HyNet North West Hydrogen Pipeline

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Appendix 12B

Factual Report

October 2024

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Volume 0001
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IAN FARMER ASSOCIATES

UNITED LIVING ENERGY SERVICES (ULES)

HYNET, NORTH WEST HYDROGEN PIPELINE

FACTUAL REPORT ON GROUND INVESTIGATION

Contract: 2230746

Date: May 2023

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RSK GEOSCIENCES

FACTUAL REPORT ON

GROUND INVESTIGATION

Carried out at

HYNET, NORTH WEST

HYDROGEN PIPELINE

Prepared for

UNITED LIVING ENERGY SERVICES (ULES)
c/o Wood
Compass Point
78-87 Kingston Road
Staines-upon-Thames
TW18 1DT

Contract No: 2230746

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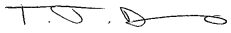
Document Control

Project reference: **2230746 (02)**

Project name: **HYNET, NORTH WEST**

Report title: **FACTUAL REPORT ON GROUND INVESTIGATION**

Version	Date	Comment
00	27/01/2023	Complete report
01	14/02/2023	Final report. Monitoring is ongoing.
02	31/03/2023	Comments addressed. Monitoring is ongoing.
03	17/05/2023	Final report. Monitoring is ongoing.

Author	Reviewer	Project Manager
		
M Hirst-Watson	T Downes	M Hirst-Watson
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1.0 INTRODUCTION

1.1 It is understood that the proposed development comprises a hydrogen transportation pipeline network across the northwest of England. The project is expected to consist of approximately 90km of underground high pressure steel pipeline with associated consumer connection spurs and Hydrogen Above Ground Installations (HAGI).

1.2 On the instructions of United Living Energy Services (ULES), working on behalf on Wood and Cadent, with RSK acting as Consulting Engineers, a ground investigation was undertaken to determine ground and groundwater conditions across the site.

1.3 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.4 Any comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.5 Groundwater observations may be made at the time the site work was carried out or during subsequent monitoring. It should be noted that groundwater levels may vary outside the limits of these observations due to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

2.1.1 The site is situated in the northwest of England, extending from Thornton-le-Moors (Stanlow) in the west to Dunham Massey in the east and Rainhill (St Helens) in the north to Davenham in the south.

2.1.2 The extents of the investigation may be located by the following approximate grid references:

- North: SJ 512 900 (Rainhill)
- East: SJ 722 886 (Dunham Massey)
- South: SJ 646 695 (Davenham)
- West: SJ 448 748 (Thornton-le-Moors).

2.1.3 A site location plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.2.1 The general site layout consisted of a number of linear routes forming a 'cross' shape.

2.2.2 The investigation was predominantly undertaken on agricultural land that comprised of poor, extremely soft, grassed and/or ploughed ground conditions that required tracked vehicle assistance or track-way access.

2.2.3 The site also included a number of industrial areas including Solvay, a chemical processing plant located in Warrington, and Fiddlers Ferry Power Station, north east of Widnes. The area of interest at Solvay was situated on a gravelled hard standing surface, and a pulverised fuel ash (PFA) mound at Fiddlers Ferry Power Station.

2.2.4 An additional site was located within Runcorn Golf Course which comprised a well managed, firm, grassed surface

2.2.5 The linear route spanned west to east from Thornton-le-Moors (Stanlow) along the M56 motorway through Sutton Weaver to Dunham Massey to the east.

2.2.6 The linear route spanned north to south from Rainhill across the River Mersey at Penketh (Warrington), continuing south to Davenham (north of Winsford).

3.0 SITE WORK

3.1 The site work was carried out between 28th September and 22nd December 2022.

3.2 The proposed exploratory hole location co-ordinates were provided by Wood. ULES with the use of a GPS device located and marked out the exploratory hole locations prior to RSK undertaking work. The British National Grid Coordinates of the exploratory hole location and ground level elevation Above Ordnance Datum was recorded by ULES.

3.3 The site works were carried out on the basis of the practices set out in and BS 5930 (ref. 5.1), BS EN ISO 14688-1 (ref. 5.2), BS EN ISO 14689-1 (ref. 5.3) and BS 10175 (ref. 5.4).

3.4 Exploratory holes were carried out as follows:

Exploratory Hole Type	Quantity	Hole Reference	Depths (m bgl)	Notes
Cable Percussive Boreholes	3	BH040, BH106 and BH114	2.20m to 11.00m	BH040 was set out incorrectly so was terminated and relocated as BH040A.
Cable Percussive Boreholes with Rotary coring follow on	12	BH002, BH021, BH040A, BH096, BH097, BH120, BH300, BH301, BH326, BH327, BH332A and BH338	10.00m to 40.00m	None
Dynamic Sampling Borehole	1	BH332	8.50m	Borehole terminated due to stability problems beneath rig and restarted with cable percussion rig as BH332A.
Dynamic Sampling Boreholes with rotary follow on	20	BH017, BH033, BH036, BH037, BH042, BH060, BH061, BH063, BH066, BH067, BH069, BH070, BH094, BH206, BH302, BH303, BH305, BH318, BH329 and BH330	10.00m to 50.70m	Rotary drilling carried out was coring and/or open hole
Window Sampler Boreholes	6	WS10, WS32 to WS35 and WS37	3.00m to 4.35m	None
Trial Pits – Machine Excavated	5	ATP23, ATP24, ATP41, TP12 and TP20	2.30m to 3.00m	None
Slotted Standpipe Installations	7	BH002, BH037, BH067, BH070, BH094, BH114 and BH326	Response zones from 1.00m to 3.50m & 10.50m to 40.50	Installed to monitor groundwater and gas levels, each with gas valve and raised cover fitted.

Exploratory Hole Type	Quantity	Hole Reference	Depths (m bgl)	Notes
Piezometer Installations	1	BH096	Response zones from 8.70 to 9.00m	Installed to monitor groundwater levels, with raised cover fitted.

3.5 A site plan showing the positions of the exploratory holes is presented in Appendix 1.

3.6 The depths of the exploratory holes, descriptions of strata encountered and comments on groundwater conditions are given in the site work records in Appendix 2.

3.7 Each exploratory hole location was surveyed using ground penetrating radar (GPR) and a Cable Avoidance Tool (CAT) prior to any physical excavation.

3.8 At the location of boreholes an inspection pit was excavated by hand to a depth of 1.20m below ground level to check for buried services.

3.9 Representative disturbed and 'undisturbed' samples were taken at the depths shown on the exploratory hole records and dispatched to the laboratory for examination and testing.

3.10 Samples for environmental purposes were collected in appropriate containers, placed in a cool box, and dispatched to a UKAS accredited laboratory for testing.

3.11 A summary of the samples taken on the project is presented in the following table:

Exploratory Hole Type	Sample Type				
	D	B/LB	ES	U/UT	C
Borehole (Cable percussive, dynamic sampling and rotary)	510	196	56	7 (recovered)	197
Window Sampler Borehole	42	22	0	0	NA
Trial Pit	21	21	18	NA	NA
Total	**573**	**239**	**74**	**7**	**197**

D = disturbed, B = bulk disturbed, LB = large bulk disturbed, ES = environmental sample, U = undisturbed, UT = undisturbed thin wall and C = core sample

3.12 Photographs of core recovery from the rotary boreholes, together with photographs of the trial pits are given in Appendix 2.

3.13 Rotary coring was carried out incorporating a semi-rigid plastic liner to obtain core at a nominal diameter of 92mm.

3.14 Standard penetration tests (SPT), ref. 5.5, were carried out in the boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records. SPT certificates are included within Appendix 2.

3.15 The details of the borehole installations are presented on the borehole records in Appendix 2 and summarised in the following table:

Borehole ID	Top (m bgl)	Base (m bgl)	Diameter (mm)	Pipe type
BH002	0.00	6.00	50	Plain
	6.00	10.00	50	Slotted
BH037	0.00	15.00	50	Plain
	15.00	25.00	50	Slotted
BH067	0.00	2.00	50	Plain
	2.00	7.00	50	Slotted
BH070	0.00	10.00	50	Plain
	10.00	40.50	50	Slotted
BH094	0.00	6.00	50	Plain
	6.00	9.00	50	Slotted
BH096	0.00	8.70	19	Plain
	8.70	9.00	19	Piezo tip
BH114	0.00	1.00	50	Plain
	1.00	3.50	50	Slotted
BH326	0.00	4.00	50	Plain
	4.00	10.80	50	Slotted

3.16 Boreholes not installed with instrumentation were backfilled with bentonite and reinstated to their original surface condition. Trial pits were backfilled with arisings compacted in layers.

3.17 The co-ordinates and levels reported on the exploratory hole records were provided by ULES and surveyed by GPS methods.

3.18 A water level monitoring visit was undertaken on the 9th and 12th December 2022 of the installed boreholes to this date and the results are included within Appendix 2.

3.19 Gas and groundwater monitoring is being carried out monthly for 12 visits. The results of which are included within Appendix 2. The results of future visits will be issued as addendums.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 Schedules for geotechnical testing were prepared by RSK.

4.1.2 All soil samples were prepared in accordance with BS1377: Part One: 1990 ref. 5.6 and representative sub-samples were taken for testing. The following tests were carried out:

- 278 No. Moisture contents
- 201 No. Plasticity indices
- 6 No. Particle density
- 121 No. Particle size distributions by wet sieving
- 83 No. Particle size distributions by sedimentation
- 12 No. 2.5kg Compactions
- 13 No. Moisture condition value
- 13 No. California bearing ratio
- 40 No. Hand vane
- 6 No. Single stage undrained triaxials
- 7 No. Oedometer consolidations
- 49 No. Organic matter contents
- 99 No. BRE SD1 suite A
- 2 No. BRE SD1 suite B.

4.1.3 Rock samples for geotechnical testing were prepared and tested in accordance with ISRM Suggested Methods, ref. 5.7. The following tests were carried out:

- 181 No. Water content
- 73 No. Uniaxial Compressive Strength (UCS)
- 218 No. Point Load Index Test (PLT)
- 1 No. Rock porosity
- 53 No. BRE SD1 suite A.

4.1.4 The results of the physical testing are given in Appendix 3, Test Reports 2230746, 223746A to 223746Z and 2230746AA to 2230746AU.

4.1.5 The results of the organic matter and BRE SD1 suites A and B are given in Appendix 4, Test Reports 22/10560, 22/10568, 22/10570, 22/10652, 22/10654, 22/10815, 22/10824, 22/10827, 22/10883, 22/11485, 22/11928, 22/11930, 22/11931, 22/11991 to 22/11996, 22/11998, 22/12043, 22/12082, 22/12085, 22/12087, 22/12089, 22/12091, 22/12092, 22/12094, 22/12095, 22/12097, 22/12098, 22/12099, 22/12112, 22/12205, 22/12206, 22/12358, 22/12360 to 22/12363, 22/12478, 23/00011, 23/00227, 23/00264 and 23/00266.

4.2 Chemical Testing

4.2.1 Schedules for chemical testing were prepared by RSK.

4.2.2 Chemical testing was carried out by Envirolab, Hyde.

4.2.3 Chemical analysis was carried out on four samples of soil. The nature of the analysis is detailed below.

4.2.4 **Metals screen** - arsenic, cadmium, chromium (total and hexavalent), lead, mercury, selenium, copper, nickel, zinc and boron (water soluble).

4.2.5 **Organic Screen -** total petroleum hydrocarbons (TPH) – Criteria Working Group, polyaromatic hydrocarbons (PAH) – USEPA 16 suite, total phenols.

4.2.6 **Others** - cyanide (total), pH, organic matter, asbestos.

4.2.7 The results of chemical analysis on soil samples are presented in Appendix 4, Test Reports 22/10290 and 22/11776.

5.0 REFERENCES

5.1 BS 5930:2015+A1:2020, Code of practice for ground investigations.

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

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

5.4 BS 10175:2011+A2:2017, Investigation of potentially contaminated sites. Code of practice

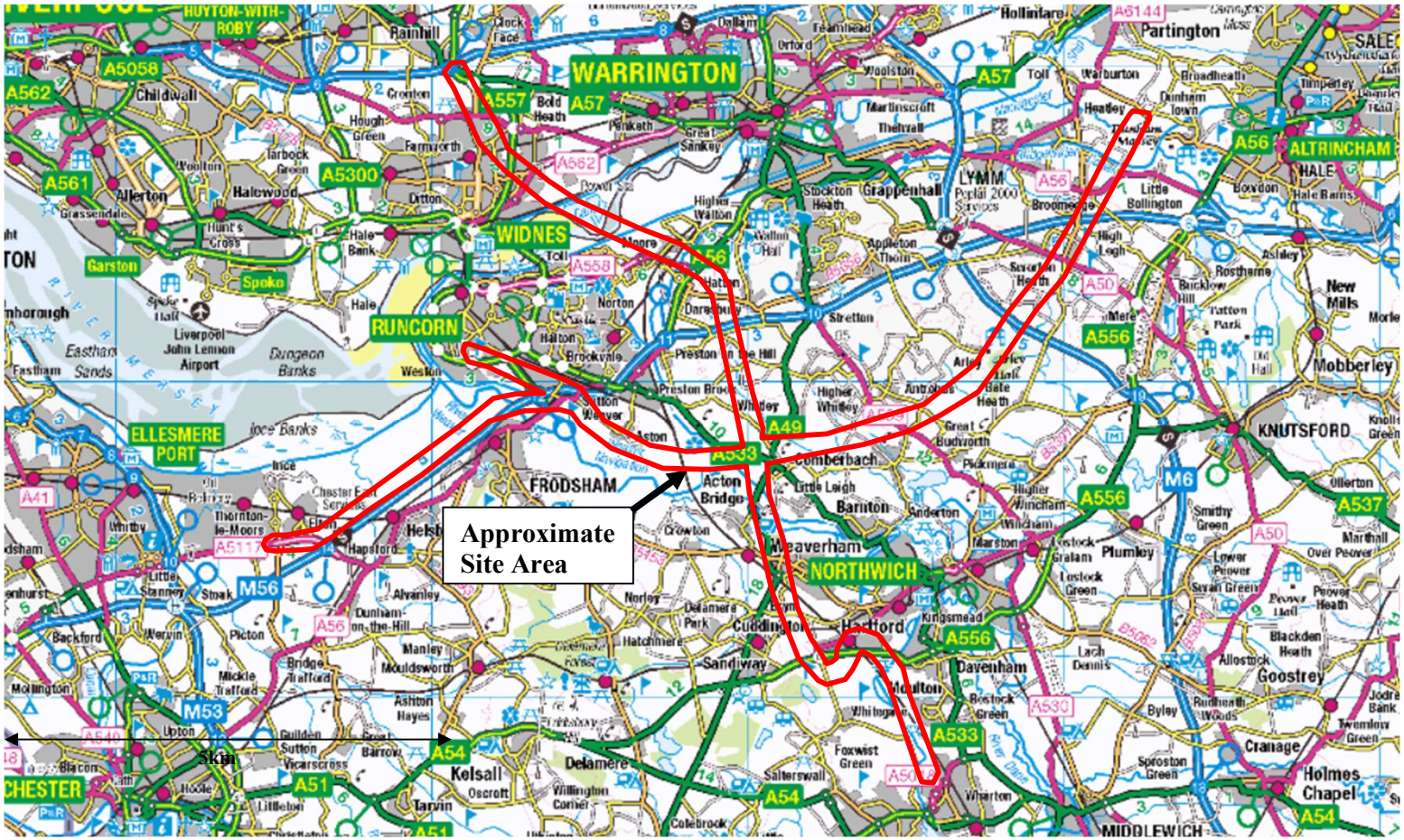
5.5 BS EN ISO 22476-3:2005+A1:2011, Geotechnical investigation and testing. Field testing. Standard penetration test.

5.6 BS 1377-1:2016, Methods of Test for Soils for Civil Engineering Purposes. General requirements and sample preparation.

5.7 Ulusay, R. (Ed). The ISRM Suggested Methods for Rock Characterization, Testing and Monitoring 2007-2014. Springer 2014.

APPENDIX 1

DRAWINGS



PROJECT: HyNet	
FIGURE No. A1.1.	**SCALE: As above**
TITLE: Site Location Plan	
IAN FARMER ASSOCIATES Geotechnical & Environmental Specialists	

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350000 360000 370000

390000 380000 370000

Sheet 11 Sheet 10 Sheet 09 Sheet 08 Sheet 07 Sheet 06 Sheet 05 Sheet 04 Sheet 03 Sheet 02

Line 1 West Line 2 South Line 3 East Line 4 North

Newton-le-Willows Culcheth New Lane End Irlam Collins Green Croft Burtonwood Winwick Glazebrook Partington Hollinfare Lane End Warburton Heatley Dunham Town Little Bollington Broomedge Prescot Bold Heath Cronton Warrington Lymm Widnes Hale Bank Runcorn Liverpool John Lennon Airport Hale Moore Higher Walton Appleton Thorn Stretton Lower Stretton Rostherne Bucklow Hill Hoo Green Mere Preston on the Hill Dutton Lower Whitley Antrobus Frodsham Comberbach Pickmere Higher Marston Barrington Little Leigh Acton Bridge Barnton Marston Lostock Gralam Plumley Lower Peover Swan Green Elton Helsby Thornton-le-Moors Kingsley Crowton Alvanley Northwich Lostock Green Rudheath Dunham-on-the-Hill Norley Hatchmere Hartford Leftwich Lach Dennis Manley Mouldsworth Cuddington Sandiway Davenham Allostock Rudheath Woods Mere Heath Moulton Mickle Trafford Hoole Bank Ashton Hayes Daleford Whitegate Byley Great Barrow Guilden Sutton Kelsall Delamere Foxwist Green Meadowbank Marton Cranage

M57 M62 M6 M56 A57 A570 A5080 A5300 A557 A562 A533 A561 A558 A56 A49 A450 A5033 A556 A530 A54

J1 J2 J3 J4 J5 J6 J7 J8 J9 J10 J11 J12 J14 J19 J20 J21 J21A J22

Legend:

- Borehole
- Trial Pit
- Window Sample
- Preferred Route Centreline
- Preferred Spurs Centreline

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Bolton Manchester St Helens Liverpool Liverpool Bay Rhyl Chester Wrexham Stoke-on-

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TITLE:
Ground Investigation Locations Overview

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National Geographic Style Base: Sources: Esri, USGS
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Contains data from OS Zoomstack
World Hillshade: Esri, CGIAR, USGS

344500
345000
345500
375500
375000
374500

Stanlow HPP HAGI
0
BH002
500
1000
Hill View Way A5117
Pool Lane
Grinsome Road
Elton Primary School
Parkland Drive
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Old Hall
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St Mary's Church
Thornton le Moors
Poole Lane
Thornton Green
M56

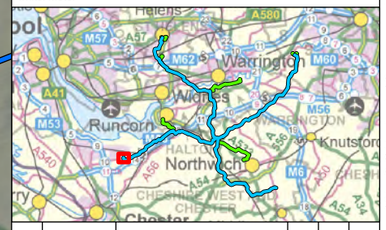
Legend:

- Preferred Route Centreline
- HAGI Layouts
- Preferred Route Centreline KP Marker

Exploratory Hole Locations (Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



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351500 352000 352500 353000 353500 354000 354500

380500 380000 379500 379000 378500

Clifton Road
Weston Link
Cavendish High School
A557
Beechwood Avenue
Beechwood
Beechwood Primary School
Hallwood Park Primary School and Nursery
Hallwood Link Road
Halton General Hospital
St Lukes
Beechcroft Nursing Home
Palacefields Avenue
Palace Fields
Queen Elizabeth II Playing Fields
A533
Brookvale Primary School
Southern Expressway
Hey Lane
Weston Power Station
Clifton
Paddock Moor
Sutton Weaver Community Park
Wood Lane
Weaver Navigation
Sutton Weaver
Halton House School
Chester Road
Ashville Industrial Estate
River Weaver
Sutton Quays Business Park
Sutton Dock
Frodsham Weaver Vale Primary School
Weaver Park Industrial Estate
Ship Street
Bridge Lane
River Weaver

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BH206
500
Western Point Expressway A557
Runcorn HAGI
0
0
1000
500
Rocksavage HAGI
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9000
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BH120
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12000
11500
11000
BH332
BH332A
Sutton Weaver River

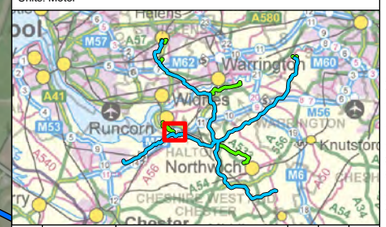
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- Preferred Spurs Centreline
- HAGI Layouts
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker

Exploratory Hole Locations (Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



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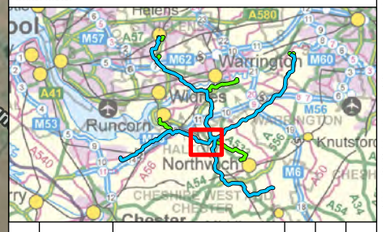
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- Preferred Route Centreline
- Preferred Spurs Centreline
- HAGI Layouts
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker

Exploratory Hole Locations (Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



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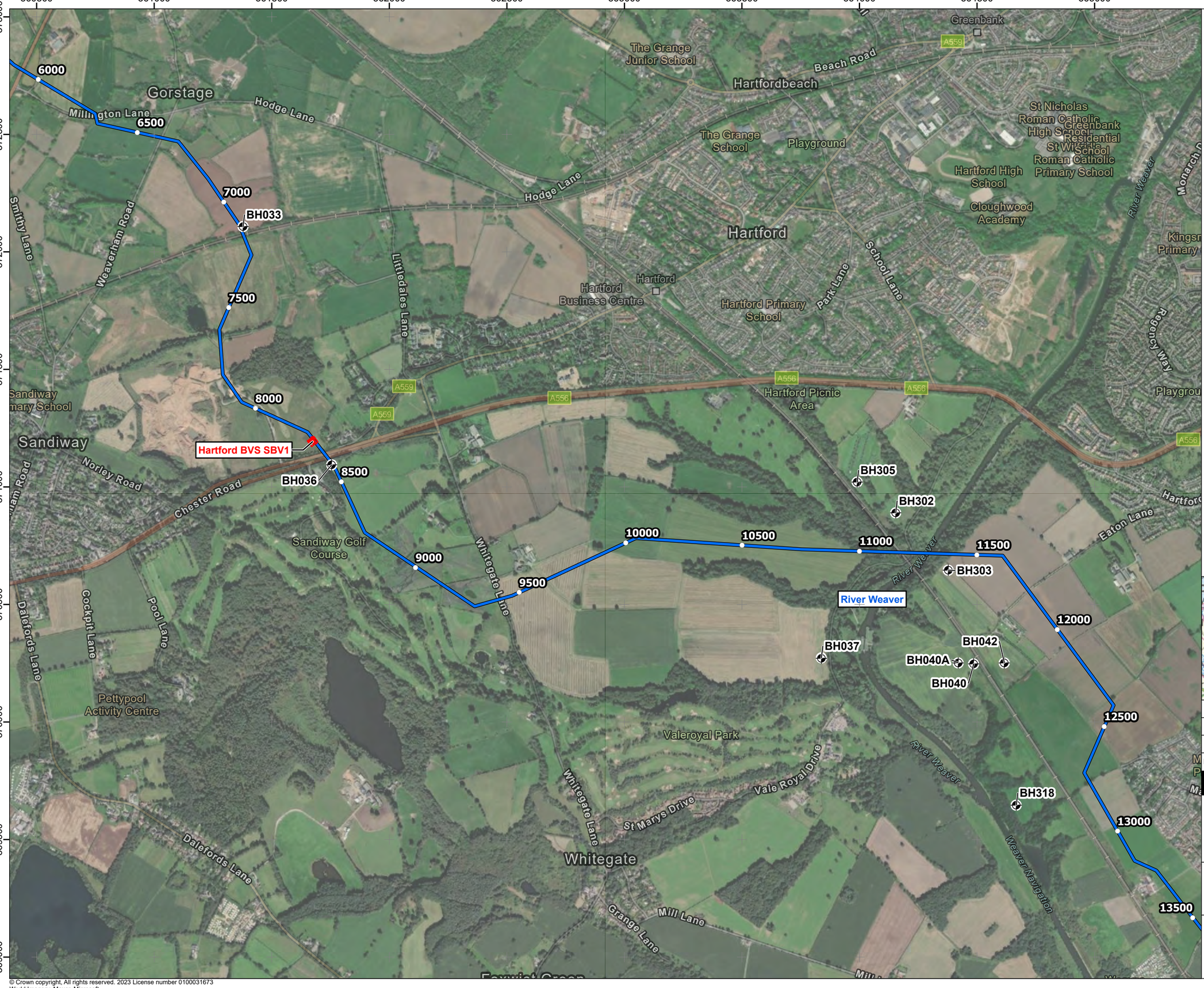
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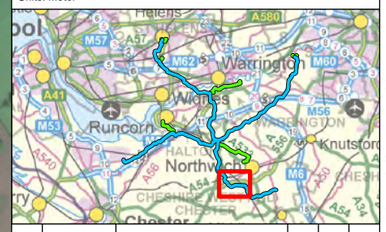
Legend:

- Preferred Route Centreline
- Block Valve Layout
- Preferred Route Centreline KP Marker

Exploratory Hole Locations
(Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



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364000 364500 365000 365500 366000 366500

382500 382000 381500 381000 380500 380000

Occupation Lane
New Road
New Road
Crowley
Arley Road
Arley
Reed Lane
Barbers Lane
Barbers Lane
Lodge Lane
Flash Lane
Keepers Lane
Lane

8500
8000
WS34
7500
ATP41
7000
6500
WS33
WS32
6000
5500
5000
4500

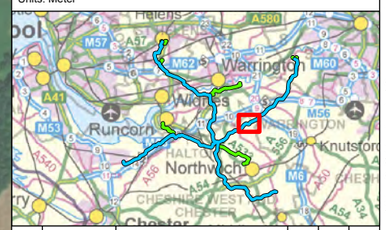
Legend:

- Preferred Route Centreline
- Preferred Route Centreline KP Marker

Exploratory Hole Locations
(Surveyed to British National Grid Coordinate system OSGB 1936)

- Trial Pit
- Window Sample

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	04/05/2023	First Draft	DR	GJ	GJ

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE:
Ground Investigation Locations
Sheet 06 of 11

0 100 200
Metres

SCALE: 1:10,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\Ground Investigation Locations - Sheets 2 to 11.aprx

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World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

367500 368000 368500 369000 369500 370000

384500 384000 383500 383000 382500

Warrington Road
Withers Lane
M56
A50
Sworton Heath
Warrington Road
Heath Lane
Fanners Lane
Swineyard Lane
Swineyard Lane
Moss Lane
Moss Lane
Moss Lane
Golborne Lane
Hobbs Hill Lane
Rowley Bank Lane
Halliwells Brow
Ditchfield Lane
West Lane
High Legh
High Legh Primary School
Mowpen Brook
M6

12500
12000
11500
11000
10500
10000
9500
9000

BH097
BH096
BH094
WS37
WS35

Sworton Heath BVS EBV3
A50 Warrington Road

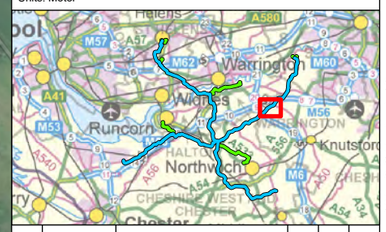
Legend:

- Preferred Route Centreline
- Block Valve Layout
- Preferred Route Centreline KP Marker

Exploratory Hole Locations (Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole
- Window Sample

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	04/05/2023	First Draft	DR	GJ	GJ

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE:
Ground Investigation Locations
Sheet 07 of 11

0 100 200
Metres
SCALE: 1:10,000 @ A3

N W E S

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389000 388500 388000



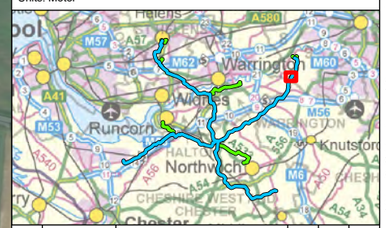
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- Preferred Spurs Centreline
- HAGI Layouts
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker

Exploratory Hole Locations
(Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole
- Trial Pit

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	04/05/2023	First Draft	DR	GJ	GJ

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United Living Energy Services

RSK GEOSCIENCES

TITLE:
Ground Investigation Locations
Sheet 08 of 11

0 100 200
Metres
SCALE: 1:5,000 @ A3

N W E S

REV 00

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357500 358000 358500 359000 359500 360000 360500

386500 386000 385500 385000 384500 384000

River Mersey
River Mersey
Higher Walton HAGI
West Coast Mainline Railway Viaduct
Manchester Ship Canal
Solvay/ Ingevity Works
Bridgewater Canal
A56 Chester Road
Morley Common
Baronet Works
Manchester Ship Canal
Chester Road
Birchwood Lane
Mill Lane
Warrington Sports Club
Church Park
Walton Lea Road
Walton Hall Gardens
Houghs Lane
Moore
Moore Primary School
Runcorn Road
Moore Lane
Hobb Lane
Park Lane
A56

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BH330 BH300 BH301 BH329 BH338 BH063 WS10 BH061 BH060 BH327 BH326

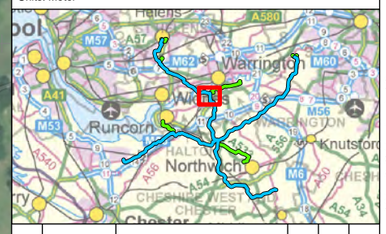
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- Preferred Spurs Centreline
- HAGI Layouts
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker

Exploratory Hole Locations (Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole
- Window Sample

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	04/05/2023	First Draft	DR	GJ	GJ

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE:
Ground Investigation Locations
Sheet 09 of 11

0 100 200
Metres
SCALE: 1:10,000 @ A3

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354000 354500 355000 355500 356000 356500 357000

387000 386500 386000 385500 385000

14000 13500 13000 12500 12000 11500

A562 Widnes Road

River Mersey/ Sankey Canal/Skelton Junction to Ditton Railway

Fiddlers Ferry Power Station

ATP24 ATP23

BH070 BH069 BH067 BH066

Cuerdley Fiddler's Ferry Lapwing

Mowcroft Lane Widnes Road Tannery Lane

St Vincent's Catholic Primary School

Hall Nook Penkeith Brook St Helens Canal

St Helens Canal River Mersey Manchester Ship Canal

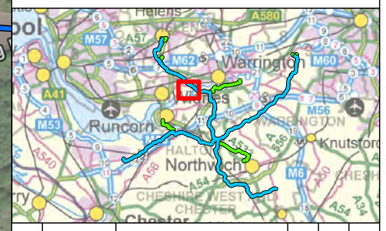
Legend:

- Preferred Route Centreline
- Preferred Route Centreline KP Marker

Exploratory Hole Locations (Surveyed to British National Grid Coordinate system OSGB 1936)

- Borehole
- Trial Pit

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	04/05/2023	First Draft	DR	GJ	GJ

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE:
Ground Investigation Locations
Sheet 10 of 11

0 100 200
Metres

SCALE: 1:10,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\Ground Investigation Locations - Sheets 2 to 11.aprx

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World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

350500 351000 351500 352000

391000 390500 390000

Sutton Manor Primary School
Tennyson Street
Milton Street
Jubits Lane
Sutton Manor
Bell Lane
Chapel Lane
St Helens Linkway
School Lane
Union Bank Lane
Rainhill Stoops
Warrington Road
M62
A57
7

1000
1000
500
500
TP12
0
0
19000
18500

Clockface HAGI

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World Imagery: Maxar, Microsoft
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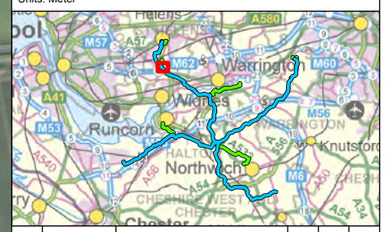
Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- HAGI Layouts
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker

Exploratory Hole Locations
(Surveyed to British National Grid Coordinate system OSGB 1936)

- Trial Pit

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	04/05/2023	First Draft	DR	GJ	GJ

322968 - HyNet NW
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RSK GEOSCIENCES

TITLE:
Ground Investigation Locations
Sheet 11 of 11

0 100 200
Metres
SCALE: 1:5,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\Ground Investigation Locations - Sheets 2 to 11.aprx

APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 General

Site work is carried out in general accordance with the guidelines given in BS 5930, ref 5.1, and BS 10175, ref. 5.4.

A2.1.2 Trial Pits

Shallow trial pits are generally dug by mechanical excavator, however, in difficult access locations or adjacent to structures, such pits may be hand dug. Pits are best used where the ground will stand unsupported and generally, the maximum depth of machine dug pits is 4m to 5m. Where personnel are required to enter pits, it is essential that side support is provided. Entry by personnel into unsupported pits deeper than 1.2m is not allowed for health and safety reasons.

Trial pits allow the in-situ condition of the ground to be examined both laterally and vertically and also allow discontinuities to be recorded. The field record should give the orientation of the pit with details of which face was logged, assessment of stability of sides of pit and groundwater as well as the strata encountered. Photographs of the pit may also be taken.

In-situ testing, such as hand penetrometer, hand vane, Macintosh probe, or similar, can be undertaken in the sides or base of pits while both disturbed and undisturbed samples may be recovered.

It is generally advisable to backfill the pits as soon as possible, open pits should not be left unattended.

A2.1.3 Light Cable Percussion Boring

The light cable percussion rig is generally employed for boring through soils and weak rocks. It consists of a powered winch and tripod frame, with running wheels that are permanently attached so that the rig may be towed behind a suitable vehicle. The rig is towed into position and set up using its own winching system.

The locations of services are checked to make sure the borehole is not situated unacceptably near any services. Regardless of the proximity of services, a CAT scan is undertaken at the borehole location and an inspection pit dug to 1.20m by hand.

Boreholes are advanced in soil by the percussive action of the cable tool. The force of the cylindrical tool as it is dropped a short distance cuts a plug of cohesive soil that is removed by the tool.

In non-cohesive soils, the borehole is advanced by a ‘shell’, otherwise known as a ‘bailer’ or ‘sand pump’, which incorporates a clack valve. Material is transferred into the shell and retained by the clack valve. The water level in a borehole is maintained above that in the surrounding granular soil to allow for temporary reductions in the head of water as the shell is withdrawn from the borehole. Water should flow from the borehole into the surrounding soil at all times to prevent

'piping' and loosening the soil at the base of the hole. The casing is always advanced with the borehole in granular soil so that material is drawn from the base rather than the borehole sides.

Obstructions to boring are overcome by fitting a serrated chiselling ring to the base of the percussion tool. For large obstructions, a heavy chisel with a hardened cutting edge may have to be used.

Disturbed samples are taken in polythene bags, jars or tubs that are sealed against air or water loss.

Undisturbed samples are generally taken in cohesive materials at changes in strata and at one metre intervals to 5 metres then at 1.5 metre intervals to the full depths of the borehole. The open-tube sampler is suitable for firm to stiff clays, but is often used to retrieve disturbed samples of weak rocks, soft or hard clay and also clayey sand or silts. This has been adopted for routine use, and usually consists of a 100mm internal diameter tube (U100), which is capable of taking soil samples up to 450mm in length. The undisturbed samples are sealed at each end using micro-crystalline wax to prevent drying.

The thin-walled open-tube sampler has been used on this contract, and consists of a 100mm internal diameter tube (UT100), which is capable of taking soil samples up to 450mm in length.

Standard penetration tests are generally carried out at frequencies similar to that of undisturbed sampling.

A2.1.4 Rotary Drilling

For exploration within rock rotary drilling methods are employed, where the drill bit is rotated on the bottom of the borehole. This method is occasionally used for drilling within soils. The drilling fluid is transferred from the surface though hollow drilling rods to the bit cooling and lubricating. Drilling fluids commonly comprise clean water, air, foam, mud or polymers which aid the transportation of drill cuttings to the surface and maximise core recovery.

There are two basic types of rotary drilling:

- Open hole where the drill bit cuts all the material within the diameter of the borehole. This technique is sometimes used in soils and weak rocks as a rapid and economical means of making holes for taking soil samples, carrying out in-situ soil tests, installing instruments and probing for voids such as mine workings or solution cavities. The only samples recovered are the poor quality drill cuttings.
- Core drilling where an annular bit fixed to the bottom of the core barrel cuts a core, which is recovered within the innermost tube of the core barrel. Coring is normally carried out by triple tube core barrels. At the end of the core run the core barrel assembly is brought to the surface. The core is prevented from dropping out of the barrel by a core catcher made of spring steel. The non-rotating inner barrel contains a removable sample tube or liner. At the end of each coring run the liner is extracted from the barrel and stored in a core box, where it can be photographed, described and tested.

A2.1.5 Drive-in Window Sampler

The dynamic sampler, consists generally of a track mounted window sampler and a series of cylindrical sample tubes, generally varying in diameter from 98mm to 35mm. A cutting shoe is fitted to the bottom of each tube, while samples are collected in plastic liners fitted inside the sample tube.

The borehole is extended by using progressively smaller diameter tubes.

A2.2 IN-SITU TESTS

A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended in ref 5.5.

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.5kg hammer with a 760mm drop. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the 'N' value.

The 'N' value reported on the borehole logs is as measured but may be corrected for the energy ratio (E_r) of the specific test equipment to give a normalised N_{60} value.

E_r for the drilling apparatus used for this ground investigation is referenced within the exploratory hole records.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT.**

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

- Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.
- If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.
- For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels with the general descriptions as follows:

Term	SPT N-Value: Blows/300mm Penetration
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

A2.3 SAMPLES / TESTS

U represents undisturbed 100mm diameter sample, the number of blows to obtain the sample also recorded.

UT represents undisturbed 100mm diameter thin-wall sample, the number of blows to obtain the sample also recorded.

U (NR) indicates undisturbed sample not recovered.

B represents bulk disturbed sample.

LB represents large bulk disturbed sample.

D represents small disturbed sample.

ES represents environmental soil sample, consisting of amber jar, vial and plastic tub.

C represents core sample

W represents water sample.

$\underline{\nabla}$ represents water strike.

$\underline{\blacktriangledown}$ represents level to which water rose.

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

The procedures and principles given in BS EN ISO 14688 Parts 1 and 2, ref 5.2, supplemented by section 6 of BS 5930, ref. 5.1 have been used in the soil descriptions contained within this report.

A2.5 DESCRIPTION OF ROCK

A2.5.1 General

The procedures and principles given in BS EN ISO 14689, ref 5.3, supplemented by section 6 of BS 5930, ref. 5.1 have been used in the rock descriptions contained within this report.

A core run is the length of rock drilled from the base of the hole each time the core barrel is run into the hole.

A2.5.2 Fracture State

Various criteria may be used for quantitative description of the Fracture State of rock cores. The standard terms are as follows.

TCR (%)	ratio of core recovered (solid and non intact) to length of core run.
SCR (%)	ratio of solid core recovered to length of core run.
RQD (%)	ratio of solid core pieces longer than 100mm to length of core run.
Fracture Index	a count of the number or spacing of fractures over an arbitrary length of core of similar intensity of fracturing. Reported as Fracture Index (FI, number of fractures per metre).
NR	indicates no core recovery.
AZCL	indicates assessed zone of core loss.
NA	indicates not applicable as material is soil.
NI	indicates intensely fractured rock which is not of sufficient quality to allow an assessment of fracture spacing to be made.
NIDD	indicates intensely fractured rock suspected to be drilling disturbed.

SPT Hammer Calibration Certificates

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	AR2371
Test Date:	24/11/2022
Report Date:	24/11/2022
File Name:	AR2371.spt
Test Operator:	JL

Instrumented Rod Data

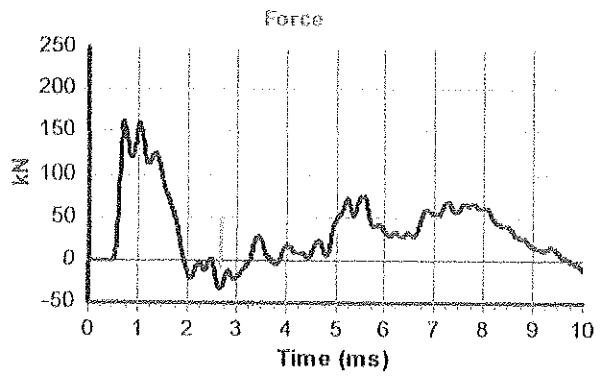
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Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	72572
Accelerometer No.2:	72757

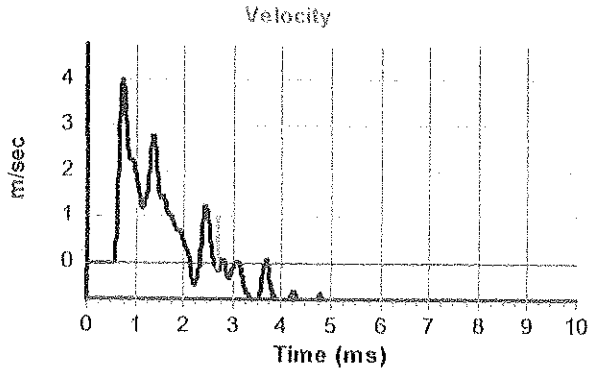
SPT Hammer Information

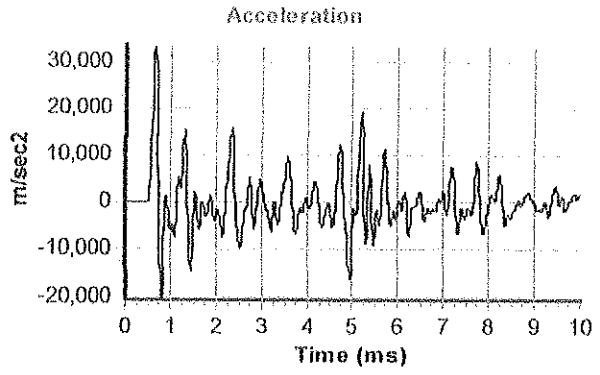
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

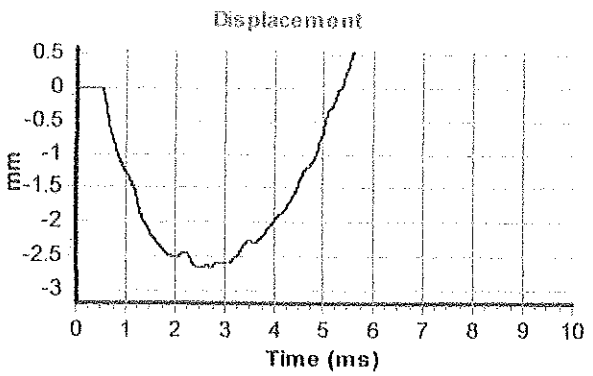
Comments / Location

GARY HART DRILLING - 82808









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	292

Energy Ratio E_r (%): **62**

Signed: J.LOCK

Title: FITTER

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	LSI1
Test Date:	04/03/2022
Report Date:	04/03/2022
File Name:	LSI1.spt
Test Operator:	JL

Instrumented Rod Data

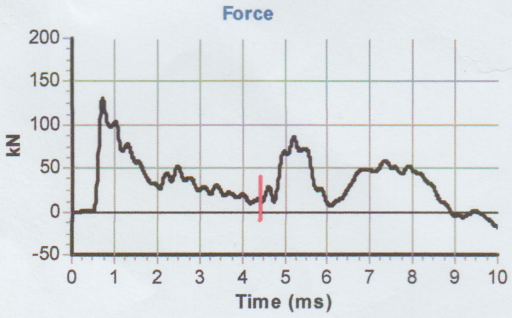
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
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Accelerometer No.2:	11609

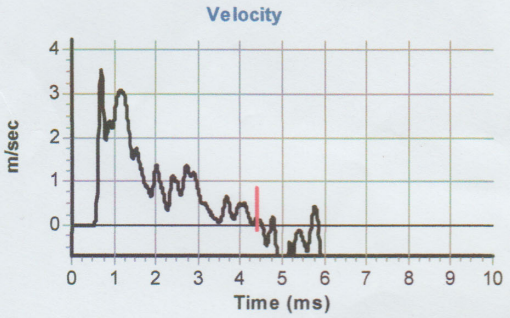
SPT Hammer Information

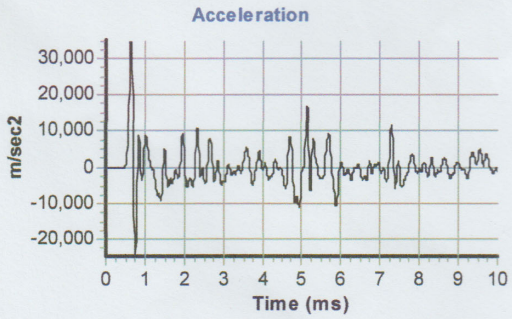
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Falling Height h (mm):	760
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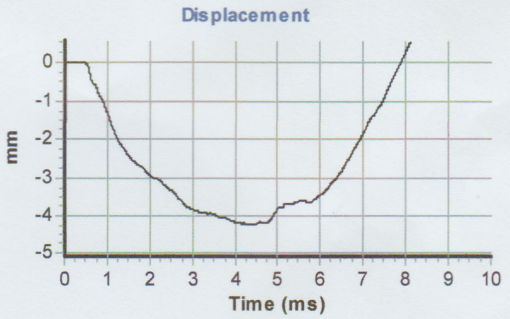
Comments / Location

LSI - 79461









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	290

Energy Ratio E_r (%): **61**

Signed: J.LOCK

Title: FITTER

The recommended calibration interval is 12 months

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	LSI2
Test Date:	04/03/2022
Report Date:	04/03/2022
File Name:	LSI2.spt
Test Operator:	JL

Instrumented Rod Data

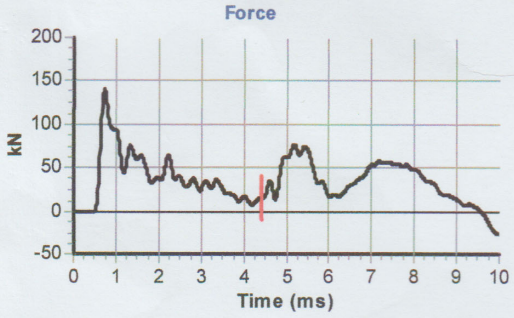
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7080
Accelerometer No.2:	11609

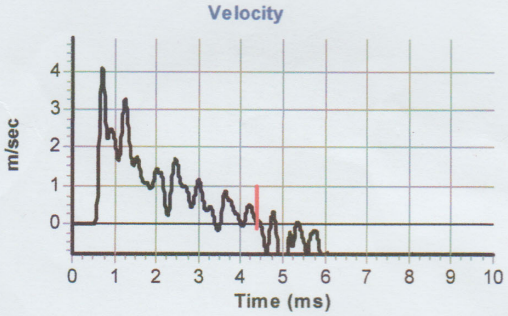
SPT Hammer Information

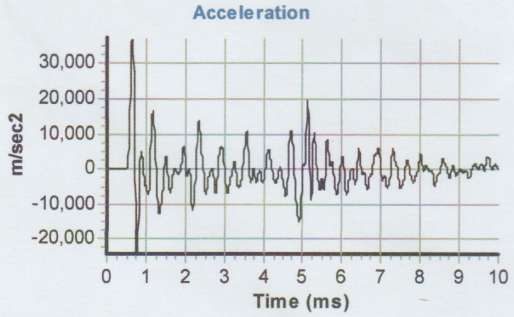
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

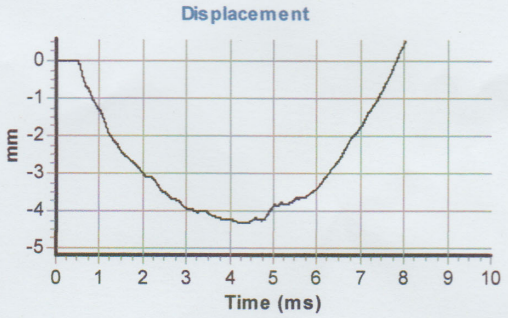
Comments / Location

LSI - 79461









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	291

Energy Ratio E_r (%): **62**

Signed: J.LOCK

Title: FITTER

The recommended calibration interval is 12 months

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	PBD02
Test Date:	17/02/2022
Report Date:	17/02/2022
File Name:	PBD02.spt
Test Operator:	CM

Instrumented Rod Data

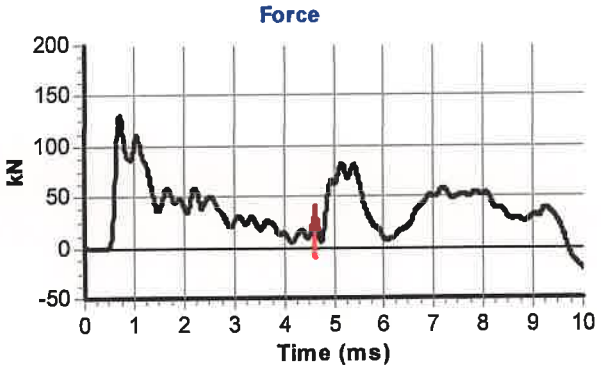
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7080
Accelerometer No.2:	11609

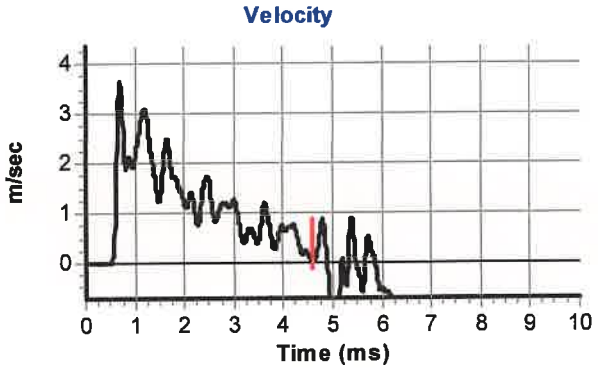
SPT Hammer Information

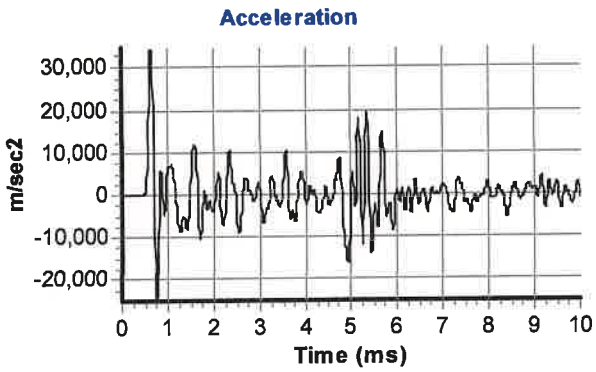
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

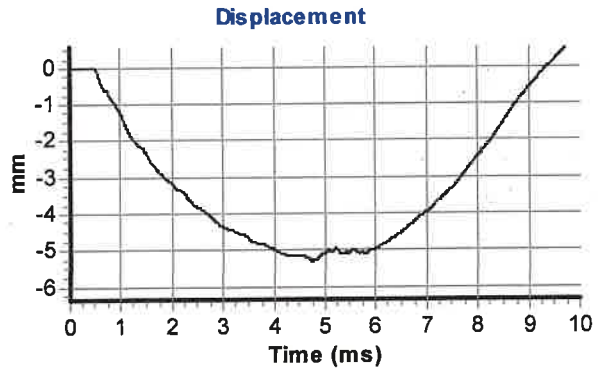
Comments / Location

PB DRILLING LTD/79197









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	331

Energy Ratio E_r (%): **70**

The recommended calibration interval is 12 months

Signed: C.McCLUSKEY

Title: FITTER

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	AR4034
Test Date:	19/08/2022
Report Date:	19/08/2022
File Name:	AR4034.spt
Test Operator:	MT

Instrumented Rod Data

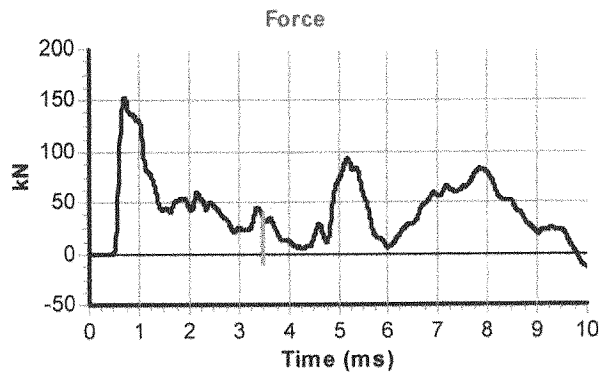
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	72572
Accelerometer No.2:	72757

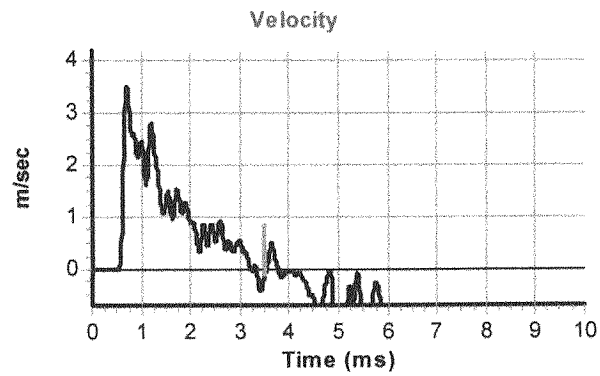
SPT Hammer Information

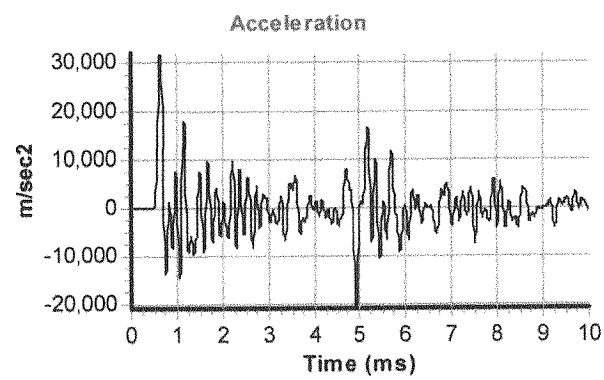
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

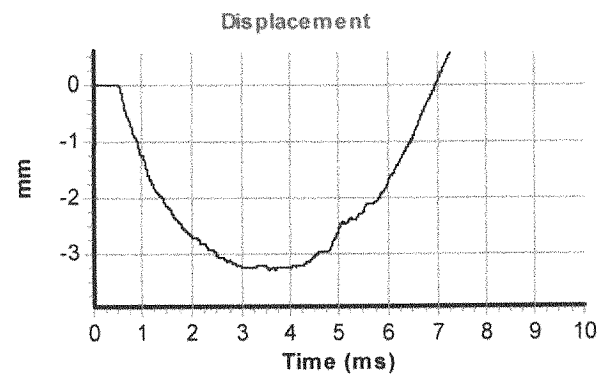
Comments / Location

LSI DRILLING SERVICE LTD - 81500









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	299

Energy Ratio E_r (%): 63

Signed: M.TONER

Title: FITTER

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Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Hammer Ref:	JS.01.
Test Date:	25/11/2021
Report Date:	
File Name:	JS.01..spt
Test Operator:	B HUNTER

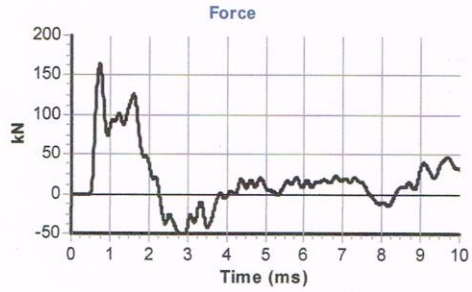
Instrumented Rod Data

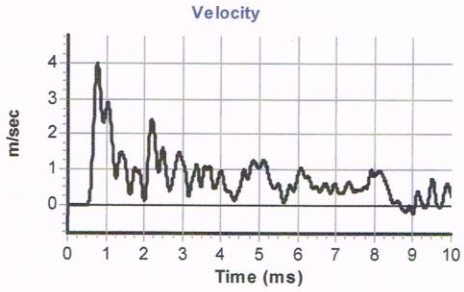
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	62901
Accelerometer No.2:	62902

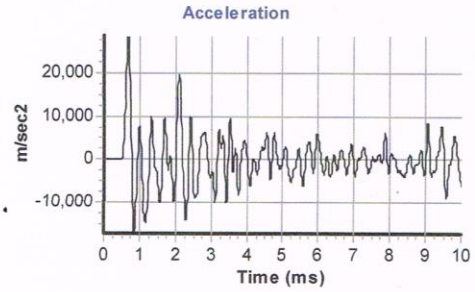
Hammer Information

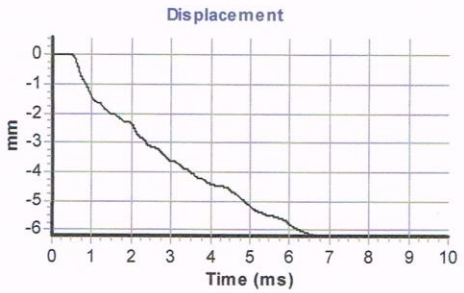
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	10.0

Comments / Location









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	273

Energy Ratio E_r (%): **58**

The recommended calibration interval is 12 months

Signed:

Title: Operations Manager

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Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic Sampling
Unit 8
Victory Park
Victory Road
Derby
DE248ZF

Hammer Ref:	JN01
Test Date:	09/02/2022
Report Date:	10/02/2022
File Name:	JN01.spt
Test Operator:	B HUNTER

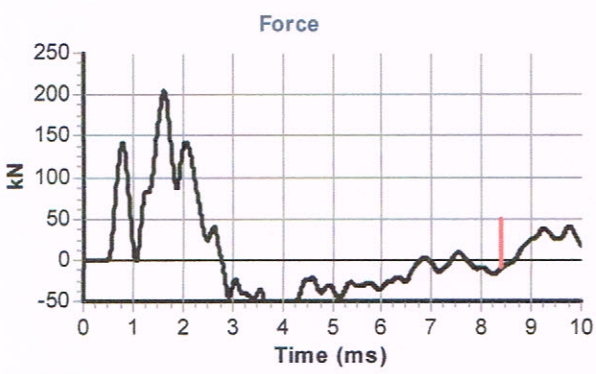
Instrumented Rod Data

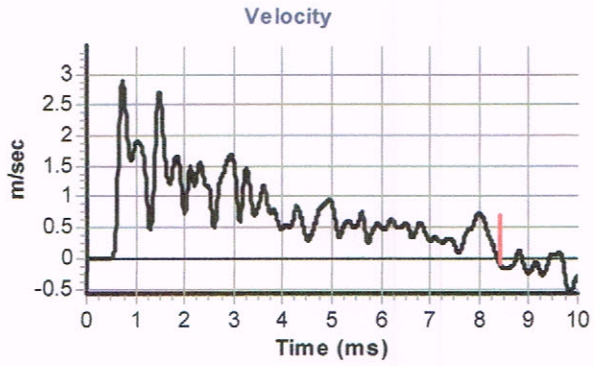
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	62901
Accelerometer No.2:	62902

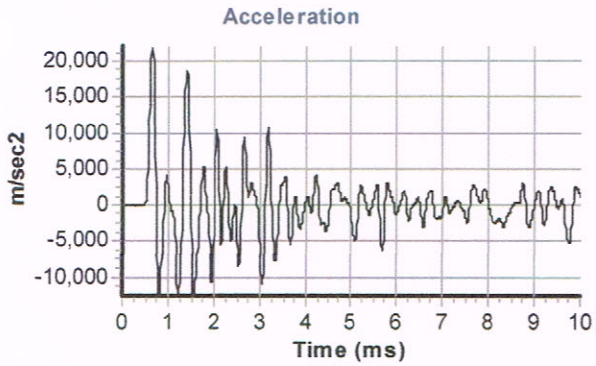
Hammer Information

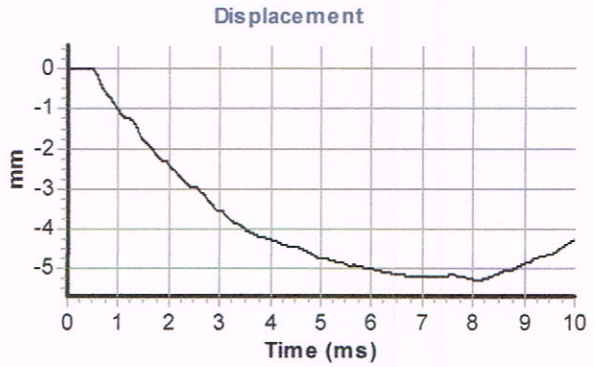
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	10.0

Comments / Location





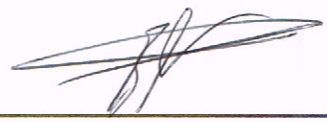




Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	309

Energy Ratio E_r (%): **65**



Signed: B.Hunter

Title: Operations Manager

The recommended calibration interval is 12 months

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Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic Sampling Uk Ltd
Unit 8 Victory Park
Victory Road
Derby
DE24 8ZF

Hammer Ref:	JT01
Test Date:	06/05/2022
Report Date:	06/05/2022
File Name:	JT01.spt
Test Operator:	B.HUNTER

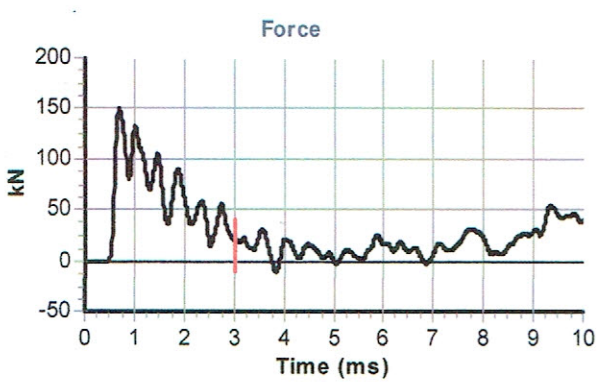
Instrumented Rod Data

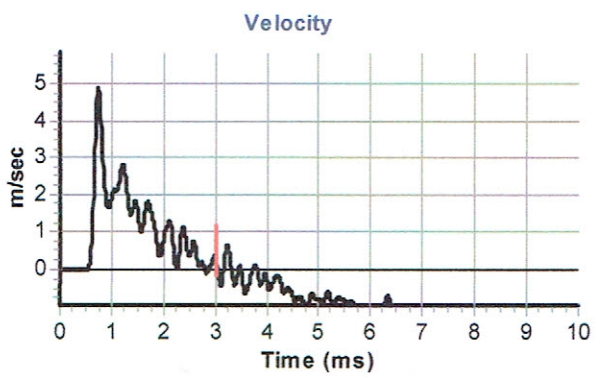
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	62901
Accelerometer No.2:	62902

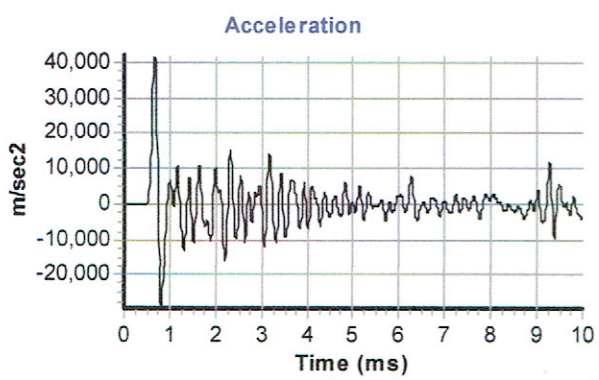
Hammer Information

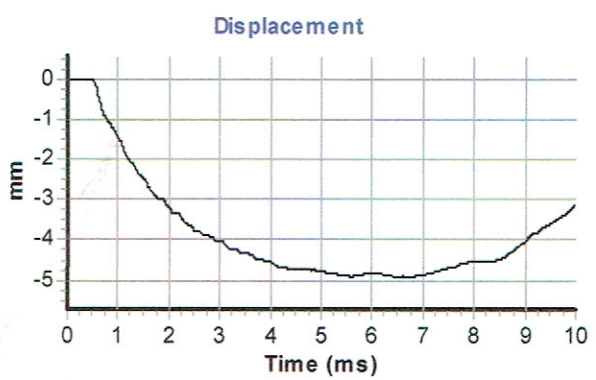
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	10.0

Comments / Location









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	314

Energy Ratio E_r (%): **66**

Signed: B.Hunter

Title: Operations Manager

The recommended calibration interval is 12 months

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Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic Sampling Uk Ltd
Unit 8 Victory Park
Victory Road
Derby
DE24 8ZF

Hammer Ref:	KM01
Test Date:	06/05/2022
Report Date:	06/05/2022
File Name:	KM01.spt
Test Operator:	B.HUNTER

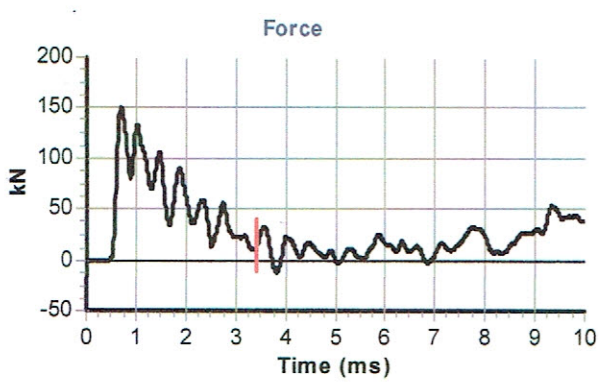
Instrumented Rod Data

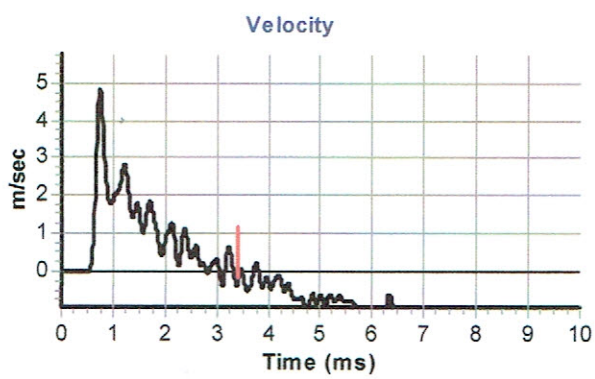
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	62901
Accelerometer No.2:	62902

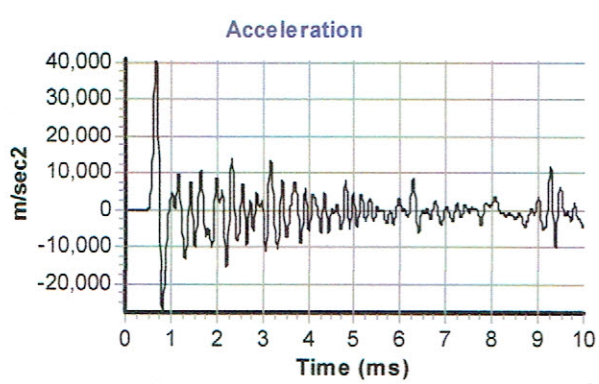
Hammer Information

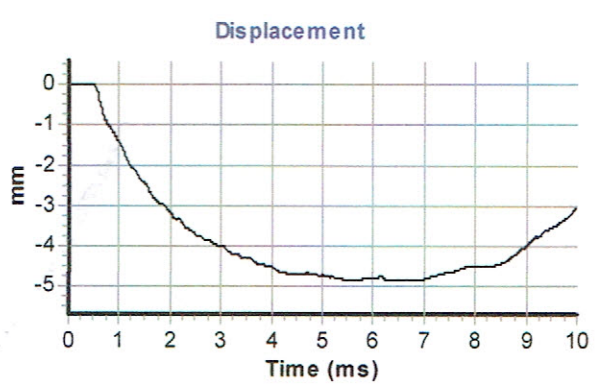
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	10.0

Comments / Location









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	321

Energy Ratio E_r (%): **68**



Signed: B.Hunter

Title: Operations Manager

The recommended calibration interval is 12 months

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	DART 504
Test Date:	08/09/2022
Report Date:	08/09/2022
File Name:	Dart 428.spt
Test Operator:	CM

Instrumented Rod Data

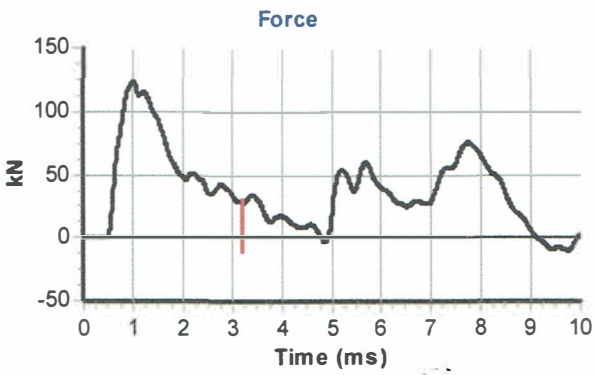
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.3
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	7080
Accelerometer No.2:	11609

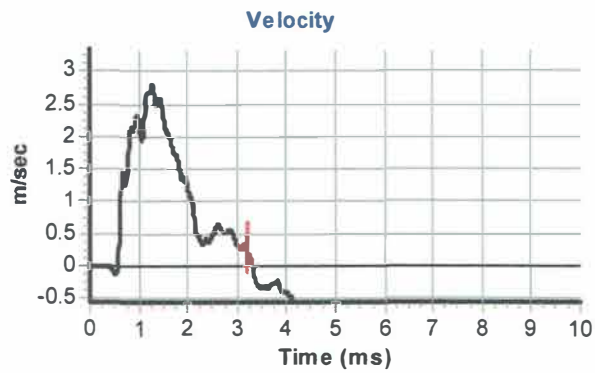
SPT Hammer Information

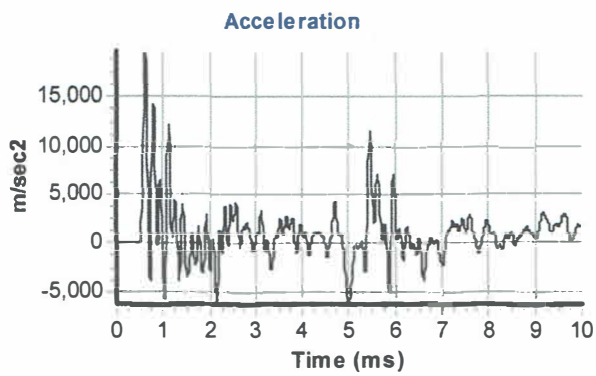
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

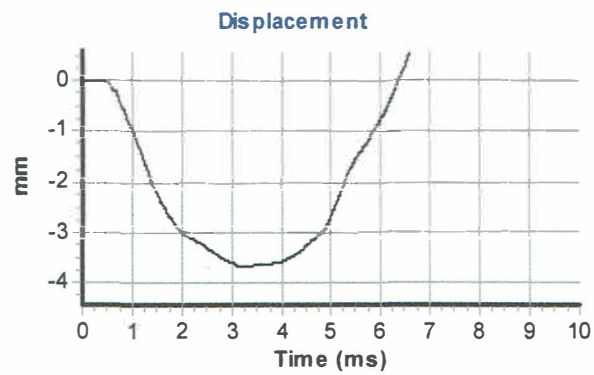
Comments / Location

PM SAMPLING/74532









Calculations

Area of Rod A (mm2):	944
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	319

Energy Ratio E_r (%): **67**

Signed: C.McCLUSKEY

Title: FITTER

The recommended calibration interval is 12 months

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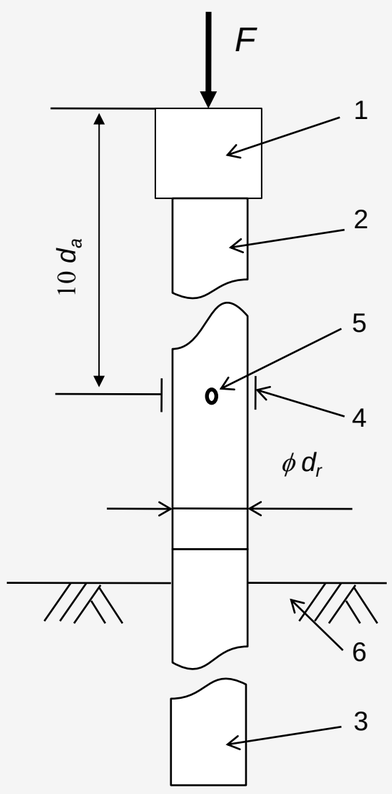
SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer		Hammer
Test No		2022_85
Client		Marriott Geotechnical
Test Depth (m)		11.00
Mass of hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	473J

Characteristics of the instrumented rod

Diameter	d_r =	0.052 m
Length of instrumented rod		0.558 m
Area	A =	11.61 cm²
Modulus	E_a =	206843 MPa



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

DATE OF TEST	VALID UNTIL	HAMMER ID
14/01/2022	14/01/2023	AR3408

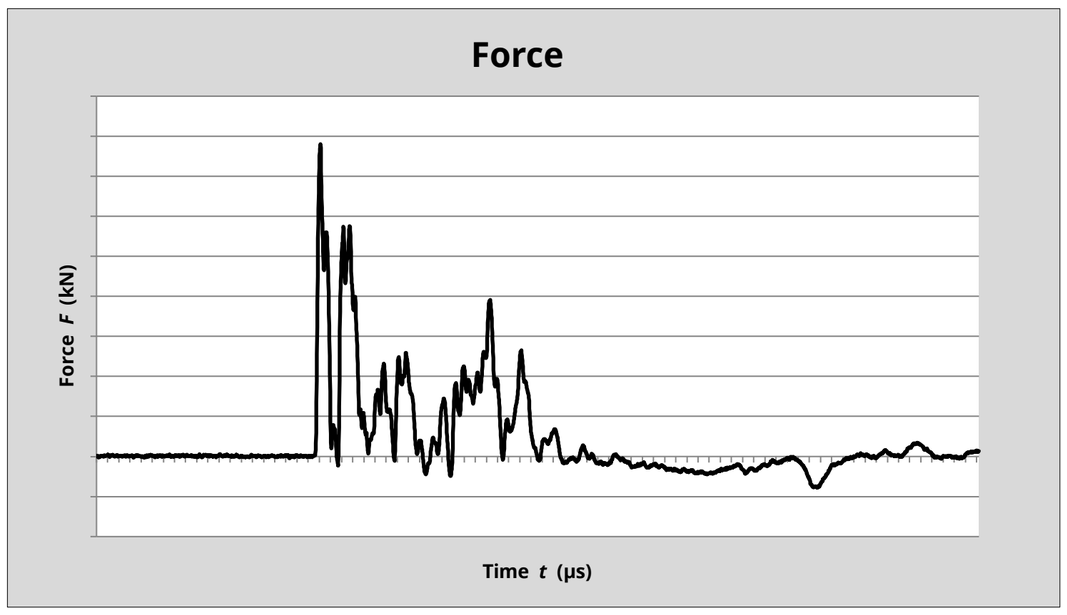
E_{meas} = **0.312** kN-m

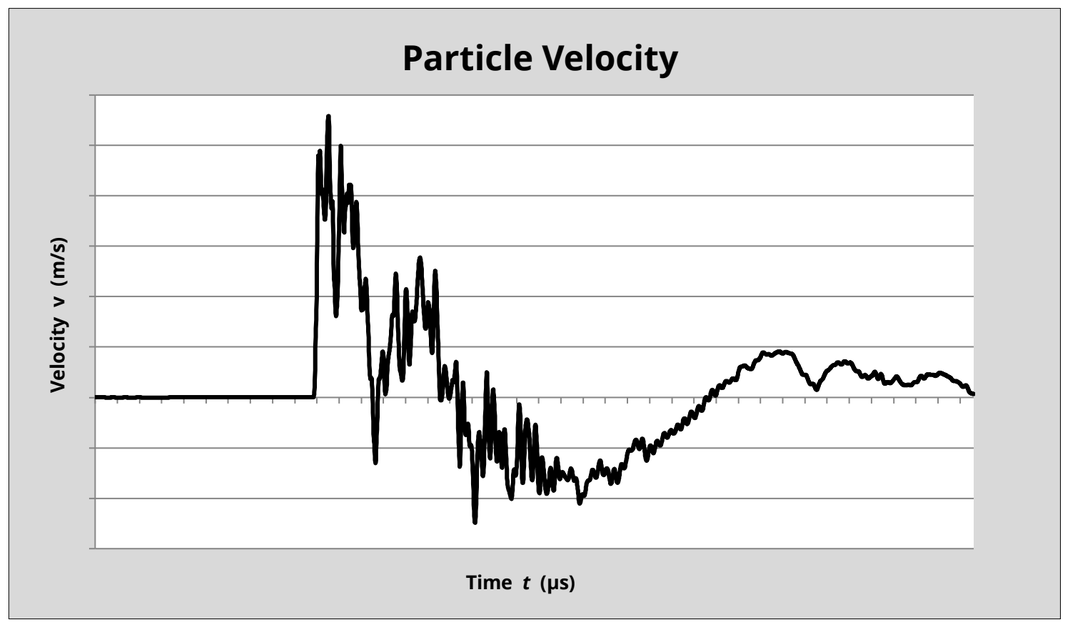
E_{theor} = **0.473** kN-m

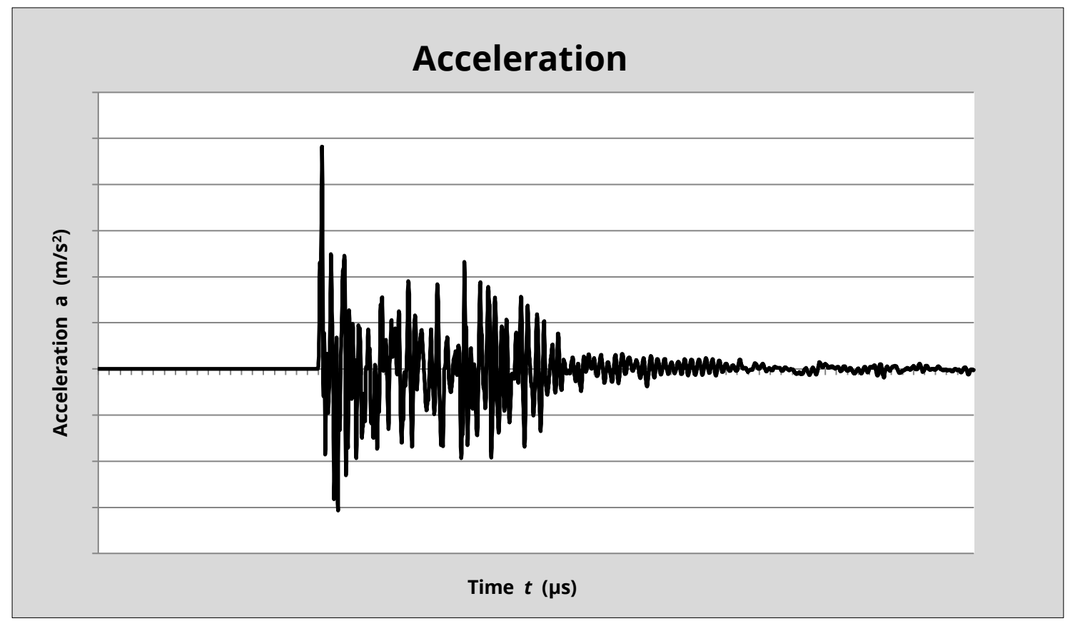
Comments

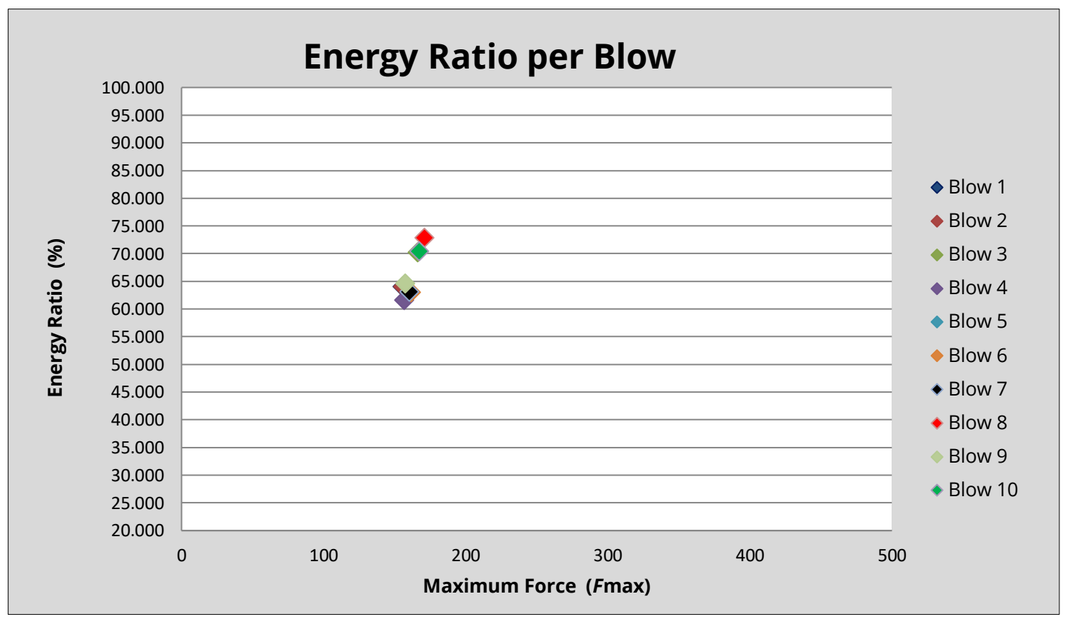
Energy Ratio (Er) = $\frac{E_{meas}}{E_{theor}}$ **66.03%**

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Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
AF	25/01/2022	25/01/2022	25/01/2022

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Borehole Records

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH002**
Dates: 18/10/2022 - 26/10/2022	Client: Cadent		Sheet 1 of 2
Cable Percussion and Rotary Boring Log	Location: 344837.96E 374822.98N	Ground level: 10.55mOD / Logged by: JB/AE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 0.20	D1 ES2			(0.40)	Dark greyish brown, slightly gravelly, slightly clayey, fine SAND with occasional rootlets up to 2mm. Gravel is subrounded, fine to coarse including sandstone and mudstone.			
0.40 - 0.90 0.50	B3 D4		10.15	0.40	TOPSOIL			
				(0.50)	Firm, reddish brown mottled grey, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse, including mudstone and sandstone.			
0.90 - 1.20 1.00	B5 ES6		9.65	0.90	GLACIAL TILL			
1.20		SPT(S) 50 (5,10/50 for 275mm)		(0.80)	Reddish brown, slightly gravelly, silty, clayey, fine and medium SAND. Gravel is subangular, fine to coarse including sandstone. SHERWOOD SANDSTONE GROUP *Below 1.20m: very dense.*			
1.20 - 1.65 1.20 - 1.70	D7 B8		8.85	1.70				
2.00 - 2.20	B9			(0.50)	Very weak, reddish brown, fine and medium grained SANDSTONE recovered as sandy, angular to subangular fine to coarse gravel. [CHESTER FORMATION]			
		2.20m - SPT(C) 50 (25 for 115mm/50 for 80mm)	8.35	2.20	SHERWOOD SANDSTONE GROUP			
2.20 - 3.20	3 3 3	AZCL		(0.95)	Assessed zone of core loss, possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP			
	0		7.40	3.15				
		3.20m - SPT(S) 50 (25 for 131mm/50 for 140mm) 3.20m - D10	7.35	3.20	Very weak, reddish brown, fine grained, slightly micaceous SANDSTONE. (CLASS B) [CHESTER FORMATION] SHERWOOD SANDSTONE GROUP			
3.20 - 4.70	0 0 0	AZCL		(1.50)	Assessed zone of core loss, possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP			
		4.70m - SPT(S) 50 (25 for 90mm/50 for 95mm) 4.70m - D11 5.25m - C12	5.85	4.70	Weak locally moderately weak, thinly laminated (15 to 30 degrees) reddish brown locally stained yellowish grey, fine grained, micaceous SANDSTONE, with occasional bluish grey laminae (2mm) of micaceous silt. Discontinuities are: 15 to 30 degrees, medium to widely spaced, planar, slightly rough, clean. (CLASS B) [CHESTER FORMATION] SHERWOOD SANDSTONE GROUP *Between 4.70m and 5.10m: non intact, drilling disturbed, recovered as; angular to subangular, fine to coarse gravel.* *Between 5.10m and 5.18m: frequent tabular, demineralised, dissolution vugs (up to 20mm).* *At 5.25m: very weak.*			
4.70 - 5.70	100 100 100	NIDD						
5.70 - 7.20	100 100 100	7.00m - C13						
				(5.50)				
7.20 - 8.70	100 100 100	3 7.95m - C14			*Between 7.58m and 7.68m: frequent, tabular, demineralised, dissolution vugs (up to 30mm).* *Between 7.65m and 7.72m: non intact, drilling disturbed.* *At 7.95m: very weak, extremely weak diametrically.*			
		8.80m - C15			*At 8.80m: weak, very weak diametrically.*			
8.70 - 10.20	100 100 100							
	TCR/SCR/RQD	FI	Samples & Tests		Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
1.70	2.20	60	

Borehole Diameter

Depth (m)	Dia (mm)
10.20	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
18/10	16:00	2.20	2.20	1.70
24/10	08:00	2.20	2.20	
24/10	16:30	10.20	4.70	8.50
25/10	00:00	10.20		6.10

Casing Diameter

Depth (m)	Dia (mm)
2.20	150
10.20	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
8.70	4.70		20	8.70	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	6.00	Plain	50
6.00	10.00	Slotted	50

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371/JS01 Energy Ratio: 62/58%

Checked by: MHW
Log status: FINAL
IFA CP v01.01

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH002**
Dates: 18/10/2022 - 26/10/2022	Client: Cadent		Sheet 2 of 2
Rotary Boring Log	Location: 344837.96E 374822.98N	Ground level: 10.55mOD / Logged by: JB/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
			10.05m - C16	0.35	10.20	Weak locally moderately weak, thinly laminated (15 to 30 degrees) reddish brown locally stained yellowish grey, fine grained, micaceous SANDSTONE, with occasional bluish grey laminae (2mm) of micaceous silt. Discontinuities are: 15 to 30 degrees, medium to widely spaced, planar, slightly rough, clean. (CLASS B) [CHESTER FORMATION] SHERWOOD SANDSTONE GROUP *Between 9.90m and 9.95m: extremely closely spaced, thin laminations (5 to 15 degrees) of extremely weak, grey siltstone.* End of Borehole at 10.20m		11 12 13 14 15 16 17 18 19 20		

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: AR2371/JS01 Energy Ratio: 62/58%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH002



Core Photographs
BH002



Core Photographs
BH002



IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH017**
Dates: 03/10/2022 - 04/10/2022	Client: Cadent		Sheet 1 of 2
Dynamic Sampling and Rotary Boring Log	Location: 357858.01E 377504.03N	Ground level: 26.49mOD / Logged by: CG/TW / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.20	D1		26.24	0.25	Grass over brownish grey, slightly sandy, clayey SILT with frequent rootlets. TOPSOIL			
0.30 - 0.40	D2			(0.45)	Very stiff, reddish brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to well rounded, fine to coarse including siltstone, mudstone and occasional chert. GLACIAL TILL			
0.50 - 0.70	B3		25.79	0.70				
0.60	ES4							
0.80 - 0.90	D5			(0.50)				
0.90 - 1.20	B6							
1.00	ES7							
1.20		SPT(S) N=9 (2,1/1,3,3,2)	25.29	1.20	Very stiff, reddish brown mottled light blueish grey, slightly gravelly CLAY. Gravel is angular to subangular, fine and medium including siltstone and mudstone. (GRADE IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
1.20 - 1.65	D8			(0.35)				
1.70 - 1.80	D9		24.94	1.55	Soft, reddish brown, locally mottled light greenish grey, silty CLAY, with up to 20 percent, angular lithorelicts (up to 35mm) of extremely weak mudstone and very weak siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
2.00		SPT(S) N=19 (2,3/3,3,4,9)						
2.00 - 2.45	D10			(1.35)				
2.70 - 2.80	D11		23.59	2.90	Soft, reddish brown, locally mottled light bluish grey, very silty CLAY, with up to 10 percent, subangular to subrounded lithorelicts (up to 8mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
3.00		SPT(S) N=15 (2,3/3,4,4,4)						
3.00 - 3.45	D12				Firm, fissured, reddish brown locally light bluish grey, silty CLAY, with up to 40 percent, angular lithorelicts (up to 30mm) of extremely weak mudstone and siltstone. Fissures are 65 degrees, widely spaced, planar, smooth, with localised polishing. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
3.60 - 3.70	D13							
4.00		SPT(S) N=21 (2,3/4,5,6,6)						
4.00 - 4.45	D14							
4.20 - 4.30	D15				*Between 4.35m and 4.40m: 1x pocket (up to 50mm) of light brown silt.*			
5.00		SPT(S) N=13 (3,2/2,4,4,3)						
5.00 - 5.45	D16				*Between 5.45m and 5.60m: medium strong, bluish grey siltstone, non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.*			
5.80 - 5.90	D17			(6.05)				
6.00		SPT(S) N=9 (2,1/2,2,2,3)						
6.00 - 6.45	D18							
6.60 - 6.70	D19							
7.00		SPT(S) N=29 (5,6/6,7,7,9)						
7.00 - 7.45	D20							
7.50 - 7.60	D21							
8.00		SPT(S) N=22 (8,6/5,5,6,6)						
8.50 - 8.60	D22				*Between 8.45m and 8.55m: light bluish grey.*			
		NA: 8.80m - SPT(S) 50 (25 for 100mm/50 for 75mm)	17.54	8.95				
8.80 - 10.20	100 89 89	1: 9.36m - C23		(1.25)	Weak, thickly laminated (0 to 10 degrees) reddish brown, locally light bluish grey, locally cemented MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 9.45m and 9.70m: frequent greyish white gypsum veins, at 65 degrees (up to 35mm). Between 9.80m and 9.95m: 65 degree joint, undulating, rough, with brown surface staining (up to 1mm).*			
	TCR/SCR/RQD	FI: Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	
3.00	4.00		100	
4.00	5.00		100	
5.00	6.00		88	
6.00	7.00		88	
7.00	8.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JN01 Energy Ratio: 65%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
5.30			20	4.75	Fast flow

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH017**	
Dates: 03/10/2022 - 04/10/2022	Client: Cadent	Sheet 2 of 2	
Rotary Boring Log	Location: 357858.01E 377504.03N	Ground level: 26.49mOD	Logged by: CG/TW	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
				16.29	10.20	Weak, thickly laminated (0 to 10 degrees) reddish brown, locally light bluish grey, locally cemented MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
						End of Borehole at 10.20m			

11 12 13 14 15 16 17 18 19 20

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %

Borehole Diameter

Depth (m)	Dia (mm)
10.20	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
03/10	16:30	8.80		4.60
04/10	08:00	8.80	8.80	3.80
04/10	16:30	10.20	8.80	7.60

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Casing Diameter

Depth (m)	Dia (mm)
10.20	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH017



Core Photographs
BH017



Core Photographs
BH017



Core Photographs
BH017



IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH021**
Dates: 28/09/2022 - 05/10/2022	Client: Cadent		Sheet 1 of 2
Cable Percussion and Rotary Boring Log	Location: 359368.97E 377709.04N	Ground level: 42.11mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.70	B1			41.91	0.20	Dark brown, slightly clayey, silty, fine to coarse SAND with frequent rootlets. TOPSOIL			
0.20	ES2				(0.50)	Dark grey, slightly gravelly, clayey, fine to coarse SAND. Gravel is subangular to subrounded, fine and medium including quartzite, occasional sandstone and siltstone. GLACIOFLUVIAL DEPOSITS			
0.50	ES3			41.41	0.70				
0.70 - 1.20	B4				(0.70)	Brown and light brown, slightly gravelly, very clayey, very silty, fine and medium SAND with occasional pockets of firm, brown, slightly sandy, slightly gravelly silt. Gravel is subangular to subrounded, fine and medium including quartzite, occasional sandstone and siltstone. GLACIOFLUVIAL DEPOSITS			
1.00	ES5								
1.20		SPT(S) N=11 (2,2/2,2,3,4)		40.71	1.40				
1.20 - 1.65	D6								
1.40 - 2.00	B7				(0.60)				
				40.11	2.00	Firm, brown, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine and medium including quartzite, sandstone and occasional siltstone. GLACIAL TILL			
2.20		SPT(S) 50 (8,17/50 for 225mm)							
2.20 - 2.58	D8					Extremely weak, thinly and thickly laminated, reddish brown MUDSTONE recovered as clayey, angular to subrounded, fine to coarse very silty, very sandy gravel. (Grade IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
2.20 - 2.70	B9				(1.20)				
3.00		SPT(S) 50 (5,14/50 for 180mm)							
3.00 - 3.33	D10			38.91	3.20				
3.20 - 3.70	B11					Very weak, thickly laminated, light grey SILTSTONE recovered as silty, angular to subangular, fine and medium gravel. (Grade III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(0.80)				
				38.11	4.00	Assessed zone of core loss, possible very weak siltstone. MERCIA MUDSTONE GROUP			
4.00 - 5.00	0 0 0	AZCL	4.00m - D13 4.20m - SPT(S) 50 (25 for 135mm/50 for 60mm) 4.20m - D12		(1.20)				
5.00 - 5.70	71 34 34	NIDD 19	5.00m - SPT(S) 51 (25 for 75mm/51 for 94mm)	36.91	5.20	Weak, thinly laminated (10 to 15 degrees) light greenish grey SILTSTONE. Discontinuities are set 1: 10 to 20 degrees, very closely spaced, planar, smooth, clean, with yellowish brown staining (1mm). Set 2: 85 to 90 degrees, very closely spaced, planar, smooth, clean, with yellowish brown staining (1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 5.20m and 5.44m: weak, greenish grey siltstone, non intact, drilling disturbed, recovered as; clayey, subangular and angular coarse gravel.* *Between 5.70m and 5.90m: assessed zone of core loss.* *Between 5.90m and 6.20m: weak light greenish grey siltstone, non intact, drilling disturbed, recovered as; clayey subangular and angular, coarse gravel.*			
		AZCL			(1.23)				
		NIDD							
5.70 - 7.20	87 13 13	9		35.68	6.43				
		NA			(0.92)				
				34.76	7.35	Stiff, reddish brown locally mottled light greenish grey, silty, slightly calcareous CLAY, with up to 70 percent, angular and subangular lithorelicts (up to 30mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
7.20 - 8.20	86 55 55	7	7.64m - C14		(0.71)				
				34.05	8.06	Extremely weak, thinly laminated (20 to 25 degrees) reddish brown, slightly micaceous, slightly calcareous MUDSTONE. Discontinuities are 25 to 30 degrees, extremely closely and very closely spaced, planar, smooth, clean, with dark brown staining (1mm) (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 7.85m and 7.94m: very stiff, reddish brown, silty clay, with up to 90 percent, angular lithorelicts (up to 50mm) of very weak mudstone. (Grade III)*			
8.20 - 8.60	0								
			8.60m - SPT(S) 50 (9,10/50 for 205mm)		(2.40)				
		AZCL				Assessed zone of core loss, possible extremely to very weak mudstone. MERCIA MUDSTONE GROUP			
8.60 - 10.10	0 0 0								
	TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
3.70	4.20	60	

Borehole Diameter

Depth (m)	Dia (mm)
10.10	121

Casing Diameter

Depth (m)	Dia (mm)
4.20	150
10.10	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
28/09	12:30	4.40	4.20	3.70
04/10	08:00	0.00	4.00	Dry
04/10	16:30	8.60	5.00	6.80
05/10	08:00	8.60	5.00	1.00

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
0.80			0	0.80	Wet

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Between 4.00m and 5.00m casing wasn't flushing correctly and concrete from above was trapped causing
SPT Hammer: AR2371/JN01 Energy Ratio: 62/65%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH021**
Dates: 28/09/2022 - 05/10/2022	Client: Cadent		Sheet 2 of 2
Rotary Boring Log	Location: 359368.97E 377709.04N	Ground level: 42.11mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
			10.10m - SPT(S) 50 (10,12/50 for 210mm)	31.65	10.46	Assessed zone of core loss, possible extremely to very weak mudstone. MERCIA MUDSTONE GROUP				
						End of Borehole at 10.46m				

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
4.00	5.00	Air	20
5.00	5.70	Air	100
5.70	7.20	Air	100
7.20	8.20	Air	100
8.20	8.60	Air	10

Borehole Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
05/10	20:52	10.10	5.00	3.80

Remarks:
no recovery.
Between 8.20m and 8.60m run was terminated as it was not drilling correctly and when pulled back the core was likely blown away.
SPT Hammer: AR2371/JN01 Energy Ratio: 62/65%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH021



Core Photographs
BH021



Core Photographs
BH021



IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH033**
Dates: 13/10/2022 - 21/10/2022	Client: Cadent		Sheet 1 of 3
Dynamic Sampling and Rotary Boring Log	Location: 361377.98E 372106.97N	Ground level: 43.33mOD	Logged by: MT/TW	Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.25	B24				Soft, dark brown, sandy CLAY. TOPSOIL			
0.20 - 0.25	D25		43.08	0.25				
0.25 - 0.80	B26				Firm, reddish brown, sandy, silty CLAY. GLACIOFLUVIAL DEPOSITS			
0.50 - 0.60	ES21			(0.55)				
0.70 - 0.80	D27							
0.80 - 1.20	B28		42.53	0.80				
1.00 - 1.10	ES22			(0.40)	Firm, reddish brown, slightly clayey, sandy SILT. GLACIOFLUVIAL DEPOSITS			
1.10 - 1.20	D29							
1.20		SPT(S) N=15 (2,3/3,4,4,4)	42.13	1.20				
1.20 - 1.65	D1			(0.30)	Firm, brown, clayey SILT. GLACIOFLUVIAL DEPOSITS			
1.30 - 1.40	D13		41.83	1.50				
1.50 - 2.80	B14				Medium dense, light orangish brown, fine SAND. GLACIOFLUVIAL DEPOSITS			
					Between 1.56m and 1.60m: light reddish brown, slightly clayey, fine grained sand.			
2.00 - 2.10	ES23				*Between 1.80m and 1.83m: light reddish brown, slightly clayey, fine grained sand.*			
2.20		SPT(S) N=14 (4,4/3,3,3,5)		(1.40)				
2.20 - 2.65	D2				*Between 2.50m and 2.90m: occasional pockets (up to 4mm) of soft, brown clay.*			
			40.43	2.90				
3.00 - 3.80	B15				Medium dense, light brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS			
3.20		SPT(S) N=13 (2,2/3,4,3,3)						
3.20 - 3.65	D3			(0.90)				
3.80 - 4.20	B16		39.53	3.80				
				(0.50)	Medium dense, light orangish brown, fine SAND, with occasional pockets (up to to 5mm) of soft, brown clay. GLACIOFLUVIAL DEPOSITS			
4.20		SPT(S) N=11 (2,3/3,3,2,3)	39.03	4.30				
4.20 - 4.65	D4				Medium dense, light brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS			
5.20		SPT(S) N=10 (2,2/2,2,2,4)						
5.20 - 5.65	D5							
5.20 - 6.20	B17			(2.90)				
					Between 5.90m and 5.95m: subrounded pocket of brown clay, up to 50mm.			
6.20		SPT(S) N=12 (3,2/3,3,3,3)			*Between 6.20m and 7.20m: light orangish brown.*			
6.20 - 6.65	D6							
7.20		SPT(S) N=16 (4,3/3,4,5,4)	36.13	7.20				
7.20 - 7.60	B18			(0.40)	Medium dense, brown, fine SAND. GLACIOFLUVIAL DEPOSITS			
7.20 - 7.65	D7							
7.60 - 8.20	B19		35.73	7.60				
				(0.60)	Firm, brown, slightly sandy, slightly gravelly CLAY. Gravel is subrounded, fine and medium including quartzite, sandstone and siltstone. GLACIOFLUVIAL DEPOSITS			
8.20		SPT(S) N=21 (2,1/3,6,6,6)	35.13	8.20				
8.20 - 8.65	D8				Medium dense, brown, slightly clayey, silty, fine and medium SAND with rare fine gravel. GLACIOFLUVIAL DEPOSITS			
9.20		SPT(S) N=19 (3,4/4,4,6,5)						
9.20 - 10.20	B20							
9.20 - 9.65	D9							
10.00 - 11.00	D11							
					Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		100	
2.20	3.20		85	
3.20	4.20		100	
4.20	5.20		100	
5.20	6.20		100	
6.20	7.20		100	
7.20	8.20		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Between 10.00m and 11.00m open hole with casing through blowing sands. Between 11.00m and 11.50m dynamic sampling refused on sand. Between 11.50m and 25.00m open hole with casing to advance through blowing sand.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
8.20	7.20		20	6.10	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH033**
Dates: 13/10/2022 - 21/10/2022	Client: Cadent		Sheet 2 of 3
Location: 361377.98E 372106.97N	Ground level: 43.33mOD	Logged by: MT/TW	Vertical scale: 1:50
Dynamic Sampling and Rotary Boring Log			Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
10.20 10.20 - 10.65	D10	SPT(S) N=23 (4,6/7,6,5,5)			Medium dense, brown, slightly clayey, silty, fine and medium SAND with rare fine gravel. GLACIOFLUVIAL DEPOSITS			
11.00		SPT(S) N=31 (4,4/6,9,9,7)		(3.80)	*Between 11.00m and 11.45m: SPT sample recovered as brown, slightly sandy, slightly gravelly clay. Gravel is subrounded, fine to coarse including quartzite, sandstone and siltstone.*			
11.50		SPT(S) N=13 (5,3/3,3,4,3)			*Between 11.50m and 11.95m: SPT sample recovered as, medium dense, brown, slightly clayey, fine and medium SAND.*			
			31.33	12.00	Orangish brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS			
				(13.00)				
					Continued next sheet			

TCR/SCR/RQD | FI | Samples & Tests

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
8.20	9.20		60	
9.20	10.20		100	

Remarks:
When pulling casing borehole collapsed to 10.30m.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH033**
Dates:	**Client:**	Sheet 3 of 3
13/10/2022 - 21/10/2022	Cadent	

Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	361377.98E 372106.97N	43.33mOD	MT/TW	1:50	2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Orangish brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS			
				18.33	25.00	End of Borehole at 25.00m			

21 22 23 24 25 26 27 28 29 30

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %

Borehole Diameter

Depth (m)	Dia (mm)
25.00	121

Casing Diameter

Depth (m)	Dia (mm)
25.00	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
13/10	16:30	7.20	2.00	Dry
14/10	08:00	7.20	7.20	Dry
14/10	16:30	10.20	7.20	6.10
17/10	08:00	10.20		Dry

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH033



Core Photographs
BH033



Core Photographs
BH033



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH036**
Dates:	**Client:**	Sheet 1 of 3
14/10/2022 - 21/10/2022	Cadent	

Dynamic Sampling and Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	361754.98E 371093.95N	42.70mOD	ST/CE	1:50	2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.40	B1				MADE GROUND: Dark brown, slightly clayey, silty, fine to coarse SAND and subangular to subrounded, fine to coarse GRAVEL including sandstone and brick.			
0.40 - 0.80	B2							
0.50 - 0.60	ES3			(1.20)	MADE GROUND			
0.80 - 1.20	B4							
1.00 - 1.10	ES5							
1.20		SPT(S) N=2 (1,0/1,0,1,0)	41.50	1.20				
1.20 - 1.65	D6				MADE GROUND: Loose, dark greyish brown, silty, gravelly SAND. Gravel is subangular and subrounded, fine to coarse including quartzite, sandstone, brick and tarmacadam. With rare pockets (up to 15mm) of soft, brown clay.			
					MADE GROUND			
2.00		SPT(S) N=2 (1,1/0,1,0,1)						
2.00 - 2.10	ES7							
2.00 - 2.45	D8							
					Between 2.70m and 2.95m: brown, silty, fine and medium sand.			
3.00		SPT(S) N=3 (1,0/0,1,1,1)		(3.70)				
3.00 - 3.10	ES9							
3.00 - 3.45	D10							
4.00		SPT(S) N=6 (1,1/2,2,1,1)						
4.00 - 4.10	ES11							
4.00 - 4.45	D12							
					Between 4.40m and 4.65m: brown, silty, fine and medium sand.			
			37.80	4.90				
5.00		SPT(S) N=5 (1,1/1,1,2,1)			Loose, light orangish brown, fine and medium SAND.			
5.00 - 5.10	ES13				GLACIOFLUVIAL DEPOSITS			
5.00 - 5.45	D15							
5.00 - 6.00	B14							
6.00		SPT(S) N=7 (2,2/3,1,2,1)						
6.00 - 6.45	D16							
				(3.10)				
7.00		SPT(S) N=4 (1,1/1,1,1,1)						
7.00 - 7.45	D18				*Between 7.00m and 8.00m: dynamic sample run recovered in bulk bag due to drilling difficulty.*			
7.00 - 8.00	B17							
8.00		SPT(S) N=10 (1,1/2,3,3,2)	34.70	8.00				
8.00 - 8.45	D20				Medium dense, orangish brown, medium SAND.			
8.00 - 9.00	B19				GLACIOFLUVIAL DEPOSITS			
9.00		SPT(S) N=13 (3,3/4,3,3,3)		(3.00)				
9.00 - 9.45	D21							
10.00		SPT(S) N=13 (2,2/3,4,3,3)						
					Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	
3.00	4.00		100	
4.00	5.00		100	
5.00	6.00		100	
6.00	7.00		40	
7.00	8.00		0	

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Between 11.00m and 15.00m open hole with casing to advance through blowing sands. Between 19.00m and 24.00m open hole with casing to advance through sand.

SPT Hammer: JS01 Energy Ratio: 58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
7.00	6.00		20	7.00	Fast
18.00	17.00		20	18.00	Slow

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH036**
Dates: 14/10/2022 - 21/10/2022	Client: Cadent		Sheet 2 of 3
Dynamic Sampling and Rotary Boring Log	Location: 361754.98E 371093.95N	Ground level: 42.70mOD / Logged by: ST/CE / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
10.00 - 10.45	D23				Medium dense, orangish brown, medium SAND. GLACIOFLUVIAL DEPOSITS				
10.00 - 11.00	B22								
11.00		SPT(S) 60 (4,6/60 for 285mm)	31.70	11.00	Orangish brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS		11		
11.00 - 11.45	D24								
							12		
				(4.50)			13		
							14		
							15		
15.50		SPT(S) 50 (9,16/50 for 196mm)	27.20	15.50	Stiff, brown, slightly sandy, silty CLAY. GLACIOFLUVIAL DEPOSITS				
15.50 - 15.55	D26						16		
15.50 - 15.95	D25								
16.00		SPT(S) 50 (12,12/50 for 240mm)		(1.50)					
16.00 - 16.45	D27								
16.95 - 17.00	D28		25.70	17.00			17		
17.00		SPT(S) N=28 (3,3/5,6,7,10)			Medium dense, light orangish brown, medium SAND. GLACIOFLUVIAL DEPOSITS				
17.00 - 17.45	D30								
17.00 - 17.50	B29				*Between 17.60m and 17.80m: stiff, brown. silty clay.*				
18.00		SPT(S) N=18 (1,1/2,4,4,8)		(2.00)	*Between 17.90m and 18.00m: stiff, brown, silty clay.*		18	▼	
18.00 - 18.45	D31				*Between 18.40m and 18.68m: stiff, brown, silty clay.*				
					Between 18.75m and 19.00m: orangish brown, gravelly, coarse sand. Gravel is subangular, fine to coarse of quartzite.				
			23.70	19.00	Orangish brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS		19		
							20		
					Continued next sheet				

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
8.00	9.00		100	
9.00	10.00		100	
10.00	11.00		100	
15.50	16.00		100	
16.00	17.00		100	
17.00	18.00		100	
18.00	19.00		100	

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH036**
Dates: 14/10/2022 - 21/10/2022	Client: Cadent		Sheet 3 of 3
Dynamic Sampling and Rotary Boring Log	Location: 361754.98E 371093.95N	Ground level: 42.70mOD / Logged by: ST/CE / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
					Orangish brown, fine and medium SAND. GLACIOFLUVIAL DEPOSITS		21		
22.00		SPT(S) N=4 (1,2/1,1,1,1)		(5.00)	*Between 22.00m and 22.45m: spt recovered as orangish brown, silty, fine and medium sand.*		22		
22.00 - 22.45	D32								
							23		
24.00		SPT(S) 50 (5,6/50 for 296mm)	18.70	24.00	Stiff, brown, slightly sandy, silty CLAY. GLACIOFLUVIAL DEPOSITS		24		
24.00 - 24.45	D33								
24.50 - 24.55	D34			(1.39)					
25.00		SPT(S) 50 (10,11/50 for 236mm)					25		
25.00 - 25.39	D35		17.31	25.39	End of Borehole at 25.39m				
							26		
							27		
							28		
							29		
							30		

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
24.00	25.00		100	

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Core Photographs
BH036



Core Photographs
BH036



Core Photographs
BH036



Core Photographs
BH036



Core Photographs
BH036



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH037**
Dates:	**Client:**	Sheet 1 of 4
13/12/2022 - 19/12/2022	Cadent	

Dynamic Sampling and Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	363837.97E 370272.01N	23.63mOD	JM/NC	1:50	2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.40	B1				(0.40)	Dark brownish grey, slightly gravelly, silty, fine and medium SAND with rootlets. Gravel is subangular to rounded, fine and medium including quartzite.			
0.40 - 0.70	B2			23.23	0.40	TOPSOIL			
0.50	D3					Brown, slightly mottled light brown, slightly gravelly, silty, fine and medium SAND. Gravel is subangular to rounded, fine and medium including quartzite.			
0.70 - 1.20	B4				(0.80)	ALLUVIUM			
1.20		SPT(S) N=11 (2,3/3,3,2,3)		22.43	1.20	*Below 0.70m: rare gravel.*			
1.20 - 1.65	D6					Medium dense, brown, silty, fine SAND.			
1.20 - 2.00	B5				(0.85)	ALLUVIUM			
1.85	D7								
2.20		SPT(S) N=8 (2,2/2,2,2,2)		21.58	2.05	Loose, light brown, slightly silty, fine and medium SAND with rare gravel. Gravel is subrounded to rounded, fine and medium including mudstone and sandstone.			
2.20 - 2.65	D9					ALLUVIUM			
2.20 - 3.20	B8					*Between 2.60m and 2.80m: slightly gravelly.*			
2.70	D10				(2.15)				
3.20		SPT(S) N=10 (3,2/3,2,2,3)				*At 3.25m: pocket of dark brown, slightly sandy, clayey silt with occasional rootlets.*			
3.20 - 3.65	D11								
3.30	D12								
3.40 - 4.20	B13								
3.70	D14								
4.20		SPT(S) N=25 (2,3/3,6,8,8)		19.43	4.20				
4.20 - 4.65	D15			19.33	4.30	Light brown, gravelly, slightly silty, fine and medium SAND with rare cobbles. Gravel is rounded, fine to coarse including mudstone and siltstone. Cobbles are rounded including siltstone.			
4.40	D16					ALLUVIUM			
4.75 - 7.85	D17				(0.90)	Soft, brown locally mottled light greenish grey, clayey, slightly sandy, slightly gravelly SILT. Gravel is subangular, fine and medium including mudstone and siltstone.			
5.20		SPT(S) 50 (7,9/50 for 275mm)		18.43	5.20	ALLUVIUM			
5.20 - 5.65	D18					*Below 4.50m: lithorelicts absent.*			
5.60 - 5.70	D19					Very dense, brown, fine to coarse SAND.			
					(1.00)	ALLUVIUM			
						Between 5.80m and 6.00m: rare subrounded fine and medium gravel of quartzite.			
						Between 6.00m and 6.20m: slightly clayey.			
6.20		SPT(S) N=27 (3,5/7,7,6,7)		17.43	6.20				
6.20 - 6.65	D20					Firm brown locally mottled light blueish grey CLAY with up to 5% subangular and subrounded lithorelicts (up to 10 mm) of extremely weak mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER]			
6.90 - 7.00	D21				(2.00)	MERCIA MUDSTONE GROUP			
7.20 - 8.20	80 0 0	NA	7.20m - SPT(S) N=19 (3,4/5,4,5,5) 7.20m - D22						
8.20 - 9.50	96 0 0	NA	8.20m - SPT(S) 50 (25 for 115mm/50 for 235mm) 8.20m - D23 9.00m - D24	15.43	8.20	Very stiff thinly bedded (0 to 15 degrees) reddish brown locally mottled light blueish grey SILT with up to 5% subrounded lithorelicts (up to 5mm) of extremely weak mudstone. Frequent off-white gypsum crystals (up to 10mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER]			
					(2.80)	MERCIA MUDSTONE GROUP			
	TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		93	
2.20	3.20		100	
3.20	4.20		100	
4.20	5.20		84	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
8.20	8.20	8.20	20	6.70	
20.00	16.00	20.00	20	4.20	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	15.00	Plain	50
15.00	25.00	Slotted	50

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

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Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH037**
Dates: 13/12/2022 - 19/12/2022	Client: Cadent		Sheet 2 of 4
Rotary Boring Log	Location: 363837.97E 370272.01N	Ground level: 23.63mOD / Logged by: JM/NC / Vertical scale: 1:50	Project ID: 2230746

Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Groundwater: Water Strike	Groundwater: Backfill/ Installation
9.50 - 11.00	100 0 0					Very stiff thinly bedded (0 to 15 degrees) reddish brown locally mottled light blueish grey SILT with up to 5% subrounded lithorelicts (up to 5mm) of extremely weak mudstone. Frequent off-white gypsum crystals (up to 10mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
				12.63	11.00			11		
		AZCL				Extremely weak, reddish brown locally mottled light blueish grey MUDSTONE. Discontinuities are 0 to 90 degrees, extremely to very closely spaced, planar, smooth, tight with soft brown silt infill (up to 0.25mm) and localised black manganese staining (<1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
11.00 - 12.50	73 0 0	18	12.00m - D25		(1.60)			12		
				11.03	12.60	*Between 12.50m and 12.60m: recovered from drilling barrel into a tub.*				
12.50 - 14.00	7 0 0	AZCL	14.00m - SPT(C) N=42 (7,6/8,7,14,13)		(2.60)	Assessed zone of core loss. Possible extremely weak siltstone. Soft drilling and lost flush at 13.50 m. (Driller description). *At 13.50m: soft drilling and lost flush.*		13 14		
14.00 - 15.00	0 0 0									
			15.00m - SPT(C) N=48 (12,10/12,12,12,12)	8.43	15.20			15		
15.00 - 16.00	80 55 55	20 NIDD		8.18	15.45	Extremely weak, light blueish grey SILTSTONE. Highly fractured. Discontinuities are 0 to 90 degrees, extremely closely to very closely spaced, undulating, smooth, clean with localised black manganese staining (<1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
			16.00m - SPT(S) 50 (25 for 95mm/50 for 78mm) 16.00m - D26 16.18m - C27			Very weak, thinly bedded (0 to 10 degrees) reddish brown locally mottled light blueish grey MUDSTONE. Discontinuities are 0 to 10 degrees, closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		16		
16.00 - 17.00	100 100 100	5	17.00m - C28		(2.05)	*Between 15.45m and 16.00m: non intact, drilling disturbed, recovered as silty subangular to subrounded fine to coarse gravel.* *At 17.00m: extremely weak diametrically.*		17		
			17.50m - C29	6.13	17.50	Interbedded very weak, thickly laminated (0 to 5 degrees) light blueish grey SILTSTONE and reddish brown MUDSTONE. Discontinuities are 0 to 5 degrees, very closely to closely spaced, planar smooth, clean with localised black manganese staining (<1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
17.00 - 18.50	80 80 67	12			(0.70)			18		
		AZCL		5.43	18.20	Very weak reddish brown locally mottled light blueish grey MUDSTONE. Discontinuities are 0 to 90 degrees, very closely spaced, planar and undulating, smooth, clean, with localised black manganese staining (<1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
18.50 - 19.50	90 10 0	15			(1.30)			19		
				4.13	19.50	Very weak, very thinly bedded (0 to 5 degrees) reddish brown locally mottled light blueish grey MUDSTONE with frequent off-white gypsum veins (up to 5mm). (GRADE I) [BOLLIN				
		NIDD				Continued next sheet		20		

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
8.20	9.50	Air mist	100
9.50	11.00	Air mist	100
11.00	12.50	Air mist	100
12.50	14.00	Air mist	0
14.00	15.00	Air mist	0
15.00	16.00	Air mist	0
16.00	40.00	Air mist	100

Checked by: MHW — IFA RC v01.01
Log status: FINAL

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
13/12	16:30	6.20		Dry
14/12	08:00	6.20		Dry
14/12	16:30	16.00	16.00	15.40
15/12	08:00	16.00	16.00	15.10

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH037**
	Dates: 13/12/2022 - 19/12/2022	Client: Cadent	Sheet 3 of 4
Rotary Boring Log	Location: 363837.97E 370272.01N	Ground level: 23.63mOD / Logged by: JM/NC / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
19.50 - 21.00	100 100 100	0	20.10m - C30 21.15m - C31		(4.50)	Very weak, very thinly bedded (0 to 5 degrees) reddish brown locally mottled light blueish grey MUDSTONE with frequent off-white gypsum veins (up to 5mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 19.50m and 20.05m: non intact, drilling disturbed, recovered as subrounded tine to coarse gravel.* *At 21.15m: locally weak.*			
21.00 - 22.50	100 100 100								
22.50 - 24.00	100 100 100	NIDD 0	23.00m - C32			*Between 22.50m and 22.90m: non intact, drilling disturbed recovered as clayey subangular to subrounded fine to coarse gravel.*			
24.00 - 25.50	0 0 0	AZCL		-0.37	24.00 (2.00)	Assessed zone of core loss. Possible mudstone. MERCIA MUDSTONE GROUP			
25.50 - 27.00	67 67 67	0	26.10m - D33	-2.37	26.00 (1.00)	Very weak, thinly to thickly laminated (0 to 10 degree), light blueish grey and light brown SILTSTONE. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
27.00 - 27.75	0 0 0	AZCL		-3.37	27.00 (0.75)	Assessed zone of core loss. Driller notes very fractured mudstone. [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
27.75 - 28.50	100 100 100	0	28.00m - D34	-4.12	27.75 (0.95)	Extremely weak to very weak, dark brown locally mottled light blueish grey MUDSTONE. Non intact drilling disturbed, recovered as clayey subangular to subrounded fine to coarse gravel. (Grade III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
28.50 - 29.25	100 100 100		28.80m - D35	-5.07 -5.37	28.70 (0.30) 29.00	Very weak, light blueish grey, locally mottled brown SILTSTONE. Non intact, likely drilling disturbed, recovered as subangular coarse gravel. (Grade II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
29.25 - 30.00	0 0 0			-5.62	29.25 (1.50)	Extremely weak, thinly to thickly laminated (0 to 10 degree), light reddish brown mottled brownish grey SILTSTONE. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Assessed zone of core loss. Possible mudstone.			
						Continued next sheet			

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
15/12	16:30	28.50	21.00	12.40
16/12	08:00	28.50	21.00	10.10
16/12	16:30	40.00	31.50	19.70
19/12	08:00	40.00	31.50	33.60

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH037**
Dates: 13/12/2022 - 19/12/2022	Client: Cadent		Sheet 4 of 4
Rotary Boring Log	Location: 363837.97E 370272.01N	Ground level: 23.63mOD / Logged by: JM/NC / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
30.00 - 30.75	0 0 0	AZCL	30.00m - SPT(S) 50 (8,13/50 for 230mm)			Assessed zone of core loss. Possible mudstone. MERCIA MUDSTONE GROUP				
				-7.12	30.75					
30.75 - 31.50	100 0 0	20	31.00m - D36		(0.75)	Very weak, thickly laminated to very thinly bedded (0 to 5 degrees), dark reddish brown MUDSTONE. Discontinuities are 0 to 90 degrees, very closely spaced, planar, smooth, clean. Drilling disturbed predominantly recovered as gravel. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		31		
				-7.87	31.50					
31.50 - 32.50	0 0 0	AZCL			(1.00)	Assessed zone of core loss. Possible mudstone. MERCIA MUDSTONE GROUP		32		
32.50 - 33.25	93 0 0	16	32.50m - SPT(S) 50 (6,6/50 for 275mm)	-8.87	32.50 (0.75)	Very weak, thinly to thickly laminated (0 to 5 degrees), light blueish grey mottled brown SILTSTONE. Discontinuities are 0 to 90 degrees, very closely spaced, undulating, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		33		
33.25 - 34.00	100 0 0	15	33.50m - D37	-9.62	33.25 (0.75)	Very weak, reddish brown MUDSTONE. Discontinuities are 0 to 90 degrees, very closely spaced, planar, smooth, tight with soft brown silt infill (up to 0.25mm). (GRADE II) MERCIA MUDSTONE GROUP				
34.00 - 35.50	73 7 0	AZCL 12	34.50m - C38 35.00m - D39	-10.37	34.00 (1.50)	Very weak, thinly to thickly laminated (0 to 10 degrees) dark brown mottled light blueish grey MUDSTONE. Discontinuities are set 1: 50 to 60 degrees, very closely spaced, planar and undulating, smooth, clean. Set 2: 75 to 80 degrees, very closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		34 35		
35.50 - 37.00	100 27 0	15	36.30m - D40 36.35m - C41	-11.87	35.50	Very weak, thinly to thickly laminated (0 to 5 degrees) brown mottled blueish grey MUDSTONE. Discontinuities are set 1: 0 to 10 degrees, very closely to closely spaced, planar, smooth, clean. Set 2: 60 to 70 degrees, very closely spaced, planar, smooth, clean. (GRADE II) MERCIA MUDSTONE GROUP		36		
37.00 - 38.50	67 13 0	AZCL 15	38.00m - C42		(3.10)	*At 38.00m: locally weak.*		37 38		
38.50 - 40.00	7 0 0	AZCL		-14.97	38.60 (1.40)	Assessed zone of core loss. Possible mudstone. MERCIA MUDSTONE GROUP		39		
				-16.37	40.00	End of Borehole at 40.00m		40		

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
											SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH037



Core Photographs
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IAN FARMER ASSOCIATES

Plant used: Dando 2000	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH040**	
Dates: 11/11/2022	Client: Cadent	Sheet 1 of 1	
Cable Percussion Borehole Log	Location: 364485.94E 370248.00N	Ground level: 36.44mOD	Logged by: JM	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.30	B1			(0.30)	Dark brownish grey, gravelly, clayey, very silty, fine and medium SAND with rare gravel. Gravel is subangular to rounded, fine and medium including quartzite, siltstone, sandstone and occasional lignite. TOPSOIL			
0.30 - 0.60	B2		36.14	0.30				
0.40	ES3			(0.30)				
			35.84	0.60	Firm, light brown mottled grey, slightly gravelly, sandy CLAY. Gravel is subangular to rounded, fine and medium including quartzite, siltstone, sandstone and occasional limestone. GLACIAL TILL			
1.20		SPT(S) N=11 (1,3/2,2,3,4)						
1.20 - 1.65	D5			(1.60)	Stiff, reddish brown, silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine and medium including quartzite, occasional siltstone, sandstone and limestone. GLACIAL TILL			
1.20 - 1.70	B4							
			34.24	2.20	End of Borehole at 2.20m			

Chiselling				Borehole Diameter	
From (m)	To (m)	Time (mins)	Remarks	Depth (m)	Dia (mm)
				2.20	121

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
11/11	16:30	2.20	2.20	Dry

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Borehole terminated due to being positioned incorrectly. Borehole relocated as BH040A.
SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter	
Depth (m)	Dia (mm)
1.20	150

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH040A**
	Dates: 14/11/2022 - 29/11/2022	Client: Cadent	Sheet 1 of 6

Cable Percussion and Rotary Boring Log	Location: 364420.02E 370251.97N	Ground level: 34.79mOD	Logged by: JM/AE	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.40	B1			(0.40)	Dark brownish grey, slightly gravelly, silty, fine and medium SAND with frequent rootlets. Gravel is subangular to rounded, fine and medium including sandstone, siltstone, limestone and quartzite. TOPSOIL			
0.40 - 0.70	B2		34.39	0.40				
0.50	ES3			(0.30)	Firm, light brown mottled grey, slightly gravelly, sandy CLAY. Gravel is subangular to rounded, fine and medium including sandstone, siltstone, limestone and quartzite. GLACIAL TILL			
0.70 - 1.20	B4		34.09	0.70				
1.20		SPT(S) N=12 (1,2/2,3,3,4)			Firm, reddish brown slightly mottled grey, slightly silty, slightly sandy CLAY with occasional gravel. Gravel is subangular to rounded, fine and medium including sandstone, siltstone limestone and quartzite. GLACIAL TILL			
1.20 - 1.65	D6							
1.20 - 1.70	B5							
2.20		SPT(S) N=37 (6,6/7,10,10,10)			*Below 2.20m: stiff, slightly gravelly, sandy.*			
2.20 - 2.65	D8							
2.20 - 2.70	B7							
3.20		SPT(S) N=40 (5,5/7,10,10,13)		(4.70)				
3.20 - 3.65	D10							
3.20 - 3.70	B9							
4.00		SPT(S) 50 (6,7/50 for 285mm)						
4.00 - 4.44	D12							
4.00 - 4.50	B11							
5.30		SPT(S) 50 (4,8/50 for 225mm)	29.39	5.40				
5.30 - 5.68	D13		29.19	5.60	Reddish brown, slightly gravelly, fine to coarse SAND. Gravel is subangular to subrounded, fine and medium including siltstone, mudstone and occasional quartzite and sandstone. GLACIAL TILL			
5.60 - 6.00	B14							
6.50		SPT(S) 50 (4,11/50 for 235mm)			Very stiff, reddish brown, slightly sandy CLAY, with up to 10 percent subangular to subrounded lithorelicts (up to 60mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Below 6.00m: occasional grey siltstone lithorelicts.*			
6.50 - 6.89	D16							
6.50 - 7.00	B15			(5.60)				
8.20		SPT(S) 50 (4,12/50 for 225mm)			*Below 8.20m: gypsum crystals present.*			
8.20 - 8.58	D18							
8.20 - 8.70	B17							
9.50		SPT(S) N=17 (5,3/3,4,5,5)						
9.50 - 10.00	B19							
9.50 - 9.95	D20							
					Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
3.00	3.20	30	
5.20	5.30	30	
15.50	16.00	60	

Borehole Diameter

Depth (m)	Dia (mm)
50.50	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
14/11	16:30	1.20		Dry
15/11	08:00	1.20		1.00
15/11	16:30	11.20	10.50	Wet
16/11	08:00	11.20	10.50	10.50

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter

Depth (m)	Dia (mm)
16.00	150
50.50	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
45.00	22.00		20	45.00	Fast

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH040A**
	Dates: 14/11/2022 - 29/11/2022	Client: Cadent		Sheet 2 of 6
Cable Percussion and Rotary Boring Log	Location: 364420.02E 370251.97N	Ground level: 34.79mOD	Logged by: JM/AE	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details					Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
						Very stiff, reddish brown, slightly sandy CLAY, with up to 10 percent subangular to subrounded lithorelicts (up to 60mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		11		
11.20 11.20 - 11.65 11.20 - 11.70	D22 B21	SPT(S) N=11 (2,2/2,3,3,3)		23.59	11.20 (1.30)	Firm, reddish brown CLAY, with up to 10 percent subangular and subrounded lithorelicts (up to 20mm) of extremely weak mudstone and siltstone. Occasional lenses of extremely weak, grey siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		12		
12.20 - 12.65 12.20 - 12.70	UT B23	10 blows. No recovery		22.29	12.50	Soft, reddish brown mottled grey CLAY, with up to 20 percent subangular and subrounded lithorelicts (up to 20mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		13		
13.50 13.50 - 14.20 13.50 - 14.20	B24 D25	SPT(S) N=0 (0,0/0,0,0,0)			(3.00)	*Below 13.50m: very soft.*		14		
15.00 - 15.45	UT26	25 blows. 60% recovery						15		
15.50	D27			19.29	15.50 (0.50)	Stiff, grey CLAY, with up to 15 percent subangular and subrounded lithorelicts (up to 20mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER]		16		
		AZCL	16.00m - SPT(S) N=50 (5,8/8,12,15,15)	18.79	16.00 (0.58)	MERCIA MUDSTONE GROUP Stiff, grey, clayey SILT, with up to 30 percent subangular and angular lithorelicts (up to 20mm) of very weak siltstone. Rare, off white, gypsum crystals (up to 10mm). (GRADE III) [BOLLIN MUDSTONE MEMBER]				
16.00 - 17.50	86 23 23	NA	16.00m - D28 16.40m - D30 16.90m - D31	18.21	16.58 (0.57)	MERCIA MUDSTONE GROUP Stiff, thinly laminated (0 to 10 degrees) reddish brown locally mottled light bluish grey, silty CLAY, with rare, (0 to 10 degrees) off white, gypsum veins (up to 12mm). (GRADE IVb) [BOLLIN MUDSTONE MEMBER]		17		
		0		17.64	17.15 (0.75)	MERCIA MUDSTONE GROUP Very weak, light bluish grey SILTSTONE, with frequent, (0 to 90 degrees) off white, crystalline, gypsum veins (up to 2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER]				
		NIDD 0	17.70m - C32	16.89	17.90	MERCIA MUDSTONE GROUP *Between 17.50m and 17.75m: non intact, drilling disturbed, recovered as; angular and subangular, fine to coarse gravel of siltstone.*		18		
17.50 - 19.00	100 43 43	NA	18.75m - D33		(1.10)	Stiff, reddish brown locally mottled bluish grey, silty CLAY, with up to 35 percent angular lithorelicts (up to 30mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
		AZCL		15.79	19.00			19		
19.00 - 20.50	84 0 0		19.38m - D34		(1.00)	Very stiff, thinly laminated (0 to 5 degrees) light bluish grey locally mottled reddish brown, clayey SILT, with up to 10 percent subangular lithorelicts (up to 20mm) of extremely weak to weak siltstone. Rare, (0 to 5 degrees) off white, crystalline, gypsum veins (up to 3mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
TCR/SCR/RQD		FI	Samples & Tests	14.79	20.00	Continued next sheet		20		

Chiselling			
From (m)	To (m)	Time (mins)	Remarks

Borehole Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
16/11	16:30	16.00	16.00	11.20
17/11	08:00	16.00	16.00	9.10
17/11	16:30	19.00	19.00	15.60
24/11	08:00	19.00	19.00	NR

Remarks:

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH040A**
	Dates: 14/11/2022 - 29/11/2022	Client: Cadent	Sheet 3 of 6
Rotary Boring Log	Location: 364420.02E 370251.97N	Ground level: 34.79mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
20.50 - 22.00	94 0 0	NA	21.25m - D35			Very stiff, locally thinly laminated (0 to 10 degrees) reddish brown locally mottled light bluish grey, silty CLAY. with up to 20 percent angular and subangular lithorelicts (up to 25mm) of extremely weak mudstone. Rare, (0 to 10 degrees) off white, crystaline, gypsum veins (up to 5mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		21		
		AZCL								
22.00 - 23.50	100 0 0	NA	22.35m - D36		(6.75)	*Between 22.28m and 22.55m: very stiff, grey, clayey silt.* *Between 22.67m and 22.76m: very stiff, grey, clayey silt.*		22 23		
23.50 - 25.00	94 0 0		24.75m - D37					24		
		AZCL								
25.00 - 26.50	100 0 0	NA	26.25m - D38			*Between 25.70m and 25.85m: very stiff, grey, clayey silt.*		25 26		
26.50 - 28.00	100 83 83	1	27.30m - C39	8.04	26.75 (1.00)	Very weak, thinly laminated (5 to 10 degrees) reddish brown and light bluish grey MUDTSONE, with rare, (45 to 80 degree) off white, crystalline, gypsum veins (up to 2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 27.52m and 27.65m: 60 degree joint, planar, rough, clean.*		27		
28.00 - 29.50	100 30 30	5	28.40m - D40	7.04	27.75 (1.00)	Very weak, thinly laminated (0 to 5 degrees) reddish brown and light bluish grey MUDSTONE. Discontinuities are 30 to 45 degrees, very closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 28.06m and 28.02m: non intact, drilling disturbed.* *Between 28.02m and 28.35m: 85 degree joint, planar, smooth, clean.* *Between 28.54m and 28.62m: 1x rounded cobble (80mm) of medium strong, reddish brown, fine grained sandstone.*		28		
		NA		6.04	28.75	Very stiff, light bluish grey locally mottled reddish brown, clayey SILT, with up to 60 percent angular lithorelicts (up to 20mm) of very weak siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		29		
		AZCL	29.45m - D41		(1.70)					
						Continued next sheet		30		

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
24/11	16:30	22.00	19.00	NR
25/11	08:00	22.00	22.00	19.10
25/11	16:30	34.00	22.00	30.10
28/11	08:00	34.00	22.00	12.90

Remarks:

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH040A**
Dates: 14/11/2022 - 29/11/2022	Client: Cadent		Sheet 4 of 6
Rotary Boring Log	Location: 364420.02E 370251.97N	Ground level: 34.79mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
29.50 - 31.00	96 0 0	NA		4.34	30.45	Very stiff, light bluish grey locally mottled reddish brown, clayey SILT, with up to 60 percent angular lithorelicts (up to 20mm) of very weak siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
31.00 - 32.50	96 0 0	AZCL	31.20m - D42			Very stiff, thinly laminated (0 to 5 degrees) reddish brown locally mottled light bluish grey, silty CLAY, with up to 40 percent subangular and subrounded lithorelicts (up to 40mm) of extremely to very weak mudstone and siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 31.70m and 31.94m: very stiff, greenish grey, clayey silt, with up to 30 percent subangular lithorelicts (up to 30mm) of very weak siltstone.*		31 32		
32.50 - 34.00	96 0 0	NA AZCL	33.65m - D43					33 34		
34.00 - 35.50	100 0 0	NA	35.50m - D44		(8.55)	*Between 35.85m and 36.05m: very stiff, bluish grey, clayey silt, with up to 20 percent subangular lithorelicts (up to 15mm) of very weak siltstone.*		35 36		
35.50 - 37.00	95 0 0	AZCL								
37.00 - 38.50	93 0 0	NA AZCL	37.70m - D45					37 38		
38.50 - 40.00	100 66 66	NA 0 NIDD	39.30m - C46	-4.21	39.00 (1.20)	Very weak, thinly laminated (0 to 5 degrees) reddish brown MUDSTONE, with frequent (0 to 90 degrees) off white, crystalline, gypsum veins (up to 2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 39.53m and 40.20m: non intact drilling disturbed, recovered as; angular, fine to coarse, clayey gravel os weak mudstone.*		39 40		

Continued next sheet

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
28/11	16:30	46.00	22.00	21.10
29/11	08:00	46.00	22.00	19.10
29/11	16:30	50.50	22.00	32.50

Remarks:

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Dando 2000/Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH040A**
Dates:	**Client:**	Sheet 5 of 6
14/11/2022 - 29/11/2022	Cadent	

Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	364420.02E 370251.97N	34.79mOD	JM/AE	1:50	2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
40.00 - 41.50	67 53 53	NA 0 NIDD AZCL	40.40m - D47	-5.41	40.20 (1.55)	Very weak, thinly laminated (0 to 5 degrees) reddish brown MUDSTONE, with frequent (0 to 90 degrees) off white, crystalline, gypsum veins (up to 2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Very stiff, reddish brown, silty CLAY, with up to 25 percent subangular lithorelicts (up to 10mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 40.70m and 40.90m: weak, reddish brown mottled greenish grey mudstone.* *Between 41.00m and 41.10m: non intact, drilling disturbed, recovered as; angular, fine to coarse, clayey gravel of weak mudstone.*		41		
41.50 - 43.00	83 75 75	4	42.30m - C48	-6.96	41.75 (1.85)	Very weak, thinly laminated (0 to 5 degrees) light bluish grey locally mottled reddish brown SILTSTONE, with occasional (0 to 5 degrees) off white, crystalline, gypsum veins (up to 3mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 43.00m and 43.60m: non intact, drilling disturbed, recovered as; subangular and angular, fine to coarse, clayey gravel of siltstone.*		42 43		
43.00 - 44.50	73 60 60	NIDD AZCL		-8.81	43.60	Very weak, reddish brown MUDSTONE. Highly fractured zone. Discontinuities are: 0 to 90 degrees, very closely spaced, planar, smooth, tight, with soft, brown, clay infill (up to 0.25mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 44.12m and 44.25m: 85 degree joint, undulating, smooth, clean.*		44		
44.50 - 46.00	90 20 20	15 AZCL	44.80m - C49 45.30m - D50		(2.60)	*Between 44.70m and 44.90m: very weak, reddish brown mudstone.*		45	▼	
46.00 - 47.50	100 66 66	NIDD 0 NIDD NA	46.40m - C51 47.00m - D52	-11.41 -12.21 -12.56	46.20 (0.80) 47.00 (0.35) 47.35	*Between 46.00m and 46.20m: non intact, drilling disturbed, recovered as; angular, fine to coarse, clayey gravel of mudstone and siltstone.* Very weak, thinly laminated (0 to 15 degrees) light greenish grey SILTSTONE, with frequent (0 to 60 degree) off white, crystalline, gypsum veins (up to 3mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Very stiff, reddish brown, silty CLAY, with up to 50 percent angular lithorelicts (up to 25mm) of extremely and very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		46 47		
47.50 - 49.00	100 7 7	13	48.40m - D53		(1.75)	Weak, reddish brown MUDSTONE. Highly fractured zone. Discontinuities are: 0 to 90 degrees, very closely spaced, planar, smooth locally undulating, tight with soft brown clay infill (up to 0.25mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		48		
49.00 - 50.50	93 37 37	2	49.15m - C54	-14.31 -14.91 -15.21	49.10 (0.60) 49.70 (0.30) 50.00	Very weak, reddish brown MUDSTONE, with frequent (0 to 30 degrees) off white, crystalline, gypsum veins (up to 3mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Very stiff, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 25mm) of very weak mudstone. (GRADE III)		49 50		

Continued next sheet

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
											SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH040A**
Dates: 14/11/2022 - 29/11/2022	Client: Cadent		Sheet 6 of 6
Rotary Boring Log	Location: 364420.02E 370251.97N	Ground level: 34.79mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
		NA	50.20m - D55			Very stiff, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 25mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
		AZCL				End of Borehole at 50.50m		51 52 53 54 55 56 57 58 59 60		

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH040A



Core Photographs
BH040A



Core Photographs
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BH040A



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH042**
Dates:	**Client:**	Sheet 1 of 6
01/11/2022 - 15/11/2022	Cadent	

Dynamic Sampling and Rotary Boring Log

Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
364615.94E 370251.99N	37.59mOD	FH/CE	1:50	2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Groundwater: Water Strike	Groundwater: Backfill/ Installation
0.00 - 0.40	B1							
0.20	D2		37.19	(0.40) 0.40	Soft, dark brown, slightly gravelly, very sandy SILT. Gravel is subrounded to rounded, fine and medium including sandstone, slate and quartz. TOPSOIL			
0.50 - 1.00	B3							
0.70	D4			(0.80)	Light brown, silty, fine and medium SAND. ALLUVIUM			
1.20		SPT(S) N=18 (2,3/4,4,5,5)	36.39	1.20				
1.20 - 1.65	D5				Medium dense, greyish brown, fine and medium SAND, with rare pockets (up to 30mm) of firm, dark grey, silty clay with a slight organic odour. ALLUVIUM			
1.20 - 2.20	B17			(1.45)				
2.20		SPT(S) N=12 (1,2/3,3,3,3)						
2.20 - 2.65	D6		34.94	2.65				
					Very loose to loose, orangish brown, silty, fine and medium SAND. ALLUVIUM			
3.20		SPT(S) N=4 (1,1/1,1,1,1)						
3.20 - 3.65	D7							
3.20 - 4.20	B18			(2.55)				
4.20		SPT(S) N=22 (2,4/5,4,5,8)			*Below 4.20m: medium dense.*			
4.20 - 4.65	D8							
5.20 - 6.00	19 0 0	AZCL: 5.20m - SPT(S) N=30 (4,3/5,5,9,11) 5.20m - D9	32.39	5.20	*Between 5.10m and 5.20m: firm, reddish brown, silty clay.* Stiff, reddish brown, slightly gravelly, sandy, silty CLAY. Gravel is subangular to rounded, fine to coarse including mudstone, siltstone and quartzite. Occasional angular fragments (up to 10mm) of black lignite. GLACIAL TILL			
6.00 - 7.00	100 0 0	NA: 6.00m - SPT(S) 50 (7,7/50 for 190mm) 6.00m - D10 6.00m - D19		(3.30)				
7.00 - 7.50	16 0 0	AZCL						
7.50 - 9.00	67 0 0	NA: 7.50m - SPT(S) N=28 (3,5/5,6,9,8) 7.50m - D11 8.00m - D20	29.09	8.50	Assessed zone of core loss, likely clay. GLACIAL TILL			
9.00 - 10.20	21 0 0	AZCL: 9.00m - SPT(S) 50 (3,3/50 for 230mm) 9.00m - D12		(1.45)				
			27.64	9.95				
TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		100	
2.20	3.20		100	
3.20	4.20		100	
4.20	5.20		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m. Between 4.20m and 5.20m: blowing sands.

SPT Hammer: AR3408 Energy Ratio: 63%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
0.90			20	0.90	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH042**
	Dates: 01/11/2022 - 15/11/2022	Client: Cadent	Sheet 2 of 6
Rotary Boring Log	Location: 364615.94E 370251.99N	Ground level: 37.59mOD / Logged by: FH/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
10.20 - 11.70	100 0 0	NA	10.20m - SPT(S) 50 (25 for 95mm/50 for 155mm) 10.20m - D13 10.35m - D21	26.54	(1.10) 11.05	Very stiff, fissured, reddish brown, silty CLAY, with up to 45 percent angular lithorelicts (up to 25mm) of extremely weak and very weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		22	11.40m - D22		(0.65)	Extremely weak to very weak, thinly bedded (5 to 15 degrees) reddish brown MUDSTONE, with rare, light bluish grey reduction spots (up to 5mm). Discontinuities are 0 to 90 degrees, very closely spaced, planar, smooth, tight, with soft, brown, clay infill (up to 25mm) and localised black manganese staining (<1mm) (GRADE II) [BOLLIN MUDSTONE MEMBER]			
11.70 - 13.20	27 0 0	AZCL	11.70m - SPT(S) N=12 (1,1/1,3,4,4) 11.70m - D14	25.89	11.70	MERCIA MUDSTONE GROUP			
					(2.00)	Very stiff, fissured, thickly laminated (0 to 5 degrees) bluish grey locally mottled reddish brown, clayey SILT, with up to 60 percent angular lithorelicts (up to 25mm) of extremely and very weak siltstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished, with localised, off white, gypsum mineralisation (<3mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
13.20 - 14.70	33 0 0	NA	13.20m - SPT(S) 50 (25 for 80mm/50 for 80mm)						
		AZCL	13.20m - D15 13.20m - D23	23.89	13.70	Extremely weak to very weak, reddish brown MUDSTONE, with rare light bluish grey reduction spots (up to 5mm). Discontinuities are 0 to 90 degrees, very closely spaced, planar, smooth, tight, with soft, brown, clay infill (up to 0.25mm) and localised black manganese staining (<1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
14.70 - 16.20	90 0 0	22	14.70m - SPT(S) 50 (6,9/50 for 210mm) 14.70m - D16 15.10m - D24		(2.35)	*Between 14.70m and 15.0m: drilling disturbed.*			
		NA				*Between 15.65m and 15.99m: very stiff, reddish brown, locally mottled light bluish grey clay, with up to 50 percent angular lithorelicts (up to 25mm) of extremely weak mudstone and very weak siltstone.* *Between 15.99m and 16.05m: moderately weak, light bluish grey siltstone.*			
16.20 - 17.70	27 0 0	AZCL		21.54	16.05	Assessed zone of core loss, likely fissured, silty clay. [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(1.25)	*Between 16.70m and 17.30m: brown clayey fine sand, collapsed material into borehole. Not representative of depth.*			
			17.30m - D25	20.29	17.30				
					(0.40)	Very stiff, reddish brown, silty CLAY, with up to 60 percent angular lithorelicts (up to 35mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
17.70 - 19.20	100 0 0	NA	17.80m - D26	19.89	17.70	Very stiff, fissured, locally very thinly bedded (10 to 15 degrees) reddish brown, locally mottled grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished, with black manganese staining (<1mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(2.80)	*Between 19.00m and 19.15m: very stiff, light bluish grey, clayey silt.*			
19.20 - 20.70	100 0 0								
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
5.20	6.00	Air mist	90
6.00	7.50	Air mist	90
7.50	9.00	Air mist	90
9.00	10.20	Air mist	90
10.20	11.70	Air mist	90
11.70	13.20	Air mist	90
13.20	14.70	Air mist	90
14.70	16.20	Air mist	90

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)
50.70	121

Casing Diameter	
Depth (m)	Dia (mm)
50.70	139

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
01/11	16:30	1.20		0.90
02/11	08:00	1.20		0.70
02/11	16:30	4.20	3.20	0.80
03/11	08:00	4.20	3.20	0.70

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: AR3408 Energy Ratio: 63%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH042**
	Dates: 01/11/2022 - 15/11/2022	Client: Cadent	Sheet 3 of 6
Rotary Boring Log	Location: 364615.94E 370251.99N	Ground level: 37.59mOD / Logged by: FH/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
			20.10m - D27	17.09	20.50	Very stiff, fissured, locally very thinly bedded (10 to 15 degrees) reddish brown, locally mottled grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished, with black manganese staining (<1mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		0	20.70m - C28		(1.00)	*Between 19.90m and 20.30m: very closely spaced, off white gypsum veins (up to 20mm).*			
20.70 - 22.20	100 13 13		21.40m - D29	16.09	21.50	Very stiff, fissured, thickly laminated (10 to 15 degrees) light bluish grey, locally mottled reddish brown, clayey SILT, with up to 5 percent angular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 0 to 30 degrees, very closely spaced, planar, smooth. Rare, off white, angular fragments (up to 5mm) of crystalline gypsum. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
			22.10m - D30		(1.60)	*Between 20.70m and 20.90m: weak, light bluish grey siltstone.*			
22.20 - 23.70	100 0 0	NA		14.49	23.10	Very stiff, fissured, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 35 to 50 degrees, closely spaced, planar, smooth, locally polished with black manganese staining (<1mm). Rare, angular fragments (up to 5mm) of light greyish white gypsum. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
			23.40m - D31	13.89	(0.60) 23.70	Very stiff, fissured, locally thickly laminated (10 to 15 degrees) light bluish grey, clayey SILT, with up to 5 percent angular lithorelicts (up to 8mm) of very weak siltstone. Fissures are 0 to 40 degrees, very closely spaced, planar, smooth, locally polished with black manganese staining (<1mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		12	24.00m - C32	13.44	(0.45) 24.15	Very weak, thinly bedded (10 to 20 degrees) light bluish grey SILSTONE. Discontinuities are 15 to 30 degrees, very closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
23.70 - 25.20	100 30 0	NA	24.90m - D33	12.59	(0.85) 25.00	Very stiff, fissured, thickly laminated (20 to 30 degrees) light bluish grey, locally mottled reddish brown, clayey SILT, with up to 20 percent angular lithorelicts (up to 30mm) of very weak siltstone. Fissures are 0 to 45 degrees, very closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		16				Very stiff, fissured, reddish brown, locally mottled light bluish grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 8mm) of extremely weak mudstone and siltstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
25.20 - 26.70	100 19 0	NA	26.70m - D34			*Between 25.50m and 25.78m: moderately weak, light bluish grey siltstone. Discontinuities are set 1: 15 to 30 degrees, very closely and closely spaced, planar, rough, clean. Set 2: 60 to 80 degrees, smooth, clean.*			
26.70 - 28.20	60 0 0	AZCL			(8.15)	*Between 27.60m and 28.20m: assessed zone of core loss, likely fissured silty clay.*			
28.20 - 29.70	100 0 0	NA	28.70m - D35						
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
16.20	17.70	Air mist	90
17.70	19.20	Air mist	90
19.20	20.70	Air mist	90
20.78	22.70	Air mist	90
22.20	23.70	Air mist	90
23.70	25.20	Air mist	90
25.20	26.70	Air mist	90
26.70	28.20	Air mist	90

Checked by:	MHW	IFA RC
Log status:	FINAL	v01.01

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
03/11	16:30	9.00	5.20	9.00
09/11	08:00	9.00	5.20	0.85
09/11	16:30	11.70	10.20	0.00
10/11	08:00	11.70	10.20	0.85

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: AR3408 Energy Ratio: 63%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH042**
	Dates: 01/11/2022 - 15/11/2022	Client: Cadent			Sheet 4 of 6
Rotary Boring Log	Location: 364615.94E 370251.99N	Ground level: 37.59mOD	Logged by: FH/CE	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
29.70 - 31.20	100 0 0		30.50m - D36			Very stiff, fissured, reddish brown, locally mottled light bluish grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 8mm) of extremely weak mudstone and siltstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
31.20 - 32.70	33 0 0	AZCL	31.65m - D37			*Between 31.15m and 31.40m: very stiff, light bluish grey, clayey silt.* *Between 31.70m and 32.70m: assessed zone of core loss, likely fissured silty clay.*			
32.70 - 34.20	100 0 0	NA	33.45m - D38	4.44	33.15	Very stiff, fissured, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 30mm) of extremely weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
34.20 - 35.70	100 0 0		35.10m - D39		(2.55)				
35.70 - 37.20	100 100 100		36.26m - C40	1.89	35.70	Weak, thickly laminated (0 to 10 degrees) reddish brown, locally mottled light bluish grey SILTSTONE. Discontinuities are 30 to 50 degrees, widely spaced, planar, undulating, rough, clean. 80 to 90 degrees, very closely spaced, planar, rough, clean. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
37.20 - 38.70	100 100 100	2	38.48m - C41		(3.25)	*At 38.48m: very weak.* *Between 38.70m and 38.80m: non intact, drilling disturbed, recovered as; angular, fine to coarse siltstone gravel.*			
38.70 - 40.20	100 30 30	22	39.55m - D42	-1.36	38.95 (1.05)	Extremely weak to very weak, reddish brown MUDSTONE. Discontinuities are 0 to 90 degrees, extremely closely and very closely spaced, planar, smooth, tight, with soft, brown, clay infill (up to 0.25mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
				-2.41	40.00	Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
28.20	29.70	Air mist	90
29.70	31.20	Air mist	90
31.20	32.70	Air mist	90
32.70	34.20	Air mist	90
34.20	35.70	Air mist	90
35.70	37.20	Air mist	90
37.20	38.70	Air mist	90
38.70	40.20	Air mist	90

Checked by:	MHW	IFA RC
Log status:	FINAL	v01.01

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
10/11	16:30	22.20	10.20	17.60
11/11	08:00	22.20	10.20	1.85
11/11	16:30	31.20	11.00	20.00
14/11	08:00	31.20	11.00	0.00

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: AR3408 Energy Ratio: 63%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH042**
	Dates: 01/11/2022 - 15/11/2022	Client: Cadent	Sheet 5 of 6
Rotary Boring Log	Location: 364615.94E 370251.99N	Ground level: 37.59mOD / Logged by: FH/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Very stiff, fissured, reddish brown, locally mottled light bluish grey, silty CLAY. Fissures are 0 to 90 degrees, closely spaced, planar, smooth. (GRADE IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
40.20 - 41.70	100 0 0		41.14m - D43		(1.50)				
				-3.91	41.50	Very stiff, fissured, light bluish grey, silty CLAY, with up to 10 percent angular lithorelicts (up to 5mm) of very weak siltstone. Fissures are 30 to 50 degrees, medium spaced, planar, smooth, locally polished. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 42.20m and 42.25m: moderately weak, light bluish grey siltstone.* *Between 42.40m and 42.43m: moderately weak, light bluish grey siltstone.*			
41.70 - 43.20	100 5 0		42.25m - D44		(1.25)				
				-5.16	42.75	Very stiff, fissured, reddish brown, silty CLAY, with up to 25 percent angular lithorelicts (up to 30mm) of very weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
43.20 - 44.70	100 0 0	NA	43.20m - D45	-6.06	(0.90) 43.65	Very stiff, reddish brown, locally mottled light bluish grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 8mm) of very weak mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
			44.65m - D46		(2.50)				
44.70 - 46.20	100 0 0		45.70m - D47			*Between 45.50m and 45.70m: frequent, extremely closely spaced, thick laminations of off white, fibrous gypsum.*			
				-8.56	46.15	Very stiff, reddish brown, silty CLAY, with up to 70 percent angular lithorelicts (up to 30mm) of very weak and weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
46.20 - 47.70	100 0 0		46.50m - D48		(1.05)				
				-9.61	47.20	Very weak, thickly laminated (0 to 15 degrees) reddish brown MUDSTONE. Discontinuities are 0 to 90 degrees, extremely closely and very closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
47.70 - 49.20	100 0 0	25	47.80m - D49		(2.20)	*Between 48.70m and 48.90m: occasional, light greenish grey reduction spots (up to 10mm).*			
49.20 - 50.70	100 87 87		49.40m - C50	-11.81	49.40	Weak, thinly to thickly laminated (5 to 15 degrees) light bluish grey, locally mottled reddish brown SILTSTONE, with frequent (0 to 5 degree) off white gypsum veins (up to 30mm). Discontinuities are 20 to 40 degrees, widely spaced, planar, smooth, clean, with			

Continued next sheet

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
40.20	41.70	Air mist	90
41.70	43.20	Air mist	90
43.20	44.70	Air mist	90
44.70	46.20	Air mist	90
46.20	47.70	Air mist	90
47.70	49.20	Air mist	90
49.20	50.70	Air mist	90

Checked by: MHW — IFA RC v01.01
Log status: FINAL

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
14/11	16:30	37.20	14.00	24.00
15/11	08:00	37.20	14.00	4.40
15/11	16:30	50.70	14.00	24.50
16/11	08:00	50.70	14.00	17.70

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: AR3408 Energy Ratio: 63%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH042**
Dates: 01/11/2022 - 15/11/2022	Client: Cadent		Sheet 6 of 6
Rotary Boring Log	Location: 364615.94E 370251.99N	Ground level: 37.59mOD / Logged by: FH/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
		2			(1.30)	Weak, thinly to thickly laminated (5 to 15 degrees) light bluish grey, locally mottled reddish brown SILTSTONE, with frequent (0 to 5 degree) off white gypsum veins (up to 30mm). Discontinuities are 20 to 40 degrees, widely spaced, planar, smooth, clean, with black manganese staining (<1mm). (GRADE I) [BOLLIN MUDSTONE MEMBER]				
				-13.11	50.70	MERCIA MUDSTONE GROUP				
						End of Borehole at 50.70m		51		
								52		
								53		
								54		
								55		
								56		
								57		
								58		
								59		
								60		

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: AR3408 Energy Ratio: 63%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH042



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IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH060**
Dates: 29/09/2022 - 30/09/2022	Client: Cadent		Sheet 1 of 1
Dynamic Sampling and Rotary Boring Log	Location: 359084.97E 384776.00N	Ground level: 26.29mOD / Logged by: JJ/CE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.30	B1				Grass over dark brown becoming black, fine and medium SAND with frequent roots and rootlets (<2mm).			
0.20	ES2			(0.40)				
0.30	D3		25.89	0.40	TOPSOIL			
0.50	ES4				Loose, brown and dark reddish brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION			
0.50 - 0.80	B5							
0.60	D6							
1.00	D8							
1.00 - 1.20	B7							
1.20 - 2.00	B9			(1.70)	*Between 1.20m and 1.50m: light brown.*			
1.50		SPT(S) N=8 (1,1/1,2,2,3)			*Below 1.50m: dark brownish grey.*			
					Between 2.00m and 2.10m: dark brown with a strong organic odour.			
			24.19	2.10	Firm, orangish brown, slightly gravelly, sandy CLAY with rare fragments (up to 5mm) of black organic matter. Gravel is subangular to rounded, fine and medium including quartz, siltstone and mudstone.			
2.45 - 2.50	D10							
2.50		SPT(S) N=9 (1,2/1,2,2,4)		(1.20)	GLACIAL TILL			
					Between 2.10m and 2.30m: brownish grey.			
3.35 - 3.40	D11		22.99	3.30	Stiff, reddish brown, slightly gravelly, very sandy CLAY. Gravel is angular to subrounded fine and medium including mudstone and siltstone. (CLASS E) [WILMSLOW SANDSTONE FORMATION]			
3.50		SPT(S) N=27 (3,5/5,6,8,8)		(0.60)	SHERWOOD SANDSTONE GROUP			
			22.39	3.90	Reddish brown, slightly gravelly, clayey, fine and medium SAND. Gravel is angular to subrounded, fine to coarse including mudstone, siltstone and sandstone. (CLASS E) [WILMSLOW SANDSTONE FORMATION]			
				(0.60)				
				4.50	SHERWOOD SANDSTONE GROUP			
		4.50m - SPT(S) 50 (10,13/50 for 190mm)	21.79		*Between 4.35m and 4.45m: 1x light grey reduction spot (30mm x 100mm)*			
4.50 - 6.00	23 0 0	AZCL		(1.15)	Assumed zone of core loss, assumed to be sand. SHERWOOD SANDSTONE GROUP			
		NA	20.64	5.65	Firm, reddish brown, very sandy CLAY. (CLASS E) [WILMSLOW SANDSTONE FORMATION]			
				(0.35)				
		6.00m - SPT(S) 50 (25 for 120mm/50 for 125mm)	20.29	6.00	SHERWOOD SANDSTONE GROUP			
6.00 - 6.75	100 100 100	2 NIDD			Weak, thinly bedded (0 to 10 degrees), reddish brown, slightly micaceous, fine and medium grained SANDSTONE. Discontinuities are set 1: 0 to 15 degrees medium to widely spaced planar rough. Set 2: 40 degrees medium to widely spaced planar rough. (CLASS A) [WILMSLOW SANDSTONE FORMATION]			
		6.41m - C12			SHERWOOD SANDSTONE GROUP			
		6.75m - SPT(S) 55 (25 for 60mm/55 for 50mm)			*Between 6.00m and 6.08m: non intact drilling disturbed.*			
6.75 - 7.50	100 100 100				*Between 6.09m and 6.38m: yellow grey discolouration.*			
					Between 6.28m and 6.38m: non intact drilling disturbed recovered as subangular fine to coarse sandstone gravel.			
		7.61m - C13			*At 6.41m: diametrally very weak.*			
7.50 - 8.50	100 100 100	2		(4.00)	*Between 6.60m and 6.75m missing core located in CR3 (see photograph).*			
					Between 6.98m and 7.03m: yellowish grey and grey discolouration, very micaceous.			
					Between 7.09m and 7.11m: yellowish grey and grey discolouration, very micaceous.			
					Between 7.88m and 7.90m: calcareous.			
					Between 8.53m and 8.60m: yellowish grey and grey discolouration, very micaceous.			
8.50 - 10.00	100 100 100							
		9.50m - C14			*At 9.50m: diametrally very weak.*			
					Between 9.80m and 9.92m: up to 20 percent subangular clasts (up to 25mm) of mudstone and siltstone.			
	TCR/SCR/RQD	FI Samples & Tests	16.29	10.00	End of Borehole at 10.00m			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	1.50		100	
1.50	2.50		100	
2.50	3.50		100	
3.50	4.50		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: KM01 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			20	1.20	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Core Photographs
BH060



Core Photographs
BH060



Core Photographs
BH060



Core Photographs
BH060



IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH061**
	Dates: 28/09/2022 - 29/09/2022	Client: Cadent	Sheet 1 of 2
Dynamic Sampling and Rotary Boring Log	Location: 359086.95E 384803.97N	Ground level: 25.91mOD / Logged by: CG/TW / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.30	D1				(0.40)	Dark grey to black, slightly silty, fine and medium sand. TOPSOIL			
0.30 - 0.60	B2			25.51	0.40				
0.60 - 0.90	D3					Brown mottled greyish brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION			
0.90 - 1.20	B4								
1.00	ES5				(1.80)	*Below 1.20m: medium dense.*			
1.60 - 1.65	ES6					*Between 1.60m and 1.65m: dark brown, fine and medium sand, with a strong organic odour.*			
1.70		SPT(S) N=12 (2,2/2,2,3,5)							
2.20 - 3.00	B7			23.71	2.20	Soft, grey, silty CLAY with occasional sand and gravel. Gravel is subrounded to rounded, fine including quartzite and siltstone. Slight organic odour. ALLUVIUM			
2.50 - 2.60	D8								
2.70		SPT(S) N=8 (1,2/1,3,2,2)			(0.96)	*Between 2.80 and 3.16m: brownish grey.*			
				22.75	3.16	Light reddish brown, slightly gravelly, very clayey, fine and medium SAND. Gravel is subrounded to rounded, fine to coarse including quartzite. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
3.70 - 4.70	25 25 25	AZCL	3.70m - SPT(S) 50 (7,10/50 for 225mm)		(1.29)	*Between 3.70m and 4.45m: assessed zone of core loss, likely to be sand.*			
		NIDD		21.46	4.45	Weak, reddish brown, fine grained, micaceous SANDSTONE, non intact drilling disturbed recovered as subangular, medium and coarse gravel (up to 40x40x50mm) (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
4.70 - 5.70	20 20 20	AZCL	4.70m - SPT(S) 50 (9,12/50 for 70mm)	21.21	4.70				
					(0.80)	Assessed zone of core loss, possible extremely weak sandstone. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		NIDD		20.41	5.50 (0.30)				
5.70 - 6.70	100 100 100	1	5.70m - SPT(S) 50 (25 for 115mm/50 for 35mm) 5.90m - C9	20.11	5.80	Weak, reddish brown, fine grained, micaceous SANDSTONE, non intact drilling disturbed recovered as subangular, medium and coarse gravel (up to 40x45x55mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 5.70m and 5.79m: non intact drilling disturbed.*			
6.70 - 8.20	100 100 100		7.62m - C10		(3.10)	Very weak, thickly laminated to very thinly bedded (0 to 10 degrees), dark reddish brown, fine and medium grained, micaceous SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 5.90m: diametrically extremely weak.* *Between 6.50m and 6.51m: 3 degree, undulating, slightly rough discontinuity.* *Between 6.55m and 6.60m: light bluish grey.* *At 7.62m: diametrically extremely weak.* *Between 8.00m and 8.20m: moderately weak, thickly laminated (35 to 40 degrees), light reddish brown, fine and medium grained sandstone, with up to 10 percent, rounded clasts (up to 6mm) including quartzite.*			
8.20 - 9.70	100 100 100	0	9.25m - C11	17.01	8.90	Moderately weak, thickly laminated (30 degrees), light reddish brown, fine and medium grained, calcareous SANDSTONE, with up to 15 percent subangular clasts (up to 40x40x50mm) including siltstone and quartzite. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 9.25m: moderately weak.*			
					(0.60)				
		2		16.41	9.50				
9.70 - 10.20	100				(0.70)				
	TCR/SCR/RQD	FI	Samples & Tests			Moderately weak, thickly laminated to very thinly bedded (0 to 5			

Continued next sheet

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	1.70		100	
1.70	2.70		100	
2.70	3.70		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JN01 Energy Ratio: 65%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			0	0.78	Slow

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH061**
Dates:	**Client:**	Sheet 2 of 2
28/09/2022 - 29/09/2022	Cadent	

Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	359086.95E 384803.97N	25.91mOD	CG/TW	1:50	2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
				15.71	10.20	Moderately weak, thickly laminated to very thinly bedded (0 to 5 degrees), reddish brown locally mottled light greenish grey, micaceous SILTSTONE. Discontinuities are 0 to 20 degrees, medium spaced, planar, slightly rough. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
						End of Borehole at 10.20m			

11 12 13 14 15 16 17 18 19 20

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
3.70	4.70	Air	100
4.70	5.70	Air	100
5.70	6.70	Air	80
6.70	8.20	Air	80
8.20	9.70	Air	80

Borehole Diameter

Depth (m)	Dia (mm)
10.20	121

Casing Diameter

Depth (m)	Dia (mm)
5.00	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
28/09	16:30	1.20		Dry
29/09	08:00	1.20		0.78
29/09	16:30	9.70	4.50	3.90
30/09	00:00	10.20	4.50	3.70

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH061



Core Photographs
BH061



Core Photographs
BH061



Core Photographs
BH061



IAN FARMER ASSOCIATES	Plant used: Comacchio 205/Commacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH063**
	Dates: 07/12/2022 - 12/12/2022	Client: Cadent	Sheet 1 of 5
Dynamic Sampling and Rotary Boring Log	Location: 358980.82E 385586.07N	Ground level: 13.44mOD / Logged by: NC / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.30	B1			(0.30)	Dark greyish brown, slightly gravelly, slightly clayey, silty, fine and medium SAND with occasional rootlets.			
0.30 - 0.70	B2		13.14	0.30	TOPSOIL			
0.50	ES3				Dark brown mottled brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION			
0.70 - 1.20	B4			(0.90)	*Below 0.70m: mottled light brown.*			
1.20		SPT(S) N=22 (4,6/6,4,5,7)	12.24	1.20				
1.20	D5				Medium dense, yellowish brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION			
1.20 - 2.20	B8			(1.00)				
2.20		SPT(S) N=32 (4,5/6,7,6,13)	11.24	2.20				
2.20	D6				Dense, light brown, slightly gravelly, slightly silty, fine and medium SAND. Gravel is subrounded, fine and medium of mixed lithologies.			
2.20 - 2.70	B9			(0.50)	SHIRDLEY HILL SAND FORMATION			
2.70 - 3.10	B10		10.74	2.70	Reddish brown, slightly silty, fine and medium SAND. (CLASS E)			
2.20 - 3.00		AZCL 3.00m - SPT(S) 50 (8,7/50 for 240mm)	10.34	(0.40) 3.10	[HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		3.00m - D7			Very weak, thinly to thickly laminated (0-20 degrees), reddish brown, fine and medium grained, micaceous SANDSTONE. Discontinuities are 80 degrees, very closely spaced, planar, rough clean. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
3.00 - 4.50	93 76 76	3		(1.60)				
		4.27m - C11						
			8.74	4.70	Very weak, locally extremely weak, thinly bedded (0-10 degrees) light reddish brown, locally discoloured light greenish grey, fine to coarse grained SANDSTONE with (up to 40mm) of extremely weak mudstone. (CLASS B) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		AZCL						
4.50 - 6.00	93 93 93	2		(0.90)				
		5.25m - C12						
			7.84	5.60	*Between 4.80m and 4.90m: extremely weak.* *Between 5.07m and 5.14m: 60 degree joint, undulating, rough clean.* *Between 5.07m and 5.14m: 40 degree joint, planar, rough clean.* *Between 5.40m and 5.60m: extremely weak.*			
		3		(0.80)				
		6.00m - C13						
			7.04	6.40	Moderately weak, thinly bedded (0-20 degrees) light reddish brown, medium grained SANDSTONE with up to 5% subangular and subrounded clasts (up to 50mm) of very weak siltstone. Discontinuities are 0-20 degrees, closely spaced, undulating rough, clean. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
6.00 - 7.50	100 100 100	2						
		NIDD			Moderately weak to medium strong, medium bedded (0-20 degrees) light reddish brown, fine and medium grained SANDSTONE with up to 5% subangular and subrounded clasts (up to 30mm) of extremely weak mudstone and siltstone. Discontinuities are 20 degrees, widely spaced, undulating rough, clean. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
					Between 6.90m and 7.00m: non intact drilling disturbed.			
7.50 - 9.00	100 100 100	8.15m - C14			*At 8.15m: weak.*			
9.00 - 10.50	100 100 100							
	TCR/SCR/RQD	FI Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
2.20			100	
3.00			100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
22.00	3.00		20	12.10	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205/Commacchio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH063**
	Dates: 07/12/2022 - 12/12/2022	Client: Cadent			Sheet 2 of 5
Rotary Boring Log	Location: 358980.82E 385586.07N	Ground level: 13.44mOD	Logged by: NC	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Moderately weak to medium strong, medium bedded (0-20 degrees) light reddish brown, fine and medium grained SANDSTONE with up to 5% subangular and subrounded clasts (up to 30mm) of extremely weak mudstone and siltstone. Discontinuities are 20 degrees, widely spaced, undulating rough, clean. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
10.50 - 12.00	100 100 100								
12.00 - 13.50	100 100 100	1			(8.85)	*Between 12.25m and 12.50m: cemented with up to 40% clasts (up to 50mm) of mudstone, siltstone and quartz.*			
13.50 - 15.00	100 100 100		13.75m - C15						
15.00 - 16.50	100 100 100	0	16.00m - C16	-1.81	15.25 (1.25)	Weak, thickly laminated (20-30 degrees) dark reddish brown, fine and medium grained micaceous SANDSTONE with up to 5% subrounded clasts (up to 40mm) of mudstone. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 16.00m: very weak diametrically.*			
16.50 - 18.00	100 100 100	5	16.50m - C17	-3.06	16.50 (0.35)	*Between 16.45m and 16.50m: partially recovered subangular clasts (50x50x50mm) of very weak mudstone.*			
		0		-3.41	16.85 (1.20)	Medium strong, thickly laminated (0-5 degrees) reddish brown and light greenish grey, fine grained SANDSTONE. Discontinuities are 40 degrees, medium spaced, planar smooth. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP Moderately weak, thickly laminated to very thinly bedded (0-10 degrees) reddish brown, locally discoloured light greenish grey, fine to coarse grained SANDSTONE with up to 5% subangular clasts (up to 10mm) of mudstone and siltstone. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
18.00 - 19.50	100 100 85	10	18.14m - C18	-4.61	18.05 (0.40)				
		NIDD 0							
		5	18.84m - C19	-5.01	18.45 (0.70)	Very weak, thinly to thickly laminated (0-5 degrees) reddish brown mottled light greenish grey MUDSTONE. Discontinuities are 1) 0-5 degrees, very closely to closely spaced, undulating smooth, clean with black staining (<1mm). Set 2) 85 degrees, very closely spaced, planar, smooth, clean with black staining (<1mm). (CLASS B) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		0		-5.71	19.15 (0.35)	*Between 18.25m and 18.35m: non intact, drilling disturbed, recovered as subangular coarse gravel.*			
		AZCL NIDD 0		-6.06	19.50 (0.40)	Very weak, brown mottled light grey, medium and coarse grained SANDSTONE with up to 5% subrounded clasts (up to 20mm) of mudstone. Discontinuities are 50-60 degrees, closely spaced, planar, rough, clean. (CLASS B) [HELSBY SANDSTONE			
				-6.46	19.90	Continued next sheet			

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
				40.50	121	07/12	16:30	1.20		Dry	
						08/12	16:30	18.00	4.50	17.50	
						09/12	08:00	18.00	3.00	3.80	
						09/12	16:30	27.00	3.00	12.00	SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)
3.00	139										

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205/Commacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH063**
	Dates: 07/12/2022 - 12/12/2022	Client: Cadent	Sheet 3 of 5
Rotary Boring Log	Location: 358980.82E 385586.07N	Ground level: 13.44mOD / Logged by: NC / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
19.50 - 21.00	93 93 93	2			(1.05)	Very weak, brown mottled light grey, medium and coarse grained SANDSTONE with up to 5% subrounded clasts (up to 20mm) of mudstone. Discontinuities are 50-60 degrees, closely spaced, planar, rough, clean. (CLASS B) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
			21.00m - C20	-7.51	20.95	Weak, brown, fine and medium grained SANDSTONE with up to 5% subrounded clasts (up to 30mm) of siltstone. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
21.00 - 22.50	100 100 100	0		-8.16	(0.65) 21.60	Extremely weak, thickly laminated (10-30 degrees) dark orange brown, fine to coarse grained micaceous SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 19.60m and 19.75m: non intact, drilling disturbed, recovered as, fine to coarse sandy gravel.*			
			22.70m - C21		(1.40)	Moderately weak, thickly laminated (0-10 degrees) brown and light greyish brown, fine and medium grained micaceous SANDSTONE. Discontinuities are 45 degrees, closely spaced, undulating rough, clean. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
22.50 - 24.00	100 100 100	4	23.45m - C22	-9.56	23.00 (0.75)	Weak to moderately weak, thinly laminated (0-10 degrees) light blueish grey and reddish brown, fine grained, heavily micaceous SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
			24.00m - C23	-10.31	23.75 (0.65)	Moderately weak to medium strong, thinly to medium bedded (0-10 degrees) dark reddish brown, fine grained, micaceous SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		NI 0		-10.96	24.40	Very weak, thinly bedded (0-10 degrees) reddish brown, medium grained SANDSTONE. Discontinuities are 30 to 40 degrees, closely spaced, planar, rough clean. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
24.00 - 25.50	100 78 42	16	24.60m - C24		(0.90)	Weak, dark reddish brown, stained dark yellowish grey, fine and medium grained, very micaceous SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 23.85m and 23.90m: 45 degrees joint, undulating, rough clean.* *Between 24.18m and 24.21m: 90 degree joint, undulating rough clean.* *Between 24.30m and 24.37m: non intact, drilling disturbed.*			
				-11.86	25.30	Very weak, very thinly bedded (0-20 degrees) reddish brown MUDSTONE. Discontinuities are 1) 0-20 degrees, very closely to closely spaced, undulating smooth, clean with localised black staining (<1mm). 2) 40-60 degrees, very closely spaced, planar, smooth clean, with black staining (<1mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
25.50 - 27.00	100 100 100		26.16m - C25						
27.00 - 28.50	100 100 100	3	28.17m - C26		(4.55)	Weak, thinly to medium bedded (0-10 degrees) reddish brown, locally discoloured light greenish grey, fine grained SANDSTONE. Discontinuities are 0-10 degrees, closely to medium spaced, undulating rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 25.50m and 25.75m: extremely weak, thickly laminated (0-5 degrees) light reddish brown, fine grained, weakly cemented sandstone.* *At 26.16m: very weak.* *Between 27.05m and 27.25m: 70 degrees joint, undulating, rough, clean.* *Between 27.40m and 27.50m: extremely weak, thickly laminated (0-10 degrees) brown, fine and medium grained sandstone.*			
28.50 - 30.00	93 93 93								
		NI AZCL		-16.41	29.85	Extremely weak, thinly to thickly laminated (0-15 degrees) reddish			

Continued next sheet

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
12/12	08:00	27.00	3.00	12.00
12/12	16:30	40.50	3.00	Dry
13/12	08:00	40.50		37.40

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205/Commacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH063**
	Dates: 07/12/2022 - 12/12/2022	Client: Cadent	Sheet 4 of 5
Rotary Boring Log	Location: 358980.82E 385586.07N	Ground level: 13.44mOD / Logged by: NC / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
30.00 - 31.50	100 9 9	18	30.50m - D27		(1.51)	Extremely weak, thinly to thickly laminated (0-15 degrees) reddish brown, fine grained, weakly cemented SANDSTONE. Discontinuities are 0-90 degrees, extremely to very closely spaced, planar, rough clean. (CLASS C) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 29.85m and 29.90m: non intact, drilling disturbed.*			
		0	31.40m - D28	-17.92 -18.06	31.36 31.50	Very weak, thickly laminated to very thinly bedded (0-10 degrees) light reddish grey and light greenish grey, fine grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
31.50 - 33.00	0 0 0					Zone of no recovery. Possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP			
33.00 - 34.50	0 0 0	NR	33.00m - SPT(C) 50 (25 for 100mm/50 for 35mm)		(4.50)				
34.50 - 36.00	0 0 0		34.50m - SPT(C) 50 (25 for 15mm/50 for 30mm)						
36.00 - 37.50	100 66 62	12	36.00m - SPT(C) 50 (25 for 100mm/50 for 40mm) 37.09m - C29	-22.56	36.00	Very weak, thickly laminated to very thinly bedded (0-20 degrees) reddish brown, locally discoloured light greenish grey, fine and medium grained SANDSTONE. Discontinuities are 1) 30-50 degrees, very closely spaced, planar rough, clean. 2) 75-85 degrees, very closely spaced, planar, rough and clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 37.50m and 39.00m: no recovery, possible extremely weak sandstone.*			
37.50 - 39.00	0 0 0	NR			(4.50)				
39.00 - 40.50	100 76 76	6	39.00m - SPT(C) 50 (25 for 100mm/50 for 50mm)						
						Continued next sheet			

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205/Commacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH063**
Dates: 07/12/2022 - 12/12/2022	Client: Cadent		Sheet 5 of 5
Rotary Boring Log	Location: 358980.82E 385586.07N	Ground level: 13.44mOD	Logged by: NC	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
			40.30m - C30	-27.06	40.50	Very weak, thickly laminated to very thinly bedded (0-20 degrees) reddish brown, locally discoloured light greenish grey, fine and medium grained SANDSTONE. Discontinuities are 1) 30-50 degrees, very closely spaced, planar rough, clean. 2) 75-85 degrees, very closely spaced, planar, rough and clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 40.30m: weak.* End of Borehole at 40.50m		41 42 43 44 45 46 47 48 49 50		

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
											SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH063



Core Photographs
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IAN FARMER ASSOCIATES	Plant used: Commachio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH066**
	Dates: 28/09/2022 - 05/10/2022	Client: Cadent	Sheet 1 of 4
Dynamic Sampling and Rotary Boring Log	Location: 356245.02E 386002.03N	Ground level: 5.37mOD / Logged by: MT/CE / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
				(0.35)	Soft, greyish brown, slightly sandy, clayey SILT. TOPSOIL			
0.35 - 0.80	B1		5.02	0.35				
0.50	D3				Firm to stiff, grey brown, slightly sandy, silty CLAY. TIDAL FLAT DEPOSITS			
0.50	ES2			(0.45)				
0.80 - 1.00	B4		4.57	0.80				
1.00	D6			(0.40)	Firm to stiff, thinly laminated, light brown and reddish grey, slightly sandy SILT. TIDAL FLAT DEPOSITS			
1.00	ES5		4.17	1.20				
1.20		SPT(S) N=4 (1,1/1,1,1,1)			Loose, light yellowish brown, mottled brown, clayey, very silty, fine SAND, with rare fragments (up to 5mm) of dark brown, decaying, organic matter. TIDAL FLAT DEPOSITS			
1.20 - 1.65	D8							
1.20 - 2.20	B7			(1.30)	*Between 1.20m and 1.40m: dark orangish brown mottling.*			
2.00		SPT(S) N=4 (1,2/1,1,1,1)						
2.00	ES9							
2.00 - 2.45	D10							
			2.87	2.50	Loose, grey, silty, fine SAND, with a slight organic odour. TIDAL FLAT DEPOSITS			
3.00		SPT(S) N=9 (1,2/2,2,3,2)						
3.00 - 3.45	D12			(1.25)				
3.00 - 3.80	B11							
			1.62	3.75	Loose, brownish grey, slightly clayey, silty, fine and medium SAND with occasional fragments (up to 5mm) of black organic matter. TIDAL FLAT DEPOSITS			
4.00		SPT(S) N=7 (2,2/1,2,2,2)			*Between 3.80m and 4.00m: sand is medium.*			
4.00 - 4.45	D14							
4.00 - 4.70	B13			(1.65)				
5.00		SPT(S) N=6 (1,2/2,1,2,1)			*Between 4.80m and 4.90m: occasional pockets (40 x 50 x 60mm) of soft, dark grey, organic clay.*			
5.00 - 5.45	D15							
5.40 - 6.40	B16		-0.03	5.40	Medium dense to very dense, brownish grey, fine and medium SAND, with rare fragments (up to 3mm) of black organic matter. TIDAL FLAT DEPOSITS			
6.00		SPT(S) N=8 (2,2/1,2,3,2)						
6.00 - 6.45	D17							
				(2.60)				
7.00		SPT(S) N=34 (2,3/6,7,10,11)						
7.00 - 7.45	D18							
7.40 - 8.00	B19							
8.00		SPT(S) 50 (5,20/50 for 70mm)	-2.63	8.00	Very dense, reddish brown, gravelly, fine and medium SAND. Gravel is angular to subrounded, fine to coarse, including siltstone, sandstone, quartzite and granite. (CLASS E)			
				(0.60)				
		NIDD 8.50m - SPT(S) 50 (7,14/50 for 115mm)	-3.23	8.60	[WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
8.50 - 9.80	77 77 77	3			Moderately weak, locally weak, thinly bedded (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE. Discontinuities are set 1: 0 to 15 degrees, widely spaced, planar, rough, with localised black staining (up to 1mm). Set 2: 60 to 75 degrees, medium and widely spaced, planar, smooth and rough, with localised heavy, black staining (up to 2mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		AZCL						
		NIDD						
	TCR/SCR/RQD	FI Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		75	
2.00	3.00		60	
3.00	4.00		100	
4.00	5.00		100	
5.00	6.00		70	
6.00	7.00		100	
7.00	8.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
5.00	3.00	5.00	20	2.65	Fast

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Commachio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH066**
	Dates: 28/09/2022 - 05/10/2022	Client: Cadent	Sheet 2 of 4
Rotary Boring Log	Location: 356245.02E 386002.03N	Ground level: 5.37mOD / Logged by: MT/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
9.80 - 11.30	100 100 100					Moderately weak, locally weak, thinly bedded (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE. Discontinuities are set 1: 0 to 15 degrees, widely spaced, planar, rough, with localised black staining (up to 1mm). Set 2: 60 to 75 degrees, medium and widely spaced, planar, smooth and rough, with localised heavy, black staining (up to 2mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 9.20m and 9.23m: light grey discolouration.* *Between 9.80m and 10.12m: moderately weak, reddish brown sandstone, non intact, drilling disturbed, recovered as; sandy, angular, medium and coarse gravel. Sand is fine.*			
11.30 - 12.80	100 100 100					*Between 12.60m and 12.80m: light greenish grey discolouration.*			
12.80 - 14.30	100 100 100	2			(9.00)				
14.30 - 15.80	100 100 100								
15.80 - 17.30	100 100 100		16.76m - C20			*At 16.76m: weak, very weak diametrically.*			
17.30 - 18.80	100 100 100	2	18.50m - C21 18.56m - C22	-12.23	17.60	Moderately weak, very thinly bedded to thinly bedded (5 to 25 degrees) reddish brown, locally light greenish grey, slightly micaceous, fine and medium grained SANDSTONE. Discontinuities are 60 to 80 degrees, medium and widely spaced, planar, rough, with black staining (1mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 18.50m and 18.60m: black mineralisation (up to 1mm) along bedding planes.* *Between 18.80m and 19.15m: moderately weak, reddish brown sandstone, non intact, drilling disturbed, recovered as; fine and medium sand.*			
18.80 - 20.30	100 100 100	NIDD							

Continued next sheet

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
8.50	9.80	Water	50
9.80	11.30	Water	50
11.30	12.80	Water	50
12.80	14.30	Water	100
14.30	15.80	Water	50
15.80	17.30	Water	50
18.80	17.30	Water	50
20.30	18.80	Water	50

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)
40.00	121

Casing Diameter	
Depth (m)	Dia (mm)
40.00	139

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
28/09	16:30	8.00	6.00	6.50
29/09	08:00	8.00	8.00	1.00
29/09	10:00	8.00	8.50	
03/10	08:00	8.50	8.50	1.00

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES

Plant used: Commachio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH066**
Dates: 28/09/2022 - 05/10/2022	Client: Cadent		Sheet 3 of 4
Rotary Boring Log	Location: 356245.02E 386002.03N	Ground level: 5.37mOD / Logged by: MT/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
20.30 - 21.80	100 100 100					Moderately weak, very thinly bedded to thinly bedded (5 to 25 degrees) reddish brown, locally light greenish grey, slightly micaceous, fine and medium grained SANDSTONE. Discontinuities are 60 to 80 degrees, medium and widely spaced, planar, rough, with black staining (1mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 21.05m and 21.08m: very thin bed of weak, reddish brown mudstone.*		21		
21.80 - 23.30	100 100 100		22.30m - C23			*At 22.30m: weak, very weak diametrically.* *Between 22.30m and 23.85m: up to 10 percent, subrounded and rounded clasts (up to 20mm) of mudstone and siltstone.*		22 23		
23.30 - 24.80	100 100 100							24		
24.80 - 26.30	100 100 100	2			(22.40)			25 26		
26.30 - 27.80	100 100 100		26.52m - C24			*Between 27.80m and 27.83m: up to 5 percent, subrounded clasts (up to 15mm) of mudstone.*		27 28		
27.80 - 29.30	100 100 100							29		
						Continued next sheet		30		

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
21.80	20.30	Water	50
23.30	21.80	Water	50
24.80	23.30	Water	50
26.30	24.80	Water	50
27.80	26.30	Water	50
29.30	27.80	Water	50
30.80	29.30	Water	50
32.30	30.80	Water	50

Checked by: MHW — IFA RC v01.01
Log status: FINAL

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
03/10	16:03	17.30	12.80	4.80
04/10	08:00	17.30	12.80	4.60
04/10	16:30	32.30	12.80	5.10
05/10	08:00	32.30	12.80	1.50

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES

Plant used: Commachio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH066**
Dates: 28/09/2022 - 05/10/2022	Client: Cadent		Sheet 4 of 4
Rotary Boring Log	Location: 356245.02E 386002.03N	Ground level: 5.37mOD / Logged by: MT/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
29.30 - 30.80	100 100 100					Moderately weak, very thinly bedded to thinly bedded (5 to 25 degrees) reddish brown, locally light greenish grey, slightly micaceous, fine and medium grained SANDSTONE. Discontinuities are 60 to 80 degrees, medium and widely spaced, planar, rough, with black staining (1mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
30.80 - 32.30	100 100 100		31.30m - C25						
32.30 - 33.80	100 100 100								
33.80 - 35.30	100 100 100		34.30m - C26			*At 34.40m: diametrically weak.*			
35.30 - 36.80	100 100 100								
36.80 - 38.30	100 100 100		37.60m - C27						
38.30 - 39.80	100 100 100					*Between 39.06m and 39.10m: up to 5 percent, subrounded, elongated clasts (up to 20mm) of mudstone.* *Between 39.80m and 40.00m: assessed zone of core loss. Possible sandstone scrubbed by drilling.*			
39.80 -…	0	AZCL		-34.63	40.00	End of Borehole at 40.00m			

31 32 33 34 35 36 37 38 39 40

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
33.80	32.30	Water	50
35.30	33.80	Water	50
36.80	35.30	Water	50
38.30	36.80	Water	50
39.80	38.30	Water	50
40.00	39.80	Water	50

Borehole Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
05/10	16:30	40.00	12.80	4.80

Casing Diameter

Depth (m)	Dia (mm)

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH066



Core Photographs
BH066



Core Photographs
BH066



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IAN FARMER ASSOCIATES	Plant used: Commacchio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH067**
	Dates: 29/09/2022 - 05/10/2022	Client: Cadent			Sheet 1 of 4
Dynamic Sampling and Rotary Boring Log	Location: 356117.82E 386020.94N	Ground level: 5.57mOD	Logged by: JB/AE	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10	D1				(0.40)	Dark grey, sandy, clayey SILT with frequent rootlets up to 3mm diameter. TOPSOIL			
				5.17	0.40				
0.50	D4					Firm, light brownish grey, slightly sandy, silty CLAY. TIDAL FLAT DEPOSITS			
0.50	ES2				(0.40)				
0.50 - 0.60	B3			4.77	0.80				
0.90	D5					Light brownish grey orangish mottled, silty, fine SAND with clay laminations. TIDAL FLAT DEPOSITS			
1.00	ES6				(0.40)				
1.00 - 1.10	B7			4.37	1.20				
1.20		SPT(S) N=7 (1,1/2,1,2,2)				Loose, greyish brown, stained orangish brown, silty, fine SAND, with very closely and closely spaced, thick laminations of soft, brown clay. TIDAL FLAT DEPOSITS			
1.20 - 1.65	D9								
1.20 - 2.65	B8								
2.00		SPT(S) N=1 (1,0/0,0,0,1)			(1.45)	*At 2.00m: very loose.*			
2.00 - 2.45	D10								
2.65 - 4.00	B11			2.92	2.65	Loose, brownish grey, silty, fine SAND, with occasional lenses (up to 20mm) of soft, brown, silty clay. TIDAL FLAT DEPOSITS			
3.00		SPT(S) N=6 (1,1/2,1,1,2)							
3.00 - 3.45	D12				(1.35)				
4.00		SPT(S) N=7 (1,1/1,2,2,2)		1.57	4.00	*Between 3.90m and 4.00m: soft, dark brownish grey, organic clay with frequent fragments (up to 10mm) of black lignite. With a strong, organic odour.*			
4.00 - 4.45	D14					Loose, brown, silty, fine and medium SAND, with closely and medium spaced thick laminations of soft, grey clay. TIDAL FLAT DEPOSITS			
4.00 - 5.00	B13								
5.00		SPT(S) N=8 (1,1/1,2,2,3)							
5.00 - 5.45	D16								
5.00 - 6.00	B15								
6.00		SPT(S) N=9 (1,1/2,1,3,3)			(4.00)				
6.00 - 6.40	B17								
6.00 - 6.45	D18								
7.00 - 7.30	B19								
7.00 - 7.45	D20								
8.00		SPT(S) 50 (2,2/50 for 297mm)		-2.43	8.00	Very dense, brownish grey, medium SAND. TIDAL FLAT DEPOSITS			
8.00 - 8.45	D21				(0.60)				
				-3.03	8.60	Brownish red, fine and medium SAND. [WILMSLOW SANDSTONE FORMATION]			
					(0.40)				
				-3.43	9.00	SHERWOOD SANDSTONE GROUP			
9.00 - 10.00	60 / 60 / 55	3 / AZCL	9.00m - SPT(S) 50 (25 for 130mm/50 for 67mm) 9.00m - D22 9.06m - C23 9.52m - C24			Very weak, thinly laminated (0 to 5 degrees) reddish brown, fine grained SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 9.30m and 9.45m: light greenish grey.*			
	TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		56	
2.00	3.00		100	
3.00	4.00		100	
4.00	5.00		100	
5.00	6.00		100	
6.00	7.00		40	
7.00	8.00		30	

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Blowing sands noted between 6.00m and 8.00m. Driller notes barrel and casing stuck together.
Rotary open hole drilling between 8.00m and 9.00m.

SPT Hammer: JS01 Energy Ratio: 58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
5.00	3.00		20	5.00	Fast

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	2.00	Plain	50
2.00	7.00	Slotted	50

IAN FARMER ASSOCIATES

Plant used: Commacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH067**
Dates: 29/09/2022 - 05/10/2022	Client: Cadent		Sheet 2 of 4
Rotary Boring Log	Location: 356117.82E 386020.94N	Ground level: 5.57mOD / Logged by: JB/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
10.00 - 11.50	100 100 100	1	10.40m - C25			Very weak, thinly laminated (0 to 5 degrees) reddish brown, fine grained SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 10.40m locally weak.*		11		
11.50 - 13.00	93 93 93				(5.05)	*Between 11.93m and 12.00m: non intact drilling disturbed.*		12		
		AZCL				*Between 12.90m and 13.00m: non intact drilling disturbed.*		13		
13.00 - 14.50	100 100 100		13.91m - C26	-8.48	14.05	*Below 13.90m: weak.*		14		
14.50 - 16.00	100 100 100		14.50m - C27			Moderately weak, thinly laminated (0 to 5 degrees) reddish brown, locally grey, fine and medium grained, micaceous SANDSTONE. Discontinuities are 15 to 25 degrees, widely spaced, planar, rough, tight, with soft, brown clay infill (0.20mm) (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP		15		
16.00 - 17.50	100 100 100	1	16.15m - C28			*Between 15.87m and 15.92m: stained greyish yellow.* *Between 16.10m and 16.45m: stained greyish yellow.* *At 16.15m: diametrically very weak.* *Between 16.80m and 17.00m: up to 5 percent, rounded clasts (up to 15mm) of quartzite.*		16 17		
17.50 - 19.00	100 100 100		18.56m - C22			*Between 17.83m and 17.88m: non intact drilling disturbed.* *Below 18.55m: weak, locally diametrically very weak.*		18 19		
19.00 - 20.50	97 97 97					*Between 19.15m and 19.23m: non intact drilling disturbed.* *Between 19.33m and 19.46m: 50 degree joint, planar, rough, clean.*		20		
						Continued next sheet				

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
1.20	2.00	Air mist	30
2.00	3.00	Air mist	100
3.00	4.00	Air mist	100
4.00	5.00	Air mist	100
5.00	6.00	Air mist	100
6.00	7.00	Air mist	40
7.00	8.00	Air mist	30
9.00	10.00	Water	100

Borehole Diameter

Depth (m)	Dia (mm)
40.00	121

Casing Diameter

Depth (m)	Dia (mm)
40.00	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
03/10	08:00	9.00	9.00	1.80
03/10	16:30	22.00	9.00	0.60
04/10	08:00	22.00	9.00	3.20
04/10	16:30	32.50	9.00	2.70

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Commacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH067**
	Dates: 29/09/2022 - 05/10/2022	Client: Cadent	Sheet 3 of 4
Rotary Boring Log	Location: 356117.82E 386020.94N	Ground level: 5.57mOD / Logged by: JB/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Moderately weak, thinly laminated (0 to 5 degrees) reddish brown, locally grey, fine and medium grained, micaceous SANDSTONE. Discontinuities are 15 to 25 degrees, widely spaced, planar, rough, tight, with soft, brown clay infill (0.20mm) (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
20.50 - 22.00	100 100 100					*Between 20.90m and 20.95m: non intact drilling disturbed.* *Between 21.36m and 21.42m: non intact drilling disturbed.*			
22.00 - 23.50	100 100 100		22.25m - C29			*At 23.27m: locally diametrically very weak.*			
23.50 - 25.00	100 100 100	NIDD	23.27m - C30		(13.35)	*Between 23.65m and 23.70m: non intact drilling disturbed.* *Between 25.25m and 25.40m: moderately weak, reddish brown, sandstone, non inact, drilling disturbed, recovered as; subangular, medium and coarse gravel.*			
25.00 - 26.50	100 100 100	1	26.00m - C31						
26.50 - 28.00	100 100 100			-21.83	27.40	Moderately weak, locally weak, thinly laminated (0 to 30 degrees) brownish red, fine grained SANDSTONE. Discontinuities are set 1: 20 to 30 degrees, widely spaced, planar, rough, clean. Set 2: 70 degrees, widely spaced, planar, rough, clean. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 27.97m and 28.20m: reddish brown silty fine and medium sand. (CLASS E)*			
28.00 - 29.50	100 83 78	NA			(3.35)				
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
10.00	11.50	Water	90
11.50	13.00	Water	100
13.00	14.50	Water	90
14.50	16.00	Water	80
16.00	17.50	Water	80
17.50	19.00	Water	80
19.00	20.50	Water	80
20.50	22.00	Water	70

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
05/10	08:00	32.50	9.00	3.40
05/10	16:30	40.00	9.00	
29/10	16:30	9.00	9.00	4.70

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Commacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH067**
	Dates: 29/09/2022 - 05/10/2022	Client: Cadent	Sheet 4 of 4
Rotary Boring Log	Location: 356117.82E 386020.94N	Ground level: 5.57mOD / Logged by: JB/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
29.50 - 31.00	100 100 100		30.30m - C32	-25.18	30.75	Moderately weak, locally weak, thinly laminated (0 to 30 degrees) brownish red, fine grained SANDSTONE. Discontinuities are set 1: 20 to 30 degrees, widely spaced, planar, rough, clean. Set 2: 70 degrees, widely spaced, planar, rough, clean. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 30.60m and 30.70m: moderately weak light greenish grey fine grained sandstone.*			
31.00 - 32.50	100 100 100	1				Moderately weak to medium strong, thinly laminated (0 to 5 degrees) reddish brown, fine and medium grained SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
32.50 - 34.00	97 97 97					*Between 33.90m and 33.95m: discoloured grey.*			
34.00 - 35.50	93 93 93	AZCL 0 NIDD			(9.25)	*Between 34.65m and 34.80m: moderately weak, reddish brown sandstone, non intact, drilling disturbed, recovered as; subangular fine to coarse gravel.*			
35.50 - 37.00	100 100 100		36.80m - C33			*At 36.80m: locally medium strong.*			
37.00 - 38.50	100 100 100	1				*Between 37.97m and 38.05m: non intact driling disturbed.*			
38.50 - 40.00	100 100 100		39.85m - C34			*Between 39.20m and 39.25m: non intact drilling disturbed.* *At 39.85m: diametrically very weak.*			
				-34.43	40.00	End of Borehole at 40.00m			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
22.00	23.50	Water	80
23.50	25.00	Water	70
25.00	26.50	Water	70
26.50	28.00	Water	60
28.00	29.50	Water	50
29.50	31.00	Water	50
31.00	32.50	Water	80
32.50	34.00	Water	70

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Core Photographs
BH067



NB. Core sample between 4.00m and 9.00m retained in bulk bags rather than liner due to drilling issues.

Core Photographs
BH067



Core Photographs
BH067



Core Photographs
BH067



Core Photographs
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Core Photographs
BH067



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Commacchio 205/Comacchio 205/Dando 2000	HyNet North West - Hydrogen Pipeline	**BH069**
Dates:	**Client:**	Sheet 1 of 3
28/10/2022 - 15/11/2022	Cadent	

Dynamic Sampling and Rotary Boring Log

Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
355737.97E 386101.02N	21.46mOD	CG/JM/AE	1:50	2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.10	D1		21.36	0.10	MADE GROUND: Grass over dark greyish brown, slightly sandy SILT with frequent rootlets. MADE GROUND			
0.20	D2							
0.50	ES3			(1.10)	MADE GROUND: Grey SILT and fine SAND. (PULVERISED FUEL ASH) MADE GROUND			
0.50 - 0.70	B4							
1.00	ES5							
1.00 - 1.20	B6		20.26	1.20				
1.20		SPT(S) N=32 (7,8/7,10,8,7)			MADE GROUND: Very stiff, dark grey, sandy SILT. (PULVERISED FUEL ASH) MADE GROUND			
2.00		SPT(S) 50 (25 for 115mm/50 for 130mm)						
2.00	ES7							
2.00 - 3.00	D8							
3.00		SPT(C) 50 (25 for 120mm/50 for 135mm)						
3.00 - 4.00	D9							
4.00		SPT(C) 50 (9,9/50 for 295mm)			*Between 4.00m and 6.50m: rare pockets (up to 55mm) of grey and reddish brown, clayey silt.*			
4.00	D11							
4.00 - 5.00	D10							
5.00		SPT(C) 50 (8,13/50 for 235mm)						
5.00 - 6.50	D12							
				(15.80)				
6.50		SPT(C) 50 (9,9/50 for 265mm)			*Between 6.50m and 17.00m: rare, subangular and subrounded, fine to coarse gravel of slag.*			
6.50 - 8.00	D13							
8.00		SPT(C) N=33 (6,8/6,6,8,13)						
8.00 - 9.50	D14				*Between 8.80m and 9.30m: driller notes hard piece of slag.*			
9.50		SPT(C) 50 (7,7/50 for 290mm)						
9.50 - 11.00	D15							
					Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Between 1.20m and 2.00m: dynamic sampling.
Between 2.00m and 17.00m: open hole though PFA.

SPT Hammer: JN01/AR2371/JS01 Energy Ratio: 65/62/58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Commacchio 205/Comacchio 205/Dando 2000	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH069**
Dates: 28/10/2022 - 15/11/2022	Client: Cadent		Sheet 2 of 3
Dynamic Sampling and Rotary Boring Log	Location: 355737.97E 386101.02N	Ground level: 21.46mOD / Logged by: CG/JM/AE / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
					MADE GROUND: Very stiff, dark grey, sandy SILT. (PULVERISED FUEL ASH) MADE GROUND			
11.00		SPT(C) 50 (7,8/50 for 295mm)						
11.00 - 12.50	D16							
12.50		SPT(C) 50 (7,8/50 for 280mm)						
12.50 - 14.00	D17							
14.00		SPT(C) 50 (8,8/50 for 280mm)						
14.00 - 15.50	D18							
15.50		SPT(C) 50 (9,9/50 for 265mm)						
15.50 - 17.00	D19							
16.00	ES20							
17.00		SPT(S) N=40 (6,6/8,9,10,13)	4.46	17.00 (0.30)	Firm to stiff, grey mottled brown, slightly sandy clayey SILT. TIDAL FLAT DEPOSITS			
17.00 - 17.30	B21		4.16	17.30	Medium dense, grey, clayey, very silty, fine SAND. TIDAL FLAT DEPOSITS			
17.00 - 17.45	D22							
18.50		SPT(S) N=24 (4,4/4,6,6,8)		(3.70)				
18.50 - 18.95	D24							
18.50 - 19.00	B23							
20.00		SPT(S) N=29 (4,5/6,7,7,9)			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks

Remarks:
Between 17.00m and 25.00m: cable percussion drilling. Chiselling between 24.30m and 24.80m.
Between 25.00m and 26.50m: dynamic sampling.
Between 26.50m and 28.00m: rotary coring.

SPT Hammer: JN01/AR2371/JS01 Energy Ratio: 65/62/58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Commacchio 205/Comacchio 205/Dando 2000	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH069**
	Dates: 28/10/2022 - 15/11/2022	Client: Cadent	Sheet 3 of 3

Dynamic Sampling and Rotary Boring Log	Location: 355737.97E 386101.02N	Ground level: 21.46mOD	Logged by: CG/JM/AE	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
20.00 - 20.45	D26				Medium dense, grey, clayey, very silty, fine SAND. TIDAL FLAT DEPOSITS			
20.00 - 20.50	B25							
			0.46	21.00				
21.50		SPT(C) 47 (6,7/47 for 285mm)			Dense, brown, gravelly, medium and coarse SAND. Gravel is subangular to subrounded, fine to coarse including sandstone, mudstone, granite and metamorphic lithologies. TIDAL FLAT DEPOSITS			
				(3.30)				
23.00		SPT(C) 50 (6,9/50 for 75mm)			*Below 23.00m: becomes slightly gravelly.*			
23.00 - 23.23	D28							
23.00 - 23.50	B27							
24.30 - 24.80	B29		-2.84	24.30	Brown, very sandy, angular to subangular, medium and coarse GRAVEL including sandstone, mudstone, granite and metamorphic lithologies. With medium cobble content. TIDAL FLAT DEPOSITS			
				(0.50)				
			-3.34	24.80	Very stiff, locally thinly laminated, reddish brown, slightly sandy, slightly gravelly CLAY, with rare, rounded pockets (up to 20mm) of fine, brown sand. Gravel is subangular to subrounded, fine to coarse, including quartzite, mudstone and siltstone. GLACIAL TILL			
25.00		SPT(S) 50 (6,9/50 for 265mm)						
25.00 - 25.42	D30							
25.60 - 25.70	D31			(2.40)				
26.00		SPT(S) N=46 (10,13/12,12,10,12)						
26.50 - 27.50	0 0 0	NR			26.50m - SPT(S) 50 (25 for 85mm/50 for 68mm) 26.50m - D32			
			-5.74	27.20	Very dense, orangish brown, slightly gravelly, fine and medium SAND. Gravel is subangular to subrounded, fine to coarse including mudstone, sandstone and metamorphic lithologies. GLACIAL SAND AND GRAVEL *At 27.50m: blowing sands rising up casing to 26.40m.* *At 28.00m: blowing sands rising up casing to 27.20m.*			
27.50 - 28.00	0 0 0			(1.12)	27.50m - SPT(S) 50 (8,8/50 for 297mm)			
					28.00m - SPT(S) 50 (10,12/50 for 174mm)			
			-6.86	28.32	End of Borehole at 28.32m			
	TCR/SCR/RQD	FI			Samples & Tests			

Dynamic Sample Recovery				
Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks

Remarks:
Borehole terminated as unable to advance further due to casing becoming too tight in the ground.

SPT Hammer: JN01/AR2371/JS01 Energy Ratio: 65/62/58%

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Core Photographs
BH069



Core Photographs
BH069



IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH070**
Dates: 28/10/2022 - 04/11/2022	Client: Cadent		Sheet 1 of 5
Dynamic Sampling and Rotary Boring Log	Location: 355264.96E 386206.20N	Ground level: 8.16mOD	Logged by: JB/CE	Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.20	D1			(0.40)	Dark greyish brown, slightly sandy, slightly gravelly, organic CLAY with frequent rootlets up to 2mm. Gravel is subangular to subrounded, fine to coarse including sandstone and mudstone.			
			7.76	0.40	TOPSOIL			
0.50	D2							
0.50 - 0.70	B3			(0.50)	Orangish brown and light brown, slightly gravelly, slightly clayey, fine and medium SAND. Gravel is subangular, fine to coarse including sandstone and mudstone.			
			7.26	0.90	TIDAL FLAT DEPOSITS			
1.00	D4							
1.00 - 1.20	B5							
1.20		SPT(S) N=9 (1,0/1,2,3,3)		(0.70)	Firm, orangish brown mottled grey, slightly silty, slightly sandy CLAY.			
1.20 - 1.65	D6				TIDAL FLAT DEPOSITS			
			6.56	1.60				
1.70 - 1.75	D13				Firm, brown mottled grey CLAY, with rare fragments (up to 5mm) of black organic matter.			
				(0.40)	TIDAL FLAT DEPOSITS			
2.00		SPT(S) N=1 (0,0/0,1,0,0)	6.16	2.00				
2.00 - 2.45	D7				Very loose, yellowish brown, slightly silty, clayey, fine and medium SAND with rare fine gravel.			
2.10 - 3.00	B14				TIDAL FLAT DEPOSITS			
				(1.00)				
			5.16	3.00				
					Zone of no recovery, possible sand.			
					TIDAL FLAT DEPOSITS			
				(1.00)				
4.00		SPT(S) N=0 (2,0/0,0,0,0)	4.16	4.00				
4.00 - 4.45	D8				Very loose, greyish brown and yellowish brown, gravelly, slightly silty, clayey, fine and medium SAND.			
4.30 - 5.00	B15				TIDAL FLAT DEPOSITS			
				(1.10)				
5.00		SPT(S) N=15 (1,2/2,4,6,3)						
5.00 - 5.45	D9		3.06	5.10				
5.00 - 6.00	B16				Medium dense, dark yellowish brown, slightly gravelly, slightly silty, fine to coarse SAND. Gravel is subangular to rounded, fine to coarse, including mudstone, siltstone and quartzite.			
5.50		SPT(S) N=40 (4,12/18,6,6,10)			GLACIOFLUVIAL DEPOSITS			
5.50 - 5.95	D10			(1.35)	*Below 5.50m: dense.*			
6.00		SPT(S) 50 (25 for 110mm/50 for 277mm)			*Below 6.00m: very dense.*			
6.00 - 6.45	D11							
			1.71	6.45	SAND and GRAVEL (drillers description)			
					GLACIOFLUVIAL DEPOSITS			
				(1.55)				
7.50		SPT(S) 50 (25 for 125mm/50 for 197mm)						
			0.16	8.00	Red SANDSTONE (drillers description) [WILMSLOW SANDSTONE FORMATION]			
					SHERWOOD SANDSTONE GROUP			
				(1.00)				
		NIDD	-0.84	9.00				
9.00 - 10.50	100 100 100	9.80m - C17			Very weak, thickly laminated and very thinly bedded (0 to 15 degrees) reddish brown, medium grained SANDSTONE. Discontinuities are set 1: 0 to 10 degrees, medium spaced, planar and undulating, rough, clean with black staining (<1mm). Set 2: 70 to 85 degrees, planar, smooth and rough, with localised, black staining (<1mm). Set 3: 20 to 40 degrees, widely spaced, planar, rough, clean. (CLASS B) [WILMSLOW SANDSTONE			
	TCR/SCR/RQD	FI	Samples & Tests		Continued next sheet			

Groundwater: Water Strike; Backfill/ Installation

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		50	
2.00	3.00		90	
3.00	4.00		0	
4.00	5.00		70	
5.00	5.50		100	
5.50	6.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
No SPT taken at 3.00m as installing casing due to blowing sands.
Between 6.00m and 8.00m open hole through sand and gravel.

SPT Hammer: JS01 Energy Ratio: 58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.00	1.20		0	2.00	Fast flow
6.00	6.00		0	6.00	Fast flow
25.00	9.00		20	0.70	Fast flow

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	10.00	Plain	50
10.00	40.50	Slotted	50

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH070**
Dates: 28/10/2022 - 04/11/2022	Client: Cadent		Sheet 2 of 5
Rotary Boring Log	Location: 355264.96E 386206.20N	Ground level: 8.16mOD / Logged by: JB/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Very weak, thickly laminated and very thinly bedded (0 to 15 degrees) reddish brown, medium grained SANDSTONE. Discontinuities are set 1: 0 to 10 degrees, medium spaced, planar and undulating, rough, clean with black staining (<1mm). Set 2: 70 to 85 degrees, planar, smooth and rough, with localised, black staining (<1mm). Set 3: 20 to 40 degrees, widely spaced, planar, rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
10.50 - 12.00	100 100 100	4	10.86m - C18 11.85m - C19			*Between 9.00m and 9.18m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel of extremely weak sandstone. Between 10.86m and 11.00m: light reddish grey.*			
12.00 - 13.50	100 100 100		13.10m - C20		(7.40)	*Between 12.40m and 12.47m: light bluish grey.*			
13.50 - 15.00	100 100 100	NIDD 3	14.30m - C21			*Between 13.42m and 13.50m: bluish grey and micaceous. Between 13.50m and 13.75m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.* *Between 14.27m and 14.52m: extremely weak and pitted.* *Between 14.82m and 15.00m: light bluish grey.*			
15.00 - 16.50	100 100 100	NIDD 2	15.80m - C22			*Between 15.00m and 15.14m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.*			
				-8.24	16.40	Moderately weak, thinly bedded (0 to 15 degrees) dark reddish brown, fine and medium grained SANDSTONE. Discontinuities are set 1: 25 to 40 degrees, widely spaced, planar, rough, clean, with heavy black staining (<3mm). Set 2: 75 to 85 degrees, widely spaced, planar, rough, clean, with black staining (<1mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
16.50 - 18.00	100 100 100	1	17.00m - C23		(2.28)				
18.00 - 19.50	100 100 87	10	19.10m - C24	-10.52	18.68	Very weak, thickly laminated (0 to 15 degrees) reddish brown, medium and coarse grained, pitted SANDSTONE. Discontinuities are 20 to 40 degrees, very closely and closely spaced, planar, rough, clean, with black staining (<1mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 19.10: weak.*			
				-11.84	20.00				

Continued next sheet

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	blowing sands. Between 6.00m and 8.00m open hole through sand and gravel. Between 8.00m and 9.00m: open hole through red
				40.50	121	28/10	16:30	1.20			SPT Hammer: JS01 Energy Ratio: 58%
						31/10	08:00	1.20		1.00	
						31/10	16:30	7.50	7.50	4.70	
						01/11	08:00	7.50	7.50	0.50	

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)
40.50	139										

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH070**
	Dates: 28/10/2022 - 04/11/2022	Client: Cadent	Sheet 3 of 5
Rotary Boring Log	Location: 355264.96E 386206.20N	Ground level: 8.16mOD / Logged by: JB/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
19.50 - 21.00	100 100 83					Moderately weak, thinly bedded (0 to 15 degrees) reddish brown, medium grained SANDSTONE. Discontinuities are 20 to 40 degrees, widely spaced, planar, rough, clean, with black staining (<1mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
21.00 - 22.50	100 100 100		21.42m - C25			*Between 21.00m and 21.20m: very weak and pitted.* *Between 21.20m and 21.28m: light grey discolouration.*			
22.50 - 24.00	100 10 100	1			(5.12)	*Between 23.00m and 23.27m: very weak and pitted.*			
24.00 - 25.50	100 100 100		24.60m - C26			*Between 24.68m and 25.00m: occasional light grey reduction spots (up to 12mm).*			
			25.25m - C27	-16.96	25.12				
25.50 - 27.00	100 100 100	2			(1.48)	Weak, thinly to thickly laminated (5 to 15 degrees) reddish brown, locally discoloured light grey, fine grained micaceous SANDSTONE. Discontinuities are 30 to 50 degrees, medium spaced, planar, rough, clean, with black staining (<1mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
				-18.44	26.60				
27.00 - 28.50	100 100 100	2	27.28m - C28		(1.90)	Moderately weak, thinly bedded (0 to 15 degrees) reddish brown, medium grained SANDSTONE. Discontinuities are set 1: 20 to 40 degrees, widely spaced, planar, rough, clean with black staining (<1mm). Set 2: 70 to 80 degrees, planar, rough, clean, with slight orange brown staining (<1mm) (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
				-20.34	28.50				
28.50 - 30.00	67 67 57	AZCL			(0.50)	Assessed zone of core loss, possible extremely weak sandstone. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		8		-20.84	29.00 (0.38)	Very weak becoming weak, dark reddish brown and light yellowish grey, fine grained, micaceous SANDSTONE. Discontinuities are 30 to 40 degrees, closely spaced, planar, smooth, clean, with orange brown and black staining (<1mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		2		-21.22	29.38	Moderately weak, thickly laminated to thinly bedded (0 to 15			
						Continued next sheet			

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
01/11	16:30	24.00	9.00	1.60
02/11	08:00	24.00	9.00	0.50
02/11	16:30	31.50	9.00	0.50
03/11	08:00	31.50	9.00	0.50

Remarks:
sandstone.

SPT Hammer: JS01 Energy Ratio: 58%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH070**
	Dates: 28/10/2022 - 04/11/2022	Client: Cadent	Sheet 4 of 5
Rotary Boring Log	Location: 355264.96E 386206.20N	Ground level: 8.16mOD / Logged by: JB/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
30.00 - 31.50	100 100 100	NIDD	30.70m - C29			Moderately weak, thickly laminated to thinly bedded (0 to 15 degrees) reddish brown, medium grained, locally pitted SANDSTONE. Discontinuities are set 1: 20 to 40 degrees, widely spaced, planar, rough, clean. Set 2: 75 to 85 degrees, planar, rough, clean, with black and yellowish brown staining (<1mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 30.00m and 30.30m: non intact, drilling disturbed, recovered as; angular, coarse gravel.* *Between 31.15m and 31.24m: non intact, drilling disturbed.*			
31.50 - 33.00	100 100 100	2	32.58m - C30						
33.00 - 34.50	100 100 100	NIDD			(7.90)	*Between 33.00m and 33.25m: non intact, drilling disturbed, recovered as: angular, coarse gravel.*			
34.50 - 36.00	100 100 100	2	34.65m - C31			*Between 34.55m and 34.62m: light grey discolouration.*			
36.00 - 37.50	100 100 100		36.80m - C32						
37.50 - 39.00	100 100 100	3		-29.12	37.28	Weak, thickly laminated to very thinly bedded (5 to 20 degrees) reddish brown, fine and medium grained, very micaceous SANDSTONE. Discontinuities are set 1: 10 to 30 degrees, widely spaced, planar, rough, clean. Set 2: 80 to 90 degrees, planar, rough, clean, with black and yellowish brown staining (<1mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 38.80m and 38.85m: light grey discolouration.*			
39.00 - 40.50	100 100 100		39.25m - C33	-31.49	(2.37) 39.65	Moderately weak, thickly laminated to thinly bedded (0 to 15 degrees) reddish brown, medium grained, locally pitted			
						Continued next sheet			

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
03/11	16:30	39.00	9.00	0.70
04/11	08:00	39.00	9.00	0.50
04/11	16:30	40.50	9.00	

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH070**	
Dates: 28/10/2022 - 04/11/2022	Client: Cadent	Sheet 5 of 5	
Rotary Boring Log	Location: 355264.96E 386206.20N	Ground level: 8.16mOD	Logged by: JB/CE	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
		0			(0.85)	Moderately weak, thickly laminated to thinly bedded (0 to 15 degrees) reddish brown, medium grained, locally pitted SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION]				
				-32.34	40.50	SHERWOOD SANDSTONE GROUP *Between 39.78m and 39.90m: light yellowish grey discolouration.* End of Borehole at 40.50m		41 42 43 44 45 46 47 48 49 50		

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

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BH070



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Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH094**
Dates: 03/10/2022	Client: Cadent		Sheet 1 of 2
Dynamic Sampling and Rotary Boring Log	Location: 367615.00E 382666.05N	Ground level: 55.20mOD / Logged by: JJ/AE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.30	B1				Grass over, dark brown, slightly gravelly, fine to coarse SAND.			
0.20	ES2			(0.40)	Gravel is angular to subangular, fine to coarse including			
0.30	D3		54.80	0.40	sandstone and quartzite. With occasional roots and rootlets.			
0.50	ES4				TOPSOIL			
0.50 - 0.80	B5			(0.50)	Brown and light brownish grey, slightly gravelly, silty, fine to			
0.60	D6				coarse SAND with occasional pockets (up to 5mm) of soft reddish			
			54.30	0.90	brown, sandy, clay. Gravel is angular to subangular, fine to coarse			
1.00	D9			(0.30)	including sandstone and quartzite.			
1.00	ES7		54.00	1.20	GLACIAL TILL			
1.00 - 1.20	B8				Firm, reddish brown, sandy CLAY. (GRADE IVb) [BOLLIN			
1.20 - 1.50	D10				MUDSTONE MEMBER]			
1.50		SPT(S) N=17 (2,2/3,3,5,6)			MERCIA MUDSTONE GROUP			
1.50 - 2.50	D11			(1.05)	Very stiff, locally thinly laminated (0 to 5 degrees), reddish brown,			
1.80 - 1.90	D12				silty, slightly micaceous, slightly calcareous CLAY, with up to 5			
					percent, angular lithorelicts (5mm), of extremely weak mudstone.			
					(GRADE IVa) [BOLLIN MUDSTONE MEMBER]			
			52.95	2.25	MERCIA MUDSTONE GROUP			
2.35 - 2.45	D13				*Between 1.20m and 1.50m: frequent pockets, (up to 15mm) of greenish grey silt.*			
					Between 2.15m and 2.25m: frequent pockets, (up to 15mm) of greenish grey silt.			
		2.50m - SPT(S) 50 (7,13/50 for 190mm)		(0.90)				
2.50 - 3.50	100 0 0		52.05	3.15	Very stiff, locally thinly laminated (0 to 5 degrees), reddish brown, silty, slightly micaceous, slightly calcareous CLAY, with up to 60 percent, angular lithorelicts (up to 30mm) of extremely weak			
				(0.35)	mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER]			
			51.70	3.50	MERCIA MUDSTONE GROUP			
		NA			Very stiff, reddish brown, silty, slightly micaceous, slightly calcareous CLAY, with up to 3 percent, angular lithorelicts (up to 5mm) of extremely weak mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER]			
					MERCIA MUDSTONE GROUP			
3.50 - 5.00	97 0 0			(1.70)	Very stiff, reddish brown, silty, slightly micaceous, slightly calcareous CLAY, with up to 70 percent, angular lithorelicts (up to 20mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER]			
					MERCIA MUDSTONE GROUP			
		AZCL			*Between 4.20m and 4.25m: very weak, greenish grey siltstone, non intact, drilling disturbed, recovered as; angular, fine to coarse gravel.*			
			50.00	5.20	*Between 4.95m and 5.20m: assessed zone of core loss, possible clay or mudstone.*			
		5.40m - C14			Extremely weak, reddish brown, slightly calcareous MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER]			
5.00 - 6.50	87 87 87	1		(1.10)	MERCIA MUDSTONE GROUP			
		5.90m - C15			*Between 5.70m and 6.05m: 85 degree joint, undulating, smooth.*			
			48.90	6.30				
		0			Very weak, reddish brown, locally calcareous MUDSTONE. Discontinuities are 40 to 50 degrees, very closely spaced, planar, smooth. (GRADE II) [BOLLIN MUDSTONE MEMBER]			
		NIDD			MERCIA MUDSTONE GROUP			
		0		(1.20)	*Between 6.50m and 6.65m: very weak, reddish brown mudstone, non intact, drilling disturbed, recovered as; soft, gravelly, silty clay. Gravel is angular, fine to coarse of very weak mudstone.*			
		NA			*Between 6.65m and 6.70m: extremely weak, thinly laminated (0 to 5 degrees) light greenish grey siltstone.*			
6.50 - 8.00	97 83 73	4			*Between 6.85m and 7.05m: very stiff, reddish brown, silty clay, with up to 5 percent, angular lithorelicts (up to 5mm) of extremely weak mudstone.*			
			47.70	7.50				
		7.73m - C16			Moderately weak, thinly laminated (0 to 5 degrees) reddish brown and greenish grey, locally calcareous MUDSTONE, with occasional, light greyish white lenses (up to 5mm) of weathered gypsum. Discontinuities are 30 to 45 degrees, medium spaced, planar, smooth, tight, with a soft, brown, clay infill (up to 0.20mm) (GRADE I) [BOLLIN MUDSTONE MEMBER]			
		2		(1.50)	MERCIA MUDSTONE GROUP			
8.00 - 9.00	100 100 100	8.60m - C17			*Between 7.67m and 7.74m: medium strong, light greenish grey siltstone.*			
			46.20	9.00	*At 7.73m: diametrically weak, axially medium strong.*			
		NIDD			*At 8.60m: extremely weak.*			
					Between 8.80m and 8.90m: weak, greenish grey siltstone.			
	100				Weak, locally thinly laminated (0 to 5 degrees) reddish brown,			
9.00 - 10.50	100 100	1		(1.50)	slightly calcareous MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER]			
		9.70m - C18			MERCIA MUDSTONE GROUP			
	TCR/SCR/RQD	FI	Samples & Tests		Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	1.50		100	
1.50	2.50		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: KM01 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
8.00			0	8.00	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	6.00	Plain	50
6.00	9.00	Slotted	50

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

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Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH094**	
Dates: 03/10/2022	Client: Cadent	Sheet 2 of 2	
Rotary Boring Log	Location: 367615.00E 382666.05N	Ground level: 55.20mOD	Logged by: JJ/AE	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
			10.20m - C19			Weak, locally thinly laminated (0 to 5 degrees) reddish brown, slightly calcareous MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER]			
				44.70	10.50	MERCIA MUDSTONE GROUP *Between 9.00m and 9.15m: weak, reddish brown mudstone, non intact, drilling disturbed, recovered as; firm gravelly, silty clay. Gravel is angular, fine to coarse of weak mudstone.* *Between 9.45m and 9.70m: 70 degree joint, undulating, smooth.* *At 9.70m: diametrically very weak.* *Below 10.20m: very weak, extremely weak diametrically.*			
						End of Borehole at 10.50m			

11 12 13 14 15 16 17 18 19 20

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
				10.50	121						SPT Hammer: KM01 Energy Ratio: 68%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)
10.50	139										

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

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BH094



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IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH096**
	Dates: 12/10/2022 - 18/10/2022	Client: Cadent	Sheet 1 of 1
Cable Percussion and Rotary Boring Log	Location: 369343.97E 383993.98N	Ground level: 71.53mOD / Logged by: JJ/AE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Groundwater: Water Strike	Groundwater: Backfill/ Installation
0.10 - 0.30	B1				Dark brown, gravelly, clayey, very silty, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse including sandstone, siltstone and flint.				
0.20	D2			(0.40)					
			71.13	0.40	TOPSOIL				
0.50	D4				Light reddish brown, gravelly, clayey, silty, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse including sandstone. (Grade IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
0.50 - 0.80	B3								
1.00 - 1.20	B5			(1.10)			1		
					Below 1.20m: becoming very gravelly.				
1.50		SPT(S) 50 (20 for 125mm/50 for 70mm)	70.03	1.50	Very dense, reddish brown, sandy GRAVEL. Gravel is angular to subangular, fine to coarse including sandstone. (Grade III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
1.50 - 1.70	D6								
				(1.00)			2		
2.30		SPT(C) 50 (25 for 70mm/50 for 70mm)							
2.30 - 2.44	D7	100	69.03	2.50	Very weak, thinly laminated (0 to 5 degrees) reddish brown, silty, slightly micaceous, fine grained SANDSTONE, with very closely spaced, thin laminations of extremely weak, brown mudstone. Discontinuities are: 0 to 5 degrees, very closely spaced, planar and undulating, rough, clean with frequent black staining (1mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
2.50 - 3.00		74 40							
		9		(1.10)			3		
3.00 - 4.00		100 95 75	67.93	3.60	*Between 3.50m and 3.55m: non intact drilling disturbed.*				
					Weak, locally moderately weak, thinly laminated to very thinly bedded (0 to 5 degrees) reddish brown locally mottled light blueish grey, slightly micaceous, fine grained SANDSTONE and SILTSTONE, with extremely closely and very closely spaced thin laminations of extremely weak, brown mudstone. Discontinuities are 0 to 5 degrees, closely to medium spaced, planar and undulating, rough, clean with localised black staining (1mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
		4.10m - C8			*At 4.10m: very weak.* *Between 4.33m and 4.40m: 70 degrees joint, planar, rough, clean.* *Between 4.50m and 5.40m: 85 degree joint, planar, rough, clean.* *Between 4.75m and 5.00m: moderately weak.*				
4.00 - 5.50		100 100 98					4		
		6							
							5		
		NIDD			*Between 5.90m and 6.00m: non inact, drilling disturbed, recovered as; subangular, fine to coarse gravel of moderately weak sandstone.*				
					Between 6.24m and 6.30m: non intact, drilling disturbed.		6		
5.50 - 7.00		97 85 85			*Between 6.40m and 6.64m: moderately weak.*				
		2			*Between 6.67m and 6.95m: 85 degree joint, undulating, rough, clean.*				
		6.40m - C9		(6.40)					
		AZCL			*Between 7.00m and 7.14m: 85 degree joint, planar, smooth, clean.* *Between 7.14m and 7.22m: non intact, drilling disturbed.* *Between 7.22m and 7.60m: 90 degree joint, stepped, rough, clean.*		7		
					Between 7.44m and 7.47m: frequent dissolution vugs (up to 4mm) with white mineralisation. *Between 7.56m and 7.69m: frequent dissolution vugs (up to 6mm).*				
7.00 - 8.50		100 86 86					8		
		2			*Between 8.42m and 8.90m: moderately weak.*				
		8.70m - C10							
							9		
8.50 - 10.00		100 100 100			*Between 9.47m and 9.51m: highly micaceous.* *Between 9.75m and 10.00m: moderately weak.*				
	TCR/SCR/RQD	FI	61.53	10.00	End of Borehole at 10.00m		10		
		Samples & Tests							

Chiselling

From (m)	To (m)	Time (mins)	Remarks
1.80	2.30	60	

Borehole Diameter

Depth (m)	Dia (mm)
10.00	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
12/10	16:30	2.30	2.30	1.90
17/10	08:00	2.50	2.50	1.20
17/10	16:30	10.00	2.50	7.80

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR4034 Energy Ratio: 63%

Casing Diameter

Depth (m)	Dia (mm)
2.50	150
10.00	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
8.50	2.50		20	7.80	8.50 - 10.00m

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	8.70	Plain	19
8.70	9.00	Piezo tip	19

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

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Plant used:	Project:	Location ID:
Dando 2000/Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH097**
Dates:	**Client:**	Sheet 1 of 2
17/10/2022 - 25/10/2022	Cadent	

Cable Percussion and Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	369365.95E 384035.95N	72.42mOD	JJ/TW	1:50	2230746

Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
0.00 - 0.30	B1				Dark brown, slightly gravelly, silty, fine to coarse SAND with frequent roots and rootlets (<2mm). Gravel is angular to subangular and subrounded, fine to coarse including sandstone and quartz.				
0.20	D2			(0.40)					
			72.02	0.40	TOPSOIL				
0.50 - 1.00	B3			(0.60)	Reddish brown, gravelly, fine to coarse SAND. Gravel is angular to subangular and subrounded, fine to coarse including sandstone, quartz and flint.				
0.80	D4								
			71.42	1.00	GLACIOFLUVIAL DEPOSITS		1		
1.50		SPT(S) 50 (4,10/50 for 125mm)			Very dense, reddish brown, gravelly, clayey, very silty fine to coarse SAND locally becoming, slightly gravelly, sandy silt. Gravel is angular to subangular, fine and medium including sandstone and siltstone. (Grade IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
1.50 - 1.78	D6			(1.30)					
1.50 - 2.00	B5						2		
2.30		SPT(S) 50 (25 for 50mm/50 for 70mm)	70.12	2.30					
				2.50	Very dense, reddish brown, sandy GRAVEL. Gravel is angular and subangular, fine to coarse, including sandstone lithorelicts. (Grade III)[BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
2.30 - 2.42	D7		69.92	(0.85)					
2.50 - 4.00	100 100 100	0			Weak, thickly laminated (0 to 5 degrees) reddish brown, locally mottled light bluish grey, slightly micaceous SILTSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		3		
			69.07	3.35	*Between 3.20m and 3.23m: non intact, drilling disturbed.*				
				(0.50)	Very weak to weak, thickly laminated (0 to 5 degrees) reddish brown, locally mottled light bluish grey, fine grained, slightly micaceous SANDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
			68.57	3.85			4		
4.00 - 5.50	100 100 100				Weak, thickly laminated to very thinly bedded (0 to 5 degrees) reddish brown, locally mottled light bluish grey, fine grained, slightly micaceous SANDSTONE and SILTSTONE, with occasional light bluish grey reduction spots (up to 5mm). Discontinuities are 3 to 5 degrees, widely spaced, planar locally undulating, slightly rough, clean with localised black staining (<2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP				
		5.20m - C8					5		
5.50 - 7.00	100 100 100			(4.65)			6		
		1			*Between 6.85m and 7.10m: weak, light bluish grey, slightly micaceous siltstone.*				
		7.17m - C9					7		
7.00 - 8.50	100 100 100				*Between 7.74m and 7.77m: non intact, drilling disturbed.*		8		
			63.92	8.50					
8.50 - 10.00	100 100 100			(3.00)	Weak, thickly laminated (0 to 5 degrees) reddish brown, slightly micaceous SILTSTONE with occasional light bluish grey reduction spots (up to 5mm). Discontinuities are: 3 to 5 degrees, widely spaced. planar and undulating, slightly rough, clean with localised black staining (<2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		9		
					Between 8.50m and 8.57m: non intact, drilling disturbed.				
	TCR/SCR/RQD	FI	Samples & Tests		Continued next sheet		10		

Chiselling			
From (m)	To (m)	Time (mins)	Remarks
1.80	2.30	60	

Borehole Diameter	
Depth (m)	Dia (mm)
11.50	121

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
17/10	16:30	2.50		
21/10	08:00	2.50	2.50	
21/10	16:30	8.50	2.50	
24/10	08:00	8.50	2.50	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter	
Depth (m)	Dia (mm)
2.50	150
11.50	139

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

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Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH097**
Dates: 17/10/2022 - 25/10/2022	Client: Cadent		Sheet 2 of 2
Rotary Boring Log	Location: 369365.95E 384035.95N	Ground level: 72.42mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
10.00 - 11.50	100 100 100		10.50m - C10			Weak, thickly laminated (0 to 5 degrees) reddish brown, slightly micaceous SILTSTONE with occasional light bluish grey reduction spots (up to 5mm). Discontinuities are: 3 to 5 degrees, widely spaced. planar and undulating, slightly rough, clean with localised black staining (<2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 10.07m and 10.09m: elongate, light greyish white, calcite vug (20x30x30mm)*		11		
				60.92	11.50	End of Borehole at 11.50m		12		
								13		
								14		
								15		
								16		
								17		
								18		
								19		
								20		

Flush Details				Borehole Diameter		Boring Progress				Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)
						24/10	16:30	11.50	2.50	

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

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Plant used: Dando 2000	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH106**
Dates: 29/09/2022	Client: Cadent		Sheet 1 of 2
Cable Percussion Borehole Log	Location: 372281.03E 388603.95N	Ground level: 23.43mOD / Logged by: TB / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.60	B1				MADE GROUND: Dark brown, slightly gravelly, silty, organic, fine to coarse SAND. Gravel is subangular to subrounded, fine to coarse including sandstone, siltstone, mudstone, slate and glass fragments.			
0.20	ES2			(0.60)				
0.60 - 1.00	B3		22.83	0.60	MADE GROUND			
0.70	ES4			(0.40)	Light brown, silty, fine to coarse SAND. SHIRDLEY HILL SAND FORMATION			
1.00 - 1.20	B5		22.43	1.00				
1.10	ES6			(0.30)	Firm, brown, locally mottled light grey, slightly sandy CLAY. ALLUVIUM			
1.20		SPT(S) N=11 (2,2/2,3,3,3)	22.13	1.30				
1.20 - 1.65	D7				Medium dense, brown, slightly clayey, very silty, fine and medium SAND. ALLUVIUM			
1.30 - 1.80	B8							
2.20		SPT(S) N=10 (2,1/2,3,2,3)						
2.20 - 2.65	D10							
2.20 - 2.70	B9							
3.00		SPT(S) N=11 (2,2/3,3,2,3)			*Between 3.00m and 5.00m: with occasional bands and lenses of clay.*			
3.00 - 3.45	D12							
3.00 - 3.50	B11							
4.20		SPT(S) N=15 (2,3/3,4,4,4)		(5.70)				
4.20 - 4.65	D14							
4.20 - 4.70	B13							
5.20		SPT(S) N=5 (1,1/2,1,1,1)			*Below 5.20m: loose.*			
5.20 - 5.65	D16							
5.20 - 5.70	B15							
6.70		SPT(S) N=4 (1,1/0,1,1,2)						
6.70 - 7.15	D17							
7.00 - 7.50	B18		16.43	7.00	Firm, thinly to thickly laminated, brown silty CLAY. ALLUVIUM			
8.00 - 8.45	UT19	30 blows. 90% recovery			*At 8.00m: medium strength.*			
8.50	D20			(3.10)				
9.00		SPT(S) N=11 (2,2/2,3,3,3)						
9.50 - 9.95	D21							
					Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks

Borehole Diameter

Depth (m)	Dia (mm)
11.00	121

Casing Diameter

Depth (m)	Dia (mm)
11.00	150

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
29/09	16:03	11.00	11.00	9.00

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371 Energy Ratio: 62%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH106**	
Dates: 29/09/2022	Client: Cadent	Sheet 2 of 2	
Cable Percussion Borehole Log	Location: 372281.03E 388603.95N	Ground level: 23.43mOD	Logged by: TB	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
			13.33	10.10	Firm, thinly to thickly laminated, brown silty CLAY. ALLUVIUM				
				(0.90)	Brown, silty, fine and medium SAND. ALLUVIUM				
			12.43	11.00	End of Borehole at 11.00m		11		
							12		
							13		
							14		
							15		
							16		
							17		
							18		
							19		
							20		

Chiselling				Borehole Diameter		Boring Progress					Remarks:
From (m)	To (m)	Time (mins)	Remarks	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
											SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH114**
Dates: 29/09/2022	Client: Cadent		Sheet 1 of 1
Cable Percussion Borehole Log	Location: 372153.01E 388551.97N	Ground level: 25.20mOD / Logged by: FH / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.40	B1							
0.20	D2			(0.40)	Dark greyish brown, very silty, fine SAND with rare gravel. Gravel is subrounded to rounded, fine and medium including sandstone. TOPSOIL			
			24.80	0.40				
0.50	ES3				Brownish orange, slightly silty, fine SAND. SHIRDLEY HILL SAND FORMATION			
0.50 - 1.00	B4							
0.60	D5							
1.00	ES6				*At 1.20m: medium dense.*			
1.50		SPT(S) N=11 (2,1/4,3,2,2)						
1.50 - 1.95	D7			(2.60)				
1.80 - 2.20	B8							
2.00		SPT(S) N=8 (2,2/2,2,2,2)			*Below 2.00m: loose.*			
2.00	ES9							
2.00 - 2.45	D10							
3.00		SPT(S) N=7 (1,3/2,2,1,2)	22.20	3.00				
3.00 - 3.45	D11			(0.50)	Loose, brown, very silty, fine SAND. ALLUVIUM			
			21.70	3.50				
3.80	D12				Firm, brown, silty CLAY with frequent bands of brown, fine sand. ALLUVIUM			
4.00		SPT(S) N=8 (2,2/2,2,2,2)						
4.00 - 4.45	D14							
4.00 - 4.50	B13							
4.80	D15							
5.00	U	82 blows. No recovery						
5.00 - 5.50	B16							
5.80	D17							
6.00		SPT(S) N=16 (2,3/3,4,4,5)						
6.00 - 6.45	D18							
6.80	D19			(6.50)				
7.00	U	49 blows. No recovery						
7.00 - 7.50	B20							
7.80	D21							
8.20		SPT(S) N=16 (2,3/3,4,4,5)						
8.20 - 8.65	D22							
8.80	D23							
9.50		SPT(S) N=17 (2,4/4,4,4,5)						
9.50	D24							
			15.20	10.00	End of Borehole at 10.00m			

Chiselling

From (m)	To (m)	Time (mins)	Remarks

Borehole Diameter

Depth (m)	Dia (mm)
10.00	150

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
29/09	14:00	10.00	9.50	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: LSI2 Energy Ratio: 62%

Casing Diameter

Depth (m)	Dia (mm)
9.50	150

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.50	1.50	2.60	20	2.10	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	1.00	Plain	50
1.00	3.50	Slotted	50

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH120**
	Dates: 16/12/2022 - 22/12/2022	Client: Cadent	Sheet 1 of 3
Cable Percussion and Rotary Boring Log	Location: 353857.06E 379181.05N	Ground level: 20.70mOD / Logged by: FH/TB/NC / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10	D1			(0.40)	Grass over soft, dark brown, slightly sandy, slightly gravelly, clayey SILT with occasional rootlets. TOPSOIL			
0.50	ES2		20.30	0.40	Firm, orangish brown, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subrounded to rounded, fine and medium including sandstone and mudstone. GLACIAL TILL			
0.50 - 1.00	B3				*Below 1.00m: sandy.*			
0.60	D4							
1.00	ES5						1	
1.00 - 1.20	B6							
1.20 - 1.65	UT7	37 blows. 100% recovery			*At 1.20m: medium strength.*			
1.65 - 1.90	D8			(2.40)				
2.00		SPT(S) N=7 (1,1/1,2,2,2)					2	
2.00	ES9							
2.00 - 2.45	D10							
2.50	D11							
2.80 - 3.00	B12		17.90	2.80	Stiff, brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is subrounded to rounded, medium and coarse including sandstone, siltstone and mudstone. GLACIAL TILL			
3.00 - 3.45	UT13	82 blows. 100% recovery			*At 3.00m: very high strength.*		3	
3.45 - 3.70	D14							
4.00		SPT(S) N=31 (5,6/7,7,8,9)					4	
4.00 - 4.45	B15			(2.60)				
4.00 - 4.45	D16							
5.00 - 5.45	UT17	72 blows. 100% recovery			*At 5.00m: medium strength.*		5	
5.45 - 5.70	D18		15.30	5.40	Extremely weak, reddish brown and light grey MUDSTONE, recovered as sandy, clayey, very silty, angular to subangular, fine to coarse gravel. (Grade III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
5.50 - 5.70	B19							
		AZCL 5.70m - SPT(C) 50 (25 for 50mm/50 for 50mm)		(0.70)			6	
5.70 - 6.70	60 45 45	3 6.40m - C20	14.60	6.10	Moderately weak, thinly to thickly laminated (0 to 5 degrees) light bluish grey SILTSTONE (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		NIDD		(0.60)				
			14.00	6.70	*Between 6.20m and 6.25m: 45 degree joint, undulating, smooth, clean. Between 6.60m and 6.70m: 90 degree joint, undulating, smooth, clean.*			
6.70 - 8.20	100 76 76	2 7.20m - C21 7.70m - C22			Very weak, thinly to thickly laminated (0 to 5 degrees) dark reddish brown and light bluish grey slightly micaceous SILTSTONE. Discontinuities are 85 degrees, undulating, smooth, clean, with localized yellow grey staining (<2mm) (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		7	
					Between 6.70m and 6.85m: non intact drilling disturbed, recovered as subangular to subrounded gravel.			
				(2.70)			8	
		AZCL						
8.20 - 9.70	86 80 80	2 8.60m - C23			*At 8.60m: weak, extremely weak diametrically.*		9	
		NA	11.30	9.40	*Between 9.30m and 9.40m: firm, brown, clayey silt.*			
		9.50m - C24			Extremely weak becoming very weak, locally thickly laminated (0 to 5 Degrees) brown, slightly micaceous MUDSTONE. Discontinuities are 70 to 80 degrees, very closely to closely spaced, undulating, smooth clean. GRADE II) [BOLLIN			
	TCR/SCR/RQD	FI Samples & Tests			Continued next sheet		10	

Chiselling

From (m)	To (m)	Time (mins)	Remarks
5.50	5.70	60	

Borehole Diameter

Depth (m)	Dia (mm)
5.70	250
29.20	121

Casing Diameter

Depth (m)	Dia (mm)
5.70	250
7.00	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
16/12	16:30	4.00	4.00	Dry
19/12	08:00	4.00	4.00	Dry
19/12	16:30	5.70	5.70	Dry
20/12	08:00	5.70	5.70	1.00

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
27.70	7.00		20	-0.20	Fast. 2.40 mAGL head of water.

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Borehole terminated due to artesian water encountered. Head of water recorded at 2.40magl.
SPT Hammer: PBD02 Energy Ratio: 70%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH120**
	Dates: 16/12/2022 - 22/12/2022	Client: Cadent	Sheet 2 of 3
Rotary Boring Log	Location: 353857.06E 379181.05N	Ground level: 20.70mOD / Logged by: FH/TB/NC / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
9.70 - 11.20	100 83 83	3	11.08m - C25		(2.25)	Extremely weak becoming very weak, locally thickly laminated (0 to 5 Degrees) brown, slightly micaceous MUDSTONE. Discontinuities are 70 to 80 degrees, very closely to closely spaced, undulating, smooth clean. GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
11.20 - 12.70	100 100 100	0	12.07m - C26 12.64m - C27	9.05	11.65 (2.25)	Very weak, thinly to thickly, laminated (0 to 20 degrees) dark reddish brown locally mottled light bluish grey MUDSTONE. Discontinuities are 70 to 80 degrees, very closely to closely spaced, undulating, smooth, clean. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *At 12.64m: extremely weak diametrically.*			
12.70 - 14.20	50 50 50	AZCL 0 NIDD 0 3		6.80	13.90	*Between 13.55m and 13.80m: non intact, drilling disturbed, recovered as subangular to subrounded, fine to coarse gravel.* Very weak, thinly to thickly laminated (0 to 5 degrees) light bluish grey SILTSTONE. Discontinuities are 0 to 5 degrees, closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 14.20m and 14.30m: non intact drilling disturbed.* *At 14.42m: extremely weak.*			
14.20 - 15.70	100 100 100	NIDD 6 4	14.42m - C28 15.42m - C29	6.00	(0.80) 14.70	Interbedded, weak, very weak diametrically, thinly to thickly laminated (0 to 10 degrees) dark reddish brown mottled light bluish grey MUDSTONE and SILTSTONE with occasional demineralized dissolution vugs (up to 40mm). Discontinuities are set 1: 0 to 5 degrees, very closely spaced, planar, smooth, clean with yellow brown staining (<1mm). Set 2: 50 to 60 degrees, closely to medium spaced, undulating, smooth, local polished clean. Set 3: 80 to 90 degrees, planar, smooth clean (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
15.70 - 17.20	93 93 88	AZCL 0	16.42m - C30						
17.20 - 18.70	100 100 73	10 2	17.65m - C31		(7.65)	*At 17.65m: very weak.*			
18.70 - 20.20	93 86 86		19.03m - C32 19.93m - C33						

Continued next sheet

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)
6.70	5.70	Air mist			
8.20	6.70	Air mist			
9.70	8.20	Air mist			
11.20	9.70	Air mist			
12.70	11.20	Air mist			
14.20	12.70	Air mist			
15.70	14.20	Air mist			
17.20	15.70	Air mist			

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
20/12	16:30	29.20	7.00	-0.20
21/12	00:00	29.20	7.00	-2.40

Remarks:

SPT Hammer: PBD02 Energy Ratio: 70%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH120**
Dates: 16/12/2022 - 22/12/2022	Client: Cadent		Sheet 3 of 3
Rotary Boring Log	Location: 353857.06E 379181.05N	Ground level: 20.70mOD / Logged by: FH/TB/NC / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Interbedded, weak, very weak diametrically, thinly to thickly laminated (0 to 10 degrees) dark reddish brown mottled light bluish grey MUDSTONE and SILTSTONE with occasional demineralized dissolution vugs (up to 40mm). Discontinuities are set 1: 0 to 5 degrees, very closely spaced, planar, smooth, clean with yellow brown staining (<1mm). Set 2: 50 to 60 degrees, closely to medium spaced, undulating, smooth, local polished clean. Set 3: 80 to 90 degrees, planar, smooth clean (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		NIDD				*Between 20.20m and 20.30m: non intact drilling disturbed.* *At 20.96m: weak.*			
20.20 - 21.70	100 100 100	0	20.96m - C34						
		AZCL							
		2	22.03m - C35						
21.70 - 23.20	100 100 100	0	22.34m - C36 22.69m - C37	-1.65	22.35 (0.85)	Very weak, reddish brown MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *At 22.69m: extremely weak.*			
23.20 - 24.70	100 100 100	1	23.31m - C38	-2.50	23.20 (1.50)	Very weak, thinly to thickly laminated (0 to 20 degrees) dark reddish brown mottled bluish grey MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 23.95m and 24.05m: 70 degree joint, undulating, rough, clean.*			
24.70 - 26.20	100 100 100	0	24.90m - C39	-4.00	24.70 (1.12)	Very weak thinly to thickly laminated (0 to 5 degrees) light blueish grey SILTSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 25.72m and 25.82m: non intact drilling disturbed.*			
		NIDD		-5.12	25.82	Weak locally very weak, thinly to thickly laminated (0 to 15 degrees) dark reddish brown, mottled light bluish grey MUDSTONE. Discontinuities are set 1: 70 to 80 degrees, very closely spaced, planar, rough, clean. Set 2: 90 degree, planar, smooth, locally polished, clean. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 26.10m and 26.20m: non intact drilling disturbed.*			
		0	25.94m - C40						
		NIDD							
26.20 - 27.70	100 92 92	2	26.63m - C41 27.40m - C42		(2.88)				
27.70 - 29.20	100 83 83	8	28.50m - C43			*At 28.50m: extremely weak diametrically.*			
				-8.00	28.70 (0.50)	Weak, thinly to thickly laminated (0 to 20 degrees) light blueish grey mottled dark reddish brown SILTSTONE. Discontinuities are set 1: 60 to 70 degrees, very closely spaced, undulating, smooth, clean. Set 2: 90 degrees, planar, smooth, locally polished, clean. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
				-8.50	29.20	End of Borehole at 29.20m			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
18.70	17.20	Air mist	
20.20	18.70	Air mist	
21.70	20.20	Air mist	
23.20	21.70	Air mist	
24.70	23.20	Air mist	
26.20	24.70	Air mist	
27.70	26.20	Air mist	
29.20	27.70	Air mist	

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: PBD02 Energy Ratio: 70%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Core Photographs
BH120



Core Photographs
BH120



Core Photographs
BH120



Core Photographs
BH120



Core Photographs
BH120



Core Photographs
BH120



Core Photographs
BH120



Core Photographs
BH120



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH206**
Dates:	Client:	Sheet 1 of 4
20/10/2022 - 31/10/2022	Cadent	

Dynamic Sampling and Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	351967.97E 380416.96N	70.40mOD	CG/CE	1:50	2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10	D1			70.15	0.25	Grass over, dark greyish brown, slightly sandy, slightly gravelly SILT with frequent rootlets. Gravel is subangular to subrounded, fine including chert, mudstone and siltstone. TOPSOIL			
0.30	D2				(0.45)				
0.40 - 0.70	B3			69.70	0.70	Brown, slightly clayey, slightly gravelly, sandy SILT. Gravel is subangular to subrounded, fine including chert, quartzite, mudstone and siltstone. GLACIAL TILL			
0.50	ES4				(0.50)				
0.80	D5								
0.90 - 1.20	B6			69.20	1.20	Orangish brown, gravelly, clayey, silty, fine to coarse SAND. Gravel is subangular to rounded, fine including chert, quartzite, siltstone and other mixed lithologies. GLACIAL TILL			
1.20		SPT(S) N=37 (7,12/10,9,8,10)				*Below 0.90m: becoming less clayey, silty, increase in gravel, sand is fine.*			
1.20 - 1.65	D8								
1.50 - 1.55	D10								
2.00		SPT(S) N=33 (5,4/5,9,8,11)			(1.55)	Very stiff, light reddish brown, silty CLAY, with up to 5 percent angular lithorelicts (up to 10mm) of extremely weak, reddish brown mudstone, with black surface staining (1mm) (GRADE IVa) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
2.00 - 2.45	D9					*Between 2.62m and 2.80m: light greenish grey discolouration.*			
				67.65	2.75 (0.45)	Very stiff, reddish brown, silty CLAY, with up to 50 percent angular lithorelicts (up to 30mm) of extremely weak, reddish brown mudstone. (GRADE III) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
		NA	3.00m - SPT(S) 50 (25 for 140mm/50 for 45mm)	67.20	3.20				
3.00 - 4.00	100 80 42	13	3.00m - D10 3.00m - D11			Very weak, thinly bedded (5 to 15 degrees) reddish brown SILTSTONE, with rare, light greenish grey, reduction spots (up to 5mm). Discontinuities are set 1: 0 to 10 degrees, closely spaced, planar, smooth, clean with black staining (<1mm). Set 2: 50 to 70 degrees, closely to medium spaced, planar, rough, clean. Set 3: 80 to 90 degrees, very closely to closely spaced, planar, smooth, clean, with black surface staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
		NIDD	4.00m - C12						
4.00 - 5.50	100 100 23	13			(3.48)	*Between 3.90m and 4.00m: non intact, drilling disturbed, recovered as; subangular, coarse gravel.*			
		NIDD				*Between 5.09m and 5.20m: non intact, drilling disturbed, recovered as; angular, coarse gravel.*			
5.50 - 7.00	100 100 67	11							
				63.72	6.68	Weak, thinly laminated (0 to 15 degrees) reddish brown, mottled light greenish grey SILTSTONE. Discontinuities are set 1: 0 to 10 degrees, closely to medium spaced, planar, rough and smooth, clean, with black staining (<1mm). Set 2: 30 to 50 degrees, medium spaced, planar, smooth, clean with black staining (<1mm). Set 3: 70 to 90 degrees, smooth and rough, clean, with black staining (<1mm). (GRADE II) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
7.00 - 8.50	100 100 67	8			(2.73)				
			8.60m - C13			*At 8.60m: very weak diametrically.*			
8.50 - 10.00	93 93 67	1		60.99	9.41	Weak, thinly laminated (0 to 15 degrees) reddish brown and light grey SILTSTONE. Discontinuities are set 1: 0 to 10 degrees, widely spaced, planar, smooth, clean, with black staining (<1mm). Set 2: 30 to 50 degrees, widely spaced, planar, smooth, with			
		AZCL				Continued next sheet			
	TCR/SCR/RQD	FI	Samples & Tests						

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	
3.00	4.00		100	
4.00	5.50		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JN01 Energy Ratio: 65%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH206**
	Dates: 20/10/2022 - 31/10/2022	Client: Cadent	Sheet 2 of 4
Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD / Logged by: CG/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
10.00 - 11.00	100 100 100	3			(2.15)	Weak, thinly laminated (0 to 15 degrees) reddish brown and light grey SILTSTONE. Discontinuities are set 1: 0 to 10 degrees, widely spaced, planar, smooth, clean, with black staining (<1mm). Set 2: 30 to 50 degrees, widely spaced, planar, smooth, with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 9.53m and 9.62m: non intact, drilling disturbed.* *Between 9.72 and 9.90m: non intact, drilling disturbed, recovered as; clayey, angular, medium and coarse gravel.* *Between 9.90m and 10.00m: assessed zone of core loss.*			
11.00 - 12.20	100 100 89		11.61m - C14	58.84	11.56	Weak, thinly bedded (0 to 10 degrees) reddish brown SILTSTONE. (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
12.20 - 13.30	100 100 64	2			(2.69)	*Between 12.70m and 13.10m: 2 no. intersecting 85 degree fractures, planar, rough, clean.*			
13.30 - 14.70	100 100 100		13.97m - C15			*At 13.97m: very weak.*			
				56.15	14.25	Weak, thickly laminated (0 to 10 degrees) reddish brown and light greenish grey MUDSTONE. Discontinuities are 80 to 90 degrees, planar and undulating, rough with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 14.46m and 14.69m: non intact, drilling disturbed, recovered as; angular, coarse gravel.*			
14.70 - 16.10	100 100 100	2			(1.30)				
				54.85	15.55	Weak, thinly bedded (0 to 10 degrees) reddish brown, mottled light bluish grey SILTSTONE, with rare, light bluish grey, reduction spots (up to 5mm). Discontinuities are set 1: 10 to 20 degrees, medium spaced, planar, rough and smooth, clean. Set 2: 60 to 75 degrees, closely to medium spaced, planar, rough, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *At 16.72m: very weak.*			
16.10 - 17.40	100 100 100		16.72m - C16						
17.40 - 18.60	100 100 71	5			(5.90)				
18.60 - 20.10	100 100 87		19.59m - C17						
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
5.50	7.00	Air	100
7.00	8.50	Air	100
8.50	10.00	Air	100
10.00	11.00	Air	100
11.00	12.20	Air	100
12.20	13.30	Water	100
13.30	14.70	Water	100
14.70	16.10	Water	100

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)
40.00	121

Casing Diameter	
Depth (m)	Dia (mm)
40.00	139

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
19/10	16:30	5.50	3.00	Dry
20/10	08:00	5.50	3.00	1.98
20/10	16:30	12.20	3.00	4.20
21/10	08:00	12.20	3.00	5.60

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH206**
	Dates: 20/10/2022 - 31/10/2022	Client: Cadent	Sheet 3 of 4
Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD / Logged by: CG/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
20.10 - 21.60	100 100 100					Weak, thinly bedded (0 to 10 degrees) reddish brown, mottled light bluish grey SILTSTONE, with rare, light bluish grey, reduction spots (up to 5mm). Discontinuities are set 1: 10 to 20 degrees, medium spaced, planar, rough and smooth, clean. Set 2: 60 to 75 degrees, closely to medium spaced, planar, rough, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
				48.95	21.45				
21.60 - 23.10	93 93 93	2	22.26m - C18			Weak, thinly to thickly laminated (0 to 15 degrees) reddish brown, interlaminated MUDSTONE and SILTSTONE. Discontinuities are set 1: 5 to 15 degrees, medium spaced, planar, rough, clean, with black staining (<1mm). Set 2: 40 to 60 degrees, widely spaced, planar, smooth, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 21.50m and 21.60m: light bluish grey discolouration.*			
		AZCL							
23.10 - 24.10	90 90 90	2	23.55m - C19		(3.92)	*At 23.55m: very weak, extremely weak diametrically.*			
		AZCL							
24.10 - 25.10	100 78 78	0 NA 3				*Between 24.34m and 24.56m: stiff, reddish brown clay, with up to 70 percent angular lithorelicts (up to 35mm) of weak mudstone and siltstone. (grade III)* *Between 24.95m and 25.10m: 85 degree joint, planar, rough, with black staining (<1mm).*			
		NA		45.03	25.37				
25.10 - 26.60	100 35 18	20 NA 25	25.95m - C20		(2.59)	Very weak, thickly laminated (5 to 15 degrees) reddish brown MUDSTONE. Discontinuities are set 1: 0 to 10 degrees, extremely closely to closely spaced, planar and undulating, smooth, tight with soft, brown clay infill (up to 0.25mm). Set 2: 40 to 70 degrees, closely spaced, planar and undulating, rough locally smooth with black staining (<1mm). Set 3: 80 to 90 degrees, very closely spaced, planar, smooth, clean. (GRADE II) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 25.37m and 25.52m: stiff, reddish brown clay, with up to 50 percent subangular lithorelicts (up to 30mm) of weak mudstone. (grade III)* *Between 25.83m and 25.94m: stiff, reddish brown clay, with up to 60 percent subangular lithorelicts (up to 25mm) of weak mudstone. (grade III)*			
26.60 - 28.10	100 92 7	5 20 NA 7				*Between 27.39m and 27.58m: medium strong, reddish brown siltstone.* *Between 27.48m and 27.96m: stiff, reddish brown clay, with up to 50 percent subangular lithorelicts (up to 30mm) of weak, reddish brown mudstone. (grade III)*			
				42.44	27.96				
28.10 - 29.50	100 71 44	NIDD 10	28.96m - C21		(1.14)	Weak, thickly laminated (0 to 10 degrees) reddish brown and bluish grey MUDSTONE. Discontinuities are Set 1: 0 to 15 degrees, closely spaced, undulating, smooth, clean with black staining (<1mm). Set 2: 60 to 75 degrees, medium spaced, planar and undulating, smooth, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 28.10m and 28.46m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.* *At 28.90m: extremely weak diametrically.*			
		NA		41.30	29.10	Very stiff, reddish brown and bluish grey, silty CLAY, with up to 75 percent angular lithorelicts (up to 35mm) of weak, reddish brown mudstone. (GRADE III) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
16.10	17.40	Water	100
17.40	18.60	Water	100
18.60	20.10	Water	100
20.10	21.60	Water	100
21.60	23.10	Water	100
23.10	24.10	Water	100
24.10	25.10	Water	100
25.10	26.60	Air	95

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
21/10	16:30	18.60	5.00	4.15
24/10	08:00	18.60	5.00	25.10
24/10	16:30	25.10	5.00	4.35
25/10	08:00	25.10	5.00	7.70

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH206**
	Dates: 20/10/2022 - 31/10/2022	Client: Cadent	Sheet 4 of 4
Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD / Logged by: CG/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQ	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
29.50 - 31.00	100 26 26	0 NA 0			(2.60)	Very stiff, reddish brown and bluish grey, silty CLAY, with up to 75 percent angular lithorelicts (up to 35mm) of weak, reddish brown mudstone. (GRADE III) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 30.05m and 30.17m: medium strong, bluish grey siltstone.* *Between 30.40m and 30.54m: medium strong, bluish grey siltstone.*			
31.00 - 32.00	100 30 30	NA	31.50m - D22						
				38.70	31.70				
32.00 - 33.00	86 86 70	6 0 AZCL	32.50m - C23		(1.00)	Weak, thinly bedded (0 to 10 degrees) reddish brown SILTSTONE. Discontinuities are set 1: 0 to 15 degrees, closely spaced, undulating, smooth, with black staining (<1mm). Set 2: 50 to 70 degrees, medium spaced, planar, smooth, with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *At 32.50m: extremely weak diametrically.*			
				37.70	32.70				
33.00 - 34.00	100 100 100	3	33.40m - C24		(1.16)	Very weak, thinly to thickly laminated (0 to 20 degrees) bluish grey SILTSTONE. Discontinuities are 5 to 20 degrees, medium spaced, planar, smooth, clean with reduction in wall strength (up to 2mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
				36.54	33.86				
34.00 - 35.00	80 70 55	7 NA 4	34.82m - C25		(1.64)	Very weak, thickly laminated (5 to 20 degrees) reddish brown and bluish grey SILTSTONE. Discontinuities are set 1: 10 to 20 degrees, closely spaced, planar, smooth, open with soft, reddish brown clay infill (up to 2mm). Set 2: 50 to 70 degrees, medium spaced, planar, smooth, clean with slight black and orange brown surface staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 34.00m and 35.00m: core slipped and recovered.* *Between 34.57m and 34.72m: stiff, reddish brown and bluish grey, silty clay, with up to 40 percent angular lithorelicts (up to 30mm) of weak mudstone and siltstone. (grade III)* *Between 35.14m and 35.50m: assessed zone of core loss, possibly dropped and scrubbed.*			
35.00 - 35.50	28 14 0	AZCL							
				34.90	35.50				
35.50 - 36.00	100 76 76	NA				Very weak locally weak, thinly bedded (0 to 10 degrees) reddish brown SILTSTONE. Discontinuities are set 1: 20 to 30 degrees, closely to medium spaced, planar, smooth and rough, clean with black surface staining (<1mm). Set 2: 50 to 70 degrees, medium spaced, planar, rough, clean, with black and orange brown surface staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 35.50m and 35.62m: stiff, reddish brown, silty clay, with up to 60 percent angular lithorelicts (up to 35mm) of weak mudstone. (grade III)* *Between 35.55m and 35.68m: light greyish white gypsum growth along very closely spaced, incipient fractures (80 degrees).* *Between 37.16m and 37.40m: stiff, reddish brown, silty clay, with up to 50 percent angular lithorelicts (up to 30mm) of weak, reddish brown mudstone. (grade III)* *Between 37.55m and 37.88m: stiff reddish brown, silty clay, with up to 50 percent subangular lithorelicts (up to 35mm) of weak mudstone.* *At 38.00m: very weak diametrically.*			
36.00 - 37.50	93 76 66	5	36.27m - C26						
		NA AZCL							
37.50 - 38.50	100 87 87	4 NA	38.00m - C27		(4.50)				
38.50 - 40.00	100 100 84	4	39.00m - C28			*Between 39.50m and 39.63m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.*			
		NIDD 8							
				30.40	40.00	End of Borehole at 40.00m			

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
26.60	28.10	Air	100
28.10	29.50	Air	100
29.50	31.00	Air	100
31.00	32.50	Air	100
32.50	34.00	Air	100
34.00	35.50	Air	100
35.50	36.00	Air	100
36.00	37.50	Air	100

Checked by: MHW | IFA RC v01.01
Log status: FINAL

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
25/10	16:30	34.00	5.00	7.60
26/10	08:00	34.00	5.00	7.90
26/10	16:30	40.00	5.00	8.10

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Core Photographs
BH206



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IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH300**
Dates: 21/10/2022	Client: Cadent		Sheet 1 of 2
Cable Percussion and Rotary Boring Log	Location: 358325.00E 385128.99N	Ground level: 15.71mOD / Logged by: JJ/AE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Groundwater: Water Strike	Groundwater: Backfill/ Installation
0.10 - 0.30	B1								
0.20	D2			(0.40)	Dark, brown, fine and medium SAND with frequent roots and rootlets. TOPSOIL				
			15.31	0.40					
0.50 - 1.00	B3				Light orangish brown, slightly silty, fine and medium grained SAND. TIDAL FLAT DEPOSITS				
0.80	D4			(0.90)					
					At 1.10m: with 1no angular, sandstone cobble.		1		
			14.41	1.30					
1.50		SPT(S) N=8 (1,1/2,2,2,2)			Soft, reddish brown locally mottled light grey, slightly gravelly, sandy CLAY with occasional black organic fragments (up to 3mm). Gravel is subangular to subrounded, fine to coarse including quartz and sandstone. TIDAL FLAT DEPOSITS				
1.50 - 1.95	D5			(0.80)					
			13.61	2.10			2		
2.20	D6				Very dense, reddish brown, gravelly, clayey, fine and medium SAND, with occasional pockets (up to 4mm) of greenish grey silt. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
2.50		SPT(S) 49 (7,8/49 for 275mm)		(1.00)					
2.50 - 2.95	D8								
2.50 - 3.00	B7						3		
			12.61	3.10					
3.20	D9				Extremely weak, reddish brown, fine and medium grained SANDSTONE, recovered as; very dense, slightly gravelly, fine and medium sand. Gravel is angular to subangular, medium and coarse of sandstone. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
3.50		SPT(S) 50 (4,7/50 for 170mm)							
3.50 - 3.95	D11								
3.50 - 4.00	B10						4		
4.20	D12			(2.40)					
4.50		SPT(S) 50 (5,11/50 for 150mm)							
4.50 - 4.95	D14								
4.50 - 5.00	B13						5		
5.20	D15								
		NIDD 5.50m - D16	10.21	5.50	Extremely weak, thinly laminated (0 to 10 degrees) reddish brown, locally discoloured light grey, fine grained SANDSTONE. Discontinuities are set 1: 0 to 10 degrees, medium spaced, planar, rough, clean. Set 2: 65 to 70 degrees, medium spaced, planar, rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
	3	6.00m - C17		(0.80)			6		
5.50 - 7.00	53 53 53		9.41	6.30	Assessed zone of core loss, possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP				
7.00 - 8.00	0 0 0	AZCL		(2.15)			7		
							8		
8.00 - 9.00	55 55 55		7.26	8.45	Very weak becoming extremely weak from 8.75m, thinly laminated (0 to 5 degrees) reddish brown, locally discoloured light grey, fine grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
	1	8.75m - C18 9.00m - C19		(0.70)			9		
9.00 - 9.50	30 30 30		6.56	9.15	Assessed zone of core loss, possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP				
				(1.70)					
	TCR/SCR/RQD	FI Samples & Tests			Continued next sheet		10		

Chiselling

From (m)	To (m)	Time (mins)	Remarks
5.00	5.50	60	

Borehole Diameter

Depth (m)	Dia (mm)
15.00	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
21/10	16:30	5.70	5.50	5.00
25/10	08:00	5.50	2.50	Dry
28/10	16:30	15.00	2.50	Dry

Casing Diameter

Depth (m)	Dia (mm)
5.50	150
15.00	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: LSI1 Energy Ratio: 61%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Dando 2000/Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH300**
Dates:	**Client:**	Sheet 2 of 2
21/10/2022	Cadent	

Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	358325.00E 385128.99N	15.71mOD	JJ/AE	1:50	2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
9.50 - 10.50	0 0 0	AZCL		4.86	10.85	Assessed zone of core loss, possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP				
10.50 - 11.50	65 65 65	5	11.33m - C20		(1.85)	Extremely weak, thinly laminated (0 to 10 degrees) reddish brown, locally discoloured light grey, fine grained SANDSTONE. Discontinuities are 0 to 10 degrees, very closely to closely spaced, undulating, slightly rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 12.10m and 12.10m: assessed zone of core loss likely extremely weak sandstone.*		11		
11.50 - 12.50	60 60 60	AZCL	12.00m - C21 12.50m - SPT(S) 50 (25 for 48mm/50 for 99mm)	3.01	12.70			12		
12.50 - 13.50	80 80 80	3	13.40m - C22	2.21	(0.80) 13.50	Very weak, thinly to thickly laminated (0 to 5 degrees) reddish brown, fine grained SANDSTONE. Discontinuities are: 45 degrees, closely spaced, undulating, rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP		13		
13.50 - 15.00	47 47 42	3 AZCL	14.00m - C23	1.51	(0.70) 14.20	Extremely weak, thinly to thickly laminated (0 to 5 degrees) reddish brown, locally stained light yellowish grey, fine grained SANDSTONE. Discontinuities are: 25 degrees, closely spaced, undulating, rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP		14		
					(0.80)	Assessed zone of core loss, possible extremely weak sandstone. SHERWOOD SANDSTONE GROUP				
				0.71	15.00	End of Borehole at 15.00m		15		
								16		
								17		
								18		
								19		
								20		

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: LSI1 Energy Ratio: 61%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH300



Core Photographs
BH300



Core Photographs
BH300



Core Photographs
BH300



IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH301**
Dates: 11/10/2022 - 12/10/2022	Client: Cadent		Sheet 1 of 1
Cable Percussion and Rotary Boring Log	Location: 358390.08E 385049.04N	Ground level: 16.42mOD / Logged by: JJ/CE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.30	B1			(0.30)	Grass over dark brown, fine and medium SAND with frequent roots and rootlets (<2mm).			
0.20	D2		16.12	0.30	TOPSOIL			
0.40 - 0.70	B3			(0.50)	Brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION			
0.50	D5							
0.50 - 1.00	B4							
0.70	D6		15.62	0.80				
1.00	D8		15.42	1.00	Brown, slightly gravelly, fine to coarse SAND with rare cobbles. Gravel is angular to subrounded, fine to coarse including sandstone. Cobbles are angular including sandstone. SHIRDLEY HILL SAND FORMATION			
1.00 - 1.20	B7							
1.50		SPT(S) N=21 (2,4/4,5,5,7)			Medium dense, reddish brown, slightly clayey, silty, fine and medium SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
1.50 - 1.95	D10							
1.50 - 2.00	B9							
2.50		SPT(S) 50 (3,11/50 for 245mm)			*Below 2.50m: very dense.*			
2.50 - 2.95	D12			(4.10)				
2.50 - 3.00	B11							
3.50		SPT(S) 50 (3,12/50 for 150mm)						
3.50 - 3.95	D14							
3.50 - 4.00	B13							
4.30		SPT(S) 50 (25 for 75mm/50 for 70mm)						
4.30 - 4.50	D15	4.50m - D16						
	40	AZCL						
4.50 - 5.50	0							
	0	NA	11.32	5.10	Very dense, reddish brown, fine and medium grained SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		5.50m - SPT(S) 50 (10,8/50 for 105mm)	10.92	(0.40)				
	0	5.50m - D17		5.50	No recovery/assessed zone of core loss, driller notes red SAND, likely highly weathered sandstone. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
5.50 - 6.50	0							
	0							
		6.50m - SPT(S) 50 (25 for 125mm/50 for 60mm)						
	0	AZCL		(2.40)				
6.50 - 7.50	0	6.50m - D18						
	0							
		7.50m - SPT(S) 50 (3,4/50 for 180mm)						
	60	7.50m - D19						
7.50 - 8.50	11	0 7.90m - C21	8.52	7.90	Very dense, reddish brown, fine and medium SAND, with up to 15 percent, angular to subrounded lithorelicts (up to 25mm) of extremely weak sandstone. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
	11	NA			*Between 7.90m and 8.01m: extremely weak, thinly laminated (0 to 5 degrees) reddish brown sandstone, with occasional, light greenish grey reduction spots (up to 5mm). (CLASS B)*			
		8.50m - SPT(S) 50 (25 for 45mm/50 for 30mm)			*Between 8.65m and 8.75m: very weak, reddish brown sandstone, non intact, drilling disturbed, recovered as; angular, coarse gravel.*			
		AZCL			*Between 8.75m and 8.85m: weak, thinly laminated (0 to 5 degrees) reddish brown sandstone. (CLASS B)*			
		NIDD 0						
		8.50m - D20		(2.10)				
	90							
8.50 - 10.00	13							
	13	NA			*Between 9.50m and 9.70m: up to 60 percent, angular lithorelicts (up to 30mm) of extremely weak sandstone.*			
	TCR/SCR/RQD	FI Samples & Tests	6.42	10.00	End of Borehole at 10.00m			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
3.80	4.30	45	

Borehole Diameter

Depth (m)	Dia (mm)
10.00	121

Casing Diameter

Depth (m)	Dia (mm)
4.50	150
10.00	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
11/10	16:30	4.50	4.30	4.10
12/10	08:00	4.50	4.50	3.20
12/10	16:30	10.00	6.00	5.10

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR4034/JT01 Energy Ratio: 63/66%

Checked by: MHW
Log status: FINAL
IFA CP v01.01

Core Photographs
BH301



Core Photographs
BH301



IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH302**
	Dates: 10/11/2022 - 15/11/2022	Client: Cadent	Sheet 1 of 5
Dynamic Sampling and Rotary Boring Log	Location: 364154.00E 370890.03N	Ground level: 34.74mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.30	B1					Dark brown, slightly gravelly, silty, fine and medium SAND with frequent roots and rootlets (<3mm). Gravel is angular to subangular, fine to coarse including flint and quartz. TOPSOIL			
0.20	D2			34.34	(0.40) 0.40				
0.50 - 0.80	B3					Reddish brown, very gravelly, clayey, fine and medium SAND with rare to occasional fine rootlets (<1mm). Gravel is angular to subangular, fine to coarse including sandstone and quartz. GLACIOFLUVIAL DEPOSITS			
0.60	D4				(0.80)	*Below 1.00m: becoming light brown, rootlets absent and gravelly.*			
1.00 - 1.20	B5								
1.10	D6			33.54	1.20				
1.20		SPT(S) N=10 (1,1/2,1,3,4)				Firm, reddish brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is subrounded and rounded, fine to coarse, including quartzite, siltstone and quartz. GLACIAL TILL			
1.20 - 1.65	D7								
1.80 - 1.90	D22					*Below 2.00m: stiff.*			
2.20		SPT(S) N=16 (3,4/4,3,4,5)							
2.20 - 2.65	D8				(3.70)				
3.20 - 3.70	UT9	39 blows. 100% recovery				*At 3.20m: high strength, sandy.*			
						At 3.70m: sandy.			
4.20		SPT(S) N=33 (4,5/7,8,9,9)							
4.20 - 4.65	D10								
4.50 - 4.60	D23								
				29.84	4.90	Very stiff, reddish brown, silty CLAY, with up to 15 percent subangular lithorelicts (up to 5mm) of extremely weak reddish brown mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
5.10 - 5.20	D24				(0.50)				
5.20		SPT(S) N=48 (7,9/9,12,14,13)		29.34	5.40	*Between 5.25m and 5.30m: 25 degree fissure, planar, smooth, with reddish brown, fine sand infill (up to 3mm).*			
5.20 - 5.65	D11					Very stiff, fissured, reddish brown mottled light bluish grey, silty CLAY, with up to 40 percent angular lithorelicts (up to 25mm) of extremely weak mudstone. Fissures are 0 to 35 degrees, extremely closely spaced, planar, smooth. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
6.20		SPT(S) N=44 (4,7/9,12,11,12)			(3.20)				
6.20 - 6.30	D25								
6.20 - 6.65	D12								
7.20 - 8.20	100 0 0	NA	7.20m - SPT(S) N=44 (9,8/8,9,14,13) 7.20m - D13 7.50m - D26						
8.20 - 9.00	50 0 0	AZCL / NA		26.14	8.60	Very stiff, reddish brown mottled light bluish grey, silty CLAY, with up to 10 percent subangular lithorelicts (up to 6mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
9.00 - 10.00	85 0 0	AZCL / NA	9.00m - SPT(S) N=39 (4,4/7,9,7,16) 9.00m - D14 9.30m - D27 9.80m - D28	25.19	(0.95) 9.55				
				24.74	(0.45) 10.00	Very stiff, reddish brown, silty CLAY, with up to 60 percent angular lithorelicts (up to 20mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER]			
	TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		100	
2.20	3.20		100	
3.20	3.70		100	UT100
3.70	4.20		100	
4.20	5.20		100	
5.20	6.20		100	
6.20	7.20		100	

Remarks:
Service inspection pit hand excavated from GL to 7.00m.
Between 17.50m and 19.50m; dynamic sampling.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			0	1.20	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH302**
	Dates: 10/11/2022 - 15/11/2022	Client: Cadent	Sheet 2 of 5
Rotary Boring Log	Location: 364154.00E 370890.03N	Ground level: 34.74mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
10.00 - 11.50	0 0 0	AZCL	11.50m - SPT(S) N=22 (4,3/4,7,5,6) 11.50m - D15			Very stiff, reddish brown, silty CLAY, with up to 60 percent angular lithorelicts (up to 20mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Stiff, fissured, reddish brown mottled light bluish grey, silty CLAY, with up to 15 percent angular lithorelicts (up to 15mm) of extremely weak siltstone and mudstone. Fissures are 10 to 45 degrees, extremely closely spaced, planar, smooth and locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 10.00m and 11.65m: assessed zone of core loss, likely clay.*			
11.50 - 12.50	85 0 0	NA	12.10m - D29 12.50m - SPT(S) N=42 (8,7/8,9,13,12) 12.50m - D16		(4.10)				
12.50 - 13.50	50 0 0	AZCL	13.50m - SPT(S) N=42 (7,6/8,12,9,13) 13.50m - D17						
13.50 - 14.50	60 0 0	NA	14.20m - D30 14.50m - SPT(S) N=42 (3,6/6,12,13,11) 14.50m - D18 14.90m - D31	20.64 20.24	14.10 (0.40) 14.50	Very stiff, thinly laminated (0 to 35 degrees) reddish brown, locally mottled light bluish grey, silty CLAY, with up to 10 percent subrounded lithorelicts (up to 10mm) of extremely weak mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
14.50 - 15.50	100 0 0				(1.10)	Very stiff, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 5mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
15.50 - 16.50	10 0 0	AZCL		19.14	15.60	Assessed zone of core loss. Soft silty ground, barrel dropped through soft silty ground to 17.50m (drillers description). MERCIA MUDSTONE GROUP			
16.50 - 17.50	0 0 0		17.50m - SPT(S) N=18 (1,3/5,4,4,5)		(2.15)				
17.50 - 18.50	75 0 0		17.50m - D19 18.20m - D32 18.50m - SPT(S) N=30 (5,7/6,6,7,11)	16.99	17.75	Very stiff, fissured, reddish brown locally mottled light bluish grey, silty CLAY, with up to 10 percent subangular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 15 to 20 degrees, very closely spaced, planar, smooth, locally polished and striated. Occasional 0 to 90 degree, off white, gypsum veins (up to 2mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 17.75m and 19.50m: drilling disturbed, recovered as very soft.*			
18.50 - 19.50	100 0 0		18.50m - D20 18.70m - D33 19.50m - SPT(S) N=46 (12,12/10,12,14,10) 19.50m - D21			Continued next sheet			

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)
				45.00	121
				21.00	139

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
10/11	16:30	8.20	7.20	Dry
11/11	08:00	8.20	8.20	Dry
11/11	16:30	21.00	19.50	19.40
14/11	08:00	21.00	19.50	17.90

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH302**
	Dates: 10/11/2022 - 15/11/2022	Client: Cadent	Sheet 3 of 5
Rotary Boring Log	Location: 364154.00E 370890.03N	Ground level: 34.74mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
19.50 - 21.00	100 0 0		20.10m - D34			Very stiff, fissured, reddish brown locally mottled light bluish grey, silty CLAY, with up to 10 percent subangular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 15 to 20 degrees, very closely spaced, planar, smooth, locally polished and striated. Occasional 0 to 90 degree, off white, gypsum veins (up to 2mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
21.00 - 22.50	100 0 0		22.25m - D35						
22.50 - 24.00	100 0 0	NA	22.95m - D36		(7.45)				
24.00 - 25.50	100 30 30		24.75m - D37						
25.50 - 27.00	100 10 10	1 NA 5	25.20m - C45 26.70m - D38	9.54 9.14 8.44	25.20 (0.40) 25.60 (0.70) 26.30 (1.25)	Very weak, thinly laminated (o to 5 degrees) reddish brown locally mottled light bluish grey SILTSTONE, with occasional, 0 to 90 degree, off white, gypsum veins (up to 4mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 25.50m and 25.60m: 40 degree joint, planar, smooth with localised black staining (<1mm).* Very stiff, thinly laminated (0 to 5 degrees) reddish brown and light bluish grey, silty CLAY, with up to 15 percent subrounded lithorelicts (up to 6mm) of extremely weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 25.95m and 26.15m: moderately weak, light bluish grey siltstone.* *Between 25.95m and 26.15m: 40 degree joint, planar, smooth locally polished.*			
27.00 - 28.00	100 0 0		27.70m - D39	7.19 6.89	27.55 (0.30) 27.85	Very stiff, thinly laminated (0 to 5 degrees) reddish brown and light bluish grey, silty CLAY, with up to 30 percent subangular lithorelicts (up to 30mm) of extremely weak mudstone and siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 26.82m and 26.88m: very weak, thinly laminated (0 to 5 degrees) reddish brown mottled light bluish grey siltstone.*			
28.00 - 29.50	100 0 0	NA	28.45m - D40		(2.15)	Very stiff, fissured, reddish brown, silty CLAY, with up to 60 percent subangular lithorelicts (up to 35mm) of extremely weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. Frequent 0 to 90 degree, off white, gypsum veins (2mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
				4.74	30.00	Very stiff, reddish brown locally mottled light bluish grey, silty CLAY, with up to 15 percent subangular lithorelicts (up to 10mm) of extremely weak mudstone and siltstone. Occasional 0 to 90 degree, off white, gypsum veins (2mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER]			

Continued next sheet

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
15/11	08:00	35.50	21.00	13.10
15/11	16:30	45.00	21.00	42.30

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH302**
	Dates: 10/11/2022 - 15/11/2022	Client: Cadent	Sheet 4 of 5
Rotary Boring Log	Location: 364154.00E 370890.03N	Ground level: 34.74mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
29.50 - 31.00	100 0 0		30.45m - D41			Very stiff, reddish brown locally mottled light bluish grey, silty CLAY, with up to 15 percent subangular lithorelicts (up to 10mm) of extremely weak mudstone and siltstone. Occasional 0 to 90 degree, off white, gypsum veins (2mm). (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
31.00 - 32.50	100 18 11	0	31.48m - C46			Very stiff, thinly to thickly laminated (5 to 10 degrees) reddish brown locally mottled light bluish grey, silty CLAY, with up to 50 percent subangular lithorelicts (up to 40mm) of very weka mudstone and siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 31.30m and 31.39m: very weak, thickly laminated (25 to 30 degrees) light bluish grey siltstone.* *Between 31.48m and 31.64m: moderately weak, thickly laminated (5 degrees) light bluish grey mottled reddish brown siltstone.*			
32.50 - 34.00	100 0 0	NA	33.55m - D42			*Between 32.30m and 32.35m: very weak, light bluish grey siltstone.*			
34.00 - 35.50	100 3 0		35.30m - D43		(9.40)	*34.67m and 34.72m: very weak, thinly laminated (10 degrees) light bluish grey siltstone.*			
35.50 - 37.00	100 10 10	0	35.70m - C47			*Between 35.70m and 35.85m: weak, light bluish grey siltstone, with 45 degree, extremely closely spaced, off white, gypsum veins (1mm).*			
37.00 - 38.50	100 0 0	NA							
38.50 - 40.00	100 40 40	0	39.40m - C48	-4.66	39.40	Very weak, reddish brown MUDSTONE, with frequent, off white, gypsum veins (up to 2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
						Continued next sheet			

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
											SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH302**
Dates: 10/11/2022 - 15/11/2022	Client: Cadent		Sheet 5 of 5
Rotary Boring Log	Location: 364154.00E 370890.03N	Ground level: 34.74mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
40.00 - 41.50	60 60 60	AZCL 0 AZCL			(2.10)	Very weak, reddish brown MUDSTONE, with frequent, off white, gypsum veins (up to 2mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
41.50 - 43.00	100 43 43	0 NA	42.00m - C49 42.50m - D44	-6.76 -7.41	41.50 (0.65) 42.15 (1.35)	Very weak, thinly laminated (0 to 5 degrees) reddish brown locally mottled light bluish grey SILSTONE, with occasional 0 to 90 degree, off white, gypsum veins (2mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Very stiff, thinly to thickly laminated (0 to 10 degrees) reddish brown mottled light bluish grey, silty CLAY, with up to 30 percent subangular lithorelicts (up to 25mm) of extremely weak mudstone and siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
43.00 - 44.50	100 66 66	NIDD 1		-8.76	43.50 (1.00)	Very weak, reddish brown MUDSTONE. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 43.50m and 43.70m: non intact, drilling disturbed, recovered as; reddish brown, sandy, silty gravel. Gravel is angular, fine to coarse of extremely weak mudstone.* *Between 44.10m and 44.50m: 80 degree joint, planar, smooth, clean.*			
44.50 - 45.00	70 0 0	AZCL NA		-9.76 -10.26	44.50 (0.50) 45.00	Very stiff, reddish brown mottled light bluish grey, silty CLAY, with up to 15 percent subangular lithorelicts (up to 10mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP End of Borehole at 45.00m			

41 42 43 44 45 46 47 48 49 50

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
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IAN FARMER ASSOCIATES	Plant used: Comachio 205/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH303**
	Dates: 31/10/2022 - 07/11/2022	Client: Cadent	Sheet 1 of 5
Dynamic Sampling and Rotary Boring Log	Location: 364377.59E 370646.22N	Ground level: 38.57mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.30	B1				Dark brown, slightly gravelly, silty, fine to coarse SAND. Gravel is angular to subrounded, fine and medium including sandstone, quartz and flint.			
0.20 - 0.30	D2			(0.40)				
			38.17	0.40	TOPSOIL			
0.50 - 0.60	D4				Firm, brown, locally mottled orange brown and light grey, slightly sandy, silty CLAY with occasional gravel. Gravel is subangular to subrounded, fine and medium including sandstone. GLACIAL TILL			
0.50 - 1.00	B3			(0.80)				
1.00 - 1.10	D5							
1.20		SPT(S) N=19 (2,2/3,4,6,6)	37.37	1.20	Medium dense, light orangish brown, fine SAND, with occasional pockets (up to 50mm) of soft, brown, silty clay. GLACIAL TILL			
1.20 - 1.65	D7			(0.30)				
1.20 - 2.00	B6		37.07	1.50	Medium dense, light brown, fine and medium SAND. GLACIAL TILL			
				(0.70)				
2.20		SPT(S) N=19 (4,6/5,4,4,6)	36.37	2.20	Stiff, brown, slightly sandy, slightly gravelly CLAY. Gravel is subrounded, fine and medium, including quartzite. GLACIAL TILL			
2.20 - 2.25	D8			(0.30)				
2.20 - 2.65	D9		36.07	2.50	Medium dense, light brown and greyish brown, locally mottled orangish brown, medium SAND. GLACIAL TILL			
3.20		SPT(S) N=22 (3,3/4,7,6,5)			*Between 2.50m and 2.60m: occasional pockets (up to 40mm) of firm, dark brown, silty clay.*			
3.20 - 3.65	D11			(1.70)				
3.20 - 4.20	B10							
4.20		SPT(S) N=30 (4,6/5,7,8,10)	34.37	4.20	Very stiff, brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is subrounded, fine and medium, including quartzite and microgranite. GLACIAL TILL			
4.20 - 4.65	D12			(0.30)				
4.40 - 4.50	D13		34.07	4.50	Stiff, brown, slightly sandy CLAY. GLACIAL TILL			
				(0.70)				
5.20		SPT(S) N=17 (3,4/4,3,5,5)	33.37	5.20	Medium dense, orangish brown, slightly gravelly, slightly clayey, fine SAND with pockets of clay. Gravel is subrounded, fine and medium, including quartzite, quartz and granite. GLACIAL TILL			
5.20 - 5.65	D14							
5.40 - 6.40	B15			(1.60)	*Between 6.00m and 6.20m: firm, brown, slightly gravelly, silty clay. Gravel is subrounded, fine and medium including quartzite and granite. Below 6.20m: medium dense to dense.*			
6.20		SPT(S) N=30 (7,6/6,8,7,9)						
6.20 - 6.65	D16							
			31.77	6.80	*Between 6.70m and 6.80m: firm, brown, slightly gravelly, silty clay. Gravel is subrounded, fine and medium, including quartzite and quartz.*			
				(0.40)	Greyish brown, silty, fine SAND. GLACIAL TILL			
7.20		SPT(S) N=27 (3,3/4,6,7,10)	31.37	7.20	Very stiff, greyish brown, slightly sandy, gravelly, silty CLAY. Gravel is subangular to subrounded, fine to coarse, including quartzite, quartz and granite. GLACIAL TILL			
7.20 - 7.65	D17							
7.45 - 7.50	D18			(1.70)				
8.00		SPT(S) N=43 (7,9/9,10,12,12)						
8.00 - 8.45	D19							
8.40 - 8.45	D20							
		NA			8.50m - SPT(S) N=43 (8,12/10,6,12,15)			
	40							
8.50 - 9.50	0		29.67	8.90	8.50m - D21			
	0				Assessed zone of core loss, likely to be slightly sandy, gravelly, silty CLAY. GLACIAL TILL			
		AZCL		(1.95)	9.50m - SPT(S) 50 (6,9/50 for 170mm)			
					9.50m - D22			
	TCR/SCR/RQD	FI			Samples & Tests			
					Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		100	
2.20	3.20		100	
3.20	4.20		100	
4.20	5.20		100	
5.20	6.20		80	
6.20	7.20		100	
7.20	8.00		88	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
4.20	3.00	4.20	20	3.00	Slow

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comachio 205/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH303**
	Dates: 31/10/2022 - 07/11/2022	Client: Cadent	Sheet 2 of 5
Rotary Boring Log	Location: 364377.59E 370646.22N	Ground level: 38.57mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
9.50 - 10.50	0 0 0		10.50m - SPT(S) N=33 (6,7/4,6,10,13)	27.72	10.85	Assessed zone of core loss, likely to be slightly sandy, gravelly, silty CLAY. GLACIAL TILL			
10.50 - 11.50	65 0 0		10.50m - D23		(1.35)	Very stiff, fissured, reddish brown, locally mottled light bluish grey, silty CLAY, with up to 20 percent angular lithorelicts (up to 5mm) of extremely weak mudstone and siltstone. Fissures are 15 to 25 degrees, extremely closely spaced, planar, smooth. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
11.50 - 13.00	100 0 0		11.80m - D24	26.37	12.20	Very stiff, fissured, reddish brown and light bluish grey CLAY, with up to 65 percent angular lithorelicts (up to 12mm) of very weak mudstone and siltstone. Fissures are 15 to 25 degrees, very closely spaced, planar, smooth, with rare, light orangish brown silt infill (up to 1mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 12.57m and 12.72m: 65 degree fissure, planar, smooth, with localised yellowish brown staining (<1mm)* *Between 13.00m and 13.08m: extremely weak, thinly laminated (0 to 5mm) reddish brown and light bluish grey siltstone.*			
13.00 - 14.50	100 0 0	NA	13.30m - D25		(2.30)				
14.50 - 16.00	66 0 0		14.50m - D26	24.07	14.50	Very stiff, fissured, light bluish grey, locally mottled reddish brown CLAY, with up to 35 percent angular lithorelicts (up to 8mm) of very weak siltstone. Fissures are 20 to 35 degrees, extremely closely to very closely spaced, planar, smooth, locally polished. Frequent, 0 to 90 degree, off white, gypsum veins (up to 20mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
			15.25m - D27	23.32	15.25				
		AZCL		23.07	15.50 (0.50)	Very stiff, fissured, reddish brown CLAY, with up to 20 percent angular lithorelicts (up to 3mm) of extremely weak mudstone. Fissures are 5 to 30 degrees, very closely spaced, planar, smooth. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
16.00 - 17.50	100 73 73	1	16.20m - C28	22.57	16.00 (0.60)	Assessed zone of core loss. Possible clay/mudstone. MERCIA MUDSTONE GROUP			
		NA	16.80m - D29	21.97	16.60 (0.40)	Very weak, thinly to thickly laminated (10 to 15 degrees) reddish brown, locally mottled light bluish grey MUDSTONE, with very closely spaced, off white, gypsum veins (up to 8mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 16.30m and 16.34m: 30 degree fracture, planar, slightly rough, clean.*			
		1	17.40m - C30	21.57	17.00 (0.60)				
17.50 - 19.00	100 40 40	NA	17.80m - D31	20.97	17.60 (1.40)	Very stiff, fissured, reddish brown, locally mottled light bluish grey CLAY, with up to 20 percent subangular lithorelicts (up to 10mm) of extremely weak mudstone. Fissures are 5 to 25 degrees, very closely spaced, planar, smooth. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 16.75m and 17.00m: occasional 0 to 90 degree, off white, gypsum veins (up to 2mm).* Very weak, thinly laminated (0 to 15 degrees) light bluish grey, locally mottled reddish brown SILTSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 17.00m and 17.30m: 65 degree joint, planar, smooth, locally polished, clean, localised orangish brown staining (<1mm)*			
19.00 - 20.50	0 0 0			19.57	19.00	Very stiff, reddish brown, silty CLAY, with up to 40 percent subangular lithorelicts (up to 15mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 17.70m and 17.80m: bluish grey.*			
						Continued next sheet			

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)
				40.00	121

Casing Diameter	
Depth (m)	Dia (mm)
21.60	139

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
31/10	16:30	7.20	7.20	6.10
01/11	08:00	7.20	7.20	6.50
01/11	16:30	16.00	13.00	14.10
02/11	08:00	16.00	13.00	Dry

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comachio 205/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH303**
	Dates: 31/10/2022 - 07/11/2022	Client: Cadent	Sheet 3 of 5
Rotary Boring Log	Location: 364377.59E 370646.22N	Ground level: 38.57mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
						Zone of no recovery. Driller notes soft silt or void. After coring to 20.50m, barrel dropped by its own weight to 21.60m.				
20.50 - 21.60	0 0 0	AZCL			(2.60)			21		
21.60 - 23.10	100 0 0		21.60m - SPT(S) N=34 (2,4/6,7,6,15) 21.60m - D32 21.80m - D33	16.97	21.60 (2.00)	Very stiff, fissured, light bluish grey, locally mottled reddish brown, silty CLAY, with up to 25 percent subangular lithorelicts (up to 10mm) of extremely weak siltstone. Fissures are 5 to 25 degrees, very closely spaced, planar, smooth. Occasional off white gypsum veins (up to 2mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 22.75m and 22.90m: 55 degree fissure, undulating, smooth.* *Between 23.07m and 23.60m: very soft, light bluish grey clay. Likely drilling disturbed.*		22 23		
23.10 - 24.60	100 0 0	NA	23.20m - D34 24.00m - D35	14.97	23.60	Very stiff, fissured, reddish brown mottled light bluish grey CLAY, with up to 35 percent subangular lithorelicts (up to 10mm) of extremely weak mudstone. Fissures are 10 to 35 degrees, very closely spaced, planar, smooth. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		24		
24.60 - 26.10	100 17 10	0	24.80m - D36		(4.20)	*Between 24.70m and 24.76m: very weak, thinly laminated (10 degrees) light bluish grey and reddish brown siltstone, with frequent, off white gypsum veins (up to 2mm).* *Between 25.15m and 25.30m: very weak, thinly laminated (15 degrees) reddish brown and light bluish grey siltstone, with frequent, off white gypsum veins (up to 2mm).* *Between 25.43m and 25.47m: very weak, thinly laminated (15 degrees) reddish brown and light bluish grey siltstone, with frequent, off white gypsum veins (up to 4mm).*		25 26		
26.10 - 27.60	100 5 0		26.50m - D37			*Between 27.02m and 27.10m: very weak, thinly laminated (15 degrees) reddish brown and bluish grey siltstone, with frequent, 0 to 90 degree, off white gypsum veins (up to 10mm).*		27		
27.60 - 29.10	100 9 0	NA	28.00m - D38 28.80m - D39	10.77	27.80 (3.20)	*Between 27.68m and 27.74m: very weak, thinly laminated (15 degrees) reddish brown and light bluish grey siltstone.* Very stiff, thinly laminated (0 to 15 degrees) reddish brown mottled light bluish grey CLAY, with up to 40 percent subangular lithorelicts (up to 15mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 28.70m and 28.78m: very weak, reddish brown siltstone.*		28 29		
29.10 - 30.60	100 4 0		30.00m - D40			*Between 29.42m and 29.48m: very weak, reddish brown siltstone.*		30		
						Continued next sheet				

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
02/11	16:30	31.00	21.60	27.70
03/11	08:00	31.00	21.60	27.80
03/11	16:30	40.00	21.60	34.10
04/11	08:00	40.00	21.60	19.10

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comachio 205/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH303**
	Dates: 31/10/2022 - 07/11/2022	Client: Cadent	Sheet 4 of 5
Rotary Boring Log	Location: 364377.59E 370646.22N	Ground level: 38.57mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
			30.40m - D41			Very stiff, thinly laminated (0 to 15 degrees) reddish brown mottled light bluish grey CLAY, with up to 40 percent subangular lithorelicts (up to 15mm) of very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 31.60m and 31.00m: assessed zone of core loss, likely clay.*			
30.60 - 31.00	0	AZCL		7.57	31.00				
31.00 - 32.50	13 13 13	0 AZCL		7.37	31.20 (2.00)	Weak, thinly laminated (0 to 15 degrees) reddish brown, locally mottled light bluish grey SILTSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Assessed zone of core loss, possible clay. MERCIA MUDSTONE GROUP			
32.50 - 33.50	20 0 0		32.50m - SPT(S) 50 (6,6/50 for 240mm)	5.37	33.20				
33.50 - 34.50	80 20 20	NA AZCL	33.40m - D42 33.50m - SPT(S) 50 (25 for 75mm/50 for 125mm) 33.50m - D43		(1.45)	Very stiff, fissured, light bluish grey, locally mottled reddish brown CLAY, with up to 40 percent subangular lithorelicts (up to 8mm) of extremely weak siltstone and mudstone. Fissures are 15 to 30 degrees, very closely spaced, planar, smooth. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 34.00m and 34.65m: assessed zone of core loss, likely clay.*			
34.50 - 35.50	80 20 20	0 NA	34.50m - SPT(S) 50 (25 for 45mm/50 for 50mm) 34.50m - D44 34.70m - C45 35.10m - D46	3.92	34.65 (0.95)	Very stiff, fissured, reddish brown, silty CLAY, with up to 35 percent subangular lithorelicts (up to 20mm) of extremely weak mudstone. Fissures are 20 to 30 degrees, very closely spaced, planar, smooth. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 34.70m and 34.90m: very weak, thinly laminated (15 degrees) light bluish grey locally mottled reddish brown siltstone.*			
35.50 - 36.50	100 30 30	0 NA	35.70m - C47 36.00m - D48	2.97 2.67	35.60 (0.30) 35.90 (0.80)	Weak, very weak diametrically, thinly laminated (20 to 40 degrees) light bluish grey SILTSTONE, with frequent, off white gypsum veins (up to 5mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 35.82m and 35.90m: non intact, drilling disturbed.*			
36.50 - 38.00	100 30 30	0 NA	36.70m - C49 37.50m - D50	1.87 1.42	36.70 (0.45) 37.15 (0.95)	Very stiff, fissured, light bluish grey CLAY, with up to 40 percent angular lithorelicts (up to 10mm) of extremely weak siltstone. Fissures are 45 degrees, very closely spaced, planar, smooth. Frequent, off white gypsum veins (up to 5mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP Very weak, thinly laminated (20 to 40 degrees) light bluish grey, locally mottled reddish brown SILTSTONE, with frequent, 45 degree, off white gypsum veins (up to 5mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 36.85m and 36.94m: non intact, drilling disturbed.*			
38.00 - 39.00	100 0 0	NA	38.50m - D51	0.47	38.10	Very stiff, fissured, light bluish grey mottled reddish brown CLAY, with up to 50 percent angular lithorelicts (up to 25mm) of very weak siltstone. Fissures are 45 degrees, very closely spaced, planar, smooth. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
39.00 - 40.00	70 15 15	0 NA AZCL			(2.60)	Very stiff, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 15mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 39.35m and 39.50m: moderately weak, thinly laminated (0 to 5 degrees) reddish brown siltstone.* *Between 39.70m and 40.00m: assessed zone of core loss, likely weathered mudstone.*			
						Continued next sheet			

Flush Details				Borehole Diameter	
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
07/11	08:00	40.00	21.60	19.20
07/11	16:30	45.00	21.60	28.50
08/11	08:00	45.00	21.60	19.20

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comachio 205/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH303**
	Dates: 31/10/2022 - 07/11/2022	Client: Cadent	Sheet 5 of 5
Rotary Boring Log	Location: 364377.59E 370646.22N	Ground level: 38.57mOD / Logged by: JJ/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
40.00 - 41.50	100 26 26	NA	40.60m - D52	-2.13	40.70	Very stiff, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 15mm) of extremely weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 40.41m and 40.50m: weak, thinly laminated (45 degree) light bluish grey and reddish brown siltstone.*			
					(0.50)				
		3	41.35m - C53	-2.63	41.20	Very stiff, thinly laminated (3 to 15 degrees) reddish brown and light bluish grey CLAY, with up to 15 percent subangular lithorelicts (up to 6mm) of extremely weak mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(0.30)				
41.50 - 43.00	100 0 0	NA	42.00m - D54	-2.93	41.50	Very weak, thinly laminated (0 to 15 degrees) light bluish grey SILTSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 41.25m and 41.30m: 35 degree fracture, planar, smooth, clean.*			
						Very stiff, fissured, reddish brown locally mottled light bluish grey CLAY, with up to 30 percent subangular lithorelicts (up to 25mm) of extremely weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth. Occasional, 0 to 90 degree, off white, gypsum veins (2mm). (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
43.00 - 44.50	90 0 0		43.00m - D55		(3.20)				
44.50 - 45.00	60 0 0	AZCL NA	44.70m - D56	-6.13	44.70				
					(0.30)				
				-6.43	45.00	Very stiff, thinly laminated (0 to 5 degrees) reddish brown, locally mottled light bluish grey CLAY, with up to 10 percent subangular lithorelicts (up to 4mm) of extremely weak mudstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
						End of Borehole at 45.00m			

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	
											SPT Hammer: JT01 Energy Ratio: 66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH303



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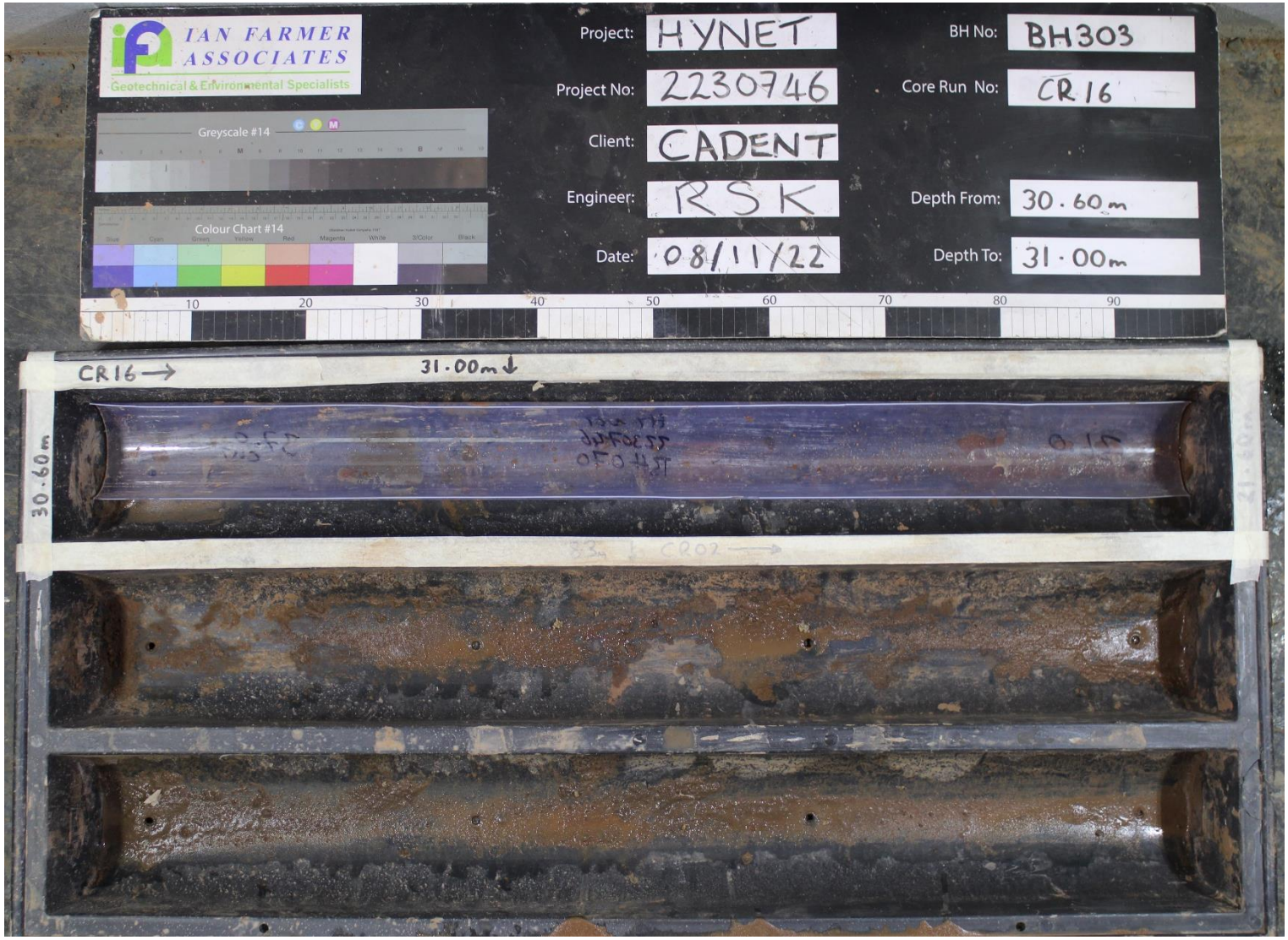
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IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH305**
Dates: 10/11/2022 - 15/11/2022	Client: Cadent		Sheet 1 of 3
Dynamic Sampling and Rotary Boring Log	Location: 363989.99E 371020.03N	Ground level: 41.42mOD / Logged by: CE/CG / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
				(0.30)	Grass over, soft, dark grey mottled reddish brown, slightly sandy CLAY with abundant rootlets.			
0.20	D1							
0.30 - 1.20	D2		41.12	0.30	TOPSOIL			
0.40	D3		40.92	0.50	Firm, reddish brown speckled black mottled light grey CLAY with occasional rootlets and roots.			
0.50 - 0.70	B4							
0.60	D5			(0.40)	GLACIAL TILL			
0.70	ES6		40.52	0.90	Firm to stiff, reddish brown CLAY with root traces and gleyed surfaces and rare rootlets.			
1.00 - 1.20	B7				GLACIAL TILL			
1.20		SPT(S) N=15 (2,2/3,4,3,5)						
1.20 - 1.65	D8				Stiff, fissured, brown, slightly gravelly, slightly sandy, silty CLAY with rare, fragments (up to 5mm) of black lignite. Gravel is angular to subrounded, fine to coarse, including sandstone, quartzite and chert. Fissures are 0 to 90 degrees, extremely closely to very closely spaced, planar, smooth, with localised light bluish grey silt infill (1mm).			
1.50 - 1.55	D9							
2.00		SPT(S) N=28 (5,6/6,6,7,9)						
2.00 - 2.45	D10				GLACIAL TILL			
3.00		SPT(S) N=22 (4,4/4,5,6,7)		(4.10)				
3.00 - 3.45	D11							
4.00		SPT(S) N=25 (5,5/5,6,6,8)						
4.00 - 4.05	D13							
4.00 - 4.45	D12							
5.00		SPT(S) N=16 (3,3/3,4,4,5)	36.42	5.00	Stiff, reddish brown, sandy, clayey SILT, drilling disturbed, recovered as; very soft, sandy, clayey silt.			
5.00 - 5.45	D14							
5.30 - 5.35	D15			(0.70)	GLACIAL TILL			
			35.72	5.70	Firm, reddish brown, sandy, gravelly, silty CLAY. Gravel is subrounded and rounded, fine to coarse including quartzite and quartz.			
5.90 - 5.95	D16				GLACIAL TILL			
6.00 - 7.00	30 0 0	AZCL		(1.00)	6.00m - SPT(S) N=48 (25 for 145mm/12,12,12,12) 6.00m - D17			
		NA	34.72	6.70	Stiff, reddish and orangish brown, slightly gravelly, slightly sandy, silty CLAY with a low cobble content. Gravel is subrounded and rounded, fine to coarse, including quartzite and quartz. Cobbles are subrounded of quartzite.			
7.00 - 7.70	43 0 0	AZCL			7.00m - SPT(S) 50 (5,6/50 for 150mm) 7.00m - B18 7.00m - D19 7.00m - D20 GLACIAL TILL			
					Between 7.30m and 7.93m: assessed zone of core loss, likely clay.			
7.70 - 8.20	54 0 0	NA						
		AZCL			8.20m - SPT(C) 50 (6,9/50 for 190mm)			
					Between 8.20m and 8.58m: assessed zone of core loss, likely likely clay.			
8.20 - 9.00	52 0 0	NA			*Between 8.58m and 9.00m: recovered as subrounded, coarse gravel including quartz and quartzite, clay possibly washed out.*			
		AZCL			9.00m - SPT(C) 50 (7,9/50 for 135mm)			
					Between 9.00m and 9.50m: assessed zone of core loss, likely likely clay.			
9.00 - 10.00	50 0 0	NA			9.80m - D21			
					Between 9.50m and 9.70m: recovered as subrounded, coarse gravel of quartz and quartzite, clay likely washed out.			
	TCR/SCR/RQD	FI			Samples & Tests	Continued next sheet		

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	
3.00	4.00		100	
4.00	5.00		100	
5.00	6.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JN01 Energy Ratio: 65%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH305**
Dates: 10/11/2022 - 15/11/2022	Client: Cadent		Sheet 2 of 3
Rotary Boring Log	Location: 363989.99E 371020.03N	Ground level: 41.42mOD	Logged by: CE/CG	Vertical scale: 1:50	Project ID: 2230746

Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Groundwater: Water Strike	Groundwater: Backfill/ Installation
10.00 - 11.00	60 0 0	AZCL	10.00m - SPT(C) 50 (25 for 145mm/50 for 90mm) 10.00m - D22			Stiff, reddish and orangish brown, slightly gravelly, slightly sandy, silty CLAY with a low cobble content. Gravel is subrounded and rounded, fine to coarse, including quartzite and quartz. Cobbles are subrounded of quartzite. GLACIAL TILL *Between 10.00m and 10.40m: assessed zone of core loss, likely clay.*				
		NA	11.00m - SPT(S) 50 (9,12/50 for 205mm) 11.00m - D23					11		
11.00 - 12.00	30 0 0	AZCL				*Between 11.30m and 12.00m: assessed zone of core loss, likely clay.*				
			12.00m - D24		(7.80)			12		
12.00 - 13.00	100 0 0									
13.00 - 14.50	90 0 0	NA	13.95m - D25					13		
								14		
		AZCL	14.50m - SPT(S) 50 (5,9/50 for 205mm) 14.50m - D26 14.50m - D27 15.00m - D28	26.92	14.50	Very stiff, fissured, reddish brown locally mottled light bluish grey, silty CLAY, with up to 15 percent angular lithorelicts (up to 20mm) of extremely and very weak mudstone. Fissures are 0 to 90 degrees, extremely and very closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP		15		
14.50 - 15.50	100 0 0									
15.50 - 16.20	100 0 0	NA			(2.30)			16		
16.20 - 17.70	100 0 0	NA	17.10m - D29	24.62	16.80	Very stiff, fissured, reddish brown, silty CLAY, with up to 5 percent angular lithorelicts (up to 5mm) of extremely weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth and polished. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 17.35m and 17.50m: thinly and thickly laminated.* *Between 17.70m and 18.45m: assessed zone of core loss, likely clay.*		17		
		AZCL			(2.60)			18		
17.70 - 19.20	50 0 0					*Between 18.50m and 18.70m: very stiff, light bluish grey, clayey silt.*				
		NA	19.20m - SPT(S) 50 (3,8/50 for 225mm) 19.20m - D30 19.20m - D31 19.20m - D32					19		
19.20 - 20.20	40 0 0			22.02	19.40	Very stiff, reddish brown and light bluish grey, silty CLAY, with up to 40 percent angular lithorelicts (up to 40mm) of extremely and very weak mudstone and siltstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE III)		20		

Continued next sheet

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
6.00	7.00	Air	100
7.00	7.70	Air	100
7.70	8.20	Air	100
8.20	9.00	Air	100
9.00	10.00	Air	100
10.00	11.00	Air	100
11.00	12.00	Air	100
12.00	13.00	Air	100

Checked by: MHW | IFA RC v01.01
Log status: FINAL

Borehole Diameter

Depth (m)	Dia (mm)
25.20	121

Casing Diameter

Depth (m)	Dia (mm)
25.20	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
10/11	16:30	5.00		Dry
11/11	08:00	5.00		4.67
11/11	16:30	15.50	9.00	15.20
14/11	08:00	15.50	9.00	12.00

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH305**
Dates: 10/11/2022 - 15/11/2022	Client: Cadent		Sheet 3 of 3
Rotary Boring Log	Location: 363989.99E 371020.03N	Ground level: 41.42mOD / Logged by: CE/CG / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
20.20 - 21.20	45 0 0	AZCL	20.95m - D33 21.14m - C34			Very stiff, reddish brown and light bluish grey, silty CLAY, with up to 40 percent angular lithorelicts (up to 40mm) of extremely and very weak mudstone and siltstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 19.60m and 20.75m: assessed zone of core loss, likely clay.* *Between 21.00m and 21.34m: weak, thinly laminated (0 to 5 degrees) light bluish grey siltstone.*		21		
		NA								
21.20 - 22.20	85 34 34	0 NA				*Between 22.05 and 23.10m: assessed zone of core loss, likely clay.*		22		
22.20 - 23.20	10 0 0	AZCL	23.10m - D35 23.10m - D39 23.20m - SPT(S) 50 (25 for 130mm/50 for 50mm) 23.20m - D36		(5.80)			23		
		NA								
23.20 - 24.20	0 0 0	AZCL				*Between 23.20 and 24.20m: assessed zone of core loss, likely clay.*		24		
24.20 - 25.20	100 0 0	NA	24.20m - SPT(S) 50 (25 for 95mm/50 for 65mm) 24.20m - D37 24.60m - D38					25		
				16.22	25.20	End of Borehole at 25.20m				
								26		
								27		
								28		
								29		
								30		

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
13.00	14.50	Air	100
14.50	15.50	Air	100
23.20	24.20	Air	100
24.20	25.20	Air	100

Borehole Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
14/11	16:30	23.20	9.00	18.70
15/11	08:00	23.20	23.20	14.30
15/11	16:30	25.20	23.20	23.40

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Casing Diameter

Depth (m)	Dia (mm)

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH305



Core Photographs
BH305



Core Photographs
BH305



Core Photographs
BH305



Core Photographs
BH305



Core Photographs
BH305



Core Photographs
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Core Photographs
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Core Photographs
BH305



Core Photographs
BH305



IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH318**
Dates: 28/11/2022 - 01/12/2022	Client: Cadent		Sheet 1 of 4
Dynamic Sampling and Rotary Boring Log	Location: 364667.03E 369647.01N	Ground level: 33.47mOD / Logged by: JM/CE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.20	D1			(0.40)	Grass over soft, dark greyish brown, silty CLAY with frequent rootlets. TOPSOIL			
0.40 - 0.70	B2		33.07	0.40				
0.50	D3			(0.30)	Firm, reddish brown, grey mottled yellowish brown, slightly silty, slightly gravelly, sandy CLAY with occasional rootlets and root traces. Gravel is angular, fine, and includes chert and quartzite. GLACIAL TILL			
0.80	D4		32.77	0.70				
1.00 - 1.20	B5			(0.50)				
1.20		SPT(S) N=13 (2,2/2,3,4,4)	32.27	1.20	Firm becoming stiff, reddish brown mottled light grey, slightly sandy, slightly gravelly CLAY. Gravel is angular to well rounded, fine and medium including sandstone, siltstone, occasional chert and quartzite. GLACIAL TILL			
1.20 - 1.65	D6							
1.90 - 1.95	D9				Stiff, light brown locally mottled light grey, slightly silty, slightly gravelly, sandy CLAY. Gravel is angular to subrounded, fine to coarse including mudstone, siltstone, sandstone and quartzite. GLACIAL TILL			
2.20 - 2.70	UT8	127 blows. 100% recovery		(2.00)	*At 2.20m: very high strength.*			
2.70		SPT(S) 50 (5,5/50 for 220mm)						
2.70 - 3.07	D7							
3.20 - 4.20	100 0 0	3.50m - D10	30.27	3.20	Very stiff, brown, sandy, gravelly CLAY with low cobble content. Gravel is angular to subrounded, fine to coarse including mudstone, siltstone, sandstone, quartzite and chert. Cobbles are subrounded of quartzite. GLACIAL TILL			
4.20 - 5.70	86 0 0	NA / 5.00m - D11 / AZCL		(3.70)				
5.70 - 6.20	50 0 0	NA / AZCL						
6.20 - 7.20	100 0 0	NA / 6.90m - D12	26.57	6.90	Very stiff, reddish brown, silty CLAY with up to 30 percent angular lithorelicts (up to 25mm) of extremely and very weak mudstone. Occasional fragments (up to 15mm) of light greyish white, crystalline gypsum. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
7.20 - 8.00	44 0 0	AZCL						
8.00 - 8.70	64 0 0	NA / AZCL		(2.65)				
8.70 - 9.20	90 0 0	NA / AZCL / 9.10m - D13						
9.20 - 10.20	100 45 45	NA / 9.60m - C14 / 0	23.92	9.55	Weak, thinly and thickly laminated (0 to 15 degrees) light grey and reddish brown SILTSTONE, with frequent veins (up to 10mm) of light greyish white, crystalline gypsum. (GRADE I) [BOLLIN			
			23.47	10.00	Continued next sheet			

TCR/SCR/RQD | FI | Samples & Tests

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		100	
2.70	3.20		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JN01 Energy Ratio: 65%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.30			20	1.20	Slow
12.80	8.70		20	10.20	Fast

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH318**
	Dates: 28/11/2022 - 01/12/2022	Client: Cadent	Sheet 2 of 4
Rotary Boring Log	Location: 364667.03E 369647.01N	Ground level: 33.47mOD / Logged by: JM/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Weak, thinly and thickly laminated (0 to 15 degrees) light grey and reddish brown SILTSTONE, with frequent veins (up to 10mm) of light greyish white, crystalline gypsum. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
10.20 - 11.70	80 6 0	NA	11.00m - D15		(1.70)	Very stiff, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 25mm) of extremely and very weak mudstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 10.20m and 10.32m: very stiff, light bluish grey silt.*			
		AZCL		21.77	11.70				
11.70 - 13.20	100 61 61	1	12.40m - C16		(1.00)	Very weak, thinly and thickly laminated (0 to 10 degrees) light bluish grey SILTSTONE, with rare veins (up to 5mm) of light greyish white, crystalline gypsum. Discontinuities are 5 to 15 degrees, widely spaced, planar, smooth, tight with soft, brown, silt infill (up to 0.25mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 12.00m and 12.09m: very stiff, light bluish grey and reddish brown, silty clay.*			
13.20 - 14.70	100 0 0	NA	14.00m - D17	20.77	12.70 (2.25)	Very stiff, fissured, reddish brown and light bluish grey, silty CLAY, with up to 20 percent angular lithorelicts (up to 20mm) of extremely and very weak mudstone. Fissures are 0 to 90 degrees, very closely spaced, planar, smooth, locally polished. Occasional to frequent fragments (up to 5mm) of light greyish white, crystalline gypsum. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
14.70 - 16.20	100 0 0		15.70m - D18	18.52	14.95	Very stiff, fissured, reddish brown locally light bluish grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 5m) of extremely and very weak mudstone. Fissures are 0 to 90 degrees, very closely and closely spaced, planar, smooth, polished. Occasional fragments (up to 30mm) of light greyish white, crystalline gypsum. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
16.20 - 17.70	87 0 0		17.20m - D19			*Between 16.40m and 16.60m: very stiff, reddish brown, silty clay, with up to 25 percent angular lithorelicts (up to 20mm) of very weak mudstone.*			
		AZCL			(5.85)				
17.70 - 19.00	92 0 0	NA							
		AZCL							
19.00 - 20.50	100 0 0								
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
3.20	4.20	Air	100
4.20	5.70	Air	100
5.70	6.20	Air	100
6.20	7.20	Air	100
7.20	8.00	Air	100
8.00	8.70	Air	100
8.70	9.20	Air	100
9.20	10.20	Air	100

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
28/11	16:30	3.20	3.20	Dry
29/11	08:00	3.20	3.20	1.80
29/11	16:30	17.70	8.70	15.10
30/11	08:00	17.70	8.70	7.60

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH318**
	Dates: 28/11/2022 - 01/12/2022	Client: Cadent			Sheet 3 of 4
Rotary Boring Log	Location: 364667.03E 369647.01N	Ground level: 33.47mOD	Logged by: JM/CE	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
						Very stiff, fissured, reddish brown locally light bluish grey, silty CLAY, with up to 5 percent angular lithorelicts (up to 5m) of extremely and very weak mudstone. Fissures are 0 to 90 degrees, very closely and closely spaced, planar, smooth, polished. Occasional fragments (up to 30mm) of light greyish white, crystalline gypsum. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
20.50 - 22.00	100 0 0	NA	20.70m - D20	12.67	20.80				
			21.50m - D21		(1.25)	Very stiff, reddish brown, silty CLAY, with up to 40 percent angular lithorelicts (up to 25mm) of very weak mudstone. Rare fragments (up to 5mm) of light greyish white, crystalline gypsum. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
22.00 - 23.50	100 100 57	2	22.40m - C22	11.42	22.05	Weak, thinly and thickly laminated (0 to 10 degrees) reddish brown and light bluish grey MUDSTONE. Discontinuities are 5 to 15 degrees, medium spaced, planar, smooth, clean with black staining (<1mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(0.85)				
		25		10.57	22.90	Very weak, locally thickly laminated (0 to 10 degrees) reddish brown and light bluish grey MUDSTONE. Discontinuities are 0 to 90 degrees, very closely spaced, planar and undulating, smooth, tight, with soft, brown, silt infill (up to 0.25mm) and black staining (<1mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
23.50 - 25.00	73 73 17	AZCL							
		25	24.05m - C23		(2.10)				
		0	24.75m - C24			*Between 24.75m and 25.00m: extremely weak, thinly laminated (0 to 10 degrees) light bluish grey siltstone. (grade I)*			
25.00 - 26.50	100 0 0	NA	25.55m - D25	8.47	25.00	Very stiff, fissured, reddish brown, silty CLAY, with up to 55 percent angular lithorelicts (up to 25mm) of very weak mudstone. Fissures are 0 to 90 degrees, closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(1.80)				
		1	26.90m - C26	6.67	26.80 (0.30)	Very weak, thickly laminated (0 to 10 degrees) reddish brown and light bluish grey MUDSTONE. (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
26.50 - 28.00	40 20 20	AZCL		6.37	27.10	*Between 26.80m and 26.90m: 65 degree joint, planar, rough, tight, with soft, reddish brown, silt infill (up to 0.25mm)* Very stiff, thickly laminated (0 to 10 degrees) bluish grey, clayey SILT, with up to 80 percent angular lithorelicts (up to 30mm) of weak siltstone. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
					(1.80)				
28.00 - 28.50	80 16 0	NA				*Between 28.42m and 28.75m: very weak, light bluish grey siltstone. (grade I)*			
		2							
28.50 - 29.50	90 25 25	NA	29.00m - D27	4.57	28.90	Very stiff, fissured, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 30mm) of very weak and weak mudstone. Fissures are set 1: 10 to 30 degrees, closely spaced, planar, smooth. Set 2: 60 to 75 degrees, closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
		AZCL			(1.85)				
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
10.20	11.70	Air	100
11.70	12.20	Air	100
12.20	13.20	Air	100
13.20	14.70	Air	100
14.70	16.20	Air	100
16.20	17.70	Air	100
17.70	19.00	Air	100
19.00	20.50	Air	100

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
30/11	16:30	29.50	8.70	15.70
01/12	08:00	29.50	8.70	9.10
01/12	16:30	40.00	8.70	24.60

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH318**
	Dates: 28/11/2022 - 01/12/2022	Client: Cadent			Sheet 4 of 4
Rotary Boring Log	Location: 364667.03E 369647.01N	Ground level: 33.47mOD	Logged by: JM/CE	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
29.50 - 31.00	100 0 0	NA	31.00m - D28	2.72	30.75	Very stiff, fissured, reddish brown, silty CLAY, with up to 30 percent angular lithorelicts (up to 30mm) of very weak and weak mudstone. Fissures are set 1: 10 to 30 degrees, closely spaced, planar, smooth. Set 2: 60 to 75 degrees, closely spaced, planar, smooth, locally polished. (GRADE III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
31.00 - 32.50	100 0 0				(3.65)	Very stiff, fissured, reddish brown, silty CLAY, with up to 5 percent angular lithorelicts (up to 5mm) of very weak mudstone. Fisures are set 1: 0 to 20 degrees, closely spaced, planar, smooth, locally polished. Set 2: 60 to 80 degrees, closely spaced, planar, smooth, locally polished. Occasional fragments (0 to 10mm) of light greyish white, crystalline gypsum. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
32.50 - 34.00	100 5 0		33.00m - D29 33.50m - C30			*Between 33.50m and 33.58m: weak, very weak diametrically, light bluish grey siltstone.*			
34.00 - 35.50	100 17 17	25	34.70m - C31	-0.93	34.40 (1.45)	Extremely weak to very weak, locally thinly laminated (0 to 10 degrees) reddish brown SILTSTONE, with rare, light bluish grey reduction spots (up to 5mm). Discontinuities are: 0 to 90 degrees, extremely closely and very closely spaced, planar, smooth, tight with soft, brown silt infill (up to 0.25mm). (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *At 34.70m: extremely weak.*			
35.50 - 37.00	100 77 61	3	36.50m - C32 36.68m - C34	-2.38	35.85	Very weak, thinly laminated (0 to 10 degrees) light bluish grey and reddish brown SILTSTONE, with occasional veins (up to 10mm) of light greyish white, crystalline gypsum. Discontinuities are: 0 to 15 degrees, medium spaced, planar, smooth, tight, with soft, bluish grey, silt infill (up to 0.25mm). (GRADE I) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
37.00 - 38.50	67 67 55	AZCL	37.88m - C33		(3.05)				
38.50 - 40.00	100 49 40	0 20 0 15	39.50m - C35	-5.43	38.90 (1.10)	Extremely weak to very weak, reddish brown MUDSTONE, with occasional veins (up to 1mm) of light greyish white, crystalline gypsum. Discontinuities are: 0 to 90 degrees, very closely spaced, planar, smooth, clean. (GRADE II) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP *Between 39.50m and 39.70m: very weak, reddish brown siltstone (grade I).*			
				-6.53	40.00	End of Borehole at 40.00m			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
20.50	22.00	Air	100
22.00	23.50	Air	100
23.50	25.00	Air	100
25.00	26.50	Air	100
26.50	28.00	Air	100
28.00	28.50	Air	100
28.50	29.50	Air	100

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Borehole Diameter	
Depth (m)	Dia (mm)

Casing Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

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IAN FARMER ASSOCIATES	Plant used: CT50 Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH326**
	Dates: 28/10/2022 - 04/11/2022	Client: Cadent			Sheet 1 of 2
Cable Percussion and Rotary Boring Log	Location: 359085.04E 384339.98N	Ground level: 38.10mOD	Logged by: JM/AE	Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.50	B1			(0.50)	Dark brownish grey, slightly gravelly, fine and medium SAND. Gravel is subangular to rounded, fine and medium including quartzite, siltstone, and sandstone.			
0.50 - 1.20	B2		37.60	0.50	TOPSOIL			
0.60	ES3				Light reddish brown, slightly silty, fine and medium SAND. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
1.20		SPT(S) N=21 (2,1/3,4,6,8)			*Below 1.20m: medium dense.*			
1.20 - 1.65	D4							
1.20 - 1.70	B5			(2.80)				
2.20		SPT(S) 50 (25 for 135mm/50 for 75mm)			*Below 2.00m: very dense, probable weathered sandstone.*			
2.20 - 2.65	D6							
2.20 - 2.70	B7							
3.00		SPT(C) 50 (25 for 80mm/50 for 60mm)						
3.00 - 3.30	B9							
3.00 - 3.30	D8	3.30m - SPT(C) 50 (25 for 75mm/50 for 60mm)	34.80	3.30	Assessed zone of core loss, assumed to be SAND/very weakly cemented SANDSTONE. SHERWOOD SANDSTONE GROUP *Between 3.30m and 4.30m: driller notes drilling quickly likely to be sand/very weakly cemented sandstone.*			
3.30 - 4.30	0 0 0	AZCL		(1.10)				
4.30 - 5.30	90 90 90	4.30m - SPT(S) 50 (25 for 40mm/50 for 40mm) 4.30m - D10 6 NIDD 4.66m - C12	33.70	4.40	Extremely weak, locally thinly laminated (0 to 5 degrees), orangish brown, fine grained SANDSTONE with localised black manganese oxide staining. Discontinuities are 0 to 5 degrees, closely spaced, planar, rough, clean, with black manganese staining (<2mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 4.80m and 4.90m: non intact, drilling disturbed, recovered as; slightly gravelly, fine and medium sand. Gravel is angular, medium and coarse.* *Between 5.30m and 6.80m: driller notes sand bands between rock.* *Between 5.80m and 5.83m: 20 degree fracture, planar, slightly rough.*			
		6 5.50m - C13		(1.60)				
5.30 - 6.80	47 47 47	AZCL	32.10	6.00	Assessed zone of core loss, likely to be extremely weak SANDSTONE. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
				(0.80)				
		NIDD 6.80m - SPT(S) 50 (25 for 50mm/50 for 35mm)	31.30	6.80	Very weak, thinly laminated (0 to 5 degrees) orangish brown, fine grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 6.80m and 6.90m: non intact, drilling disturbed, recovered as; slightly sandy, subangular, coarse gravel.*			
6.80 - 7.80	100 55 55	0 NA 6.80m - D11 7.52m - C14	31.03 30.58	7.07 (0.45) 7.52	Orangish brown, fine and medium SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
7.80 - 9.30	95 88 88	5 8.44m - C15		(3.28)	Extremely weak, thinly laminated (0 to 25 degrees) orangish brown, fine grained SANDSTONE, with localised, black manganese staining (up to 4mm). Discontinuities are 0 to 25 degrees, closely spaced, planar, rough, clean with localised, black manganese staining (up to 2mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 7.64m and 7.72m: non intact, drilling disturbed.* *At 8.44m: weak.*			
		AZCL						
TCR/SCR/RQD		FI Samples & Tests			Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
2.80	3.30	60	

Borehole Diameter

Depth (m)	Dia (mm)
3.30	150
10.80	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
28/10	16:30	3.30	3.30	2.50
04/11	08:00	3.30	3.30	Dry
04/11	16:30	10.80	6.80	10.45

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371/JN01 Energy Ratio: 62/65%

Casing Diameter

Depth (m)	Dia (mm)
3.30	150
6.80	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)
0.00	4.00	Plain	50
4.00	10.80	Slotted	50

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: CT50 Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH326**
Dates: 28/10/2022 - 04/11/2022	Client: Cadent		Sheet 2 of 2
Rotary Boring Log	Location: 359085.04E 384339.98N	Ground level: 38.10mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
9.30 - 10.80	91 91 91	4	10.06m - C16	27.30	10.80	Extremely weak, thinly laminated (0 to 25 degrees) orangish brown, fine grained SANDSTONE, with localised, black manganese staining (up to 4mm). Discontinuities are 0 to 25 degrees, closely spaced, planar, rough, clean with localised, black manganese staining (up to 2mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 10.06m: very weak.*		11 12 13 14 15 16 17 18 19 20		
						End of Borehole at 10.80m				

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
4.30	5.30	Air	100
5.30	6.80	Air	100
6.80	7.80	Air	100
7.80	9.30	Air	100
9.30	10.80	Air	100

Borehole Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: AR2371/JN01 Energy Ratio: 62/65%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

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IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Dando 2000/Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH327**
Dates:	**Client:**	Sheet 1 of 2
27/10/2022 - 10/11/2022	Cadent	

Cable Percussion and Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	359026.04E 384394.02N	37.66mOD	JM/AE	1:50	2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.50	B1			(0.50)	Dark brownish grey, slightly gravelly, silty, fine to coarse SAND. Gravel is subangular to rounded, fine and medium including sandstone and quartzite.			
0.50 - 0.90	B2		37.16	0.50	TOPSOIL			
0.60	ES3			(0.40)	Brown and dark brown, slightly silty, fine and medium SAND with occasional gravel. Gravel is subangular to rounded, fine and medium including quartzite and occasional sandstone and siltstone.			
0.90 - 1.20	B4		36.76	0.90	GLACIAL TILL			
1.20		SPT(S) N=17 (2,1/3,4,5,5)		(0.70)	Light greyish brown, gravelly, clayey, silty, fine to coarse SAND. Gravel is subangular to rounded, fine and medium including quartzite and occasional sandstone and siltstone.			
1.20 - 1.60	B5				GLACIAL TILL			
1.20 - 1.65	D6		36.06	1.60	Dense, reddish brown, slightly clayey, fine and medium SAND. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
2.20		SPT(S) N=38 (4,6/7,8,10,13)						
2.20 - 2.65	D8							
2.20 - 2.70	B7			(2.40)				
3.00		SPT(S) 50 (7,9/50 for 225mm)			*Below 3.00m: very dense (possible weathered rock).*			
3.00 - 3.45	D10							
3.00 - 3.50	B9							
		2	33.66	4.00	Extremely weak, locally thinly laminated (10 to 15 degrees) orangish brown, fine grained SANDSTONE, with black manganese staining (up to 2mm). Discontinuities are 85 to 90 degrees, very closely spaced, undulating, rough, clean. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		NIDD			*Between 4.37m and 4.77m: non intact, drilling disturbed, recovered as; angular, coarse gravel.*			
4.00 - 5.50	80 73 73	NA		(1.50)	*Between 4.77m and 4.88m: orangish brown, fine sand.*			
		0			*Between 5.00m and 5.15m: non intact, drilling disturbed, recovered as; sandy, subangular and subrounded, fine to coarse gravel.*			
		AZCL						
		3	32.16	5.50	Extremely weak, thinly laminated (0 to 30 degrees) orangish brown, fine grained SANDSTONE, with localised black manganese staining (up to 1mm). Discontinuities are 0 to 5 degrees, very closely spaced, undulating, rough, clean, with black manganese staining (<2mm). (CLASS B) [WILMSLOW FORMATION] SHERWOOD SANDSTONE GROUP			
5.50 - 7.00	67 60 60			(1.01)				
			31.15	6.51	*Between 6.16m and 6.27m: very weak, thinly laminated (0 to 5 degrees) reddish brown, locally light greenish grey, silty, fine grained sandstone.*			
					Zone of no recovery/assessed zone of core loss, driller notes SAND between 6.51m and 7.91m. [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
7.00 - 8.00	0 0 0	AZCL		(1.72)				
			29.43	8.23	Extremely weak, thinly laminated (5 to 20 degrees) orangish brown, fine grained, slightly micaceous SANDSTONE, with localised black manganese staining (<8mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
8.00 - 9.00	77 77 77				*Below 8.62m: weak.*			
		2		(2.27)	*Between 8.79m and 8.94m: 65 degree joint, planar, rough, clean.*			
9.00 - 10.50	93 93 93				*Between 9.63m and 9.70m: 70 degree joint, planar, rough, clean.*			
	TCR/SCR/RQD	FI			Continued next sheet			

4.00m - SPT(C) 50 (25 for 85mm/50 for 135mm)
4.00m - B11
4.28m - C12
6.36m - C13
8.00m - SPT(C) 50 (25 for 55mm/50 for 25mm)
8.62m - C14

Samples & Tests

Chiselling

From (m)	To (m)	Time (mins)	Remarks
3.70	4.00	60	

Borehole Diameter

Depth (m)	Dia (mm)
10.50	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
27/10	16:30	4.00	4.00	3.50
07/11	08:00	4.00	4.00	Dry
07/11	16:30	10.50	4.00	10.26

Casing Diameter

Depth (m)	Dia (mm)
4.00	150
10.50	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371/JN01 Energy Ratio: 62/65%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH327**
Dates: 27/10/2022 - 10/11/2022	Client: Cadent		Sheet 2 of 2
Rotary Boring Log	Location: 359026.04E 384394.02N	Ground level: 37.66mOD / Logged by: JM/AE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
			10.13m - C15			Extremely weak, thinly laminated (5 to 20 degrees) orangish brown, fine grained, slightly micaceous SANDSTONE, with localised black manganese staining (<8mm). (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
		AZCL		27.16	10.50	*Between 10.40m and 10.50m: assessed zone of core loss, likely extremely weak sandstone.*				
						End of Borehole at 10.50m		11		
								12		
								13		
								14		
								15		
								16		
								17		
								18		
								19		
								20		

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
4.00	5.50	Air	100
5.50	7.00	Air	100
7.00	8.00	Air	100
8.00	9.00	Air	100
9.00	10.50	Air	100

Borehole Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)

Casing Diameter

Depth (m)	Dia (mm)

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: AR2371/JN01 Energy Ratio: 62/65%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
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IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH329**
	Dates: 11/10/2022 - 12/10/2022	Client: Cadent	Sheet 1 of 2
Dynamic Sampling and Rotary Boring Log	Location: 358487.01E 384740.99N	Ground level: 23.01mOD / Logged by: ST/CE / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 0.10	B1 D2			(0.50)	Crop over. dark brown, fine and medium SAND with occasional rootlets. TOPSOIL			
0.50	D3		22.51	0.50				
0.70 0.70 0.70	B5 D6 ES4		22.41	0.60 (0.60)	Orangish brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION Firm locally soft, orangish brown brown mottled grey, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine and medium including sandstone. GLACIAL TILL			
1.20 1.20 - 1.65	D7	SPT(S) N=15 (2,2/3,4,3,5)	21.81	1.20	Stiff, reddish brown, slightly gravelly, sandy CLAY, with occasional fragments (up to 10mm) of back organic matter. Gravel is subangular to rounded, fine to coarse including mudstone, siltstone and quartz. GLACIAL TILL			
1.90 - 1.95 2.00 2.00 - 2.45	D11 D8	SPT(S) N=20 (2,3/3,5,6,6)		(2.80)				
2.50 - 2.55	D12							
3.00 - 4.00	50 0 0	AZCL NA 3.00m - SPT(S) 50 (3,4/50 for 298mm) 3.00m - D9			*Between 3.00m and 3.50m: assessed zone of core loss, likely clay.*			
4.00 - 5.00	50 0 0	AZCL NA 4.00m - SPT(S) 50 (25 for 120mm/50 for 146mm) 4.00m - D10	19.01	4.00	Very dense, reddish brown, fine and medium SAND, with up to 15 percent subangular lithorelicts (up to 10mm) of extremely weak sandstone. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 4.00m: and 4.50m: assessed zone of core loss, likely sand.*			
5.00 - 6.00	60 20 0	AZCL 15 NA 5.00m - SPT(C) 50 (25 for 141mm/50 for 160mm)		(2.60)	*Between 5.40m and 5.60m: extremely weak, thinly laminated (0 to 15 degrees) reddish brown, fine and medium grained sandstone. Fractures are 0 to 15 degrees, very closely spaced, planar, rough, clean with localised, black surface staining (1mm)* *Between 6.00m: and 6.60m: assessed zone of core loss, likely sand.*			
6.00 - 7.00	40 25 0	AZCL 12 6.00m - SPT(C) 50 (25 for 130mm/50 for 178mm)	16.41	6.60 (0.60)	Very weak, thickly laminated (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE. (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
7.00 - 8.00	80 53 42	AZCL 0 NA 0 7.50m - C13	15.81	7.20	Very weak to weak, thickly laminated, locally thinly laminated (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE. Discontinuities are set 1: 0 to 15 degrees, widely spaced, planar, rough, tight with a brown silty fine sand infill (up to 0.25mm). Set 2: 60 to 70 degrees, widely spaced, planar, rough. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *At 7.50m: extremely weak.* *Between 8.00m and 8.10m: assessed zone of core loss, possible sand.* *Between 8.10m and 8.15m: non intact, drilling disturbed, recovered as; reddish brown, medium sand, with up to 5 percent, subangular lithorelicts (up to 20mm) of extremely weak sandstone.*			
8.00 - 9.50	93 87 75	AZCL NA 2		(3.20)				
					Continued next sheet			

TCR/SCR/RQD | FI | Samples & Tests

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		80	
2.00	3.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JS01 Energy Ratio: 58%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			20	0.70	Slow
9.50	3.00		20	9.50	Fast

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH329**
Dates:	**Client:**	Sheet 2 of 2
11/10/2022 - 12/10/2022	Cadent	

Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	358487.01E 384740.99N	23.01mOD	ST/CE	1:50	2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
9.50 - 11.00	100 100 100			12.61	10.40	Very weak to weak, thickly laminated, locally thinly laminated (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE. Discontinuities are set 1: 0 to 15 degrees, widely spaced, planar, rough, tight with a brown silty fine sand infill (up to 0.25mm). Set 2: 60 to 70 degrees, widely spaced, planar, rough. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
11.00 - 12.50	100 100 100	3	12.30m - C14		(3.60)	Very weak to weak, thinly bedded (0 to 20 degrees) reddish brown, locally mottled light greenish grey, fine and medium grained SANDSTONE. Discontinuities are: 0 to 10 degrees, medium spaced, planar, smooth and rough, tight with brown silt infill (up to 0.25mm). (CLASS A) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 10.70m and 10.85m: very weak reddish brown mudstone.* *Between 11.90m and 11.98m: 70 degree joint, planar, rough, clean.*			
12.50 - 14.00	100 100 100					*Between 13.40m and 13.50m: up to 20 percent angular clasts (up to 30mm) of very weak mudstone.*			
14.00 - 15.00	85 47 30	AZCL NA 15 NA 0	14.90m - C15	9.01 8.01	14.00 (1.00) 15.00	Very weak, thickly laminated (5 to 20 degrees) reddish brown, fine and medium grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 14.15m and 14.25m: reddish brown, medium sand, with up to 5 percent subangular lithorelicts (up to 20mm) of extremely weak sandstone.* *Between 14.25m and 14.42m: 0 to 10 degrees, very closely spaced, planar, rough clean.* *Between 14.55m and 14.83m: reddish brown, medium sand, with up to 10 percent angular lithorelicts (up to 15mm) of extremely weak sandstone.* *At 14.90m: extremely weak.* End of Borehole at 15.00m			

11 12 13 14 15 16 17 18 19 20

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
1.20	2.00	Air mist	100
2.00	3.00	Air mist	100

Borehole Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
11/10	16:30	3.00		2.10
12/10	08:00	3.00	3.00	1.90
12/10	16:00	15.00	3.00	

Remarks:

SPT Hammer: JS01 Energy Ratio: 58%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

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Core Photographs
BH329



IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH330**
	Dates: 07/10/2022 - 11/10/2022	Client: Cadent	Sheet 1 of 3
Dynamic Sampling and Rotary Boring Log	Location: 357613.96E 385189.98N	Ground level: 7.90mOD / Logged by: AE/TW / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10 - 0.80	B1			7.80	0.10	Grass over dark brown, fine and medium SAND. TOPSOIL			
0.50	D3				(0.70)	Dark brown, clayey, fine to coarse SAND with roots (up to 3mm). SHIRDLEY HILL SAND FORMATION			
0.50	ES2					*Below 0.30m: roots absent.*			
0.70 - 1.20	D4			7.10	0.80				
0.80 - 1.20	B5				(0.40)	Light brown yellow, slightly gravelly, slightly clayey, silty, fine to coarse SAND. Gravel is subangular to subrounded, fine to coarse including sandstone, quartz and siltstone.			
1.00	D7								
1.00	ES6			6.70	1.20	SHIRDLEY HILL SAND FORMATION			
1.20		SPT(S) N=29 (3,4/5,6,8,10)				Medium dense, locally dense, light brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION			
1.20 - 1.65	D9								
1.20 - 2.20	D8								
1.20 - 2.50	B12								
2.00	ES10								
2.20		SPT(S) N=31 (6,6/7,8,8,8)			(2.70)				
3.20		SPT(S) N=28 (5,7/8,7,6,7)							
3.20 - 4.20	D11					*Between 3.40m and 3.90m: discoloured light greyish brown.*			
3.90 - 4.00	D13			4.00	3.90	Very dense, thinly laminated (3 to 10 degrees) reddish brown, silty, fine SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
		NA	4.20m - SPT(S) 50 (25 for 130mm/50 for 50mm)		(0.70)				
	77		4.30m - D14	3.30	4.60	Very weak, thinly laminated (3 to 10 degrees) reddish brown, fine grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
4.20 - 5.50	32	0			(0.60)				
	32			2.70	5.20	*Between 4.60m and 4.69m: non intact, drilling disturbed.* *Between 4.80m and 4.85m: non intact, drilling disturbed.* *Between 4.90m and 4.95m: non intact, drilling disturbed.*			
		AZCL	5.50m - B15			Light brown and reddish brown, fine and medium grained SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
	100	NA			(1.50)	*Between 5.20m and 5.50m: assessed zone of core loss, likely sand.*			
5.50 - 7.00	17								
	17			1.20	6.70				
		0	6.80m - C16		(0.30)	Extremely weak, thinly laminated (3 to 8 degrees) reddish brown fine and medium grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP			
				0.90	7.00	*Between 6.75m and 6.80m: non intact, drilling disturbed.*			
	0					Assessed zone of core loss, likely sand. SHERWOOD SANDSTONE GROUP			
7.00 - 8.50	0								
	0								
		AZCL	8.50m - SPT(S) 50 (10,13/50 for 280mm)		(3.65)				
	0								
8.50 - 9.50	0								
	0								
			9.50m - SPT(S) 50 (5,5/50 for 170mm)						
	TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.20		100	
2.20	3.20		100	
3.20	4.20		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JT01 Energy Ratio: 66%

Water Strikes						Monitoring Installations			
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH330**
Dates: 07/10/2022 - 11/10/2022	Client: Cadent		Sheet 2 of 3
Rotary Boring Log	Location: 357613.96E 385189.98N	Ground level: 7.90mOD	Logged by: AE/TW	Vertical scale: 1:50	Project ID: 2230746

Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
9.50 - 10.50	0 0 0					Assessed zone of core loss, likely sand. SHERWOOD SANDSTONE GROUP				
			10.50m - SPT(S) 50 (11,10/50 for 40mm)	-2.75	10.65					
		NA			(0.30)	Reddish brown, slightly clayey, fine and medium grained SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION]				
10.50 - 11.50	85 28 28	3	11.00m - C17	-3.05	10.95	SHERWOOD SANDSTONE GROUP		11		
		NA				Very weak, thinly laminated (3 to 10 degrees) reddish brown, fine grained SANDSTONE, with closely spaced, very thin beds of reddish brown, slightly clayey, fine to medium sand. Discontinuities are 3 to 10 degrees, medium and widely spaced, planar, slightly rough clean. (CLASS C) [WILMSLOW SANDSTONE FORMATION]				
		0								
		NA								
11.50 - 12.50	100 78 78	2			(1.95)	SHERWOOD SANDSTONE GROUP *Between 11.23m and 11.45m: reddish brown, fine and medium sand, with up to 25 percent subangular lithorelicts (up to 35mm) of extremely weak sandstone.* *Between 11.65m and 11.87m: reddish brown, locally light grey, slightly clayey, fine and medium sand, with up to 20 percent, subangular lithorelicts (up to 35mm) of extremely weak sandstone.* *Between 12.50m and 12.57m: reddish brown, clayey, fine and medium sand, with up to 10 percent subangular lithorelicts (up to 10mm) of extremely weak sandstone.*		12		
			12.66m - C18							
12.50 - 13.50	100 9 0	NA		-5.00	12.90	*At 12.66m: extremely weak.*		13		
					(0.60)	Reddish brown, fine and medium SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION]				
				-5.60	13.50	SHERWOOD SANDSTONE GROUP				
13.50 - 15.00	0 0 0	AZCL			(1.70)	Assessed zone of core loss, likely sand. SHERWOOD SANDSTONE GROUP		14		
			15.00m - SPT(S) 50 (25 for 120mm/50 for 20mm)					15		
				-7.30	15.20					
15.00 - 16.00	80 0 0	NA		-7.70	(0.40) 15.60	Very dense, thinly laminated (3 to 10 degrees) reddish brown, fine and medium SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
					(0.40)	Reddish brown, fine and medium SAND, with up to 45 percent, subangular lithorelicts (up to 40mm) of extremely weak sandstone. (CLASS D [WILMSLOW SANDSTONE FORMATION]				
				-8.10	16.00	SHERWOOD SANDSTONE GROUP		16		
16.00 - 17.00	0 0 0	AZCL			(1.00)	Assessed zone of core loss, likely sand. SHERWOOD SANDSTONE GROUP				
			17.00m - SPT(S) 50 (25 for 75mm/50 for 10mm)	-9.10	17.00			17		
		NA			(0.53)	Very dense, reddish brown, fine and medium SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 17.00m and 17.25m: slightly clayey.*				
			17.52m - C20	-9.63	17.53					
17.00 - 18.50	100 20 20	0				Extremely weak, thinly laminated (0 to 5 degrees) reddish brown, fine and medium grained SANDSTONE. (CLASS C) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 17.72m and 18.15m: reddish brown, fine and medium sand, with up to 50 percent subrounded lithorelicts (up to 40mm) of extremely weak sandstone.* *Between 18.26m and 18.66m: reddish brown, fine and medium sand, with up to 30 percent subrounded lithorelicts (up to 20mm) of extremely weak sandstone.*		18		
		NA								
		0								
		NA								
			18.66m - C19		(2.47)					
18.50 - 20.00	100 69 69	0						19		
		NA				*Between 19.50m and 19.65m: reddish brown, fine and medium sand, with up to 10 percent angular lithorelicts (up to 30mm) of extremely weak sandstone.* *Between 19.75m and 19.90m: reddish brown, fine and medium sand,*				
		0								
		NA								
		0		-12.10	20.00			20		

Continued next sheet

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
4.20	5.50	Water	100
5.50	7.00	Water	90
7.00	8.50	Water	90
8.50	9.50	Water	90
9.50	10.50	Water	90
10.50	11.50	Water	90
11.50	12.50	Water	90
12.50	13.50	Water	90

Borehole Diameter

Depth (m)	Dia (mm)
26.00	121

Casing Diameter

Depth (m)	Dia (mm)
26.00	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
07/10	16:30	5.50	4.20	1.70
10/10	08:00	5.50	5.50	Dry
10/10	16:30	20.00	8.50	3.10
11/10	08:00	20.00	8.50	2.10

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH330**
Dates: 07/10/2022 - 11/10/2022	Client: Cadent		Sheet 3 of 3
Rotary Boring Log	Location: 357613.96E 385189.98N	Ground level: 7.90mOD / Logged by: AE/TW / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
20.00 - 21.50	100 27 27	NA 2		-12.90	(0.80) 20.80	Extremely weak, thinly laminated (0 to 5 degrees) reddish brown, fine and medium grained SANDSTONE. (CLASS C) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 19.75m and 19.90m: reddish brown, fine and medium sand, with up to 60 percent angular lithorelicts (up to 50mm) of extremely weak sandstone.*		21		
21.50 - 23.00	100 70 65	NA 0 NA 0	22.13m - C21			Reddish brown, fine and medium SAND. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 20.00m and 20.30m: up to 20 percent, subrounded, moderately weak, light greenish grey siltstone concretions (up to 80mm)* Very weak, locally extremely weak, thinly laminated (0 to 5 degrees) reddish brown, fine and medium grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 20.85m and 21.16m: 80 degree joint, planar rough, clean.* *Between 21.05m and 21.10m: reddish brown fine and medium sand.* *Between 21.20m and 21.40m: 85 degree joint, planar, rough, clean.* *reddish brown, fine and medium sand, with up to 40 percent subangular lithorelicts (up to 40mm) of extremely weak sandstone.* *Between 22.03m and 22.13m: reddish brown, fine and medium sand, with up to 50 percent subangular lithorelicts (up to 35mm) of extremely weak sandstone.* *At 22.13m: extremely weak.*		22		
23.00 - 24.50	100 70 65	NA 0 NA 0			(5.20)	*Between 22.75m and 22.85m: reddish brown, fine and medium sand.* *Between 23.12m and 23.20m: reddish brown, fine and medium sand, with up to 60 percent subangular lithorelicts (up to 30mm) of extremely weak sandstone.* *Between 23.28m and 23.38m: reddish brown, fine and medium sand, with up to 50 percent subangular lithorelicts (up to 20mm) of extremely weak sandstone.*		23		
24.50 - 26.00	97 59 50	NA 0 NA 0 NA 2 NA AZCL		-18.10	26.00	*Between 24.23m and 24.50m: reddish brown, fine and medium sand, with up to 20 percent subrounded lithorelicts (up to 50mm) of extremely weak sandstone.* *Between 24.58m and 24.74m: reddish brown, fine and medium sand, with up to 50 percent subangular lithorelicts (up to 70mm) of extremely weak sandstone.* *Between 24.87m and 24.91m: reddish brown fine and medium sand.* *Between 25.01m and 25.28m: reddish brown, fine and medium sand, with up to 20 percent subangular lithorelicts (up to 60mm) of extremely weak sandstone.* *Between 25.60m and 25.80m: 90 degrees joint, stepped, rough, clean.* *Between 25.80m and 25.90m: reddish brown, fine and medium sand, with up to 40 percent subangular lithorelicts (up to 20mm) of extremely weak sandstone.* End of Borehole at 26.00m		24 25 26		
								27 28 29 30		

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
13.50	15.00	Water	90
15.00	16.00	Water	90
16.00	17.00	Water	90
17.00	18.50	Water	90
18.50	20.00	Water	90
20.00	21.50	Water	90
21.50	23.00	Water	90
23.00	24.50	Water	90

Checked by: MHW — Log status: FINAL — IFA RC v01.01

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
11/10	16:30	26.00	8.50	3.20

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JT01 Energy Ratio: 66%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

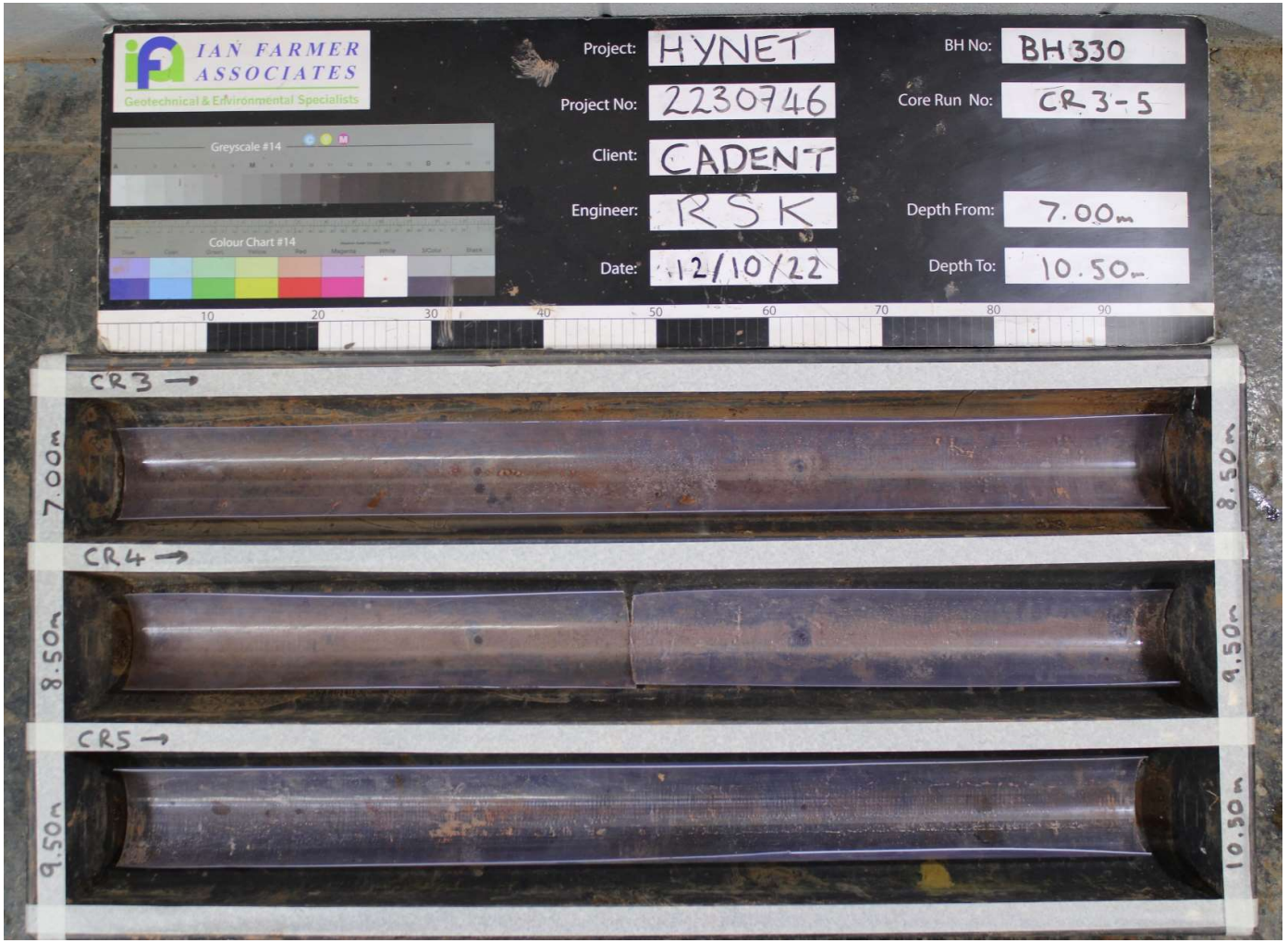
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IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH332**
Dates: 28/11/2022	Client: Cadent		Sheet 1 of 1
Dynamic Sample Borehole Log	Location: 353403.17E 378848.00N	Ground level: 5.83mOD / Logged by: JB / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10	D1		5.63	0.20	Dark greyish brown, slightly sandy, slightly gravelly CLAY with frequent rootlets up to 3mm diameter. Gravel is subangular to subrounded, fine to coarse including sandstone and mudstone. TOPSOIL			
0.30	D3			(0.30)				
0.30 - 0.40	B2		5.33	0.50	Firm, grey and brown, slightly silty, sandy locally very sandy CLAY. TIDAL FLAT DEPOSITS			
0.60	D5			(0.50)				
0.60 - 0.80	B4		4.83	1.00	Light grey, slightly silty, fine and medium SAND. TIDAL FLAT DEPOSITS			
1.10	D7		4.63	1.20	Brown, slightly gravelly, slightly silty, fine and medium SAND. Gravel is subangular to subrounded, fine and medium including mudstone, sandstone and metamorphic lithologies. TIDAL FLAT DEPOSITS		▼	
1.10 - 1.20	B6							
1.20		SPT(S) N=12 (3,4/4,4,2,2)						
1.20 - 1.65	D9			(0.60)				
1.20 - 1.80	B8		4.03	1.80	Medium dense, greyish brown, silty, fine and medium SAND. TIDAL FLAT DEPOSITS			
1.90 - 2.00	D10		3.83	2.00	Soft, grey, slightly sandy SILT with slight organic odour. TIDAL FLAT DEPOSITS			
2.00		SPT(S) N=12 (1,1/3,3,3,3)						
2.00 - 2.45	D12							
2.00 - 2.66	B11			(0.66)	Medium dense, greyish brown, slightly gravelly, fine and medium rarely coarse SAND. Gravel is subangular to subrounded, fine and medium including sandstone.			
			3.17	2.66	TIDAL FLAT DEPOSITS			
2.80 - 2.90	D13			(0.34)	Greyish brown, gravelly, fine and medium SAND. Gravel is			
			2.83	3.00	rounded, tabular, medium and coarse including quartzite, siltstone and sandstone. TIDAL FLAT DEPOSITS *Between 2.90m and 3.00m: brown fine and medium sand.*			
					SAND (driller's description). TIDAL FLAT DEPOSITS *Between 3.00m and 4.00m: no recovery. Casing dropped to 4.00m when casing off to 3.00m.*			
				(5.50)			▼	
			-2.67	8.50	End of Borehole at 8.50m			

1 2 3 4 5 6 7 8 9 10

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Blowing sands encountered at 4.00m. Borehole terminated at 8.50m due to ground stability problems beneath rig.
Borehole restarted with cable percussion rig as BH332A.

SPT Hammer: KM01 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			0	1.20	Slow
6.00	6.00		0	6.00	Fast

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Core Photographs
BH332



IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comachio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH332A**
	Dates: 29/11/2022 - 07/12/2022	Client: Cadent			Sheet 1 of 4
Cable Percussion and Rotary Boring Log	Location: 353403.17E 378848.00N	Ground level: 5.83mOD	Logged by: JB/CE	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.40	B1			(0.40)	Dark greyish brown, slightly sandy, slightly gravelly CLAY with frequent rootlets up to 3mm. Gravel is subangular to subrounded, fine to coarse including sandstone and mudstone. TOPSOIL			
0.40 - 0.80	B2		5.43	0.40				
				(0.40)	Firm, brown and grey, very sandy CLAY. TIDAL FLAT DEPOSITS			
0.80 - 1.20	B3		5.03	0.80				
				(0.40)	Grey to light grey, slightly silty, fine and medium SAND. TIDAL FLAT DEPOSITS			
1.20		SPT(S) N=3 (1,0/1,0,1,1)	4.63	1.20	*At 0.80m: wet.*			
1.20 - 1.65	D5				Very loose, grey and brown, slightly clayey, silty, slightly organic, fine and medium SAND.			
1.20 - 1.70	B4				TIDAL FLAT DEPOSITS			
				(0.80)				
			3.83	2.00				
2.20		SPT(S) N=10 (1,2/2,2,3,3)			Loose to medium dense, grey, gravelly, fine and medium SAND with low cobble content. Gravel is subangular to subrounded, fine to coarse, including sandstone, mudstone and metamorphic lithologies. Cobbles are subangular to subrounded including mudstone and metamorphic lithologies. TIDAL FLAT DEPOSITS			
2.20 - 2.65	D7							
2.20 - 2.70	B6							
3.20		SPT(S) N=10 (1,1/2,3,2,3)			*Below 3.20m: very gravelly.*			
3.20 - 3.65	D9							
3.20 - 3.70	B8							
4.00		SPT(S) N=16 (2,4/3,4,4,5)			*Below 4.00m: medium dense.*			
4.00 - 4.45	D11							
4.00 - 4.50	B10			(4.80)				
5.20		SPT(S) N=17 (2,3/3,4,5,5)			*Below 5.20m: locally becoming very sandy gravel.*			
5.20 - 5.65	D13							
5.20 - 5.70	B12							
6.50		SPT(C) N=25 (4,5/6,6,6,7)						
6.50 - 6.95	D14							
6.80 - 7.50	B15		-0.97	6.80	Stiff, reddish brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is subangular to subrounded, fine to coarse, including mudstone, sandstone and metamorphic lithologies. GLACIAL TILL			
				(1.20)				
			-2.17	8.00				
8.20		SPT(S) 50 (6,8/50 for 180mm)			Very dense, greyish brown, slightly gravelly, clayey, silty, fine and medium SAND with low cobble content. Gravel is subangular to subrounded, fine to coarse, including mudstone and metamorphic lithologies. Cobbles are subrounded including mudstone. GLACIAL TILL			
8.20 - 8.53	D17			(1.00)	*At 8.00m: wet.*			
8.20 - 8.70	B16							
			-3.17	9.00	Stiff, brown, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine and medium including sandstone, mudstone and metamorphic lithologies. GLACIAL TILL			
9.50		SPT(S) N=30 (2,4/5,6,9,10)						
9.50 - 10.00	B18							
9.50 - 9.95	D19							
					Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
6.80	7.50	120	

Borehole Diameter

Depth (m)	Dia (mm)
14.00	200
40.00	121

Casing Diameter

Depth (m)	Dia (mm)
14.00	200
34.50	139

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
29/11	16:30	6.00	6.00	1.00
30/11	08:00	6.00	6.00	1.00
30/11	16:30	14.00	14.00	8.00
01/12	08:00	14.00	14.00	0.30

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Between 14.00m and 15.00m: rotary cored.
Between 15.00m and 16.00m: dynamic sampling and SPT Hammer: AR2371/KM01/JT01 Energy Ratio: 62/68/66%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comachio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH332A**
Dates: 29/11/2022 - 07/12/2022	Client: Cadent		Sheet 2 of 4
Cable Percussion and Rotary Boring Log	Location: 353403.17E 378848.00N	Ground level: 5.83mOD / Logged by: JB/CE / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
11.00 11.00 - 11.45 11.00 - 11.50	D21 B20	SPT(S) N=40 (6,8/9,9,10,12)			(5.00)	Stiff, brown, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine and medium including sandstone, mudstone and metamorphic lithologies. GLACIAL TILL			
12.50 12.50 - 12.95 12.50 - 13.00	D23 B22	SPT(S) N=36 (6,7/8,8,10,10)				*Below 12.50m: silty.*			
14.00 - 15.00	65 0 0	AZCL NA	14.00m - UT 14.50m - D35	-8.17	14.00	Stiff, brown, slightly sandy, gravelly, silty CLAY, with rare cobbles. Gravel is angular to subrounded, fine to coarse, including mudstone, siltstone, sandstone and quartzite. Cobbles are subrounded of quartzite. GLACIAL TILL			
			15.00m - SPT(S) N=17 (0,0/2,5,5,5) 15.00m - D24						
16.00 - 17.50	100 0 0	AZCL NA	16.00m - SPT(S) N=35 (3,5/5,9,9,12) 16.00m - D25 16.80m - D36		(6.80)				
17.50 - 18.50	65 0 0	AZCL NA	17.50m - SPT(S) N=35 (5,6/7,7,11,10) 17.50m - D26 18.40m - D37						
18.50 - 19.50	0 0 0	AZCL							
			19.50m - SPT(S) N=37 (7,7/6,8,11,12) 19.50m - D27						
	TCR/SCR/RQD	FI	Samples & Tests			Continued next sheet			

Chiselling			
From (m)	To (m)	Time (mins)	Remarks

Borehole Diameter	
Depth (m)	Dia (mm)

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
01/12	16:00	19.50	14.00	19.10
02/12	08:00	19.50	14.00	17.30
02/12	16:30	23.50	22.50	23.20
05/12	08:00	23.50	22.50	6.70

Remarks:
then open holing to clear clay stuck in hole.
On 06/12/2022 sand had risen with water overnight, as such borehole open holed 10.10m to 31.50m to clean out.
SPT Hammer: AR2371/KM01/JT01 Energy Ratio: 62/68/66%

Casing Diameter	
Depth (m)	Dia (mm)

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comachio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH332A**
Dates: 29/11/2022 - 07/12/2022	Client: Cadent		Sheet 3 of 4
Rotary Boring Log	Location: 353403.17E 378848.00N	Ground level: 5.83mOD / Logged by: JB/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
19.50 - 21.00	13 0 0					Stiff, brown, slightly sandy, gravelly, silty CLAY, with rare cobbles. Gravel is angular to subrounded, fine to coarse, including mudstone, siltstone, sandstone and quartzite. Cobbles are subrounded of quartzite. GLACIAL TILL				
		NA	20.95m - D38	-14.97	20.80	Firm, brown, slightly sandy, gravelly, silty CLAY. Gravel is angular to subrounded, fine to coarse, including quartz and quartzite. GLACIAL TILL		21		
21.00 - 22.50	13 0 0	AZCL	21.00m - SPT(S) N=25 (4,5/4,4,8,9)		(2.70)			22		
		NA	22.45m - D39							
			22.50m - SPT(S) N=10 (2,3/2,3,3,2)					23		
			22.50m - D28							
			23.05m - D40							
			23.50m - SPT(S) N=43 (12,10/11,10,10,12)	-17.67	23.50	Dense, reddish brown, gravelly, fine to coarse SAND. Gravel is subangular to subrounded, fine to coarse including sandstone, mudstone, quartzite. GLACIAL TILL				
23.50 - 25.00	0 0 0		23.50m - D29	-17.87	23.70 (0.30)			24		
				-18.17	24.00	Stiff, thickly laminated, reddish brown CLAY, with occasional brown, silt partings. GLACIAL TILL				
						No recovery, clayey, gravelly SILT (driller's description). GLACIAL TILL		25		
			25.00m - SPT(C) N=40 (6,8/8,10,10,12)							
25.00 - 26.00	0 0 0				(3.00)			26		
			26.00m - SPT(C) N=47 (10,10/12,12,11,12)			*At 26.00m: driller notes: while doing core run from 26.00m to 27.00m casing dropped to 30.00m.*				
26.00 - 27.00	0 0 0	NR						27		
				-21.17	27.00	No recovery, gravelly SAND (driller's description). GLACIAL SAND AND GRAVEL				
								28		
					(3.00)					
								29		
				-24.17	30.00			30		

Continued next sheet

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	Unable to take SPT at 40.00m due to large gravel falling in.
14.00	19.50	Air mist				05/12	16:30	31.50	30.00	28.40	
						06/12	08:00	31.50	31.50	0.60	
						06/12	16:30	40.00	34.50	33.50	

SPT Hammer: AR2371/KM01/JT01 Energy Ratio: 62/68/66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES	Plant used: Dando 2000/Comachio 205	Project: HyNet North West - Hydrogen Pipeline			Location ID: **BH332A**
	Dates: 29/11/2022 - 07/12/2022	Client: Cadent			Sheet 4 of 4
Rotary Boring Log	Location: 353403.17E 378848.00N	Ground level: 5.83mOD	Logged by: JB/CE	Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
30.00 - 31.50	0 0 0		30.00m - SPT(C) N=45 (4,7/11,11,10,13)		(1.50)	No recovery, SAND and GRAVEL (driller's description). GLACIAL SAND AND GRAVEL		31		
31.50 - 32.50	0 0 0		31.50m - SPT(C) N=37 (6,7/8,8,12,9)	-25.67	31.50	Silty SAND and GRAVEL (driller's description). GLACIAL SAND AND GRAVEL		32		
32.50 - 34.00	0 0 0		32.50m - SPT(C) N=43 (10,10/11,10,11,11)					33		
34.00 - 35.50	0 0 0		34.00m - SPT(C) 50 (6,8/50 for 275mm)		(5.30)			34		
35.50 - 37.00	13 0 0	AZCL	35.50m - SPT(C) N=43 (4,12/11,9,12,11)					35		
		NA	36.90m - D30	-30.97	36.80	Stiff, brown, slightly sandy, gravelly, silty CLAY. Gravel is angular to subrounded, fine to coarse, including siltstone and quartzite. GLACIAL TILL		36		
37.00 - 38.50	13 0 0	AZCL	37.00m - SPT(S) 50 (6,8/50 for 85mm)	-31.17	37.00	Assessed zone of core loss, driller notes brown glacial till with large gravel and sand bands. GLACIAL TILL		37		
					(1.30)			38		
38.50 - 40.00	60 0 0	NA	38.45m - D31	-32.47	38.30	Stiff, brown, slightly sandy, gravelly, silty CLAY. Gravel is angular to subrounded, fine to coarse, including siltstone and quartzite. GLACIAL TILL		39		
			39.35m - D32		(1.70)	*Between 39.40m and 40.00m: assessed zone of core loss. Possible gravel or sand band.*				
		AZCL		-34.17	40.00	End of Borehole at 40.00m		40		

Flush Details				Borehole Diameter		Boring Progress					Remarks:
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)	SPT Hammer: AR2371/KM01/JT01 Energy Ratio: 62/68/66%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH332A



Core Photographs
BH332A



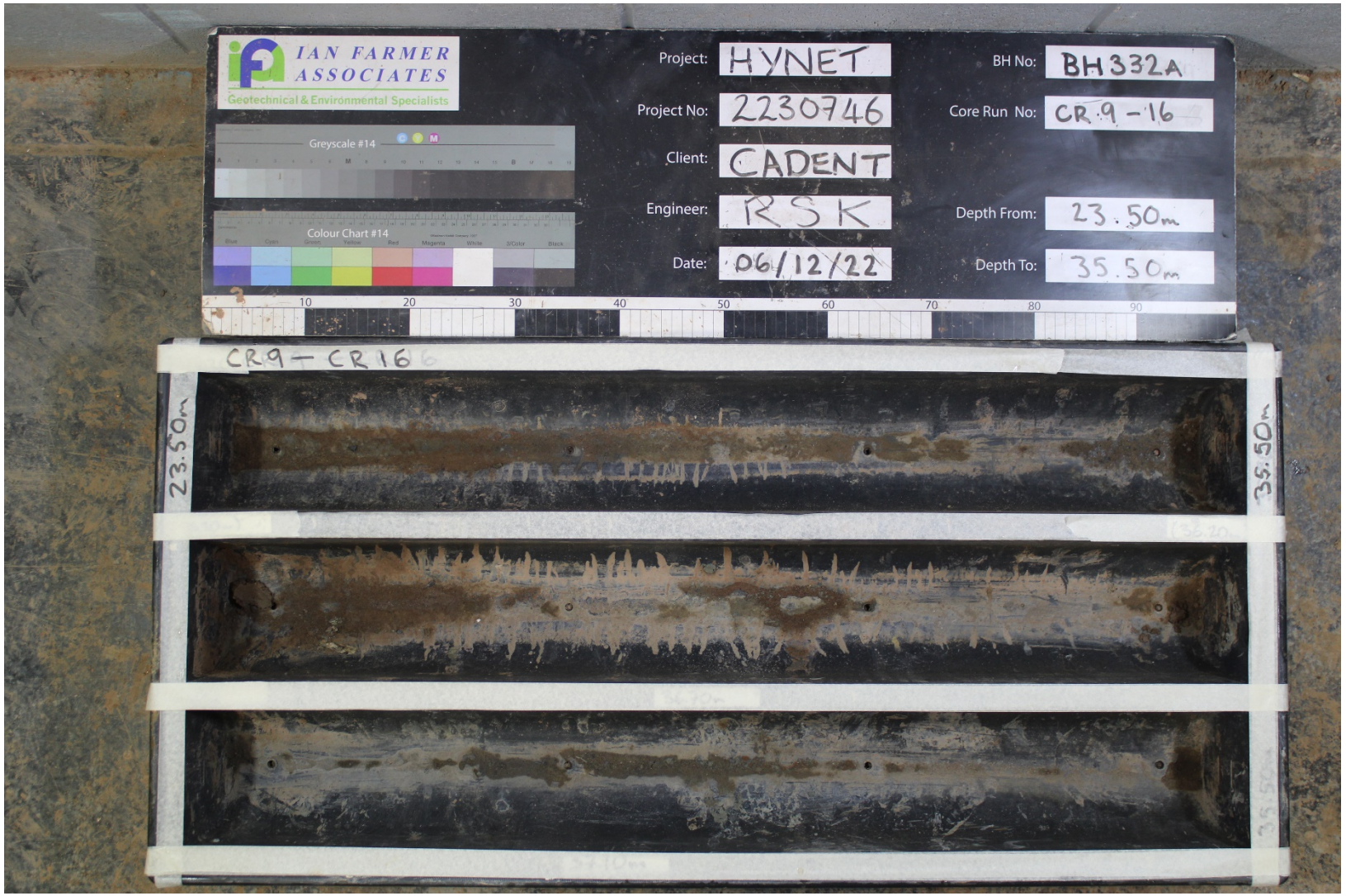
Core Photographs
BH332A



Core Photographs
BH332A



Core Photographs
BH332A



Core Photographs
BH332A



IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH338**
Dates: 29/11/2022 - 30/11/2022	Client: Cadent		Sheet 1 of 2
Cable Percussion and Rotary Boring Log	Location: 359374.00E 385868.02N	Ground level: 10.16mOD / Logged by: FH/TW / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.20	B1		9.96	0.20	MADE GROUND: Grass over brown, very sandy, very silty, angular to subrounded, fine to coarse GRAVEL including limestone and brick. With occasional rootlets.			
0.10	ES2			(0.30)				
0.20 - 0.50	B3		9.66	0.50	MADE GROUND			
0.30	ES4			(0.30)	MADE GROUND: Brown, slightly gravelly, silty, fine SAND. Gravel is angular to subrounded, fine and medium including limestone, brick and mudstone.			
0.50 - 0.80	B5		9.36	0.80	MADE GROUND			
0.60	ES6			(0.40)	MADE GROUND: Black, very gravelly ashy SAND. Gravel is angular to subrounded, fine to coarse including siltstone and clinker.			
0.80 - 1.20	B7		8.96	1.20	MADE GROUND			
1.00	ES8				Brown, very silty, fine SAND with occasional lenses of soft brown, sandy clay and occasional fine and medium gravel.			
1.20		SPT(S) N=4 (1,1/1,1,1,1)			TIDAL FLAT DEPOSITS			
1.20 - 1.65	D10				Soft, brown and grey, sandy CLAY with occasional bands of brown and grey silty, fine sand.			
1.20 - 1.70	B9			(2.20)	TIDAL FLAT DEPOSITS			
2.20		SPT(S) N=7 (1,1/2,2,1,2)						
2.20 - 2.65	D12							
2.20 - 2.70	B11							
3.20		SPT(S) N=15 (2,2/3,4,3,5)						
3.20 - 3.65	D13		6.76	3.40				
3.40 - 3.70	B14				Firm, reddish brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is subrounded to rounded, fine and medium including mudstone, siltstone and sandstone. (CLASS E) [HELSBY SANDSTONE FORMATION]			
				(0.60)	SHERWOOD SANDSTONE GROUP			
			6.16	4.00	Reddish brown, fine grained SANDSTONE recovered as slightly sandy, clayey, fine to coarse gravel. (CLASS E) [HELSBY SANDSTONE FORMATION]			
4.20		SPT(S) 50 (3,5/50 for 295mm)			SHERWOOD SANDSTONE GROUP			
4.20 - 4.65	D16			(0.85)				
4.20 - 4.70	B15							
		NIDD 4.80m - SPT(S) 50 (25 for 40mm/50 for 10mm)	5.31	4.85	Very weak, thinly to thickly laminated (0 to 10 degrees) reddish brown, fine and medium grained, micaceous SANDSTONE. Discontinuities are set 1: 0 to 10 degrees, closely spaced, planar, smooth, tight with soft, brown, clay infill (up to 0.25mm). Set 2: 20 to 40 degrees, closely spaced, planar, rough, clean. Set 3: 70 degrees, medium spaced, planar, rough clean. (CLASS B) [HELSBY SANDSTONE FORMATION]			
		5 4.80m - D17						
	90	NIDD		(1.25)				
4.85 - 6.30	75	6 5.78m - C18						
	75				SHERWOOD SANDSTONE GROUP			
					Between 4.85m and 5.08m, 5.27m and 5.33m and 5.42m and 5.55m: non intact, drilling disturbed, recovered as angular, medium and coarse gravel.			
			4.06	6.10	*Between 6.03m and 6.04m: very soft, reddish brown, micaceous clay.*			
		AZCL			*Between 6.04m and 6.10m: thinly laminated (0 to 5 degrees).*			
				(1.30)	Very weak, thinly bedded (0 to 10 degrees) dark reddish brown, medium and coarse grained SANDSTONE, with occasional dissolution vugs (up to 10mm) locally infilled with orange brown, fine sand. Discontinuities are 20 to 30 degrees, very closely spaced, undulating, rough, clean. (CLASS B) [HELSBY SANDSTONE FORMATION]			
	73	6.80m - C19						
6.30 - 7.80	73	5						
	60				SHERWOOD SANDSTONE GROUP			
		0	2.76	7.40	*Between 6.90m and 6.95m: up to 25 percent clasts (up to 10mm) of subrounded sandstone and siltstone.*			
		NIDD			*Between 6.98m and 7.10m: 80 degree joint, undulating, slightly rough, clean, with black staining (<1mm).*			
				(1.30)	*Between 7.25m and 7.30m: 35 degree joint, undulating, rough, clean.*			
		8.00m - C20			*Between 7.37m and 7.41m: moderately weak, light greenish grey siltstone.*			
	90	5			Very weak, thinly to medium bedded (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE, with very closely to medium spaced, thick laminations and very thin beds of extremely weak, reddish brown mudstone and very weak, light greenish grey siltstone. Discontinuities are 10 to 30 degrees, very closely spaced, undulating, rough, clean. (CLASS A) [HELSBY SANDSTONE FORMATION]			
7.80 - 8.90	81	8.54m - C21						
	81		1.46	8.70	SHERWOOD SANDSTONE GROUP			
		0 9.00m - C22			*Between 7.50m and 7.70m: non intact, drilling disturbed, recovered as; sandy, subangular, medium and coarse gravel.*			
	45			(1.30)	*Between 7.70m and 7.90m: up to 25 percent subrounded clasts (up to 20mm) of sandstone and silststone.*			
8.90 - 10.00	45	AZCL						
	45							
	TCR/SCR/RQD	FI Samples & Tests	0.16	10.00	Continued next sheet			

Chiselling

From (m)	To (m)	Time (mins)	Remarks
4.60	4.80	40	

Borehole Diameter

Depth (m)	Dia (mm)
10.00	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
29/11	16:30	4.85	4.80	4.00
30/11	08:00	4.85	4.85	5.30
30/11	16:30	10.00	4.85	8.10

Casing Diameter

Depth (m)	Dia (mm)
4.80	150
10.00	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371 Energy Ratio: 62%

Checked by:	MHW	IFA CP v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Dando 2000/Comacchio 205	HyNet North West - Hydrogen Pipeline	**BH338**
Dates:	**Client:**	Sheet 2 of 2
29/11/2022 - 30/11/2022	Cadent	

Rotary Boring Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	359374.00E 385868.02N	10.16mOD	FH/TW	1:50	2230746

Coring, Samples & In Situ Testing				Strata Details					Groundwater	
Depth	TCR/SCR/ RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
						Very weak, thinly to medium bedded (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE, with very closely to medium spaced, thick laminations and very thin beds of extremely weak, reddish brown mudstone and very weak, light greenish grey siltstone. Discontinuities are 10 to 30 degrees, very closely spaced, undulating, rough, clean. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Between 7.90m and 8.00m: non intact, drilling disturbed.* *At 8.00m: moderately weak.*		11		
						Moderately weak, light grey, fine and medium grained, cemented SANDSTONE, interbedded with weak, reddish brown, fine grained SANDSTONE. (CLASS A) [HELSBY SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP *Below 9.30m: assessed zone of core loss, likely to be sandstone.*		12		
						End of Borehole at 10.00m		13		
								14		
								15		
								16		
								17		
								18		
								19		
								20		

Flush Details				Borehole Diameter		Boring Progress				
Top (m)	Base (m)	Flush Type	Flush Return %	Depth (m)	Dia (mm)	Date	Time	Depth (m)	Cased (m)	Water (m)

Remarks:

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter		Water Strikes						Monitoring Installations			
Depth (m)	Dia (mm)	Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA RC v01.01
Log status:	FINAL	

Core Photographs
BH338



Core Photographs
BH338



Window Sampler Borehole Records

IAN FARMER ASSOCIATES

Plant used: Competitor Dart	Project: HyNet North West - Hydrogen Pipeline		Location ID: **WS10**
Dates: 07/11/2022	Client: Cadent		Sheet 1 of 1
Dynamic Sample Borehole Log	Location: 359090.93E 384912.99N	Ground level: 26.51mOD / Logged by: RS / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Water Strike	Backfill/ Installation
0.20 - 0.70	B1				Dark brown, silty, organic, fine to coarse SAND. TOPSOIL				
				(0.70)	*Between 0.00m and 0.20m: rare rootlets.*				
0.50 - 0.60	D2								
			25.81	0.70					
0.80 - 1.20	B3				Loose, brown mottled orange brown, fine and medium SAND. SHIRDLEY HILL SAND FORMATION				
1.00 - 1.10	D4						1		
1.20		SPT(S) N=4 (1,1/1,1,1,1)							
1.20 - 1.65	D5								
1.20 - 2.00	B6			(1.65)					
1.50 - 1.60	D7								
2.00		SPT(S) N=10 (1,1/2,2,3,3)			*Below 2.00m: orangish brown, mottled brown.*		2		
2.00 - 2.45	D8								
2.10 - 2.20	D9								
2.30 - 3.00	B10		24.16	2.35	Soft becoming firm, reddish brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is subangular to subrounded, fine to coarse, including sandstone and siltstone. (CLASS E) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
2.50 - 2.60	D11								
				(0.95)					
3.00		SPT(S) 50 (1,2/50 for 235mm)			*At 2.35m: wet.*		3		
3.00 - 3.39	D12		23.21	3.30					
			23.12	3.39	Very weak, reddish brown, coarse grained SANDSTONE. (CLASS B) [WILMSLOW SANDSTONE FORMATION] SHERWOOD SANDSTONE GROUP				
					End of Borehole at 3.39m		4		
							5		
							6		
							7		
							8		
							9		
							10		

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: DART504 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Competitor Dart	Project: HyNet North West - Hydrogen Pipeline		Location ID: **WS32**
Dates: 15/11/2022	Client: Cadent		Sheet 1 of 1
Dynamic Sample Borehole Log	Location: 364975.99E 381081.96N	Ground level: 58.71mOD / Logged by: OG / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.30	B1			(0.33)	Grass over soft, dark brown, slightly sandy CLAY with occasional rootlets.			
0.20	D2							
0.30 - 1.00	B3		58.38	0.33	TOPSOIL			
0.50	D4				Grey mottled orangish brown, slightly clayey, silty, fine to coarse SAND. ALLUVIUM			
1.20		SPT(S) N=13 (2,3/3,3,4,3)			*At 1.20m: medium dense.*			
1.20 - 2.00	B5			(2.07)				
2.00		SPT(S) N=1 (1,1/1,0,0,0)			*At 2.00m: very loose.*			
2.00 - 2.45	D6							
			56.31	2.40	Soft, reddish brown, slightly sandy CLAY. (GRADE IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
				(0.80)				
3.00		SPT(S) N=50 (7,7/12,12,13,13)						
			55.51	3.20				
3.00 - 3.45	D7				Firm, reddish brown CLAY. (GRADE IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
			55.26	3.45	End of Borehole at 3.45m			

1 2 3 4 5 6 7 8 9 10

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Terminated due to refusal.

SPT Hammer: DART504 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			20	1.00	Seepage

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Competitor Dart	HyNet North West - Hydrogen Pipeline	**WS33**
Dates:	**Client:**	Sheet 1 of 1
14/11/2022	Cadent	

Dynamic Sample Borehole Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	365122.97E 381044.02N	58.32mOD	OG	1:50	2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.30	B1			(0.30)	Grass over soft, dark brown, slightly sandy CLAY with occasional rootlets.			
0.20	D2		58.02	0.30	TOPSOIL			
0.30 - 1.00	B3				Grey mottled light yellowish brown, clayey, silty, fine and medium SAND with occasional fine gravel.			
0.50	D4			(1.10)	ALLUVIUM			
1.00 - 1.20	D5				*At 1.00m: becoming pinkish grey.*			
1.20		SPT(S) N=4 (1,1/1,1,1,1)						
1.20 - 1.65	D6		56.92	1.40	Soft, greyish brown, silty, slightly sandy CLAY with rare decomposed plant fragments (roots).			
1.40 - 2.00	B7				ALLUVIUM			
2.00		SPT(S) N=14 (1,1/1,2,4,7)		(1.30)				
2.00 - 2.45	D8							
2.70	D9		55.62	2.70				
				(0.30)	Reddish brown, fine to coarse SAND. (GRADE IVb) [BOLLIN MUDSTONE MEMBER]			
3.00		SPT(S) N=50 (5,8/12,13,13,12)	55.32	3.00	MERCIA MUDSTONE GROUP			
3.00 - 3.45	D10			(0.45)	Stiff, reddish brown, slightly sandy CLAY with occasional fine quartz and siltstone gravel. (GRADE IVb) [BOLLIN MUDSTONE MEMBER]			
			54.86	3.45	MERCIA MUDSTONE GROUP			
					End of Borehole at 3.45m			

1 2 3 4 5 6 7 8 9 10

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		80	
3.00	4.00		90	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.
Refusal in 3m sample barrel.

SPT Hammer: DART504 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			0	1.20	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Competitor Dart	Project: HyNet North West - Hydrogen Pipeline		Location ID: **WS34**
Dates: 16/11/2022	Client: Cadent		Sheet 1 of 1
Dynamic Sample Borehole Log	Location: 366336.03E 381693.97N	Ground level: 59.70mOD / Logged by: OG / Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.35	B1				Grass over soft, dark greyish brown, slightly sandy CLAY. TOPSOIL			
0.20	D2			(0.60)				
0.60 - 1.00	B4		59.10	0.60	Soft, reddish brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is subangular to subrounded, fine to coarse including siltstone. GLACIAL TILL			
0.80	D3				*At 1.00m: saturated ground.*			
1.20		SPT(S) N=14 (2,3/3,3,4,4)		(1.10)				
1.20 - 1.65	D5							
1.70 - 2.00	B6		58.00	1.70	Firm, reddish brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is very angular to subrounded, fine and medium including quartz and siltstone. GLACIAL TILL			
1.90	D7							
2.00		SPT(S) N=24 (3,5/5,5,6,8)						
2.00 - 2.45	D9							
2.00 - 3.00	B8			(2.10)				
3.00		SPT(S) N=32 (5,6/6,7,9,10)						
3.00 - 3.45	D10							
3.80 - 3.90	D11		55.90	3.80				
3.90 - 4.00	D12		55.80	3.90	Firm, reddish brown, slightly sandy, gravelly CLAY. Gravel is very angular to subrounded, fine and medium including mudstone. Multicoloured (GRADE IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
4.00		SPT(S) 50 (25 for 105mm/50 for 85mm)	55.51	4.19	Stiff, reddish brown, slightly sandy, slightly gravelly CLAY. Gravel is very angular to subangular, fine to coarse including quartz, sandstone and siltstone. (GRADE IVb) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
4.00 - 4.19	D13				End of Borehole at 4.35m			

1 2 3 4 5 6 7 8 9 10

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		80	
3.00	4.00		80	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: DART504 Energy Ratio: 68%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
3.30			0	3.30	

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

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Plant used: Competitor Dart	Project: HyNet North West - Hydrogen Pipeline		Location ID: **WS35**
Dates: 25/11/2022	Client: Cadent		Sheet 1 of 1
Dynamic Sample Borehole Log	Location: 367751.99E 382822.98N	Ground level: 51.94mOD / Logged by: FH / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.05 - 0.30	B1			(0.30)	Dark brown, slightly sandy, clayey SILT with rare gravel and frequent rootlets. Gravel is subrounded to rounded, fine and medium including quartz and siltstone.			
0.15	D2		51.64	0.30	TOPSOIL			
0.40 - 1.00	B3				*Below 0.15m: occasional rootlets.*			
0.45	D4			(0.70)				
0.90	D5		50.94	1.00	Firm, light brownish grey, slightly sandy, slightly gravelly, silty CLAY with rare lenses of grey, very silty, fine sand and rare partially decomposed plant matter.			
1.20		SPT(S) N=12 (1,1/3,2,4,3)			GLACIAL TILL			
1.20 - 1.65	D7				*Between 0.60m and 1.50m: wet.*			
1.20 - 2.00	B6				*Below 0.80m: reddish brown clay.*			
1.90	D8			(1.60)	Firm, reddish brown, slightly silty, slightly gravelly, sandy CLAY with rare partially decomposed plant matter. Gravel is angular to subrounded, fine to coarse including mudstone.			
2.00		SPT(S) N=26 (4,5/6,6,6,8)			GLACIAL TILL			
2.00 - 2.45	D10				*Below 1.50m: partially decomposed plant matter absent.*			
2.00 - 2.60	B9				*Below 1.80m: friable.*			
					Below 2.00m: stiff, silty and slightly sandy.			
2.70	D11		49.34	2.60	Extremely weak, grey and brown MUDSTONE recovered as clayey, angular, fine to coarse gravel. (Grade IVa) [BOLLIN MUDSTONE MEMBER]			
2.80		SPT(S) 50 (8,14/50 for 175mm)		(0.53)	MERCIA MUDSTONE GROUP			
2.80	D12		48.81	3.13	End of Borehole at 3.13m			

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	2.80		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: DART504 Energy Ratio: 67%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
Competitor Dart	HyNet North West - Hydrogen Pipeline	**WS37**
Dates:	**Client:**	Sheet 1 of 1
24/11/2022	Cadent	

Dynamic Sample Borehole Log	Location:	Ground level:	Logged by:	Vertical scale:	Project ID:
	368394.00E 383415.01N	53.47mOD	FH	1:50	2230746

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.05 - 0.30	B1			(0.30)	Soft, dark brown, slightly sandy, slightly gravelly SILT with frequent rootlets. Gravel is subangular to rounded, fine and medium including sandstone, mudstone and quartz. TOPSOIL			
0.20	D2		53.17	0.30	*Below 0.15m: occasional rootlets.*			
0.35	D3		53.02	0.45	Light brown and light grey, slightly gravelly, very silty, fine SAND. Gravel is subrounded to rounded, fine to coarse including sandstone and siltstone. GLACIAL TILL			
0.50 - 1.00	B4							
0.70	D5							
1.20		SPT(S) N=8 (1,2/1,2,2,3)		(1.55)			▼	
1.20 - 1.65	D7				Firm, brown mottled light grey, slightly silty, slightly sandy, slightly gravelly CLAY with occasional partially decomposed plant matter and rare lenses of sandy silt (2-30mm thick). Gravel is subrounded to rounded, fine and medium including sandstone and siltstone. GLACIAL TILL			
1.20 - 2.00	B6							
2.00		SPT(S) N=20 (2,3/4,4,6,6)	51.47	2.00				
2.00 - 2.45	D9				Firm, reddish brown locally mottled bluish grey, slightly sandy, silty CLAY, with up to 10 percent subrounded lithorelicts (up to 10mm) of very weak mudstone and siltstone. (GRADE IVa) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
2.00 - 2.55	B8			(0.55)				
2.60		SPT(S) 50 (7,8/50 for 245mm)	50.92	2.55				
2.60 - 3.00	D10			(0.45)	Extremely weak, blueish grey MUDSTONE recovered as clayey, angular, medium and coarse gravel. (Grade III) [BOLLIN MUDSTONE MEMBER] MERCIA MUDSTONE GROUP			
			50.47	3.00	End of Borehole at 3.00m			

1 2 3 4 5 6 7 8 9 10

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		59	
2.00	2.60		62	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: DART504 Energy Ratio: 67%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			20	1.20	Seepage

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

Trial Pit Records

IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
JCB 3CX	HyNet North West - Hydrogen Pipeline	**ATP23**
Dates:	**Client:**	Sheet 1 of 1
09/11/2022	Cadent	

Trial Pit Log	Location:	Ground level:	Logged by:	Vertical scale:	Contract ID:
	356810.00E 385864.03N	6.17mOD	RS	1:25	2230746

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
0.10	D2				Brown, slightly clayey, organic , fine to coarse SAND. TOPSOIL				
0.10 - 0.40	LB1			(0.40)					
0.20	ES3								
			5.77	0.40	Orangish brown, slightly clayey, silty, fine and medium SAND. TIDAL FLAT DEPOSITS				
0.50	D5								
0.50 - 0.80	LB4			(0.50)					
0.90 - 1.10	B6		5.27	0.90	Firm, reddish brown mottled light grey, slightly gravelly, sandy CLAY. Gravel is subangular to rounded, fine to coarse including sandstone and siltstone. TIDAL FLAT DEPOSITS		1		
1.00	D8								
1.00	ES7		5.07	1.10					
1.20 - 1.50	LB9				Reddish brown mottled light grey, slightly clayey, slightly silty, fine and medium SAND occasionally weakly cemented highly weathered sandstone. (CLASS E) [WILMSLOW FORMATION] SHERWOOD SANDSTONE GROUP				
1.40	D10								
				(1.40)					
2.00	ES11				*Below 2.00m: frequently weakly cemented, mottled yellowish brown and light grey.*		2		
2.20	D13				*At 2.20m: clayey, very silty.*				
2.20 - 2.50	B12								
			3.67	2.50	End of Trial Pit at 2.50m				
							3		
							4		
							5		

Termination:
Trial pit collapsing.

Stability:
Between 2.00m and 2.50m: major spalling of trial pit sides.

Remarks:

Dimensions (Length m x Width m):
3.50 x 0.70

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks
1.30	0	1.30	Seepage

Checked by:	MHW	IFA TP v01.01
Status:	FINAL	

Trial Pit Photographs ATP23



Trial Pit Photographs ATP23



Trial Pit Photographs ATP23



Trial Pit Photographs ATP23



IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: HyNet North West - Hydrogen Pipeline		Location ID: **ATP24**
Dates: 11/11/2022	Client: Cadent		Sheet 1 of 1
Trial Pit Log	Location: 355017.98E 386385.96N	Ground level: 11.98mOD / Logged by: RS / Vertical scale: 1:25	Contract ID: 2230746

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
0.10 - 0.40	LB1				Dark brown, slightly gravelly, very clayey, fine to coarse SAND. Gravel is angular to rounded, fine to coarse including quartz and limestone.				
0.20	D3			(0.40)	TOPSOIL				
0.20	ES2								
			11.58	0.40					
0.50	D5				Brown, very silty, very clayey, fine to coarse SAND with occasional fine gavel.				
0.50 - 0.80	LB4				ALLUVIUM				
1.00	ES6				*Below 1.00m: greyish brown.*		1		
				(1.40)					
1.40 - 1.60	B7				*Below 1.30m: slightly gravelly. Gravel is subangular to rounded, fine to coarse including limestone.*				
1.50	D8								
			10.18	1.80					
1.90 - 2.10	LB9				Light greyish brown, slightly gravelly, slightly silty, fine to coarse SAND. Gravel is subangular to rounded, fine to coarse including sandstone, siltstone, mudstone and limestone.				
2.00	D11				ALLUVIUM		2		
2.00	ES10			(0.50)	*Between 1.80m and 1.90m: very gravelly.*				
			9.68	2.30	End of Trial Pit at 2.30m				
							3		
							4		
							5		

Termination:
Terminated due to repeated collapsing.

Stability:
Major spalling of trial pit sides throughout.

Remarks:

Dimensions (Length m x Width m):
3.50 x 0.70

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks
1.80	0	1.80	Seepage

Checked by:	MHW	IFA TP v01.01
Status:	FINAL	

Trial Pit Photographs ATP24



Trial Pit Photographs ATP24



Trial Pit Photographs ATP24



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
JCB 3CX	HyNet North West - Hydrogen Pipeline	**ATP41**
Dates:	**Client:**	Sheet 1 of 1
16/11/2022	Cadent	

Trial Pit Log	Location:	Ground level:	Logged by:	Vertical scale:	Contract ID:
	365999.00E 381548.94N	59.03mOD	RS	1:25	2230746

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
0.10 - 0.30	LB1				Dark brown, slightly gravelly, clayey, sandy SILT, with frequent grey and brown roots (up to 4mm). Gravel is subangular to subrounded, fine to coarse including sandstone, siltstone and limestone and quartzite. Rare subangular fragments (up to 5mm) of brick.				
0.20	D3			(0.35)					
0.20	ES2								
			58.68	0.35	TOPSOIL				
0.40 - 0.60	LB4				Firm, reddish brown, locally mottled light bluish grey and yellow brown, slightly silty, slightly gravelly, sandy CLAY with low cobble and content. Gravel is subangular to rounded, fine to coarse including sandstone, siltstone, limestone, mudstone and rare lignite. Cobbles are subrounded including quartzite. Rare laminae (2mm) of light grey silt.				
0.50	D5			(0.85)					
					GLACIAL TILL				
1.00	ES6						1		
			57.83	1.20	Stiff, locally fissured, dark reddish brown, locally mottled light bluish grey, slightly silty, slightly gravelly, sandy CLAY, with a low cobble content. Gravel is subangular to rounded, fine to coarse including mudstone, siltstone, quartz and sandstone. Cobbles are subangular, up to 70mm, of quartzite. Fissures are closely spaced, undulating, smooth, with orange brown staining (<1mm). Occasional, black, subangular lignite fragments (up to 5mm). Rare, off white shell fragments (up to 5mm).				
1.40 - 1.60	B7				GLACIAL TILL				
1.50	D8								
2.00	ES9				*Below 2.00m: fissured, with occasional gleying on fissure faces.*		2		
				(1.80)					
2.40 - 2.60	LB10								
2.50	D11								
2.90	ES12								
			56.03	3.00	End of Trial Pit at 3.00m		3		
							4		
							5		

Termination:	Stability:	Remarks:
Scheduled depth.	Trial pit remained stable during excavation.	No groundwater encountered.
Dimensions (Length m x Width m):		
3.00 x 0.70		

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Checked by:	MHW	IFA TP v01.01
Status:	FINAL	

Trial Pit Photographs
ATP41



Trial Pit Photographs
ATP41



Trial Pit Photographs
ATP41



Trial Pit Photographs
ATP41



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Plant used:	Project:	Location ID:
JCB 3CX	HyNet North West - Hydrogen Pipeline	**TP12**
Dates:	**Client:**	Sheet 1 of 1
16/11/2022	Cadent	

Trial Pit Log	Location:	Ground level:	Logged by:	Vertical scale:	Contract ID:
	351285.98E 390035.96N	56.05mOD	RS	1:25	2230746

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
0.10	D2				Dark brown, slightly gravelly, silty, very clayey, fine to coarse SAND with occasional rootlets. Gravel is subangular to subrounded, fine to coarse including sandstone, siltstone and limestone.				
0.10 - 0.30	LB1			(0.30)					
0.20	ES3		55.75	0.30	TOPSOIL				
0.40	D5				Stiff, brownish grey, silty, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse including sandstone, siltstone, limestone, mudstone and lignite. GLACIAL TILL				
0.40 - 0.60	LB4				*Between 0.30m and 1.40m: occasionally mottled orangish brown.*				
1.00	ES6						1		
1.40	D8								
1.40 - 1.60	B7			(2.70)					
2.00	ES9						2		
2.40 - 2.60	LB10				*Below 2.40m: occasional sandy partings <5mm thick.*				
2.50	D11								
2.90	ES12								
			53.05	3.00	End of Trial Pit at 3.00m		3		
							4		
							5		

Termination:

Stability:
Trial pit remained stable during excavation.

Remarks:
No groundwater encountered.

Dimensions (Length m x Width m):
3.00 x 0.70

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Checked by:	MHW	IFA TP v01.01
Status:	FINAL	

Trial Pit Photographs TP12



Trial Pit Photographs TP12



Trial Pit Photographs TP12



Trial Pit Photographs TP12



IAN FARMER ASSOCIATES

Plant used:	Project:	Location ID:
JCB 3CX	HyNet North West - Hydrogen Pipeline	**TP20**
Dates:	**Client:**	Sheet 1 of 1
11/11/2022	Cadent	

Trial Pit Log	Location:	Ground level:	Logged by:	Vertical scale:	Contract ID:
	372213.98E 388638.00N	23.82mOD	RS	1:25	2230746

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
0.10	D1				MADE GROUND: Dark brown, gravelly, slightly clayey, silty, organic, fine and medium SAND. Gravel is subangular to subrounded, fine to coarse including cinder. MADE GROUND				
0.20	ES2								
0.20 - 0.60	LB3			(0.80)					
			23.02	0.80	Light brown, fine to coarse SAND. SHIRDLEY HILL SAND FORMATION				
0.90	D5								
0.90 - 1.40	LB4				*At 1.00m: red terracotta land drain encountered, not damaged, pit extended to avoid.*		1		
1.00	ES6				*Between 1.20m and 1.40m: band of brown, slightly silty, fine to coarse sand with occasional lenses <70cm x 70cm x <5cm thick of pseudo-fibrous peat.*			▼	
				(1.90)					
1.90	D8								
1.90 - 2.40	B7						2		
2.00	ES9								
2.70 - 3.00	LB10		21.12	2.70	Firm, reddish brown, silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine and medium including lignite. GLACIAL TILL				
2.80	D11			(0.30)					
2.90	ES12								
			20.82	3.00	End of Trial Pit at 3.00m		3		
							4		
							5		

Termination:	Stability:	Remarks:
Scheduled depth.	Major spalling of trial pit sides throughout.	
Dimensions (Length m x Width m): 4.80 x 0.70		

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks
1.40	0	1.40	Seepage

Checked by:	MHW	IFA TP v01.01
Status:	FINAL	

Trial Pit Photographs TP20



Trial Pit Photographs TP20



Trial Pit Photographs TP20



Trial Pit Photographs TP20



Results of Monitoring

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Water Level Monitoring

Contract Number: 2230746	**Contract Name:** Hynet

Date: 9/12/22
Weather: Sleeting, freezing
Readings Taken By: BL

Location	Time	Base of well	SWL
	hh:mm	mBGL	mBGL
BH002	*13:52*	*9.60*	*2.05*
BH067	*12:24*	*6.07*	*2.12*
BH094	*14:52*	*8.81*	*1.47*
BH326	*13:21*	*10.72*	*10.69*

Remarks:

Checked by: MHW

Date: 12/12/22
Weather: Dry, freezing
Readings Taken By: BL

Location	Time	Base of well	SWL
	hh:mm	mBGL	mBGL
BH070	*14:10*	*39.45*	*0.24*
BH096	*15:05*	*7.78*	*3.62*
BH114	*15:32*	*3.48*	*1.36*

Remarks:

Checked by: MHW

Date:
Weather:
Readings Taken By:

Location	Time	Base of well	SWL
	hh:mm	mBGL	mBGL

Remarks:

Checked by:

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GAS AND GROUNDWATER MONITORING RESULTS

| | | |

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GAS AND GROUNDWATER MONITORING RESULTS

Project name :	Hynet					**Project number:**	2230746	**Equipment:**	GFM436
Client:	ULES					**Date:**	09/02/23	**Visit:**	1
Atmospheric Readings:	**O_2% v/v :**	20.7	**CO_2% v/v :**	0.0	**CH_4% v/v :**	-0.2	**Weather Conditions :** Cold, clear	**Readings by:**	JB
	H_2S ppm :	0	**CO ppm :**	0	**Pressure trend :**	NA	**Ground Conditions :** Damp	**Checked by:**	MHW

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (Pa)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH067	12:50:00	50mm	1030	0.0	0.3	0.2	19.1	19.3	0.9	0.8	-0.2	-0.2	NR	NR	0.0	0.0	0.0	0.0	NR	NR	NR	2.87	NR	5.73
BH070	14:15:00	50mm	1031	3.0	119.8	0.5	7.2	7.2	1.7	1.7	-0.2	-0.2	NR	NR	0.0	0.0	0.0	0.0	NR	NR	NR	0.06	NR	11.15
BH326	11:30:00	50mm	1028	-14.0	-2.5	-2.5	20.6	20.6	0.0	0.0	-0.2	-0.2	NR	NR	0.0	0.0	0.0	0.0	NR	NR	NR	10.72	NR	10.85

Remarks :

BH070: Borehole depth to be checked on next visit.

Symbols:

>>>>> denotes flow above upper limit of detection (>30l/hr)

<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit NR denotes not recorded

IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	Hynet				**Project number:**	2230746	**Equipment:**	GFM436
Client:	ULES				**Date:**	09/02/23	**Visit:**	1
Atmospheric Readings:	**O_2% v/v :** 20.4	**CO_2% v/v :** 0.0	**CH_4% v/v :** -0.2	**Weather Conditions :** Cold, clear			**Readings by:**	JB
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :** NA	**Ground Conditions :** Damp			**Checked by:**	MHW

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (Pa)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH037	10:00:00	50mm	1031	-1.0	0.3	-0.1	20.1	20.1	0.1	0.1	-0.2	-0.2	NR	NR	0.0	0.0	0.0	0.0	NR	NR	NR	5.08	NR	25.33
BH096	11:05:00	19mm	1025	-2.0	1.1	-0.3	20.3	20.3	0.1	0.0	-0.2	-0.2	NR	NR	0.0	0.0	0.0	0.0	NR	NR	NR	2.56	NR	7.83
BH114	12:00:00	50mm	1030	1.0	5.7	0.1	19.0	19.3	1.0	0.7	-0.2	-0.2	NR	NR	0.0	0.0	0.0	0.0	NR	NR	NR	1.52	NR	3.44

Remarks :

Symbols:

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<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit NR denotes not recorded

IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	HyNet				**Project number:**	2230746	**Equipment:**	GFM 436
Client:	ULES				**Date:**	02/03/23	**Visit:**	2
Atmospheric Readings:	**O_2% v/v :** 20.3	**CO_2% v/v :** 0.0	**CH_4% v/v :** 0.0	**Weather Conditions :**	Cold, overcast, dry		**Readings by:**	FH
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :** -	**Ground Conditions :**	Dry		**Checked by:**	MHW

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (mb)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH002	09:10:00	50	1027	0.14	7.0	2.0	18.7	18.9	2.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	ND	2.01	ND	9.62
BH037	11:30:00	50	1026	-0.01	0.0	0.0	19.8	20.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	5.20	ND	10.36
BH067	16:10:00	50	1026	0.01	0.3	0.0	16.1	19.1	1.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	3.08	ND	5.78
BH094	14:10:00	50	1021	-0.01	-0.5	0.0	16.4	19.6	1.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	1.40	ND	8.87
BH096	13:00:00	19	1020	0.00	0.1	0.0	20.3	20.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	2.75	ND	7.96
BH114	13:30:00	50	1025	0.06	-15.9	-0.9	15.1	15.6	3.3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	1.60	ND	3.48
BH326	15:10:00	50	1023	0.04	1.0	0.4	18.2	18.2	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	10.71	ND	10.74

Remarks :

Symbols:

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<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit

IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	HyNet				**Project number:**	2230746	**Equipment:**	GFM 436
Client:	ULES				**Date:**	03/03/23	**Visit:**	2
Atmospheric Readings:	**O_2% v/v :** 20.3	**CO_2% v/v :** 0.0	**CH_4% v/v :** 0.0	**Weather Conditions :**	Cold, overcast, dry		**Readings by:**	FH
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :** -	**Ground Conditions :**	Dry		**Checked by:**	MHW

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (mb)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH070	09:40:00	50	1031	0.10	13.2	0.0	10.0	10.0	2.2	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	0.22	ND	13.97

Remarks : BH070 Water in tube at 3m 10s, stopped monitoring.

Symbols:

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<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit

IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	HyNet				**Project number:**	2230746	**Equipment:**	GFM 436
Client:	ULES				**Date:**	30/03/23	**Visit:**	3
Atmospheric Readings:	**O_2% v/v :** 20.9	**CO_2% v/v :** 0.0	**CH_4% v/v :** 0.0	**Weather Conditions :**	Cold, overcast, dry		**Readings by:**	AC
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :** -	**Ground Conditions :**	Wet		**Checked by:**	

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (mb)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH002	12:49:00	50	998	0.00	0.0	0.0	20.1	20.4	0.7	0.3	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	NR	1.63	NR	9.67
BH037	14:03:00	50	997	0.00	0.0	0.0	20.2	20.2	0.3	0.3	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	NR	4.98	NR	25.33
BH067	09:59:00	50	977	0.00	0.0	0.0	17.8	18.2	1.9	1.6	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	NR	2.55	NR	5.84
BH070	08:28:00	50	997	0.15	2.8	2.7	11.7	11.7	1.9	1.9	0.0	0.0	0.0	0.0	0	0	0	0	0.3	0.1	NR	0.09	NR	39.26
BH094	15:29:00	50	993	0.00	0.0	0.0	20.4	20.6	0.4	0.2	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	NR	1.00	NR	8.90
BH326	11:16:00	50	995	0.00	0.0	0.0	20.3	20.5	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	NR	Dry	NR	10.78

Remarks : BH037, BH067: Silty base

BH094: Occasional fluctuations in readings.

Symbols:

>>>>> denotes flow above upper limit of detection (>30l/hr)

<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit

IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	HyNet				**Project number:**	2230746	**Equipment:**	GFM 436
Client:	ULES				**Date:**	31/03/23	**Visit:**	3
Atmospheric Readings:	**O_2% v/v :** 20.5	**CO_2% v/v :** 0.0	**CH_4% v/v :** 0.0	**Weather Conditions :**	Cold, cool, showers		**Readings by:**	AC
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :** -	**Ground Conditions :**	Wet		**Checked by:**	

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (mb)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH096	09:23:00	19	976	0.02	0.3	0.0	20.0	20.4	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	NR	2.40	NR	8.85
BH114	08:25:00	50	981	0.08	1.8	1.6	14.6	14.6	3.2	3.2	0.0	0.0	0	0	0	0	0	0	0	0	NR	1.17	NR	3.47

Remarks : BH114: Silty base.

Symbols:

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IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	HyNet					**Project number:**	2230746	**Equipment:**	GFM436
Client:	ULES					**Date:**	26/04/23	**Visit:**	4
Atmospheric Readings:	**O_2% v/v :** 20.9	**CO_2% v/v :** 0.0	**CH_4% v/v :** 0.0	**Weather Conditions :**	Dry, suuny and warm			**Readings by:**	TB
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :**	**Ground Conditions :**	Dry			**Checked by:**	MHW

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (mb)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH002	14:15:00	50	1015	NR	14.1	0.0	20.6	20.6	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	1.88	ND	9.57
BH067	15:15:00	50	1015	NR	0.0	0.0	18.5	18.5	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	2.98	ND	5.87
BH070	16:06:00	50	1015	NR	0.0	0.0	13.0	13.0	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	0.18	ND	39.1
BH114	17:02:00	50	1014	NR	-47.3	0.0	20.3	20.3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	1.50	ND	3.50
BH326	14:47:00	50	1011	NR	0.0	0.0	18.6	18.6	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	DRY	ND	10.73

Remarks :

Symbols:

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<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit

IAN FARMER ASSOCIATES

GAS AND GROUNDWATER MONITORING RESULTS

Project name :	HyNet				**Project number:**	2230746	**Equipment:**	GFM436
Client:	ULES				**Date:**	27/04/23	**Visit:**	4
Atmospheric Readings:	**O_2% v/v :** 20.9	**CO_2% v/v :** 0.0	**CH_4% v/v :** 0.0	**Weather Conditions :**	Dry and cloudy		**Readings by:**	TB
	H_2S ppm : 0	**CO ppm :** 0	**Pressure trend :**	**Ground Conditions :**	Dry		**Checked by:**	MHW

Location	Time	Standpipe Diameter (mm)	Atmospheric Pressure (mb)	Differential Pressure (mb)	Gas Flow Rate (l/hr)		O_2(% v/v)		CO_2 (% v/v)		CH_4 (% v/v)		CH_4 (% LEL)		H_2S (ppm)		CO (ppm)		VOC (ppm)		Depth to LNAPL	Water Depth	Depth to DNAPL	Well Depth
					Peak min (-) or max (+)	Steady	Low	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	(mbgl)	(mbgl)	(mbgl)	(mbgl)
BH037	08:35:00	50	1012	NR	0.3	0.0	20.0	20.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	5.01	ND	25.19
BH094	10:22:00	50	1007	NR	1.2	0.0	19.8	19.8	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	1.40	ND	8.85
BH096	09:59:00	19	1006	NR	-0.1	0.1	20.6	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ND	2.80	ND	8.85

Remarks :

Symbols:

>>>>> denotes flow above upper limit of detection (>30l/hr)

<<< denotes negative flow below lower limit of detection (<-10l/hr)

>Max denotes in excess of lower explosive limit

APPENDIX 3

GEOTECHNICAL TESTS

APPENDIX 3

GENERAL NOTES ON LABORATORY TESTS

A3.1 Geotechnical Testing

A3.1.1 Geotechnical analysis was carried out to the testing procedures identified on the test reports.

A3.1.2 Subcontracted results are presented directly on headed paper from the subcontracting laboratory.

Geotechnical Test Results – Soil and Rock

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746 / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	21/10/2022
Date Testing Started:	26/10/2022
Date Testing Finished:	02/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 02/11/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH017	2.00	D10	17.1	Natural	98	18	35	22	13	-0.34	CL/CI			Red Brown/Light Grey sandy, very silty CLAY
BH017	4.00	D14	19.4	Natural	97	20	32	17	15	0.21	CL			Brown/Light Grey sandy, silty CLAY
BH017	7.00	D20	16.8	Natural	97	17		20*						Brown sandy, silty CLAY *Insufficient sample. PL tested only.

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 3

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH017	9.36	C23	Red/Brown MUDSTONE	4.2						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746 / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 4

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH017	9.36	C23	Red/Brown MUDSTONE	86.0	246.4	2.9	2.31	4.2	as received	0.4997	S	7.8	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Final Test Report - 2230746 / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746
Originating Client:	Cadent

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

This test report shall not be reproduced, except in full and only with the written permission of Ian Farmer Associates Ltd.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 02/11/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746A / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746A
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	28/09/2022
Date Scheduled:	21/10/2022
Date Testing Started:	26/10/2022
Date Testing Finished:	04/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 07/11/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746A

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH021	0.70	B4	23.1	Sieved	58	40		NP						Brown sandy, clayey SILT
BH021	2.20	B9	21.2	Sieved	59	36	23	15	8	2.59	CL			Brown clayey SILT/GRAVEL/SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

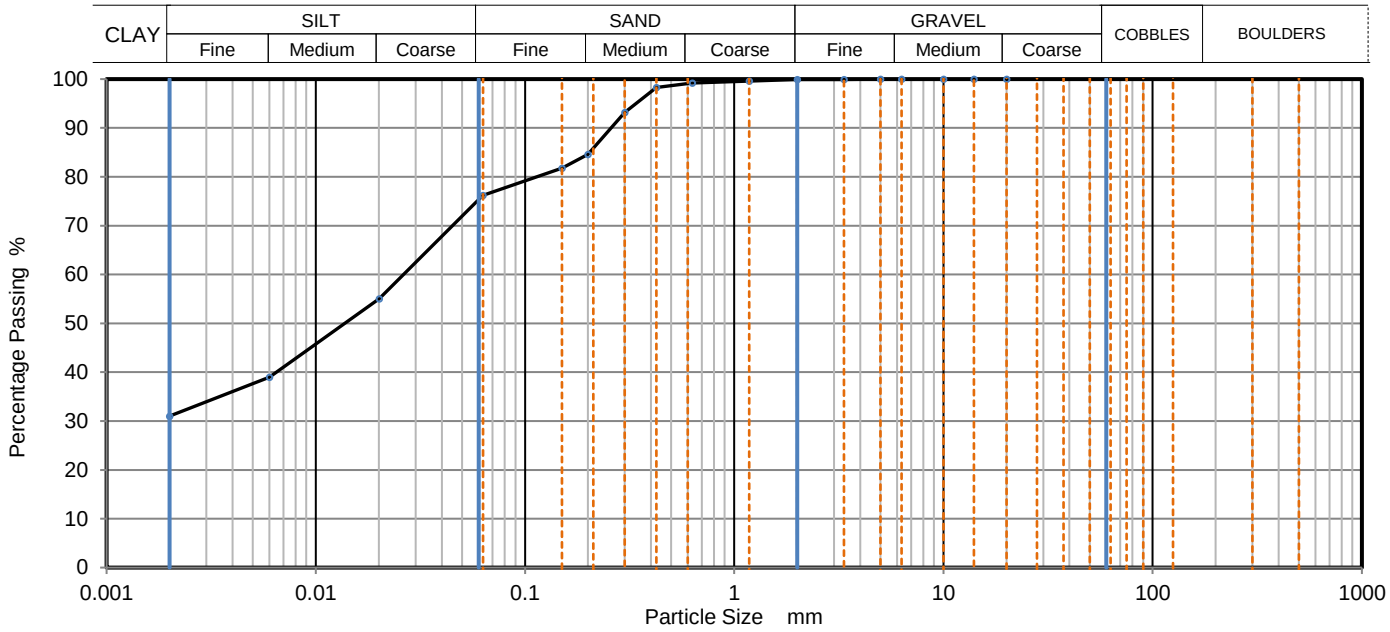
Laboratory Test Report	2230746A / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746A

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH021	0.70	B4	Wet Sieve + Pipette	Brown sandy, clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	55
		0.0060	39
		0.0020	31
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	93		
0.2	85		
0.15	82		
0.063	76		

Dry Mass of sample, g	1163

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	24
Silt	45
Clay	31

Grading Analysis		
D100	mm	6.3
D60	mm	0.0263
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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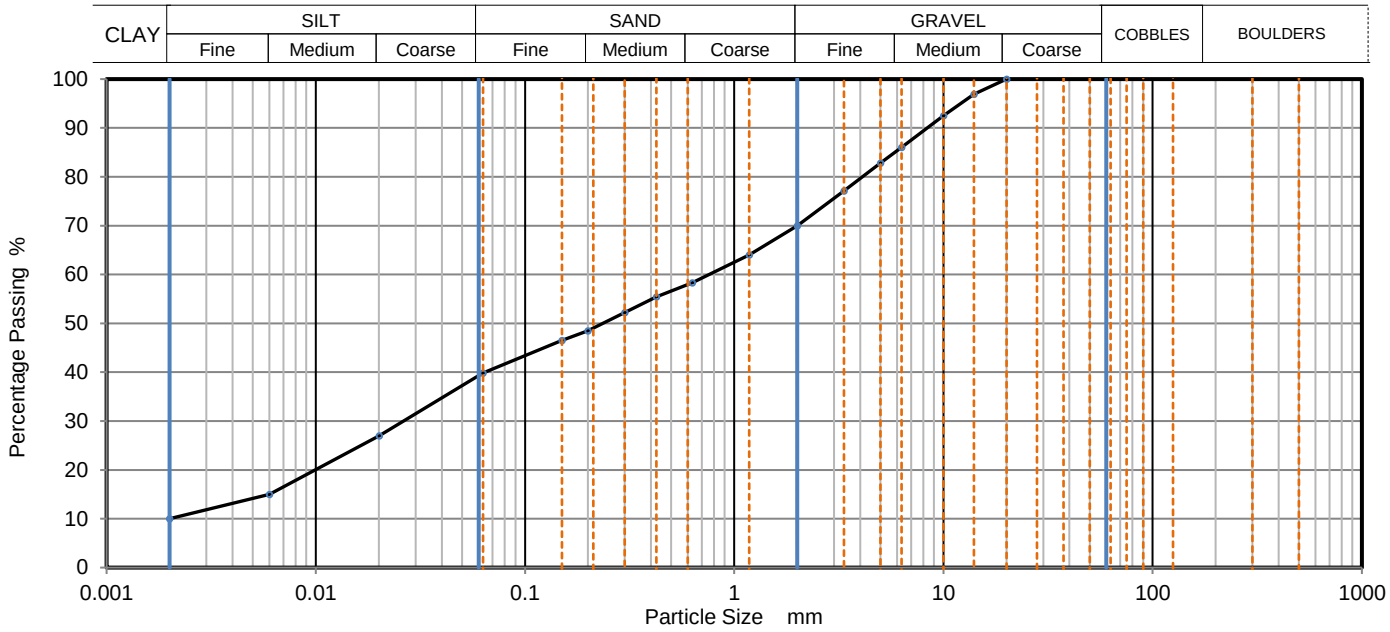
Laboratory Test Report	2230746A / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746A

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH021	2.20	B9	Wet Sieve + Pipette	Brown clayey SILT/GRAVEL/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	27
		0.0060	15
		0.0020	10
20	100		
14	97		
10	93		
6.3	86		
5	83		
3.35	77		
2	70	Particle density	(assumed)
1.18	64	2.65	Mg/m3
0.63	58		
0.425	55		
0.3	52		
0.2	49		
0.15	47		
0.063	40		

Dry Mass of sample, g: 1117

Sample Proportions	% dry mass
Very coarse	0
Gravel	30
Sand	30
Silt	30
Clay	10

Grading Analysis		
D100	mm	20
D60	mm	0.761
D30	mm	0.0255
D10	mm	0.00207
Uniformity Coefficient		370
Curvature Coefficient		0.41

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746A / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746A

Client: Cadent **Page:** 5

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH021	7.64	C14	Red/Brown MUDSTONE/SILTSTONE	9.2						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746A / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746A

Client: Cadent **Page:** 6

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH021	7.64	C14	Red/Brown MUDSTONE/SILTSTONE	86.0	99.7	*1.2	2.38	9.2	as received	0.4988	F	0.8	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Final Test Report - 2230746A / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746A
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 07/11/2022

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F.A.O.

Final Test Report - 2230746B / 2

Site: HyNet North West - Hydrogen Pipeline

Job Number: 2230746B

Originating Client: Cadent

Originating Reference: 2230746

Date Sampled: Not Given

Date Scheduled: 21/10/2022

Date Testing Started: 26/10/2022

Date Testing Finished: 11/11/2022

Previous Reports		Amendments	Date Issued
1	Interim		02/11/2022

Amendments: Additional tests added

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 14/11/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746B

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH060	1.00	B7	20.1	Sieved	48	42		NP						Brown SAND
BH060	2.45	D10	15.6	Natural	100	16	24	13	11	0.24	CL			Brown slightly gravelly, sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

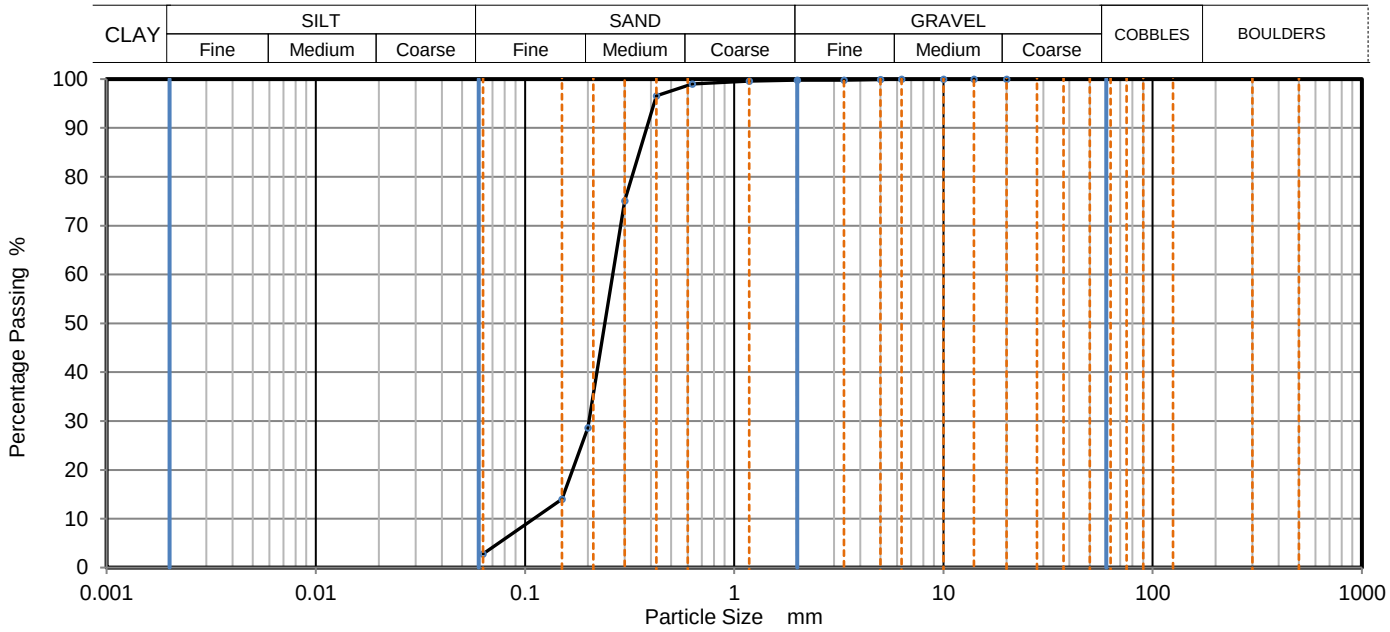
Laboratory Test Report 2230746B / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746B

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH060	1.00	B7	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	97		
0.3	75		
0.2	29		
0.15	14		
0.063	3		

Dry Mass of sample, g 663

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	97
Fines <0.063mm	3

Grading Analysis		
D100	mm	6.3
D60	mm	0.263
D30	mm	0.202
D10	mm	0.11
Uniformity Coefficient		2.4
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746B

Client: Cadent **Page:** 4

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH060	6.41	C12	Red/Brown SANDSTONE	11.7						
BH060	7.61	C13	Red/Brown SANDSTONE	3.1						
BH060	9.50	C14	Red/Brown SANDSTONE	11.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746B

Client: Cadent **Page:** 5

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH060	7.61	C13	Red/brown SANDSTONE	86.0	212.5	2.5	2.26	10.7	as received	0.4996	AC	12.7	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746B

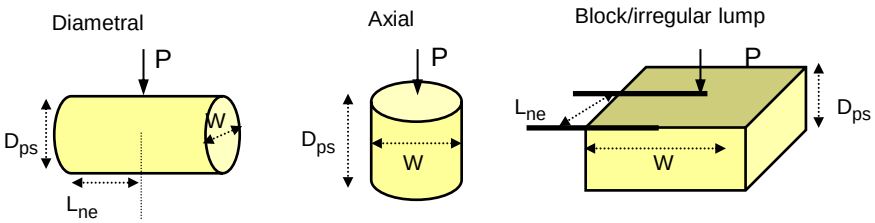
Client: Cadent **Page:** 6

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH060	6.41	C12	Red/Brown SANDTONE As received	D	U	YES	59.1	85.9	85.9	82.9	0.5	85.9	0.07	0.09	
BH060	6.41	C12	Red/Brown SANDTONE As received	A	U	YES		85.9	57.9	41.9	1.7	79.5	0.27	0.34	
BH060	9.50	C14	Red/Brown SANDTONE As received	D	U	YES	78.4	86.2	86.2	83.2	1.0	86.2	0.13	0.17	
BH060	9.50	C14	Red/Brown SANDTONE As received	A	U	YES		86.1	76.6	71.6	2.2	91.6	0.26	0.34	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746B / 2

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746B
Originating Client:	Cadent

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Report Issue Date: 14/11/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746C / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746C
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	21/10/2022
Date Testing Started:	26/10/2022
Date Testing Finished:	15/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 15/11/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746C

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH061	0.90	B4	19.3	Sieved	93	21		NP						Brown slightly silty, slightly clayey SAND
BH061	2.50	D8	22	Natural	97	23	32	17	15	0.38	CL			Brown slightly silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

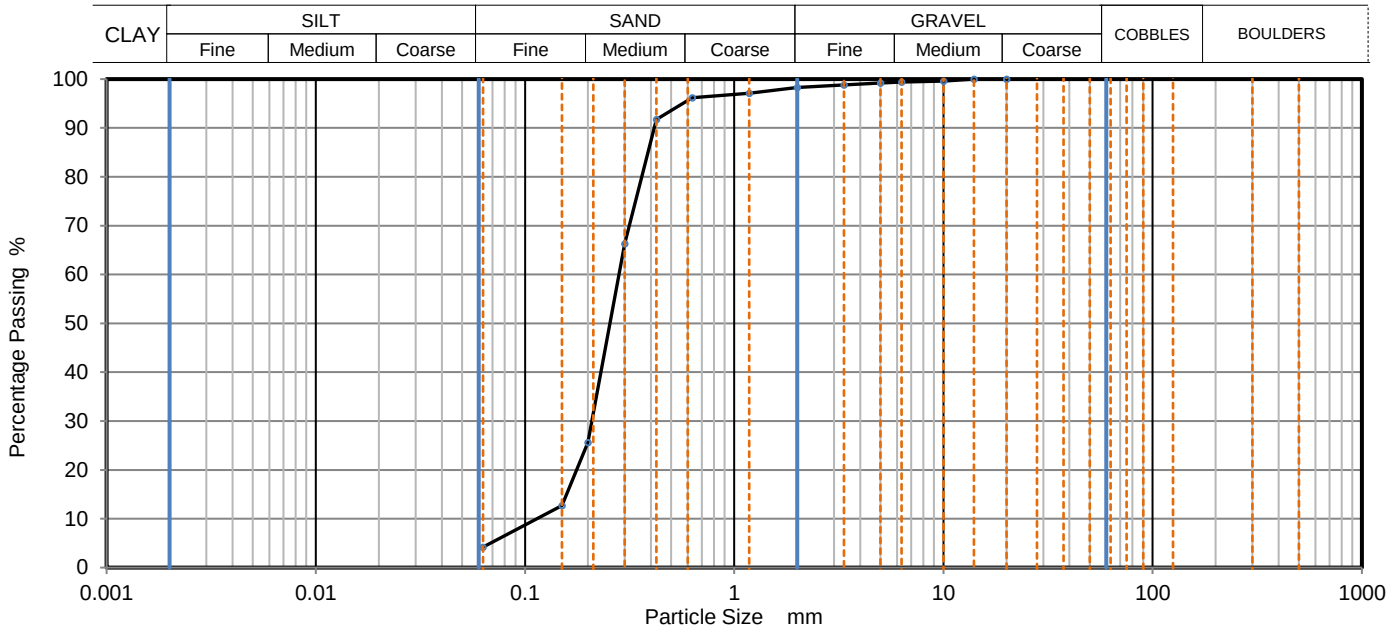
Laboratory Test Report	2230746C / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746C

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH061	0.90	B4	Wet Sieve	Brown slightly silty, slightly clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	97		
0.63	96		
0.425	92		
0.3	66		
0.2	26		
0.15	13		
0.063	4		

Dry Mass of sample, g: 1025

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	94
Fines <0.063mm	4

Grading Analysis		
D100	mm	14
D60	mm	0.282
D30	mm	0.209
D10	mm	0.113
Uniformity Coefficient		2.5
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746C

Client: Cadent **Page:** 4

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH061	5.90	C9	Red/Brown SANDSTONE	12.7						
BH061	7.62	C10	Red/Brown SANDSTONE	11.2						
BH061	9.25	C11	Red/Brown SANDSTONE	7.8						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746C / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746C

Client: Cadent **Page:** 5

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH061	9.25	C11	Red/brown SANDSTONE	85.7	200.6	*2.3	2.46	7.8	as received	0.5031	AC	22.0	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746C / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746C

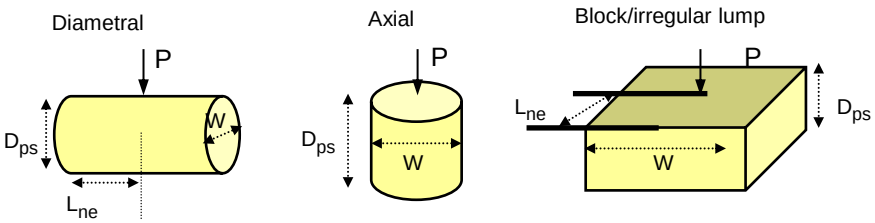
Client: Cadent **Page:** 6

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH061	5.90	C9	Red/ Brown SANDSTONE As received	D	U	YES	18.8	83.4	83.4	81.4	0.1	83.4	0.01	0.01	
BH061	5.90	C9	Red/ Brown SANDSTONE As received	A	U	YES		83.6	22.4	18.4	0.2	48.8	0.07	0.07	
BH061	7.62	C10	Red/Brown SANDSTONE As received	D	U	YES	29.9	85.2	85.2	84.2	0.2	85.2	0.03	0.04	
BH061	7.62	C10	Red/Brown SANDSTONE As received	A	U	YES		85.8	32.3	24.3	0.5	59.4	0.15	0.17	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746C / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746C
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 15/11/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746D / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746D
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	21/10/2022
Date Testing Started:	31/10/2022
Date Testing Finished:	09/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 10/11/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746D

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH066	1.00	D6	26.8	Sieved	100	27		NP						Brown sandy, clayey SILT
BH066	1.20	B7	26.9	Sieved	100	27		NP						Brown clayey SILT/SAND
BH066	4.00	B13	25	Sieved	76	33		NP						Brown slightly silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

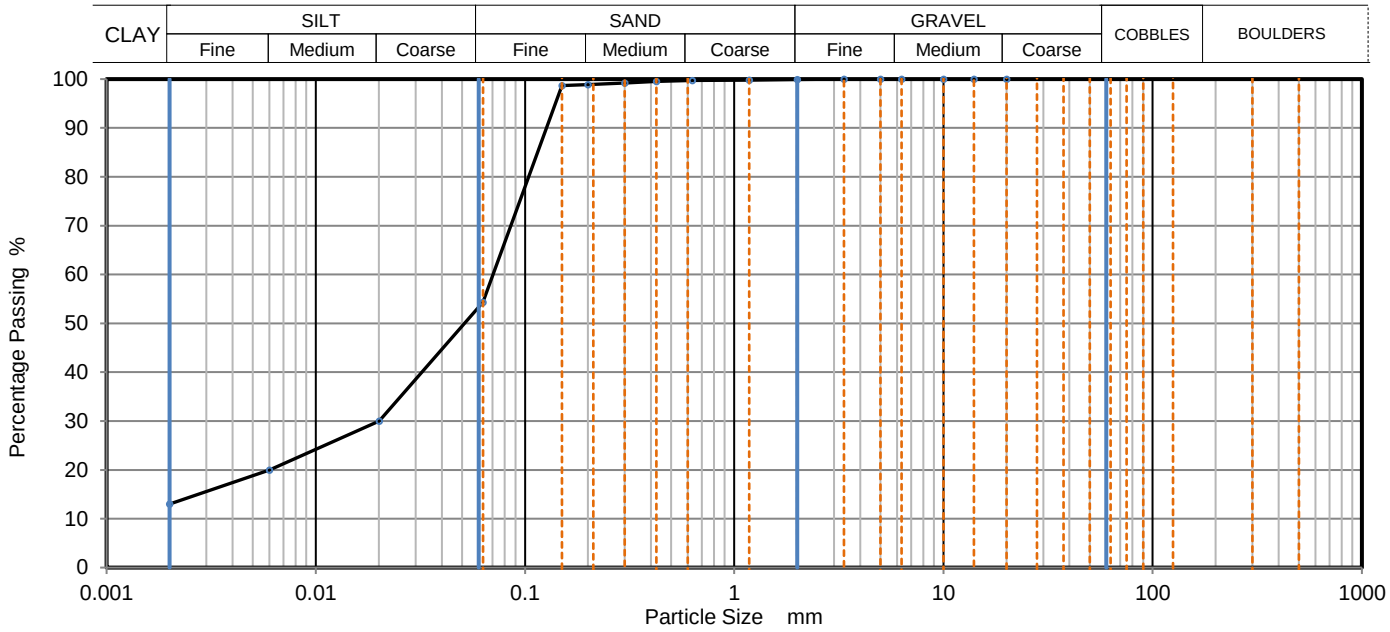
Laboratory Test Report | 2230746D / 1

Site: HyNet North West - Hydrogen Pipeline | **Job Number:** 2230746D

Client: Cadent | **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH066	1.20	B7	Wet Sieve + Pipette	Brown clayey SILT/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	30
		0.0060	20
		0.0020	13
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	100		
0.3	99		
0.2	99		
0.15	99		
0.063	54		

Dry Mass of sample, g: 463

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	46
Silt	41
Clay	13

Grading Analysis		
D100	mm	3.35
D60	mm	0.0704
D30	mm	0.0193
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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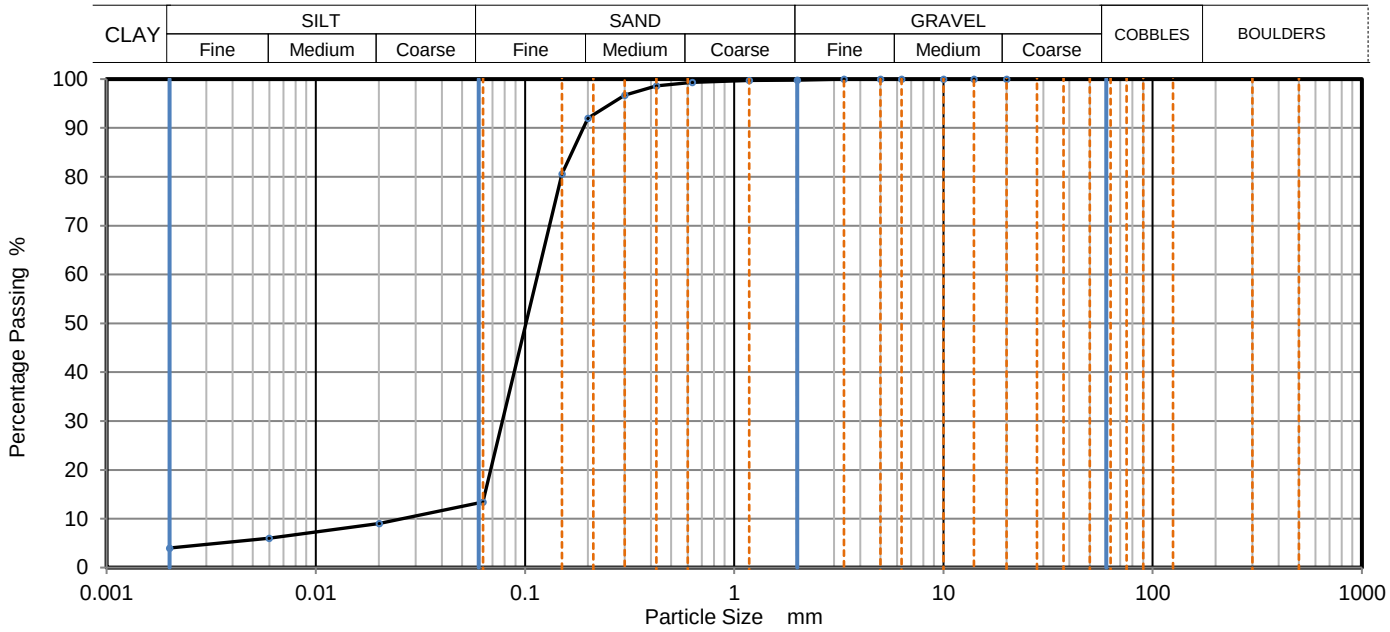
Laboratory Test Report	2230746D / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746D

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH066	4.00	B13	Wet Sieve + Pipette	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	9
		0.0060	6
		0.0020	4
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	99		
0.3	97		
0.2	92		
0.15	81		
0.063	13		

Dry Mass of sample, g	335

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	86
Silt	10
Clay	4

Grading Analysis		
D100	mm	3.35
D60	mm	0.115
D30	mm	0.0781
D10	mm	0.0259
Uniformity Coefficient		4.4
Curvature Coefficient		2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746D

Client: Cadent **Page:** 5

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH066	16.76	C20		11.2						
BH066	18.50	C21		12.1						
BH066	22.30	C23		9.3						
BH066	26.52	C24		9.1						
BH066	31.30	C25		9.1						
BH066	34.30	C26		9.4	1.89	16.2			2.07	
BH066	37.60	C27		10.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746D

Client: Cadent **Page:** 6

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH066	18.50	C21	Red/Brown SANDSTONE	84.5	211.9	2.5	2.24	12.1	as received	0.4944	AC	19.9	
BH066	26.52	C24	Red/Brown SANDSTONE	82.8	164.3	*2	2.34	9.1	as received	0.4903	AC	20.3	
BH066	37.60	C27	Red/brown SANDSTONE	85.4	210.5	2.5	2.32	10.0	as received	0.4833	AC	25.3	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746D

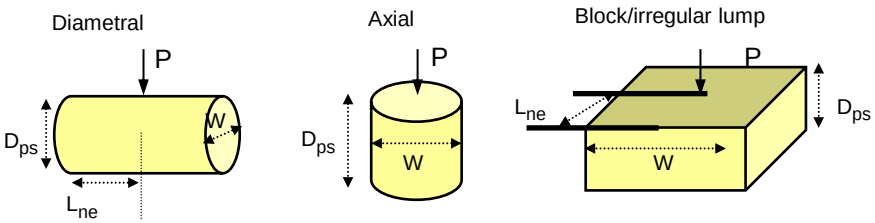
Client: Cadent **Page:** 7

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH066	16.76	C20	Red/Brown SANDSTONE As received	D	U	YES	37.1	83.7	83.7	80.7	1.2	83.7	0.17	0.21	
BH066	16.76	C20	Red/Brown SANDSTONE As received	A	U	YES		84.4	42.0	38.0	1.1	67.2	0.24	0.28	
BH066	22.30	C23	Red/Brown SANDSTONE As received	D	U	YES	55.0	80.5	80.5	77.5	0.6	80.5	0.10	0.12	
BH066	22.30	C23	Red/Brown SANDSTONE As received	A	U	YES		80.5	41.3	36.3	1.1	65.0	0.26	0.30	
BH066	31.30	C25	Red/Brown SANDSTONE As received	D	U	YES	46.5	82.4	82.4	79.4	3.8	82.4	0.56	0.70	
BH066	31.30	C25	Red/Brown SANDSTONE As received	A	U	YES		82.5	52.6	48.6	3.6	74.3	0.65	0.77	
BH066	34.30	C26	Red/Brown/Grey SANDSTONE As received	D	U	YES	62.1	80.8	80.8	76.8	1.9	80.8	0.29	0.36	
BH066	34.30	C26	Red/Brown/Grey SANDSTONE As received	A	U	YES		80.5	66.0	46.0	5.0	82.3	0.74	0.92	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746D / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746D
Originating Client:	Cadent

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Report Issue Date: 10/11/2022

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F.A.O.

Final Test Report - 2230746E / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746E
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	21/10/2022
Date Testing Started:	01/11/2022
Date Testing Finished:	08/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 09/11/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746E

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH067	2.65	B11	31.7	Sieved	96	33		NP						Brown slightly clayey, silty SAND
BH067	7.00	B19	21.7	Sieved	83	26		NP						Brown slightly clayey, silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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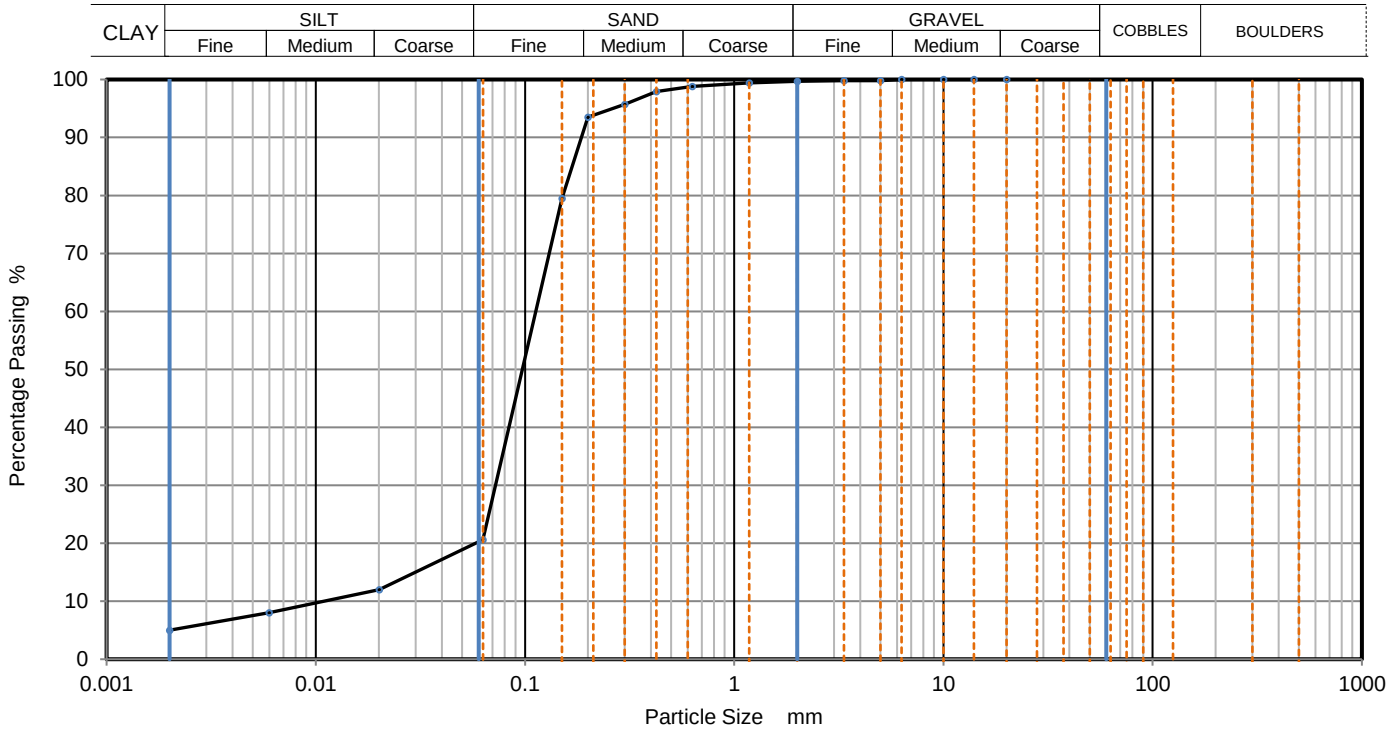
Laboratory Test Report 2230746 / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH067	2.65	B11	Wet Sieve + Pipette	Brown slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	12
		0.0060	8
		0.0020	5
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density (assumed)	
1.18	99	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	96		
0.2	94		
0.15	80		
0.063	21		

Dry Mass of sample, g: 380

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	79
Silt	15
Clay	5

Grading Analysis		
D100	mm	6.3
D60	mm	0.113
D30	mm	0.0723
D10	mm	0.0122
Uniformity Coefficient		9.2
Curvature Coefficient		3.8

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7 3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method
BS1377:Part 2:1990, clause 9.4 Determination of sedimentation by pipette method

UKAS TESTING
1464

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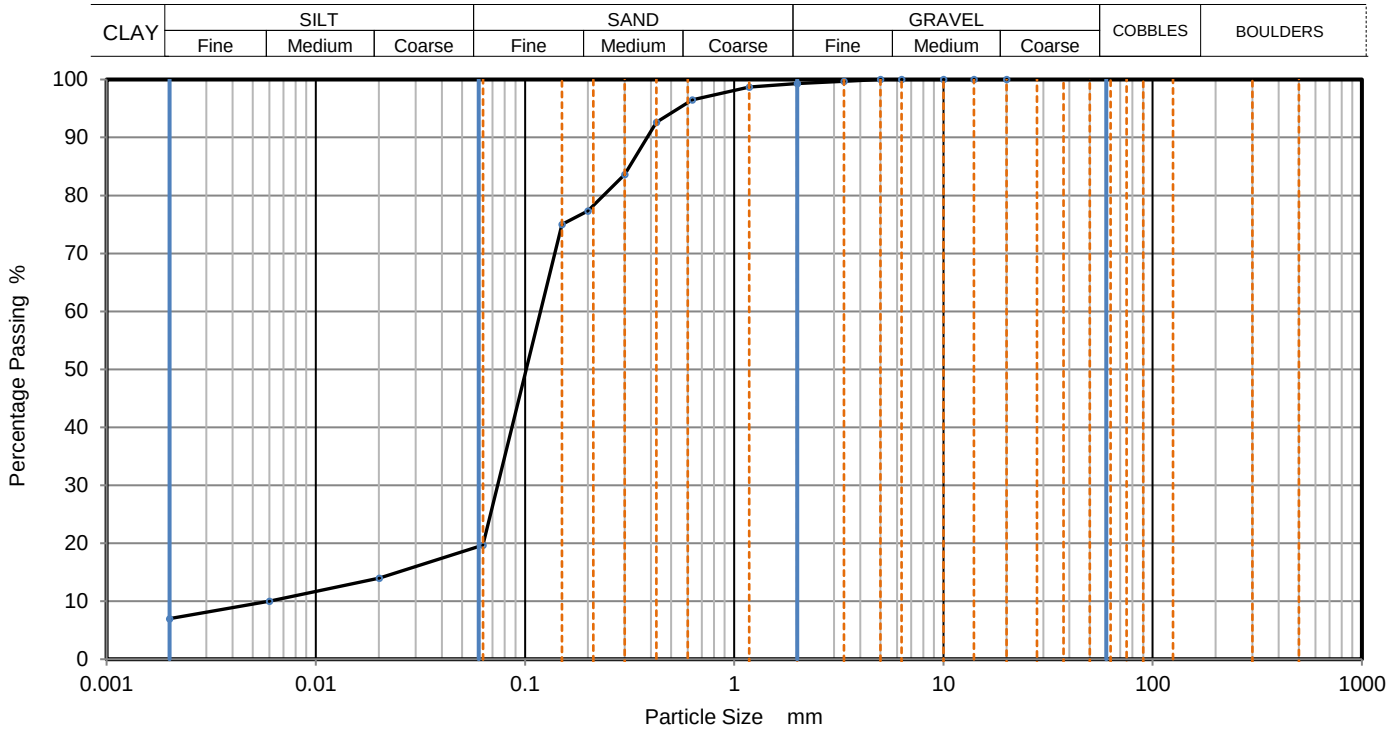
Laboratory Test Report 2230746 / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH067	7.00	B19	Wet Sieve + Pipette	Brown slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	14
		0.0060	10
		0.0020	7
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99	Particle density (assumed)	
1.18	99	2.65	Mg/m3
0.63	97		
0.425	93		
0.3	84		
0.2	77		
0.15	75		
0.063	20		

Dry Mass of sample, g: 506

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	80
Silt	13
Clay	7

Grading Analysis		
D100	mm	5
D60	mm	0.119
D30	mm	0.074
D10	mm	0.00566
Uniformity Coefficient		21
Curvature Coefficient		8.2

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7 3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method
BS1377:Part 2:1990, clause 9.4 Determination of sedimentation by pipette method

UKAS TESTING
1464

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746E

Client: Cadent **Page:** 5

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH067	9.52	C24	Red/Brown SANDSTONE	8.7						
BH067	10.40	C25	Red/Brown SANDSTONE	8.9						
BH067	13.91	C26	Red/Brown SANDSTONE	11.0						
BH067	14.50	C27	Red/Brown SANDSTONE	12.1						
BH067	16.15	C28	Brown SANDSTONE	6.8						
BH067	18.56	C22	Red/Brown SANDSTONE	10.8						
BH067	22.25	C29	Red/Brown SANDSTONE	10.9						
BH067	23.27	C30	Red/Brown SANDSTONE	7.2						
BH067	26.00	C31	Red/Brown SANDSTONE	6.5						
BH067	30.30	C32	Red/Brown SANDSTONE	10.7						
BH067	36.80	C33	Red/Brown SANDSTONE	9.8						
BH067	39.85	C34	Red/Brown SANDSTONE	10.2						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746E

Client: Cadent **Page:** 6

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH067	10.40	C25	Red/brown SANDSTONE	85.7	141.0	*1.6	2.32	8.9	as received	0.5024	F	6.7	
BH067	14.50	C27	Red/Brown SANDSTONE	85.8	158.8	*1.9	2.22	12.1	as received	0.5022	AC	16.9	
BH067	22.25	C29	Red/Brown SANDSTONE	86.6	190.1	*2.2	2.22	10.8	as received	0.4699	AC	16.4	
BH067	36.80	C33	Red/Brown SANDSTONE	86.2	100.9	*1.2	2.29	10.7	as received	0.4970	AC	26.2	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746E

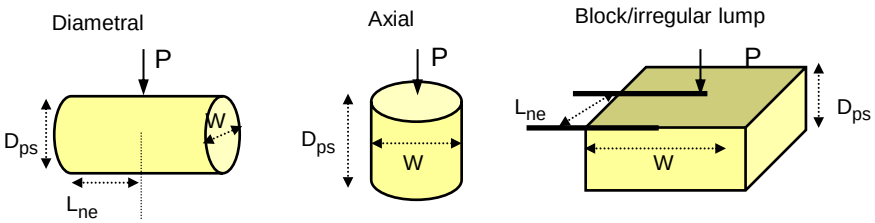
Client: Cadent **Page:** 7

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH067	9.52	C24	Red/Brown/Grey SANDSTONE As received	D	U	YES	30.5	85.2	85.2	81.2	1.0	85.2	0.14	0.17	
BH067	9.52	C24	Red/Brown/Grey SANDSTONE As received	A	U	YES		85.0	36.8	33.8	0.7	63.1	0.18	0.20	
BH067	13.91	C26	Red/Brown SANDSTONE As received	D	U	YES	57.5	85.5	85.5	81.5	2.3	85.5	0.32	0.41	
BH067	13.91	C26	Red/Brown SANDSTONE As received	A	U	YES		85.7	48.3	41.3	2.1	72.6	0.40	0.47	
BH067	16.15	C28	Light Brown/Grey SANDSTONE As received	D	U	YES	48.0	85.7	85.7	81.7	1.3	85.7	0.17	0.22	
BH067	16.15	C28	Light Brown/Grey SANDSTONE As received	A	U	YES		85.6	51.2	43.2	3.4	74.7	0.61	0.73	
BH067	18.56	C22	Red/Brown SANDSTONE As received	D	U	YES	59.9	85.0	85.0	82.0	0.5	85.0	0.07	0.08	
BH067	18.56	C22	Red/Brown SANDSTONE As received	A	U	YES		84.9	57.4	52.4	1.7	78.8	0.27	0.33	
BH067	23.27	C30	Red/Brown SANDSTONE As received	D	U	YES	60.1	86.2	86.2	82.2	0.6	86.2	0.08	0.10	
BH067	23.27	C30	Red/Brown SANDSTONE As received	A	U	YES		86.3	49.7	40.7	1.8	73.9	0.33	0.40	
BH067	26.00	C31	Red/Brown SANDSTONE As received	D	U	YES	49.5	86.7	86.7	82.7	1.5	86.7	0.20	0.26	
BH067	26.00	C31	Red/Brown SANDSTONE As received	A	U	YES		87.2	50.7	38.7	2.1	75.1	0.38	0.46	
BH067	30.30	C32	Red/Brown SANDSTONE As received	D	U	YES	55.1	86.3	86.3	82.3	2.2	86.3	0.29	0.38	
BH067	30.30	C32	Red/Brown SANDSTONE As received	A	U	YES		86.2	47.9	38.9	2.3	72.5	0.45	0.53	
BH067	39.85	C34	Red/Brown SANDSTONE As received	D	U	YES	53.5	83.2	83.2	80.2	1.2	83.2	0.18	0.22	
BH067	39.85	C34	Red/Brown SANDSTONE As received	A	U	YES		83.1	52.4	46.4	1.4	74.4	0.26	0.31	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746E / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746E
Originating Client:	Cadent

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 09/11/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Supplemental Test Report - 2230746F / 2

Site: HyNet North West - Hydrogen Pipeline

Job Number: 2230746F

Originating Client: Cadent

Originating Reference: 2230746

Date Sampled: Not Given

Date Scheduled: 21/10/2022

Date Testing Started: 01/11/2022

Date Testing Finished: 18/11/2022

Previous Reports		Amendments	Date Issued
1	Final		14/11/2022

Amendments: 2x Point Load results added

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 18/11/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746F

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH094	0.50	B5	16.2	Sieved	75	22	31	20	11	0.14	CL			Brown slightly gravelly, clayey, silty SAND
BH094	1.50	D11	19.1	Natural	100	19	36	17	19	0.11	CI			Brown silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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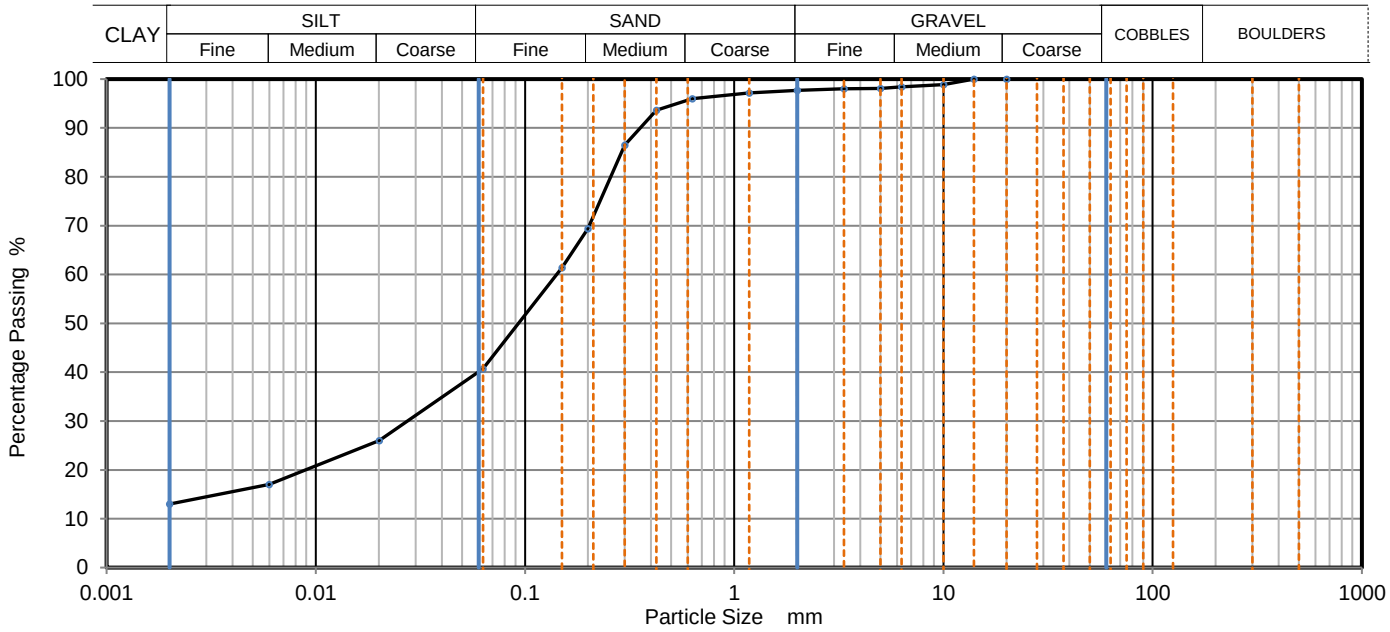
Laboratory Test Report	2230746F / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746F

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH094	0.50	B5	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	26
		0.0060	17
		0.0020	13
20	100		
14	100		
10	99		
6.3	98		
5	98		
3.35	98		
2	98	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.63	96		
0.425	94		
0.3	87		
0.2	69		
0.15	61		
0.063	41		

Dry Mass of sample, g: 705

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	57
Silt	28
Clay	13

Grading Analysis		
D100	mm	14
D60	mm	0.141
D30	mm	0.0276
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746F

Client: Cadent **Page:** 4

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH094	5.40	C14	Red/Brown MUD/SANDSTONE	10.3						
BH094	5.90	C15	Red/Brown MUD/SANDSTONE	10.0						
BH094	7.73	C16	Red/Brown MUD/SANDSTONE	7.2						
BH094	8.60	C17	Red/Brown MUD/SANDSTONE	10.4						
BH094	9.70	C18	Red/Brown MUD/SANDSTONE	7.9						
BH094	10.20	C19	Red/Brown MUD/SANDSTONE	7.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746F

Client: Cadent **Page:** 5

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH094	5.90	C15	Red/Brown MUDSTONE	85.5	131.1	*1.5	2.37	10.0	as received	0.5046	AC	0.6	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746F

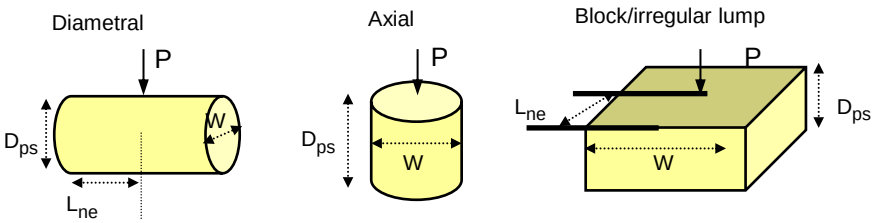
Client: Cadent **Page:** 6

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH094	5.40	C14	Red/Brown MUD/SANDSTONE As received	D	U	YES	29.9	85.4	85.4	81.4	0.3	85.4	0.04	0.05	
BH094	5.40	C14	Red/Brown MUD/SANDSTONE As received	A	U	YES		85.5	39.2	34.2	0.1	65.3	0.02	0.02	
BH094	7.73	C16	Red/Brown MUD/SANDSTONE As received	D	U	YES	36.5	85.5	85.5	82.5	1.7	85.5	0.23	0.29	
BH094	7.73	C16	Red/Brown MUD/SANDSTONE As received	A	U	YES		86.1	47.7	38.7	6.0	72.3	1.15	1.35	
BH094	8.60	C17	Red/Brown MUD/SANDSTONE As received	D	U	YES	31.0	84.7	84.7	82.7	0.0	84.7	0.01	0.01	
BH094	8.60	C17	Red/Brown MUD/SANDSTONE As received	A	U	YES		85.4	39.0	23.0	0.2	65.1	0.04	0.05	
BH094	9.70	C18	Red/Brown MUD/SANDSTONE As received	D	U	YES	23.9	85.9	85.9	80.9	1.3	85.9	0.18	0.23	
BH094	9.70	C18	Red/Brown MUD/SANDSTONE As received	A	U	YES		86.0	36.3	32.3	1.1	63.0	0.28	0.31	
BH094	10.20	C19	Brown MUD/SANDSTONE As received	D	PL	YES	32.2	86.7	86.7	83.7	0.1	86.7	0.01	0.01	
BH094	10.20	C19	Brown MUD/SANDSTONE As received	A	PD	YES		86.6	41.6	33.6	0.5	67.7	0.11	0.13	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Supplemental Test Report - 2230746F / 2

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746F
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 18/11/2022

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washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230746G / 2

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746G
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	29/09/2022
Date Scheduled:	21/10/2022
Date Testing Started:	27/10/2022
Date Testing Finished:	21/11/2022

Previous Reports		Amendments	Date Issued
1	Interim		10/11/2022

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 21/11/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746G

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH106	1.30	B8	22.2	Sieved	98	23		NP						Brown clayey SAND/SILT
BH106	5.20	B15	24.8	Sieved	99	25		NP						Brown slightly gravelly, silty SAND
BH106	8.00	UT19	23	Natural	100	23	30	17	13	0.46	CL			Brown clayey SILT
BH106	9.50	D21	16.7	Sieved	92	18	34	15	19	0.17	CL	20.2 20.2	0.9968	Brown sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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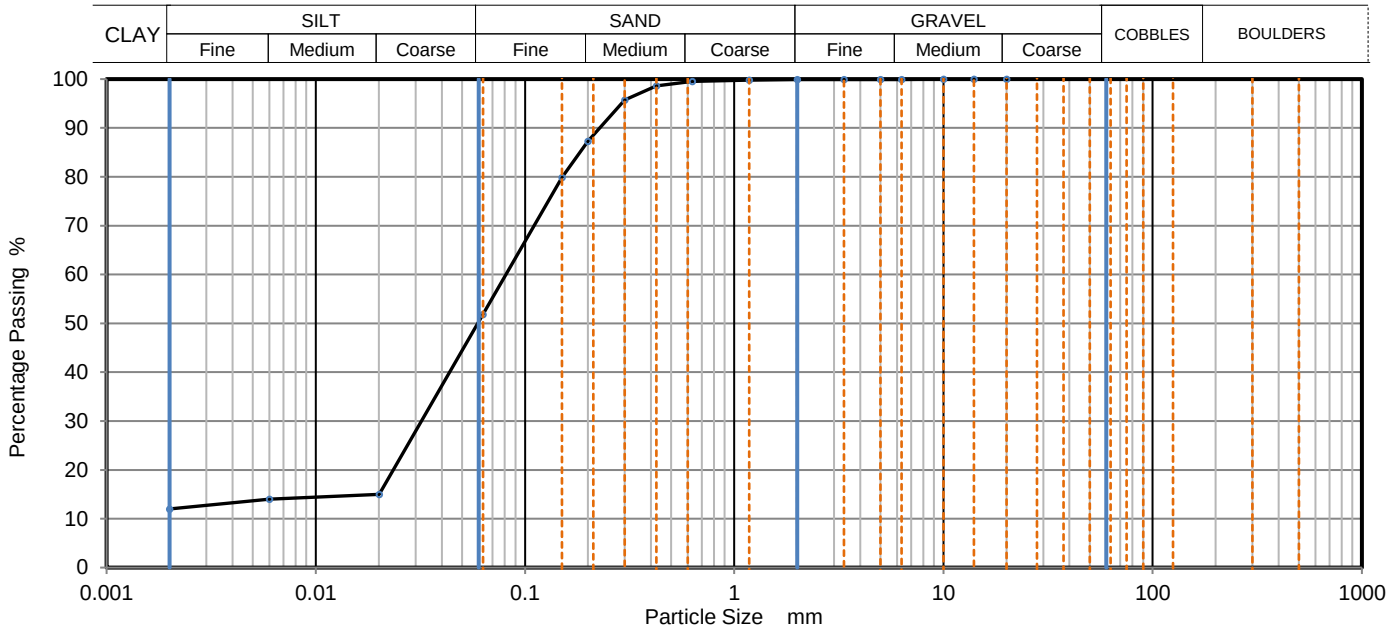
Laboratory Test Report	2230746G / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746G

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH106	1.30	B8	Wet Sieve + Pipette	Brown clayey SAND/SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	15
		0.0060	14
		0.0020	12
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	99		
0.3	96		
0.2	87		
0.15	80		
0.063	52		

Dry Mass of sample, g: 511

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	48
Silt	40
Clay	12

Grading Analysis		
D100	mm	10
D60	mm	0.0811
D30	mm	0.0317
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

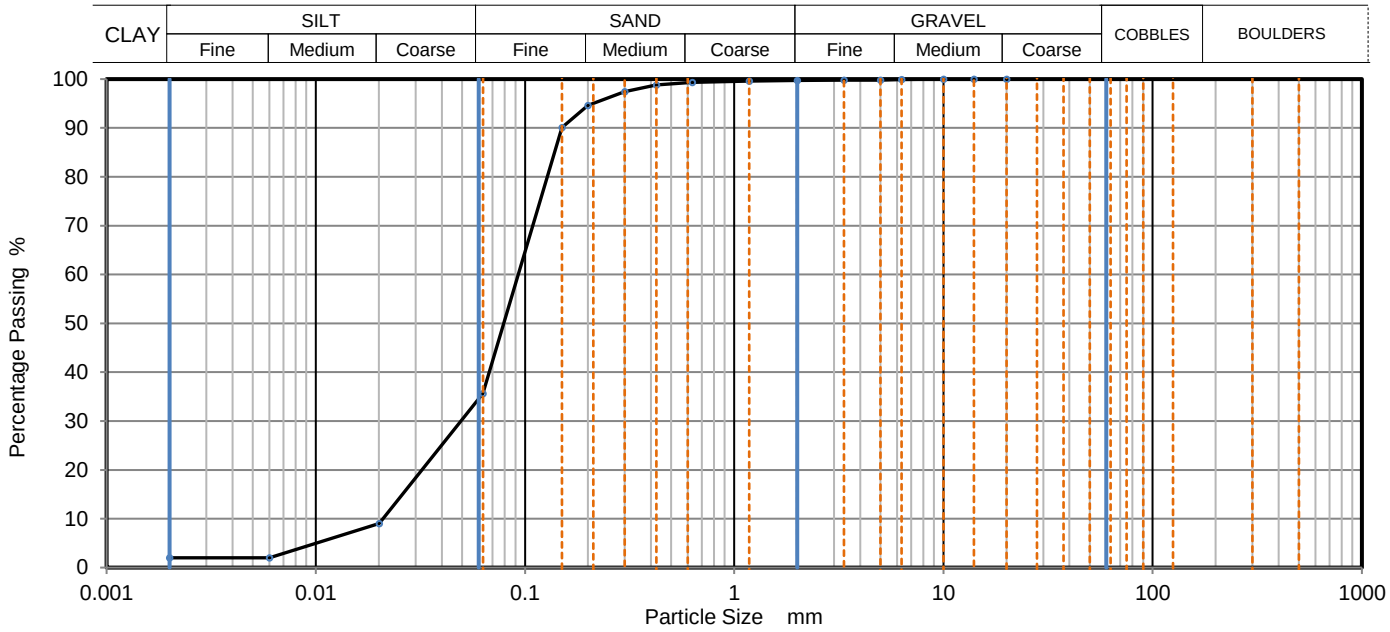
Laboratory Test Report	2230746G / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746G

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH106	5.20	B15	Wet Sieve + Pipette	Brown slightly gravelly, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	9
		0.0060	2
		0.0020	2
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	99		
0.3	97		
0.2	95		
0.15	90		
0.063	36		

Dry Mass of sample, g: 459

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	64
Silt	34
Clay	2

Grading Analysis		
D100	mm	10
D60	mm	0.0928
D30	mm	0.0493
D10	mm	0.0207
Uniformity Coefficient		4.5
Curvature Coefficient		1.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746G

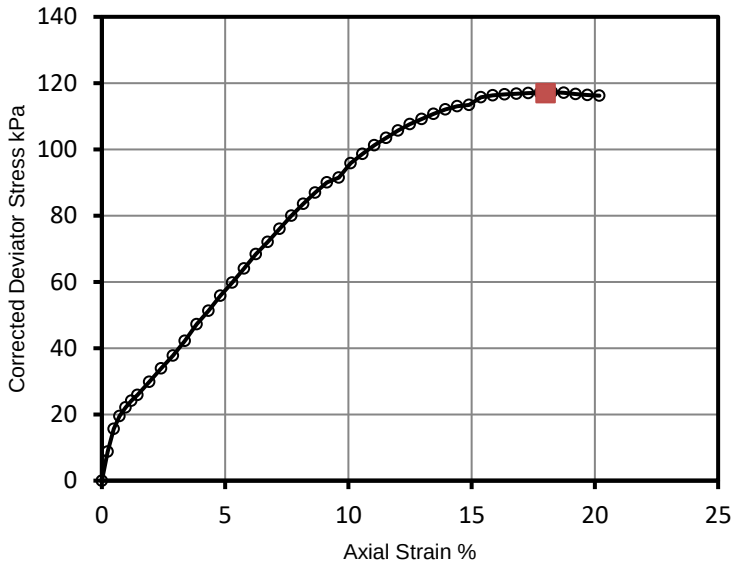
Client: Cadent **Page:** 5

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

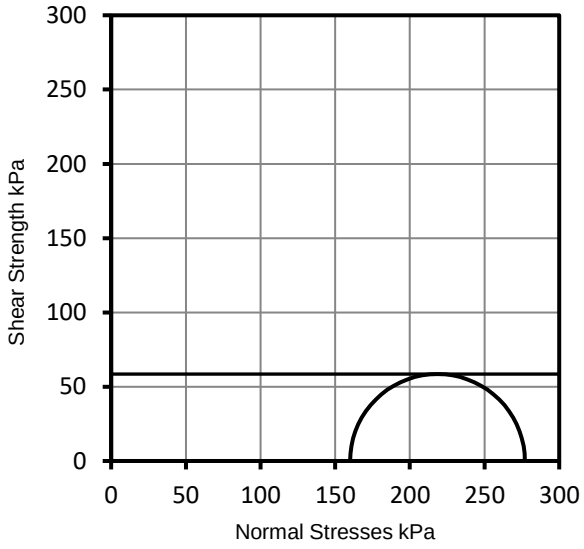
Borehole / Trial Pit	Depth (m)	Sample	Description
BH106	8.00	UT19	**Brown clayey SILT**

Initial Sample	Test Number	1
	Original Length (mm)	400.16
	Depth from Top (mm)	10.11
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		208.09
Diameter (mm)		101.79
Moisture Content (%)		22
Bulk Density (Mg/m3)		2.11
Dry Density (Mg/m3)		1.72
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	160
	Axial Strain (%)	18
	Membrane Corr. (kPa)	1.23
	Deviator Stress, (σ1 - σ3)f (kPa)	117
	Undrained Shear Strength, cu = ½(σ1 - σ3)f (kPa)	59
	Mode of Failure	Compound

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746G / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746G

Client: Cadent **Page:** 6

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

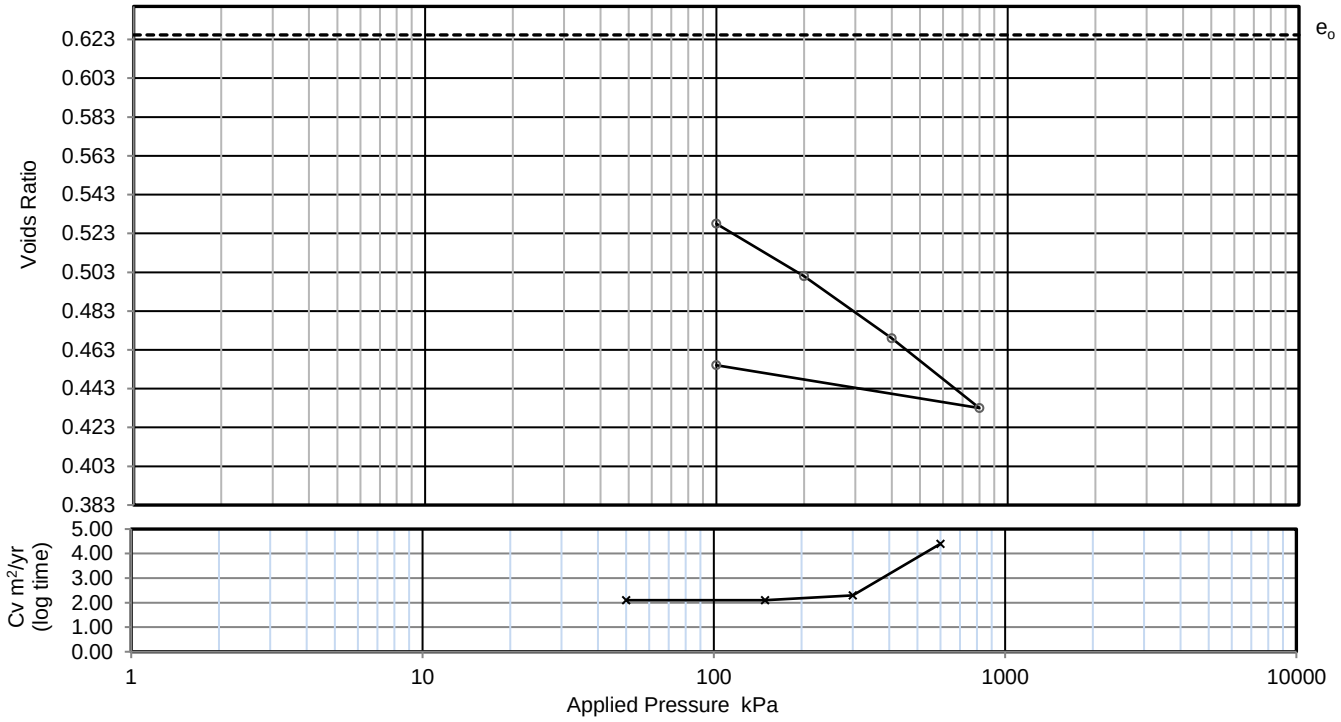
Borehole / Trial Pit	Depth (m)	Sample	Description
BH106	8.00	UT19	Brown clayey SILT

Initial Specimen



Length of Sample (mm)	400.00
Depth from top of specimen (mm)	210.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.99
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	21



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.625
100	0.60	2.1	16	0.0021	0.528
200	0.18	2.1	3.8	0.0022	0.501
400	0.11	2.3	4.6	0.0016	0.469
800	0.062	4.4	6.7	0.0031	0.433
100	0.022				0.455

	Initial	Final
Height (mm)	18.99	17.00
Moisture Content (%)	27	22
Bulk density (Mg/m³)	2.07	2.22
Dry density (Mg/m³)	1.63	1.82
Voids Ratio	0.625	0.455
Degree of Saturation (%)	113	127

Remarks:

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

Final Test Report - 2230746G / 2

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746G
Originating Client:	Cadent

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Report Issue Date: 21/11/2022

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F.A.O.

Final Test Report - 2230746H / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746H
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	29/09/2022
Date Scheduled:	21/10/2022
Date Testing Started:	28/10/2022
Date Testing Finished:	07/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 08/11/2022

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AGS

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746H / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746H

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH114	1.50	D7	17.3											Brown SAND
BH114	1.80	B8	14.7	Sieved	95	15		NP						Brown slightly silty SAND
BH114	2.00	D10	12.6											Brown SAND
BH114	3.00	D11	23.9											Brown silty SAND
BH114	3.80	D12	21.8											Brown sandy, silty CLAY
BH114	4.80	D15	24.1											Brown silty CLAY
BH114	5.00	B16	27.1	Natural	99	27	37	17	20	0.52	CI			Brown sandy, clayey SILT
BH114	6.00	D18	21.8											Brown silty CLAY
BH114	6.80	D19	24.3											Brown silty CLAY
BH114	8.20	D22	22.8											Brown very silty CLAY
BH114	9.50	D24	27.7											Brown silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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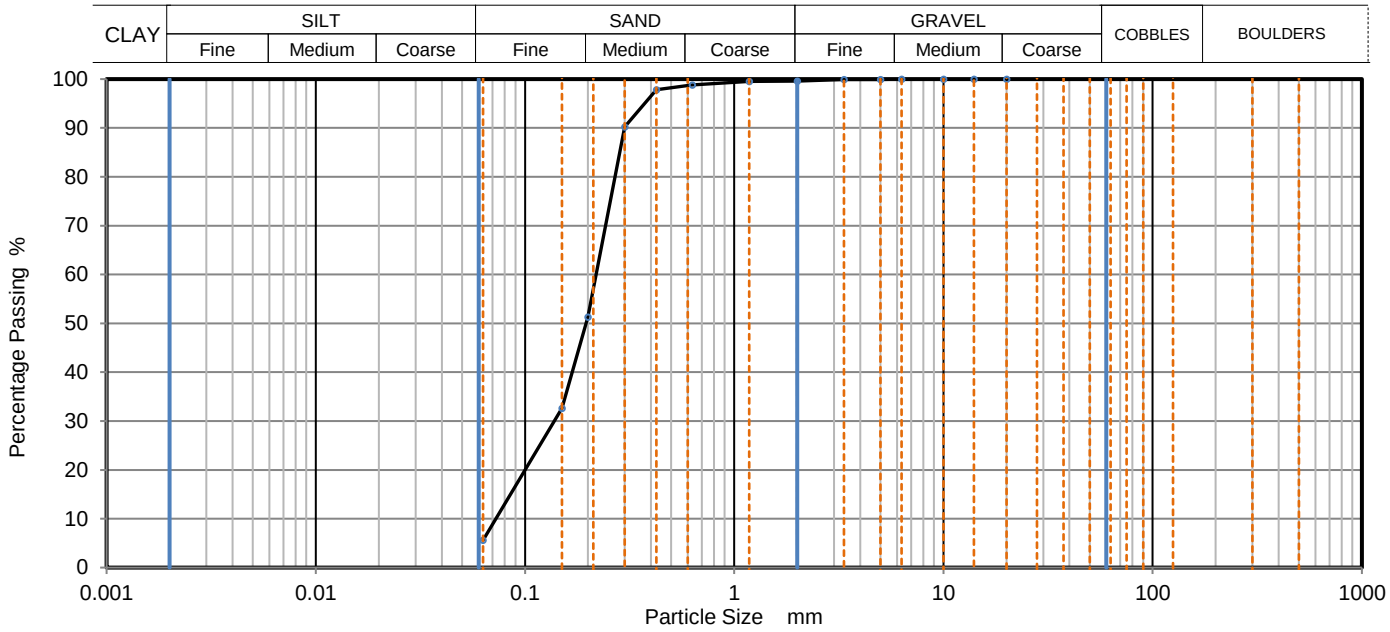
Laboratory Test Report 2230746H / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746H

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH114	1.80	B8	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	98		
0.3	90		
0.2	51		
0.15	33		
0.063	6		

Dry Mass of sample, g: 800

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	94
Fines <0.063mm	6

Grading Analysis		
D100	mm	6.3
D60	mm	0.219
D30	mm	0.138
D10	mm	0.0726
Uniformity Coefficient		3
Curvature Coefficient		1.2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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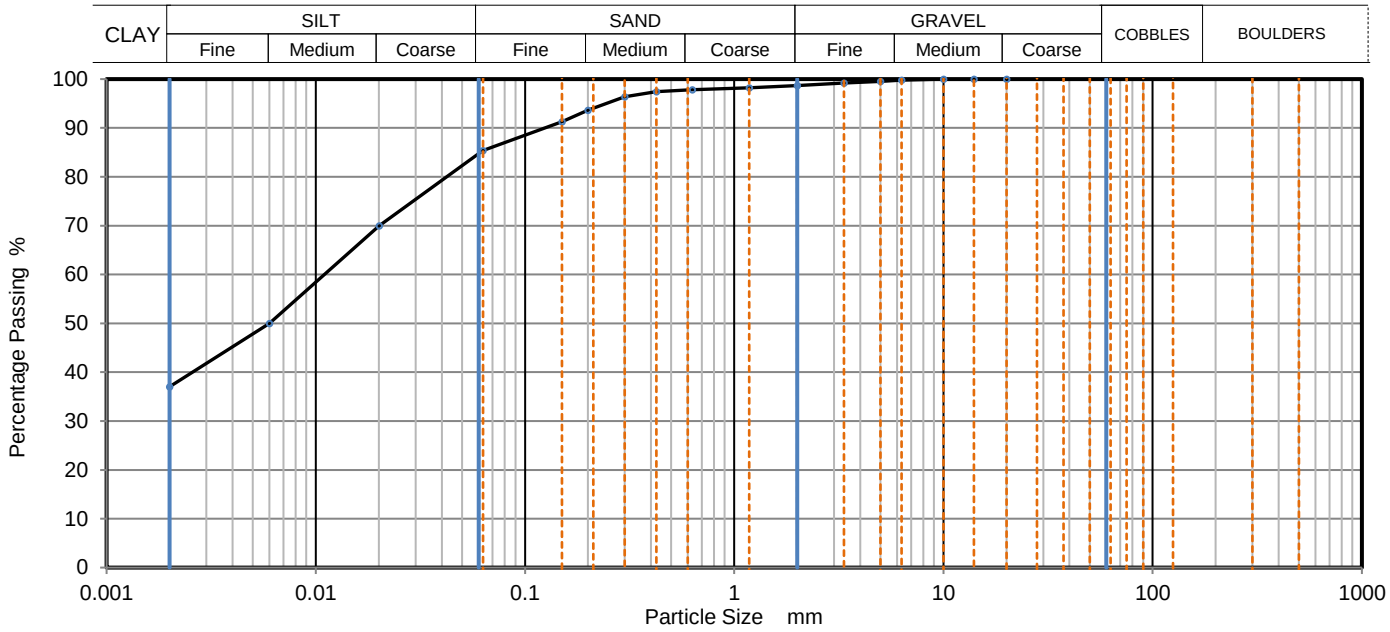
Laboratory Test Report	2230746H / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746H

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH114	5.00	B16	Wet Sieve + Pipette	Brown sandy, clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	70
		0.0060	50
		0.0020	37
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.63	98		
0.425	97		
0.3	96		
0.2	94		
0.15	91		
0.063	85		

Dry Mass of sample, g	367

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	13
Silt	48
Clay	37

Grading Analysis		
D100	mm	10
D60	mm	0.0112
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746H / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746H
Originating Client:	Cadent

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Report Issue Date: 08/11/2022

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washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230746I / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746I
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	21/10/2022
Date Testing Started:	01/11/2022
Date Testing Finished:	09/11/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 10/11/2022

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Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746I

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH301	1.50	D10	22.4											Brown sandy SILT
BH301	1.50	B9	5.8	Sieved	77	7.5	39	21	18	-0.75	CI	20.4 20.4	0.994	Brown slightly clayey, slightly silty SAND
BH301	2.50	D12	13											Brown gravelly, silty SAND
BH301	3.50	D14	23.8											Brown gravelly, silty SAND
BH301	4.30	D15	11.8											Brown silty SILT
BH301	5.50	D17	16.7											Brown slightly silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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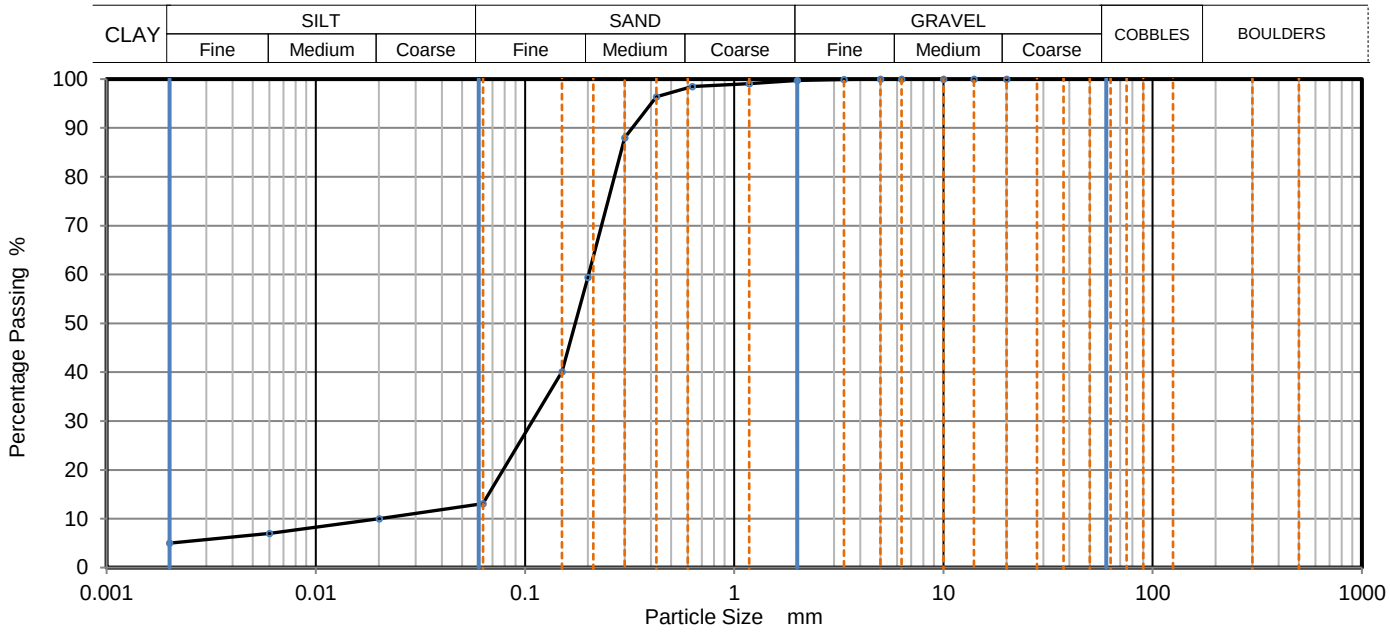
Laboratory Test Report	2230746I / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746I

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH301	1.50	B9	Wet Sieve + Pipette	Brown slightly clayey, slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	10
		0.0060	7
		0.0020	5
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	96		
0.3	88		
0.2	59		
0.15	40		
0.063	13		

Dry Mass of sample, g	843

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	87
Silt	8
Clay	5

Grading Analysis		
D100	mm	5
D60	mm	0.202
D30	mm	0.109
D10	mm	0.0216
Uniformity Coefficient		9.3
Curvature Coefficient		2.7

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746I

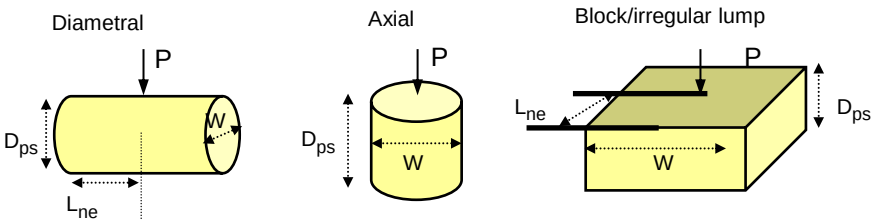
Client: Cadent **Page:** 4

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH301	7.90	C21	Red/Brown SANDSTONE As received	D	U	YES	21.3	83.4	83.4	80.5	0.1	83.4	0.01	0.01	
BH301	7.90	C21	Red/Brown SANDSTONE As received	A	U	YES		84.6	30.5	28.5	0.1	57.3	0.03	0.03	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746I / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746I
Originating Client:	Cadent

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Report Issue Date: 10/11/2022

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F.A.O.

Final Test Report - 2230746J / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746J
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	07/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH206	0.40	B3	9.8	Sieved	45	22	31	21	10	0.10	CLO	20.3 20.3	0.996	Brown slightly clayey, silty, gravelly SAND
BH206	0.90	B6	4	Sieved	38	11	27	16	11	-0.49	CLO			Brown slightly clayey, gravelly, silty SAND
BH206	1.50	D10	11.3	Natural	97	12	32	17	15	-0.36	CL			Reddish Brown sandy, silty CLAY
BH206	3.00	D10	22.4											Reddish Brown sandy, silty CLAY
BH206	31.50	D22	10.6	Natural	59	18	31	18	13	0.00	CL			Brown/Grey slightly sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746J / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

Client: Cadent **Page:** 3

Determination of Particle Density by Gas Jar Method

Borehole / Trial Pit	Depth (m)	Sample	Particle Density Mg/m3	Description / Remarks
BH206	3.00	D10	2.72	Reddish Brown sandy, silty CLAY

Method of Preparation: BS 1377 : Part 1 : 2016 : Clause 8.3 Initial preparation of disturbed samples
BS 1377 : Part 1 : 2016 : Clause 8.4.4 Preparation of samples for particle density tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 8.2 Determination of particle density (Gas jar method)

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

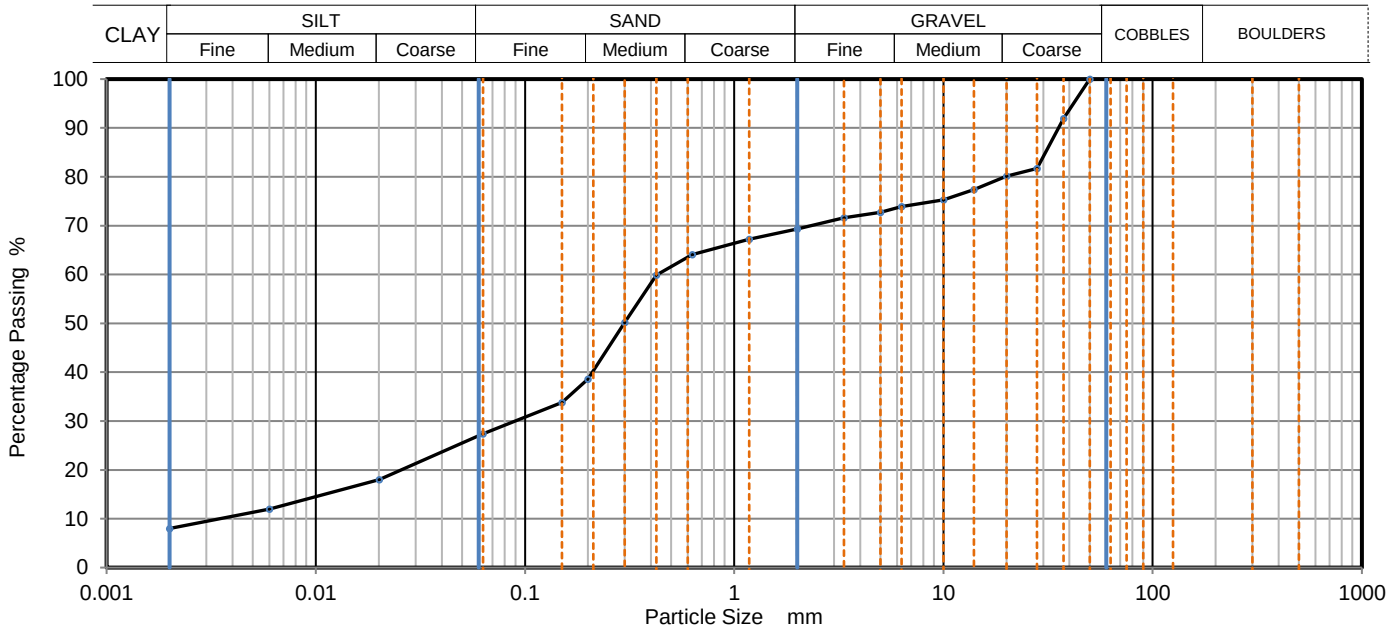
Laboratory Test Report	2230746J / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH206	0.40	B3	Wet Sieve + Pipette	Brown slightly clayey, silty, gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	18
		0.0060	12
		0.0020	8
50	100		
37.5	92		
28	82		
20	80		
14	77		
10	75		
6.3	74		
5	73		
3.35	72		
2	69	Particle density	(assumed)
1.18	67	2.65	Mg/m3
0.63	64		
0.425	60		
0.3	50		
0.2	39		
0.15	34		
0.063	27		

Dry Mass of sample, g	1125

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	42
Silt	20
Clay	8

Grading Analysis		
D100	mm	50
D60	mm	0.427
D30	mm	0.0897
D10	mm	0.00377
Uniformity Coefficient		110
Curvature Coefficient		5

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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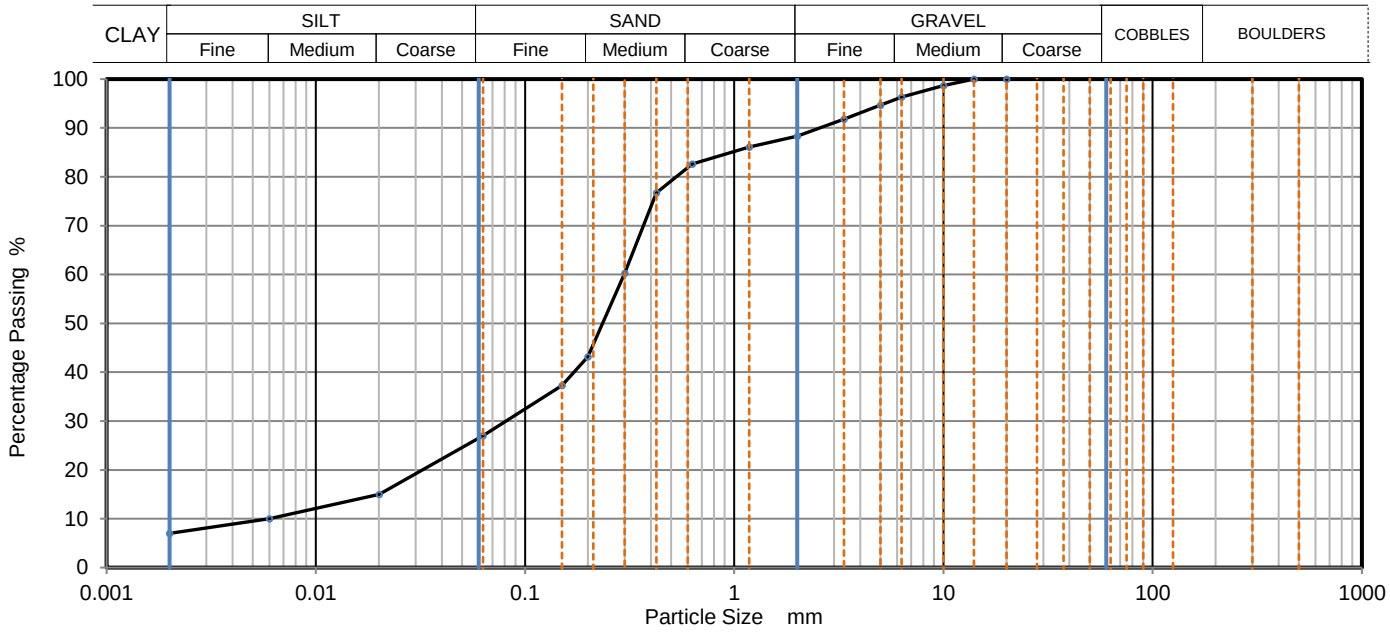
Laboratory Test Report	2230746J / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH206	0.90	B6	Wet Sieve + Pipette	Brown slightly clayey, gravelly, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	15
		0.0060	10
		0.0020	7
20	100		
14	100		
10	99		
6.3	96		
5	95		
3.35	92		
2	88	Particle density	(assumed)
1.18	86	2.65	Mg/m3
0.63	83		
0.425	77		
0.3	60		
0.2	43		
0.15	37		
0.063	27		

Dry Mass of sample, g: 730

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	61
Silt	20
Clay	7

Grading Analysis		
D100	mm	14
D60	mm	0.298
D30	mm	0.0809
D10	mm	0.00662
Uniformity Coefficient		45
Curvature Coefficient		3.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

Client: Cadent **Page:** 6

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH206	4.00	C12	Red/Brown SANDSTONE	8.0						
BH206	8.60	C13	Red/Brown SILTSTONE	6.6						
BH206	11.61	C14	Red/Brown/Grey MUD/SANDSTONE	6.7						
BH206	13.97	C15	Red/Brown SILTSTONE	6.3						
BH206	16.72	C16	Red/Brown MUD/SANDSTONE	5.7						
BH206	19.59	C17	Red/Brown SILTSTONE	5.5						
BH206	22.26	C18	Red/Brown MUD/SANDSTONE	6.3						
BH206	23.55	C19	Red/Brown SILTSTONE	9.3						
BH206	25.95	C20	Red/Brown SILTSTONE	6.5						
BH206	28.96	C21	Red/Grey SILTSTONE	5.7						
BH206	32.50	C23	Red/Brown SILTSTONE	8.6						
BH206	33.40	C24	Red/Grey SILTSTONE	6.9						
BH206	34.82	C25	Red/Grey SILTSTONE	6.9						
BH206	36.27	C26	Red/Brown MUD/SANDSTONE	8.5						
BH206	38.00	C27	Red/Brown SILTSTONE	5.3						
BH206	39.00	C28	Red/Brown/Grey MUD/SANDSTONE	4.9						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

Client: Cadent **Page:** 7

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH206	11.61	C14	Red/Brown/Grey MUD/SANDSTONE	84.1	209.0	2.5	2.47	6.7	as received	0.4985	AC	7.0	
BH206	16.72	C16	Red/Brown MUD/SANDSTONE	83.3	191.7	*2.3	2.50	5.7	as received	0.4848	AC	1.6	
BH206	22.26	C18	Red/Brown MUD/SANDSTONE	81.1	238.3	2.9	2.48	6.3	as received	0.4864	AC	5.0	
BH206	33.40	C24	Red/Brown/Grey MUD/SILTSTONE	84.3	95.2	*1.1	2.45	6.9	as received	0.4966	AC	2.1	
BH206	36.27	C26	Red/Brown MUD/SANDSTONE	83.6	151.8	*1.8	2.43	8.5	as received	0.4815	F	3.4	
BH206	39.00	C28	Red/Brown/Grey MUD/SANDSTONE	85.7	198.1	*2.3	2.53	4.9	as received	0.5022	F	4.9	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746J / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746J

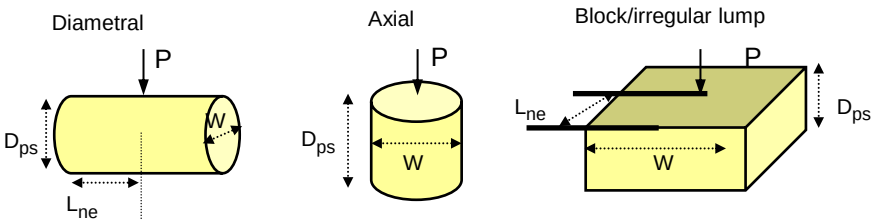
Client: Cadent **Page:** 8

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH206	4.00	C12	Red/Brown SANDSTONE As received	D	PL	YES	28.5	84.3	84.3	81.3	0.7	84.3	0.09	0.12	
BH206	4.00	C12	Red/Brown SANDSTONE As received	A	PD	YES		83.7	44.5	31.5	0.8	68.9	0.17	0.19	
BH206	8.60	C13	Red/Brown SILTSTONE As received	D	PL	YES	38.6	83.7	83.7	81.7	0.3	83.7	0.04	0.06	
BH206	8.60	C13	Red/Brown SILTSTONE As received	A	PD	YES		83.8	47.8	37.8	1.3	71.4	0.26	0.31	
BH206	13.97	C15	Red/Brown SILTSTONE As received	D	PL	YES	96.1	82.6	82.6	78.6	1.0	82.6	0.14	0.18	
BH206	13.97	C15	Red/Brown SILTSTONE As received	A	PD	YES		82.4	76.8	60.8	2.0	89.8	0.24	0.32	
BH206	19.59	C17	Red/Brown SILTSTONE As received	D	PL	YES	138.3	85.9	85.9	80.9	2.2	85.9	0.30	0.38	
BH206	19.59	C17	Red/Brown SILTSTONE As received	A	PD	NO		86.3	83.7	68.7	2.4	95.9	0.26	0.35	
BH206	23.55	C19	Red/Brown SILTSTONE As received	D	PL	YES	25.1	84.5	84.5	83.5	0.1	84.5	0.01	0.01	
BH206	23.55	C19	Red/Brown SILTSTONE As received	A	PD	YES		84.5	26.6	21.6	0.2	53.5	0.07	0.07	
BH206	25.95	C20	Red/Brown SILTSTONE As received	D	PL	YES	67.4	85.6	85.6	83.6	0.9	85.6	0.12	0.15	
BH206	25.95	C20	Red/Brown SILTSTONE As received	A	PD	YES		85.5	63.4	60.4	0.4	83.0	0.06	0.08	
BH206	28.96	C21	Red/Grey SILTSTONE As received	D	PL	YES	37.3	81.9	81.9	79.9	0.1	81.9	0.02	0.02	
BH206	28.96	C21	Red/Grey SILTSTONE As received	A	PD	YES		81.9	49.5	28.5	1.5	71.8	0.28	0.33	
BH206	32.50	C23	Red/Brown SILTSTONE As received	D	PL	YES	45.4	84.9	84.9	82.9	0.2	84.9	0.03	0.03	
BH206	32.50	C23	Red/Brown SILTSTONE As received	A	PD	YES		85.0	38.9	30.9	2.2	64.9	0.53	0.59	
BH206	34.82	C25	Red/Grey SILTSTONE As received	D	PL	YES	92.1	78.8	78.8	72.8	0.9	78.8	0.14	0.17	
BH206	34.82	C25	Red/Grey SILTSTONE As received	A	PD	NO		78.6	71.7	64.7	0.2	84.7	0.02	0.03	
BH206	38.00	C27	Red/Brown SILTSTONE As received	D	PL	YES	56.3	84.5	84.5	80.5	0.6	84.5	0.08	0.10	
BH206	38.00	C27	Red/Brown SILTSTONE As received	A	PD	YES		84.7	43.5	34.5	1.9	68.5	0.41	0.48	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746J / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746J
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746K / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746K
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	09/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 09/12/2022

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AGS

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746K / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746K

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH301	3.50	B13	21.6											Brown silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

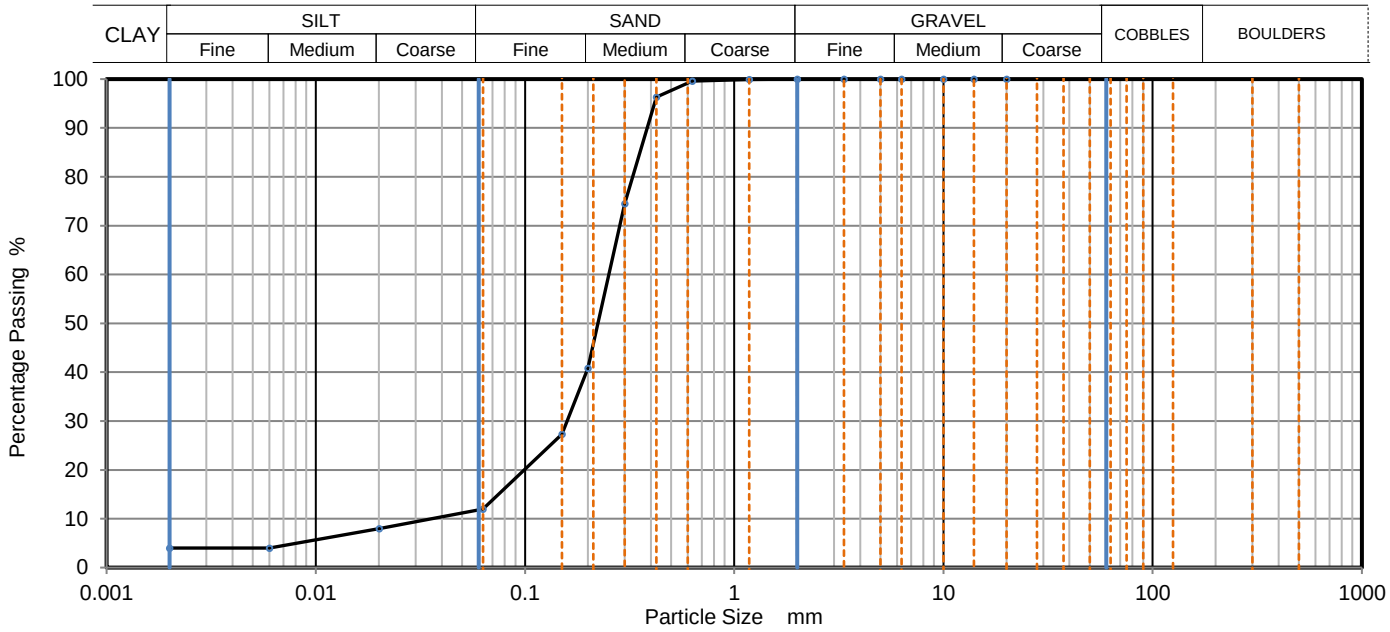
Laboratory Test Report	2230746K / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746K

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH301	3.50	B13	Wet Sieve + Pipette	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	8
		0.0060	4
		0.0020	4
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	96		
0.3	75		
0.2	41		
0.15	27		
0.063	12		

Dry Mass of sample, g: 788

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	88
Silt	8
Clay	4

Grading Analysis		
D100	mm	2
D60	mm	0.252
D30	mm	0.159
D10	mm	0.0334
Uniformity Coefficient		7.5
Curvature Coefficient		3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746K / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746K
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 09/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746L / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746L
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	24/11/2022
Date Scheduled:	02/12/2022
Date Testing Started:	07/12/2022
Date Testing Finished:	13/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 13/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

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Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746L

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
WS37	0.50	B4	23	Natural	100	23	34	18	16	0.31	CL			Brown sandy SILT/CLAY
WS37	2.00	B8	22.7	Natural	98	23	25	12	13	0.85	CL			Brown sandy, clayey SILT
WS37	2.60	D10	16	Natural	92	17	31	18	13	-0.05	CL			Mottled Brown/Grey sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

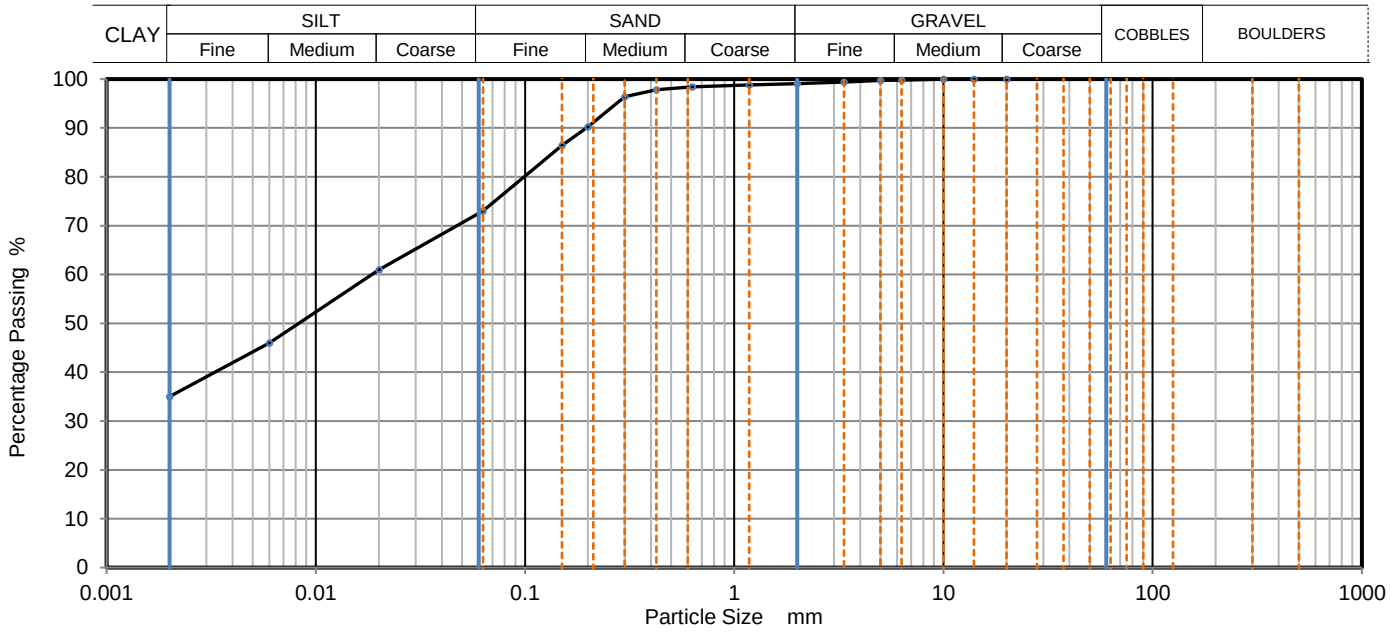
Laboratory Test Report	2230746L / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746L

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS37	0.50	B4	Wet Sieve + Pipette	Brown sandy SILT/CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	61
		0.0060	46
		0.0020	35
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	98		
0.425	98		
0.3	96		
0.2	90		
0.15	86		
0.063	73		

Dry Mass of sample, g: 756

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	26
Silt	38
Clay	35

Grading Analysis		
D100	mm	10
D60	mm	0.019
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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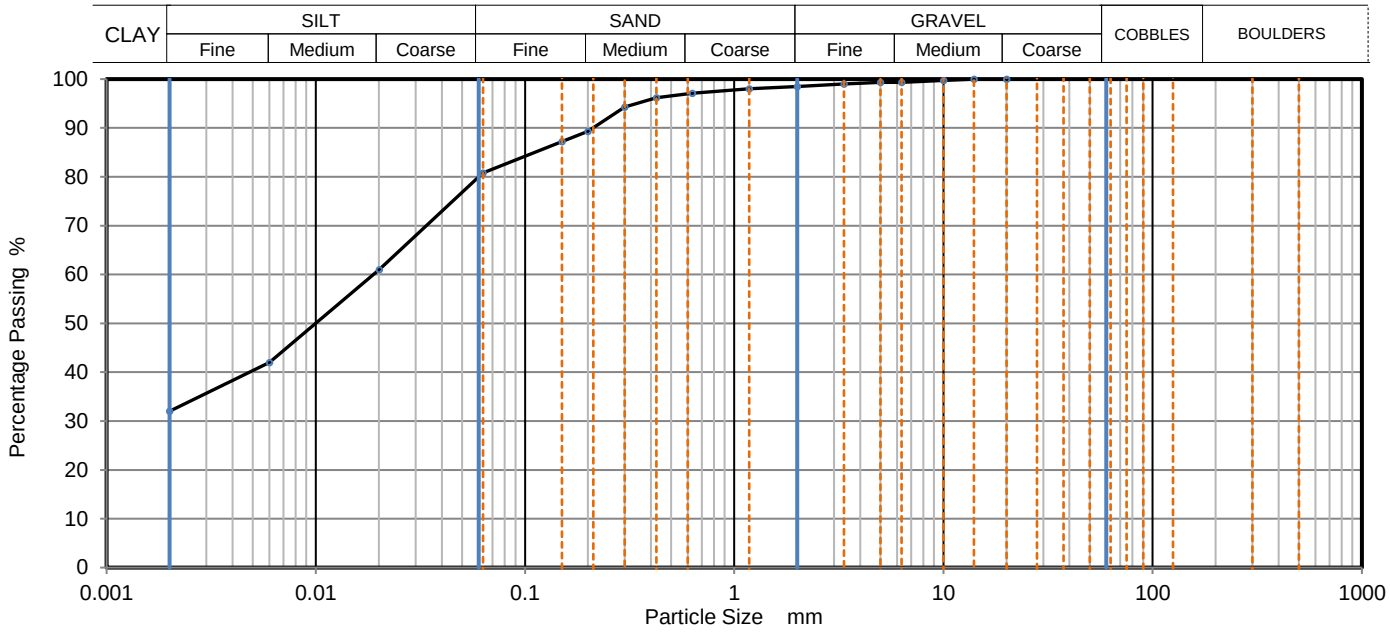
Laboratory Test Report	2230746L / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746L

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS37	2.00	B8	Wet Sieve + Pipette	Brown sandy, clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	61
		0.0060	42
		0.0020	32
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	99		
2	99	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.63	97		
0.425	96		
0.3	94		
0.2	89		
0.15	87		
0.063	81		

Dry Mass of sample, g: 575

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	18
Silt	49
Clay	32

Grading Analysis		
D100	mm	14
D60	mm	0.0192
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746L / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746L
Originating Client:	Cadent

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Report Issue Date: 13/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746M / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746M
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	25/11/2022
Date Scheduled:	05/12/2022
Date Testing Started:	08/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

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Laboratory Test Report 2230746M / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746M

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
WS35	1.20	B6	14.2	Sieved	41	35	36	20	16	0.93	CI			Brown/Grey gravelly, clayey SILT/SAND
WS35	2.00	B9	23.5	Natural	96	25	32	21	11	0.32	CL			Brown/Grey sandy, clayey SILT
WS35	2.80	D12	13.1	Sieved	56	23	35	18	17	0.32	CL/CI	20.1 20	0.9996	Brown/Grey slightly sandy, gravelly, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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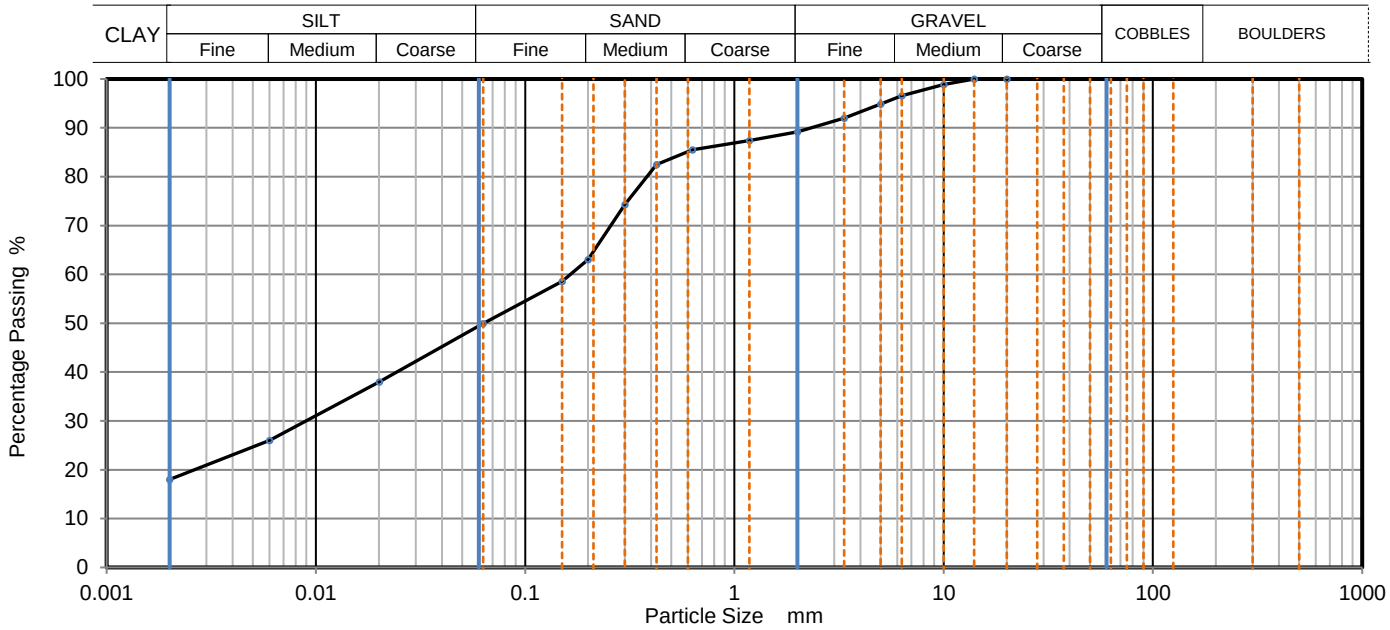
Laboratory Test Report	2230746M / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746M

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS35	1.20	B6	Wet Sieve + Pipette	Brown/Grey gravelly, clayey SILT/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	38
		0.0060	26
		0.0020	18
20	100		
14	100		
10	99		
6.3	97		
5	95		
3.35	92		
2	89	Particle density	(assumed)
1.18	87	2.65	Mg/m3
0.63	86		
0.425	83		
0.3	74		
0.2	63		
0.15	59		
0.063	50		

Dry Mass of sample, g: 668

Sample Proportions	% dry mass
Very coarse	0
Gravel	11
Sand	39
Silt	32
Clay	18

Grading Analysis		
D100	mm	14
D60	mm	0.165
D30	mm	0.00895
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

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Result reported relates only to the sample tested.

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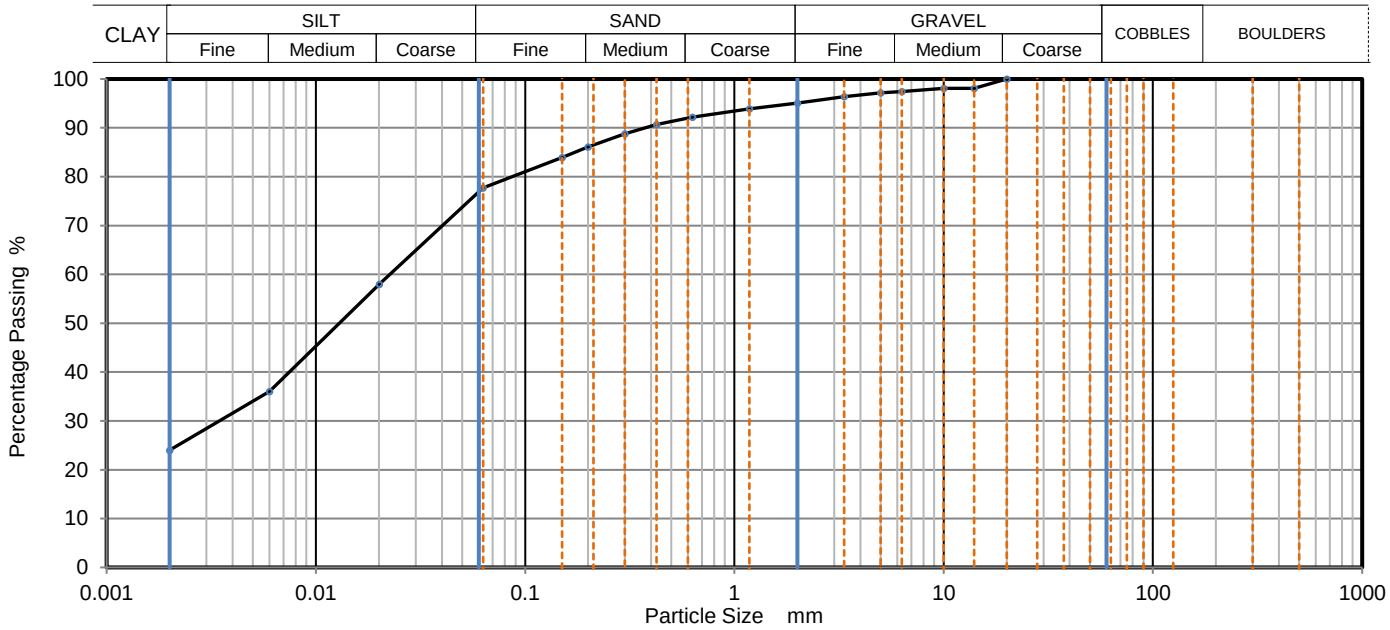
Laboratory Test Report	2230746M / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746M

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS35	2.00	B9	Wet Sieve + Pipette	Brown/Grey sandy, clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	58
		0.0060	36
		0.0020	24
20	100		
14	98		
10	98		
6.3	97		
5	97		
3.35	96		
2	95	Particle density	(assumed)
1.18	94	2.65	Mg/m3
0.63	92		
0.425	91		
0.3	89		
0.2	86		
0.15	84		
0.063	78		

Dry Mass of sample, g: 439

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	17
Silt	54
Clay	24

Grading Analysis		
D100	mm	20
D60	mm	0.0222
D30	mm	0.00357
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746M / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746M
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230746N / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746N
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	16/11/2022
Date Scheduled:	05/12/2022
Date Testing Started:	08/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746N

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
WS34	0.60	B4	17.6	Natural	89	20	28	19	9	0.09	CLO			Brown slightly clayey, silty, gravelly SAND
WS34	1.70	B6	12	Natural	92	13	24	12	12	0.08	CL			Brown slightly gravelly, clayey, silty SAND
WS34	2.00	B8	14.2	Natural	56	26	25	12	13	1.04	CL			Brown gravelly, clayey, silty SAND
WS34	3.00	D10	12.6	Natural	97	13	24	12	12	0.09	CL			Brown slightly gravelly, sandy CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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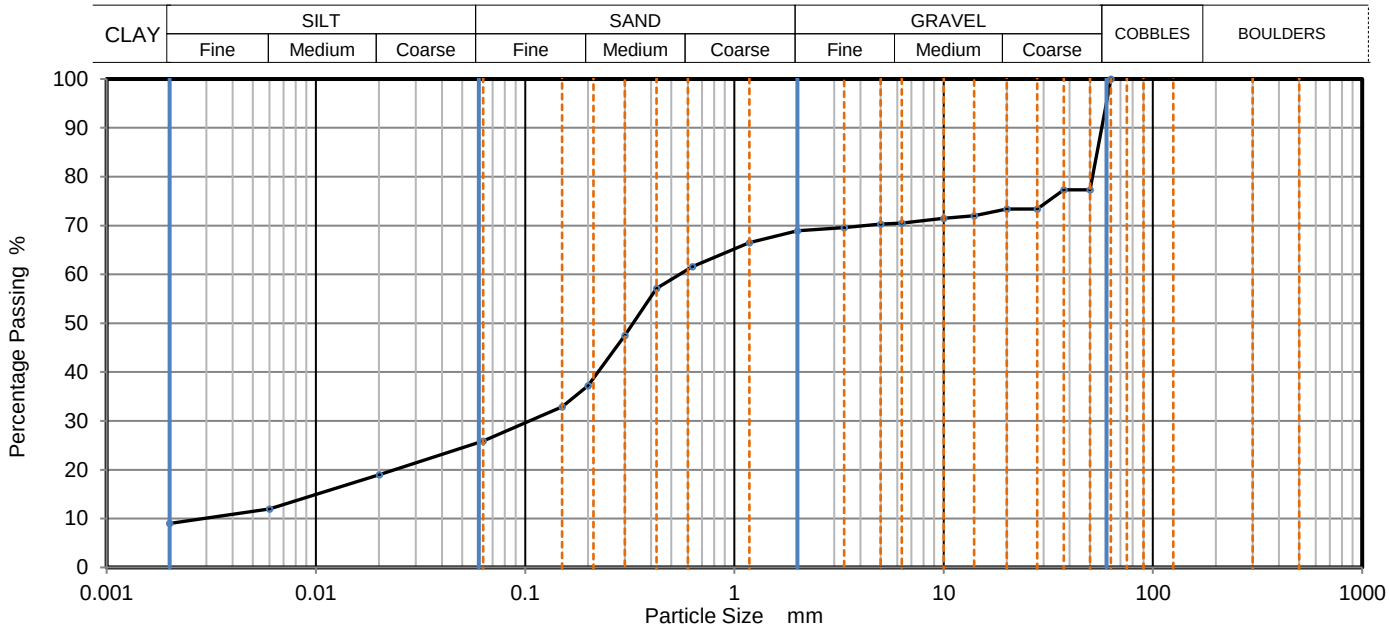
Laboratory Test Report 2230746N / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746N

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS34	0.60	B4	Wet Sieve + Pipette	Brown slightly clayey, silty, gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	19
		0.0060	12
		0.0020	9
63	100		
50	77		
37.5	77		
28	73		
20	73		
14	72		
10	72		
6.3	71		
5	70		
3.35	70		
2	69	Particle density	(assumed)
1.18	67	2.65	Mg/m3
0.63	62		
0.425	57		
0.3	48		
0.2	37		
0.15	33		
0.063	26		

Dry Mass of sample, g 1008

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	43
Silt	17
Clay	9

Grading Analysis		
D100	mm	63
D60	mm	0.548
D30	mm	0.105
D10	mm	0.00255
Uniformity Coefficient		210
Curvature Coefficient		7.9

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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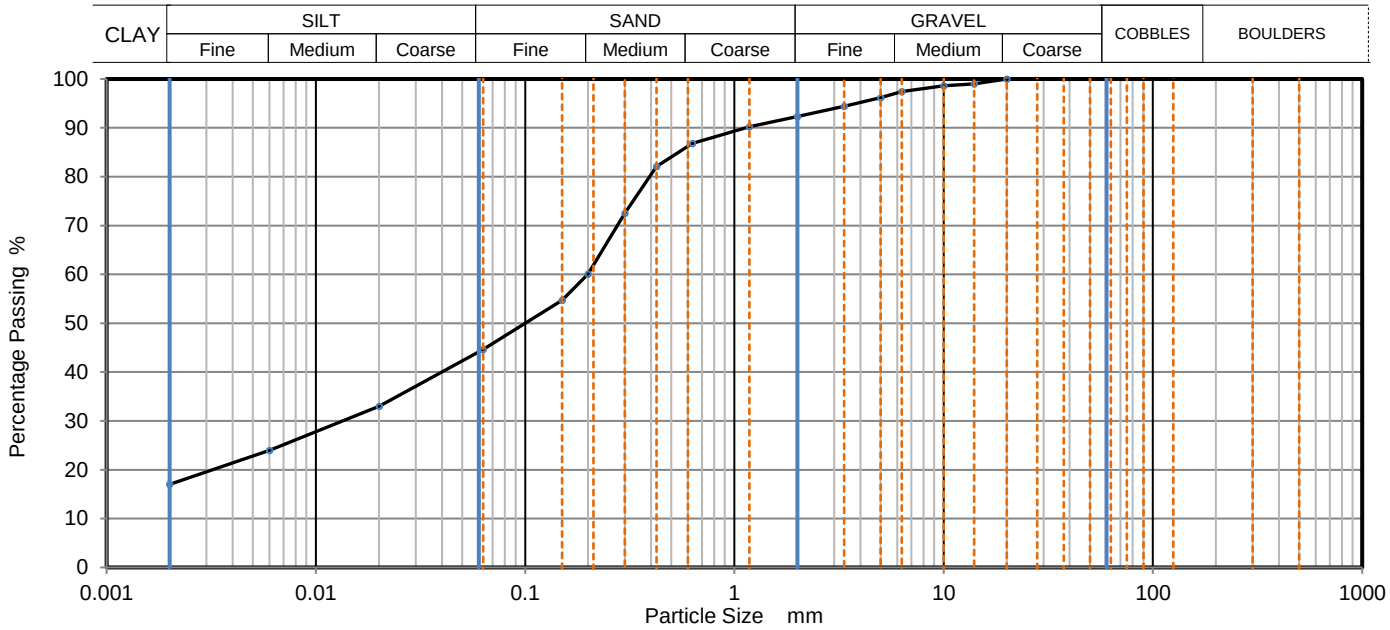
Laboratory Test Report	2230746N / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746N

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS34	1.70	B6	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	33
		0.0060	24
		0.0020	17
20	100		
14	99		
10	99		
6.3	97		
5	96		
3.35	94		
2	92	Particle density	(assumed)
1.18	90	2.65	Mg/m3
0.63	87		
0.425	82		
0.3	73		
0.2	60		
0.15	55		
0.063	45		

Dry Mass of sample, g: 614

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	48
Silt	28
Clay	17

Grading Analysis		
D100	mm	20
D60	mm	0.199
D30	mm	0.0138
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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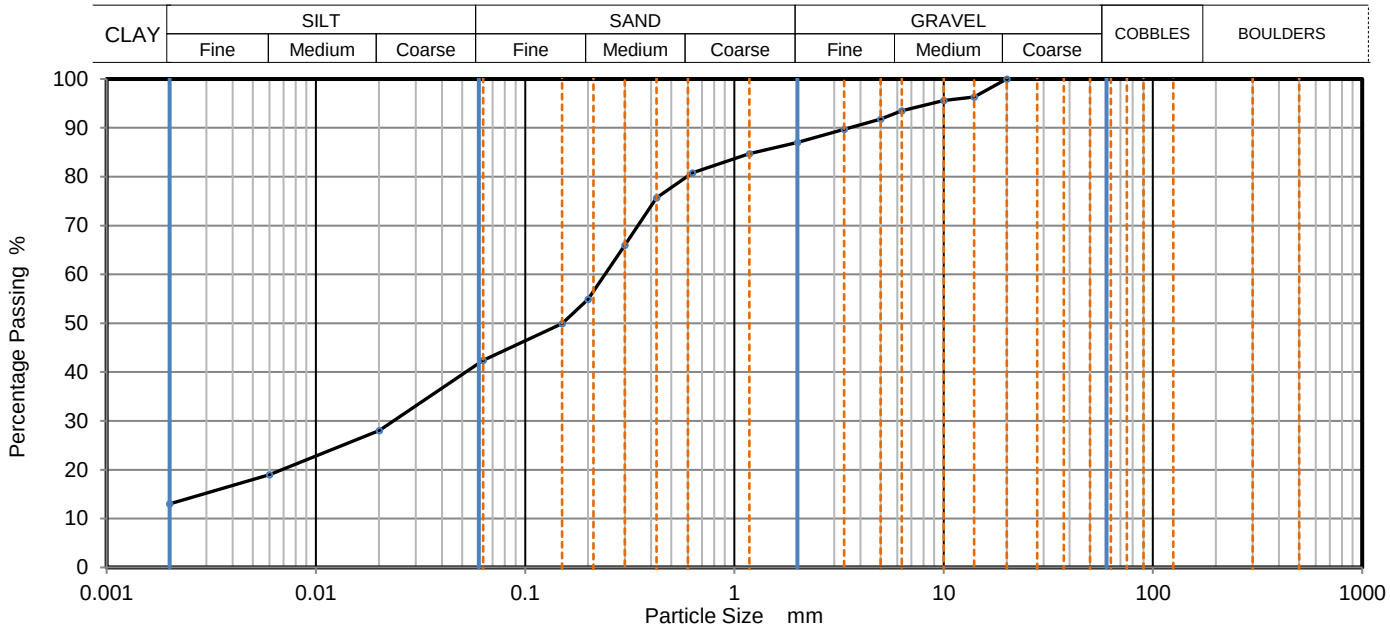
Laboratory Test Report	2230746N / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746N

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS34	2.00	B8	Wet Sieve + Pipette	Brown gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	28
		0.0060	19
		0.0020	13
20	100		
14	96		
10	96		
6.3	94		
5	92		
3.35	90		
2	87	Particle density	(assumed)
1.18	85	2.65	Mg/m3
0.63	81		
0.425	76		
0.3	66		
0.2	55		
0.15	50		
0.063	42		

Dry Mass of sample, g: 792

Sample Proportions	% dry mass
Very coarse	0
Gravel	13
Sand	45
Silt	29
Clay	13

Grading Analysis		
D100	mm	20
D60	mm	0.241
D30	mm	0.0237
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746N / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746N
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746O / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746O
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	14/11/2022
Date Scheduled:	05/12/2022
Date Testing Started:	09/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746O

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
WS33	0.30	B3	26.8	Sieved	80	33		NP						Brown slightly clayey, silty SAND
WS33	1.20	D6	18.3											Brown sandy CLAY
WS33	1.40	B7	25.2	Natural	100	25	30	14	16	0.70	CL			Brown clayey, sandy SILT
WS33	2.00	D8	26.4											Brown sandy CLAY
WS33	3.00	D10	9.6											Brown sandy CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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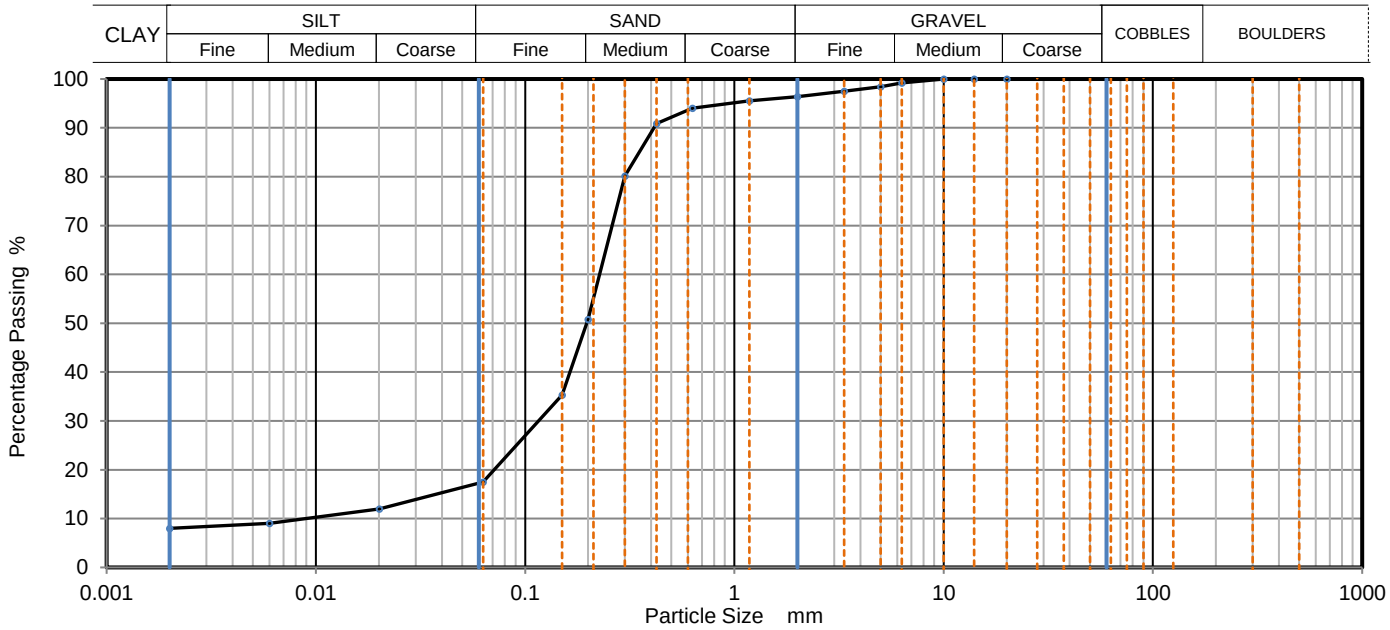
Laboratory Test Report	2230746O / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746O

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS33	0.30	B3	Wet Sieve + Pipette	Brown slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	12
		0.0060	9
		0.0020	8
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	98		
2	96	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	94		
0.425	91		
0.3	80		
0.2	51		
0.15	35		
0.063	18		

Dry Mass of sample, g	651

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	79
Silt	10
Clay	8

Grading Analysis		
D100	mm	10
D60	mm	0.227
D30	mm	0.116
D10	mm	0.0084
Uniformity Coefficient		27
Curvature Coefficient		7

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

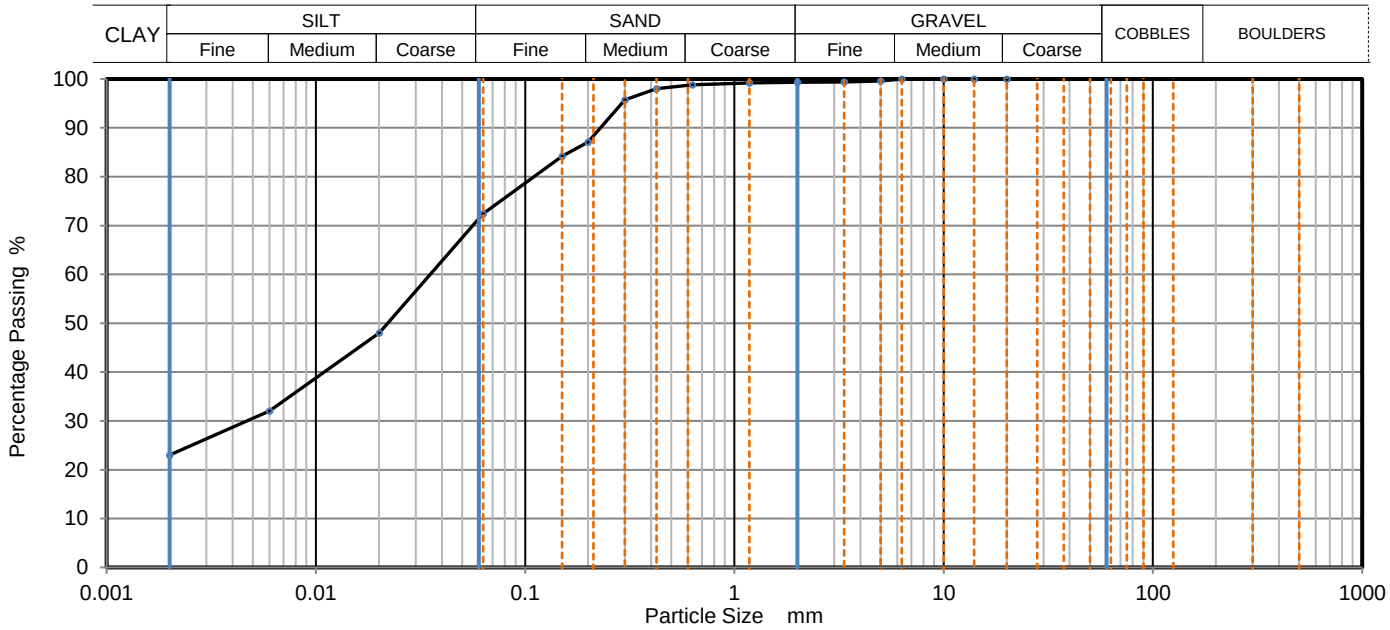
Laboratory Test Report	2230746O / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746O

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS33	1.40	B7	Wet Sieve + Pipette	Brown clayey, sandy SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	48
		0.0060	32
		0.0020	23
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	96		
0.2	87		
0.15	84		
0.063	72		

Dry Mass of sample, g	490

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	27
Silt	50
Clay	23

Grading Analysis		
D100	mm	6.3
D60	mm	0.0353
D30	mm	0.00493
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746O / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746O
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746P / 1

Site: HyNet North West - Hydrogen Pipeline

Job Number: 2230746P

Originating Client: Cadent

Originating Reference: 2230746

Date Sampled: 14/11/2022

Date Scheduled: 05/12/2022

Date Testing Started: 08/12/2022

Date Testing Finished: 19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746P

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
WS32	0.30	B3	28.2	Sieved	83	34		NP						Brown slightly clayey, slightly gravelly, silty SAND
WS32	1.20	B5	21.3	Sieved	72	30		NP						Brown slightly silty SAND
WS32	2.00	D6	18.8	Sieved	48	39		NP						Brown SAND
WS32	3.00	D7	20	Natural	93	21	28	11	17	0.62	CL			Brown sandy CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

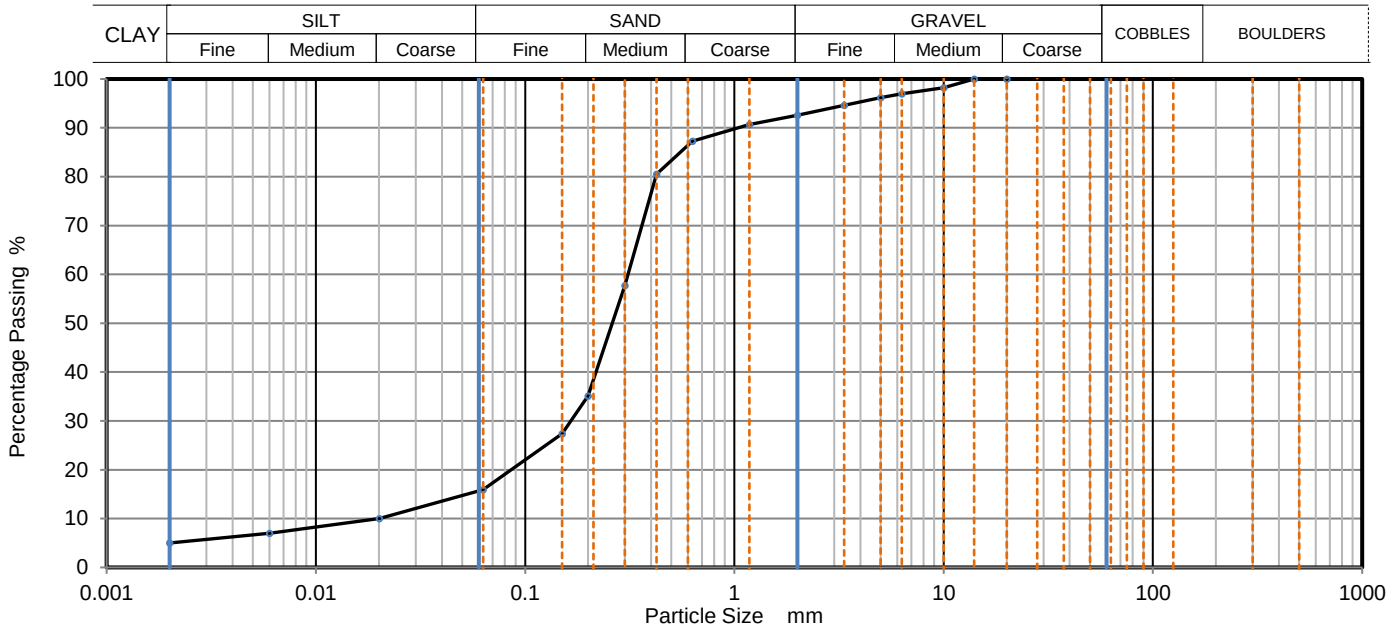
Laboratory Test Report 2230746P / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746P

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS32	0.30	B3	Wet Sieve + Pipette	Brown slightly clayey, slightly gravelly, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	10
		0.0060	7
		0.0020	5
20	100		
14	100		
10	98		
6.3	97		
5	96		
3.35	95		
2	93	Particle density	(assumed)
1.18	91	2.65	Mg/m3
0.63	87		
0.425	81		
0.3	58		
0.2	35		
0.15	27		
0.063	16		

Dry Mass of sample, g: 689

Sample Proportions	% dry mass
Very coarse	0
Gravel	7
Sand	77
Silt	10
Clay	6

Grading Analysis		
D100	mm	14
D60	mm	0.311
D30	mm	0.165
D10	mm	0.0203
Uniformity Coefficient		15
Curvature Coefficient		4.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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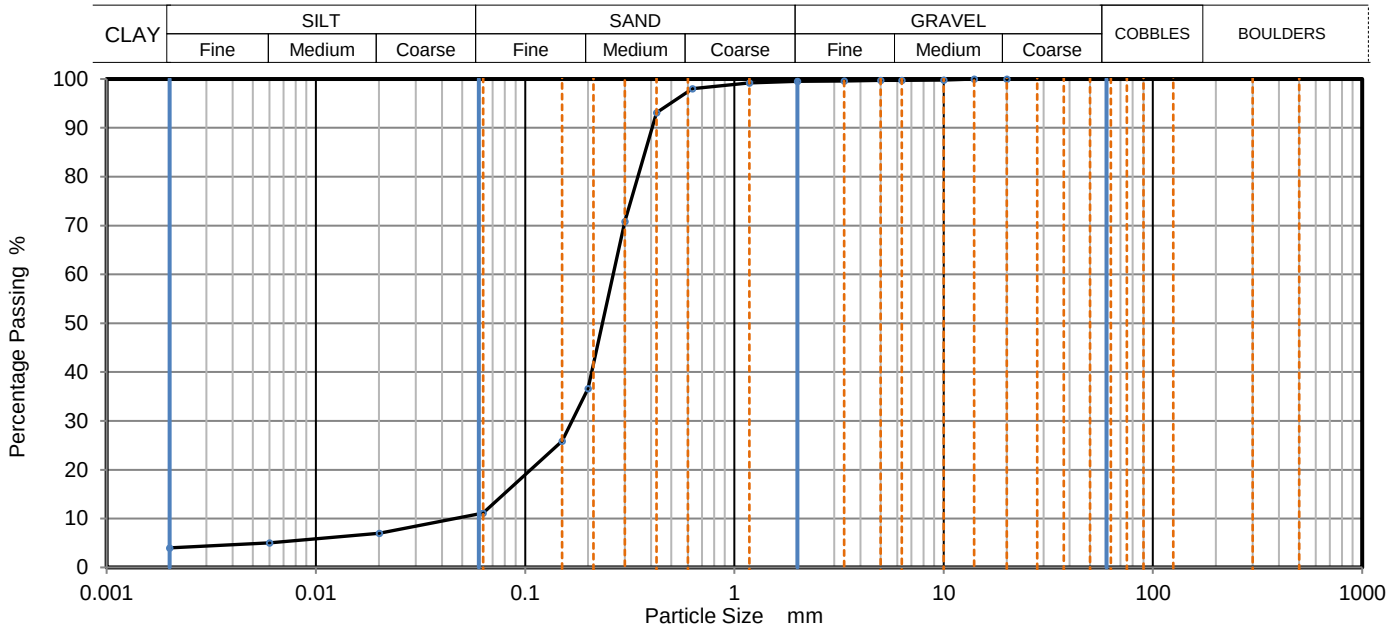
Laboratory Test Report	2230746P / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746P

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS32	1.20	B5	Wet Sieve + Pipette	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	7
		0.0060	5
		0.0020	4
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	98		
0.425	93		
0.3	71		
0.2	37		
0.15	26		
0.063	11		

Dry Mass of sample, g: 1266

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	89
Silt	7
Clay	4

Grading Analysis		
D100	mm	14
D60	mm	0.264
D30	mm	0.168
D10	mm	0.0465
Uniformity Coefficient		5.7
Curvature Coefficient		2.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746P / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746P
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746Q / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746Q
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	07/11/2022
Date Scheduled:	05/12/2022
Date Testing Started:	08/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Q

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
WS10	0.80	B3	7.8	Sieved	13	61		NP						Brown slightly organic SAND
WS10	1.50	D7	5.6	Sieved	10	56		NP						Brown SAND
WS10	2.30	B10	16.3	Natural	57	29	22	13	9	1.72	CL			Brown clayey, silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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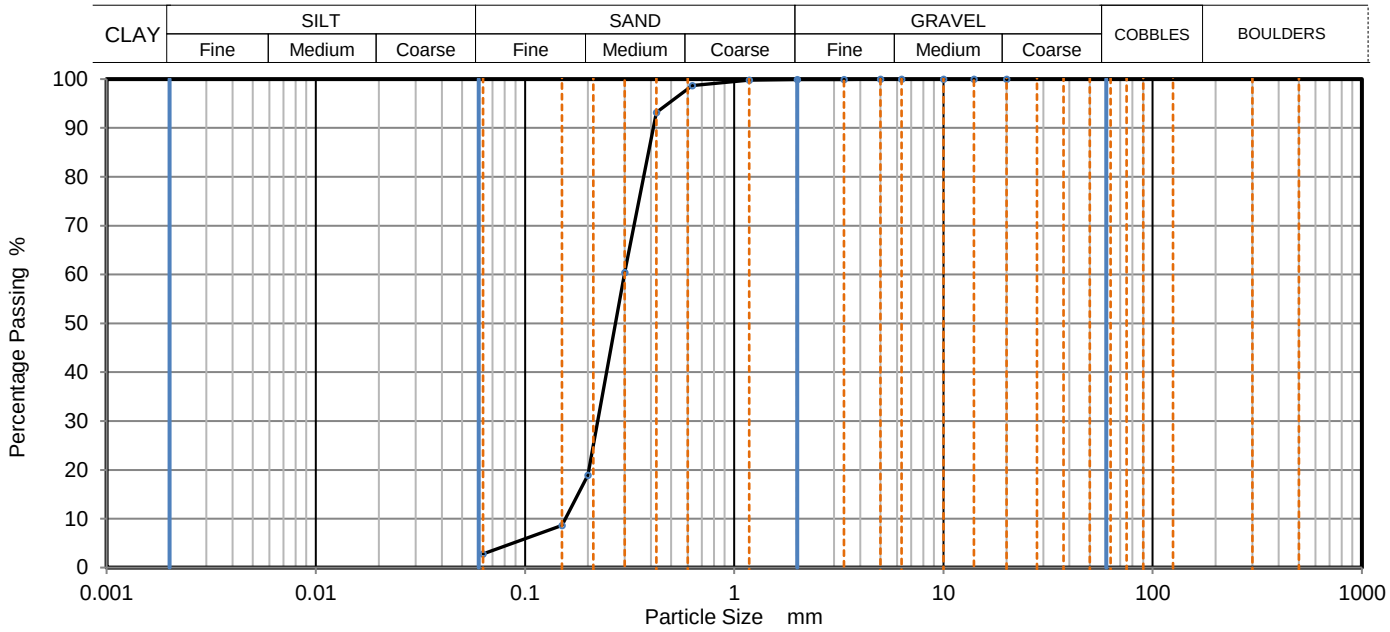
Laboratory Test Report 2230746Q / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Q

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS10	0.80	B3	Wet Sieve	Brown slightly organic SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	93		
0.3	60		
0.2	19		
0.15	9		
0.063	3		

Dry Mass of sample, g: 630

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	97
Fines <0.063mm	3

Grading Analysis		
D100	mm	5
D60	mm	0.299
D30	mm	0.223
D10	mm	0.156
Uniformity Coefficient		1.9
Curvature Coefficient		1.1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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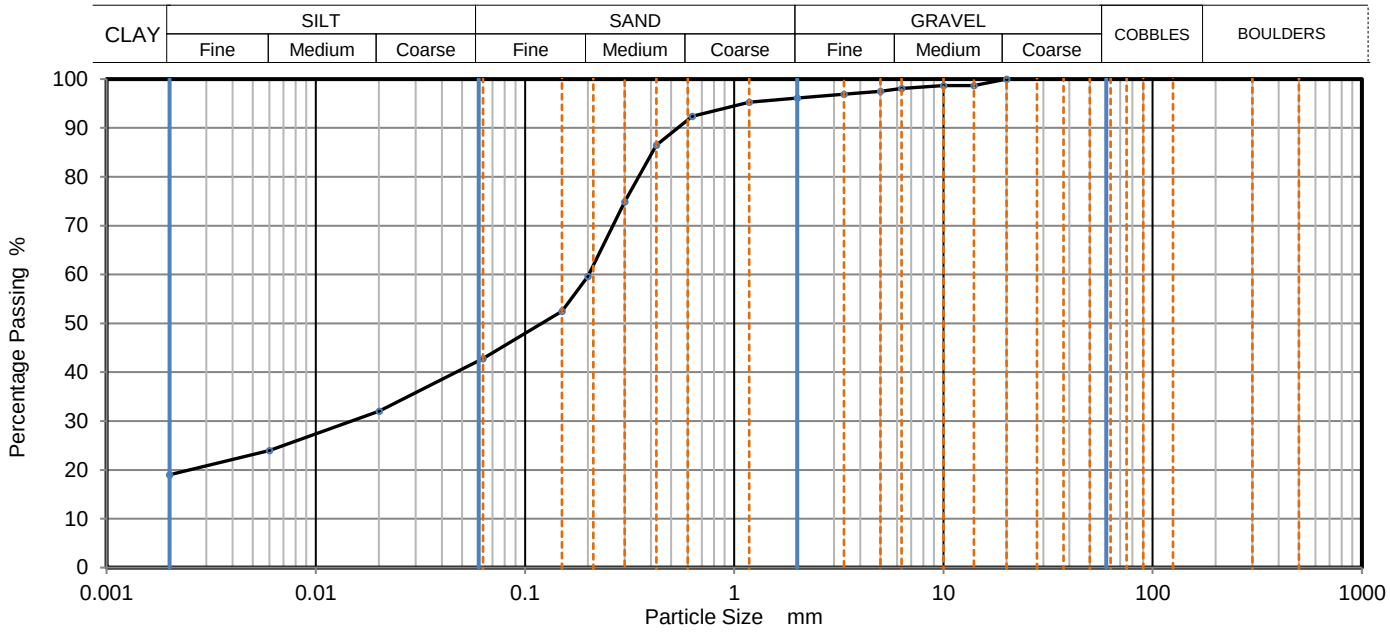
Laboratory Test Report	2230746Q / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Q

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
WS10	2.30	B10	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	32
		0.0060	24
		0.0020	19
20	100		
14	99		
10	99		
6.3	98		
5	98		
3.35	97		
2	96	Particle density	(assumed)
1.18	95	2.65	Mg/m3
0.63	92		
0.425	87		
0.3	75		
0.2	60		
0.15	53		
0.063	43		

Dry Mass of sample, g: 769

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	53
Silt	24
Clay	19

Grading Analysis		
D100	mm	20
D60	mm	0.202
D30	mm	0.0152
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746Q / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746Q
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746R / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746R
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	11/11/2022
Date Scheduled:	05/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 20/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
TP20	0.20	LB3	21.7	Sieved	51	43	44	29	15	0.92	MI			Brown slightly gravelly, silty SAND (Topsoil)
TP20	0.90	LB4	14.4	Sieved	15	99		NP						Brown slightly silty SAND
TP20	2.70	LB10	20.7	Natural	100	21	34	17	17	0.22	CL			Brown slightly sandy, clayey SILT

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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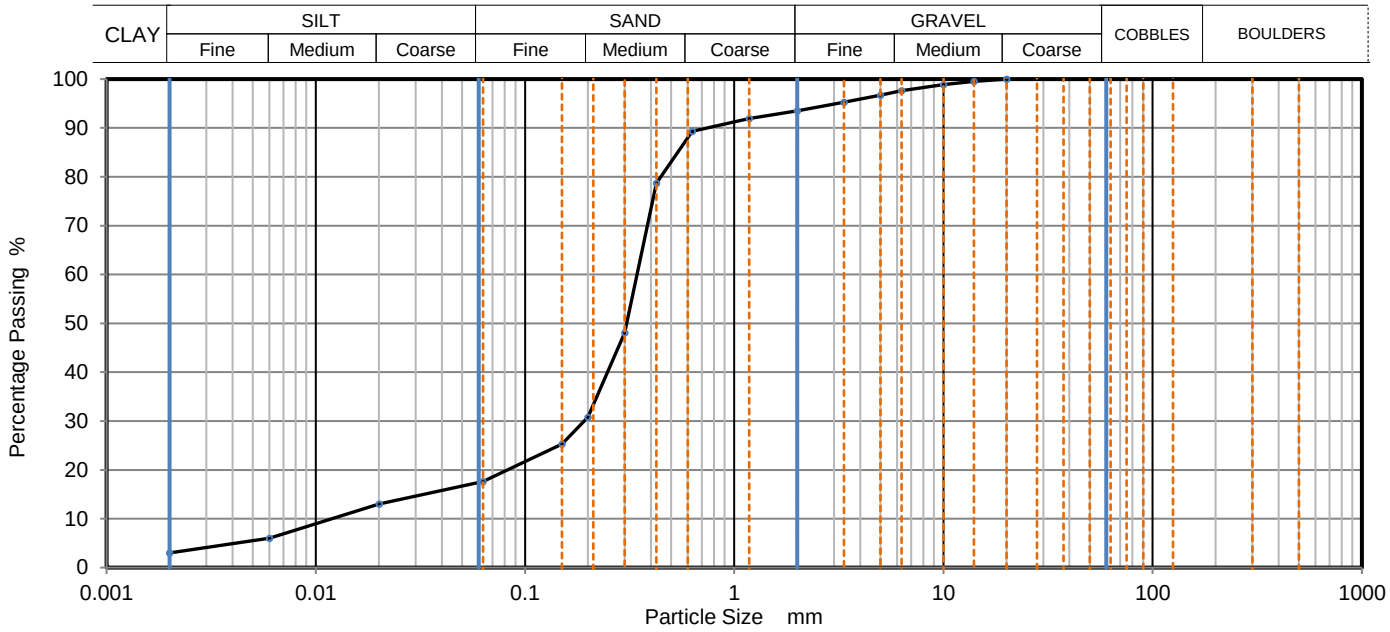
Laboratory Test Report	2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP20	0.20	LB3	Wet Sieve + Pipette	Brown slightly gravelly, silty SAND (Topsoil)



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	13
		0.0060	6
		0.0020	3
20	100		
14	100		
10	99		
6.3	98		
5	97		
3.35	95		
2	94	Particle density	(assumed)
1.18	92	2.65	Mg/m3
0.63	89		
0.425	79		
0.3	48		
0.2	31		
0.15	25		
0.063	18		

Dry Mass of sample, g: 652

Sample Proportions	% dry mass
Very coarse	0
Gravel	7
Sand	76
Silt	15
Clay	3

Grading Analysis		
D100	mm	20
D60	mm	0.343
D30	mm	0.191
D10	mm	0.0122
Uniformity Coefficient		28
Curvature Coefficient		8.7

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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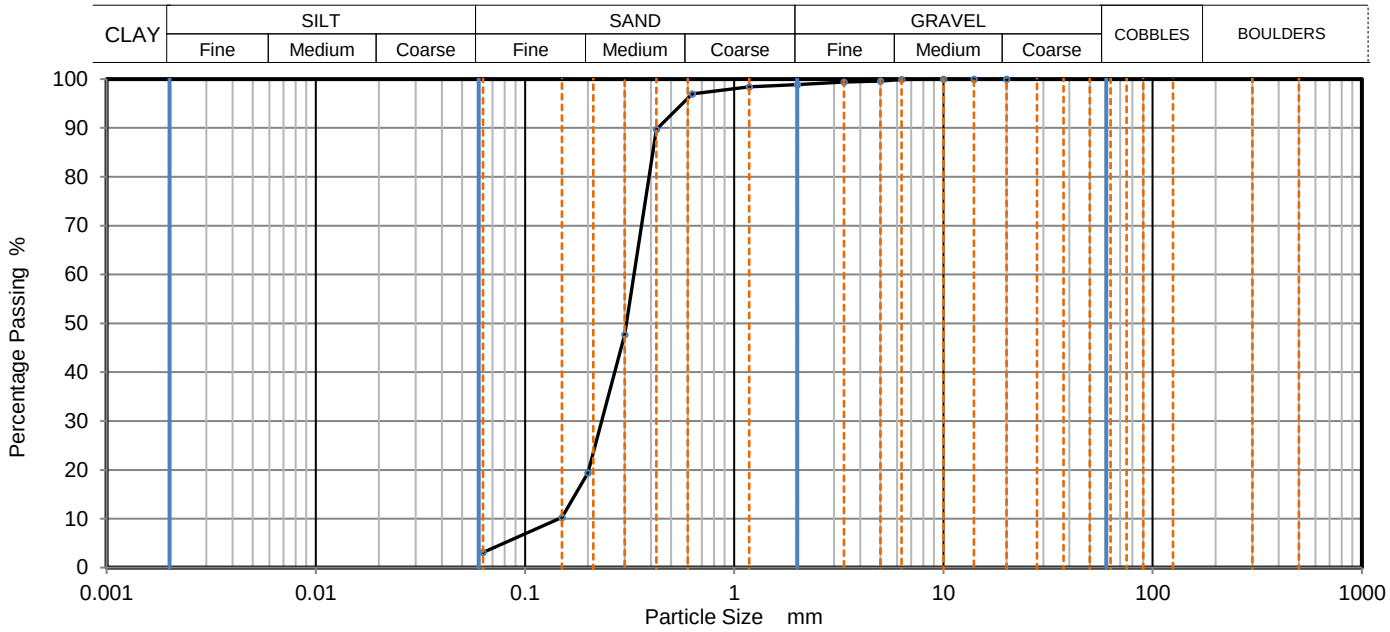
Laboratory Test Report	2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP20	0.90	LB4	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.63	97		
0.425	90		
0.3	48		
0.2	19		
0.15	10		
0.063	3		

Dry Mass of sample, g: 538

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	96
Fines <0.063mm	3

Grading Analysis		
D100	mm	10
D60	mm	0.332
D30	mm	0.233
D10	mm	0.144
Uniformity Coefficient		2.3
Curvature Coefficient		1.1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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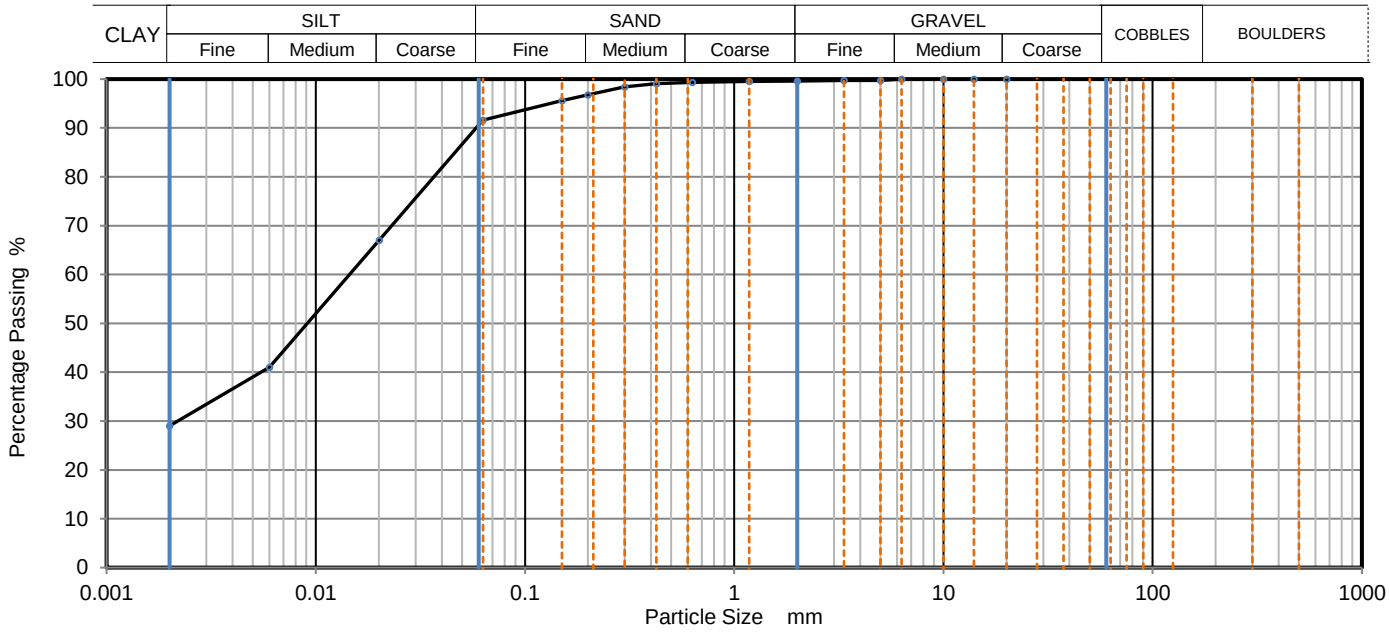
Laboratory Test Report	2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP20	2.70	LB10	Wet Sieve + Pipette	Brown slightly sandy, clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	67
		0.0060	41
		0.0020	29
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	99		
0.3	98		
0.2	97		
0.15	96		
0.063	92		

Dry Mass of sample, g	373

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	8
Silt	63
Clay	29

Grading Analysis		
D100	mm	6.3
D60	mm	0.0144
D30	mm	0.00228
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 6

Determination of Particle Density by Gas Jar Method

Borehole / Trial Pit	Depth (m)	Sample	Particle Density Mg/m3	Description / Remarks
TP20	0.20	LB3	2.49	Brown slightly gravelly, silty SAND (Topsoil)
TP20	0.90	LB4	2.61	Brown slightly silty SAND
TP20	2.70	LB10	2.64	Brown slightly sandy, clayey SILT

Method of Preparation: BS 1377 : Part 1 : 2016 : Clause 8.3 Initial preparation of disturbed samples
BS 1377 : Part 1 : 2016 : Clause 8.4.4 Preparation of samples for particle density tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 8.2 Determination of particle density (Gas jar method)

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746R / 1

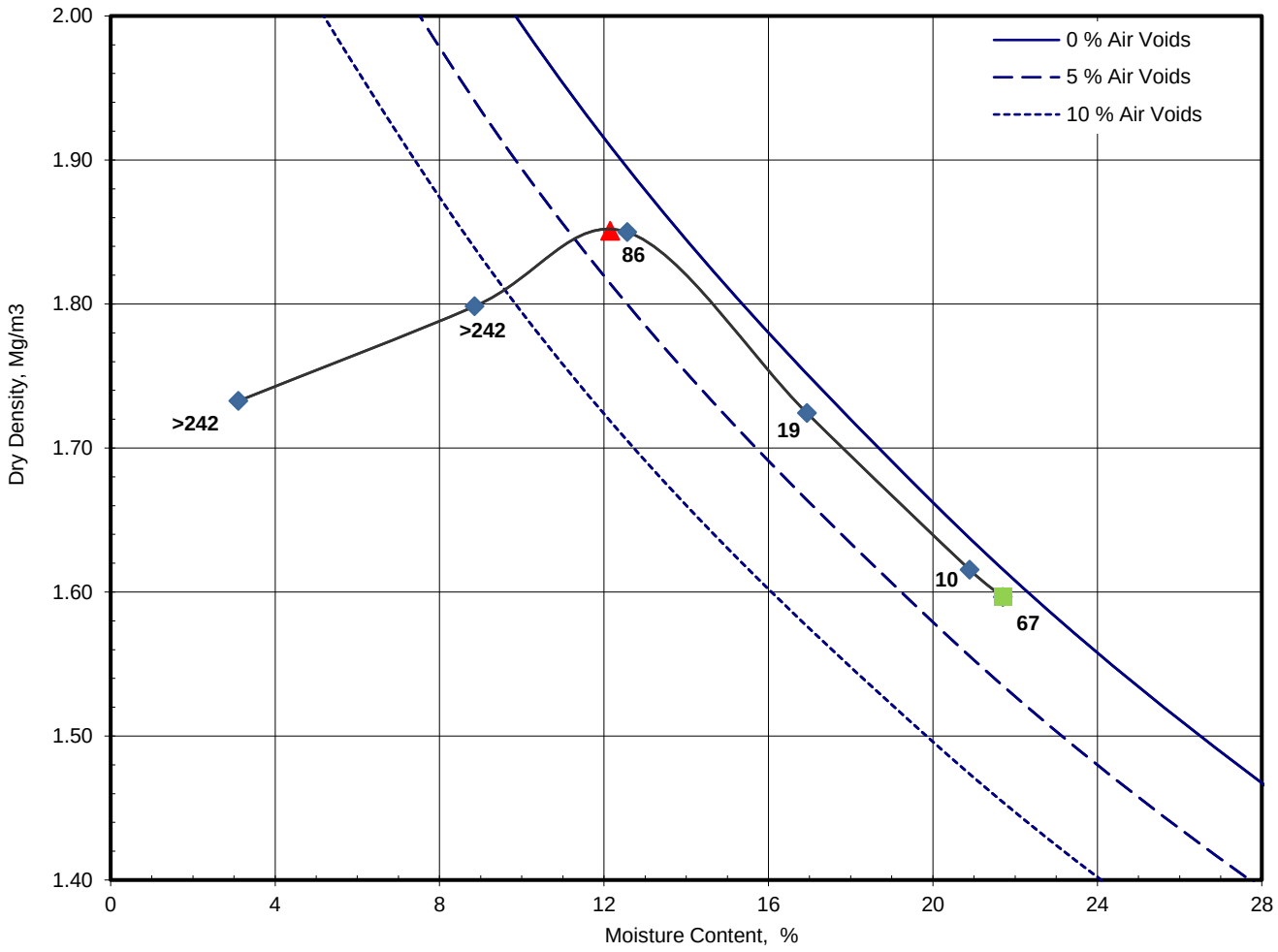
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 7

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP20	0.20	LB3	Brown slightly gravelly, silty SAND (Topsoil)

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	1	Particle Density	2.49 Mg/m³ Measured using gas jar
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.85 Mg/m³**	**Optimum Moisture Content**	**12 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
BS1377:Part 2:1990:8.2 Determination of Particle Density (Gas Jar method) - 'Not UKAS Accredited'
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

Result reported relates only to the sample tested.

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IAN FARMER ASSOCIATES	Laboratory Test Report	2230746R / 1

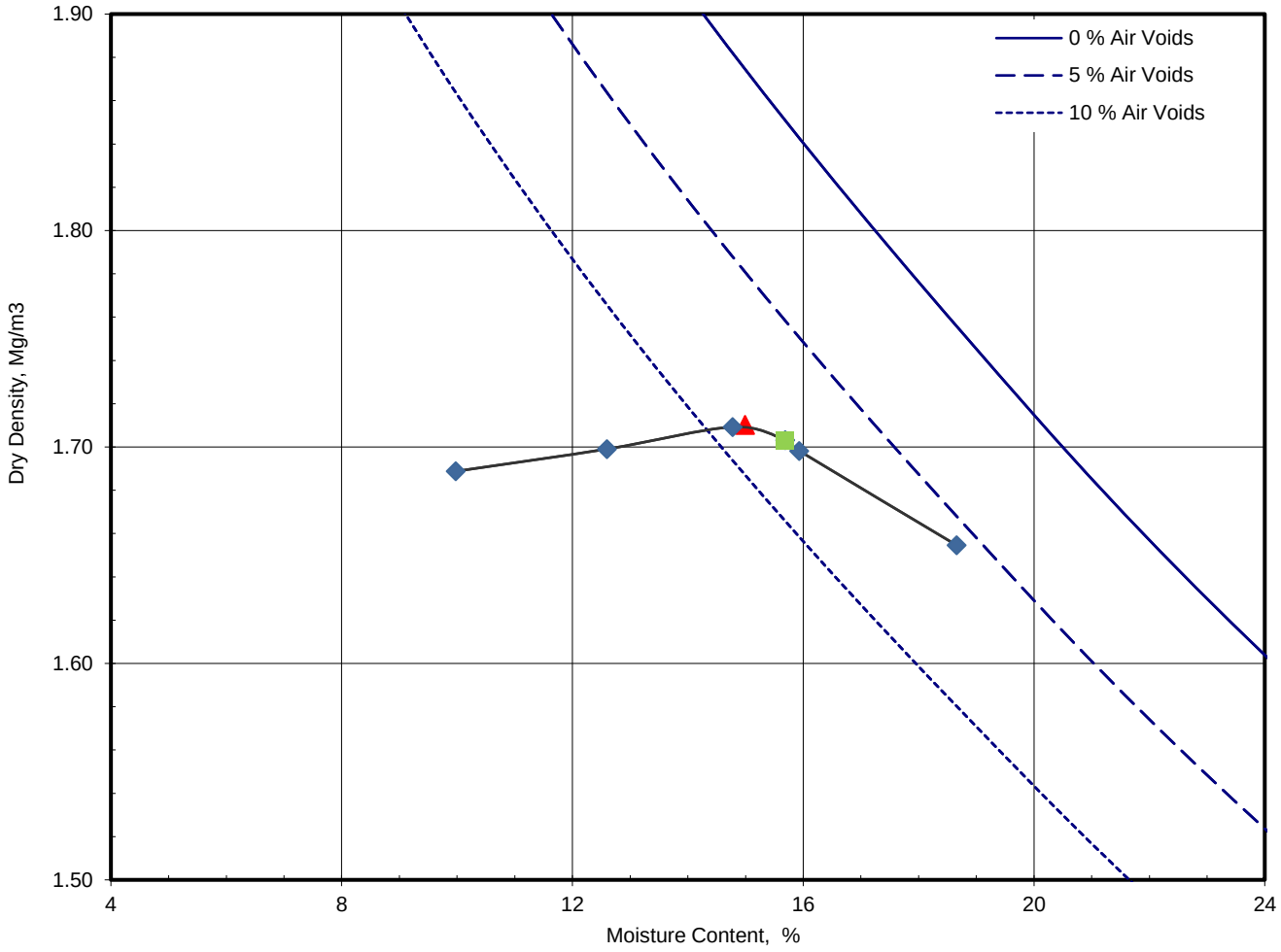
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 8

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP20	0.90	LB4	Brown slightly silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	1	Particle Density	2.61 Mg/m³ Measured using gas jar
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.71 Mg/m³**	**Optimum Moisture Content**	**15 %**



▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
BS1377:Part 2:1990:8.2 Determination of Particle Density (Gas Jar method) - 'Not UKAS Accredited'

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1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746R / 1

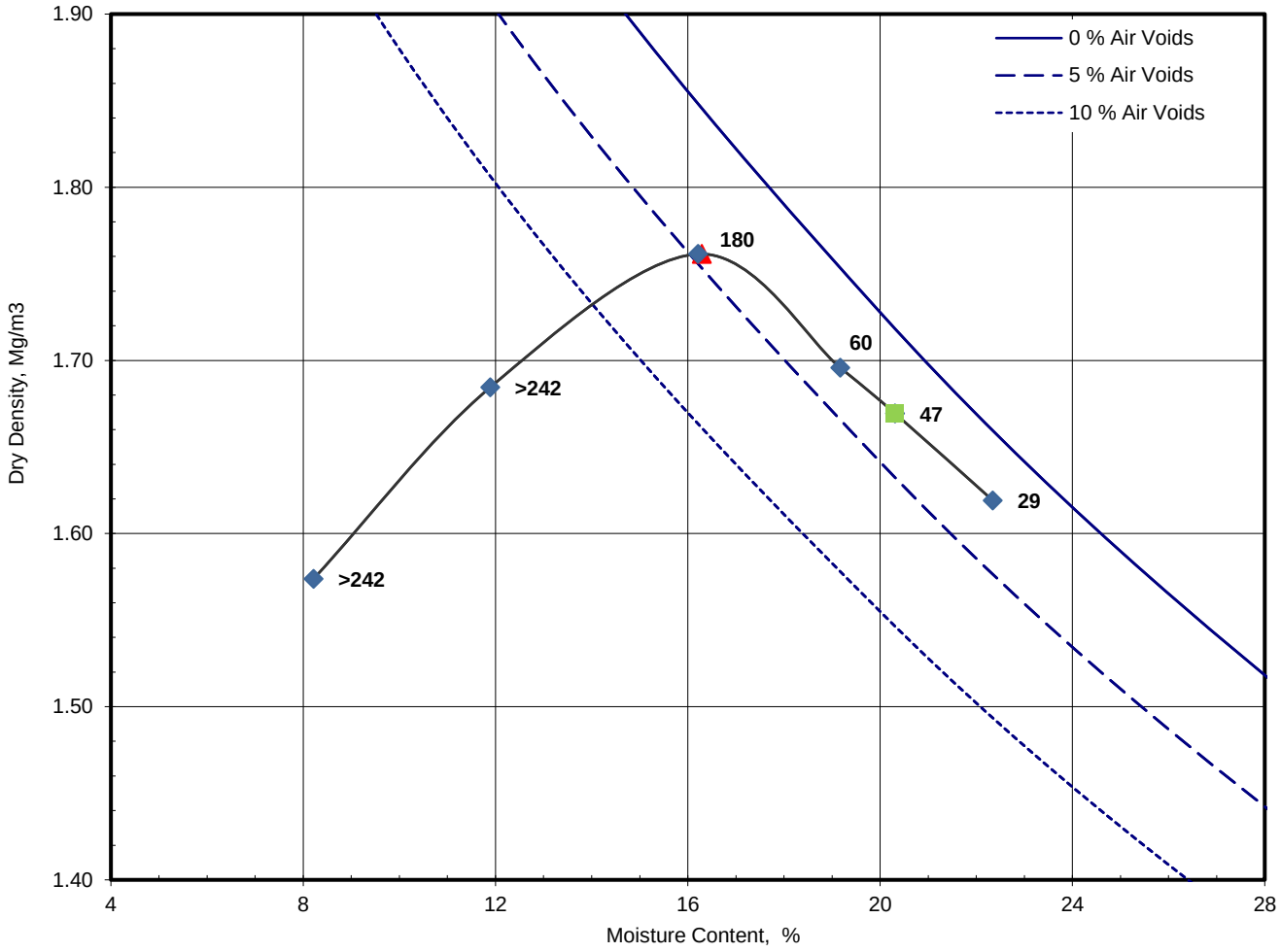
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 9

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP20	2.70	LB10	Brown slightly sandy, clayey SILT

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	1	Particle Density	2.64 Mg/m³ Measured using gas jar
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.76 Mg/m³**	**Optimum Moisture Content**	**16 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
BS1377:Part 2:1990:8.2 Determination of Particle Density (Gas Jar method) - 'Not UKAS Accredited'
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

Result reported relates only to the sample tested.

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Laboratory Test Report | 2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 10

DETERMINATION OF MOISTURE CONDITION VALUE AT NATURAL MOISTURE CONTENT SUMMARY RESULTS

Borehole / Trial Pit	Depth (m)	Sample	Retained on 20mm sieve (%)	Moisture Content <20mm (%)	Moisture Condition Value	Method of Interpretation	Description / Remarks
TP20	0.20	LB3	1	21.8	6.3	Steepest straight line	Brown slightly gravelly, silty SAND (Topsoil)
TP20	0.90	LB4	0	18.6	4.3	Steepest straight line	Brown slightly silty SAND
TP20	2.70	LB10	0	21.6	6.6	Steepest straight line	Brown slightly sandy, clayey SILT

Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

Method of Test: BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

UKAS TESTING 1464

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 11

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP20	0.20	**LB3**	**99.50%**	Brown slightly gravelly, silty SAND (Topsoil)

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.92	Mg/m3
Dry density	1.60	Mg/m3
Moisture content	20	%

Soaking details: Not soaked

Period of soaking: days

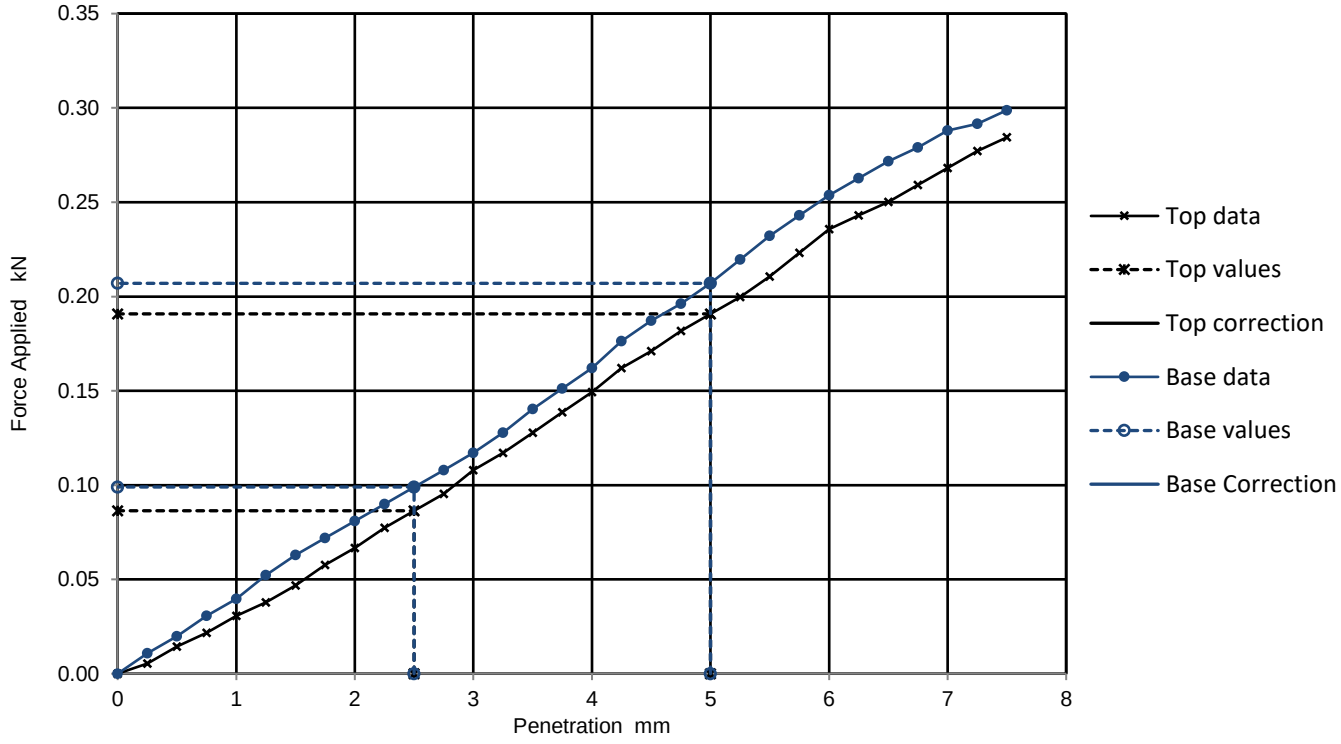
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.65	0.95	0.95	0.99	22
BASE	No	0.75	1.0	1.0		22

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 12

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP20	0.90	**LB4**	**100%**	Brown slightly silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.89	Mg/m3
Dry density	1.49	Mg/m3
Moisture content	27	%

Soaking details: Not soaked

Period of soaking: days

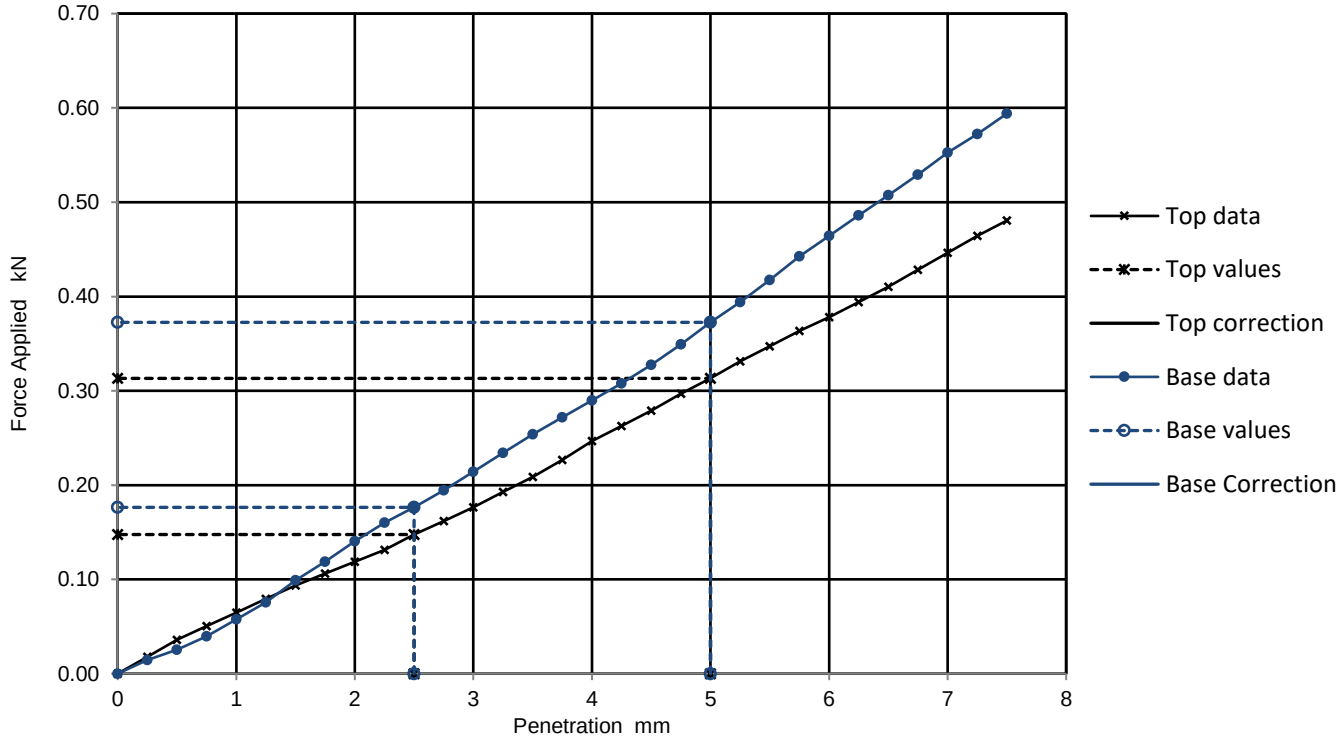
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	1.1	1.6	1.6	1.7	22
BASE	No	1.3	1.9	1.9		21

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

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Laboratory Test Report 2230746R / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746R

Client: Cadent **Page:** 13

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP20	2.70	**LB10**	**100%**	Brown slightly sandy, clayey SILT

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	2.07	Mg/m3
Dry density	1.71	Mg/m3
Moisture content	21	%

Soaking details: Not soaked

Period of soaking: days

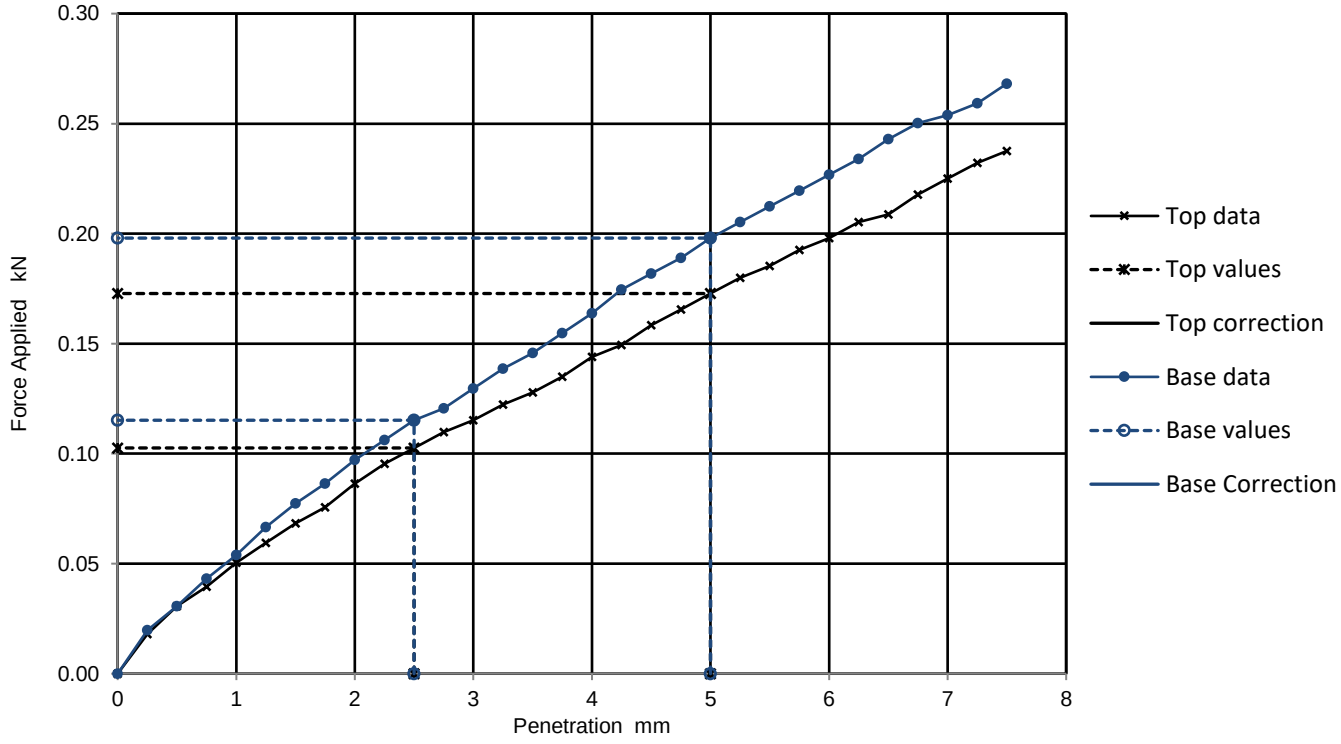
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.78	0.86	0.86	0.93	21
BASE	No	0.87	0.99	0.99		21

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

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Final Test Report - 2230746R / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746R
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 20/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746S / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746S
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	16/11/2022
Date Scheduled:	02/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	13/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 14/12/2022

Constructionline
Part of Capita plc

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
TP12	0.10	LB1	30.1	Natural	94	32	41	26	15	0.39	CI			Brown slightly gravelly, slightly clayey, silty SAND
TP12	0.40	LB4	16.4	Natural	96	17	33	16	17	0.07	CL			Brown clayey SAND/SILT
TP12	2.40	LB10	15.8	Natural	96	16	30	16	14	0.04	CL			Brown slightly gravelly, clayey SAND/SILT

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

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General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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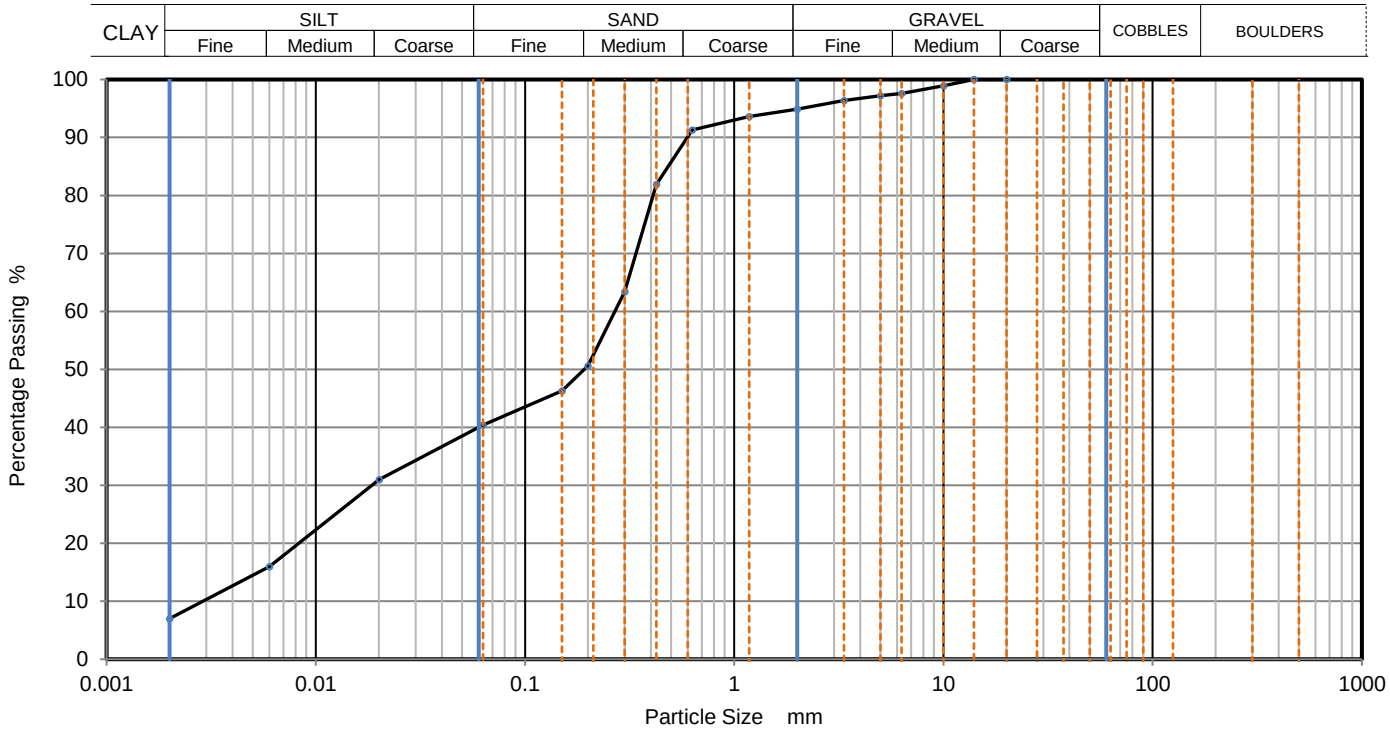
Laboratory Test Report 2230746 / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP12	0.10	LB1	Wet Sieve + Pipette	Brown slightly gravelly, slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	31
		0.0060	16
		0.0020	7
20	100		
14	100		
10	99		
6.3	98		
5	97		
3.35	96		
2	95	Particle density (assumed)	
1.18	94	2.65	Mg/m3
0.63	91		
0.425	82		
0.3	63		
0.2	51		
0.15	46		
0.063	40		

Dry Mass of sample, g: 730

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	55
Silt	33
Clay	7

Grading Analysis		
D100	mm	14
D60	mm	0.269
D30	mm	0.0193
D10	mm	0.00277
Uniformity Coefficient		97
Curvature Coefficient		0.5

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7 3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method
BS1377:Part 2:1990, clause 9.4 Determination of sedimentation by pipette method

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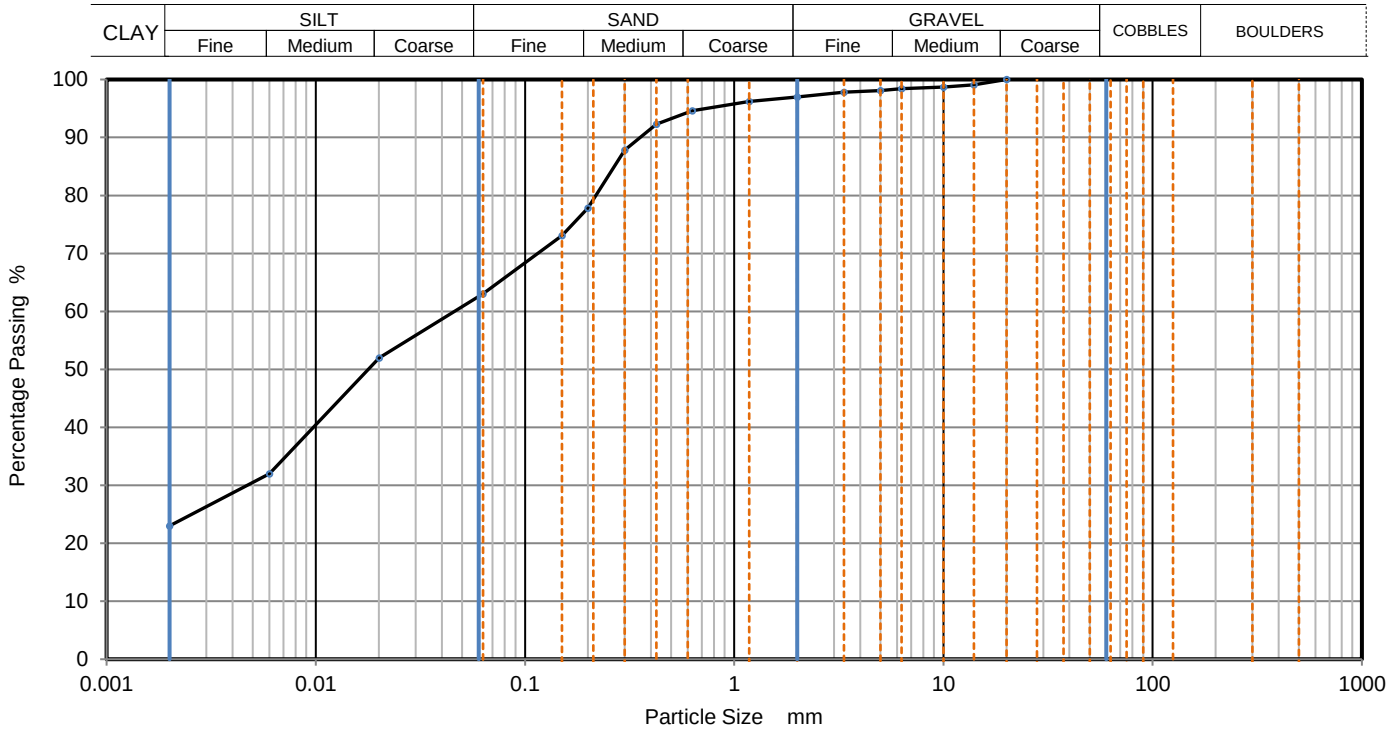
Laboratory Test Report 2230746 / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP12	0.40	LB4	Wet Sieve + Pipette	Brown clayey SAND/SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	52
		0.0060	32
		0.0020	23
20	100		
14	99		
10	99		
6.3	98		
5	98		
3.35	98		
2	97	Particle density (assumed)	
1.18	96	2.65	Mg/m3
0.63	95		
0.425	92		
0.3	88		
0.2	78		
0.15	73		
0.063	63		

Dry Mass of sample, g: 632

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	34
Silt	40
Clay	23

Grading Analysis		
D100	mm	20
D60	mm	0.0466
D30	mm	0.00479
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7 3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method
BS1377:Part 2:1990, clause 9.4 Determination of sedimentation by pipette method

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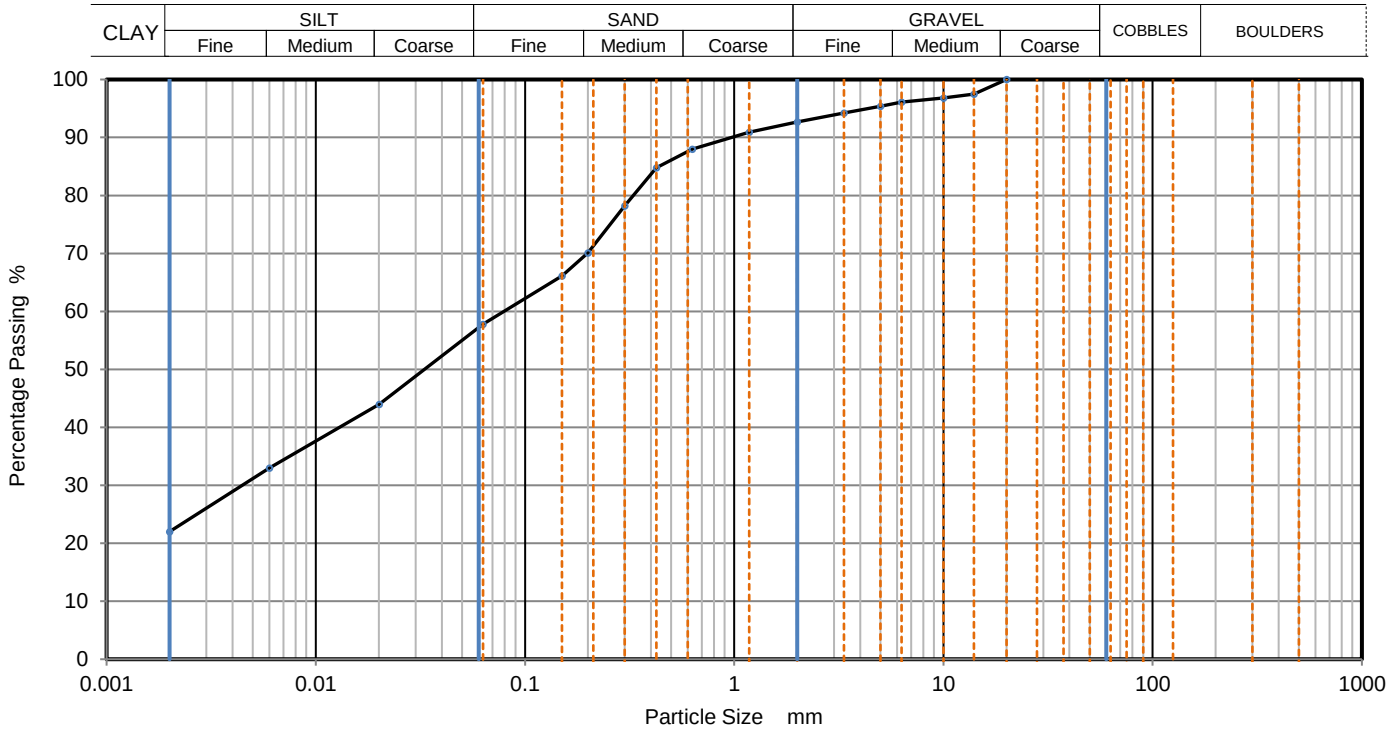
Laboratory Test Report | 2230746 / 1

Site: HyNet North West - Hydrogen Pipeline | **Job Number:** 2230746

Client: Cadent | **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP12	2.40	LB10	Wet Sieve + Pipette	Brown slightly gravelly, clayey SAND/SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	44
		0.0060	33
		0.0020	22
20	100		
14	98		
10	97		
6.3	96		
5	95		
3.35	94		
2	93	Particle density (assumed)	
1.18	91	2.65	Mg/m3
0.63	88		
0.425	85		
0.3	78		
0.2	70		
0.15	66		
0.063	58		

Dry Mass of sample, g: 547

Sample Proportions	% dry mass
Very coarse	0
Gravel	7
Sand	35
Silt	35
Clay	22

Grading Analysis		
D100	mm	20
D60	mm	0.0796
D30	mm	0.00453
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7 3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method
BS1377:Part 2:1990, clause 9.4 Determination of sedimentation by pipette method

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IAN FARMER ASSOCIATES	Laboratory Test Report	2230746S / 1

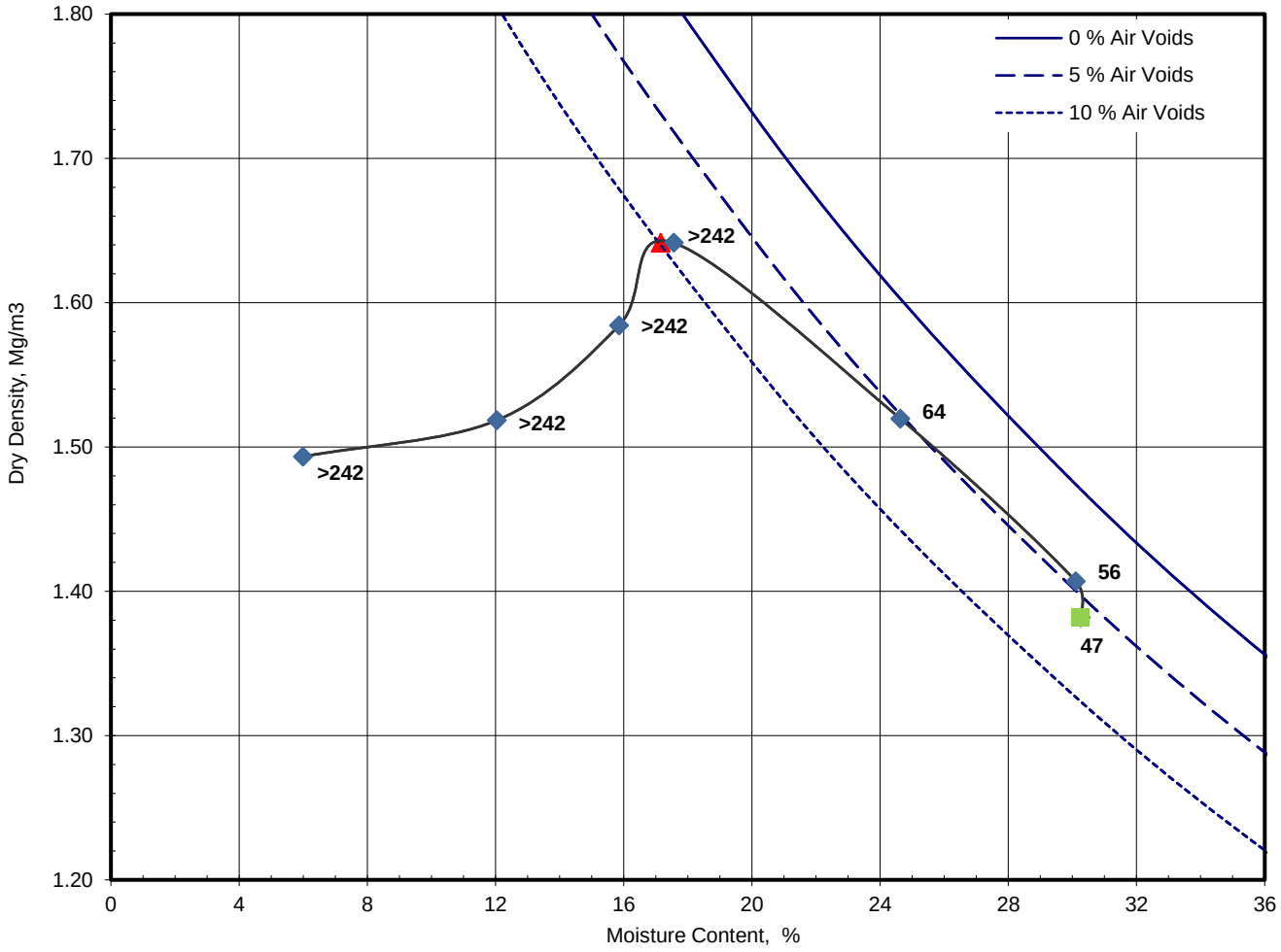
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 6

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP12	0.10	LB1	Brown slightly gravelly, slightly clayey, silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	4 %	Samples Used	Single sample tested
Grading Zone	2	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.64 Mg/m³**	**Optimum Moisture Content**	**17 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

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Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746S / 1

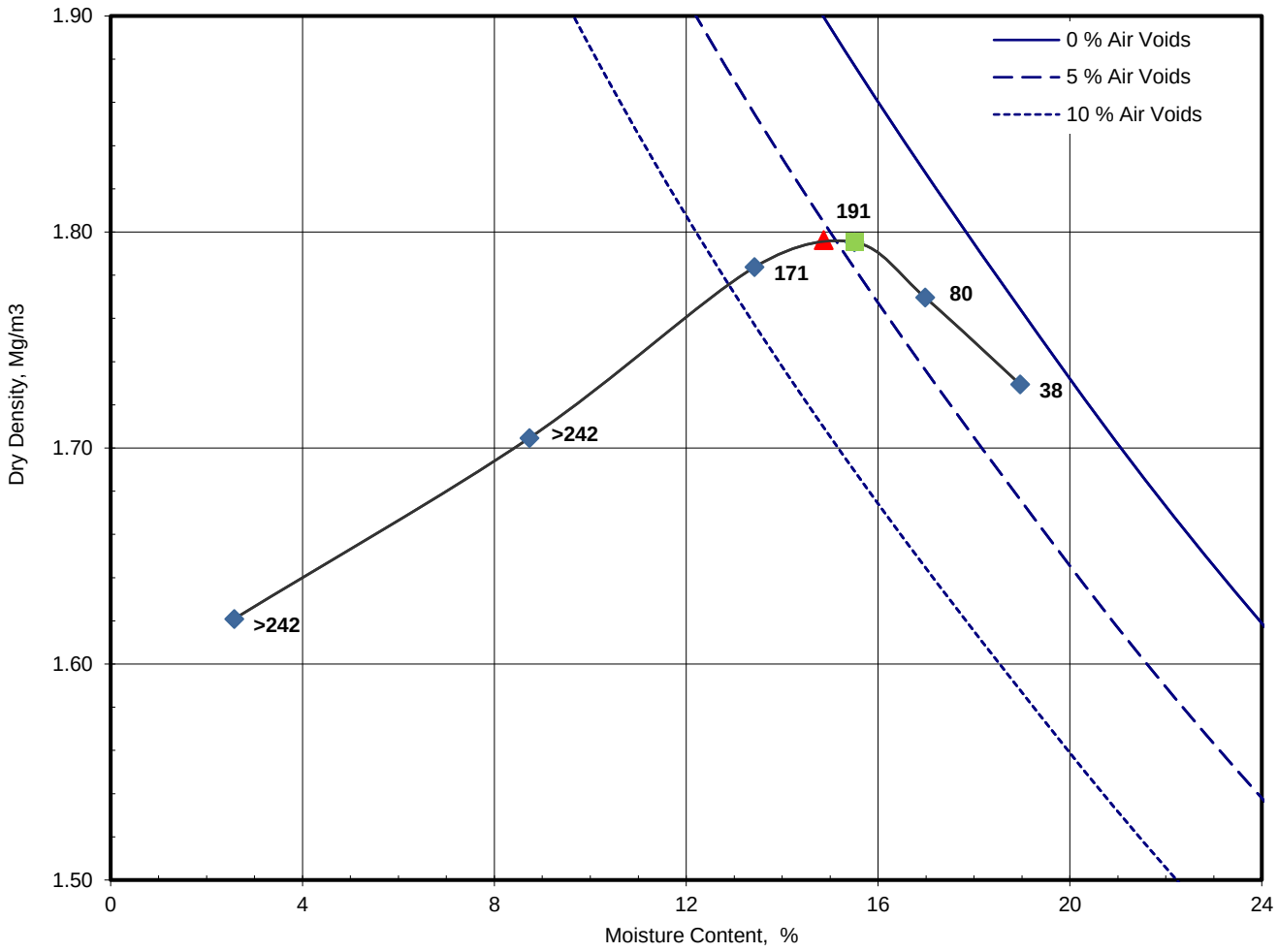
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 7

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP12	0.40	LB4	Brown clayey SAND/SILT

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	1 %	Samples Used	Single sample tested
Grading Zone	2	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.80 Mg/m³**	**Optimum Moisture Content**	**15 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

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1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746S / 1

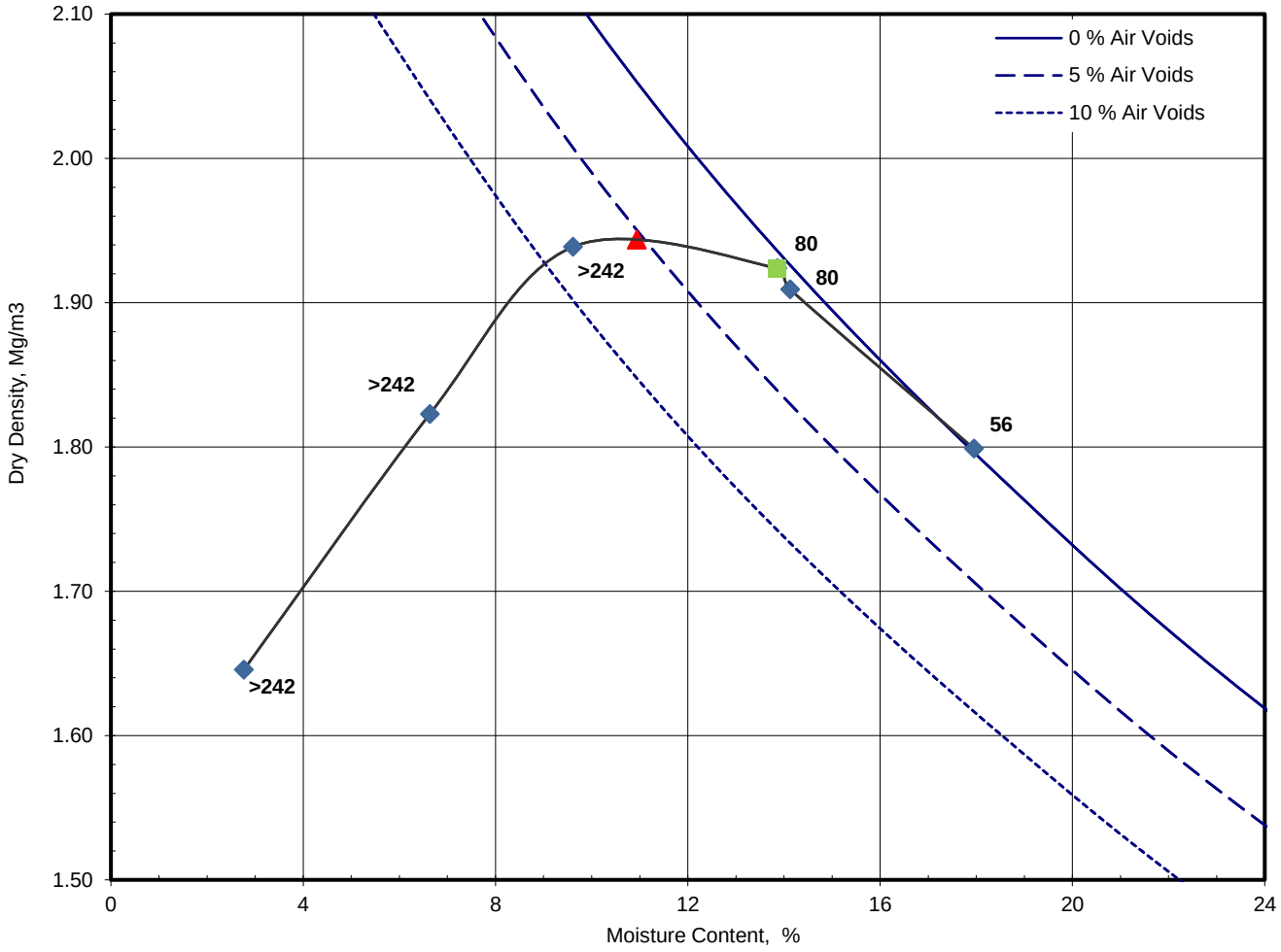
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 8

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP12	2.40	LB10	Brown slightly gravelly, clayey SAND/SILT

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	1 %	Samples Used	Single sample tested
Grading Zone	2	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.94 Mg/m³**	**Optimum Moisture Content**	**11 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report | 2230746S / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 9

DETERMINATION OF MOISTURE CONDITION VALUE AT NATURAL MOISTURE CONTENT SUMMARY RESULTS

Borehole / Trial Pit	Depth (m)	Sample	Retained on 20mm sieve (%)	Moisture Content <20mm (%)	Moisture Condition Value	Method of Interpretation	Description / Remarks
TP12	0.10	LB1	4	30.1	3.8	Steepest straight line	Brown slightly gravelly, slightly clayey, silty SAND
TP12	0.40	LB4	1	16.2	10.2	Steepest straight line	Brown clayey SAND/SILT
TP12	2.40	LB10	0	15.4	9.0	Steepest straight line	Brown slightly gravelly, clayey SAND/SILT

Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

Method of Test: BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

UKAS TESTING 1464

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746S / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 10

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP12	0.10	**LB1**	**100%**	Brown slightly gravelly, slightly clayey, silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.82	Mg/m3
Dry density	1.39	Mg/m3
Moisture content	31	%

Soaking details: Not soaked

Period of soaking: days

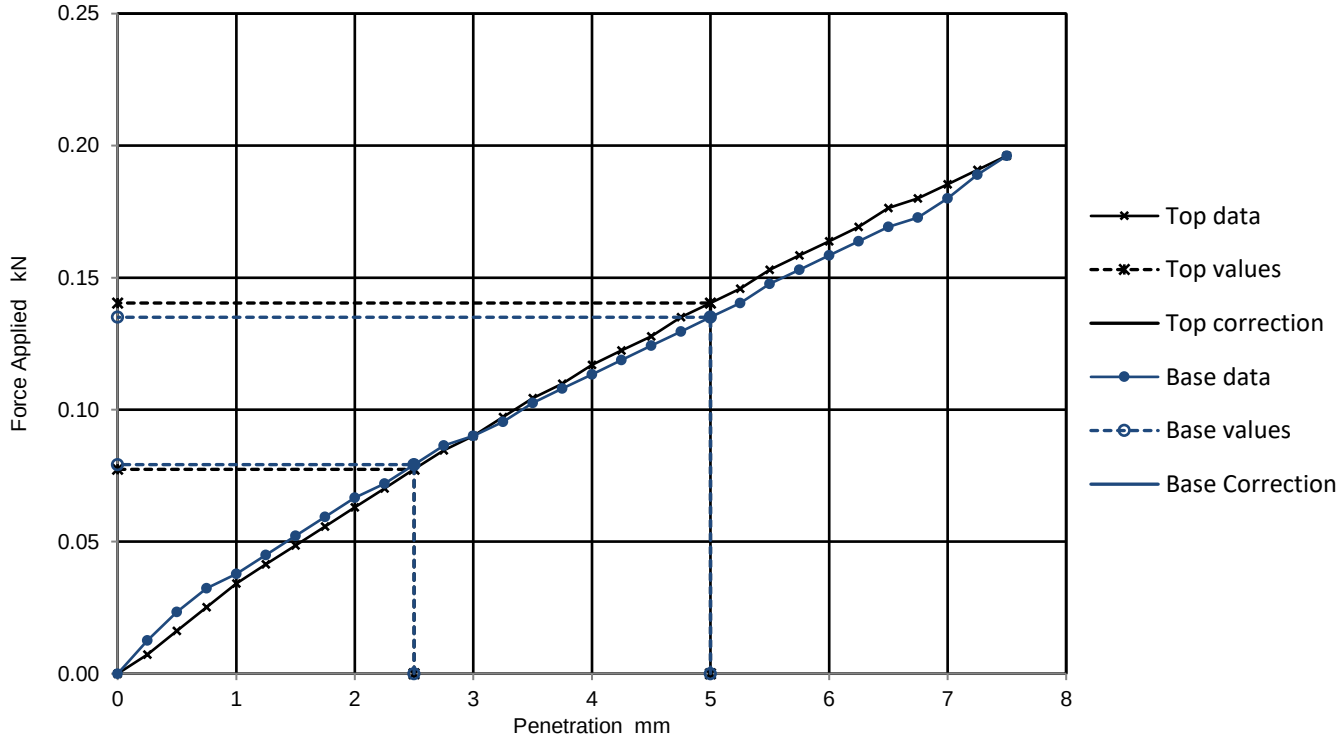
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.59	0.70	0.70	0.69	30
BASE	No	0.60	0.67	0.67		30

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746S / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 11

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP12	0.40	**LB4**	**99.10%**	Brown clayey SAND/SILT

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.93	Mg/m3
Dry density	1.68	Mg/m3
Moisture content	15	%

Soaking details: Not soaked

Period of soaking: days

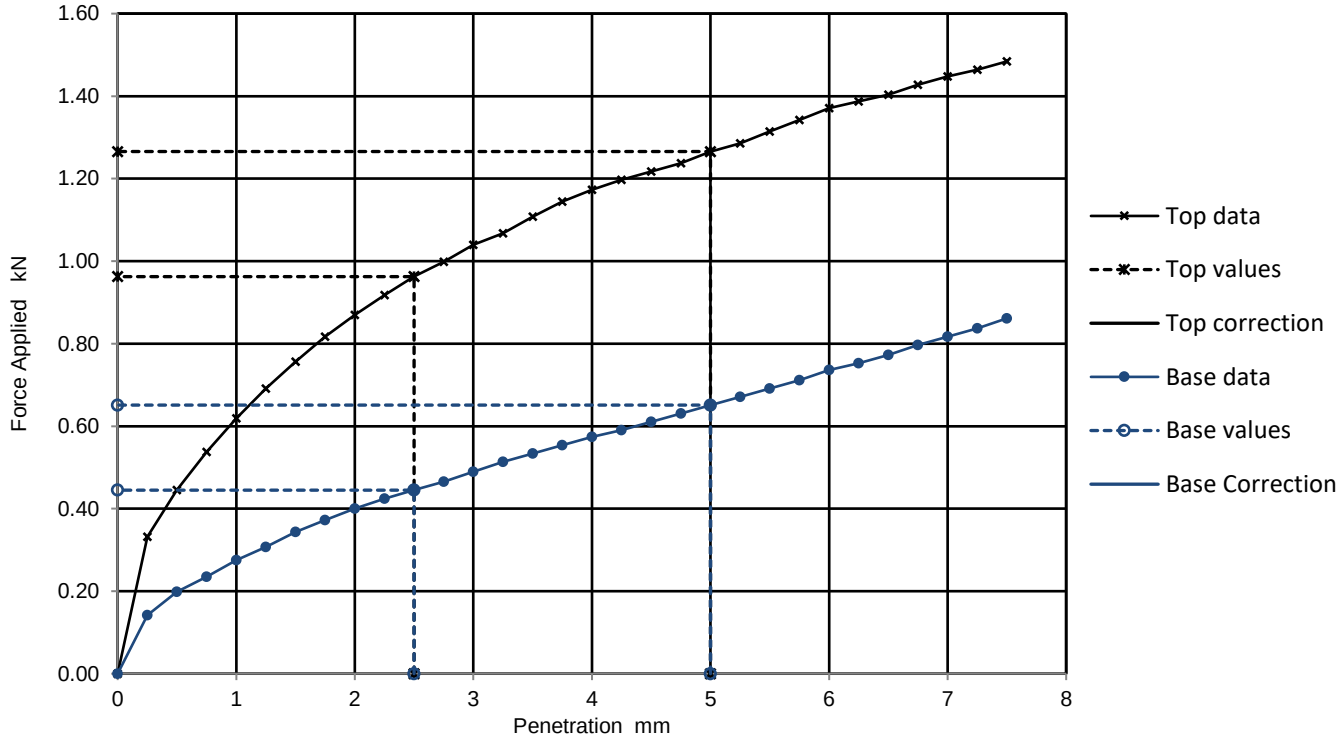
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg, 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	7.3	6.3	7.3		16
BASE	No	3.4	3.3	3.4		16

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

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Laboratory Test Report 2230746S / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746S

Client: Cadent **Page:** 12

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP12	2.40	**LB10**	**100%**	Brown slightly gravelly, clayey SAND/SILT

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.96	Mg/m3
Dry density	1.70	Mg/m3
Moisture content	15	%

Soaking details: Not soaked

Period of soaking: days

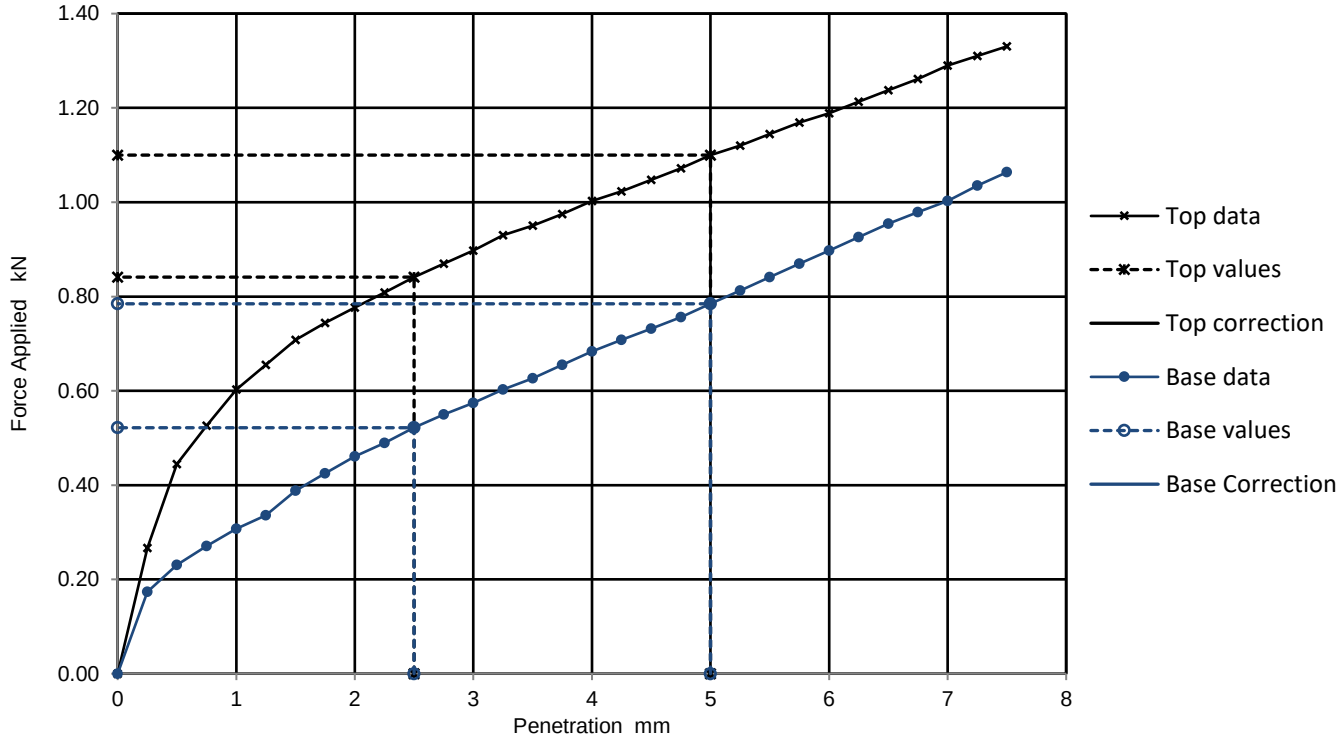
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	6.4	5.5	6.4		14
BASE	No	4.0	3.9	4.0		14

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

Final Test Report - 2230746S / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746S
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 14/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746T / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746T
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	27/10/2022
Date Scheduled:	02/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	13/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 13/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH327	0.50	B2	9.5	Sieved	45	21		NP						Brown slightly silty SAND
BH327	1.20	B5	13.4	Sieved	63	21		NP						Brown clayey, silty SAND
BH327	2.20	B7	18.5	Sieved	42	44		20*						Brown clayey SAND *Insufficient sample. PL tested only.
BH327	3.00	D10	11.7	Sieved	70	17		17*						Reddish Brown slightly silty SAND *Insufficient sample. PL tested only.

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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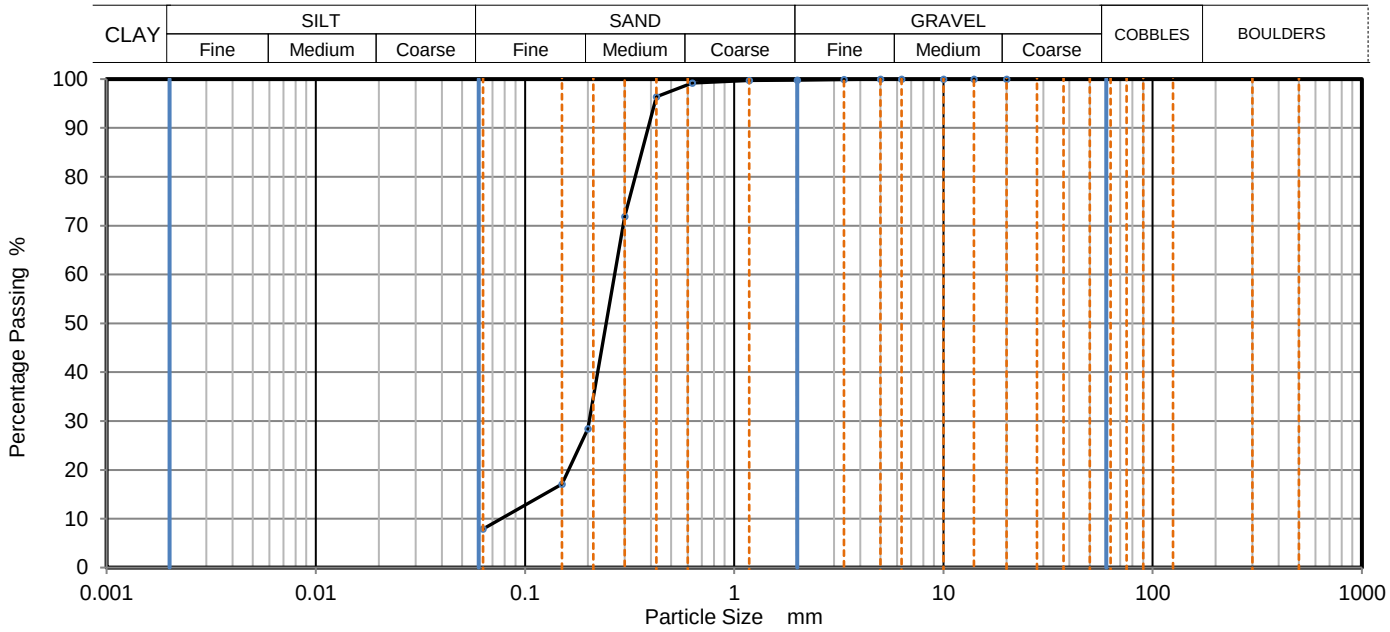
Laboratory Test Report 2230746T / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH327	0.50	B2	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	96		
0.3	72		
0.2	28		
0.15	17		
0.063	8		

Dry Mass of sample, g: 419

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	92
Fines <0.063mm	8

Grading Analysis		
D100	mm	5
D60	mm	0.269
D30	mm	0.203
D10	mm	0.0769
Uniformity Coefficient		3.5
Curvature Coefficient		2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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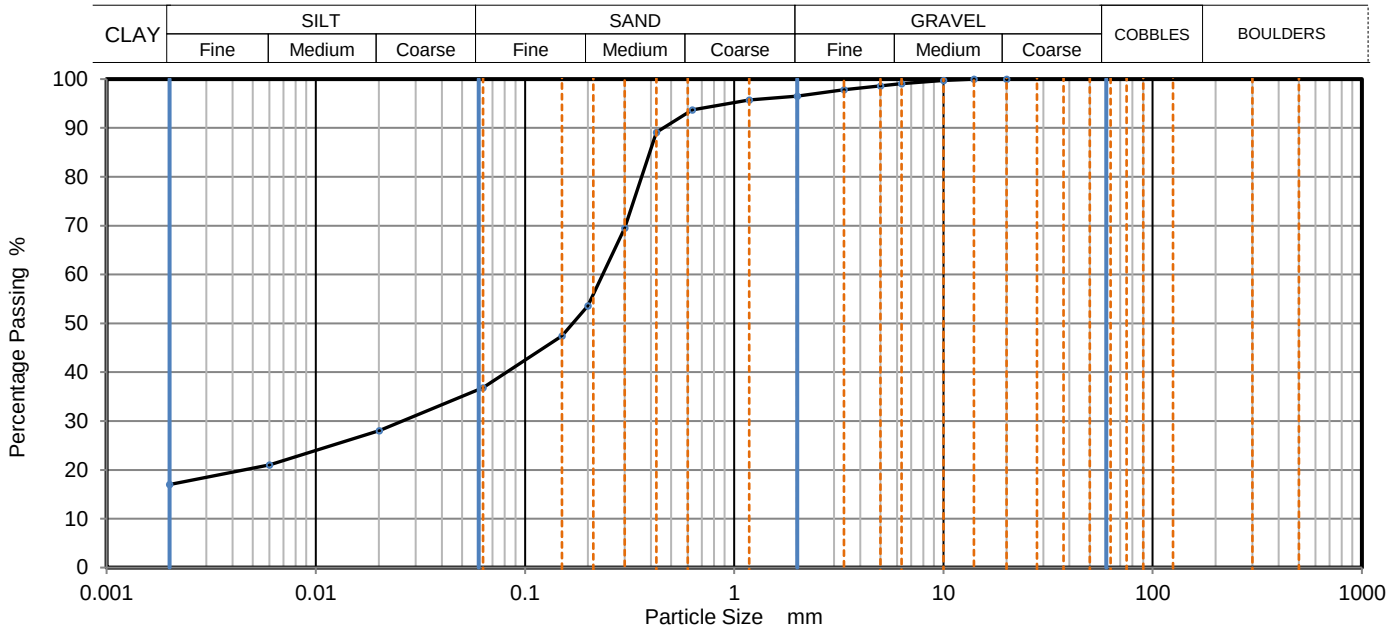
Laboratory Test Report	2230746T / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH327	1.20	B5	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	28
		0.0060	21
		0.0020	17
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	98		
2	97	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	94		
0.425	89		
0.3	70		
0.2	54		
0.15	47		
0.063	37		

Dry Mass of sample, g: 408

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	60
Silt	20
Clay	17

Grading Analysis		
D100	mm	14
D60	mm	0.235
D30	mm	0.0257
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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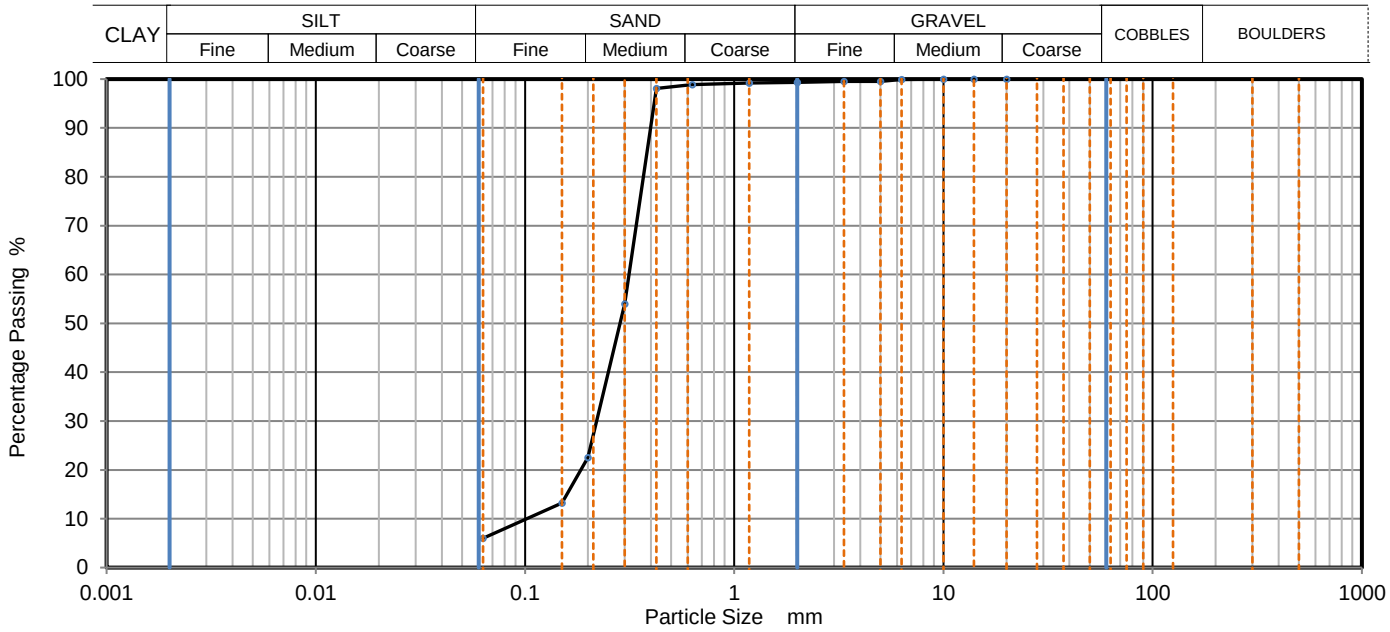
Laboratory Test Report 2230746T / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH327	2.20	B7	Wet Sieve	Brown clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.63	99		
0.425	98		
0.3	54		
0.2	23		
0.15	13		
0.063	6		

Dry Mass of sample, g 902

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	93
Fines <0.063mm	6

Grading Analysis		
D100	mm	10
D60	mm	0.315
D30	mm	0.22
D10	mm	0.102
Uniformity Coefficient		3.1
Curvature Coefficient		1.5

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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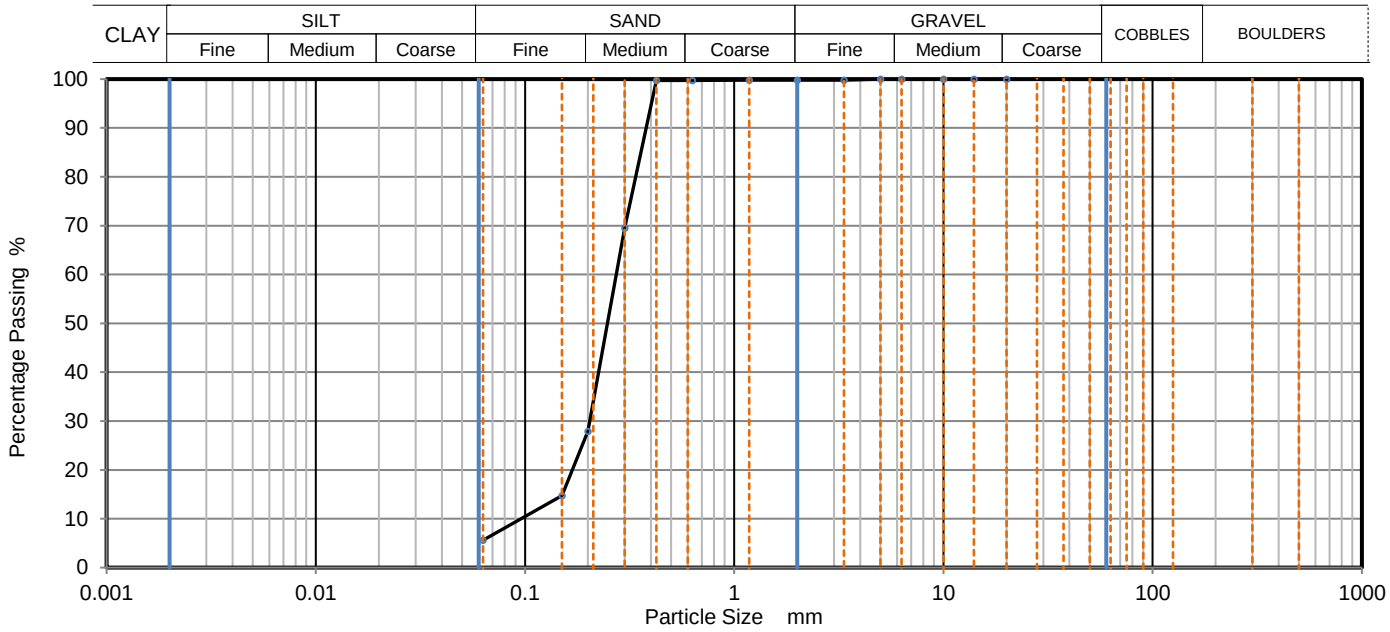
Laboratory Test Report 2230746T / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH327	3.00	D10	Wet Sieve	Reddish Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	100		
0.3	70		
0.2	28		
0.15	15		
0.063	6		

Dry Mass of sample, g: 221

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	94
Fines <0.063mm	6

Grading Analysis		
D100	mm	5
D60	mm	0.273
D30	mm	0.204
D10	mm	0.0957
Uniformity Coefficient		2.9
Curvature Coefficient		1.6

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 7

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH327	4.28	C12	Red/Brown SANDSTONE	9.7						
BH327	6.36	C13	Red/Brown SANDSTONE	13.8						
BH327	8.62	C14	Red SANDSTONE	11.3						
BH327	10.13	C15	Red SANDSTONE	14.9						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH327	6.36	C13	Red/Brown SANDSTONE	83.8	98.0	*1.2	1.94	13.8	as received	0.5025	AC	0.6	
BH327	8.62	C14	Red SANDSTONE	85.3	102.8	*1.2	2.00	11.3	as received	0.4852	AC	5.9	
BH327	10.13	C15	Red SANDSTONE	85.4	89.2	*1	2.16	14.9	as received	0.4838	AC	6.0	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746T / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746T

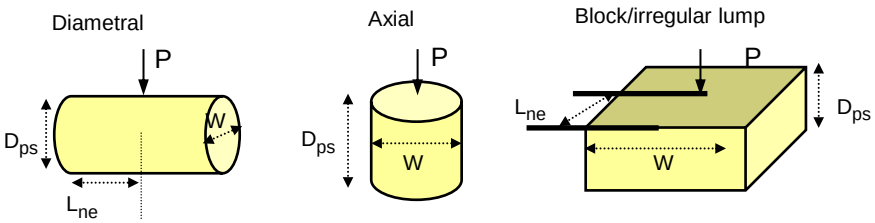
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH327	4.28	C12	Red SANDSTONE As received	D	U	YES	34.1	84.7	84.7	83.7	0.1	84.7	0.01	0.02	
BH327	4.28	C12	Red SANDSTONE As received	A	U	YES		84.5	44.4	41.4	0.1	69.1	0.01	0.01	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746T / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746T
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 13/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746U / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746U
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	02/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	12/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 12/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH326	1.20	B5	8.2	Sieved	36	23		NP						Reddish Brown slightly silty SAND
BH326	2.20	B7	20.7	Sieved	37	57		NP						Reddish Brown slightly silty SAND
BH326	3.00	B9	19.4	Sieved	33	59		NP						Reddish Brown slightly silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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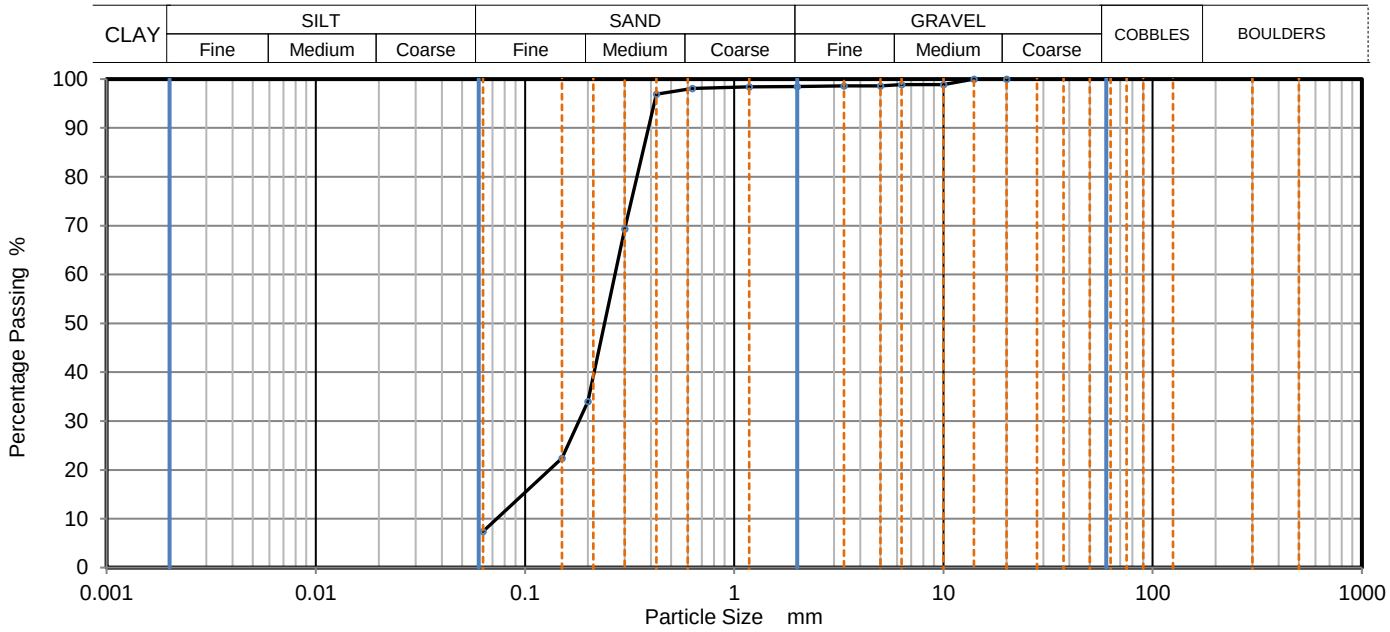
Laboratory Test Report 2230746U / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH326	1.20	B5	Wet Sieve	Reddish Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.63	98		
0.425	97		
0.3	69		
0.2	34		
0.15	22		
0.063	7		

Dry Mass of sample, g 300

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	91
Fines <0.063mm	7

Grading Analysis		
D100	mm	14
D60	mm	0.27
D30	mm	0.181
D10	mm	0.0731
Uniformity Coefficient		3.7
Curvature Coefficient		1.7

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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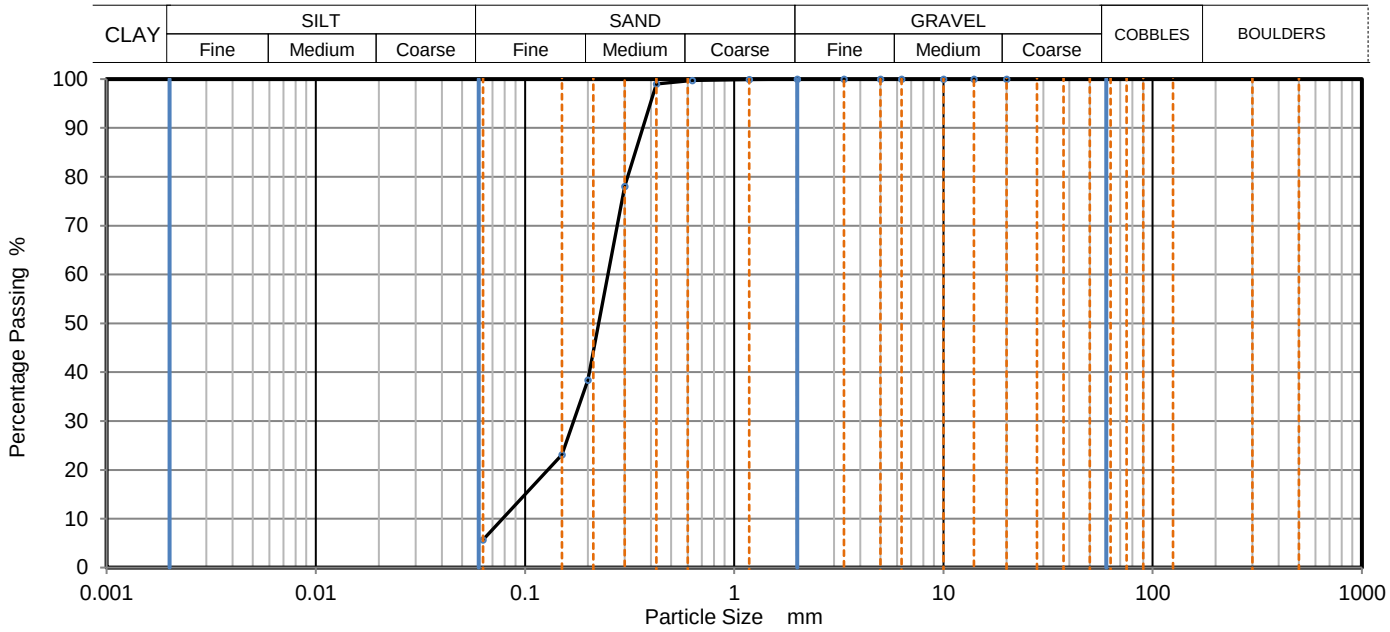
Laboratory Test Report 2230746U / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH326	2.20	B7	Wet Sieve	Reddish Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	99		
0.3	78		
0.2	38		
0.15	23		
0.063	6		

Dry Mass of sample, g 727

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	94
Fines <0.063mm	6

Grading Analysis		
D100	mm	2
D60	mm	0.249
D30	mm	0.171
D10	mm	0.0782
Uniformity Coefficient		3.2
Curvature Coefficient		1.5

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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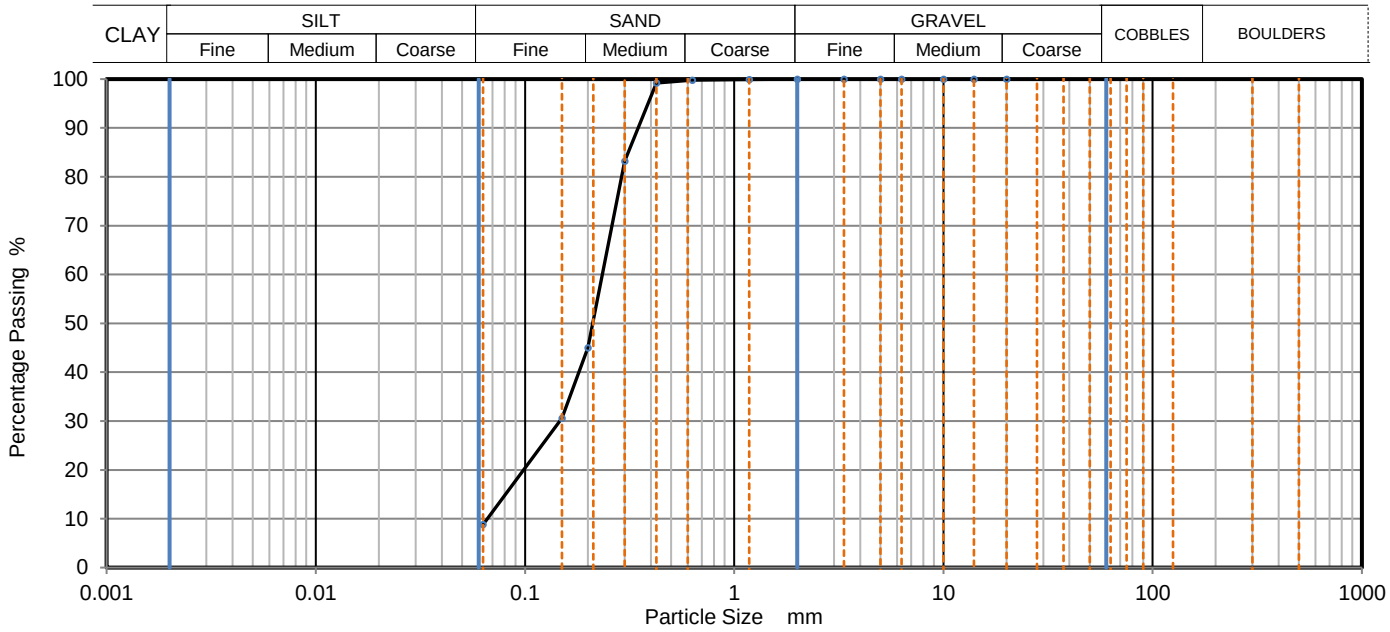
Laboratory Test Report 2230746U / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH326	3.00	B9	Wet Sieve	Reddish Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	99		
0.3	83		
0.2	45		
0.15	31		
0.063	9		

Dry Mass of sample, g 1064

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	91
Fines <0.063mm	9

Grading Analysis		
D100	mm	2
D60	mm	0.235
D30	mm	0.147
D10	mm	0.0661
Uniformity Coefficient		3.5
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

Client: Cadent **Page:** 6

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH326	4.66	C12	Red SANDSTONE	12.6						
BH326	5.50	C13	Red SANDSTONE	1.9						
BH326	7.52	C14	Red SANDSTONE	13.1						
BH326	8.44	C15	Red SANDSTONE	10.2						
BH326	10.06	C16	Red SANDSTONE	11.3						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

Client: Cadent **Page:** 7

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH326	8.44	C15	Red SANDSTONE	84.5	111.6	*1.3	2.11	10.2	as received	0.4941	AC	10.9	
BH326	10.06	C16	Red SANDSTONE	84.5	186.1	*2.2	2.03	11.3	as received	0.4945	AC	2.0	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746U

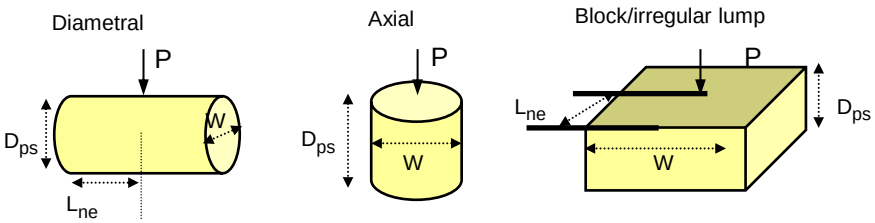
Client: Cadent **Page:** 8

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH326	4.66	C12	RED SANDSTONE As received	D	U	YES	33.3	84.6	84.6	82.6	0.1	84.6	0.02	0.02	
BH326	4.66	C12	RED SANDSTONE As received	A	U	YES		83.5	44.8	42.8	0.1	69.0	0.02	0.02	
BH326	5.50	C13	RED SANDSTONE As received	D	U	YES	36.1	84.9	84.9	82.9	0.1	84.9	0.01	0.01	
BH326	5.50	C13	RED SANDSTONE As received	A	U	YES		84.8	41.3	38.3	0.2	66.8	0.05	0.05	
BH326	7.52	C14	RED SANDSTONE As received	D	U	YES	37.7	78.0	78.0	76.0	0.1	78.0	0.01	0.01	
BH326	7.52	C14	RED SANDSTONE As received	A	U	YES		78.1	51.7	49.7	0.1	71.7	0.01	0.01	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746U / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746U
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 12/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746V / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746V
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	02/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	14/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 14/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746V

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH305	1.00	B7	15.8	Natural	100	20	42	18	24	0.08	CI			Brown slightly sandy, clayey SILT
BH305	3.00	D11	15.8	Natural	100	19	43	18	25	0.02	CI			Brown slightly sandy, slightly silty CLAY
BH305	5.00	D14	15.8	Natural	98	15	39	17	22	-0.11	CI			Brown slightly gravelly, slightly sandy, slightly silty CLAY
BH305	7.00	B18	15.8	Natural	98	19	32	15	17	0.23	CL			Brown sandy CLAY/SILT
BH305	10.00	D22	15.8	Natural	97	13	27	14	13	-0.07	CL			Brown slightly gravelly, slightly silty, sandy CLAY
BH305	12.00	D24	15.8	Sieved	83	13	26	14	12	-0.10	CL			Brown slightly gravelly, slightly silty, sandy CLAY
BH305	14.50	D27	14.9	Sieved	79	19	41	19	22	-0.01	CI			Brown slightly gravelly, silty, sandy CLAY
BH305	17.10	D29	16.3	Natural	100	16	39	20	19	-0.19	CI			Brown slightly gravelly, slightly sandy, very silty CLAY
BH305	19.20	D31	19.3	Natural	100	19	34	22	12	-0.23	CL			Brown slightly gravelly, slightly sandy, very silty CLAY
BH305	20.95	D33	19.3	Natural	100	19	36	19	17	0.02	CI			Brown slightly gravelly, slightly sandy, very silty CLAY
BH305	23.10	D39	18.8	Natural	99	19	33	19	14	0.00	CL			Brown slightly gravelly, sandy, very silty CLAY
BH305	24.20	D37	14.7	Sieved	76	19	29	18	11	0.13	CL	19.7 19.7	1.0045	Brown slightly gravelly, sandy, very silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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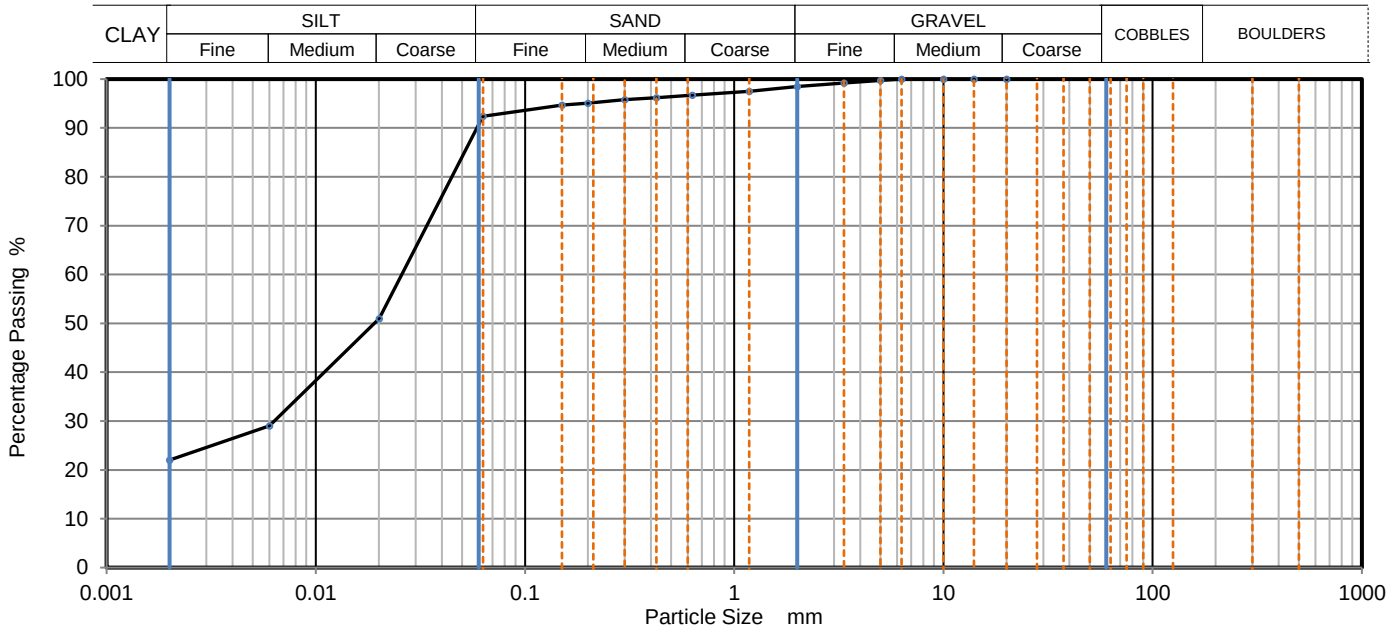
Laboratory Test Report	2230746V / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746V

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH305	1.00	B7	Wet Sieve + Pipette	Brown slightly sandy, clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	51
		0.0060	29
		0.0020	22
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.63	97		
0.425	96		
0.3	96		
0.2	95		
0.15	95		
0.063	92		

Dry Mass of sample, g	850

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	6
Silt	71
Clay	22

Grading Analysis		
D100	mm	6.3
D60	mm	0.0255
D30	mm	0.00629
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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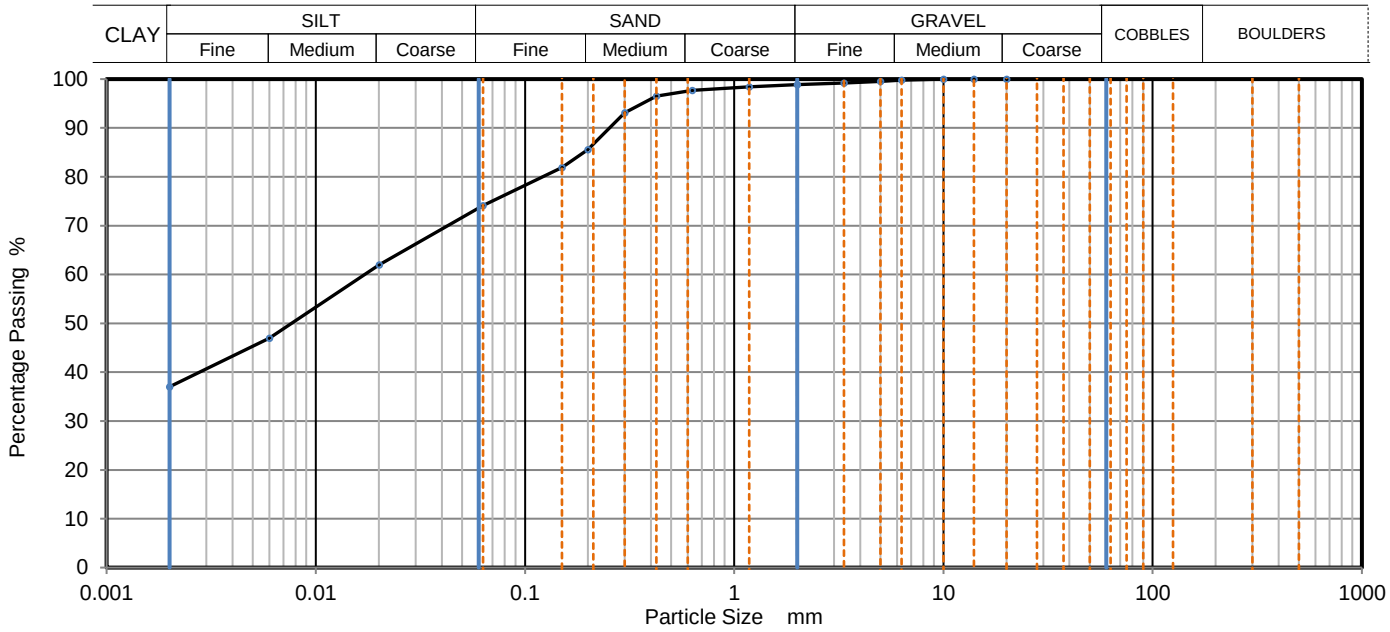
Laboratory Test Report	2230746V / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746V

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH305	7.00	B18	Wet Sieve + Pipette	Brown sandy CLAY/SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	62
		0.0060	47
		0.0020	37
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.63	98		
0.425	97		
0.3	93		
0.2	86		
0.15	82		
0.063	74		

Dry Mass of sample, g: 199

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	25
Silt	38
Clay	37

Grading Analysis		
D100	mm	10
D60	mm	0.0166
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746V

Client: Cadent **Page:** 5

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH305	21.14	C34	Brown/Grey SANDSTONE	7.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746V

Client: Cadent **Page:** 6

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH305	21.14	C34	Brown/Grey SANDSTONE	85.7	126.8	*1.5	2.31	7.0	as received	0.5027	AC	8.6	Crack 97.38mm from core top

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Final Test Report - 2230746V / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746V
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 14/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746W / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746W
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	02/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	14/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 14/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH303	0.50	B3	20.5	Natural	100	21	48	23	25	-0.10	CI			Brown sandy CLAY/SILT
BH303	1.20	B6	6.8	Sieved	97	7		NP						Reddish Brown slightly silty SAND
BH303	3.20	B10	16.1	Sieved	7	225		NP						Reddish Brown SAND
BH303	5.40	B15	19.2	Sieved	99	19	41	20	21	-0.03	CI			Reddish Brown slightly clayey SAND
BH303	9.50	D22	11.1	Natural	73	15	25	12	13	0.24	CLO			Brown slightly sandy, slightly silty CLAY
BH303	11.80	D24	17.8	Natural	100	18	44	22	22	-0.19	CI			Brown slightly sandy, slightly silty CLAY
BH303	16.80	D29	19.3	Natural	100	19	39	21	18	-0.09	CI			Brown very silty CLAY
BH303	26.50	D37	16.3	Natural	100	16	32	19	13	-0.21	CL			Brown very silty CLAY
BH303	33.40	D42	20.9	Sieved	35	60	35	20	15	2.64	CL/CI			Grey highly weathered SILTSTONE
BH303	35.10	D46	16	Sieved	46	35	32	20	12	1.25	CL	19.8 19.8	1.0034	Brown hghly weathered SILTSTONE
BH303	38.50	D51	15.8	Natural	100	16	30	19	11	-0.29	CL			Brown slightly gravelly, very silty CLAY
BH303	43.00	D55	19.8	Sieved	40	49	31	21	10	2.82	CL	20.3 20.3	0.9952	Brown/Grey highly weathered SILTSTONE

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

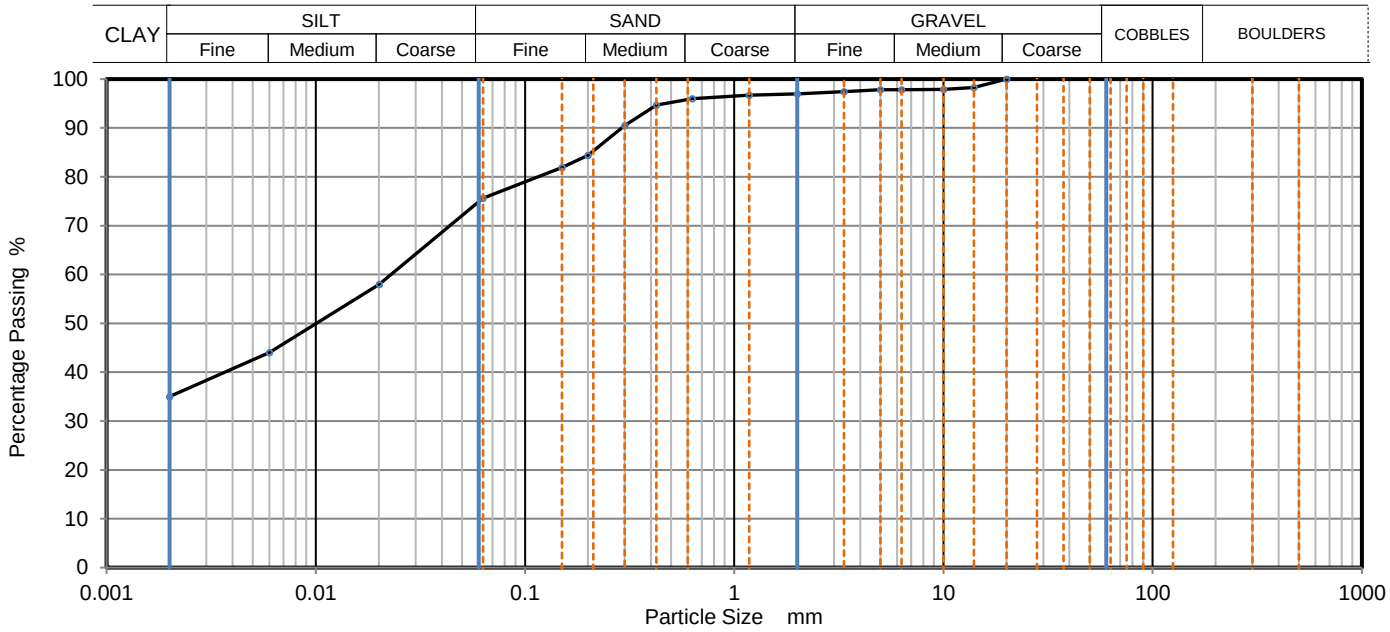
Laboratory Test Report	2230746W / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	0.50	B3	Wet Sieve + Pipette	Brown sandy CLAY/SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	58
		0.0060	44
		0.0020	35
20	100		
14	98		
10	98		
6.3	98		
5	98		
3.35	97		
2	97	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.63	96		
0.425	95		
0.3	91		
0.2	84		
0.15	82		
0.063	76		

Dry Mass of sample, g	452

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	22
Silt	40
Clay	35

Grading Analysis		
D100	mm	20
D60	mm	0.0225
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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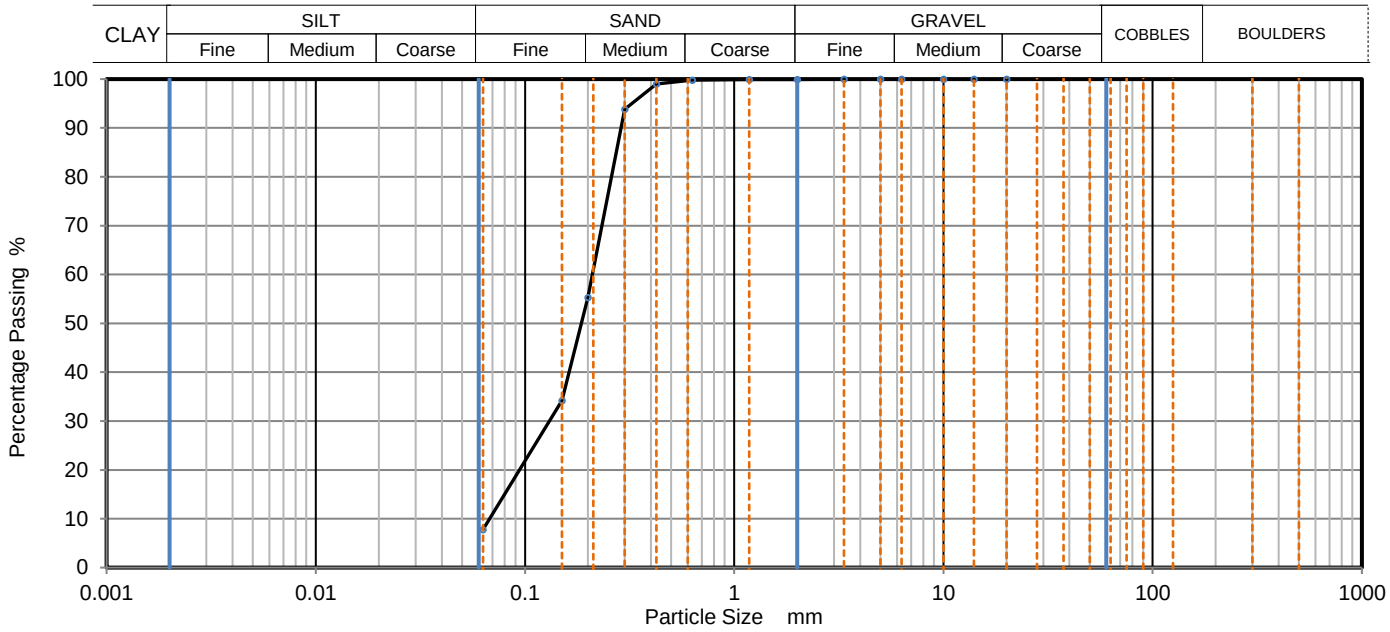
Laboratory Test Report	2230746W / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	1.20	B6	Wet Sieve	Reddish Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	99		
0.3	94		
0.2	55		
0.15	34		
0.063	8		

Dry Mass of sample, g: 442

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	92
Fines <0.063mm	8

Grading Analysis		
D100	mm	3.35
D60	mm	0.21
D30	mm	0.131
D10	mm	0.0676
Uniformity Coefficient		3.1
Curvature Coefficient		1.2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

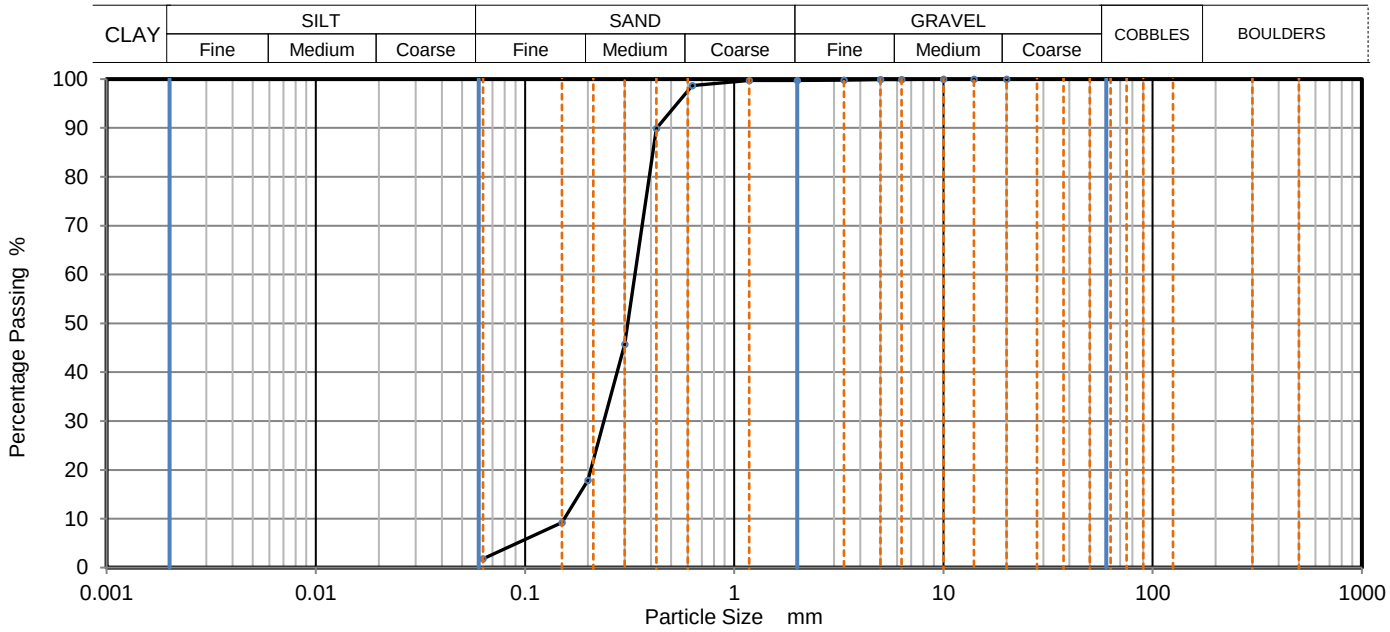
Laboratory Test Report	2230746W / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	3.20	B10	Wet Sieve	Reddish Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	90		
0.3	46		
0.2	18		
0.15	9		
0.063	2		

Dry Mass of sample, g: 688

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	98
Fines <0.063mm	2

Grading Analysis		
D100	mm	10
D60	mm	0.336
D30	mm	0.239
D10	mm	0.154
Uniformity Coefficient		2.2
Curvature Coefficient		1.1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

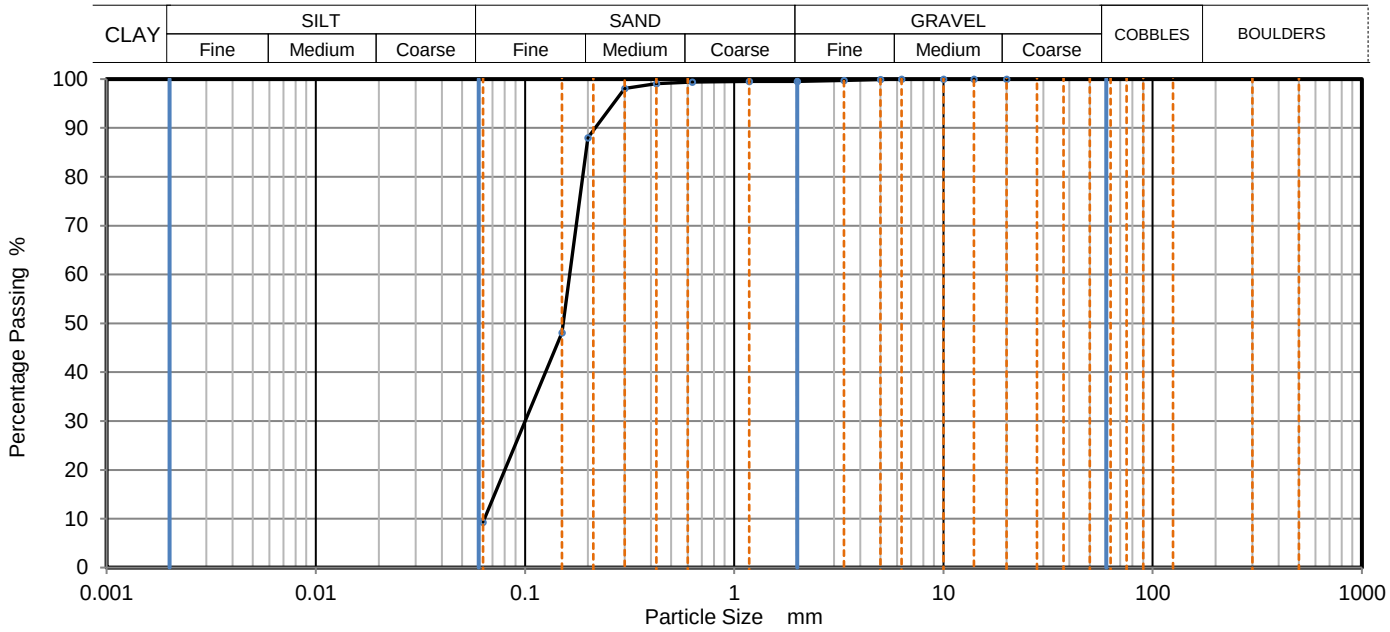
Laboratory Test Report 2230746W / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH303	5.40	B15	Wet Sieve	Reddish Brown slightly clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	99		
0.3	98		
0.2	88		
0.15	48		
0.063	9		

Dry Mass of sample, g 1249

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	90
Fines <0.063mm	9

Grading Analysis		
D100	mm	6.3
D60	mm	0.163
D30	mm	0.1
D10	mm	0.064
Uniformity Coefficient		2.6
Curvature Coefficient		0.96

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 7

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH303	16.20	C28	Red/Grey SANDSTONE	9.4						
BH303	17.40	C30	Grey SILTSTONE	14.9						
BH303	34.70	C45	Red/Grey SANDSTONE	10.0						
BH303	35.70	C47	Red/Grey SANDSTONE	12.8						
BH303	36.70	C49	Red/Grey SANDSTONE	14.3						
BH303	41.35	C53	Grey SANDSTONE	13.4						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH303	16.20	C28	Red/Grey SANDSTONE	84.6	77.8	*0.9	2.20	9.4	as received	0.4934	AC	2.1	
BH303	41.35	C53	Grey SANDSTONE	85.7	77.1	*0.9	2.16	13.4	as received	0.5031	AC	1.8	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746W

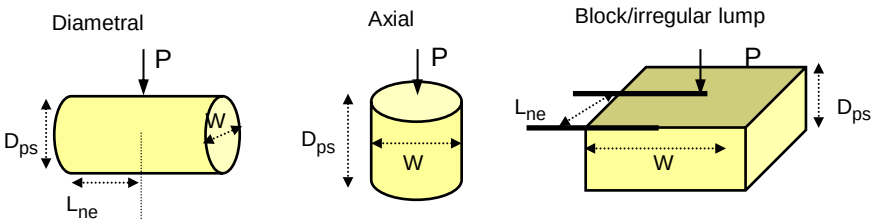
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH303	17.40	C30	Grey SILTSTONE As received	D	PL	NO	35.2	82.6	82.6	78.6	0.3	82.6	0.05	0.06	
BH303	17.40	C30	Grey SILTSTONE As received	A	PD	NO		82.7	60.3	55.3	0.5	79.7	0.09	0.11	
BH303	34.70	C45	Grey SANDSTONE As received	I	PL	NO	30.1	85.60 69.22	84.6	75.6	0.3	91.3	0.03	0.04	
BH303	34.70	C45	Grey SANDSTONE As received	I	PD	YES	29.3	84.95 61.20	55.9	46.9	0.2	72.1	0.04	0.05	
BH303	35.70	C47	Grey SILTSTONE As received	D	PL	YES	25.9	85.1	85.1	69.1	1.2	85.1	0.16	0.21	
BH303	35.70	C47	Grey SILTSTONE As received	A	PD	YES		86.0	40.4	22.4	1.2	66.5	0.28	0.32	
BH303	36.70	C49	Grey SILTSTONE As received	I	U	YES	43.6	84.67 73.30	83.6	79.6	0.1	91.7	0.01	0.02	
BH303	36.70	C49	Grey SILTSTONE As received	I	U	YES	21.0	79.42 70.49	43.7	38.7	0.1	64.6	0.03	0.03	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746W / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746W
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 14/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746X / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746X
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	12/10/2022
Date Scheduled:	21/10/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	15/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Paul Cathcart
Laboratory Manager

Report Issue Date: 15/12/2022

Constructionline Part of Capita plc

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH096	0.10	B1	16	Sieved	80	20	29	17	12	0.25	CLO			Brown gravelly, clayey, very silty SAND
BH096	0.50	B3	16.6	Sieved	72	23	23	17	6	1.01	CL			Brown clayey, gravelly, silty SAND
BH096	1.00	B5	16.8	Sieved	83	20	25	16	9	0.47	CL			Brown slightly gravelly, clayey, silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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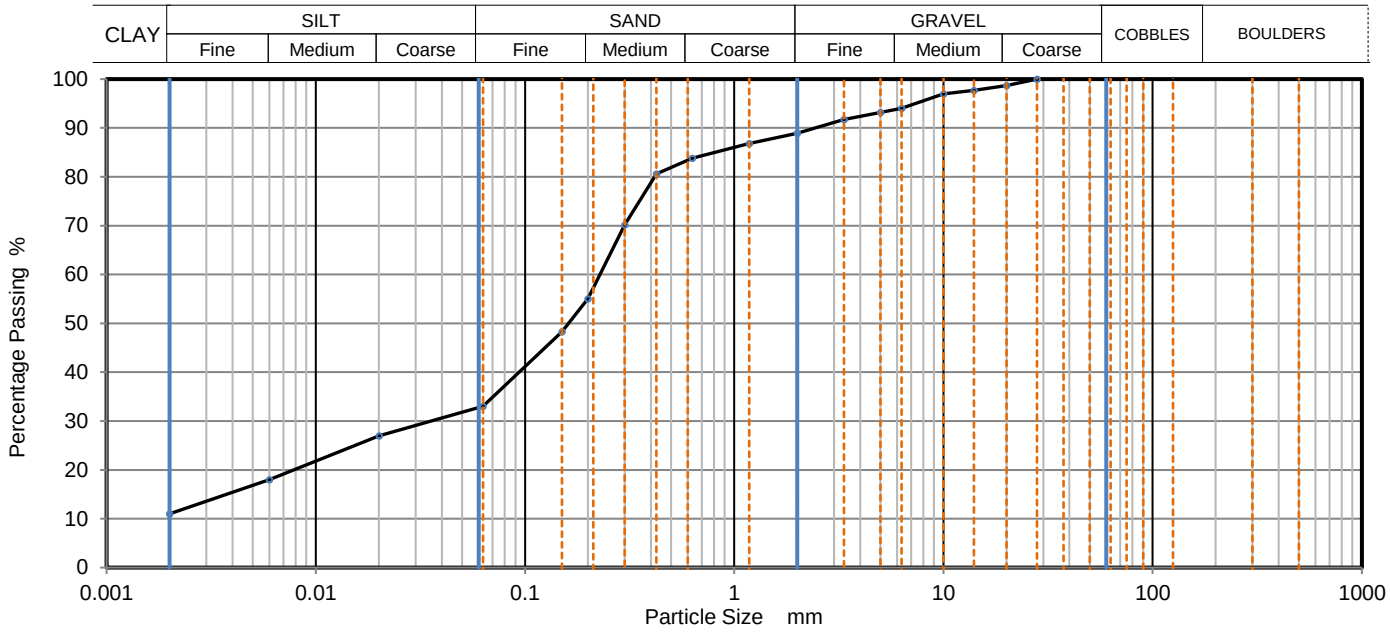
Laboratory Test Report	2230746X / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH096	0.10	B1	Wet Sieve + Pipette	Brown gravelly, clayey, very silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	27
		0.0060	18
		0.0020	11
28	100		
20	99		
14	98		
10	97		
6.3	94		
5	93		
3.35	92		
2	89	Particle density	(assumed)
1.18	87	2.65	Mg/m3
0.63	84		
0.425	81		
0.3	70		
0.2	55		
0.15	48		
0.063	33		

Dry Mass of sample, g: 1070

Sample Proportions	% dry mass
Very coarse	0
Gravel	11
Sand	56
Silt	22
Clay	11

Grading Analysis		
D100	mm	28
D60	mm	0.229
D30	mm	0.0361
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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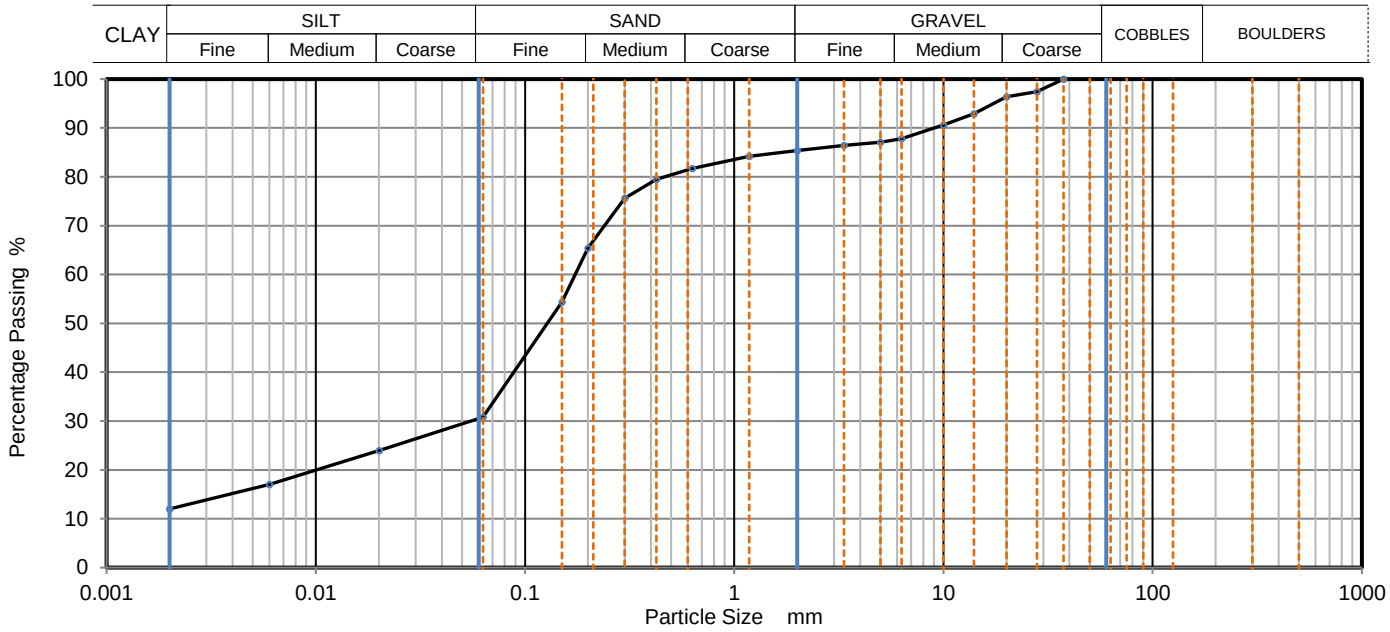
Laboratory Test Report	2230746X / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH096	0.50	B3	Wet Sieve + Pipette	Brown clayey, gravelly, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	24
		0.0060	17
		0.0020	12
37.5	100		
28	97		
20	96		
14	93		
10	91		
6.3	88		
5	87		
3.35	86		
2	85	Particle density	(assumed)
1.18	84	2.65	Mg/m3
0.63	82		
0.425	80		
0.3	76		
0.2	65		
0.15	54		
0.063	31		

Dry Mass of sample, g: 1348

Sample Proportions	% dry mass
Very coarse	0
Gravel	15
Sand	55
Silt	18
Clay	13

Grading Analysis		
D100	mm	37.5
D60	mm	0.174
D30	mm	0.0547
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

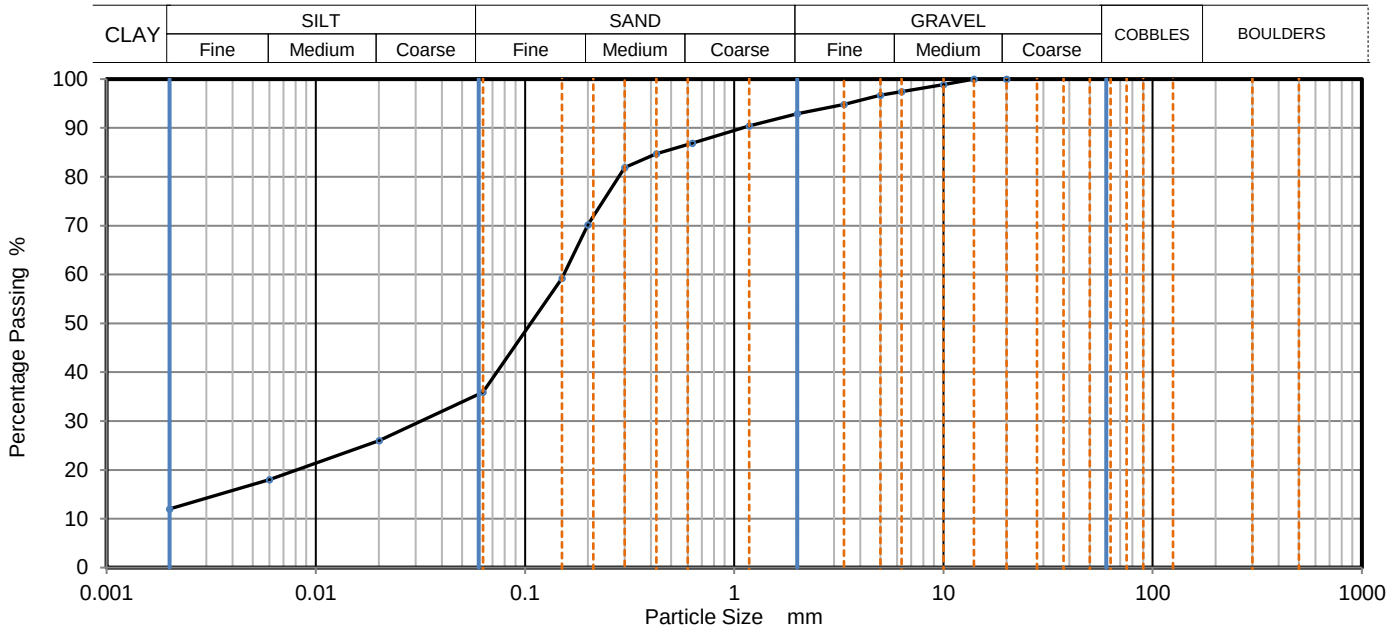
Laboratory Test Report	2230746X / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH096	1.00	B5	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	26
		0.0060	18
		0.0020	12
20	100		
14	100		
10	99		
6.3	97		
5	97		
3.35	95		
2	93	Particle density	(assumed)
1.18	90	2.65	Mg/m3
0.63	87		
0.425	85		
0.3	82		
0.2	70		
0.15	59		
0.063	36		

Dry Mass of sample, g: 1351

Sample Proportions	% dry mass
Very coarse	0
Gravel	7
Sand	57
Silt	24
Clay	12

Grading Analysis		
D100	mm	14
D60	mm	0.153
D30	mm	0.0312
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

Client: Cadent **Page:** 6

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content[1] %	Caliper[2] Dry density Mg/m³	Caliper[2] Porosity %	Buoyancy[3] Dry density Mg/m³	Buoyancy[3] Porosity %	Natural Bulk density Mg/m³	Remarks
BH096	4.10	C8	Red/Brown SILTSTONE	6.9						
BH096	6.40	C9	Red/Brown/Grey SANDSTONE	10.1						
BH096	8.70	C10	Red SANDSTONE	8.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 °C, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746X / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

Client: Cadent **Page:** 7

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH096	8.70	C10	Red SANDSTONE	85.6	153.0	*1.8	2.43	8.0	as received	0.5036	F	15.3	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746X

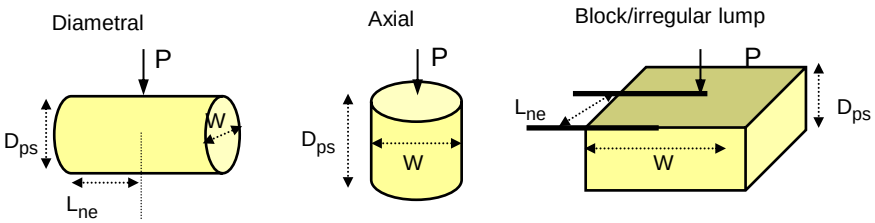
Client: Cadent **Page:** 8

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH096	4.10	C8	Red/Brown/Grey SANDSTONE As received	D	U	YES	118.5	85.6	85.6	83.6	0.9	85.6	0.12	0.15	
BH096	4.10	C8	Red/Brown/Grey SANDSTONE As received	A	U	YES		85.9	35.8	31.8	0.8	62.6	0.20	0.23	
BH096	6.40	C9	Red/Brown SILTSTONE As received	D	U	YES	34.5	86.0	86.0	84.0	1.7	86.0	0.23	0.29	
BH096	6.40	C9	Red/Brown SILTSTONE As received	A	U	YES		85.9	38.6	33.6	2.5	65.0	0.60	0.68	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746X / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746X
Originating Client:	Cadent

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Report Issue Date: 15/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746Y / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746Y
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	02/12/2022
Date Testing Started:	05/12/2022
Date Testing Finished:	14/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 14/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH070	1.00	B5	36.1	Natural	99	36	57	28	29	0.29	CH			Mottled Brown/Grey sandy, silty CLAY
BH070	2.10	B14	21.7	Sieved	44	49	39	16	23	1.46	CI			Brown slightly silty, slightly clayey SAND
BH070	4.30	B15	18.4	Sieved	68	27		NP						Brown slightly silty, slightly gravelly, slightly clayey SAND
BH070	5.50	D10	14.6											Brown slightly silty, slightly gravelly SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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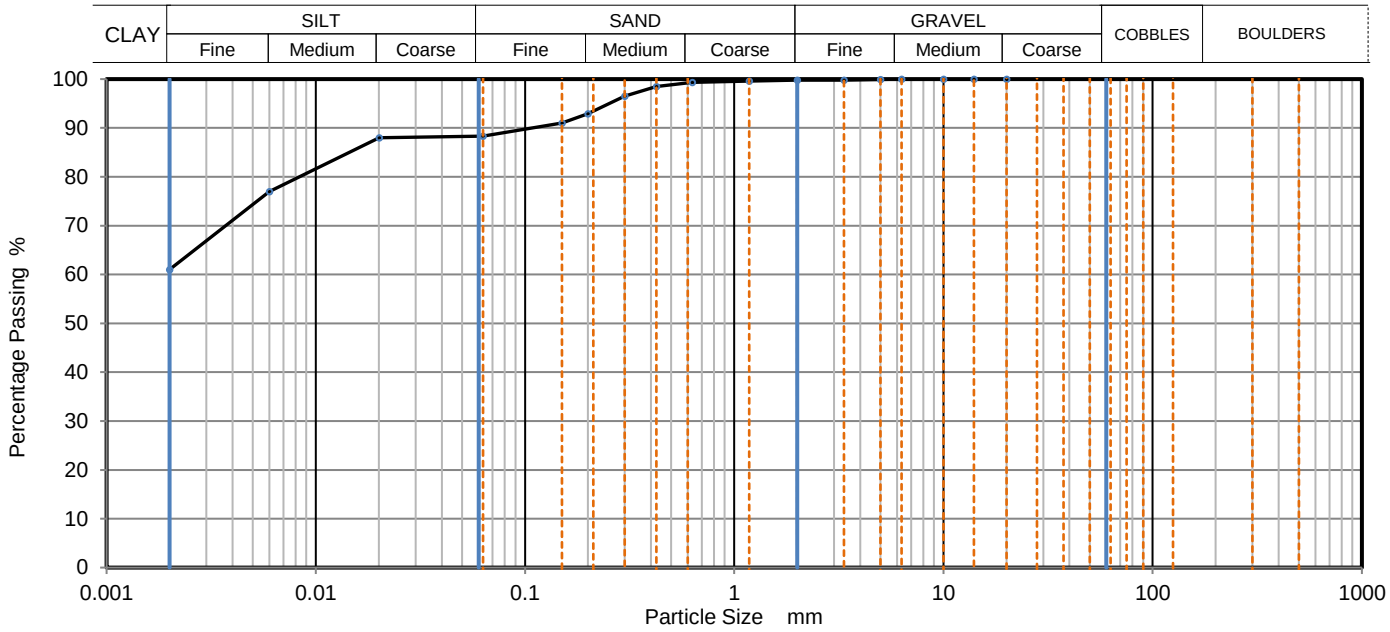
Laboratory Test Report	2230746Y / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH070	1.00	B5	Wet Sieve + Pipette	Mottled Brown/Grey sandy, silty CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	88
		0.0060	77
		0.0020	61
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	99		
0.3	97		
0.2	93		
0.15	91		
0.063	88		

Dry Mass of sample, g	422

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	12
Silt	28
Clay	61

Grading Analysis		
D100	mm	6.3
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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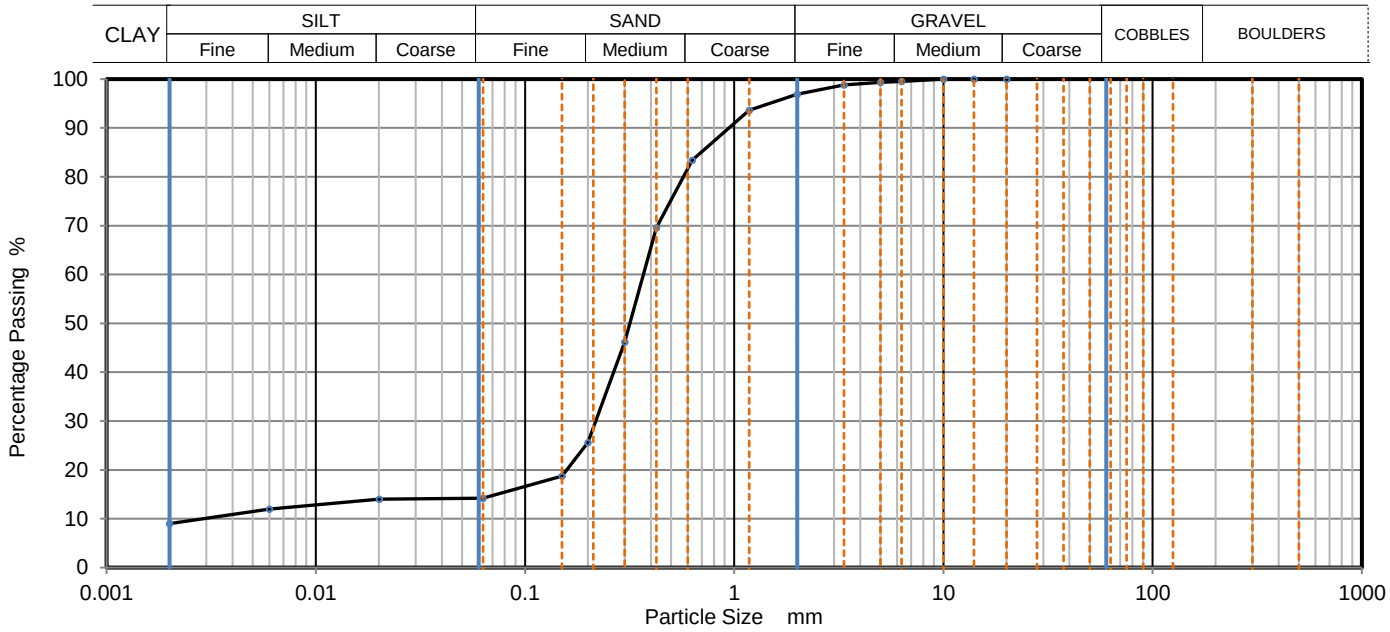
Laboratory Test Report	2230746Y / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH070	2.10	B14	Wet Sieve + Pipette	Brown slightly silty, slightly clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	14
		0.0060	12
		0.0020	9
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	97	Particle density	(assumed)
1.18	94	2.65	Mg/m3
0.63	83		
0.425	70		
0.3	46		
0.2	26		
0.15	19		
0.063	14		

Dry Mass of sample, g: 741

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	83
Silt	5
Clay	9

Grading Analysis		
D100	mm	10
D60	mm	0.368
D30	mm	0.218
D10	mm	0.00324
Uniformity Coefficient		110
Curvature Coefficient		40

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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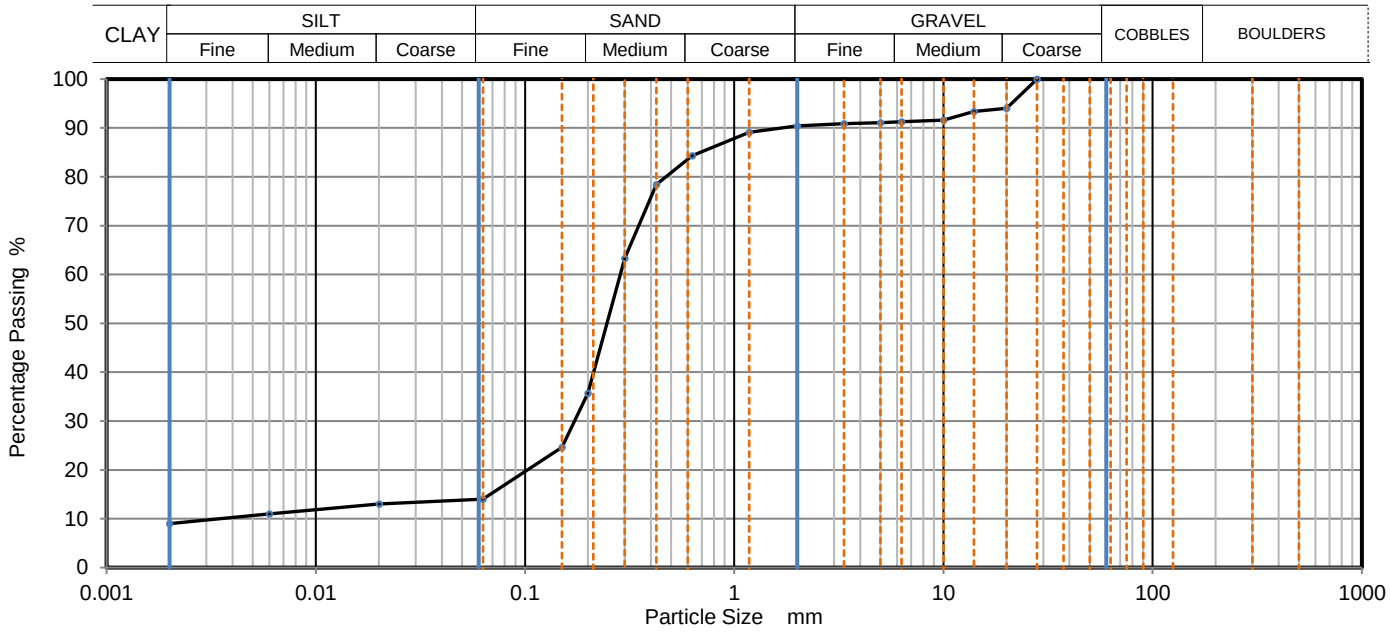
Laboratory Test Report 2230746Y / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH070	4.30	B15	Wet Sieve + Pipette	Brown slightly silty, slightly gravelly, slightly clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	13
		0.0060	11
		0.0020	9
28	100		
20	94		
14	93		
10	92		
6.3	91		
5	91		
3.35	91		
2	90	Particle density	(assumed)
1.18	89	2.65	Mg/m3
0.63	84		
0.425	78		
0.3	63		
0.2	36		
0.15	25		
0.063	14		

Dry Mass of sample, g 1157

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	77
Silt	5
Clay	9

Grading Analysis		
D100	mm	28
D60	mm	0.286
D30	mm	0.173
D10	mm	0.00376
Uniformity Coefficient		76
Curvature Coefficient		28

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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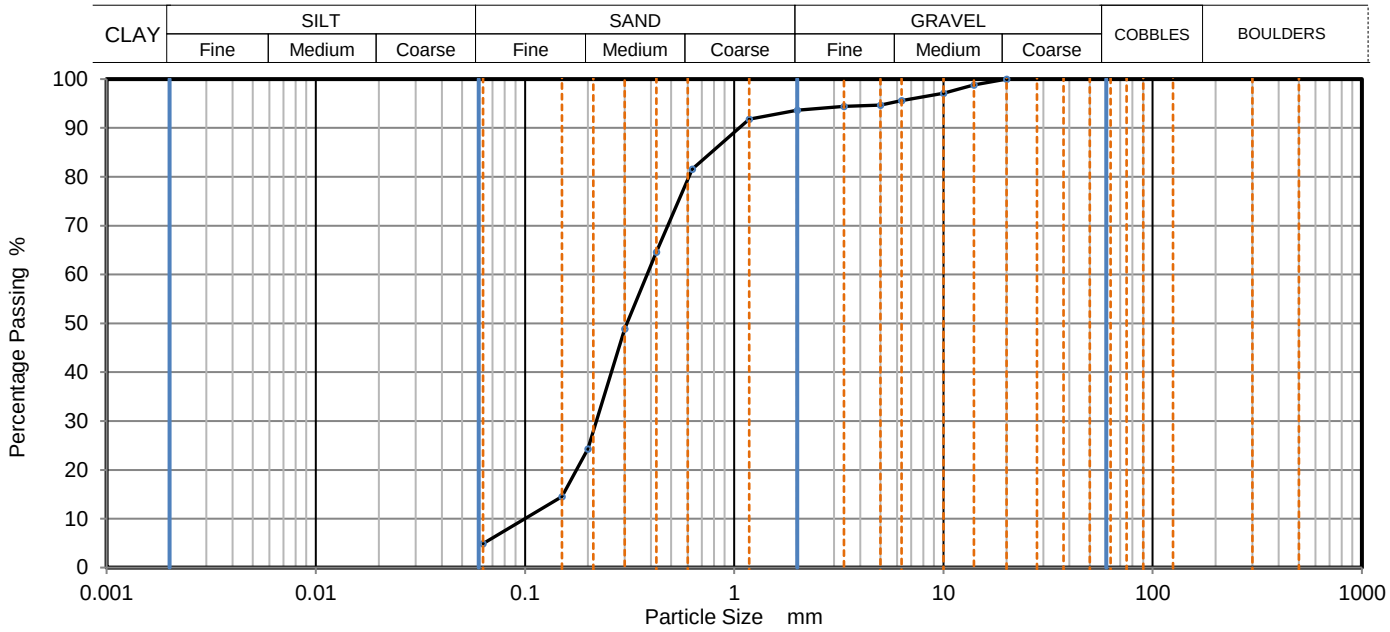
Laboratory Test Report	2230746Y / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH070	5.50	D10	Wet Sieve	Brown slightly silty, slightly gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	99		
10	97		
6.3	96		
5	95		
3.35	94		
2	94		
1.18	92		
0.63	82		
0.425	65		
0.3	49		
0.2	24		
0.15	15		
0.063	5		

Dry Mass of sample, g: 681

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	89
Fines <0.063mm	5

Grading Analysis		
D100	mm	20
D60	mm	0.384
D30	mm	0.22
D10	mm	0.0998
Uniformity Coefficient		3.8
Curvature Coefficient		1.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 7

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH070	9.80	C17	Red/Brown SANDSTONE	13.7						
BH070	10.86	C18	Red/Brown SANDSTONE	11.3						
BH070	14.30	C21	Red/Brown SANDSTONE	14.3						
BH070	19.10	C24	Red SANDSTONE	14.8						
BH070	25.25	C27	Red SANDSTONE	10.5						
BH070	32.58	C30	Red SANDSTONE	9.1						
BH070	39.25	C33	Red SANDSTONE	11.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH070	19.10	C24	Red SANDSTONE	87.2	81.4	*0.9	2.11	14.8	as received	0.4856	AC	7.9	
BH070	25.25	C27	Red SANDSTONE	87.1	147.1	*1.7	2.33	10.5	as received	0.4865	AC	6.7	
BH070	32.58	C30	Red SANDSTONE	86.7	203.6	*2.3	2.30	9.1	as received	0.4913	AC	19.8	
BH070	39.25	C33	Red SANDSTONE	86.6	119.6	*1.4	2.36	11.0	as received	0.4925	AC	6.3	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Y

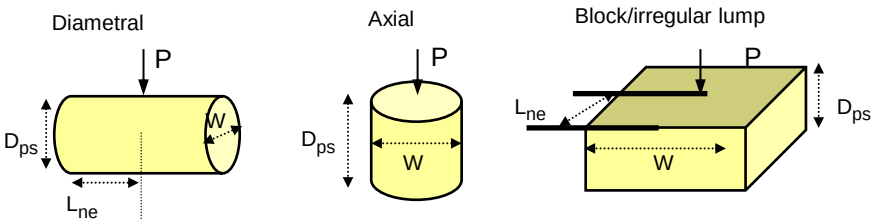
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH070	9.80	C17	Red/Brown SANDSTONE As received	D	U	YES	30.0	86.7	86.7	78.7	0.3	86.7	0.04	0.05	
BH070	9.80	C17	Red/Brown SANDSTONE As received	A	U	YES		86.5	45.0	41.0	0.3	70.4	0.06	0.07	
BH070	10.86	C18	Red/Brown/Grey SANDSTONE As received	D	U	YES	35.7	87.2	87.2	84.2	0.6	87.2	0.07	0.09	
BH070	10.86	C18	Red/Brown/Grey SANDSTONE As received	A	U	YES		87.4	34.1	31.1	0.5	61.6	0.12	0.13	
BH070	14.30	C21	Red/Brown SANDSTONE As received	D	U	YES	35.3	86.3	86.3	84.3	0.5	86.3	0.06	0.08	
BH070	14.30	C21	Red/Brown SANDSTONE As received	A	U	YES		87.3	43.3	39.3	0.5	69.4	0.10	0.11	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746Y / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746Y
Originating Client:	Cadent

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Report Issue Date: 14/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746Z / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746Z
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	02/12/2022
Date Testing Started:	07/12/2022
Date Testing Finished:	16/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 16/12/2022

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Newcastle upon Tyne (0191) 482 8500. Motherwell (01698) 230231. Warrington (01925) 855440. Washington (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH042	0.50	B3	13.6	Sieved	24	58		NP						Brown silty SAND
BH042	1.20	B17	16.2	Sieved	21	76	26	18	8	7.29	CL	19.6 19.6	1.0064	Brown slightly clayey, slightly silty SAND
BH042	3.20	B18	17.6	Sieved	60	29		NP						Brown silty SAND
BH042	6.00	D10	9.8	Natural	96	10	24	10	14	0.01	CL			Brown slightly sandy CLAY
BH042	7.50	D11	13.8	Natural	95	14	29	15	14	-0.04	CL			Brown slightly sandy CLAY
BH042	9.00	D12	18.6											Brown sandy, silty CLAY
BH042	10.20	D13	22.3	Natural	100	22	37	20	17	0.14	CI			Mottled Brown/Grey sandy, very silty CLAY
BH042	11.70	D14	22.6	Sieved	73	31	34	22	12	0.74	CL			Grey sandy, very silty CLAY
BH042	13.20	D15	14.8											Grey sandy, very silty CLAY
BH042	14.70	D16	18.1	Sieved	91	20	40	22	18	-0.11	CI			Mottled Brown/Grey sandy SILT/CLAY
BH042	17.30	D25	22.2	Sieved	54	41	29	16	13	1.92	CL			Mottled Grey/Brown slightly gravelly, sandy SILT/CLAY
BH042	20.10	D27	17.5	Natural	100	18	39	24	15	-0.43	CI			Brown sandy, very silty CLAY
BH042	21.40	D29	17.6	Sieved	29	61	36	21	15	2.69	CI	19.6 19.7	1.0075	Brown sandy, SILT/CLAY
BH042	22.10	D30	14.3	Natural	100	14	30	16	14	-0.12	CL			Grey sandy CLAY/SILT
BH042	23.40	D31	13.3	Sieved	22	59		18*						Light Bluish Grey clayey SILT *Insufficient sample. PL tested only..
BH042	24.90	D33	17.2	Natural	100	17	34	20	14	-0.20	CL			Brown sandy, silty CLAY
BH042	26.70	D34	16.7	Natural	100	17	30	20	10	-0.33	CL			Brown sandy, very silty CLAY
BH042	31.65	D37	17.3	Natural	100	17	34	19	15	-0.11	CL			Brown sandy, very silty CLAY
BH042	35.10	D39	17.1	Natural	100	17	32	20	12	-0.24	CL			Brown sandy, very silty CLAY
BH042	39.55	D42	14.2	Natural	100	14	33	21	12	-0.57	CL			Grey/Brown sandy CLAY/SILT
BH042	42.25	D44	16.7	Natural	100	17	33	20	13	-0.25	CL			Grey sandy CLAY/SILT
BH042	44.65	D46	17.2	Natural	100	17	32	21	11	-0.35	CL			Brown slightly clayey, sandy SILT
BH042	47.80	D49	16.2	Sieved	6	261		25*						Reddish Brown MUDSTONE *Insufficient sample. PL tested only..

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

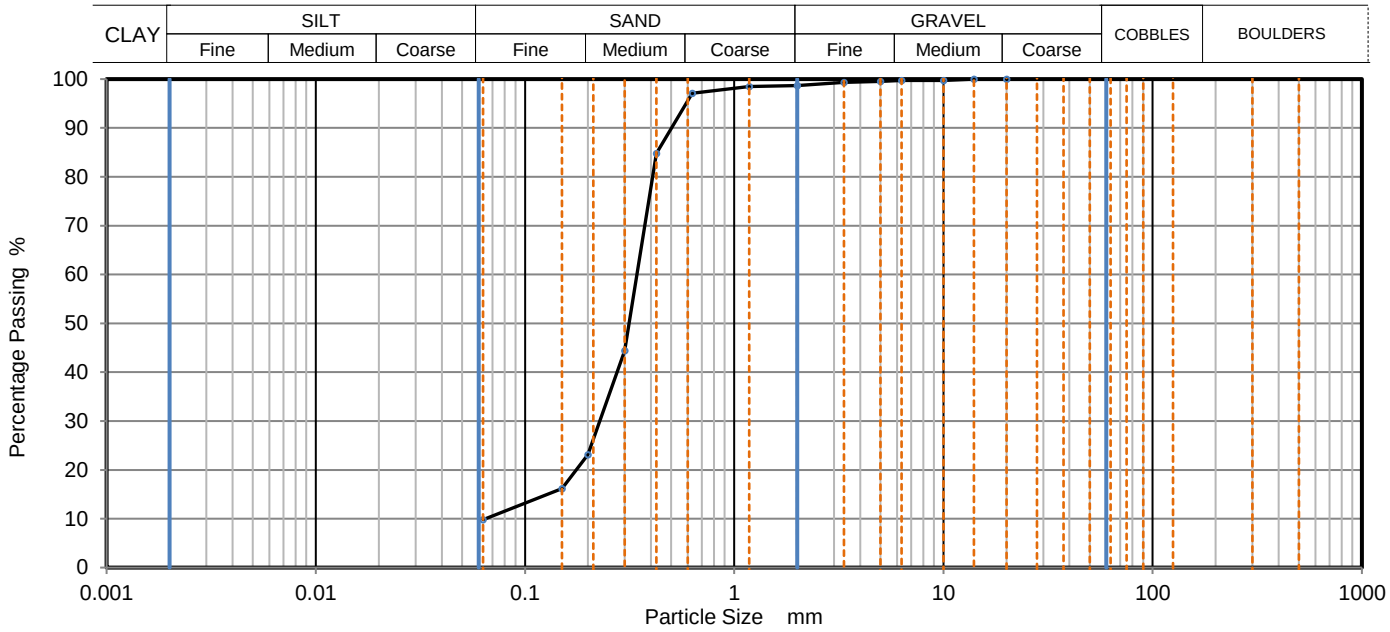
Laboratory Test Report 2230746Z / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH042	0.50	B3	Wet Sieve	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.63	97		
0.425	85		
0.3	44		
0.2	23		
0.15	16		
0.063	10		

Dry Mass of sample, g 776

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	89
Fines <0.063mm	10

Grading Analysis		
D100	mm	14
D60	mm	0.343
D30	mm	0.228
D10	mm	0.0651
Uniformity Coefficient		5.3
Curvature Coefficient		2.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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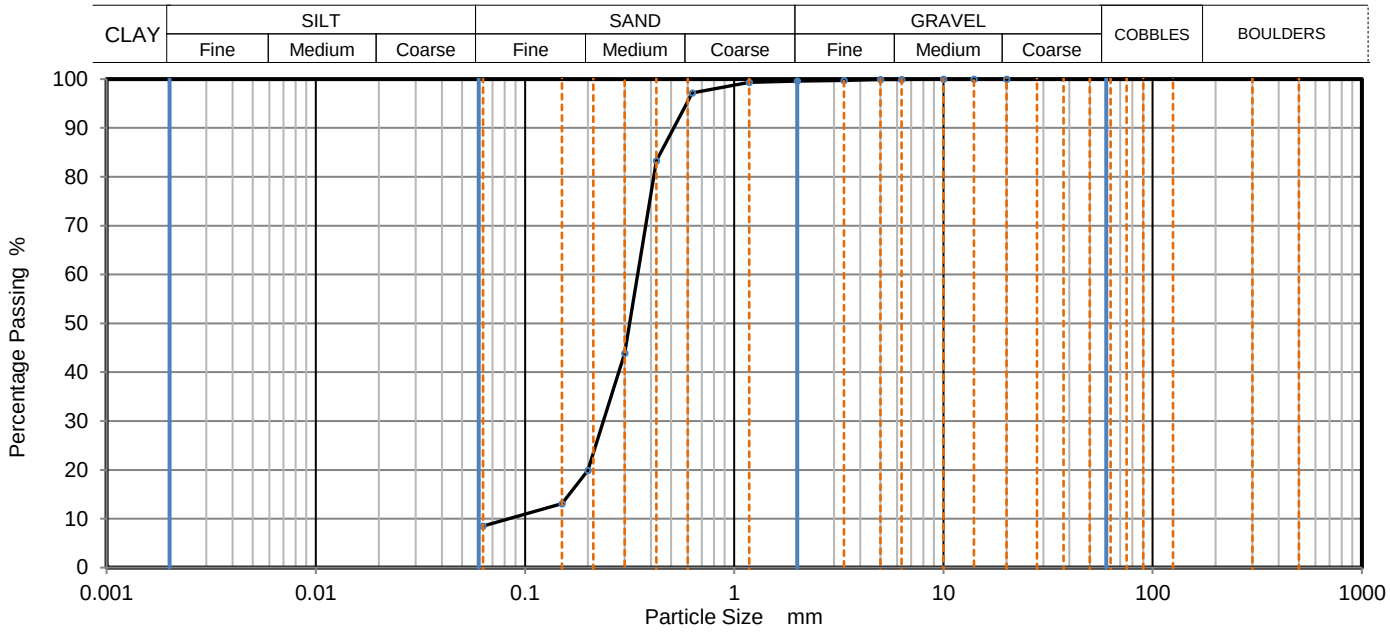
Laboratory Test Report 2230746Z / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH042	1.20	B17	Wet Sieve	Brown slightly clayey, slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.63	97		
0.425	83		
0.3	44		
0.2	20		
0.15	13		
0.063	9		

Dry Mass of sample, g 1082

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	91
Fines <0.063mm	9

Grading Analysis		
D100	mm	10
D60	mm	0.346
D30	mm	0.237
D10	mm	0.0836
Uniformity Coefficient		4.1
Curvature Coefficient		1.9

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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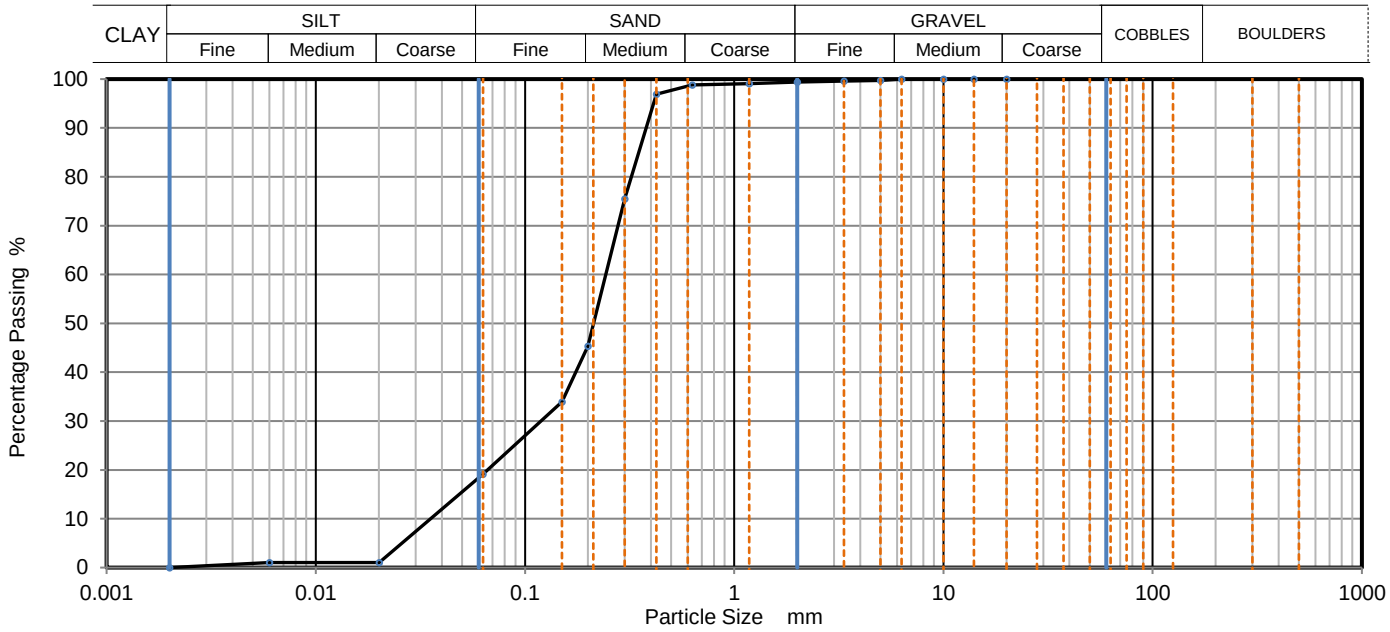
Laboratory Test Report	2230746Z / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH042	3.20	B18	Wet Sieve + Pipette	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	1
		0.0060	1
		0.0020	0
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	97		
0.3	76		
0.2	45		
0.15	34		
0.063	19		

Dry Mass of sample, g: 1316

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	80
Silt	19
Clay	0

Grading Analysis		
D100	mm	10
D60	mm	0.244
D30	mm	0.12
D10	mm	0.0358
Uniformity Coefficient		6.8
Curvature Coefficient		1.6

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

Client: Cadent **Page:** 6

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH042	20.70	C28	Red/Grey SILSTONE	11.9						
BH042	24.00	C32	Red/Grey SILSTONE	14.3						
BH042	36.26	C40	Red/Grey SILTSTONE	15.6						
BH042	38.48	C41	Grey SILTSTONE	14.3						
BH042	49.40	C50	Red/Grey SILTSTONE	15.3						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

Client: Cadent **Page:** 7

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH042	36.26	C40	Red/Grey SILTSTONE	101.7	162.8	*1.6	2.27	15.6	as received	0.5034	AC	7.4	
BH042	38.48	C41	Grey SILTSTONE	101.6	183.5	*1.8	2.32	14.3	as received	0.5040	F	4.8	
BH042	49.40	C50	Red/Grey SILTSTONE	101.5	193.7	*1.9	2.27	15.3	as received	0.4855	AC	6.9	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746Z

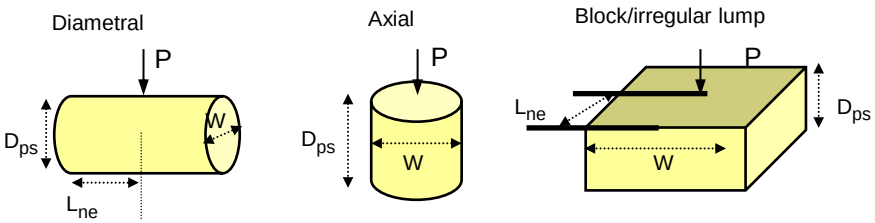
Client: Cadent **Page:** 8

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH042	20.70	C28	Red/Grey SILTSTONE As received	D	PL	YES	49.4	100.7	100.7	96.7	2.4	100.7	0.23	0.32	
BH042	20.70	C28	Red/Grey SILTSTONE As received	A	PD	YES		100.4	34.0	25.0	1.6	65.9	0.37	0.42	
BH042	24.00	C32	Red/Grey SILTSTONE As received	D	PL	YES	33.5	99.3	99.3	89.3	0.4	99.3	0.04	0.05	
BH042	24.00	C32	Red/Grey SILTSTONE As received	A	PD	YES		100.5	37.5	22.5	0.7	69.3	0.15	0.18	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746Z / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746Z
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 16/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746AA / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AA
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	11/11/2022
Date Scheduled:	21/10/2022
Date Testing Started:	07/12/2022
Date Testing Finished:	15/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 16/12/2022

Constructionline
Part of Capita plc

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AA

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH040	0.00	B1	23.7	Sieved	59	40	56	32	24	0.33	MHO			Brown slightly gravelly, clayey, silty SAND
BH040	1.20	B4	18	Natural	97	19	38	20	18	-0.08	CI			Brown sandy SILT/CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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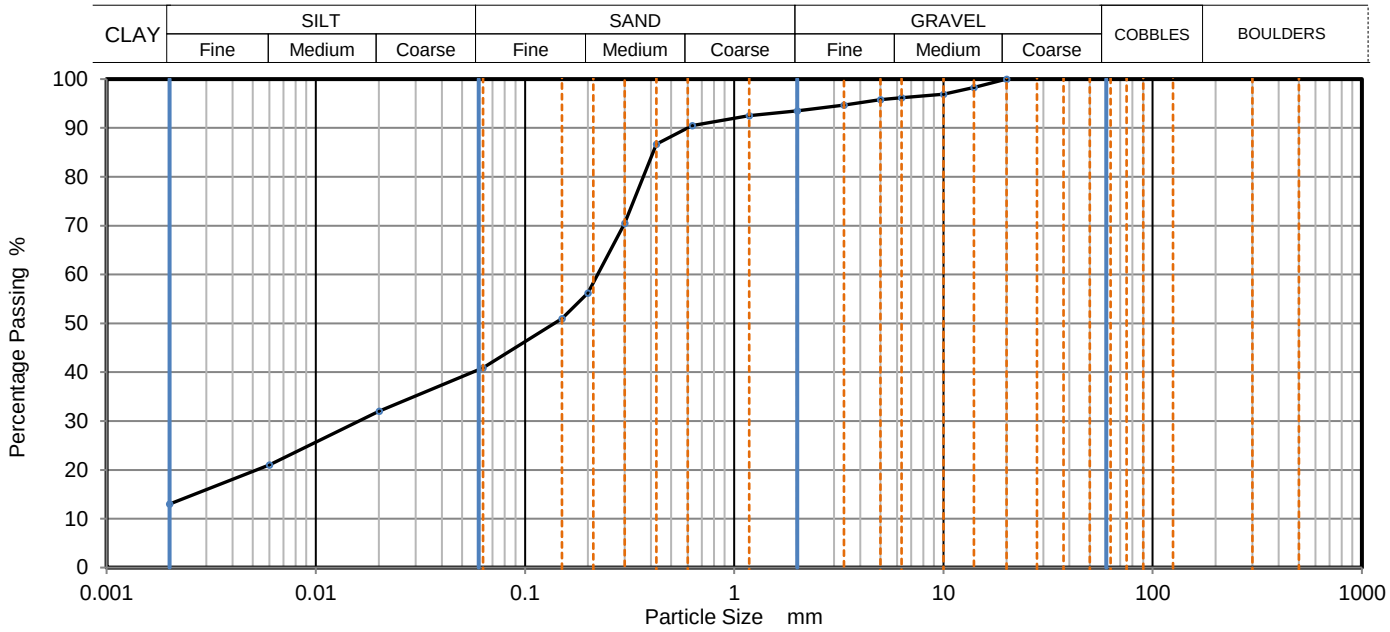
Laboratory Test Report	2230746AA / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AA

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH040	0.00	B1	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	32
		0.0060	21
		0.0020	13
20	100		
14	98		
10	97		
6.3	96		
5	96		
3.35	95		
2	94	Particle density	(assumed)
1.18	93	2.65	Mg/m3
0.63	91		
0.425	87		
0.3	71		
0.2	56		
0.15	51		
0.063	41		

Dry Mass of sample, g: 770

Sample Proportions	% dry mass
Very coarse	0
Gravel	7
Sand	53
Silt	28
Clay	13

Grading Analysis		
D100	mm	20
D60	mm	0.223
D30	mm	0.0166
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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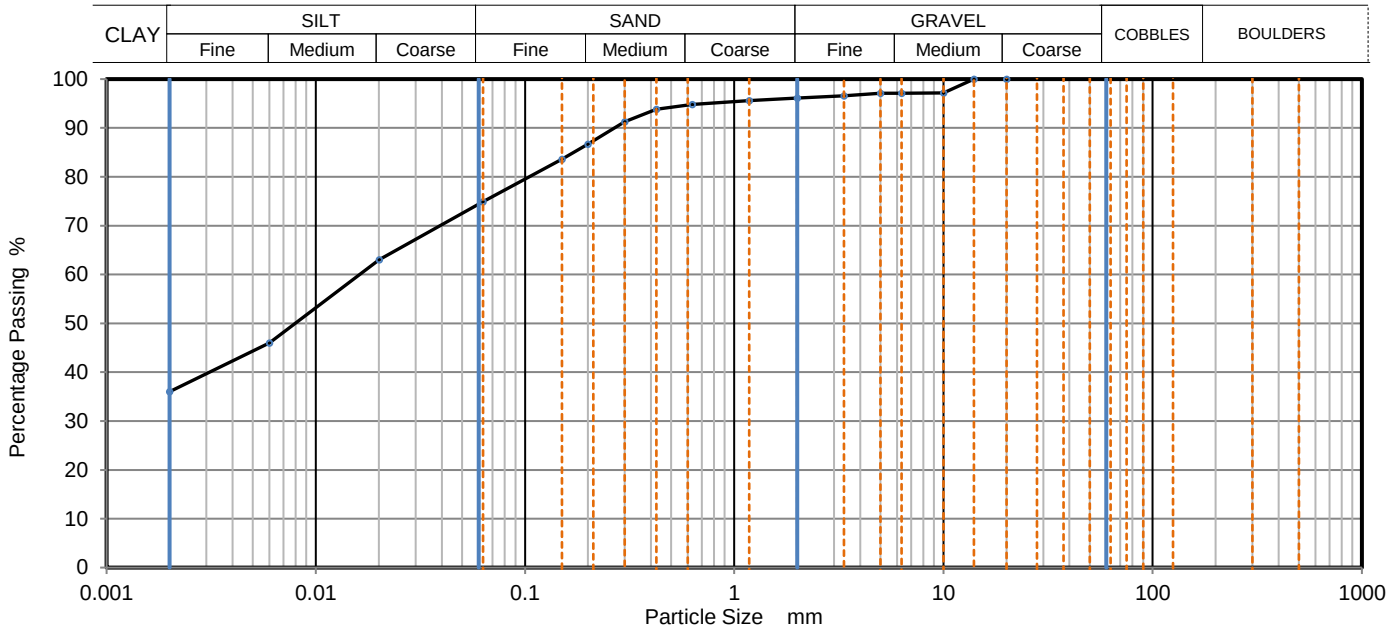
Laboratory Test Report	2230746AA / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AA

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH040	1.20	B4	Wet Sieve + Pipette	Brown sandy SILT/CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	63
		0.0060	46
		0.0020	36
20	100		
14	100		
10	97		
6.3	97		
5	97		
3.35	97		
2	96	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	95		
0.425	94		
0.3	91		
0.2	87		
0.15	84		
0.063	75		

Dry Mass of sample, g: 276

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	21
Silt	39
Clay	36

Grading Analysis		
D100	mm	14
D60	mm	0.0159
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746AA / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AA
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 16/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AB / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AB
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	02/12/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	14/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 16/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
ATP41	0.40	LB4	13.4	Natural	100	13	27	12	15	0.09	CL			Brown slightly gravelly, silty, clayey SAND
ATP41	1.40	B7	10.6	Natural	91	12	25	13	12	-0.11	CL			Brown clayey, gravelly, silty SAND
ATP41	2.40	LB10	11.6	Natural	100	12	23	11	12	0.05	CL			Brown gravelly, clayey, silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

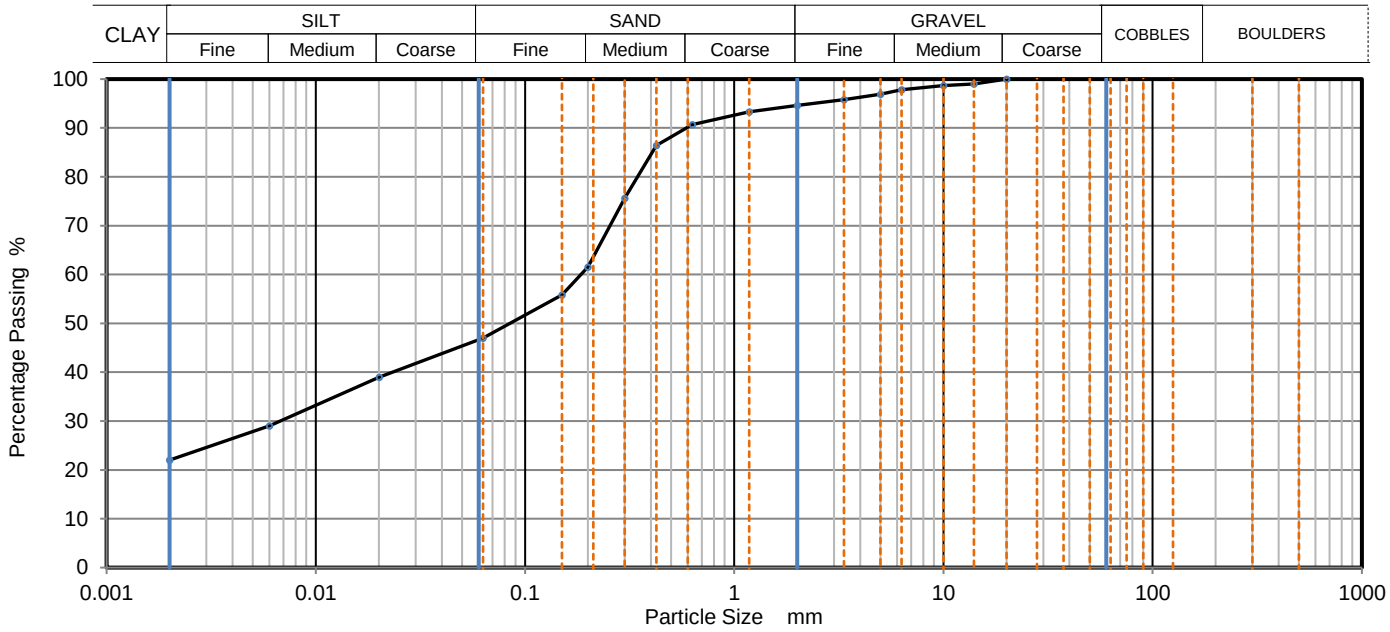
Laboratory Test Report | 2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline | **Job Number:** 2230746AB

Client: Cadent | **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP41	0.40	LB4	Wet Sieve + Pipette	Brown slightly gravelly, silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	39
		0.0060	29
		0.0020	22
20	100		
14	99		
10	99		
6.3	98		
5	97		
3.35	96		
2	95	Particle density	(assumed)
1.18	93	2.65	Mg/m3
0.63	91		
0.425	86		
0.3	76		
0.2	62		
0.15	56		
0.063	47		

Dry Mass of sample, g: 490

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	48
Silt	25
Clay	22

Grading Analysis		
D100	mm	20
D60	mm	0.186
D30	mm	0.00706
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

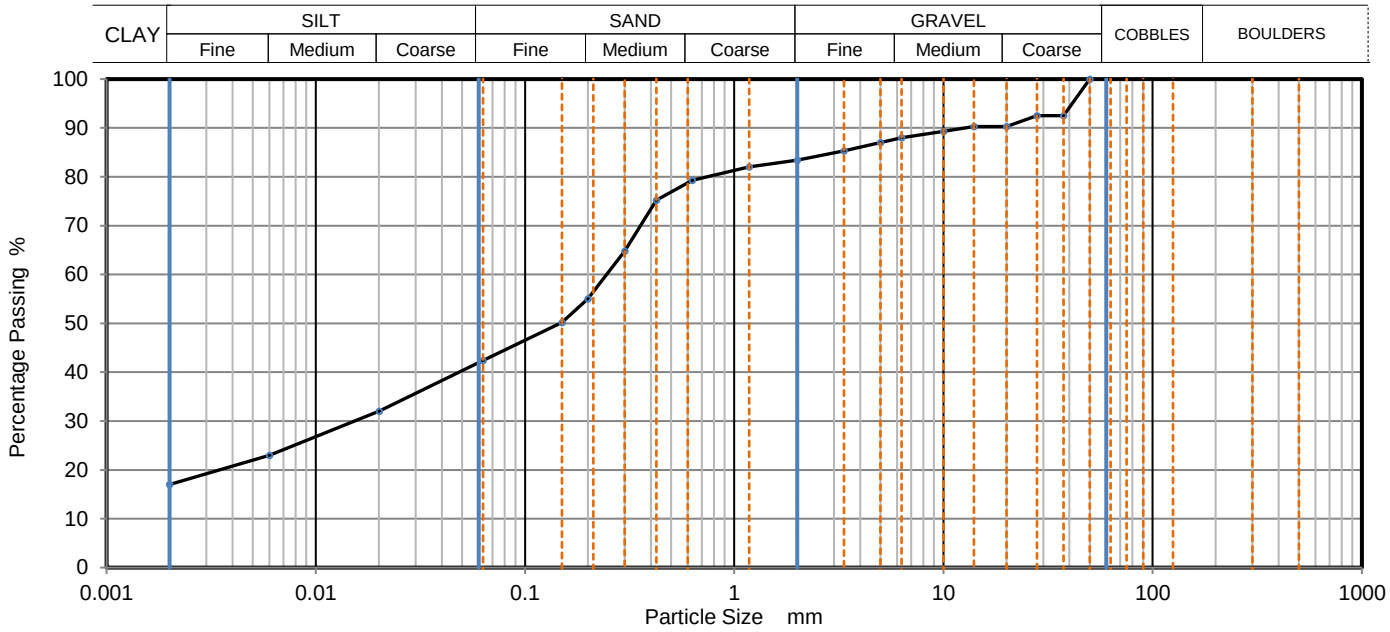
Laboratory Test Report	2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP41	1.40	B7	Wet Sieve + Pipette	Brown clayey, gravelly, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	32
		0.0060	23
		0.0020	17
50	100		
37.5	93		
28	93		
20	90		
14	90		
10	89		
6.3	88		
5	87		
3.35	85		
2	83	Particle density	(assumed)
1.18	82	2.65	Mg/m3
0.63	79		
0.425	75		
0.3	65		
0.2	55		
0.15	50		
0.063	42		

Dry Mass of sample, g	862

Sample Proportions	% dry mass
Very coarse	0
Gravel	17
Sand	41
Silt	26
Clay	17

Grading Analysis		
D100	mm	50
D60	mm	0.246
D30	mm	0.0152
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

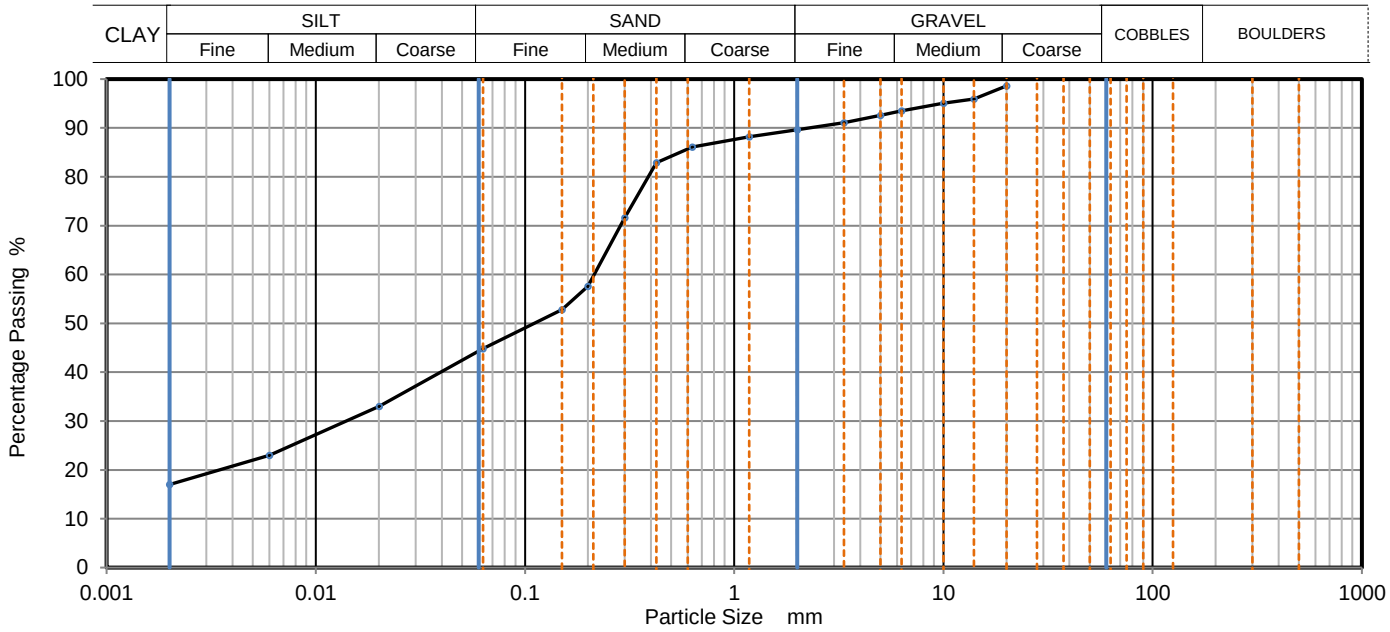
Laboratory Test Report	2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP41	2.40	LB10	Wet Sieve + Pipette	Brown gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	33
		0.0060	23
		0.0020	17
20	99		
14	96		
10	95		
6.3	94		
5	93		
3.35	91		
2	90	Particle density	(assumed)
1.18	88	2.65	Mg/m3
0.63	86		
0.425	83		
0.3	72		
0.2	58		
0.15	53		
0.063	45		

Dry Mass of sample, g: 826

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	45
Silt	28
Clay	17

Grading Analysis		
D100	mm	
D60	mm	0.214
D30	mm	0.0137
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AB / 1

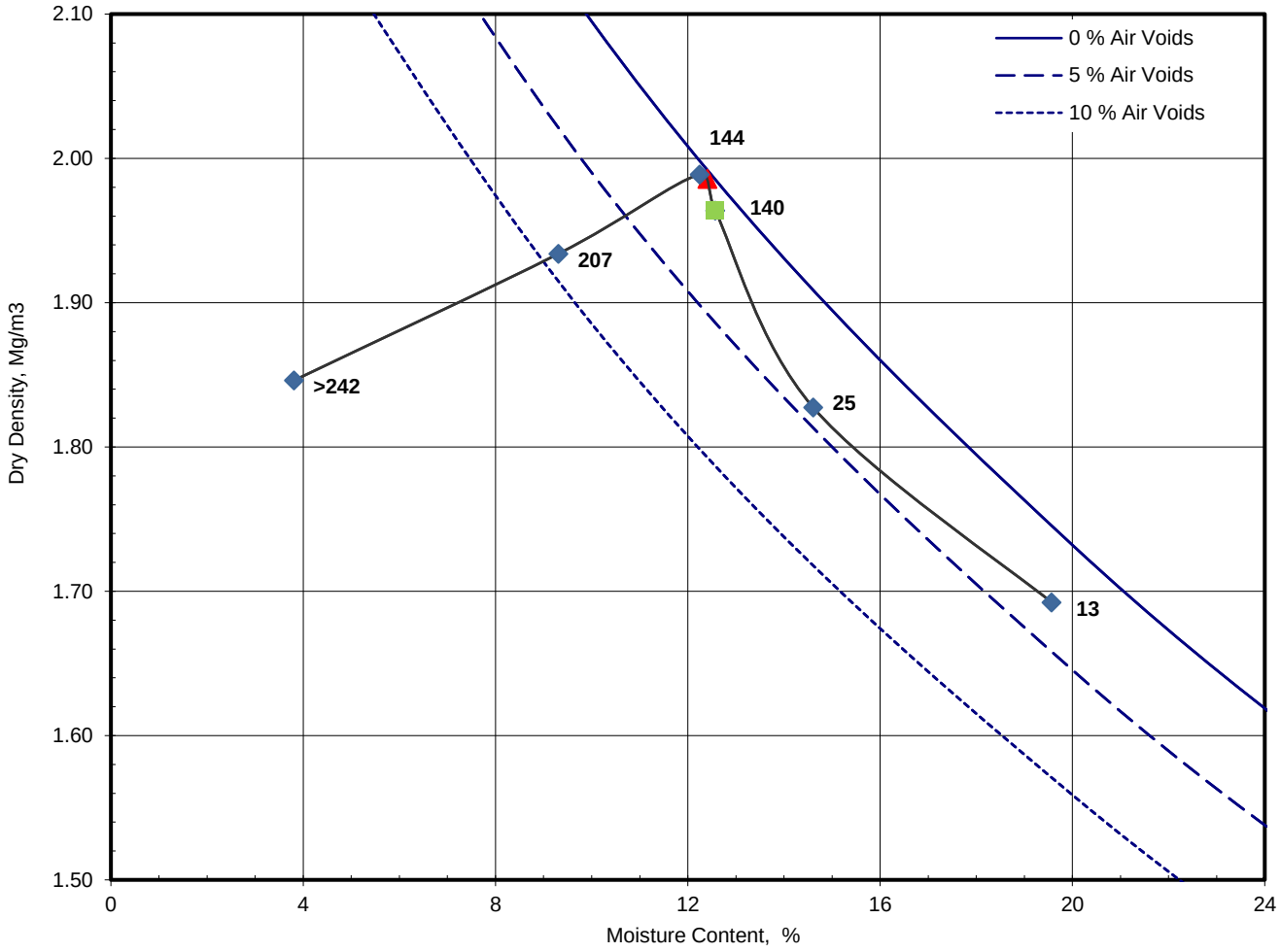
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 6

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
ATP41	0.40	LB4	Brown slightly gravelly, silty, clayey SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	1 %	Samples Used	Single sample tested
Grading Zone	2	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.99 Mg/m³**	**Optimum Moisture Content**	**12 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AB / 1

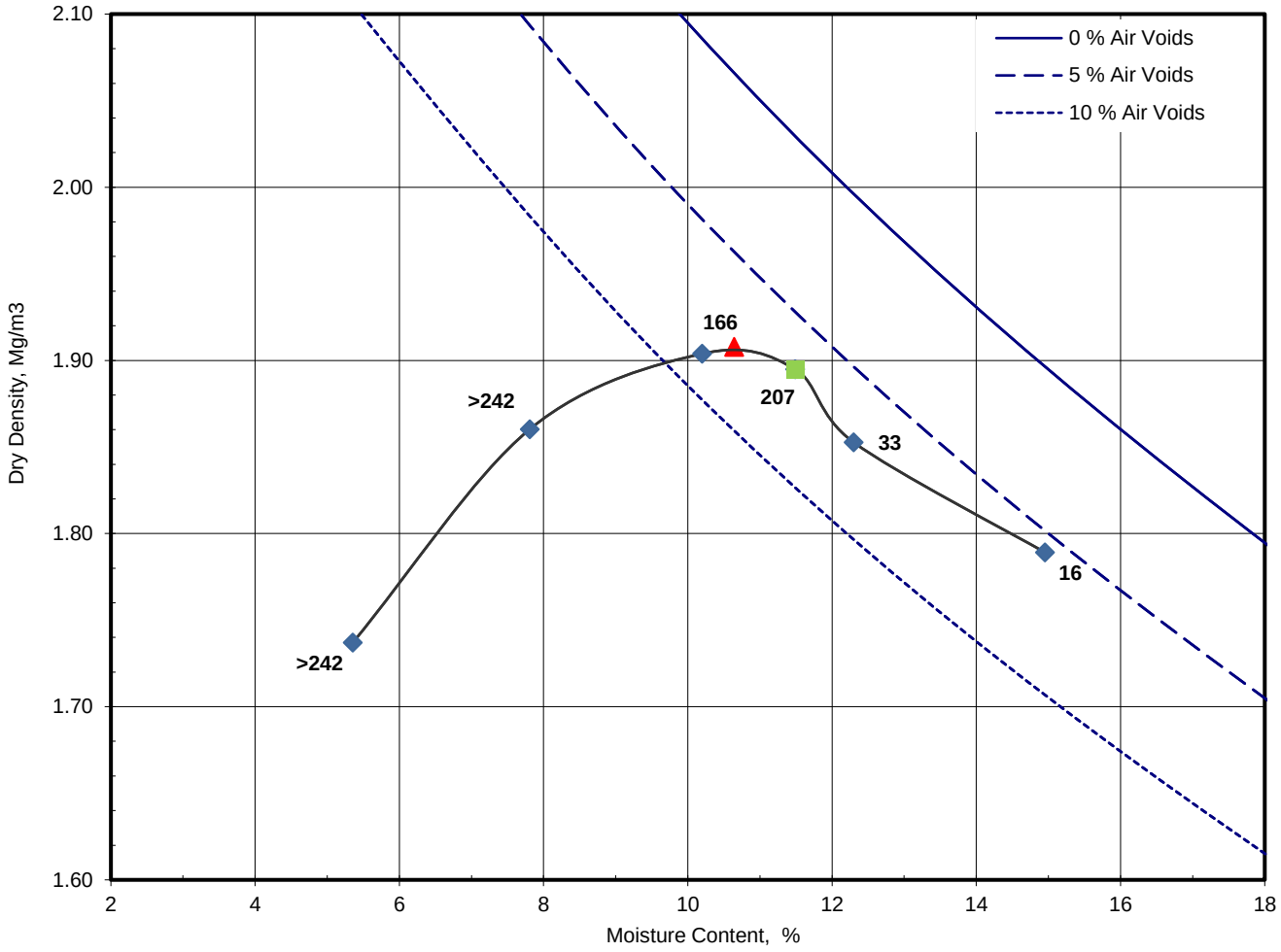
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 7

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
ATP41	2.40	LB10	Brown gravelly, clayey, silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	2	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.91 Mg/m³**	**Optimum Moisture Content**	**11 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

UKAS TESTING
1464

Result reported relates only to the sample tested.

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Laboratory Test Report | 2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 8

DETERMINATION OF MOISTURE CONDITION VALUE AT NATURAL MOISTURE CONTENT SUMMARY RESULTS

Borehole / Trial Pit	Depth (m)	Sample	Retained on 20mm sieve (%)	Moisture Content <20mm (%)	Moisture Condition Value	Method of Interpretation	Description / Remarks
ATP41	0.40	LB4	1	14.6	9.4	Steepest straight line	Brown slightly gravelly, silty, clayey SAND
ATP41	1.40	B7	2	11.1	10.9	Steepest straight line	Brown clayey, gravelly, silty SAND
ATP41	2.40	LB10	1	9.1	12.2	Steepest straight line	Brown gravelly, clayey, silty SAND

Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

Method of Test: BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

UKAS TESTING
1464

Results reported relate only to the samples tested.

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Laboratory Test Report	2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 9

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP41	0.40	**LB4**	**99.10%**	Brown slightly gravelly, silty, clayey SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	2.14	Mg/m3
Dry density	1.89	Mg/m3
Moisture content	13	%

Soaking details: Not soaked

Period of soaking: days

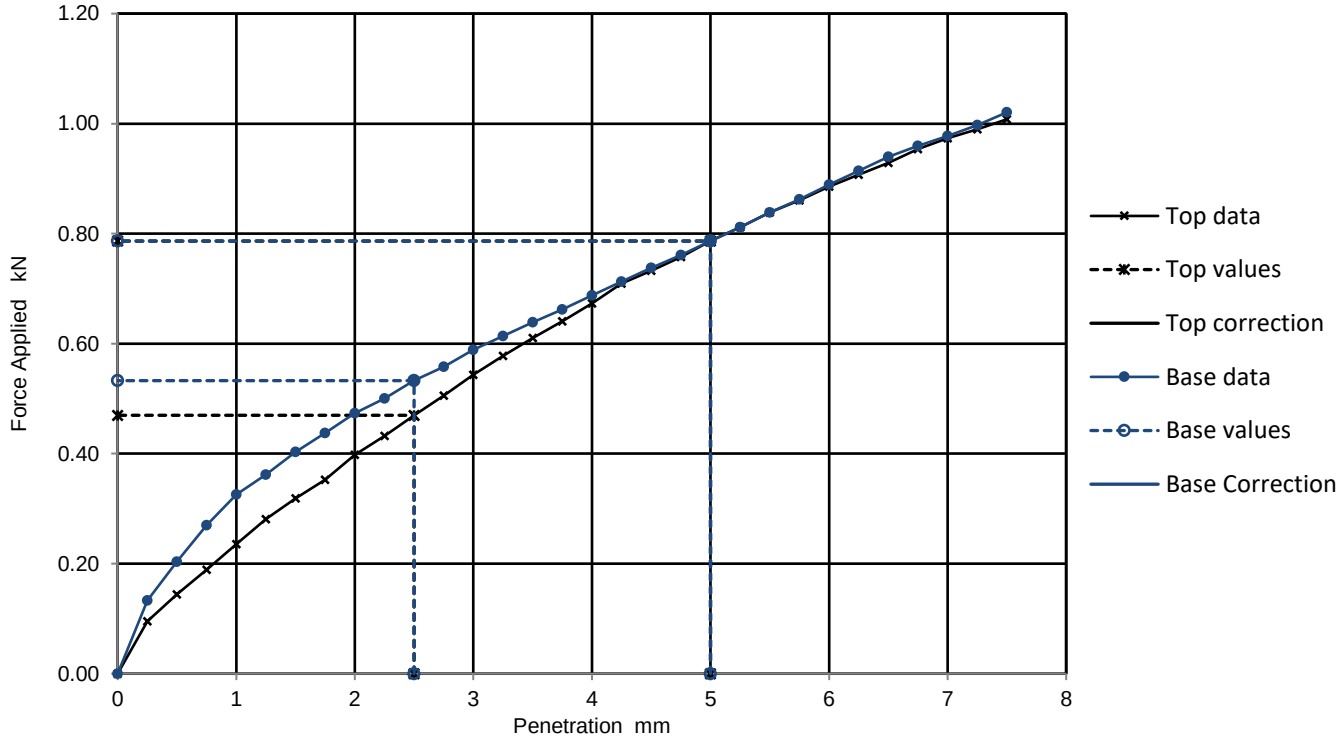
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	3.6	3.9	3.9	4.0	13
BASE	No	4.0	3.9	4.0		14

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES

Laboratory Test Report | 2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline | **Job Number:** 2230746AB

Client: Cadent | **Page:** 10

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP41	1.40	**B7**	**100%**	Brown clayey, gravelly, silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	2.09	Mg/m3
Dry density	1.90	Mg/m3
Moisture content	10	%

Soaking details: Not soaked

Period of soaking: days

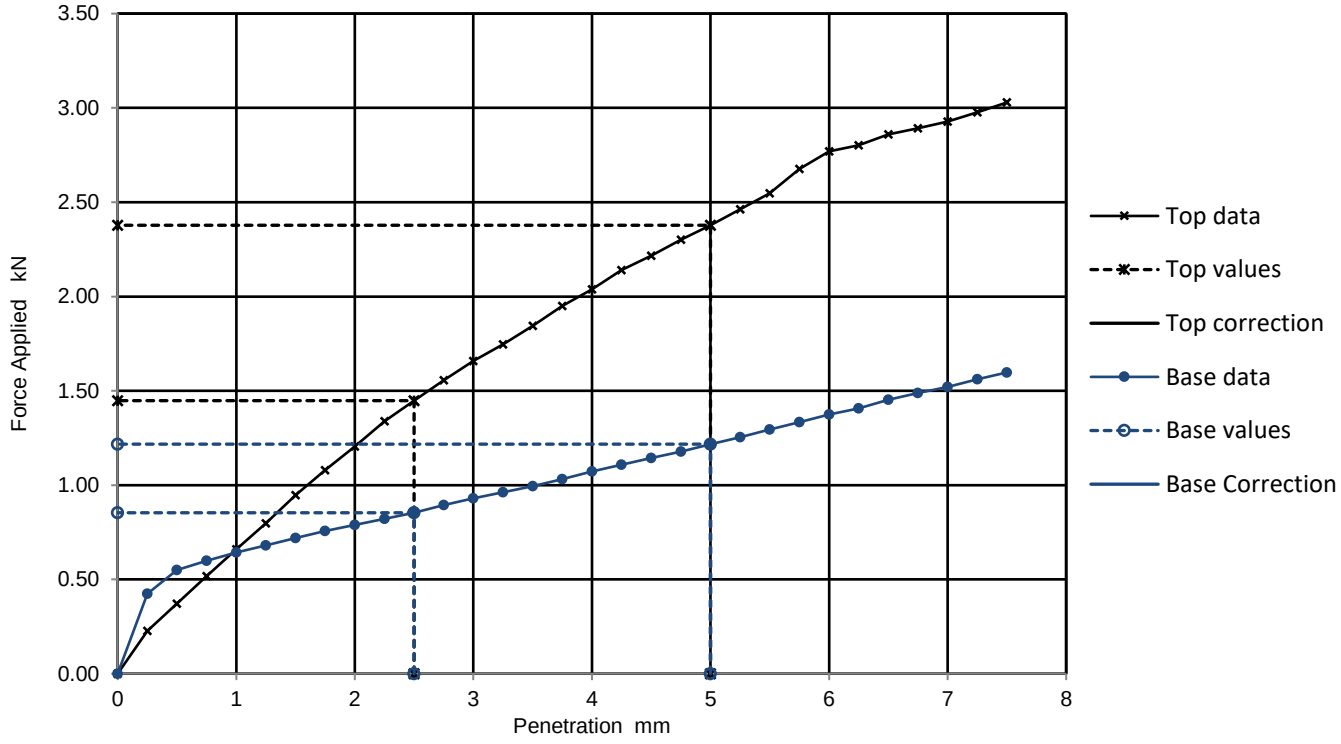
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	11	12	12		11
BASE	No	6.5	6.1	6.5		11

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AB / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AB

Client: Cadent **Page:** 11

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP41	2.40	**LB10**	**98.90%**	Brown gravelly, clayey, silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	2.14	Mg/m3
Dry density	1.93	Mg/m3
Moisture content	11	%

Soaking details: Not soaked

Period of soaking: days

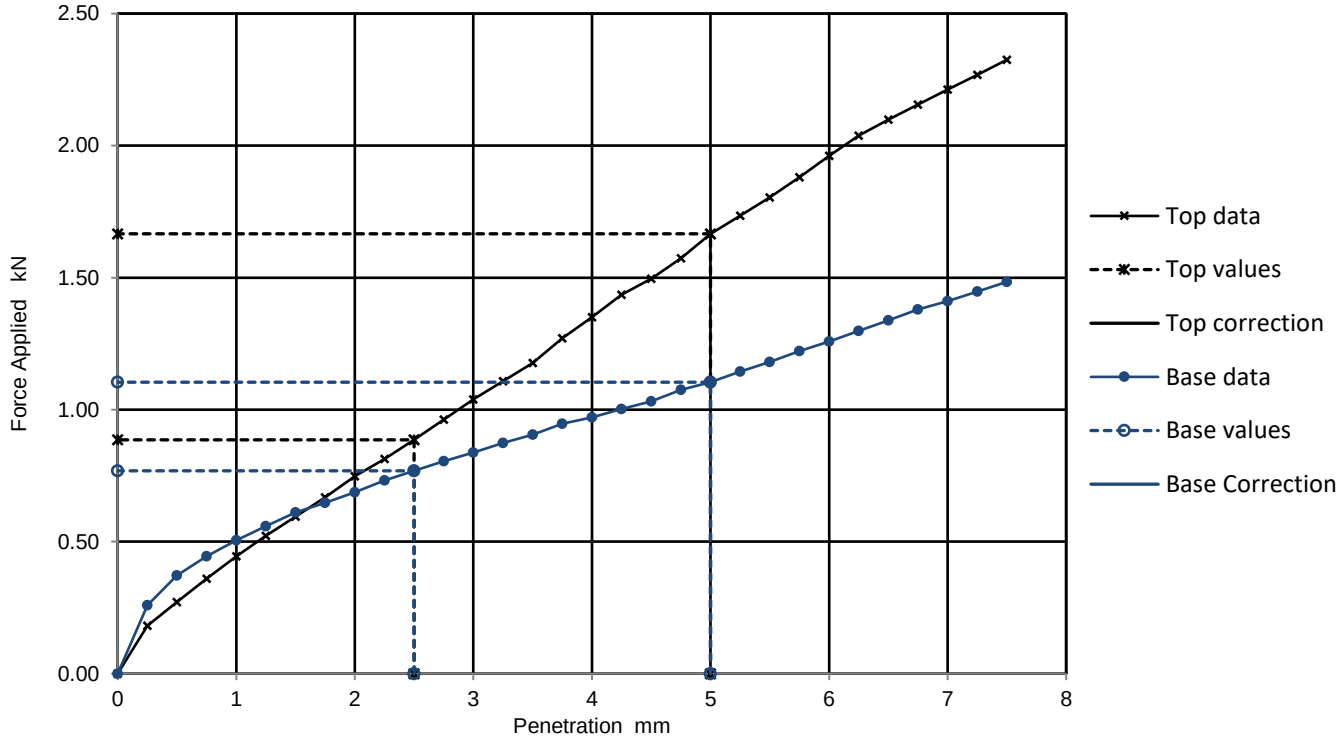
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	6.7	8.3	8.3		11
BASE	No	5.8	5.5	5.8		11

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

Final Test Report - 2230746AB / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AB
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 16/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AC / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AC
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	11/11/2022
Date Scheduled:	02/12/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

Constructionline
Part of Capita plc

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
ATP24	0.50	LB4	20	Natural	99	20	29	16	13	0.32	CL			Brown clayey, silty SAND
ATP24	1.90	LB9	21.6	Sieved	39	56		NP						Brown slightly silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

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General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 3

Determination of Particle Density by Gas Jar Method

Borehole / Trial Pit	Depth (m)	Sample	Particle Density Mg/m3	Description / Remarks
ATP24	0.50	LB4	2.49	Brown clayey, silty SAND
ATP24	1.90	LB9	2.66	Brown slightly silty SAND

Method of Preparation: BS 1377 : Part 1 : 2016 : Clause 8.3 Initial preparation of disturbed samples
BS 1377 : Part 1 : 2016 : Clause 8.4.4 Preparation of samples for particle density tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 8.2 Determination of particle density (Gas jar method)

Results reported relate only to the samples tested.

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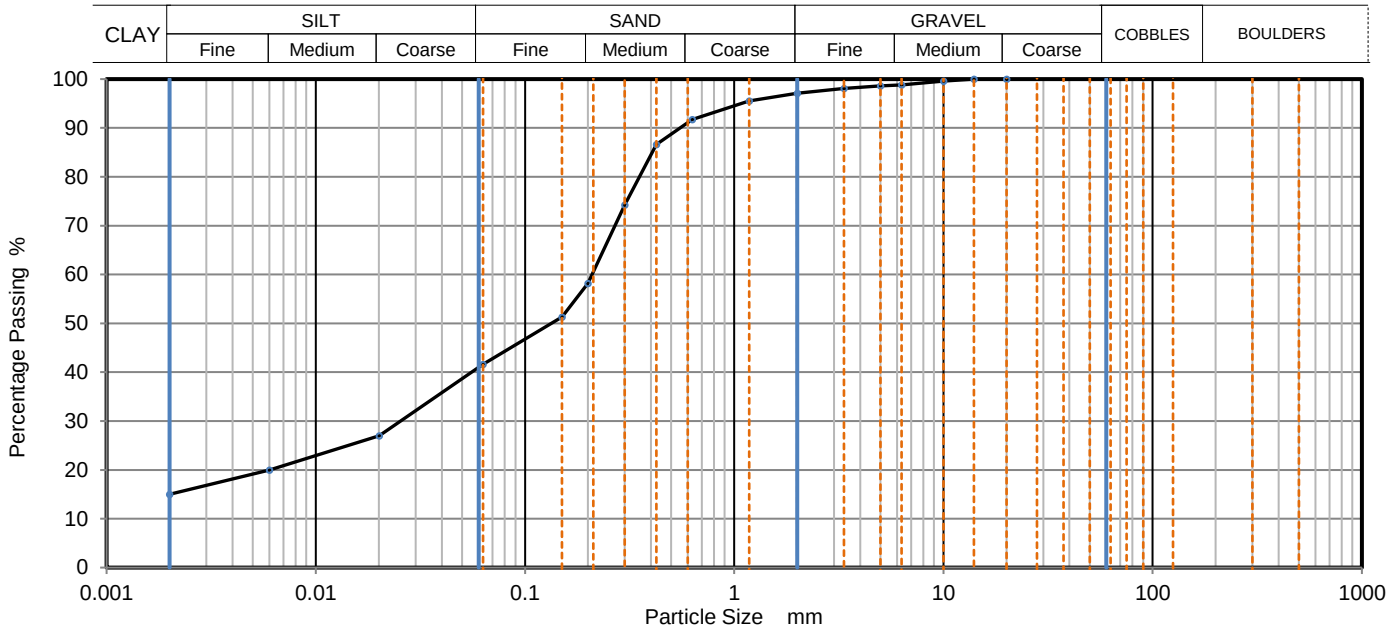
Laboratory Test Report	2230746AC / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP24	0.50	LB4	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	27
		0.0060	20
		0.0020	15
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	98		
2	97	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	92		
0.425	87		
0.3	74		
0.2	58		
0.15	51		
0.063	42		

Dry Mass of sample, g: 1021

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	55
Silt	27
Clay	15

Grading Analysis		
D100	mm	14
D60	mm	0.209
D30	mm	0.0259
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

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1464

Result reported relates only to the sample tested.

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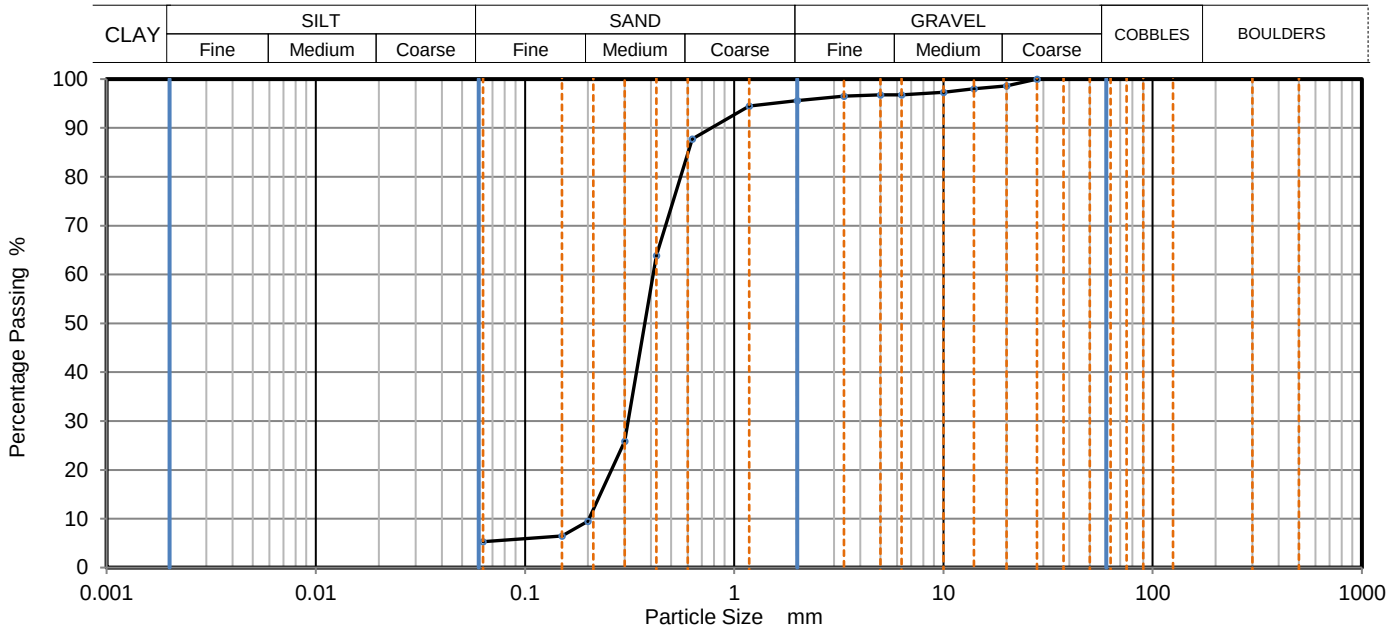
Laboratory Test Report 2230746AC / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP24	1.90	LB9	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
28	100		
20	99		
14	98		
10	97		
6.3	97		
5	97		
3.35	97		
2	96		
1.18	95		
0.63	88		
0.425	64		
0.3	26		
0.2	10		
0.15	7		
0.063	5		

Dry Mass of sample, g 1230

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	90
Fines <0.063mm	5

Grading Analysis		
D100	mm	28
D60	mm	0.41
D30	mm	0.312
D10	mm	0.203
Uniformity Coefficient		2
Curvature Coefficient		1.2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

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Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AC / 1

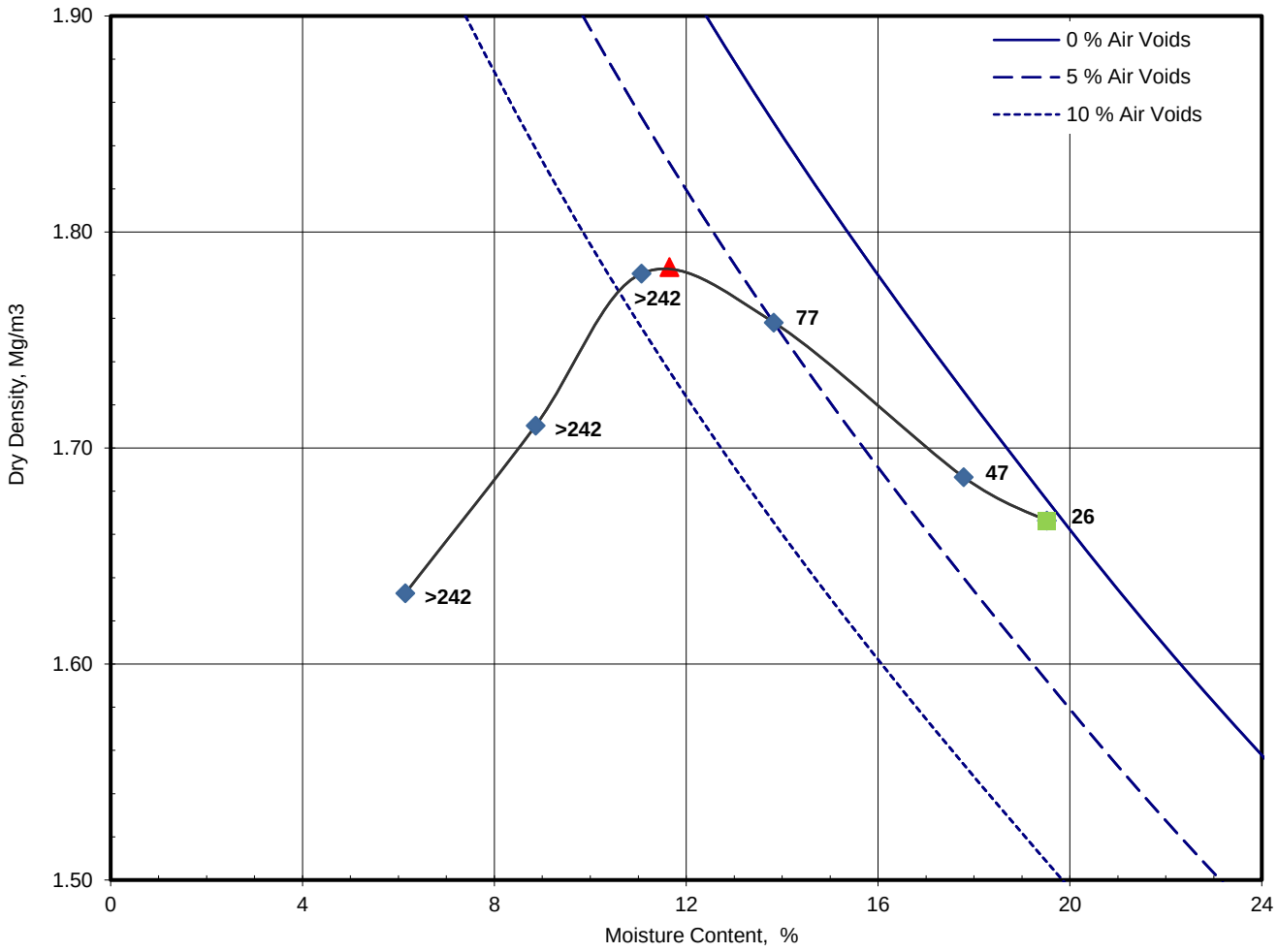
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 6

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
ATP24	0.50	LB4	Brown clayey, silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	1	Particle Density	2.49 Mg/m³ Measured using gas jar
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.78 Mg/m³**	**Optimum Moisture Content**	**12 %**



*Hand Vane Shear Strength (in kPA) shown at each compaction point

▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
BS1377:Part 2:1990:8.2 Determination of Particle Density (Gas Jar method) - 'Not UKAS Accredited'
Hand Vane test broadly in accordance with BS 1377:Part 9:1990 - 'Not UKAS Accredited'

Result reported relates only to the sample tested.

UKAS TESTING
1464

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AC / 1

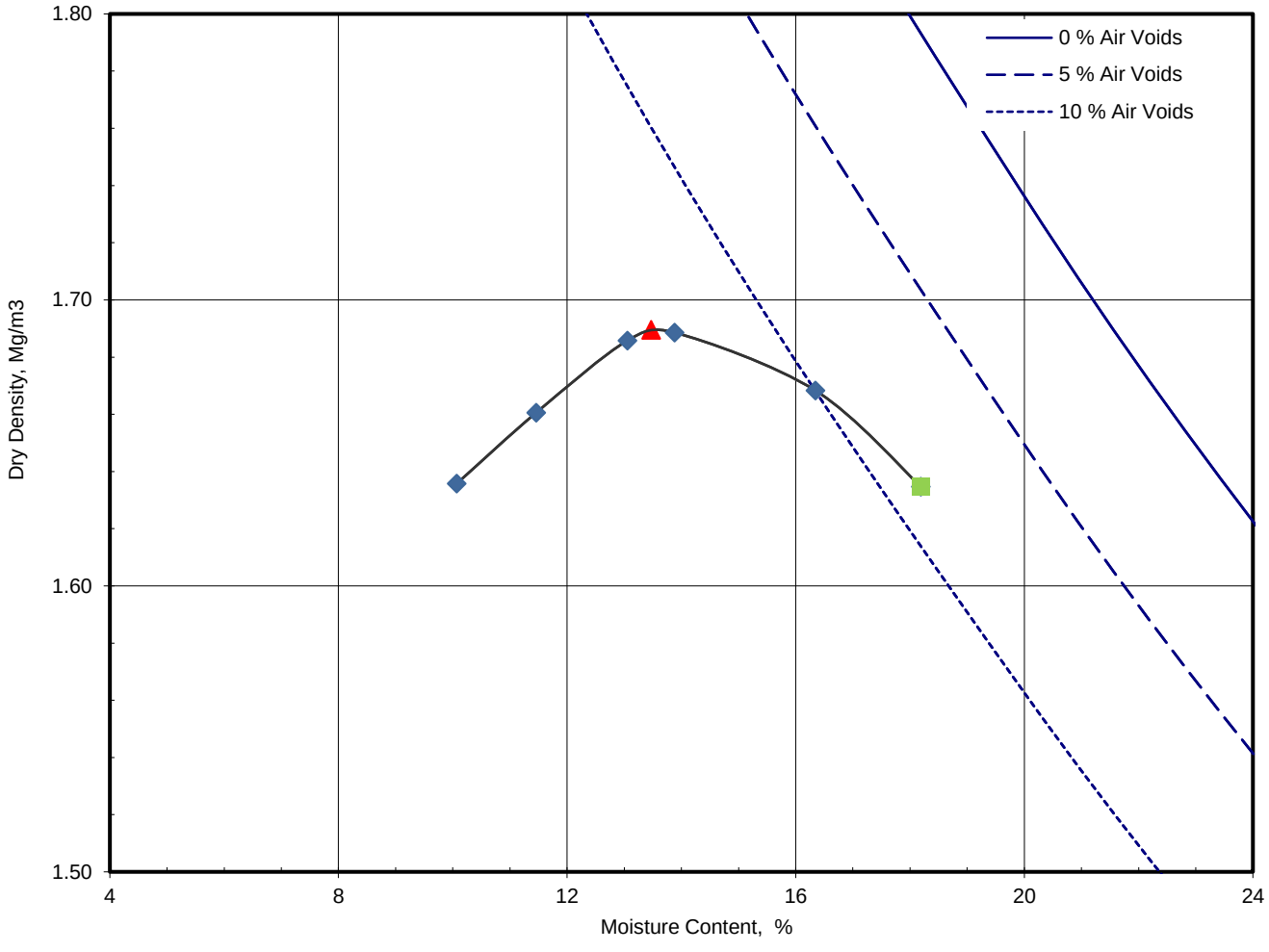
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 7

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
ATP24	1.90	LB9	Brown slightly silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	2	Particle Density	2.66 Mg/m³ Measured using gas jar
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.69 Mg/m³**	**Optimum Moisture Content**	**13 %**



▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer
BS1377:Part 2:1990:8.2 Determination of Particle Density (Gas Jar method) - 'Not UKAS Accredited'

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Result reported relates only to the sample tested.

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Laboratory Test Report | 2230746AC / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 8

DETERMINATION OF MOISTURE CONDITION VALUE AT NATURAL MOISTURE CONTENT SUMMARY RESULTS

Borehole / Trial Pit	Depth (m)	Sample	Retained on 20mm sieve (%)	Moisture Content <20mm (%)	Moisture Condition Value	Method of Interpretation	Description / Remarks
ATP24	0.50	LB4	1	21.5	4.5	Steepest straight line	Brown clayey, silty SAND
ATP24	1.90	LB9	0	17.1	3.9	Steepest straight line	Brown slightly silty SAND

Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

Method of Test: BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

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Results reported relate only to the samples tested.

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Laboratory Test Report	2230746AC / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 9

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP24	0.50	**LB4**	**99.20%**	Brown clayey, silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	2.01	Mg/m3
Dry density	1.68	Mg/m3
Moisture content	20	%

Soaking details: Not soaked

Period of soaking: days

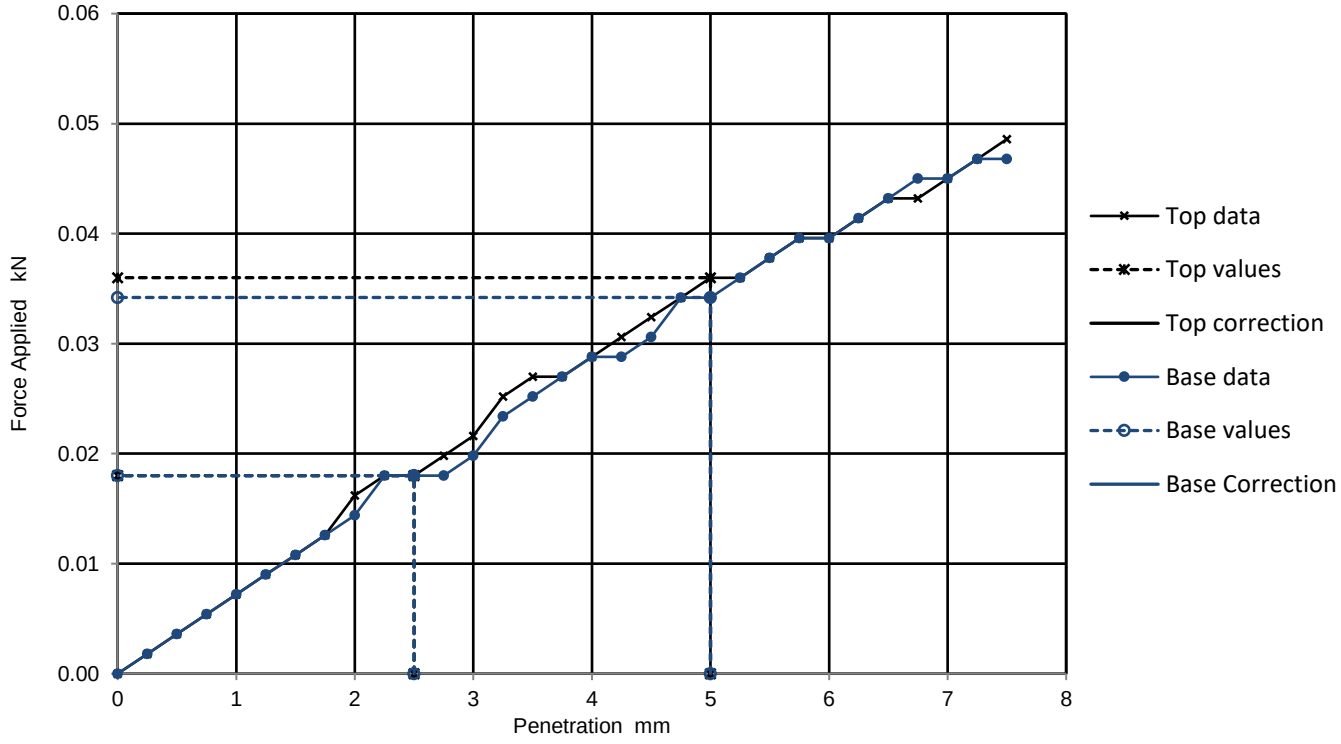
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.14	0.18	0.18	0.18	21
BASE	No	0.14	0.17	0.17		21

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AC / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AC

Client: Cadent **Page:** 10

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP24	1.90	**LB9**	**100%**	Brown slightly silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.96	Mg/m3
Dry density	1.63	Mg/m3
Moisture content	20	%

Soaking details: Not soaked

Period of soaking: days

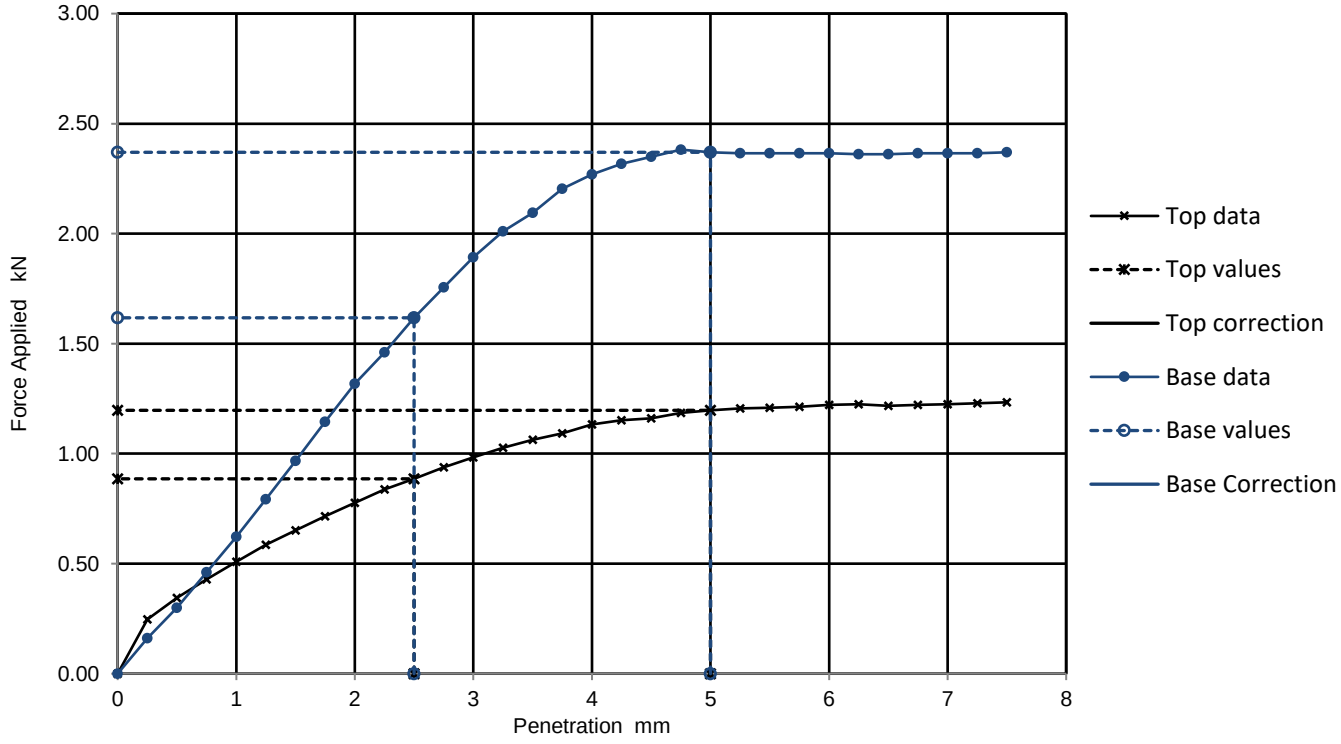
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	6.7	6.0	6.7		19
BASE	No	12	12	12		19

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

Final Test Report - 2230746AC / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AC
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746AD / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AD
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	09/11/2022
Date Scheduled:	02/12/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 20/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

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Laboratory Test Report 2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 1

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
ATP23	0.50	LB4	18.6	Sieved	44	43		NP						Brown slightly silty SAND
ATP23	1.20	LB9	18.3	Sieved	51	36		NP						Brown slightly silty SAND
ATP23	2.20	B12	21.6	Natural	99	22	26	12	14	0.70	CL			Brown clayey, silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

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General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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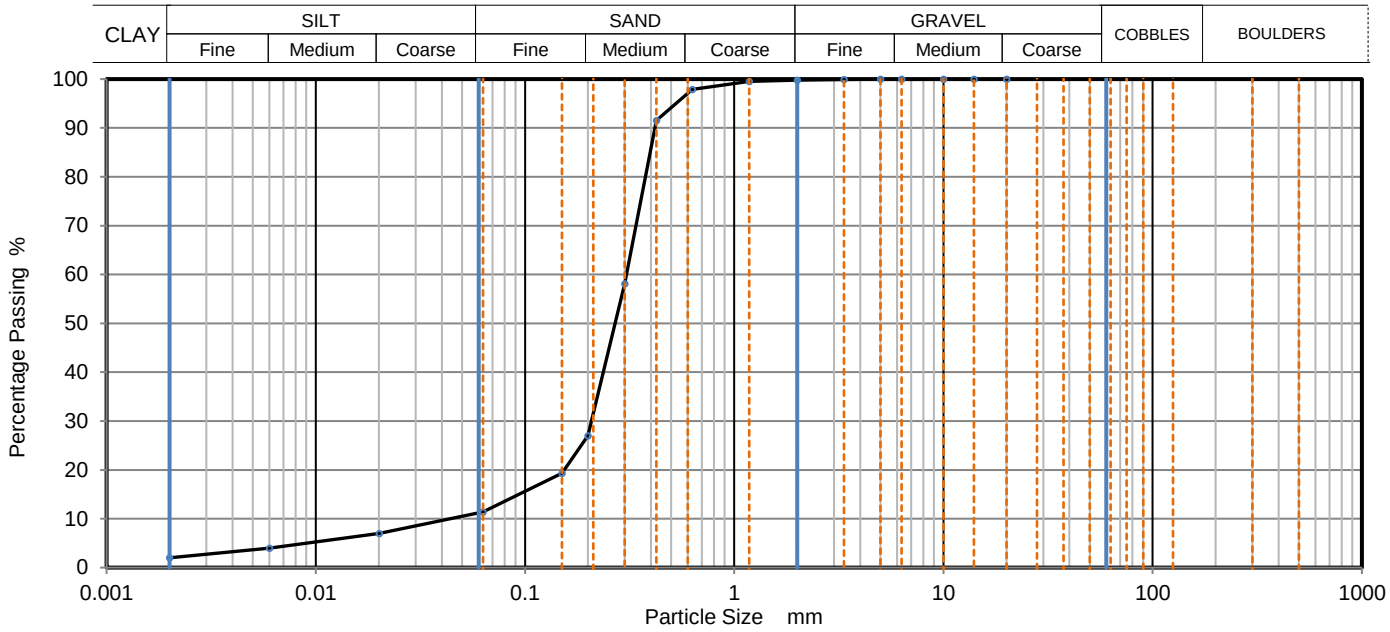
Laboratory Test Report	2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP23	0.50	LB4	Wet Sieve + Pipette	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	7
		0.0060	4
		0.0020	2
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	98		
0.425	92		
0.3	58		
0.2	27		
0.15	19		
0.063	11		

Dry Mass of sample, g: 1114

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	88
Silt	9
Clay	3

Grading Analysis		
D100	mm	5
D60	mm	0.306
D30	mm	0.208
D10	mm	0.0441
Uniformity Coefficient		6.9
Curvature Coefficient		3.2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

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1464

Result reported relates only to the sample tested.

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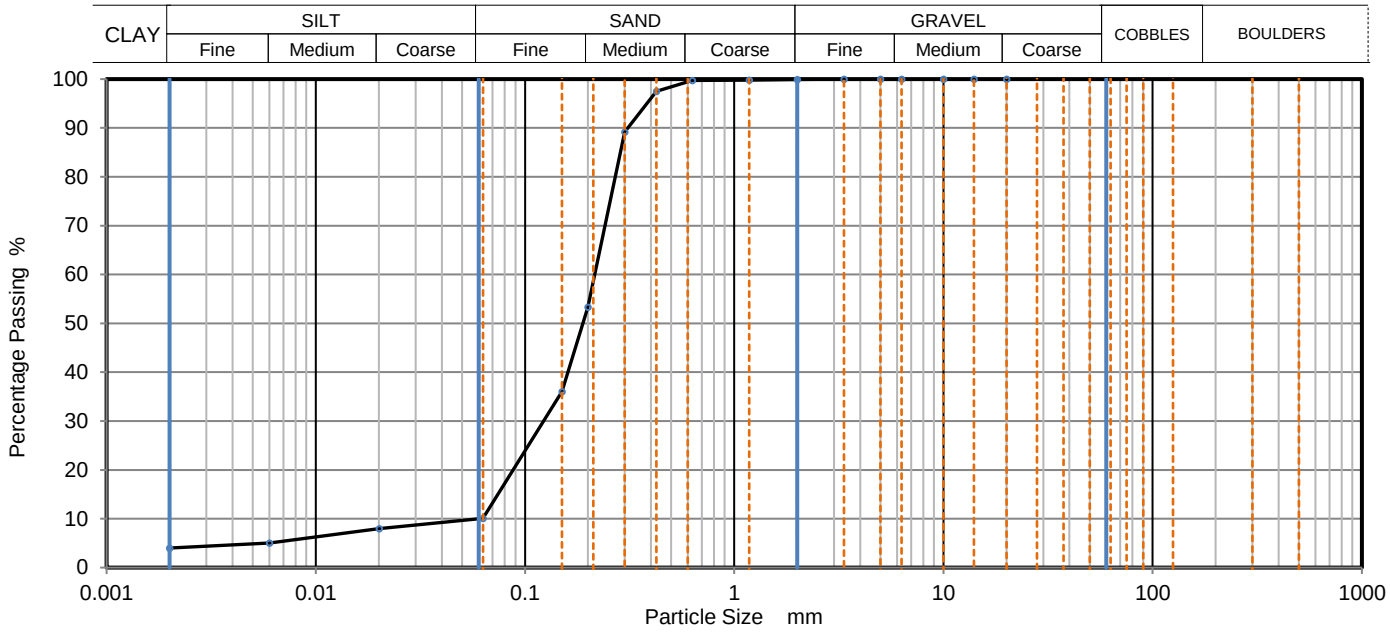
Laboratory Test Report	2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP23	1.20	LB9	Wet Sieve + Pipette	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	8
		0.0060	5
		0.0020	4
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	98		
0.3	89		
0.2	53		
0.15	36		
0.063	10		

Dry Mass of sample, g: 887

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	90
Silt	6
Clay	4

Grading Analysis		
D100	mm	3.35
D60	mm	0.216
D30	mm	0.123
D10	mm	0.0605
Uniformity Coefficient		3.6
Curvature Coefficient		1.2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

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Result reported relates only to the sample tested.

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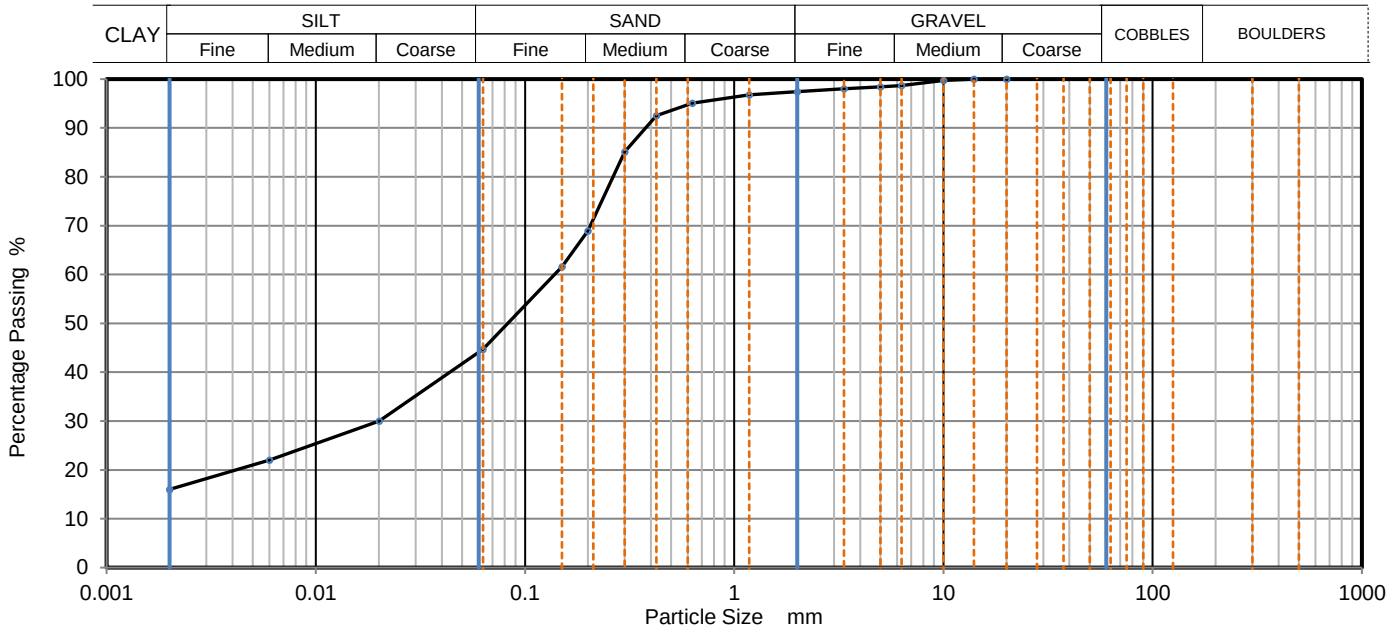
Laboratory Test Report	2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
ATP23	2.20	B12	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	30
		0.0060	22
		0.0020	16
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	98		
2	97	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.63	95		
0.425	93		
0.3	85		
0.2	69		
0.15	62		
0.063	45		

Dry Mass of sample, g	585

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	53
Silt	29
Clay	16

Grading Analysis		
D100	mm	14
D60	mm	0.138
D30	mm	0.0198
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AD / 1

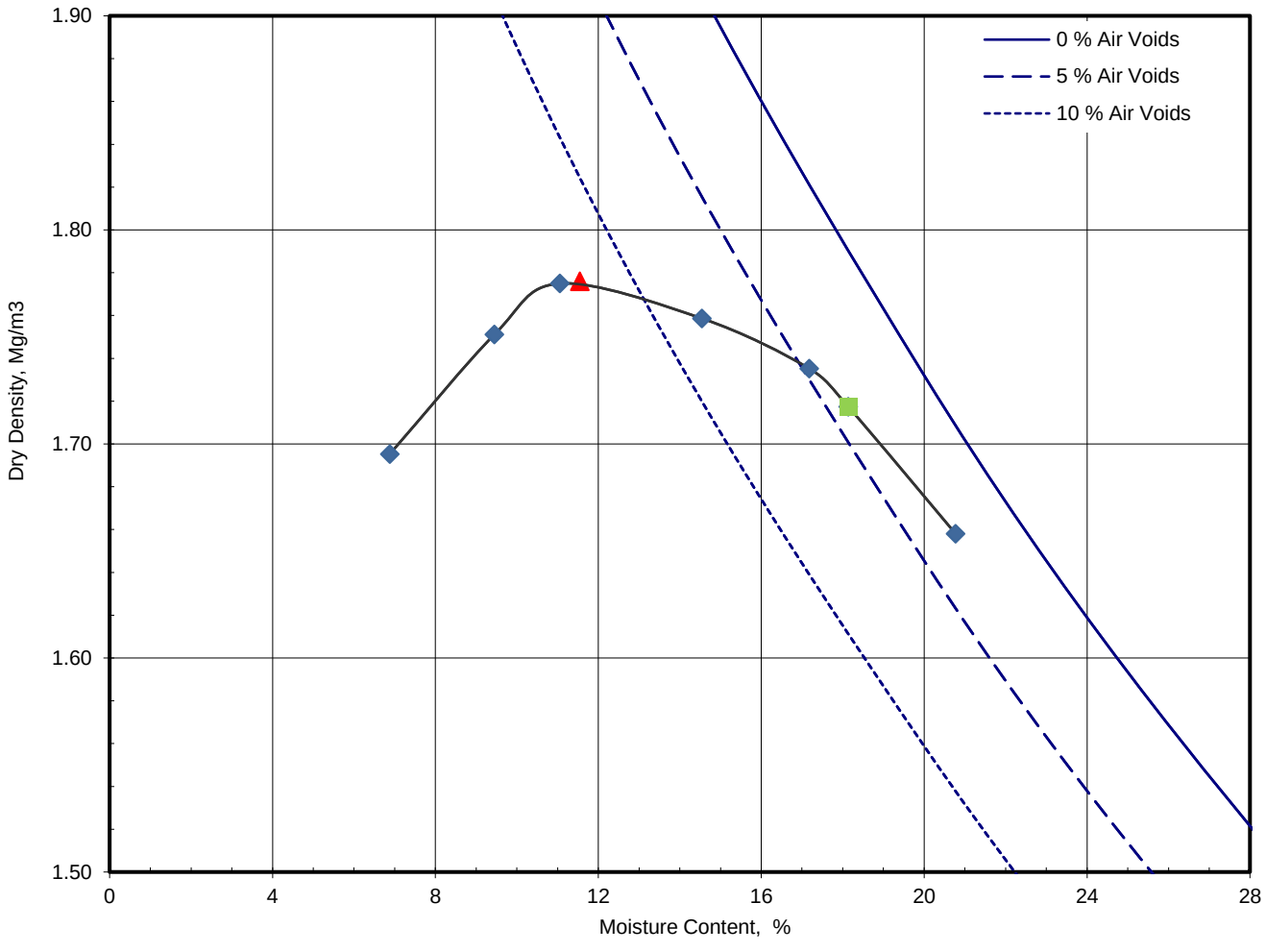
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 6

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
ATP23	0.50	LB4	Brown slightly silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	1	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.78 Mg/m³**	**Optimum Moisture Content**	**12 %**



▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer

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Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AD / 1

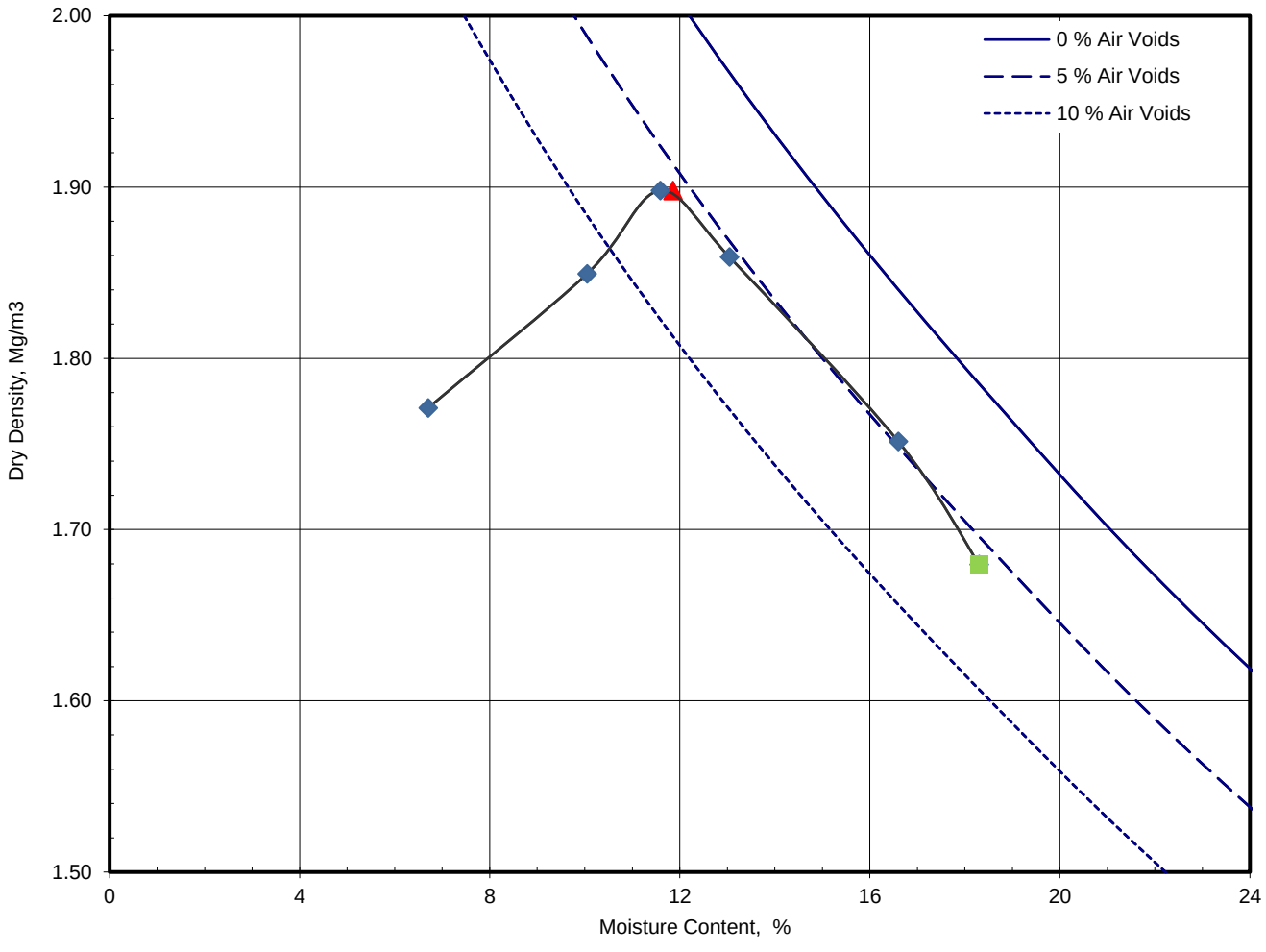
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 7

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
ATP23	1.20	LB9	Brown slightly silty SAND

Percentage Retained 37.5mm	0 %		
Percentage Retained 20.0mm	0 %	Samples Used	Single sample tested
Grading Zone	1	Particle Density	2.65 Mg/m³ Assumed
Mould Type	1 LITRE	Method of compaction	Compaction using 2.5kg rammer
Maximum Dry Density	**1.90 Mg/m³**	**Optimum Moisture Content**	**12 %**



▲ : Maximum Dry Density vs. Optimum Water Content

■ : Point at Natural Moisture Content

Remarks:

Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was oven dried at 50ºC. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 2.5kg rammer

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Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report | 2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 8

DETERMINATION OF MOISTURE CONDITION VALUE AT NATURAL MOISTURE CONTENT SUMMARY RESULTS

Borehole / Trial Pit	Depth (m)	Sample	Retained on 20mm sieve (%)	Moisture Content <20mm (%)	Moisture Condition Value	Method of Interpretation	Description / Remarks
ATP23	0.50	LB4	0	15.5	4.6	Steepest straight line	Brown slightly silty SAND
ATP23	1.20	LB9	0	18.1	<3	Steepest straight line	Brown slightly silty SAND

Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

Method of Test: BS 1377:Part 4:1990:5.4 Determination of the MCV of a sample of soil at its natural moisture content

UKAS TESTING 1464

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 9

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP23	0.50	**LB4**	**100%**	Brown slightly silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.97	Mg/m3
Dry density	1.70	Mg/m3
Moisture content	16	%

Soaking details: Not soaked

Period of soaking: days

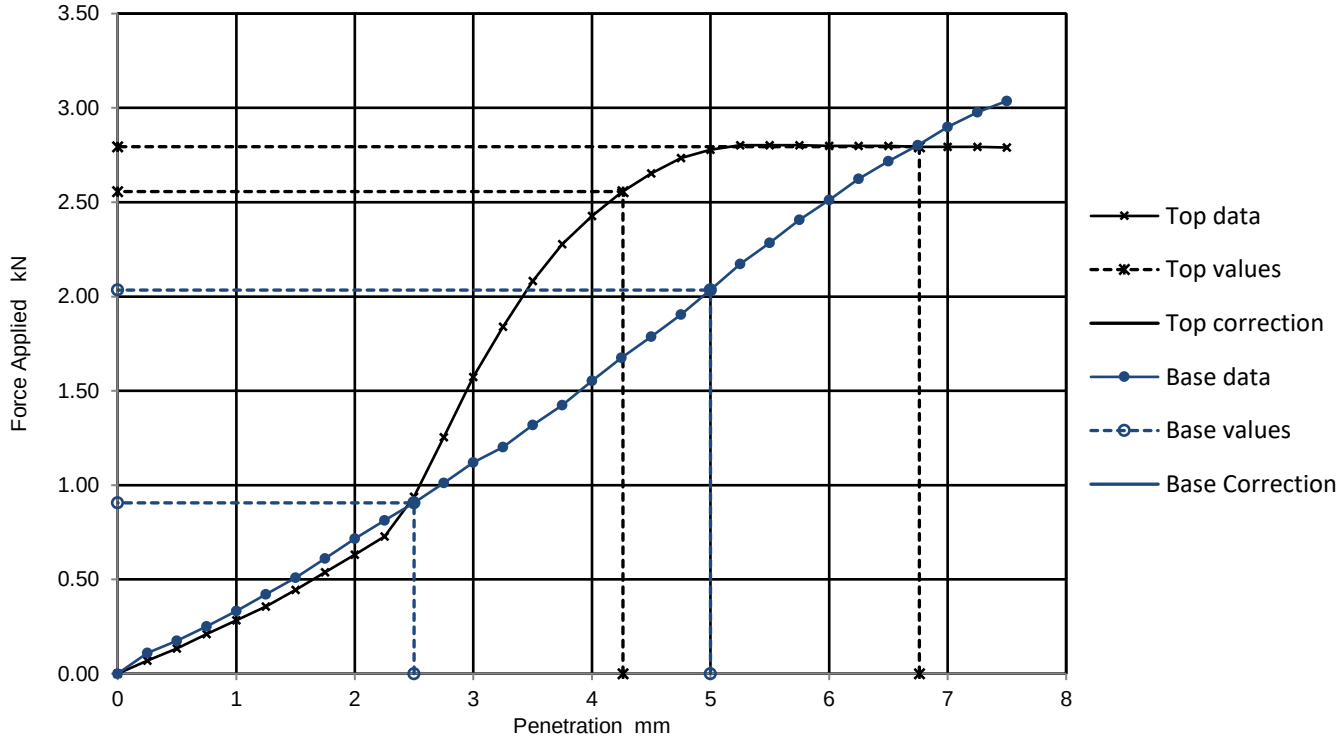
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	Yes	19	14	19		16
BASE	No	6.9	10	10		15

Approved
Sanaz Sayehvand

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AD / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AD

Client: Cadent **Page:** 10

Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
ATP23	1.20	**LB9**	**100%**	Brown slightly silty SAND

Specimen Preparation

Condition

Details: Recompacted with specified standard effort using 2.5kg rammer

Initial Specimen details

Bulk density	1.97	Mg/m3
Dry density	1.67	Mg/m3
Moisture content	18	%

Soaking details: Not soaked

Period of soaking: days

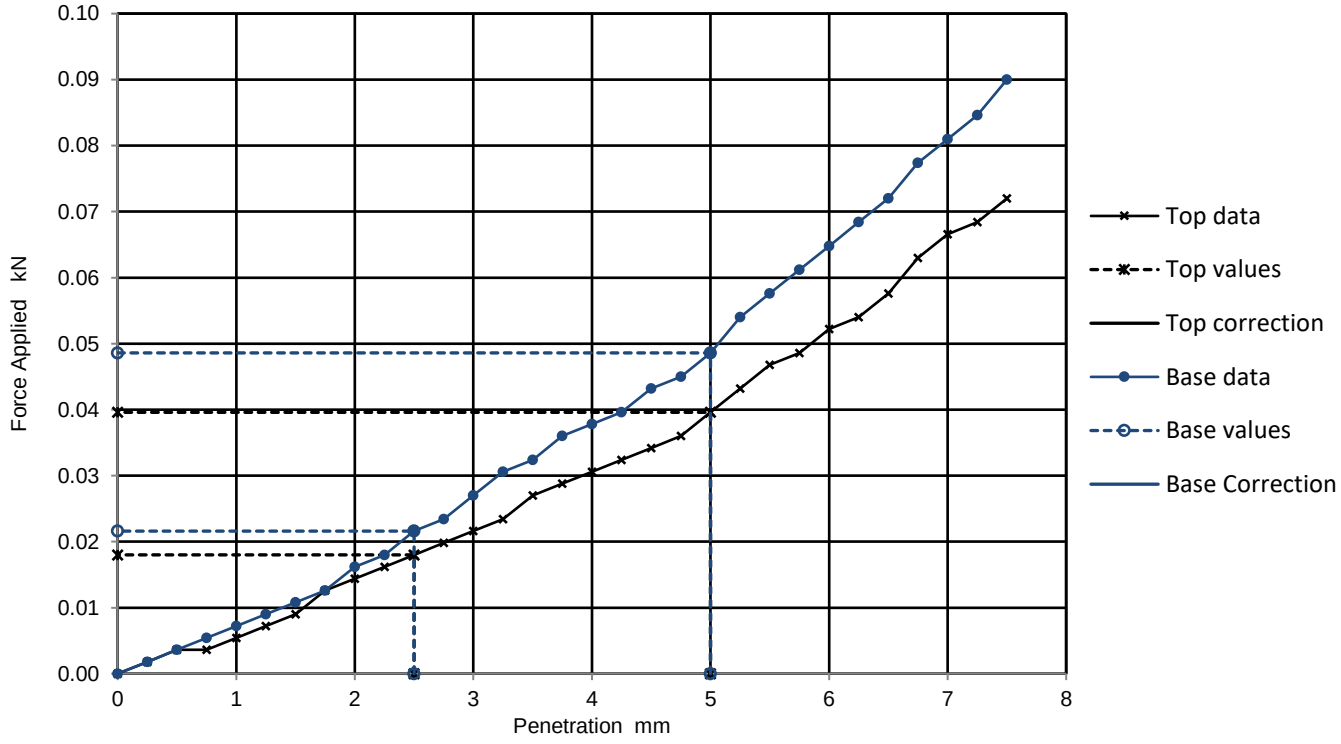
Time to surface: days

Amount of swell recorded: mm

Dry density after soaking: Mg/m3

Surcharge applied: 4.2 kg / 3 kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.14	0.20	0.20		19
BASE	No	0.16	0.24	0.24		18

Approved
Paul Cathcart

Method of Preparation: BS1377 : Part 4 : 1990, clause 7.2, Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7.4, Penetration test procedure to determine California Bearing Ratio (CBR)

Remarks:

Result reported relates only to the sample tested.

UKAS TESTING 1464

Final Test Report - 2230746AD / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AD
Originating Client:	Cadent

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Report Issue Date: 20/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AE / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AE
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	08/12/2022
Date Testing Finished:	16/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AE

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH330	0.80	B5	16.6											Red Brown slightly silty SAND
BH330	1.20	B12	3.8	Sieved	9	42		NP						Brown SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

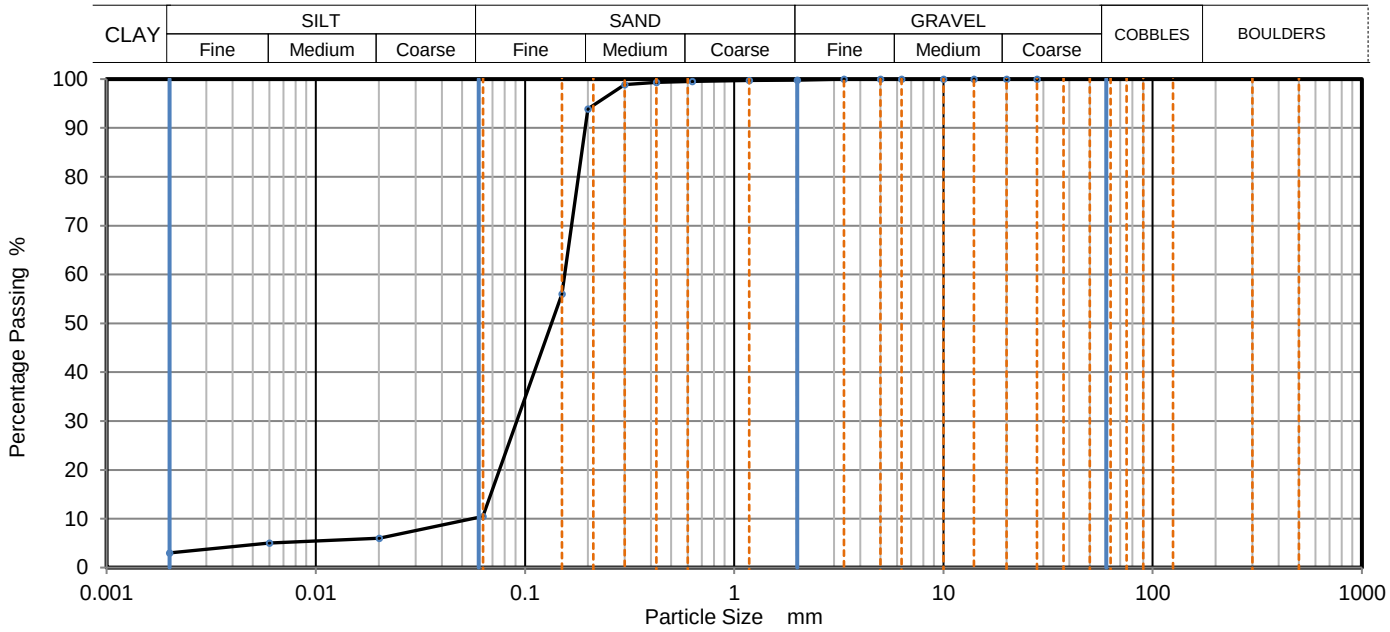
Laboratory Test Report	2230746AE / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AE

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH330	0.80	B5	Wet Sieve + Pipette	Red Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	6
		0.0060	5
		0.0020	3
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	99		
0.3	99		
0.2	94		
0.15	56		
0.063	11		

Dry Mass of sample, g: 557

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	89
Silt	7
Clay	4

Grading Analysis		
D100	mm	3.35
D60	mm	0.155
D30	mm	0.0914
D10	mm	0.0556
Uniformity Coefficient		2.8
Curvature Coefficient		0.97

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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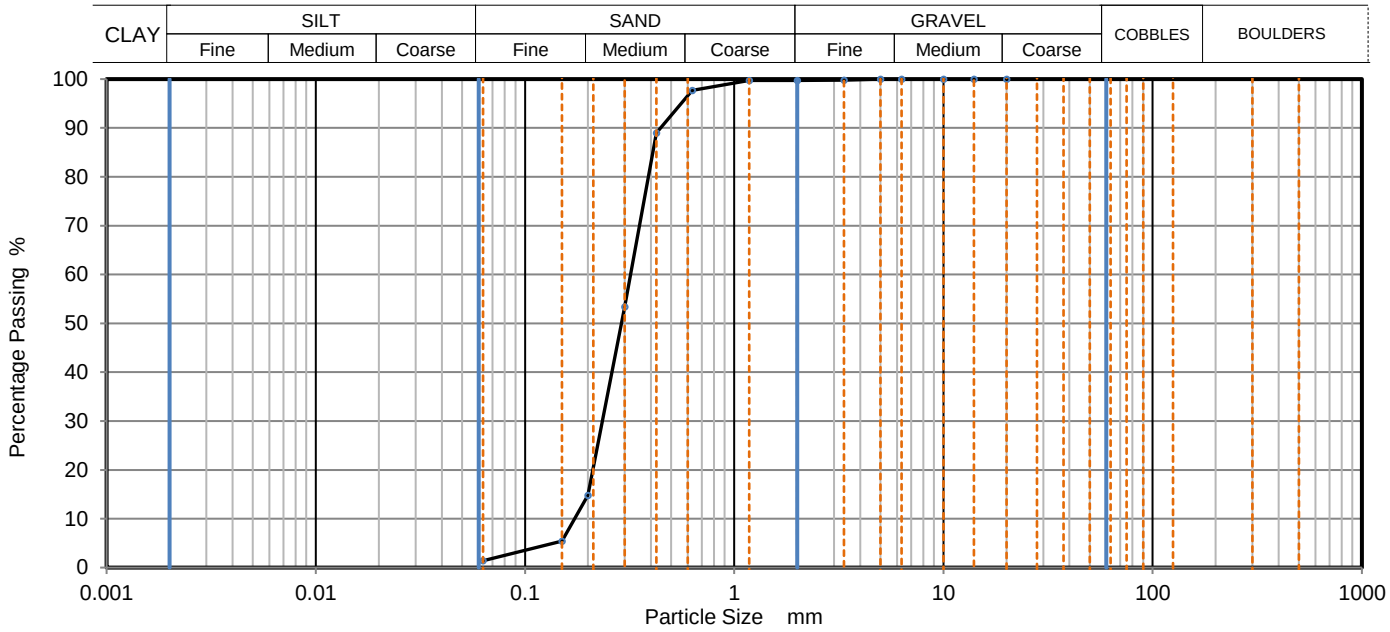
Laboratory Test Report 2230746AE / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AE

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH330	1.20	B12	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	98		
0.425	89		
0.3	53		
0.2	15		
0.15	5		
0.063	1		

Dry Mass of sample, g: 746

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	98
Fines <0.063mm	1

Grading Analysis		
D100	mm	5
D60	mm	0.32
D30	mm	0.235
D10	mm	0.173
Uniformity Coefficient		1.9
Curvature Coefficient		1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AE

Client: Cadent **Page:** 5

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH330	6.80	C16	Red SANDSTONE	13.2						
BH330	11.00	C17	Red SANDSTONE	13.7						
BH330	12.66	C18	Red SANDSTONE	13.9						
BH330	17.52	C20	Red SANDSTONE	12.2						
BH330	18.66	C19	Red SANDSTONE	14.9						
BH330	22.13	C21	Red/Brown MUD/SANDSTONE	14.4						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AE / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AE

Client: Cadent **Page:** 6

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH330	22.13	C21	Red/Brown MUD/SANDSTONE	84.9	94.8	*1.1	2.24	14.4	as received	0.4894	AC	0.8	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AE

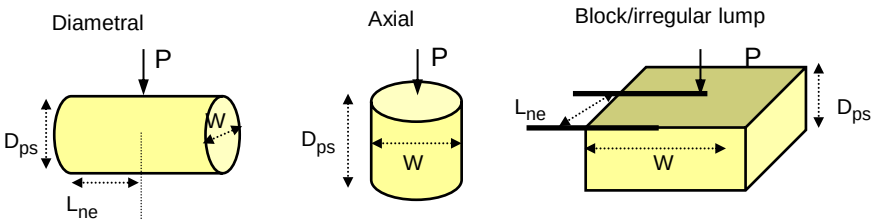
Client: Cadent **Page:** 7

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH330	6.80	C16	Red SANDSTONE As received	D	PL	YES	31.7	83.2	83.2	80.2	0.0	83.2	0.01	0.01	
BH330	6.80	C16	Red SANDSTONE As received	A	PD	YES		83.5	38.1	36.1	0.1	63.7	0.03	0.03	
BH330	11.00	C17	Red SANDSTONE As received	D	PL	YES	40.5	83.8	83.8	81.8	0.1	83.8	0.02	0.02	
BH330	11.00	C17	Red SANDSTONE As received	A	PD	YES		84.0	55.3	46.3	0.3	76.9	0.05	0.06	
BH330	12.66	C18	Red SANDSTONE As received	D	PL	YES	34.0	78.7	78.7	73.7	0.1	78.7	0.01	0.01	
BH330	12.66	C18	Red SANDSTONE As received	A	PD	NO		78.9	54.1	50.1	0.1	73.7	0.02	0.03	
BH330	17.52	C20	Red SANDSTONE As received	D	PL	YES	19.6	83.1	83.1	81.1	0.1	83.1	0.01	0.02	
BH330	17.52	C20	Red SANDSTONE As received	A	PD	YES		83.6	34.0	31.0	0.1	60.2	0.03	0.04	
BH330	18.66	C19	Red SANDSTONE As received	D	PL	NO	23.6	84.9	84.9	81.9	0.1	84.9	0.02	0.02	
BH330	18.66	C19	Red SANDSTONE As received	A	PD	NO		85.2	48.8	42.8	0.0	72.8	0.01	0.01	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AE / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AE
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AF / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AF
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	16/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 16/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AF

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH329	0.70	D6	17.4	Natural	99	18	23	12	11	0.51	CL			Brown slightly gravelly, slightly sandy, silty CLAY
BH329	2.00	D8	15.1	Natural	99	15	24	14	10	0.13	CL	20.5 20.4	0.9928	Brown slightly gravelly, slightly sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AF

Client: Cadent **Page:** 3

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH329	7.50	C13	Red SANDSTONE	7.8						
BH329	12.30	C14	Red SANDSTONE	6.6						
BH329	14.90	C15	Red SANDSTONE	6.1						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AF

Client: Cadent **Page:** 4

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH329	12.30	C14	Red SANDSTONE	85.6	159.6	*1.9	2.49	6.6	as received	0.5036	AC	3.9	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AF

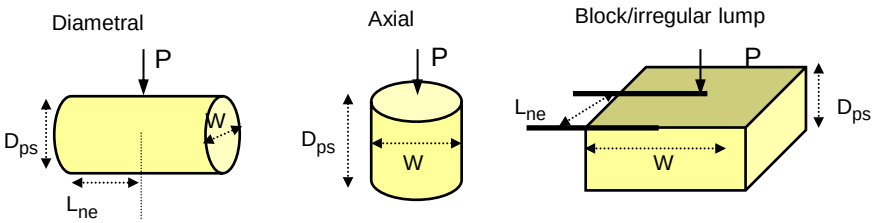
Client: Cadent **Page:** 5

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH329	7.50	C13	Red SANDSTONE As received	D	PL	YES	25.7	85.9	85.9	82.9	0.0	85.9	0.01	0.01	
BH329	7.50	C13	Red SANDSTONE As received	A	PD	YES		85.9	30.0	28.0	0.1	57.2	0.02	0.02	
BH329	14.90	C15	Red SANDSTONE As received	D	PL	YES	35.2	86.1	86.1	80.1	0.1	86.1	0.02	0.02	
BH329	14.90	C15	Red SANDSTONE As received	A	PD	YES		86.3	53.5	48.5	0.2	76.7	0.04	0.04	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AF / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AF
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 16/12/2022

IAN FARMER ASSOCIATES

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washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230746AG / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AG
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	21/10/2022
Date Scheduled:	05/12/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	16/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 16/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AG

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH300	0.50	B3	11	Sieved	41	27		NP						Brown slightly silty, slightly organic SAND
BH300	1.50	D5	12.8	Sieved	81	16	27	16	11	-0.01	CL	20.2 20.2	0.9968	Brown slightly gravelly, sandy CLAY
BH300	2.50	B7	13.4	Sieved	71	19	21	15	6	0.65	CL			Brown slightly clayey, gravelly, silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

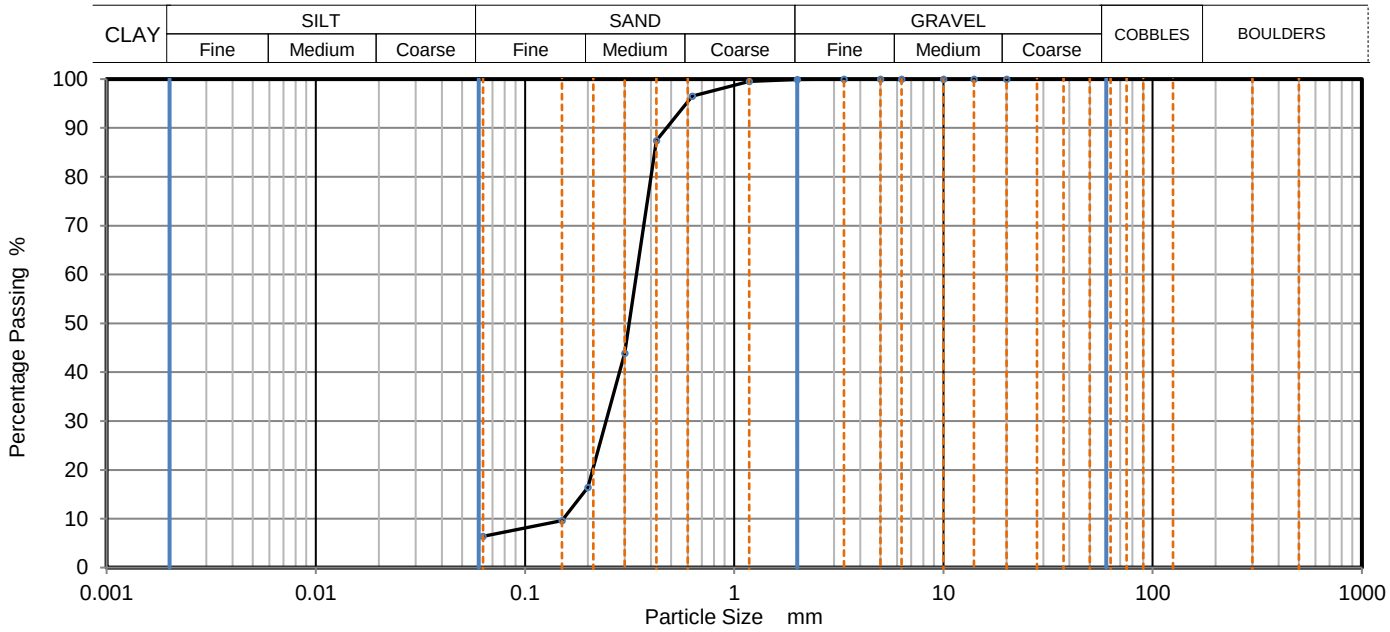
Laboratory Test Report 2230746AG / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AG

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH300	0.50	B3	Wet Sieve	Brown slightly silty, slightly organic SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	97		
0.425	87		
0.3	44		
0.2	16		
0.15	10		
0.063	6		

Dry Mass of sample, g: 876

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	94
Fines <0.063mm	6

Grading Analysis		
D100	mm	3.35
D60	mm	0.341
D30	mm	0.244
D10	mm	0.152
Uniformity Coefficient		2.2
Curvature Coefficient		1.1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

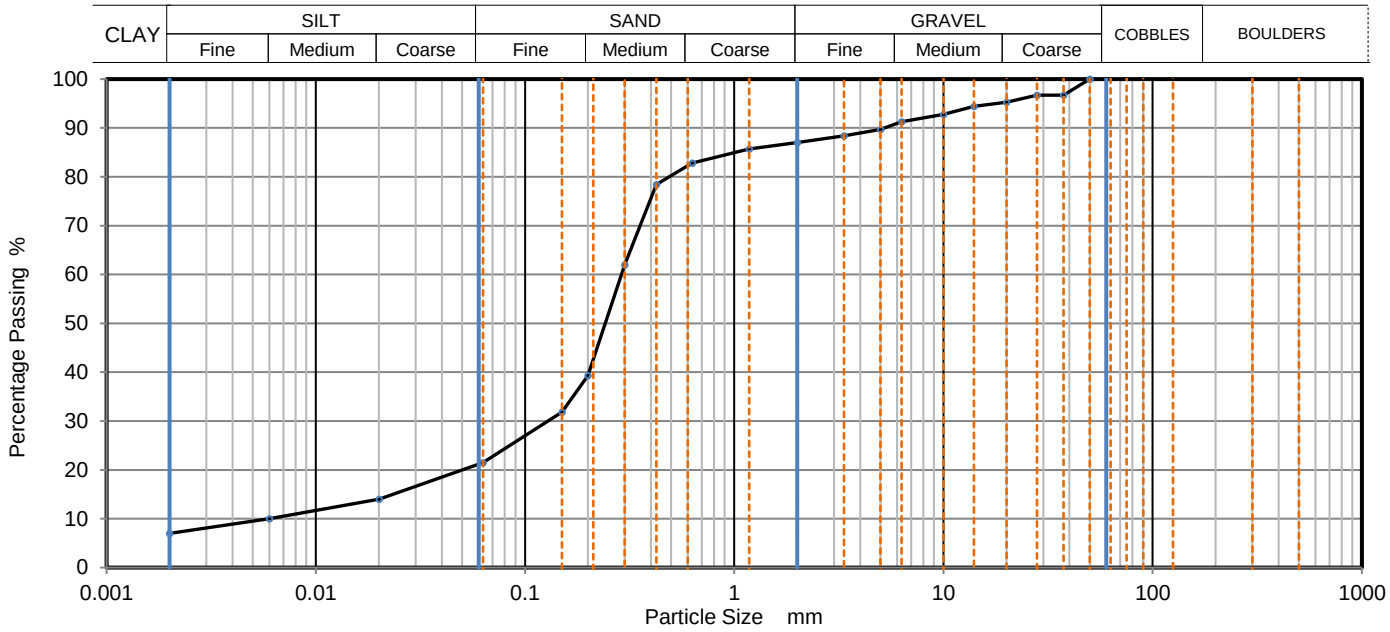
Laboratory Test Report 2230746AG / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AG

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH300	2.50	B7	Wet Sieve + Pipette	Brown slightly clayey, gravelly, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	14
		0.0060	10
		0.0020	7
50	100		
37.5	97		
28	97		
20	95		
14	94		
10	93		
6.3	91		
5	90		
3.35	88		
2	87	Particle density	(assumed)
1.18	86	2.65	Mg/m3
0.63	83		
0.425	78		
0.3	62		
0.2	39		
0.15	32		
0.063	22		

Dry Mass of sample, g 1470

Sample Proportions	% dry mass
Very coarse	0
Gravel	13
Sand	66
Silt	14
Clay	7

Grading Analysis		
D100	mm	50
D60	mm	0.29
D30	mm	0.129
D10	mm	0.00618
Uniformity Coefficient		47
Curvature Coefficient		9.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AG

Client: Cadent **Page:** 5

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH300	6.00	C17	Red SANDSTONE	12.2						
BH300	8.75	C18	Red SANDSTONE	13.5						
BH300	11.33	C20	Red SANDSTONE	12.5						
BH300	13.40	C22	Red SANDSTONE	8.8						
BH300	14.00	C23	Red SANDSTONE	12.8						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AG

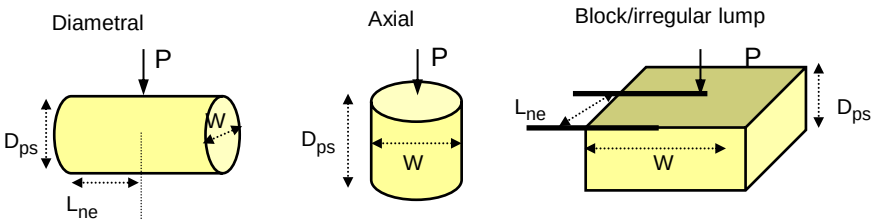
Client: Cadent **Page:** 6

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH300	6.00	C17	Red SANDSTONE As received	D	PL	YES	20.7	84.5	84.5	81.5	0.1	84.5	0.01	0.02	
BH300	6.00	C17	Red SANDSTONE As received	A	PD	YES		85.1	37.5	34.5	0.1	63.8	0.03	0.04	
BH300	8.75	C18	Red SANDSTONE As received	D	PL	YES	13.5	84.3	84.3	83.3	0.0	84.3	0.00	0.01	
BH300	8.75	C18	Red SANDSTONE As received	A	PD	YES		84.5	25.4	18.4	0.0	52.3	0.01	0.01	
BH300	11.33	C20	Red SANDSTONE As received	D	PL	YES	19.6	84.6	84.6	82.6	0.2	84.6	0.02	0.03	
BH300	11.33	C20	Red SANDSTONE As received	A	PD	YES		84.3	34.2	31.2	0.3	60.6	0.08	0.08	
BH300	13.40	C22	Red SANDSTONE As received	D	PL	YES	48.4	84.3	84.3	81.3	0.3	84.3	0.05	0.06	
BH300	13.40	C22	Red SANDSTONE As received	A	PD	YES		85.8	46.6	39.6	0.4	71.3	0.08	0.09	
BH300	14.00	C23	Red SANDSTONE As received	D	PL	YES	8.3	84.4	84.4	83.4	0.2	84.4	0.03	0.03	
BH300	14.00	C23	Red SANDSTONE As received	A	PD	YES		84.6	26.8	24.8	0.1	53.8	0.02	0.02	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AG / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AG
Originating Client:	Cadent

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Report Issue Date: 16/12/2022

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Final Test Report - 2230746AH / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AH
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	17/10/2022
Date Scheduled:	05/12/2022
Date Testing Started:	06/12/2022
Date Testing Finished:	15/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 16/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AH

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH097	1.50	B5	25.9	Sieved	61	42	27	19	8	2.92	CL			Reddish Brown clayey, gravelly SILT/SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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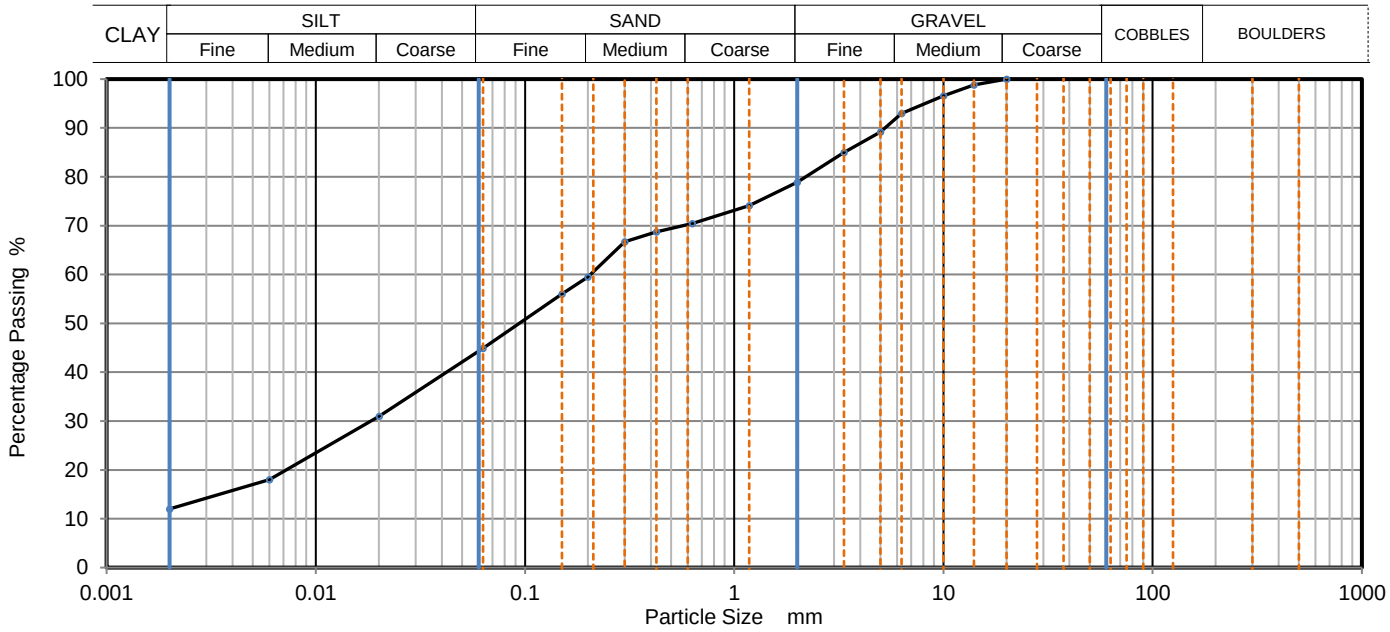
Laboratory Test Report 2230746AH / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AH

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH097	1.50	B5	Wet Sieve + Pipette	Reddish Brown clayey, gravelly SILT/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	31
		0.0060	18
		0.0020	12
20	100		
14	99		
10	97		
6.3	93		
5	89		
3.35	85		
2	79	Particle density	(assumed)
1.18	74	2.65	Mg/m3
0.63	70		
0.425	69		
0.3	67		
0.2	60		
0.15	56		
0.063	45		

Dry Mass of sample, g 1225

Sample Proportions	% dry mass
Very coarse	0
Gravel	21
Sand	34
Silt	33
Clay	12

Grading Analysis		
D100	mm	20
D60	mm	0.205
D30	mm	0.0182
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AH

Client: Cadent **Page:** 4

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH097	5.20	C8	Red SANDSTONE	10.8						
BH097	7.17	C9	Grey SANDSTONE	8.1						
BH097	10.50	C10	Red SANDSTONE	5.5						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AH

Client: Cadent **Page:** 5

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH097	5.20	C8	Red SANDSTONE	85.7	74.2	*0.9	2.24	10.8	as received	0.5023	AC	3.9	
BH097	7.17	C9	Grey SANDSTONE	86.4	111.3	*1.3	2.31	8.1	as received	0.4947	AC	11.0	
BH097	10.50	C10	Red SANDSTONE	85.6	98.4	*1.1	2.51	5.5	as received	0.5044	AC	22.5	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Final Test Report - 2230746AH / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AH
Originating Client:	Cadent

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Report Issue Date: 16/12/2022

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F.A.O.

Final Test Report - 2230746AI / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AI
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	08/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 20/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AI

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH036	0.80	B4	19.3	Sieved	62	31		NP						Brown slightly silty GRAVEL/SAND
BH036	5.00	B14	18.3	Sieved	57	32		NP						Brown SAND
BH036	15.50	D25	16.5	Natural	100	17	25	20	5	-0.70	ML			Brown very sandy CLAY/SILT
BH036	17.00	B29	18.2	Sieved	32	56		NP						Brown SAND
BH036	24.50	D34	12.3	Natural	97	13	30	11	19	0.09	CL			Brown slightly gravelly, sandy CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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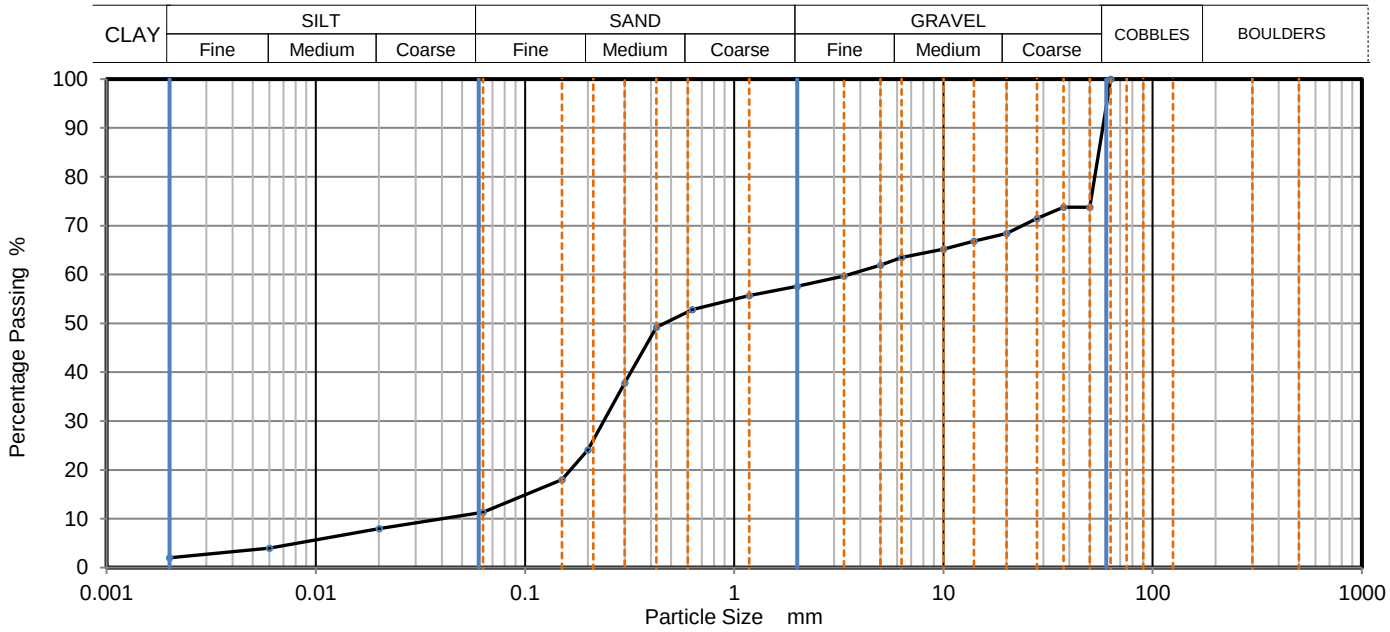
Laboratory Test Report	2230746AI / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AI

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH036	0.80	B4	Wet Sieve + Pipette	Brown slightly silty GRAVEL/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	8
		0.0060	4
		0.0020	2
63	100		
50	74		
37.5	74		
28	72		
20	68		
14	67		
10	65		
6.3	64		
5	62		
3.35	60		
2	58	Particle density (assumed)	
1.18	56	2.65	Mg/m3
0.63	53		
0.425	49		
0.3	38		
0.2	24		
0.15	18		
0.063	11		

Dry Mass of sample, g: 1175

Sample Proportions	% dry mass
Very coarse	0
Gravel	42
Sand	46
Silt	10
Clay	2

Grading Analysis		
D100	mm	63
D60	mm	3.53
D30	mm	0.238
D10	mm	0.0421
Uniformity Coefficient		84
Curvature Coefficient		0.38

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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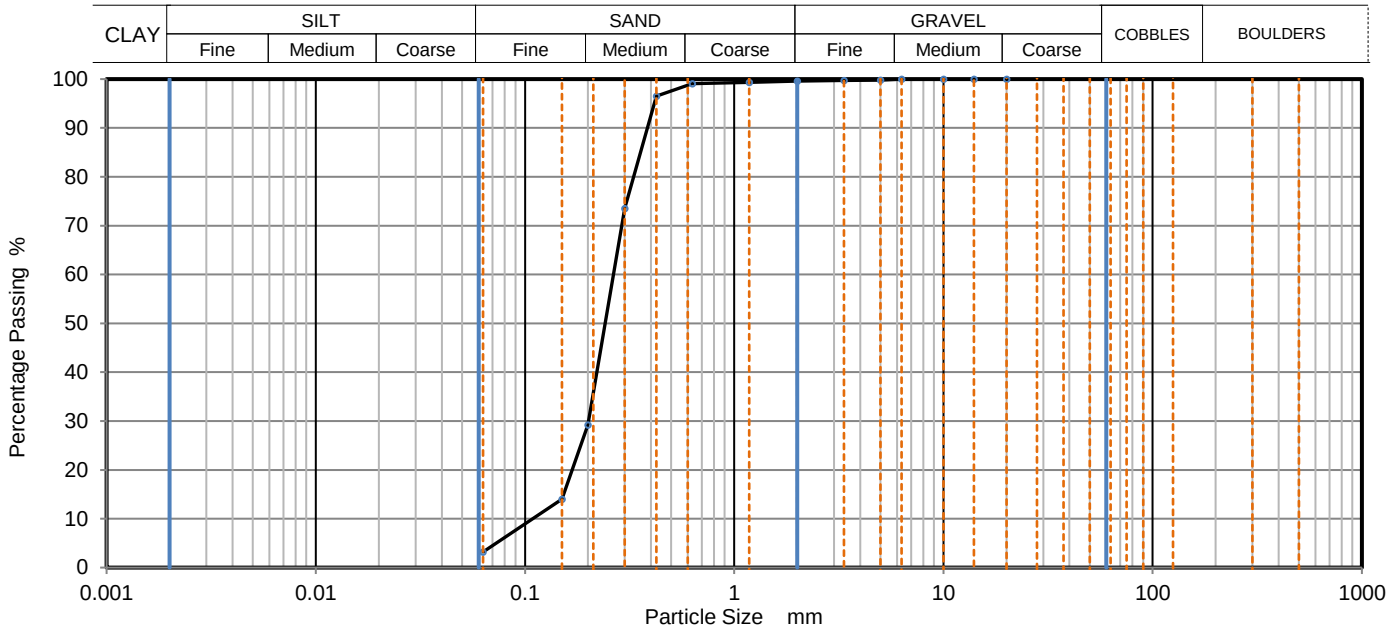
Laboratory Test Report	2230746AI / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AI

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH036	5.00	B14	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.63	99		
0.425	97		
0.3	74		
0.2	29		
0.15	14		
0.063	3		

Dry Mass of sample, g	580

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	96
Fines <0.063mm	3

Grading Analysis		
D100	mm	6.3
D60	mm	0.265
D30	mm	0.201
D10	mm	0.109
Uniformity Coefficient		2.4
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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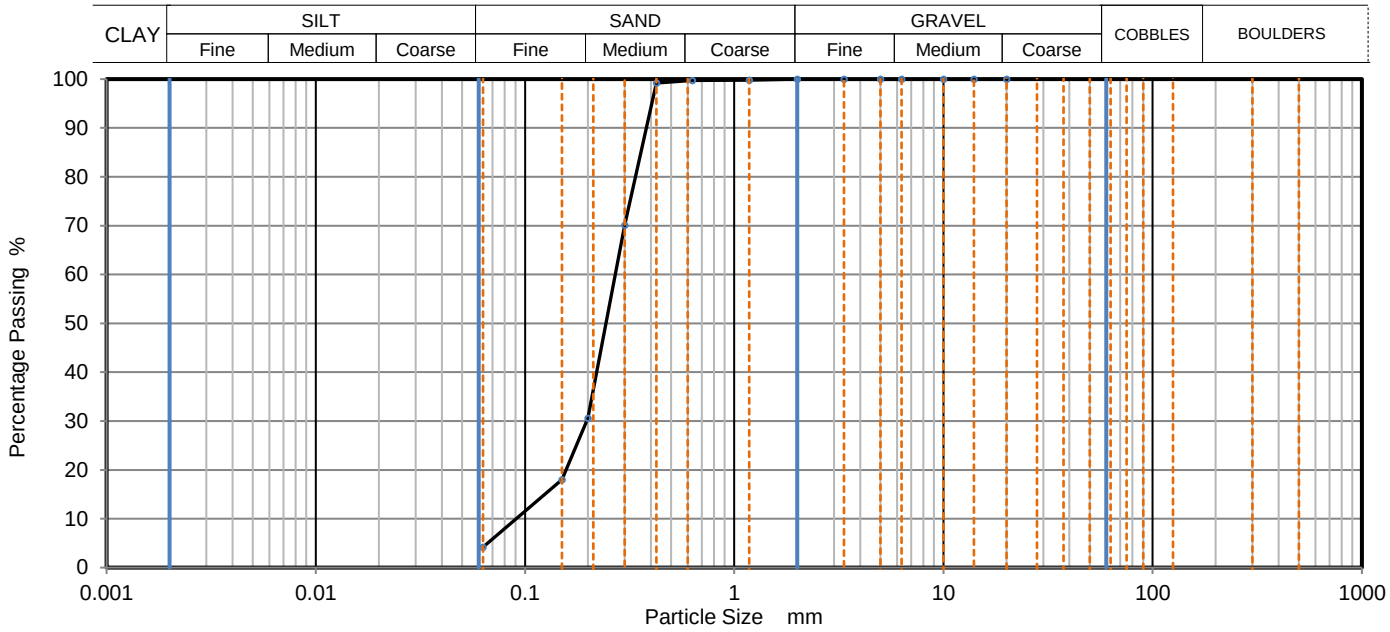
Laboratory Test Report 2230746AI / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AI

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH036	17.00	B29	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	100		
0.425	99		
0.3	70		
0.2	31		
0.15	18		
0.063	4		

Dry Mass of sample, g 1017

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	96
Fines <0.063mm	4

Grading Analysis		
D100	mm	2
D60	mm	0.27
D30	mm	0.197
D10	mm	0.0907
Uniformity Coefficient		3
Curvature Coefficient		1.6

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Final Test Report - 2230746AI / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AI
Originating Client:	Cadent

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IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AJ / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AJ
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	08/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AJ

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH033	0.80	B28	20.8	Sieved	86	24	32	19	13	0.41	CL			Reddish Brown clayey SAND/SILT
BH033	3.00	B15	8.2	Sieved	11	77		NP						Brown SAND
BH033	5.20	B17	3.5	Sieved	9	40		NP						Brown SAND
BH033	9.20	B20	17.2	Sieved	52	33		NP						Brown slightly silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

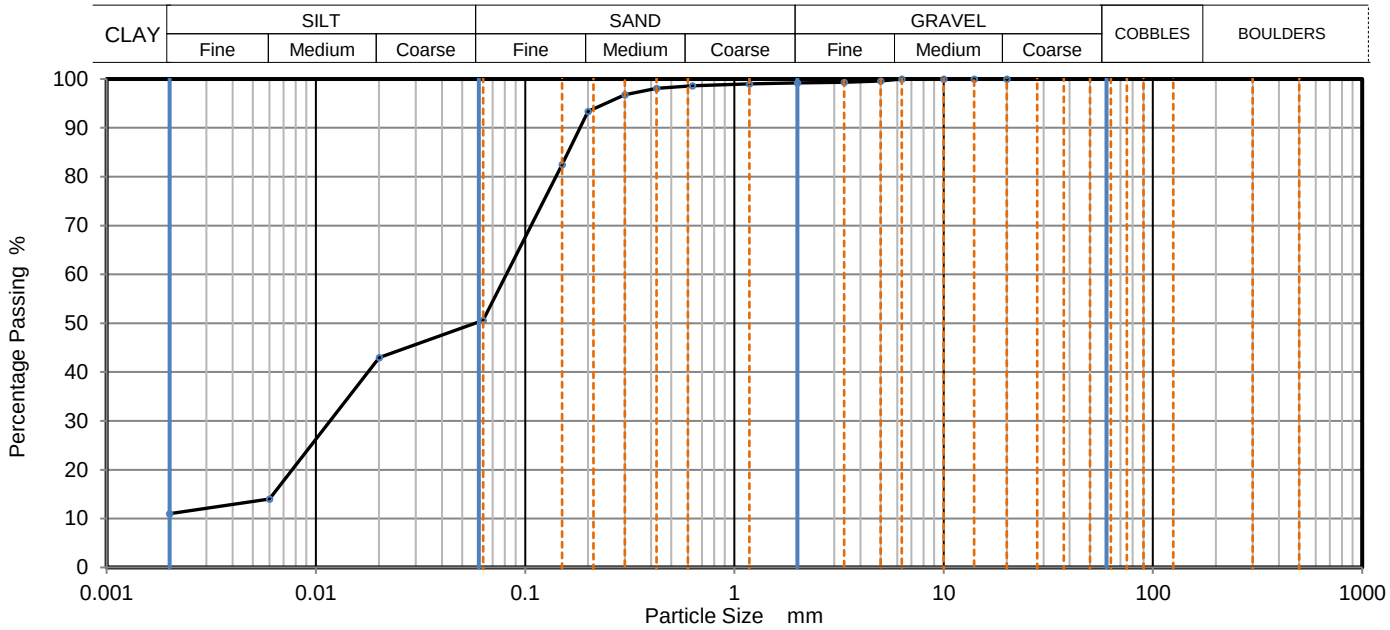
IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AJ / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AJ

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH033	0.80	B28	Wet Sieve + Pipette	Reddish Brown clayey SAND/SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	43
		0.0060	14
		0.0020	11
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	97		
0.2	93		
0.15	83		
0.063	51		

Dry Mass of sample, g: 703

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	49
Silt	39
Clay	11

Grading Analysis		
D100	mm	6.3
D60	mm	0.0814
D30	mm	0.0117
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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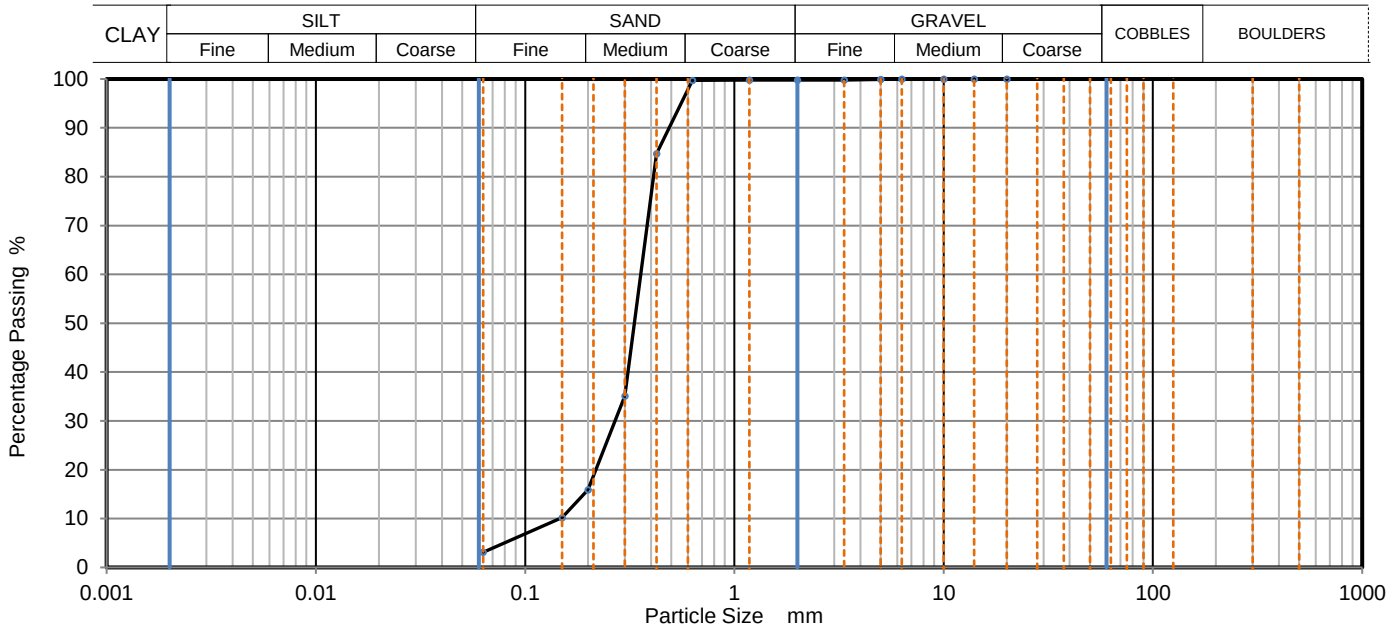
Laboratory Test Report 2230746AJ / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AJ

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH033	3.00	B15	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	85		
0.3	35		
0.2	16		
0.15	10		
0.063	3		

Dry Mass of sample, g: 554

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	97
Fines <0.063mm	3

Grading Analysis		
D100	mm	6.3
D60	mm	0.357
D30	mm	0.27
D10	mm	0.147
Uniformity Coefficient		2.4
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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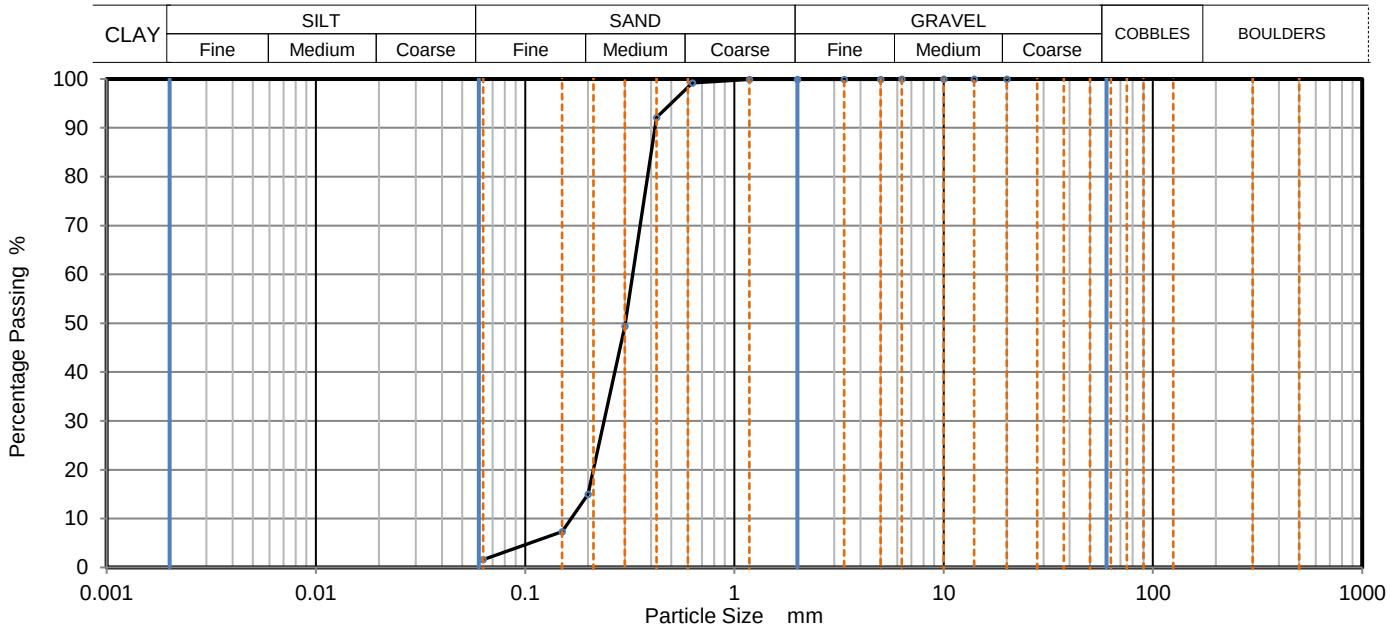
Laboratory Test Report 2230746AJ / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AJ

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH033	5.20	B17	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	99		
0.425	92		
0.3	49		
0.2	15		
0.15	7		
0.063	2		

Dry Mass of sample, g: 735

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	98
Fines <0.063mm	2

Grading Analysis		
D100	mm	6.3
D60	mm	0.327
D30	mm	0.239
D10	mm	0.166
Uniformity Coefficient		2
Curvature Coefficient		1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

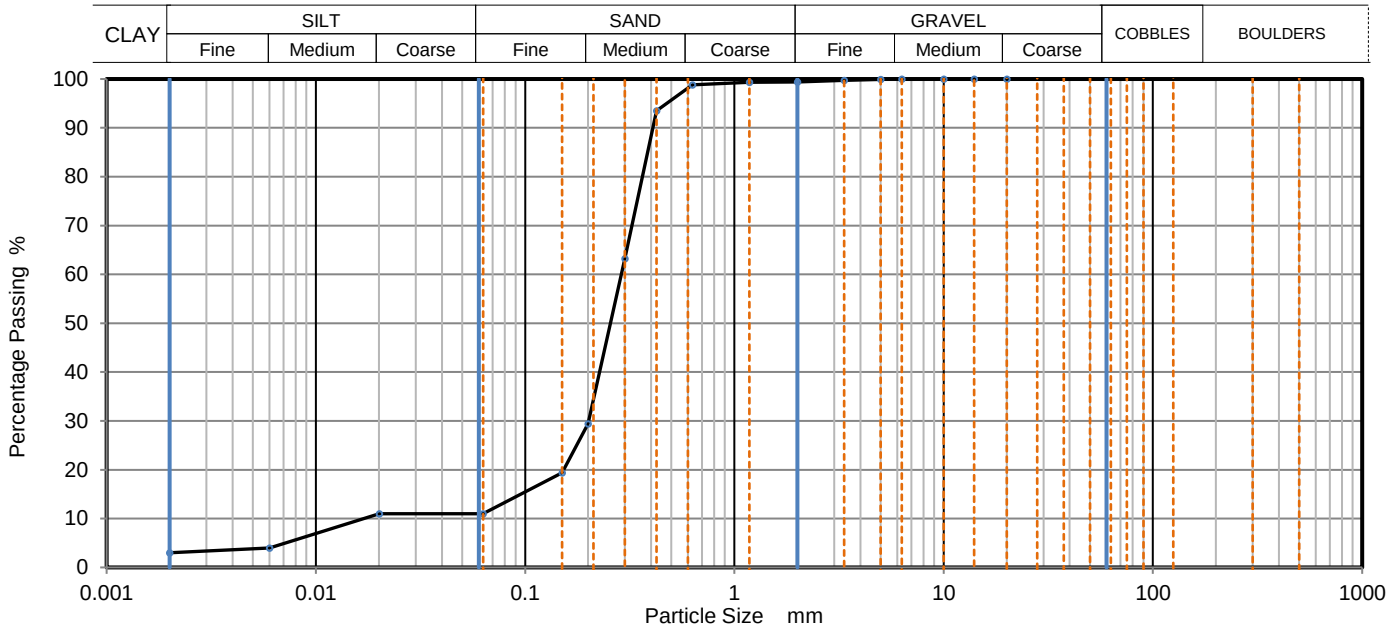
Laboratory Test Report	2230746AJ / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AJ

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH033	9.20	B20	Wet Sieve + Pipette	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	11
		0.0060	4
		0.0020	3
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	94		
0.3	63		
0.2	29		
0.15	19		
0.063	11		

Dry Mass of sample, g: 702

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	88
Silt	8
Clay	3

Grading Analysis		
D100	mm	6.3
D60	mm	0.289
D30	mm	0.201
D10	mm	0.0181
Uniformity Coefficient		16
Curvature Coefficient		7.8

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746AJ / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AJ
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 19/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AK / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AK
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	05/12/2022
Date Testing Started:	07/12/2022
Date Testing Finished:	19/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 19/12/2022

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AGS

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AK / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AK

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH002	0.90	B5	20.6	Sieved	32	65	36	18	18	2.63	CI	20 20.1	0.9996	Brown slightly silty, slightly clayey SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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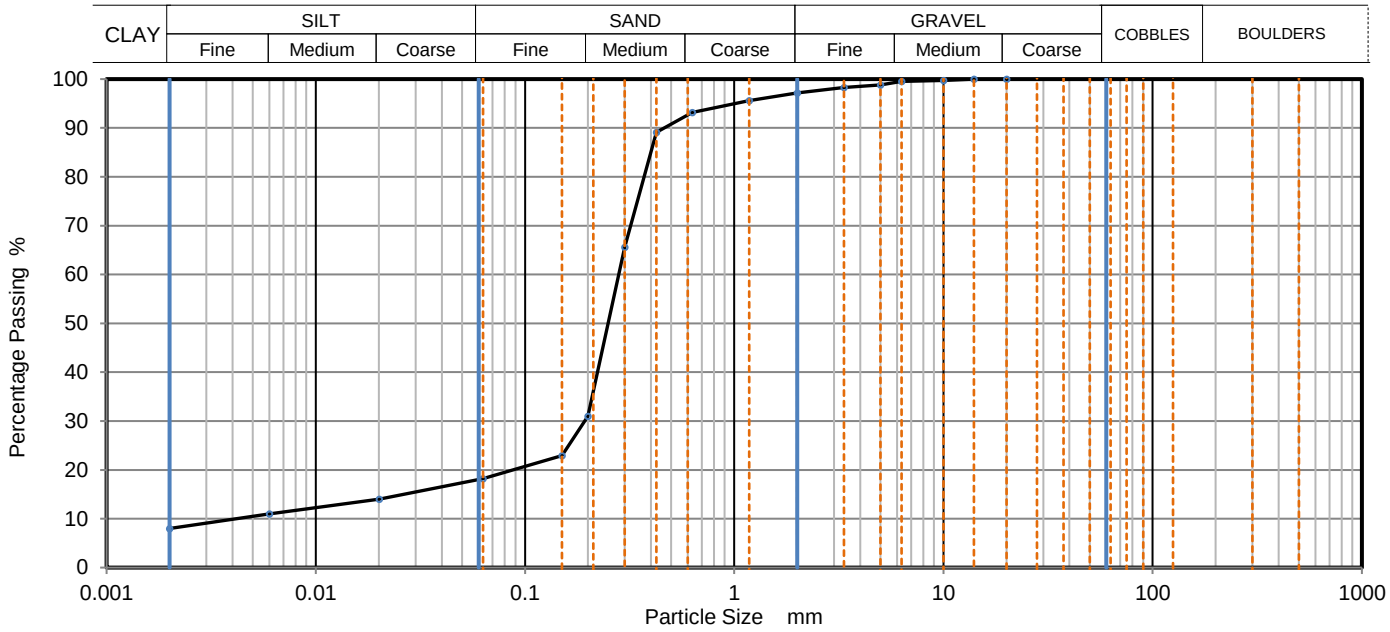
Laboratory Test Report	2230746AK / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AK

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH002	0.90	B5	Wet Sieve + Pipette	Brown slightly silty, slightly clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	14
		0.0060	11
		0.0020	8
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	97	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	93		
0.425	89		
0.3	66		
0.2	31		
0.15	23		
0.063	18		

Dry Mass of sample, g: 901

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	79
Silt	10
Clay	8

Grading Analysis		
D100	mm	14
D60	mm	0.281
D30	mm	0.193
D10	mm	0.00414
Uniformity Coefficient		68
Curvature Coefficient		32

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AK

Client: Cadent **Page:** 4

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH002	5.25	C12	Red/Brown SANDSTONE	9.3						
BH002	7.00	C13	Red/Brown SANDSTONE	10.4						
BH002	7.95	C14	Red/Brown SANDSTONE	9.9						
BH002	8.80	C15	Red/Brown SANDSTONE	9.3						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746AK / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AK

Client: Cadent **Page:** 5

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH002	7.00	C13	Red/Brown SANDSTONE	86.4	105.9	*1.2	2.20	10.4	as received	0.4951	AC	14.5	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AK

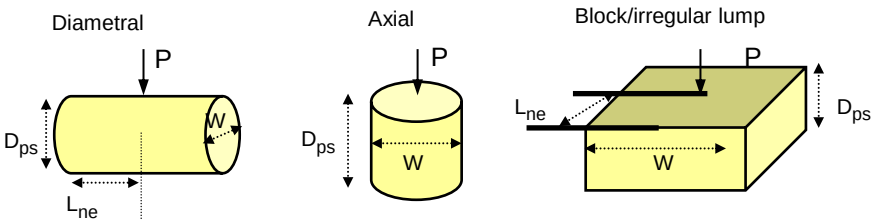
Client: Cadent **Page:** 6

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH002	5.25	C12	Red/Brown SANSTONE As received	D	PL	YES	29.5	87.7	87.7	84.7	0.8	87.7	0.10	0.13	
BH002	5.25	C12	Red/Brown SANSTONE As received	A	PD	YES		87.3	40.6	36.6	0.6	67.2	0.14	0.16	
BH002	7.95	C14	Red/Brown SANDSTONE As received	D	PL	YES	56.3	86.5	86.5	83.5	0.2	86.5	0.02	0.03	
BH002	7.95	C14	Red/Brown SANDSTONE As received	A	PD	YES		86.6	59.4	53.4	0.6	80.9	0.10	0.12	
BH002	8.80	C15	Red/Brown SANDSTONE As received	D	PL	YES	52.6	87.0	87.0	83.0	0.9	87.0	0.12	0.15	
BH002	8.80	C15	Red/Brown SANDSTONE As received	A	PD	YES		86.9	60.6	51.6	1.8	81.9	0.27	0.34	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AK / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AK
Originating Client:	Cadent

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Report Issue Date: 19/12/2022

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Final Test Report - 2230746AL / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AL
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	13/12/2022
Date Testing Started:	14/12/2022
Date Testing Finished:	04/01/2023

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 05/01/2023

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH338	0.80	B7	20.8	Sieved	71	29		NP						Brown slightly clayey, silty SAND
BH338	1.20	D10	19.5											Brown clayey, silty SAND
BH338	2.20	B11	26.9	Sieved	71	38	33	19	14	1.36	CLO			Brown slightly gravelly, silty, sandy, soft CLAY
BH338	3.20	D13	20.7											Brown slightly gravelly, slightly clayey, wet SAND
BH338	3.40	B14	18.7	Sieved	84	22	43	19	24	0.13	CI			Brown clayey SILT/SAND
BH338	4.20	D16	14											Brown slightly gravelly, sity, sandy CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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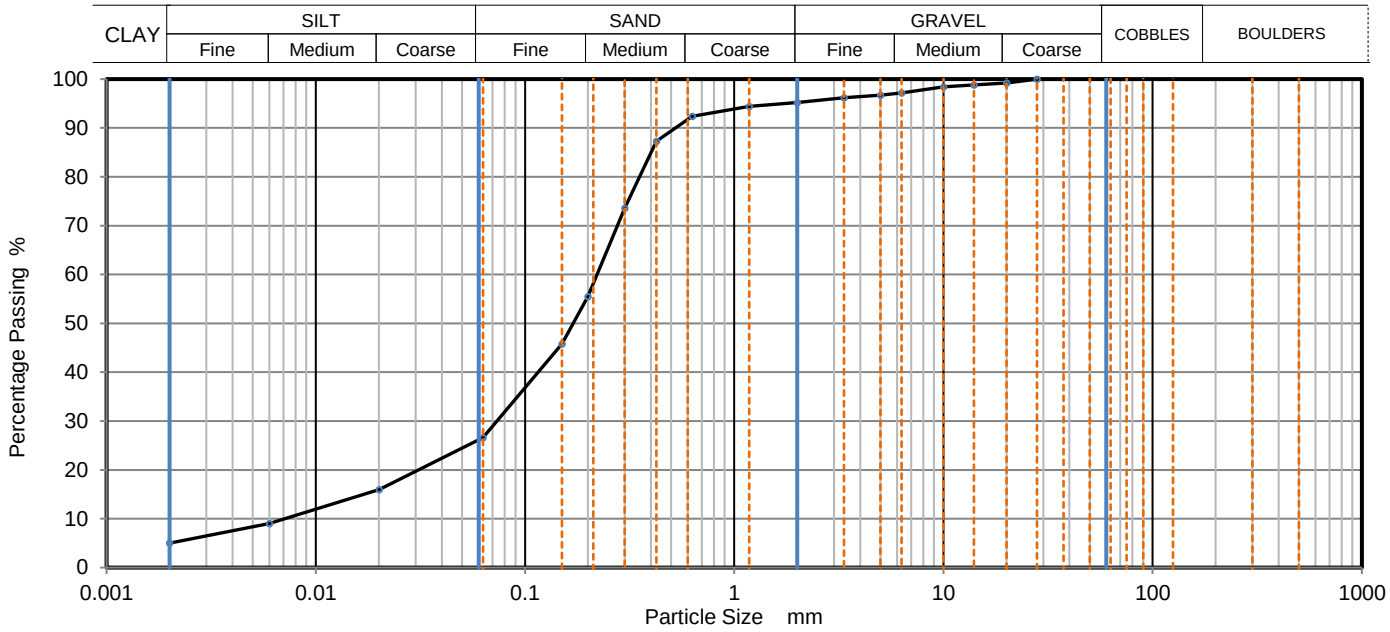
Laboratory Test Report	2230746AL / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH338	0.80	B7	Wet Sieve + Pipette	Brown slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	16
		0.0060	9
		0.0020	5
28	100		
20	99		
14	99		
10	98		
6.3	97		
5	97		
3.35	96		
2	95	Particle density	(assumed)
1.18	94	2.65	Mg/m3
0.63	92		
0.425	87		
0.3	74		
0.2	56		
0.15	46		
0.063	27		

Dry Mass of sample, g: 1444

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	69
Silt	22
Clay	5

Grading Analysis		
D100	mm	28
D60	mm	0.221
D30	mm	0.0733
D10	mm	0.00747
Uniformity Coefficient		30
Curvature Coefficient		3.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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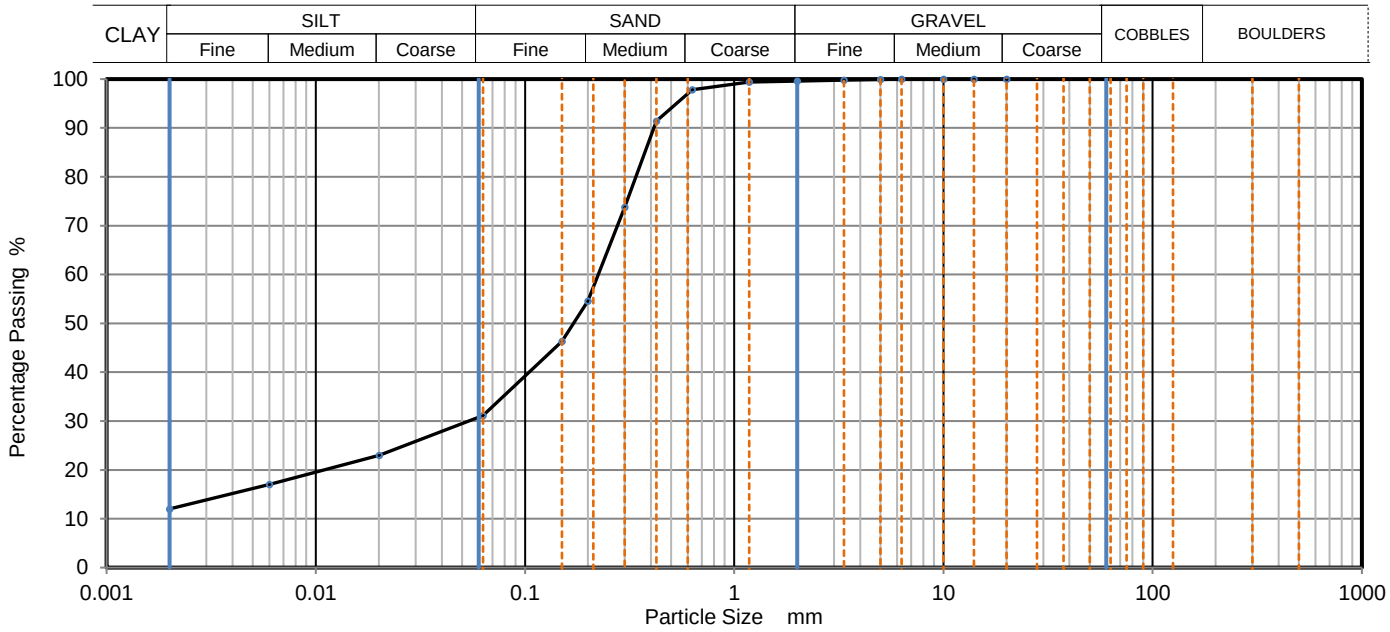
Laboratory Test Report	2230746AL / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH338	1.20	D10	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	23
		0.0060	17
		0.0020	12
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	98		
0.425	91		
0.3	74		
0.2	55		
0.15	46		
0.063	31		

Dry Mass of sample, g: 483

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	69
Silt	19
Clay	12

Grading Analysis		
D100	mm	6.3
D60	mm	0.224
D30	mm	0.0544
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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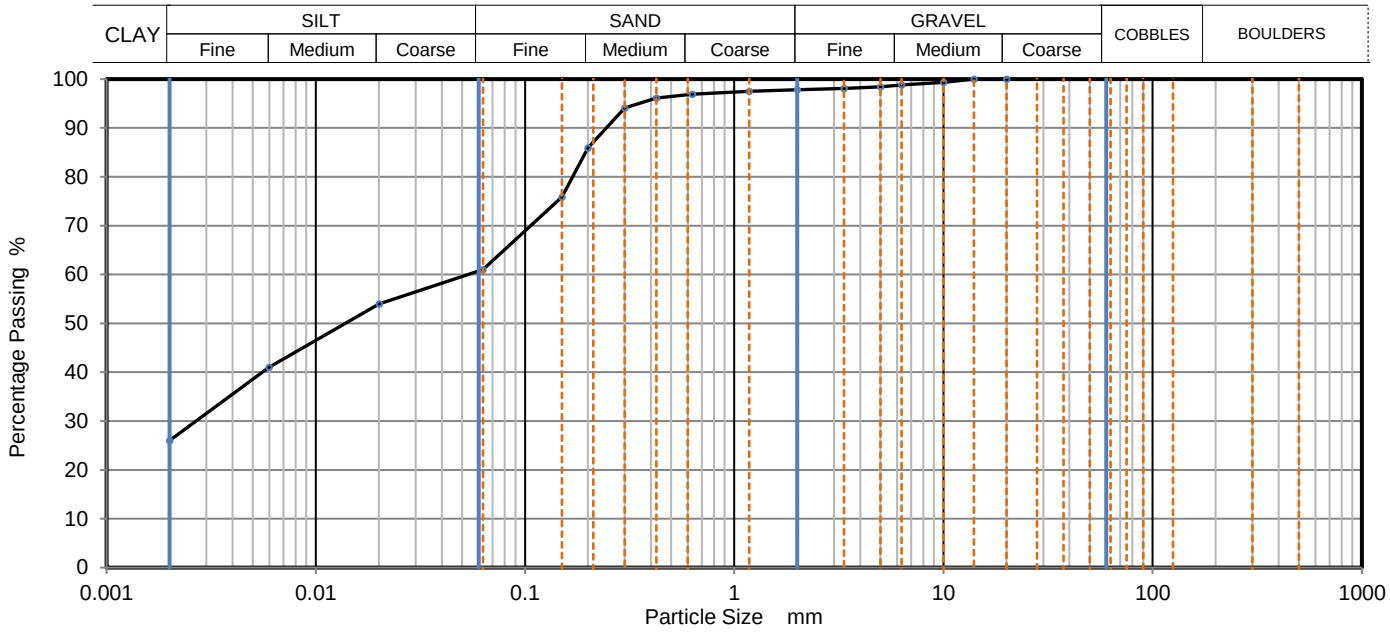
Laboratory Test Report	2230746AL / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH338	3.40	B14	Wet Sieve + Pipette	Brown clayey SILT/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	54
		0.0060	41
		0.0020	26
20	100		
14	100		
10	99		
6.3	99		
5	98		
3.35	98		
2	98	Particle density	(assumed)
1.18	98	2.65	Mg/m3
0.63	97		
0.425	96		
0.3	94		
0.2	86		
0.15	76		
0.063	61		

Dry Mass of sample, g	1425

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	37
Silt	35
Clay	27

Grading Analysis		
D100	mm	14
D60	mm	0.0534
D30	mm	0.00263
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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Laboratory Test Report 2230746AL / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

Client: Cadent **Page:** 6

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2		Buoyancy3		Natural Bulk density Mg/m3	Remarks
					Dry density Mg/m3	Porosity %	Dry density Mg/m3	Porosity %		
BH338	5.78	C18	Red/Brown SANDSTONE	9.4						
BH338	6.80	C19	Red/Brown SANDSTONE	8.5						
BH338	8.00	C20	Brown MUD/SANDSTONE	10.0						
BH338	8.54	C21	Red/Brown SANDSTONE	8.4						
BH338	9.00	C22	Red/Brown SANDSTONE	7.6						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

Client: Cadent **Page:** 7

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH338	8.00	C20	Brown SAND/MUDSTONE	85.2	152.5	*1.8	2.26	10.0	as received	0.4854	AC	13.3	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AL

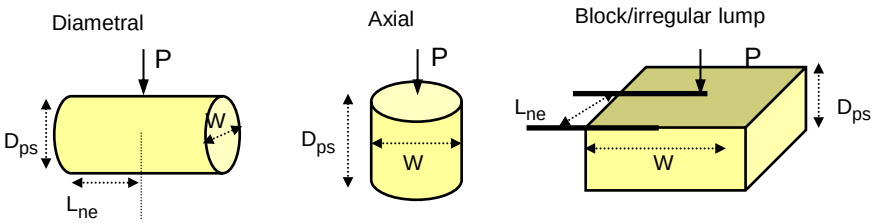
Client: Cadent **Page:** 8

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH338	5.78	C18	Red/Brown SANDTONE As received	D	U	YES	18.7	85.5	85.5	82.5	0.5	85.5	0.07	0.09	
BH338	5.78	C18	Red/Brown SANDTONE As received	A	U	YES		86.8	22.3	19.3	0.3	49.7	0.13	0.13	
BH338	6.80	C19	Red/Brown SANDTONE As received	D	U	YES	30.0	84.9	84.9	79.9	0.7	84.9	0.10	0.12	
BH338	6.80	C19	Red/Brown SANDTONE As received	A	U	YES		83.3	20.9	17.9	0.2	47.1	0.09	0.09	
BH338	8.54	C21	Red/Brown SANDTONE As received	D	U	YES	16.1	84.3	84.3	82.3	0.2	84.3	0.03	0.04	
BH338	8.54	C21	Red/Brown SANDTONE As received	I	U	YES	39.5	81.68 67.26	36.1	33.1	0.2	58.5	0.06	0.07	
BH338	9.00	C22	Red/Brown SANDTONE As received	I	U	YES	34.8	56.91 44.38	40.8	36.8	0.3	51.3	0.11	0.11	
BH338	9.00	C22	Red/Brown SANDTONE As received	I	U	YES	29.6	61.59 46.21	26.3	23.3	0.1	42.5	0.03	0.03	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AL / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AL
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 05/01/2023

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AM / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AM
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	28/11/2022
Date Scheduled:	13/12/2022
Date Testing Started:	14/12/2022
Date Testing Finished:	22/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 23/12/2022

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AM

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH332	0.30	B2	14.8	Sieved	62	24	39	22	17	0.10	CI			Brown slightly clayey, silty SAND
BH332	1.10	B6	23.2	Sieved	25	93		NP						Brown slightly silty SAND
BH332	1.20	B8	13.2	Sieved	32	41		NP						Brown SAND
BH332	2.00	B11	14.5	Sieved	18	80		NP						Brown slightly silty SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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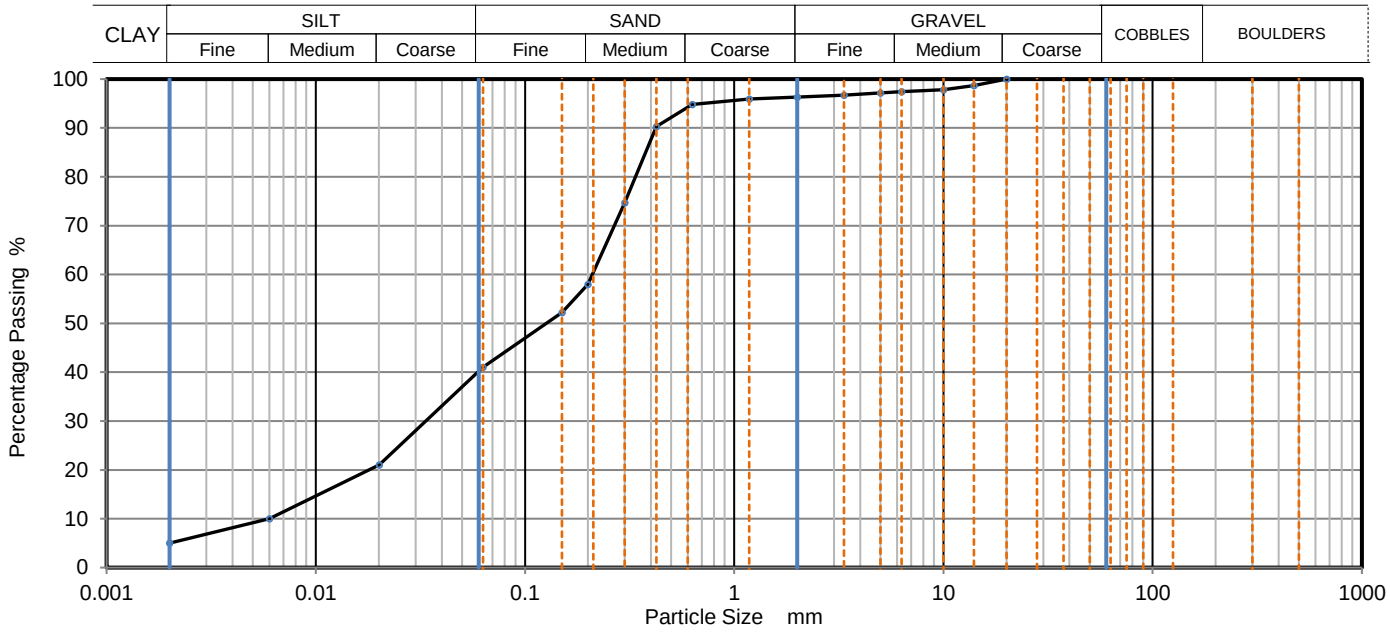
Laboratory Test Report	2230746AM / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AM

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332	0.30	B2	Wet Sieve + Pipette	Brown slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	21
		0.0060	10
		0.0020	5
20	100		
14	99		
10	98		
6.3	97		
5	97		
3.35	97		
2	96	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	95		
0.425	90		
0.3	75		
0.2	58		
0.15	52		
0.063	41		

Dry Mass of sample, g: 806

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	55
Silt	36
Clay	5

Grading Analysis		
D100	mm	20
D60	mm	0.21
D30	mm	0.0333
D10	mm	0.00626
Uniformity Coefficient		34
Curvature Coefficient		0.85

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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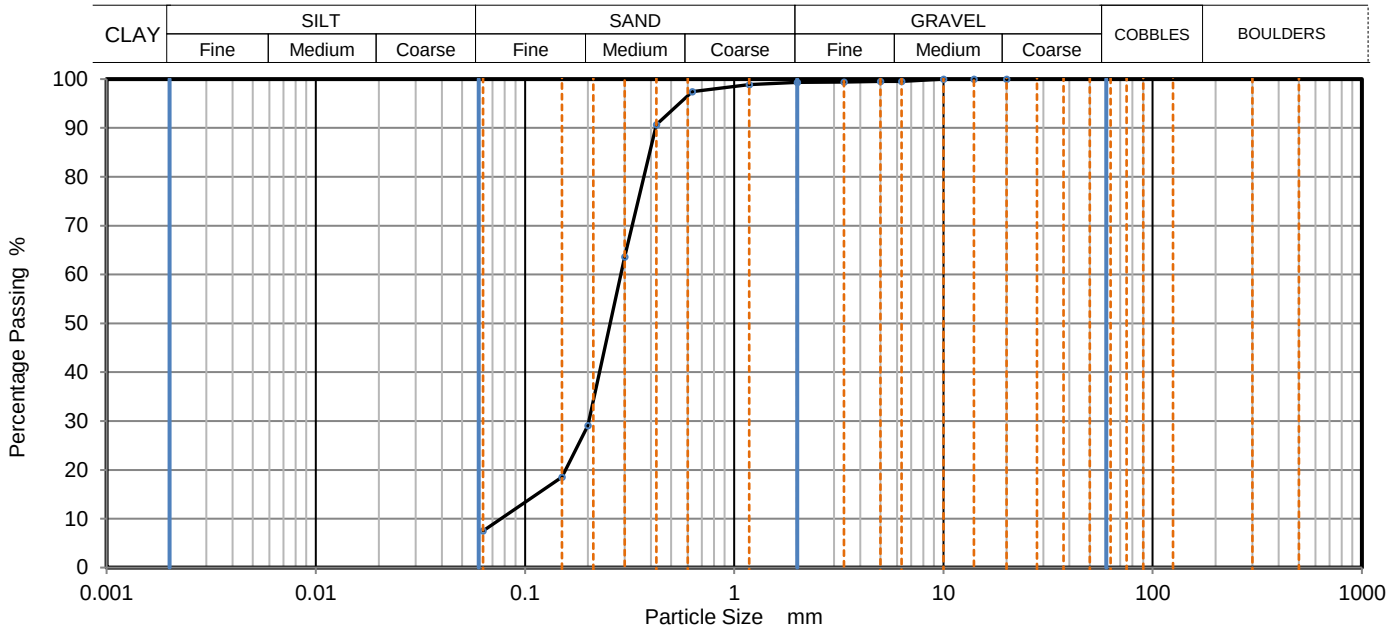
Laboratory Test Report	2230746AM / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AM

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332	1.10	B6	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.63	97		
0.425	91		
0.3	64		
0.2	29		
0.15	19		
0.063	8		

Dry Mass of sample, g: 543

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	92
Fines <0.063mm	8

Grading Analysis		
D100	mm	10
D60	mm	0.288
D30	mm	0.202
D10	mm	0.0765
Uniformity Coefficient		3.8
Curvature Coefficient		1.9

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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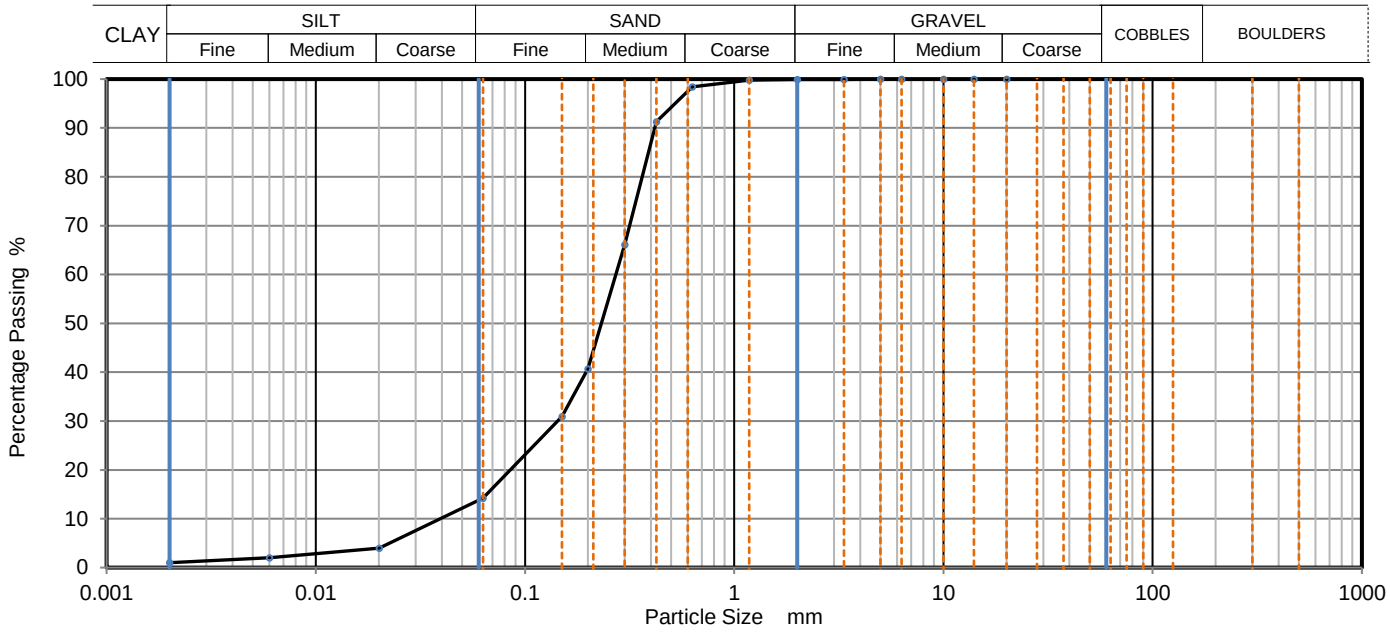
Laboratory Test Report 2230746AM / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AM

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332	1.20	D9	Wet Sieve + Pipette	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	4
		0.0060	2
		0.0020	1
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	98		
0.425	91		
0.3	66		
0.2	41		
0.15	31		
0.063	14		

Dry Mass of sample, g 593

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	86
Silt	13
Clay	2

Grading Analysis		
D100	mm	5
D60	mm	0.272
D30	mm	0.143
D10	mm	0.0393
Uniformity Coefficient		6.9
Curvature Coefficient		1.9

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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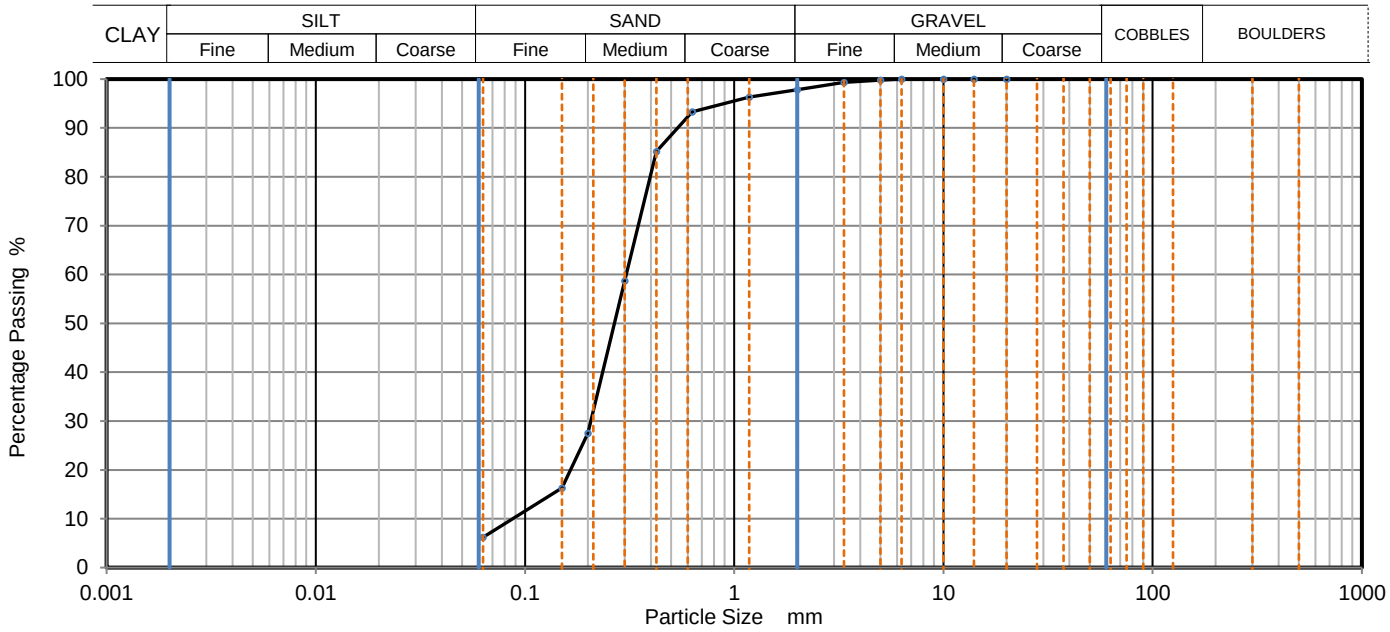
Laboratory Test Report 2230746AM / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AM

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332	2.00	B11	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	96		
0.63	93		
0.425	85		
0.3	59		
0.2	28		
0.15	16		
0.063	6		

Dry Mass of sample, g 535

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	92
Fines <0.063mm	6

Grading Analysis		
D100	mm	6.3
D60	mm	0.305
D30	mm	0.207
D10	mm	0.0873
Uniformity Coefficient		3.5
Curvature Coefficient		1.6

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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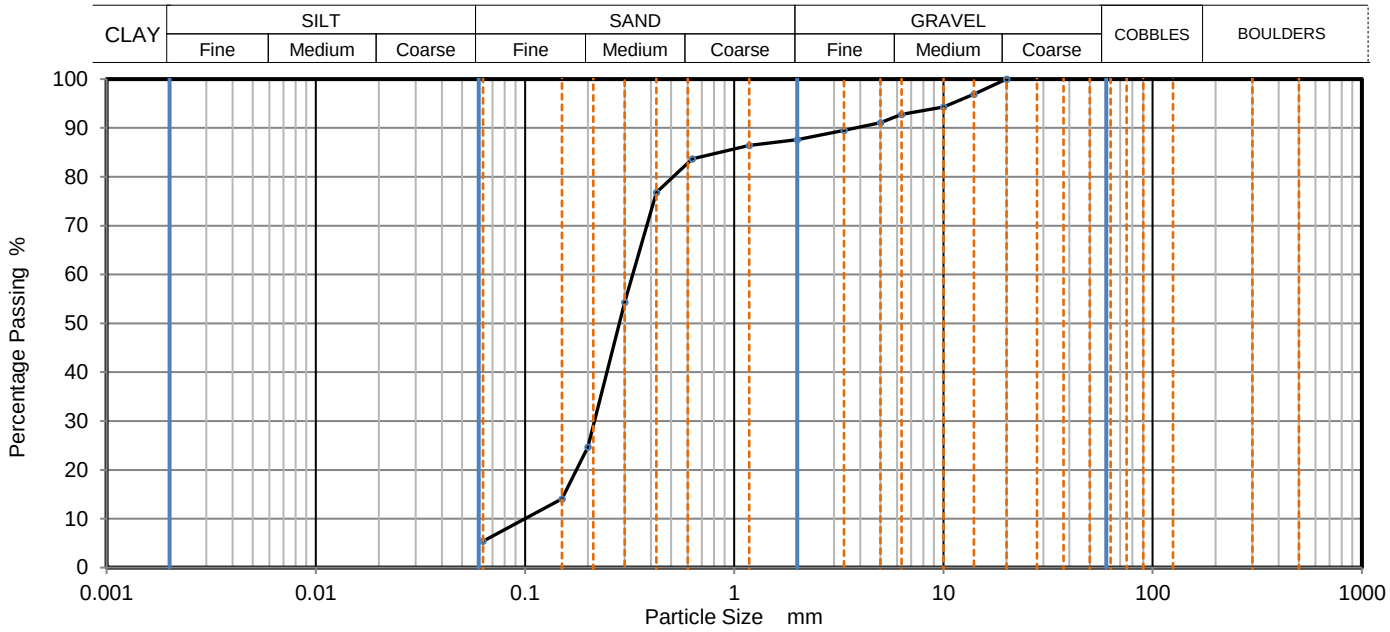
Laboratory Test Report	2230746AM / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AM

Client: Cadent **Page:** 7

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332	2.00	D12	Wet Sieve	Brown slightly silty, gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	97		
10	94		
6.3	93		
5	91		
3.35	90		
2	88		
1.18	86		
0.63	84		
0.425	77		
0.3	54		
0.2	25		
0.15	14		
0.063	5		

Dry Mass of sample, g: 548

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	82
Fines <0.063mm	5

Grading Analysis		
D100	mm	20
D60	mm	0.328
D30	mm	0.215
D10	mm	0.0995
Uniformity Coefficient		3.3
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Final Test Report - 2230746AM / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AM
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 23/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AN / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AN
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	13/12/2022
Date Testing Started:	15/12/2022
Date Testing Finished:	22/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 23/12/2022

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

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Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH318	0.40	B2	19.2	Natural	85	23	34	16	18	0.36	CL			Brown slightly gravelly, clayey, silty SAND
BH318	1.00	B5	18.1	Sieved	82	22		NP						Brown clayey, silty SAND
BH318	2.20	UT8	8.5	Natural	89	9.5	24	11	13	-0.11	CL			Brown slightly gravelly, sandy, silty CLAY
BH318	5.00	D11	13.5											Brown slightly gravelly, sandy, silty CLAY
BH318	14.00	D17	16.9											Brown gravelly, sandy, silty CLAY
BH318	21.50	D21	16.3											Brown gravelly, sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

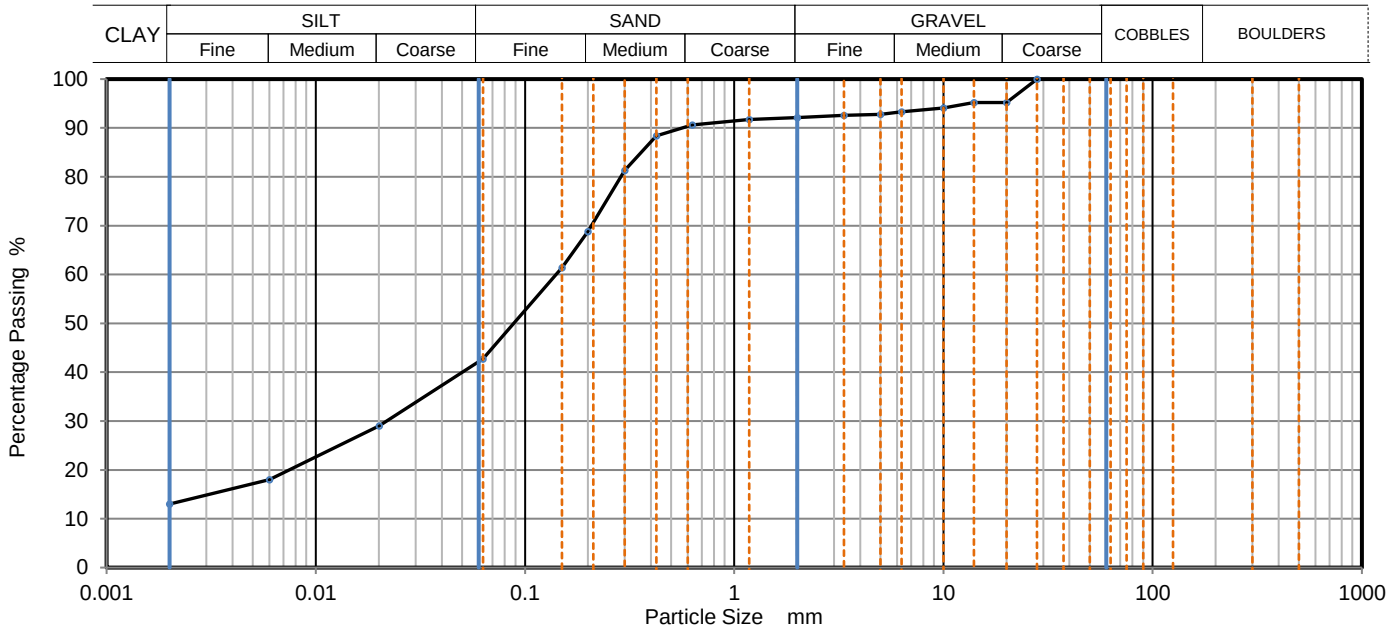
Laboratory Test Report	2230746AN / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH318	0.40	B2	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	29
		0.0060	18
		0.0020	13
28	100		
20	95		
14	95		
10	94		
6.3	93		
5	93		
3.35	93		
2	92	Particle density	(assumed)
1.18	92	2.65	Mg/m3
0.63	91		
0.425	88		
0.3	81		
0.2	69		
0.15	61		
0.063	43		

Dry Mass of sample, g: 508

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	49
Silt	29
Clay	13

Grading Analysis		
D100	mm	28
D60	mm	0.141
D30	mm	0.0223
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

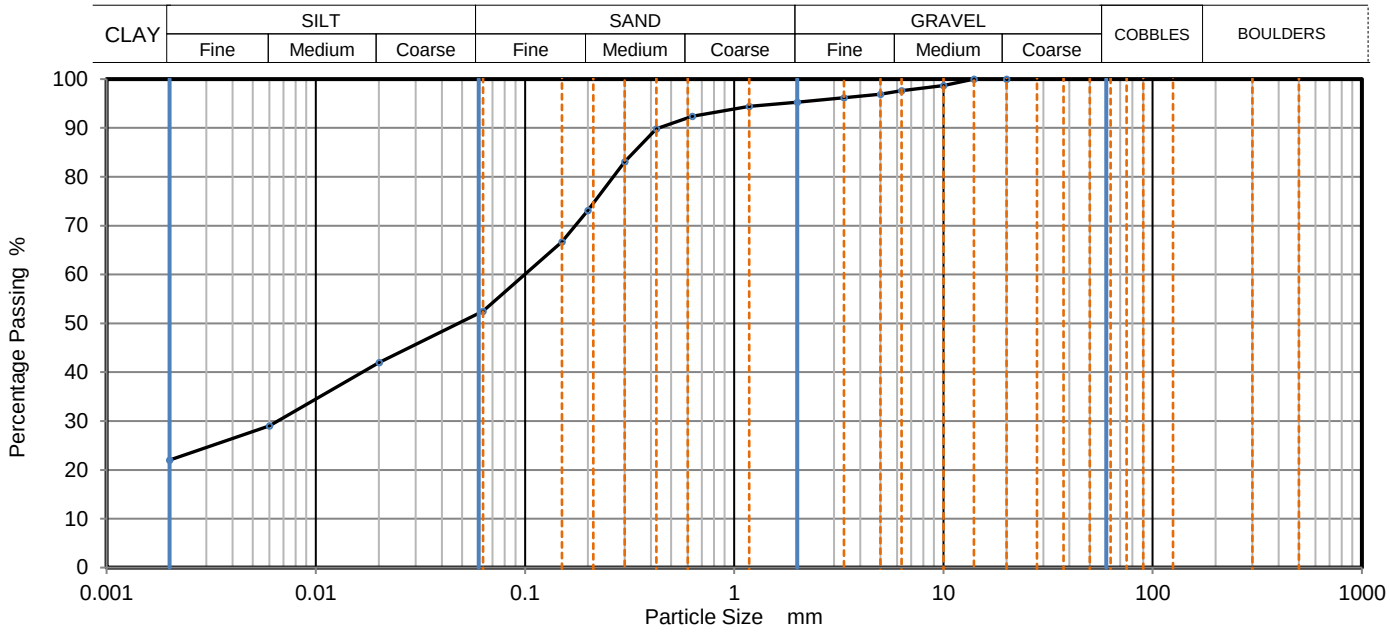
Laboratory Test Report	2230746AN / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH318	1.00	B5	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	42
		0.0060	29
		0.0020	22
20	100		
14	100		
10	99		
6.3	98		
5	97		
3.35	96		
2	95	Particle density	(assumed)
1.18	94	2.65	Mg/m3
0.63	92		
0.425	90		
0.3	83		
0.2	73		
0.15	67		
0.063	53		

Dry Mass of sample, g: 638

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	43
Silt	30
Clay	22

Grading Analysis		
D100	mm	14
D60	mm	0.0994
D30	mm	0.00637
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AN / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

Client: Cadent **Page:** 5

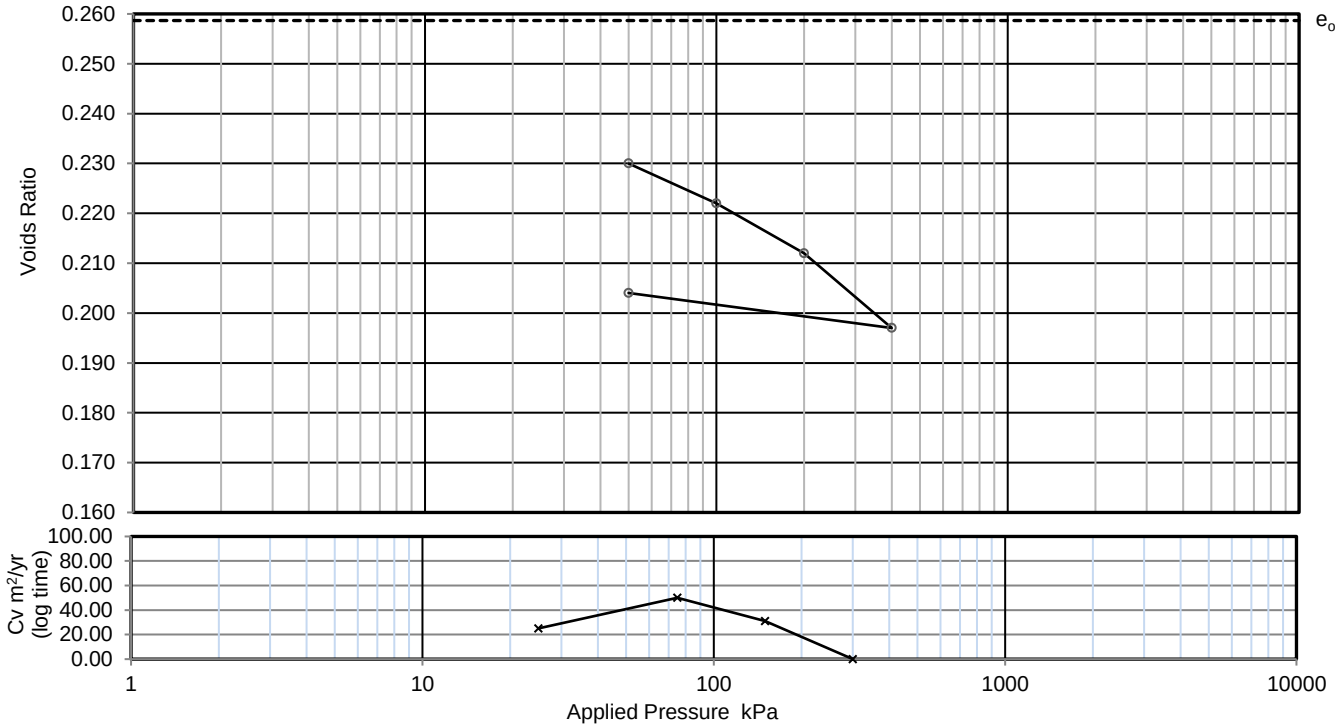
DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH318	2.20	UT8	Brown slightly gravelly, sandy, silty CLAY

Initial Specimen

Length of Sample (mm)	450.00
Depth from top of specimen (mm)	10.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.00
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.259
50	0.46	25	23	0.00048	0.230
100	0.11	50	65	0.00069	0.222
200	0.079	31	67	0.00053	0.212
400	0.059	0.058	64	0.00094	0.197
50	0.019				0.204

	Initial	Final
Height (mm)	19.00	18.18
Moisture Content (%)	11	11
Bulk density (Mg/m³)	2.34	2.44
Dry density (Mg/m³)	2.11	2.20
Voids Ratio	0.259	0.204
Degree of Saturation (%)	113	140

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AN / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

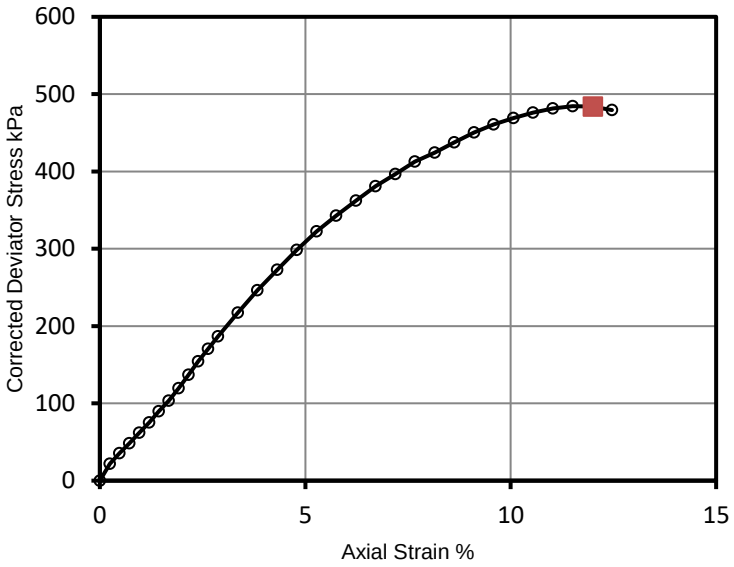
Client: Cadent **Page:** 6

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

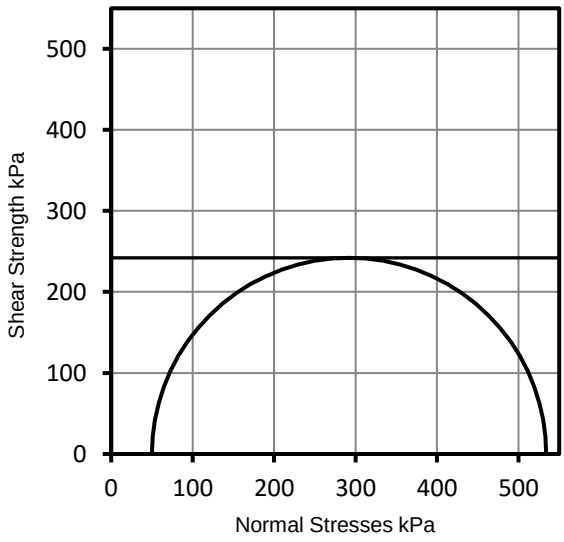
Borehole / Trial Pit	Depth (m)	Sample	Description
BH318	2.20	UT8	**Brown slightly gravelly, sandy, silty CLAY**

Initial Sample	Test Number	1
	Original Length (mm)	450.00
	Depth from Top (mm)	50.00
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		208.61
Diameter (mm)		102.70
Moisture Content (%)		8.5
Bulk Density (Mg/m3)		2.36
Dry Density (Mg/m3)		2.17
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	50
	Axial Strain (%)	12
	Membrane Corr. (kPa)	0.84
	Deviator Stress, (σ1 - σ3)f (kPa)	484
	Undrained Shear Strength, cu = ½(σ1 - σ3)f (kPa)	242
	Mode of Failure	Compound

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.

UKAS TESTING
1464

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH318	9.60	C14	Red/Grey SILTSTONE	18.5						
BH318	12.40	C16	Grey SANDSTONE	17.0						
BH318	22.40	C22	Brown SAND/MUDSTONE	15.4						
BH318	24.05	C23	Red/Grey SILTSTONE	16.6						
BH318	24.75	C24	Brown SAND/MUDSTONE	14.9						
BH318	26.90	C26	Red/Grey SILTSTONE	15.4						
BH318	33.50	C30	Brown/Grey MUD/SANDSTONE	12.1						
BH318	34.70	C31	Brown/Grey MUD/SANDSTONE	9.8						
BH318	36.50	C32	Brown/Grey MUD/SANDSTONE	17.7						
BH318	36.68	C34	Brown/Grey MUD/SANDSTONE	13.2						
BH318	37.88	C33	Brown/Grey MUD/SANDSTONE	14.1						
BH318	39.50	C35	Brown/Grey MUD/SANDSTONE	13.2						

Notes 1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory

2. ISRM p87 test 2, Porosity/density determination using saturation and caliper

3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy

2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH318	12.40	C16	Grey SANDSTONE	86.1	109.0	*1.3	2.23	17.0	as received	0.4983	AC	1.1	
BH318	22.40	C22	Brown SAND/MUDSTONE	85.9	198.0	*2.3	2.28	15.4	as received	0.5001	AC	8.0	
BH318	24.75	C24	Brown SAND/MUDSTONE	86.4	204.2	*2.4	2.25	14.9	as received	0.4941	AC	0.7	
BH318	36.50	C32	Grey SAND/MUDSTONE	86.2	175.1	*2	2.29	17.7	as received	0.4972	AC	4.5	
BH318	37.88	C33	Grey SAND/MUDSTONE	85.8	96.3	*1.1	2.26	14.1	as received	0.5022	AC	3.9	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746AN / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AN

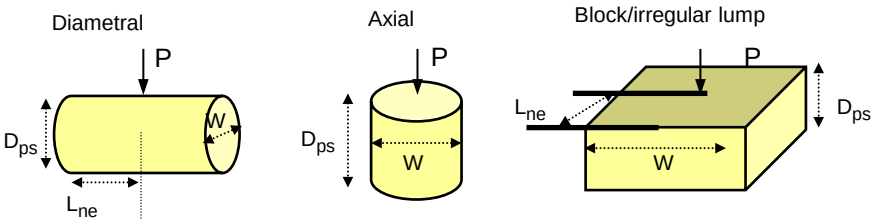
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH318	9.60	C14	Red/Grey SILTSTONE As received	D	PL	YES	60.6	86.2	86.2	76.2	2.7	86.2	0.37	0.47	
BH318	9.60	C14	Red/Grey SILTSTONE As received	A	PD	YES		87.3	41.9	34.9	2.1	68.2	0.45	0.51	
BH318	24.05	C23	Red/Grey SILTSTONE As received	D	PL	NO	18.2	86.1	86.1	84.1	0.3	86.1	0.04	0.05	
BH318	24.05	C23	Red/Grey SILTSTONE As received	A	PD	YES		86.0	44.8	42.8	0.4	70.0	0.09	0.10	
BH318	26.90	C26	Red/Grey SILTSTONE As received	D	PL	YES	36.2	85.4	85.4	79.4	0.1	85.4	0.02	0.02	
BH318	26.90	C26	Red/Grey SILTSTONE As received	A	PD	YES		85.0	37.6	27.6	0.7	63.8	0.18	0.20	
BH318	33.50	C30	Brown MUD/SANDSTONE (Gypsum)	D	U	YES	37.4	83.4	83.4	81.4	0.5	83.4	0.07	0.09	
BH318	33.50	C30	Brown MUD/SANDSTONE (Gypsum)	A	U	YES		84.4	38.6	33.7	1.1	64.4	0.28	0.31	
BH318	34.70	C31	Red/Grey SILTSTONE As received	D	PL	YES	48.3	85.5	85.5	84.5	0.2	85.5	0.02	0.03	
BH318	34.70	C31	Red/Grey SILTSTONE As received	A	PD	YES		85.7	41.7	39.7	0.1	67.5	0.02	0.02	
BH318	36.68	C34	Red/Grey SILTSTONE As received	D	PL	YES	55.5	85.2	85.2	84.2	0.6	85.2	0.08	0.10	
BH318	36.68	C34	Red/Grey SILTSTONE As received	A	PD	YES		85.2	61.5	49.5	0.8	81.7	0.13	0.16	
BH318	39.50	C35	Red/Grey SILTSTONE As received	D	PL	YES	46.9	86.2	86.2	84.2	0.4	86.2	0.05	0.07	
BH318	39.50	C35	Red/Grey SILTSTONE As received	A	PD	YES		86.1	59.9	47.9	0.7	81.1	0.11	0.13	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AN / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AN
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 23/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230746AO / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AO
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	13/12/2022
Date Testing Started:	15/12/2022
Date Testing Finished:	22/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 23/12/2022

Constructionline Part of Capita plc

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH302	0.50	B3	13.1											Brown slightly clayey, silty, gravelly SAND
BH302	1.00	B5	18.5	Sieved	52	36		NP						Brown slightly silty, slightly gravelly SAND
BH302	1.20	D7	22.3	Natural	100	22	35	15	20	0.37	CL/CI			Brown sandy CLAY
BH302	3.20	UT9	16.3	Sieved	83	20	26	14	12	0.48	CL			Brown slightly gravelly, sandy CLAY
BH302	4.50	D23	9.2											Brown slightly sandy, slightly silty CLAY
BH302	5.20	D11	17.8											Brown slightly silty CLAY
BH302	6.20	D25	19.5											Brown slightly silty CLAY
BH302	7.50	D26	19.5											Brown silty CLAY
BH302	9.30	D27	18.8											Brown/Grey silty CLAY
BH302	11.50	D15	19.8											Brown sandy, silty CLAY
BH302	12.50	D16	22.4											Brown slightly sandy, silty CLAY
BH302	14.20	D30	21.6											Brown/Grey slightly sandy, slightly silty CLAY
BH302	14.90	D31	16											Brwon sandy silty CLAY
BH302	18.20	D32	23											Brown slightly sandy, silty CLAY
BH302	18.70	D33	26.9											Brown/Grey very gravelly, sandy, silty CLAY
BH302	20.10	D34	19.2											Brown/Grey slightly gravelly, sandy, silty CLAY
BH302	22.95	D36	17.6											Brown slightly gravelly, sandy, silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

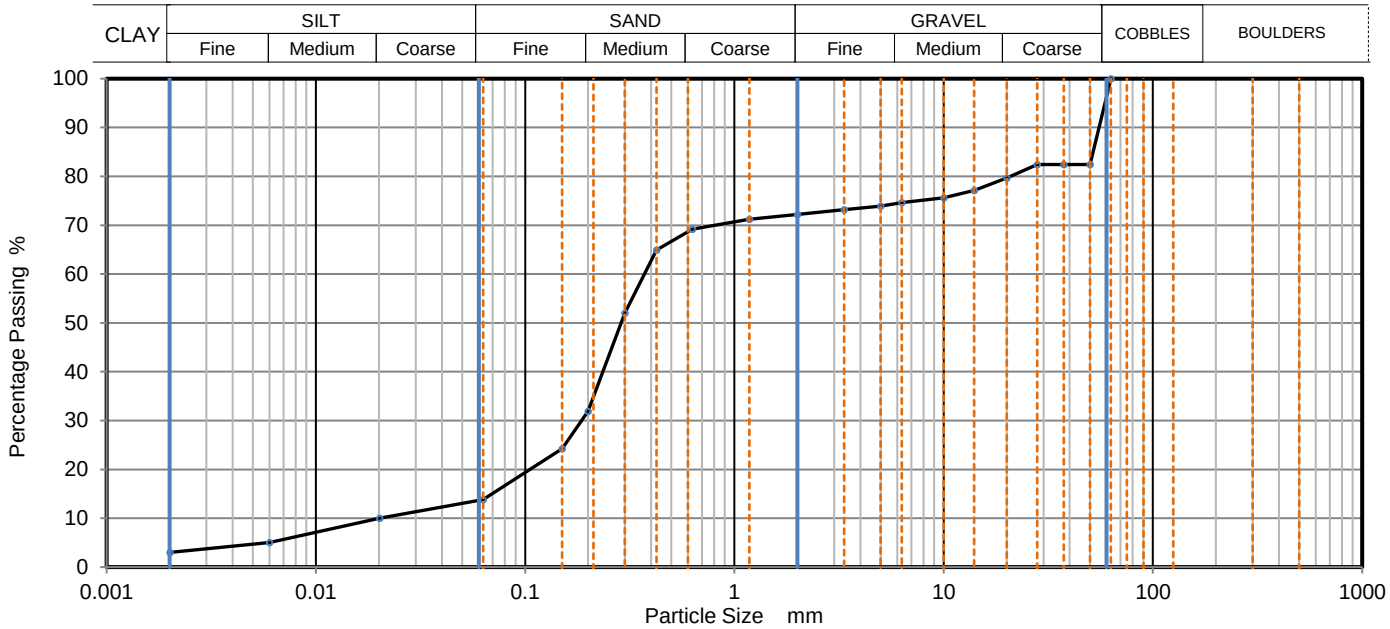
Laboratory Test Report 2230746AO / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH302	0.50	B3	Wet Sieve + Pipette	Brown slightly clayey, silty, gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0202	10
		0.0060	5
		0.0020	3
63	100		
50	82		
37.5	82		
28	82		
20	80		
14	77		
10	76		
6.3	75		
5	74		
3.35	73		
2	72	Particle density	(assumed)
1.18	71	2.65	Mg/m3
0.63	69		
0.425	65		
0.3	52		
0.2	32		
0.15	24		
0.063	14		

Dry Mass of sample, g 1443

Sample Proportions	% dry mass
Very coarse	0
Gravel	28
Sand	58
Fines <0.063mm	14

Grading Analysis		
D100	mm	63
D60	mm	0.372
D30	mm	0.186
D10	mm	0.0229
Uniformity Coefficient		16
Curvature Coefficient		4.1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

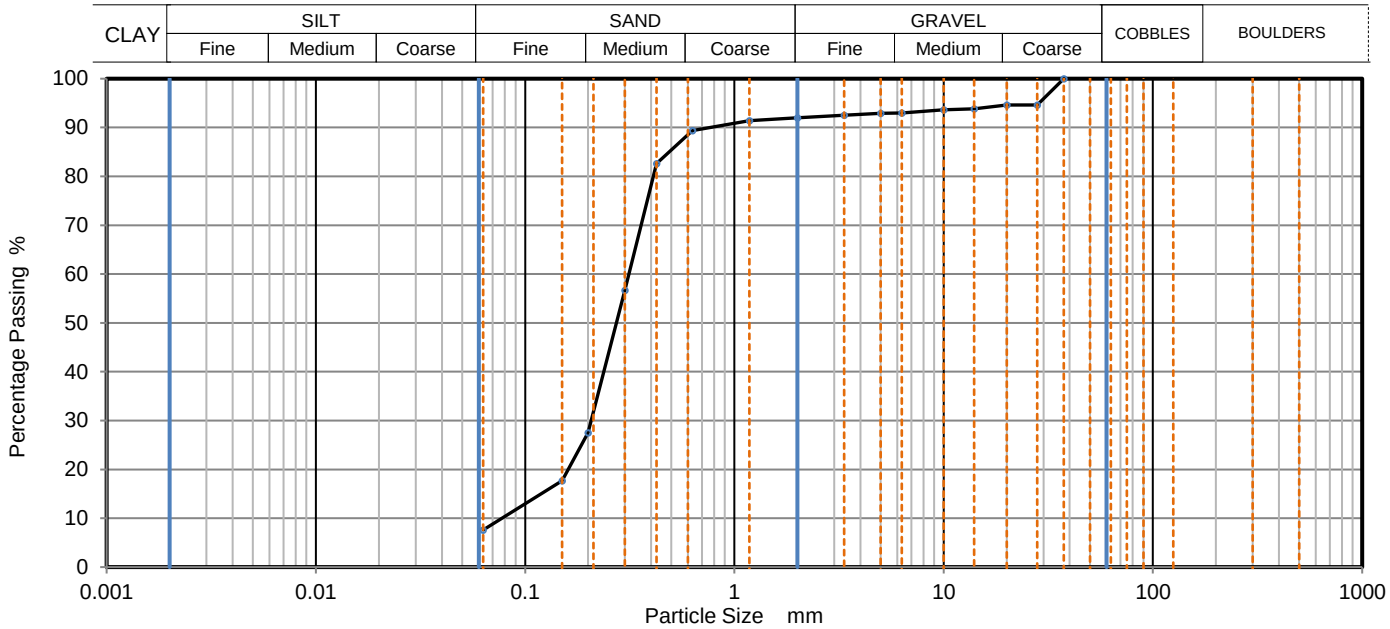
Laboratory Test Report	2230746AO / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH302	1.00	B5	Wet Sieve	Brown slightly silty, slightly gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
37.5	100		
28	95		
20	95		
14	94		
10	94		
6.3	93		
5	93		
3.35	93		
2	92		
1.18	91		
0.63	89		
0.425	83		
0.3	57		
0.2	28		
0.15	18		
0.063	8		

Dry Mass of sample, g	906

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	84
Fines <0.063mm	8

Grading Analysis		
D100	mm	37.5
D60	mm	0.313
D30	mm	0.207
D10	mm	0.0774
Uniformity Coefficient		4
Curvature Coefficient		1.8

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AO / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

Client: Cadent **Page:** 5

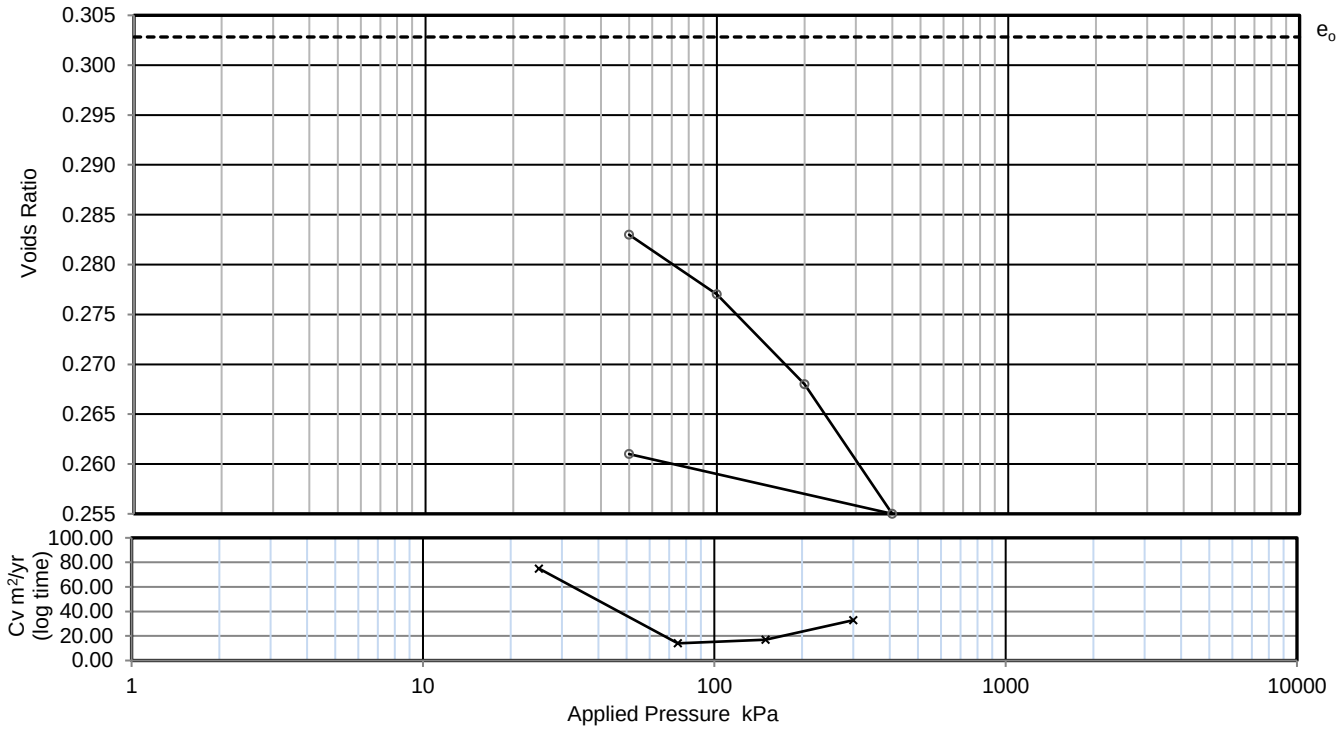
DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Borehole / Trial Pit	Depth (m)	Sample	Description
BH302	3.20	UT9	Brown slightly gravelly, sandy CLAY

Initial Specimen

Length of Sample (mm)	450.00
Depth from top of specimen (mm)	20.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.95
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.303
50	0.30	75	74	0.00066	0.283
100	0.098	14	64	0.00053	0.277
200	0.060	17	93	0.00051	0.268
400	0.049	33	92	0.001	0.255
50	0.013				0.261

	Initial	Final
Height (mm)	19.03	18.42
Moisture Content (%)	13	13
Bulk density (Mg/m³)	2.29	2.37
Dry density (Mg/m³)	2.03	2.10
Voids Ratio	0.303	0.261
Degree of Saturation (%)	111	128

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

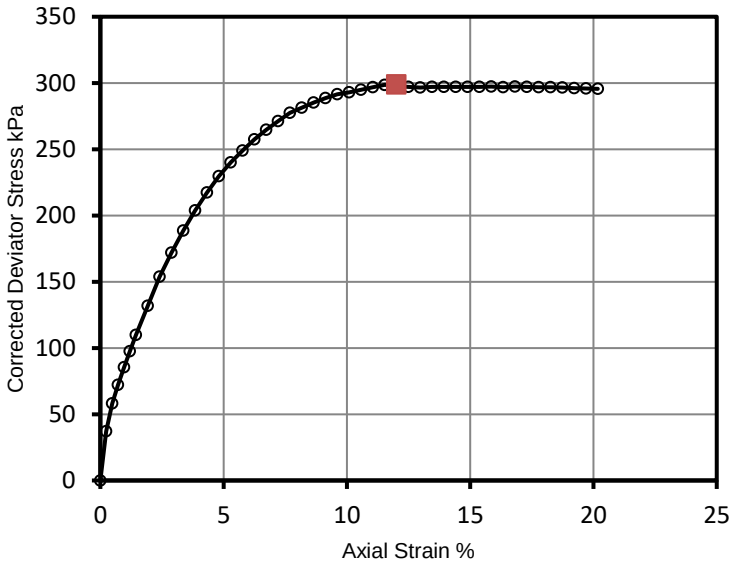
Client: Cadent **Page:** 6

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

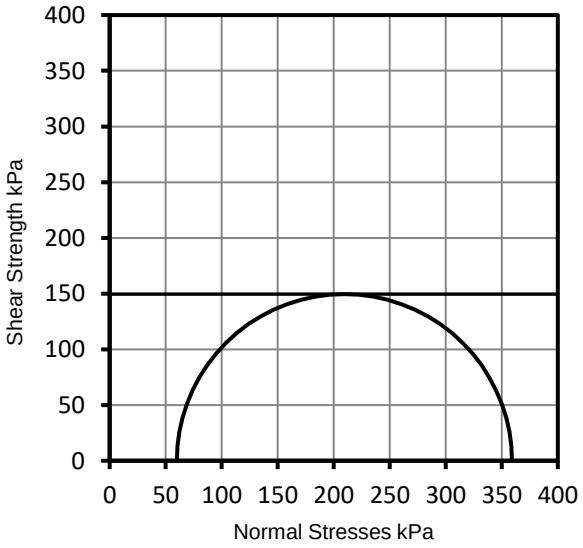
Borehole / Trial Pit	Depth (m)	Sample	Description
BH302	3.20	UT9	**Brown slightly gravelly, sandy CLAY**

Initial Sample	Test Number	1
	Original Length (mm)	450.00
	Depth from Top (mm)	100.00
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		208.17
Diameter (mm)		102.39
Moisture Content (%)		16
Bulk Density (Mg/m3)		2.29
Dry Density (Mg/m3)		1.98
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	60
	Axial Strain (%)	12
	Membrane Corr. (kPa)	0.85
	Deviator Stress, (σ1 - σ3)f (kPa)	299
	Undrained Shear Strength, cu = ½(σ1 - σ3)f (kPa)	149
	Mode of Failure	Compound

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.

UKAS TESTING 1464

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

Client: Cadent **Page:** 7

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH302	25.20	C45	Brown MUD/SANDSTONE (Gypsum)	11.1						
BH302	31.48	C46	Brown MUD/SANDSTONE (Gypsum)	14.0						
BH302	35.70	C47	Brown MUD/SANDSTONE (Gypsum)	14.9						
BH302	39.40	C48	Red MUDSTONE	14.5						
BH302	42.00	C49	Brown MUDSTONE	15.4						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH302	42.00	C49	Brown MUDSTONE	84.7	103.5	*1.2	2.24	15.4	as received	0.4919	AC	3.5	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

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Laboratory Test Report 2230746AO / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AO

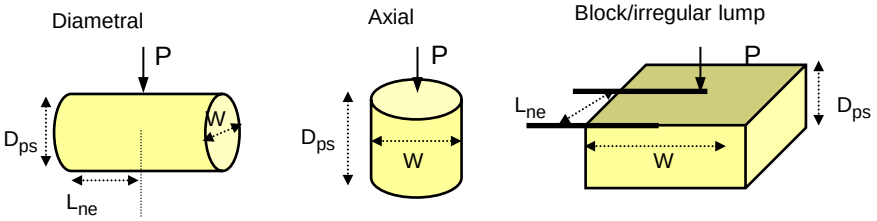
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH302	25.20	C45	Brown MUD/SANDSTONE (Gypsum)	D	U	NO	27.2	84.5	84.5	77.5	0.8	84.5	0.11	0.14	
BH302	25.20	C45	Brown MUD/SANDSTONE (Gypsum)	A	U	NO		85.2	65.9	57.9	0.5	84.5	0.07	0.09	
BH302	31.48	C46	Brown MUD/SANDSTONE (Gypsum)	D	U	YES	30.3	85.8	85.8	80.8	0.6	85.8	0.08	0.10	
BH302	31.48	C46	Brown MUD/SANDSTONE (Gypsum)	A	U	YES		85.9	53.6	45.6	1.0	76.6	0.16	0.20	
BH302	35.70	C47	Brown MUD/SANDSTONE (Gypsum)	D	U	YES	23.4	84.6	84.6	80.6	0.3	84.6	0.03	0.04	
BH302	35.70	C47	Brown MUD/SANDSTONE (Gypsum)	I	U	YES	26.6	53.25 71.72	34.0	19.0	1.2	52.0	0.45	0.46	
BH302	39.40	C48	Red MUDSTONE As received	D	PL	YES	42.5	83.5	83.5	78.5	1.2	83.5	0.18	0.22	
BH302	39.40	C48	Red MUDSTONE As received	A	PD	YES		83.2	43.9	27.9	0.6	68.2	0.13	0.15	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AO / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AO
Originating Client:	Cadent

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 23/12/2022

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AP / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AP
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	13/12/2022
Date Testing Started:	14/12/2022
Date Testing Finished:	22/12/2022

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 23/12/2022

Constructionline
Part of Capita plc

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AP

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH069	4.00	D10	26.2											Grey slightly gravelly, sandy CLAY/SILT
BH069	8.00	D14	23.9											Grey slightly gravelly, sandy CLAY/SILT
BH069	12.50	D17	32.7											Grey slightly gravelly, sandy CLAY/SILT
BH069	17.00	B21	28.7	Natural	100	29	44	36	8	-0.91	MI			Grey/Brown slightly sandy, soft clayey SILT
BH069	18.50	B23	28.7											Brown wet, silty, clayey SAND
BH069	20.00	B25	28.4	Sieved	92	31		NP						Brown wet, silty, clayey SAND
BH069	23.00	B27	22.1											Brown wet, silty, gravelly SAND
BH069	24.30	B29	8.7	Sieved	11	81		NP						Brown sandy GRAVEL
BH069	25.60	D31	9.5											Brown slightly gravelly, silty, sandy clay

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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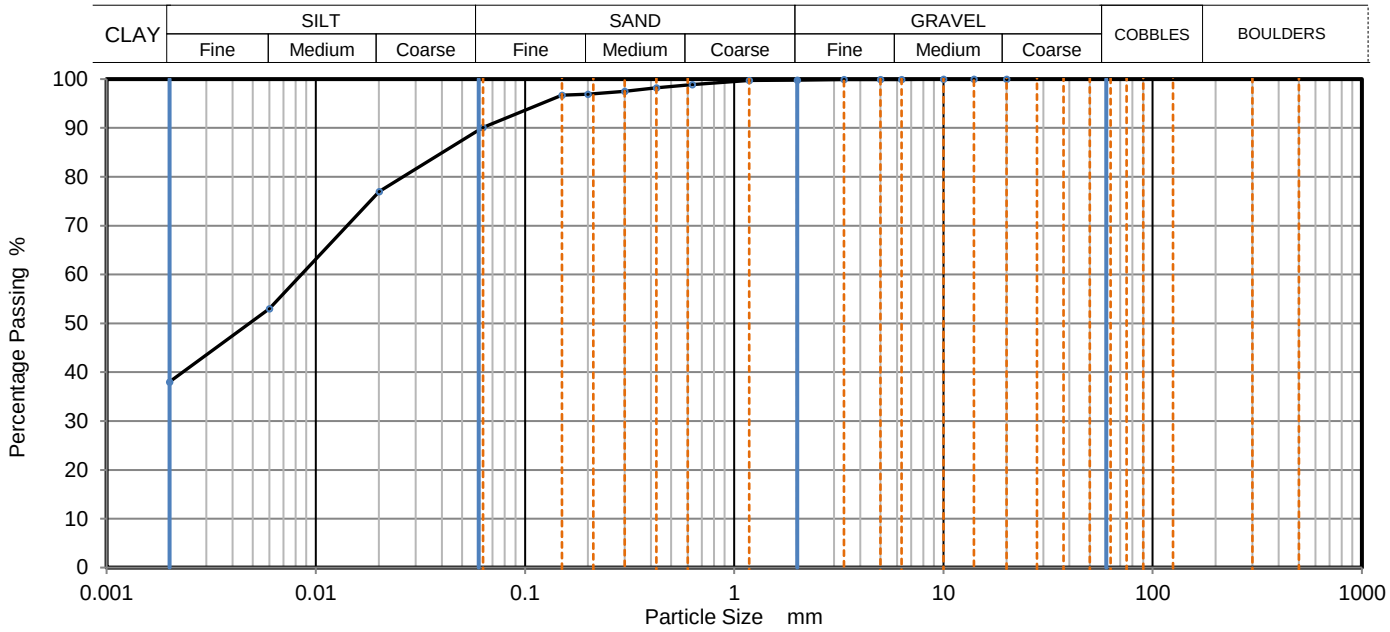
Laboratory Test Report	2230746AP / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AP

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH069	17.00	B21	Wet Sieve + Pipette	Grey/Brown slightly sandy, soft clayey SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	77
		0.0060	53
		0.0020	38
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	98		
0.2	97		
0.15	97		
0.063	90		

Dry Mass of sample, g: 699

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	10
Silt	52
Clay	38

Grading Analysis		
D100	mm	10
D60	mm	0.00835
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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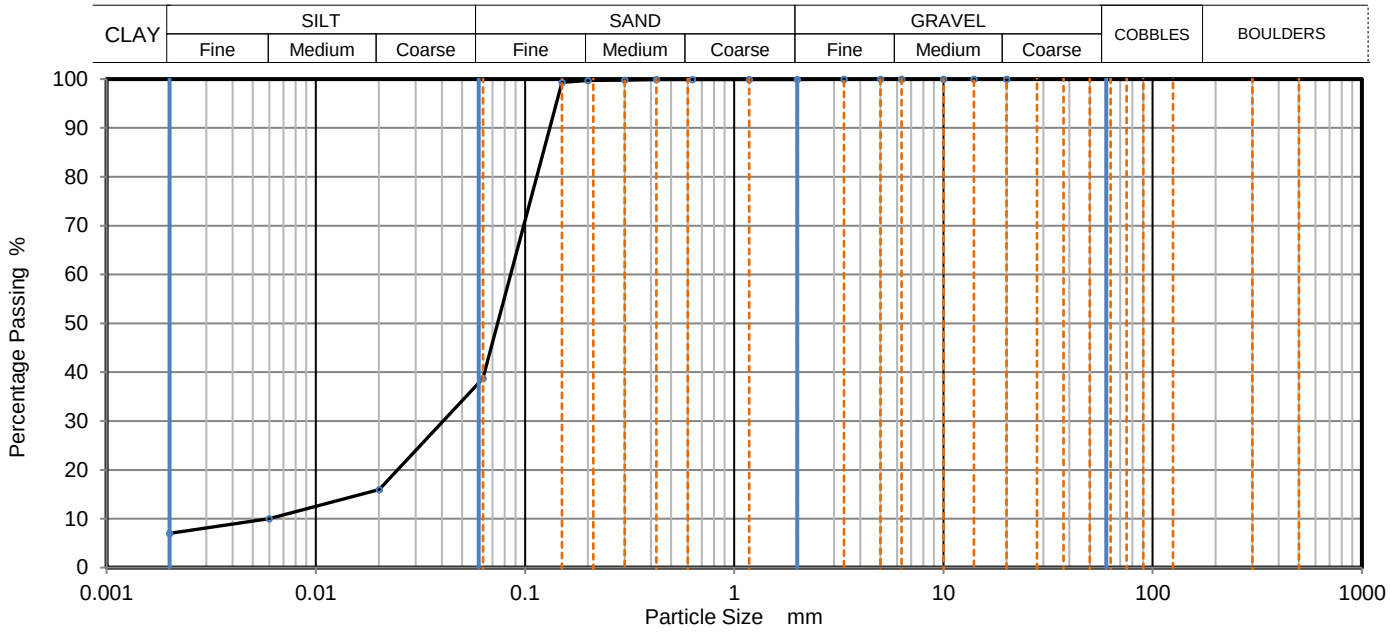
Laboratory Test Report 2230746AP / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AP

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH069	18.50	B23	Wet Sieve + Pipette	Brown wet, silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	16
		0.0060	10
		0.0020	7
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	100		
0.425	100		
0.3	100		
0.2	100		
0.15	99		
0.063	39		

Dry Mass of sample, g 654

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	61
Silt	32
Clay	7

Grading Analysis		
D100	mm	3.35
D60	mm	0.0854
D30	mm	0.0404
D10	mm	0.00565
Uniformity Coefficient		15
Curvature Coefficient		3.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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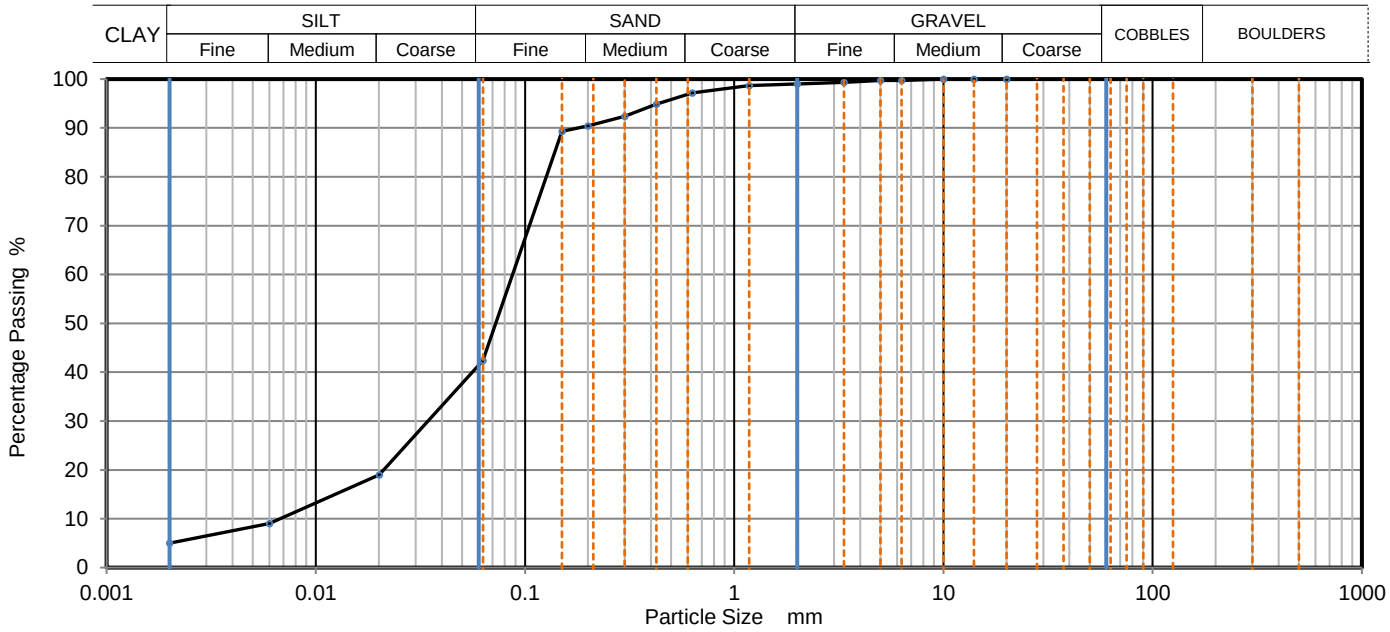
Laboratory Test Report	2230746AP / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AP

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH069	20.00	B25	Wet Sieve + Pipette	Brown wet, silty, clayey SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	19
		0.0060	9
		0.0020	5
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	97		
0.425	95		
0.3	92		
0.2	90		
0.15	89		
0.063	42		

Dry Mass of sample, g: 843

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	57
Silt	38
Clay	5

Grading Analysis		
D100	mm	10
D60	mm	0.0872
D30	mm	0.0345
D10	mm	0.00681
Uniformity Coefficient		13
Curvature Coefficient		2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

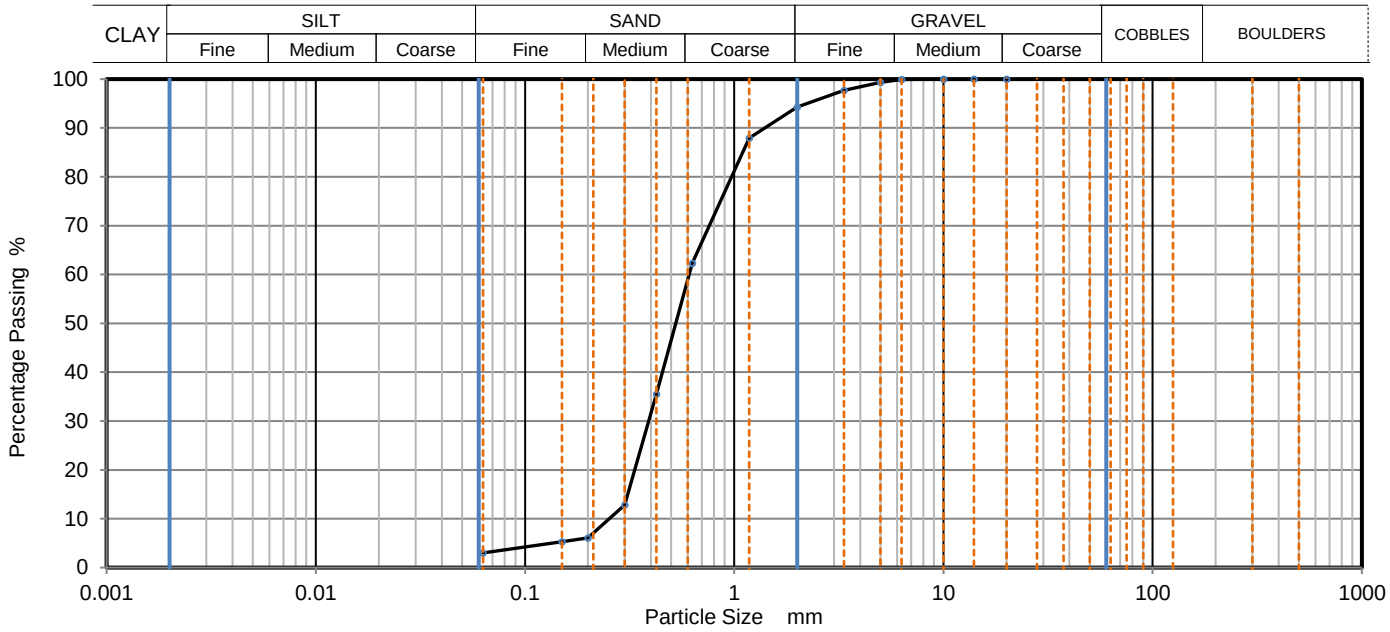
Laboratory Test Report 2230746AP / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AP

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH069	23.00	B27	Wet Sieve	Brown wet, silty, gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	94		
1.18	88		
0.63	62		
0.425	36		
0.3	13		
0.2	6		
0.15	5		
0.063	3		

Dry Mass of sample, g: 936

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	91
Fines <0.063mm	3

Grading Analysis		
D100	mm	10
D60	mm	0.609
D30	mm	0.391
D10	mm	0.253
Uniformity Coefficient		2.4
Curvature Coefficient		0.99

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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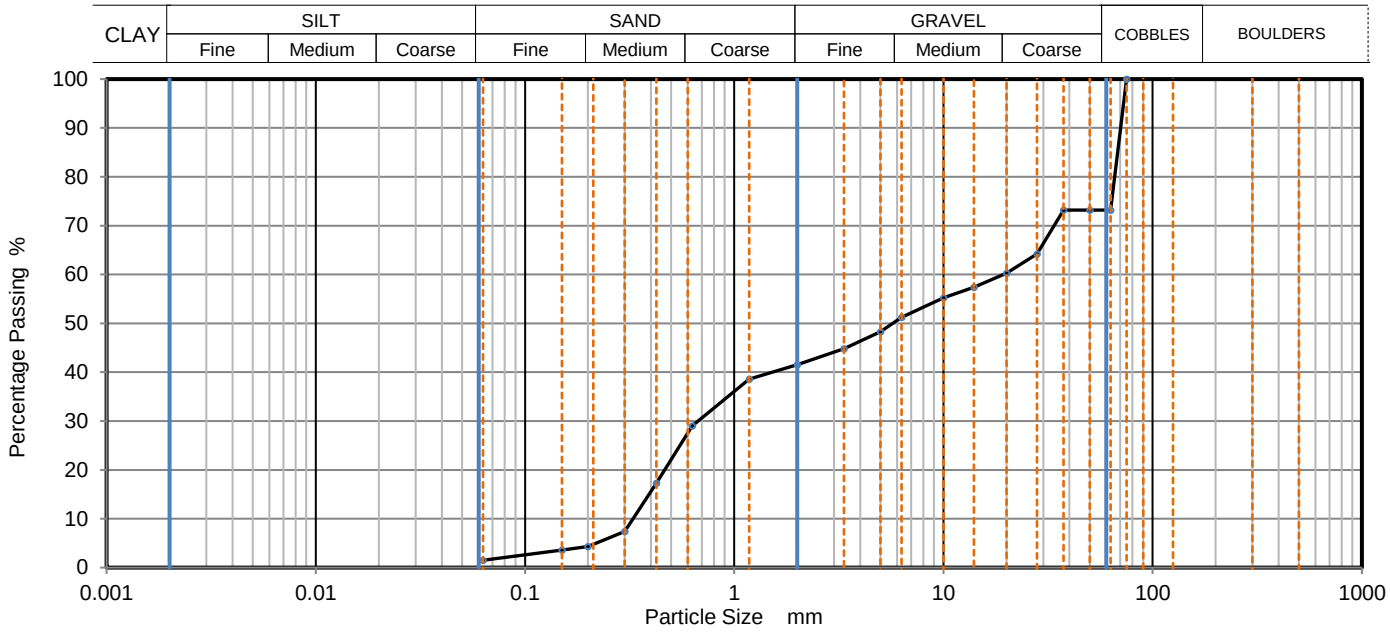
Laboratory Test Report	2230746AP / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AP

Client: Cadent **Page:** 7

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH069	24.30	B29	Wet Sieve	Brown sandy GRAVEL



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	73		
50	73		
37.5	73		
28	64		
20	60		
14	57		
10	55		
6.3	51		
5	48		
3.35	45		
2	42		
1.18	39		
0.63	29		
0.425	17		
0.3	7		
0.2	4		
0.15	4		
0.063	2		

Dry Mass of sample, g	1690

Sample Proportions	% dry mass
Very coarse	27
Gravel	32
Sand	40
Fines <0.063mm	1

Grading Analysis		
D100	mm	75
D60	mm	19.3
D30	mm	0.672
D10	mm	0.329
Uniformity Coefficient		59
Curvature Coefficient		0.071

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746AP / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AP
Originating Client:	Cadent

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Report Issue Date: 23/12/2022

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Supplemental Test Report - 2230746AQ / 2

Site: HyNet North West - Hydrogen Pipeline

Job Number: 2230746AQ

Originating Client: Cadent

Originating Reference: 2230746

Date Sampled: Not Given

Date Scheduled: 13/12/2022

Date Testing Started: 19/12/2022

Date Testing Finished: 06/01/2023

Previous Reports		Amendments	Date Issued
1	Final		05/01/2023

Amendments: 2x Point Load test results added

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 06/01/2023

Constructionline Part of Capita plc

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH040A	1.20	D6	19.5											Brown slightly silty CLAY
BH040A	2.20	B7	17.4	Sieved	80	22	31	15	16	0.42	CL			Brown slightly gravelly, clayey, silty SAND
BH040A	4.00	B11	16	Natural	93	17	25	12	13	0.40	CL			Brown gravelly, clayey, silty SAND
BH040A	5.30	D13	15											Brown slightly sandy CLAY
BH040A	6.50	D16	16.2											Grey sandy, very silty CLAY
BH040A	8.20	D18	15.9											Grey/Brown sandy, very silty CLAY
BH040A	9.50	D20	20.5											Grey sandy, silty CLAY
BH040A	11.20	D22	20.6											Grey sandy, silty CLAY
BH040A	12.20	B23	26.4	Sieved	82	32	31	16	15	1.09	CL			Grey gravelly, clayey, sandy SILT
BH040A	15.00	UT26	28.3	Natural	100	28	31	18	13	0.79	CL			Brown silty CLAY
BH040A	16.00	D28	17	Natural	100	17	31	20	11	-0.27	CL			Brown silty CLAY
BH040A	16.90	D31	19.1	Natural	97	20	35	22	13	-0.18	CL/CI			Brown silty CLAY
BH040A	22.35	D36	13.3											Mottled Brown/Grey slightly sandy, gravelly, silty CLAY
BH040A	26.25	D38	16.5	Natural	100	17	31	20	11	-0.32	CL			Brown sandy, silty CLAY
BH040A	29.45	D41	19.8											Grey gravelly, sandy, silty CLAY
BH040A	35.50	D44	21.7	Sieved	56	39	30	18	12	1.74	CL			Grey gravelly, sandy, silty CLAY
BH040A	45.30	D50	14.7	Sieved	18	83		17*						Brown sandy, silty GRAVEL *Insufficient sample. PL test only.

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

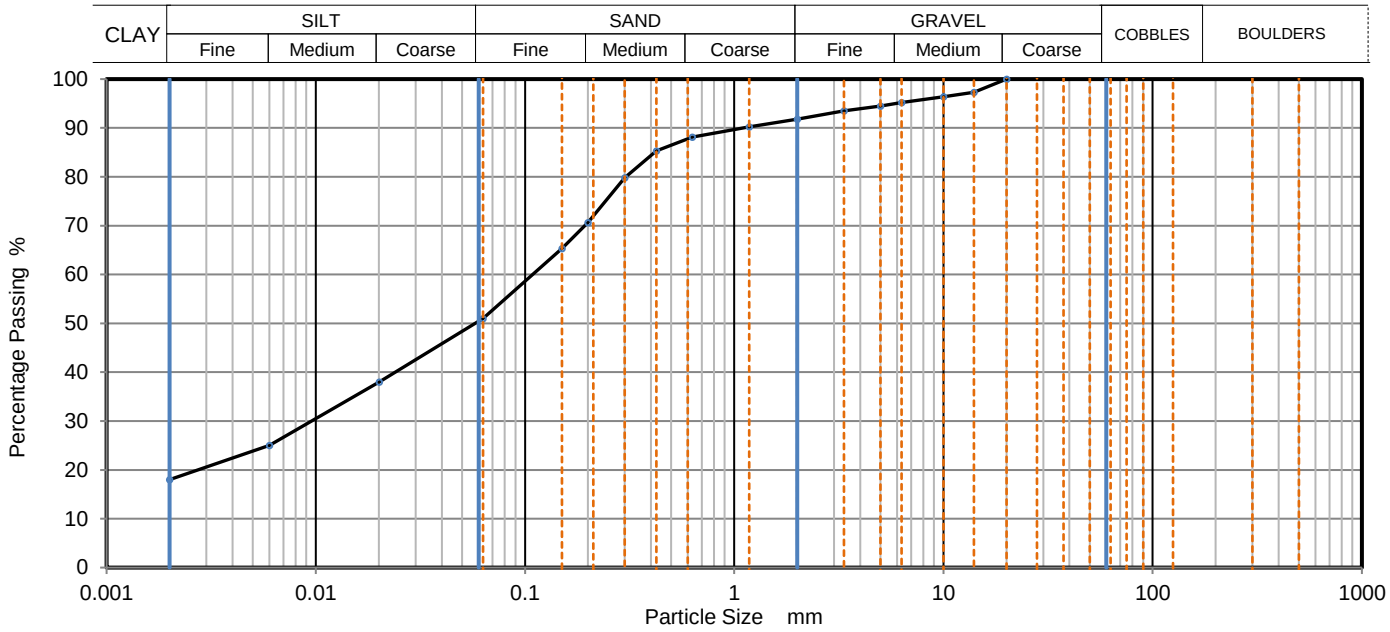
Laboratory Test Report	2230746AQ / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH040A	2.20	B7	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	38
		0.0060	25
		0.0020	18
20	100		
14	97		
10	96		
6.3	95		
5	95		
3.35	94		
2	92	Particle density	(assumed)
1.18	90	2.65	Mg/m3
0.63	88		
0.425	85		
0.3	80		
0.2	71		
0.15	65		
0.063	51		

Dry Mass of sample, g: 582

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	41
Silt	33
Clay	18

Grading Analysis		
D100	mm	20
D60	mm	0.109
D30	mm	0.00954
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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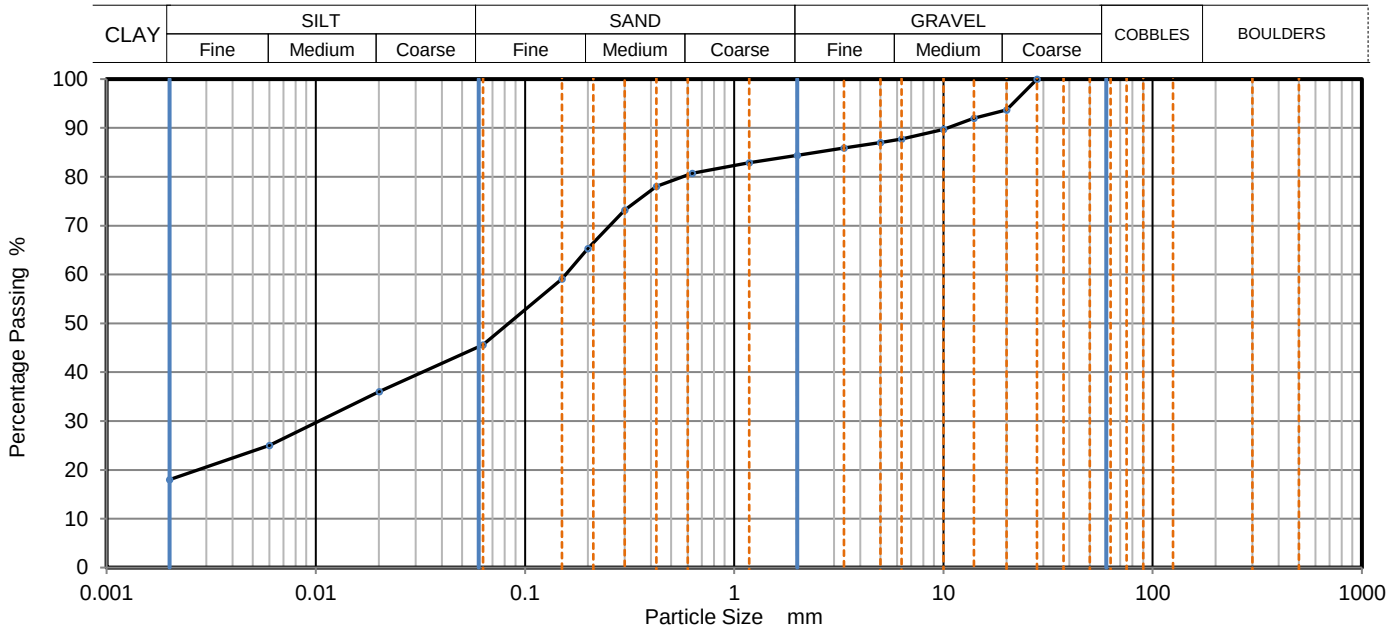
Laboratory Test Report 2230746AQ / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH040A	4.00	B11	Wet Sieve + Pipette	Brown gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	36
		0.0060	25
		0.0020	18
28	100		
20	94		
14	92		
10	90		
6.3	88		
5	87		
3.35	86		
2	84	Particle density	(assumed)
1.18	83	2.65	Mg/m3
0.63	81		
0.425	78		
0.3	73		
0.2	65		
0.15	59		
0.063	46		

Dry Mass of sample, g 523

Sample Proportions	% dry mass
Very coarse	0
Gravel	16
Sand	39
Silt	28
Clay	18

Grading Analysis		
D100	mm	28
D60	mm	0.156
D30	mm	0.0105
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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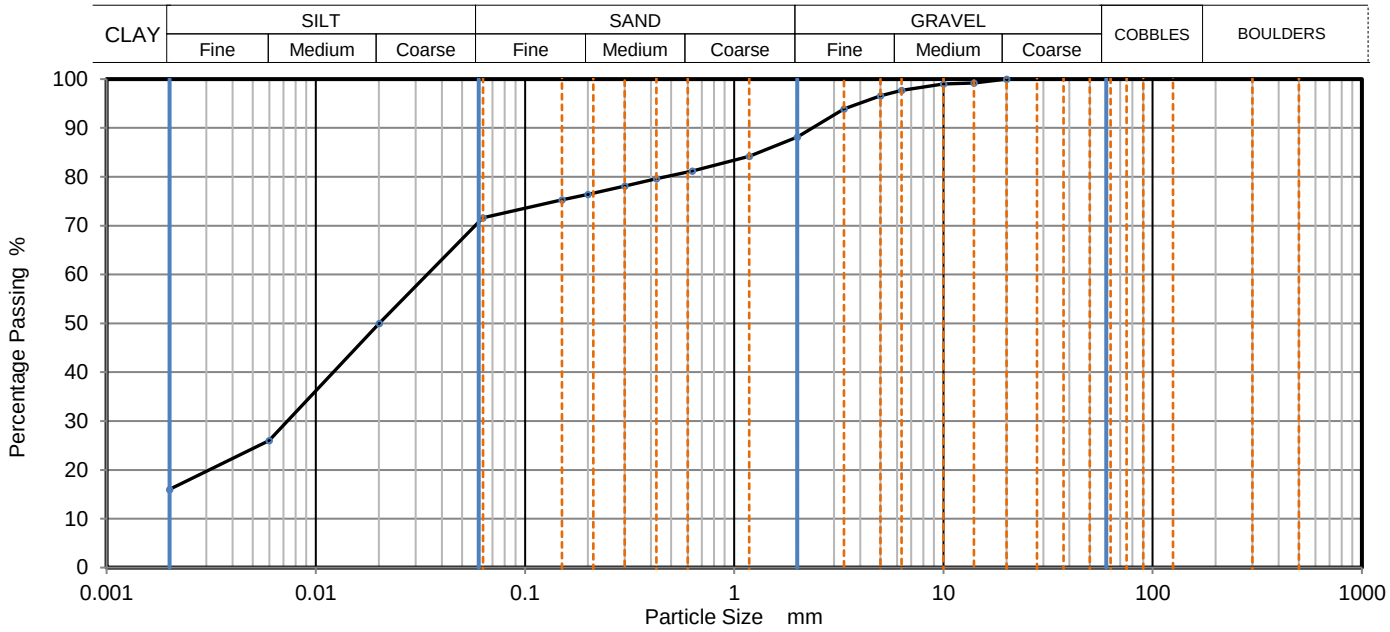
Laboratory Test Report	2230746AQ / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH040A	12.20	B23	Wet Sieve + Pipette	Grey gravelly, clayey, sandy SILT



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	50
		0.0060	26
		0.0020	16
20	100		
14	99		
10	99		
6.3	98		
5	97		
3.35	94		
2	88	Particle density	(assumed)
1.18	84	2.65	Mg/m3
0.63	81		
0.425	80		
0.3	78		
0.2	76		
0.15	75		
0.063	72		

Dry Mass of sample, g: 519

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	17
Silt	55
Clay	16

Grading Analysis		
D100	mm	20
D60	mm	0.0338
D30	mm	0.00725
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AQ / 2

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 6

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

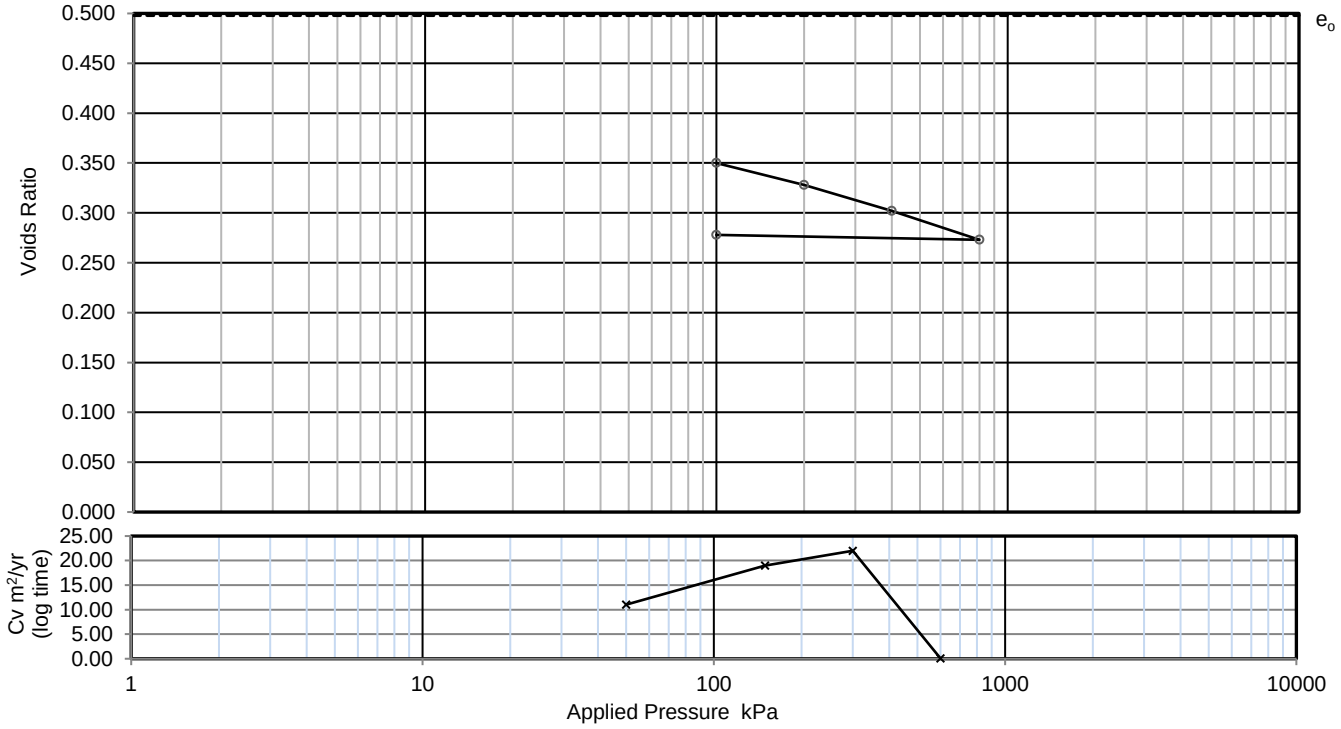
Borehole / Trial Pit	Depth (m)	Sample	Description
BH040A	15.00	UT26	Brown silty CLAY

Initial Specimen



Length of Sample (mm)	400.00
Depth from top of specimen (mm)	200.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.01
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.498
100	0.99	11	41	0.0012	0.350
200	0.16	19	32	0.0015	0.328
400	0.092	22	55	0.0013	0.302
800	0.055	0.072	55	0.0019	0.273
100	0.0056				0.278

	Initial	Final
Height (mm)	19.25	16.42
Moisture Content (%)	19	11
Bulk density (Mg/m³)	2.10	2.29
Dry density (Mg/m³)	1.77	2.07
Voids Ratio	0.498	0.278
Degree of Saturation (%)	100	101

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 7

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH040A	17.70	C32	Grey SANDSTONE	16.5						
BH040A	27.30	C39	Brown SAND/MUDSTONE	14.4						
BH040A	39.30	C46	Brown SAND/MUDSTONE	11.6						
BH040A	42.30	C48	Grey SAND/MUDSTONE	13.2						
BH040A	44.80	C49	Brown SAND/MUDSTONE	13.2						
BH040A	46.40	C51	Grey/Brown SAND/MUDSTONE	15.7						
BH040A	49.15	C54	Brown SANDSTONE	13.0						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH040A	17.70	C32	Grey SANDSTONE	81.3	110.6	*1.4	2.23	22.0	as received	0.4837	AC	3.1	
BH040A	27.30	C39	Brown SAND/MUDSTONE	85.7	99.3	*1.2	2.20	14.4	as received	0.5024	F	2.9	
BH040A	39.30	C46	Brown SAND/MUDSTONE	85.3	89.8	*1.1	2.31	11.6	as received	0.5070	AC	2.6	
BH040A	42.30	C48	Grey SAND/MUDSTONE	85.1	110.6	*1.3	2.33	13.2	as received	0.4874	AC	7.3	
BH040A	44.80	C49	Brown SAND/MUDSTONE	86.4	90.2	*1	2.12	13.2	as received	0.4942	AC	4.7	
BH040A	49.15	C54	Brown SANDSTONE	86.4	116.4	*1.3	2.27	13.0	as received	0.4944	F	2.0	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AQ

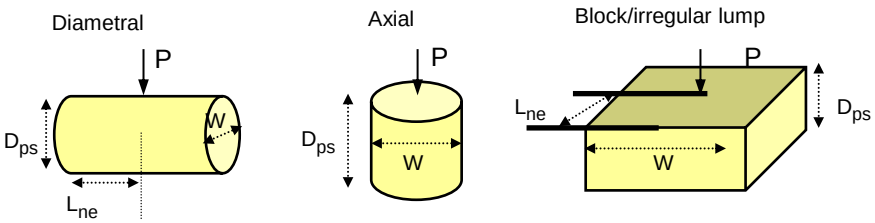
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH040A	46.40	C51	Red/Brown SANDSTONE As received	D	U	YES	11.7	85.5	85.5	76.5	0.6	85.5	0.08	0.10	
BH040A	46.40	C51	Red/Brown SANDSTONE As received	A	U	YES		86.0	16.0	14.0	0.2	41.9	0.13	0.12	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Supplemental Test Report - 2230746AQ / 2

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AQ
Originating Client:	Cadent

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Report Issue Date: 06/01/2023

IAN FARMER ASSOCIATES

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F.A.O.

Final Test Report - 2230746AR / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AR
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	10/01/2023
Date Testing Started:	12/01/2023
Date Testing Finished:	20/01/2023

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 20/01/2023

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Newcastle upon Tyne (0191) 482 8500. **Motherwell** (01698) 230231. **Warrington** (01925) 855440. **Washington** (0191) 482 8500.

AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH332A	0.80	B3	21.9											Brown SAND
BH332A	1.20	B4	18.9	Sieved	43	44		NP						Brown slightly silty SAND
BH332A	1.20	D5	25.1											Brown SAND
BH332A	2.20	B6	10											Brown SAND
BH332A	2.20	D7	18.9											Brown slightly gravelly SAND
BH332A	3.20	B8	10.4	Sieved	22	48		NP						Brown GRAVEL/SAND
BH332A	3.20	D9	16.3											Brown slightly gravelly SAND
BH332A	4.00	B10	13.9											Brown slightly gravelly SAND
BH332A	4.00	D11	15.9											Brown slightly gravelly SAND
BH332A	5.20	B12	8.8	Sieved	22	40		NP						Brown sandy GRAVEL
BH332A	5.20	D13	16.2											Brown slightly gravelly SAND
BH332A	6.50	D14	15.2											Brown slightly gravelly, slightly clayey SAND
BH332A	6.80	B15	14.2	Natural	100	14	27	14	13	0.02	CL			Brown slightly gravelly, clayey, silty SAND
BH332A	8.20	B16	20.9	Sieved	84	25		NP						Brown slightly clayey SAND
BH332A	8.20	D17	22.4											Brown slightly gravelly SAND
BH332A	9.50	B18	17.6	Natural	95	19	34	15	19	0.19	CL			Brown sandy SILT/CLAY
BH332A	9.50	D19	13.1											Brown slightly silty CLAY
BH332A	11.00	B20	17	Natural	98	17	34	16	18	0.08	CLO			Brown silty CLAY/SAND
BH332A	11.00	D21	18.4											Brown slightly silty CLAY
BH332A	12.50	B22	25.4	Natural	100	25	47	19	28	0.23	CI			Brown slightly sandy, silty CLAY
BH332A	12.50	D23	17.8											Brown slightly silty CLAY
BH332A	14.50	D35	15.1	Natural	92	16	28	13	15	0.23	CL			Brown slightly silty CLAY
BH332A	15.00	D24	15.7											Brown slightly silty CLAY
BH332A	16.00	D25	16.4											Brown slightly silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 3

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH332A	16.80	D36	15.7	Natural	100	16	32	15	17	0.04	CL			Brown slightly silty CLAY
BH332A	17.50	D26	12.7											Brown slightly silty CLAY
BH332A	18.40	D37	12.9											Brown slightly silty CLAY
BH332A	19.50	D27	13.5	Natural	95	14	29	14	15	0.02	CL			Brown slightly silty CLAY
BH332A	20.95	D38	14.4	Natural	69	21	32	15	17	0.35	CL	19.9 20.1	1	Brown slightly silty, gravelly CLAY
BH332A	22.45	D39	16.7											Brown slightly silty CLAY
BH332A	22.50	D28	21.4											Brown very clayey SAND
BH332A	23.05	D40	29.9	Natural	99	30	42	20	22	0.46	CI			Brown silty CLAY
BH332A	23.50	D29	31.7	Natural	93	34	39	19	20	0.75	CI			Brown slightly silty CLAY
BH332A	36.90	D30	14.2	Natural	98	14	25	12	13	0.19	CL			Brown slightly silty CLAY
BH332A	38.45	D31	15.2											Brown slightly silty CLAY
BH332A	39.35	D32	11.8	Natural	88	13	23	12	11	0.13	CL			Brown slightly silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

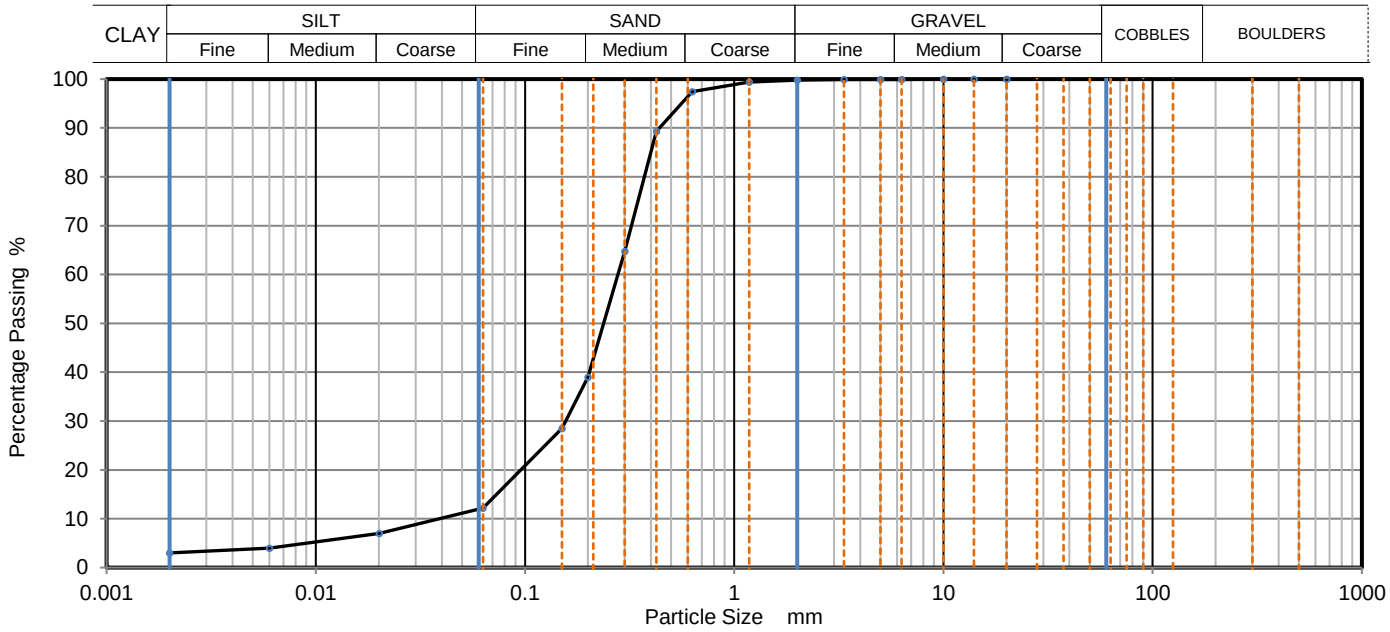
Laboratory Test Report	2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	1.20	B4	Wet Sieve + Pipette	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	7
		0.0060	4
		0.0020	3
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	97		
0.425	89		
0.3	65		
0.2	39		
0.15	29		
0.063	12		

Dry Mass of sample, g: 513

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	88
Silt	9
Clay	3

Grading Analysis		
D100	mm	10
D60	mm	0.279
D30	mm	0.156
D10	mm	0.0399
Uniformity Coefficient		7
Curvature Coefficient		2.2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

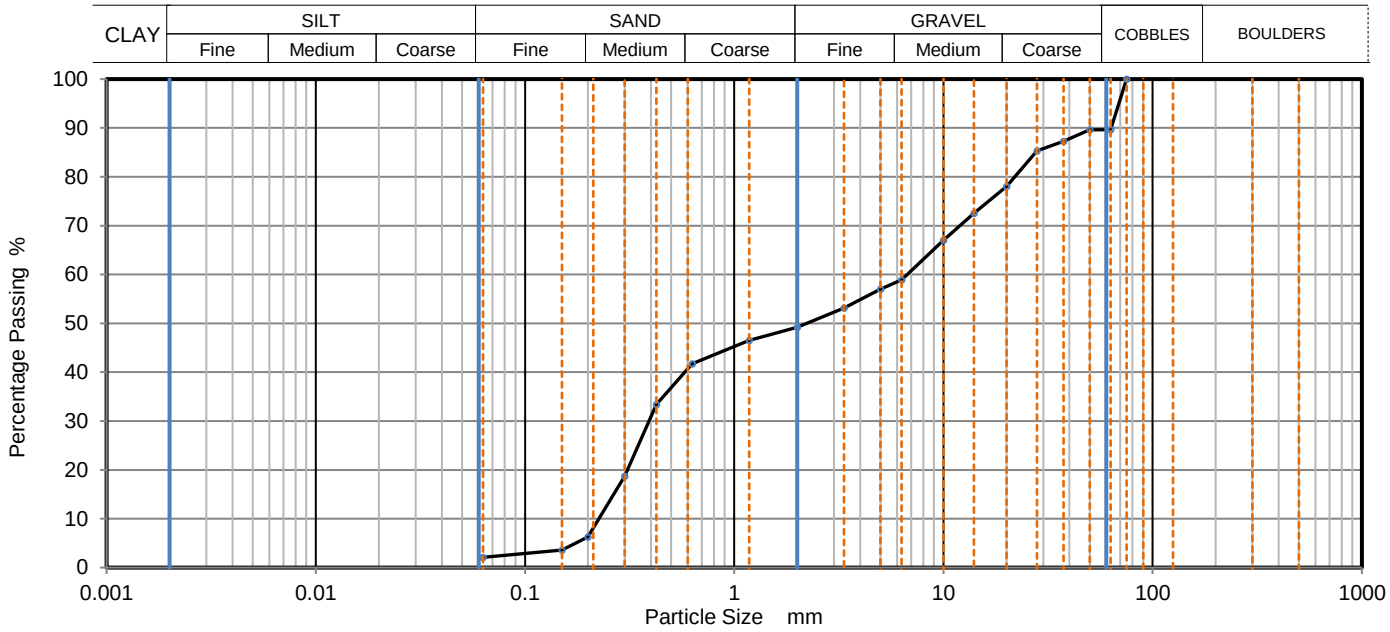
Laboratory Test Report	2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	3.20	B8	Wet Sieve	Brown GRAVEL/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	90		
50	90		
37.5	87		
28	85		
20	78		
14	73		
10	67		
6.3	59		
5	57		
3.35	53		
2	49		
1.18	47		
0.63	42		
0.425	33		
0.3	19		
0.2	6		
0.15	4		
0.063	2		

Dry Mass of sample, g	4067

Sample Proportions	% dry mass
Very coarse	10
Gravel	40
Sand	47
Fines <0.063mm	2

Grading Analysis		
D100	mm	75
D60	mm	6.72
D30	mm	0.392
D10	mm	0.225
Uniformity Coefficient		30
Curvature Coefficient		0.1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

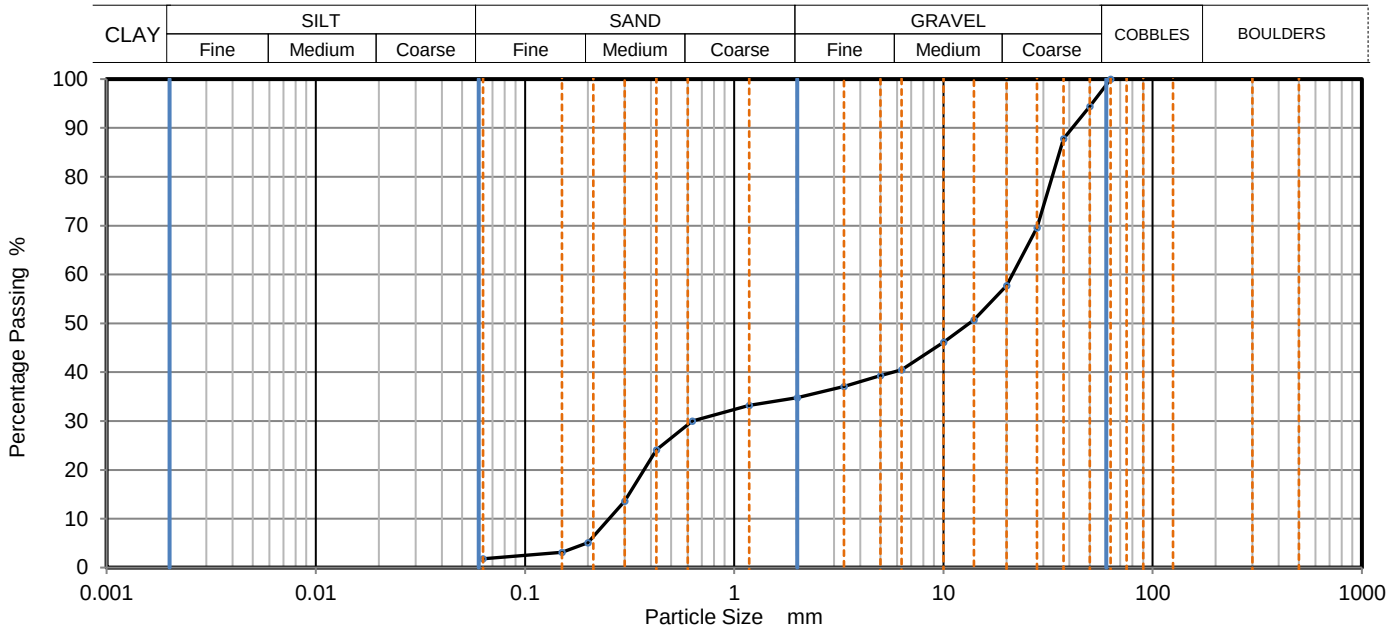
Laboratory Test Report 2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	5.20	B12	Wet Sieve	Brown sandy GRAVEL



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
63	100		
50	94		
37.5	88		
28	70		
20	58		
14	51		
10	46		
6.3	41		
5	39		
3.35	37		
2	35		
1.18	33		
0.63	30		
0.425	24		
0.3	14		
0.2	5		
0.15	3		
0.063	2		

Dry Mass of sample, g 3868

Sample Proportions	% dry mass
Very coarse	0
Gravel	65
Sand	33
Fines <0.063mm	2

Grading Analysis		
D100	mm	63
D60	mm	21.4
D30	mm	0.635
D10	mm	0.253
Uniformity Coefficient		85
Curvature Coefficient		0.075

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

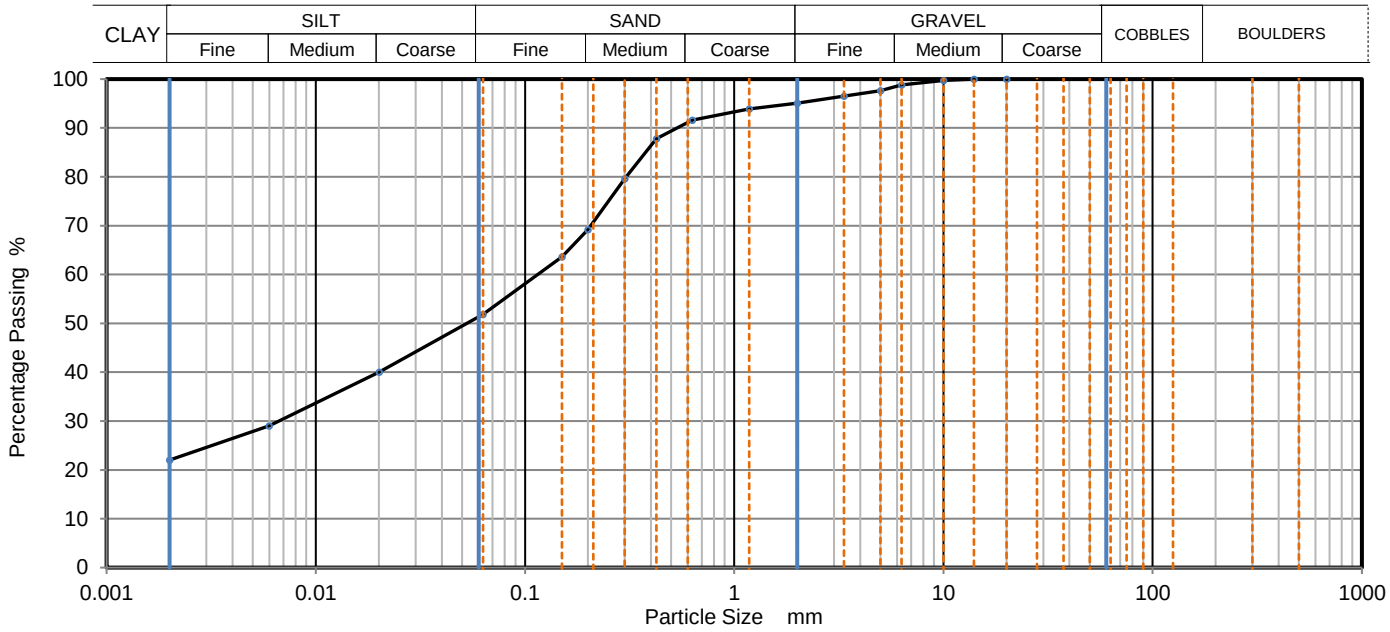
Laboratory Test Report	2230746AR / 1

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Client: Cadent **Page:** 7

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	6.80	B15	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	40
		0.0060	29
		0.0020	22
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	97		
2	95	Particle density	(assumed)
1.18	94	2.65	Mg/m3
0.63	92		
0.425	88		
0.3	80		
0.2	69		
0.15	64		
0.063	52		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	43
Silt	30
Clay	22

Grading Analysis		
D100	mm	14
D60	mm	0.115
D30	mm	0.00676
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

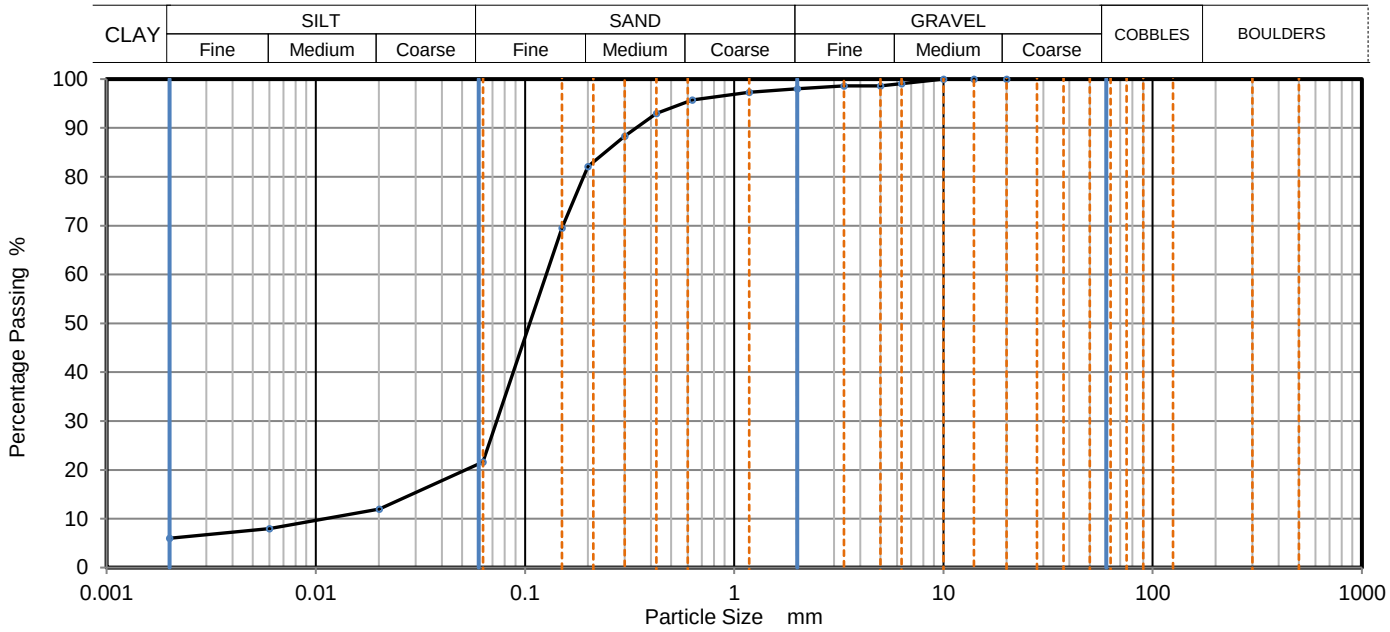
Laboratory Test Report	2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 8

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	8.20	B16	Wet Sieve + Pipette	Brown slightly clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	12
		0.0060	8
		0.0020	6
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	99		
2	98	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.63	96		
0.425	93		
0.3	88		
0.2	82		
0.15	70		
0.063	22		

Dry Mass of sample, g: 513

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	76
Silt	16
Clay	6

Grading Analysis		
D100	mm	10
D60	mm	0.126
D30	mm	0.0733
D10	mm	0.0125
Uniformity Coefficient		10
Curvature Coefficient		3.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

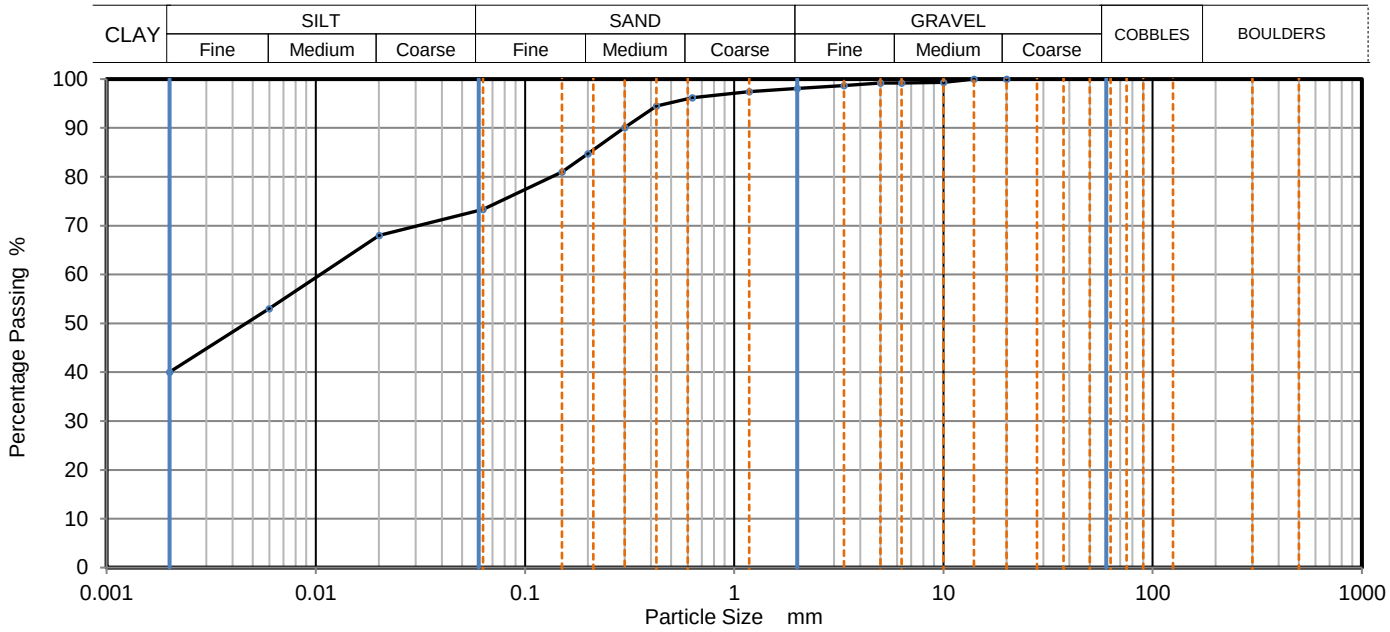
Laboratory Test Report	2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 9

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	9.50	B18	Wet Sieve + Pipette	Brown sandy SILT/CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	68
		0.0060	53
		0.0020	40
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	99		
2	98	Particle density	(assumed)
1.18	97	2.65	Mg/m3
0.63	96		
0.425	95		
0.3	90		
0.2	85		
0.15	81		
0.063	73		

Dry Mass of sample, g: 510

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	25
Silt	33
Clay	40

Grading Analysis		
D100	mm	14
D60	mm	0.0108
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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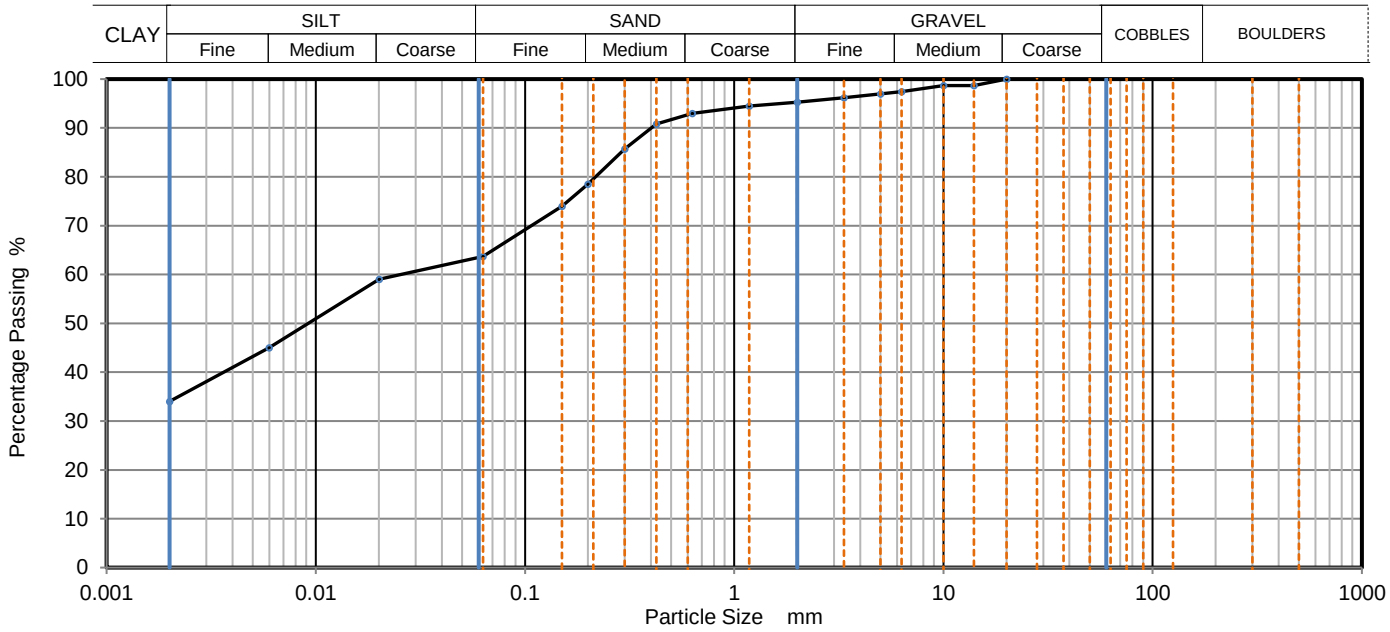
Laboratory Test Report	2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 10

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	11.00	B20	Wet Sieve + Pipette	Brown silty CLAY/SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	59
		0.0060	45
		0.0020	34
20	100		
14	99		
10	99		
6.3	97		
5	97		
3.35	96		
2	95	Particle density	(assumed)
1.18	95	2.65	Mg/m3
0.63	93		
0.425	91		
0.3	86		
0.2	79		
0.15	74		
0.063	64		

Dry Mass of sample, g: 518

Sample Proportions	% dry mass
Very coarse	0
Gravel	5
Sand	32
Silt	30
Clay	34

Grading Analysis		
D100	mm	20
D60	mm	0.0272
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

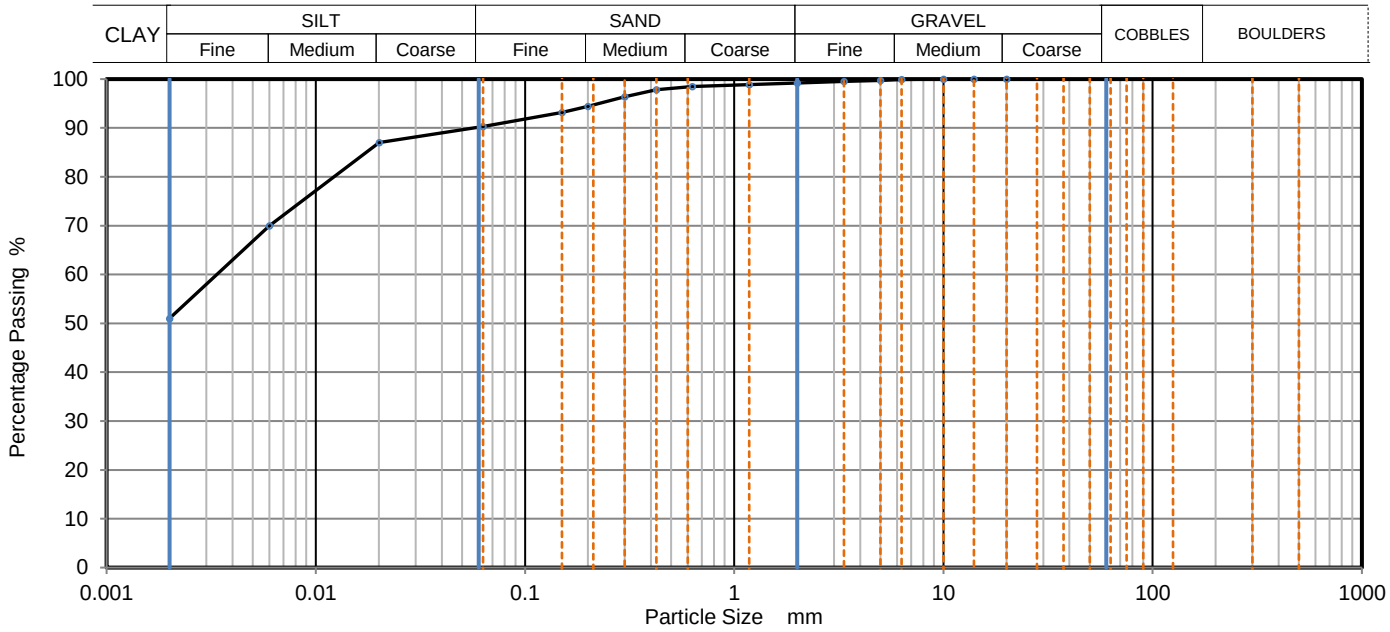
Laboratory Test Report	2230746AR / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AR

Client: Cadent **Page:** 11

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH332A	12.50	B22	Wet Sieve + Pipette	Brown slightly sandy, silty CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	87
		0.0060	70
		0.0020	51
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99	Particle density	(assumed)
1.18	99	2.65	Mg/m3
0.63	99		
0.425	98		
0.3	96		
0.2	94		
0.15	93		
0.063	90		

Dry Mass of sample, g	502

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	9
Silt	39
Clay	51

Grading Analysis		
D100	mm	10
D60	mm	0.00331
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

Final Test Report - 2230746AR / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AR
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 20/01/2023

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2230746AS / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AS
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	11/01/2023
Date Testing Started:	12/01/2023
Date Testing Finished:	23/01/2023

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 23/01/2023

Constructionline
Part of Capita plc

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH120	1.00	B6	16.5	Sieved	77	21	43	20	23	0.06	CI			Brown clayey, silty SAND
BH120	1.20	UT7	14.2	Natural	81	18	27	14	13	0.27	CL			Brown gravelly CLAY
BH120	2.00	D10	11.5	Natural	87	13	29	14	15	-0.05	CL	19.9 19.8	1.0026	Brown slightly gravelly CLAY
BH120	2.80	B12	8.4	Natural	89	9.4	22	11	11	-0.14	CL			Brown slightly gravelly, clayey, silty SAND
BH120	3.00	UT13	5.7	Natural	87	6.5	24	14	10	-0.75	CL			Hard Brown slightly gravelly CLAY
BH120	4.00	B15	13	Natural	95	14	30	14	16	-0.02	CL			Brown slightly gravelly CLAY
BH120	5.00	UT17	13.7	Sieved	43	32	29	17	12	1.24	CL			Brown and Grey gravelly CLAY
BH120	5.50	B19	9.5	Sieved	30	32	34	19	15	0.86	CL	19.5 19.5	1.0075	Grey slightly clayey, sandy, silty GRAVEL

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING
1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

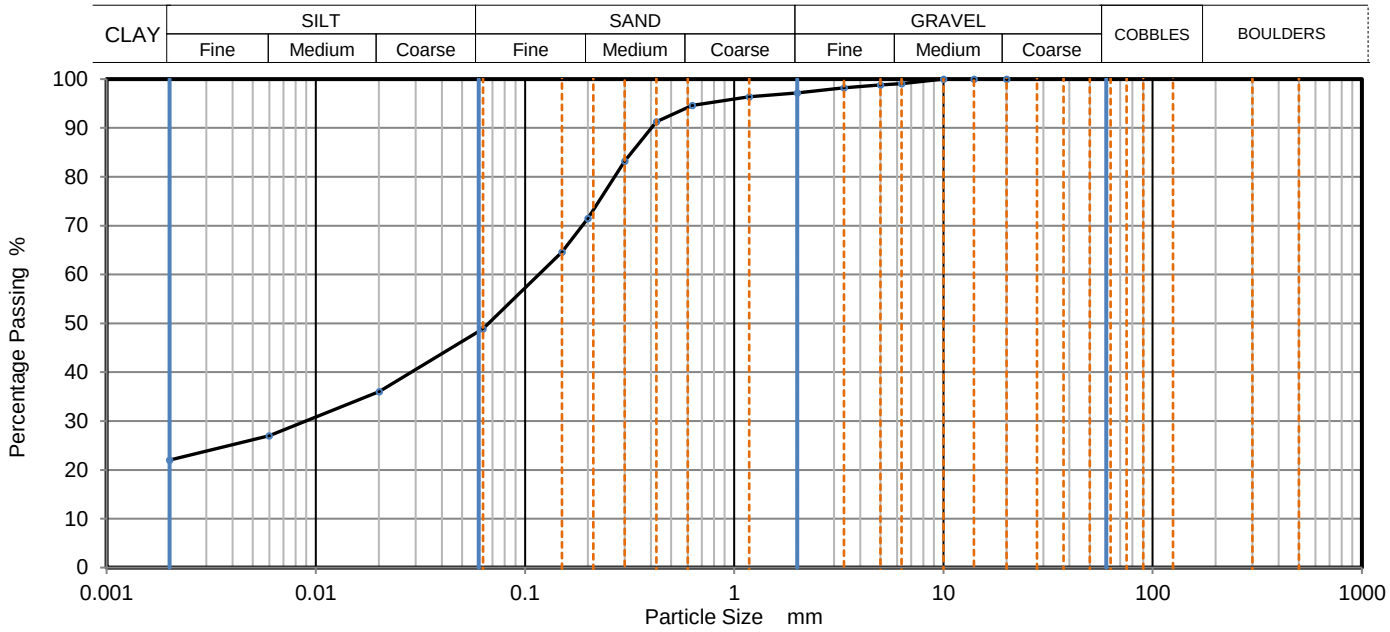
Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH120	1.00	B6	Wet Sieve + Pipette	Brown clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	36
		0.0060	27
		0.0020	22
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	98		
2	97	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	95		
0.425	91		
0.3	83		
0.2	72		
0.15	65		
0.063	49		

Dry Mass of sample, g	551

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	48
Silt	27
Clay	22

Grading Analysis		
D100	mm	10
D60	mm	0.116
D30	mm	0.00902
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

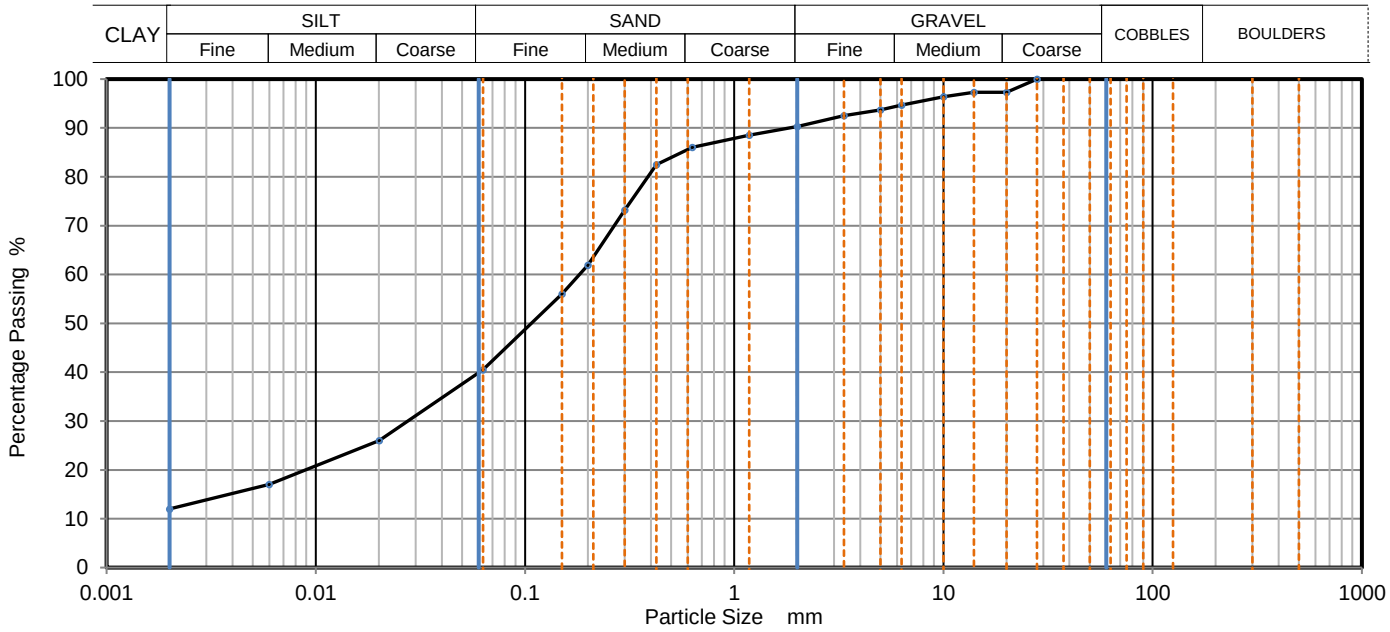
Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH120	2.80	B12	Wet Sieve + Pipette	Brown slightly gravelly, clayey, silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	26
		0.0060	17
		0.0020	12
28	100		
20	97		
14	97		
10	96		
6.3	95		
5	94		
3.35	93		
2	90	Particle density	(assumed)
1.18	89	2.65	Mg/m3
0.63	86		
0.425	83		
0.3	73		
0.2	62		
0.15	56		
0.063	41		

Dry Mass of sample, g: 590

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	50
Silt	28
Clay	12

Grading Analysis		
D100	mm	28
D60	mm	0.182
D30	mm	0.0269
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

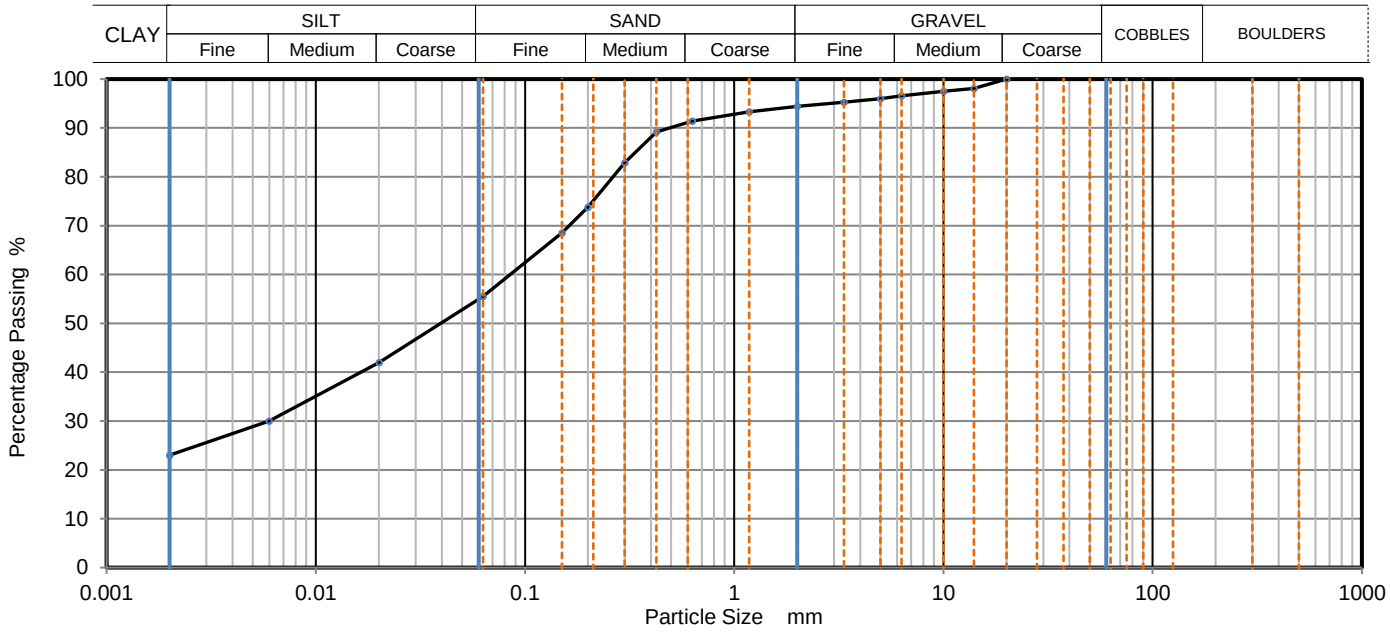
Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH120	4.00	B15	Wet Sieve + Pipette	Brown slightly gravelly CLAY



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	42
		0.0060	30
		0.0020	23
20	100		
14	98		
10	98		
6.3	97		
5	96		
3.35	95		
2	94	Particle density	(assumed)
1.18	93	2.65	Mg/m3
0.63	91		
0.425	89		
0.3	83		
0.2	74		
0.15	69		
0.063	56		

Dry Mass of sample, g: 558

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	39
Silt	33
Clay	23

Grading Analysis		
D100	mm	20
D60	mm	0.0849
D30	mm	0.00612
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

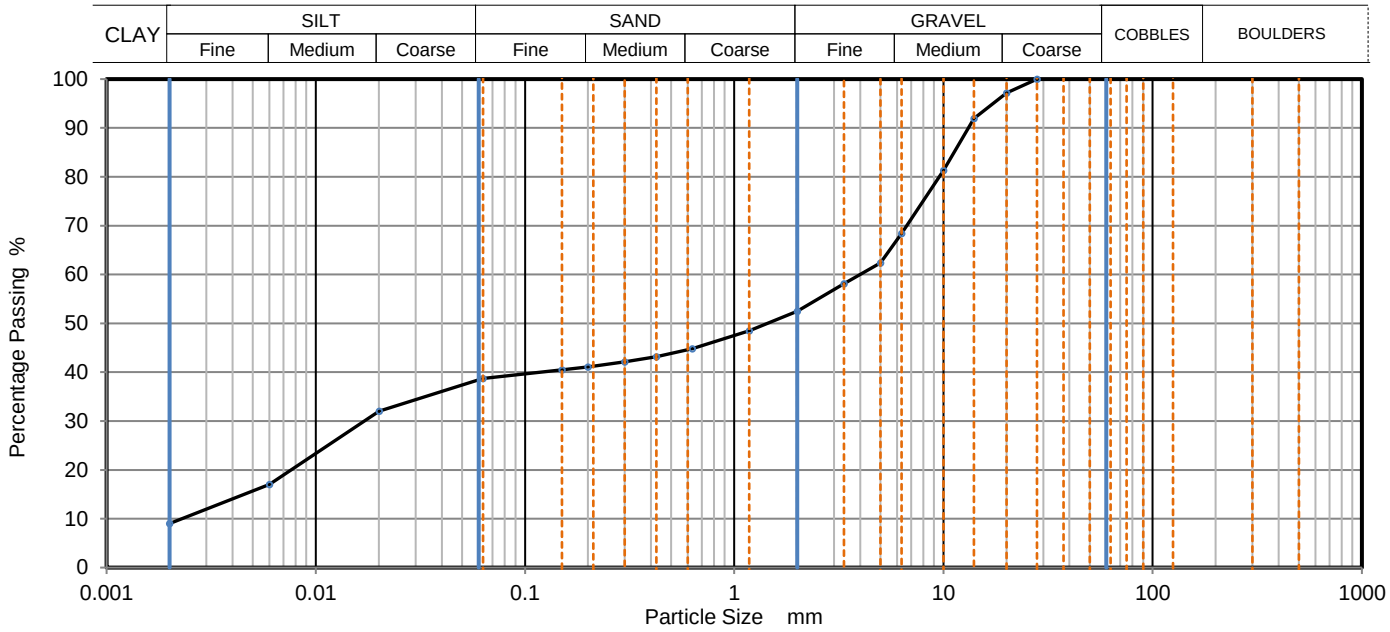
Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH120	5.50	B19	Wet Sieve + Pipette	Grey slightly clayey, sandy, silty GRAVEL



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	32
		0.0060	17
		0.0020	9
28	100		
20	97		
14	92		
10	81		
6.3	68		
5	62		
3.35	58		
2	53	Particle density	(assumed)
1.18	49	2.65	Mg/m3
0.63	45		
0.425	43		
0.3	42		
0.2	41		
0.15	41		
0.063	39		

Dry Mass of sample, g: 477

Sample Proportions	% dry mass
Very coarse	0
Gravel	48
Sand	14
Silt	29
Clay	9

Grading Analysis		
D100	mm	28
D60	mm	4
D30	mm	0.0176
D10	mm	0.00219
Uniformity Coefficient		1800
Curvature Coefficient		0.036

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 7

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

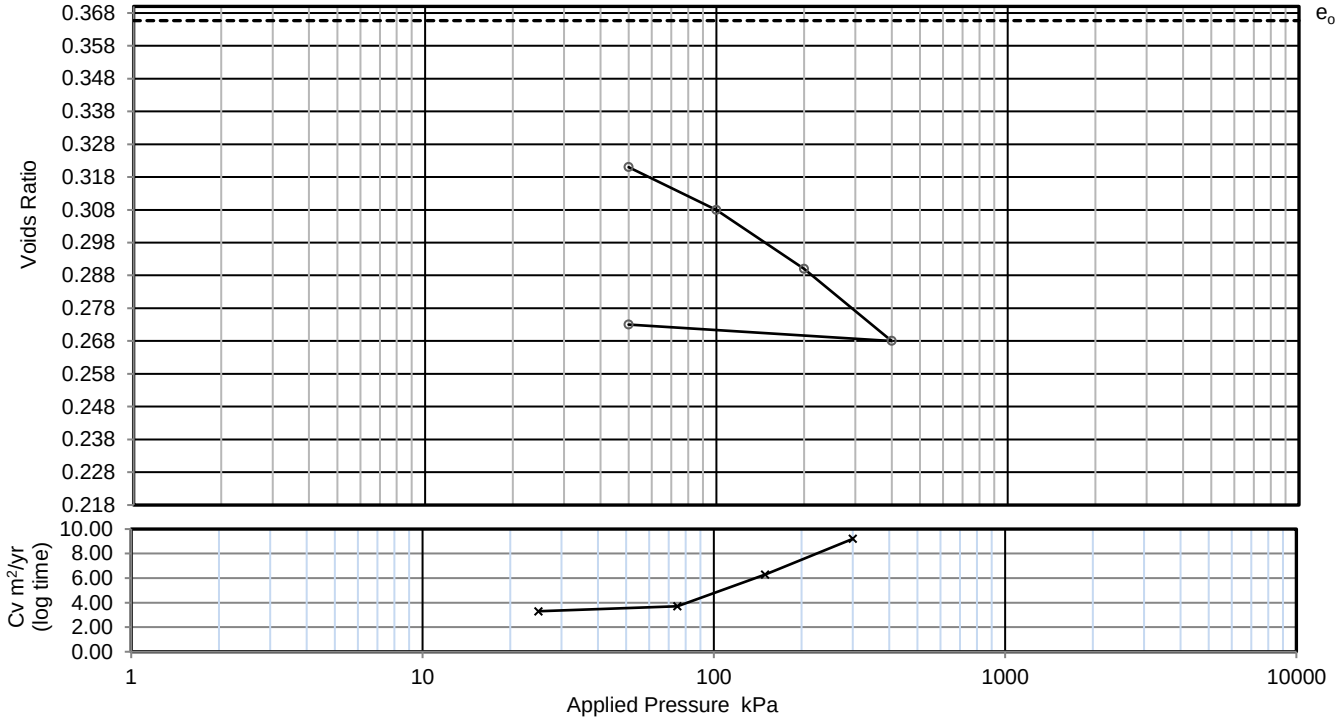
Borehole / Trial Pit	Depth (m)	Sample	Description
BH120	1.20	UT7	Brown gravelly CLAY

Initial Specimen



Length of Sample (mm)	450.00
Depth from top of specimen (mm)	220.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.98
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.366
50	0.65	3.3	7.4	0.00085	0.321
100	0.19	3.7	32	0.0005	0.308
200	0.14	6.3	34	0.0011	0.290
400	0.084	9.2	32	0.0013	0.268
50	0.010				0.273

	Initial	Final
Height (mm)	19.02	17.73
Moisture Content (%)	16	14
Bulk density (Mg/m³)	2.25	2.36
Dry density (Mg/m³)	1.94	2.08
Voids Ratio	0.366	0.273
Degree of Saturation (%)	117	132

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AS / 1

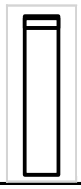
Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

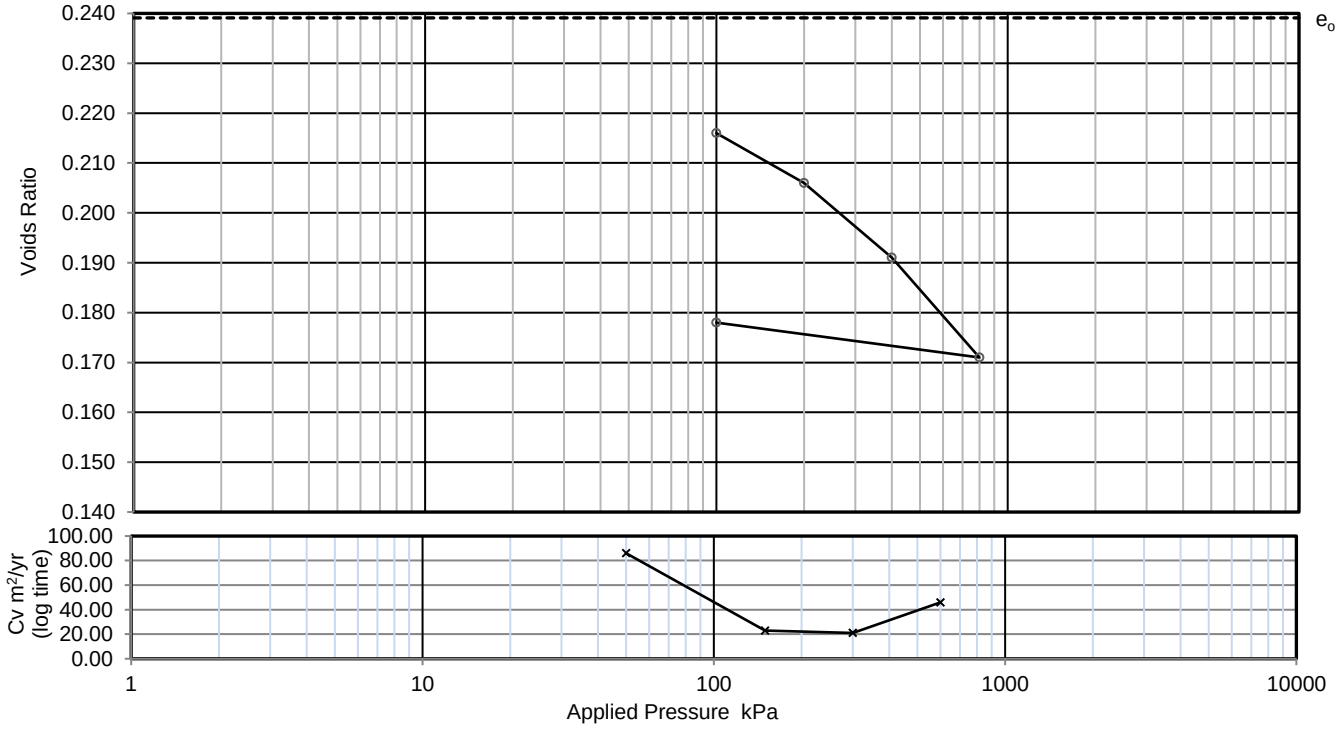
Borehole / Trial Pit	Depth (m)	Sample	Description
BH120	3.00	UT13	Hard Brown slightly gravelly CLAY

Initial Specimen



Length of Sample (mm)	450.00
Depth from top of specimen (mm)	10.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.00
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.239
100	0.19	86	73	0.00056	0.216
200	0.076	23	110	0.00072	0.206
400	0.057	21	65	0.00094	0.191
800	0.041	46	68	0.00078	0.171
100	0.0073				0.178

	Initial	Final
Height (mm)	19.01	18.07
Moisture Content (%)	9	9.4
Bulk density (Mg/m³)	2.33	2.46
Dry density (Mg/m³)	2.14	2.25
Voids Ratio	0.239	0.178
Degree of Saturation (%)	99	140

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

Laboratory Test Report 2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

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DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

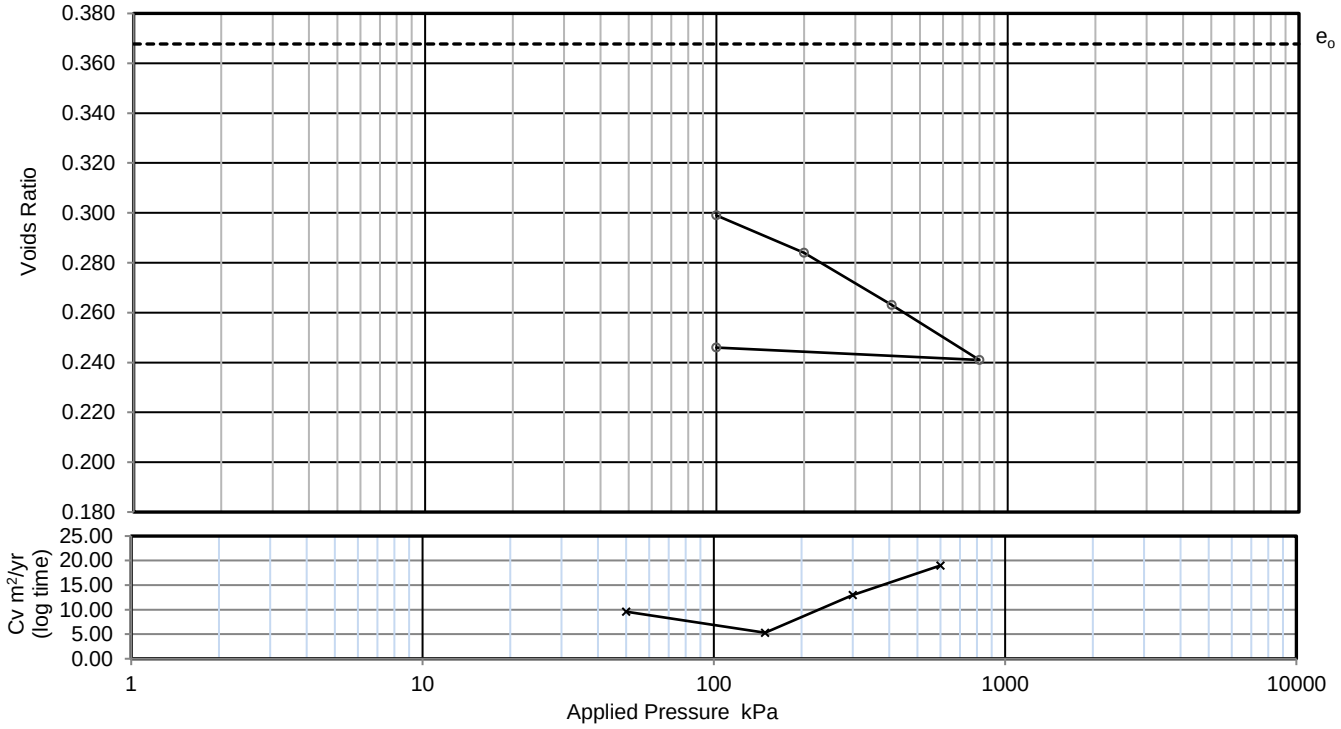
Borehole / Trial Pit	Depth (m)	Sample	Description
BH120	5.00	UT17	Brown and Grey gravelly CLAY

Initial Specimen



Length of Sample (mm)	450.00
Depth from top of specimen (mm)	220.00
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	75.01
Particle density (Mg/m³)	2.65 assumed
Swelling Pressure (kPa)	
Lab Temp. (°C)	20



Applied Pressure kPa	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root) m2/yr	Csec	Voids ratio
0.0	-	-	-	-	0.368
100	0.50	9.6	110	0.00094	0.299
200	0.10	5.3	35	0.00066	0.284
400	0.077	13	58	0.0013	0.263
800	0.045	19	89	0.0015	0.241
100	0.0056				0.246

	Initial	Final
Height (mm)	19.02	17.32
Moisture Content (%)	16	12
Bulk density (Mg/m³)	2.24	2.39
Dry density (Mg/m³)	1.94	2.13
Voids Ratio	0.368	0.246
Degree of Saturation (%)	112	133

Remarks: GRAVEL REMOVED

Method of Preparation: BS 1377:Part 5:1990, clause 3.3 Preparation of specimen
BS 1377:Part 5:1990, clause 3.4 Preparation and assembly of apparatus

Method of Test: BS 1377:Part 5:1990, clause 3.5 Determination of the one-dimensional consolidation properties

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

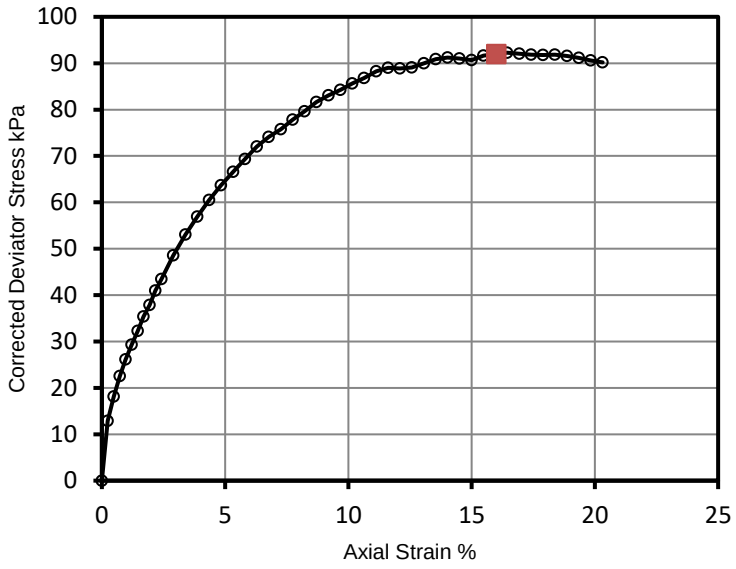
Client: Cadent **Page:** 10

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

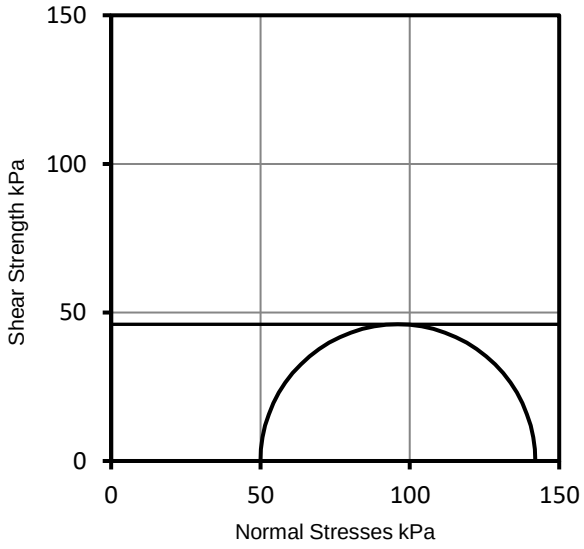
Borehole / Trial Pit	Depth (m)	Sample	Description
BH120	1.20	UT7	**Brown gravelly CLAY**

Initial Sample	Test Number	1
	Original Length (mm)	450.00
	Depth from Top (mm)	10.00
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		206.75
Diameter (mm)		104.42
Moisture Content (%)		17
Bulk Density (Mg/m3)		2.20
Dry Density (Mg/m3)		1.89
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	50
	Axial Strain (%)	16
	Membrane Corr. (kPa)	1.1
	Deviator Stress, (σ1 - σ3)f (kPa)	92
	Undrained Shear Strength, cu = ½(σ1 - σ3)f (kPa)	46
	Mode of Failure	Compound

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement. BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.

UKAS TESTING 1464

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

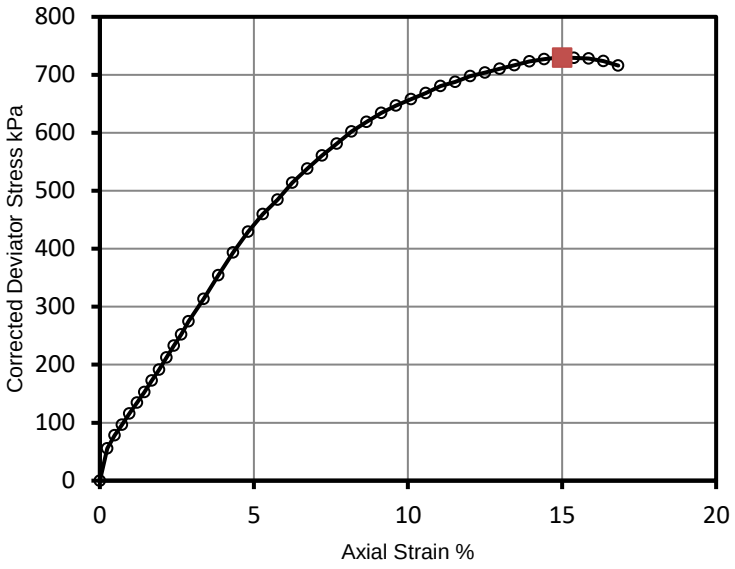
Client: Cadent **Page:** 11

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

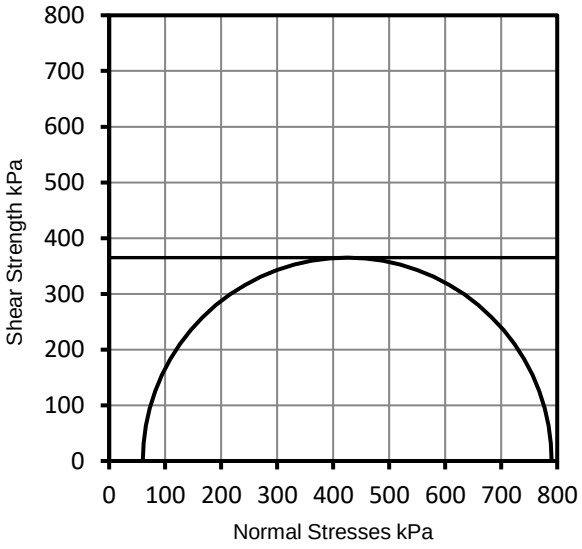
Borehole / Trial Pit	Depth (m)	Sample	Description
BH120	3.00	UT13	**Hard Brown slightly gravelly CLAY**

Initial Sample	Test Number	1
	Original Length (mm)	450.00
	Depth from Top (mm)	50.00
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		208.04
Diameter (mm)		104.27
Moisture Content (%)		8.5
Bulk Density (Mg/m3)		2.30
Dry Density (Mg/m3)		2.12
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	60
	Axial Strain (%)	15
	Membrane Corr. (kPa)	1.01
	Deviator Stress, (σ1 - σ3)f (kPa)	730
	Undrained Shear Strength, cu = ½(σ1 - σ3)f (kPa)	365
	Mode of Failure	Compound

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.

UKAS TESTING
1464

IAN FARMER ASSOCIATES	Laboratory Test Report	2230746AS / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

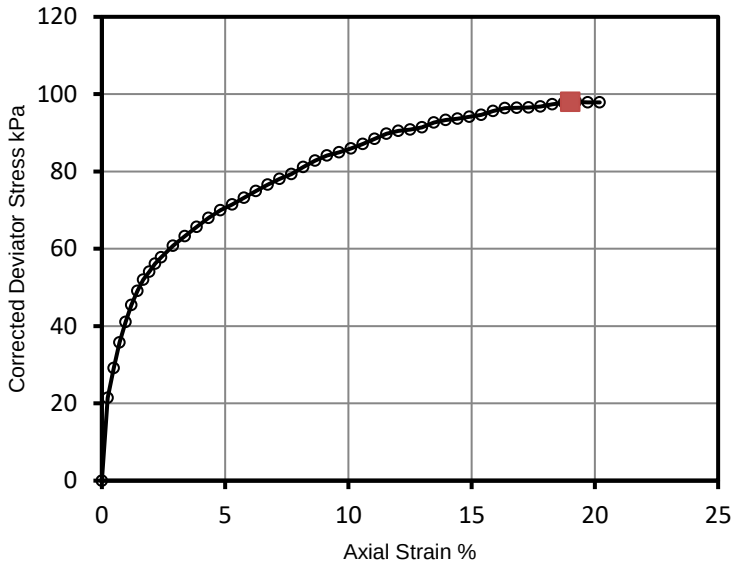
Client: Cadent **Page:** 12

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

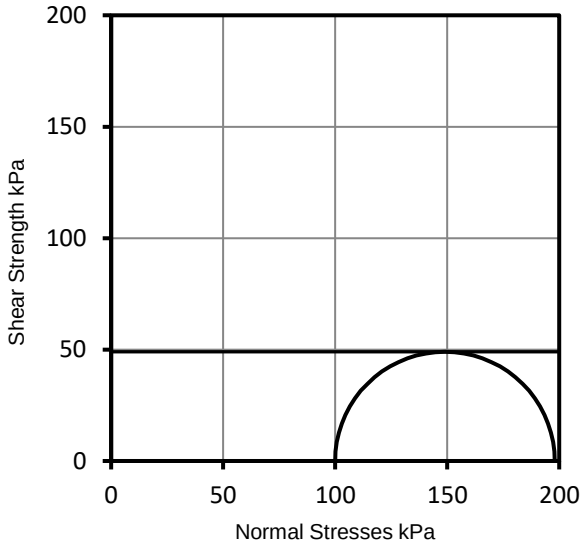
Borehole / Trial Pit	Depth (m)	Sample	Description
BH120	5.00	UT17	**Brown and Grey gravelly CLAY**

Initial Sample	Test Number	1
	Original Length (mm)	450.00
	Depth from Top (mm)	10.00
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		207.94
Diameter (mm)		104.58
Moisture Content (%)		14
Bulk Density (Mg/m3)		2.22
Dry Density (Mg/m3)		1.95
Membrane Thickness (mm)		0.35
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	100
	Axial Strain (%)	19
	Membrane Corr. (kPa)	1.25
	Deviator Stress, (σ1 - σ3)f (kPa)	98
	Undrained Shear Strength, cu = ½(σ1 - σ3)f (kPa)	49
	Mode of Failure	Compound

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Method of Preparation: BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test: BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Result reported relates only to the sample tested.

UKAS TESTING
1464

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

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ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH120	6.40	C20	Grey SILTSTONE	7.9						
BH120	7.20	C21	Red/Brown/Grey MUD/SILTSTONE	12.2						
BH120	7.70	C22	Red/Brown MUDSTONE	13.3						
BH120	8.60	C23	Grey MUD/SILTSTONE	8.7						
BH120	9.50	C24	Red/Brown MUDSTONE	13.1						
BH120	11.08	C25	Red/Brown MUDSTONE	10.9						
BH120	12.07	C26	Red/Brown SANDSTONE	7.8						
BH120	12.64	C27	Red/Brown MUD/SILTSTONE	10.7						
BH120	14.42	C28	Grey MUDSTONE	15.7						
BH120	15.42	C29	Red/Brown/Grey MUD/SILTSTONE	7.8						
BH120	16.42	C30	Brown SILTSTONE	7.3						
BH120	17.65	C31	Brown/Grey MUD/SILTSTONE	12.2						
BH120	19.03	C32	Brown SILTSTONE	11.2						
BH120	19.93	C33	Brown/Grey MUD/SILTSTONE	10.4						
BH120	20.96	C34	Brown SILTSTONE	8.0						
BH120	22.03	C35	Red/Brown MUD/SILTSTONE	8.0						
BH120	22.34	C36	Red/Brown SILTSTONE	11.6						
BH120	22.69	C37	Red/Brown MUD/SILTSTONE	12.9						
BH120	23.31	C38	Red./Brown MUDSTONE	10.3						
BH120	24.90	C39	Grey MUD/SILTSTONE	14.7						
BH120	25.94	C40	Brown SILTSTONE	7.8						
BH120	26.63	C41	Brown SILTSTONE	7.5						
BH120	27.40	C42	Brown SILTSTONE	6.8						

Notes 1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory

2. ISRM p87 test 2, Porosity/density determination using saturation and caliper

3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy

2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 14

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH120	28.50	C43	Brown SILTSTONE	10.4						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

Client: Cadent **Page:** 15

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH120	7.70	C22	Red/Brown MUDSTONE	85.8	96.4	*1.1	2.27	13.3	as received	0.5011	AC	1.6	
BH120	9.50	C24	Red/Brown MUDSTONE	86.0	171.0	*2	2.28	13.1	as received	0.4989	AC	0.6	
BH120	12.07	C26	Red/Brown SANDSTONE	85.9	96.2	*1.1	2.44	7.8	as received	0.5009	F	2.5	
BH120	14.42	C28	Grey MUDSTONE	84.6	86.3	*1	2.20	15.7	as received	0.4928	AC	0.6	
BH120	22.34	C36	Red/Brown SILTSTONE	86.2	194.1	*2.3	2.39	11.6	as received	0.4968	AC	2.6	
BH120	23.31	C38	Red/Brown MUDSTONE	86.1	133.9	*1.6	2.36	10.3	as received	0.4978	F	1.9	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

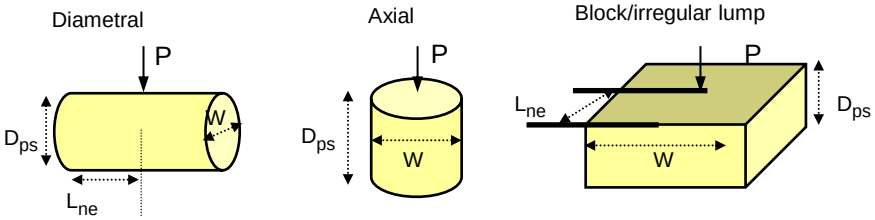
Client: Cadent **Page:** 16

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH120	6.40	C20	Grey SILTSTONE As received	D	U	YES	51.4	85.8	85.8	83.8	6.9	85.8	0.94	1.20	
BH120	6.40	C20	Grey SILTSTONE As received	A	U	YES		86.4	41.5	37.5	5.8	67.6	1.26	1.44	
BH120	7.20	C21	Red/Brown/Grey MUD/SILTSTONE As received	I	PL	YES	40.8	81.91 86.26	65.6	63.6	0.4	83.8	0.05	0.06	
BH120	7.20	C21	Red/Brown/Grey MUD/SILTSTONE As received	I	PD	YES	39.5	81.52 65.94	53.1	19.1	0.5	70.6	0.10	0.11	
BH120	8.60	C23	Grey MUD/SILTSTONE As received	D	PL	YES	31.1	86.4	86.4	84.4	0.2	86.4	0.02	0.03	
BH120	8.60	C23	Grey MUD/SILTSTONE As received	A	PD	YES		86.4	36.8	16.8	1.8	63.7	0.44	0.49	
BH120	11.08	C25	Red/Brown MUDSTONE As received	D	U	YES	40.1	84.7	84.7	80.7	0.4	84.7	0.05	0.07	
BH120	11.08	C25	Red/Brown MUDSTONE As received	A	U	YES		84.5	53.8	47.8	0.3	76.1	0.05	0.06	
BH120	12.64	C27	Red/Brown MUD/SILTSTONE As received	D	U	YES	12.6	85.7	85.7	62.7	0.1	85.7	0.01	0.02	
BH120	12.64	C27	Red/Brown MUD/SILTSTONE As received	I	U	YES	42.5	80.61 59.89	31.9	10.9	0.2	53.4	0.05	0.06	
BH120	15.42	C29	Red/Brown/Grey MUD/SILTSTONE As received	D	U	YES	39.1	86.2	86.2	83.2	0.3	86.2	0.04	0.05	
BH120	15.42	C29	Red/Brown/Grey MUD/SILTSTONE As received	A	U	YES		86.0	34.9	18.9	1.8	61.8	0.46	0.50	
BH120	16.42	C30	Brown SILTSTONE As received	D	PL	YES	49.3	86.2	86.2	85.2	0.7	86.2	0.09	0.11	
BH120	16.42	C30	Brown SILTSTONE As received	A	PD	YES		86.2	35.2	27.2	1.7	62.2	0.43	0.47	
BH120	17.65	C31	Brown/Grey MUD/SILTSTONE As received	D	U	YES	27.7	85.8	85.8	81.8	0.1	85.8	0.01	0.02	
BH120	17.65	C31	Brown/Grey MUD/SILTSTONE As received	A	U	YES		86.1	35.2	16.2	0.3	62.2	0.07	0.07	
BH120	19.03	C32	Brown SILTSTONE As received	A	PD	YES		86.1	67.8	51.8	0.6	86.2	0.09	0.11	
BH120	19.03	C32	Brown SILTSTONE As received	I	PL	YES	20.5	85.33 40.22	35.9	32.9	0.2	53.6	0.07	0.07	
BH120	19.93	C33	Brown/Grey MUD/SILTSTONE As received	D	U	YES	43.0	85.9	85.9	82.9	0.1	85.9	0.01	0.02	
BH120	19.93	C33	Brown/Grey MUD/SILTSTONE As received	A	U	YES		85.9	37.1	30.1	0.2	63.7	0.05	0.05	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AS

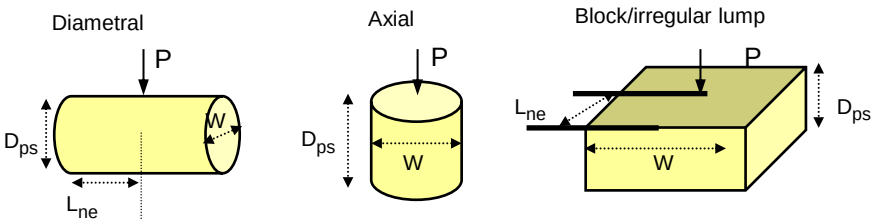
Client: Cadent **Page:** 17

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH120	20.96	C34	Brown SILTSTONE As received	A	PD	YES		86.6	61.5	42.5	1.6	82.4	0.23	0.29	
BH120	20.96	C34	Brown SILTSTONE As received	A	PD	YES		86.1	41.3	39.3	1.1	67.3	0.24	0.27	
BH120	22.03	C35	Red/Brown MUD/SILTSTONE As received	D	U	YES	38.0	85.9	85.9	81.9	0.3	85.9	0.05	0.06	
BH120	22.03	C35	Red/Brown MUD/SILTSTONE As received	A	U	YES		86.3	39.5	17.5	0.9	65.9	0.20	0.23	
BH120	22.69	C37	Red/Brown MUD/SILTSTONE As received	D	U	YES	94.4	85.4	85.4	80.4	0.2	85.4	0.02	0.03	
BH120	22.69	C37	Red/Brown MUD/SILTSTONE As received	A	U	YES		86.2	35.7	30.7	0.0	62.6	0.01	0.01	
BH120	24.90	C39	Grey MUD/SILTSTONE As received	D	U	YES	24.9	85.8	85.8	82.8	0.3	85.8	0.04	0.06	
BH120	24.90	C39	Grey MUD/SILTSTONE As received	A	U	YES		85.6	52.4	27.4	0.7	75.5	0.12	0.14	
BH120	25.94	C40	Brown SILTSTONE As received	A	PD	YES		87.4	42.9	18.8	2.2	69.1	0.46	0.53	
BH120	25.94	C40	Brown SILTSTONE As received	A	PD	YES		87.7	21.4	18.4	1.5	48.9	0.62	0.61	
BH120	26.63	C41	Brown SILTSTONE As received	A	PD	YES		86.4	38.5	30.5	0.6	65.1	0.13	0.15	
BH120	26.63	C41	Brown SILTSTONE As received	I	PD	YES	24.2	48.42 86.10	38.2	30.2	0.9	57.2	0.27	0.29	
BH120	27.40	C42	Brown SILTSTONE As received	A	PD	YES		86.6	72.5	67.5	0.3	89.4	0.04	0.05	
BH120	27.40	C42	Brown SILTSTONE As received	I	PD	YES	19.8	86.20 34.64	23.2	22.2	0.3	42.2	0.19	0.17	
BH120	28.50	C43	Brown SILTSTONE As received	D	PL	YES	45.6	86.8	86.8	85.8	0.1	86.8	0.02	0.02	
BH120	28.50	C43	Brown SILTSTONE As received	A	PD	YES		87.3	36.9	31.9	1.0	64.0	0.24	0.27	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

IAN FARMER ASSOCIATES

Final Test Report - 2230746AS / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AS
Originating Client:	Cadent

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 23/01/2023

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746AT / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AT
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	Not Given
Date Scheduled:	11/01/2023
Date Testing Started:	12/01/2023
Date Testing Finished:	23/01/2023

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 23/01/2023

Constructionline
Part of Capita plc

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH063	0.00	B1	21.6	Sieved	54	40		NP						Brown silty SAND
BH063	1.20	B8	7.2	Sieved	24	30		NP						Brown SAND
BH063	2.20	B9	7.9	Sieved	48	16		NP						Brown slightly silty, slightly gravelly SAND
BH063	2.70	B10	9.3	Sieved	38	24		NP						Brown slightly silty SAND
BH063	30.50	D27	16.4	Sieved	77	21		NP						Red slightly gravelly SAND

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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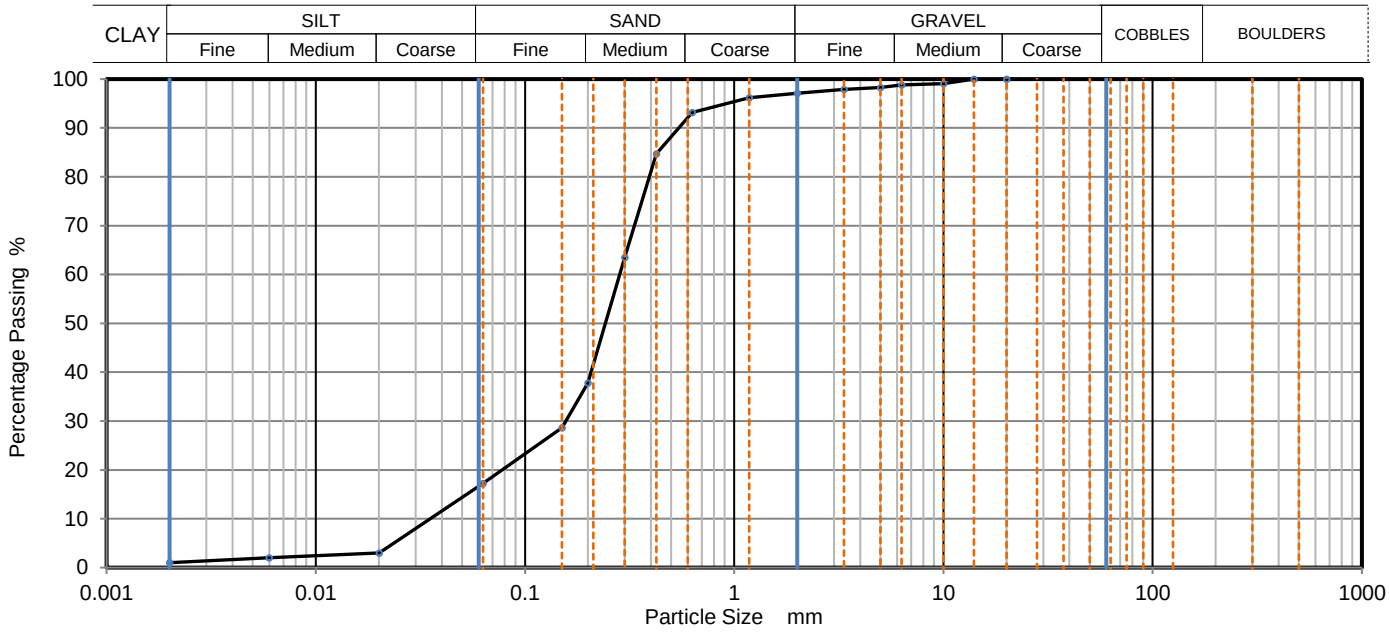
Laboratory Test Report 2230746AT / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH063	0.00	B1	Wet Sieve + Pipette	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	3
		0.0060	2
		0.0020	1
20	100		
14	100		
10	99		
6.3	99		
5	98		
3.35	98		
2	97	Particle density	(assumed)
1.18	96	2.65	Mg/m3
0.63	93		
0.425	85		
0.3	64		
0.2	38		
0.15	29		
0.063	17		

Dry Mass of sample, g 541

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	80
Silt	16
Clay	1

Grading Analysis		
D100	mm	14
D60	mm	0.284
D30	mm	0.157
D10	mm	0.0353
Uniformity Coefficient		8
Curvature Coefficient		2.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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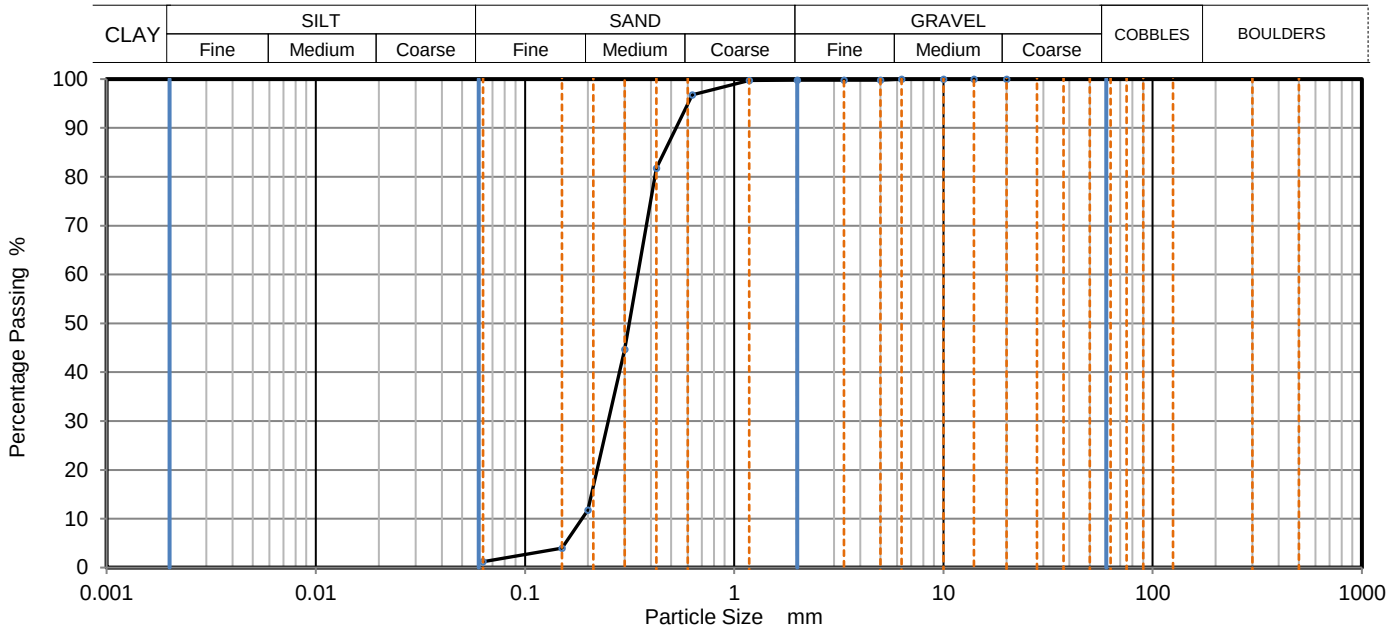
Laboratory Test Report 2230746AT / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH063	1.20	B8	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	97		
0.425	82		
0.3	45		
0.2	12		
0.15	4		
0.063	1		

Dry Mass of sample, g: 503

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	99
Fines <0.063mm	1

Grading Analysis		
D100	mm	6.3
D60	mm	0.346
D30	mm	0.25
D10	mm	0.187
Uniformity Coefficient		1.9
Curvature Coefficient		0.97

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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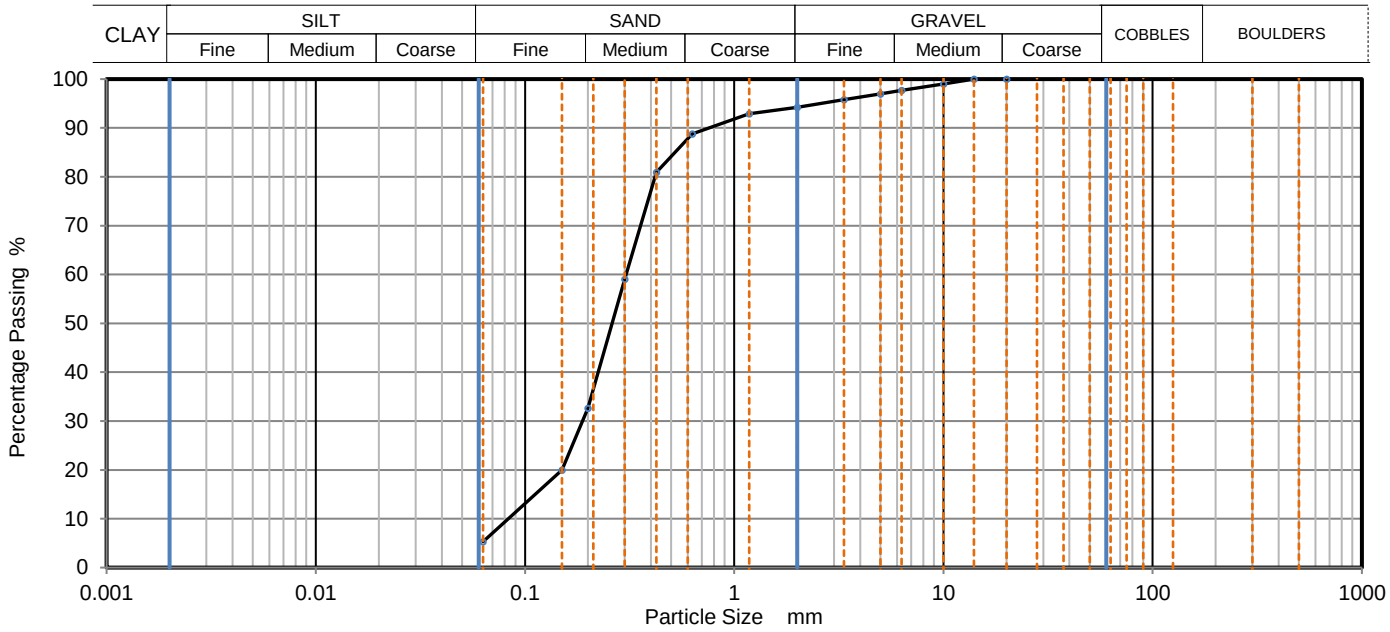
Laboratory Test Report	2230746AT / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH063	2.20	B9	Wet Sieve	Brown slightly silty, slightly gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	99		
6.3	98		
5	97		
3.35	96		
2	94		
1.18	93		
0.63	89		
0.425	81		
0.3	59		
0.2	33		
0.15	20		
0.063	5		

Dry Mass of sample, g: 505

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	89
Fines <0.063mm	5

Grading Analysis		
D100	mm	14
D60	mm	0.305
D30	mm	0.188
D10	mm	0.0832
Uniformity Coefficient		3.7
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

IAN FARMER ASSOCIATES

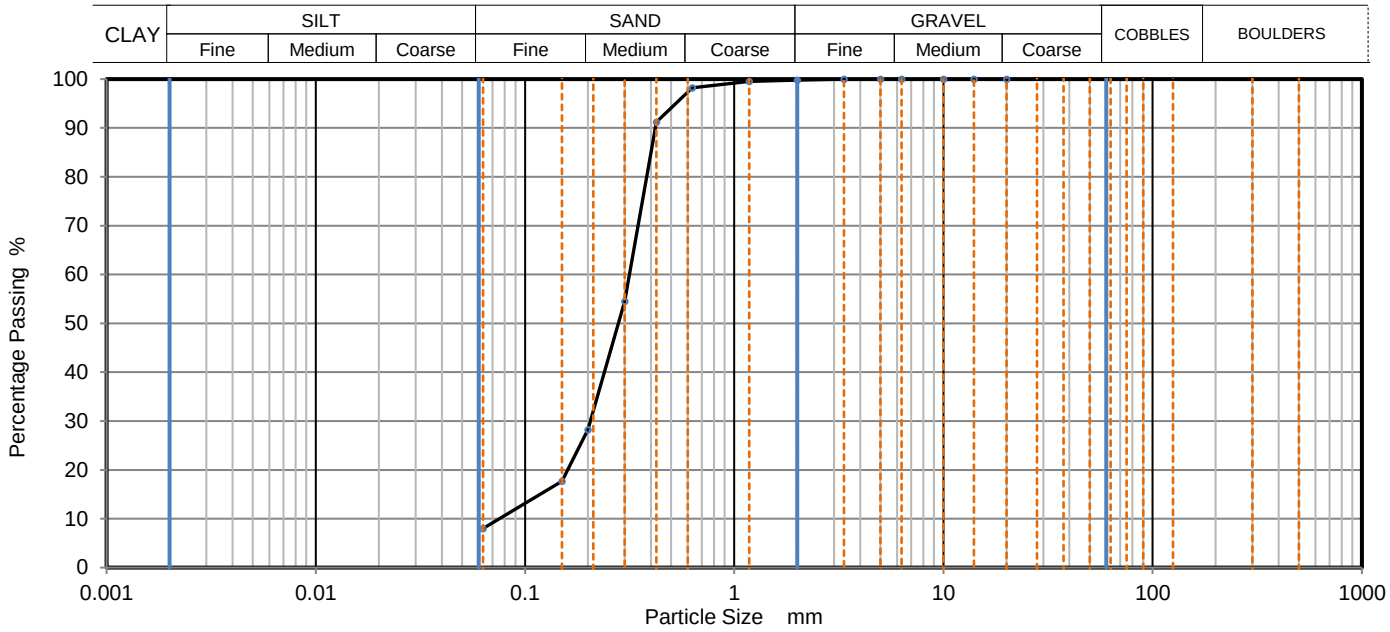
Laboratory Test Report 2230746AT / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH063	2.70	B10	Wet Sieve	Brown slightly silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.63	98		
0.425	91		
0.3	55		
0.2	28		
0.15	18		
0.063	8		

Dry Mass of sample, g: 573

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	92
Fines <0.063mm	8

Grading Analysis		
D100	mm	3.35
D60	mm	0.316
D30	mm	0.206
D10	mm	0.0755
Uniformity Coefficient		4.2
Curvature Coefficient		1.8

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 7

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH063	4.27	C11	Red/Brown SANDSTONE	9.0						
BH063	5.25	C12	Brown SANDSTONE	10.7						
BH063	6.00	C13	Red/Brown SANDSTONE	9.6						
BH063	8.15	C14	Brown SANDSTONE	8.1						
BH063	13.75	C15	Red/Brown SANDSTONE	8.1						
BH063	16.00	C16	Brown SANDSTONE	8.3						
BH063	16.50	C17	Red/Grey SANDSTONE	6.8						
BH063	18.14	C18	Grey/Brown SANDSTONE	6.5						
BH063	18.84	C19	Red/Brown SANDSTONE	9.1						
BH063	21.00	C20	Grey/Brown SANDSTONE	6.7						
BH063	22.70	C21	Red/Brown SANDSTONE	12.5						
BH063	23.45	C22	Brown SANDSTONE	12.1						
BH063	24.00	C23	Red/Brown SANDSTONE	5.8						
BH063	24.60	C24	Brown MUDSTONE	9.0						
BH063	26.16	C25	Red/Brown SANDSTONE	5.7						
BH063	28.17	C26	Brown SANDSTONE	10.1						
BH063	37.09	C29	Brown SANDSTONE	11.2						
BH063	40.30	C30	Red/Brown SANDSTONE	11.6						

Notes 1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory

2. ISRM p87 test 2, Porosity/density determination using saturation and caliper

3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy

2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

Client: Cadent **Page:** 8

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH063	4.27	C11	Red/Brown SANDSTONE	86.1	92.8	*1.1	2.08	9.0	as received	0.4978	AC	4.5	
BH063	6.00	C13	Red/Brown SANDSTONE	86.3	196.1	*2.3	2.10	9.6	as received	0.4963	AC	18.1	
BH063	13.75	C15	Red/Brown SANDSTONE	86.7	196.7	*2.3	2.20	8.1	as received	0.4916	F	18.0	
BH063	16.50	C17	Red/Grey SANDSTONE	86.5	198.1	*2.3	2.38	6.8	as received	0.4933	S	27.6	
BH063	18.84	C19	Red/Brown SANDSTONE	85.7	106.4	*1.2	2.15	9.0	as received	0.5025	F	4.1	
BH063	22.70	C21	Red/Brown SANDSTONE	86.6	198.0	*2.3	2.23	12.5	as received	0.4929	AC	24.7	
BH063	24.00	C23	Red/Brown SANDSTONE	86.3	107.9	*1.3	2.42	5.8	as received	0.4955	AC	9.5	
BH063	26.16	C25	Red/Brown SANDSTONE	86.4	191.4	*2.2	2.43	5.7	as received	0.4951	AC	4.8	
BH063	40.30	C30	Red/Brown SANDSTONE	86.3	85.1	*1	2.21	11.6	as received	0.4952	AC	5.5	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AT

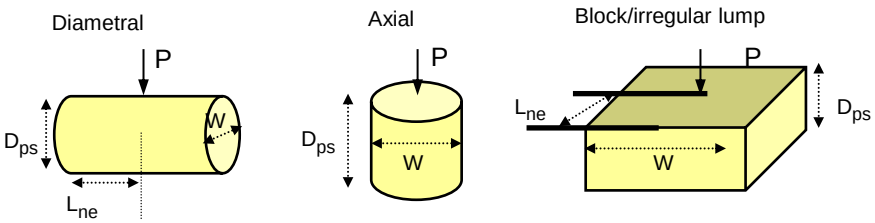
Client: Cadent **Page:** 9

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is . MPa	Point Load Strength Index: Is (50) MPa	Remarks (including water content if measured)
BH063	5.25	C12	Brown SANDSTONE As received	D	U	YES	71.5	86.5	86.5	84.5	0.3	86.5	0.04	0.05	
BH063	5.25	C12	Brown SANDSTONE As received	A	U	YES		86.5	75.4	74.4	0.5	91.1	0.06	0.08	
BH063	8.15	C14	Brown SANDSTONE As received	D	U	YES	77.5	86.6	86.6	84.6	1.4	86.6	0.19	0.24	
BH063	8.15	C14	Brown SANDSTONE As received	A	U	YES		86.2	84.1	82.1	2.4	96.1	0.26	0.35	
BH063	16.00	C16	Brown SANDSTONE As received	D	U	YES	69.7	86.4	86.4	84.4	0.5	86.4	0.06	0.08	
BH063	16.00	C16	Brown SANDSTONE As received	A	U	YES		87.6	53.0	48.0	1.8	76.9	0.30	0.36	
BH063	18.14	C18	Grey/Brown SANDSTONE As received	A	PD	YES		85.3	78.5	69.5	1.6	92.3	0.18	0.24	
BH063	18.14	C18	Grey/Brown SANDSTONE As received	I	PD	YES	42.8	85.21 43.58	34.6	31.6	0.4	53.3	0.13	0.13	
BH063	21.00	C20	Grey/Brown SANDSTONE As received	D	PL	YES	101.8	86.5	86.5	85.5	0.8	86.5	0.10	0.13	
BH063	21.00	C20	Grey/Brown SANDSTONE As received	A	PD	YES		86.2	53.8	44.8	3.0	76.8	0.51	0.62	
BH063	23.45	C22	Brown SANDSTONE As received	D	U	YES	76.6	86.2	86.2	83.2	0.6	86.2	0.09	0.11	
BH063	23.45	C22	Brown SANDSTONE As received	A	U	YES		86.5	70.0	64.0	1.5	87.8	0.19	0.24	
BH063	24.60	C24	Brown MUDSTONE As received	A	PD	YES	42.7	85.3	78.6	56.6	0.4	92.4	0.05	0.06	
BH063	24.60	C24	Brown MUDSTONE As received	I	PD	YES	42.2	84.51 55.16	39.2	36.2	0.1	59.0	0.04	0.04	
BH063	28.17	C26	Brown SANDSTONE As received	D	PL	YES	138.3	86.2	86.2	82.2	1.9	86.2	0.26	0.33	
BH063	28.17	C26	Brown SANDSTONE As received	A	PD	YES		86.3	70.6	67.6	2.7	88.1	0.34	0.44	
BH063	37.09	C29	Brown SANDSTONE As received	A	U	YES		86.6	59.1	57.1	1.1	80.8	0.17	0.21	
BH063	37.09	C29	Brown SANDSTONE As received	A	U	YES		86.4	35.3	32.3	0.1	62.3	0.01	0.02	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AT / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AT
Originating Client:	Cadent

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Report Issue Date: 23/01/2023

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ Tel: 0191 482 8500
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F.A.O.

Final Test Report - 2230746AU / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AU
Originating Client:	Cadent
Originating Reference:	2230746
Date Sampled:	13/12/2022
Date Scheduled:	11/01/2023
Date Testing Started:	12/01/2023
Date Testing Finished:	20/01/2023

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 20/01/2023

Constructionline
Part of Capita plc

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AGS

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

Client: Cadent **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
BH037	0.70	B4	10.2	Sieved	80	13		NP						Brown silty SAND
BH037	2.20	B8	4.2	Sieved	22	19		NP						Brown SAND
BH037	3.40	B13	5.3	Sieved	24	22		NP						Brown SAND
BH037	4.40	D16	13.3	Sieved	18	74	31	15	16	3.66	CL	20.4 20.1	0.9964	Reddsih Brown slightly clayey, very gravelly SAND
BH037	5.60	D19	14.9	Sieved	17	86		NP						Reddish Brown SAND
BH037	7.20	D22	15.9	Natural	100	16	29	17	12	-0.09	CL			Reddish Brown slightly sandy, slightly silty CLAY
BH037	12.00	D25	15.4	Sieved	31	50	31	23	8	3.39	CL			Reddish Brown slightly clayey, slightly sandy GRAVEL
BH037	26.10	D33	15.3	Sieved	12	129	34	24	10	10.54	CL	19.9 19.9	1.0015	Grey mudstone slightly clayey GRAVEL
BH037	31.00	D36	13.4	Sieved	19	71	29	21	8	6.27	CL			Red/Brown slightly clayey GRAVEL (Mudstone)
BH037	35.00	D39	10.9	Sieved	15	73		19*						Brown MUDSTONE *Insufficient sample. PL tested only.

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

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1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

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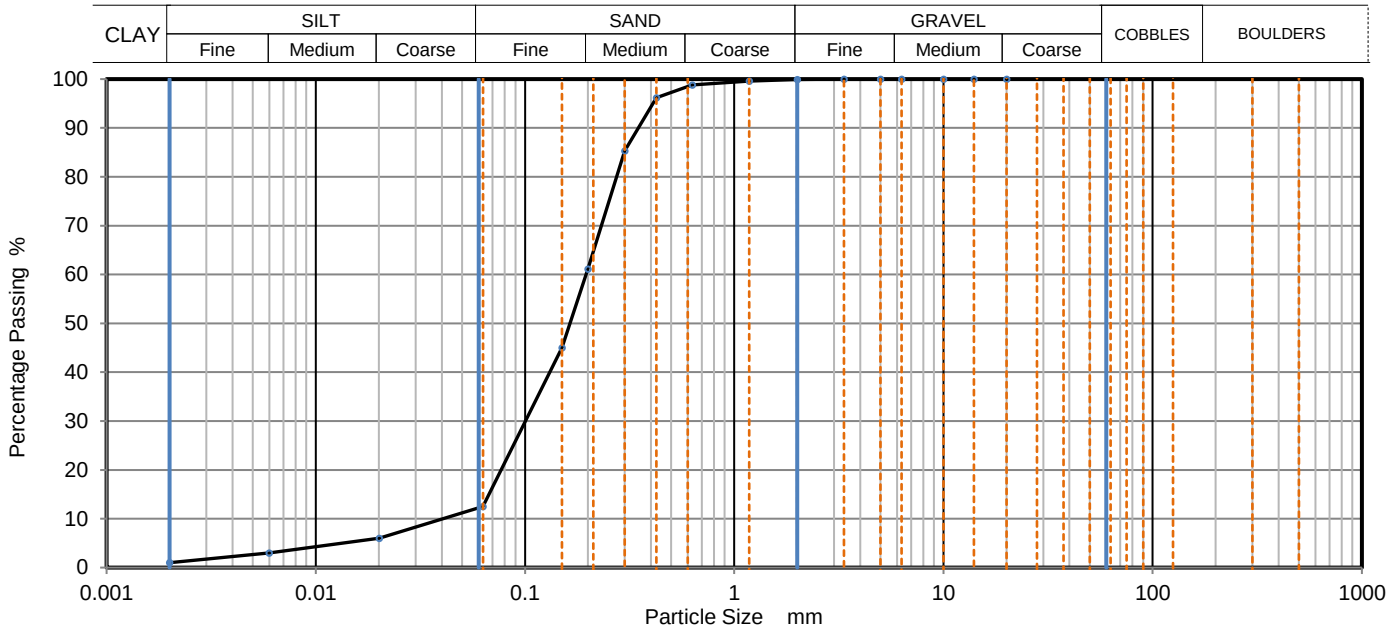
Laboratory Test Report	2230746AU / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

Client: Cadent **Page:** 3

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH037	0.70	B4	Wet Sieve + Pipette	Brown silty SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0201	6
		0.0060	3
		0.0020	1
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100	Particle density	(assumed)
1.18	100	2.65	Mg/m3
0.63	99		
0.425	96		
0.3	85		
0.2	61		
0.15	45		
0.063	13		

Dry Mass of sample, g	541

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	87
Silt	11
Clay	1

Grading Analysis		
D100	mm	3.35
D60	mm	0.196
D30	mm	0.1
D10	mm	0.0411
Uniformity Coefficient		4.8
Curvature Coefficient		1.3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test
BS EN 17892:Part4:2016, clause 5.4.2 Preparation of samples for pipette test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method
BS EN 17892:Part4:2016, clause 5.4.3 Determination of sedimentation by pipette method

UKAS TESTING
1464

Result reported relates only to the sample tested.

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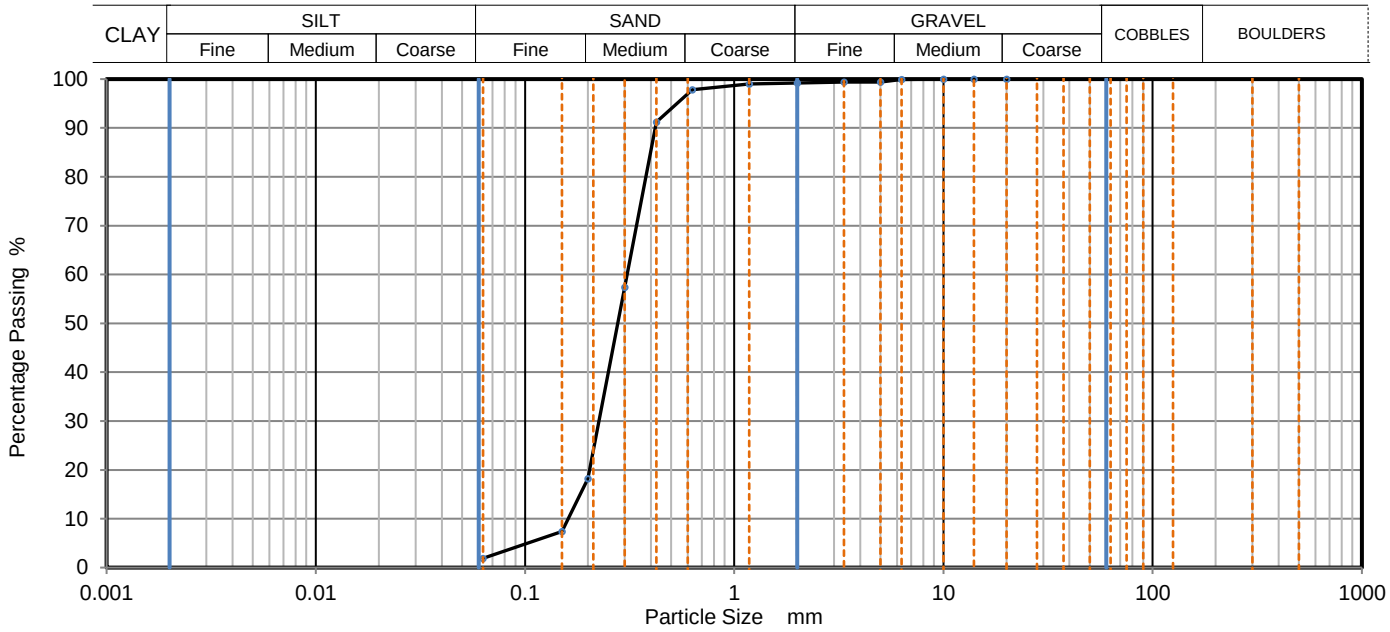
Laboratory Test Report	2230746AU / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

Client: Cadent **Page:** 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH037	2.20	B8	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	99		
1.18	99		
0.63	98		
0.425	91		
0.3	57		
0.2	18		
0.15	7		
0.063	2		

Dry Mass of sample, g	501

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	97
Fines <0.063mm	2

Grading Analysis		
D100	mm	10
D60	mm	0.308
D30	mm	0.226
D10	mm	0.161
Uniformity Coefficient		1.9
Curvature Coefficient		1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

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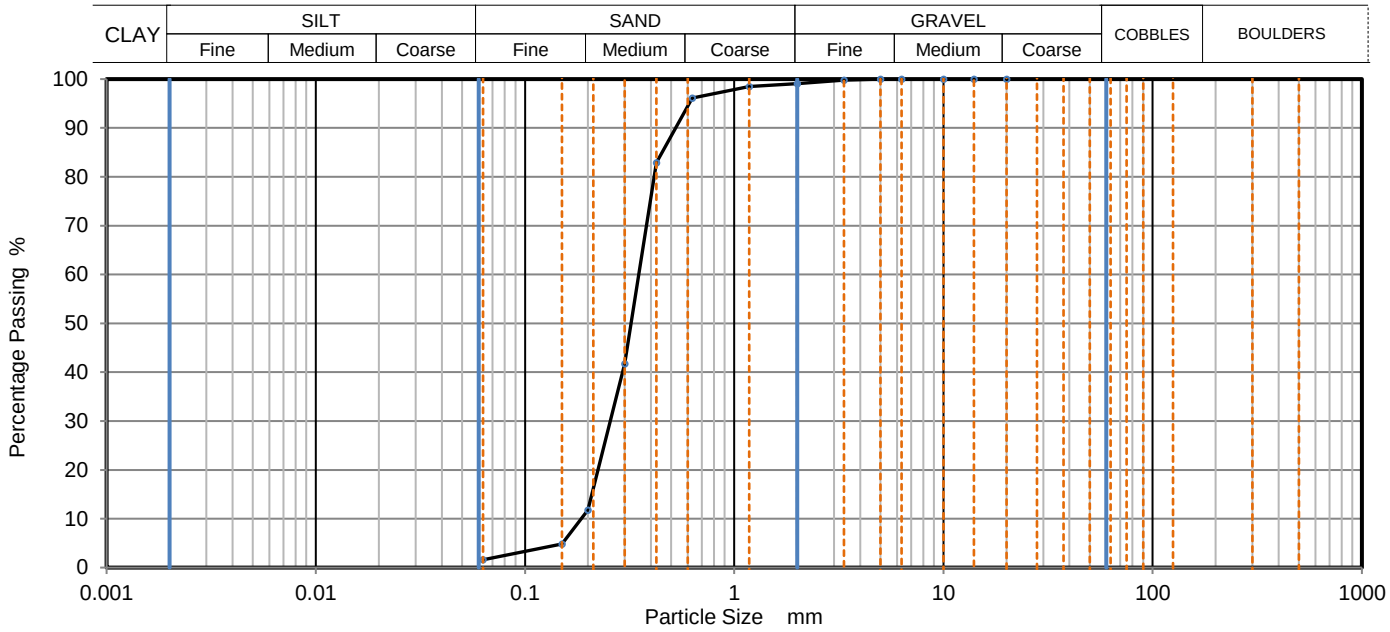
Laboratory Test Report 2230746AU / 1

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

Client: Cadent **Page:** 5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
BH037	3.40	B13	Wet Sieve	Brown SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.63	96		
0.425	83		
0.3	42		
0.2	12		
0.15	5		
0.063	2		

Dry Mass of sample, g: 504

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	98
Fines <0.063mm	2

Grading Analysis		
D100	mm	5
D60	mm	0.35
D30	mm	0.256
D10	mm	0.186
Uniformity Coefficient		1.9
Curvature Coefficient		1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Method of Preparation: BS EN 17892:Part4:2016, clause 5.2.2 Preparation of samples for wet sieving test

Method of Test: BS EN 17892:Part4:2016, clause 5.2.3 Determination of particle size distribution by wet sieving method

UKAS TESTING 1464

Result reported relates only to the sample tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

Client: Cadent **Page:** 6

ROCK INDEX TESTS - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock description / Rock type	Natural Water Content1 %	Caliper2 Dry density Mg/m3	Caliper2 Porosity %	Buoyancy3 Dry density Mg/m3	Buoyancy3 Porosity %	Natural Bulk density Mg/m3	Remarks
BH037	16.18	C27	Brown/Grey MUD/SILTSTONE	13.5						
BH037	17.00	C28	Red/Brown MUDSTONE	13.8						
BH037	17.50	C29	Brown/Grey MUD/SILTSTONE	10.1						
BH037	20.10	C30	Red/Brown SILTSTONE	11.8						
BH037	21.15	C31	Brown SANDSTONE	9.9						
BH037	23.00	C32	Red/Brown SILTSTONE	15.2						
BH037	34.50	C38	Red/Brown MUD/SILTSTONE	10.5						
BH037	36.35	C41	Red/Brown MUD/SILTSTONE	11.3						
BH037	38.00	C42	Red/Brown MUD/SILTSTONE	10.1						

Notes
1. ISRM p87 test 1, water content at 105 ± 3 oC, specimen as received at the laboratory
2. ISRM p87 test 2, Porosity/density determination using saturation and caliper
3. ISRM p88 test 3, Porosity/density determination using saturation and buoyancy
2/3. pore volume determined by water saturation

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007.
Part 1.1 Suggested method for determination of the water conrent of a rock sample

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

Client: Cadent **Page:** 7

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Hole No.	Depth m	Sample	Rock Type	Specimen Dimensions2			Bulk Density2	Water Content 1	Uniaxial Compression3				Remarks
				Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Stress Rate MPa/s	Mode of failure	UCS MPa	
BH037	16.18	C27	Brown/Grey MUD/SILTSTONE	85.5	80.0	*0.9	2.28	13.5	as received	0.4830	AC	3.4	
BH037	17.50	C29	Brown/Grey MUD/SILTSTONE	85.5	132.6	*1.6	2.29	10.1	as received	0.4825	AC	4.7	
BH037	20.10	C30	Red/Brown SILTSTONE	86.0	190.5	*2.2	2.29	11.8	as received	0.4996	AC	3.5	
BH037	21.15	C31	Brown SANDSTONE	85.9	258.4	3	2.30	9.9	as received	0.5005	AC	6.3	
BH037	23.00	C32	Red/Brown SILTSTONE	85.9	248.2	2.9	2.30	15.2	as received	0.5009	AC	4.2	

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

*Denotes length diameter ratio outside ISRM specification

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

Method of Preparation: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Method of Test: International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

Results reported relate only to the samples tested.

Site: HyNet North West - Hydrogen Pipeline **Job Number:** 2230746AU

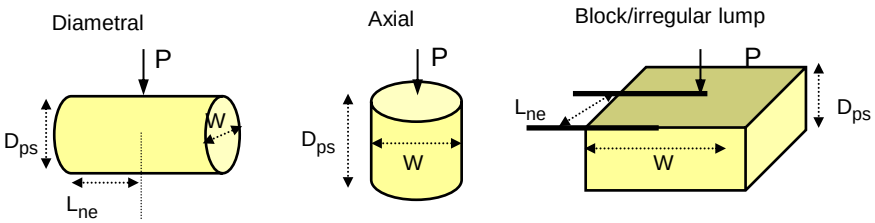
Client: Cadent **Page:** 8

Point Load Strength Index Tests
Summary of Results

Borehole No.	Depth m	Sample	Rock Type and Test condition	Test Type see ISRM: Type (D, A, I, B)	Test Type see ISRM: Direction (PL, PD or U)	Failure Valid (Y/N)	Dimensions: Lne mm	Dimensions: W mm	Dimensions: Dps mm	Dimensions: Dps' mm	Force P kN	Equivalent diameter, De mm	Point Load Strength Index: Is. MPa	Point Load Strength Index: Is(50) MPa	Remarks (including water content if measured)
BH037	17.00	C28	Red/Brown MUDSTONE As received	D	U	YES	17.7	86.2	86.2	80.2	0.2	86.2	0.03	0.04	
BH037	17.00	C28	Red/Brown MUDSTONE As received	A	U	YES		86.0	40.8	38.8	0.3	66.8	0.07	0.08	
BH037	34.50	C38	Red/Brown MUD/SILTSTONE As received	I	U	YES	40.7	82.05 49.10	32.0	29.0	0.1	51.7	0.04	0.04	
BH037	34.50	C38	Red/Brown MUD/SILTSTONE As received	I	U	YES	35.1	63.96 24.94	28.3	25.3	0.2	40.0	0.10	0.09	
BH037	36.35	C41	Red/Brown MUD/SILTSTONE As received	I	U	YES	42.0	83.67 86.47	24.4	22.4	0.2	51.4	0.09	0.09	
BH037	36.35	C41	Red/Brown MUD/SILTSTONE As received	I	U	YES	36.1	70.40 41.33	24.0	19.0	0.3	41.3	0.20	0.18	
BH037	38.00	C42	Red/Brown/Grey MUD/SILTSTONE As received	I	PL	YES	32.7	86.34 52.09	71.0	66.0	0.7	79.1	0.11	0.14	
BH037	38.00	C42	Red/Brown/Grey MUD/SILTSTONE As received	I	PD	YES	38.6	84.26 69.88	29.3	15.3	0.9	53.6	0.33	0.34	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
PL - Parallel to planes of weakness
PD - 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
Size factor, F = (De/50)0.45 for all tests.

Detailed legend for test and dimensions, based on ISRM



Method of Preparation: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Method of Test: ISRM 2007 Suggested method for point load strength index (pages 125 - 132)

Results reported relate only to the samples tested.

Final Test Report - 2230746AU / 1

Site:	HyNet North West - Hydrogen Pipeline
Job Number:	2230746AU
Originating Client:	Cadent

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Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 20/01/2023

Geotechnical Test Results - Chemical

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10560
Issue Number: 1 **Date:** 03 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746A
Order No: P7534138
Date Samples Received: 27/10/22
Date Instructions Received: 27/10/22
Date Analysis Completed: 03/11/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/10560

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746A

Lab Sample ID	22/10560/1	22/10560/2	22/10560/3					Units	Limit of Detection	Method ref
Client Sample No	4	9	14							
Client Sample ID	BH021	BH021	BH021							
Depth to Top	0.70	2.20	7.64							
Depth To Bottom										
Date Sampled	28-Sep-22	28-Sep-22								
Sample Type	Soil - B	Solid	Soil - C							
Sample Matrix Code	4A	7	5A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.77	9.52	8.60					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	12	<10	<10					mg/l	10	A-T-026s

REPORT NOTES

General

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The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746A

Project No: 22/10560

Date Received: 27/10/2022 (am)

Cool Box Temperatures (°C): 15.9

Lab Sample ID	22/10560/1	22/10560/3
Client Sample No	4	14
Client Sample ID/Depth	BH021 0.70m	BH021 7.64m
Date Sampled	28/09/22	
Deviation Code		
E (no date)		✓
F	✓	

Key

E (no date) *No sampling date provided (all results affected if not provided)*

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/10560/1
Client Sample No	4
Client Sample ID/Depth	BH021 0.70m
Date Sampled	28/09/22
Sulphate BRE (water sol 2:1)	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10560/1	22/10560/2	22/10560/3
Client Sample No	4	9	14
Client Sample ID/Depth	BH021 0.70m	BH021 2.20m	BH021 7.64m
Date Sampled	28/09/22	28/09/22	
A-T-026s	03/11/2022	03/11/2022	03/11/2022
A-T-031s	03/11/2022	03/11/2022	03/11/2022
A-T-044	02/11/2022	02/11/2022	02/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10568
Issue Number: 1 **Date:** 03 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746
Order No: P7534138
Date Samples Received: 27/10/22
Date Instructions Received: 27/10/22
Date Analysis Completed: 03/11/22

Approved by:



Richard Wong
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/10568

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746

Lab Sample ID	22/10568/1	22/10568/2						Units	Limit of Detection	Method ref
Client Sample No	10	20								
Client Sample ID	BH017	BH017								
Depth to Top	2.00	7.00								
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D	Soil - D								
Sample Matrix Code	3	3								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.06	8.40						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	34						mg/l	10	A-T-026s

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.
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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746

Project No: 22/10568

Date Received: 27/10/2022 (am)

Cool Box Temperatures (°C): 15.9

Lab Sample ID	22/10568/1	22/10568/2
Client Sample No	10	20
Client Sample ID/Depth	BH017 2.00m	BH017 7.00m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10568/1	22/10568/2
Client Sample No	10	20
Client Sample ID/Depth	BH017 2.00m	BH017 7.00m
Date Sampled		
A-T-026s	03/11/2022	03/11/2022
A-T-031s	02/11/2022	02/11/2022
A-T-044	02/11/2022	02/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10570
Issue Number: 1 **Date:** 03 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746B
Order No: P7534138
Date Samples Received: 27/10/22
Date Instructions Received: 27/10/22
Date Analysis Completed: 03/11/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/10570

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746B

Lab Sample ID	22/10570/1	22/10570/2						Units	Limit of Detection	Method ref
Client Sample No	10	13								
Client Sample ID	BH060	BH060								
Depth to Top	2.45	7.61								
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D	Soil - D								
Sample Matrix Code	5A	5A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.51	8.62						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	31	<10						mg/l	10	A-T-026s

REPORT NOTES

General

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746B

Project No: 22/10570

Date Received: 27/10/2022 (am)

Cool Box Temperatures (°C): 15.9

Lab Sample ID	22/10570/1	22/10570/2
Client Sample No	10	13
Client Sample ID/Depth	BH060 2.45m	BH060 7.61m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10570/1	22/10570/2
Client Sample No	10	13
Client Sample ID/Depth	BH060 2.45m	BH060 7.61m
Date Sampled		
A-T-026s	03/11/2022	03/11/2022
A-T-031s	02/11/2022	02/11/2022
A-T-044	02/11/2022	02/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10652
Issue Number: 1 **Date:** 08 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746H
Order No: P7534138
Date Samples Received: 31/10/22
Date Instructions Received: 31/10/22
Date Analysis Completed: 08/11/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/10652

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746H

Lab Sample ID	22/10652/1	22/10652/2	22/10652/3					Units	Limit of Detection	Method ref
Client Sample No	8	16	22							
Client Sample ID	BH114	BH114	BH114							
Depth to Top	1.80	5.00	8.20							
Depth To Bottom			8.65							
Date Sampled	29-Sep-22	29-Sep-22	29-Sep-22							
Sample Type	Soil - B	Soil - B	Soil - D							
Sample Matrix Code	4A	3	5A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.75	9.06	9.47					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	33	33					mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.7	0.9	-					% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746H

Project No: 22/10652

Date Received: 31/10/2022 (am)

Cool Box Temperatures (°C): 13.0

Lab Sample ID	22/10652/1	22/10652/2	22/10652/3
Client Sample No	8	16	22
Client Sample ID/Depth	BH114 1.80m	BH114 5.00m	BH114 8.20-8.65m
Date Sampled	29/09/22	29/09/22	29/09/22
Deviation Code			
F	✓	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/10652/1	22/10652/2	22/10652/3
Client Sample No	8	16	22
Client Sample ID/Depth	BH114 1.80m	BH114 5.00m	BH114 8.20-8.65m
Date Sampled	29/09/22	29/09/22	29/09/22
Organic Matter	✓	✓	
Sulphate BRE (water sol 2:1)	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10652/1	22/10652/2	22/10652/3
Client Sample No	8	16	22
Client Sample ID/Depth	BH114 1.80m	BH114 5.00m	BH114 8.20-8.65m
Date Sampled	29/09/22	29/09/22	29/09/22
A-T-026s	04/11/2022	04/11/2022	04/11/2022
A-T-031s	04/11/2022	04/11/2022	04/11/2022
A-T-032 OM	08/11/2022	08/11/2022	
A-T-044	04/11/2022	04/11/2022	04/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10654
Issue Number: 1 **Date:** 08 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746G
Order No: P7534138
Date Samples Received: 31/10/22
Date Instructions Received: 31/10/22
Date Analysis Completed: 08/11/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/10654

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746G

Lab Sample ID	22/10654/1	22/10654/2	22/10654/3					Units	Limit of Detection	Method ref
Client Sample No	8	15	19							
Client Sample ID	BH106	BH106	BH106							
Depth to Top	1.30	5.20	8.00							
Depth To Bottom										
Date Sampled	29-Sep-22	29-Sep-22	29-Sep-22							
Sample Type	Soil - B	Soil - B	Soil - UT							
Sample Matrix Code	5A	4	3							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.71	-	8.90					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	20	-	27					mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	1.0	0.8	-					% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746G

Project No: 22/10654

Date Received: 31/10/2022 (am)

Cool Box Temperatures (°C): 13.0

Lab Sample ID	22/10654/1	22/10654/2	22/10654/3
Client Sample No	8	15	19
Client Sample ID/Depth	BH106 1.30m	BH106 5.20m	BH106 8.00m
Date Sampled	29/09/22	29/09/22	29/09/22
Deviation Code			
F	✓	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/10654/1	22/10654/2	22/10654/3
Client Sample No	8	15	19
Client Sample ID/Depth	BH106 1.30m	BH106 5.20m	BH106 8.00m
Date Sampled	29/09/22	29/09/22	29/09/22
Sulphate BRE (water sol 2:1)	✓		✓
Organic Matter	✓	✓	

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10654/1	22/10654/2	22/10654/3
Client Sample No	8	15	19
Client Sample ID/Depth	BH106 1.30m	BH106 5.20m	BH106 8.00m
Date Sampled	29/09/22	29/09/22	29/09/22
A-T-026s	03/11/2022		03/11/2022
A-T-031s	03/11/2022		03/11/2022
A-T-032 OM	07/11/2022	08/11/2022	
A-T-044	04/11/2022	04/11/2022	04/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10815
Issue Number: 1 **Date:** 09 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746E
Order No: P7534138
Date Samples Received: 03/11/22
Date Instructions Received: 03/11/22
Date Analysis Completed: 09/11/22

Approved by:



Gemma Berrisford
Client Manager

Envirolab Job Number: 22/10815

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746E

Lab Sample ID	22/10815/1	22/10815/2	22/10815/3	22/10815/4				Units	Limit of Detection	Method ref
Client Sample No	11	19	27	32						
Client Sample ID	BH067	BH067	BH067	BH067						
Depth to Top	2.65	7.00	14.50	30.30						
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - C	Solid						
Sample Matrix Code	4A	4	5A	7						
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.41	-	9.70	10.75				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	139	-	11	16				mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.7	0.5	-	-				% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
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If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746E

Project No: 22/10815

Date Received: 03/11/2022 (am)

Cool Box Temperatures (°C): 9.3

Lab Sample ID	22/10815/1	22/10815/2	22/10815/3	22/10815/4
Client Sample No	11	19	27	32
Client Sample ID/Depth	BH067 2.65m	BH067 7.00m	BH067 14.50m	BH067 30.30m
Date Sampled				
Deviation Code				
E (no date)	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10815/1	22/10815/2	22/10815/3	22/10815/4
Client Sample No	11	19	27	32
Client Sample ID/Depth	BH067 2.65m	BH067 7.00m	BH067 14.50m	BH067 30.30m
Date Sampled				
A-T-026s	08/11/2022		08/11/2022	08/11/2022
A-T-031s	08/11/2022		08/11/2022	08/11/2022
A-T-032 OM	09/11/2022	09/11/2022		
A-T-044	04/11/2022	04/11/2022	04/11/2022	04/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10824
Issue Number: 1 **Date:** 08 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746I
Order No: P7534138
Date Samples Received: 03/11/22
Date Instructions Received: 03/11/22
Date Analysis Completed: 08/11/22

Approved by:



Richard Wong
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/10824

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746I

Lab Sample ID	22/10824/1	22/10824/2	22/10824/3					Units	Limit of Detection	Method ref
Client Sample No	9	17	21							
Client Sample ID	BH301	BH301	BH301							
Depth to Top	1.50	5.50	7.90							
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - D	Soil - C							
Sample Matrix Code	4A	4A	5A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.16	6.70	6.47					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	<10					mg/l	10	A-T-026s

REPORT NOTES

General

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746I

Project No: 22/10824

Date Received: 03/11/2022 (am)

Cool Box Temperatures (°C): 9.8

Lab Sample ID	22/10824/1	22/10824/2	22/10824/3
Client Sample No	9	17	21
Client Sample ID/Depth	BH301 1.50m	BH301 5.50m	BH301 7.90m
Date Sampled			
Deviation Code			
E (no date)	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10824/1	22/10824/2	22/10824/3
Client Sample No	9	17	21
Client Sample ID/Depth	BH301 1.50m	BH301 5.50m	BH301 7.90m
Date Sampled			
A-T-026s	08/11/2022	08/11/2022	08/11/2022
A-T-031s	08/11/2022	08/11/2022	08/11/2022
A-T-044	04/11/2022	04/11/2022	04/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10827
Issue Number: 1 **Date:** 09 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746D
Order No: P7534138
Date Samples Received: 03/11/22
Date Instructions Received: 03/11/22
Date Analysis Completed: 09/11/22

Approved by:



Gemma Berrisford
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/10827

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746D

Lab Sample ID	22/10827/1	22/10827/2	22/10827/3	22/10827/4				Units	Limit of Detection	Method ref
Client Sample No	7	13	21	24						
Client Sample ID	BH066	BH066	BH066	BH066						
Depth to Top	1.20	4.00	18.50	26.52						
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - C	Soil - C						
Sample Matrix Code	4	4	5A	5A						
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.96	8.57	9.41	9.56				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	208	<10	<10				mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.5	0.2	-	-				% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746D

Project No: 22/10827

Date Received: 03/11/2022 (am)

Cool Box Temperatures (°C): 9.8

Lab Sample ID	22/10827/1	22/10827/2	22/10827/3	22/10827/4
Client Sample No	7	13	21	24
Client Sample ID/Depth	BH066 1.20m	BH066 4.00m	BH066 18.50m	BH066 26.52m
Date Sampled				
Deviation Code				
E (no date)	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10827/1	22/10827/2	22/10827/3	22/10827/4
Client Sample No	7	13	21	24
Client Sample ID/Depth	BH066 1.20m	BH066 4.00m	BH066 18.50m	BH066 26.52m
Date Sampled				
A-T-026s	08/11/2022	08/11/2022	08/11/2022	08/11/2022
A-T-031s	08/11/2022	08/11/2022	08/11/2022	08/11/2022
A-T-032 OM	09/11/2022	09/11/2022		
A-T-044	04/11/2022	04/11/2022	04/11/2022	04/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10883
Issue Number: 1 **Date:** 09 November, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746F
Order No: P7534138
Date Samples Received: 03/11/22
Date Instructions Received: 04/11/22
Date Analysis Completed: 09/11/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/10883

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746F

Lab Sample ID	22/10883/1	22/10883/2	22/10883/3					Units	Limit of Detection	Method ref
Client Sample No	5	15	18							
Client Sample ID	BH094	BH094	BH094							
Depth to Top	0.50	5.90	9.70							
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - C	Soil - C							
Sample Matrix Code	4A	3	6A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.89	8.57	8.94					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	21	11					mg/l	10	A-T-026s

REPORT NOTES

General

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
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For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
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Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
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Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

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v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746F

Project No: 22/10883

Date Received: 04/11/2022 (am)

Cool Box Temperatures (°C): 9.4

Lab Sample ID	22/10883/1	22/10883/2	22/10883/3
Client Sample No	5	15	18
Client Sample ID/Depth	BH094 0.50m	BH094 5.90m	BH094 9.70m
Date Sampled			
Deviation Code			
E (no date)	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10883/1	22/10883/2	22/10883/3
Client Sample No	5	15	18
Client Sample ID/Depth	BH094 0.50m	BH094 5.90m	BH094 9.70m
Date Sampled			
A-T-026s	09/11/2022	09/11/2022	09/11/2022
A-T-031s	09/11/2022	09/11/2022	09/11/2022
A-T-044	09/11/2022	09/11/2022	09/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11485
Issue Number: 1 **Date:** 25 November, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746B
Order No: P7534138
Date Samples Received: 22/11/22
Date Instructions Received: 22/11/22
Date Analysis Completed: 25/11/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/11485

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746B

Lab Sample ID	22/11485/1							Units	Limit of Detection	Method ref
Client Sample No	7									
Client Sample ID	BH060									
Depth to Top	1.00									
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B									
Sample Matrix Code	4									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.27							pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10							mg/l	10	A-T-026s

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
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Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746B

Project No: 22/11485

Date Received: 22/11/2022 (pm)

Cool Box Temperatures (°C): 11.6

Lab Sample ID	22/11485/1
Client Sample No	7
Client Sample ID/Depth	BH060 1.00m
Date Sampled	
Deviation Code	
E (no date)	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11485/1
Client Sample No	7
Client Sample ID/Depth	BH060 1.00m
Date Sampled	
A-T-026s	24/11/2022
A-T-031s	24/11/2022
A-T-044	25/11/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

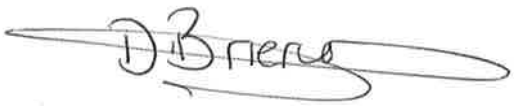
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11928
Issue Number: 1 **Date:** 14 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746T
Order No: P7534632
Date Samples Received: 06/12/22
Date Instructions Received: 06/12/22
Date Analysis Completed: 14/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/11928

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746T

Lab Sample ID	22/11928/1	22/11928/2	22/11928/3	22/11928/4				Units	Limit of Detection	Method ref
Client Sample No	2	5	7	10						
Client Sample ID	BH327	BH327	BH327	BH327						
Depth to Top	0.50	1.20	2.20	3.00						
Depth To Bottom										
Date Sampled	27-Oct-22	27-Oct-22	27-Oct-22	27-Oct-22						
Sample Type	Soil - B	Soil - B	Soil - B	Soil - D						
Sample Matrix Code	4AE	5A	4AE	4A						
% Stones >10mm$_A$	0.2	<0.1	<0.1	0.6				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.26	-	7.65	8.18				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	-	<10	<10				mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.4	0.3	0.2	-				% w/w	0.1	A-T-032 OM

REPORT NOTES

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Soil chemical analysis:
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TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
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Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/11928

Date Received: 06/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 6.3

Clients Project No: 2230746T

Lab Sample ID	22/11928/1	22/11928/2	22/11928/3	22/11928/4
Client Sample No	2	5	7	10
Client Sample ID/Depth	BH327 0.50m	BH327 1.20m	BH327 2.20m	BH327 3.00m
Date Sampled	27/10/22	27/10/22	27/10/22	27/10/22
Deviation Code				
F	✓	✓	✓	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11928/1	22/11928/2	22/11928/3	22/11928/4
Client Sample No	2	5	7	10
Client Sample ID/Depth	BH327 0.50m	BH327 1.20m	BH327 2.20m	BH327 3.00m
Date Sampled	27/10/22	27/10/22	27/10/22	27/10/22
Organic Matter	✓	✓	✓	
Sulphate BRE (water sol 2:1)	✓		✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11928/1	22/11928/2	22/11928/3	22/11928/4
Client Sample No	2	5	7	10
Client Sample ID/Depth	BH327 0.50m	BH327 1.20m	BH327 2.20m	BH327 3.00m
Date Sampled	27/10/22	27/10/22	27/10/22	27/10/22
A-T-026s	12/12/2022		12/12/2022	12/12/2022
A-T-031s	14/12/2022		14/12/2022	14/12/2022
A-T-032 OM	09/12/2022	09/12/2022	09/12/2022	
A-T-044	13/12/2022	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

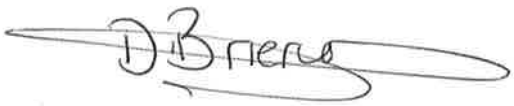
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11930
Issue Number: 1 **Date:** 14 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746U
Order No: P7534632
Date Samples Received: 06/12/22
Date Instructions Received: 06/12/22
Date Analysis Completed: 14/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/11930

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746U

Lab Sample ID	22/11930/1	22/11930/2	22/11930/3	22/11930/4				Units	Limit of Detection	Method ref
Client Sample No	5	7	13	15						
Client Sample ID	BH326	BH326	BH326	BH326						
Depth to Top	1.20	2.20	5.50	8.44						
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - C	Soil - C						
Sample Matrix Code	4	4	4A	4A						
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.26	6.99	5.41	6.71				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	<10	<10				mg/l	10	A-T-026s

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746U

Project No: 22/11930

Date Received: 06/12/2022 (am)

Cool Box Temperatures (°C): 6.3

Lab Sample ID	22/11930/1	22/11930/2	22/11930/3	22/11930/4
Client Sample No	5	7	13	15
Client Sample ID/Depth	BH326 1.20m	BH326 2.20m	BH326 5.50m	BH326 8.44m
Date Sampled				
Deviation Code				
E (no date)	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11930/1	22/11930/2	22/11930/3	22/11930/4
Client Sample No	5	7	13	15
Client Sample ID/Depth	BH326 1.20m	BH326 2.20m	BH326 5.50m	BH326 8.44m
Date Sampled				
A-T-026s	12/12/2022	12/12/2022	12/12/2022	12/12/2022
A-T-031s	14/12/2022	14/12/2022	14/12/2022	14/12/2022
A-T-044	13/12/2022	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

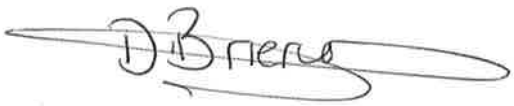
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11931
Issue Number: 1 **Date:** 14 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746X
Order No: P7534632
Date Samples Received: 06/12/22
Date Instructions Received: 06/12/22
Date Analysis Completed: 14/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/11931

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746X

Lab Sample ID	22/11931/1	22/11931/2						Units	Limit of Detection	Method ref
Client Sample No	1	3								
Client Sample ID	BH096	BH096								
Depth to Top	0.10	0.50								
Depth To Bottom										
Date Sampled	12-Oct-22	12-Oct-22								
Sample Type	Soil - B	Soil - B								
Sample Matrix Code	4A	4A								
% Stones >10mm$_A$	2.8	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.73	7.02						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10						mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	2.0	-						% w/w	0.1	A-T-032 OM

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/11931

Date Received: 06/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 6.3

Clients Project No: 2230746X

Lab Sample ID	22/11931/1	22/11931/2
Client Sample No	1	3
Client Sample ID/Depth	BH096 0.10m	BH096 0.50m
Date Sampled	12/10/22	12/10/22
Deviation Code		
F	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11931/1	22/11931/2
Client Sample No	1	3
Client Sample ID/Depth	BH096 0.10m	BH096 0.50m
Date Sampled	12/10/22	12/10/22
Organic Matter	✓	
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11931/1	22/11931/2
Client Sample No	1	3
Client Sample ID/Depth	BH096 0.10m	BH096 0.50m
Date Sampled	12/10/22	12/10/22
A-T-026s	12/12/2022	12/12/2022
A-T-031s	14/12/2022	14/12/2022
A-T-032 OM	09/12/2022	
A-T-044	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11991
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746V
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Gemma Berrisford
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/11991

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746V

Lab Sample ID	22/11991/1	22/11991/2	22/11991/3	22/11991/4	22/11991/5	22/11991/6		Units	Limit of Detection	Method ref
Client Sample No	7	11	14	18	27	34				
Client Sample ID	BH305	BH305	BH305	BH305	BH305	BH305				
Depth to Top	1.00	3.00	5.00	7.00	14.50	21.14				
Depth To Bottom										
Date Sampled					11-Nov-22					
Sample Type	Soil - B	Soil - D	Soil - D	Soil - B	Soil - D	Soil - C				
Sample Matrix Code	6A	3	3	3	3	6A				
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE$_D^{M\#}$	8.69	-	8.78	8.46	7.94	7.30		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	36	-	65	82	348	1500		mg/l	10	A-T-026s
Organic Matter$_D^{M\#}$	1.1	0.9	-	0.8	-	-		% w/w	0.1	A-T-032 OM

REPORT NOTES

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Soil chemical analysis:
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For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
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All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746V

Project No: 22/11991

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 2.7

Lab Sample ID	22/11991/1	22/11991/2	22/11991/3	22/11991/4	22/11991/5	22/11991/6
Client Sample No	7	11	14	18	27	34
Client Sample ID/Depth	BH305 1.00m	BH305 3.00m	BH305 5.00m	BH305 7.00m	BH305 14.50m	BH305 21.14m
Date Sampled					11/11/22	
Deviation Code						
E (no date)	✓	✓	✓	✓		✓
F					✓	

Key
E (no date) *No sampling date provided (all results affected if not provided)*
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11991/5
Client Sample No	27
Client Sample ID/Depth	BH305 14.50m
Date Sampled	11/11/22
Sulphate BRE (water sol 2:1)	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11991/1	22/11991/2	22/11991/3	22/11991/4	22/11991/5	22/11991/6
Client Sample No	7	11	14	18	27	34
Client Sample ID/Depth	BH305 1.00m	BH305 3.00m	BH305 5.00m	BH305 7.00m	BH305 14.50m	BH305 21.14m
Date Sampled					11/11/22	
A-T-026s	13/12/2022		13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-031s	13/12/2022		13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-032 OM	12/12/2022	12/12/2022		12/12/2022		
A-T-044	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11992
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746W
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Gemma Berrisford
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/11992

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746W

Lab Sample ID	22/11992/1	22/11992/2	22/11992/3	22/11992/4	22/11992/5	22/11992/6	22/11992/7	Units	Limit of Detection	Method ref
Client Sample No	3	6	10	15	30	45	49			
Client Sample ID	BH303	BH303	BH303	BH303	BH303	BH303	BH303			
Depth to Top	0.50	1.20	3.20	5.40	17.40	34.70	36.70			
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - B	Soil - B	Soil - C	Soil - C	Soil - C			
Sample Matrix Code	6A	4	4A	4A	6A	6A	6A			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH BRE$_D^{M\#}$	7.12	7.52	5.51	8.74	7.38	7.48	7.70	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	448	<10	<10	12	1530	1520	1060	mg/l	10	A-T-026s
Organic Matter$_D^{M\#}$	0.4	<0.1	<0.1	0.2	-	-	-	% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746W

Project No: 22/11992

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 2.7

Lab Sample ID	22/11992/1	22/11992/2	22/11992/3	22/11992/4	22/11992/5	22/11992/6	22/11992/7
Client Sample No	3	6	10	15	30	45	49
Client Sample ID/Depth	BH303 0.50m	BH303 1.20m	BH303 3.20m	BH303 5.40m	BH303 17.40m	BH303 34.70m	BH303 36.70m
Date Sampled							
Deviation Code							
E (no date)	✓	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11992/1	22/11992/2	22/11992/3	22/11992/4	22/11992/5	22/11992/6	22/11992/7
Client Sample No	3	6	10	15	30	45	49
Client Sample ID/Depth	BH303 0.50m	BH303 1.20m	BH303 3.20m	BH303 5.40m	BH303 17.40m	BH303 34.70m	BH303 36.70m
Date Sampled							
A-T-026s	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-031s	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-032 OM	12/12/2022	12/12/2022	12/12/2022	12/12/2022			
A-T-044	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11993
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746R
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Gemma Berrisford
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/11993

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746R

Lab Sample ID	22/11993/1	22/11993/2	22/11993/3					Units	Limit of Detection	Method ref
Client Sample No	3	4	8							
Client Sample ID	TP20	TP20	TP20							
Depth to Top	0.20	0.90	1.90							
Depth To Bottom										
Date Sampled	11-Nov-22	11-Nov-22	11-Nov-22							
Sample Type	Soil - B	Soil - B	Soil - D							
Sample Matrix Code	4A	4A	4							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.40	6.31	6.47					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	31	<10	26					mg/l	10	A-T-026s

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746R

Project No: 22/11993

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 3.9

Lab Sample ID	22/11993/1	22/11993/2	22/11993/3
Client Sample No	3	4	8
Client Sample ID/Depth	TP20 0.20m	TP20 0.90m	TP20 1.90m
Date Sampled	11/11/22	11/11/22	11/11/22
Deviation Code			
F	✓	✓	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11993/1	22/11993/2	22/11993/3
Client Sample No	3	4	8
Client Sample ID/Depth	TP20 0.20m	TP20 0.90m	TP20 1.90m
Date Sampled	11/11/22	11/11/22	11/11/22
Sulphate BRE (water sol 2:1)	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11993/1	22/11993/2	22/11993/3
Client Sample No	3	4	8
Client Sample ID/Depth	TP20 0.20m	TP20 0.90m	TP20 1.90m
Date Sampled	11/11/22	11/11/22	11/11/22
A-T-026s	13/12/2022	13/12/2022	13/12/2022
A-T-031s	13/12/2022	13/12/2022	13/12/2022
A-T-044	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11994
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: Hynet north West - Hydrogen Pipeline
Project Ref: 2230746AG
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Gemma Berrisford
Client Manager

Envirolab Job Number: 22/11994

Client Project Name: Hynet north West - Hydrogen Pipeline

Client Project Ref: 2230746AG

Lab Sample ID	22/11994/1	22/11994/2	22/11994/3	22/11994/4				Units	Limit of Detection	Method ref
Client Sample No	3	5	7	18						
Client Sample ID	BH300	BH300	BH300	BH300						
Depth to Top	0.50	1.50	2.50	8.75						
Depth To Bottom										
Date Sampled	21-Oct-22	21-Oct-22	21-Oct-22	21-Oct-22						
Sample Type	Soil - B	Soil - B	Soil - B	Soil - B						
Sample Matrix Code	4A	6A	4A	5A						
% Stones >10mm$_A$	<0.1	<0.1	5.3	<0.1				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.05	6.13	5.75	7.06				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	22	15	40				mg/l	10	A-T-026s

REPORT NOTES

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Soil chemical analysis:
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For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
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TPH analysis of water by method A-T-007:
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Electrical Conductivity of water by Method A-T-037:
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Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: Hynet north West - Hydrogen Pipeline

Clients Project No: 2230746AG

Project No: 22/11994

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 3.9

Lab Sample ID	22/11994/1	22/11994/2	22/11994/3	22/11994/4
Client Sample No	3	5	7	18
Client Sample ID/Depth	BH300 0.50m	BH300 1.50m	BH300 2.50m	BH300 8.75m
Date Sampled	21/10/22	21/10/22	21/10/22	21/10/22
Deviation Code				
F	✓	✓	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11994/1	22/11994/2	22/11994/3	22/11994/4
Client Sample No	3	5	7	18
Client Sample ID/Depth	BH300 0.50m	BH300 1.50m	BH300 2.50m	BH300 8.75m
Date Sampled	21/10/22	21/10/22	21/10/22	21/10/22
Sulphate BRE (water sol 2:1)	✓	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11994/1	22/11994/2	22/11994/3	22/11994/4
Client Sample No	3	5	7	18
Client Sample ID/Depth	BH300 0.50m	BH300 1.50m	BH300 2.50m	BH300 8.75m
Date Sampled	21/10/22	21/10/22	21/10/22	21/10/22
A-T-026s	13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-031s	13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-044	13/12/2022	13/12/2022	13/12/2022	13/12/2022

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End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11995
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746Y
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/11995

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746Y

Lab Sample ID	22/11995/1	22/11995/2	22/11995/3	22/11995/4				Units	Limit of Detection	Method ref
Client Sample No	5	17	24	30						
Client Sample ID	BH070	BH070	BH070	BH070						
Depth to Top	1.00	9.80	19.10	32.58						
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - C	Soil - C	Solid						
Sample Matrix Code	6A	4A	4A	7						
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	-	7.76	6.82	8.46				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	-	10	71	18				mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.8	-	-	-				% w/w	0.1	A-T-032 OM

REPORT NOTES

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Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746Y

Project No: 22/11995

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 2.6

Lab Sample ID	22/11995/1	22/11995/2	22/11995/3	22/11995/4
Client Sample No	5	17	24	30
Client Sample ID/Depth	BH070 1.00m	BH070 9.80m	BH070 19.10m	BH070 32.58m
Date Sampled				
Deviation Code				
E (no date)	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11995/1	22/11995/2	22/11995/3	22/11995/4
Client Sample No	5	17	24	30
Client Sample ID/Depth	BH070 1.00m	BH070 9.80m	BH070 19.10m	BH070 32.58m
Date Sampled				
A-T-026s		13/12/2022	13/12/2022	13/12/2022
A-T-031s		13/12/2022	13/12/2022	13/12/2022
A-T-032 OM	12/12/2022			
A-T-044	13/12/2022	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11996
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: Hynet North West - Hydrogen Pipeline
Project Ref: 2230746AF
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/11996

Client Project Name: Hynet North West - Hydrogen Pipeline

Client Project Ref: 2230746AF

Lab Sample ID	22/11996/1	22/11996/2						Units	Limit of Detection	Method ref
Client Sample No	8	13								
Client Sample ID	BH329	BH329								
Depth to Top	2.00	7.50								
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D	Soil - C								
Sample Matrix Code	6A	1A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.65	8.90						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	55	178						mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.3	-						% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
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Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
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Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: Hynet North West - Hydrogen Pipeline

Clients Project No: 2230746AF

Project No: 22/11996

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 2.6

Lab Sample ID	22/11996/1	22/11996/2
Client Sample No	8	13
Client Sample ID/Depth	BH329 2.00m	BH329 7.50m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11996/1	22/11996/2
Client Sample No	8	13
Client Sample ID/Depth	BH329 2.00m	BH329 7.50m
Date Sampled		
A-T-026s	13/12/2022	13/12/2022
A-T-031s	13/12/2022	13/12/2022
A-T-032 OM	12/12/2022	
A-T-044	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11998
Issue Number: 1 **Date:** 13 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AH
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 07/12/22
Date Analysis Completed: 13/12/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/11998

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AH

Lab Sample ID	22/11998/1	22/11998/2	22/11998/3					Units	Limit of Detection	Method ref
Client Sample No	5	8	10							
Client Sample ID	BH097	BH097	BH097							
Depth to Top	1.50	5.20	10.50							
Depth To Bottom										
Date Sampled	17-Oct-22									
Sample Type	Soil - B	Soil - C	Soil - C							
Sample Matrix Code	5A	1A	6A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.34	8.96	8.79					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	<10					mg/l	10	A-T-026s

REPORT NOTES

General

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The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AH

Project No: 22/11998

Date Received: 07/12/2022 (am)

Cool Box Temperatures (°C): 2.6

Lab Sample ID	22/11998/1	22/11998/2	22/11998/3
Client Sample No	5	8	10
Client Sample ID/Depth	BH097 1.50m	BH097 5.20m	BH097 10.50m
Date Sampled	17/10/22		
Deviation Code			
E (no date)		✓	✓
F	✓		

Key
E (no date) *No sampling date provided (all results affected if not provided)*
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11998/1
Client Sample No	5
Client Sample ID/Depth	BH097 1.50m
Date Sampled	17/10/22
Sulphate BRE (water sol 2:1)	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11998/1	22/11998/2	22/11998/3
Client Sample No	5	8	10
Client Sample ID/Depth	BH097 1.50m	BH097 5.20m	BH097 10.50m
Date Sampled	17/10/22		
A-T-026s	13/12/2022	13/12/2022	13/12/2022
A-T-031s	13/12/2022	13/12/2022	13/12/2022
A-T-044	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12043
Issue Number: 1 **Date:** 14 December, 2022

Client:
Ian Farmer Associates (Newcastle)
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart; washington@ianfarmer.co.uk
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746S
Order No: P7534632
Date Samples Received: 07/12/22
Date Instructions Received: 08/12/22
Date Analysis Completed: 14/12/22

Approved by:

Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12043

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746S

Lab Sample ID	22/12043/1	22/12043/2	22/12043/3					Units	Limit of Detection	Method ref
Client Sample No	1	4	10							
Client Sample ID	TP12	TP12	TP12							
Depth to Top	0.10	0.40	2.40							
Depth To Bottom										
Date Sampled	16-Nov-22	16-Nov-22	16-Nov-22							
Sample Type	Soil - B	Soil - B	Soil - B							
Sample Matrix Code	4A	6AE	6A							
% Stones >10mm$_A$	22.6	<0.1	2.7					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.96	8.49	8.77					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	31					mg/l	10	A-T-026s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
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The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle), Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746S

Project No: 22/12043

Date Received: 08/12/2022 (am)

Cool Box Temperatures (°C): 3.9

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12043/1	22/12043/2	22/12043/3
Client Sample No	1	4	10
Client Sample ID/Depth	TP12 0.10m	TP12 0.40m	TP12 2.40m
Date Sampled	16/11/22	16/11/22	16/11/22
A-T-026s	13/12/2022	13/12/2022	13/12/2022
A-T-031s	14/12/2022	14/12/2022	14/12/2022
A-T-044	13/12/2022	13/12/2022	13/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

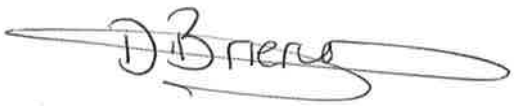
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12082
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746Z
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12082

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746Z

Lab Sample ID	22/12082/1	22/12082/2	22/12082/3	22/12082/4	22/12082/5	22/12082/6	22/12082/7	Units	Limit of Detection	Method ref
Client Sample No	3	17	18	10	11	16	32			
Client Sample ID	BH042	BH042	BH042	BH042	BH042	BH042	BH042			
Depth to Top	0.50	1.20	3.20	6.00	7.50	14.70	24.00			
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - B	Soil - D	Soil - D	Soil - D	Soil - C			
Sample Matrix Code	4A	4A	4A	6A	3	4A	6A			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.50	7.48	8.47	-	8.51	7.96	8.08	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	270	30	14	-	21	1550	1520	mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.3	0.2	<0.1	0.9	-	-	-	% w/w	0.1	A-T-032 OM

Envirolab Job Number: 22/12082

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746Z

Lab Sample ID	22/12082/8	22/12082/9						Units	Limit of Detection	Method ref
Client Sample No	40	46								
Client Sample ID	BH042	BH042								
Depth to Top	36.26	44.65								
Depth To Bottom										
Date Sampled		21-Nov-22								
Sample Type	Soil - C	Soil - D								
Sample Matrix Code	6A	6A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.14	8.22						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	1560	1530						mg/l	10	A-T-026s

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12082

Date Received: 09/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 0.4

Clients Project No: 2230746Z

Lab Sample ID	22/12082/1	22/12082/2	22/12082/3	22/12082/4	22/12082/5	22/12082/6	22/12082/7	22/12082/8
Client Sample No	3	17	18	10	11	16	32	40
Client Sample ID/Depth	BH042 0.50m	BH042 1.20m	BH042 3.20m	BH042 6.00m	BH042 7.50m	BH042 14.70m	BH042 24.00m	BH042 36.26m
Date Sampled								
Deviation Code								
E (no date)	✓	✓	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12082/1	22/12082/2	22/12082/3	22/12082/4	22/12082/5	22/12082/6	22/12082/7	22/12082/8	22/12082/9
Client Sample No	3	17	18	10	11	16	32	40	46
Client Sample ID/Depth	BH042 0.50m	BH042 1.20m	BH042 3.20m	BH042 6.00m	BH042 7.50m	BH042 14.70m	BH042 24.00m	BH042 36.26m	BH042 44.65m
Date Sampled									21/11/22
A-T-026s	14/12/2022	14/12/2022	14/12/2022		14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022	15/12/2022		15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-032 OM	15/12/2022	15/12/2022	15/12/2022	15/12/2022					
A-T-044	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

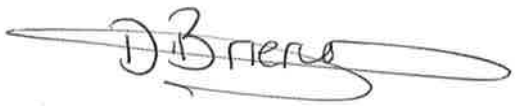
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12085
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AC
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12085

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AC

Lab Sample ID	22/12085/1	22/12085/2						Units	Limit of Detection	Method ref
Client Sample No	4	9								
Client Sample ID	ATP24	ATP24								
Depth to Top	0.50	1.90								
Depth To Bottom										
Date Sampled	11-Nov-22	11-Nov-22								
Sample Type	Soil	Soil								
Sample Matrix Code	5A	4A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.17	7.31						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10						mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	1.3	0.6						% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12085

Date Received: 09/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 1.9

Clients Project No: 2230746AC

Lab Sample ID	22/12085/1	22/12085/2
Client Sample No	4	9
Client Sample ID/Depth	ATP24 0.50m	ATP24 1.90m
Date Sampled	11/11/22	11/11/22
Deviation Code		
F	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12085/1	22/12085/2
Client Sample No	4	9
Client Sample ID/Depth	ATP24 0.50m	ATP24 1.90m
Date Sampled	11/11/22	11/11/22
Organic Matter	✓	✓
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12085/1	22/12085/2
Client Sample No	4	9
Client Sample ID/Depth	ATP24 0.50m	ATP24 1.90m
Date Sampled	11/11/22	11/11/22
A-T-026s	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022
A-T-032 OM	13/12/2022	13/12/2022
A-T-044	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

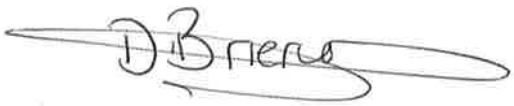
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12087
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AD
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/12087

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AD

Lab Sample ID	22/12087/1	22/12087/2						Units	Limit of Detection	Method ref
Client Sample No	4	9								
Client Sample ID	ATP23	ATP23								
Depth to Top	0.50	1.20								
Depth To Bottom										
Date Sampled	09-Nov-22	09-Nov-22								
Sample Type	Soil	Soil								
Sample Matrix Code	4A	4A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.13	7.20						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10						mg/l	10	A-T-026s

REPORT NOTES

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TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12087

Date Received: 09/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 1.9

Clients Project No: 2230746AD

Lab Sample ID	22/12087/1	22/12087/2
Client Sample No	4	9
Client Sample ID/Depth	ATP23 0.50m	ATP23 1.20m
Date Sampled	09/11/22	09/11/22
Deviation Code		
F	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12087/1	22/12087/2
Client Sample No	4	9
Client Sample ID/Depth	ATP23 0.50m	ATP23 1.20m
Date Sampled	09/11/22	09/11/22
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12087/1	22/12087/2
Client Sample No	4	9
Client Sample ID/Depth	ATP23 0.50m	ATP23 1.20m
Date Sampled	09/11/22	09/11/22
A-T-026s	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

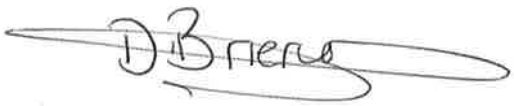
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12089
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746N
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12089

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746N

Lab Sample ID	22/12089/1	22/12089/2	22/12089/3	22/12089/4				Units	Limit of Detection	Method ref
Client Sample No	4	6	8	10						
Client Sample ID	WS34	WS34	WS34	WS34						
Depth to Top	0.60	1.70	2.00	3.00						
Depth To Bottom										
Date Sampled	16-Nov-22	16-Nov-22	16-Nov-22	16-Nov-22						
Sample Type	Soil - B	Soil - B	Soil - B	Soil - B						
Sample Matrix Code	5A	3	3	3						
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.02	8.53	-	8.79				pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	-	<10				mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.8	0.8	1.0	-				% w/w	0.1	A-T-032 OM

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746N

Project No: 22/12089

Date Received: 09/12/2022 (am)

Cool Box Temperatures (°C): 1.8

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12089/1	22/12089/2	22/12089/3	22/12089/4
Client Sample No	4	6	8	10
Client Sample ID/Depth	WS34 0.60m	WS34 1.70m	WS34 2.00m	WS34 3.00m
Date Sampled	16/11/22	16/11/22	16/11/22	16/11/22
A-T-026s	14/12/2022	14/12/2022		14/12/2022
A-T-031s	15/12/2022	15/12/2022		15/12/2022
A-T-032 OM	13/12/2022	13/12/2022	13/12/2022	
A-T-044	16/12/2022	16/12/2022	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

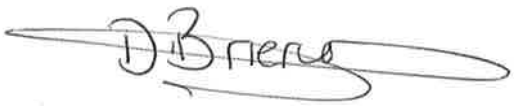
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12091
Issue Number: 1 **Date:** 20 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AI
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 20/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12091

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AI

Lab Sample ID	22/12091/1	22/12091/2	22/12091/3					Units	Limit of Detection	Method ref
Client Sample No	4	14	25							
Client Sample ID	BH036	BH036	BH036							
Depth to Top	0.80	5.00	15.50							
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - D							
Sample Matrix Code	4AB	4A	4A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.15	8.82	8.75					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	15					mg/l	10	A-T-026s
Sulphate BRE (acid sol)$_D$$^{M\#}$	0.03	<0.02	-					% w/w	0.02	A-T-028s
Sulphur BRE (total)$_D$	0.02	<0.01	-					% w/w	0.01	A-T-024s

REPORT NOTES

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Soil chemical analysis:
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For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
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Asbestos:
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Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AI

Project No: 22/12091

Date Received: 09/12/2022 (am)

Cool Box Temperatures (°C): 1.9

Lab Sample ID	22/12091/1	22/12091/2	22/12091/3
Client Sample No	4	14	25
Client Sample ID/Depth	BH036 0.80m	BH036 5.00m	BH036 15.50m
Date Sampled			
Deviation Code			
E (no date)	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12091/1	22/12091/2	22/12091/3
Client Sample No	4	14	25
Client Sample ID/Depth	BH036 0.80m	BH036 5.00m	BH036 15.50m
Date Sampled			
A-T-024s	14/12/2022	19/12/2022	
A-T-026s	14/12/2022	14/12/2022	14/12/2022
A-T-028s	15/12/2022	20/12/2022	
A-T-031s	15/12/2022	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

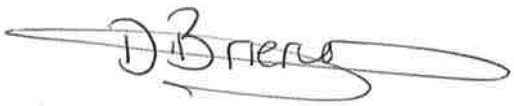
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12092
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746Q
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12092

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746Q

Lab Sample ID	22/12092/1	22/12092/2						Units	Limit of Detection	Method ref
Client Sample No	3	10								
Client Sample ID	WS10	WS10								
Depth to Top	0.80	2.30								
Depth To Bottom										
Date Sampled	07-Nov-22	07-Nov-22								
Sample Type	Soil - B	Soil - B								
Sample Matrix Code	4A	6A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.46	5.94						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10						mg/l	10	A-T-026s

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TPH analysis of water by method A-T-007:
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Asbestos:
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Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
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Superscript "M" indicates method accredited to MCERTS.
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12092

Date Received: 09/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 1.5

Clients Project No: 2230746Q

Lab Sample ID	22/12092/1	22/12092/2
Client Sample No	3	10
Client Sample ID/Depth	WS10 0.80m	WS10 2.30m
Date Sampled	07/11/22	07/11/22
Deviation Code		
F	✓	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12092/1	22/12092/2
Client Sample No	3	10
Client Sample ID/Depth	WS10 0.80m	WS10 2.30m
Date Sampled	07/11/22	07/11/22
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12092/1	22/12092/2
Client Sample No	3	10
Client Sample ID/Depth	WS10 0.80m	WS10 2.30m
Date Sampled	07/11/22	07/11/22
A-T-026s	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

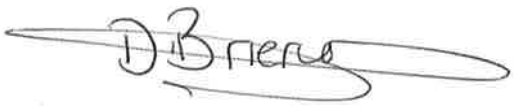
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12094
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AJ
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12094

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AJ

Lab Sample ID	22/12094/1	22/12094/2	22/12094/3					Units	Limit of Detection	Method ref
Client Sample No	28	15	20							
Client Sample ID	BH033	BH033	BH033							
Depth to Top	0.80	3.00	9.20							
Depth To Bottom										
Date Sampled		19-Oct-22	19-Oct-22							
Sample Type	Soil - B	Soil - B	Soil - B							
Sample Matrix Code	4A	4	4A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.76	7.64	9.06					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	19	<10	<10					mg/l	10	A-T-026s

REPORT NOTES

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Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
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Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12094

Date Received: 09/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 1.5

Clients Project No: 2230746AJ

Lab Sample ID	22/12094/1	22/12094/2	22/12094/3
Client Sample No	28	15	20
Client Sample ID/Depth	BH033 0.80m	BH033 3.00m	BH033 9.20m
Date Sampled		19/10/22	19/10/22
Deviation Code			
E (no date)	✓		
F		✓	✓

Key

E (no date) *No sampling date provided (all results affected if not provided)*

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12094/2	22/12094/3
Client Sample No	15	20
Client Sample ID/Depth	BH033 3.00m	BH033 9.20m
Date Sampled	19/10/22	19/10/22
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12094/1	22/12094/2	22/12094/3
Client Sample No	28	15	20
Client Sample ID/Depth	BH033 0.80m	BH033 3.00m	BH033 9.20m
Date Sampled		19/10/22	19/10/22
A-T-026s	14/12/2022	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

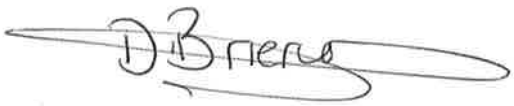
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12095
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AE
Order No: P7534635
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12095

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AE

Lab Sample ID	22/12095/1	22/12095/2						Units	Limit of Detection	Method ref
Client Sample No	12	16								
Client Sample ID	BH330	BH330								
Depth to Top	1.20	6.80								
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - C								
Sample Matrix Code	4	4A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.07	8.09						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10						mg/l	10	A-T-026s

REPORT NOTES

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Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

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Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AE

Project No: 22/12095

Date Received: 09/12/2022 (am)

Cool Box Temperatures (°C): 1.9

Lab Sample ID	22/12095/1	22/12095/2
Client Sample No	12	16
Client Sample ID/Depth	BH330 1.20m	BH330 6.80m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12095/1	22/12095/2
Client Sample No	12	16
Client Sample ID/Depth	BH330 1.20m	BH330 6.80m
Date Sampled		
A-T-026s	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

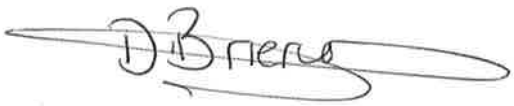
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12097
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AA
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12097

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AA

Lab Sample ID	22/12097/1	22/12097/2						Units	Limit of Detection	Method ref
Client Sample No	1	4								
Client Sample ID	BH040	BH040								
Depth to Top	0.00	1.20								
Depth To Bottom										
Date Sampled	11-Nov-22	11-Nov-22								
Sample Type	Soil - B	Soil - B								
Sample Matrix Code	5A	3								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
Organic Matter$_D^{M\#}$	2.9	0.9						% w/w	0.1	A-T-032 OM

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
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Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
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EPH CWG GCxGC ID from TPH CWG

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v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12097

Date Received: 09/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 1.9

Clients Project No: 2230746AA

Lab Sample ID	22/12097/1	22/12097/2
Client Sample No	1	4
Client Sample ID/Depth	BH040 0.00m	BH040 1.20m
Date Sampled	11/11/22	11/11/22
Deviation Code		
F	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12097/1	22/12097/2
Client Sample No	1	4
Client Sample ID/Depth	BH040 0.00m	BH040 1.20m
Date Sampled	11/11/22	11/11/22
Organic Matter	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12097/1	22/12097/2
Client Sample No	1	4
Client Sample ID/Depth	BH040 0.00m	BH040 1.20m
Date Sampled	11/11/22	11/11/22
A-T-032 OM	14/12/2022	14/12/2022
A-T-044	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

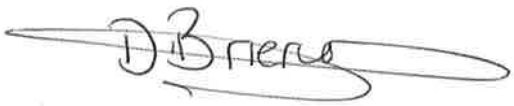
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12098
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AK
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12098

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AK

Lab Sample ID	22/12098/1	22/12098/2						Units	Limit of Detection	Method ref
Client Sample No	5	12								
Client Sample ID	BH002	BH002								
Depth to Top	0.90	5.25								
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - C								
Sample Matrix Code	4A	4A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.26	8.69						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	28	14						mg/l	10	A-T-026s

REPORT NOTES

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TPH analysis of water by method A-T-007:
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AK

Project No: 22/12098

Date Received: 09/12/2022 (am)

Cool Box Temperatures (°C): 1.9

Lab Sample ID	22/12098/1	22/12098/2
Client Sample No	5	12
Client Sample ID/Depth	BH002 0.90m	BH002 5.25m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

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Envirolab Analysis Dates

Lab Sample ID	22/12098/1	22/12098/2
Client Sample No	5	12
Client Sample ID/Depth	BH002 0.90m	BH002 5.25m
Date Sampled		
A-T-026s	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

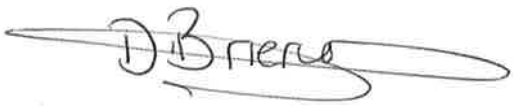
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12099
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746J
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12099

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746J

Lab Sample ID	22/12099/1	22/12099/2	22/12099/3	22/12099/4	22/12099/5	22/12099/6		Units	Limit of Detection	Method ref
Client Sample No	3	6	12	16	20	24				
Client Sample ID	BH206	BH206	BH206	BH206	BH206	BH206				
Depth to Top	0.40	0.90	4.00	16.72	25.95	33.40				
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - C	Soil - C	Soil - C	Soil - C				
Sample Matrix Code	4A	4A	6A	5A	4A	6A				
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	6.57	6.95	8.76	8.64	8.40	8.41		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	<10	11	<10	71		mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	1.0	0.2	-	-	-	-		% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746J

Project No: 22/12099

Date Received: 09/12/2022 (am)

Cool Box Temperatures (°C): 1.8

Lab Sample ID	22/12099/1	22/12099/2	22/12099/3	22/12099/4	22/12099/5	22/12099/6
Client Sample No	3	6	12	16	20	24
Client Sample ID/Depth	BH206 0.40m	BH206 0.90m	BH206 4.00m	BH206 16.72m	BH206 25.95m	BH206 33.40m
Date Sampled						
Deviation Code						
E (no date)	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12099/1	22/12099/2	22/12099/3	22/12099/4	22/12099/5	22/12099/6
Client Sample No	3	6	12	16	20	24
Client Sample ID/Depth	BH206 0.40m	BH206 0.90m	BH206 4.00m	BH206 16.72m	BH206 25.95m	BH206 33.40m
Date Sampled						
A-T-026s	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-032 OM	13/12/2022	13/12/2022				
A-T-044	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

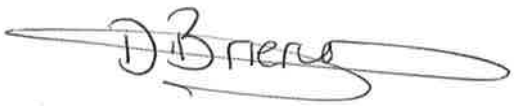
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12112
Issue Number: 1 **Date:** 16 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AB
Order No: P7534632
Date Samples Received: 09/12/22
Date Instructions Received: 09/12/22
Date Analysis Completed: 16/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12112

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AB

Lab Sample ID	22/12112/1	22/12112/2	22/12112/3					Units	Limit of Detection	Method ref
Client Sample No	4	7	10							
Client Sample ID	ATP41	ATP41	ATP41							
Depth to Top	0.40	1.40	2.40							
Depth To Bottom										
Date Sampled										
Sample Type	Soil	Soil - B	Soil							
Sample Matrix Code	6A	6A	6A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.53	8.56	8.33					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	67	45	159					mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	0.7	0.8	1.0					% w/w	0.1	A-T-032 OM

REPORT NOTES

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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AB

Project No: 22/12112

Date Received: 09/12/2022 (am)

Cool Box Temperatures (°C): 1.8

Lab Sample ID	22/12112/1	22/12112/2	22/12112/3
Client Sample No	4	7	10
Client Sample ID/Depth	ATP41 0.40m	ATP41 1.40m	ATP41 2.40m
Date Sampled			
Deviation Code			
E (no date)	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12112/1	22/12112/2	22/12112/3
Client Sample No	4	7	10
Client Sample ID/Depth	ATP41 0.40m	ATP41 1.40m	ATP41 2.40m
Date Sampled			
A-T-026s	14/12/2022	14/12/2022	14/12/2022
A-T-031s	15/12/2022	15/12/2022	15/12/2022
A-T-032 OM	15/12/2022	15/12/2022	15/12/2022
A-T-044	16/12/2022	16/12/2022	16/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12205
Issue Number: 1 **Date:** 19 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746O
Order No: P7534632
Date Samples Received: 13/12/22
Date Instructions Received: 13/12/22
Date Analysis Completed: 19/12/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/12205

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746O

Lab Sample ID	22/12205/1	22/12205/2						Units	Limit of Detection	Method ref
Client Sample No	3	7								
Client Sample ID	WS33	WS33								
Depth to Top	0.30	1.40								
Depth To Bottom										
Date Sampled	14-Nov-22	14-Nov-22								
Sample Type	Soil - B	Soil - B								
Sample Matrix Code	4	4E								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.78	8.16						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	24	47						mg/l	10	A-T-026s

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12205

Date Received: 13/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 3.8

Clients Project No: 2230746O

Lab Sample ID	22/12205/1	22/12205/2
Client Sample No	3	7
Client Sample ID/Depth	WS33 0.30m	WS33 1.40m
Date Sampled	14/11/22	14/11/22
Deviation Code		
F	✓	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12205/1	22/12205/2
Client Sample No	3	7
Client Sample ID/Depth	WS33 0.30m	WS33 1.40m
Date Sampled	14/11/22	14/11/22
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12205/1	22/12205/2
Client Sample No	3	7
Client Sample ID/Depth	WS33 0.30m	WS33 1.40m
Date Sampled	14/11/22	14/11/22
A-T-026s	19/12/2022	19/12/2022
A-T-031s	19/12/2022	19/12/2022
A-T-044	19/12/2022	19/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12206
Issue Number: 1 **Date:** 21 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746P
Order No: P7534632
Date Samples Received: 13/12/22
Date Instructions Received: 13/12/22
Date Analysis Completed: 20/12/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/12206

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746P

Lab Sample ID	22/12206/1	22/12206/2						Units	Limit of Detection	Method ref
Client Sample No	3	5								
Client Sample ID	WS32	WS32								
Depth to Top	0.30	1.20								
Depth To Bottom										
Date Sampled	14-Nov-22	14-Nov-22								
Sample Type	Soil - B	Soil - B								
Sample Matrix Code	4AE	1								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	4.65	6.79						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	224	74						mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	1.8	<0.1						% w/w	0.1	A-T-032 OM

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746P

Project No: 22/12206

Date Received: 13/12/2022 (am)

Cool Box Temperatures (°C): 3.8

Lab Sample ID	22/12206/1	22/12206/2
Client Sample No	3	5
Client Sample ID/Depth	WS32 0.30m	WS32 1.20m
Date Sampled	14/11/22	14/11/22
Deviation Code		
F	✓	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/12206/1	22/12206/2
Client Sample No	3	5
Client Sample ID/Depth	WS32 0.30m	WS32 1.20m
Date Sampled	14/11/22	14/11/22
Organic Matter	✓	✓
Sulphate BRE (water sol 2:1)	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12206/1	22/12206/2
Client Sample No	3	5
Client Sample ID/Depth	WS32 0.30m	WS32 1.20m
Date Sampled	14/11/22	14/11/22
A-T-026s	19/12/2022	19/12/2022
A-T-031s	20/12/2022	20/12/2022
A-T-032 OM	20/12/2022	20/12/2022
A-T-044	19/12/2022	19/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

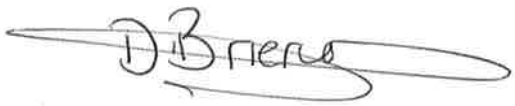
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12358
Issue Number: 1 **Date:** 22 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AL
Order No: P7534730
Date Samples Received: 16/12/22
Date Instructions Received: 16/12/22
Date Analysis Completed: 22/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12358

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AL

Lab Sample ID	22/12358/1	22/12358/2	22/12358/3					Units	Limit of Detection	Method ref
Client Sample No	7	10	14							
Client Sample ID	BH338	BH338	BH338							
Depth to Top	0.80	1.20	3.40							
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - D	Soil - B							
Sample Matrix Code	4AE	5A	5A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.41	7.72	-					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	12	36	-					mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	1.1	0.8	1.7					% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
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NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AL

Project No: 22/12358

Date Received: 16/12/2022 (am)

Cool Box Temperatures (°C): .4

Lab Sample ID	22/12358/1	22/12358/2	22/12358/3
Client Sample No	7	10	14
Client Sample ID/Depth	BH338 0.80m	BH338 1.20m	BH338 3.40m
Date Sampled			
Deviation Code			
E (no date)	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12358/1	22/12358/2	22/12358/3
Client Sample No	7	10	14
Client Sample ID/Depth	BH338 0.80m	BH338 1.20m	BH338 3.40m
Date Sampled			
A-T-026s	22/12/2022	22/12/2022	
A-T-031s	22/12/2022	22/12/2022	
A-T-032 OM	22/12/2022	22/12/2022	22/12/2022
A-T-044	22/12/2022	22/12/2022	22/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

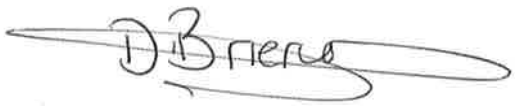
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12360
Issue Number: 1 **Date:** 22 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AO
Order No: P7534730
Date Samples Received: 16/12/22
Date Instructions Received: 16/12/22
Date Analysis Completed: 22/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12360

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AO

Lab Sample ID	22/12360/1	22/12360/2	22/12360/3	22/12360/4	22/12360/5	22/12360/6	22/12360/7	Units	Limit of Detection	Method ref
Client Sample No	5	9	14	30	33	45	46			
Client Sample ID	BH302	BH302	BH302	BH302	BH302	BH302	BH302			
Depth to Top	1.00	3.20	9.00	14.20	18.70	25.20	31.48			
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D	Soil - UT	Soil - D	Soil - D	Soil - D	Soil - C	Soil - C			
Sample Matrix Code	4A	6A	6A	3	4A	6A	6A			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.55	8.38	8.28	8.32	8.40	7.91	8.06	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	15	<10	15	38	1570	1610	mg/l	10	A-T-026s

Envirolab Job Number: 22/12360

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AO

Lab Sample ID	22/12360/8							Units	Limit of Detection	Method ref
Client Sample No	48									
Client Sample ID	BH302									
Depth to Top	39.40									
Depth To Bottom										
Date Sampled										
Sample Type	Soil - C									
Sample Matrix Code	6A									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.61							pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	1710							mg/l	10	A-T-026s

REPORT NOTES

General

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 22/12360

Date Received: 16/12/2022 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 0.4

Clients Project No: 2230746AO

Lab Sample ID	22/12360/1	22/12360/2	22/12360/3	22/12360/4	22/12360/5	22/12360/6	22/12360/7	22/12360/8
Client Sample No	5	9	14	30	33	45	46	48
Client Sample ID/Depth	BH302 1.00m	BH302 3.20m	BH302 9.00m	BH302 14.20m	BH302 18.70m	BH302 25.20m	BH302 31.48m	BH302 39.40m
Date Sampled								
Deviation Code								
E (no date)	✓	✓	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12360/1	22/12360/2	22/12360/3	22/12360/4	22/12360/5	22/12360/6	22/12360/7	22/12360/8
Client Sample No	5	9	14	30	33	45	46	48
Client Sample ID/Depth	BH302 1.00m	BH302 3.20m	BH302 9.00m	BH302 14.20m	BH302 18.70m	BH302 25.20m	BH302 31.48m	BH302 39.40m
Date Sampled								
A-T-026s	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022
A-T-031s	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022
A-T-044	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

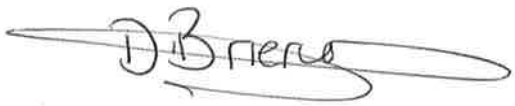
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12361
Issue Number: 1 **Date:** 23 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AN
Order No: P7534730
Date Samples Received: 16/12/22
Date Instructions Received: 16/12/22
Date Analysis Completed: 23/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/12361

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AN

Lab Sample ID	22/12361/1	22/12361/2	22/12361/3	22/12361/4	22/12361/5	22/12361/6		Units	Limit of Detection	Method ref
Client Sample No	2	8	16	23	32	33				
Client Sample ID	BH318	BH318	BH318	BH318	BH318	BH318				
Depth to Top	0.40	2.20	12.40	24.05	36.50	37.88				
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - UT	Soil - C	Soil - C	Soil - C	Soil - C				
Sample Matrix Code	6AE	6A	4A	5A	6A	6A				
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE$_D^{M\#}$	-	8.65	7.76	8.27	8.04	7.98		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	-	<10	1580	946	2060	2200		mg/l	10	A-T-026s
Organic Matter$_D^{M\#}$	0.4	-	-	-	-	-		% w/w	0.1	A-T-032 OM

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

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Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AN

Project No: 22/12361

Date Received: 16/12/2022 (am)

Cool Box Temperatures (°C): 0.4

Lab Sample ID	22/12361/1	22/12361/2	22/12361/3	22/12361/4	22/12361/5	22/12361/6
Client Sample No	2	8	16	23	32	33
Client Sample ID/Depth	BH318 0.40m	BH318 2.20m	BH318 12.40m	BH318 24.05m	BH318 36.50m	BH318 37.88m
Date Sampled						
Deviation Code						
E (no date)	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12361/1	22/12361/2	22/12361/3	22/12361/4	22/12361/5	22/12361/6
Client Sample No	2	8	16	23	32	33
Client Sample ID/Depth	BH318 0.40m	BH318 2.20m	BH318 12.40m	BH318 24.05m	BH318 36.50m	BH318 37.88m
Date Sampled						
A-T-026s		22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022
A-T-031s		22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022
A-T-032 OM	23/12/2022					
A-T-044	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12362
Issue Number: 1 **Date:** 22 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AM
Order No: P7534730
Date Samples Received: 16/12/22
Date Instructions Received: 16/12/22
Date Analysis Completed: 22/12/22

Approved by:



Gemma Berrisford
Client Manager

Envirolab Job Number: 22/12362

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AM

Lab Sample ID	22/12362/1	22/12362/2	22/12362/3					Units	Limit of Detection	Method ref
Client Sample No	2	6	11							
Client Sample ID	BH332	BH332	BH332							
Depth to Top	0.30	1.10	2.00							
Depth To Bottom										
Date Sampled	28-Nov-22	28-Nov-22	28-Nov-22							
Sample Type	Soil - B	Soil - B	Soil - B							
Sample Matrix Code	4A	4A	4A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.57	-	-					pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	-	-					mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	1.1	0.4	0.1					% w/w	0.1	A-T-032 OM

REPORT NOTES

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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
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Key:
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AM

Project No: 22/12362

Date Received: 16/12/2022 (am)

Cool Box Temperatures (°C): 0.4

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12362/1	22/12362/2	22/12362/3
Client Sample No	2	6	11
Client Sample ID/Depth	BH332 0.30m	BH332 1.10m	BH332 2.00m
Date Sampled	28/11/22	28/11/22	28/11/22
A-T-026s	22/12/2022		
A-T-031s	22/12/2022		
A-T-032 OM	22/12/2022	22/12/2022	22/12/2022
A-T-044	22/12/2022	22/12/2022	22/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12363
Issue Number: 1 **Date:** 22 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AP
Order No: P7534730
Date Samples Received: 16/12/22
Date Instructions Received: 16/12/22
Date Analysis Completed: 22/12/22

Approved by:



Gemma Berrisford
Client Manager

Envirolab Job Number: 22/12363

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AP

Lab Sample ID	22/12363/1	22/12363/2	22/12363/3	22/12363/4	22/12363/5			Units	Limit of Detection	Method ref
Client Sample No	21	23	25	27	30					
Client Sample ID	BH069	BH069	BH069	BH069	BH069					
Depth to Top	17.00	18.50	20.00	23.00	25.00					
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - B	Soil - B	Soil - ES					
Sample Matrix Code	5A	4A	4A	4A	5A					
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1			% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	-	8.95	-	7.92	8.92			pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	-	82	-	38	59			mg/l	10	A-T-026s
Organic Matter$_D$$^{M\#}$	2.5	0.8	1.5	-	-			% w/w	0.1	A-T-032 OM

REPORT NOTES

General

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
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Key:
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NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
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EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AP

Project No: 22/12363

Date Received: 16/12/2022 (am)

Cool Box Temperatures (°C): 0.4

Lab Sample ID	22/12363/1	22/12363/2	22/12363/3	22/12363/4	22/12363/5
Client Sample No	21	23	25	27	30
Client Sample ID/Depth	BH069 17.00m	BH069 18.50m	BH069 20.00m	BH069 23.00m	BH069 25.00m
Date Sampled					
Deviation Code					
E (no date)	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12363/1	22/12363/2	22/12363/3	22/12363/4	22/12363/5
Client Sample No	21	23	25	27	30
Client Sample ID/Depth	BH069 17.00m	BH069 18.50m	BH069 20.00m	BH069 23.00m	BH069 25.00m
Date Sampled					
A-T-026s		22/12/2022		22/12/2022	22/12/2022
A-T-031s		22/12/2022		22/12/2022	22/12/2022
A-T-032 OM	22/12/2022	22/12/2022	22/12/2022		
A-T-044	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12478
Issue Number: 1 **Date:** 23 December, 2022

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AQ
Order No: P7534730
Date Samples Received: 20/12/22
Date Instructions Received: 20/12/22
Date Analysis Completed: 23/12/22

Approved by:



Richard Wong
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/12478

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AQ

Lab Sample ID	22/12478/1	22/12478/2	22/12478/3	22/12478/4	22/12478/5	22/12478/6		Units	Limit of Detection	Method ref
Client Sample No	6	10	23	39	46	51				
Client Sample ID	BH040A	BH040A	BH040A	BH040A	BH040A	BH040A				
Depth to Top	1.20	3.20	12.20	27.30	39.30	46.40				
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D	Soil - D	Soil - B	Soil - C	Soil - C	Soil - C				
Sample Matrix Code	6	6	4A	6	6	6				
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.01	8.78	7.42	8.14	7.63	8.00		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	37	1580	844	1620	2050		mg/l	10	A-T-026s

REPORT NOTES

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TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
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1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
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Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

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US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
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EPH CWG GCxGC ID from TPH CWG

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v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AQ

Project No: 22/12478

Date Received: 20/12/2022 (am)

Cool Box Temperatures (°C): 9.2

Lab Sample ID	22/12478/1	22/12478/2	22/12478/3	22/12478/4	22/12478/5	22/12478/6
Client Sample No	6	10	23	39	46	51
Client Sample ID/Depth	BH040A 1.20m	BH040A 3.20m	BH040A 12.20m	BH040A 27.30m	BH040A 39.30m	BH040A 46.40m
Date Sampled						
Deviation Code						
E (no date)	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12478/1	22/12478/2	22/12478/3	22/12478/4	22/12478/5	22/12478/6
Client Sample No	6	10	23	39	46	51
Client Sample ID/Depth	BH040A 1.20m	BH040A 3.20m	BH040A 12.20m	BH040A 27.30m	BH040A 39.30m	BH040A 46.40m
Date Sampled						
A-T-026s	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022
A-T-031s	23/12/2022	23/12/2022	23/12/2022	23/12/2022	23/12/2022	23/12/2022
A-T-044	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022	22/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

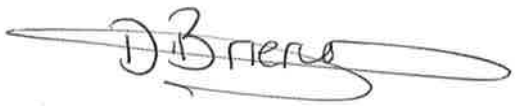
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/00011
Issue Number: 1 **Date:** 09 January, 2023

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AL
Order No: P7534730
Date Samples Received: 04/01/23
Date Instructions Received: 04/01/23
Date Analysis Completed: 09/01/23

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 23/00011

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AL

Lab Sample ID	23/00011/1	23/00011/2						Units	Limit of Detection	Method ref
Client Sample No	19	21								
Client Sample ID	BH338	BH338								
Depth to Top	6.80	8.54								
Depth To Bottom										
Date Sampled										
Sample Type	Solid	Soil - C								
Sample Matrix Code	7	4A								
% Stones >10mm$_A$	<0.1	<0.1						% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	9.08	8.29						pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	26						mg/l	10	A-T-026s

REPORT NOTES

General

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The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project: HyNet North West - Hydrogen Pipeline

Clients Project No: 2230746AL

Project No: 23/00011

Date Received: 04/01/2023 (am)

Cool Box Temperatures (°C): 11.8

Lab Sample ID	23/00011/1	23/00011/2
Client Sample No	19	21
Client Sample ID/Depth	BH338 6.80m	BH338 8.54m
Date Sampled		
Deviation Code		
E (no date)	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/00011/1	23/00011/2
Client Sample No	19	21
Client Sample ID/Depth	BH338 6.80m	BH338 8.54m
Date Sampled		
A-T-026s	09/01/2023	09/01/2023
A-T-031s	09/01/2023	09/01/2023
A-T-044	05/01/2023	05/01/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/00227
Issue Number: 1 **Date:** 17 January, 2023

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West - Hydrogen Pipeline
Project Ref: 2230746AR
Order No: P7534887
Date Samples Received: 13/01/23
Date Instructions Received: 13/01/23
Date Analysis Completed: 17/01/23

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 23/00227

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AR

Lab Sample ID	23/00227/1	23/00227/2	23/00227/3	23/00227/4	23/00227/5	23/00227/6	23/00227/7	Units	Limit of Detection	Method ref
Client Sample No	4	8	12	15	16	22	25			
Client Sample ID	BH332A	BH332A	BH332A	BH332A	BH332A	BH332A	BH332A			
Depth to Top	1.20	3.20	5.20	6.80	8.20	12.50	16.00			
Depth To Bottom										
Date Sampled										
Sample Type	Soil - B	Soil - B	Soil - B	Soil - B	Soil - B	Soil - B	Soil - D			
Sample Matrix Code	4	1A	1A	3	1	3	3			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.64	8.83	8.65	8.60	8.98	8.84	8.77	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	17	23	51	35	55	46	40	mg/l	10	A-T-026s

Envirolab Job Number: 23/00227

Client Project Name: HyNet North West - Hydrogen Pipeline

Client Project Ref: 2230746AR

Lab Sample ID	23/00227/8							Units	Limit of Detection	Method ref
Client Sample No	38									
Client Sample ID	BH332A									
Depth to Top	20.95									
Depth To Bottom										
Date Sampled										
Sample Type	Soil - D									
Sample Matrix Code	3									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	9.07							pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	49							mg/l	10	A-T-026s

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 23/00227

Date Received: 13/01/2023 (am)

Project: HyNet North West - Hydrogen Pipeline

Cool Box Temperatures (°C): 8.5

Clients Project No: 2230746AR

Lab Sample ID	23/00227/1	23/00227/2	23/00227/3	23/00227/4	23/00227/5	23/00227/6	23/00227/7	23/00227/8
Client Sample No	4	8	12	15	16	22	25	38
Client Sample ID/Depth	BH332A 1.20m	BH332A 3.20m	BH332A 5.20m	BH332A 6.80m	BH332A 8.20m	BH332A 12.50m	BH332A 16.00m	BH332A 20.95m
Date Sampled								
Deviation Code								
E (no date)	✓	✓	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/00227/1	23/00227/2	23/00227/3	23/00227/4	23/00227/5	23/00227/6	23/00227/7	23/00227/8
Client Sample No	4	8	12	15	16	22	25	38
Client Sample ID/Depth	BH332A 1.20m	BH332A 3.20m	BH332A 5.20m	BH332A 6.80m	BH332A 8.20m	BH332A 12.50m	BH332A 16.00m	BH332A 20.95m
Date Sampled								
A-T-026s	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023
A-T-031s	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023
A-T-044	16/01/2023	16/01/2023	16/01/2023	16/01/2023	16/01/2023	16/01/2023	16/01/2023	16/01/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

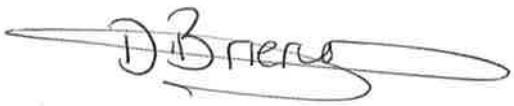
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/00264
Issue Number: 1 **Date:** 19 January, 2023

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West- Hydrogen Pipeline
Project Ref: 2230746AU
Order No: P7534887
Date Samples Received: 16/01/23
Date Instructions Received: 16/01/23
Date Analysis Completed: 19/01/23

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 23/00264

Client Project Name: HyNet North West- Hydrogen Pipeline

Client Project Ref: 2230746AU

Lab Sample ID	23/00264/1	23/00264/2	23/00264/3	23/00264/4	23/00264/5	23/00264/6		Units	Limit of Detection	Method ref
Client Sample No	4	13	19	30	38	41				
Client Sample ID	BH037	BH037	BH037	BH037	BH037	BH037				
Depth to Top	0.70	3.40	5.60	20.10	34.50	36.35				
Depth To Bottom										
Date Sampled	13-Dec-22	13-Dec-22	03-Jan-23	03-Jan-23	13-Dec-22	13-Dec-22				
Sample Type	Soil - B	Soil - B	Soil - D	Soil - C	Soil - C	Soil - C				
Sample Matrix Code	4	4	4A	6A	6A	6A				
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	7.38	7.97	8.57	7.81	8.74	8.71		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	<10	<10	13	1570	94	95		mg/l	10	A-T-026s

REPORT NOTES

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For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
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Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
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Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
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US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
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Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
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TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

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Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 23/00264

Date Received: 16/01/2023 (am)

Project: HyNet North West- Hydrogen Pipeline

Cool Box Temperatures (°C): 6.2

Clients Project No: 2230746AU

Lab Sample ID	23/00264/1	23/00264/2	23/00264/5	23/00264/6
Client Sample No	4	13	38	41
Client Sample ID/Depth	BH037 0.70m	BH037 3.40m	BH037 34.50m	BH037 36.35m
Date Sampled	13/12/22	13/12/22	13/12/22	13/12/22
Deviation Code				
F	✓	✓	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	23/00264/1	23/00264/2	23/00264/5	23/00264/6
Client Sample No	4	13	38	41
Client Sample ID/Depth	BH037 0.70m	BH037 3.40m	BH037 34.50m	BH037 36.35m
Date Sampled	13/12/22	13/12/22	13/12/22	13/12/22
Sulphate BRE (water sol 2:1)	✓	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/00264/1	23/00264/2	23/00264/3	23/00264/4	23/00264/5	23/00264/6
Client Sample No	4	13	19	30	38	41
Client Sample ID/Depth	BH037 0.70m	BH037 3.40m	BH037 5.60m	BH037 20.10m	BH037 34.50m	BH037 36.35m
Date Sampled	13/12/22	13/12/22	03/01/23	03/01/23	13/12/22	13/12/22
A-T-026s	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023
A-T-031s	18/01/2023	18/01/2023	18/01/2023	18/01/2023	18/01/2023	18/01/2023
A-T-044	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

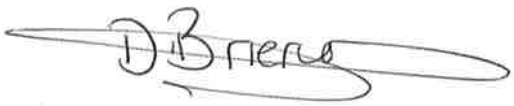
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/00266
Issue Number: 1 **Date:** 19 January, 2023

Client:
Ian Farmer Associates (Newcastle) Lab
Unit 4, Faraday Close
Pattinson North Industrial Estate
Washington
Tyne and Wear
NE38 8QJ

Project Manager: Paul Cathcart
Project Name: HyNet North West- Hydrogen Pipeline
Project Ref: 2230746AS
Order No: P7534887
Date Samples Received: 16/01/23
Date Instructions Received: 16/01/23
Date Analysis Completed: 19/01/23

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 23/00266

Client Project Name: HyNet North West- Hydrogen Pipeline

Client Project Ref: 2230746AS

Lab Sample ID	23/00266/1	23/00266/2	23/00266/3	23/00266/4	23/00266/5	23/00266/6	23/00266/7	Units	Limit of Detection	Method ref
Client Sample No	7	13	17	21	25	31	36			
Client Sample ID	BH120	BH120	BH120	BH120	BH120	BH120	BH120			
Depth to Top	1.20	3.00	5.00	7.20	11.08	17.65	22.34			
Depth To Bottom										
Date Sampled										
Sample Type	Soil - UT	Soil - UT	Soil - UT	Soil - C	Soil - C	Soil - C	Soil - C			
Sample Matrix Code	5A	6A	6A	6A	5A	6A	4A			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.08	8.74	9.00	9.10	9.03	9.22	8.87	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	11	29	42	40	41	10	39	mg/l	10	A-T-026s

Envirolab Job Number: 23/00266

Client Project Name: HyNet North West- Hydrogen Pipeline

Client Project Ref: 2230746AS

Lab Sample ID	**23/00266/8**							**Units**	**Limit of Detection**	**Method ref**
Client Sample No	**41**									
Client Sample ID	**BH120**									
Depth to Top	**26.63**									
Depth To Bottom										
Date Sampled										
Sample Type	**Soil - C**									
Sample Matrix Code	**6A**									
% Stones >10mm$_A$	**<0.1**							**% w/w**	**0.1**	**A-T-044**
pH BRE$_D$$^{M\#}$	**9.34**							**pH**	**0.01**	**A-T-031s**
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	**17**							**mg/l**	**10**	**A-T-026s**

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Newcastle) Lab, Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, Tyne and Wear, NE38 8QJ

Project No: 23/00266

Date Received: 16/01/2023 (am)

Project: HyNet North West- Hydrogen Pipeline

Cool Box Temperatures (°C): 6.2

Clients Project No: 2230746AS

Lab Sample ID	23/00266/1	23/00266/2	23/00266/3	23/00266/4	23/00266/5	23/00266/6	23/00266/7	23/00266/8
Client Sample No	7	13	17	21	25	31	36	41
Client Sample ID/Depth	BH120 1.20m	BH120 3.00m	BH120 5.00m	BH120 7.20m	BH120 11.08m	BH120 17.65m	BH120 22.34m	BH120 26.63m
Date Sampled								
Deviation Code								
E (no date)	✓	✓	✓	✓	✓	✓	✓	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/00266/1	23/00266/2	23/00266/3	23/00266/4	23/00266/5	23/00266/6	23/00266/7	23/00266/8
Client Sample No	7	13	17	21	25	31	36	41
Client Sample ID/Depth	BH120 1.20m	BH120 3.00m	BH120 5.00m	BH120 7.20m	BH120 11.08m	BH120 17.65m	BH120 22.34m	BH120 26.63m
Date Sampled								
A-T-026s	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023
A-T-031s	18/01/2023	18/01/2023	18/01/2023	18/01/2023	18/01/2023	18/01/2023	18/01/2023	18/01/2023
A-T-044	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023	17/01/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

APPENDIX 4

GEOENVIRONMENTAL TESTS

APPENDIX 4

GENERAL NOTES ON CHEMICAL TESTS

A4.1 ACCREDITATION

A4.1.1 Testing has been carried out to either UKAS or MCERTS accreditation, as specified in the results tables.

A4.1.2 The unique reference for each sample is as stated on the relevant engineering log. Each sample is logged on a chain of custody and can be traced from exploratory hole to laboratory. The date of soil samples taken is as per the date shown on the engineering log.

A4.1.3 Subcontracted results are presented directly on headed paper from the subcontracting laboratory.

Chemical Test Results – Soil and Leachate

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/10290
Issue Number: 1 **Date:** 27 October, 2022

Client: Ian Farmer Associates (Warrington)
14/15 Rufford Court
Hardwick Grange
Warrington
WA1 4RF

Project Manager: Michelle Hirst-Watson
Project Name: Hynet North West
Project Ref: 2230746
Order No: P7534114
Date Samples Received: 13/10/22
Date Instructions Received: 19/10/22
Date Analysis Completed: 27/10/22

Approved by:



Richard Wong
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 22/10290

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/10290/6							Units	Limit of Detection	Method ref
Client Sample No	2									
Client Sample ID	BH106									
Depth to Top	0.20									
Depth To Bottom										
Date Sampled	29-Sep-22									
Sample Type	Soil - ES									
Sample Matrix Code	2A									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH$_D$[M#]	7.26							pH	0.01	A-T-031s
Cyanide (total)$_A$[M#]	<1							mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2							mg/kg	0.2	A-T-050s
Total Organic Carbon$_D$[M#]	0.90							% w/w	0.03	A-T-032s
Arsenic$_D$[M#]	<1							mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0							mg/kg	1	A-T-027s
Cadmium$_D$[M#]	<0.5							mg/kg	0.5	A-T-024s
Copper$_D$[M#]	7							mg/kg	1	A-T-024s
Chromium$_D$[M#]	9							mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1							mg/kg	1	A-T-040s
Lead$_D$[M#]	9							mg/kg	1	A-T-024s
Mercury$_D$	<0.17							mg/kg	0.17	A-T-024s
Nickel$_D$[M#]	7							mg/kg	1	A-T-024s
Selenium$_D$[M#]	<1							mg/kg	1	A-T-024s
Zinc$_D$[M#]	12							mg/kg	5	A-T-024s

Envirolab Job Number: 22/10290

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/10290/6							Units	Limit of Detection	Method ref
Client Sample No	2									
Client Sample ID	BH106									
Depth to Top	0.20									
Depth To Bottom										
Date Sampled	29-Sep-22									
Sample Type	Soil - ES									
Sample Matrix Code	2A									
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD									A-T-045
Asbestos Matrix (visual)$_{D}$	-									A-T-045
Asbestos Matrix (microscope)$_{D}$	-									A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A									A-T-045

Envirolab Job Number: 22/10290

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/10290/6							Units	Limit of Detection	Method ref
Client Sample No	2									
Client Sample ID	BH106									
Depth to Top	0.20									
Depth To Bottom										
Date Sampled	29-Sep-22									
Sample Type	Soil - ES									
Sample Matrix Code	2A									
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.01							mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01							mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.03							mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.18							mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.18							mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.21							mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.09							mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07							mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.24							mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04							mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	0.32							mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.01							mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.10							mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03							mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.14							mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.32							mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	1.83							mg/kg	0.01	A-T-019s

Envirolab Job Number: 22/10290

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/10290/6							Units	Limit of Detection	Method ref
Client Sample No	2									
Client Sample ID	BH106									
Depth to Top	0.20									
Depth To Bottom										
Date Sampled	29-Sep-22									
Sample Type	Soil - ES									
Sample Matrix Code	2A									
TPH CWG with Clean Up										
Ali >C5-C6$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1							mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1							mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1							mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	2							mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	17							mg/kg	1	A-T-055s
Total Aliphatics$_A$	19							mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	2							mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1							mg/kg	1	A-T-055s
Aro >C12-C16$_A$	11							mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	46							mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	82							mg/kg	1	A-T-055s
Total Aromatics$_A$	141							mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	160							mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01							mg/kg	0.01	A-T-022s

REPORT NOTES

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The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Warrington), 14/15 Rufford Court, Hardwick Grange, Warrington, WA1 4RF

Project: Hynet North West

Clients Project No: 2230746

Project No: 22/10290

Date Received: 19/10/2022 (am)

Cool Box Temperatures (°C): 10.9

Lab Sample ID	22/10290/6
Client Sample No	2
Client Sample ID/Depth	BH106 0.20m
Date Sampled	29/09/22
Deviation Code	
F	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/10290/6
Client Sample No	2
Client Sample ID/Depth	BH106 0.20m
Date Sampled	29/09/22
VPHCWG	✓
PAH-16MS	✓
Cyanide (total)	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/10290/6
Client Sample No	2
Client Sample ID/Depth	BH106 0.20m
Date Sampled	29/09/22
A-T-019s	24/10/2022
A-T-022s	24/10/2022
A-T-024s	25/10/2022
A-T-027s	26/10/2022
A-T-031s	27/10/2022
A-T-032s	27/10/2022
A-T-040s	25/10/2022
A-T-042sTCN	24/10/2022
A-T-044	21/10/2022
A-T-045	20/10/2022
A-T-050s	25/10/2022
A-T-055s	25/10/2022
Calc-As Recd	25/10/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

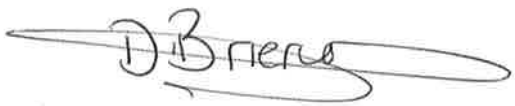
FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/11776
Issue Number: 1 **Date:** 08 December, 2022

Client: Ian Farmer Associates (Warrington)
14/15 Rufford Court
Hardwick Grange
Warrington
WA1 4RF

Project Manager: Michelle Hirst-Watson
Project Name: Hynet North West
Project Ref: 2230746
Order No: P7534619
Date Samples Received: 27/10/22
Date Instructions Received: 30/11/22
Date Analysis Completed: 08/12/22

Approved by:



Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 22/11776

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/11776/1	22/11776/3	22/11776/4					Units	Limit of Detection	Method ref
Client Sample No	3	7	9							
Client Sample ID	BH036	BH036	BH036							
Depth to Top	0.50	2.00	3.00							
Depth To Bottom										
Date Sampled	20-Oct-22	20-Oct-22	20-Oct-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AEB	4A	1A							
% Stones >10mm$_A$	<0.1	<0.1	<0.1					% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.78	7.78	8.06					pH	0.01	A-T-031s
Total Organic Carbon$_D$$^{M\#}$	1.95	1.22	0.23					% w/w	0.03	A-T-032s
Arsenic$_D$$^{M\#}$	7	6	3					mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0	<1.0					mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	<0.5					mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	23	17	9					mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	11	10	8					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1					mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	44	37	6					mg/kg	1	A-T-024s
Mercury$_D$	0.55	<0.17	<0.17					mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	13	10	8					mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1					mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	59	85	11					mg/kg	5	A-T-024s

Envirolab Job Number: 22/11776

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/11776/1	22/11776/3	22/11776/4					Units	Limit of Detection	Method ref
Client Sample No	3	7	9							
Client Sample ID	BH036	BH036	BH036							
Depth to Top	0.50	2.00	3.00							
Depth To Bottom										
Date Sampled	20-Oct-22	20-Oct-22	20-Oct-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AEB	4A	1A							
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.04	0.03	<0.01					mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.06	0.02	<0.01					mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.13	0.16	<0.02					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.59	0.62	<0.04					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.62	0.55	<0.04					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.69	0.64	<0.05					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.35	0.32	<0.05					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.28	0.23	<0.07					mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.69	0.67	<0.06					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.08	0.08	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	1.39	1.20	<0.08					mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.08	0.05	<0.01					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.38	0.36	<0.03					mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	1.04	0.64	<0.03					mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	1.15	1.08	<0.07					mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	7.60	6.65	<0.08					mg/kg	0.01	A-T-019s

Envirolab Job Number: 22/11776

Client Project Name: Hynet North West

Client Project Ref: 2230746

Lab Sample ID	22/11776/1	22/11776/3	22/11776/4					Units	Limit of Detection	Method ref
Client Sample No	3	7	9							
Client Sample ID	BH036	BH036	BH036							
Depth to Top	0.50	2.00	3.00							
Depth To Bottom										
Date Sampled	20-Oct-22	20-Oct-22	20-Oct-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4AEB	4A	1A							
TPH CWG with Clean Up										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	2	<1					mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	7	9	2					mg/kg	1	A-T-055s
Total Aliphatics$_A$	7	11	2					mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A$	1	1	<1					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	8	9	<1					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	40	32	<1					mg/kg	1	A-T-055s
Total Aromatics$_A$	49	43	<1					mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	56	54	2					mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Ian Farmer Associates (Warrington), 14/15 Rufford Court, Hardwick Grange, Warrington, WA1 4RF

Project: Hynet North West

Clients Project No: 2230746

Project No: 22/11776

Date Received: 30/11/2022 (am)

Cool Box Temperatures (°C): 13.6

Lab Sample ID	22/11776/1	22/11776/3	22/11776/4
Client Sample No	3	7	9
Client Sample ID/Depth	BH036 0.50m	BH036 2.00m	BH036 3.00m
Date Sampled	20/10/22	20/10/22	20/10/22
Deviation Code			
F	✓	✓	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	22/11776/1	22/11776/3	22/11776/4
Client Sample No	3	7	9
Client Sample ID/Depth	BH036 0.50m	BH036 2.00m	BH036 3.00m
Date Sampled	20/10/22	20/10/22	20/10/22
EPHCWG	✓	✓	✓
VPHCWG	✓	✓	✓
PAH-16MS	✓	✓	✓
Total Organic Carbon	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/11776/1	22/11776/3	22/11776/4
Client Sample No	3	7	9
Client Sample ID/Depth	BH036 0.50m	BH036 2.00m	BH036 3.00m
Date Sampled	20/10/22	20/10/22	20/10/22
A-T-019s	05/12/2022	05/12/2022	05/12/2022
A-T-022s	05/12/2022	05/12/2022	05/12/2022
A-T-024s	06/12/2022	06/12/2022	06/12/2022
A-T-027s	07/12/2022	07/12/2022	07/12/2022
A-T-031s	08/12/2022	08/12/2022	08/12/2022
A-T-032s	06/12/2022	06/12/2022	06/12/2022
A-T-040s	06/12/2022	06/12/2022	06/12/2022
A-T-044	02/12/2022	02/12/2022	02/12/2022
A-T-055s	06/12/2022	06/12/2022	06/12/2022
Calc-As Recd	06/12/2022	06/12/2022	06/12/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

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