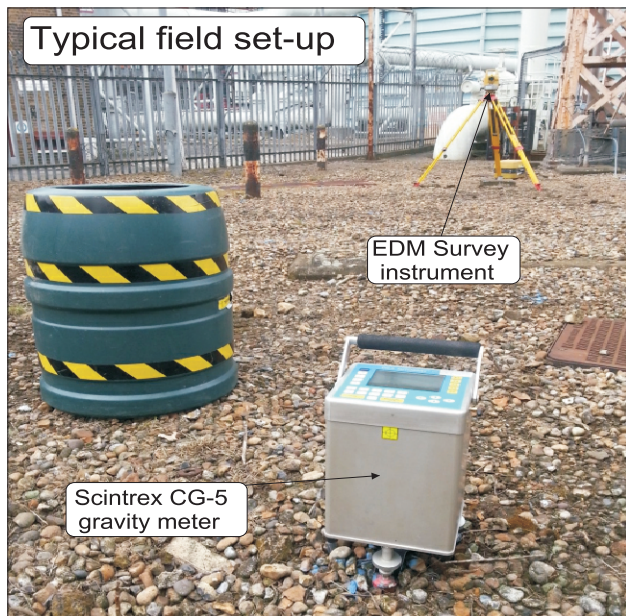


Appendix - Gravity Survey

The gravity technique is based on measuring localised variations in the Earth's gravitational field which are caused by materials of different densities. The presence of an anomalously high (or low) density body in the subsurface causes a localised high (or low) anomaly in the measured gravitational field. The gravity effects described are extremely small, however, modern instrumentation and exhaustive data processing techniques enable detection of both geological and artificial structures or voids.

The CG-5 gravity meter is a semi-automated system that enables statistical averaging and filtering of readings taken every second over a fixed period of time (typically 2-3 minutes). The elevation of the gravity instrument was recorded to a 1mm precision ($<0.3\text{cm}$ error) at each survey station to facilitate accurate elevation correction. The results from the microgravity survey can be presented as a series of gravity profiles or colour contoured plot displaying the derived Bouguer Anomaly. Interpretation of the microgravity data is based on observing the shape, amplitude and wavelength of a particular anomaly and comparing it against the modelled gravity profile of a given target feature.



In order to remove (reduce) background gravitational effects i.e. those that do not originate from the target feature, the following processing steps were applied to the acquired dataset using a combination of internal CG-5 software and TerraDat proprietary software GRED.

Earth Tide, Temperature & Tilt Correction: Applied automatically by the gravity meter software.

Un-modelled Temporal Residual Correction: Obtained by least-squares fitting of a quadratic polynomial through the base station readings for each day. It is our normal practice to set the Bouguer anomaly at the base to zero so that the calculated values for the other stations are relative to a base station zero.

Latitude Correction: Calculated on the basis of the site latitude. Typically, due to the small latitude extent of the survey grid the correction is assumed to be linear per metre north.

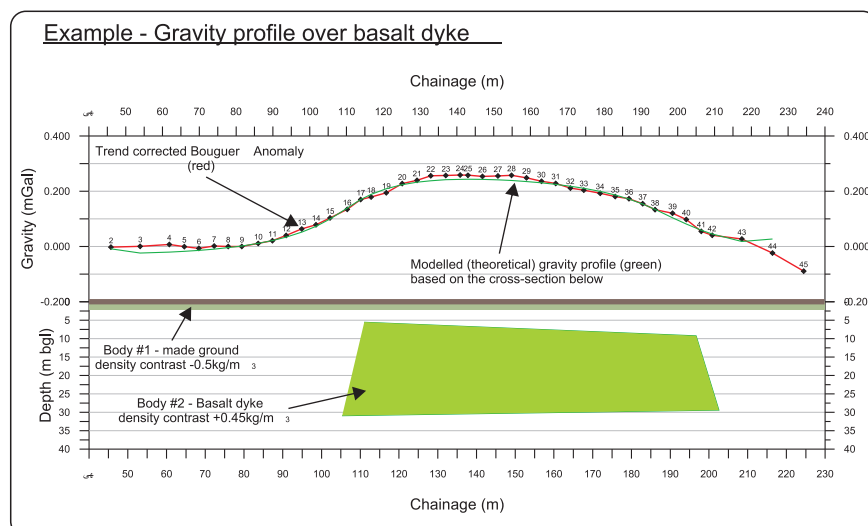
Free-air Correction: Applied to the dataset based on the instrument elevations, which were recorded to a 1mm precision ($<0.3\text{cm}$ error) using an EDM survey system.

Terrain Correction: Based on the measured ground level at each gravity reading station and selected points beyond the survey grid.

Bouguer Correction: The selection of the reduction density is based on both site and geological consideration plus Nettleton's method where appropriate.

Constraints

The principal limitation on the use of gravity is the time required for careful acquisition and data processing. The detectability of a feature using the gravity methods is proportional to its size/depth ratio and its density contrast with the host material. There is a decrease in spatial resolution with increased depth of burial. In terms of site considerations, it is best to avoid sites with severe terrain or are have excessive vibrational noise.



APPENDIX X – GROUND GAS & GROUNDWATER MONITORING RECORDS

Page 1 of 1

Project Name:	GCRE
Project No.:	Q0652
BH/TP No.:	BH07
Instruments Used:	Water Dip Meter Probe, GA2000 Gas Analyser

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
271.278	A	50mm	10.00	8.00-10.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
236.953	A	50mm	5.00	1.00-5.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
280.709	A	50mm	10.00	8.00-10.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
	A	50mm	28.20	25.20-28.20

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
213.006	A	50mm	34.00	29.00-34.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
257.707	A	50mm	49.20	39.20-49.20

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
210977	A	50mm	49.20	39.20-49.20

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.736	A	50mm	15.00	12.00-15.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.738	A	50mm	4.00	3.00-4.00

[illegible]

Page 1 of 1

Project Name:	GCRE
Project No.:	Q0652
BH/TP No.:	BH31
Instruments Used:	Water Dip Meter Probe, GA2000 Gas Analyser

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
238.608	A	50mm	21.00	16.00-21.00
	B	19mm	5.00	1.00-5.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.745	A	50mm	17.50	12.50-17.50

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.736	A	50mm	20.00	15.00-20.00

[illegible]

Page 1 of 1

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
230.736	A	50mm	13.00	11.00-13.00
	B	50mm	3.30	1.00-3.30

[illegible]



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Global Centre of Rail Excellence (GCRE)

Stage 1 Ground Investigation

Factual Report

G22069

March 2023

GCRE Limited

**Global Centre of Rail Excellence
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Neath Port Talbot
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Report Control Sheet**Report Number**

G22069

Date of Issue

March 2023

Site Address

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Jackson Geo Services is a trading name of Jackson Drilling Holdings Limited – registered company number 06919550.

QMS ref: GEO-Q021

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1 Introduction

1.1 General

GCRE Limited entered into a contract with Jackson Geo Services (JGS) to complete a ground investigation at the Global Centre of Rail Excellence (GCRE) site (hereafter referred to as The Site). The contract was agreed during October 2022. As per the Construction Design and Management (CDM) Regulations (2015), parties were attributed the following responsibilities:

Table 1: Responsibility Under CDM

Client	GCRE Limited
Designer	Atkins (SNC-Lavalin)
Principal Contractor	Walters UK Limited
Sub-Contractor	Jackson Geo Services

1.2 Proposed Development

The site is proposed to be developed as a new rail testing and training centre, with the proposed development comprising a rail testing, storage and maintenance facility. The Phase 1 proposed works associated to this ground investigation comprise earthworks for the proposed rail depot and storage facility which will consist of the installation of multiple sidings for train stabling, inspection and maintenance sheds, fuelling roads and carriage wash facilities. In addition, to the track elements, it is also proposed to construct several buildings forming and Innovation Hub as well as further industrial/commercial developments.

1.3 Scope of Works

The scope of investigation was defined by Atkins and is detailed within specification document GCRE001-AWJV-EW-XX-SP-GE-00001 3.0 (dated November 2022) (hereafter referred to as The Specification). In summary, the scope of investigation comprised:

- ✍ Dynamic Sampling with Rotary Follow-on Coring
- ✍ Rotary open holing (probe holing) for mine workings
- ✍ Machine Excavated Trial Pitting
- ✍ In-situ Testing
- ✍ Geotechnical Testing
- ✍ Geoenvironmental Testing
- ✍ Factual Reporting
- ✍ Production of Digital Data in AGS4 format

1.4 Limitations

The project has been undertaken in accordance with The Specification and current standards and guidance as applicable (see References).

This report presents the observations made during desk based studies and the fieldwork period on a factual basis. Any observations within the report are limited to those which can be made based upon the information available at the time.

JGS consider the contents of the report have been produced accurately and the data presented is representative of the site conditions at the time. JGS assumes any third party data included in the report is accurate and correct. No responsibility is accepted by JGS for inaccuracies within third party data.

This report has been written to The Specification and is for use only in this context by the named Client and their advisers and is confidential to the named Client.

This report presents information on ground conditions, including groundwater, gas and contamination concentrations and soil properties, which are based upon the available dataset for the investigation. This dataset is considered representative of the site as whole, however is limited by the locations of investigation. Ground conditions, in particular Made Ground, can vary substantially and JGS do not accept responsibility for local unforeseen changes. Furthermore, groundwater, gas concentrations and chemical concentration can vary with time, atmospheric conditions and spatially dependent upon a variety of confining factors.

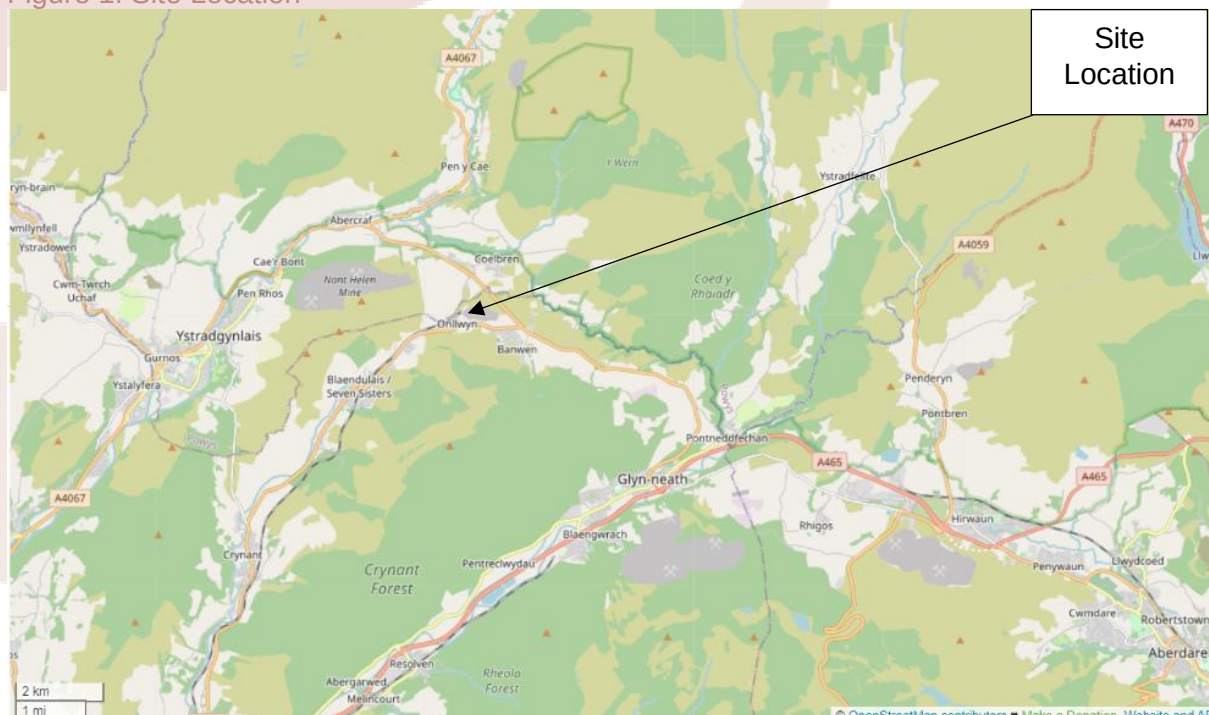
Consideration should be made as to the relevance of the information if the dataset is to be utilised after a significant period of time has elapsed from the date of investigation.

2 The Site

2.1 Site Location

The Site is situated at National Grid Reference (NGR) SN 844 104, and is approximately 200 m north of Onllwyn Welfare Hall. The location of The Site is shown in Figure 1:

Figure 1: Site Location



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2.2 Current Use

The Site comprises part of the now defunct Onllwyn Washery and Distribution Centre. It is pseudo-triangular in shape and measures approximately 830 m (west to east) and 170 m (north to south) along its longest axes. For descriptive purposes the site has been divided into two sections, the “main area” and the “northern embankment”.

Main Area

The Main Area was being decommissioned during the fieldwork period with many of the rail tracks, buildings, conveyors and related concrete slabs and basements in the process of being, or having already been, removed. There are several structures onsite relating to its previous use comprising a mixture of brick structures (substation and laboratory) and metal structures (fitting shops, stores, and associated buildings). Although the Main Area steps up in places (west to east) it is predominantly flat rising very gently from west to east. The exception to this is at the eastern most point of the Main Area where it rises moderately steeply from south to north. There are numerous drainage channels around the site that flow freely (east to west) during periods of rainfall. There are unnamed watercourse along the north and west of the site that feed in to (occasionally via settlement ponds) Avon Dulais. To the south of the Main Area are three brick buildings comprising a bath house, a main reception and a visitor's centre.

The northern boundary follows a railway track that was used to export the coal away from the site, beyond which is an area of grassy bog and grassland. The small settlement of Coelbren lies beyond the bog and grassland. The former Nant Helen Opencast Mine is to the north east. The west of the site is bound by Onllwyn Road, a highway. which also crosses the site via two bridges which are adjacent to each other. Beyond Onllwyn Road lies open grassland and the A4109 highway to the southwest which leads to Seven Sisters. Immediately to the south of the site are buildings and infrastructure associated with the washery, beyond which lie the settlements of Onllwyn and Bawneen, plus land associated with Mesgwyn Wind Farm and Walter's Arena further to the south. To the west the site is bounded by land associated with the washery including a weighbridge and a small independent coal merchant, beyond which lies grassland and woodland leading to The Brecon Beacons.

Northern Embankment

The Northern Embankment comprises a boggy grassed moorland area on the southern face of a east-west trending valley which heads towards Caehopkin. It is pseudo-triangular in shape and measures approximately 600 m (west to east) by 250 m (north to south) along its longest axes.

Parts of the site show signs that the Northern Embankment was once used as a tip for spoil (likely from mining at Nant Helen), however the majority if the area is covered in thick moorland type grass. Many areas of the site are very boggy. The area slopes steeply from south to north with a track in the centre of the site trending in the same direction which allows access. The area comprises approximately 6 fields with boundaries ranging from mesh fencing to hedgerows and banks.

Both northern and southern boundaries of the Northern Embankment are characterised by non-metalled tracks running east to west. The western boundary is another track (running north-south), and the eastern boundary comprises the A4221 highway.

There are two unnamed watercourses, both flowing north to south, however there are a number of routes that water takes during heavy rainfall.

2.3 Anticipated Ground Conditions

The anticipated ground conditions have been assessed using the data available on the British Geological Survey (BGS) GeoIndex (onshore) Map Viewer (2022) and the published BGS map (map no. 231, 1979), these are summarised within Table 2:

Table 2: Anticipated Ground Conditions

Artificial Ground	Made Ground	Artificial Deposit
Superficial Deposits	Peat in northern section of the site. None recorded in the remainder of the site.	Peat
Solid Geology	South Wales Middle Coal Measures Formation in the west of the site. South Wales Lower Coal Measure Formation in the east underlies the majority of the site.	Mudstone, Siltstone and Sandstone.

Areas of artificial ground, considered to be associated with the former washery and related mining activity are located to the south, south west and north east of the site only as isolated features.

There is an inferred fault of unknown displacement shown on the GeoIndex (onshore) Viewer. It trends south south-east to north north-west, through the site and also demarcates the geological boundary between the middle and lower South Wales Coal Measures.

It is known that mine workings associated with the South Wales Coal Measures are located beneath the site.

The Department for Environment, Food & Rural Affairs (DEFRA) MAGIC mapping system (2021) indicates The Site is located within an area where the bedrock is classified as a secondary A aquifer. The superficial (peat) deposits are not shown as being classified.

3 Fieldwork

3.1 General Information

The fieldwork was completed in two phases, the first phase was completed between 7 November and 23 December 2022, whilst the second phase was completed between 17 and 2 February 2023.

The ground investigation was undertaken in accordance with BS5930:2015+A1:2020. The works were supervised by a trained and competent JGS engineer.

The layout of the investigation locations and their unique identifiers were determined by Atkins and are listed within Schedule 2 of The Specification. This information was provided to JGS prior to works commencing onsite. Walters UK Limited set out the locations onsite using GPS survey equipment to set out the location to the co-ordinates provided.

Service drawings were provided to JGS by Walters UK Limited prior to works commencing on site and the location of the proposed investigation locations was checked against the service drawings prior to excavation.

Prior to excavation, each exploratory hole location was scanned using a Cable Avoidance Tool (CAT) to confirm the absence of services beneath the proposed excavation.

All exploratory hole locations, with the exception of machine excavated trial pits and rotary open (probe holes), were excavated to a depth of 1.20 m by hand prior to using mechanical plant. As hand excavation progressed, the excavations were scanned using a Cable Avoidance Tool (CAT) to continue to confirm the absence of services.

Where rotary open (probe) holes were completed, a trench was excavated to a depth of 1.20 m depth by hand around each proposed batch of drill hole locations to confirm no services had been laid into the area of investigation.

Where exploratory holes were extended into the Coal Measures, 5 in 1 gas monitors measuring carbon monoxide (CO), methane (CH₄), Carbon dioxide (CO₂), Oxygen (O₂) and Hydrogen Sulphide (H₂S) were placed at the well head during drilling in order to confirm gas concentrations, and 4 in 1 personal gas monitors were used within the drilling operatives breathing zones.

Photographs of the materials encountered were taken in accordance with The Specification and are presented in Appendix II.

Following completion of the fieldwork, all investigation locations been surveyed to National Grid and Ordnance Datum using GSP survey equipment. The location of the exploratory holes is shown on the drawing within Appendix I. The survey was completed by Walters UK Limited.

3.2 Exploratory Holes

The proposed numbers of exploratory holes, their unique identifiers, termination depths and installation requirements were provided to JGS within Schedule 2 of The Specification. The details of the as built exploratory holes, including the location ID, construction method, actual termination depth and installation detail, are listed within Table 3.

Table 3: Exploratory Hole Details

Exploratory Hole ID	Construction Method	Termination Depth (m)	Installation Details		
			Type	Internal Diameter (mm)	Response Zone (m bgl)
S1-BH101	Dynamic Sampling with Rotary Coring	24.60	SP	50	11.00 – 14.00
S1-BH102		30.00	SP	50	6.00 – 9.00
S1-BH103		30.80	SP	50	2.00 – 5.50
S1-BH105		30.80	SP	50	11.00 – 15.00
S1-BH106		20.00	Backfilled with Bentonite		
S1-BH107		8.00	Backfilled with Bentonite Cement Grout		
S1-BH107B		18.00	Packer installed at 14.50m depth. Backfilled with Bentonite Cement Grout above packer. High strength, fast setting grout was pressure injected through a non-return valve in the packer to base of hole.		
S1-BH108		30.00	SP	50	13.00 – 15.50
S1-BH109		15.90	Backfilled with Bentonite		
S1-BH110		12.00	Backfilled with Bentonite		
S1-BH112		30.40	SP	50	1.00 – 2.50
S1-BH113		30.00	SP	50	8.00 – 15.00
S1-BH114		30.00	SP	50	3.00 – 5.50
S1-BH114B	Dynamic Sampling	9.00	Backfilled with Bentonite		
S1-BH114C	Dynamic Sampling with Rotary Coring	4.00	Backfilled with Bentonite Cement Grout		
S1-BH116		21.00	Packer installed at 16.00m depth. Backfilled with Bentonite Cement Grout above packer. High strength, fast setting grout was pressure injected through a non-return valve in the packer to base of hole		
S1-BH121		17.40	Backfilled with Bentonite		
S1-BH122		10.50	SP	50	2.00 – 3.50
SOP001.1	Rotary Open Holing	10.50	SP	50	1.00 – 1.90
SOP001.2		25.00	Backfilled with Bentonite		
SOP001.3		15.00			
SOP001.4		15.00			
SOP001.5		15.00			
SOP001.6		15.00			
SOP001.7		15.00			
SOP001.8		15.00			
SOP001.9		15.00			
SOP001.10		15.00			
SOP001.11		15.00			
SOP001.12		15.00			
SOP001.13		15.00			
SOP001.14		15.00			
SOP001.15		15.00			
SOP001.16		15.00			
SOP001.17		15.00			
SOP001.18		15.00			
SOP001.19		15.00			
SOP001.20		15.00			
SOP002.1	Rotary Open Holing	20.00			
SOP002.2		15.00			
SOP002.3		11.50			
SOP002.4		11.50			
SOP002.5		11.50			
SOP002.6		11.50			
SOP002.8		11.50			
SOP002.9		11.50			
SOP002.10		11.50			
SOP002.11		11.50			
SOP002.12		11.50			
SOP002.13		11.50			
SOP002.14		11.50			
SOP002.15		11.50			
SOP002.16		11.50			
SOP002.17		11.50			
SOP002.18		11.50			
SOP002.19		11.50			
SOP002.20		11.50			
SOP002.21		11.50			

SOP002.22		11.50			
SOP002.23		11.50			
SOP002.24		11.50			
SOP002.25		11.50			
SOP003.1		14.00			
SOP003.2		12.50			
SOP003.3		15.00			
SOP003.4		15.00			
SOP003.5		15.00			
SOP003.6		13.00			
SOP003.7		15.00			
SOP003.8		13.00			
SOP003.9		15.00			
SOP003.10		15.00			
SOP003.11		15.00			
SOP003.12		15.00			
SOP003.13		15.00			
SOP003.14		15.00			
SOP003.15		25.00			
SOP003.16		23.00	SP	50	10.00 – 13.00
Emb 2 Soakaway		2.00			
S1-TP101		2.40			
S1-TP102		3.90			
S1-TP103		4.00			
S1-TP104		4.00			
S1-TP105		0.80			
S1-TP106	Machine Excavated Trial Pit	4.00			
S1-TP109		4.00			
S1-TP110		3.50			
S1-TP111		3.50			
S1-TP112		1.70			
S1-TP113		4.00			
S1-TP114		2.40			
S1-TP115		0.70			
Trial Emb Cut		2.00			
			Backfilled with Arisings		

Notes: SP – Standpipe piezometer; P – Piezometer

Exploratory hole S1-BH101 was extended beyond the proposed scheduled depth of 17.00 m as per Atkins instruction due to bedrock not being encountered within the borehole. The exploratory was extended to a maximum depth of 24.60 m.

Exploratory hole S1-BH107 was terminated at 8.00 m depth due to encountering artesian water. An additional borehole, S1-BH107B, was drilled to 18.00 m depth during the second phase of investigation. S1-BH107B was terminated within possible workings.

Exploratory hole S1-BH114 was terminated at 9.00 m depth due to encountering artesian water. The location was relocated approximately 20 m east and renamed S1-BH114B. This exploratory was subsequently terminated at 4.00 m depth due to encountering artesian water. An additional borehole, S1-BH114C, was drilled to 21.00 m depth during the second phase of investigation.

The rotary open (probe) hole locations (designated SOP001, SOP002 and SOP003) were all terminated at depths as per Atkins onsite instructions.

Exploratory hole S1-TP101 was terminated at 2.40 m depth due to instability.

Exploratory hole S1-TP102 was terminated at 3.90 m depth due to hard ground preventing further excavation.

Exploratory hole S1-TP105 was terminated at 0.80 m depth due to water ingress.

Exploratory holes S1-TP107 and S1-TP108 were not excavated due to waterlogged ground preventing access.

Exploratory hole S1-TP110 was terminated at 3.50 m due to instability.

Exploratory hole S1-TP111 was terminated at 3.50 m depth on bedrock.

Exploratory hole S1-TP112 was terminated at 1.70 m depth due to water ingress and instability.

Exploratory hole S1-TP114 was terminated at 2.40 m due to water ingress and instability.

Exploratory hole S1-TP115 was terminated at 0.70 m due to water ingress.

Fair copy logs, which record the method, samples obtained, in-situ testing completed within the exploratory holes, backfill and descriptions of the material encountered, are presented within Appendix II.

3.3 Logging and Sampling

Samples of the materials encountered were obtained in accordance with The Specification for descriptive and geotechnical and geoenvironmental testing purposes.

The description of the materials encountered was completed in accordance with BS5930:2015+A1:2020, BS EN ISO 14688-1 (2018) and BS EN ISO 14689 (2018).

Geotechnical samples were stored at ambient temperature and protected from extremes of weather until lab testing commenced, either onsite or at the JGS Llantrisant sample storage facility. Once scheduled for testing, the samples were transported to Geo Site and Testing Services (GSTL).

Geoenvironmental samples were packaged appropriately and dispatched directly from site to Eurofins Chemtest ensuring compliance with the deviant sampling policy. The samples were subsequently stored under laboratory conditions until testing commenced.

3.4 In-situ Testing, Monitoring and Well Development during Fieldwork

In-situ testing was completed in accordance with The Specification and relevant associated technical standards. In summary, the in-situ testing comprised the following:

- ☞ Standard Penetration testing
- ☞ Hand shear vane testing
- ☞ Headspace testing using a Photo Ionisation Detector
- ☞ Soakaway Testing

The lateral and vertical spacing of the in-situ testing was determined by Atkins.

Soakaway testing was unable to be completed within exploratory hole locations; S1-TP112 and S1-TP114 due to water ingress and instability during excavation, S1-TP113 due to water ingress occurring into the pit overnight and S1-TP115 due to water ingress during excavation.

The in-situ testing results are presented within Appendix II. Where an in-situ test is not listed as separate item on the appendix cover page, the results of the in-situ testing are presented on the exploratory hole logs. Calibration certificates for the equipment used are presented within Appendix II as appropriate.

Monitoring of the groundwater was undertaken during fieldwork by JGS in accordance with The Specification and relevant technical standards. Monitoring undertaken during the fieldwork period is presented within Appendix III.

Each installation was developed during the fieldwork period. The well development was undertaken in accordance with The Specification and groundwater extracted using an in-situ impellor pump. Records of the well development are presented within Appendix III.

3.5 Post Fieldwork Monitoring and Sampling

Monitoring of the groundwater and ground gas was undertaken post fieldwork by JGS in accordance with The Specification and relevant technical standards. Three post fieldwork monitoring visits were completed; the first round was completed on 9, 10 16 and 17 January 2023, the second round was completed between 31 January and 2 February 2023 and the third round was completed between 13 ad 15 February 2023.

Records of the groundwater and gas levels recorded during monitoring are presented within Appendix III along with associated calibration certificates for the equipment used.

Barometric pressure readings were recorded for a 24 hour time period the day before each monitoring round was completed. The records of the barometric pressure readings recorded are presented within Appendix III.

Samples of the were be obtained from the installations post fieldwork in accordance with The Specification. The samples were obtained using low flow techniques. The record of the in-situ parameters recorded during purging and sampling are presented within Appendix III.

During the first monitoring round, sub-zero temperatures made the extraction of groundwater from the installations extremely difficult as the groundwater froze on contact with the surface. This caused the monitoring and sampling period to be extended to four days over a two week period such that the weather was suitable to allow for groundwater sampling.

4 Laboratory Testing

4.1 Geotechnical Testing

Laboratory testing for geotechnical purposes was completed at Geo Site and Testing Services Limited, UKAS registration number 2788. The testing requirements were specified by Aktins

and the testing has been completed in accordance with the requirements of The Specification and relevant technical standards. The geotechnical testing was completed on 15 March 2023. The testing is summarised in Table 4 and the results are presented within Appendix IV.

Table 4: Geotechnical Testing Summary

Test Type	Number of Tests
Moisture Content	83
Atterberg Limits	45
Particle Size Distribution	69
Organic Matter Content	22
Dry Density / Moisture Content Relationship	4
One Dimensional Consolidation	4
Point Load Index	13
Consolidated Drained Peak Shear Strength	13
BRE Suite D	26

4.2 Geoenvironmental and Geochemical Testing

Laboratory testing for geoenvironmental and geochemical purposes was completed at Eurofins Chemtest, UKAS registration number 2183. The testing requirements were specified by Atkins and the testing has been completed in accordance with The Specification and relevant technical standards. The geoenvironmental testing was completed on 21 February 2023. The testing is summarised within Table 5 and the results are presented within Appendix V.

Table 5: Geoenvironmental Testing Summary

Test Type	Number of Tests
Suite E – Soil	80
Suite F – Leachate	29
Suite G – Waters	37
Suite H – Inert Waste WAC	33

5 References

- AGS. Electronic Transfer of Geotechnical and Geoenvironmental Data (Edition 4.1.1). Association of Geotechnical and Geoenvironmental Specialists. (2022)
- BGS England and Wales Sheet 231, Merthyr Tydfil, 1:50000 geological map (solid and drift). British Geological Survey. (1979)
- BGS GeoIndex (onshore) Map Viewer. www.bgs.ac.uk. British Geological Survey. (2023)
- BRE Digest DG 365. Soakaway design. Building Research Establishment, Garston, Watford. (2016)
- BRE Special Digest 1. Concrete in aggressive ground. Building Research Establishment. (2005)
- BS 1377. Methods of test for soils for civil engineering purposes. British Standards Institution. (1990)
- BS 5930:2015+A1. Code of practice for ground investigations. British Standards Institution. (2020)
- BS 10175:2011+A2. Investigation of potentially contaminated sites. Code of practice. (2017)
- BS EN 1997-2. Eurocode 7. Geotechnical design. Part 2 Ground investigation and testing. British Standards Institution. (2007, incorporating corrigendum June 2010)
- BS EN ISO 14688-1. Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description (2018)
- BS EN ISO 14688-2. Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification (2018)
- BS EN ISO 14689. Geotechnical investigation and testing. Identification, description and classification of rock (2018)
- BS EN ISO 22475-1. Geotechnical investigation and testing. Sampling methods and groundwater measurements. Part 1 Technical principles for the sampling of soil, rock and groundwater. British Standards Institution. (2021)
- BS EN ISO 22476-3:2005+A1. Geotechnical investigation and testing. Field testing. Part 3 Standard penetration test. British Standards Institution. (2011)
- Department for Environment, Food and Rural Affairs (DEFRA) MAGIC maps online application. DEFRA (2022)
- ISRM. The Complete ISRM Suggested Methods for Rock Characterisation, Testing and Monitoring (1974-2006). Commission on Testing Methods, International Society for Rock Mechanics (Editors Ulusay R & Hudson JA). (2007)
- Open Street Map (2022)

Appendix I

Drawings

Exploratory Hole Plan

**Drawing Numbers: G22069-JGS-001
to G22069-JGS-006**



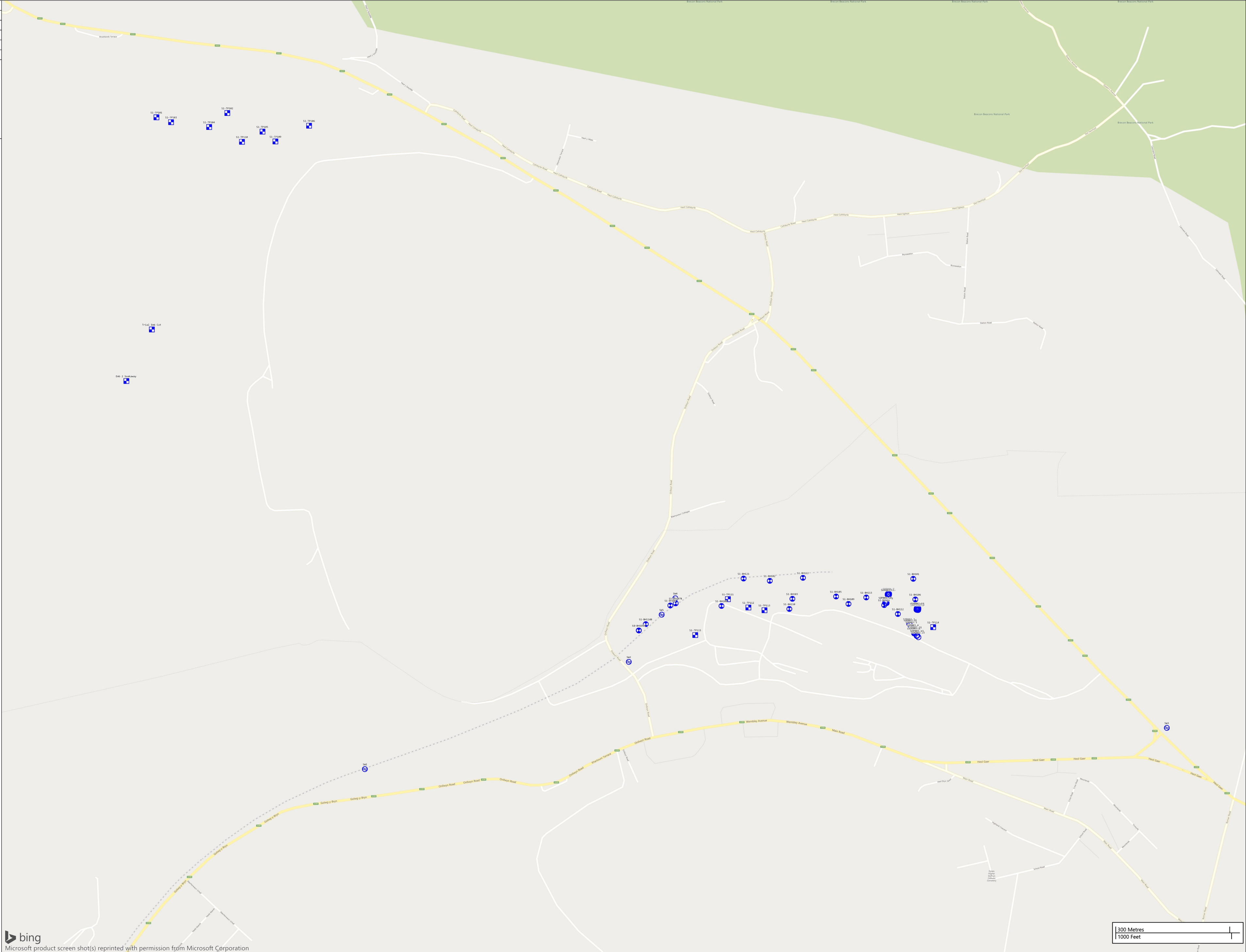
Project	Global Centre of Rail Excellence
Client	Walters UK Limited
Project Number	G22069
Drawing Number	G22069-JGS-001
Scale	1:6500
Printed	16/03/2023 13:25



Legend Key

- Locations By Type - DS
- Locations By Type - DS+RC
- Locations By Type - RO
- Locations By Type - SLSW
- Locations By Type - TP

SITE PLAN



Legend Key

-  Locations By Type - DS
-  Locations By Type - DS+RO
-  Locations By Type - RO
-  Locations By Type - SLSW
-  Locations By Type - TP

Trial Emb Cut

Emb 2 Soakaway

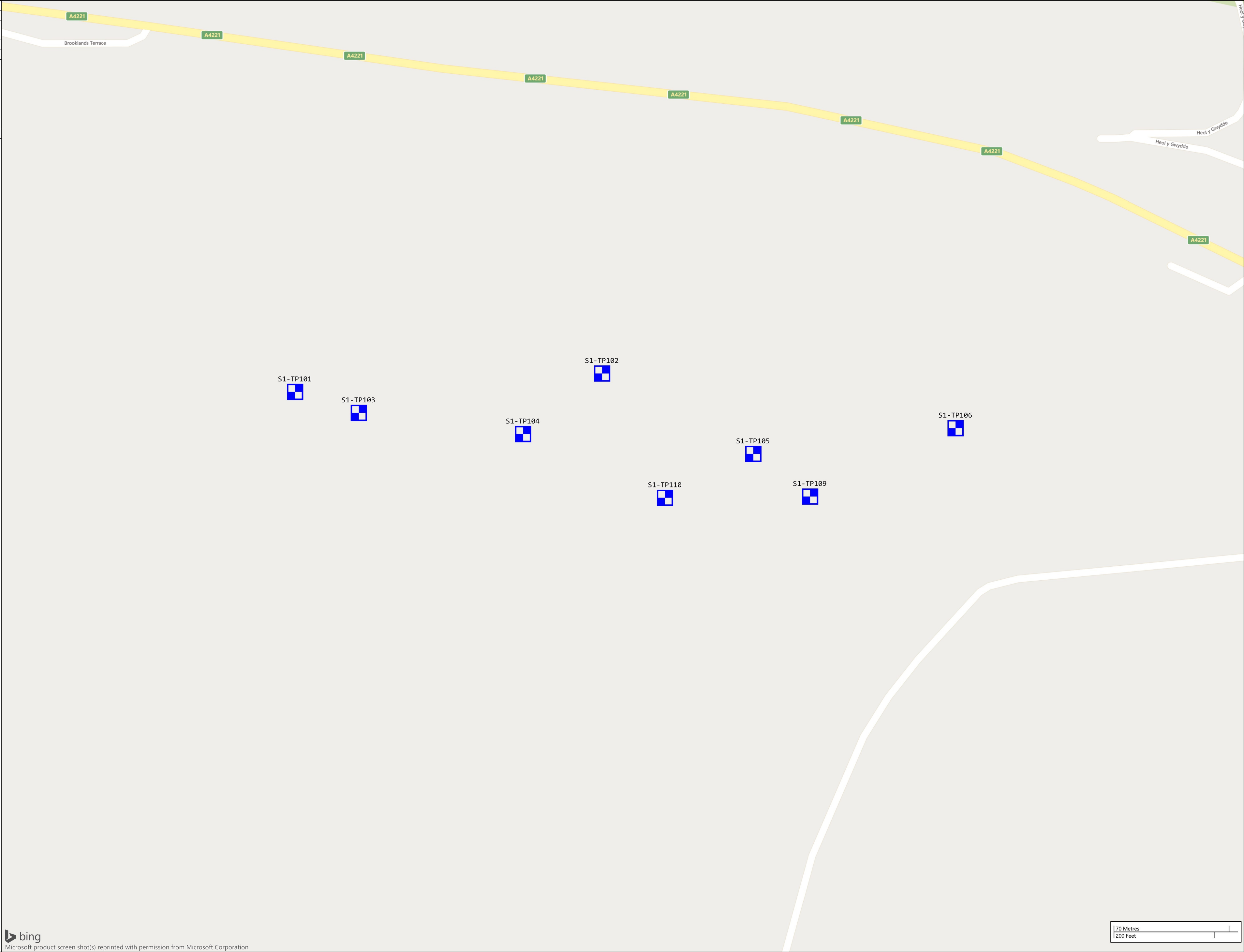


Project	Global Centre of Rail Excellence
Client	Walters UK Limited
Project Number	G22069
Drawing Number	G22069-JGS-002
Scale	1:1500
Printed	16/03/2023 13:27



- Legend Key
-  Locations By Type - DS
 -  Locations By Type - DS+RC
 -  Locations By Type - RO
 -  Locations By Type - SLSW
 -  Locations By Type - TP

SITE PLAN



Project	Global Centre of Rail Excellence
Client	Walters UK Limited
Project Number	G22069
Drawing Number	G22069-JGS-004
Scale	1:1500
Printed	16/03/2023 13:29



Legend Key

-  Locations By Type - DS
-  Locations By Type - DS+RC
-  Locations By Type - RO
-  Locations By Type - SLSW
-  Locations By Type - TP



Project	Global Centre of Rail Excellence
Client	Walters UK Limited
Project Number	G22069
Drawing Number	G22069-JGS-005
Scale	1:1500
Printed	16/03/2023 13:30



Legend Key

-  Locations By Type - DS
-  Locations By Type - DS+RC
-  Locations By Type - RO
-  Locations By Type - SLSW
-  Locations By Type - TP



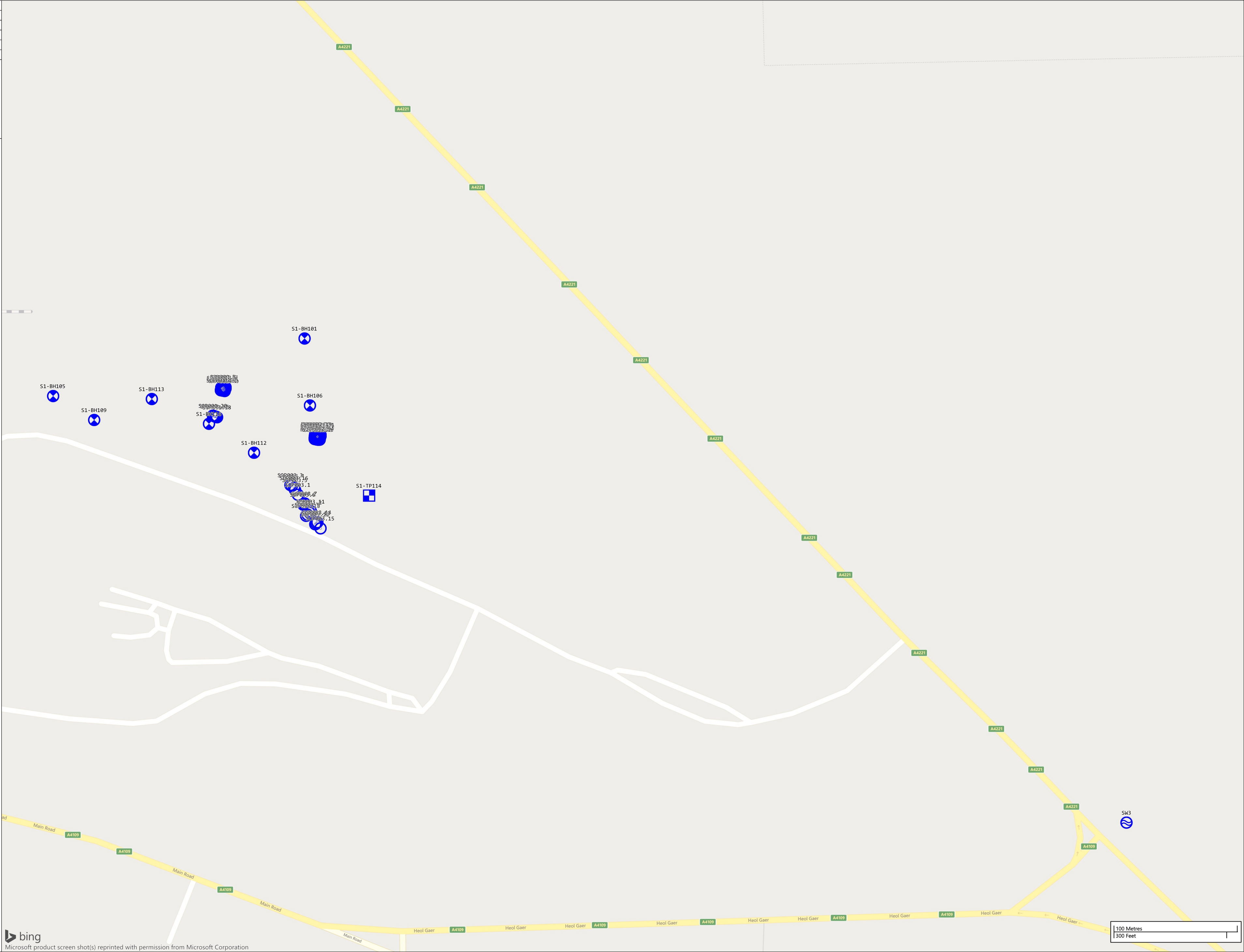
SITE PLAN

Project	Global Centre of Rail Excellence
Client	Walters UK Limited
Project Number	G22069
Drawing Number	G22069-JGS-006
Scale	1:2000
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Legend Key

- Locations By Type - DS
- Locations By Type - DS+RC
- Locations By Type - RO
- Locations By Type - SLSW
- Locations By Type - TP



Appendix II

Exploratory Hole Logs and In-situ Testing

SPT Hammer Calibration Certificate

Certificate Numbers: TECH1,

AR1327 (JD01), AR2394 (JD04),

AR2724 (JD06), AR3829 (JD07)

Dynamic Sampling and Rotary

S1-BH101 to S1-BH103, S1-BH105

Coring Borehole Logs

to S1-BH110 (inc. S1-BH107B),

S1-BH112 to S1-BH114, S1-BH114B

S1-BH114C, S1-BH116, S1-BH121

and S1-BH122

Rotary Open Hole Logs

SOP1.1 to SOP1.20, SOP2.1 to

SOP2.25 and SOP3.1 to SOP3.16

Trial Pits Logs

Emb 2 Soakaway, S1-TP101 to

S1-TP106, S1-TP109 to S1-TP115

and Trial Emb Cut

Soakaway Test Results

Emb 2 Soakaway Test 1 to Test 3

S1-TP111 Test 1

Trial Emb Cut Test 1 to Test 3



Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic Sampling
Unit 8
Victory Park
Victory Road
Derby
DE248ZF

Hammer Ref: TECH1
Test Date: 28/01/2022
Report Date: 28/01/22
File Name: TECH1.spt
Test Operator: B HUNTER

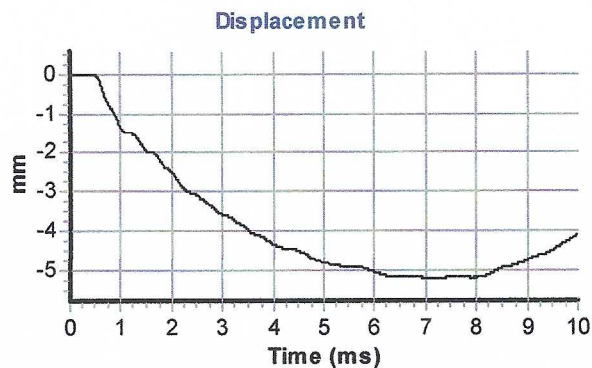
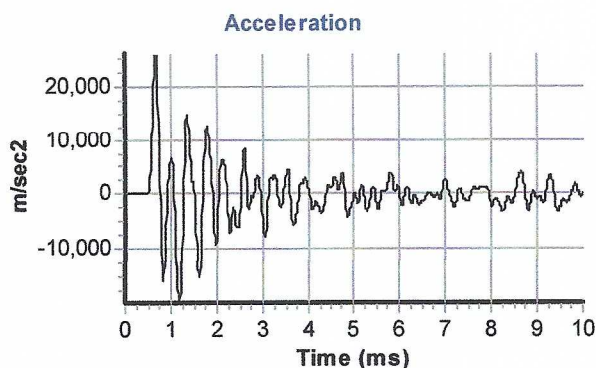
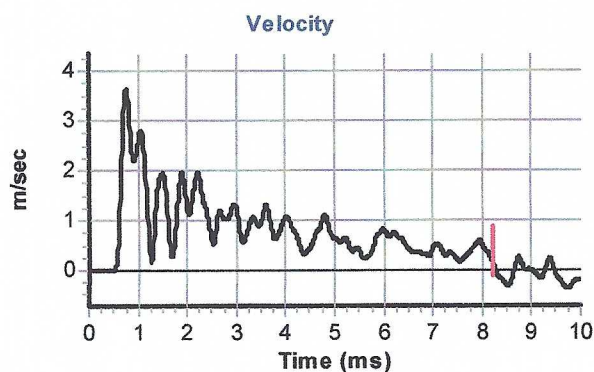
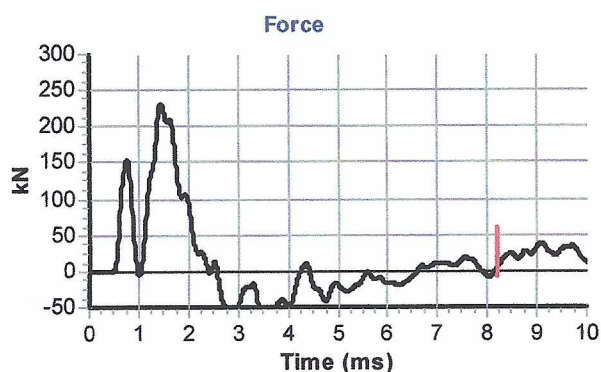
Instrumented Rod Data

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 (mm^2): 905
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 312

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

Signed: B Hunter
Title: Operations Manager

The recommended calibration interval is 12 months

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: AR1327
Test Date: 10/01/2022
Report Date: 10/01/2022
File Name: AR1327.spt
Test Operator: MT

JD01

Instrumented Rod Data

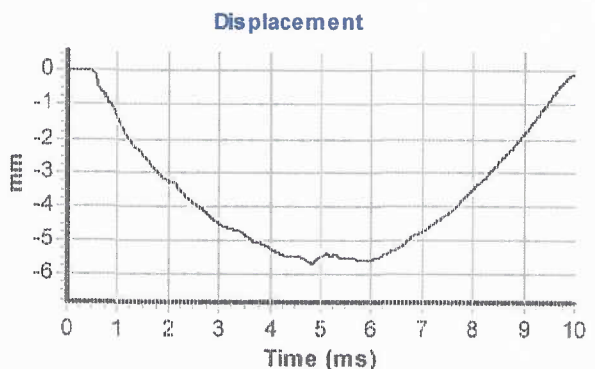
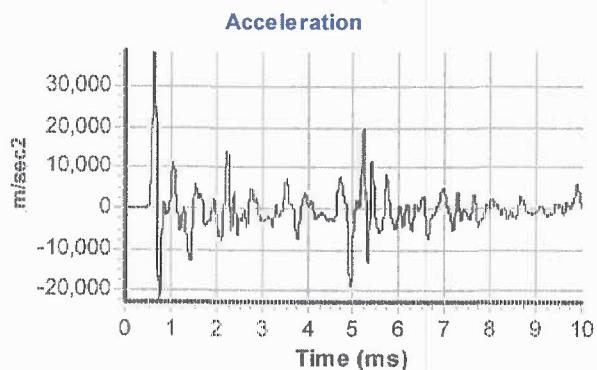
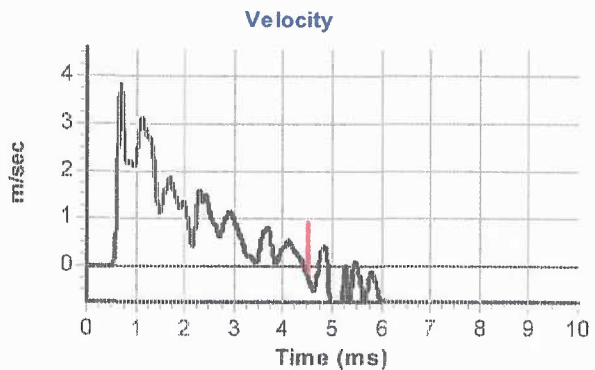
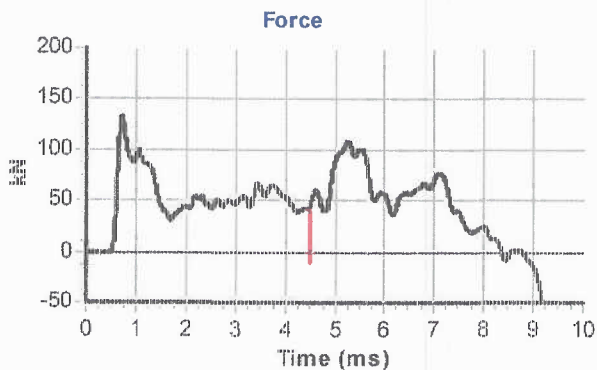
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.0
Assumed Modulus E_a (GPa): 200
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

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

Comments / Location

JACKSON DRILLINGS HOLDINGS LTD - 78642



Calculations

Area of Rod A (mm²): 905
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 332

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

Signed: M. TONER
Title: FITTER

The recommended calibration interval is 12 months

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Hammer
JD04

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

SPT Hammer Ref: AR2394
Test Date: 10/01/2022
Report Date: 10/01/2022
File Name: AR2394.spt
Test Operator: MT

Instrumented Rod Data

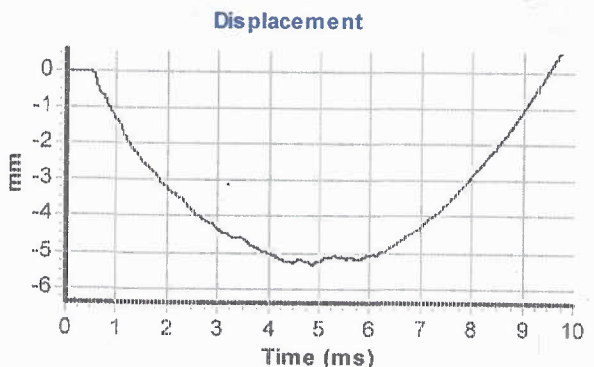
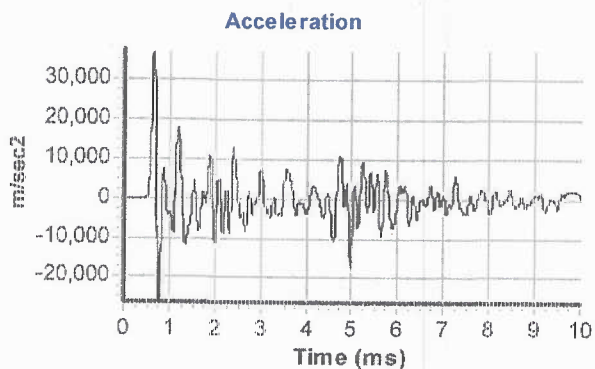
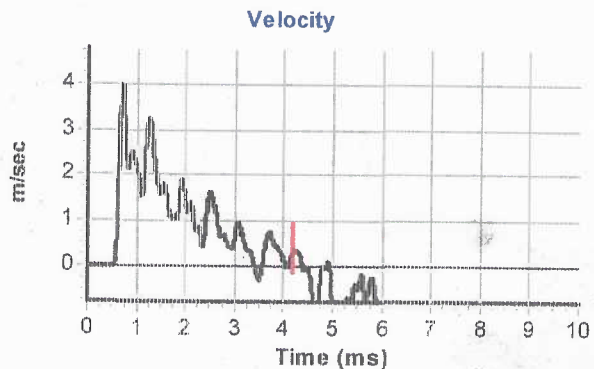
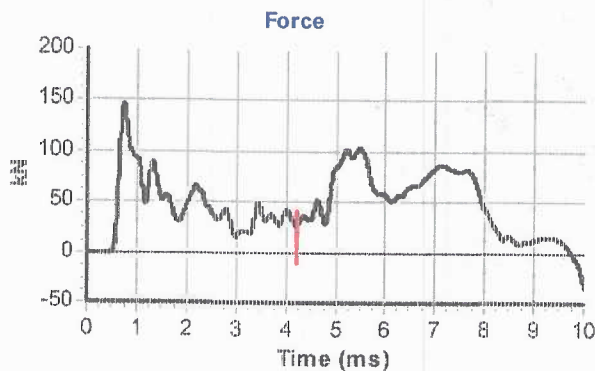
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.0
Assumed Modulus E_a (GPa): 200
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

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

Comments / Location

JACKSON DRILLING HOLDINGS LTD - 78642



Calculations

Area of Rod A (mm²): 905
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 318

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

M.T.

Signed: M.TONER
Title: *TRAINER*
FITTER

The recommended calibration interval is 12 months

J. Lock *FITTER*

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: AR2724
Test Date: 10/01/2022
Report Date: 10/01/2022
File Name: AR2724.spt
Test Operator: MT

JDO6

Instrumented Rod Data

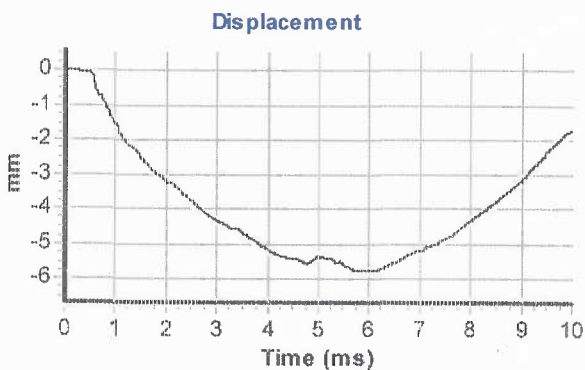
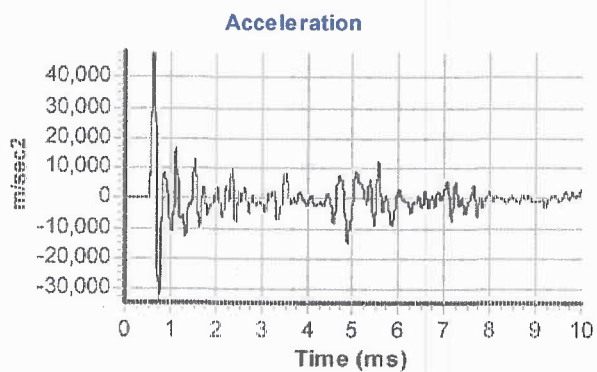
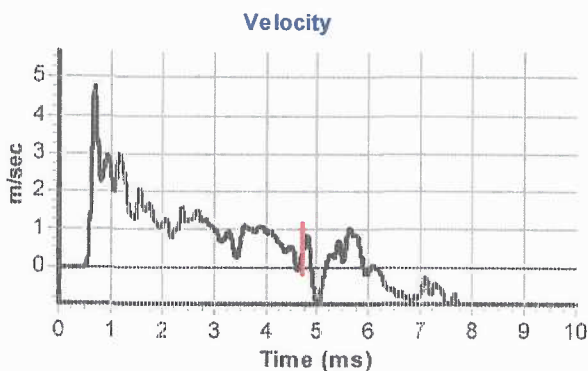
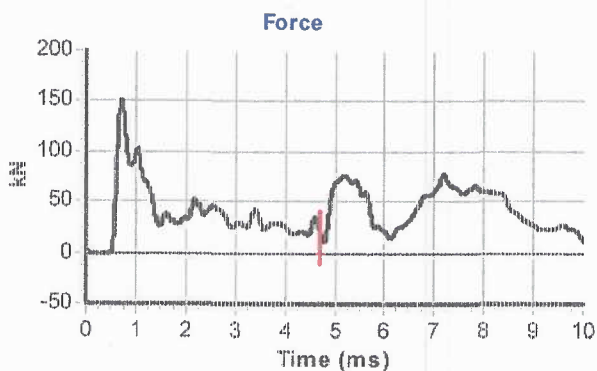
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.0
Assumed Modulus E_a (GPa): 200
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

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

Comments / Location

JACKSON DRILLING HOLDINGS LTD - 78642



Calculations

Area of Rod A (mm²): 905
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 326

Energy Ratio E_r (%): **69**

Signed: M.TONER
Title: **TRANCE**
FITTER

The recommended calibration interval is 12 months

SPT Hammer Energy Test Report

in accordance with BS EN ISO 22476-3:2005

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

SPT Hammer Ref: AR3829
Test Date: 22/12/2021
Report Date: 22/12/2021
File Name: AR3829.spt
Test Operator: JL

JDO7

Instrumented Rod Data

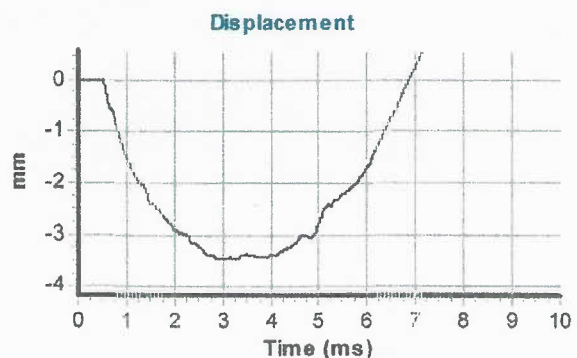
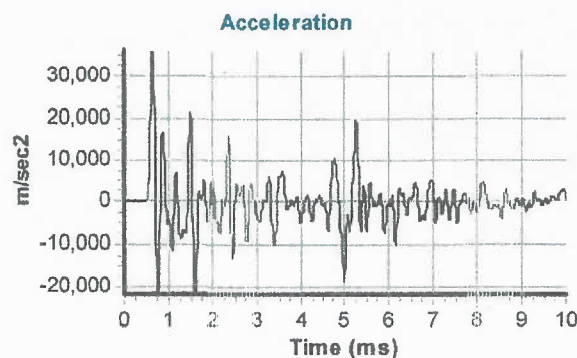
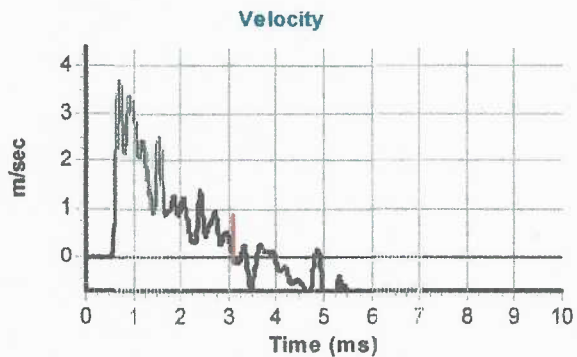
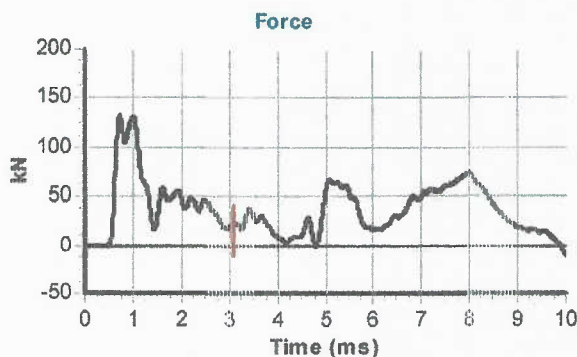
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.0
Assumed Modulus E_s (GPa): 200
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

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

Comments / Location

JACKSON DRILLING HOLDINGS LTD - 78579



Calculations

Area of Rod A (mm²): 905
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 286

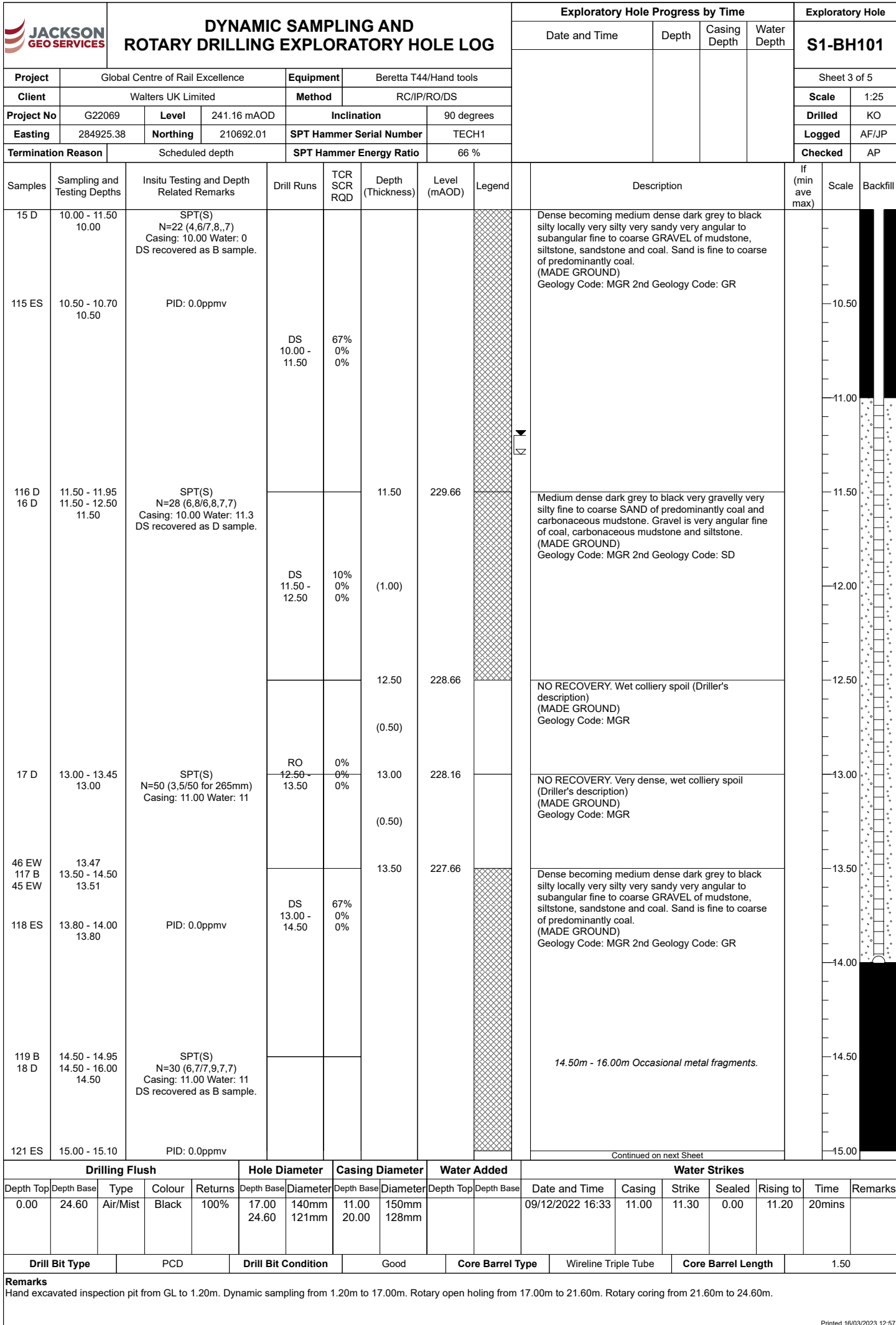
Energy Ratio E_r (%): **61**

Signed: J. LOCK
Title: FITTER

The recommended calibration interval is 12 months

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		DYNAMIC SAMPLING AND ROTARY DRILLING EXPLORATORY HOLE LOG						Exploratory Hole Progress by Time				Exploratory Hole					
								Date and Time		Depth	Casing Depth	Water Depth	S1-BH101				
Project		Global Centre of Rail Excellence			Equipment		Beretta T44/Hand tools			Sheet 2 of 5							
Client		Walters UK Limited			Method		RC/IP/RO/DS			Scale		1:25					
Project No		G22069		Level		241.16 mAOD		Inclination		90 degrees		Drilled		KO			
Easting		284925.38		Northing		210692.01		SPT Hammer Serial Number		TECH1		Logged		AF/J/P			
Termination Reason		Scheduled depth			SPT Hammer Energy Ratio		66 %			Checked		AP					
Samples	Sampling and Testing Depths		Insitu Testing and Depth Related Remarks			Drill Runs	TCR SCR RQD	Depth (Thickness)	Level (mAOD)	Legend	Description		If (min ave max)	Scale	Backfill		
106 B 11 D	5.00		SPT(S) N=24 (3,4/5,5,8,6) Casing: 3.00 Water: 0			DS 5.00 - 6.00	0% 0% 0%	(1.00)	235.16		NO RECOVERY. Colliery spoil (Driller's description) (MADE GROUND) Geology Code: MGR			5.50			
	6.00 - 6.45 6.00 - 7.35 6.00		SPT(S) N=24 (3,5/6,6,8) Casing: 6.00 Water: 0								Medium dense and dense dark grey to black silty to very silty very sandy very angular to subangular fine to coarse GRAVEL of mudstone, siltstone, sandstone and coal. Sand is fine to coarse of predominantly coal. (MADE GROUND) Geology Code: MGR 2nd Geology Code: GR						
107 ES	6.50 - 6.70 6.50		PID: 0.0ppmv			DS 6.00 - 7.00	100% 0% 0%	(1.35)			Dark grey to black gravelly very silty fine to coarse SAND of predominantly coal and carbonaceous mudstone. Gravel is very angular fine of coal, carbonaceous mudstone and siltstone. (MADE GROUND) Geology Code: MGR 2nd Geology Code: SD			6.50			
12 D	7.00 - 7.45 7.00		SPT(S) N=32 (5,9/14,6,6,6) Casing: 6.00 Water: 0			DS 7.00 - 8.00	100% 0% 0%	(0.65)	233.81		Dark grey to black gravelly very silty fine to coarse SAND of predominantly coal and carbonaceous mudstone. Gravel is very angular fine of coal, carbonaceous mudstone and siltstone. (MADE GROUND) Geology Code: MGR 2nd Geology Code: SD			7.00			
108 B	7.35 - 8.00		PID: 0.0ppmv								Dense becoming medium dense dark grey to black silty locally very silty very sandy very angular to subangular fine to coarse GRAVEL of mudstone, siltstone, sandstone and coal. Sand is fine to coarse of predominantly coal. (MADE GROUND) Geology Code: MGR 2nd Geology Code: GR						
109 ES	7.50 - 7.70 7.50		PID: 0.0ppmv			DS 8.00 - 9.00	100% 0% 0%	(3.50)	233.16		Dense becoming medium dense dark grey to black silty locally very silty very sandy very angular to subangular fine to coarse GRAVEL of mudstone, siltstone, sandstone and coal. Sand is fine to coarse of predominantly coal. (MADE GROUND) Geology Code: MGR 2nd Geology Code: GR			7.50			
110 B 13 D	8.00 - 8.45 8.00 - 9.00 8.00		SPT(S) N=33 (5,6/8,8,8,9) Casing: 6.00 Water: 0								Continued on next Sheet						
111 ES	8.50 - 8.70 8.50		PID: 0.0ppmv			DS 9.00 - 10.00	100% 0% 0%	(3.50)			Dense becoming medium dense dark grey to black silty locally very silty very sandy very angular to subangular fine to coarse GRAVEL of mudstone, siltstone, sandstone and coal. Sand is fine to coarse of predominantly coal. (MADE GROUND) Geology Code: MGR 2nd Geology Code: GR			8.50			
112 B 14 D	9.00 - 10.00 9.00 - 9.45 9.00		SPT(S) N=19 (3,2/3,4,6,6) Casing: 9.00 Water: 0 DS recovered as B sample.								Continued on next Sheet						
113 ES	9.50 - 9.70 9.50		PID: 0.0ppmv			DS 9.00 - 10.00	100% 0% 0%	(3.50)			Dense becoming medium dense dark grey to black silty locally very silty very sandy very angular to subangular fine to coarse GRAVEL of mudstone, siltstone, sandstone and coal. Sand is fine to coarse of predominantly coal. (MADE GROUND) Geology Code: MGR 2nd Geology Code: GR			9.50			
114 B	10.00 - 10.45		PID: 0.0ppmv								Continued on next Sheet						
Drilling Flush					Hole Diameter		Casing Diameter		Water Added		Water Strikes						
Depth Top	Depth Base	Type	Colour	Returns	Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Date and Time	Casing	Strike	Sealed	Rising to	Time	Remarks
0.00	24.60	Air/Mist	Black	100%	17.00 24.60	140mm 121mm	11.00 20.00	150mm 128mm			09/12/2022 16:33	11.00	11.30	0.00	11.20	20mins	
Drill Bit Type		PCD		Drill Bit Condition		Good		Core Barrel Type		Wireline Triple Tube		Core Barrel Length		1.50			
Remarks Hand excavated inspection pit from GL to 1.20m. Dynamic sampling from 1.20m to 17.00m. Rotary open holing from 17.00m to 21.60m. Rotary coring from 21.60m to 24.60m.																	
Printed 16/03/2023 12:57																	

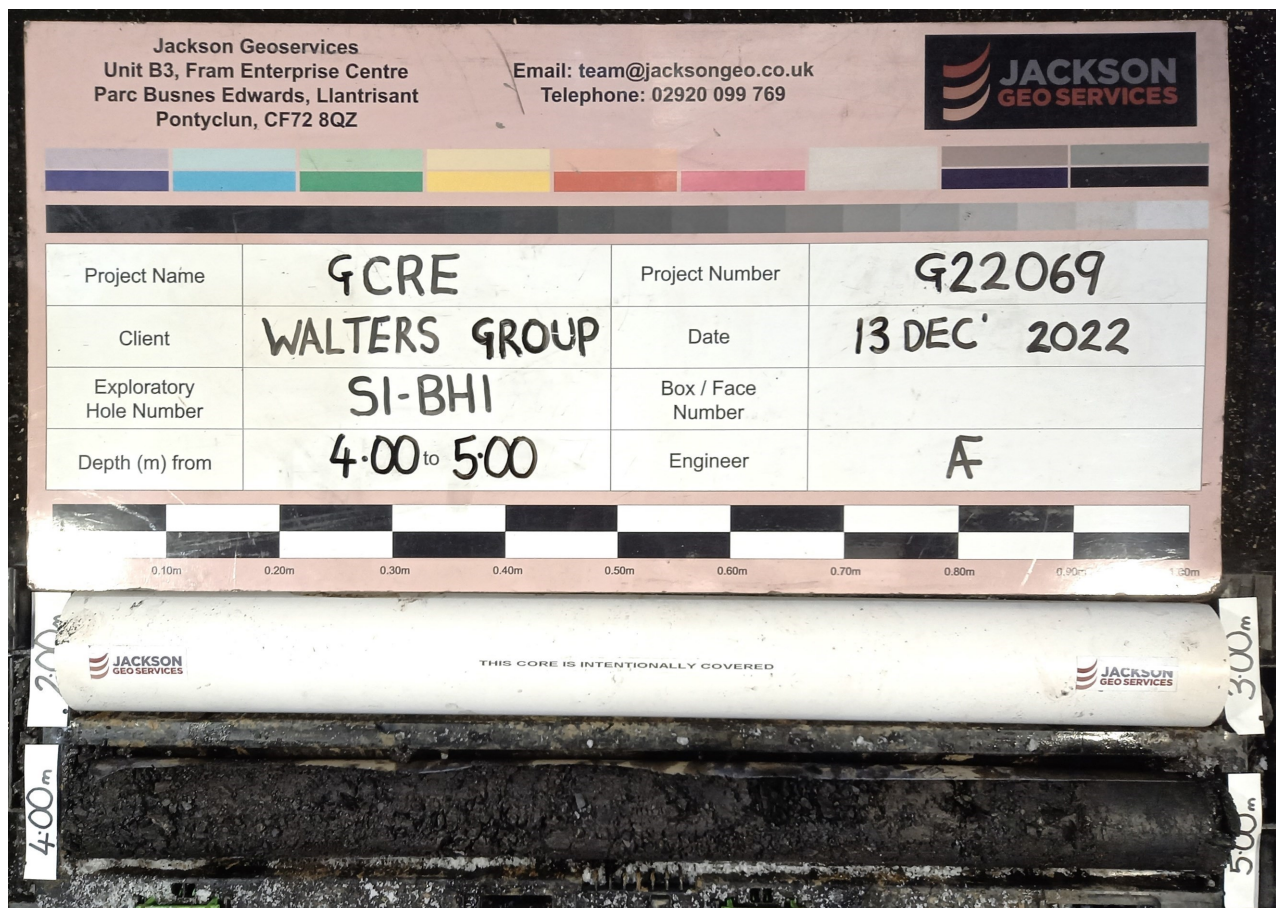


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		EXPLORATORY HOLE PHOTOGRAPHS		Remarks Hand excavated inspection pit from GL to 1.20m. Dynamic sampling from 1.20m to 17.00m. Rotary open holeing from 17.00m to 21.60m. Rotary coring from 21.60m to 24.60m.		Exploratory Hole S1-BH101
Project	Global Centre of Rail Excellence	Easting	284925.38	Equipment	Beretta T44/Hand tools	Sheet 1 of 4
Client	Walters UK Limited	Northing	210692.01	Method	RC/IP/RO/DS	
Project No	G22069	Level	241.16 mAOD	Termination Reason	Scheduled depth	

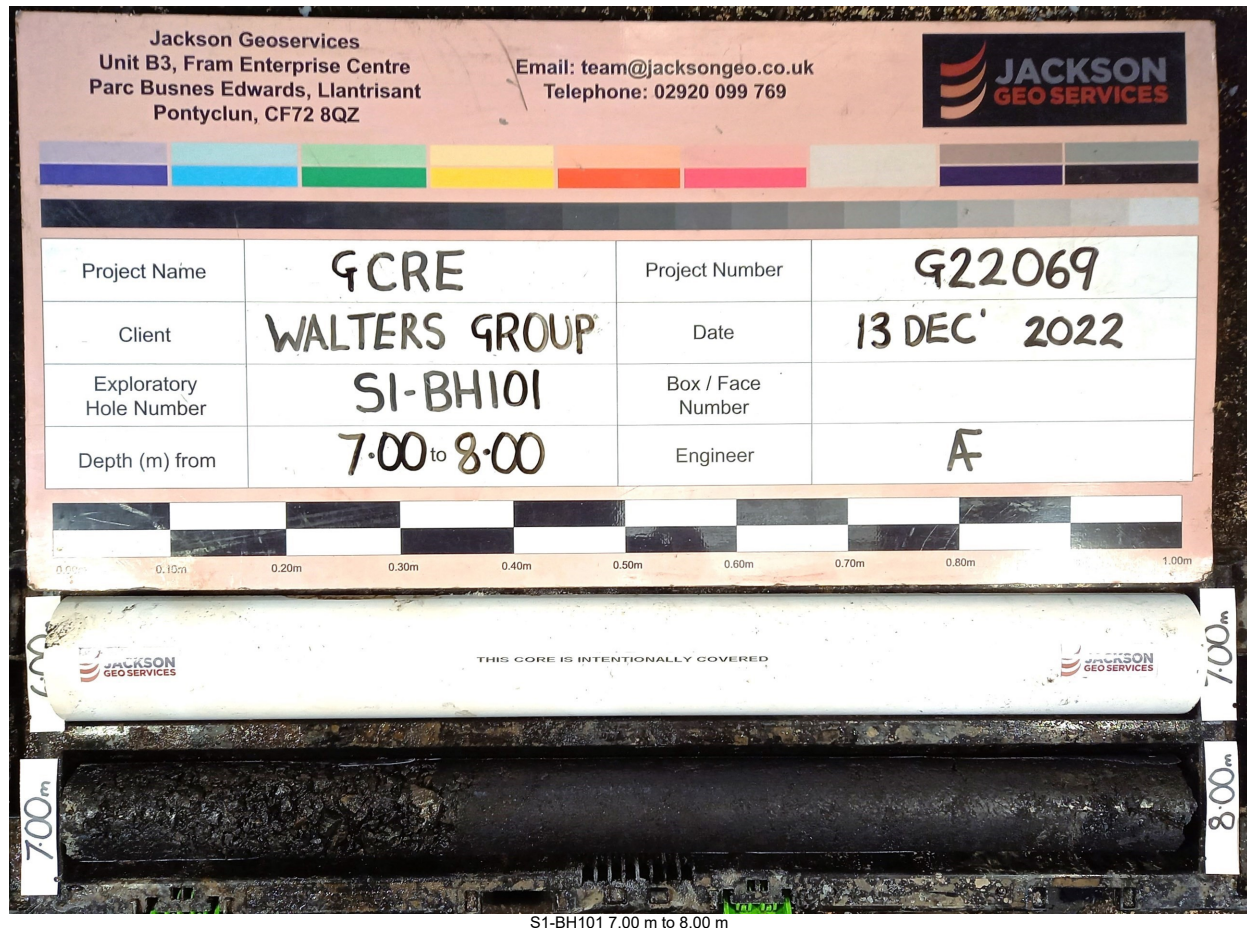


S1-BH101 2.00 m to 3.00 m



S1-BH101 4.00 m to 5.00 m

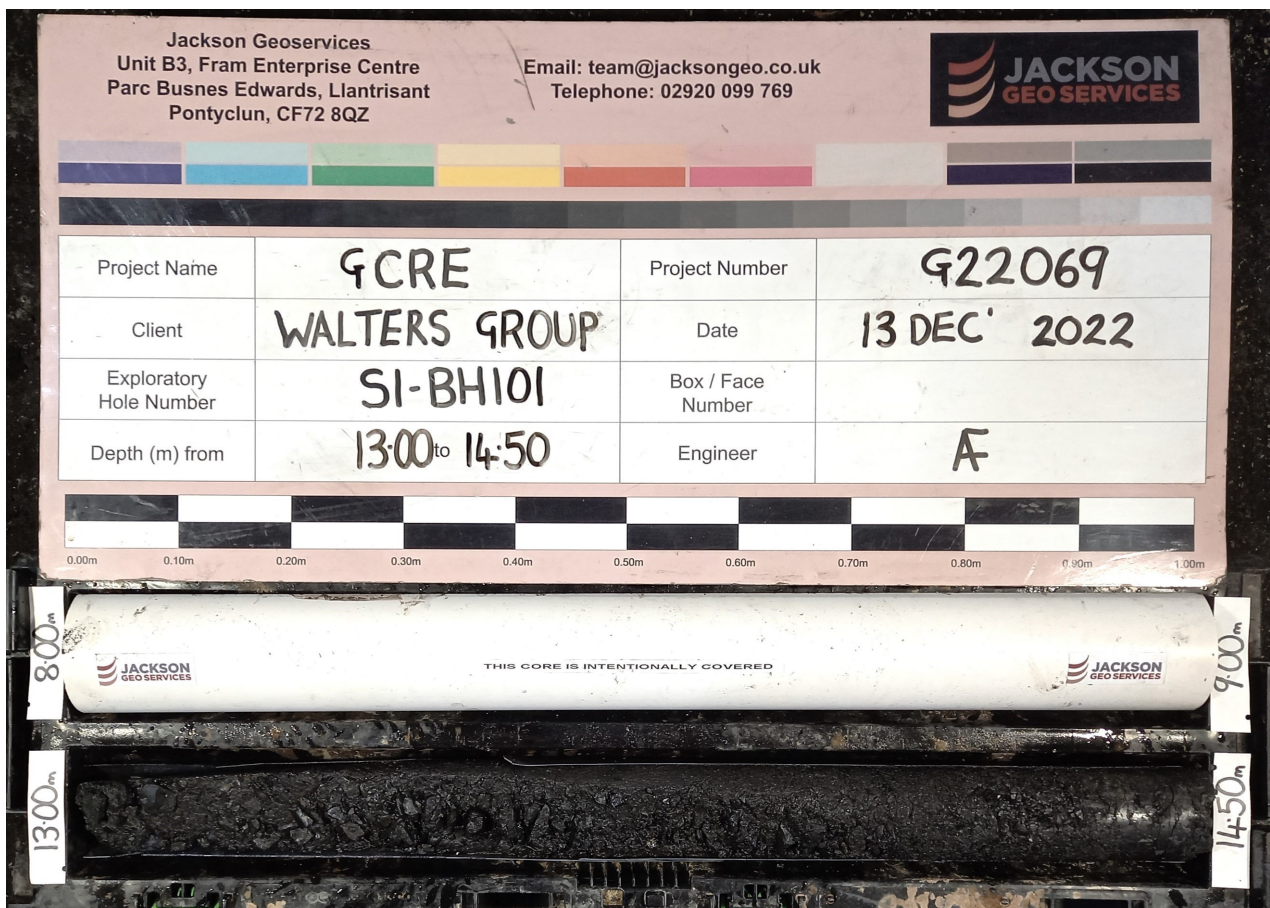
		EXPLORATORY HOLE PHOTOGRAPHS		Remarks Hand excavated inspection pit from GL to 1.20m. Dynamic sampling from 1.20m to 17.00m. Rotary open holing from 17.00m to 21.60m. Rotary coring from 21.60m to 24.60m.		Exploratory Hole S1-BH101
Project	Global Centre of Rail Excellence	Easting	284925.38	Equipment	Beretta T44/Hand tools	Sheet 2 of 4
Client	Walters UK Limited	Northing	210692.01	Method	RC/IP/RO/DS	
Project No	G22069	Level	241.16 mAOD	Termination Reason	Scheduled depth	



		EXPLORATORY HOLE PHOTOGRAPHS		Remarks Hand excavated inspection pit from GL to 1.20m. Dynamic sampling from 1.20m to 17.00m. Rotary open holing from 17.00m to 21.60m. Rotary coring from 21.60m to 24.60m.		Exploratory Hole S1-BH101
Project	Global Centre of Rail Excellence	Easting	284925.38	Equipment	Beretta T44/Hand tools	Sheet 3 of 4
Client	Walters UK Limited	Northing	210692.01	Method	RC/IP/RO/DS	
Project No	G22069	Level	241.16 mAOD	Termination Reason	Scheduled depth	



S1-BH101 8.00 m to 9.00 m



S1-BH101 13.00 m to 14.50 m

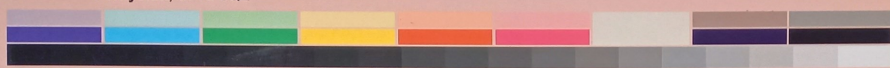
		EXPLORATORY HOLE PHOTOGRAPHS		Remarks Hand excavated inspection pit from GL to 1.20m. Dynamic sampling from 1.20m to 17.00m. Rotary open holing from 17.00m to 21.60m. Rotary coring from 21.60m to 24.60m.		Exploratory Hole S1-BH101
Project	Global Centre of Rail Excellence	Easting	284925.38	Equipment	Beretta T44/Hand tools	Sheet 4 of 4
Client	Walters UK Limited	Northing	210692.01	Method	RC/IP/RO/DS	
Project No	G22069	Level	241.16 mAOD	Termination Reason	Scheduled depth	

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Project Name	GCRE	Project Number	G22069
Client	WALTERS GROUP	Date	20 DEC' 2022
Exploratory Hole Number	S1-BH101	Box / Face Number	
Depth (m) from	21.60 to 23.10	Engineer	A





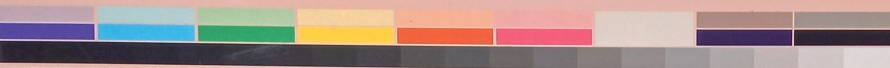
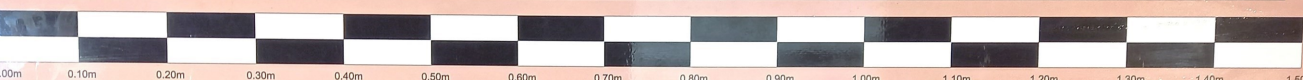

S1-BH101 21.60 m to 23.10 m

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Project Name	GCRE	Project Number	G22069
Client	WALTERS GROUP	Date	20 DEC' 2022
Exploratory Hole Number	S1-BH101	Box / Face Number	
Depth (m) from	23.10 to 24.60	Engineer	A



S1-BH101 23.10 m to 24.60 m



Exploratory Hole Progress by Time				Exploratory Hole	
Date and Time	Depth	Casing Depth	Water Depth	S1-BH102	
11/11/2022 13:33	0.00				
11/11/2022 15:10	1.00	1.00	0.20	Sheet 1 of 6	
14/11/2022 08:57	1.00	1.00	0.60		
14/11/2022 16:00	10.00	10.00	0.90	Scale	1:25
15/11/2022 07:30	10.00	10.00	0.90	Drilled	KO
15/11/2022 16:00	17.00	14.00	0.90	Logged	JP/AF
16/11/2022 08:05	17.00	14.00	0.90	Checked	AP
16/11/2022 16:00	27.00	14.00	0.90		

Drilling Flush					Hole Diameter		Casing Diameter		Water Added		Water Strikes						
Depth Top	Depth Base	Type	Colour	Returns	Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Date and Time	Casing	Strike	Sealed	Rising to	Time	Remarks
7.00	30.00	Air/Mist	Black	100%	30.00	104mm	14.00	168mm			11/11/2022 13:48 14/11/2022 13:38	0.00 7.00	0.60 7.00		0.45 0.90	20mins 20mins	
Drill Bit Type		PCD			Drill Bit Condition		Good		Core Barrel Type		Conventional Triple Tube		Core Barrel Length			1.50	

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		DYNAMIC SAMPLING AND ROTARY DRILLING EXPLORATORY HOLE LOG						Exploratory Hole Progress by Time				Exploratory Hole					
								Date and Time		Depth	Casing Depth	Water Depth	S1-BH102				
Project		Global Centre of Rail Excellence			Equipment		Insulated Hand Tools/Beretta T44			17/11/2022 08:00		27.00	14.00	0.90	Sheet 2 of 6		
Client		Walters UK Limited			Method		IP/RC/WLS			17/11/2022 10:00		30.00	14.00	0.90	Scale 1:25		
Project No		G22069		Level		230.73 mAOD		Inclination		90 degrees				Drilled KO			
Easting		284544.49		Northing		210695.40		SPT Hammer Serial Number		TECH1				Logged JP/AF			
Termination Reason		Scheduled depth			SPT Hammer Energy Ratio		66 %							Checked AP			
Samples	Sampling and Testing Depths		Insitu Testing and Depth Related Remarks			Drill Runs		TCR SCR RQD	Depth (Thickness)	Level (mAOD)	Legend	Description			If (min ave max)	Scale	Backfill
11 D	5.00 - 6.00		SPT(S) N=41 (3,5/9,9,11,12) Casing: 5.00 Water: 0.90 PID: 0.0ppmv Recovered as D from DS 5.00-6.00m.			DS 5.00 - 6.00		10% 0% 0%	(0.65) 5.45	225.28		Dense grey sandy very clayey very angular to angular fine to coarse GRAVEL of mudstone and siltstone. Sand is fine to coarse. (Possible Residual Soil - LOWER SOUTH WALES COAL MEASURES FORMATION) Geology Code: SWCM 2nd Geology Code: GR				5.50	
	12 D 13 D	6.00 - 6.45 6.00 - 7.00 6.00 6.00		SPT(S) N=50 (25 for 95mm/50 for 275mm) Casing: 6.00 Water: 0.90 PID: 0.1ppmv Recovered as D from DS 6.00-7.00m.			DS 6.00 - 7.00		0% 0% 0%	(1.55)		Minimal recovery. Core loss presumed to be weaker/ more weathered material. Recovered core comprises dense and very dense clayey sandy very angular fine to coarse GRAVEL of predominantly siltstone with occasional fine sandstone. Sand is fine to coarse. (Possible Weathered - LOWER SOUTH WALES COAL MEASURES FORMATION) Geology Code: SWCM 2nd Geology Code: SZT					
	7.00		SPT(S) N=38 (3,6/8,8,11,11) Casing: 7.00 Water: 0.90			RC 7.00 - 7.50		0% 0% 0%	(0.50)	223.73		NO RECOVERY. Grey silty CLAY with mudstone gravel. Possible completely weathered mudstone. (Driller's description). (Possible Weathered LOWER SOUTH WALES COAL MEASURES FORMATION) Geology Code: SWCM 2nd Geology Code: CL			Set 1 NA NA NA	7.00	
	28 EW 30 EW 29 EW	8.00		SPT(C) N=44 (5,8/9,12,11,12) Casing: 8.00 Water: 0.90			RC 7.50 - 8.00		40% 0% 0%	7.50		223.23	Minimal recovery. Core loss presumed to be weaker/ more weathered material. Recovered core comprises slightly clayey slightly sandy very angular to subangular fine to coarse GRAVEL very weak to weak mudstone and locally moderately weak siltstone. Possible extremely closely to very closely spaced discontinuities. (Weathered LOWER SOUTH WALES COAL MEASURES FORMATION) Geology Code: SWCM 2nd Geology Code: MST 8.00m - 8.50m No core recovery.			Set 1 NI NI 50	
		8.00		SPT(C) N=50 (7,9/50 for 245mm) Casing: 9.00 Water: 0.90			RC 8.00 - 8.50		0% 0% 0%	(3.00)							8.00
		9.00					RC 8.50 - 9.00		20% 0% 0%								
		9.00					RC 9.00 - 9.50		20% 0% 0%						9.00		
		9.00					RC 9.50 - 10.00		90% 10% 0%								
10.00															10.00		
Continued on next Sheet																	
Drilling Flush					Hole Diameter		Casing Diameter		Water Added		Water Strikes						
Depth Top	Depth Base	Type	Colour	Returns	Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Date and Time	Casing	Strike	Sealed	Rising to	Time	Remarks
7.00	30.00	Air/Mist	Black	100%	30.00	104mm	14.00	168mm			11/11/2022 13:48 14/11/2022 13:38	0.00 7.00	0.60 7.00		0.45 0.90	20mins 20mins	
Drill Bit Type		PCD		Drill Bit Condition		Good		Core Barrel Type		Conventional Triple Tube		Core Barrel Length		1.50			
Remarks Hand excavated inspection pit from GL to 1.20m depth. Dynamic sampling from 1.20m to 7.00m depth. Rotary coring from 7.00m to 30.00m depth.																	
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Exploratory Hole Progress by Time				Exploratory Hole									
Date and Time	Depth	Casing Depth	Water Depth	S1-BH102 Sheet 5 of 6 <table><tr><td>Scale</td><td>1:25</td></tr><tr><td>Drilled</td><td>KO</td></tr><tr><td>Logged</td><td>JP/AF</td></tr><tr><td>Checked</td><td>AP</td></tr></table>		Scale	1:25	Drilled	KO	Logged	JP/AF	Checked	AP
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Exploratory Hole Progress by Time				Exploratory Hole									
Date and Time	Depth	Casing Depth	Water Depth	S1-BH102 Sheet 6 of 6 <table><tr><td>Scale</td><td>1:25</td></tr><tr><td>Drilled</td><td>KO</td></tr><tr><td>Logged</td><td>JP/AF</td></tr><tr><td>Checked</td><td>AP</td></tr></table>		Scale	1:25	Drilled	KO	Logged	JP/AF	Checked	AP
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Drilling Flush					Hole Diameter		Casing Diameter		Water Added		Water Strikes						
Depth Top	Depth Base	Type	Colour	Returns	Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Date and Time	Casing	Strike	Sealed	Rising to	Time	Remarks
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