

NISA Additional GI – Ground Investigation



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Document Control Sheet

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The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

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

BS 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 Ground Investigation.

Abbreviations used	l 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).
Р	Nominal 100mm diameter undisturbed piston sample.
В	Bulk disturbed sample.
LB	Large bulk disturbed sample.
D	Small disturbed sample.
С	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 strengthVR: 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 Nx5=Cu 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.
\bigtriangledown	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+A1:2020
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.





NISA Additional GI

1 AUTHORITY

On the instructions of ARUP, ("the Client's Representative"), acting on the behalf of Statkraft Limited ("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 a proposed onshore cable route.

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.

All information given in this report is based upon the ground conditions encountered during the ground 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, trial pits, soil and rock core sampling, environmental sampling, groundwater monitoring, 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 agricultural lands north of Balbriggan, County Dublin and extending southwards, as far as Kinsealy, County Dublin. The site works can be split into seven sites; Kinsealy, Malahide West, Blakes Cross South, Blakes Cross North, Oberstown, Courtlough and Balbriggan.





The Kinsealy site is bounded by agricultural land to the north, west and south and the R107 to the east. The Malahide West site is bounded by Kileen Park to the west, the R106 to the south and residential housing to the east. The Blakes Cross South site is bounded by the M1 to the west, agricultural land to the south and north and the R132 to the east. The Blakes Cross North site is bound by the R132 to the east, the R129 to the south and agricultural land to the north and west. The Oberstown site is bounded by the R132 to the east and agricultural land to the north, west and south. The Courtlough site is bounded by the R132 to the east and agricultural land to the north, west and south. The Landfall site is bounded by the R132 to the east and agricultural land to the north, west and south.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between the 23^{rd} of January and the 17^{th} of February 2023, comprised:

- six boreholes by light cable percussion extended by rotary follow-on drilling
- a standpipe installation in four boreholes
- eight machine dug trial pits; and
- an infiltration test performed in one trial pit.

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

4.2 Boreholes

Six boreholes (BH101-BH102 and BH104-BH107) were put down by a combination of light cable percussion boring and rotary follow-on drilling techniques with core recovery in bedrock. Where the cable percussion borehole had not been advanced onto bedrock, rotary percussive methods were employed to advance the borehole to completion. Symmetrix cased full-hole drilling was used, with SPTs carried out at standard intervals as required.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals throughout the overburden 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 I.

Where coring was carried out, 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.

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+A1:2020: Code of practice for ground investigations.*

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

4.3 Standpipe installations

A groundwater monitoring standpipe was installed in BH101, BH102, BH104 and BH106.

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

4.4 Trial Pits

Eight trial pits (TP101–TP108) were excavated using a 10t wheeled excavator fitted with a 600mm wide bucket, to depths of 2.80m.

Environmental samples were taken at depths of 0.50m and 1.00m in each trial pit.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix D presents the trial pit logs with photographs of the pits and arising provided in Appendix E.

4.5 Infiltration test

An infiltration/soakaway test was carried out at one location (SA01) in accordance with BRE Digest 365 - Soakaways (BRE, 2016). The test was conducted in a similarly numbered trial pit.

Appendix F presents the results and analysis of the infiltration test. The absence of the outflow from the pits precluded calculation of infiltration coefficients.





4.6 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 location plan presented in Appendix A shows these as-built positions.

Note: At the time of issuing this report the surveying of exploratory hole locations is still outstanding

4.7 Groundwater monitoring

Following completion of site works, groundwater monitoring was conducted over one round. Ground water monitoring was carried out using a water interface probe.

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, bulk and dry density
- shear strength (effective stress): Consolidated undrained triaxial test
- **compaction related:** dry density/moisture content relationship, Moisture Condition Value, California bearing ratio tests
- soil chemistry: BRE Suite B
- **electrochemical**: thermal conductivity

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 G.





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	ISRM Suggested Methods (1981) Suggested method for determining													
compression	deformability of rock materials in uniaxial compression, Part 2													
strength tests	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 G.

NOTE: At the time of issuing this report, rock testing is ongoing.

5.3 Environmental laboratory testing of soils

Environmental testing, as specified by the Client's Representative was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out according to Arup Test Suite E, testing for a range of determinants, including:

- Metals
- Speciated total petroleum hydrocarbons (TPH)
- BTEX compounds
- Volatile Organic Compounds (VOCs)
- Semi-Volatile Organic Compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)
- Phenols
- Asbestos screen
- Sulphate
- Sulphur
- pH

Results of environmental laboratory testing are presented in Appendix H.





6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise glacial till and alluvium. These deposits are underain by andesite, pillow breccia and mudstone of the Belcamp Formation of the Balbriggan site, dark micrites, calcernites and shales of the Loughshinny Formation of the Courtlough site. Dark limestones and shales of the Malahide and Tober Colleen Formations underly the deposits of the Kinsealy, Malahide West, Blakes Cross North and South and the Oberstown sites.

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:

- **Topsoil:** encountered typically in 200mm thickness across all seven sites.
- **Made Ground (fill):** reworked sandy gravelly clay fill extending to depths ranging between 0.45-2.80m was encountered in TP101-TP103, TP104 and TP107. In addition, red brick and plastic were noted within the made ground in TP102, TP103 and TP107.
- **Glacial Till:** encountered across all seven sites as sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.
- Bedrock (Limestone, Mudstone and Volcaniclastic Conglomerate): Medium strong dark grey limestone at 6.50m in BH101 and 7.20m in BH102 (Kinsealy). Moderately weak dark grey limestone rockhead was encountered at a depth of 8.70m in BH104 (Blakes Cross South). Strong dark grey calcareous mudstone rockhead was encountered at depths ranging from 4.70m in BH106 to 5.00m in BH105 (Blakes Cross North) and strong grey volcaniclastic conglomerate rockhead at 6.90m in BH107 (Balbriggan).

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 the ground investigation as water strikes as shown in Table 1.



TP101

TP104

TP105

TP106

TP107

1.60

1.30

2.30

2.40

2.50



Slow seepage

Slow seepage

Heavy flow

Medium flow

Heavy flow

Table 1. 0	I ouliuwater stilk	es encounter eu uur mg the grounu mvestigation.
Location	Depth (mbgl)	Comments
BH101	1.30	Water rose from 1.30m to 1.20m over 20 minutes

able 1. Groundwater strikes encountered during the ground investigation.

Groundwater was not noted during drilling at borehole locations BH102, BH104-BH107. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any or additional groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out.

It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Subsequent groundwater monitoring of the standpipe installations recorded water levels as shown in Table 2.

Date		Water level (mbgl)										
Date	BH101	BH102	BH104	BH106								
20/02/2023	2.52	1.92	1.82	2.05								

Table 2. Groundwater monitoring.

Continued monitoring of the four installed standpipes will give an indication of the seasonal variation in groundwater level which 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.

Building Research Establishment (2007), BRE Digest 365: Soakaways.



APPENDIX A SITE AND EXPLORATORY HOLE LOCATION PLANS













	CEVAVAV	Project No.:	22-1750	Client:	Statkraft Limited
CAU	GEOTECH	Project Name:	NISA Additional GI	Client's Representative:	ARUP
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GEOTECH	Project Name:	NISA Additional GI	Client's Representative:	ARUP
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Title: Exploratory Hole Location Plan Last Revised: Scale: 13/04/2023 1:1500	bing	The child manufactured with the manufacture of the		70 Metres 200 Feet





APPENDIX B BOREHOLE LOGS

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Casing Details Water Added
To (m) Diam (m) From (m) To (m)
1.40 200 4.00 210 Core Barrel Flush Type Termination Reason
13.00 146 74 74 SK6L Water Terminated at scheduled depth. 13/04/2023 AGS

								Proje	ect No.	Project	Name: NISA Ad	ditional GI				Bor	ehole	ID
						22-	2-1750 Client: Statkraft Limited						BH101					
GEOTECH								Client's	s Rep: ARUP									
Meth	od	Plant I	Used	<u></u>	Top	(m)	Base (m) Coor	Coordinates		epth: 13.00 m	Start Date:	10/02/2023	Driller:	CB BE	She	et 2 o	f 2
Rotary Per	cussion	Comacch	1io 60) 01	1.	0.00 1.40 1.40 4.00		72114	47.00 E		·				+JG	Sca	ale: 1:	50
Rotary C	oring	Comaccr	110 60	01	4.	.00	13.00	74336	67.00 N	Elevatio	evation: 11.07 mOD End Date: 13/02/2023 Logge				HCMc	Mc FINAI		-
Depth (m)	Samples /	Field Records	TCR	SCR	RQD	FI	Casing Water Depth Depth (m) (m)	Level mOD	Depth (m)	Legend		Desc	ription			Water		
											Medium strong dar slightly reduced stre	k grey to black ength, slightly	LIMESTONE. Slig	ghtly weath pacing, ora	nered: ngish			9.5
											brown discolouration penetrating in from	on on some fra hthe fracture si	cture surfaces so urfaces (up to 5r	ometimes nm).				
10.00						1					Discontinuities:							10.0 -
						9					1. 5-10 degree bedo	ding fractures,	medium spaced	(20/205/7	00),			, 10.5
			100	100	76						planar, smooth, pat surfaces.	thcy orangish b	rown staining or	n some frac	cture			-
											2. 15-30 degree joir	nts, widely spa	ced (150/670/10)00), plana	r,			11.0
									(5.35)		smooth, orangish b penetrating in from	rown staining on the fracture s	on joint surfaces urfaces (up to 5r	, sometime nm).	25			-
11.50				<u> </u>		+			-		3. Roughly 55 degre	ee joint at 8.10	m, planar, smoo	th, orangis	h brown			11.5 —
											staining on joint sur	rface penetrati	ng in from the jo	oint surface	e (5mm).			-
			100	100	95	3					4. 70-85 degree joir 10.60-10.70 and 10	nts from 8.30-8).90-11.10m, pl	8.60m, 9.50-9.65 anar, smooth, oi	m, 10.00-1 rangish bro	0.15m, wn			
											staining on joint sur	rfaces.						12.5 — -
																		-
13.00								-1.93	13.00			End of Borel	nole at 13.00m					13.0
																		-
																		-
																		14.0
																		-
																		14.5 —
																		-
																		15.5 -
																		-
																		16.0
																		16.5
									-									
									-									 17.0 —
																		-
																		17.5 — -
																		-
																		18.0
																		- - 18.5
		o. !!	TCR	SCR	RQD	FI			<u> </u>									
Struck at (m) C	Water Casing to (m)	Strikes Time (min)	Rose	e to (r	n) F	rom (m) To	ng Details (m) Tim	5 ne (hh:mm)	Remarks Inspection	; n pit hand dug to 1.20)m.						
1.30	0.00	20	1	1.20		1.20) 1	.40	01:00									
Casing D	Details	Water	Add	ed	-													
To (m) [1 40	Diam (mm) 200	From (m)	To	o (m)	\neg													
4.00	210 146				\vdash	Core	Barrel	Flush	Туре	Termina	tion Reason				Last Up	dated		
						S	K6L	Wa	ater	Terminat	ed at scheduled depth	h.			13/04/	2023	A	GS

								Pro	ject No.	Projec	t Name: NISA Ad	ditional GI				Boreł	nole ID
	C	AUS	E	W	A	Y		22	2-1750	Client:	Statkraft	Limited				BH	102
	- 19	G	GEC	DTE	EC	Н				Client'	s Rep: ARUP					1	
Meth	od	Plant U	Jsed		Тор	(m)	Base (n	n) Co	ordinates		12.00		10/02/2022			Sheet	t 1 of 2
Cable Perc Rotary Per	cussion	Dando : Comacch	2000 10 60))1	0. 1	00 40	1.40 4.00	721	.065.00 E	Final De	eptn: 13.00 m	Start Date:	16/02/2023	Driller: J	IG+CB	Scale	e: 1:50
Rotary Coring Comacchio 601			4.	00	13.00	743	369.00 N	Elevatio	on: 11.39 mOD	End Date:	17/02/2023	Logger:	CMc +GH	FI	NAL		
Depth	Sample /	Fie	Field Records				Casing Wat Depth Dep	Leve	Depth	Legend		Desc	cription			ate Bac	ckfill
(m)	lests						(m) (m	mol	(m)		TOPSOIL: Brown slig	ghtly sandy slig	ghtly gravelly CLA	AY. Sand is fin	ne to	3	-
								11.1	9 - 0.20		coarse. Gravel is sul Firm dark brown sli	brounded fine ghtly sandy sli	to coarse. ghtly gravelly CL	AY. Sand is fir	ne to		-
0.50 0.50 - 1.20	ES3 B1								Ē		coarse. Gravel is rou	unded fine to o	coarse.				0.5 -
1.00	53								Ē		Possible BEDROCK (recovered thr	ough percussive	drilling as an	ngular		-
1.00	ES4							10.1	9 1.20		gravel) Very dense dark gre	ey BOULDER w	rith some clay (re	ecovered thro	ough		-
1.20 1.20 - 1.32	D5 SPT (C)	N=50 (25 for	90m	m/50	for		1.20 0.0	0 9.99	, 1.40		percussive drilling a	is angular grav	vel)				1.5 -
		30mm)						9.79) = 1.60		Firm dark brown sli	ghtly sandy gr	avelly CLAY. (Dril	ler's descript	ion)		-
									Ē		-						2.0
									Ē		-						-
									Ē								2.5 _
									Ē		-						-
									Ē		-						3.0
									Ē		-						
									Ē								
									E 4 00		-						
								7.39)		Very stiff dark greyi gravelly CLAY with I	sh brown sligh ow cobble con	ntly sandy gravell Itent. Sand is fine	ly becoming v e to coarse. G	very Gravel		
									Ē		is angular to subang limestone. Cobbles	gular fine to co are subangula	parse of predomi ar of grey limesto	inantly dark រួ one.	grey		4.5 -
			100	0	0				Ē			are subangula					
									Ē								
									Ē								
5.50						-			(3.15	، من من من من من							5.5
									Ē							••• •••	
									Ē		Angular to subangular fin	e to coarse gravel o	of dark grey limestone.			•••	- <u>1.</u> 6.0
			100	0	0				Ē		Wedium strong dar weathered, slightly	closer fracture	ONE. Slightly we e spacing, orangi	athered: sligi ish brown sta	htly aining		-
									Ē		on some fracture su fracture surfaces (u	urfaces, somet p to 15mm), g	imes penetrating ravelly clay infill	g in from the on some frac	cture		6.5 -
7.00									Ē		surfaces (up to 20m	nm thick).					7.0-
7.00								4.24	7.15		Discontinuities:						-
									Ē		1. 0-15 degree bed	ding fractures,	medium spaced	(20/450/920	0),		7.5 —
			100	90	73						sometimes penetra	ting in from th	taining on some	ces (up to 10	mm),		
									Ē		gravelly clay infill or	n fractures at 7	7.55m and 8.20m	n.			8.0
						6					2. 25-40 degree joir smooth, orangish b	nts, widely spa rown staining	iced (150/835/23 on some joint su	300), planar, Irfaces, some	etimes		
8.50			-								penetrating in from	the fracture s	surfaces (up to 20 n (10mm thick)	0mm thick), g	gravelly		8.5
			90	90	75				Ē		2 70 00 dogroo joir	atc from 7.45	7 EEm 8 E0 8 70	m 11.00.11	15m		-
									Ē		and 11.50-11.80m,	planar, smoot	h, orangish brow	n staining or	n joint		9.0
			TCR	SCR	RQD	FI			-		surraces.						
Chruch at / Ma	Water	Strikes	Do-	to /	0) 5	ro~ '	Chisell	ng Deta	lils	Remark	5						
Struck at (m) C	asing to (m)	Time (min)	ROSE	e to (n	n) F	1.20	<u>m) i</u>	L.40	01:00	Inspectio No groun	n pit hand dug to 1.20 dwater encountered.	lm.					
Casing D	Details	Water	Add	ed													
To (m) [4.00	Diam (mm) 210	From (m) 1.20	1 Tc	o (m) 40	-												
13.00	146					Core	Barrel	Flu	sh Type	Termina	tion Reason				Last Up	dated	
						S	K6L	,	Water	Terminate	ed at scheduled depth	l.			13/04/2	2023	AGS

						Project No.		Io. Project Name: NISA Additional GI				Borehol		rehole ID	, ,		
	C	AUS	E	W	A	Y		22-	1750	Client:	Statkraft	Limited			F	3H102	
	/ –	C	GEC	DTI	EC	Н				Client's	s Rep: ARUP						
Met	hod	Plant U	Jsed		Тор) (m)	Base (m) Coor	dinates	- Final D	12 00 m	Start Data: 16/02/2023	Drillor		Sh	eet 2 of 2	
Cable Pe Rotary Pe	rcussion ercussion	Dando Comaccł	2000 nio 60) 01	0.	.00 .40	1.40 4.00	7210	65.00 E		:ptil. 15.00 m	Start Date: 10/02/2023	Driller.	10+00	S	cale: 1:50	
Rotary	Coring	Comacch	nio 60	01	4.	.00	13.00	7433	69.00 N	Elevatio	n: 11.39 mOD	End Date: 17/02/2023	Logger:	CMc +GH		FINAL	
Depth (m)	Samples ,	/ Field Records	TCR	SCR	RQD	FI	Casing Water Depth Depth (m) (m)	Level mOD	Depth (m)	Legend		Description			Nater	Backfill	
									-		Medium strong dar	k grey LIMESTONE. Slightly v	eathered: sl	ightly staining		9.5	
											on some fracture su	urfaces, sometimes penetrat	ng in from th	he			-
10.00											surfaces (up to 20m	nm thick).	ii on some n	racture		10.0) —
											Discontinuities:						-
											1. 0-15 degree bed	ding fractures, medium spac	ed (20/450/9	920),		10.5	; _
			100	100	79						planar, smooth, ora sometimes penetra	ingish brown staining on son ting in from the fracture sur	e fracture su aces (up to 1	urfaces, 10mm),			-
									(5.85)		gravelly clay infill or	n fractures at 7.55m and 8.2)m.			11.0	,
11 50						-					2. 25-40 degree joir	nts, widely spaced (150/835,	2300), plana	ır, netimes		44 F	-
11.50											penetrating in from	the fracture surfaces (up to	20mm thick), gravelly		11.5	
																12.0	- -
			100	100	93						3. 70-90 degree join and 11.50-11.80m,	nts from 7.45-7.55m, 8.50-8. planar, smooth, orangish bro	/0m, 11.00-1 wn staining	on joint			-
											surfaces.					12.5	;
																	-
13.00								-1.61	13.00			End of Borehole at 13.00r	ı			13.0) —
																-	
																13.5	,
																14.0	-
																14.0	-
																14.5	- ; _
																	_
																15.0	,
																	-
																15.5	;
																	-
																16.0	
																16.5	-
																	-
																17.0) —
																	-
																17.5	; _
																	-
									-							18.0)
																	-
			TCR	SCR	RQD	FI			Ē							18.5	-
Charles for the later	Water	Strikes			-	·	Chisellin	ng Details	5	Remarks					<u></u>		
Struck at (m)	casing to (m)	(min)	INUSE	ະ ເບ (r	ii) F	1.20) 1	.40	01:00	Inspection No groun	n pit hand dug to 1.20 dwater encountered.	ım.					
Casing	Details	Water	Add	ed													
4.00	210	1.20	1	L.40													
13.00	146	146 Core Barr						Flush	Туре	e Termination Reason Las					dated		J
						S	K6L	Water		Terminate	ed at scheduled depth	1.		13/04/2	2023	AG	3

							Proj	ect No.	Project Name: NISA Additional GI	Borehole ID
	⟨ ⟩ (AUS	EV	VAY			22	1750	Client: Statkraft Limited	BH104
	8 -	G	EOT	ECH					Client's Rep: ARUP	
Meth	nod	Plant U	Jsed	Top (n) Base	e (m)	Coo	rdinates	Final Denth: 13.20 m Start Date: 23/01/2023 Driller: MW/+CB	Sheet 1 of 2
Cable Per Rotary Per	cussion rcussion	Dando : Beretta	2000 1 T44	0.00	4.	20 70	7196	56.00 E		Scale: 1:50
Rotary (Coring	Beretta	T44	4.70	13	.20	7515	84.00 N	Elevation: 4.79 mOD End Date: 29/01/2023 Logger: DM	FINAL
Depth (m)	Sample / Tests	Fie	eld Record	s	Casing Depth (m)	Water Depth	Level mOD	Depth (m)	Legend Description	Backfill
(,					(,	(,	4.69	0.10	TOPSOIL: Brown slightly sandy slightly gravelly CLAY. Sand is fine to	>
0.50	567								Coarse. Graver is subrounded fine to coarse.	=
0.50 - 1.20	B1								Content. Sand is fine to coarse. Gravel is subangular fine to coarse.	0.5 -
1.00	D3									1.0
1.00 1.20 - 2.00	ES8 B2									-
1.20 - 1.65	SPT (S)	N=18 (3,4/4,4	4,5,5) Ha	mmer SN	= 0.00	Dry				1.5 —
		1411								_
2.00	D4 89							-		2.0
2.00 - 2.45	SPT (S)	N=20 (4,4/4,4	4,6,6) Ha	mmer SN	= 2.00	Dry				-
		1411					2.09	2.70		2.5 —
3 00	D11						2.05		is fine to coarse. Gravel is subangular fine to coarse.	
3.00 - 4.00	B10		f 245			David				-
3.00 - 3.40	SPT (S)	Hammer SN	= 1411	nm)	3.00	Dry				3.5 —
										-
4.00	D12								<u> 2474</u> 고양31	4.0
4.00 4.00 - 4.14	D6 SPT (S)	N=50 (25 for	60mm/5	0 for	4.00	Dry	0.59	4.20	Very dense dark brownish grey slightly clayey slightly cobbly	_
		80mm) Hami	mer SN =	1411					الله الله الله الله الله الله الله الله	4.5
4.20 - 4.58	SPT(C) N (17.8/8	N=83 3 for								-
	230mm) Hammer	40							5.0 —
	311 - 00	45								
5.70										-
5.70 - 6.15	SPT(C) N (13,12/2	N=50 10,11,13,16)						(3.00)		6.0
	Hamme	r SN = 0643								-
			40							6.5 —
										-
7 20							2 /1	- 7.20		7.0
7.20	SPT(C) N	N=50 (25 for					-2.41	7.20	Control of the second s	_
	3/mm/s 42mm)	Hammer SN							coarse. Cobbles are subangular.	7.5 —
	= 0643		60					(1.50)	further weakened, closer fracture spacing, brown discolouration on	8.0
									Contraction of the second seco	-
									1. 1.0-20 degree fractures medium spaced (50/230/390), planar,	8.5
8.70 8.70 - 8.78	SPT(C) N	√=50 (25 for					-3.91	8.70	2. 45-60 degree fractures medium spaced (100/375/520), planar,	
	40mm/! 35mm)	50 for Hammer SN							smooth and clean. 3. 80-90 degree fractures from 10.30-10.50m and 12.00-12.20m,	9.0
	= 0643		TCR SC	R RQD F						
Struck at (m) (Water	ater Strikes Chise						ls me (bb:mm)	Remarks	
	cooring to (III			4.	00	4.2	20	01:00	No groundwater encountered.	
Casing I	Details Diam (mm)	Water	Added)						
4.20	200	200 0.00 4.20 100 Corre Dourse								
13.20	100			Co	re Bar	rel	Flusi	n Type	Termination Reason Last Upd	lated
					SK6L		W	ater	Terminated at scheduled depth. 13/04/2	O23 AGS

R						Proj	ect No.	No. Project Name: NISA Additional GI				Borehole II		nole ID		
	C	AUS	E	W	A	Y		22-	1750	Client:	Statkraft	Limited			BH	104
	7/ -		GEC	DTE	ECI	Н				Client'	s Rep: ARUP					
Met	hod	Plant L	Jsed		Тор	(m)	Base (r	n) Coor	dinates	Final D	onth : 13.20 m	Start Date: 23/01/2023	Driller: MW	V+CB	Sheef	2 of 2
Rotary Pe	rcussion	Dando Beretta	2000 a T44)	0. 4.	00 20	4.20	7196	56.00 E		.ptil. 13.20 m			VICD	Scale	2: 1:50
Rotary	Coring	Beretta	a T44		4.	70	13.20	7515	84.00 N	Elevatio	4.79 mOD	End Date: 29/01/2023	Logger: DM	1	۶I	I AL
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Wa Depth Dep (m) (n	r Level	Depth (m)	Legend		Description			Vater Bac	kfill
											Moderately weak d	ark grey LIMESTONE. Distinctly	weathered:	on	_	- 9.5
			80			NI					joint surfaces.	closer macture spacing, brown				
											Discontinuities:		(200)		••••	-
10.20									1. 10-20 degree fractures medium spaced (30/230/390), rough with light brown discolouration on joint surfaces.							
											2. 45-60 degree frages smooth and clean.	ctures medium spaced (100/3)	5/520), planar,			10.5 -
			100	95	10						3. 80-90 degree fra planar, rough with l	ctures from 10.30-10.50m and prown discolouration on fractu	12.00-12.20m, re surfaces.		•••	-
									(4 50)							
									- (1100)						• •	
11.70						12			Ē						• • •	
																12.0
															•••	
			100	95	15											12.5 -
															•••	
13.20								-8.41	13.20			End of Borehole at 13 20m			· · · ·	
																13.5 —
																-
																14.0
																-
																14.5
																15.0 -
																-
																- 15.5 —
																-
																-
									Ē							16.5 — -
																- 17.0 —
									Ē							- 17.5 —
									E E							-
									-							18.0 -
																-
			TCR	SCR	RQD	FI			Ē							18.5 —
Charles ()	Water	Strikes	Po-	. to /		ro=- '	Chisell	ing Detail	S	Remarks				I	<u>'</u>	i
Struck at (m)	Casing to (m)	i lime (min)	ROSE	e to (n	n) F	4.00	<u>(m) i</u>	4.20	01:00	Inspection No groun	n pit hand dug to 1.20 dwater encountered.	lm.				
Casing To (m)	Details Diam (mm)	Water From (m)	Add Tr	ed o (m)												
4.20	200	0.00	4	1.20					_	_						
13.20	100 Core Bar						Barrel	Flush	Туре	Je Termination Reason Last					Jated	
		SK6L						Wa	ater	Terminate	ed at scheduled depth	l.	1	13/04/2	.023	AGS

	C	AUS	E	w	A	Y		Project No. 22-1750			Project Name: NISA Additional GI Client: Statkraft Limited	Borehole ID BH105			
	9/ -	G	ΕC	DTI	EC	Н					Client's Rep: ARUP				
Metho Cable Perc Rotary Dr	od cussion rilling	Plant U Dando 2 Comacch	Jsed 2000) 01	Top 0. 3.	o (m) .00 .50	Base (m 3.50 4.00) Co	ordi	nates	Final Depth: 13.00 m Start Date: 09/02/2023 Driller: JG+CB	Sheet 1 of 2 Scale: 1:50			
Rotary Co	oring	Comacch	io 60	01	4.	.00	13.00	752	2642	2.00 N	Elevation: 7.85 mOD End Date: 09/02/2023 Logger: DM+GH	FINAL			
Depth (m)	Sample / Tests	Fie	ld Re	cords			Casing Water Depth Depth (m) (m)	Leve mOE	:)	Depth (m)	Legend Description	Backfill			
								7.74	4	0.10	TOPSOIL: Brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.	-			
0.50	ES1										Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	0.5			
0.50 - 1.20	В3											-			
1.00 1.00	D6 ES2									-		1.0			
1.20 - 2.00 1.20 - 1.65	B4 SPT (S)	N=19 (5,5/5,4	4,5,5)							(1)				
												-			
2.00	D7									-		2.0			
2.00 - 3.00	В5							5.4/	1	2 /0		-			
								5.4	*	2.40	Very stiff dark greyish black slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	2.5			
3.00	20									_					
3.00	00											5.0 -			
								4 34	1	3.50	Stiff dark brown slightly sandy gravelly CLAY Sand is fine to coarse	3.5			
											Gravel is subanagular fine to coarse.	-			
										-		4.0			
					NI					(1 50)					
			100	35	0					(1.50)	(A)	4.3			
								2.84	4	- 5.00	Strong dark grey thinly to thickly laminated calcareous MUDSTONE	5.0			
											with the occasional white calcite veins up to 30mm thick. Slightly weathered: slight weakening slight discolouration	-			
5.50						-						5.5 —			
						11				_	1 5-10 degree fractures medium spaced (40/307/550) planar	-			
			100	97	50	11					smooth and clean.	-			
											2. 45-60 degree fractures medium spaced (110/350/780), planar and rough	6.5 —			
											3, 80-90 degree fractures from 5, 60-5, 70m, 8, 00-8, 50m, 8, 50-8, 70m	-			
7.00										- (8.00)	9.40-9.50m, 9.85-10.00m and 11.30-11.40m, undulating and rough.	7.0			
									Ē	/					
			100	97	25							7.5 — — —			
										-		8.0			
						13			Ē			-			
8.50					-	-						8.5 —			
			97	95	40				Ē	_					
		37 33 40										-			
	TCR SCR RQD FI Water Strikes Chis						Chisellin	ng Deta	ails	ſ	Remarks				
Struck at (m) Ca	Casing to (m) Time (min) Rose to (m) From (m) 3.50						m) To	(m)	Time	(hh:mm)	Hand dug inspection pit excavated to 1.20m.				
	3.50						. 5		U	1.00	no grounawater encountered.				
Casing D	Casing Details Water Added														
To (m) D 3.50	Diam (mm) From (m) To (m) 200 0.00 3.50														
4.00 13.00	210 146	0 6 Core Barre						Flu	sh T	уре	ype Termination Reason Last U				
					S	K6L	Water		er	Terminated at scheduled depth. 13/04/20	AGS				

				v		Proje	ect No.	 Project Name: NISA Additional GI Client: Statkraft Limited 				Borehole ID BH105					
			GE C	DTE		Н		22-:	1750	Client:	Statkraft	Limited		ВН1	105		
Meth	nod	Plant l	Jsed		Тор	(m)	Base (m	Coord	dinates	Cheffe 3	12 00 m	Stort Date: 00/02/2022		Sheet	2 of 2		
Cable Per Rotary D	cussion Drilling	Dando Comacch	2000 nio 6) 01	0. 3.	00 50	3.50 4.00	71959	95.00 E		ptn: 13.00 m		Dimer. JG+CB	Scale:	1:50		
Rotary (Coring	Comacch	10 6	01	4.	00	13.00	75264	42.00 N	Elevatio	n: 7.85 mOD	End Date: 09/02/2023	Logger: DM+GH	FIN	AL		
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Water Depth Depth (m) (m)	Level mOD	Depth (m)	Legend	Strong dark grow th	Description		Aater N Back	fill		
											with the occasional weathered: slight w	white calcite veins up to 30mn reakening, slight discolouration	n thick. Slightly		9.5 —		
10.00											Discontinuities:	0, 0			10.0		
											1. 5-10 degree fract	ures medium spaced (40/307/	550), planar,		-		
			95	95	50						2. 45-60 degree fra	ctures medium spaced (110/35	0/780), planar and		10.5 -		
					50						rough.				11.0		
											3. 80-90 degree fra 9.40-9.50m, 9.85-1	ctures from 5.60-5.70m, 8.00-8 0.00m and 11.30-11.40m, undu	.50m, 8.50-8.70m, Ilating and rough.				
11.50															11.5		
						7									12.0		
			97	97	60												
															12.5 -		
13.00	3.00							-5.16	13.00			End of Borehole at 13.00m			13.0 -		
															125		
															-		
															14.0		
															14.5 —		
															-		
															15.0		
															15.5 —		
															-		
															16.0		
															16.5		
															17.0		
															17.5 —		
															-		
															- 18.0		
			700	000										-	18.5		
,	TCR SCR RQD FI Water Strikes Chise					Chisellin	g Details	i 5	Remarks	i							
Struck at (m)	uck at (m) Casing to (m) Time (min) Rose to (m) From (m) 3.50					m) To) 3	(m) Tim .60	ne (hh:mm) 01:00	Hand dug No ground	inspection pit excava dwater encountered.	ted to 1.20m.						
Casing Details Water Added																	
To (m) 3.50	To (m) Diam (mm) From (m) To (m) 3.50 200 0.00 3.50																
4.00 13.00	210 146 Core Barro						Barrel	Flush	Туре	e Termination Reason La					ast Updated		
		SK6L							ter	Terminate	d at scheduled depth	I.	13/04/	2023	AGS		

							Project No. 22-1750			Project Name: NISA Additional GI	Borehole ID	
			E F			Y			22-:	1750	Client: Statkraft Limited	BH106
Meth	od	Plant I	Isod		Ton	(m)	Basa (r		Coord	linatos	Client's Rep: ARUP	Shoot 1 of 2
Cable Perc	cussion	Dando	2000)	0.	00	3.20		71000		Final Depth: 13.00 m Start Date: 08/02/2023 Driller: JG+CB BE	Scale: 1:50
Rotary Pero Rotary Co	oring	Comacch	io 60)1)1	3. 4.	20 00	4.00		75265	6.00 N	Elevation: 8.19 mOD End Date: 09/02/2023 Logger: DM	FINAL
Depth (m)	Sample / Tests	Fie	eld Re	cords			Casing Wa Depth Dep (m) (n	er th)	Level mOD	Depth (m)	Legend Description	Backfill
								1	8.09	0.10	TOPSOIL: Brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.	
0.50	ES1										Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to	0.5
0.50 - 1.20	В3											
1.00 1.00	D5 ES2											1.0
1.20 - 1.65 1.20 - 2.00 1.20 - 1.65	B4 SPT (S)	N=15 (3 4/4 /	434) Harr	nmer	SN =	0 00 0	00				1.5
		1411	.,_,.	,								
2.00	D7 ES6											2.0 -
2.00 - 2.45 2.00 - 2.50	D9 B10 SPT (S)	N-50 (9 14/5	50 for	· 1/10r	nm)		2 00 0	10	5.69	2.50	Very stiff dark grevish black slightly sandy gravelly CLAY with low	2.5
2.50 - 3.00	B11	Hammer SN	= 141	140	,		2.00 0.				cobble content. Sand is fine to coarse. Gravel is angular fine to	
3.00 - 3.45	D12	N=50 (25 for 76mm/50 for 3.00 0.0 100mm) Hammer SN = 1411										3.0
3.20	SFT (C)	100mm) Hammer SN = 1411 3.00 0.0 23-01-2023 3.00 0.0							4.74	3.45	Stiff dark brown slightly sandy gravelly CLAY. Sand is fine to coarse.	3.5
		23-01-2023 3.00 0									Control of the subangular fine to coarse.	
										4.0		
		NI								(1.25)		4.5
		90 50 10						3	3.49	4.70	Strong dark grey thinly to thickly laminated calcareous MUDSTONE	
											weathered: slight weakening, slight discolouration.	5.0
5.50											Discontinuities:	· · · · · · · · · · · · · · · · · · ·
						11					1. 5-10 degree fractures widely spaced (100/730/1100), undulating and rough.	
			97	95	70						2. 40-50 degree fractures medium spaced (40/280/540), planar,	6.0
			57		/0						smooth and clean.	
7.00										(8.30)		7.0
												7.5
			97	97	50							
												* * <u>8.0</u> _ 8.0
8.50												8.5
			100	97	30							
			100		50							9.0
	Mate	Strikes	TCR	SCR	RQD	FI	Chical	ing D	otaila	<u> </u>	Pemarks	
Struck at (m) C	asing to (m	Time (min)	Rose	e to (r	n) F	rom (m) 1	ing D io (m) 3 20	Tim	e (hh:mm)	Inspection pit hand dug to 1.20m.	
						5.00		5.20		01.00	no groundwater encountered.	
Casing D To (m) D)etails Diam (mm	Water	Add To	ed o (m)								
3.20	200 0.00 3.20 Core Barrel					Barrel		Flush	Type	Termination Reason	dated	
		SK6L							Flush Type T Water T		Terminated at scheduled depth. 13/04/2	2023 AGS

						Proje	ect No.	Io. Project Name: NISA Additional GI					Borehole ID			
	C	AUS	E	W	A	Y		22-:	1750	Client:	Statkraft	Limited			В	H106
	- 12	C	GEC	DTI	EC	Н				Client's	Rep: ARUP					
Met	hod	Plant L	Jsed		Тор	(m)	Base (m)	Coord	linates	Final De	epth: 13.00 m	Start Date: 08/02/2023	Driller:	JG+CB	She	et 2 of 2
Rotary Pe	rcussion	Comacch	2000 nio 60	,)1	3.	20	4.00	71960)4.00 E		· · · · · · · · · · · · · · · · · · ·			BE	Sca	ale: 1:50
Rotary	Coring	Comacch	110 60)1	4.	00	13.00	75265	56.00 N	Elevatio	on: 8.19 mOD	End Date: 09/02/2023	Logger:	DM	F	INAL
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Water Depth Depth (m) (m)	Level mOD	Depth (m)	Legend		Description			Water	Backfill
											Strong dark grey th with occasional veir	inly to thickly laminated calcare ns of white calcite up to 10mm	eous MUDS thick. Sligh	STONE htly		9.5
											weathered: slight w	veakening, slight discolouration	•			-
10.00						1					Discontinuities:					10.0
											 5-10 degree fract and rough. 	tures widely spaced (100/730/1	L100), und	ulating		- - 10.5 —
			97	97	40						2. 40-50 degree fra	ctures medium spaced (40/280	/540), plar	har,		-
						0			-		smooth and clean.					11.0
						8										-
11.50						1										11.5
			100													-
																12.5 -
																-
13.00						-4.81	13.00			End of Borehole at 13.00m				13.0		
																- 13.5 —
																-
																14.0
																-
																14.5 -
																-
																-
																15.5 -
																-
																16.0
																-
																-
																17.0
																-
																17.5 —
																-
																- 18.5 —
	Wator	Strikos	TCR	SCR	RQD	FI	Chicollin	a Dotaila		Pomarke						
Struck at (m)	at (m) Casing to (m) Time (min) Rose to (m) From (m) 3.00							(m) Tim 20	.e (hh:mm) 01:00	Inspection No groun	n pit hand dug to 1.20 dwater encountered.)m.				
Casing	Details	Water	Add	ed												
3.20	Diam (mm) From (m) To (m) 200 0.00 3.20															
		Core Barr							I Flush Type		Termination Reason La					
						S	K6L	Wa	ter	Terminate	ed at scheduled depth	1.		13/04/2	2023	AGS

									Proje	ct No.	No. Project Name: NISA Additional GI				Borehole ID			
		CAUS	E	W	A	Y			22-	1750	Client:	Statkraft	: Limited				E	3H107
	9 -	G	GEC	DTE	ECI	Н					Client's	Rep: ARUP						
Meth	hod	Plant U	Jsed		Тор	(m)	Base	e (m)	Coord	dinates	Final De	opth: 13.00 m	Start Date:	02/02/2023	Driller:	IG+CB	Sh	eet 1 of 2
Rotary 0	rcussion Coring	Comacch	2000 nio 60))1	0. 4.	00 00	4. 13	00 .00	71875	57.00 E							S	cale: 1:50
									76499	98.00 N	Elevatio	n: 32.90 mOD	End Date:	02/02/2023	Logger:	DM+GH		FINAL
Depth (m)	Sample / Tests	Fie	eld Re	cords			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend		Des	cription			Water	Backfill
									32.70	0.20		TOPSOIL: Brown slig	ghtly sandy slig brounded fine	ghtly gravelly CLA to coarse.	AY. Sand is fi	ine to		
0.50	ES1											Firm brown slightly	sandy gravelly	/ CLAY. Sand is fin to coarse.	ne to coarse	. Gravel		- - 0.5 —
0.50 - 1.20	B3																	
1.00	D7																	1.0
1.00 1.20 - 2.00	ES2 B4																	-
1.20 - 1.48	SPT (S)	N=50 (3,4/50 Hammer SN =) for 1 = 141	L35m .1	m)		0.00	Dry										1.5 -
2.00 2.00 - 2.45	D8 SPT (S)	N=18 (3,4/4,4	4,5,5) Ham	nmer	SN =	2.00	Dry										2.0
		1411																2.5 -
2.70 - 3.00	В5								30.20	2.70		Very stiff dark greyi	sh black slight	ly sandy slightly ;	gravelly CLA	AY. Sand		
3.00	D9											is fine to coarse. Gr	avel is subang	ular fine to medi	um.			3.0
3.00 - 4.00 3.00 - 3.32	B6 SPT (S)	N=50 (4,5/50) for 1	L75m	m)		3.00	Dry			مرد المبتري المبتر الهمين (المستري) 							
		Hammer SN :	= 141	.1														3.5 -
																		-
4.00	D10 SPT(S)	N=50 (25 for					4.00	Dry	28.90	4.00		Very stiff brown slig	shtly sandy gra	welly CLAY. Sand	is fine to co	arse.		4.0
4.00 4.05	50mm/	50 for										Graver is Subuliguiu			•			- 4.5 -
	= 1411	nammer siv	100															
																		5.0 —
																		-
5.50		N-20				NI	5.50	0.00		(2.90)								5.5 -
5.50 - 5.95	(5,5/7,8	N-30 3,11,12)																
	натте	er SIN = 1387																6.0 —
			100	10	10													-
																		-
7.00									26.00	6.90		Strong grey mottled	d dark grey VO	LCANICLASTIC CO	ONGLOMER	ATE		7.0 —
												with occasional whi weathered: light br	ite calcite vein own discolour	s up to 10mm th ation on fracture	iick. Slightly e surfaces ai	nd slight		-
												weakening.						7.5 -
			100	97	30	>20						Discontinuities:						
												1.5-15 degree fract smooth with light b	ures medium s prown discolou	spaced (40/205/4 Iration on fractur	450), planaı re surfaces	r,		8.0
8 50												2. 45-60 degree frag	ctures medium	n spaced (100/34	10/620) nla	nar.		-
0.50						L					 2. 45-60 degree fractures medium spaced (100/340/620), planar, rough with light brown discolouration on joint surfaces. 							6.5
		60							3. One 90 degree fr	acture from 8.	.50-8.80m, undul	lating and r	ough.		9.0			
	TCR SCR RQD FI									Ē								
	Water Strikes Chi								g Details	 ;	Remarks	;						
Struck at (m)	ick at (m) Casing to (m) Time (min) Rose to (m) From (m) 4.00								m) Tim 20	ie (hh:mm) 01:00	Hand dug	inspection pit excava	ted to 1.20m.					
											no groun	anater encountered.						
Casing Details Water Added																		
To (m) 4.00	Diam (mm 2010) From (m)	Tc	o (m)	-													
13.00	146 Core Barr								Flush	Туре	Termina	tion Reason				Last Up	dated	
						S	K6L	Water		Terminate	d at scheduled depth	۱.			13/04/2023 AGS			

R									Proje	ect No.	o. Project Name: NISA Additional GI				Borehole ID		ehole ID
	C	CAUS	SE	W	A	Y			22-:	1750	Client:	Statkraft	Limited			В	H107
	/ -	(SEC	TC	ECI	Н					Client's	Rep: ARUP					
Cable Per	hod	Plant Dando	Used	0	Тор	(m)	Base	(m)	Coorc	linates	Final De		Start Date: 02/02/2023	Driller: J	G+CB	She	et 2 of 2
Rotary	Coring	Comacch	nio 6() 01	4.	.00	13.0	20	71875	57.00 E						Sca	ale: 1:50
									76499	}8.00 N	Elevatio	n: 32.90 mOD	End Date: 02/02/2023	Logger:	DM+GH	F	INAL
Depth (m)	Samples	/ Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend		Description			Water	ackfill
											0000	Strong grey mottled with occasional whi	d dark grey VOLCANICLASTIC C ite calcite veins up to 10mm t	ONGLOMERA	ATE		9.5 —
						5						weathered: light brown weakening.	own discolouration on fractur	e surfaces an	d slight		
10.00				\square		$\left \right $					0000 0000 0000	Discontinuities:					10.0
												1.5-15 degree fract	ures medium spaced (40/205,	(450), planar,			10.5 —
			100	97	40							smooth with light b	prown discolouration on tractu	re surfaces.			
										(6 10)	0000	2. 45-60 degree trac rough with light brc	ctures medium spaced (100/3 own discolouration on joint su	40/620), pian rfaces.	iar,		11.0
										(0.10)		3. One 90 degree fr	acture from 8.50-8.80m, undu	lating and ro	ugh.		
11.50						13											11.5 -
																	12.0
			100	95	30						0000						
																	12.5
12.00									19 90	13.00	0000 0000						-
15.00									19.50	13.00			End of Borehole at 13.00m				-
																	13.5 —
																	-
																14.0	
																	- - 14.5
																	-
																	15.0 -
										Ē							
																	15.5 — - -
																	16.0
																	16.5
																	-
									ı								-
																	17.5 -
																	18.0
																	18.5
	TCR SCR RQD FI									<u> </u>							
Struck at (m)	Water Strikes Chis ruck at (m) Casing to (m) Time (min) Rose to (m) From (m)							lling: To (3 Details (m) Tim	ne (hh:mm)	Remarks Hand dug	inspection pit excava	ted to 1.20m.				
	4.00							4.2	20	01:00	No ground	lwater encountered.					
Casing	Details	Water	Add	led	_												
To (m) 4.00	0 (m) Diam (mm) From (m) To (m) 4.00 2010																
13.00	146 Core Barre						Barre	əl	Flush	Туре	pe Termination Reason Last					dated	
		SK6L							Wa	ter	Terminate	d at scheduled depth	1.		13/04/2	2023	AGS



APPENDIX C CORE PHOTOGRAPHS


BH101: 4.00-5.50m

	Project: N. I. S. A.	Project No.: 22-1750	
	BH No.: BH-101	Box: 2 Depth: 5.50-7.00	
(m) 0.1 0.2 0.3	0.4 0.5 0.6	0.7 0.8 0.9 1.0 1.1	1.2 1.3 1.4 1.5
C. Bosto Ja	UDIS SEREN	THE STATES	

BH101: 5.50-7.00m



BH101: 7.00-8.50m



BH101: 8.50-10.00m



BH101: 10.00-11.50m





BH101: 11.50-13.00m





BH102: 4.00-5.50m



BH102: 5.50-7.00m



BH102: 7.00-8.50m

	CAL	SEWAY GEOTECH		Proje	ect: N.I.S	٠A٠	area - the -		Project No	22-17	50		F		7
				вн г	10.: BH-10	12	вох: 4	De	pth: 8.	50-10.	00		E		
(m)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
		N					No.			-					

BH102: 8.50-10.00m



BH102: 10.00-11.50m





BH102: 11.50-13.00m



$\underbrace{\text{MSA Additional GI}}_{\texttt{Constrained}} \underbrace{\text{Rept No.: 22-1750}}_{\texttt{Constrained}} \underbrace{\text{Rept No.: 22-1750}}_{\texttt{Constra$

BH104: 4.70-5.70m



BH104: 5.20-7.20m



BH104: 7.20-8.70m



BH104: 8.70-10.20m



BH104: 10.20-11.70m



NISA Additional GI Export No.: 22-1750

BH104: 11.70-13.20m



NISA Additional GIReport No.: 22-1750Project:MISAProject No.:22-1750mining colspan="2<math>0.50.50.70.80.910111213

BH105 4.00-5.50m



BH105 5.50-7.00m



BH105 7.00-8.50m



BH105 8.50-10.00m



BH105 10.00-11.50m





BH105 11.50-13.00m



Report No.: 22-1750

NISA Additional GI



BH106 4.00-5.50m



BH106 5.50-7.00m



BH106 7.00-8.50m



BH106 8.50-10.00m



BH106 10.00-11.50m





BH106 11.50-13.00m



NISA Additional GIReport No.: 22-1750Image: Constrained by the state of the st

BH107: 4.00-5.50m

D		-		Y	Proj	ect:	NISA			Project	No.: 22-1750) /	J.		H	
					вни	ю.: ВЦ 107		вох: 2		Depth:	5.50-7.00m					
	(m)	<i>C</i> .1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
	ſ			ê e				NÖ 1	This		6	A C		169		

BH107: 5.50-7.00m



BH107: 7.00-8.50m



BH107: 8.50-10.00m



BH107: 10.00-11.50m





BH107: 11.50-13.00m





APPENDIX D TRIAL PIT LOGS

			Proje	ect No.	Project Name:				al Pit ID	
	CAUS	FWAY	22-	1750	NISA A	dditional GI				
		EOTECH	Coor	dinates	Client:			Т	P101	
			7209	39.00 F	Statkra	ft Limited				
Method:			7457	91.00 N	Client's	Representative:		She	et 1 of 1	
Trial Pitting					ARUP	l.		Sca	ale: 1:25	
Plant:			Elev	vation	Date:	Logger		F		
10t Wheeled E	xcavator		7.91	mod	24/01/	2023 RS		-		
(m)	Tests	Field Records	(mOD)	Depth (m)	Legend	Description		Wate		
				-		MADE GROUND: Firm brown slightly gravelly sandy CLAY with I content. Sand is fine to coarse. Gravel is rounded fine to coarse	ow cobble		_	
				-		are rounded.	. cobbies		_	
									_	
				-					_	
0.50 - 0.50 0 50 - 0 50	B3 FS1			-					0.5	
0.50		HVP=43, HVR=9		e a						
				-					_	
				-					-	
1.00 - 1.00	B4			-					1.0	
1.00 - 1.00	£52								_	
1.20 - 1.20	B5			-					_	
				-					_	
				-					1.5	
		Slow seepage at 1.60m		-				▼	-	
				-					-	
			6.11	1.80		End of trial pit at 1.80m			_	
				-					20	
				-					2.0	
				-					_	
									_	
				-					_	
				-					2.5	
				a a						
				-					_	
				-					_	
				-					3.0	
									_	
				-					_	
				-					_	
									3.5 —	
				-					-	
				-					_	
				-					_	
				-					4.0	
				-					_	
									_	
				-					-	
				-					-	
				-					4.5	
				-					_	
				-					-	
				-					-	
Water	Strikes	Depth: 1.80	Rem	arks:						
Struck at (m)	Remarks	width: 1.00								
1.00	1.60m	Length: 2.20								
		Stability:	Tern	nination R	eason		Last Up	dated		
		Unstable	iermination Keason							
	Unstable			mateu at rê	usai UN D	ouraci / possible belli UCK.	13/04/2	_UZ3	AUS	

		Proje	ect No.	Project Name:				Trial Pit ID
CA	USEWAY	22-	-1750	NISA A	dditional GI			TD102
	—GEOTECH	Coor	dinates	Statkra	ft Limited			TP102
Method:		- 7208	88.00 E	Client's	s Representative:			Sheet 1 of 1
Trial Pitting		7458	19.00 N	ARUP				Scale: 1:25
Plant:		Elev	vation	Date:		Logger:		
10t Wheeled Excavato	or	8.46	5 mOD	24/01/	2023	RS		TINAL
Depth Samp (m) Test	le / Field Records	Level (mOD)	Depth (m)	Legend	Description			Mare
Depth (m) Samp Test 0.50 - 0.50 0.50 - 0.50 B2 1.00 - 1.00 B4 1.00 - 1.00 ES3 1.20 - 1.20 B5 2.00 - 2.00 B6	Ie / S Field Records HVP=152, HVR=17	Level (mOD) 8.16 6.76 6.16	Depth (m)	Legend	Description TOPSOIL: Brown slightly sandy slightly gravelly CLAY. 1 coarse. Gravel is subrounded fine to coarse. MADE GROUND: Firm brown slightly sandy slightly gravelly coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. Coarse. MADE GROUND: Firm grey slightly sandy slightly gravelly coarse. Coarse. Gravel is rounded fine to coarse. Sand is fine to coarse. Gravel is rounded fine to coarse. End of trial pit at 2.30m	Sand is fine to	ow ts.	
								4.5
		+		+				
Water Strikes Struck at (m) Re	Depth: 2.30 Width: 0.65 Length: 2.25 Stability: Moderately stable	Rem No g Terr	narks: groundwate nination R	er encou eason	ntered. oulder / possible bedrock.	La	1 st Upda	ted AGS

			Proj	ect No.	Project Name:					al Pit ID
	CAU	SEWAY	22	-1750	NISA A	dditional GI				
HH.		GEOTECH	Coor	dinates	Client:				Т	P103
		GLOTLETT	7107	41 OO F	Statkra	ft Limited				
Method:			- /19/	41.00 E	Client's	s Representative:			She	et 1 of 1
Trial Pitting			/52/	79.00 N	ARUP				Sca	le: 1:25
Plant:			Ele	vation	Date:		Logger:			
10t Wheeled	Excavator		11.93	3 mOD	24/01/	2023	RS		F	INAL
Depth	Sample /	Field Becords	Level	Depth	Legend	Description			ater	
(m)	Tests		(mOD)	(m)		MADE GPOLIND: Firm brown clightly condy clightly gr		with	š	
						rare fragments of red brick. Sand is fine to coarse. Gr	avel is subro	ounded		-
				-		fine to coarse.				_
				-						-
			11.48	0.45						_
0.50 - 0.50 0 50 - 0 50	B1 FS2			-		Gravel is subrounded fine to coarse.	is fine to co	barse.		0.5
0.50 - 0.50	ES4			-	 					_
0.50		HVP=106, HVR=20		-						_
				-						_
1.00 - 1.00	в3			-						1.0
				-						_
1.20 - 1.20	В5			-						_
				-						_
				-						_
			10.43	- 1.50	·····	End of trial pit at 1.50m				1.5 —
				-						-
				-						_
				-						-
				-						-
				-						2.0
				[_
				-						_
				-						_
				-						2.5
				-						-
										-
				_						-
				-						-
				-						3.0
				-						_
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				Ē						_
				-						4.0
				-						-
				-						_
				-						-
				-						-
				E						4.5
				-						_
				-						_
				-						_
				-					+	
Wate	er Strikes		Ren	narks:	1					
Struck at (m)	Remark	Depth: 1.50	No g	groundwat	er encou	ntered.				
. ,		Width: 0.65								
		Length: 2.00								
		Stability:	Terr	nination R	eason			Last Upd	ated	
		Stable	Term	ninated at re	fusal on b	oulder / possible bedrock.		13/04/2	023	AGS
1										ACO

VILLOW VILLOW<				Proj	ect No.	Project		Trial Pit ID	
Vieweit Coordinates Clent: T2049 Mathical: 7356000 Starkard United Sta		CAUS	SFWAY	22-	-1750	NISA A	dditional GI		
Number 72520000 Statutar 1 immedia Maren 1 inf 1 Print: Statu 7 Statu 7 <thstatu 7<="" th=""> Statu 7 Statu 7</thstatu>		(GEOTECH	Coor	dinates	Client:			TP104
Method: 72238.00 Control Special of 1 ARUP Special of 2 Special of 2 200/2023 Mode Mode Special of 2 200/2023				7195	69.00 E	Statkra	ft Limited		
Pintal Pintal Description Solution MUB Description Solution Solution Description Table / Pintal S.5 H TOO 24.00.2/2.23 Description Solution Solution <t< td=""><td>Method:</td><td></td><td></td><td>7523</td><td>88.00 N</td><td>Client's</td><td>s Representative:</td><td></td><td>Sheet 1 of 1</td></t<>	Method:			7523	88.00 N	Client's	s Representative:		Sheet 1 of 1
Pient Diet Doby Doby Doby Secondor Find Records Defin Secondor Red Records Kole Pient Decide Records Secondor	Trial Pitting			, 020		ARUP	1-		Scale: 1:25
Out Deskti Partial Redd Records Loss mode Control Contro Control Control <	Plant:			Elev	vation	Date:	Logger:		ΓΙΝΔΙ
Depth Simple / End Field Records (red) Repth (red) (red) Repth </th <th>10t Wheeled</th> <th>Excavator</th> <th></th> <th>8.54</th> <th>l mOD</th> <th>24/01/</th> <th>2023 RS</th> <th></th> <th></th>	10t Wheeled	Excavator		8.54	l mOD	24/01/	2023 RS		
0.00 0.00 <th< td=""><td>Depth (m)</td><td>Sample / Tests</td><td>Field Records</td><td>Level (mOD)</td><td>Depth (m)</td><td>Legend</td><td>Description</td><td>Water</td><td></td></th<>	Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water	
0.00-0.00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00 0.00-00	,			1	-		MADE GROUND: Firm brown slightly sandy slightly gravelly CLAY with	low	
900-950 85 100-100 100 100-100							cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are rounded.		
0.00 0.00					-				_
0.00-0.00 0.00 05 05 100-100 050 100-100					F				_
0.00-0.50 0.00 652 0.00 nup-s6, nv8c0 7.94 0.60 0.00 0.00 0.00 0.00 0.	0.50 - 0.50	B1			-				0.5
0.00 0.00 00	0.50 - 0.50	ES2		7.94	0.60		Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse		-
100-100 83 Sow scepage 2t 1.30m 6.54 2.00 End of majpit 42 200m 4	0.50		HVP=95, HVR=0				Gravel is rounded fine to coarse.		-
1.00 - 1.00 1.00 - 1.00 - 1.00 1.00 - 1.00 - 1.00 1.00 - 1.00 - 1.00 - 1.00 1.00 - 1.0					-				-
1.00-1.00 85 Sow seepage at 1.30m 5.54 2.00 End of thist pit at 2.00m 4<					-				-
Line Loc Line Loc <thline loc<="" th=""> Line Loc <thl< td=""><td>1.00 - 1.00</td><td>B3 FS4</td><td></td><td></td><td>-</td><td></td><td></td><td></td><td>1.0</td></thl<></thline>	1.00 - 1.00	B3 FS4			-				1.0
Lab Lab Sow seepage at 1.30m Sow seepage at 1.30m Sow seepage at 1.30m End of trial pit at 2.00m Image: Control pit at	1.00 1.00	254			-				-
2.00 - 2.00 86 86 6.54 2.00 End of trial plat 2.00m 1 </td <td>1.20 - 1.20</td> <td>82</td> <td>Slow seenage at 1.20m</td> <td></td> <td>E</td> <td></td> <td></td> <td></td> <td></td>	1.20 - 1.20	82	Slow seenage at 1.20m		E				
200-2.00 B6 55 2.00 End of trial pt at 2.00m I			Slow seepage at 1.30m						
2.00 - 2.00 86 6.54 2.00 End of that pit at 2.00m I 1 </td <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>1.5 —</td>					-				1.5 —
2.00 - 2.00 B6 5.54 2.00 End of this pet at 2.00m I </td <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>_</td>					-				_
2.00-2.00 B6 6.54 2.00 End of trial pit at 2.00n H 1 2.00-2.01 B6 Field End of trial pit at 2.00n H 1 1 1 <					-				_
200-2.00 B6 6.54 2.00 End of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Control of thial pl at 2.00n Image: Contro of thial pl at 2.0					-				-
2.00 - 2.00 66 6.54 2.00 2.00 End of trial pit at 2.00m 1 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td></td<>									-
Note: Note: <th< td=""><td>2.00 - 2.00</td><td>B6</td><td></td><td>6.54</td><td>- 2.00</td><td><u></u></td><td>End of trial pit at 2.00m</td><td></td><td>2.0</td></th<>	2.00 - 2.00	B6		6.54	- 2.00	<u></u>	End of trial pit at 2.00m		2.0
Value Value <th< td=""><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td>-</td></th<>					-				-
Value Image: Stability in the stability in th					-				-
Variante Image: Stability: Stab					-				-
Water Struck at (m) Remarks: Remarks: Additional at refusal on boulder / possible bedrock. Last Updated Last Updated <thlast th="" updated<=""> Last Updated Last</thlast>					-				25
Image: Struck at (m) Remarks: 1.30 Sovepage I Moderately stable Terminated at refusal on boulder / possible bedrock.					-				
water water Pert: 2.00 With: 0.65 I.300 Pert: 2.00 With: 0.65 Lengt: 2.40 Pert: 2.40					-				_
Vate Image: Struck at (m) Remarks: Partin: 2.00 Moderately stable Image: Struck at (m) Remarks: Image: Struck at (m) Remarks: <td< td=""><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td>_</td></td<>					-				_
Material (m) Remarks Path: 2.00 Noterately stable Path: 2.00 Noterately stable Image: Control (Control (Contro) (Control (Control (Contro) (Control (Con					-				-
Struck at (m) Remarks Struck at (m) Remarks 1.30 Slow senger at (1.30) Vidti: 0.65 Struck at (m) Remarks 1.30 Slow senger at (1.30) Vidti: 0.65 Struck at (m) Remarks: Struck at (m) Remarks Struck at (m) Remarks:					-				3.0
Struck at (m) Remarks: Image: Slow seepage at 1.30 Depth: 2.00 Midt: 0.65 Image: Slow seepage at 1.30 Image: Slow seepage at 1.30 Slow seepage at 1.30 Slow seepage at 1.30 Terminated at refusal on boulder / possible bedrock. Image: Slow seepage at 1.30 Terminated at refusal on boulder / possible bedrock. Image: Last Update Slow seepage at 1.30 Terminated at refusal on boulder / possible bedrock. Image: Last Update Slow seepage at 1.30 Image: Last Update Slow seepage at 1.30 Terminated at refusal on boulder / possible bedrock. Image: Last Update Slow seepage at 1.30 Image: Last Update					-				-
Value Value Perter 2.00 Struck at (m) Remarks 1.30 Vidth: 0.65 Perter Value Value<					-				-
Value Value <td< td=""><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td>-</td></td<>					-				-
Value Image: Starting and Starting an									25
Water Strikes Depth: 2.00 Marks					-				
Water Strikes Pepth: 2.00 Remarks: I.30 Pepth: 2.00 Remarks: Image: Strike of the strike of					-				_
Water Struck at (m) Remarks: 1.30 Jow seepage at 1.30m Struck at (m) Remarks: 1.30m Jow seepage at 1.30m Struck at (m) Remarks: 1.30m Jow seepage at 1.30m Stability: Termination Reason Moderately stable Terminated at refusal on boulder / possible bedrock.					-				_
Struck at (m) Remarks 1.30 Slow seepage at 1.30m Struck at (m) Remarks 1.30 Slow seepage at 1.30m Stability: Termination Reason Stability: Termination at refusal on boulder / possible bedrock.					-				-
since					- -				4.0
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$ \begin{array}{ c c c c c } \hline \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $					-				4.5
$ \begin{array}{ c c c c c } \hline \ \ \ \ \ \ \ \ \ \ \ \ \$					-				
$ \begin{array}{ c c c c c } \hline \ \ & \ & \ & \ & \ & \ & \ $					F				
Image: constraint of the second s					-				-
Water Strikes Depth: 2.00 Remarks: Struck at (m) Remarks Width: 0.65 1.30 Slow seepage at 1.30m Length: 2.40 Stability: Termination Reason Last Updated 13/04/2023 Moderately stable Terminated at refusal on boulder / possible bedrock. 13/04/2023					<u> </u>				
Struck at (m) Remarks Weptit. 2.00 1.30 Slow seepage at Width: 0.65 1.30m Length: 2.40 Stability: Termination Reason Last Updated Moderately stable Terminated at refusal on boulder / possible bedrock. 13/04/2023	Wate	r Strikes	Donth: 2.00	Rem	narks:	1	1		1
1.30 Slow seepage at 1.30m With: 0.05 Length: 2.40 Length: 2.40 Stability: Termination Reason Moderately stable Terminated at refusal on boulder / possible bedrock.	Struck at (m)	Remark	s peptn: 2.00						
Length: 2.40 Stability: Termination Reason Moderately stable Terminated at refusal on boulder / possible bedrock.	1.30	Slow seepag	ge at viath: 0.65						
Stability: Termination Reason Last Updated Moderately stable Terminated at refusal on boulder / possible bedrock. 13/04/2023		1.30m	Length: 2.40						
Moderately stable Terminated at refusal on boulder / possible bedrock. 13/04/2023			Stability:	Tern	nination R	eason	Las	t Upda	ted
			Moderately stable	Term	ninated at re	efusal on b	oulder / possible bedrock. 13	/04/202	²³ AGS

			Proj	ect No.	Project Name:				ial Pit ID
	CAUS	SEWAY	22-	-1750	NISA A	dditional GI			
		GEOTECH	Coor	dinates	Client:			•	TP105
			7194	16 00 F	Statkra	ft Limited			
Method:			7556	02.00 N	Client's	s Representative:		Sh	eet 1 of 1
Trial Pitting			/330	02.00 N	ARUP			Sc	ale: 1:25
Plant:			Elev	vation	Date:	Logger	:		ΕΙΝΙΛΙ
10T Excavator			22.41	l mOD	23/01/	2023 MRG			
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water	
(,			(-		TOPSOIL: Brown slightly sandy slightly gravelly CLAY with fine ro	ootlets		
				-		(0.5-2.0mm). Sand is fine to coarse. Gravel is subrounded fine t	o coarse.		_
			22.16	0.25	XXXX	Firm light brown slightly sandy slightly gravelly SILT. Sand is fine	e to		_
				-	XXXX	coarse. Gravel is subrounded fine to medium.			_
0.50	B3			-	$\times \times \times$				0.5 —
0.50 - 0.50 0.50	ESI			-	$\times \times \times$				-
				-	$ \times \times \times $ $ \times \times \times \rangle$				-
			21.61	- 0.80		Firm to stiff grey slightly sandy gravelly CLAY with medium cobb	ole		_
1 00 - 1 00	F\$2					content. Sand is fine to coarse. Gravel is subangular fine to coar	rse.		1.0
1.00 1.00	202			-					_
1.20	B5			-	a				-
					a 1000				-
				-					_
1.50	ES4			-					1.5 —
				-					_
				-	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				_
				-	0 0 0 0 0 0 0 0 0 0 0				_
				-					2.0
				-	μα				_
				-	÷a : 10° 0 0 0 0 0 0 0 0 0 0 0 0 0 0				-
		Heavy flow at 2.30m		-			1	▰	-
				-	1000 000 000 000				-
				-	1000 (0000 (000 (0000 (0000) (0000 (0000 (0000) (0000 (0000) (0000 (0000) (0				2.5
2.70	ES6		19.71	2.70	4 10° 0	5 1 (1 1 1 1 1 2 2			_
				-		End of that pit at 2.70m			_
				-					-
				-					3.0
				-					-
				-					-
				-					_
				-					3.5 —
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				-					-
				⊢ [4.0
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				-					_
				-					4.5
				-					_
				-					_
				-					_
				-					
14/at -	r Strikes		Rom	narks [.]					
Struck at (m)	Remarks	Depth: 2.70	neil						
2.30	Heavy flow	at Width: 1.00							
	2.30m	Length: 2.20							
		Stability:	Tern	nination R	eason		Last Upd	atec	
		Moderately stable	le Terminated at refusal on boulder / possible bedrock. 13/04					023	AGS
	1						1		

			Proj	ect No.	p. Project Name:				l Pit ID
	CAUS	SEWAY	22-	1750	NISA A	dditional GI			
		GEOTECH	Coor	dinates	Client:			TF	P106
		01011011	7192	76 00 F	Statkra	ft Limited			
Method:			7558	65 00 N	Client'	s Representative:		Shee	et 1 of 1
Trial Pitting			/330	05.00 1	ARUP			Sca	e: 1:25
Plant:			Elev	vation	Date:	Logger	•	E'	ΝΑΙ
101 Excavator		1	23.72	2 mOD	23/01/	2023 MRG		· · ·	
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description		Water	
				-		TOPSOIL: Brown slightly sandy slightly gravelly CLAY with very f	ine fino to		_
			23.52	0.20		coarse.	line to		_
				a.		Firm light brown slightly sandy slightly gravelly CLAY. Sand is fin coarse. Gravel is subangular fine to medium	e to		-
				-					_
0.50	B3 FS1			-					0.5
0.50	231			ar G					_
				-					_
			22.87	0.85	× ×	Light grey and brown very sandy silty subangular fine to coarse	GRAVEL.		_
1.00	B4			-	Ô × .	Sand is fine to coarse.			1.0
1.00 - 1.00	ES2			-	Ô × .				-
1.20	B5			-	Û × v				-
				-	Î x				_
				-	×.				1.5
				-	×.				-
				-	××				-
				97 97	××				-
			24.72	-	××				-
			21.72	- 2.00		Stiff grey sandy gravelly CLAY with medium cobble content. San	ıd is fine		2.0
				-		to coarse. Graver is subangular line to coarse.			_
				-					-
		Medium flow at 2.40m		-			-	⊈	_
2.50	B6		21.22	- 2.50	<u>. 414.551</u>	End of trial pit at 2.50m			2.5
				• •					_
				-					_
				-					_
				-					3.0
				-					_
				-					_
									_
				-					3.5
				-					-
				-					-
				-					_
				-					4.0
				-					_
				-					_
				-					-
				-					-
				-					4.5
				-					_
				-					_
				-					-
Water	Strikes	Depth: 2.50	Rem	arks:					
Struck at (m)	Remarks	Width: 1.10							
2.40	2.40m	Length: 2.70							
		Stability:	Tern	nination R	eason		Last Upd	ated	
		Stabla	Torre	insted st	fusal on h	oulder / possible bedrock	12/04/2	022	
	Stable			inialed at re	nusäi on b	ouiuei / possible bedrock.	13/04/20	772	AUS

		Proj	ect No.	p. Project Name:				al Pit ID	
	CALIS	SEWAY	22-	1750	NISA A	dditional GI			
		GEOTECH	Coor	dinates	Client:			דן	P107
		GLOTLETT	7105	02 00 F	Statkra	ft Limited			
Method:			/185	83.00 E	Client's	s Representative:		She	et 1 of 1
Trial Pitting			/585	66.00 N	ARUP			Sc	ale: 1:25
Plant:			Elev	vation	Date:	Logger:	:		
10T Excavator			35.33	8 mOD	23/01/	2023 MRG		F	INAL
Depth	Sample /	Field Records	Level	Depth	Legend	Description		ater	
(m)	Tests		(mOD)	(m)	- Cegenia	MADE GROUND: Dark brownich grev sandy clavey angular fine t	o coarse	Š	
			55.20	0.05		GRAVEL with low cobble content and fragments of red brick, pla	stic and		-
						cootlets. Sand is fine to coarse. Cobbles are subangular.	fine to		-
			35.03	- 0.30		coarse GRAVEL with low cobble content. Sand is fine to coarse.	Cobbles		_
				-		are subangular.			-
0.50 0.50 - 0.50	B3 ES1			-		Sand is fine to coarse. Gravel is angular fine to medium.	JIY JILI.		0.5
0.50				-					
				-					_
				-					_
1.00 - 1.00	ES2			-					1.0
				-					-
1.20	B5			-					-
				-					-
				-					_
1.50	B4			-					1.5 —
			33.73	1.60		MADE GROUND: Light brown gravelly very silty fine to coarse SA	ND with		_
				-		low cobble content. Gravel is angular fine to coarse. Cobbles are subrounded.	5		_
									_
			33.33	- - 2.00			1. 6		2.0
				-		to coarse.	na is fine		-
				-					_
2.30	B6			-					-
				-					_
		Heavy flow at 2.50m		-					2.5 —
									-
			22.52	-					_
			32.53	2.80		End of trial pit at 2.80m			_
				-					3.0
									_
				-					-
				-					_
									_
				-					3.5 —
				-					-
				-					-
									_
				L					4.0
				-					
				-					_
				-					-
				-					_
				-					4.5
				-					_
				-					-
				-					_
				-					
	n Chuilter		Rom	arke					
Struck at (m)	r Strikes	Depth: 2.80	Ken						
2.50	Heavy flow	width: 0.80							
	2.50m	Length: 3.40							
		Stability:	Tern	nination R	eason		Last Up	dated	
		Linstable	Torre	unated at re-	fucal car l	oulder (possible bedrock	12/04/	2022	
	Unstable			Terminated at refusal on boulder / possible bedrock. 13/04/					

			Proj	ect No.	Projec	ד	rial Pit ID	
	CAUS	SEWAY	22-	-1750	NISA A	dditional GI		
		GEOTECH	Coor	dinates	Client:			TP108
			7186	85.00 F	Statkra	ft Limited		
Method:			7650	83.00 N	Client'	s Representative:	S	neet 1 of 1
Trial Pitting					ARUP	1-		icale: 1:25
Plant:			Elev	vation	Date:	Logger:		FINAL
101 Rubber D	UCK		31.85	5 mOD	23/01/			
(m)	Tests	Field Records	(mOD)	(m)	Legend	Description	Wate	
				-		TOPSOIL: Brown slightly sandy slightly gravelly CLAY with medium roots (2.0-5.0mm). Sand is fine to coarse. Gravel is subrounded fine to coarse		_
			31.64	0.20		Firm light growich brown clightly condy clightly growelly CLAV with low	_	
				-		cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse		-
				-		Cobbles are angular.		-
0.50 - 0.50 0.50	ES1			-				0.5
				-				_
0.80 - 0.80	В3			-				
			30.94	0.90		Firm greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to	-	-
1.00 - 1.00	ES2			-		coarse. Gravel is subangular fine to coarse.		1.0
1 20 1 20	DE			-				_
1.20 - 1.20	65			-				_
				-				_
1.50 - 1.50	B4			-				1.5 —
				-				-
			30.14	- 1.70		Light greyish brown sandy slightly clayey subangular fine to coarse	1	-
				-		GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are angular.		_
			29.84	- 2.00	+0 +0		_	2.0
				-		Stiff greyish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		-
				-				-
2.30 - 2.30	B6		29.54	2.30	<u>1997 (1997)</u> (1	End of trial pit at 2.30m	-	-
				-				25
				-				
				-				-
				-				-
				-				-
				-				3.0
				-				-
				-				-
				-				-
				-				3.5 —
				-				_
				-				_
				-				
				-				4.0
				-				
				-				
				-				
				-				4.5 —
				-				
				-				-
				-				_
				-			—	
Wate	r Strikes	Donth: 2.30	Rem	narks:	1	1		1
Struck at (m)	Remarks	Width: 1.15	No g	groundwat	er encou	ntered.		
		length: 2.50						
		Ctability		ninetic: P	0000	· · · · ·		a -
		Stability:	ierr	mination R	eason	Last U	puate	
Moderately stable			Term	nnated at re	etusal on b	poulder / possible bedrock. 13/04	/2023	AGS

			Proje	ect No.	Projec	Name:			Tri	ial Pit ID
	CAUS	FWAY	22-	·1750	NISA A	dditional GI				
		GEOTECH	Coor	dinates	Client:					SA01
			7189	97 00 F	Statkra	ft Limited				
Method:			7640	02.00 N	Client'	s Representative:			She	eet 1 of 1
Trial Pitting			7049.	92.00 N	ARUP				Sc	ale: 1:25
Plant:			Elev	<i>v</i> ation	Date:		Logger:		ſ	
10t Wheeled I	Excavator		30.24	i mOD	23/01/	2023	MRG			INAL
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description			Water	
			(- (,		TOPSOIL TOPSOIL: Brown slightly sandy slightly gravelly	y CLAY with	i fine	-	
			20.04	0.20		rootlets (0.5-2.0mm). Sand is fine to coarse. Gravel is s	ubrounded	fine to		_
			30.04	0.20		Firm greyish brown slightly sandy slightly gravelly CLAY	. Sand is fin	ie to		
				ŀ		coarse. Gravel is subangular fine to coarse.				_
0.50 - 0.50	ES1			F						0.5
0.50 - 0.50	ES3			F						_
				Ĺ						_
0.80 - 0.80	B4			L L						_
				ŀ						_
1.00 - 1.00	ES2			F						1.0
1.20	DE			f						_
1.20	82			Ē						
				Ĺ						_
			28.74	- 1.50						1.5
				F		End of that pit at 1.50m				_
				F						-
				È						_
				ŀ						_
				 -						2.0
				F						_
				f						_
				Ĺ						
				+						2.5
				F						_
				F						_
				Ē						_
				-						-
				 -						3.0
				F						-
				F						_
				Ĺ						
				ŀ						3.5 —
				F						-
				F						-
				ŧ						_
				Ĺ						-
				 -						4.0
				F						-
				f						_
				Ē						
				ŀ						4.5
				F						_
				F						_
				Ē						_
				- -						-
Wate	r Strikes	Depth: 1.50	Rem	iarks:						
Struck at (m)	Remarks	Width: 0.40	NO g	groundwat	er encou	nterea.				
		Length: 1.97								
		Stability		nination P	02025			Lact	date d	
		Stability.			casuii			Last Opt	Jaied	
		Stable	Term	inated at sc	heduled o	lepth.		13/04/2	2023	AGS



APPENDIX E TRIAL PIT PHOTOGRAPHS

Report No.: 22-1750



TP101





Report No.: 22-1750



TP101





Report No.: 22-1750





Report No.: 22-1750





Report No.: 22-1750



TP101



TP101



Report No.: 22-1750



TP101



TP101



Report No.: 22-1750



TP101



Report No.: 22-1750



TP101







Report No.: 22-1750



TP102



TP102



Report No.: 22-1750



TP102



TP102



Report No.: 22-1750





Report No.: 22-1750



TP102


Report No.: 22-1750



TP102



TP102



April 2023

Report No.: 22-1750



TP103



April 2023

Report No.: 22-1750



TP103





Report No.: 22-1750



TP103





Report No.: 22-1750



TP103



April 2023

Report No.: 22-1750



TP103









April 2023

Report No.: 22-1750





Report No.: 22-1750



TP104





Report No.: 22-1750





Report No.: 22-1750



TP104





Report No.: 22-1750



TP104



April 2023





Report No.: 22-1750



TP104

















Report No.: 22-1750



TP105





Report No.: 22-1750





Report No.: 22-1750



TP105





Report No.: 22-1750



TP105



April 2023

Report No.: 22-1750



TP105





Report No.: 22-1750



TP106





Report No.: 22-1750









Report No.: 22-1750





Report No.: 22-1750





Report No.: 22-1750





Report No.: 22-1750



TP106





Report No.: 22-1750



TP106





Report No.: 22-1750



TP107





Report No.: 22-1750





Report No.: 22-1750



TP107





Report No.: 22-1750



TP107





Report No.: 22-1750





Report No.: 22-1750




Report No.: 22-1750





Report No.: 22-1750



TP107



Report No.: 22-1750



TP108









Report No.: 22-1750



TP108





Report No.: 22-1750





Report No.: 22-1750



TP108



Report No.: 22-1750



TP108





Report No.: 22-1750





Report No.: 22-1750





Report No.: 22-1750



SA01



Report No.: 22-1750



SA01



Report No.: 22-1750



SA01



Report No.: 22-1750



SA01



Report No.: 22-1750



SA01



Report No.: 22-1750



SA01



Report No.: 22-1750



SA01



SA01





APPENDIX F SOAKAWAY TEST RESULTS



Soakaway Infiltration Test



Project No.:	22-1750
Site:	NISA
Test Location:	SA101
Test Date:	23 rd Janua

0.10

0.00

Test Date:	23 rd Janu	uary 2023									
test pit top test pit base test p	o dimensions e dimensions oit depth (m)	width (m) 0.40 0.40 1.50	length (m)Analysis using method as described in BRE Digest1.92and CIRIA Report C697-The SUDS Mar0.45depth to groundwater before adding water (m) = Dry								
time (mins) 0 1 2 4 6 8 10 15 20 25 30 45 60	depth to water surface (m) 0.76 0.76 0.76 0.76 0.76 0.76 0.76 0.75 0.75 0.75 0.75 0.75 0.75	depth of water in pit (m) 0.74 0.74 0.74 0.74 0.74 0.74 0.74 0.74	From graph below: test start - 75% depth at 0.555 m water depth time is not determined test end - 25% depth at 0.185 m water depth time is not determined infiltration rate (q) is very low								
time (mins)	depth to water (m)	depth of water in pit (m)	timevolume of elapsedArea of walls and base at 50% dropq(mins)(m³)(m²)(m/min)(r						q (m/h)		
0.80 0.70 0.60 (m) 0.50 0.50 0.30 0.30											

time (mins)



APPENDIX G GEOTECHNICAL LABORATORY TEST RESULTS





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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

SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

6 April 2023

Project Name:	NISA Additional GI
Project No.:	22-1750
Client:	Statfkraft Limited
Engineer:	ARUP

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 09/03/2023 and 06/04/2023.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd











BRITISH

DRILLING ASSOCIATION Project Name: NISA Additional GI

Report Reference: Rock Schedule 2

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.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	2

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties	Standard	No. of results
	measured/Range of	specifications	included in
	measurement		the report
ROCK – subcontracted to MATtest Limited (UKAS 2643)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	2

• C/	USEV		r	Point Load Strength Index Tests														
Project No	GEO	TECH		Summary of Results														
2	2-1750			FIOJE	CUNAIN	e				NISA	Additio	nal Gl						
Borehole	Sa	ample		Spe	ecimen	Book Type	Test see	Type SRM	alid (Y/N)		Dime	nsions		Force P	ent diameter, De	Point Strengtl	Load h Index	Remarks (including
No.	Depth	Ref.	Туре	Ref.	Depth	косктуре	Type (D, A, I, B)	Direction (L, P or U)	Failure Va	Lne	W	Dps	Dps'	KN1	B Equival	Is	Is(5 0)	water content if measured)
BH105	7.00	2	с	2	7.00	LIMESTONE	A	U	NO		101.3	85.0	81.0	6.8	102.2	0.7	0.9	
BH106	12.70	2	с	2	12.70	LIMESTONE	D	U	YES	107.3	101.9	101.9	99.0	11.6	100.4	1.1	1.6	
Test Type D - Diametral, A - Axial, I - Irregular Lump, B - Block Diametral Diametral L - parallel to planes of weakness P - perpendicular to planes of weakness U - unknown or random Dimensions Dps - Distance between platens (platen separation) Dps' - at failure (see ISRM note 6) Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P						P Dps												
Test performed in Detailed legend fo	Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise Detailed legend for test and dimensions, based on ISRM, is shown above.							Date Printed Approved By										
Size factor, F = (De/50)0.45 for all tests. LAB 17R - Version 5									Steph	nen V	Vatson		testing 10122					

LABORATORY TEST CERTIFICATE

Certificate No :

To :

Client :

23/274 - 02-1 Stephen Watson

Causeway Geotech Limited 8 Drumahiskey Road Ballymoney Co. Antrim BT53 7QL



10 Queenslie Point Queenslie Industrial Estate 120 Stepps Road Glasgow G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org Website: www.mattest.org

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from NISA Add GI and delivered to our laboratory on 16th March 2023.

Material & Source

:	See Report Plate
:	Client
:	Not Supplied
:	See Report Plate
:	Rock Core
:	Not Supplied
:	16th March 2023 Onwards
:	22-1750 - NISA Add GI
	: : : : : : :

Test Results

As Detailed On Page 2 to Page 3 inclusive

Comments

The results contained in this report relate to the sample(s) as received Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks

Approved	for	lssue
----------	-----	-------

- <u>All</u>

T McLelland (Director)



06/04/2023



CAUSEWAY GEOTECH LIMITED NISA ADD GI



BOREHOLE		BH105]
SAMPLE		C1	
DEPTH	m	5.90-6.30	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.32	
SAMPLE HEIGHT	mm	205.50	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	2.5	
TEST DURATION	min.sec	5.43	
DATE OF TESTING		05/04/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	813.9	
UNCONFINED COMPRESSIVE STRENGTH	MPa	100.9	
WATER CONTENT (ISRM Suggested Methods)	%	0.1	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.72	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.71]

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

Page 2 of 3

CAUSEWAY GEOTECH LIMITED NISA ADD GI



BOREHOLE		BH106	
SAMPLE		C1	
DEPTH	m	12.10-12.50	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.21	
SAMPLE HEIGHT	mm	201.13	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	0.9	
TEST DURATION	min.sec	2.10	
DATE OF TESTING		05/04/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	113.3	
UNCONFINED COMPRESSIVE STRENGTH	MPa	14.1	
WATER CONTENT (ISRM Suggested Methods)	%	0.7	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.70	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.68	

BOREHOLE			
SAMPLE			
DEPTH	m	SAMPLE FAILURE SHAPES	
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%	External Internal	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³		
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³		

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

Page 3 of 3



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> ROI: +353 (0)1 526 7465 Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

6 April 2023

Project Name:	NISA Additional GI
Project No.:	22-1750
Client:	Statfkraft Limited
Engineer:	ARUP

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 09/03/2023 and 06/04/2023.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd











BRITISH

DRILLING ASSOCIATION Project Name: NISA Additional GI

Report Reference: Rock Schedule 3

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.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	4

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties Standard		No. of results
	measured/Range of	specifications	included in
	measurement		the report
ROCK – subcontracted to MATtest Limited (UKAS 2643)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	3

• C/			-	Point Load Strength Index Tests														
Project No.	910	I L C II		Project Name							y OI	Res	uits					
2	2-1750			NISA Additional GI														
Borehole	Sa	ample	-	Spe	cimen	Pock Type	Test see	Type ISRM	alid (Y/N)		Dime	ensions		Force P	ent diameter, De	Point Strengtl	Load n Index	Remarks (including
No.	Depth	Ref.	Туре	Ref.	Depth	Nock Type	Type (D, A, I, B)	Direction (L, P or U)	Failure V.	Lne	W	Dps	Dps'	kN	B Equival	Is MPa	Is(5 0) MPa	water content if measured)
BH101	7.80	1	с	2	7.80	LIMESTONE	D	U	YES	54.9	101.7	101.7	99.0	2.7	100.3	0.3	0.4	
BH101	11.80	3	с	2	11.80	LIMESTONE	A	U	YES		101.4	105.0	100.0	11.7	113.6	0.9	1.3	
BH102	8.00	2	с	2	8.00	LIMESTONE	D	U	YES	112.2	101.3	101.3	97.0	8.3	99.1	0.8	1.1	
BH102	10.40	3	с	2	10.40	LIMESTONE	А	U	YES		100.9	89.0	84.0	12.0	103.9	1.1	1.5	
Test Type D - Diametral, A - Direction L - parallel to plan P - perpendicular U - unknown or ra Dimensions Dps - Distance be Dps' - at failure (s Lne - Length from W - Width of sho	Axial, I - Irre es of weakr to planes of ndom tween plate see ISRM no platens to r ortest dimen	egular I ness weakn ns (pla ote 6) nearest sion pe	Lump, I less aten se free el erpendi	Axial Block P - Block Diametral Axial Block Irregular lump pps b W W W W P pps b p														
Test performed in Detailed legend fo Size factor, F = (I	accordance or test and d De/50)0.45	e with Is imension for all t	SRM S ons, ba ests.	uggested Methods : 2007, unless noted otherwise Date Printed Approved By ased on ISRM, is shown above. 04/03/2023 00:00 UKAS														
	LAB 17R - Version 5 Stephen Watson 10122						10122											

LABORATORY TEST CERTIFICATE

Certificate No :

To :

Client :

23/274 - 02-2

Stephen Watson

Causeway Geotech Limited 8 Drumahiskey Road Ballymoney Co. Antrim BT53 7QL



10 Queenslie Point Queenslie Industrial Estate 120 Stepps Road Glasgow G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org Website: www.mattest.org

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from NISA Add GI and delivered to our laboratory on 16th March 2023.

Material & Source

:	See Report Plate
:	Client
:	Not Supplied
:	See Report Plate
:	Rock Core
:	Not Supplied
:	16th March 2023 Onwards
:	22-1750 - NISA Add GI
	: : : : : : :

Test Results

As Detailed On Page 2 to Page 3 inclusive

Comments

The results contained in this report relate to the sample(s) as received Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks

Approved	for	lssue
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- T.M.

T McLelland (Director)



06/04/2023



CAUSEWAY GEOTECH LIMITED NISA ADD GI



BOREHOLE		BH101]
SAMPLE		C2	
DEPTH	m	11.50-11.80	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	100.81	
SAMPLE HEIGHT	mm	217.27	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.9	
TEST DURATION	min.sec	2.05	
DATE OF TESTING		05/04/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	237.2	
UNCONFINED COMPRESSIVE STRENGTH	MPa	29.7	
WATER CONTENT (ISRM Suggested Methods)	%	0.7	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.68	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.67	

BOREHOLE			
SAMPLE			
DEPTH	m	SAMPLE FAIL	URE SHAPES
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%	External	Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³		
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³		

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

Page 2 of 3

CAUSEWAY GEOTECH LIMITED NISA ADD GI



BOREHOLE		BH102	1
SAMPLE		C1	
DEPTH	m	7.50-7.95	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.11	
SAMPLE HEIGHT	mm	201.53	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	2.2	
TEST DURATION	min.sec	2.52	
DATE OF TESTING		05/04/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	338.2	
UNCONFINED COMPRESSIVE STRENGTH	MPa	42.1	
WATER CONTENT (ISRM Suggested Methods)	%	1.3	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.64	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.61]



BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

Page 3 of 3



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www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

2 March 2023

Project Name:	NISA Additional GI
Project No.:	22-1750
Client:	Statfkraft Limited
Engineer:	ARUP

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 31/01/2023 and 02/03/2023.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd













Project Name: NISA Additional GI

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.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	21
SOIL	Liquid and Plastic Limits of soil-4 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	19
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	16
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	18
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	16
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	3
SOIL	Moisture Condition Value at natural moisture content	BS 1377-4: 1990: Cl 5.4	8
SOIL	Moisture Condition Value / Moisture Content Relationship	BS 1377-4: 1990: Cl 5.5	2
SOIL	California Bearing Ratio (CBR)	BS 1377-4: 1990: Cl 7	3

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Eurofins Chemtest Ltd (UKAS 2183)	BRE Test - Suite B		8
SOIL – Subcontracted to Professional Soils Ltd (UKAS 4043)	Determination of Thermal Conductivity by Thermal Needle Probe Procedure	ASTM – D5334-14 Documented In-House Method No.: TMP 033	24

CAUSEWAY GEOTECH		Summary of Classification Test Results												
Project No.		Project	Project Name											
22-1	750	Sar	mplo				NISA	Additic	onal GI					
Hole No.	Ref	Тор	Base	Туре	Specimen Description	Dens bulk Mg/m	dry 13	W %	Passing 425µm %	LL %	PL %	РІ %	Particle density Mg/m3	Casagrande Classification
BH101	6	1.20	1.40	в	Brown gravelly clayey fine to coarse SAND.	1.90	1.70	11	47	48	27	21		CI
BH102	1	0.50	1.20	в	Brown sandy slightly gravelly silty CLAY.	1.75	1.33	30	90	36	19	17		CI
BH104	3	1.00	1.00	D	Brown sandy slightly gravelly silty CLAY.			27	61	36	20	16		CI
BH104	10	3.00	4.00	в	Greyish brown sandy slightly gravelly silty CLAY.	1.94	1.70	14	71	34	17	17		CL
BH105	4	1.20	2.00	в	Greyish brown sandy slightly gravelly silty CLAY.	2.16	1.86	16	54	34	17	17		CL
BH105	5	2.00	3.00	в	Greyish brown sandy slightly gravelly silty CLAY.			13	57	35	18	17		CL/CI
BH106	4	1.20	2.00	в	Greyish brown sandy slightly gravelly silty CLAY.	1.92	1.62	20	76	36	19	17		CI
BH106	12	3.00	3.45	D	Greyish brown sandy slightly gravelly silty CLAY.			22	52	40	25	15		MI/CI
BH107	6	3.00	4.00	в	Greyish brown silty CLAY.	1.95	1.70	14	64	31	17	14		CL
SA01	5	1.20		в	Greyish brown sandy slightly gravelly silty CLAY.	1.92	1.63	19	77	39	21	18		CI
TP101	4	1.00	1.00	В	Greyish brown sandy slightly gravelly silty CLAY.	2.02	1.77	14	73	29	16	13		CL
TP102	4	1.00	1.00	в	Greyish brown sandy slightly gravelly silty CLAY.	1.94	1.61	20	79	33	21	12		CL
All tests performed in accordance with BS1377:1990 unless specified otherwise LAB 01R Version 6														
Key Density Linear n	test neasure	ment unles	s :	Liquid I 4pt con	_imit Particl ie unless : sp - sn	e density nall pyknom	ieter	Date F	Printed 22/02/20	23	Appr	oved	Ву	
wd - water displacement wi - immersion in water		cas - C 1pt - sir	asagrande method gj - ga: ngle point test	s jar					Step	hen	Watson	TESTING 10122		
	JSE GEC	WAY DTECH			Summar	y of C	las	sific	ation	Test	Res	sult	S	
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Project No.	75.0		Project	Name				۸ ما جا ۱۰۰						
22-1	750	Sar	mple			Dono		Additio	Donal GI		ы	ы	Porticlo	
Hole No.	Ref	Тор	Base	Туре	Specimen Description	bulk Mg/n	dry n3	%	425µm %	%	%	%	density Mg/m3	Casagrande Classification
TP103	3	1.00	1.00	в	Greyish brown sandy slightly gravelly silty CLAY.	2.00	1.55	27	80	47	25	22		CI
TP104	6	2.00	2.00	в	Greyish brown sandy slightly gravelly silty CLAY.	1.89	1.66	13	62	27	18	9		CL
TP105	3	0.50		в	Greyish brown sandy slightly gravelly clayey SILT.	2.04	1.55	33	93	54	31	23		МН
TP106	3	0.50		в	Greyish brown sandy slightly gravelly silty CLAY.	2.06	1.72	23	74	39	23	16		CI
TP106	5	1.20		В	Greyish brown sandy slightly gravelly silty CLAY.			21						
TP107	3	0.50		в	Greyish brown slightly sandy clayey SILT.	1.92	1.25	57	98	70	47	23		MH/MV
TP107	6	2.30		в	Greyish brown sandy subangular fine to coarse GRAVEL.			11						
TP108	5	1.20	1.20	в	Greyish brown sandy slightly gravelly silty CLAY.	1.99	1.64	23	78	41	22	19		CI
TP108	6	2.30	2.30	В	Greyish brown sandy slightly gravelly silty CLAY.	2.24	1.95	14	65	33	18	15		CL
All tests perfor	ned i	n accord	lance wit	h BS1	377:1990 unless specified	otherwis	e				1	1	LAB	01R Version 6
Key Density Linear n	test neasure	ment unles	s :	Liquid I 4pt con	Limit Particl	e density nall pyknom	neter	Date F	Printed 22/02/20	23	Appr	oved	Ву	
wd - wa wi - imr	ter displ	acement in water		cas - C 1pt - sii	asagrande method gj - ga ngle point test	s jar					Sten	hen	Watson	TESTING 10122





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



Approved

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0.3 0.212

0.15

0.063

	CAUSEWAY	P	ARTICLE SIZE	DISTRIBUTION	l	Job Ref			22-1750
•	GEOTECH					Borehole/P	Pit No.		BH104
Site	e Name	NISA Additional	GI			Sample No			10
Spe	ecimen Description	Greyish brown sar	ndy slightly gravelly si	ilty CLAY.		Sample	Тор		3.00
			Specimen			Depth (III)	Base		4.00
Spe	ecimen Reference	8	Depth	3	m	Sample Typ	be		В
Tes	t Method	BS1377:Part 2:199	90, clauses 9.2 and 9.	5		KeyLAB ID		Ca	aus202301313
	CLAY	SILT		SAND		GRAVEL		COBBLES	BOULDERS
	100	ne Medium	Coarse Fine	Medium Coa	rse Fine	Medium	Coarse	·	
	90								
	00								
	80								
%	70						_		
ssing	60			/					
e Pas	50								
entage	40								
rerce									
-	30								
	20								
	10								
	0								
	0.001	0.01	0.1	1 Dortiolo Siz	o	10		100	100
				Particle Siz	e mm				
	Sie	eving	Sedime	ntation	Dry I	Mass of same	nle σ		506
	Particle Size mm	% Passing	Particle Size mm	% Passing	Diyi		510, 5		300
	125	100	0.06300	48	Sample Pro	portions			% dry mass
	90	100	0.04912	44	Cobbles				0.0
	75	100	0.03496	42	Gravel				18.9
	63	100	0.02505	38	Sand				33.1
	50 27 F	100	0.01794	34	Silt				32.0
	28	100	0.00344	23	Clay				10.0
	20	100	0.00480	19	Grading Ana	alveis		I	
	14	99	0.00150	13	D100		mm		
	10	97			D60		mm	1	0.174
	6.3	92	∦────┤		D30		mm		0.0109
	5	89			D10		mm		
	3.35	86			Uniformity (Coefficient		1	
	2	81			Curvature C	oefficient		1	
	1.18	78			·			-	
	0.6	73	Particle density	(assumed)	Remarks				
	0.425	71	2.65	Mg/m3	Preparation and	testing in accordar	nce with BS1377-	2 :1990 unless	noted below
	0.3	67							
	0.0								
	0.212	63							170 1121 - 1121



Approved

48

0.063





Approved

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0.063



Remarks

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



Approved

69

66

63

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54

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Particle density

2.65

(assumed)

Mg/m3

0.6

0.425

0.3

0.212

0.15

0.063

	CAUSEWAY			ייסדאס			Job Ref		22-1750
	GEOTECH	р Р		אופוע			Borehole/I	Pit No.	BH107
Sit	e Name	NISA Additional	GI				Sample No).	6
							Sample	Тор	3.00
Sp	ecimen Description	Greyish brown slit	ty CLAY.				Depth (m)	Base	4.00
Sp	ecimen Reference	8	Specimen Depth		3	m	Sample Ty	pe	В
Te	st Method	BS1377:Part 2:199	90, clauses 9.2 and 9.	.5			KeyLAB ID		Caus202301318
	CLAY	SILT	Coorco Eino	SAND		Fino	GRAVEL	Coorco	COBBLES BOULDERS
	100								
	90								
	80								
_	70								
g %									
ssin	60								
e Pa:	50								
tage									
cen	40								
Per	30								
	20	+ + + + + + + + + + + + + + + + + + + +		_					
	10								
	0	0.01	0.1		1		10		100 1000
				Ρ	article Size	mm			
	Sie	ving	Sedime	ntation		Dry	Mass of sam	nlo a	507
	Particle Size mm	% Passing	Particle Size mm	% Pass	sing	DIYI		pie, g	507
	125	100	0.05905	95		Sample Prov	nortions		% dry mass
	90	100	0.04464	90		Cobbles	portions		0.0
	75	100	0.03232	82		Gravel			2.5
	63	100	0.02321	77		Sand			2.6
	50	100	0.01677	70		Silt			62.4
	37.5	100	0.00891	60 47		Сіаў			32.5
	20	100	0.00271	40		Grading Ana	alysis		
	14	100	0.00148	25		D100		mm	
	10	99				D60		mm	0.00894
	6.3	99				D30		mm	0.00181
	5	98 98	┨─────┤			Uniformity (Coefficient	mm	
	2	98	1			Curvature Co	oefficient		
	1.18	97				L			
	0.6	97	Particle density	(assumed)		Remarks			
	0.425	97	2.65	Mg/m3		Preparation and	testing in accorda	nce with BS1377-	2 :1990 unless noted below
	0.3	96	-						
	0.212	96	-						(F
	0.063	95	╢						
		Approved]				
		Stenhen Wate	son		1		LAB 05R -	Version 6	10122
		Stephen wats	5011		1		-	-	10122



Remarks

Mg/m3

2.65

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



Approved

67

64

60

55

47

0.425

0.3 0.212

0.15

0.063



Remarks

Mg/m3

2.65

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



Approved

67

63

58

50

43

0.425

0.3

0.212

0.15

0.063



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



Approved

Mg/m3

2.65

Stephen Watson

70

67

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55

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0.425

0.3

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0.063





Approved

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Approved

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T€	est M	ethod		BS13	77:F	Part 2:19	990, c	claus	ses 9	9.2 a	and 9	9.5												Ke	уLА	BI	2							Ca	us2	023	013	312	1	
		CLAY	Fir		S	SILT	6	area	_		Fino		S	SAN	D		6	arec			Fin	_		GR Me	AV	EL		Cor	area		6	COE	BBLE	ES		BOL	JLDE	ERS	;	_
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	Pa	article Siz	e mm	9	% Pa	assing	P	arti	cle S	ize i	mm		%	Pas	ssin	g					C	Dry	Ma	ass	of	san	npl	e,	g							503	3			
	-	125			1	00	╢	(0.06	190				6	5	-	_		[Sam	ple	Pro	ро	rtic	ns										% (dry i	mas	55		
		90			1	00		(0.04	737				5	7				(Cobl	bles	i														0.0)			
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Stephen Watson

LAB 05R - Version 6

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10122

Approved

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		CAUSEWAY			STDID			Job Ref		22-1750
Site Name NISA Additional GI Sample No. 3 Specimen Description Greych brown slightly andy dayey SIT. Depth m) Sample No. 3 Specimen Description Greych brown slightly andy dayey SIT. Depth m) 0.5 m Sample No. 8 Test Method B1377 Par 2:1990; clauses 9.3 and 9.5 KeyABI ID Canu20220212127 Understand GLAV Test Method Gase Test Method Cases OWNUSL Coase OWNUSL	×,	GEOTECH		ANTICLE SIZE DI				Borehole/F	Pit No.	TP107
Specimen Description Graph thrown slightly sindy darys SIT. Sample (n) Graph (n) <thgraph (n)<="" th=""> Graph (n) <thgraph (n)<="" td="" th<=""><td>Si</td><td>te Name</td><td>NISA Additional (</td><td>GI</td><td></td><td></td><td></td><td>Sample No</td><td>).</td><td>3</td></thgraph></thgraph>	Si	te Name	NISA Additional (GI				Sample No).	3
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Sr	pecimen Description	Grevish brown sligh	htly sandy clayey SILT				Sample	Тор	0.50
Specimen Reference 9 Specimen Decimen 0.5 n Sample Type B Text Method \$31377.Part 21390, daues 9.2 and 9.5 KryLAB ID Cauz022031327 CLAY Free Method Coarse Free Method Coarse Free Method Coarse Coar		becimen Description	Greyish brown sign	intry sandy clayey Sier.				Depth (m)	Base	
	Sp	ecimen Reference	9	Specimen Depth		0.5	m	Sample Ty	ре	В
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20 100 0.00270 41 14 100 0.00146 29 10 100 0.00146 29 10 100 0.00146 29 10 100 0.00146 29 11 100 0.00146 29 11 100 0.00146 29 11 100 0.00154 100 11.18 97 0.00100 0.00154 11.18 97 0.00100 0.00100 0.6 96 Particle density (assumed) 0.425 96 2.65 Mg/m3 0.15 87 0.063 80 0.0015 0.00100 0.00100 Approved LAB 05R - Version 6 10122		28	100	0.00456	51		Carealise			
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Approved

Stephen Watson

LAB 05R - Version 6

testing 10122



10122

Approved

	JSEV GEOT	VAY			Moisture Condi	tion Valu Summa	e at Natu rv of Res	ral Moist	ure Conte	ent
Project No			Project N	Jame		• • • • • • • • • • • • • • • • • • • •	.,			
22-	1750		1 10,0001	lanio		NISA	Additional GI			
Hole No.		Sar	nple	-	Specimen Description	Retained on 20mm sieve	Moisture Content <20mm	Moisture Condition Value	Method of Interpretation	Remarks
	Ref	Гор	Base	туре		%	%			
TP101	4	1.00	1.00	в	Greyish brown sandy slightly gravelly silty CLAY.	2	25	7.8	Best fit line	
TP102	5	1.20	1.20	в	Greyish brown sandy slightly gravelly silty CLAY.	4	16	6.9	Best fit line	
TP103	1	0.50	0.50	в	Greyish brown sandy slightly gravelly silty CLAY.	2	25	10.9	Best fit line	
TP104	5	1.20	1.20	В	Greyish brown sandy slightly gravelly silty CLAY.	2	11	11.8	Best fit line	
TP105	3	0.50		в	Greyish brown sandy slightly gravelly clayey SILT.	9	33	11.3	Best fit line	
TP106	4	1.00		В	Greyish brown sandy slightly gravelly silty CLAY.	7	21	too wet	Best fit line	
TP107	3	0.50		в	Greyish brown slightly sandy clayey SILT.	5	15	>18	Best fit line	
TP108	3	0.80	0.80	в	Greyish brown sandy slightly gravelly silty CLAY.	0	23	7.1	Best fit line	
			-		-	-			LA	B 10R - Version 7
Key Test per annotate	formed ed othe	in accorda rwise	ance with I	3S1377	7:Part4:1990, clause 5.4 unless	Date Printed 22/02	/2023	Approved By Stepher	n Watson	

CALISEWAY	Moisture Con	dition Value /	Moisture Content	Job Ref			22-1750
GEOTECH		Relationsh	lip	Borehole/	Pit No.		TP106
Site Name	NISA Additional GI			Sample N	0.		6
Coll Decerintian	Oneviele brever een du e	liadath canactally ailt		Sample	Тор		2.5
Soli Description	Greyish brown sandy s	lightly gravelly slit	Y CLAY.	Depth (m)	Base		
Specimen Reference	2	Specimen Depth	2.5 m	Sample T	уре		В
Specimen Description	Greyish brown sandy s	lightly gravelly silt	y CLAY.	KeyLAB II	D	(Caus2023013126
Test Method	BS1377:Part4:1990:cla	use 5.5		Date start	ed		10/02/2023
Sample preparation	Amount of	material larger tha	an 20mm sieve removed	3	i i	%	
	Natural Moi	sture Content of s	sample	17	7	%	
	Initial Moist	ure Content of tes	st sample below 20mm	18	3	%	
	Separate s	pecimens tested					

General remarks

Table of results

.

MCV Test Number	1	2	3	4	
Moisture Content, %	18	15	13	16	
Moisture Condition Value	5.2	11.0	14.9	8.4	
MCV report	5.2	11	14.9	8.4	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					

valid points × invalid points - - - - extended regression

- linear regression



CALISEWAY	Moisture Cor	ndition Value	Moisture Content		Job Ref			22-1750
GEOTECH		Relationsh	hip	ſ	Borehole/	Pit No.		TP108
Site Name	NISA Additional GI				Sample N	0.		4
Cail Decerintian	Crewish harmon and the				Sample	Тор		1.5
Soli Description	Greyish brown sandy s	slightly gravelly slit	Y CLAY.		Depth (m)	Base		1.5
Specimen Reference	4	Specimen Depth	1.5 r	m	Sample T	уре		В
Specimen Description	Greyish brown sandy s	lightly gravelly silt	y CLAY.		KeyLAB II	C	(Caus2023013132
Test Method	BS1377:Part4:1990:cla	ause 5.5			Date start	ed		15/02/2023
Sample preparation	Amount of	material larger that	an 20mm sieve removed		9		%	
	Natural Mo	sture Content of	sample		11	1	%	
	Initial Mois	ture Content of tes	st sample below 20mm		12	2	%	
	Separate s	pecimens tested						

General remarks

Table of results

16

14

12

10

8

6

4

2

0 0

Moisture Content %

.

MCV Test Number	1	2	3	4	
Moisture Content, %	12	8	10	11	
Moisture Condition Value	4.1	17.0	12.4	10.3	
MCV report	4.1	17	12.4	10.3	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					

valid points invalid points --- extended regression linear regression × _

2 4 6 8 12 14 16 18 10 20 **Moisture Condition Value**

Approved

Stephen Watson

LAB 11R - Version 7





















Contract Number: PSL23/0749

Report Date: 01 March 2023

Client's Reference: 22-1750

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: NISA Additional GI

8/2/2023
8/2/2023
1/3/2023

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)

LAS

L Knight (Assistant Laboratory Manager) S Eyre (Senior Technician) T Watkins (Senior Technician)

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awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP101	5	В	1.20	1.20	Brown gravelly very sandy CLAY.
TP102	5	В	1.20	1.20	Brown slightly gravelly sandy CLAY.
TP103	5	В	1.20	1.20	Brown slightly gravelly sandy CLAY.
TP104	5	В	1.20	1.20	Brown slightly gravelly very sandy CLAY.
TP105	5	В	1.20		Brown slightly gravelly sandy CLAY.
TP106	5	В	1.20		Brown gravelly very sandy CLAY.
TP107	5	В	1.20		Brown slightly gravelly very sandy CLAY.
TP108	5	В	1.20	1.20	Brown slightly gravelly sandy CLAY.

				Contract No:	
UKAS TESTING 4043	PSI		NISA Additional	PSL23/0749	
			INISA AUUIUUIA	Client Ref:	
	PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY			22-1750	
	PSLRF011	Issue No.1	Approved by: L Pavey	03/01/2022	

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal		
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	Test Temp	Domorks
Number	Number	Туре	Depth	Depth	%	Mg/m ³	Mg/m ³				Remarks
			m	m				W/m K	C.cm/W	Co	
TP101	5	В	1.20	1.20	13	2.21	1.96	2.356	42.5	18.1	Natural
TP101	5	В	1.20	1.20	8.4	2.05	1.89	2.542	39.3	18.4	
TP101	5	В	1.20	1.20	4.1	1.86	1.79	1.534	65.2	18.5	
TP102	5	В	1.20	1.20	19	2.03	1.71	2.424	41.3	18.0	Natural
TP102	5	В	1.20	1.20	13	2.05	1.81	2.228	44.9	18.2	
TP102	5	В	1.20	1.20	6.0	1.81	1.71	1.671	59.8	18.3	
TP103	5	В	1.20	1.20	21	2.02	1.67	2.174	46.0	17.8	Natural
TP103	5	В	1.20	1.20	14	2.01	1.76	2.269	44.1	18.0	
TP103	5	В	1.20	1.20	6.6	1.70	1.59	1.618	61.8	18.1	
TP104	5	В	1.20	1.20	12	2.26	1.96	2.262	44.2	18.4	Natural
TP104	5	В	1.20	1.20	7.5	2.03	1.89	2.598	38.5	18.4	
TP104	5	В	1.20	1.20	3.7	1.87	1.80	1.545	64.7	18.2	
TP105	5	В	1.20		20	2.05	1.70	1.911	52.3	18.6	Natural
TP105	5	В	1.20		15	2.01	1.75	1.790	55.9	18.7	
TP105	5	В	1.20		6.5	1.78	1.67	1.297	77.1	18.4	
TP106	5	В	1.20		21	2.01	1.66	1.947	51.4	18.3	Natural
TP106	5	В	1.20		15	2.06	1.79	2.138	46.8	18.6	
TP106	5	В	1.20		6.5	1.74	1.64	1.522	65.7	18.5	

OPSL		NISA Additional GI					
PROFESSIONAL SOILS LABORATORY							
PSLRF021	Issue No.1	Approved by: L Pavey 0	3/01/2023				

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

					Moisture	Bulk	Dry	Thermal	Thermal		
Hole	Sample	Sample	Тор	Base	Content	Density	Density	Conductivity	Resistivity	Test Temp	Damasla
Number	Number	Туре	Depth	Depth	%	Mg/m ³	Mg/m ³				Kemarks
			m	m				W/m K	C.cm/W	C	
TP107	5	В	1.20		26	1.91	1.52	2.151	46.5	18.5	Natural
TP107	5	В	1.20		17	1.98	1.70	2.220	45.0	18.9	
TP107	5	В	1.20		7.3	1.69	1.58	2.010	49.8	18.6	
TP108	5	В	1.20	1.20	22	1.94	1.60	1.999	50.0	18.6	Natural
TP108	5	В	1.20	1.20	17	2.00	1.72	2.144	46.7	18.7	
TP108	5	В	1.20	1.20	7.9	1.73	1.60	2.033	49.2	18.5	

			Contract No:	
		NICA Additional	PSL23/0749	
		NISA AUUIU0IIA	Client Ref:	
PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY			22-1750	
PSLRF021	Issue No.1	Approved by: L Pavey	03/01/2023	

🔅 eurofins

Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Final Report		En	nail: info@chemtest.cor
Report No.:	23-04146-1		
Initial Date of Issue:	16-Feb-2023		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Alistair McQuat Carin Cornwall Celine Rooney Colm Hurley Darren O'Mahony Dean McCloskey Gabriella Horan Joe Gervin John Cameron Lucy Newland Martin Gardiner Matthew Gilbert Matthew Graham Neil Haggan Paul Dunlop Sean Ross Stephen Franey S		
Project	22-1750 NISA Additional GI		
Quotation No.:		Date Received:	08-Feb-2023
Order No.:		Date Instructed:	08-Feb-2023
No. of Samples:	8		
Turnaround (Wkdays):	7	Results Due:	16-Feb-2023
Date Approved:	16-Feb-2023		
Approved By:			

Details:

2183

Stuart Henderson, Technical Manager

eurofins 👬

Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

<u> Results - Soil</u>

Project: 22-1750 NISA Additional GI

Client: Causeway Geotech Ltd Chemtest Job No.:			23-04146	23-04146	23-04146	23-04146	23-04146	23-04146	23-04146	23-04146		
Quotation No.:	Chemtest Sample ID.:			1586746	1586747	1586748	1586749	1586750	1586751	1586752	1586753	
Order No.:	Client Sample Ref.:		5	6	1	3	3	4	5	3		
		Sa	ample Lo	ocation:	TP101	TP102	TP103	TP104	TP105	TP106	TP107	TP108
	Sample Type:			SOIL	SOIL							
	Top Depth (m):			1.2	2	0.5	1	0.5	1	1.2	0.8	
	Date Sampled:		07-Feb-2023									
			Asbest	os Lab:							IN-TRAN-C	
Determinand	Accred.	SOP	Units	LOD								
Moisture	N	2030	%	0.020	13	16	13	11	18	14	20	15
pH (2.5:1)	N	2010		4.0	8.9	8.5	8.4	8.7	10.4	8.8	8.4	8.3
Sulphate (2:1 Water Soluble) as SO4 U 2120 g/l 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.80	0.020	0.078	0.062			
Total Sulphur	U	2175	%	0.010	0.012	0.038	0.051	0.027	0.27	0.019	0.036	0.023
Sulphate (Acid Soluble)	U	2430	%	0.010	0.022	0.051	< 0.010	0.045	0.25	0.017	0.043	0.044

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	рН	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.
Report Information

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	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
Т	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

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



HEAD OFFICE Causeway Geotech Ltd 8 Drumahiskey Road Ballymoney Co. Antrim, N. Ireland, BT53 7QL NI: +44 (0)28 276 66640

Registered in Northern Ireland. Company Number: NI610766 ROI: +353 (0)1 526 7465 Registered in Ireland. Company Number: 633786

www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS LABORATORY TEST REPORT

24 March 2023

Project Name:	NISA Additional GI
Project No.:	22-1750
Client:	Statfkraft Limited
Engineer:	ARUP

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 01/03/2023 and 24/03/2023.

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.

John Worm

Stephen Watson Laboratory Manager Signed for and on behalf of Causeway Geotech Ltd













Project Name: NISA Additional GI

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.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	2
SOIL	Liquid and Plastic Limits of soil-4 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	2
SOIL	Bulk and dry density by Linear Measurement Method	BS 1377-2: 1990: Cl 7.2	1
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	2
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	2
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	3

SUB-CONTRACTED TESTS

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited (UKAS 2643)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	1
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

GEOTECH				Summary of Classification Test Results											
Project N	lo. 22-17	750		Project	roject Name NISA Additional GI										
			Sar	mple			Dens	ity	W	Passing	LL	PL	ΡI	Particle	Casagranda
Hole N	No.	Ref	Тор	Base	Туре	Specimen Description	bulk Mg/m	dry 13	%	425µm %	%	%	%	density Mg/m3	Classification
BH10)7	1	4.00	4.80	С	Greyish brown sandy gravelly silty CLAY.	2.68	2.46	9.4	66	30	15	15		CL
BH10)7	3	5.50	6.30	С	Greyish brown sandy gravelly silty CLAY.			21	69	32	15	17		CL
All tests	perforr	med i	n accord	lance wit	th BS1	377:1990 unless specified	otherwis	e	-		-			LAB	01R Version 6
Key	Key Density test Linear measurement unless : wd - water displacement		Liquid I 4pt con cas - C	imit Particle density e unless : sp - small pyknometer sagrande method gj - gas jar		Date Printed 13/03/2023			Appr	oved	Ву				
,	wi - immersion in water 1pt - single point test						Stephen Watson			10122					



Remarks

Mg/m3

2.65

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



Approved

Stephen Watson

47

44

42

40

34

0.425

0.3 0.212

0.15

0.063



LAB 05R - Version 6

10122

Approved

Stephen Watson







Contract Number: PSL23/1422

Report Date: 16 March 2023

Client's Reference: 22-1750

Client Name: Causeway Geotech 8 Drumahiskey Road Ballymoney Co.Antrim BT53 7QL

For the attention of: Stephen Watson

Contract Title: NISA Additional GI

Date Received:	8/3/2023
Date Commenced:	8/3/2023
Date Completed:	16/3/2023

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 (Assistant Laboratory Manager) S Eyre (Senior Technician) D Burton

(Advanced Testing Manager)

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster, DN4 0AR Tel: 01302 768098 Email: rberriman@prosoils.co.uk awatkins@prosoils.co.uk Page 1 of

Summary Report

Sample Details	Depth	5.15-5.50n	n C2					
	Description Type	Brown very gravelly slightly sandy CLAY. Undisturbed, vertical orientation.						
Ĵ,	Initial Sample Length Initial Sample Diameter	Lo Do	(mm) (mm)	211.0 104.2				
sketch showing specimen location in original sample	Initial Sample Weight Initial Bulk Density Particle Density	VVο ρο ρs	(gr) (Mg/m3) (Mg/m3)	4153.0 2.31 2.66				
Initial Conditions				Stage 1	2			
Initial Cell Pressure		σзі	(kPa)	500				
Initial Back Pressure		U Бі	(kPa)	400				
Membrane Thickness		mь	(mm)	0.600				
Displacement Input		LIP	(mm)	CH 2				
Load Input		N IP	(N)	CH 1				
Pore Water Pressure Input		Արտր	(kPa)	CH 3				
Sample Volume		V	(cc)	CH 2				
Initial Moisture		ωi	(%)	9.95				
Initial Dry Density		ρdi	(Mg/m3)	2.10				
Initial Voids Ratio		ei	•	0.267				
Initial Degree of Saturation		Si	(%)	99				
B Value		B		0.95				
Final Conditions								
Final Moisture		ωf	(%)	9.72				
Final Dry Density		ρdf	(Mg/m3)	2.12				
Final Voids Ratio		ef		0.252				
Final Degree of Saturation		Sf	(%)	100.0				
Failure Criteria				Stage 1 Max. Dev.	2			
Strain At Failure		Σ <i>4</i>	(%)	15.84				
Stress At Failure		- (σ.1-σ.2) - (σ.1-σ.2)	(/v) (kPa)	483 1				
Minor Stress At Failure		σ3'	(kPa)	189.1				
Maior Stress At Failure		σ1'	(kPa)	672.2				
Principal Stress Ratio At Failure		σ1'/σ3'	(3.555				
PwP At Failure Criteria		u f		310.9				

Notes

AND	(agent)
SAMA S	5
4	Plastic

O PS	5L	Test Method	Clause 7		Test Name Test Date	BH107 5.15 09/03/2023	5-5.50m	
PROFESSIONAL SOILS L	ABORATORY					Borehole	BH107	
		Jobfile	NISA Additional G	SI		Sample	5.15-5.50m	
UKAS TESTING 4043		Client	Causeway Geoteo	ch		Depth 5.15-5.50		C2
		Operator	D.Burton	Checked	S.R	oyle	Approved	S.Royle

Saturation Plots





OPSL	Test Method	BS1377-8 : 1990 :	Clause 7	Test Name Test Date	BH107 5.15- 09/03/2023	-5.50m
PROFESSIONAL SOILS LABORATORY				Borehole	BH107	
t de la	Jobfile	NISA Additional G	61	Sample	5.15-5.50m	
	Client	Causeway Geoteo	ch	Depth	5.15-5.50m (C2
4043	Operator	D.Burton	Checked S	Royle	Approved	S.Royle

Consolidation Plots

Initial Conditions			
Initial Cell Pressure	σз	(kPa)	500
Initial Back Pressure	и Бі	(kPa)	400
Pore Water Pressure Input	И рмр	(kPa)	483
Drainage Method			Radial+One End
Final Conditions			
PWP Dissipation %	U%	(%)	100.00
Volumetric Strain	εν%	(%)	1.19
Corrected Length	Lc	(mm)	210.2
Corrected Area	Ac	(cm2)	84.60
Corrected Volume	Vс	(cc)	1777.974
t100	t 100	(min)	46.94
Consolidation	сv	(m2/year)	0.047
Compressibility	mν	(m2/MN)	0.143
Test Time	t F	(h:m:s)	02:00:00
Estimated Strain to Failure	ε%	(%)	5.0
Shear Machine Speed	dr	(mm/min)	0.08757
Notes			



Г		Test Method	BS1377-8 : 1990 :	Clause 7		Test Name	BH107 5.15	5-5.50m
	VPSL				Test Date	09/03/2023		
	PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY					Borehole	BH107	
		Jobfile	NISA Additional G	il		Sample	5.15-5.50m	
		Client	Causeway Geoteo	Causeway Geotech			5.15-5.50m	C2
L	4043	Operator	D.Burton	Checked	S.R	oyle	Approved	S.Royle

Shear Stage Plots



		Test Method	BS1377-8 : 1990 :	Clause 7		Test Name	BH107 5.15-	5.50m
	<u>YPSL</u>					Test Date	09/03/2023	
PR	OFESSIONAL SOILS LABORATORY					Borehole	BH107	
	t de la constante de la consta	Jobfile	NISA Additional G	il		Sample	5.15-5.50m	
		Client	Causeway Geoteo	h		Depth	5.15-5.50m C	2
	4043	Operator	D.Burton	Checked	S.R	oyle	Approved	S.Royle

Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots



ſ		Test Method	BS1377-8 : 1990 :	Clause 7		Test Name	BH107 5.15-	5.50m
l	VPSL					Test Date	09/03/2023	
l	PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY					Borehole	BH107	
l		Jobfile	NISA Additional G	S I		Sample	5.15-5.50m	
l	UKAS	Client	Causeway Geote	ch		Depth	5.15-5.50m (C2
l	4043	Operator	D.Burton	Checked	S.R	oyle	Approved	S.Royle

Point Load Stree GEOTECH Summary												ength Index Tests						
GEOTECH Summary Project No. Project Name												Res	ults					
Project No. 2	2-1750			Proje	ect Name	e		NISA	Additio	nal GI								
Borehole	Sa	Imple		Spe	ecimen Rock Type		Test see l	Type SRM	alid (Y/N)		Dime	Dimensions		Force P	ent diameter, De	Point Strengtł	Load n Index	Remarks (including
No.	Depth	Ref.	Туре	Ref.	Depth	коск туре	Type (D, A, I, B)	Direction (L, P or U)	Failure Va	Lne	W	Dps	Dps'	kN	a Equival	Is MPa	Is(5 0) MPa	water content if measured)
BH104	12.70	1	с	1	12.70	LIMESTONE	D	U	YES	130.7	101.7	101.7	100.0	3.8	100.8	0.4	0.5	
BH107	8.00	5	с	1	8.00	LIMESTONE	A	U	YES		101.6	88.0	86.0	19.4	105.5	1.7	2.4	
BH107	11.75	6	с	1	11.75	LIMESTONE	D	U	YES	125.1	101.5	101.5	96.0	33.5	98.7	3.4	4.7	
Test Type D - Diametral, A - Axial, I - Irregular Lump, B - Block Direction L - parallel to planes of weakness U - unknown or random Dimensions Dps - Distance between platens (platen separation) Dps' - at failure (see ISRM note 6) Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P												P Dps						
Test performed in Detailed legend fo Size factor, F = ([N - Width of shortest dimension perpendicular to load, P W2 Fest performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise Date Printed Approved By Detailed legend for test and dimensions, based on ISRM, is shown above. 13/03/2023 13/03/2023																	

LABORATORY TEST CERTIFICATE

Certificate No :

To :

Client :

Stephen Watson

23/274 - 01-1

Causeway Geotech Limited 8 Drumahiskey Road Ballymoney Co. Antrim BT53 7QL

materials testing & consultancy

10 Queenslie Point Queenslie Industrial Estate 120 Stepps Road Glasgow G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org Website: www.mattest.org

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from NISA Add GI and delivered to our laboratory on 03rd March 2023.

Material & Source

Sample Reference	:	See Report Plate
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plate
Description	:	Rock Core
Date Sampled	:	Not Supplied
Date Tested	:	03rd March 2023 Onwards
Source	:	22-1750 - NISA Add GI

Test Results

As Detailed On Page 2

Comments

The results contained in this report relate to the sample(s) as received Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks



- T.M.

T McLelland (Director)



24/03/2023



CAUSEWAY GEOTECH LIMITED NISA ADD GI



BOREHOLE		BH107]
SAMPLE		C4	
DEPTH	m	9.50-9.85	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	101.50	
SAMPLE HEIGHT	mm	216.99	
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	1.3	
TEST DURATION	min.sec	9.32	
DATE OF TESTING		23/03/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	727.9	
UNCONFINED COMPRESSIVE STRENGTH	MPa	90.0	
WATER CONTENT (ISRM Suggested Methods)	%	0.4	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.77	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.76]

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

BOREHOLE		
SAMPLE		
DEPTH	m	SAMPLE FAILURE SHAPES
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	External Internal
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

Issue No. 01

Page 2 of 2



APPENDIX H ENVIRONMENTAL LABORATORY TEST RESULTS



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Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Final Report

Report No.:	23-02475-1		
Initial Date of Issue:	13-Feb-2023		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Colm Hurley Sean Ross		
Project	22-1750 NISA Add GI		
Quotation No.:	Q21-26199	Date Received:	26-Jan-2023
Order No.:		Date Instructed:	02-Feb-2023
No. of Samples:	8		
Turnaround (Wkdays):	7	Results Due:	10-Feb-2023
Date Approved:	13-Feb-2023		
Approved By:			
and			

Som

Details:

Stuart Henderson, Technical Manager

Results - Leachate

Project: 22-1750 NISA Add GI

Client: Causeway Geotech Ltd	Chemtest Job No.:				t Job No.:	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475
Quotation No.: Q21-26199		Chemtest Sample ID.:					1579985	1579986	1579987	1579988	1579989	1579990	1579991
				Client S	ample ID.:			1	3	2	4		
				Sample	Location:	TP101	TP101	TP102	TP102	TP103	TP103	TP106	TP106
				San	nple Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):				0.5	1	0.5	1	0.5	0.5	0.5	1
	Date Sampled: 2			24-Jan-2023									
Determinand	Accred.	SOP	Туре	Units	LOD								
Total Dissolved Solids	N	1020	10:1	mg/l	1.0	44	46	25	28	25	41	16	16
Chloride	U	1220	10:1	mg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.7	< 1.0	< 1.0
Fluoride	U	1220	10:1	mg/l	0.050	0.13	0.14	0.13	0.13	0.16	0.12	0.19	0.12
Sulphate	U	1220	10:1	mg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.7	< 1.0	< 1.0
Arsenic (Dissolved)	U	1455	10:1	mg/l	0.0002	0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Barium (Dissolved)	U	1455	10:1	mg/l	0.005	0.009	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Dissolved)	U	1455	10:1	mg/l	0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011
Chromium (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper (Dissolved)	U	1455	10:1	mg/l	0.0005	0.0012	0.0006	0.0009	0.0010	0.0009	0.0007	0.0017	0.0013
Mercury (Dissolved)	U	1455	10:1	mg/l	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Molybdenum (Dissolved)	U	1455	10:1	mg/l	0.0002	0.0006	0.0007	0.0003	0.0005	0.0002	0.0003	0.0005	0.0009
Nickel (Dissolved)	U	1455	10:1	mg/l	0.0005	0.0009	0.0006	0.0006	0.0008	0.0006	< 0.0005	0.0008	0.0009
Lead (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Antimony (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Selenium (Dissolved)	U	1455	10:1	mg/l	0.0005	0.0025	0.0022	0.0017	0.0011	0.0019	0.0012	0.0012	0.0023
Zinc (Dissolved)	U	1455	10:1	mg/l	0.002	0.006	0.004	0.003	0.004	0.003	0.007	0.003	0.005
Dissolved Organic Carbon	U	1610	10:1	mg/l	2.0	4.2	2.3	3.6	3.3	3.7	3.8	4.5	3.9
Total Phenols	U	1920	10:1	mg/l	0.030	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030

<u> Results - Soil</u>

Project: 22-1750 NISA Add GI

Client: Causeway Geotech Ltd		Ch	emtest .	Job No.:	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475
Quotation No.: Q21-26199		Chem	test Sar	nple ID.:	1579984	1579985	1579986	1579987	1579988	1579989	1579990	1579991
		С	lient Sa	mple ID.:			1	3	2	4		
		5	Sample I	Location:	TP101	TP101	TP102	TP102	TP103	TP103	TP106	TP106
			Samp	ole Type:	SOIL							
			Top D	epth (m):	0.5	1	0.5	1	0.5	0.5	0.5	1
			Date S	Sampled:	24-Jan-2023							
		-	Asbes	stos Lab:	DURHAM							
Determinand	Accred.	SOP	Units	LOD								
АСМ Туре	U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected							
Moisture	N	2030	%	0.020	15	16	18	22	22	16	17	21
pH	U	2010	70	4.0	86	8.4	8.4	8.2	8.5	80	8.3	87
Arsenic	U	2455	ma/ka	0.5	13	5.1	14	20	15	13	23	7.1
Barium	U	2455	ma/ka	0	270	97	97	120	130	99	120	36
Cadmium	U	2455	ma/ka	0.10	1.1	0.49	1.3	1.6	1.0	1.0	7.4	1.5
Mercury Low Level	U	2450	mg/kg	0.05	0.14	0.05	0.33	0.28	0.08	0.05	0.07	0.06
Molybdenum	U	2455	mg/kg	0.5	2.9	1.4	3.1	4.2	2.7	2.8	6.5	2.3
Antimony	N	2455	mg/kg	2.0	< 2.0	< 2.0	< 2.0	2.2	< 2.0	< 2.0	2.5	< 2.0
Copper	U	2455	mg/kg	0.50	26	15	30	39	28	24	45	34
Nickel	U	2455	mg/kg	0.50	33	21	36	48	38	34	85	55
Lead	U	2455	mg/kg	0.50	48	15	59	73	35	23	23	12
Selenium	U	2455	mg/kg	0.25	1.2	0.60	1.4	1.7	1.3	1.0	1.8	2.4
Zinc	U	2455	mg/kg	0.50	88	37	100	120	72	67	100	59
Chromium (Trivalent)	Ν	2490	mg/kg	1.0	20	9.7	21	26	32	28	36	27
Chromium (Hexavalent)	Ν	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
LOI	U	2610	%	0.10	5.6	5.0	4.5	4.5	5.1	3.7	3.5	2.7
Total Organic Carbon	U	2625	%	0.20	1.9	1.7	1.3	1.5	1.2	0.79	0.72	0.69
Mineral Oil	Ν	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
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
Aliphatic TPH >C6-C8	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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
I otal Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
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
Aromatic TPH >C/-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	N	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	N	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	N N	2680	rng/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	N NI	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	N N	2080	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
AIUMATIC TPH >035-044	IN	L7080	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

<u> Results - Soil</u>

Project: 22-1750 NISA Add GI

Client: Causeway Geotech Ltd		Ch	emtest	Job No.:	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475	23-02475
Quotation No.: Q21-26199		Chem	test Sar	nple ID.:	1579984	1579985	1579986	1579987	1579988	1579989	1579990	1579991
		С	lient Sa	mple ID.:			1	3	2	4		
		Sample Location:		TP101	TP101	TP102	TP102	TP103	TP103	TP106	TP106	
			Sam	ole Type:	SOIL							
			Top D	epth (m):	0.5	1	0.5	1	0.5	0.5	0.5	1
			Date S	Sampled:	24-Jan-2023							
			Asbe	stos Lab:	DURHAM							
Determinand	Accred.	SOP	Units	LOD								
Total Aromatic Hydrocarbons	Ν	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	Ν	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m & p-Xylene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
o-Xylene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methyl Tert-Butyl Ether	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Naphthalene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	0.57	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthylene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluorene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Anthracene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	Ν	2800	mg/kg	0.010	0.23	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Pyrene	Ν	2800	mg/kg	0.010	0.20	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chrysene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Coronene	Ν	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Of 17 PAH's	Ν	2800	mg/kg	0.20	0.43	< 0.20	0.57	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 28	Ν	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 52	Ν	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 90+101	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 118	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 153	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 138	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 180	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

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	рН	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
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.
2455	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) ICES7Congeners 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	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	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
Т	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

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: <u>customerservices@chemtest.com</u>

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Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Final Report

Report No.:	23-02477-1		
Initial Date of Issue:	13-Feb-2023		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Colm Hurley Sean Ross Darren O'Mahony Gabriella Horan John Cameron Lucy Peaker Matthew Gilbert Neil Haggan Paul Dunlop Stephen Franey Stephen Franey Stephen Watson Stuart Abraham Alistair McQuat Carin Cornwall Celine Rooney Ciaran Doherty Dean McCloskey		
Project	21-1750 North Irish sea Array (NISA) ADD gi		
Quotation No.:	Q21-26199	Date Received:	26-Jan-2023
Order No.:		Date Instructed:	02-Feb-2023
No. of Samples:	6		
Turnaround (Wkdays):	7	Results Due:	10-Feb-2023
Date Approved:	13-Feb-2023		

Approved By:

Details:

Stuart Henderson, Technical Manager

eurofins 👬

Chemtest

Eurofins Chemtest Ltd Depot Road Newmarket CB8 0AL Tel: 01638 606070 Email: info@chemtest.com

Results - Leachate

Project: 21-1750 North Irish sea Array (NISA) ADD gi

Client: Causeway Geotech Ltd	ent: Causeway Geotech Ltd Chemtest Job No.:		23-02477	23-02477	23-02477	23-02477	23-02477	23-02477			
Quotation No.: Q21-26199	Chemtest Sample ID.:				ample ID.:	1580010	1580011	1580012	1580013	1580014	1580015
	Sample Location:					TP105	TP105	TP08	TP08	TP07	TP07
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Тор [Depth (m):	0.5	1	0.5	1	0.5	1
				Date	Sampled:	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023
Determinand	Accred.	SOP	Туре	Units	LOD						
Total Dissolved Solids	N	1020	10:1	mg/l	1.0	30	39	37	40	42	51
Chloride	U	1220	10:1	mg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Fluoride	U	1220	10:1	mg/l	0.050	0.14	0.096	0.14	0.14	0.12	0.12
Sulphate	U	1220	10:1	mg/l	1.0	< 1.0	4.0	< 1.0	2.9	13	15
Arsenic (Dissolved)	U	1455	10:1	mg/l	0.0002	< 0.0002	< 0.0002	0.0079	< 0.0002	0.0003	0.0003
Barium (Dissolved)	U	1455	10:1	mg/l	0.005	< 0.005	< 0.005	0.007	< 0.005	0.007	0.008
Cadmium (Dissolved)	U	1455	10:1	mg/l	0.00011	< 0.00011	< 0.00011	0.00017	< 0.00011	< 0.00011	< 0.00011
Chromium (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	0.0011	< 0.0005	< 0.0005	0.0007
Copper (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	0.0005	0.0066	< 0.0005	0.0018	0.0018
Mercury (Dissolved)	U	1455	10:1	mg/l	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Molybdenum (Dissolved)	U	1455	10:1	mg/l	0.0002	0.0011	0.0013	0.0093	0.0011	0.0017	0.0020
Nickel (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	0.0050	< 0.0005	0.0021	0.0019
Lead (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Antimony (Dissolved)	U	1455	10:1	mg/l	0.0005	< 0.0005	< 0.0005	0.0010	< 0.0005	< 0.0005	< 0.0005
Selenium (Dissolved)	U	1455	10:1	mg/l	0.0005	0.0015	0.018	0.0027	0.0014	0.0015	0.0010
Zinc (Dissolved)	U	1455	10:1	mg/l	0.002	< 0.003	< 0.003	0.006	< 0.003	0.003	0.004
Dissolved Organic Carbon	U	1610	10:1	mg/l	2.0	2.8	2.8	12	2.8	3.9	4.0
Total Phenols	U	1920	10:1	mg/l	0.030	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030

Project: 21-1750 North Irish sea Array (NISA) ADD gi

Client: Causeway Geotech Ltd	Chemtest Job No.:			23-02477	23-02477	23-02477	23-02477	23-02477	23-02477	
Quotation No.: Q21-26199	Chemtest Sample ID.:		1580010	1580011	1580012	1580013	1580014	1580015		
	Sample Location:		TP105	TP105	TP08	TP08	TP07	TP07		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		0.5	1	0.5	1	0.5	1		
	Date Sampled:		23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023		
			Asbes	stos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
АСМ Туре	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected					
Moisture	N	2030	%	0.020	20	13	45	17	18	17
рН	U	2010		4.0	8.8	8.5	7.4	8.4	8.2	8.2
Arsenic	U	2455	mg/kg	0.5	16	22	22	22	15	30
Barium	U	2455	mg/kg	0	95	50	180	82	59	130
Cadmium	U	2455	mg/kg	0.10	2.1	1.5	4.8	1.5	2.0	3.8
Mercury Low Level	U	2450	mg/kg	0.05	< 0.05	0.06	0.12	0.07	< 0.05	0.05
Molybdenum	U	2455	mg/kg	0.5	5.3	6.5	6.2	3.8	6.2	9.3
Antimony	N	2455	mg/kg	2.0	2.2	3.0	< 2.0	2.2	< 2.0	2.8
Copper	U	2455	mg/kg	0.50	35	40	55	40	44	52
Nickel	U	2455	mg/kg	0.50	50	53	39	59	76	96
Lead	U	2455	mg/kg	0.50	21	22	22	23	15	29
Selenium	U	2455	mg/kg	0.25	1.7	16	5.7	1.2	2.5	3.4
Zinc	U	2455	mg/kg	0.50	56	73	56	75	53	73
Chromium (Trivalent)	N	2490	mg/kg	1.0	25	28	23	30	19	28
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
LOI	U	2610	%	0.10	3.1	2.0	10	1.9	2.7	3.7
Total Organic Carbon	U	2625	%	0.20	0.38	0.43	4.3	0.41	0.32	0.91
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	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
Aliphatic TPH >C8-C10	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	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	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	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
Aromatic TPH >C8-C10	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	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	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Project: 21-1750 North Irish sea Array (NISA) ADD gi

Client: Causeway Geotech Ltd	Chemtest Job No.:		23-02477	23-02477	23-02477	23-02477	23-02477	23-02477		
Quotation No.: Q21-26199		Chem	test Sar	nple ID.:	1580010	1580011	1580012	1580013	1580014	1580015
	Sample Location:		TP105	TP105	TP08	TP08	TP07	TP07		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		0.5	1	0.5	1	0.5	1		
			Date S	Sampled:	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023	23-Jan-2023
			Asbes	stos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m & p-Xylene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
o-Xylene	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methyl Tert-Butyl Ether	U	2760	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Naphthalene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluorene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chrysene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Coronene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Of 17 PAH's	N	2800	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 28	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 52	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 90+101	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 118	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 153	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 138	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 180	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

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	рН	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		
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.		
2455	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) ICES7Congeners 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	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	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
Т	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

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: <u>customerservices@chemtest.com</u>



APPENDIX I SPT HAMMER ENERGY MEASUREMENT REPORT





SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing				
Unit 11				
Charlwoods Road				
East Grinstead				
West Sussex				
RH19 2HU				

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 Ref:	0643
Test Date:	12/02/2022
Report Date:	14/02/2022
File Name:	0643.spt
Test Operator:	NPB
Report Date: File Name: Test Operator:	14/02/2022 0643.spt NPB

SPT Hammer Information

Hammer Mass	m (kg):	63.0
Falling Height	h (mm):	760
SPT String Len	gth L (m):	12.0

Comments / Location

CAUSEWAY

*:



The recommended calibration interval is 12 months





Signed: N Burrows Title: FOC Manager



SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing		
Unit 11		
Charlwoods Road		
East Grinstead		
West Sussex		
RH19 2HU		

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 Ref:	1387
Test Date:	12/02/2022
Report Date:	14/02/2022
File Name:	1387.spt
Test Operator:	NPB

SPT Hammer Information

Hammer Mass	m (kg):	63.0
Falling Height	h (mm):	760
SPT String Leng	gth L (m):	12.0

Comments / Location

CAUSEWAY

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The recommended calibration interval is 12 months





NPBuracens

Signed: N Burrows Title: FOC Manager