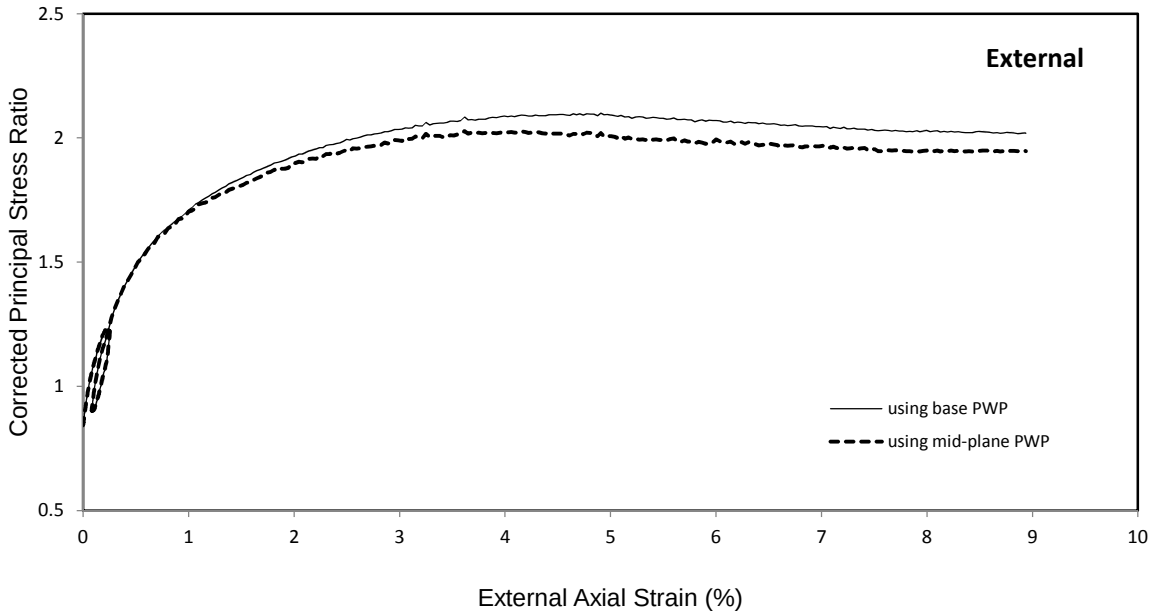
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Shearing Stage

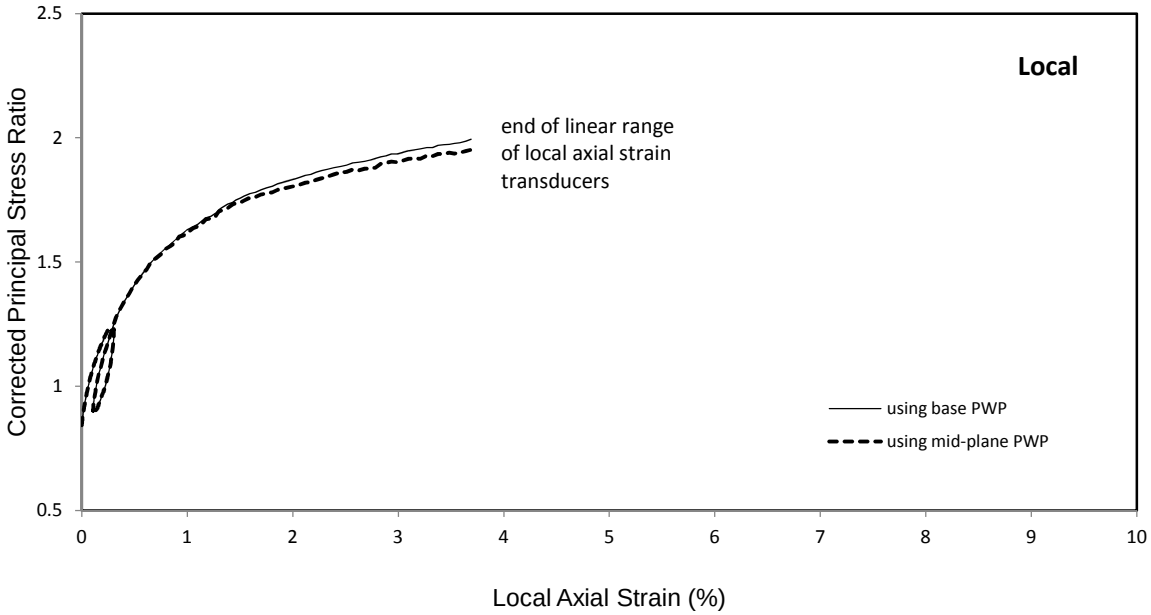
Corrected Principal Stress Ratio v External Axial Strain

(with area change and filter drain corrections)



Corrected Principal Stress Ratio v Local Axial Strain

(with area change and filter drain corrections)



Checked and Approved Initials CW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

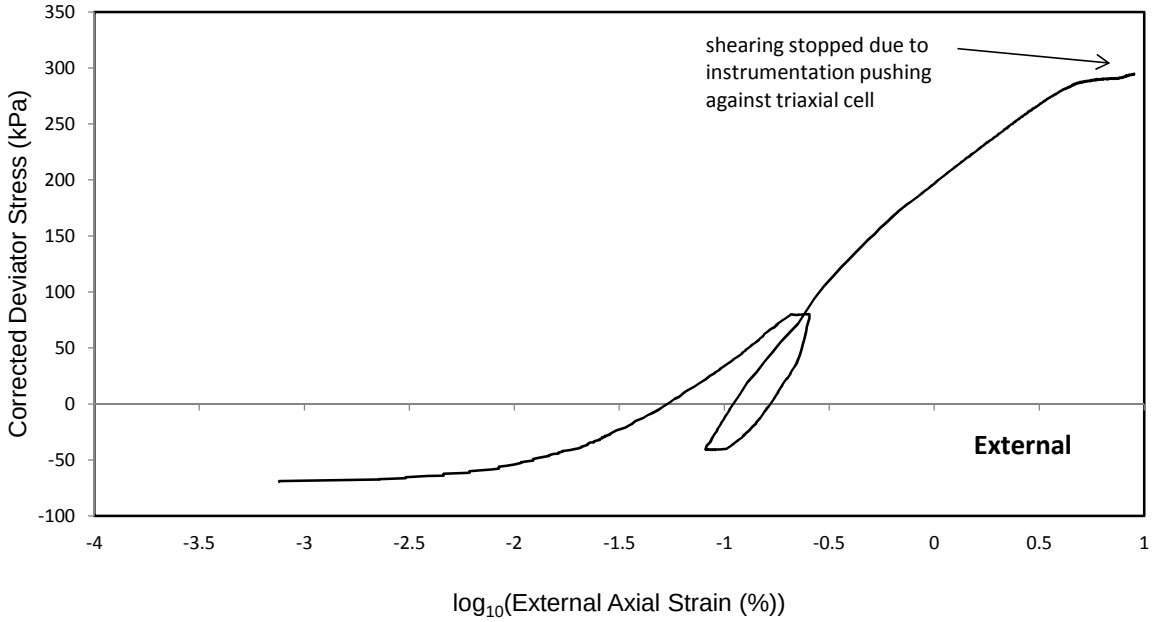
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Shearing Stage

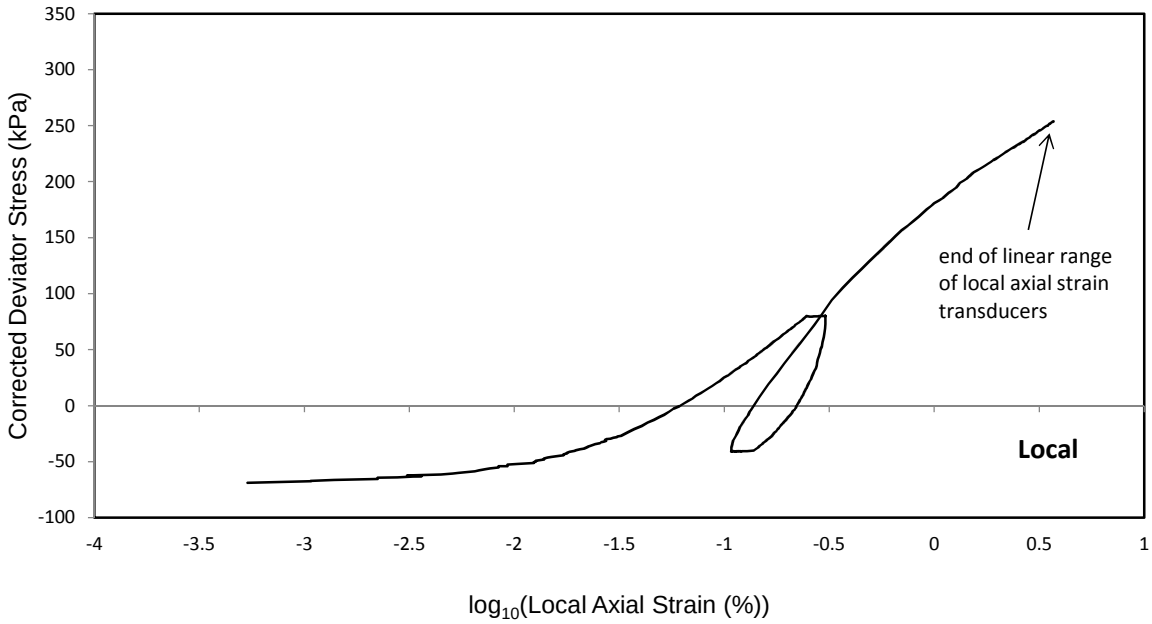
Corrected Deviator Stress v log(External Axial Strain)

(with area change and filter drain corrections)



Corrected Deviator Stress v log(Local Axial Strain)

(with area change and filter drain corrections)



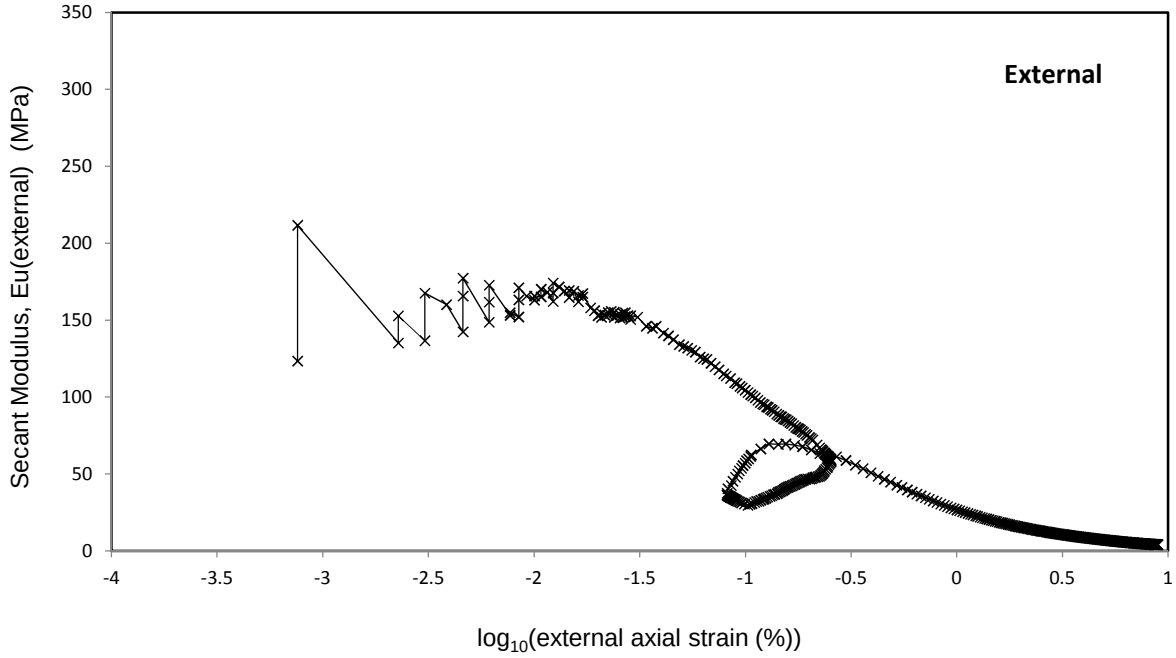
Checked and Approved Initials CW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

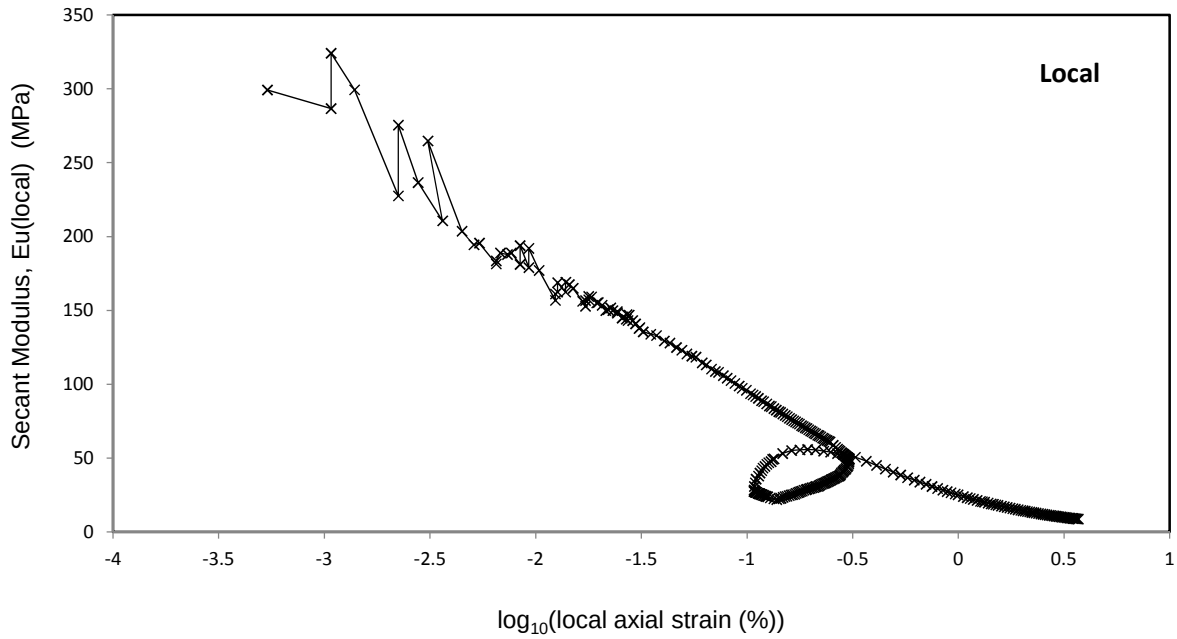
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Shearing Stage

Corrected Eu_{ext} v log(ext strain)
(with area change and filter darin corrections)



Corrected Eu_{local} v log(local strain)
(with area change and filter drain corrections)



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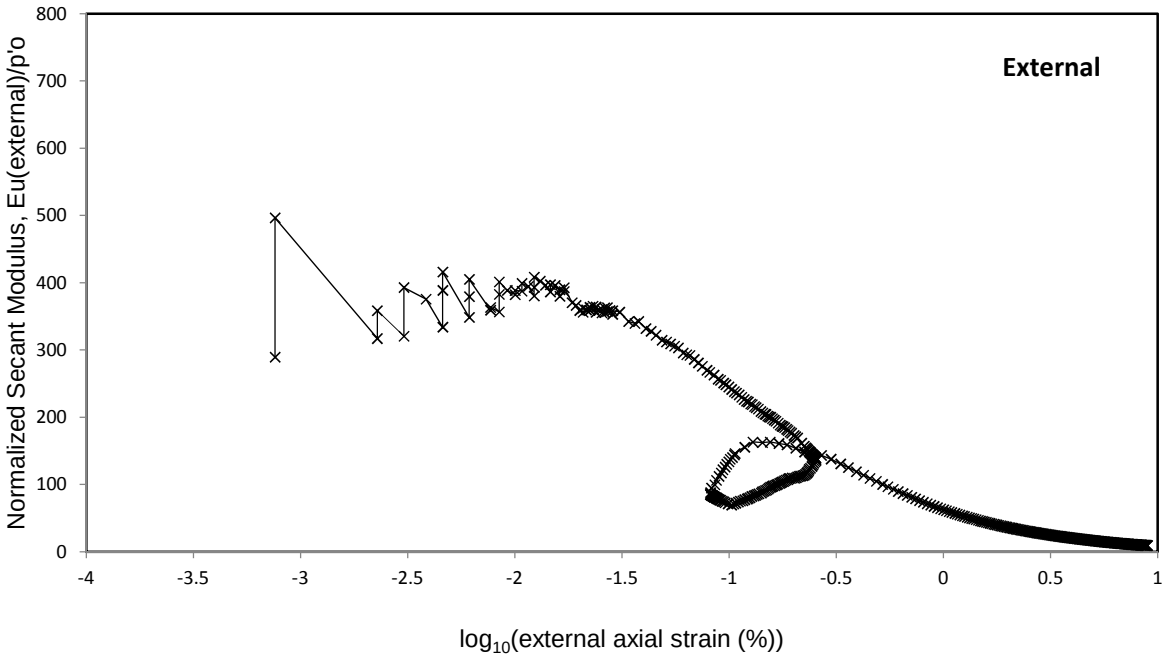
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

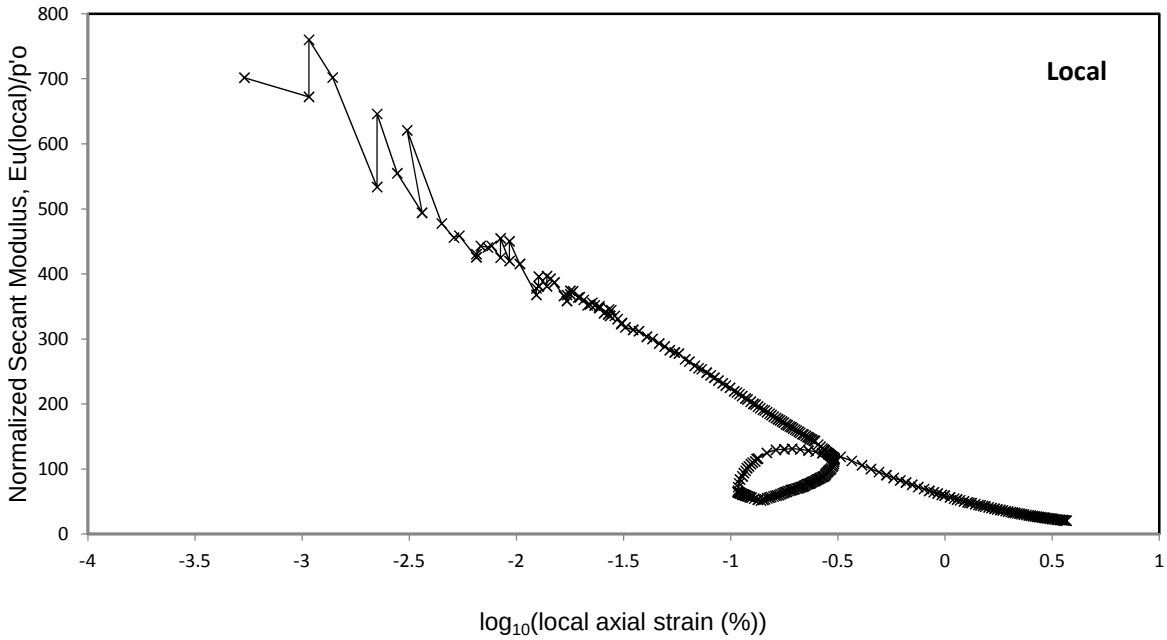
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Shearing Stage

Corrected Eu_{ext} /p'o v log(ext strain)
(with area change and filter drain corrections)



Corrected Eu_{local}/p'o v log(local strain)
(with area change and filter drain corrections)



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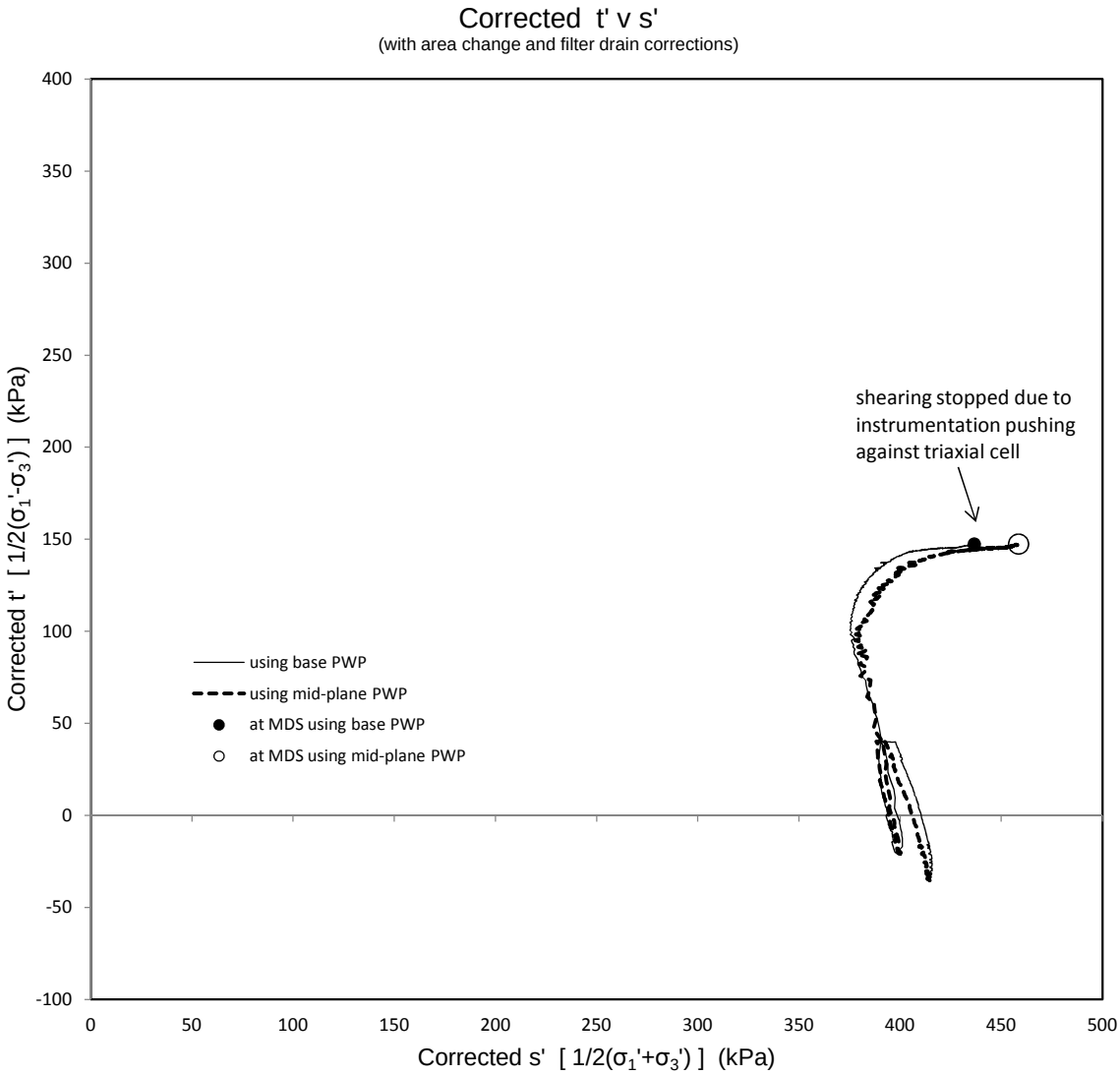
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shearing Stage
Sample Ref: C17	
Depth (m): 25.56 - 25.86	



Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Borehole No: PB01 Sample Ref: C17 Depth (m): 25.56 - 25.86	Shearing Stage - Calculations Notes

Cross-Sectional Area Calculations

a) The cross-sectional area is calculated assuming a right-cylinder deformation of the specimen.

Membrane Corrections

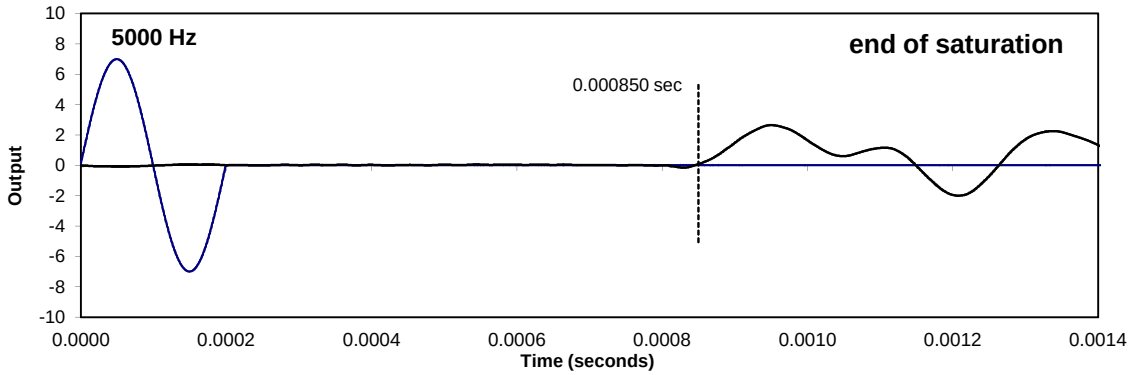
b) Corrections for membrane restraint are according to BS1377:Part 8:1990

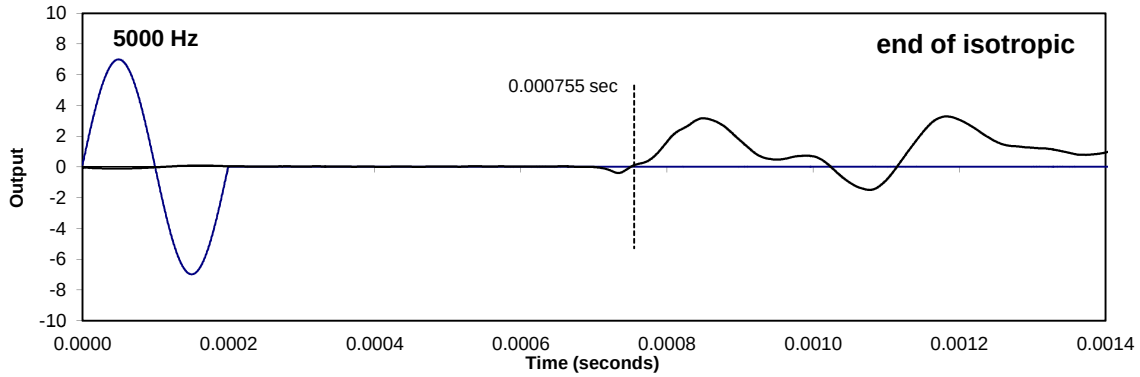
Filter Paper Corrections

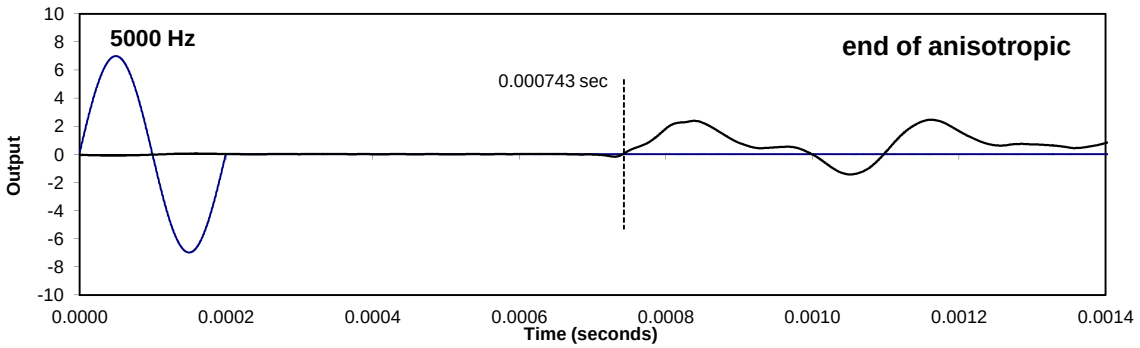
c) Corrections for strength due to peripheral filter papers are according to BS1377:Part 8:1990
but with the correction from 0 to 2% strain proportionally increasing from 0 kPa to the value calculated at 2% strain.

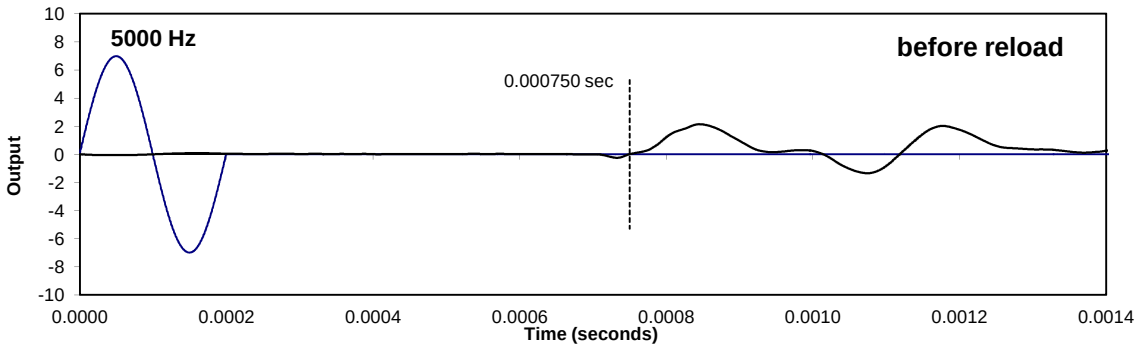
Determination of Gmax Using Bender Elements
Stage Traces

Borehole No:	PB01	**Svh**
Sample Ref:	C17	
Depth (m):	25.56 - 25.86	





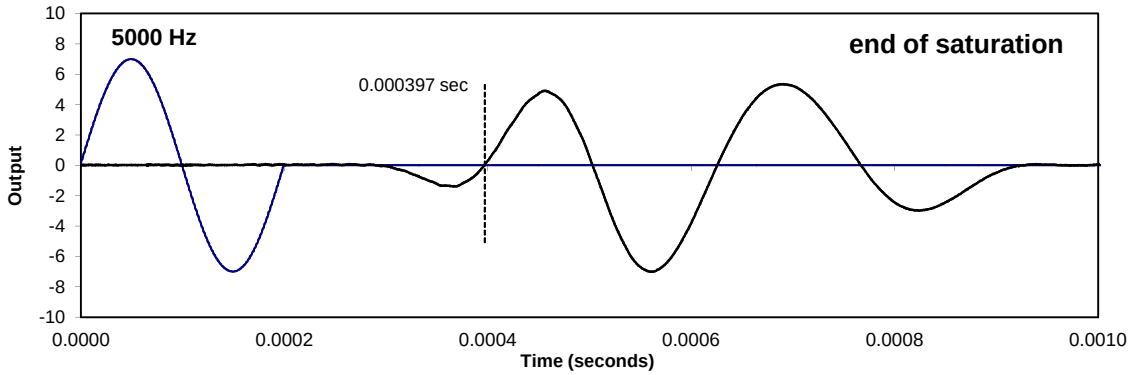


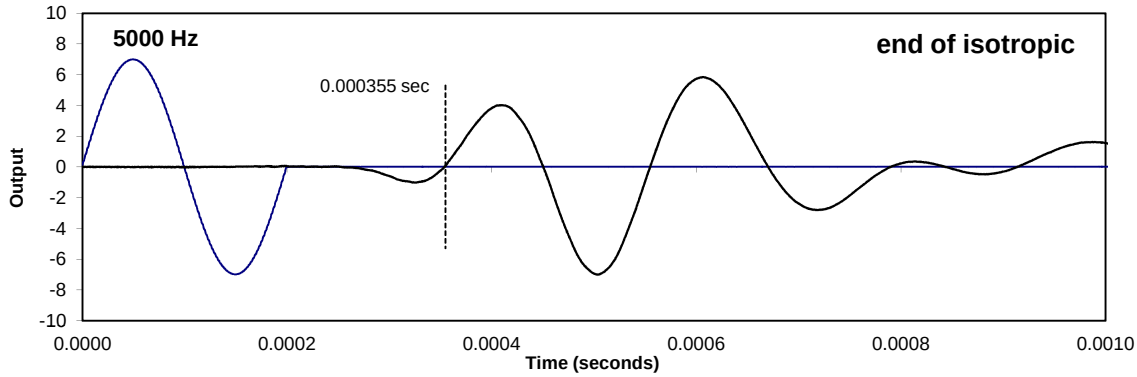


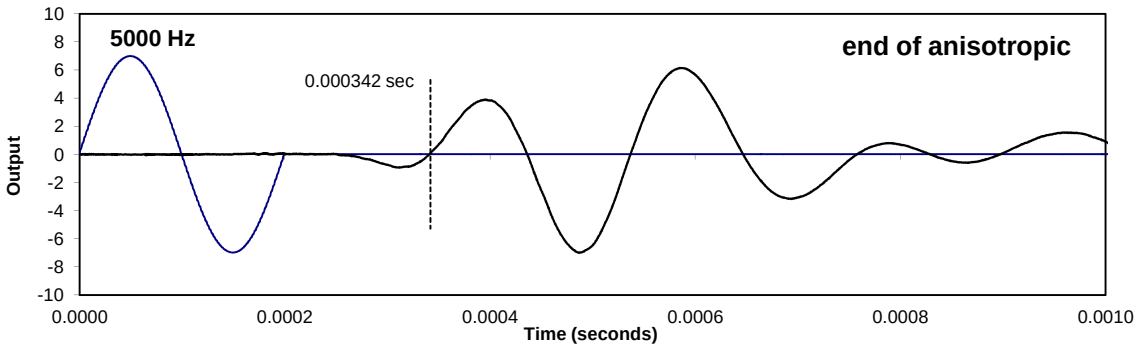
Checked and Approved Initials: *CFW* 16/03/2015	Project Number: **22150** Project Name: **ST GILES CIRCUS** **Project Number 14/2669**	***GEOLABS*®**

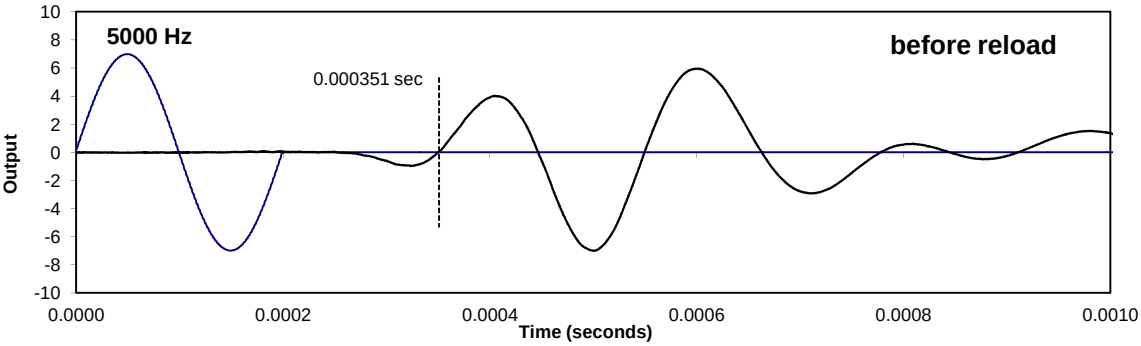
Determination of Gmax Using Bender Elements
Stage Traces

Borehole No:	PB01	**Shh**
Sample Ref:	C17	
Depth (m):	25.56 - 25.86	









Checked and Approved Initials: CFW 16/03/2015	Project Number: **22150** Project Name: **ST GILES CIRCUS** **Project Number 14/2669**	***GEOLABS*®**

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Description:
Sample Ref: C26	Very stiff fissured brown mottled blueish grey CLAY.
Depth (m): 35.80 - 36.10	

Initial Specimen Conditions	**Initial**		**Final**
Location within sample	50mm from top		
Orientation	Vertical		
Condition	Undisturbed		
Diameter	98.1 mm		
Height	197.4 mm		
Moisture content	21.4 %		20.9 %
Bulk density	2.12 Mg/m³		2.14 Mg/m³
Dry density	1.75 Mg/m³		1.77 Mg/m³

At End of Saturation	**base**	**mid-plane**
Cell pressure	1432 kPa	
Pore pressure	1155 kPa	1155 kPa
B value	0.98	0.99
Method used	Constant moisture content	

At End of Isotropic Consolidation	**base**	**mid-plane**
Cell pressure	1432 kPa	
Back pressure	842 kPa	
Pore pressure	842 kPa	842 kPa

At End of Anisotropic Stage		
Cell pressure	1552 kPa	
Back pressure	843 kPa	
Deviator stress	-122 kPa	
Base pore pressure	842 kPa	842 kPa
Ko	1.21	1.21

Shearing Stage (compression)	**base**	**mid-plane**
Initial conditions:		
Cell pressure	1552 kPa	
Pore pressure	842 kPa	842 kPa
Mean effective stress, p_0', $(\sigma_1'+2\sigma_3')/3$	669 kPa	669 kPa
Set rate of external axial strain	0.20 %/hr	

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Checked and Approved	Project Number:	
Initials	GEO / 22150	***GEOLABS®***
CFW	Project Name:	
16/03/2015	ST GILES CIRCUS Project Number 14/2669	

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No:	PB01	Description:
Sample Ref:	C26	Very stiff fissured brown mottled blueish grey CLAY.
Depth (m):	35.80 - 36.10	

Stiffnesses From Shear Stage

	External	Local
Secant Modulus, Eu, at **0.01%** axial strain	256.7 MPa	376.5 MPa
- normalized with respect to mean effective stress, p'o	384	563
Secant Modulus, Eu, at **0.1%** axial strain	170.2 MPa	181.6 MPa
- normalized with respect to mean effective stress, p'o	255	272
Degree of Non-Linearity, L	0.67	0.48

Local Axial Creep Rates

Immediately prior to shearing	-0.0003 %/hr
Immediately prior to unloading	0.0094 %/hr
Immediately prior to reloading	-0.0030 %/hr

Conditions at failure (with filter drain strength correction)

	base	mid-plane	
Failure criteria	Maximum deviator stress		**SEE NOTE**
External axial strain	3.45 %		
Local axial strain	outside range		
Deviator stress	584.6 kPa		
Filter drain strength correction to deviator stress	3.7 kPa		
Undrained shear strength	292.3 kPa		
Pore pressure	1094.7 kPa	1026.6 kPa	
Axial effective stress, σ_v'	1041.9 kPa	1110.0 kPa	
Radial effective stress, σ_h'	457.3 kPa	525.4 kPa	
s' $[(\sigma_1'+\sigma_3')/2]$	749.6 kPa	817.7 kPa	
t $[(\sigma_1-\sigma_3)/2]$	292.3 kPa		
Pore pressure parameter A, $(u - u_o)/(\sigma_V - \sigma_{Vo})$	0.36	0.26	
Principal stress ratio	2.28	2.11	

Note:
Shearing stage stopped due to deformation of specimen forcing piezo bender elements against triaxial cell. Deviator stress had not peaked at this point, but was only rising very slowly.

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shear Wave Velocities
Sample Ref: C26	
Depth (m): 35.80 - 36.10	

Gmax Determination
Using First Arrival Shear Wave Velocities from Bender Elements

Note: The travel time determinations can be subjective, so the associated Gmax and Wave Velocity values should be taken as guide only

Svh Determination At End Of Stage:	Bulk Density (Mg/m³)	Travel time (s)	Travel Length (m)	Gmax (MPa)	Shear Wave Velocity **Svh** (m/s)
Saturation	2.121	0.000633	0.1939	199.0	306.3
Isotropic Consolidation	2.136	0.000561	0.1929	252.4	343.8
Anisotropic Consolidation	2.138	0.000562	0.1929	251.8	343.2
End of Unload (before reloac	2.138	0.000569	0.1927	245.2	338.6

Shh Determination At End Of Stage:	Bulk Density (Mg/m³)	Travel time (s)	Travel Length (m)	Gmax (MPa)	Velocity **Shh** (m/s)
Saturation	2.121	0.000319	0.0953	189.3	298.7
Isotropic Consolidation	2.136	0.000288	0.0949	232.0	329.6
Anisotropic Consolidation	2.138	0.000280	0.0948	245.1	338.6
End of Unload (before reloac	2.138	0.000285	0.0953	239.0	334.4

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

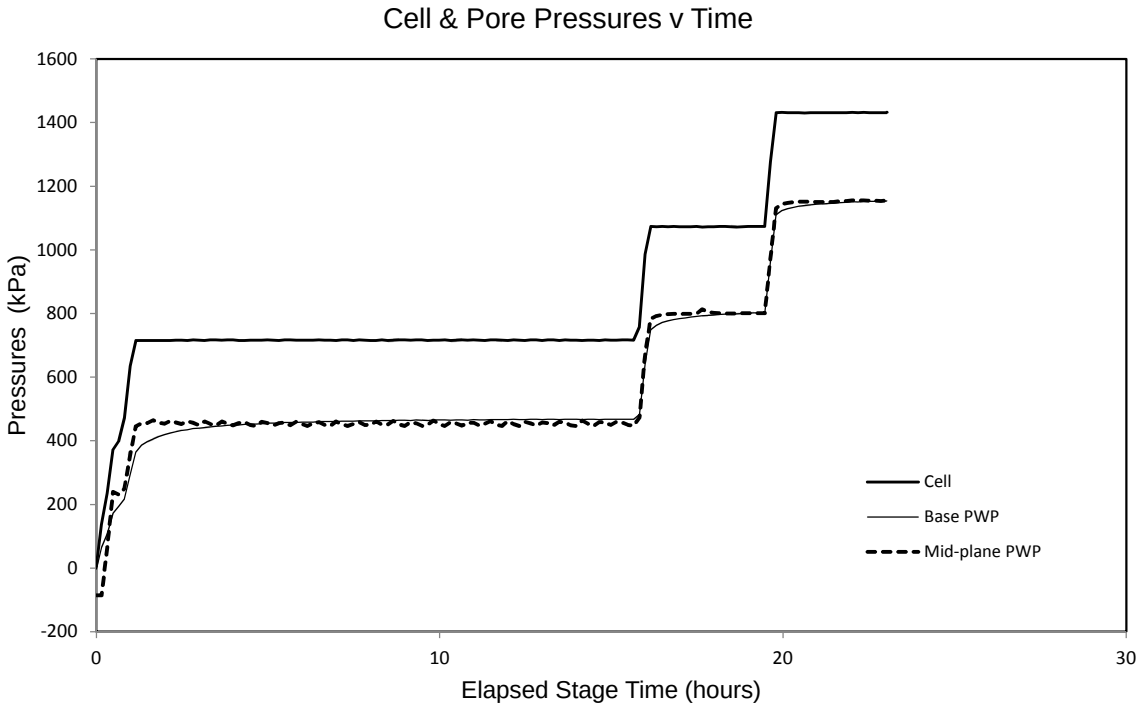
Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	End of test photograph

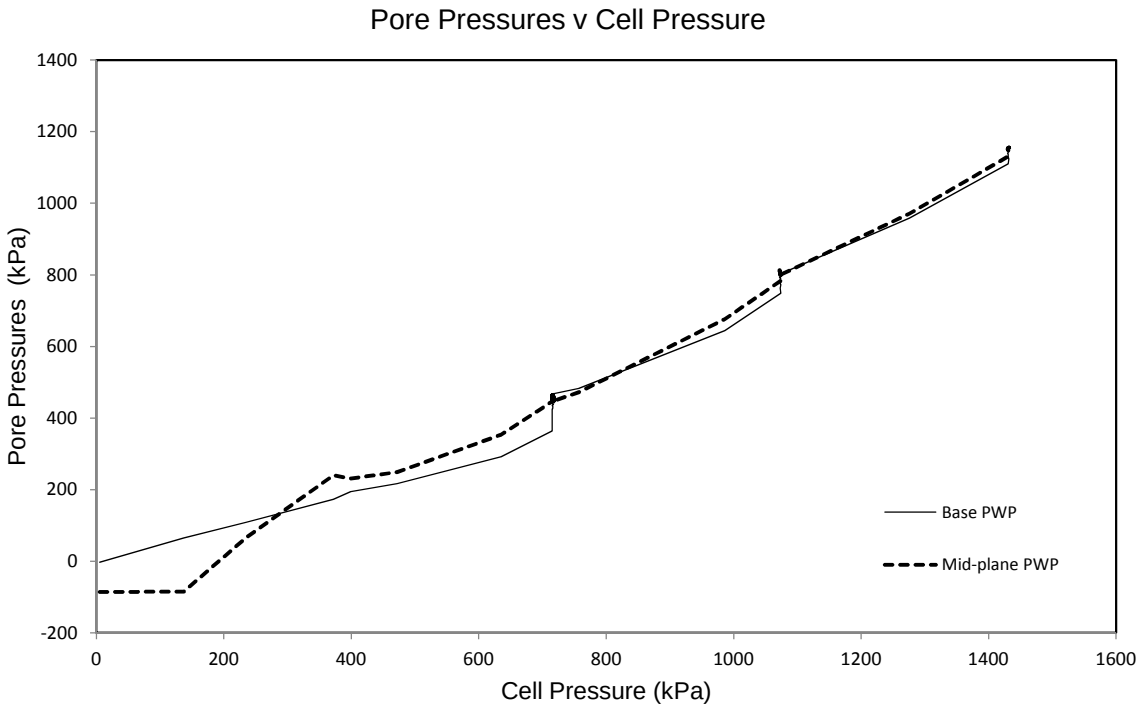
Checked and Approved Initials CW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Saturation Stage
Sample Ref: C26	
Depth (m): 35.80 - 36.10	





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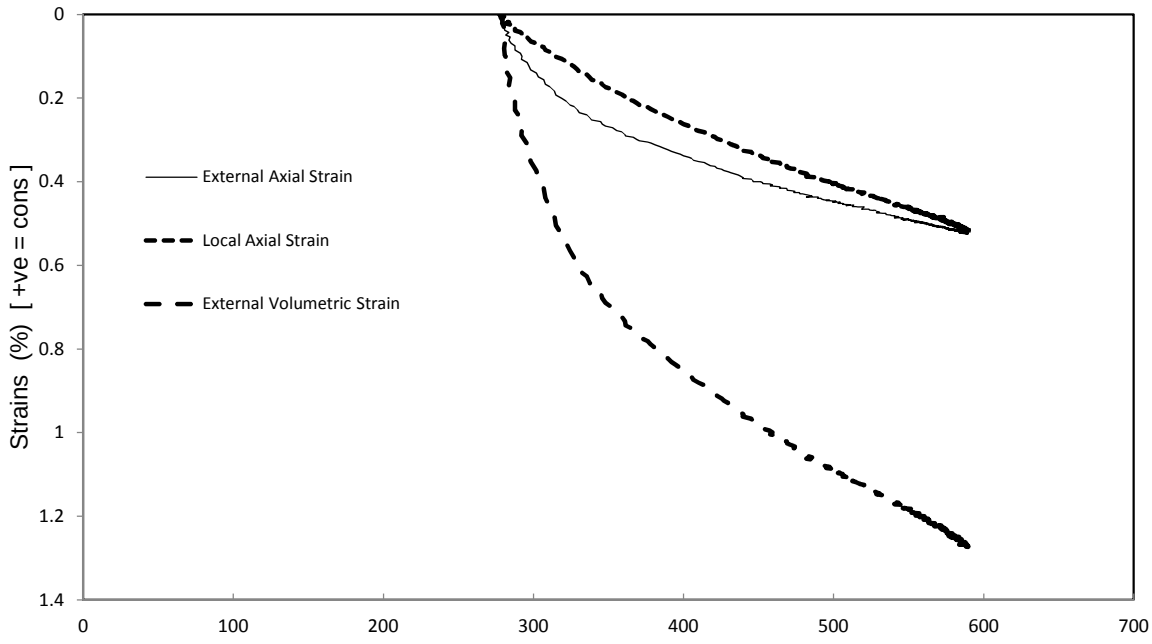
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

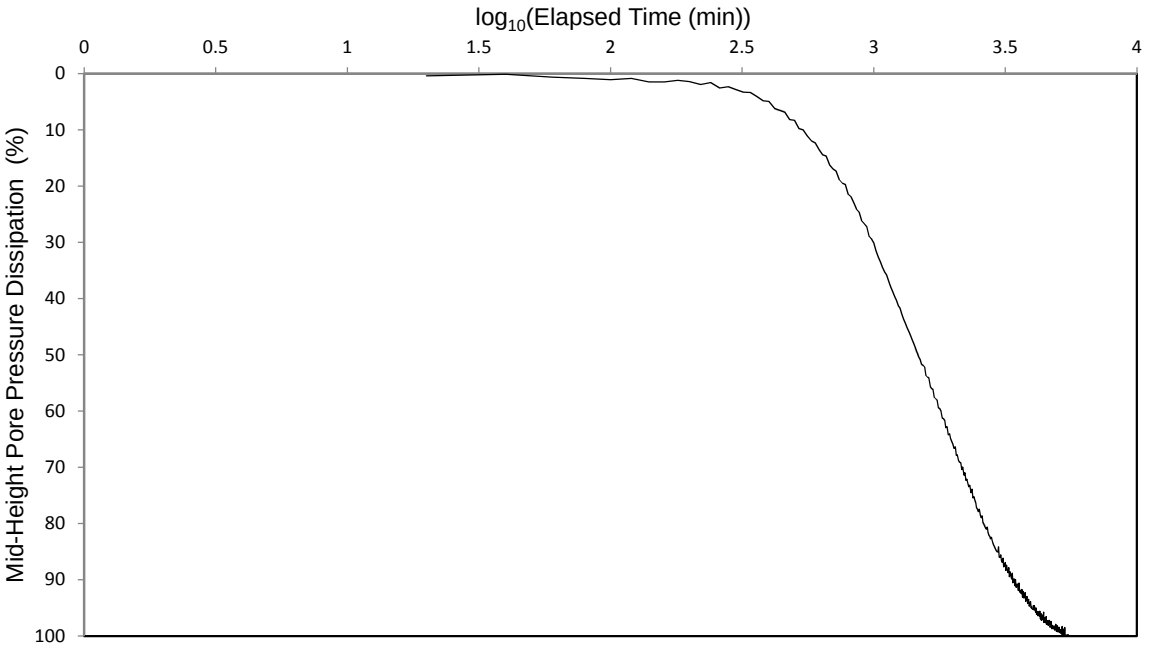
Custom Procedure Agreed By Client

Borehole No:	PB01	Isotropic Consolidation Stage
Sample Ref:	C26	
Depth (m):	35.80 - 36.10	

Axial and Volumetric Strains v Mean Effective Stress



Pore Pressure Dissipation v log Elapsed Time



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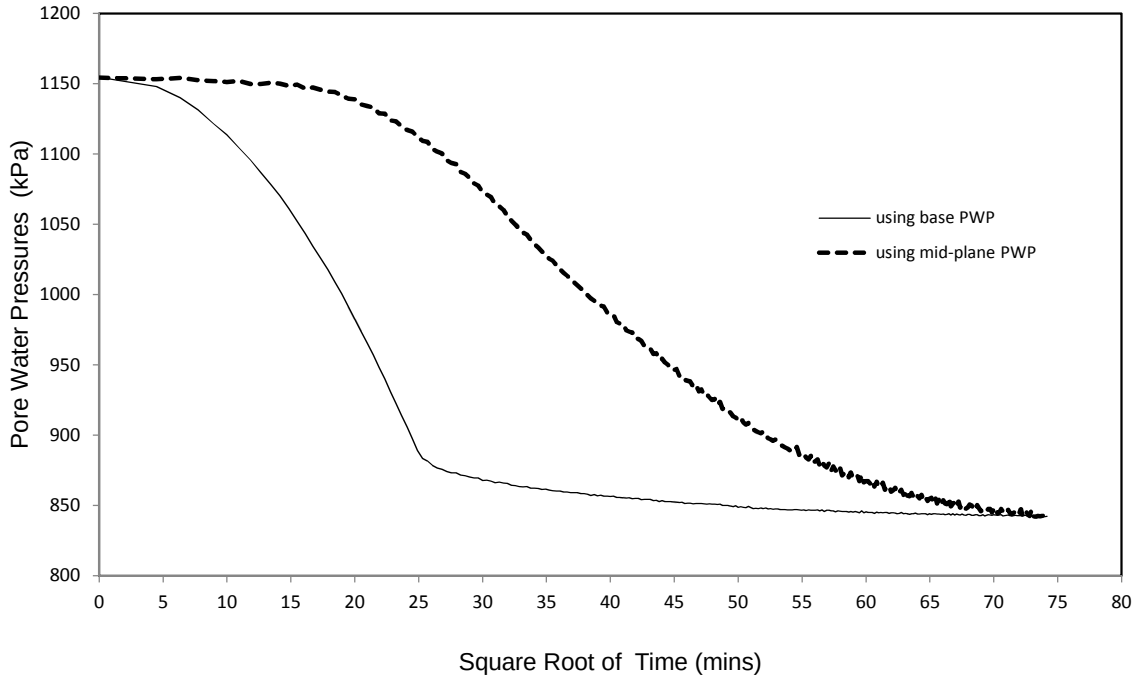
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

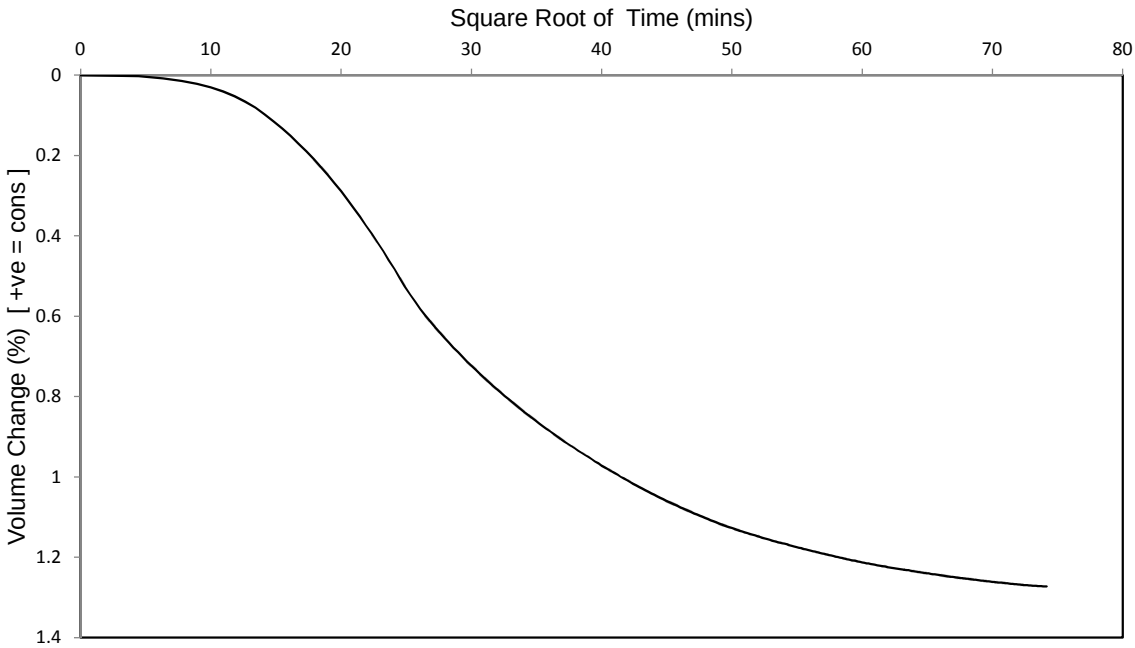
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Isotropic Consolidation Stage

Pore Water Pressures v Square Root of Time



Volume Change v Square Root of Time



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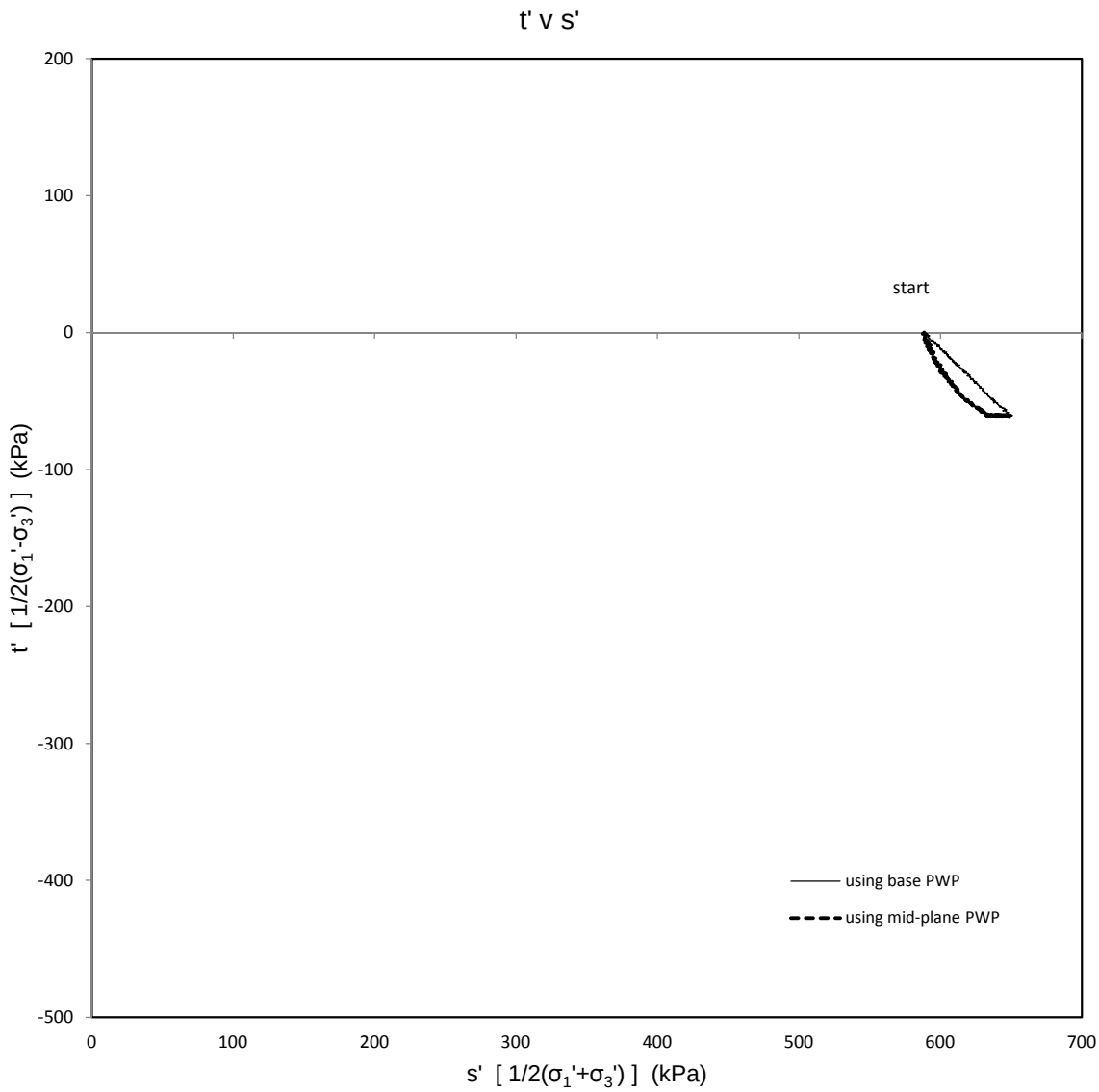
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Anisotropic Stage
Sample Ref: C26	
Depth (m): 35.80 - 36.10	



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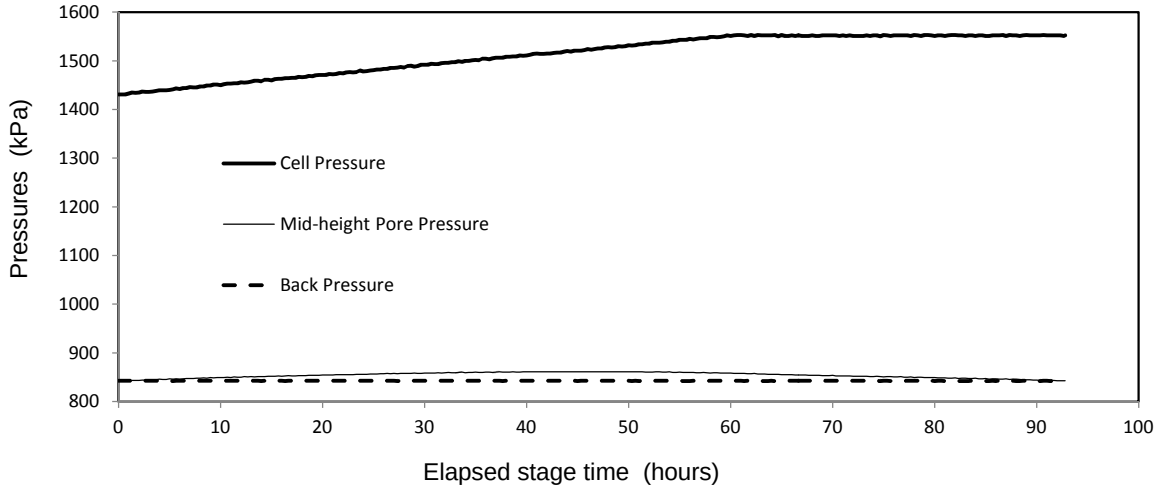
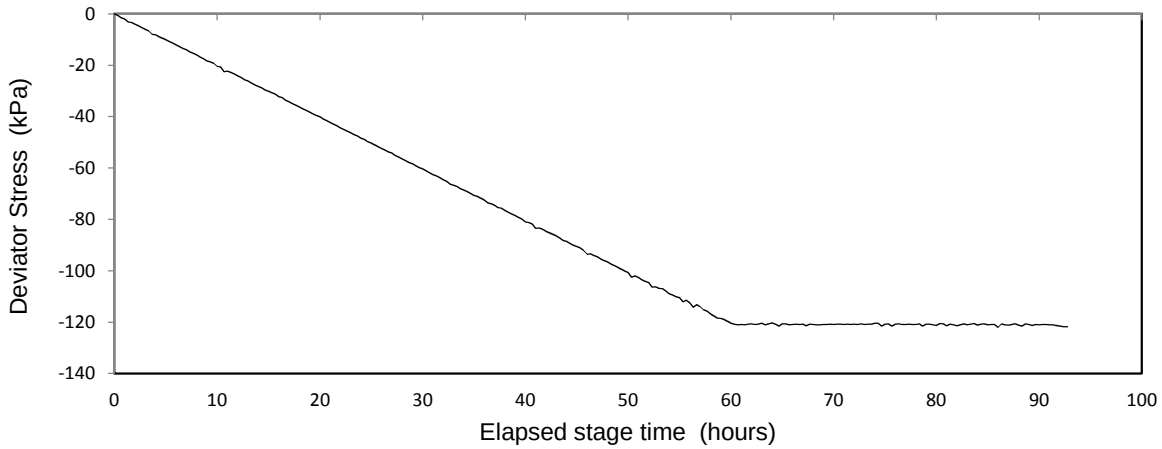
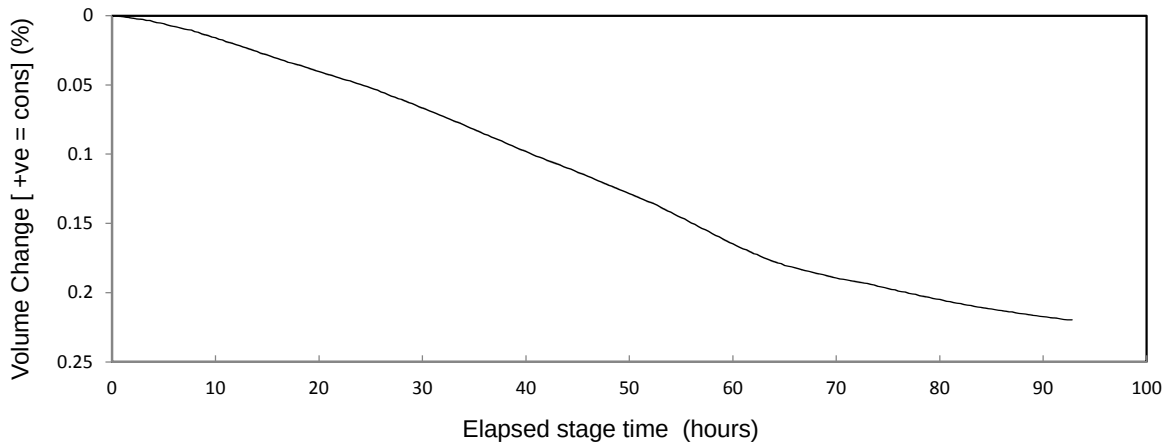
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Anisotropic Stage
Sample Ref: C26	
Depth (m): 35.80 - 36.10	







Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

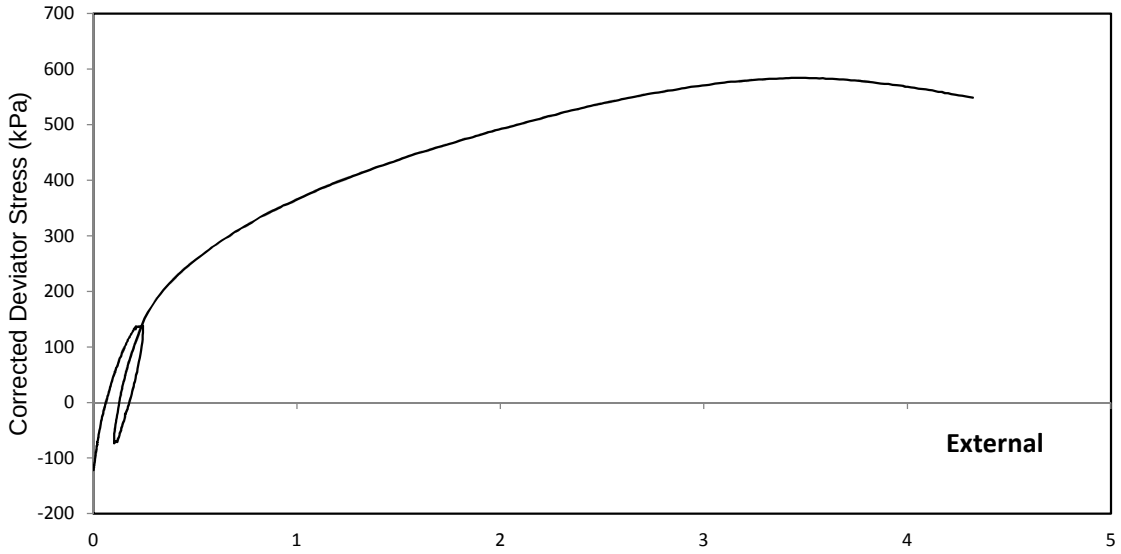
Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Shearing Stage
Sample Ref: C26	
Depth (m): 35.80 - 36.10	

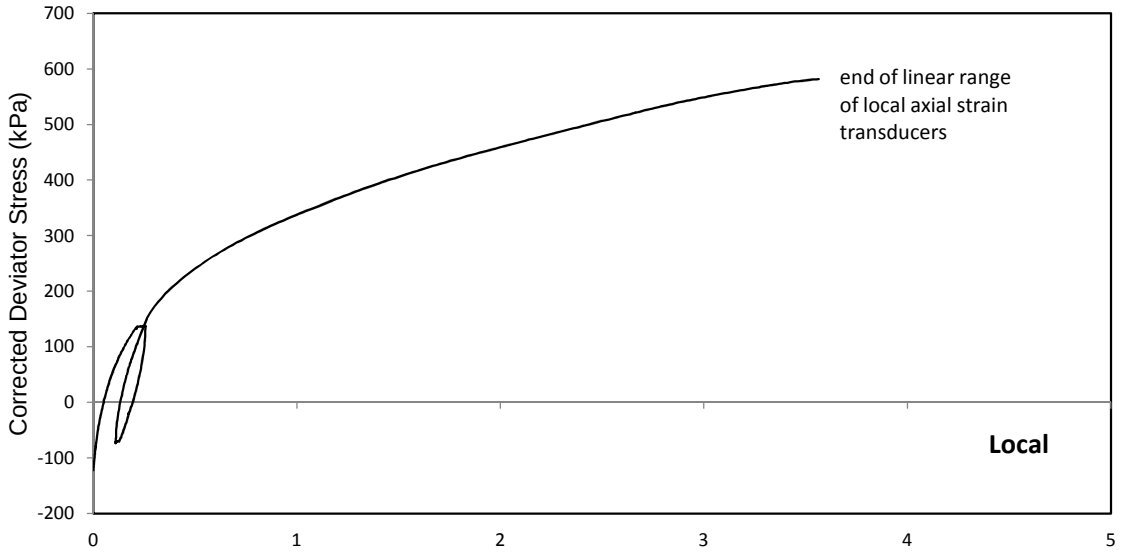
Corrected Deviator Stress v External Axial Strain

(with area change and filter drain corrections



Corrected Deviator Stress v Local Axial Strain

(with area change and filter drain corrections



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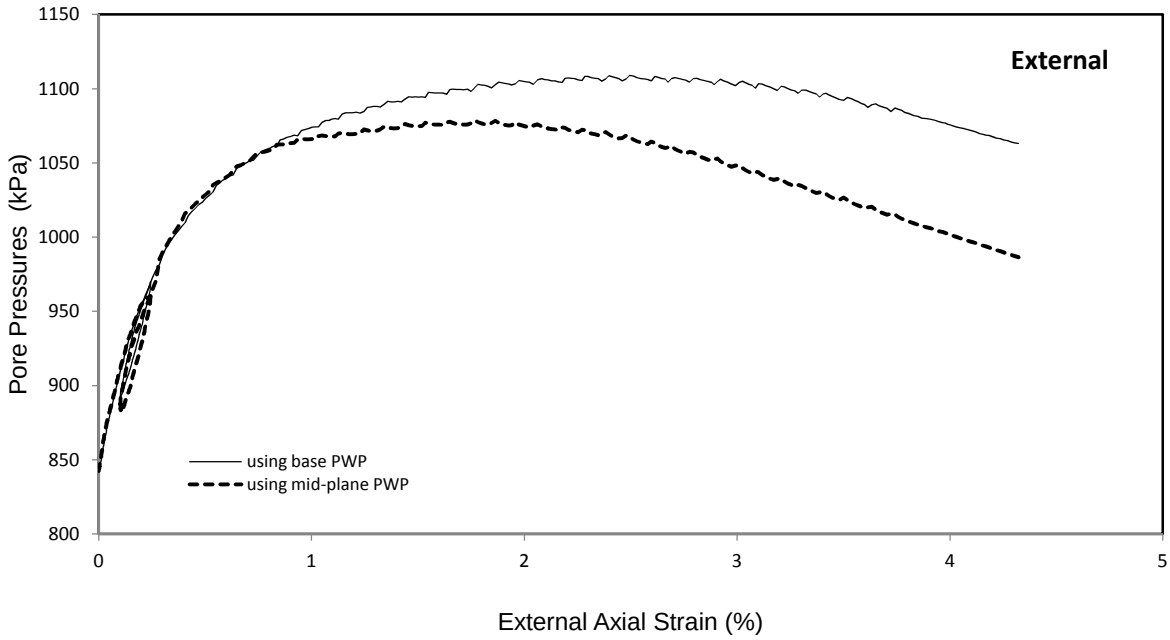
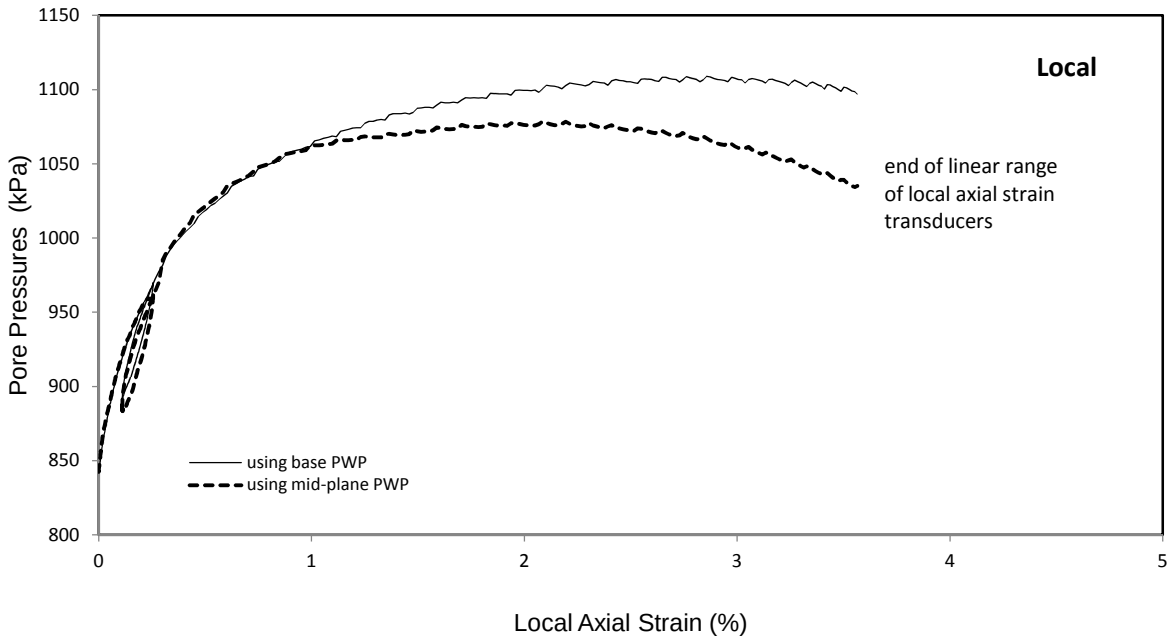
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Shearing Stage

Pore Pressures v External Axial Strain



Pore Pressures v Local Axial Strain



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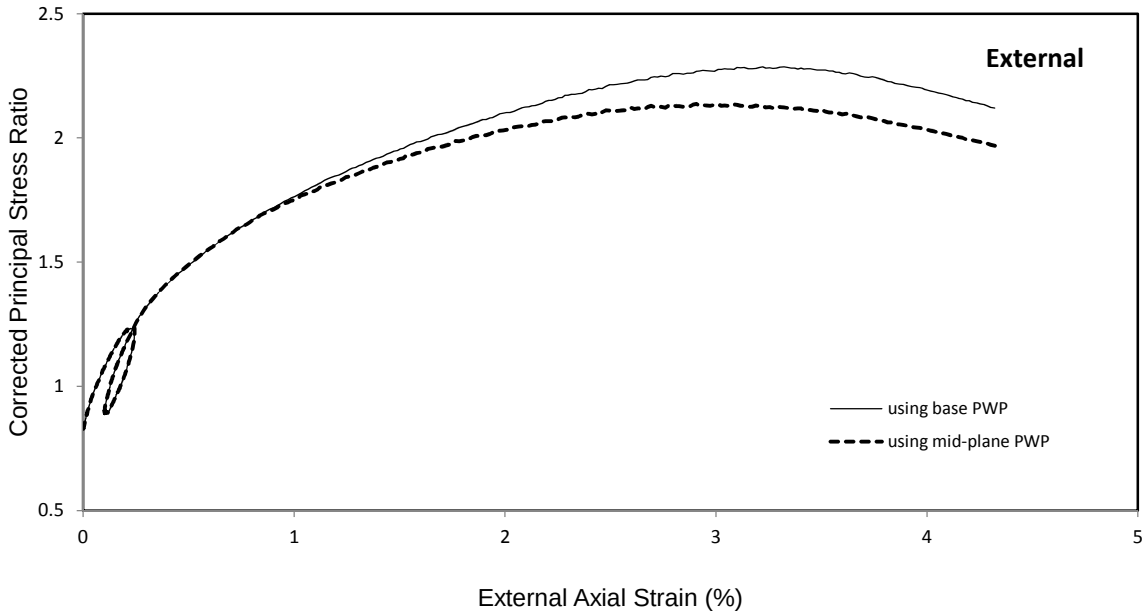
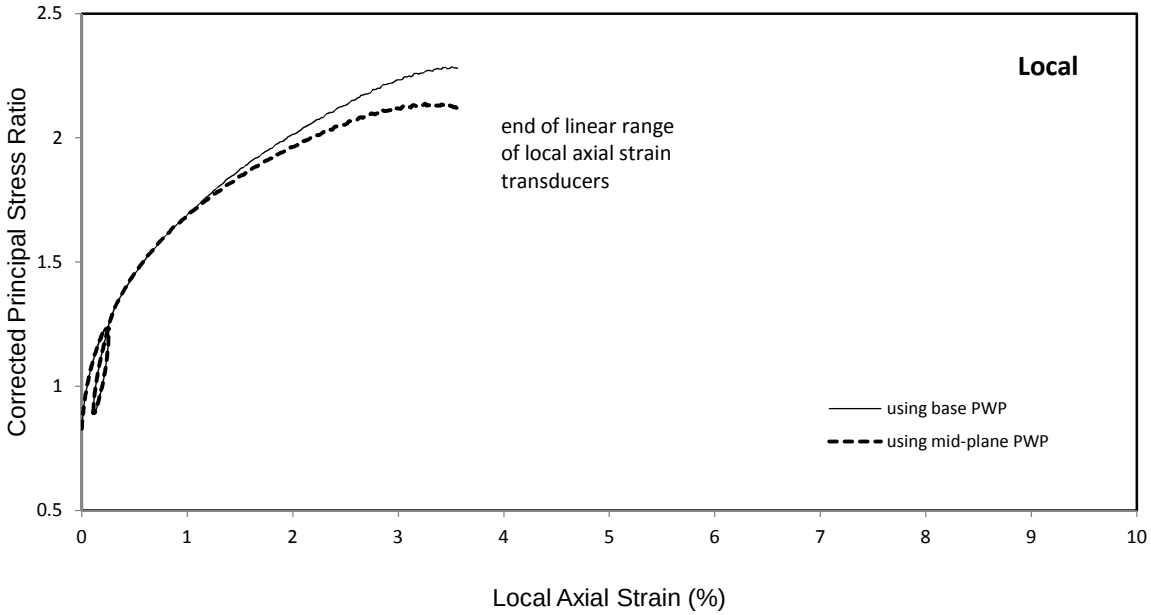
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Shearing Stage

Corrected Principal Stress Ratio v External Axial Strain
(with area change and filter drain corrections)



Corrected Principal Stress Ratio v Local Axial Strain
(with area change and filter drain corrections)



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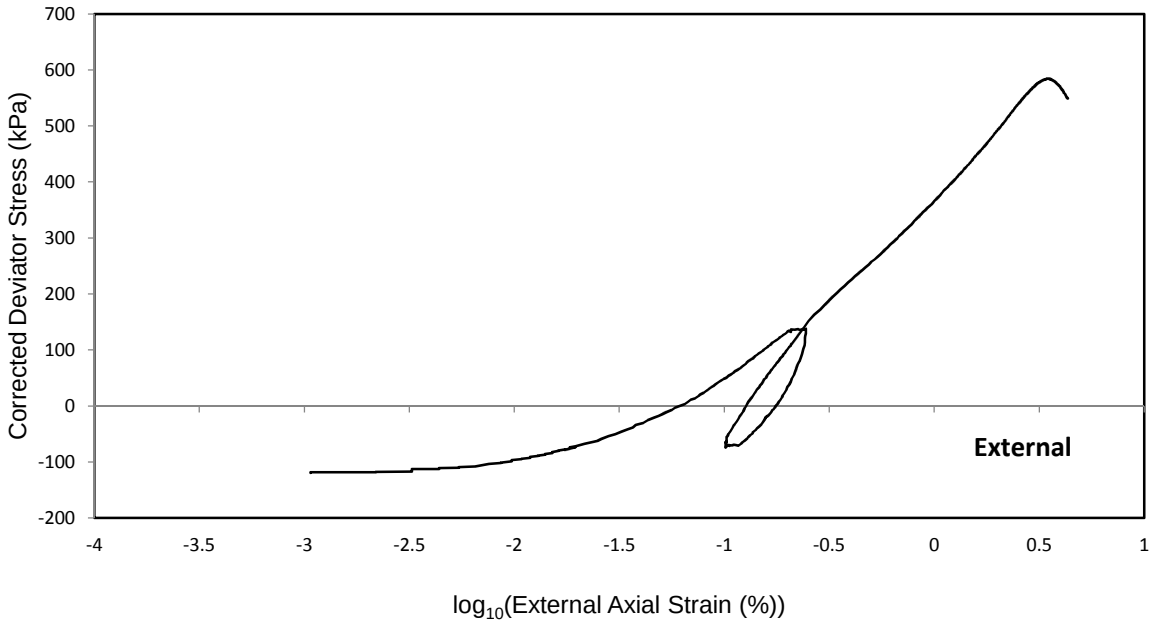
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Shearing Stage

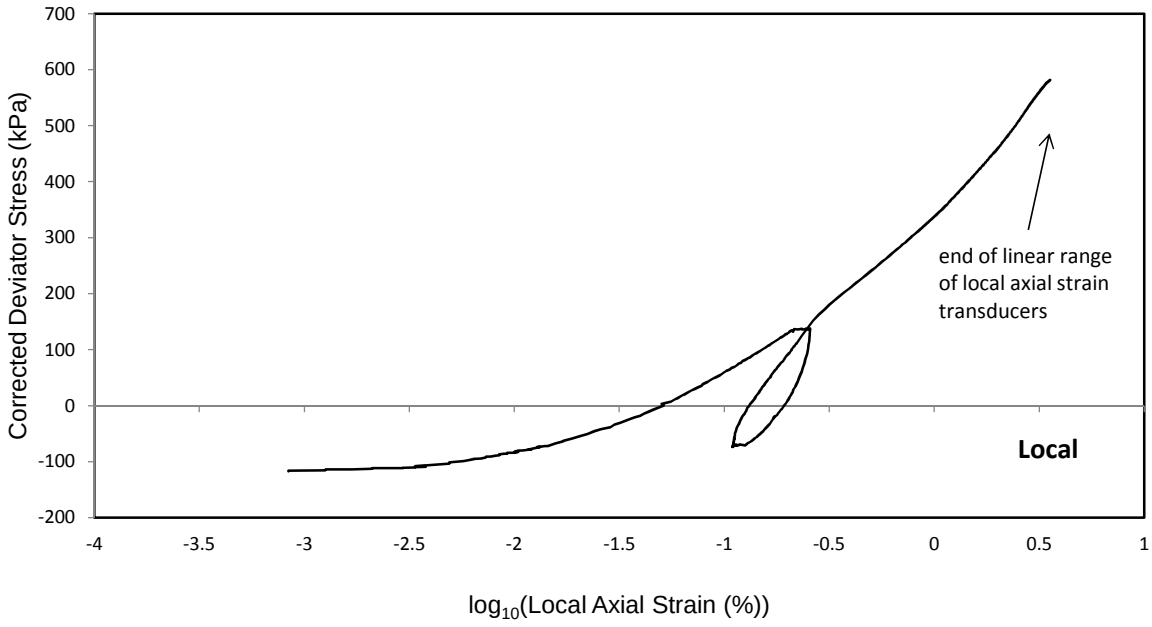
Corrected Deviator Stress v log(External Axial Strain)

(with area change and filter drain corrections)



Corrected Deviator Stress v log(Local Axial Strain)

(with area change and filter drain corrections)



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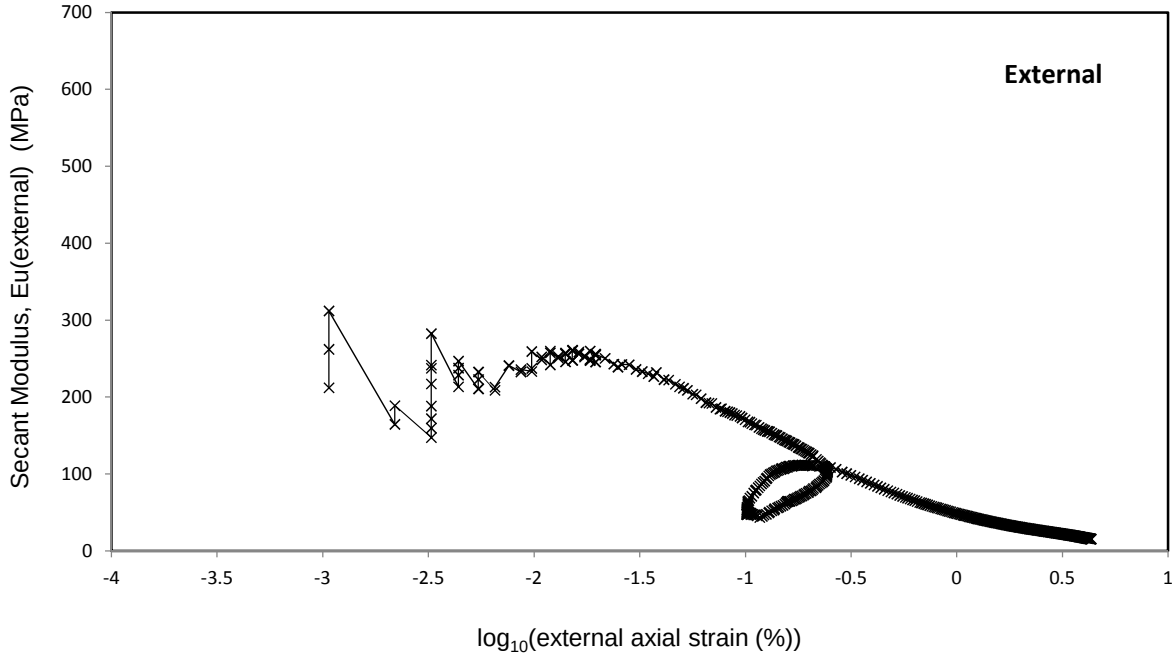
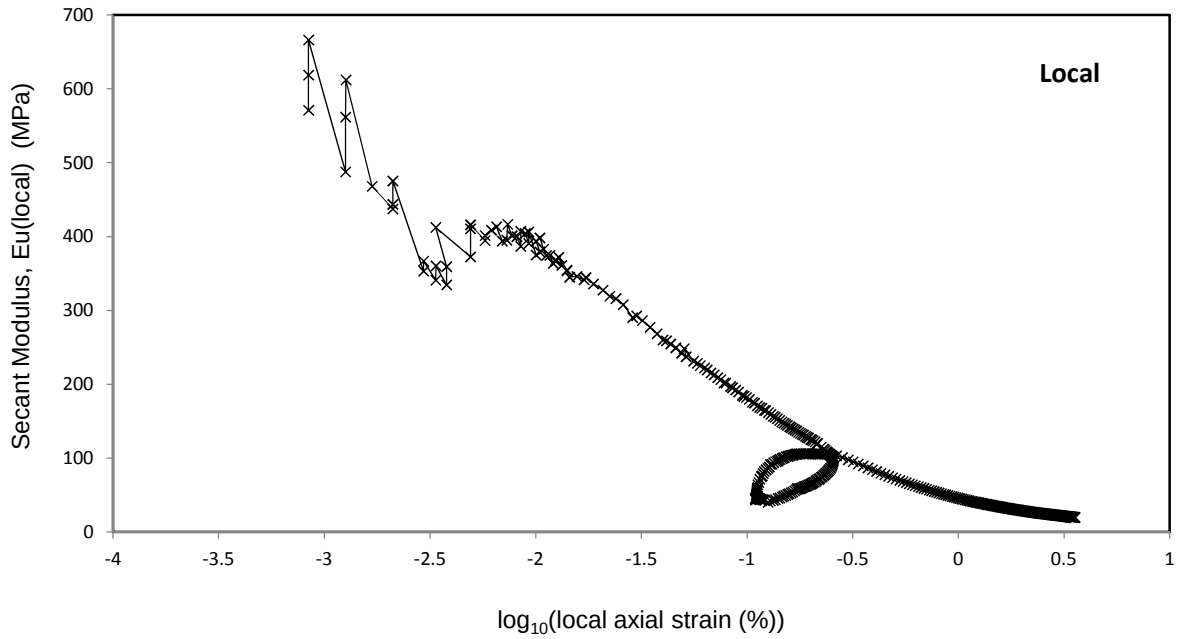
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Shearing Stage

Corrected Eu_{ext} v log(ext strain)
(with area change and filter darin corrections)



Corrected Eu_{local} v log(local strain)
(with area change and filter drain corrections)



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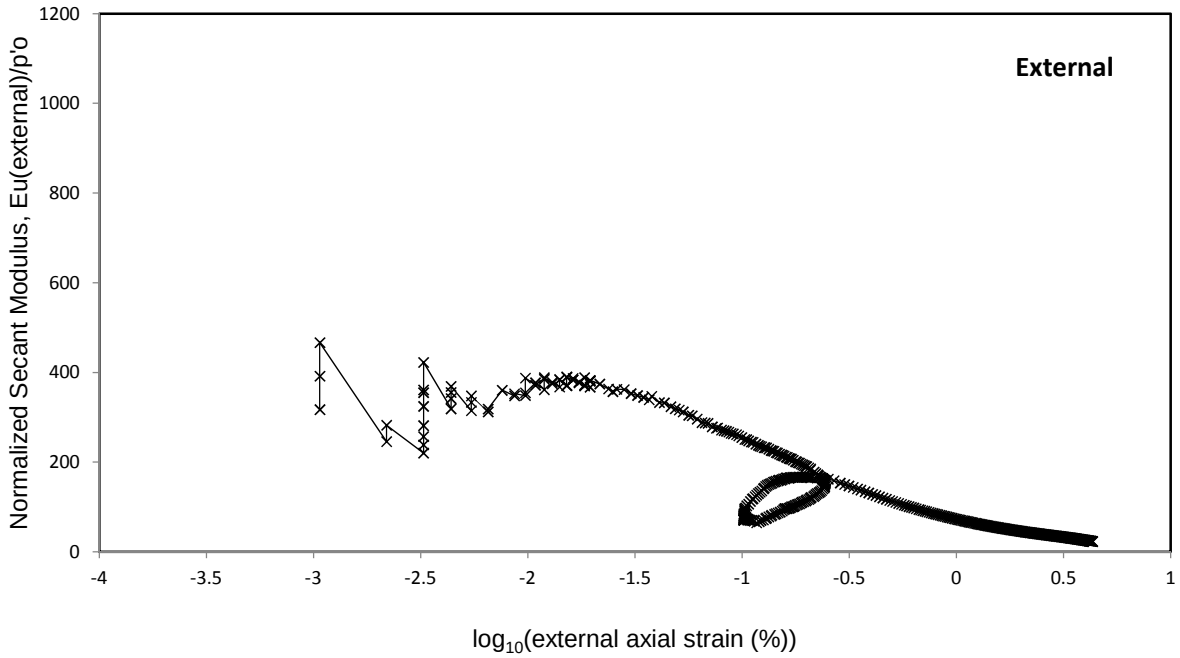
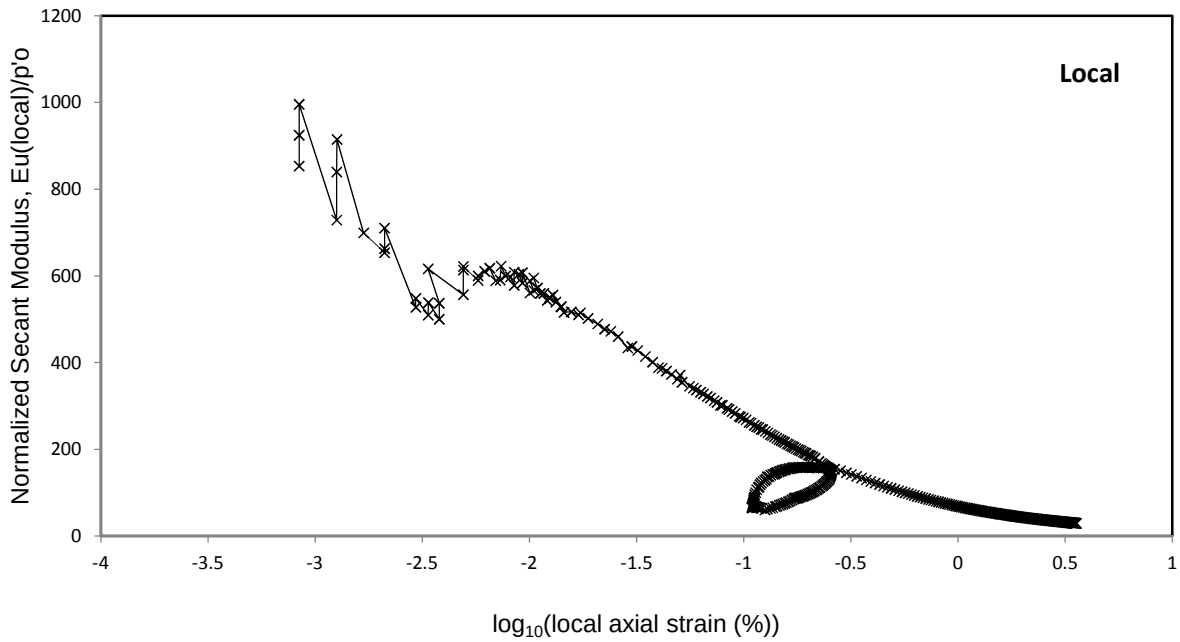
Custom Procedure Agreed By Client

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Shearing Stage

Corrected Eu_{ext} /p'o v log(ext strain)
(with area change and filter drain corrections)



Corrected Eu_{local}/p'o v log(local strain)
(with area change and filter drain corrections)



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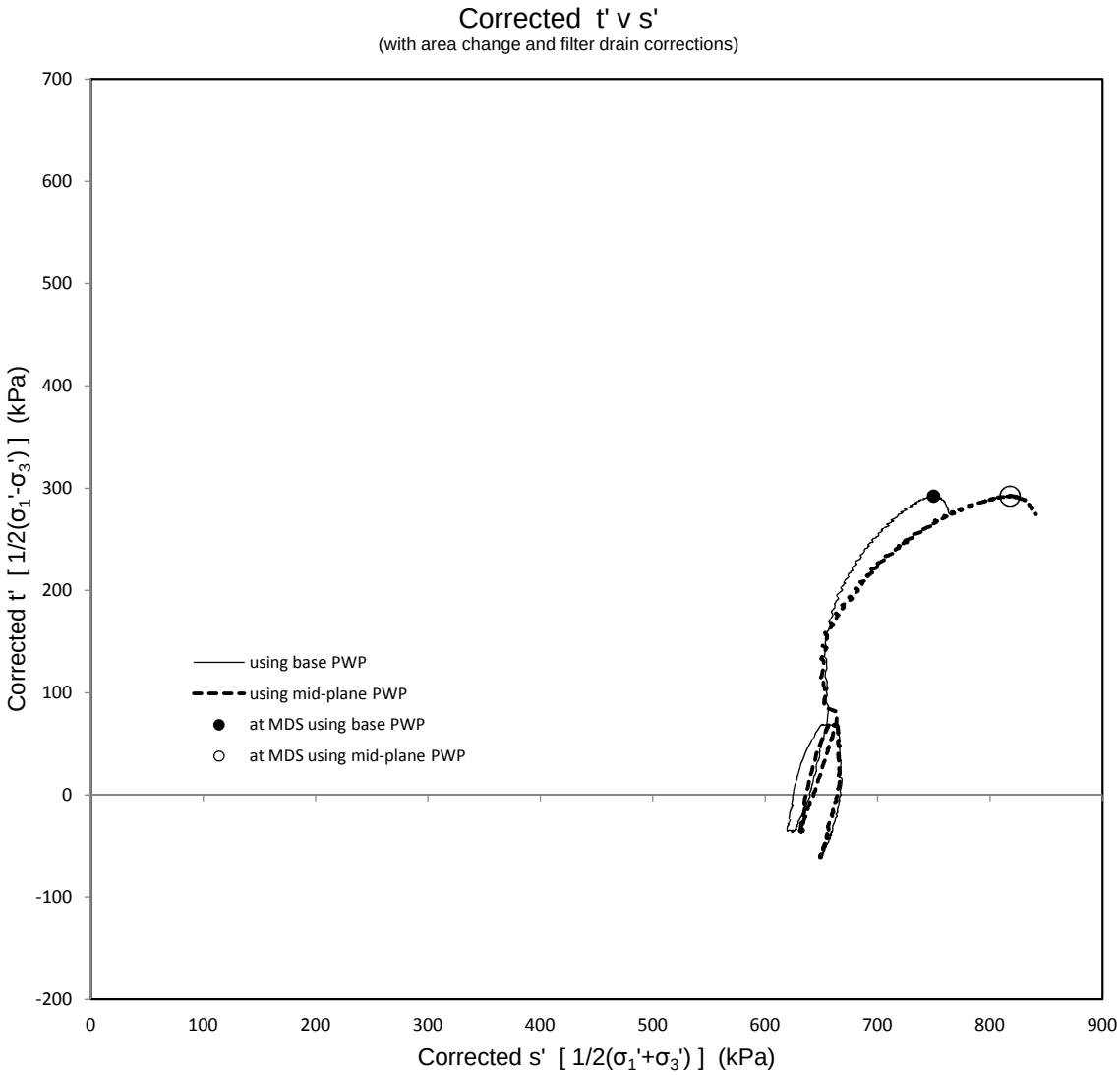
Custom Procedure Agreed By Client

Borehole No: PB01	Shearing Stage
Sample Ref: C26	
Depth (m): 35.80 - 36.10	



Checked and Approved Initials CFW 16/03/2015	Project Number: GEO / 22150 Project Name: ST GILES CIRCUS Project Number 14/2669	GEOLABS®

Borehole No: PB01 Sample Ref: C26 Depth (m): 35.80 - 36.10	Shearing Stage - Calculations Notes

Cross-Sectional Area Calculations

a) The cross-sectional area is calculated assuming a right-cylinder deformation of the specimen.

Membrane Corrections

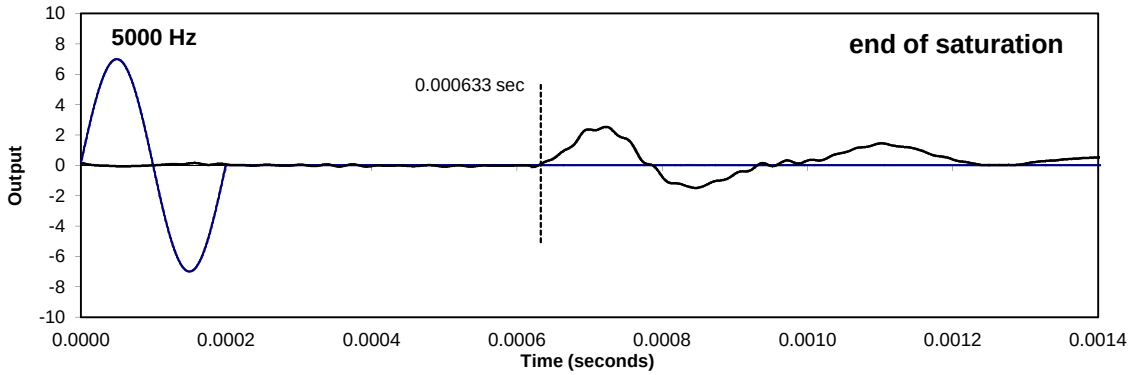
b) Corrections for membrane restraint are according to BS1377:Part 8:1990

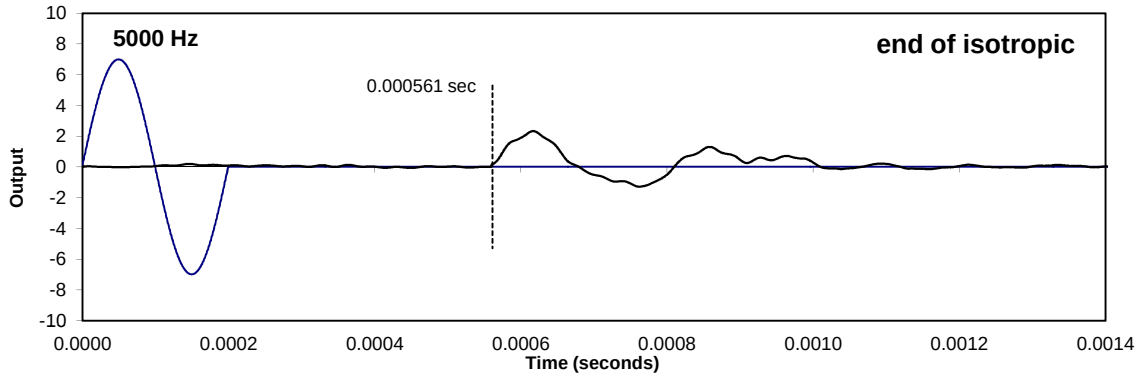
Filter Paper Corrections

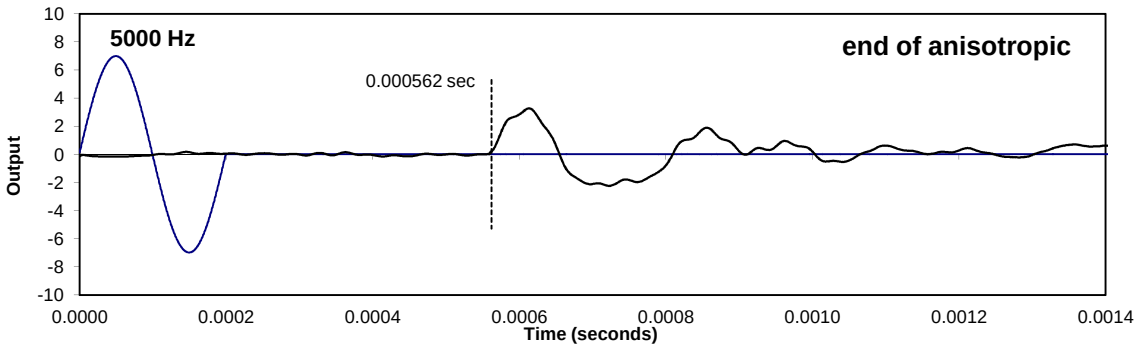
c) Corrections for strength due to peripheral filter papers are according to BS1377:Part 8:1990
but with the correction from 0 to 2% strain proportionally increasing from 0 kPa to the value calculated at 2% strain.

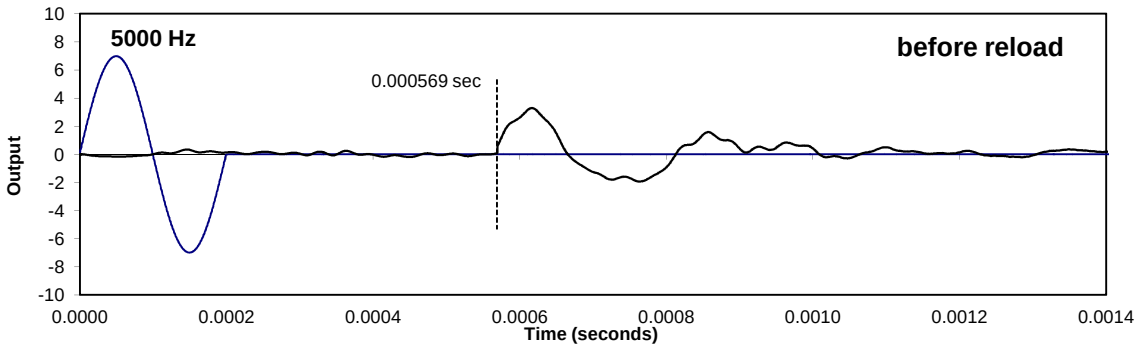
Determination of Gmax Using Bender Elements
Stage Traces

Borehole No:	PB01	**Svh**
Sample Ref:	C26	
Depth (m):	35.80 - 36.10	





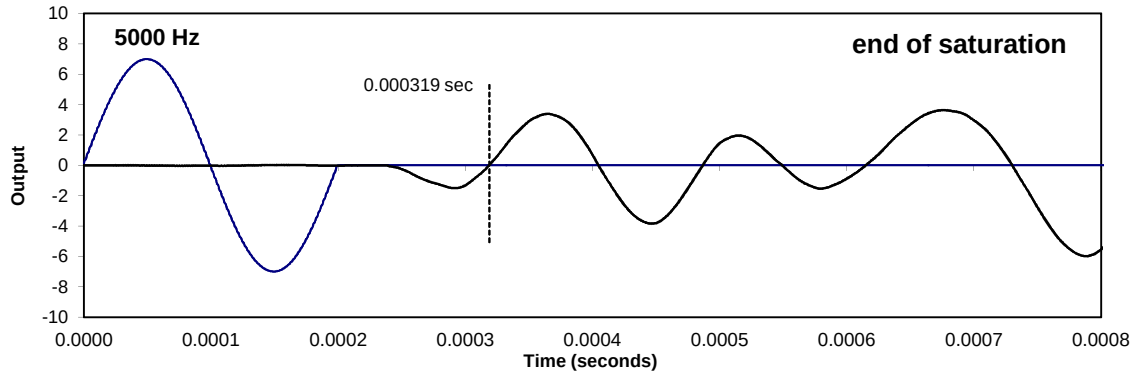


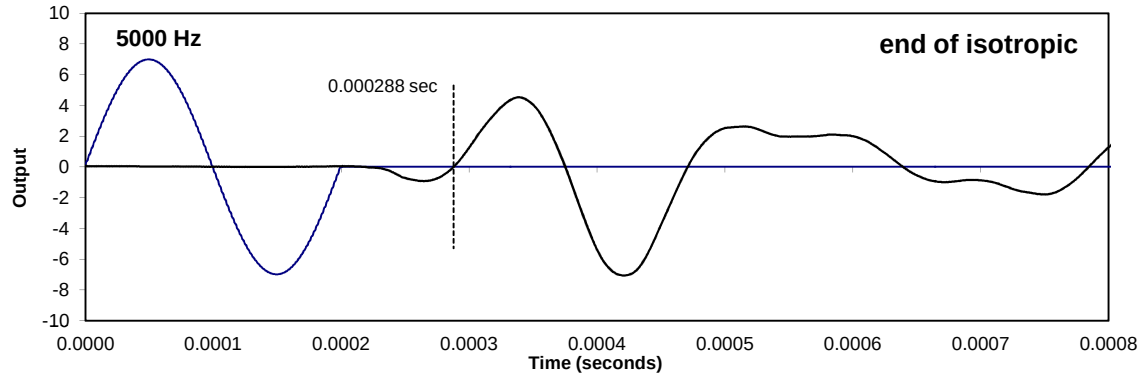


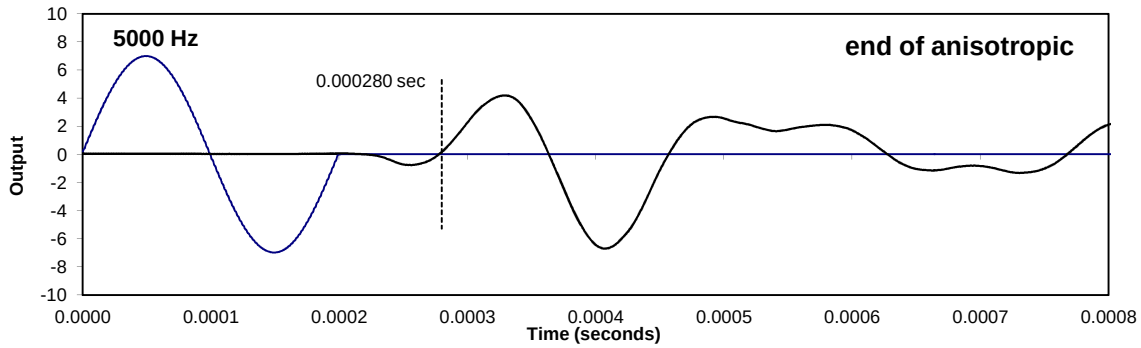
Checked and Approved Initials: CFW 16/03/2015	Project Number: **22150** Project Name: **ST GILES CIRCUS** **Project Number 14/2669**	***GEOLABS*®**

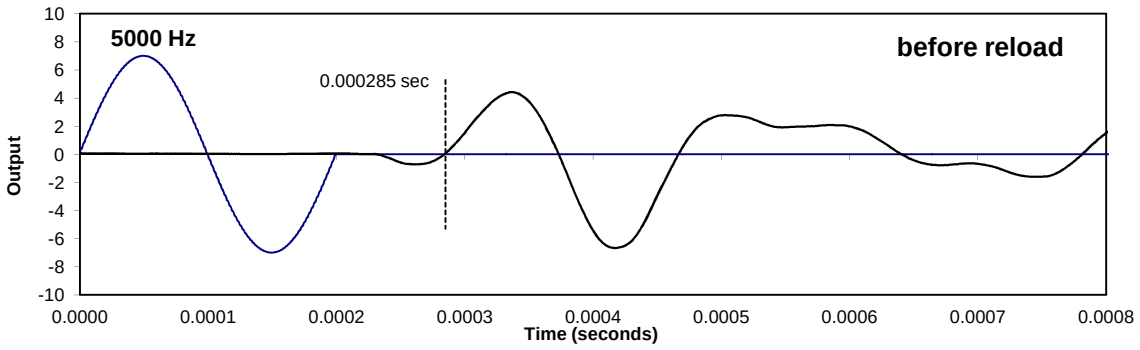
Determination of Gmax Using Bender Elements
Stage Traces

Borehole No:	PB01	**Shh**
Sample Ref:	C26	
Depth (m):	35.80 - 36.10	









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Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No: PB01	Description:
Sample Ref: C31	Stiff brown mottled blueish grey CLAY.
Depth (m): 42.25 - 42.55	

Initial Specimen Conditions	**Initial**		**Final**
Location within sample	50mm from top		
Orientation	Vertical		
Condition	Undisturbed		
Diameter	99.5 mm		
Height	200.9 mm		
Moisture content	15.0 %		14.6 %
Bulk density	2.20 Mg/m³		2.21 Mg/m³
Dry density	1.91 Mg/m³		1.93 Mg/m³

At End of Saturation	**base**	**mid-plane**
Cell pressure	1399 kPa	
Pore pressure	1045 kPa	1051 kPa
B value	0.97	0.98
Method used	Constant moisture content	

At End of Isotropic Consolidation	**base**	**mid-plane**
Cell pressure	1400 kPa	
Back pressure	710 kPa	
Pore pressure	706 kPa	710 kPa

At End of Anisotropic Stage		
Cell pressure	1540 kPa	
Back pressure	711 kPa	
Deviator stress	-141 kPa	
Base pore pressure	704 kPa	707 kPa
Ko	1.20	1.20

Shearing Stage (compression)	**base**	**mid-plane**
Initial conditions:		
Cell pressure	1540 kPa	
Pore pressure	704 kPa	707 kPa
Mean effective stress, p_0', $(\sigma_1'+2\sigma_3')/3$	789 kPa	785 kPa
Set rate of external axial strain	0.20 %/hr	

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

Checked and Approved	Project Number:	
Initials: CFW	GEO / 22150	GEOLABS®
16/03/2015	Project Name: ST GILES CIRCUS Project Number 14/2669	

Consolidated Anisotropically Undrained Triaxial Compression Test with Measurement of Base and Mid-plane Pore Water Pressure, Local Strain and Shearwave Velocities

Custom Procedure Agreed By Client

Borehole No:	PB01	Description:
Sample Ref:	C31	Stiff brown mottled blueish grey CLAY.
Depth (m):	42.25 - 42.55	

Stiffnesses From Shear Stage

	External	Local
Secant Modulus, Eu, at **0.01%** axial strain	409.6 MPa	1048.1 MPa
- normalized with respect to mean effective stress, p'o	522	1334
Secant Modulus, Eu, at **0.1%** axial strain	262.5 MPa	320.5 MPa
- normalized with respect to mean effective stress, p'o	340	412
Degree of Non-Linearity, L	0.65	0.31

Local Axial Creep Rates

Immediately prior to shearing	-0.0004 %/hr
Immediately prior to unloading	-0.0020 %/hr
Immediately prior to reloading	0.0000 %/hr

Conditions at failure (with filter drain strength correction)

	base	mid-plane
Failure criteria	Maximum deviator stress	
External axial strain	2.01 %	
Local axial strain	outside range	
Deviator stress	1523.5 kPa	
Filter drain strength correction to deviator stress	3.4 kPa	
Undrained shear strength	761.7 kPa	
Pore pressure	907.0 kPa	887.7 kPa
Axial effective stress, σ_v'	2157.5 kPa	2176.8 kPa
Radial effective stress, σ_h'	634.0 kPa	653.3 kPa
s' [$(\sigma_1'+\sigma_3')/2$]	1395.7 kPa	1415.0 kPa
t [$(\sigma_1-\sigma_3)/2$]	761.7 kPa	
Pore pressure parameter A, $(u - u_o)/(\sigma_V - \sigma_{Vo})$	0.12	0.11
Principal stress ratio	3.40	3.33

Notes: All shearing stage calculations include area correction. Values indicated as 'corrected' also include filter drain strength correction. See calculations page at end for full details.

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