

## **Appendix 6-4. DAA Airfield Underpass – Ground Investigation**



**CAUSEWAY**  
— GEOTECH

## DAA Airfield Underpass – Ground Investigation

Client: DAA

Client's Representative: Ramboll Consulting Engineers

Report No.: 21-1219

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Rev 0

## CONTENTS

Document Control Sheet




Note on: Methods of describing soils and rocks & abbreviations used on exploratory hole logs

1	AUTHORITY .....	4
2	SCOPE .....	4
3	DESCRIPTION OF SITE .....	4
4	SITE OPERATIONS.....	5
4.1	Summary of site works.....	5
4.2	Boreholes.....	5
4.3	Standpipe installations.....	6
4.4	Pump tests.....	6
4.5	Surveying.....	7
5	LABORATORY WORK.....	7
5.1	Geotechnical laboratory testing of soils.....	7
5.2	Geotechnical laboratory testing of rock.....	8
5.3	Environmental laboratory testing of soils .....	8
5.4	Environmental laboratory testing of water samples .....	9
6	GROUND CONDITIONS .....	9
6.1	General geology of the area .....	9
6.2	Ground types encountered during investigation of the site .....	9
6.3	Groundwater.....	10
7	REFERENCES .....	11

## APPENDICES

Appendix A	Site and exploratory hole location plans
Appendix B	Borehole logs
Appendix C	Core photographs
Appendix D	Groundwater monitoring
Appendix E	Geotechnical laboratory test results
Appendix F	Environmental laboratory test results
Appendix G	SPT hammer energy measurement report

## Document Control Sheet

<b>Report No.:</b>		21-1219			
<b>Project Title:</b>		DAA Airfield Underpass			
<b>Client:</b>		DAA			
<b>Client's Representative:</b>		Ramboll Consulting Engineers			
<b>Revision:</b>	A00	<b>Status:</b>	Draft Report	<b>Issue Date:</b>	10 <sup>th</sup> June 2022
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The works were conducted in accordance with:

British Standards Institute (2015) BS 5930:2015+A1:2020, Code of practice for site investigations.

EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

## METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015+A1:2020, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
D	Small disturbed sample.
C	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V VR	Shear vane test (borehole). Shear strength stated in kPa. V: undisturbed vane shear strength      VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of $N \times 5 = C_u$ is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.

## **DAA Airfield Underpass**

### **1 AUTHORITY**

On the instructions of Ramboll Consulting Engineers, (“the Client’s Representative”), acting on the behalf of DAA (“the Client”), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of proposed underpass tunnel to connect the existing facilities in the eastern part of Dublin Airport (in the vicinity of the current Pier 3) to proposed areas of development to the west. To facilitate this, a cut-and-cover tunnel is proposed, passing beneath the existing crosswind runway. The tunnel will be approximately 1km in plan length, with the construction depth below ground level extending to a maximum of approximately 15-20m.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results. A discussion on the recommendations for construction is also provided.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client’s Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

### **2 SCOPE**

The extent of the investigation, as instructed by the Client’s Representative, included boreholes, soil and rock core sampling, environmental sampling, in-situ and laboratory testing, and the preparation of a factual report on the findings.

### **3 DESCRIPTION OF SITE**

As shown on the site location plan in Appendix A, the works were conducted on the site of Dublin Airport, in an east-west direction in the vicinity of the crosswind runway. The operational crosswind runway is bounded on both sides by several adjoining taxiways and areas of soft landscaping. The majority of the investigation lies within the grass areas however there was also some works on the existing apron areas, adjacent to Pier 3.

## 4 SITE OPERATIONS

### 4.1 Summary of site works

Site operations, which were conducted between 09<sup>th</sup> March and 3<sup>rd</sup> May 2022, comprised:

- thirteen rotary drilled boreholes
- a standpipe installation in eleven boreholes; and
- two pump tests

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

### 4.2 Boreholes

Eleven boreholes (BH101-BH111) were put to their completion by rotary drilling techniques only. The boreholes were completed using a Comacchio 601 tracked drilling rig, a Comacchio 405 tracked drilling rig and a truck mounted Beretta T44 rotary drilling rig.

Inspection pits at all boreholes locations were undertaken by Kilwex. They were not logged or photographed by Causeway Geotech.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes to a certain depth, after which rotary coring was employed to recover core samples of the overburden and bedrock. SPTs were carried out at standard intervals throughout the overburden, in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals using the split spoon sampler (SPT(s)) or solid cone attachment (SPT(c)). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix G.

Where coring was carried out within overburden and bedrock strata, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

Following completion of BH105 and BH107, both boreholes were re-drilled to a larger diameter to allow installation of a pumping well.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

### 4.3 Standpipe installations

Groundwater monitoring standpipes were installed in boreholes as shown below in Table 1.

**Table 1 Summary of standpipe installations**

GI Ref	Standpipe Type	Response Zone (mbgl)
BH101	50mm standpipe	15.0-20.0
BH102	50mm standpipe	3.0-14.0
BH103	50mm standpipe	5.0-12.0
BH104	50mm standpipe	15.0-19.0
BH105	150mm pumping well	2.50-20.5
BH106	50mm standpipe	13.0-18.5
BH107	150mm pumping well	2.50-28.0
BH108	50mm standpipe	14.0-18.0
BH109	50mm standpipe	2.5-25.0
BH110	50mm standpipe	3.8-16.0
BH111	50mm standpipe	4.0-31.5

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

### 4.4 Pump tests

Pump and step tests were carried in borehole BH105 and BH107 after the installation of a 150mm groundwater well.

Monitoring of nearby standpipes was carried out using manual dip-meters and digital data loggers to measure “drawdown” of the groundwater during tests.



Results have been provided to the client's representative in electronic format and are not presented as part of this report.

## 4.5 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R10 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish Transverse Mercator) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

Note, at the time of issuing this report, BH110 and BH111 have not been surveyed due to access restrictions. Co-ordinates and elevations provided on the logs are based on the co-ordinates provided in the tender documents and drawings.

## 5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

### 5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests, particle size distribution analysis and bulk density tests
- **shear strength** (total stress): unconsolidated undrained triaxial tests (UU)
- **shear stress** (effective stress): consolidated undrained triaxial tests (CU)
- **consolidation:** oedometer testing
- **compaction related:** California bearing ratio tests and dry density/moisture content relationship tests
- **soil chemistry:** pH, organic matter content, BRE Test Suite C and D.

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990).*

The test results are presented in Appendix E.

## 5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- point load index
- unconfined compressive strength (UCS) tests

Test	Test carried out in accordance with
Point load index	ISRM Suggested Methods (1985) Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60
Uniaxial compression strength tests	ISRM Suggested Methods (1981) Suggested method for determining deformability of rock materials in uniaxial compression, Part 2 and ISRM (2007) Ulusay R, Hudson JA (eds) The complete ISRM suggested methods for rock characterization, testing and monitoring, 2007

The test results are presented in Appendix E.

## 5.3 Environmental laboratory testing of soils

Environmental testing was conducted on selected environmental soil and water samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out in accordance with Engineer's Ireland Specification for Ground Investigation (2016) Suite I. This included testing for a range of determinants, including:

- Metals
- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)
- BTEX compounds
- Volatile Organic Compounds (VOCs)
- Semi-Volatile Organic Compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)
- Phenols
- Organic matter
- Total Organic Carbon (TOC)
- Cyanides
- Asbestos screen
- Sulphate and sulphide

- Sulphur
- Phosphate
- Calcium
- pH
- Waste acceptance criteria (WAC)

Results of environmental laboratory testing are presented in Appendix F.

## 5.4 Environmental laboratory testing of water samples

Environmental testing was conducted on groundwater samples from before and after pump tests by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out in accordance with Engineer's Ireland Specification for Ground Investigation (2016) Suite F and also for PFAS and ammonia.

Results of laboratory testing are presented in Appendix F.

NOTE GW TESTING FROM AFTER PUMP TESTS IS OUTSTANDING AT THE TIME OF ISSUING THIS REPORT.

## 6 GROUND CONDITIONS

### 6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise Glacial Till. These deposits are underlain by calcareous shale and limestone conglomerate of the Tober Colleen Formation.

### 6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Glacial Till:** sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth. Frequently with lenses of granular material, same large in extent as seen in BH103 and BH104. It should be noted that the method of drilling may have washed out the fines content of the granular deposits and it is possible they may just be a more granular glacial till.
- **Bedrock (Limestone):** Rockhead comprising mudstone and limestone was encountered at depths ranging from 21.40m in BH102 to 32.55m in BH111

### 6.3 Groundwater

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Groundwater was encountered during rotary drilling through soil as water strikes as shown in Table 2 below.

**Table 2 Groundwater strikes encountered during ground investigations.**

<b>Location</b>	<b>Depth (mbgl)</b>
<b>BH101</b>	<b>4.00</b>
<b>BH102</b>	<b>4.00</b>
<b>BH103</b>	<b>3.70</b>
<b>BH105-Well</b>	<b>16.50</b>

Groundwater was not noted during drilling at any of the other borehole locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out.

Due to the nature of the drilling system (Geobor-S), whereby water is added, groundwater strikes within overburden or bedrock may have been masked by the fluid used as the drilling flush medium.

Seasonal variations should be factored into design considerations.

## 7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland.

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. National Standards Authority of Ireland.

BS 5930: 2015+A1:2020: Code of practice for ground investigations. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

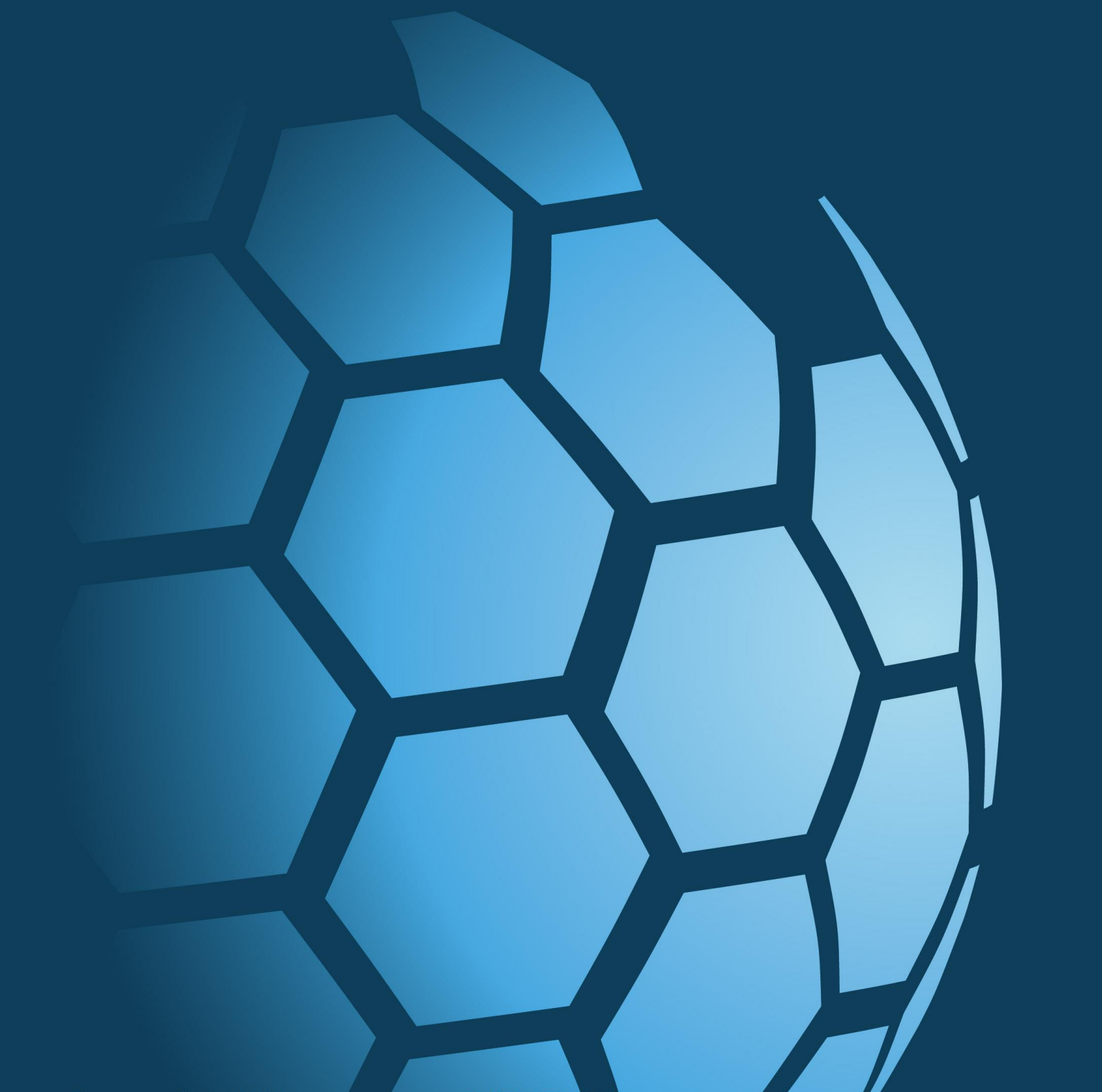
BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.



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**APPENDIX A**  
**SITE AND EXPLORATORY HOLE LOCATION PLANS**





**Project No.:** 21-1219

**Client:** DAA

**Project Name:** DAA Airfield Underpass

**Client's Representative:** Ramboll Consulting Engineers

Legend Key



**Title:**  
Site Location Plan

**Last Revised:**  
10/06/2022

**Scale:**  
1:50000

 Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

2 Kilometres  
1 Miles



**Project No.:** 21-1219

**Client:** DAA

**Project Name:** DAA Airfield Underpass

**Client's Representative:** Ramboll Consulting Engineers

**Legend Key**

- ⊗ Locations By Type - RC
- Locations By Type - RO



**Title:**  
Exploratory Hole Location Plan

**Last Revised:**  
10/06/2022

**Scale:**  
1:5000

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

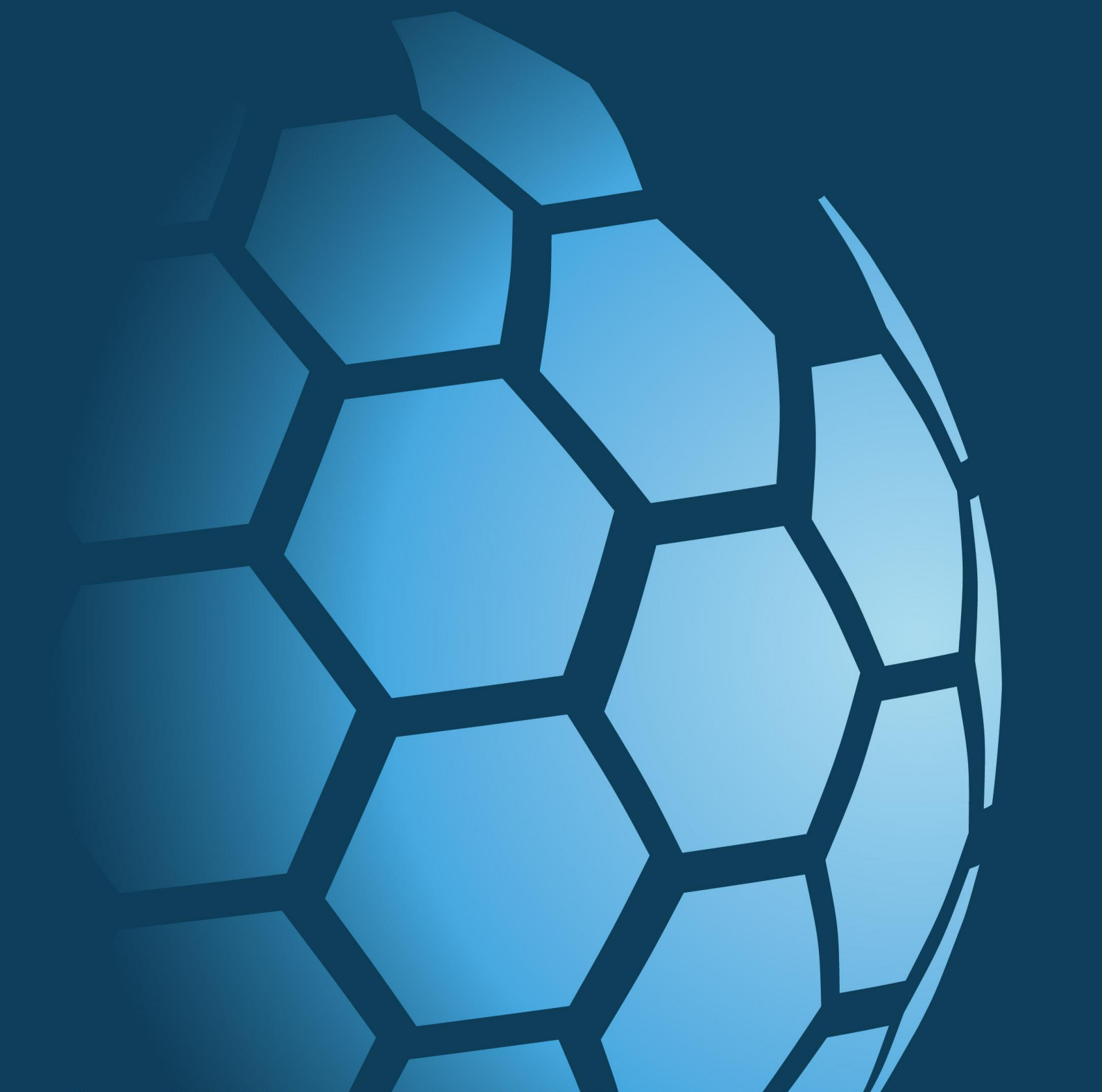
200 Metres  
800 Feet





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**APPENDIX B**  
**BOREHOLE LOGS**





**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH101

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 4.20	<b>Base (m)</b> 4.20 27.70	<b>Coordinates</b> 715774.50 E 743117.50 N	<b>Final Depth:</b> 27.70 m	<b>Start Date:</b> 21/03/2022	<b>Driller:</b> MW	Sheet 1 of 4 Scale: 1:40
					<b>Elevation:</b> 62.84 mOD	<b>End Date:</b> 23/03/2022	<b>Logger:</b> MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.20 1.20 - 1.65	D1 SPT(S) N=15 (1,1/2,3,4,6) Hammer SN = 0643					1.20	Dry	61.64	1.20		Inspection pit excavated by Kilwex to 1.20m		
2.70 2.70 - 3.15	D2 SPT(S) N=40 (4,7/10,9,7,14) Hammer SN = 0643					2.70	Dry				Stiff becoming very stiff dark brown sandy gravelly CLAY. (Driller's description)		
4.20 4.20 - 4.65	Slow seepage at 4.00m D3 SPT(S) N=44 (3,4/6,12,12,14) Hammer SN = 0643					4.20	4.00	58.64	4.20		Very stiff greyish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of predominantly limestone. Cobbles are subangular to subrounded of limestone.		
4.30 4.60 - 4.85	ES1 B1	60											
5.20 5.55	ES2												
6.10 6.25 - 6.60	D4 C1	100											
6.70													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m.			
4.00	4.00	20	4.00				
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.20	200						
27.70	150						
		<b>Flush Type</b>		<b>Termination Reason</b>		<b>Last Updated</b>	
		Water		Terminated at scheduled depth.		10/06/2022	





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**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH101**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 27.70 m	<b>Start Date:</b> 21/03/2022	<b>Driller:</b> MW	Sheet 2 of 4 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 4.20	4.20 27.70	715774.50 E 743117.50 N	<b>Elevation:</b> 62.84 mOD	<b>End Date:</b> 23/03/2022	<b>Logger:</b> MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.10 8.20	ES3	100									Very stiff greyish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of predominantly limestone. Cobbles are subangular to subrounded of limestone.		
8.40 8.50 - 8.80	D5 B2												
9.70		100											
10.90 - 11.20	C2												
11.20		100											
11.90 - 12.30	B3												
12.50 12.70	D6												
14.20		100											

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m.			
4.00	4.00	20	4.00				
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.20	200						
27.70	150						
		<b>Flush Type</b>		<b>Termination Reason</b>		<b>Last Updated</b>	
		Water		Terminated at scheduled depth.		10/06/2022	





**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH101

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 3 of 4
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 4.20	4.20 27.70	715774.50 E 743117.50 N	27.70 m	21/03/2022	MW	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					62.84 mOD	23/03/2022	MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
15.00 - 15.30	B4										Very stiff greyish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of predominantly limestone. Cobbles are subangular to subrounded of limestone.		
15.45	D7	100						47.04	15.80				
15.70											Stiff thinly laminated dark greyish brown slightly sandy gravelly SILT. Sand is fine to coarse. Gravel is subangular fine to coarse.		
17.20		90											
17.55 - 17.90	C3												
18.70		80											
19.10 - 19.50	B5							43.64	19.20		Grey and greyish brown gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine to coarse.		
19.60	D8	100						43.19	19.65		Very stiff dark grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are subangular to subrounded.		
20.20								42.54	20.30		Very stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.		
20.90 - 21.30	C4	100						41.79	21.05		Very stiff dark grey slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular of limestone. Medium strong thinly laminated grey argillaceous LIMESTONE. Partially weathered.		
21.70								41.14	21.70		Discontinuities: 1. 0 to 15 degree bedding fractures, closely spaced (10/76/170). 2. 80 to 90 degree joint at 21.70m to 27.70m, planar, rough, with patchy brown staining on joint surface.		
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
4.00	4.00	20	4.00	
Inspection pit excavated by Kilwex to 1.20m.				
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
4.20	200			
27.70	150			
Flush Type		Termination Reason		Last Updated
Water		Terminated at scheduled depth.		10/06/2022





<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 4.20	<b>Base (m)</b> 4.20 27.70	<b>Coordinates</b> 715774.50 E 743117.50 N	<b>Final Depth:</b> 27.70 m	<b>Start Date:</b> 21/03/2022	<b>Driller:</b> MW	Sheet 4 of 4 Scale: 1:40
					<b>Elevation:</b> 62.84 mOD	<b>End Date:</b> 23/03/2022	<b>Logger:</b> MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.35 - 22.53	C5	100						40.44	22.40		Medium strong thinly laminated grey argillaceous LIMESTONE. Partially weathered. Discontinuities: 1. 0 to 15 degree bedding fractures, closely spaced (10/76/170). 2. 80 to 90 degree joint at 21.70m to 27.70m, planar, rough, with patchy brown staining on joint surface. Weak thinly laminated dark grey MUDSTONE. Distinctly weathered. Discontinuities: 1. 0 to 20 degree bedding fractures, very closely spaced (11/38/90) with orange brown staining. 2. 80 to 90 degree joint at 23.65m to 23.90m, at 23.65m to 23.96m, planar, rough with patchy brown and orange staining on joint surface at 24.15m to 24.35m undulating, rough with brown patches on surface.		
23.20		100						38.34	24.50		Medium strong thickly laminated dark grey LIMESTONE. Largely unweathered with some light brown staining on fracture surface. Discontinuities: 1. 0 to 15 degree bedding fractures medium spaced (60/232/600) with some brown staining on surfaces. 2. 80 to 90 degree joint at 25.50m to 25.65m at 27.55m planar, rough with some light brown staining.		
24.70													
24.97	C6	100											
25.65 - 26.08	C7												
26.20 - 26.45	C8	100											
26.20													
27.70								35.14	27.70		End of Borehole at 27.70m		

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
4.00	4.00	20	4.00	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
4.20	200			
27.70	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH102**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 4.00	<b>Base (m)</b> 4.00 23.50	<b>Coordinates</b> 715939.80 E 743123.10 N	<b>Final Depth:</b> 23.50 m	<b>Start Date:</b> 12/05/2022	<b>Driller:</b> GT	Sheet 1 of 4 Scale: 1:40
					<b>Elevation:</b> 62.65 mOD	<b>End Date:</b> 12/05/2022	<b>Logger:</b> DMC	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
									61.45	1.20	Inspection pit excavated by Kilwex to 1.20m.		
									60.15	2.50	Soft brown sandy gravelly CLAY (Driller description)		
2.50 - 2.95	SPT(S) N=7 (1,1/1,2,2,2)								59.15	3.50	Gravels/Grey silty CLAY(Drillers description)		
4.00 - 5.00	B1								58.65	4.00	Grey slightly sandy gravel (Drillers description)		
4.00 - 4.45	SPT(S) N=11 (2,2/3,3,3,2)										Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
4.50	D11	87											
5.00 - 13.00	B2								57.65	5.00	Stiff becoming very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone		
5.50 - 5.95	SPT(S) N=22 (4,4/4,6,6,6)										<i>Fines possibly washed out by drilling.</i>		
5.50		87											
7.00 - 7.45	SPT(S) N=42 (6,8/10,10,10,12)										<i>firm dark brown slightly clayey sand.</i>		
7.00													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m.			
4.00							
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.00	200						
23.50	150						
<b>Flush Type</b>		<b>Termination Reason</b>		<b>Last Updated</b>			
Water		Terminated at scheduled depth		10/06/2022			



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH102**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 4
Rotary Drilling Rotary Coring	Beretta T44 Beretta T44	0.00 4.00	4.00 23.50	715939.80 E 743123.10 N	23.50 m	12/05/2022	GT	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					62.65 mOD	12/05/2022	DMC	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
7.70 - 8.00	ES18										Stiff becoming very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone		
8.00	D12	100											
8.50 - 8.65 8.50	SPT(S) N=0 (0,0/0 for 0mm)												
10.00 - 10.45 10.00	SPT(S) N=47 (7,8/11,12,12,12)	100											
10.70 - 11.00	ES19												
11.50 - 11.91 11.50	SPT(S) 0 (75 for 111mm/,,)										<i>firm dark brown slightly sandy clay</i>		
13.00 - 13.95 13.00 - 13.45 13.00	B3 SPT(S) N=40 (6,8/8,10,10,12)							49.65	13.00		Firm brown slightly clayey SAND. Sand is fine to coarse.		
13.50	D13	100											
13.95 - 14.50	B4							48.70	13.95		Very stiff greyish brown slightly sandy GRAVEL. Sand is fine to coarse gravel is subangular fine to coarse of various lithologies.		
14.50 14.50 - 15.15	D14 B5							48.15	14.50		Firm brown slightly clayey SAND. Sand is fine to coarse.		
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
4.00				
				Inspection pit excavated by Kilwex to 1.20m.
Casing Details		Core Barrel		Termination Reason
To (m)	Diam (mm)	SK6L		
4.00	200			
23.50	150	Flush Type		Last Updated
		Water		
				Terminated at scheduled depth
				10/06/2022





<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 4.00	<b>Base (m)</b> 4.00 23.50	<b>Coordinates</b> 715939.80 E 743123.10 N	<b>Final Depth:</b> 23.50 m	<b>Start Date:</b> 12/05/2022	<b>Driller:</b> GT	Sheet 3 of 4 Scale: 1:40
					<b>Elevation:</b> 62.65 mOD	<b>End Date:</b> 12/05/2022	<b>Logger:</b> DMC	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.50 - 14.88 14.50	SPT(S) 75 (12,13/75 for 229mm)										Firm brown slightly clayey SAND. Sand is fine to coarse.		
15.00 15.15 - 16.40	D15 B6	100						47.50	15.15		Stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse gravel is subangular fine to coarse of various lithologies.		
15.50	D16										<i>firm slightly clayey slightly gravelly SAND</i>		
16.00 - 16.00 16.00	SPT(S) 0 (0 for 0mm/0 for 0mm)												
16.40 - 20.25	B7	100						46.25	16.40		Firm becoming stiff dark brown slightly sandy CLAY. Sand is fine to coarse.		
17.50 - 17.95 17.50	SPT(S) N=34 (8,8/7,8,9,10)												
18.00	D17	100											
19.00 - 19.42 19.00	SPT(S) 0 (75 for 119mm/,/,/,)												
20.25 - 21.40	B8							42.40	20.25		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse gravel is subangular fine to coarse of various lithologies.		
20.50 - 20.50 20.50	SPT(S) 0 (0 for 0mm/0 for 0mm)												
		100											
								41.25	21.40		Medium strong grey LIMESTONE. Partially weathered; slightly reduced strength, slightly reduced fracture spacing. Discontinuities: 1. 5-10 degree joints, medium spaced (70/260/500), clean, smooth with some brown discolouration on joint surfaces. 2. One 80-90 degree joint from 22.35-23.00m, rough and undulating.		

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m.			
4.00							
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.00	200						
23.50	150						
		<b>Flush Type</b>	<b>Termination Reason</b>		<b>Last Updated</b>		
		Water	Terminated at scheduled depth		10/06/2022		







<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 23.50 m	<b>Start Date:</b> 12/05/2022	<b>Driller:</b> GT	Sheet 4 of 4 Scale: 1:40
Rotary Drilling Rotary Coring	Beretta T44 Beretta T44	0.00 4.00	4.00 23.50	715939.80 E 743123.10 N	<b>Elevation:</b> 62.65 mOD	<b>End Date:</b> 12/05/2022	<b>Logger:</b> DMC	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill	
22.00 - 22.39 22.00	SPT(S) 0 (75 for 94mm/,,)										Medium strong grey LIMESTONE. Partially weathered; slightly reduced strength, slightly reduced fracture spacing. Discontinuities: 1. 5-10 degree joints, medium spaced (70/260/500), clean, smooth with some brown discolouration on joint surfaces. 2. One 80-90 degree joint from 22.35-23.00m, rough and undulating.			
23.05 - 23.40	U10	100	90	55	5									
23.40 - 23.50 23.50	U9							39.15	23.50				End of Borehole at 23.50m	

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m.			
4.00							
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.00	200						
23.50	150	<b>Flush Type</b>		<b>Termination Reason</b>		<b>Last Updated</b>	
		Water		Terminated at scheduled depth		10/06/2022	







**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH103

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 4
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 25.50	715891.00 E 743087.30 N	25.50 m	11/05/2022	JG	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					63.05 mOD	11/05/2022	TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.00 - 8.15 8.00	SPT(C) N=0 (25,25/0 for 0mm)										Dark greyish brown clayey fine to coarse SAND with very widely spaced medium beds of subrounded fine to coarse GRAVEL with low cobble content. Gravel and cobbles are of limestone.		
8.50 - 8.80	ES20	90											
9.00 - 9.30	ES21												
9.50 - 11.25 9.50 - 9.95 9.50	B3 SPT(C) N=38 (3,8/6,8,11,13)	100											
11.00													
11.25 - 11.25 11.25 - 13.15 11.50 - 11.95	D13 B4 SPT(C) N=46 (4,7/10,10,12,14)	100						51.80	11.25		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
12.50													
13.15 - 13.15 13.15 - 14.15	D14 B5	97						49.90	13.15		Very stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
14.00 - 14.45 14.00	SPT(C) N=46 (5,7/9,10,12,15)												
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
3.70	4.00			
Inspection pit excavated by Kilwex to 1.20m.				
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
4.00	200			
25.50	150			
Flush Type		Termination Reason		
Water		Terminated at scheduled depth		
			Last Updated	
			10/06/2022	



<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 25.50 m	<b>Start Date:</b> 11/05/2022	<b>Driller:</b> JG	Sheet 3 of 4 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 25.50	715891.00 E 743087.30 N	<b>Elevation:</b> 63.05 mOD	<b>End Date:</b> 11/05/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
15.50		100									Very stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
16.10 - 16.40	U22	97											
16.90	D15							46.15	16.90		Dense dark greyish brown very clayey fine to coarse SAND. <i>17.00-17.50m: AZCL disturbance due to SPT.</i>		
16.90 - 18.50 17.00 - 17.45 17.00	B6 SPT(C) N=34 (5,6/7,9,9,9)				AZCL								
18.50		67											
19.60	D16							43.45	19.60		Very dense dark grey fine to medium SAND.		
19.60 - 20.60 20.00 - 20.40 20.00	B7 SPT(C) N=50 (4,8/50 for 250mm)												
21.50		83											
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m.			
3.70	4.00						
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.00	200						
25.50	150						
<b>Flush Type</b>		<b>Termination Reason</b>		<b>Last Updated</b>			
Water		Terminated at scheduled depth		10/06/2022			



Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 4 of 4 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 25.50	715891.00 E 743087.30 N	25.50 m	11/05/2022	JG	
					<b>Elevation:</b> 63.05 mOD	<b>End Date:</b> 11/05/2022	<b>Logger:</b> TH	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.35 22.35 - 22.90	D17 B8	100						40.70	22.35		Very dense dark grey fine to medium SAND.		
22.90 22.90 - 23.90 23.00 - 23.45 23.00	D18 B9 SPT(C) N=50 (6,8,9,12,13,16)	100						40.15	22.90		Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.		
24.30 - 24.65 24.50	B10							38.75	24.30		Very dense greyish black silty fine SAND.		
		80	80	80	1			38.40	24.65		Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse of limestone.		
								37.55	25.50		Medium strong massive dark grey LIMESTONE. Partially weathered: slightly reduced strength, dark orangish brown discolouration on some fracture surfaces. Discontinuities: 1. 70-90 degree joint, at 24.75-25.50m (incipient from 24.90-25.50m), undulating, smooth, dark orangish brown staining on joint surface.		
25.50											End of Borehole at 25.50m		

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
3.70	4.00			
Casing Details		Core Barrel		Termination Reason
To (m)	Diam (mm)	SK6L		
4.00	200			
25.50	150	Flush Type		Last Updated
		Water		10/06/2022
				Terminated at scheduled depth





**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH104

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 4
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 29.00	716195.12 E 743047.22 N	29.00 m	21/04/2022	JG	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					62.44 mOD	22/04/2022	TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.20 - 1.65	SPT(C) N=15 (1,2/3,3,4,5) Hammer SN = 1387							61.24	1.20		Inspection pit excavated by Kilwex to 1.20m.		
2.50 - 2.95	SPT(C) N=16 (3,3/3,3,4,6) Hammer SN = 1387										Soft to firm brown sandy gravelly CLAY (Driller's description)		
4.00 4.00 - 5.00 4.00 - 4.45	D27 B1 SPT(C) N=28 (3,5/6,6,8,8) Hammer SN = 1387	100						58.44	4.00		Stiff dark greyish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse of limestone. Cobbles are subangular of limestone.		
5.00 - 5.45 5.00	SPT(C) N=22 (4,4/5,6,5,6) Hammer SN = 1387				AZCL						5.00-5.40m: AZCL disturbance due to SPT.		
6.40 6.40 - 7.40 6.50 - 6.95 6.50	D28 B2 SPT(C) N=27 (3,5/5,7,7,8) Hammer SN = 1387							56.04	6.40		Stiff, becoming very stiff, dark brownish grey slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of predominantly limestone and rare quartz. Cobbles are subangular of limestone.		
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
4.00	200			
29.00	150			
Flush Type		Termination Reason		Last Updated
Water		Terminated at scheduled depth.		10/06/2022





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH104**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 4
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 29.00	716195.12 E 743047.22 N	29.00 m	21/04/2022	JG	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					62.44 mOD	22/04/2022	TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.00 - 8.28 8.00	SPT(C) N=38 (3,8/38 for 130mm) Hammer SN = 1387										Stiff, becoming very stiff, dark brownish grey slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of predominantly limestone and rare quartz. Cobbles are subangular of limestone.		
		40			AZCL						8.00-8.90m: AZCL disturbance due to SPT.		
9.50 - 9.95 9.50	SPT(C) N=41 (4,6/8,10,11,12) Hammer SN = 1387												
		90									9.95-10.10m: Lens of subangular fine to coarse gravel of limestone.		
11.00													
11.45 - 11.75	U21												
		87											
11.95 11.95 - 12.50	D29 B3							50.49	11.95		Very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are angular of limestone.		
12.50 12.50 - 12.80	D30 B4							49.94	12.50		Dark brown very sandy CLAY. Sand is fine to coarse.		
12.80 12.80 - 13.45	D31 B5							49.64	12.80		Stiff dark brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular fine to coarse of limestone. Cobbles are subangular of limestone.		
		100											
13.45 13.45 - 13.80	D32 B6							48.99	13.45		Dark brown gravelly very clayey fine to coarse SAND with low cobble content. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.		
13.80 13.80 - 14.70	D33 B7							48.64	13.80		Very stiff dark brownish grey sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.		
14.00											13.70-13.80m: Lens of subangular fine to coarse gravel of limestone.		
											14.45-15.55m: Lens of gravelly very clayey fine to coarse sand.		

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
4.00	200			
29.00	150			
Flush Type		Termination Reason		
Water		Terminated at scheduled depth.		
			<b>Last Updated</b>	
			10/06/2022	



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH104**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 601 Comacchio 601	<b>Top (m)</b> 0.00 4.00	<b>Base (m)</b> 4.00 29.00	<b>Coordinates</b> 716195.12 E 743047.22 N	<b>Final Depth:</b> 29.00 m	<b>Start Date:</b> 21/04/2022	<b>Driller:</b> JG	Sheet 3 of 4 Scale: 1:40
					<b>Elevation:</b> 62.44 mOD	<b>End Date:</b> 22/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.70 14.70 - 15.50	D34 B8	100						47.74	14.70		Very stiff dark brownish grey sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.		
15.50 15.50 - 16.25 15.50	D35 B9							46.94	15.50		Very stiff dark brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.		
16.25 16.25 - 17.00	D36 B10	100						46.19	16.25		Dark grey subangular fine to coarse GRAVEL of limestone with high cobble content. Cobbles are subangular of limestone.		
17.00 17.00 - 18.10 17.00	D37 B11	93						45.44	17.00		Dark grey very clayey fine to coarse SAND.		
18.10 18.10 - 19.10 18.50	D38 B12							44.34	18.10		Very stiff dark greyish brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are of limestone. <i>18.50-18.60m: Lens of subangular fine to coarse gravel of limestone.</i>		
19.20 - 19.50	U22	100									<i>19.75-19.80m: Lens of subangular fine to medium gravel of limestone.</i>		
20.00 20.25 20.25 - 20.55	D39 B13							42.19	20.25		Very stiff dark greyish brown sandy SILT. Sand is fine to coarse.		
20.55 20.55 - 21.55	D40 B14	100						41.89	20.55		Greyish black fine to medium SAND.		
21.50													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
4.00 29.00	200 150			
		<b>Flush Type</b> Water	<b>Last Updated</b> 10/06/2022	







<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 29.00 m	<b>Start Date:</b> 21/04/2022	<b>Driller:</b> JG	Sheet 4 of 4 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 29.00	716195.12 E 743047.22 N	<b>Elevation:</b> 62.44 mOD	<b>End Date:</b> 22/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.55 22.55 - 23.55	D41 B15	100									Greyish black fine to medium SAND.		
23.00		100											
24.50 24.50 - 24.90 24.50	D42 B16							37.94	24.50		Greyish black silty fine to coarse SAND.		
24.90 24.90 - 25.05 25.05	D43 B17 D44							37.54	24.90		Very stiff dark grey CLAY.		
25.05 - 26.00	D44 B18	97						37.39	25.05		Greyish black fine SAND.		
26.00													
26.45 26.45 - 27.30	D46 B20	100	4	4				35.99	26.45		Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse Gravel is subangular of limestone.		
27.45 - 27.50 27.50	C24							35.14	27.30		Medium strong indistinctly thinly laminated black LIMESTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 5-15 degree bedding fractures, closely spaced (25/105/390), planar, rough. 2. 30-50 degree joints, at 27.50-27.60m and 27.95-27.03m, slightly undulating, smooth. 3. 60-70 degree joint, at 28.10-28.30m, planar, rough.		
27.83 - 27.95	C25				11								
28.20 - 28.50	C23	100	93	57									
28.70 - 28.80	C26				7								
29.00								33.44	29.00		End of Borehole at 29.00m		
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.			
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
4.00	200						
29.00	150						
		<b>Flush Type</b>	<b>Termination Reason</b>		<b>Last Updated</b>		
		Water	Terminated at scheduled depth.		10/06/2022		





<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 27.00 m	<b>Start Date:</b> 25/04/2022	<b>Driller:</b> JG	Sheet 1 of 4 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 27.00	716016.20 E 743061.80 N	<b>Elevation:</b> 62.81 mOD	<b>End Date:</b> 25/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.20 - 1.65	SPT(C) N=19 (3,3/4,5,5,5) Hammer SN = 1387							61.61	1.20		Inspection pit excavated by Kilwex to 1.20m.		
4.00 - 5.00 4.00 - 4.45	B1 SPT(C) N=32 (4,5/6,8,8,10) Hammer SN = 1387	50						58.81	4.00		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse. (Driller's description)		
5.00 - 8.00 5.00	B2	50						57.81	5.00		Dark grey GRAVEL and COBBLES of limestone with some slightly sandy slightly gravelly clay. <i>5.00-5.90m: AZCL fines washed out with drilling fluid.</i>		
6.50 - 6.79 6.50	SPT(C) N=40 (3,6/40 for 140mm) Hammer SN = 1387	50									<i>6.50-7.30m: AZCL disturbance due to SPT.</i>		
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.									
<b>Casing Details</b>		<b>Core Barrel</b>											
To (m)	Diam (mm)	SK6L											
4.00	200												
27.00	150	<b>Flush Type</b>		<b>Termination Reason</b>						<b>Last Updated</b>			
		Water		Terminated at scheduled depth.						10/06/2022			



<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 601 Comacchio 601	<b>Top (m)</b> 0.00 4.00	<b>Base (m)</b> 4.00 27.00	<b>Coordinates</b> 716016.20 E 743061.80 N	<b>Final Depth:</b> 27.00 m	<b>Start Date:</b> 25/04/2022	<b>Driller:</b> JG	Sheet 2 of 4 Scale: 1:40
					<b>Elevation:</b> 62.81 mOD	<b>End Date:</b> 25/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.00 - 12.95 8.00	B3							54.81	8.00		Dark grey GRAVEL and COBBLES of limestone with some slightly sandy slightly gravelly clay.		
9.50 - 9.57 9.50	SPT(C) N=0 (14 for 75mm/0 for 0mm) Hammer SN = 1387	50									Greyish brown gravelly very clayey fine to coarse SAND with low cobble content. Gravel is subrounded fine to coarse of limestone. Cobbles are subangular. <i>8.00-8.90m: AZCL fines washed out with drilling fluid.</i>		
11.00 - 11.45 11.00	SPT(C) N=44 (4,7,7,10,13,14) Hammer SN = 1387	65									<i>9.50-10.00m: AZCL disturbance due to SPT.</i>		
12.50													
12.95 - 13.95	B4							49.86	12.95		Very stiff dark brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		
13.50 - 13.95	SPT(C) N=44 (5,8/10,11,11,12) Hammer SN = 1387	95											
14.00											<i>14.00-14.70m: Dark greyish brown very clayey fine to coarse sand, possibly disturbed by drilling.</i>		
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		
To (m)	Diam (mm)	SK6L		
4.00	200			
27.00	150			
<b>Flush Type</b>		<b>Termination Reason</b>		
Water		Terminated at scheduled depth.		
<b>Last Updated</b>				<b>AGS</b>
10/06/2022				



**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH105

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 3 of 4
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 27.00	716016.20 E 743061.80 N	27.00 m	25/04/2022	JG	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					62.81 mOD	25/04/2022	TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.70	D9										Very stiff dark brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		
15.50		80									15.50-16.10m: Dark greyish brown very clayey fine to coarse sand, possibly disturbed by drilling.		
16.50 - 16.95	SPT(C) N=44 (3,6/8,11,11,14) Hammer SN = 1387												
17.00	D10							45.81	17.00		Very stiff greyish black slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
17.00 - 18.10	B5												
17.00		95											
18.00 - 18.29	SPT(C) N=47 (6,17/47 for 140mm) Hammer SN = 1387												
18.10	D11							44.71	18.10		Dense greyish black very silty fine to medium SAND.		
18.10 - 19.10	B6												
18.50		75											
20.00													
21.00 - 21.45	SPT(C) N=34 (3,3/5,8,10,11) Hammer SN = 1387												
21.50		100											
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		Termination Reason
To (m)	Diam (mm)	SK6L		
4.00	200			
27.00	150	Flush Type		Terminated at scheduled depth.
		Water		
				Last Updated
				10/06/2022



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH105**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 4 of 4
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 27.00	716016.20 E 743061.80 N	27.00 m	25/04/2022	JG	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					62.81 mOD	25/04/2022	TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.50 - 22.95	SPT(S) N=34 (4,4/6,8,10,10) D12 B7	100						40.06	22.75	[Symbol]	Dense greyish black very silty fine to medium SAND.		
22.75 - 23.75									23.00		Greyish black fine to coarse SAND.		
24.00 - 24.45	SPT(S) N=44 (8,8/10,10,12,12) D13 B8	100						38.51	24.30	[Symbol]	23.35-23.40m: Greyish black clay. 23.50-23.60m: Greyish black slightly sandy slightly gravelly clay.		
24.30 - 25.30									24.50		Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
25.50 - 25.62	SPT(S) N=50 (25 for 50mm/50 for 70mm)	100	26	0				37.41	25.40	[Symbol]	Medium strong indistinctly thinly laminated LIMESTONE. Partially weathered: slightly reduced strength, closer fracture spacing, some gravelly clay infill. Discontinuities: 1. 10-15 degree bedding fractures, closely spaced (15/94/110), planar, rough, dark grey gravelly clay infill on some fracture surfaces, up to 15mm thick. 2. 80-90 degree joints, at 25.40-25.80m, 26.00-26.10m and 26.30-26.45m, undulating, rough.		
26.00									26.00				
27.00								35.81	27.00		End of Borehole at 27.00m		

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
4.00	200			
27.00	150			
Flush Type		Termination Reason		
Water		Terminated at scheduled depth.		
Last Updated				
10/06/2022				



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH105-Well**

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 22.00	<b>Coordinates</b> 716016.20 E 743061.80 N	<b>Final Depth:</b> 22.00 m	<b>Start Date:</b> 27/04/2022	<b>Driller:</b> JG	Sheet 1 of 4 Scale: 1:40
					<b>Elevation:</b> 62.81 mOD	<b>End Date:</b> 27/04/2022	<b>Logger:</b> CH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					61.61	1.20		Inspection pit excavated by Kilwex to 1.20m.		
								Firm brown sandy gravelly CLAY. (Driller's description)		
					57.81	5.00		Dark grey GRAVEL with cobbles. (Driller's description)		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
16.50											
<b>Casing Details</b>				<b>Water Added</b>							
To (m)	Diam (mm)	From (m)	To (m)								
22.00	254										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>			<b>Last Updated</b>		
					Air	Terminated at scheduled depth.			10/06/2022		



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

**Borehole ID**  
**BH105-Well**

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 22.00	<b>Coordinates</b> 716016.20 E 743061.80 N	<b>Final Depth:</b> 22.00 m	<b>Start Date:</b> 27/04/2022	<b>Driller:</b> JG	Sheet 2 of 4 Scale: 1:40
					<b>Elevation:</b> 62.81 mOD	<b>End Date:</b> 27/04/2022	<b>Logger:</b> CH	<b>FINAL</b>

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					54.81	8.00		Dark grey GRAVEL with cobbles. (Driller's description)		
					49.86	12.95		Grey to brown SAND. (Driller's description)		
								Sandy slightly gravelly CLAY. (Driller's description)		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
16.50											
<b>Casing Details</b>				<b>Water Added</b>							
To (m)	Diam (mm)	From (m)	To (m)								
22.00	254										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>			<b>Last Updated</b>		
					Air	Terminated at scheduled depth.			10/06/2022		



**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH105-Well

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 22.00	<b>Coordinates</b> 716016.20 E 743061.80 N	<b>Final Depth:</b> 22.00 m	<b>Start Date:</b> 27/04/2022	<b>Driller:</b> JG	Sheet 3 of 4 Scale: 1:40
					<b>Elevation:</b> 62.81 mOD	<b>End Date:</b> 27/04/2022	<b>Logger:</b> CH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
		Strike at 16.50m			44.71	18.10		Sandy slightly gravelly CLAY. (Driller's description)		
								Grey SAND. (Driller's description)		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
16.50											
<b>Casing Details</b>				<b>Water Added</b>							
To (m)	Diam (mm)	From (m)	To (m)								
22.00	254										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>			<b>Last Updated</b>		
					Air	Terminated at scheduled depth.			10/06/2022		





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

**Borehole ID**  
**BH105-Well**

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 22.00	<b>Coordinates</b> 716016.20 E 743061.80 N	<b>Final Depth:</b> 22.00 m	<b>Start Date:</b> 27/04/2022	<b>Driller:</b> JG	Sheet 4 of 4 Scale: 1:40
				<b>Elevation:</b> 62.81 mOD	<b>End Date:</b> 27/04/2022	<b>Logger:</b> CH	FINAL	

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
40.81					40.81	22.00		Grey SAND. (Driller's description) End of Borehole at 22.00m		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
16.50											
<b>Casing Details</b>				<b>Water Added</b>							
To (m)	Diam (mm)	From (m)	To (m)								
22.00	254										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>				<b>Last Updated</b>	
					Air	Terminated at scheduled depth.				10/06/2022	





Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 4
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 4.00	4.00 29.00	716152.58 E 743117.56 N	29.00 m	20/04/2022	JG+GT	Scale: 1:40
					<b>Elevation:</b> 63.04 mOD	<b>End Date:</b> 21/04/2022	<b>Logger:</b> TH	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.00 - 8.14 8.00	SPT(S) N=50 (25 for 68mm/50 for 75mm) Hammer SN = 0208										Very stiff dark greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are of limestone.		
9.50 9.50 - 10.50 9.50	D25 B7	100						53.54	9.50		Very stiff dark brown slightly sandy gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles and boulders are of limestone.		
11.00 - 11.45 11.00	SPT(S) N=39 (7,8/8,10,10,11) Hammer SN = 0208												
12.50 12.50 - 13.65 12.50 - 12.95 12.50	D26 B8 SPT(S) N=47 (10,10/12,12,11,12) Hammer SN = 0208										Dense greyish brown very clayey fine to coarse SAND		
13.65 13.65 - 14.00	D27 B9							49.39	13.65		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
14.00 14.00 - 14.90 14.00 - 14.45 14.00	D28 B10 SPT(S) N=31 (6,6/8,8,8,7) Hammer SN = 0208	90						49.04	14.00		Dense dark greyish brown slightly clayey fine to coarse SAND.		
		TCR	SCR	RQD	FI								

Water Strikes				Remarks	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)		
Casing Details		Core Barrel		Termination Reason	
To (m)	Diam (mm)	SK6L			
2.50	200				
29.00	150	Flush Type		Last Updated	
		Water			
				Terminated at scheduled depth.	10/06/2022





**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH106

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 601 Comacchio 601	<b>Top (m)</b> 0.00 4.00	<b>Base (m)</b> 4.00 29.00	<b>Coordinates</b> 716152.58 E 743117.56 N	<b>Final Depth:</b> 29.00 m	<b>Start Date:</b> 20/04/2022	<b>Driller:</b> JG+GT	Sheet 3 of 4 Scale: 1:40
					<b>Elevation:</b> 63.04 mOD	<b>End Date:</b> 21/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.90	D29							48.14	14.90		Dense dark greyish brown slightly clayey fine to coarse SAND.		
14.90 - 15.50	B11	95									14.80m to 14.90m: Lens of subangular fine to medium gravel.		
15.50	D30							47.54	15.50		Dark grey subangular fine to coarse GRAVEL of limestone with medium cobble content. Cobbles are of limestone.		
15.50 - 16.00	B12										Dark greyish brown slightly clayey fine to coarse SAND.		
15.50													
16.00	D31							47.04	16.00		Dark greyish brown fine to medium SAND with pockets of dark brown sandy clay.		
16.00 - 16.65	B13	95											
16.60 - 17.00	B14							46.39	16.65		Dark greyish brown gravelly very clayey fine to coarse SAND. Gravel is subrounded fine to coarse of limestone.		
16.65	D32												
17.00	D33							46.04	17.00		Dark greyish brown fine to coarse SAND		
17.00 - 17.30	B15												
17.00													
17.30	D34							45.74	17.30		Greyish black silty fine to coarse SAND.		
17.30 - 17.85	B16												
17.85	D35	100						45.19	17.85		Very stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
17.85 - 18.50	B17												
17.95 - 18.25	U40												
18.50	D36							44.54	18.50		Dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of limestone. (Possibly disturbed by drilling)		
18.50 - 19.10	B18												
18.50													
19.10 - 19.40	B19	87						43.94	19.10		Dark grey subangular fine to coarse GRAVEL		
19.40	D37							43.64	19.40		Very stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
19.40 - 20.40	B20												
20.00 - 20.45	SPT(C) N=50 (4,7/10,13,14,13)												
20.00	Hammer SN = 0208	100											
21.50 - 21.95	SPT(C) N=41 (4,6/9,9,10,13)										21.50m to 22.10m: AZCL disturbance due to SPT		
21.50	Hammer SN = 0208				AZCL								
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.			
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
2.50	200						
29.00	150						
		<b>Flush Type</b>	<b>Termination Reason</b>		<b>Last Updated</b>		
		Water	Terminated at scheduled depth.		10/06/2022		



**Project No.** 21-1219  
**Project Name:** DAA Airfield Underpass  
**Client:** DAA  
**Client's Rep** Ramboll Consulting Engineers  
**Borehole ID** BH106

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 601 Comacchio 601	<b>Top (m)</b> 0.00 4.00	<b>Base (m)</b> 4.00 29.00	<b>Coordinates</b> 716152.58 E 743117.56 N	<b>Final Depth:</b> 29.00 m <b>Elevation:</b> 63.04 mOD	<b>Start Date:</b> 20/04/2022 <b>End Date:</b> 21/04/2022	<b>Driller:</b> JG+GT <b>Logger:</b> TH	Sheet 4 of 4 Scale: 1:40  FINAL
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Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
23.00	D38	60						40.04	23.00	[Pattern]	Very stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
23.00 - 23.70	B21								23.00				
23.00 - 23.45	SPT(C) N=44 (5,8/8,10,12,14) Hammer SN = 0208	95						39.34	23.70	[Pattern]	Dense dark grey clayey fine to coarse SAND  Very stiff dark grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are of limestone.  <i>24.20m to 24.30m: Lens of subangular fine to medium gravel</i>		
23.00	D39 B22								23.70				
24.50 - 24.95	SPT(C) N=44 (5,6/7,11,13,13) Hammer SN = 0208	95						36.94	26.10	[Pattern]	Medium strong indistinctly thinly laminated black LIMESTONE. Partially weathered: slightly reduced strength, closer fracture spacing, some dark brown discolouration on some fracture surfaces. Discontinuities: 1. 0 to 10 degree bedding fractures, closely spaced (10/80/150) planar, rough. 2. 70 to 80 degree joints, at 26.10m to 26.40m, 26.60m to 26.80m, slightly undulating, rough, dark brown staining on some joint surfaces.  Strong indistinctly thinly laminated black LIMESTONE. Partially weathered; closer fracture spacing. Discontinuities: 1. 0 to 10 degree bedding fractures, closely spaced (25/200/370) planar, smooth. 2. 80 to 90 degree joints at 27.05m to 27.25m and 28.03m to 28.15m, undulating, smooth.		
24.50	C2								26.10				
26.00 - 26.29	SPT(C) N=43 (5,8/43 for 140mm) Hammer SN = 0208	87	60	47	15			36.14	26.90	[Pattern]	End of Borehole at 29.00m		
26.00	C3								26.90				
26.40 - 26.57	C4	93	93	72				34.04	29.00	[Pattern]			
26.40	C1								29.00				
27.50 - 27.60	C3												
27.50													
27.95 - 28.03	C4				11								
28.15 - 28.45	C1												
29.00													

<b>Water Strikes</b>				<b>Remarks</b>									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.									
<b>Casing Details</b>		<b>Core Barrel</b>											
To (m)	Diam (mm)	SK6L											
2.50	200												
29.00	150												
		<b>Flush Type</b>		<b>Termination Reason</b>						<b>Last Updated</b>			
		Water		Terminated at scheduled depth.						10/06/2022			



**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH107

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 30.00 m	<b>Start Date:</b> 11/04/2022	<b>Driller:</b> JG	Sheet 1 of 5 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 2.00	2.00 30.00	716243.80 E 743104.60 N	<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 12/04/2022	<b>Logger:</b> DMC	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
2.00 2.00 - 3.00 2.00 - 2.45	D13 B1 SPT(C) N=18 (2,2/3,5,5,5) Hammer SN = 1387							62.11	1.20		Inspection pit excavated by Kilwex to 1.20m		
								61.31	2.00		Soft brown gravelly CLAY (Driller's description)		
3.00 3.00 - 3.45	D14 SPT(C) N=41 (3,5/8,10,11,12) Hammer SN = 1387	78						60.31	3.00		Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. Cobbles are subangular.		
3.50 3.50 - 4.50 3.50	D15 B2							59.81	3.50		Firm dark brown slightly organic slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse.		
5.00 - 5.45 5.00	SPT(C) N=41 (4,6/9,9,10,13) Hammer SN = 1387				AZCL						5.00m to 5.30m: AZCL		
6.50 - 6.86 6.50 6.60 6.60 - 7.60	SPT(C) N=50 (3,7/50 for 210mm) Hammer SN = 1387 D16 B3							56.71	6.60		Very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. Cobbles are subangular.		
											Very stiff dark brown slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		

<b>Water Strikes</b>				<b>Remarks</b>									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.									
<b>Casing Details</b>		<b>Core Barrel</b>											
To (m)	Diam (mm)	SK6L											
3.50	200												
28.50	150												
		<b>Flush Type</b>		<b>Termination Reason</b>						<b>Last Updated</b>			
		Water		Terminated at scheduled depth.						10/06/2022		AGS	



<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 30.00 m	<b>Start Date:</b> 11/04/2022	<b>Driller:</b> JG	Sheet 2 of 5 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 2.00	2.00 30.00	716243.80 E 743104.60 N	<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 12/04/2022	<b>Logger:</b> DMC	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.00											Very stiff dark brown slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		
9.50 - 9.95 9.50 9.70 - 9.95	SPT(C) N=50 (4,7/10,13,14,13) Hammer SN = 1387 U27	100											
11.00 - 11.45 11.00	SPT(C) N=50 (4,6/11,11,15,13) Hammer SN = 1387										Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
12.00 12.00 - 13.00	D17 B4	93											
12.50 - 12.95 12.50	SPT(C) N=49 (4,6/9,13,13,14) Hammer SN = 1387												
13.00 13.00 - 14.00 13.20 - 13.45	D18 B5 U26	95						50.31	13.00				
14.00													
								48.71	14.60				

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.			
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
3.50	200						
28.50	150						
		<b>Flush Type</b>		<b>Termination Reason</b>		<b>Last Updated</b>	
		Water		Terminated at scheduled depth.		10/06/2022	





**Project No.** 21-1219 **Project Name:** DAA Airfield Underpass  
**Client:** DAA **Borehole ID** BH107  
**Client's Rep** Ramboll Consulting Engineers

<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 30.00 m	<b>Start Date:</b> 11/04/2022	<b>Driller:</b> JG	Sheet 3 of 5 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 2.00	2.00 30.00	716243.80 E 743104.60 N	<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 12/04/2022	<b>Logger:</b> DMC	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.50 - 14.95	SPT(C) N=35 (3,5/5,8,10,12) Hammer SN = 1387										Brown sandy very clayey subangular fine to coarse GRAVEL with medium spaced thin beds of stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
14.60	D19	94						46.81	16.50				
14.60 - 15.60	B6												
15.00 - 15.27	SPT(C) N=47 (7,13/47 for 120mm) Hammer SN = 1387	94						46.81	16.50				
15.00	D20												
16.50 - 17.50	B7												
16.50 - 16.95	SPT(C) N=50 (7,7/9,14,12,15) Hammer SN = 1387	87						46.81	16.50				
16.50	D21												
18.00 - 19.00	B8												
18.00 - 18.45	SPT(C) N=47 (8,10/10,11,13,13) Hammer SN = 1387	97						43.81	19.50	18.30m to 18.50m: Lens of fine to coarse gravel			
18.00	D22												
19.30 - 20.20	B9												
19.50 - 19.95	SPT(S) N=40 (7,8/8,10,10,12) Hammer SN = 1387	100						43.11	20.20	Greyish brown very clayey fine to coarse SAND			
19.50	D23												
20.20 - 21.00	B10												
21.00 - 21.15	SPT(S) N=50 (25 for 66mm/50 for 85mm) Hammer SN = 1387	100						42.31	21.00	Very stiff dark greyish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular fine to coarse of limestone.			
21.00													
								41.81	21.50	Very stiff greyish black slightly gravelly CLAY with closely spaced, partings of fine to medium sand. Gravel is sub angular fine to coarse.			
										Very stiff dark greyish brown slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular fine to coarse of limestone.			

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		
To (m)	Diam (mm)	SK6L		
3.50	200			
28.50	150			
<b>Flush Type</b>		<b>Termination Reason</b>		
Water		Terminated at scheduled depth.		
<b>Last Updated</b>				
10/06/2022				







**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH107**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 4 of 5
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 2.00	2.00 30.00	716243.80 E 743104.60 N	30.00 m	11/04/2022	JG	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					63.31 mOD	12/04/2022	DMC	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.00 22.00 - 23.00	D24 B11										Very stiff dark greyish brown slightly sandy slightly gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular fine to coarse of limestone.		
22.50 - 22.95 22.50	SPT(S) N=46 (10,10/10,12,12,12) Hammer SN = 1387	100											
24.00 - 24.45 24.00	SPT(S) N=42 (7,8/8,10,12,12) Hammer SN = 1387	100											
25.50 - 25.60 25.50	SPT(S) N=50 (25 for 39mm/50 for 57mm) Hammer SN = 1387	100											
27.00		100											
28.00 28.00 - 29.00	D25 B12												
28.50 - 28.63 28.50	SPT(S) N=50 (25 for 55mm/50 for 75mm) Hammer SN = 1387							34.31	29.00		Medium strong probably thinly laminated black LIMESTONE. Partially weathered slightly reduced strength and slightly reduced fracture spacing. Discontinuities: 1. 10 to 15 degree bedding fractures medium spaced (60/200/360) planar, smooth) 2. 30 to 40 degree joints at 29.20m and 29.80m planar, smooth.		
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
3.50	200			
28.50	150			
Flush Type		Termination Reason		
Water		Terminated at scheduled depth.		
				<b>Last Updated</b> 10/06/2022



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH107**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 30.00 m	<b>Start Date:</b> 11/04/2022	<b>Driller:</b> JG	Sheet 5 of 5 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 601 Comacchio 601	0.00 2.00	2.00 30.00	716243.80 E 743104.60 N	<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 12/04/2022	<b>Logger:</b> DMC	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
30.00		100	67	77	7			33.31	30.00		Medium strong probably thinly laminated black LIMESTONE. Partially weathered slightly reduced strength and slightly reduced fracture spacing. Discontinuities: 1. 10 to 15 degree bedding fractures medium spaced (60/200/360) planar, smooth 2. 30 to 40 degree joints at 29.20m and 29.80m planar, smooth. End of Borehole at 30.00m		

<b>Water Strikes</b>				<b>Remarks</b>											
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.											
<b>Casing Details</b>		<b>Core Barrel</b>													
To (m)	Diam (mm)	SK6L													
3.50	200			<b>Flush Type</b>					<b>Termination Reason</b>					<b>Last Updated</b>	
28.50	150			Water					Terminated at scheduled depth.					10/06/2022	





**Project No.**  
**21-1219**

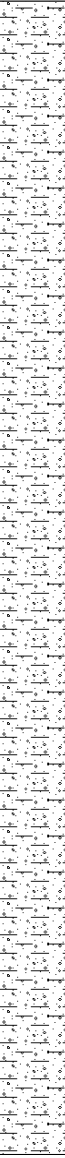
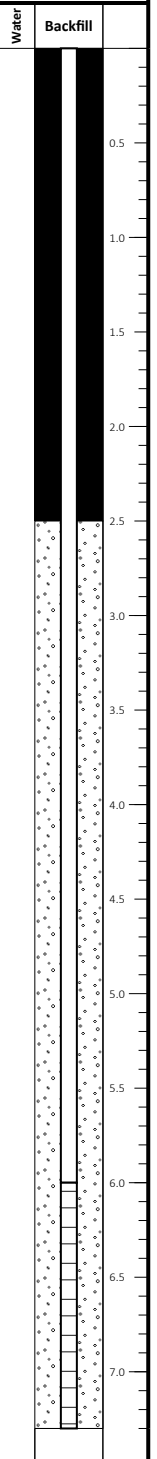
**Project Name:** DAA Airfield Underpass


**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

**Borehole ID**  
**BH107-Well**

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 28.00	<b>Coordinates</b> 716243.80 E 743104.60 N	<b>Final Depth:</b> 28.00 m	<b>Start Date:</b> 18/04/2022	<b>Driller:</b> GT+JG	Sheet 1 of 4 Scale: 1:40
					<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 19/04/2022	<b>Logger:</b>	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					62.11	1.20		Inspection pit excavated by Kilwex to 1.20m.		
								Stiff brown sandy slightly gravelly CLAY. (Driller's description)		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
<b>Casing Details</b>		<b>Water Added</b>									
To (m)	Diam (mm)	From (m)	To (m)								
22.50	254										
28.00	190										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>	<b>Last Updated</b>				
					Air	Terminated at scheduled depth.	10/06/2022				



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH107-Well**

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 28.00	<b>Coordinates</b> 716243.80 E 743104.60 N	<b>Final Depth:</b> 28.00 m	<b>Start Date:</b> 18/04/2022	<b>Driller:</b> GT+JG	Sheet 2 of 4 Scale: 1:40
					<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 19/04/2022	<b>Logger:</b>	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					50.31	13.00		Stiff brown sandy slightly gravelly CLAY. (Driller's description)		
					48.71	14.60		Stiff blackish grey slightly sandy gravelly CLAY. (Driller's description)		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
<b>Casing Details</b>		<b>Water Added</b>									
To (m)	Diam (mm)	From (m)	To (m)								
22.50	254										
28.00	190										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>	<b>Last Updated</b>				
					Air	Terminated at scheduled depth.	10/06/2022				



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

**Borehole ID**  
**BH107-Well**

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 28.00	<b>Coordinates</b> 716243.80 E 743104.60 N	<b>Final Depth:</b> 28.00 m	<b>Start Date:</b> 18/04/2022	<b>Driller:</b> GT+JG	Sheet 3 of 4 Scale: 1:40
					<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 19/04/2022	<b>Logger:</b>	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					46.81	16.50		GRAVEL. (Driller's description)		
					43.81	19.50		Stiff grey slightly sandy slightly gravelly CLAY. (Driller's description)		
					43.11	20.20		Brown SAND. (Driller's description)		
								Stiff grey slightly sandy slightly gravelly CLAY. (Driller's description)		

<b>Water Strikes</b>				<b>Remarks</b> BH105 expanded to allow installation of 150mm ID pumping well.							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)								
<b>Casing Details</b>				<b>Water Added</b>				<b>Core Barrel</b>			
To (m)	Diam (mm)	From (m)	To (m)	From (m)	To (m)	From (m)	To (m)				
22.50	254										
28.00	190			<b>Flush Type</b> Air				<b>Termination Reason</b> Terminated at scheduled depth.			
								<b>Last Updated</b> 10/06/2022			



**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH107-Well**

**Client:** DAA

**Client's Rep:** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling	<b>Plant Used</b> Comacchio 601	<b>Top (m)</b> 0.00	<b>Base (m)</b> 28.00	<b>Coordinates</b> 716243.80 E 743104.60 N	<b>Final Depth:</b> 28.00 m	<b>Start Date:</b> 18/04/2022	<b>Driller:</b> GT+JG	Sheet 4 of 4 Scale: 1:40
					<b>Elevation:</b> 63.31 mOD	<b>End Date:</b> 19/04/2022	<b>Logger:</b>	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
								Stiff grey slightly sandy slightly gravelly CLAY. (Driller's description)		
					34.81	28.50		End of Borehole at 28.00m		

<b>Water Strikes</b>				<b>Remarks</b>							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	BH105 expanded to allow installation of 150mm ID pumping well.							
<b>Casing Details</b>		<b>Water Added</b>									
To (m)	Diam (mm)	From (m)	To (m)								
22.50	254										
28.00	190										
				<b>Core Barrel</b>	<b>Flush Type</b>	<b>Termination Reason</b>	<b>Last Updated</b>				
					Air	Terminated at scheduled depth.	10/06/2022				



<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 30.50	<b>Coordinates</b> 716384.10 E 743090.70 N	<b>Final Depth:</b> 30.50 m	<b>Start Date:</b> 06/04/2022	<b>Driller:</b> GT	Sheet 1 of 5 Scale: 1:40
					<b>Elevation:</b> 64.88 mOD	<b>End Date:</b> 11/04/2022	<b>Logger:</b> TH	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
2.50 - 2.95	SPT(S) N=20 (4,4/4,5,5,6)							63.68	1.20		Inspection pit excavated by Kilwex to 1.20m.		
											Soft brown slightly sandy slightly gravelly CLAY (Driller's description)		
4.00 - 4.45	SPT(S) N=33 (8,7/8,8,8,9)	40						62.38	2.50		Medium dense coarse GRAVEL.		
4.00 - 5.00	14 B1							60.88	4.00		Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
5.50 - 5.63	SPT(S) N=50 (25 for 56mm/50 for 75mm)												
5.85 - 6.15	U28	100											
7.00 - 7.45	SPT(S) N=42 (7,8/10,10,10,12)												
7.00													

<b>Water Strikes</b>				<b>Remarks</b>				
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.				
<b>Casing Details</b>		<b>Core Barrel</b>						
To (m)	Diam (mm)	SK6L						
2.50	200							
30.50	150							
		<b>Flush Type</b>		<b>Termination Reason</b>				<b>Last Updated</b>
		Water		Terminated at scheduled depth.				10/06/2022





**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH108

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 30.50	<b>Coordinates</b> 716384.10 E 743090.70 N	<b>Final Depth:</b> 30.50 m	<b>Start Date:</b> 06/04/2022	<b>Driller:</b> GT	Sheet 2 of 5 Scale: 1:40
					<b>Elevation:</b> 64.88 mOD	<b>End Date:</b> 11/04/2022	<b>Logger:</b> TH	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
8.50											Very stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
8.70	15							56.18	8.70		Lens of subrounded fine to coarse gravel.		
8.70 - 9.70	B2										Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
10.00 - 10.13											Lens of subangular fine to coarse gravel of limestone.		
10.00	SPT(S) N=50 (25 for 60mm/50 for 70mm)										Lens of subangular fine to coarse gravel of limestone.		
11.50 - 11.95													
11.50	SPT(S) N=50 (10,10/12,12,12,14)												
13.00	16							51.88	13.00		Dense dark greyish brown clayey fine to medium SAND.		
13.00 - 13.35	B3												
13.00 - 13.11	SPT(S) N=50 (25 for 40mm/50 for 70mm)							51.53	13.35		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
13.35	17												
13.35 - 14.35	B4												
14.50	18							50.38	14.50		Dense dark greyish brown clayey fine to medium SAND.		
14.50 - 15.40	B5												

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
2.50	200			
30.50	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022







**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH108**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 3 of 5
Rotary Drilling Rotary Coring	Beretta T44 Beretta T44	0.00 2.50	2.50 30.50	716384.10 E 743090.70 N	30.50 m	06/04/2022	GT	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					64.88 mOD	11/04/2022	TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.50 - 14.95 14.50	SPT(S) N=33 (7,7/7,8,8,10)										Dense dark greyish brown clayey fine to medium SAND.		
15.40 15.40 - 16.40	19 B6	100						49.48	15.40		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone.		
16.00 - 16.45 16.00	SPT(S) N=33 (4,4/7,8,8,10)										<i>Bed of dark greyish brown clayey fine to medium sand.</i>		
17.50 - 17.95 17.50	SPT(S) N=44 (8,8/10,10,12,12)												
18.30 - 18.60	U29	100											
19.00 - 19.21 19.00	SPT(S) N=50 (29 for 125mm/50 for 87mm)												
19.40 19.40 - 20.35	20 B7	100											
20.35 20.35 - 21.35 20.50	21 B8							44.53	20.35		Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		Termination Reason
To (m)	Diam (mm)	SK6L		
2.50 30.50	200 150			
		Flush Type	Last Updated	
		Water	Terminated at scheduled depth.	10/06/2022





<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 30.50 m	<b>Start Date:</b> 06/04/2022	<b>Driller:</b> GT	Sheet 4 of 5 Scale: 1:40
Rotary Drilling Rotary Coring	Beretta T44 Beretta T44	0.00 2.50	2.50 30.50	716384.10 E 743090.70 N	<b>Elevation:</b> 64.88 mOD	<b>End Date:</b> 11/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.00 - 22.45 22.00	SPT(S) N=48 (10,10/10,12,12,14)										Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
23.50 23.50 - 24.20 23.50 - 23.62 23.50	22 B9 SPT(S) N=0 (75 for 120mm/0 for 0mm)	100						41.38	23.50		Very loose dark greyish brown clayey fine to medium SAND.		
24.20 24.20 - 25.00	23 B10	100						40.68	24.20		Very stiff greyish black slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.		
25.00 25.00 - 25.85 25.00 - 25.45 25.00	24 B11 SPT(S) N=28 (4,4/5,7,8,8)	100						39.88	25.00		Medium dense dark greyish brown clayey fine SAND.		
25.85 25.85 - 26.50	25 B12	100						39.03	25.85		Very stiff greyish black slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subangular of limestone.		
26.50 26.50 - 26.95 26.50	26 SPT(S) N=27 (4,5/6,7,7,7)							38.38	26.50		Medium dense dark greyish brown clayey fine to coarse SAND.		
27.00 27.00 - 28.00	27 B13	100						37.88	27.00		Very stiff greyish black slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		
28.00 - 28.45 28.00	SPT(S) N=42 (8,8/10,10,10,12)										<i>Greyish black slightly clayey fine sand.</i>		
		98											
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.			
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
2.50	200						
30.50	150						
		<b>Flush Type</b>	<b>Termination Reason</b>		<b>Last Updated</b>		
		Water	Terminated at scheduled depth.		10/06/2022		





**CAUSEWAY**  
GEOTECH

**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH108

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 30.50 m	<b>Start Date:</b> 06/04/2022	<b>Driller:</b> GT	Sheet 5 of 5 Scale: 1:40
Rotary Drilling Rotary Coring	Beretta T44 Beretta T44	0.00 2.50	2.50 30.50	716384.10 E 743090.70 N	<b>Elevation:</b> 64.88 mOD	<b>End Date:</b> 11/04/2022	<b>Logger:</b> TH	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
29.50								35.38	29.50		Very stiff greyish black slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone. Medium strong massive black LIMESTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing. Discontinuities: 1. 5-15 degree joints, medium spaced (35/200/250), slightly undulating, smooth. 2. 40-50 degree joint, at 29.60-29.65m, planar, smooth.		
30.50		80	70	56	6			34.38	30.50		End of Borehole at 30.50m		

<b>Water Strikes</b>				<b>Remarks</b>									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.									
<b>Casing Details</b>		<b>Core Barrel</b>											
To (m)	Diam (mm)	SK6L											
2.50	200	<b>Flush Type</b>		<b>Termination Reason</b>							<b>Last Updated</b>		
30.50	150			Water Terminated at scheduled depth.							10/06/2022		



**Project No.**  
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**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.50	<b>Coordinates</b> 716406.60 E 743039.50 N	<b>Final Depth:</b> 32.50 m	<b>Start Date:</b> 28/03/2022	<b>Driller:</b> GT	Sheet 1 of 5 Scale: 1:40
					<b>Elevation:</b> 63.75 mOD	<b>End Date:</b> 04/04/2022	<b>Logger:</b> TH	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
2.50	D11							62.55	1.20		Excavation pit excavated by Kilwex to 1.20m.		
2.50 - 3.50	B1										Greyish brown CLAY with roots (Driller's description)		
2.50 - 2.95	SPT(S) N=22 (4,4/5,5,6,6) Hammer SN = 0208	93						61.25	2.50		Stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies.		
3.50	D12							60.25	3.50		Very stiff dark greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		
3.50 - 4.50	B2												
4.00 - 4.45	SPT(S) N=40 (8,8/8,10,10,12) Hammer SN = 0208	100											
4.00													
4.25 - 4.50	U21												
5.50 - 5.95	SPT(S) N=48 (10,10/12,12,12,12) Hammer SN = 0208	100											
5.50													
7.00													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
2.50	200			
<b>Flush Type</b> Water		<b>Termination Reason</b> Terminated at scheduled depth.		<b>Last Updated</b> 10/06/2022





**CAUSEWAY**  
GEOTECH

**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH109**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.50	<b>Coordinates</b> 716406.60 E 743039.50 N	<b>Final Depth:</b> 32.50 m	<b>Start Date:</b> 28/03/2022	<b>Driller:</b> GT	Sheet 2 of 5 Scale: 1:40
					<b>Elevation:</b> 63.75 mOD	<b>End Date:</b> 04/04/2022	<b>Logger:</b> TH	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
7.70 7.70 - 8.70	D13 B3	100						56.05	7.70		Very stiff dark greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular of limestone.		
8.50 - 8.95 8.50	SPT(S) N=44 (8,8/10,10,12,12) Hammer SN = 0208	100									Very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded of limestone.		
9.55 - 9.85	U22												
10.00 - 10.13 10.00	SPT(S) N=50 (25 for 60mm/50 for 72mm) Hammer SN = 0208	100											
11.50 11.70 11.70 - 12.70	D14 B4	100											
13.00 - 13.27 13.00	SPT(S) N=50 (10,15/50 for 117mm) Hammer SN = 0208	100											
14.50													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>				
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.				
<b>Casing Details</b>		<b>Core Barrel</b>						
To (m)	Diam (mm)	SK6L						
2.50	200							
		<b>Flush Type</b>			<b>Termination Reason</b>			<b>Last Updated</b>
		Water			Terminated at scheduled depth.			10/06/2022





<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.50	<b>Coordinates</b> 716406.60 E 743039.50 N	<b>Final Depth:</b> 32.50 m	<b>Start Date:</b> 28/03/2022	<b>Driller:</b> GT	Sheet 3 of 5 Scale: 1:40
					<b>Elevation:</b> 63.75 mOD	<b>End Date:</b> 04/04/2022	<b>Logger:</b> TH	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.90 14.90 - 15.90	D15 B5							48.85	14.90		Very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded of limestone.		
		83									Very stiff dark brown slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is subangular fine to medium.		
16.00 - 16.14 16.00	SPT(S) N=10 (25 for 68mm/10 for 71mm) Hammer SN = 0208												
16.70 - 17.00	U23	100											
17.50 17.50 - 18.50 17.50	D16 B6							46.25	17.50				
19.00 - 19.45 19.00	SPT(S) N=50 (8,8/10,12,14,14) Hammer SN = 0208												
		100											
20.30 20.30 - 21.30 20.50	D17 B7							43.45	20.30				
		100											

<b>Water Strikes</b>				<b>Remarks</b>			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.			
<b>Casing Details</b>		<b>Core Barrel</b>					
To (m)	Diam (mm)	SK6L					
2.50	200			<b>Flush Type</b>			<b>Termination Reason</b>
		Water		Terminated at scheduled depth.			<b>Last Updated</b>
							10/06/2022





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH109**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.50	<b>Coordinates</b> 716406.60 E 743039.50 N	<b>Final Depth:</b> 32.50 m	<b>Start Date:</b> 28/03/2022	<b>Driller:</b> GT	Sheet 4 of 5 Scale: 1:40
					<b>Elevation:</b> 63.75 mOD	<b>End Date:</b> 04/04/2022	<b>Logger:</b> TH	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
22.00 - 22.45 22.00	SPT(S) N=50 (8,10/12,12,12,14) Hammer SN = 0208										Very stiff greyish black slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		
23.50		100											
24.30 24.30 - 25.30	D18 B8										Very stiff greyish black slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
25.00 - 25.45 25.00	SPT(S) N=48 (7,9/10,12,12,14) Hammer SN = 0208	100											
26.50 - 26.65 26.50	SPT(S) N=50 (25 for 75mm/50 for 75mm) Hammer SN = 0208							37.15	26.60				
26.60 26.60 - 27.60	D19 B9	100											
28.00 - 28.45 28.00	SPT(S) N=44 (8,8/10,10,12,12) Hammer SN = 0208												
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b>				
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.				
<b>Casing Details</b>		<b>Core Barrel</b>						
To (m)	Diam (mm)	SK6L						
2.50	200							
		<b>Flush Type</b>		<b>Termination Reason</b>			<b>Last Updated</b>	
		Water		Terminated at scheduled depth.			10/06/2022	





<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Beretta T44 Beretta T44	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.50	<b>Coordinates</b> 716406.60 E 743039.50 N	<b>Final Depth:</b> 32.50 m	<b>Start Date:</b> 28/03/2022	<b>Driller:</b> GT	Sheet 5 of 5 Scale: 1:40
					<b>Elevation:</b> 63.75 mOD	<b>End Date:</b> 04/04/2022	<b>Logger:</b> TH	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
29.50											Very stiff greyish black slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
29.90 29.90 - 30.90	D20 B10	100						33.85	29.90		Very stiff greyish black slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.		
31.00													
32.50		97	45	15	11			32.35	31.40		Medium strong indistinctly thinly laminated black LIMESTONE. Partially weathered: slightly reduced strength, closer fracture spacing. Discontinuities: 1. 0-10 degree bedding fractures, closely spaced (20/110/190), planar, smooth, clayey gravelly infill on some fracture surfaces up to 10mm thick. 2. 70-90 degree joints, at 31.40-31.65m and 32.10-32.50m, undulating, smooth.		
								31.25	32.50		End of Borehole at 32.50m		

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		
To (m)	Diam (mm)	SK6L		
2.50	200			
<b>Flush Type</b>		<b>Termination Reason</b>		
Water		Terminated at scheduled depth.		
<b>Last Updated</b>				<b>AGS</b>
10/06/2022				





**Project No.** 21-1219  
**Project Name:** DAA Airfield Underpass  
**Client:** DAA  
**Client's Rep:** Ramboll Consulting Engineers  
**Borehole ID** BH110

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.00	<b>Coordinates</b> 716511.40 E 743139.06 N	<b>Final Depth:</b> 32.00 m <b>Elevation:</b> 65.09 mOD	<b>Start Date:</b> 11/03/2022 <b>End Date:</b> 14/03/2022	<b>Driller:</b> MW <b>Logger:</b> MRG	Sheet 1 of 5 Scale: 1:40  FINAL
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Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
1.20	D1					1.20	Dry	63.89	1.20		Inspection pit excavated by Kilwex to 1.20m.		
1.20 - 1.36	SPT(S) N=50 (6,10/50 for 10mm) Hammer SN = 0643									[Cross-hatch pattern]	MADE GROUND: Grey sandy silty GRAVEL. (Driller's description)		
2.20	D2					2.20	Dry	63.09	2.00		Frim brown sandy gravelly CLAY. (Driller's description)		
2.20 - 2.65	SPT(S) N=12 (2,3/3,3,3,3) Hammer SN = 0643									[Dotted pattern]			
2.50 - 3.50	B1 ES1 C1	80						62.59	2.50		Stiff brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to medium of mixed lithologies. Cobbles are of limestone.		
3.50 - 3.95	SPT(C) N=20 (4,6/6,5,4,5) Hammer SN = 0643							61.59	3.50		Low recovery: Medium dense becoming dense blackish grey slightly sandy clayey subangular to subrounded fine to coarse GRAVEL of limestone with low cobble content. Cobbles are of limestone.		
3.50		26								[Dotted pattern]			
4.90	ES2				AZCL								
5.00 - 5.45	SPT(C) N=18 (2,3/3,5,5,5) Hammer SN = 0643												
5.00		15											
6.50 - 6.95	SPT(C) N=18 (3,4/4,5,4,5) Hammer SN = 0643												
6.50													
7.20	D3												
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
16.00	200			
32.00	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH110**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 2 of 5
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 2.50	2.50 32.00	716511.40 E 743139.06 N	32.00 m	11/03/2022	MW	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					65.09 mOD	14/03/2022	MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
7.20 - 7.65	SPT(S) N=34 (3,10/8,8,10,8) Hammer SN = 0643										Low recovery: Medium dense becoming dense blackish grey slightly sandy clayey subangular to subrounded fine to coarse GRAVEL of limestone with low cobble content. Cobbles are of limestone.		
7.65 7.80	ES3 D4	70			AZCL			56.89	8.20				
8.20 - 8.55	B2										Very stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mixed lithologies. Cobbles are of limestone.		
8.20 8.40	ES4												
8.80 - 9.10	C2												
		75											
9.60 9.70	D5												
		100											
11.20 11.30	D6												
11.50 - 11.90	B3												
		100											
12.70													
		100											
13.75 - 14.05	C3												
14.20													
		TCR	SCR	RQD	FI								

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		Termination Reason
To (m)	Diam (mm)	SK6L		
16.00	200			
32.00	150	Flush Type		Terminated at scheduled depth.
		Water		
				Last Updated
				10/06/2022



**Project No.** 21-1219  
**Project Name:** DAA Airfield Underpass  
**Client:** DAA  
**Client's Rep:** Ramboll Consulting Engineers  
**Borehole ID** BH110

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.00	<b>Coordinates</b> 716511.40 E 743139.06 N	<b>Final Depth:</b> 32.00 m	<b>Start Date:</b> 11/03/2022	<b>Driller:</b> MW	Sheet 3 of 5 Scale: 1:40
					<b>Elevation:</b> 65.09 mOD	<b>End Date:</b> 14/03/2022	<b>Logger:</b> MRG	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.70 - 14.92	SPT(C) N=50 (11,14/50 for 75mm) Hammer SN = 0643	63			AZCL						Very stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mixed lithologies. Cobbles are of limestone. <i>14.70-16.00m: AZCL (driller noted band of sand and gravel likely washed out due to flush)</i>		
15.00		0											
16.00											Brownish grey slightly sandy very clayey subangular to subrounded fine to coarse GRAVEL of limestone.		
16.25 - 16.55	B4												
16.60	D7	100									Very stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse. Cobbles are of limestone.		
17.00													
17.85 - 18.20	C4	70						47.79	17.30		Low recovery: Brownish grey slightly sandy clayey subangular to subrounded fine to coarse GRAVEL of limestone.		
18.50								47.59	17.50				
18.80	D8				AZCL						Very stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse. Cobbles are of limestone.		
18.80 - 19.40	B5												
20.00		75						45.69	19.40		Very stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse. Cobbles are of limestone.		
20.30 - 20.60	B6												
20.70	D9	100									Very stiff dark grey slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are of limestone.		
21.50								45.04	20.05				

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
16.00	200			
32.00	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022





<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 32.00	<b>Coordinates</b> 716511.40 E 743139.06 N	<b>Final Depth:</b> 32.00 m	<b>Start Date:</b> 11/03/2022	<b>Driller:</b> MW	Sheet 4 of 5 Scale: 1:40
					<b>Elevation:</b> 65.09 mOD	<b>End Date:</b> 14/03/2022	<b>Logger:</b> MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
23.00		100									Very stiff dark grey slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are of limestone.		
23.30 - 23.70	C5												
23.60 23.70 - 24.10	D10 B7	80											
24.50													
26.00		100											
27.50 27.62	C6	100	100	35	16			38.44	26.65		Medium strong thickly laminated dark grey MUDSTONE. Distinctly weathered. Discontinuities: 1. 0 to 30 degree bedding fractures, closely paced (50/94/150) undulating, rough.		
29.00					4			37.59	27.50		Medium strong thickly laminated dark grey LIMESTONE. Distinctly weathered. Discontinuities: 1. 0 to 30 degree bedding fractures, closely spaced (10/84/180) (10/84/180) planar and undulating, smooth, brown staining on surfaces. 2. 80 to 90 degree joint a 30.08m to 30.21m, at 30.91m to 31.03m, at 31.70m to 32.00m, planar, rough, with patchy brown and dark brown staining on joint surface. <i>28.42m to 28.50m: Band of dark brownish grey slightly silty slightly sandy clayey subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse.</i>		
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		
To (m)	Diam (mm)	SK6L		
16.00	200			
32.00	150			
<b>Flush Type</b>		<b>Termination Reason</b>		
Water		Terminated at scheduled depth.		
<b>Last Updated</b>				<b>AGS</b>
10/06/2022				



**CAUSEWAY**  
GEOTECH

**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH110

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 5 of 5
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 2.50	2.50 32.00	716511.40 E 743139.06 N	32.00 m	11/03/2022	MW	Scale: 1:40
					Elevation:	End Date:	Logger:	FINAL
					65.09 mOD	14/03/2022	MRG	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
29.50 - 29.75	C7										Medium strong thickly laminated dark grey LIMESTONE. Distinctly weathered. Discontinuities: 1. 0 to 30 degree bedding fractures, closely spaced (10/84/180) (10/84/180) planar and undulating, smooth, brown staining on surfaces. 2. 80 to 90 degree joint a 30.08m to 30.21m, at 30.91m to 31.03m, at 31.70m to 32.00m, planar, rough, with patchy brown and dark brown staining on joint surface.		
30.50		100	100	50									
31.30 - 31.45	C8	100	100	18	2								
32.00								33.09	32.00		End of Borehole at 32.00m		

Water Strikes				Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
				Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Casing Details		Core Barrel		
To (m)	Diam (mm)	SK6L		
16.00	200			
32.00	150	Flush Type		Termination Reason
		Water		Terminated at scheduled depth.
				<b>Last Updated</b> 10/06/2022





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH111**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 36.60	<b>Coordinates</b> 716507.31 E 743276.32 N	<b>Final Depth:</b> 36.60 m	<b>Start Date:</b> 09/03/2022	<b>Driller:</b> MW	Sheet 1 of 6 Scale: 1:40
					<b>Elevation:</b> 66.61 mOD	<b>End Date:</b> 09/03/2022	<b>Logger:</b> RS	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
											Inspection pit excavated by Kilwex to 1.20m.		
								65.41	1.20		Firm brown sandy gravelly CLAY. (Driller's description)		
2.50 - 3.50	B1							64.11	2.50		Very stiff brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mixed lithologies.		
3.00	ES1	73											
3.60													
3.80 - 4.10	C1												
4.30	D1	100											
5.10													
6.25 - 6.60	B2							60.36	6.25		Very stiff brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
6.60													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
2.50	200			
36.60	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022





<b>Method</b>	<b>Plant Used</b>	<b>Top (m)</b>	<b>Base (m)</b>	<b>Coordinates</b>	<b>Final Depth:</b> 36.60 m	<b>Start Date:</b> 09/03/2022	<b>Driller:</b> MW	Sheet 2 of 6 Scale: 1:40
Rotary Drilling Rotary Coring	Comacchio 405 Comacchio 405	0.00 2.50	2.50 36.60	716507.31 E 743276.32 N	<b>Elevation:</b> 66.61 mOD	<b>End Date:</b> 09/03/2022	<b>Logger:</b> RS	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill			
8.10											Very stiff brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.					
8.55 - 8.85 8.60	C2 D2	100												7.5		
9.50 9.60 9.70 - 10.00	ES2 B3													8.0		
		100												8.5		
														9.0		
		100												9.5		
11.10														10.0		
		100												10.5		
11.60	D3													11.0		
		100												11.5		
12.60														12.0		
12.80 - 13.10	B4													12.5		
		100												13.0		
14.10														13.5		
14.37 - 14.73	C3									14.0						
										14.5						
		TCR	SCR	RQD	FI											

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		
To (m)	Diam (mm)	SK6L		
2.50	200			
36.60	150			
<b>Flush Type</b>		<b>Termination Reason</b>		
Water		Terminated at scheduled depth.		
<b>Last Updated</b>				
10/06/2022				



**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH111

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 36.60	<b>Coordinates</b> 716507.31 E 743276.32 N	<b>Final Depth:</b> 36.60 m	<b>Start Date:</b> 09/03/2022	<b>Driller:</b> MW	Sheet 3 of 6 Scale: 1:40
					<b>Elevation:</b> 66.61 mOD	<b>End Date:</b> 09/03/2022	<b>Logger:</b> RS	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
14.90	D4	100									Very stiff brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
15.60													
16.25 - 16.65	B5	100						50.36	16.25				
17.10											Very stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are of limestone.		
17.70	D5	100											
18.00 - 18.35	C4												
18.60													
19.00 - 19.40	B6	100											
20.10								46.51	20.10		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mixed lithologies. Cobbles are of mixed lithologies.		
20.80 - 21.15	B7	100						45.91	20.70		Very stiff grey slightly sandy very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded.		
21.40	D6												
21.60													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
2.50	200			
36.60	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022







<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 36.60	<b>Coordinates</b> 716507.31 E 743276.32 N	<b>Final Depth:</b> 36.60 m	<b>Start Date:</b> 09/03/2022	<b>Driller:</b> MW	Sheet 4 of 6 Scale: 1:40
					<b>Elevation:</b> 66.61 mOD	<b>End Date:</b> 09/03/2022	<b>Logger:</b> RS	<b>FINAL</b>

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
23.10		100									Very stiff grey slightly sandy very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded.		
23.60 - 23.95	B8	100									23.40m to 24.50m: Dark brown very silty gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies predominantly limestone.		
24.40	D7												
24.60													
24.95 - 25.40	C5	100											
26.00	D8												
26.10													
26.70 - 27.10	B9	90						39.91	26.70		Very stiff dark grey sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded.		
27.60													
29.10													
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Killwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
2.50	200			
36.60	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022





**Project No.**  
21-1219

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
BH111

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 36.60	<b>Coordinates</b> 716507.31 E 743276.32 N	<b>Final Depth:</b> 36.60 m	<b>Start Date:</b> 09/03/2022	<b>Driller:</b> MW	Sheet 5 of 6 Scale: 1:40
					<b>Elevation:</b> 66.61 mOD	<b>End Date:</b> 09/03/2022	<b>Logger:</b> RS	

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
29.70 - 30.10	B10	90						36.01	30.60		Very stiff dark grey sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded.		
30.20	D9												
30.60		100									Dark grey sandy very clayey subangular GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular. (Weathered bedrock)		
32.10								34.06	32.55		Medium strong thickly laminated dark grey LIMESTONE. Largely unweathered: possibly slightly closer fracture spacing. Discontinuities: 1. 0 to 30 degree bedding fractures, medium spaced (40/320/520) planar, smooth.		
33.60													
33.90 - 34.10	C6												
34.09 - 34.36	30	100	100	96	3								
34.88 - 35.03	C7												
35.10													
35.80 - 36.00	C8	100	97	89									
		TCR	SCR	RQD	FI								

<b>Water Strikes</b>				<b>Remarks</b> Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	
<b>Casing Details</b>		<b>Core Barrel</b>		<b>Termination Reason</b> Terminated at scheduled depth.
To (m)	Diam (mm)	SK6L		
2.50	200			
36.60	150	<b>Flush Type</b> Water		<b>Last Updated</b> 10/06/2022





**Project No.**  
**21-1219**

**Project Name:** DAA Airfield Underpass

**Borehole ID**  
**BH111**

**Client:** DAA

**Client's Rep** Ramboll Consulting Engineers

<b>Method</b> Rotary Drilling Rotary Coring	<b>Plant Used</b> Comacchio 405 Comacchio 405	<b>Top (m)</b> 0.00 2.50	<b>Base (m)</b> 2.50 36.60	<b>Coordinates</b> 716507.31 E 743276.32 N	<b>Final Depth:</b> 36.60 m	<b>Start Date:</b> 09/03/2022	<b>Driller:</b> MW	Sheet 6 of 6 Scale: 1:40
					<b>Elevation:</b> 66.61 mOD	<b>End Date:</b> 09/03/2022	<b>Logger:</b> RS	<b>FINAL</b>

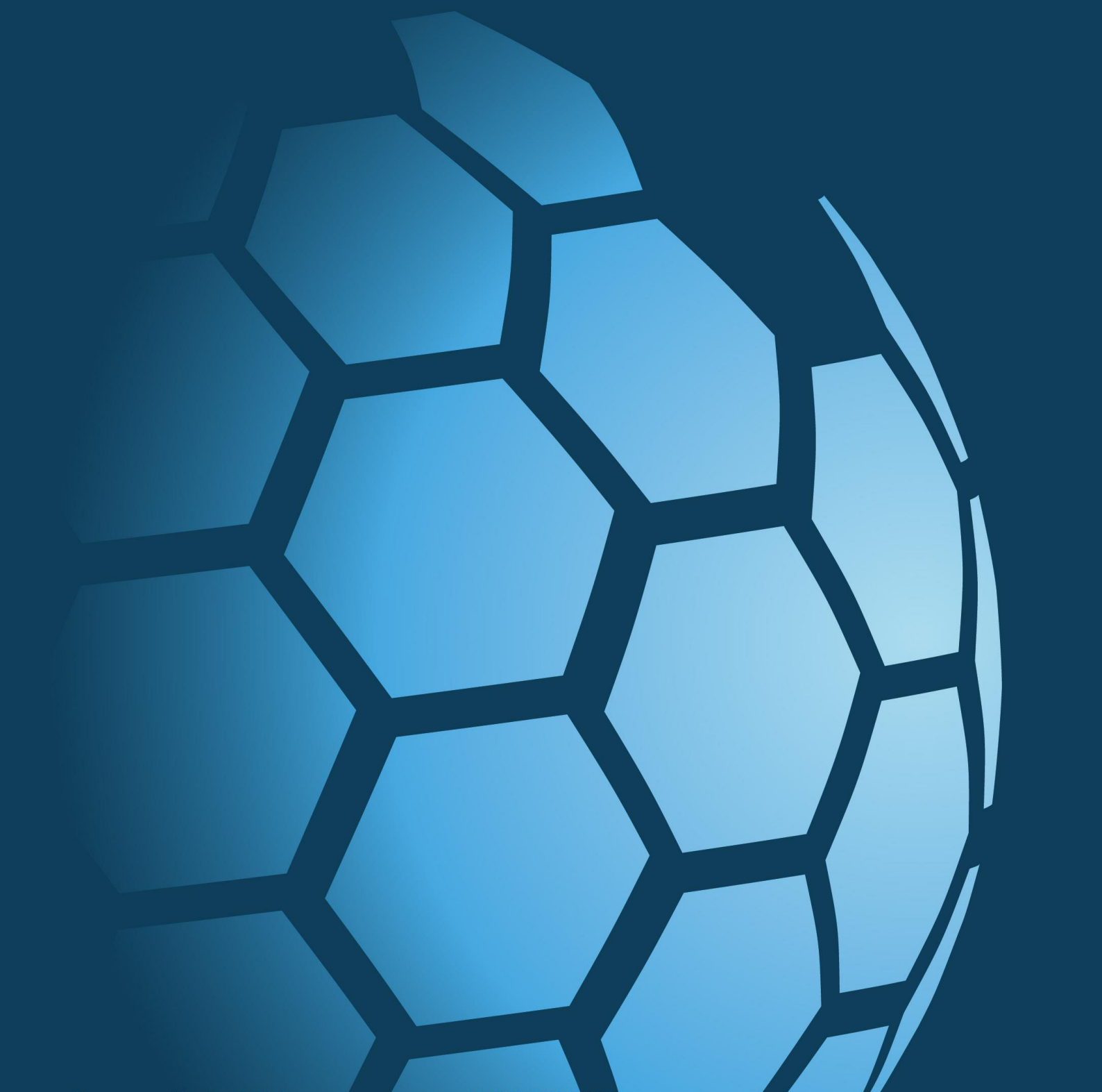
Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
36.60								30.01	36.60		Medium strong thickly laminated dark grey LIMESTONE. Largely unweathered: possibly slightly closer fracture spacing. Discontinuities: 1. 0 to 30 degree bedding fractures, medium spaced (40/320/520) planar, smooth.  End of Borehole at 36.60m		

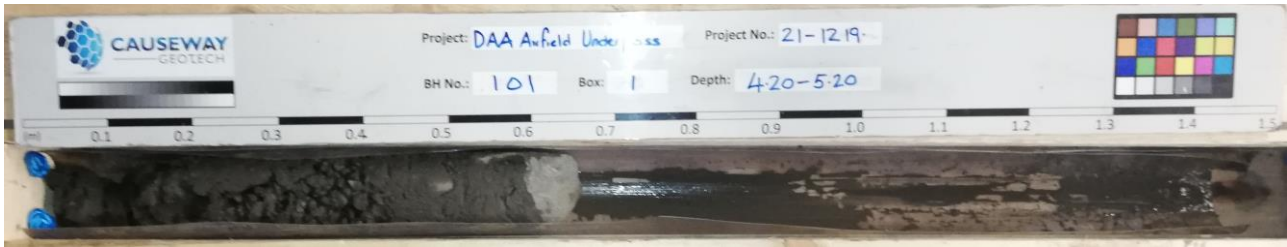
<b>Water Strikes</b>				<b>Remarks</b>											
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit excavated by Kilwex to 1.20m. No noticeable groundwater strikes, water added during drilling.											
<b>Casing Details</b>		<b>Core Barrel</b>													
To (m)	Diam (mm)	SK6L													
2.50	200														
36.60	150			<b>Flush Type</b>							<b>Termination Reason</b>			<b>Last Updated</b>	
		Water		Terminated at scheduled depth.							10/06/2022				



**CAUSEWAY**  
— GEOTECH

**APPENDIX C**  
**CORE PHOTOGRAPHS**

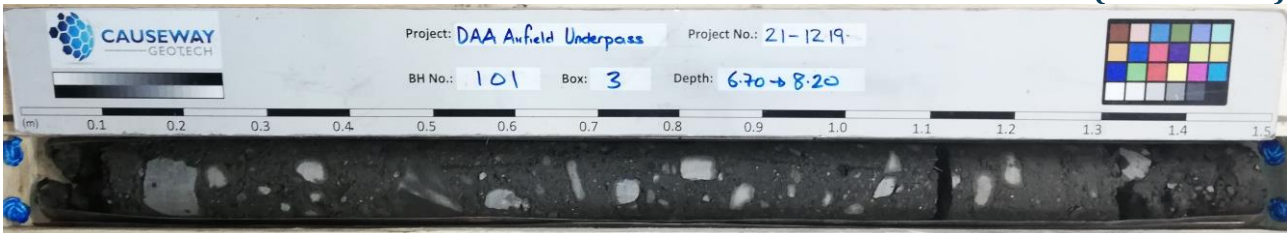




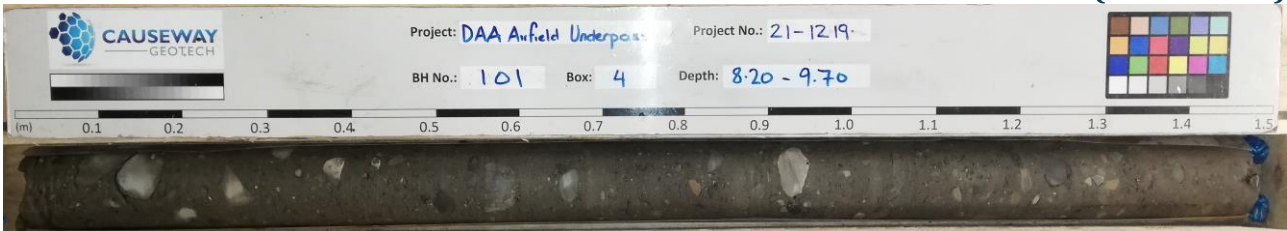
**BH101 Box 1 (4.20-5.20m)**



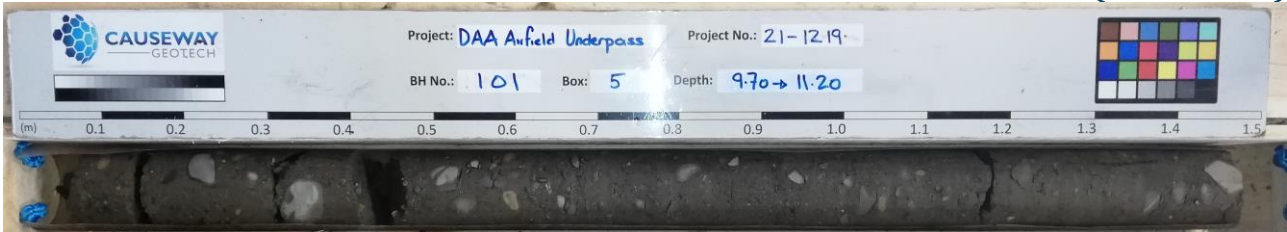
**BH101 Box 2 (5.20-6.70m)**



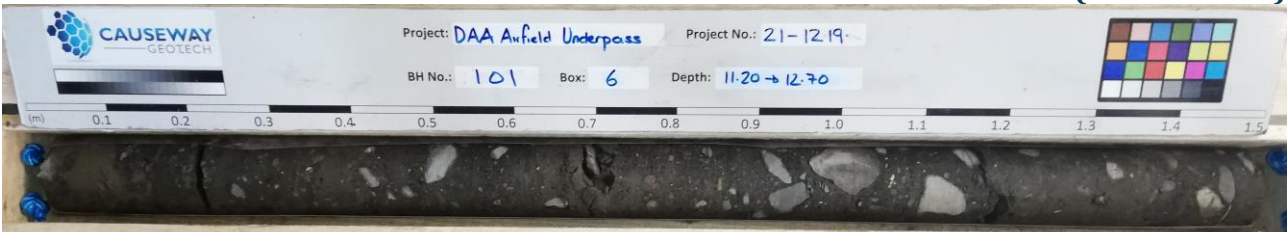
**BH101 Box 3 (6.70-8.20m)**



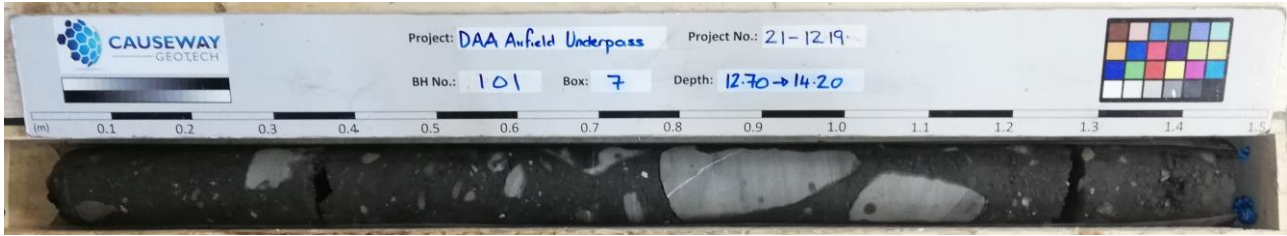
**BH101 Box 4 (8.20-9.70m)**



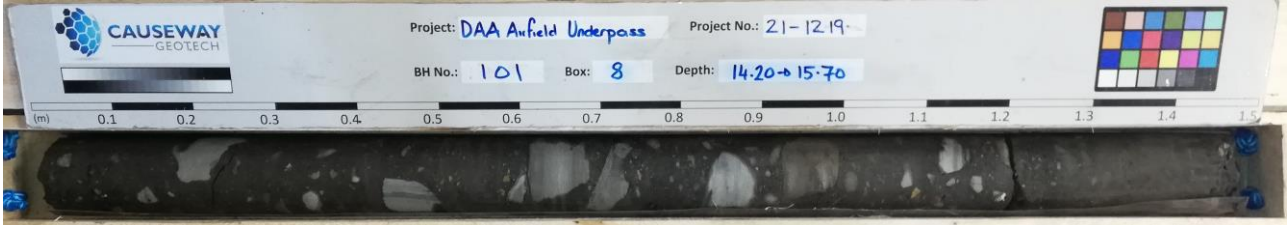
**BH101 Box 5 (9.70-11.20m)**



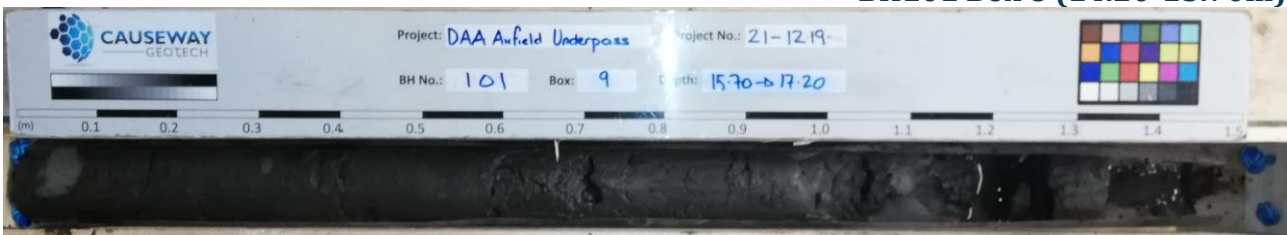
**BH101 Box 6 (11.20-12.70m)**



BH101 Box 7 (12.70-14.20m)



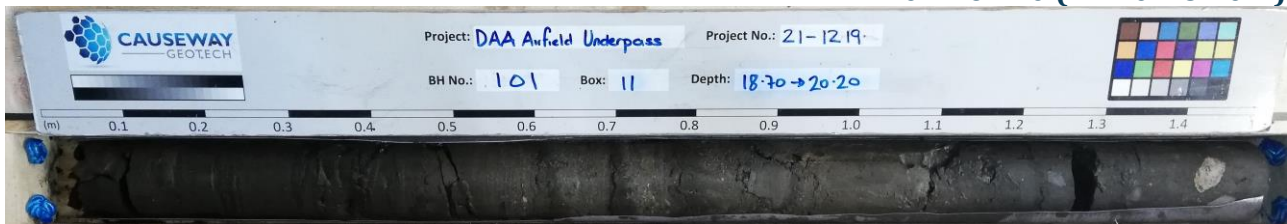
BH101 Box 8 (14.20-15.70m)



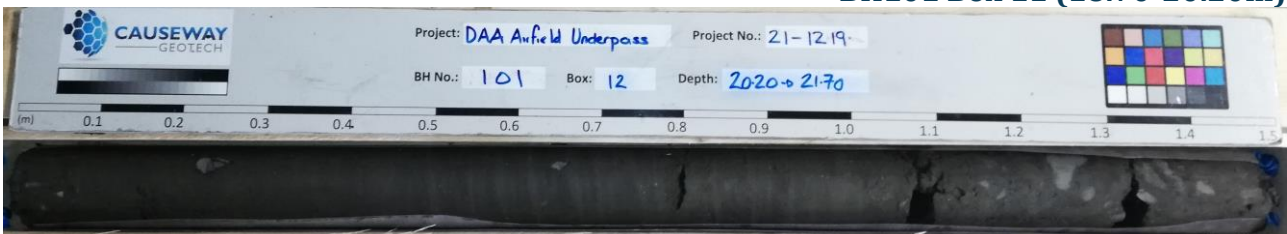
BH101 Box 9 (15.70-17.20m)



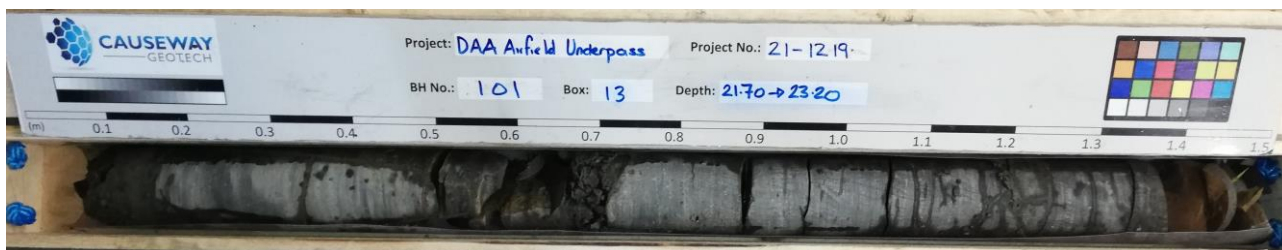
BH101 Box 10 (17.20-18.70m)



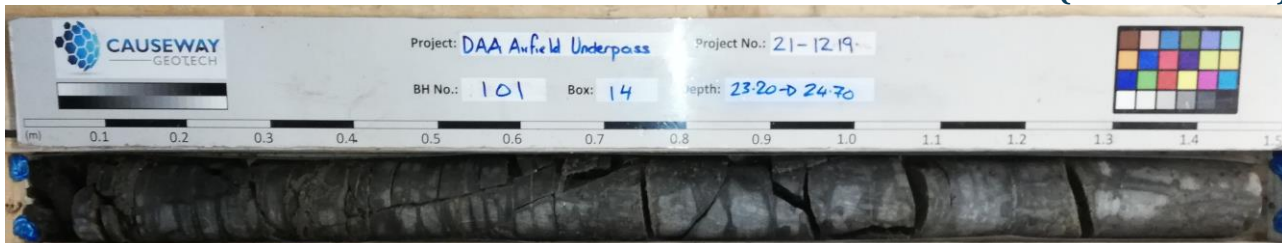
BH101 Box 11 (18.70-20.20m)



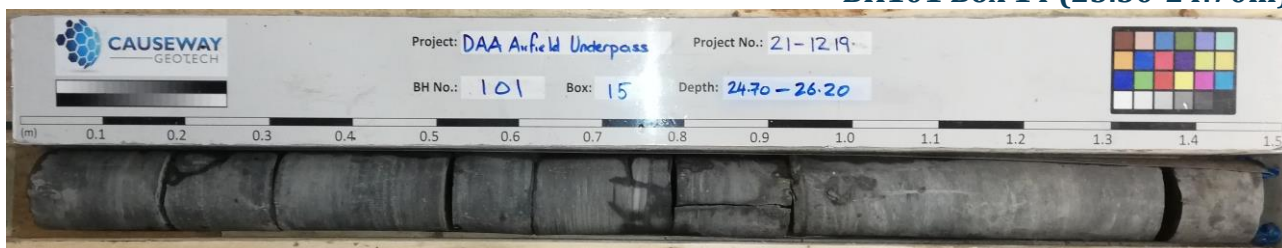
BH101 Box 12 (20.20-21.70m)



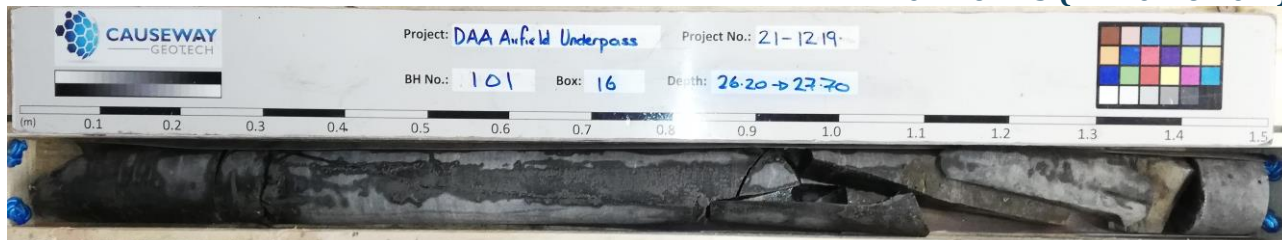
**BH101 Box 13 (21.70-23.20m)**



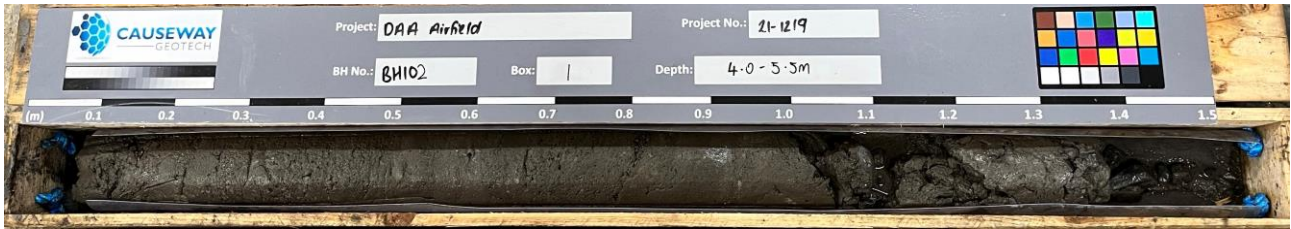
**BH101 Box 14 (23.30-24.70m)**



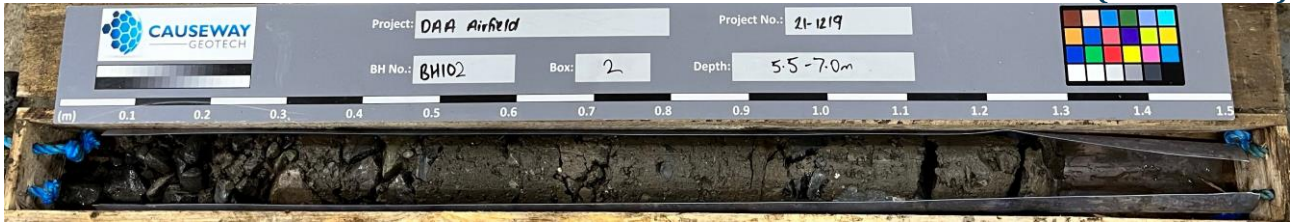
**BH101 Box 15 (24.70-26.20m)**



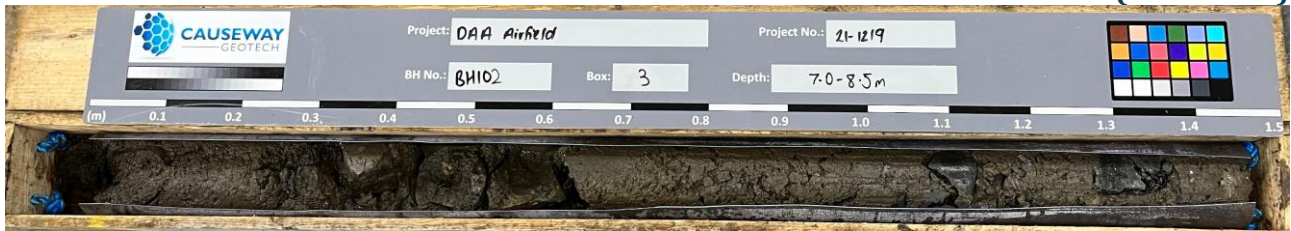
**BH101 Box 16 (26.20-27.70m)**



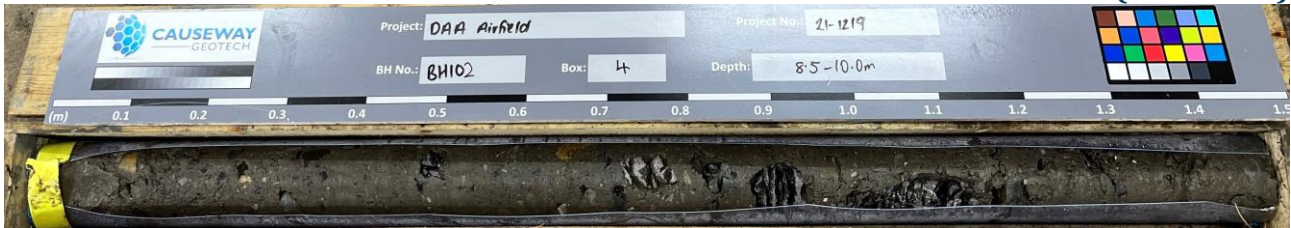
**BH102 Box 01 (4.50-5.50m)**



**BH102 Box 02 (5.50-7.0m)**



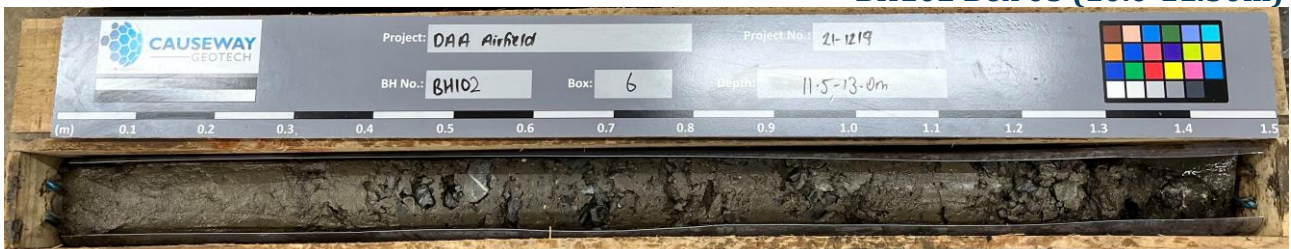
**BH102 Box 03 (7.0-8.50m)**



**BH102 Box 04 (8.50-10.0m)**

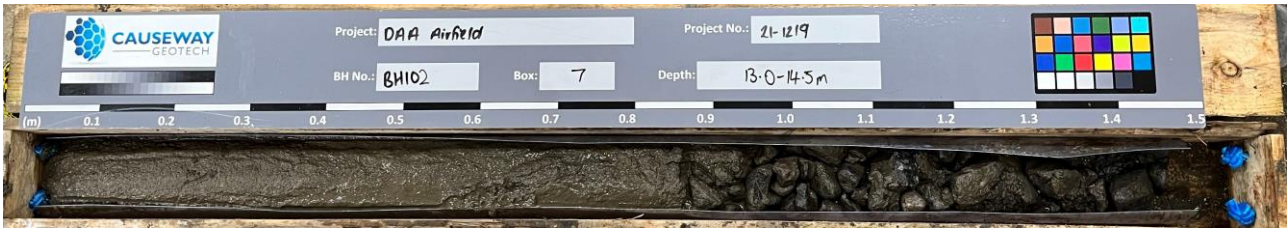


**BH102 Box 05 (10.0-11.50m)**

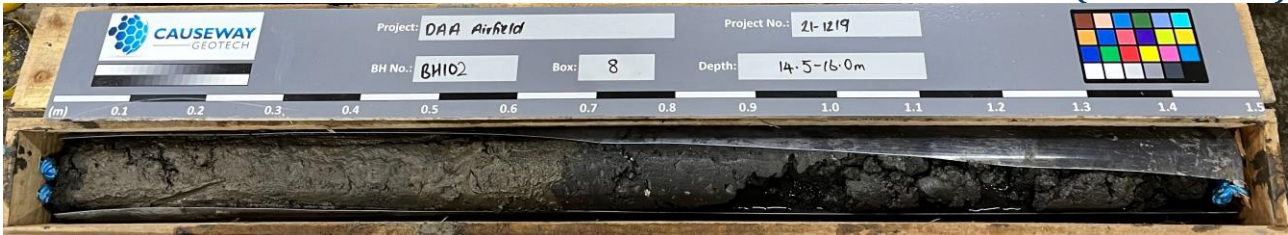


**BH102 Box 06 (11.50-13.0m)**

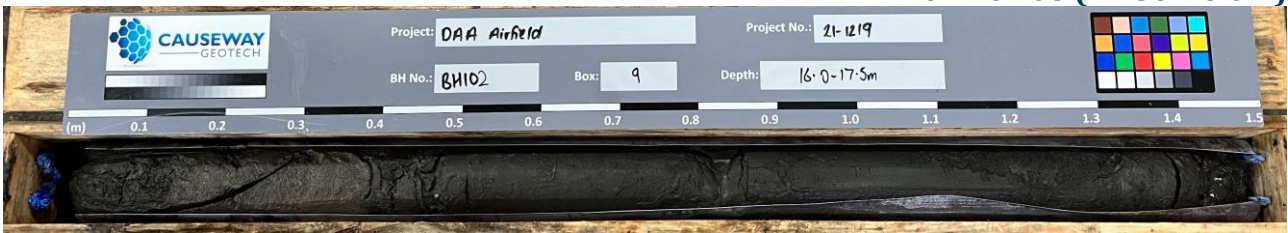




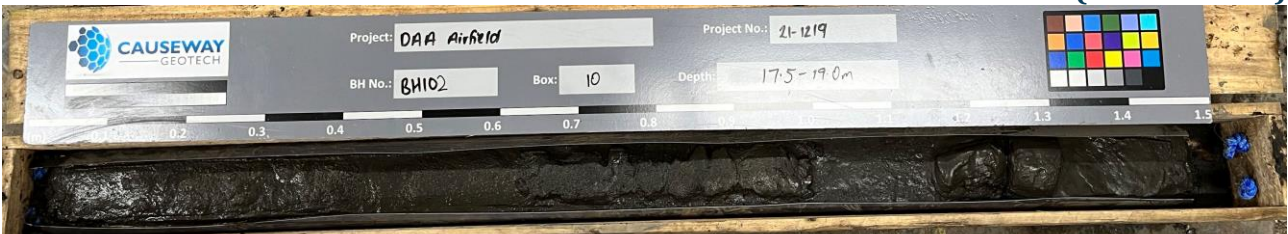
BH102 Box 07 (13.0-14.50m)



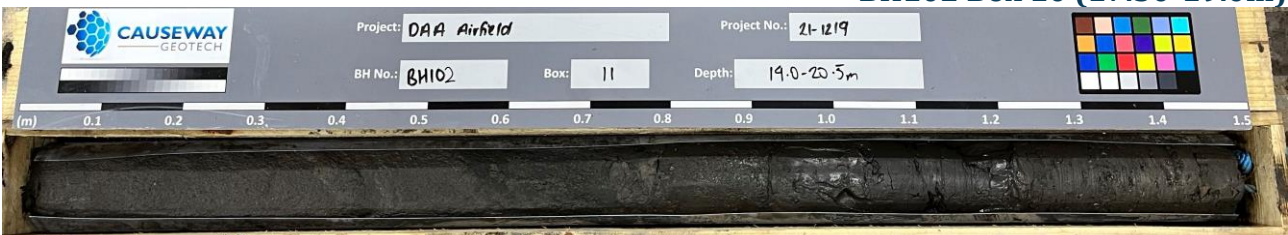
BH102 Box 08 (14.50-16.0m)



BH102 Box 09 (16.0-17.50m)



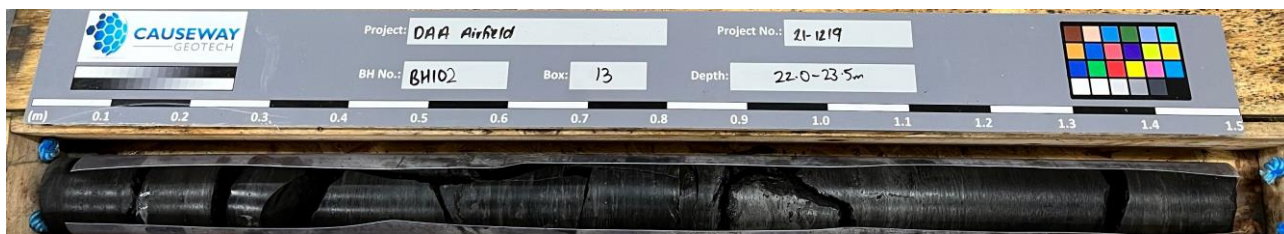
BH102 Box 10 (17.50-19.0m)



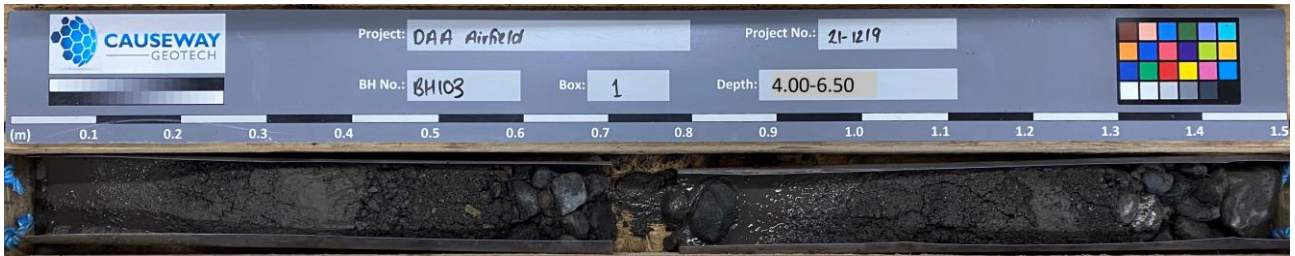
BH102 Box 11 (19.0-20.50m)



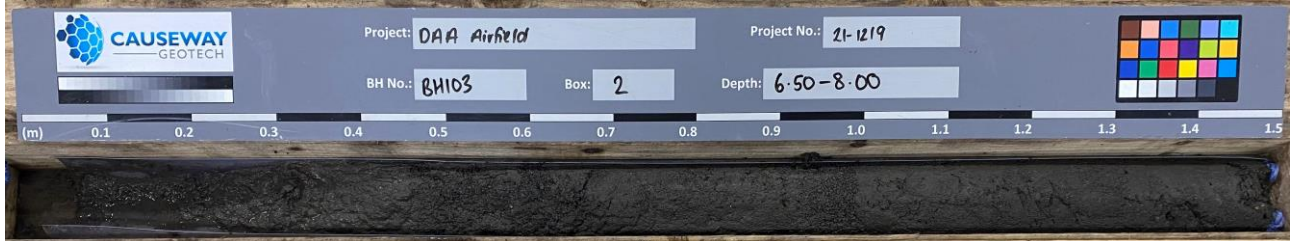
BH102 Box 12 (20.50-22.0m)



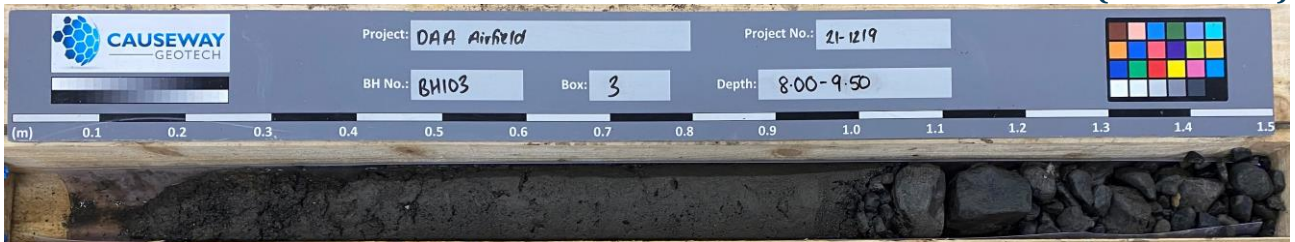
**BH102 Box 13 (22.0-23.50m)**



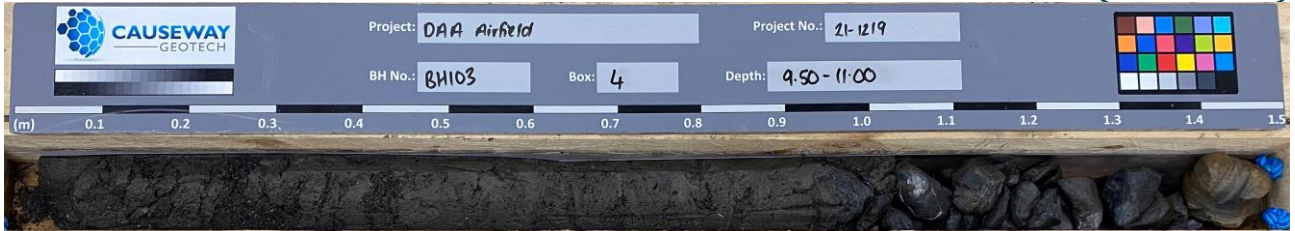
BH103 Box 1 (4.00-6.50m)



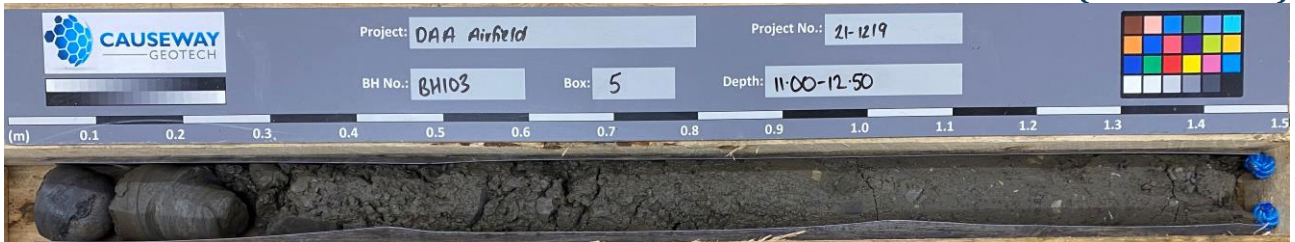
BH103 Box 2 (6.50-8.00m)



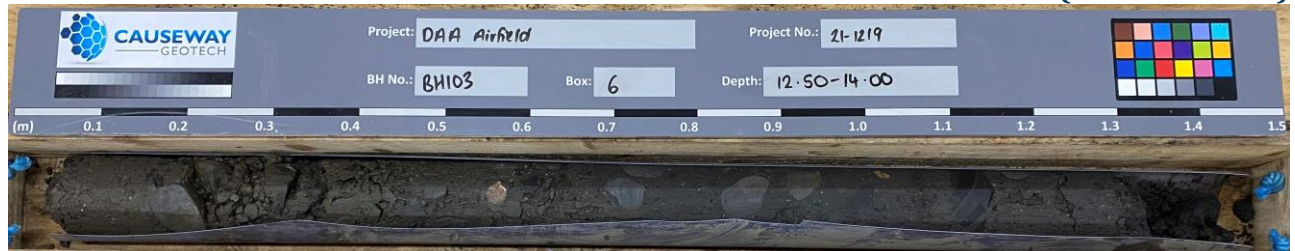
BH103 Box 3 (8.00-9.50m)



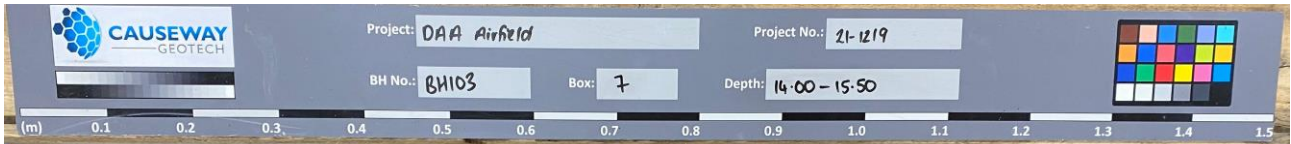
BH103 Box 4 (9.50-11.00m)



BH103 Box 5 (11.00-12.50m)



BH103 Box 6 (12.50-14.00m)



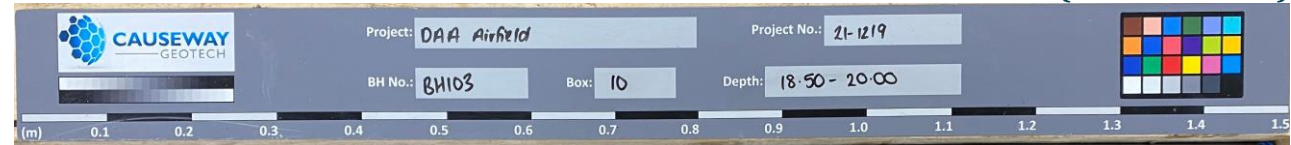
BH103 Box 7 (14.00-15.50m)



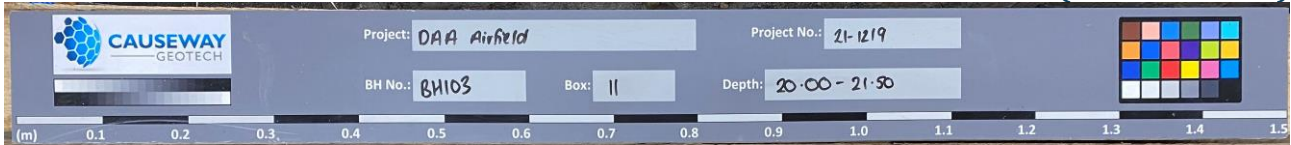
BH103 Box 8 (15.50-17.00m)



BH103 Box 9 (17.00-18.50m)



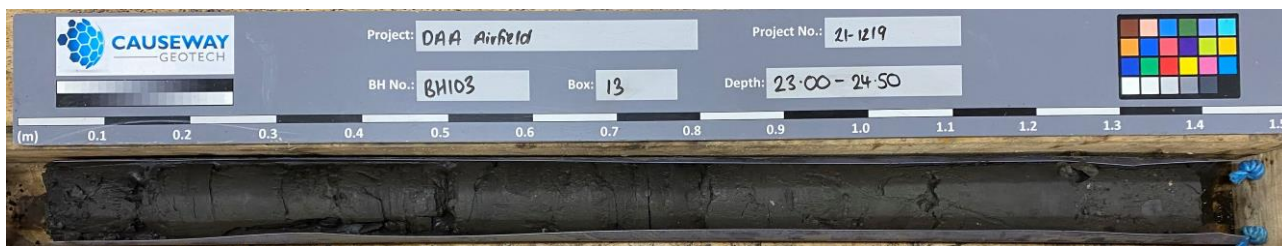
BH103 Box 10 (18.50-20.00m)



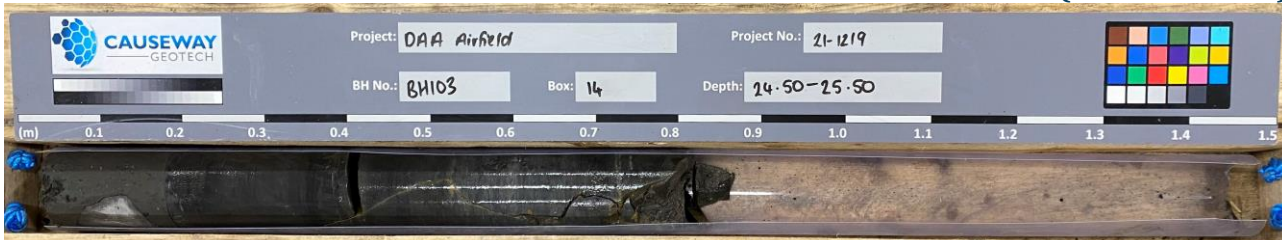
BH103 Box 11 (20.00-21.50m)



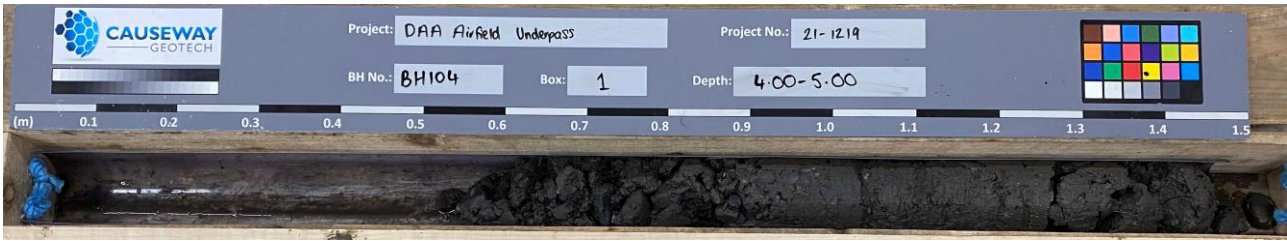
BH103 Box 12 (21.50-23.00m)



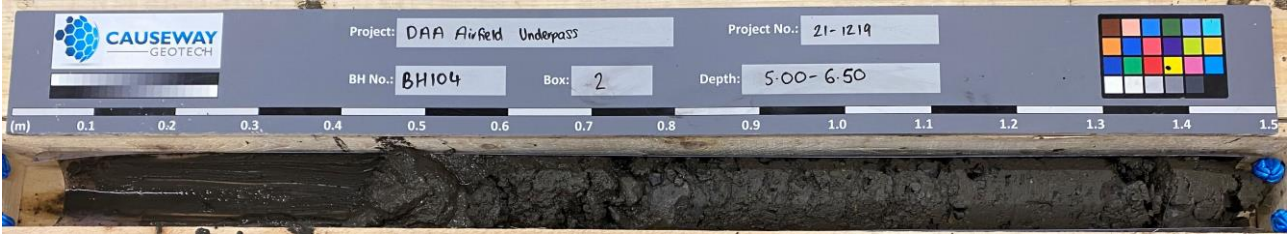
**BH103 Box 13 (23.00-24.50m)**



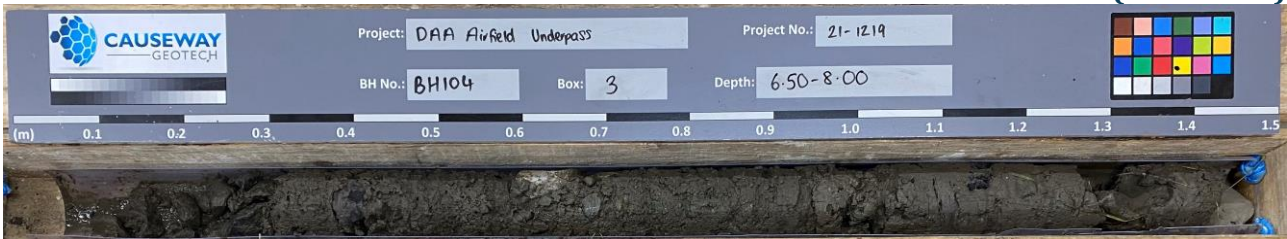
**BH103 Box 14 (24.50-25.50m)**



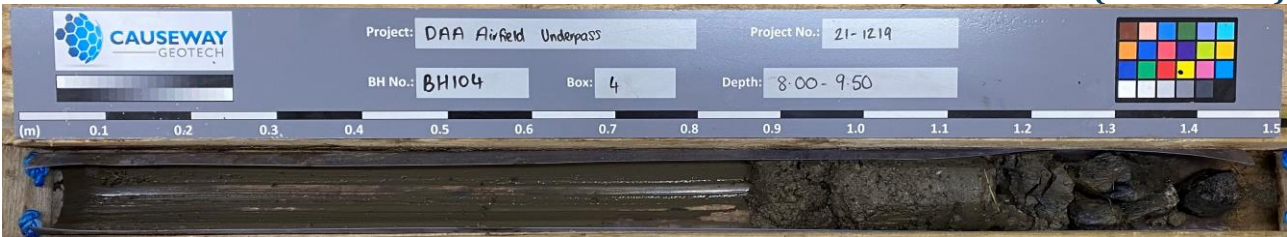
**BH104 Box 1 (4.00-5.00m)**



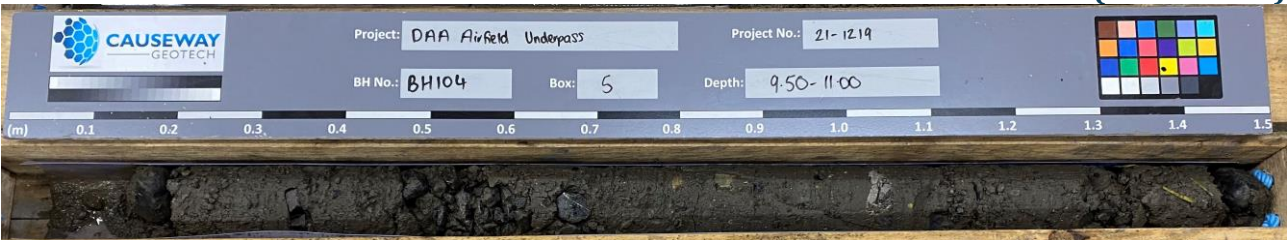
**BH104 Box 2 (5.0-6.50m)**



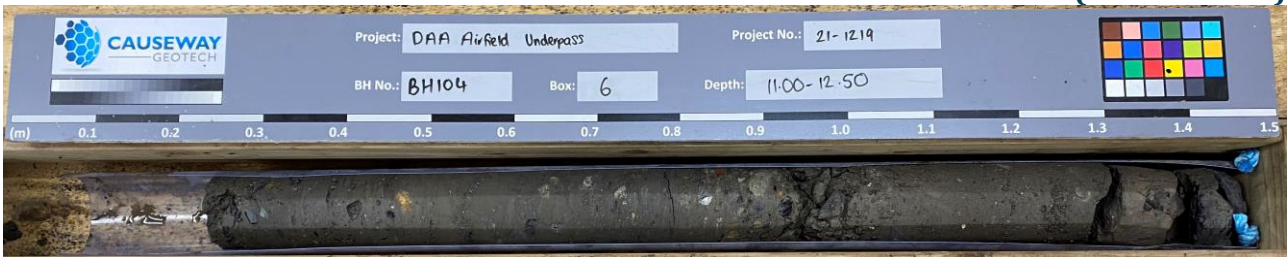
**BH104 Box 3 (6.50-8.00m)**



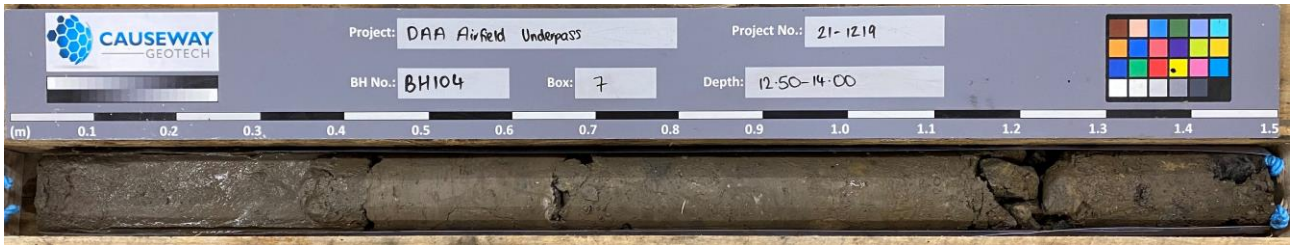
**BH104 Box 4 (8.00-9.50m)**



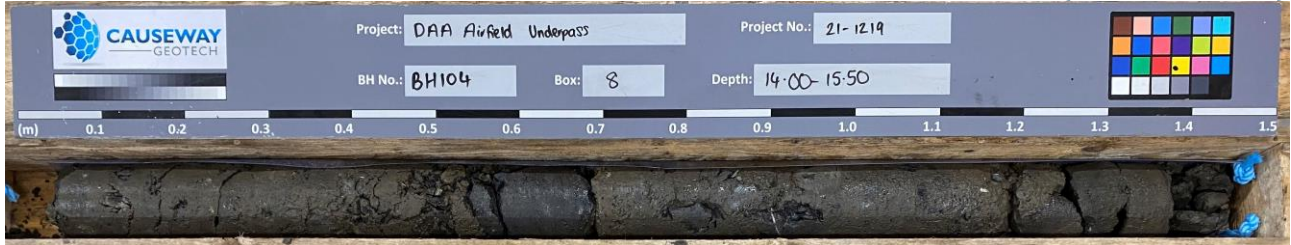
**BH104 Box 5 (9.50-11.00m)**



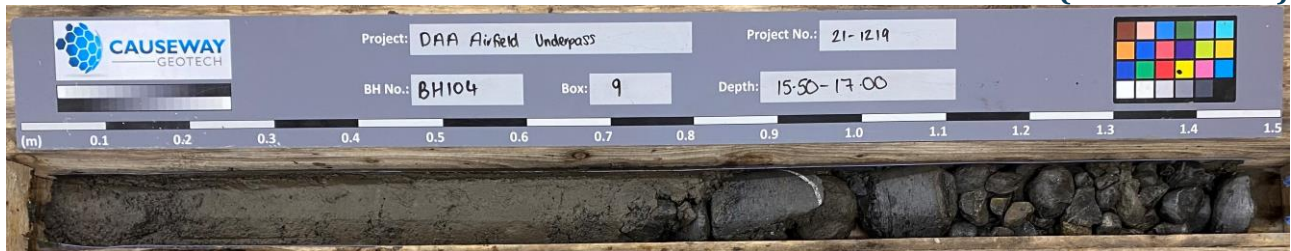
**BH104 Box 6 (11.00-12.50m)**



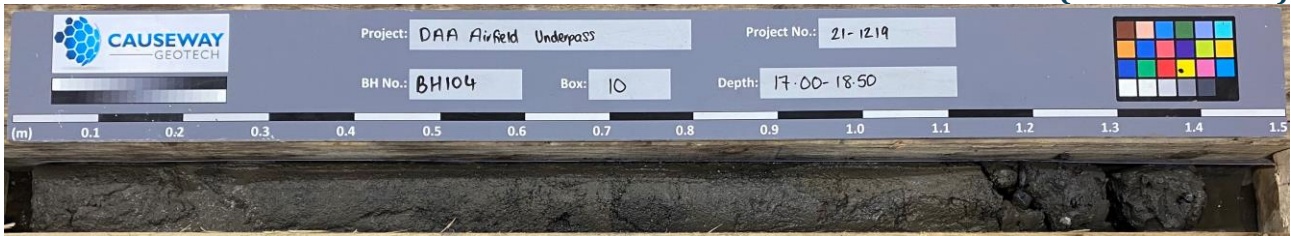
**BH104 Box 7 (12.50-14.00m)**



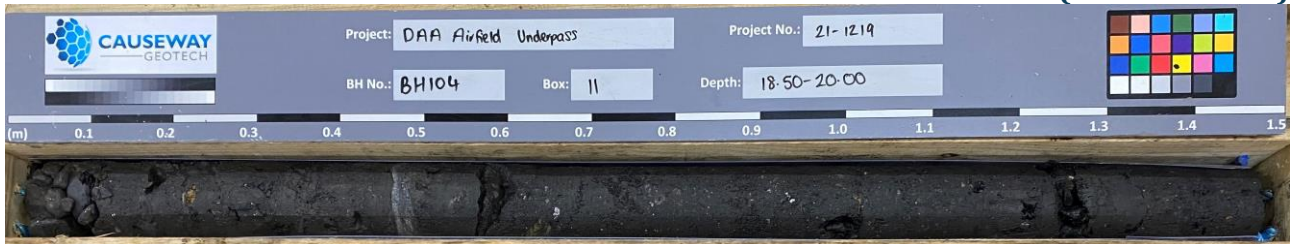
**BH104 Box 8 (14.00-15.50m)**



**BH104 Box 9 (15.50-17.00m)**



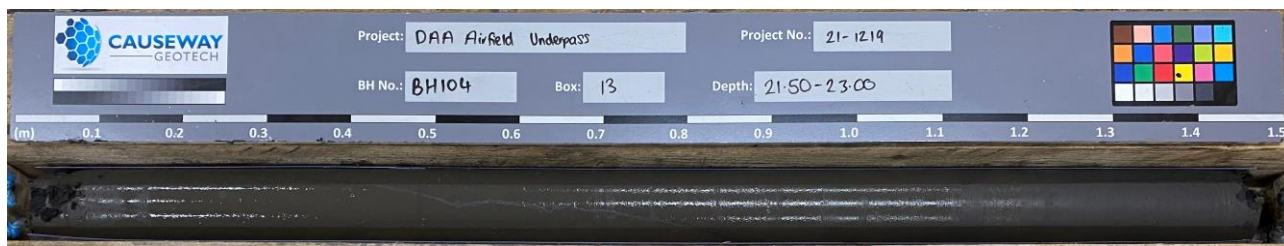
**BH104 Box 10 (17.00-18.50m)**



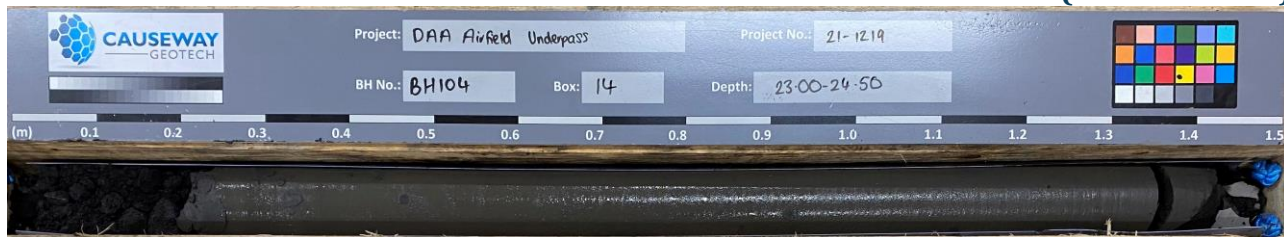
**BH104 Box 11 (18.50-20.00m)**



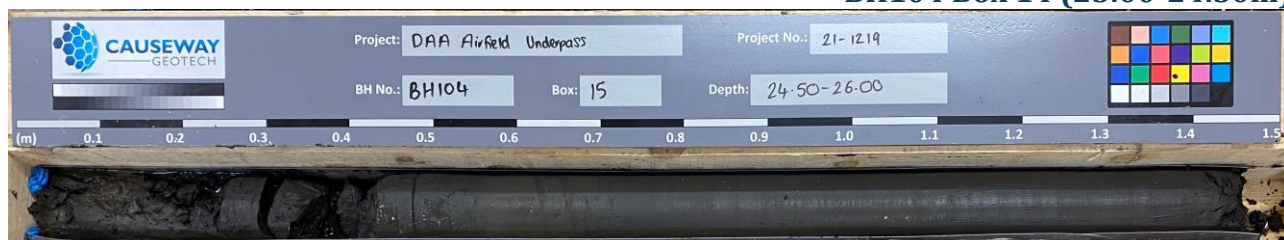
**BH104 Box 12 (20.00-21.50m)**



**BH104 Box 13 (21.50-23.00m)**



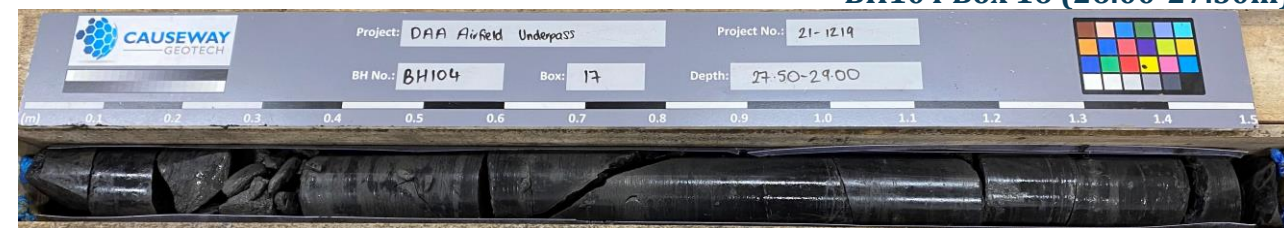
**BH104 Box 14 (23.00-24.50m)**



**BH104 Box 15 (24.50-26.00m)**

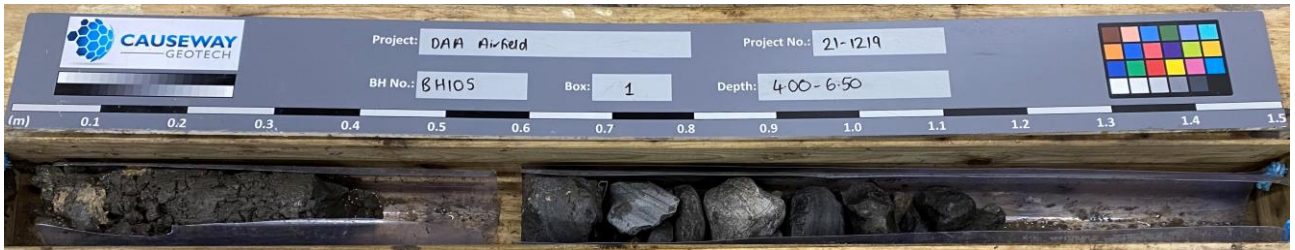


**BH104 Box 16 (26.00-27.50m)**

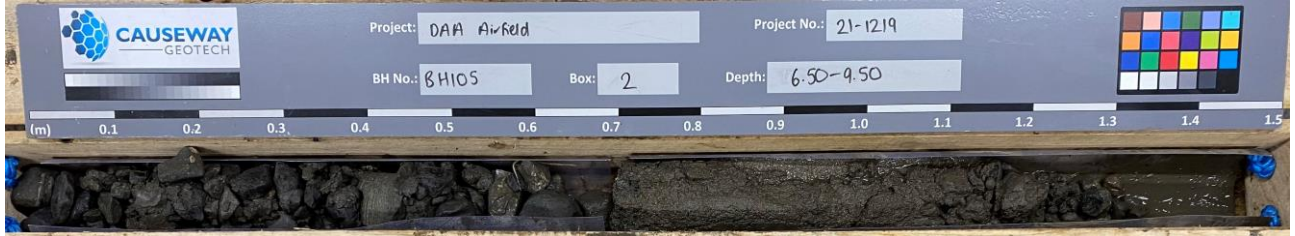


**BH104 Box 17 (27.50-29.00m)**

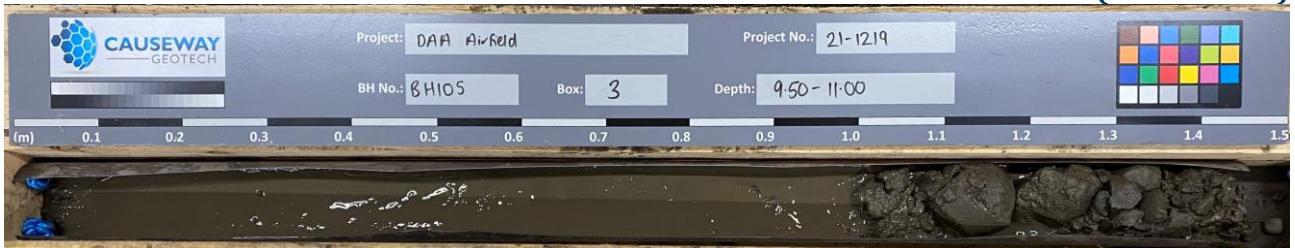




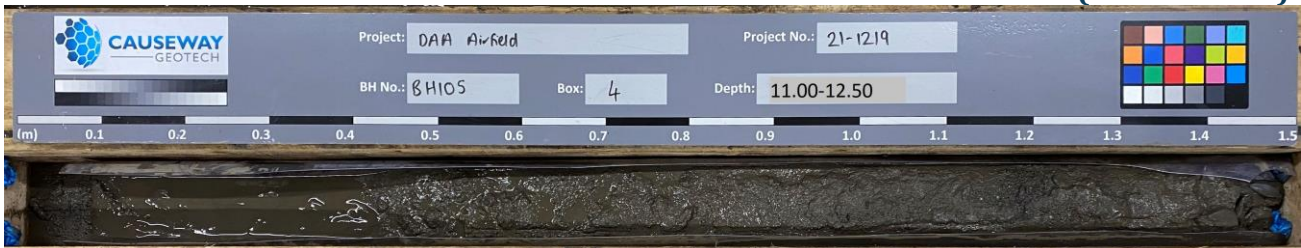
**BH105 Box 1 (4.00-6.50m)**



**BH105 Box 2 (6.50-9.50m)**



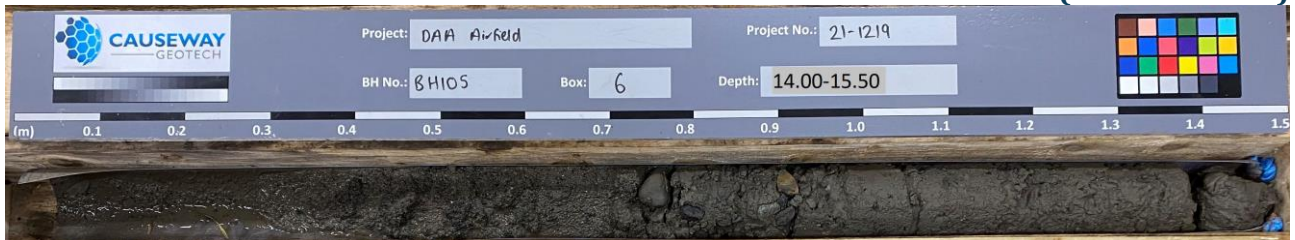
**BH105 Box 3 (9.50-11.00m)**



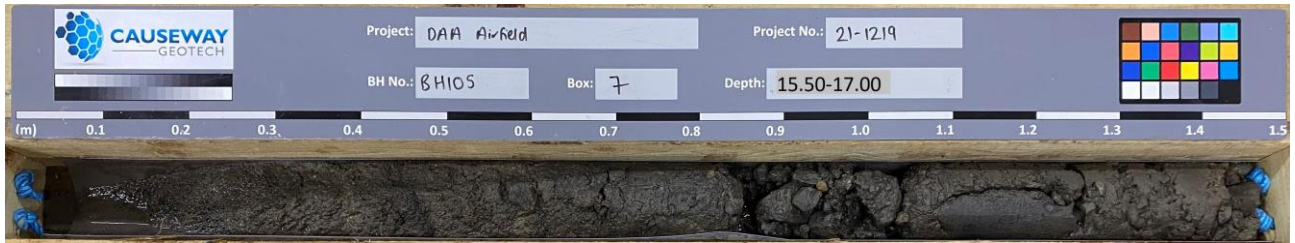
**BH105 Box 4 (11.00-12.50m)**



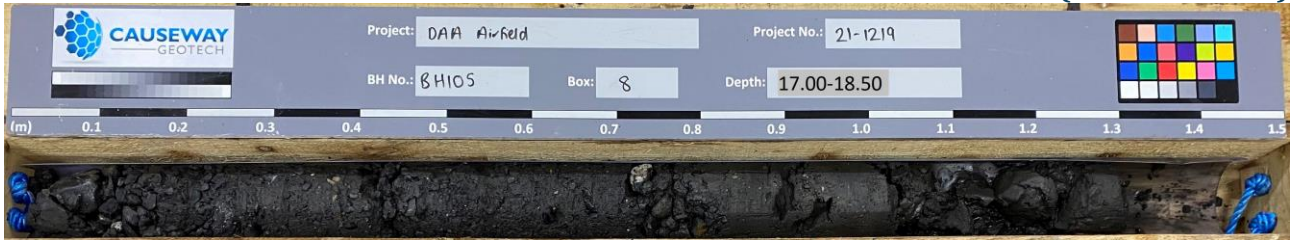
**BH105 Box 5 (12.50-14.00m)**



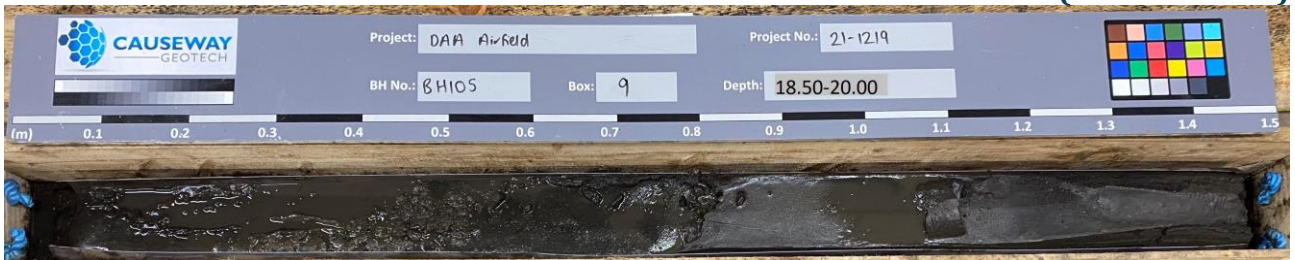
**BH105 Box 6 (14.00-15.50m)**



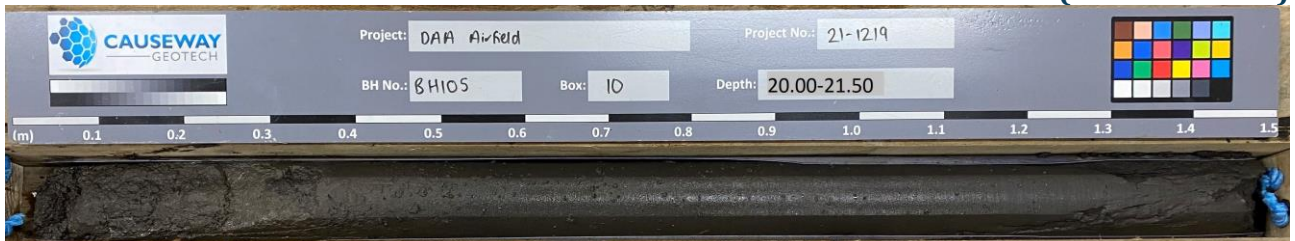
**BH105 Box 7 (15.50-17.00m)**



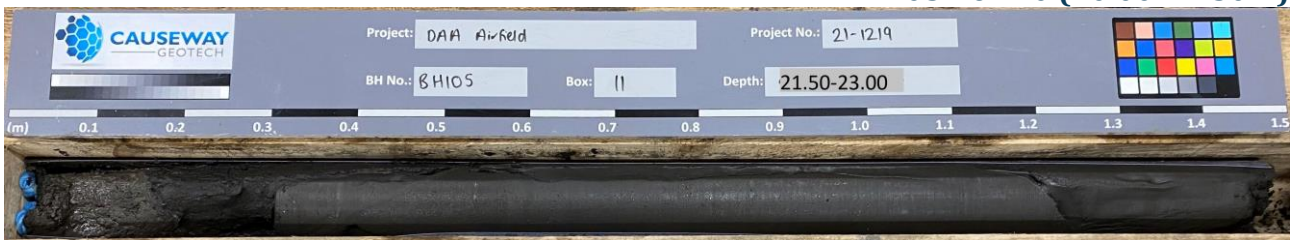
**BH105 Box 8 (17.00-18.50m)**



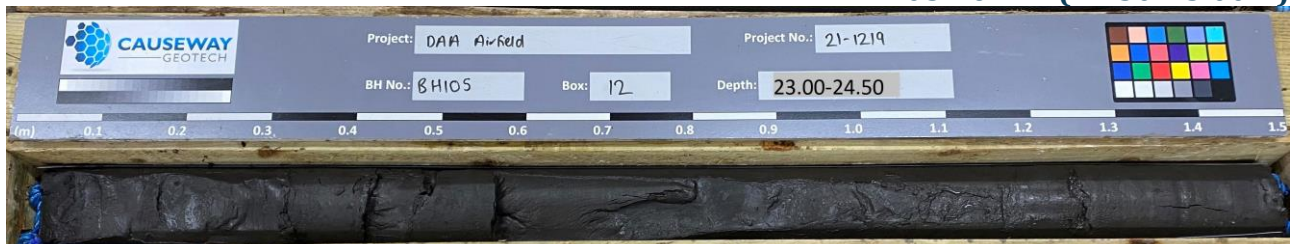
**BH105 Box 9 (18.50-20.00m)**



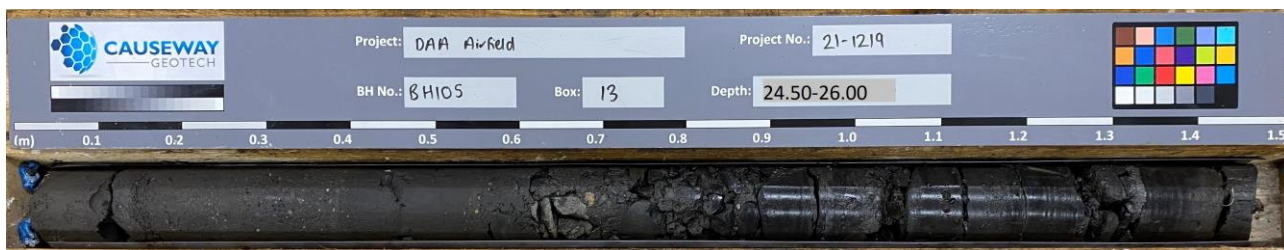
**BH105 Box 10 (20.00-21.50m)**



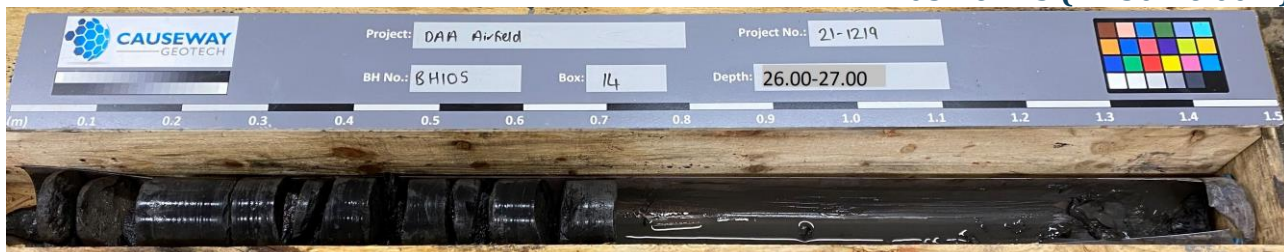
**BH105 Box 11 (21.50-23.00m)**



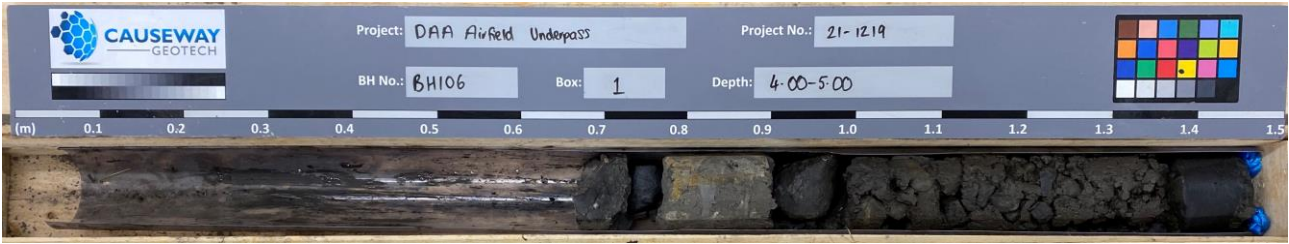
**BH105 Box 12 (23.00-24.50m)**



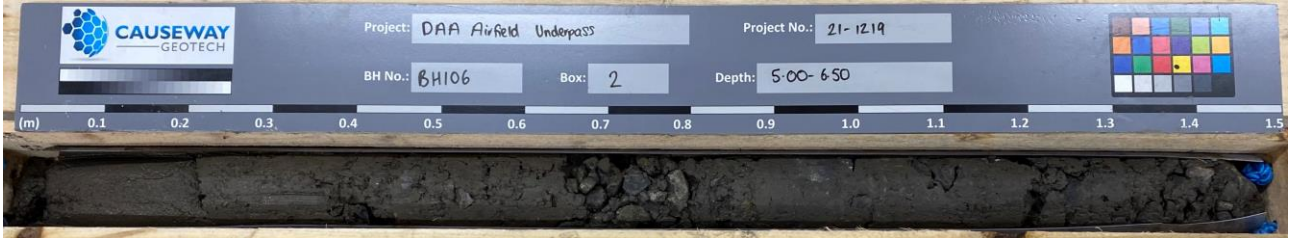
**BH105 Box 13 (24.50-26.00m)**



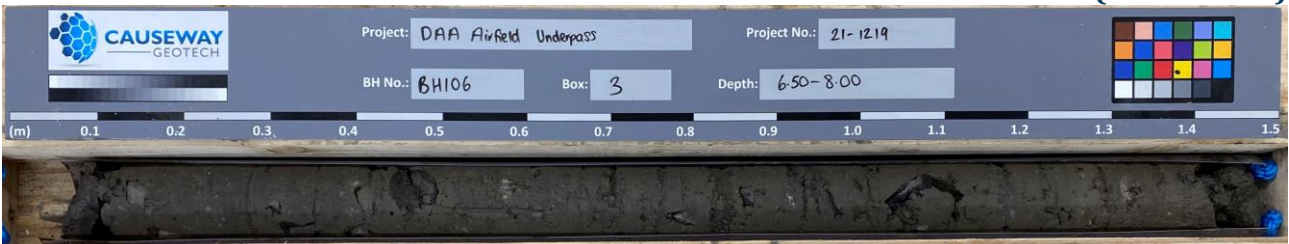
**BH105 Box 14 (26.00-27.00m)**



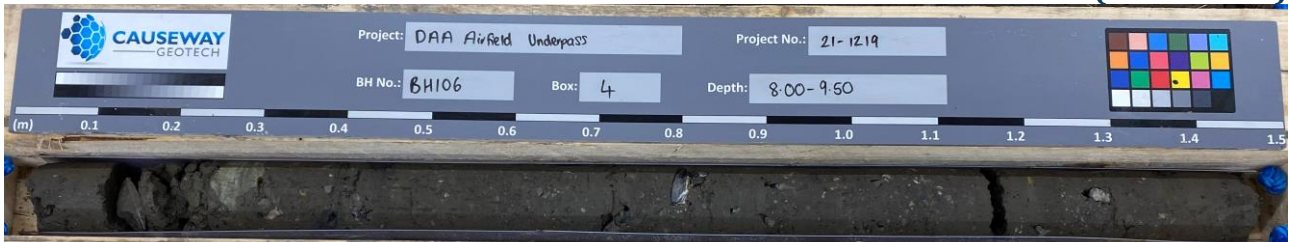
**BH106 Box 1 (4.00-5.00m)**



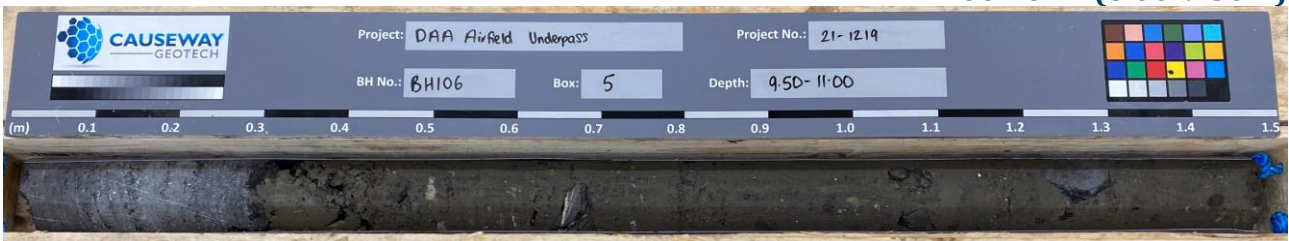
**BH106 Box 2 (5.00-6.50m)**



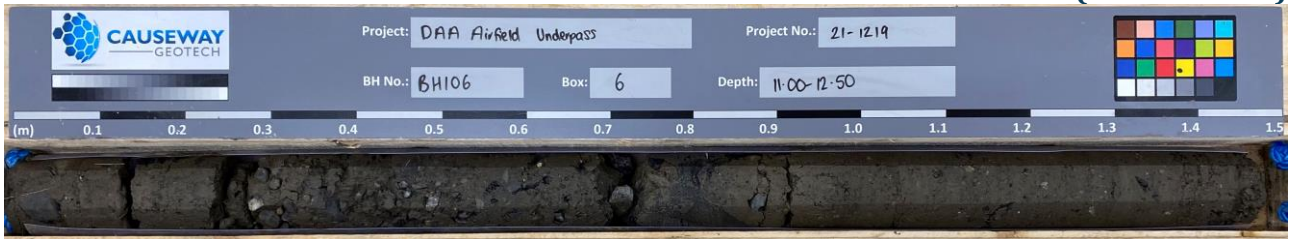
**BH106 Box 3 (6.50-8.00m)**



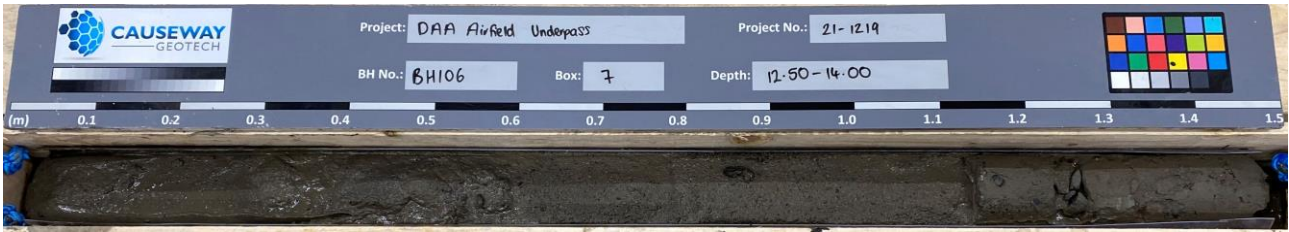
**BH106 Box 4 (8.00-9.50m)**



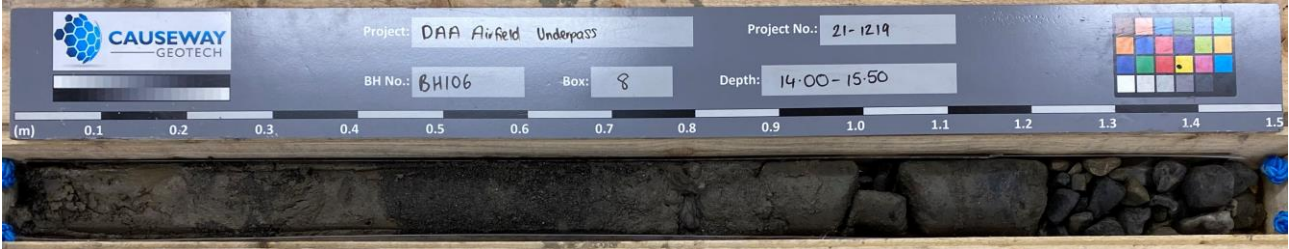
**BH106 Box 5 (9.50-11.00m)**



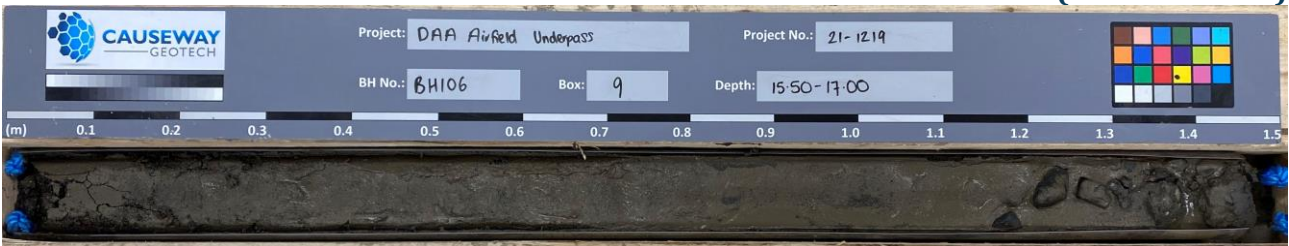
**BH106 Box 6 (11.00-12.50m)**



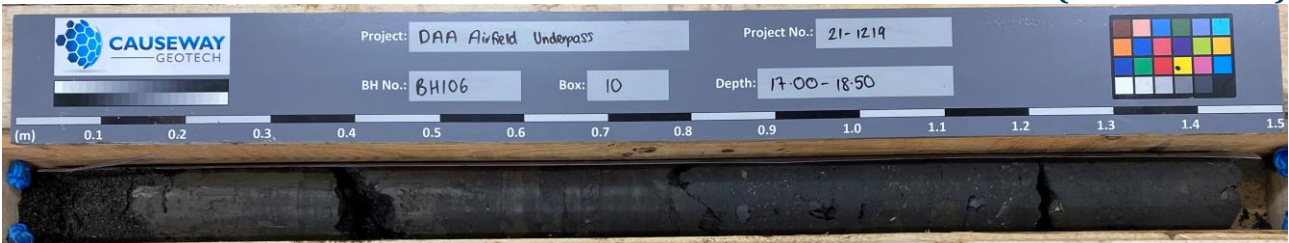
**BH106 Box 7 (12.50-14.00m)**



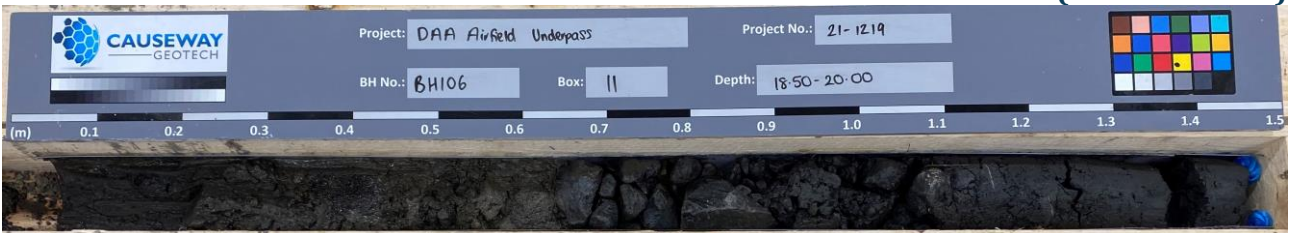
**BH106 Box 8 (14.00-15.50m)**



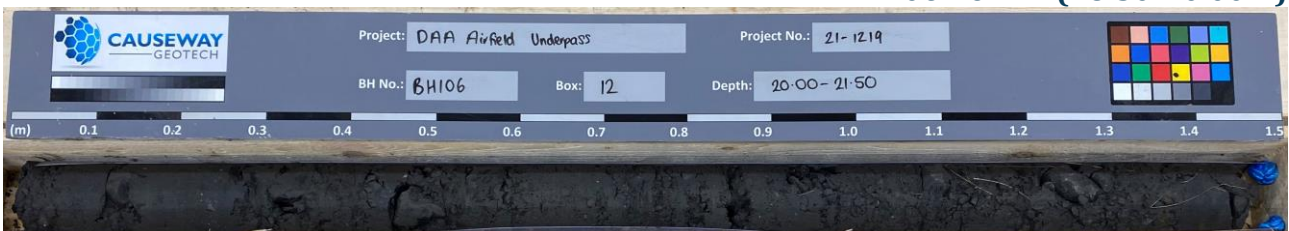
**BH106 Box 9 (15.50-17.00m)**



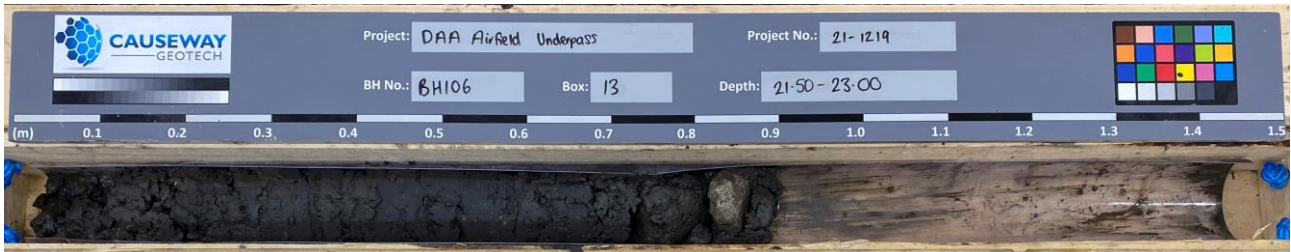
**BH106 Box 10 (17.00-18.50m)**



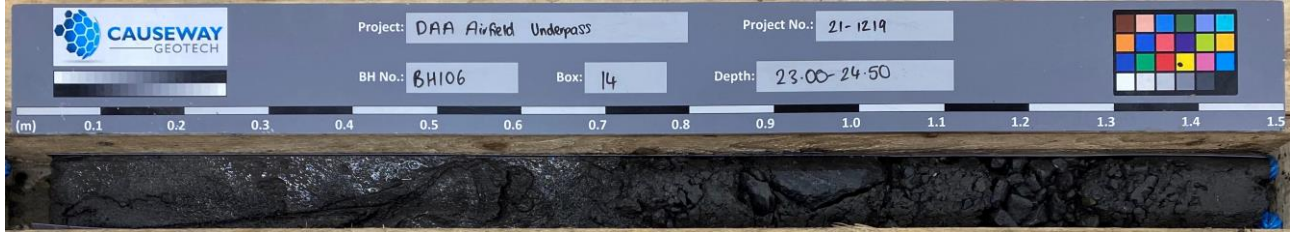
**BH106 Box 11 (18.50-20.00m)**



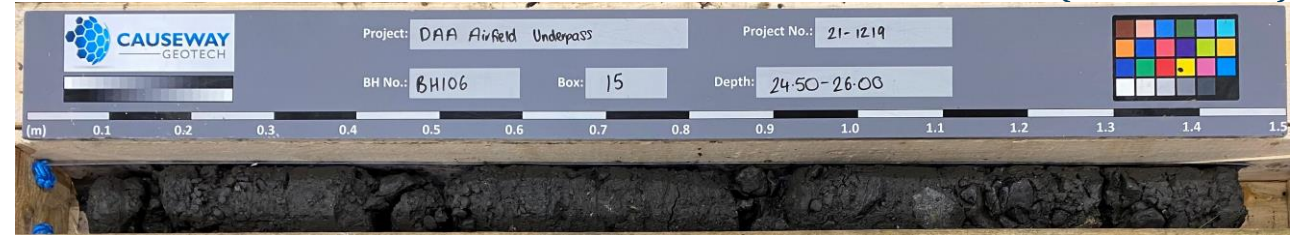
**BH106 Box 12 (20.00-21.50m)**



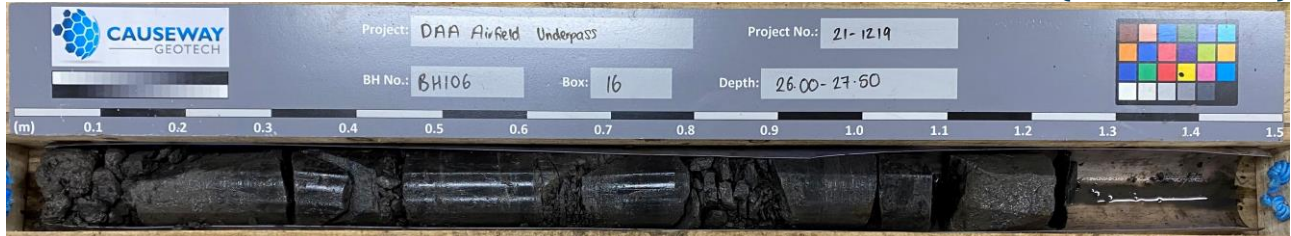
**BH106 Box 13 (21.50-23.00m)**



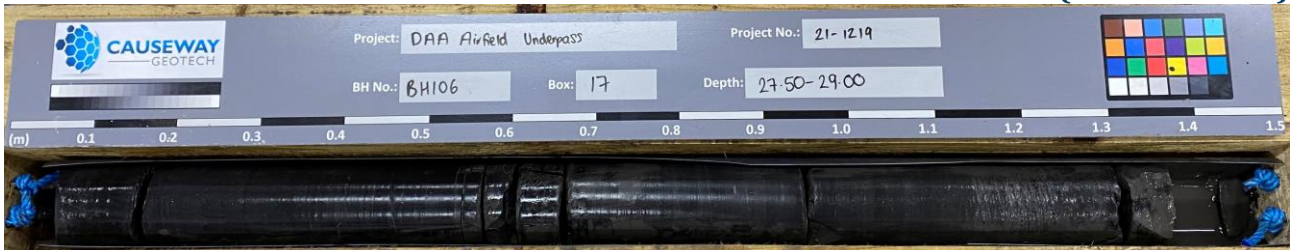
**BH106 Box 14 (23.00-24.50m)**



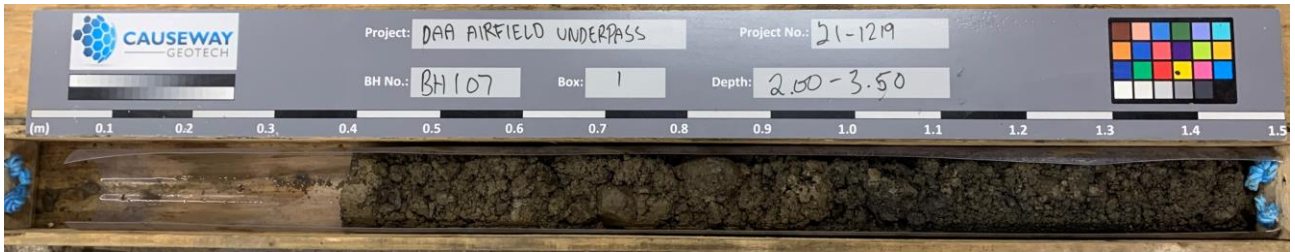
**BH106 Box 15 (24.50-26.00m)**



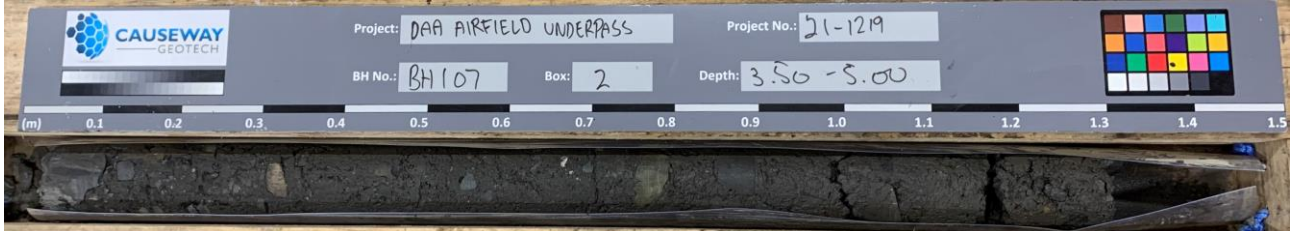
**BH106 Box 16 (26.00-27.50m)**



**BH106 Box 17 (27.50-29.00m)**



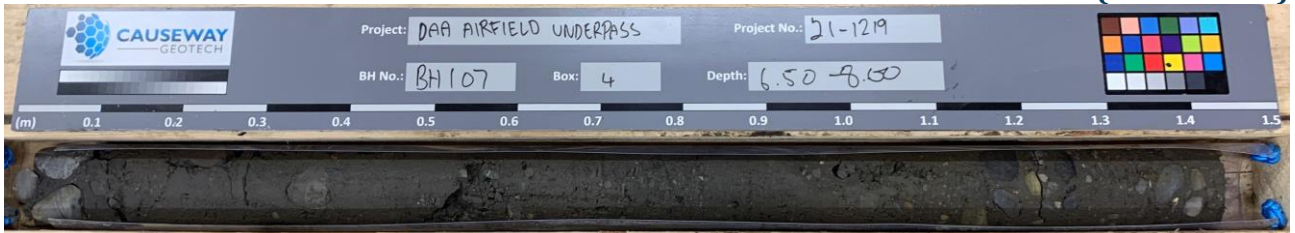
BH107 Box 1 (2.00-3.50m)



BH107 Box 2 (3.50-5.00m)



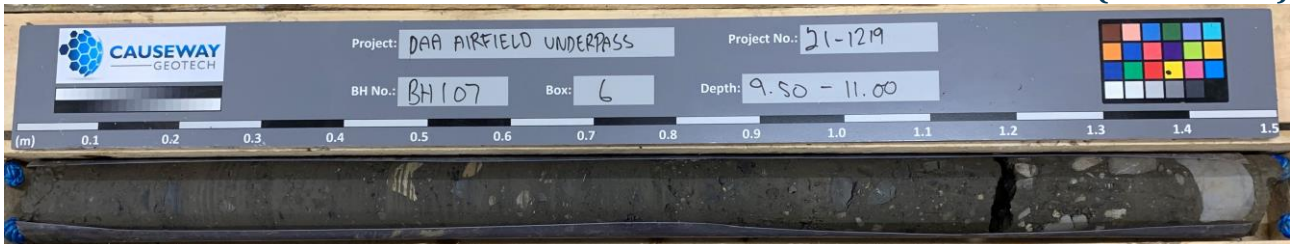
BH107 Box 3 (5.00-6.50m)



BH107 Box 4 (6.50-8.00m)



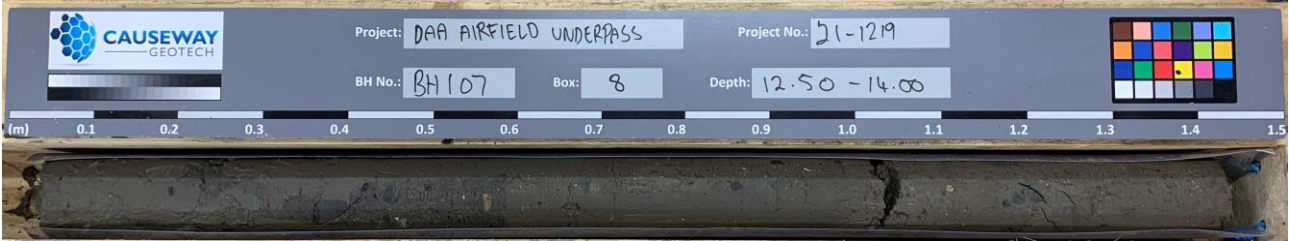
BH107 Box 5 (8.00-9.50m)



BH107 Box 6 (9.50-11.00m)



**BH107 Box 7 (11.00-12.50m)**



**BH107 Box 8 (12.50-14.00m)**



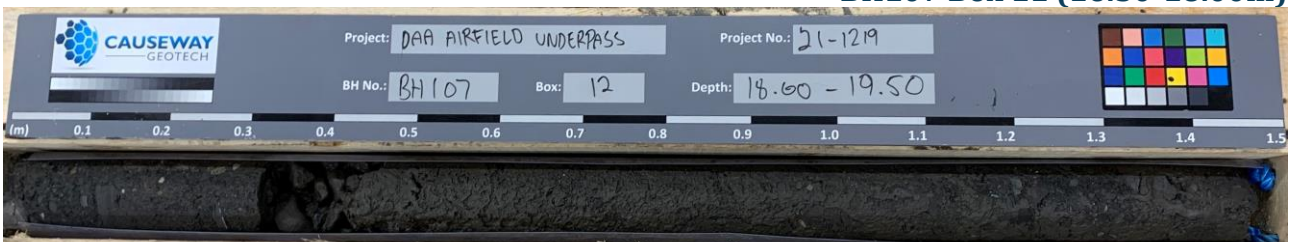
**BH107 Box 9 (14.00-15.50m)**



**BH107 Box 10 (15.00-16.50m)**



**BH107 Box 11 (16.50-18.00m)**

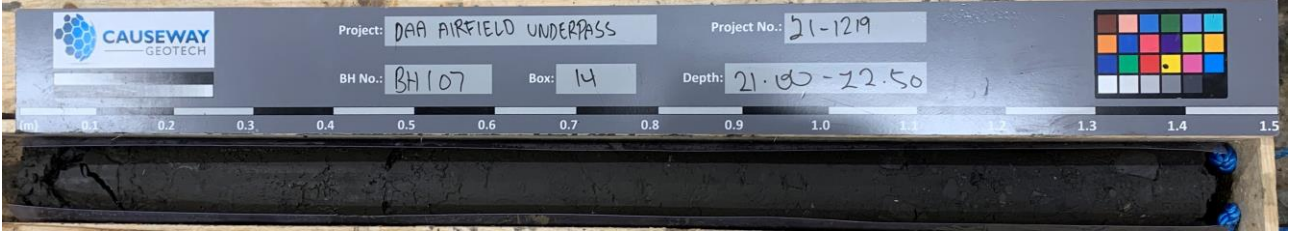


**BH107 Box 12 (18.00-19.50m)**

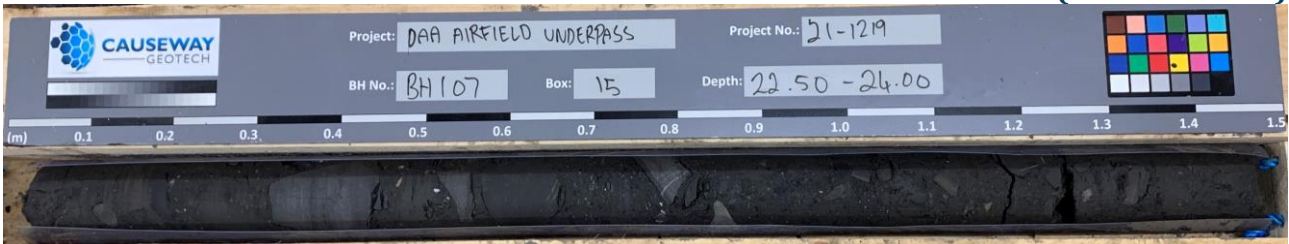




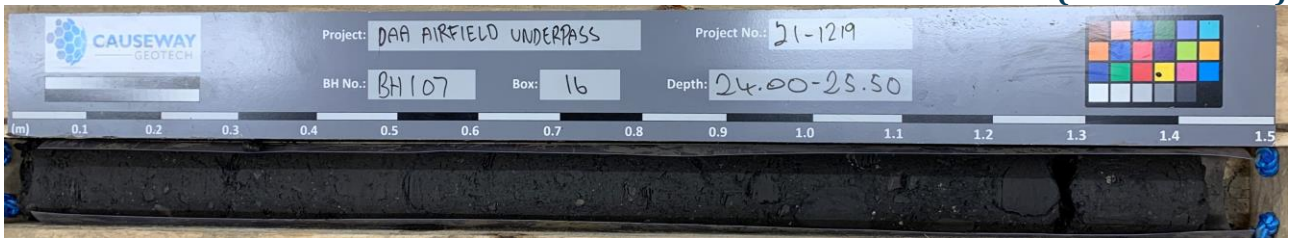
**BH107 Box 13 (19.50-21.00m)**



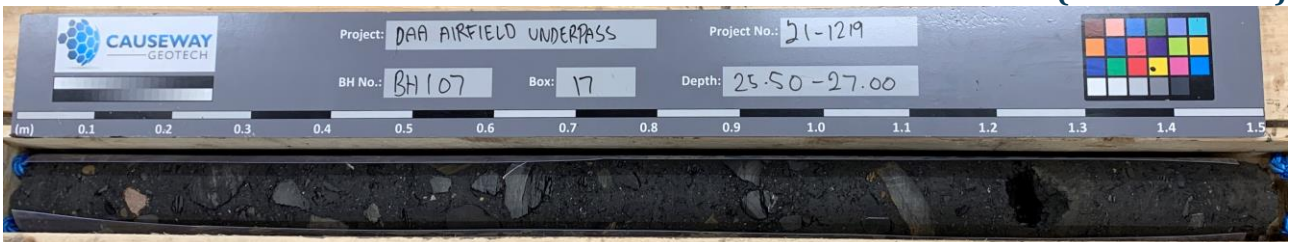
**BH107 Box 14 (21.00-22.50m)**



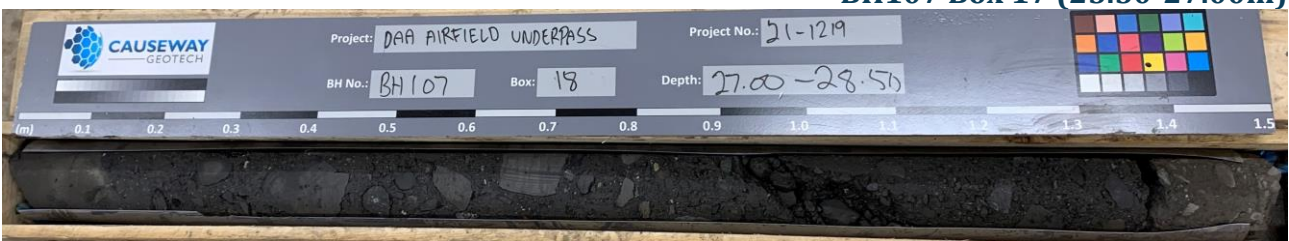
**BH107 Box 15 (22.50-24.00m)**



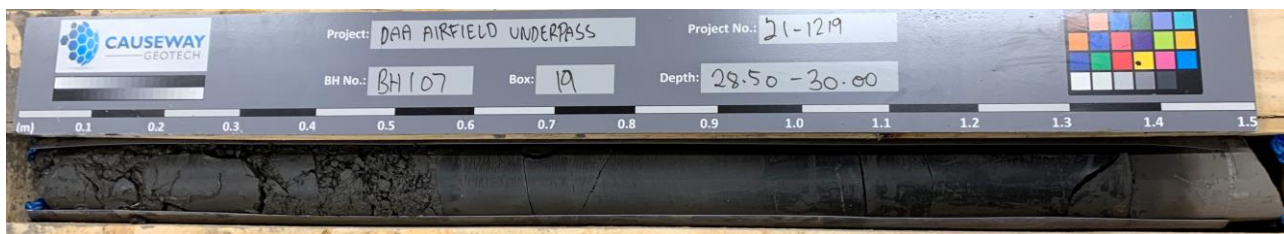
**BH107 Box 16 (24.00-25.50m)**



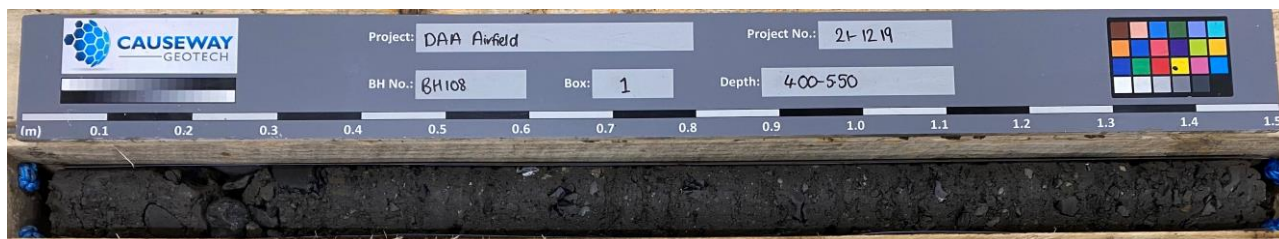
**BH107 Box 17 (25.50-27.00m)**



**BH107 Box 18 (27.00-28.50m)**



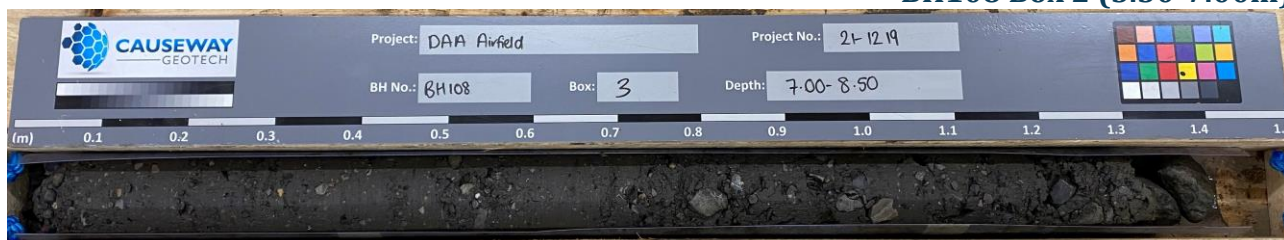
**BH107 Box 19 (28.50-30.00m)**



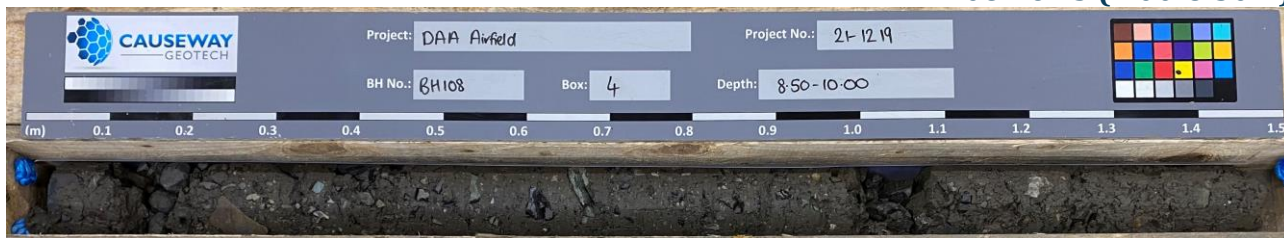
**BH108 Box 1 (4.00-5.50m)**



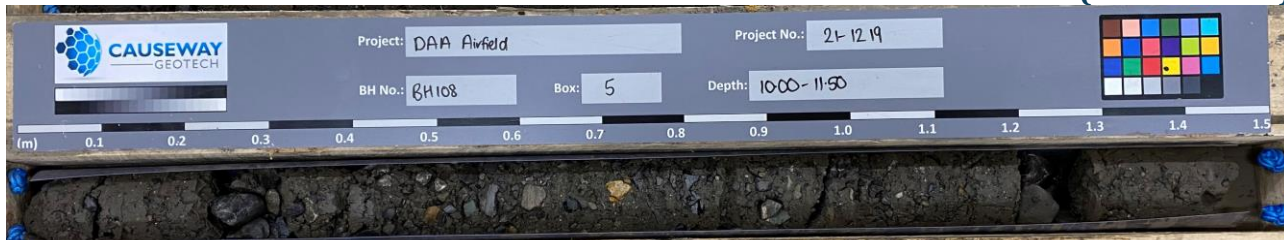
**BH108 Box 2 (5.50-7.00m)**



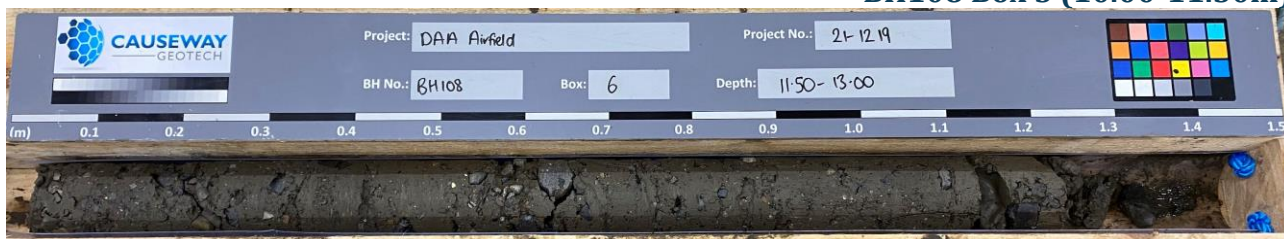
**BH108 Box 3 (7.00-8.50m)**



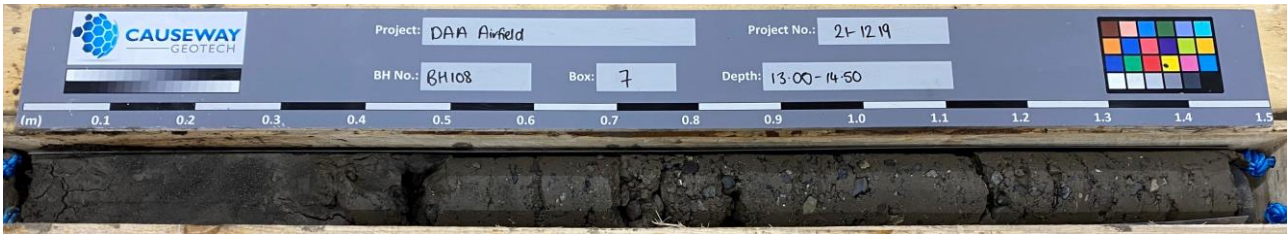
**BH108 Box 4 (8.50-10.00m)**



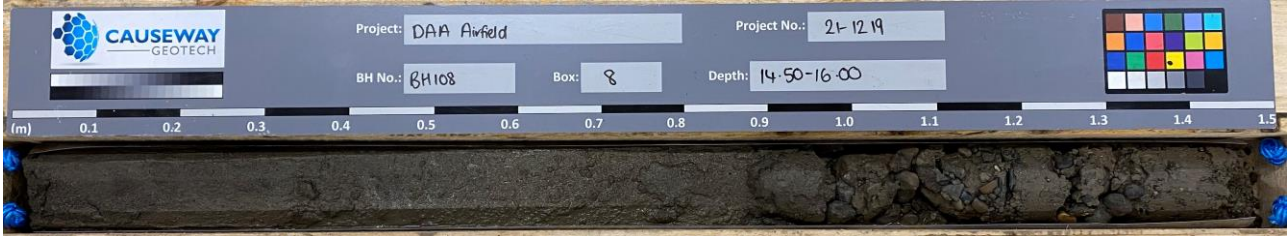
**BH108 Box 5 (10.00-11.50m)**



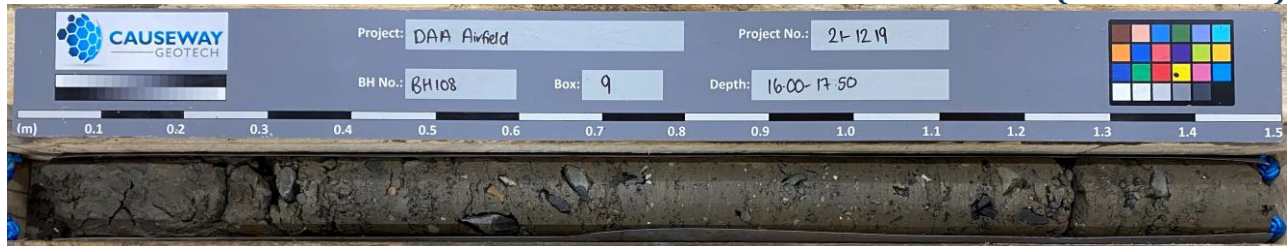
**BH108 Box 6 (11.50-13.00m)**



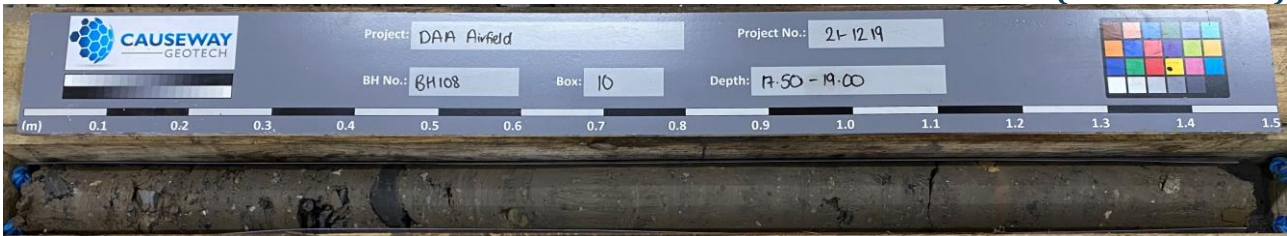
**BH108 Box 7 (13.00-14.50m)**



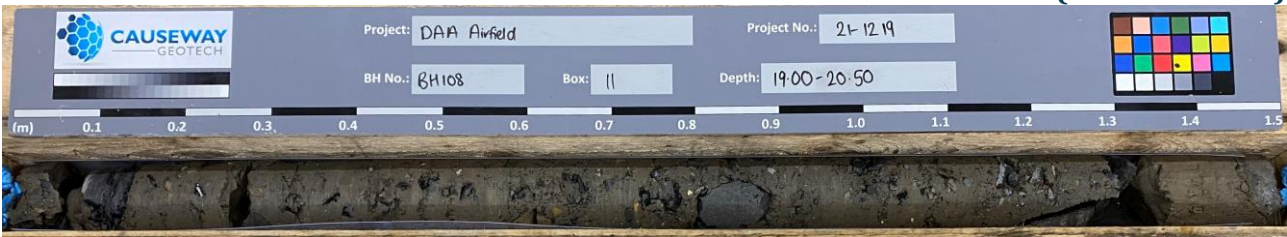
**BH108 Box 8 (14.50-16.00m)**



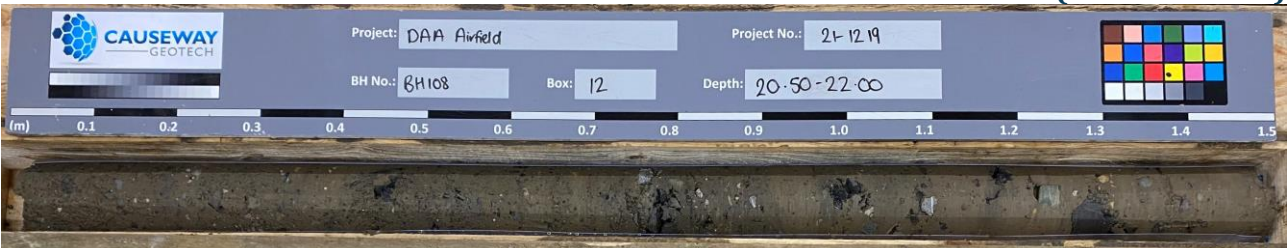
**BH108 Box 9 (16.00-17.50m)**



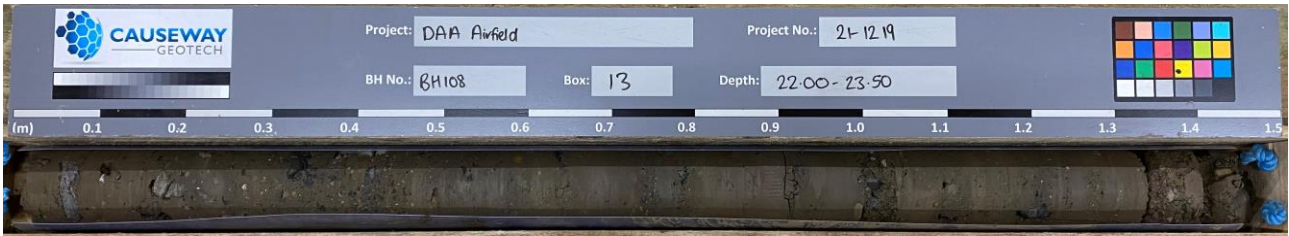
**BH108 Box 10 (17.50-19.00m)**



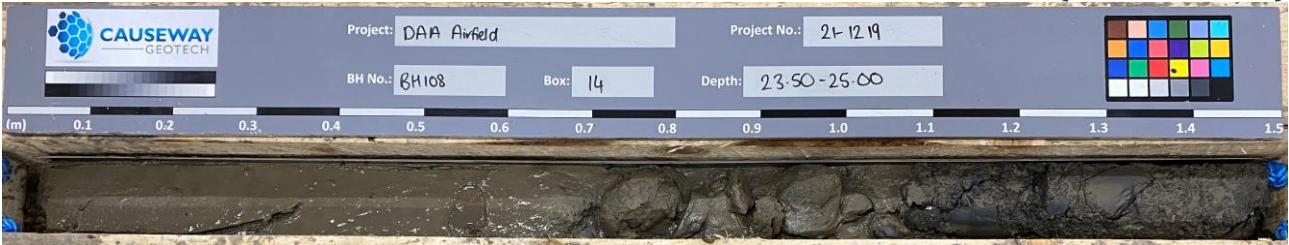
**BH108 Box 11 (19.00-20.50m)**



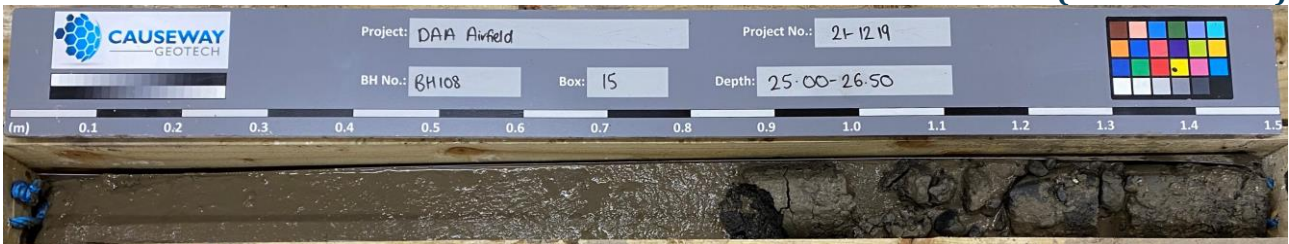
**BH108 Box 12 (20.50-22.00m)**



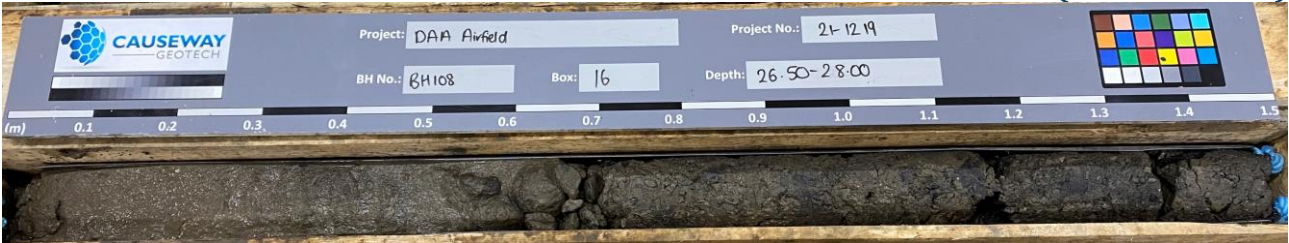
**BH108 Box 13 (22.00-23.50m)**



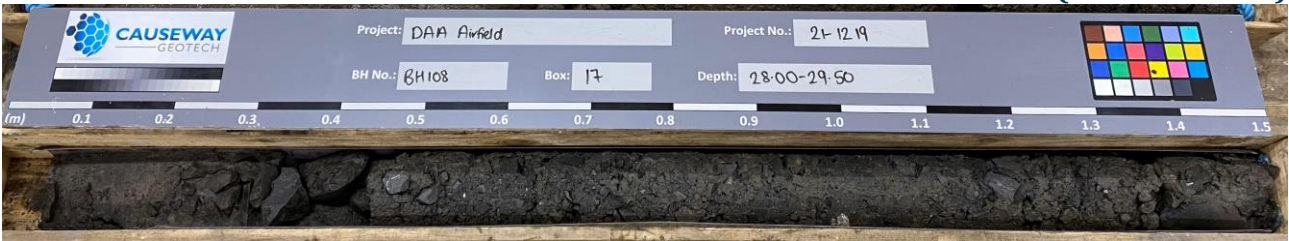
**BH108 Box 14 (23.50-25.00m)**



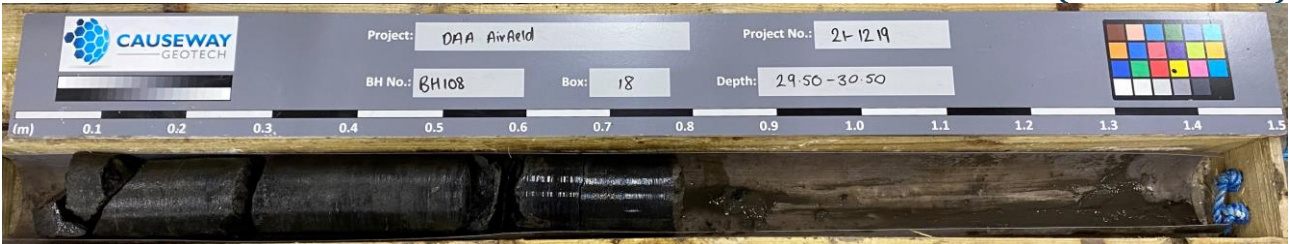
**BH108 Box 15 (25.00-26.50m)**



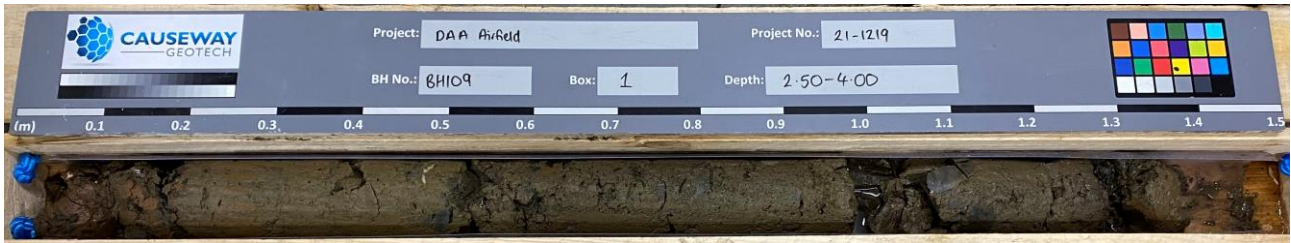
**BH108 Box 16 (26.50-28.00m)**



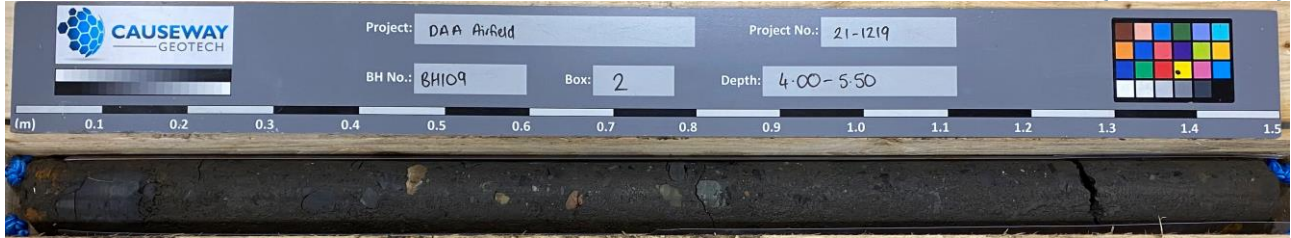
**BH108 Box 17 (28.00-29.50m)**



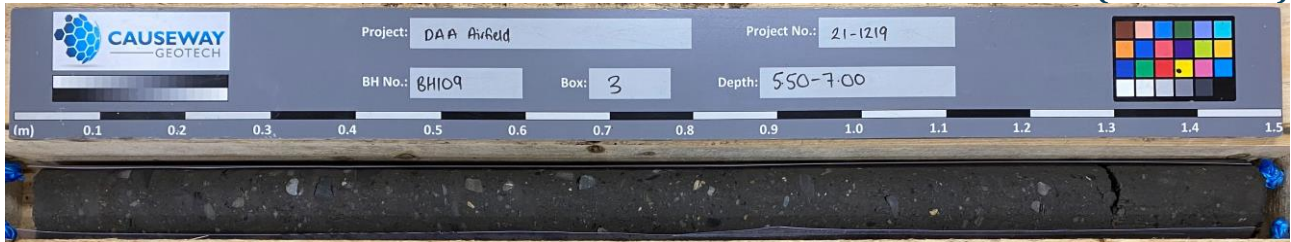
**BH108 Box 18 (29.50-30.50m)**



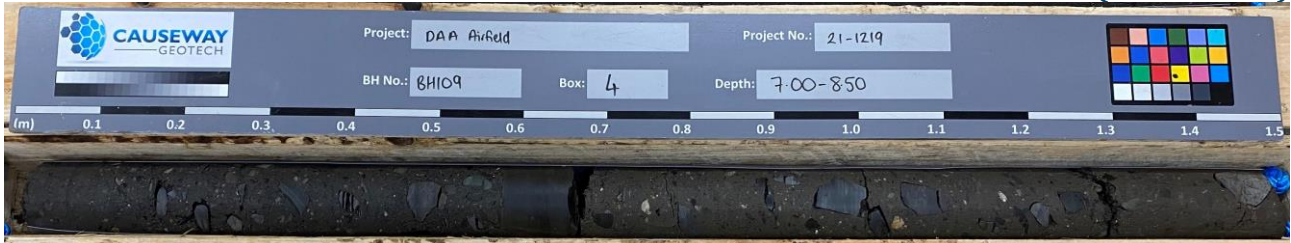
**BH109 Box 1 (2.50-4.00m)**



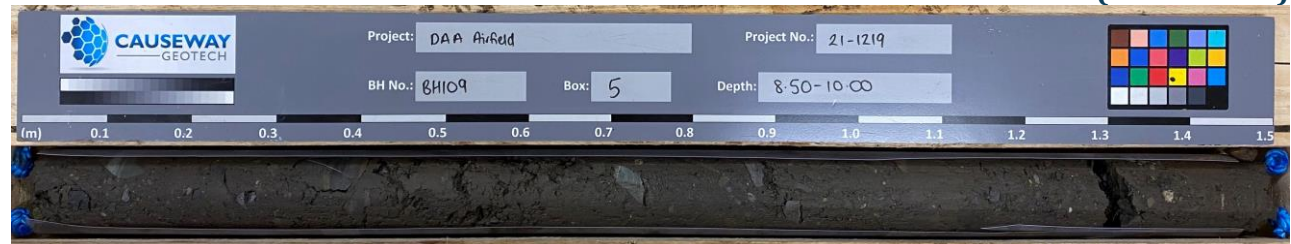
**BH109 Box 2 (4.00-5.50m)**



**BH109 Box 3 (5.50-7.00m)**



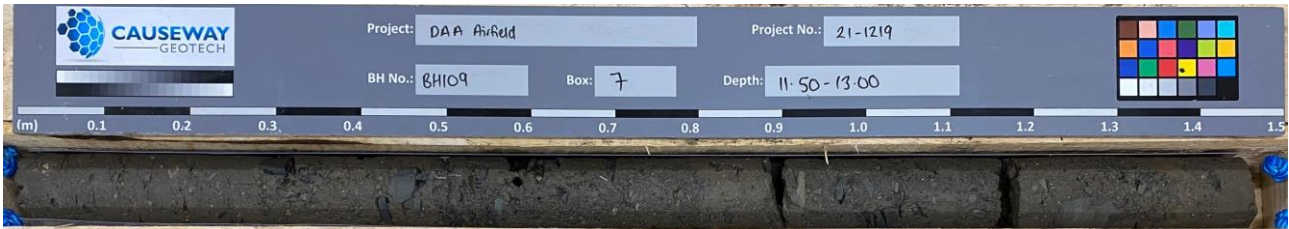
**BH109 Box 4 (7.00-8.50m)**



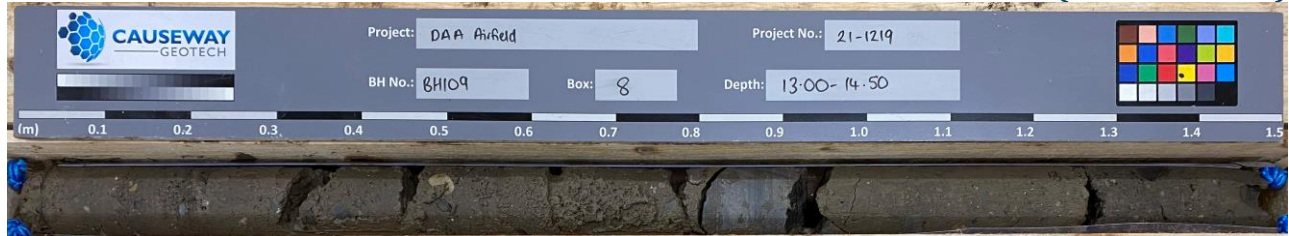
**BH109 Box 5 (8.50-10.00m)**



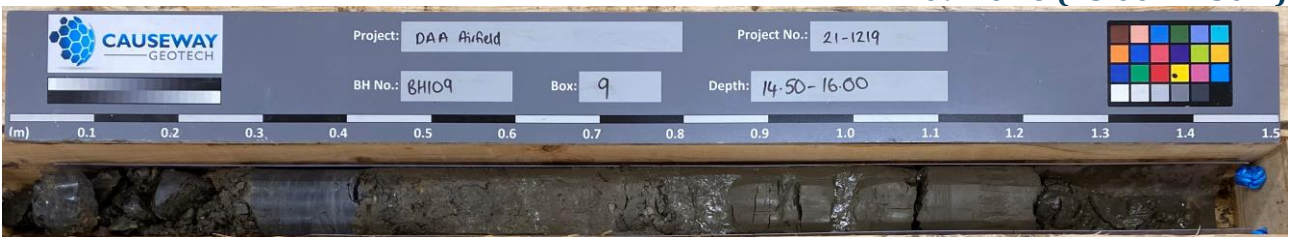
**BH109 Box 6 (10.00-11.50m)**



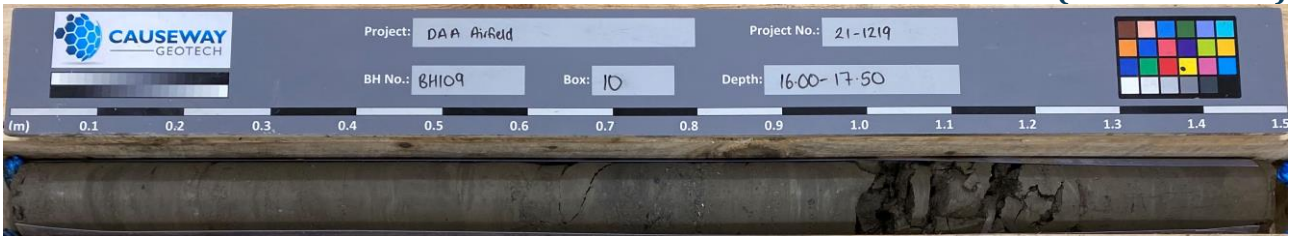
**BH109 Box 7 (11.50-13.00m)**



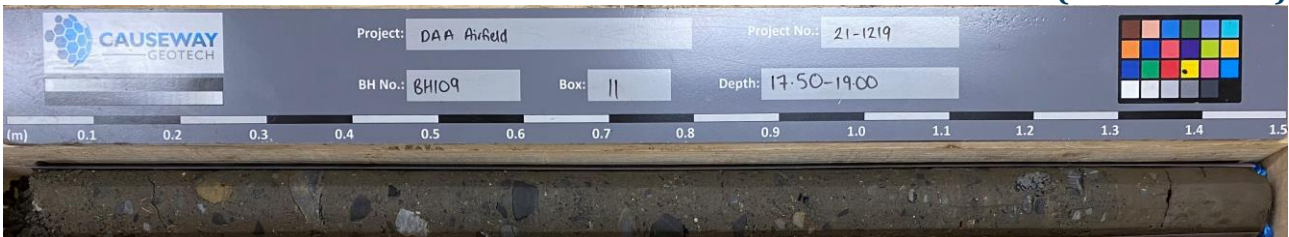
**BH109 Box 8 (13.00-14.50m)**



**BH109 Box 9 (14.50-16.00m)**



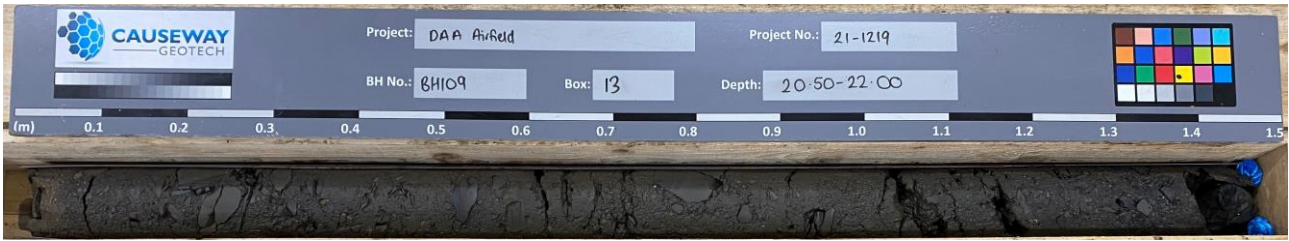
**BH109 Box 10 (16.00-17.50m)**



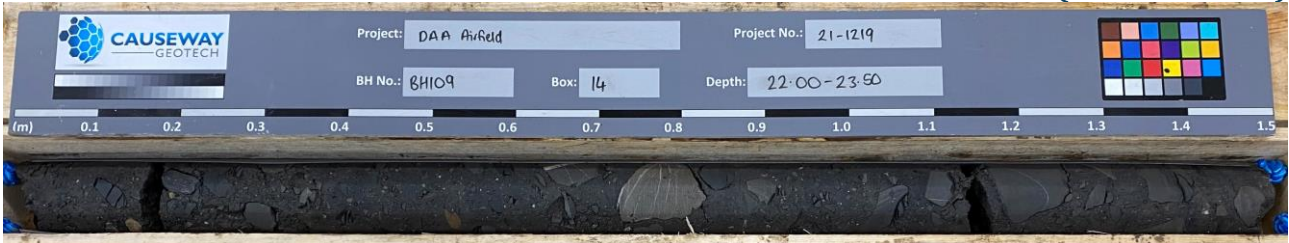
**BH109 Box 11 (17.50-19.00m)**



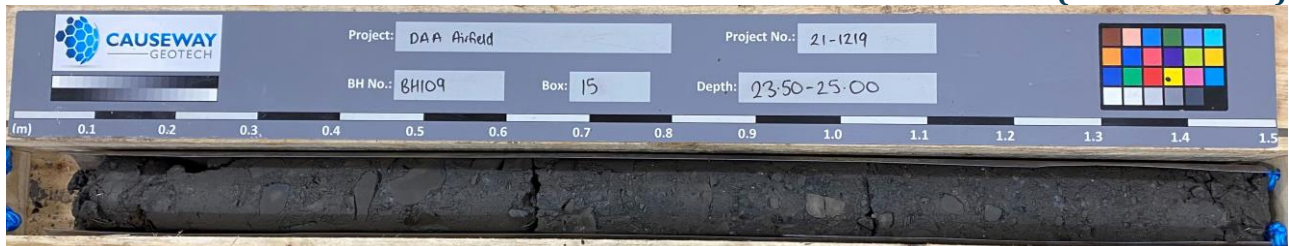
**BH109 Box 12 (19.00-20.50m)**



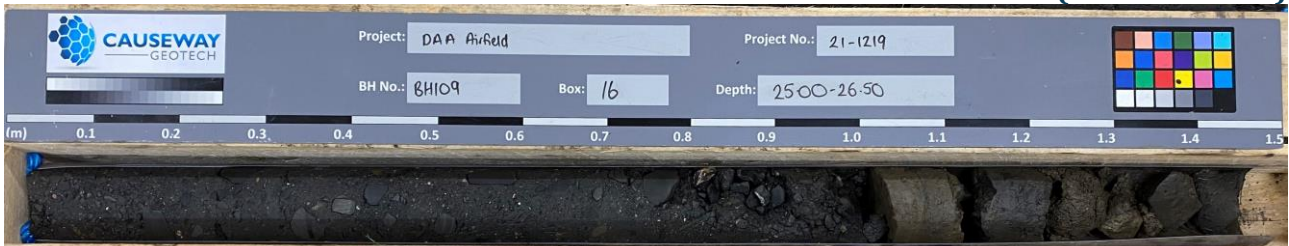
BH109 Box 13 (20.50-22.00m)



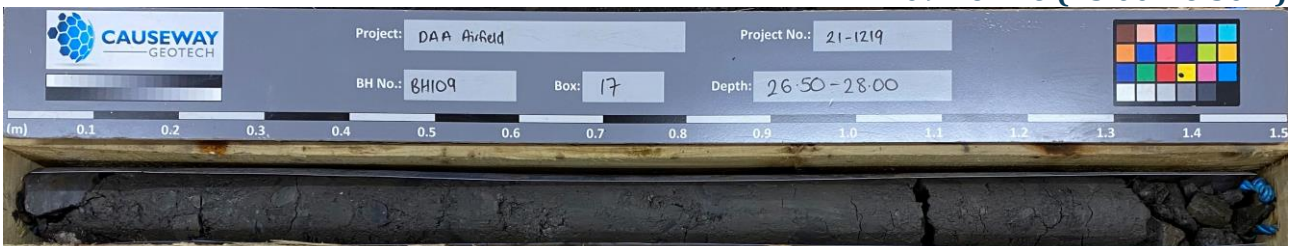
BH109 Box 14 (22.00-23.50m)



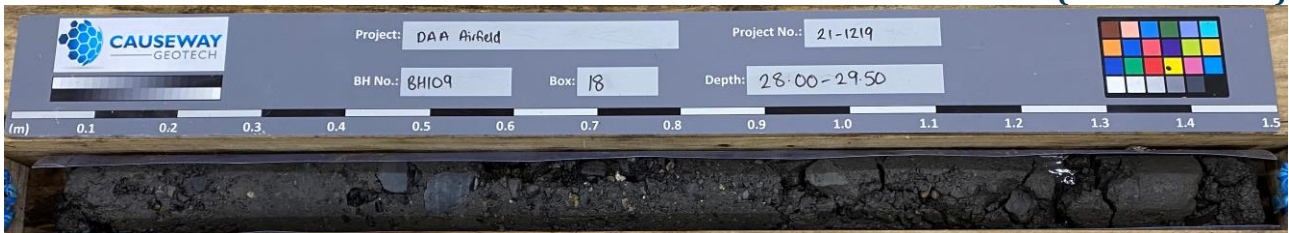
BH109 Box 15 (23.50-25.00m)



BH109 Box 16 (25.00-26.50m)



BH109 Box 17 (26.50-28.00m)

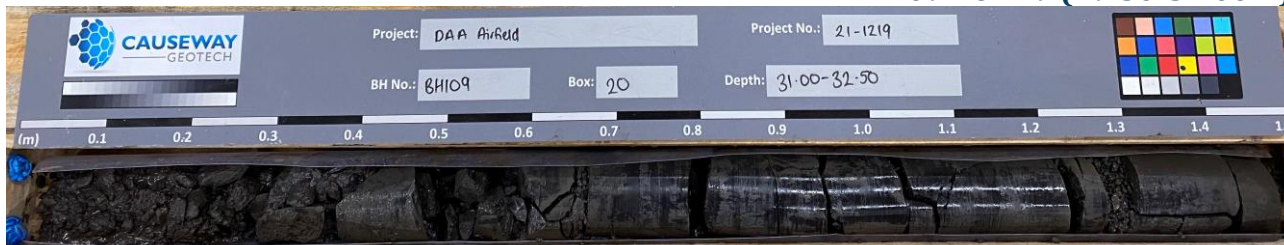


BH109 Box 18 (28.00-29.50m)

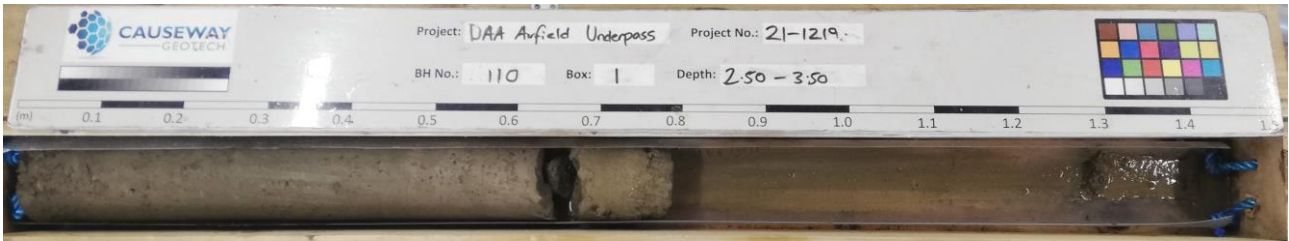




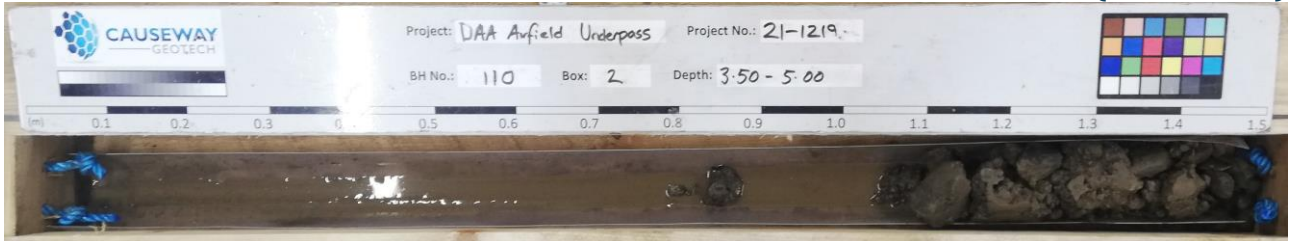
**BH109 Box 19 (29.50-31.00m)**



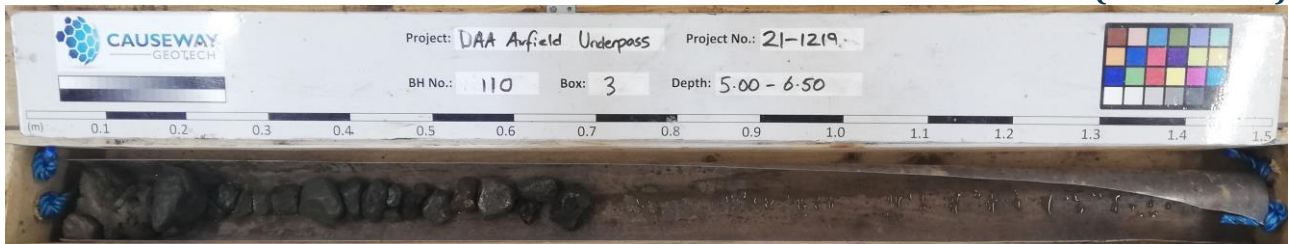
**BH109 Box 20 (31.00-32.50m)**



**BH110 Box 1 (2.50-3.50m)**



**BH110 Box 2 (3.50-5.00m)**



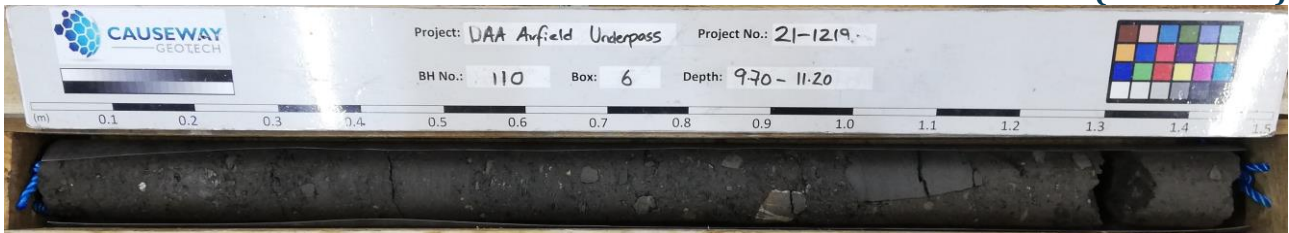
**BH110 Box 3 (5.00-6.50m)**



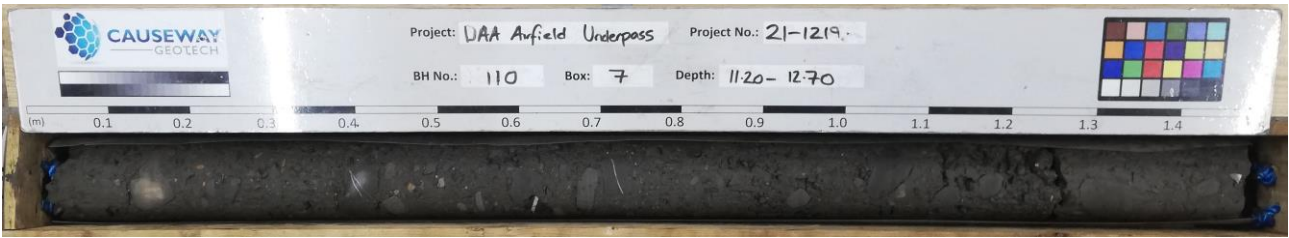
**BH110 Box 4 (7.20-8.20m)**



**BH110 Box 5 (8.20-9.70m)**



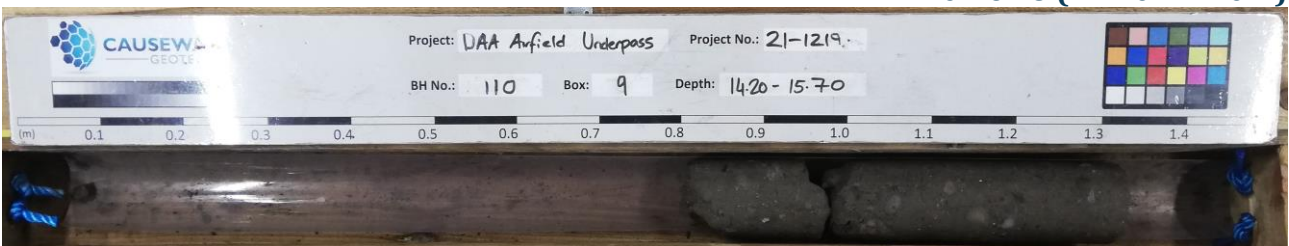
**BH110 Box 6 (9.70-11.20m)**



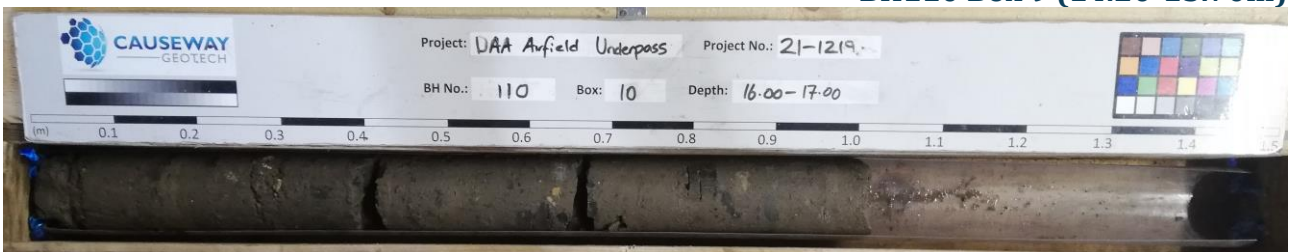
**BH110 Box 7 (11.20-12.70m)**



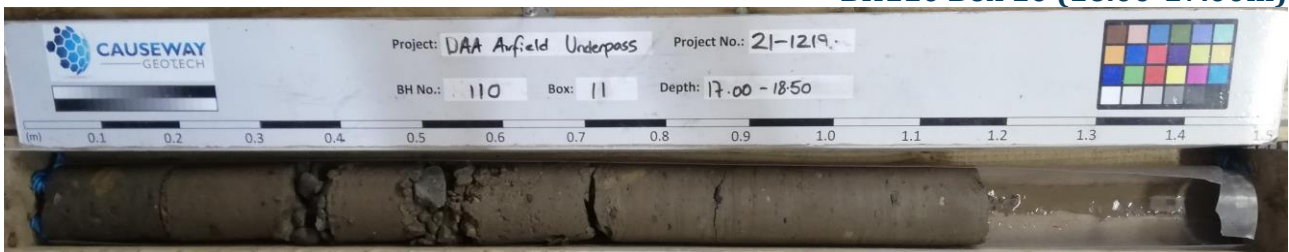
**BH110 Box 8 (12.70-14.20m)**



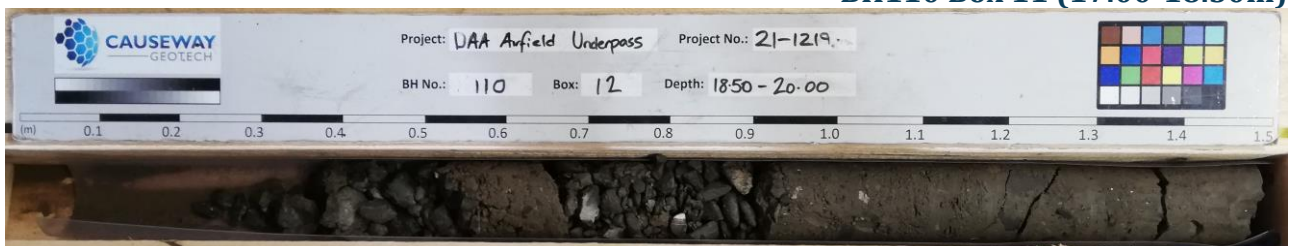
**BH110 Box 9 (14.20-15.70m)**



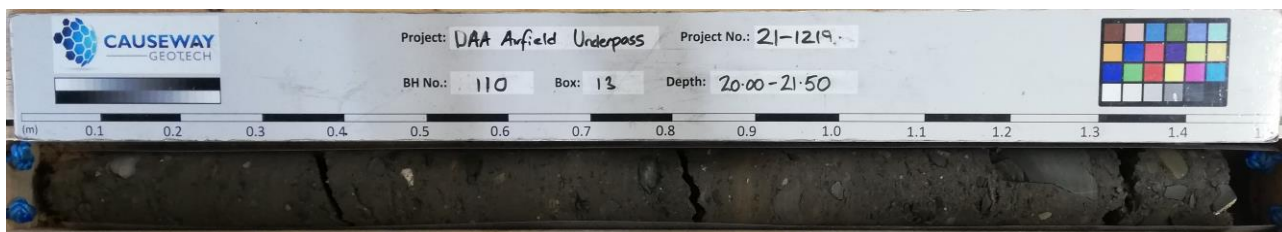
**BH110 Box 10 (16.00-17.00m)**



**BH110 Box 11 (17.00-18.50m)**



**BH110 Box 12 (18.50-20.00m)**



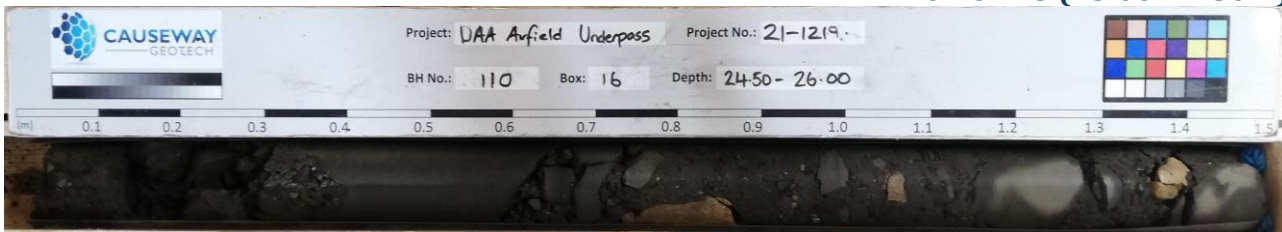
**BH110 Box 13 (20.00-21.50m)**



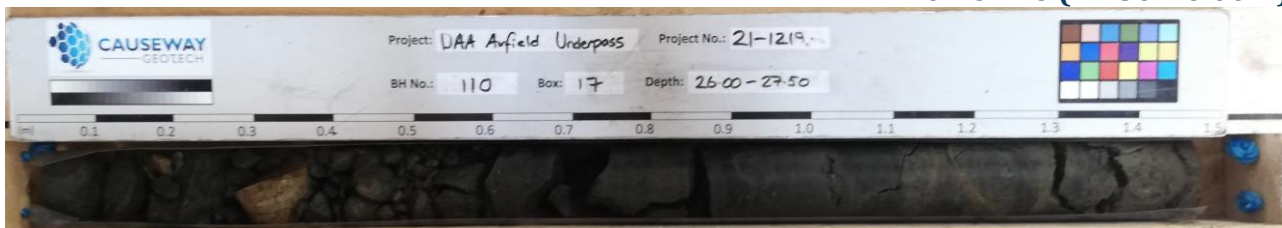
**BH110 Box 14 (21.50-23.00m)**



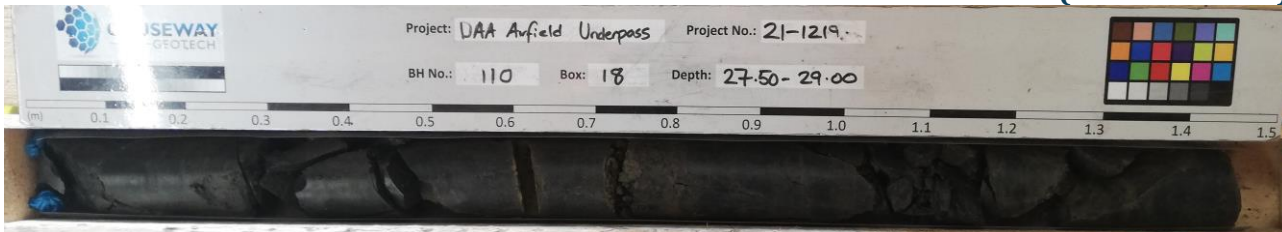
**BH110 Box 15 (23.00-24.50m)**



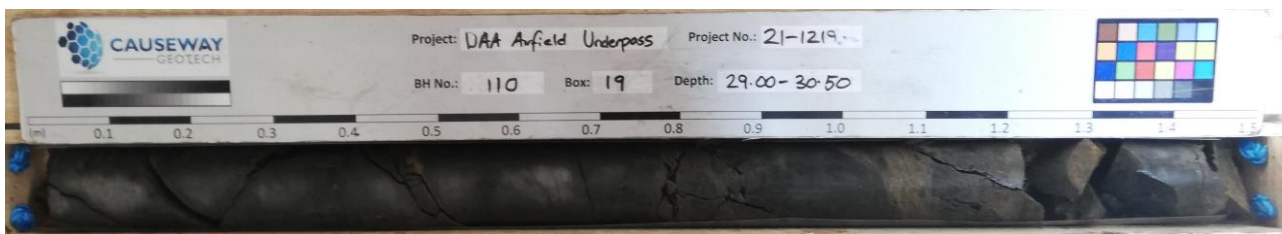
**BH110 Box 16 (24.50-26.00m)**



**BH110 Box 17 (26.00-27.50m)**



**BH110 Box 18 (27.50-29.00m)**



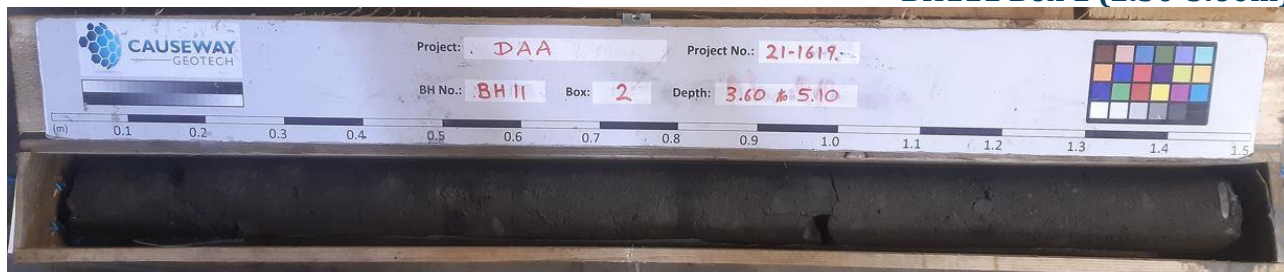
**BH110 Box 19 (29.00-30.50m)**



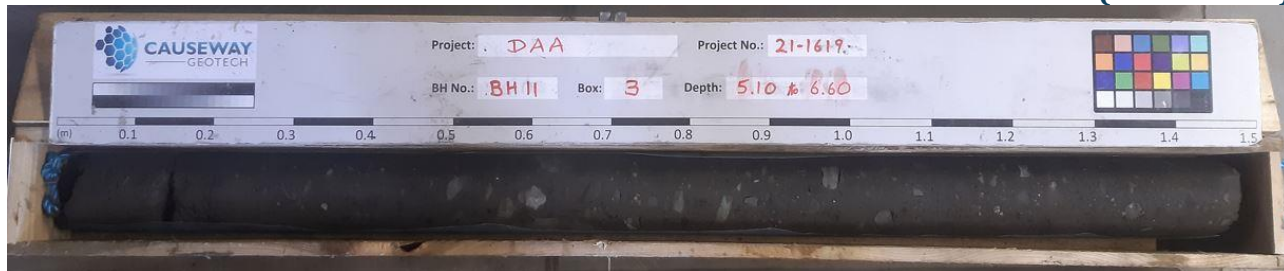
**BH110 Box 20 (30.50-32.00m)**



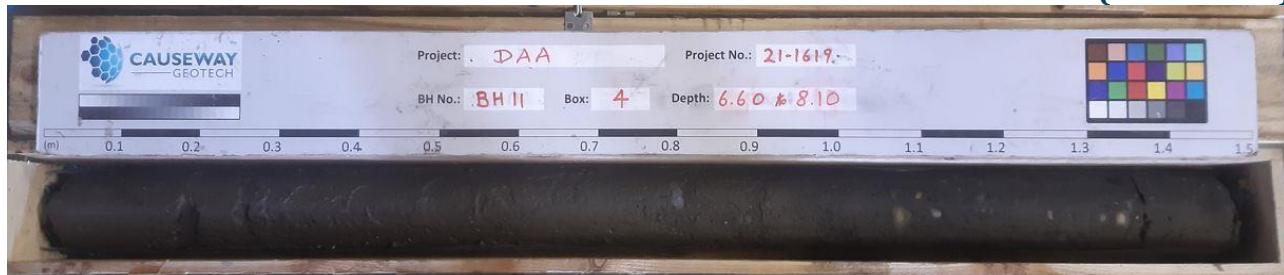
**BH111 Box 1 (2.50-3.60m)**



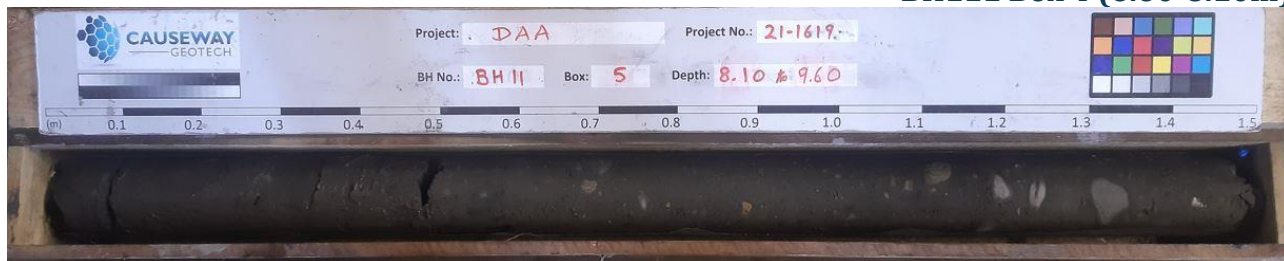
**BH111 Box 2 (3.60-5.10m)**



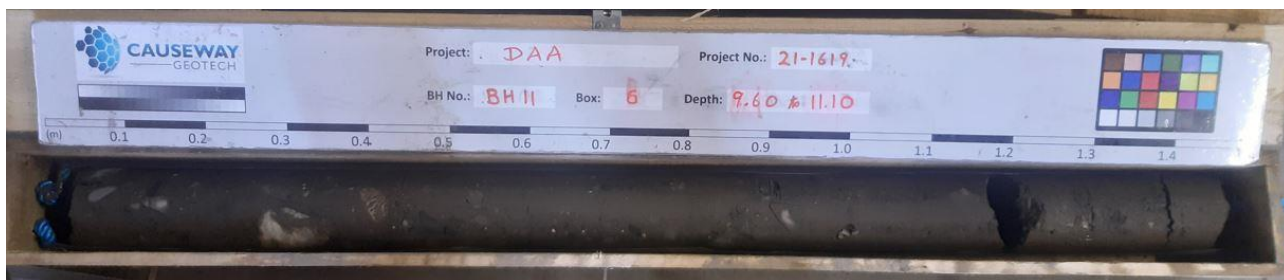
**BH111 Box 3 (5.10-6.60m)**



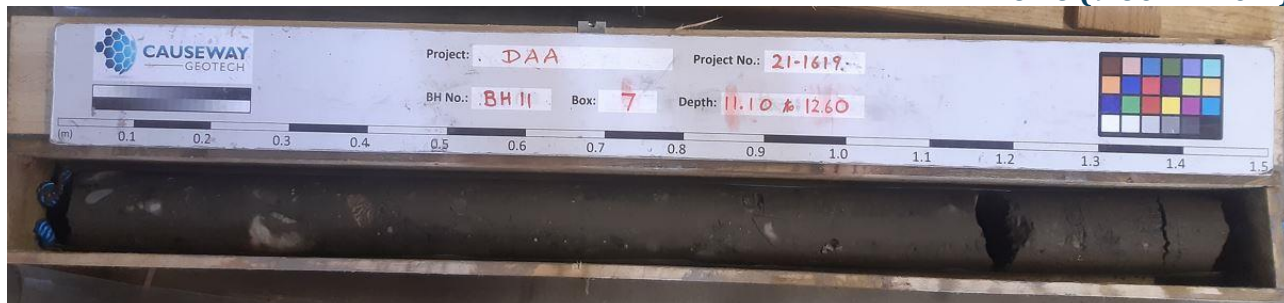
**BH111 Box 4 (6.60-8.10m)**



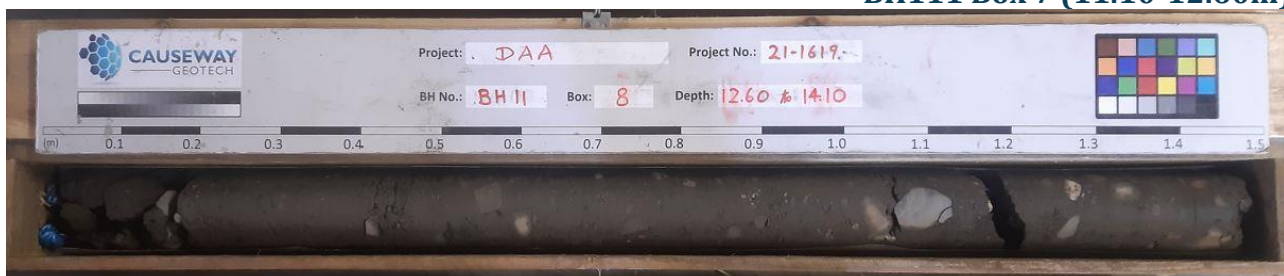
**BH111 Box 5 (8.10-9.60m)**



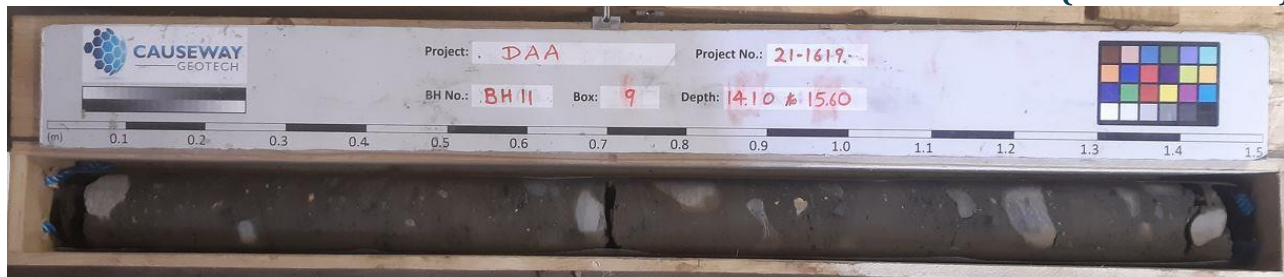
**BH111 Box 6 (9.60-11.10m)**



**BH111 Box 7 (11.10-12.60m)**



**BH111 Box 8 (12.60-14.10m)**



**BH111 Box 9 (14.10-15.60m)**

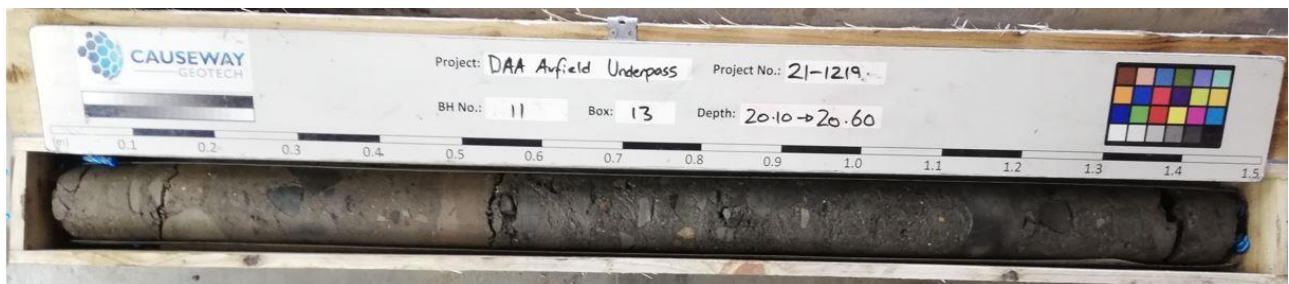


**BH111 Box 10 (15.60-17.10m)**



BH111 Box 11 (17.10-18.60m)

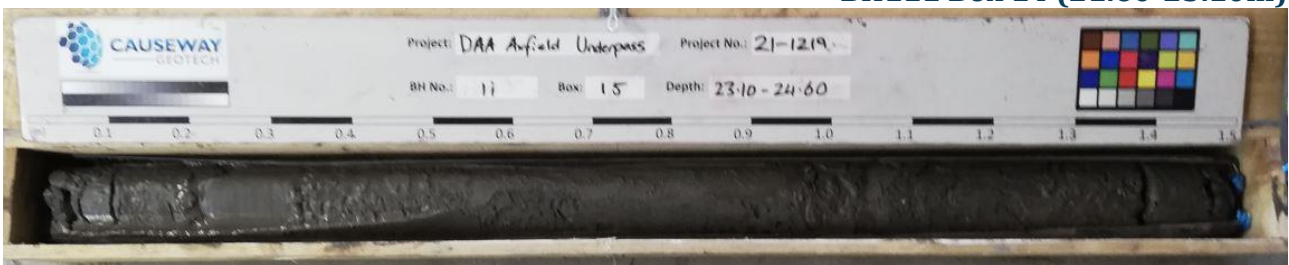
BH111 Box 12 (18.60-20.10m)



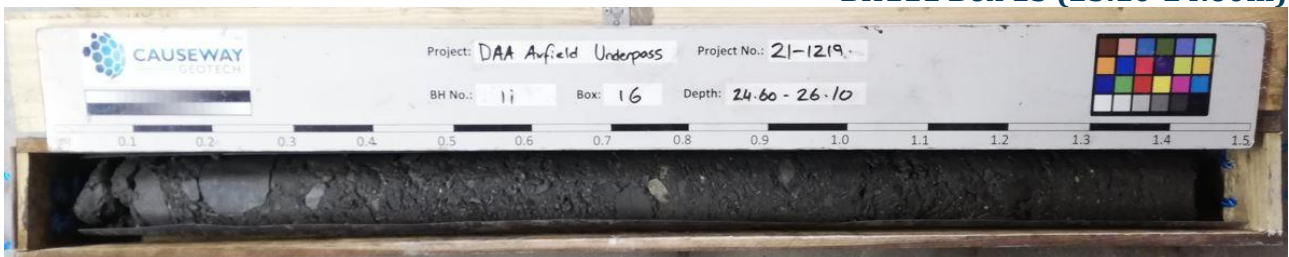
BH111 Box 13 (20.10-21.60m)



BH111 Box 14 (21.60-23.10m)



BH111 Box 15 (23.10-24.60m)

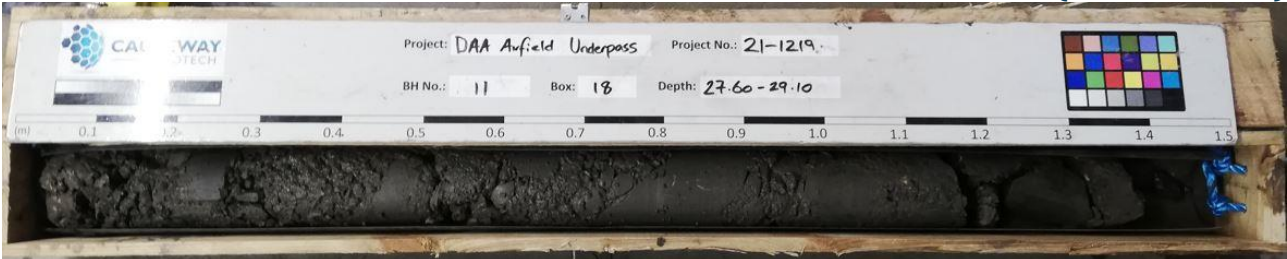


BH111 Box 16 (24.60-26.10m)





**BH111 Box 17 (26.10-27.60m)**



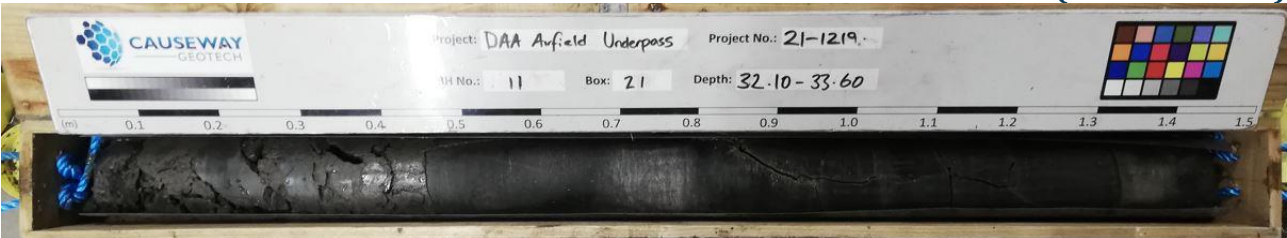
**BH111 Box 18 (27.60-29.10m)**



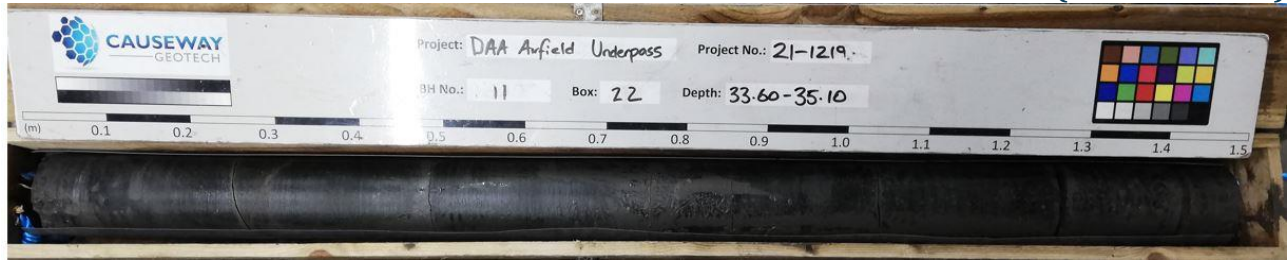
**BH111 Box 19 (29.10-30.60m)**



**BH111 Box 20 (30.60-32.10m)**



**BH111 Box 21 (32.10-33.60m)**



**BH111 Box 22 (33.60-35.10m)**



**CAUSEWAY**  
— GEOTECH

**APPENDIX D**  
**PUMP TEST DATA**  
**(PROVIDED ELECTRONICALLY TO THE CLIENT)**

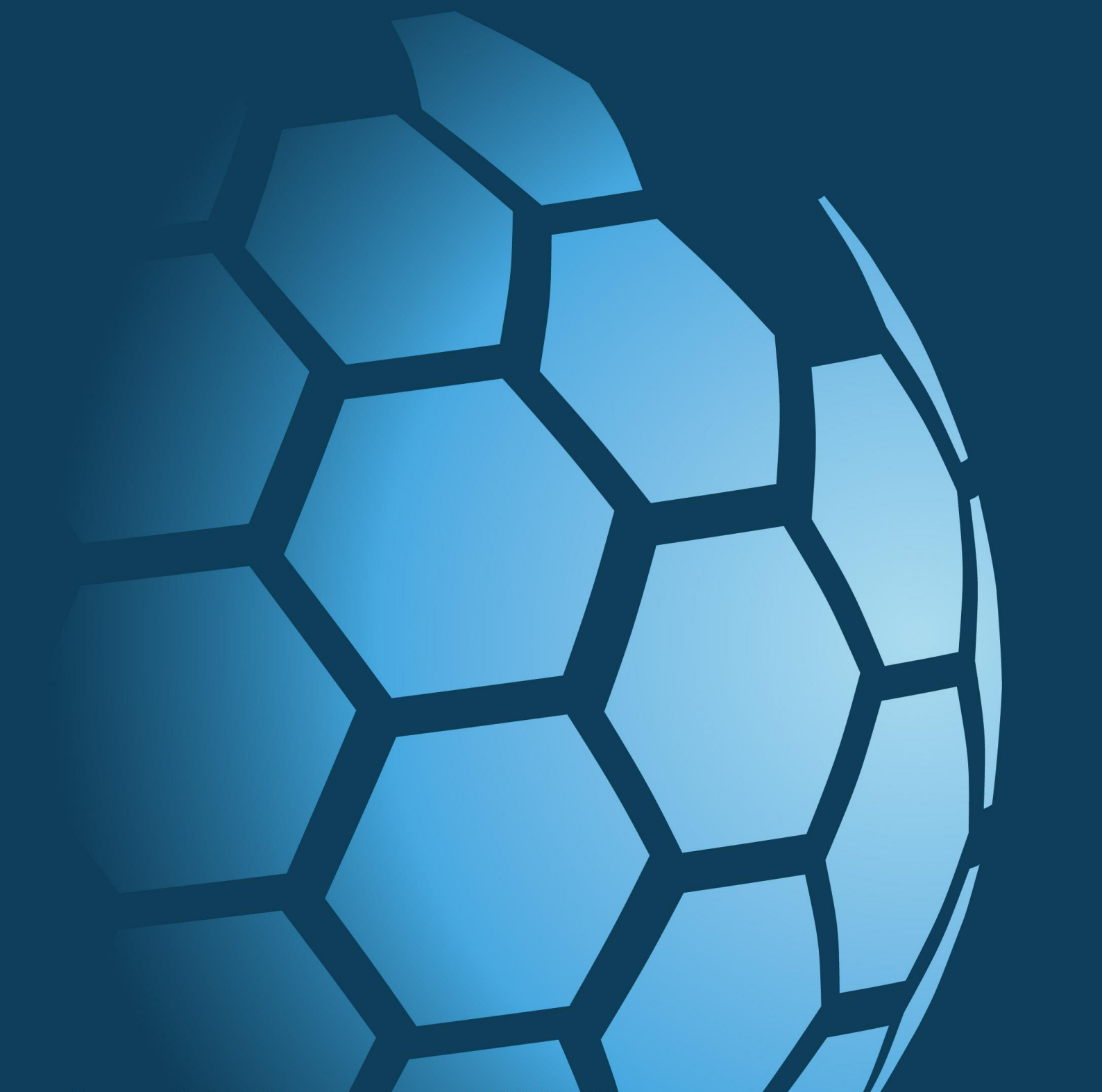




**CAUSEWAY**  
— GEOTECH

**APPENDIX E**

**GEOTECHNICAL LABORATORY TEST RESULTS**





**CAUSEWAY**  
GEOTECH

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Registered in Ireland.  
Company Number: 633786

[www.causewaygeotech.com](http://www.causewaygeotech.com)

**SOIL AND ROCK SAMPLE ANALYSIS  
LABORATORY TEST REPORT**

12 May 2022

<b>Project Name:</b>	DAA Airfield Underpass Ground Investigation
<b>Project No.:</b>	21-1219
<b>Client:</b>	DAA
<b>Engineer:</b>	Ramboll Consulting Engineers

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 10/04/2022 and 12/05/2022.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



**Project Name:** DAA Airfield Underpass Ground Investigation

**Report Reference:** Schedule 1 - FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received

Tests marked with\* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	8
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	8
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	8
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	15
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	8
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	2
SOIL	California Bearing Ratio (CBR)	BS 1377-4: 1990: Cl 7	2
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	1
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	6
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	10
ROCK	Uniaxial Compressive Strength (UCS)*	ISRM Suggested Methods -Rock Characterization Testing and Monitoring, Ed. E T Brown - 1981	2

## SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL – subcontracted to Pro Soils Limited ( <i>UKAS 4043</i> )	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	3
	Extra over days (more than initial 4 days)		0
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	Organic Matter Content		4
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	BRE Test - Suite C		3
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	BRE Test - Suite D		3



## Summary of Classification Test Results

Project No. 21-1219	Project Name DAA Airfield Underpass Ground Investigation
------------------------	---

Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		bulk	dry							
BH101	1	4.60	4.85	B	Brown sandy gravelly silty CLAY with cobbles.	1.85	1.66	4.8	68	24 -1pt	15	9		CL
BH101	2	8.50	8.80	B	Brown sandy gravelly silty CLAY	2.48	2.28	7.0	76	28 -1pt	13	15		CL
BH101	5	19.10	19.50	B	Brown sandy slightly gravelly silty CLAY	2.08	1.72	21.0	76	26 -1pt	16	10		CL
BH110	1	2.50	3.50	B	Brown sandy slightly gravelly silty CLAY	2.03	1.61	26.0	81	38 -1pt	19	19		CI
BH110	2	8.20	8.55	B	Brown sandy gravelly silty CLAY	2.29	2.07	11.0	64	29 -1pt	14	15		CL
BH110	4	16.25	16.55	B	Brown sandy gravelly silty CLAY	2.26	2.06	9.4	77	28 -1pt	14	14		CL
BH111	1	2.50	3.50	B	Brown sandy gravelly silty CLAY	2.13	1.96	7.1	73	28 -1pt	14	14		CL
BH111	2	6.25	6.60	B	Brown sandy gravelly silty CLAY	2.32	2.15	2.3	58	28 -1pt	15	13		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise
LAB 01R Version 5

<b>Key</b>  Density test                      Liquid Limit                      Particle density  Linear measurement unless :    4pt cone unless :                      sp - small pyknometer  wd - water displacement        cas - Casagrande method        gj - gas jar  wi - immersion in water        1pt - single point test	Date Printed  05/05/2022 00:00	Approved By  Stephen.Watson	 10122
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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH101**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **1**

Soil Description **Brown sandy gravelly silty CLAY with cobbles.**

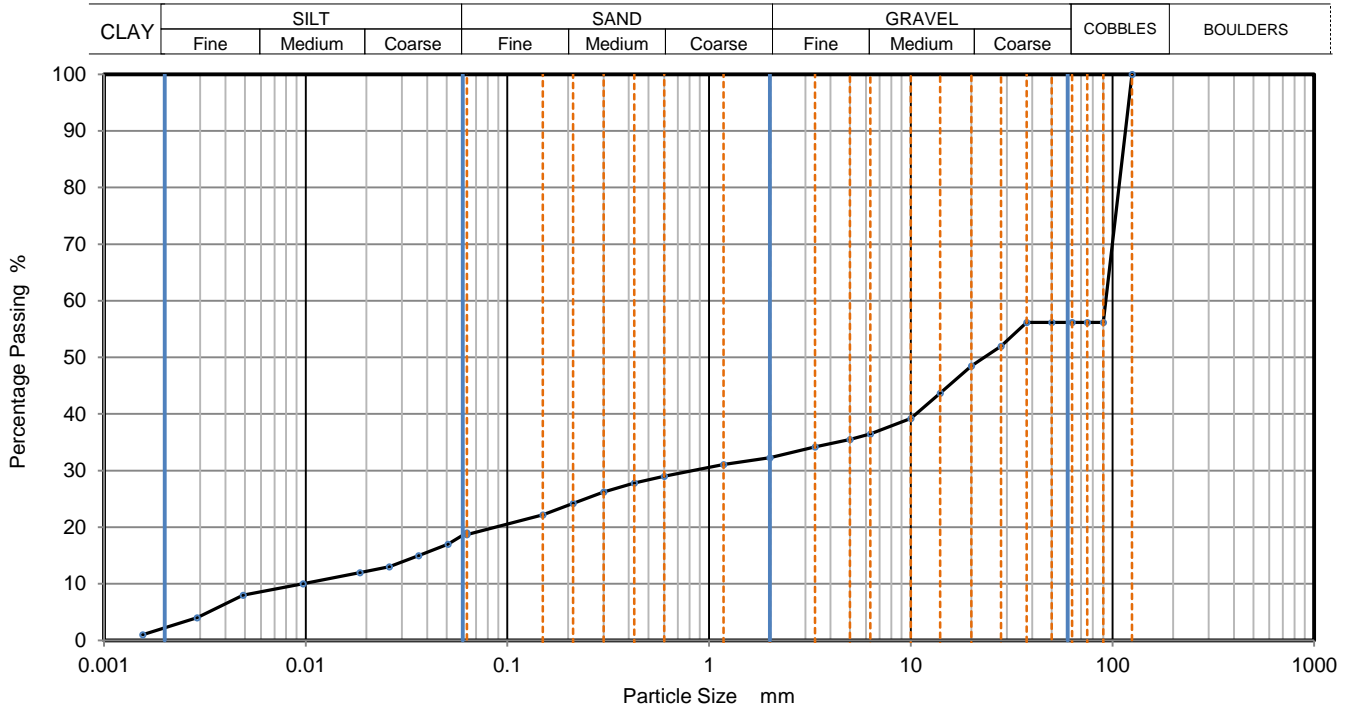
Depth, m **4.60**

Specimen Reference **8** Specimen Depth **4.6** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202204067**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	19
90	56	0.05065	17
75	56	0.03625	15
63	56	0.02594	13
50	56	0.01855	12
37.5	56	0.00969	10
28	52	0.00490	8
20	49	0.00289	4
14	44	0.00155	1
10	39		
6.3	37		
5	36		
3.35	34		
2	32		
1.18	31		
0.6	29	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	28		
0.3	26		
0.212	24		
0.15	22		
0.063	19		

Dry Mass of sample, g

**5844**

Sample Proportions	% dry mass
Cobbles	43.8
Gravel	23.9
Sand	13.6
Silt	16.4
Clay	2.3

Grading Analysis		
D100	mm	125
D60	mm	92.6
D30	mm	0.822
D10	mm	0.0104
Uniformity Coefficient		8900
Curvature Coefficient		0.7

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122





## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH101**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Brown sandy gravelly silty CLAY**

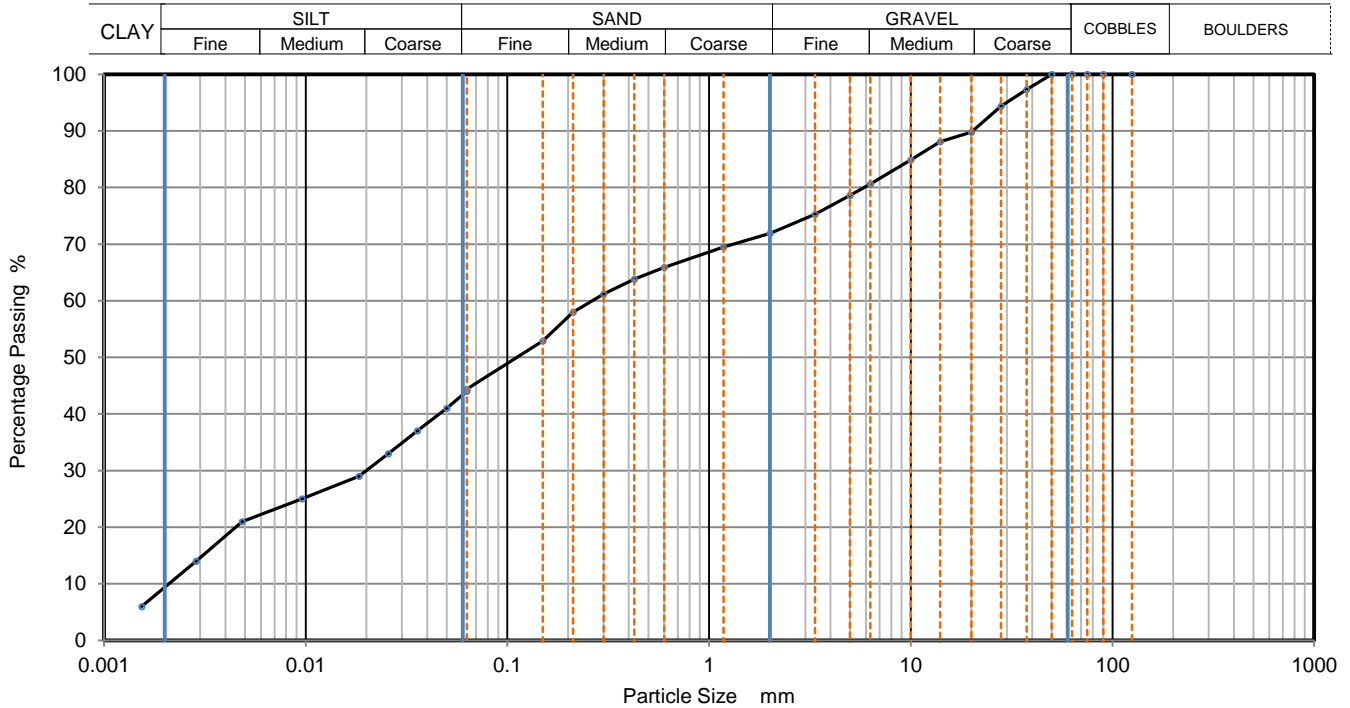
Depth, m **8.50**

Specimen Reference **10** Specimen Depth **8.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202204068**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.05002	41
75	100	0.03581	37
63	100	0.02563	33
50	100	0.01834	29
37.5	97	0.00958	25
28	94	0.00485	21
20	90	0.00286	14
14	88	0.00154	6
10	85		
6.3	81		
5	79		
3.35	75		
2	72		
1.18	70		
0.6	66	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	64		
0.3	61		
0.212	58		
0.15	53		
0.063	44		

Dry Mass of sample, g

**6149**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	28.1
Sand	27.6
Silt	35.2
Clay	9.1

Grading Analysis		
D100	mm	
D60	mm	0.263
D30	mm	0.0201
D10	mm	0.00216
Uniformity Coefficient		120
Curvature Coefficient		0.71

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

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10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH101**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Brown sandy gravelly silty CLAY**

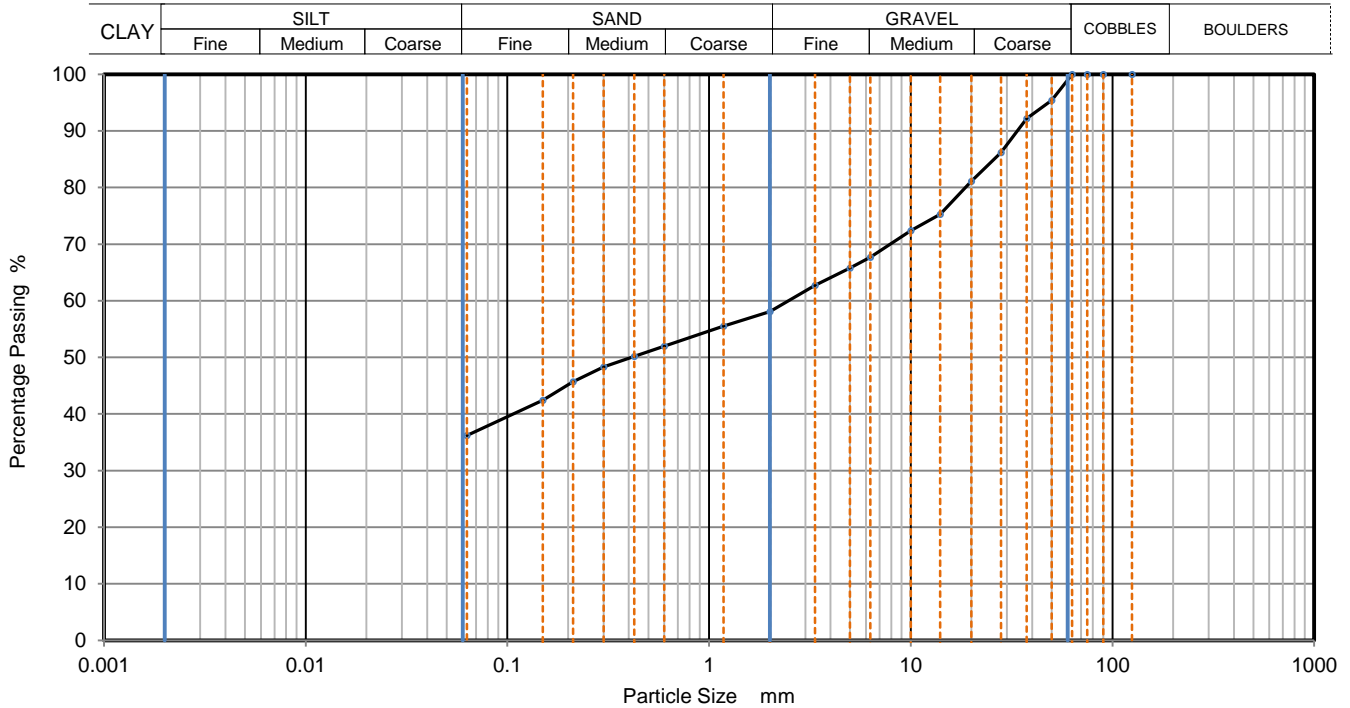
Depth, m **11.90**

Specimen Reference **2** Specimen Depth **11.9** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040610**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	95		
37.5	92		
28	86		
20	81		
14	75		
10	72		
6.3	68		
5	66		
3.35	63		
2	58		
1.18	56		
0.6	52		
0.425	50		
0.3	48		
0.212	46		
0.15	42		
0.063	36		

Dry Mass of sample, g 5062

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	41.9
Sand	22.0
Fines <0.063mm	36.0

Grading Analysis	
D100	mm
D60	mm 2.47
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH101**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Brown sandy gravelly silty CLAY**

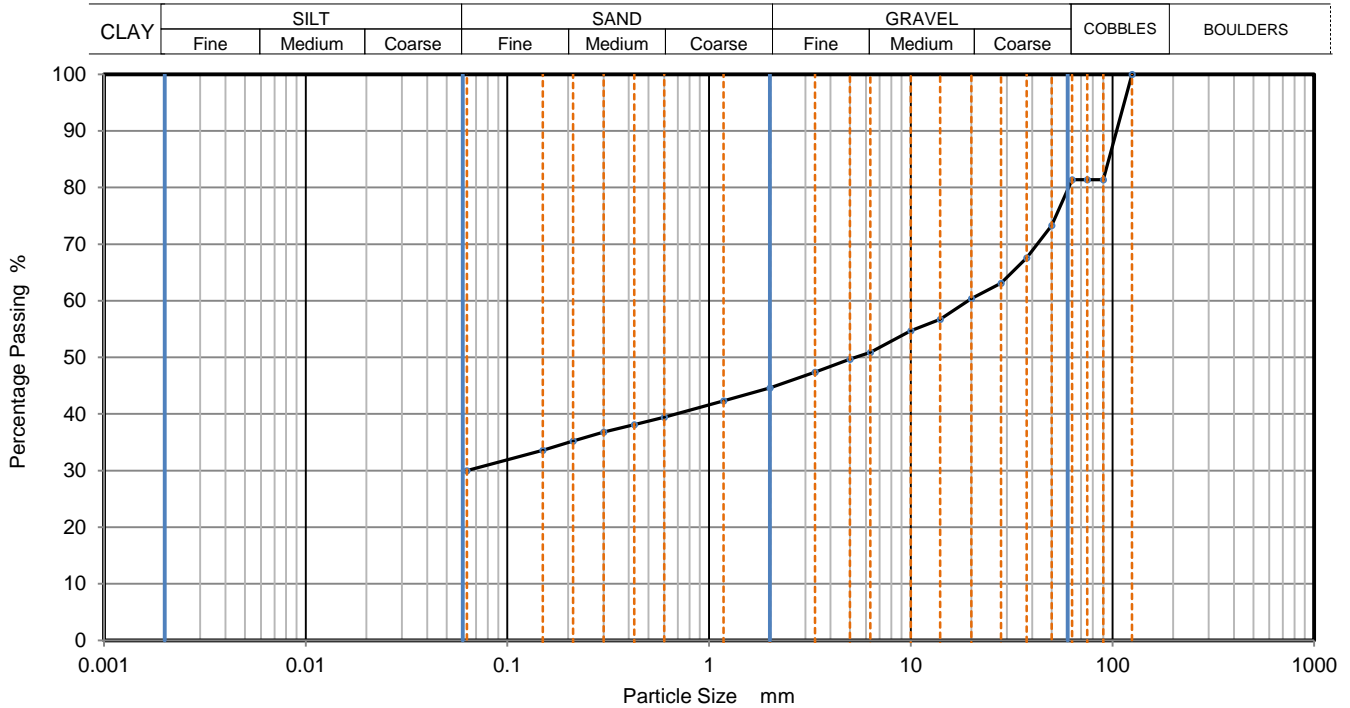
Depth, m **15.00**

Specimen Reference **2** Specimen Depth **15** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040611**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	81		
75	81		
63	81		
50	73		
37.5	68		
28	63		
20	60		
14	57		
10	55		
6.3	51		
5	50		
3.35	47		
2	45		
1.18	42		
0.6	39		
0.425	38		
0.3	37		
0.212	35		
0.15	34		
0.063	30		

Dry Mass of sample, g 7813

Sample Proportions	% dry mass
Cobbles	18.6
Gravel	36.8
Sand	14.6
Fines <0.063mm	30.0

Grading Analysis		
D100	mm	125
D60	mm	19.3
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH101**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Brown sandy slightly gravelly silty CLAY**

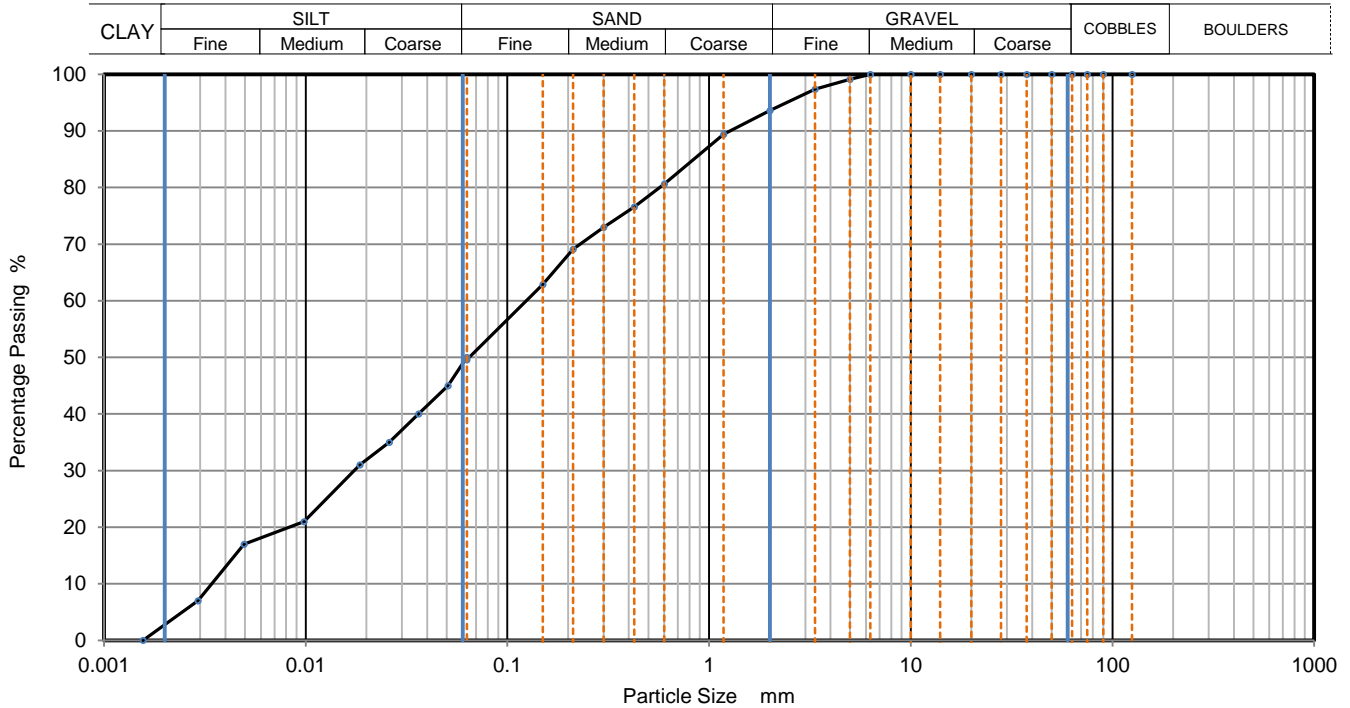
Depth, m **19.10**

Specimen Reference **8** Specimen Depth **19.1** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022040613**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	50
90	100	0.05065	45
75	100	0.03625	40
63	100	0.02594	35
50	100	0.01855	31
37.5	100	0.00980	21
28	100	0.00495	17
20	100	0.00292	7
14	100	0.00156	0
10	100		
6.3	100		
5	99		
3.35	97		
2	94		
1.18	89		
0.6	81	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	77		
0.3	73		
0.212	69		
0.15	63		
0.063	50		

Dry Mass of sample, g

**209**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	6.4
Sand	44.0
Silt	46.8
Clay	2.8

Grading Analysis		
D100	mm	
D60	mm	0.124
D30	mm	0.0177
D10	mm	0.00344
Uniformity Coefficient		36
Curvature Coefficient		0.74

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

LAB 05R - Version 5



10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH110**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **1**

Soil Description **Brown sandy slightly gravelly silty CLAY**

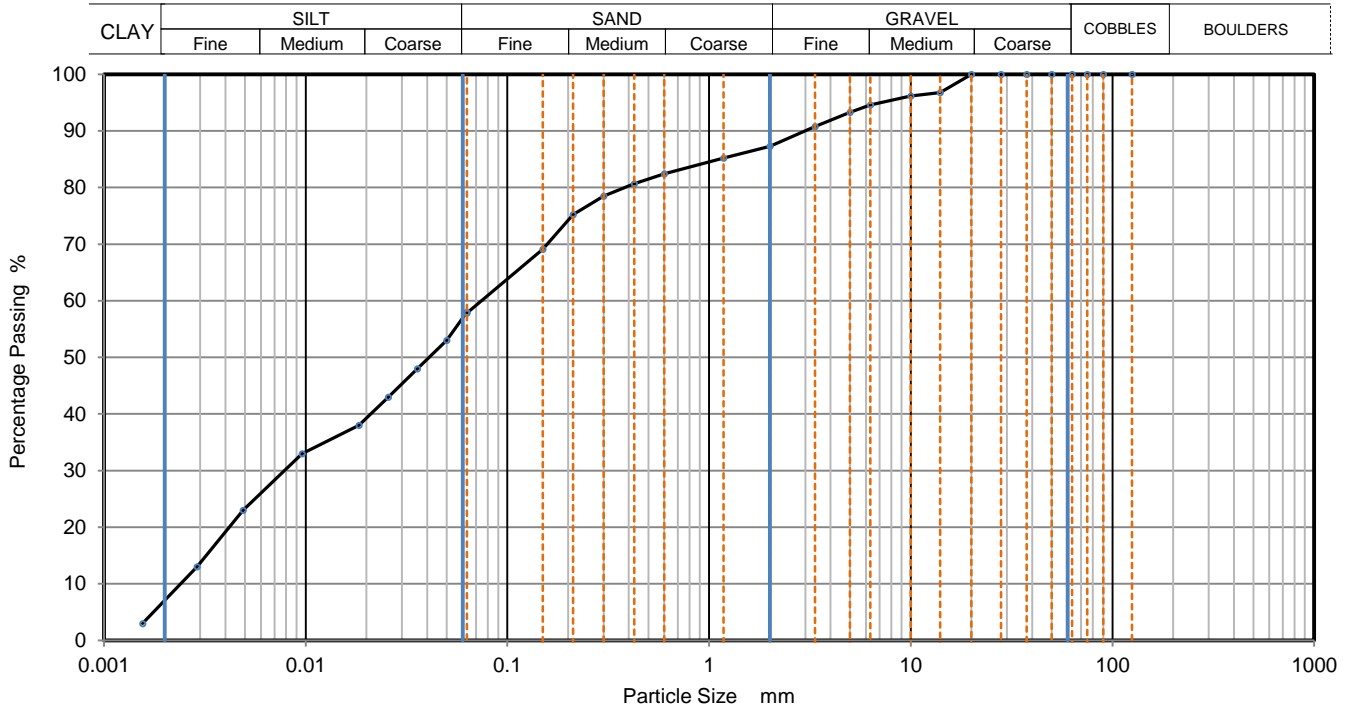
Depth, m **2.50**

Specimen Reference **10** Specimen Depth **2.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022040614**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	58
90	100	0.05002	53
75	100	0.03581	48
63	100	0.02563	43
50	100	0.01834	38
37.5	100	0.00958	33
28	100	0.00490	23
20	100	0.00289	13
14	97	0.00155	3
10	96		
6.3	95		
5	93		
3.35	91		
2	87		
1.18	85		
0.6	82	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	81		
0.3	79		
0.212	75		
0.15	69		
0.063	58		

Dry Mass of sample, g

**505**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	12.7
Sand	29.5
Silt	51.2
Clay	6.6

Grading Analysis		
D100	mm	
D60	mm	0.0748
D30	mm	0.00802
D10	mm	0.00247
Uniformity Coefficient		30
Curvature Coefficient		0.35

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH110**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Brown sandy gravelly silty CLAY**

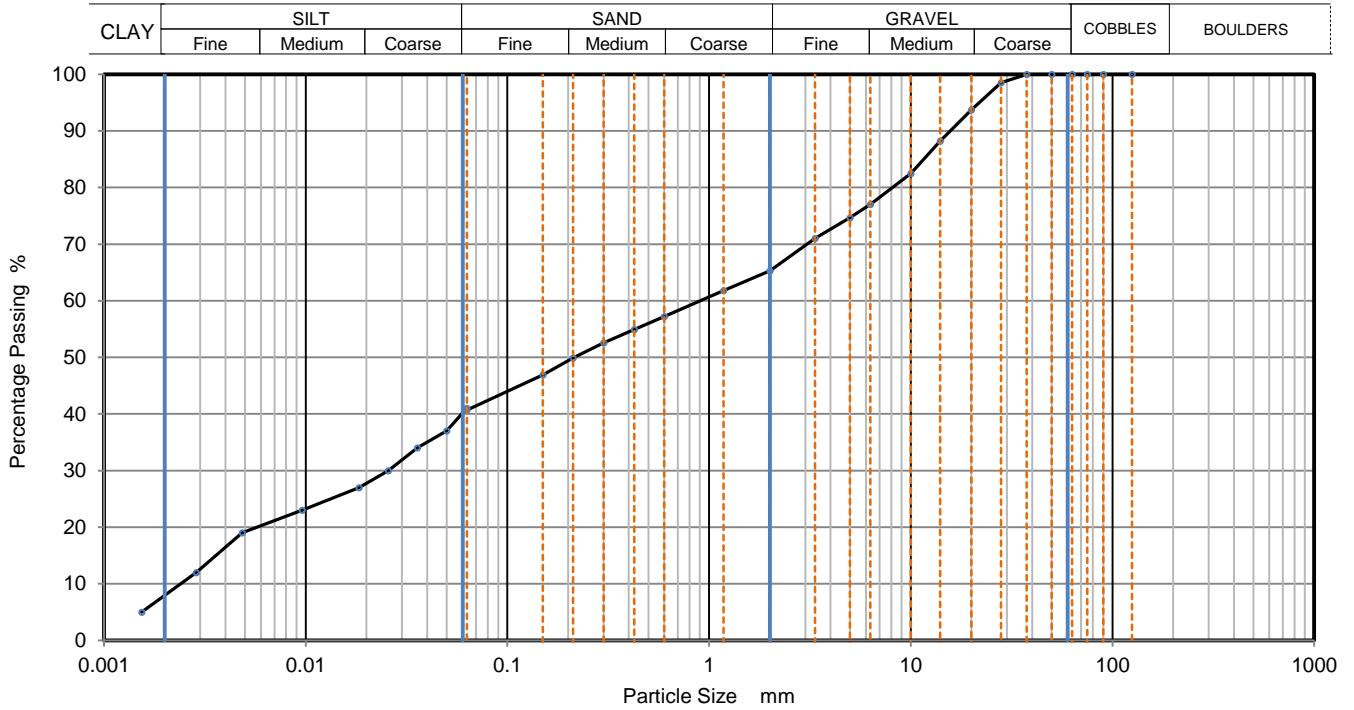
Depth, m **8.20**

Specimen Reference **8** Specimen Depth **8.2** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022040616**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	41
90	100	0.05002	37
75	100	0.03581	34
63	100	0.02563	30
50	100	0.01834	27
37.5	100	0.00958	23
28	99	0.00485	19
20	94	0.00286	12
14	88	0.00154	5
10	83		
6.3	77		
5	75		
3.35	71		
2	65		
1.18	62		
0.6	57	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	55		
0.3	53		
0.212	50		
0.15	47		
0.063	41		

Dry Mass of sample, g

**4719**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	34.7
Sand	24.6
Silt	32.4
Clay	8.3

Grading Analysis		
D100	mm	
D60	mm	0.909
D30	mm	0.0254
D10	mm	0.00232
Uniformity Coefficient		390
Curvature Coefficient		0.31

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH110**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Brown sandy gravelly silty CLAY**

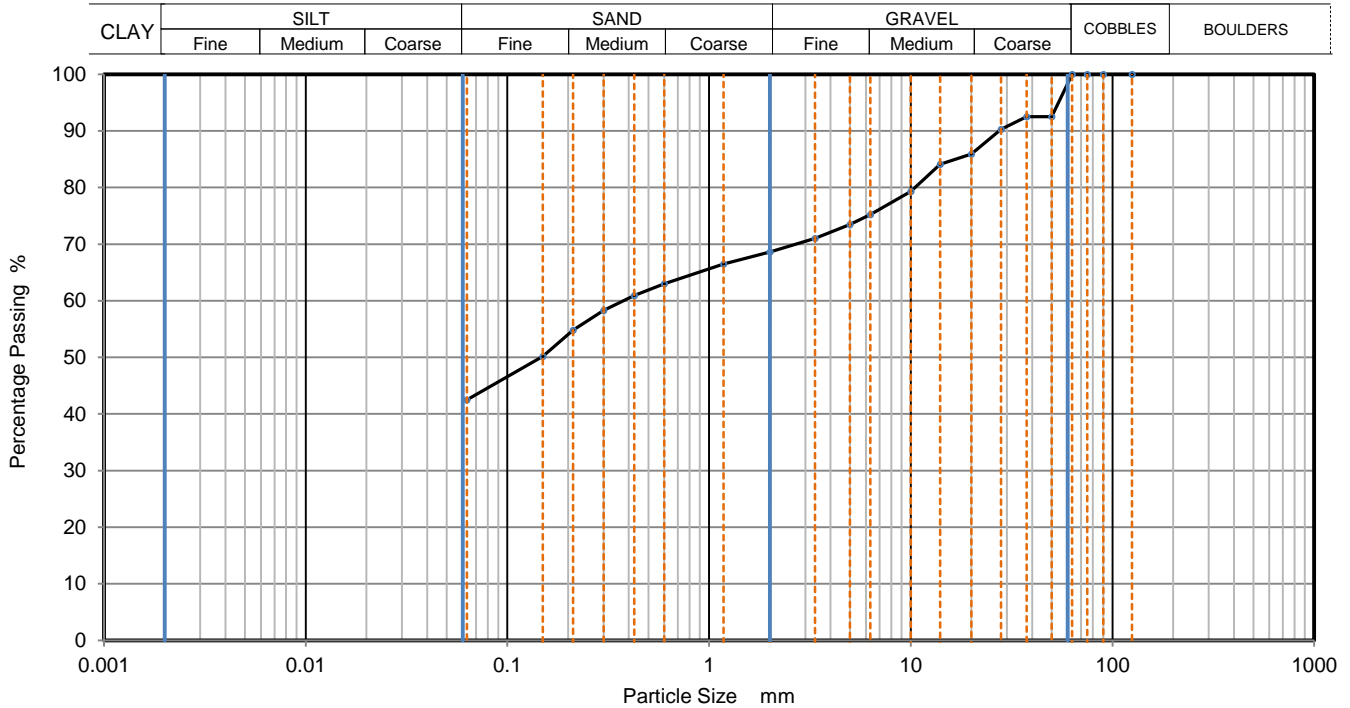
Depth, m **11.50**

Specimen Reference **2** Specimen Depth **11.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040617**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	93		
37.5	93		
28	90		
20	86		
14	84		
10	79		
6.3	75		
5	74		
3.35	71		
2	69		
1.18	67		
0.6	63		
0.425	61		
0.3	58		
0.212	55		
0.15	50		
0.063	43		

Dry Mass of sample, g 6128

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	31.4
Sand	26.1
Fines <0.063mm	42.0

Grading Analysis		
D100	mm	
D60	mm	0.378
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH110**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Brown sandy gravelly silty CLAY**

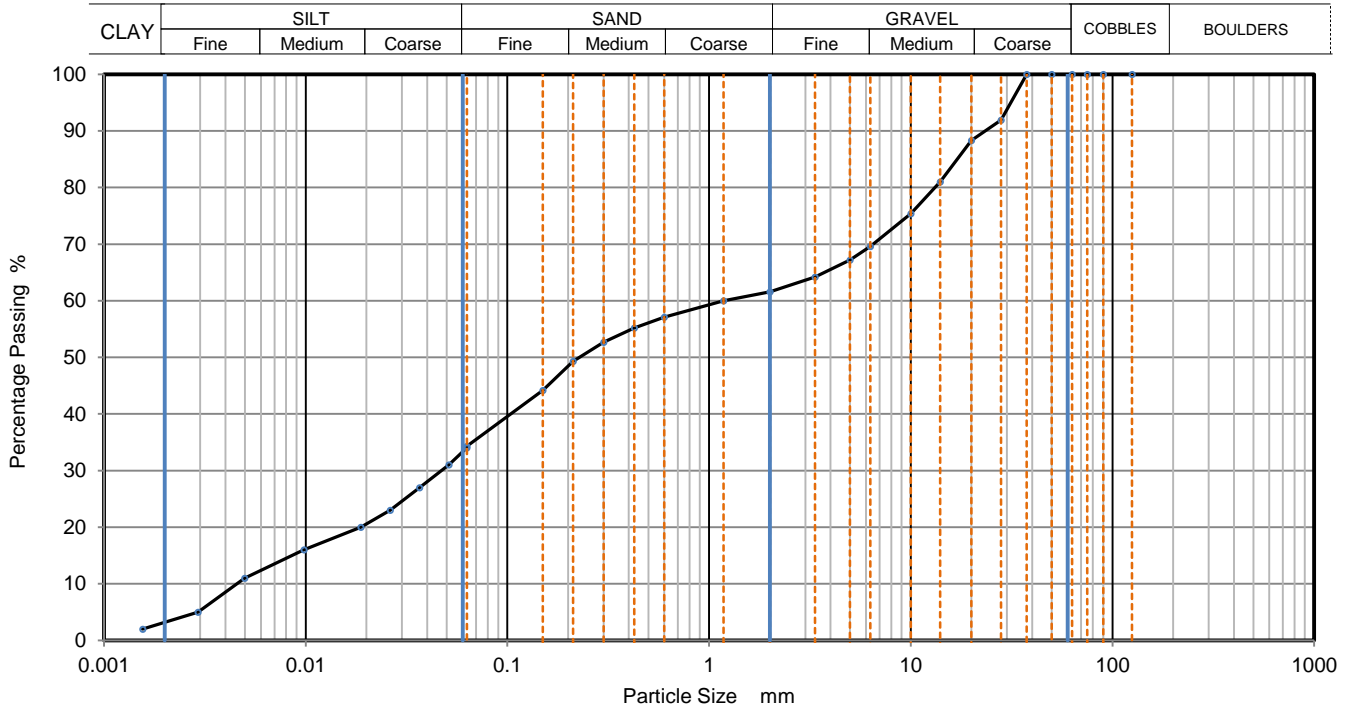
Depth, m **16.25**

Specimen Reference **8** Specimen Depth **16.25** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022040619**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	34
90	100	0.05127	31
75	100	0.03668	27
63	100	0.02624	23
50	100	0.01877	20
37.5	100	0.00980	16
28	92	0.00498	11
20	88	0.00292	5
14	81	0.00155	2
10	75		
6.3	70		
5	67		
3.35	64		
2	62		
1.18	60		
0.6	57	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	55		
0.3	53		
0.212	49		
0.15	44		
0.063	34		

Dry Mass of sample, g

**4072**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	38.4
Sand	27.3
Silt	31.0
Clay	3.3

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	260
Curvature Coefficient	0.43

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122





# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH110**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Brown sandy gravelly silty CLAY**

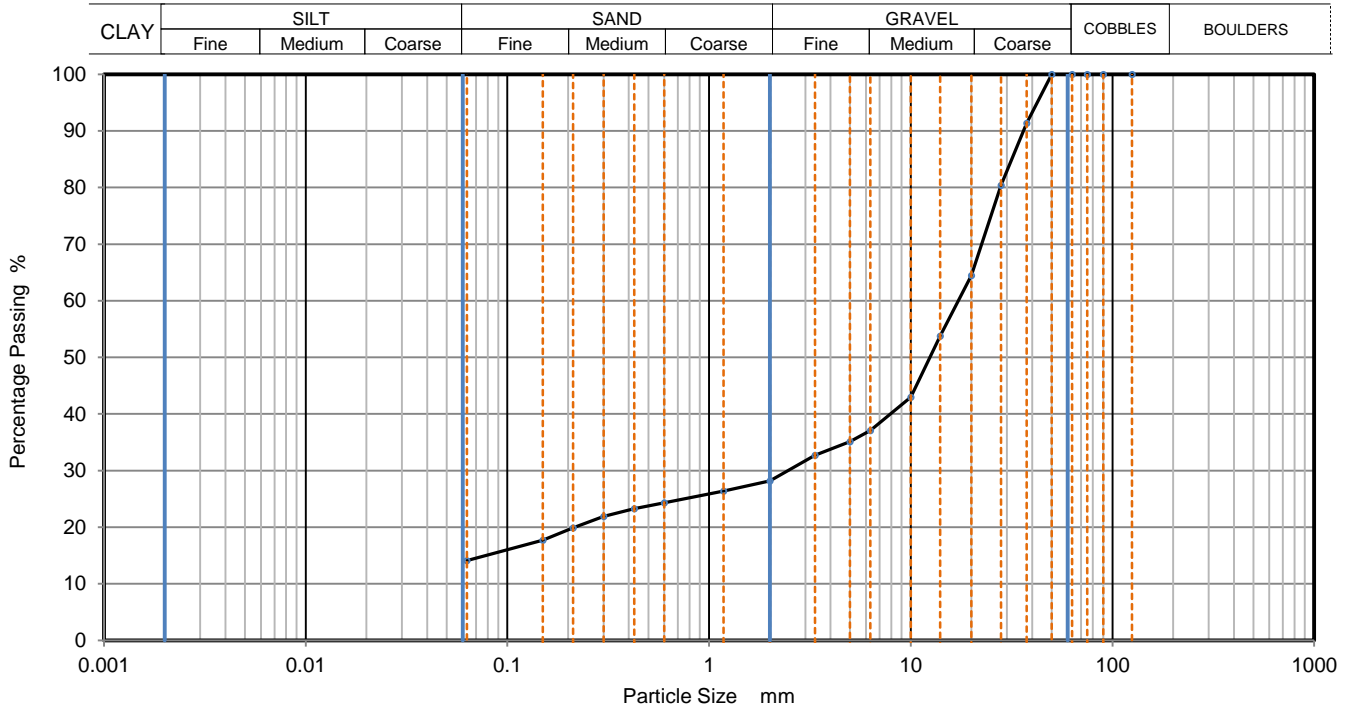
Depth, m **18.80**

Specimen Reference **2** Specimen Depth **18.8** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040621**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	91		
28	80		
20	65		
14	54		
10	43		
6.3	37		
5	35		
3.35	33		
2	28		
1.18	26		
0.6	24		
0.425	23		
0.3	22		
0.212	20		
0.15	18		
0.063	14		

Dry Mass of sample, g

**4320**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	71.8
Sand	14.0
Fines <0.063mm	14.0

Grading Analysis	
D100	mm
D60	mm 17.2
D30	mm 2.47
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH111**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **1**

Soil Description **Brown sandy gravelly silty CLAY**

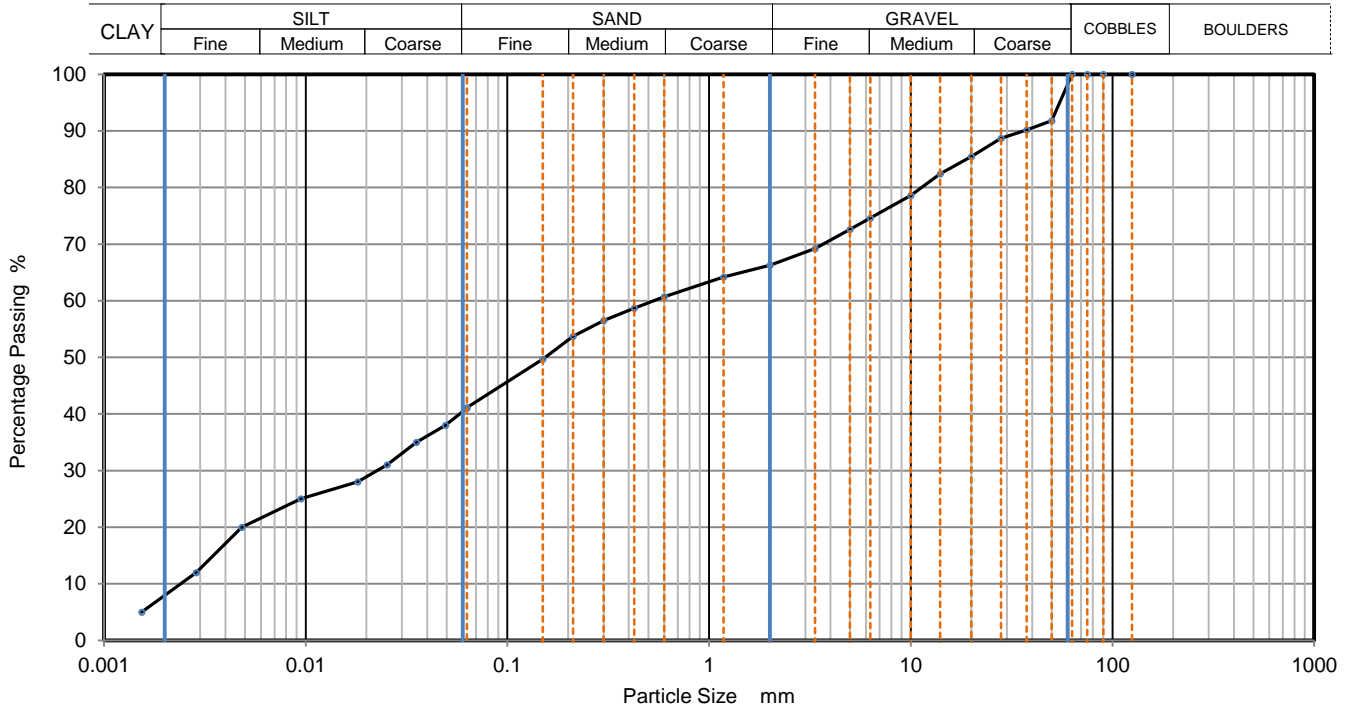
Depth, m **2.50**

Specimen Reference **10** Specimen Depth **2.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022040622**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	41
90	100	0.04939	38
75	100	0.03537	35
63	100	0.02532	31
50	92	0.01813	28
37.5	90	0.00947	25
28	89	0.00482	20
20	86	0.00286	12
14	82	0.00154	5
10	79		
6.3	75		
5	73		
3.35	69		
2	66		
1.18	64		
0.6	61	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	59		
0.3	57		
0.212	54		
0.15	50		
0.063	41		

Dry Mass of sample, g

**6145**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	33.7
Sand	25.2
Silt	33.4
Clay	7.7

Grading Analysis		
D100	mm	
D60	mm	0.533
D30	mm	0.0223
D10	mm	0.00248
Uniformity Coefficient		210
Curvature Coefficient		0.38

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH111**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Brown sandy gravelly silty CLAY**

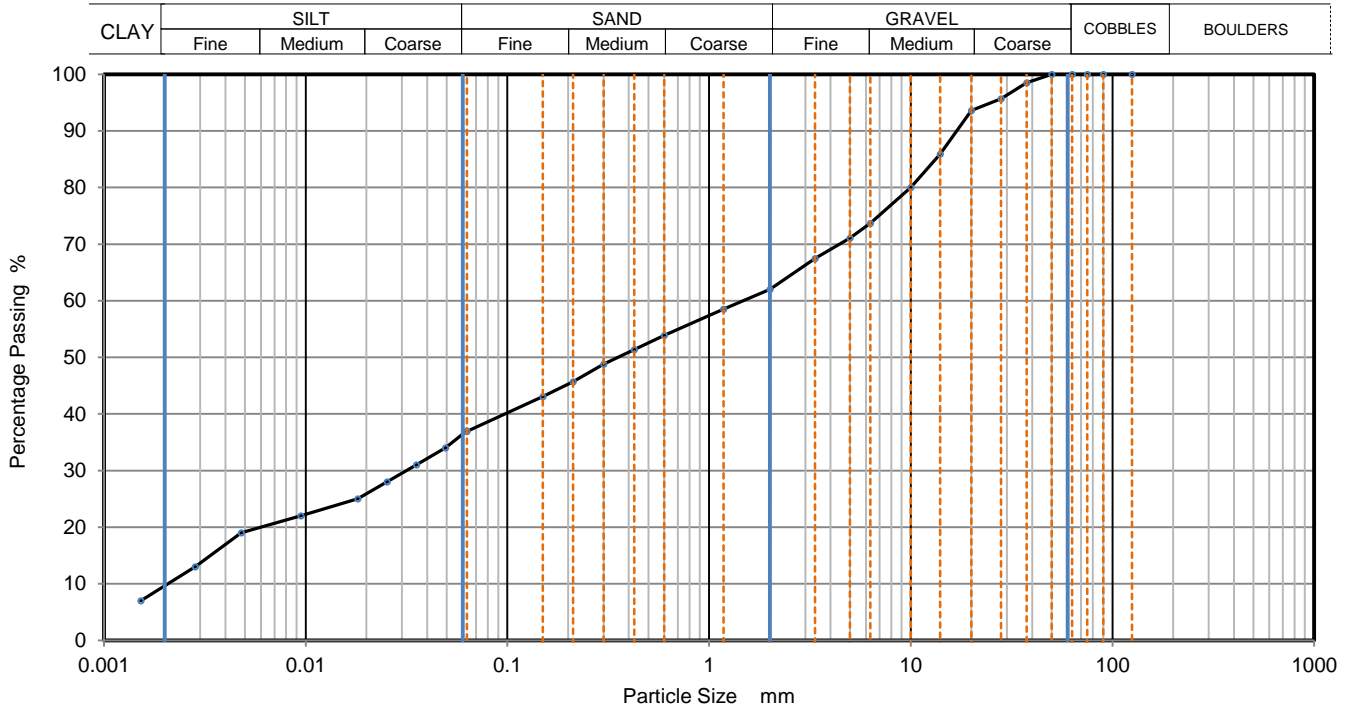
Depth, m **6.25**

Specimen Reference **8** Specimen Depth **6.25** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022040623**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	37
90	100	0.04939	34
75	100	0.03537	31
63	100	0.02532	28
50	100	0.01813	25
37.5	99	0.00947	22
28	96	0.00479	19
20	94	0.00283	13
14	86	0.00152	7
10	80		
6.3	74		
5	71		
3.35	68		
2	62		
1.18	59		
0.6	54	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	51		
0.3	49		
0.212	46		
0.15	43		
0.063	37		

Dry Mass of sample, g

**6524**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	38.0
Sand	25.2
Silt	26.8
Clay	10.0

Grading Analysis		
D100	mm	
D60	mm	1.48
D30	mm	0.0316
D10	mm	0.002
Uniformity Coefficient		740
Curvature Coefficient		0.34

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH111**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Brown sandy gravelly silty CLAY**

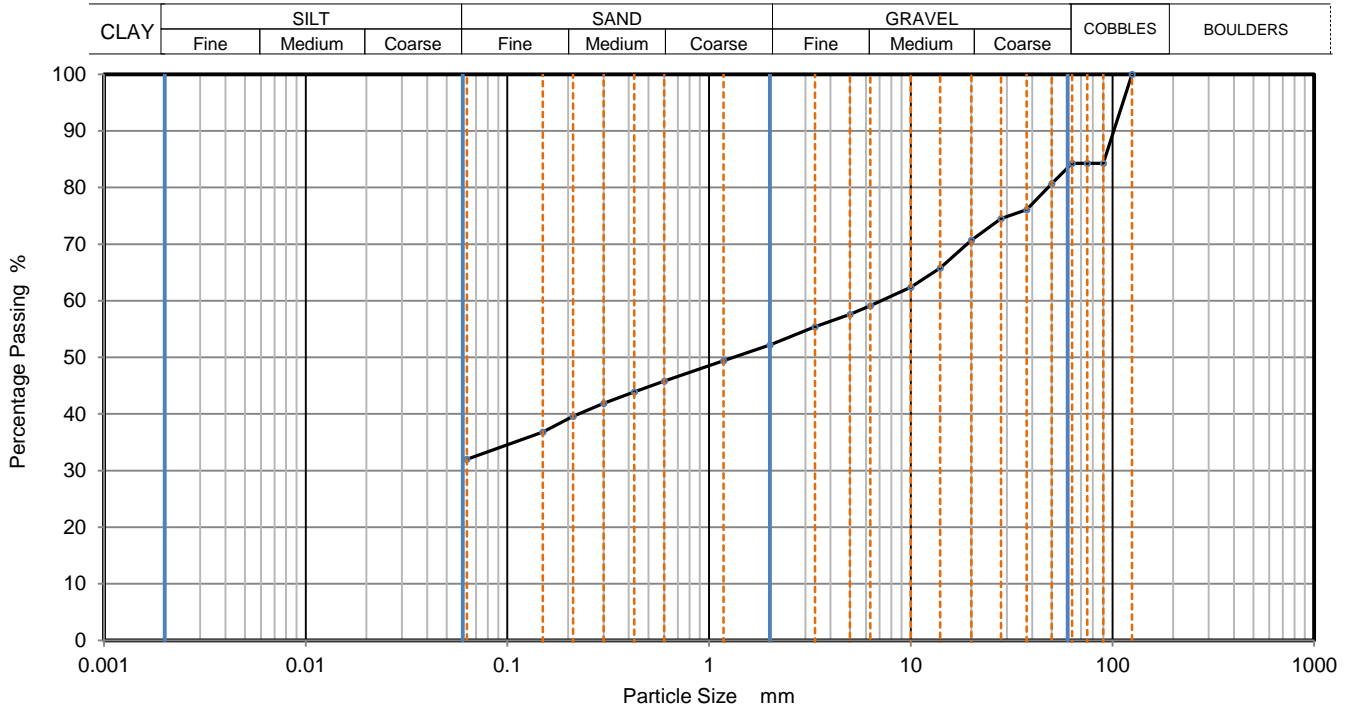
Depth, m **9.70**

Specimen Reference **2** Specimen Depth **9.7** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040625**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	84		
75	84		
63	84		
50	81		
37.5	76		
28	75		
20	71		
14	66		
10	62		
6.3	59		
5	58		
3.35	55		
2	52		
1.18	49		
0.6	46		
0.425	44		
0.3	42		
0.212	40		
0.15	37		
0.063	32		

Dry Mass of sample, g 5954

Sample Proportions	% dry mass
Cobbles	15.7
Gravel	32.0
Sand	20.3
Fines <0.063mm	32.0

Grading Analysis		
D100	mm	125
D60	mm	7.15
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH111**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Brown sandy gravelly silty CLAY**

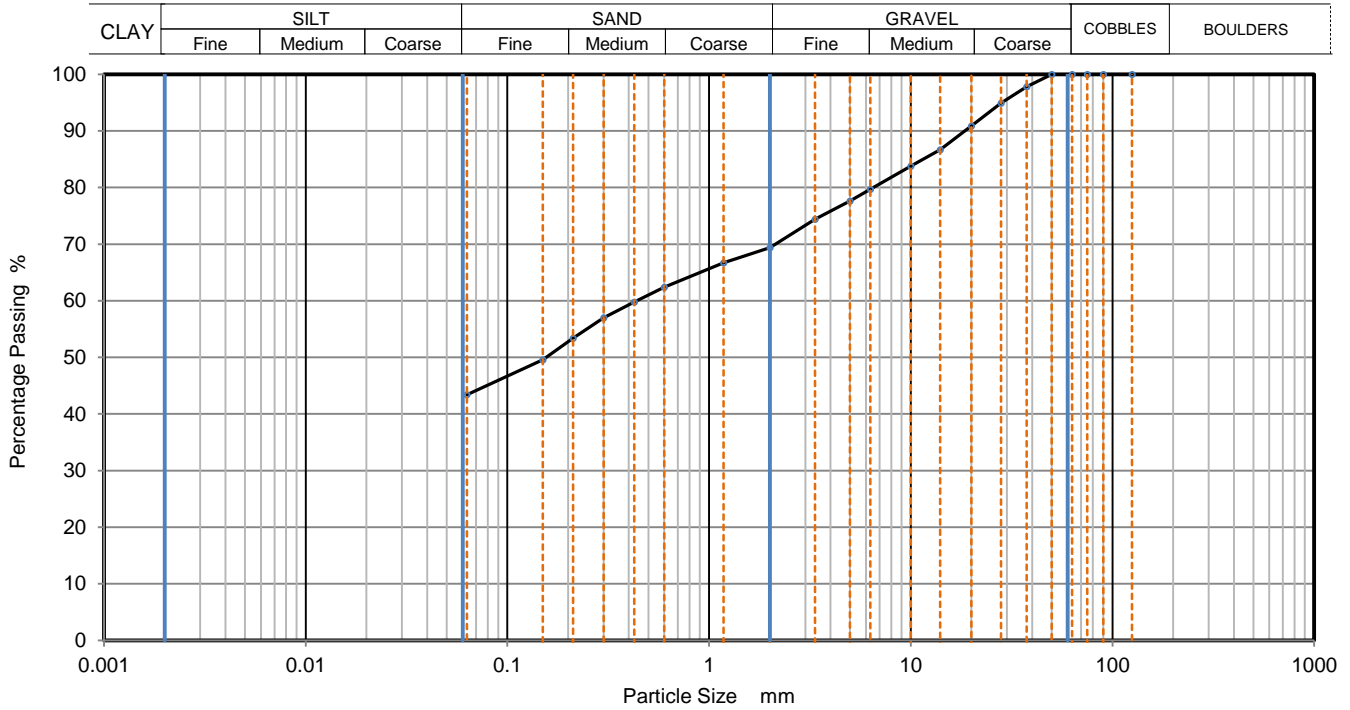
Depth, m **12.80**

Specimen Reference **2** Specimen Depth **12.8** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040626**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	98		
28	95		
20	91		
14	87		
10	84		
6.3	80		
5	78		
3.35	74		
2	69		
1.18	67		
0.6	62		
0.425	60		
0.3	57		
0.212	53		
0.15	50		
0.063	43		

Dry Mass of sample, g 6121

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	30.6
Sand	26.0
Fines <0.063mm	43.0

Grading Analysis		
D100	mm	
D60	mm	0.434
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH111**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Brown sandy gravelly silty CLAY**

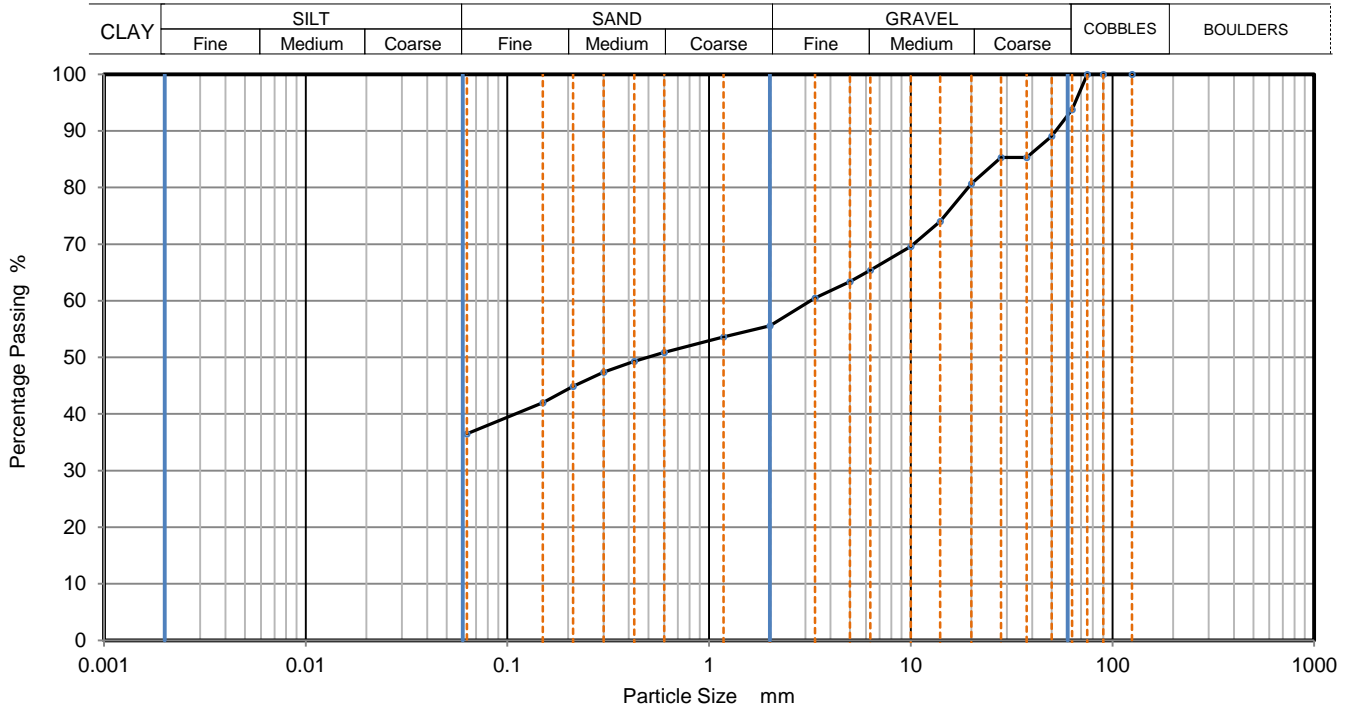
Depth, m **16.25**

Specimen Reference **2** Specimen Depth **16.25** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022040628**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	94		
50	89		
37.5	85		
28	85		
20	81		
14	74		
10	70		
6.3	65		
5	63		
3.35	61		
2	56		
1.18	54		
0.6	51		
0.425	49		
0.3	47		
0.212	45		
0.15	42		
0.063	37		

Dry Mass of sample, g

**6614**

Sample Proportions	% dry mass
Cobbles	6.2
Gravel	38.1
Sand	19.1
Fines <0.063mm	37.0

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



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**Dry Density / Moisture Content Relationship  
Light Compaction**

Job Ref **21-1219**

Borehole / Pit No **BH101**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No **2**

Soil Description **Brown sandy gravelly silty CLAY**

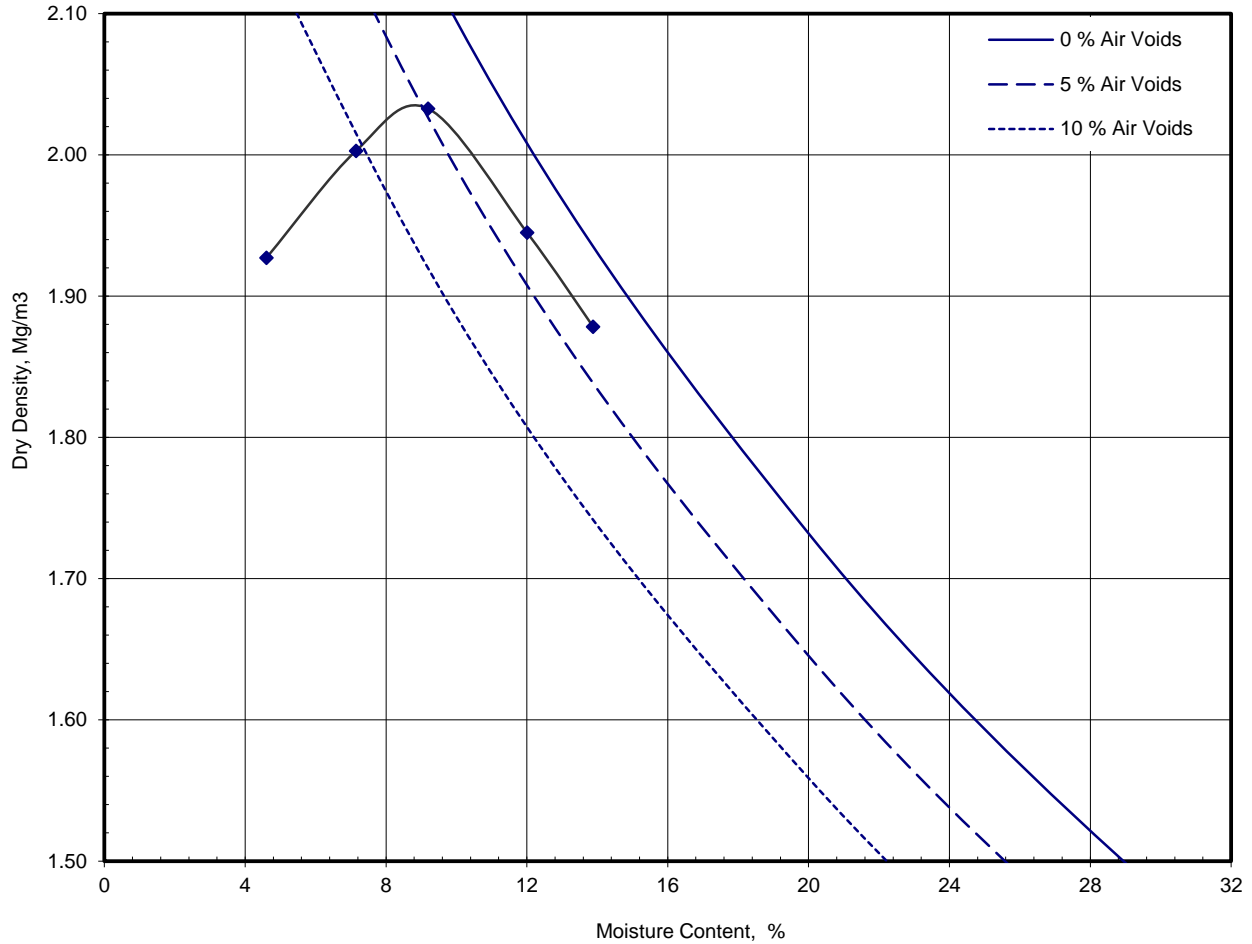
Depth **8.50 m**

Specimen Ref. **11** Specimen Depth **m**

Sample Type **B**

Test Method **BS1377:Part 4:1990, clause 3.4, 2.5kg rammer**

Keylab ID **Caus202204068**



Preparation	Material used was air dried	
Mould Type	CBR	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	2
Material Retained on 20.0 mm Sieve	%	6
Particle Density - Assumed	Mg/m³	2.65

<b>Maximum Dry Density</b>	Mg/m³	<b>2.03</b>
<b>Optimum Moisture Content</b>	%	<b>9.2</b>

Approved

Stephen.Watson

Remarks



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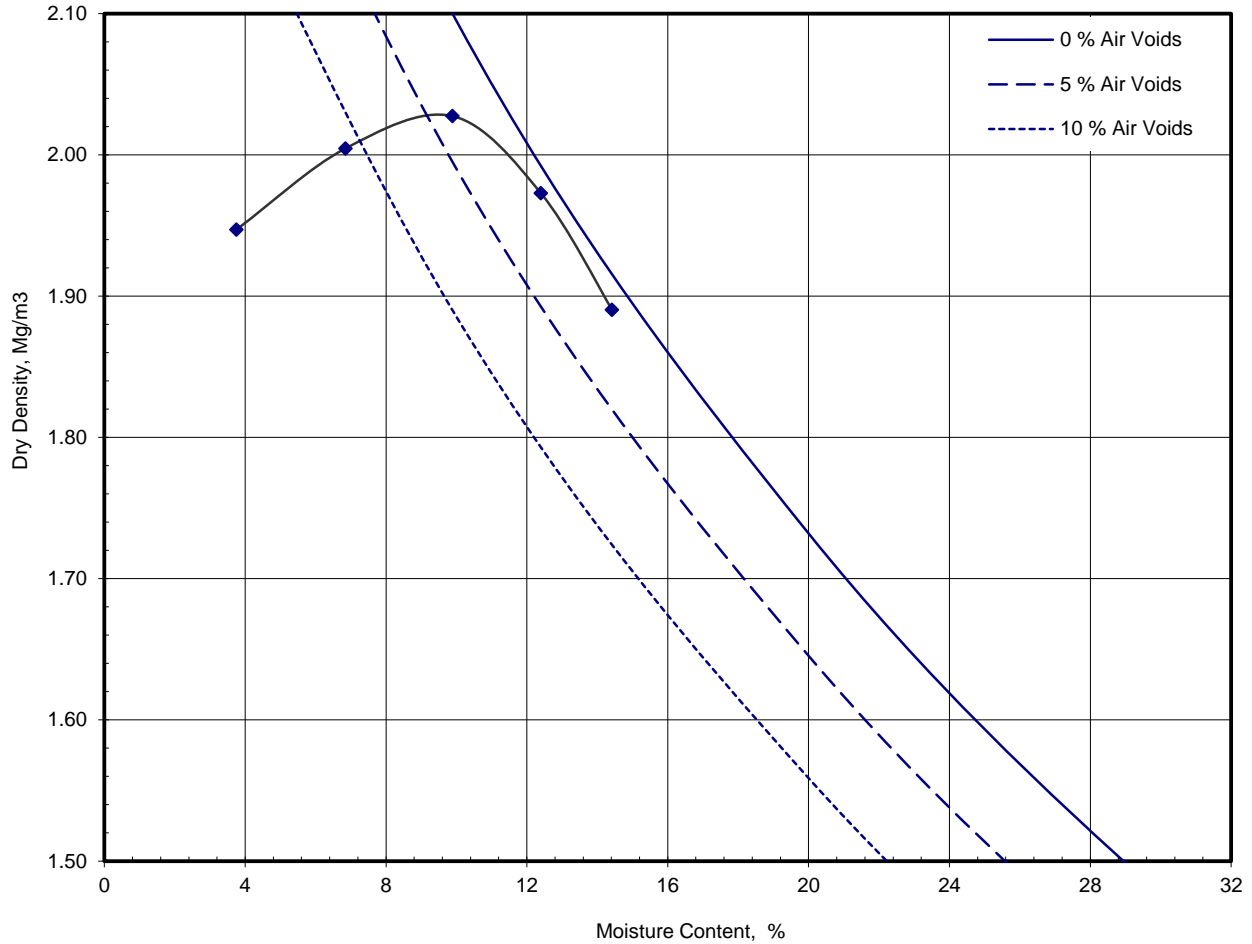
10122



**Dry Density / Moisture Content Relationship  
Light Compaction**

Job Ref	21-1219
Borehole / Pit No	BH111
Sample No	1
Depth	2.50 m
Sample Type	B
Keylab ID	Caus2022040622

Site Name	<b>DAA Airfield Underpass Ground Investigation</b>	
Soil Description	Brown sandy gravelly silty CLAY	
Specimen Ref.	11	Specimen Depth
Test Method	BS1377:Part 4:1990, clause 3.4, 2.5kg rammer	



Preparation	Material used was air dried	
Mould Type	CBR	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	1
Material Retained on 20.0 mm Sieve	%	13
Particle Density - Assumed	Mg/m³	2.65

<b>Maximum Dry Density</b>	Mg/m³	<b>2.03</b>
<b>Optimum Moisture Content</b>	%	<b>9.9</b>

Approved
Stephen.Watson

Remarks

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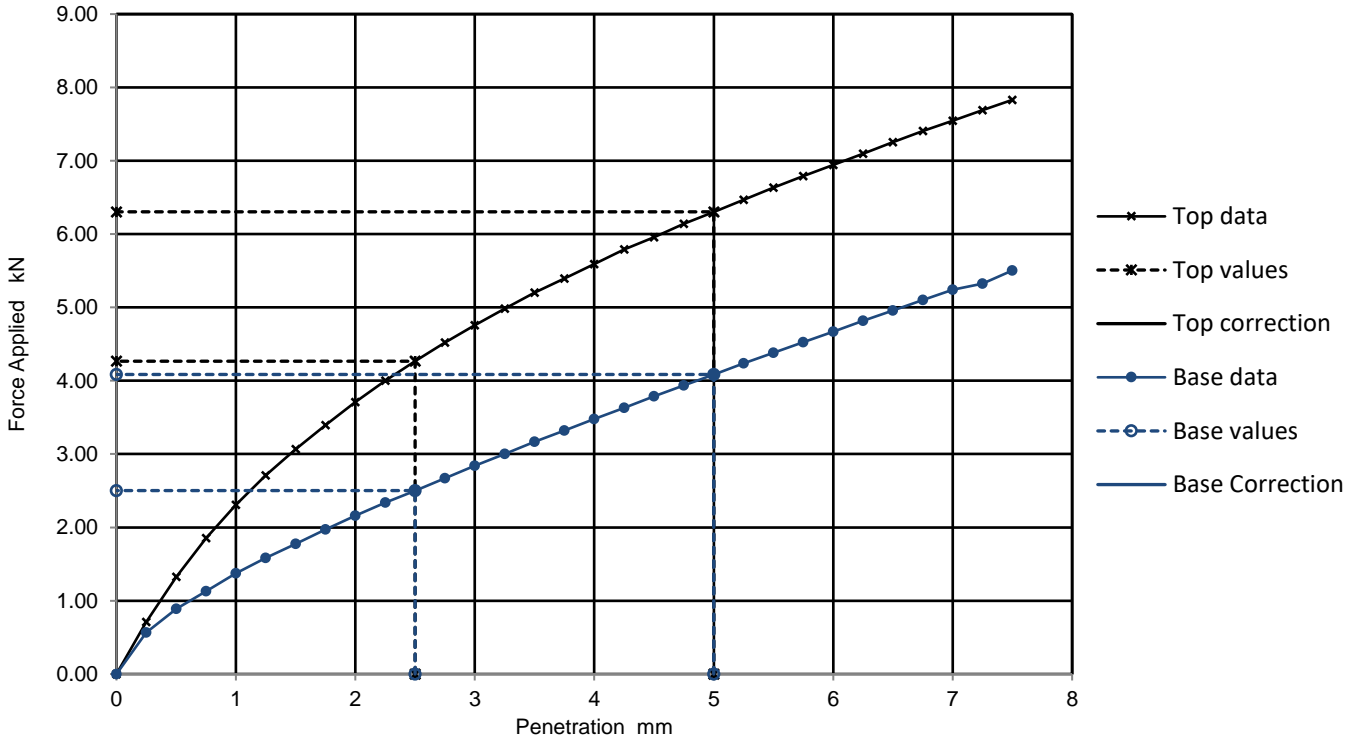
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH101
Site Name	DAA Airfield Underpass Ground Investigation
Sample No.	2
Soil Description	Brown sandy gravelly silty CLAY
Depth m	8.50
Specimen Reference	Specimen Depth m
Sample Type	B
Specimen Description	Brown sandy gravelly silty CLAY
KeyLAB ID	Caus202204068
Test Method	BS1377 : Part 4 : 1990, clause 7
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	9 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.10 Mg/m3	Surcharge applied	4.5 kg
	Dry density 1.94 Mg/m3		3 kPa
	Moisture content 8 %		

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	32.0	32.0	32.0	8	
BASE	No	19.0	20.0	20.0		

**General remarks**

**Test specific remarks**

**Approved**

Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson
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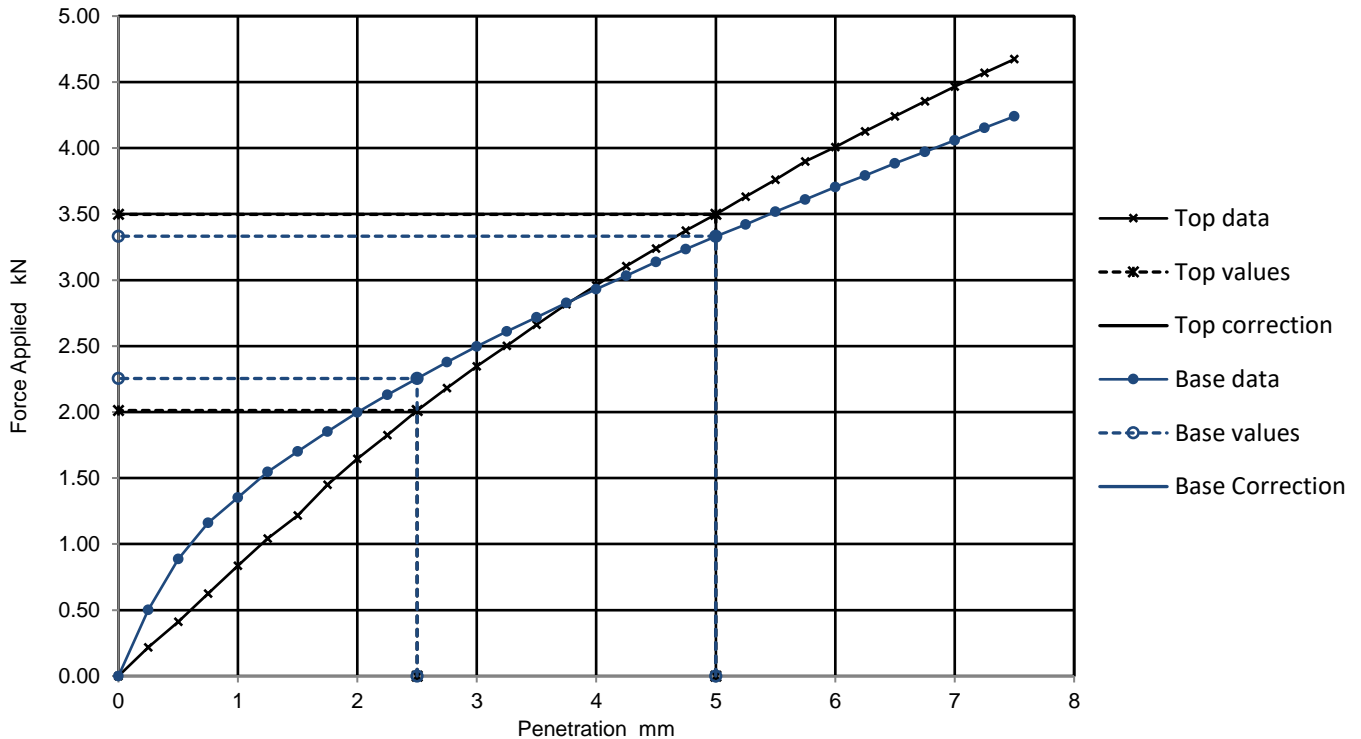
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH111
Sample No.	1
Depth m	2.50
Sample Type	B
KeyLAB ID	Caus2022040622
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	15 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.13 Mg/m3	Surcharge applied	4.5 kg
	Dry density 1.96 Mg/m3		3 kPa
	Moisture content 9 %		

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	15.0	17.0	17.0	17.0	9
BASE	No	17.0	17.0	17.0		9

General remarks	Test specific remarks	Approved
Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson

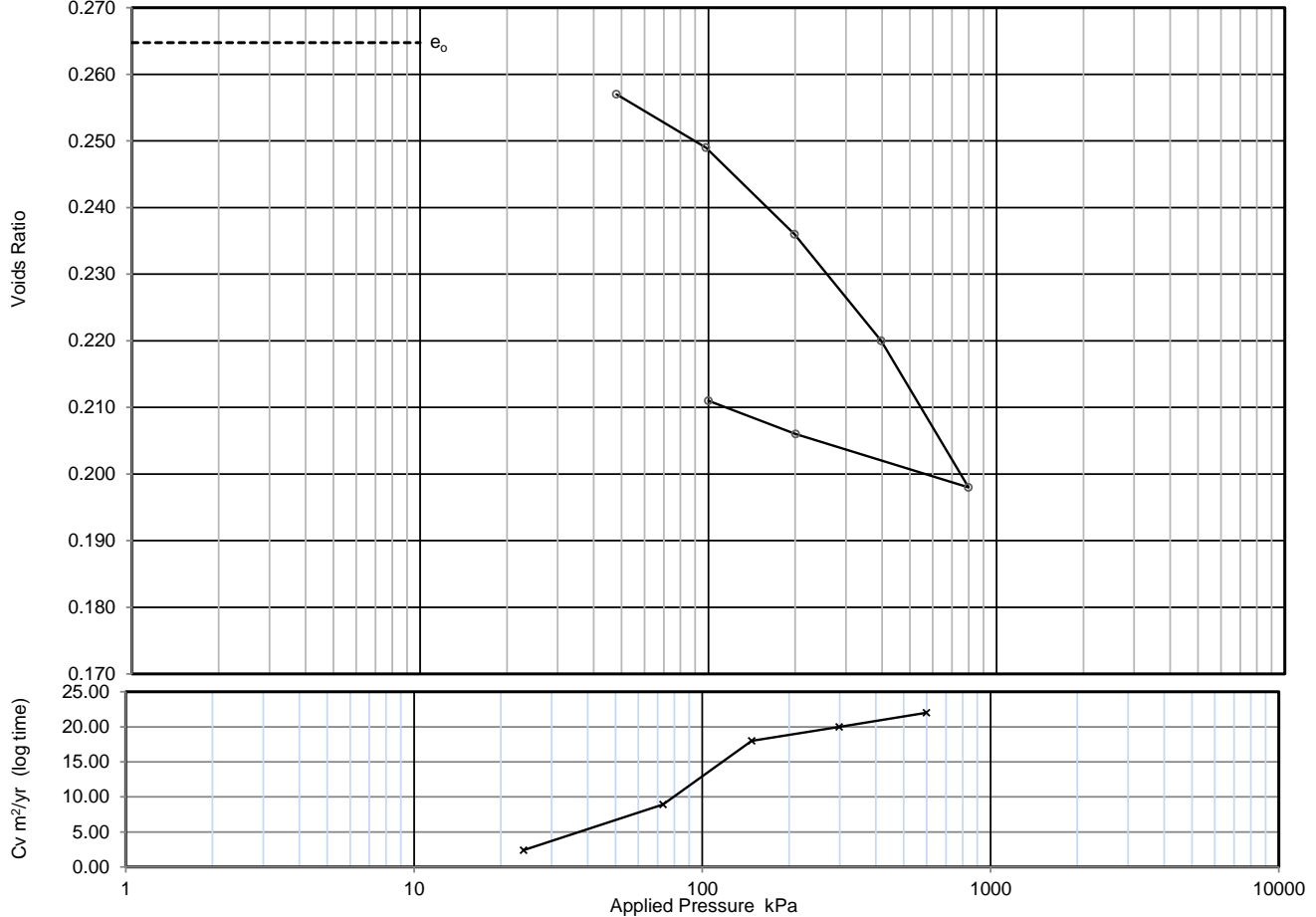




**ONE DIMENSIONAL CONSOLIDATION TEST  
BS1377:Part 5:1990, clause 3**

Job Ref	21-1219
Borehole/Pit No.	BH110
Sample No.	3
Depth	13.75
Sample Type	C
KeyLAB ID	Caus2022040618
Date started	22/04/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy silty CLAY.		
Specimen Reference	2	Specimen Depth	13.75 m
Specimen Description	Greyish brown sandy silty CLAY.		
Test Method	BS1377:Part 5:1990, clause 3		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.265	-	-	-	-
48	0.257	0.12	2.4	2.9	0.00055
98	0.249	0.14	8.9	160	0.00042
199	0.236	0.1	18	70	0.00065
398	0.220	0.067	20	97	0.00049
799	0.198	0.044	22	78	0.00092
201	0.206	0.011			
100	0.211	0.044			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details

	Initial	Final	
Diameter	75.30	-	mm
Height	19.80	18.96	mm
Moisture Content	11.8	11.1	%
Bulk density	2.34	2.43	Mg/m3
Dry density	2.10	2.19	Mg/m3
Voids Ratio	0.265	0.211	
Saturation	118	140	%
Average temperature for test			oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen.Watson

Printed :

05/05/2022 09:55

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**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219
Borehole/Pit No.	BH101
Sample No.	2
Depth	10.90
Sample Type	C
KeyLAB ID	Caus202204069
Date of test	04/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.		
Specimen Reference	2	Specimen Depth	10.95 m
Specimen Description	Very stiff greyish brown sandy slightly gravelly silty CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

1
210.0
104.7
2.23
9
2.05

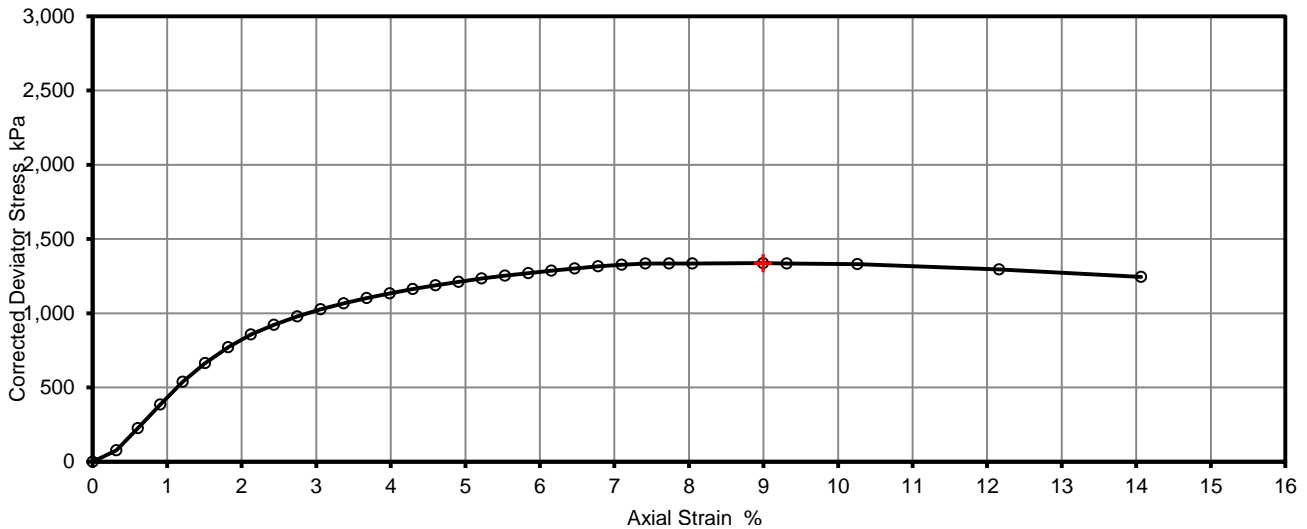
Rate of Strain  
Cell Pressure  
At failure

4.0
225
9.0
1338
669
Compound

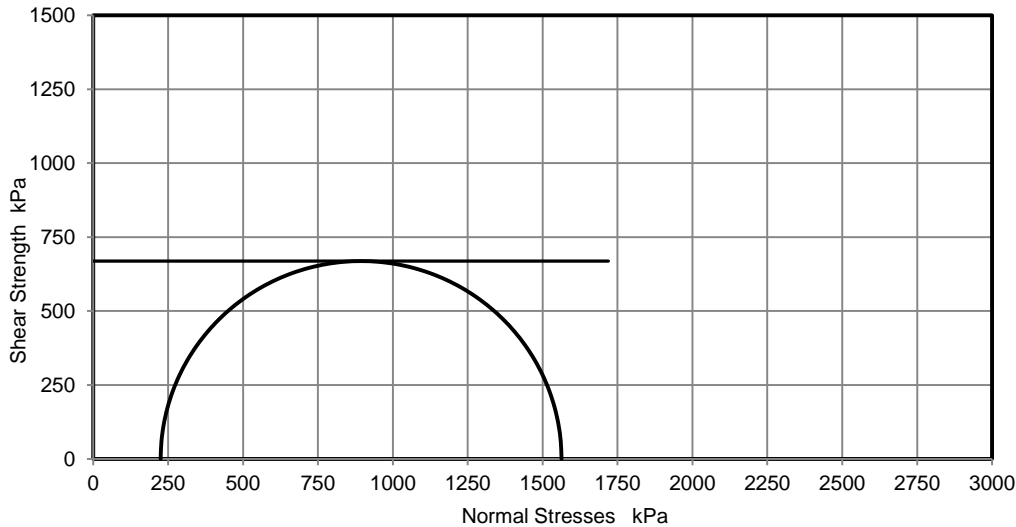
Axial Strain  
Deviator Stress, ( $\sigma_1 - \sigma_3$ )  
Undrained Shear Strength,  $c_u$   
Mode of Failure

Mg/m3  
%  
Mg/m3  
%/min  
kPa  
%  
kPa  
kPa  $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

Printed

05/05/2022 09:57





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219
Borehole/Pit No.	BH101
Sample No.	3
Depth	17.55
Sample Type	C
KeyLAB ID	Caus2022040612
Date of test	04/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.		
Specimen Reference	2	Specimen Depth	17.55 m
Specimen Description	Very stiff greyish brown sandy slightly gravelly silty CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

1
184.5
105.6
1.88
21
1.56

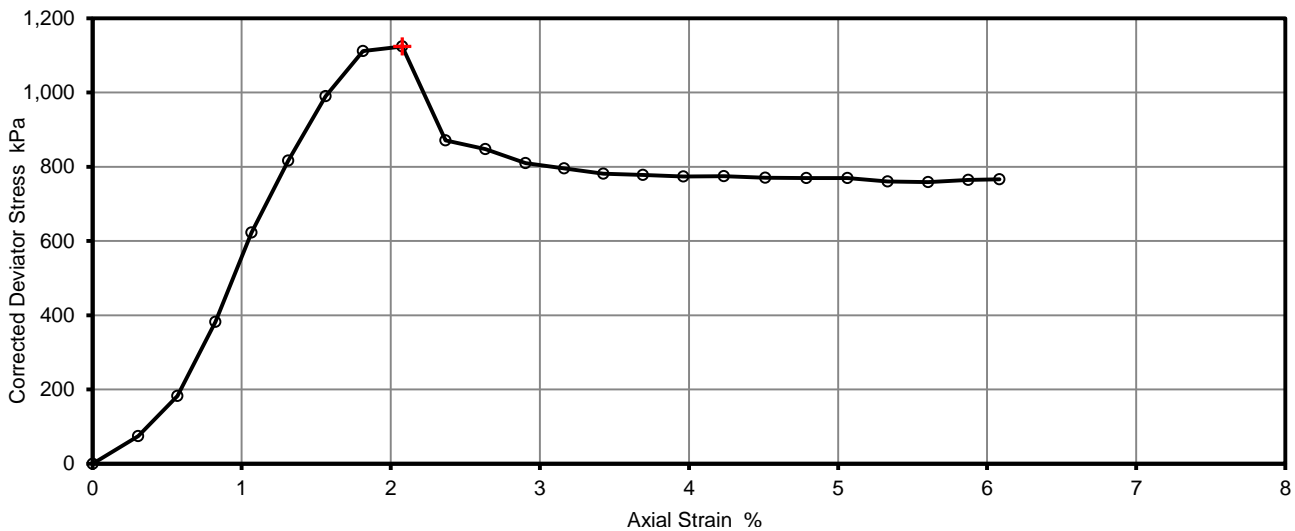
Rate of Strain  
Cell Pressure  
At failure

3.0
350
2.1
1124
562
Compound

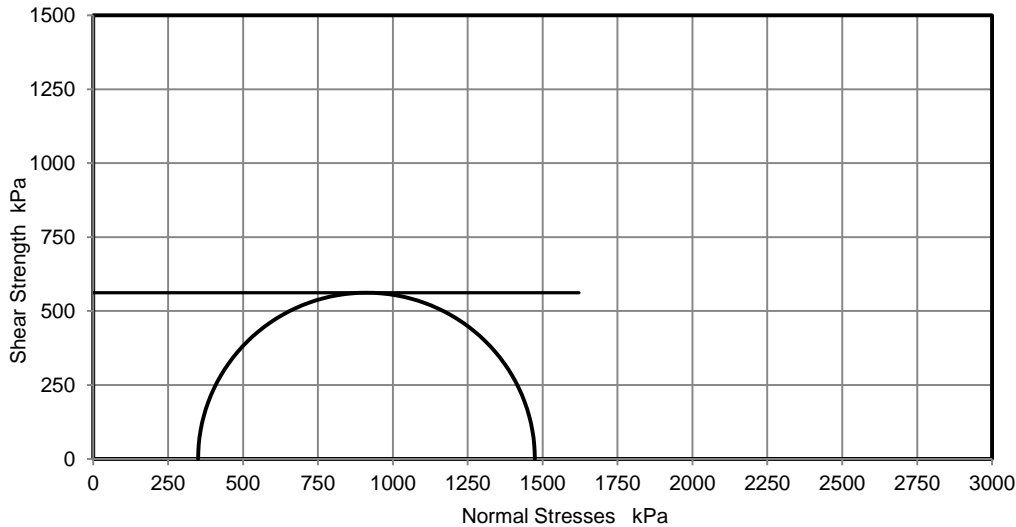
Axial Strain  
Deviator Stress, ( $\sigma_1 - \sigma_3$ )f  
Undrained Shear Strength, cu  
Mode of Failure

kPa  
kPa  $\frac{1}{2}(\sigma_1 - \sigma_3)$ f

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

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05/05/2022 09:57





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219
Borehole/Pit No.	BH110
Sample No.	1
Depth	2.85
Sample Type	C
KeyLAB ID	Caus2022040615
Date of test	04/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.		
Specimen Reference	2	Specimen Depth	2.85 m
Specimen Description	Firm greyish brown sandy slightly gravelly silty CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

1
210.0
105.4
1.71
33
1.29

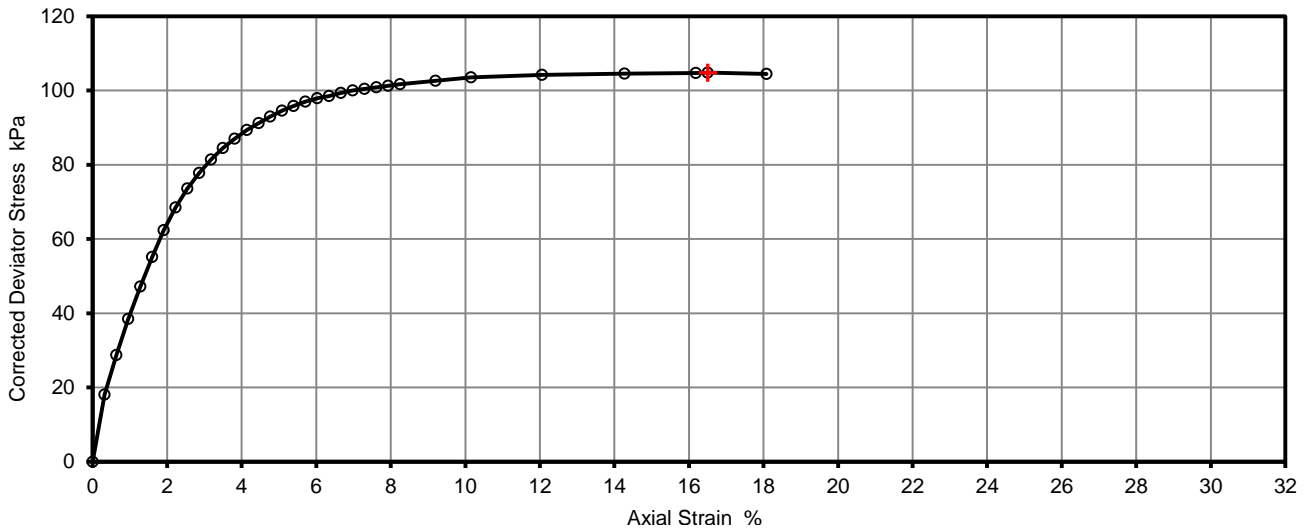
Rate of Strain  
Cell Pressure  
At failure

4.0
60
16.5
105
52
Compound

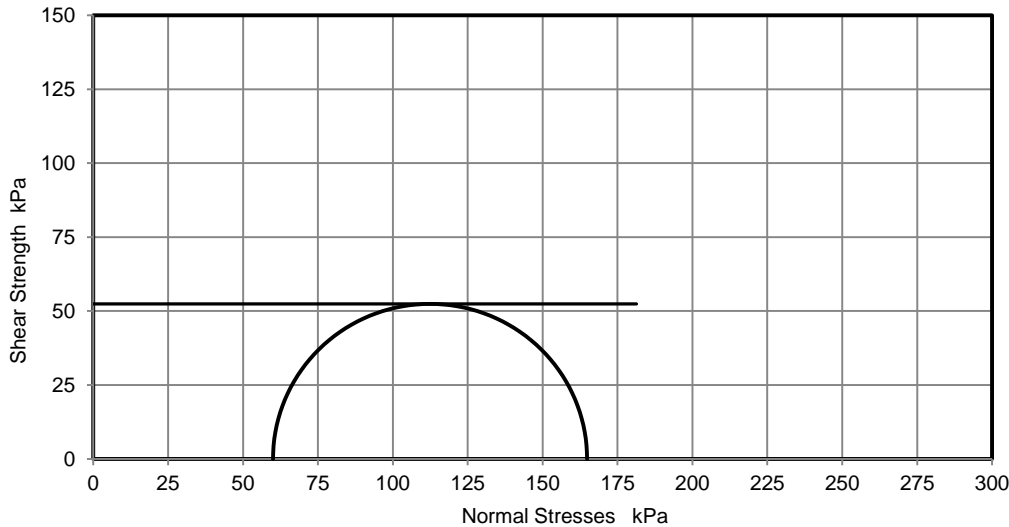
Axial Strain  
Deviator Stress, ( $\sigma_1 - \sigma_3$ )  
Undrained Shear Strength,  $c_u$   
Mode of Failure

$\frac{1}{2}(\sigma_1 - \sigma_3)$

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

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05/05/2022 09:57





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref 21-1219

Borehole/Pit No. BH110

Site Name DAA Airfield Underpass Ground Investigation

Sample No. 4

Soil Description Greyish brown sandy slightly gravelly silty CLAY.

Depth 17.85

Specimen Reference 2 Specimen Depth 17.85 m

Sample Type C

Specimen Description Stiff greyish brown sandy slightly gravelly silty CLAY.

KeyLAB ID Caus2022040620

Test Method BS1377 : Part 7 : 1990, clause 8, single specimen

Date of test 04/05/2022

Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

1	
210.0	mm
104.4	mm
2.09	Mg/m3
12	%
1.86	Mg/m3

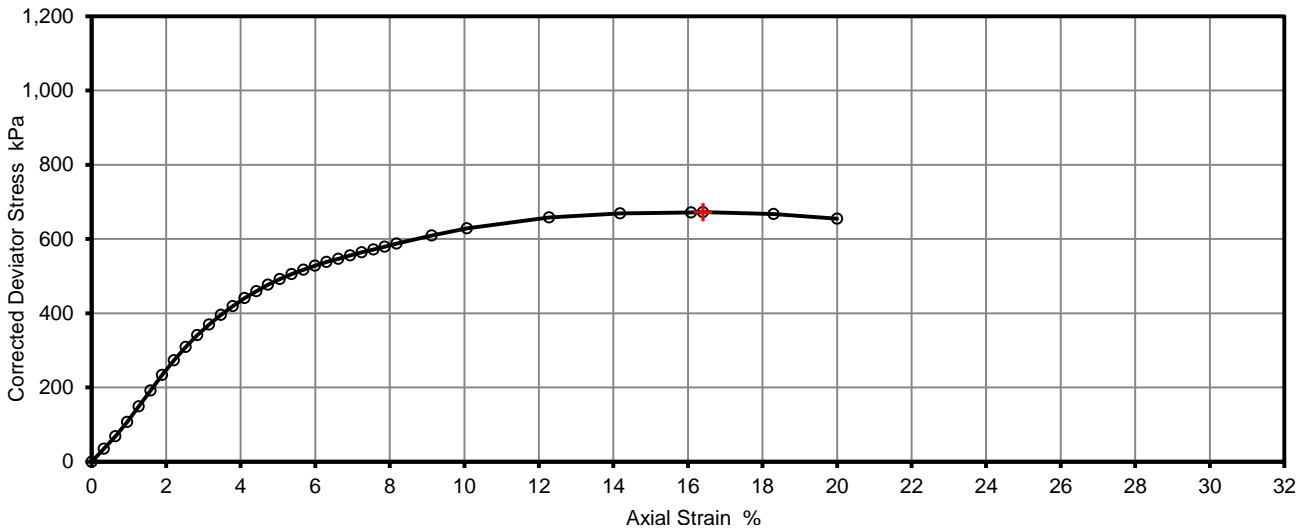
Rate of Strain  
Cell Pressure  
At failure

4.0	%/min
360	kPa

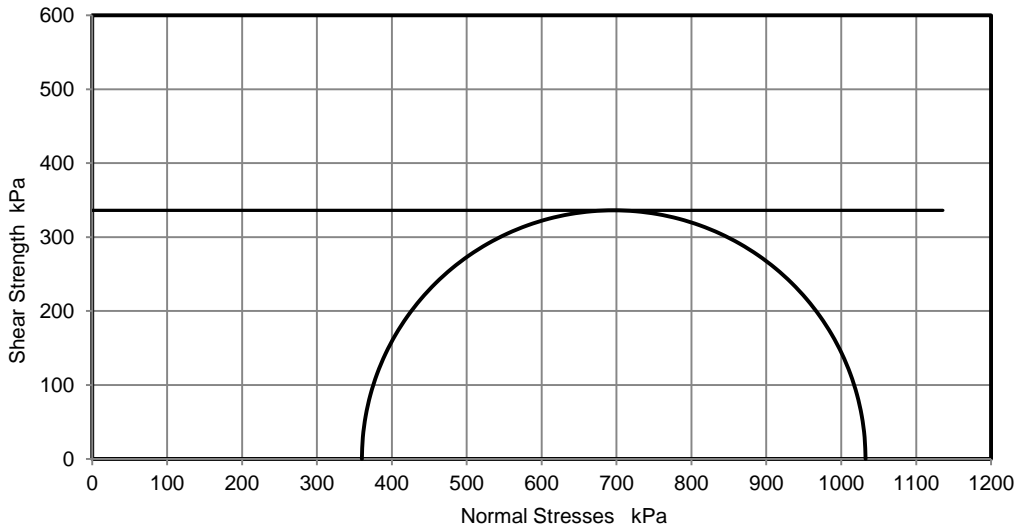
Axial Strain  
Deviator Stress, ( $\sigma_1 - \sigma_3$ )  
Undrained Shear Strength,  $c_u$   
Mode of Failure

16.4	%
672	kPa
336	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Compound	

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

Printed

05/05/2022 09:57





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219
Borehole/Pit No.	BH111
Sample No.	2
Depth	8.55
Sample Type	C
KeyLAB ID	Caus2022040624
Date of test	05/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.		
Specimen Reference	2	Specimen Depth	8.55 m
Specimen Description	Very stiff greyish brown sandy slightly gravelly silty CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

1
210.0
104.9
2.27
6
2.13

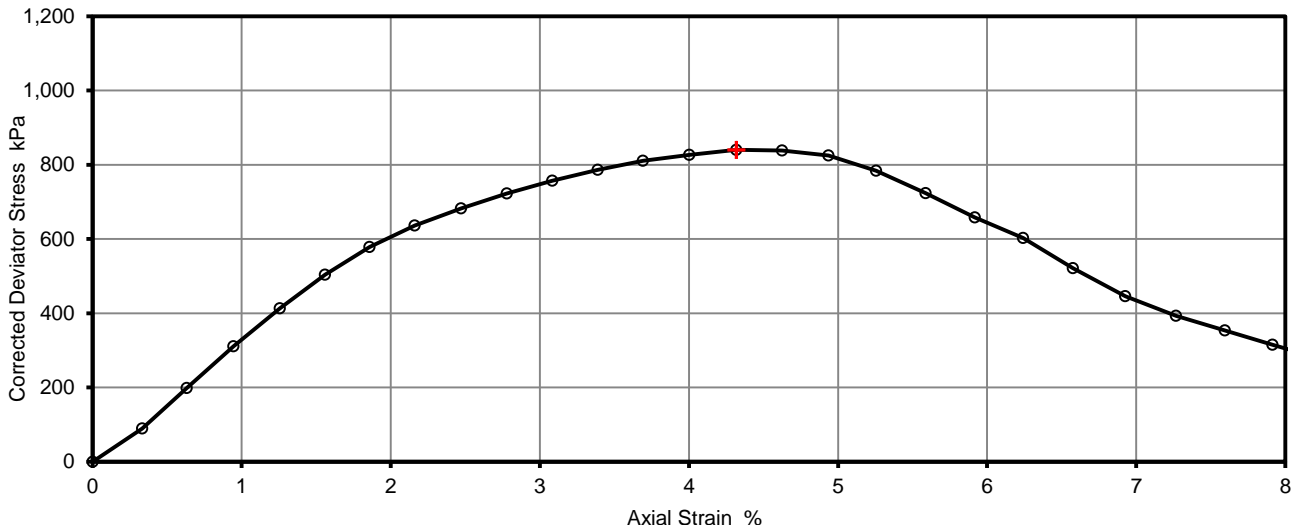
Rate of Strain  
Cell Pressure  
At failure

4.0
180
4.3
840
420
Brittle

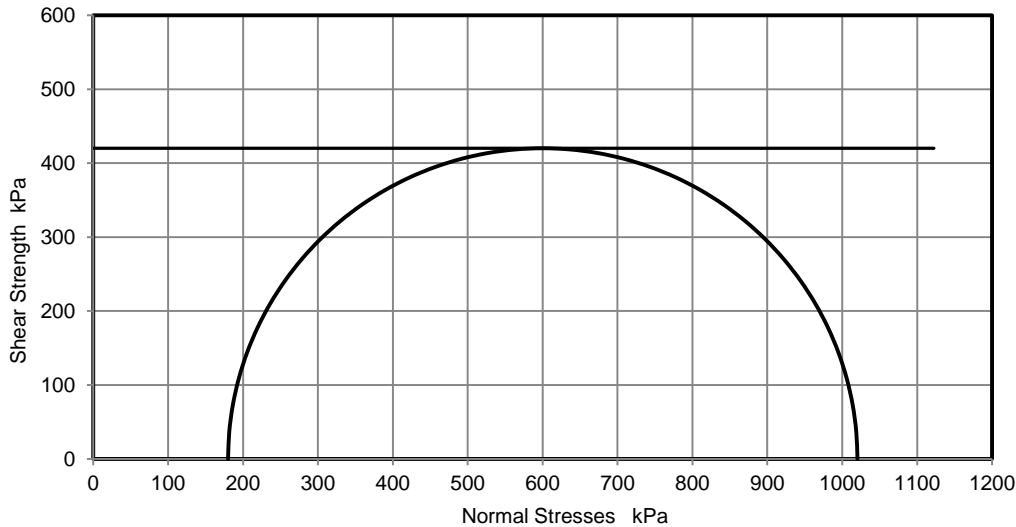
Axial Strain  
Deviator Stress, ( $\sigma_1 - \sigma_3$ )f  
Undrained Shear Strength, cu  
Mode of Failure

kPa  
kPa  
kPa  $\frac{1}{2}(\sigma_1 - \sigma_3)$ f

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

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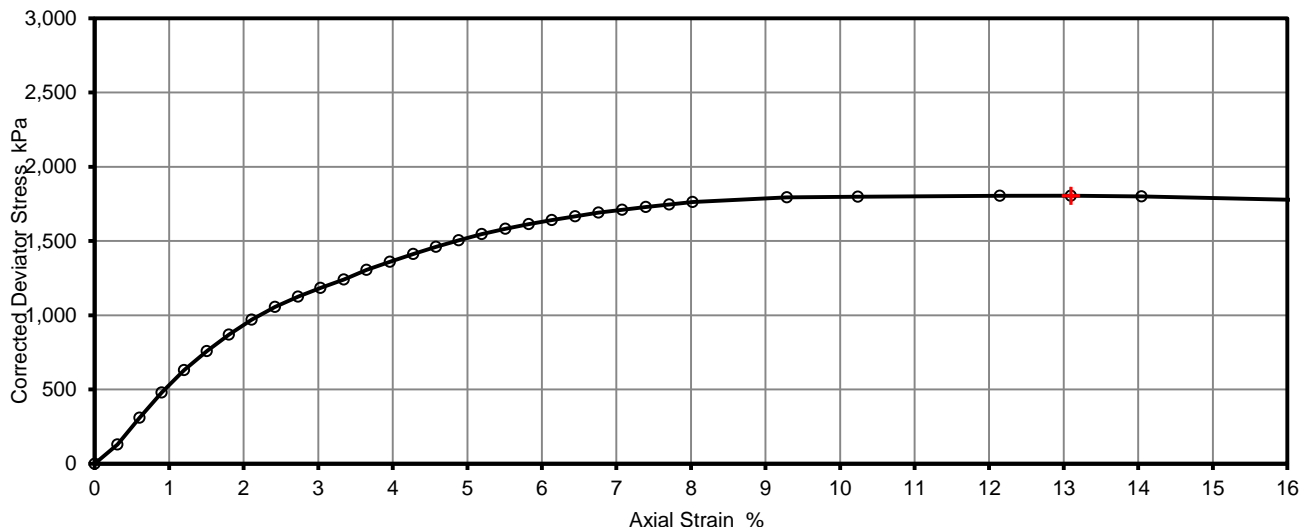
**Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen**

Job Ref	21-1219
Borehole/Pit No.	BH111
Sample No.	3
Depth	14.37
Sample Type	C
KeyLAB ID	Caus2022040627
Date of test	04/05/2022

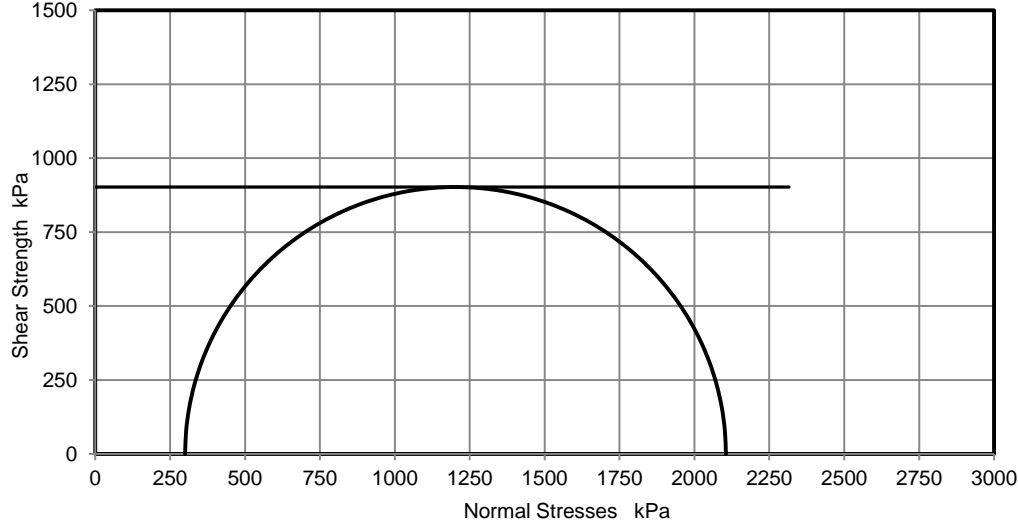
Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.		
Specimen Reference	2	Specimen Depth	14.37 m
Specimen Description	Very stiff greyish brown sandy slightly gravelly silty CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number	1	
Length	210.0	mm
Diameter	104.9	mm
Bulk Density	2.26	Mg/m3
Moisture Content	8	%
Dry Density	2.10	Mg/m3
Rate of Strain	4.0	%/min
Cell Pressure	300	kPa
At failure	13.1	%
Axial Strain	1805	kPa
Deviator Stress, ( $\sigma_1 - \sigma_3$ )f	903	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f
Undrained Shear Strength, cu		
Mode of Failure	Brittle	

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

Printed

05/05/2022 09:57







# UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Project No. 21-1219	Project Name DAA Airfield Underpass Ground Investigation
------------------------	---

Hole No.	Sample				Rock Type	Specimen Dimensions <sup>2</sup>			Bulk Density <sup>2</sup> Mg/m <sup>3</sup>	Water Content <sup>1</sup> %	Uniaxial Compression <sup>3</sup>			Remarks
	Ref	Top	Base	Type		Dia. mm	Length mm	H/D			Condition	Mode of failure	UCS MPa	
BH101	5	25.65	26.08	C	LIMESTONE	100.3	206.3	2.1	2.76	1.1	as received	S	19.5	
BH111	5	34.10	34.36	C	LIMESTONE	101.0	206.1	2.0	2.71	1.1	as received	F	20.5	

Notes

1 ISRM p87 test 1, water content at 105 ± 3 oC, specimen as tested for UCS  
 2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density  
 3 ISRM p153 part 1, determination of Uniaxial Compressive Strength ( UCS ) of Rock Materials  
 above notes apply unless annotated otherwise in the remarks

Mode of failure :  
 S - Single shear      MS - multiple shear  
 AC - Axial cleavage      F - Fragmented

Test Specification International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007	Date Printed 05/05/2022 00:00	Approved By Stephen.Watson	Table 1 sheet 1
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# LABORATORY REPORT



4043

**Contract Number: PSL22/2906**

Report Date: 12 May 2022  
Client's Reference: 21-1219  
Client Name: Causeway Geotech  
8 Drumahiskey Road  
Ballymoney  
Co. Antrim  
BT53 7QL

**For the attention of: Stephen Watson**

Contract Title: DAA Airfield Underpass Ground Investigation  
Date Received: 22/4/2022  
Date Commenced: 22/4/2022  
Date Completed: 12/5/2022

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:


A Watkins  
(Director)

R Berriman  
(Quality Manager)

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(Laboratory Manager)

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(Senior Technician)

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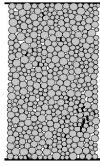
Page 1 of

# Effective Stress Triaxial Compression

## Consolidated Undrained

Summary Report

### Sample Details



sketch showing specimen location in original sample

Depth	6.25-6.60m		
Description	Grey very gravelly slightly sandy CLAY.		
Type	Undisturbed, vertical orientation.		
Initial Sample Length	$L_0$	(mm)	211.0
Initial Sample Diameter	$D_0$	(mm)	104.7
Initial Sample Weight	$W_0$	(gr)	4047.0
Initial Bulk Density	$\rho_0$	(Mg/m <sup>3</sup> )	2.23
Particle Density	$\rho_s$	(Mg/m <sup>3</sup> )	2.66

### Initial Conditions

			Stage 1	2
Initial Cell Pressure	$\sigma_{3i}$	(kPa)	980	
Initial Back Pressure	$U_{bi}$	(kPa)	850	
Membrane Thickness	$m_b$	(mm)	0.600	
Displacement Input	$L_{IP}$	(mm)	CH 2	
Load Input	$N_{IP}$	(N)	CH 1	
Pore Water Pressure Input	$U_{pwp}$	(kPa)	CH 3	
Sample Volume	$V$	(cc)	CH 2	
Initial Moisture	$\omega_i$	(%)	7.83	
Initial Dry Density	$\rho_{di}$	(Mg/m <sup>3</sup> )	2.07	
Initial Voids Ratio	$e_i$	.	0.288	
Initial Degree of Saturation	$S_i$	(%)	72	
B Value	$B$	.	0.96	

### Final Conditions

Final Moisture	$\omega_f$	(%)	8.98	
Final Dry Density	$\rho_{df}$	(Mg/m <sup>3</sup> )	2.08	
Final Voids Ratio	$e_f$	.	0.280	
Final Degree of Saturation	$S_f$	(%)	85.4	
			Stage 1	2
Failure Criteria	.		Max. Dev. Stress	
Strain At Failure	$\epsilon_f$	(%)	15.02	
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	943.0	
Minor Stress At Failure	$\sigma_3'$	(kPa)	349.6	
Major Stress At Failure	$\sigma_1'$	(kPa)	1292.6	
Principal Stress Ratio At Failure	$\sigma_1' / \sigma_3'$		3.697	

### Notes



Plastic



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH101 6.25-6.60m C1
		Test Date	06/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH101
Client	Causeway Geotech	Sample	6.25-6.60m
		Depth	6.25-6.60m

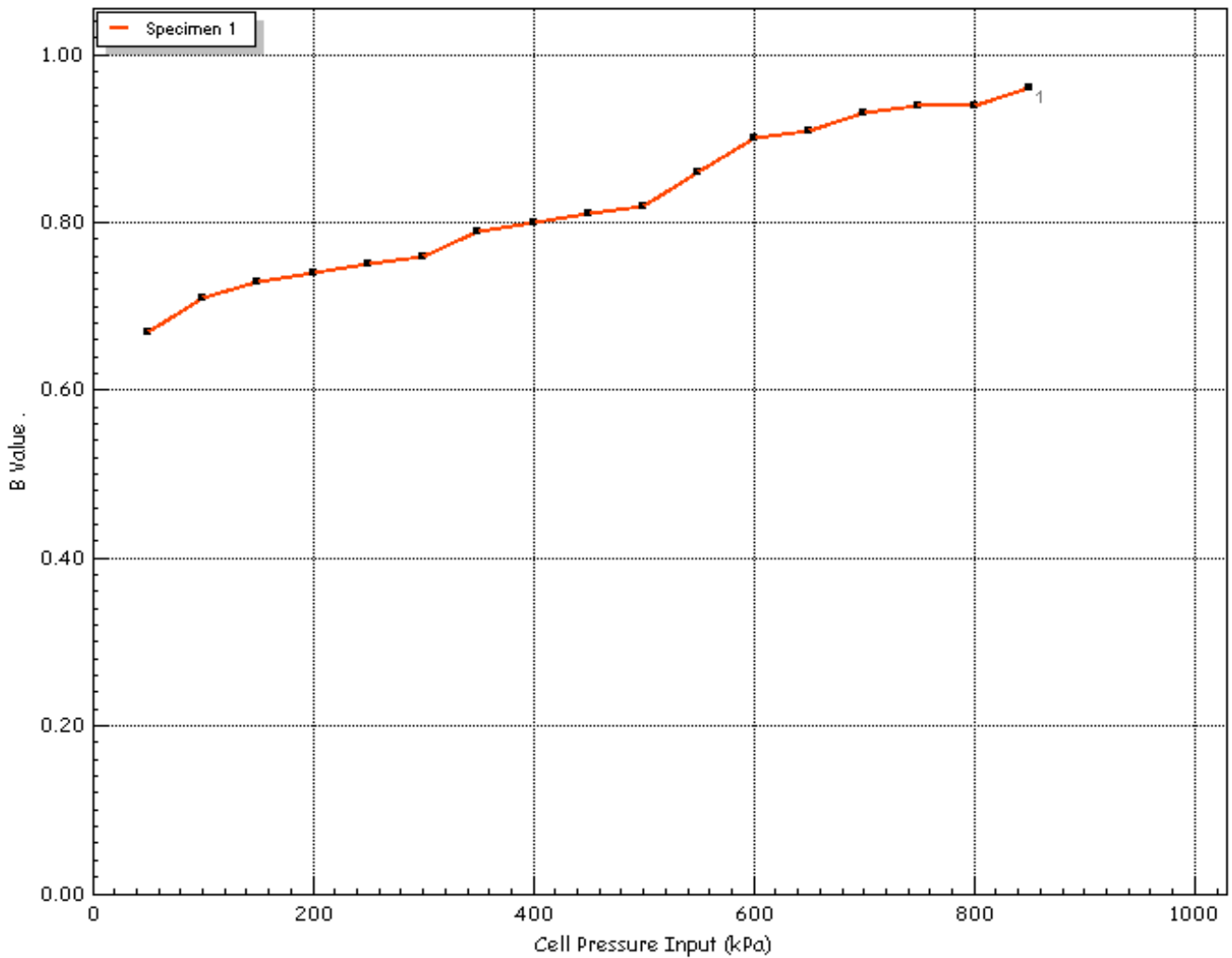



# Effective Stress Triaxial Compression

## Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	$\sigma$	(kPa)	850
Pore Water Pressure Input	$u_{pwp}$	(kPa)	842
B Value	B	.	0.96



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH101 6.25-6.60m C1
			Test Date	06/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH101
	Client	Causeway Geotech	Sample	6.25-6.60m
			Depth	6.25-6.60m

# Effective Stress Triaxial Compression

## Consolidated Undrained

Consolidation Plots

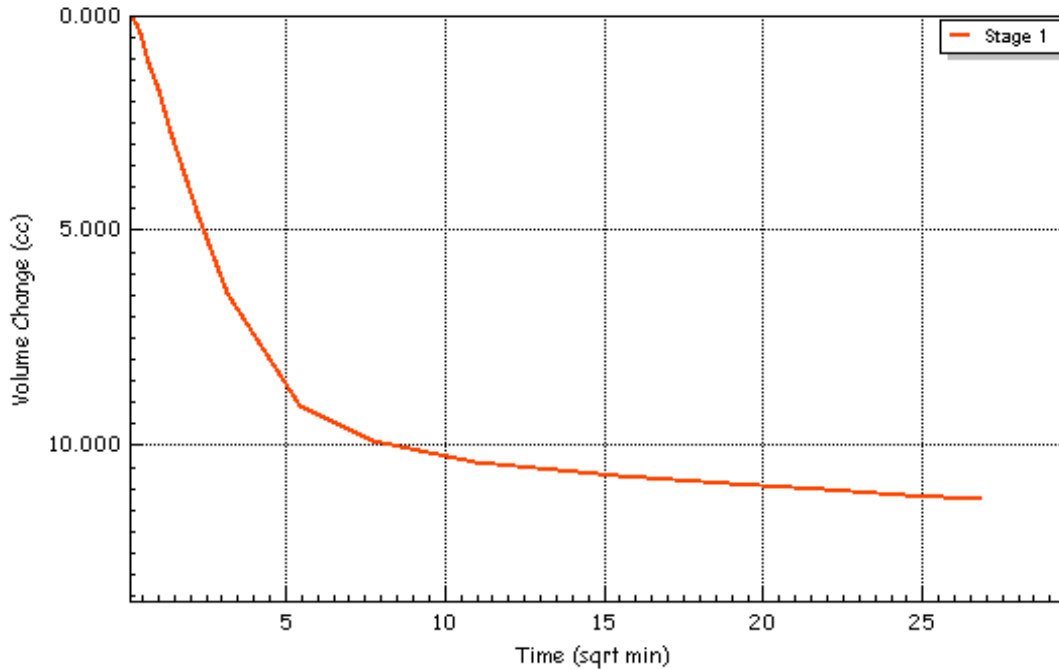
### Initial Conditions


Initial Cell Pressure	$\sigma_3$	(kPa)	980
Initial Back Pressure	$u_{bi}$	(kPa)	850
Pore Water Pressure Input	$u_{pwp}$	(kPa)	921
Drainage Method			Radial+One End

### Final Conditions

PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	$\epsilon_v$	(%)	0.62
Corrected Length	$L_c$	(mm)	210.6
Corrected Area	$A_c$	(cm <sup>2</sup> )	85.74
Corrected Volume	$V_c$	(cc)	1805.380
T100 Time to Failure	$t_{100}$	(min)	25.58
Consolidation	$c_v$	(m <sup>2</sup> /year)	8.849
Compressibility	$m_v$	(m <sup>2</sup> /MN)	0.088
Test Time	$t_F$	(h:m:s)	02:00:00
Estimated Strain to Failure	$\epsilon$	(%)	5.0
Shear Machine Speed	$d_r$	(mm/min)	0.08774

### Notes

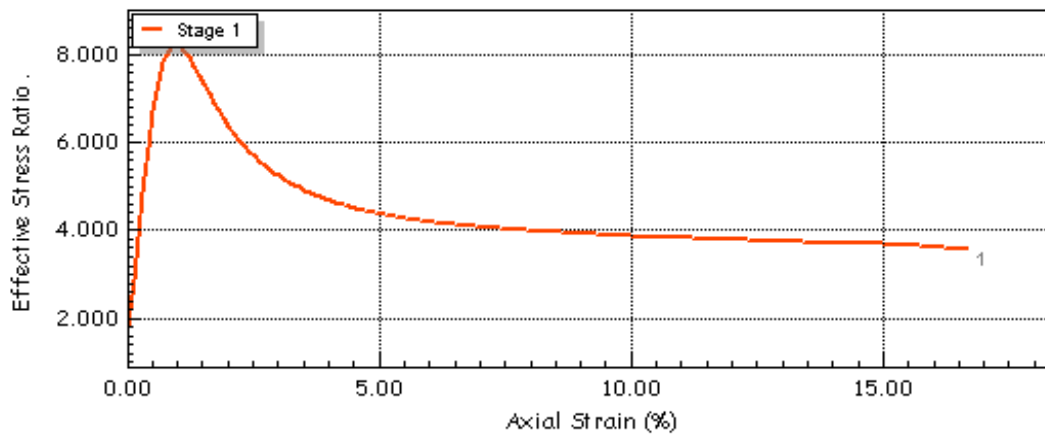
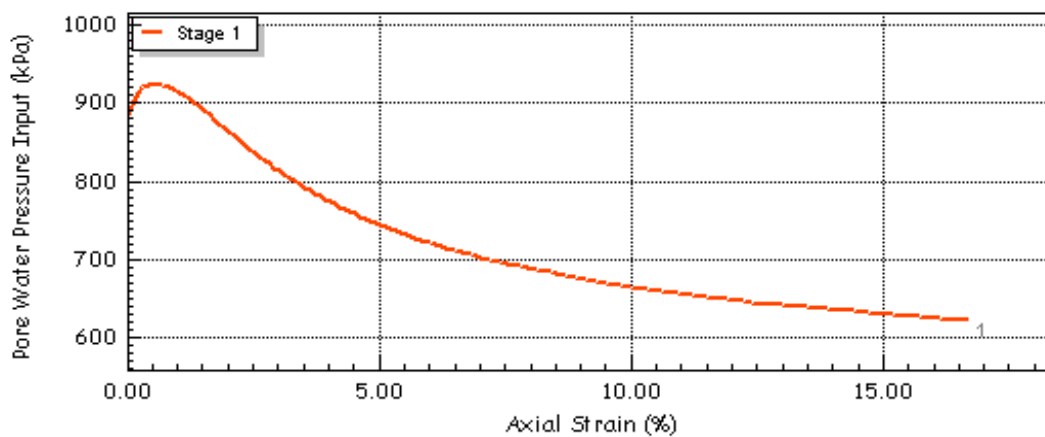
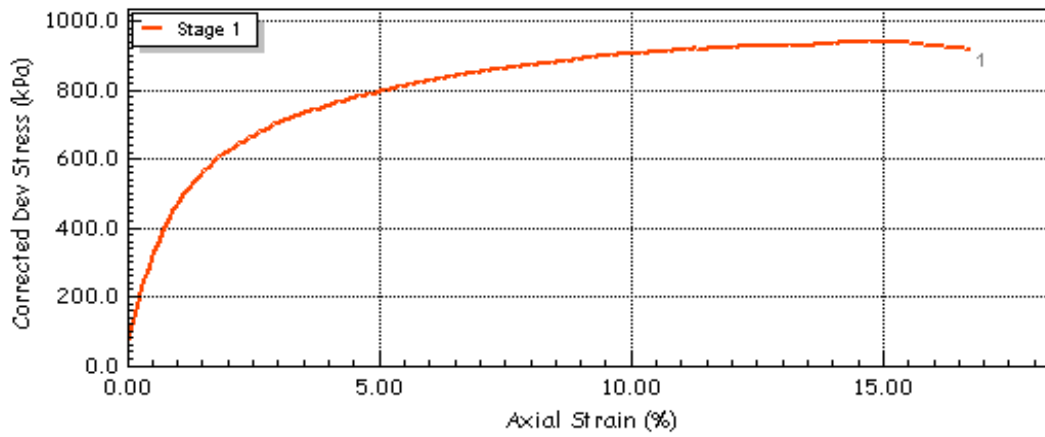



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH101 6.25-6.60m C1
			Test Date	06/05/2022
	Site Reference	DAA Airfield Underpass Ground Investigation	Borehole	BH101
	Jobfile		Sample	6.25-6.60m
Client	Causeway Geotech	Depth	6.25-6.60m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH101 6.25-6.60m C1
			Test Date	06/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH101
	Client	Causeway Geotech	Sample	6.25-6.60m
			Depth	6.25-6.60m

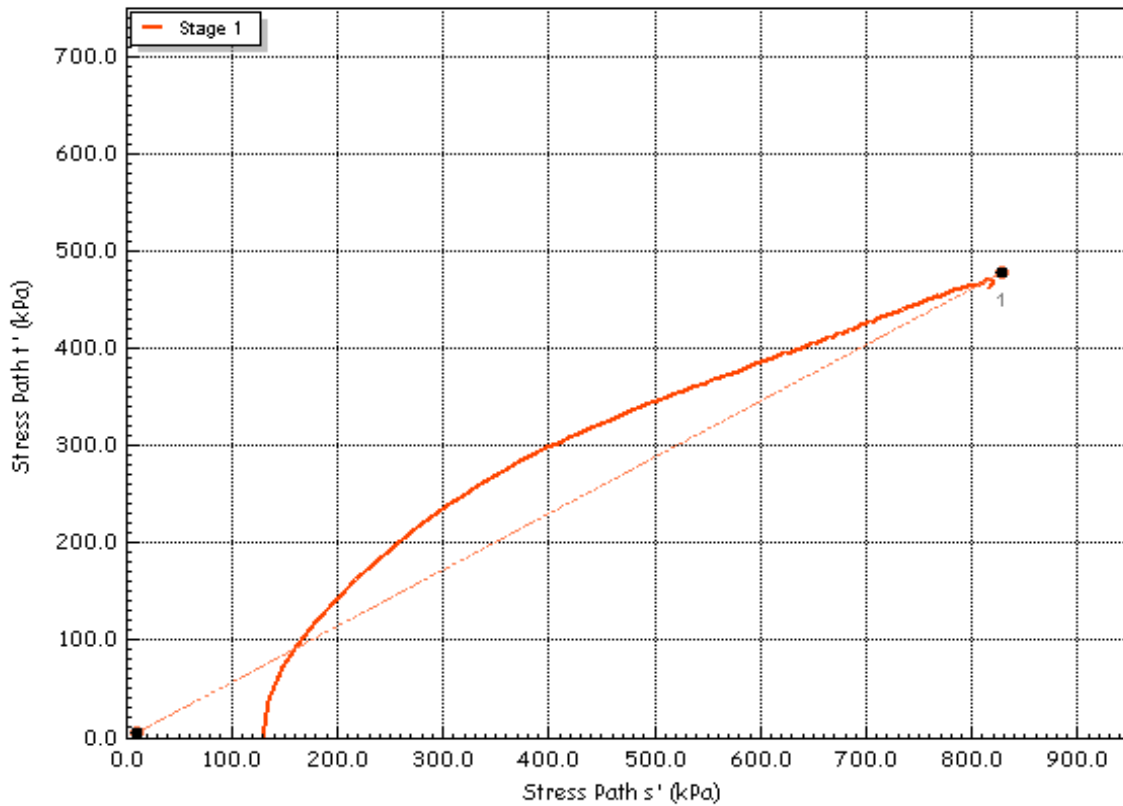
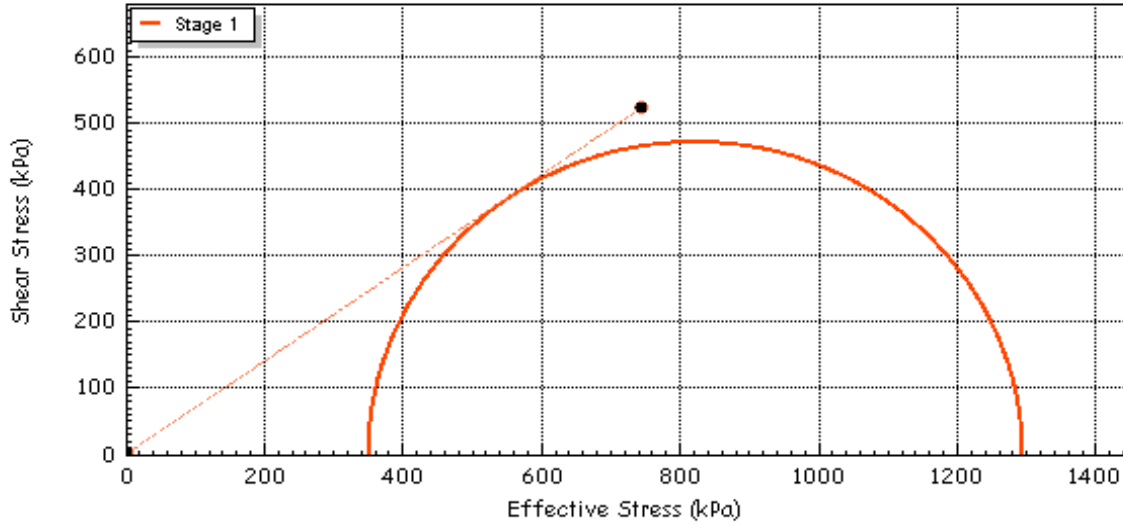



# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots

Effective	$c'$	(kPa)	0.00	Effective Cohesion $c'$	(kPa)	0.00
Effective Friction	$\phi'$	(deg)	35.2	Effective Friction $\phi'$	(deg)	35.2



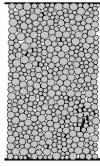
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH101 6.25-6.60m C1
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	06/05/2022
Client	Causeway Geotech	Borehole	BH101	
		Sample	6.25-6.60m	
		Depth	6.25-6.60m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Summary Report

### Sample Details



sketch showing specimen location in original sample

Depth	8.80-9.10m		
Description	Brown very gravelly slightly sandy CLAY.		
Type	Undisturbed, vertical orientation.		
Initial Sample Length	$L_0$	(mm)	211.0
Initial Sample Diameter	$D_0$	(mm)	105.0
Initial Sample Weight	$W_0$	(gr)	3939.0
Initial Bulk Density	$\rho_0$	(Mg/m <sup>3</sup> )	2.16
Particle Density	$\rho_s$	(Mg/m <sup>3</sup> )	2.66

### Initial Conditions

			Stage 1	2
Initial Cell Pressure	$\sigma_{3i}$	(kPa)	980	
Initial Back Pressure	$U_{bi}$	(kPa)	800	
Membrane Thickness	$m_b$	(mm)	0.600	
Displacement Input	$L_{IP}$	(mm)	CH 2	
Load Input	$N_{IP}$	(N)	CH 1	
Pore Water Pressure Input	$U_{pwp}$	(kPa)	CH 3	
Sample Volume	$V$	(cc)	CH 2	
Initial Moisture	$\omega_i$	(%)	10	
Initial Dry Density	$\rho_{di}$	(Mg/m <sup>3</sup> )	1.96	
Initial Voids Ratio	$e_i$	.	0.358	
Initial Degree of Saturation	$S_i$	(%)	75	
B Value	$B$	.	1.00	

### Final Conditions

Final Moisture	$\omega_f$	(%)	11	
Final Dry Density	$\rho_{df}$	(Mg/m <sup>3</sup> )	2.04	
Final Voids Ratio	$e_f$	.	0.307	
Final Degree of Saturation	$S_f$	(%)	96.0	
			Stage 1	2
Failure Criteria	.		Max. Dev. Stress	
Strain At Failure	$\epsilon_f$	(%)	20.00	
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	139.6	
Minor Stress At Failure	$\sigma_3'$	(kPa)	56.0	
Major Stress At Failure	$\sigma_1'$	(kPa)	195.6	
Principal Stress Ratio At Failure	$\sigma_1' / \sigma_3'$		3.493	

### Notes



Plastic



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH110 8.80-9.10m C2
		Test Date	06/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH110
Client	Causeway Geotech	Sample	8.80-9.10m
		Depth	8.80-9.10m

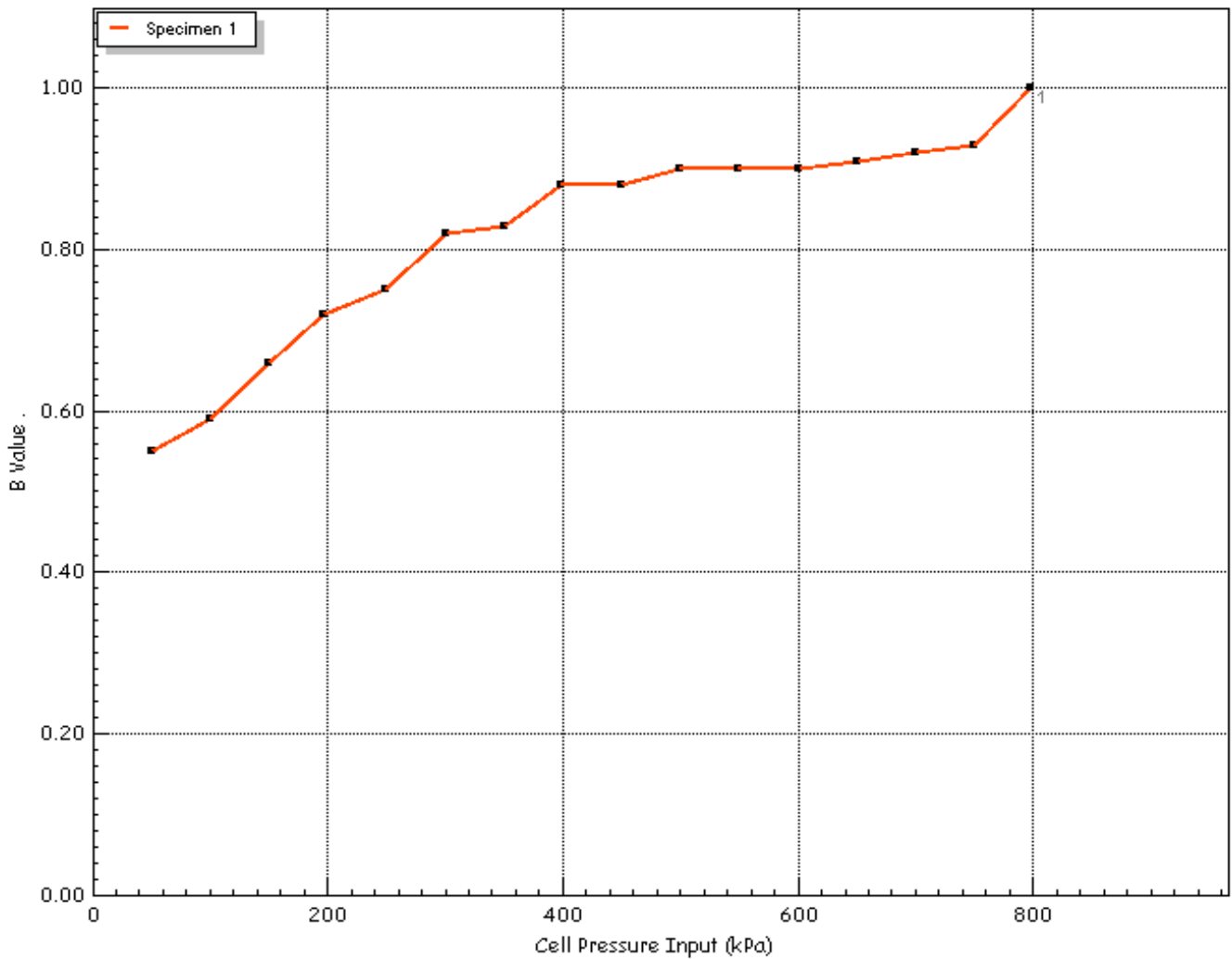



# Effective Stress Triaxial Compression

## Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	$\sigma$	(kPa)	798
Pore Water Pressure Input	$u_{pwp}$	(kPa)	785
B Value	B	.	1.00



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH110 8.80-9.10m C2
			Test Date	06/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH110
	Client	Causeway Geotech	Sample	8.80-9.10m
			Depth	8.80-9.10m

# Effective Stress Triaxial Compression

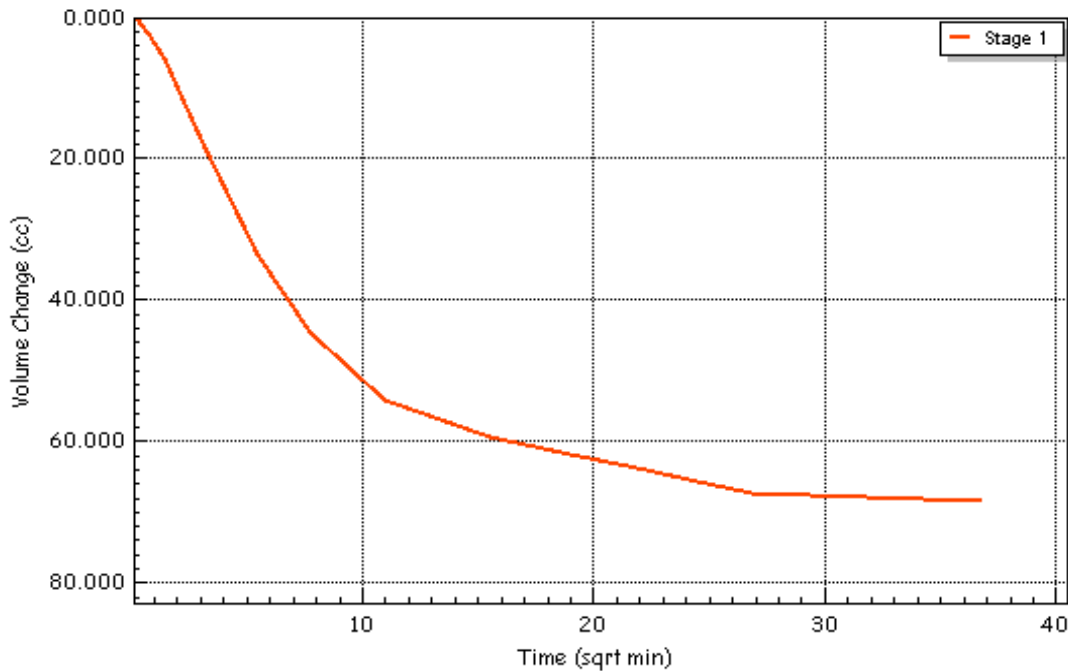
## Consolidated Undrained


Consolidation Plots

Initial Conditions			
Initial Cell Pressure	$\sigma_3$	(kPa)	980
Initial Back Pressure	$u_{bi}$	(kPa)	800
Pore Water Pressure Input	$u_{pwp}$	(kPa)	954
Drainage Method			Radial+One End

Final Conditions			
PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	$\epsilon_v$	(%)	3.74
Corrected Length	$L_c$	(mm)	208.4
Corrected Area	$A_c$	(cm <sup>2</sup> )	84.43
Corrected Volume	$V_c$	(cc)	1758.646
T100 Time to Failure	$t_{100}$	(min)	90.67
Consolidation	$c_v$	(m <sup>2</sup> /year)	2.511
Compressibility	$m_v$	(m <sup>2</sup> /MN)	0.243
Test Time	$t_F$	(h:m:s)	02:43:12
Estimated Strain to Failure	$\epsilon$	(%)	5.0
Shear Machine Speed	$d_r$	(mm/min)	0.06384

**Notes**

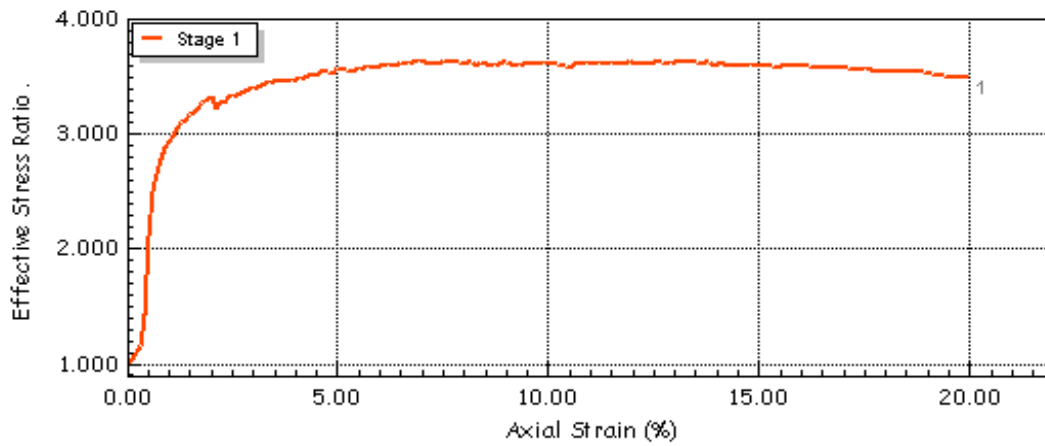
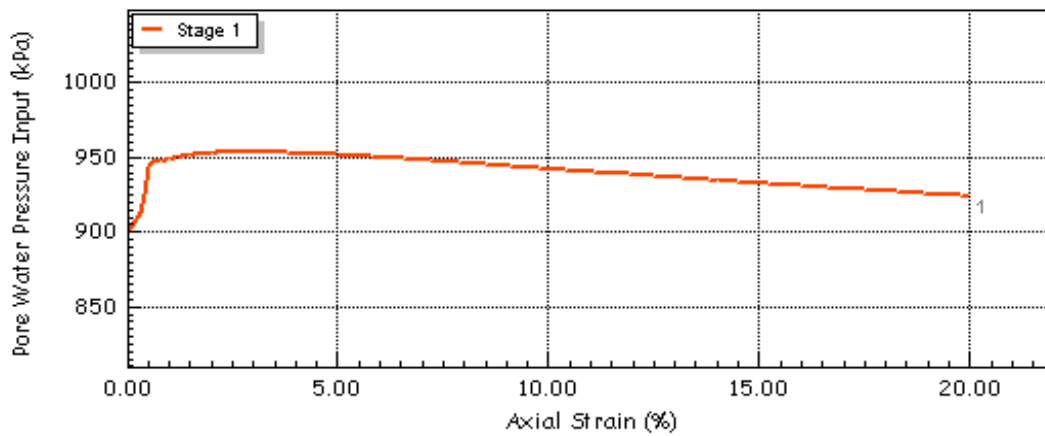
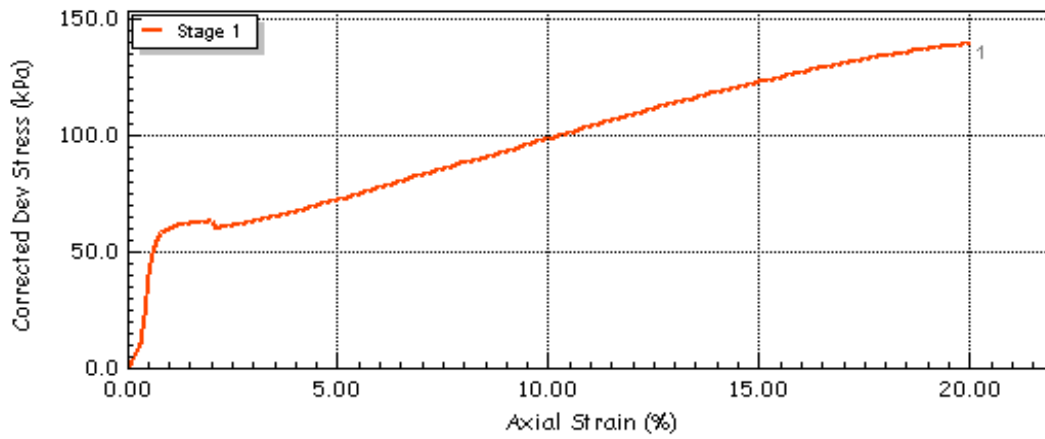



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH110 8.80-9.10m C2	
			Test Date	06/05/2022	
	Jobfile	DAA Airfield Underpass Ground Investigation		Borehole	BH110
	Client	Causeway Geotech		Sample Depth	8.80-9.10m

# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots



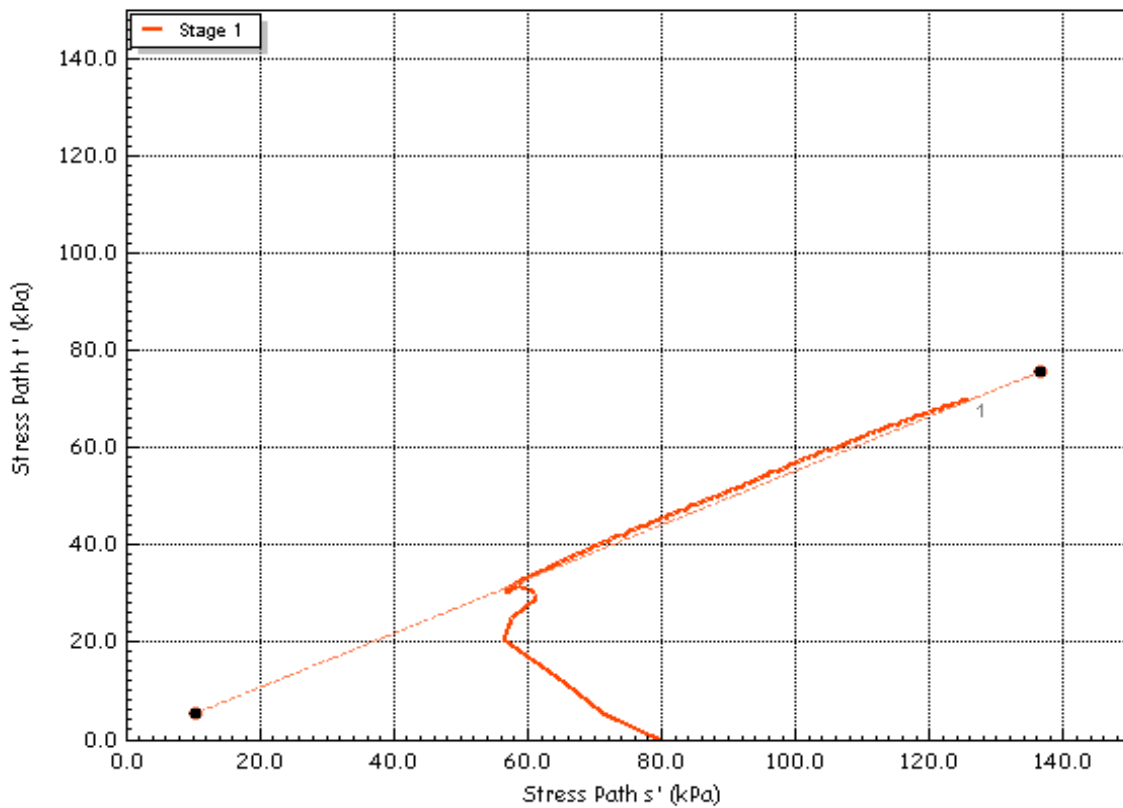
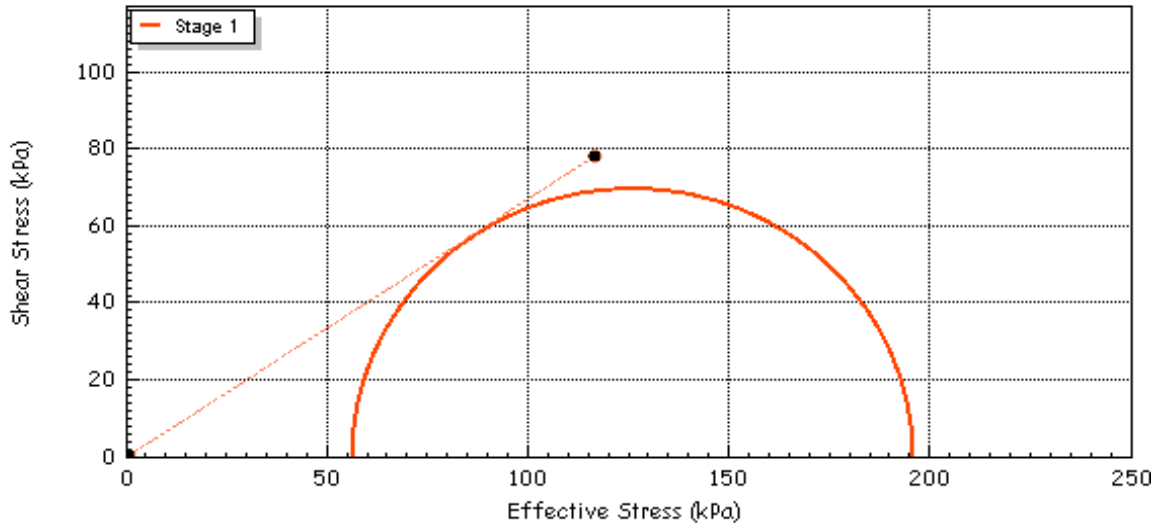
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH110 8.80-9.10m C2
			Test Date	06/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH110
	Client	Causeway Geotech	Sample Depth	8.80-9.10m


# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots

Effective	$c'$	(kPa)	0.00	Effective Cohesion $c'$	(kPa)	0.00
Effective Friction	$\phi'$	(deg)	33.9	Effective Friction $\phi'$	(deg)	33.9



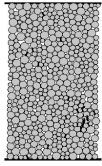
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	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	06/05/2022
Client	Causeway Geotech	Borehole	BH110	
		Sample	8.80-9.10m	
		Depth	8.80-9.10m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Summary Report

### Sample Details



sketch showing specimen location in original sample

Depth	3.80-4.10m		
Description	Grey very gravelly very sandy CLAY.		
Type	Undisturbed, vertical orientation.		
Initial Sample Length	$L_0$	(mm)	211.5
Initial Sample Diameter	$D_0$	(mm)	105.4
Initial Sample Weight	$W_0$	(gr)	4122.6
Initial Bulk Density	$\rho_0$	(Mg/m <sup>3</sup> )	2.23
Particle Density	$\rho_s$	(Mg/m <sup>3</sup> )	2.66

### Initial Conditions

			Stage 1	2
Initial Cell Pressure	$\sigma_{3i}$	(kPa)	530	
Initial Back Pressure	$U_{bi}$	(kPa)	450	
Membrane Thickness	$m_b$	(mm)	0.600	
Displacement Input	$L_{IP}$	(mm)	CH 2	
Load Input	$N_{IP}$	(N)	CH 1	
Pore Water Pressure Input	$U_{pwp}$	(kPa)	CH 3	
Sample Volume	$V$	(cc)	CH 2	
Initial Moisture	$\omega_i$	(%)	8.95	
Initial Dry Density	$\rho_{di}$	(Mg/m <sup>3</sup> )	2.05	
Initial Voids Ratio	$e_i$	.	0.297	
Initial Degree of Saturation	$S_i$	(%)	80	
B Value	$B$	.	0.95	

### Final Conditions

Final Moisture	$\omega_f$	(%)	8.88	
Final Dry Density	$\rho_{df}$	(Mg/m <sup>3</sup> )	2.07	
Final Voids Ratio	$e_f$	.	0.286	
Final Degree of Saturation	$S_f$	(%)	82.6	
			Stage 1	2
Failure Criteria	.		Max. Dev. Stress	
Strain At Failure	$\epsilon_f$	(%)	18.91	
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	492.6	
Minor Stress At Failure	$\sigma_3'$	(kPa)	211.0	
Major Stress At Failure	$\sigma_1'$	(kPa)	703.6	
Principal Stress Ratio At Failure	$\sigma_1' / \sigma_3'$		3.335	

### Notes



Plastic



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH111 3.80-4.10m C1
		Test Date	06/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH111
Client	Causeway Geotech	Sample	3.80-4.10m
		Depth	3.80-4.10m

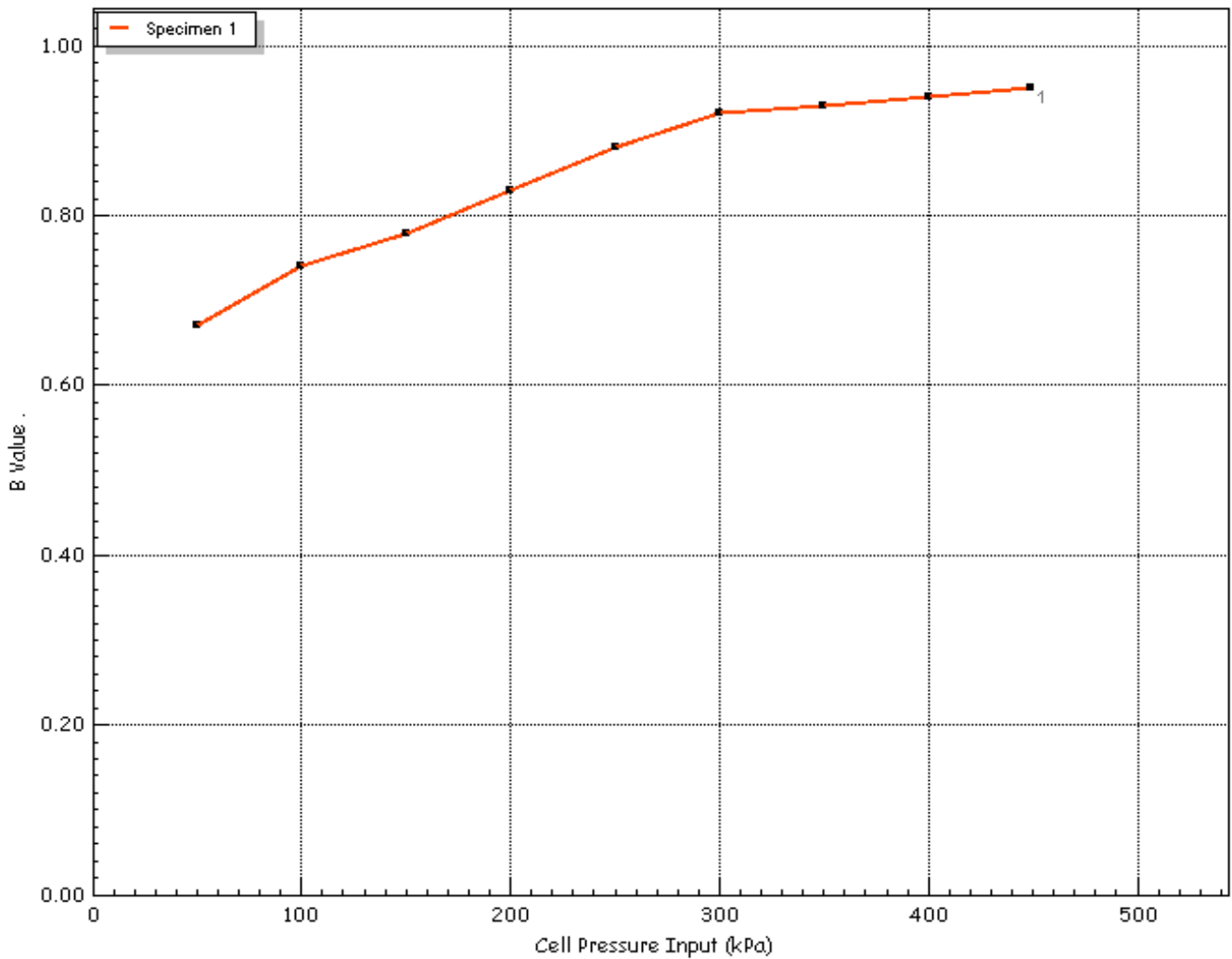



# Effective Stress Triaxial Compression

## Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	$\sigma$	(kPa)	449
Pore Water Pressure Input	$u_{pwp}$	(kPa)	439
B Value	B	.	0.95



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH111 3.80-4.10m C1
			Test Date	06/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH111
	Client	Causeway Geotech	Sample	3.80-4.10m
			Depth	3.80-4.10m



# Effective Stress Triaxial Compression

## Consolidated Undrained

Consolidation Plots

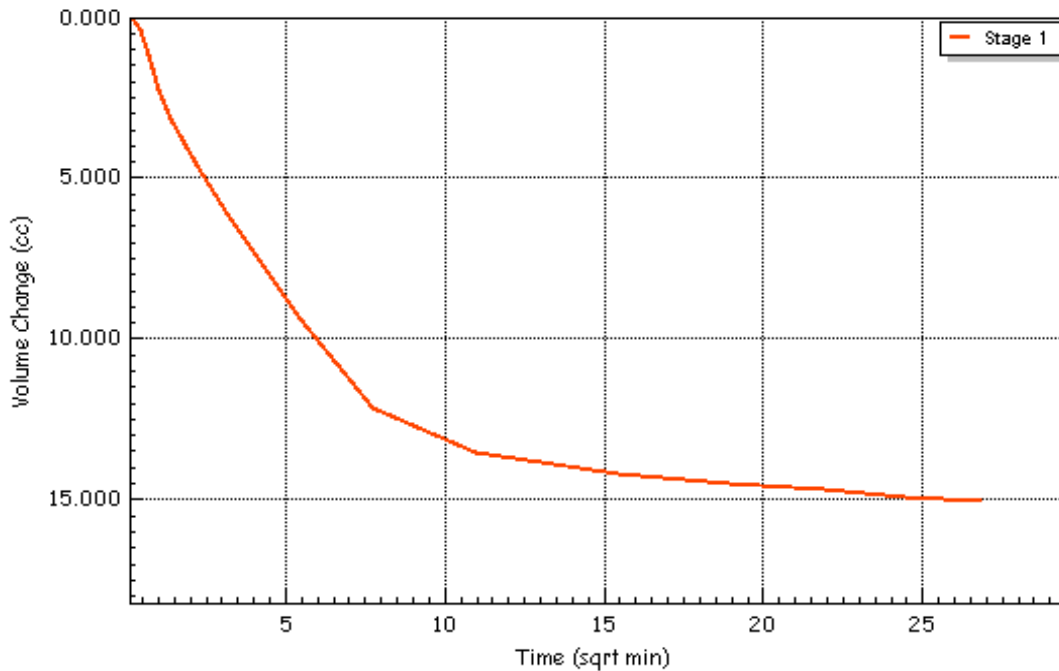
### Initial Conditions


Initial Cell Pressure	$\sigma_3$	(kPa)	530
Initial Back Pressure	$u_{bi}$	(kPa)	450
Pore Water Pressure Input	$u_{pwp}$	(kPa)	512
Drainage Method			Radial+One End

### Final Conditions

PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	$\epsilon_v$	(%)	0.82
Corrected Length	$L_c$	(mm)	210.9
Corrected Area	$A_c$	(cm <sup>2</sup> )	86.78
Corrected Volume	$V_c$	(cc)	1830.318
T100 Time to Failure	$t_{100}$	(min)	65.01
Consolidation	$c_v$	(m <sup>2</sup> /year)	3.529
Compressibility	$m_v$	(m <sup>2</sup> /MN)	0.132
Test Time	$t_F$	(h:m:s)	02:00:00
Estimated Strain to Failure	$\epsilon$	(%)	5.0
Shear Machine Speed	$d_r$	(mm/min)	0.08789

### Notes

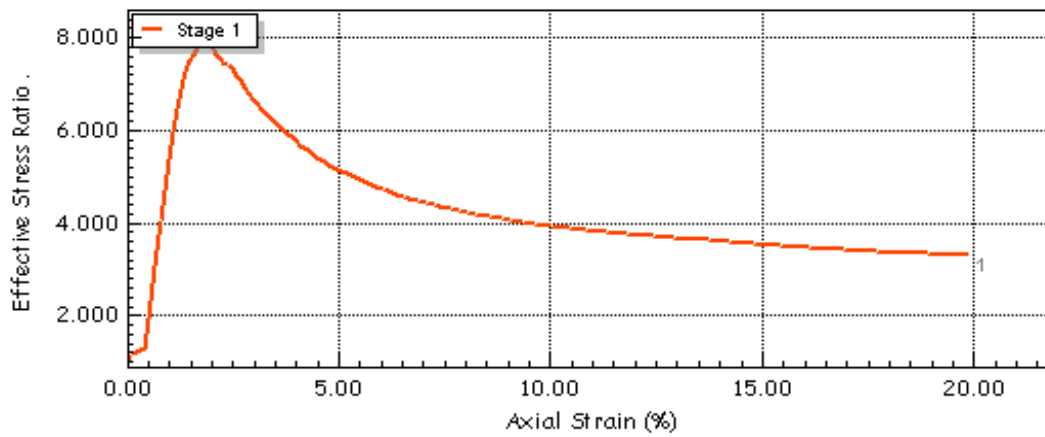
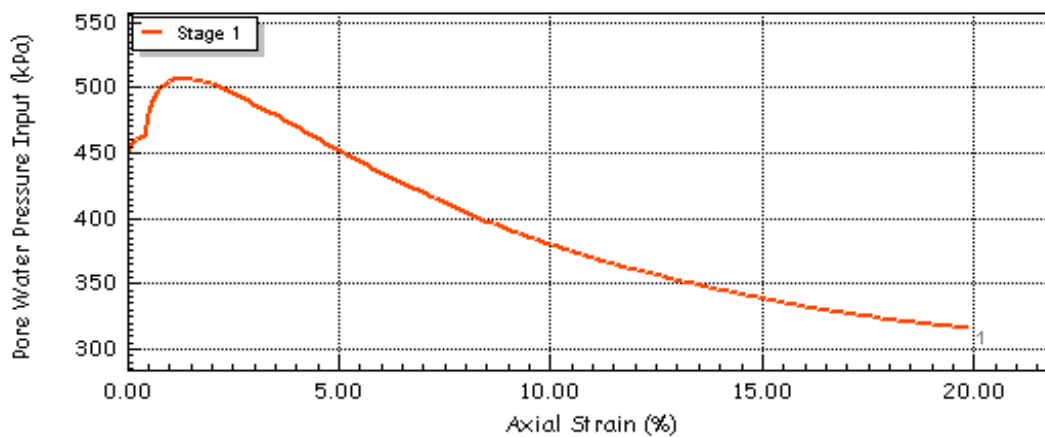
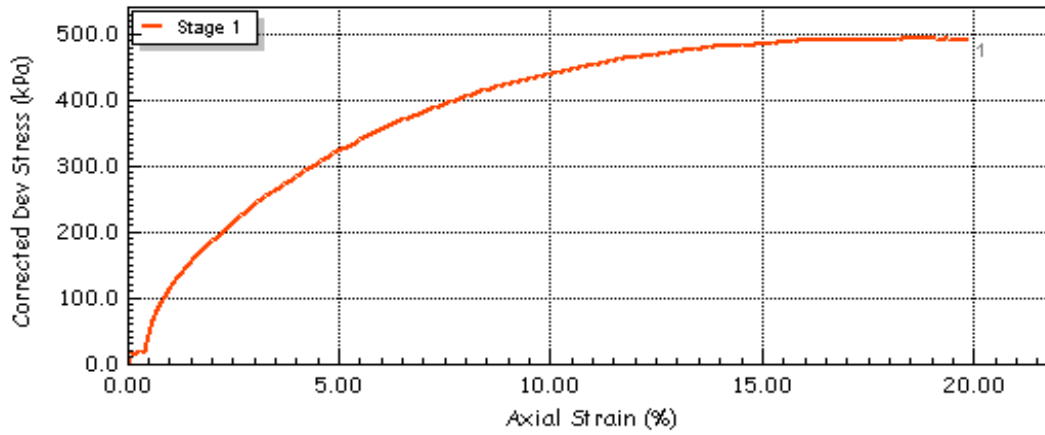



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH111 3.80-4.10m C1
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	06/05/2022
Client	Causeway Geotech	Borehole	BH111	
		Sample	3.80-4.10m	
		Depth	3.80-4.10m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots



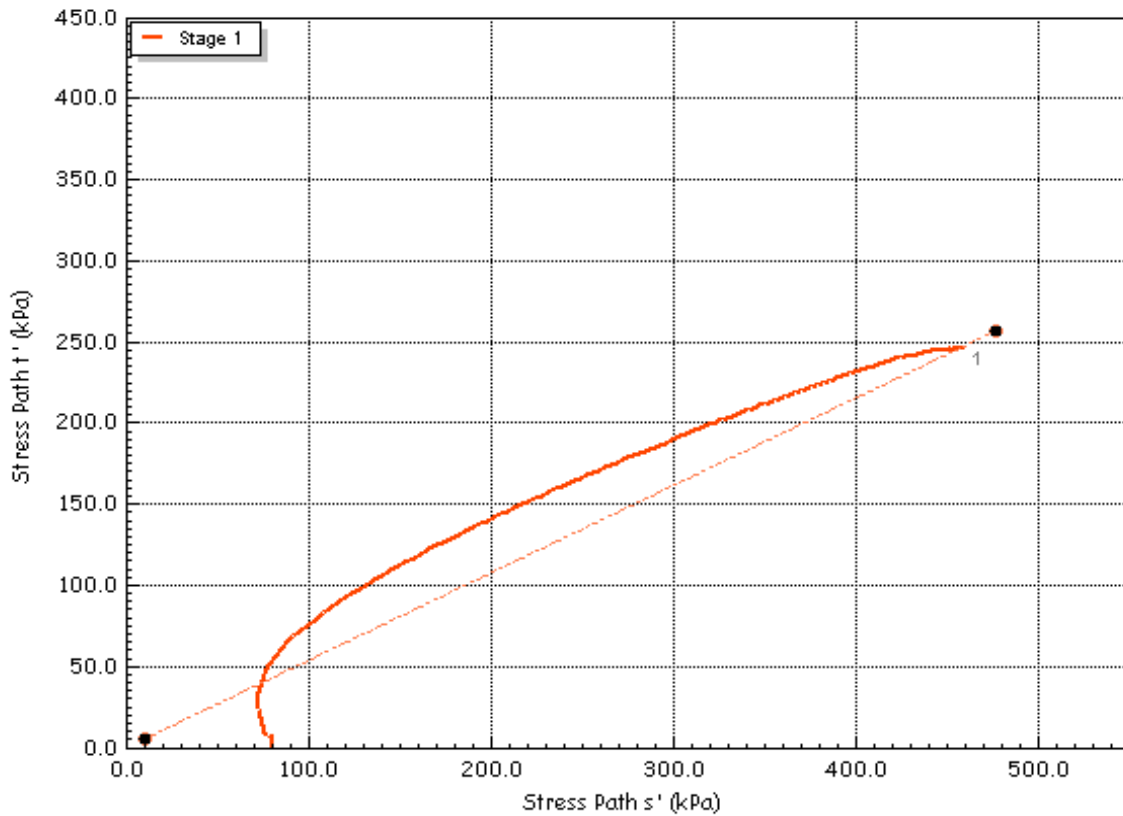
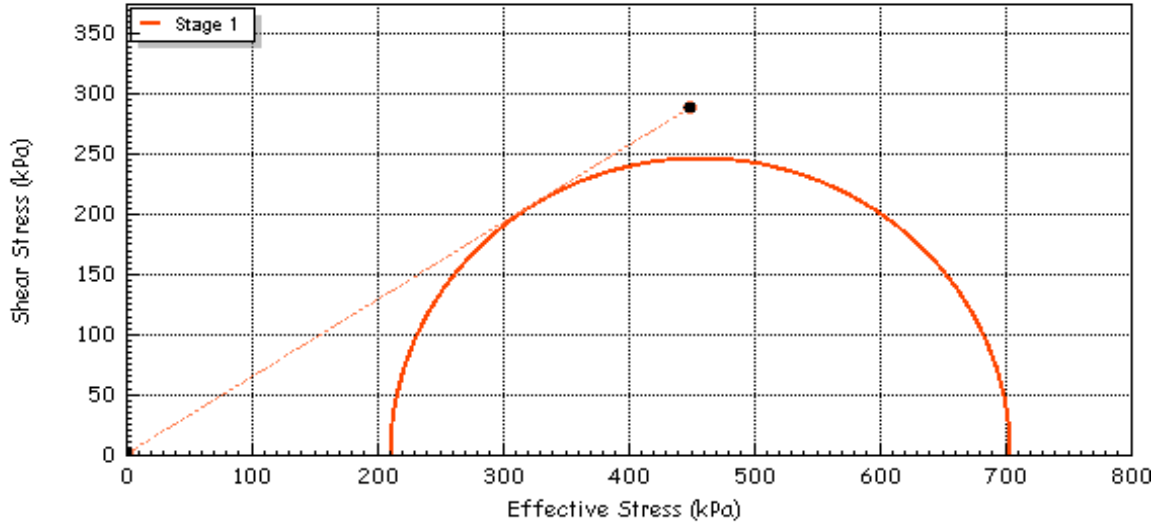
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH111 3.80-4.10m C1
			Test Date	06/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH111
	Client	Causeway Geotech	Sample Depth	3.80-4.10m


# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots

Effective	$c'$	(kPa)	0.00	Effective Cohesion $c'$	(kPa)	0.00
Effective Friction	$\phi'$	(deg)	32.7	Effective Friction $\phi'$	(deg)	32.7



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH111 3.80-4.10m C1
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	06/05/2022
Client	Causeway Geotech	Borehole	BH111	
		Sample	3.80-4.10m	
		Depth	3.80-4.10m	



## Amended Report

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**Report No.:** 22-14852-2

**Initial Date of Issue:** 26-Apr-2022      **Date of Re-Issue:** 12-May-2022

**Client:** Causeway Geotech Ltd

**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister

**Project:** 1`-1219 DAA Airfield Underpass

**Quotation No.:**      **Date Received:** 21-Apr-2022

**Order No.:** COLM HURLEY      **Date Instructed:** 21-Apr-2022

**No. of Samples:** 10

**Turnaround (Wkdays):** 16      **Results Due:** 13-May-2022

**Date Approved:** 12-May-2022

**Approved By:**



**Details:** Stuart Henderson, Technical Manager

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## Results - Soil

**Project: 1'-1219 DAA Airfield Underpass**

<b>Client: Causeway Geotech Ltd</b>		<b>Chemtest Job No.:</b>		22-14852	22-14852	22-14852	22-14852	22-14852	22-14852	22-14852	22-14852	22-14852	22-14852
Quotation No.:		<b>Chemtest Sample ID.:</b>		1415021	1415022	1415023	1415024	1415025	1415026	1415027	1415028	1415029	
Order No.: COLM HURLEY		Client Sample Ref.:		2	3	4	5	1	2	3	4	1	
		Sample Location:		BH101	BH101	BH101	BH101	BH110	BH110	BH110	BH110	BH111	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		2.7	4.2	6.1	8.4	1.2	2.2	7.2	7.8	2.5	
		Date Sampled:		15-Apr-2022	15-Apr-2022	15-Apr-2022	15-Apr-2022	15-Apr-2022	15-Apr-2022	15-Apr-2022	15-Apr-2022	15-Apr-2022	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>									
Moisture	N	2030	%	0.020	8.1	14	5.9	9.0	6.3	21	9.4	9.5	21
pH	U	2010		4.0	8.0	8.2			8.8	8.3			
pH (2.5:1)	N	2010		4.0			9.0	9.1			8.7	7.9	8.1
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010			0.042	0.022			0.033	0.084	0.042
Total Sulphur	U	2175	%	0.010			0.27				0.16		0.061
Sulphate (Acid Soluble)	U	2430	%	0.010			0.032				0.037		0.030
Organic Matter	U	2625	%	0.40	0.88	0.69			0.74	2.6			

## Results - Soil

**Project: 1'-1219 DAA Airfield Underpass**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>		22-14852		
Quotation No.:	<b>Chemtest Sample ID.:</b>		1415030		
Order No.: COLM HURLEY	Client Sample Ref.:		1		
	Sample Location:		BH111		
	Sample Type:		SOIL		
	Top Depth (m):		4.3		
	Date Sampled:		15-Apr-2022		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
Moisture	N	2030	%	0.020	7.1
pH	U	2010		4.0	
pH (2.5:1)	N	2010		4.0	8.6
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.13
Total Sulphur	U	2175	%	0.010	
Sulphate (Acid Soluble)	U	2430	%	0.010	
Organic Matter	U	2625	%	0.40	

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.



## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

## LABORATORY RESTRICTION REPORT

Project Reference	21-1219	To	Colm Hurley
Project Name	DAA Airfield Underpass Ground Investigation	Position	Project Manager
TR reference	21-1219 /	From	Stephen Watson
		Position	Laboratory Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
BH110	1	2.50-3.50	B	Dry Density / WC Relationship (2.5kg rammer)	Insufficient material	Priority given to classification testing
BH110	1	2.50-3.50	B	California Bearing Ratio (CBR)	Insufficient material	Priority given to classification testing

For electronic reporting a form of electronic signature or printed name is acceptable

Laboratory Signature Stephen Watson	Project Manager Signature Colm Hurley
Date 25 April 2022	Date 25 April 2022



**CAUSEWAY**  
GEOTECH

**HEAD OFFICE**  
Causeway Geotech Ltd  
8 Drumahiskey Road  
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Registered in Northern Ireland.  
Company Number: NI610766

**REGIONAL OFFICE**  
Causeway Geotech (IRL) Ltd  
Unit 1 Fingal House  
Stephenstown Industrial Estate  
Balbriggan, Co Dublin, Ireland, K32 VR66  
**ROI:** +353 (0)1 526 7465  
Registered in Ireland.  
Company Number: 633786

[www.causewaygeotech.com](http://www.causewaygeotech.com)

**SOIL AND ROCK SAMPLE ANALYSIS  
LABORATORY TEST REPORT**

30 May 2022

<b>Project Name:</b>	DAA Airfield Underpass Ground Investigation
<b>Project No.:</b>	21-1219
<b>Client:</b>	DAA
<b>Engineer:</b>	Ramboll Consulting Engineers

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 10/05/2022 and 30/05/2022.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



**Project Name:** DAA Airfield Underpass Ground Investigation

**Report Reference:** Schedule 2 - FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received

Tests marked with\* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	7
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	7
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	8
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	25
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	14
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	3
SOIL	California Bearing Ratio (CBR)	BS 1377-4: 1990: Cl 7	4
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	2
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	5
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	11
ROCK	Uniaxial Compressive Strength (UCS)*	ISRM Suggested Methods -Rock Characterization Testing and Monitoring, Ed. E T Brown - 1981	3

## SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL – subcontracted to Pro Soils Limited ( <i>UKAS 4043</i> )	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	2
	Extra over days (more than initial 4 days)		0
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	Organic Matter Content		8
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	BRE Test - Suite D		8



## Summary of Classification Test Results

Project No. 21-1219	Project Name DAA Airfield Underpass Ground Investigation
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Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		bulk	dry							
BH104	2	6.40	7.40	B	Greyish brown sandy gravelly silty CLAY with cobbles.	2.12	1.88	7.2	66	29 -1pt	15	14		CL
BH104	3	11.95	12.50	B	Greyish brown sandy gravelly silty CLAY.	2.39	2.19	7.3	69	30 -1pt	15	15		CL
BH106	7	9.50	10.50	B	Greyish brown sandy slightly gravelly silty CLAY.	2.18	1.98	12.0	64	30 -1pt	15	15		CL
BH106	20	19.40	20.40	B	Greyish brown sandy gravelly silty CLAY with some cobbles.	2.54	2.23	6.3	61	33 -1pt	17	16		CL
BH107	4	12.00	13.00	B	Brownish grey sandy gravelly silty CLAY with some cobbles.	2.03	1.83	6.9	74	29 -1pt	15	14		CL
BH107	6	14.60	15.60	B	Greyish brown sandy gravelly silty CLAY with cobbles.	2.20	1.98	6.2	71	30 -1pt	14	16		CL
BH108	4	13.35	14.35	B	Greyish brown sandy gravelly silty CLAY.	2.26	2.02	11.0	71	29 -1pt	14	15		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise
LAB 01R Version 5

<b>Key</b>  Density test                      Liquid Limit                      Particle density  Linear measurement unless :    4pt cone unless :                      sp - small pyknometer  wd - water displacement        cas - Casagrande method        gj - gas jar  wi - immersion in water        1pt - single point test	Date Printed  <p style="text-align: center;">25/05/2022</p>	Approved By  <p style="text-align: center;">Stephen.Watson</p>	 10122
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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Greyish brown sandy gravelly silty CLAY with cobbles.**

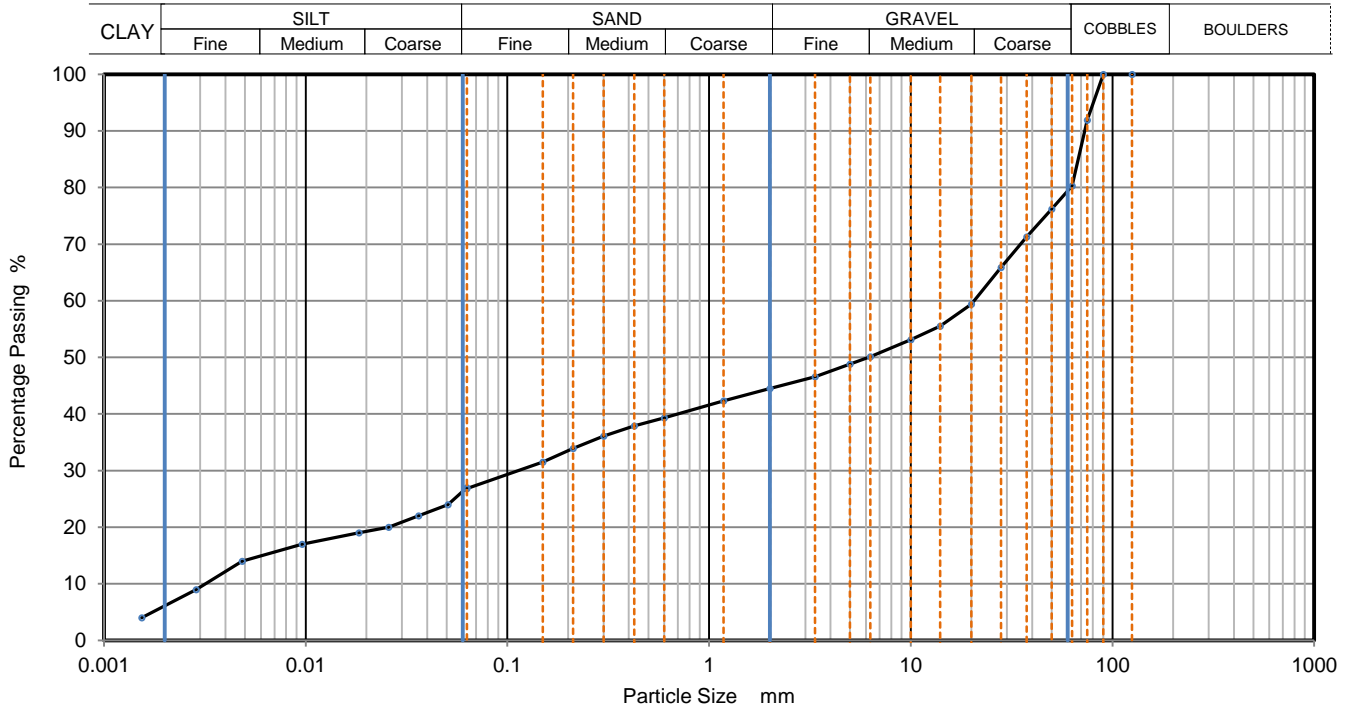
Depth, m **6.40**

Specimen Reference **8** Specimen Depth **6.4** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051010**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	27
90	100	0.05065	24
75	92	0.03625	22
63	80	0.02579	20
50	76	0.01834	19
37.5	71	0.00958	17
28	66	0.00485	14
20	59	0.00286	9
14	56	0.00154	4
10	53		
6.3	50		
5	49		
3.35	47		
2	45		
1.18	42		
0.6	39	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	38		
0.3	36		
0.212	34		
0.15	32		
0.063	27		

Dry Mass of sample, g 9342

Sample Proportions	% dry mass
Cobbles	19.7
Gravel	35.8
Sand	17.7
Silt	20.8
Clay	6.0

Grading Analysis		
D100	mm	
D60	mm	20.6
D30	mm	0.114
D10	mm	0.00319
Uniformity Coefficient		6500
Curvature Coefficient		0.2

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122





## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

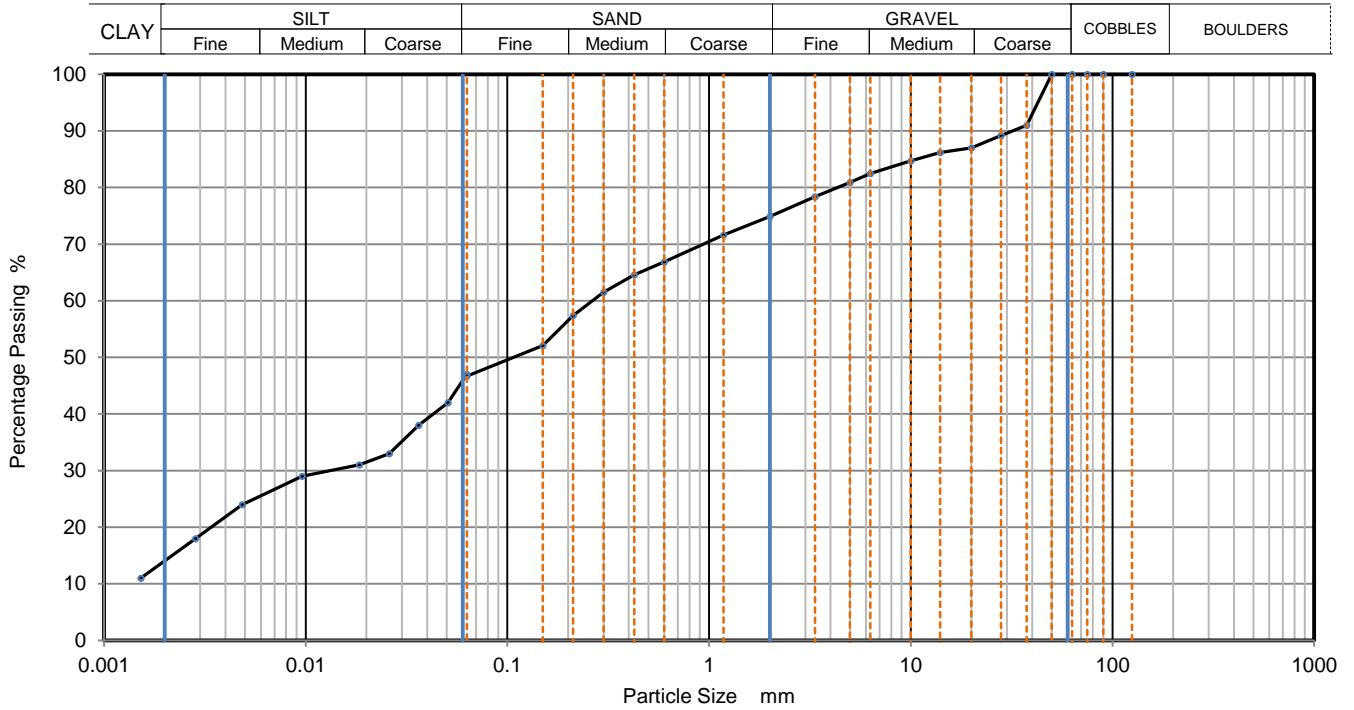
Depth, m **11.95**

Specimen Reference **8** Specimen Depth **11.95** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051012**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	47
90	100	0.05065	42
75	100	0.03625	38
63	100	0.02594	33
50	100	0.01845	31
37.5	91	0.00958	29
28	89	0.00485	24
20	87	0.00284	18
14	86	0.00152	11
10	85		
6.3	83		
5	81		
3.35	78		
2	75		
1.18	72		
0.6	67	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	65		
0.3	62		
0.212	57		
0.15	52		
0.063	47		

Dry Mass of sample, g

4606

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	25.1
Sand	28.2
Silt	32.7
Clay	14.0

Grading Analysis		
D100	mm	
D60	mm	0.265
D30	mm	0.0132
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

LAB 05R - Version 5



10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Greyish brown slightly gravelly clayey fine to coarse SAND.**

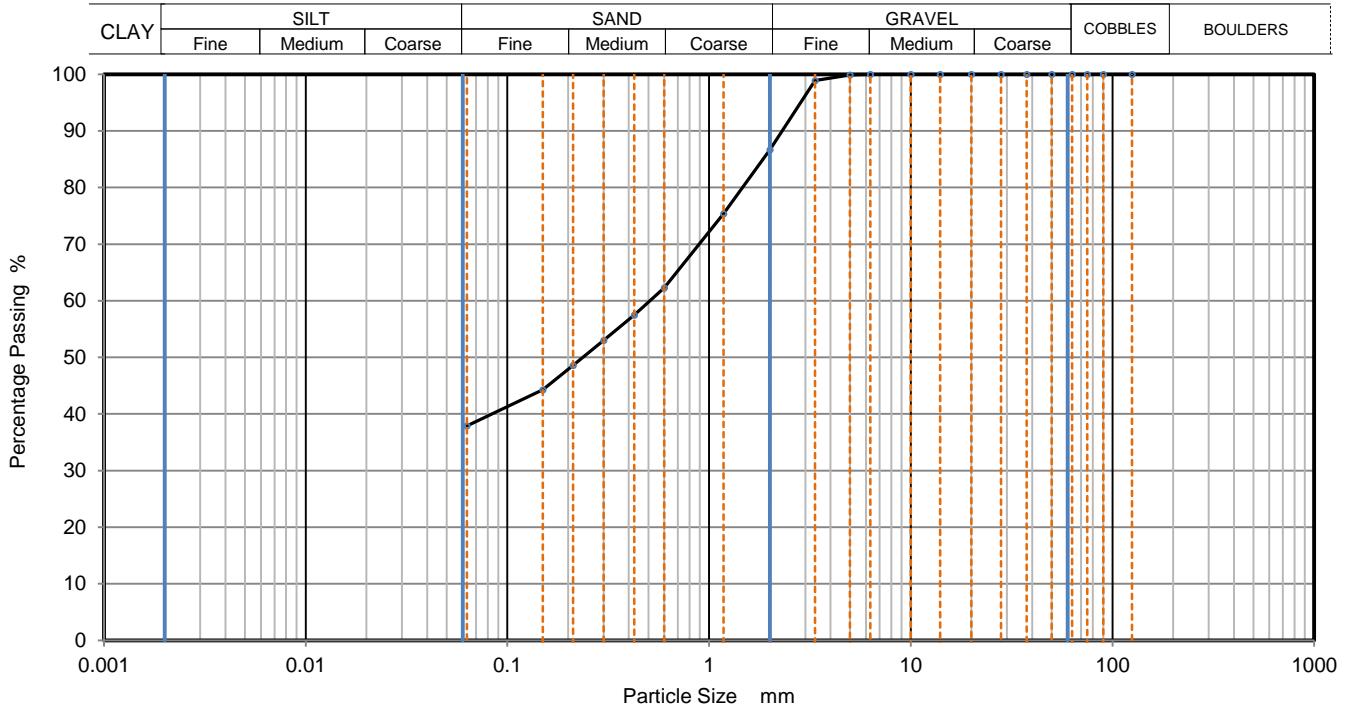
Depth, m **12.50**

Specimen Reference **2** Specimen Depth **12.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051013**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	87		
1.18	75		
0.6	62		
0.425	58		
0.3	53		
0.212	49		
0.15	44		
0.063	38		

Dry Mass of sample, g

**221**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	13.3
Sand	48.8
Fines <0.063mm	38.0

Grading Analysis		
D100	mm	
D60	mm	0.508
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122



# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Greyish brown sandy gravelly silty CLAY with cobbles.**

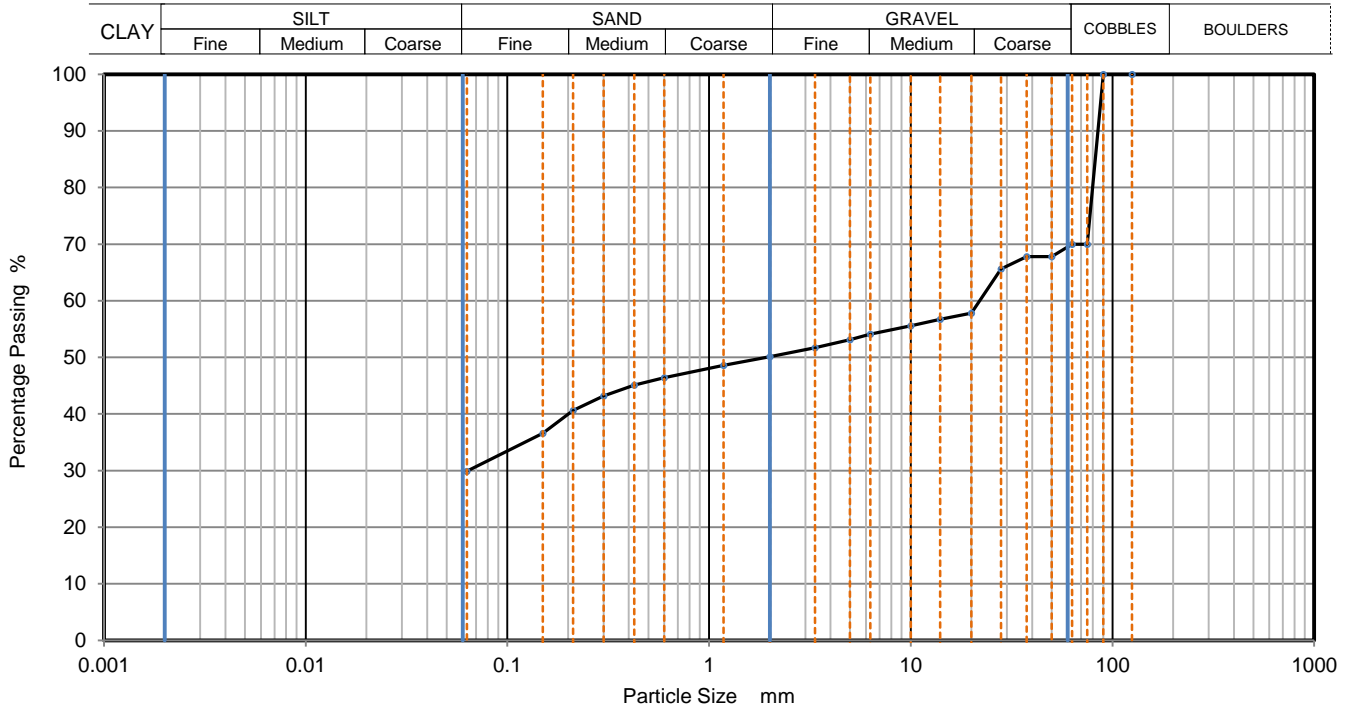
Depth, m **12.80**

Specimen Reference **2** Specimen Depth **12.8** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051014**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	70		
63	70		
50	68		
37.5	68		
28	66		
20	58		
14	57		
10	56		
6.3	54		
5	53		
3.35	52		
2	50		
1.18	49		
0.6	46		
0.425	45		
0.3	43		
0.212	41		
0.15	37		
0.063	30		

Dry Mass of sample, g

7388

Sample Proportions	% dry mass
Cobbles	30.0
Gravel	19.9
Sand	20.2
Fines <0.063mm	30.0

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **9**

Soil Description **Grey slightly gravelly clayey fine to coarse SAND.**

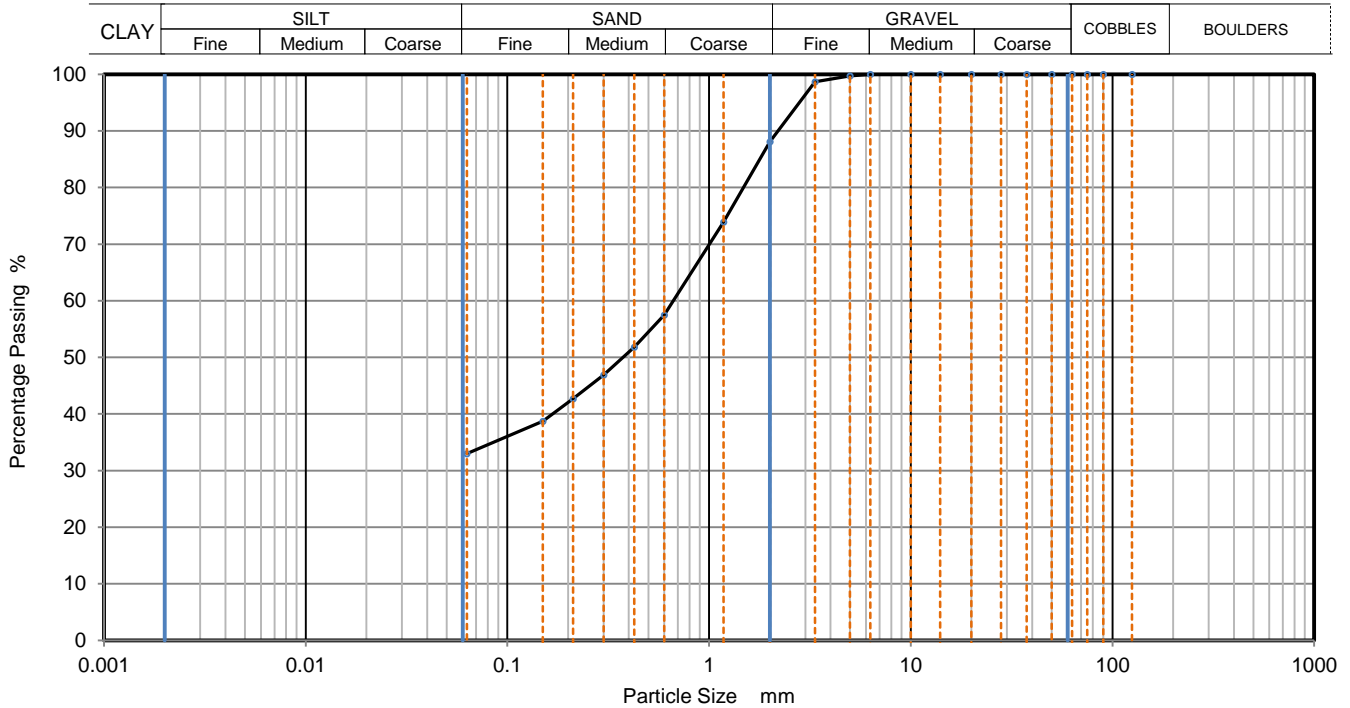
Depth, m **15.50**

Specimen Reference **2** Specimen Depth **15.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051015**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	88		
1.18	74		
0.6	58		
0.425	52		
0.3	47		
0.212	43		
0.15	39		
0.063	33		

Dry Mass of sample, g

**215**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	11.9
Sand	55.0
Fines <0.063mm	33.0

Grading Analysis		
D100	mm	
D60	mm	0.666
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **11**

Soil Description **Grey slightly gravelly clayey fine to coarse SAND.**

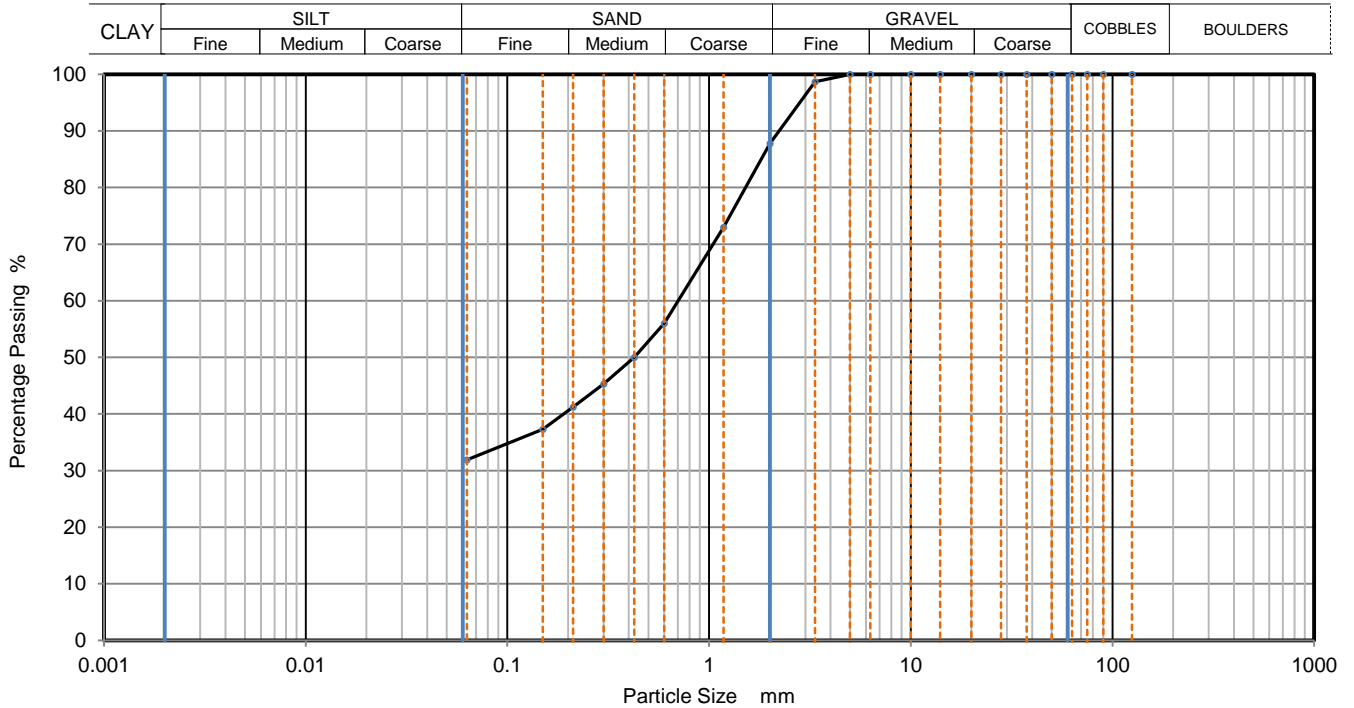
Depth, m **17.00**

Specimen Reference **2** Specimen Depth **17** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051016**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	88		
1.18	73		
0.6	56		
0.425	50		
0.3	45		
0.212	41		
0.15	37		
0.063	32		

Dry Mass of sample, g 223

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	12.2
Sand	55.9
Fines <0.063mm	32.0

Grading Analysis		
D100	mm	
D60	mm	0.704
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **13**

Soil Description **Grey sandy silty CLAY.**

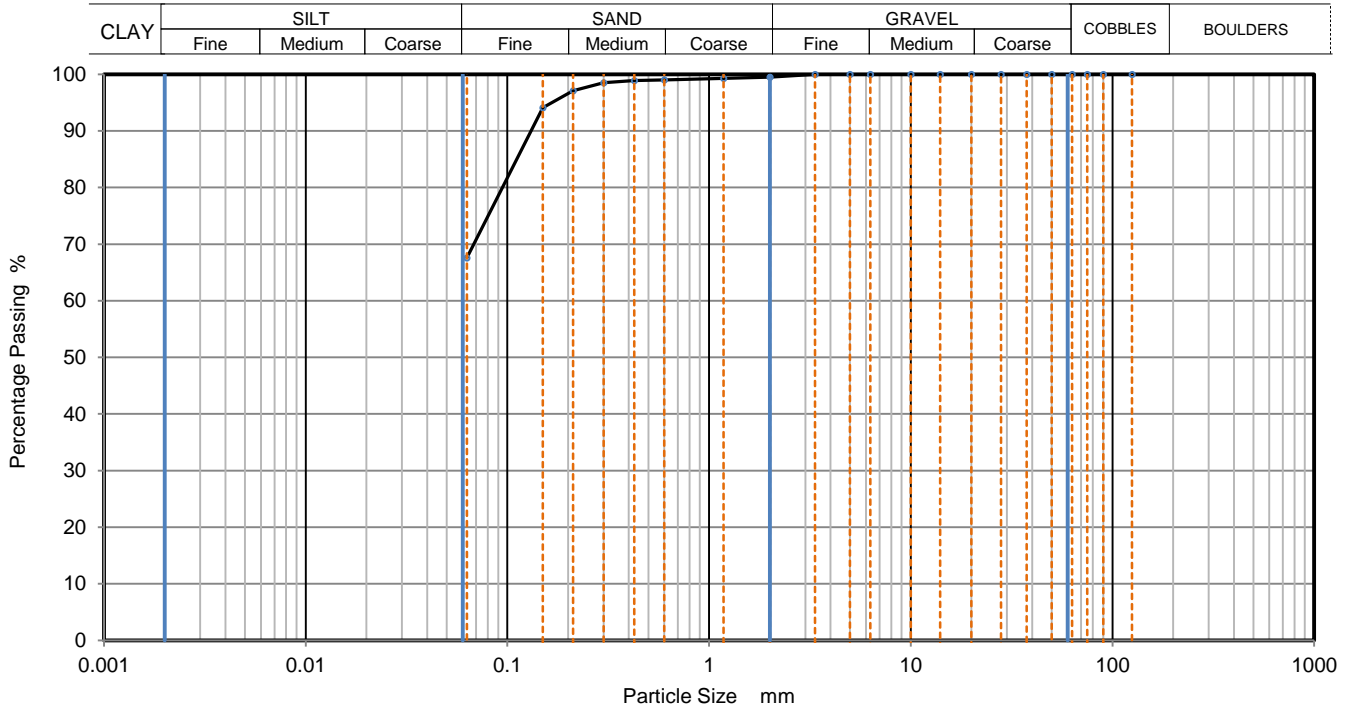
Depth, m **20.25**

Specimen Reference **4**      Specimen Depth **20.25** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051018**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	99		
0.3	99		
0.212	97		
0.15	94		
0.063	68		

Dry Mass of sample, g

**220**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.5
Sand	31.9
Fines <0.063mm	68.0

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **41**

Soil Description **Grey clayey fine to coarse SAND.**

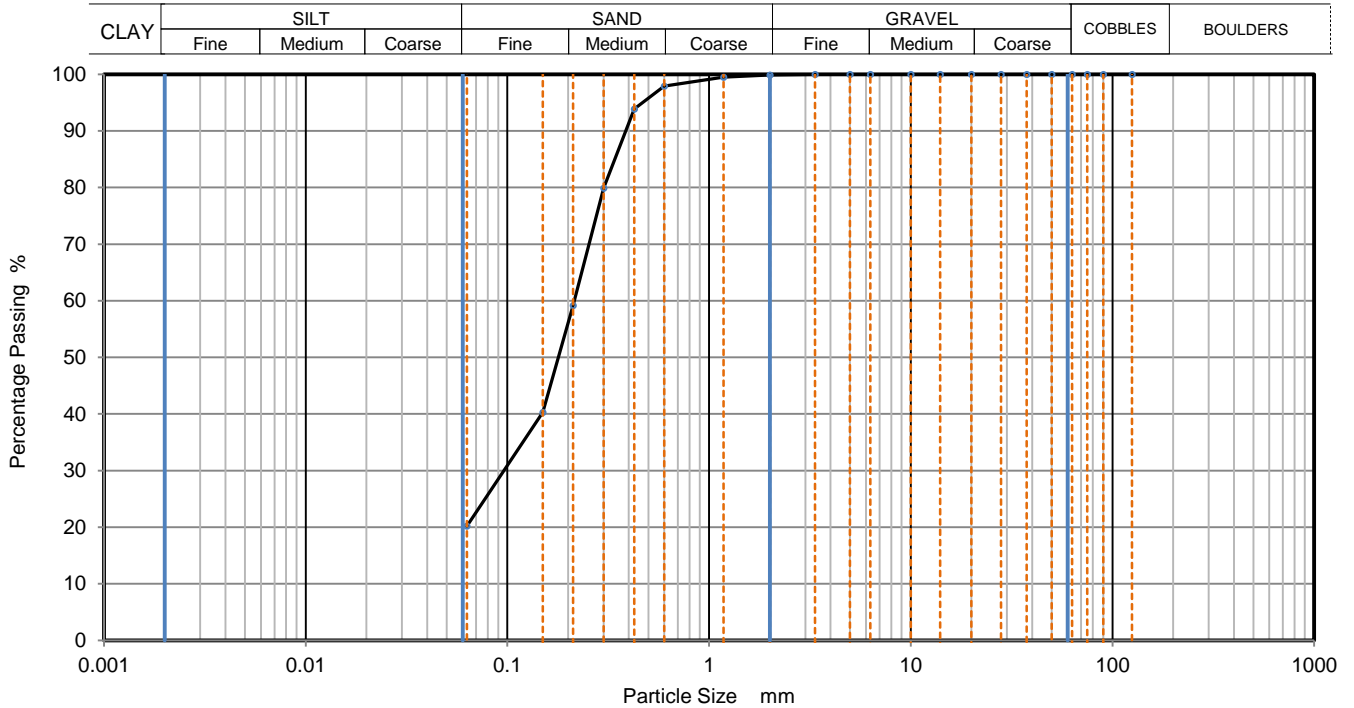
Depth, m **22.55**

Specimen Reference **2** Specimen Depth **22.55** m

Sample Type **D**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051019**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	98		
0.425	94		
0.3	80		
0.212	59		
0.15	40		
0.063	20		

Dry Mass of sample, g

210

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.1
Sand	79.7
Fines <0.063mm	20.0

Grading Analysis		
D100	mm	
D60	mm	0.215
D30	mm	0.0963
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH104**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **18**

Soil Description **Grey clayey fine to coarse SAND.**

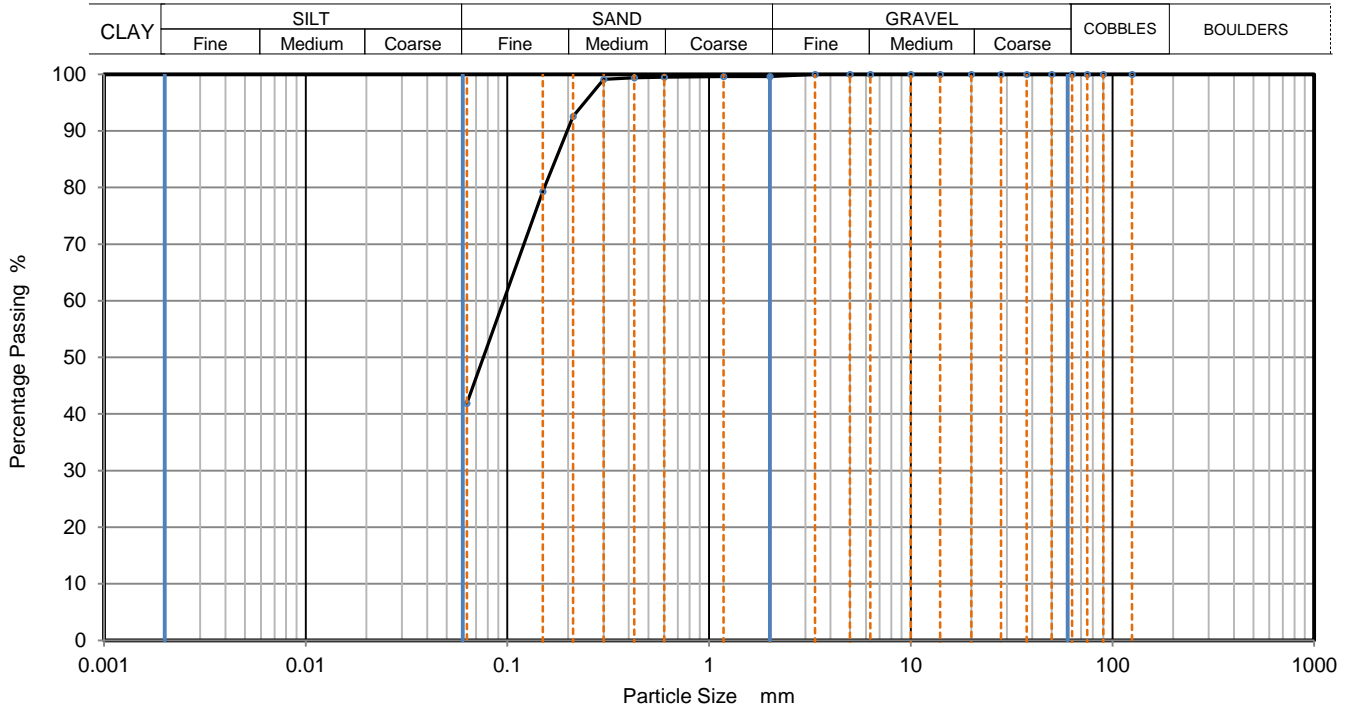
Depth, m **25.05**

Specimen Reference **2** Specimen Depth **25.05** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051020**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	99		
0.212	93		
0.15	79		
0.063	42		

Dry Mass of sample, g 210

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.4
Sand	57.7
Fines <0.063mm	42.0

Grading Analysis		
D100	mm	
D60	mm	0.0959
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH106**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **7**

Soil Description **Greyish brown sandy slightly gravelly silty CLAY.**

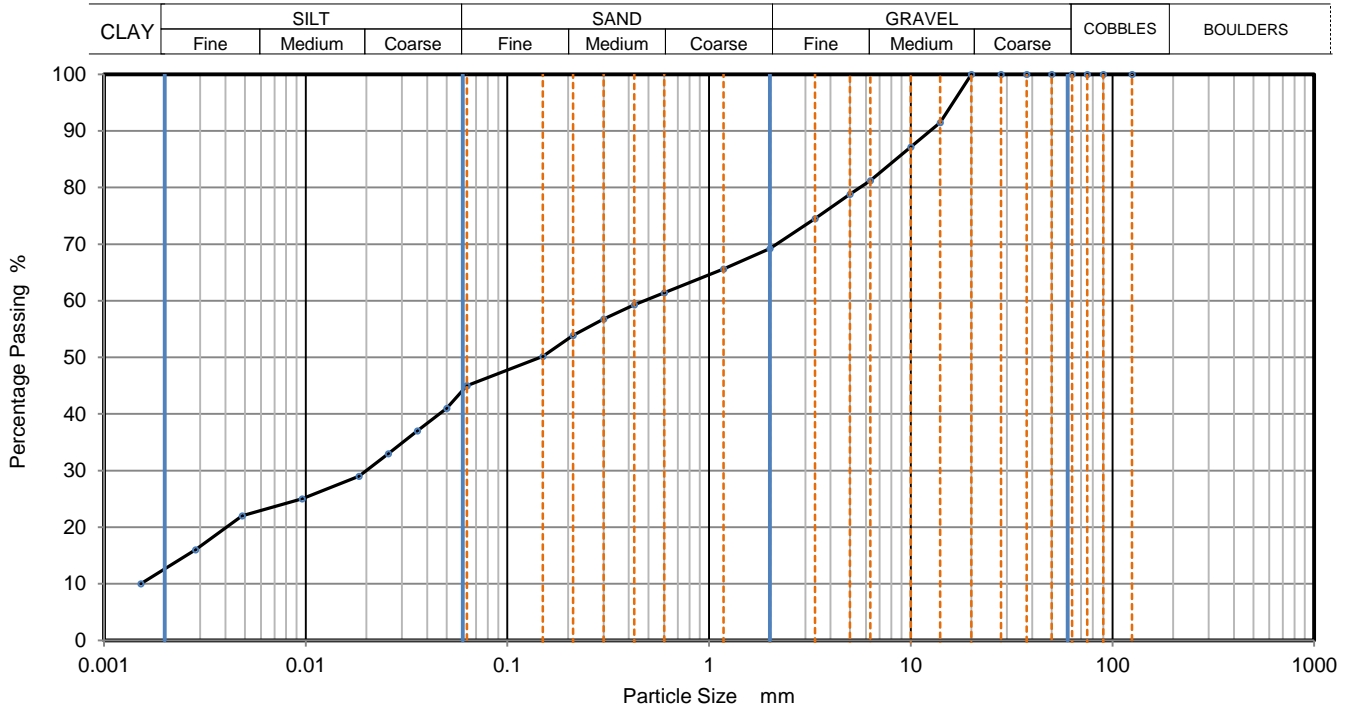
Depth, m **9.50**

Specimen Reference **8** Specimen Depth **9.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051022**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	45
90	100	0.05002	41
75	100	0.03581	37
63	100	0.02563	33
50	100	0.01834	29
37.5	100	0.00958	25
28	100	0.00485	22
20	100	0.00284	16
14	92	0.00152	10
10	87		
6.3	81		
5	79		
3.35	75		
2	69		
1.18	66		
0.6	61	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	59		
0.3	57		
0.212	54		
0.15	50		
0.063	45		

Dry Mass of sample, g

**502**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	30.8
Sand	24.2
Silt	32.6
Clay	12.4

Grading Analysis		
D100	mm	
D60	mm	0.477
D30	mm	0.0194
D10	mm	0.00156
Uniformity Coefficient		310
Curvature Coefficient		0.51

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH106**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **8**

Soil Description **Greyish brown slightly gravelly clayey fine to coarse SAND.**

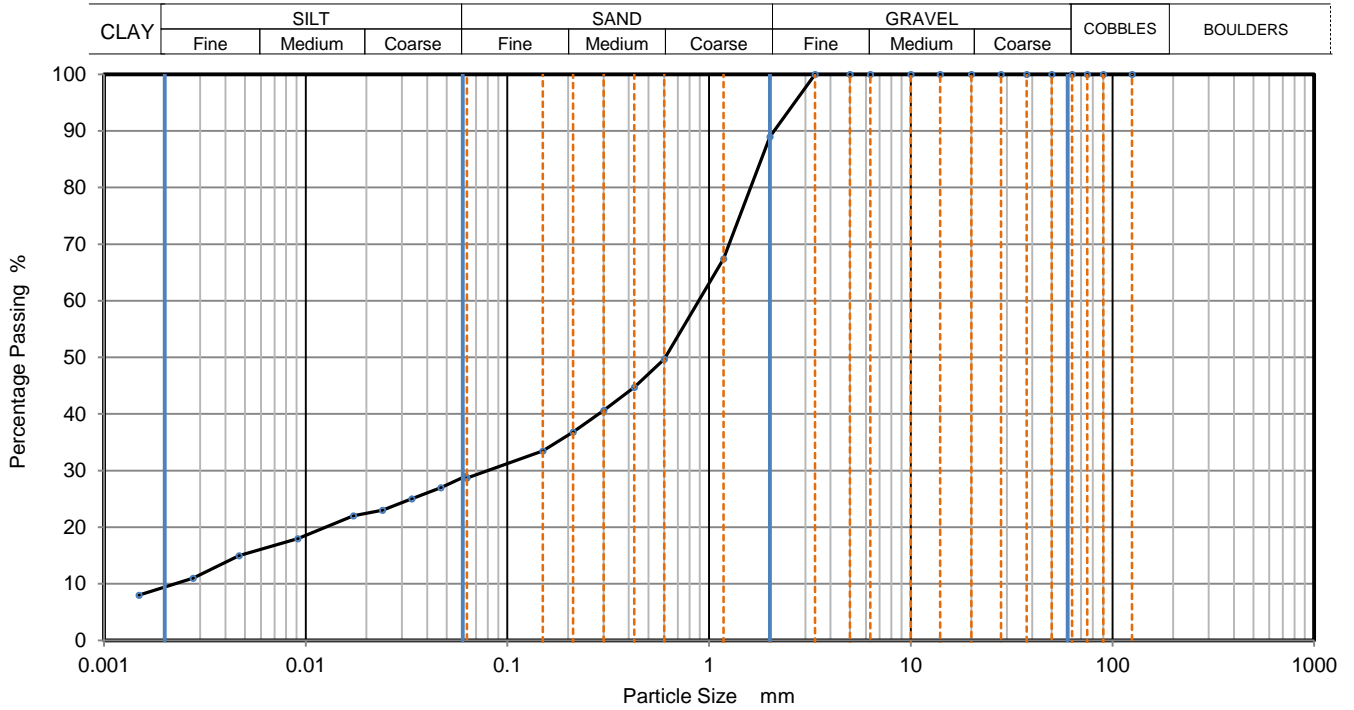
Depth, m **12.50**

Specimen Reference **2** Specimen Depth **12.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051024**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06199	29
90	100	0.04677	27
75	100	0.03355	25
63	100	0.02405	23
50	100	0.01724	22
37.5	100	0.00913	18
28	100	0.00468	15
20	100	0.00277	11
14	100	0.00149	8
10	100		
6.3	100		
5	100		
3.35	100		
2	89		
1.18	67		
0.6	50	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	45		
0.3	41		
0.212	37		
0.15	34		
0.063	29		

Dry Mass of sample, g

**212**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	11.0
Sand	60.3
Silt	19.2
Clay	9.5

Grading Analysis	
D100	mm
D60	mm 0.889
D30	mm 0.0796
D10	mm 0.00219
Uniformity Coefficient	410
Curvature Coefficient	3.3

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH106**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **10**

Soil Description **Greyish brown slightly gravelly clayey fine to coarse SAND.**

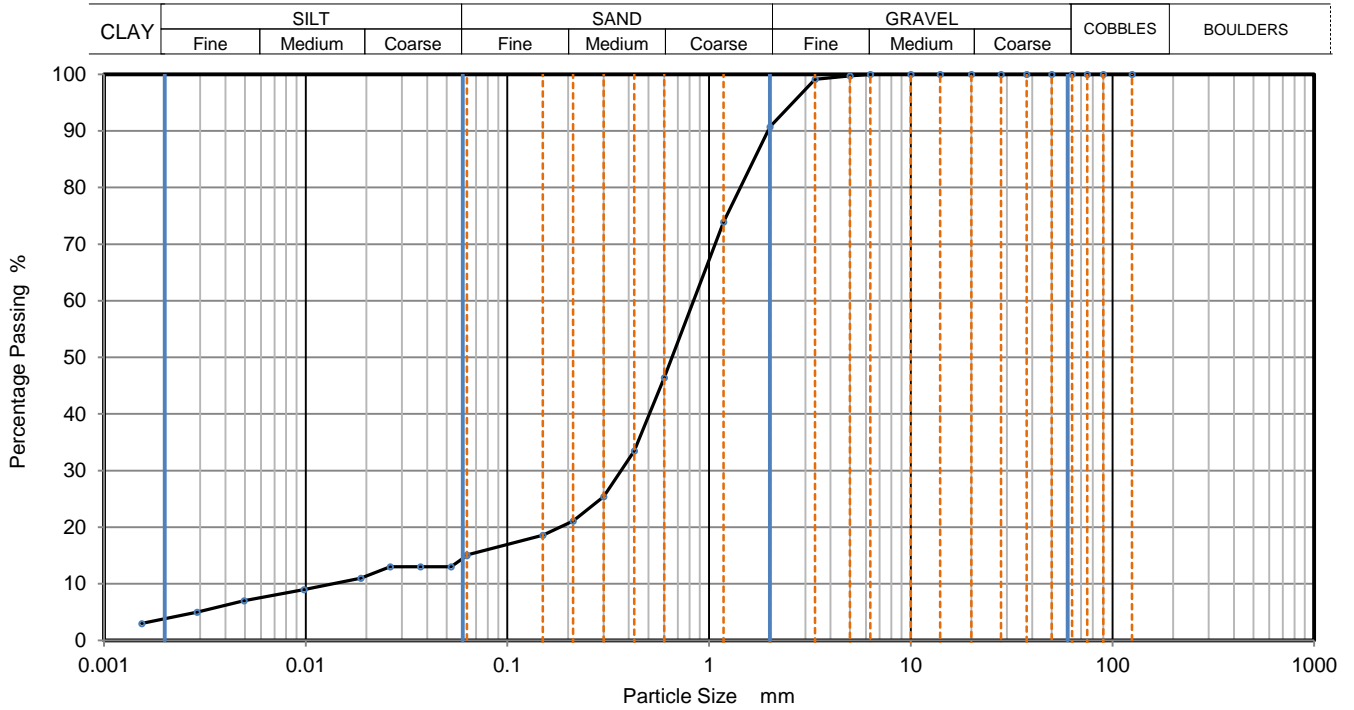
Depth, m **14.00**

Specimen Reference **2** Specimen Depth **14** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051025**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	15
90	100	0.05248	13
75	100	0.03711	13
63	100	0.02624	13
50	100	0.01877	11
37.5	100	0.00980	9
28	100	0.00495	7
20	100	0.00289	5
14	100	0.00154	3
10	100		
6.3	100		
5	100		
3.35	99		
2	91		
1.18	74		
0.6	46	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	34		
0.3	25		
0.212	21		
0.15	19		
0.063	15		

Dry Mass of sample, g

**214**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	9.3
Sand	75.6
Silt	11.2
Clay	3.9

Grading Analysis		
D100	mm	
D60	mm	0.838
D30	mm	0.365
D10	mm	0.0133
Uniformity Coefficient		63
Curvature Coefficient		12

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH106**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **13**

Soil Description **Greyish brown slightly gravelly clayey fine to coarse SAND.**

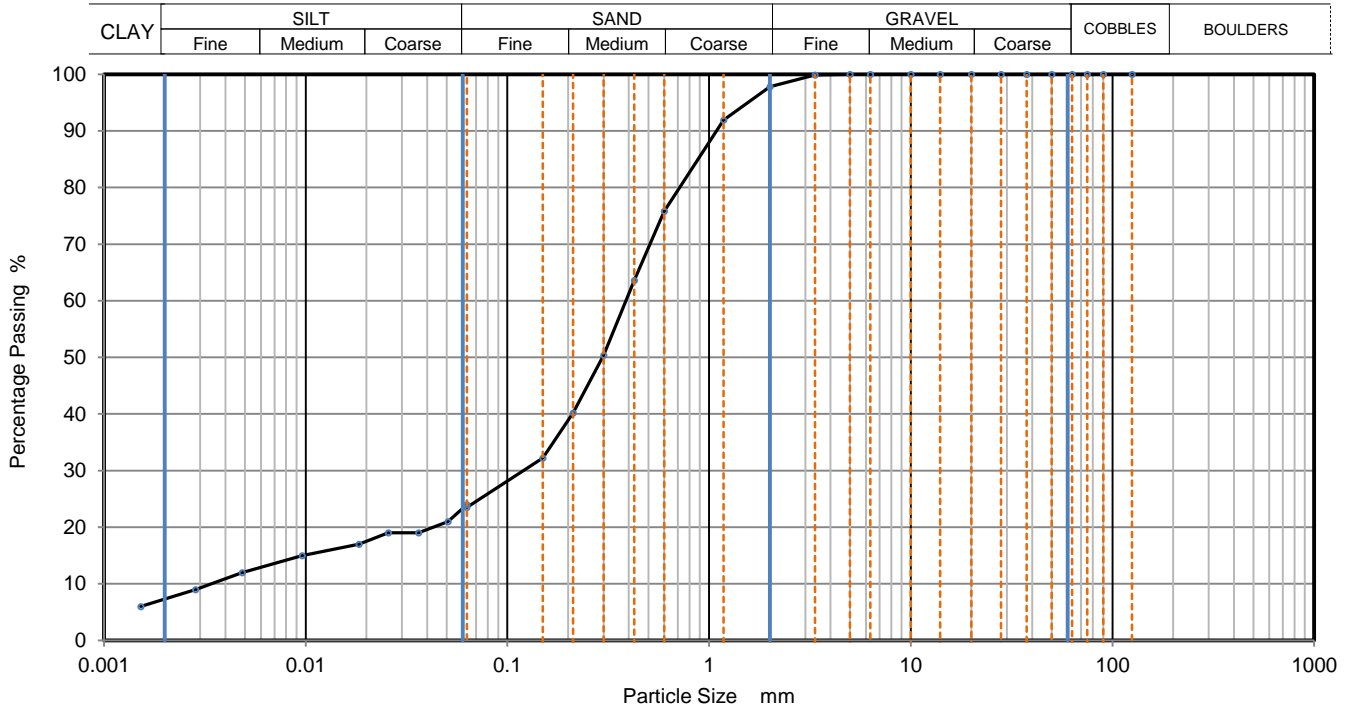
Depth, m **16.00**

Specimen Reference **2** Specimen Depth **16** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051026**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	24
90	100	0.05065	21
75	100	0.03625	19
63	100	0.02563	19
50	100	0.01834	17
37.5	100	0.00958	15
28	100	0.00485	12
20	100	0.00284	9
14	100	0.00152	6
10	100		
6.3	100		
5	100		
3.35	100		
2	98		
1.18	92		
0.6	76	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	64		
0.3	50		
0.212	40		
0.15	32		
0.063	24		

Dry Mass of sample, g

202

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	2.2
Sand	74.3
Silt	16.4
Clay	7.1

Grading Analysis		
D100	mm	
D60	mm	0.386
D30	mm	0.121
D10	mm	0.00336
Uniformity Coefficient		120
Curvature Coefficient		11

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH106**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **20**

Soil Description **Greyish brown sandy gravelly silty CLAY with some cobbles.**

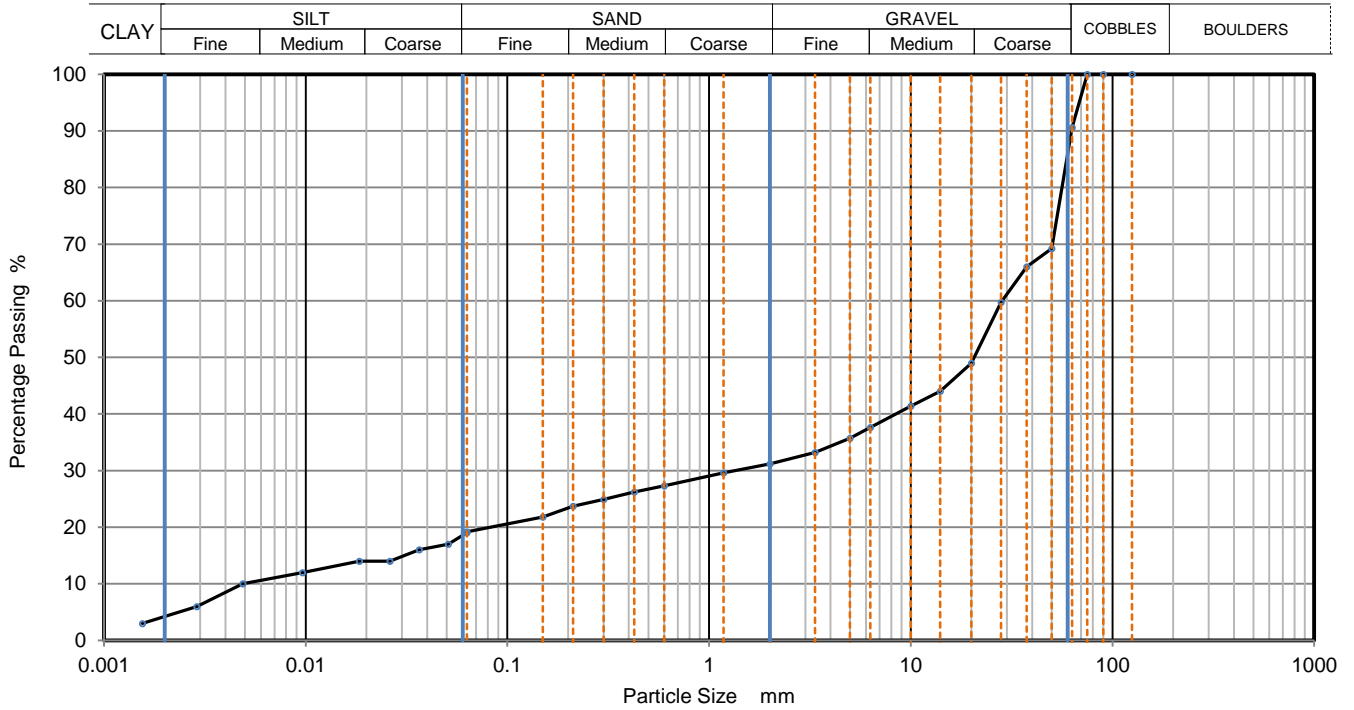
Depth, m **19.40**

Specimen Reference **8** Specimen Depth **19.4** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051028**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	19
90	100	0.05097	17
75	100	0.03649	16
63	91	0.02611	14
50	69	0.01846	14
37.5	66	0.00965	12
28	60	0.00488	10
20	49	0.00288	6
14	44	0.00155	3
10	41		
6.3	38		
5	36		
3.35	33		
2	31		
1.18	30		
0.6	27	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	26		
0.3	25		
0.212	24		
0.15	22		
0.063	19		

Dry Mass of sample, g

**6519**

Sample Proportions	% dry mass
Cobbles	9.4
Gravel	59.4
Sand	12.0
Silt	14.9
Clay	4.3

Grading Analysis		
D100	mm	
D60	mm	28.4
D30	mm	1.35
D10	mm	0.00484
Uniformity Coefficient		5900
Curvature Coefficient		13

Remarks

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Greyish brown sandy gravelly silty CLAY with some cobbles.**

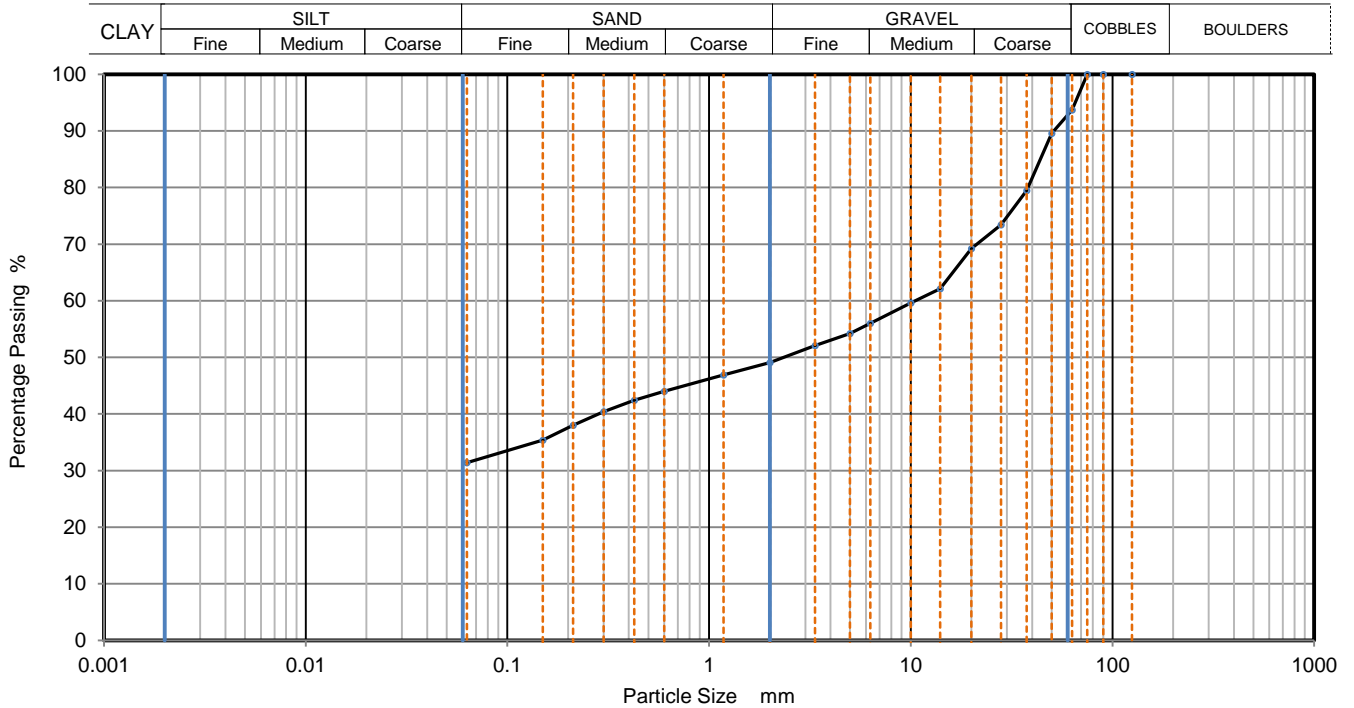
Depth, m **6.60**

Specimen Reference **2** Specimen Depth **6.6** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051030**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	94		
50	90		
37.5	80		
28	73		
20	69		
14	62		
10	60		
6.3	56		
5	54		
3.35	52		
2	49		
1.18	47		
0.6	44		
0.425	42		
0.3	40		
0.212	38		
0.15	35		
0.063	31		

Dry Mass of sample, g

**5428**

Sample Proportions	% dry mass
Cobbles	6.3
Gravel	44.6
Sand	17.7
Fines <0.063mm	31.0

Grading Analysis		
D100	mm	
D60	mm	10.6
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Brownish grey sandy gravelly silty CLAY with some cobbles.**

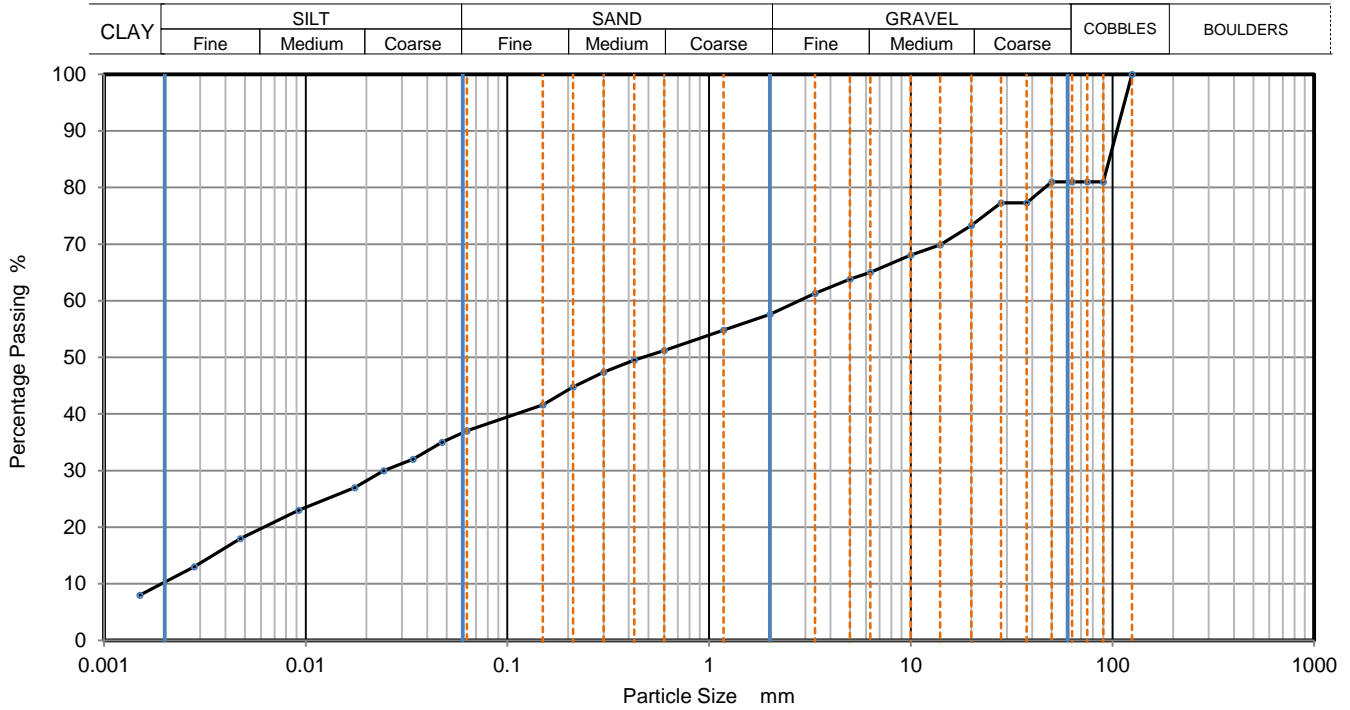
Depth, m **12.00**

Specimen Reference **8** Specimen Depth **12** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051032**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06290	37
90	81	0.04744	35
75	81	0.03401	32
63	81	0.02437	30
50	81	0.01746	27
37.5	77	0.00925	23
28	77	0.00474	18
20	73	0.00280	13
14	70	0.00150	8
10	68		
6.3	65		
5	64		
3.35	61		
2	58		
1.18	55		
0.6	51	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	50		
0.3	47		
0.212	45		
0.15	42		
0.063	37		

Dry Mass of sample, g

7111

Sample Proportions	% dry mass
Cobbles	19.0
Gravel	23.4
Sand	20.6
Silt	26.5
Clay	10.5

Grading Analysis		
D100	mm	125
D60	mm	2.78
D30	mm	0.0249
D10	mm	0.00186
Uniformity Coefficient		1500
Curvature Coefficient		0.12

Remarks  
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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

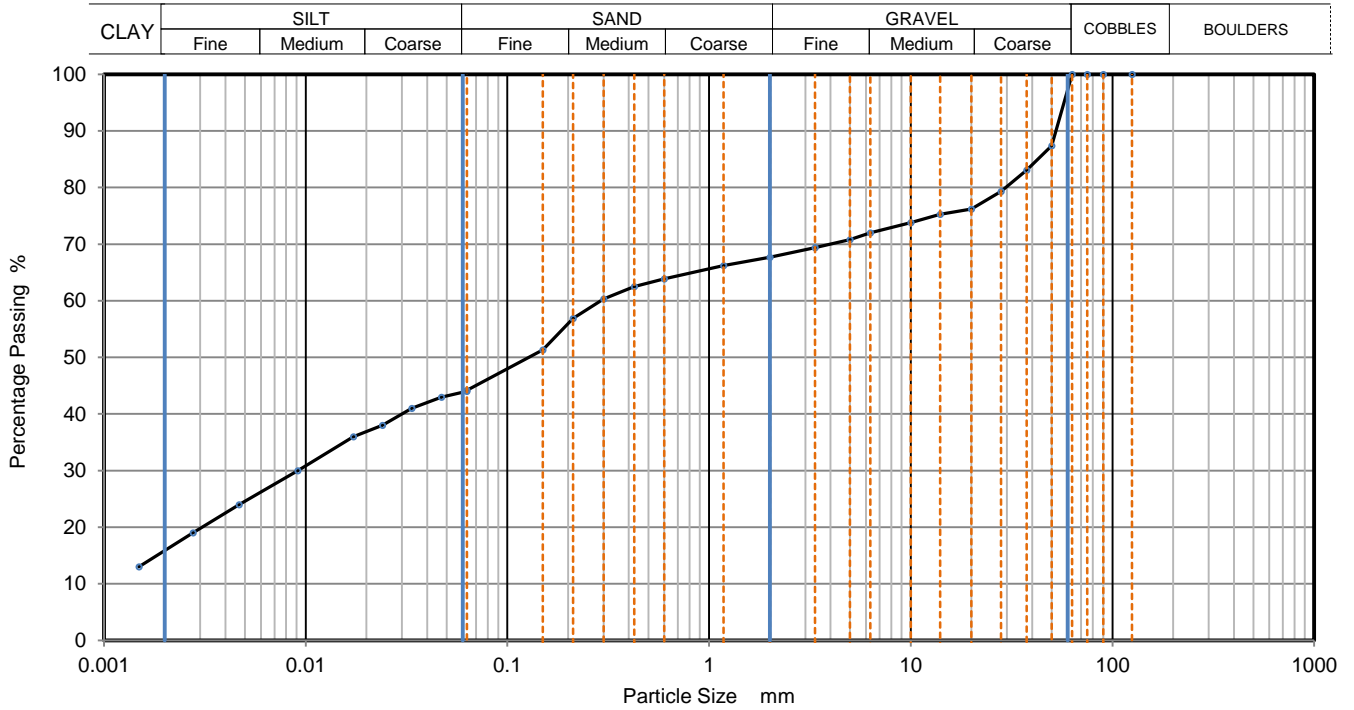
Depth, m **13.00**

Specimen Reference **2** Specimen Depth **13** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051034**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06290	44
90	100	0.04711	43
75	100	0.03355	41
63	100	0.02405	38
50	87	0.01724	36
37.5	83	0.00913	30
28	79	0.00468	24
20	76	0.00277	19
14	75	0.00149	13
10	74		
6.3	72		
5	71		
3.35	69		
2	68		
1.18	66		
0.6	64	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	63		
0.3	60		
0.212	57		
0.15	51		
0.063	44		

Dry Mass of sample, g

**5361**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	32.3
Sand	23.4
Silt	28.7
Clay	15.6

Grading Analysis		
D100	mm	
D60	mm	0.292
D30	mm	0.00919
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **6**

Soil Description **Greyish brown sandy gravelly silty CLAY with cobbles.**

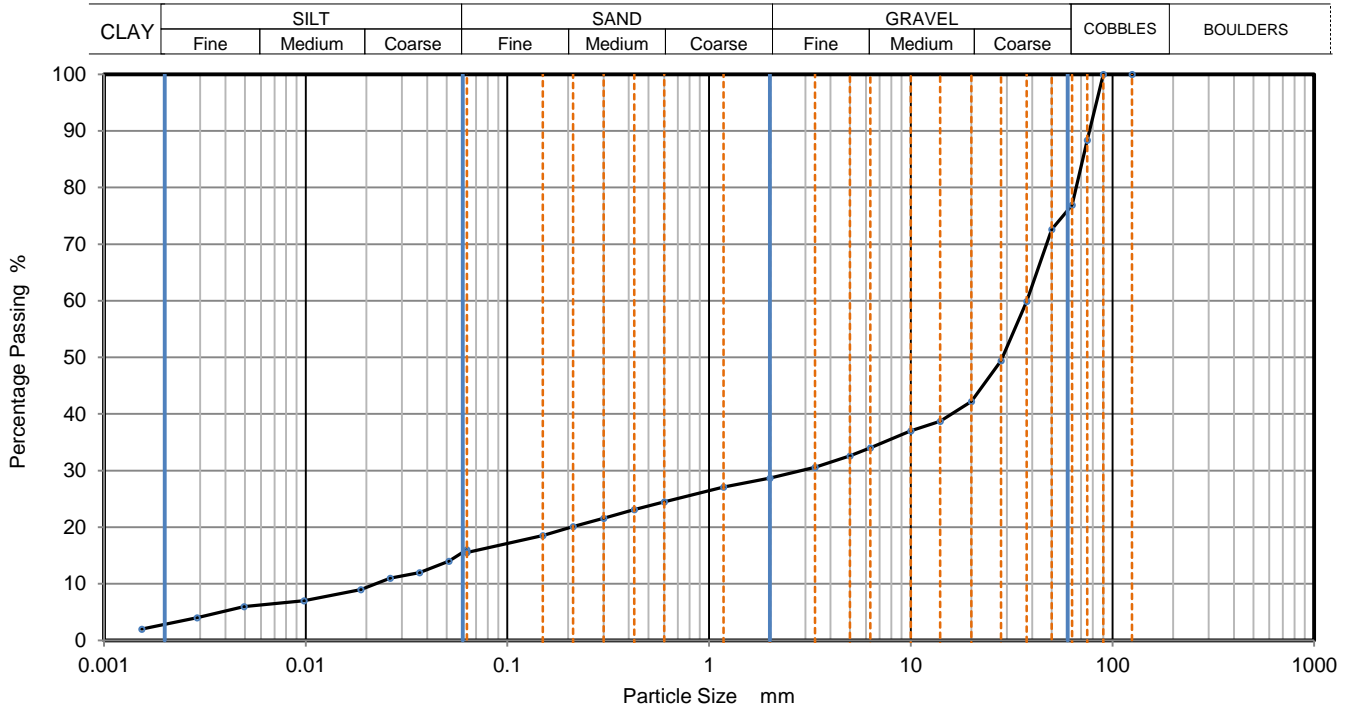
Depth, m **14.60**

Specimen Reference **8** Specimen Depth **14.6** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051036**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	16
90	100	0.05127	14
75	88	0.03668	12
63	77	0.02624	11
50	73	0.01877	9
37.5	60	0.00980	7
28	49	0.00495	6
20	42	0.00289	4
14	39	0.00154	2
10	37		
6.3	34		
5	33		
3.35	31		
2	29		
1.18	27		
0.6	25	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	23		
0.3	22		
0.212	20		
0.15	19		
0.063	16		

Dry Mass of sample, g

**7905**

Sample Proportions	% dry mass
Cobbles	23.1
Gravel	48.2
Sand	13.2
Silt	12.4
Clay	3.1

Grading Analysis		
D100	mm	
D60	mm	37.6
D30	mm	2.87
D10	mm	0.0232
Uniformity Coefficient		1600
Curvature Coefficient		9.4

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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10122



# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **8**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

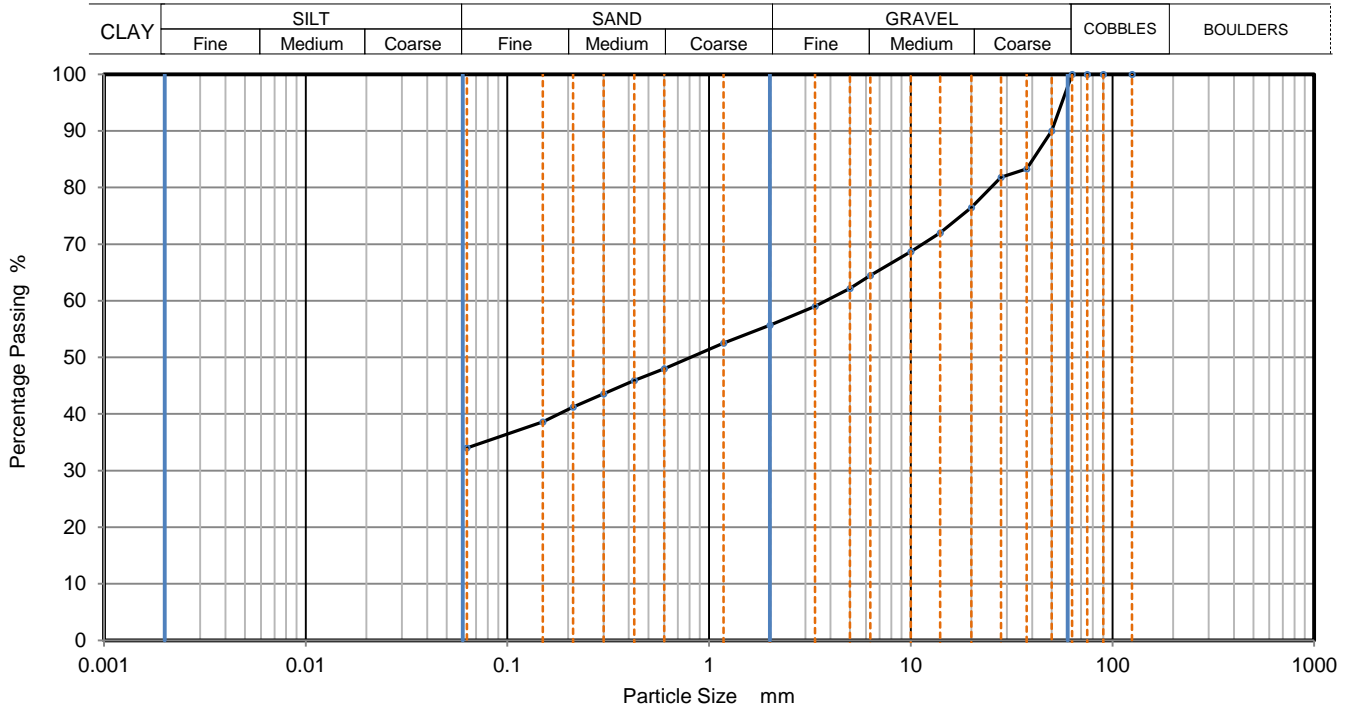
Depth, m **18.00**

Specimen Reference **2** Specimen Depth **18** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051038**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	90		
37.5	83		
28	82		
20	77		
14	72		
10	69		
6.3	65		
5	62		
3.35	59		
2	56		
1.18	53		
0.6	48		
0.425	46		
0.3	44		
0.212	41		
0.15	39		
0.063	34		

Dry Mass of sample, g 4301

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	44.3
Sand	21.7
Fines <0.063mm	34.0

Grading Analysis	
D100	mm
D60	mm 3.78
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **9**

Soil Description **Greyish brown slightly gravelly clayey fine to coarse SAND.**

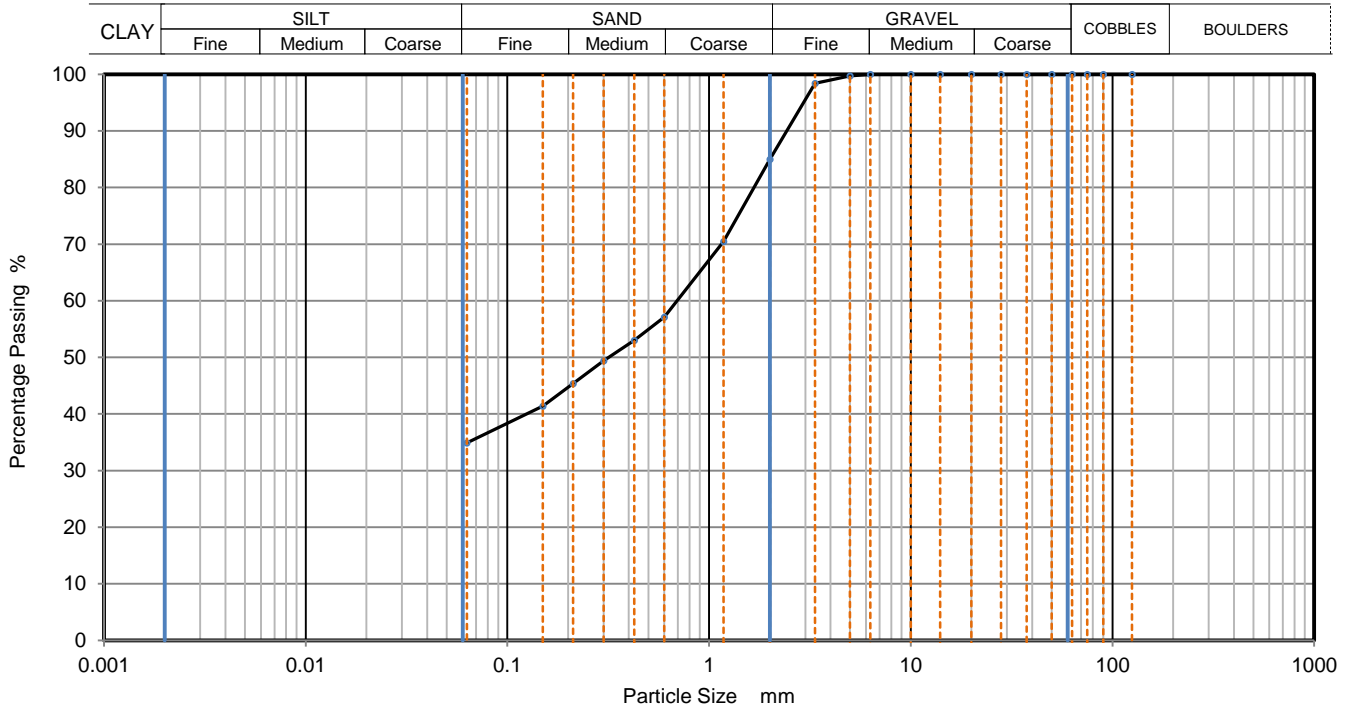
Depth, m **19.30**

Specimen Reference **2** Specimen Depth **19.3** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051039**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	98		
2	85		
1.18	71		
0.6	57		
0.425	53		
0.3	49		
0.212	45		
0.15	41		
0.063	35		

Dry Mass of sample, g

**209**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	15.0
Sand	50.1
Fines <0.063mm	35.0

Grading Analysis		
D100	mm	
D60	mm	0.694
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH107**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **10**

Soil Description **Greyish brown sandy gravelly silty CLAY with cobbles.**

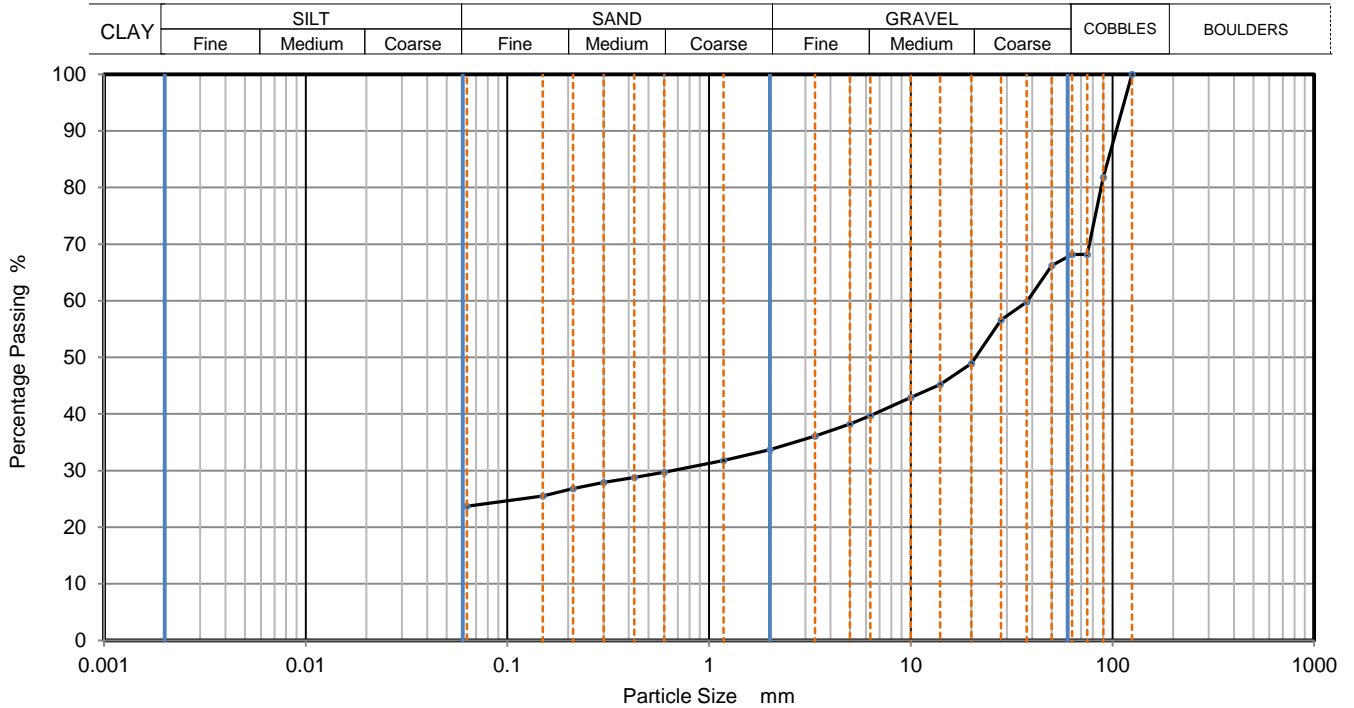
Depth, m **20.20**

Specimen Reference **2** Specimen Depth **20.2** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022051040**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	82		
75	68		
63	68		
50	66		
37.5	60		
28	57		
20	49		
14	45		
10	43		
6.3	40		
5	38		
3.35	36		
2	34		
1.18	32		
0.6	30		
0.425	29		
0.3	28		
0.212	27		
0.15	26		
0.063	24		

Dry Mass of sample, g 7676

Sample Proportions	% dry mass
Cobbles	31.8
Gravel	34.5
Sand	10.0
Fines <0.063mm	24.0

Grading Analysis		
D100	mm	125
D60	mm	37.8
D30	mm	0.667
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH108**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **1**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

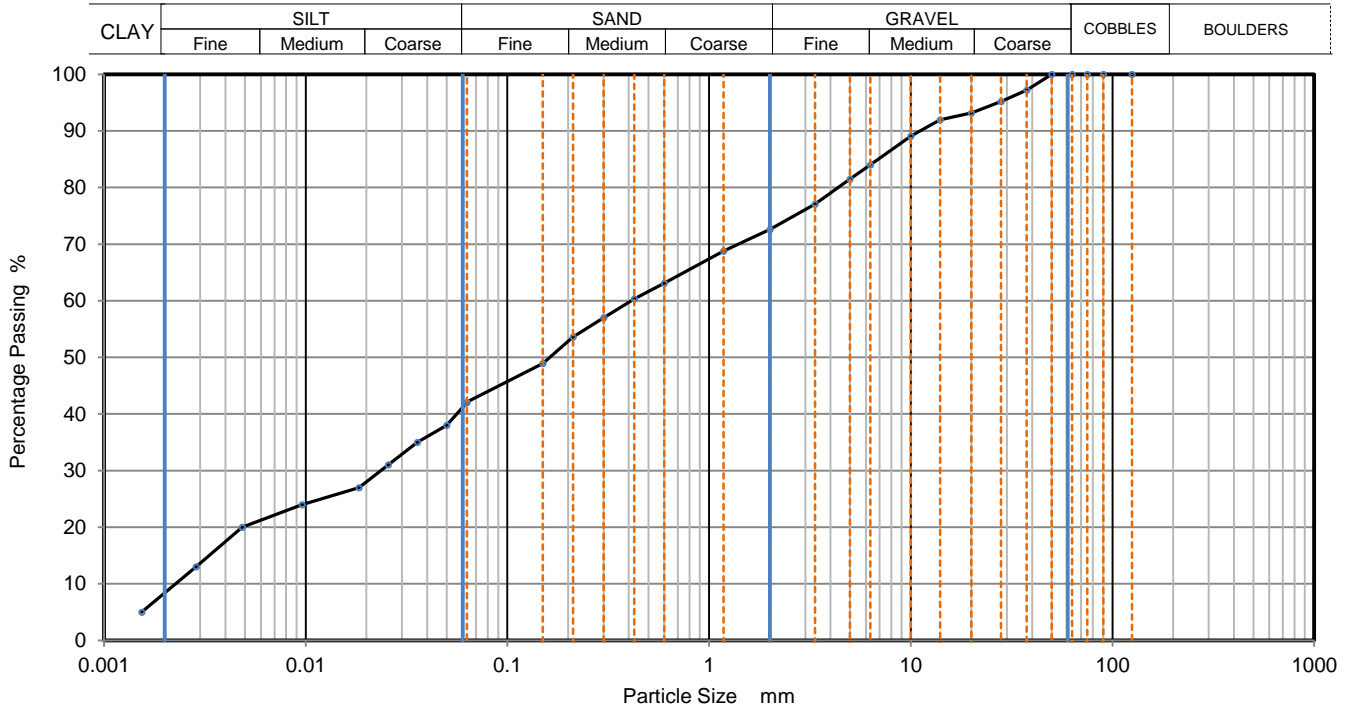
Depth, m **4.00**

Specimen Reference **6** Specimen Depth **4** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051041**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	42
90	100	0.05002	38
75	100	0.03581	35
63	100	0.02563	31
50	100	0.01834	27
37.5	97	0.00958	24
28	95	0.00485	20
20	93	0.00286	13
14	92	0.00154	5
10	89		
6.3	84		
5	82		
3.35	77		
2	73		
1.18	69		
0.6	63	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	60		
0.3	57		
0.212	54		
0.15	49		
0.063	42		

Dry Mass of sample, g

**3181**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.4
Sand	30.5
Silt	33.5
Clay	8.6

Grading Analysis		
D100	mm	
D60	mm	0.412
D30	mm	0.0231
D10	mm	0.00225
Uniformity Coefficient		180
Curvature Coefficient		0.58

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH108**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

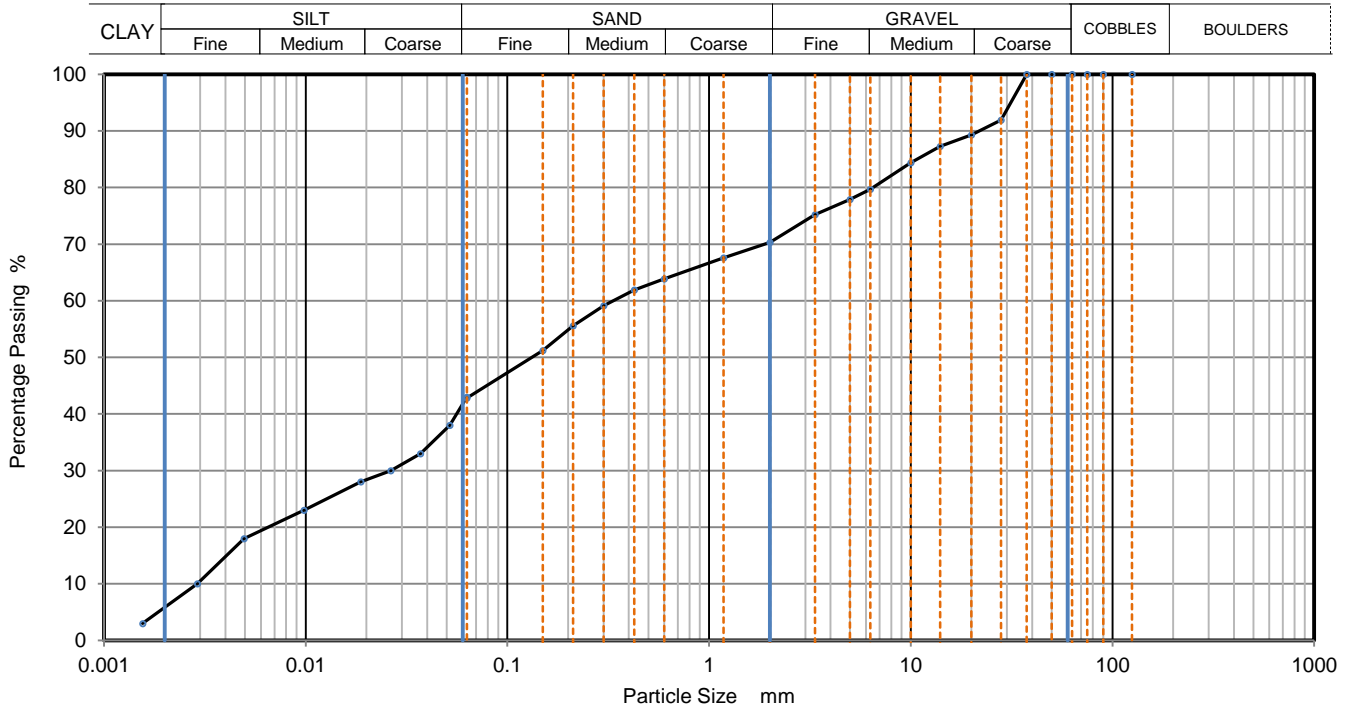
Depth, m **13.35**

Specimen Reference **8** Specimen Depth **13.35** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051044**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	43
90	100	0.05188	38
75	100	0.03711	33
63	100	0.02639	30
50	100	0.01877	28
37.5	100	0.00980	23
28	92	0.00495	18
20	89	0.00290	10
14	87	0.00155	3
10	84		
6.3	80		
5	78		
3.35	75		
2	70		
1.18	68		
0.6	64	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	62		
0.3	59		
0.212	56		
0.15	51		
0.063	43		

Dry Mass of sample, g 3400

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.7
Sand	27.5
Silt	37.2
Clay	5.6

Grading Analysis		
D100	mm	
D60	mm	0.334
D30	mm	0.0256
D10	mm	0.00289
Uniformity Coefficient		120
Curvature Coefficient		0.68

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

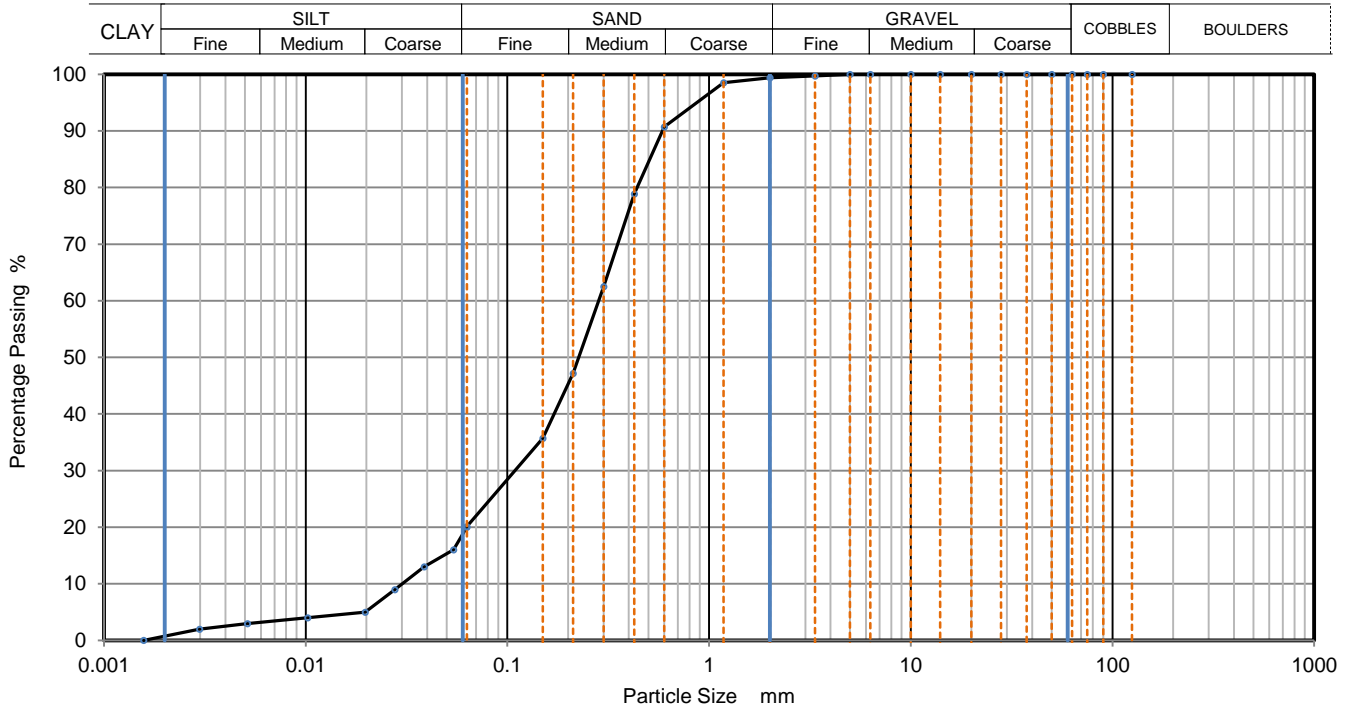
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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**Borehole/Pit No. **BH108**Site Name **DAA Airfield Underpass Ground Investigation**Sample No. **5**Soil Description **Greyish brown clayey fine to coarse SAND.**Depth, m **14.50**Specimen Reference **2** Specimen Depth **14.5** mSample Type **B**Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**KeyLAB ID **Caus2022051045**

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	20
90	100	0.05405	16
75	100	0.03864	13
63	100	0.02761	9
50	100	0.01973	5
37.5	100	0.01024	4
28	100	0.00514	3
20	100	0.00297	2
14	100	0.00157	0
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	91	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	79		
0.3	63		
0.212	47		
0.15	36		
0.063	20		

Dry Mass of sample, g

**228**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.6
Sand	79.4
Silt	19.3
Clay	0.7

Grading Analysis		
D100	mm	
D60	mm	0.283
D30	mm	0.109
D10	mm	0.0299
Uniformity Coefficient		9.5
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen.Watson

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH108**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **6**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

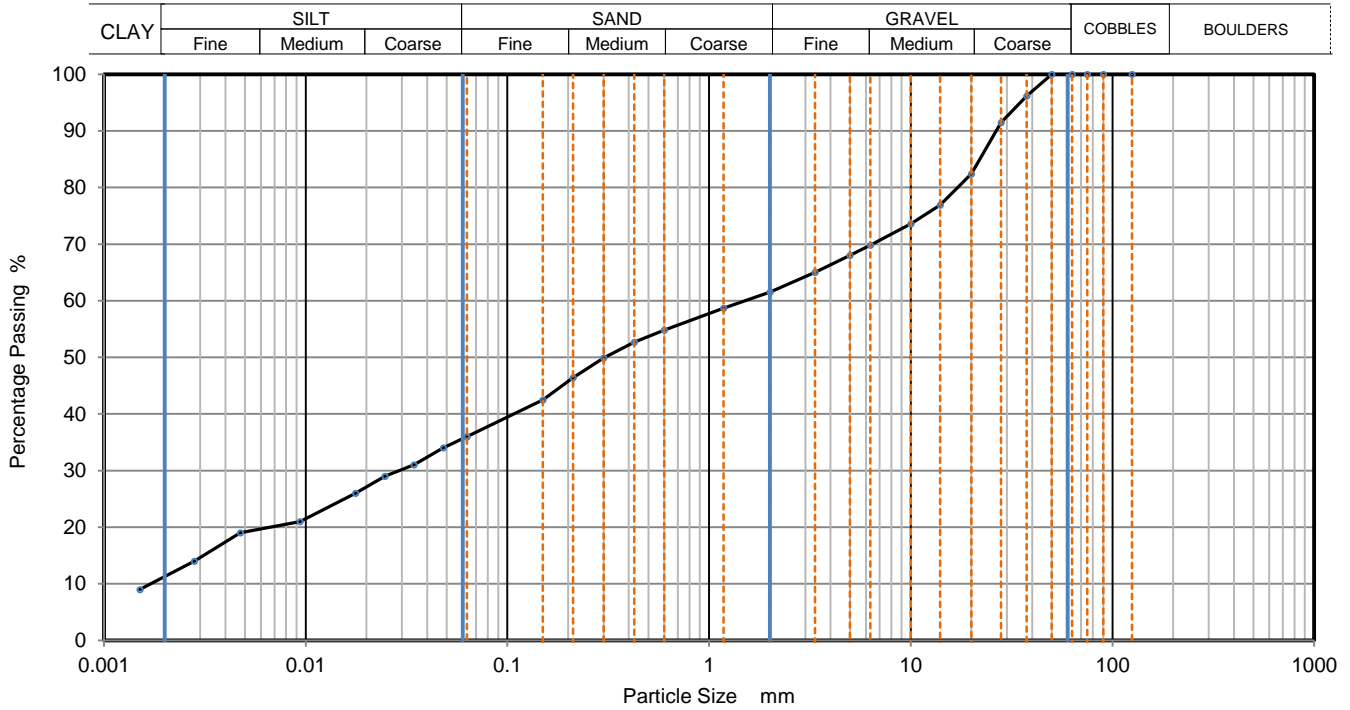
Depth, m **15.40**

Specimen Reference **2** Specimen Depth **15.4** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051046**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	36
90	100	0.04810	34
75	100	0.03447	31
63	100	0.02470	29
50	100	0.01769	26
37.5	96	0.00936	21
28	92	0.00474	19
20	82	0.00280	14
14	77	0.00150	9
10	74		
6.3	70		
5	68		
3.35	65		
2	62		
1.18	59		
0.6	55	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	53		
0.3	50		
0.212	46		
0.15	43		
0.063	36		

Dry Mass of sample, g

**4398**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	38.5
Sand	25.5
Silt	25.0
Clay	11.0

Grading Analysis	
D100	mm
D60	mm 1.51
D30	mm 0.03
D10	mm 0.00177
Uniformity Coefficient	850
Curvature Coefficient	0.34

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below

Approved
Stephen.Watson

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10122





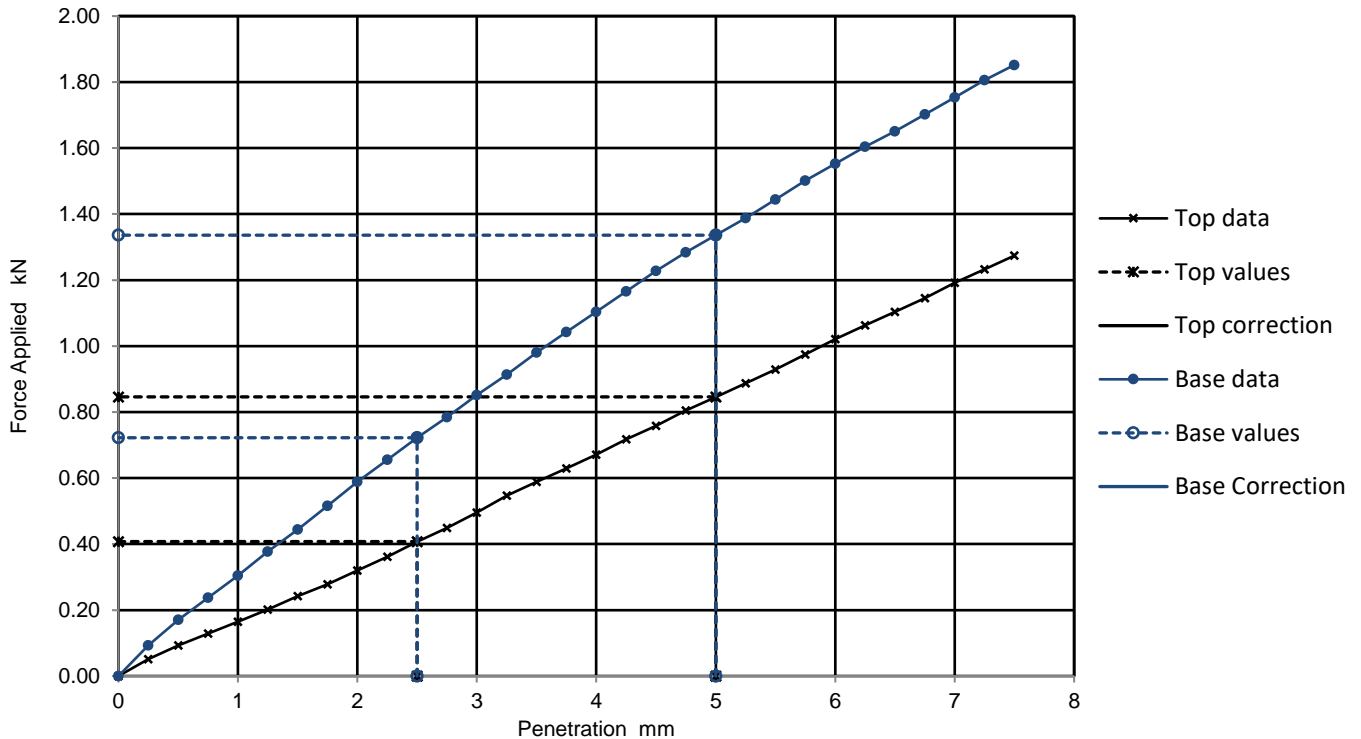
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH104
Sample No.	1
Depth m	4.00
Sample Type	B
KeyLAB ID	Caus202205109
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	24 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.26 Mg/m3	Surcharge applied	4.5 kg
	Dry density 2.06 Mg/m3		3 kPa
	Moisture content 10 %		

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	3.1	4.2	4.2		10
BASE	No	5.5	6.7	6.7		10

**General remarks**

**Test specific remarks**

**Approved**

Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson
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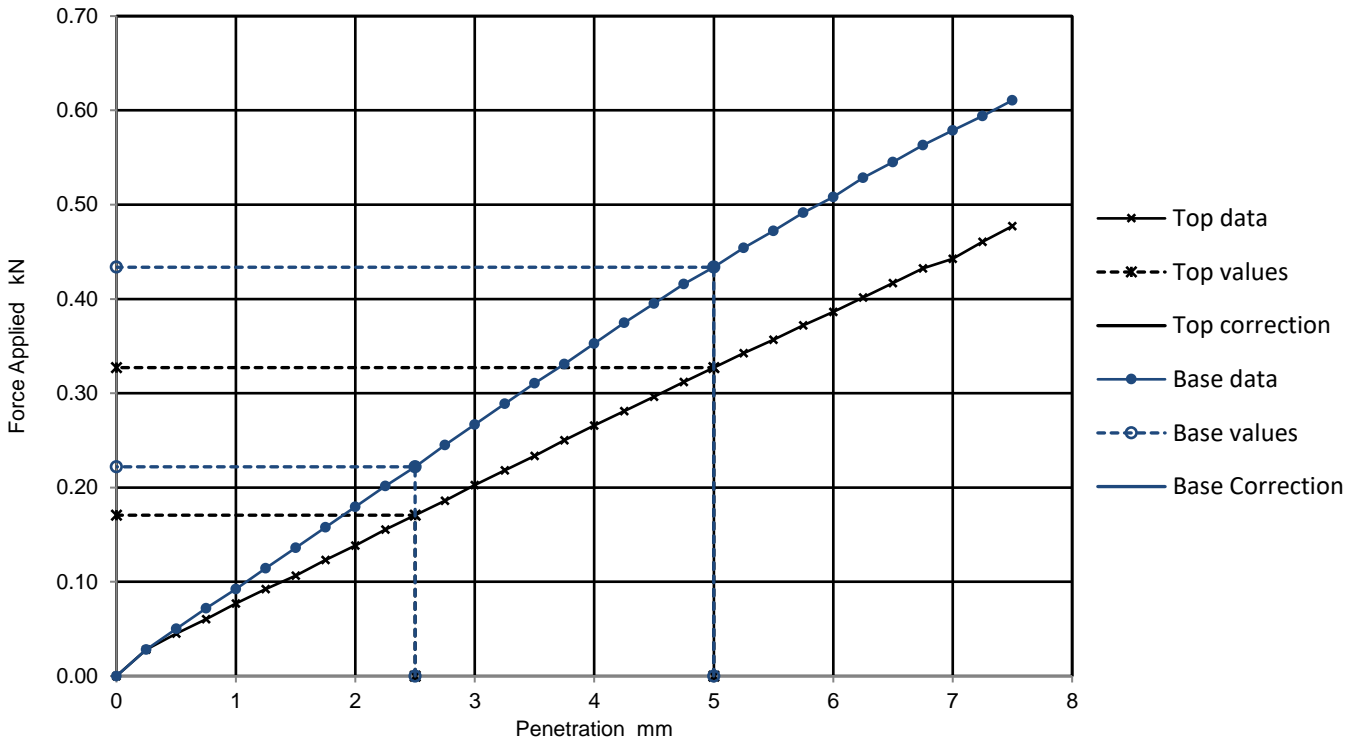
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH106
Sample No.	6
Depth m	4.30
Sample Type	B
KeyLAB ID	Caus2022051021
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	44 %	Dry density after soaking	Mg/m3
Initial Specimen details		Surcharge applied	4.5 kg
	Bulk density 2.25 Mg/m3		3 kPa
	Dry density 2.02 Mg/m3		
	Moisture content 12 %		

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	1.3	1.6	1.6		12
BASE	No	1.7	2.2	2.2		11

General remarks	Test specific remarks	Approved
Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson





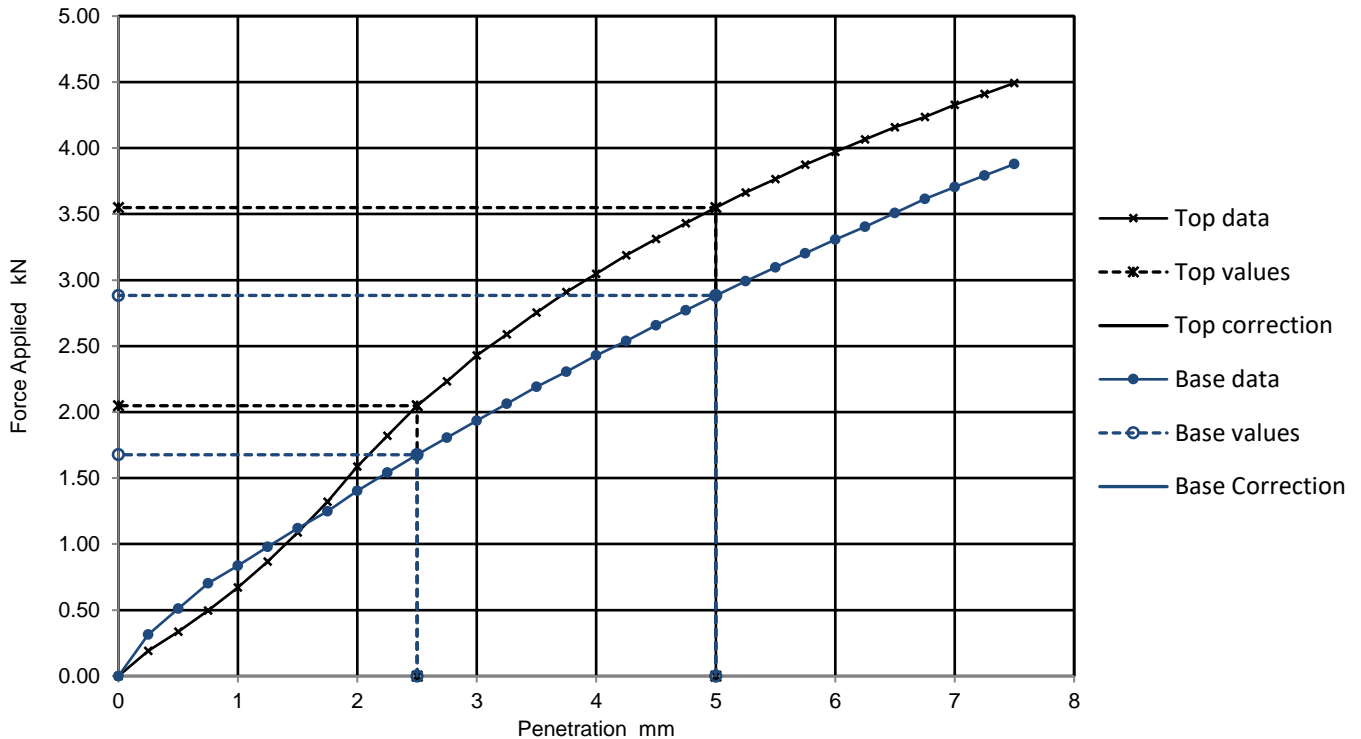
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH107
Sample No.	2
Depth m	3.50
Sample Type	B
KeyLAB ID	Caus2022051029
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	18 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.19 Mg/m3	Surcharge applied	4.5 kg
	Dry density 2.01 Mg/m3		3 kPa
	Moisture content 9 %		

**Force v Penetration Plots**



**Results**

Curve correction applied	CBR Values, %				Moisture Content %
	2.5mm	5mm	Highest	Average	
TOP	No	16.0	18.0	18.0	9
BASE	No	13.0	14.0	14.0	9

**General remarks**

**Test specific remarks**

**Approved**

Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson
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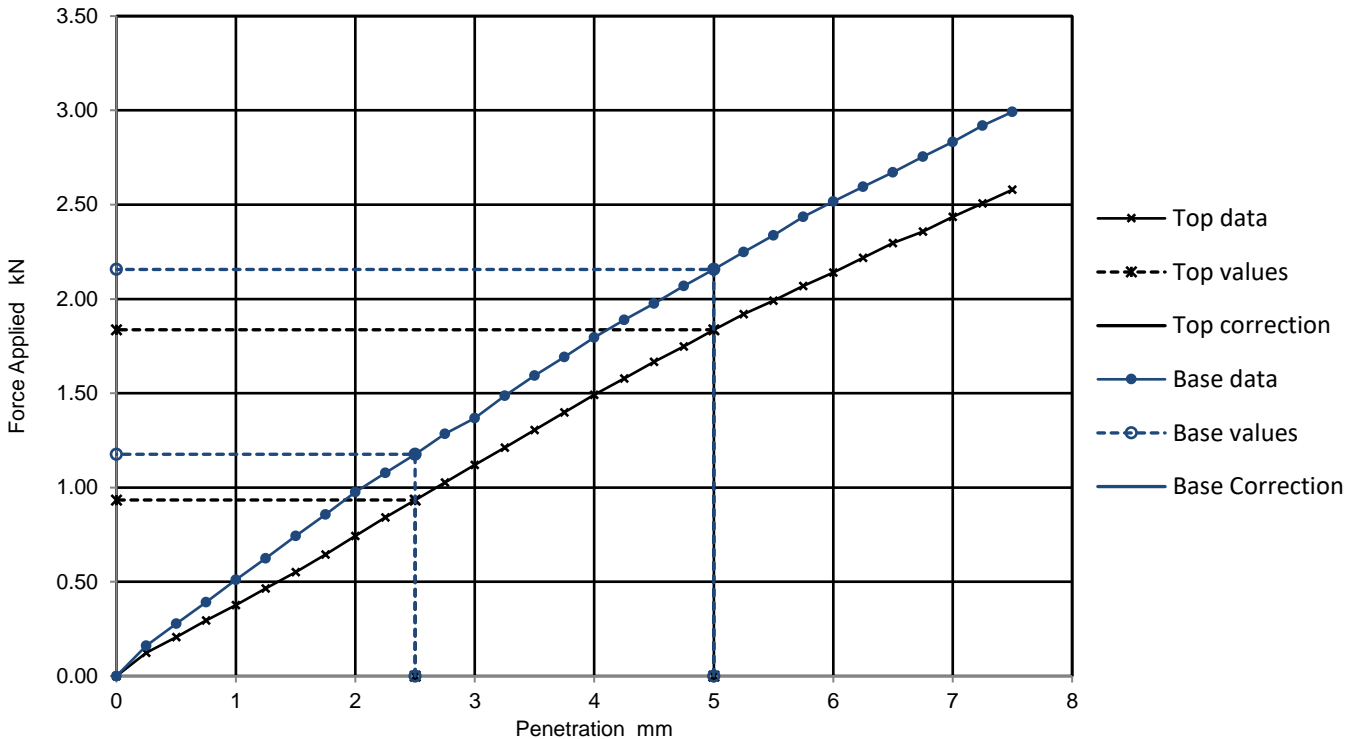
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH108
Sample No.	1
Depth m	4.00
Sample Type	B
KeyLAB ID	Caus2022051041
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	16 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.26 Mg/m3	Surcharge applied	4.5 kg
	Dry density 2.06 Mg/m3		3 kPa
	Moisture content 10 %		

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	7.1	9.2	9.2	10.0	10
BASE	No	8.9	11.0	11.0		9

General remarks	Test specific remarks	Approved
Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson

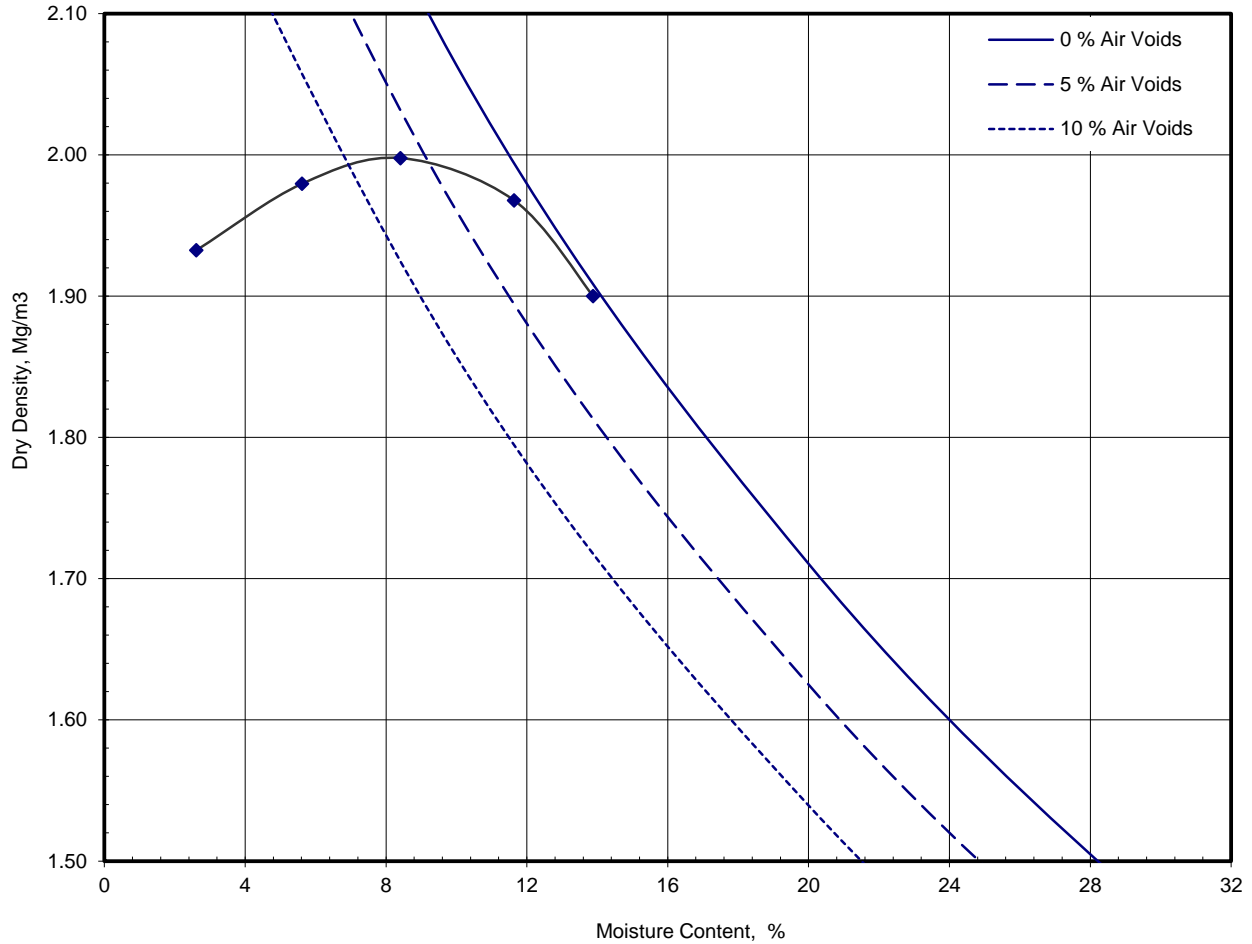




### Dry Density / Moisture Content Relationship Light Compaction

Job Ref	21-1219
Borehole / Pit No	BH104
Sample No	1
Depth	4.00 m
Sample Type	B
Keylab ID	Caus202205109

Site Name	DAA Airfield Underpass Ground Investigation	
Soil Description	Greyish brown sandy gravelly silty CLAY.	
Specimen Ref.	3	Specimen Depth
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer	



Preparation	Material used was air dried	
Mould Type	1 LITRE	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	18
Material Retained on 20.0 mm Sieve	%	24
Particle Density - Assumed	Mg/m³	2.60

<b>Maximum Dry Density</b>	Mg/m³	<b>2.00</b>
<b>Optimum Moisture Content</b>	%	<b>8.4</b>

Approved
Stephen.Watson

Remarks	Non-Standard
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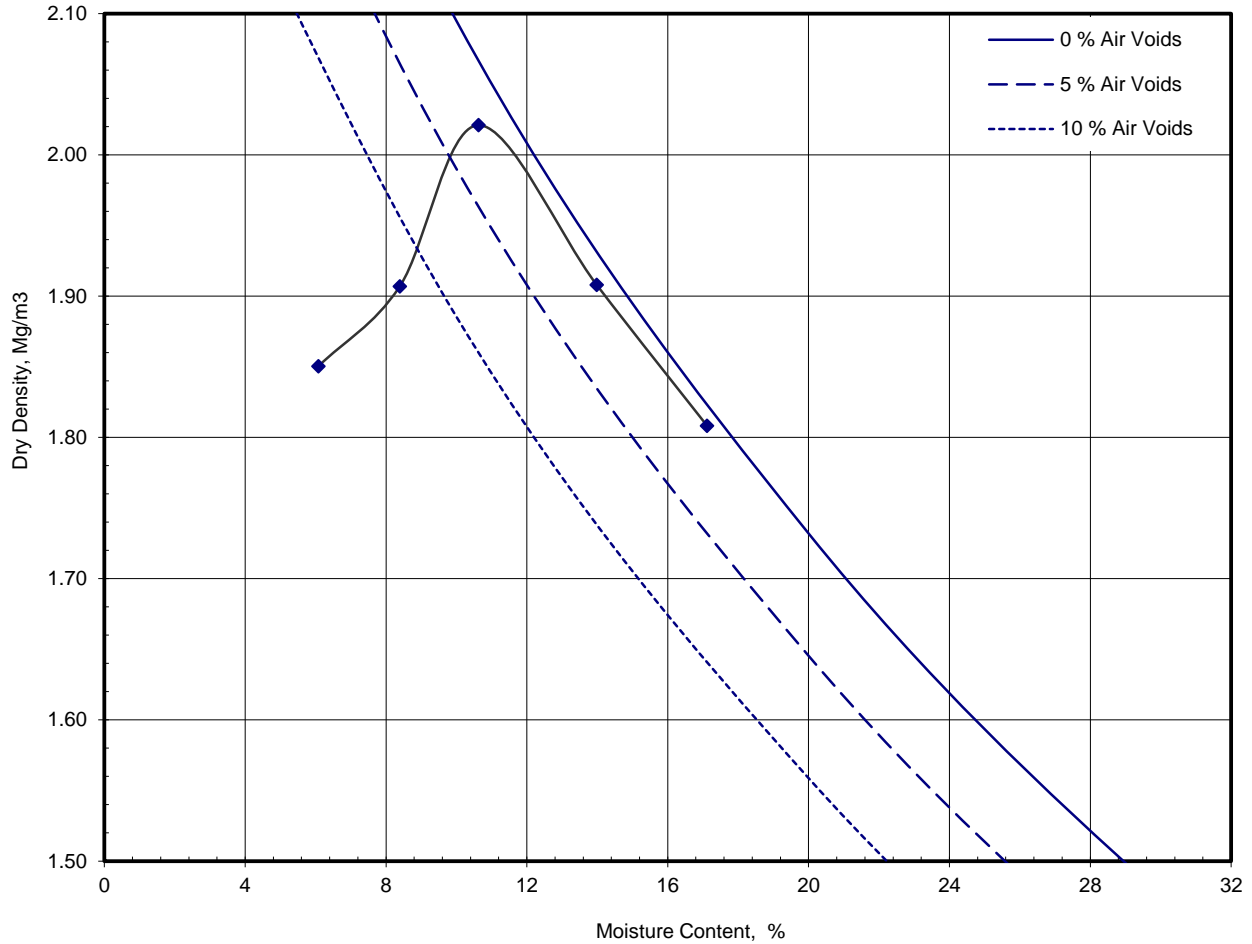




**Dry Density / Moisture Content Relationship  
Light Compaction**

Job Ref	21-1219
Borehole / Pit No	BH107
Sample No	2
Depth	3.50 m
Sample Type	B
Keylab ID	Caus2022051029

Site Name	<b>DAA Airfield Underpass Ground Investigation</b>	
Soil Description	Brownish grey sandy gravelly silty CLAY.	
Specimen Ref.	3	Specimen Depth
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer	



Preparation	Material used was air dried	
Mould Type	1 LITRE	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	11
Material Retained on 20.0 mm Sieve	%	18
Particle Density - Assumed	Mg/m³	2.65

<b>Maximum Dry Density</b>	Mg/m³	<b>2.02</b>
<b>Optimum Moisture Content</b>	%	<b>11</b>

Approved
Stephen.Watson

Remarks  
Non-Standard

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10122



**Dry Density / Moisture Content Relationship  
Light Compaction**

Job Ref **21-1219**

Borehole / Pit No **BH108**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No **1**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

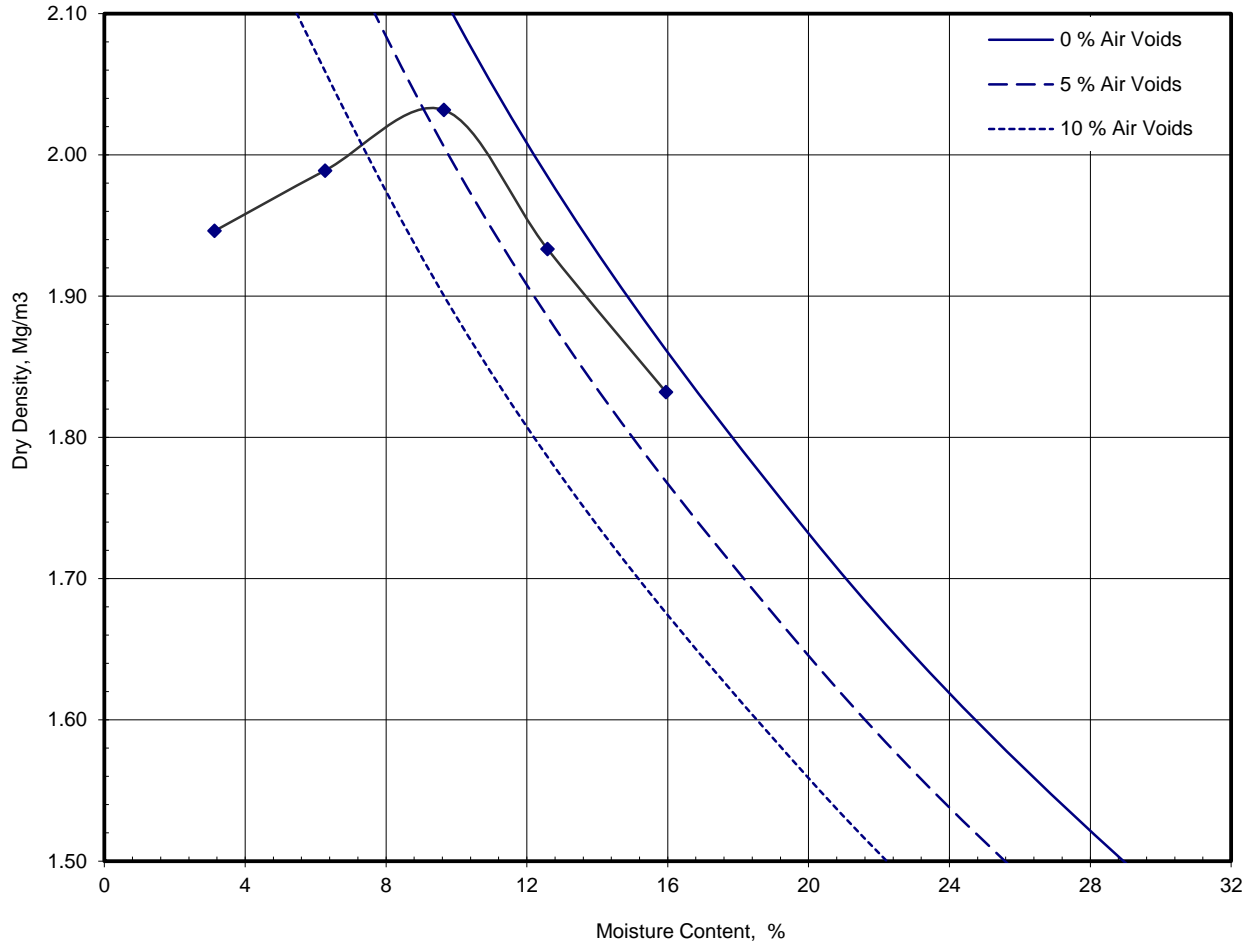
Depth **4.00 m**

Specimen Ref. **4** Specimen Depth **m**

Sample Type **B**

Test Method **BS1377:Part 4:1990, clause 3.4, 2.5kg rammer**

Keylab ID **Caus2022051041**



Preparation	Material used was air dried
Mould Type	CBR
Samples Used	Single sample tested
Material Retained on 37.5 mm Sieve	% 8
Material Retained on 20.0 mm Sieve	% 16
Particle Density - Assumed	Mg/m³ 2.65

<b>Maximum Dry Density</b>	Mg/m³	<b>2.03</b>
<b>Optimum Moisture Content</b>	%	<b>9.6</b>

Approved

Stephen.Watson

Remarks



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10122



**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219		
Borehole/Pit No.	BH104		
Site Name	DAA Airfield Underpass Ground Investigation	Sample No.	21
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.	Depth	11.45
Specimen Reference	2	Specimen Depth	11.50 m
Specimen Description	Very stiff greyish brown sandy slightly gravelly silty CLAY.	KeyLAB ID	Caus2022051011
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	21/05/2022

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

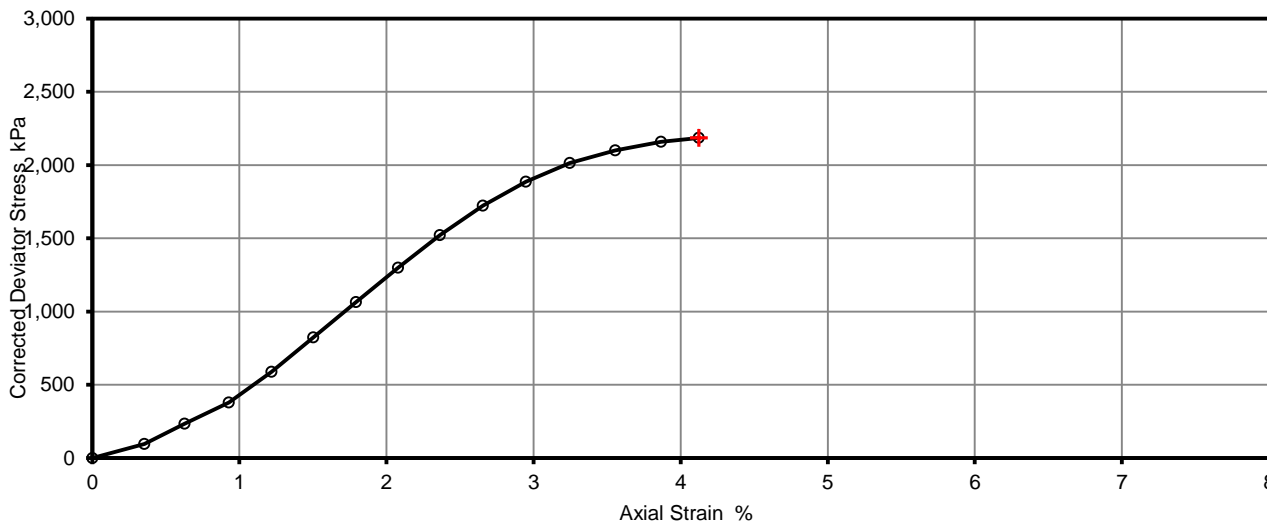
UNDISTURBED	
1	
210.1	mm
105.1	mm
2.26	Mg/m <sup>3</sup>
8	%
2.09	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

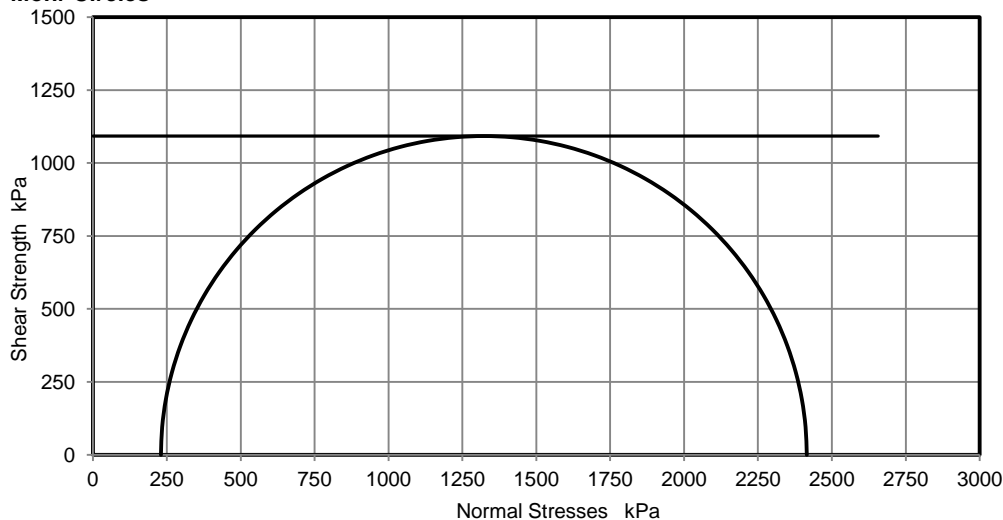
4.0	%/min
230	kPa
4.1	%
2185	kPa
1093	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

**Remarks**

No failure defined. Maximum capacity of load ring met.

**Approved**

Stephen.Watson

**Printed**

25/05/2022 12:21







**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219		
Borehole/Pit No.	BH104		
Site Name	DAA Airfield Underpass Ground Investigation	Sample No.	22
Soil Description	Grey sandy slightly gravelly silty CLAY.	Depth	19.20
Specimen Reference	3	Specimen Depth	19.25 m
Specimen Description	Very stiff grey sandy slightly gravelly silty CLAY.	KeyLAB ID	Caus2022051017
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	23/05/2022

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

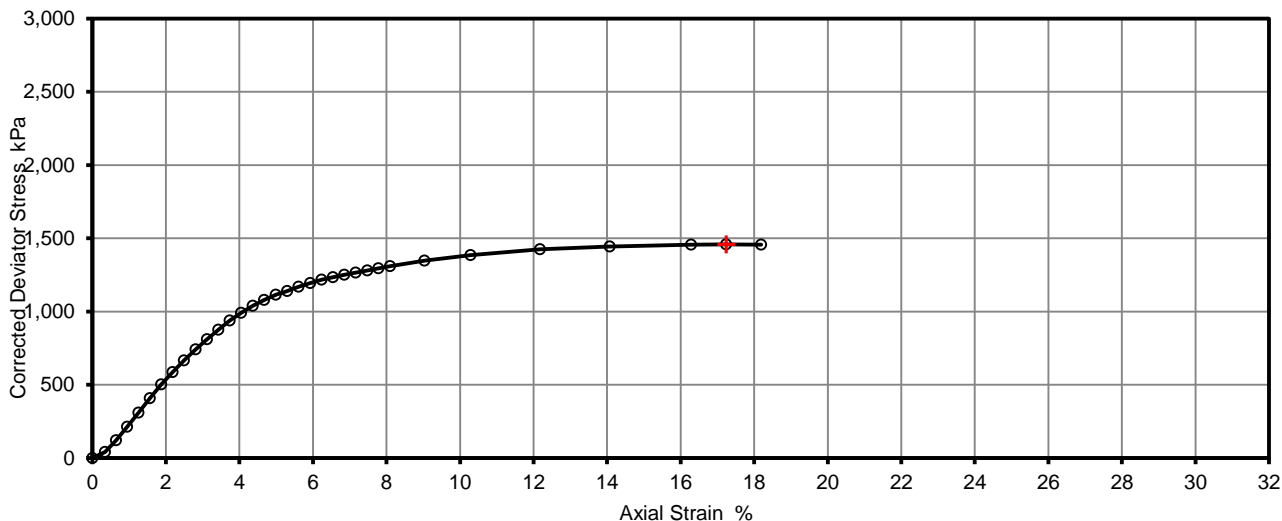
UNDISTURBED	
1	
210.0	mm
105.4	mm
2.29	Mg/m <sup>3</sup>
9	%
2.11	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

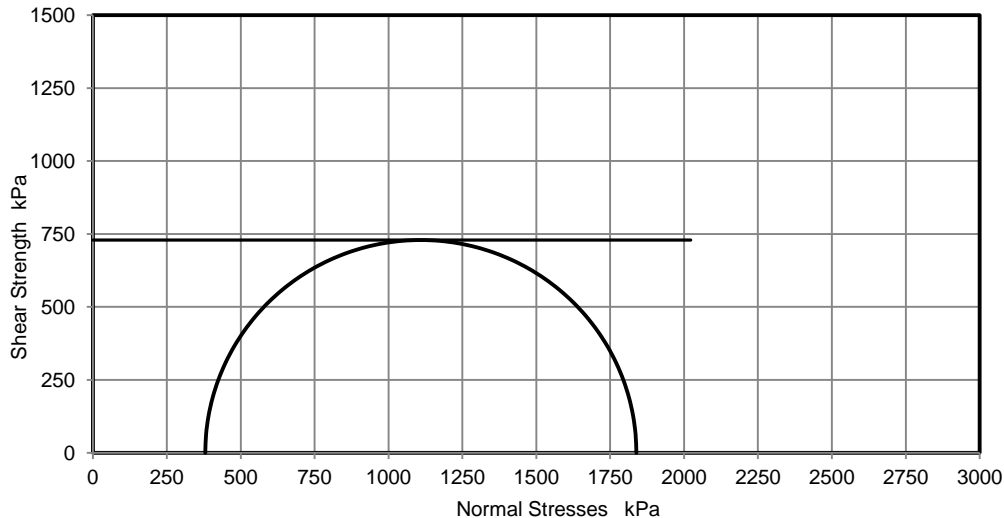
4.0	%/min
380	kPa
17.2	%
1459	kPa
729	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Compound	

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Stephen.Watson

Printed

25/05/2022 12:21





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219		
Borehole/Pit No.	BH106		
Site Name	DAA Airfield Underpass Ground Investigation	Sample No.	40
Soil Description	Greyish brown sandy slightly gravelly silty CLAY.	Depth	17.95
Specimen Reference	2	Specimen Depth	17.95 m
Specimen Description	Very stiff greyish brown sandy slightly gravelly silty CLAY.	KeyLAB ID	Caus2022051027
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	Date of test	23/05/2022

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

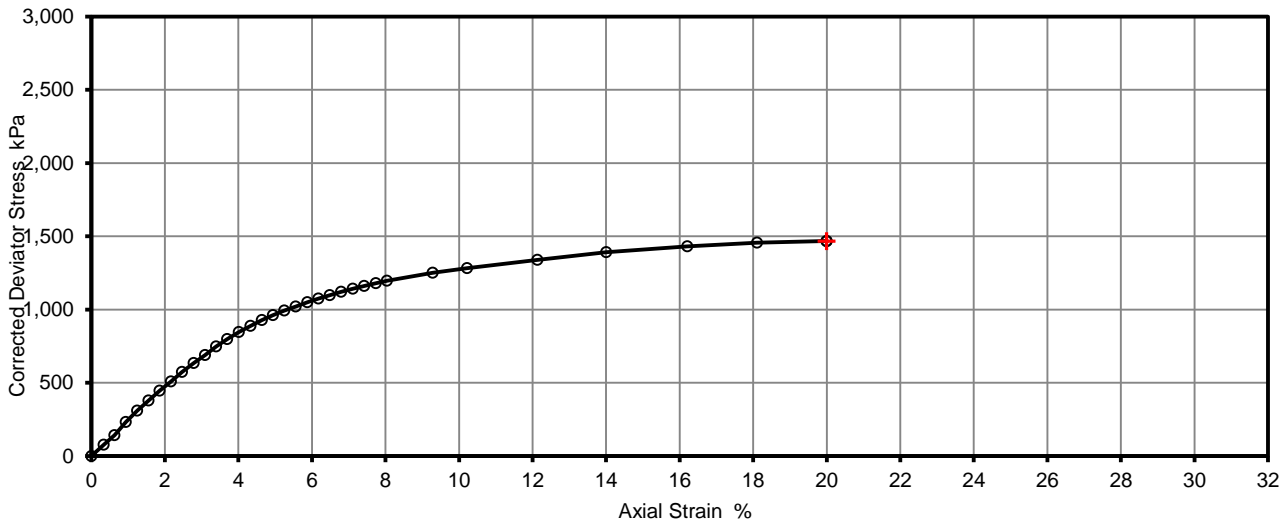
UNDISTURBED	
1	
210.0	mm
104.3	mm
2.27	Mg/m <sup>3</sup>
9	%
2.08	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

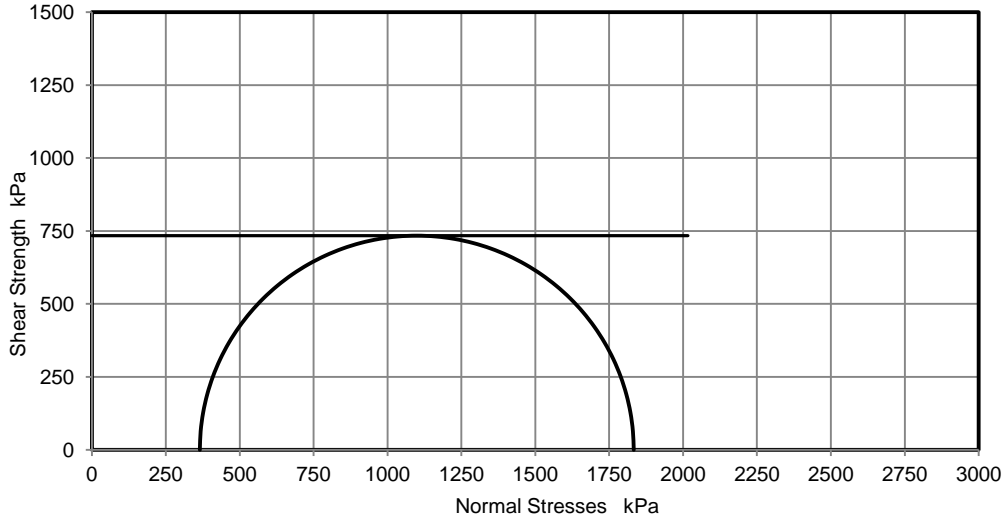
4.0	%/min
365	kPa
20.0	%
1468	kPa
734	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

**Remarks**

No failure defined. Testing terminated at 20% axial strain.

**Approved**

Stephen.Watson

**Printed**

25/05/2022 12:21





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219				
Borehole/Pit No.	BH108				
Site Name	DAA Airfield Underpass Ground Investigation		Sample No.	28	
Soil Description	Greyish brown sandy gravelly silty CLAY.		Depth	5.85	
Specimen Reference	2	Specimen Depth	5.85 m	Sample Type	U
Specimen Description	Very stiff greyish brown sandy gravelly silty CLAY.		KeyLAB ID	Caus2022051042	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		Date of test	23/05/2022	

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

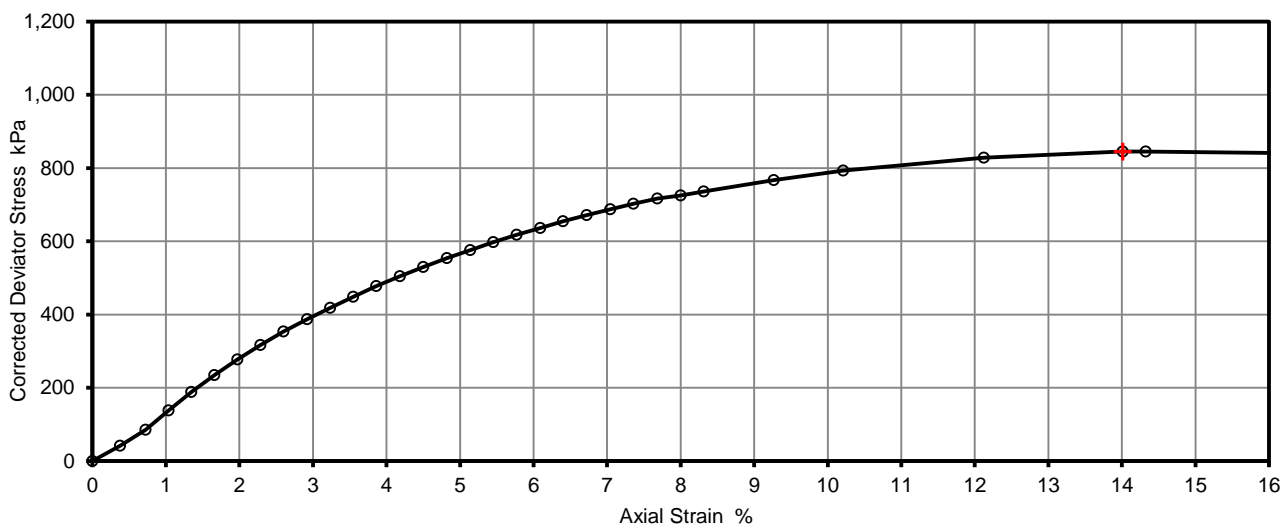
UNDISTURBED	
1	
210.0	mm
104.6	mm
2.28	Mg/m <sup>3</sup>
10	%
2.08	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

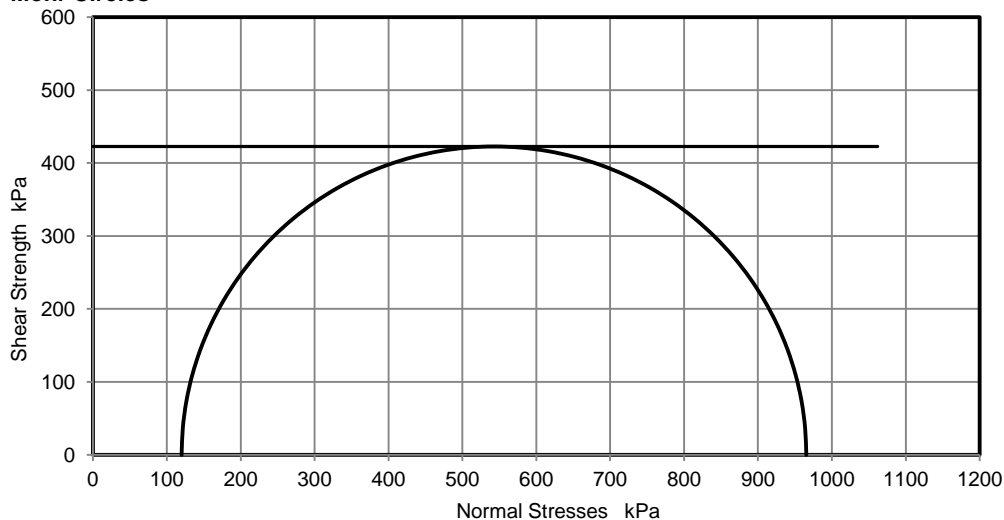
4.0	%/min
120	kPa
14.0	%
845	kPa
423	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Compound	

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Printed





**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219				
Borehole/Pit No.	BH108				
Site Name	DAA Airfield Underpass Ground Investigation		Sample No.	29	
Soil Description	Greyish brown sandy gravelly silty CLAY.		Depth	18.30	
Specimen Reference	3	Specimen Depth	18.35 m	Sample Type	U
Specimen Description	Very stiff greyish brown sandy gravelly silty CLAY.		KeyLAB ID	Caus2022051047	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		Date of test	23/05/2022	

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

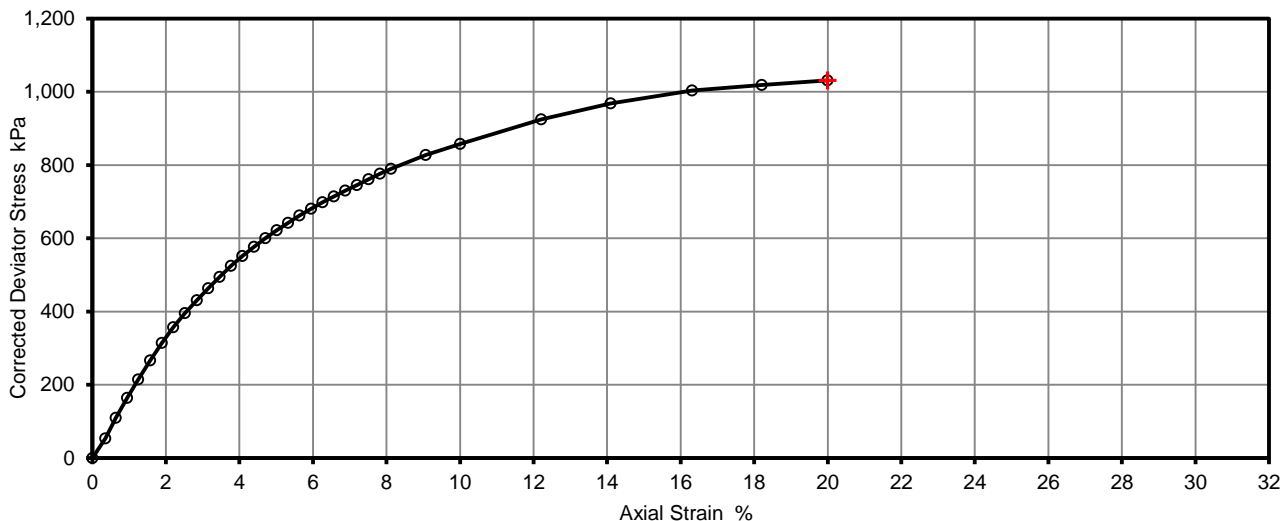
UNDISTURBED	
1	
210.0	mm
105.1	mm
2.30	Mg/m <sup>3</sup>
10	%
2.10	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

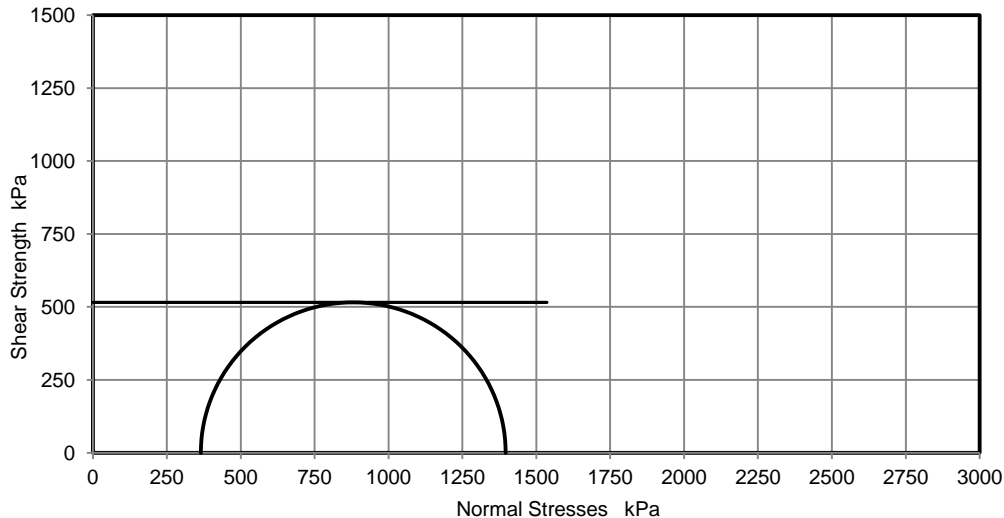
4.0	%/min
365	kPa
20.0	%
1031	kPa
516	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

**Remarks**

No failure defined. Testing terminated at 20% axial strain.

**Approved**

Stephen.Watson

**Printed**

25/05/2022 12:21

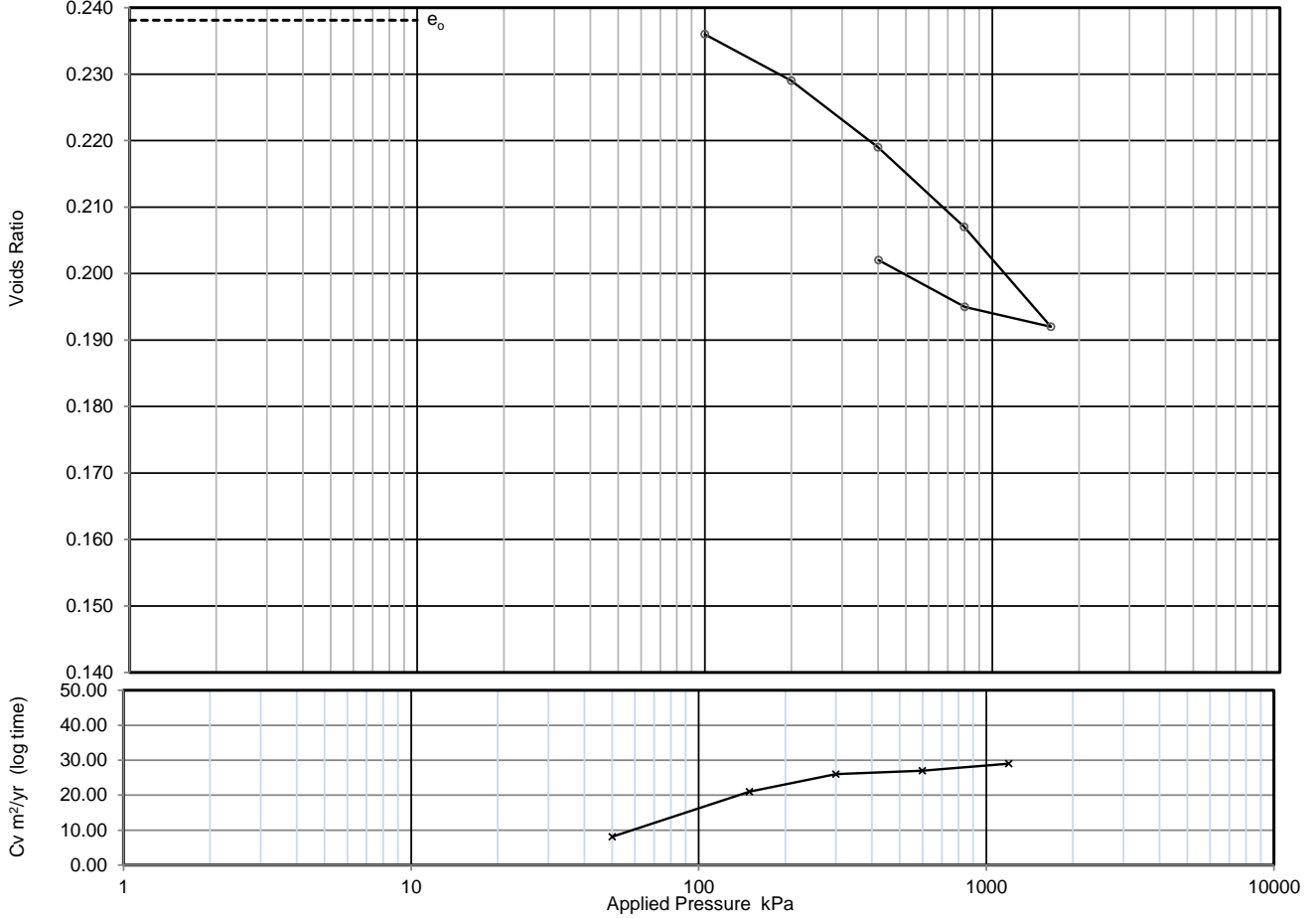




**ONE DIMENSIONAL CONSOLIDATION TEST  
BS1377:Part 5:1990, clause 3**

Job Ref	21-1219
Borehole/Pit No.	BH104
Sample No.	22
Depth	19.2
Sample Type	U
KeyLAB ID	Caus2022051017
Date started	19/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Grey sandy slightly gravelly silty CLAY.		
Specimen Reference	4	Specimen Depth	19.2 m
Specimen Description	Grey sandy slightly gravelly silty CLAY.		
Test Method	BS1377:Part 5:1990, clause 3		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.238	-	-	-	-
100	0.236	0.019	8.1	10	0.00018
200	0.229	0.056	21	190	0.00002
400	0.219	0.039	26	200	0.00027
798	0.207	0.025	27	62	0.00044
1,598	0.192	0.016	29	180	0.00079
802	0.195	0.0033			
402	0.202	0.015			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details

	Initial	Final	
Diameter	75.10	-	mm
Height	20.00	19.41	mm
Moisture Content	9.6	10.1	%
Bulk density	2.35	2.43	Mg/m3
Dry density	2.14	2.21	Mg/m3
Voids Ratio	0.238	0.202	
Saturation	107	132	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen.Watson

Printed :

25/05/2022 12:20

LAB 13R - Version 5

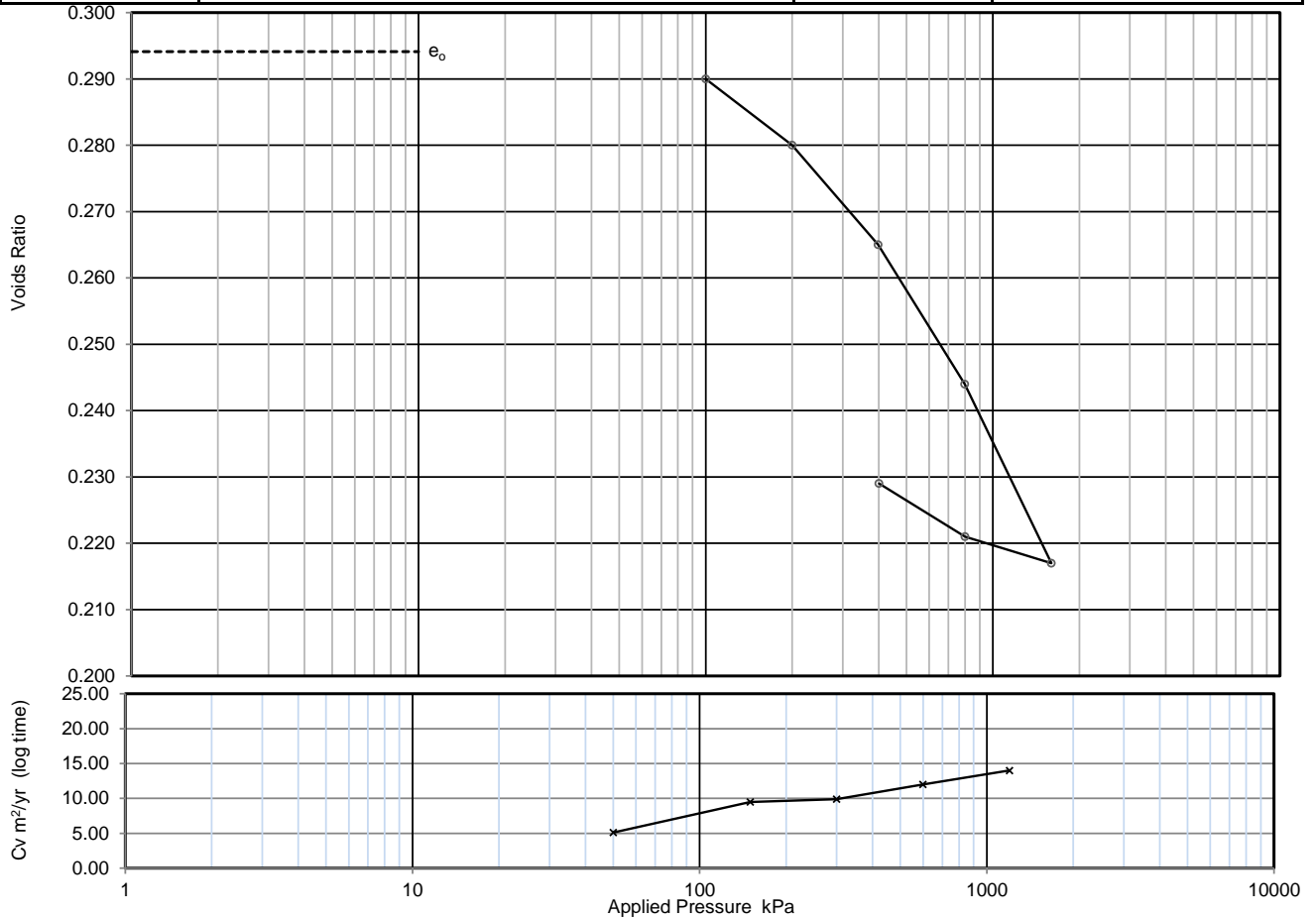




**ONE DIMENSIONAL CONSOLIDATION TEST  
BS1377:Part 5:1990, clause 3**

Job Ref	21-1219
Borehole/Pit No.	BH108
Sample No.	29
Depth	18.3
Sample Type	U
KeyLAB ID	Caus2022051047
Date started	20/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy gravelly silty CLAY.		
Specimen Reference	4	Specimen Depth	18.3 m
Specimen Description	Greyish brown sandy gravelly silty CLAY.		
Test Method	BS1377:Part 5:1990, clause 3		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.294	-	-	-	-
100	0.290	0.033	5.1	7.5	0.00032
200	0.280	0.078	9.5	160	0.00016
399	0.265	0.059	9.9	290	0.00038
798	0.244	0.041	12	410	0.0008
1,599	0.217	0.027	14	410	0.0012
801	0.221	0.0049			
401	0.229	0.016			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details

	Initial	Final	
Diameter	75.10	-	mm
Height	19.80	18.81	mm
Moisture Content	11.8	11.6	%
Bulk density	2.29	2.41	Mg/m3
Dry density	2.05	2.16	Mg/m3
Voids Ratio	0.294	0.229	
Saturation	106	134	%
Average temperature for test			oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen.Watson

Printed :

25/05/2022 12:20

LAB 13R - Version 5



10122





## UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Project No. 21-1219	Project Name DAA Airfield Underpass Ground Investigation
------------------------	---

Hole No.	Sample				Rock Type	Specimen Dimensions <sup>2</sup>			Bulk Density <sup>2</sup> Mg/m <sup>3</sup>	Water Content <sup>1</sup> %	Uniaxial Compression <sup>3</sup>			Remarks
	Ref	Top	Base	Type		Dia. mm	Length mm	H/D			Condition	Mode of failure	UCS MPa	
BH106	1	28.15	28.45	C	LIMESTONE	100.7	186.2	1.8	2.69	0.9	as received	F	48.2	
BH107	1	29.80	30.05	C	LIMESTONE	100.2	198.0	2.0	2.69	0.9	as received	F	67.0	
BH108	1	29.30	29.60	C	LIMESTONE	101.4	200.5	2.0	2.73	0.9	as received	F	37.6	

**Notes**

1 ISRM p87 test 1, water content at 105 ± 3 °C, specimen as tested for UCS	Mode of failure :
2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density	S - Single shear      MS - multiple shear
3 ISRM p153 part 1, determination of Uniaxial Compressive Strength ( UCS ) of Rock Materials	AC - Axial cleavage      F - Fragmented

above notes apply unless annotated otherwise in the remarks

<b>Test Specification</b> International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007	<b>Date Printed</b> 30/05/2022	<b>Approved By</b> Stephen.Watson	<b>Table</b> sheet 1 1
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# LABORATORY REPORT



4043

**Contract Number: PSL22/3409**

Report Date: 26 May 2022  
Client's Reference: 21-1219  
Client Name: Causeway Geotech  
8 Drumahiskey Road  
Ballymoney  
Co. Antrim  
BT53 7QL

**For the attention of: Stephen Watson**

Contract Title: DAA Airfield Underpass Ground Investigation  
Date Received: 12/5/2022  
Date Commenced: 12/5/2022  
Date Completed: 26/5/2022

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:


A Watkins  
(Director)

R Berriman  
(Quality Manager)

S Royle  
(Laboratory Manager)

L Knight  
(Senior Technician)

S Eyre  
(Senior Technician)

  
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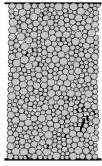
Page 1 of

# Effective Stress Triaxial Compression

## Consolidated Undrained

Summary Report

### Sample Details



sketch showing specimen location in original sample

Depth	9.70-9.95m		
Description	Brown gravelly slightly sandy CLAY.		
Type	Undisturbed, vertical orientation.		
Initial Sample Length	$L_0$	(mm)	211.0
Initial Sample Diameter	$D_0$	(mm)	105.1
Initial Sample Weight	$W_0$	(gr)	4116.0
Initial Bulk Density	$\rho_0$	(Mg/m <sup>3</sup> )	2.25
Particle Density	$\rho_s$	(Mg/m <sup>3</sup> )	2.66

### Initial Conditions

			Stage 1	2
Initial Cell Pressure	$\sigma_{3i}$	(kPa)	700	
Initial Back Pressure	$U_{bi}$	(kPa)	500	
Membrane Thickness	$m_b$	(mm)	0.600	
Displacement Input	$L_{IP}$	(mm)	CH 2	
Load Input	$N_{IP}$	(N)	CH 4	
Pore Water Pressure Input	$U_{pwp}$	(kPa)	CH 3	
Sample Volume	$V$	(cc)	CH 2	
Initial Moisture	$\omega_i$	(%)	9.09	
Initial Dry Density	$\rho_{di}$	(Mg/m <sup>3</sup> )	2.06	
Initial Voids Ratio	$e_i$	.	0.291	
Initial Degree of Saturation	$S_i$	(%)	83	
B Value	$B$	.	0.96	

### Final Conditions

Final Moisture	$\omega_f$	(%)	8.93	
Final Dry Density	$\rho_{df}$	(Mg/m <sup>3</sup> )	2.09	
Final Voids Ratio	$e_f$	.	0.274	
Final Degree of Saturation	$S_f$	(%)	86.6	
			Stage 1	2
Failure Criteria	.		Max. Dev. Stress	
Strain At Failure	$\epsilon_f$	(%)	11.70	
Stress At Failure	$(\sigma_1 - \sigma_3)'$	(kPa)	1363.8	
Minor Stress At Failure	$\sigma_3'$	(kPa)	606.0	
Major Stress At Failure	$\sigma_1'$	(kPa)	1969.8	
Principal Stress Ratio At Failure	$\sigma_1' / \sigma_3'$		3.251	

### Notes



Plastic



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 9.70-9.95m U27
		Test Date	19/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
Client	Causeway	Sample	9.70-9.95m U27
		Depth	9.70-9.95m

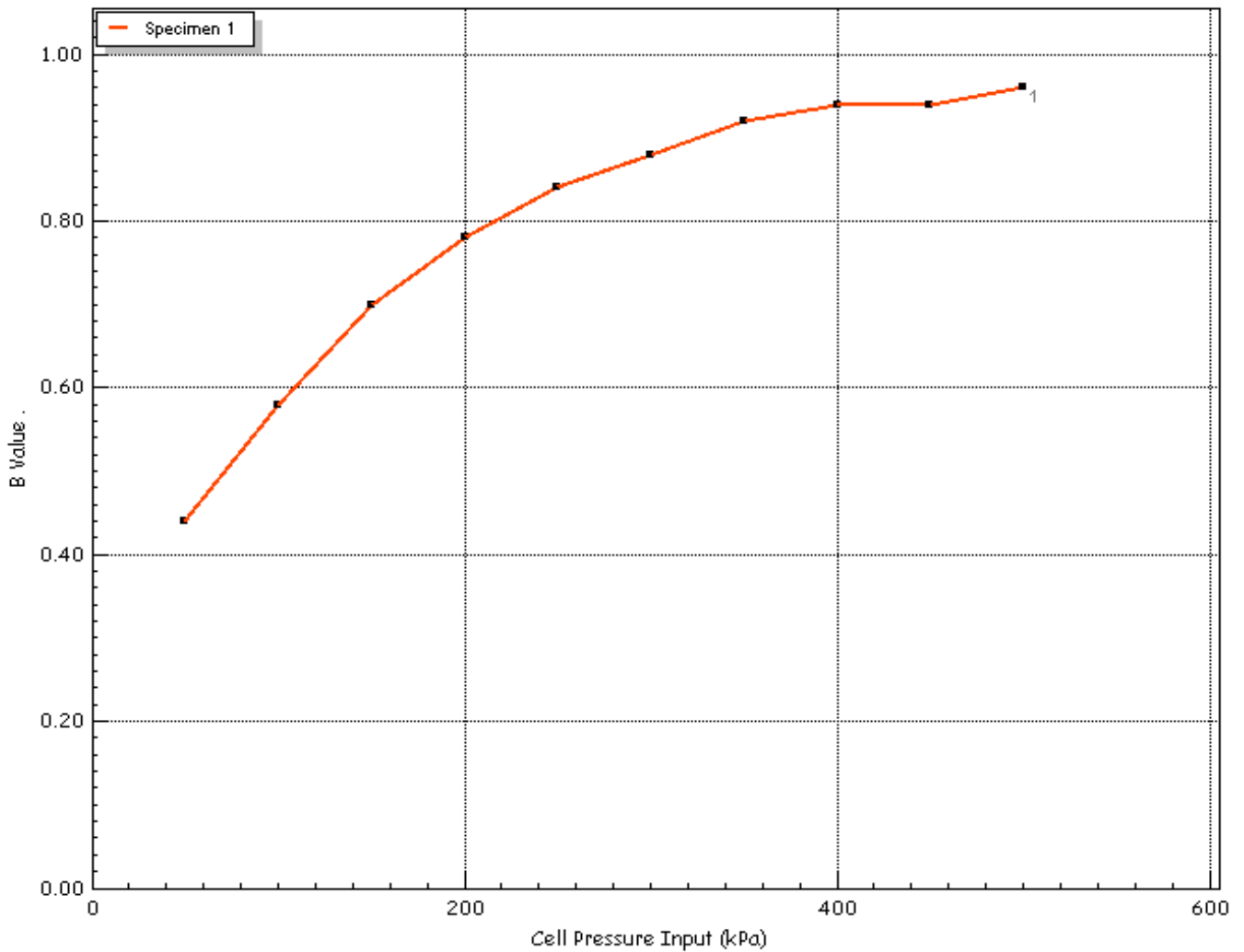



# Effective Stress Triaxial Compression

## Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	$\sigma$	(kPa)	500
Pore Water Pressure Input	$u_{pwp}$	(kPa)	487
B Value	B	.	0.96



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 9.70-9.95m U27
			Test Date	19/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
	Client	Causeway	Sample	9.70-9.95m U27
			Depth	9.70-9.95m

# Effective Stress Triaxial Compression

## Consolidated Undrained

Consolidation Plots

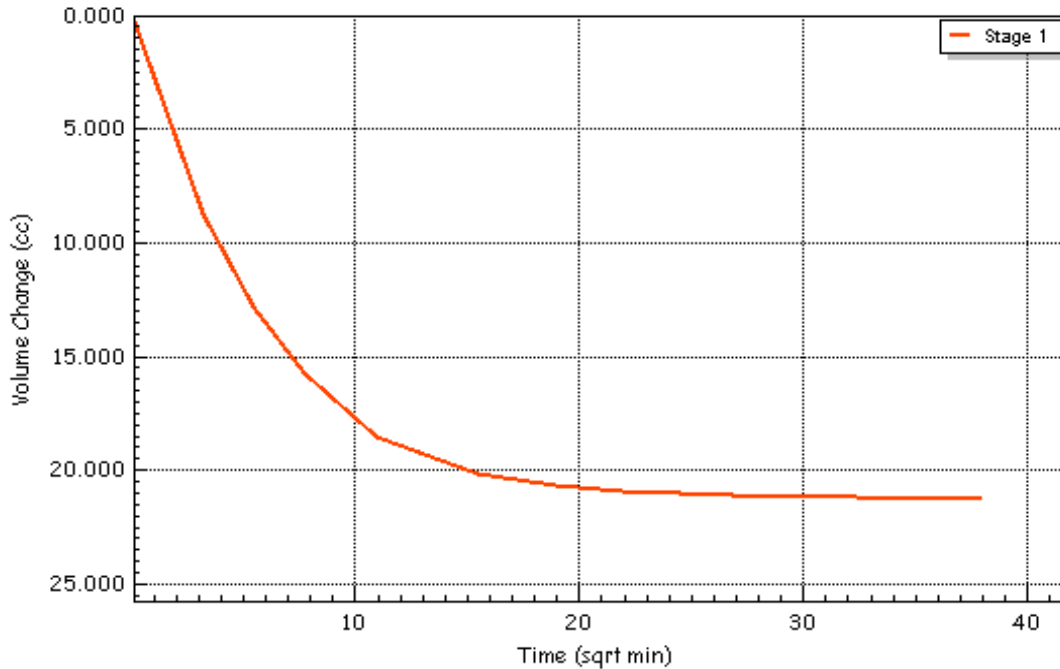
### Initial Conditions


Initial Cell Pressure	$\sigma_3$	(kPa)	700
Initial Back Pressure	$u_{bi}$	(kPa)	500
Pore Water Pressure Input	$u_{pwp}$	(kPa)	674
Drainage Method			Radial+One End

### Final Conditions

PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	$\epsilon_v$	(%)	1.16
Corrected Length	$L_c$	(mm)	210.2
Corrected Area	$A_c$	(cm <sup>2</sup> )	86.08
Corrected Volume	$V_c$	(cc)	1809.266
T100 Time to Failure	$t_{100}$	(min)	58.83
Consolidation	$c_v$	(m <sup>2</sup> /year)	3.877
Compressibility	$m_v$	(m <sup>2</sup> /MN)	0.067
Test Time	$t_F$	(h:m:s)	02:00:00
Estimated Strain to Failure	$\epsilon$	(%)	5.0
Shear Machine Speed	$d_r$	(mm/min)	0.08758

### Notes

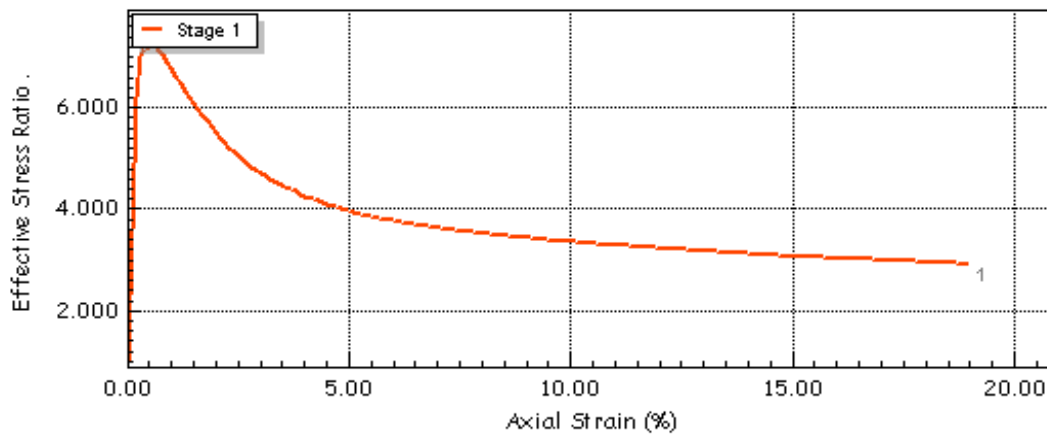
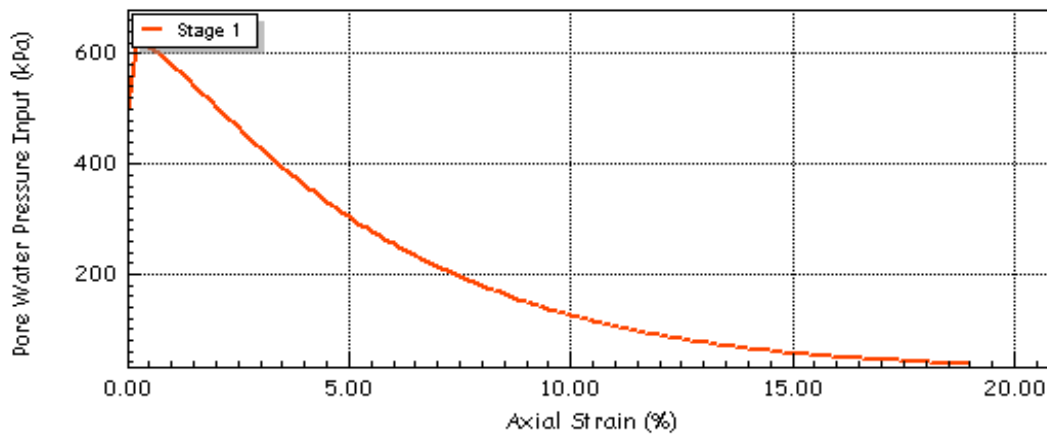
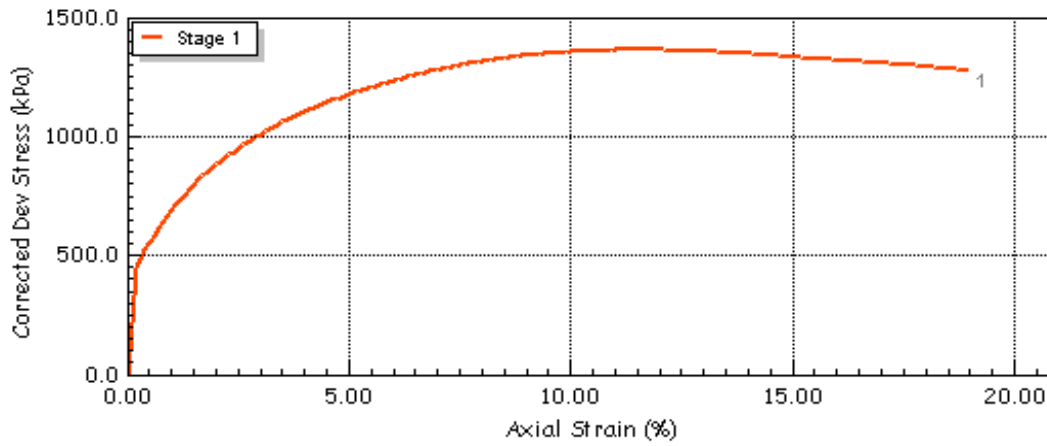



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 9.70-9.95m U27
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	19/05/2022
Client	Causeway	Borehole	BH107	
		Sample	9.70-9.95m U27	
		Depth	9.70-9.95m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots



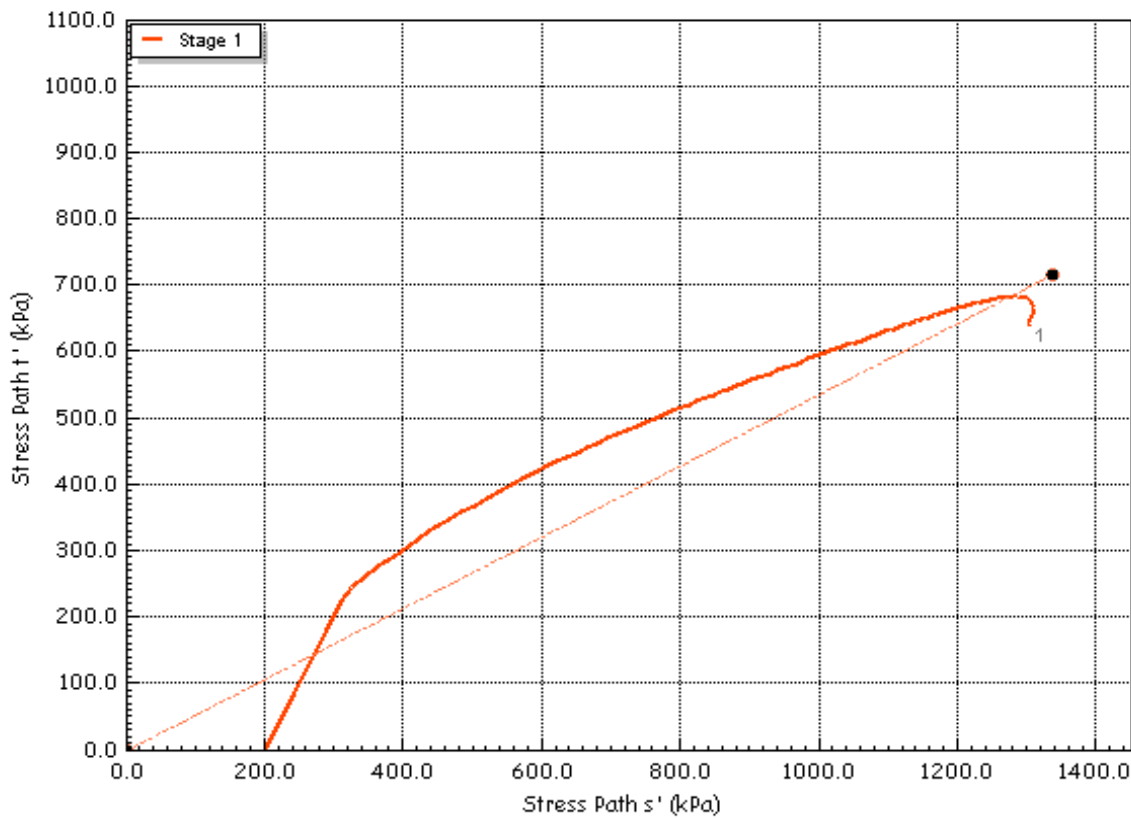
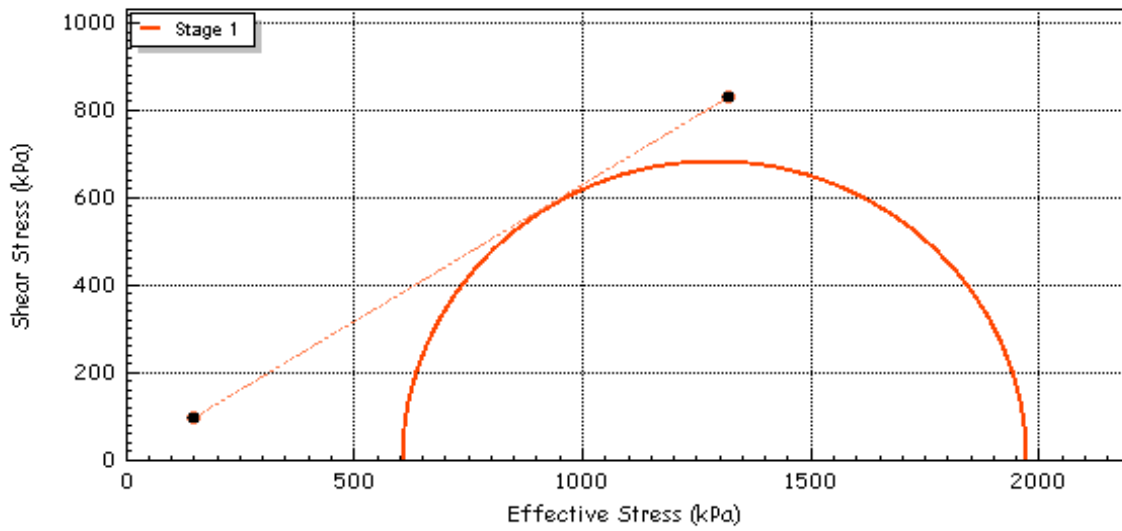
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 9.70-9.95m U27
			Test Date	19/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
	Client	Causeway	Sample Depth	9.70-9.95m U27


# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots

Effective	$c'$	(kPa)	0.00	Effective Cohesion $c'$	(kPa)	0.00
Effective Friction	$\phi'$	(deg)	32.3	Effective Friction $\phi'$	(deg)	32.3



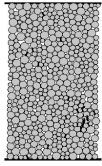
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 9.70-9.95m U27
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	19/05/2022
Client	Causeway	Borehole	BH107	
		Sample	9.70-9.95m U27	
		Depth	9.70-9.95m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Summary Report

### Sample Details



sketch showing specimen location in original sample

Depth	13.20-13.45m		
Description	See summary of soil descriptions.		
Type	Undisturbed, vertical orientation.		
Initial Sample Length	$L_0$	(mm)	211.0
Initial Sample Diameter	$D_0$	(mm)	103.8
Initial Sample Weight	$W_0$	(gr)	3993.0
Initial Bulk Density	$\rho_0$	(Mg/m <sup>3</sup> )	2.24
Particle Density	$\rho_s$	(Mg/m <sup>3</sup> )	2.66

### Initial Conditions

			Stage 1	2
Initial Cell Pressure	$\sigma_{3i}$	(kPa)	560	
Initial Back Pressure	$U_{bi}$	(kPa)	300	
Membrane Thickness	$m_b$	(mm)	0.600	
Displacement Input	$L_{IP}$	(mm)	CH 2	
Load Input	$N_{IP}$	(N)	CH 1	
Pore Water Pressure Input	$U_{pwp}$	(kPa)	CH 3	
Sample Volume	$V$	(cc)	CH 6	
Initial Moisture	$\omega_i$	(%)	10	
Initial Dry Density	$\rho_{di}$	(Mg/m <sup>3</sup> )	2.03	
Initial Voids Ratio	$e_i$	.	0.310	
Initial Degree of Saturation	$S_i$	(%)	87	
B Value	$B$	.	0.97	

### Final Conditions

Final Moisture	$\omega_f$	(%)	9.87	
Final Dry Density	$\rho_{df}$	(Mg/m <sup>3</sup> )	2.09	
Final Voids Ratio	$e_f$	.	0.274	
Final Degree of Saturation	$S_f$	(%)	95.7	
			Stage 1	2
Failure Criteria	.		Max. Dev. Stress	
Strain At Failure	$\epsilon_f$	(%)	15.24	
Stress At Failure	$(\sigma_1 - \sigma_3)'$	(kPa)	1388.6	
Minor Stress At Failure	$\sigma_3'$	(kPa)	538.0	
Major Stress At Failure	$\sigma_1'$	(kPa)	1926.6	
Principal Stress Ratio At Failure	$\sigma_1' / \sigma_3'$		3.581	

### Notes



Plastic



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 13.20-13.45m U26
		Test Date	19/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
Client	Causeway	Sample	13.20-13.45m U26
		Depth	13.20-13.45m

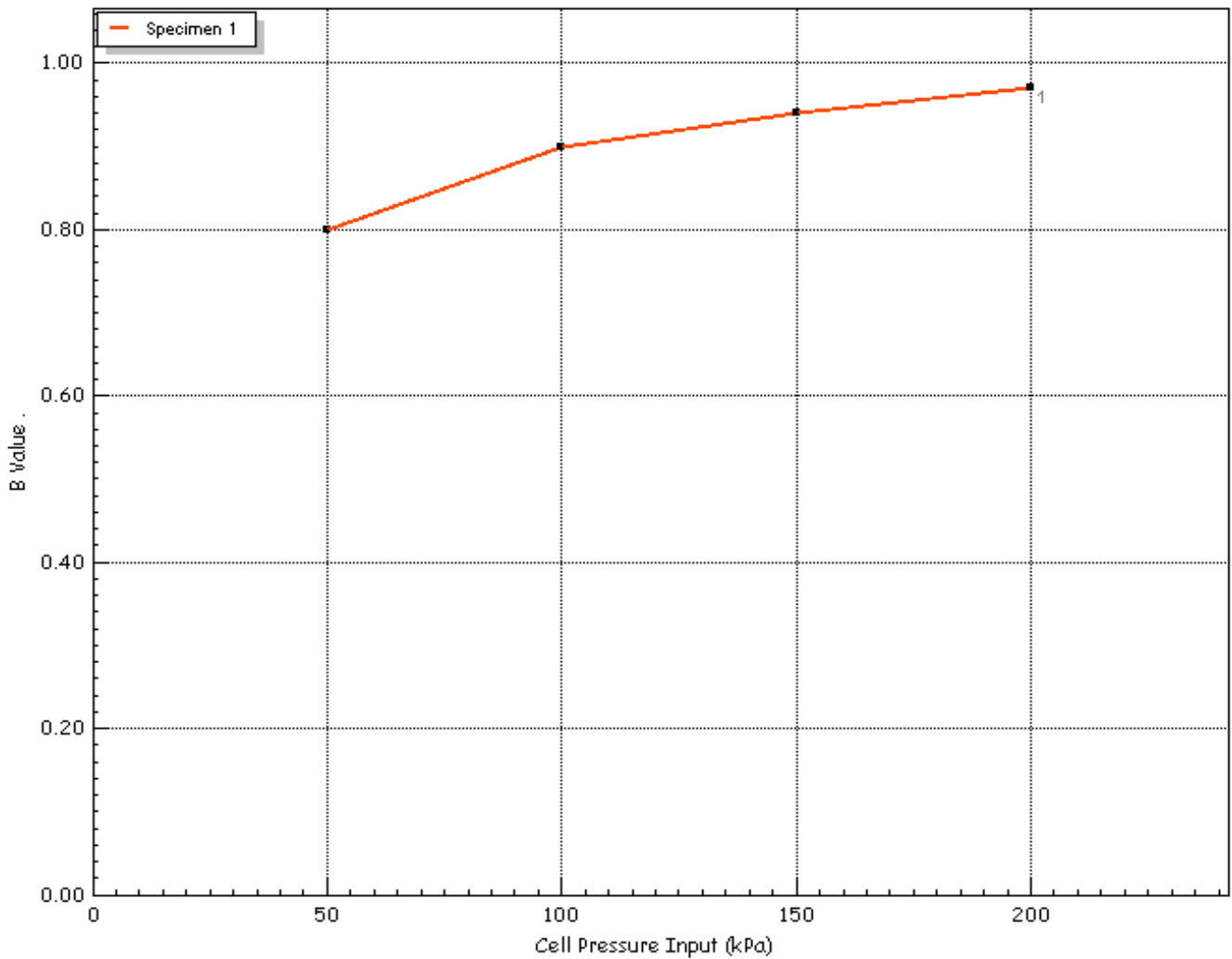



# Effective Stress Triaxial Compression

## Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	$\sigma$	(kPa)	200
Pore Water Pressure Input	$u_{pwp}$	(kPa)	186
B Value	B	.	0.97



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 13.20-13.45m U26
			Test Date	19/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
	Client	Causeway	Sample	13.20-13.45m U26
			Depth	13.20-13.45m



# Effective Stress Triaxial Compression

## Consolidated Undrained

Consolidation Plots

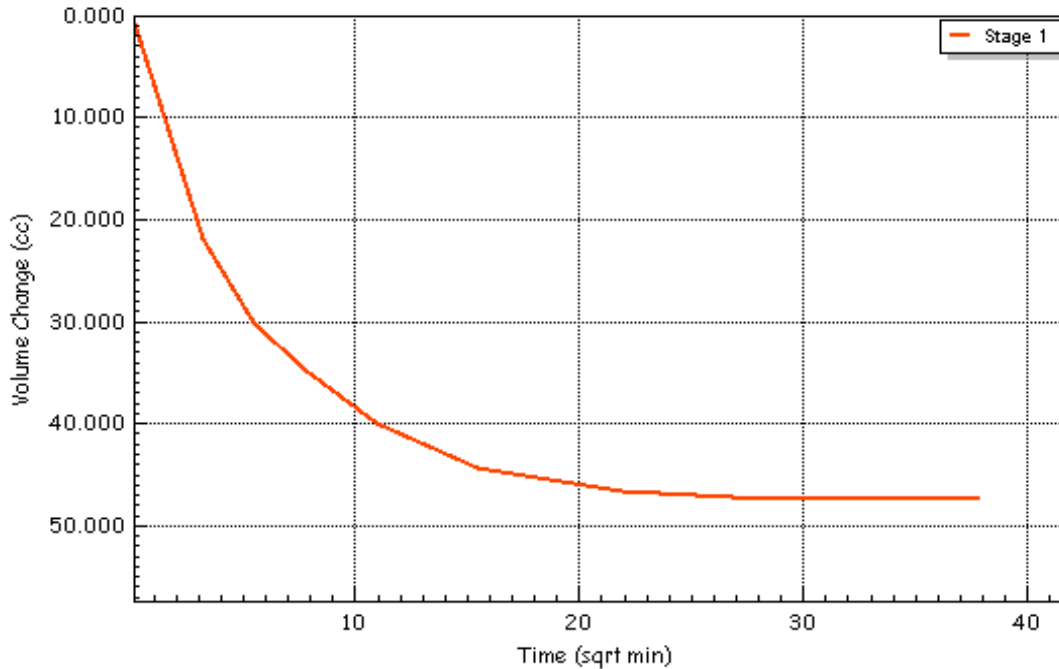
### Initial Conditions


Initial Cell Pressure	$\sigma_3$	(kPa)	560
Initial Back Pressure	$u_{bi}$	(kPa)	300
Pore Water Pressure Input	$u_{pwp}$	(kPa)	545
Drainage Method			Radial+One End

### Final Conditions

PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	$\epsilon_v$	(%)	2.65
Corrected Length	$L_c$	(mm)	209.1
Corrected Area	$A_c$	(cm <sup>2</sup> )	83.12
Corrected Volume	$V_c$	(cc)	1738.139
t <sub>100</sub>	t <sub>100</sub>	(min)	46.41
Consolidation	$c_v$	(m <sup>2</sup> /year)	4.794
Compressibility	$m_v$	(m <sup>2</sup> /MN)	0.108
Test Time	t <sub>F</sub>	(h:m:s)	02:00:00
Estimated Strain to Failure	$\epsilon$	(%)	5.0
Shear Machine Speed	d <sub>r</sub>	(mm/min)	0.08714

### Notes

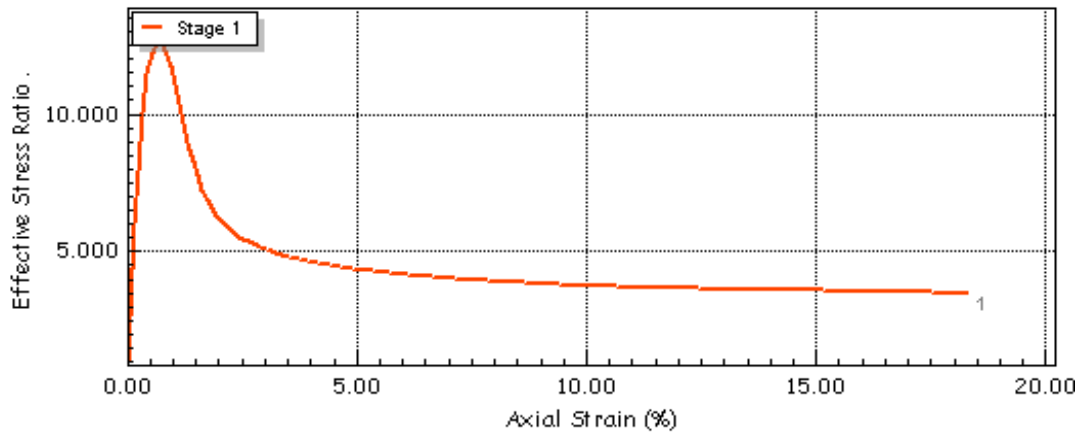
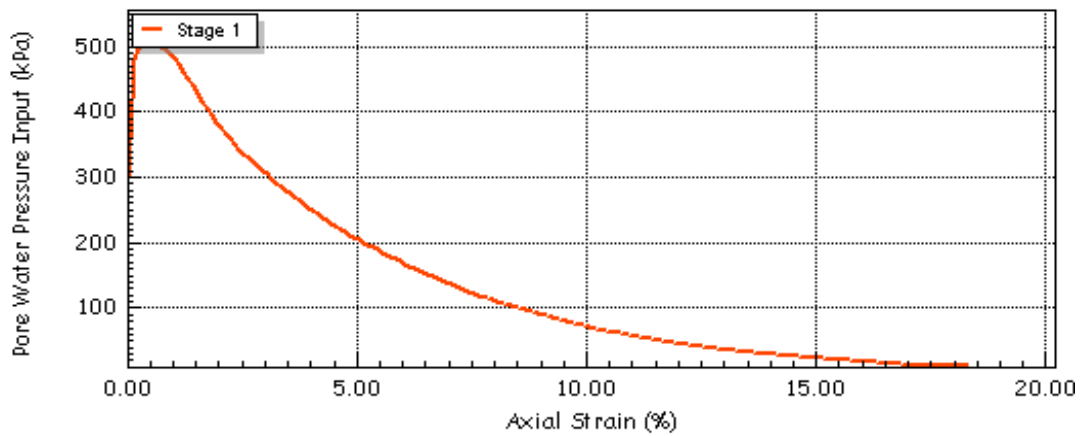
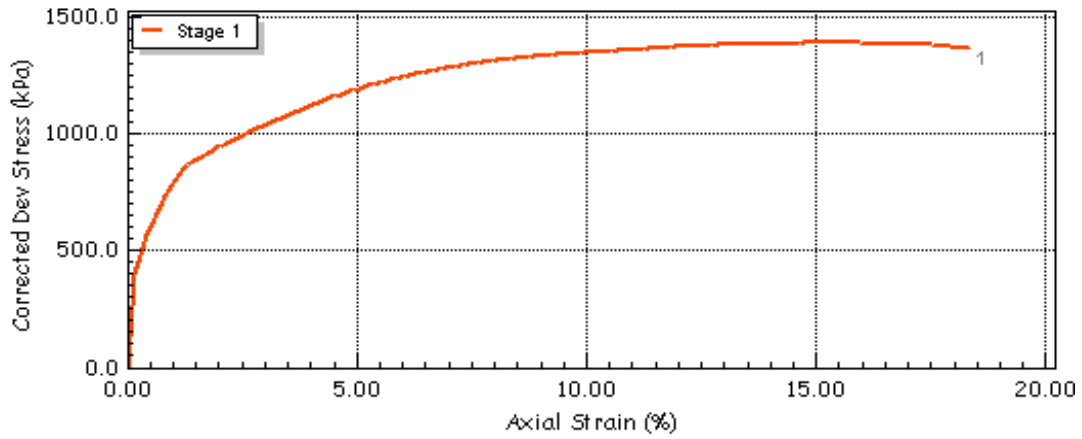



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 13.20-13.45m U26
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	19/05/2022
Client	Causeway	Borehole	BH107	
		Sample	13.20-13.45m U26	
		Depth	13.20-13.45m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots



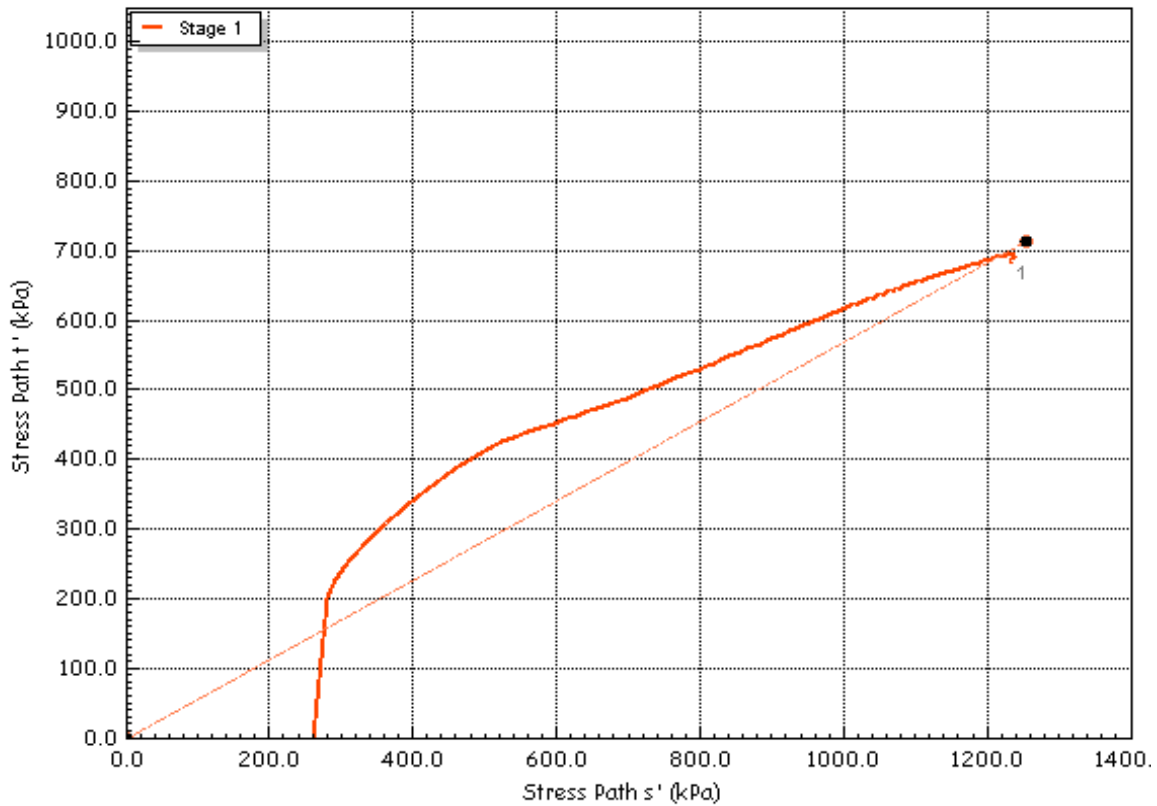
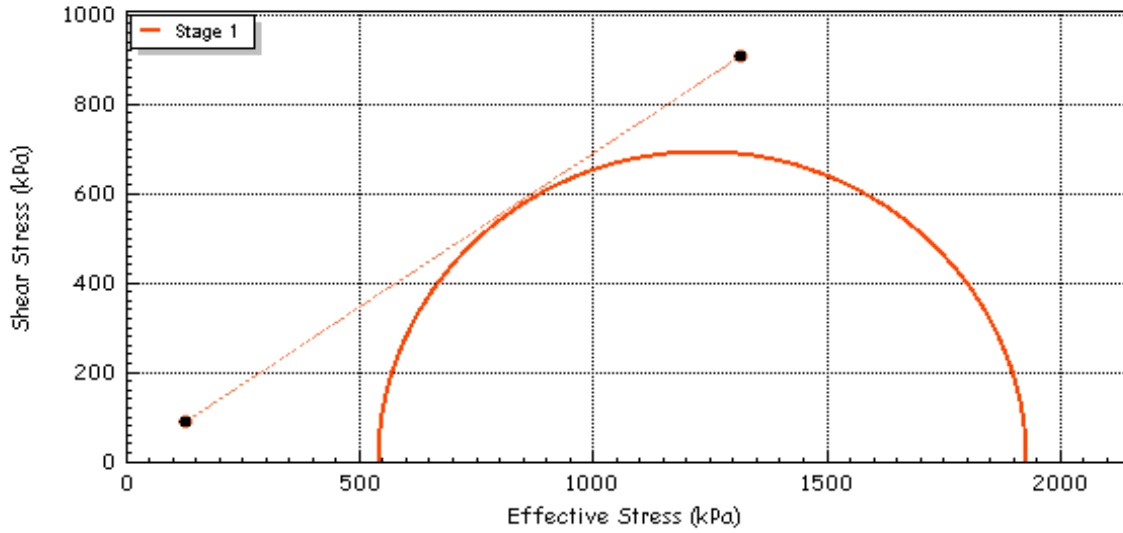
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 13.20-13.45m U26
			Test Date	19/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
	Client	Causeway	Sample	13.20-13.45m U26
			Depth	13.20-13.45m

# Effective Stress Triaxial Compression

## Consolidated Undrained

### Shear Stage Plots

Effective	$c'$	(kPa)	0.00	Effective Cohesion $c'$	(kPa)	0.00
Effective Friction	$\phi'$	(deg)	34.6	Effective Friction $\phi'$	(deg)	34.6



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH107 13.20-13.45m U26
		Test Date	19/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH107
Client	Causeway	Sample	13.20-13.45m U26
		Depth	13.20-13.45m





# Final Report

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**Report No.:** 22-18277-1  
**Initial Date of Issue:** 24-May-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL  
**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister  
**Project** 21-1219 DAA Airfield Underpass

<b>Quotation No.:</b>		<b>Date Received:</b>	17-May-2022
<b>Order No.:</b>		<b>Date Instructed:</b>	17-May-2022
<b>No. of Samples:</b>	10		
<b>Turnaround (Wkdays):</b>	7	<b>Results Due:</b>	25-May-2022
<b>Date Approved:</b>	24-May-2022		

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

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## Results - Soil

**Project: 21-1219 DAA Airfield Underpass**

<b>Client: Causeway Geotech Ltd</b>		<b>Chemtest Job No.:</b>		22-18277	22-18277	22-18277	22-18277	22-18277	22-18277	22-18277	22-18277	22-18277
Quotation No.:		<b>Chemtest Sample ID.:</b>		1430305	1430306	1430307	1430308	1430309	1430310	1430311	1430312	
Order No.:		Client Sample Ref.:		2	3	7	1	25	8	18	19	
		Sample Location:		BH104	BH104	BH106	BH108	BH106	BH106	BH107	BH107	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		6.40	11.95	9.50	4.00	9.50	12.50	13.00	14.60	
		Date Sampled:		16-May-2022	16-May-2022	16-May-2022	16-May-2022	16-May-2022	16-May-2022	16-May-2022	16-May-2022	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>								
Moisture	N	2030	%	0.020	8.5	6.9	7.8	8.5	6.1	20	8.1	8.4
pH (2.5:1)	N	2010		4.0	9.2	9.3			9.2	9.1	9.0	9.0
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.044	< 0.010			0.043	0.023	0.021	0.049
Total Sulphur	U	2175	%	0.010	0.15	0.13			0.17	0.35	0.063	0.055
Chloride (Water Soluble)	U	2220	g/l	0.010	< 0.010	< 0.010			0.012	< 0.010	< 0.010	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.034	0.026			0.027	0.037	0.015	0.021
Organic Matter	U	2625	%	0.40	0.60	0.76	0.59	1.4				

## Results - Soil

**Project: 21-1219 DAA Airfield Underpass**

<b>Client: Causeway Geotech Ltd</b>		<b>Chemtest Job No.:</b>		22-18277	22-18277	
Quotation No.:		<b>Chemtest Sample ID.:</b>		1430313	1430314	
Order No.:		Client Sample Ref.:		3	5	
		Sample Location:		BH108	BH108	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		13.00	14.50	
		Date Sampled:		16-May-2022	16-May-2022	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	16	17
pH (2.5:1)	N	2010		4.0	9.2	9.4
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.059	0.018
Total Sulphur	U	2175	%	0.010	0.16	0.15
Chloride (Water Soluble)	U	2220	g/l	0.010	< 0.010	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.028	0.020
Organic Matter	U	2625	%	0.40		

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.



## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

**LABORATORY RESTRICTION REPORT**

Project Reference	21-1219	To	Colm Hurley
Project Name	DAA Airfield Underpass GI	Position	Project Manager
TR reference	21-1219 / G02	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
BH106	6	4.30	B	Dry density/ moisture content	>10% retained on 37.5mm sieve >30% retained on 20mm sieve	
BH104	25	27.83	C	UCS	Too bady fractured	Carry out point load

For electronic reporting a form of electronic signature or printed name is acceptable

Laboratory Signature Joseph Nicholl	Project Manager Signature Colm Hurley
Date 18 May 2022	Date



**CAUSEWAY**  
— GEOTECH

**HEAD OFFICE**  
Causeway Geotech Ltd  
8 Drumahiskey Road  
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**NI:** +44 (0)28 276 66640  
Registered in Northern Ireland.  
Company Number: NI610766

**REGIONAL OFFICE**  
Causeway Geotech (IRL) Ltd  
Unit 1 Fingal House  
Stephenstown Industrial Estate  
Balbriggan, Co Dublin, Ireland, K32 VR66  
**ROI:** +353 (0)1 526 7465  
Registered in Ireland.  
Company Number: 633786

[www.causewaygeotech.com](http://www.causewaygeotech.com)

**SOIL AND ROCK SAMPLE ANALYSIS  
LABORATORY TEST REPORT**

31 May 2022

<b>Project Name:</b>	DAA Airfield Underpass Ground Investigation
<b>Project No.:</b>	21-1219
<b>Client:</b>	DAA
<b>Engineer:</b>	Ramboll Consulting Engineers

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 10/05/2022 and 31/05/2022.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



**Project Name:** DAA Airfield Underpass Ground Investigation

**Report Reference:** Schedule 2 - FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received

Tests marked with\* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	7
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	7
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	7
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	11
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	10
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	2
SOIL	California Bearing Ratio (CBR)	BS 1377-4: 1990: Cl 7	2
SOIL	Consolidation properties in oedometer - Using 5 pressures (up to 5 days total duration)	BS 1377-5: 1990: Cl 3: 1	1
	Extra over days (more than initial 5 days)		2
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	2
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	5

## SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL – subcontracted to Pro Soils Limited ( <i>UKAS 4043</i> )	Effective shear strength consolidated-undrained triaxial compression test with measurement of pore pressure (up to 4 days)	BS 1377-8:1990	1
	Extra over days (more than initial 4 days)		0
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	Organic Matter Content		2
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	BRE Test - Suite D		4



## Summary of Classification Test Results

Project No. 21-1219	Project Name DAA Airfield Underpass Ground Investigation
------------------------	---

Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		bulk	dry							
BH105	4	12.95	13.95	B	Greyish brown sandy gravelly silty CLAY.	2.24	1.98	11.0	67	28 -1pt	15	13		CL
BH105	5	17.00	18.10	B	Greyish brown sandy gravelly silty CLAY.	1.97	1.81	8.4	67	29 -1pt	16	13		CL
BH105	8	24.30	25.30	B	Greyish brown sandy gravelly silty CLAY.	2.10	1.88	8.2	71	30 -1pt	17	13		CL
BH109	2	3.50	4.50	B	Greyish brown sandy gravelly silty CLAY.	2.36	2.13	6.7	61	29 -1pt	16	13		CL
BH109	3	7.70	8.70	B	Greyish brown sandy gravelly silty CLAY.	2.19	2.02	7.8	70	27 -1pt	14	13		CL
BH109	4	11.70	12.70	B	Greyish brown sandy gravelly silty CLAY.	2.17	1.95	10.0	82	26 -1pt	14	12		CL
BH109	5	14.90	15.90	B	Greyish brown slightly gravelly silty fine to coarse SAND.	2.17	1.91	14.0	100	20 -1pt	16	4		ML

All tests performed in accordance with BS1377:1990 unless specified otherwise
LAB 01R Version 5

<b>Key</b>  Density test                      Liquid Limit                      Particle density  Linear measurement unless :    4pt cone unless :                      sp - small pyknometer  wd - water displacement        cas - Casagrande method        gj - gas jar  wi - immersion in water        1pt - single point test	Date Printed  <p style="text-align: center;">31/05/2022</p>	Approved By  <p style="text-align: center;">Stephen.Watson</p>	 10122
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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Greyish brown sandy slightly clayey subangular fine to coarse GRAVEL.**

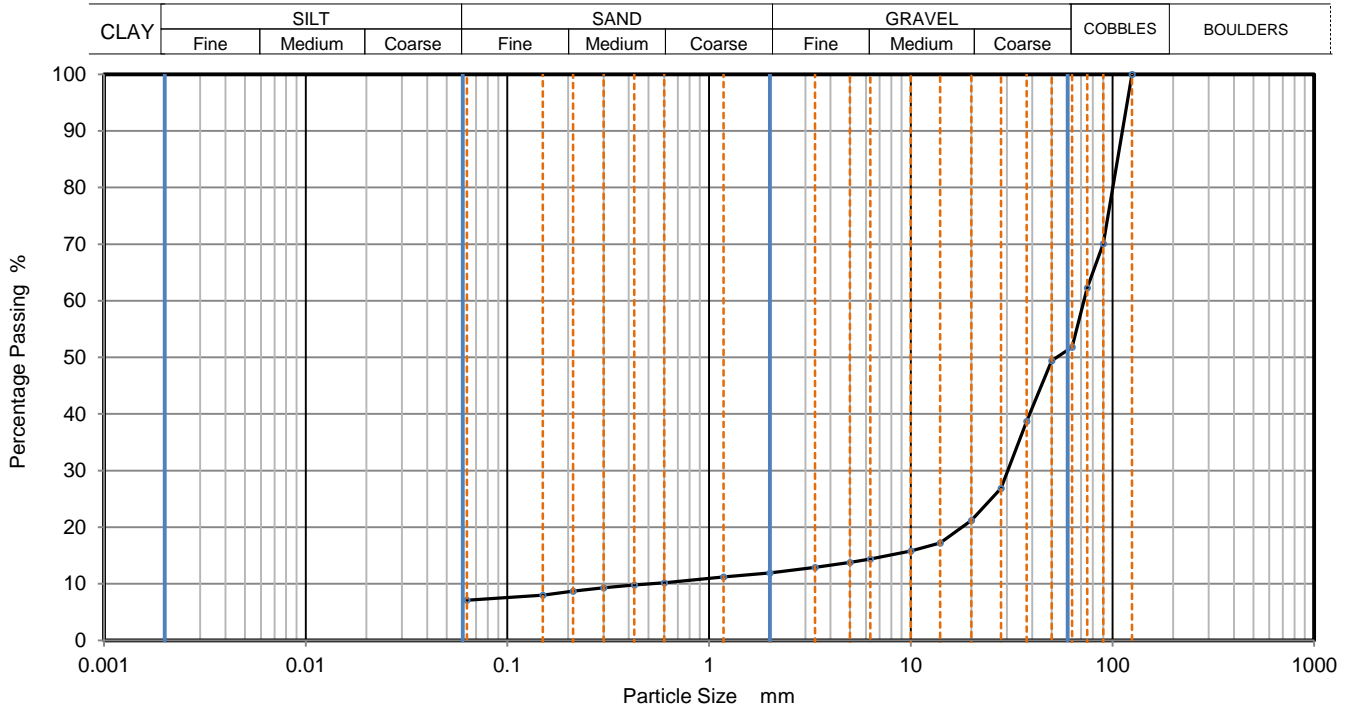
Depth, m **5.00**

Specimen Reference **2** Specimen Depth **5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus202205111**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	70		
75	62		
63	52		
50	49		
37.5	39		
28	27		
20	21		
14	17		
10	16		
6.3	14		
5	14		
3.35	13		
2	12		
1.18	11		
0.6	10		
0.425	10		
0.3	9		
0.212	9		
0.15	8		
0.063	7		

Dry Mass of sample, g 8569

Sample Proportions	% dry mass
Cobbles	48.2
Gravel	39.9
Sand	4.8
Fines <0.063mm	7.0

Grading Analysis		
D100	mm	125
D60	mm	72.2
D30	mm	30.3
D10	mm	0.502
Uniformity Coefficient		140
Curvature Coefficient		25

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

LAB 05R - Version 5



10122





## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Grey slightly gravelly clayey fine to coarse SAND.**

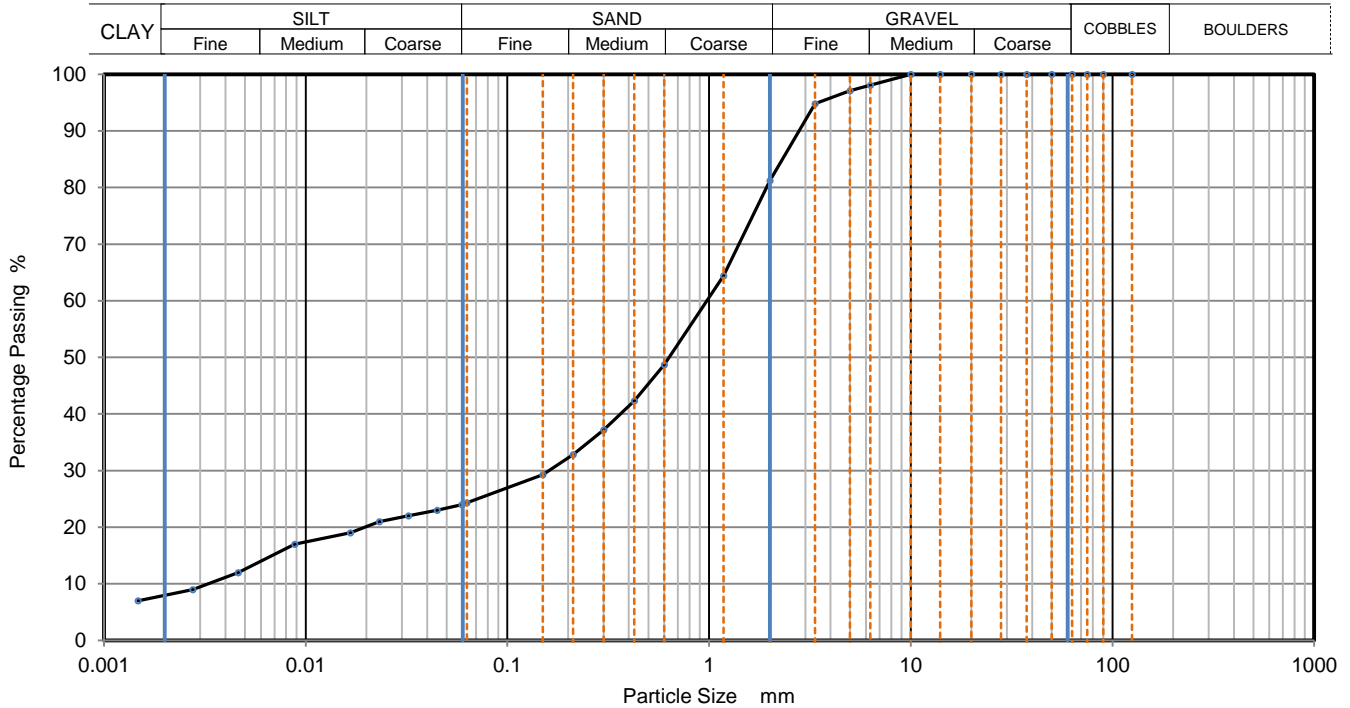
Depth, m **8.00**

Specimen Reference **2** Specimen Depth **8** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205112**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05942	24
90	100	0.04491	23
75	100	0.03226	22
63	100	0.02316	21
50	100	0.01662	19
37.5	100	0.00883	17
28	100	0.00462	12
20	100	0.00275	9
14	100	0.00147	7
10	100		
6.3	98		
5	97		
3.35	95		
2	81		
1.18	64		
0.6	49	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	42		
0.3	37		
0.212	33		
0.15	29		
0.063	24		

Dry Mass of sample, g

**211**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	18.8
Sand	56.8
Silt	16.0
Clay	8.4

Grading Analysis		
D100	mm	
D60	mm	0.975
D30	mm	0.161
D10	mm	0.00307
Uniformity Coefficient		320
Curvature Coefficient		8.7

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

LAB 05R - Version 5



10122



## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

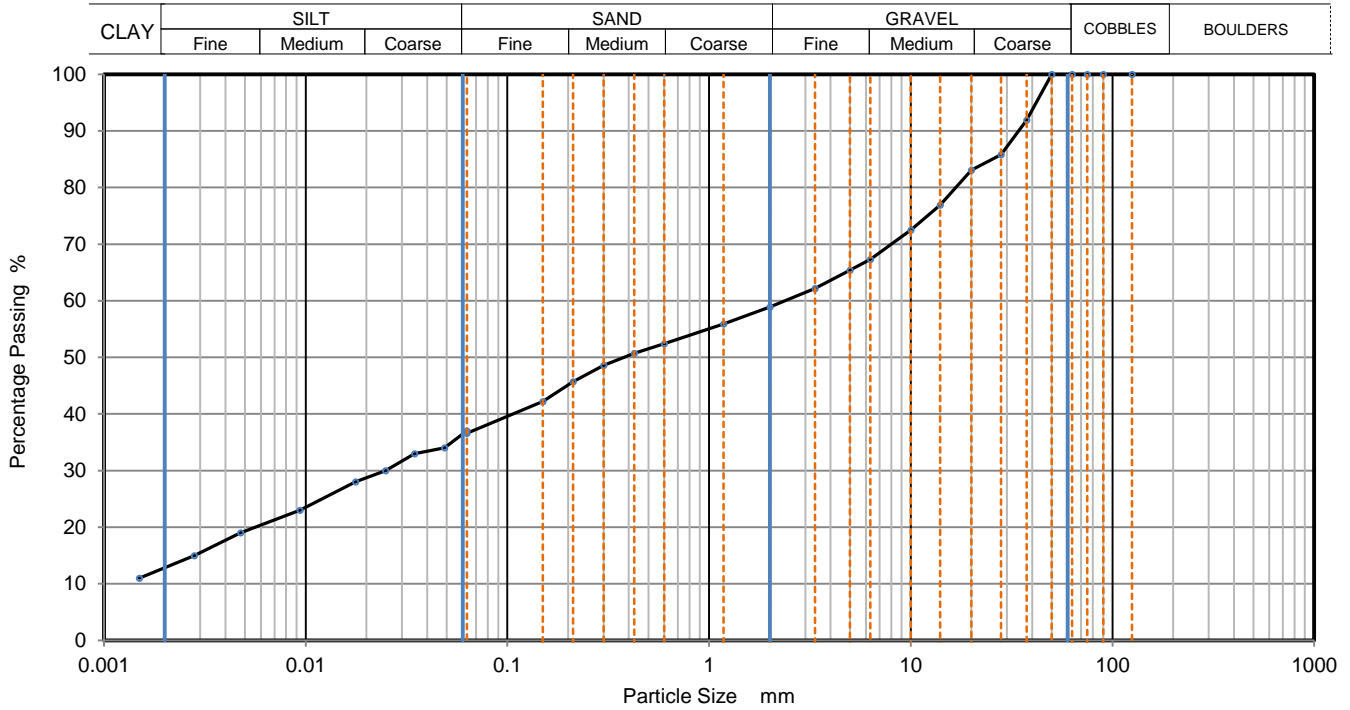
Depth, m **12.95**

Specimen Reference **5** Specimen Depth **12.95** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205113**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	37
90	100	0.04875	34
75	100	0.03470	33
63	100	0.02485	30
50	100	0.01769	28
37.5	92	0.00936	23
28	86	0.00476	19
20	83	0.00280	15
14	77	0.00150	11
10	73		
6.3	67		
5	65		
3.35	62		
2	59		
1.18	56		
0.6	52	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	51		
0.3	49		
0.212	46		
0.15	42		
0.063	37		

Dry Mass of sample, g 3489

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	41.1
Sand	22.3
Silt	23.9
Clay	12.7

Grading Analysis	
D100	mm
D60	mm 2.38
D30	mm 0.0254
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

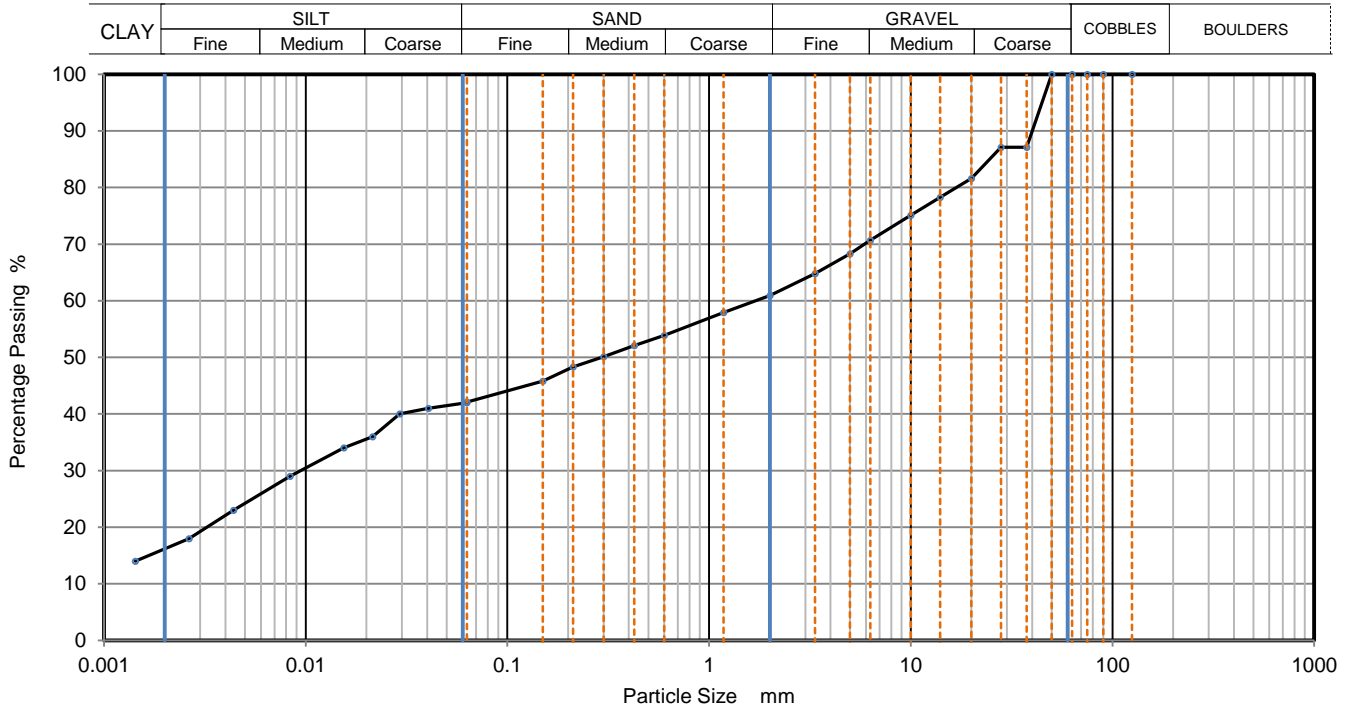
Depth, m **17.00**

Specimen Reference **5** Specimen Depth **17** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205114**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	42
90	100	0.04065	41
75	100	0.02929	40
63	100	0.02146	36
50	100	0.01543	34
37.5	87	0.00835	29
28	87	0.00439	23
20	82	0.00264	18
14	78	0.00143	14
10	75		
6.3	71		
5	68		
3.35	65		
2	61		
1.18	58		
0.6	54	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	52		
0.3	50		
0.212	48		
0.15	46		
0.063	42		

Dry Mass of sample, g

**3457**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	39.1
Sand	18.8
Silt	26.0
Clay	16.1

Grading Analysis		
D100	mm	
D60	mm	1.7
D30	mm	0.00917
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **6**

Soil Description **Greyish brown clayey fine to coarse SAND.**

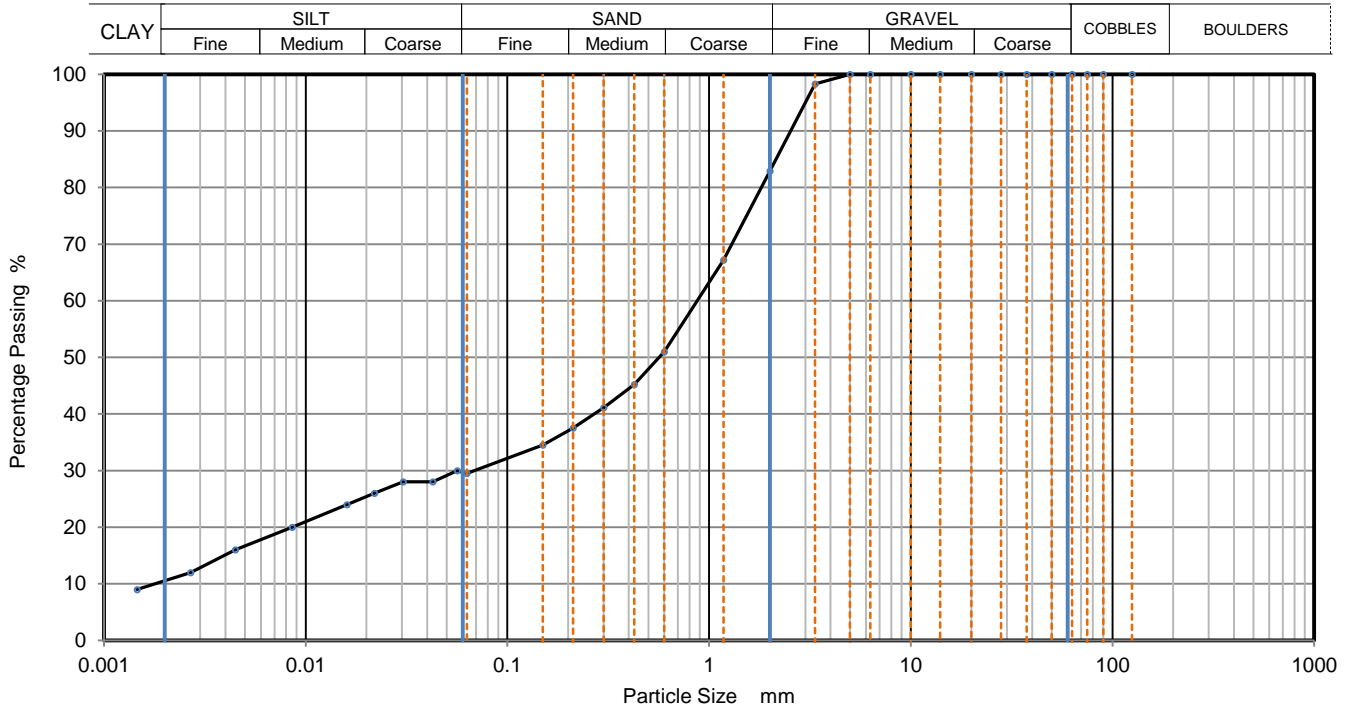
Depth, m **18.10**

Specimen Reference **2** Specimen Depth **18.1** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205115**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05639	30
90	100	0.04269	28
75	100	0.03046	28
63	100	0.02191	26
50	100	0.01600	24
37.5	100	0.00858	20
28	100	0.00448	16
20	100	0.00269	12
14	100	0.00146	9
10	100		
6.3	100		
5	100		
3.35	98		
2	83		
1.18	67		
0.6	51	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	45		
0.3	41		
0.212	38		
0.15	35		
0.063	30		

Dry Mass of sample, g

217

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	17.1
Sand	53.4
Silt	18.6
Clay	10.9

Grading Analysis		
D100	mm	
D60	mm	0.874
D30	mm	0.0687
D10	mm	0.0017
Uniformity Coefficient		510
Curvature Coefficient		3.2

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **7**

Soil Description **Greyish brown clayey fine to coarse SAND.**

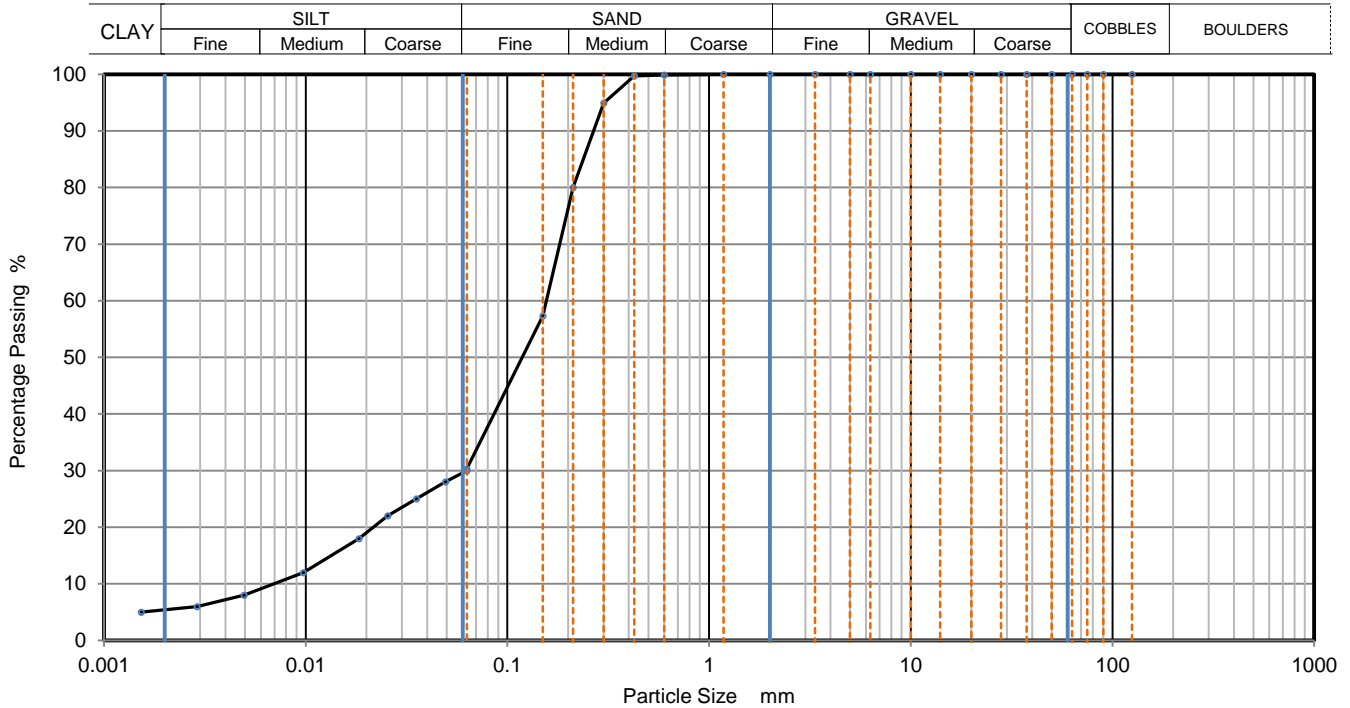
Depth, m **22.75**

Specimen Reference **2** Specimen Depth **22.75** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205116**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	30
90	100	0.04939	28
75	100	0.03537	25
63	100	0.02548	22
50	100	0.01834	18
37.5	100	0.00974	12
28	100	0.00495	8
20	100	0.00289	6
14	100	0.00153	5
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	100		
0.3	95		
0.212	80		
0.15	57		
0.063	30		

Dry Mass of sample, g 209

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.0
Sand	69.7
Silt	24.9
Clay	5.4

Grading Analysis		
D100	mm	
D60	mm	0.156
D30	mm	0.0609
D10	mm	0.00657
Uniformity Coefficient		24
Curvature Coefficient		3.6

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH105**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **8**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

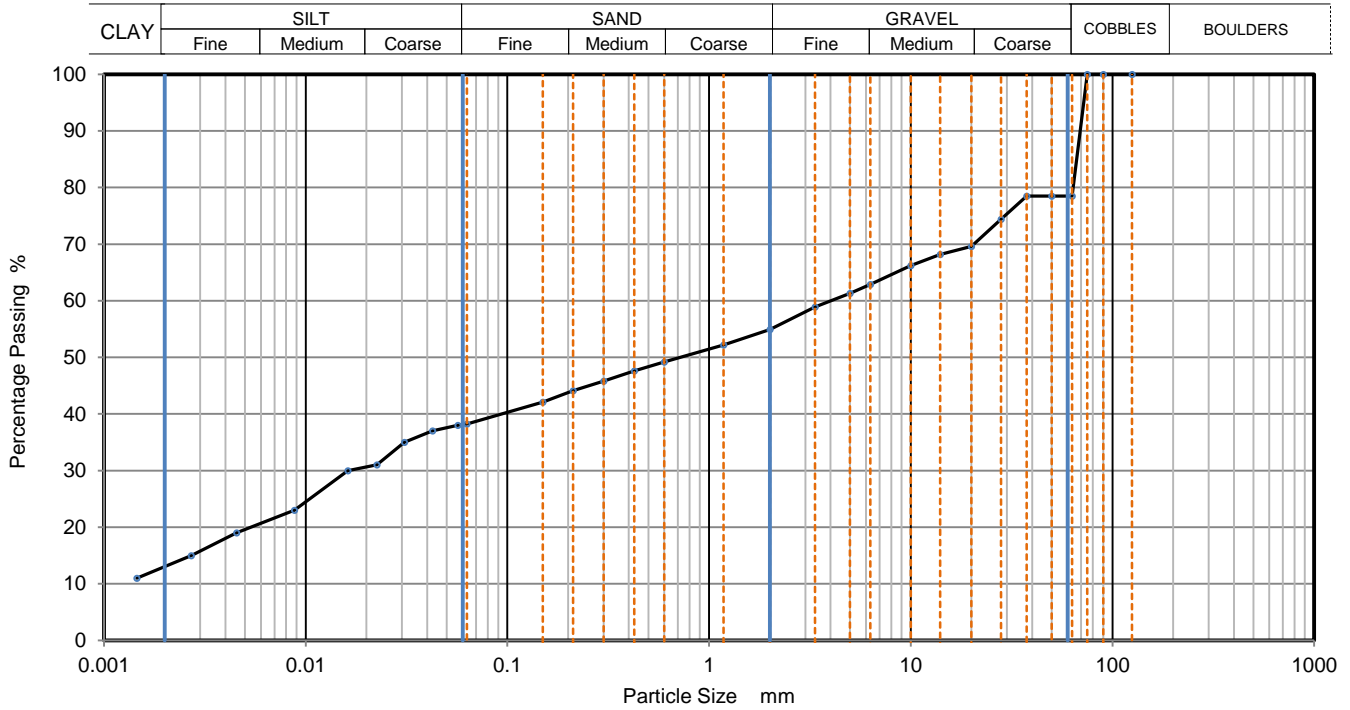
Depth, m **24.30**

Specimen Reference **5** Specimen Depth **24.3** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205117**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.05672	38
90	100	0.04254	37
75	100	0.03086	35
63	79	0.02253	31
50	79	0.01618	30
37.5	79	0.00878	23
28	74	0.00454	19
20	70	0.00270	15
14	68	0.00146	11
10	66		
6.3	63		
5	61		
3.35	59		
2	55		
1.18	52		
0.6	49	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	48		
0.3	46		
0.212	44		
0.15	42		
0.063	38		

Dry Mass of sample, g 3492

Sample Proportions	% dry mass
Cobbles	21.5
Gravel	23.6
Sand	16.7
Silt	25.1
Clay	13.1

Grading Analysis	
D100	mm
D60	mm 4.04
D30	mm 0.0177
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH109**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

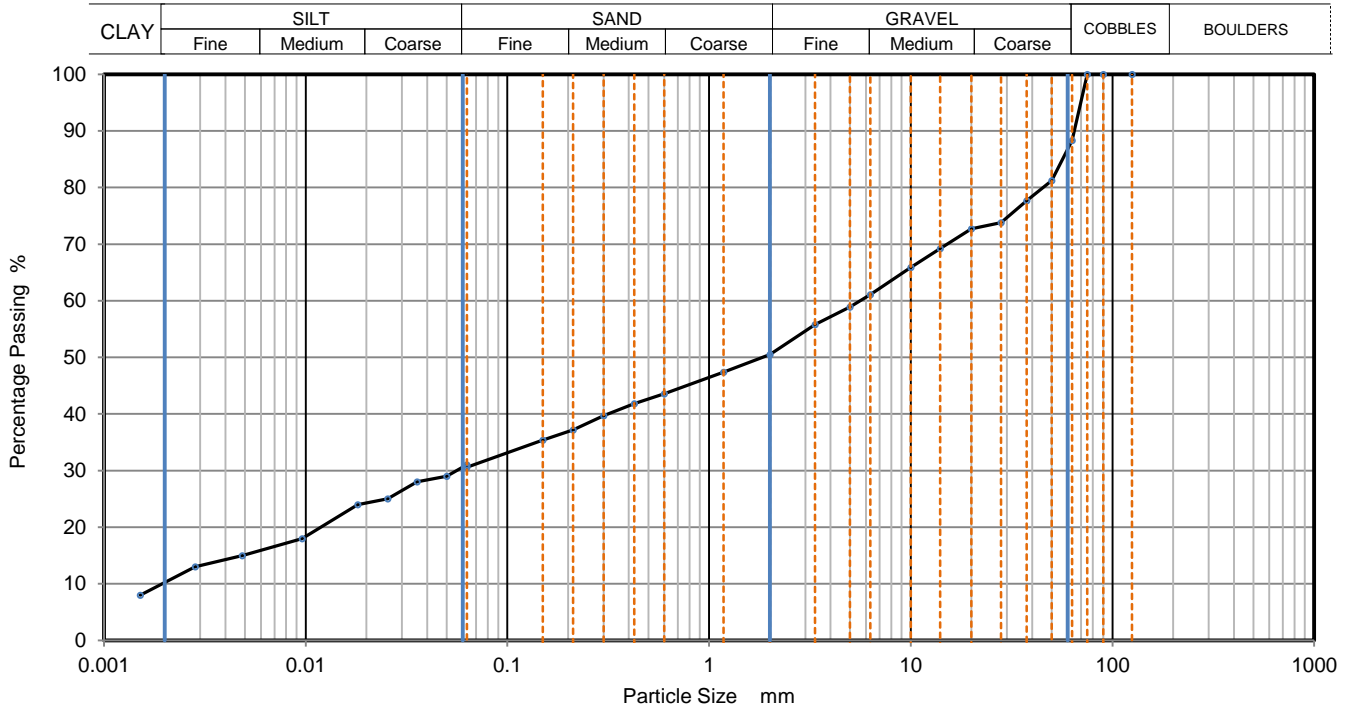
Depth, m **3.50**

Specimen Reference **5** Specimen Depth **3.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051111**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	31
90	100	0.05002	29
75	100	0.03559	28
63	88	0.02548	25
50	81	0.01813	24
37.5	78	0.00958	18
28	74	0.00485	15
20	73	0.00283	13
14	69	0.00151	8
10	66		
6.3	61		
5	59		
3.35	56		
2	51		
1.18	47		
0.6	44	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	42		
0.3	40		
0.212	37		
0.15	35		
0.063	31		

Dry Mass of sample, g

**4565**

Sample Proportions	% dry mass
Cobbles	11.7
Gravel	37.8
Sand	19.9
Silt	20.4
Clay	10.2

Grading Analysis		
D100	mm	
D60	mm	5.62
D30	mm	0.0568
D10	mm	0.00194
Uniformity Coefficient		2900
Curvature Coefficient		0.3

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH109**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

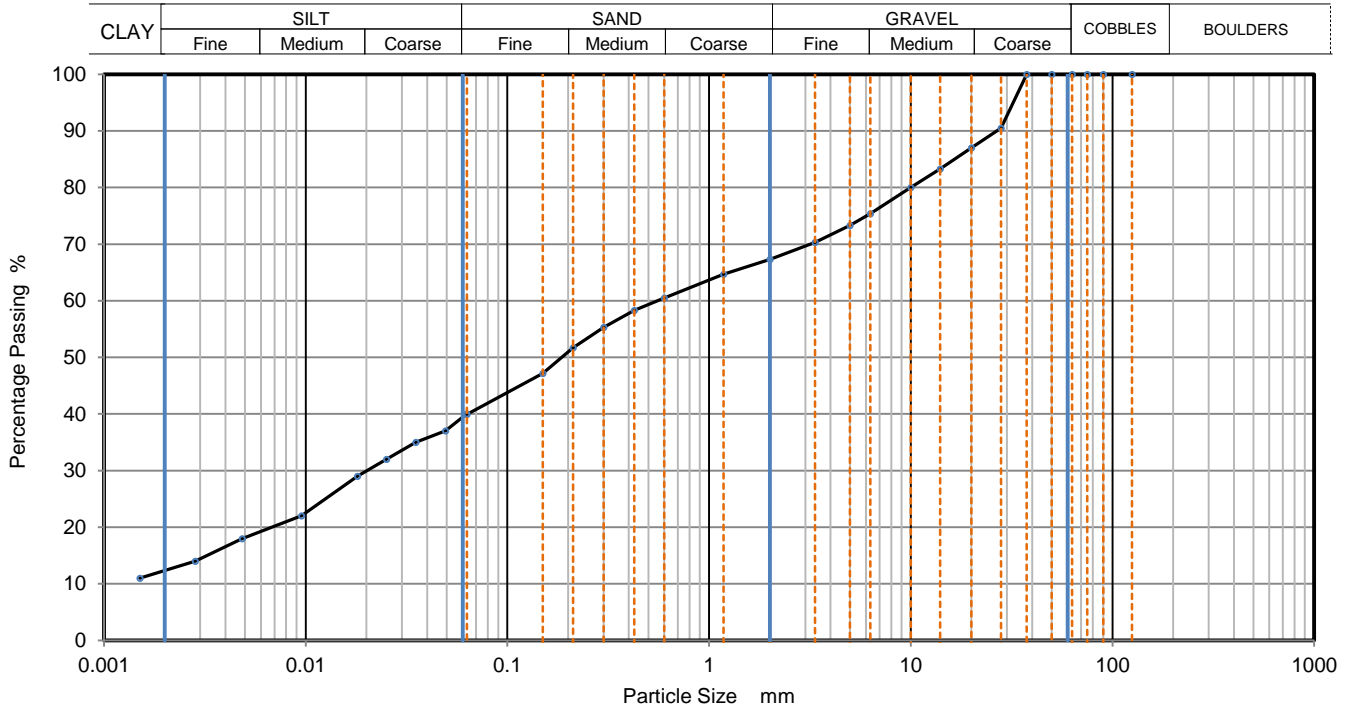
Depth, m **7.70**

Specimen Reference **5** Specimen Depth **7.7** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051113**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	40
90	100	0.04939	37
75	100	0.03515	35
63	100	0.02517	32
50	100	0.01802	29
37.5	100	0.00953	22
28	91	0.00485	18
20	87	0.00283	14
14	83	0.00150	11
10	80		
6.3	75		
5	73		
3.35	70		
2	67		
1.18	65		
0.6	61	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	58		
0.3	55		
0.212	52		
0.15	47		
0.063	40		

Dry Mass of sample, g

**4032**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	32.7
Sand	27.5
Silt	27.2
Clay	12.6

Grading Analysis	
D100	mm
D60	mm 0.552
D30	mm 0.0206
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

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## PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH109**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **4**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

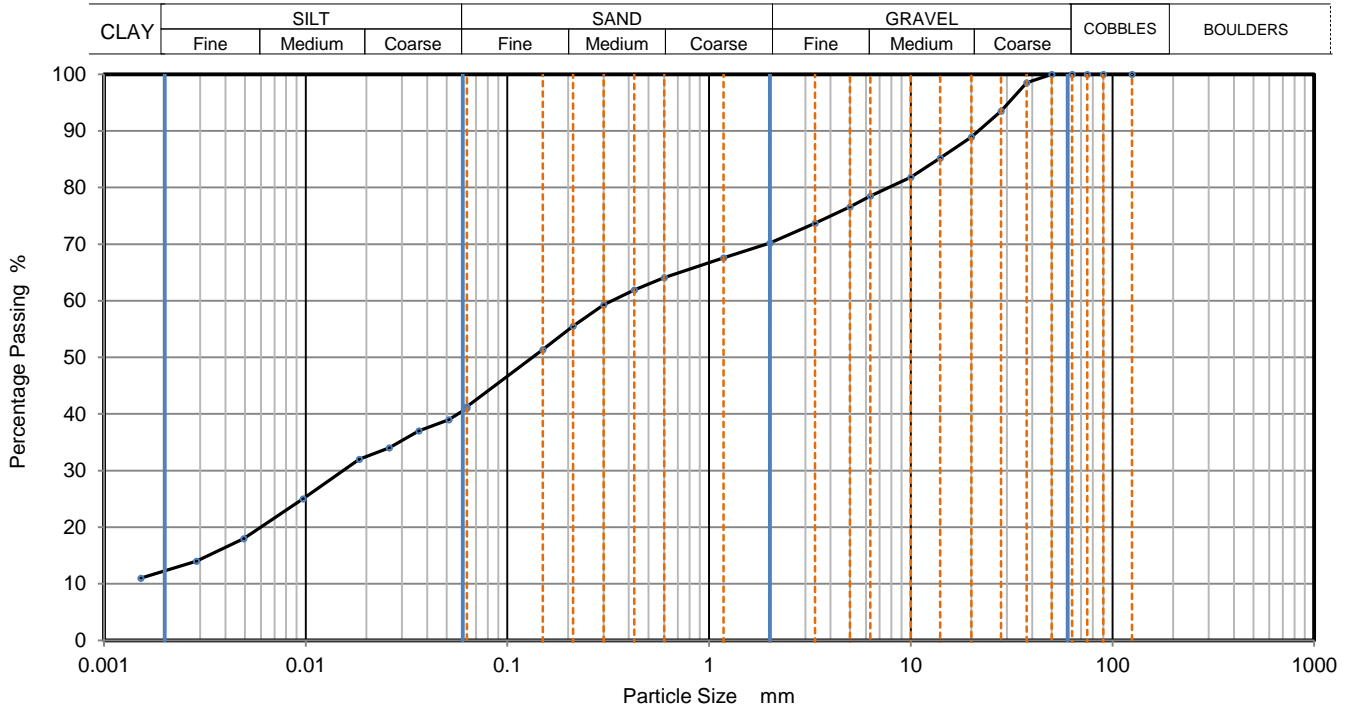
Depth, m **11.70**

Specimen Reference **5** Specimen Depth **11.7** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051115**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	41
90	100	0.05127	39
75	100	0.03647	37
63	100	0.02594	34
50	100	0.01845	32
37.5	99	0.00969	25
28	94	0.00493	18
20	89	0.00287	14
14	85	0.00152	11
10	82		
6.3	79		
5	77		
3.35	74		
2	70		
1.18	68		
0.6	64	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	62		
0.3	59		
0.212	56		
0.15	51		
0.063	41		

Dry Mass of sample, g 3672

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	29.8
Sand	28.8
Silt	28.9
Clay	12.5

Grading Analysis		
D100	mm	
D60	mm	0.33
D30	mm	0.0151
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH109**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **5**

Soil Description **Greyish brown slightly gravelly silty fine to coarse SAND.**

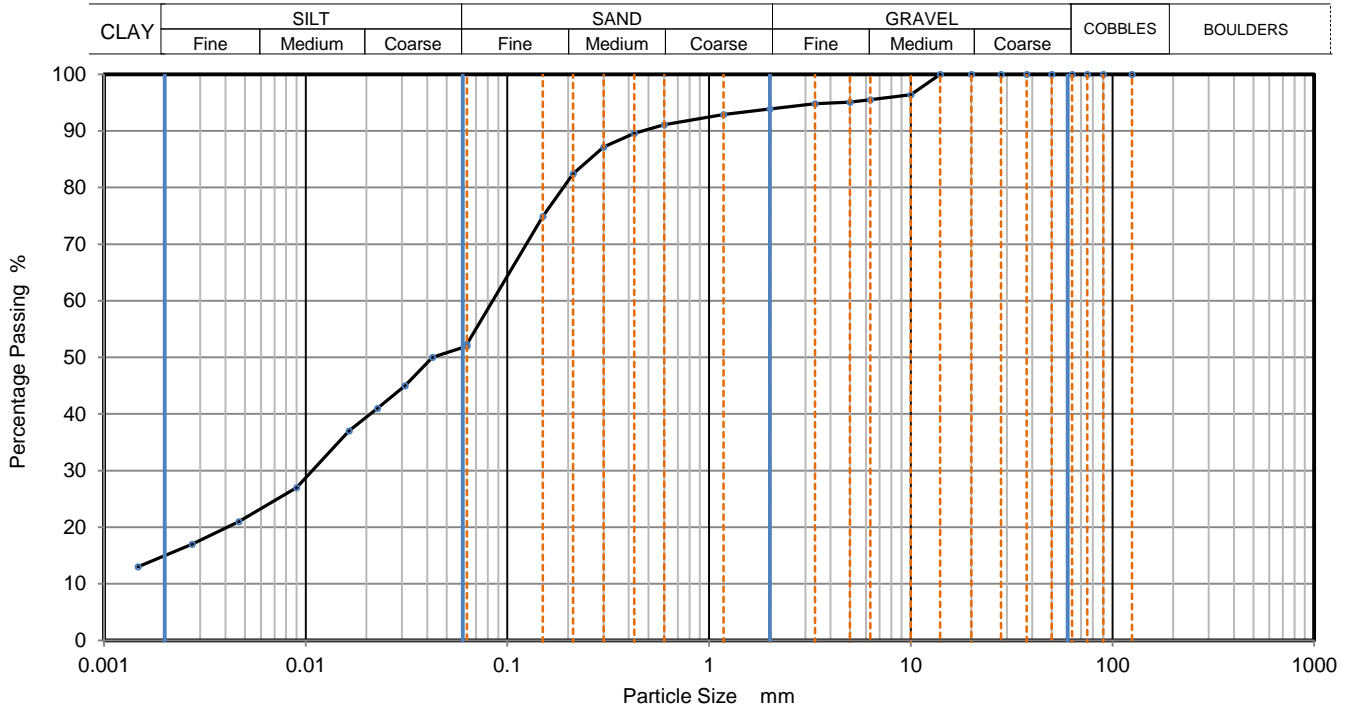
Depth, m **14.90**

Specimen Reference **5** Specimen Depth **14.9** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2022051116**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	52
90	100	0.04254	50
75	100	0.03111	45
63	100	0.02270	41
50	100	0.01642	37
37.5	100	0.00902	27
28	100	0.00465	21
20	100	0.00273	17
14	100	0.00147	13
10	96		
6.3	96		
5	95		
3.35	95		
2	94		
1.18	93		
0.6	91	Particle density (assumed)	
0.425	90	2.65	Mg/m <sup>3</sup>
0.3	87		
0.212	82		
0.15	75		
0.063	52		

Dry Mass of sample, g

**225**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	6.1
Sand	41.6
Silt	37.2
Clay	15.1

Grading Analysis		
D100	mm	
D60	mm	0.0847
D30	mm	0.0109
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

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10122



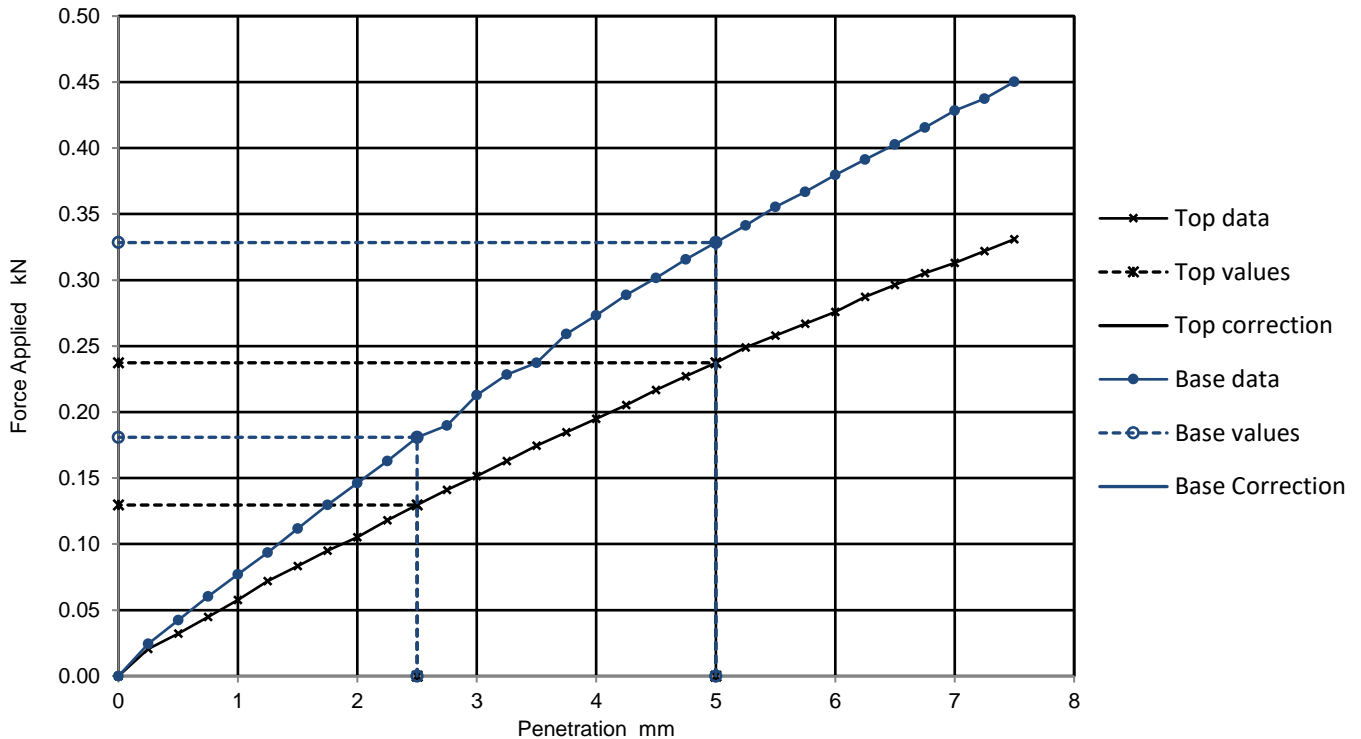
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH105
Site Name	DAA Airfield Underpass Ground Investigation
Sample No.	1
Soil Description	Greyish brown sandy gravelly silty CLAY.
Depth m	4.00
Specimen Reference	Specimen Depth m
Sample Type	B
Specimen Description	Greyish brown sandy gravelly silty CLAY.
KeyLAB ID	Caus202205110
Test Method	BS1377 : Part 4 : 1990, clause 7
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	24 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.26 Mg/m3	Surcharge applied	4.5 kg
	Dry density 2.03 Mg/m3		3 kPa
	Moisture content 11 %		

**Force v Penetration Plots**



**Results**

Curve correction applied	CBR Values, %				Moisture Content %
	2.5mm	5mm	Highest	Average	
TOP	No	1.0	1.2	1.2	11
BASE	No	1.4	1.6	1.6	11

**General remarks**

**Test specific remarks**

**Approved**

Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson
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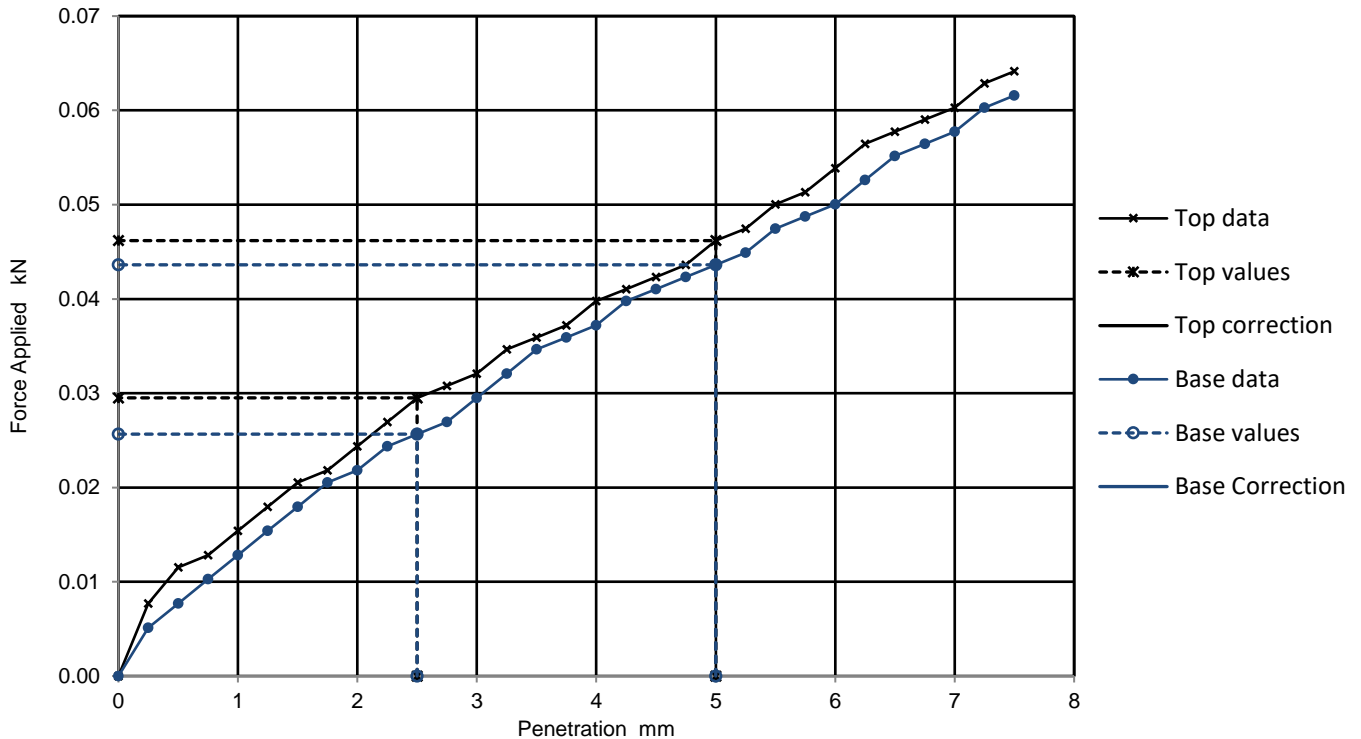
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH109
Site Name	DAA Airfield Underpass Ground Investigation
Sample No.	1
Soil Description	Greyish brown sandy gravelly silty CLAY.
Depth m	2.50
Specimen Reference	Specimen Depth m
Sample Type	B
Specimen Description	Greyish brown sandy gravelly silty CLAY.
KeyLAB ID	Caus202205118
Test Method	BS1377 : Part 4 : 1990, clause 7
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	15 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 2.00 Mg/m3	Surcharge applied	4.5 kg
	Dry density 1.62 Mg/m3		3 kPa
	Moisture content 23 %		

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.2	0.2	0.2	0.2	23
BASE	No	0.2	0.2	0.2		23

**General remarks**

**Test specific remarks**

**Approved**

Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson
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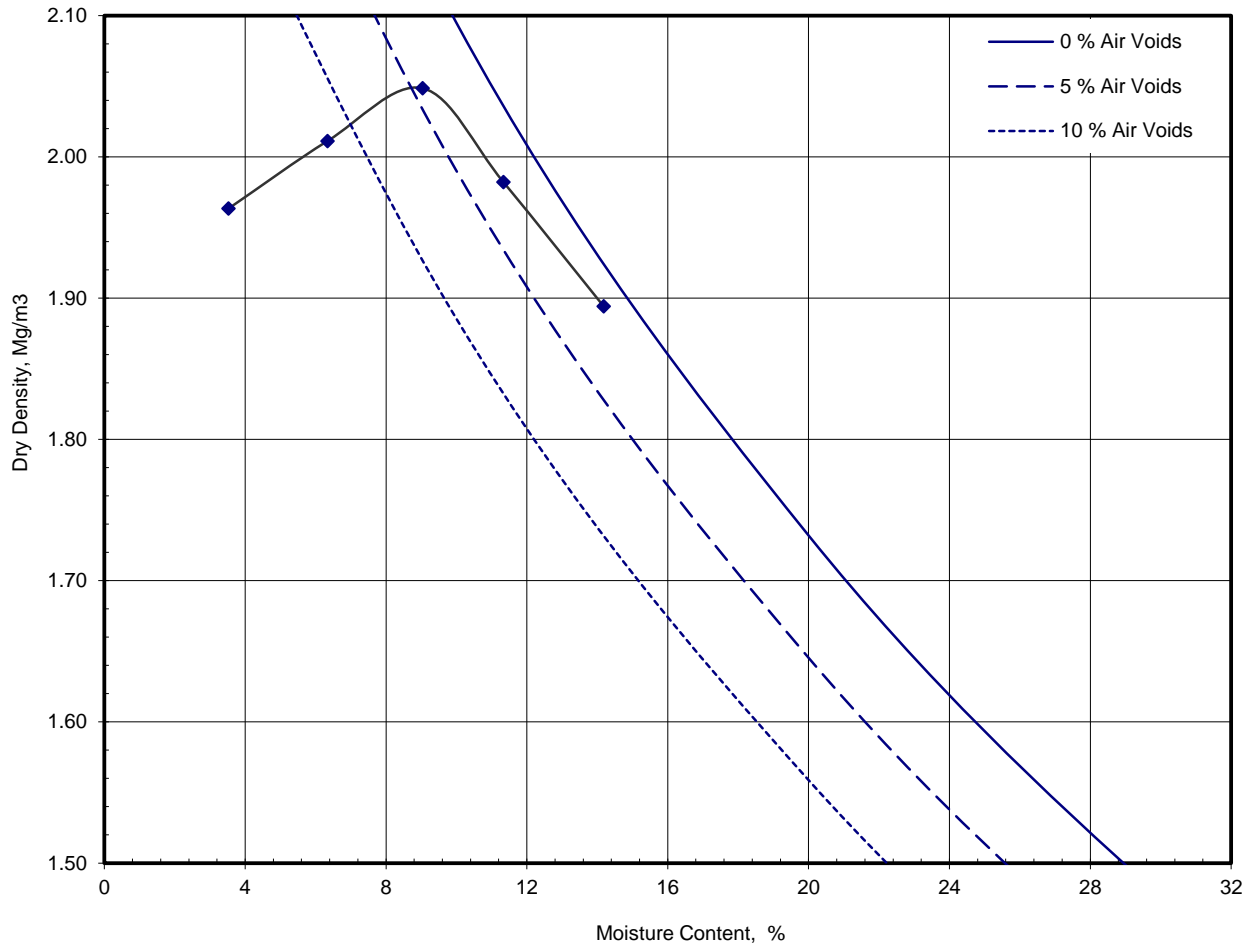




**Dry Density / Moisture Content Relationship  
Light Compaction**

Job Ref	21-1219
Borehole / Pit No	BH105
Sample No	1
Depth	4.00 m
Sample Type	B
Keylab ID	Caus202205110

Site Name	<b>DAA Airfield Underpass Ground Investigation</b>	
Soil Description		
Specimen Ref.	3	Specimen Depth
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer	



Preparation	Material used was air dried	
Mould Type	1 LITRE	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	17
Material Retained on 20.0 mm Sieve	%	24
Particle Density - Assumed	Mg/m³	2.65

<b>Maximum Dry Density</b>	Mg/m³	<b>2.05</b>
<b>Optimum Moisture Content</b>	%	<b>9</b>

Approved
Stephen.Watson

Remarks

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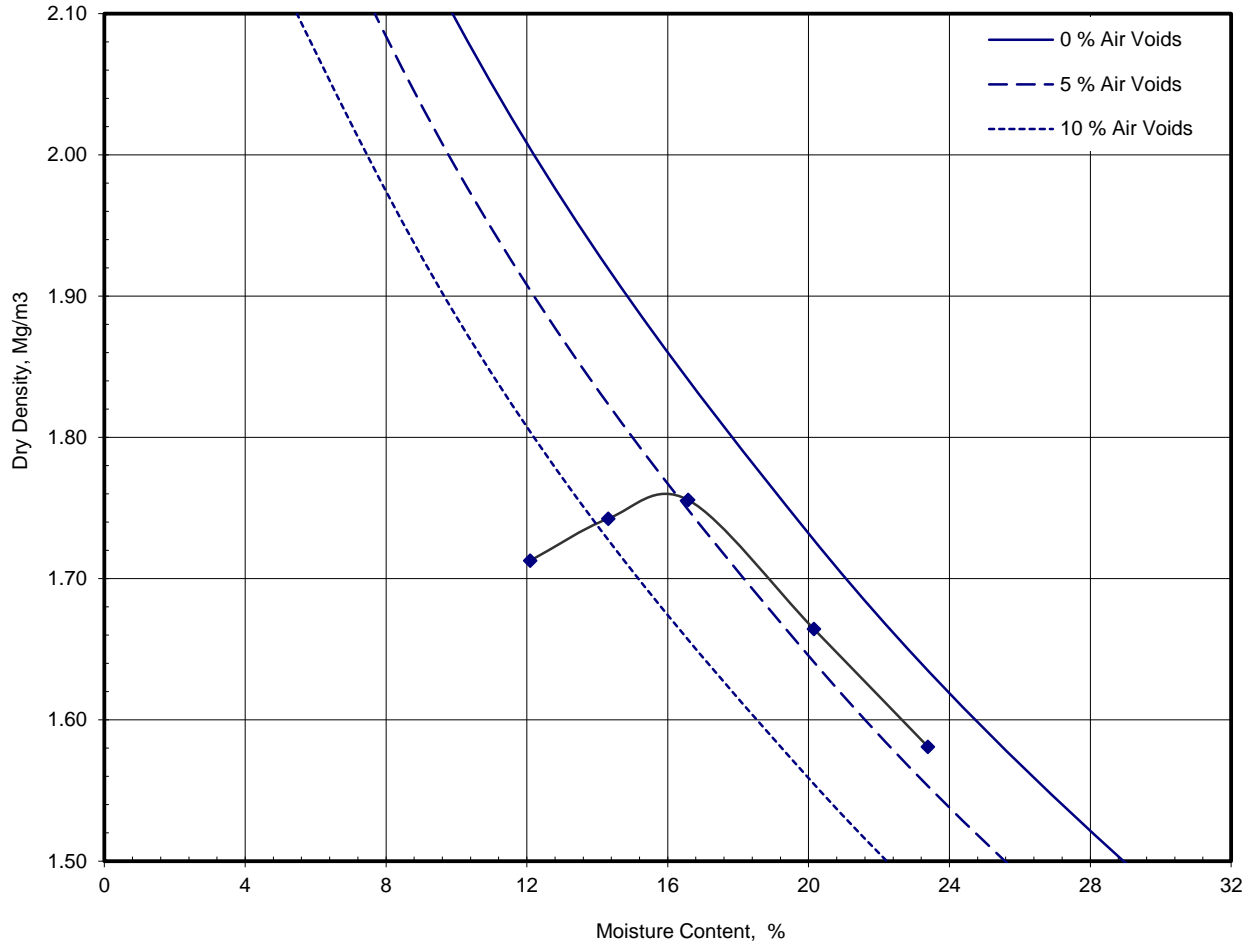
10122



**Dry Density / Moisture Content Relationship  
Light Compaction**

Job Ref	21-1219
Borehole / Pit No	BH109
Sample No	1
Depth	2.50 m
Sample Type	B
Keylab ID	Caus202205118

Site Name	<b>DAA Airfield Underpass Ground Investigation</b>	
Soil Description		
Specimen Ref.	3	Specimen Depth
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer	



Preparation	Material used was air dried	
Mould Type	1 LITRE	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	5
Material Retained on 20.0 mm Sieve	%	15
Particle Density - Assumed	Mg/m³	2.65

<b>Maximum Dry Density</b>	Mg/m³	<b>1.76</b>
<b>Optimum Moisture Content</b>	%	<b>17</b>

Approved
Stephen.Watson

Remarks

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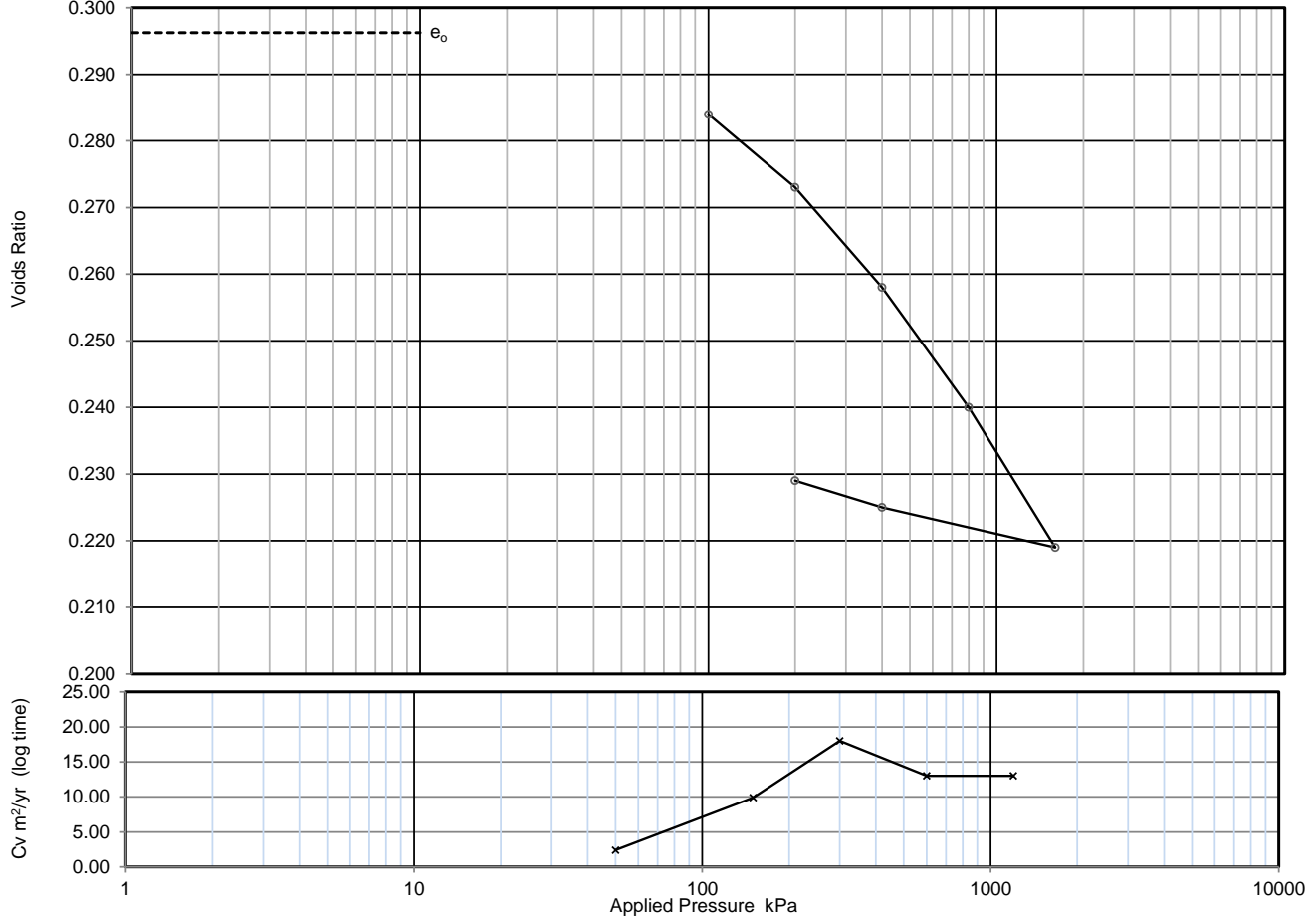
10122



**ONE DIMENSIONAL CONSOLIDATION TEST  
BS1377:Part 5:1990, clause 3**

Job Ref	21-1219
Borehole/Pit No.	BH109
Sample No.	22
Depth	9.55
Sample Type	U
KeyLAB ID	Caus2022051114
Date started	20/05/2022

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Greyish brown sandy gravelly silty CLAY.		
Specimen Reference	3	Specimen Depth	9.55 m
Specimen Description	Greyish brown sandy gravelly silty CLAY.		
Test Method	BS1377:Part 5:1990, clause 3		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec
0.0	0.296	-	-	-	-
100	0.284	0.095	2.4	3.5	0.00041
200	0.273	0.089	9.9	39	0.0011
400	0.258	0.057	18	75	0.00069
800	0.240	0.036	13	50	0.00087
1,598	0.219	0.022	13	260	0.0011
400	0.225	0.0042			
200	0.229	0.019			

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details

	Initial	Final	
Diameter	75.10	-	mm
Height	19.90	18.87	mm
Moisture Content	12.5	11.6	%
Bulk density	2.30	2.41	Mg/m3
Dry density	2.04	2.16	Mg/m3
Voids Ratio	0.296	0.229	
Saturation	111	134	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%
Remarks			

Final values should be used with caution

Cv plotted at mid point of load increments

Cv corrected to 20oC

Approved

Stephen.Watson

Printed :

31/05/2022 14:34

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**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219				
Borehole/Pit No.	BH109				
Site Name	DAA Airfield Underpass Ground Investigation		Sample No.	22	
Soil Description	Greyish brown sandy gravelly silty CLAY.		Depth	9.55	
Specimen Reference	4	Specimen Depth	9.60 m	Sample Type	U
Specimen Description	Stiff greyish brown sandy gravelly silty CLAY.		KeyLAB ID	Caus2022051114	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		Date of test	26/05/2022	

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

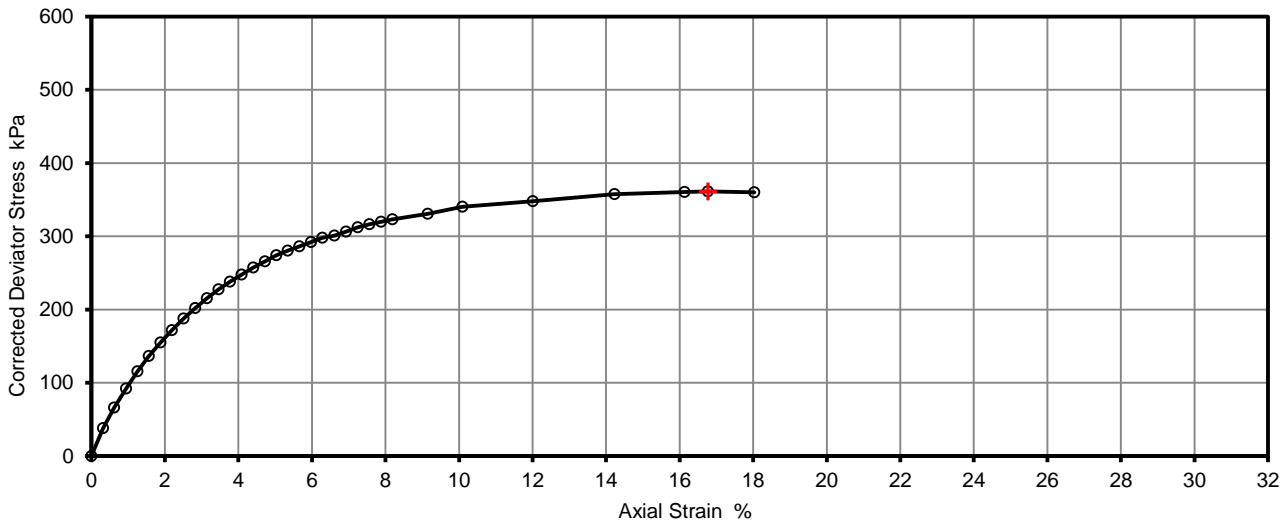
UNDISTURBED	
1	
210.0	mm
105.3	mm
2.28	Mg/m <sup>3</sup>
12	%
2.05	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

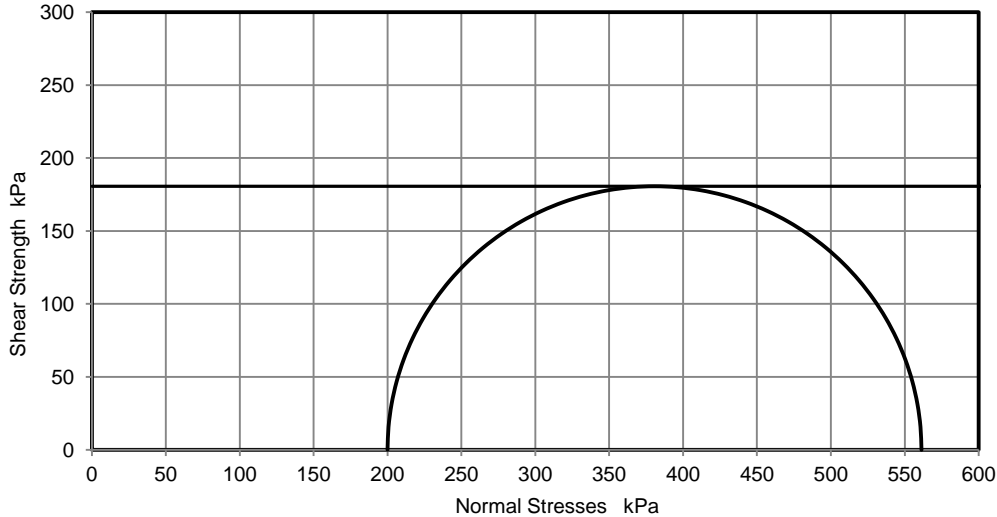
4.0	%/min
200	kPa
16.8	%
361	kPa
181	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Compound	

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks

Approved

Printed







**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219	
Borehole/Pit No.	BH109	
Site Name	DAA Airfield Underpass Ground Investigation	Sample No. 23
Soil Description	Greyish brown sandy gravelly silty CLAY.	Depth 16.70
Specimen Reference	3	Specimen Depth 16.75 m
Specimen Description	Stiff greyish brown sandy gravelly silty CLAY.	Sample Type U
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	KeyLAB ID Caus2022051117
		Date of test 26/05/2022

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

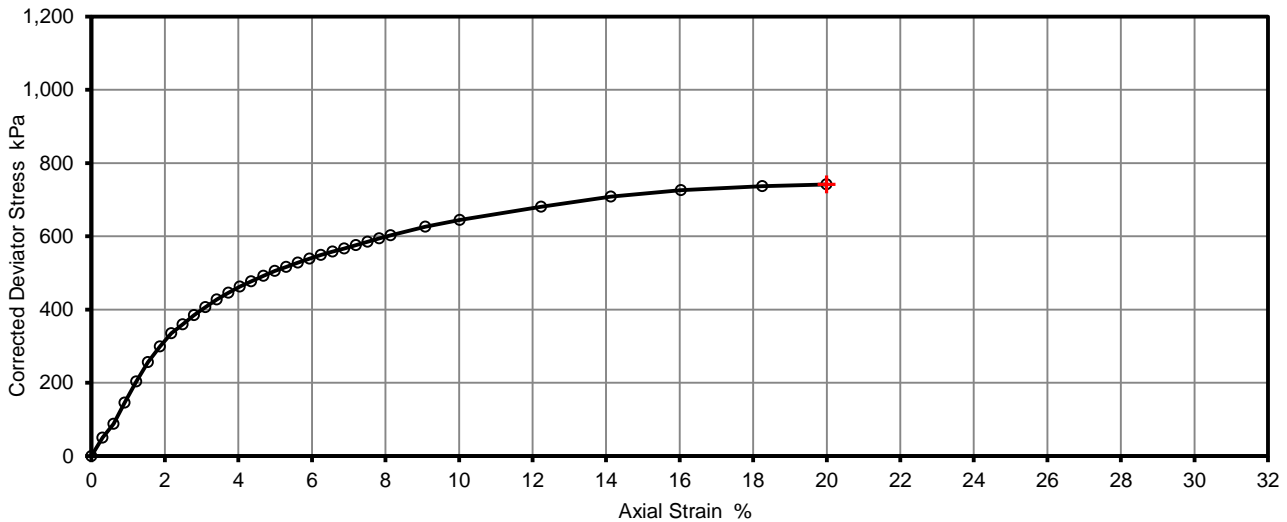
UNDISTURBED	
1	
210.1	mm
105.8	mm
2.08	Mg/m <sup>3</sup>
12	%
1.85	Mg/m <sup>3</sup>

Rate of Strain  
Cell Pressure  
At failure

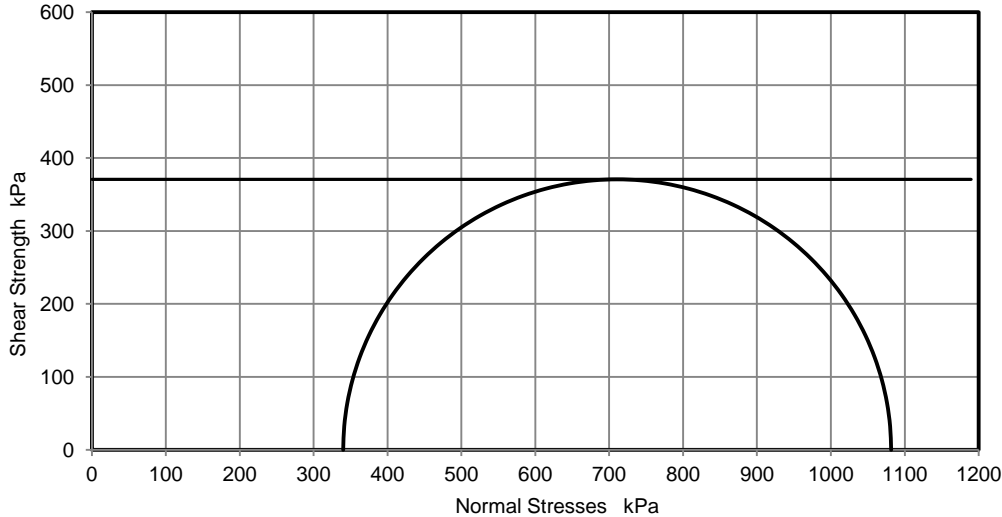
4.0	%/min
340	kPa
20.0	%
742	kPa
371	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

**Remarks**

No failure defined. Testing terminated at 20% axial strain.

**Approved**

Stephen.Watson

**Printed**

31/05/2022 14:40







# LABORATORY REPORT



4043

**Contract Number: PSL22/3407**

Report Date: 26 May 2022  
Client's Reference: 21-1219  
Client Name: Causeway Geotech  
8 Drumahiskey Road  
Ballymoney  
Co. Antrim  
BT53 7QL

**For the attention of: Stephen Watson**

Contract Title: DAA Airfield Underpass Ground Investigation  
Date Received: 12/5/2022  
Date Commenced: 12/5/2022  
Date Completed: 26/5/2022

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:


A Watkins  
(Director)

R Berriman  
(Quality Manager)

S Royle  
(Laboratory Manager)

L Knight  
(Senior Technician)

S Eyre  
(Senior Technician)

  
D Burton  
(Advanced Testing Manager)

5 – 7 Hexthorpe Road, Hexthorpe,  
Doncaster DN4 0AR  
tel: +44 (0)844 815 6641  
fax: +44 (0)844 815 6642  
e-mail: rberriman@prosoils.co.uk  
awatkins@prosoils.co.uk

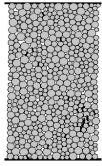
Page 1 of

# Effective Stress Triaxial Compression

## Consolidated Undrained

Summary Report

### Sample Details



sketch showing specimen location in original sample

Depth	4.25-4.50m		
Description	Brown gravelly slightly sandy CLAY.		
Type	Undisturbed, vertical orientation.		
Initial Sample Length	$L_0$	(mm)	211.0
Initial Sample Diameter	$D_0$	(mm)	104.9
Initial Sample Weight	$W_0$	(gr)	4266.0
Initial Bulk Density	$\rho_0$	(Mg/m <sup>3</sup> )	2.34
Particle Density	$\rho_s$	(Mg/m <sup>3</sup> )	2.66

### Initial Conditions

			Stage 1	2
Initial Cell Pressure	$\sigma_{3i}$	(kPa)	630	
Initial Back Pressure	$U_{bi}$	(kPa)	550	
Membrane Thickness	$m_b$	(mm)	0.600	
Displacement Input	$L_{IP}$	(mm)	CH 2	
Load Input	$N_{IP}$	(N)	CH 1	
Pore Water Pressure Input	$U_{pwp}$	(kPa)	CH 3	
Sample Volume	$V$	(cc)	CH 2	
Initial Moisture	$\omega_i$	(%)	7.56	
Initial Dry Density	$\rho_{di}$	(Mg/m <sup>3</sup> )	2.17	
Initial Voids Ratio	$e_i$	.	0.223	
Initial Degree of Saturation	$S_i$	(%)	90	
B Value	$B$	.	0.96	

### Final Conditions

Final Moisture	$\omega_f$	(%)	7.72	
Final Dry Density	$\rho_{df}$	(Mg/m <sup>3</sup> )	2.21	
Final Voids Ratio	$e_f$	.	0.204	
Final Degree of Saturation	$S_f$	(%)	100.0	
			Stage 1	2
Failure Criteria	.		Max. Dev. Stress	
Strain At Failure	$\epsilon_f$	(%)	6.30	
Stress At Failure	$(\sigma_1 - \sigma_3)$	(kPa)	393.7	
Minor Stress At Failure	$\sigma_3'$	(kPa)	129.0	
Major Stress At Failure	$\sigma_1'$	(kPa)	522.7	
Principal Stress Ratio At Failure	$\sigma_1' / \sigma_3'$		4.052	

### Notes



Plastic



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH109 4.25-4.50m
		Test Date	19/05/2022
Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH109
Client	Causeway	Sample	4.25-4.50m
		Depth	4.25-4.50m

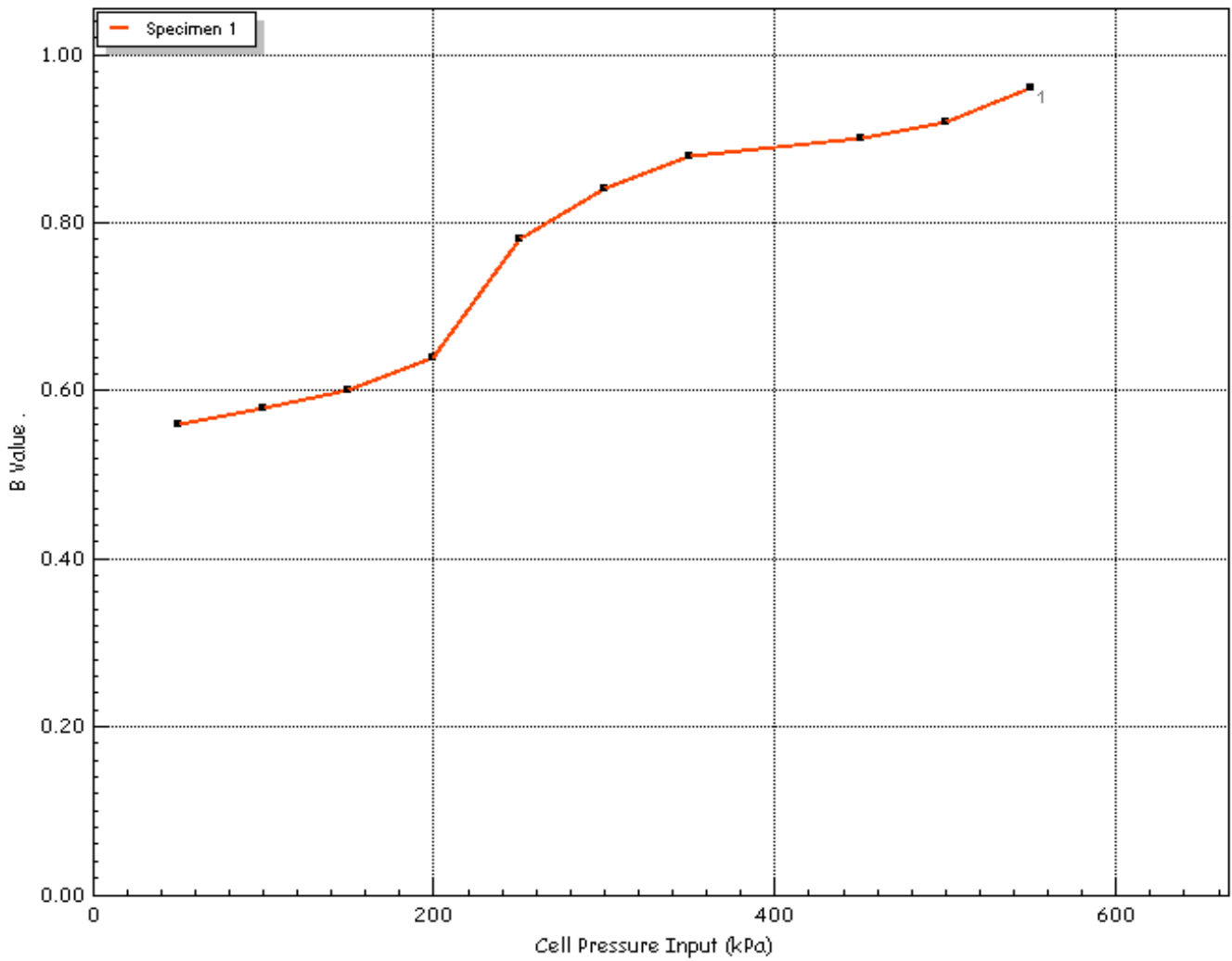



# Effective Stress Triaxial Compression

## Consolidated Undrained

Saturation Plots

Saturation Method			Stepped
Cell Pressure Input	$\sigma$	(kPa)	550
Pore Water Pressure Input	$u_{pwp}$	(kPa)	528
B Value	B	.	0.96



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH109 4.25-4.50m	
			Test Date	19/05/2022	
	Jobfile	DAA Airfield Underpass Ground Investigation		Borehole	BH109
	Client	Causeway	Sample	4.25-4.50m	
			Depth	4.25-4.50m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Consolidation Plots

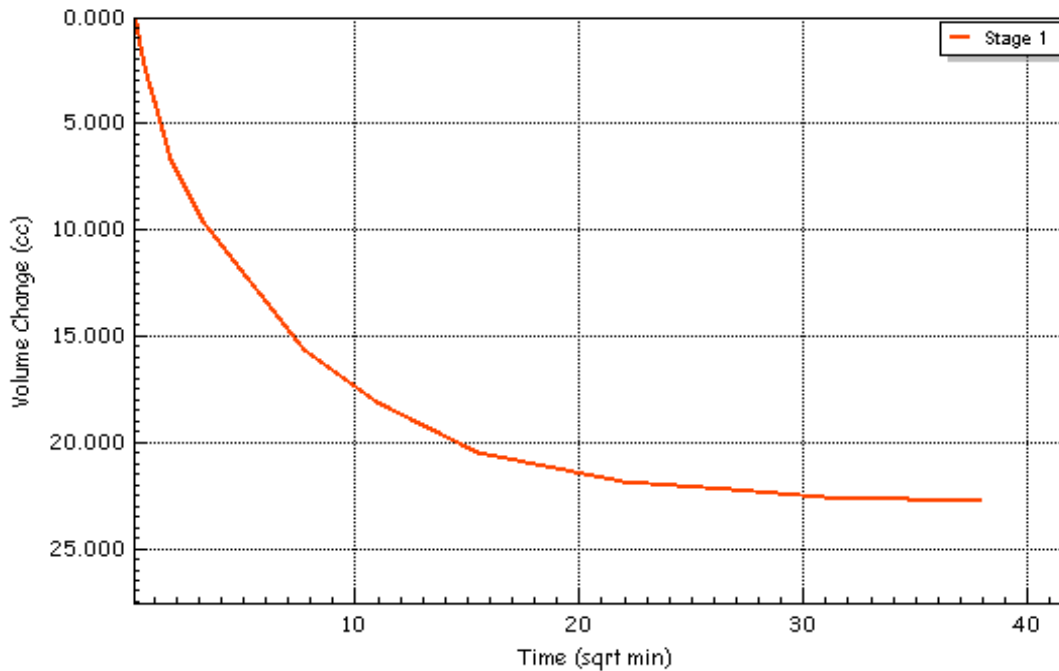
### Initial Conditions


Initial Cell Pressure	$\sigma_3$	(kPa)	630
Initial Back Pressure	$u_{bi}$	(kPa)	550
Pore Water Pressure Input	$u_{pwp}$	(kPa)	606
Drainage Method			Radial+One End

### Final Conditions

PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	$\epsilon_v$	(%)	1.25
Corrected Length	$L_c$	(mm)	210.1
Corrected Area	$A_c$	(cm <sup>2</sup> )	85.71
Corrected Volume	$V_c$	(cc)	1800.806
t <sub>100</sub>	t <sub>100</sub>	(min)	66.24
Consolidation	$c_v$	(m <sup>2</sup> /year)	3.430
Compressibility	$m_v$	(m <sup>2</sup> /MN)	0.223
Test Time	t <sub>F</sub>	(h:m:s)	02:00:00
Estimated Strain to Failure	$\epsilon$	(%)	5.0
Shear Machine Speed	d <sub>r</sub>	(mm/min)	0.08755

### Notes

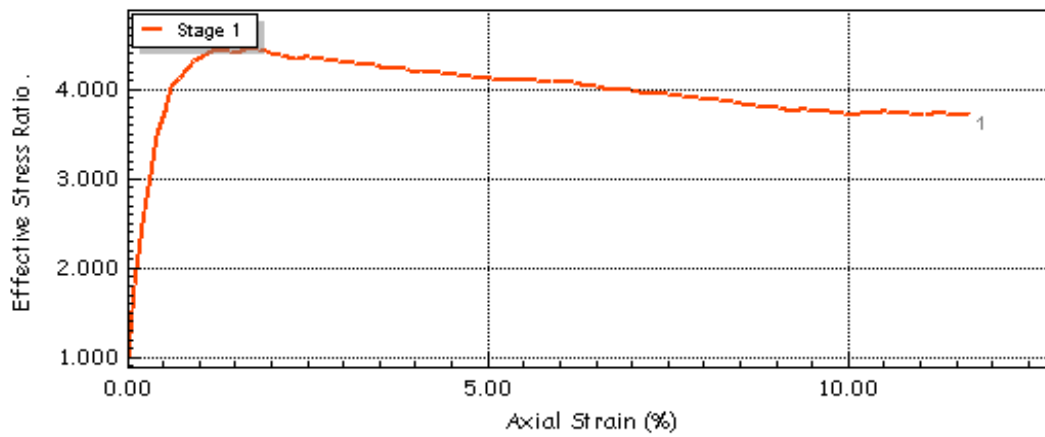
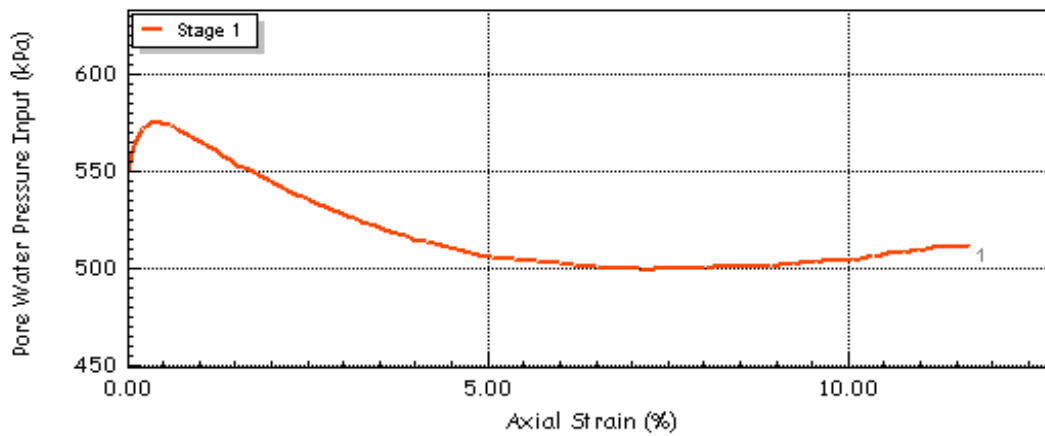
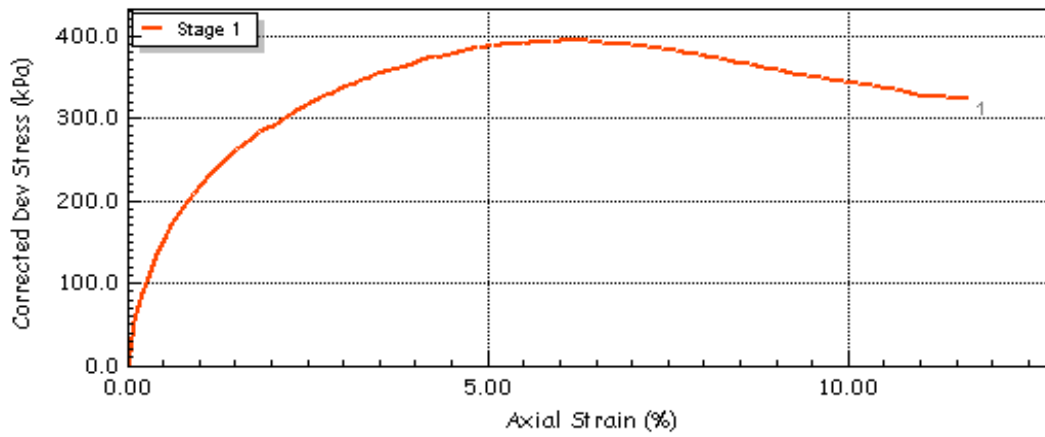



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH109 4.25-4.50m
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	19/05/2022
Client	Causeway	Borehole	BH109	
		Sample	4.25-4.50m	
		Depth	4.25-4.50m	

# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots



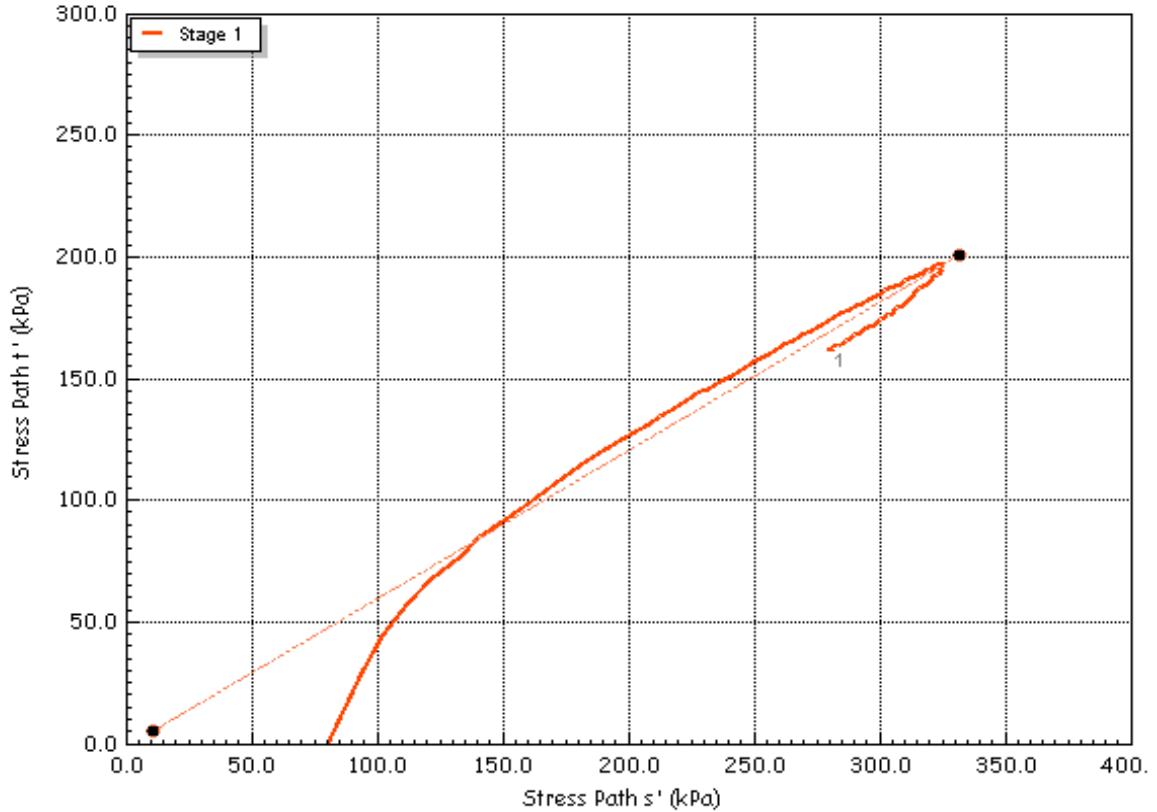
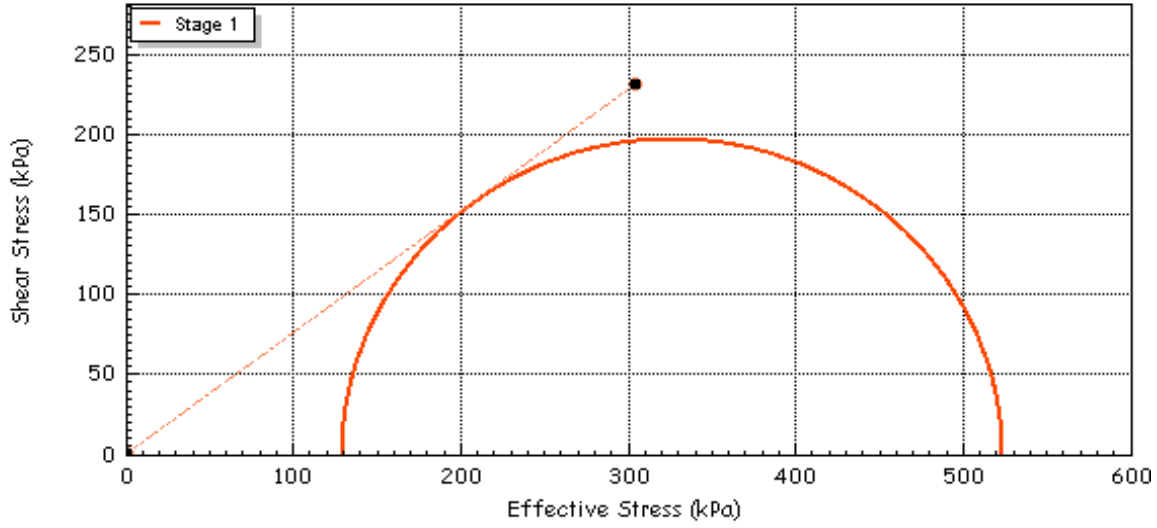
	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH109 4.25-4.50m
			Test Date	19/05/2022
	Jobfile	DAA Airfield Underpass Ground Investigation	Borehole	BH109
	Client	Causeway	Sample Depth	4.25-4.50m


# Effective Stress Triaxial Compression

## Consolidated Undrained

Shear Stage Plots

Effective	$c'$	(kPa)	0.00	Effective Cohesion $c'$	(kPa)	0.00
Effective Friction	$\phi'$	(deg)	37.4	Effective Friction $\phi'$	(deg)	37.4



	Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH109 4.25-4.50m	
	Jobfile	DAA Airfield Underpass Ground Investigation	Test Date	19/05/2022	
Client	Causeway	Borehole	BH109	Sample	4.25-4.50m
		Depth	4.25-4.50m		





# Final Report

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**Report No.:** 22-18273-1  
**Initial Date of Issue:** 24-May-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL  
**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron0  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister  
**Project** 21-1219 DAA Airfield Underpass

<b>Quotation No.:</b>		<b>Date Received:</b>	17-May-2022
<b>Order No.:</b>		<b>Date Instructed:</b>	17-May-2022
<b>No. of Samples:</b>	4		
<b>Turnaround (Wkdays):</b>	7	<b>Results Due:</b>	25-May-2022
<b>Date Approved:</b>	24-May-2022		

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

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## Results - Soil

**Project: 21-1219 DAA Airfield Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-18273	22-18273	22-18273	22-18273	
Quotation No.:		Chemtest Sample ID.:		1430289	1430290	1430291	1430292	
Order No.:		Client Sample Ref.:		2	3	11	12	
		Sample Location:		BH105	BH105	BH109	BH109	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		5.0	8.0	2.5	3.5	
		Date Sampled:		16-May-2022	16-May-2022	16-May-2022	16-May-2022	
Determinand	Accred.	SOP	Units	LOD				
Moisture	N	2030	%	0.020	6.4	14	18	11
pH (2.5:1)	N	2010		4.0	9.7	9.8	9.2	9.4
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.13	0.11	< 0.010	0.023
Total Sulphur	U	2175	%	0.010	0.45	0.29	0.10	0.049
Chloride (Water Soluble)	U	2220	g/l	0.010	0.012	0.010	< 0.010	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.023	0.039	0.076	0.023
Organic Matter	U	2625	%	0.40			1.3	0.45

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

**SOIL AND ROCK SAMPLE ANALYSIS  
LABORATORY TEST REPORT**

8 June 2022

<b>Project Name:</b>	DAA Airfield Underpass Ground Investigation
<b>Project No.:</b>	21-1219
<b>Client:</b>	DAA
<b>Engineer:</b>	Ramboll Consulting Engineers

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 26/05/2022 and 08/06/2022.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.



Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



**Project Name:** DAA Airfield Underpass Ground Investigation

**Report Reference:** Schedule 4 - FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received

Tests marked with\* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	3
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	3
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	3
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	7
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	2
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	1
SOIL	California Bearing Ratio (CBR)	BS 1377-4: 1990: Cl 7	1
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	1
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	2
ROCK	Uniaxial Compressive Strength (UCS)*	ISRM Suggested Methods -Rock Characterization Testing and Monitoring, Ed. E T Brown - 1981	1

## SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>No. of results included in the report</b>
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	pH Value of Soil		1
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	Organic Matter Content		1
SOIL – Subcontracted to Eurofins Chemtest Ltd ( <i>UKAS 2183</i> )	BRE Test - Suite D		1




## Summary of Classification Test Results

Project No. 21-1219	Project Name DAA Airfield Underpass Ground Investigation
------------------------	---

Hole No.	Sample				Soil Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
BH102	2	5.00	13.00	B	Greyish brown sandy gravelly silty CLAY.	2.54	2.31	9.2	80	21 -1pt	14	7		CL
BH102	7	16.40	20.25	B	Greyish brown sandy silty CLAY.	1.99	1.65	19.0	97	25 -1pt	19	6		ML/CL
BH103	4	11.25	13.15	B	Grey sandy gravelly silty CLAY.	2.22	2.04	9.4	62	28 -1pt	15	13		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise LAB 01R Version 5

<b>Key</b>  Density test                      Liquid Limit                      Particle density  Linear measurement unless :    4pt cone unless :                      sp - small pyknometer  wd - water displacement        cas - Casagrande method        gj - gas jar  wi - immersion in water        1pt - single point test	Date Printed  06/08/2022 00:00	Approved By  Stephen.Watson	 10122
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# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH102**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **2**

Soil Description **Greyish brown sandy gravelly silty CLAY.**

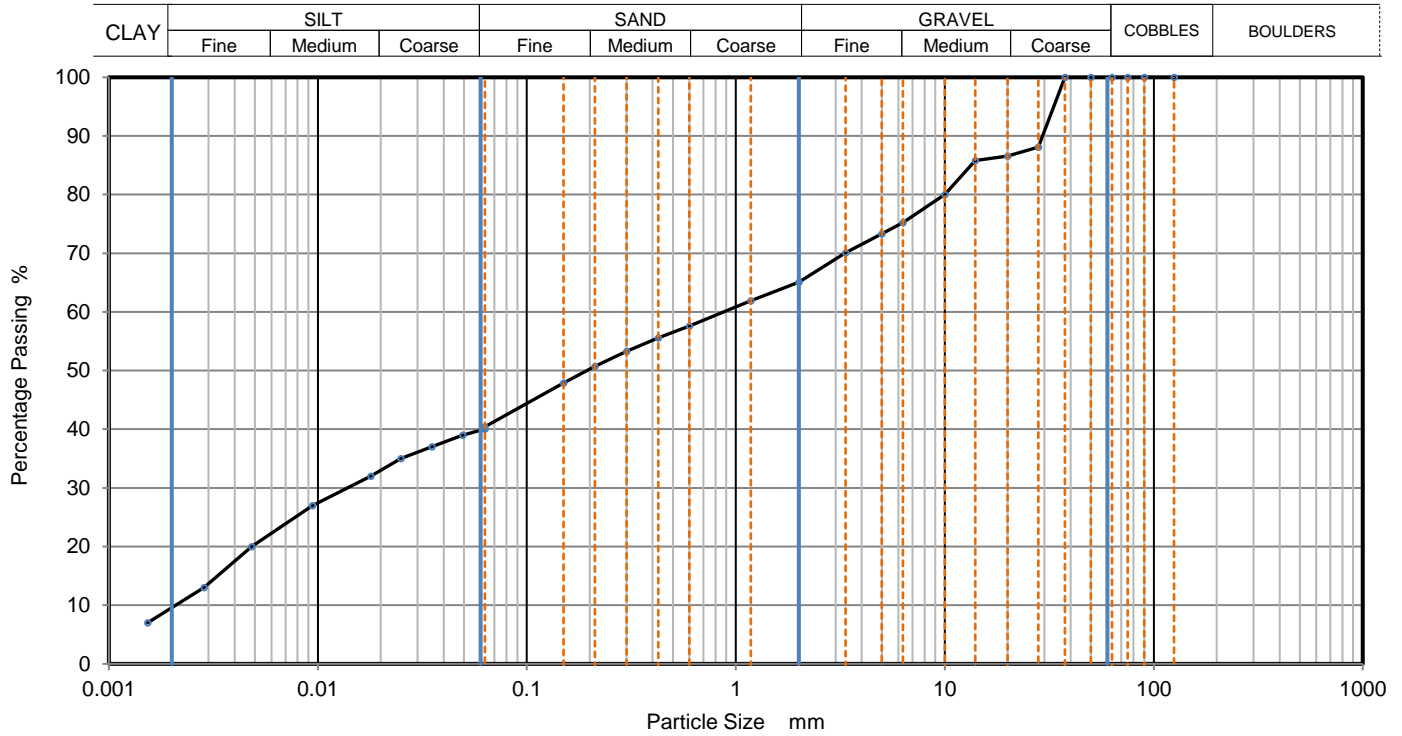
Depth, m **5.00**

Specimen Reference **10** Specimen Depth **5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205237**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	40
90	100	0.04935	39
75	100	0.03513	37
63	100	0.02500	35
50	100	0.01791	32
37.5	100	0.00942	27
28	88	0.00482	20
20	87	0.00285	13
14	86	0.00153	7
10	80		
6.3	75		
5	73		
3.35	70		
2	65		
1.18	62		
0.6	58	Particle density (assumed)	
0.425	56	2.65 Mg/m <sup>3</sup>	
0.3	53		
0.212	51		
0.15	48		
0.063	40		

Dry Mass of sample, g 2928

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	34.9
Sand	24.7
Silt	30.8
Clay	9.6

Grading Analysis	
D100	mm
D60	mm 0.875
D30	mm 0.0139
D10	mm 0.00207
Uniformity Coefficient	420
Curvature Coefficient	0.11

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson





# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH102**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Greyish brown clayey fine to coarse SAND.**

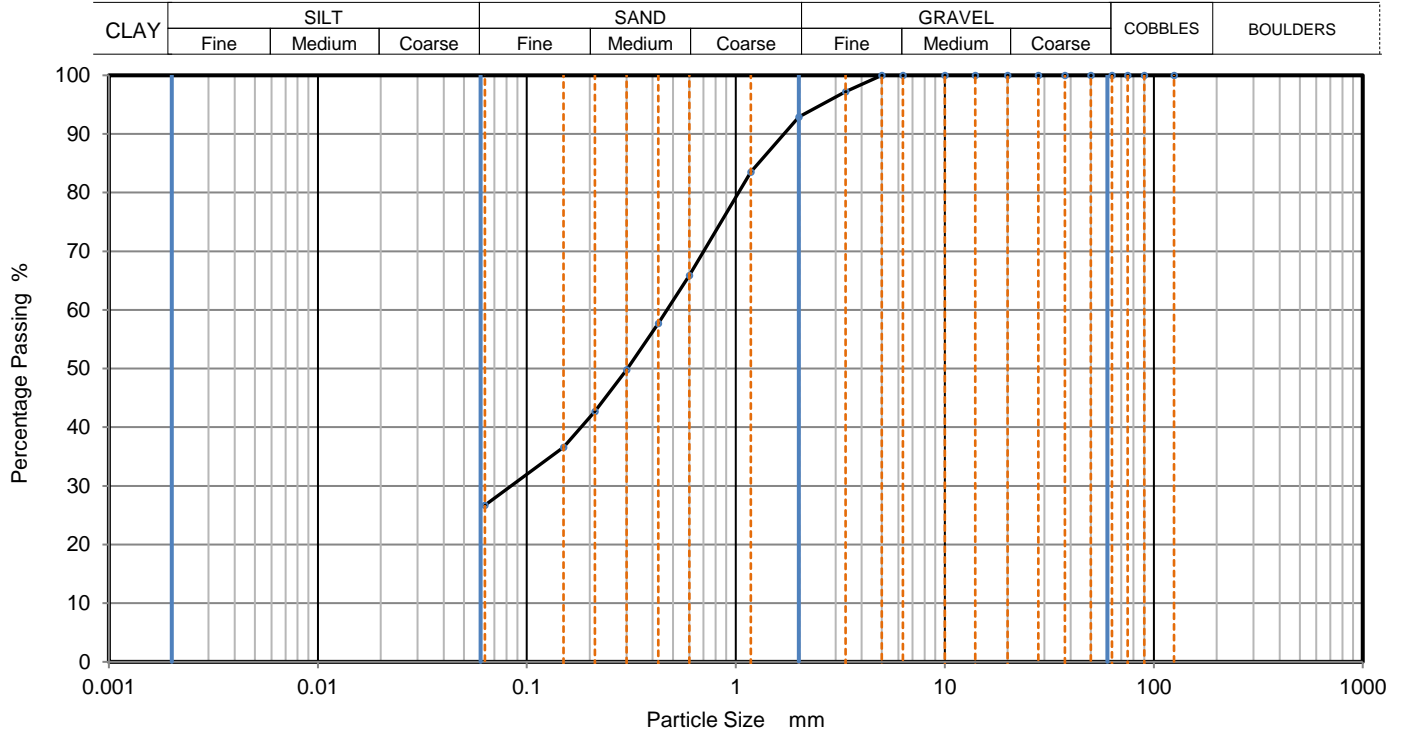
Depth, m **13.00**

Specimen Reference **3** Specimen Depth **13** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus202205238**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	97		
2	93		
1.18	84		
0.6	66		
0.425	58		
0.3	50		
0.212	43		
0.15	37		
0.063	27		

Dry Mass of sample, g 211

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	7.1
Sand	66.2
Fines <0.063mm	27.0

Grading Analysis	
D100	mm
D60	mm 0.468
D30	mm 0.0841
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson





# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH102**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **7**

Soil Description **Greyish brown sandy silty CLAY.**

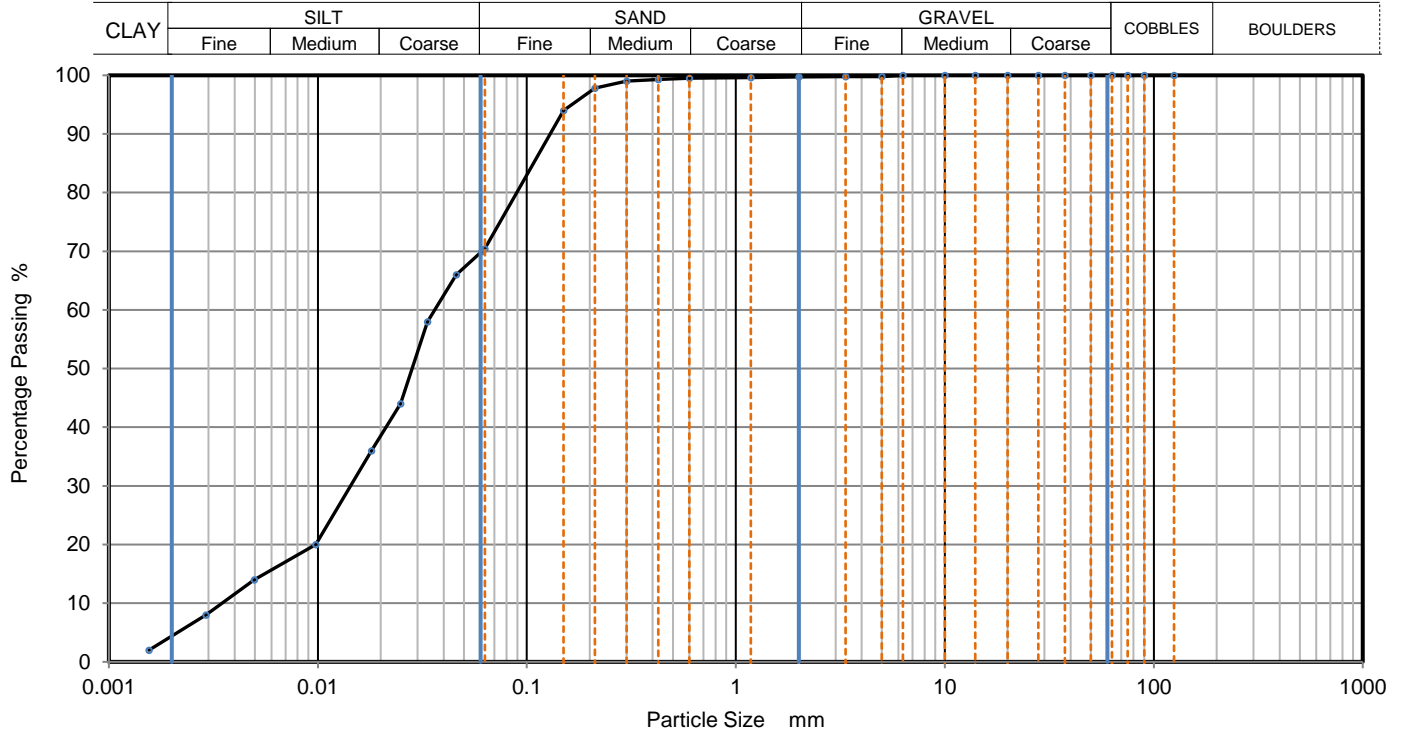
Depth, m **16.40**

Specimen Reference **11** Specimen Depth **16.4** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus202205239**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06086	70
90	100	0.04596	66
75	100	0.03348	58
63	100	0.02484	44
50	100	0.01802	36
37.5	100	0.00976	20
28	100	0.00496	14
20	100	0.00291	8
14	100	0.00156	2
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	99	2.65	Mg/m <sup>3</sup>
0.3	99		
0.212	98		
0.15	94		
0.063	70		

Dry Mass of sample, g **241**

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	0.3
Sand	29.3
Silt	66.0
Clay	4.4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	10
Curvature Coefficient	1.6

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson

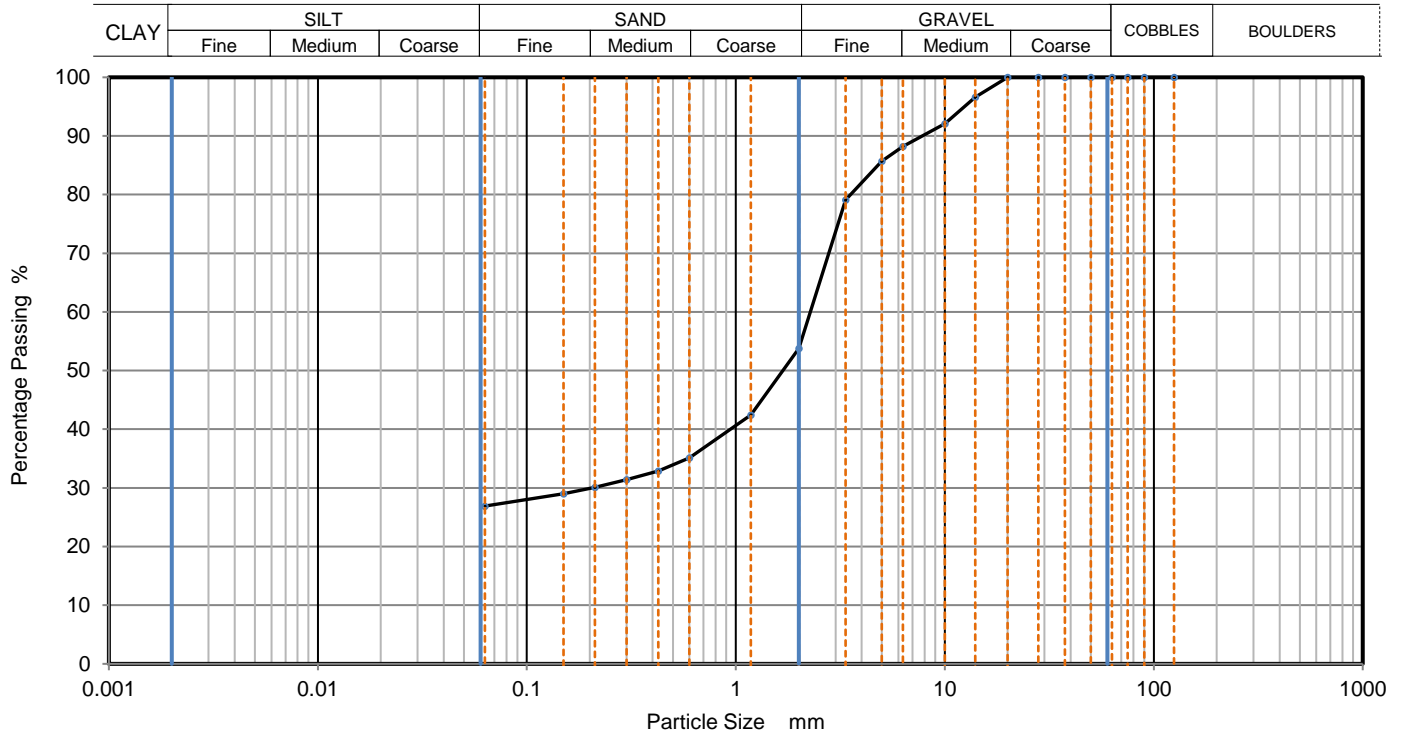




# PARTICLE SIZE DISTRIBUTION

Job Ref	21-1219
Borehole/Pit No.	BH103
Sample No.	2
Depth, m	4.90
Sample Type	B
KeyLAB ID	Caus2022052313

Site Name	DAA Airfield Underpass Ground Investigation		
Soil Description	Grey slightly gravelly slightly clayey fine to coarse SAND.		
Specimen Reference	3	Specimen Depth	4.9 m
Test Method	BS1377:Part 2:1990, clause 9.2		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	92		
6.3	88		
5	86		
3.35	79		
2	54		
1.18	42		
0.6	35		
0.425	33		
0.3	31		
0.212	30		
0.15	29		
0.063	27		

Dry Mass of sample, g 505

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	46.2
Sand	26.9
Fines <0.063mm	27.0

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson





# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH103**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **3**

Soil Description **Grey slightly gravelly slightly clayey fine to coarse SAND.**

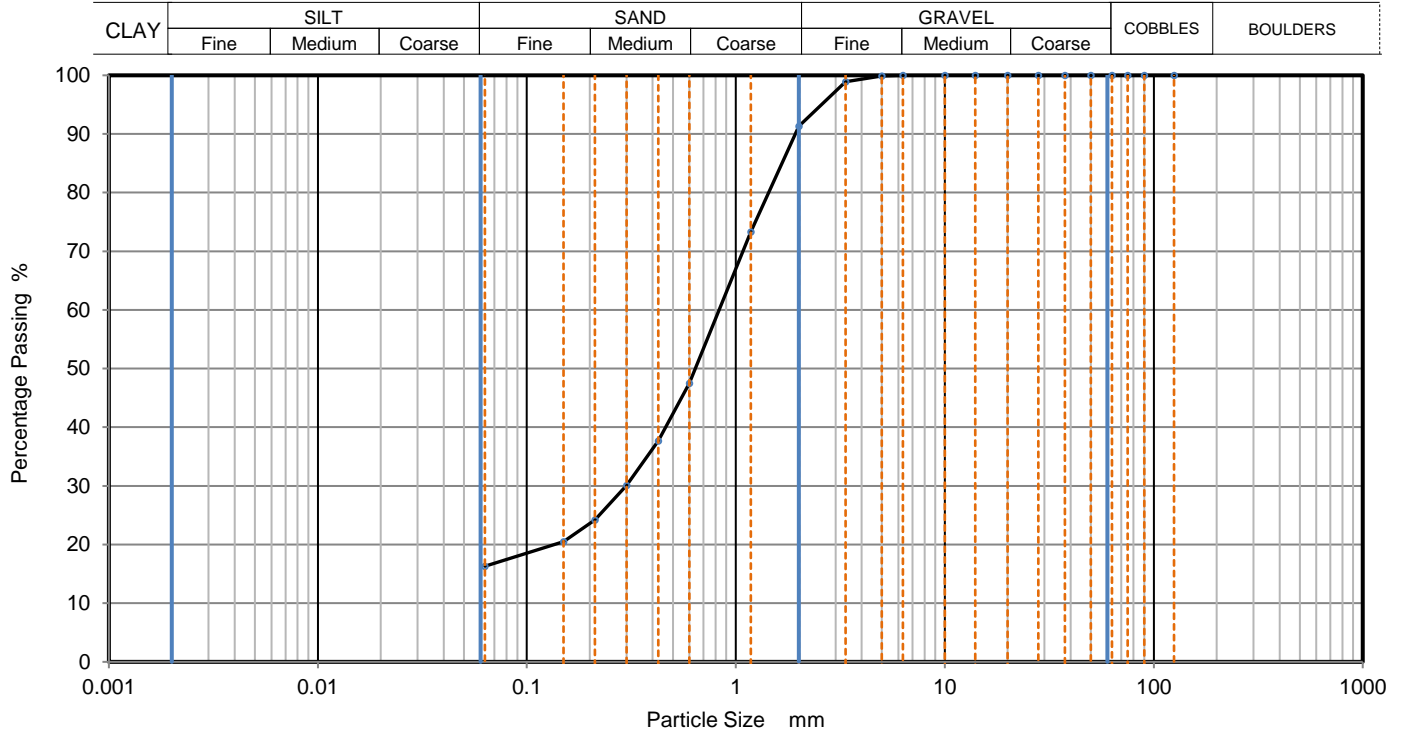
Depth, m **9.50**

Specimen Reference **3** Specimen Depth **9.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022052314**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	91		
1.18	73		
0.6	48		
0.425	38		
0.3	30		
0.212	24		
0.15	21		
0.063	16		

Dry Mass of sample, g 238

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	8.7
Sand	74.9
Fines <0.063mm	16.0

Grading Analysis	
D100	mm
D60	mm 0.833
D30	mm 0.298
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

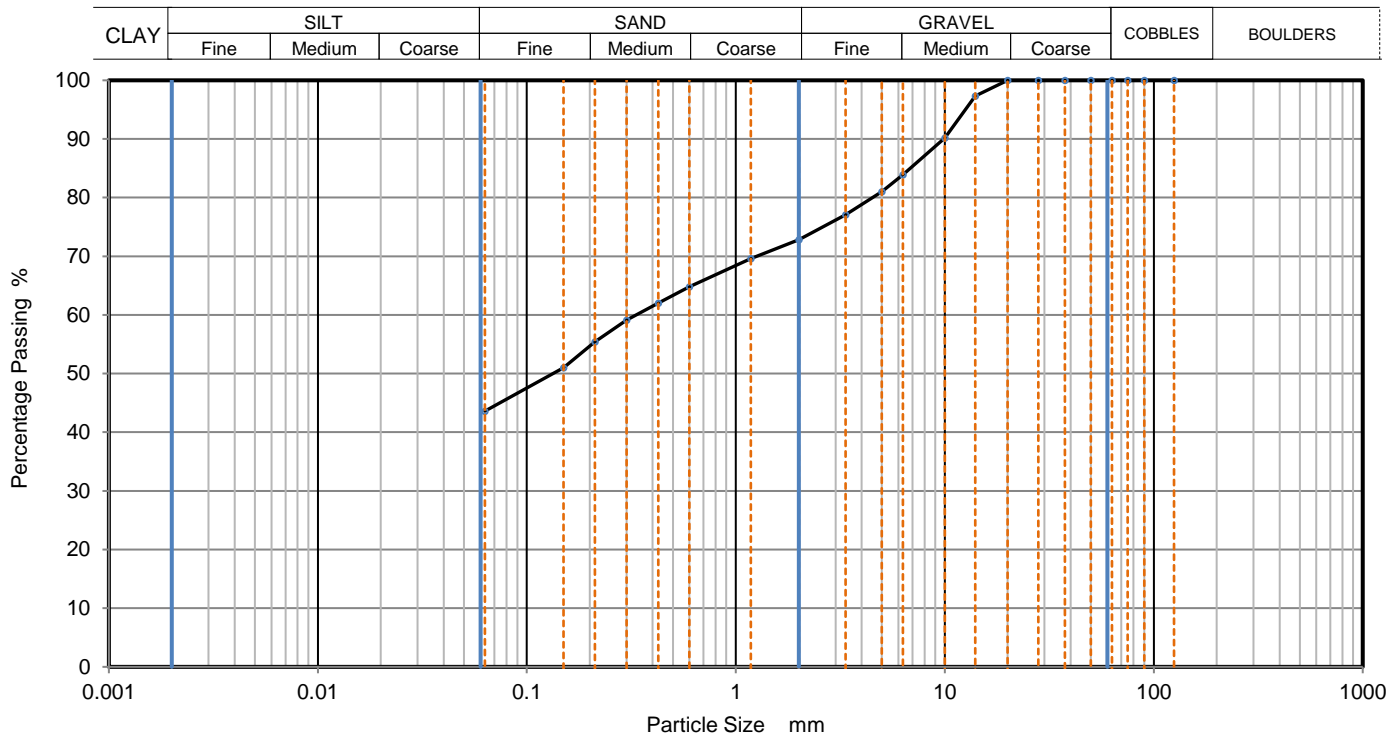
Approved  
  
Stephen.Watson





## PARTICLE SIZE DISTRIBUTION

Job Ref	21-1219
Borehole/Pit No.	BH103
Site Name	DAA Airfield Underpass Ground Investigation
Sample No.	4
Soil Description	Grey sandy gravelly silty CLAY.
Depth, m	11.25
Specimen Reference	11
Specimen Depth	11.25 m
Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2
KeyLAB ID	Caus2022052315



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	90		
6.3	84		
5	81		
3.35	77		
2	73		
1.18	70		
0.6	65		
0.425	62		
0.3	59		
0.212	55		
0.15	51		
0.063	44		

Dry Mass of sample, g 506

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.2
Sand	29.2
Fines <0.063mm	44.0

Grading Analysis	
D100	mm
D60	mm 0.335
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson





# PARTICLE SIZE DISTRIBUTION

Job Ref **21-1219**

Borehole/Pit No. **BH103**

Site Name **DAA Airfield Underpass Ground Investigation**

Sample No. **6**

Soil Description **Grey slightly gravelly slightly clayey fine to coarse SAND.**

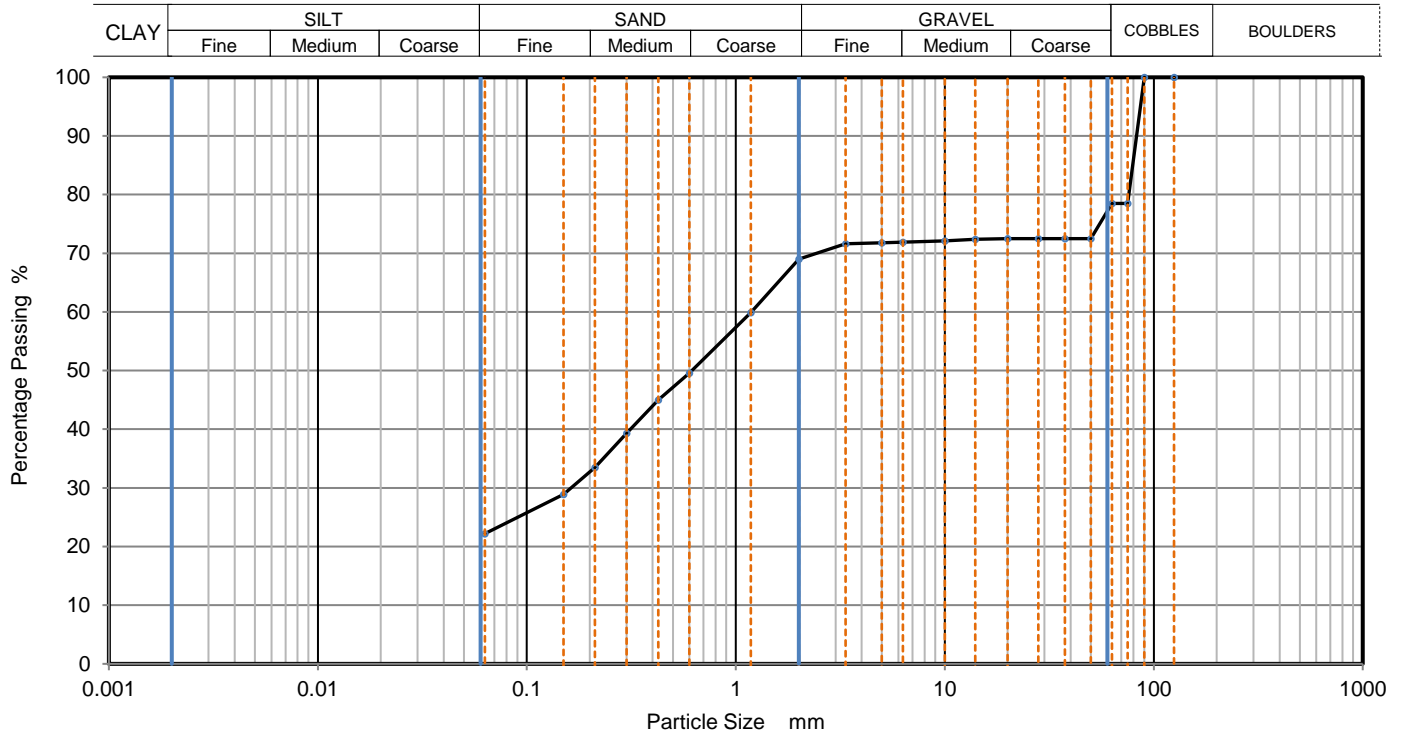
Depth, m **16.90**

Specimen Reference **3** Specimen Depth **16.9** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clause 9.2**

KeyLAB ID **Caus2022052317**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	79		
63	79		
50	73		
37.5	73		
28	73		
20	73		
14	72		
10	72		
6.3	72		
5	72		
3.35	72		
2	69		
1.18	60		
0.6	50		
0.425	45		
0.3	39		
0.212	34		
0.15	29		
0.063	22		

Dry Mass of sample, g **5165**

Sample Proportions	% dry mass
Cobbles	21.5
Gravel	9.5
Sand	46.8
Fines <0.063mm	22.0

Grading Analysis	
D100	mm
D60	mm 1.19
D30	mm 0.163
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved  
  
Stephen.Watson







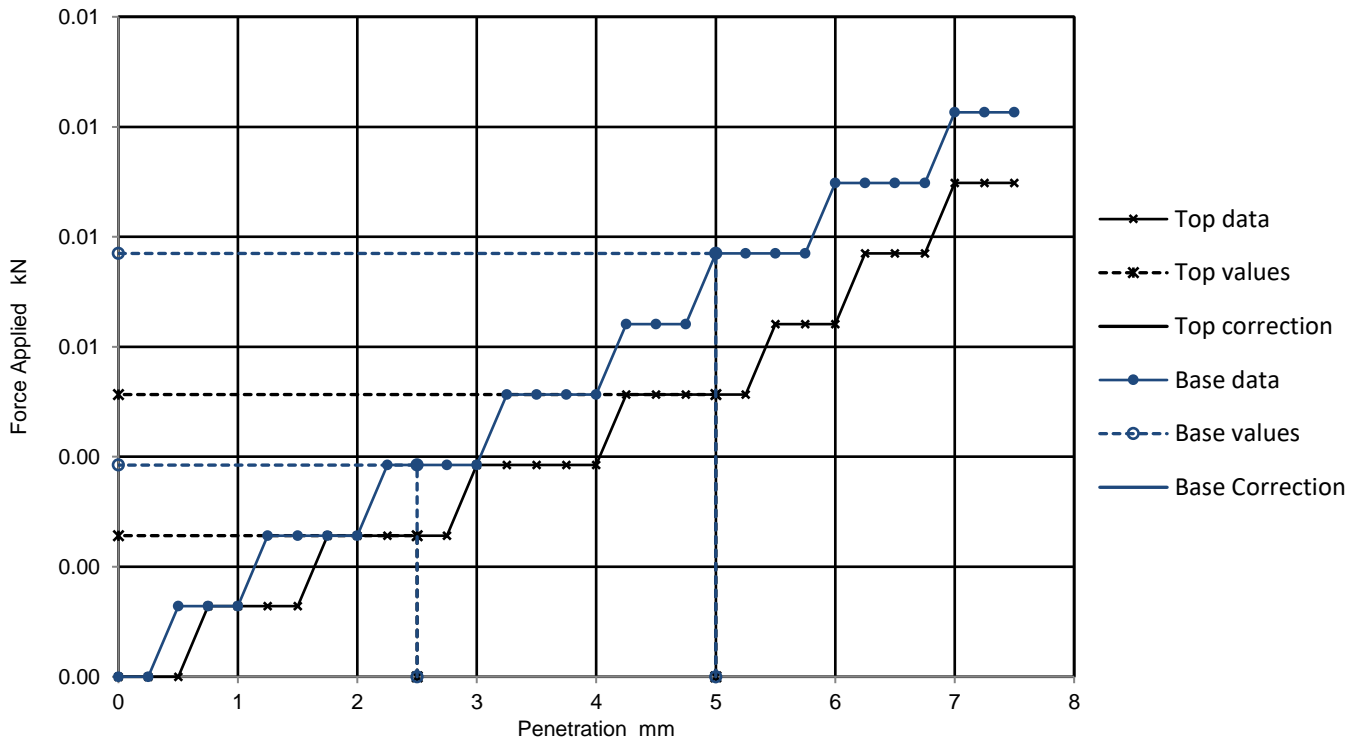
## California Bearing Ratio ( CBR )

Job Ref	21-1219
Borehole/Pit No.	BH102
Sample No.	1
Depth m	4.00
Sample Type	B
KeyLAB ID	Caus202205236
CBR Test Number	1

### Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.79 Mg/m3	Surcharge applied
	Dry density	1.34 Mg/m3	4.5 kg
	Moisture content	34 %	3 kPa

**Force v Penetration Plots**



**Results**

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.0	0.0	0.0		34
BASE	No	0.0	0.0	0.0		36

**General remarks**

**Test specific remarks**

**Approved**

Tested at natural moisture content.	Average result may be reported if within 10% of the mean CBR value of top and base.	Stephen.Watson
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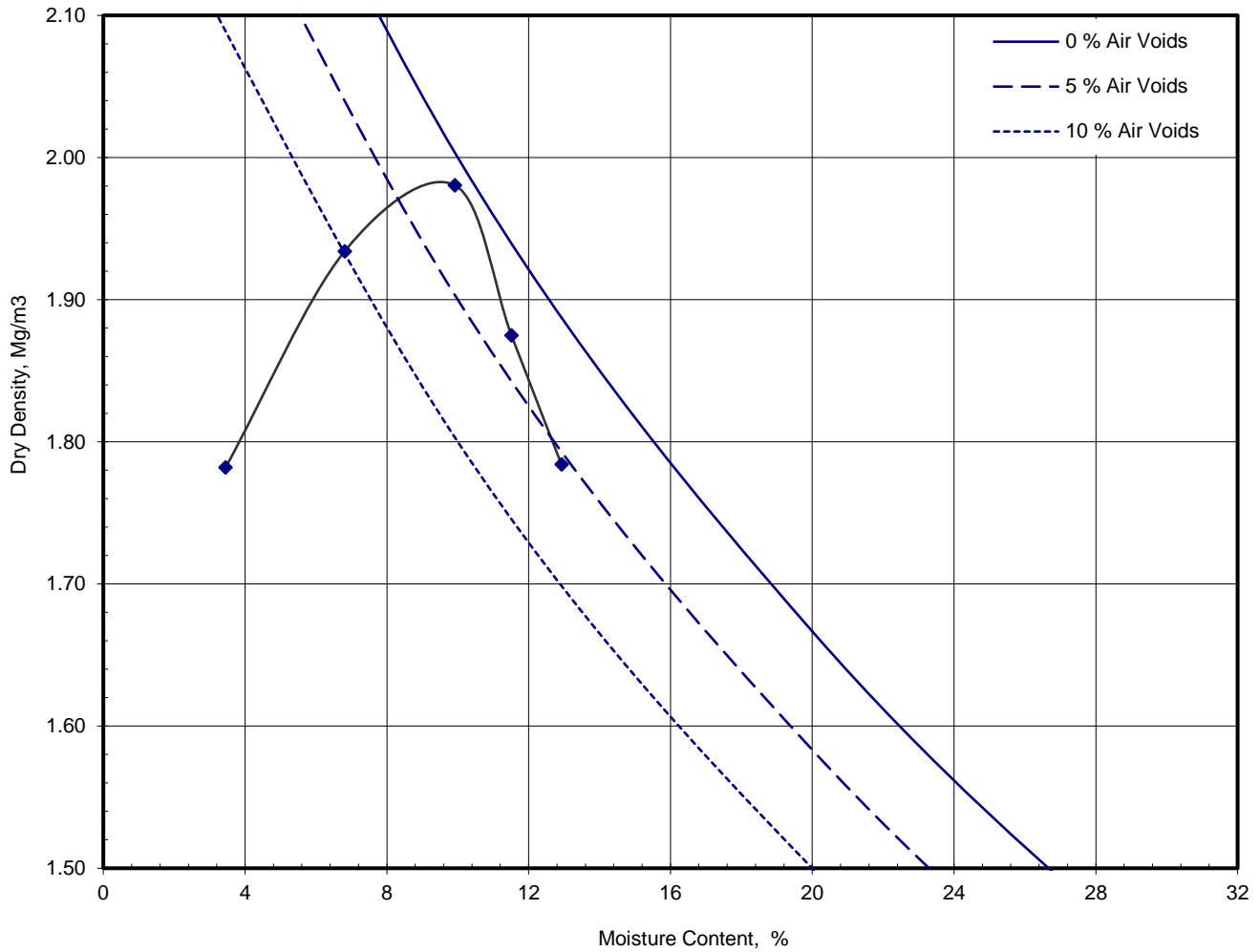




## Dry Density / Moisture Content Relationship Light Compaction

Job Ref	21-1219
Borehole / Pit No	BH102
Sample No	1
Depth	4.00 m
Sample Type	B
Keylab ID	Caus202205236

Site Name	<b>DAA Airfield Underpass Ground Investigation</b>	
Soil Description	Dark brown sandy slightly gravelly silty CLAY.	
Specimen Ref.	5	Specimen Depth
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer	



Preparation	Material used was air dried	
Mould Type	1 LITRE	
Samples Used	Single sample tested	
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m <sup>3</sup>	2.50

<b>Maximum Dry Density</b>	Mg/m <sup>3</sup>	<b>1.98</b>
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<b>Optimum Moisture Content</b>	%	<b>9.9</b>
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Approved
Stephen.Watson

Remarks

LAB 08R - Version 5



10122



**Unconsolidated Undrained Triaxial  
Compression Test without measurement  
of pore pressure - single specimen**

Job Ref	21-1219	
Borehole/Pit No.	BH103	
Site Name	DAA Airfield Underpass Ground Investigation	
Soil Description	Brownish grey sandy slightly gravelly silty CLAY.	
Specimen Reference	3	Specimen Depth 16.15 m
Specimen Description	Stiff brownish grey sandy slightly gravelly silty CLAY.	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	
Sample No.	22	
Depth	16.10	
Sample Type	U	
KeyLAB ID	Caus2022052316	
Date of test	07/06/2022	

Sample Condition  
Test Number  
Length  
Diameter  
Bulk Density  
Moisture Content  
Dry Density

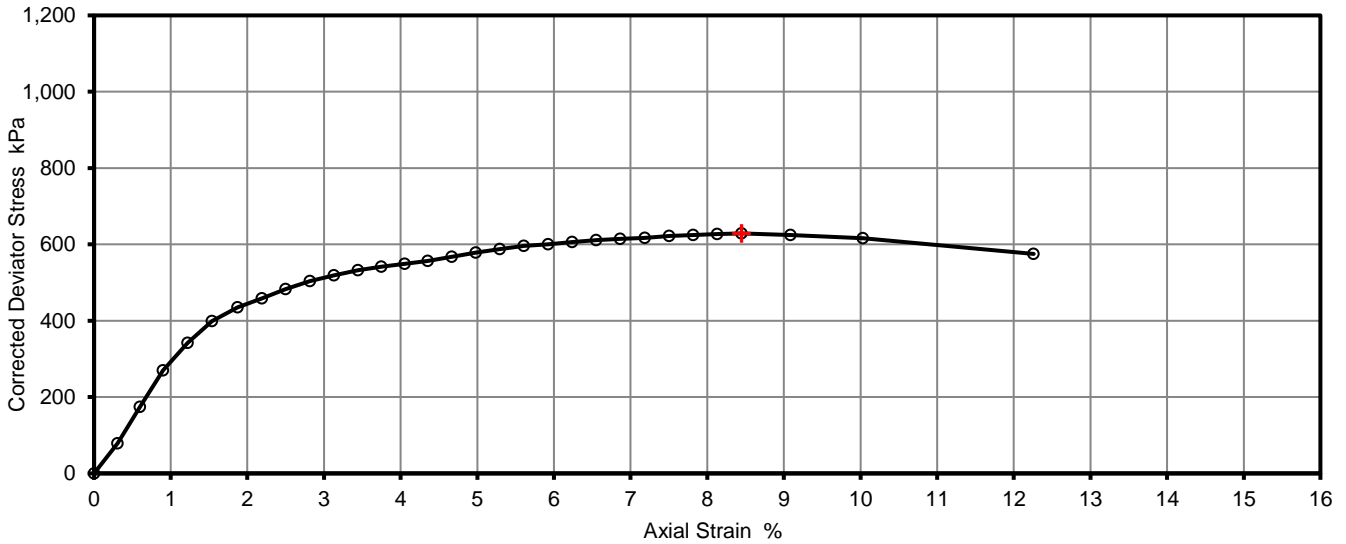
UNDISTURBED
1
210.0
mm
105.0
mm
2.30
Mg/m3
9
%
2.11
Mg/m3

Rate of Strain  
Cell Pressure  
At failure

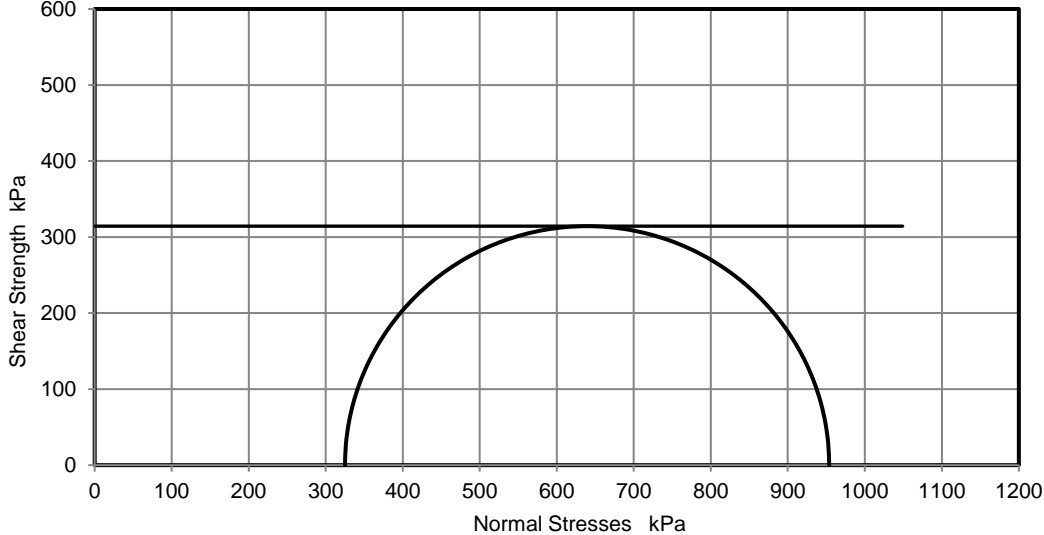
Axial Strain  
Deviator Stress,  $(\sigma_1 - \sigma_3)_f$   
Undrained Shear Strength,  $c_u$   
Mode of Failure

4.0
%/min
325
kPa
8.4
%
629
kPa
314
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Compound

**Deviator Stress v Axial Strain**



**Mohr Circles**



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

**Remarks**

**Approved**

Stephen.Watson

**Printed**

08/06/2022 11:43









# Final Report

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**Report No.:** 22-19763-1  
**Initial Date of Issue:** 31-May-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL  
**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister  
**Project** 21-1219 DAA Airfield Underpass

<b>Quotation No.:</b>		<b>Date Received:</b>	26-May-2022
<b>Order No.:</b>		<b>Date Instructed:</b>	26-May-2022
<b>No. of Samples:</b>	2		
<b>Turnaround (Wkdays):</b>	7	<b>Results Due:</b>	07-Jun-2022
<b>Date Approved:</b>	31-May-2022		

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

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## Results - Soil

**Project: 21-1219 DAA Airfield Underpass**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>		22-19763	22-19763		
Quotation No.:	<b>Chemtest Sample ID.:</b>		1436873	1436874		
Order No.:	Client Sample Ref.:		1	1		
	Sample Location:		BH102	BH103		
	Sample Type:		SOIL	SOIL		
	Top Depth (m):		4	4		
	Date Sampled:		25-May-2022	25-May-2022		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	33	16
pH (2.5:1)	N	2010		4.0	11.3	11.2
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.20	0.15
Total Sulphur	U	2175	%	0.010	0.34	0.32
Chloride (Water Soluble)	U	2220	g/l	0.010	0.013	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.040	0.030
Organic Matter	U	2625	%	0.40	1.2	1.4



## Test Methods

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.

## **Report Information**

### **Key**

---

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

## LABORATORY RESTRICTION REPORT

Project Reference	21-1219	To	Colm Hurley
Project Name	DAA Airfield Underpass GI	Position	Project Manager
TR reference	21-1219 / G04	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
BH102	10	23.05	U	UU Triaxial	LIMESTONE	CANCEL
BH102	9	23.40	U	UU Triaxial	LIMESTONE	CANCEL
BH103	1	4.00	B	CBR	Insufficient material to conduct test	CANCEL
BH103	1	4.00	B	Dry density/ moisture content	Insufficient material to conduct test	CANCEL

For electronic reporting a form of electronic signature or printed name is acceptable

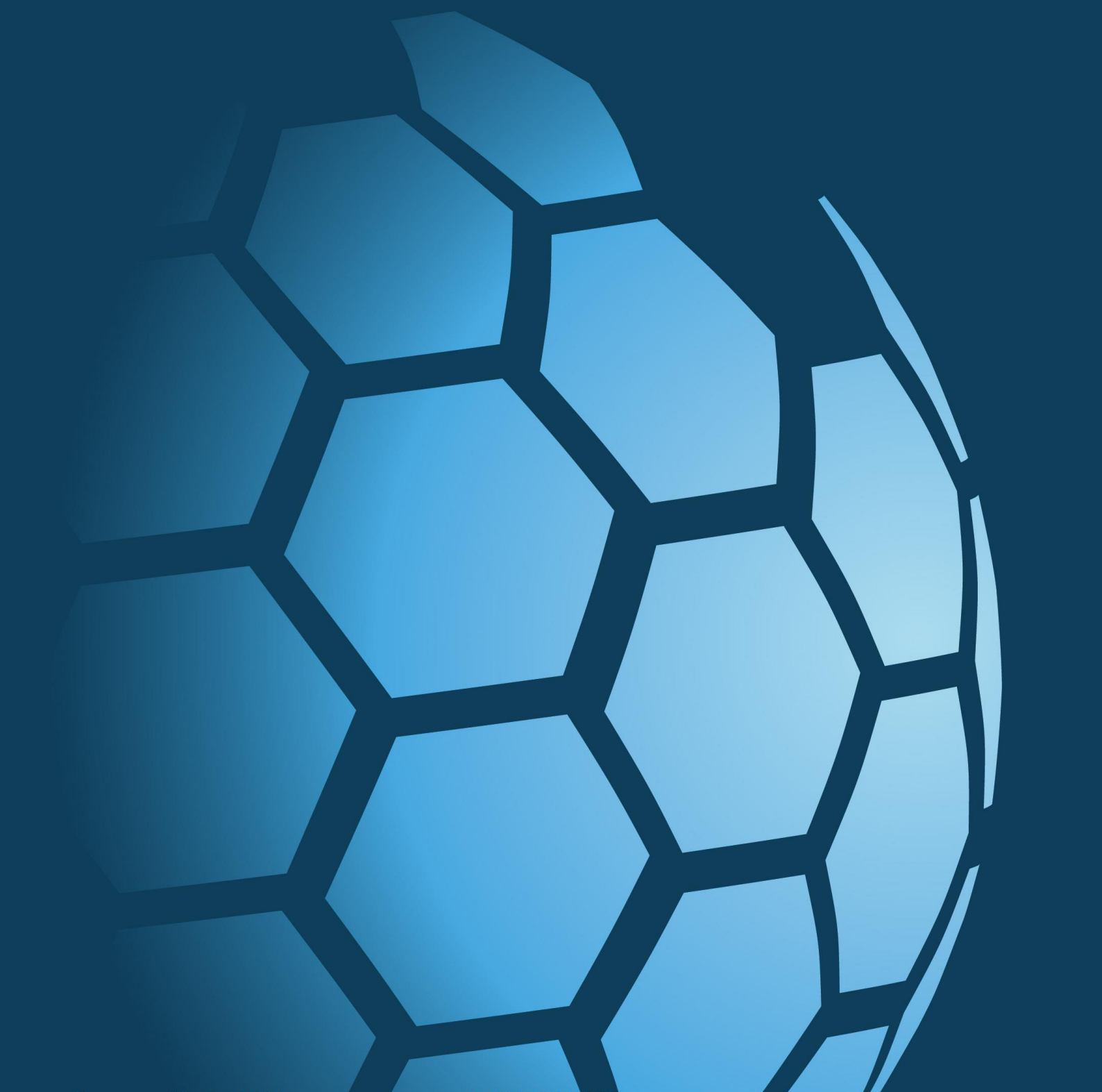
Laboratory Signature Joseph Nicholl	Project Manager Signature Colm Hurley
Date 24 May 2022	Date



**CAUSEWAY**  
— GEOTECH

**APPENDIX F**

**ENVIRONMENTAL LABORATORY TEST RESULTS**



# Final Report

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**Report No.:** 22-12231-1  
**Initial Date of Issue:** 12-Apr-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
 Balnamore  
 Ballymoney  
 County Antrim  
 BT53 7QL  
  
**Contact(s):** Carin Cornwall  
 Colm Hurley  
 Darren O'Mahony  
 Gabriella Horan  
 Joe Gervin  
 John Cameron  
 Lucy Newland  
 Martin Gardiner  
 Matthew Gilbert  
 Neil Haggan  
 Paul Dunlop  
 Sean Ross  
 Stephen Franey  
 Stephen Watson  
 Stuart Abraham  
 Thomas McAllister

**Project** DAA Airfield Underpass

**Quotation No.:** Q18-13245 **Date Received:** 31-Mar-2022

**Order No.:** **Date Instructed:** 04-Apr-2022

**No. of Samples:** 2

**Turnaround (Wkdays):** 7 **Results Due:** 12-Apr-2022

**Date Approved:** 12-Apr-2022

**Approved By:**



**Details:** Stuart Henderson, Technical Manager



## Results - Soil

**Project: DAA Airfield Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-12231	22-12231	
Quotation No.: Q18-13245		Chemtest Sample ID.:		1402848	1402850	
		Sample Location:		BH110	BH110	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		2.60	7.65	
		Date Sampled:		29-Mar-2022	29-Mar-2022	
		Asbestos Lab:		NEW-ASB	NEW-ASB	
Determinand	Accred.	SOP	Units	LOD		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	24	2.5
pH	U	2010		4.0	8.3	9.1
Arsenic	U	2450	mg/kg	1.0	12	14
Barium	U	2450	mg/kg	10	120	85
Cadmium	U	2450	mg/kg	0.10	2.2	0.92
Chromium	U	2450	mg/kg	1.0	27	10
Molybdenum	U	2450	mg/kg	2.0	3.2	3.6
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	42	12
Mercury	U	2450	mg/kg	0.10	0.27	0.12
Nickel	U	2450	mg/kg	0.50	45	20
Lead	U	2450	mg/kg	0.50	65	9.8
Selenium	U	2450	mg/kg	0.20	1.1	3.3
Zinc	U	2450	mg/kg	0.50	120	33
Chromium (Trivalent)	N	2490	mg/kg	1.0	27	10
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	4.2	0.72
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10

## Results - Soil

**Project: DAA Airfield Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-12231	22-12231	
Quotation No.: Q18-13245		Chemtest Sample ID.:		1402848	1402850	
		Sample Location:		BH110	BH110	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		2.60	7.65	
		Date Sampled:		29-Mar-2022	29-Mar-2022	
		Asbestos Lab:		NEW-ASB	NEW-ASB	
Determinand	Accred.	SOP	Units	LOD		
Benzene	U	2760	µg/kg	1.0	< 1.0	1.3
Toluene	U	2760	µg/kg	1.0	< 1.0	3.5
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	0.57	< 0.10
Anthracene	U	2800	mg/kg	0.10	0.13	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	0.23	< 0.10
Pyrene	U	2800	mg/kg	0.10	0.30	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10	0.19	< 0.10
Chrysene	U	2800	mg/kg	0.10	0.16	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	< 0.10	< 0.10



## Results - Single Stage WAC

**Project: DAA Airfield Underpass**

<b>Chemtest Job No:</b> 22-12231					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1402848					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b>							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH110							
<b>Top Depth(m):</b> 2.60							
<b>Bottom Depth(m):</b>							
<b>Sampling Date:</b> 29-Mar-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	U	%	4.2	3	5	
Loss On Ignition	2610	U	%	11	--	10	
Total BTEX	2760	U	mg/kg	< 0.010	6	--	
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	
TPH Total WAC	2670	U	mg/kg	< 10	500	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	
pH	2010	U		8.3	--	>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.0090	--	To evaluate	
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0022	0.022	0.5	2	
Barium	1455	U	0.026	0.26	20	100	
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	
Chromium	1455	U	< 0.0005	< 0.0005	0.5	10	
Copper	1455	U	0.0053	0.053	2	50	
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	
Molybdenum	1455	U	0.012	0.12	0.5	10	
Nickel	1455	U	0.0023	0.024	0.4	10	
Lead	1455	U	0.0006	0.0058	0.5	10	
Antimony	1455	U	0.0027	0.027	0.06	0.7	
Selenium	1455	U	0.0006	0.0055	0.1	0.5	
Zinc	1455	U	< 0.003	< 0.003	4	50	
Chloride	1220	U	1.6	16	800	15000	
Fluoride	1220	U	0.26	2.6	10	150	
Sulphate	1220	U	6.6	66	1000	20000	
Total Dissolved Solids	1020	N	120	1200	4000	60000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	
Dissolved Organic Carbon	1610	U	8.9	89	500	800	

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	24

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield Underpass**

<b>Chemtest Job No:</b> 22-12231					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1402850					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b>							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH110							
<b>Top Depth(m):</b> 7.65							
<b>Bottom Depth(m):</b>							
<b>Sampling Date:</b> 29-Mar-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	U	%	0.72	3	5	
Loss On Ignition	2610	U	%	1.1	--	10	
Total BTEX	2760	U	mg/kg	< 0.010	6	--	
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	
TPH Total WAC	2670	U	mg/kg	< 10	500	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	
pH	2010	U		9.1	--	>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.058	--	To evaluate	
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0005	0.0050	0.5	2	
Barium	1455	U	0.034	0.34	20	100	
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	
Chromium	1455	U	< 0.0005	< 0.0005	0.5	10	
Copper	1455	U	0.0015	0.015	2	50	
Mercury	1455	U	0.00009	0.00086	0.01	0.2	
Molybdenum	1455	U	0.012	0.12	0.5	10	
Nickel	1455	U	< 0.0005	< 0.0005	0.4	10	
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	
Antimony	1455	U	0.0018	0.019	0.06	0.7	
Selenium	1455	U	0.022	0.22	0.1	0.5	
Zinc	1455	U	< 0.003	< 0.003	4	50	
Chloride	1220	U	4.9	49	800	15000	
Fluoride	1220	U	0.17	1.7	10	150	
Sulphate	1220	U	27	270	1000	20000	
Total Dissolved Solids	1020	N	98	980	4000	60000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	2.5

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.

## Test Methods

SOP	Title	Parameters included	Method summary
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7 Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	Compliance Test for Leaching of Granular Waste Material and Sludge

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

# Final Report

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**Report No.:** 22-12969-1  
**Initial Date of Issue:** 14-Apr-2022  
**Client:** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
 Balnamore  
 Ballymoney  
 County Antrim  
 BT53 7QL  
**Contact(s):** Carin Cornwall  
 Colm Hurley  
 Darren O'Mahony  
 Gabriella Horan  
 Joe Gervin  
 John Cameron  
 Lucy Newland  
 Martin Gardiner  
 Matthew Gilbert  
 Neil Haggan  
 Paul Dunlop  
 Sean Ross  
 Stephen Franey  
 Stephen Watson  
 Stuart Abraham  
 Thomas McAllister  
**Project:** 21-12231 DAA Airfields Underpass  
**Quotation No.:** Q18-13245  
**Order No.:**  
**No. of Samples:** 2  
**Turnaround (Wkdays):** 8  
**Date Approved:** 14-Apr-2022

**Date Received:** 06-Apr-2022

**Date Instructed:** 06-Apr-2022

**Results Due:** 19-Apr-2022

**Approved By:**



**Details:** Stuart Henderson, Technical  
 Manager

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## Results - Soil

**Project: 21-12231 DAA Airfields Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-12969	22-12969
Quotation No.: Q18-13245		Chemtest Sample ID.:		1406469	1406470
		Sample Location:		BH101	BH101
		Sample Type:		SOIL	SOIL
		Top Depth (m):		4.30	5.55
		Date Sampled:		03-Apr-2022	03-Apr-2022
		Asbestos Lab:		DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected
Moisture	N	2030	%	0.020	9.8
pH	U	2010		4.0	9.1
Arsenic	U	2450	mg/kg	1.0	20
Barium	U	2450	mg/kg	10	87
Cadmium	U	2450	mg/kg	0.10	1.6
Chromium	U	2450	mg/kg	1.0	19
Molybdenum	U	2450	mg/kg	2.0	4.1
Antimony	N	2450	mg/kg	2.0	2.0
Copper	U	2450	mg/kg	0.50	27
Mercury	U	2450	mg/kg	0.10	0.12
Nickel	U	2450	mg/kg	0.50	44
Lead	U	2450	mg/kg	0.50	22
Selenium	U	2450	mg/kg	0.20	2.3
Zinc	U	2450	mg/kg	0.50	65
Chromium (Trivalent)	N	2490	mg/kg	1.0	19
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	0.55
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10



## Results - Soil

**Project: 21-12231 DAA Airfields Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-12969	22-12969
Quotation No.: Q18-13245		Chemtest Sample ID.:		1406469	1406470
		Sample Location:		BH101	BH101
		Sample Type:		SOIL	SOIL
		Top Depth (m):		4.30	5.55
		Date Sampled:		03-Apr-2022	03-Apr-2022
		Asbestos Lab:		DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD	
Benzene	U	2760	µg/kg	1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	0.14
Pyrene	U	2800	mg/kg	0.10	0.15
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	< 0.10

## Results - Single Stage WAC

Project: 21-12231 DAA Airfields Underpass

Chemtest Job No: 22-12969					<b>Landfill Waste Acceptance Criteria Limits</b>		
Chemtest Sample ID: 1406469							
Sample Ref:							
Sample ID:							
Sample Location: BH101							
Top Depth(m): 4.30							
Bottom Depth(m):				<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>	
Sampling Date: 03-Apr-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	U	%	0.55	3	5	
Loss On Ignition	2610	U	%	1.7	--	10	
Total BTEX	2760	U	mg/kg	< 0.010	6	--	
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	
TPH Total WAC	2670	U	mg/kg	< 10	500	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	
pH	2010	U		9.1	--	>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.069	--	To evaluate	
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0005	0.0049	0.5	2	
Barium	1455	U	0.048	0.48	20	100	
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	
Chromium	1455	U	0.0048	0.048	0.5	10	
Copper	1455	U	0.0028	0.028	2	50	
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	
Molybdenum	1455	U	0.012	0.12	0.5	10	
Nickel	1455	U	0.0032	0.032	0.4	10	
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	
Antimony	1455	U	0.0014	0.014	0.06	0.7	
Selenium	1455	U	0.021	0.21	0.1	0.5	
Zinc	1455	U	< 0.003	< 0.003	4	50	
Chloride	1220	U	3.5	35	800	15000	
Fluoride	1220	U	0.35	3.5	10	150	
Sulphate	1220	U	27	270	1000	20000	
Total Dissolved Solids	1020	N	98	970	4000	60000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	
Dissolved Organic Carbon	1610	U	3.1	< 50	500	800	

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	9.8

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 21-12231 DAA Airfields Underpass

Chemtest Job No: 22-12969					<b>Landfill Waste Acceptance Criteria Limits</b>		
Chemtest Sample ID: 1406470					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
Sample Ref:							
Sample ID:							
Sample Location: BH101							
Top Depth(m): 5.55							
Bottom Depth(m):							
Sampling Date: 03-Apr-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	U	%	0.72	3	5	
Loss On Ignition	2610	U	%	1.9	--	10	
Total BTEX	2760	U	mg/kg	< 0.010	6	--	
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	
TPH Total WAC	2670	U	mg/kg	170	500	--	
Total (Of 17) PAH's	2800	N	mg/kg	17	100	--	
pH	2010	U		9.3	--	>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.10	--	To evaluate	
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0009	0.0090	0.5	2	
Barium	1455	U	0.006	0.056	20	100	
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	
Chromium	1455	U	0.0057	0.057	0.5	10	
Copper	1455	U	0.0024	0.025	2	50	
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	
Molybdenum	1455	U	0.0011	0.011	0.5	10	
Nickel	1455	U	0.0038	0.038	0.4	10	
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	
Antimony	1455	U	0.0012	0.012	0.06	0.7	
Selenium	1455	U	0.0016	0.016	0.1	0.5	
Zinc	1455	U	< 0.003	< 0.003	4	50	
Chloride	1220	U	1.3	13	800	15000	
Fluoride	1220	U	0.21	2.1	10	150	
Sulphate	1220	U	1.7	17	1000	20000	
Total Dissolved Solids	1020	N	39	390	4000	60000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	5.0

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.

## Test Methods

SOP	Title	Parameters included	Method summary
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7 Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	Compliance Test for Leaching of Granular Waste Material and Sludge

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

# Final Report

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**Report No.:** 22-13471-1  
**Initial Date of Issue:** 19-Apr-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
 Balnamore  
 Ballymoney  
 County Antrim  
 BT53 7QL  
**Contact(s):** Carin Cornwall  
 Colm Hurley  
 Darren O'Mahony  
 Gabriella Horan  
 Joe Gervin  
 John Cameron  
 Lucy Newland  
 Martin Gardiner  
 Matthew Gilbert  
 Neil Haggan  
 Paul Dunlop  
 Sean Ross  
 Stephen Franey  
 Stephen Watson  
 Stuart Abraham  
 Thomas McAllister  
**Project** 21-1219 DAA Airfield Underpass  
**Quotation No.:** Q18-13245  
**Order No.:**  
**No. of Samples:** 2  
**Turnaround (Wkdays):** 5  
**Date Approved:** 19-Apr-2022

**Date Received:** 08-Apr-2022  
**Date Instructed:** 11-Apr-2022  
**Results Due:** 19-Apr-2022

**Approved By:**



**Details:** Stuart Henderson, Technical  
 Manager

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# Results - Soil

**Project: 21-1219 DAA Airfield Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-13471	22-13471	
Quotation No.: Q18-13245		Chemtest Sample ID.:		1408738	1408739	
		Sample Location:		BH111	BH111	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		3.00	9.50	
		Date Sampled:		05-Apr-2022	05-Apr-2022	
		Asbestos Lab:		DURHAM	DURHAM	
Determinand	Accred.	SOP	Units	LOD		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	7.4	7.0
pH	U	2010		4.0	9.4	8.9
Arsenic	U	2450	mg/kg	1.0	2.6	20
Barium	U	2450	mg/kg	10	29	110
Cadmium	U	2450	mg/kg	0.10	< 0.10	2.4
Chromium	U	2450	mg/kg	1.0	7.2	24
Molybdenum	U	2450	mg/kg	2.0	< 2.0	4.1
Antimony	N	2450	mg/kg	2.0	< 2.0	2.0
Copper	U	2450	mg/kg	0.50	59	30
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	85	49
Lead	U	2450	mg/kg	0.50	1.4	23
Selenium	U	2450	mg/kg	0.20	< 0.20	2.0
Zinc	U	2450	mg/kg	0.50	63	80
Chromium (Trivalent)	N	2490	mg/kg	1.0	7.2	24
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	0.21	0.58
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10

## Results - Soil

**Project: 21-1219 DAA Airfield Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-13471	22-13471	
Quotation No.: Q18-13245		Chemtest Sample ID.:		1408738	1408739	
		Sample Location:		BH111	BH111	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		3.00	9.50	
		Date Sampled:		05-Apr-2022	05-Apr-2022	
		Asbestos Lab:		DURHAM	DURHAM	
Determinand	Accred.	SOP	Units	LOD		
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10	0.64
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.89
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	2.7
Fluorene	U	2800	mg/kg	0.10	< 0.10	2.6
Phenanthrene	U	2800	mg/kg	0.10	< 0.10	34
Anthracene	U	2800	mg/kg	0.10	< 0.10	9.0
Fluoranthene	U	2800	mg/kg	0.10	< 0.10	57
Pyrene	U	2800	mg/kg	0.10	< 0.10	50
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10	28
Chrysene	U	2800	mg/kg	0.10	< 0.10	25
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10	30
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10	11
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10	28
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10	15
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	3.2
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10	15
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	310
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	< 0.10	< 0.10

## Results - Single Stage WAC

Project: 21-1219 DAA Airfield Underpass

Chemtest Job No: 22-13471					<b>Landfill Waste Acceptance Criteria Limits</b>		
Chemtest Sample ID: 1408738					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
Sample Ref:							
Sample ID:							
Sample Location: BH111							
Top Depth(m): 3.00							
Bottom Depth(m):							
Sampling Date: 05-Apr-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	U	%	0.21	3	5	
Loss On Ignition	2610	U	%	1.6	--	10	
Total BTEX	2760	U	mg/kg	< 0.010	6	--	
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	
TPH Total WAC	2670	U	mg/kg	< 10	500	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	
pH	2010	U		9.4	--	>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.0040	--	To evaluate	
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0007	0.0067	0.5	2	
Barium	1455	U	0.052	0.52	20	100	
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	
Chromium	1455	U	0.0046	0.046	0.5	10	
Copper	1455	U	0.0038	0.038	2	50	
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	
Molybdenum	1455	U	0.019	0.19	0.5	10	
Nickel	1455	U	0.0043	0.043	0.4	10	
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	
Antimony	1455	U	0.0025	0.025	0.06	0.7	
Selenium	1455	U	0.049	0.49	0.1	0.5	
Zinc	1455	U	0.006	0.057	4	50	
Chloride	1220	U	9.6	96	800	15000	
Fluoride	1220	U	0.35	3.5	10	150	
Sulphate	1220	U	31	310	1000	20000	
Total Dissolved Solids	1020	N	98	970	4000	60000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	
Dissolved Organic Carbon	1610	U	3.1	< 50	500	800	

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	7.4

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 21-1219 DAA Airfield Underpass

Chemtest Job No: 22-13471					<b>Landfill Waste Acceptance Criteria Limits</b>		
Chemtest Sample ID: 1408739					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
Sample Ref:							
Sample ID:							
Sample Location: BH111							
Top Depth(m): 9.50							
Bottom Depth(m):							
Sampling Date: 05-Apr-2022							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.58	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	310	100	--	--
pH	2010	U		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.052	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0005	0.0050	0.5	2	25
Barium	1455	U	0.028	0.28	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0047	0.047	0.5	10	70
Copper	1455	U	0.0031	0.031	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.013	0.13	0.5	10	30
Nickel	1455	U	0.0034	0.034	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0006	0.0056	0.06	0.7	5
Selenium	1455	U	0.018	0.18	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	3.0	30	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	11	110	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	22	220	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	7.0

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.

## Test Methods

SOP	Title	Parameters included	Method summary
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7 Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	Compliance Test for Leaching of Granular Waste Material and Sludge

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



# Final Report

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**Report No.:** 22-17599-1  
**Initial Date of Issue:** 20-May-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL  
**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister

**Project** DAA Airfield

**Quotation No.:** Q18-13245

**Date Received:** 12-May-2022

**Order No.:**

**Date Instructed:** 12-May-2022

**No. of Samples:** 11

**Turnaround (Wkdays):** 7

**Results Due:** 20-May-2022

**Date Approved:** 20-May-2022

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

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## Results - Leachate

**Project: DAA Airfield**

<b>Client: Causeway Geotech Ltd</b>		<b>Chemtest Job No.:</b>		22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599		
Quotation No.: Q18-13245		<b>Chemtest Sample ID.:</b>		1427259	1427260	1427261	1427262	1427263	1427264	1427265	1427266		
Order No.:		Client Sample Ref.:		1	2	1	1	2	1	2	1		
		Sample Location:		BH104	BH104	BH105	BH106	BH106	BH107	BH107	BH108		
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
		Top Depth (m):		4.00	9.50	8.90	4.00	9.50	2.00	7.60	8.70		
		Bottom Depth (m):		4.50	10.00	9.50	4.30	10.00	2.40	8.00	9.00		
		Date Sampled:		11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Type</b>	<b>Units</b>	<b>LOD</b>								
Ammonium	U	1220	10:1	mg/l	0.050	0.24	0.19	0.12	0.21	0.20	0.15	0.20	0.18
Ammonium	N	1220	10:1	mg/kg	0.10	2.7	2.5	1.5	2.5	2.6	1.7	2.4	2.3

## Results - Leachate

**Project: DAA Airfield**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>					22-17599	22-17599	22-17599
Quotation No.: Q18-13245	<b>Chemtest Sample ID.:</b>					1427267	1427268	1427269
Order No.:	Client Sample Ref.:					2	1	2
	Sample Location:					BH108	BH109	BH109
	Sample Type:					SOIL	SOIL	SOIL
	Top Depth (m):					9.70	4.50	8.70
	Bottom Depth (m):					10.00	5.00	9.00
	Date Sampled:					11-May-2022	11-May-2022	11-May-2022
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Type</b>	<b>Units</b>	<b>LOD</b>			
Ammonium	U	1220	10:1	mg/l	0.050	0.13	0.14	0.26
Ammonium	N	1220	10:1	mg/kg	0.10	2.1	1.9	3.3

# Results - Soil

**Project: DAA Airfield**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599
Quotation No.: Q18-13245		Chemtest Sample ID.:		1427259	1427260	1427261	1427262	1427263	1427264	1427265	1427266	1427267	1427267
Order No.:		Client Sample Ref.:		1	2	1	1	2	1	2	1	2	2
		Sample Location:		BH104	BH104	BH105	BH106	BH106	BH107	BH107	BH108	BH108	BH108
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		4.00	9.50	8.90	4.00	9.50	2.00	7.60	8.70	9.70	9.70
		Bottom Depth (m):		4.50	10.00	9.50	4.30	10.00	2.40	8.00	9.00	10.00	10.00
		Date Sampled:		11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022
		Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	6.0	9.4	12	3.0	8.5	19	7.6	9.0	7.2
pH	M	2010		4.0	9.2	9.3	9.0	9.0	8.9	8.9	8.9	9.2	9.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.4	0.70	1.1	0.82	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Sulphur (Elemental)	M	2180	mg/kg	1.0	110	140	8.1	7.1	6.0	8.1	7.4	1.1	1.3
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	15	13	12	9.1	6.9	10	12	11	11
Sulphate (Total)	U	2430	%	0.010	0.27	0.28	0.53	0.45	0.74	0.90	0.70	0.59	0.67
Arsenic	M	2455	mg/kg	0.5	5.9	5.7	50	12	9.3	10	12	8.1	7.8
Barium	M	2455	mg/kg	0	23	26	66	78	56	64	70	72	68
Cadmium	M	2455	mg/kg	0.10	0.36	0.30	1.2	1.5	1.0	1.1	1.3	0.98	1.2
Chromium	M	2455	mg/kg	0.5	11	11	9.5	14	11	9.9	11	14	14
Molybdenum	M	2455	mg/kg	0.5	0.9	0.9	1.8	2.8	2.2	2.3	2.5	2.8	2.9
Antimony	N	2455	mg/kg	2.0	< 2.0	< 2.0	5.8	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Copper	M	2455	mg/kg	0.50	15	16	17	21	16	17	18	19	19
Mercury	M	2455	mg/kg	0.05	0.25	0.33	< 0.05	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	M	2455	mg/kg	0.50	13	13	23	33	24	26	27	31	30
Lead	M	2455	mg/kg	0.50	63	74	35	27	18	20	25	14	13
Selenium	M	2455	mg/kg	0.25	0.56	0.54	1.7	1.9	2.0	2.0	1.9	2.3	2.3
Zinc	M	2455	mg/kg	0.50	48	40	96	100	88	110	110	52	57
Chromium (Trivalent)	N	2490	mg/kg	1.0	11	11	9.5	14	11	9.9	11	14	14
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20	1.8	1.8	0.96	0.85	0.84	0.66	0.64	0.47	0.67
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10	< 10	49	110	< 10	40	73	< 10	120	61
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	6.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	49	99	< 1.0	40	73	< 1.0	120	61
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	49	110	< 5.0	40	73	< 5.0	120	61
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

## Results - Soil

**Project: DAA Airfield**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	
Quotation No.: Q18-13245		Chemtest Sample ID.:		1427259	1427260	1427261	1427262	1427263	1427264	1427265	1427266	1427267	
Order No.:		Client Sample Ref.:		1	2	1	1	2	1	2	1	2	
		Sample Location:		BH104	BH104	BH105	BH106	BH106	BH107	BH107	BH108	BH108	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		4.00	9.50	8.90	4.00	9.50	2.00	7.60	8.70	9.70	
		Bottom Depth (m):		4.50	10.00	9.50	4.30	10.00	2.40	8.00	9.00	10.00	
		Date Sampled:		11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	
		Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	
Determinand	Accred.	SOP	Units	LOD									
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	150	< 1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	70	92	< 1.0	72	< 1.0	87	82	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	70	92	< 5.0	72	< 5.0	240	82	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	120	200	< 10	110	73	< 10	360	140
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Naphthalene	M	2800	mg/kg	0.10	< 0.10	0.72	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	0.18	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	M	2800	mg/kg	0.10	< 0.10	0.28	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	M	2800	mg/kg	0.10	1.3	2.3	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Anthracene	M	2800	mg/kg	0.10	0.37	0.59	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Fluoranthene	M	2800	mg/kg	0.10	1.6	3.4	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Pyrene	M	2800	mg/kg	0.10	1.5	3.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.83	1.5	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Chrysene	M	2800	mg/kg	0.10	0.79	1.8	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	1.1	1.8	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.28	0.63	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.94	1.5	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	0.95	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	0.16	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	0.91	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Total Of 17 PAH's	N	2800	mg/kg	2.0	8.7	20	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	

## Results - Soil

**Project: DAA Airfield**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>		22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599	22-17599
Quotation No.: Q18-13245	<b>Chemtest Sample ID.:</b>		1427259	1427260	1427261	1427262	1427263	1427264	1427265	1427266	1427267	1427267
Order No.:	Client Sample Ref.:		1	2	1	1	2	1	2	1	2	2
	Sample Location:		BH104	BH104	BH105	BH106	BH106	BH107	BH107	BH108	BH108	BH108
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		4.00	9.50	8.90	4.00	9.50	2.00	7.60	8.70	9.70	9.70
	Bottom Depth (m):		4.50	10.00	9.50	4.30	10.00	2.40	8.00	9.00	10.00	10.00
	Date Sampled:		11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022	11-May-2022
	Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>								
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	0.48	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

## Results - Soil

**Project: DAA Airfield**

<b>Client: Causeway Geotech Ltd</b>		<b>Chemtest Job No.:</b>		22-17599	22-17599	
Quotation No.: Q18-13245		<b>Chemtest Sample ID.:</b>		1427268	1427269	
Order No.:	Client Sample Ref.:		1	2		
	Sample Location:		BH109	BH109		
	Sample Type:		SOIL	SOIL		
	Top Depth (m):		4.50	8.70		
	Bottom Depth (m):		5.00	9.00		
	Date Sampled:		11-May-2022	11-May-2022		
	Asbestos Lab:		DURHAM	DURHAM		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	7.7	7.9
pH	M	2010		4.0	9.1	9.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.54	0.72
Sulphur (Elemental)	M	2180	mg/kg	1.0	1.3	< 1.0
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	9.2	9.3
Sulphate (Total)	U	2430	%	0.010	0.54	0.66
Arsenic	M	2455	mg/kg	0.5	6.8	6.9
Barium	M	2455	mg/kg	0	66	65
Cadmium	M	2455	mg/kg	0.10	0.74	0.75
Chromium	M	2455	mg/kg	0.5	12	13
Molybdenum	M	2455	mg/kg	0.5	2.6	2.4
Antimony	N	2455	mg/kg	2.0	< 2.0	< 2.0
Copper	M	2455	mg/kg	0.50	17	16
Mercury	M	2455	mg/kg	0.05	< 0.05	< 0.05
Nickel	M	2455	mg/kg	0.50	26	26
Lead	M	2455	mg/kg	0.50	11	12
Selenium	M	2455	mg/kg	0.25	1.9	2.0
Zinc	M	2455	mg/kg	0.50	42	44
Chromium (Trivalent)	N	2490	mg/kg	1.0	12	13
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20	0.60	0.40
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10	42	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	42	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	42	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0

## Results - Soil

**Project: DAA Airfield**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-17599	22-17599	
Quotation No.: Q18-13245		Chemtest Sample ID.:		1427268	1427269	
Order No.:		Client Sample Ref.:		1	2	
		Sample Location:		BH109	BH109	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		4.50	8.70	
		Bottom Depth (m):		5.00	9.00	
		Date Sampled:		11-May-2022	11-May-2022	
		Asbestos Lab:		DURHAM	DURHAM	
Determinand	Accred.	SOP	Units	LOD		
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	55	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	55	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	96	< 10
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010



## Results - Soil

**Project: DAA Airfield**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>		22-17599	22-17599	
Quotation No.: Q18-13245	<b>Chemtest Sample ID.:</b>		1427268	1427269	
Order No.:	Client Sample Ref.:		1	2	
	Sample Location:		BH109	BH109	
	Sample Type:		SOIL	SOIL	
	Top Depth (m):		4.50	8.70	
	Bottom Depth (m):		5.00	9.00	
	Date Sampled:		11-May-2022	11-May-2022	
	Asbestos Lab:		DURHAM	DURHAM	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
PCB 138	U	2815	mg/kg	0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	< 0.10
Total Phenols	M	2920	mg/kg	0.10	< 0.10

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599				<b>Landfill Waste Acceptance Criteria Limits</b>			
<b>Chemtest Sample ID:</b> 1427259							
<b>Sample Ref:</b> 1							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH104							
<b>Sampling Date:</b> 11-May-2022							
<b>Top Depth(m):</b>	4.00						
<b>Bottom Depth(m):</b>	4.50						
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>		<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
Total Organic Carbon	2625	M	%	1.8	3	5	6
Loss On Ignition	2610	M	%	3.6	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	8.7	100	--	--
pH	2010	M		9.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.025	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0006	0.0056	0.5	2	25
Barium	1455	U	0.040	0.40	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0011	0.011	0.5	10	70
Copper	1455	U	0.0025	0.025	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.011	0.11	0.5	10	30
Nickel	1455	U	0.0012	0.012	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0015	0.015	0.06	0.7	5
Selenium	1455	U	0.016	0.16	0.1	0.5	7
Zinc	1455	U	0.005	0.048	4	50	200
Chloride	1220	U	2.3	23	800	15000	25000
Fluoride	1220	U	0.21	2.1	10	150	500
Sulphate	1220	U	40	400	1000	20000	50000
Total Dissolved Solids	1020	N	98	980	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	6.0

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1427260					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b> 2							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH104							
<b>Top Depth(m):</b> 9.50							
<b>Bottom Depth(m):</b> 10.00							
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	1.8	3	5	6
Loss On Ignition	2610	M	%	4.1	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	120	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	20	100	--	--
pH	2010	M		9.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.057	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0009	0.0090	0.5	2	25
Barium	1455	U	0.020	0.20	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0010	0.010	0.5	10	70
Copper	1455	U	0.0013	0.013	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.014	0.14	0.5	10	30
Nickel	1455	U	0.0009	0.0085	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	0.0067	0.067	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	4.1	41	1000	20000	50000
Total Dissolved Solids	1020	N	59	580	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.6	86	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	9.4

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599				<b>Landfill Waste Acceptance Criteria Limits</b>			
<b>Chemtest Sample ID:</b> 1427261							
<b>Sample Ref:</b> 1							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH105							
<b>Top Depth(m):</b> 8.90							
<b>Bottom Depth(m):</b> 9.50				<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>	
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.96	3	5	6
Loss On Ignition	2610	M	%	1.9	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	200	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		9.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.012	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0007	0.0067	0.5	2	25
Barium	1455	U	0.045	0.45	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0008	0.0084	0.5	10	70
Copper	1455	U	0.0014	0.014	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0092	0.092	0.5	10	30
Nickel	1455	U	0.0011	0.011	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0009	0.0093	0.06	0.7	5
Selenium	1455	U	0.0071	0.071	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	1.4	14	800	15000	25000
Fluoride	1220	U	0.22	2.2	10	150	500
Sulphate	1220	U	8.8	88	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.6	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	12

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1427262					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b> 1							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH106							
<b>Top Depth(m):</b> 4.00							
<b>Bottom Depth(m):</b> 4.30							
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.85	3	5	6
Loss On Ignition	2610	M	%	2.4	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		9.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.025	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0003	0.0029	0.5	2	25
Barium	1455	U	0.025	0.25	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0013	0.013	0.5	10	70
Copper	1455	U	0.0015	0.015	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.22	0.5	10	30
Nickel	1455	U	0.0016	0.016	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0017	0.017	0.06	0.7	5
Selenium	1455	U	0.039	0.39	0.1	0.5	7
Zinc	1455	U	0.003	0.034	4	50	200
Chloride	1220	U	14	140	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	61	610	1000	20000	50000
Total Dissolved Solids	1020	N	130	1300	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	3.0

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

Chemtest Job No: 22-17599 Chemtest Sample ID: 1427263 Sample Ref: 2 Sample ID: Sample Location: BH106 Top Depth(m): 9.50 Bottom Depth(m): 10.00 Sampling Date: 11-May-2022				Landfill Waste Acceptance Criteria			
				Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	0.84	3	5	6
Loss On Ignition	2610	M	%	2.7	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	110	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.068	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0012	0.012	0.5	2	25
Barium	1455	U	0.082	0.82	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0009	0.0085	0.5	10	70
Copper	1455	U	0.0026	0.026	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0065	0.065	0.5	10	30
Nickel	1455	U	0.0009	0.0088	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0005	0.0055	0.06	0.7	5
Selenium	1455	U	0.015	0.15	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	4.1	41	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	11	110	1000	20000	50000
Total Dissolved Solids	1020	N	72	710	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.2	82	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	8.5

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1427264					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b> 1							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH107							
<b>Top Depth(m):</b> 2.00							
<b>Bottom Depth(m):</b> 2.40							
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.66	3	5	6
Loss On Ignition	2610	M	%	2.6	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	73	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.021	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0008	0.0082	0.5	2	25
Barium	1455	U	0.029	0.29	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0010	0.0099	0.5	10	70
Copper	1455	U	0.0043	0.043	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.22	0.5	10	30
Nickel	1455	U	0.0020	0.020	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0021	0.021	0.06	0.7	5
Selenium	1455	U	0.0006	0.0062	0.1	0.5	7
Zinc	1455	U	0.013	0.14	4	50	200
Chloride	1220	U	1.8	18	800	15000	25000
Fluoride	1220	U	0.27	2.7	10	150	500
Sulphate	1220	U	11	110	1000	20000	50000
Total Dissolved Solids	1020	N	98	970	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.3	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	19

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599				<b>Landfill Waste Acceptance Criteria Limits</b>			
<b>Chemtest Sample ID:</b> 1427265							
<b>Sample Ref:</b> 2							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH107							
<b>Top Depth(m):</b> 7.60							
<b>Bottom Depth(m):</b> 8.00				<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>	
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.64	3	5	6
Loss On Ignition	2610	M	%	3.1	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.026	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0006	0.0059	0.5	2	25
Barium	1455	U	0.052	0.52	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0019	0.019	2	50	100
Mercury	1455	U	0.00025	0.0025	0.01	0.2	2
Molybdenum	1455	U	0.011	0.11	0.5	10	30
Nickel	1455	U	0.0008	0.0081	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0011	0.011	0.06	0.7	5
Selenium	1455	U	0.018	0.17	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.30	3.0	10	150	500
Sulphate	1220	U	27	270	1000	20000	50000
Total Dissolved Solids	1020	N	98	970	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.5	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	7.6

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.



## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599				<b>Landfill Waste Acceptance Criteria Limits</b>			
<b>Chemtest Sample ID:</b> 1427266							
<b>Sample Ref:</b> 1							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH108							
<b>Top Depth(m):</b> 8.70							
<b>Bottom Depth(m):</b> 9.00				<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>	
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.47	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	360	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		9.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.021	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0008	0.0081	0.5	2	25
Barium	1455	U	0.037	0.37	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0008	0.0083	0.5	10	70
Copper	1455	U	0.0017	0.017	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.011	0.11	0.5	10	30
Nickel	1455	U	0.0008	0.0080	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0005	0.0054	0.06	0.7	5
Selenium	1455	U	0.015	0.15	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.30	3.0	10	150	500
Sulphate	1220	U	7.2	72	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	13	130	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	9.0

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599				<b>Landfill Waste Acceptance Criteria Limits</b>			
<b>Chemtest Sample ID:</b> 1427267							
<b>Sample Ref:</b> 2							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH108							
<b>Top Depth(m):</b> 9.70							
<b>Bottom Depth(m):</b> 10.00				<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>	
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.67	3	5	6
Loss On Ignition	2610	M	%	2.3	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	140	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		9.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.023	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0004	0.0036	0.5	2	25
Barium	1455	U	0.012	0.12	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0009	0.0092	0.5	10	70
Copper	1455	U	0.0011	0.011	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0015	0.015	0.5	10	30
Nickel	1455	U	0.0009	0.0089	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	0.0026	0.026	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	1.6	16	1000	20000	50000
Total Dissolved Solids	1020	N	39	390	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	7.2

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599				<b>Landfill Waste Acceptance Criteria Limits</b>			
<b>Chemtest Sample ID:</b> 1427268							
<b>Sample Ref:</b> 1							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH109							
<b>Top Depth(m):</b> 4.50							
<b>Bottom Depth(m):</b> 5.00				<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>	
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.60	3	5	6
Loss On Ignition	2610	M	%	2.5	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	96	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	M		9.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.028	--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0004	0.0043	0.5	2	25
Barium	1455	U	0.049	0.49	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0010	0.0099	0.5	10	70
Copper	1455	U	0.0017	0.017	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.013	0.13	0.5	10	30
Nickel	1455	U	0.0009	0.0091	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.020	0.06	0.7	5
Selenium	1455	U	0.030	0.30	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	4.9	49	800	15000	25000
Fluoride	1220	U	0.31	3.1	10	150	500
Sulphate	1220	U	23	230	1000	20000	50000
Total Dissolved Solids	1020	N	91	910	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.6	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	7.7

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-17599					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1427269					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b> 2							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH109							
<b>Top Depth(m):</b> 8.70							
<b>Bottom Depth(m):</b> 9.00							
<b>Sampling Date:</b> 11-May-2022							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	0.40	3	5	
Loss On Ignition	2610	M	%	2.7	--	10	
Total BTEX	2760	M	mg/kg	< 0.010	6	--	
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	
TPH Total WAC	2670	M	mg/kg	< 10	500	--	
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	
pH	2010	M		9.1	--	>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.0060	--	To evaluate	
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0007	0.0073	0.5	2	
Barium	1455	U	0.054	0.54	20	100	
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	
Chromium	1455	U	0.0011	0.011	0.5	10	
Copper	1455	U	0.0020	0.020	2	50	
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	
Molybdenum	1455	U	0.016	0.16	0.5	10	
Nickel	1455	U	0.0010	0.010	0.4	10	
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	
Antimony	1455	U	0.0010	0.010	0.06	0.7	
Selenium	1455	U	0.022	0.22	0.1	0.5	
Zinc	1455	U	< 0.003	< 0.003	4	50	
Chloride	1220	U	1.1	11	800	15000	
Fluoride	1220	U	0.53	5.3	10	150	
Sulphate	1220	U	17	170	1000	20000	
Total Dissolved Solids	1020	N	85	840	4000	60000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	
Dissolved Organic Carbon	1610	U	8.0	80	500	800	

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	7.9

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.

## Test Methods

SOP	Title	Parameters included	Method summary
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7 Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and Trimethylphenols Note: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	Compliance Test for Leaching of Granular Waste Material and Sludge

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



# Final Report

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**Report No.:** 22-19134-1  
**Initial Date of Issue:** 31-May-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL  
**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister

**Project** DAA Airfield

**Quotation No.:** Q21-25458

**Date Received:** 23-May-2022

**Order No.:**

**Date Instructed:** 23-May-2022

**No. of Samples:** 5

**Turnaround (Wkdays):** 7

**Results Due:** 31-May-2022

**Date Approved:** 31-May-2022

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

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## Results - Soil

**Project: DAA Airfield**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-19134	22-19134	22-19134	22-19134	22-19134
Quotation No.: Q21-25458		Chemtest Sample ID.:		1433814	1433815	1433816	1433817	1433818
		Sample Location:		BH102	BH102	BH103	BH103	BH103
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		7.70	10.70	7.00	8.50	9.00
		Bottom Depth (m):		8.00	11.00	7.30	8.80	9.30
		Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	12	8.1	16	24
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	[A] < 0.40	[A] < 0.40	[A] < 0.40	[A] < 0.40
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] 5.5	[A] < 1.0	[A] < 1.0	[A] < 1.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 7.3	[A] 10	[A] 9.4	[A] 12
Sulphate (Total)	U	2430	%	0.010	[A] 0.037	[A] 0.18	[A] 0.32	[A] 0.51
Arsenic	M	2455	mg/kg	0.5	6.0	9.5	5.1	6.8
Barium	M	2455	mg/kg	0	36	44	24	28
Cadmium	M	2455	mg/kg	0.10	0.77	0.85	0.68	0.95
Chromium	M	2455	mg/kg	0.5	10	7.8	6.6	7.8
Molybdenum	M	2455	mg/kg	0.5	1.4	1.3	1.5	1.7
Antimony	N	2455	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Copper	M	2455	mg/kg	0.50	16	14	13	14
Mercury	M	2455	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	M	2455	mg/kg	0.50	30	21	17	21
Lead	M	2455	mg/kg	0.50	13	20	9.5	11
Selenium	M	2455	mg/kg	0.25	1.4	1.0	1.2	1.4
Zinc	M	2455	mg/kg	0.50	52	46	66	110
Chromium (Trivalent)	N	2490	mg/kg	1.0	10	7.8	6.6	7.8
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	M	2625	%	0.20	[A] 0.29	[A] 0.70	[A] 0.59	[A] 0.77
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10	< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0

## Results - Soil

**Project: DAA Airfield**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-19134	22-19134	22-19134	22-19134	22-19134	
Quotation No.: Q21-25458		Chemtest Sample ID.:		1433814	1433815	1433816	1433817	1433818	
		Sample Location:		BH102	BH102	BH103	BH103	BH103	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		7.70	10.70	7.00	8.50	9.00	
		Bottom Depth (m):		8.00	11.00	7.30	8.80	9.30	
		Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD					
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10
Benzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Toluene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0
Naphthalene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.18	< 0.10	< 0.10
Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	0.17	< 0.10	< 0.10
Benzo[a]anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 52	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 90+101	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 118	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 153	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 138	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
PCB 180	U	2815	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10	[A] < 0.10
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-19134					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1433814					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b>							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH102							
<b>Top Depth(m):</b> 7.70							
<b>Bottom Depth(m):</b> 8.00							
<b>Sampling Date:</b>							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	[A] 0.29	3	5	6
Loss on Ignition					--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH					--	>6	--
Acid Neutralisation Capacity					--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0006	0.0062	0.5	2	25
Barium	1455	U	0.041	0.41	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0009	0.0087	0.5	10	70
Copper	1455	U	0.0030	0.030	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.026	0.26	0.5	10	30
Nickel	1455	U	0.0007	0.0069	0.4	10	40
Lead	1455	U	0.0011	0.011	0.5	10	50
Antimony	1455	U	0.0007	0.0070	0.06	0.7	5
Selenium	1455	U	0.0032	0.032	0.1	0.5	7
Zinc	1455	U	0.004	0.039	4	50	200
Chloride	1220	U	1.4	14	800	15000	25000
Fluoride	1220	U	0.48	4.8	10	150	500
Sulphate	1220	U	10	100	1000	20000	50000
Total Dissolved Solids	1020	N	91	910	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.1	71	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	12

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-19134					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1433815					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b>							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH102							
<b>Top Depth(m):</b> 10.70							
<b>Bottom Depth(m):</b> 11.00							
<b>Sampling Date:</b>							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	[A] 0.70	3	5	6
Loss on Ignition					--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH					--	>6	--
Acid Neutralisation Capacity					--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0006	0.0062	0.5	2	25
Barium	1455	U	0.056	0.56	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0009	0.0094	0.5	10	70
Copper	1455	U	0.0023	0.023	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0086	0.086	0.5	10	30
Nickel	1455	U	0.0005	0.0051	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0006	0.0060	0.06	0.7	5
Selenium	1455	U	0.010	0.10	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	1.8	18	800	15000	25000
Fluoride	1220	U	0.28	2.8	10	150	500
Sulphate	1220	U	9.7	97	1000	20000	50000
Total Dissolved Solids	1020	N	72	710	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.5	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	8.1

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-19134					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1433816					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b>							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH103							
<b>Top Depth(m):</b> 7.00							
<b>Bottom Depth(m):</b> 7.30							
<b>Sampling Date:</b>							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	[A] 0.59	3	5	6
Loss on Ignition					--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH					--	>6	--
Acid Neutralisation Capacity					--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0011	0.011	0.5	2	25
Barium	1455	U	0.035	0.35	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0011	0.011	0.5	10	70
Copper	1455	U	0.0021	0.021	2	50	100
Mercury	1455	U	0.00026	0.0026	0.01	0.2	2
Molybdenum	1455	U	0.0092	0.092	0.5	10	30
Nickel	1455	U	0.0009	0.0094	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0016	0.016	0.06	0.7	5
Selenium	1455	U	0.011	0.11	0.1	0.5	7
Zinc	1455	U	0.003	0.028	4	50	200
Chloride	1220	U	22	220	800	15000	25000
Fluoride	1220	U	0.32	3.2	10	150	500
Sulphate	1220	U	15	150	1000	20000	50000
Total Dissolved Solids	1020	N	78	780	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.6	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	16

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

<b>Chemtest Job No:</b> 22-19134					<b>Landfill Waste Acceptance Criteria Limits</b>		
<b>Chemtest Sample ID:</b> 1433817					<b>Inert Waste Landfill</b>	<b>Stable, Non-reactive hazardous waste in non-hazardous Landfill</b>	<b>Hazardous Waste Landfill</b>
<b>Sample Ref:</b>							
<b>Sample ID:</b>							
<b>Sample Location:</b> BH103							
<b>Top Depth(m):</b> 8.50							
<b>Bottom Depth(m):</b> 8.80							
<b>Sampling Date:</b>							
<b>Determinand</b>	<b>SOP</b>	<b>Accred.</b>	<b>Units</b>				
Total Organic Carbon	2625	M	%	[A] 0.77	3	5	6
Loss on Ignition					--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH					--	>6	--
Acid Neutralisation Capacity					--	To evaluate	To evaluate
<b>Eluate Analysis</b>			<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>		
Arsenic	1455	U	0.0012	0.012	0.5	2	25
Barium	1455	U	0.037	0.37	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0017	0.017	0.5	10	70
Copper	1455	U	0.0038	0.038	2	50	100
Mercury	1455	U	0.00029	0.0029	0.01	0.2	2
Molybdenum	1455	U	0.0083	0.083	0.5	10	30
Nickel	1455	U	0.0015	0.015	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0014	0.015	0.06	0.7	5
Selenium	1455	U	0.0092	0.092	0.1	0.5	7
Zinc	1455	U	0.007	0.074	4	50	200
Chloride	1220	U	2.3	23	800	15000	25000
Fluoride	1220	U	0.33	3.3	10	150	500
Sulphate	1220	U	11	110	1000	20000	50000
Total Dissolved Solids	1020	N	78	770	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.5	55	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	24

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: DAA Airfield**

Chemtest Job No: 22-19134 Chemtest Sample ID: 1433818 Sample Ref: Sample ID: Sample Location: BH103 Top Depth(m): 9.00 Bottom Depth(m): 9.30 Sampling Date:				Landfill Waste Acceptance Criteria Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	M	%	[A] 1.0	3	5	6
Loss on Ignition					--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH					--	>6	--
Acid Neutralisation Capacity					--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0003	0.0034	0.5	2	25
Barium	1455	U	0.012	0.12	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0014	0.014	0.5	10	70
Copper	1455	U	0.0017	0.017	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0007	0.0073	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0008	0.0078	0.06	0.7	5
Selenium	1455	U	0.0009	0.0090	0.1	0.5	7
Zinc	1455	U	0.003	0.032	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	1.1	11	10	150	500
Sulphate	1220	U	3.7	37	1000	20000	50000
Total Dissolved Solids	1020	N	39	390	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	< 2.5	< 50	500	800	1000

### **Solid Information**

Dry mass of test portion/kg	0.090
Moisture (%)	0.36

### **Waste Acceptance Criteria**

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.



## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1433814			BH102		A	Amber Glass 250ml
1433814			BH102		A	Amber Glass 60ml
1433814			BH102		A	Plastic Tub 500g
1433815			BH102		A	Amber Glass 250ml
1433815			BH102		A	Amber Glass 60ml
1433815			BH102		A	Plastic Tub 500g
1433816			BH103		A	Amber Glass 250ml
1433816			BH103		A	Amber Glass 60ml
1433816			BH103		A	Plastic Tub 500g
1433817			BH103		A	Amber Glass 250ml
1433817			BH103		A	Amber Glass 60ml
1433817			BH103		A	Plastic Tub 500g
1433818			BH103		A	Amber Glass 250ml
1433818			BH103		A	Amber Glass 60ml
1433818			BH103		A	Plastic Tub 500g

## Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

## Test Methods

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



# Final Report

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**Report No.:** 22-16300-1  
**Initial Date of Issue:** 13-May-2022  
**Client** Causeway Geotech Ltd  
**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL  
**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
Joe Gervin  
John Cameron  
Lucy Newland  
Martin Gardiner  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Thomas McAllister

**Project** DAA Airfield Underpass

**Quotation No.:** Q22-27411 **Date Received:** 03-May-2022

**Order No.:** **Date Instructed:** 03-May-2022

**No. of Samples:** 2

**Turnaround (Wkdays):** 7 **Results Due:** 11-May-2022

**Date Approved:** 13-May-2022 **Subcon Results Due:** 24-May-2022

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

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## Results - Water

**Project: DAA Airfield Underpass**

Client: Causeway Geotech Ltd		Chemtest Job No.:		22-16300	22-16300	
Quotation No.: Q22-27411		Chemtest Sample ID.:		1421449	1421450	
		Sample Location:		BH107	BH105	
		Sample Type:		WATER	WATER	
		Top Depth (m):		0.00	0.00	
		Date Sampled:		27-Apr-2022	28-Apr-2022	
Determinand	Accred.	SOP	Units	LOD		
PFAS in Waters (Subcon)	SN			0.0200000	See Attached	See Attached
pH	U	1010		N/A	7.5	7.8
Ammonia (Free)	N	1220	mg/l	0.050	< 0.050	< 0.050
Ammonium	U	1220	mg/l	0.050	0.91	0.30
Sulphate	U	1220	mg/l	1.0	5.2	31
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1455	µg/l	0.20	1.0	1.2
Boron (Dissolved)	U	1455	µg/l	10.0	37	55
Cadmium (Dissolved)	U	1455	µg/l	0.11	0.13	< 0.11
Chromium (Dissolved)	U	1455	µg/l	0.50	< 0.50	7.0
Copper (Dissolved)	U	1455	µg/l	0.50	3.2	2.2
Mercury (Dissolved)	U	1455	µg/l	0.05	< 0.05	< 0.05
Nickel (Dissolved)	U	1455	µg/l	0.50	5.7	2.9
Lead (Dissolved)	U	1455	µg/l	0.50	< 0.50	< 0.50
Selenium (Dissolved)	U	1455	µg/l	0.50	1.3	4.1
Zinc (Dissolved)	U	1455	µg/l	2.5	18	23
TPH >C6-C10	N	1670	µg/l	0.10	7.2	< 0.10
TPH >C10-C21	N	1670	µg/l	0.10	740	< 0.10
TPH >C21-C40	N	1670	µg/l	0.10	33	< 0.10
Total TPH >C6-C40	U	1670	µg/l	10	780	< 10
Naphthalene	U	1800	µg/l	0.10	< 0.10	< 0.10
Acenaphthylene	U	1800	µg/l	0.10	< 0.10	< 0.10
Acenaphthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Fluorene	U	1800	µg/l	0.10	< 0.10	< 0.10
Phenanthrene	U	1800	µg/l	0.10	< 0.10	< 0.10
Anthracene	U	1800	µg/l	0.10	< 0.10	< 0.10
Fluoranthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Pyrene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	1800	µg/l	0.10	< 0.10	< 0.10
Chrysene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1800	µg/l	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1800	µg/l	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	1800	µg/l	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1800	µg/l	0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	1800	µg/l	2.0	< 2.0	< 2.0
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030

## Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.



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Eurofins Chemtest Ltd  
Attn. Mr. J. King  
Depot Road 11  
GB-CB8 0AL NEWMARKET  
GROOT BRITTANIE

Your reference : 22218  
Our reference : Project 1349910  
Validation Ref. : 1349910\_certificaat\_v1  
Verificationcode : HTNS-XQJY-YKIM-YGIF  
Enclosure(s) : 2 table(s) + 1 supplement(s)

Amsterdam, 13 May 2022

I hereby enclose the results of the laboratory tests that have been carried out on your request on the samples that you supplied to us.

I would like to point out to you that the results apply only to the samples supplied, such as these were presented for testing.

The research has been carried out according to the methods that are set out in the current accreditation certificate L086 and/or in the volume "Analysevoorschriften Eurofins Omegam". These protocols are, as far as possible, based on the NEN- EN- and/or ISO standards.

Do also note that the enclosed report may not be copied or reproduced in any way except in its entirety. I trust that we have completed your order as agreed and to your full satisfaction. If you have any questions reading this report, then please don't hesitate to contact our Customer Service.

Yours sincerely,  
On behalf of Eurofins Omegam,



BSc J. Tukker  
Production manager

Conditions of delivery of Eurofins Omegam have been registered.  
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VAT: NL8139.67.132.B01  
Trade register No. 34215654

**CERTIFICATE**

**Project code** : 1349910  
**Your Project Description** : 22218  
**Client** : Eurofins Chemtest Ltd

**Your Sample identification**

7169069 = 1421449  
 7169070 = 1421450

	BH107	BH105
<b>Client sampling date</b>	27/04/2022	28/04/2022
<b>Date of receipt</b>	05/05/2022	05/05/2022
<b>Startdate</b>	05/05/2022	05/05/2022
<b>Reference number</b>	7169069	7169070
<b>Your Matrix</b>	Water	Water

**Organic compounds - per- and polyfluoroalkylsubstances (PFAS)**
*Perfluorinated carboxylic acids:*

	µg/l	< 0,03	< 0,02
PFBA	µg/l	< 0,03	< 0,02
PFPeA	µg/l	< 0,02	< 0,02
PFHxA	µg/l	< 0,02	< 0,02
PFHpA	µg/l	< 0,02	< 0,02
PFOA linear	µg/l	< 0,02	< 0,02
PFOA branched	µg/l	< 0,02	< 0,02
PFNA	µg/l	< 0,02	< 0,02
PFDA	µg/l	< 0,02	< 0,02
PFUnDA	µg/l	< 0,02	< 0,02
PFDODA	µg/l	< 0,02	< 0,02
PFTTrDA	µg/l	< 0,02	< 0,02
PFTeDA	µg/l	< 0,02	< 0,02
PFHxDA	µg/l	< 0,02	< 0,02
PFODA	µg/l	< 0,02	< 0,02

*Perfluorinated sulfonic acids:*

	µg/l	< 0,02	< 0,02
PFBS	µg/l	< 0,02	< 0,02
PFPeS	µg/l	< 0,02	< 0,02
PFHxS	µg/l	< 0,02	< 0,02
PFHpS	µg/l	< 0,02	< 0,02
PFOS linear	µg/l	< 0,02	< 0,02
PFOS branched	µg/l	< 0,02	< 0,02
PFDS	µg/l	< 0,02	< 0,02

*Perfluorinated alkyl substances - precursors:*

	µg/l	< 0,05	< 0,05
4:2 FTS	µg/l	< 0,05	< 0,05
6:2 FTS	µg/l	< 0,05	< 0,05
8:2 FTS	µg/l	< 0,1	< 0,1
10:2 FTS	µg/l	< 0,05	< 0,05
PFOSA	µg/l	< 0,02	< 0,02

*Perfluorinated alkyl substances - remainder:*

	µg/l	< 0,5	< 0,5
HPFHpA	µg/l	< 0,5	< 0,5
4H-PFUnDA	µg/l	< 0,05	< 0,05
8:2 FTUCA	µg/l	< 0,05	< 0,05
9Cl-PF3ONS (F53-B)	µg/l	< 0,02	< 0,02
ADONA	µg/l	< 0,02	< 0,02
EtFOSA	µg/l	< 0,05	< 0,05
EtFOSAA	µg/l	< 0,02	< 0,02
MeFBSA	µg/l	< 0,02	< 0,02
MeFOSAA	µg/l	< 0,1	< 0,1
P37DMOA	µg/l	< 0,5	< 0,5
PFBSA	µg/l	< 0,02	< 0,02
MeFOSA	µg/l	< 0,05	< 0,05
MeFBSAA	µg/l	< 0,02	< 0,02
8:2 DiPAP	µg/l	< 0,1	< 0,1
sum PFOA	µg/l	0,03	0,03
sum PFOS	µg/l	0,03	0,03

- The frontpage and, where applicable, appendices of this document are integral parts of this certificate.

- Analyses marked with a 'Q' are part of the RvA accreditation certificate L086.

Verificationcode: HTNS-XQJY-YKIM-YGIF

Ref.: 1349910\_certificaat\_v1

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**CERTIFICATE**


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**Project code** : 1349910  
**Your Project Description** : 22218  
**Client** : Eurofins Chemtest Ltd

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## Notes related to analyses

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### General comments

The following information has been provided by the client if applicable:  
 Project description, Sample identificaton, Client sampling date, Client Matrix, Sample depth, Pot number (Barcode), Field data, Field observations and sampling data. The client sampling date can affect the validity of the results.

Quantification of branched PFOS/POA is based on DIN 38414-14.

### Summation of concentrations for group parameters

Summation is calculated according to AS3000 protocol, paragraph 2.5.2 and appendix 3.

---

**Sample identification** : 1421449  
**Reference number** : 7169069

Results Note(s):  
 perfluorobutanoic acid (PFBA) - Raised reporting limit because of interference by the matrix.

---

**CERTIFICATE**

<b>Project code</b>	: 1349910
<b>Your Project Description</b>	: 22218
<b>Client</b>	: Eurofins Chemtest Ltd

**Appendix Index PFAS**

PFAS component	Full name PFAS component
10:2 FTS	10:2 FTS (10:2 Fluorotelomer sulfonic acid)
4:2 FTS	4:2 FTS (4:2 Fluorotelomer sulfonic acid)
4H-PFUnDA	4H-PFUnDA (2H,2H,3H,3H-Perfluoroundecanoic acid)
6:2 FTS	6:2 FTS (6:2 Fluorotelomer sulfonic acid)
8:2 DiPAP	8:2 DiPAP (8:2 Fluorotelomer phosphate diester)
8:2 FTS	8:2 FTS (8:2 Fluorotelomer sulfonic acid)
8:2 FTUCA	8:2 FTUCA (8:2 Fluorotelomer unsaturated carboxylic acid)
9Cl-PF3ONS (F53-B)	9Cl-PF3ONS (F53-B) (9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid)
ADONA	ADONA (ammonium 4,8-dioxa-3H-perfluorononanoate)
EtFOSA	EtFOSA (N-ethyl perfluorooctanesulfonamide)
EtFOSAA	EtFOSAA (perfluorooctanesulfonylamide(N-ethyl)acetate)
HPFHpA	HPFHpA (7H-perfluoroheptanoic acid)
MeFBSA	MeFBSA (N-methylperfluorobutanesulfonylamide)
MeFBSAA	MeFBSAA (perfluorobutanesulfonylamide(N-methyl)acetate)
MeFOSA	MeFOSA (N-methyl perfluorooctanesulfonamide)
MeFOSAA	MeFOSAA (N-methyl perfluorooctanesulfonamidoacetic acid)
P37DMOA	P37DMOA (perfluoro-3,7-dimethyloctanoic acid)
PFBA	PFBA (perfluorobutanoic acid)
PFBS	PFBS (perfluorobutanesulfonic acid)
PFBSA	PFBSA (perfluorobutanesulfonamide)
PFDA	PFDA (perfluorodecanoic acid)
PFDoDA	PFDoDA (perfluorododecanoic acid)
PFDS	PFDS (perfluorodecanesulfonic acid )
PFHpA	PFHpA (perfluoroheptanoic acid)
PFHpS	PFHpS (perfluoroheptanesulfonic acid )
PFHxA	PFHxA (perfluorohexanoic acid)
PFHxDA	PFHxDA (perfluorohexadecanoic acid)
PFHxS	PFHxS (perfluorohexanesulfonic acid)
PFNA	PFNA (perfluorononanoic acid)
PFOA branched	PFOA branched (perfluorooctanoic acid)
PFOA linear	PFOA linear (perfluorooctanoic acid)
PFODA	PFODA (perfluorooctadecanoic acid)
PFOS branched	PFOS branched (perfluorooctanesulfonic acid )
PFOS linear	PFOS linear (perfluorooctanesulfonic acid )
PFOSA	PFOSA (perfluorooctanesulfonamide)
PFPeA	PFPeA (perfluoropentanoic acid)
PFPeS	PFPeS (perfluoropentanesulfonic acid)
PFTeDA	PFTeDA (perfluorotetradecanoic acid)
PFTrDA	PFTrDA (perfluorotridecanoic acid)
PFUnDA	PFUnDA (perfluoroundecanoic acid)

Eurofins Chemtest Ltd  
Attn. Mr. J. King  
Depot Road 11  
GB-CB8 0AL NEWMARKET  
GROOT BRITTANIE

Your reference : 22218  
Our reference : Project 1349910 (concerns updated certificate)  
Validation Ref. : 1349910\_certificaat\_v2  
Verificationcode : HTNS-XQJY-YKIM-YGIF  
Modification : 20/5 Monster omshriving aangepast van 1421449 naar 1421449/1421449 / BH107 en1421450  
naar1421450 / BH105  
Enclosure(s) : 2 table(s) + 1 supplement(s)

Amsterdam, 20 May 2022

I hereby enclose the results of the laboratory tests that have been carried out on your request on the samples that you supplied to us.

I would like to point out to you that the results apply only to the samples supplied, such as these were presented for testing.

The research has been carried out according to the methods that are set out in the current accreditation certificate L086 and/or in the volume "Analysevoorschriften Eurofins Omegam". These protocols are, as far as possible, based on the NEN- EN- and/or ISO standards.

Do also note that the enclosed report may not be copied or reproduced in any way except in its entirety. I trust that we have completed your order as agreed and to your full satisfaction. If you have any questions reading this report, then please don't hesitate to contact our Customer Service.

Yours sincerely,  
On behalf of Eurofins Omegam,



BSc J. Tukker  
Production manager

Conditions of delivery of Eurofins Omegam have been registered.  
This certificate may not be reproduced other than in full, except with the prior written approval of Eurofins Omegam.

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CSOmegam@eurofins.com  
www.eurofins.nl/en

IBAN NL 16 BNPA 0227667980  
Swiftaddress BNPANL2A  
VAT: NL8139.67.132.B01  
Trade register No. 34215654

**CERTIFICATE**

**Project code** : 1349910  
**Your Project Description** : 22218  
**Client** : Eurofins Chemtest Ltd

**Your Sample identification**

7169069 = 1421449/BH107

7169070 = 1421450/BH105

BH107

BH105

<b>Client sampling date</b>	:	<b>27/04/2022</b>	<b>28/04/2022</b>
<b>Date of receipt</b>	:	<b>05/05/2022</b>	<b>05/05/2022</b>
<b>Startdate</b>	:	<b>05/05/2022</b>	<b>05/05/2022</b>
<b>Reference number</b>	:	<b>7169069</b>	<b>7169070</b>
<b>Your Matrix</b>	:	<b>Water</b>	<b>Water</b>

**Organic compounds - per- and polyfluoroalkylsubstances (PFAS)**
*Perfluorinated carboxylic acids:*

PFBA	µg/l	< 0,03	< 0,02
PFPeA	µg/l	< 0,02	< 0,02
PFHxA	µg/l	< 0,02	< 0,02
PFHpA	µg/l	< 0,02	< 0,02
PFOA linear	µg/l	< 0,02	< 0,02
PFOA branched	µg/l	< 0,02	< 0,02
PFNA	µg/l	< 0,02	< 0,02
PFDA	µg/l	< 0,02	< 0,02
PFUnDA	µg/l	< 0,02	< 0,02
PFDoDA	µg/l	< 0,02	< 0,02
PFTTrDA	µg/l	< 0,02	< 0,02
PFTeDA	µg/l	< 0,02	< 0,02
PFHxDA	µg/l	< 0,02	< 0,02
PFODA	µg/l	< 0,02	< 0,02

*Perfluorinated sulfonic acids:*

PFBS	µg/l	< 0,02	< 0,02
PFPeS	µg/l	< 0,02	< 0,02
PFHxS	µg/l	< 0,02	< 0,02
PFHpS	µg/l	< 0,02	< 0,02
PFOS linear	µg/l	< 0,02	< 0,02
PFOS branched	µg/l	< 0,02	< 0,02
PFDS	µg/l	< 0,02	< 0,02

*Perfluorinated alkyl substances - precursors:*

4:2 FTS	µg/l	< 0,05	< 0,05
6:2 FTS	µg/l	< 0,05	< 0,05
8:2 FTS	µg/l	< 0,1	< 0,1
10:2 FTS	µg/l	< 0,05	< 0,05
PFOSA	µg/l	< 0,02	< 0,02

*Perfluorinated alkyl substances - remainder:*

HPFHpA	µg/l	< 0,5	< 0,5
4H-PFUnDA	µg/l	< 0,05	< 0,05
8:2 FTUCA	µg/l	< 0,05	< 0,05
9Cl-PF3ONS (F53-B)	µg/l	< 0,02	< 0,02
ADONA	µg/l	< 0,02	< 0,02
EtFOSA	µg/l	< 0,05	< 0,05
EtFOSAA	µg/l	< 0,02	< 0,02
MeFBSA	µg/l	< 0,02	< 0,02
MeFOSAA	µg/l	< 0,1	< 0,1
P37DMOA	µg/l	< 0,5	< 0,5
PFBSA	µg/l	< 0,02	< 0,02
MeFOSA	µg/l	< 0,05	< 0,05
MeFBSAA	µg/l	< 0,02	< 0,02
8:2 DiPAP	µg/l	< 0,1	< 0,1
sum PFOA	µg/l	<b>0,03</b>	<b>0,03</b>
sum PFOS	µg/l	<b>0,03</b>	<b>0,03</b>

- The frontpage and, where applicable, appendices of this document are integral parts of this certificate.

- Analyses marked with a 'Q' are part of the RvA accreditation certificate L086.

Verificationcode: HTNS-XQJY-YKIM-YGIF

Ref.: 1349910\_certificaat\_v2

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**C E R T I F I C A T E**


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**Project code** : 1349910  
**Your Project Description** : 22218  
**Client** : Eurofins Chemtest Ltd

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## Notes related to analyses

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### General comments

The following information has been provided by the client if applicable:  
 Project description, Sample identificaton, Client sampling date, Client Matrix, Sample depth, Pot number (Barcode), Field data, Field observations and sampling data. The client sampling date can affect the validity of the results.

Quantification of branched PFOS/POA is based on DIN 38414-14.

### Summation of concentrations for group parameters

Summation is calculated according to AS3000 protocol, paragraph 2.5.2 and appendix 3.

---

**Sample identification** : 1421449/BH107  
**Reference number** : 7169069

Results Note(s):  
 perfluorobutanoic acid (PFBA) - Raised reporting limit because of interference by the matrix.

---



**CERTIFICATE**

<b>Project code</b>	: 1349910
<b>Your Project Description</b>	: 22218
<b>Client</b>	: Eurofins Chemtest Ltd

**Appendix Index PFAS**

PFAS component	Full name PFAS component
10:2 FTS	10:2 FTS (10:2 Fluorotelomer sulfonic acid)
4:2 FTS	4:2 FTS (4:2 Fluorotelomer sulfonic acid)
4H-PFUnDA	4H-PFUnDA (2H,2H,3H,3H-Perfluoroundecanoic acid)
6:2 FTS	6:2 FTS (6:2 Fluorotelomer sulfonic acid)
8:2 DiPAP	8:2 DiPAP (8:2 Fluorotelomer phosphate diester)
8:2 FTS	8:2 FTS (8:2 Fluorotelomer sulfonic acid)
8:2 FTUCA	8:2 FTUCA (8:2 Fluorotelomer unsaturated carboxylic acid)
9Cl-PF3ONS (F53-B)	9Cl-PF3ONS (F53-B) (9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid)
ADONA	ADONA (ammonium 4,8-dioxa-3H-perfluorononanoate)
EtFOSA	EtFOSA (N-ethyl perfluorooctanesulfonamide)
EtFOSAA	EtFOSAA (perfluorooctanesulfonylamide(N-ethyl)acetate)
HPFHpA	HPFHpA (7H-perfluoroheptanoic acid)
MeFBSA	MeFBSA (N-methylperfluorobutanesulfonylamide)
MeFBSAA	MeFBSAA (perfluorobutanesulfonylamide(N-methyl)acetate)
MeFOSA	MeFOSA (N-methyl perfluorooctanesulfonamide)
MeFOSAA	MeFOSAA (N-methyl perfluorooctanesulfonamidoacetic acid)
P37DMOA	P37DMOA (perfluoro-3,7-dimethyloctanoic acid)
PFBA	PFBA (perfluorobutanoic acid)
PFBS	PFBS (perfluorobutanesulfonic acid)
PFBSA	PFBSA (perfluorobutanesulfonamide)
PFDA	PFDA (perfluorodecanoic acid)
PFDoDA	PFDoDA (perfluorododecanoic acid)
PFDS	PFDS (perfluorodecanesulfonic acid )
PFHpA	PFHpA (perfluoroheptanoic acid)
PFHpS	PFHpS (perfluoroheptanesulfonic acid )
PFHxA	PFHxA (perfluorohexanoic acid)
PFHxDA	PFHxDA (perfluorohexadecanoic acid)
PFHxS	PFHxS (perfluorohexanesulfonic acid)
PFNA	PFNA (perfluorononanoic acid)
PFOA branched	PFOA branched (perfluorooctanoic acid)
PFOA linear	PFOA linear (perfluorooctanoic acid)
PFODA	PFODA (perfluorooctadecanoic acid)
PFOS branched	PFOS branched (perfluorooctanesulfonic acid )
PFOS linear	PFOS linear (perfluorooctanesulfonic acid )
PFOSA	PFOSA (perfluorooctanesulfonamide)
PFPeA	PFPeA (perfluoropentanoic acid)
PFPeS	PFPeS (perfluoropentanesulfonic acid)
PFTeDA	PFTeDA (perfluorotetradecanoic acid)
PFTrDA	PFTrDA (perfluorotridecanoic acid)
PFUnDA	PFUnDA (perfluoroundecanoic acid)

**Southern Testing**  
**Unit 11**  
**Charlwoods Road**  
**East Grinstead**  
**West Sussex**  
**RH19 2HU**

SPT Hammer Ref: 0208  
Test Date: 12/02/2022  
Report Date: 14/02/2022  
File Name: 0208.spt  
Test Operator: NPB

**Instrumented Rod Data**

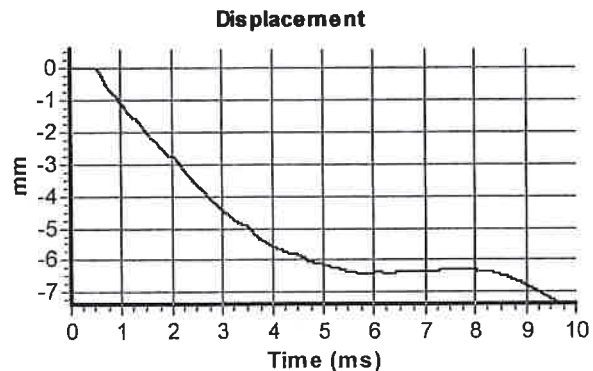
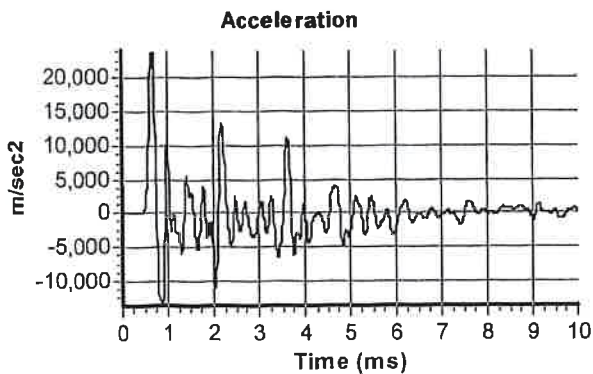
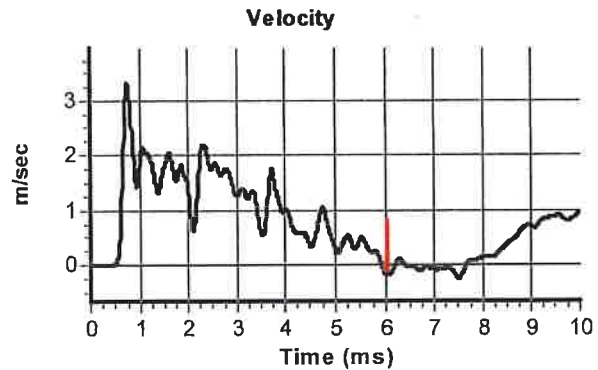
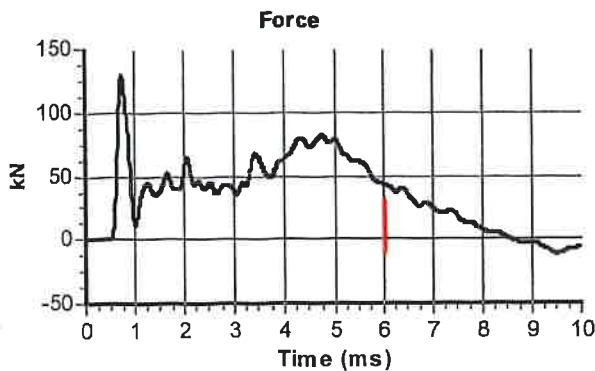
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 64786  
Accelerometer No.2: 64789

**SPT Hammer Information**

Hammer Mass  $m$  (kg): 63.0  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 12.0

**Comments / Location**

CAUSEWAY



**Calculations**

Area of Rod  $A$  (mm<sup>2</sup>): 905  
Theoretical Energy  $E_{theor}$  (J): 473  
Measured Energy  $E_{meas}$  (J): 357

**Energy Ratio  $E_r$  (%):** **76**

*NPBurrows*

Signed: N Burrows  
Title: FOC Manager

The recommended calibration interval is 12 months

**Southern Testing**  
**Unit 11**  
**Charlwoods Road**  
**East Grinstead**  
**West Sussex**  
**RH19 2HU**

SPT Hammer Ref: 0643  
Test Date: 12/02/2022  
Report Date: 14/02/2022  
File Name: 0643.spt  
Test Operator: NPB

**Instrumented Rod Data**

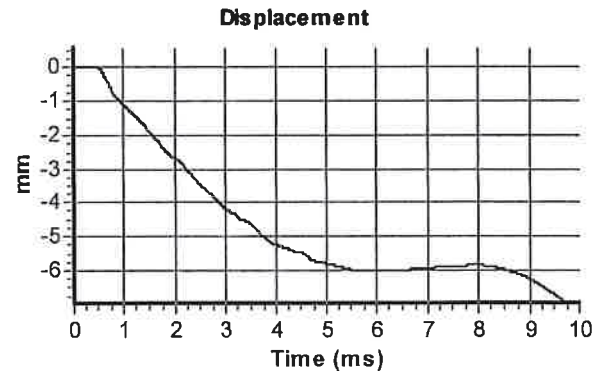
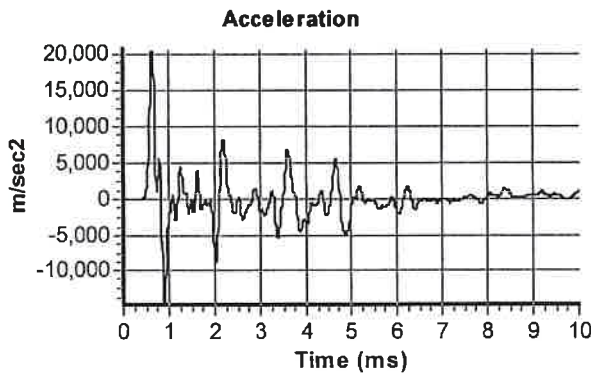
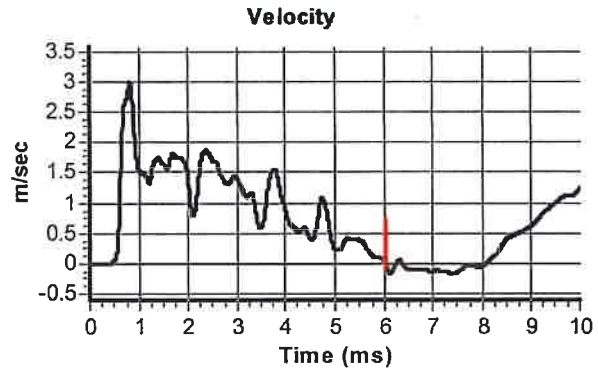
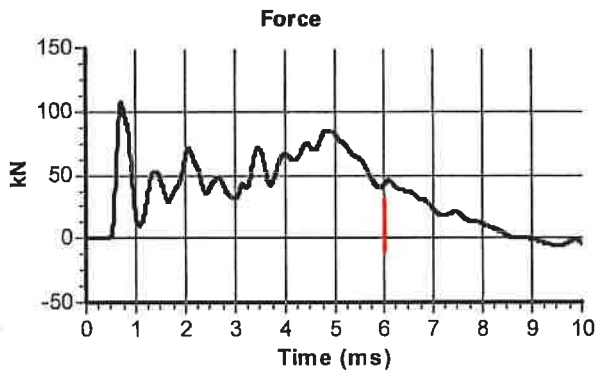
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 64786  
Accelerometer No.2: 64789

**SPT Hammer Information**

Hammer Mass  $m$  (kg): 63.0  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 12.0

**Comments / Location**

CAUSEWAY



**Calculations**

Area of Rod A ( $\text{mm}^2$ ): 905  
Theoretical Energy  $E_{\text{theor}}$  (J): 473  
Measured Energy  $E_{\text{meas}}$  (J): 340

**Energy Ratio  $E_r$  (%):** **72**

*NPB Burrows*

Signed: N Burrows  
Title: FOC Manager

The recommended calibration interval is 12 months

**Southern Testing**  
**Unit 11**  
**Charlwoods Road**  
**East Grinstead**  
**West Sussex**  
**RH19 2HU**

SPT Hammer Ref: 1387  
Test Date: 12/02/2022  
Report Date: 14/02/2022  
File Name: 1387.spt  
Test Operator: NPB

**Instrumented Rod Data**

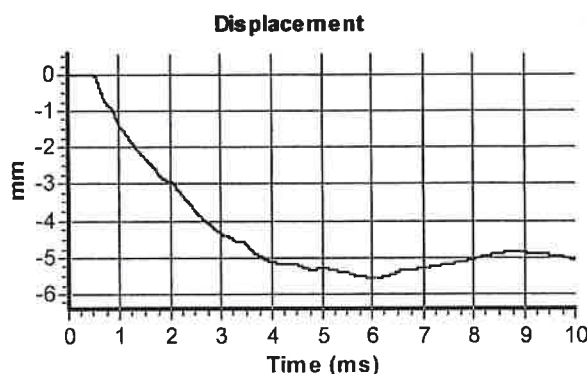
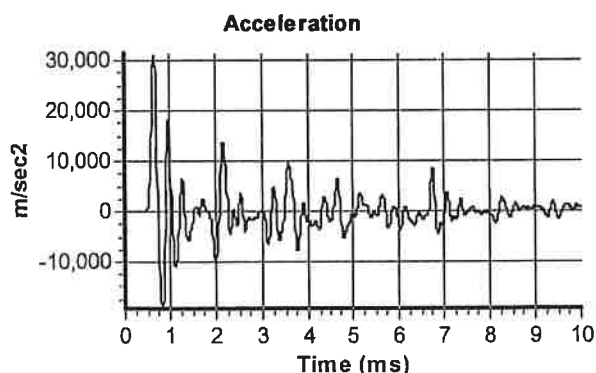
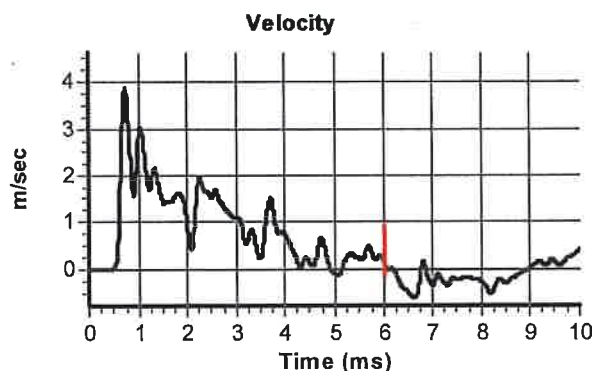
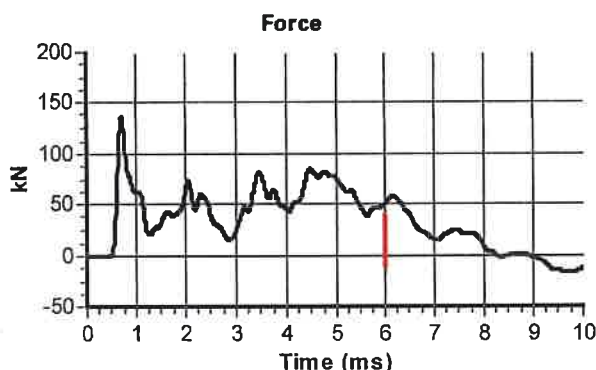
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 64786  
Accelerometer No.2: 64789

**SPT Hammer Information**

Hammer Mass  $m$  (kg): 63.0  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 12.0

**Comments / Location**

CAUSEWAY



**Calculations**

Area of Rod  $A_r$  (mm<sup>2</sup>): 905  
Theoretical Energy  $E_{theor}$  (J): 473  
Measured Energy  $E_{meas}$  (J): 308

**Energy Ratio  $E_r$  (%):**

**65**

*NPB Burrows*

Signed: N Burrows  
Title: FOC Manager

The recommended calibration interval is 12 months



**CAUSEWAY**  
— GEOTECH

**APPENDIX G**

**SPT HAMMER ENERGY MEASUREMENT REPORT**

