Hart Environmental Ltd.

Lower Edge Quarry, Brighouse

PFA Site Investigation Report

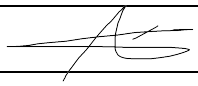
Revision 01

August 2024

Vertase FLI

Contaminated Land, Brownfield & Environmental Contracting

REPORT TITLE:	**Lower Edge Quarry PFA Site Investigation**
REPORT NUMBER:	**2030BRI 001**
CLIENT NAME:	**Hart Environmental Ltd**

Author	**Signed**	**Date**
Yassin Khanteche		05 August 2024
Project Manager	**Signed**	**Date**
QA Approved	**Signed**	**Date**

Issue 1	Revision A	

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Appendices

1.0 Introduction

1.1 Scope

1.1.1 VertaseFLI Limited (Vertase) has been instructed by Hart Environmental Ltd (the Client) to undertake a site investigation within the Lower Edge Quarry (The Site).

1.1.2 The aim of this investigation is to confirm the presence or absence of Pulverized Fuel Ash (PFA) within the backfill at the base of the quarry, for which there is anecdotal evidence of historic dumping. However, no records have been found to confirm this.

1.1.3 This report details the results of this site investigation works along with the trial pit logging and soil chemical results.

2.0 Background

2.1 Site Information

2.1.1 The Site is situated on Lower Edge Road, southwest of Brighouse. The site is located on National Grid Reference 412839, 421356.

2.1.2 The Site is an active quarry, with two separate pits. The larger pit is approximately rectangular in shape. At the base of the quarry, there is a pond situated by the northern boundary. The quarry is considered the last working quarry in the immediate area and has been used to mine high quality sandstone.

2.1.3 The depth to base of the quarry is estimated to be 20 meters below ground level.

2.2 Purpose of Investigation

2.2.1 The purpose for the investigation is to investigate the potential presence of Pulverised Fuel Ash (PFA), as it is a waste known to contain heavy metals such as lead (Pb), cadmium (Cd), mercury (Hg), arsenic (As), chromium (Cr) and vanadium (V), which may leach into surface and groundwater.

2.2.2 A report compiled by a third-party consultant during a hydrogeological impact assessment (Stephen Buss Consulting Ltd: Hydrogeological Risk Assessment of Elland Edge Quarry Recovery Scheme, Feb 2015) reported findings of PFA in nearby quarries. As a result, the Environment Agency (EA) has requested an investigation to determine the presence of PFA within the quarry.

3.0 Methodology

3.1 Trial Pits

3.1.1 Trial pits were excavated using a 360-degree excavator, a large bucket was utilised to allow removal of potentially large sandstone if encountered.

3.1.2 A total of eight (8No.) trial pits, were undertaken along the base of the quarry.

3.1.3 Each trial pit was excavated to a maximum depth of up to 4m and had an average width of 3m in diameter. The trial pits were logged to identify any signs of contamination present. The Trial Pit logs are presented in Appendix B.

3.2 Trial Pit Logging

3.2.1 All the Borehole and Trial Pits were logged to BS 5930 Standards.

3.3 Trial Pit Locations

3.3.1 The following table provides information on Easting, Northing and depth for each of the trial pits.

Table 1. Trial Pit placements and depth excavated.

Trial Pit ID	Easting (X)	Northing (Y)	Depth (metres)
TP 1	413006	421277	1.8
TP 2	412976	421278	0.7
TP 3	412951	421302	1.6
TP 4	412933	421332	4.0
TP 5	412922	421363	2.6
TP 6	412923	421341	2.4
TP 7	412992	421265	2.6
TP 8	413010	421263	4.0

3.3.2 The locations of the trial pits are shown in Drawing D2030_02 As-Dug Trial Pit Locations in Appendix A.

3.4 Geological Logs

3.4.1 The geological logs from the trial pits can be found in Appendix B.

3.4.2 Photos of the trial pits and arisings are presented in Appendix C.

3.5 Soil Sampling and Analysis

3.5.1 Six (6No.) soil samples were taken, among the six samples, five (5No.) were taken from the trial pits at various depths and one (1No.) was taken from the surface, where some slightly grey soils were identified and labelled as blue shale.

3.5.2 The samples were sent off to the laboratory for a chemical analysis of TPH CWG (Total Petroleum Hydrocarbons – Criteria Working Group), Loss on Ignition (LoI), and Heavy Metals.

4.0 Results

4.1 Soil Analysis Results

4.1.1 The laboratory certificates for the findings are shown in Appendix D - Laboratory Certificates – Soils.

4.1.1 The following table provides a summary of the chemical testing results for each of the trial pits.

Table 2. Summary of the chemical testing results

Analysis		TP4	TP5	TP6	TP7	TP8	Blue Shale	Mean Average
Loss on Ignition	Stone Content (%)	0.1	0.1	0.1	59.1	0.1	0.1	9.9
	Moisture Content (%)	11	10	10	11	13	5.5	10.1
	Total mass of sample received (kg)	0.5	0.4	0.4	0.4	0.4	0.4	0.4
	Loss on Ignition @ 450°C (%)	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Heavy Metals	Arsenic (mg/kg)	5.6	5.5	4.9	3.7	5	5.6	5.1
	Boron (mg/kg)	0.4	0.6	0.3	0.2	0.3	0.3	0.4
	Cadmium (mg/kg)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Chromium (mg/kg)	48	50	49	42	51	1	40.2
	Copper (mg/kg)	25	28	25	22	25	1	21.0
	Lead (mg/kg)	19	17	16	17	19	1	14.8
	Mercury (mg/kg)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Nickel (mg/kg)	37	38	38	32	38	1	30.7
	Selenium (mg/kg)	1	1	1	1	1	1	1.0
	Zinc (mg/kg)	95	94	92	74	88	1	74.0
TPH CWG	Total TPH CWG - Aliphatic (EC5 - EC35) (mg/kg)	10	10	10	10	10	13	10.5
	Total TPH CWG - Aromatic (EC5 - EC35) (mg/kg)	10	10	10	10	10	11	10.2
VOC	MTBE (µg/kg)	5	5	5	5	5	5	5.0
	Benzene (µg/kg)	5	5	5	5	5	5	5.0
	Toluene (µg/kg)	5	5	5	5	5	5	5.0
	Ethylbenzene (µg/kg)	5	5	5	5	5	5	5.0
	Xylenes (µg/kg)	5	5	5	5	5	5	5.0

5.0 Conclusion

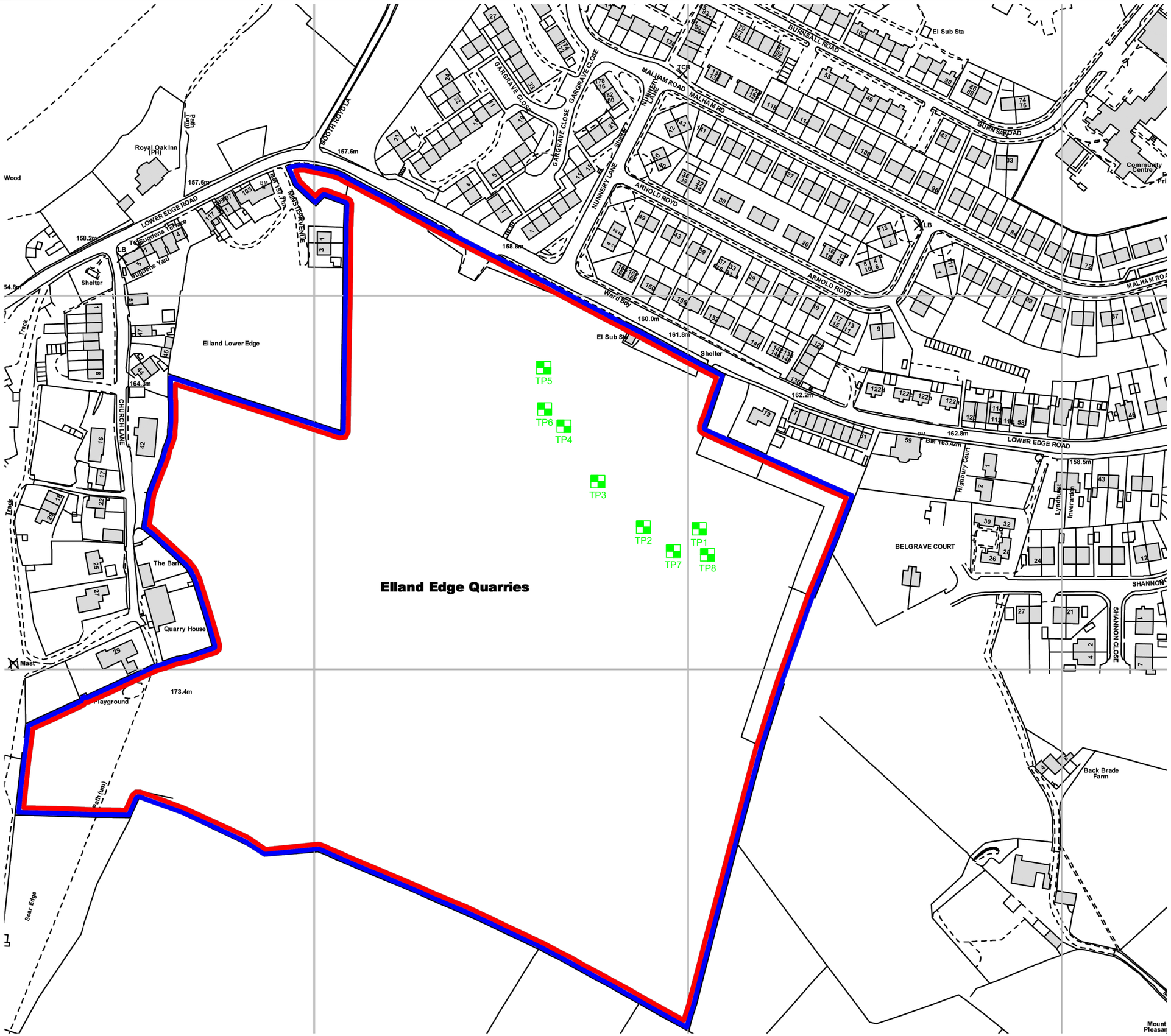
5.1.1 The investigation identified no visible evidence of Pulverized Fuel Ash (PFA) present in the soils.

5.1.2 The lithologies encountered in the trial pits were a grey, cobbly, gravelly, sandy, clay, quarry backfill (Made Ground), above a blue grey shale bedrock.

5.1.3 Chemical testing of samples of Made Ground did not identify notably elevated concentrations of contaminants that are typically associated with PFA (e.g., arsenic, cadmium, mercury and lead), when compared to C4SL/S4UL for residential development.

Appendix A

Drawings



A3

Legend

- Land Under Control of Applicant
- Planning Application Area
- TP1 VFLI Trial Pit Location

Rev.	Description	Revised By	Date
	FIRST ISSUE		22-07-2024

DO NOT SCALE OFF THIS DRAWING

- Critical dimensions should be checked on site prior to works commencing.
- Dimensional conflicts should be brought to the company's attention as soon as they become apparent. Failure to do so could render the contractor liable for subsequent losses.
- Copyright in this drawing and any work executed from this drawing remains the property of VertaseFLI

Vertase FLI

Contaminated Land, Brownfield & Environmental Contracting Specialists

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Bristol Head Office: Tel: 01275 397600 Fax:01275 397601

Sheffield Office: Tel: 01246 813289 Fax: 01246 812963

Site Address:

Elland Lower Edge Quarry
Elland

Rev:

Title: As-Dug Trial Pit Locations

Client: Rand & Asquith (Aceblade) Ltd

Drawn: TN	Checked: YK	Approved: YK
Dwg: D2030_02	Contract: 2030BRI	Scale: 1:2000

Appendix B

Geographical Log

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP1
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 413006.00 - 421277.00 Level:	Date 16/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): Depth 1.80	Scale 1:25
Client:			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Dark Grey colour, Cobbly Clayey (MADEGROUND), Cobble size is 180mm Cobbles are Subangular to round
				1.30			Dark Grey colour, Bouldery Clayey soil (MADEGROUND), Boulder (Large) size is 1200mm, Boulders are Angular. Groundwater struck at 1.8
▼				1.80			End of Pit at 1.80m

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Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP2
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 412976.00 - 421278.00	Date 16/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): Depth 0.70	Scale 1:25
Client:			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
▼				0.70			Dark Grey, Bouldery Clayey MADEGROUND, Boulder (Large) size is 800mm Boulders are Subangular to round. GW Struck at 0.6
							End of Pit at 0.70m

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Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP3
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 412951.00 - 421302.00	Date 16/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): 3.00 x 3.00	Scale 1:25
Client:		Depth 1.60	Logged YK

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Grey, Bouldery Gravely Clay MADEGROUND, Boulder size is 400mm Boulders are Subangular to round. Shale is present at 0.7m bgl.
				0.70			Dark Grey, Bouldery Gravely Clayey MADEGROUND, Boulder size is 400mm Boulders are Subangular to round. GW struck at 1.3 mbgl.
▼				1.30			Dark grey Shale (NATURAL), cobbly clayey soil, cobble size is 150mm.
				1.60			End of Pit at 1.60m

Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP4
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 412933.00 - 421332.00	Date 16/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): 3.00 x 3.00 Depth 4.00	Scale 1:25
Client:			Logged YK

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Dark Grey , Bouldery, Gravelly Clayey soil MADEGROUND, Boulder size is 300mm Cobbles are Subangular to round
				1.10			Dark Grey , Sandy gravelly, clayey soils MADEGROUND, gravel is coarse, size is 30mm. Gravel is subangular to round, sand is coarse.
				2.20			Dark grey, sandy gravely clayey soils (MADEGROUND), sand is course, gravel size is course, with a diameter of 40mm. Gravel is subangular to round.
	3.00 - 4.00	ES		3.00			Dark grey, sandy gravely clayey soils (MADEGROUND), sand is course, gravel size is course with a 30mm diameter. Gravel is subangular to round.
				4.00			End of Pit at 4.00m

1 2 3 4 5

Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP5
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 412922.00 - 421363.00 Level:	Date 16/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): Depth 2.60 — 3.00 × 3.00	Scale 1:25
Client:			Logged YK

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Brownish Grey, Bouldery, Gravelly, Clayey, Sandy soils, MADEGROUND. Boulder size is 300 mm, Gravel is coarse, Sand is coarse.
				1.10			Dark Grey , Sandy gravelly, clayey soils MADEGROUND, gravel is coarse, size is 30mm. Gravel is subangular to round, sand is coarse.
	2.00 - 2.60	ES		2.00			Dark Grey Blue Shale, Gravelly, bouldery clayey soils (MADEGROUND), boulder size is 400mm. GW struck at 2.6m
▼				2.60			End of Pit at 2.60m

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Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP6
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 412923.00 - 421341.00	Date 16/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): 3.00 x 3.00	Scale 1:25
Client:		Depth 2.40	Logged YK

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.10 - 2.20	ES					Brownish Grey, Bouldery, Gravelly, Clayey soils, MADEGROUND. Boulder size is 380 mm, Gravel is coarse. Boulder is Angular to subangular.
				2.20			Dark Blue Shale
				2.40			End of Pit at 2.40m

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Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP7
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 412992.00 - 421265.00	Date 17/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): Depth 2.60 — 3.00 × 3.00	Scale 1:25
Client:			Logged YK

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.10 - 2.20	ES					Brownish Grey, Bouldery, Gravelly, Clayey soils, MADEGROUND. Boulder size is 400 mm, Gravel is coarse. Boulder is Angular to subangular.
				2.20			Dark Blue Shale
				2.60			End of Pit at 2.60m

Remarks:

Stability:

AGS

Vertase FLI
No. 1 Middle Bridge Business Park
Bristol Road
Portishead
BS20 6PN

Trial Pit Log

TrialPit No
TP8
Sheet 1 of 1

Project Name: Lower Edge Quarry	Project No. 2030BRI	Co-ords: 413010.00 - 421263.00	Date 17/07/2024
Location: Lower Edge Rd, Brighouse, HD6 3LL		Dimensions (m): 3.00 x 3.00	Scale 1:25
Client:		Depth 4.00	Logged YK

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Dark Grey, Bouldery Clayey soil MADEGROUND, Boulder (Large) size is 1000mm, Boulders are Angular.
	3.00 - 3.80	ES					
				3.80			Dark Blue Shale
				4.00			End of Pit at 4.00m

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Remarks:

Stability:

AGS

Appendix C

Photo Plates

Trial Pit 1

Very Large Sandstone

Trial Pit 1

Trial Pit 2

Trial Pit 3

Trial Pit 3

Plastic sheet found within the made ground in TP 4

Dark Blue Shale in the base of Trial Pit 4

View of the pond at the base of the quarry

Trial Pit 4

Trial Pit 5

Trial Pit 6

Trial Pit 7

Trial Pit 7

Trial Pit 8

Trial Pit 8

Base of the quarry

View of the quarry from above

Appendix D

Geochemical Laboratory Certificates - Soils

Vertase Ltd
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e: ykhantechce@vertasefli.co.uk
ajdunhill@vertasefli.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-032092

Project / Site name:	Lower Edge Quarry	**Samples received on:**	19/07/2024
Your job number:	2030BRI	**Samples instructed on/ Analysis started on:**	17/07/2024
Your order number:		**Analysis completed by:**	26/07/2024
Report Issue Number:	1	**Report issued on:**	26/07/2024
Samples Analysed:	5 soil samples		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-032092
Project / Site name: Lower Edge Quarry

Lab Sample Number				264753	264754	264755	264756	264757
Sample Reference				TP4	TP5	TP6	TP7	TP8
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				17/07/2024	17/07/2024	17/07/2024	18/07/2024	18/07/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	59.1	< 0.1
Moisture Content	%	0.01	NONE	11	10	10	11	13
Total mass of sample received	kg	0.1	NONE	0.5	0.4	0.4	0.4	0.4
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.6	5.5	4.9	3.7	5
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.6	0.3	0.2	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	0.2	0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	48	50	49	42	51
Copper (aqua regia extractable)	mg/kg	1	MCERTS	25	28	25	22	25
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19	17	16	17	19
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	37	38	38	32	38
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	95	94	92	74	88
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.02	MCERTS	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-032092
Project / Site name: Lower Edge Quarry

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
264753	TP4	None Supplied	None Supplied	Brown clay and loam with gravel and vegetation
264754	TP5	None Supplied	None Supplied	Brown clay and loam with gravel
264755	TP6	None Supplied	None Supplied	Brown clay and loam with gravel
264756	TP7	None Supplied	None Supplied	Brown clay and loam with gravel and stones
264757	TP8	None Supplied	None Supplied	Brown clay and loam with gravel

Analytical Report Number : 24-032092
Project / Site name: Lower Edge Quarry

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

Sample Deviation Report

Analytical Report Number : 24-032092

Project / Site name: Lower Edge Quarry

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP4	N/A	S	264753	b	BTEX and/or Volatile organic compounds in soil	L073B	b
TP4	N/A	S	264753	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
TP5	N/A	S	264754	b	BTEX and/or Volatile organic compounds in soil	L073B	b
TP5	N/A	S	264754	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
TP6	N/A	S	264755	b	BTEX and/or Volatile organic compounds in soil	L073B	b
TP6	N/A	S	264755	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
TP7	N/A	S	264756	b	BTEX and/or Volatile organic compounds in soil	L073B	b
TP7	N/A	S	264756	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
TP8	N/A	S	264757	b	BTEX and/or Volatile organic compounds in soil	L073B	b
TP8	N/A	S	264757	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b

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Analytical Report Number : 24-032224

Project / Site name:	Lower Edge Quarry	**Samples received on:**	19/07/2024
Your job number:	2030BRI	**Samples instructed on/ Analysis started on:**	24/07/2024
Your order number:		**Analysis completed by:**	29/07/2024
Report Issue Number:	1	**Report issued on:**	29/07/2024
Samples Analysed:	1 soil sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-032224
Project / Site name: Lower Edge Quarry

Lab Sample Number				265397
Sample Reference				Blue Shale
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				18/07/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	5.5
Total mass of sample received	kg	0.1	NONE	0.4
General Inorganics				
Loss on Ignition @ 450°C	%	0.2	MCERTS	3.8
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.6
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	51
Copper (aqua regia extractable)	mg/kg	1	MCERTS	32
Lead (aqua regia extractable)	mg/kg	1	MCERTS	17
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	47
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	95
Petroleum Hydrocarbons				
TPHCWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	13
TPHCWG - Aliphatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	13
TPHCWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.02	MCERTS	< 0.020
TPHCWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	11
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	11
VOCs				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-032224
Project / Site name: Lower Edge Quarry

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
265397	Blue Shale	None Supplied	None Supplied	Brown loam with gravel and vegetation

Analytical Report Number : 24-032224
Project / Site name: Lower Edge Quarry

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
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#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
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Quality control parameter failure associated with individual result applies to calculated sum of individuals.
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Sample Deviation Report

Analytical Report Number : 24-032224
Project / Site name: Lower Edge Quarry

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Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
Blue Shale	N/A	S	265397	b	BTEX and/or Volatile organic compounds in soil	L073B	b
Blue Shale	N/A	S	265397	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b

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