Geote	echnical	Laborat	ory Test	ing Master I	List													
													Test					
Project Area	Investigation ID	Depth (m) From	Depth (m) To	Sample Type	Testing Status (as of 15 Feb. 2022)	No. of test	Organic content	Atterberg Limits incl.	PSD (Wet sieve & pipette/hydrometer)	<b>▶</b> Particle density	Uniaxial Compressive Strength (without strain measurement)	1D consolidation	00 U Triaxial - 3 stages, undisturbed	CU Triaxial - 3 stages, undisturbed	Uniaxial Compressive Strength (with strain measurement)	90 Point Load Index (axial)	Corrosivity suite (pH, chloride, sulphate)	Determination of water content
EB3C	DH301	4.50	5.00	Push tube	Results received	1107 07 1001		1				1	1	1				1
EB3C EB3C	DH301 DH301	18.50 18.75	18.75 19.00	Corestick Corestick	Results received Results received						1	-			1	1		
EB3C	DH301	23.10	23.40	Corestick	Results received						1					1		
EB3C EB3C	DH301 DH301	13.15 15.45	13.50 15.80	Jar Jar	Results received Results received												1	
EB3C	DH301_P	13.40	13.50	Bag	Results received		1										'	
EB3C EB3C	DH302	6.50	7.00	Push tube	Results received		1	1	1			1	1					1
EB3C	DH302 DH302	9.00 7.50	9.50 8.15	Push tube Jar	Results received Results received		- 1					-	1				1	
EB3C EB3C	DH302 DH303	12.42	12.69 8.00	Corestick	Results received			1	1		1	1				2		1
EB3C	DH303	7.50 9.50	10.00	Push tube Push tube	Results received Results received		1	1	- '			1						1
EB3C	DH303	2.4	3	Jar	Results received											2	1	
EB3C	DH303 DH304	14.23 5.5	14.42	Corestick Push tube	Results received Results received			1					1			2		1
EB3C	DH304	9.5	10	Push tube	Results received		1					1	1	1			4	
EB3C EB3C	DH304 DH304	5.00 10.95	5.35 11.20	Jar Jar	Results received Results received												1 1	
EB3C	DH304	11.27	11.44	Corestick	Results received											2		
EB3C EB3C	DH304 DH304	23.51	23.82 24.00	Corestick Corestick	Results received Results received					_	1					2		
EB3C	DH305_P	18.13	18.50	Corestick	Results received						1					1		
EB3C EB3C	DH306 DH306	6.00 7.50	6.50 8.00	Push tube Push tube	Results received Results received			1	1	-		1	1					1
EB3C	DH306	18.48	18.70	Corestick	Results received						1	<u> </u>						
EB3C	DH306 DH307	18.80 1.95	18.94 2.40	Corestick Jar	Results received Results received											1	1	
EB3C	DH307	14.45	14.88	Corestick	Results received						1					1	'	
EB3C	DH308	7.00	7.30	Jar	Results received											1	1	
EB3C	DH308_P DH308_P	15.78 1.00	15.98 1.38	Corestick Corestick	Results received Results received						1					1		
EB3C	DH308_P	3.33	3.67	Corestick	Results received			4	4		1	4		4		1		4
EB3C	DH309_P DH309_P	7.50 9.00	8.00 9.50	Push tube Push tube	Results received Results received			1	1	1		1	1	1				1
EB3C	DH311_P	5.50	6.00	Push tube	Results received			1	1									1
EB3C EB3C	DH311_P DH312	9.00 7.00	9.50 7.50	Push tube Bag	Results received Results received		1	1	2									1
EB3C	DH312	1.25	1.50	Corestick	Results received				_		1					1		
EB3C	DH312 DH314	3.20 1.75	3.70 2.25	Corestick Push tube	Results received Results received			1	1		1	1		1		2		1
EB3C	DH314	1.50	1.80	Jar	Results received												1	
EB3C	DH315_P DH316_P	1.50 6.00	2.00 6.50	Push tube Push tube	Results received Results received								1	-				
EB3C	DH316_P	9.00	9.50	Push tube	Results received		1					1	1					
EB3C EB3C	DH318 DH318_P	4.00 3.00	4.50 3.50	Jar Push tube	Results received Results received								1				1	
EB3C	DH318_P	10.20	10.90	Bag	Results received				1									1
EB3C EB3C	DH319 DH319_P	5.20 10.50	5.80 11.00	Jar Push tube	Results received Results received				1	-		1					1	
EB3C	DH320	6.00	6.10	Bag	Results received		1					Ė						
EB3C EB3C	DH320 DH322	25.23 6.50	25.34 7.00	Corestick Bag	Results received Results received		1	1						-		1		1
EB3C	DH322	11.00	11.50	Bag	Results received			1	2									1
EB3C	DH322 DH322	18.45 21.60	18.57 21.92	Corestick	Results received Results received						1 1			-				
EB3C	DH322	21.92	22.18	Corestick	Results received											2		
EB3C	DH323 DH323	0.50 5.50	1.00 6.00	Jar Push tube	Results received Results received		1					1	1				1	
EB3C	DH323	3.00	3.45	Bag	Results received			1	2		<u> </u>	Ė						1
EB3C EB3C	DH323 DH323	21.84	22.01 22.13	Corestick Corestick	Results received Results received						1			-		1		
EB3C	DH324	4.50	5.00	Push tube	Results received								1					
EB3C EB3C	DH324 DH324	7.00 15.45	7.50 15.55	Push tube Corestick	Results received Results received			1						-		1		1
EB3C	DH324	15.63	15.72	Corestick	Results received											1		
EB3C EB3C	DH325 DH325	1.20 4.00	2.00 4.50	Jar Push tube	Results received Results received			1	2				1				1	
EB3C	DH325	5.50	6.00	Push tube	Results received							1	1					
EB3C EB3C	DH325 DH326	5.40 4.50	5.50 5.00	Bag Push tube	Results received Results received		1					1	1	1				
EB3C	DH327	2.50	3.00	Push tube Push tube	Results received							1	1					
EB3C	DH327	6.00	6.50	Push tube	Results received						4	1	1			1		
EB3C EB3C	DH328_P DH329	7.00	4.20 7.50	Corestick Push tube	Results received Results received			1	1		1	1				1		1
EB3C	DH329	8.50	9.00	Push tube	Results received									1				
EB3C EB3C	DH329 DH329	12.00 34.95	12.50 35.18	Push tube Corestick	Results received Results received		1				1	1	1	1				
EB3C	DH329	35.20	35.34	Corestick	Results received											1		
EB3C EB3C	DH330 DH330	3.00 2.00	3.50 2.50	Push tube Jar	Results received Results received								1	1			1	
EB3C	DH330	20.61	20.89	Corestick	Results received											2		
EB3C	DH332	18.36	18.63	Corestick	Results received						L			<u> </u>		1		



# **Determination of Solid Density of Medium and Fine soils**



1 Hill Street Onehunga Auckland 1061 New Zealand p. +64 9 356 3510

**Geotechnics Project ID** 

1017784.1000 Phase A

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**Customer Project ID** 

406084

		TEST DET	AILS	
OCATION	ID	DH309		
	Description	Eastern Busway		
	Data	N/A		
AMPLE	Geotechnics ID	AKL371.4		
	Reference	-	Depth	9.0-9.5 m
	Description	sandy SILT with some	e clay and trace of gravel, dark blueis	h grey; soft, moist, low plasticity
PECIMEN	Reference	-	Depth	<u>-</u>
	Description	-		
		TEST RES	ULT	
Average Solid Density	2.76 t/m³			
		TEST REM	ARKS	
The material used for testing was n	natural, whole soil. • Date tested	1/02/2023		

Our Ref: 1017784.1000.A.0/Rep12A



# **Determination of the Particle Size Distribution**



1 Hill Street, Onehunga Auckland

New Zealand

P 64 09 356 3510

www.geotechnics.co.nz

Site: Eastern Busway

BH No.: DH302 Sample ID.: AKL67.2

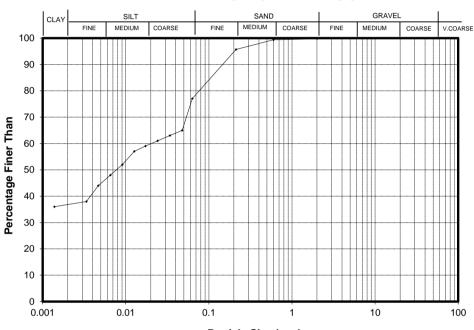
Test Method Used: NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: Schedule 7

Our Job No.: 1017784

Depth: 6.5-6.73 m

#### PARTICLE SIZE ANALYSIS



Particle Size (mm)

Sieve	Total %	Sieve	Total %	Equivalent Particle	% of Particles
(mm)	Passing	(mm)	Passing	Diameter D (mm)	Finer than D
4.75	-			0.0477	65
3.35	-			0.0340	63
2.00	100			0.0242	61
0.600	99			0.0172	59
0.212	96			0.0127	57
0.063	77			0.0091	52
				0.0065	48
				0.0047	44
				0.0034	38
				0.0014	36

Sample history: Natural sample was tested

Description: clayey SILT with trace sand, blueish grey-brown, moist, high plasticity

Solid Density (Assumed): 2.65 t/m<sup>3</sup>

Remarks: A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with

a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into

suspension, before proceeding with the test.

Suspension pH 9.07

The classification of gravel-sand-silt-clay components were described on the basis of particle size

analysis.

Sample description is not IANZ accredited.

Entered by: CAG (14/04/2022 Date : Checked by: GEG@<sub>7/03/2</sub>@<sub>28</sub>te: 28/04/2022



1 Hill Street Onehunga Auckland 1061 New Zealand

Geotechnics Project ID
Customer Project ID

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406084

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Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

#### TEST DETAILS

 LOCATION
 ID
 DH303

 Description
 Eastern Busway

 Data
 N/A

 SAMPLE
 Geotechnics ID
 AKL371.1

- -

 Reference
 Depth
 7.5-8.0 m

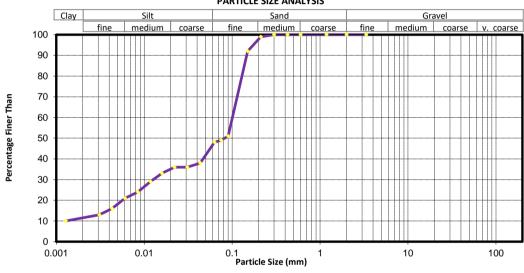
**Description** silty SAND with minor clay and trace of gravel, dark blueish grey with brown; firm, moist, low plasticity

SPECIMEN Reference - Depth -

Description -

#### **TEST RESULTS**

### PARTICLE SIZE ANALYSIS



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	99
53.0	-	4.75	-	0.150	92
37.5	-	3.35	100	0.090	51
26.5	-	2.00	100	0.075	49
19.0	-	1.18	100	0.063	48

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0470	38	0.0035	13
0.0335	36	0.0014	10
0.0239	36		
0.0171	33		
0.0128	29		
0.0093	24		
0.0067	21		
0.0049	16		

## TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

ld

Date tested: 01/02/2023

This test result is IANZ accredited.

Approved by KTP

Date 07/03/2023



SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

**Geotechnics Project ID** 

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1017784.1000 Phase 4

406084

**Customer Project ID** 

p. +64 9 356 3510

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method) **TEST DETAILS**

DH306 ID Description Eastern Busway 12

Data N/A

**Geotechnics ID** AKL377.1

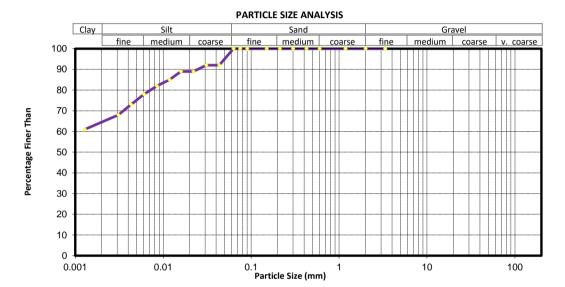
Reference Depth 6.0-6.5 m

Description silty CLAY with trace of sand and gravel, light orange brown with orange; soft, moist, high plasticity

SPECIMEN Reference Depth

Description

#### **TEST RESULTS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	100
53.0	-	4.75	-	0.150	100
37.5	-	3.35	100	0.090	100
26.5	-	2.00	100	0.075	100
19.0	-	1.18	100	0.063	100

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0449	92	0.0031	68
0.0317	92	0.0013	61
0.0226	89		
0.0160	89		
0.0119	85		
0.0085	82		
0.0061	78		
0.0044	73		

## **TEST REMARKS**

Our Ref: 1017784.1000.A.0/Rep13

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP 8/03/2023 Date

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SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

**Geotechnics Project ID Customer Project ID** 

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406084

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## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method) **TEST DETAILS** DH309

ID Description Eastern Busway 11 Data N/A

**Geotechnics ID** AKL371.3

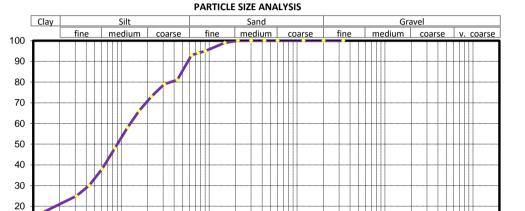
Reference Depth 7 5-8 0 m

Description clayey SILT with minor sand and trace of gravel, dark blueish grey; very soft, moist, high plasticity

SPECIMEN Reference Depth

Description

#### **TEST RESULTS**



0.1 Particle Size (mm)

Sieve Size	Percentage	Sieve Size	Percentage	Sieve Size	Percentage
	Passing		Passing		Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	100
53.0	-	4.75	-	0.150	99
37.5	-	3.35	100	0.090	95
26.5	-	2.00	100	0.075	94
19.0	-	1.18	100	0.063	93

0.01

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0452	81	0.0035	25
0.0322	79	0.0015	17
0.0233	73		
0.0169	66		
0.0127	58		
0.0092	48		
0.0067	38		
0.0049	30		

100

## **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP

Percentage Finer Than

10

0.001

3/03/2023 Date

10

Our Ref: 1017784.1000.A.0/Rep12A



SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

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Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

#### **TEST DETAILS**

LOCATION ID DH309

Description Eastern Busway 11

Data N/A

Geotechnics ID AKL371.4

**Reference** - **Depth** 9.0-9.5 m

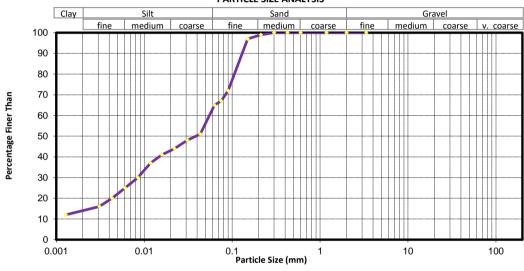
**Description** sandy SILT with some clay and trace of gravel, dark blueish grey; soft, moist, low plasticity

SPECIMEN Reference - Depth -

Description -

#### **TEST RESULTS**

#### **PARTICLE SIZE ANALYSIS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	99
53.0	-	4.75	-	0.150	97
37.5	-	3.35	100	0.090	72
26.5	-	2.00	100	0.075	67
19.0	-	1.18	100	0.063	65

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0469	51	0.0034	16
0.0336	48	0.0014	12
0.0241	44		
0.0173	41		
0.0128	37		
0.0093	30		
0.0067	25		
0.0048	20		

### **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.76 t/m³ (Measured)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

Suspension pH 8.0

Our Ref: 1017784.1000.A.0/Rep12A

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP CHME Jate 3/03/2023

Page 1 of 1



SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

Geotechnics Project ID
Customer Project ID

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1017784.1000 Phase 4

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Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

#### TEST DETAILS

ID DH311

Description Eastern Busway 12

Data N/A

Geotechnics ID AKL377.2

**Reference** - **Depth** 5.5-6.0 m

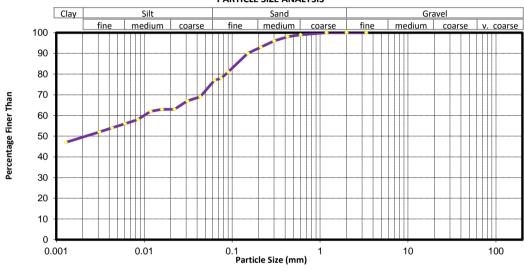
**Description** silty sandy CLAY with trace of gravel, dark greenish grey; firm, moist, high plasticity

SPECIMEN Reference - Depth -

Description -

#### **TEST RESULTS**

#### **PARTICLE SIZE ANALYSIS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	99
100.0	-	13.2	-	0.425	98
75.0	-	9.50	-	0.300	96
63.0	-	6.70	-	0.212	93
53.0	-	4.75	-	0.150	90
37.5	-	3.35	100	0.090	81
26.5	-	2.00	100	0.075	78
19.0	-	1.18	100	0.063	77

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0456	69	0.0031	52
0.0325	67	0.0013	47
0.0233	63		
0.0165	63		
0.0121	62		
0.0087	58		
0.0062	56		
0.0044	54		

### **TEST REMARKS**

Our Ref: 1017784.1000.A.0/Rep13

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

Suspension pH 8.0

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP CHME B/03/2023



1 Hill Street Onehunga Auckland 1061 New Zealand

**Geotechnics Project ID** 

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406084 **Customer Project ID** 

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## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method) **TEST DETAILS** DH311

SAMPLE **Geotechnics ID** AKL377.3

ID Description

Data

Reference Depth 9 0-9 5 m

Description silty SAND with minor clay and trace of gravel, dark brown; firm, moist, low plasticity

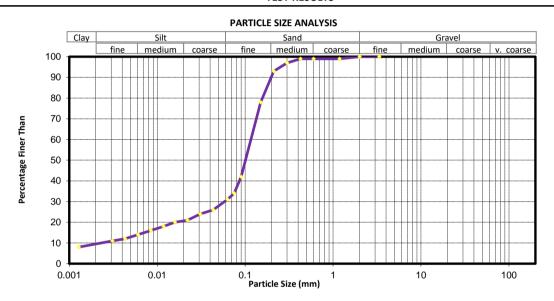
SPECIMEN Reference Depth N/A

N/A

Eastern Busway 12

Description

#### **TEST RESULTS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	99
100.0	-	13.2	-	0.425	99
75.0	-	9.50	-	0.300	97
63.0	-	6.70	-	0.212	93
53.0	-	4.75	-	0.150	78
37.5	-	3.35	100	0.090	42
26.5	-	2.00	100	0.075	34
19.0	-	1.18	99	0.063	31

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0434	26	0.0034	11
0.0312	24	0.0014	8
0.0230	21		
0.0166	20		
0.0124	18		
0.0090	16		
0.0065	14		
0.0047	12		

## **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

Our Ref: 1017784.1000.A.0/Rep13

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP 8/03/2023 Date



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Geotechnics Project ID

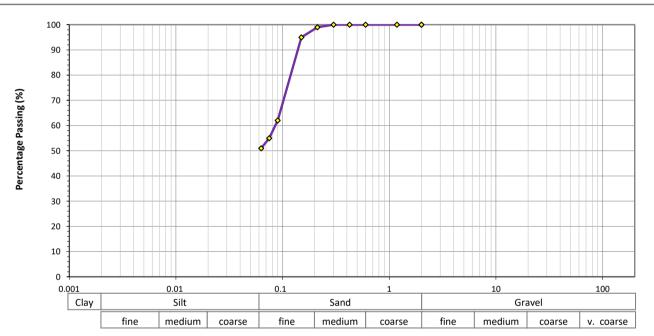
Customer Project ID

1017784 ALCOE-103

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS							
ID	DH312						
Description	ALCOE-103						
Data	N/A						
Geotechnics ID	AKL101.1						
Reference	-	Depth	7-7.5 m				
Description	sandy SILT minor	clay, whiteish grey; soft, moist, lov	v plasticity				
Reference		Denth	_				
		Бериі	_				
	Description Data Geotechnics ID Reference Description Reference	ID DH312  Description ALCOE-103  Data N/A  Geotechnics ID AKL101.1  Reference - sandy SILT minor  Reference -	ID DH312  Description ALCOE-103  Data N/A  Geotechnics ID AKL101.1  Reference - Depth  Description sandy SILT minor clay, whiteish grey; soft, moist, low	DH312 Description ALCOE-103 Data N/A Geotechnics ID AKL101.1 Reference - Depth 7-7.5 m Description sandy SILT minor clay, whiteish grey; soft, moist, low plasticity			

#### **TEST RESULTS**



## Particle Size (mm)

Sieve Size (mm)	Percentage Passing (%)						
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.00	100	0.150	95
63.0	-	13.2	-	1.18	100	0.090	62
53.0	-	9.50	-	0.600	100	0.075	55
37.5	-	6.70	-	0.425	100	0.063	51

#### **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By Eul Date 17/06/2022



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New Zealand

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Site: **Eastern Busway** BH No.: **DH312** 

DH312 Sample ID.: AKL101.1

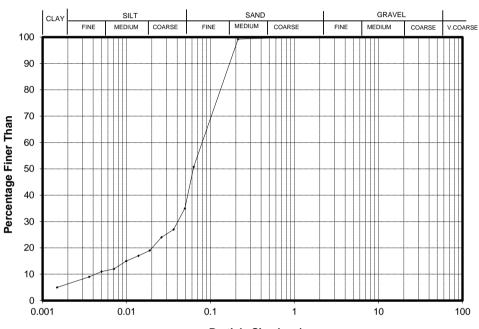
Test Method Used: NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.:

ALCOE-103

Our Job No.: Depth: 1017784 7-7.5 m

### **PARTICLE SIZE ANALYSIS**



Particle Size (mm)

Sieve	Total %	Sieve	Total %	Equivalent Particle	% of Particles
(mm)	Passing	(mm)	Passing	Diameter D (mm)	Finer than D
4.75	-			0.0494	35
3.35	-			0.0363	27
2.00	100			0.0260	24
0.600	100			0.0188	19
0.212	99			0.0138	17
0.063	51			0.0099	15
				0.0071	12
				0.0050	11
				0.0036	9
				0.0015	5

Sample history: Tested as recived

Description: sandy SILT minor clay, whiteish grey; soft, mosist, low plasticity

Solid Density (Measured): 2.65 t/m<sup>3</sup>

Remarks: A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with

a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into

suspension, before proceeding with the test.

Suspension pH 8.1

The classification of gravel-sand-silt-clay components were described on the basis of particle size

analysis.

Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022



SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

Geotechnics Project ID

Customer Project ID

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406084

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Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)
Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

#### TEST DETAILS

Description DH314

Description Eastern Busway 12

Data N/A

Geotechnics ID AKL377.4

**Reference** - **Depth** 1.75-2.25 m

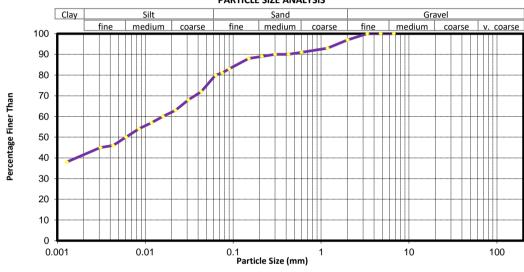
**Description** silty CLAY with some sand and trace of gravel, dark orange brown with black; soft, moist, high plasticity

SPECIMEN Reference - Depth -

Description -

#### **TEST RESULTS**

#### **PARTICLE SIZE ANALYSIS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	91
100.0	-	13.2	-	0.425	90
75.0	-	9.50	-	0.300	90
63.0	-	6.70	100	0.212	89
53.0	-	4.75	100	0.150	88
37.5	-	3.35	100	0.090	83
26.5	-	2.00	97	0.075	81
19.0	-	1.18	93	0.063	80

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0434	72	0.0032	45
0.0312	68	0.0013	38
0.0226	63		
0.0162	60		
0.0121	57		
0.0087	54		
0.0062	50		
0.0045	46		

## TEST REMARKS

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

Our Ref: 1017784.1000.A.0/Rep13

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 06/03/2023

This test result is IANZ accredited.

Approved by KTP CHME Date 8/03/2023

Page 1 of 1



SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

**Geotechnics Project ID** 

Page 5 of 6 1017784.1000.A.0

**Customer Project ID** 

406084

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## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method)

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method) **TEST DETAILS**

DH318 P ID Description Eastern Busway Data N/A

**Geotechnics ID** AKL475.4

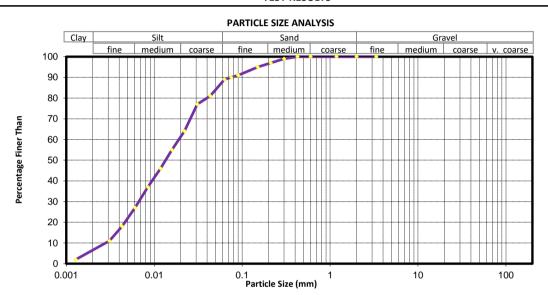
10.2-10.9 m Reference Depth

Description SILT with minor sand and clay and trace of gravel, light brownish grey with black; soft, moist, high plasticity

SPECIMEN Reference Depth

Description

#### **TEST RESULTS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	99
63.0	-	6.70	-	0.212	97
53.0	-	4.75	-	0.150	95
37.5	-	3.35	100	0.090	91
26.5	-	2.00	100	0.075	90
19.0	-	1.18	100	0.063	89

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0456	81	0.0036	11
0.0328	77	0.0015	2
0.0242	64		
0.0176	55		
0.0132	46		
0.0096	37		
0.0070	27		
0.0050	18		

### **TEST REMARKS**

Our Ref: 1017784.1000.A.0/Rep15

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 04/05/2023

This test result is IANZ accredited.

SJA 11/05/2023 Approved by KTP Date

Page 1 of 1



1 Hill Street Onehunga Auckland 1061 New Zealand

**Geotechnics Project ID Customer Project ID** 

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1017784.1000 Phase A

406084

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Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method) Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

#### **TEST DETAILS**

LOCATION DH319 P ID Description Eastern Busway 11 Data N/A SAMPLE

**Geotechnics ID** AKL371.5

10 5-11 0 m Reference Depth

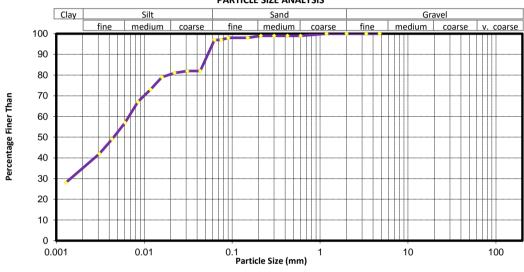
Description clayey SILT with trace of sand and gravel, dark brown with black; firm, moist, high plasticity

SPECIMEN Depth Reference

Description

#### **TEST RESULTS**

#### **PARTICLE SIZE ANALYSIS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	99
100.0	-	13.2	-	0.425	99
75.0	-	9.50	-	0.300	99
63.0	-	6.70	-	0.212	99
53.0	-	4.75	100	0.150	98
37.5	-	3.35	100	0.090	98
26.5	-	2.00	100	0.075	97
19.0	-	1.18	100	0.063	97

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0466	82	0.0034	42
0.0329	82	0.0014	28
0.0234	81		
0.0167	79		
0.0124	73		
0.0089	67		
0.0065	57		
0.0047	49		

### **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP

07/03/2023 Date

Our Ref: 1017784.1000.A.0/Rep12A



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**Geotechnics Project ID** 

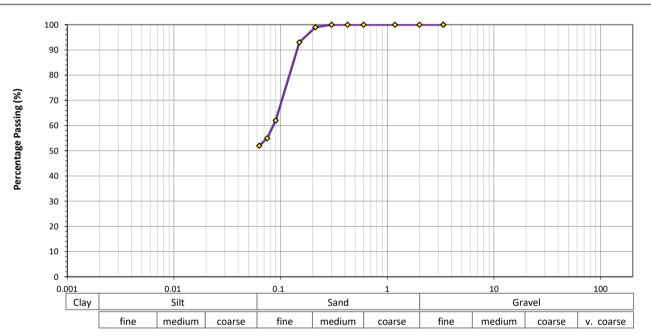
1017784

Customer Project ID ALCOE-103

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

		TEST DE	TAILS	
LOCATION	ID	DH322		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL103.2		
	Reference	-	Depth	11-11.5 m
	Description	sandy SILT minor	clay, dark grey; soft, moist, non-plas	sticity
SPECIMEN	Reference	-	Depth	-
	Description	-		

#### **TEST RESULTS**



## Particle Size (mm)

Sieve Size (mm)	Percentage Passing (%)						
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	100	0.212	99
75.0	-	16.0	-	2.00	100	0.150	93
63.0	-	13.2	-	1.18	100	0.090	62
53.0	-	9.50	-	0.600	100	0.075	55
37.5	-	6.70	-	0.425	100	0.063	52

#### **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By Eul Date 17/06/2022



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Site: Eastern Busway

Your Job N Our Job No ALCOE-103

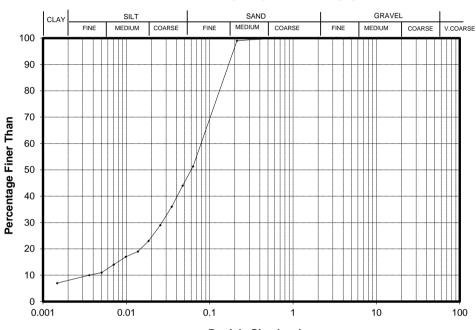
BH No.: **DH322** 

Sample ID.: AKL103.2

Our Job No 1017784 Depth: 11-11.5 m

Test Method Used: NZS 4402:1986 Test 2.8.4 Hydrometer

#### PARTICLE SIZE ANALYSIS



Particle Size (mm)

Sieve	Total %	Sieve	Total %	Equivalent Particle	% of Particles
(mm)	Passing	(mm)	Passing	Diameter D (mm)	Finer than D
4.75	-			0.0474	44
3.35	-			0.0350	36
2.00	-			0.0255	29
0.600	100			0.0185	23
0.212	99			0.0138	19
0.063	51			0.0098	17
				0.0070	14
				0.0050	11
				0.0036	10
				0.0015	7

Sample history: Tested as Recived

Description: sandy SILT minor clay, dark grey; soft, moist, low plasticity

Solid Density (Assumed): 2.65 t/m<sup>3</sup>

Remarks: A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with

a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into

suspension, before proceeding with the test.

Suspension pH 9.7

The classification of gravel-sand-silt-clay components were described on the basis of particle size

analysis.

Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022



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**Geotechnics Project ID** 

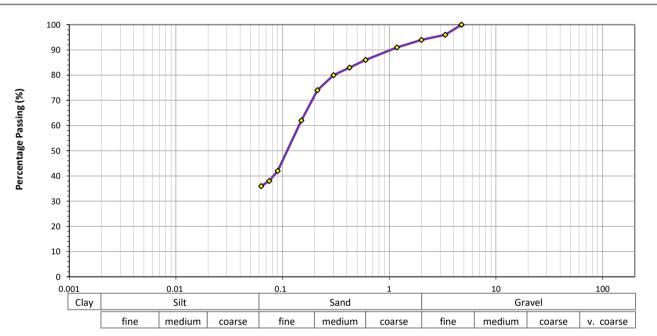
Customer Project ID ALCOE-103

1017784

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

		TEST DE	TAILS	
LOCATION	ID	DH323		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL104.2		
	Reference	-	Depth	3-3.45 m
	Description	silty SAND, minor	clay, dark brown; soft, moist, low p	lasticity
SPECIMEN	Reference	-	Depth	-
	Description	-		
l .				

#### **TEST RESULTS**



## Particle Size (mm)

Sieve Size (mm)	Percentage Passing (%)						
150	-	26.5	-	4.75	100	0.300	80
100	-	19.0	-	3.35	96	0.212	74
75.0	-	16.0	-	2.00	94	0.150	62
63.0	-	13.2	-	1.18	91	0.090	42
53.0	-	9.50	-	0.600	86	0.075	38
37.5	-	6.70	-	0.425	83	0.063	36

#### **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By Eul Date 17/06/2022



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Site: ALCOE-103 BH No.: DH323

Sample ID.: AKL104.2

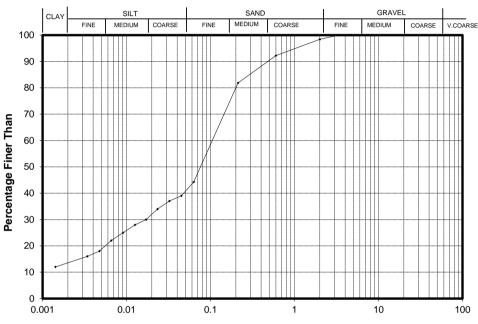
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **1017784** 

Our Job No.: ALCOE-103

Depth: **3-3.45 m** 

### **PARTICLE SIZE ANALYSIS**



Particle Size (mm)

Sieve	Total %	Sieve	Total %	]	Equivalent Particle	% of Particles
(mm)	Passing	(mm)	Passing		Diameter D (mm)	Finer than D
4.75	100				0.0449	39
3.35	100				0.0322	37
2.00	98				0.0233	34
0.600	92				0.0170	30
0.212	82				0.0126	28
0.063	44				0.0091	25
					0.0066	22
					0.0048	18
					0.0034	16
					0.0014	12

Sample history: Tested as Recived

Description: silty SAND, minor clay, dark brown; soft, moist, low plasticity

Solid Density (Assumed): 2.65 t/m<sup>3</sup>

Remarks: A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with

a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into

suspension, before proceeding with the test.

Suspension pH 8.8

The classification of gravel-sand-silt-clay components were described on the basis of particle size

analysis.

Sample description is not IANZ accredited.

Entered by: GEGO Date: 16/06/2022 Checked by: CAGI Date: 17/06/2022



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**Geotechnics Project ID** 

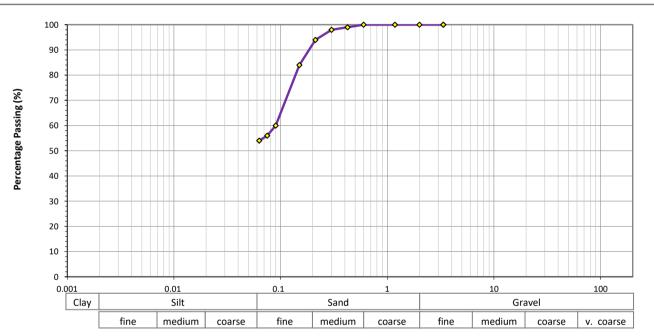
Customer Project ID ALCOE-103

1017784

## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

		TEST DE	TAILS		
LOCATION	ID	DH325			
	Description	ALCOE-103			
	Data	N/A			
SAMPLE	Geotechnics ID	AKL106.1			
	Reference	-	Depth	4-4.5 m	
	Description	silty SAND minor o	lay, light greyish brown; soft, mois	t, low plasticity	
SPECIMEN	Reference	-	Depth	-	
	Description	-			

#### **TEST RESULTS**



## Particle Size (mm)

Sieve Size (mm)	Percentage Passing (%)						
150	-	26.5	-	4.75	-	0.300	98
100	-	19.0	-	3.35	100	0.212	94
75.0	-	16.0	-	2.00	100	0.150	84
63.0	-	13.2	-	1.18	100	0.090	60
53.0	-	9.50	-	0.600	100	0.075	56
37.5	-	6.70	-	0.425	99	0.063	54

#### **TEST REMARKS**

• The material used for testing was natural, whole soil. • The percentage passing the <0.063mm was obtained by difference. Test By gego 13/06/2022

This test result is IANZ accredited.

Approved By Eul Date 17/06/2022



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Site: ALCOE-103 BH No.: DH325

DH325 Sample ID.: AKL106.1

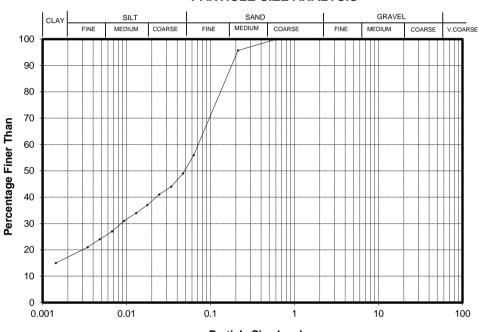
Test Method Used: NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.:

Our Job No.: 1017784 Depth: 4-4.5 m

ALCOE-103

## **PARTICLE SIZE ANALYSIS**



Particle Size (mm)

Sieve	Total %	Sieve	Total %	Equivalent Particle	% of Particles
(mm)	Passing	(mm)	Passing	Diameter D (mm)	Finer than D
4.75	-			0.0470	49
3.35	-			0.0340	44
2.00	100			0.0244	41
0.600	100			0.0176	37
0.212	96			0.0130	34
0.063	56			0.0093	31
				0.0067	27
				0.0048	24
				0.0034	21
				0.0014	15

Sample history: Tested as Recived

Description: silty SAND minor clay, light greyish brown, soft, moist, low plasticity

Solid Density (Assumed): 2.65 t/m3

Remarks: A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with

a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into

suspension, before proceeding with the test.

Suspension pH 9.4

The classification of gravel-sand-silt-clay components were described on the basis of particle size

analysis.

Sample description is not IANZ accredited.

Entered by : GEGO Date : 16/06/2022 Checked by : CAGI Date : 17/06/2022



SAMPLE

1 Hill Street Onehunga Auckland 1061 New Zealand

**Geotechnics Project ID** 

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406084

**Customer Project ID** 

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## Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve Method) Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.4 (Hydrometer Method)

## **TEST DETAILS**

DH329 P ID Description Eastern Busway 11 Data N/A

**Geotechnics ID** AKL371.6

7 0-7 5 m Reference Depth

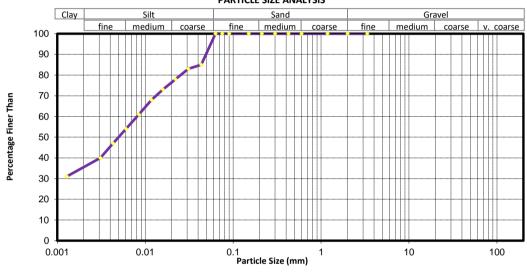
Description clayey SILT with trace of sand and gravel, dark brownish grey with orange; firm, moist, high plasticity

SPECIMEN Depth Reference

Description

#### **TEST RESULTS**

#### **PARTICLE SIZE ANALYSIS**



Sieve Size	Percentage Passing	Sieve Size	Percentage Passing	Sieve Size	Percentage Passing
(mm)	(%)	(mm)	(%)	(mm)	(%)
150.0	-	16.0	-	0.600	100
100.0	-	13.2	-	0.425	100
75.0	-	9.50	-	0.300	100
63.0	-	6.70	-	0.212	100
53.0	-	4.75	-	0.150	100
37.5	-	3.35	100	0.090	100
26.5	-	2.00	100	0.075	100
19.0	-	1.18	100	0.063	100

Equivalent	Percentage of	Equivalent	Percentage of
Particle	Particles Finer	Particle	Particles Finer
Diameter D	than D	Diameter D	than D
(mm)	(%)	(mm)	(%)
0.0460	85	0.0034	40
0.0328	83	0.0014	31
0.0235	78		
0.0169	73		
0.0125	68		
0.0090	61		
0.0065	54		
0.0047	47		

### **TEST REMARKS**

Our Ref: 1017784.1000.A.0/Rep12A

• The material used for testing was natural, whole soil. • The percentage passing the <0.063 mm was obtained by difference. • Solid Density = 2.65 t/m³ (Assumed)

Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063 mm test sieve, until the individual particles were clean. The material retained on 0.063 mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063 mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve.

The classification of gravel-sand-silt-clay components are described on the basis of particle size analysis.

Date tested: 01/03/2023

This test result is IANZ accredited.

Approved by KTP

3/03/2023 Date



## **Organic Content by Ignition**



1 Hill Street Onehunga Auckland 1061 New Zealand

p. +64 9 356 3510

**Geotechnics Project ID** 

1017784.1000.A.0

**Customer Project ID** 

406084

Project Name

G-SL Eastern Busway

Page 3 of 6

## Organic Content by Ignition - NZS 4402:1986 Test 3.1.2

		TEST DETAILS	S	
LOCATION	ID	DH301_P		
	Location Description	Eastern Busway		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL475.3	Date Received	-
	Reference	-	Depth from	13.4 m
			Depth to	13.5 m
	Description	organic clayey SILT, black	with dark brown; soft, moist, high	plasticity
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESULT		
Organic Matter Content		40 %		
C. Darine imatter content		.0 /0		
o. Barne matter content				
e. Barne matter content				
		TEST REMARK		
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	the nearest 5 % • For highly organic soil
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0		
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
<ul> <li>The material used for testing</li> </ul>	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
• The material used for testing	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
<ul> <li>The material used for testing</li> </ul>	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
<ul> <li>The material used for testing</li> </ul>	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	
<ul> <li>The material used for testing</li> </ul>	was natural, fraction passing a	TEST REMARK 9.5 mm sieve. • Date tested 2/0	05/2023 • The test was rounded to	

Date

11/05/2023

SJA

Approved by KTP



45%

Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

Schedule 7

**GEOTECHNICS** p. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS					
OCATION	ID	DH302			
	Description	ALCOE-84			
	Data	-			
AMPLE	Geotechnics ID	AKL67.3			
	Reference	-	Depth	9 - 9.5 m	
	Description	Peat with organic	material, brownish black, soft.		
SPECIMEN	Reference	-	Depth	-	
	Description				

## **TEST RESULT**

Organic Matter Content

## **TEST REMARKS**

Orgainc matter content was rounded to the nearest 5%.

 Test By:
 CAGI
 Date
 13/04/2022

 Approved By
 Flaw Adver Date
 25/05/2022



30%

Auckland, New Zealand

Geotechnics Project ID

Customer Project ID

P. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS					
LOCATION	ID	DH303			
	Description	Eastern Busway			
	Data	-			
SAMPLE	Geotechnics ID	AKL371.2			
	Reference	-	Depth	9.5-10.0 m	
	Description	clayey SILT, blac	k; soft, moist, high plasticity		
SPECIMEN	Reference	-	Depth	-	
	Description	-	•		

## **TEST RESULT**

Organic Matter Content

#### **TEST REMARKS**

Date tested 28/02/2023.

Test was rounded to the nearest 1%.

For highly organic soils this method is sufficiently accurate for day-to-day engineering purposes but it should not be relied on for organic contents less than about 15%.

 Test By:
 KESA
 Date
 28/02/2023

 Approved By KTP
 €√√
 Date
 07/03/2023



50%

Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

Schedule 7

DEOTECHNICS p. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS				
LOCATION	ID	DH304		
	Description	ALCOE-84		
	Data	-		
SAMPLE	Geotechnics ID	AKL68.3		
	Reference	-	Depth	9.5 - 10 m
	Description	peat with organic	material, brownish black, soft.	
SPECIMEN	Reference	<u>-</u>	Depth	
	Description		Dept	

## **TEST RESULT**

Organic Matter Content

**TEST REMARKS** 

Orgainc matter content was rounded to the nearest 5%.

 Test By:
 CAGI
 Date
 13/04/2022

 Approved By
 Alexan Alexan
 Date
 25/05/2022

Our Ref: 1017784 Phase A/Rep8B



Auckland, New Zealand

Geotechnics Project ID

Customer Project ID

P. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS					
LOCATION	ID	DH311			
	Description	Eastern Busway 12			
	Data	-			
SAMPLE	Geotechnics ID	AKL377.3			
	Reference	-	Depth	9.0-9.5 m	
	Description	silty SAND with minor clay and trace of gravel, dark brown; firm, moist, low plasticity			
SPECIMEN	Reference	-	Depth	-	
	Description	-			

## **TEST RESULT**

Organic Matter Content < 1 %

#### **TEST REMARKS**

Date tested 28/02/2023.

Test was rounded to the nearest 1%.

For highly organic soils this method is sufficiently accurate for day-to-day engineering purposes but it should not be relied on for organic contents less than about 15%.

 Test By:
 KESA
 Date
 28/02/2023

 Approved By KTP
 CHME
 Date
 8/03/2023

Our Ref: 1017784.1000.A.0/Rep13



1 Hill Street Onehunga Auckland 1061 New Zealand

p. +64 9 356 3510

Geotechnics Project ID

**Project Name** 

1017784.1000.A.0

Page 5 of 5

Customer Project ID

406084

G-SL Eastern Busway

## Organic Content by Ignition - NZS 4402:1986 Test 3.1.2

		TEST DETA	ILS	
OCATION	ID	DH316		
	Location Description	Eastern Busway		
	Data	N/A		
AMPLE	Geotechnics ID	AKL475.2	Date Received	Unknown
	Reference	-	Depth from	9.0 m
			Depth to	9.5 m
	Description	organic clayey SILT, bla	ack with dark brown; soft, moist, high	plasticity
PECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESU	LT	
	•	•		
Organic Matter Content		50 %		
	_	TEST REMAI	RKS	
			2/05/2022 • The test was rounded to	
	was natural, fraction passing a			
			relied on for organic contents less th	

GEOTECHNICS LTD NZS 4402 - Test 3.1.2 Organic Content

Approved by KTP

SJA

Document Owners: NAPO CHME
Our Ref: 1017784.1000.A.0/Rep14A

15/05/2023

Date



25%

Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

GEOTECHNICS

p. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS					
LOCATION	ID	DH320			
	Description	-			
	Data	-			
SAMPLE	Geotechnics ID	AKL102.1			
	Reference	-	Depth	6-6.1 m	
	Description	spongy PEAT			
SPECIMEN	Reference	-	Depth	-	
	Description				

## **TEST RESULT**

Organic Matter Content

## **TEST REMARKS**

Orgainc matter content was rounded to the nearest 5%.

 Test By:
 GEGO
 Date
 13/06/2022

 Approved By
 Eff
 Date
 17/06/2022



1 Hill Street, Onehunga, 1061

Auckland, New Zealand

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**Geotechnics Project ID** 

1017784

Customer Project ID

ALCOE103

Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

ID DH322
Description -

Data -

SAMPLE Geotechnics ID AKL103.1

 Reference
 Depth
 6.5-7 m

 Description
 peaty CLAY with decomposed wood flecks; soft, wet, high plasticity

SPECIMEN Reference - Depth -

Description

**TEST RESULT** 

Organic Matter Content 15%

**TEST REMARKS** 

Organic matter content was rounded to the nearest 5%.

 Test By:
 GEGO
 Date
 13/06/2022

Approved By Exu Date 17/06/2022



15%

Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

ALCOE-103

**GEOTECHNICS** p. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS					
LOCATION	ID	DH323			
	Description	ALCOE-103			
	Data	-			
SAMPLE	Geotechnics ID	AKL104.3			
	Reference	-	Depth	5.5-6 m	
	Description	peaty CLAY black;	soft, wet, high plasticity		
SPECIMEN	Reference	-	Depth	-	
	Description	-			

## **TEST RESULT**

Organic Matter Content

**TEST REMARKS** 

Organic matter content was rounded to the nearest 5%.

 Test By:
 GEGO
 Date
 13/06/2022

 Approved By
 Quality
 Date
 17/06/2022



4%

Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

**GEOTECHNICS** 

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## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS				
LOCATION	ID	DH325		
	Description	-		
	Data	-		
SAMPLE	Geotechnics ID	AKL106.2		
	Reference	-	Depth	5.40-5.5 Description
	clayey SILT with some	peat; firm, moist, high plast	icity	
SPECIMEN	Reference	-	Depth	-
	Description			

## **TEST RESULT**

**Organic Matter Content** 

#### **TEST REMARKS**

Organic matter content was rounded to the nearest 1% • The ignition method is sufficiently accurate for day-to-day engineering purposes, but it should not be relied on for organic contents less than about 15%..

GEGO Test By: Date 13/06/2022 Approved By exy Date 17/06/2022



Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

**GEOTECHNICS** p. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS

LOCATION ID DH326
Description -Data

SAMPLE Geotechnics ID AKL107.1

Reference - Depth 4.5-5 m Description
spongy PEAT, black; very soft, wet, high plasticity

SPECIMEN Reference - Depth Description

**TEST RESULT** 

Organic Matter Content 65%

**TEST REMARKS** 

Organic matter content was rounded to the nearest 5%.

Test By: GEGO Date 13/06/2022

Approved By Exu Date 17/06/2022



Auckland, New Zealand

**Geotechnics Project ID** 

1017784

**Customer Project ID** 

ALCOE-103

**GEOTECHNICS** p. p. +64 3 361 0300

## Organic Content By Ignition - NZS 4402:1986 Test 3.1.2

TEST DETAILS				
LOCATION	ID	DH329		
	Description	-		
	Data	-		
SAMPLE	Geotechnics ID	AKL108.1		
	Reference	-	Depth	12-12.5 m
	Description	peaty CLAY, black;	soft, wet, high plasticity	
SPECIMEN	Reference	-	Depth	-
	Description			

## **TEST RESULT**

Organic Matter Content 35%

## **TEST REMARKS**

Organic matter content was rounded to the nearest 5%.

 Test By:
 GEGO
 Date
 13/06/2022

 Approved By
 Date
 17/06/2022



## **Laboratory Vane Test**



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID: 1017784.1000.2.0

Customer Project ID: EBA\_16

Site: Eastern Busway

Test Method used: BS 1377:Part 7:1990 Clause 3 Determination of Shear strength by the laboratory vane method

**Laboratory Vane Test** 

Location ID Samp	Sample Reference	Depth	Samplin	g tube	Vane Shear Strength (kPa)		
	Sample Reference	(m)	Type	Diameter (mm)	Peak	Residual	
DH301		10.56	Push tube	55	150	93	

Photo:



Soil description: 10.56-10.90m: clayey SILT with a trace of sand, firm, dark grey with some brown; moist, high plasticity

10.90-10.98m: clayey SILT with minor sand, firm, dark grey; moist, high plasticity

<u>'</u>	Sample Reference	Depth	Samplin	g tube	Vane Shear Strength (kPa)		
	Jampie Reference	(m)	Туре	Diameter (mm)	Peak	Residual	
DH318_P		12.4	Push tube	55	57	11	

Photo:



Soil description: 12.34-12.46m: silty CLAY with some organics, soft, dark brownish grey; moist, high plasticity

Location ID Sample Refe	Sample Reference	Depth	Samplin	g tube	Vane Shear Strength (kPa)		
	Sample Reference	(m)	Type	Diameter (mm)	Peak	Residual	
DH318_P		12.08	Push tube	55	45	9.9	

Photo:



Soil description: 12.04-12.34m: Organic silty CLAY, soft, black; moist, high plasticity

**Test Remarks** 

DH301- Requested top of sample tested, DH318\_P- Request both ends tested



1 Hill Street, Onehunga, Auckland 1061 p 64 9 356 3510

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Your Job No.: EBA\_12

Project ID: G-TL Eastern Busway

Our Job No.: 1017784.0000.2.0

Test Method: BS 1377:Part 7:1990 Clause 3 Determination of Shear strength by the laboratory vane method

#### **TEST RESULTS**

#### Table 1: Test Results Summary

DH No.:		DH308
Depth	(m)	10.96m
Peak vane shear strength	(kPa)	149
Residual vane shear strength	(kPa)	22



Sample Description for

10.5-10.83m: silty CLAY, firm to soft, blueish dark grey; moist, extremely high plasticity

10.83-10.93: Clayey SILT with minor organic inclusions, firm, brown with grey; moist, high plasticity

10.93-10.99m: Organic clayey SILT, firm, black; high plasticity, moist

Remarks:

Diameter of the push tube: 54mm

Decriptions are not IANZ accredited.

Test by: CHLU
Date: 31/3/2023

Approved by:

Date

3/04/2023



1 Hill Street, Onehunga, Auckland 1061 p 64 9 356 3510

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Your Job No.: EBA\_12

Project ID: G-TL Eastern Busway

Our Job No.: 1017784.0000.2.0

Test Method: BS 1377:Part 7:1990 Clause 3 Determination of Shear strength by the laboratory vane method

#### **TEST RESULTS**

Table 1: Test Results Summary

DH No.:		DH315_P
Depth	(m)	6.36m
Peak vane shear strength	(kPa)	56
Residual vane shear strength	(kPa)	12



Sample Description for

6.0-6.22m: Clayey SILT with minor sand, soft, mottled grey and black with orange; moist, high plasticity

6.22-6.50m: Organic clayey SILT, soft, blackish brown; moist, extremely high plasticity

Remarks:

Diameter of the push tube: 54mm

Decriptions are not IANZ accredited.

Test by: CHLU
Date: 31/3/2023

Approved by:

Date

3/04/2023



# **Consolidated-Undrained Triaxial Compression Test**



1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID: QESTLab Work Order ID:

D: 1017784.1000.B.0

Customer Project ID: EBA\_16

GEOTECHNICS p. +64 9 356 3510

Site: Eastern Busway

Sample Ref.: --

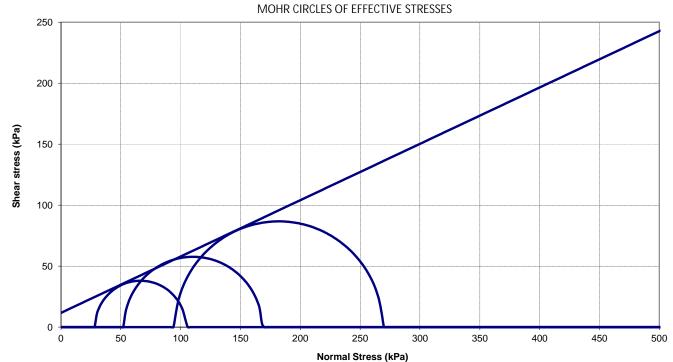
Location ID: DH301 Depth: 4.89-4.9

4.89-4.99 (m)

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

### CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)



General Sample Parameters											
Initial Sample Height:	111.52	mm	Initial Water Content:	42.0	%						
Initial Sample Diameter:	54.04	mm	Initial Bulk Density:	1.79	t/m³						
Initial B Value:	64	%	Initial Dry Density:	1.26	t/m³						
B Value before Consolidation:	96	%	Final Water Content:	38.9	%						

<b>T</b> .	n .	
Lest	Resu	ITS

	At the End of Consolidation Stage							Failure V	'alues		
	Effective		Back	Volumetric		<b>Deviator Stress</b>	Vertical	Effecti	ve Stress	Correction	s (kPa)
	Horizontal	Vertical	Pressure	Strain	Rate	$(\boldsymbol{\sigma}_{v}' - \boldsymbol{\sigma}_{h}')$	Strain	Vertical	Horizontal	Membrane	Filter P
	<b>σ</b> <sub>h</sub> (kPa)	σ <sub>v</sub> -(kPa)	(kPa)	(%)	(%/hr)	(kPa)	ε (%)	<b>σ</b> √- (kPa)	<b>σ</b> <sub>h</sub> (kPa)	$(\Delta \sigma_{\rm v})_{\rm m}$	$(\Delta \sigma_{v})_{fp}$
Stage 1	50	51	400	0.99	0.00	76.10	1.39	104.50	28.40	0.43	2.46
Stage 2	100	101	400	1.42	0.01	115.37	1.42	168.07	52.70	0.44	2.51
Stage 3	200	201	400	3.35	0.01	173.50	3.05	268.80	95.30	0.95	3.56

Effective Strength

Angle of Frictional Resistance:  $\phi'=25$  ° Cohesion: c'=12 kPa Linear Regression Coefficient: r=0.999

Sample History: Undisturbed core trimmed at natural water content.

Failure Mode & Photo Planar

Soil description: silty CLAY, orange brown with blueish grey; firm, moist, high plasticity

Test Speed: 0.015 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by either the maximum effective stress ratio or the maximum deviator stress. Strength

parameters have been derived by using a linear regression fitting method.

Tested by: YHW Date: 3/04/2023 Approved by KTP: \times Date: 12/05/2023

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

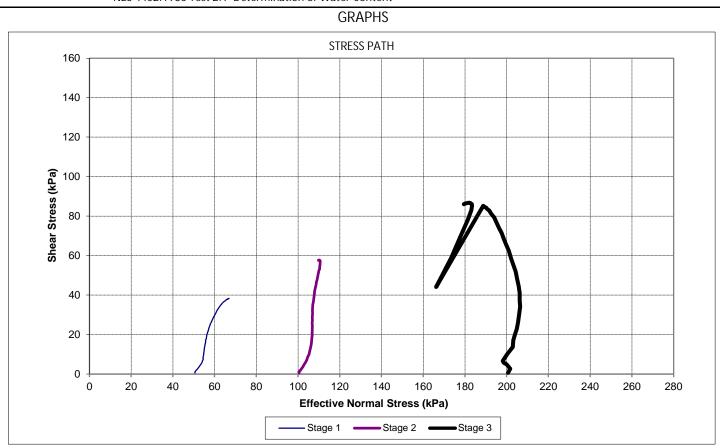
1017784.1000.B.0

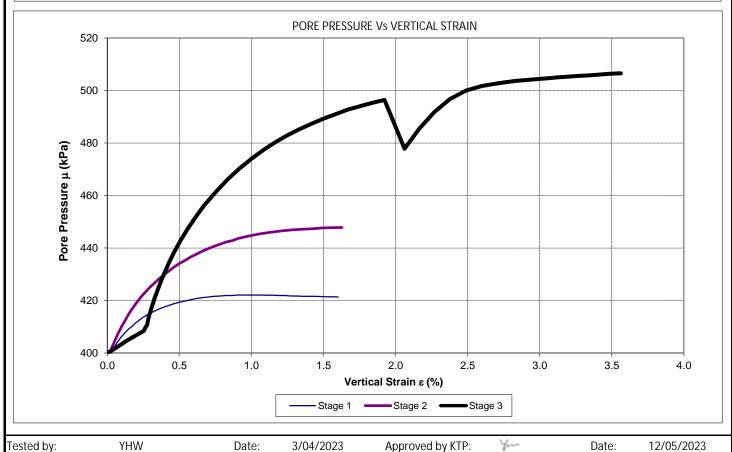
QESTLab Work Order ID:

Customer Project ID: EBA\_16

Location ID: DH301 Site: Eastern Busway Sample Ref.:

4.89-4.99 Depth: (m) ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





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Geotechnics Project ID: 1017784.1000.B.0

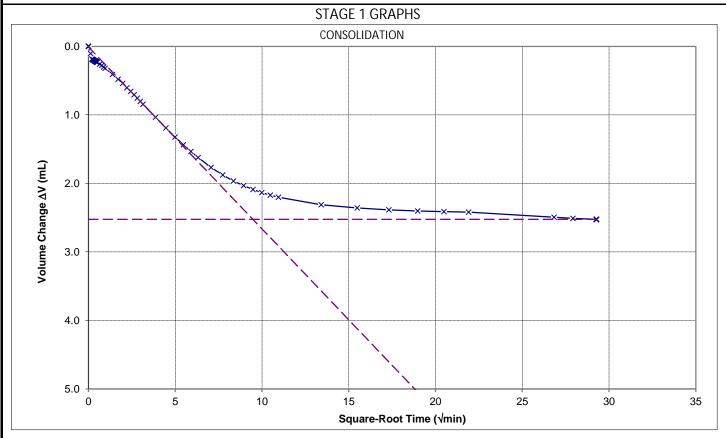
QESTLab Work Order ID:

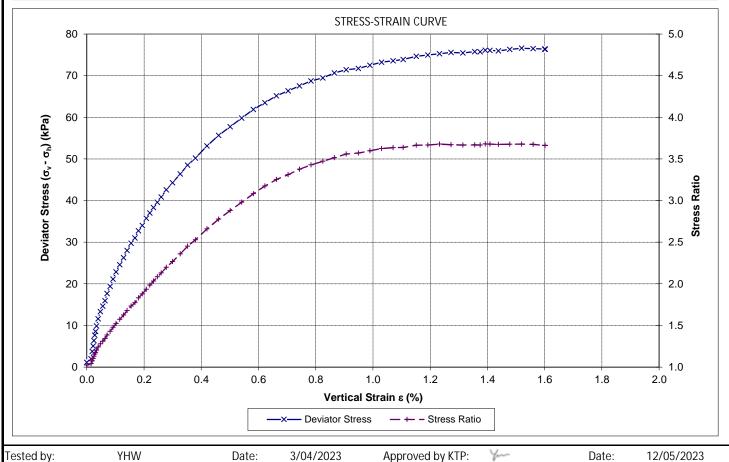
Customer Project ID: EBA\_16

Site: Location ID: DH301 Eastern Busway Sample Ref.:

4.89-4.99 Depth: (m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





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p. +64 9 356 3510

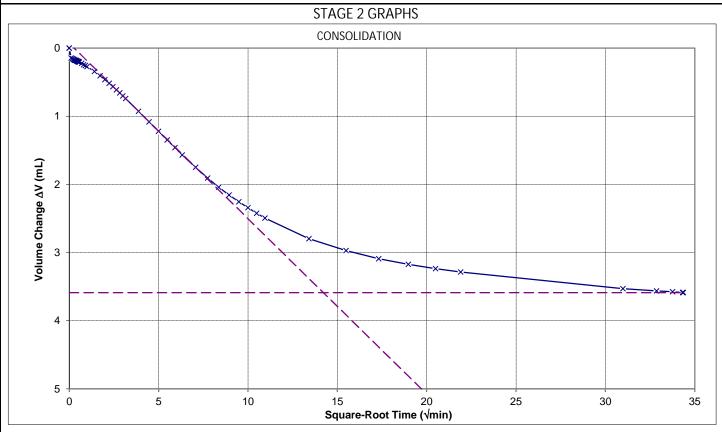
Geotechnics Project ID: QESTLab Work Order ID: 1017784.1000.B.0

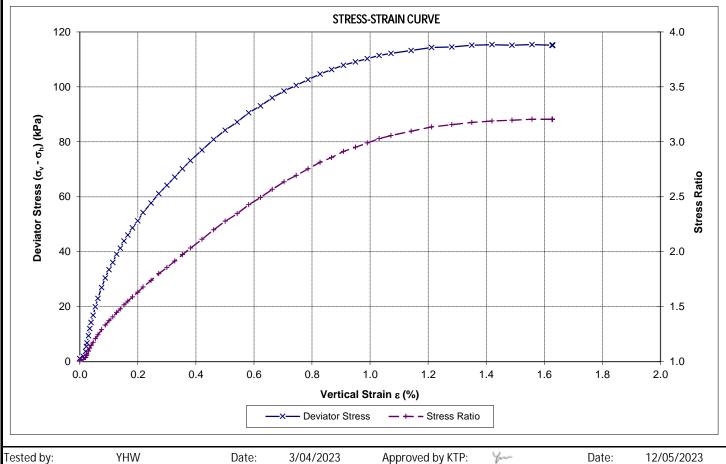
Customer Project ID: EBA\_16

Site: Location ID: DH301 Eastern Busway Sample Ref.:

4.89-4.99 Depth: (m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





Site:

Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

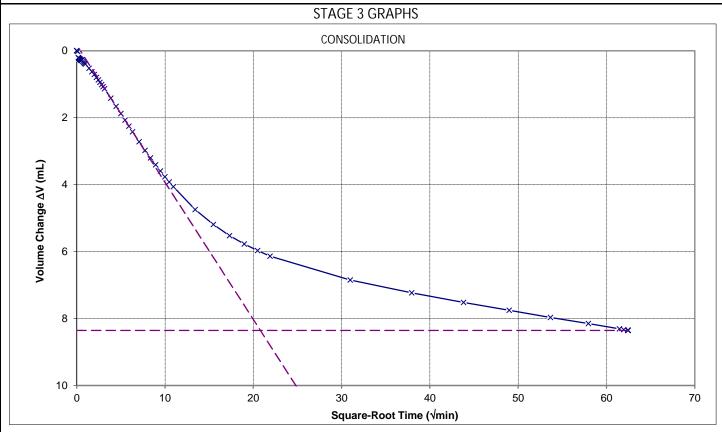
Geotechnics Project ID: 1017784.1000.B.0

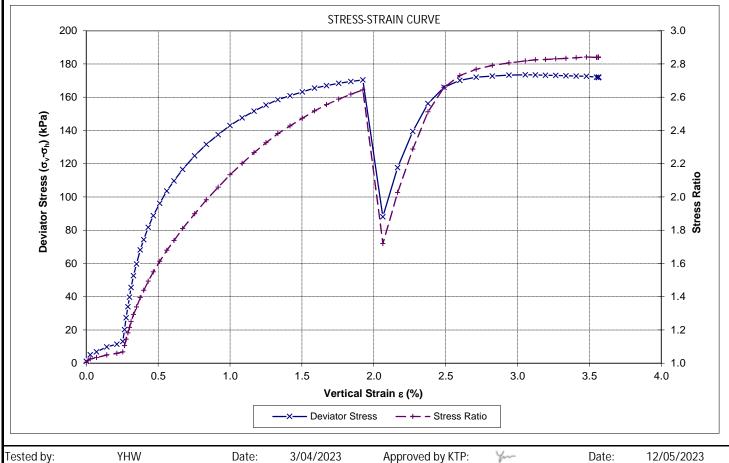
QESTLab Work Order ID:

Customer Project ID: EBA\_16

Location ID: DH301 Eastern Busway 4.89-4.99 Depth:

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:







1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

**Geotechnics Project ID: QESTLab Work Order ID:**  1017784.0000 Phase B

**Customer Project ID:** 

ALCOE-84

DH304

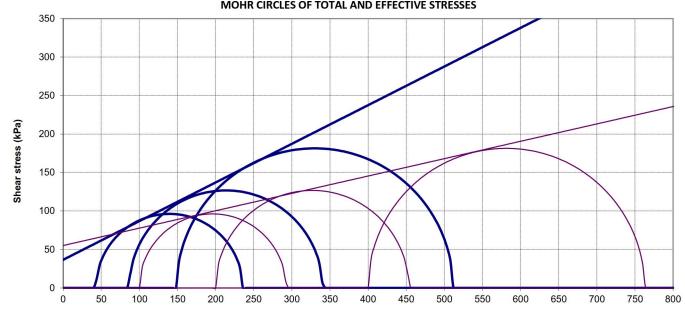
Site: Location ID: Eastern Busway 2

Sample Ref.: Depth: 9.67 - 9.80 (m) Test method used:

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

# CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE) MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES



Normal Stress (kPa)

Total Stress Effective Stress

General Sample Parameters											
Initial Sample Height:	113.05	mm	Initial Water Content:	126	%						
Initial Sample Diameter:	53.81	mm	Initial Bulk Density:	1.28	t/m³						
Initial B Value:	62	%	Initial Dry Density:	0.56	t/m³						
B Value before Consolidation:	96	%	Final Water Content:	116	%						

**Test Results** 

_													
	At the End of Consolidation Stage					Failure Values							
	Effective	Stress	Back	Back Volumetric		Back Volumetric		<b>Deviator Stress</b>	Vertical	Effecti	ve Stress	Correction	s (kPa)
	Horizontal	Vertical	Pressure	Strain	Rate	$(\sigma_{v}' - \sigma_{h}')$	Strain	Vertical	Horizontal	Membrane	Filter P		
	σ <sub>h</sub> '(kPa)	σ <sub>v</sub> -(kPa)	(kPa)	(%)	(%/hr)	(kPa)	ε (%)	σ <sub>v</sub> - (kPa)	σ <sub>h</sub> '(kPa)	$(\Delta \sigma_{\rm v})_{\rm m}$	$(\Delta\sigma_{\rm v})_{\rm fp}$		
Stage 1	100	101	300	2.53	0.00	192.39	2.39	235.69	43.30	0.93	4.70		
Stage 2	200	201	300	2.47	0.01	253.43	2.71	340.23	86.80	1.06	4.72		
Stage 3	400	401	300	7.26	0.01	362.73	6.22	511.43	148.70	2.42	4.82		

Failure Mode & Photo

Planar / Plastic

Total Angle of Frictional Resistance:  $\phi =$ 13 55 Cohesion: c = kPa **Linear Regression Coefficient:** 1.000 r=

**Effective** 27 37 kPa 0.999

Sample History: Undisturbed core trimmed at natural water content.

Soil description: Spongy PEAT, firm, black / dark brown.

0.020

Test Speed:

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

(mm/min)

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by the maximum Deviator stress. Strength parameters have been derived by using a linear

regression fitting method.

Approved Signatory: 3/05/2022 Date:

Our Ref: 1017784.0000PhaseB/Rep7 Page 9 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID: QESTLab Work Order ID:

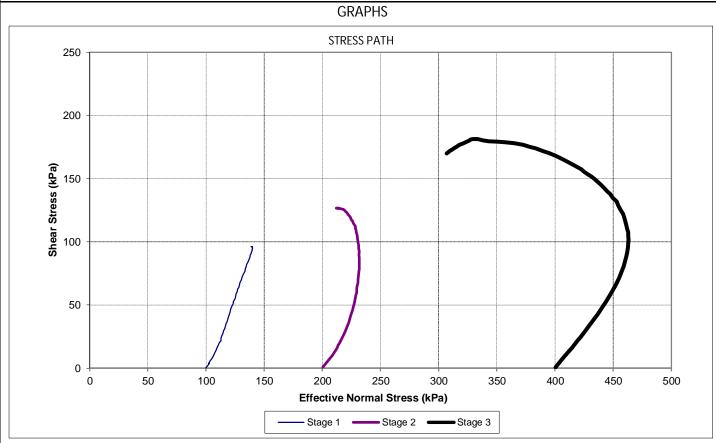
1017784.0000 Phase B

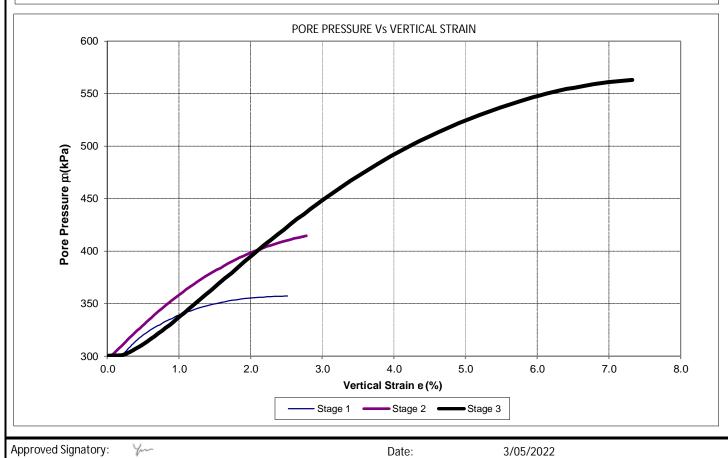
Customer Project ID: ALCOE-84

Location ID: DH304 Site: Eastern Busway 2 Sample Ref.:

9.67 - 9.80 Depth: (m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





Our Ref: 1017784.0000PhaseB/Rep7 Page 10 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

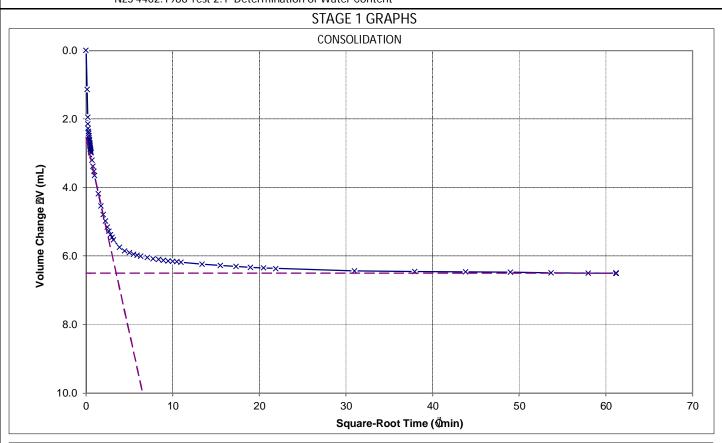
Geotechnics Project ID: QESTLab Work Order ID: 1017784.0000 Phase B

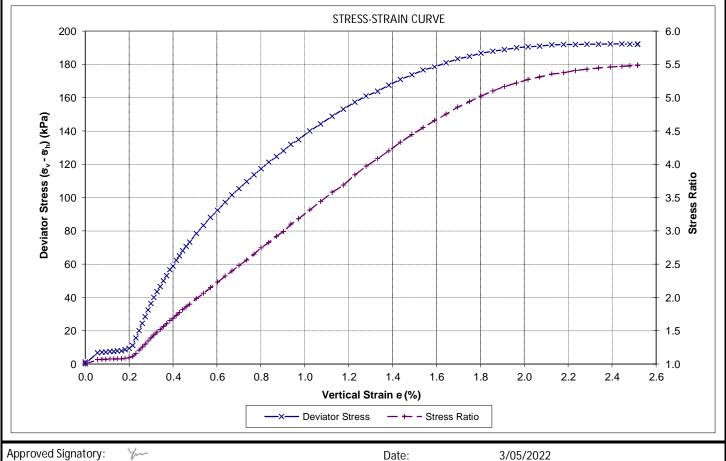
**Customer Project ID:** ALCOE-84

Location ID: DH304 Site: Eastern Busway 2 Sample Ref.:

9.67 - 9.80 Depth: (m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





 Our Ref: 1017784.0000PhaseB/Rep7
 Page 11 of 17



Site:

Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID: QESTLab Work Order ID: 1017784.0000 Phase B

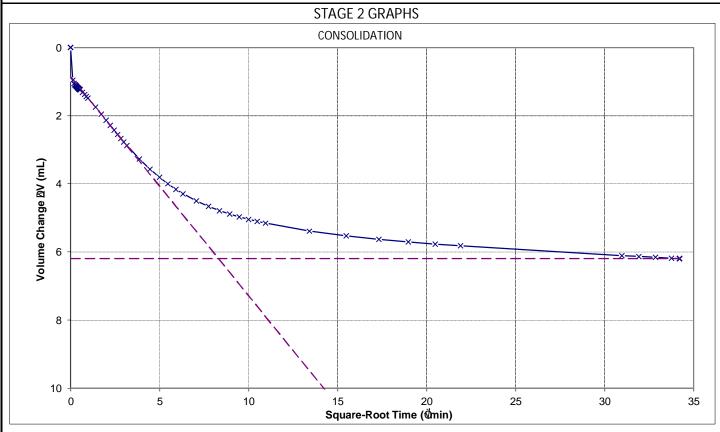
(m)

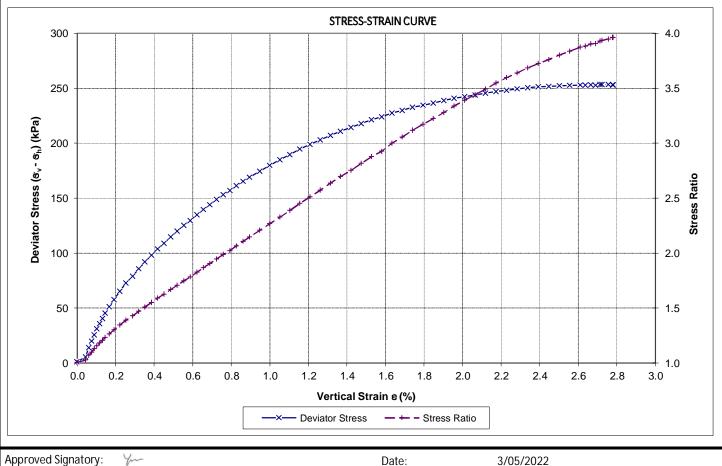
Customer Project ID: ALCOE-84

Eastern Busway 2 Location ID: DH304

Depth: 9.67 - 9.80

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





Our Ref: 1017784.0000PhaseB/Rep7 Page 12 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

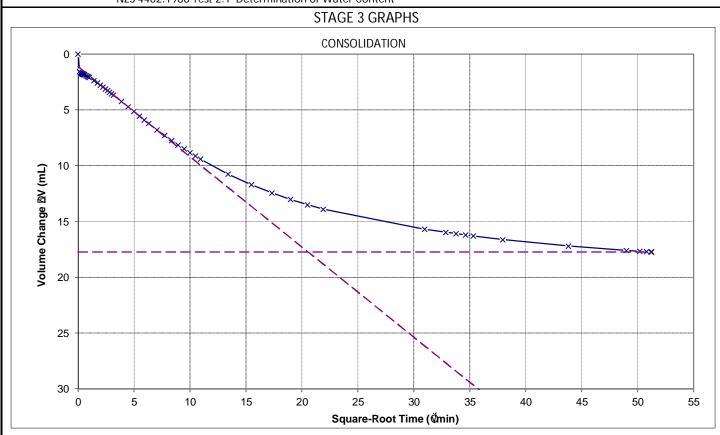
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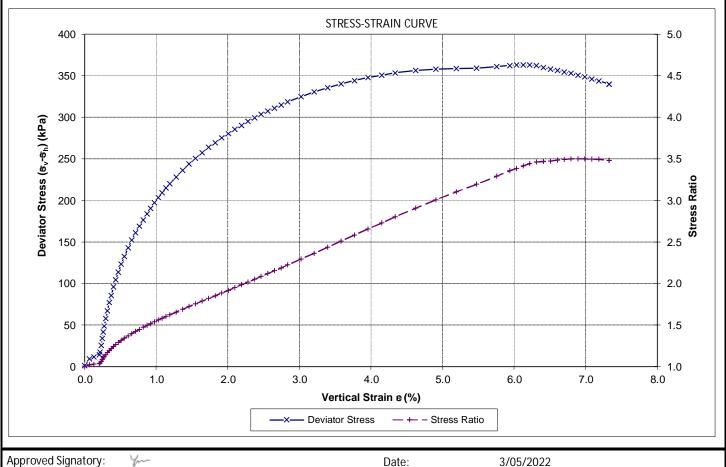
Customer Project ID: ALCOE-84

Location ID: DH304 Site: Eastern Busway 2 Sample Ref.:

9.67 - 9.80 Depth: (m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





1017784.1000 Phase B



1 Hill Street Onehunga Auckland New Zealand

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Geotechnics Project ID: QESTLab Work Order ID:

**Customer Project ID:** 

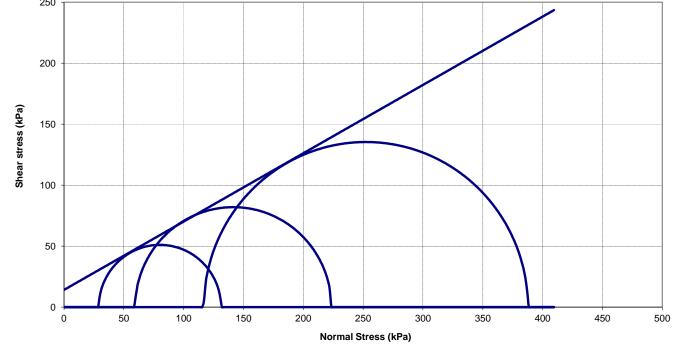
EBA\_11

Location ID: Site: Eastern Busway DH309 Sample Ref.: Depth: 7.77-7.94

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

### CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE) MOHR CIRCLES OF EFFECTIVE STRESSES 250 200



General Sample Parameters											
Initial Sample Height:	106.82	mm	Initial Water Content:	44.7	%						
Initial Sample Diameter:	53.48	mm	Initial Bulk Density:	1.83	t/m³						
Initial B Value:		%	Initial Dry Density:	1.26	t/m³						
B Value before Consolidation:	100	%	Final Water Content:	32.3	%						

						Test Res	ults					
At the End of Consolidation Stage					Failure Values						П	
	Effective		Back		netric	<b>Deviator Stress</b>	Vertical	Effecti	ve Stress	Correction	s (kPa)	Г
	Horizontal <b>σ</b> <sub>h</sub> '(kPa)	Vertical <b>σ</b> <sub>ν</sub> <del>'</del> (kPa)		Strain (%)	Rate (%/hr)	( <b>σ</b> <sub>v</sub> ' - <b>σ</b> <sub>h</sub> ') (kPa)	Strain ε (%)	Vertical <b>σ</b> <sub>v</sub> <del>'</del> (kPa)		Membrane $(\Delta \sigma_v)_m$	Filter P $(\Delta \sigma_v)_{fp}$	
Stage 1	75	76	300	4.61	0.00	102.15	7.42	131.25	29.10	2.35	3.61	İ
Stage 2	150	151	300	3.99	0.01	163.99	5.53	223.49	59.50	1.75	3.57	l
Stage 3	300	301	300	4.43	0.01	270.81	3.65	387.71	116.90	1.16	3.56	ĺ

Effective Strength

Angle of Frictional Resistance: φ' 29 14 kPa Cohesion: c' = Linear Regression Coefficient: 1.000

Sample History: Undisturbed core trimmed at natural water content.

Failure Mode & Photo Planar / Plastic

CLAY, with a trace of sand (fine), soft, light grey; moist, high plasticity Soil description:

Test Speed: 0.023 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by either the maximum effective stress ratio or the maximum deviator stress. Strength parameters have been derived by using a linear regression fitting method.

There was a sudden drop on vertical displacement and vertical load during the 2nd compression stage. The compression frame and measuring devices used for the test was checked and after the compression stage completed, and no issue found.

YHW 24/01/2023 Approved by KTP: 16/03/2023 Tested by: Date: Date:

Test method used:

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Geotechnics Project ID:

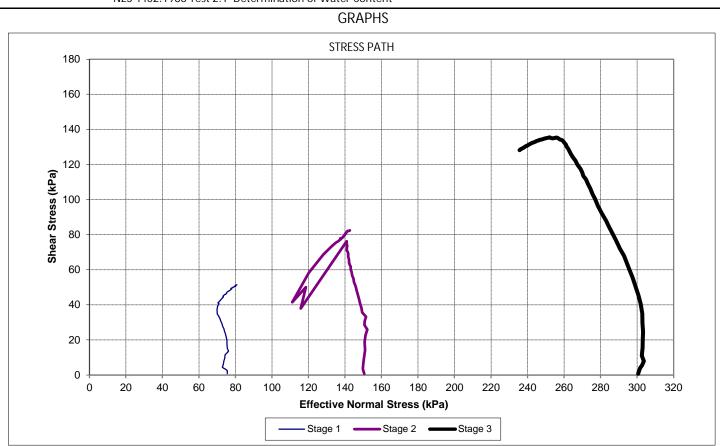
1017784.1000 Phase B

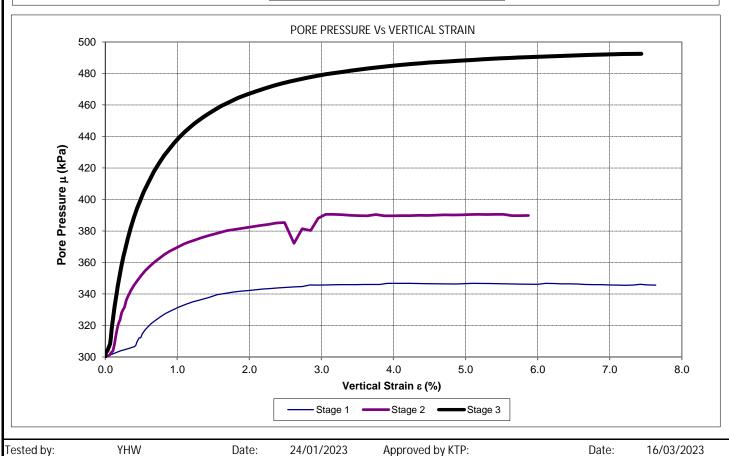
QESTLab Work Order ID:

Customer Project ID: EBA\_11

Location ID: DH309 Site: Eastern Busway 7.77-7.94 Sample Ref.: Depth:

(m) ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





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Geotechnics Project ID:

1017784.1000 Phase B

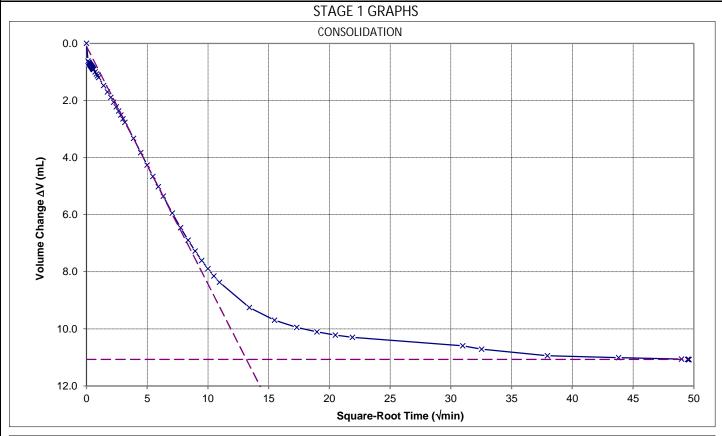
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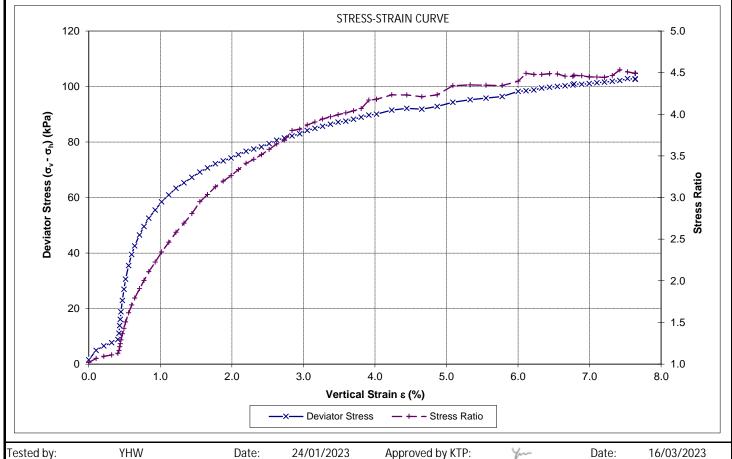
Customer Project ID: EBA\_11

Site: Location ID: DH309 Eastern Busway Sample Ref.:

7.77-7.94 Depth:

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:







Site:

Sample Ref.:

Test method used:

1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID: QESTLab Work Order ID: 1017784.1000 Phase B

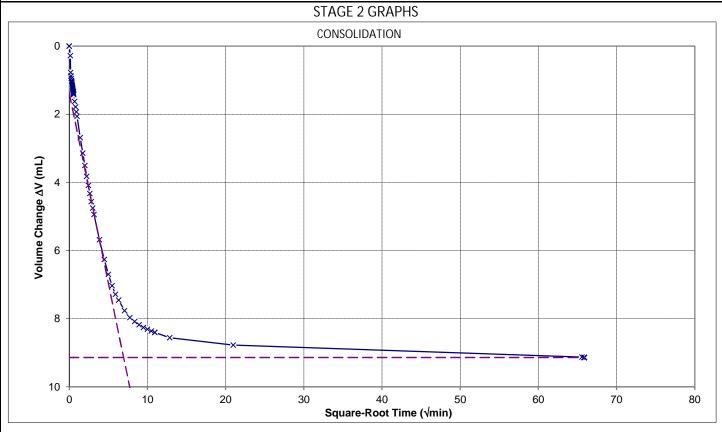
EBA\_11

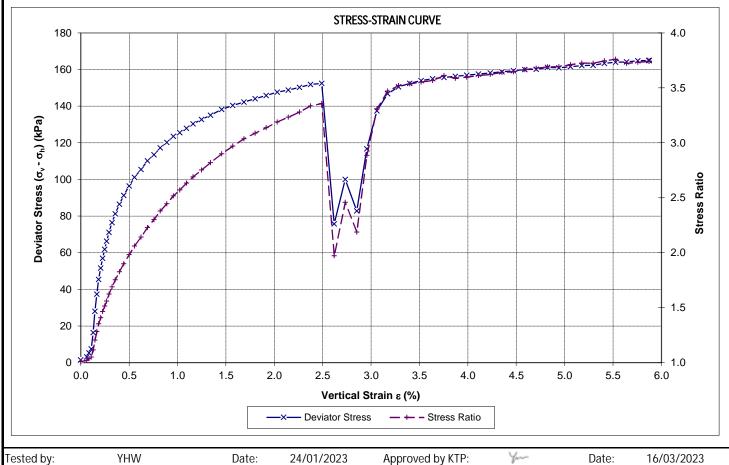
Customer Project ID:

p. +64 9 356 3510

Location ID: DH309 Eastern Busway 7.77-7.94 Depth:

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







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Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

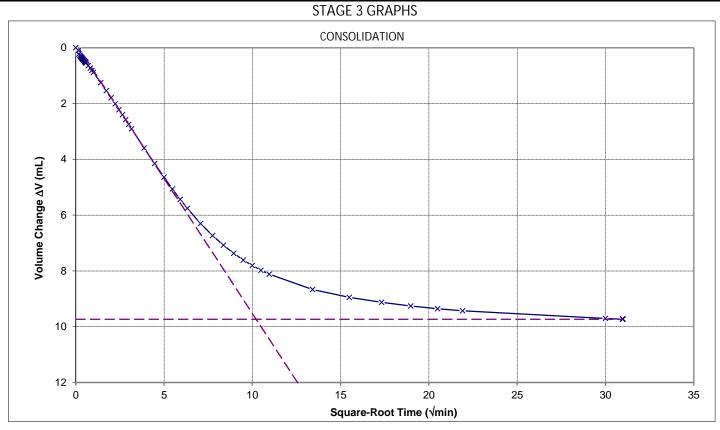
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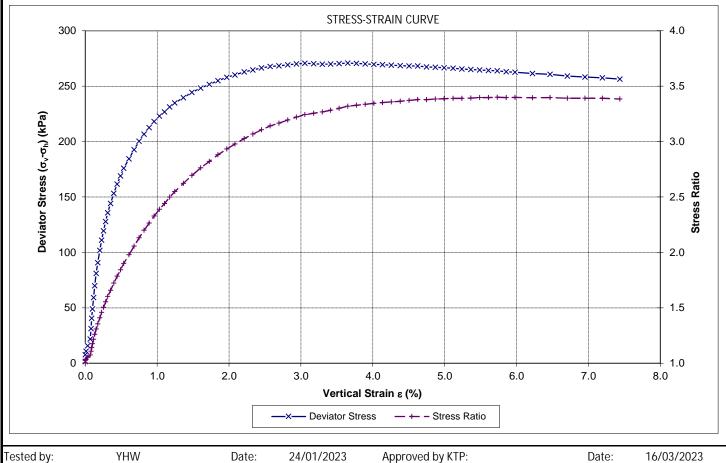
Site: Eastern Busway Sample Ref.:

Location ID: DH309 7.77-7.94 Depth:

(m)

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Test method used:

1 Hill Street Onehunga Auckland

New Zealand p. +64 9 356 3510 Geotechnics Project ID:

Location ID:

1017784.1000 Phase B

QESTLab Work Order ID:

Customer Project ID: EBA\_12

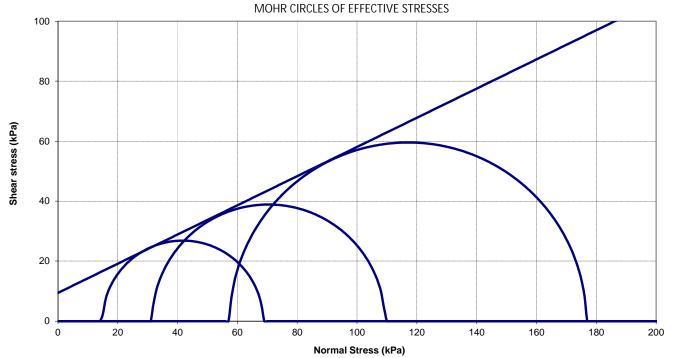
DH314

Site: Eastern Busway
Sample Ref.: --

LSO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

### CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)



General Sample Parameters											
Initial Sample Height:	111.40	mm	Initial Water Content:	38.5	%						
Initial Sample Diameter:	53.37	mm	Initial Bulk Density:	1.76	t/m³						
Initial B Value:	22	%	Initial Dry Density:	1.27	t/m³						
B Value before Consolidation:	96	%	Final Water Content:	39.4	%						

Test Results

	At the End of Consolidation Stage						Failure Values									
	Effective		Back		Volumetric		Volumetric		Volumetric		<b>Deviator Stress</b>	Vertical	Effectiv	ve Stress	Correction	s (kPa)
	Horizontal			Strain	Rate		$(\boldsymbol{\sigma}_{v}' - \boldsymbol{\sigma}_{h}')$	Strain			Membrane					
	<b>σ</b> <sub>h</sub> '(kPa)	<b>σ</b> √(kPa)	(kPa)	(%)	(%/hr)		(kPa)	ε (%)	<b>σ</b> √ (kPa)	<b>σ</b> <sub>h</sub> (kPa)	$(\Delta\sigma_{\rm v})_{\rm m}$	$(\Delta \sigma_{\rm v})_{\rm fp}$				
Stage 1	25	26	300	0.48	0.00		53.69	0.84	68.59	14.90	0.19	1.49				
Stage 2	50	51	300	0.85	0.00		77.77	2.60	109.27	31.50	0.58	3.57				
Stage 3	100	101	300	1.43	0.01		119.13	4.27	176.63	57.50	0.96	3.56				

Effective Strength

Angle of Frictional Resistance:  $\phi'=26$  ° Cohesion: c'=9 kF Linear Regression Coefficient: r=1.000

Sample History: Undisturbed core trimmed at natural water content.

9 kPa 1.000

 $Soil \ description: \qquad silty \ CLAY, \ firm, \ light \ grey \ with \ orange \ and \ brown; \ high \ plasticity, \ moist$ 

Test Speed: 0.012 - 0.022 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear

regression fitting method.

Tested by: YHW Date: 24/02/2023 Approved by KTP: \( \sqrt{--} \) Date: 17/03/2023

Failure Mode & Photo
Planar / Plastic

Test method used:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

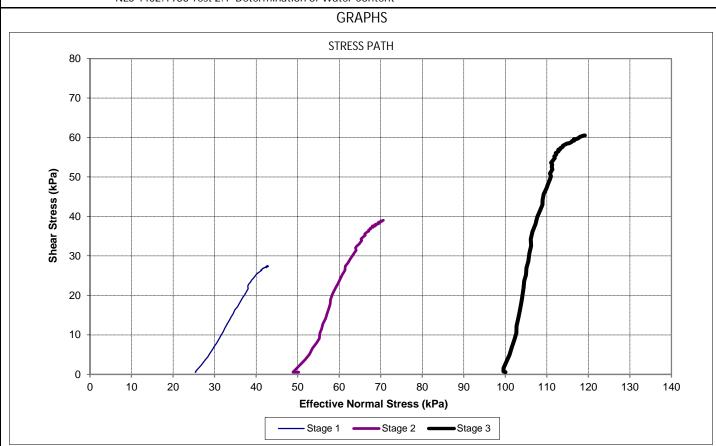
1017784.1000 Phase B

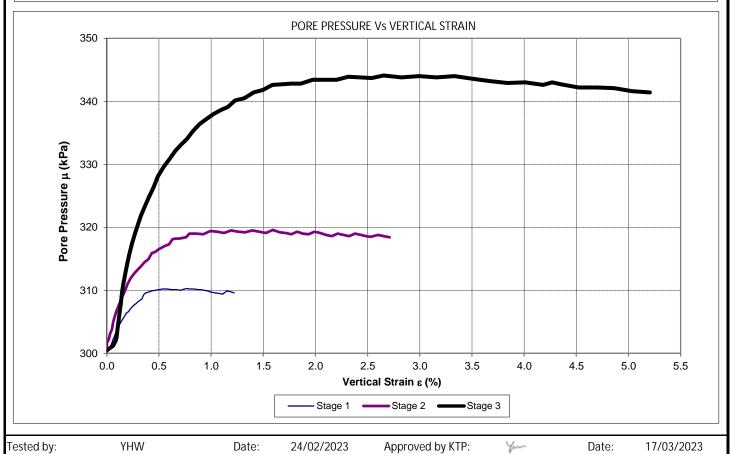
QESTLab Work Order ID:

**Customer Project ID:** EBA\_12

Site: Location ID: DH314 Eastern Busway Sample Ref.:

Depth: 1.88-2.00 (m) ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





Test method used:

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p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

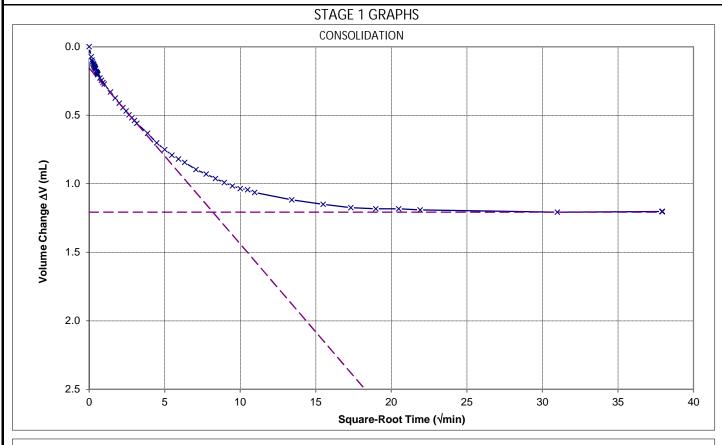
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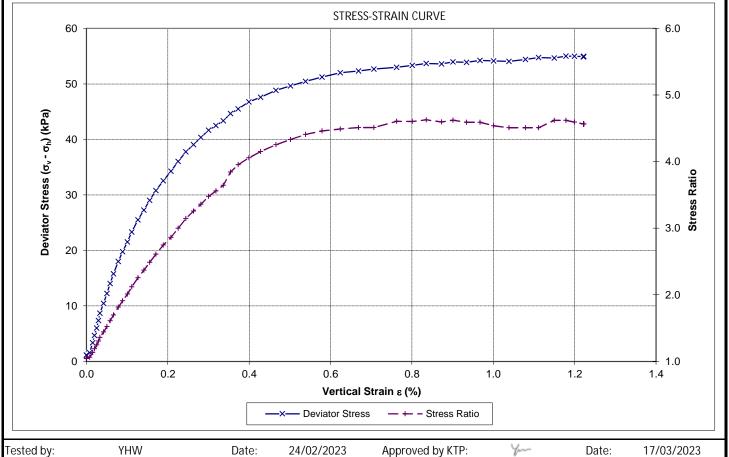
**Customer Project ID:** EBA\_12

Site: Location ID: DH314 Eastern Busway Sample Ref.:

Depth: 1.88-2.00

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** EBA\_12

DH314

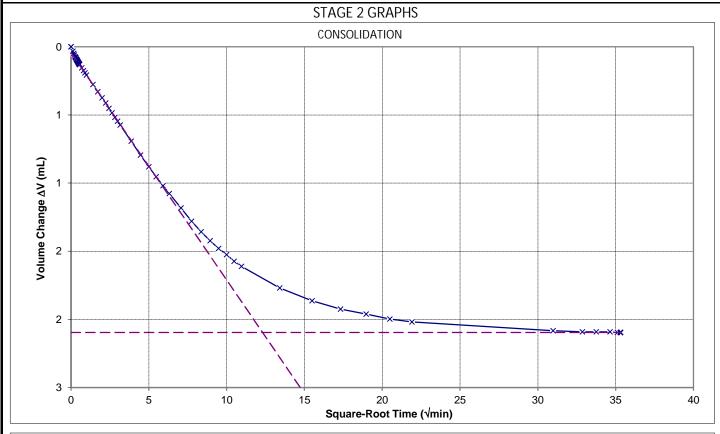
1.88-2.00

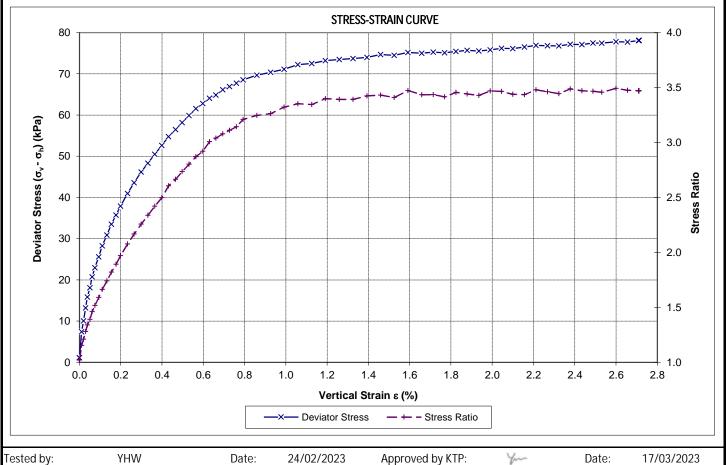
Site: Eastern Busway

Location ID: Depth:

(m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:







Test method used:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID: QESTLab Work Order ID: 1017784.1000 Phase B

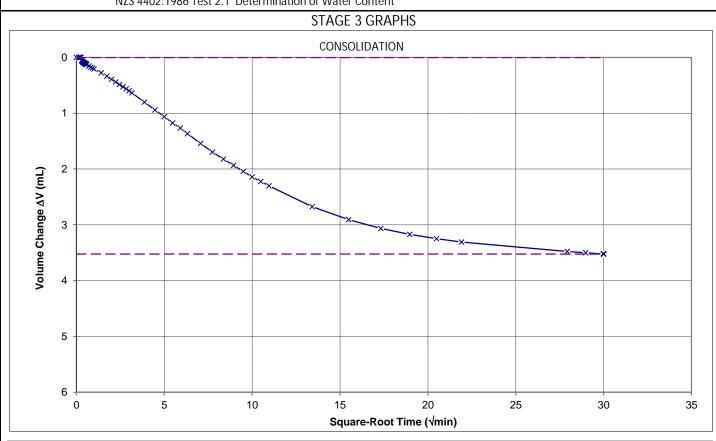
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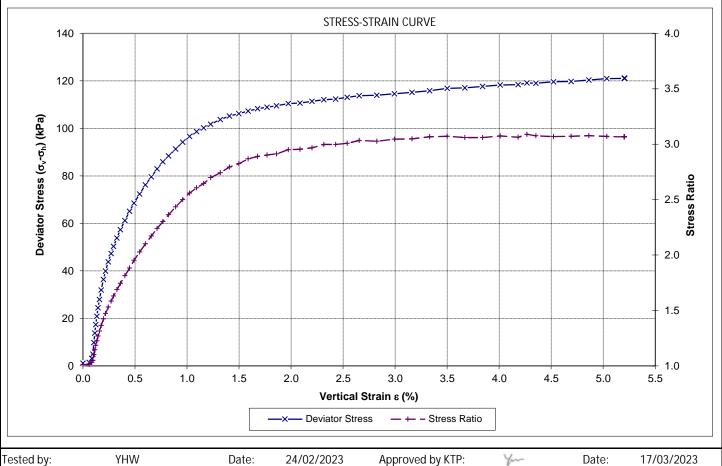
Site: Location ID: Eastern Busway Sample Ref.:

Depth: 1.88-2.00

DH314

(m) ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







1 Hill Street Onehunga Auckland

New Zealand p. +64 9 356 3510 Geotechnics Project ID: QESTLab Work Order ID: 1017784.0000 Phase B

Customer Project ID: ALCOE-103

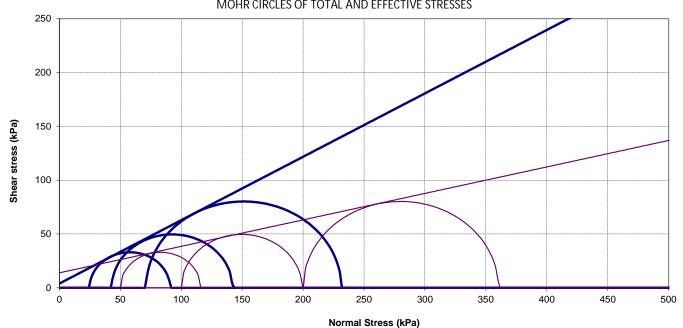
DH326

Site: Eastern Busway 2 Location ID:

Sample Ref.: Depth: 4.66 - 4.79 Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

### CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE) MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES



Total Stress Effective Stress

General Sample Parameters										
Initial Sample Height:	113.58	mm	Initial Water Content:	115	%					
Initial Sample Diameter:	53.77	mm	Initial Bulk Density:	1.37	t/m³					
Initial B Value:	62	%	Initial Dry Density:	0.64	t/m³					
B Value before Consolidation:	96	%	Final Water Content:	99.2	%					

**Test Results** 

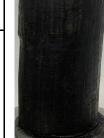
	At th	ne End of	Consolida	tion Stag	je		Failure Values							
	Effective	Stress	Back	Volun	Volumetric		Volumetric		<b>Deviator Stress</b>	Vertical	Effectiv	Effective Stress		s (kPa)
	Horizontal			Strain	Rate		( <b>s</b> <sub>v</sub> ' - <b>s</b> <sub>h</sub> ')	Strain			Membrane			
	<b>s</b> h'(kPa)	<b>s</b> <sub>v</sub> -(kPa)	(kPa)	(%)	(%/hr)		(kPa)	e (%)	<b>s</b> <sub>v</sub> - (kPa)	<b>s</b> h'(kPa)	$(\mathbf{Ds}_{v})_{m}$	$(\mathbf{Ds}_{v})_{fp}$		
Stage 1	50	51	300	2.65	0.00		66.01	4.26	90.81	24.80	1.66	4.71		
Stage 2	100	101	300	3.45	0.01		99.22	3.79	142.12	42.90	1.47	4.72		
Stage 3	200	201	300	6.33	0.03		160.33	5.47	231.43	71.10	2.13	4.80		

Total 14

Effective 30 f = 14 kPa C' = 4 kPa C = 1.000 1.000 r=

Sample History: Undisturbed core trimmed at natural water content. Planar / Plastic

Failure Mode & Photo



Soil description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Speed: 0.019 - 0.026 (mm/min)

Angle of Frictional Resistance:

Linear Regression Coefficient:

Cohesion:

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by the maximum Deviator stress. Strength parameters have been derived by using a linear

regression fitting method.

Approved Signatory:



Date:

1/07/2022

1 Hill Street Onehunga Auckland New Zealand

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Geotechnics Project ID:

1017784.0000 Phase B

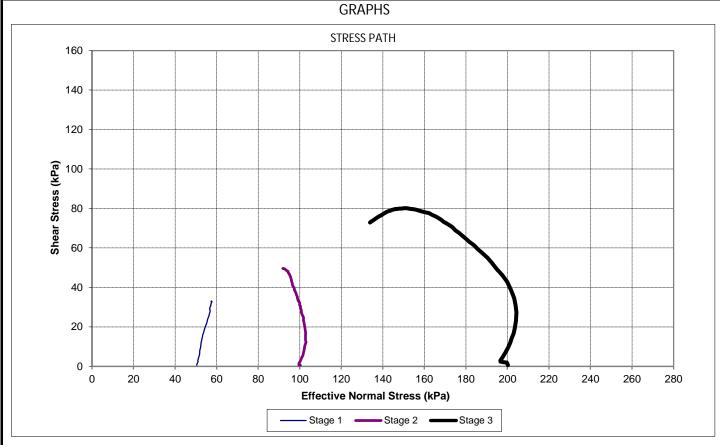
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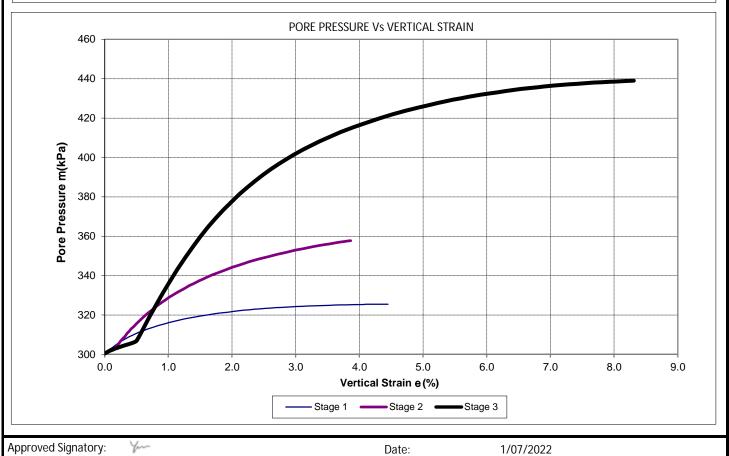
**Customer Project ID:** ALCOE-103

Site: Eastern Busway 2 Sample Ref.:

Location ID: DH326 Depth: 4.66 - 4.79

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:





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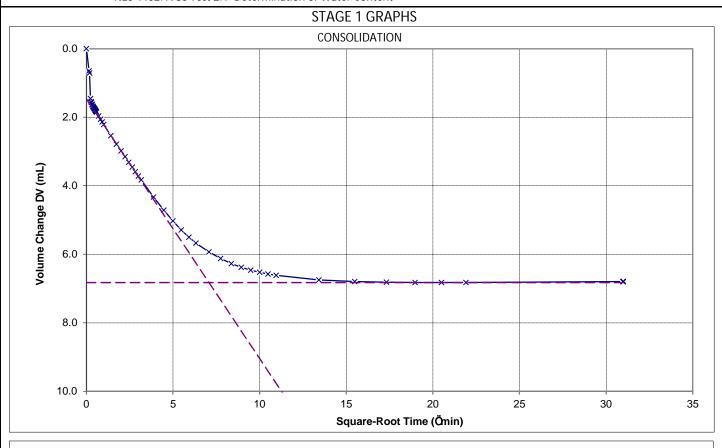
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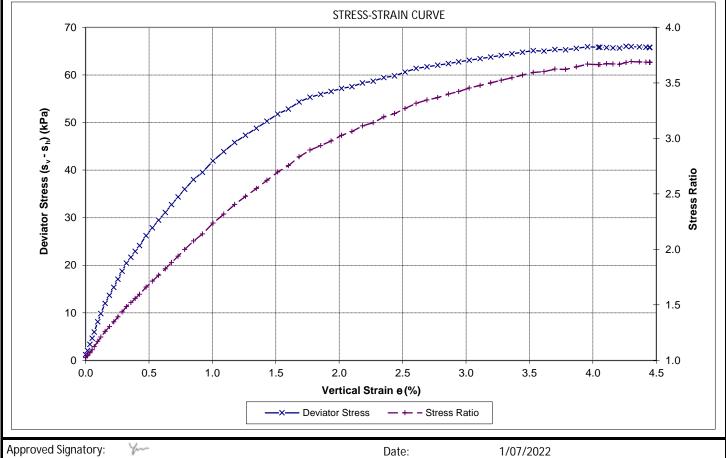
Customer Project ID: ALCOE-103

Site: Eastern Busway 2 Sample Ref.:

Location ID: DH326 Depth: 4.66 - 4.79

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Test method used:

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Geotechnics Project ID:

1017784.0000 Phase B

QESTLab Work Order ID:

Customer Project ID:

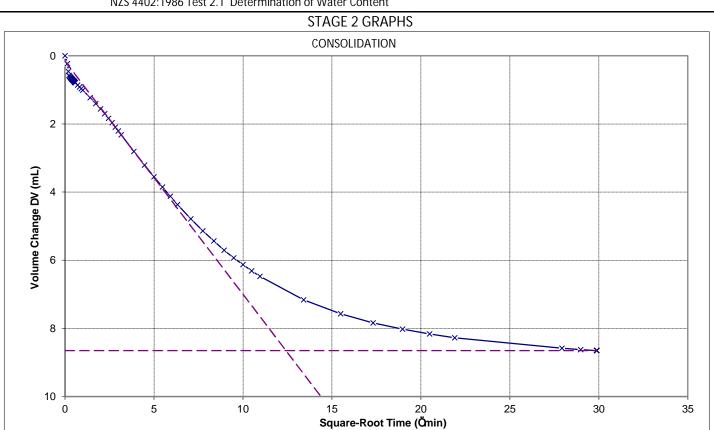
ALCOE-103

Site: Sample Ref.:

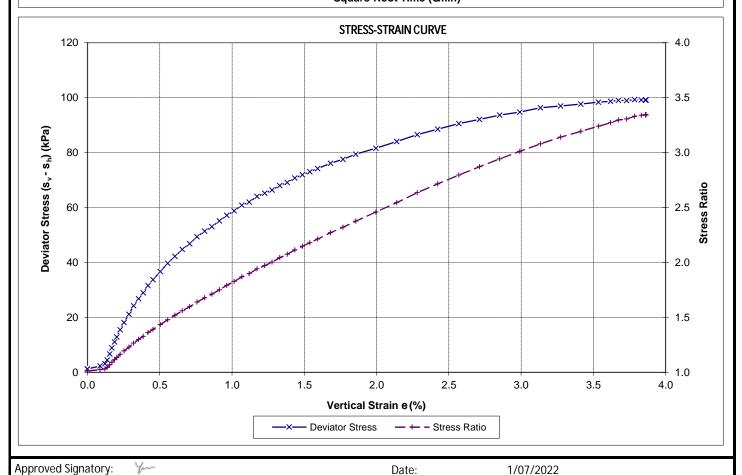
Location ID: Eastern Busway 2

DH326 Depth: 4.66 - 4.79

NZS 4402:1986 Test 2.1 Determination of Water Content



ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





Sample Ref.:

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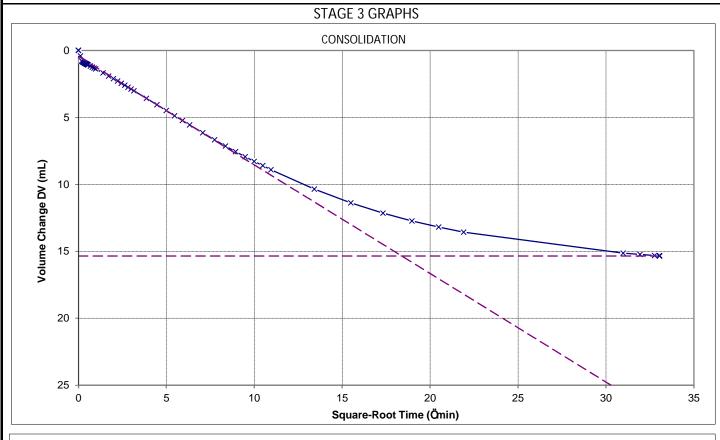
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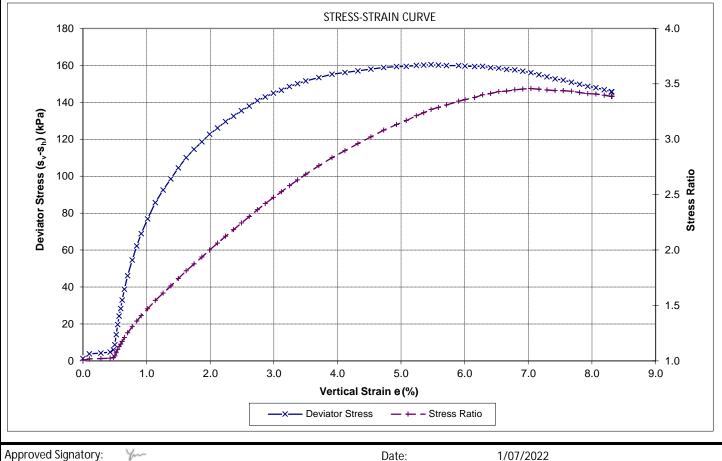
Customer Project ID: ALCOE-103

Site: Eastern Busway 2

Location ID: DH326 Depth: 4.66 - 4.79

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







1 Hill Street Onehunga Auckland

New Zealand p. +64 9 356 3510 Geotechnics Project ID: QESTLab Work Order ID:

Location ID:

1017784.0000 Phase B

Customer Project ID: A

DH329

ALCOE-103

Site: Eastern Busway 2

Sample Ref.: -Test method used: ISO 17

- Depth: 8.82-8.98

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

### CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE) MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES 300 250 200 Shear stress (kPa) 150 100 50 100 150 200 250 300 350 400 450 500 550 600

Normal Stress (kPa)

Effective Stress —— Total Stress

General Sample Parameters										
Initial Sample Height:	114.63	mm	Initial Water Content:	33.9	%					
Initial Sample Diameter:	54.03	mm	Initial Bulk Density:	1.90	t/m³					
Initial B Value:		%	Initial Dry Density:	1.42	t/m³					
B Value before Consolidation:	98	%	Final Water Content:	32.0	%					

<b>Test Results</b>	
---------------------	--

	At th	ne End of	Consolida	tion Stag	je	Failure Values							
	Effective	Stress	Back	Volumetric		<b>Deviator Stress</b>	Vertical	Effecti	ve Stress	Correction	s (kPa)		
	Horizontal			Strain	Rate	( <b>s</b> <sub>v</sub> ' - <b>s</b> <sub>h</sub> ')	Strain						
	<b>s</b> h'(kPa)	<b>s</b> <sub>v</sub> -(kPa)	(kPa)	(%)	(%/hr)	(kPa)	e (%)	s√ (kPa)	<b>s</b> h'(kPa)	$(\mathbf{Ds}_{v})_{m}$	$(\mathbf{Ds}_{v})_{fp}$		
Stage 1	75	76	300	2.71	0.00	117.02	2.55	167.02	50.00	0.99	4.69		
Stage 2	150	151	300	1.49	0.00	178.33	2.49	273.03	94.70	0.97	4.67		
Stage 3	300	301	300	2.51	0.00	289.93	3.45	477.43	187.50	1.34	4.68		

Effective

c' = 19 kPa

r = 1.000

Sample History: Undisturbed core trimmed at natural water content.

C =

r=

Soil description: clayey SILT, stiff, blueish grey.

Angle of Frictional Resistance:

Linear Regression Coefficient:

Cohesion:

Test Speed: 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

Total

16

23

1.000

kPa

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear

regression fitting method.

Approved Signatory: Date: 13/07/2022

Failure Mode & Photo
Planar / Plastic



Test method used:

1 Hill Street Onehunga Auckland

p. +64 9 356 3510

Geotechnics Project ID: QESTLab Work Order ID: 1017784.0000 Phase B

New Zealand

**Customer Project ID:** 

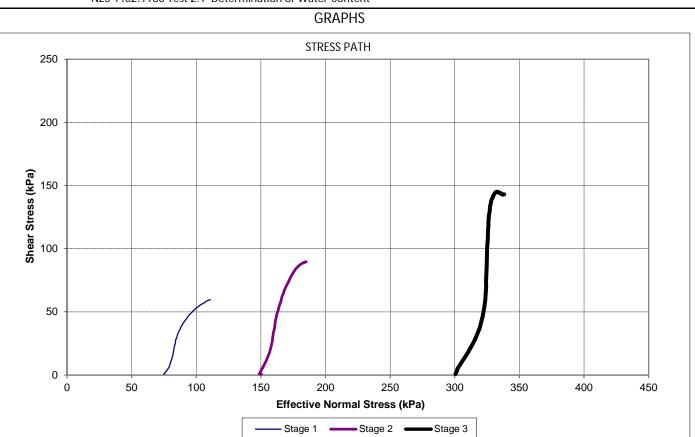
ALCOE-103

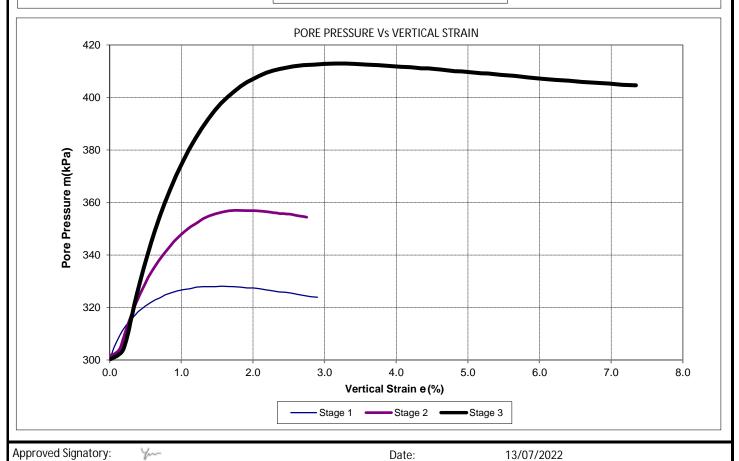
DH329

Site: Eastern Busway 2 Sample Ref.:

Location ID: Depth:

8.82-8.98 (m) ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.0000 Phase B

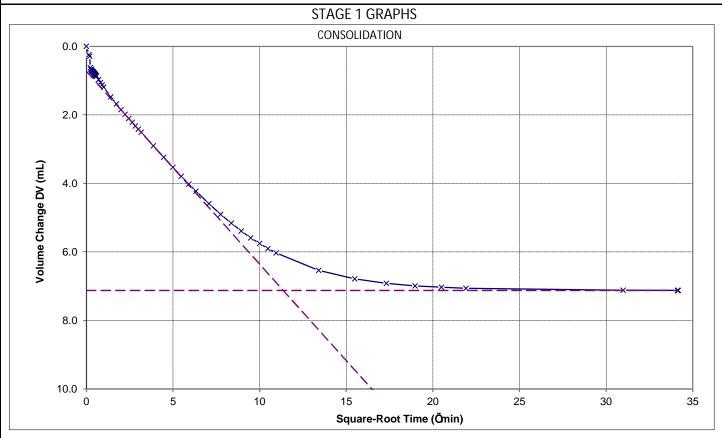
QESTLab Work Order ID:

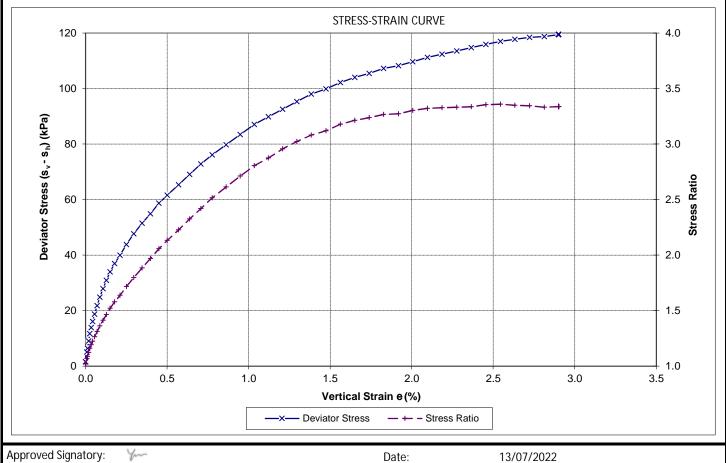
**Customer Project ID:** ALCOE-103

Site: Eastern Busway 2

Location ID: DH329 Depth: 8.82-8.98

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.0000 Phase B

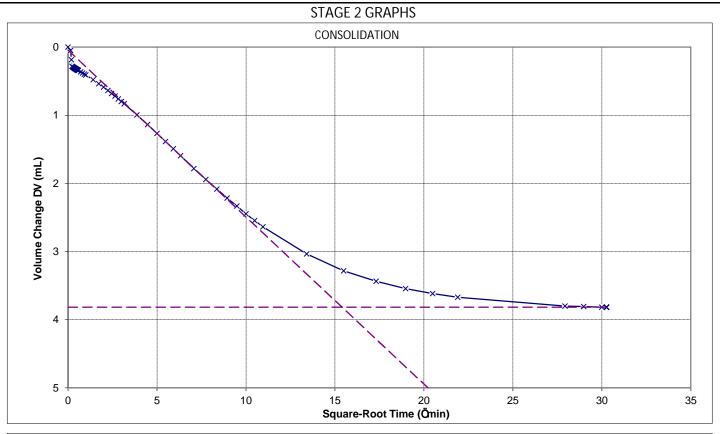
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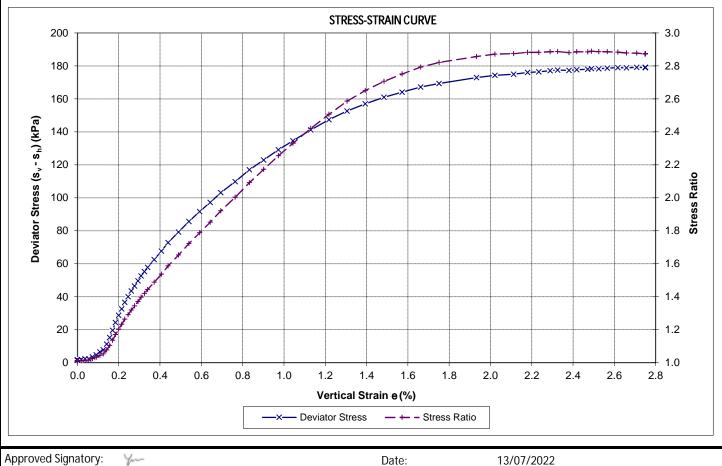
**Customer Project ID:** ALCOE-103

Site: Eastern Busway 2

Location ID: DH329 Depth: 8.82-8.98

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID:

1017784.0000 Phase B

QESTLab Work Order ID:

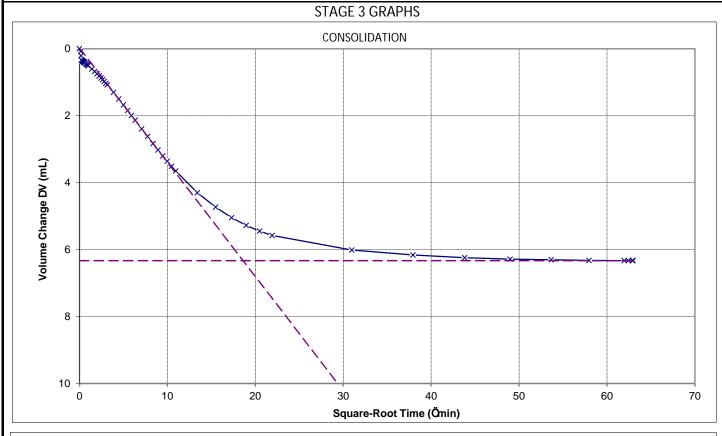
Customer Project ID: ALCOE-103

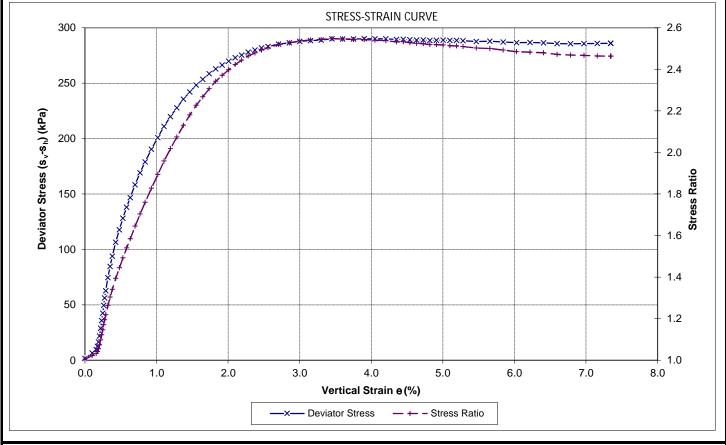
p. +64 9 356 3510 Site: Eastern Busway 2

Location ID: DH329 Depth: 8.82-8.98

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content





Date:

13/07/2022

Approved Signatory:



Test method used:

1 Hill Street Onehunga Auckland

New Zealand p. +64 9 356 3510 Geotechnics Project ID: QESTLab Work Order ID:

Depth:

1017784.0000 Phase B

Customer Project ID:

ALCOE-103

DH329

12.18 - 12.30

Site: Eastern Busway 2 Location ID: Sample Ref.:

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)

NZS 4402:1986 Test 2.1 Determination of Water Content

### CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE) MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES 300 250 200 Shear stress (kPa) 150 100 50 50 100 150 200 250 300 350 400 450 500 550 600 Normal Stress (kPa) Effective Stress - Total Stress

		General Sample	e Parameters		
Initial Sample Height:	113.88	mm	Initial Water Content:	200	%
Initial Sample Diameter:	54.25	mm	Initial Bulk Density:	1.19	t/m³
Initial B Value:	6	%	Initial Dry Density:	0.40	t/m³
B Value before Consolidation:	100	%	Final Water Content:	181	%
		Test Re	esults		

	TOST NOSURIS															
	At th	ne End of	Consolida	tion Stag	je			Failure Values								
	Effective	Stress	Back	Volur	Volumetric		Volumetric		<b>Deviator Stress</b>	Deviator Stress   Vertical   Effective Stre		ve Stress	Corrections (kPa)		Planar / Plastic	
	Horizontal			Strain	Rate		( <b>s</b> <sub>v</sub> ' - <b>s</b> <sub>h</sub> ')	Strain			Membrane		Tianai / Tiastic			
	<b>s</b> h'(kPa)	<b>s</b> <sub>v</sub> -(kPa)	(kPa)	(%)	(%/hr)		(kPa)	e (%)	<b>s</b> <sub>v</sub> -' (kPa)	<b>s</b> h'(kPa)	$(\mathbf{Ds}_{v})_{m}$	$(\mathbf{Ds}_{v})_{fp}$				
Stage 1	75	76	300	2.17	0.00		163.85	2.59	170.55	6.70	0.60	4.66	1 3 1			
Stage 2	150	151	300	2.48	0.01		187.69	3.03	213.69	26.00	0.71	4.68				
Stage 3	300	301	300	7.97	0.03		244.71	5.67	309.71	65.00	1.32	4.78	\$ 1 July 1			

Total

9 58 kPa C =

0.999

Effective 24 50 kPa 1.000

Sample History: Undisturbed core trimmed at natural water content.

r=

Soil description: peaty CLAY, black; soft, wet, high plasticity

Test Speed: 0.018 - 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by the maximum Deviator stress. Strength parameters have been derived by using a linear

regression fitting method.

Approved Signatory:

Angle of Frictional Resistance:

Linear Regression Coefficient:

Cohesion:

Date:

1/07/2022



Sample Ref.:

Test method used:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.0000 Phase B

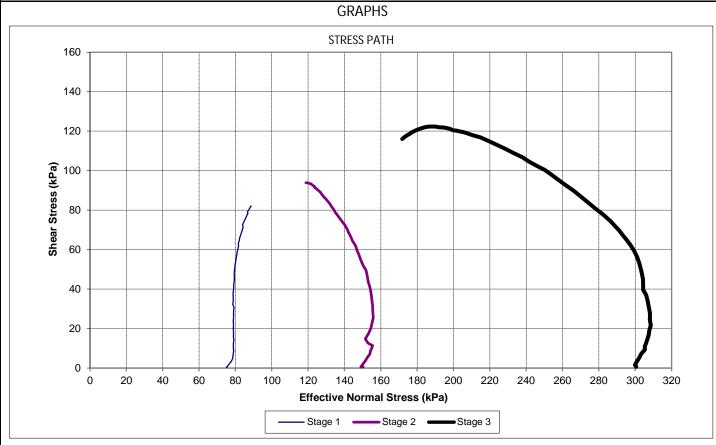
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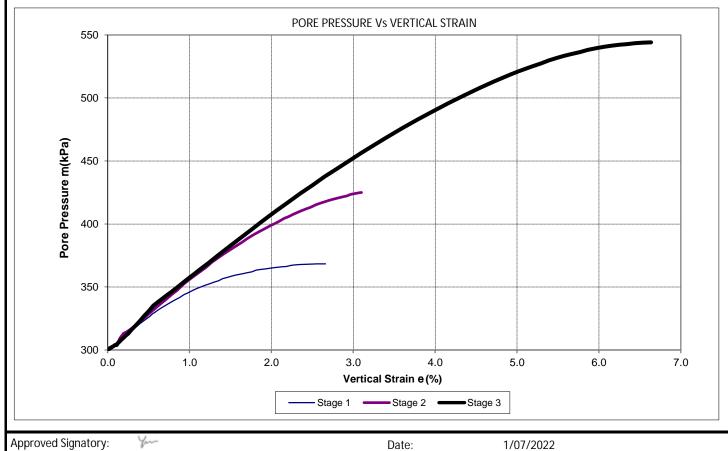
**Customer Project ID:** ALCOE-103

Site: Eastern Busway 2

Location ID: DH329 Depth: 12.18 - 12.30

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID:

1017784.0000 Phase B

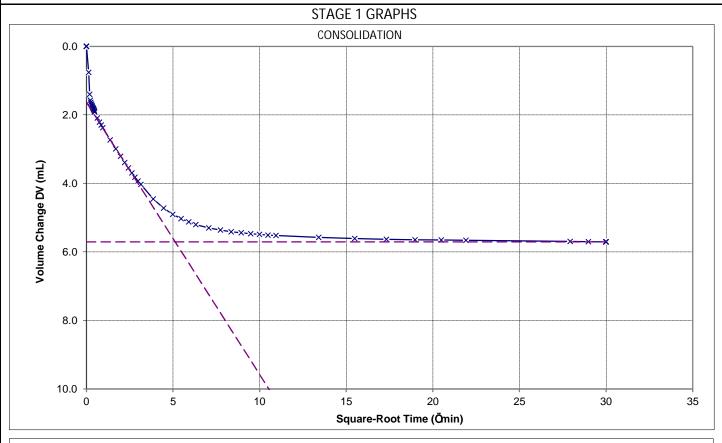
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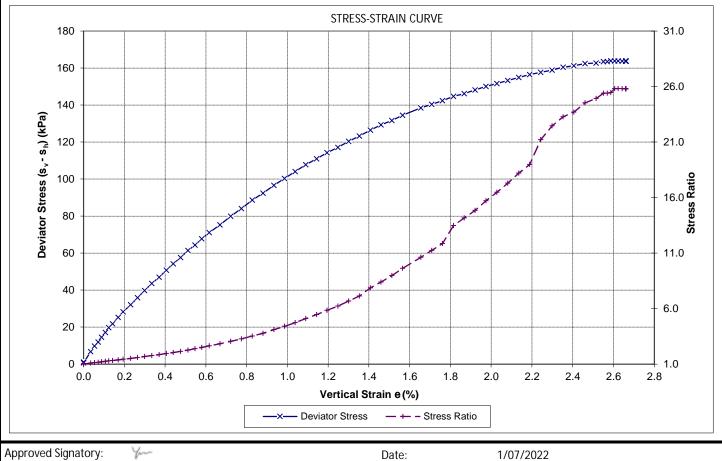
**Customer Project ID:** ALCOE-103

p. +64 9 356 3510 Site: Eastern Busway 2

Location ID: DH329 Depth: 12.18 - 12.30

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

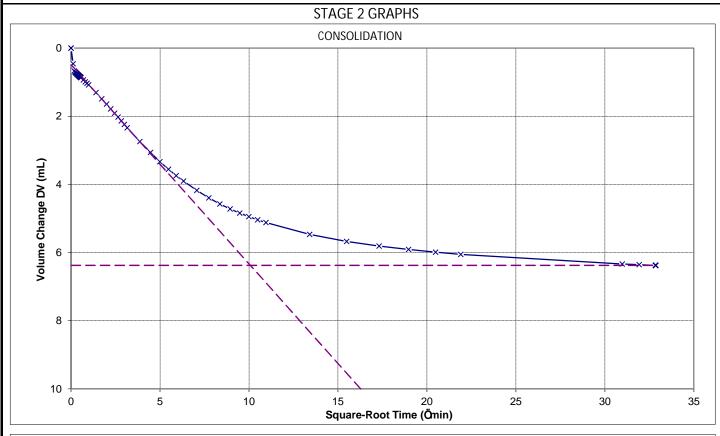
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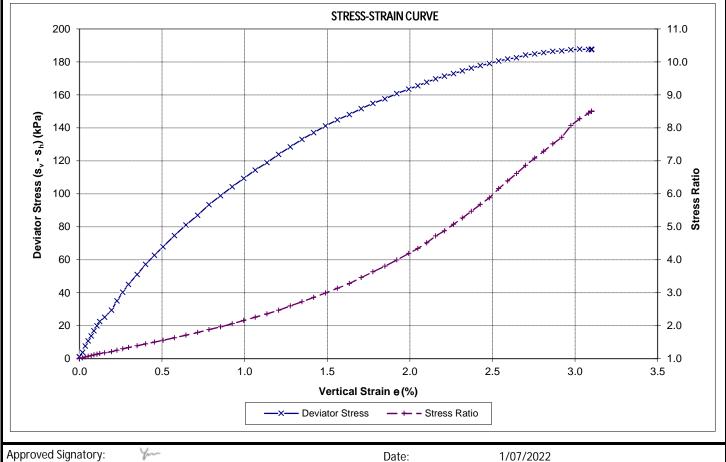
Customer Project ID: ALCOE-103

Site: Eastern Busway 2

Location ID: DH329 Depth: 12.18 - 12.30

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Sample Ref.:

Test method used:

1 Hill Street Onehunga Auckland New Zealand

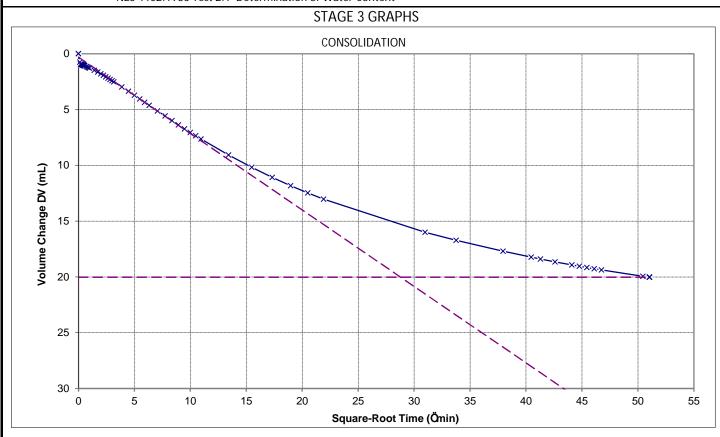
Geotechnics Project ID: QESTLab Work Order ID: 1017784.0000 Phase B

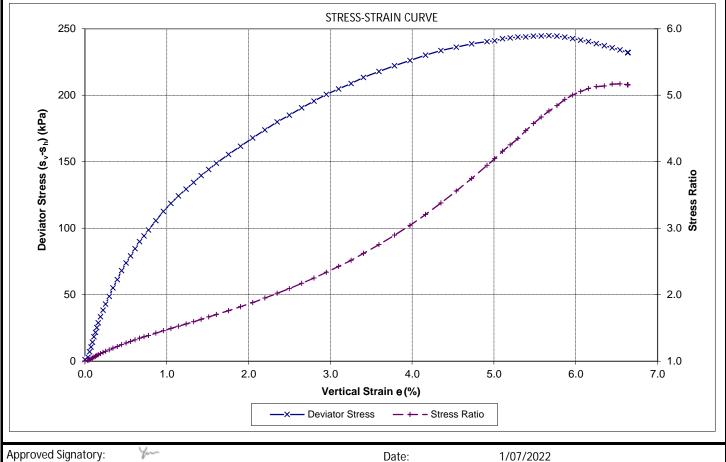
Customer Project ID: ALCOE-103

p. +64 9 356 3510 Site: Eastern Busway 2

Location ID: DH329 Depth: 12.18 - 12.30

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)







Test method used:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

**Geotechnics Project ID: QESTLab Work Order ID:** 

Location ID:

1017784.0000 Phase B

(m)

**Customer Project ID:** ALCOE-84

DH330

Site: Eastern Busway 2

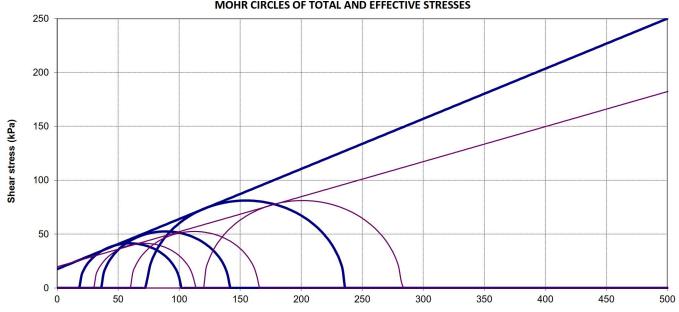
Sample Ref.:

Depth: 3.19 - 3.31

NZS 4402:1986 Test 2.1 Determination of Water Content

# CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE) MOHR CIRCLES OF TOTAL AND EFFECTIVE STRESSES

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)



Normal Stress (kPa)

Total Stress Effective Stress

		General San	nple Parameters		
Initial Sample Height:	111.74	mm	Initial Water Content:	38.9	%
Initial Sample Diameter:	54.28	mm	Initial Bulk Density:	1.83	t/m³
Initial B Value:		%	Initial Dry Density:	1.32	t/m³

**Test Results** 

	At ti	he End of	Consolida	tion Sta	ge				Failure V	alues			П
	Effective	Stress	Back	Volu	netric		<b>Deviator Stress</b>	Vertical	Effectiv	ve Stress	Correction	s (kPa)	Γ
	Horizontal	The second second second second	SO OF THE PROPERTY OF THE PARTY	Strain	Rate		(σ <sub>v</sub> ' - σ <sub>h</sub> ')	Strain			Membrane		
	σ <sub>h</sub> '(kPa)	σ <sub>v</sub> -(kPa)	(kPa)	(%)	(%/hr)		(kPa)	ε (%)	σ <sub>v</sub> - (kPa)	σ <sub>h</sub> '(kPa)	$(\Delta\sigma_{\rm v})_{\rm m}$	$(\Delta \sigma_{\rm v})_{\rm fp}$	
Stage 1	30	31	400	0.91	0.01		82.81	1.07	101.11	18.30	0.42	2.48	l
Stage 2	60	61	400	0.49	0.00		104.87	0.84	141.17	36.30	0.33	1.94	l
Stage 3	120	121	400	0.88	0.00		162.24	1.30	235.74	73.50	0.50	3.01	

Failure Mode & Photo

%

40.0

Planar / Plastic

**Total** Angle of Frictional Resistance:  $\phi =$ 18 Cohesion: 20 c = kPa **Linear Regression Coefficient:** 0.998 r=

**Effective** 25 17 kPa 0.999

**Final Water Content:** 

Undisturbed core trimmed at natural water content. Sample History:

Soil description: SILT, clayey, firm to stiff, greenish/bluish grey with light grey.

Test Speed: 0.012 - 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.

It was drained from radial boundary and both ends in the consolidation stages.

Failure for each stage was determined by either the maximum effective stress ratio or the maximum deviator stress. Strength parameters

have been derived by using a linear regression fitting method.

96

Approved Signatory:

B Value before Consolidation:



Date:

3/05/2022

Our Ref: 1017784.0000PhaseB/Rep7 Page 14 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID: QESTLab Work Order ID: 1017784.0000 Phase B

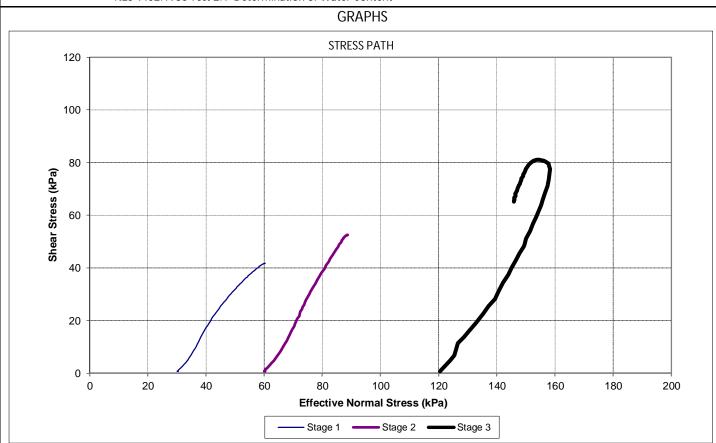
(m)

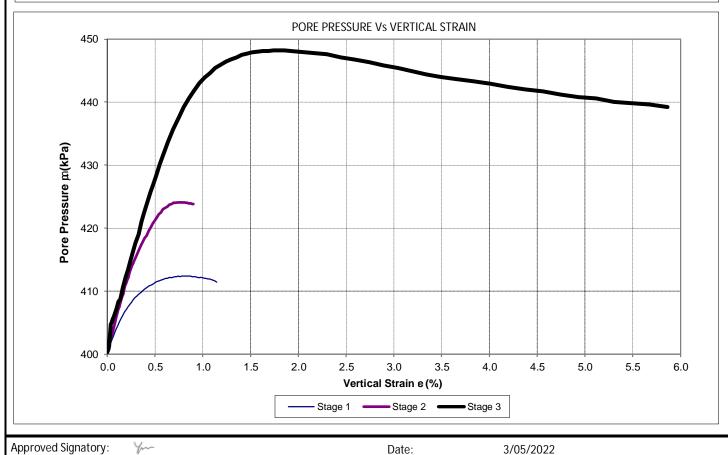
Customer Project ID: ALCOE-84

Location ID: DH330 Site: Eastern Busway 2

3.19 - 3.31 Sample Ref.: Depth: Test method used:

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





 Our Ref: 1017784.0000PhaseB/Rep7
 Page 15 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.0000 Phase B

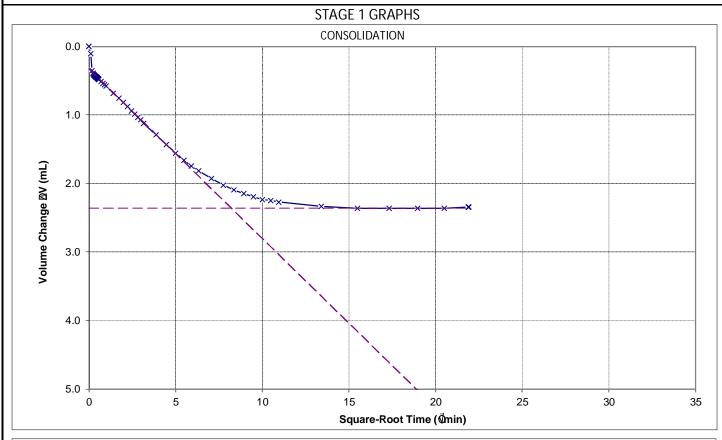
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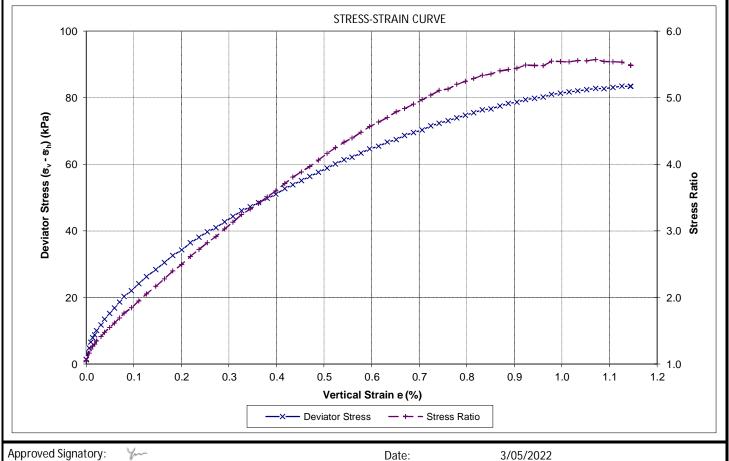
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH330

Sample Ref.: -- Depth: 3.19 - 3.31 (m)

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





 Our Ref: 1017784.0000PhaseB/Rep7
 Page 16 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

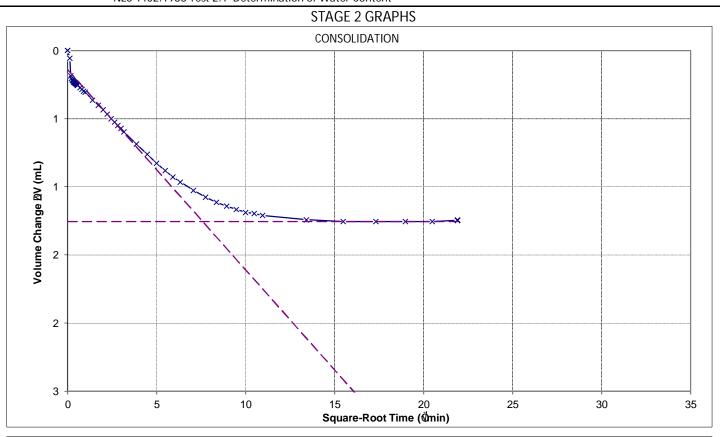
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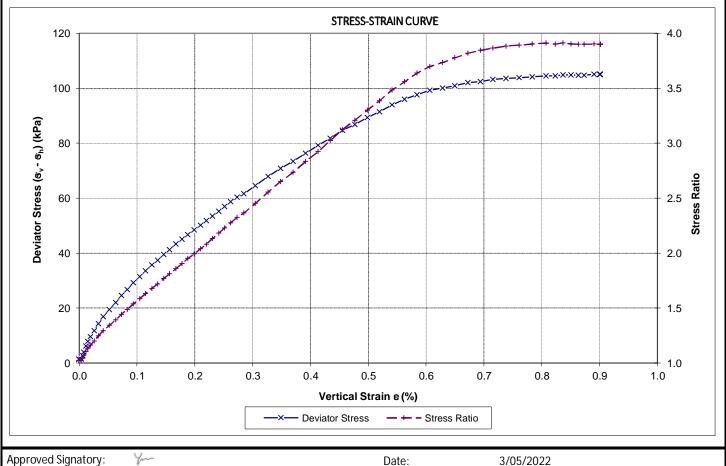
Customer Project ID: ALCOE-84

Site: Eastern Busway 2 Location ID: DH330

Sample Ref.: -- Depth: 3.19 - 3.31 (m)

Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)





Our Ref: 1017784.0000PhaseB/Rep7 Page 17 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

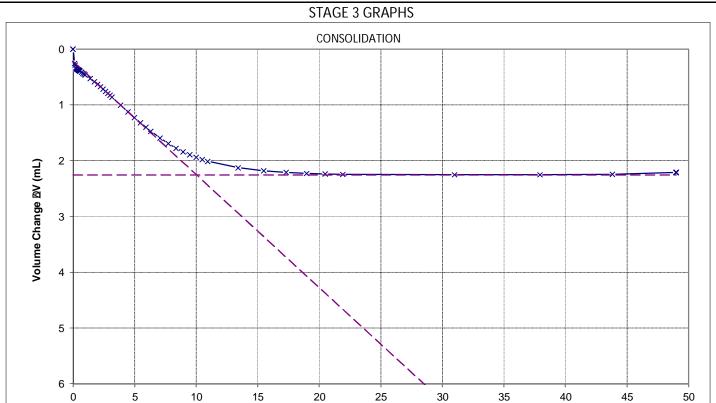
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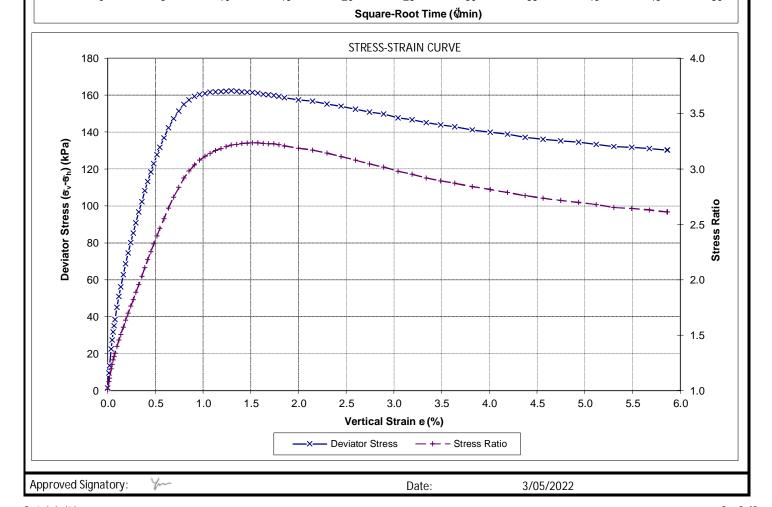
Customer Project ID: ALCOE-84

Location ID: DH330 Site: Eastern Busway 2 Sample Ref.:

Depth: 3.19 - 3.31 (m)

ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU) Test method used:







# **Unconsolidated-Undrained Compression Test**



Geotechnics Project ID: 1017784.0000.Phase B.0

QESTLab Work Order ID:

Customer Project ID: EBA\_16

Site/Location: Eastern Busway Location ID: DH301

Sample No.: -- Depth: 4.51-4.62 (m)

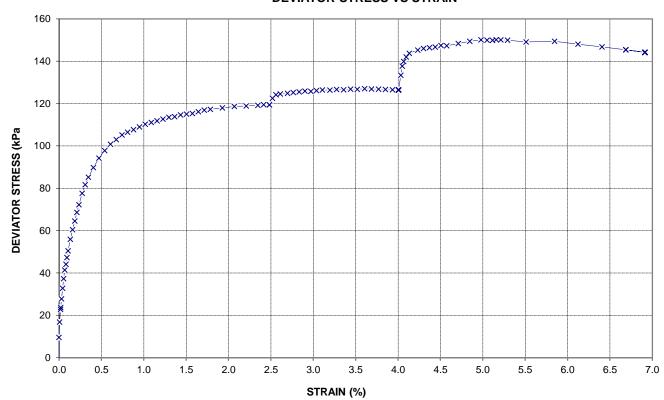
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST





Initial Sample Parameters:

Sample Height: **Bulk Density:** t/m<sup>3</sup> 110.12 mm 1.70 Sample Diameter: Dry Density: t/m<sup>3</sup> 52.87 mm 1.09 Height / Diameter: 2.08 Water Content: 55.2

<u>Failure Value:</u>

Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress $\sigma 1 - \sigma 3$ (kPa)	Shear Strength C <sub>u</sub> (kPa)	Test Speed (mm/min)
50	2.41	0.54	119.47	60	
100	3.61	0.77	127.00	63	0.26
200	5.16	1.04	150.15	75	

Mode of Failure:

Stage 1 Stage 2 Stage 3

Planar / Plastic

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY, orange brown with blueish grey; firm, moist, high plasticity.

Test Remarks: --

Tested by: C

CHLU

Date: 11/04/2023 Approved by KTP:

Ym

Date:

12/05/2023



**Geotechnics Project ID:** 

1017784.0000 Phase B

**QESTLab Work Order ID:** 

**Customer Project ID:** ALCOE-84

Site/Location: Eastern Busway 2 Location ID:

DH302

Depth: 6.80 - 6.91

(m)

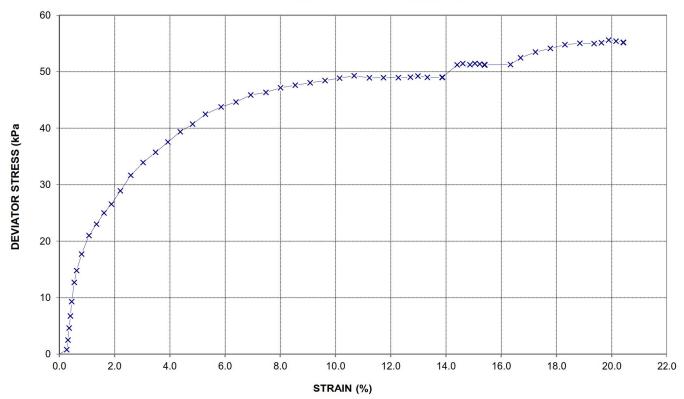
Sample No.: Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# **UNCONSOLIDATED-UNDRAINED COMPRESSION TEST**

#### **DEVIATOR STRESS VS STRAIN**



#### Initial Sample Parameters:

Sample Height: 111.67 Sample Diameter: 54.46

**Bulk Density:** mm

t/m³ 1.79

Height / Diameter:

mm

2.05

Dry Density: Water Content:

38.8

1.29

t/m³

Failure Value:

Stage 1 Stage 2 Stage 3

Cell Pressure	Cell Pressure Axial Strain		Corrected Maximum Deviator	Shear Strength	Test Speed
σ3 (kPa)	ε (%)	Correction (kPa)	Stress $\sigma 1 - \sigma 3$ (kPa)	C <sub>u</sub> (kPa)	(mm/min)
50	10.68	1.73	49.26	25	
100	15.05	2.14	51.46	26	0.30
200	19.89	2.52	55.59	28	

Mode of Failure:

Planar / Plastic

**Photo at Failure:** 

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description:

SILT, with some clay and sand, firm, grey.

**Test Remarks:** 

3/05/2022 Date:



**Geotechnics Project ID:** 

1017784.0000 Phase B

**QESTLab Work Order ID:** 

**Customer Project ID:** ALCOE-84

Site/Location: Eastern Busway 2 Location ID:

DH302

(m)

Sample No.:

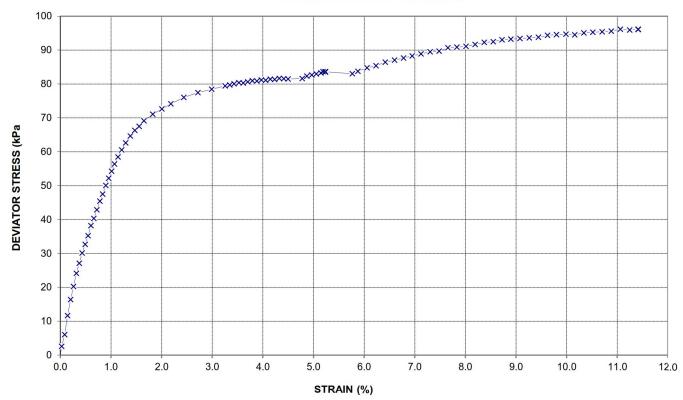
Depth: 9.35 - 9.48 m

Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# **UNCONSOLIDATED-UNDRAINED COMPRESSION TEST**

#### **DEVIATOR STRESS VS STRAIN**



#### Initial Sample Parameters:

Sample Height: Sample Diameter: 113.02 54.20

mm

mm

**Bulk Density:** Dry Density:

1.29 0.57 t/m³ t/m³

Height / Diameter:

2.09

Water Content:

124.8

Failure Value:

Stage 1 Stage 2 Stage 3

Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)			Test Speed (mm/min)
100	4.32	0.87	81.64	41	
200	5.19	1.02	83.63	42	0.57
400	11.06	1.78	96.12	48	

Mode of Failure: Planar / Plastic

**Photo at Failure:** 

Sample History:

Undisturbed core trimmed at natural water content.

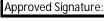
Soil Description:

Spongy PEAT, firm.

Ym

**Test Remarks:** 

3/05/2022 Date:



Our Ref: 1017784.0000PhaseB/Rep7 Page 5 of 17



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.0000 Phase B

DH304

QESTLab Work Order ID:

**Customer Project ID:** ALCOE-84

Site/Location: Location ID: Eastern Busway 2

Sample No.: Depth: 5.70 - 5.86 (m)

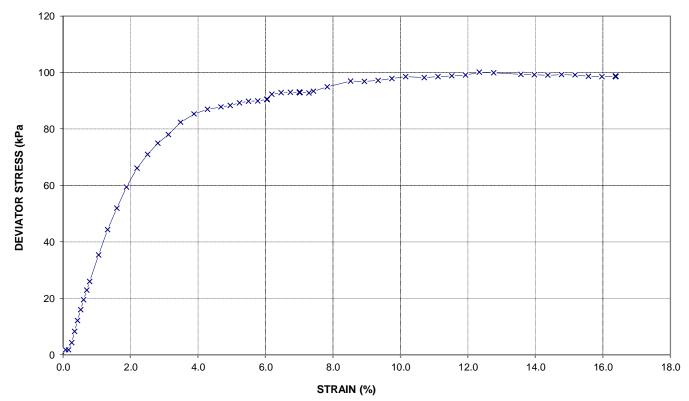
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

#### UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: t/m<sup>3</sup> 111.72 mm **Bulk Density:** 1.83 Sample Diameter: 53.86 Dry Density: t/m³ mm1.32 Height / Diameter: 2.07 Water Content: 38.9

Failure Value:

Stage 1 Stage 2 Stage 3

Cell Pressure	Axial Strain	Membrane	Corrected Maximum Deviator	Shear Strength	Test Speed
s3 (kPa)	e (%)	Correction (kPa)	Stress s1 - s3 (kPa)	C <sub>u</sub> (kPa)	(mm/min)
50	6.05	1.16	90.40	45	
100	7.01	1.30	93.00	46	0.70
200	12.34	1.92	100.06	50	

Mode of Failure: Planar / Plastic Photo at Failure:

Undisturbed core trimmed at natural water content. Sample History: NA

Soil Description: SILT, with some clay and minor sand, firm to stiff, brown with orangey brown and dark

grey. A trace of organic matter was present.

Test Remarks:

Y. 3/05/2022 Approved Signature: Date:



**Geotechnics Project ID:** 

1017784.0000 Phase B

DH304

**QESTLab Work Order ID:** 

**Customer Project ID:** ALCOE-84

Site/Location: Eastern Busway 2 Location ID:

Depth: 9.52 - 9.65 m

(m)

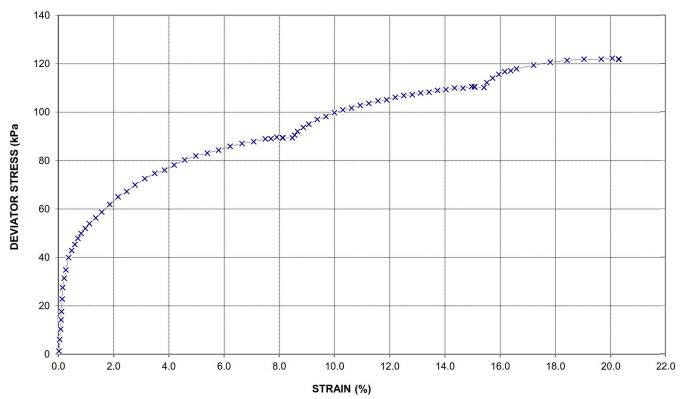
Sample No.: Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# **UNCONSOLIDATED-UNDRAINED COMPRESSION TEST**

#### **DEVIATOR STRESS VS STRAIN**



**Initial Sample Parameters:** 

Sample Height: 112.96 mm **Bulk Density:** 1.39 t/m3 Sample Diameter: Dry Density: 54.31 mm 0.73 t/m3

2.08

Failure Value:

Stage 1

Stage 2

Stage 3

Corrected Maximum Deviator Test Speed Cell Pressure **Axial Strain** Membrane **Shear Strength** σ3 (kPa) ε (%) C<sub>u</sub> (kPa) (mm/min) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) 100 7.91 1.41 89.62 45 0.64 200 14.97 2.14 110.55 55 400 20.06 2.54 122.24 61

**Mode of Failure:** Planar / Plastic

**Photo at Failure:** 

Water Content:

91.2

%

Undisturbed core trimmed at natural water content. Sample History:

Height / Diameter:

Spongy PEAT, firm, black / dark brown. Soil Description:

**Test Remarks:** 

Y. Approved Signature: Date: 2/05/2022



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID: QESTLab Work Order ID:

**Customer Project ID:** 

Depth:

1017784.0000.Phase B.0

EBA\_18

Site/Location: Eastern Busway

Sample No.:

DH306 Location ID: 7.75-7.86

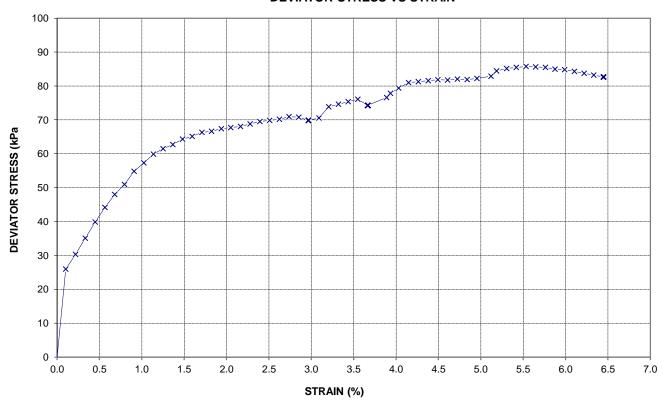
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 109.82 **Bulk Density:**  $t/m^3$ 1.53 mm Sample Diameter: 53.73 Dry Density: t/m³ mm 0.84 Height / Diameter: 2.04 Water Content: 81.9 %

Failure Value:

Axial Strain Corrected Maximum Deviator Membrane Test Speed Cell Pressure Shear Strength σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 50 0.74 70.91 2.74 35 0.50 100 3.55 0.93 76.07 38 200 5.53 1.35 85.73 43

Mode of Failure:

Planar / Plastic

Photo at Failure:

Sample History:

Stage 1

Stage 2 Stage 3

Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY with a trace of organics, soft, dark grey; moist, high plasticity

Test Remarks:

Tested by: CHLU Date: 19/04/2023 Approved by KTP: Date: 11/05/2023



1 Hill Street Onehunga Auckland New Zealand

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Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** EBA\_11

Site/Location: Location ID: DH309 Eastern Busway

Sample No.: Depth: 9.25-9.36 (m)

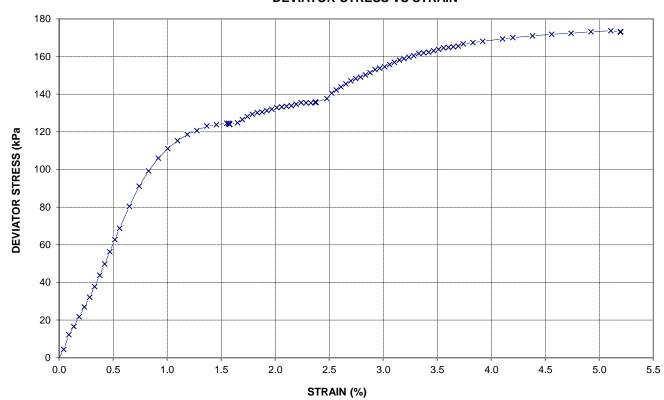
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

#### UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 110.05 mm **Bulk Density:** 1.94  $t/m^3$ Sample Diameter: Dry Density: 54.07 mm 1.46  $t/m^3$ Height / Diameter: 2.04 Water Content: % 32.7

Failure Value:

Corrected Maximum Deviator Cell Pressure **Axial Strain** Membrane Shear Strength Test Speed σ3 (kPa) ε (%) Correction (kPa) C<sub>u</sub> (kPa) (mm/min) Stress  $\sigma 1 - \sigma 3$  (kPa) 50 1.55 0.26 124.51 62 0.20 100 2.37 0.39 135.67 68 5.11 0.75 173.65 87 200

Mode of Failure:

Stage 1

Stage 2

Stage 3

Planar / Plastic

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description: SILT with minor clay and sand (fine), soft, blueish grey; moist, high plasticity.

Test Remarks:

**CHLU** 11/01/2023 Approved by KTP: Tested by: Date: BS 1377:Part 7:1990 Test 9 Unconsolidated-undrained Triaxial Compression Test with Multistage Loading and without Measurement of Pore Pressure 16/03/2023

Date:



Geotechnics Project ID:

1017784.0000.Phase B.0

QESTLab Work Order ID:

**Customer Project ID:** EBA\_16

Site/Location: DH315 Location ID: Eastern Busway

1.80-1.91 Sample No.: Depth: (m)

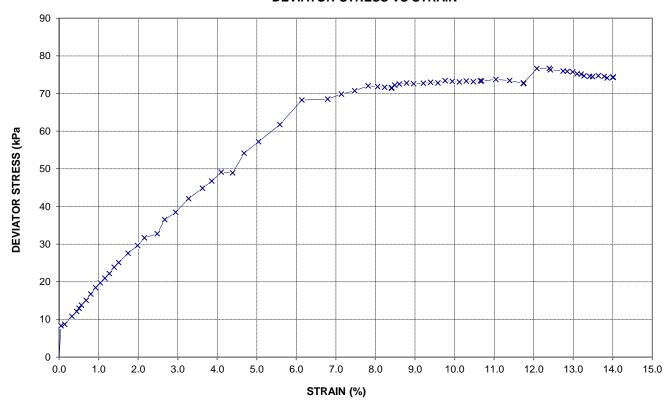
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 110.44 **Bulk Density:**  $t/m^3$ 1.72 mm Dry Density: Sample Diameter: 53.93 1.22 t/m³ mm Height / Diameter: 2.05 Water Content: 41.2 %

Failure Value:

Cell Pressure σ3 (kPa)	Axial Strain ε (%)	Membrane Correction (kPa)	Corrected Maximum Deviator Stress $\sigma1-\sigma3$ (kPa)	Shear Strength C <sub>u</sub> (kPa)	Test Speed (mm/min)
15	7.82	1.41	72.03	36	
30	11.04	1.79	73.75	37	0.39
60	12.40	1.93	76.69	38	

Mode of Failure:

Stage 1 Stage 2 Stage 3

Planar / Plastic

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

clayey SILT, with minor sand and a trace of gravel, firm, mottled brown, orange and grey; Soil Description:

moist, high plasticity

Test Remarks:

Tested by: **CHLU** Date: 11/04/2023 Approved by KTP: Date: 28/04/2023



Geotechnics Project ID:

1017784.0000.Phase B.0

QESTLab Work Order ID:

Customer Project ID: EBA\_16

Site/Location: DH316 Location ID: Eastern Busway

Sample No.: Depth: 9.38-9.49 (m)

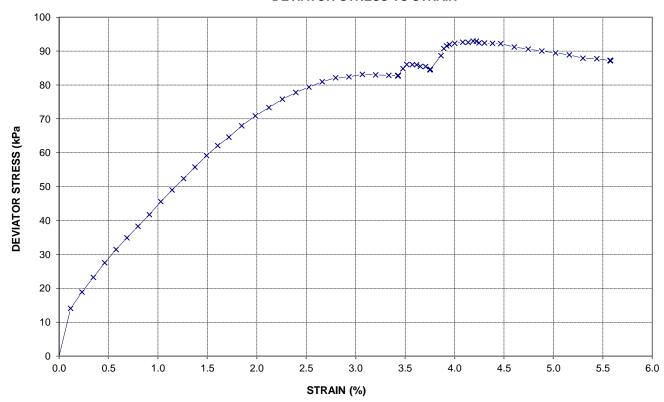
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

## UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: **Bulk Density:**  $t/m^3$ 110.16 1.12 mm Sample Diameter: 53.74 Dry Density: 0.28 t/m³ mm Height / Diameter: 2.05 Water Content: 304.6 %

Failure Value:

Stage 1

Stage 2 Stage 3

Corrected Maximum Deviator Axial Strain Membrane Test Speed Cell Pressure Shear Strength σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 50 0.65 83.10 3.07 42 0.57 100 3.52 0.74 86.03 43 200 4.19 0.86 92.91 46

Mode of Failure:

Planar / Plastic

Photo at Failure:

Undisturbed core trimmed at natural water content. Sample History:

Organic clayey SILT, soft, black; moist, high plasticity, layer of plant fibers Soil Description:

Test Remarks:

Geotechnics Ltd

Tested by: CHLU Date: 18/04/2023 Approved by KTP: Date: 28/04/2023



1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000.Phase B.0

QESTLab Work Order ID:

**Customer Project ID:** EBA\_17

Site/Location: DH316 Location ID: Eastern Busway

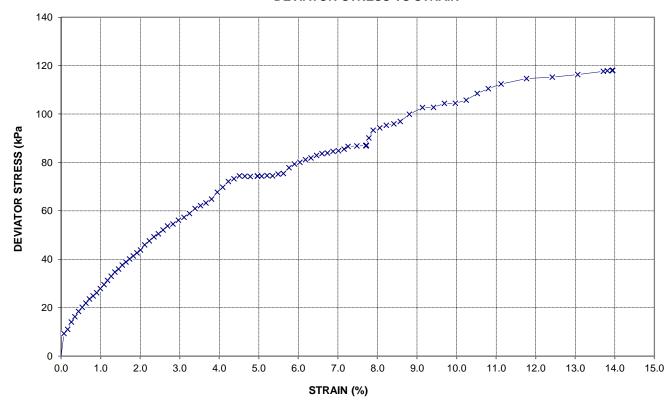
Sample No.: Depth: 6.32-6.43 (m) Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

## UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 108.62 **Bulk Density:**  $t/m^3$ 1.76 mm Sample Diameter: 53.61 Dry Density: t/m³ mm 1.18 Height / Diameter: 2.03 Water Content: 49.5 %

Failure Value:

Stage 1

Stage 2 Stage 3

Axial Strain Corrected Maximum Deviator Membrane Test Speed Cell Pressure Shear Strength σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 50 0.91 74.40 4.51 37 0.57 100 7.72 1.40 86.92 43 200 13.94 2.08 118.03 59

Mode of Failure:

Planar / Plastic

Photo at Failure:

Undisturbed core trimmed at natural water content. Sample History:

clayey SILT with minor sand, firm to soft, blueish grey; moist, low plasticity Soil Description:

Test Remarks: Test failed but deviator stress kept on increasing.

Tested by: **CHLU** Date: 19/04/2023 Approved by KTP: Date: 11/05/2023



Geotechnics Project ID: 1017784.0000.Phase B.0

QESTLab Work Order ID:

**Customer Project ID:** EBA\_16

Site/Location: Location ID: DH318\_P Eastern Busway

Sample No.: Depth: 3.19-3.30 (m)

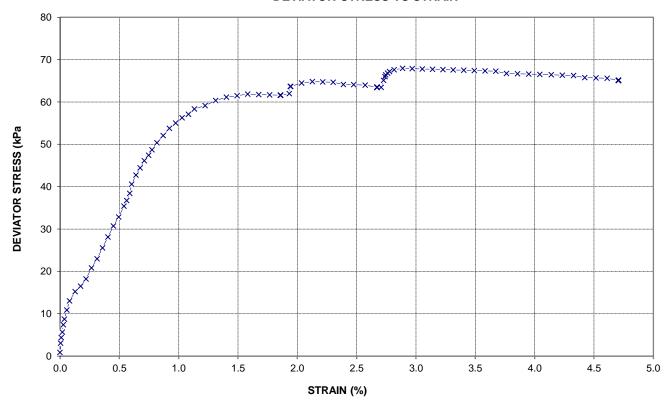
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: **Bulk Density:**  $t/m^3$ 110.01 1.54 mm Sample Diameter: 54.06 Dry Density: 0.85 t/m³ mm Height / Diameter: 2.04 Water Content: 80.1 %

Failure Value:

Corrected Maximum Deviator Axial Strain Membrane Test Speed Cell Pressure Shear Strength σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 0.35 61.82 25 1.58 31 0.47 0.28 50 2.13 64.77 32 100 2.89 0.61 67.93 34

Mode of Failure:

Stage 1

Stage 2 Stage 3

Planar / Plastic

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY with a trace of sand, soft, light grey; very high plasticity, moist

Test Remarks:

Tested by: CHLU Date: 11/04/2023 Approved by KTP: Date: 28/04/2023



Geotechnics Project ID: 1017784.0000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** ALCOE-103

Site/Location: Location ID: DH323 Eastern Busway 2

Sample No.: Depth: 5.73 - 5.88 (m)

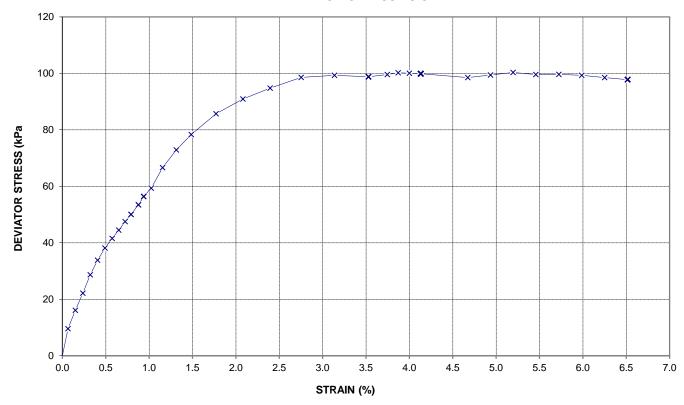
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 113.23 mm **Bulk Density:** 1.48 t/m3 Sample Diameter: 53.97 Dry Density: mm 0.86 t/m3 Height / Diameter: 2.10 Water Content: 72.7 %

Failure Value:

Stage 1

Stage 2

Stage 3

Corrected Maximum Deviator Cell Pressure **Axial Strain** Membrane Shear Strength Test Speed s3 (kPa) e (%) Correction (kPa) C<sub>u</sub> (kPa) (mm/min) Stress s1 - s3 (kPa) 1.08 99.29 50 3.14 50 0.66 100 3.87 1.30 100.20 50 200 5.20 1.66 100.30 50

Mode of Failure: Planar Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: peaty CLAY black; soft, wet, high plasticity

Test Remarks:

4/07/2022 Approved Signature: Date:



Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** EBA\_11

Site/Location: DH324 Location ID: Eastern Busway

4.51-4.64 Sample No.: Depth: (m)

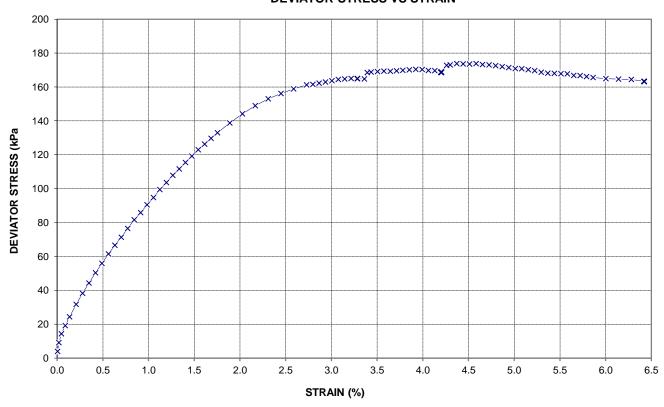
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

#### UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 107.20 **Bulk Density:** t/m³ 1.28 mm Sample Diameter: 54.06 Dry Density:  $t/m^3$ mm 0.51 Height / Diameter: 1.98 Water Content: 149.4 %

Failure Value:

Stage 1

Stage 2 Stage 3

Axial Strain Corrected Maximum Deviator Membrane Test Speed Cell Pressure Shear Strength σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 50 0.34 164.97 3.22 82 0.30 100 3.92 0.40 170.39 85 200 4.58 0.46 173.73 87

Mode of Failure: Planar / Plastic Photo at Failure:

Undisturbed core trimmed at natural water content. Sample History:

ORGANIC SOIL with minor clay, soft to firm, black with dark brown; moist, low plasicity Soil Description:

Test Remarks:

Tested by: chlu Date: 27/02/2023 Approved by KTP: Date: 27/03/2023



Geotechnics Project ID:

1017784.0000 Phase B

DH325

QESTLab Work Order ID:

**Customer Project ID:** ALCOE-103

Location ID:

Site/Location: Eastern Busway 2

Sample No.: Depth: 5.77 - 5.88 (m)

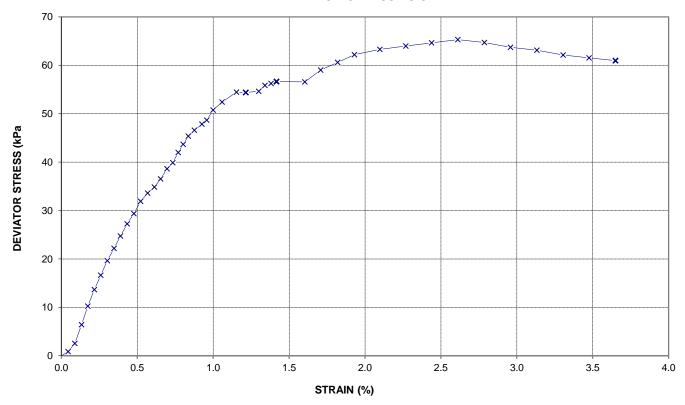
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 114.78 mm **Bulk Density:** 1.72 t/m3 Sample Diameter: Dry Density: 54.41 mm 1.18  $t/m^3$ 

Water Content:

46.4

%

Failure Value:

Stage 1

Stage 2

Stage 3

Corrected Maximum Deviator Cell Pressure **Axial Strain** Membrane Shear Strength Test Speed s3 (kPa) e (%) Correction (kPa) C<sub>u</sub> (kPa) (mm/min) Stress s1 - s3 (kPa) 50 1.15 0.42 54.43 27 0.28 100 1.42 0.52 56.61 28 2.61 0.91 65.28 33 200

Mode of Failure: Planar / Plastic

Photo at Failure:

2.11

Sample History: Undisturbed core trimmed at natural water content.

Height / Diameter:

Soil Description: clayey SILT with some peat; firm, moist, high plasticity

Test Remarks:

4/07/2022 Approved Signature: Date:



Geotechnics Project ID:

1017784.0000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH326

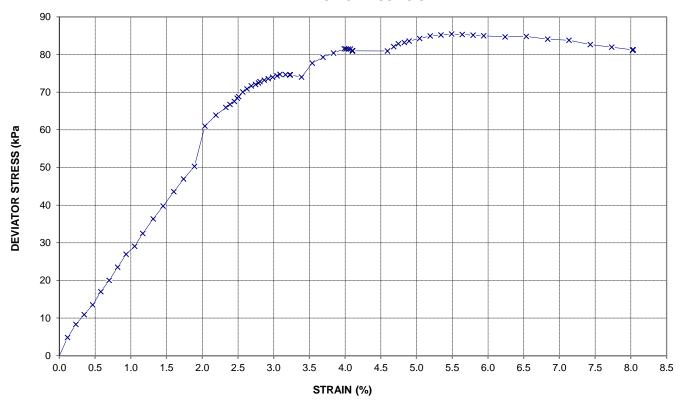
Sample No.: Depth: 4.83 - 4.96 (m) Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 113.40 mm **Bulk Density:** 1.14 t/m3 Sample Diameter: Dry Density: 53.74 mm 0.34 t/m<sup>3</sup> Height / Diameter: 2.11 Water Content: 236 %

Failure Value:

Corrected Maximum Deviator Cell Pressure **Axial Strain** Membrane Shear Strength Test Speed s3 (kPa) e (%) Correction (kPa) C<sub>u</sub> (kPa) (mm/min) Stress s1 - s3 (kPa) 0.49 74.70 50 3.09 37 0.97 100 3.99 0.62 81.50 41 5.49 0.80 85.44 43 200

Stage 3 Mode of Failure:

Stage 1

Stage 2

Planar / Plastic

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Remarks:

4/07/2022 Approved Signature: Date:



Geotechnics Project ID:

1017784.0000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** ALCOE-103

Site/Location: Eastern Busway 2 Location ID: Depth:

DH325 4.36 - 4.48

(m)

Sample No.:

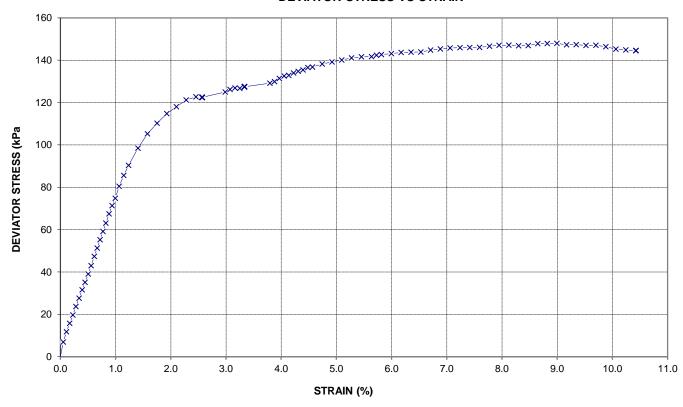
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height:

112.80

mm **Bulk Density:** 

Corrected Maximum Deviator

147.95

1.92 1.45 t/m3 t/m3

Sample Diameter: Height / Diameter: 53.49 2.11

2.55

Dry Density: Water Content:

32.7

Shear Strength

74

%

Failure Value:

Stage 1 Stage 2

Cell Pressure **Axial Strain** Membrane s3 (kPa) e (%) Correction (kPa) 2.46 50 0.87 100 3.34 1.15

9.00

Stress s1 - s3 (kPa) 122.68 127.43

mm

C<sub>u</sub> (kPa) 61 64

(mm/min) 0.56

Test Speed

Stage 3 Mode of Failure:

Planar / Plastic

200

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description:

SAND, silty, with some clay, firm, light grey. A trace of organic matter was present.

Test Remarks:

4/07/2022 Date:



Geotechnics Project ID:

1017784.0000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH326

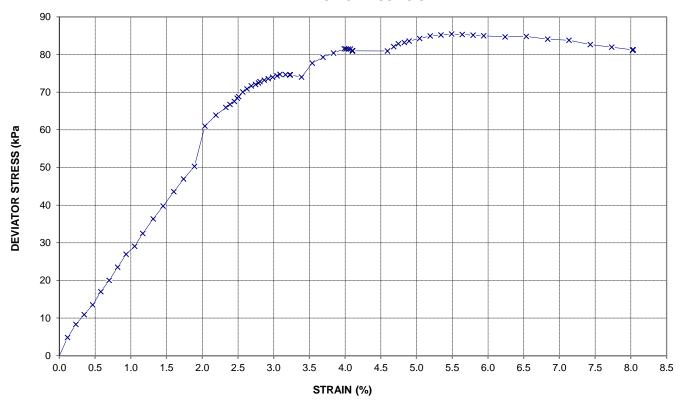
Sample No.: Depth: 4.83 - 4.96 (m) Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: 113.40 mm **Bulk Density:** 1.14 t/m3 Sample Diameter: Dry Density: 53.74 mm 0.34 t/m<sup>3</sup> Height / Diameter: 2.11 Water Content: 236 %

Failure Value:

Corrected Maximum Deviator Cell Pressure **Axial Strain** Membrane Shear Strength Test Speed s3 (kPa) e (%) Correction (kPa) C<sub>u</sub> (kPa) (mm/min) Stress s1 - s3 (kPa) 0.49 74.70 50 3.09 37 0.97 100 3.99 0.62 81.50 41 5.49 0.80 85.44 43 200

Stage 3 Mode of Failure:

Stage 1

Stage 2

Planar / Plastic

Photo at Failure:

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description: Spongy PEAT, black; very soft, wet, high plasticity.

Test Remarks:

4/07/2022 Approved Signature: Date:



Geotechnics Project ID:

1017784.1000.Phase B.0

QESTLab Work Order ID:

**Customer Project ID:** EBA\_17

Site/Location: DH327 Location ID: Eastern Busway

Sample No.: Depth: 2.75-2.86 (m)

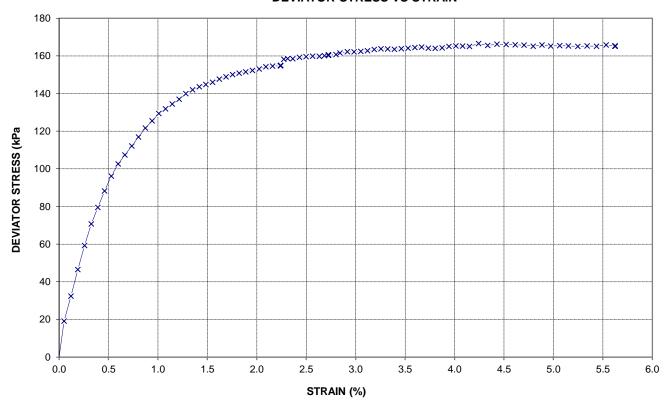
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

#### UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: **Bulk Density:**  $t/m^3$ 110.34 1.89 mm Sample Diameter: 53.57 Dry Density: t/m³ mm 1.44 Height / Diameter: 2.06 Water Content: 30.9 %

Failure Value:

Stage 1

Stage 2 Stage 3

Corrected Maximum Deviator Axial Strain Membrane Test Speed Cell Pressure Shear Strength σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 2.24 0.49 154.78 25 77 0.32 50 2.73 0.59 160.39 80 100 4.24 0.87 166.52 83

Mode of Failure: Planar / Plastic

Photo at Failure:

Undisturbed core trimmed at natural water content. Sample History:

clayey SILT, firm, light grey; moist, high plasticity Soil Description:

Test Remarks:

Geotechnics Ltd

Tested by: CHLU Date: 19/04/2023 Approved by KTP: Date: 11/05/2023



Geotechnics Project ID: 1017784.1000.Phase B.0

QESTLab Work Order ID:

Customer Project ID: EBA\_17

Site/Location: Eastern Busway Location ID: DH327

Sample No.: Depth: 6.24-6.35 (m)

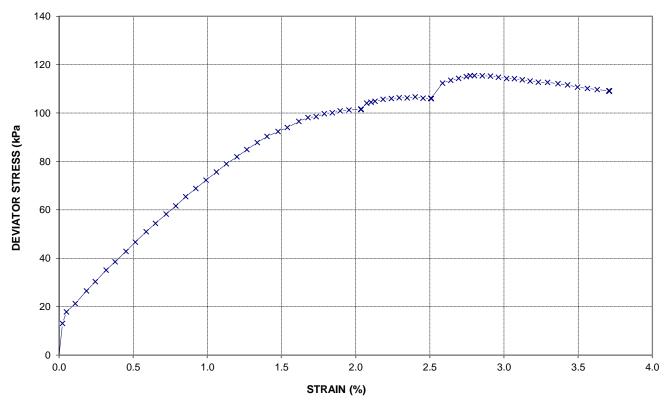
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### DEVIATOR STRESS VS STRAIN



Initial Sample Parameters:

Sample Height: **Bulk Density:**  $t/m^3$ 110.33 1.21 mm Sample Diameter: 54.07 Dry Density: t/m³ mm 0.44 Height / Diameter: 2.04 Water Content: 172.3 %

Failure Value:

Stage 1

Stage 2 Stage 3

Corrected Maximum Deviator Axial Strain Membrane Shear Strength Test Speed Cell Pressure σ3 (kPa) ε (%) C<sub>u</sub> (kPa) Correction (kPa) Stress  $\sigma 1 - \sigma 3$  (kPa) (mm/min) 50 0.45 101.53 2.04 51 0.60 100 2.40 0.52 106.60 53 200 2.77 0.59 115.44 58

Mode of Failure: Pla

Planar / Plastic

Photo at Failure:

Sample History: Undisturbed core trimmed at natural water content.

<u>Soil Description:</u> PEAT, firm, black; moist, amorphous.

Test Remarks: --

Tested by: CHLU Date: 18/04/2023 Approved by KTP: 🖟 Date: 11/05/2023



Geotechnics Project ID: QESTLab Work Order ID:

1017784.0000 Phase B

**Customer Project ID:** ALCOE-103

Site/Location: Eastern Busway 2 Location ID: DH329

Sample No.: Depth: 12.35 - 12.48 (m)

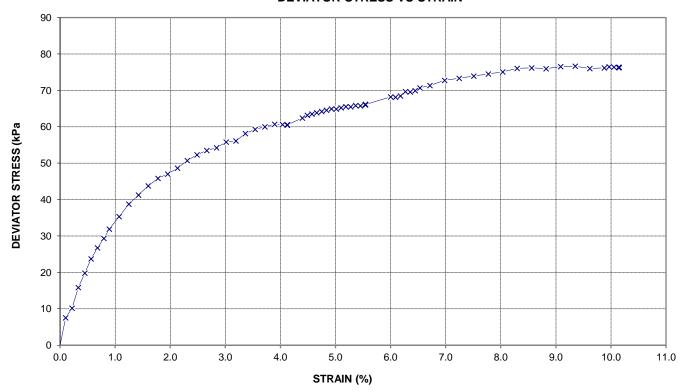
Test Method Used: BS 1377: Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# UNCONSOLIDATED-UNDRAINED COMPRESSION TEST

#### **DEVIATOR STRESS VS STRAIN**



Initial Sample Parameters:

Sample Height: **Bulk Density:** t/m³ 113.34 mm 1.28 Sample Diameter: 53.63 Dry Density: 0.52 t/m<sup>3</sup> mm Height / Diameter: 2.11 Water Content: 147 %

Failure Value:

Stage 1 Stage 2 Stage 3

Cell Pressure s3 (kPa)	Axial Strain e (%)	Membrane	Corrected Maximum Deviator	Shear Strength C,, (kPa)	Test Speed
33 (Ki d)	C (70)	Correction (kPa)	Stress s1 - s3 (kPa)	C <sub>u</sub> (KFa)	(mm/min)
75	3.90	0.61	60.71	30	
150	5.54	0.81	66.10	33	0.61
300	9.35	1.21	76.66	38	

Mode of Failure: Planar / Plastic Photo at Failure:

Undisturbed core trimmed at natural water content. Sample History:

Soil Description: Peaty CLAY, black; soft, wet, high plasticity.

Test Remarks:

Approved Signature: Ym Date: 4/07/2022



Sample No.:

1 Hill Street Onehunga Auckland **New Zealand** p. +64 9 356 3510

**Geotechnics Project ID:** 

1017784.0000 Phase B

**QESTLab Work Order ID:** 

**Customer Project ID:** ALCOE-84

Site/Location: Eastern Busway 2

Location ID:

DH330

Depth:

3.31 - 3.43

(m)

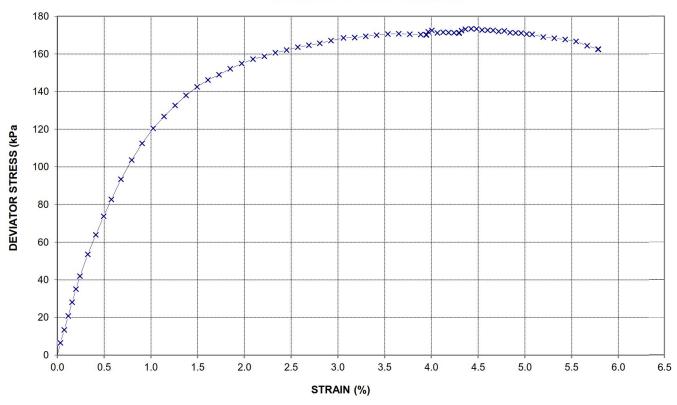
Test Method Used: BS 1377:Part 7:1990 Test 9 Determination of the Undrained Shear Strength in Triaxial Compression with Multistage Loading

and without Measurement of pore Pressure

NZS 4402:1986 Test 2.1 Determination of Water Content

# **UNCONSOLIDATED-UNDRAINED COMPRESSION TEST**

#### **DEVIATOR STRESS VS STRAIN**



#### **Initial Sample Parameters:**

Sample Height: Sample Diameter: 113.11 mm 54.17

mm

**Bulk Density:** Dry Density:

1.84 1.32 t/m3 t/m<sup>3</sup>

Height / Diameter:

2.09

Water Content:

38.9

Failure Value:

Stage 1 Stage 2 Stage 3

Cell Pressure Axial Strain		Membrane Corrected Maximum Deviato		Shear Strength	Test Speed
$\sigma$ 3 (kPa)	ε (%)	Correction (kPa)	Stress $\sigma 1 - \sigma 3$ (kPa)	C <sub>u</sub> (kPa)	(mm/min)
30	3.65	0.76	170.68	85	
60	4.01	0.82	172.49	86	0.38
120	4.43	0.89	173.32	87	

**Mode of Failure:** 

Planar / Plastic

**Photo at Failure:** 

Sample History:

Undisturbed core trimmed at natural water content.

Soil Description:

SILT, clayey, stiff to very stiff, greenish/bluish grey with light grey.

**Test Remarks:** 

3/05/2022 Approved Signature: Date:



# **One Dimensional Consolidation Test**



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

DH301

4.62-4.65

QESTLab Work Order ID:

Location ID:

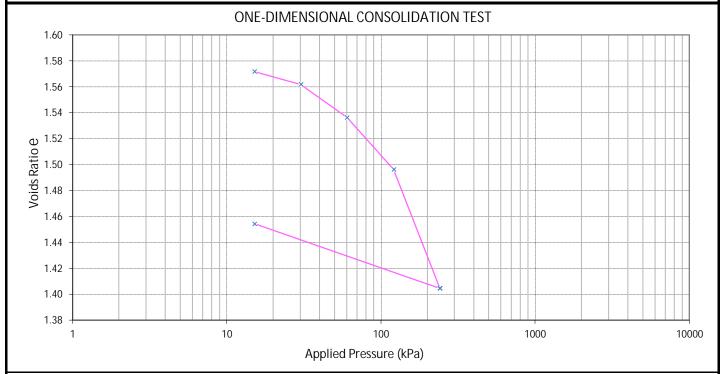
Customer Project ID: EBA\_16

Site/Location: Eastern Busway

Depth:

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 58.7 % Initial Saturation Degree: 100 % 2.70 Initial Bulk Density: 1.66 Solid Density (assumed):  $t/m^3$  $t/m^3$ Initial Dry Density: 1.05 t/m³ **Temperature During Testing:** 20.0 to 26.0 °C

			One-Dimensional Co	nsolidation Results	
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
As received	0	1.577			
Preload	15.1	1.572	0 to 15.1	NA	0.13
	30.2	1.562	15.1 to 30.2	66	0.26
	60.3	1.536	30.2 to 60.3	4.2	0.33
	121	1.496	60.3 to 121	2.2	0.26
Loading	241	1.404	121 to 241	1.0	0.31
Unload	15.1	1.454	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: silty CLAY, firm, mottled brown and blueish grey; mosit, high plasticity, organic inclusions.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.7 t/m³. The calculations of void ratio are

affected by the solid density value.

Site:

BH No.:

1 Hill Street, Onehunga Auckland

New Zealand

P 64 09 356 3510

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Page of

**AKL67.4** 

Your Job No.: ALCOE-84

Our Job No.: 1017784 Phase A

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Depth: 9.26 - 9.34 m

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

Sample No.:

**Eastern Busway Alliance** 

DH302

# 2.20 2.15 2.10 2.00 1.95 10 100 1000 ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure (kPa)

		Void		Coefficient of	Coefficient of Volume
Pressure		Ratio	Pressure Increment	Consolidation	Compressibility
(kPa)		(e)	(kPa)	Cv (m²/yr)	$Mv (m^2/MN)$
As received	0	2.149			
Preload	15.1	2.145	0 to 15.1	NA	0.094
	30.2	2.139	15.1 to 30.2	13	0.121
	60.3	2.120	30.2 to 60.3	7	0.206
	121	2.082	60.3 to 121	6	0.198
	241	1.988	121 to 241	3	0.253
Unload	15.1	2.053	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC. SQR of time fitting method used.

Description: Spongy PEAT with organic material, soft, dark blackish brown

Initial Dry Density (t/m³): 0.75 Initial Water Content: 86.6% Solid Density (t/m³): 2.35 (Assumed) Initial Saturation: 95%

Temperature During Testing: Max = 21  $^{\circ}C$  Min = 20  $^{\circ}C$ 

Remarks: The calculations of void ratio are affected by the solid density value. We have assumed

a value of 2.35 t/m<sup>3</sup>.

Sample description is not IANZ accredited.

Entered by: CAGI Date: 29/04/2022 Checked by: CHLU Date: 20/5/2022



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

**Customer Project ID:** EBA\_11

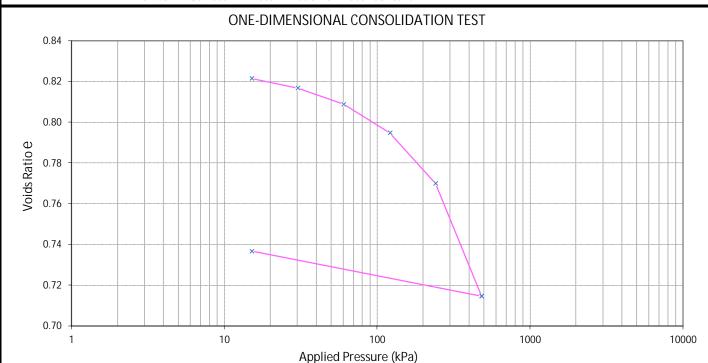
DH303

7.76-7.80

Site/Location: Eastern Busway Location ID: Depth:

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 29.2 % Initial Saturation Degree: 92 % 2.60 Initial Bulk Density: 1.84 Solid Density (assumed):  $t/m^3$  $t/m^3$ Initial Dry Density: 1.42  $t/m^3$ **Temperature During Testing:** 21.0 to 21.5 °C

	One-Dimensional Consolidation Results									
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility					
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)					
As received	0	0.830								
Preload	15.1	0.821	0 to 15.1	NA	0.31					
	30.2	0.817	15.1 to 30.2	17	0.17					
	60.3	0.809	30.2 to 60.3	13	0.14					
	121	0.795	60.3 to 121	13	0.13					
Loading	241	0.770	121 to 241	13	0.12					
	483	0.715	241 to 483	12	0.13					
Unload	15.1	0.737	483 to 15.1	NA	NA					

Sample History: Undisturbed core trimmed at natural water content.

(fine) sandy SILT, firm, blueish dark grey with mottled orange; moist, low plasticity Soil Description:

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.6 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

CHLU 28/02/2023 Date: 27/03/2023 Tested by: Date: Approved by KTP:



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

DH303

9.77-9.81

QESTLab Work Order ID:

Customer Project ID: EBA\_11

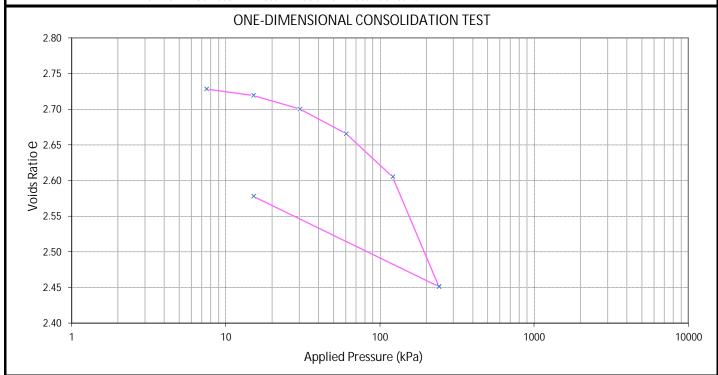
Site/Location: Eastern Busway
Sample Ref.: --

Location ID:

Depth:

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 105 % Initial Saturation Degree: 100 % 2.60 Initial Bulk Density: 1.43 Solid Density (assumed):  $t/m^3$  $t/m^3$ Initial Dry Density: 0.70  $t/m^3$ **Temperature During Testing:** 21.0 to 24.0 °C

One-Dimensional Consolidation Results					
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
As received	0	2.734			
Preload	7.5	2.728	0 to 7.5	NA	0.19
	15.1	2.719	7.5 to 15.1	11	0.32
	30.2	2.700	15.1 to 30.2	11	0.34
	60.3	2.666	30.2 to 60.3	10	0.31
Loading	121	2.605	60.3 to 121	5.1	0.27
	241	2.451	121 to 241	0.90	0.36
Unload	15.1	2.578	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: ORGANIC clayey SILT, with some clay, firm, black; high plasticity, moist.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.6 t/m³. The calculations of void ratio are

affected by the solid density value.

Site:

1 Hill Street, Onehunga Auckland

New Zealand

P 64 09 356 3510

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Your Job No.: ALCOE-84

Our Job No.: 1017784 Phase A

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BH No.: DH303 Sample No.: AKL68.1 Depth: 6 - 6.5 m

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

**Eastern Busway Alliance** 

# 1.27 1.26 1.25 1.24 1.22 1 10 100 100 1000

Applied Pressure (kPa)

		Void		Coefficient of	Coefficient of Volume
Pressure		Ratio	Pressure Increment	Consolidation	Compressibility
(kPa)		(e)	(kPa)	Cv (m²/yr)	Mv (m²/MN)
As received	0	1.264			
Preload	7.5	1.262	0 to 7.5	NA	0.143
	15.1	1.261	7.5 to 15.1	34	0.085
	30.2	1.258	15.1 to 30.2	26	0.085
	60.3	1.253	30.2 to 60.3	24	0.076
	121	1.245	60.3 to 121	22	0.060
	241	1.232	121 to 241	13	0.048
Unload	15 1	1 242	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC. SQR of time fitting method used.

Description: Clayey SILT with minor sand, firm, medium brown.

Initial Dry Density (t/m³): 1.19 Initial Water Content: 46.2%

Solid Density (t/m³): 2.70 (Assumed) Initial Saturation: 99%

Temperature During Testing: Max = 21  $^{\circ}C$  Min = 20  $^{\circ}C$ 

Remarks: The calculations of void ratio are affected by the solid density value. We have assumed

a value of  $2.70 \text{ t/m}^3$ .

Sample description is not IANZ accredited.

Entered by: CAGI 13/04/2022 Checked by: CHLU Date: 20/5/2022

Site:

1 Hill Street, Onehunga Auckland

New Zealand

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Your Job No.: ALCOE-84

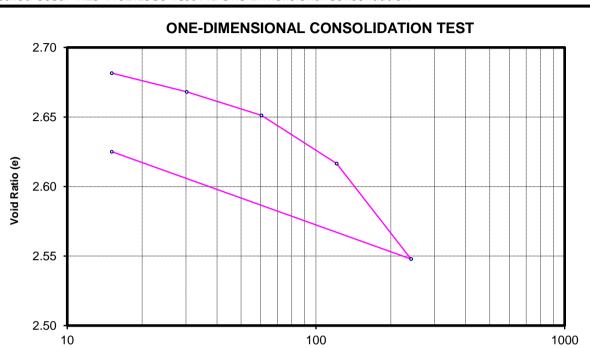
Our Job No.: 1017784 Phase A

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BH No.: DH304 Sample No.: AKL68.4 Depth: 9.8 - 9.9 m

Test Method Used: NZS 4402:1986 Test 7.1 One-Dimensional Consolidation

**Eastern Busway Alliance** 



Applied Pressure (kPa)

		Void		Coefficient of	Coefficient of Volume
Pressure		Ratio	Pressure Increment	Consolidation	Compressibility
(kPa)		(e)	(kPa)	Cv (m²/yr)	Mv (m²/MN)
As received	0	2.687			
Preload	15.1	2.682	0 to 15.1	NA	0.103
	30.2	2.668	15.1 to 30.2	14	0.242
	60.3	2.651	30.2 to 60.3	10	0.153
	121	2.617	60.3 to 121	7	0.156
	241	2.548	121 to 241	6	0.158
Unload	15.1	2.625	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at NWC. SQR of time fitting method used.

Description: Spongy PEAT with organic matter, soft, dark blackish brown.

Initial Dry Density (t/m³): 0.57 Initial Water Content: 121.5%

Solid Density (t/m³): 2.10 (Assumed) Initial Saturation: 95%

Temperature During Testing: Max = 21  $^{\circ}C$  Min = 20  $^{\circ}C$ 

Remarks: The calculations of void ratio are affected by the solid density value. We have assumed

a value of 2.10 t/m<sup>3</sup>.

Sample description is not IANZ accredited.

Entered by: CAGI Date: 29/04/2022 Checked by: CHLU Date: 20/5/2022



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

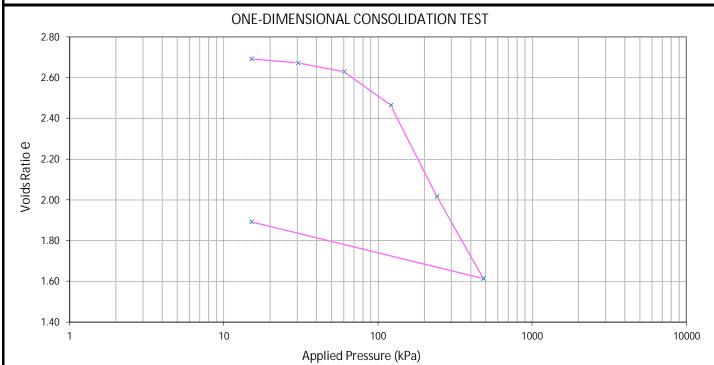
**Customer Project ID:** EBA\_18

Site/Location: Eastern Busway Location ID: DH306 Depth:

7.88-7.92

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 102 % Initial Saturation Degree: 100 % 2.65 Initial Bulk Density: 1.45 Solid Density (assumed):  $t/m^3$  $t/m^3$ Initial Dry Density: 0.72 t/m³ **Temperature During Testing:** 20.0 to 26.0 °C

One Dimensional Consolidation Deputs								
One-Dimensional Consolidation Results								
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility			
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)			
As received	0	2.701						
Preload	15.1	2.692	0 to 15.1	NA	0.17			
	30.2	2.672	15.1 to 30.2	11	0.35			
	60.3	2.629	30.2 to 60.3	12	0.39			
	121	2.464	60.3 to 121	4.4	0.75			
Loading	241	2.016	121 to 241	0.80	1.1			
	483	1.613	241 to 483	0.80	0.55			
Unload	15.1	1.892	483 to 15.1	NA	NA			

Sample History: Undisturbed core trimmed at natural water content.

silty CLAY, firm to soft, blueish grey; moist, high plasticity Soil Description:

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.65 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

CHLU Date: 5/4/023 Approved by KTP: Date: 11/05/2023 Tested by:

°C



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

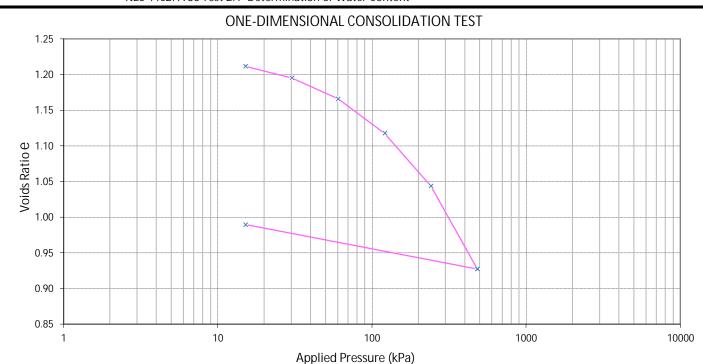
Customer Project ID: EBA\_11

Site/Location: Eastern Busway

Location ID: DH309 Depth: 7.69-7.73

Sample Ref.: -- Depth: 7
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 43.8 % Initial Saturation Degree: 99 %
Initial Bulk Density: 1.78 t/m³ Solid Density (assumed): 2.75 t/m³

Initial Dry Density: 1.24 t/m³ Temperature During Testing: 21.0 to 24.0

One-Dimensional Consolidation Results					
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
As received 0 1.		1.223			
Preload	15.1	1.212	0 to 15.1	NA	0.33
	30.2	1.195	15.1 to 30.2	17	0.49
	60.3	1.166	30.2 to 60.3	19	0.44
	121	1.118	60.3 to 121	20	0.37
Loading	241	1.044	121 to 241	13	0.29
	483	0.927	241 to 483	7.3	0.24
Unload	15.1	0.989	483 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT, soft to firm, blueish grey, moist, high plasticity.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.75 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

Tested by: CHLU Date: 9/03/2023 Approved by KTP: V- Date: 31/03/2023



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

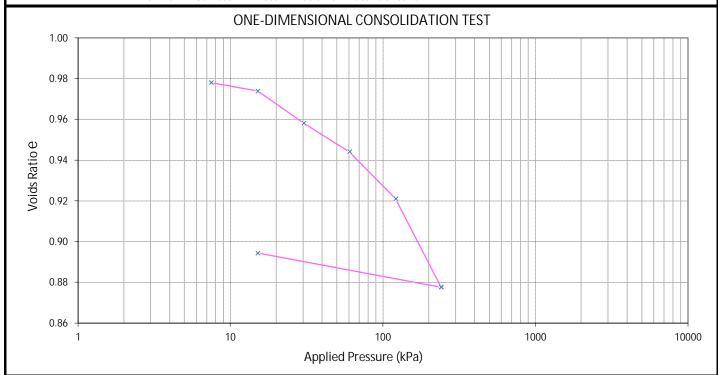
Customer Project ID: EBA\_11

Site/Location: Eastern Busway

Busway Location ID: DH309
Depth: 9.2-9.32

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 36.6 % Initial Saturation Degree: 99 % 1.83 Initial Bulk Density: Solid Density (assumed): 2.65  $t/m^3$  $t/m^3$ Temperature During Testing: Initial Dry Density: 1.34 t/m³ 21.0 to 24.0 °C

One-Dimensional Consolidation Results								
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility			
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)			
As received	0	0.981						
Preload	7.5	0.978	0 to 7.5	NA	0.20			
	15.1	0.974	7.5 to 15.1	17	0.28			
	30.2	0.958	15.1 to 30.2	14	0.53			
	60.3	0.944	30.2 to 60.3	13	0.24			
Loading	121	0.921	60.3 to 121	16	0.19			
	241	0.878	121 to 241	13	0.19			
Unload	15.1	0.894	241 to 15.1	NA	NA			

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: sandy SILT, with minor clay, soft to firm, blueish grey; moist, low plasticity

Test Remarks: Square root of time fitting method was used. The calculations of void ratio are affected by the solid density value,

which was assumed to be 2.65 t/m³ for the test.

Consols are to be over a 24hour period

Tested by: CHLU Date: 8/03/2023 Approved by KTP:  $\checkmark$  Date: 27/03/2023



Sample Ref.:

1 Hill Street
Onehunga
Auckland
New Zealand

p. +64 9 356 3510

Geotechnics Project ID: 101

ject ID: 1017784.1000 Phase B

QESTLab Work Order ID:

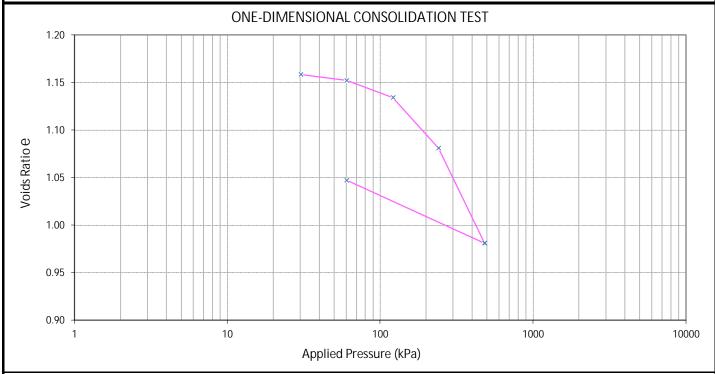
Customer Project ID: EBA\_12

Site/Location: Eastern Busway

DH314 Depth: 2.00-2.05

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 42.9 % Initial Saturation Degree: 98 % Initial Bulk Density: 1.76 Solid Density (assumed): 2.65  $t/m^3$  $t/m^3$ Initial Dry Density: 1.23  $t/m^3$ **Temperature During Testing:** 21.0 to 24.0 °C

One-Dimensional Consolidation Results						
Test Applied Pressure   Void Ratio		Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility	
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)	
As received	0	1.156				
Preload	30.2	1.158	0 to 30.2	NA		
	60.3	1.152	30.2 to 60.3	6.2	0.10	
	121	1.134	60.3 to 121	1.9	0.14	
	241	1.081	121 to 241	0.77	0.21	
Loading	483	0.981	241 to 483	0.42	0.20	
Unload	60.3	1.047	483 to 60.3	NA	NA	

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT with a trace of sand (fine), firm, greyish brown; moist, high plasticity.

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.65 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

Due to swelling pre load was increased to 30 kPa

Tested by: CHLU Date: 28/03/2023 Approved by KTP: 

Date: 31/03/2023



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

DH316

9.02-9.06

QESTLab Work Order ID:

Location ID:

Depth:

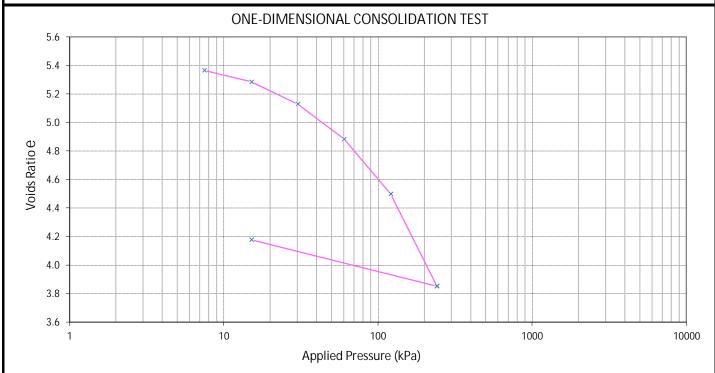
**Customer Project ID:** EBA\_16

Site/Location: Eastern Busway

Test method used:

NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 307 % Initial Saturation Degree: 93 % Initial Bulk Density: 1.04 Solid Density (assumed): 1.63  $t/m^3$  $t/m^3$ Initial Dry Density: 0.26  $t/m^3$ **Temperature During Testing:** 20.0 to 26.0 °C

One-Dimensional Consolidation Results								
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility			
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)			
As received	0	5.390						
Preload	7.5	5.365	0 to 7.5	NA	0.52			
	15.1	5.285	7.5 to 15.1	9.9	1.7			
	30.2	5.129	15.1 to 30.2	1.9	1.6			
	60.3	4.883	30.2 to 60.3	2.1	1.3			
Loading	121	4.500	60.3 to 121	1.5	1.1			
	241	3.852	121 to 241	0.76	0.98			
Unload	15.1	4.177	241 to 15.1	NA	NA			

Sample History: Undisturbed core trimmed at natural water content.

Organic clayey SILT, soft to firm, black; moist to wet, high plasticity, rootlet inclusions Soil Description:

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.63 t/m<sup>3</sup>. The calculations of void ratio

are affected by the solid density value.

Max pressure 241kPa

CHLU Date: 6/04/2023 Approved by KTP: Ym Date: 28/04/2023 Tested by:



1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

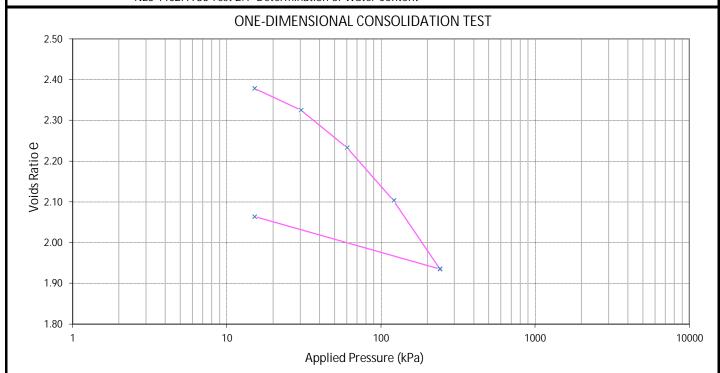
QESTLab Work Order ID:

**Customer Project ID:** EBA\_11

Site/Location: Eastern Busway Location ID: DH319 10.92-10.96

Sample Ref.: Depth: Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 87.8 % Initial Saturation Degree: 95 % Initial Bulk Density: 1.44 Solid Density (assumed): 2.60 t/m³  $t/m^3$ Initial Dry Density: 0.76  $t/m^3$ **Temperature During Testing:** 21.0 to 23.0 °C

One-Dimensional Consolidation Results								
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility			
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)			
As received	0	2.402						
Preload	15.1	2.378	0 to 15.1	NA	0.46			
	30.2	2.325	15.1 to 30.2	0.99	1.0			
	60.3	2.233	30.2 to 60.3	0.99	0.92			
	121	2.103	60.3 to 121	1.1	0.66			
Loading	241	1.935	121 to 241	1.0	0.45			
Unload	15.1	2.064	241 to 15.1	NA	NA			

Undisturbed core trimmed at natural water content. Sample History:

clayey SILT with a trace of sand, firm, dark brown with black; moist, high plasticity, organic inclusions Soil Description:

Logarithm of time fitting method was used. We have assumed a value of 2.6 t/m³. The calculations of void ratio are Test Remarks:

affected by the solid density value.

CHLU 22/02/2023 Approved by KTP: Date: 31/03/2023 Tested by: Date:



1 Hill Street
Onehunga
Auckland
New Zealand

Geotechnics Project ID: 10

1017784.0000 Phase b

QESTLab Work Order ID:

Customer Project ID: ALCOE-103

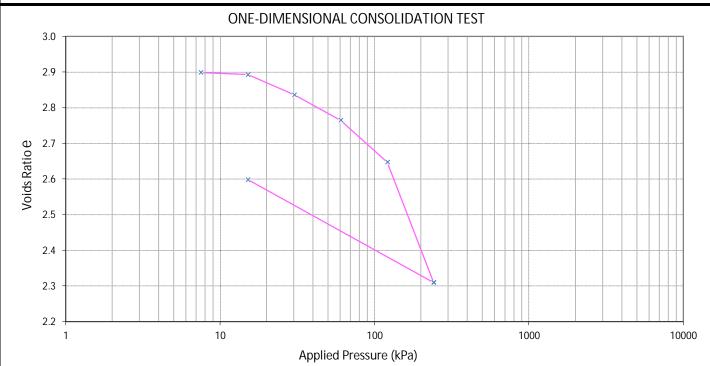
p. +64 9 356 3510
Site/Location: Eastern Busway 2

Location ID: Depth: DH323 5.85-5.98

Sample Ref.: --Test method used:

NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



#### Sample Parameters

**Initial Water Content** 126 % Initial Saturation Degree: 95 % Initial Bulk Density: 1.27 t/m³ Solid Density (assumed): 2.20  $t/m^3$ Initial Dry Density: **Temperature During Testing:** 23.0 to 25.0 °C 0.56 t/m³

Une-Dimensional Consc	Dildation Results
-----------------------	-------------------

Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
As received	0	2.914			
Preload	7.5	2.899	0 to 7.5	NA	0.52
	15.1	2.893	7.5 to 15.1	9.8	0.2
	30.2	2.836	15.1 to 30.2	10	0.97
	60.3	2.765	30.2 to 60.3	9	0.62
Loading	121	2.647	60.3 to 121	3.3	0.51
	241	2.310	121 to 241	2	0.77
Unload	15.1	2.598	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: peaty CLAY black; soft, wet, high plasticity.

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.2 t/m³. The calculations of void ratio are

affected by the solid density value.



1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.0000 Phase b

QESTLab Work Order ID:

Customer Project ID: ALCOE-103

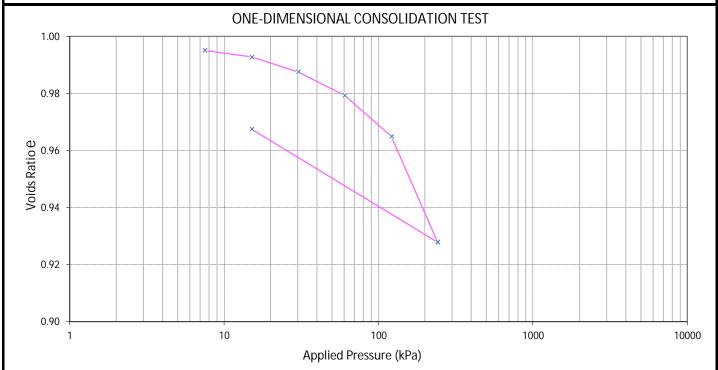
Site/Location: Eastern Busway 2 Location ID: Depth:

DH325 5.69-5.75

Sample Ref.: Test method used:

NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



^		_	
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Jann	סוכ	гага	111101013

% Initial Water Content 36.7 Initial Saturation Degree: 98 % Initial Bulk Density: 1.82 Solid Density (assumed): t/m3 2.65  $t/m^3$ Initial Dry Density: **Temperature During Testing:** 23.0 to 25.0 °C 1.33 t/m<sup>3</sup>

**One-Dimensional Consolidation Results** 

	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility
	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
_					

	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				,
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
As received	0	0.994			
Preload	7.5	0.995	0 to 7.5	NA	-0.072
	15.1	0.993	7.5 to 15.1	19	0.15
	30.2	0.988	15.1 to 30.2	11	0.17
	60.3	0.979	30.2 to 60.3	8.9	0.14
Loading	121	0.965	60.3 to 121	5.6	0.12
	241	0.928	121 to 241	5.4	0.16
Unload	15.1	0.967	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: clayey SILT, stiff, dark grey with blue and brown.

Square root of time fitting method was used. We have assumed a value of 2.65 t/m3. The calculations of void ratio are Test Remarks:

affected by the solid density value.

1/07/2022 Approved Signatory: Date:

Test



Test method used:

1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID:

Customer Project ID:

1017784.0000 Phase b

QESTLab Work Order ID:

ALCOE-103

p. +64 9 356 3510

Location ID:

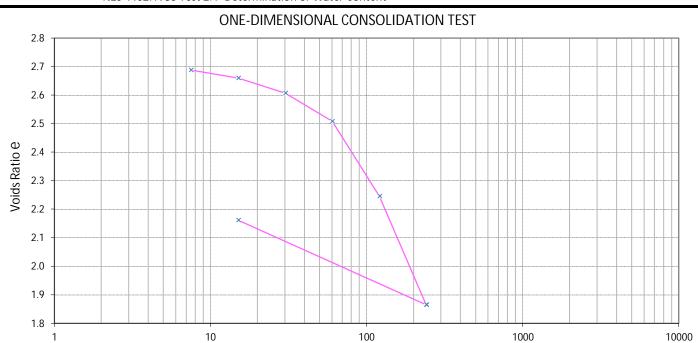
DH326 4.79 - 4.83

(m)

Site/Location: Eastern Busway 2 Sample Ref.:

Depth: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



#### Sample Parameters

Applied Pressure (kPa)

97 **Initial Water Content** 138 % Initial Saturation Degree: % Initial Bulk Density: 1.22 t/m<sup>3</sup> Solid Density (assumed): 1.90  $t/m^3$ Initial Dry Density: 0.51 t/m<sup>3</sup> Temperature During Testing: 23.0 to 25.0 °C

One-Dimensional Consolidation Results	

Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility
					, ,
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)
As received	0	2.692			
Preload	7.5	2.688	0 to 7.5	NA	0.14
	15.1	2.660	7.5 to 15.1	12	1
	30.2	2.607	15.1 to 30.2	9.8	0.96
	60.3	2.508	30.2 to 60.3	8.7	0.91
Loading	121	2.246	60.3 to 121	3.6	1.2
	241	1.865	121 to 241	2.5	0.98
Unload	15.1	2.161	241 to 15.1	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Spongy PEAT, black; very soft, wet, high plasticity. Soil Description:

Square root of time fitting method was used. We have assumed a value of 1.9 t/m3. The calculations of void ratio are Test Remarks:

affected by the solid density value.

1/07/2022 Approved Signatory: Date: Y.



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

DH327

2.95-2.99

QESTLab Work Order ID:

Location ID:

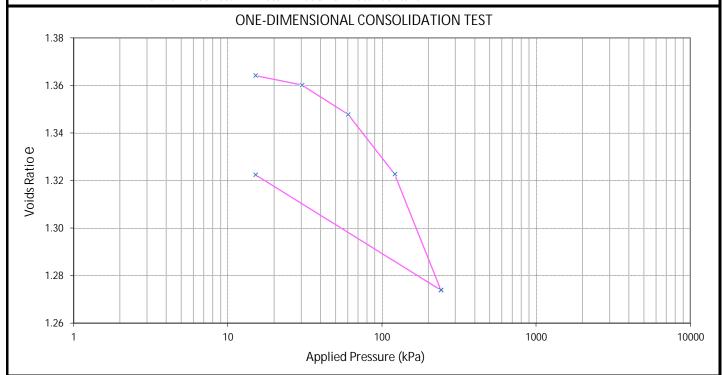
**Customer Project ID:** EBA\_17

Site/Location: Eastern Busway

Depth:

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 50.2 % Initial Saturation Degree: 99 % 2.70 Initial Bulk Density: 1.71 Solid Density (assumed):  $t/m^3$  $t/m^3$ Initial Dry Density: 1.14 t/m³ **Temperature During Testing:** 20.0 to 26.0 °C

	One-Dimensional Consolidation Results								
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility				
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)				
As received	0	1.367							
Preload	15.1	1.364	0 to 15.1	NA	0.08				
	30.2	1.360	15.1 to 30.2	3.0	0.11				
	60.3	1.348	30.2 to 60.3	1.8	0.17				
	121	1.323	60.3 to 121	1.7	0.18				
Loading	241	1.274	121 to 241	1.6	0.17				
Unload	15.1	1.322	241 to 15.1	NA	NA				

Sample History: Undisturbed core trimmed at natural water content.

clayey SILT with a trace of sand, firm, light grey; moist, extremely high, plasticity Soil Description:

Test Remarks: Square root of time fitting method was used. We have assumed a value of 2.7 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

CHLU 6/04/2023 Approved by KTP: Date: 11/05/2023 Tested by: Date:



1 Hill Street Onehunga Auckland New Zealand p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

QESTLab Work Order ID:

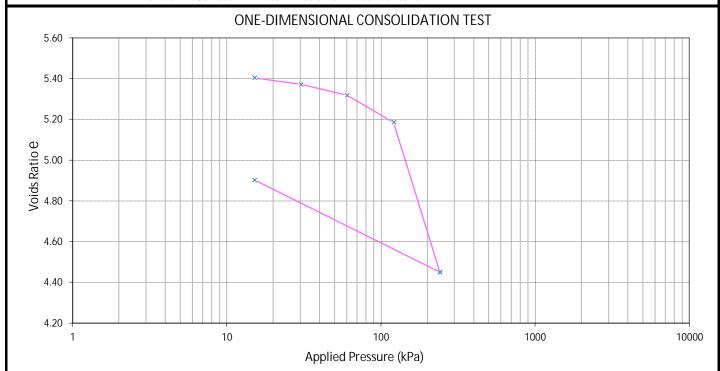
Customer Project ID: EBA\_17

Site/Location: Eastern Busway

Sample Ref.: --Test method used: Location ID: DH327
Depth: 6.36-6.4

NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 290 % Initial Saturation Degree: 96 % 1.09 Initial Bulk Density: Solid Density (assumed): 1.80  $t/m^3$  $t/m^3$ Initial Dry Density: 0.28  $t/m^3$ **Temperature During Testing:** 20.0 to 24.0 °C

	One-Dimensional Consolidation Results							
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility			
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)			
As received	0	5.431						
Preload	15.1	5.405	0 to 15.1	NA	0.27			
	30.2	5.371	15.1 to 30.2	54	0.34			
	60.3	5.318	30.2 to 60.3	39	0.28			
	121	5.186	60.3 to 121	19	0.35			
Loading	241	4.450	121 to 241	1.4	0.99			
Unload	15.1	4.901	241 to 15.1	NA	NA			

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: PEAT, firm, black; moist, amorphous

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.8 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

Max 241 kPa

Tested by: CHLU Date: 4/04/2023 Approved by KTP: /-- Date: 11/05/2023



Geotechnics Project ID:

Customer Project ID:

1017784.0000 Phase b

QESTLab Work Order ID:

): ALCOE-103

GEOTECHNICS p. +64 9 356 3510

Location ID: Depth: DH329

12.25-12.3

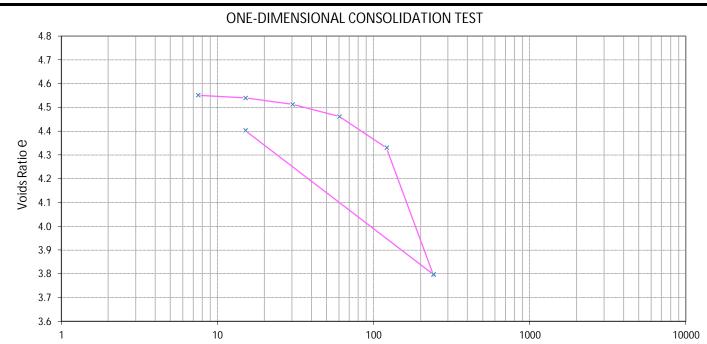
(m)

Site/Location: Eastern Busway 2

Sample Ref.: --Test method used:

NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Applied Pressure (kPa)

Sample Parameters

97 **Initial Water Content** 233 % % Initial Saturation Degree: Initial Bulk Density: 1.14  $t/m^3$ Solid Density (assumed): 1.90 t/m<sup>3</sup> Initial Dry Density: 0.34 t/m<sup>3</sup> Temperature During Testing: 23.0 to 25.0 °C

	One-Dimensional Consolidation Results								
Test	Applied Pressure	d Pressure   Void Ratio   Pressure Increment   Coefficient of Consolidation   Coefficient of Volume							
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)				
As received	0	4.552							
Preload	7.5	4.551	0 to 7.5	NA	0.036				
	15.1	4.539	7.5 to 15.1	10	0.28				
	30.2	4.513	15.1 to 30.2	7.5	0.32				
	60.3	4.461	30.2 to 60.3	6.2	0.31				
Loading	121	4.330	60.3 to 121	3.9	0.4				
	241	3.798	121 to 241	0.89	0.83				
Unload	15.1	4.403	241 to 15.1	NA	NA				

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Sponge PEAT, with some clay, soft, black, high plasticity.

Test Remarks: Square root of time fitting method was used. We have assumed a value of 1.9 t/m³. The calculations of void ratio are

affected by the solid density value.

Approved Signatory: Date: 1/07/2022



Sample Ref.:

1 Hill Street Onehunga Auckland New Zealand

p. +64 9 356 3510

Geotechnics Project ID:

1017784.1000 Phase B

BH329\_P

7.45-7.49

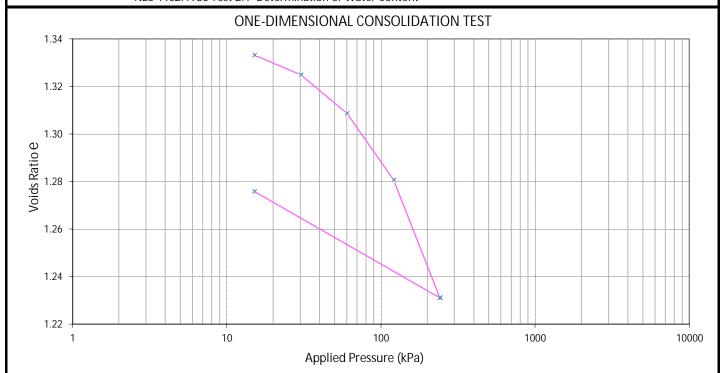
QESTLab Work Order ID:

**Customer Project ID:** EBA\_11

Site/Location: Eastern Busway Location ID: Depth:

Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties

NZS 4402:1986 Test 2.1 Determination of Water Content



Sample Parameters

Initial Water Content: 50.1 % Initial Saturation Degree: 99 % 1.70 Initial Bulk Density: Solid Density (assumed): 2.65  $t/m^3$  $t/m^3$ Initial Dry Density: 1.13  $t/m^3$ **Temperature During Testing:** 21.0 to 23.0 °C

	One-Dimensional Consolidation Results							
Test	Applied Pressure	Void Ratio	Pressure Increment	Coefficient of Consolidation	Coefficient of Volume Compressibility			
Status	(kPa)	е	(kPa)	Cv (m2/yr)	Mv (m²/MN)			
As received	0	1.340						
Preload	15.1	1.333	0 to 15.1	NA	0.19			
	30.2	1.325	15.1 to 30.2	22	0.23			
	60.3	1.309	30.2 to 60.3	39	0.23			
	121	1.281	60.3 to 121	22	0.20			
Loading	241	1.231	121 to 241	21	0.18			
Unload	15.1	1.276	241 to 15.1	NA	NA			

Sample History: Undisturbed core trimmed at natural water content.

silty CLAY, soft to firm, greyish brown; moist, high plasticity Soil Description:

Test Remarks: Logarithm of time fitting method was used. We have assumed a value of 2.65 t/m<sup>3</sup>. The calculations of void ratio are

affected by the solid density value.

CHLU 21/02/2023 Date: 31/03/2023 Tested by: Date: Approved by KTP:



# **Corrosivity Suite**

Private Bag 3205

T 0508 HILL LAB (44 555 22) +64 7 858 2000 Ε mail@hill-labs.co.nz W www.hill-laboratories.com

# **Certificate of Analysis**

Page 1 of 2

Client: Eastern Busway Contact: Grace Wigglesworth

C/- The Fletcher Construction Company Limited -Inf

Private Bag 92059 Victoria Street West Auckland 1142

Lab No: 3224044 **Date Received:** 31-Mar-2023 **Date Reported:** 17-May-2023 **Quote No:** 118436 **Order No:** 454740

**Client Reference:** EBA\_16 HILLS Submitted By: Grace Wigglesworth

Sample Type: Soil						
Sa	mple Name:	DH301 13.15-13.5m 30-Mar-2023 12:00 pm	DH301 15.45-15.8m 30-Mar-2023 12:00 pm	DH307 1.95-2.4m 30-Mar-2023 12:00 pm	DH308 7.0-7.3m 30-Mar-2023 12:00 pm	DH314 1.5-1.8m 31-Mar-2023 12:00 pm
L	.ab Number:	3224044.1	3224044.2	3224044.3	3224044.4	3224044.5
Individual Tests						
Chloride	mg/kg dry wt	191	< 50	< 50	51	54
рН	pH Units	5.9	7.7	8.2	5.9	4.9
Water Soluble Sulphate as SO4	and SO3					
Water Soluble Sulphate	g/100g dry wt	0.084	0.074	0.035	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	0.070	0.062	0.029	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	0.42	0.37	0.17	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	0.35	0.31	0.14	< 0.10	< 0.10

Sa	mple Name:		DH319 5.2-5.8m 31-Mar-2023 12:00 pm	DH323 0.5-1.0m 31-Mar-2023 12:00 pm	DH325 1.2-2.0m 31-Mar-2023 12:00 pm
L	ab Number:	3224044.6	3224044.7	3224044.8	3224044.9
Individual Tests					
Chloride	mg/kg dry wt	< 50	< 50	< 50	< 50
pH	pH Units	5.8	5.3	5.8	5.8
Water Soluble Sulphate as SO4 a	and SO3				
Water Soluble Sulphate	g/100g dry wt	< 0.010	0.013	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	< 0.010	0.011	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10

## **Summary of Methods**

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Non-Routine Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-9
Non-Routine sample preparation. Air drying and 425 um sieving.	Air dried and sieved, <425 um fraction. Used for sample preparation.	-	1-9
Non-Routine sample preparation. Air drying and 90 um sieving.	Air dried and sieved, <90 um fraction. Used for sample preparation.	-	1-9
Water Soluble Sulphate as SO4 and SO3		-	1-9
Water Soluble Chloride	Extraction into boiling water, potentiometric titration with silver nitrate. DIN 4030 Part 2 section 5.3.5.	50 mg/kg dry wt	1-9
pH	2.5:1 water:air dried, sub-2mm sieved soil, vol:wt, stand 8 hrs, electrometric with a pH meter. BS 1377: Part 3: 1990 section 9.5.	0.1 pH Units	1-9
Water Soluble Sulphate	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9

Sample Type: Soil							
Test	Method Description	<b>Default Detection Limit</b>	Sample No				
Water Soluble Sulphate as SO3	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9				
Water Soluble Sulphate	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9				
Water Soluble Sulphate as SO3	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9				

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 04-Apr-2023 and 17-May-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Martin Cowell - BSc

Client Services Manager - Environmental

Private Bag 3205

T 0508 HILL LAB (44 555 22) +64 7 858 2000 Ε mail@hill-labs.co.nz W www.hill-laboratories.com

# **Certificate of Analysis**

Page 1 of 2

Client: Eastern Busway Contact: Grace Wigglesworth

C/- The Fletcher Construction Company Limited -Inf

Private Bag 92059 Victoria Street West Auckland 1142

Lab No: 3224044 **Date Received:** 31-Mar-2023 **Date Reported:** 17-May-2023 **Quote No:** 118436 **Order No:** 454740

**Client Reference:** EBA\_16 HILLS Submitted By: Grace Wigglesworth

Sample Type: Soil						
Sa	mple Name:	DH301 13.15-13.5m 30-Mar-2023 12:00 pm	DH301 15.45-15.8m 30-Mar-2023 12:00 pm	DH307 1.95-2.4m 30-Mar-2023 12:00 pm	DH308 7.0-7.3m 30-Mar-2023 12:00 pm	DH314 1.5-1.8m 31-Mar-2023 12:00 pm
L	.ab Number:	3224044.1	3224044.2	3224044.3	3224044.4	3224044.5
Individual Tests						
Chloride	mg/kg dry wt	191	< 50	< 50	51	54
рН	pH Units	5.9	7.7	8.2	5.9	4.9
Water Soluble Sulphate as SO4	and SO3					
Water Soluble Sulphate	g/100g dry wt	0.084	0.074	0.035	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	0.070	0.062	0.029	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	0.42	0.37	0.17	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	0.35	0.31	0.14	< 0.10	< 0.10

Sa	mple Name:		DH319 5.2-5.8m 31-Mar-2023 12:00 pm	DH323 0.5-1.0m 31-Mar-2023 12:00 pm	DH325 1.2-2.0m 31-Mar-2023 12:00 pm
L	ab Number:	3224044.6	3224044.7	3224044.8	3224044.9
Individual Tests					
Chloride	mg/kg dry wt	< 50	< 50	< 50	< 50
pH	pH Units	5.8	5.3	5.8	5.8
Water Soluble Sulphate as SO4 and SO3					
Water Soluble Sulphate	g/100g dry wt	< 0.010	0.013	< 0.010	< 0.010
Water Soluble Sulphate as SO3	g/100g dry wt	< 0.010	0.011	< 0.010	< 0.010
Water Soluble Sulphate as SO4	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10
Water Soluble Sulphate as SO3	g/L in extract	< 0.10	< 0.10	< 0.10	< 0.10

## **Summary of Methods**

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Non-Routine Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-9
Non-Routine sample preparation. Air drying and 425 um sieving.	Air dried and sieved, <425 um fraction. Used for sample preparation.	-	1-9
Non-Routine sample preparation. Air drying and 90 um sieving.	Air dried and sieved, <90 um fraction. Used for sample preparation.	-	1-9
Water Soluble Sulphate as SO4 and SO3		-	1-9
Water Soluble Chloride	Extraction into boiling water, potentiometric titration with silver nitrate. DIN 4030 Part 2 section 5.3.5.	50 mg/kg dry wt	1-9
pH	2.5:1 water:air dried, sub-2mm sieved soil, vol:wt, stand 8 hrs, electrometric with a pH meter. BS 1377: Part 3: 1990 section 9.5.	0.1 pH Units	1-9
Water Soluble Sulphate	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9

Sample Type: Soil			
Test	Method Description	<b>Default Detection Limit</b>	Sample No
Water Soluble Sulphate as SO3	Gravimetric after 2:1 water extn of sub-425um sample, dried at 80°C, and pptn as BaSO4. BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.010 g/100g dry wt	1-9
Water Soluble Sulphate	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9
Water Soluble Sulphate as SO3	BS 1377:Part 3:1990 sections 5.3.3, 5.5.	0.10 g/L in extract	1-9

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 04-Apr-2023 and 17-May-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Martin Cowell - BSc

Client Services Manager - Environmental



# **Unconfined Compression Strength Test**



p. +64 9 356 3510

Geotechnics Project ID
Customer Project ID

1017784.1000.2.0

EBA\_16

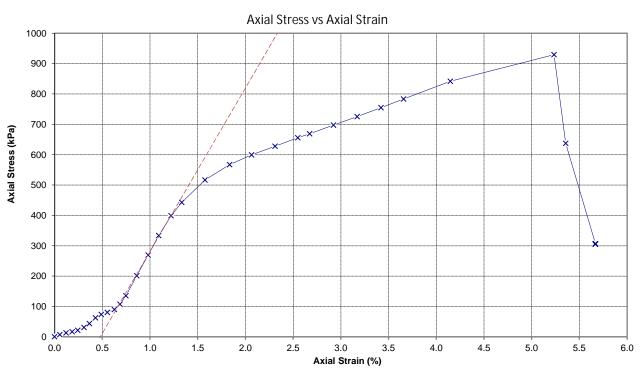
Site: Eastern Busway Location ID: DH301

Sample Ref.: -- Depth: 18.5-18.75 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method D)

NZS 4402:1986 Test 2.1 Determination of Water Content

#### UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm) 121.67
Sample Diameter (mm) 60.18
Test Length (mm) 121.67
Test Height / Diameter Ratio 2.02

Bulk Density (t/m³)
Dry Density (t/m³)

2.04 1.65

Water Content (%) 23.6

Failure Value:

Axial Strain  $\epsilon$  (%) 5.24

Unconfined Compressive Strength q<sub>u</sub> (kPa) 929

Rate of Compression (mm/min) 0.33

Modulus of Elasticity (MPa) 54

Mode of Failure: Shear

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILTSTONE, extremely weak, dark brownish grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.





Tested by: CHLU Date: 29/03/2023 Approved by: \( \sqrt{--} \) Date: 28/04/2023



Geotechnics Project ID 1017784.1000.2.0 **Customer Project ID** EBA\_16

p. +64 9 356 3510

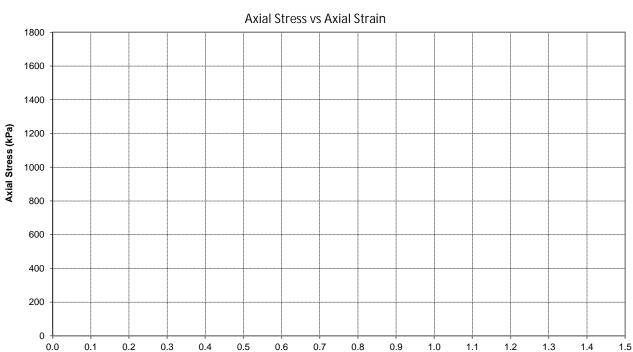
Site: Eastern Busway Location ID: DH301

Sample Ref.: Depth: 23.1-23.4 (m) Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 **Determination of Water Content** 

#### **UNCONFINED COMPRESSION STRENGTH TEST**



Axial Strain (%)

Initial Sample Parameters:

Sample Length (mm) 120.77 Sample Diameter (mm) 60.65 Test Length (mm) 120.77 Test Height / Diameter Ratio

1.99

Failure Value:

**Unconfined Compressive** Strength q<sub>11</sub> (kPa)

2354

Water Content (%)

Bulk Density (t/m3)

Dry Density (t/m3)

Mode of Failure:

Shear

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SANDSTONE, very weak, dark grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.



2.08

1.70

21.8



Tested by: **CHLU** Date: 29/03/2023 Date: 28/04/2023 Approved by:



p. +64 9 356 3510

Geotechnics Project ID

Customer Project ID

1017784

Page 7 of 16

Schedule 7

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

**Sample Details** 

Geotechnics Sample ID	AKL56.1				
Site	Eastern Busway ALCOE-84				
Test Request Number	-	BH No.	DH302	Depth	12.69-12.98 m
Sample Description	grey, very weak, sandy SILTST	ONE			

**Sample Parameters** 

Sample Height	(mm)	123.75
Sample Diameter	(mm)	60.35
Test Height	(mm)	123.75
Test H/D Ratio		2.05

Bulk Density	(t/m³)	1.99
Dry Density	(t/m³)	1.62
Water Content	(%)	23.0

Failure Value
Unconfined Compressive
Strength qu (kPa)
1850

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

**Test Remarks** 

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

GEGO Date: 21/04/2022 Checked by: CAGI Date: 21/04/2022 Entered by:

Our Ref: 1017784 Phase A/Rep8B

Version 1.1: 25 November 2015



1 Hill Street Onehunga Auckland, 1061 New Zealand p. +64 9 356 3510

Page 12 of 16

Geotechnics Project ID

Customer Project ID

1017784 Schedule 7

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample	Details
--------	---------

Geotechnics Sample ID	AKL56.2				
Site	Eastern Busway ALCOE-84				
Test Request Number	-	BH No.	DH304	Depth	23.82-24.0 m
Sample Description	grey, very weak, sandy SILTST	ONE			

#### **Sample Parameters**

Sample Height	(mm)	123.80
Sample Diameter	(mm)	61.86
Test Height	(mm)	123.80
Test H/D Ratio		2.00

Bulk Density	(t/m³)	1.85
Dry Density	(t/m³)	1.58
Water Content	(%)	17.3

Failure Value
Unconfined Compressive
Strength qu (kPa)
1700

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

#### **Test Remarks**

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

Entered by: GEGO Date: 21/04/2022 Checked by: CAGI Date: 21/04/2022

GEOTECHNICS LTD
NZS 4402 Test 6.3.1 - Unconfined Compression - Output

Our Ref: 1017784 Phase A/Rep8B Page 1 of 1

Version 1.1: 25 November 2015



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Geotechnics Project ID

1017784.1000.2.0

**Customer Project ID** EBA\_17

DH305

Site: Eastern Busway Location ID:

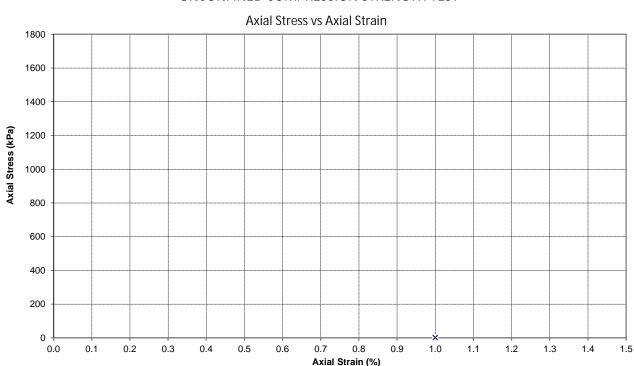
Sample Ref.: Depth: 18.17-18.29 (m)

Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 **Determination of Water Content** 

#### **UNCONFINED COMPRESSION STRENGTH TEST**



Initial Sample Parameters:

Failure Value:

Sample Length (mm) 124.91 Sample Diameter (mm) 60.73 Test Length (mm) 124.91 2.06

Bulk Density (t/m3) Dry Density (t/m3) Water Content (%)

Mode of Failure:

2.03 1.66 22.0

Test Height / Diameter Ratio

Shear

**Unconfined Compressive** 

Strength q<sub>11</sub> (kPa) 2441

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: slightly weathered SANDSTONE, very weak, dark brownish grey.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.





Tested by: **CHLU** Date: 29/03/2023 Date: 11/05/2023 Approved by:



ckland Geotechnics Project ID 1017784.1000.2.0 ew Zealand Customer Project ID EBA\_16

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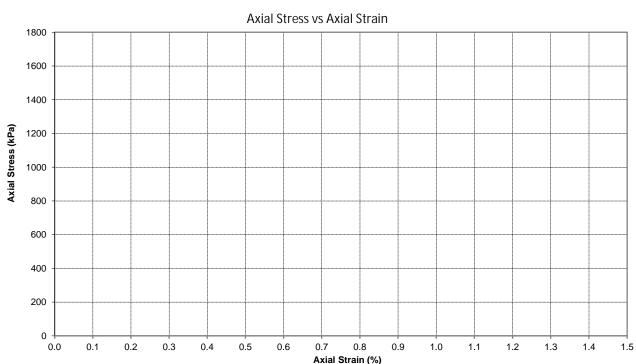
Site: Eastern Busway Location ID: DH306

Sample Ref.: -- Depth: 18.48-18.7 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 Determination of Water Content

#### **UNCONFINED COMPRESSION STRENGTH TEST**



Initial Sample Parameters:

Failure Value:

Sample Length (mm) 124.77
Sample Diameter (mm) 60.07
Test Length (mm) 124.77

Test Height / Diameter Ratio 2.08

Unconfined Compressive

Strength q<sub>u</sub> (kPa) 1330 Water Content (%)

Mode of Failure:

Bulk Density (t/m3)

Dry Density (t/m3)

Shear

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SANDSTONE, very weak, dark grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.



1.97

1.57

25.2



Tested by: CHLU Date: 29/03/2023 Approved by: \( \sqrt{--} \) Date: 28/04/2023



Site:

1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID **Customer Project ID** 

1017784.1000.2.0

EBA\_

p. +64 9 356 3510 Eastern Busway

Location ID:

DH307

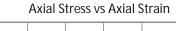
Sample Ref.:

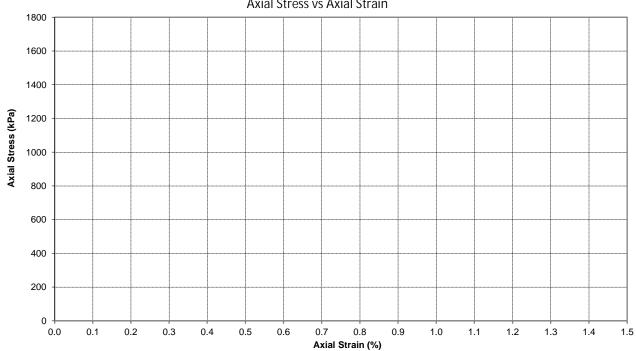
Depth: 14.52-14.64 Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 **Determination of Water Content** 

#### **UNCONFINED COMPRESSION STRENGTH TEST**





Initial Sample Parameters:

Failure Value:

Sample Length (mm) 123.86 Sample Diameter (mm) 60.49 Test Length (mm) 123.86 2.05

Bulk Density (t/m3) Dry Density (t/m³)

Mode of Failure:

1.96 1.59

Water Content (%)

23.6

Test Height / Diameter Ratio

**Unconfined Compressive** 

Strength q<sub>u</sub> (kPa)

Shear

1777

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SANDSTONE, very weak, light grey.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.

Failure Photo:



**CHLU** Date: 8/05/2023 Date: 11/05/2023 Tested by: Approved by:



ckland Geotechnics Project ID 1017784.1000.2.0 w Zealand Customer Project ID EBA\_16

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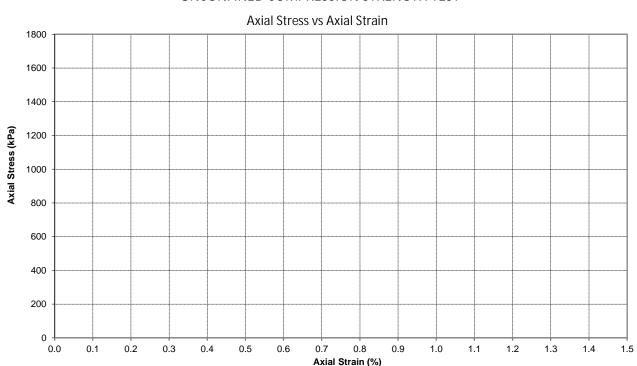
Site: Eastern Busway Location ID: DH308

Sample Ref.: -- Depth: 1-1.38 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 Determination of Water Content

#### **UNCONFINED COMPRESSION STRENGTH TEST**



Initial Sample Parameters:

Sample Length (mm) 125.36 Bulk Density (t/m³)
Sample Diameter (mm) 60.73 Dry Density (t/m³)
Test Length (mm) 125.36 Water Content (%)

Test Height / Diameter Ratio 2.06

Failure Value: Mode of Failure:

Unconfined Compressive Shear Strength q<sub>II</sub> (kPa)

58871

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: BASALT, slightly weathered, strong, light grey and black; highly vesicular.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.



2.44

2.40

1.4





Site:

1 Hill Street Onehunga Auckland New Zealand

Geotechnics Project ID

1017784.1000.2.0

**Customer Project ID** EBA\_17

DH308 P

p. +64 9 356 3510 Eastern Busway

Location ID:

Sample Ref.:

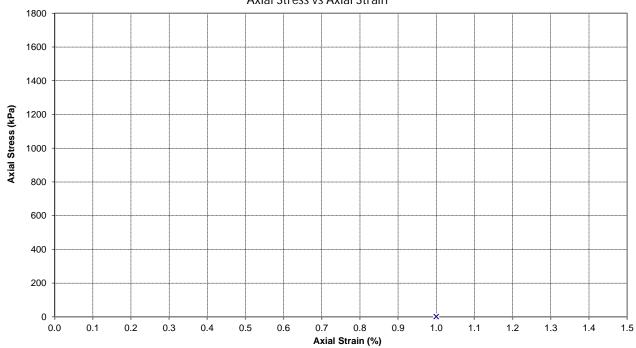
Depth: 3.35-3.47 (m) Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 **Determination of Water Content** 

#### **UNCONFINED COMPRESSION STRENGTH TEST**

# Axial Stress vs Axial Strain



Initial Sample Parameters:

Failure Value:

Sample Length (mm) 124.18 Sample Diameter (mm) 60.77 Test Length (mm) 124.18 Test Height / Diameter Ratio 2.04

Bulk Density (t/m3) Dry Density (t/m3) Water Content (%)

Mode of Failure:

2.71 2.69 0.9

**Unconfined Compressive** 

Shear

Strength q<sub>11</sub> (kPa) 86345

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: slightly weathered BASALT, strong, light grey; slightly vesicular.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.





Tested by: **CHLU** Date: 30/03/2023 Date: 11/05/2023 Approved by:



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Onehunga
Auckland, 1061

New Zealand p. +64 9 356 3510

Geotechnics Project ID Customer Project ID 1017784

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ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Samp	le Details	
------	------------	--

Geotechnics Sample ID	AKL101.2			
Site	Eastern Busway			
BH No.	DH312		Depth	1.25-1.5 m
Sample Description	BASALT, vesicular, strong.			

#### Sample Parameters

Sample Height	(mm)	119.29
Sample Diameter	(mm)	60.49
Test Height	(mm)	119.29
Test H/D Ratio		1.97

Bulk Density	(t/m³)	2.39
Dry Density	(t/m³)	2.34
Water Content	(%)	1.9

Failure Value
Unconfined Compressive
Strength qu (kPa)
49000

Mode of Failure

Sample History

Undisturbed core trimmed at natural water content.

**Test Remarks** 

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Axial

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022



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Geotechnics Project ID

Customer Project ID

1017784

ALCOE-103

#### Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details					
Geotechnics Sample ID	AKL101.3				
Site	Eastern Busway				
BH No.	DH312			Depth	3.2-3.7 m
Sample Description	BASALT, vesicular, strong.				

#### **Sample Parameters**

Sample Height	(mm)	119.53
Sample Diameter	(mm)	60.39
Test Height	(mm)	119.53
Test H/D Ratio		1.98

Bulk Density	(t/m³)	2.78
Dry Density	(t/m³)	2.66
Water Content	(%)	4.4

Failure Value
Unconfined Compressive
Strength qu (kPa)
80000

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

#### **Test Remarks**

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

Our Ref: 1017784.0000.A.0/Rep9



Geotechnics Project ID

1017784.1000.2.0

**Customer Project ID** EBA\_16

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Eastern Busway

Location ID:

DH322

(m)

Sample Ref.:

Site:

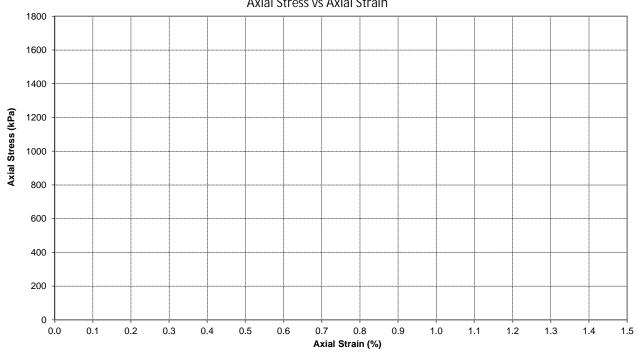
Depth: 18.45-18.57 Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 **Determination of Water Content** 

#### **UNCONFINED COMPRESSION STRENGTH TEST**





Initial Sample Parameters:

Sample Length (mm) 120.10 Sample Diameter (mm) 60.24 Test Length (mm) 120.10 Test Height / Diameter Ratio 1.99

Bulk Density (t/m3) Dry Density (t/m³)

1.94 1.53

Water Content (%)

Mode of Failure:

27.2

Failure Value:

**Unconfined Compressive** Strength q<sub>u</sub> (kPa)

Shear

74

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: SILTSTONE, extremely weak, dark grey

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.





**CHLU** Date: 8/05/2023 Date: 10/05/2023 Tested by: Approved by:



**Geotechnics Sample ID** 

Sample Description

Site BH No. 1 Hill Street
Onehunga
Auckland, 1061

New Zealand

p. +64 9 356 3510

Geotechnics Project ID
Customer Project ID

1017784

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ALCOE-103

#### $Determination \ of \ the \ unconfined \ compressive \ strength \ of \ cohesive \ soil - NZS \ 4402:1986 \ Test \ 6.3.1$

	Sample D	etails		
AKL103.3				
Eastern Busway				
DH322			Depth	21.6-21.92 m
SILTSTONE, grey, extremely w	<i>r</i> eak			

#### **Sample Parameters**

Sample Height	(mm)	120.44
Sample Diameter	(mm)	60.33
Test Height	(mm)	120.44
Test H/D Ratio		2.00

Bulk Density	(t/m³)	2.07
Dry Density	(t/m³)	1.71
Water Content	(%)	21.3

Failure Value
Unconfined Compressive
Strength qu (kPa)
660

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

#### **Test Remarks**

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022



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Geotechnics Project ID Customer Project ID

1017784

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ALCOE-103

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Samp	le Details
------	------------

ounipie secund					
Geotechnics Sample ID	AKL104.4				
Site	Eastern Busway				
BH No.	DH323			Depth	21.84-22.01 m
Sample Description	SILTSTONE, grey, extremely w	veak			

#### **Sample Parameters**

Sample Height	(mm)	111.12
Sample Diameter	(mm)	56.62
Test Height	(mm)	111.12
Test H/D Ratio		1.96

Bulk Density	(t/m³)	2.13
Dry Density	(t/m³)	1.83
Water Content	(%)	16.4

Failure Value
Unconfined Compressive
Strength qu (kPa)
860

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

#### **Test Remarks**

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

GEGO 13/06/2022 Checked by: CAGI Date: 17/06/2022 Tested by: Date:

Our Ref: 1017784.0000.A.0/Rep9



Geotechnics Project ID 1017784.1000.2.0 lew Zealand Customer Project ID EBA\_17

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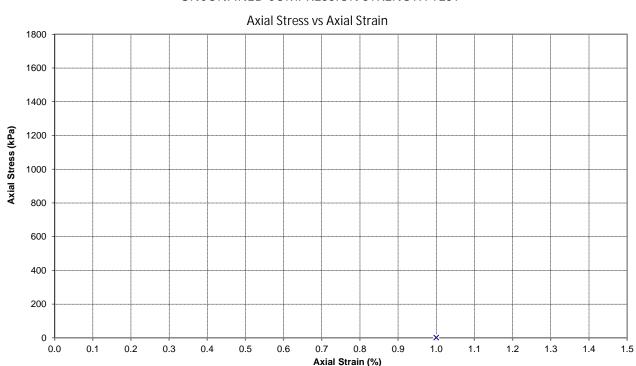
Site: Eastern Busway Location ID: DH328\_P

Sample Ref.: -- Depth: 3.82-3.95 (m)
Test method used: ASTM D7012-14e1 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and

Temperatures (Method C)

NZS 4402:1986 Test 2.1 Determination of Water Content

#### **UNCONFINED COMPRESSION STRENGTH TEST**



Initial Sample Parameters:

Sample Length (mm)125.45Bulk Density (t/m³)2.73Sample Diameter (mm)61.05Dry Density (t/m³)2.64Test Length (mm)125.45Water Content (%)3.3

Shear

Test Height / Diameter Ratio 2.05

Failure Value: Mode of Failure:

Unconfined Compressive Strength  $q_u$  (kPa)

75975

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: slightly weathered BASALT, strong, light grey with black; vesicular.

Test Remarks: Unconfined Compressive Strength reported to the nearest 1 kPa.

The test is not IANZ accredited.







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Geotechnics Project ID
Customer Project ID

1017784

ALCOE-103

#### Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

Sample Details					
Geotechnics Sample ID	AKL108.2				
Site	Eastern Busway				
BH No.	DH329			Depth	34.95-35.18 m
Sample Description	SILTSTONE, grey, very weak				

#### **Sample Parameters**

Sample Height	(mm)	112.17
Sample Diameter	(mm)	58.28
Test Height	(mm)	112.17
Test H/D Ratio		1.92

Bulk Density	(t/m³)	2.06
Dry Density	(t/m³)	1.71
Water Content	(%)	20.6

Failure Value
Unconfined Compressive
Strength qu (kPa)
1500

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

#### **Test Remarks**

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

This test is not IANZ accredited

Tested by: GEGO Date: 13/06/2022 Checked by: CAGI Date: 17/06/2022

Our Ref: 1017784.0000.A.0/Rep9



**Geotechnics Sample ID** 

Test Request Number

Sample Description

1 Hill Street Onehunga Auckland, 1061 New Zealand

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grey, extremely weak, SILTSTONE

Page 13 of 16

Geotechnics Project ID

Customer Project ID

1017784 Schedule 7

Determination of the unconfined compressive strength of cohesive soil - NZS 4402:1986 Test 6.3.1

	Sample D	etails		
AKL56.3				
Eastern Busway ALCOE-84				
-	BH No.	DH330	Depth	20.43-20.61 m

**Sample Parameters** 

Sample Height	(mm)	122.57
Sample Diameter	(mm)	60.86
Test Height	(mm)	122.57
Test H/D Ratio		2.01

Bulk Density	(t/m³)	2.12
Dry Density	(t/m³)	1.74
Water Content	(%)	21.3

Failure Value
Unconfined Compressive
Strength qu (kPa)
650

Mode of Failure Axial

Sample History Undisturbed core trimmed at natural water content.

**Test Remarks** 

Strain was not measured.

Unconfined compressive strength (kPa) is rounded 2 significant figures

Sample description are not IANZ accredited.

Entered by: GEGO Date: 21/04/2022 Checked by: CAGI Date: 21/04/2022

GEOTECHNICS LTD
NZS 4402 Test 6.3.1 - Unconfined Compression - Output

Our Ref: 1017784 Phase A/Rep8B



# **Liquid Limit, Plastic limit, Plasticity index**



**Geotechnics Project ID** 

1017784.1000.A.0

Page 4 of 5

Customer Project ID 406084

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETA	ILS	
OCATION	ID	DH301		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL475.1		
	Reference	-	Depth	4.5-5.0 m
	Description	silty CLAY, orange bro	wn with blueish grey; firm, mois	t, high plasticity
PECIMEN	Reference	_	Depth	-
	Description	-	Эсри.	
		TEST RESU	LTS	
iquid Limit	75			
Plastic Limit	28			
Plasticity Index	47			
		TECT DEAA	DVC	
		TEST REMA	KIV2	
• The material used for testing	g was natural, fraction passing a 425u	im sieve. • Date tested 9/05/2023		
his test result is IANZ acc	redited.			
Approved by KTD	011	Data	E/0E/2022	

15/05/2023

Our Ref: 1017784.1000.A.0/Rep14A

Date

Approved by KTP

exu



**Geotechnics Project ID Customer Project ID** 

1017784

Schedule 7

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# Determination of Liquid & Plastic Limit Plasticity Index -

		TEST	DETAILS	
LOCATION	ID	DH302		
	Description	ALCOE-84		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL67.1		
	Reference	-	Depth	6.5-7 m
	Description	clayey SILT wit	h trace sand, blueish grey-brown, mois	
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST	RESULTS	
Liquid Limit	52	1231	ILIJOLIJ	
Plastic Limit	21			
Plasticity Index	31			
,				
		TEST F	EEMARKS	
• The material used for testing	g was natural, fraction passing a 425			
This test result is IANZ acc	redited.			
	Stan Adexa	Date	25/05/2022	

Our Ref: 1017784 Phase A/Rep8B



**Geotechnics Project ID Customer Project ID** 

1017784.1000 Phase A

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406084

		TE	ST DETAILS		
OCATION	ID	DH303			
	Description	Eastern Bu	sway		
	Data	N/A			
AMPLE	Geotechnics ID	AKL371.1			
	Reference	-	Dept	th	7.5-8.0 m
	Description				eish grey with brown; firm, moist, low
		plasticity			
PECIMEN	Reference	-	Dept	th	-
	Description	-			
		TE	ST RESULTS		
iquid Limit	37				
Plastic Limit	21				
Plasticity Index	16				
The material used for testing	was natural, fraction passing a 425u		T REMARKS 1/03/2023		
his test result is IANZ accre	edited.				



**Geotechnics Project ID** 

1017784.1000 Phase A

Page 6 of 16

Customer Project ID

406084

#### Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

Description Data Geotechnics ID Reference Description Reference Description	DH303 Eastern Busway N/A AKL371.2 - clayey SILT, black; soft	<b>Depth</b> , moist, high plasticity <b>Depth</b>	9.5-10.0 m
Data Geotechnics ID Reference Description Reference Description	N/A  AKL371.2  - clayey SILT, black; soft	, moist, high plasticity	9.5-10.0 m
Geotechnics ID Reference Description Reference Description	AKL371.2 - clayey SILT, black; soft	, moist, high plasticity	9.5-10.0 m
Reference Description Reference Description	AKL371.2 - clayey SILT, black; soft	, moist, high plasticity	9.5-10.0 m
Description Reference Description	clayey SILT, black; soft	, moist, high plasticity	9.5-10.0 m
Description Reference Description		, moist, high plasticity	
Description 361	- -	Depth	
361	-	•	-
	TEST RESUL	TS	
224			
137			
	TEST REMAR	RKS	
	n sieve. • Date tested 1/03/2023		
urai, traction passing a 425un	n sieve. ▼ Date lested 1/03/2023		
urai, traction passing a 425un	n sieve. • Date tested 1/03/2023		
urai, traction passing a 425un	ii sieve. • Date tested 1/03/2023		
urai, traction passing a 425un	n sieve. • Date testeu 1/U3/2023		
	traction paging a 425ur		TEST REMARKS

3/03/2023

CHME

Date

Our Ref: 1017784.1000.A.0/Rep12A

Approved by KTP



Geotechnics Project ID

Customer Project ID

1017784

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Schedule 7

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETA	AILS	
LOCATION	ID	DH304		
	Description	ALCOE-84		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL68.2		
	Reference	-	Depth	5.5-6 m
	Description		e sand, blueish grey-brown, mois	
SPECIMEN	Reference	<u>-</u>	Depth	-
	Description	-	•	
		TEST RESU	ILTS	
Liquid Limit	44			
Plastic Limit	24			
Plasticity Index	20			
		TEST REMA	ARKS	
The material used for te	sting was natural, fraction passing a 425u			
This test result is IANZ	accredited			
THIS LEST LESUIT IS IMINZ	An. Aderor			

Our Ref: 1017784 Phase A/Rep8B



Geotechnics Project ID

Customer Project ID

Page 5 of 13 1017784.1000 Phase 4

406084

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETAIL	S		
OCATION	ID	DH306			
	Description	Eastern Busway 12			
	Data	N/A			
AMPLE	Geotechnics ID	AKL377.1			
	Reference	-	Depth	6.0-6.5 m	
	Description	silty CLAY with trace of	sand and gravel, light orange b	rown with orange; soft, moist, high pl	astici
PECIMEN	Reference	-	Depth	-	
	Description	-			
		TEST RESULT	S		
quid Limit	138				
lastic Limit	34				
Plasticity Index	104				
		TEST REMAR	(S		
The material used for testing	was natural, fraction passing a 425u	im sieve. • Date tested 1/03/2023			
his test result is IANZ accr	redited				
naround by KTD	CUME	Data	9/02/2022		

8/03/2023

CHME

Date

Our Ref: 1017784.1000.A.0/Rep13

Approved by KTP



Geotechnics Project ID

Customer Project ID

1017784.1000 Phase A

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406084

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETAIL	LS	
OCATION	ID	DH309		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL371.3		
	Reference	-	Depth	7.5-8.0 m
	Description	clayey SILT with minor	sand and trace of gravel, dark	blueish grey; very soft, moist, high plasticit
PECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESUL	TS	
iquid Limit	63			
Plastic Limit	26			
Plasticity Index	37			
		TEST REMAR	KS	
The material used for testing	was natural, fraction passing a 425u	m sieve. • Date tested 28/02/2023		

3/03/2023

CHME

Date

Our Ref: 1017784.1000.A.0/Rep12A

Approved by KTP



**Geotechnics Project ID** 

1017784.1000 Phase A

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Customer Project ID

406084

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETAIL	.S	
LOCATION	ID	DH309		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL371.4		
	Reference	-	Depth	9.0-9.5 m
	Description	sandy SILT with some o	lay and trace of gravel, dark blu	ueish grey; soft, moist, low plasticity
SPECIMEN	Reference	<u>-</u>	Depth	-
	Description	-		
		TEST RESUL	rs	
iquid Limit	40			
Plastic Limit	24			
Plasticity Index	16			
		TEST REMAR	KS	
• The material used for testing	was natural, fraction passing a 425u	m sieve. • Date tested 28/02/2023		
his test result is IANZ accr	raditad			
Approved by KTD	CUME	Data	2/02/2022	

CHME

Approved by KTP

Date

3/03/2023



**Geotechnics Project ID Customer Project ID** 

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406084

		TEST DETAILS		
LOCATION	ID	DH311		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL377.2		
	Reference	-	Depth	5.5-6.0 m
	Description	silty sandy CLAY with trac	e of gravel, dark greenish gr	rey; firm, moist, high plasticity
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESULTS		
iquid Limit	91			
Plastic Limit	33			
Plasticity Index	58			
The market 1 10 10 11		TEST REMARKS	5	
ı ine material used for testing	g was natural, fraction passing a 425u	im sieve. • Date tested 1/03/2023		
his test result is IANZ acc	redited.			

8/03/2023

Approved by KTP

CHME

Date

Our Ref: 1017784.1000.A.0/Rep13



Geotechnics Project ID

Customer Project ID

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ALCOE-103

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETA	ILS	
OCATION	ID	DH312		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL101.1		
	Reference	-	Depth	7-7.5 m
	Description	sandy SILT minor cla	y, whiteish grey; soft, moist, lov	
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESU	LTS	
iquid Limit	28			
Plastic Limit	20			
Plasticity Index	8			
		TEAT DELC	DIVE	
The material used for testing	g was natural, fraction passing a 425um si	TEST REMA	KKS	
est By cagi 13/06/2022				
his test result is IANZ acc	redited.			

exy

Approved By

17/06/2022

Date



**Geotechnics Project ID** 

1017784.1000 Phase 4

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**Customer Project ID** 406084

		TEST DETA	AILS	
OCATION	ID	DH314		
	Description	Eastern Busway 12		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL377.4		
	Reference	- -	Depth	1.75-2.25 m
	Description			ange brown with black; soft, moist, high
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESU	ILTS	
iquid Limit	60			
Plastic Limit	25			
Plasticity Index	35			
The material west for the con-	unas natural fraction reire (27	TEST REMA		
The material used for testing	was natural, fraction passing a 425u			
The material used for testing				

Our Ref: 1017784.1000.A.0/Rep13



**Geotechnics Project ID** 

1017784.1000.A.0

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Customer Project ID 406084

		TEST DETAIL	5	
OCATION	ID	DH318_P		
	Description	Eastern Busway		
	Data	N/A		
AMPLE	Geotechnics ID	AKL475.4		
	Reference	-	Depth	10.2-10.9 m
	Description	SILT with minor sand an plastic	d clay and trace of gravel, lig	ht brownish grey with black; soft, moist, no
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESULT	S	
iquid Limit	Not Obtainable			
Plastic Limit	Not Obtainable			
Plasticity Index	Not Obtainable			
		TEST REMARI	<u> </u>	
The meterial ward ( )	upo potuvol franklas and 1 427			shteinable during the accuracy of the control of th
The material used for testing v .0/05/2023	was naturai, fraction passing a 425um	sieve. • Both the final Liquid Limit	and Plastic Limit results were und	obtainable during the course of testing. • Date to
.0,00,2023				
his test result is IANZ accre				

Date

Our Ref: 1017784.1000.A.0/Rep15

11/05/2023

exy

Approved by KTP



Geotechnics Project ID

Customer Project ID

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ALCOE-103

### Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETA	LS	
LOCATION	ID	DH322		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL103.1		
	Reference	-	Depth	6.5-7 m
	Description	organic CLAY, with de	composed wood flecks; soft, mo	ist, high plasticity
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESUI	TS	
Liquid Limit	126			
Plastic Limit	45			
Plasticity Index	81			
		TEST REMA	RKS	
The material used for testing Test By cagi 13/06/2022	g was natural, fraction passing a 425u	m sieve.		
, 3 -,,				
This test result is IANZ acc	redited.			
5 1001 1004110 17142 000				

exy

Approved By

17/06/2022

Date



**Geotechnics Project ID Customer Project ID** 

Page 13 of 31

ALCOE-103

		TEST DETA	ILS		
OCATION	ID	DH322			
	Description	ALCOE-103			
	Data	N/A			
AMPLE	Geotechnics ID	AKL103.2			
	Reference	-	Depth	11-11.5 m	
	Description	sandy SILT minor cla	y, dark grey; soft, moist, non-pla	esticity	
PECIMEN	Reference	-	Depth	-	
	Description	-			
		TEST RESU	LTS		
iquid Limit	31				
Plastic Limit	Non-Plastic				
Plasticity Index	<b>Result Not Obtainable</b>				
		TEST REMA	RKS		
The material used for testing	was natural, fraction passing a 425um sie		-		
est By cagi 13/06/2022	, , ,				

Approved By

exy

Date

17/06/2022



Geotechnics Project ID

Customer Project ID

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ALCOE-103

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETA	ILS	
LOCATION	ID	DH323		
	Description	ALCOE-103		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL104.2		
	Reference	-	Depth	3-3.45 m
	Description	silty SAND, minor clay	, dark brown; soft, moist, low pl	asticity
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESUI	.TS	
iquid Limit	38			
Plastic Limit	24			
Plasticity Index	14			
		TEST REMA	RKS	
<ul> <li>The material used for testing</li> <li>Test By cagi 13/06/2022</li> </ul>	g was natural, fraction passing a 425u	ım sieve.		
This test result is IANZ acci	redited.			

exy

Approved By

Date

17/06/2022



Geotechnics Project ID

Customer Project ID

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406084

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETA	AILS		
OCATION	ID	DH324			
	Description	Eastern Busway 12			
	Data	N/A			
SAMPLE	Geotechnics ID	AKL377.6			
	Reference	-	Depth	7.0-7.5 m	
	Description	sandy CLAY, greenish	blueish grey; stiff, moist, high p	lasticity	
SPECIMEN	Reference	-	Depth	-	
	Description	-			
		TEST RESU	LTS		
iquid Limit	66				
Plastic Limit	21				
Plasticity Index	45				
		TEST REMA	RKS		
• The material used for testing	was natural, fraction passing a 425u	ım sieve. • Date tested 2/03/2023			
	les I				
his test result is IANZ accr					

8/03/2023

CHME

Date

Our Ref: 1017784.1000.A.0/Rep13

Approved by KTP



**Geotechnics Project ID Customer Project ID** 

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ALCOE-103

		TEST DETA	ILS		
OCATION	ID	DH325			
	Description	ALCOE-103			
	Data	N/A			
SAMPLE	Geotechnics ID	AKL106.1			
	Reference	-	Depth	4-4.5 m	
	Description	silty SAND minor clay,	light greyish brown; soft, moist	, low plasticity	
SPECIMEN	Reference	-	Depth	-	
	Description	-			
		TEST RESUI	TS		
iquid Limit	42				
Plastic Limit	24				
Plasticity Index	18				
			DVC		
		TECT DERAG			
• The material used for testing Test By cagi 13/06/2022	g was natural, fraction passing a 425c	TEST REMA	KKS		

Approved By

exy

Date

17/06/2022



**Geotechnics Project ID** 

1017784.1000 Phase A

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Customer Project ID

406084

# Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

		TEST DETAI	LS	
LOCATION	ID	DH329_P		
	Description	Eastern Busway		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL371.6		
	Reference	-	Depth	7.0-7.5 m
	Description	clayey SILT with trace plasticity	of sand and gravel, dark browni	sh grey with orange; firm, moist, high
SPECIMEN	Reference	-	Depth	-
	Description	-		
		TEST RESUL	TS	
Liquid Limit	65			
Plastic Limit	32			
Plasticity Index	33			
		TEST REMAR	RKS	
<ul> <li>The material used for testing</li> </ul>	g was natural, fraction passing a 425u	m sieve. • Date tested 28/02/2023		
This test result is IANZ acc	redited.			
Approved by VTD	CHME	Data	2/02/2022	

CHME

Approved by KTP

Date

3/03/2023



# **Axial Point load strength**



1 Hill Street, Onehunga, Auckland 1061

p 64 9 356 3510

NICS www.geotechnics.co.nz

Site: Eastern Busway - ALCOE-84

Your Job No.: Schedule 7

Our Job No.:

1017784.000

Page 15 of 16

Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

		POINT	LOAD TEST – AXIAL				
BH No.:		DH302	DH302	DH303	DH303	DH304	DH304
Sample ID		AKL60.1	AKL60.2	AKL61.1	AKL61.2	AKL62.1	AKL62.2
Depth	(m)	12.42-12.69	12.42-12.69	14.23-14.42	14.23-14.42	11.27-11.44	11.27-11.44
Sample History		Natural	Natural	Natural	Natural	Natural	Natural
Shape		Core	Core	Core	Core	Core	Core
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw
Type of Test		Axial	Axial	Axial	Axial	Axial	Axial
Direction of loading to plane of weakness							
Average Distance D	(mm)	55.9	54.4	52.5	48.8	55.3	48.7
Average Width W	(mm)	60.8	60.5	60.8	60.7	61.1	61.1
Failure Load - Corrected Load P	(kN)	0.5900	0.647	0.13	0.23	0.4380	0.491
Platen Separation D'	(mm)	56	54	53	49	55	49
Equivalent core diameter (De) <sup>2</sup>	(mm²)	4322	4187	4065	3768	4305	3787
Equivalent core diameter (De)	(mm)	65.7	64.7	63.8	61.4	65.6	61.5
$Is = P/(De)^2$	(MPa)	0.13650	0.1545	0.031	0.061	0.10170	0.1296
Size Correction F = (De/50)^0.45		1.13	1.12	1.12	1.10	1.13	1.10
Strength Index Is(50)=F*Is	(MPa)	0.154	0.173	0.035	0.067	0.115	0.143
Mean Strength Index Is(50)=F*Is	(MPa)						
Water Content	(%)	21.9	20.6	22.1	24.4	21.4	21.7

#### Sample Description:

AKL60.1-2: grey, very weak, SANDSTONE

AKL61.1-2: grey, extremely weak, SILTSTONE

AKL62.1-2: grey, very weak, SANDSTONE

#### Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean

of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean

of the remaining values.

- 2) The corrected load (kN) is calculated from calibration records.
- 3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.
- 3) We have tested two specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.
- 4) The sample description and test results are not IANZ accredited.

 Test By
 GEGO
 Date:
 27/04/2022

 Approved By
 Flaus Aderon
 Date:
 25/05/2022

Our Ref: 1017784 Phase A/Rep8B



1 Hill Street, Onehunga, Auckland 1061

p 64 9 356 3510

OTECHNICS www.geotechnics.co.nz

Site: Eastern Busway - ALCOE-84 Your Job No.:

Your Job No.: Schedule 7
Our Job No.: 1017784.000

Page 16 of 16

Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

		POINT	LOAD TEST – AXIAL			
BH No.:		DH304	DH304	DH330	DH330	
Sample ID		AKL63.1	AKL63.2	AKL64.1	AKL64.2	
Depth	(m)	23.51-23.82	23.51-23.82	20.61-20.89	20.61-20.89	
Sample History		Natural	Natural	Natural	Natural	
Shape		Core	Core	Core	Core	
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	
Type of Test		Axial	Axial	Axial	Axial	
Direction of loading to plane of weakness						
Average Distance D	(mm)	65.3	65.9	47.4	48.0	
Average Width W	(mm)	61.0	60.8	61.1	61.5	
Failure Load - Corrected Load P	(kN)	0.4380	0.387	0.44	0.34	
Platen Separation D'	(mm)	61	66	47	48	
Equivalent core diameter (De) <sup>2</sup>	(mm²)	5067	5105	3692	3761	
Equivalent core diameter (De)	(mm)	71.2	71.5	60.8	61.3	
$Is = P/(De)^2$	(MPa)	0.08640	0.0758	0.119	0.089	
Size Correction F = (De/50)^0.45		1.17	1.17	1.09	1.10	
Strength Index Is(50)=F*Is	(MPa)	0.101	0.089	0.130	0.098	
Mean Strength Index Is(50)=F*Is	(MPa)					
Water Content	(%)	20.2	20.1	19.2	19.5	

#### Sample Description:

AKL63.1-2: grey, extremely weak, SILTSTONE

AKL64.1-2: grey, extremely weak, SILTSTONE

n

#### Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean

of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean

of the remaining values.

- 2) The corrected load (kN) is calculated from calibration records.
- 3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.
- 3) We have tested two specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.
- 4) The sample description and test results are not IANZ accredited.

 Test By
 GEGO
 Date:
 27/04/2022

 Approved By
 Jan. Alexon
 Date:
 25/05/2022

Our Ref: 1017784 Phase A/Rep8B



Geotechnics Project ID: Customer Project ID: 1017784.0000.B.0 EBA\_17

Site:

Eastern Busway

Test Method used: ASTM D2216-19Determination of the Water Content

ASTM D5731-16Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

POINT I	CAO!	TFST -	ΑΧΙΔΙ

			FOINT LOAD ILS	I - ANIAL		
BH No.:		DH305_P	DH308	DH328_P		
Depth (m)		18.29-18.35	3.47-3.67	3.94-4.01		
Number of Specimen	s Tested	1	1	1		
Sample History		Concrete Saw	Concrete Saw	Concrete Saw		
Shape		Cylinder	Cylinder	Cylinder		
Type of Test		Axial	Axial	Axial		
Direction of loading		Parallel	Parallel	Parallel		
	1	64.10	64.45	63.05		
Distance D (mm)	2	64.33	64.74	62.48		
Distance D (min)	3	64.21	64.74	62.87		
	Average	64.21	64.64	62.80		
	1	60.48	60.65	60.98		
Width W (mm)	2	60.89	60.76	61.01		
Width W (illin)	3	60.30	60.75	60.94		
	Average	60.56	60.72	60.98		
Failure Load	Uncorrected Load P (kN)	0.9	28.0	28.0		
Tanure Load	Corrected Load P (kN)	0.894	28.035	28.035		
Platen Separation D'	(mm)	64	60	63		
Equivalent core diam	eter (D <sub>e</sub> ) <sup>2</sup> (mm) <sup>2</sup>	4951.07	4997.39	4875.93		
Equivalent core diam	eter D <sub>e</sub> (mm)	70.36	70.69	69.83		
Is = $P/(D_e)^2$ (MPa)		0.1805	5.6099	5.7497		
Size Correction F = (	D <sub>e</sub> /50) <sup>0.45</sup>	1.17	1.17	1.16		
Strength Index Is(50)	=F*Is (MPa)	0.21	6.56	6.67		
Mean Strength Index	Is(50)=F*Is (MPa)				 	
Water content (%)		22.2	1.2	3.4		

#### Sample Description:

DH305_P	18.29-18.35 (m)	slightly unweathered SANDSTONE, weak, dark brownish grey
DH308	3.47-3.67 (m)	slightly unweathered BASALT, strong, light grey; slightly vesicular
DH328_P	3.94-4.01 (m)	slightly unweathered BASALT, strong, lightgrey with black, vesicular

#### Remarks:

#### 1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values. For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

- 2) The corrected load (kN) is calculated from the calibration records.
- 3) We have tested one specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.
- 4) The test results are not IANZ accredited.

Tested by:	CHLU	Date:	30/03/2023	Approved by KTP:	SJA	Date:	12/05/2023



Geotechnics Project ID: Customer Project ID: 1017784.0000.B.0 EBA\_18

GEOTECHNICS

Site:

Eastern Busway

Test Method used:

ASTM D2216-19Determination of the Water Content

ASTM D5731-16Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

#### POINT LOAD TEST – AXIAL

			POINT LOAD TES	T – AXIAL		
BH No.:		DH307				
Depth (m)		14.46-14.52				
Number of Specimer	ns Tested	1				
Sample History		Natural				
Shape		Cylinder				
Type of Test		Axial				
Direction of loading		Parallel				
	1	67.40				
Distance D (mm)	2	67.60				
Distance D (IIIIII)	3	67.56				
	Average	67.52				
	1	60.71				
Width W (mm)	2	60.20				
width w (iiiii)	3	60.57				
	Average	60.49				
Failure Load	Uncorrected Load P (kN)	0.6				
i aliul e Loau	Corrected Load P (kN)	0.590				
Platen Separation D'	(mm)	67				
Equivalent core diam	neter (D <sub>e</sub> ) <sup>2</sup> (mm) <sup>2</sup>	5200.27				
Equivalent core diam	neter D <sub>e</sub> (mm)	72.11				
$Is = P/(D_e)^2$ (MPa)		0.1134				
Size Correction F =	(D <sub>e</sub> /50) <sup>0.45</sup>	1.18				
Strength Index Is(50)	)=F*Is (MPa)	0.13				
Mean Strength Inde	x Is(50)=F*Is (MPa)				 	
Water content (%)		23.8				
CI- Diti	'					

Sample Description:

DH304

14.46-14.52 (m)

SANDSTONE, very weak, dark grey

#### Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean of the remaining values. For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean of the remaining values.

- 2) The corrected load (kN) is calculated from the calibration records.
- 3) We have tested one specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.
- 4) The test results are not IANZ accredited.

Tested by:	CHLU	Date:	8/05/2023	Approved by KTP:	SJA	Date:	12/05/2023

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Site: Eastern Busway - ALCOE-103

Your Job No.: Our Job No.:

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Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

		POINT	LOAD TEST – AXIAL				
BH No.:		DH312	DH302	DH312	DH320	DH322	DH322
Sample ID		AKL101.2	AKL101.3	AKL101.4	AKL102.2	AKL103.4	AKL103.5
Depth	(m)	1.25-1.5 m	3.2-3.7 m	3.2-3.7 m	25.23-25.34 m	21.92-22.18 m	21.92-22.18 m
Sample History		Natural	Natural	Natural	Natural	Natural	Natural
Shape		Core	Core	Core	Core	Core	Core
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw
Type of Test		Axial	Axial	Axial	Axial	Axial	Axial
Direction of loading to plane of weakness							
Average Distance D	(mm)	60.1	60.0	60.1	53.1	50.0	51.4
Average Width W	(mm)	60.4	60.4	60.3	56.8	59.8	58.4
Failure Load - Corrected Load P	(kN)	20.111	24.069	36.594	0.236	0.084	0.084
Platen Separation D'	(mm)	60	60	60	53	50	51
Equivalent core diameter (De) <sup>2</sup>	(mm²)	4622	4607	4616	3845	3802	3821
Equivalent core diameter (De)	(mm)	68.0	67.9	67.9	62.0	61.7	61.8
$Is = P/(De)^2$	(MPa)	4.35120	5.2241	7.928	0.061	0.02210	0.0220
Size Correction F = (De/50)^0.45		1.15	1.15	1.15	1.10	1.10	1.10
Strength Index Is(50)=F*Is	(MPa)	5.004	6.008	9.117	0.068	0.024	0.024
Mean Strength Index Is(50)=F*Is	(MPa)						
Water Content	(%)	2.2	4.2	4.6	18.3	20.6	20.8

#### Sample Description:

AKL101.2 - BASALT vesicular, dark grey, very strong

AKL101.3 - BASALT vesicular, dark grey, very strong

AKL101.4 -BASALT vesicular, dark grey, very strong

AKL102.2 - SANDSTONE, greenish grey, extremely weak

AKL103.4 - SILTSTONE, greenish grey, extremely weak

AKL103.4 - SILTSTONE, greenish grey, extremely weak

#### Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean

of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean

of the remaining values.

- 2) The corrected load (kN) is calculated from calibration records.
- 3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.
- 3) We have tested one or two specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.
- 4) The sample description and test results are not IANZ accredited.

 Test By
 GEGO
 Date:
 16/06/2022

 Approved By
 Eff.
 Date:
 17/06/2022

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Site: Eastern Busway - ALCOE-103

Your Job No.: ALCOE-103

Our Job No.: 1017784

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Test Method: ASTM D 2216-19 Determination of the Water Content

ASTM D 5731-16 Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

		POINT	LOAD TEST – AXIAL		
BH No.:		DH323	DH324	DH324	DH329
Sample ID		AKL104.5	AKL105.1	AKL105.2	AKL108.3
Depth	(m)	22.01-22.13 m	15.45-15.55 m	15.63-15.72 m	35.2-35.34 m
Sample History		Natural	Natural	Natural	Natural
Shape		Core	Core	Core	Core
Specimen Preparation		Concrete Saw	Concrete Saw	Concrete Saw	Concrete Saw
Type of Test		Axial	Axial	Axial	Axial
Direction of loading to plane of weakness					
Average Distance D	(mm)	51.7	51.5	55.7	48.7
Average Width W	(mm)	56.0	56.1	53.2	58.6
Failure Load - Corrected Load P	(kN)	0.236	0.084	0.033	0.286
Platen Separation D'	(mm)	52	52	56	49
Equivalent core diameter (De) <sup>2</sup>	(mm²)	3686	3676	3772	3637
Equivalent core diameter (De)	(mm)	60.7	60.6	61.4	60.3
$Is = P/(De)^2$	(MPa)	0.06400	0.0229	0.009	0.079
Size Correction F = (De/50)^0.45		1.09	1.09	1.10	1.09
Strength Index Is(50)=F*Is	(MPa)	0.070	0.025	0.010	0.086
Mean Strength Index Is(50)=F*Is	(MPa)				
Water Content	(%)	16.2	17.0	18.2	19.3

#### Sample Description:

AKL104.5 - SILTSTONE, greenish grey, extremely weak

AKL105.1 - SILTSTONE, greenish grey, extremely weak

AKL105.2 -SANDSTONE, greenish grey, extremely weak

AKL108.3 - SANDSTONE, greenish grey, extremely weak

#### Test Remarks:

1) Mean Value Calculation:

For 10 or more samples - Calculate the mean by deleting the two highest and two lowest values and calculate the mean

of the remaining values.

For less than 10 samples - Calculate the mean by deleting the highest and lowest value and calculate the mean

of the remaining values.

- 2) The corrected load (kN) is calculated from calibration records.
- 3) If difference between D and D' is greater than 5%, the value of D' is used for calculation. Otherwise, the value of D is used.
- 3) We have tested one specimen as opposed to ten or more and do not know the correlation factor to estimate the UCS.
- 4) The sample description and test results are not IANZ accredited.

 Test By
 GEGO
 Date:
 16/06/2022

 Approved By
 Date:
 17/06/2022



# **Determination of water content**



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**Geotechnics Project ID** 

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**Customer Project ID** 

406084

### Determination of Water Content - NZS 4402:1986 Test 2.1

TEST DETAILS				
Location ID	DH301			
Location Description	Eastern Busway			
Location Data - Easting	-			
Location Data - Northing	-			
Location Data - Level	-			
Location Data - Chainage	-			
Location Data - Offset	-			
Geotechnics Sample ID	AKL475.1			
Sample Reference	EBA_16			
Sample Depth	4.5-5.0 m			
Sample Description	silty CLAY, orange brown with blueish grey; firm, moist, high plasticity			
Specimen Reference	-			
Specimen Depth	-			
Specimen Description	-			
	TE	ST RESULT		
Natural Water Content	40.3%			
		T REMARKS		
	The material used for testing was natural.     Date tested 28/04/2023			
	IANZ Accredited			
Approved by KTP	LKU 15/05/2023			

Our Ref: 1017784.1000.A.0/Rep14A



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Geotechnics Project ID
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**Customer Project ID** 

1017784 Phase A

ALCOE-84

#### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH302	DH304	
Location Description	N/A	N/A	
Location Data - Easting	N/A	N/A	
Location Data - Northing	N/A	N/A	
Location Data - Level	N/A	N/A	
Location Data - Chainage	N/A	N/A	
Location Data - Offset	N/A	N/A	
Geotechnics Sample ID	AKL60.3	AKL62.3	
Sample Reference	N/A	N/A	
Sample Depth	6.80 - 6.91 m	5.70 - 5.86	
Sample Description	clayey SILT with trace sand, blueish grey- brown, stiff, high plasticity	clayey SILT with trace sand, blueish grey- brown, stiff, intermediate plasticity	
Specimen Reference	N/A	N/A	
Specimen Depth	N/A	N/A	
Specimen Description	N/A	N/A	
	TE	ST RESULT	
Natural Water Content	38.8%	38.9%	
	TES	T REMARKS	
	SAMPLE HISTORY UNDEFINED.	SAMPLE HISTORY UNDEFINED.	
	IANZ Accredited	IANZ Accredited	
Approved By France Andrew 25/05/2022			



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**Geotechnics Project ID** 

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**Customer Project ID** 

406084

### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH303	DH303	DH309
Location Description	Eastern Busway	Eastern Busway	Eastern Busway
Location Data - Easting	-	-	-
Location Data - Northing	-	-	-
Location Data - Level	-	-	-
Location Data - Chainage	-	-	-
Location Data - Offset	-	-	-
Geotechnics Sample ID	AKL371.1	AKL371.2	AKL371.3
Sample Reference	-	-	-
Sample Depth	7.5-8.0 m	9.5-10.0 m	7.5-8.0 m
Sample Description	silty SAND with minor clay and trace of gravel, dark blueish grey with brown; firm, moist, low plasticity	clayey SILT, black; soft, moist, high plasticity	clayey SILT with minor sand and trace of gravel, dark blueish grey; very soft, moist high plasticity
Specimen Reference	-	-	-
Specimen Depth	-	-	-
Specimen Description	- TE	- EST RESULT	-
		J. KLJOLI	
Natural Water Content	34.7%	94.3%	53.5%
	TES	T REMARKS	<u> </u>
	<ul> <li>The material used for testing was natural.</li> <li>Date tested 22/02/2023</li> </ul>	The material used for testing was natural.  Date tested 22/02/2023	<ul> <li>The material used for testing was natural.</li> <li>Date tested 15/02/2023</li> </ul>
		IANZ Accredited	IANZ Accredited
	IANZ Accredited	IANZ Accredited	IAINZ ACCIEUILEU
Approved by KTP	CHME	CHME	CHME



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**Geotechnics Project ID** 

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**Customer Project ID** 

406084

### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH306	DH311	DH314
Location Description	Eastern Busway 12	Eastern Busway 12	Eastern Busway 12
Location Data - Easting	-	-	-
Location Data - Northing	-	-	-
Location Data - Level	-	-	-
Location Data - Chainage	-	-	-
Location Data - Offset	-	-	-
Geotechnics Sample ID	AKL377.1	AKL377.2	AKL377.4
Sample Reference	-	-	-
Sample Depth	6.0-6.5 m	5.5-6.0 m	1.75-2.25 m
Sample Description	silty CLAY with trace of sand and gravel, light orange brown with orange; soft, moist, high plasticity	silty sandy CLAY with trace of gravel, dark greenish grey; firm, moist, high plasticity	silty CLAY with some sand and trace of gravel, dark orange brown with black; soft, moist, high plasticity
Specimen Reference	-	-	-
Specimen Depth	-	-	-
Specimen Description	-	- ST RESULT	-
	115	ST RESULT	
Natural Water Content	63.2%	58.8%	47.5%
	TES	T REMARKS	
		<ul> <li>The material used for testing was natural.</li> <li>Date tested 28/02/2023</li> </ul>	The material used for testing was natural.  Date tested 21/02/2023
	IANZ Accredited	IANZ Accredited	IANZ Accredited
Approved by KTP	СНМЕ	СНМЕ	СНМЕ
Date	8/03/2023	8/03/2023	8/03/2023

Our Ref: 1017784.1000.A.0/Rep13



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**Customer Project ID** 

406084

### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH309	DH329_P	
Location Description	Eastern Busway	Eastern Busway	
Location Data - Easting	-	-	
Location Data - Northing	-	-	
Location Data - Level	-	-	
Location Data - Chainage	-	-	
Location Data - Offset	-	-	
Geotechnics Sample ID	AKL371.4	AKL371.6	
Sample Reference	-	-	
Sample Depth	9.0-9.5 m	7.0-7.5 m	
Sample Description	sandy SILT with some clay and trace of gravel, dark blueish grey; soft, moist, low plasticity	clayey SILT with trace of sand and gravel, dark brownish grey with orange; firm, moist, high plasticity	
Specimen Reference	-	-	
Specimen Depth	-	-	
Specimen Description		- EST RESULT	
	<u>''</u>		
Natural Water Content	34.3%	47.5%	
	TES	T REMARKS	
	The material used for testing was natural.     Date tested 15/02/2023	The material used for testing was natural.     Date tested 15/02/2023	
	IANZ Accredited	IANZ Accredited	
Approved by KTP	CHME	СНМЕ	
Date	3/03/2023	3/03/2023	

Our Ref: 1017784.1000.A.0/Rep12A



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**Customer Project ID** 

ALCOE-103

#### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH312	DH322	DH322
Location Description	ALCOE-103	ALCOE-103	ALCOE-103
Location Data - Easting	-	-	-
Location Data - Northing	-	-	-
Location Data - Level	-	-	-
Location Data - Chainage	-	-	-
Location Data - Offset	-	-	-
Geotechnics Sample ID	AKL101.1	AKL103.2	AKL103.1
Sample Reference	-	-	-
Sample Depth	7-7.5 m	11-11.5 m	6.5-7 m
Sample Description	sandy SILT minor clay, whiteish grey; soft, moist, low plasticity	sandy SILT minor clay, dark grey; soft, moist, non-plasticity	organic CLAY, with decomposed wood flecks; soft, moist, high plasticity
Specimen Reference	-	-	-
Specimen Depth	-	-	-
Specimen Description	-	-	-
	TE	EST RESULT	
Natural Water Content	17.3%	22.9%	72.3%
Natural Water Content	17.3%	22.376	72.376
	TES	T REMARKS	
	The material used for testing was natural.	The material used for testing was natural.	The material used for testing was natural.
Tested by: GEGO 13/06/2022	IANZ Accredited	IANZ Accredited	IANZ Accredited
Approved By	EXU	exu	exu .



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**Geotechnics Project ID** 

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**Customer Project ID** 

406084

### Determination of Water Content - NZS 4402:1986 Test 2.1

	TEST DETAILS				
Location ID	DH318_P				
Location Description	Eastern Busway				
Location Data - Easting	-				
Location Data - Northing	-				
Location Data - Level	-				
Location Data - Chainage	-				
Location Data - Offset	-				
Geotechnics Sample ID	AKL475.4				
Sample Reference	EBA_17				
Sample Depth	10.2-10.9 m				
Sample Description	SILT with minor sand and clay and trace of gravel, light brownish grey with black; soft, moist, high plasticity				
Specimen Reference	-				
Specimen Depth	-				
Specimen Description	-				
	TE	ST RESULT			
Natural Water Content	39.8%				
		T REMARKS			
	The material used for testing was natural.     Date tested 28/04/2023				
	IANZ Accredited				
Approved by KTP Date	LKU 11/05/2023				

Our Ref: 1017784.1000.A.0/Rep15



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1017784 **Customer Project ID** 

ALCOE-103

#### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH323	DH325	
Location Description	ALCOE-103	ALCOE-103	
Location Description	ALCOE-105	ALCOE-105	
Location Data - Easting	-	-	
Location Data - Northing	-	-	
Location Data - Level	-	-	
Location Data - Chainage	-	-	
Location Data - Offset	-	-	
Geotechnics Sample ID	AKL104.2	AKL106.1	
Sample Reference	-	-	
Sample Depth	3-3.45 m	4-4.5 m	
Sample Description	silty SAND, minor clay, dark brown; soft,	silty SAND minor clay, light greyish brown;	
Sample Bescription	moist, low plasticity	soft, mosit, low plasticity	
Specimen Reference	-	-	
Specimen Depth	-	-	
Specimen Description	_	_	
Specificit Bescription			
	TE	EST RESULT	
Natural Water Content	24.2%	33.1%	
	The material used for testing was natural.	TREMARKS  • The material used for testing was natural.	I
	The material used for testing was natural.	The material used for testing was natural.	
Tested by: GEGO 13/06/2022			
	IANZ Accredited	IANZ Accredited	
Approved By	Exu	lk4	
Date	17/06/2022	17/06/2022	

Our Ref: 1017784.0000.A.0/Rep9



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**Geotechnics Project ID** 

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**Customer Project ID** 

406084

### Determination of Water Content - NZS 4402:1986 Test 2.1

	TE	ST DETAILS	
Location ID	DH324		
Location Description	Eastern Busway 12		
Location Data - Easting	-		
Location Data - Northing	-		
Location Data - Level	-		
Location Data - Chainage	-		
Location Data - Offset	-		
Geotechnics Sample ID	AKL377.6		
Sample Reference	-		
Sample Depth	7.0-7.5 m		
Sample Description	sandy CLAY, greenish blueish grey; stiff, moist, high plasticity		
Specimen Reference	-		
Specimen Depth	-		
Specimen Description	-		
	TI	EST RESULT	
Natural Water Content	43.1%		
	TES	ST REMARKS	
	The material used for testing was natural.     Date tested 21/02/2023  IANZ Accredited		
Approved by KTP	СНМЕ		
Date	8/03/2023		

Our Ref: 1017784.1000.A.0/Rep13