017/5003/AG/cc

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Dear Jonathan

Lower Edge Quarry – Factual Report

Further to recent completion of fieldwork at the above site please find enclosed a summary of our fieldwork findings.

The site is located off Lower Edge Road, approximately 5.3km southeast of Halifax town centre and currently comprises an active quarry operated by Rand & Asquith. We understand the quarry is partially infilled with "stone, shale and pockets of fly ash", however, in places the existing quarry void is c.20m deep.

The existing topographic survey (dated 13th December 2022) indicates that the quarry floor is not a uniform level, suggesting that backfilling has occurred over time.

Lithos were commissioned by Britology to supervise the drilling of 5 boreholes to approximately 35m depth, with associated monitoring well installations, to inform a landfill permit application, as requested by Hart Environmental Ltd.

Geology

The site is underlain by Elland Flags Bedrock. The Elland Flags consist of a major lower leaf of sandstone about 20m thick with one or more thin leaves close above, separated by about 20m of mudstone from an overlying series of sandstone-siltstone-mudstone alternations 25 to 30m thick.

The Elland Flags were extensively mined and quarried in the local area between 1850 and 1940. It is understood the site contains multiple quarries, excavated to a range of depths between 1850 and present day. Whilst the depths of quarrying are unknown, current quarrying operations have terminated on a basal mudstone unit at c.138mAOD.

Anecdotal evidence suggests an artesian sandstone aquifer underlies the basal mudstone, and therefore it has been assumed that historical quarrying operations will have also terminated on the basal mudstone.

BGS 1:10,000 geological map SE12SW suggests the sandstone dips approximately 5 degrees to the east and is underlain by Lower Coal Measures.

The anticipated depth of the basal mudstone was calculated using the approximate dip of the Elland Flags bedrock, and the base of the current quarry (138m AOD), where basal mudstone has been encountered. These depths were used as an indication of likely borehole termination depths, to ensure the sandstone aquifer was not breached. Calculated depths are given in the table below.

Hole	Calculated basal mudstone depth (m AOD)	Calculated basal mudstone depth (m bgl)
BH01	144.0	14.0
BH02	163.0	11.0
BH03	148.0	30.0
BH04	139.0	37.0
BH05	136.0	37.0

Scope of works

Lithos supervised the drilling of 5 rotary openhole boreholes to allow for the installation of dual gas and groundwater monitoring wells around the perimeter of the site. Monthly gas and groundwater monitoring on 12 occasions will be undertaken over the next 12 months to aid the application of a landfill permit.

The final depth and details of monitoring well installations were provided by Hart Environmental upon the completion of each borehole. It is understood the monitoring wells targeted the base of the quarrying operations/existing landfills.

Fieldwork

The boreholes were drilled using rotary openhole drilling techniques between the 7th and 15th October 2024 and comprised the exploratory holes listed below.

Exploratory holes	Coordinates		Level	Final depth (mbgl)	Final depth (mAOD)	Remarks
	easting	northing				
BH01	412845.1	421374.6	160.149	22.0m	138.149	Dual gas and groundwater monitoring well installed.
BH02	412729.9	421182.0	172.376	26.0m	146.376	
BH03	412813.4	421106.3	177.696	32.4m	145.290	
BH04	412940.4	421050.0	176.317	44.5m	131.817	
BH05	413013.5	421099.8	173.108	39.5m	133.608	

Notes describing ground investigation techniques are included in Appendix A to this report.

Exploratory hole logs are presented in Appendix B to this Report. These logs include details of the:

- Samples taken
- Descriptions of the solid strata, and any groundwater encountered.
- Results of the in-situ testing
- The monitoring wells installed

Exploratory hole locations are shown on Drawing 5003/6 presented in Appendix C; exploratory holes were set-out by a surveyor and co-ordinates/ground levels are included on the logs.

Ground conditions

A complete record of strata encountered in the 5 boreholes is given on the exploratory hole records, presented in Appendix B. Ground conditions are however summarised in the table below.

Hole	Final depth (m bgl)	Final depth (m AOD)	Depth to base m bgl (m AOD)	Depth to top m bgl (m AOD)		Remarks
			Quarry backfill	Rockhead	Basal MST	
BH01	22.0m	138.149	22.0 (138.15)	-	-	Borehole terminated due to borehole reaching depth (m AOD) of adjacent quarrying operations.
BH02	26.0m	146.376	-	1.5 (170.90)	22.0 (150.40)	Borehole terminated 4.0m into basal mudstone.
BH03	32.4m	145.290	6.5 (171.20)	6.5 (171.20)	31.0 (146.70)	Borehole terminated 1.0m into basal mudstone.
BH04	44.5m	131.817	44.5 (131.80)	-	-	Borehole terminated in quarry backfill due to level of borehole going below adjacent quarrying operations.
BH05	39.5m	133.608		0.0 (173.19)	38.5 (134.60)	Borehole terminated 1.0m into basal mudstone.

As expected, the base of the quarry appears to be uneven, as evidenced by ongoing quarrying operations in the northeast of site. Furthermore, historical quarrying operations appear to extend further than previously thought, with BH01 and BH04 encountering quarry backfill to the base of the hole.

Anticipated levels of the basal mudstone appear to only be accurate (within 5m) for BH03 and BH05. The basal mudstone was encountered 13m lower than expected in BH02, and was not encountered in BH01 and BH04.

It is possible that minor faults are present across the site, the base of the sandstone is variable, or the dip of the sandstone varies across the site. It is also likely that historical quarrying operations extended further into the basal mudstone than previously thought, given that holes terminated in quarry backfill, and natural bedrock was not encountered.

Monitoring well installation

Dual purpose gas and groundwater monitoring wells have been installed in all 5 boreholes to allow monthly monitoring of gas and groundwater, in addition to monthly sampling of groundwater. Details of the required monitoring well installation depths were provided by Hart Environmental after the drilling of each borehole.

Details of the monitoring wells are given in the table below.

Monitoring well	Installation	Response zone depths m bgl (m AOD)	Response zone lithology
BH01	19mm HDPE pipe	1.0 – 3.0 (159.15 – 157.15)	Quarry backfill
	50mm HDPE pipe	18.0 – 22.0 (142.15 – 138.15)	Quarry backfill
BH02	19mm HDPE pipe	1.0 – 3.0 (171.38 – 169.38)	Elland Flags
	50mm HDPE pipe	18.0 – 22.0 (154.38 – 150.38)	(Elland Flags
BH03	19mm HDPE pipe	1.0 – 3.0 (176.70 – 174.70)	Granular Residual Soils
	50mm HDPE pipe	28.0 – 32.0 (149.70 – 145.70)	Elland Flags
BH04	19mm HDPE pipe	1.0 – 3.0 (175.32 – 173.32)	Quarry backfill
	50mm HDPE pipe	36.0 – 40.0 (140.32 – 136.32)	Possible Elland Flags
BH05	19mm HDPE pipe	1.0 – 3.0 (172.12 – 170.12)	Elland Flags
	50mm HDPE pipe	35.5 – 39.5 (137.61 – 133.61)	Elland Flags

All groundwater wells will be developed and purged after their installation, followed by monthly gas and groundwater monitoring (12 visits in total). Groundwater will be sampled and tested monthly for 12 months for the following suite:

- Metals (AS, Cd, Cr, Cu, Pb, Hg, Ni, Se, Sn & B)
- Chloride
- Ammoniacal nitrogen
- Conductivity
- Dissolved organic carbon
- pH
- Total phenol
- Speciated TPH
- Speciated PAH

A monthly report detailing the findings of the gas and groundwater monitoring will be issued upon completion of each monitoring visit. The first monthly report will be issued in November 2024.

It is hoped the above is sufficient for your present needs. However, should you require any further information, please contact the undersigned.

Yours sincerely

Adam Gombocz
Director
for and on behalf of
LITHOS CONSULTING LIMITED

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Appendix A – General Notes
Appendix B - Borehole Records
Appendix C - Drawings

Appendix A

General Notes

02 - Ground investigation fieldwork
Generic notes – geoenvironmental investigations

General

Lithos Ground Investigations are undertaken in accordance with current UK guidance including:

- BS5930:2015 "Code of practice for site investigation"
- Eurocode 7: BS EN 1997-1:2004. Geotechnical design - Part 1: General rules
- Eurocode 7: BS EN 1997-2:2007. Geotechnical design - Part 2: Ground investigation and testing
- BS10175:2013 "Code of practice for the identification of potentially contaminated sites"
- "Technical Aspects of Site Investigation" – EA R&D Technical Report P5-065/TR (2000)
- "Development of appropriate soil sampling strategies for land contamination" – EA R&D Technical Report P5-066/TR (2001)
- Contaminated Land Reports 1 to 6, most notably CLR Report No. 4 "Sampling strategies for contaminated land"
- "Guidance on the protection of housing on contaminated land" – NHBC & EA R&D Publication 66 (2000)
- AGS: 1996 "Guide to the selection of Geotechnical Soil Laboratory Testing"

Exploratory hole locations

Exploratory hole locations are selected by Lithos, prior to commencement of fieldwork, to provide a representative view of the strata beneath the site and to target potential contaminant sources identified during the preliminary investigation (desk study). Additional exploratory locations are often determined by the site engineer in light of the ground conditions actually encountered; this enables better delineation of the depth and lateral extent of organic contamination, poor ground, relict structures etc.

Investigation techniques

Ground conditions can be investigated by a number of techniques; the procedures used are in general accordance with BS5930: 2015 and BS1377: 1990. Techniques most commonly used by Lithos include:

- Machine excavated trial pits, usually equipped with a backactor and a 0.6m wide bucket. Allows a thorough inspection of the ground; especially the uppermost 1m or so (but able to reach depths of up to c. 4m), with the recovery of representative, disturbed samples. Also used to conduct soakaway testing.
- Window or windowless sampling boreholes (dynamic sampling). Constraints associated with existing buildings, operations and underground service runs can render some sites partly or wholly inaccessible to a mechanical excavator. In such circumstances, window sampling is often the most appropriate technique. A window sampling drilling rig can be manoeuvred in areas of restricted access and results in minimal disturbance of the ground (a 150mm diameter tarmac/concrete core can be lifted and put to one side). However, it should be noted that window sampling allows only a limited inspection of the ground (especially made ground with a significant proportion of coarse material).
- Cable percussive (Shell & Auger) boreholes, typically using 150mm diameter tools and casing. Enables the recovery of soil samples and data from greater depth than is possible via trial pitting or a mini-percussive drill rig. Also enables the installation of better/deeper monitoring wells (cf use of a mini-percussive drill rig) due to the utilisation of temporary steel casing during drilling.
- Rotary percussive open-hole probeholes are typically drilled using a tri-cone rock roller or polycrystalline diamond compact (PDC) bit with air as the flushing medium. Probeholes are generally lined through made ground with temporary steel casing to prevent hole collapse. Often used to penetrate bedrock to investigate abandoned shallow mineworkings
- Rotary cored boreholes. A rock core is cut by a bit, passes up into the inner barrel and, at the end of the coring run, the core barrel assembly is lifted to the surface. Core drilling is relatively expensive, but essential if quality data is required to assess issues associated with deep excavation, rock slope stability etc.

Where installed, gas\groundwater monitoring wells typically comprise a lower slotted section, surrounded by a filter pack of 10 mm non-calcareous gravel and an upper plain section surrounded in part by a bentonite seal and in part by gravel or arisings. The top of the plain pipe is cut off below ground level and the monitoring well protected by a square, stopcock type manhole cover set in concrete, or the plain pipe is cut off just above ground level and the well protected by 100mm diameter steel borehole helmet set in concrete. Monitoring well details, including the location of the response zone and bentonite seal are presented on the relevant exploratory hole logs.

In-situ testing

Relative densities of granular materials given on the trial pit logs are based on visual inspection only, they do not relate to any specific bearing capacities.

The relative densities of granular materials encountered in cable percussive boreholes are based on Standard Penetration Test (SPT) results. SPTs are carried out boreholes, in accordance with BS 1377 1990, Part 9 Section 3.3. Where full penetration (600mm) is not possible, N values are calculated by linear extrapolation and are shown on the logs as N* = x. The strength of cohesive deposits is determined using a hand shear vane.

Shear strength test results (hand vane readings) reported on trial pit logs are considered to be more reliable than those reported on window sample logs. Significant sample disturbance occurs during window sampling and consequently shear strength results on disturbed window samples are generally lower than results obtained during trial pitting, in-situ or in large excavated blocks.

Sampling

Typically Lithos collect at least three soil samples from each exploratory hole, although in practice a greater number are often taken. The collection of a sufficient number of samples provides a sound basis upon which to schedule laboratory analysis, ensuring:

- A sufficient number of samples from each (common) site material are tested
- Horizontal and vertical coverage of the site is adequate, thereby providing a robust data set for use in the conceptual ground model
- Any localised, significant, but non-pervasive conditions are considered

Made ground and natural soils encountered in the field during a ground investigation often contain a significant proportion of coarse grained material (e.g. brick etc). Soil samples obtained during most investigations are often only truly representative of the in-situ soil mass where there is an absence of particles coarser than medium gravel; i.e the entire soil mass would pass a 20mm sieve.

Representative bulk samples of the soil mass are retrieved from coarse soils for specific geotechnical tests (most notably grading and compaction); this typically requires the collection of at least 10kg of soil, and occasionally >50kg. However, in the context of assessing land contamination, it is generally accepted that samples should be representative of the soil matrix of the stratum from which they are taken. Consequently, truly representative samples of coarse soils for subsequent contaminant analysis are not obtained - only the finer fraction is placed in sample containers. Coarse constituents not sampled would typically comprise any 'particles' with an average diameter greater than about 20mm (i.e. coarse gravel, cobble and boulder).

At present, neither ISO/IEC 17025 nor MCERTS specify sample pre-treatment with respect to stone removal. Unsurprisingly therefore UKAS accredited testing laboratories do not adopt the same approach to stones[1] – some crush and test the "as received" soil, whilst others sieve out stones and analyse only the residual soil (the sieve size used varies depending on the laboratory).

In essence, samples taken from coarser soils for contaminant analysis are "screened" by the geoenvironmental engineer in the field, and often sieved again by the laboratory during sample preparation. Geoenvironmental engineers do not typically re-calculate soil mass contaminant concentrations by taking account of the unsampled coarse fraction. Likewise, laboratories that remove stones typically report contaminant concentrations based on the dry weight of soil passing the sieve. In the context of land contamination and human health risk assessment, this is considered reasonable, because it is the soil matrix which is of greatest concern. Stones are unlikely to:

- Provide a significant source for plant uptake (consumption of vegetables)
- Remain on vegetables after washing (consumption of vegetables)
- Be eaten (accidentally by an adult, or deliberately by a child)
- Be whipped-up by the wind for dust generation (inhalation)
- Stick to the skin for any length of time (dermal contact)
- Yield toxic vapour (inhalation)

Consequently, Lithos instruct labs to remove all stones >10mm, and to report the results as dry-weight based on the mass of matrix tested. However, the laboratory are given site-specific instruction where coarse stones are coated in say oil, or impregnated with mobile contaminants such as diesel. Where the stones are predominantly natural, or inert (e.g. brick, concrete etc), removal will clearly result in higher reported concentrations, than if the stones were crushed and added to the matrix.

Where the stones include a significant proportion of contaminant-rich material (e.g. slag, fragments of galvanised metal etc) an argument could be made for crushing and analysing. However, provided the stones are stable (i.e. unlikely to disintegrate or degrade) they should not pose a significant risk to human health for the reasons stated above.

Sometimes it is necessary to obtain samples that are not representative of the wider soil matrix, for example when investigating localised, significant, but non-pervasive conditions. Any such unrepresentative samples are annotated with the suffix '*' (eg 2D*, or 4G*). Lithos' site engineer describes both the unrepresentative sample, and the soil mass from which it was been taken.

Sample Containers (for contaminant analysis). Samples of soil for contaminant testing are placed into appropriate containers (see below). Soil samples for organic analysis are stored in cool boxes, at a temperature of approximately 4ºC, until delivery to the selected laboratory.

Anticipated testing	Container(s)
Asbestos identification	1000ml plastic tub
pH & metals	1000ml plastic tub or 250ml glass jars
non-volatile organics	250ml glass jars
Speciated TPH	250ml & 50ml glass jars
VOCs (incl. naphthalene and \or GRO)	50ml glass jar

Sample Containers (for geotechnical analysis). The majority of samples are only scheduled for PI and sulphate testing, for which 500g of sample is required (a full 0.5-litre plastic tub). However, bulk bags are taken where scheduling of compaction or grading tests is proposed.

Groundwater

Where encountered during fieldwork, groundwater is recorded on exploratory hole logs. If monitoring wells are installed, groundwater levels are also recorded on one or more occasions after completion of the fieldwork. Long-term monitoring of standpipes or piezometers is always recommended if water levels are likely to have a significant effect on earthworks or foundation design.

It should be borne in mind that the rapid excavation rates used during a ground investigation may not allow the establishment of equilibrium water levels. Water levels are likely to fluctuate with season/rainfall and could be substantially higher at wetter times of the year than those found during this investigation.

Description of strata

Soils encountered during a Lithos investigation are described (logged) in general accordance with BS 5930:2015. The descriptions and depth of strata encountered are presented on the exploratory hole logs and summarised in the Ground Conditions section within the main body of text. The materials encountered in the trial pits are logged, samples taken, and tests performed on the in-situ materials in the excavation faces, to depths of up to 1.2m; below this depth these operations are conducted at the surface on disturbed samples recovered from the excavation.

[1] *Mark Perrin. Stoned – Sample Preparation for Soils Analysis. Ground Engineering, April 2007.*

Appendix B

Borehole Logs

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Borehole Log

Borehole No.
BH01
Sheet 1 of 2

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412845.06 - 421374.61	Hole Type PH
Location:	Rastrick		Level:	160.15	Scale 1:100
Client:	Britology		Dates:	15/10/2024 - 15/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Light brown QUARRY BACKFILL. Recovered as sandstone with occasional flecks of mudstone. (QUARRY BACKFILL)

Continued on next sheet

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH01
Sheet 2 of 2

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412845.06 - 421374.61	Hole Type PH
Location:	Rastrick		Level:	160.15	Scale 1:100
Client:	Britology		Dates:	15/10/2024 - 15/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					22.00	138.15		End of borehole at 22.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH02
Sheet 1 of 2

Project Name: Quarry at Rastrick	Project No. 5003	Co-ords: 412729.92 - 421181.99	Hole Type PH
Location: Rastrick		Level: 172.40	Scale 1:100
Client: Britology		Dates: 07/10/2024 - 07/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overburden. (GRANULAR RESIDUAL SOIL)
					1.50	170.90		Light brown SANDSTONE. (ELLAND FLAGS)
					7.00	165.40		Interbedded SANDSTONE and MUDSTONE. (ELLAND FLAGS)
					8.40	164.00		Light brown SANDSTONE. (ELLAND FLAGS) *Between 12.4m and 15.4m depth, loss of flush.*
	▼				16.30	156.10		Dark grey MUDSTONE. (ELLAND FLAGS) *Between 17.3m and 20.3m, water strike. Exact depth of strike difficult to determine.*
					18.00	154.40		Light brown SANDSTONE with fine bands of dark grey MUDSTONE. (ELLAND FLAGS)

Continued on next sheet

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered between 17.3m and 20.3m depth. 3. Flush returns were lost from 12.4m and 15.4m depth. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH02
Sheet 2 of 2

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412729.92 - 421181.99	Hole Type PH
Location:	Rastrick		Level:	172.40	Scale 1:100
Client:	Britology		Dates:	07/10/2024 - 07/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					22.00	150.40		Dark grey MUDSTONE. (ELLAND FLAGS)
					26.00	146.40		End of borehole at 26.00 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater encountered between 17.3m and 20.3m depth. 3. Flush returns were lost from 12.4m and 15.4m depth. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

LITHOS CONSULTING			Borehole No. **BH03** Sheet 1 of 2
Project Name: Quarry at Rastrick	Project No. 5003	Co-ords: 412813.40 - 421106.28	Hole Type PH
Location: Rastrick		Level: 177.70	Scale 1:100
Client: Britology		Dates: 08/10/2024 - 09/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Overbuden. (GRANULAR RESIDUAL SOIL)
					6.50	171.20		Light brown SANDSTONE with occasional bands of dark grey MUDSTONE. (ELLAND FLAGS)
								Between 11.5m and 17.4m depth, loss of flush.
								Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH03
Sheet 2 of 2

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412813.40 - 421106.28	Hole Type PH
Location:	Rastrick		Level:	177.70	Scale 1:100
Client:	Britology		Dates:	08/10/2024 - 09/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					26.00	151.70		Dark grey MUDSTONE. (ELLAND FLAGS)
					27.00	150.70		Interbedded SANDSTONE and MUDSTONE. (ELLAND FLAGS)
					31.00	146.70		Dark grey MUDSTONE. (ELLAND FLAGS)
					32.40	145.30		End of borehole at 32.40 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No. **BH04**

Sheet 1 of 3

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412940.37 - 421050.00	Hole Type PH
Location:	Rastrick		Level:	176.30	Scale 1:100
Client:	Britology		Dates:	10/10/2024 - 10/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Light brown QUARRY BACKFILL. Recovered as a light brown sandstone with occasional bands of dark grey mudstone. (QUARRY BACKFILL)
								Between 8.5m and 11.5m, wood returned.
								At 16.0m, textiles returned.
								Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Flush returns were lost from 40.0m and 44.5m depth. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH04
Sheet 2 of 3

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412940.37 - 421050.00	Hole Type PH
Location:	Rastrick		Level:	176.30	Scale 1:100
Client:	Britology		Dates:	10/10/2024 - 10/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								At 33.5m, wood returned.
								At 37.0m, clinker returned.
					40.00	136.30		Continued on next sheet

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Flush returns were lost from 40.0m and 44.5m depth. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH04
Sheet 3 of 3

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	412940.37 - 421050.00	Hole Type PH
Location:	Rastrick		Level:	176.30	Scale 1:100
Client:	Britology		Dates:	10/10/2024 - 10/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Soft drilling, limited flush returns. Possible mudstone?
					44.50	131.80		End of borehole at 44.50 m

41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Flush returns were lost from 40.0m and 44.5m depth. 4. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No. **BH05**

Sheet 1 of 2

Project Name: Quarry at Rastrick	Project No. 5003	Co-ords: 413013.46 - 421099.76	Hole Type PH
Location: Rastrick		Level: 173.10	Scale 1:100
Client: Britology		Dates: 14/10/2024 - 14/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Light brown SANDSTONE. (ELLAND FLAGS)
					6.00	167.10		Dark grey MUDSTONE. (ELLAND FLAGS)
					11.50	161.60		Light brown SANDSTONE. (ELLAND FLAGS)
					16.00	157.10		Dark grey MUDSTONE. (ELLAND FLAGS)
								Continued on next sheet

Remarks

1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

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Borehole Log

Borehole No.
BH05
Sheet 2 of 2

Project Name:	Quarry at Rastrick	Project No. 5003	Co-ords:	413013.46 - 421099.76	Hole Type PH
Location:	Rastrick		Level:	173.10	Scale 1:100
Client:	Britology		Dates:	14/10/2024 - 14/10/2024	Logged By CC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					21.50	151.60		Light brown SANDSTONE. (ELLAND FLAGS)
					35.50	137.60		Dark grey MUDSTONE. (ELLAND FLAGS)
					37.00	136.10		Interbedded SANDSTONE and MUDSTONE. (ELLAND FLAGS)
					38.50	134.60		Dark grey MUDSTONE. (ELLAND FLAGS)
					39.50	133.60		End of borehole at 39.50 m

Remarks
1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not encountered. 3. Exploratory hole surveyed in (level and co-ordinates) on completion.

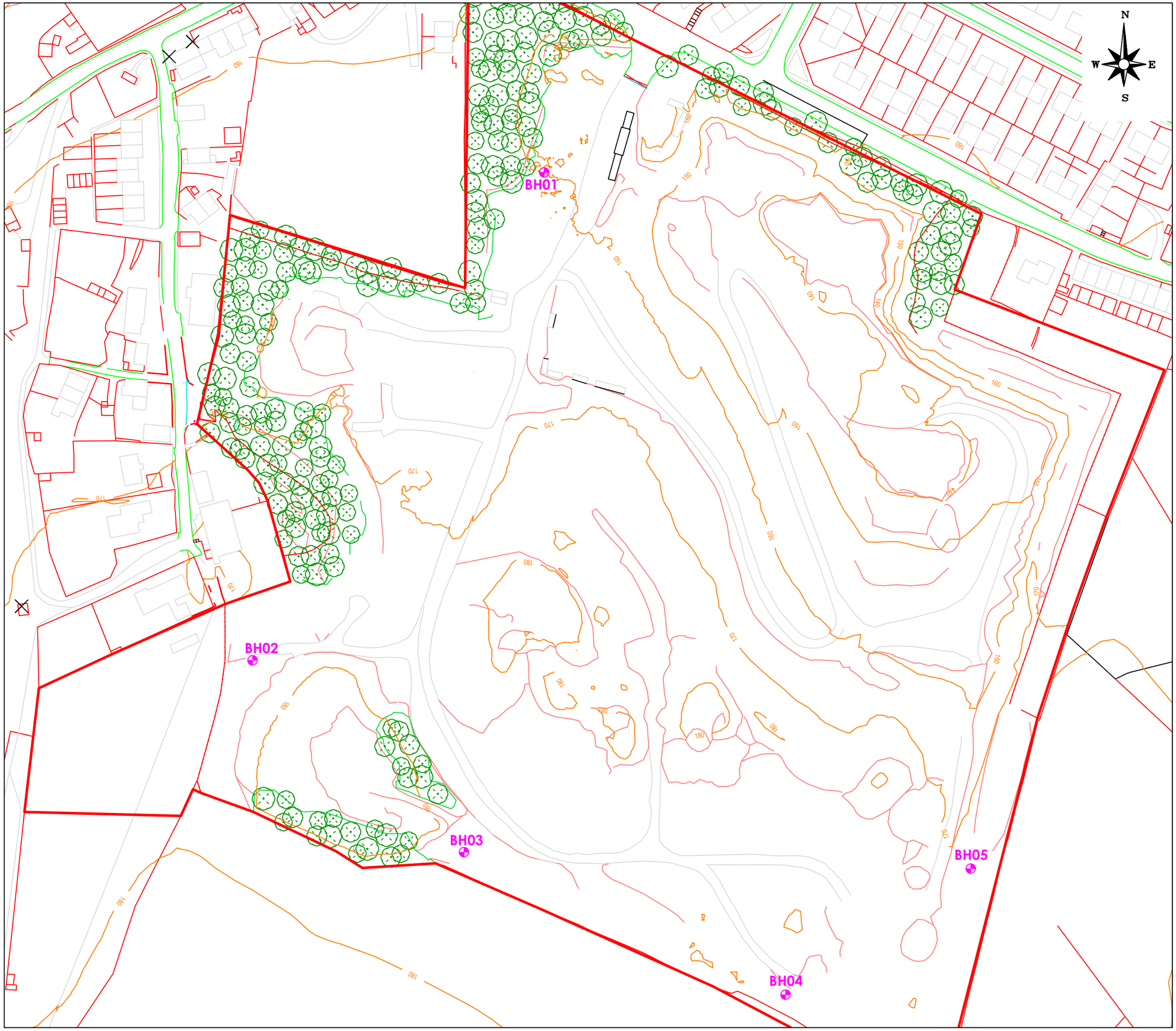
AGS

Appendix C

Drawings

LITHOS CONSULTING
info@lithos.co.uk
www.lithos.co.uk
Tel 01937 545330

CLIENT	BRITOLOGY
JOB TITLE	QUARRY NEAR RASTRICK, BRIGHOUSE
DRAWING TITLE	SITE LOCATION PLAN
DRAWN	LEW
DATE	22 10 2024
CHECKED	AG
DATE	22 10 2024
STATUS	FOR COMMENT ☐ DRAFT ☐ FOR APPROVAL ☐ FINAL ☑
SCALE	1:25,000
SHEET	A4
DRAWING NO.	5003/1
REVISION	



NOTES

BOREHOLE LOCATION

APPROXIMATE SITE BOUNDARY

EXPLORATORY HOLE LOCATIONS HAVE BEEN SURVEYED IN (COORDINATES & GROUND LEVEL) ON COMPLETION

REV.	DESCRIPTION	DATE

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CLIENT

BRITOLOGY

JOB TITLE

QUARRY NEAR RASTRICK, BRIGHOUSE

DRAWING TITLE

EXPLORATORY HOLE LOCATIONS

DRAWN	DATE	STATUS
LEW	16 10 2025	FOR COMMENT ☐
CHECKED	DATE	FOR APPROVAL ☐
AG	16 10 2025	DRAFT ☐
		FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:1500	A3	5003/6	