

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 25/08/25
 Sampling method : Core
 Sample description : Interbedded SILTSTONE/MUDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/21-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1104	BH2B_1104	Water content as received(%)	12.19
Depth (m) :	31.30-31.50	31.30-31.50	Water content at testing(%)	12.19
Test Type :	Axial	Diametral	Bulk density (t/m ³)	3.05
Width, W (mm) :	60.09	60.08	Dry density (t/m ³)	2.72
Diameter, D (mm) :	48.40	50.24		
Load, P (kN)	0.52	0.26		
D _e ² (mm ²)	3703	2524		
D _e (mm)	60.85	50.24		
I _s (MPa)	0.14	0.10		
Size Factor, F	1.09	1.00		
I _{s(50)} (MPa)	0.15	0.10		

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 10/10/25

Date reported : 23/12/25

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 All information supplied by Client

Approved

Thirushen Pillay

Designation : Senior Civil Engineering Technician

Date : 07/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1104
Sample depth (m): 31.70-32.00
Age at test: -

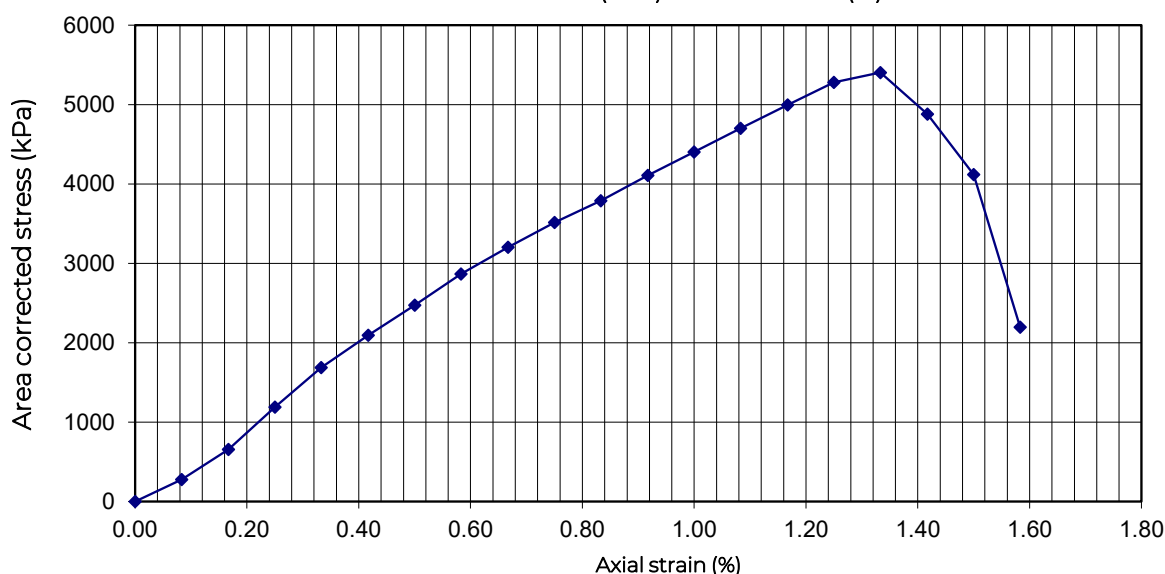
Date sampled: 25/08/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 4-UCS
Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.35	Water content as received (%)	11.2
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	11.2	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.10	Initial sample area (mm ²)	2835.9
UCS Max stress (kPa)	5400	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1.3	* Young's modulus (MPa)	506
Mode of failure:	Shear Along Side Plane	for strain range	0.00 - 0.33%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1 * Young's modulus is not covered by IANZ Accreditation.	-The strain rate for this test was kept constant at 0.3mm/min. -Some sample details supplied by client.

Date tested: 24/11/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
Date reported: 23/12/25 This report may only be reproduced in full.

Approved Signatory *Thirushen Pillay*
Senior Civil Engineering Technician

Date : 23/12/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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Website www.wsp.com/nz

**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1104
Sample depth (m): 31.70-32.00
Age at test: -

Date sampled: 25/08/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 4-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 24/11/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



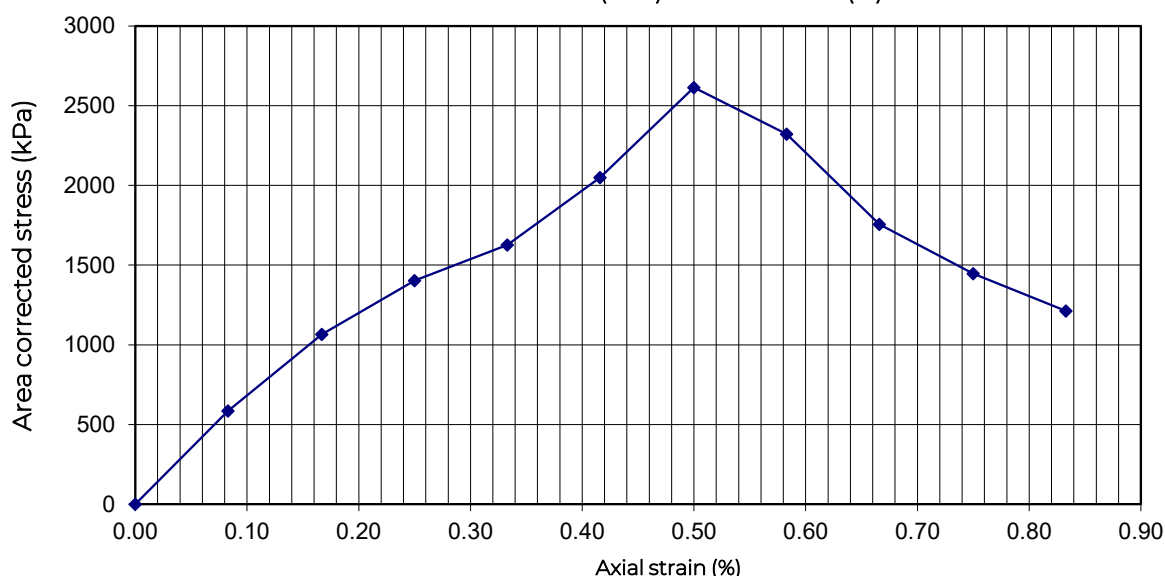
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 27/08/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Very weak SANDSTONE
 Sample reference: BH2B_1104
 Sample depth (m): 39.78-42.00
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 23-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.35	Water content as received (%)	10.9
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	10.9	Initial sample length (mm)	120.1
Dry density (t/m ³)	2.10	Initial sample area (mm ²)	2835.9
UCS Max stress (kPa)	2600	Initial Length:Diameter ratio	2:1
Strain at failure (%)	0.5	* Young's modulus (MPa)	639
Mode of failure:	Shear	for strain range	0.00 - 0.17%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



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WHG-NLC06 (10/25)

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 Albany, Auckland 0745
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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



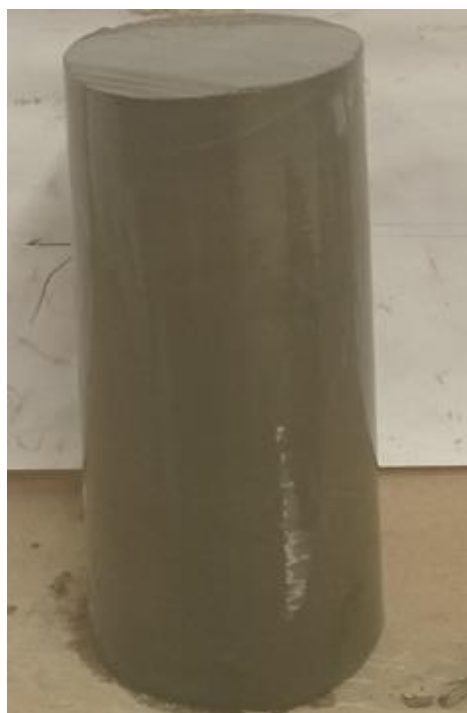
Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Very weak SANDSTONE
Sample reference: BH2B_1104
Sample depth (m): 39.78-42.00
Age at test: -

Date sampled: 27/08/25

Project number:	1-C2466.16
Lab ref number:	WL4708/23-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 27/08/25
 Sampling method : Core
 Sample description : SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/22-PL
 Client Ref No : -

Test Results

Lab Ref No :	1		Water Content and Density	
Location ID No :	BH2B_1104		Water content as received(%)	11.23
Depth (m) :	40.10-40.30		Water content at testing(%)	11.23
Test Type :	Axial		Bulk density (t/m ³)	2.56
Width, W (mm) :	60.04		Dry density (t/m ³)	2.30
Diameter, D (mm) :	45.62			
Load, P (kN)	0.25			
D _e ² (mm ²)	3487			
D _e (mm)	59.05			
I _s (MPa)	0.07			
Size Factor, F	1.08			
I _{s(50)} (MPa)	0.08			

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 10/10/25

Date reported : 18/12/25

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 All information supplied by Client

Approved

Thirushen Pillay

Designation : Senior Civil Engineering Technician

Date : 07/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



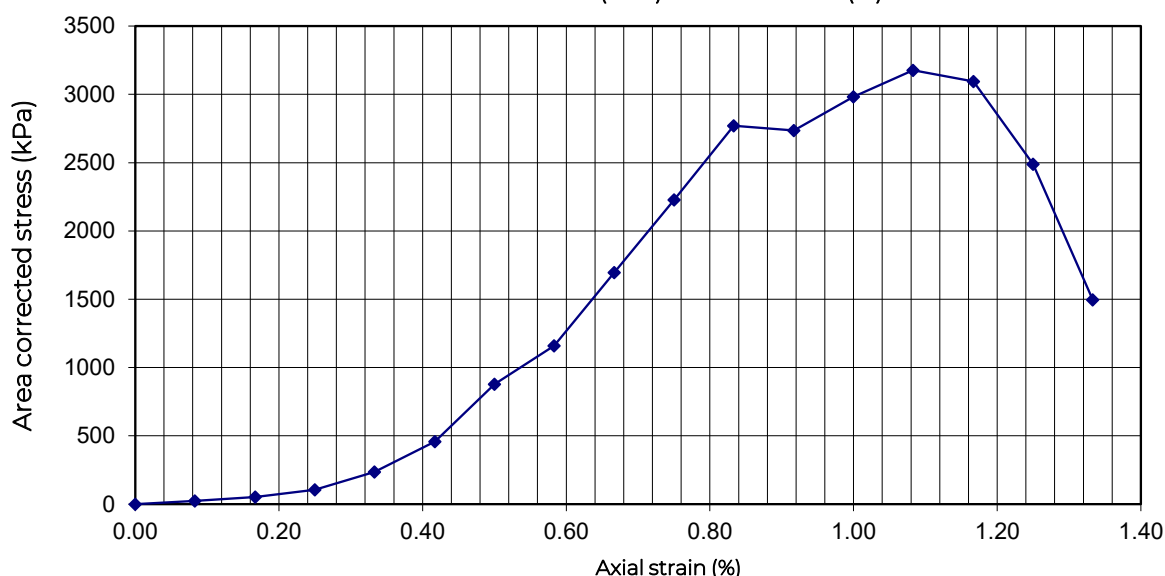
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 3/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Very weak calcareous SILTSTONE
 Sample reference: BH2B_1105
 Sample depth (m): 17.40-17.90
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 31-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.25	Water content as received (%)	11.8
Water content at compaction (%)	-	Initial sample diameter (mm)	60.0
Water content at testing (%)	11.8	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.05	Initial sample area (mm ²)	2827.4
UCS Max stress (kPa)	3200	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1.1	* Young's modulus (MPa)	556
Mode of failure:	Multiple Fracturing	for strain range	0.42 - 0.83%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.3mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team Date sampled: 3/09/25
Sampling method: Core
Sample condition: As received
Sample description: Very weak calcareous SILTSTONE
Sample reference: BH2B_1105
Sample depth (m): 17.40-17.90
Age at test: -

Project number: 1-C2466.16
Lab ref number: WL4708/ 31-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



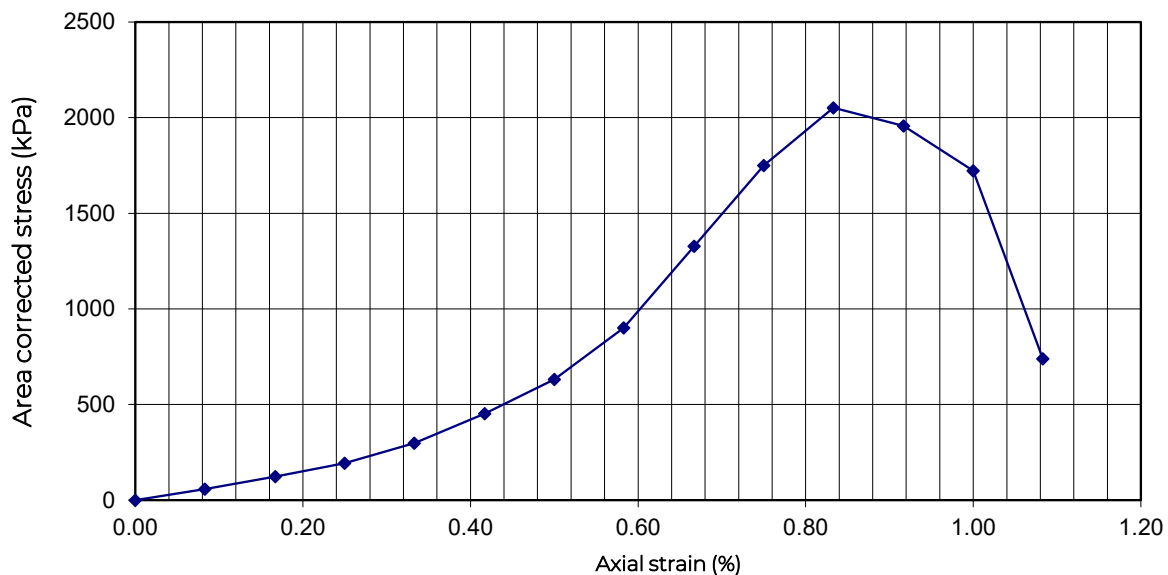
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 4/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Very Weak Calcareous SILTSTONE
 Sample reference: BH2B_1105
 Sample depth (m): 21.60-22.00
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 32-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.25	Water content as received (%)	10.9
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	10.9	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.05	Initial sample area (mm ²)	2835.0
UCS Max stress (kPa)	2100	Initial Length:Diameter ratio	2:1
Strain at failure (%)	0.83	* Young's modulus (MPa)	426
Mode of failure:	Shear	for strain range	0.50 - 0.83%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1 * Young's modulus is not covered by IANZ Accreditation.	-The strain rate for this test was kept constant at 0.2mm/min. -Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Very Weak Calcareous SILTSTONE
Sample reference: BH2B_1105
Sample depth (m): 21.60-22.00
Age at test: -
Date sampled: 4/09/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 32-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SANDSTONE
 Sample reference: BH2B_1105
 Sample depth (m): 38.25-38.60
 Age at test: -

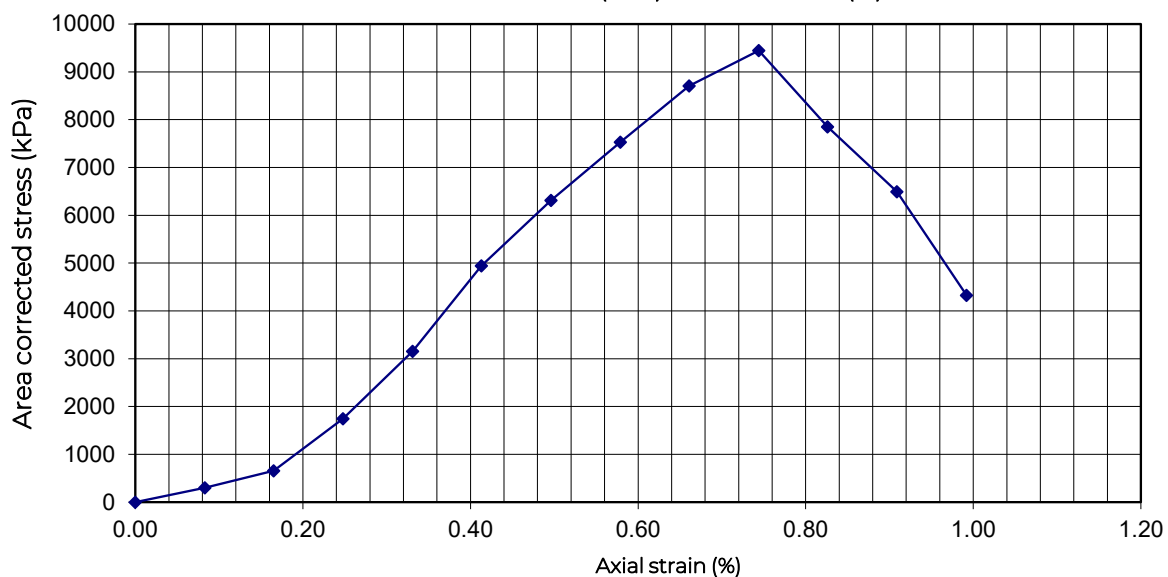
Date sampled: 4/09/25

Project number: 1-C2466.16
 Lab ref number: WL4708/ 34-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.50	Water content as received (%)	5.9
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	5.9	Initial sample length (mm)	121.0
Dry density (t/m ³)	2.35	Initial sample area (mm ²)	2835.9
UCS Max stress (kPa)	9400	Initial Length:Diameter ratio	2.01:1
Strain at failure (%)	0.74	* Young's modulus (MPa)	1623
Mode of failure:	Shear Along Side Plane	for strain range	0.17 - 0.66%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1105
Sample depth (m): 38.25-38.60
Age at test: -
Date sampled: 4/09/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 34-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 21/08/25
 Sampling method : Core
 Sample description : SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/8 -PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1106	BH2B_1106	Water content as received(%)	-
Depth (m) :	21.65-21.85	21.65-21.85	Water content at testing(%)	-
Test Type :	Axial	Diametral	Bulk density (t/m ³)	-
Width, W (mm) :	60.00		Dry density (t/m ³)	-
Diameter, D (mm) :	41.07	42.55		
Load, P (kN)	10.49	8.66		
D _e ² (mm ²)	3138	1811		
D _e (mm)	56.01	42.55		
I _s (MPa)	3.34	4.78		
Size Factor, F	1.05	0.93		
I _{s(50)} (MPa)	3.52	4.45		

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 24/11/25

Date reported : 19/12/25

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 All information supplied by Client

Approved

Thirushen Pillay

Designation : Senior Civil Engineering Technician

Date : 14/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: SANDSTONE
Sample reference: BH2B_1106
Sample depth (m): 28.30-28.50
Age at test: -

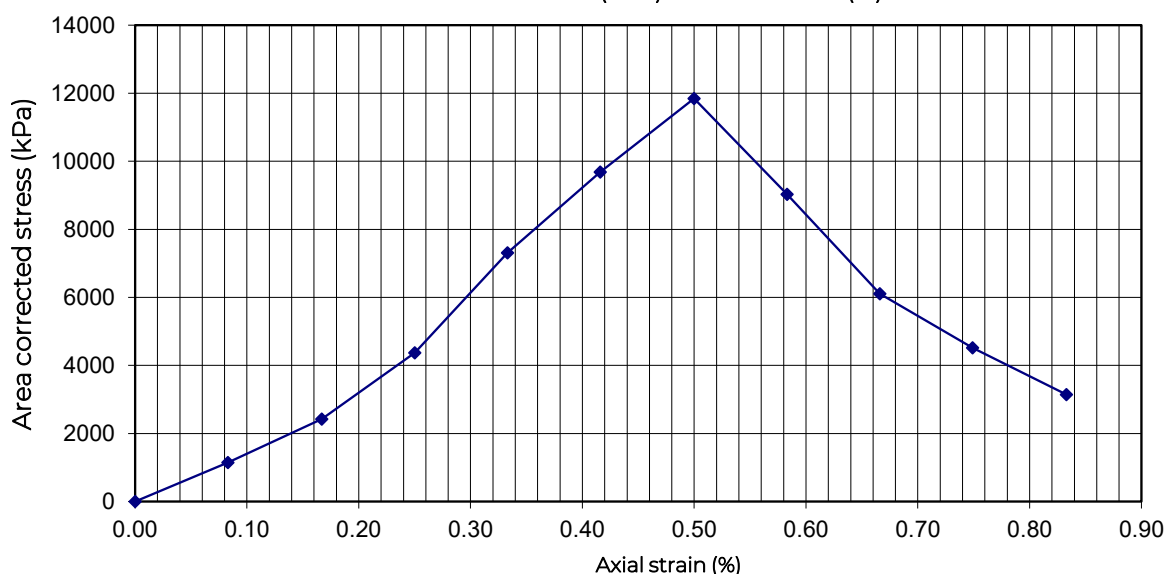
Date sampled: 26/08/25

Project number: 1-C2466.16
Lab ref number: WL4708/10-UCS
Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.80	Water content as received (%)	0.4
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	0.4	Initial sample length (mm)	120.1
Dry density (t/m ³)	2.80	Initial sample area (mm ²)	2834.0
UCS Max stress (kPa)	12000	Initial Length:Diameter ratio	2:1
Strain at failure (%)	0.5	* Young's modulus (MPa)	2369
Mode of failure:	Shear	for strain range	0.00 - 0.50%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	-Method requires 5-10mins failure time. This test deviates from that.
Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 24/11/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
Date reported: 14/01/26

Approved Signatory *Thirushen Pillay*
Senior Civil Engineering Technician

Date : 14/01/26



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WHG-NLC06 (10/25)

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UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: SANDSTONE
Sample reference: BH2B_1106
Sample depth (m): 28.30-28.50
Age at test: -

Date sampled: 26/08/25

Project number:	1-C2466.16
Lab ref number:	WL4708/10-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 24/11/25

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 26/08/25
 Sampling method : Core
 Sample description : UW SANDSTONE/SILTSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/38-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1106	BH2B_1106	Water content as received(%)	0.68
Depth (m) :	39.15-39.50	39.15-39.50	Water content at testing(%)	0.68
Test Type :	Axial	Diametral	Bulk density (t/m ³)	2.49
Width, W (mm) :	61.00		Dry density (t/m ³)	2.48
Diameter, D (mm) :	46.80	56.20		
Load, P (kN)	2.97	1.86		
D _e ² (mm ²)	3635	3158		
D _e (mm)	60.29	56.20		
I _s (MPa)	0.82	0.59		
Size Factor, F	1.09	1.05		
I _{s(50)} (MPa)	0.89	0.62		

Test Methods	Notes
Point Load Strength : ASTM D5731-16	

Date tested : 10/10/25
 Date reported : 12/12/25

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 All information supplied by Client

Approved

Thirushen Pillay
 Designation : Senior Civil Engineering Technician
 Date : 07/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



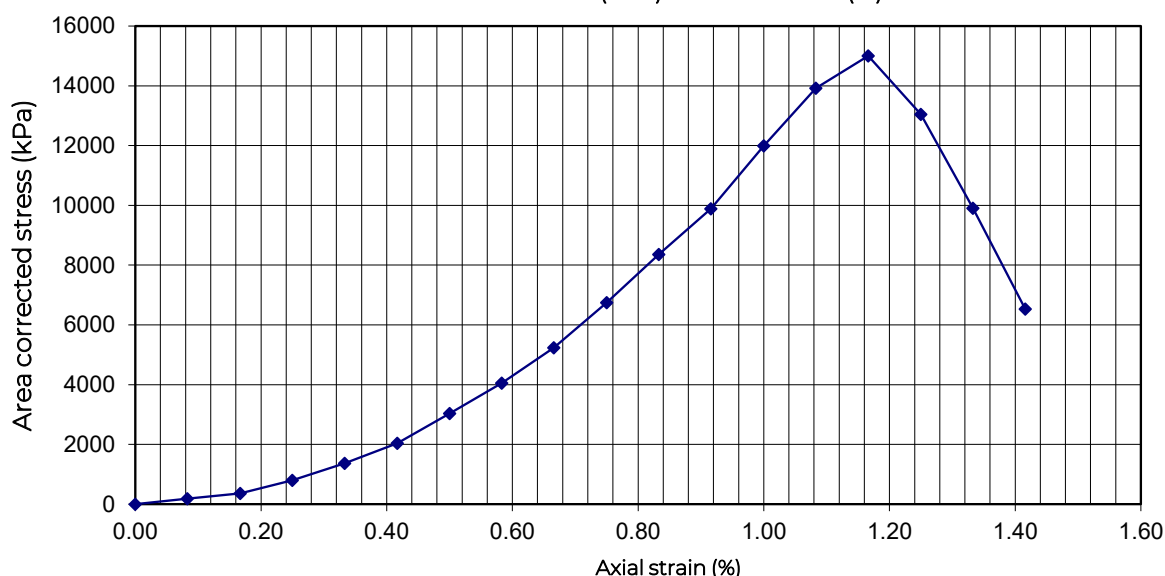
Project: Ground Investigation for Northland Corridor
 Location: Section 2 - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 16/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SANDSTONE
 Sample reference: BH2B_1117
 Sample depth (m): 21.60-21.90
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 72-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.75	Water content as received (%)	14.8
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	14.8	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.40	Initial sample area (mm ²)	2833.1
UCS Max stress (kPa)	15000	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1.2	* Young's modulus (MPa)	1974
Mode of failure:	Shear	for strain range	0.58 - 1.08%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	
Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.3mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 28/10/25

Approved Signatory *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 28/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

Page 1 of 2

**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2 - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1117
Sample depth (m): 21.60-21.90
Age at test: -

Date sampled: 16/09/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 72-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 3/09/25
 Sampling method : Core
 Sample description : SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/71-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1117	BH2B_1117	Water content as received(%)	0.90
Depth (m) :	22.35-22.55	22.35-22.55	Water content at testing(%)	0.90
Test Type :	Axial	Diametral	Bulk density (t/m ³)	3.29
Width, W (mm) :	60.08		Dry density (t/m ³)	3.26
Diameter, D (mm) :	49.60	52.42		
Load, P (kN)	9.61	5.21		
D _e ² (mm ²)	3794	2748		
D _e (mm)	61.60	52.42		
I _s (MPa)	2.53	1.90		
Size Factor, F	1.10	1.02		
I _{s(50)} (MPa)	2.78	1.94		

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 10/10/25

Date reported : 18/12/25

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 All information supplied by Client

Approved

Thirushen Pillay

Designation : Senior Civil Engineering Technician

Date : 07/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak UW SILTSTONE
Sample reference: BH2B_1122
Sample depth (m): 23.50-23.80
Age at test: -

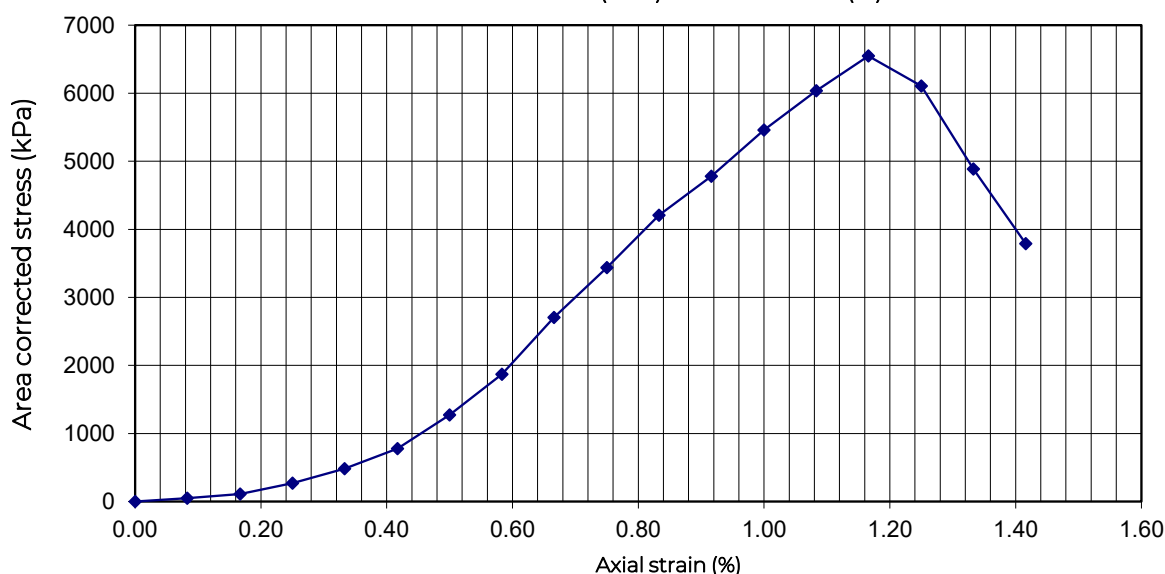
Date sampled: 23/09/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 39-UCS
Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.30	Water content as received (%)	9.8
Water content at compaction (%)	-	Initial sample diameter (mm)	60.0
Water content at testing (%)	9.8	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.10	Initial sample area (mm ²)	2828.4
UCS Max stress (kPa)	6500	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1.2	* Young's modulus (MPa)	770
Mode of failure:	Multiple Fracturing	for strain range	0.42 - 1.17%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1 * Young's modulus is not covered by IANZ Accreditation.	-The strain rate for this test was kept constant at 0.3mm/min. -Some sample details supplied by client.

Date tested: 24/11/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
Date reported: 23/12/25

Approved Signatory: *Thirushen Pillay*
Senior Civil Engineering Technician

Date: 23/12/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



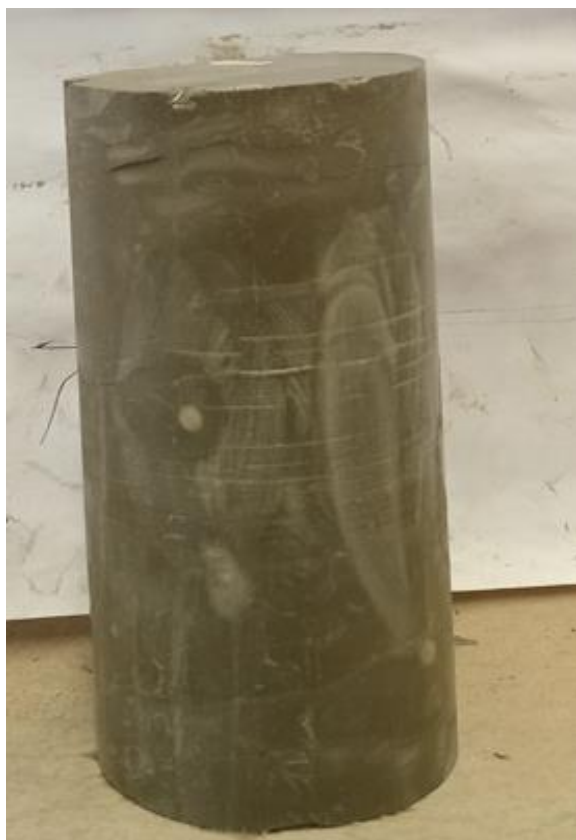
Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak UW SILTSTONE
Sample reference: BH2B_1122
Sample depth (m): 23.50-23.80
Age at test: -

Date sampled: 23/09/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 39-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 24/11/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



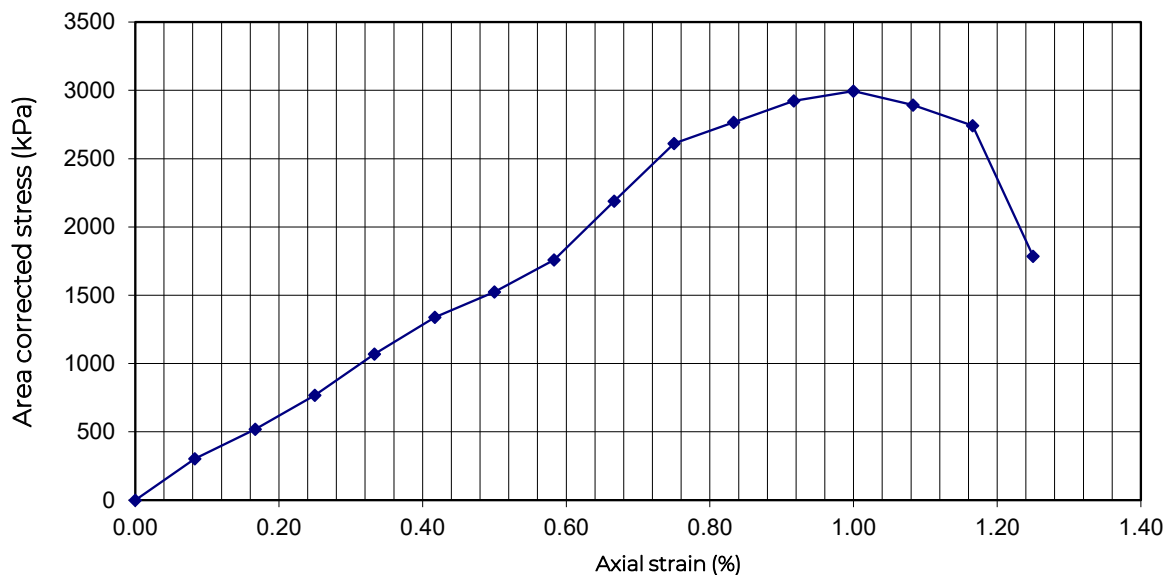
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 10/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Very weak SILTSTONE
 Sample reference: BH2B_1140
 Sample depth (m): 21.00-21.61
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 80-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.20	Water content as received (%)	12.7
Water content at compaction (%)	-	Initial sample diameter (mm)	60.0
Water content at testing (%)	12.7	Initial sample length (mm)	120.0
Dry density (t/m ³)	1.95	Initial sample area (mm ²)	2827.4
UCS Max stress (kPa)	3000	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1	* Young's modulus (MPa)	348
Mode of failure:	Shear Along Side Plane	for strain range	0.00 - 0.75%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1 * Young's modulus is not covered by IANZ Accreditation.	-The strain rate for this test was kept constant at 0.3mm/min. -Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Very weak SILTSTONE
Sample reference: BH2B_1140
Sample depth (m): 21.00-21.61
Age at test: -

Date sampled: 10/09/25

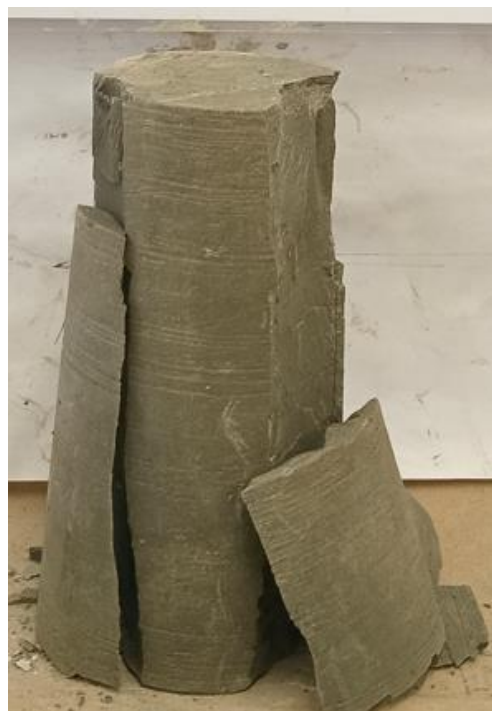
Project number:	1-C2466.16
Lab ref number:	WL4708/ 80-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



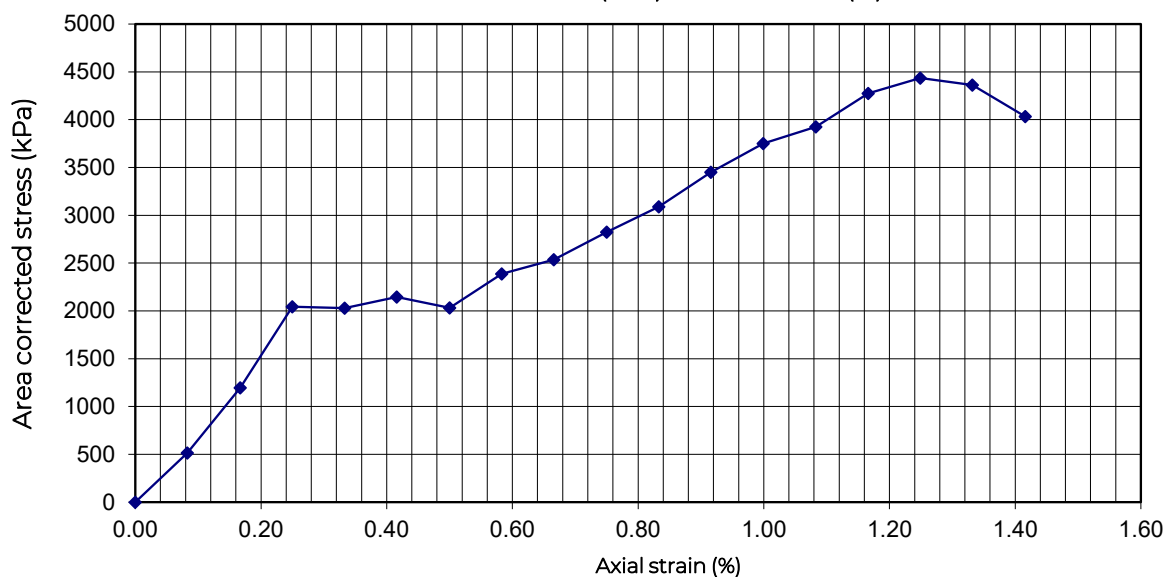
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 10/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Very weak SANDSTONE
 Sample reference: BH2B_1140
 Sample depth (m): 24.00-24.38
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 81-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.30	Water content as received (%)	10.8
Water content at compaction (%)	-	Initial sample diameter (mm)	60.0
Water content at testing (%)	10.8	Initial sample length (mm)	120.1
Dry density (t/m ³)	2.05	Initial sample area (mm ²)	2831.2
UCS Max stress (kPa)	4400	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1.2	* Young's modulus (MPa)	817
Mode of failure:	Shear	for strain range	0.00 - 0.25%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	
Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.3mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25 This report may only be reproduced in full.

Approved Signatory *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



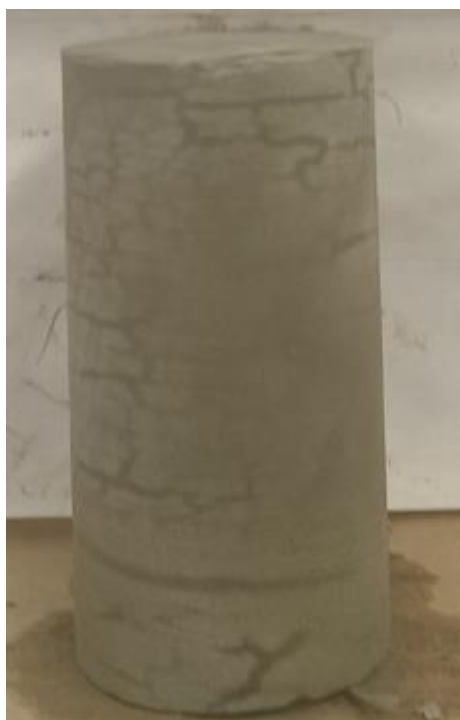
Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Very weak SANDSTONE
Sample reference: BH2B_1140
Sample depth (m): 24.00-24.38
Age at test: -

Date sampled: 10/09/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 81-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



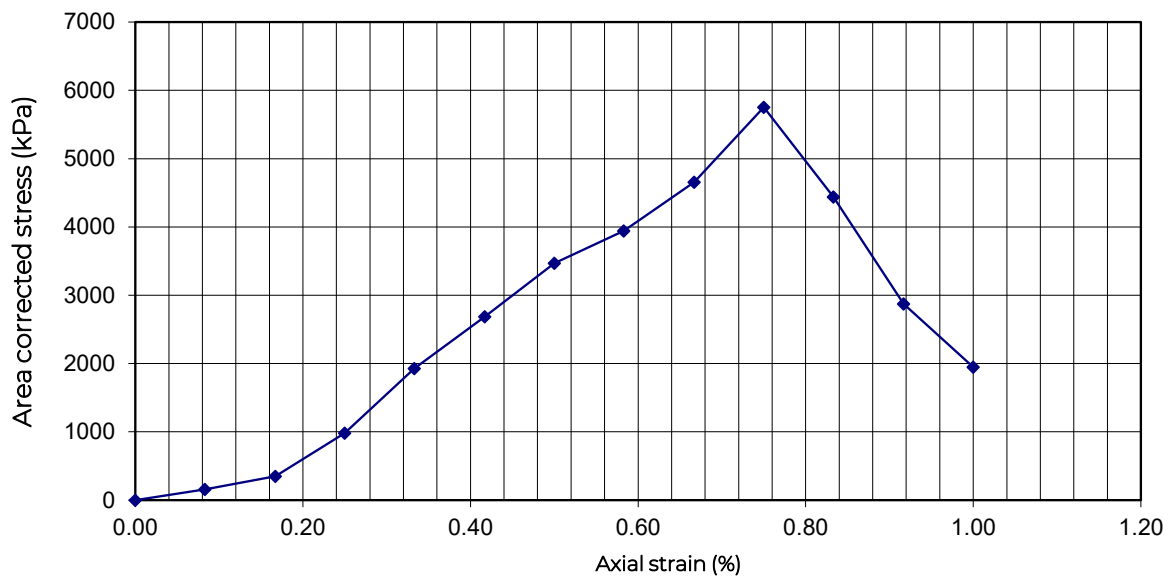
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 11/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SILTSTONE
 Sample reference: BH2B_1140
 Sample depth (m): 29.20-29.80
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 82-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.35	Water content as received (%)	11.2
Water content at compaction (%)	-	Initial sample diameter (mm)	60.0
Water content at testing (%)	11.2	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.10	Initial sample area (mm ²)	2831.2
UCS Max stress (kPa)	5800	Initial Length:Diameter ratio	2:1
Strain at failure (%)	0.75	* Young's modulus (MPa)	927
Mode of failure:	Columnar	for strain range	0.17 - 0.75%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	
Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not
 accredited are outside the
 scope of the laboratory's
 accreditation

WHG-NLC06 (10/25)

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7A Ride Way
 Albany, Auckland 0745
 New Zealand

Website www.wsp.com/nz

**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SILTSTONE
Sample reference: BH2B_1140
Sample depth (m): 29.20-29.80
Age at test: -

Date sampled: 11/09/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 82-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 29/08/25
 Sampling method : Core
 Sample description : GREYWACKE SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/83-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1144		Water content as received(%)	0.56
Depth (m) :	21.46-25.50		Water content at testing(%)	0.56
Test Type :	Axial		Bulk density (t/m ³)	2.71
Width, W (mm) :	60.08		Dry density (t/m ³)	2.69
Diameter, D (mm) :	49.65			
Load, P (kN)	2.33			
D _e ² (mm ²)	3798			
D _e (mm)	61.63			
I _s (MPa)	0.61			
Size Factor, F	1.10			
I _{s(50)} (MPa)	0.67			

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 19/01/26
 Date reported : 20/01/26

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 All information supplied by Client

Approved

Thirushen Pillay
 Designation : Senior Civil Engineering Technician
 Date : 21/01/26

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 29/08/25
 Sampling method : Core
 Sample description : GREYWACKE SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/84-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1144		Water content as received(%)	0.98
Depth (m) :	26.50-31.20		Water content at testing(%)	0.98
Test Type :	-		Bulk density (t/m ³)	2.60
Width, W (mm) :	60.08		Dry density (t/m ³)	2.58
Diameter, D (mm) :	120.02			
Load, P (kN)	-			
D _e ² (mm ²)	-			
D _e (mm)	-			
I _s (MPa)	-			
Size Factor, F	-			
I _{s(50)} (MPa)	-			

Test Methods	Notes
Insitu Density: NZS 4402: 1986, Test 5.1.3 Water Content: NZS 4402: 1986, Test 2.1	

Date tested : 13/01/26
 Date reported : 14/01/26

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 All information supplied by Client

Approved

Thirushen Pillay
 Designation : Senior Civil Engineering Technician
 Date : 14/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



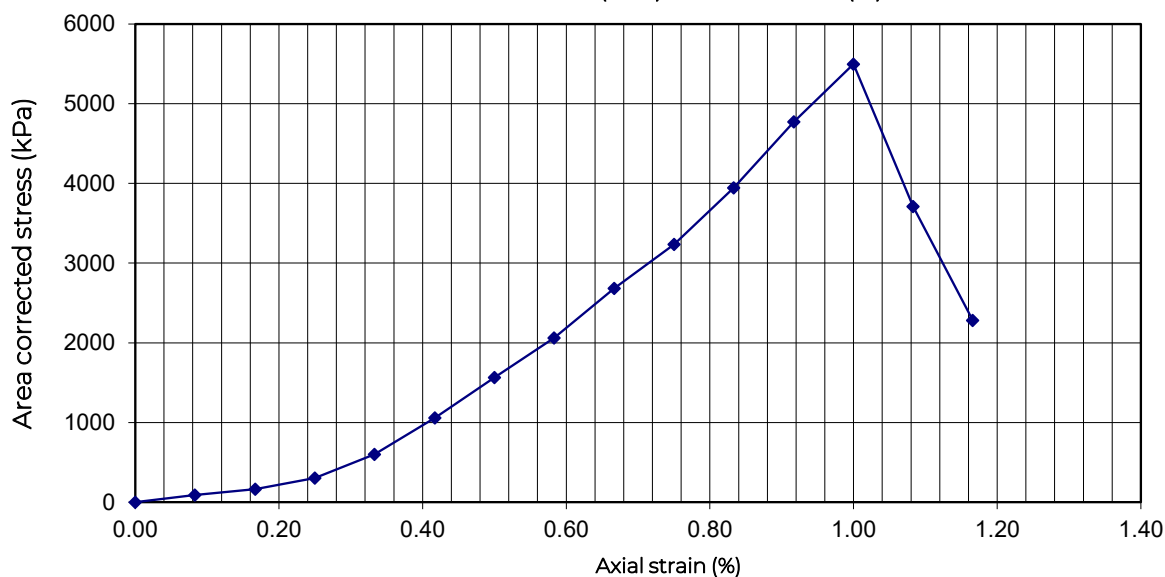
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 29/08/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak GREYWACKE SANDSTONE
 Sample reference: BH2B_1144
 Sample depth (m): 33.37-33.77
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 54-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.65	Water content as received (%)	1.5
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	1.5	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.60	Initial sample area (mm ²)	2835.0
UCS Max stress (kPa)	5500	Initial Length:Diameter ratio	2:1
Strain at failure (%)	1	* Young's modulus (MPa)	734
Mode of failure:	Shear	for strain range	0.33 - 1.00%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.3mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

Page 1 of 2

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7A Ride Way
 Albany, Auckland 0745
 New Zealand

Website www.wsp.com/nz

**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak GREYWACKE SANDSTONE
Sample reference: BH2B_1144
Sample depth (m): 33.37-33.77
Age at test: -

Date sampled: 29/08/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 54-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 29/08/25
 Sampling method : Core
 Sample description : GREYWACKE SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/58-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1144	BH2B_1144	Water content as received(%)	3.56
Depth (m) :	38.75-39.00	38.75-39.00	Water content at testing(%)	3.56
Test Type :	Axial	Diametral	Bulk density (t/m ³)	2.79
Width, W (mm) :	60.08		Dry density (t/m ³)	2.69
Diameter, D (mm) :	48.84	50.60		
Load, P (kN)	2.84	3.24		
D _e ² (mm ²)	3736	2560		
D _e (mm)	61.12	50.60		
I _s (MPa)	0.76	1.26		
Size Factor, F	1.09	1.01		
I _{s(50)} (MPa)	0.83	1.27		

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 10/10/25

Date reported : 25/11/25

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 All information supplied by Client

Approved

Thirushen Pillay

Designation : Senior Civil Engineering Technician

Date : 14/01/26

**POINT LOAD STRENGTH OF ROCK
TEST REPORT**



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 29/08/25
 Sampling method : Core
 Sample description : GREYWACKE SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/85-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1144		Water content as received(%)	1.36
Depth (m) :	41.10-46.50		Water content at testing(%)	1.36
Test Type :			Bulk density (t/m ³)	2.23
Width, W (mm) :	60.05		Dry density (t/m ³)	2.20
Diameter, D (mm) :	80.00			
Load, P (kN)	-			
D _e ² (mm ²)	-			
D _e (mm)	-			
I _s (MPa)	-			
Size Factor, F	-			
I _{s(50)} (MPa)	-			

Test Methods	Notes
Insitu Density: NZS 4402: 1986, Test 5.1.3 Water Content: NZS 4402: 1986, Test 2.1	

Date tested : 13/01/26
 Date reported : 14/01/26

This report may only be reproduced in full
 All information supplied by Client

Approved

Thirushen Pillay
 Designation : Senior Civil Engineering Technician
 Date : 14/01/26

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 29/08/25
 Sampling method : Core
 Sample description : GREYWACKE SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/61-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1144	BH2B_1144	Water content as received(%)	0.28
Depth (m) :	46.70-46.85	46.70-46.85	Water content at testing(%)	0.28
Test Type :	Axial	Diametral	Bulk density (t/m ³)	2.33
Width, W (mm) :	60.00		Dry density (t/m ³)	2.32
Diameter, D (mm) :	50.04	48.42		
Load, P (kN)	5.24	3.48		
D _e ² (mm ²)	3823	2344		
D _e (mm)	61.83	48.42		
I _s (MPa)	1.37	1.48		
Size Factor, F	1.10	0.99		
I _{s(50)} (MPa)	1.51	1.46		

Test Methods

Point Load Strength : ASTM D5731-16

Notes

Date tested : 19/01/26
 Date reported : 20/01/26

This report may only be reproduced in full
 All information supplied by Client

Approved

Thirushen Pillay
 Designation : Senior Civil Engineering Technician
 Date : 21/01/26

POINT LOAD STRENGTH OF ROCK TEST REPORT



Project : Ground Investigation for Northland Corridor
 Location : Alternative to Brynderwyn Hills Section
 Client : NZTA C/- Aurecon & WSP NZ Ltd
 Contractor : N/A
 Sampled by : NC Site Team
 Date sampled : 29/08/25
 Sampling method : Core
 Sample description : GREYWACKE SANDSTONE
 Sample condition : As Received

Project No : 1-C2466.16
 Lab Ref No : WL4708/86-PL
 Client Ref No : -

Test Results

Lab Ref No :	1	2	Water Content and Density	
Location ID No :	BH2B_1144		Water content as received(%)	0.86
Depth (m) :	48.20-50.55		Water content at testing(%)	0.86
Test Type :			Bulk density (t/m ³)	2.26
Width, W (mm) :	60.03		Dry density (t/m ³)	2.24
Diameter, D (mm) :	78.88			
Load, P (kN)				
D _e ² (mm ²)				
D _e (mm)				
I _s (MPa)				
Size Factor, F				
I _{s(50)} (MPa)				

Test Methods

Insitu Density: NZS 4402: 1986, Test 5.1.3
 Water Content: NZS 4402: 1986, Test 2.1

Notes

Date tested : 13/01/26
 Date reported : 14/01/26

This report may only be reproduced in full
 All information supplied by Client

Approved

Thirushen Pillay

Designation : Senior Civil Engineering Technician
 Date : 14/01/26

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Section 2 - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak GREYWACKE SANDSTONE
Sample reference: BH2B_1144
Sample depth (m): 54.20-54.40
Age at test: -

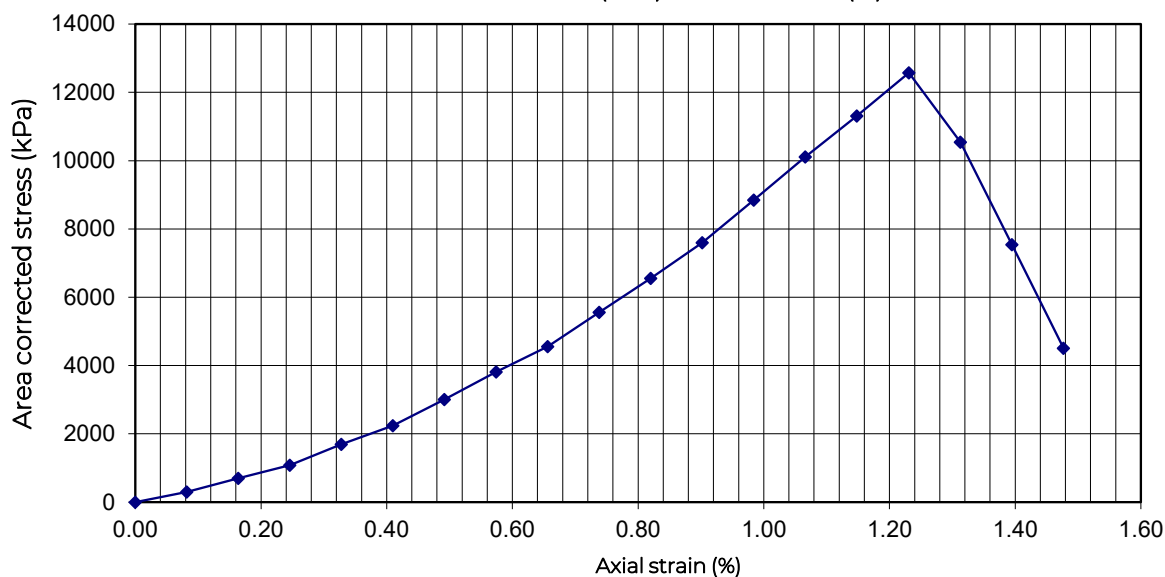
Date sampled: 29/08/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 24-UCS
Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.75	Water content as received (%)	0.9
Water content at compaction (%)	-	Initial sample diameter (mm)	60.1
Water content at testing (%)	0.9	Initial sample length (mm)	121.9
Dry density (t/m ³)	2.75	Initial sample area (mm ²)	2835.0
UCS Max stress (kPa)	13000	Initial Length:Diameter ratio	2.03:1
Strain at failure (%)	1.2	* Young's modulus (MPa)	1394
Mode of failure:	Shear	for strain range	0.66 - 1.23%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	
Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
Date reported: 22/10/25

Approved Signatory *Thirushen Pillay*
Senior Civil Engineering Technician

Date: 22/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2 - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak GREYWACKE SANDSTONE
Sample reference: BH2B_1144
Sample depth (m): 54.20-54.40
Age at test: -

Date sampled: 29/08/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 24-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



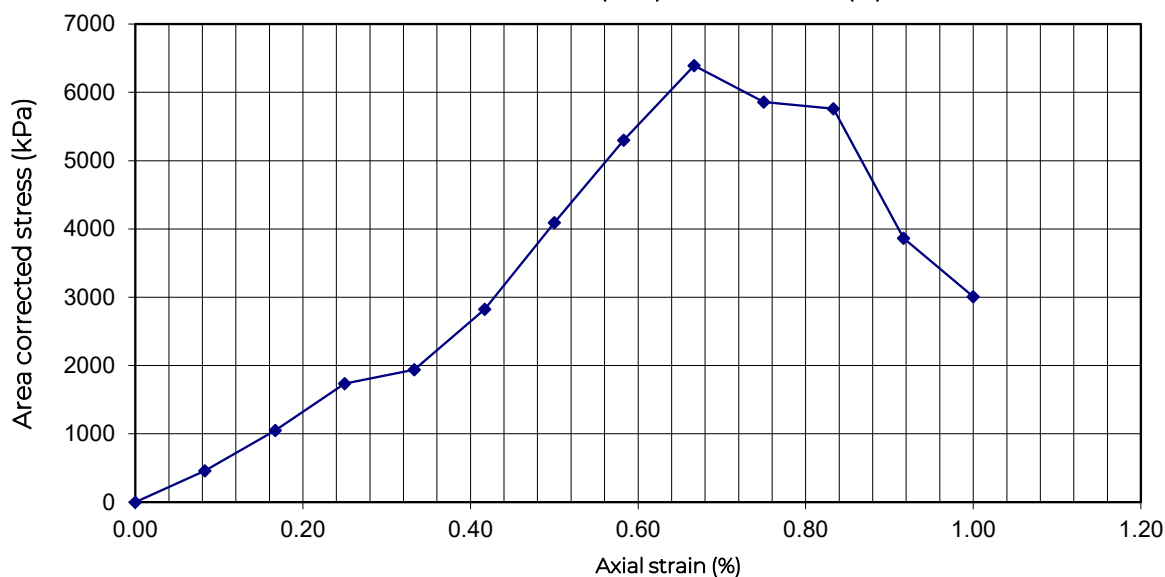
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 3/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SANDSTONE
 Sample reference: BH2B_1145
 Sample depth (m): 27.00-27.60
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 89-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.30	Water content as received (%)	8.7
Water content at compaction (%)	-	Initial sample diameter (mm)	61.0
Water content at testing (%)	8.7	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.15	Initial sample area (mm ²)	2922.5
UCS Max stress (kPa)	6400	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	0.67	* Young's modulus (MPa)	1333
Mode of failure:	Cone & Shear	for strain range	0.33 - 0.67%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	
Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1145
Sample depth (m): 27.00-27.60
Age at test: -
Date sampled: 3/09/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 89-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



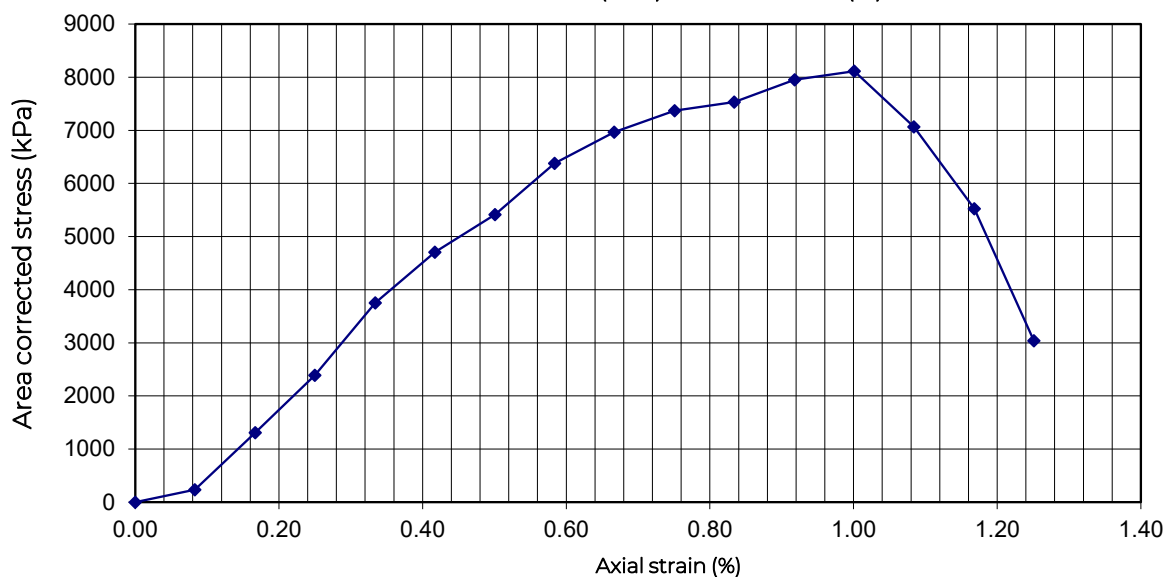
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 4/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SANDSTONE
 Sample reference: BH2B_1145
 Sample depth (m): 36.00-36.53
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 88-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.30	Water content as received (%)	7.8
Water content at compaction (%)	-	Initial sample diameter (mm)	61.0
Water content at testing (%)	7.8	Initial sample length (mm)	119.9
Dry density (t/m ³)	2.15	Initial sample area (mm ²)	2922.5
UCS Max stress (kPa)	8100	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	1	* Young's modulus (MPa)	1400
Mode of failure:	Multiple Fracturing	for strain range	0.08 - 0.33%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1	-The strain rate for this test was kept constant at 0.3mm/min.
Water content: NZS 4402: 1986: Test 2.1	
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



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 scope of the laboratory's
 accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1145
Sample depth (m): 36.00-36.53
Age at test: -

Date sampled: 4/09/25

Project number: 1-C2466.16
Lab ref number: WL4708/ 88-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



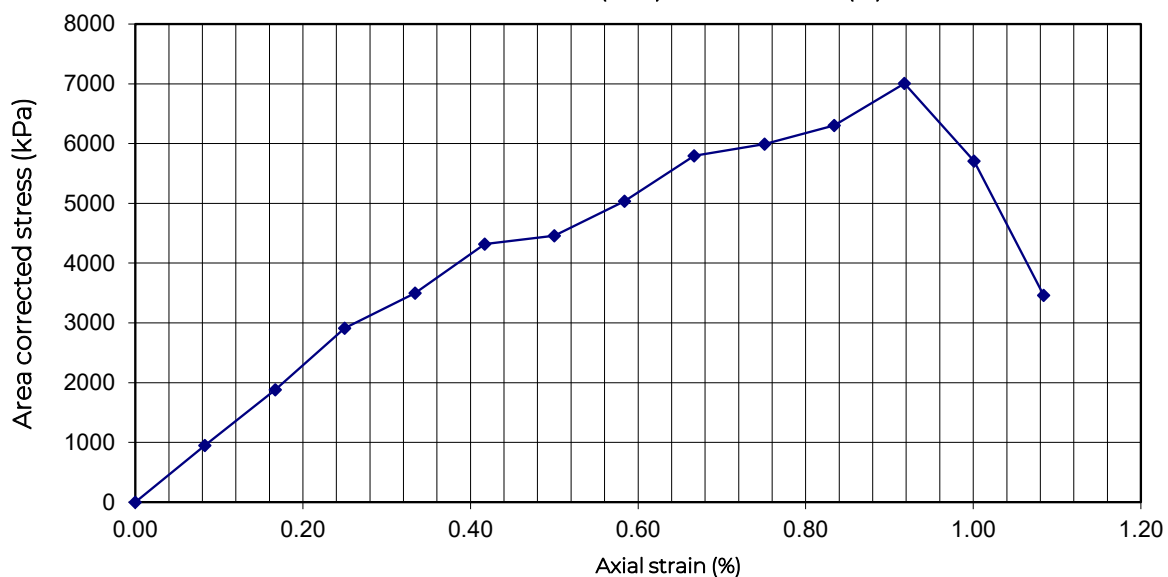
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 4/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SANDSTONE
 Sample reference: BH2B_1145
 Sample depth (m): 36.53-37.08
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 87-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.25	Water content as received (%)	7.8
Water content at compaction (%)	-	Initial sample diameter (mm)	61.0
Water content at testing (%)	7.8	Initial sample length (mm)	119.9
Dry density (t/m ³)	2.10	Initial sample area (mm ²)	2922.5
UCS Max stress (kPa)	7000	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	0.92	* Young's modulus (MPa)	1165
Mode of failure:	Shear Along Side Plane	for strain range	0.00 - 0.25%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25 This report may only be reproduced in full.

Approved Signatory *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1145
Sample depth (m): 36.53-37.08
Age at test: -

Date sampled: 4/09/25

Project number:	1-C2466.16
Lab ref number:	WL4708/ 87-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



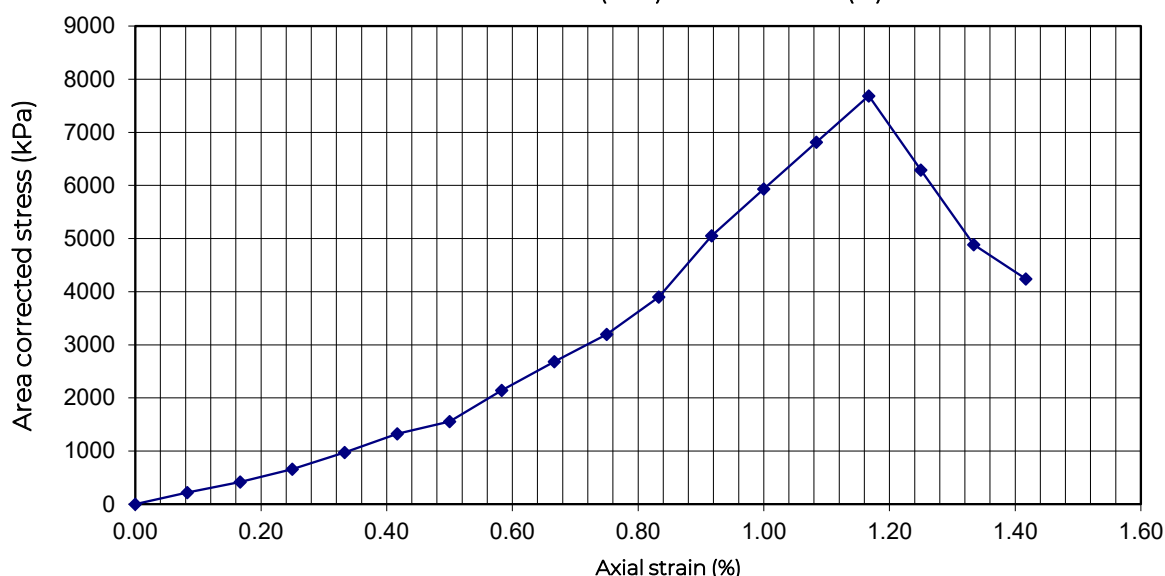
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 10/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak SANDSTONE
 Sample reference: BH2B_1151
 Sample depth (m): 13.95-14.53
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 97-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.30	Water content as received (%)	8.7
Water content at compaction (%)	-	Initial sample diameter (mm)	61.0
Water content at testing (%)	8.7	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.15	Initial sample area (mm ²)	2924.4
UCS Max stress (kPa)	7700	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	1.2	* Young's modulus (MPa)	1077
Mode of failure:	Shear	for strain range	0.75 - 1.17%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



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WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



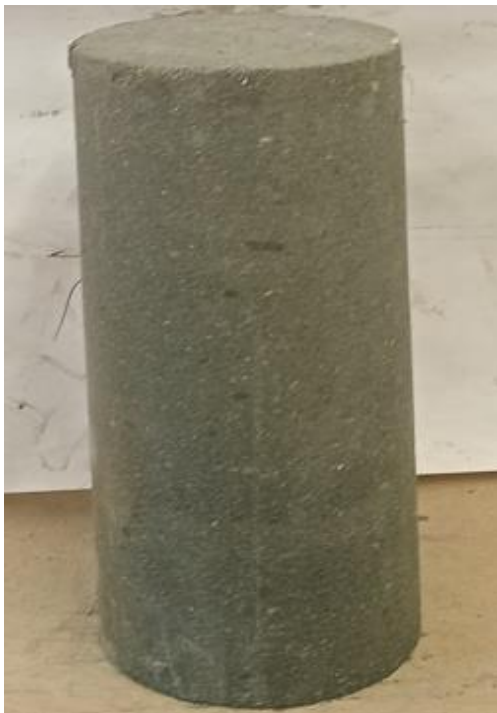
Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak SANDSTONE
Sample reference: BH2B_1151
Sample depth (m): 13.95-14.53
Age at test: -

Date sampled: 10/09/25

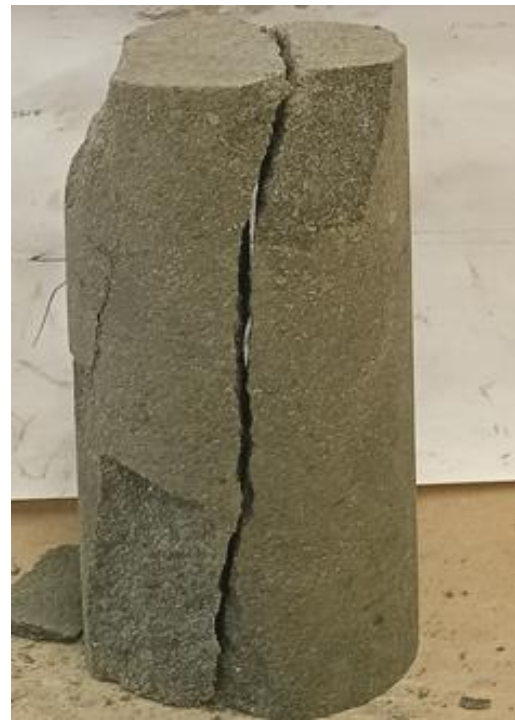
Project number:	1-C2466.16
Lab ref number:	WL4708/97-UCS
Client ref number:	1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



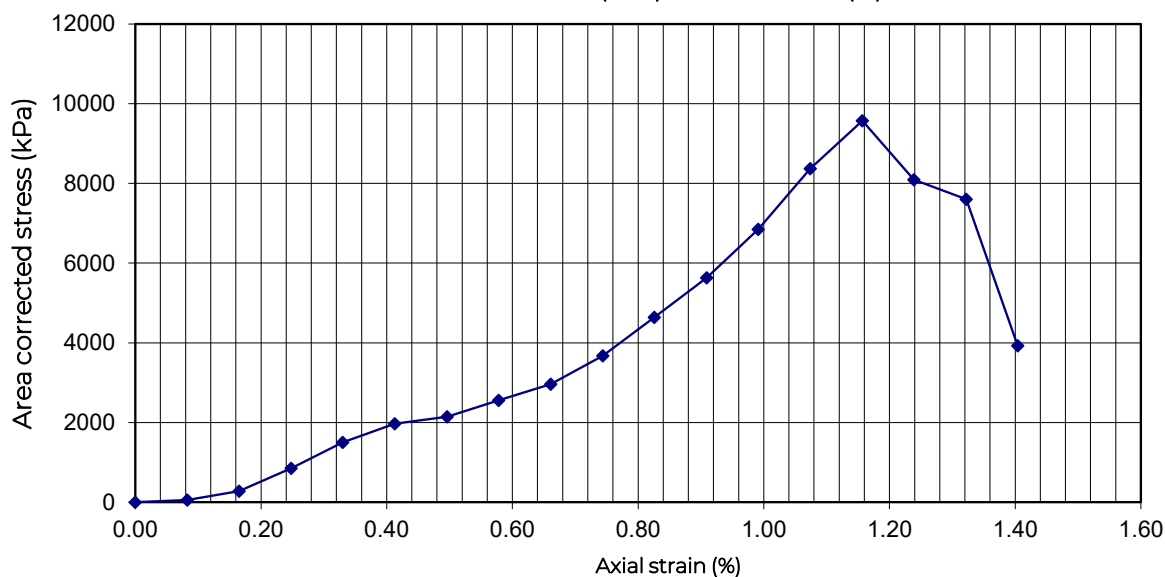
Project: Ground Investigation for Northland Corridor
 Location: Section 2 - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 11/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak Conglomeratic SANDSTONE
 Sample reference: BH2B_1151
 Sample depth (m): 26.15-26.60
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 96-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.35	Water content as received (%)	6.4
Water content at compaction (%)	-	Initial sample diameter (mm)	61.2
Water content at testing (%)	6.4	Initial sample length (mm)	121.0
Dry density (t/m ³)	2.25	Initial sample area (mm ²)	2941.7
UCS Max stress (kPa)	9600	Initial Length:Diameter ratio	1.98:1
Strain at failure (%)	1.2	* Young's modulus (MPa)	1333
Mode of failure:	Cone & Split	for strain range	0.66 - 1.16%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.3mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 28/10/25 This report may only be reproduced in full.

Approved Signatory *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 28/10/25



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WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



Project: Ground Investigation for Northland Corridor
Location: Section 2 - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak Conglomeratic SANDSTONE
Sample reference: BH2B_1151
Sample depth (m): 26.15-26.60
Age at test: -

Date sampled: 11/09/25

Project number: 1-C2466.16
Lab ref number: WL4708/96-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



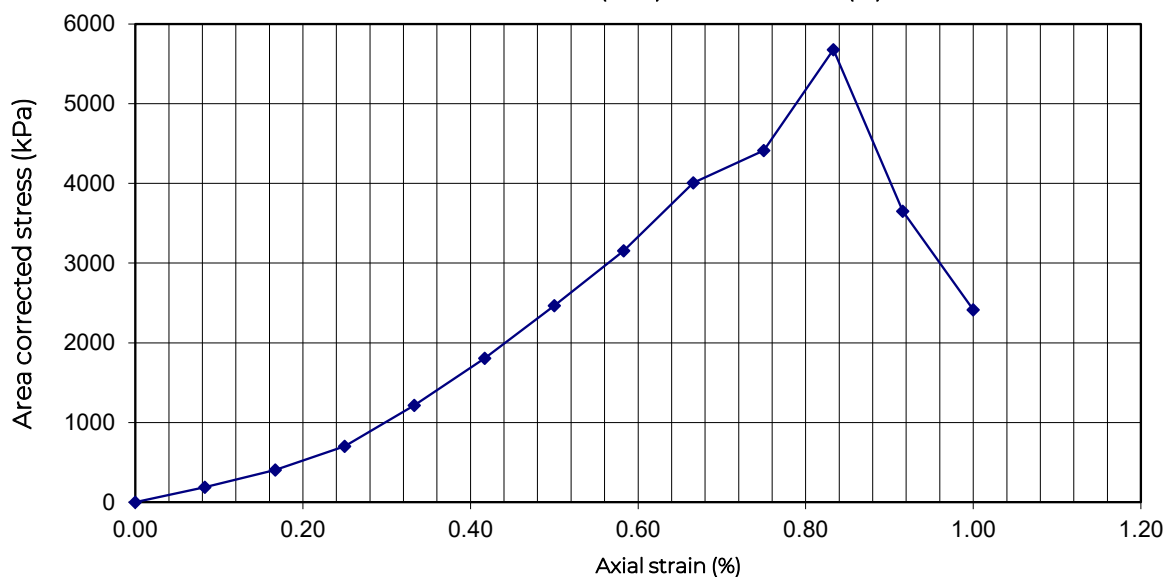
Project: Ground Investigation for Northland Corridor
 Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
 Client: NZTA c/- Aurecon & WSP NZ Ltd
 Contractor: N/A
 Sampled by: NC_Site Team Date sampled: 11/09/25
 Sampling method: Core
 Sample condition: As received
 Sample description: Weak Conglomeratic SANDSTONE
 Sample reference: BH2B_1151
 Sample depth (m): 31.82-32.15
 Age at test: -

Project number: 1-C2466.16
 Lab ref number: WL4708/ 95-UCS
 Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.40	Water content as received (%)	6.1
Water content at compaction (%)	-	Initial sample diameter (mm)	61.0
Water content at testing (%)	6.1	Initial sample length (mm)	120.0
Dry density (t/m ³)	2.25	Initial sample area (mm ²)	2924.4
UCS Max stress (kPa)	5700	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	0.83	* Young's modulus (MPa)	854
Mode of failure:	Shear	for strain range	0.25 - 0.83%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1	-The strain rate for this test was kept constant at 0.2mm/min.
* Young's modulus is not covered by IANZ Accreditation.	-Some sample details supplied by client.

Date tested: 29/09/25 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
 Date reported: 17/10/25

Approved Signatory: *Thirushen Pillay*
 Senior Civil Engineering Technician

Date: 17/10/25



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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**UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS**



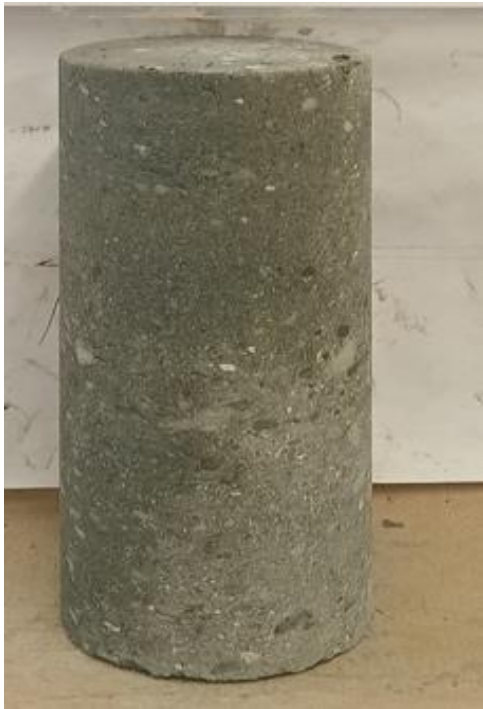
Project: Ground Investigation for Northland Corridor
Location: Section 2B - Te Hana to Port Marsden Highway, Section 2B GI
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: Weak Conglomeratic SANDSTONE
Sample reference: BH2B_1151
Sample depth (m): 31.82-32.15
Age at test: -

Date sampled: 11/09/25

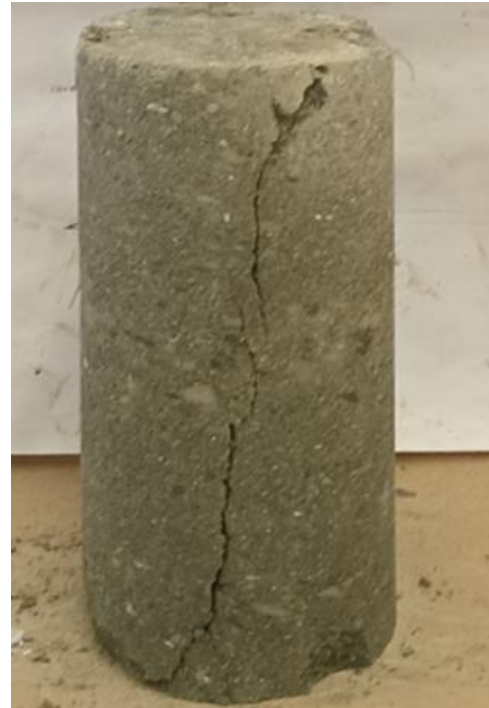
Project number: 1-C2466.16
Lab ref number: WL4708/95-UCS
Client ref number: 1-C2466.16

Test photos

Before Test



Post Test



Date tested: 29/09/25

UNCONFINED COMPRESSIVE STRENGTH (UCS) WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: SANDSTONE
Sample reference: BH2B_1157
Sample depth (m): 31.25-31.50
Age at test: -

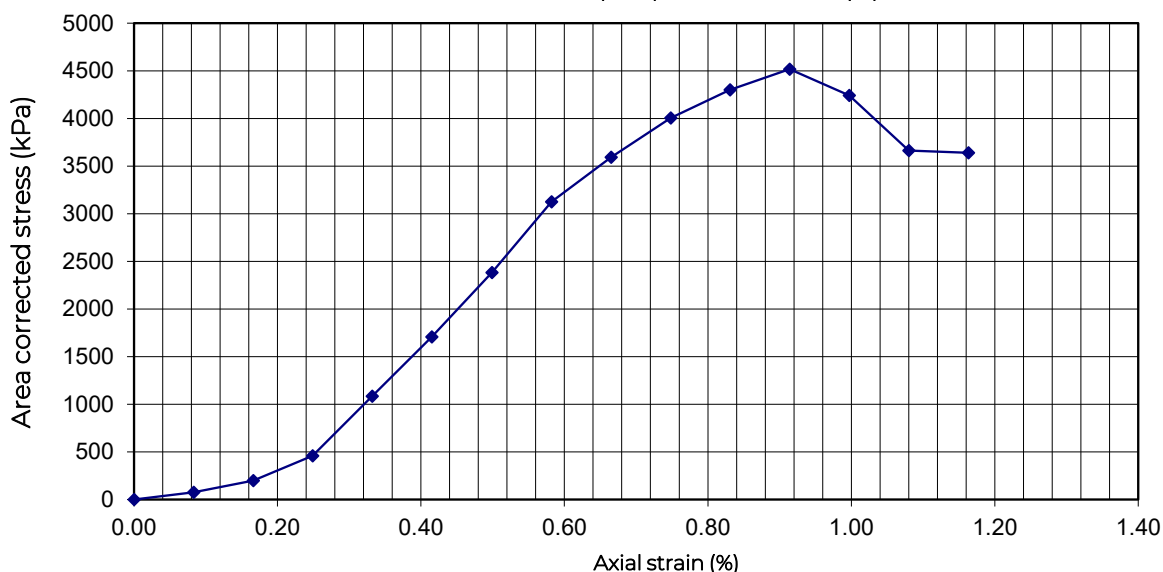
Date sampled: 29/10/25

Project number: 1-C2466.16
Lab ref number: WL4708/200-UCS
Client ref number: 1-C2466.16

Test results

Material size used	Whole sample	Wet mass passing size used (%)	-
Bulk density (t/m ³)	2.15	Water content as received (%)	6.6
Water content at compaction (%)	-	Initial sample diameter (mm)	61.0
Water content at testing (%)	6.6	Initial sample length (mm)	120.3
Dry density (t/m ³)	2.05	Initial sample area (mm ²)	2927.3
UCS Max stress (kPa)	4500	Initial Length:Diameter ratio	1.97:1
Strain at failure (%)	0.91	* Young's modulus (MPa)	801
Mode of failure:	Shear	for strain range	0.25 - 0.58%

Area corrected Stress (kPa) Vs Axial strain (%)



Test Methods	Notes
UCS: NZS 4402: 1986: Test 6.3.1 Water content: NZS 4402: 1986: Test 2.1 * Young's modulus is not covered by IANZ Accreditation.	-The strain rate for this test was kept constant at 0.2mm/min. -Some sample details supplied by client.

Date tested: 07/01/26 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
Date reported: 14/01/26

Approved Signatory: *Thirushen Pillay*
Senior Civil Engineering Technician

Date: 14/01/26



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

WHG-NLC06 (10/25)

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UNCONFINED COMPRESSIVE STRENGTH (UCS)
WITH YOUNG'S MODULUS



Project: Ground Investigation for Northland Corridor
Location: Alternative to Brynderwyn Hills Section
Client: NZTA c/- Aurecon & WSP NZ Ltd
Contractor: N/A
Sampled by: NC_Site Team
Sampling method: Core
Sample condition: As received
Sample description: SANDSTONE
Sample reference: BH2B_1157
Sample depth (m): 31.25-31.50
Age at test: -

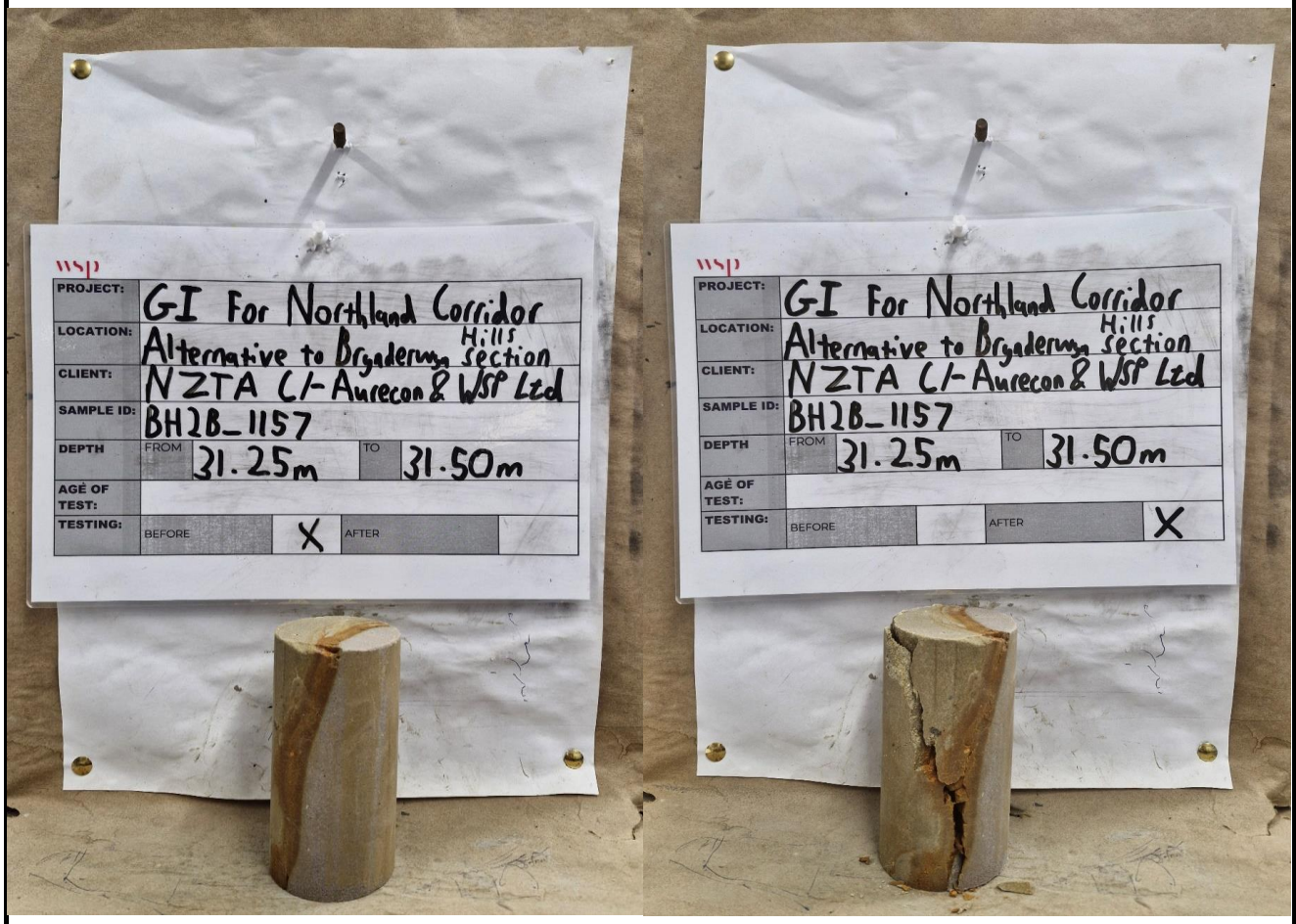
Date sampled: 29/10/25

Project number: 1-C2466.16
Lab ref number: WL4708/200-UCS
Client ref number: 1-C2466.16

Test photos

Before Test

Post Test



Date tested: 07/01/26