

# **Network Rail (Huddersfield to Westtown (Dewsbury) Improvements) Order**

## **Condition 10: Phase 2 Land Contamination Risk Assessment – Stage 4**

**Document reference: 151667-TSA-00-TRU-REP-W-EN-001237**

**Network Rail**

**June 2023**



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## **1. INTRODUCTION**

### **1.1 Background**

- 1.1.1 The Scheme is part of a wider programme of works under the Transpennine Route Upgrade (TRU) which will improve the Transpennine railway between Manchester, Huddersfield, Leeds and York and improve connections between key towns and cities across the north of England.
- 1.1.2 Planning Direction for the Huddersfield to Westtown (Dewsbury) section of the TRU was received from the Department for Transport referenced TWA/21/APP/03, dated 13 October 2022.
- 1.1.3 This document sets out details in relation to Condition 10 of the Deemed Planning Permission.

## 2. STAGED APPROACH TO DISCHARGE AND STAGE DESCRIPTION

- 2.1.1 As set out in document ref: 151667-TSA-00-TRU-REP-W-EN-001189 version 3 (submitted in relation to Condition 3 of the Deemed Planning) a staged approach is proposed in relation to discharge of the deemed planning conditions.
- 2.1.2 This document sets out details in relation to Stage 4 of the works for the Huddersfield to Westtown (Dewsbury) Scheme.
- 2.1.3 Stage 4 comprises the main civils works at Huddersfield Station and Huddersfield Viaduct (Stage 4 limits are set as Westgate Overbridge and Hillhouse Lane Underbridge) and are set out in Table 2-1, as well as links to the relevant planning drawings. Figure 1 in Appendix A shows the geographical locations of the works. Route drawings relevant to Stage 4 are [NR13 Planning Drawing - Route Drawing 3.pdf \(windows.net\)](#) and [NR13 Planning Drawing - Route Drawing 4.pdf \(windows.net\)](#).
- 2.1.4 Works within the Huddersfield and Gledholt tunnels, to the west of the station, will be detailed in the Stage 5 submission.
- 2.1.5 The entire Scheme will be subject to electrification; details of the electrification works will be detailed in the Stage 5 submission.
- 2.1.6 At Huddersfield Station remodelling works are required with alterations to platforms and roof structures required to facilitate the delivery of a four track railway. East of Huddersfield Station the four-track railway is reinstated across the viaduct.
- 2.1.7 There are existing earthworks throughout the Scheme area associated with the existing operational railway. Earthworks allow the track to stay relatively level through a varied topography and allows trains to operate more efficiently by reducing the need for additional acceleration and deceleration to climb and descend climbs.
- 2.1.8 As set out in Figure 2-1<sup>1</sup> in Volume 4 of the Environmental Statement (ES) and Table 2-4 in Chapter 2: Scheme Description (Route Section 1)<sup>2</sup> in Volume 2i of the ES, a 55m length retaining structure (0.5m high) was proposed along the eastern end of Huddersfield Viaduct (MVL3/92) near to Hillhouse Lane Underbridge (MVL3/94). This was proposed as either king post wall or soil nailing. Following design iteration, soil nailing is planned in this area of existing embankment to the south of the railway (E0).
- 2.1.9 Earthworks (new and where they have been reworked) will generally be covered in topsoil and landscaped as appropriate. Any exceptions to this will be detailed within the Landscape and Ecological Management Plan (LEMP) Stage 8.
- 2.1.10 The Scheme impacts on various existing transmission and distribution utility networks. Conflicts with utility services may occur in Stage 4 where the Scheme crosses highways and. Works within the highway will be carried out in compliance with the Highways Agreement and any impacts on the highways network will be discussed through the Highway Network Management Group.

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<sup>1</sup> [Ch02 Scheme Description - Fig 2-1 Scheme drawings.pdf \(windows.net\)](#)

<sup>2</sup> [Ch02 Huddersfield - Scheme Description.pdf \(windows.net\)](#)

**Table 2-1 Works description**

Location	Structure/works	Summary description	Deemed Planning Drawing Title and Reference
Huddersfield Station	Passenger Footbridge	A covered footbridge (Huddersfield Station Footbridge (MVL3/91AA), with stairs and a lift, to be constructed to the eastern end of the station. This will provide step free access to the central platforms.	<ul style="list-style-type: none"> <li>• Footbridge - Proposed Elevations - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168053</a></li> <li>• Footbridge - Proposed Plan Deck Level - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168051</a></li> <li>• Footbridge - Proposed General Arrangement Platform Level - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168050</a></li> <li>• Footbridge - Proposed Roof Level General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168052</a></li> <li>• Footbridge - Proposed Sections - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168054</a></li> <li>• Existing and Proposed Long Sections (A-A) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168003</a></li> <li>• Existing and Proposed Long Sections (B-B) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168005</a></li> </ul>
Huddersfield Station	Passenger Subway	Extension to existing Subway (MVL3/91) (of 12.5m) required to service the new island platform to the north of the station.	<ul style="list-style-type: none"> <li>• Existing Plan and Sections - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168064</a></li> <li>• Proposed Plan and Section - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168065</a></li> </ul>
Huddersfield Station	Parcel Subway (MVL3/91A)	Utilising existing subway for utilities ducting and signalling equipment. Concrete infill.	<ul style="list-style-type: none"> <li>• Existing Plan and Sections - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168067</a></li> <li>• Proposed Plan and Section - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168068</a></li> </ul>
Huddersfield Station	Tearooms	Existing Tea Rooms - Timber structure to be carefully dismantled and relocated within island platform. To be dismantled and reconstructed.	<ul style="list-style-type: none"> <li>• Existing Floor Plan and Elevations - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168016</a></li> <li>• Existing and Proposed Elevations - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168015</a></li> <li>• Proposed Floor Plan and Elevations - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168017</a></li> </ul>
Huddersfield Station	Proposed Platforms	Works to railway lines including provision of new platforms and removal of existing railway sidings.	<ul style="list-style-type: none"> <li>• Existing Plan - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168060</a></li> <li>• Existing and Proposed Platform General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168001</a></li> <li>• Proposed Plan and Section - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168061</a></li> <li>• Proposed Plan and Section - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168062</a></li> <li>• Proposed Plan and Section - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168063</a></li> </ul>

Location	Structure/works	Summary description	Deemed Planning Drawing Title and Reference
Huddersfield Station	Canopy A	<p>Works to the main train shed within Huddersfield Station includes:</p> <ul style="list-style-type: none"> <li>• Structural works to maintain and strengthen;</li> <li>• Demolition of two canopy bays at Manchester end of the station;</li> <li>• Construction of two new bays at Leeds end;</li> <li>• Grit blasting of structure; and</li> <li>• Reinstatement of main train shed lantern.</li> </ul>	<ul style="list-style-type: none"> <li>• Existing and Proposed Roof General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-1680000</a></li> <li>• Existing and Proposed Short Sections (A-A) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168002</a></li> <li>• Existing and Proposed Short Sections (B-B) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168004</a></li> <li>• Existing Roof A Structural Plan (Roof Level) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168010</a>;</li> <li>• Existing Roof A Structural Sections Sheet (1) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168011</a></li> <li>• Existing Roof A Structural Sections Sheet (2) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168012</a>;</li> <li>• Existing Roof A OLE Support Details - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168013</a></li> </ul>
Huddersfield Station	Canopy B & C	<p>Canopy B&amp;C are to be demolished with new replacements to be constructed to cover platforms to north.</p>	<ul style="list-style-type: none"> <li>• Existing and Proposed Roof General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168000</a></li> <li>• Existing and Proposed Short Sections (A-A) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168002</a></li> <li>• Existing and Proposed Short Sections (B-B) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168004</a></li> <li>• Proposed Roof B (Shed Roof) Structural Plan (Roof Level) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168020</a></li> <li>• Proposed Roof B (Shed Roof) Structural Plan (Platform Level) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168021</a></li> <li>• Proposed Roof B (Shed Roof) Structural Sections (1) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168022</a></li> <li>• Proposed Roof B (Shed Roof) Structural Sections (2) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168023</a></li> <li>• Proposed Roof B (Shed Roof) Structural Sections (3) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168024</a></li> </ul>
Huddersfield Station	Platform free standing canopies	<p>Free standing canopies to be constructed over island platforms to eastern end of station.</p>	<ul style="list-style-type: none"> <li>• Existing and Proposed Roof General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168000</a></li> <li>• Proposed Platform General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168030</a></li> </ul>

Location	Structure/works	Summary description	Deemed Planning Drawing Title and Reference
			<ul style="list-style-type: none"> <li>Proposed Platform Canopies Elevation (1) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168034</a></li> <li>Proposed Platform Canopies Elevation (2) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168035</a></li> <li>Proposed Platform Canopies Structural Plan (Platform Level) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168031</a></li> <li>Proposed Platform Canopies Structural Sections - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168032</a></li> <li>Proposed Platform Canopies Structural Sections - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168033</a></li> </ul>
Huddersfield Station	Canopies – Penistone Line	Extension of Penistone Line canopies.	<ul style="list-style-type: none"> <li>Proposed Penistone Line Canopy Platform Level Plan General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168036</a></li> <li>Proposed Platform Penistone Canopies Structural Sections - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168037</a></li> <li>Proposed Platform Penistone Canopies Proposed Roof Covering Plans - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168038</a></li> <li>Proposed Platform Penistone Canopies Elevation (1) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168039</a></li> </ul>
Huddersfield Station	Relay Room	Existing relay room to be demolished.	<ul style="list-style-type: none"> <li>Existing and Proposed Platform General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168001</a></li> </ul>
Huddersfield Station	Drainage Works	Fitzwilliam Street sewer outfall (New) SE 1430 1707. Proposed new storm water drainage outfall for the re-modelled areas of Huddersfield Station. It will be a piped outfall from the drainage system, either directly into the sewer in the highway, or into an existing culvert within Network Rail land which connects into this sewer. A new manhole will be provided at the outfall.	<ul style="list-style-type: none"> <li>No relevant planning drawings</li> </ul>

Location	Structure/works	Summary description	Deemed Planning Drawing Title and Reference
Huddersfield Viaduct (MVL3/92)		Works across Huddersfield Viaduct includes general strengthening works along the length of viaduct together with localised repairs to arches where necessary. These works include pinning and grouting, shear anchors and spandrel strengthening with tie bar and pattress plates.	<ul style="list-style-type: none"> <li>Existing and Proposed East Elevation (Sheet 1) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168075</a></li> <li>Existing and Proposed East Elevation (Sheet 2) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168076</a></li> <li>Existing and Proposed East Elevation (Sheet 3) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168077</a></li> <li>Existing and Proposed East Elevation (Sheet 4) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168078</a></li> <li>Existing and Proposed East Elevation (Sheet 5) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168079</a></li> </ul>
Huddersfield Viaduct	Span 1 – John William Street Underbridge (MVL3/92(2))	The existing Span 1 bridge deck will be removed and replaced with a new single span bridge deck due to the current structural arrangement of the bridge clashing with the proposed track and platform works.	<ul style="list-style-type: none"> <li>Existing Plan and Proposed Plan (Sheet 1) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168070</a></li> <li>Existing Plan and Proposed Plan (Sheet 2) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168071</a></li> <li>Existing Plan and Proposed Plan (Sheet 3) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168072</a></li> </ul>
Huddersfield Viaduct	Span 4 – Fitzwilliam Street Underbridge (MVL3/92(3))	Substructure repairs including removal and reinstatement of the pier to the south-western corner of the structure. Strengthening to cross girders. Removal and replacement of parapet.	<ul style="list-style-type: none"> <li>Existing Plan and Proposed Plan (Sheet 4) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168073</a></li> <li>Existing Plan and Proposed Plan (Sheet 5) - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168074</a></li> <li>John William Street Bridge - Existing Highways General Arrangement - <a href="#">151667-TSA-30-MVL3-DRG-T-LP-168081</a></li> <li>John William Street Bridge - Proposed Highways General Arrangement - <a href="#">1667-TSA-30-MVL3-DRG-T-LP-168082</a></li> </ul>
Huddersfield Viaduct	Span 29 Bradford Road Underbridge (MVL3/92(9))	Existing bridge deck to be removed and replaced. Additional masonry pilasters/buttresses will be formed at the corners of the new abutments into which the concrete parapet will join. New concrete abutments to be built with stone facing in front of existing sandstone at both ends and, on both elevations.	

### 3. PLANNING CONDITION INFORMATION

#### 3.1.1 The wording of Condition 10 is reproduced as follows:

*10. In relation to contaminated land:*

*a) Where the Environmental Statement (Volume 2i, Chapter 12: Geology, soils and land contamination) indicates that intrusive investigation is necessary for that stage, no development in the relevant stage is to commence until a Phase II Site Investigation Report for that stage has been submitted to, and approved in writing by, the Local Planning Authority.*

*b) Where remediation measures are shown to be necessary in the Environmental Statement or the Phase II Reports undertaken pursuant to (a) above confirm remediation measures are necessary for the relevant stage, no development in the relevant stage is to commence until a Remediation Statement, demonstrating how the site will be made suitable for the intended use, has been submitted to and approved in writing by the local planning authority. The Remediation Statement must include a programme for all works and for the provision of and timescale for the submission to the local planning authority of Verification Reports for written approval.*

*c) Remediation of the site shall be carried out and completed in accordance with the approved Remediation Statement. In the event that remediation is unable to proceed in accordance with the approved Remediation Statement, the local planning authority must be notified in writing immediately and where agreed as necessary, operations on the affected part of the site must cease. An amended or new Remediation Statement must be submitted to, and approved in writing by, the local planning authority prior to any further remediation works which must thereafter be carried out in accordance with the revised approved Statement.*

**Reason:** *To ensure that the presence of contamination is identified, risks assessed and proposed remediation works are agreed in order to make the site suitable for use.*

#### 4. SCHEME INFORMATION

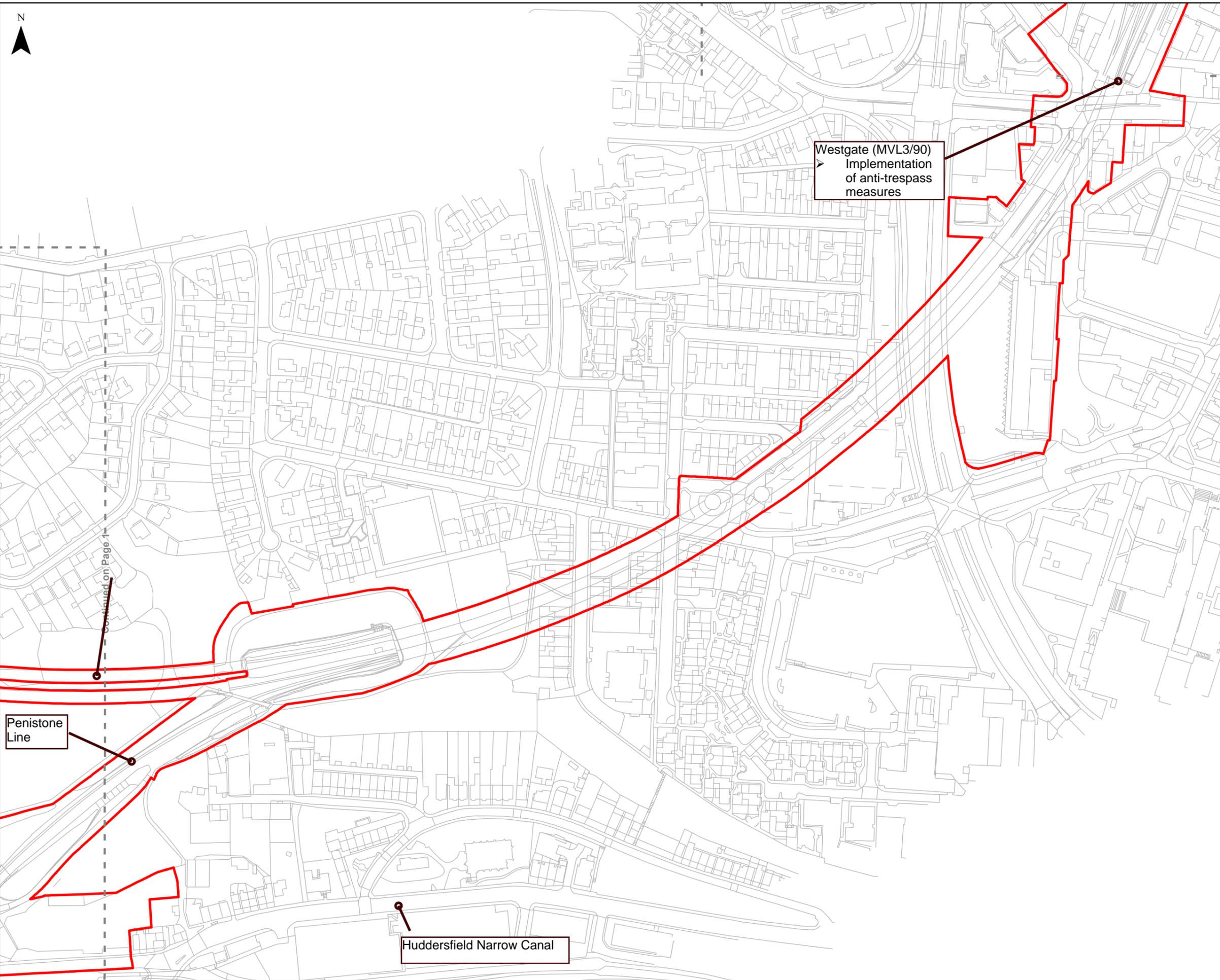
- 4.1.1 As set out in Chapter 9 (Geology, Soils and Land Contamination) (Route Section 1) in Volume 2ii of the Environmental Statement (ES)<sup>3</sup> where GI and associated risk assessments have indicated the potential for unacceptable risk, remediation of soil/groundwater contamination will be undertaken. The Huddersfield Station site was identified as falling into this category and therefore a Phase 2 Land Contamination Risk Assessment (LCRA) for Huddersfield Station is included in Appendix B.
- 4.1.2 Piling works are required at the Huddersfield Station site, however these are dealt with under Condition 5b(x) Environmental Design Plan (Land Contamination and Hydrogeology) for Stage 4 (document ref: 151667-TSA-00-TRU-REP-W-EN-001244) and are not reproduced in this document/submission.

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<sup>3</sup> [W3 ES Volume 2ii Route Section 1 \(Huddersfield\) - Ch09 Geology, Soils and Land Contamination](#)

# Appendices

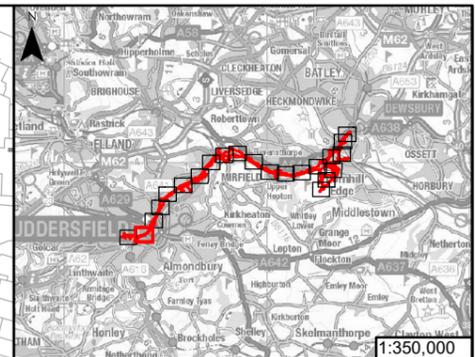
## **APPENDIX A – STAGE 4 WORKS LOCATION PLAN**



Westgate (MVL3/90)  
Implementation  
of anti-trespass  
measures

Penistone  
Line

Huddersfield Narrow Canal



Scheme Boundary  
 Adjacent Map Sheet



P01	12/02/21	FIRST ISSUE	RB	PB	PB
Rev	Date	Description of Revisions	Drwn	Chkd	Appr
Status					Suitability
<b>SHARED</b>					



Project  
**TRANSPENNINE ROUTE UPGRADE**

Contract No.  
**151667**

Scheme Title  
**THE NETWORK RAIL (HUDDERSFIELD TO WESTTOWN (DEWSBURY) IMPROVEMENTS) ORDER**

Drawing Title  
**Figure 1  
Stage 4 works**

Designed	R.Bowes	Signed Electronically	Date	12/02/2021
Drawn	R.Bowes	Signed Electronically	Date	12/02/2021
Checked	P.Butler	Signed Electronically	Date	12/02/2021
Approved	P.Butler	Signed Electronically	Date	12/02/2021

Scale(s)  
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ELR & Project Chainage  
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Alternative Reference  
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Sheet  
2 of 22

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Revision  
P01.1

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Railway works include

- 4 tracking
- Horizontal track realignment
- Relaying of ballast and tracks

Continued on Page 4

Halfords - access to business to be maintained

**Huddersfield Viaduct (MVL3/92) Bradford Road**

- Existing bridge deck to be removed and replaced
- Additional masonry pilasters/butresses will be formed at the corners of the new abutments into which the concrete parapet will join.
- New concrete abutments to be built with stone facing in front of existing sandstone at both ends and, on both elevations.

**Huddersfield Viaduct – Span 4 – Fitzwilliam Street Underbridge**

- Substructure repairs including removal and reinstatement of the pier to the south-western corner of the structure
- Strengthening to cross girders
- Removal of parapet and replacement with replica in cast iron

**Huddersfield Viaduct - general strengthening works** along the length of viaduct together with localised repairs to arches where necessary. These works include pinning and grouting, shear anchors and spandrel strengthening with tie bar and pattress plates.

DNO - Fitzwilliam Street

**Huddersfield Viaduct Span 1 (MVL3/929 (1)) - John William Street**

- existing bridge deck will be removed and replaced with a new single span bridge deck

Fitzwilliam Street Construction Compound

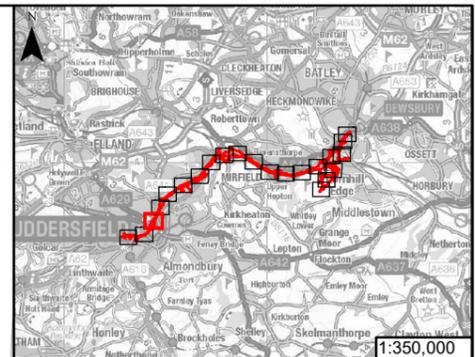
Huddersfield Station - construction compound

Brian Jackson House

**Huddersfield Station**

- main train shed - structural works, two bays at Manchester end of canopy to be demolished, two new bays at Leeds end of platform 1; reinstatement of main train shed lantern;
- smaller train shed (canopies B&C) to be demolished, new roof to be constructed;
- free standing canopies over island platforms
- extension to canopy to service Penistone line;
- tea rooms to be deconstructed and relocated;
- a covered footbridge (with lift and stairs) to be constructed (step free access)
- concrete infill of existing parcel subway
- extension to existing passenger subway to service new island platform to north of station
- Grit blasting of main train shed
- Works to railway lines including provision of new platforms and removal of existing railway sidings
- Demolition of existing relay room

Continued on Page 2



Legend:  
 Scheme Boundary  
 Adjacent Map Sheet

0 10 20 40 60 80 100 Metres  
 SCALE 1:2,500

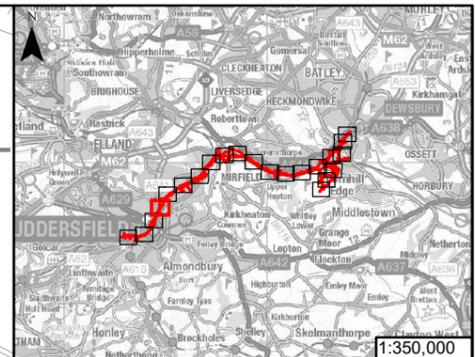
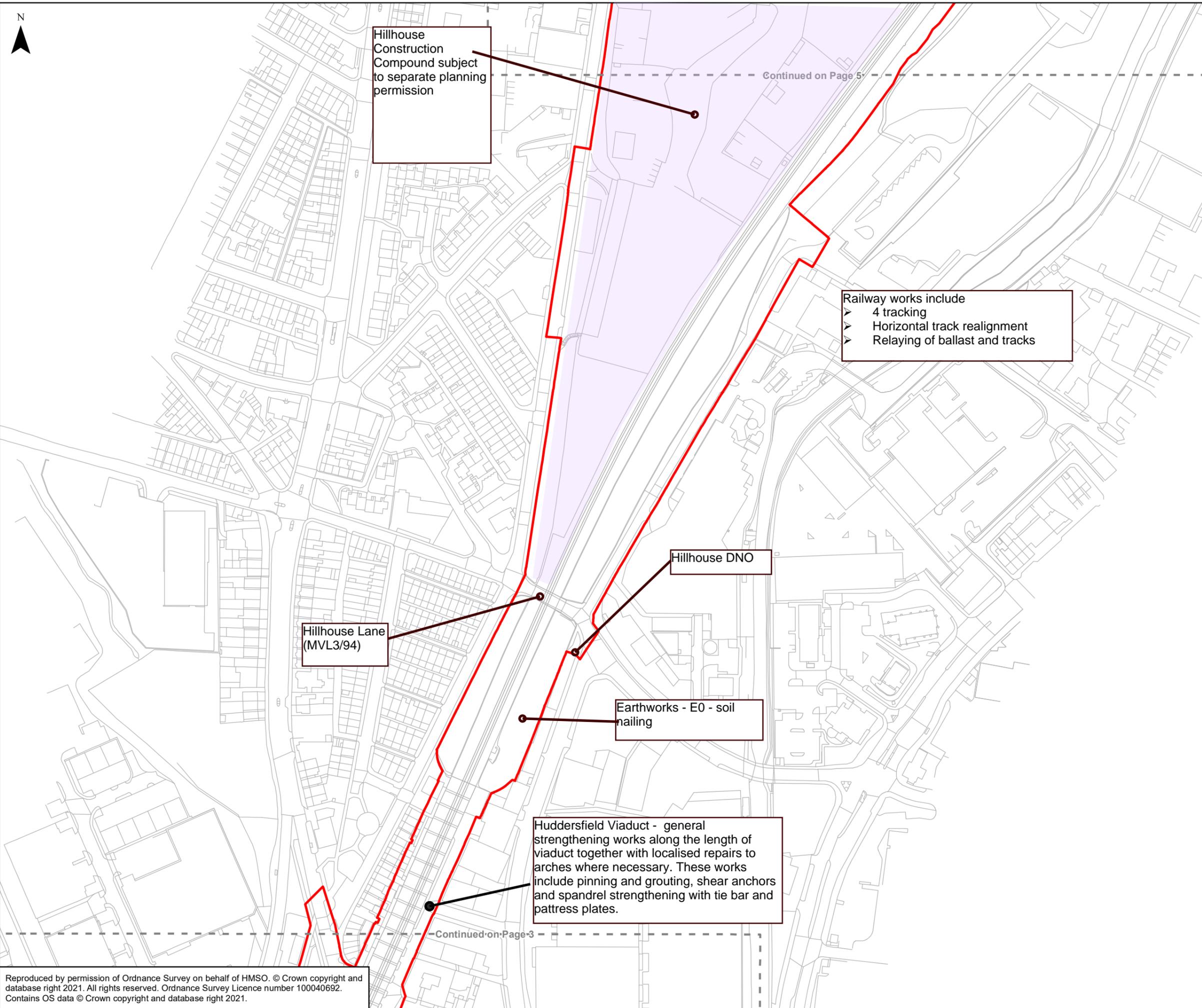
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Rev	Date	Description of Revisions	Drwn	Chkd	Appr
Status	SHARED				Suitability



Project  
 TRANSPENNINE ROUTE UPGRADE  
 Contract No.  
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 Scheme Title  
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**Figure 1  
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Scale(s)	1:2,500	ELR & Project Chainage	---	
Alternative Reference	---			Sheet
				3 of 22
Drawing Number	151667-TSA-00-REP-W-EN-001370			Revision
				P01.1



- Scheme Boundary
- Adjacent Map Sheet

Railway works include

- 4 tracking
- Horizontal track realignment
- Relaying of ballast and tracks



P01	12/02/21	FIRST ISSUE	RB	PB	PB
Rev	Date	Description of Revisions	Drwn	Chkd	Appr
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Scale(s)  
1:2,500

ELR & Project Chainage  
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4 of 22

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## **APPENDIX B – PHASE 2 LAND CONTAMINATION RISK ASSESSMENT REPORT – HUDDERSFIELD STATION**

**NetworkRail**

# Huddersfield Station

## Phase 2 Land Contamination Risk Assessment (Stage 4 works)

Network Rail

June 2023



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## INTRODUCTION

### 1.1 Background

- 1.1.1 The Transpennine Route Upgrade Programme (TRU) will increase local network capacity, improve reliability, and reduce journey times on the route between Manchester Victoria and York via Huddersfield and Leeds. These benefits are realised through a series of discrete geographical interventions forming discrete Projects. The TRU West works between Huddersfield Viaduct and Westtown (Dewsbury) are described as Project W3.
- 1.1.2 A Transport and Works Act Order (TWAO) for the Huddersfield and Westtown (Dewsbury) section of the TRU was submitted to the Secretary of State for Transport on 31 March 2021 (The Network Rail Huddersfield to Westtown (Dewsbury) Improvements Order). Upgrading the railway between Huddersfield and Westtown (Dewsbury) is key to delivering passenger benefits along the Transpennine railway.
- 1.1.3 This report is focused on the proposed improved works at Huddersfield Station, which includes the remodelling of the station.

### 1.2 Purpose of the document

- 1.2.1 The purpose of this document is to present the findings and interpretation of the recent phases of ground investigation (up to and including GRIP 4) undertaken to inform the design and support the consenting requirements for the site.
- 1.2.2 This report has been designed to deliver an assessment of potential contamination risks to human health and the environment in accordance with Land Contamination Risk Management (LCRM) guidance (EA, 2021 (1)). The objectives of this report are as follows:
- Review the historical land use and environmental setting of the site and its immediate surrounding area;
  - Develop an initial Conceptual Site Model (CSM) which describes the relationship between potential sources of contamination (both on and off site), receptors and pathways following completion of the works;
  - Summarise and review available ground investigation data from published information to date which includes factual and interpretative reports from several phases of ground investigation;
  - Provide a summary of ground conditions;
  - Provide a hydrogeological overview;
  - Undertake a generic quantitative human health and controlled waters risk assessment;
  - Undertake a preliminary ground gas risk assessment; and
  - Update the CSM; and
  - Provide constraints relating to contamination and recommendations for further work.

## 2. THE DEVELOPMENT

### 2.1 Site location

- 2.1.1 The site is located at Huddersfield Station, St. George Square, Huddersfield, centred on 414341E, 416900N between TRU chainages A:41290 and A:41660.
- 2.1.2 The Huddersfield Station project site encompasses an area of approximately 2.2 hectares (ha), which is entirely under the ownership of Network Rail. The site is operational railway land within the meaning of Section 263 of the Town and Country Planning Act 1990 (2).
- 2.1.3 The site is bounded by residential properties to the east, north and south, and former railway land and a warehouse to the west.
- 2.1.4 The site boundary is shown in Figure 1, Appendix A. The current site layout is shown in 151667-TSA-30-MVL3-DRG-T-LP-166002 (Appendix A), and comprises Huddersfield Station and platforms, railway tracks from south-west to north-east, a subway and lift providing platform access, and a bridge over John William Street in the north-east of the site.

### 2.2 The development

- 2.2.1 The improvement works are shown in drawing 151667-TSA-30-MVL3-DRG-T-LP-166002 in Appendix A, and are proposed to comprise:
- Current smaller train shed to be demolished.
  - New roof to be constructed to cover platforms to north;
  - Free standing canopies to be constructed over island platforms to eastern end of station;
  - Installation of Overhead Line Electrification (OLE) equipment, supported by piled foundations;
  - Existing tea rooms to be retained but relocated within island platform. Timber structure to be dismantled and reconstructed;
  - Additional access and egress through the station and platforms is required.
  - A covered footbridge (with lifts and associated motor rooms) is to be constructed to the eastern end of the station, supported by piled foundations;
  - Track modifications;
  - A new station canopy is proposed, assumed to be supported by piled foundations;
  - Extension to existing subway MVL3/91 (of 12.5m) required to service the new island platform to the north of the station, with an additional lift; and
  - A new drainage system and an attenuation water tank.

### 2.3 Information sources

- 2.3.1 The following sources of information have been used in this report:
- Network Rail, Environment Statement Volume 2ii: Huddersfield, 2019 (3).
  - Groundsure, Enviro Insight report and Historical Mapping, 2019 (4).
  - Transpire Alliance, Mining Risk Assessment, 151667-TSA-30-MVL3-REP-W-GE-030400 A01, November 2021 (5).
  - Transpire Alliance, W3 - Huddersfield Station – Piling Specification, 151667-TSA-30-MVL3-SPE-W-GE-030000 B01, December 2022 (6).
  - Transpire Alliance, W3 - GEO - Mining Risk Mitigation Remit: Report, 151667-TSA-W3-000-REP-W-GE-030510 A01, May 2022 (7).

- Transpire Alliance, Ground Investigation Report for W3.1 Gledholt to Huddersfield Viaduct, 2021 (8)
- Information obtained from multiple phases of ground investigation, detailed in Section 5.1.

## 2.4 Limitations

- 2.4.1 The report authors are responsible for selecting and summarising the data supplied by third parties but cannot be held responsible for any mistakes or inaccuracies or the completeness of third-party data on which it has relied. As with any point data, ground conditions can only be inferred between test locations and as such localised conditions on site may vary between point locations. Groundwater/ground gas conditions may differ from those encountered during the monitoring periods. Therefore, this report cannot guarantee against unexpected ground conditions occurring between the sampling points.
- 2.4.2 This report presents the preliminary findings of a geo-environmental ground investigation and risk assessment to inform the client about potential contamination hazards and constraints relating to the development. Constraints relating to geotechnical hazards, ecology, heritage, flooding/drainage, utilities, air quality and noise are beyond the remit of this report.
- 2.4.3 The report has been prepared using all chemical testing and monitoring data identified and available at the time of writing. The data used in this report is recorded within factual reports provided by contractors. Several of the factual reports are currently in draft form, and therefore the data analysed is in a preliminary form. The ground investigations were combined geotechnical and geo-environmental investigations, and environmental sampling was not undertaken at all locations.
- 2.4.4 Ground gas and groundwater conditions are based on observations made at the time of the ground investigations and monitoring programmes, and may be subject to variation due to atmospheric, seasonal or other effects.
- 2.4.5 The CSM developed and Generic Quantitative Risk Assessment (GQRA) carried out for human health has been based on screening criteria for a commercial and public open space (park) land use scenario. Any changes to the development from those indicated in Section 2.2 may require a revision of the CSM and reassessment of the risk assessment findings if the final development differs substantially from these assumptions.
- 2.4.6 This report does not advise on measures to manage risks associated with asbestos, where present. Detailed advice should be sought from a specialist contractor.

## SITE CHARACTERISTICS

### 3.1 Site characteristics

3.1.1 A summary of the historical and environmental setting of the site is presented in Table 3-1. This information has been summarised from the information used to inform the Environmental Statement (3).

**Table 0-1 Summary of the site’s historical and environmental setting**

Item	Description
Current site description and use	<p>The site comprises Huddersfield Station, centred on National Grid Reference (NGR) SE 414341E, 416900N in Huddersfield, West Yorkshire.</p> <p>The site is roughly rectangular in shape and covers approximately 2.2 ha in area. The site is an active railway station, and it is surrounded by residential and commercial areas.</p> <p>Huddersfield Station is located on a cut-fill platform, at approximately 85 m above ordnance datum (AOD) above naturally sloping ground which falls away to the south and east. The eastern end of the station is raised from the natural ground level.</p>
Key historical land uses	<p>The 2021 GIR indicates the 1826 Crosland map shows an approximately rectangular reservoir present in the southern part of the site, and the 1850 Nixon map shows a possible reservoir present beneath the off-site goods shed.</p> <p>Huddersfield Station and associated infrastructure, including buildings and railway sidings, are first shown on the 1893 map.</p> <p>To the west of the station the land included railway sidings and a goods shed. Whilst to the north, east and south the surrounding land contained residential and commercial areas.</p> <p>In addition, the surrounding land had the following industrial uses within 250 m of the site: a garage, a national shell factory, electrical substations, cuttings, a goods station, railway sidings, tanks, two infilled ponds and a historical petrol station.</p>
Geology	<p><b>Superficial Deposits:</b> Head deposits are present beneath most of the station site and north of the station, whilst no superficial deposits are recorded in the southern section of the site.</p> <p><b>Bedrock:</b> Pennine Lower Coal Measures (PLCM) formation, comprising predominantly mudstones interbedded with sandstone and siltstones. The Middle Band Rock formation comprising sandstone is located adjacent the site’s southern boundary.</p> <p>No geological faults are recorded on site.</p>
Mining	<p>The site is located within a Surface Coal Resource Area and an area of probable shallow coal mine workings. Evidence of potential mining was reported within the Mining Risk Assessment (5), as detailed further in Section 6.2.</p>
Hydrogeology	<p><b>Superficial:</b> Secondary Undifferentiated Aquifer</p> <p><b>Bedrock:</b> Secondary A Aquifer</p> <p>The site is not located within 250 m of a Source Protection Zone (SPZ). There are two groundwater abstraction licences recorded within 250 m of the site, but only one licence is registered as active. The active licence is located 194 m north-east and is registered to the Kirklees Council and relates to a heat pump.</p> <p>The 2021 Ground Investigation Report (GIR) (8) states that groundwater flow was expected to be predominantly through fractures</p>

Item	Description
	and discontinuities, and likely to flowing towards the river basin towards the east.
Hydrology	<p>No main rivers as designated by the Environment Agency, or other surface water features, are located within 250 m of the site. The nearest main river is the River Colne, situated approximately 1 km to the east of the site. The Huddersfield Broad Canal is located approximately 550 m east of the site</p> <p>The 2021 Ground Investigation Report (8) identified a masonry arch culvert daylighting onto John William Street beneath Huddersfield station. The culvert is orientated south-east to north-west and it is approximately 5 m below the ground. Based on the information contained in the historical maps, the 2021 GIR indicated it is likely the culvert collected water from the springs that were recorded on site prior to the station being built. Further information is provided in Section 6.4.6.</p>
Landfills and Waste	There are no recorded active or historical landfill sites or waste management facilities located within 250 m of the site.
Discharge consents	There are no recorded groundwater discharge consents within 250 m of the site boundary. There are no discharge consents relating to surface water recorded within 250 m of the site.
Pollution Incidents	No pollution incidents have been recorded within 250 m of the site boundary.
Pollution Controls	<p>Several historical and current pollution controls have been identified within 250 m of the site, including:</p> <ul style="list-style-type: none"> <li>• Two Licensed Pollutant Releases;</li> <li>• One Pollution Inventory Substance; and</li> <li>• One Licensed Industrial Activity.</li> </ul> <p>None of these activities were located on site.</p>
Trade Directory Entries and Fuel Stations	<p>Six trade directory entries/fuel stations were located on or within 250 m of the site boundary:</p> <ul style="list-style-type: none"> <li>• Train station;</li> <li>• Electrical substation;</li> <li>• Bus and coach station, depot;</li> <li>• Fuel distributors and suppliers; and,</li> <li>• Vehicle repairs, testing and servicing.</li> </ul> <p>One petrol station is located within 250 m of the site, which is operated by Tesco and is located approximately 90 m north-east of the site.</p>
Sensitive Land Uses	The site is not located within 250 m of any statutory designated sites for nature conservation (for example, Sites of Special Scientific Interest, National/Local Nature Reserves, ancient woodland, etc.). The Huddersfield Broad Canal is a Local Wildlife Site (LWS).
Radon	The site is located within a radon affected area, as between 1 and 3% of properties are above the action level.
UXO Risk	A detailed unexploded ordnance (UXO) assessment was undertaken by 1st Line Defence (9) for the wider TRU Scheme using a 'buffer zone' forming a corridor either side of the existing railway. The UXO report concluded the railway was in a low-risk area and recommended site-specific UXO awareness briefings be given to all personnel conducting intrusive works. Further sub-surface assessments, including UXO and utility checks, on areas not covered by the initial assessment of the rail corridor, are implemented through Network Rail Health and Safety contractual requirements with its contractors.

## INITIAL CONCEPTUAL SITE MODEL

### 4.1 Introduction

- 4.1.1 Land contamination is assessed through development of a CSM which describes the links between contamination which may be present from current and historical activities on-site (including any off-site activities from which contaminants may migrate onto a site), receptors to that contamination and pathways between the two.
- 4.1.2 Sources of contamination and associated contaminants, receptors to that contamination and the pathways are identified and assessed to determine whether all three are present or are likely to be present. If all three are present, then they form a Potential Contaminant Linkage (PCL). These PCLs can then be subjected to the risk assessment process.
- 4.1.3 The approach adopted in this assessment is in accordance with the guidance presented in the Environment Agency LCRM document (1). LCRM provides a technical framework for identifying and remediating contamination through the application of a risk management process. The decision of whether a risk is unacceptable in a particular case involves not only scientific and technical assessment, but also appropriate criteria by which to judge the risk and conclude exactly what level of risk would be unacceptable. Decisions regarding a site may be informed by:
- Tier 1 Preliminary Risk Assessment (PRA) – typically a desk study review to develop an initial CSM with an assessment of risk considering the likelihood and severity of the potential consequences (associated with the PCLs);
  - Tier 2 Generic Quantitative Risk Assessment (GQRA) – typically a review of ground investigation and monitoring data, development/refinement of the CSM with an assessment of risk using precautionary GAC relevant to the PCLs; and
  - Tier 3 Detailed Quantitative Risk Assessment (DQRA).
- 4.1.4 A Tier 1 PRA, including a qualitative environmental risk assessment of the PCLs identified, has been carried out based on proposed scheme details and desk study information summarised in the preceding sections of this report. A Tier 2 GQRA has been undertaken and presented in Section 7. A revised CSM is presented in Section 8, taking into account the GQRA and the development proposals. A Tier 3 DQRA, should it be required, is outside the scope of this report.
- 4.1.5 Under current health and safety legislation, construction and maintenance workers are required to carry out appropriate risk assessments and instigate appropriate mitigating measures to protect themselves, other human receptors and the environment from contamination that may be present. Such risks must be adequately mitigated by the measures required under current legislation, specifically the Construction Design Management (CDM) Regulations (10), which requires that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk.
- 4.1.6 Risks in relation to short term exposure to contamination by construction or maintenance workers (involved in ground excavations) have therefore not been considered further as part of this assessment. Acute exposure risks will need to be assessed as part of the development of the construction phase health and safety plan and managed through standard good practice health and safety procedures.
- 4.1.7 Direct contact of contaminants in the soil or groundwater to new foundations/services has been excluded from the CSM as this is considered as part of the detailed design process.
- 4.1.8 Through a review of available historical and published information (e.g., geological,

hydrogeological and hydrological information), potential sources of contamination and associated contaminants were identified and/or discounted. Those sources/contaminants, that are not discounted, are then considered in relation to potential receptors that may be harmed by the source, and potential pathways that may link the sources to the receptors, i.e., source-pathway-receptor relationship.

4.1.9 Several historical and current land uses have been identified on-site and within 250 m of the site which may have given rise to contamination. The risk assessment has been undertaken in consideration of the proposed future uses of the site.

## 4.2 Potential sources

4.2.1 Based on the review of available information, the following key potentially contaminative sources have been identified:

- On-Site
  - Made Ground from former use as railway sidings and from construction of a level area upon which the railway station was built;
  - Reservoir on 1826 map (presumably removed and/or infilled);
  - Shallow coal workings;
  - Localised spillages of hydrocarbons/fuels/lubricants from current railway activities; and
  - Asbestos Containing Materials (ACMs) from historical rolling stock and in current/former structures on-site.
- Off-Site
  - Made Ground from adjacent commercial developments;
  - Possible former reservoir beneath good sheds;
  - National shell factory;
  - Electrical substations;
  - Goods station;
  - Railway sidings;
  - Tanks;
  - Fuel distributors;
  - Bus station;
  - Two infilled ponds;
  - Operational petrol station 90 m north-east; and
  - Historical petrol station.

4.2.2 Potential contaminants associated with the above sources include:

- Inorganics including metals and metalloids, asbestos, cyanide, sulphate, ammonia, pesticides and herbicides;
- Organics including phenols, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), benzene, toluene, ethyl-benzene and xylenes (BTEX), polychlorinated biphenyls (PCBs), volatile organic compound (VOCs)/semi-volatile organic compounds (SVOCs); and
- Ground gases (including methane, carbon dioxide, hydrogen sulphide and carbon monoxide):
  - Coal mine gases;
  - Radon;

- Gases generated in Made Ground – where sufficient thicknesses are present.

### 4.3 Potential receptors

4.3.1 The following receptors have been identified at the site based on the development proposals:

- Human health:
  - On-site: Future site users comprising members of the public, railway staff and maintenance workers (not involved in excavations); and
  - Off-site: Local residents, workers in commercial properties surrounding the site, and users of surrounding public spaces.
- Controlled waters:
  - Groundwater: Secondary undifferentiated superficial aquifers;
  - Groundwater: Secondary A bedrock aquifer; and
  - Groundwater abstraction: 194 m to north-east of site
- Property and services:
  - Proposed new infrastructure, including lifts, motor rooms, and extension to the underpass;
  - Existing infrastructure; and
  - Neighbouring residential and commercial properties.

4.3.2 No surface water or ecological receptors have been identified. The River Colne is situated approximately 1 km to the east of the site, and Huddersfield Broad Canal is located at approximately 550 m east of the site. Considering the distance between the site and the canal/river, it is unlikely there will be a plausible PCL between the site and the surface water receptors and these have been excluded from the CSM.

### 4.4 Potential pathways

4.4.1 Considering the identified receptors, several pathways are considered plausible based on the information gathered to date.

- Human health
  - Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water;
  - Ingestion / inhalation of soil, soil-derived dust, fibres and gas/vapours; and
  - The site is understood to be covered by hardstanding, with no areas of vegetation proposed.
  - Piled foundations are proposed, which may bring potentially contaminated soils to the surface.
- Controlled waters:
  - Leaching of contaminants in soil to groundwater in the underlying aquifer;
  - Migration of contaminated water through preferential pathways such as underground services, piled foundations, pipes and granular material to groundwater in the underlying aquifer; and
  - Lateral migration of contaminated groundwater towards abstraction points.
- Property and services:
  - Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes, piles or differentially permeable strata, and accumulation within lifts shafts and motor rooms,.

## 4.5 Qualitative risk assessment

- 4.5.1 The preliminary risk categorisations presented are based on an assessment of the potential consequence of each PCL occurring along with the likelihood that each PCL will occur in accordance with the framework provided in Appendix C. Potential contamination that might be present has been identified through knowledge of historical land uses on or adjoining the site. Details of the potential contaminant linkages and associated risks are presented in Table 0-1.

Table 0-1 Initial Conceptual Site Model and Preliminary risk assessment

Source	Pathway	Receptor	Probability	Consequence	Risk classification and justification
<p><u>Potential on-site contamination:</u> Made Ground relating to railway buildings and sidings. Infilled reservoir. Localised spillages of hydrocarbons/fuels from current historical railway activities. Shallow mine workings. ACM in current/former structures and related to historical activities. Possible contaminants include:</p> <ul style="list-style-type: none"> <li>• Asbestos</li> <li>• Metals</li> <li>• PAHs</li> <li>• Pesticides/herbicides</li> <li>• PCBs</li> <li>• Petroleum hydrocarbons</li> <li>• VOCs/SVOCs</li> <li>• Ground gases (radon, methane, carbon dioxide, hydrogen sulphide or carbon monoxide)</li> </ul>	<p>Ingestion of contaminated soils, soil-derived dust and groundwater Inhalation of soil and soil-derived dust, asbestos and soil and groundwater droplets Dermal contact with soil, soil derived dust and groundwater Potentially contaminated soils brought to the surface through piled foundations</p>	<p>Future site users: members of the public, railway station staff, and maintenance workers (not involved in ground excavations).</p> <p>Property: gas PCL only</p>	Unlikely	Medium	<p><b>Low Risk</b> Members of the public utilising the station are unlikely to come into contact with the underlying soils. The design of the redeveloped station includes the site covered by hardstanding or ballast when complete, which would minimise the risk of contact with underlying Made Ground. Future railway staff are unlikely to be digging into the ground. Regarding maintenance workers, contractors have a duty under health and safety legislation to assess the risks posed to its workforce from contamination/asbestos and to implement the appropriate mitigation measures to protect their workers and adjacent land occupiers.</p>
	<p>Migration of ground gases and vapours along preferential pathways such as permeable ground, services, and piled foundations. Motor rooms are present on the platforms, which are connected to lifts pits via a service duct which could provide a pathway. Accumulation within confined spaces such as the proposed lift shafts and subway.</p>		Likely	Severe	<p><b>High Risk</b> Installation of new services (e.g. drainage) and piled foundations have the potential to introduce new migration pathways to the extended subway and current/proposed lift shafts and motor rooms. Gases may accumulate in these confined spaces. Additionally, if dewatering is needed to facilitate excavation of lift pits or subway extension, mobilisation of gases within the shallow coal workings may occur. Remediation of the shallow coal workings will be undertaken during Stage 3 works. This will involve probe and grouting of shallow coal workings beneath new structures, which should substantially reduce the potential for gas migration through workings (although complete sealing of all void spaces beneath the site cannot be guaranteed). There remains the possibility of mine gas to migrate from un-grouted areas through fractures in bedrock Gas mitigation measures may need to be included in the design of lift pits/motor rooms and potentially in relation to the extended subway. The potential for piles to create new pathways will be assessed in a piling risk assessment (submitted under Condition 5x EDP).</p>
	<p>Ingestion of contaminated soils, soil-derived dust and groundwater Inhalation of soil and soil-derived dust, asbestos, soil and groundwater droplets Dermal contact with soil, soil derived dust and groundwater</p>	<p>Off-site human health: residents, occupiers of commercial property and users of public areas.</p>	Unlikely	Medium	<p><b>Low Risk</b> If dust control measures are implemented correctly (in line with industry good practice and mitigation measures identified in the Nuisance Management Plan) when Made Ground is disturbed, the risk to these receptors are considered low. Once the construction of the platform and new rail track has been completed, hardstanding and ballast will minimise the risk of wind entrainment of dust. It is unlikely that occupiers of surrounding properties would encounter groundwater due to the anticipated depth several metres below ground level.</p>
	<p>Migration of ground gases and vapours along preferential pathways such as permeable ground, services and piled foundations. Accumulation within properties.</p>	<p>Off-site human health: neighbouring residential and commercial properties</p>	Low	Severe	<p><b>Moderate Risk</b> If dewatering is proposed degassing of the shallow works may occur. Installation of new services (e.g. drainage and attenuation tank) has the potential to introduce new migration pathways to off-site buildings/occupiers via trench backfill potentially forming a new pathway to existing off-site utility corridors. Gas mitigation measures may need to be included in the design of new services and attenuation tank. Details will be included within the Remediation Statement submitted to satisfy Condition 10 Part B. The potential for mine gas to be displaced laterally during probe/grout works has been assessed as part of the design of the Stage 3 works (remediation of the surface coal workings).</p>
	<p>Leaching or dissolution of contaminants in unsaturated soils and subsequent migration. Lateral and vertical migration through Made Ground, superficial deposits and bedrock.</p>	<p>Groundwater – Secondary Undifferentiated Superficial Aquifer (Head Deposits) Groundwater – Secondary A Bedrock aquifer (Pennine Lower Coal Measures)</p>	Likely	Medium	<p><b>Moderate Risk</b> The Head deposits are classified as a secondary undifferentiated aquifer and as such can provide a certain level of protection from contaminant migration (due to limited permeability) into the underlying bedrock which is classified as a Secondary A Aquifer. However, there is still a potential for a direct pathway for contaminant migration from the Made Ground into the underlying bedrock aquifer where more permeable strata (such as granular material and</p>

Source	Pathway	Receptor	Probability	Consequence	Risk classification and justification	
	Migration via preferential pathways e.g. existing drainage, foul sewer, proposed service pipes/trenches, piled foundations.	Groundwater abstraction (heat pump)			sandstone layers within the bedrock) is present. Where present, piled foundations may provide a preferential pathway for contaminant migration. Hardstanding is proposed to be placed across the majority of the site which will reduce infiltration and leachate generation.	
<u>Potential off-site contamination:</u> Key land uses various garages, a national shell factory, made ground, electrical substations, a goods station, railway sidings, tanks, fuel distributors, bus depot, two infilled ponds and possible reservoir and a petrol station. Possible contaminants include: <ul style="list-style-type: none"> <li>• Asbestos</li> <li>• Metals</li> <li>• PAHs</li> <li>• Pesticides/herbicides</li> <li>• PCBs</li> <li>• Petroleum hydrocarbons</li> <li>• VOCs/SVOCs</li> <li>• Ground gases (methane, carbon dioxide, hydrogen sulphide or carbon monoxide)</li> </ul>	Inhalation, ingestion and dermal contact with contaminants in soil derived dust	Future site users: members of the public, railway staff and maintenance workers  Property: gas PCL only	Unlikely	Medium	<b>Low Risk</b> Members of the public utilising the station are unlikely to come into contact with the underlying soils. The design of the redeveloped station includes the site covered by hardstanding and ballast when complete, which would minimise the risk of contact with underlying Made Ground. Future railway staff are unlikely to be digging into the ground. Regarding maintenance workers, contractors have a duty under health and safety legislation to assess the risks posed to its workforce from contamination/asbestos and to implement the appropriate mitigation measures to protect their workers and adjacent land occupiers.	
	Migration of ground gases and vapours along preferential pathways such as permeable ground and piled foundations. Accumulation within confined spaces. Inhalation/asphyxiation/explosion			Low	Severe	<b>Moderate</b> Several potentially contaminative land uses which may generate ground gases have been identified proximal to the site, particularly areas of made ground, infilled ground and known historical coal workings located south of the site at Huddersfield South tunnel. Offsite ground gas may migrate to site via permeable strata. Gases may accumulate in confined spaces such as the lift shaft, motor rooms, and subway.
	Leaching or dissolution of contaminants in unsaturated soils and subsequent migration Lateral and vertical migration through Made Ground, superficial deposits and bedrock. Migration via preferential pathways e.g. existing drainage, foul sewer, proposed service pipes/trenches, piled foundations.	Groundwater – Secondary Undifferentiated Superficial Aquifer (Head Deposits) Groundwater – Secondary A Bedrock aquifer (Pennine Lower Coal Measures)	Likely	Mild	<b>Moderate/low</b> Based on topography it is anticipated that groundwater will flow to the south-east. Of the potentially contaminative land uses identified in Section 3 only made ground, sidings, a goods shed, tanks associated with railway infrastructure are located up hydraulic gradient from the site. Construction works onsite such as excavations and piled foundations may create a pathway for contamination to migrate to deeper strata. Due to the absence of on-site abstractions, presence of mine workings and Secondary A Aquifer designation groundwater is considered to have a mild sensitivity.	

## GROUND INVESTIGATION

### 5.1 Introduction

- 5.1.1 To date, eight phases of ground investigation have been undertaken (up to and including GRIP 4) along this section of TRU to inform the design of the Scheme, with exploratory locations present with the site boundary in the following reports:
- BAM Ritchies (October 2018) SPO 13.2 Trial Pits Ground Investigation Report – Factual Account (Bam Ritchies, 2018) (11);
  - Structural Soils, Transpennine Route Upgrade; Zone 4 SPO 13.2 & 14.1a – Trial Pitting Huddersfield Viaduct (Structural Soils Limited, September 2018) (12);
  - Bam Ritchies, Transpennine Route Upgrade GI, W3 SPO13 – Automatic Ballast Sampling, Ground Investigation Report – Factual Account (Bam Ritchies, January 2021) (13);
  - Bam Ritchies, Transpennine Route Upgrade GI, W3 GRIP4 Window Samples, Ground Investigation Report – Factual Account (Bam Ritchies, June 2022) (14);
  - Bam Ritchies, Transpennine Route Upgrade GI, W3A Area 1 – Automatic Ballast Sampling – GRIP 4, Ground Investigation Report – Factual Account (Bam Ritchies, December 2022) (15);
  - Structural Soils, Transpennine Route Upgrade; Factual Report on Ground Investigation; 151667-TSA-W3-MVL3-DM3-X-MF-702098 W3-MVL3-GRIP4 Huddersfield Viaduct and Station Survey Report (Structural Soils Limited, November 2022) (16);
  - Structural Soils, Transpennine Route Upgrade; Factual Report on Ground Investigation; 151667-TSA-W3-MVL3-DM3-X-MF-702322 W3-MVL3-Section 1 Window Sample Survey Report on Track (Structural Soils Limited, January 2023) (17); and
  - Bam Ritchies, Transpennine Route Upgrade GI, W3A Section 1 – Boreholes GRIP4 Pt1 TWAO, Ground Investigation Report – Factual Account (Bam Ritchies, January 2023) (18).
- 5.1.2 It should be noted that these ground investigations were not targeted solely on the Huddersfield Station site and include data from other areas along the TRU Scheme.
- 5.1.3 BAM Ritchies and Structural Soils, site investigation contractors, were commissioned to undertake the ground investigation works to obtain information on the geotechnical and geo-environmental conditions at the site.
- 5.1.4 All available factual ground investigation reports have been included within Appendix B of this report. The boreholes/data that are not deemed relevant to this site or assessments herein have been omitted from this report. Data from AGS files was predominantly used to compile this report, however some of this data is not yet available in some of the pdfs of the factual reports.
- 5.1.5 The aims of the investigations, with respect to land contamination, were to:
- Collect data on the ground conditions and groundwater;
  - Collect soil and groundwater samples for laboratory analysis of potential contaminants of concern (identified from desk-based information); and
  - Undertake ground gas and groundwater monitoring from installed wells.
- 5.1.6 The authors of this report were not present on site during the ground investigation works, and information provided within this report is based upon details provided within the scheme-wide ground investigation specification and the factual reports provided by the ground

investigation contractors.

## 5.2 Exploratory holes

5.2.1 The ground investigations were designed to target potential sources of contamination and to provide an overall summary of ground conditions. Monitoring wells were installed to enable collection of groundwater samples from within the Made Ground, superficial deposits and bedrock, and to target possible gas migration pathways from on- and off-site sources. The environmental chemical testing suites were based on contaminants of concern identified during a review of desk-based information, including the historical uses of the site.

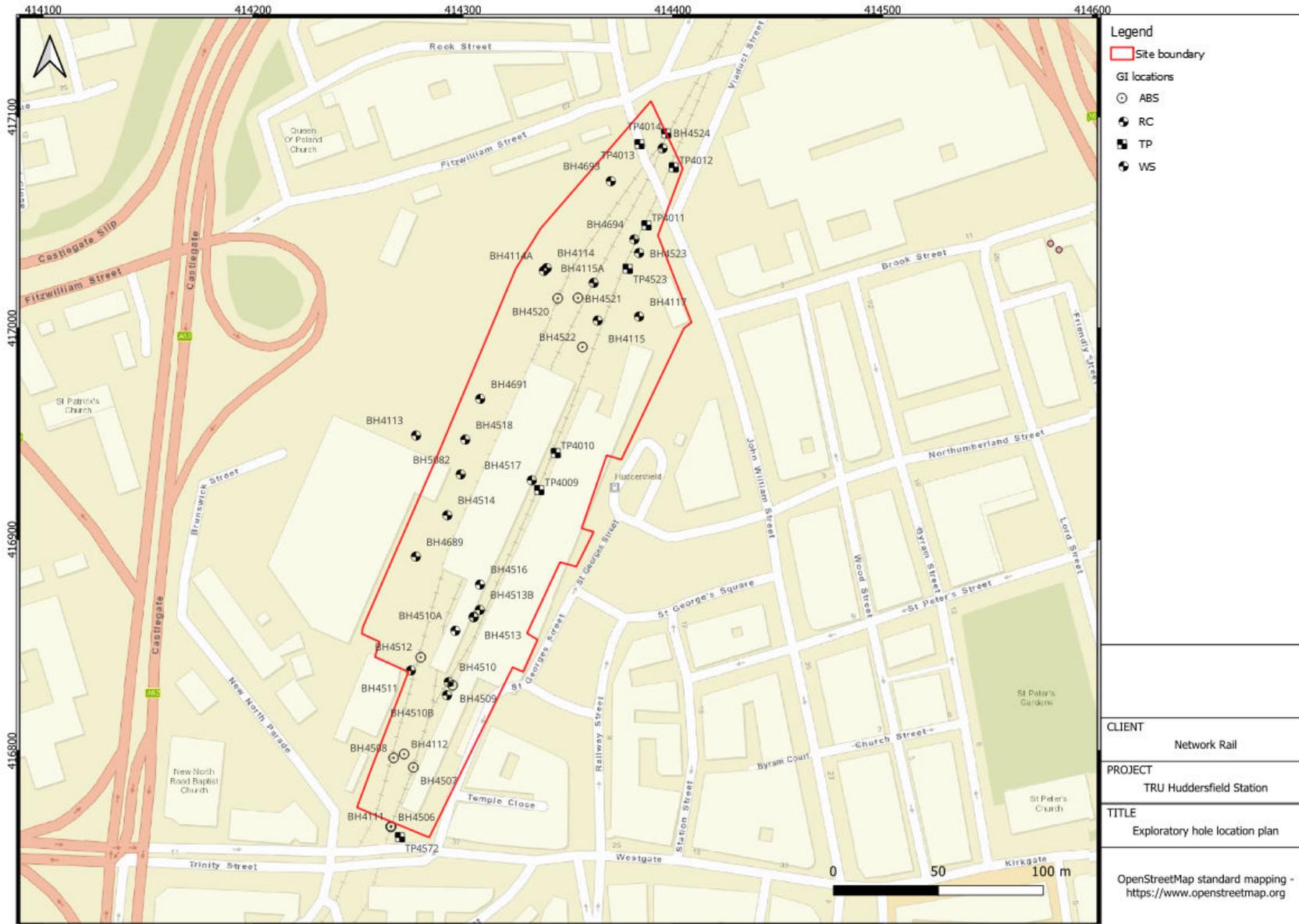
5.2.2 A total of seven exploratory holes within or proximal to the site were installed with ground gas and/or groundwater monitoring standpipes. Installations targeted both Made Ground, superficial deposits and bedrock. A summary of the exploratory holes undertaken onsite and monitoring installations is presented in Table 0-1.

5.2.3 The locations of the exploratory holes are presented Insert 0-1. The locations which environmental soil samples were tested from are presented in Insert 0-2, and monitoring well locations are presented in Insert 0-3.

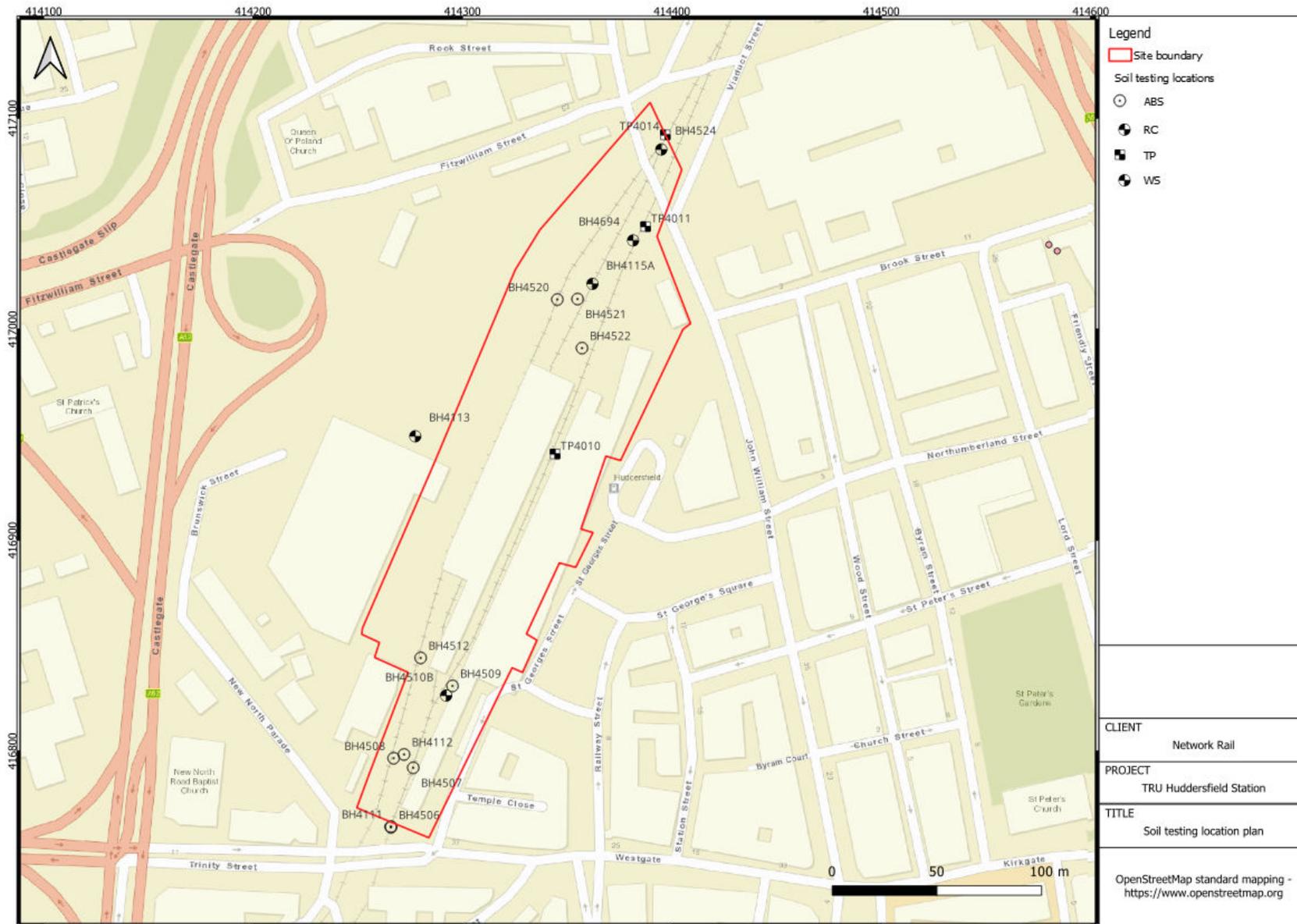
**Table 0-1 Summary of exploratory holes undertaken across the site (bold indicates where ballast or environmental soil samples have been analysed)**

GI	Exploratory Hole Type	Exploratory Hole Number	Termination Depth (m bgl)	BH Purpose/Comment	Installation response zone (m bgl)	Strata Screened
Bam Ritchies 2018 (11)	TP	TP4009	0.35	To determine ballast depth, track formation and foundation depth as well as to determine ground conditions of the historical trackbed.	-	-
		TP4010	0.60		-	-
		TP4014	1.40		-	-
Structural Soils 2018 (12)	TP	TP4011	1.18	To determine ballast depth, track formation and foundation depth as well as to determine ground conditions of the historical trackbed.	-	-
		TP4012			-	-
		TP4013			-	-
		TP4523	1.00		-	-
		TP4572	0.58		-	-
Bam Ritchies January 2021 (13)	ABS	BH4111	1.20	To validate existing track construction and inform track lowering schemes where required to enable electrification and to undertake geotechnical and geo-environmental testing.	-	-
		BH4112	1.50		-	-
		BH4506	0.80		-	-
		BH4507	0.70		-	-
		BH4508	1.10		-	-
		BH4509	1.20		-	-
		BH4512	1.20		-	-
		BH4520	2.20		-	-
Bam Ritchies June 2022 (14)	WS	BH4514	0.90	To investigate ground conditions to inform new trackbed design and to undertake geotechnical and geo-environmental testing.	-	-
	WS	BH4518	2.40		-	-
Bam Ritchies December 2022 (15)	ABS	BH4522	2.20	To validate existing track construction and inform track lowering schemes where required to enable electrification and to undertake geotechnical and geo-environmental testing.	-	-
					-	-
					-	-
Structural Soils November 2022 (16)	DS+RC	BH4113	48.63	To understand deeper ground conditions where new underpass is proposed and to undertake geotechnical and geo-environmental testing.	1.5 to 4.5	PLCM
	WS	BH4510	0.40			

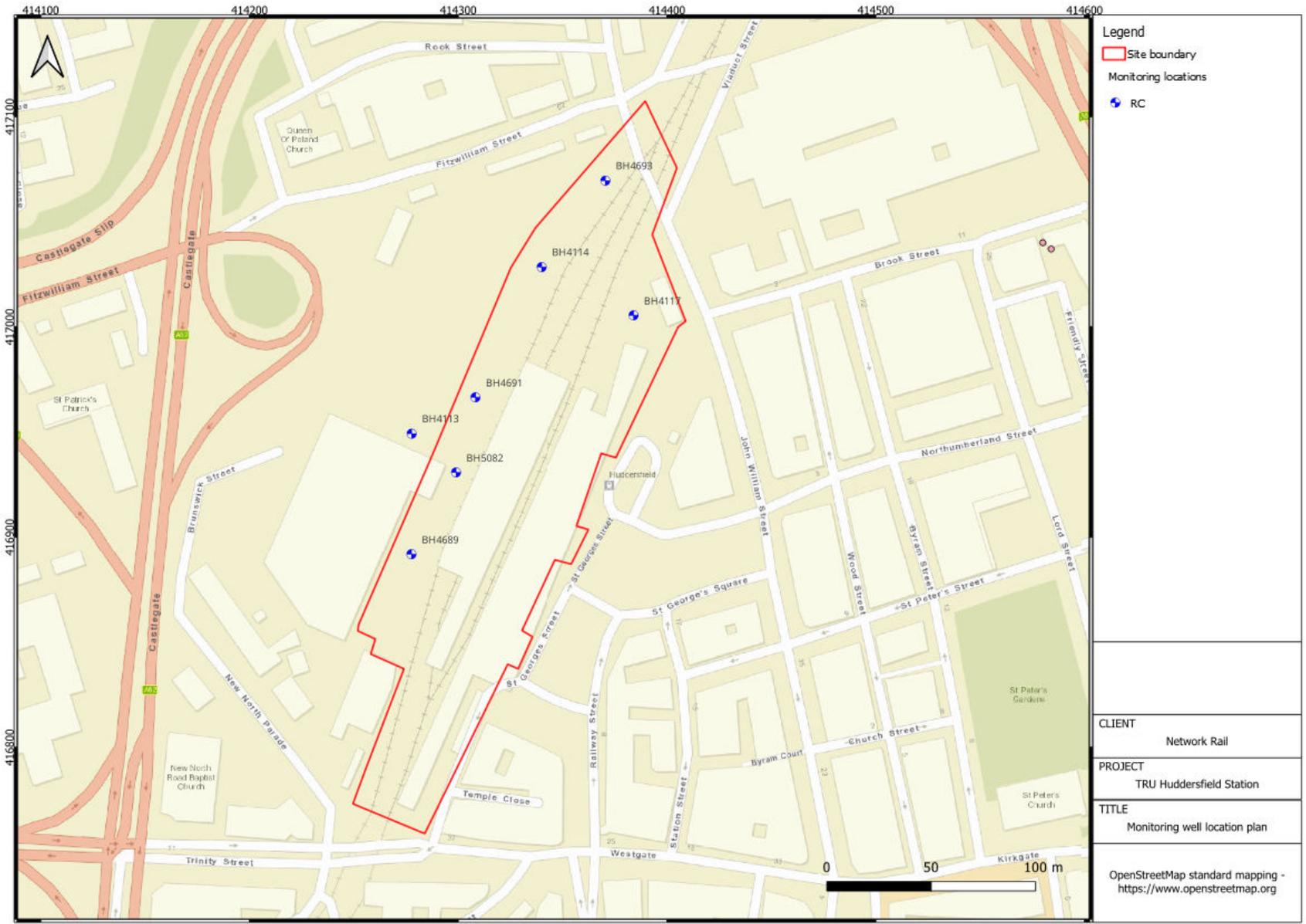
GI	Exploratory Hole Type	Exploratory Hole Number	Termination Depth (m bgl)	BH Purpose/Comment	Installation response zone (m bgl)	Strata Screened
Structural Soils January 2023 (17)		BH4510A	0.40	To investigate ground conditions to inform new trackbed design and to undertake geotechnical and geo-environmental.	-	-
		BH4510B	1.70		-	-
		BH4511	2.00		-	-
		BH4513	0.60		-	-
		BH4513A	3.00		-	-
		BH4513B	0.86		-	-
		BH4516	1.80		-	-
		BH4517	3.35		-	-
		BH4523	4.00		-	-
		BH4524	2.45		-	-
Bam Ritchies January 2023 (18)	RC	BH4114	30.60	To understand deeper ground conditions where new footbridge structure is proposed and to undertake geotechnical and geo-environmental testing.	0.8 to 6.8	Clay and PLCM
		BH4114A	6.00		-	-
		BH4115	30.00	To prove depth of Soft Bed Coal and to inform proposed platform. In addition, to understand deeper ground conditions where new footbridge structure is proposed.	-	-
	BH4115A	1.00	-		-	
	DS+RC	BH4117	30.00		5.0 to 8.0	Clay
	RC	BH4689	30.70	To understand ground conditions for proposed platform.	1.5 to 8.0	PLCM
	DS+RC	BH4691	30.70		1.0 to 5.0	PLCM
		BH4693	29.50		1.5 to 10.0	Made Ground and clay
		BH4694	30.00		-	-
	RC	BH5082	31.00	To investigate ground conditions for new bridge structure. Prove depth to Soft Bed Coal seam.	1.5 to 10.0	PLCM
<p>Note:            CP = Cable Percussive, RC = Rotary Cored, WS/WLS = Windowless Sampler, DS = Dynamic Sampler, TP = Trial Pit, BH = Borehole, PL = Plate Load; ABS = Automatic Ballast Sampling; PLCM Pennine Lower Coal Measures</p>						



Insert 0-1 Exploratory hole location plan



Insert 0-2 Environmental soil and ballast testing location plan



Insert 0-3 Monitoring well location plan

### 5.3 Soil Environmental Sampling

5.3.1 Environmental soil samples were collected on site during the ground investigation by the BAM or Structural Soils site team (hereafter referred to as the site engineer) and transported to Envirolab for chemical analysis. Envirolab is a United Kingdom Accreditation Service (UKAS) and Monitoring Certification Scheme (MCERTS) accredited laboratory. Soil samples were collected by the site engineer and transported to the laboratory under Envirolab's chain of custody delivery process.

#### Soils

5.3.2 A total of ten soil samples (nine comprising made ground, one comprising coal measures taken during several phases of ground investigation, were scheduled for soil analysis comprising a selection of the determinands presented in Table 0-2.

**Table 0-2 Soil testing suite**

Determinand	Number of samples tested
Metals: antimony, arsenic, beryllium, boron, cadmium, chromium (total), copper, lead, magnesium, mercury, nickel, potassium, zinc, selenium and vanadium)*	10
pH	10
Total Organic Carbon (TOC)	10
BTEX, PAHs (USEPA 16)	9
Cyanide (free and complex)	5
Total Cyanide	10
Thiocyanate	5
Hexavalent chromium	5
Total phenols	10
Asbestos ID and quantification	10
Speciated total petroleum hydrocarbons (TPH) criteria working group (CWG) with aliphatic/aromatic separation and carbon banding	7
Methyl tert-Butyl Ether (MTBE)	5
Phenols	10
VOCs & SVOC	1
Dioxins and Furans	1
* not all metals suites contained the same determinands	

5.3.3 The contractor undertook headspace testing using a Photo Ionisation Detector (PID) on selected samples taken from ten exploratory holes to measure the potential presence of volatile contaminants within soil samples.

#### Ballast Suite

5.3.4 Thirteen ballast samples, collected during several phases of ground investigation, were scheduled for the determinands presented in Table 0-3.

**Table 0-3 Ballast testing suite**

Determinand	Number of samples tested
Metals: arsenic, chromium (total and hexavalent), copper, nickel, lead and zinc	13
Beryllium, Boron, Cadmium, total cyanide, Selenium, Vanadium	3
Mercury	5
Thiocyanate	1
TOC	3
pH	13
PAHs (USEPA 16)	13
Phenols	3
Asbestos	13
TPHCWG	12
BTEX	13
MTBE	11

Soil leachate

5.3.5 Two soil samples collected during two phases of ground investigations were scheduled for leachate analysis, comprising the determinands set out in Table 0-4.

**Table 0-4 Soil leachate testing suite**

Determinand	Number of samples tested
Metals (antimony, arsenic, boron, chromium, lead, magnesium, mercury, nickel, selenium, vanadium and zinc)	2
Chloride, Nitrate	2
pH	2
Sulphate, Sulphur	2
Cyanide (total and free)	2
Total PAH16	2

**5.4 Groundwater and ground gas monitoring**

5.4.1 The following instrumentation was installed during the various phases of works, with the location of monitoring wells presented in Insert 0-3:

- Seven monitoring wells were fitted with 50 mm standpipes to allow for groundwater level and ground gas monitoring.
- Headspace monitoring using a PID was undertaken at each location.
- Ground gas monitoring, and groundwater monitoring and sampling, was undertaken during several post-ground investigation monitoring periods:
  - BH4113 was monitored four times on 11 and 18 February 2021, 4 and 29 March 2021.
  - BH4114, BH4689, BH4691, BH4693 and BH5082 were monitored four times on 19 August 2021, 14 October 2021, 11 November 2021 and 25 February 2022.
  - BH4117 was monitored twice on 4 April 2022 and 9 May 2022.
- Ground gas monitoring recorded concentrations of carbon dioxide, methane, hydrogen sulphide, carbon monoxide and oxygen, alongside gas flow rates and atmospheric pressure.

- Six samples of groundwater were obtained from BH4114, BH4689, BH4691 and BH5082 during two monitoring rounds (on 24 August 2021 and 16 November 2021), and tested for the following analysis:
  - Metals (antimony, arsenic, cadmium, calcium, chromium (total and hexavalent), copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, vanadium, zinc);
  - PAHs;
  - Phenols;
  - TPHCWG inc. BTEX, MTBE;
  - VOCs and SVOCs; and
  - pH, total, free and complex cyanide, thiocyanate, alkalinity, ammoniacal nitrogen, biological oxygen demand (BOD), chemical oxygen demand (COD), chloride, nitrate and nitrite, potassium, sodium, sulphate, sulphide, sulphur;
  - PCB World Health Organisation (WHO) 12 congeners (2 samples);
  - Cresols.
- There are no surface watercourses within 250 m of the site, therefore surface water sampling/testing was not undertaken to inform the risk assessment for the station.

## 5.5 Deviating samples

- 5.5.1 As part of their accreditation, laboratories are obliged to indicate where samples deviate from their testing protocols. The data used in this report is recorded within factual reports which are currently in a draft form and therefore several of the deviation reports are not currently available. The deviation reports which are available are appended to the factual reports, presented in Appendix B.
- 5.5.2 Of the 23 soil and ballast samples chemically tested:
- Three samples have analytes deviating due to the samples not being extracted within the laboratory defined holding times (samples taken from BH4115A and BH4694)
- 5.5.3 The authors are not aware of any deviations of any of the remaining samples. The deviations identified were based on dates provided on the test certificates the time elapsed between sample collection and commencement of analysis, which varies between a few weeks to six months. Much of the sampling and testing was undertaken in 2020 and 2021 when COVID restrictions, staff absence due to illness/isolation and social distancing made working conditions challenging.
- 5.5.4 The majority of inorganic soil parameters were largely unaffected, with only cyanide (free, total and complex) being reported as deviating. Deviations were recorded in organic compounds including, TPH-CWG, PAHs and/or BTEX.
- 5.5.5 The delay between sampling and extraction/analysis might have resulted in concentrations being under reported (i.e. concentrations might have been higher when the samples were collected). However, the following considerations demonstrate it is unlikely the reported deviations would significantly affect the conclusions of the risk assessments:
- It is unlikely that future site users would come into contact with underlying Made Ground. Access to railway passengers would be restricted to platforms and access footpaths, with soft-landscaped areas not proposed. Risks to construction/maintenance workers would be managed via their employers' health and safety assessments that would inform their safe working procedures.

- Groundwater level data indicates the unsaturated zone has a thickness of 1.7 to 7.3 m across the site. Much of the site is covered in hardstanding and the majority of superficial soils are head deposits comprising clay which are low permeability materials. The concentrations of organic compounds would reduce during migration through the unsaturated zone that predominantly comprises clay and mudstone due to natural processes such as adsorption and biodegradation.

## GROUND CONDITIONS

### 6.1 Summary of ground conditions

6.1.1 Ground conditions within the site have been summarised in Table 0-1, as detailed in the Transpire Alliance 2023 Ground Investigation Report (8).

**Table 0-1 Ground conditions for chainages 41300 to 41620**

Top depth range (m bgl)	Top elevation range (m AOD)*	Thickness range (m)	Geology
0 to 0.5	88 to 89	0.2 to 1.0	Made Ground: Trackbed <i>Grey slightly sandy, angular coarse GRAVEL of granite and basalt, occasional brick, limestone, ash and clinker.</i>
0 to 0.8	88 to 89	0.3 to 7.0	Made Ground: Excluding trackbed <i>Soft to firm sandy gravelly CLAY. Gravel of mudstone and sandstone</i>
0.2 to 5.0	82 to 88	0 to 5.0	Head deposits <i>Soft to stiff sandy gravelly CLAY with cobbles. Gravel of mudstone and sandstone.</i>
1.0 to 10	78 to 88	n/a	PLCM mudstone and siltstone <i>Extremely weak to weak thinly laminated MUDSTONE. Distinctly weathered in places. Up to 3m of residual soil at the top of the unit. Very weak to moderately weak SILTSTONE.</i>
12	77	0.5	PLCM Soft Bed coal <i>Possible workings recorded in BH4114.</i>
5.0 to 13.0	84 to 75	n/a	PLCM sandstone <i>Weak to medium strong sandstone.</i>
8.0	82	n/a	PLCM limestone
<p>Comments: Limestone is reported in historical borehole BH3_H. Limestone is not expected in the geological sequence, hence the borehole is assumed to sample a laterally discontinuous marine band. Fossiliferous material is also sampled in SE11NW51 at 8.3mBGL (~86mAOD) and 13mBGL (~81mAOD), and SE11NW53 at 17.5mBGL (~77mAOD).</p>			

6.1.2 Made Ground was recorded across the site in off-track locations, with a maximum thickness of 7.0 m within BH4694, and was observed to comprise clay and gravel with ash, fragments of burnt colliery spoil, clinker, slag, spent shale and sandstone, and coal. No topsoil was recorded on site.

6.1.3 Trackbed Made Ground was recorded with a maximum thickness of 1.0 m, mainly comprising ballast described as dark grey sandy gravel and gravel of coarse granite. Sub-components within the trackbed Made Ground included, limestone, brick, basalt, shale, coal, limestone, clinker and ash.

6.1.4 Head deposits were recorded within the station footprint and to the north of the station. Head deposits comprising clay were identified in locations, BH4114, BH4114A, BH4115, BH4693, BH4694, BH4517, BH4520, BH4521, BH4522, with a maximum depth of 5 m in BH4694. The clay encountered at the site is described as firm to stiff brown to dark brown slightly sandy gravelly clay. Gravel is fine to coarse of sandstone, siltstone, mudstone and coal.

6.1.5 The Soft Bed coal seam was identified at 77 m AOD (approximately 12 to 13 m bgl). Soft Bed Flags sandstone is expected at some depth below the Soft Bed coal seam. The Soft Bed coal seam is likely to contain old works dating to a time before the station was

constructed. The seam has not been recorded in boreholes east of A:41550, although a 0.5m void at the anticipated level of the Soft Bed coal was recorded in BH4114 at A:41570, which may be related to historical coal workings. To the east of BH4114, the level of the seam is approximately at the level of the base of the head deposits, hence the coal seam is anticipated to sub-crop beneath them.

6.1.6 Bedrock of the PLCM was encountered across the site within 16 exploratory holes, with top depths ranging from 1.0 m bgl to 13.0 m bgl. Bedrock was encountered at shallower depths within the south of the site than in the north, as superficial deposits were absent. The PLCM bedrock comprised predominantly mudstones (described as extremely weak to weak dark grey to grey thinly laminated fissile mudstone) interbedded with sandstone and siltstones. The sandstone encountered was interbedded with the mudstone and was present throughout the site. The base of the PLCM was not proven during the phases of ground investigation.

## 6.2 Olfactory and visual records of contamination

6.2.1 The majority of exploratory holes across the site encountered Made Ground which included anthropogenic materials such as dirty ballast, tarmacadam, brick, clinker, pottery, ash, slag, burnt colliery spoil, coal, spent shale, cement and rare inclusions of glass, plastic and metal.

6.2.2 Details of olfactory/visual evidence of hydrocarbon/chemical contamination within soil samples were recorded on the logs and are summarised in Table 0-2 (none of these were collected from ballast).

**Table 0-2 Summary of visual/olfactory evidence of contamination**

Exploratory Hole	Depth (mbgl)	Strata	Comment
BH4115	0.70 to 1.20	Made Ground	Faint organic odour
BH4115A	0.20 to 0.90	Made Ground	Strong hydrocarbon odour
BH4511	1.40 to 1.65	Made Ground	Becoming black with hydrocarbon odour and visible contamination
BH4516	0.00 to 0.35	Made Ground	Hydrocarbon odour present
	0.35 to 0.65	Made Ground	Slight hydrocarbon odour
BH4517	0.00 to 0.35	Made Ground	Hydrocarbon odour present
	0.30 to 0.50	Made Ground	Slight hydrocarbon odour present
	1.50 to 2.00	Made Ground	Faint hydrocarbon odour, black clay
BH4521	0.40 to 0.62	Made Ground	Strong hydrocarbon odour
BH4691	0.80	Made Ground	Strong hydrocarbon odour (water ingress)
	1.20 to 1.60	Made Ground	Hydrocarbon odour
BH4693	9.90 to 10.05	PLCM	Organic matter with slight odour
BH5082	6.10 to 7.55	PLCM	Occasional faint hydrocarbon odour and staining along joints and bedding fractures
	7.70 to 8.02	PLCM	Strong hydrocarbon odour

## 6.3 Coal Mining

6.3.1 A summary of work completed with respect to coal mining risk is reported here and is relevant to the later mine gas risk assessment.

### Mining risk assessment

- 6.3.2 A Mining Risk Assessment (MRA) was undertaken by Transpire Alliance in 2021 (5) for W3, including the area within and adjacent to Huddersfield Station.
- 6.3.3 Coal Authority data only indicates 'underground working' of the Soft Bed seam between chainages 42170 and 42200, north of the site. However, the Coal Authority also shows areas of probable workings, where there is no recorded evidence (maps or plans) of workings. This is generally where a seam of mineable thickness exists at a shallow depth. Coal Authority data indicates 'probable shallow coal mine workings' between chainages 40500 and 41740, corresponding with the site. This extent correlates with the underlying shallow Soft Bed seam as shown on geological maps.
- 6.3.4 Based on the findings of the Mining Gas Risk Assessment (5) no mine entries or adits are present within Huddersfield station or 20 m from the site boundary. Adits were not recorded within 100 m of the track and no mine entries recorded. It is noted that unrecorded mine entries may exist.
- 6.3.5 Known workings are present through Huddersfield South tunnel, from chainages 40650 to ch.41300, directly to the south of the site. It is expected that the Soft Bed coal is at shallow depths (~10 m bgl) beneath Huddersfield Station with an assumed possible worked thickness of 1.7 m. Although there are no known workings on site, there are possible worked extents between chainages 41330 and 41600. The Soft Bed coal seam and associated fireclay, sub-crop and occur at shallow depth throughout the Huddersfield Tunnels and under the station area. The Soft Bed is a sulphur-free coal of fair quality, which has been widely worked to a considerable extent from the outcrop.
- 6.3.6 During the ground investigations, the Soft Bed seam was recorded onsite in eight locations (BH4113, BH4114, BH4115, BH4689, BH5082, BH4691, BH4693, BH4694), at a maximum thickness of 0.5 m. Voids were recorded in two boreholes (BH4114 and BH4691).
- 6.3.7 The MRA concluded that the site is within a high-risk area, with mitigation required. Piled foundations are proposed onsite for the proposed canopy, footbridge and OLE modifications, which will require mining remedial works due to the shallow depth of the seam. A grid of probing and grouting of voids is being undertaken (Stage 3 works) prior to the main construction phase.

### Mining risk mitigation remit

- 6.3.8 A Mining Risk Mitigation Remit Report was undertaken by Transpire Alliance in 2022 (7), which was designed to present mitigation measures for the mining risk assessment high risk areas. The primary risks at Huddersfield Station relate to the Soft Bed seam.
- 6.3.9 Proposed mitigation measures for the track/structures is to undertake a grid of probing and grouting of voids (works being carried out prior to main construction phase during Stage 3) and apply gas protection measures where necessary. For OLE foundations, it is proposed that depths of superficial material are reviewed, and local grouting is undertaken where voids are encountered.

## **6.4 Hydrogeology**

### Groundwater recorded during ground investigation

- 6.4.1 Groundwater strikes were encountered during two ground investigations as summarised in Table 0-3. No visual or olfactory signs of contamination were recorded during groundwater monitoring.

**Table 0-3 Summary of groundwater strikes during the ground investigation**

GI Phase	Exploratory hole	Depth of water strike (m bgl)	Deposit	Water level after 20 min (m bgl)
Structural Soils 2023 (17)	BH4523	1.0	Made Ground	n/a
	BH4516	1.0 and 1.4	Made Ground	n/a
Bam Ritchies 2023 (18)	BH4691	0.8	Made Ground	n/a
	BH4115	1.2	Made Ground	n/a
	BH4117	5.2	Made Ground	5.0

### Groundwater levels

6.4.2 Groundwater levels were monitored on seven occasions during 2021, and on three occasions in 2022. The groundwater levels recorded are summarised in Table 0-4 to Table 0-6.

**Table 0-4 Summary of groundwater levels during early 2021 monitoring**

Exploratory hole	Well screen range (m bgl)	Screened deposits	Water depth (m bgl) and (m AOD)			
			11/02/21	18/02/21	04/03/21	29/03/21
BH4113	1.5 to 4.5	PLCM: mudstone and gravel	3.03 (86.10)	3.03 (86.10)	3.21 (85.92)	3.43 (85.70)

**Table 0-5 Summary of groundwater levels during 2021-2022 monitoring**

Exploratory hole	Well screen range (m bgl)	Screened deposits	Water depth (m bgl) and (m AOD)			
			19/08/21	14/10/21	11/11/21	25/02/22
BH4114	0.8 to 6.8	Clay and PLCM (mudstone)	1.80 (86.58)	1.80 (86.58)	1.70 (86.68)	1.60 (86.78)
BH4689	1.5 to 8.0	PLCM: siltstone, mudstone, coal	5.60 (83.55)	6.00 (83.15)	6.00 (83.15)	5.00 (84.15)
BH4691	1.0 to 5.0	PLCM: mudstone	2.70 (85.94)	3.00 (85.64)	2.80 (85.84)	2.25 (86.39)
BH4693	1.5 to 10.0	Made Ground and clay	Dry	Not monitored	Dry	Dry
BH5082	1.5 to 10.0	PLCM: siltstone, mudstone, sandstone	6.90 (82.17)	7.30 (81.77)	6.70 (82.37)	5.30 (83.77)

**Table 0-6 Summary of groundwater levels during mid-2022 monitoring**

Exploratory hole	Well screen range (m bgl)	Screened deposits	Water depth (m bgl) and (m AOD)	
			04/04/22	09/05/22
BH4117	5.0 to 8.0	Made Ground and Clay	3.5 (84.93)	3.5 (84.93)

6.4.3 Groundwater was recorded in all boreholes apart from BH4693 which was recorded as dry.

6.4.4 Based on the type of bedrock geology, it is likely that groundwater is contained within the

more permeable units of the PLCM. This is supported by the 2021 GIR (8), which indicates the existing sandstones may provide moderate yields which could give rise to springs.

- 6.4.5 Monitoring undertaken within Made Ground, superficial deposits and bedrock as part of the 2021 and 2022 ground investigations recorded groundwater levels ranging from between 81.77 and 86.78 m AOD (1.6 – 7.3 m bgl). The lowest groundwater levels were recorded in west of the site's centre, at locations BH4689 and BH5082 (81.77 – 83.55 m AOD).
- 6.4.6 The 2021 GIR describe that a drainage survey undertaken in 2014 on culvert MVL3/91B and noted the presence of spring water draining into the culvert chamber. A historical drainage plan, DMFP00107190 details a "fast-flowing" culvert from Westgate Bridge, via the rail-side of Huddersfield Station building. This culvert "*appears to take more water than would normally accrue from the station*". The culvert, reported to be 1.35m x 1.35m passes beneath Huddersfield Station oriented southwest to northeast approximately 5m below ground. It is possible the culvert receives flow from shallow groundwater beneath the station footprint and may affect the local hydrogeological regime. It is understood that this old culvert drains into the public sewer in front of the station.
- 6.4.7 As observed within the 2021 GIR, groundwater is likely to flow through fractures and discontinuities flowing down the existing geological dip towards the river basin. The River Colne is located 1 km east of the site, and therefore groundwater may be flowing in that direction (towards the east/southeast), although it is not possible to confirm this with current groundwater data. An abstraction licence is located approximately 194 m north-east of the site (registered to the Kirklees Council for non-evaporative cooling use), however it is unlikely to be influencing the groundwater regime in this area as the water is abstracted and returned.
- 6.4.8 Groundwater chemical testing results are presented in Section 7.3, and gas monitoring results are presented in Section 7.4.

## 7. GENERIC QUANTITATIVE RISK ASSESSMENT

### 7.1 Introduction

7.1.1 This contamination assessment uses site-specific soil, leachate, ground gas and groundwater data collected from the site during several phases of ground investigation undertaken to date. This combined dataset was used to assess the level of risk to human health and controlled waters receptors associated with the proposed development. The factual reports are presented in Appendix B, and the screening sheets are presented in Appendix D.

7.1.2 The locations of the exploratory holes are presented Insert 0-1. The locations which soil samples were obtained and tested from are presented in Insert 0-2, and monitoring well locations are presented in Insert 0-3.

### 7.2 Human health risk assessment

#### Methodology

7.2.1 A GQRA has been carried out to assess the potential long-term risks to human health receptors following development of the site and the recorded contaminants. The short-term risks relating to construction and future maintenance workers involved in ground excavations are not covered within this risk assessment, as they should be assessed by their employers via health and safety assessments.

7.2.2 To support the evaluation of potential risks to human health, soil chemical analysis results have been screened against Category 4 Screening Levels (C4SLs) and Atkins Soil Screening Values (SSV), collectively termed generic assessment criteria (GAC).

7.2.3 Atkins has produced SSVs for a variety of land uses based on Soil Organic Matter (SOM) contents of 1% and 6%. The 1% values provide more conservative SSVs and are based on a sandy soil type, whereas the 6% values are based on a sandy loam soil type (the default within Science Report (SR) 3 (19)). SOM was recorded at a minimum of 2.34%. For the purposes of generic screening the SSVs used have been based on a conservative site SOM of 1% in order to be suitably protective.

7.2.4 C4SLs are modelled using Contaminated Land Exposure Assessment (CLEA) (20) for standard land uses and are concentrations of contamination in soil (with 6% SOM) which are considered by DEFRA to represent a 'low risk' derived from updated exposure assessment parameters and toxicological data based on a 'Low Level of Toxicological Concern' (21). As per the accompanying Policy Statement, DEFRA state that: "*A Low Level of Toxicological Concern represents an exposure equivalent to an intake of low concern but that definitely does not approach an intake level that could be defined as causing a Significant Possibility of Significant Harm to human health*" (21).

7.2.5 The C4SLs were derived based on remaining 'strongly precautionary' for the purposes of generic screening and with the exception of benzene the change in SOM (from 1% to 6%) does not affect the derived GAC.

7.2.6 The potential for exposure from asbestos in soil is based on a number of factors including (amongst others) the quantity and type of asbestos present, the properties of the soil, the presence of any confining or covering layer, bioturbation, and rates of weathering and erosion due to site use or climate, as well as the actions undertaken on site and exposure scenario. Due to the nature of risk associated with asbestos and uncertainties associated with the above properties, a GAC cannot be derived. Therefore, for the purposes of this GQRA, the presence of asbestos in soil as identified from field observations or laboratory

analysis is considered to be an appropriate initial screening criterion. If positive asbestos identification is reported, further quantitative analysis will be undertaken in order to facilitate an assessment of asbestos related risk under the future site use.

- 7.2.7 Due to the nature of acute risk from cyanide, the SSV for cyanide has been based on the potential for an adult to ingest a bolus of soil contaminated with free cyanide.
- 7.2.8 Based on the ratio of genotoxic PAHs to benzo(a)pyrene, the surrogate marker approach for genotoxic PAHs as set out in the C4SL Project Methodology (22) has been adopted. For mercury, the C4SL (based on a low level of toxicological concern) for the commercial land use at 6% SOM has been selected as the assessment criterion.
- 7.2.9 The proposed improvement works are shown in drawing 151667-TSA-30-MVL3-DRG-T-LP-166002 (Appendix A). Given the potential pathways identified in the initial CSM, soils have been screened against GAC based on a future commercial end use. The commercial 1% GAC are considered appropriate due to the future end use of the majority of the site as railway land. In addition, the public open space (parks) 1% GAC was used for screening because Made Ground might be re-used elsewhere on the Scheme (subject to it meeting various criteria and requirements). However, Made Ground will not be reused on farmland that has been used for temporary works. Note that ballast samples were only screened against the commercial GAC, whereas the non-ballast samples were screened against both commercial and public open space GACs.
- 7.2.10 The commercial GAC are quite conservative criteria for the future land-use as it includes consideration of inhalation of vapours indoors, whereas members of the public utilising Huddersfield Station will be outdoors (other than those who may briefly use a lift).
- 7.2.11 Ballast sample test results were separated from the Made Ground and unconsolidated deposits samples, as ballast will be handled differently during construction and will only be reused under and in close proximity to the railway line in accordance with Network Rail's standard guidance for ballast reuse (NR44).

### Results

- 7.2.12 Ten soil samples and thirteen ballast samples were retrieved from across the site during the ground investigations and analysed for a range of contaminants. A full set of analytical results are included in the Factual Reports in Appendix B and the screening sheets are presented within Appendix D.
- 7.2.13 No exceedances of the respective GAC were recorded for any sample. Therefore, the analysed soils are unlikely to pose an unacceptable risk to human health based on commercial and public open space land uses.
- 7.2.14 Asbestos was not identified within the 23 samples tested. However, there is a potential risk that asbestos could be found in Made Ground, and its mitigation, if found, should be considered as part of the construction works design.
- 7.2.15 Hydrocarbons were recorded in concentrations above the laboratory Limit of Detection (LoD) within BH4115A and BH4521, which also coincide with the identification of hydrocarbon odours. It is possible that this is the source of these organic compounds within these locations.
- 7.2.16 PID measurements were taken within ten exploratory holes to measure the potential presence of volatile contaminants within soil samples. The highest measurements were generally recorded to the west of the rail tracks, within or immediately below Made Ground. Corresponding olfactory observations of hydrocarbons were recorded in locations BH4521,

BH4691, BH4693 and BH5082. VOC/SVOC testing was undertaken on sample BH4521 (0.5m) where elevated PID readings and olfactory observations were recorded, however no exceedances were recorded and the majority of results were below the LOD, with the highest result recorded as 0.002 mg/kg (1,2,4 Trimethylbenzene). The results are summarised in Table 7-1.

**Table 7-1 PID Readings**

Exploratory hole	Maximum PID reading (ppm)	Depth of maximum
BH4114A	13.0	2.8
BH4509	0.0	-
BH4512	13.9	0.4
BH4518	16.6	1.2
BH4520	8.2	0.8
BH4521	9.3	4.5
BH4522	26.7	1.2
BH4691	49.8	2.0
BH4693	7.5	2.5
BH5082	38.4	8.0

Discussion and recommendations

- 7.2.17 As presented in Section 6.2, evidence of visual/olfactory contamination was recorded in several locations. Soil chemical testing was not, however, undertaken in a number of these areas, where development works are proposed. Visual/olfactory contamination was recorded in BH4516, BH4691, BH4693 and BH5082, in the platform areas, and in BH4517 close to the eastern side of the current passenger subway.
- 7.2.18 As chemical testing was not undertaken in these areas, it is not possible to characterise these soils in terms of potential contamination. These areas are expected to be located beneath hardstanding, and therefore will not pose a human health risk. It is not anticipated that the material will be subject to reuse, however if materials are to be excavated and re-used in areas of soft-standing, testing will be undertaken during construction as part of the MMP process, and potential human health risks assessed.
- 7.2.19 Elevated PID readings were recorded in BH4115 and BH4115A, and olfactory evidence of hydrocarbons and elevated PID readings were recorded in BH4521, in the area of the lift shafts. VOC/SVOC testing in BH4521 (0.5m) recorded the majority of analytes below LOD and no exceedances were recorded, indicating the risk from vapours is low. Ground gas protection measures recommended in Section 7.4, within the design of the proposed lift shafts, motor rooms and subway, will mitigate any residual vapour risk.
- 7.2.20 As hardstanding will be present across all of the site areas accessible to the public, there is not considered to be a significant linkage between onsite soils and future site users. If soft-landscaped areas are proposed within the site designs, this assessment should be re-evaluated. Acute exposure risks, which might be posed to construction workers excavating underlying soils, will need to be assessed as part of the development of the construction phase health and safety plan and managed through standard good practice health and safety procedures.
- 7.2.21 It should be noted that, if proposed, material reuse will need to comply with the Definition of Waste: Code of Practice (DoWCoP) (23). The DoWCoP requires a Material Management Plan (MMP) to be prepared then declared by a Qualified Person (QP), with submission of a MMP Verification Report to CL:AIRE. DoWCoP requires collection of verification data demonstrating that their requirements have been complied with during construction works to

avoid regulatory action. Additionally, during earthworks a watching brief should be undertaken with validation sampling and analysis of soils proposed for reuse especially in areas of landscaping or at shallow depths where exposure of future site staff to contaminants could occur.

### 7.3 Controlled waters risk assessment

#### Introduction

- 7.3.1 The controlled waters GQRA has been undertaken to assess the potential risks posed to the identified controlled waters receptors from the migration of contaminants from potential on site sources. To assess the potential risks to the identified receptors, a comparison of soil leachate and groundwater concentrations against pertinent Water Quality Standards (WQS) has been undertaken. No surface water sampling has been undertaken for this site as no surface water bodies are within 750 m of the railway station.

#### Methodology

- 7.3.2 The potential risks to identified receptors has been assessed by comparison of soil-derived leachate and groundwater analytical results against screening criteria determinands based on the nature of the identified relevant receptors.
- 7.3.3 No surface water receptors have been identified within 750 m of the site, and therefore Environmental Quality Standards (EQS) are not considered applicable to the site. However, as soil may be reused elsewhere within the wider TRU scheme, the leachate results have been screened against EQS as presented in the EU Water Framework Directive and implemented by the Water Framework Directive (England and Wales) 2017 (24) (where available).
- 7.3.4 The bedrock underlying the site is a Secondary A Aquifer. Overall, it is considered that groundwater likely contributes baseflow discharge which may result in off-site migration to other aquifer units downstream. Therefore, the UK Drinking Water Standards (DWS), as set out in The Water Supply (Water Quality) Regulations (England and Wales) 2018 (25), have been chosen as WQS considered protective of the Secondary A Aquifer present beneath the site.
- 7.3.5 Where results are reported as below the LOD it has been assumed they are below the LOD rather than equal to it.

#### Soil leachate test results

- 7.3.6 Two soil samples, taken from BH4115A (0.3 m) and BH4510B (0.6 m) comprising Made Ground were scheduled for soil-leachate analysis. No exceedances of the DWS were recorded. Three marginal EQS exceedances were recorded, as presented in Table 7-2. Total PAHs were recorded above the LOD. It is not possible to confirm whether individual PAHs exceedances are present, as speciated testing was not undertaken.

**Table 7-2 Summary of Soil Leachate EQS Exceedances**

Determinand	No. of samples	Assessment criteria (mg/l)	Min. Value (mg/l)	Max. Value (mg/l)	No. of exceedances	Locations of exceedances
Lead	2	0.0012	0.005	0.006	2	BH4115A (0.3 m) BH4510B (0.6 m)
Zinc	1	0.0138	0.014	0.014	1	BH4115A (0.3 m)

Groundwater test results

7.3.7 Six samples of groundwater were obtained from BH4114, BH4689, BH4691 and BH5082 during two monitoring rounds (on 24 August 2021 and 16 November 2021). Table 7.3 outlines exceedances of the DWS within groundwater samples.

**Table 7-3 Summary of groundwater DWS exceedances**

Determinand	No. of samples	Assessment criteria (mg/l)	Min. Value (mg/l)	Max. Value (mg/l)	No. of EQS exceedances	Locations of exceedances
<b>Inorganics</b>						
Arsenic	6	0.01	<0.001	0.014	1	BH4691
Cadmium	6	0.005	0.0006	0.0113	1	BH4691
Lead	6	0.01	0.003	0.335	3	BH4691 (2 rounds) BH5082
Manganese	6	0.05	0.384	18.3	6	All samples - BH4114 (2 rounds) BH4689 BH4691 (2 rounds) BH5082
Nickel	6	0.02	0.003	0.08	1	BH4691
Selenium	6	0.01	<0.001	0.026	1	BH4691
<b>Organics</b>						
Ammoniacal nitrogen	6	0.39	0.13	0.92	1	BH4114
TPH Aromatic >C <sub>12</sub> -C <sub>16</sub>	5	0.09	<0.005	0.095	1	BH4691
TPH Aromatic >C <sub>16</sub> -C <sub>21</sub>	5	0.09	0.007	0.097	1	BH4691

## Discussion

- 7.3.8 Based on the soil leachate samples taken and analysed to date both samples recorded exceedances of the lead EQS, and one sample of the zinc EQS.
- 7.3.9 The majority of groundwater determinands were recorded in concentrations below the assessment criteria. Concentrations of arsenic, cadmium, nickel and selenium exceeded the DWS in a single groundwater sample, taken from BH4691. Three exceedances of lead were recorded in groundwater, and all six samples exceeded the DWS of manganese (likely derived from the natural geology). TPH Aromatic >C<sub>12</sub>-C<sub>16</sub> and TPH Aromatic >C<sub>16</sub>-C<sub>21</sub> marginally exceeded the assessment criteria in a single sample, taken from BH4691. A strong hydrocarbon odour was recorded in this location during the ground investigation. Ammoniacal nitrogen exceeded the assessment criteria in a single sample, taken from BH4114.
- 7.3.10 Due to the limited leachate tests undertaken, it is not possible to directly correlate the leachate exceedances with the groundwater exceedances. However, onsite sources of contamination are relatively limited, and primarily relate to made ground and railway land. Several potentially contaminative historical land industries have been identified in the areas surrounding the site, and therefore the contaminants observed in the groundwater may derive from offsite sources.
- 7.3.11 The proposals for the site comprise hardstanding covering the majority of the site, which will inhibit infiltration onsite. This will significantly reduce leachate generation from contaminants present within onsite soils, and therefore onsite soils are not considered likely to pose an unacceptable risk to controlled waters.
- 7.3.12 The majority of superficial soils are head deposits comprising clay which are low permeability materials. The concentrations of organic compounds would reduce during migration through the unsaturated zone due to natural processes such as adsorption and biodegradation. Therefore, risks to groundwater from contamination are considered low.
- 7.3.13 As presented in Section 6.2, evidence of visual/olfactory contamination was recorded in BH4517, close to the eastern side of the current subway, however neither soil nor groundwater testing was undertaken in this area. A piling risk assessment is being undertaken for areas where piled foundations are proposed (the footbridge and station canopy) (OLE foundations will be considered as part of the Stage 5 works)) to assess potential risks these may cause to the underlying aquifer and identify suitable mitigation measures.
- 7.3.14 As stated, the current assumption is that there is no proposal for reuse of material excavated from the station. However, should reuse of Made Ground/natural soils be proposed then further soil/soil-leachate tests will be undertaken during construction works. The leachate results will be compared to reuse criteria that will be derived for the TRU Scheme, and where these are exceeded, DQRA may be required to further assess the potential risks and whether the soils are appropriate for re-use in a particular location.

## **7.4 Gas risk assessment**

### Introduction

- 7.4.1 Potential sources of gas were identified within the initial CSM (Section 0). A preliminary ground gas risk assessment has been undertaken in accordance with the methodology presented within the Construction Industry Research Information Association (CIRIA) C665 methodology (26), BS8485:2015+A1:2019 (27), CL:AIRE's Good practice in the assessment

of emissions from mine gas (28) and the Coal Authority's Good practice in the management of hazardous gases during drilling or piling (29).

- 7.4.2 Due to the uncertainty associated with collecting reliable monitoring data from mine workings the CL:AIRE Mine Gas Risk Assessment approach requires a robust CSM, the protection required by BS8485 for a given gas screening value (GSV) is then amended to reflect the CSM and associated uncertainties.
- 7.4.3 Potential gas sources, considered in the initial CSM set out in Section 0 (all of which are located both on and off-site, unless otherwise indicated), are:
  - Made Ground;
  - Coal seams / mine workings;
  - Areas of off-site land infilled (mill ponds and possible reservoir).
- 7.4.4 Three boreholes were drilled in the approximate location of the former reservoir that was removed prior to the station being constructed. Made Ground comprising of granular materials (mostly ballast) was recorded to a maximum depth of 1.35 m bgl, where upon bedrock was encountered. This material is unlikely to represent a gas source and the former reservoir is not considered to be a gas source.
- 7.4.5 As detailed in Section 6.3 the site is within a high-risk mining area due to the presence of the Soft Bed coal seam, present at shallow depths (~10 m bgl) beneath track level, with an assumed worked thickness of 1.7 m.
- 7.4.6 During the ground investigation, the Soft Bed seam was recorded onsite in eight locations (BH4113, BH4114, BH4115, BH4689, BH5082, BH4691, BH4693, BH4694), at a maximum thickness of 0.5 m and at approximately 12 m to 13 m bgl. Voids were recorded in two boreholes (BH4114 and BH4691). The void in BH4114 was recorded from 9.75 to 10.30 mbgl, and from 6.70 to 8.20 mbgl in BH4691. These have been attributed as evidence of possible workings.

Qualitative assessment

- 7.4.7 Table 7-4 and Table 7-5 summarises the data that is relevant to assessing the level of risk posed by coal mine workings.

**Table 7-4 Initial coal mine gas risk assessment**

Factors	Summary
Source	Shallow coal measures (~10 m bgl), including the Soft Bed coal seam, are present beneath the site, as described in the MRA. Although there are no known workings on site, the site is considered to be in an area of possible worked extents, with an assumed potential worked thickness of 1.7 m: <ul style="list-style-type: none"> <li>• Soft Bed seam;</li> <li>• Voids;</li> <li>• Potential unidentified workings.</li> </ul>
Water Level	Water strikes and groundwater monitoring data consistently recorded groundwater levels between 1.6 - 7.3 m bgl. As such, encountered coal seam and potential workings, are all substantially below recorded groundwater levels and therefore flooded.
Age of Workings	The MRA indicates there is very little information on the construction and workings which were identified during the construction of Huddersfield North tunnel, directly to the south of the site. However, a plan from the Springwood Colliery shows workings which would have

Factors	Summary
	been within the Soft Bed coal between approximately ch:40500 and ch:40820 operated from 1862-1877.
Mitigation	A variable thickness of Made Ground and Head deposits (clay) are present over PLCM, which are not considered to present an effective barrier against mine gas migration. Abandoned mine methane emissions are characterised by a high rate of release immediately following closure, which typically falls to much lower rates of emission over a period of 8 to 10 years. Below ground workings on-site are likely to be >100 years old and therefore peak gas generation is considered to have passed. All potential workings have been recorded as flooded.

**Table 7-5 Summary of potential receptors**

Structure	Potential Risk	Comment
Tea Room	No	Tea Rooms are being moved to a different part of the platform. As they will be based on a concrete platform there will be limited potential for ground gas migration.
New Footbridge with lift shafts and motor rooms	Yes	Gas may migrate into, and accumulate within, motor rooms and lift pits/shafts. Potential dewatering could expose workings resulting in a greater potential for gas migration.
Extension of existing passenger subway with lift and motor rooms	Yes	Gas may migrate into, and accumulate, within the passenger subway and, motor rooms lift pit/shaft.
Proposed drainage and attenuation tank	Yes	Onsite drainage may present a pathway for ground gas, although will not be accessible for future site users. The tanks may potentially store significant volumes of gas.

7.4.8 At Huddersfield Station, lift shafts will be excavated close to seam levels. Additionally, piling for a new footbridge might intercept the Soft Bed coal seam. A drainage system and an attenuation tank are proposed which may create a pathway between source and on-site sensitive receptors. If piles were to create a new pathway from the coal seams, this might allow gases to disassociate from coal seams and migrate up piles.

7.4.9 Superficial deposits cover much of the site, however, some of the proposed structures will be dug directly into the PLCM. The potential workings have been recorded to be below ground water level and probe/grouting would significantly reduce void spaces, which would reduce gas generation/migration potential. However, groundwater dewatering may be required during construction of the subway tunnel and lift shafts which may expose mine workings.

7.4.10 As a consequence of the coal mine risk assessment set out above and the initial CSM presented in Section 0, ground gas monitoring wells have been installed in selected boreholes and ground gas monitoring completed. This monitoring data and the outcome of the risk assessment is presented in the following sections.

Gas screening methodology

7.4.11 BS8485:2015+A1:2019 (27) states that hazardous gas flow rates (Qhg) should be calculated

for methane and carbon dioxide for every borehole for each visit and suggests the Qhg be presented alongside the gas monitoring results in a database. A worse case Qhg is calculated using the maximum gas concentration recorded (unless lower values can be justified) and the maximum steady flow rate (unless lower values can be justified) using the below formula:

$$Q_{hg} \text{ (l/hr)} = \text{flow rate (l/hr)} \times [\text{gas concentration (\%)} / 100]$$

- 7.4.12 The Gas Screening Value (GSV) is the flow rate of a specific hazardous gas considered to be representative of a site, following assessment of all borehole concentrations and gas flow rates, whilst taking account of other influencing factors. Such factors being, for example, whether a response zone was completed flooded (which can compromise gas data), the temporal/spatial nature of the data set, and the acute one-off nature of the risk.
- 7.4.13 BS8485:2015+A1:2019 indicates that a decision must be made to determine whether the maximum Qhg in the dataset is appropriate to represent the site (and thereby be selected as the GSV), or whether maximum gas concentrations and maximum steady state flow rates should be combined from any borehole/visit to derive a “worst case GSV”.
- 7.4.14 The GSV considered representative for the site is then used to select a Characteristic Situation (CS), which is the ground gas regime assumed for design of gas protection measures for new buildings in accordance with BS8485:2015+A1:2019.
- 7.4.15 Where monitoring wells were flooded, flow data from these events have been excluded from the risk assessment as the flows are considered to be an artefact of the well design and water level, and not representative of ground conditions that would actually occur. Additionally, negative flows have been retained as they are considered to be indicative of potential positive flow conditions.
- 7.4.16 Gas screening values were calculated for the following situations:
1. GSV Qhg calculated for each monitoring location using highest recorded steady flow rate and highest peak methane or carbon dioxide gas concentration (whichever gas had the highest concentration in that well) from all monitoring rounds.
  2. Site wide GSV calculated based on highest recorded steady flow rate and gas concentration from either Made Ground or coal measures.
- 7.4.17 BS8485:2015+A1:2019 does not include an approach for assessing low oxygen levels, carbon monoxide or hydrogen sulphide. The relevant Workplace Exposure Limits (WELs) as outlined within the HSE EH40/2015 (2020) document (30) have been adopted for use in a preliminary assessment of carbon monoxide and hydrogen sulphide:
- Carbon monoxide: 30 parts per million (ppm) for long-term (eight hours) exposure limit and 200 ppm for short-term (15 minutes) exposure limit; and
  - Hydrogen sulphide: 5 ppm for the long-term exposure limit and 10 ppm for the short-term exposure limit.
- 7.4.18 Low oxygen levels are considered to be present when Oxygen concentration is less than 17.5%.

#### Ground gas monitoring results

- 7.4.19 Monitoring was conducted during several post-ground investigation monitoring rounds:
- BH4113 was monitored four times on 11 and 18 February, 4 and 29 March 2021.

- BH4114, BH4689, BH4691, BH4693 and BH5082 were monitored four times on: 19 August, 14 October, 11 November 2021 and 25 February 2022.
- BH4117 was monitored twice on 4 April and 9 May 2022.

- 7.4.20 Monitoring wells primarily targeted Made Ground and shallow (upper 10 m) PLCM strata.
- 7.4.21 Table 7-6 details the minimum oxygen concentrations, the maximum and steady state concentrations for methane, carbon dioxide, carbon monoxide and hydrogen sulphide concentrations, and flow rates recorded for each borehole during monitoring rounds.
- 7.4.22 The full results of the gas monitoring are presented in Appendix D, and the factual reports presented in B.

Table 7-6 Summary of ground gas monitoring undertaken at the site

Exploratory hole	Well screen range (m bgl)	Screened Deposits	Flow (l/hr)		Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Max hydrogen sulphide (ppm)	Max Carbon monoxide (ppm)	Comments
			Max	Max Steady	Max	Max Steady	Max	Max Steady	Min	Min Steady			
BH4113	1.5 to 4.5	Made Ground & PLCM (mudstone)	0.1	0.0	0.0	0.0	4.4	0.1	10.1	20.8	0	1	
BH4114	0.8 to 6.8	Made Ground, Clay and PLCM (mudstone)	0.4	0.3	1.6	0.9	2.4	2.3	0.6	13.3	0	0	
BH4117	5.0 to 8.0	Made Ground, silt, clay & PLCM (sandstone)	0.2	0.2	0.8	0.8	4.5	4.4	14.6	16.1	0	1	Flooded
BH4689	1.5 to 8.0	PLCM – mudstone, siltstone & coal seam	1.1	0.3	7.0	0.5	0.8	0.2	0.1	18.4	0	30	
BH4691	1.0 to 5.0	Made Ground (HC) & PLCM	0.4	0.4	3.2	0.9	3.6	0.3	2.5	19.4	0	0	
BH4693	1.5 to 10.0	Made Ground and clay	0.3	0.3	1.0	0.9	5.1	4.5	14.0	20.4	0	0	
BH5082	1.5 to 10.0	PLCM (HC) – siltstone & sandstone	0.3	0.3	1.0	1.0	2.2	2.0	8.6	19.6	1	0	

Footnote: PLCM = Pennine Lower Coal Measures  
 HC – hydrocarbon odour noted in Made Ground  
 v/v = volume / volume  
 ppm = parts per million  
 m bgl = meters below ground level  
 l/hr = litres per hour  
 Bold Text = maximum recorded values for gas concentrations and flow  
 Italic Text = minimum oxygen concentration recorded

- 7.4.24 A single monitoring well (BH4117) was recorded as flooded by shallow groundwater. This means that flow rates from this well may be unrepresentative of gassing conditions. Steady state flow rates in unflooded locations were generally low and were recorded at a maximum of 0.4 l/hr in BH4689.
- 7.4.25 Oxygen levels were typically recorded at depleted concentrations in all monitoring rounds, which would pose a risk if encountered in an enclosed space. Depleted oxygen concentrations generally correlate with higher concentrations of methane or carbon dioxide.
- 7.4.26 Carbon monoxide was recorded at low concentrations in all locations except in BH4689 where one monitoring round recorded 30 ppm. Hydrogen sulphide concentrations were generally less than the equipment limit of detection.
- 7.4.27 Table 7-7 details the barometric pressure trends observed during monitoring visits.

**Table 7-7 Monitoring visit pressure trend summary**

Date of monitoring round	Barometric pressures recorded during monitoring visit (mB)	Trend
11/02/2021	1020	Rising
18/02/2021	999	Falling
04/03/2021	1022	Falling
29/03/2021	1009	Rising
19/08/2021	1004	Stable
14/10/2021	1013	Falling
11/11/2021	1011	Falling
25/02/2022	1011	Rising
04/04/2022	996	Falling
09/05/2022	1014	Falling

- 7.4.28 Falling pressures coincided with monitoring events on six occasions. However, the pressure data obtained does not show the necessary frequency (i.e. hourly) to be able to confirm whether either these constitute “worst case” conditions as described in CL:AIRE TB17: Ground Gas Monitoring and Worst Case Conditions (31).
- 7.4.29 CIRIA C665 (26) suggests that for a low sensitivity end use (commercial buildings) with a moderate to high gas generation potential a minimum of six monitoring rounds should be completed at fortnightly intervals. The dataset obtained comprises ten monitoring rounds, with each borehole monitored a maximum of four times. However, as the proposed development does not include new buildings and the property receptors are a subway and lift pits/shafts and associated motor rooms the gas monitoring frequency is considered to be adequate.

Gas Screening values

- 7.4.30 A summary of the Qhg for each monitoring well is presented in Table 7-8, using the highest recorded steady state flow rate and maximum methane or carbon dioxide gas concentration (whichever gas had the highest concentration in that well) from all monitoring rounds.

**Table 7-8 Summary of gas screening values**

Location	Response zone	Max Qhg (l/hr)	Response Zone Flooded
BH4113	Made Ground & PLCM (mudstone)	0	No
BH4114	Made Ground, Clay and PLCM (mudstone)	0.007	No
BH4117	Made Ground, silt, clay & PLCM (sandstone)	disregarded	Yes
BH4689	PLCM – mudstone, siltstone & coal seam	0.021	No
BH4691	Made Ground (HC odour) & PLCM	0.014	No
BH4693	Made Ground and clay	0.015	No
BH5082	PLCM – siltstone & sandstone	0.007	No

7.4.31 A site wide GSV of 0.028 l/hr has been derived using the highest recorded steady flow rate (0.4 l/hr) and maximum gas concentration (methane of 7% v/v) from wells that screened coal measures strata.

7.4.32 Based on the methodology followed, the GSV corresponds to a CS1 (very low risk). CIRIA C665 indicates that if carbon dioxide is recorded above 5% v/v, or methane is above 1% v/v, then consideration should be made to increase to CS2. On this basis, the recordings for BH4114, BH4689, BH4691 and BH4693 indicate that the site could be revised up to CS2 (low risk) which would require appropriate gas protection measures.

7.4.33 Maximum hydrogen sulphide concentrations (1 ppm) were below both the short (5 ppm) and long term (10 ppm) exposure limits. Maximum carbon monoxide concentrations (30 ppm) were recorded at the long term (30 ppm) exposure limits on one occasion at BH4689, located south-west of the site’s centre. The concentration was below the short-term limit (200 ppm).

**Conclusions and discussion**

7.4.34 Despite the relatively low concentrations of carbon dioxide and methane, the low flow readings and the low risk characteristic situation for the site as a whole there is still considered to be a potential risk from coal mining gas migrating into confined spaces which may not have been picked up in the boreholes or monitoring visits carried out:

- The risk of gas migration is greatest from shallow workings, less than 30 m from the surface (28). The Soft Bed coal seam was recorded at shallow depths (12 to 13m bgl) beneath Huddersfield Station, with potential workings present (voids encountered in upper 10m);
- Relatively limited superficial soils are present across the site, and structures such as the subway and lift shafts may be excavated directly into the PLCM;
- Piled foundations are proposed, which depending on the type may introduce an additional pathway for gases to migrate and methane to desorb from coal seams;
- Methane, carbon dioxide and oxygen concentrations are such that there is a potential risk of explosion and/or asphyxiation if the gas concentrations encountered in monitoring wells were to be present within an enclosed space; and
- Groundwater levels have been recorded at shallow depths (1.6 - 7.3 m bgl), as such, encountered coal seams and potential workings are all below recorded groundwater

levels and are flooded. However, if dewatering is proposed onsite, potential workings could be exposed resulting in degassing.

- 7.4.35 The factors above indicate historical mine workings represent a potential source of hazardous ground gases.
- 7.4.36 Based on the assessment undertaken the **site has been classified as CS2 (Low Risk – gas mitigation required)**. This represents a precautionary approach, as following consideration of the CSM the Characteristic Situation was upgraded from CS1 to CS2 as carbon dioxide and methane were regularly recorded above 5% v/v and 1% v/v, respectively.
- 7.4.37 Risks from other ground gas sources (Made Ground) are considered to be minimal, and lower than those presented by coal mine gas.
- 7.4.38 An attenuation tank and associated drainage is included within the Development. The CL:AIRE guidance indicates that an attenuation tank has the potential to form a secondary storage of significant volumes of mine gas and new drainage might create new pathways for the lateral migration of mine gas. Carbon monoxide concentrations (30 ppm) were recorded at the long term (30 ppm) exposure limits within BH4689, located south-west of the site's centre. Depleted oxygen levels are also present that would pose a risk of asphyxiation if present within confined spaces. It is considered that gas protection installed to protect against coal mine gas risk will mitigate against this potential risk for future site users. Any workers required to enter confined spaces and excavations should follow appropriate health and safety risk assessments and mitigation actions and follow confined spaces working protocol where necessary (32).
- 7.4.39 The Mining Risk Mitigation Remit Report undertaken by Transpire Alliance in 2022 (7), proposes mitigation measures for the track/structure including undertaking a grid of probing and grouting of voids, and application of gas protection measures. For OLE foundations, it was proposed that depths of superficial material are reviewed, and local grouting is undertaken where voids are encountered.

#### Gas protection recommendations

- 7.4.40 Mitigation measures for a CS2 level of risk will be required for the proposed development based on BS8485:2015+A1:2019 (27). This represents a precautionary upgrade from CS1.
- 7.4.41 BS8485 has been considered during the design of the proposed lift shafts, motor rooms and subway and appropriate gas protective measures incorporated into the design.
- 7.4.42 The residual risk to construction workers from the accumulation of ground gases within excavations shall be managed by good site practices. Where possible, entering confined spaces should be avoided. Where confined spaces need to be entered, work method statements and risk assessments should be implemented, and the confined spaces working protocol shall be employed where necessary (32).
- 7.4.43 The residual risk from ground gas must be acknowledged by the appointed earthworks contractor and the works shall be undertaken in accordance with the approved code of practice L101 (Third edition, published 2014) (32). This shall be taken through the CDM 2015 (33) process and recorded in the construction information pack and health and safety file and delivered to the client.
- 7.4.44 It is not anticipated that dewatering is required as part of the construction works, should this occur then potential workings beneath the site may be exposed resulting in degassing and elevated levels of hazardous gases. If dewatering is proposed, this assessment will be

revaluated.

- 7.4.45 All monitoring wells will be decommissioned through backfilling and sealed in a manner that prevents them acting as migration pathways for mine gas. Decommissioning monitoring wells should be completed in line with the EA's Good practice in the decommissioning of redundant boreholes and wells (34).
- 7.4.46 The recommendations from this report will be reviewed and together with the recommendations of the Mining Risk Mitigation Remit Report undertaken by Transpire Alliance in 2022 (7), be used to inform any further design works.

## 8. REVISED CONCEPTUAL SITE MODEL

- 8.1.1 The revised conceptual site model is presented in Table 8-1. It is based on the data provided to date and attention is drawn to the data gaps discussed in Section 0. The methodology followed is as presented in Section 0.

Table 8-1 Revised Conceptual Site Model and risk assessment

Source	Pathway	Receptor	Probability	Consequence	Risk classification and justification	
<p><b>Potential on-site contamination:</b>            Made Ground (including ash, clinker), from construction of railway buildings and sidings.            Localised spillages of hydrocarbons/fuels from historical railway activities.            Shallow mine workings.            ACM in current/former structures and related to historical activities.            Possible contaminants include:</p> <ul style="list-style-type: none"> <li>• Asbestos</li> <li>• Metals</li> <li>• PAHs</li> <li>• Pesticides/herbicides</li> <li>• PCBs</li> <li>• Petroleum hydrocarbons</li> <li>• VOCs/SVOCs</li> <li>• Ground gases (radon, methane, carbon dioxide, hydrogen sulphide &amp; carbon monoxide)</li> </ul> <p><b>Key Findings of GI/GQRA:</b></p> <ul style="list-style-type: none"> <li>• Human Health: no exceedances recorded.</li> <li>• Controlled Waters: exceedance of the EQS for lead and zinc in soil leachate.</li> <li>• Groundwater testing indicated DWS exceedances of arsenic, cadmium, lead, manganese, nickel, selenium, TPH Aromatic &gt;C12-C16 and TPH Aromatic &gt;C12-C16.</li> <li>• Ground gas risk identified associated with potential underground workings.</li> </ul>	Ingestion of contaminated soils, soil-derived dust and groundwater Inhalation of soil and soil-derived dust, asbestos and soil and groundwater droplets Dermal contact with soil, soil derived dust and groundwater Potentially contaminated soils brought to the surface through piled foundations	Future site users: members of the public, railway staff and maintenance workers (not involved in ground excavations).  Property (gas risk only)	Unlikely	Medium	<p><b>Low Risk</b></p> <p>Asbestos was not recorded by the laboratory during the ground investigations undertaken across the site and no GAC exceedances were reported in the GQRA. Members of the public and railway staff utilising the station are unlikely to come into contact with the underlying soils. The design of the redeveloped station includes the site covered by hardstanding or ballast when complete, which would minimise the risk of contact with underlying Made Ground.</p> <p>Regarding maintenance workers, contractors have a duty under health and safety legislation to assess the risks posed to its workforce from contamination/asbestos and to implement the appropriate mitigation measures to protect their workers and adjacent land occupiers.</p>	
	Migration of ground gases and vapours along preferential pathways such as permeable ground, services, and piled foundations. Motor rooms are present on the platforms, which are connected to lifts pits via a service duct which could provide a pathway. Accumulation within confined spaces such as the proposed lift pits/shafts and subway.			Likely	Severe	<p><b>High Risk</b></p> <p>A potential for hazardous gas generation has been identified onsite, which may accumulate in confined spaces such as the attenuation tank, lift shafts/pits, motor rooms and subway. Additionally, if dewatering was to be needed, degassing of the shallow workings may occur.</p> <p>Remediation of the shallow coal workings will be undertaken during Stage 3 works. This will involve probe and grouting of shallow coal workings beneath new structures, which should substantially reduce the potential for gas generation/migration through workings (although complete sealing of all void spaces beneath the site cannot be guaranteed). There remains the possibility of mine gas to migrate from un-grouted areas through fractures in bedrock.</p> <p>Ground gas protection will be incorporated into the design of the proposed lift pits/shafts, motor rooms and subway where applicable. Although limited evidence of risk from vapour were identified, protection measures within the design structures, will mitigate the residual vapour risk.</p>
	Ingestion of contaminated soils, soil-derived dust and groundwater Inhalation of soil and soil-derived dust, asbestos, soil and groundwater droplets Dermal contact with soil, soil derived dust and groundwater	Off-site human health: residents, occupiers of commercial property and users of public areas.		Unlikely	Medium	<p><b>Low Risk</b></p> <p>Limited concentrations of key determinands have been encountered onsite. If dust control measures are implemented correctly (in line with industry good practice and the mitigation measures specified in the planning application) when Made Ground is disturbed, the risk to these receptors is considered low. Once the construction of the platform and new rail track has been completed, hardstanding and ballast will minimise the risk of wind entrainment of dust. It is unlikely that occupiers of surrounding properties, would encounter groundwater due being located several metres bgl.</p>
	Migration of ground gases and vapours along preferential pathways such as permeable ground, services and piled foundations. Accumulation within properties.	Off-site human health: neighbouring residential and commercial properties		Likely	Severe	<p><b>High Risk</b></p> <p>Installation of new services (e.g. drainage and attenuation tank) has the potential to introduce new migration pathways to off-site buildings/occupiers via trench backfill potentially forming a new pathway to existing off-site utility corridors. If dewatering is required degassing of the shallow works may occur.</p> <p>Gas mitigation measures will be included in the design of new service trenches if required.</p> <p>The potential for mine gas to be displaced laterally during probe/grout works has been assessed as part of the design of the Stage 3 works (remediation of the surface coal workings).</p>

Source	Pathway	Receptor	Probability	Consequence	Risk classification and justification
	Leaching or dissolution of contaminants in unsaturated soils and subsequent migration. Lateral and vertical migration through Made Ground, superficial deposits and bedrock. Migration via preferential pathways e.g. existing drainage, foul sewer, proposed service pipes/trenches, piled foundations.	Groundwater – Secondary Undifferentiated Superficial Aquifer (Head Deposits) Groundwater – Secondary A Bedrock aquifer (Pennine Lower Coal Measures) Groundwater abstraction (process water)	Low	Medium	<b>Moderate/low Risk</b> The majority of groundwater determinands were recorded in concentrations below the assessment criteria, however limited concentrations of arsenic, cadmium, nickel, selenium, lead, manganese, TPH Aromatic >C12-C16, TPH Aromatic >C16-C21, and ammoniacal nitrogen were recorded in groundwater samples. The majority of superficial soils are head deposits comprising clay which are low permeability. Hardstanding is proposed to be placed across the majority of the site which will reduce infiltration and leachate generation. Further soil and leachate testing will be required to characterise Made Ground if re-use is proposed. Piling is proposed and as such a piling risk assessment should be undertaken, in accordance with Environment Agency guidance (35).
<b>Potential off-site contamination:</b> Key land uses various garages, a national shell factory, made ground, electrical substations, a goods station, railway sidings, tanks, fuel distributors, shallow coal workings, bus depot, two infilled ponds and a petrol station. Possible contaminants include: <ul style="list-style-type: none"> <li>• Asbestos</li> <li>• Metals</li> <li>• PAHs</li> <li>• Pesticides/herbicides</li> <li>• PCBs</li> <li>• Petroleum hydrocarbons</li> <li>• VOCs/SVOCs</li> <li>• Ground gases (radon, methane, carbon dioxide, hydrogen sulphide or carbon monoxide)</li> </ul>	Inhalation, ingestion and dermal contact with contaminants in soil derived dust	Future site users: members of the public, railway staff and maintenance workers.	Unlikely	Medium	<b>Low Risk</b> If dust control measures are implemented correctly (in line with industry good practice) when offsite works are undertaken and Made Ground is disturbed and stockpiled, the risk to onsite receptors from offsite works will be low.
	Migration of ground gases and vapours along preferential pathways such as permeable ground. Accumulation within confined spaces. Inhalation/asphyxiation/explosion	Property (gas risk only)	Low	Severe	<b>Moderate</b> Several potentially contaminative land uses which may generate ground gases have been identified proximal to the site, particularly areas of made ground, infilled ground and known shallow historical coal workings located south of the site at Huddersfield South tunnel. Offsite ground gas sources may migrate to site via permeable strata. Gases may accumulate in confined spaces such as the lift shaft, motor rooms and subway. Offsite sources of hazardous gases are considered to be similar to those present onsite. Further gas monitoring is ongoing, and when complete this assessment should be re-evaluated, and the conclusions considered within detailed design. Ground gas protection shall be incorporated into the design of the proposed lift shafts and subway where applicable.
	Leaching or dissolution of contaminants in unsaturated soils and subsequent migration Lateral and vertical migration through Made Ground, superficial deposits and bedrock. Migration via preferential pathways e.g. existing drainage, foul sewer, proposed service pipes/trenches, piled foundations.	Groundwater – Secondary Undifferentiated Superficial Aquifer (Head Deposits) Groundwater – Secondary A Bedrock aquifer (Pennine Lower Coal Measures)	Likely	Mild	<b>Moderate/low</b> Potentially contaminated groundwater may migrate to site. Due to the absence of on-site abstractions, presence of mine workings and Secondary A Aquifer designation, onsite groundwater is considered to have a low sensitivity. Groundwater monitoring onsite has not identified an unacceptable risk derived from offsite sources.

## LAND CONTAMINATION CONSTRAINTS

- 9.1.1 The revised CSM presented in Section 8 comprise the decision record for this stage of risk assessment. The LCRM guidance (1) states that confirmed contaminant linkages become Relevant Pollutant Linkages (RPLs). For the purposes of this report, RPLs are considered those where the risk level in the revised CSM is higher than Moderate/Low and some form of mitigation before or during construction is considered likely to be required. The following RPLs have been identified:
- High Risk: members of the public, railway staff and maintenance workers involved in excavations below ground (ground gas)
- 9.1.2 Table 0-1 presents the key findings of the ground investigation and assessments, together with the associated constraints and the further works or mitigation procedures required.
- 9.1.3 The risk assessment presented in previous sections and the conclusions/recommendations presented in Table 0-1 are based on the development described in Section 2 of this report. If the design/layout subsequently changes then the revised CSM, the risk assessment and Table 0-1 must be reviewed and if necessary revised by a contamination and ground/mine gas specialist.

**Table 0-1 Contamination Constraints and Recommended Actions Before/During Construction**

Item	Findings of Initial Assessments	Implications to redevelopment
Exposure of maintenance workers within lift shafts, motor rooms, and the subway	<p>Oxygen concentrations less than 19.5 % v/v were frequently recorded in monitoring wells.</p> <p>Methane was recorded in each monitoring well, with peak concentration of 7% v/v recorded in BH4689 in the western part of the site.</p> <p>Carbon dioxide was detected in all monitoring locations and peak concentrations ranged from 0.8% v/v to 5.1% v/v.</p>	<p>Design should aim to minimise the need for maintenance workers to access trenches, tank excavations and inspection chambers. Where confined spaces need to be entered, work method statements and risk assessments should be implemented, and the confined spaces working protocol shall be employed where necessary (32).</p>
Exposure of members of the public and railway staff within the subway	<p>The Soft Bed seam was recorded onsite in eight locations (BH4113, BH4114, BH4115, BH4689, BH5082, BH4691, BH4693, BH4694), at a maximum thickness of 0.5 m and at approximately 12 m to 13 m bgl. Voids were recorded in two boreholes (BH4114 and BH4691). The void in BH4114 was recorded from 9.75 to 10.30 mbgl, and from 6.70 to 8.20 mbgl in BH4691. These have been attributed as evidence of possible workings.</p> <p>Radon 1-3% area.</p>	<p>Ground gas protection shall be incorporated into the design of the proposed lift shafts and subway where applicable. Protection measures must follow the recommendations presented within BS8485 (27). Further ground gas monitoring is ongoing, and once complete the gas risk should be further assessed alongside detailed design. A remediation strategy should be undertaken, which should include detail on the specific ground gas mitigation measures required to be incorporated into the station's design.</p>
Aggressive ground conditions and buried concrete and drainage pipes	<p>Petroleum hydrocarbons and sulphate were recorded within soil samples.</p> <p>An assessment has not been undertaken as this is beyond the scope of this report.</p>	<p>Risk assessments should be undertaken during design to confirm the concrete class and the requirements for drainage pipes.</p>
Re-use of site won arisings within the site boundary or elsewhere within TRU Scheme (excluding ballast)	<p>Risk assessment findings:</p> <p>No samples recorded chemical concentrations exceeding human health criteria.</p> <p>Leachate testing recorded lead and zinc concentrations in exceedance of controlled waters criteria.</p> <p>Following consideration of the potential contaminant linkages it is considered the re-use of site-won arisings on the site is unlikely to pose an unacceptable risk to human health or controlled</p>	<p>It is anticipated that the majority of arisings could be re-used in public open space areas.</p> <p>Re-use criteria will be derived for the TRU Scheme that will consider the potential risks that might be posed if design requires the placement of materials nearer to surface water features and/or over granular superficial deposits. If soils are proposed to be re-used onsite, further leachate tests should be undertaken to determine whether they potentially pose an environmental risk. The leachate results should be compared to suitable acceptability criteria, and where the criteria are exceeded, DQRA may be required to derive site-specific criteria to determine whether the soils are suitable for use.</p>

Item	Findings of Initial Assessments	Implications to redevelopment
	waters, with the enforcement of appropriate controls.	Regardless of where materials are re-used on the site or elsewhere within the TRU Scheme, it will be subject to compliance with requirements of a materials management plan (MMP) or environmental permit. Verification that re-use complied with the MMP/permit would be required, accordingly materials should be tested and compared to re-use criteria (developed for the TRU Scheme). It is recommended this approach is agreed with the contaminated land officers at the Council and Environment Agency prior to submission of the MMP/permit.
Ballast	None of the contaminant concentrations exceeded the human health commercial criteria.	It is understood that all excavated ballast within the TRU Scheme will be removed from the Scheme to one of Network Rail's aggregate handling depots (AHD) where it will be sorted/processed for reuse either on the TRU Scheme or elsewhere on the rail network (providing it meets the AHD's validation criteria).
Piling/foundations and drainage – risks to controlled waters	Leachate testing recorded exceedances of the EQS for lead and zinc, and groundwater testing recorded DWS exceedances of arsenic, cadmium, lead, manganese, nickel, selenium, TPH Aromatic >C12-C16 and TPH Aromatic >C12-C16.	Once the pile design is developed further for the footbridge and OLE foundations, a piling risk assessment should be undertaken in accordance with Environment Agency guidance.
Disposal of waste soils and Made Ground.	A waste assessment has not been undertaken to date.	It is the responsibility of the waste producer to ensure that adequate sampling/analysis is undertaken to allow waste classification in accordance with waste regulations/guidance. Waste assessment and further sampling is likely to be required to achieve this. It is recommended that the contractor discusses laboratory results and soil descriptions with a variety of landfill operators/soil recycling operators to confirm options.
Unexpected Contamination	N/A	As with any development there is always the possibility of finding ground/gas/contamination conditions that vary from those recorded in the ground investigation. Construction team should be vigilant and if such is encountered, to stop work in that area and seek advice from contamination specialists and inform the planning authority. Further sampling and assessment might be required to evaluate the risk.
Decommissioning monitoring wells	N/A	Prior to construction, all monitoring wells should be decommissioned in accordance with the Environment Agency's guidance "Good Practice for Decommissioning Redundant Boreholes and Wells" dated October 2012 (34). This is to prevent the wells from becoming damaged during construction and inadvertently becoming pollution or gas migration pathways.

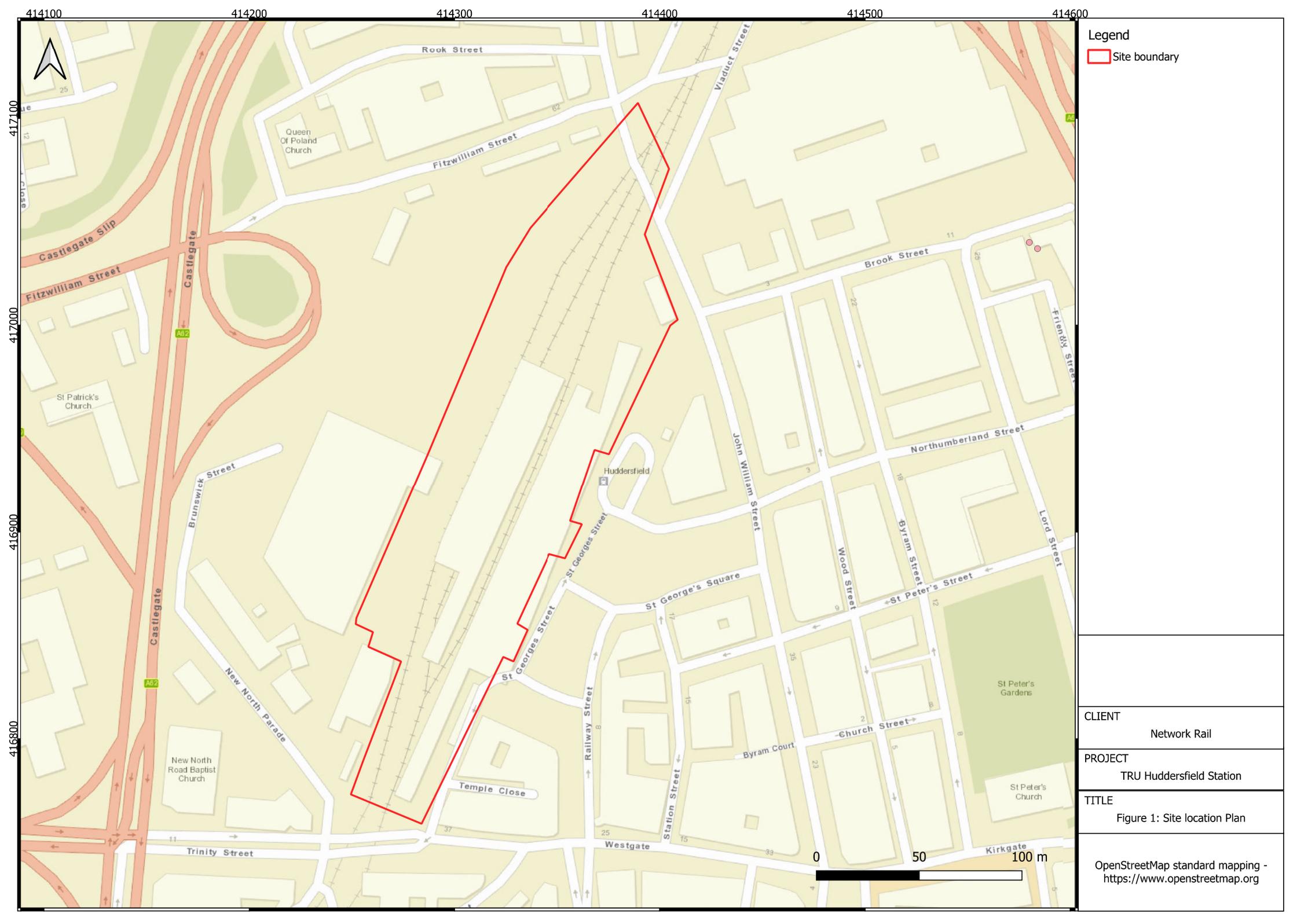
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# Appendices

## APPENDIX A – FIGURES AND DRAWINGS



Legend

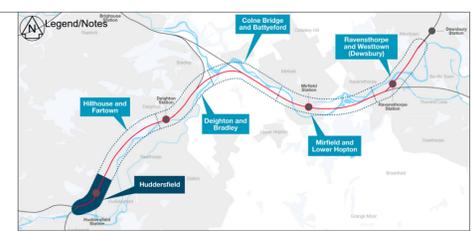
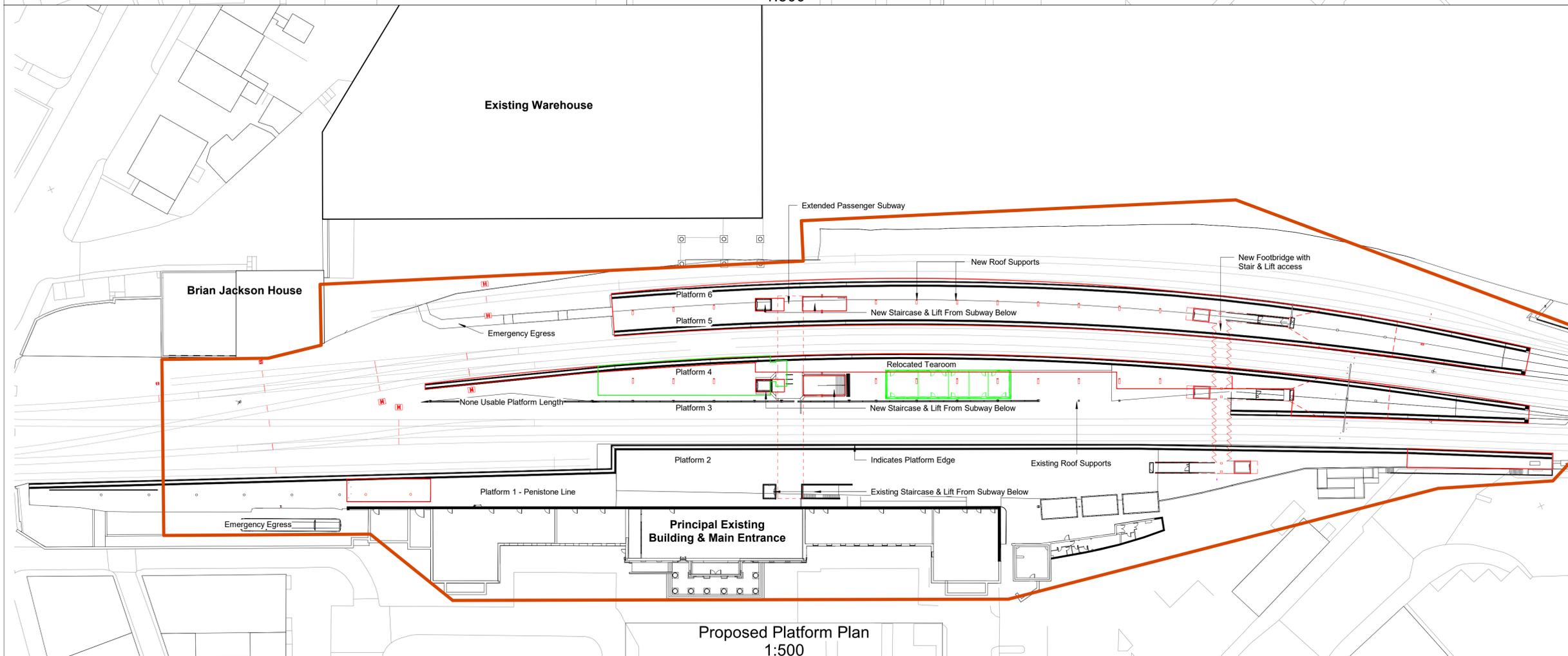
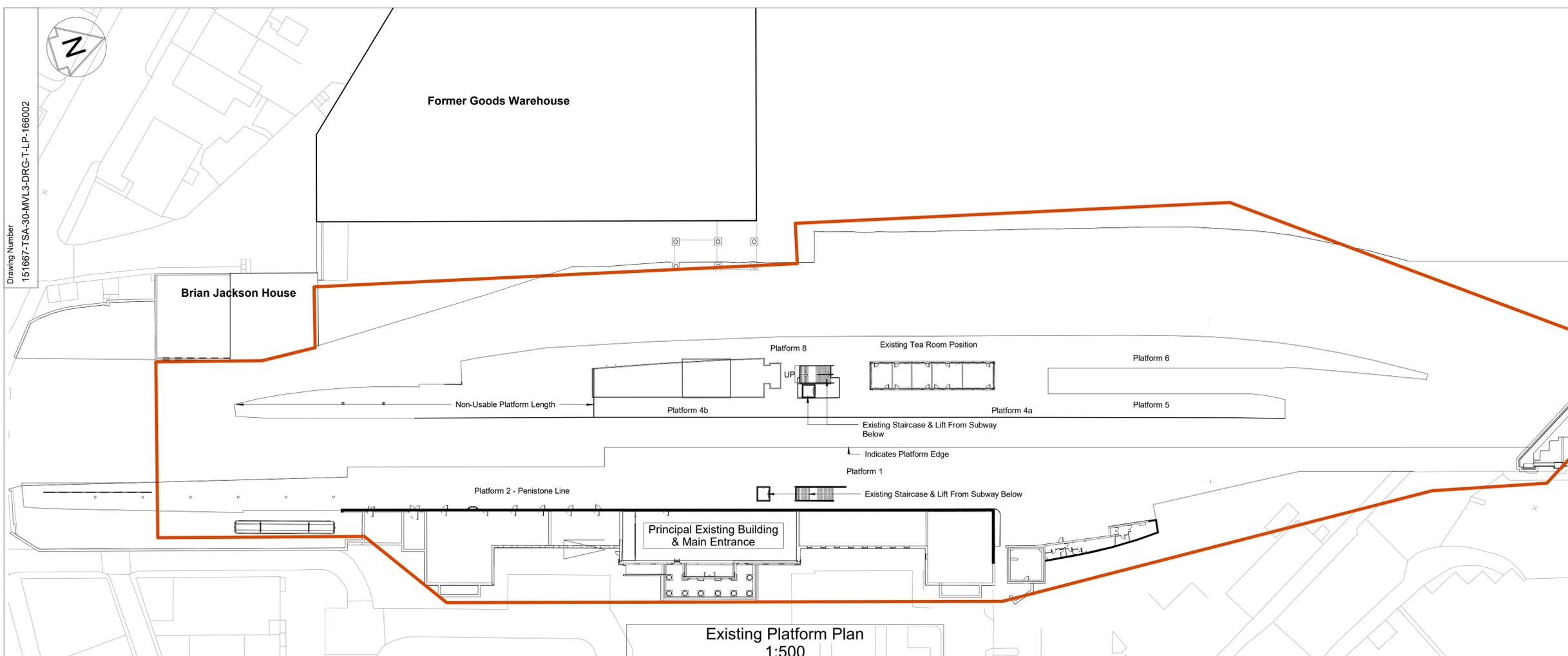
Site boundary

CLIENT  
Network Rail

PROJECT  
TRU Huddersfield Station

TITLE  
Figure 1: Site location Plan

OpenStreetMap standard mapping - <https://www.openstreetmap.org>



- Legend**
- Retained Rail Infrastructure
  - Remove/Modified Rail Infrastructure
  - Proposed Rail Infrastructure
  - LBC Application Boundary

- Notes**
- All dimensions are in millimetres unless stated otherwise.
  - Do not scale from this drawing
  - In constructing or maintaining the Works identified as Scheduled Works in Schedule 1 of the Network Rail (Huddersfield to Westtown (Dewsbury) Improvements Order Network Rail may deviate from the dimensions shown on this drawing to the extent permitted by the Order.
  - Overhead Line Equipment wires omitted for clarity.



**THE NETWORK RAIL (HUDDERSFIELD TO WESTTOWN (DEWSBURY) IMPROVEMENTS) ORDER**

Rev	Date	Description of Revisions	Drawn	Chkd
P01	05/03/21	First Issue		MS
Status				Suitability
Fit for Contractor Design				D3



Authorised: T Rivero Signed: [Signature] Date: 05/03/21

Contractor(s): **TRU – West Alliance**

Location/Level		STALYBRIDGE STN - HEATON LODGE JN (HUDD-MANC LINE)	
Type	CAD Drawing	Sub-Type	Detail
Role	Town and Country Planner	Sub-Role	General
Zone	Huddersfield	Grip Stage	0
Phasing	Proposed		

Project: **Transpennine Route Upgrade**

Contract no.: **151667**

Contract Title: **TRU – West of Leeds**

Drawing Title: **Listed Building Consent Drawings  
Huddersfield Station  
Existing and Proposed Platform  
Level GA**

Designed	J Clayton	Signed	[Signature]	Date	05/03/21
Drawn	L Priest	Signed	[Signature]	Date	05/03/21
Checked	M Steele	Signed	[Signature]	Date	05/03/21
Approved	R Gee	Signed	[Signature]	Date	05/03/21

Scale(s): As indicated  
Alternative Reference: 25.1188 to 25.1428

Drawing Number: 151667-TSA-30-MVL3-DRG-T-LP-166002  
Sheet: 1 of 1  
Revision: P01

Drawing Number: 151667-TSA-30-MVL3-DRG-T-LP-166002



## **APPENDIX B – GROUND INVESTIGATION FACTUAL REPORTS**

**Ground Investigation Report :151667-TSA-00-TRU-DM3-X-MF-200294 -  
BAM 2018  
(Bore holes: TP4009 and TP4010)**



# TRIAL PIT LOG

Trial Pit No.  
TP4009  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade	Survey Grid System:	OSGB	Hole Type:	TP
Project No:	311G	Co-ordinates:	414336.32 mE 416923.33 mN	Checked By:	JH
Client:	Network Rail	Ground Level:	89.15 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	29/05/2018			Print Date:	24/10/2018
Date Completed:	29/05/2018			Final Depth:	0.35m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Rail construction [RUNNING RAIL ABOVE SLEEPER]										
MADE GROUND: Dark grey mottled light grey coarse angular to sub angular GRAVEL of granite. [SLIGHTLY DIRTY BALLAST ]		0.20	88.95							
Trial Pit Terminated at 0.35m		0.35	88.80	0.30 0.30 0.30	B D ES					

Reason for Hole Termination: Refusal on structure.

Depth Related Exploratory Hole Information									
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	Remarks	
0.00	0.35	0.30	0.30	Sides very unstable .	None.	Gordon McKean	Hand digging tools .	Engineering Line:MVL3 Mileage:25m 1362yds Location:UP SLOW 4FT Chainage:41470m No groundwater encountered.	

Depth Related Remarks				Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks		Depth (m)	Remarks	Depth Top	Depth Base	
						0.20	0.35	Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# TRIAL PIT LOG

Trial Pit No.  
TP4010  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade	Survey Grid System:	OSGB	Hole Type:	TP
Project No:	311G	Co-ordinates:	414344.20 mE 416940.78 mN	Checked By:	JH
Client:	Network Rail	Ground Level:	89.09 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	29/05/2018			Print Date:	24/10/2018
Date Completed:	29/05/2018			Final Depth:	0.60m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Rail construction [RUNNING RAIL ABOVE SLEEPER]										
MADE GROUND: Grey mottled dark grey slightly sandy medium to coarse angular to sub angular GRAVEL of predominantly granite. Sand is medium to coarse. [SLIGHTLY DIRTY BALLAST]		0.20 [0.30]	88.89	0.30 0.30 0.30	B D ES					
MADE GROUND: Grey slightly sandy medium to coarse angular to sub angular GRAVEL of predominantly granite. Sand is medium to coarse. [SLIGHTLY DIRTY BALLAST]		0.50	88.59	0.55 0.55	B D					
Trial Pit Terminated at 0.60m		0.60	88.49	0.55	ES					

Reason for Hole Termination: Refusal on structure.

Depth Related Exploratory Hole Information									
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	Remarks	
0.00	0.60	0.30	0.30	Sides very unstable .	BSU	Gordon McKean	Hand digging tools .	Engineering Line:MVL3 Mileage:25m 1384yds Location:UP SLOW 4FT Chainage:41490m No groundwater encountered.	

Depth Related Remarks				Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks		Depth (m)	Remarks	Depth Top	Depth Base	
						0.20	0.60	Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'

## FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 18/04254  
**Issue Number:** 1  
**Date:** 14 June, 2018

**Client:** BAM Ritchies Warrington  
Unit 5  
Taurus Park  
Europa Boulevard  
Warrington  
UK  
WA5 7ZT

**Project Manager:** Jamie Hogg  
**Project Name:** Transpennine Route Upgrade  
**Project Ref:** 311G  
**Order No:** RIT 135 972 058  
**Date Samples Received:** 30/05/18  
**Date Instructions Received:** 31/05/18  
**Date Analysis Completed:** 14/06/18

**Prepared by:**

  
Melanie Marshall  
Laboratory Coordinator

**Approved by:**

  
Richard Wong  
Client Manager

Envirolab Job Number: 18/04254

Client Project Name: Transpennine Route Upgrade

Client Project Ref: 311G

Lab Sample ID	18/04254/2								Units	Method ref
Client Sample No										
Client Sample ID	TP4010									
Depth to Top	0.55									
Depth To Bottom										
Date Sampled	29-May-18									
Sample Type	Solid									
Sample Matrix Code	7									
% Stones >10mm <sub>A</sub>	<0.1									
pH <sub>D</sub> <sup>M#</sup>	9.19								pH	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1								mg/kg	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2								mg/kg	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	0.29								% w/w	A-T-032s
Antimony <sub>D</sub>	<5								mg/kg	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	<1								mg/kg	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	<0.5								mg/kg	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0								mg/kg	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	1.3								mg/kg	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	16								mg/kg	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	35								mg/kg	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	30								mg/kg	A-T-024s
Mercury <sub>D</sub>	<0.17								mg/kg	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	10								mg/kg	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	<1								mg/kg	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	29								mg/kg	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	44								mg/kg	A-T-024s

Envirolab Job Number: 18/04254

Client Project Name: Transpennine Route Upgrade

Client Project Ref: 311G

Lab Sample ID	18/04254/2								Units	Method ref
Client Sample No										
Client Sample ID	TP4010									
Depth to Top	0.55									
Depth To Bottom										
Date Sampled	29-May-18									
Sample Type	Solid									
Sample Matrix Code	7									
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Ali >C35-C44 <sub>A</sub>	<0.1							mg/kg	A-T-023s	
Total Aliphatics <sub>A</sub>	<0.1							mg/kg	A-T-023s	
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01							mg/kg	A-T-022s	
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1							mg/kg	A-T-023s	
Aro >C35-C44 <sub>A</sub>	<0.1							mg/kg	A-T-023s	
Total Aromatics <sub>A</sub>	<0.1							mg/kg	A-T-023s	
TPH (Ali & Aro) <sub>A</sub>	<0.1							mg/kg	A-T-023s	
<b>Asbestos in Soil (inc. matrix) ^</b>										
Asbestos in soil <sub>A</sub> <sup>#</sup>	NAD								A-T-045	
Asbestos ACM - Suitable for Water Absorption Test?	N/A									

Envirolab Job Number: 18/04254

Client Project Name: Transpennine Route Upgrade

Client Project Ref: 311G

Lab Sample ID	18/04254/2								Units	Method ref
Client Sample No										
Client Sample ID	TP4010									
Depth to Top	0.55									
Depth To Bottom										
Date Sampled	29-May-18									
Sample Type	Solid									
Sample Matrix Code	7									
BTEX										
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01								mg/kg	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01								mg/kg	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01								mg/kg	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01								mg/kg	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01								mg/kg	A-T-022s

Envirolab Job Number: 18/04254

Client Project Name: Transpennine Route Upgrade

Client Project Ref: 311G

Lab Sample ID	18/04254/2								Units	Method ref
Client Sample No										
Client Sample ID	TP4010									
Depth to Top	0.55									
Depth To Bottom										
Date Sampled	29-May-18									
Sample Type	Solid									
Sample Matrix Code	7									
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01							mg/kg	A-T-019s	
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.03							mg/kg	A-T-019s	
Anthracene <sub>A</sub> <sup>M#</sup>	0.10							mg/kg	A-T-019s	
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	0.28							mg/kg	A-T-019s	
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	0.26							mg/kg	A-T-019s	
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	0.30							mg/kg	A-T-019s	
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	0.15							mg/kg	A-T-019s	
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	0.13							mg/kg	A-T-019s	
Chrysene <sub>A</sub> <sup>M#</sup>	0.29							mg/kg	A-T-019s	
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04							mg/kg	A-T-019s	
Fluoranthene <sub>A</sub> <sup>M#</sup>	0.63							mg/kg	A-T-019s	
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01							mg/kg	A-T-019s	
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	0.16							mg/kg	A-T-019s	
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03							mg/kg	A-T-019s	
Phenanthrene <sub>A</sub> <sup>M#</sup>	0.18							mg/kg	A-T-019s	
Pyrene <sub>A</sub> <sup>M#</sup>	0.55							mg/kg	A-T-019s	
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	3.06							mg/kg	A-T-019s	

## **REPORT NOTES**

### **General:**

This report shall not be reproduced, except in full, without written approval from Envirolab.

All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure and there is insufficient sample to repeat the analysis. These are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

### **Soil chemical analysis:**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

### **TPH analysis of water by method A-T-007:**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

### **Electrical Conductivity of water by Method A-T-037:**

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

### **Asbestos:**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

### **Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

### **Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

### **Key:**

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

**Ground Investigation Report : 151667-TSA-08-MVL3-DM3-X-MF-  
700015**

**(Bore holes: TP4012, TP4013, TP4523 and TP4572)**



# Transpennine Route Upgrade

## Zone 4 SPO 13.2& 14.1a– Trial Pitting Huddersfield Viaduct

### Factual Report on Ground Investigation

Project No: 764383

Client: Transpire Alliance

**SEPTEMBER 2018**



<b>Project No.:</b>	764383
<b>Report No.:</b>	Z4/SPO13.2 &14.1a/TP
<b>Project Name:</b>	Transpennine Route Upgrade – West of Leeds
<b>Document Title</b>	Factual Report on Ground Investigation
<b>Client:</b>	Transpire Alliance
<b>Engineer:</b>	Transpire Alliance
<b>Status:</b>	Final

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<b>Approved by</b>		<i>Chris Hustler BSc (hons) FGS</i>

**Report Issue Date** 06<sup>th</sup> September 2018

**DOCUMENT ISSUE RECORD**

**REVISION RECORD**

Revision	Date	Description of revisions	Prepared by
00	04/07/2018	Draft Submission	AJ
01	06/09/2018	Final Submission	MG

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# 1 INTRODUCTION

---

This investigation was carried out by Structural Soils Ltd (SSL) on the instructions of Transpire Alliance (the Engineer and Client) for the Transpennine Route Upgrade – West of Leeds. The purpose of the work was to obtain geotechnical and geoenvironmental information for the proposed works to deliver faster, longer, more frequent and more reliable services across the north of England, from Newcastle, Hull and York towards between Manchester and Leeds

The intrusive works comprised twelve hand dug trial pits and the preparation of this report. The report contains a description of the site and the works carried out, the exploratory hole logs and in-situ results as well as contamination laboratory testing results.

The ground investigation has been carried out in accordance with the contract specification, and the general requirements of BS 5930:2015, BS 10175:2011+A2:2017, BS EN 1997-2 (2007), BS EN ISO 22475-1 (2006) and other relevant standards as identified below.

This report presents the factual records of the fieldwork carried out and any laboratory testing undertaken. Whilst every attempt is made to record full details of the strata encountered in the exploratory holes, techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks. All information given in this report is based on the ground conditions encountered during the site work, and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes.

This report was prepared by SSL for the sole and exclusive use of Transpire Alliance in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded. No liability will be accepted after a period of 6 years from the date of the report.

## 2 SITE DESCRIPTION

### 2.1 Location and Topography

The site is located at structure MVL3/92, a viaduct, the start of which is around 130 m north of Huddersfield Station (see Site Location Map in Appendix A). The British National Grid Reference for the site is SE 144 171. The exploratory holes are located within in multiple locations along the Up and Down lines of the MVL3 Line.

The viaduct itself is approximately 590m in length, the first span after leaving Huddersfield Station is constructed from wrought iron with the remainder of the structure comprised of stone arches. There are multiple private businesses based in the arches.

The site is set at an elevation of approximately 85 m above Ordnance Datum (AOD).

### 2.2 Geology

Information on the geology of the site was obtained from the following sources published by the British Geological Survey (BGS):

- BGS map (sheet 77, Solid and Drift scale 1:50,000 published 2003).
- The BGS digital geology map, which utilises the most up to date names for geological units ([www.bgs.ac.uk/data](http://www.bgs.ac.uk/data)).
- The BGS Lexicon of Named Rock Units, which provides typical descriptions for most geological units ([www.bgs.ac.uk/lexicon](http://www.bgs.ac.uk/lexicon)).

The site is shown to be underlain by the following descending sequence of strata:

<b>TABLE 1 : SUMMARY OF EXPECTED SITE GEOLOGY</b>	
<b>Geological Unit Name</b>	<b>Description</b>
<b>ANTHROPOGENIC GROUND</b>	
Artificial Ground	Associated with historic development of the area
<b>DRIFT DEPOSITS</b>	
Head	Clay, silt sand and gravel. Superficial deposits formed up to 3 million years ago
<b>SOLID GEOLOGY</b>	
Bed Flags	Sandstone. Sedimentary bedrock formed approximately 318 to 319 million years ago.

Note: Information obtained from BGS digital records © NERC.

The BGS online maps portal provides access to scans of almost all maps produced by the BGS since 1932. An extract of the most recent available scanned map for the site is included below:



## 3 FIELDWORK

### 3.1 General

The ground investigation was carried out by SSL between the 29<sup>th</sup> May and 1<sup>st</sup> June 2018. The investigation was supervised by an engineer from SSL. The scope of works and positions were selected and set out by the Transpire Alliance and adjusted where necessary to take account of buried or overhead services, or other restrictions. The exploratory hole locations are shown on the Exploratory Hole Location Plan presented in Appendix A.

### 3.2 Exploratory Holes

The exploratory holes are listed in the following table.

<b>TABLE 2 :SCOPE OF INTRUSIVE WORKS</b>			
<b>Quantity</b>	<b>Exploratory Hole Type</b>	<b>Maximum depth (m)</b>	<b>Hole / Test Numbers</b>
12	Hand Dug Trial Pits	1.18	TP4011, TP4012, TP4013, TP4017, TP4018, TP4019, TP4020, TP4023, TP4024, TP4025, TP4029, TP4030

The exploratory hole logs are presented in Appendix B. This provides information including the equipment and methods used, samples taken, tests carried out, water observations and descriptions of the strata encountered. Explanation of the terms and abbreviations used on the logs are given in the Key to Exploratory Hole Records in Appendix B, together with other explanatory information.

The holes were logged by an engineer in general accordance with the recommendations of BS 5930:2015 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1). Detailed descriptions, together with relevant comments, are given on the logs.

## 4 LABORATORY TESTING

Samples for potential geotechnical testing were returned to one of the Company's UKAS accredited laboratories, and those for potential geoenvironmental testing were sent to a sister company Envirolab Limited, a MCERTS and UKAS accredited testing laboratory.

### 4.1 Geotechnical Laboratory Testing

No Geotechnical Laboratory Testing was scheduled as part of these works

### 4.2 Geoenvironmental Laboratory Testing

The geotechnical testing carried out is summarised in the following table. The results are included as Appendix E of this report and include details of the test method.

<b>TABLE 1 : SUMMARY OF GEOENVIRONMENTAL LABORATORY TESTING</b>		
<b>Numbers of tests</b>	<b>Description</b>	<b>Notes</b>
<b>SOIL</b>		
4	Suite E1 – General	Arsenic, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, zinc, antimony, beryllium, vanadium, cyanide (total), pH, boron (water soluble), phenols (total), total organic carbon
4	Suite E2 - Asbestos	Asbestos presence and identification, asbestos quantification HSG248
4	Suite E3 - TPHCWG	TPHCWG
4	Suite E4 – PAH and BTEX	BTEX, US

## 5 REFERENCES

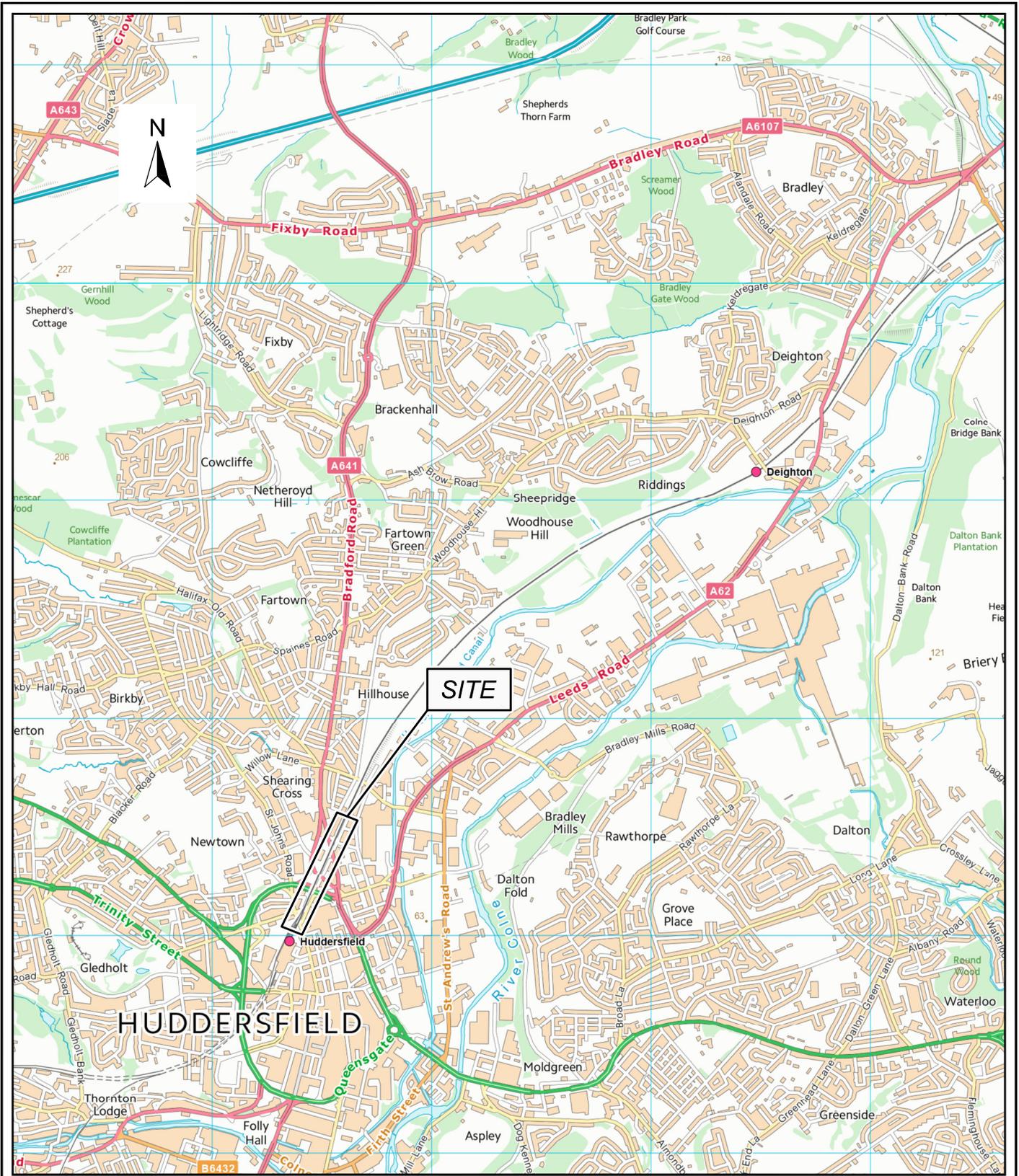
---

- 5.1 BS 5930:2015 *Code of practice for ground investigations*
- 5.2 BS EN 1997-1:2004 *Eurocode 7 — Geotechnical Design Part 1 - General Rules* incorporating corrigendum Feb 2009 and Amendment A1 2013
- 5.3 BS EN 1997-2:2007 *Eurocode 7 — Geotechnical design Part 2: Ground Investigation and testing*
- 5.4 BS 10175:2011 *Investigation of potentially contaminated sites: Code of practice, including amendment A2 2017*
- 5.5 British Geological Survey sheet 77 scale 1:50,000, published 2003
- 5.6 British Geological Survey online digital geological map, [www.bgs.ac.uk/data](http://www.bgs.ac.uk/data)
- 5.7 BS EN ISO 14688-1:2002 *Geotechnical investigation and testing – Identification and classification of soil: Part 1: Identification and description*, including Amendment A1 2013
- 5.8 BS EN ISO 14688-1:2018 *Geotechnical investigation and testing – Identification and classification of soil: Part 1: Identification and description.*
- 5.9 BS EN ISO 14688-2:2004 *Geotechnical investigation and testing – Identification and classification of soil: Part 2: Principles for a classification*, including Amendment A1 2013
- 5.10 BS EN ISO 14688-2:2018 *Geotechnical investigation and testing – Identification and classification of soil: Part 2: Principles for a classification*
- 5.11 BS EN ISO 22475-1:2006 *Geotechnical Investigation and Testing – Sampling methods and groundwater measurements, Part 1 Technical principals for execution*

# APPENDIX A - PLANS AND DRAWINGS

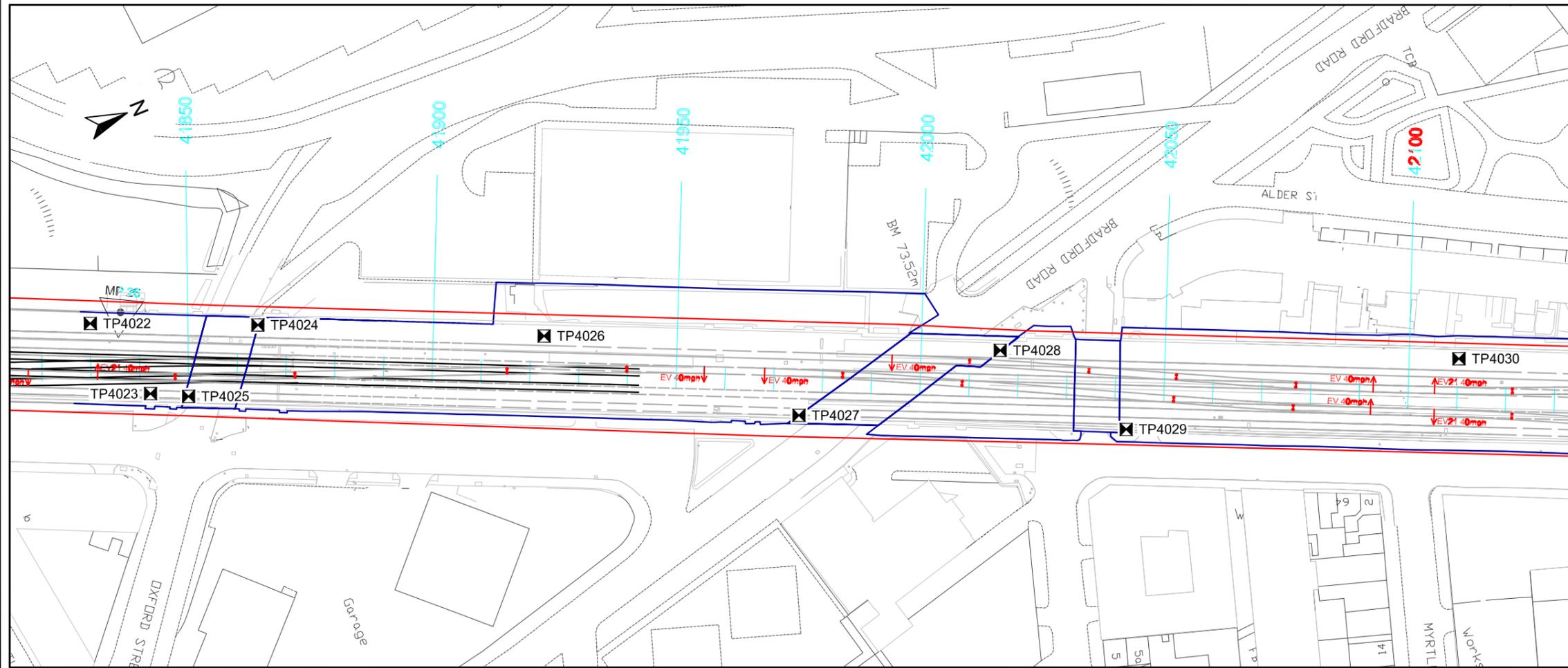
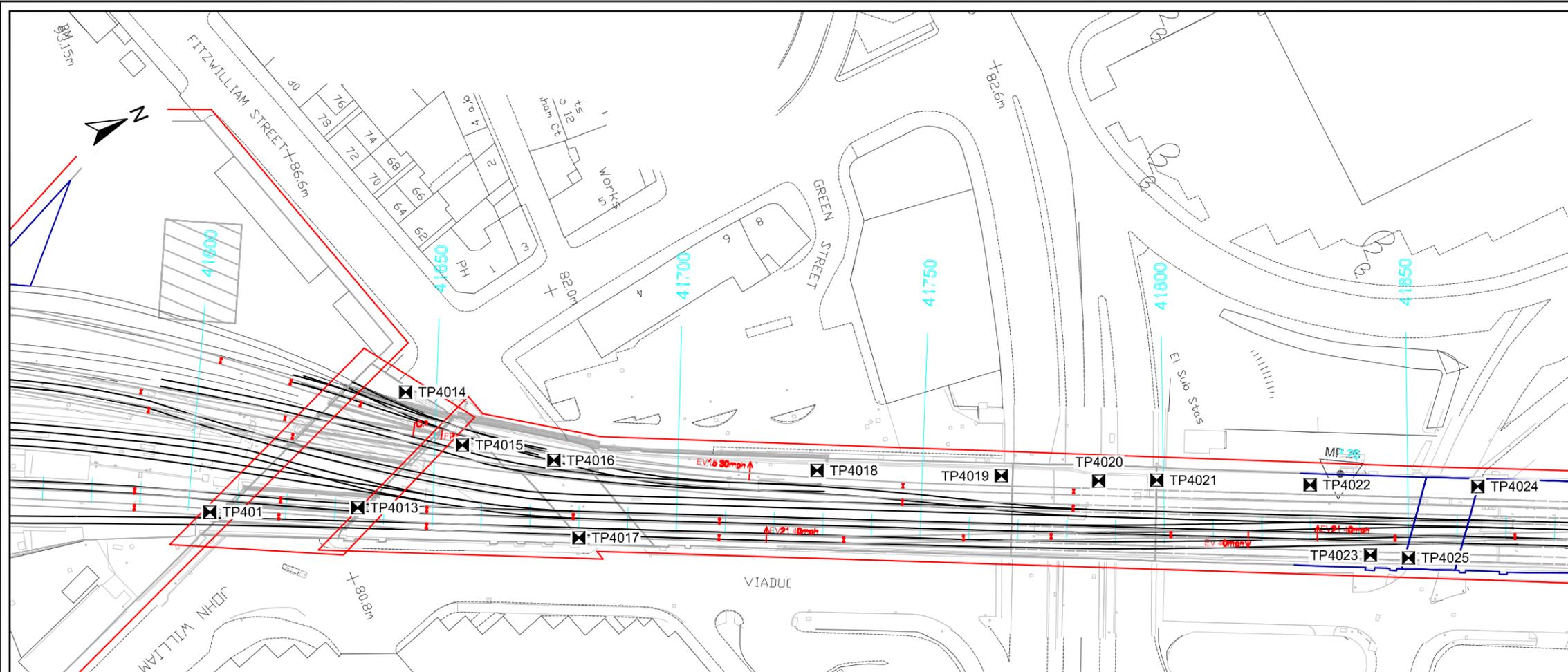
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- (i) Site Location Plan
- (ii) Exploratory Hole Location Plan



Contains Ordnance Survey data © Crown copyright and database right 2013

 <b>STRUCTURAL SOILS</b> The Potteries Pottery Street Castleford WF10 1NJ Tel: 01977 552255 ask@soils.co.uk www.soils.co.uk		CLIENT		Transpire Alliance						
		PROJECT		Transpennine Route Upgrade - West of Leeds - Zone 4 SPO 14.1a						
TITLE		SITE LOCATION MAP								
00	12.06.2018	-	MW	CH	-	JOB NO	GRID REF	SCALE BAR	ORIGIN SIZE	FIGURE
REV.	DATE	DESCRIPTION	BY	CHD.	APR.	764383	SE 143 170 and SE 145 175		A4	1
DIMENSION		SCALE	DRAWING STATUS							
m		1:25,000	-							



**LEGEND**

▣ Trial Pit Location

00	12.06.2018	-	MW	AJ	CH
REV	DATE	DESCRIPTION	BY	CHD	APR
DIMENSION		SCALE	ORIGIN SIZE		
m		1:1000	A3		



**STRUCTURAL SOILS**

The Potteries  
Pottery Street  
Castleford  
WF10 1NJ

Tel: 01977 552255  
ask@soils.co.uk  
www.soils.co.uk

CLIENT  
Transpire Alliance

PROJECT  
Transpennine Route Upgrade -  
West of Leeds - Zone 4 SPO 14.1a

TITLE  
EXPLORATORY HOLE LOCATION PLAN

JOB NO	FIGURE
764383	2

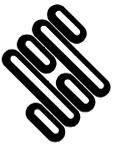
DRAWING STATUS	REV
-	00



## **APPENDIX B - EXPLORATORY HOLE RECORDS**

---

- (i) Key to Exploratory Hole Logs
- (ii) Trial Pit logs



### KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF ABBREVIATIONS

#### SAMPLING

##### *Sample type codes*

B	=	Bulk disturbed sample.
D	=	Small disturbed sample.
DSPT	=	Small disturbed sample originating from SPT test.
ES	=	Soil sample for environmental testing.
UT	=	Undisturbed thin-walled driven tube sample - Number of blows indicated. % recovery reported.

#### IN-SITU TESTING

SPT <sub>(c)</sub>	=	Standard Penetration Test using a solid 60 degree cone.
SPT	=	Standard Penetration Test using split spoon sampler. (SPT <sub>(NR)</sub> indicates 'No Sample Recovery').
	=	* denotes extrapolated N value. NP denotes 'No Penetration'.

#### ROTARY DRILLING INFORMATION

W	=	Water flush returns (%)
TCR	=	Total core recovery (%)
SCR	=	Solid core recovery (%)
RQD	=	Rock quality designations (%)
If	=	Fracture spacing (mm). In fracture column (i) denotes discontinuity is infilled (refer to Fracture Table for details). Where variable the minimum - mode - maximum spacing may be quoted. 'NI' denotes non-intact core. 'NA' denotes not applicable.

All lengths used to determine rock core mechanical properties taken along the centre line of the core.  
Obvious induced fractures have been ignored.

The assessment of solid core is based on lengths that show a full diameter and not necessarily a full circumference.

AZCL = Assessed zone of core loss.

#### ADDITIONAL NOTES

1. All soil and rock descriptions and legends in general accordance with BS EN ISO 14688-1, 14688-2, 14689-1, and BS5930:2015.
2. Material types divided by a broken line (- - -) indicates an unclear boundary.
3. The data on any sheet within the report showing the AGS icon is available in the AGS format.



## KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF GRAPHIC SYMBOLS

### WATER COLUMN SYMBOLS

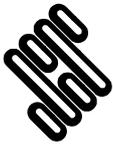
-  First water strike, second water strike etc.
-  Standing water level following first strike, standing water level following second strike etc.
-  Seepage.
-  Standing water level recorded at documented date.

### MATERIAL GRAPHIC LEGENDS

	Breccia		CLAY		Clayey gravelly SAND		Gravelly clayey SAND		Clayey SAND
	Gravelly CLAY		MADE GROUND		Mudstone		Possible MADE GROUND		Sandstone
	Gravelly sandy CLAY		Sandy gravelly CLAY		Sandy gravelly silty CLAY		Sandy gravelly SILT		Siltstone
	Silty sandy GRAVEL		MADE GROUND		Sandy gravelly CLAY		SAND		SANDSTONE
	Clean Ballast		Slightly Dirty Ballast		Dirty Ballast		Very Dirty Ballast (NON-COHESIVE)		Very Dirty Ballast (COHESIVE)
	Fine / Medium Sand		Coarse Sand		Sand and Gravel		Clayey / Silty Sand and / or Gravel		Coarse Crushed Stone Aggregate
	Fine Ash (Sand Size) Unstratified (Clayey / Silty)		Coarse Ash (Gravel Size)		Clayey Silty Ash		Any of 2 A-D in a Clay Matrix		Firm (CU 40 to 75kN/m²)
	Moderately Strong to Hard Rock		Gravelly Soil						

### INSTRUMENTATION SYMBOLS

	Backfill		Ballast (clean)		Bentonite seal		Concrete		Gravel filter
	Stopcock cover		Upstanding cover						
	Plain pipe		Slotted pipe						



Contract: <b>TRU - West of Leeds</b>		Client: <b>Transpire Alliance</b>		Trial Pit: <b>TP4011</b>
Contract Ref: <b>764383</b>	Start: <b>29.05.18</b> End: <b>29.05.18</b>	Ground Level (m AOD): <b>88.36</b>	National Grid Co-ordinate: <b>E:414387.4 N:417048.6</b>	Sheet: <b>1 of 4</b>

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.30	1	B			RAIL.	0.15		
0.40	101	ES			MADE GROUND: Grey subangular COBBLES of granite (CLEAN BALLAST).	0.36		
					MADE GROUND: Dark brown slightly silty sandy GRAVEL. Gravel is subangular fine to coarse of brick, sandstone and pottery. . . . at 0.38m, pot pipe	(0.43)		
					Trial pit terminated at 0.79m depth on sandstone masonry.	0.79		

GINT LIBRARY: V8\_06.GLB LibVersion: v8\_06 - Core+Logs - 002 | Log TRIAL PIT LOG - A4P | 764383 - TRANSPIRE PQQ.GPJ - v8\_06.  
 Structural Soils Ltd, Branch Office - Castleford, The Potteries, Pottery Street, Castleford, West Yorkshire, WF10 1NJ. Tel: 01977-552255, Fax: 01977-552299, Web: www.soils.co.uk, Email: ask@soils.co.uk | 05/09/18 - 13:53 | MG11

Plan (Not to Scale) 		<b>General Remarks</b> 1. Trial pit excavated at project chainage 41605, approximately 25 miles 1510 yards. 2. Position scanned with CAT and Genny. 3. Excavated in the cess of the UP fast, 1.64m from the nearest running rail. 4. No groundwater encountered. 5. Trial pit terminated at 0.79m on sandstone masonry. 6. Backfilled with arisings on completion.					
Method Used: <b>Hand dug</b>		Plant Used: <b>Hand tools</b>		Logged By: <b>ACutts</b>	Checked By: <b>MG</b>	Scale: <b>1:25</b>	

# APPENDIX E - GEOENVIRONMENTAL TESTING

---

- (i) Laboratory Test Results
- (ii) Laboratory UKAS Accreditation Certificate

## FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 18/04637  
**Issue Number:** 1  
**Date:** 27 June, 2018

**Client:** Structural Soils Limited (Castleford)  
The Potteries  
Pottery Street  
Castleford  
West Yorkshire  
UK  
WF10 1NJ

**Project Manager:** Alex Jones  
**Project Name:** TRU-West of Leeds  
**Project Ref:** 764383  
**Order No:** N/A  
**Date Samples Received:** 04/06/18  
**Date Instructions Received:** 13/06/18  
**Date Analysis Completed:** 27/06/18

**Prepared by:**



Kate Keningale  
Sales Executive

**Approved by:**



Iain Haslock  
Analytical Consultant

Envirolab Job Number: 18/04637

Client Project Name: TRU-West of Leeds

Client Project Ref: 764383

Lab Sample ID	18/04637/1	18/04637/4	18/04637/8	18/04637/10						
Client Sample No	101	2	2	2						
Client Sample ID	TP4011	TP4018	TP4025	TP4030						
Depth to Top	0.40	0.60	0.50	0.50						
Depth To Bottom										
Date Sampled	28-May-18	29-May-18	30-May-18	31-May-18						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	6A	4AE	4A						
									Units	Method ref
% Stones >10mm <sub>A</sub>	21.8	37.9	16.3	41.0					% w/w	A-T-044
pH <sub>D</sub> <sup>M#</sup>	7.84	7.33	7.06	7.28					pH	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1					mg/kg	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2	<0.2	<0.2	<0.2					mg/kg	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	10.7	10.4	23.6	14.2					% w/w	A-T-032s
Antimony <sub>D</sub>	6	6	5	9					mg/kg	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	20	12	29	40					mg/kg	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	2.0	0.9	1.5	1.1					mg/kg	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0	<1.0	<1.0	<1.0					mg/kg	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	2.1	1.2	1.9	1.9					mg/kg	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	161	81	154	201					mg/kg	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	144	20	31	25					mg/kg	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	220	45	85	105					mg/kg	A-T-024s
Mercury <sub>D</sub>	0.32	<0.17	0.18	0.31					mg/kg	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	56	32	49	39					mg/kg	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	<1	<1	<1	2					mg/kg	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	66	30	41	42					mg/kg	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	674	128	140	150					mg/kg	A-T-024s
Asbestos in Soil (inc. matrix) <sup>^</sup>										
Asbestos in soil <sub>A</sub> <sup>#</sup>	NAD	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A						
<b>BTEX</b>										
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s

Envirolab Job Number: 18/04637

Client Project Name: TRU-West of Leeds

Client Project Ref: 764383

Lab Sample ID	18/04637/1	18/04637/4	18/04637/8	18/04637/10					Units	Method ref
Client Sample No	101	2	2	2						
Client Sample ID	TP4011	TP4018	TP4025	TP4030						
Depth to Top	0.40	0.60	0.50	0.50						
Depth To Bottom										
Date Sampled	28-May-18	29-May-18	30-May-18	31-May-18						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	6A	4AE	4A						
<b>PAH-16MS</b>										
Acenaphthene <sub>A</sub> <sup>M#</sup>	4.24	0.08	0.13	0.08					mg/kg	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.06	0.04	0.89	0.09					mg/kg	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	6.01	0.23	2.14	0.78					mg/kg	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	9.87	0.45	6.12	1.04					mg/kg	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	5.92	0.33	4.18	0.94					mg/kg	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	6.71	0.43	9.19	1.49					mg/kg	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	2.48	0.18	1.87	0.63					mg/kg	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	2.21	0.16	3.04	0.50					mg/kg	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	9.04	0.52	7.87	1.18					mg/kg	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.70	0.04	0.60	0.15					mg/kg	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	22.1	1.30	8.58	1.58					mg/kg	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	3.55	0.06	0.13	0.06					mg/kg	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	3.16	0.23	2.71	0.76					mg/kg	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	5.58	0.06	0.16	0.11					mg/kg	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	24.9	0.76	1.51	0.75					mg/kg	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	20.4	1.18	8.69	1.63					mg/kg	A-T-019s
<b>Total PAH-16MS<sub>A</sub><sup>M#</sup></b>	<b>127</b>	<b>6.05</b>	<b>57.8</b>	<b>11.8</b>					<b>mg/kg</b>	<b>A-T-019s</b>

Envirolab Job Number: 18/04637

Client Project Name: TRU-West of Leeds

Client Project Ref: 764383

Lab Sample ID	18/04637/1	18/04637/4	18/04637/8	18/04637/10						
Client Sample No	101	2	2	2						
Client Sample ID	TP4011	TP4018	TP4025	TP4030						
Depth to Top	0.40	0.60	0.50	0.50						
Depth To Bottom										
Date Sampled	28-May-18	29-May-18	30-May-18	31-May-18						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	6A	4AE	4A						
TPH UKCWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	1.6	<0.1					mg/kg	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	2.7	<0.1					mg/kg	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	8.5	<0.1					mg/kg	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	49.4	<0.1					mg/kg	A-T-023s
Ali >C35-C44 <sub>A</sub>	<0.1	<0.1	<0.1	0.3					mg/kg	A-T-023s
Total Aliphatics <sub>A</sub>	<0.1	<0.1	62.2	<0.1					mg/kg	A-T-023s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	0.06	<0.05					mg/kg	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	9.5	<0.1	0.4	0.3					mg/kg	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	25.8	0.8	1.9	1.1					mg/kg	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	97.8	6.6	16.5	4.5					mg/kg	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	150	15.8	95.6	22.1					mg/kg	A-T-023s
Aro >C35-C44 <sub>A</sub>	3.0	0.9	2.5	0.4					mg/kg	A-T-023s
Total Aromatics <sub>A</sub>	284	23.2	114	28.1					mg/kg	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	284	23.2	176	28.1					mg/kg	A-T-023s
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.05	<0.05					mg/kg	A-T-022s

## **REPORT NOTES**

### **General:**

This report shall not be reproduced, except in full, without written approval from Envirolab.

All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure and there is insufficient sample to repeat the analysis. These are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

### **Soil chemical analysis:**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

### **TPH analysis of water by method A-T-007:**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

### **Electrical Conductivity of water by Method A-T-037:**

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

### **Asbestos:**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

### **Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

### **Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

### **Key:**

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

# United Kingdom Accreditation Service

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## ACCREDITATION CERTIFICATE



**TESTING LABORATORY**  
**No. 1247**

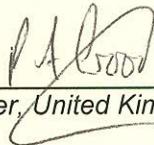
**Envirolab**

is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005  
General Requirements for the competence of testing and calibration laboratories.

This accreditation demonstrates technical competence for a defined scope as detailed in and at the locations specified in the schedule to this certificate, and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The schedule to this certificate is an essential accreditation document and from time to time may be revised and reissued by the United Kingdom Accreditation Service. The most recent issue of the schedule of accreditation, which bears the same accreditation number as this certificate, is available from the UKAS website [www.ukas.com](http://www.ukas.com).

This accreditation is subject to continuing conformity with United Kingdom Accreditation Service requirements. The absence of a schedule on the UKAS website indicates that the accreditation is no longer in force.



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*Accreditation Manager, United Kingdom Accreditation Service*

**Initial Accreditation date**  
**2 December 1992**

**This certificate issued on**  
**12 November 2012**

UKAS is appointed as the sole national accreditation body for the UK by The Accreditation Regulations 2009 (SI No 3155/2009) and operates under a Memorandum of Understanding (MoU) with the Department for Business, Innovation and Skills (BIS).

**Ground Investigation Report : 151667-TSA-W3A-MVL3-DM3-X-MF-  
701239  
(Bore hole: BH4522)**



# TRIAL PIT LOG

Trial Pit No.  
BH4522  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3A - Section 1 - ABS - Grip 4 Pt 2 Schedule 2	Survey Grid:	OSGB	Hole Type:	ABS
Project No:	317J-18-S1	Co-ordinates:	414357.00 mE 416991.00 mN	Checked By:	AP
Client:	Transpire Alliance	Ground Level:	88.65 mOD	Approved By:	JE
Engineer:	Transpire Alliance	Orientation of Logged Face:	-- deg.	Scale:	1:20
Date Started:	08/03/2021			Status:	FINAL
Date Completed:	08/03/2021			Print Date:	06/12/2022
				Final Depth:	2.20m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Black angular coarse (20-90mm) GRAVEL of basalt. [CLEAN BALLAST] <i>0.20 - 0.35m : Concrete sleeper adjacent.</i>		0.20 [0.30]	88.45	0.30 0.30 0.30 0.30	B D ES ES					
MADE GROUND: Brownish grey very clayey angular medium to coarse (6-60mm) GRAVEL of granite and basalt. [VERY DIRTY BALLAST]		0.50	88.15	0.30 0.60 0.60		PID	0.00	ppm		
MADE GROUND: Firm brown, orangish brown and light grey slightly sandy gravelly CLAY. Gravel is angular to subangular, fine to coarse of sandstone and mudstone. Sand is fine to coarse. [FIRM CLAY]		0.75	87.90	0.20 - 1.20 1.00 1.20 1.20 1.20	Liner D B ES					
		[1.45]								
				1.20 - 2.20	Liner					
				2.00	D					
				2.20	ES	PID	16.40	ppm		
Trial Pit Terminated at 2.20m		2.20	86.45	2.20						

Reason for Hole Termination: Reached scheduled depth.

Depth Related Exploratory Hole Information								Remarks
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	
0.20	2.20					John Phelan	T820-774	Engineering Line: DOWN 4ft - MVL3 - PLATFORM 4 - 25m 1432yds Nearest Structure: signal HU763 26m to high mileage. Nearest Rail: DOWN CESS RAIL NO CANT.

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.60 0.20	2.20 0.60	Concrete Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'

## FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 21/03274  
**Issue Number:** 1  
**Date:** 16 April, 2021

**Client:** BAM Ritchies Warrington  
Unit 5  
Taurus Park  
Europa Boulevard  
Warrington  
UK  
WA5 7ZT

**Project Manager:** Mailing list 1/Mailing list 2  
**Project Name:** Transpennine Route Upgrade SI GI  
**Project Ref:** 317J-18  
**Order No:** RIT135 972 058  
**Date Samples Received:** 10/03/21  
**Date Instructions Received:** 29/03/21  
**Date Analysis Completed:** 16/04/21

**Prepared by:**

  
Melanie Marshall  
Laboratory Coordinator

**Approved by:**

  
Sophie France  
Client Service Manager

Envirolab Job Number: 21/03274

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 317J-18

Lab Sample ID	21/03274/1	21/03274/2	21/03274/3	21/03274/4	21/03274/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4522	BH4923	BH4933	BH4934	BH4936					
Depth to Top	0.30	0.30	0.30	0.30	0.30					
Depth To Bottom										
Date Sampled	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21					
Sample Type	Solid	Solid	Solid	Solid	Solid					
Sample Matrix Code	7	7	7	7	7					
pH <sub>D</sub> <sup>M#</sup>	9.54	9.23	8.96	9.12	9.40					
Cyanide (free) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1			mg/kg	1	A-T-042sFCN
Cyanide (complex) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1			mg/kg	1	A-T-042sCCN
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1			mg/kg	1	A-T-042sTCN
Thiocyanate <sub>A</sub>	<5	<5	<5	<5	<5			mg/kg	5	A-T-041s
Phenols - Total by HPLC <sub>A</sub>	<0.2	<0.2	<0.2	<0.2	<0.2			mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	<0.03	0.05	0.05	0.13	0.07			% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	<5	<5	<5	<5	<5			mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	<1	<1	<1	<1			mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	<0.5	<0.5	<0.5	<0.5	<0.5			mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub>	<1.0	<1.0	<1.0	1.0	<1.0			mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	1.1	1.2	0.7	1.1	0.8			mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	184	50	29	55	27			mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	17	16	6	11	16			mg/kg	1	A-T-024s
Chromium (hexavalent) <sub>D</sub>	<1	<1	<1	<1	<1			mg/kg	1	A-T-040s
Lead <sub>D</sub> <sup>M#</sup>	9	9	7	8	7			mg/kg	1	A-T-024s
Mercury <sub>D</sub>	<0.17	<0.17	<0.17	<0.17	<0.17			mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	7	13	9	7	15			mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	<1	<1	<1	<1	<1			mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	79	92	44	57	59			mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	90	68	55	107	78			mg/kg	5	A-T-024s
Leachate Prep BS EN 12457-1 (2:1) (1 no) <sub>A</sub>	-	*	-	*	-					A-T-001
pH (leachable) <sub>A</sub> <sup>#</sup>	-	7.37	-	6.76	-			pH	0.01	A-T-031w
Ammoniacal nitrogen as N (leachable) <sub>A</sub>	-	0.18	-	0.05	-			mg/l	0.02	A-T-033w
Sulphate (leachable) <sub>A</sub> <sup>#</sup>	-	42.88	-	492.36	-			mg/l	1	A-T-026w
Cyanide (free) (leachable) <sub>A</sub> <sup>#</sup>	-	<0.005	-	<0.005	-			mg/l	0.005	A-T-042wFCN
Cyanide (total) (leachable) <sub>A</sub> <sup>#</sup>	-	<0.005	-	<0.005	-			mg/l	0.005	A-T-042wTCN
Antimony (leachable) <sub>A</sub> <sup>#</sup>	-	2	-	1	-			µg/l	1	A-T-025w
Arsenic (leachable) <sub>A</sub> <sup>#</sup>	-	4	-	<1	-			µg/l	1	A-T-025w
Boron (leachable) <sub>A</sub> <sup>#</sup>	-	116	-	250	-			µg/l	10	A-T-025w
Cadmium (leachable) <sub>A</sub> <sup>#</sup>	-	<1	-	<1	-			µg/l	1	A-T-025w
Copper (leachable) <sub>A</sub> <sup>#</sup>	-	6	-	10	-			µg/l	1	A-T-025w
Chromium (leachable) <sub>A</sub> <sup>#</sup>	-	<1	-	<1	-			µg/l	1	A-T-025w

Envirolab Job Number: 21/03274

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 317J-18

Lab Sample ID	21/03274/1	21/03274/2	21/03274/3	21/03274/4	21/03274/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4522	BH4923	BH4933	BH4934	BH4936					
Depth to Top	0.30	0.30	0.30	0.30	0.30					
Depth To Bottom										
Date Sampled	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21					
Sample Type	Solid	Solid	Solid	Solid	Solid					
Sample Matrix Code	7	7	7	7	7					
Lead (leachable) <sub>A</sub> <sup>#</sup>	-	<1	-	<1	-					
Magnesium (leachable) <sub>A</sub>	-	4	-	9	-			mg/l	1	A-T-049w
Mercury (leachable) <sub>A</sub> <sup>#</sup>	-	<0.1	-	<0.1	-			µg/l	0.1	A-T-025w
Nickel (leachable) <sub>A</sub> <sup>#</sup>	-	5	-	13	-			µg/l	1	A-T-025w
Selenium (leachable) <sub>A</sub> <sup>#</sup>	-	<1	-	<1	-			µg/l	1	A-T-025w
Vanadium (leachable) <sub>A</sub> <sup>#</sup>	-	6	-	<1	-			µg/l	1	A-T-025w
Zinc (leachable) <sub>A</sub> <sup>#</sup>	-	3	-	3	-			µg/l	1	A-T-025w

Envirolab Job Number: 21/03274

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 317J-18

Lab Sample ID	21/03274/1	21/03274/2	21/03274/3	21/03274/4	21/03274/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4522	BH4923	BH4933	BH4934	BH4936					
Depth to Top	0.30	0.30	0.30	0.30	0.30					
Depth To Bottom										
Date Sampled	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21					
Sample Type	Solid	Solid	Solid	Solid	Solid					
Sample Matrix Code	7	7	7	7	7					
Bulk Fibre ID in Solid Fines ^ (inc. matrix)										
Bulk Fibre Identification in Solid Fines <sub>D</sub> <sup>f</sup>	NAD	NAD	NAD	NAD	NAD			A-T-045		
Asbestos ACM - Suitable for Water Absorption Test? <sub>D</sub>	N/A	N/A	N/A	N/A	N/A			A-T-045		

Envirolab Job Number: 21/03274

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 317J-18

Lab Sample ID	21/03274/1	21/03274/2	21/03274/3	21/03274/4	21/03274/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4522	BH4923	BH4933	BH4934	BH4936					
Depth to Top	0.30	0.30	0.30	0.30	0.30					
Depth To Bottom										
Date Sampled	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21					
Sample Type	Solid	Solid	Solid	Solid	Solid					
Sample Matrix Code	7	7	7	7	7					
PAH 16MS (leachable)										
Acenaphthene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Acenaphthylene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Anthracene (leachable) <sub>A</sub>	-	<0.02	-	0.03	-			µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Chrysene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Fluoranthene (leachable) <sub>A</sub>	-	<0.02	-	0.08	-			µg/l	0.02	A-T-019w
Fluorene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Naphthalene (leachable) <sub>A</sub>	-	0.11	-	<0.02	-			µg/l	0.02	A-T-019w
Phenanthrene (leachable) <sub>A</sub>	-	<0.02	-	<0.02	-			µg/l	0.02	A-T-019w
Pyrene (leachable) <sub>A</sub>	-	<0.02	-	0.02	-			µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) <sub>A</sub>	-	0.11	-	0.13	-			µg/l	0.02	A-T-019w

Envirolab Job Number: 21/03274

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 317J-18

Lab Sample ID	21/03274/1	21/03274/2	21/03274/3	21/03274/4	21/03274/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4522	BH4923	BH4933	BH4934	BH4936					
Depth to Top	0.30	0.30	0.30	0.30	0.30					
Depth To Bottom										
Date Sampled	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21					
Sample Type	Solid	Solid	Solid	Solid	Solid					
Sample Matrix Code	7	7	7	7	7					
TPH UKCWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
Ali >C8-C10 <sub>A</sub>	<1	<1	<1	<1	<25			mg/kg	1	A-T-055s
Ali >C10-C12 <sub>A</sub> <sup>M#</sup>	<1	1	<1	1	<25			mg/kg	1	A-T-055s
Ali >C12-C16 <sub>A</sub> <sup>M#</sup>	1	2	<1	1	<25			mg/kg	1	A-T-055s
Ali >C16-C21 <sub>A</sub> <sup>M#</sup>	14	29	3	12	<25			mg/kg	1	A-T-055s
Ali >C21-C35 <sub>A</sub> <sup>M#</sup>	535	647	235	591	1050			mg/kg	1	A-T-055s
Ali >C35-C44 <sub>A</sub>	102	66	66	55	273			mg/kg	1	A-T-055s
Total Aliphatics <sub>A</sub>	652	745	305	660	1340			mg/kg	1	A-T-055s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
Aro >C8-C10 <sub>A</sub>	1	1	1	1	<25			mg/kg	1	A-T-055s
Aro >C10-C12 <sub>A</sub>	2	3	2	2	<25			mg/kg	1	A-T-055s
Aro >C12-C16 <sub>A</sub>	2	2	2	2	<25			mg/kg	1	A-T-055s
Aro >C16-C21 <sub>A</sub> <sup>M#</sup>	6	13	3	8	<25			mg/kg	1	A-T-055s
Aro >C21-C35 <sub>A</sub> <sup>M#</sup>	15	68	23	53	<25			mg/kg	1	A-T-055s
Aro >C35-C44 <sub>A</sub>	6	17	14	11	<25			mg/kg	1	A-T-055s
Total Aromatics <sub>A</sub>	32	104	45	77	38			mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44) <sub>A</sub>	684	849	350	737	1380			mg/kg	1	A-T-055s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-022s

Envirolab Job Number: 21/03274

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 317J-18

Lab Sample ID	21/03274/1	21/03274/2	21/03274/3	21/03274/4	21/03274/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4522	BH4923	BH4933	BH4934	BH4936					
Depth to Top	0.30	0.30	0.30	0.30	0.30					
Depth To Bottom										
Date Sampled	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21	06-Mar-21					
Sample Type	Solid	Solid	Solid	Solid	Solid					
Sample Matrix Code	7	7	7	7	7					
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	<0.02	<0.02			mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07			mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	<0.06	<0.06	<0.06			mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	0.10	<0.08	<0.08	0.09			mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03			mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	0.03			mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	0.04	0.10	<0.03	0.05	0.07			mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	0.10	<0.07	<0.07	0.08			mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	0.31	<0.08	<0.08	0.27			mg/kg	0.01	A-T-019s

## **REPORT NOTES**

### **General**

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

### **Soil chemical analysis:**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

### **TPH analysis of water by method A-T-007:**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

### **Electrical Conductivity of water by Method A-T-037:**

Results greater than 12900µS/cm @ 25°C / 1155µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

### **Asbestos:**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

### **Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

### **Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

### **Key:**

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

## Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR  
Tel. 0161 368 4921 email. ask@envlab.co.uk

<b>Client:</b>	BAM Ritchies Warrington, Unit 5, Taurus Park, Europa Boulevard, Warrington, UK, WA5 7ZT	<b>Project No:</b>	21/03274
<b>Project:</b>	Transpennine Route Upgrade SI GI	<b>Date Received:</b>	29/03/2021 (am)
<b>Clients Project No:</b>	317J-18	<b>Cool Box Temperatures (°C):</b>	17.3, 16.8

### NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

**Ground Investigation Report : 151667-TSA-W3A-MVL3-DM3-X-MF-  
701828**

**(Bore holes: BH4114, BH4114A, BH4115, BH4115A, BH4117, BH4689,  
BH4691, BH4693, BH4694 and BH5082)**



# BOREHOLE LOG

Borehole No:  
BH4114  
Sheet 1 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414339.86 mE  
417028.46 mN

Ground Level: 88.38 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.60m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill					
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units									
<p>MADE GROUND: Dark grey silty gravelly fine to coarse SAND predominantly of ash. Gravel is subangular fine to medium of clinker and occasional sandstone. Medium subrounded sandstone cobble (100-130mm) content. Rare subangular sandstone boulder (290x200x165mm). [MADE GROUND]</p> <p>MADE GROUND: Brown mottled greenish grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to medium of various lithologies. Sand is fine to medium. [MADE GROUND]</p> <p>Soft and firm brown, greyish brown and dark grey slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse of siltstone, mudstone and coal. [HEAD]</p>		(0.60)	87.78	0.20	B															
		0.20		D																
		0.20		ES																
		0.50		B																
		0.50		D																
		0.50		ES																
		1.00		B		87.18	1.00	B												
		1.00		D																
		1.00		ES																
		1.20		D																
1.20	D																			
1.20 - 1.65									S	N=5										
1.20 - 2.70	RC	146										0								
2.70	D																			
2.70 - 3.15									S	N=8		0								
2.70 - 3.30	RC	146																		
3.30	D		83.32	3.30	D															
3.30 - 3.75									S	N=7		0								
3.30 - 3.80																				
3.30 - 3.80	RC	146																		
3.80	D-NR																			
3.80 - 4.25									S	N=9		0								
3.80 - 4.30	RC	146																		
1.60 - 6.80	EW																			
4.20	D																			
1.70 - 6.80	EW																			
4.30 - 4.75								S	N=18											
4.30 - 4.80	RC	146																		
4.80 - 5.22								C	50 / 275		80									
4.80 - 5.30	RC	146									0									
											0									
<p>Extremely weak thinly to thickly laminated greyish brown silty MUDSTONE. Deconstructed to residual soil. Generally recovered as very clayey angular gravel of predominately ordered lithorelicts (20mm) and angular fine to coarse interlocking gravel size fragments. Frequent orangish brown and dark orangish brown staining on gravel fragments penetrating &lt;5mm. [PENNINE LOWER COAL MEASURES FORMATION]</p>		(3.86)	83.32	5.30 - 6.80	C							92								
		5.30 - 6.80		ES									0							
		5.30 - 6.80		RC	146															
		6.80 - 8.30		C																
				6.80 - 8.30	RC	146														
<p>Extremely weak to very weak thinly laminated to very thinly bedded dark greyish brown to black silty MUDSTONE. Distinctly weathered to deconstructed. Frequent orangish brown staining. Highly fractured. and recovered non intact as very clayey angular to subangular fine to coarse ordered gravel size clasts and ordered lithorelicts (&lt;18mm) of mudstone. [PENNINE LOWER COAL MEASURES FORMATION]</p>		(8.52)	79.86	8.30 - 9.80	C							100								
		8.30 - 9.80		RC	146								0							
No Recovery: Driller's record as possible mine workings.			78.63																	

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**





# BOREHOLE LOG

Borehole No:  
BH4114  
Sheet 3 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414339.86 mE  
417028.46 mN

Ground Level: 88.38 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.60m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units				
Moderately weak to medium strong thinly laminated to thinly bedded greyish brown and dark grey fine grained silty SANDSTONE with thinly to thickly laminated dark grey sandy SILTSTONE. Occasional closely to widely spaced, thin to medium beds of medium strong light greyish brown fine to medium grained sandstone. Unweathered to partially weathered. Locally micaceous. Locally frequent cross-stratification features. Bedding Fractures: Very closely to widely spaced, 0-3 degrees, planar and undulating, rough, locally with orangish brown staining penetrating <2mm. [PENNINE LOWER COAL MEASURES FORMATION]	.....	21.11	67.27	20.10 - 21.60	C								100	NI	
				20.10 - 21.60	RC	146						70	67		
Medium strong thinly interlaminated dark greyish brown and brownish grey micaceous sandy SILTSTONE and fine grained silty SANDSTONE with frequent black interlaminae. Partially weathered. Locally frequent lenticular bedding. Bedding Fractures: Very closely to closely spaced, undulating, rough with orangish brown surface staining. Joints: 75-84 degrees, undulating, rough with dark orangish brown surface staining. [PENNINE LOWER COAL MEASURES FORMATION]	.....	22.01	66.37	21.60 - 23.10	RC	146							98		
				21.60 - 23.10								98	98		
Moderately weak to medium strong thinly laminated to very thinly bedded dark grey to grey fine grained silty SANDSTONE very thinly interbedded with dark grey to grey sandy SILTSTONE. Unweathered. Rare very thin beds of whitish grey calcareous silty sandstone. Locally frequent lenticular laminae or cross-stratification features. Bedding Fractures: Very closely to widely spaced, undulating and planar, rough and smooth with orangish brown or brown staining penetrating <4mm. Wall strength rarely weakened to weak penetrating up to 10mm. [PENNINE LOWER COAL MEASURES FORMATION]	.....	(4.17)		23.10 - 24.60	RC	146							94	NI	570
				23.10 - 24.60								91	91		
	.....			24.60 - 26.10	C								100		
				24.60 - 26.10	RC	146						97	92		
Medium strong thinly to thickly laminated light grey and grey fine grained calcareous silty SANDSTONE with thinly to thickly laminated grey sandy SILTSTONE. Unweathered to partially weathered. Localised calcite mineralisation within incipient fractures (65-85 degrees). Frequent traces of bioturbation. Bedding Fractures: Medium to widely spaced, 0-3 degrees undulating rough, rarely with brown staining penetrating up to 310mm. [PENNINE LOWER COAL MEASURES FORMATION]	.....	(1.48)	62.20	26.10 - 27.60	RC	146							100	780	650
				26.10 - 27.60								98	98		
Medium strong to strong thinly laminated to very thinly bedded grey, dark grey and brownish grey fine grained silty SANDSTONE with grey and dark grey slightly sandy SILTSTONE. Locally with thinly laminated to very thinly bedded light grey to grey calcareous silty sandstone. Unweathered to partially weathered. Locally micaceous. Locally frequent lenticular interlaminae. Occasional undulating incipient fractures (78-87 degrees) with whitish grey calcite mineralisation <1mm. Localised bioturbation traces (<45mm). Bedding Fractures: Medium to widely spaced, 0-4 degrees, undulating rough locally with brown staining penetrating up to 64mm or whitish grey speckled calcite mineralisation (<5x9mm). [PENNINE LOWER COAL MEASURES FORMATION]	.....	(2.94)	60.72	27.60 - 29.10	C								102	180	750
				27.60 - 29.10	RC	146						102	102		
				29.10 - 30.60	RC	146							94		
													92		
													92		

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4114  
Sheet 4 of 4

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid System:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414339.86 mE 417028.46 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	88.38 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	- - deg.	Log Status:	DRAFT
Date Started:	20/03/2021	Inclination:	90 deg.	Print Date:	03/01/2023
Date Completed:	25/03/2021			Final Depth:	30.60m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
<p>Medium strong to strong thinly laminated to very thinly bedded grey, dark grey and brownish grey fine grained silty SANDSTONE with grey and dark grey slightly sandy SILTSTONE. Locally with thinly laminated to very thinly bedded light grey to grey calcareous silty sandstone. Unweathered to partially weathered. Locally micaceous. Locally frequent lenticular interlaminae. Occasional undulating incipient fractures (78-87 degrees) with whitish grey calcite mineralisation &lt;1mm. Localised bioturbation traces (&lt;45mm). Bedding Fractures: Medium to widely spaced, 0-4 degrees, undulating rough locally with brown staining penetrating up to 64mm or whitish grey speckled calcite mineralisation (&lt;5x9mm). [PENNINE LOWER COAL MEASURES FORMATION]</p> <p>Borehole Terminated at 30.60m</p>		30.60	57.78													

Stratum depths measured along borehole axis.  
 Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.  
 Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'  
 Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE INFORMATION SHEET

Borehole No  
BH4114  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWA0	Survey Grid:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414339.86 mE	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	417028.46 mN	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	88.38 mOD	Log Status:	DRAFT
Date Started:	20/03/2021	Inclination:	- - deg.	Print Date:	03/01/2023
Date Completed:	25/03/2021		90 deg.	Final Depth:	30.60m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	20/03/2021	21/03/2021	Insulated hand digging tools				Gordon McKean	Engineering Line: 10ft Huddersfield No.2/3 sidings MVL3 25m 1461yd (66.4ch). Nearest Structure: Signal HU767 37m to high mileage. Nearest Rail: Huddersfield No.2 siding 2.45m to 10ft rail no cant.
1.20	30.60	RC	20/03/2021	25/03/2021	2230	Geobor S	PCD		Calum Jones	

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
20/03/2021	23:16	0.00	0.00	Dry	Start of shift	6.50	168		6.50	168	
21/03/2021	04:04	1.20	0.00	Dry	Hole complete	30.60	146		22.00	146	
23/03/2021	07:30	1.20	0.00	Dry	Start of shift						
23/03/2021	15:00	6.80	6.80	1.20	Start of shift						
23/03/2021	23:00	15.80	15.80	1.20	End of shift						
24/03/2021	09:20	15.80	15.80	4.60	Start of shift						
24/03/2021	15:00	21.60	21.60	21.80	End of shift						
25/03/2021	08:00	21.60	22.00	20.10	Start of shift						
25/03/2021	15:14	30.60	30.60	20.10	Hole complete						

### Water Added Records

From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour	
								1.20	6.80	100 - 100	Water	Grey
								6.80	11.30	90 - 90	Water	Brown
								11.30	15.80	90 - 90	Water	Gray
								15.80	17.10	80 - 100	Water	Light brown
								17.10	20.10	100 - 100	Water	Grey
								20.10	21.60	0 - 100	Water	Grey
								21.60	30.60	0	Water	

### Water Strikes

Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
							SP	1	0.00	0.80	50	Plain		0.00	0.05	910	Flush cover
							SP	1	0.80	6.80	50	Slotted		0.05	0.30	906	Concrete
														0.30	0.80	903	Bentonite
														0.80	6.80	902	Gravel
														6.80	30.60	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.20	S	N=5	1.20	Dry		1	75	1	75	2	75	1	75	1	75	1	75	BRW03	66
2.70	S	N=8	2.70	0.80		2	75	2	75	2	75	2	75	2	75	2	75	BRW03	66
3.30	S	N=7	3.45	0.80		1	75	2	75	2	75	2	75	2	75	1	75	BRW03	66
3.80	S	N=9	4.20	0.80		1	75	2	75	1	75	2	75	3	75	3	75	BRW03	66
4.30	S	N=18	4.70	0.50		2	75	3	75	3	75	3	75	4	75	8	75	BRW03	66
4.80	C	50 / 275	5.20	0.70		3	75	5	75	9	75	15	75	16	75	10	50	BRW03	66

Reason for Hole Termination: Reached scheduled depth

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4114A  
Sheet 1 of 1

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO  
Project No: 317J-21-S1  
Client: Transpire Alliance  
Engineer: Transpire Alliance  
Date Started: 25/03/2021  
Date Completed: 25/03/2021

Survey Grid System: OSGB  
Co-ordinates: 414338.46 mE  
417027.14 mN  
Ground Level: 88.30 mOD  
Orientation: - - deg.  
Inclination: 90 deg.  
Hole Type: WLS  
Checked By: SF  
Approved By: JH  
Scale: 1:50  
Log Status: DRAFT  
Print Date: 03/01/2023  
Final Depth: 6.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill		
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units						
MADE GROUND: Soft black slightly sandy slightly gravelly CLAY. Sand is fine to coarse Gravel is rounded fine to medium of mudstone [MADE GROUND]		(0.30)	88.00														
		0.30															
MADE GROUND: Black sandy angular fine to coarse GRAVEL of ash with sandstone masonry cobbles [MADE GROUND]		(0.40)	87.60														
		0.70															
MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY (probable reworked material) [MADE GROUND]		(0.50)	87.10														
		1.20															
MADE GROUND: Orangish brown and brown sandy clayey angular and subangular fine to coarse GRAVEL of sandstone, siltstone, mudstone and coal. Sandy is fine to coarse. Frequent pockets of sandy gravelly clay <25mm. [MADE GROUND]		0.79 - 0.84m : Band of coal.	84.85	1.30	D												
				1.20 - 1.65	D												
				1.20 - 1.65	D												
				1.50	ES					S	N=4						
				1.20 - 2.00	L	87	100			PID	3.60	ppm					
				1.20 - 3.00	B												
				1.20 - 3.00	B												
				2.00 - 2.45	D												
				2.00 - 2.45	D					S	N=5						
				2.00 - 3.00	L	87	90										
				2.50	ES												
				2.80	D					PID	13.00	ppm					
			3.45	D					S	N=5							
Firm brownish grey and greenish grey slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to medium of sandstone, siltstone and coal. Sand is fine to coarse. [HEAD]		3.45	82.30	3.00 - 3.45	L	77	80										
				3.00 - 4.00	ES												
				3.50	D					PID	3.70	ppm					
				3.80	D												
				3.80	D												
				4.00 - 4.45	D												
				4.00 - 4.45	D					S	N=7						
				4.00 - 5.00	L	77	55										
				4.50	ES					PID	2.80	ppm					
				4.80	D												
				5.00 - 5.45	D												
				5.00 - 5.45	D												
			5.00 - 5.45	L	67	40			S	N=12							
			5.00 - 6.00	L													
			5.50	ES					PID	3.00	ppm						
Borehole Terminated at 6.00m		6.00															

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE INFORMATION SHEET

Borehole No  
BH4114A  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid:	OSGB	Hole Type:	WLS
Project No:	317J-21-S1	Co-ordinates:	414338.46 mE	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	417027.14 mN	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	88.30 mOD	Log Status:	DRAFT
Date Started:	25/03/2021	Inclination:	- - deg.	Print Date:	03/01/2023
Date Completed:	25/03/2021		90 deg.	Final Depth:	6.00m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	25/03/2021	25/03/2021	Insulated hand digging tools T820-774				Tom O'Sullivan	
1.20	6.00	WLS	25/03/2021	25/03/2021					Samuel Askew	

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
25/03/2021	15:59	0.00	0.00	Dry	Start of shift Hole complete	3.00	115		3.00	115	
25/03/2021	17:41	6.00	3.00	2.10		4.00	87				
						5.00	77				
						6.00	67				

### Water Added Records

From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour

### Chiselling / Hard Boring Details

### Drilling Flush Details

### Water Strikes

### Monitoring Installation Pipe Work

### Backfill Details

Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
														0.00	6.00	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.20	S	N=4		Dry		1	75	1	75	1	75	1	75	1	75	1	75	T820-774	64
2.00	S	N=5	2.00	Dry		1	75	1	75	1	75	1	75	1	75	2	75	T820-774	64
3.00	S	N=5	3.00	Dry		1	75	1	75	1	75	2	75	1	75	1	75	T820-774	64
4.00	S	N=7	3.00	Dry		2	75	2	75	1	75	2	75	2	75	2	75	T820-774	64
5.00	S	N=12	3.00	Dry		2	75	2	75	3	75	3	75	3	75	3	75	T820-774	64

Reason for Hole Termination: Refusal hole collapsed.

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**







# BOREHOLE LOG

Borehole No:  
BH4115  
Sheet 3 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO  
Project No: 317J-21-S1  
Client: Transpire Alliance  
Engineer: Transpire Alliance  
Date Started: 24/12/2020  
Date Completed: 27/12/2020

Survey Grid System: OSGB  
Co-ordinates: 414364.10 mE  
417003.61 mN  
Ground Level: 88.62 mOD  
Orientation: - - deg.  
Inclination: 90 deg.

Hole Type: RC  
Checked By: SF  
Approved By: JH  
Scale: 1:50  
Log Status: DRAFT  
Print Date: 03/01/2023  
Final Depth: 30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing							TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill			
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result					Units		
Moderately weak to medium strong light grey and grey thinly laminated fine grained SANDSTONE with frequent muddy laminae. Slightly weathered to unweathered. Frequent bioturbation traces. Bedding fractures: 28degrees closely to medium spaced planar smooth oxide staining penetrating up to 20mm. Joints: 60-84degrees planar rough oxide stained. [PENNINE LOWER COAL MEASURES FORMATION]	.....	(2.00)															
Moderately weak dark grey thinly laminated SILTSTONE with frequent light grey laminae of fine grained SANDSTONE. Slightly weathered. Bedding fractures: 28degrees closely spaced planar smooth occasional oxide coating. Joint: 74degrees planar rough oxide stained. [PENNINE LOWER COAL MEASURES FORMATION] 22.19 - 23.04m : Non intact. Drilling induced opening of incipient fractures forming angular coarse gravel and cobble sized oxide stained fragments. Appears locally distinctly weathered.	xxxxxx	(2.85)	21.44	67.18	20.60 - 22.10	RC	146						94 86 48	90 260 450			
Moderately weak dark grey sandy SILTSTONE. Unweathered. Bedding fractures: 25degrees closely spaced planar rough clean. [PENNINE LOWER COAL MEASURES FORMATION]	xxxxxx	(3.10)	24.29	64.33	23.60 - 25.10	RC	146						98 65 38	- NI -			
Medium strong light grey and grey thinly laminated fine grained SANDSTONE with locally abundant muddy laminae. Unweathered Bedding fractures: 32degrees medium spaced planar rough clean. [PENNINE LOWER COAL MEASURES FORMATION]	.....	(1.25)	27.39	61.23	26.60 - 28.10	RC	146						100 90 56	60 150 290			
Moderately weak dark grey thinly laminated SILTSTONE with occasional light grey laminae of fine grained SANDSTONE. Unweathered. Bedding fractures: 30 degrees medium spaced planar smooth occasional oxide coating. [PENNINE LOWER COAL MEASURES FORMATION]	xxxxxx	(0.86)	28.64	59.98	28.10 - 29.60	RC	146						93 82 45	NI 90 180			
Weak dark grey clayey SILTSTONE. Slightly weathered. Generally recovered non intact as tabular coarse gravel size fragments.	xxxxxx	(0.50)	29.50	59.12	29.60 - 30.00	RC	146						75 0 0	- NI -			
	xxxxxx		30.00	58.62													

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4115  
Sheet 4 of 4

Project Name:	Transpennine Route Upgrade SIG1 W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid System:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414364.10 mE 417003.61 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	88.62 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	- - deg.	Scale:	1:50
Date Started:	24/12/2020	Inclination:	90 deg.	Log Status:	DRAFT
Date Completed:	27/12/2020			Print Date:	03/01/2023
				Final Depth:	30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
Weak dark grey clayey SILTSTONE. Slightly weathered. Generally recovered non intact as tabular coarse gravel size fragments. [PENNINE LOWER COAL MEASURES FORMATION] Borehole Terminated at 30.00m																

Stratum depths measured along borehole axis.  
 Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.  
 Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'  
 Further details given on appended 'Borehole Information Sheet'.  
**Please note that this log is still draft and may be subject to change.**  
 Office: BAM Ritchies, Unit 5 Taurus Park, Europa Boulevard, Gemini Business Park, Warrington, WA5 7ZT  
 BAM R Borehole Log 03/11/2020



# BOREHOLE INFORMATION SHEET

Borehole No  
BH4115  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414364.10 mE	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	417003.61 mN	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	88.62 mOD	Log Status:	DRAFT
Date Started:	24/12/2020	Inclination:	- - deg.	Print Date:	03/01/2023
Date Completed:	27/12/2020		90 deg.	Final Depth:	30.00m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	25/12/2020	25/12/2020	Insulated hand digging tools				Gordon McKean	Engineering Line: DOWN 4ft - MVL3 - 25m 1453yd (66.0ch). Nearest Structure: Signal HU763 10m to high mileage. Nearest Rail: CESS RAIL NO CANT.
1.20	30.00	RC	25/12/2020	27/12/2020	Commachio 305	Geobor S	PCD		Daniel Roberts	

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
25/12/2020	03:00	0.00	0.00	Dry	Start of shift	30.00	146		30.00	146	
25/12/2020	08:00	2.60	2.60	2.00	End of shift						
25/12/2020	17:30	16.10	16.10	3.40	End of shift						
26/12/2020		16.10	16.10	0.50	Start of shift						
26/12/2020	05:58	30.00	30.00	20.20	End of shift						
26/12/2020	08:00	30.00	30.00		Start of shift						
26/12/2020	18:00	0.00	0.00	0.00	Hole complete						

### Water Added Records

From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour	
								1.40	2.60	100 - 100	Water	Light brown
								2.60	16.10	90 - 100	Water	Light brown
								16.10	17.60	0 - 20	Water	Light brown
								17.60	19.10	0 - 30	Water	Light brown
								19.10	30.00	0	Water	

### Chiselling / Hard Boring Details

### Drilling Flush Details

### Water Strikes

### Monitoring Installation Pipe Work

### Backfill Details

Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
														0.20	30.00	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.40	S	N=18	0.00	Dry	0	3	75	4	75	4	75	4	75	5	75	5	75	BRW03	66
2.60	S	N=8	2.60	0.80	0	1	75	2	75	3	75	2	75	1	75	2	75	BRW02	60
4.10	S	N=22	4.10	0.80	0	2	75	4	75	4	75	5	75	6	75	7	75	BRW02	60
5.60	S	N=27	5.60	0.80	0	2	75	4	75	5	75	6	75	7	75	9	75	BRW02	60

Reason for Hole Termination: Reached scheduled depth

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4115A  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWA0	Survey Grid System:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414362.20 mE 417021.45 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	88.59 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	-- deg.	Log Status:	DRAFT
Date Started:	06/12/2020	Inclination:	90 deg.	Print Date:	03/01/2023
Date Completed:	06/12/2020			Final Depth:	1.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
Track construction. [RAIL AND CLIP]		0.20	88.39													
MADE GROUND: Grey slightly silty sandy fine to medium (2-40mm) GRAVEL of granite. Sand is fine to coarse.		(0.70)			0.30	B										
[MADE GROUND]		0.90	87.69	0.30	D											
0.20 - 0.35m : Wooden sleeper adjacent		1.00	87.59	0.50	B											
0.20 - 0.90m : Strong hydrocarbon odour noted				0.50	D											
Dark grey weathered MUDSTONE.				0.50	ES											
[PENNINE LOWER COAL MEASURES FORMATION]				0.95	ES											
Borehole Terminated at 1.00m				0.95	ES											

Stratum depths measured along borehole axis.  
 Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.  
 Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'  
 Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE INFORMATION SHEET

Borehole No  
BH4115A  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414362.20 mE	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	417021.45 mN	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	88.59 mOD	Log Status:	DRAFT
Date Started:	06/12/2020	Inclination:	- - deg.	Print Date:	03/01/2023
Date Completed:	06/12/2020		90 deg.	Final Depth:	1.00m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.00	IP	06/12/2020	06/12/2020	Insulated hand digging tools				Gordon McKean	Engineering Line: MVL3 - 25m 1468yd (66.7ch). Nearest Structure: Signal HU769 22m to low mileage. Nearest Rail: CESS RAIL NO ANT. Water ingress at base of pit.

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
06/12/2020	03:31	0.00	0.00	Dry	Start of shift						
06/12/2020	03:49	1.00	0.00	0.85	Hole complete						

Water Added Records			
From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

Depth Related Remarks			Chiselling / Hard Boring Details				Drilling Flush Details				
From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour

### Water Strikes

Water Strikes						Monitoring Installation Pipe Work						Backfill Details					
Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
														0.20	1.00	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%

Reason for Hole Termination: Restricted access prevented drilling from being carried out.

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4117  
Sheet 1 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 07/09/2021

Date Completed: 10/09/2021

Survey Grid System: OSGB

Co-ordinates: 414383.86 mE  
417005.50 mN

Ground Level: 88.43 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
Black bituminous CONCRETE (Tarmacadam)		0.15	88.28	0.20	B											
[MADE GROUND]		(0.30)		0.20	D											
MADE GROUND: Dark grey silty gravelly medium to coarse SAND of ash. Gravel is angular fine to coarse of brick, clinker, coal, burnt shale, glass and sandstone.		0.45	87.98	0.20	ES											
[MADE GROUND]				0.50	B											
MADE GROUND: Soft to firm light brown mottled grey and orangish slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of brick, cement, spent shale, mudstone, sandstone and rare coal. Sand is fine to medium of ash.				0.50	D											
[MADE GROUND]				1.00	B											
				1.00	D											
				1.00	ES											
				1.20	D											
				1.20	ES											
				1.20 - 1.65					S	N=4						
				1.20 - 2.00	B											
				1.20 - 2.20	L	86	80									
				2.20	D											
		(3.75)		2.20	ES											
				2.20 - 2.65					S	N=11						
				2.20 - 3.20	B											
				2.20 - 3.20	L	86	80									
				3.20	D											
				3.20	ES											
				3.20 - 3.65					S	N=5						
				3.20 - 4.20	B											
				3.20 - 4.20	L	78	70									
MADE GROUND: Loose light brown clayey slightly gravelly fine to medium SAND. Gravel is angular and subangular fine to coarse of sandstone, spent shale, cement, brick and rare coal.		4.20	84.23	4.20	D											
[MADE GROUND]		(0.80)		4.20	ES											
				4.20 - 4.65					S	N=5						
				4.20 - 5.20	B											
				4.20 - 5.20	L	78	70									
MADE GROUND: Firm light brown mottled grey and orangish slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of brick, cement, spent shale, mudstone, sandstone and rare coal. Sand is fine to medium of ash.		5.00	83.43	5.20	D											
[MADE GROUND]		(0.60)		5.20	ES											
				5.20 - 5.65					S	N=4						
				5.60	D											
				5.20 - 6.20	L	65	60									
Dark greyish brown sandy slightly gravelly organic micaceous SILT. Gravel is angular and subangular fine to medium of mudstone and coal. With rootlets present throughout.		6.20	82.23	6.20	D-NR											
[HEAD]		(0.45)		6.20 - 6.65					S	N=50						
No recovery - Casing driven to enable triple tube coring to commence. Drillers description: Clay.		6.35	82.08	6.20 - 7.00												
[HEAD]		(0.64)		6.20 - 7.00	RC	102										
Firm dark greyish brown silty gravelly CLAY with low cobble content. Gravel is angular and subangular fine to medium sandstone.		6.46	81.97	7.00	D											
[HEAD]		(0.64)		7.00 - 7.45					S	N=9						
Firm brownish grey mottled orange CLAY.				7.00 - 8.50	C											
[HEAD]				7.00 - 8.50	RC	102										
Firm to orangish brown slightly sandy gravelly CLAY. Gravel is angular to subangular weathered fine to coarse of sandstone.																
[HEAD]																
6.86 - 6.91m : Black organic rich soil and fine coal fragments		(3.88)														
Medium strong thinly bedded orangish grey medium micaceous SANDSTONE with thinly to thickly laminated siltstone and weak thin mudstone beds. Partially weathered. 1) Bedding fractures: 45degrees very closely spaced. undulating planar smooth with film of clay and orangish brown surface staining on surfaces.				8.50 - 10.00	C											
[PENNINE LOWER COAL MEASURES FORMATION]				8.50 - 10.00	RC	102										
7.10 - 8.50m : Completely weathered to clayey grey orange thinly laminated mudstone / sandstone. Relic																

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4117  
Sheet 2 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 07/09/2021

Date Completed: 10/09/2021

Survey Grid System: OSGB

Co-ordinates: 414383.86 mE  
417005.50 mN

Ground Level: 88.43 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing							TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result					Units
<p>Medium strong thinly bedded orangish grey medium micaceous SANDSTONE with thinly to thickly laminated siltstone and weak thin mudstone beds. Partially weathered. 1) Bedding fractures: 45degrees very closely spaced. undulating planar smooth with film of clay and orangish brown surface staining on surfaces.</p> <p>[PENNINE LOWER COAL MEASURES FORMATION]</p> <p>7.10 - 8.50m : Completely weathered to clayey grey orange thinly laminated mudstone / sandstone. Relic structure preserved as 45° bedding.</p> <p>9.31 - 9.72m : Very thinly bedded thinly laminated orange black siltstone.</p> <p>10.41 - 10.47m : Weak interval of grey gravelly clay. Angular gravel fragments. Distinctly weathered. Fault breccia.</p>		10.00 - 11.50	77.45	10.00 - 11.50	C RC	102						95 84 0			
		11.50 - 13.00		RC	102							80 72 0	NI 20 40		
		13.00 - 14.50		RC	102							93 78 0			
		14.50 - 16.00	(7.14)	RC	102							88 76 0			
<p>Medium strong thinly laminated very thinly bedded grey orangish black micaceous very fine SILTSTONE with fine to medium fine to medium grained grey thin sandstone and mudstone beds. Partially weathered with orange brown staining associated to bedding and incipient fractures. Bedding fractures: 45degrees very closely spaced planar rough with orange brown surface staining.</p> <p>[PENNINE LOWER COAL MEASURES FORMATION]</p> <p>11.79 - 11.82m : Weak interval of grey gravelly clay. Angular gravel fragments. Distinctly weathered.</p> <p>12.95 - 13.00m : Recovered as Weak interval of orange grey gravelly clay. Angular gravel fragments. Distinctly weathered.</p> <p>13.51 - 13.66m : Weak interval of grey gravelly clay. Angular gravel fragments. Distinctly weathered</p>		16.00 - 17.50		RC	102							93 88 9	NI 35 140		
		17.50 - 19.00		RC	102								83 74 0		
		19.00 - 20.50		RC	102								92 90 0		
<p>Weak thinly laminated thinly bedded dark grey micaceous SILTSTONE with mudstone and fine grained grey sandstone interbedded laminae / thin beds, decrease in sandstone beds from overlying interval. Partially to distinctly weathered with orange brown staining associated to bedding fractures and incipient fractures. Locally fissile beds. Bedding Fractures: 45degrees very closely spaced planar rough with orange brown surface staining.</p> <p>[PENNINE LOWER COAL MEASURES FORMATION]</p> <p>19.00 - 19.25m : Weak to very weak highly fractured. Distinctly to partially weathered micaceous fine grained sandstone.</p>		18.12	70.31												

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**





# BOREHOLE LOG

Borehole No:  
BH4117  
Sheet 4 of 4

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid System:	OSGB	Hole Type:	DS+RC
Project No:	317J-21-S1	Co-ordinates:	414383.86 mE 417005.50 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	88.43 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	- - deg.	Log Status:	DRAFT
Date Started:	07/09/2021	Inclination:	90 deg.	Print Date:	03/01/2023
Date Completed:	10/09/2021			Final Depth:	30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units				
<p>Strong thickly bedded grey micaceous fine to medium micaceous SANDSTONE with thinly laminated black siltstone. Partially to fresh weathering with orange brown surface staining associated to fractures. 1) Bedding Fractures: closely to widely spaced 10-30 degrees undulating rough with orange brown surface staining. 2) 80 degrees medium spaced undulating rough with orange brown surface staining.</p> <p>[PENNINE LOWER COAL MEASURES FORMATION] 28.25 - 30.00m : <i>Shallowing of bedding to approx 25°</i></p> <p>Borehole Terminated at 30.00m</p>															

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**

Office: BAM Ritchies, Unit 5 Taurus Park, Europa Boulevard, Gemini Business Park, Warrington, WA5 7ZT

BAM R Borehole Log 03/11/2020





# BOREHOLE LOG

Borehole No:  
BH4689  
Sheet 2 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 22/03/2021

Date Completed: 24/03/2021

Survey Grid System: OSGB

Co-ordinates: 414277.47 mE  
416891.88 mN

Ground Level: 89.15 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.70m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units				
Very weak to weak thinly to thickly laminated dark grey silty MUDSTONE. Partially weathered locally distinctly weathered. Bedding Fractures: Extremely closely to closely spaced subhorizontal undulating rough and stepped, orangish brown staining to surfaces. [PENNINE LOWER COAL MEASURES FORMATION]		10.15	79.00	9.70 - 11.20 9.70 - 11.20	C RC	146						98 94 48			
		(0.92)													
		11.07													
		11.07													
Weak to medium strong thinly to medium bedded light grey locally stained orangish brown fine grained SANDSTONE with frequent mudstone laminae. Partially weathered. Bedding Fractures: Very closely to closely spaced subhorizontal undulating rough, orangish brown staining to surfaces. [PENNINE LOWER COAL MEASURES FORMATION] <i>10.22 - 10.49m : Joint 80 degrees undulating, rough with orangish brown staining.</i>		11.20	78.08	11.20 - 12.70	RC	146						100 83 24			
		12.21													
		12.21													
Weak to moderately weak thinly to thickly laminated, locally thinly bedded dark grey silty MUDSTONE with occasional medium strong light grey fine grained sandstone laminae. Partially weathered. Bedding Fractures: Extremely closely to closely spaced subhorizontal undulating rough, orangish brown staining to surfaces. [PENNINE LOWER COAL MEASURES FORMATION] <i>12.21 - 12.47m : Joint 70 degrees undulating, rough with orangish brown staining.</i>		12.70	73.45	12.70 - 14.20 12.70 - 14.20	C RC	146						100 84 42	17 80 190		
		(4.63)													
		14.20													
Weak and moderately weak dark grey thinly to thickly laminated SILTSTONE. Partially weathered. Bedding fractures are extremely to closely spaced, undulating rough, stained orangish brown. [PENNINE LOWER COAL MEASURES FORMATION]		15.70	73.45	15.70 - 17.20 15.70 - 17.20	C RC	146						99 91 44	10 50 150		
		(7.50)													
		17.20													
		18.70		18.70 - 20.20	RC	146						96 96 63			

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**







# BOREHOLE LOG

Borehole No:  
BH4691  
Sheet 1 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414308.17 mE  
416966.53 mN

Ground Level: 88.64 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.70m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill				
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units								
MADE GROUND: Grey and pinkish grey angular medium GRAVEL of granite. [MADE GROUND] MADE GROUND: Dark grey clayey gravelly fine to coarse SAND of predominantly ash. Gravel is subangular fine to medium of clinker and occasional sandstone. [MADE GROUND] 0.10 - 0.40m : Occasional subangular sandstone cobbles (180x160x120mm) 0.80m : Water ingress (very strong hydrocarbon odour noted)		0.05	88.59	0.20	B														
		0.20			D														
		0.20			ES														
		0.50			B														
		0.50			D														
		0.50			ES														
		1.00			B														
		1.00			D														
		1.00			ES														
		1.40			ES														
MADE GROUND: Dark grey silty sandy angular fine to coarse GRAVEL of mudstone, siltstone, sandstone, clinker and spent shale. Sand is fine to coarse moderately of ash. Occasional pockets of slight sandy slightly gravelly clay up to 15mm. Hydrocarbon odour noted. [MADE GROUND] Extremely weak thinly to thickly laminated dark grey MUDSTONE destructured to residual soil. Predominantly recovered as a very clayey angular fine gravel of ordered lithorelicts. [PENNINE LOWER COAL MEASURES FORMATION] Extremely weak thinly to thickly laminated brownish grey MUDSTONE. Destructured to residual soil and recovered as very clayey angular fine to coarse gravel of ordered lithorelicts. [PENNINE LOWER COAL MEASURES FORMATION] 4.15 - 4.35m : Extremely weak dark grey thinly to thickly laminated carbonised mudstone.		1.20	87.44	1.20 - 1.65	D						PID	26.70	ppm						
		1.20			D							S	N=10						
		1.60	87.04	1.20 - 1.65	D														
		1.50			D														
		1.20 - 2.00			L	87	100					PID	49.80	ppm					
		1.75			ES							S	N=13						
		2.00 - 2.45			D														
		2.00 - 2.45			L	87	90												
		2.00 - 3.00			L														
		2.80			ES							PID	3.60	ppm					
Very weak thinly to thickly laminated dark grey SILTSTONE. Distinctly weathered to destructured. Highly fractured and recovered non intact as angular fine to coarse interlocking gravel size fragments. [PENNINE LOWER COAL MEASURES FORMATION] 5.45 - 5.75m : Recovered as angular to subangular fine to coarse gravel size fragments.		3.00 - 3.45			D														
		3.00 - 3.45			L	77	100				S	N=14							
		3.00 - 4.00			D														
		3.50			D														
		3.80			ES														
		2.80 - 5.00			EW							PID	12.20	ppm					
		3.00 - 5.00			EW														
		4.20			ES														
		4.00 - 4.45			D							PID	6.10	ppm					
		4.00 - 4.45			D							S	N=38						
No recovery. [NO RECOVERY]		3.60 - 5.00			EW														
		4.00 - 5.00			L	77	100												
		4.50			D														
		4.80			D														
		5.00 - 5.10			D														
		5.00 - 5.42			D							S	50 / 265						
		5.20 - 6.70			ES														
		5.20 - 6.70			RC	146													
		77																	
		Very weak thinly to thickly laminated dark grey carbonaceous MUDSTONE. Distinctly weathered to destructured. Highly fractured. Predominately non-intact. Recovered as locally clayey angular fine to coarse interlocking gravel size fragments with frequent dark orangish brown and orangish brown staining on gravel fragments. Occasional very thin beds of dark brownish grey ironstone. [PENNINE LOWER COAL MEASURES FORMATION] 9.70 - 9.94m : Non-intact. Recovered as angular, tabular fine to coarse gravel size fragments.		6.70	81.94	6.70 - 6.80													
6.70																			
6.70 - 8.20					RC	146													
0																			
0																			
0																			
8.20	80.44			8.20 - 8.29															
8.20																			
8.20 - 9.70					RC	146													
100																			
Very weak thinly to thickly laminated dark grey carbonaceous MUDSTONE. Distinctly weathered to destructured. Highly fractured. Predominately non-intact. Recovered as locally clayey angular fine to coarse interlocking gravel size fragments with frequent dark orangish brown and orangish brown staining on gravel fragments. Occasional very thin beds of dark brownish grey ironstone. [PENNINE LOWER COAL MEASURES FORMATION] 9.70 - 9.94m : Non-intact. Recovered as angular, tabular fine to coarse gravel size fragments.		8.20	80.44	8.20 - 8.29															
		8.20																	
8.20 - 9.70			RC	146															
100																			
0																			
0																			
9.94	78.70																		

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE LOG

Borehole No:  
BH4691  
Sheet 3 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414308.17 mE  
416966.53 mN

Ground Level: 88.64 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.70m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units				
Moderately weak to medium strong thinly laminated to thinly bedded greyish brown and dark grey fine grained silty SANDSTONE with thinly to thickly laminated dark grey sandy SILTSTONE. Locally frequent thin black interlaminae. Unweathered to partially weathered. Locally micaceous. Locally frequent subrounded clasts of dark greyish brown iron rich siltstone (up to 7x35mm). Localised lenticular bedding and cross-stratification features. Occasional incipient fractures, 65-86degrees undulating with orangish brown staining penetrating up to 2mm. Bedding Fractures: Very closely to widely spaced 0-3degrees planar and undulating rough locally with orangish brown staining penetrating up to 4mm. Joints: 68-84degrees undulating rough with orangish brown staining penetrating up to 32mm and dark reddish brown surface staining. Locally with up to 7mm soft gravelly clay infill. [PENNINE LOWER COAL MEASURES FORMATION]	.....	20.20 - 21.70	65.87	RC	146							100	NI		
												100			92
Moderately weak to medium strong thinly to thickly laminated brownish grey and greyish brown fine grained silty SANDSTONE with brownish grey sandy SILTSTONE. Unweathered to partially weathered. Localised very thin beds of whitish grey calcareous silty sandstone. Bedding Fractures: Closely to widely spaced 0-5degrees undulating and planar rough locally with orangish brown surface staining. Joints: 70-85degrees undulating and planar rough with orangish brown surface staining, locally with a trace of gravelly clay infill. [PENNINE LOWER COAL MEASURES FORMATION]	.....	21.70 - 23.20	63.21	RC	146							100	NI	180	
												100			100
Moderately weak to medium strong thinly laminated to very thinly bedded dark grey and greyish brown fine grained silty SANDSTONE with thinly laminated to very thinly bedded dark grey and light brownish grey sandy SILTSTONE. Unweathered. Bedding Fractures: Closely to medium spaced 0-4degrees undulating rough locally with a trace of gravelly clay infill. [PENNINE LOWER COAL MEASURES FORMATION] 26.20 - 26.71m : Frequent thin black interlaminae and ripple cross laminae.	.....	23.20 - 24.70	61.59	C	146							98	NI	770	
												80			80
Moderately weak to medium strong thinly laminated to very thinly bedded dark grey and greyish brown fine grained silty SANDSTONE with thinly laminated to very thinly bedded dark grey and light brownish grey sandy SILTSTONE. Unweathered. Bedding Fractures: Closely to medium spaced 0-4degrees undulating rough locally with a trace of gravelly clay infill. [PENNINE LOWER COAL MEASURES FORMATION] 26.20 - 26.71m : Frequent thin black interlaminae and ripple cross laminae.	.....	24.70 - 26.20	59.95	RC	146							96	NI	770	
												77			77
Medium strong thinly to thickly laminated light grey and grey fine grained calcareous silty SANDSTONE with thinly to thickly laminated grey sandy SILTSTONE. Unweathered to partially weathered. Localised calcite mineralisation within incipient fractures (78-85 degrees). Frequent bioturbation traces. Bedding Fractures: Medium to widely spaced 0-3degrees undulating rough, rarely with brown staining penetrating up to 240mm. [PENNINE LOWER COAL MEASURES FORMATION]	.....	26.20 - 27.70	28.69	C	146							100	NI	770	
												98			96
Medium strong to strong thinly laminated to very thinly bedded grey, dark grey and brownish grey fine grained silty SANDSTONE with grey and dark grey slightly sandy SILTSTONE. Unweathered to partially weathered. Occasional thin beds of light brownish grey to light grey calcareous silty fine grained sandstone with frequent lenticular interlaminae. Locally micaceous. Occasional undulating and stepped incipient fractures (65-85	.....	26.70 - 27.70	28.69	RC	146							100	NI	770	
												91			91
Medium strong to strong thinly laminated to very thinly bedded grey, dark grey and brownish grey fine grained silty SANDSTONE with grey and dark grey slightly sandy SILTSTONE. Unweathered to partially weathered. Occasional thin beds of light brownish grey to light grey calcareous silty fine grained sandstone with frequent lenticular interlaminae. Locally micaceous. Occasional undulating and stepped incipient fractures (65-85	.....	27.70 - 29.20	28.69	RC	146							100	NI	770	
												100			100
Medium strong to strong thinly laminated to very thinly bedded grey, dark grey and brownish grey fine grained silty SANDSTONE with grey and dark grey slightly sandy SILTSTONE. Unweathered to partially weathered. Occasional thin beds of light brownish grey to light grey calcareous silty fine grained sandstone with frequent lenticular interlaminae. Locally micaceous. Occasional undulating and stepped incipient fractures (65-85	.....	29.20 - 30.70	28.69	RC	146							100	NI	770	
												100			100

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE LOG

Borehole No:  
BH4691  
Sheet 4 of 4

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid System:	OSGB	Hole Type:	DS+RC
Project No:	317J-21-S1	Co-ordinates:	414308.17 mE 416966.53 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	88.64 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	-- deg.	Log Status:	DRAFT
Date Started:	20/03/2021	Inclination:	90 deg.	Print Date:	03/01/2023
Date Completed:	25/03/2021			Final Depth:	30.70m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
Medium strong to strong thinly laminated to very thinly bedded grey, dark grey and brownish grey fine grained silty SANDSTONE with grey and dark grey slightly sandy SILTSTONE. Unweathered to partially weathered. Occasional thin beds of light brownish grey to light grey calcareous silty fine grained sandstone with frequent lenticular interlaminae. Locally micaceous. Occasional undulating and stepped incipient fractures (65-85 degrees), with speckled whitish grey calcite mineralisation (up to 5x5mm). Bedding Fractures: Medium to widely spaced 0-2degrees undulating rough with whitish grey speckled calcite mineralisation. [PENNINE LOWER COAL MEASURES FORMATION] Borehole Terminated at 30.70m		30.70	57.94													

Stratum depths measured along borehole axis.  
 Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.  
 Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'  
 Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE INFORMATION SHEET

Borehole No  
BH4691  
Sheet 1 of 1

Project Name: Transpennine Route Upgrade SIGI Survey Grid: OSGB Hole Type: DS+RC  
 W3A - Section 1 - Boreholes GRIP 4 Part 1 TWA0 Co-ordinates: 414308.17 mE Checked By: SF  
 Project No: 317J-21-S1 416966.53 mN Approved By: JH  
 Client: Transpire Alliance Ground Level: 88.64 mOD Log Status: DRAFT  
 Engineer: Transpire Alliance Orientation: - - deg. Print Date: 03/01/2023  
 Date Started: 20/03/2021 Inclination: 90 deg. Final Depth: 30.70m  
 Date Completed: 25/03/2021

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	21/03/2021	21/03/2021	Insulated hand digging tools				Gordon McKean	Engineering Line: 10ft Huddersfield No.3/4 siding MVL3 25m 1387yd (63.0ch). Nearest Structure: Huddersfield Station Platform 8 end 56m to low mileage. Nearest Rail: Huddersfield No.3 siding 1.90m to 10ft rail no cant.
1.20 5.10	5.10 30.70	DS RC	23/03/2021 20/03/2021	23/03/2021 21/03/2021	T820-774 FRASTE ML2	Geobor S	PCD			

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
20/03/2021	23:23	0.00	0.00	Dry	Start of shift	2.00	115		2.00	115	
21/03/2021	03:22	1.20	0.00	0.90	Hole complete	4.00	87		5.00	150	
23/03/2021	17:00	0.00	0.00	Dry	Start of shift	5.00	77				
23/03/2021	18:43	5.10	2.00	0.40	Hole complete	30.70	146				
24/03/2021	15:00	5.20	0.00	0.60	Start of shift						
24/03/2021	23:00	15.70	5.00	2.10	End of shift						
25/03/2021	06:30	15.70	15.70	3.90	Start of shift						
25/03/2021	15:00	26.20	5.00	23.70	Start of shift						
25/03/2021	17:30	26.20	26.20	25.10	End of shift						
25/03/2021	23:00	0.00	0.00	Dry	Hole complete						

### Water Added Records

From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour
0.90	1.20	Water entry no rise									
							5.20	8.20	100 - 100	Water	Brown
							8.20	9.70	90 - 90	Water	Brown
							9.70	15.70	80 - 80	Water	Gray
							15.70	23.20	100 - 100	Water	Gray
							23.20	24.70	0 - 40	Water	Gray
							24.70	26.20	40 - 50	Water	Gray
							26.20	31.00	0	Water	Water

### Water Strikes

Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
							SP	1	0.00	1.00	50	Plain		0.00	0.20	910	Flush cover
							SP	1	1.00	5.00	50	Slotted		0.50	1.00	903	Bentonite
														1.00	5.00	902	Gravel
														5.00	30.70	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.20	S	N=10				1	75	2	75	3	75	4	75	3	75	3	75	T820-774	64
2.00	S	N=13	2.00	Dry		4	75	5	75	3	75	4	75	3	75	3	75	T820-774	64
3.00	S	N=14	2.00	Dry		3	75	3	75	3	75	3	75	4	75	4	75	T820-774	64
4.00	S	N=38	2.00	Dry		4	75	5	75	7	75	8	75	10	75	13	75	T820-774	64
5.00	S	50 / 265	2.00	Dry		9	75	13	75	14	75	12	75	14	75	10	40	T820-774	64
6.70	C	50 / 45	5.20	1.80	0	25	55			50	45							BRC002	70
8.20	C	50 / 40	5.20	1.80		25	50			50	40							BRC002	70

Reason for Hole Termination: Refused in mudstone

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4693  
Sheet 1 of 3

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414370.37 mE  
417069.56 mN

Ground Level: 88.13 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 29.50m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill				
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units								
MADE GROUND: Dark grey very sandy angular medium to coarse GRAVEL of basalt. Sand is fine to coarse predominantly of ash. [MADE GROUND]		(0.60)	87.53	0.20	B														
				0.20	D														
				0.20	ES														
				0.50	B														
MADE GROUND: Grey gravelly very clayey medium to coarse SAND. Gravel is angular fine to medium of shale and rare fine fragments of burnt colliery spoil. [MADE GROUND]		(0.60)	86.93	0.50	D														
				0.50	ES														
				1.00	B														
				1.00	D														
Made Ground: Greyish brown silty sandy angular to subrounded fine to coarse GRAVEL of sandstone and siltstone. Sand is fine to coarse. Occasional pockets of slightly gravelly sandy clay up to 40mm. [MADE GROUND]		(0.72)	86.21	1.20 - 1.65	D					S	N=5								
				1.20 - 1.65	D														
				1.20 - 2.00	L	87	100												
				1.80	ES														
MADE GROUND: Dark grey and brown slightly clayey sandy angular fine to coarse GRAVEL of clinker, slag, spent shale and sandstone. Sand is fine to coarse of predominantly ash. [MADE GROUND]		(1.93)	84.28	2.10	D														
				2.00 - 2.45	D							S	N=4						
				2.00 - 3.00	L	87	90												
				2.50	ES														
				2.10 - 3.80									PID	5.50	ppm				
				3.00 - 3.45	D														
MADE GROUND: Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of sandstone, siltstone and coal. Sand is fine to coarse. [MADE GROUND]		(2.75)	83.93	3.00 - 3.45	ES														
				3.40	L	87	85												
				3.00 - 4.00															
				3.90	ES														
				3.95	D														
				4.00 - 4.20	D														
Soft becoming firm light greyish brown mottled orange sandy gravelly CLAY. Gravel is angular fine to coarse of sandstone, mudstone and rare coal. Occasional cobble sized fragments same diameter of core. Sandstone <180mm thickness. Sand is fine to coarse. [MADE GROUND]		(2.85)	81.18	4.00 - 4.20	D														
				4.50	ES														
				4.80	D														
				4.20 - 5.50	RC	146													
				5.50 - 5.95	D														
				5.50 - 5.95	D									S	N=6				
Soft greyish brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone, mudstone and rare coal. Frequent cobble sized fragments of sandstone to full core diameter. Sand is fine to coarse. [HEAD]		(2.85)	78.33	5.50 - 7.00	RC	146													
				6.30	ES														
				6.50	D														
				6.75 - 6.95m : Becoming firm dark grey slightly gravelly sandy CLAY. Gravel angular fine to medium of sandstone.															
				7.50	ES														
				7.00 - 8.50	C														
Extremely weak thinly laminated light grey to grey sandy				7.00 - 8.50	RC	146													
				8.50 - 10.00	C														
				8.50 - 10.00	RC	146													
				9.90	ES														
				10.00	D														

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4693  
Sheet 2 of 3

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414370.37 mE  
417069.56 mN

Ground Level: 88.13 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 29.50m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing							TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill		
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result					Units	
Extremely weak thinly laminated light grey to grey sandy micaceous SILTSTONE. Residual soil, destructured. Recovered as a soft sandy silt. [PENNINE LOWER COAL MEASURES FORMATION] <i>9.90 - 10.05m : Layer of black slightly clayey sand discrete particles of organic matter with slight odour.</i>	xxxxxx	(0.55) 10.35	77.78													
Extremely weak light grey to grey silty micaceous MUDSTONE. Residual soil, destructured. Recovered as soft to firm slightly sandy silty clay. Occasional cobble sized fragments of sandstone to full core diameter <300mm thickness. [PENNINE LOWER COAL MEASURES FORMATION]		(1.15) 11.50	76.63	10.00 - 11.50 10.00 - 11.50 11.00	C RC D	146						100 -				
Extremely weak Dark grey to orange grey silty micaceous MUDSTONE. Residual soil, destructured. [PENNINE LOWER COAL MEASURES FORMATION]		(1.50) 13.00	75.13	11.90 - 12.40 11.50 - 13.00 11.50 - 13.00 12.50	C C RC D	146						96 -				
<i>12.90 - 13.00m : Very weak, thinly laminated orangish brown micaceous sandstone.</i> Very weak to medium strong thinly laminated to thinly bedded orangish grey becoming grey fine to medium grained silty micaceous SANDSTONE. Partially to distinctly weathered. Frequent multi orientated incipient fractures, 35-60 degrees. Bedding Fractures: Very closely to closely spaced, 0-8 degrees, undulating rough. [PENNINE LOWER COAL MEASURES FORMATION]	.....	(1.20) 14.20	73.93	13.00 - 14.50 13.00 - 14.50	C RC	146						94 94 27	10 80 200			
Moderately weak to medium strong thinly laminated to thickly laminated dark grey, locally black SILTSTONE. Locally micaceous. Occasional partially open and open incipient fractures 45-52 degrees, undulating, stepped with orangish brown staining (<3mm). Bedding Fractures: Very closely to closely spaced, 0-8 degrees, undulating rough. with occasional clay infill (<15mm). [PENNINE LOWER COAL MEASURES FORMATION]	xxxxxx	(5.30) 19.50	68.63	14.50 - 16.00 14.50 - 16.00 16.00 - 17.50 17.50 - 19.00	C RC RC RC	146						96 96 30	25 95 140			
Very weak to medium strong thinly laminated grey to light grey silty micaceous MUDSTONE with very frequent dark grey sandy SILTSTONE interlaminae. Frequently				19.00 - 20.50 19.00 - 20.50	C RC	146						100 99 63				

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE LOG

Borehole No:  
BH4693  
Sheet 3 of 3

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid System:	OSGB	Hole Type:	DS+RC
Project No:	317J-21-S1	Co-ordinates:	414370.37 mE 417069.56 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	88.13 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	-- deg.	Log Status:	DRAFT
Date Started:	20/03/2021	Inclination:	90 deg.	Print Date:	03/01/2023
Date Completed:	25/03/2021			Final Depth:	29.50m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
Very weak to medium strong thinly laminated grey to light grey silty micaceous MUDSTONE with very frequent dark grey sandy SILTSTONE interlaminae. Frequently cross bedded. Bedding Fractures: Very closely to closely spaced 0-3degrees planar and undulating rough with up to 10mm of clay and gravel infill. [PENNINE LOWER COAL MEASURES FORMATION]		20.50 - 22.00	62.07	RC	146							98 95 89	30 200 300			
				22.00 - 23.50 22.00 - 23.50	C RC	146						99 99 59				
				23.50 - 25.00	RC	146						98 98 72				
				25.00 - 26.50	RC	146						100 100 83				
Medium strong thinly to thickly laminated light grey to grey fine grained calcareous silty SANDSTONE. With thinly laminated to thickly laminated dark grey sandy SILTSTONE. Unweathered and partially weathered with frequent bioturbation. Bedding Fractures: 0-2degrees thinly spaced undulating, rough. [PENNINE LOWER COAL MEASURES FORMATION]		26.50 - 28.00 26.50 - 28.00	62.07	C RC	146						98 98 94	70 160 420				
				27.50 - 29.50	RC	146									98 98 98	
Medium strong thinly to thickly laminated dark grey to grey fine grained calcareous silty SANDSTONE. With thinly laminated to thickly laminated dark grey sandy SILTSTONE. Unweathered to partially weathered with occasional bioturbation traces. Bedding Fractures: 0-3degrees thinly spaced undulating, rough. [PENNINE LOWER COAL MEASURES FORMATION]		28.00 - 29.50	60.63	RC	146											
Borehole Terminated at 29.50m			29.50	58.63												

Stratum depths measured along borehole axis.  
 Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.  
 Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'  
 Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE INFORMATION SHEET

Borehole No  
BH4693  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid:	OSGB	Hole Type:	DS+RC
Project No:	317J-21-S1	Co-ordinates:	414370.37 mE	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	417069.56 mN	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	88.13 mOD	Log Status:	DRAFT
Date Started:	20/03/2021	Inclination:	- - deg.	Print Date:	03/01/2023
Date Completed:	25/03/2021		90 deg.	Final Depth:	29.50m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	20/03/2021	21/03/2021	Insulated hand digging tools				Gordon McKean	Engineering Line: Huddersfield No.1/2 sidings MVL3 25m 1515yd (68.9ch). Nearest Structure: Signal HU765 7m it low mileage. Nearest Rail: Huddersfield No.1 sidings 2.55m to 10ft rail no cant.
1.20	29.50	RC	21/03/2021	25/03/2021	FRASTE ML2	Geobor S	PCD		Alexander Pearce	

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
20/03/2021	23:19	0.00	0.00	Dry	Start of shift						
21/03/2021	04:44	1.20	0.00	Dry	Hole complete						
24/03/2021	10:48	0.00	0.00	Dry	Start of shift						
24/03/2021	15:00	4.20	0.00	Dry	End of shift						
24/03/2021	23:00	13.00	5.50	3.30	End of shift						
25/03/2021	07:59	13.00	13.00	5.30	Start of shift						
25/03/2021	15:03	26.50	26.50	4.70	End of shift						

### Water Added Records

From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour	
								4.20	7.00	80 - 100	Water	Light brown
								7.00	11.50	30 - 100	Water	Light brown
								11.50	13.00	60 - 100	Water	Light brown
								13.00	26.50	0	Water	

### Water Strikes

Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
							SP	1	0.00	0.10	50	GasValve/ Plain		0.00	0.05	910	Flush cover
							SP	1	0.10	1.50	50	Plain		0.05	0.30	906	Concrete
							SP	1	1.50	10.00	50	Slotted		0.30	1.50	903	Bentonite
														1.50	10.00	902	Gravel
														10.00	29.50	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.20	S	N=5	0.00	Dry		3	75	2	75	2	75	1	75	1	75	1	75	T820-774	64
2.00	S	N=4	2.00	Dry		1	75	1	75	1	75	1	75	1	75	1	75	T820-774	64
3.00	S	N=5	3.00	Dry		1	75	1	75	1	75	1	75	2	75	1	75	T820-774	64
4.00	S	50 / 50	4.00	Dry		2	75	2	75	50	50							T820-774	64
5.50	S	N=6	5.50	Dry	0	1	75	0	75	1	75	1	75	2	75	2	75	T820-774	64

Reason for Hole Termination: Refused in sandstone

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH4694  
Sheet 1 of 3

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 06/12/2020

Date Completed: 27/12/2020

Survey Grid System: OSGB

Co-ordinates: 414381.59 mE  
417042.03 mN

Ground Level: 88.44 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
Track construction. [RAIL AND CLIP]		0.20	88.24													
MADE GROUND: Grey and pinkish grey angular coarse (50-85mm) GRAVEL of granite. [MADE GROUND]		0.40	88.04	0.30	B											
		0.60	87.84	0.30	D											
		0.70		0.70	ES											
0.20 - 0.35m : Wooden sleeper adjacent		(0.50)		0.70	B											
		1.10	87.34	0.70	D											
MADE GROUND: Grey with occasional pinkish grey angular coarse (50-75mm) and fine (5-20mm) GRAVEL of granite and burnt colliery spoil. [MADE GROUND]		1.20	87.24	1.15	ES											
		1.44	87.00	1.15	ES											
MADE GROUND: Grey with occasional reddish brown slightly silty sandy fine to medium (2-20mm) of granite and burnt colliery spoil. Sand is predominantly ash. [MADE GROUND]		1.57	86.87	1.20 - 2.20	L							90				
		(0.88)		1.20 - 2.20	RC	146						0				
MADE GROUND: Dark reddish brown silty sandy angular fine to medium (2-45mm ) GRAVEL of burnt colliery soil. Sand is fine to coarse. [MADE GROUND]		2.45	85.99	2.20 - 2.65	D				S	N=10						
				2.20 - 2.65												
MADE GROUND: Greyish brown and grey slightly silty slightly sandy angular fine to coarse (2-78mm) GRAVEL of granite. Sand is fine to coarse (possible cavings) [MADE GROUND]				2.20 - 3.70	RC	146						64				
												0				
MADE GROUND: Reddish brown slightly clayey sandy GRAVEL. Gavel is angular, fine to coarse of granite and spent shale. Sand is fine to coarse. [MADE GROUND]																
MADE GROUND: Firm greyish brown mottled orangish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular, fine to medium of mudstone, siltstone and sandstone. [MADE GROUND]				3.70 - 5.20	RC	146						62				
		(4.30)										0				
MADE GROUND: Soft to firm greyish brown and brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular and tabular, fine to coarse of mudstone and sandstone. Occasional cobble size fragments of sandstone <150mm. Occasional pockets of very clayey gravel (<70x80x80mm). [MADE GROUND]				5.20 - 5.65					S	N=6						
				5.20 - 6.70	RC	146						57				
												0				
Firm to stiff greyish brown and brown slightly sandy gravelly CLAY. Locally very gravelly. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, siltstone, mudstone and coal. Occasional angular to subangular cobble size fragments of sandstone. [PENNINE LOWER COAL MEASURES FORMATION]		6.75	81.69	6.70 - 7.15					S	N=45						
				7.26 - 7.60	UT							96				
				6.70 - 8.20	RC	146						0				
		(3.21)		8.20 - 8.65					S	N=11						
				8.20 - 9.70	RC							82				
				8.86 - 9.25	UT	146						-				
		9.96	78.48													

Stratum depths measured along borehole axis.

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Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE LOG

Borehole No:  
BH4694  
Sheet 2 of 3

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 06/12/2020

Date Completed: 27/12/2020

Survey Grid System: OSGB

Co-ordinates: 414381.59 mE  
417042.03 mN

Ground Level: 88.44 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: DS+RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 30.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing							TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result					Units
Firm to stiff greyish brown and brown slightly sandy gravelly CLAY. Locally very gravelly. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone, siltstone, mudstone and coal. Occasional angular to subangular cobble size fragments of sandstone. [PENNINE LOWER COAL MEASURES FORMATION] 9.92 - 9.96m : Slightly silty fine to medium gravel of siltstone and coal.	X X X X	(1.29)	77.19	9.70 - 11.20	RC	146						100 0 0			
Extremely weak thinly to thickly laminated grey and greyish brown mottled orangish brown and reddish brown micaceous clayey SILTSTONE. Deconstructed to residual soil. Recovered as firm to stiff slightly gravelly CLAY. Sand is fine. Gravel is angular of siltstone and predominately ordered lithorelicts <40mm. [PENNINE LOWER COAL MEASURES FORMATION]	X X X X	(1.69)		11.20 - 12.70	RC	146						100 0 0	- NI -		
Extremely weak thinly laminated to very thinly bedded grey SILTSTONE. Deconstructed to residual soil. Recovered as firm gravelly CLAY. Gravel is angular of siltstone and ordered lithorelicts <42mm. [PENNINE LOWER COAL MEASURES FORMATION] 11.25 - 11.53m : Frequent orangish brown staining on deconstructed bedding fractures penetrating <5mm. 12.70 - 13.14m : 1 no. joint, 78°, undulating, smooth with light orangish brown surface staining.	X X X X	(0.64)	75.50	12.11 - 12.55	UT							92 38 12	NI 65 190		
Weak to moderately weak thinly laminated to thinly bedded greyish brown and orangish brown fine grained silty SANDSTONE with occasional thin black interlaminae. Partially to distinctly weathered. Bedding fractures: Very closely to closely spaced, 12-23 degrees, undulating, rough with orangish brown staining penetrating <12mm. Localised wall strength weakened to very weak, penetrating <20mm. Locally with soft greyish brown silty clay infill <5mm. [PENNINE LOWER COAL MEASURES FORMATION]	X X X X	(5.01)	74.86	12.70 - 14.20	RC	146						98 75 30	NI 80 178		
Weak to moderately weak thinly laminated to very thinly bedded dark grey sandy SILTSTONE with frequent very thin to thin very closely to medium spaced beds of greyish brown fine grained silty SANDSTONE. Partially to distinctly weathered. Locally frequent multi-orientated incipient fractures with orangish brown staining penetrating <2mm. Bedding fractures: Very closely to closely spaced, 6-23 degrees, undulating and planar, rough and smooth with orangish brown staining penetrating <40mm. Locally wall strength weakened to extremely weak penetrating <35mm. Occasional soft greyish brown gravelly clay infill <22mm. [PENNINE LOWER COAL MEASURES FORMATION] 13.99 - 14.20m : Non-intact. Recovered as angular fine to coarse gravel size fragments. 14.38 - 14.47m : Extremely weak. 15.93 - 16.03m : 1 no. joint, 78°, planar, smooth with orangish brown staining penetrating <55mm. Wall strength weakened to extremely weak penetrating <35mm. 17.61 - 18.03m : 1 no. joint, 82°, stepped and rough with orangish brown surface staining.	X X X X	(5.01)		14.20 - 15.70	RC	146						100 78 32			
Weak to moderately weak thinly to thickly laminated dark grey and grey sandy SILTSTONE with thinly to thickly laminated grey and greyish brown fine grained silty SANDSTONE. Partially weathered. Localised lenticular bedding. Bedding fractures: Very closely to medium spaced, 2-12 degrees, undulating and planar, rough and smooth with orangish brown staining penetrating predominately <5mm, locally <20mm. Locally <15mm of soft greyish brown sandy clay infill.	X X X X	(5.01)	69.85	15.70 - 17.20	RC	146						100 74 34	NI 45 95		
	X X X X			17.20 - 18.70	RC	146						100 97 52	NI 110 160		
	X X X X			18.70 - 20.20	RC	146									

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

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Further details given on appended 'Borehole Information Sheet'.

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# BOREHOLE INFORMATION SHEET

Borehole No  
BH4694  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid:	OSGB	Hole Type:	DS+RC
Project No:	317J-21-S1	Co-ordinates:	414381.59 mE	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	417042.03 mN	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	88.44 mOD	Log Status:	DRAFT
Date Started:	06/12/2020	Inclination:	- - deg.	Print Date:	03/01/2023
Date Completed:	27/12/2020		90 deg.	Final Depth:	30.00m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	06/12/2020	06/12/2020	Insulated hand digging tools				Gordon McKean	Engineering Line: MVL3 - 25m 1496yd (88.0ch). Nearest Structure: Signal HU769 6m to low mileage. Nearest Rail: CESS RAIL NO CANT. Slight water ingress at base of pit.
1.20	30.00	RC	24/12/2020	26/12/2020	Commachio 305	Geobor S	PCD		Calum Jones	

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
06/12/2020	02:37	0.00	0.00	Dry	Start of shift	30.00	146		30.00	146	
06/12/2020	03:26	1.20	0.00	1.18	Hole complete						
24/12/2020	03:00	1.20	0.00	Dry	Start of shift						
24/12/2020	08:00	3.70	5.20	0.40	End of shift						
25/12/2020	07:30	5.20	2.70	2.70	Start of shift						
25/12/2020	18:00	23.20	5.70	1.90	End of shift						
25/12/2020	23:30	23.20	23.20	14.70	Start of shift						
26/12/2020	04:00	30.00	30.00	14.60	Hole complete						
26/12/2020	07:30	30.00	5.70	27.70	Start of shift						
26/12/2020	18:00	0.00	0.00	Dry	Hole complete						

### Water Added Records

From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour	
								2.20	5.20	100 - 100	Water	Brown
								5.20	15.70	90 - 90	Water	Brown
								15.70	23.20	90 - 90	Water	Grey
								23.20	30.00	0	Water	Grey

### Water Strikes

Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
														0.20	30.00	903	Bentonite

### Monitoring Installation Pipe Work

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
2.20	S	N=10	2.20	0.30		1	75	2	75	2	75	3	75	2	75	3	75	BRW03	66
5.20	S	N=6	2.70	1.00	0	2	75	2	75	2	75	2	75	1	75	1	75	BRW01	66
6.70	S	N=45	2.70	1.00	0	7	75	11	75	10	75	9	75	12	75	14	75	BRW01	66
8.20	S	N=11	5.70	1.00	0	2	75	3	75	2	75	2	75	4	75	3	75	BRW01	66

Reason for Hole Termination: Reached scheduled depth

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**



# BOREHOLE LOG

Borehole No:  
BH5082  
Sheet 1 of 4

Project Name: Transpennine Route Upgrade SIGI  
W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO

Project No: 317J-21-S1

Client: Transpire Alliance

Engineer: Transpire Alliance

Date Started: 20/03/2021

Date Completed: 25/03/2021

Survey Grid System: OSGB

Co-ordinates: 414298.85 mE  
416930.80 mN

Ground Level: 89.07 mOD

Orientation: - - deg.

Inclination: 90 deg.

Hole Type: RC

Checked By: SF

Approved By: JH

Scale: 1:50

Log Status: DRAFT

Print Date: 03/01/2023

Final Depth: 31.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units					
MADE GROUND: Dark grey slightly sandy angular medium to coarse (40-75mm) GRAVEL of basalt. Sand is fine to coarse. [MADE GROUND]		0.25	88.82	0.20	B											
		0.20		0.20	D											
MADE GROUND: Dark grey silty very sandy angular to subangular fine to coarse (2-75mm) GRAVEL of basalt, concrete and occasional brick fragments. Sand is fine to coarse partially of ash. Low subangular cobble content of half red bricks, concrete and sandstone. Rare small clay pockets. [MADE GROUND]		0.50	88.27	0.50	B											
		0.50		0.50	D											
MADE GROUND: Dark grey slightly gravelly silty fine to coarse SAND of coal dust and ash. Gravel is subangular fine to medium of shale. [MADE GROUND]		1.00	87.87	1.00	B											
		1.00		1.00	D											
MADE GROUND: Dark grey slightly silty slightly sandy angular fine to coarse GRAVEL of dolerite. Possible cavings. [MADE GROUND]		1.20 - 1.65	87.72	1.20 - 1.65	D					S	N=24					
		1.20 - 1.65		1.20 - 2.50	C								98	-		
Extremely weak thinly to thickly laminated light greyish brown and grey sandy SILTSTONE. Residual soil. Recovered as firm slightly gravelly clay. Gravel is angular of predominately ordered lithorelicts (up to 6mm). [PENNINE LOWER COAL MEASURES FORMATION]		1.20 - 2.50	87.11	1.20 - 2.50	RC	146										
		1.20 - 2.50		1.20 - 2.50	RC	146							33	-		
Very weak to weak thinly laminated to very thinly interbedded greyish brown sandy SILTSTONE with weak to moderately weak light brown fine to medium grained silty SANDSTONE. Distinctly weathered. Occasional rounded clasts of reddish brown ironstone (up to 15x20mm). Bedding Fractures: Very closely to closely spaced 0-6degrees undulating rough with orangish brown staining penetrating up to 6mm. Well strength locally reduced to extremely weak penetrating up to 11mm. [PENNINE LOWER COAL MEASURES FORMATION]		2.50 - 4.00	86.09	2.50 - 4.00	C											
		2.50 - 4.00		2.50 - 4.00	ES								100			
Very weak to weak thinly to thickly laminated dark grey slightly sandy SILTSTONE with dark grey silty MUDSTONE. Partially to distinctly weathered. Bedding Fractures: Very closely to closely spaced 0-4degrees planar smooth with orangish brown staining penetrating up to 20mm, wall strength locally reduced to extremely weak penetrating up to 10mm. [PENNINE LOWER COAL MEASURES FORMATION]		2.50 - 4.00		2.50 - 4.00	RC	146										
		2.50 - 4.00		2.50 - 4.00	RC	146							80			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		4.00 - 5.50	84.34	4.00 - 5.50	RC	146										
		4.00 - 5.50		4.00 - 5.50	RC	146							39			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		6.20		6.20	ES											
		5.50 - 7.00		5.50 - 7.00	C					PID	21.20	ppm	98			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		5.50 - 7.00		5.50 - 7.00	RC	146										
		5.50 - 7.00		5.50 - 7.00	RC	146							87			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		7.00 - 8.50		7.00 - 8.50	C											
		7.00 - 8.50		7.00 - 8.50	ES								38			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		7.00 - 8.50		7.00 - 8.50	RC	146										
		7.00 - 8.50		7.00 - 8.50	RC	146							62			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		5.75 - 10.00		5.75 - 10.00	EW											
		7.90		7.90	ES								21			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		7.20 - 10.00		7.20 - 10.00	EW											
		7.20 - 10.00		7.20 - 10.00	EW								40			
Moderately weak to medium strong thinly laminated to very thinly bedded brown, greyish brown and light brown fine grained silty SANDSTONE with very thin to thin bedded light brown and orangish brown fine to medium grained SANDSTONE. Partially to distinctly weathered. Bedding Fractures: Extremely closely to closely spaced 0-4degrees undulating and planar rough and smooth with orangish brown staining penetrating up to 10mm. Joints: 75-82degrees undulating rough with orangish brown staining penetrating up to 8mm. [PENNINE LOWER COAL MEASURES FORMATION]		8.20 - 10.00		8.20 - 10.00	EW											
		8.50 - 10.00	79.70	8.50 - 10.00	RC	146							16			

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**





# BOREHOLE LOG

Borehole No:  
BH5082  
Sheet 3 of 4

Project Name:	Transpennine Route Upgrade SIGI W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO	Survey Grid System:	OSGB	Hole Type:	RC
Project No:	317J-21-S1	Co-ordinates:	414298.85 mE 416930.80 mN	Checked By:	SF
Client:	Transpire Alliance	Ground Level:	89.07 mOD	Approved By:	JH
Engineer:	Transpire Alliance	Orientation:	-- deg.	Scale:	1:50
Date Started:	20/03/2021	Inclination:	90 deg.	Log Status:	DRAFT
Date Completed:	25/03/2021			Print Date:	03/01/2023
				Final Depth:	31.00m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing							TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result					Units
Moderately weak to medium strong thinly laminated to thinly bedded grey and dark grey fine grained SANDSTONE occasionally with grey and brownish grey locally micaceous SILTSTONE. Frequent multi-orientated incipient fractures Partially to distinctly weathered. Bedding Fractures: Very closely to closely spaced 30-42degrees planar and undulating rough and smooth with orangish brown staining penetrating up to 3mm. Joints: 65-87degrees undulating rough with orangish brown staining penetrating up to 2mm. [PENNINE LOWER COAL MEASURES FORMATION] 21.32 - 21.47m : 3 no. intersecting joint sets 42-68°, predominately non-intact, recovered as angular fine to coarse interlocking gravel size fragments. 22.00 - 22.46m : Fault, 66°, Non-intact. Highly fractured. Generally recovered as angular fine to coarse interlocking gravel size fragments with clayey angular fine to medium gravel infill (fault gouge).	.....	20.50 - 22.00 20.50 - 22.00	66.61	C RC	146						100 74 56	NI 75 145			
Moderately weak to medium strong thinly to thickly laminated grey to dark grey fine grained silty SANDSTONE. Partially to distinctly weathered. Localised lenticular bedding. Bedding Fractures: Very closely to medium spaced undulating and planar rough with orangish brown staining penetrating up to 2mm. Wall strength locally weak penetrating up to 13mm. [PENNINE LOWER COAL MEASURES FORMATION] 22.83 - 22.94m : Non-intact. Highly fractured . Recovered as angular fine to coarse interlocking gravel size fragments. 23.74 - 23.95m : 1 no. joint, 76°, undulating, rough with orangish brown staining penetrating <1mm.	..... (1.49)	22.00 - 23.50 22.00 - 23.50	65.12	C RC	146						100 64 60	NI 390 580			
Moderately weak to medium strong thinly to thickly laminated light grey and grey fine grained silty SANDSTONE with thinly to thickly laminated grey sandy SILTSTONE. Unweathered to partially weathered. Frequent bioturbation traces. Bedding Fractures: Closely to medium spaced 0-2degrees undulating rough with orangish brown staining penetrating up to 4mm. Joints: 72-80 degrees planar rough locally with dark orangish brown staining penetrating throughout core, locally with calcite mineralisation up to 1mm. [PENNINE LOWER COAL MEASURES FORMATION] 25.00 - 25.31m : Locally non-intact. Recovered as angular coarse gravel size fragments.	..... (1.66)	23.50 - 25.00 25.00 - 26.50	63.46	C RC	146						100 100 96	NI 530 840			
Moderately weak to medium strong thinly laminated to very thinly bedded dark grey and grey fine grained silty SANDSTONE with thinly laminated to very thinly bedded dark grey sandy SILTSTONE. Unweathered, rarely partially weathered. Localised lenticular bedding and bioturbation traces. Bedding Fractures: Closely to widely spaced 0-5degrees undulating rough locally wall strength weakened to weak penetrating up to 7mm. [PENNINE LOWER COAL MEASURES FORMATION]	..... (2.28)	25.00 - 26.50 26.50 - 28.00	61.18	C RC	146						98 70 63	NI 530 840			
Medium strong to strong thinly laminated to thinly bedded grey to dark grey fine grained silty SANDSTONE. Unweathered to partially weathered. Locally micaceous. Bedding Fractures: Very closely to medium spaced 0-3degrees planar and undulating rough and smooth with up to 2mm clay infill. Wall strength locally weakened to very weak penetrating up to 40mm with clayey gravel infill, gravel is of angular ordered lithorelicts up to 5mm. [PENNINE LOWER COAL MEASURES FORMATION] 28.66 - 29.01m : Non-intact. Recovered as slightly clayey angular fine to coarse interlocking gravel size fragments. Possible bedding fracture disturbed by drilling.	..... (1.93)	26.50 - 28.00 28.00 - 29.50	59.25	C RC	146						98 72 54	NI 90 210			
Medium strong to strong thinly laminated to thinly	.....														

Stratum depths measured along borehole axis.  
Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.  
Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'  
Further details given on appended 'Borehole Information Sheet'.

**Please note that this log is still draft and may be subject to change.**





# BOREHOLE INFORMATION SHEET

Borehole No  
BH5082  
Sheet 1 of 1

Project Name: Transpennine Route Upgrade SIGI Survey Grid: OSGB Hole Type: RC  
 W3A - Section 1 - Boreholes GRIP 4 Part 1 TWAO Co-ordinates: 414298.85 mE Checked By: SF  
 Project No: 317J-21-S1 416930.80 mN Approved By: JH  
 Client: Transpire Alliance Ground Level: 89.07 mOD Log Status: DRAFT  
 Engineer: Transpire Alliance Orientation: - - deg. Print Date: 03/01/2023  
 Date Started: 20/03/2021 Inclination: 90 deg. Final Depth: 31.00m  
 Date Completed: 25/03/2021

Depth Related Exploratory Hole Information											
From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks	
0.00	1.20	IP	21/03/2021	21/03/2021	Insulated hand digging tools				Gordon McKean	Engineering Line: 10ft Huddersfield No.2/3 siding MVL3 25m 1352yd (61.5ch). Nearest Structure: Huddersfield Station Platform 8 end 11m to low mileage. Nearest Rail: 2.30m to Huddersfield No.3 siding 10ft rail no cant.	
1.20	31.00	RC	20/03/2021	23/03/2021	Commachio 305-1121	Geobor S	PCD		Calum Jones		

Boring-Drilling Progress						Hole Diameter by Depth				Casing Diameter by Depth			
Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks		
20/03/2021	22:30	0.00	0.00	Dry	Start of shift	10.00	146		5.50	150			
21/03/2021	02:23	1.20	0.00	Dry	Hole complete	20.50	146						
22/03/2021	10:45	1.20	0.00	Dry	Start of shift	31.00	146						
22/03/2021	15:00	10.00	10.00	5.70	End of shift								
22/03/2021	23:00	20.50	1.50	1.80	End of shift								
23/03/2021	10:05	20.50	20.50	6.80	Start of shift								
23/03/2021	15:00	31.00	1.50	28.70	Start of shift								
23/03/2021	22:53	0.00	0.00	Dry	Hole complete								
25/03/2021	15:00	26.50	5.50	3.70	Start of shift								
25/03/2021	23:00	0.00	0.00	Dry	Hole complete								

Depth Related Remarks						Chiselling / Hard Boring Details				Drilling Flush Details				
From (m)	To (m)	Remarks				From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour
22.70	31.00	Lost Flush								1.20	4.00	100 - 100	Water	Grey
										4.00	10.00	100 - 100	Water	Light grey
										10.00	17.50	80 - 100	Water	Light brown
										17.50	20.50	80 - 100	Water	Light grey
										20.50	22.00	100 - 100	Water	Light grey
										22.00	23.50	0 - 100	Water	Light grey
										23.50	31.00	0	Water	Water

Water Strikes						Monitoring Installation Pipe Work						Backfill Details					
Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
							SP	1	0.00	1.50	50	Plain		0.00	1.50	903	Bentonite
							SP	1	1.50	10.00	50	Slotted		1.50	10.00	902	Gravel
														10.00	31.00	903	Bentonite

Standard Penetration Test Results																			
Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.20	S	N=24	0.00	Dry	0	2	75	3	75	5	75	5	75	6	75	8	75	BRW03 (AR1192)	71

Reason for Hole Termination: Reached scheduled depth

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Please note that this log is still draft and may be subject to change.**

### Appendix 3 Geo-environmental Testing

**Ground Investigation Report : 151667-TSA-W3B-MVL3-DM3-X-MF-  
701248**

**(Bore holes: BH4514 and BH4518)**



# BOREHOLE LOG

Borehole No:  
BH4514  
Sheet 1 of 1

Project Name: TRU West SIGI  
W3 GRIP 4 Window Samples  
Project No: 322Q-4  
Client: TRU West Alliance  
Engineer: TRU West Alliance  
Date Started: 22/03/2021  
Date Completed: 22/03/2021

Survey Grid System: OSGB  
Co-ordinates: 414292.49 mE  
416911.43 mN  
Ground Level: 89.12 mOD  
Orientation: - - deg.  
Inclination: 90 deg.

Hole Type: WS  
Checked By: SF  
Approved By: JH  
Scale: 1:50  
Log Status: FINAL  
Print Date: 15/06/2022  
Final Depth: 0.90m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing							TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill	
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result					Units
MADE GROUND: Grey slightly clayey sandy subangular fine to coarse GRAVEL of granite. Sand is fine to coarse [MADE GROUND] MADE GROUND: Black clayey sandy subangular fine to coarse GRAVEL of granite and mudstone. Sand is fine to coarse [MADE GROUND] Extremely weak to very weak dark brown MUDSTONE recovered non intact as tabular angular fine to coarse gravel sized fragments of mudstone. [PENNINE LOWER COAL MEASURES FORMATION] Borehole Terminated at 0.90m		(0.40)	88.72	0.20	B										
		0.40		D											
		(0.30)		ES											
		0.70		B											
		0.80		D											
		0.80		ES											
		0.80		D											
		0.80		ES											
		0.80 - 0.84								S	50 / 15				
		0.80 - 0.90		D											

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.



# BOREHOLE INFORMATION SHEET

Borehole No  
BH4514  
Sheet 1 of 1

Project Name:	TRU West SIGI W3 GRIP 4 Window Samples	Survey Grid:	OSGB	Hole Type:	WS
Project No:	322Q-4	Co-ordinates:	414292.49 mE	Checked By:	SF
Client:	TRU West Alliance	Ground Level:	416911.43 mN	Approved By:	JH
Engineer:	TRU West Alliance	Orientation:	89.12 mOD	Log Status:	FINAL
Date Started:	22/03/2021	Inclination:	- - deg.	Print Date:	15/06/2022
Date Completed:	22/03/2021		90 deg.	Final Depth:	0.90m

Depth Related Exploratory Hole Information										
From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	0.90	IP	22/03/2021	22/03/2021	Insulated hand digging tools			Ian Slater	Tom O'Sullivan	

Boring-Drilling Progress						Hole Diameter by Depth			Casing Diameter by Depth		
Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
22/03/2021	17:30	0.00	0.00	Dry	Start of shift						
22/03/2021	19:06	0.90		Dry	Hole complete						

Water Added Records			
From (m)	To (m)	Volume (litres)	Remarks

Depth Related Remarks			Chiselling / Hard Boring Details				Drilling Flush Details				
From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour

Water Strikes						Monitoring Installation Pipe Work						Backfill Details					
Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
														0.00	0.90	905	Arisings

Standard Penetration Test Results																			
Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
0.80	S	50 / 15		Dry		25	30			50	15							T820-773	64

Reason for Hole Termination: Refused in probable bedrock at 0.9m

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

BAM Ritchies, Unit 5 Taurus Park, Europa Boulevard, Gemini Business Park, Warrington, WA5 7ZT BAM R Info 17/10/2017



# BOREHOLE LOG

Borehole No:  
BH4518  
Sheet 1 of 1

Project Name: TRU West SIGI  
W3 GRIP 4 Window Samples  
Project No: 322Q-4  
Client: TRU West Alliance  
Engineer: TRU West Alliance  
Date Started: 22/03/2021  
Date Completed: 22/03/2021

Survey Grid System: OSGB  
Co-ordinates: 414301.03 mE  
416947.27 mN  
Ground Level: 88.90 mOD  
Orientation: - - deg.  
Inclination: 90 deg.  
Hole Type: WS  
Checked By: SF  
Approved By: JH  
Scale: 1:50  
Log Status: FINAL  
Print Date: 15/06/2022  
Final Depth: 2.40m

Stratum Description	Legend	Depth (Thickness) (m)	Level (m)	Sampling, Coring and In Situ Testing								TCR SCR RQD %	If min If ave If max (mm)	Water	Well/ Backfill			
				Depth (m)	Type	Dia (mm)	Rec %	Blows (mins)	Test	Test Result	Units							
<p>MADE GROUND: Dark grey slightly silty gravelly fine coarse SAND predominantly of ash. Gravel is subangular to subrounded fine to coarse of basalt, clinker and sandstone. Medium subangular sandstone cobble content (180x100x90mm). [MADE GROUND]</p> <p>MADE GROUND: Black slightly clayey gravelly fine to medium SAND of ash. Gravel is angular to subangular fine to coarse of slag and clinker. [MADE GROUND]</p> <p>MADE GROUND: Firm dark grey slightly gravelly very sandy CLAY. Gravel is angular to subangular fine to coarse of slag and clinker. [MADE GROUND]</p> <p>0.50 - 0.65m : Subangular sandstone cobble (400x150x150mm)</p> <p>Extremely weak and very weak dark grey and orangish brown thinly laminated silty MUDSTONE. Distinctly weathered. [PENNINE LOWER COAL MEASURES FORMATION]</p> <p>Borehole Terminated at 2.40m</p>		0.10	88.80	0.20	B													
		(0.40)			0.20	D												
				0.50	88.40	0.20	ES											
				0.50		0.50	B				PID	7.00	ppm					
				0.75		0.50	D											
						0.50	ES											
						1.00	B				PID	11.40	ppm					
						1.00	D											
				1.25	87.65	1.00	ES											
						1.20	D				PID	16.60	ppm					
				1.20 - 1.64	S				S	50 / 285								
				1.50	ES													
				1.50	ES													
				1.20 - 2.00	Liner				PID	4.00	ppm							
				1.50 - 2.00	B													
				1.50 - 2.00	B													
				1.80	D													
				2.00	D													
			2.40	86.50	2.00 - 2.38				S	50 / 235								

Stratum depths measured along borehole axis.

Groundwater levels may be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory Holes'

Further details given on appended 'Borehole Information Sheet'.



# BOREHOLE INFORMATION SHEET

Borehole No  
BH4518  
Sheet 1 of 1

Project Name:	TRU West SIGI W3 GRIP 4 Window Samples	Survey Grid:	OSGB	Hole Type:	WS
Project No:	322Q-4	Co-ordinates:	414301.03 mE	Checked By:	SF
Client:	TRU West Alliance	Ground Level:	416947.27 mN	Approved By:	JH
Engineer:	TRU West Alliance	Orientation:	88.90 mOD	Log Status:	FINAL
Date Started:	22/03/2021	Inclination:	- - deg.	Print Date:	15/06/2022
Date Completed:	22/03/2021		90 deg.	Final Depth:	2.40m

### Depth Related Exploratory Hole Information

From (m)	To (m)	Type	Start	End	Plant	Barrel	Drill Bit	Lead Driller	Logger	Remarks
0.00	1.20	IP	22/03/2021	22/03/2021	Insulated hand digging tools			Richard McCormick	Gordon McKean	Engineering Line: Huddersfield Station sidings No.3 MVL3 25m 1368yd (62.2ch). Nearest Structure: Huddersfield Station Platform 8 end 28m to low mileage. Nearest Rail: Huddersfield sidings No.3 0.95m to 10ft rail no cant.
1.20	2.40	WS	22/03/2021	22/03/2021	T820-774			Richard McCormick	John Phelan	

### Boring-Drilling Progress

Date	Time	Depth (m)	Casing (m)	Depth Water (m)	Remarks	Depth (m)	Dia. (mm)	Remarks	Depth (m)	Dia. (mm)	Remarks
22/03/2021	13:00	0.00	0.00	Dry	Start of shift	2.00	87		0.00	87	
22/03/2021	15:00	2.40	0.00	Dry	Hole complete						

Water Added Records			Remarks
From (m)	To (m)	Volume (litres)	Remarks

### Depth Related Remarks

Depth Related Remarks			Chiselling / Hard Boring Details				Drilling Flush Details				
From (m)	To (m)	Remarks	From (m)	To (m)	Duration (hh:mm)	Tool	From (m)	To (m)	Returns (%)	Flush	Colour

### Water Strikes

Water Strikes							Monitoring Installation Pipe Work					Backfill Details					
Date	Strike (m)	Casing (m)	Time (mins)	Depth (m)	Sealed (m)	Remarks	Type	Pipe ID	From (m)	To (m)	Dia(mm)	Pipe Type	Remarks	From (m)	To (m)	Legend	Description
														0.00	0.50	905	Arisings
														0.50	2.40	903	Bentonite

### Standard Penetration Test Results

Depth (m)	Type	N Value	Casing (m)	Water (m)	SWPen(mm)	Blows1	Pen1(mm)	Blows2	Pen2(mm)	Blows3	Pen3(mm)	Blows4	Pen4(mm)	Blows5	Pen5(mm)	Blows6	Pen6(mm)	Hammer	E. Ratio%
1.20	S	50 / 285	0.00	Dry	0	3	75	9	75	11	75	12	75	13	75	14	60	T820-773	64
2.00	S	50 / 235	0.00	Dry	0	6	75	8	75	13	75	15	75	17	75	5	10	T820-773	64

Reason for Hole Termination: Refusal

Groundwater levels can be subject to seasonal, tidal and other fluctuations and should not be taken as constant.

**Ground Investigation Report : 151667-TSA-W3-MVL3-DM3-X-MF-  
701243**

**(Bore holes: BH4111, BH4112, BH4506, BH4507, BH4508, BH4509,  
BH4512, BH4520 and BH4521)**



# ABS LOG

ABS No.  
BH4111  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414265.71 mE 416764.20 mN	Checked By:	SF
Client:	Transpire	Ground Level:	89.88 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	03/03/2019			Print Date:	21/01/2021
Date Completed:	03/03/2019			Final Depth:	1.20m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Grey and dark grey angular coarse (20-60mm) GRAVEL of granite. [CLEAN BALLAST]		0.20	89.68	0.30 0.30 0.30	B D ES					
MADE GROUND: Grey and dark grey slightly silty slightly sandy angular medium to coarse (15-60mm) GRAVEL of granite. Sand is medium to coarse. [DIRTY BALLAST]		0.45	89.43	0.55	D					
MADE GROUND: Dark grey sandy angular fine to coarse (3-40mm) GRAVEL of limestone, basalt, ash and occasional brick. [COARSE GRANULAR LAYER]		0.60	89.28	0.20 - 1.20 0.75	Liner ES					
Extremely weak, thinly to thickly laminated, dark grey fissile MUDSTONE. Distinctly weathered. [WEATHERED WEAKLY CEMENTED FINE GRAINED ROCK]		0.95	88.93	0.85 1.00	D D					
ABS Terminated at 1.20m		1.20	88.68							

Reason for Hole Termination: Reached scheduled depth

Depth Related Exploratory Hole Information								Remarks
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	
0.00	1.20					Jack Greene	DART RIG	Engineering Line: DOWN 4ft - MVL3 - 25mi 1159yd. Nearest Structure: MVL3/90 0.7m to low mileage. Nearest Rail: CESS RAIL

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.50 0.20	1.20 0.50	Concrete Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4112  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414272.02 mE 416798.39 mN	Checked By:	SF
Client:	Transpire	Ground Level:	89.66 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	16/03/2019			Print Date:	21/01/2021
Date Completed:	16/03/2019			Final Depth:	1.50m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Pinkish grey and bluish grey angular to subangular coarse (50-80mm) GRAVEL of granite. [CLEAN BALLAST]		0.20	89.46	0.25 0.25 0.25	B D ES					
MADE GROUND: Dark greyish brown slightly silty slightly sandy becoming sandy angular to subangular medium to coarse (7-80mm) GRAVEL of granite and basalt. [SLIGHTLY DIRTY BALLAST]		0.40	89.26							
MADE GROUND: Dark brown slightly clayey sandy angular to subangular fine to coarse (2-70mm) GRAVEL of granite and basalt. Sand is fine to coarse. [BALLAST VOIDS FILLED WITH CLAY]		0.56	89.10	0.60	D					
Extremely weak to very weak very closely jointed thinly to thickly laminated dark grey and dark orangish brown fissile MUDSTONE with frequent clay and silt interlaminae. Distinctly weathered, surfaces are planar smooth locally polished non penetratively oxide stained and infilled with a film of silt. Partially recovered non intact as silty flat tabular subangular fine to coarse gravel size mudstone lithorelicts aligned with bedding. [WEATHERED MUDSTONE]		0.75	88.91	0.20 - 1.20	Liner					
<i>1.20 - 1.50m : Very weak to weak mudstone lithorelicts.</i>		[0.75]		1.00 1.00	D ES					
				0.75 - 1.50	B					
				1.20 - 1.50	Liner					
ABS Terminated at 1.50m		1.50	88.16	1.50	D					

Reason for Hole Termination: Refusal

Depth Related Exploratory Hole Information								
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	Remarks
0.00	1.50	0.40	0.40		None	Simon Fell	DART RIG	Engineering Line: DOWN 4ft - MVL3 - 25mi 1197yd. Nearest Structure: MVL3/90 36m to low mileage. Nearest Rail: CESS RAIL

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.60 0.20	1.50 0.60	Concrete Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4506  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414265.80 mE 416763.86 mN	Checked By:	SF
Client:	Transpire	Ground Level:	89.84 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Scale:	1:20
Date Started:	11/05/2020			Status:	FINAL
Date Completed:	12/05/2020			Print Date:	21/01/2021
				Final Depth:	0.80m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Dark grey angular coarse (22-62mm) GRAVEL of granite. [CLEAN BALLAST]		0.20 [0.30]	89.64	0.30 0.30 0.30	B D ES					
MADE GROUND: Black slightly sandy clayey angular to subangular fine to coarse (2-60mm) GRAVEL of granite. Sand is fine to coarse. [VERY DIRTY BALLAST]		0.50 [0.30]	89.34	0.70 0.70 0.70	B D ES					
ABS Terminated at 0.80m		0.80	89.04	0.70	ES					▼

Reason for Hole Termination: Refusal on probable bedrock. Water seepage prevented visual identification.

Depth Related Exploratory Hole Information									
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	Remarks	
0.00	0.80					Tom O'Sullivan	Insulated hand tools	Engineering Line: UP 4ft - MVL3. Nearest Structure: MVL3/90 South portal is 8m to low mileage Nearest Rail: CESS RAIL HIGH.	

Depth Related Remarks				Water Strikes		Backfill Details		
From (m)	To (m)	Remarks		Depth (m)	Remarks	Depth Top	Depth Base	Description
				0.80	Slow	0.20	0.80	Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4507  
Sheet 1 of 1

Project Name: Transpennine Route Upgrade SI GI  
W3 Huddersfield (Coring and ABS)  
Project No: 314Q-1  
Client: Transpire  
Engineer: Transpire  
Date Started: 11/05/2020  
Date Completed: 12/05/2020

Survey Grid System: OSGB  
Co-ordinates: 414276.43 mE  
416792.06 mN  
Ground Level: 89.68 mOD  
Orientation of Logged Face: - - deg.  
Hole Type: ABS  
Checked By: SF  
Approved By: JH  
Scale: 1:20  
Status: FINAL  
Print Date: 21/01/2021  
Final Depth: 0.70m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Grey angular coarse (23-62mm) GRAVEL of granite. [CLEAN BALLAST]		0.20	89.48	0.30	B					
MADE GROUND: Dark brown sandy clayey subangular to subrounded fine to coarse GRAVEL of sandstone, red brick and granite. Sand is fine to coarse. [CLAYEY GRANULAR LAYER]		0.40	89.28	0.30	D					
Weak brown MUDSTONE. [WEAK MUDSTONE]		0.60	89.08	0.60	B					
ABS Terminated at 0.70m		0.70	88.98	0.60	D					
					ES					

**Reason for Hole Termination: Refusal**

Depth Related Exploratory Hole Information									
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	Remarks	
0.00	0.70					Tom O'Sullivan	Insulated hand tools	Engineering Line: UP 4ft - MVL3. Nearest Structure: MVL3/90 is 34m to low mileage Nearest Rail: CESS RAIL NO CANT.	

Depth Related Remarks				Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks		Depth (m)	Remarks	Depth Top	Depth Base	
						0.20	0.70	Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4508  
Sheet 1 of 1

Project Name: Transpennine Route Upgrade SI GI  
W3 Huddersfield (Coring and ABS)  
Project No: 314Q-1  
Client: Transpire  
Engineer: Transpire  
Date Started: 11/05/2020  
Date Completed: 12/05/2020

Survey Grid System: OSGB  
Co-ordinates: 414267.03 mE  
416796.59 mN  
Ground Level: 89.66 mOD  
Orientation of Logged Face: - - deg.  
Hole Type: ABS  
Checked By: SF  
Approved By: JH  
Scale: 1:20  
Status: FINAL  
Print Date: 21/01/2021  
Final Depth: 1.10m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Grey angular coarse (23-62mm) GRAVEL of granite. [CLEAN BALLAST]		0.20	89.46	0.30	B					
MADE GROUND: Dark brown slightly sandy clayey subangular to subrounded fine to coarse (3-62mm) GRAVEL of granite. Sand is fine to coarse. [VERY DIRTY BALLAST]		0.40	89.26	0.30	D					
				0.60	B					
		[0.65]		0.60	D					
				0.60	ES					
Weak dark brown MUDSTONE. [WEAK MUDSTONE]		1.05	88.61							
		1.10	88.56							
ABS Terminated at 1.10m										

Reason for Hole Termination: Refusal

Depth Related Exploratory Hole Information										
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	Remarks		
0.00	1.10					Tom O'Sullivan	Insulated hand tools	Engineering Line: DOWN 4ft - MVL3. Nearest Structure: MVL3/90 (station portal) is 34m to low mileage. Nearest Rail: CESS RAIL NO CANT.		

Depth Related Remarks				Water Strikes		Backfill Details		
From (m)	To (m)	Remarks		Depth (m)	Remarks	Depth Top	Depth Base	Description
				1.05	Seepage	0.20	1.10	Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4509  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414295.15 mE 416830.89 mN	Checked By:	SF
Client:	Transpire	Ground Level:	89.50 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	09/11/2019			Print Date:	21/01/2021
Date Completed:	09/11/2019			Final Depth:	1.20m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track construction. [RAIL AND CLIP]										
MADE GROUND: Grey and pink angular coarse (20-100mm) GRAVEL of granite. [CLEAN BALLAST]		0.20	89.30	0.30	B					
MADE GROUND: Brownish grey slightly sandy slightly silty angular predominantly coarse (2-60mm) GRAVEL of granite. Sand is fine to coarse. [SLIGHTLY DIRTY BALLAST]		0.40	89.10	0.30	D					
MADE GROUND: Brown and grey sandy clayey angular fine to coarse (2-25mm) GRAVEL of basalt. Sand is fine to coarse. [VERY DIRTY BALLAST]		0.60	88.90	0.20 - 1.20	Liner					
MADE GROUND: Brown slightly clayey sandy angular fine to coarse GRAVEL of sandstone and brick. Sand is fine to coarse. [COARSE GRANULAR LAYER]		0.80	88.70	0.70	ES	PID	0.00	ppm		
Weak dark grey MUDSTONE. [WEAK FINE GRAINED ROCK]		1.05	88.45	0.90	ES	PID	0.00	ppm		
ABS Terminated at 1.20m		1.20	88.30	1.10	D					

Reason for Hole Termination: Refusal

Depth Related Exploratory Hole Information							
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant
0.00	1.20					Jack Greene	DART RIG

Remarks: Engineering Line: 4ft 4ft - MVL3 - 25mi 1239yd.  
Nearest Structure: MVL3/91 99m to high mileage.  
Nearest Rail: CESS RAIL

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.20	0.60	Arisings
					0.60	1.20	Concrete

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4512  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414279.96 mE 416844.15 mN	Checked By:	SF
Client:	Transpire	Ground Level:	89.51 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	09/11/2019			Print Date:	21/01/2021
Date Completed:	09/11/2019			Final Depth:	1.20m

Stratum Description	Legend	Depth [Thick-ness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Brown orange and grey silty sandy angular to subangular fine to coarse (5-75mm) GRAVEL of granite. Sand is fine and medium. [DIRTY BALLAST]		0.20 [0.36]	89.31	0.30 0.30 0.30 0.40 0.40	B D ES ES	PID	13.90	ppm		
MADE GROUND: Dark greyish brown slightly clayey sandy angular to subangular fine to coarse GRAVEL of limestone, granite, basalt and sandstone. Sand is fine to coarse. [CLAYEY/SILTY CRUSHED STONE AGGREGATE]		0.56 [0.33]	88.95	0.20 - 1.20 0.70 0.70 0.80	Liner ES D	PID	1.10	ppm		
Extremely weak thinly laminated grey MUDSTONE. Recovered non intact as grey clayey angular fine to medium gravel of mudstone. [WEATHERED FINE GRAINED ROCK]		0.89 [0.31]	88.62	1.00 1.00 1.10	ES D	PID	0.90	ppm		
ABS Terminated at 1.20m		1.20	88.31							

Reason for Hole Termination: Refusal

Depth Related Exploratory Hole Information							
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant
0.00	1.20					Jack Greene	DART RIG

Remarks: Engineering Line: 4ft 4ft - MVL3 - 25mi 1244yd.  
Nearest Structure: MVL3/91 94m to high mileage.  
Nearest Rail: CESS RAIL

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.60 0.20	1.20 0.60	Concrete Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4520  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414345.23 mE 417014.04 mN	Checked By:	SF
Client:	Transpire	Ground Level:	88.68 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	09/11/2019			Print Date:	21/01/2021
Date Completed:	09/11/2019			Final Depth:	2.20m

Stratum Description	Legend	Depth [Thick-ness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track construction. [RAIL AND CLIP]										
MADE GROUND: Grey and pink angular coarse (20-90mm) GRAVEL of granite. [CLEAN BALLAST]		0.20 [0.30]	88.48	0.30 0.30 0.30	B D ES					
MADE GROUND: Brownish grey and pink slightly sandy angular predominantly coarse (2-60mm) GRAVEL of granite. Sand is fine to coarse. [SLIGHTLY DIRTY BALLAST]		0.50	88.18	0.60 0.60	ES	PID	0.00	ppm		
MADE GROUND: Brown and grey slightly sandy slightly clayey angular predominantly medium and coarse (2-80mm) GRAVEL of basalt and quartzite. Sand is fine to coarse. [DIRTY BALLAST]		0.75	87.93	0.80 0.80	ES	PID	8.20	ppm		
Stiff yellow brown and orange slightly sandy gravelly CLAY. Gravel is tabular angular fine to medium of mudstone and sandstone lithorelicts. Sand is fine to medium. [STIFF CLAY]		0.90	87.78	1.20	Liner					
<i>0.90m : Geotextile membrane present.</i>										
		[1.30]		0.90 - 2.20	B					
ABS Terminated at 2.20m		2.20	86.48							

Reason for Hole Termination: Reached scheduled depth

Depth Related Exploratory Hole Information								Remarks
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	
0.00	2.20					Daniel Roberts	DART RIG	Engineering Line: 4ft 4ft - MVL3 - 25mi 1444yd. Nearest Structure: MVL3/92 48m to high mileage. Nearest Rail: CESS RAIL

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.60 0.20	2.20 0.60	Concrete Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'



# ABS LOG

ABS No.  
BH4521  
Sheet 1 of 1

Project Name:	Transpennine Route Upgrade SI GI W3 Huddersfield (Coring and ABS)	Survey Grid System:	OSGB	Hole Type:	ABS
Project No:	314Q-1	Co-ordinates:	414354.87 mE 417014.25 mN	Checked By:	SF
Client:	Transpire	Ground Level:	88.52 mOD	Approved By:	JH
Engineer:	Transpire	Orientation of Logged Face:	-- deg.	Status:	FINAL
Date Started:	09/11/2019			Print Date:	21/01/2021
Date Completed:	09/11/2019			Final Depth:	2.20m

Stratum Description	Legend	Depth [Thickness] (m)	Level (m)	Sampling and In Situ Testing					Water Strikes	Well
				Depth (m)	Type	Test	Test Result	Units		
Track Construction. [RAIL AND CLIP]										
MADE GROUND: Greenish grey and grey slightly sandy slightly clayey angular to subangular medium to coarse (10-40mm) GRAVEL of limestone and granite. Sand is fine to coarse. [DIRTY BALLAST]		0.20	88.32							
MADE GROUND: Black slightly clayey sandy angular fine to coarse GRAVEL of ash, tar and clinker. Sand is coarse of predominantly ash. Strong hydrocarbon odour. [COARSE ASH]		0.40	88.12	0.30 0.30 0.30 0.30 0.50 0.50	B D ES ES	PID PID	4.00 9.30	ppm ppm		
MADE GROUND: Firm brown, greenish grey and yellowish grey gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of mudstone and sandstone. Appears reworked. [FIRM CLAY]		0.62	87.90	0.20 - 1.20 0.70 0.70 0.80	Liner ES D	PID	2.00	ppm		
		[1.58]		1.20 - 1.80	B					
				1.20 - 2.20	Liner					
ABS Terminated at 2.20m		2.20	86.32							

Reason for Hole Termination: Reached scheduled depth

Depth Related Exploratory Hole Information								Remarks
From (m)	To (m)	Length (m)	Width (m)	Stability	Shoring	Logger	Plant	
0.00	2.20					Jack Greene	DART RIG	Engineering Line: 4ft 4ft - MVL3 - 25mi 1450yd. Nearest Structure: MVL3/92 43m to high mileage. Nearest Rail: CESS RAIL

Depth Related Remarks			Water Strikes		Backfill Details		Description
From (m)	To (m)	Remarks	Depth (m)	Remarks	Depth Top	Depth Base	
					0.60 0.20	2.20 0.60	Concrete Arisings

Groundwater levels are subject to seasonal, tidal and other fluctuations and should not be taken as constant.

Explanation of symbols and abbreviations given in 'Key to Exploratory holes'

### Appendix

#### 3 Geo environmental Testing

## FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 19/02000, 19/02160, 19/02772, 19/02950, 19/03330,  
19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954  
**Issue Number:** 1 **Date:** 18 May, 2020

**Client:** BAM Ritchies Warrington  
Unit 5  
Taurus Park  
Europa Boulevard  
Warrington  
UK  
WA5 7ZT

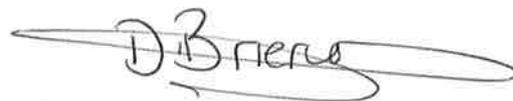
**Project Manager:** Jamie Hogg  
**Project Name:** Transpennine Route Upgrade Zone 4 Tranche 2  
**Project Ref:** 314Q-1  
**Order No:** RIT135 972 058  
**Date Samples Received:** 26/02/19  
**Date Instructions Received:** 01/03/19  
**Date Analysis Completed:** 15/01/20

**Prepared by:**



Holly Neary-King  
Administration & Client Services Supervisor

**Approved by:**



Danielle Brierley  
Client Manager

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02000/1	19/02000/2	19/02000/3	19/02000/4	19/02000/5	19/02000/6	19/02160/1	Units	Limit of Detection	Method ref
Client Sample No	BH4100ES01	BH4101ES01	BH4102ES01	BH4103ES01	BH4104ES01	BH4105ES01	BH4106ES01			
Client Sample ID	BH4100	BH4101	BH4102	BH4103	BH4104	BH4105	BH4106			
Depth to Top	0.30	0.25	0.30	0.25	0.30	0.25	0.30			
Depth To Bottom										
Date Sampled	24-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	24-Feb-19	25-Feb-19	03-Mar-19			
Sample Type	Solid - Fines									
Sample Matrix Code	7	7	7	7	7	7	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
pH <sub>D</sub> <sup>M#</sup>	8.44	9.11	8.19	8.12	8.82	9.13	9.51	pH	0.01	A-T-031s
Arsenic <sub>D</sub> <sup>M#</sup>	2	<1	<1	3	<1	<1	<1	mg/kg	1	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	38	7	42	52	11	9	77	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	19	7	24	32	8	10	9	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	13	4	8	8	3	5	4	mg/kg	1	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	16	5	16	17	7	7	4	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	93	108	99	99	49	55	78	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	4.0	<0.1	13.3	10.1	3.8	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	10.2	2.2	621	896	129	12.5	<0.1	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	136	217	1140	1640	393	36.9	8.6	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	151	220	1780	2550	526	49.2	8.6	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	1.3	<0.1	3.9	3.5	2.6	0.9	<0.1	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	2.8	0.2	142	203	31.7	5.7	<0.1	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	19.4	19.0	218	310	67.0	8.7	<0.1	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	23.6	19.2	365	516	101	15.3	<0.1	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	174	239	2140	3060	628	64.7	8.6	mg/kg	0.1	A-T-023s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02000/1	19/02000/2	19/02000/3	19/02000/4	19/02000/5	19/02000/6	19/02160/1	Units	Limit of Detection	Method ref			
Client Sample No	BH4100ES01	BH4101ES01	BH4102ES01	BH4103ES01	BH4104ES01	BH4105ES01	BH4106ES01						
Client Sample ID	BH4100	BH4101	BH4102	BH4103	BH4104	BH4105	BH4106						
Depth to Top	0.30	0.25	0.30	0.25	0.30	0.25	0.30						
Depth To Bottom													
Date Sampled	24-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	24-Feb-19	25-Feb-19	03-Mar-19						
Sample Type	Solid - Fines												
Sample Matrix Code	7	7	7	7	7	7	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD						A-T-045						
Asbestos ACM - Suitable for Water Absorption Test?	N/A												

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02000/1	19/02000/2	19/02000/3	19/02000/4	19/02000/5	19/02000/6	19/02160/1	Units	Limit of Detection	Method ref
Client Sample No	BH4100ES01	BH4101ES01	BH4102ES01	BH4103ES01	BH4104ES01	BH4105ES01	BH4106ES01			
Client Sample ID	BH4100	BH4101	BH4102	BH4103	BH4104	BH4105	BH4106			
Depth to Top	0.30	0.25	0.30	0.25	0.30	0.25	0.30			
Depth To Bottom										
Date Sampled	24-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	24-Feb-19	25-Feb-19	03-Mar-19			
Sample Type	Solid - Fines									
Sample Matrix Code	7	7	7	7	7	7	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	0.04	0.02	0.03	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	0.09	0.05	0.06	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	0.07	<0.04	0.05	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	0.14	0.07	0.07	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	0.09	0.25	0.07	0.07	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	0.29	0.13	0.14	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	0.02	0.03	0.01	0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	0.06	0.04	0.05	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	0.10	0.46	0.14	0.14	<0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	0.19	0.61	0.13	0.11	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	0.40	2.12	0.66	0.73	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02000/1	19/02000/2	19/02000/3	19/02000/4	19/02000/5	19/02000/6	19/02160/1	Units	Limit of Detection	Method ref			
Client Sample No	BH4100ES01	BH4101ES01	BH4102ES01	BH4103ES01	BH4104ES01	BH4105ES01	BH4106ES01						
Client Sample ID	BH4100	BH4101	BH4102	BH4103	BH4104	BH4105	BH4106						
Depth to Top	0.30	0.25	0.30	0.25	0.30	0.25	0.30						
Depth To Bottom													
Date Sampled	24-Feb-19	25-Feb-19	25-Feb-19	25-Feb-19	24-Feb-19	25-Feb-19	03-Mar-19						
Sample Type	Solid - Fines												
Sample Matrix Code	7	7	7	7	7	7	8						
TPH CWG													
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/2	19/02160/3	19/02160/4	19/02160/5	19/02160/6	19/02160/7	19/02160/8	Units	Limit of Detection	Method ref
Client Sample No	BH4107ES01	BH4108ES01	BH4109ES01	BH4110ES01	BH4111ES01	BH4138ES01	BH4141ES01			
Client Sample ID	BH4107	BH4108	BH4109	BH4110	BH4111	BH4138	BH4141			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	03-Mar-19									
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
pH <sub>D</sub> <sup>M#</sup>	8.73	8.85	8.54	8.67	9.12	8.90	9.33	pH	0.01	A-T-031s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	16	62	34	30	24	105	34	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	7	10	15	12	13	13	7	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	3	3	6	4	5	12	4	mg/kg	1	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	4	4	9	6	8	14	6	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	69	71	63	80	32	122	47	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	13.7	<0.1	<0.1	<0.1	36.5	11.5	<0.1	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	424	11.6	<0.1	<0.1	2430	618	21.6	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	437	11.6	<0.1	<0.1	2460	629	21.6	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	4.7	<0.1	<0.1	<0.1	12.3	4.6	<0.1	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	48.1	<0.1	<0.1	<0.1	309	67.1	<0.1	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	52.9	<0.1	<0.1	<0.1	321	71.7	<0.1	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	490	11.6	<0.1	<0.1	2780	701	21.6	mg/kg	0.1	A-T-023s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/2	19/02160/3	19/02160/4	19/02160/5	19/02160/6	19/02160/7	19/02160/8	Units	Limit of Detection	Method ref			
Client Sample No	BH4107ES01	BH4108ES01	BH4109ES01	BH4110ES01	BH4111ES01	BH4138ES01	BH4141ES01						
Client Sample ID	BH4107	BH4108	BH4109	BH4110	BH4111	BH4138	BH4141						
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30						
Depth To Bottom													
Date Sampled	03-Mar-19												
Sample Type	Solid - Fines												
Sample Matrix Code	8	8	8	8	8	8	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD						A-T-045						
Asbestos ACM - Suitable for Water Absorption Test?	N/A												

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/2	19/02160/3	19/02160/4	19/02160/5	19/02160/6	19/02160/7	19/02160/8	Units	Limit of Detection	Method ref
Client Sample No	BH4107ES01	BH4108ES01	BH4109ES01	BH4110ES01	BH4111ES01	BH4138ES01	BH4141ES01			
Client Sample ID	BH4107	BH4108	BH4109	BH4110	BH4111	BH4138	BH4141			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	03-Mar-19									
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.10	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.14	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.14	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/2	19/02160/3	19/02160/4	19/02160/5	19/02160/6	19/02160/7	19/02160/8	Units	Limit of Detection	Method ref
Client Sample No	BH4107ES01	BH4108ES01	BH4109ES01	BH4110ES01	BH4111ES01	BH4138ES01	BH4141ES01			
Client Sample ID	BH4107	BH4108	BH4109	BH4110	BH4111	BH4138	BH4141			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	03-Mar-19									
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/9	19/02160/10	19/02160/11	19/02401/1	19/02401/2	19/02401/3	19/02401/4	Units	Limit of Detection	Method ref
Client Sample No	BH4144ES01	BH4146ES01	BH4151ES01	BH4200ES01	BH4203ES01	BH4205ES01	BH4207ES01			
Client Sample ID	BH4144	BH4146	BH4151	BH4200	BH4203	BH4205	BH4207			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	03-Mar-19	03-Mar-19	03-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19			
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1			
pH <sub>D</sub> <sup>M#</sup>	9.23	9.22	8.79	9.08	8.89	9.11	8.91	pH	0.01	A-T-031s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	43	13	11	11	7	6	44	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	13	20	8	5	12	7	17	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	3	4	5	1	3	2	4	mg/kg	1	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	10	11	7	7	10	8	12	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	67	68	48	27	57	28	68	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	2.6	<0.1	0.5	<0.1	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	1.6	<0.1	14.1	29.1	2.7	11.2	3.3	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	230	70.1	685	182	157	46.4	111	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	231	70.1	700	214	159	58.0	114	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	2.0	0.4	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	0.5	<0.1	7.5	5.2	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	15.2	<0.1	68.9	8.2	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	15.7	<0.1	78.4	13.8	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	247	70.1	778	228	159	58.0	114	mg/kg	0.1	A-T-023s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/9	19/02160/10	19/02160/11	19/02401/1	19/02401/2	19/02401/3	19/02401/4	Units	Limit of Detection	Method ref			
Client Sample No	BH4144ES01	BH4146ES01	BH4151ES01	BH4200ES01	BH4203ES01	BH4205ES01	BH4207ES01						
Client Sample ID	BH4144	BH4146	BH4151	BH4200	BH4203	BH4205	BH4207						
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30						
Depth To Bottom													
Date Sampled	03-Mar-19	03-Mar-19	03-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19						
Sample Type	Solid - Fines												
Sample Matrix Code	8	8	8	8	8	8	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD						A-T-045						
Asbestos ACM - Suitable for Water Absorption Test?	N/A												

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/9	19/02160/10	19/02160/11	19/02401/1	19/02401/2	19/02401/3	19/02401/4	Units	Limit of Detection	Method ref
Client Sample No	BH4144ES01	BH4146ES01	BH4151ES01	BH4200ES01	BH4203ES01	BH4205ES01	BH4207ES01			
Client Sample ID	BH4144	BH4146	BH4151	BH4200	BH4203	BH4205	BH4207			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	03-Mar-19	03-Mar-19	03-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19			
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02160/9	19/02160/10	19/02160/11	19/02401/1	19/02401/2	19/02401/3	19/02401/4	Units	Limit of Detection	Method ref			
Client Sample No	BH4144ES01	BH4146ES01	BH4151ES01	BH4200ES01	BH4203ES01	BH4205ES01	BH4207ES01						
Client Sample ID	BH4144	BH4146	BH4151	BH4200	BH4203	BH4205	BH4207						
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30						
Depth To Bottom													
Date Sampled	03-Mar-19	03-Mar-19	03-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19						
Sample Type	Solid - Fines												
Sample Matrix Code	8	8	8	8	8	8	8						
TPH CWG													
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/5	19/02401/6	19/02401/7	19/02401/8	19/02401/9	19/02401/10	19/02401/11	Units	Limit of Detection	Method ref
Client Sample No	BH4212ES01	BH4214ES01	BH4216ES01	BH4218ES01	BH4225ES01	BH4230ES01	BH4242ES01			
Client Sample ID	BH4212	BH4214	BH4216	BH4218	BH4225	BH4230	BH4242			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	10-Mar-19			
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
pH <sub>D</sub> <sup>M#</sup>	8.93	8.88	9.09	8.85	9.03	8.84	9.18	pH	0.01	A-T-031s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	80	42	5	81	13	39	45	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	13	9	13	14	8	15	8	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	5	4	2	25	8	3	1	mg/kg	1	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	10	7	11	10	7	15	7	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	72	47	39	73	71	60	67	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	1.0	<0.1	0.7	<0.1	0.9	13.3	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	7.6	6.6	<0.1	7.3	1.3	4.3	103	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	142	69.5	<0.1	239	95.6	84.7	104	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	149	77.2	<0.1	247	96.9	89.9	220	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.6	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	19.6	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	13.7	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	36.8	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	149	77.2	<0.1	247	96.9	89.9	257	mg/kg	0.1	A-T-023s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/5	19/02401/6	19/02401/7	19/02401/8	19/02401/9	19/02401/10	19/02401/11	Units	Limit of Detection	Method ref			
Client Sample No	BH4212ES01	BH4214ES01	BH4216ES01	BH4218ES01	BH4225ES01	BH4230ES01	BH4242ES01						
Client Sample ID	BH4212	BH4214	BH4216	BH4218	BH4225	BH4230	BH4242						
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30						
Depth To Bottom													
Date Sampled	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	10-Mar-19						
Sample Type	Solid - Fines												
Sample Matrix Code	8	8	8	8	8	8	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD						A-T-045						
Asbestos ACM - Suitable for Water Absorption Test?	N/A												

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/5	19/02401/6	19/02401/7	19/02401/8	19/02401/9	19/02401/10	19/02401/11	Units	Limit of Detection	Method ref
Client Sample No	BH4212ES01	BH4214ES01	BH4216ES01	BH4218ES01	BH4225ES01	BH4230ES01	BH4242ES01			
Client Sample ID	BH4212	BH4214	BH4216	BH4218	BH4225	BH4230	BH4242			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30			
Depth To Bottom										
Date Sampled	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	10-Mar-19			
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/5	19/02401/6	19/02401/7	19/02401/8	19/02401/9	19/02401/10	19/02401/11	Units	Limit of Detection	Method ref			
Client Sample No	BH4212ES01	BH4214ES01	BH4216ES01	BH4218ES01	BH4225ES01	BH4230ES01	BH4242ES01						
Client Sample ID	BH4212	BH4214	BH4216	BH4218	BH4225	BH4230	BH4242						
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.30	0.30						
Depth To Bottom													
Date Sampled	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	09-Mar-19	10-Mar-19						
Sample Type	Solid - Fines												
Sample Matrix Code	8	8	8	8	8	8	8						
TPH CWG													
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/12	19/02772/1	19/02772/3	19/02772/5	19/02772/6	19/02772/7	19/02772/8	Units	Limit of Detection	Method ref
Client Sample No	BH4250ES01	BH4112ES01	BH4122ES02	BH4124ES02	BH4124ES03	BH4126ES01	BH4132ES01			
Client Sample ID	BH4250	BH4112	BH4122	BH4124	BH4124	BH4126	BH4132			
Depth to Top	0.30	0.25	0.60	0.45	0.65	0.25	0.25			
Depth To Bottom										
Date Sampled	10-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	6AE	8	7	8	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	27.0	<0.1	<0.1	<0.1	<0.1			
pH <sub>D</sub> <sup>M#</sup>	9.38	9.17	7.71	8.51	7.81	8.81	8.70	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	-	<10	3	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	-	0.30	6.66	0.41	1.96	0.18	0.14	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	-	<5	5	<5	<5	<5	<5	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	6	7	<1	3	<1	<1	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	-	<0.5	1.5	1.0	1.6	<0.5	<0.5	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	-	2.5	3.5	2.3	3.3	4.2	1.4	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	8	44	64	39	67	66	17	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	7	8	25	12	35	14	8	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	2	5	45	11	35	81	5	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	-	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	8	6	40	14	49	16	11	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	-	<1	1	<1	3	2	<1	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	-	60	31	53	37	234	53	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	23	71	142	70	105	97	50	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	0.7	-	<0.1	6.4	-	-	-	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	60.6	-	<0.1	96.4	-	-	-	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	61.3	-	<0.1	103	-	-	-	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	<0.1	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	61.3	-	<0.1	103	-	-	-	mg/kg	0.1	A-T-023s



Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/12	19/02772/1	19/02772/3	19/02772/5	19/02772/6	19/02772/7	19/02772/8	Units	Limit of Detection	Method ref
Client Sample No	BH4250ES01	BH4112ES01	BH4122ES02	BH4124ES02	BH4124ES03	BH4126ES01	BH4132ES01			
Client Sample ID	BH4250	BH4112	BH4122	BH4124	BH4124	BH4126	BH4132			
Depth to Top	0.30	0.25	0.60	0.45	0.65	0.25	0.25			
Depth To Bottom										
Date Sampled	10-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	6AE	8	7	8	8			
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil <sup>#</sup>	-	-	NAD	-	NAD	-	-			
Asbestos ACM - Suitable for Water Absorption Test?	-	-	N/A	-	N/A	-	-			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/12	19/02772/1	19/02772/3	19/02772/5	19/02772/6	19/02772/7	19/02772/8	Units	Limit of Detection	Method ref			
Client Sample No	BH4250ES01	BH4112ES01	BH4122ES02	BH4124ES02	BH4124ES03	BH4126ES01	BH4132ES01						
Client Sample ID	BH4250	BH4112	BH4122	BH4124	BH4124	BH4126	BH4132						
Depth to Top	0.30	0.25	0.60	0.45	0.65	0.25	0.25						
Depth To Bottom													
Date Sampled	10-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19						
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Solid	Solid - Fines	Solid - Fines						
Sample Matrix Code	8	8	6AE	8	7	8	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	NAD	-	NAD	-	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	-	N/A	-	N/A	N/A						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/12	19/02772/1	19/02772/3	19/02772/5	19/02772/6	19/02772/7	19/02772/8	Units	Limit of Detection	Method ref
Client Sample No	BH4250ES01	BH4112ES01	BH4122ES02	BH4124ES02	BH4124ES03	BH4126ES01	BH4132ES01			
Client Sample ID	BH4250	BH4112	BH4122	BH4124	BH4124	BH4126	BH4132			
Depth to Top	0.30	0.25	0.60	0.45	0.65	0.25	0.25			
Depth To Bottom										
Date Sampled	10-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	6AE	8	7	8	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	0.03	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	0.02	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	0.09	0.02	<0.02	-	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	0.14	0.05	<0.04	-	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	0.12	0.06	<0.04	-	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	0.16	0.10	<0.05	-	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	0.09	0.06	<0.05	-	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	-	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	0.15	0.08	<0.06	-	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	-	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	0.28	0.11	<0.08	-	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	0.03	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	0.10	0.07	0.04	-	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	0.09	<0.03	<0.03	-	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	0.22	0.07	0.05	-	<0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	0.23	0.10	<0.07	-	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	1.75	0.72	0.09	-	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/12	19/02772/1	19/02772/3	19/02772/5	19/02772/6	19/02772/7	19/02772/8	Units	Limit of Detection	Method ref
Client Sample No	BH4250ES01	BH4112ES01	BH4122ES02	BH4124ES02	BH4124ES03	BH4126ES01	BH4132ES01			
Client Sample ID	BH4250	BH4112	BH4122	BH4124	BH4124	BH4126	BH4132			
Depth to Top	0.30	0.25	0.60	0.45	0.65	0.25	0.25			
Depth To Bottom										
Date Sampled	10-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	6AE	8	7	8	8			
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	-	<0.01	<0.01	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	<0.01	-	-	-	-	-	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02401/12	19/02772/1	19/02772/3	19/02772/5	19/02772/6	19/02772/7	19/02772/8	Units	Limit of Detection	Method ref
Client Sample No	BH4250ES01	BH4112ES01	BH4122ES02	BH4124ES02	BH4124ES03	BH4126ES01	BH4132ES01			
Client Sample ID	BH4250	BH4112	BH4122	BH4124	BH4124	BH4126	BH4132			
Depth to Top	0.30	0.25	0.60	0.45	0.65	0.25	0.25			
Depth To Bottom										
Date Sampled	10-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19	16-Mar-19	17-Mar-19	16-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	6AE	8	7	8	8			
P-18-0076 Suite E3										
Ali >C35-C44 <sub>A</sub>	-	-	<0.1	4.0	-	-	-			
Aro >C35-C44 <sub>A</sub>	-	-	<0.1	<0.1	-	-	-	mg/kg	0.1	A-T-023s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02772/9	19/02772/10	19/02772/11	19/02772/12	19/02772/13	19/02950/1	19/02950/2	Units	Limit of Detection	Method ref
Client Sample No	BH4163ES01	BH4172ES01	BH4174ES01	BH4179ES01	BH4182ES01					
Client Sample ID	BH4163	BH4172	BH4174	BH4179	BH4182	BH4136	BH4153			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.25	0.25			
Depth To Bottom										
Date Sampled	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19					
Sample Type	Solid - Fines	Solid	Solid							
Sample Matrix Code	8	8	8	8	8	7	7			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH <sub>D</sub> <sup>M#</sup>	8.87	9.03	8.96	8.98	8.91	9.36	8.89	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	0.11	0.24	0.07	0.15	0.10	0.09	0.05	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	<5	<5	<5	<5	<5	<5	<5	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	2	<1	<1	<1	<1	<1	1	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	2.3	3.0	2.7	1.4	2.3	<0.5	<0.5	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	47	23	35	15	23	8	14	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	19	20	17	8	11	65	29	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	12	6	3	6	5	2	4	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	14	15	16	7	10	54	29	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	<1	1	2	<1	1	<1	<1	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	51	63	62	35	67	29	29	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	60	89	77	39	73	22	47	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	0.01	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s



Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02772/9	19/02772/10	19/02772/11	19/02772/12	19/02772/13	19/02950/1	19/02950/2	Units	Limit of Detection	Method ref
Client Sample No	BH4163ES01	BH4172ES01	BH4174ES01	BH4179ES01	BH4182ES01					
Client Sample ID	BH4163	BH4172	BH4174	BH4179	BH4182	BH4136	BH4153			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.25	0.25			
Depth To Bottom										
Date Sampled	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19					
Sample Type	Solid - Fines	Solid	Solid							
Sample Matrix Code	8	8	8	8	8	7	7			
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil <sup>#</sup>	-	-	-	-	-	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	-	-	-	-	N/A	N/A			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02772/9	19/02772/10	19/02772/11	19/02772/12	19/02772/13	19/02950/1	19/02950/2	Units	Limit of Detection	Method ref			
Client Sample No	BH4163ES01	BH4172ES01	BH4174ES01	BH4179ES01	BH4182ES01								
Client Sample ID	BH4163	BH4172	BH4174	BH4179	BH4182	BH4136	BH4153						
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.25	0.25						
Depth To Bottom													
Date Sampled	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19								
Sample Type	Solid - Fines	Solid	Solid										
Sample Matrix Code	8	8	8	8	8	7	7						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	NAD	NAD	NAD	NAD	-	-			A-T-045			
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	-	-						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02772/9	19/02772/10	19/02772/11	19/02772/12	19/02772/13	19/02950/1	19/02950/2	Units	Limit of Detection	Method ref
Client Sample No	BH4163ES01	BH4172ES01	BH4174ES01	BH4179ES01	BH4182ES01					
Client Sample ID	BH4163	BH4172	BH4174	BH4179	BH4182	BH4136	BH4153			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.25	0.25			
Depth To Bottom										
Date Sampled	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19					
Sample Type	Solid - Fines	Solid	Solid							
Sample Matrix Code	8	8	8	8	8	7	7			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02772/9	19/02772/10	19/02772/11	19/02772/12	19/02772/13	19/02950/1	19/02950/2	Units	Limit of Detection	Method ref
Client Sample No	BH4163ES01	BH4172ES01	BH4174ES01	BH4179ES01	BH4182ES01					
Client Sample ID	BH4163	BH4172	BH4174	BH4179	BH4182	BH4136	BH4153			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.25	0.25			
Depth To Bottom										
Date Sampled	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19					
Sample Type	Solid - Fines	Solid	Solid							
Sample Matrix Code	8	8	8	8	8	7	7			
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02772/9	19/02772/10	19/02772/11	19/02772/12	19/02772/13	19/02950/1	19/02950/2	Units	Limit of Detection	Method ref
Client Sample No	BH4163ES01	BH4172ES01	BH4174ES01	BH4179ES01	BH4182ES01					
Client Sample ID	BH4163	BH4172	BH4174	BH4179	BH4182	BH4136	BH4153			
Depth to Top	0.30	0.30	0.30	0.30	0.30	0.25	0.25			
Depth To Bottom										
Date Sampled	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19	16-Mar-19					
Sample Type	Solid - Fines	Solid	Solid							
Sample Matrix Code	8	8	8	8	8	7	7			
P-18-0076 Suite E3										
Ali >C35-C44 <sub>A</sub>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C35-C44 <sub>A</sub>	-	-	-	-	-	<0.1	<0.1	mg/kg	0.1	A-T-023s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02950/3	19/02950/4	19/02950/5	19/02950/6	19/02950/7	19/02950/8	19/03330/1	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4158	BH4169	BH4177	BH4188	BH4194	BH4197	BH4136			
Depth to Top	0.25	0.25	0.25	0.30	0.25	0.30	0.40			
Depth To Bottom										
Date Sampled			23-Mar-19	23-Mar-19	24-Mar-19	23-Mar-19	26-Mar-19			
Sample Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid - Fines			
Sample Matrix Code	7	7	7	7	7	7	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1			
pH <sub>D</sub> <sup>M#</sup>	9.28	9.39	10.98	9.28	11.04	9.41	9.28	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	0.07	0.05	0.10	0.07	0.09	0.11	0.46	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	<5	<5	<5	<5	<5	<5	<5	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	<1	<1	1	<1	<1	1	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	<0.5	<0.5	2.2	<0.5	1.7	<0.5	<0.5	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	6	8	15	32	149	12	22	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	59	52	54	44	48	37	41	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	3	2	3	5	10	2	23	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	51	47	50	39	34	41	33	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	30	33	48	42	57	17	24	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	32	23	41	37	41	44	59	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	8.5	0.6	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	33.6	21.2	25.3	416	41.3	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	<0.1	<0.1	34.2	21.2	25.3	463	42.0	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	0.4	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	3.4	2.3	<0.1	17.7	6.5	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	<0.1	<0.1	3.4	2.3	<0.1	18.3	6.9	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	<0.1	<0.1	37.6	23.5	25.3	481	48.8	mg/kg	0.1	A-T-023s



Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02950/3	19/02950/4	19/02950/5	19/02950/6	19/02950/7	19/02950/8	19/03330/1	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4158	BH4169	BH4177	BH4188	BH4194	BH4197	BH4136						
Depth to Top	0.25	0.25	0.25	0.30	0.25	0.30	0.40						
Depth To Bottom													
Date Sampled			23-Mar-19	23-Mar-19	24-Mar-19	23-Mar-19	26-Mar-19						
Sample Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid - Fines						
Sample Matrix Code	7	7	7	7	7	7	8						
Asbestos in Soil (inc. matrix) ^													
Asbestos in soil <sup>#</sup>	NAD	NAD	NAD	NAD	NAD	NAD	-						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	N/A	-						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02950/3	19/02950/4	19/02950/5	19/02950/6	19/02950/7	19/02950/8	19/03330/1	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4158	BH4169	BH4177	BH4188	BH4194	BH4197	BH4136						
Depth to Top	0.25	0.25	0.25	0.30	0.25	0.30	0.40						
Depth To Bottom													
Date Sampled			23-Mar-19	23-Mar-19	24-Mar-19	23-Mar-19	26-Mar-19						
Sample Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid - Fines						
Sample Matrix Code	7	7	7	7	7	7	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	-	-	-	-	-	-	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	-	-	-	-	-	N/A						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02950/3	19/02950/4	19/02950/5	19/02950/6	19/02950/7	19/02950/8	19/03330/1	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4158	BH4169	BH4177	BH4188	BH4194	BH4197	BH4136			
Depth to Top	0.25	0.25	0.25	0.30	0.25	0.30	0.40			
Depth To Bottom										
Date Sampled			23-Mar-19	23-Mar-19	24-Mar-19	23-Mar-19	26-Mar-19			
Sample Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid - Fines			
Sample Matrix Code	7	7	7	7	7	7	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.07	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.08	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.11	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.14	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.07	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.06	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.11	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.11	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.98	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02950/3	19/02950/4	19/02950/5	19/02950/6	19/02950/7	19/02950/8	19/03330/1	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4158	BH4169	BH4177	BH4188	BH4194	BH4197	BH4136						
Depth to Top	0.25	0.25	0.25	0.30	0.25	0.30	0.40						
Depth To Bottom													
Date Sampled			23-Mar-19	23-Mar-19	24-Mar-19	23-Mar-19	26-Mar-19						
Sample Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid - Fines						
Sample Matrix Code	7	7	7	7	7	7	8						
TPH CWG													
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/02950/3	19/02950/4	19/02950/5	19/02950/6	19/02950/7	19/02950/8	19/03330/1	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4158	BH4169	BH4177	BH4188	BH4194	BH4197	BH4136						
Depth to Top	0.25	0.25	0.25	0.30	0.25	0.30	0.40						
Depth To Bottom													
Date Sampled			23-Mar-19	23-Mar-19	24-Mar-19	23-Mar-19	26-Mar-19						
Sample Type	Solid	Solid	Solid	Solid	Solid	Solid	Solid - Fines						
Sample Matrix Code	7	7	7	7	7	7	8						
P-18-0076 Suite E3													
Ali >C35-C44 <sub>A</sub>	<0.1	<0.1	0.6	<0.1	<0.1	37.9	2.4				mg/kg	0.1	A-T-023s
Aro >C35-C44 <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	mg/kg	0.1	A-T-023s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

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Lab Sample ID	19/03330/3	19/03330/5	19/03330/6	19/03330/8	19/03330/10	19/03330/11	19/03330/13	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4136	BH4153	BH4153	BH4158	BH4169	BH4169	BH4177			
Depth to Top	1.10	0.50	0.90	0.40	0.70	1.20	0.65			
Depth To Bottom										
Date Sampled	26-Mar-19	26-Mar-19	26-Mar-19	26-Mar-19	27-Mar-19	27-Mar-19	28-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Soil - ES	Solid - Fines			
Sample Matrix Code	8	8	4A	8	4A	4A	8			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	30.2	<0.1	40.4	16.5	<0.1			
pH <sub>D</sub> <sup>M#</sup>	7.70	11.95	7.91	9.53	7.88	7.28	9.70	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	13.2	2.99	14.8	11.8	16.8	5.58	0.32	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	6	<5	8	8	7	<5	<5	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	13	<1	20	18	20	13	3	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	1.9	4.5	1.7	2.8	1.8	1.2	<0.5	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0	4.6	<1.0	1.5	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	1.3	<0.5	1.2	1.3	0.8	0.8	<0.5	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	172	22	157	96	222	149	16	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	40	39	22	43	17	18	29	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	53	4	48	52	91	43	11	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	1.13	<0.17	<0.17	<0.17	<0.17	<0.17	0.69	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	59	12	40	46	33	36	22	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	1	2	2	1	<1	<1	<1	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	46	72	44	70	34	26	18	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	186	29	50	363	73	76	31	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	1.1	8.7	1.7	-	-	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	0.9	-	2.4	46.8	3.5	-	-	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	1.9	-	10.2	313	16.0	-	-	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	24.0	-	65.1	3230	189	-	-	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	26.9	-	78.9	3600	210	-	-	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	0.4	2.1	1.1	-	-	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	3.3	-	4.3	4.5	4.2	-	-	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	7.5	-	14.3	83.4	12.2	-	-	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	17.0	-	65.2	815	50.8	-	-	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	27.9	-	84.2	905	68.4	-	-	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	54.8	-	163	4510	279	-	-	mg/kg	0.1	A-T-023s



Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/3	19/03330/5	19/03330/6	19/03330/8	19/03330/10	19/03330/11	19/03330/13	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4136	BH4153	BH4153	BH4158	BH4169	BH4169	BH4177						
Depth to Top	1.10	0.50	0.90	0.40	0.70	1.20	0.65						
Depth To Bottom													
Date Sampled	26-Mar-19	26-Mar-19	26-Mar-19	26-Mar-19	27-Mar-19	27-Mar-19	28-Mar-19						
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Soil - ES	Solid - Fines						
Sample Matrix Code	8	8	4A	8	4A	4A	8						
Asbestos in Soil (inc. matrix) ^													
Asbestos in soil <sup>#</sup>	-	-	NAD	-	NAD	NAD	-			A-T-045			
Asbestos ACM - Suitable for Water Absorption Test?	-	-	N/A	-	N/A	N/A	-						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/3	19/03330/5	19/03330/6	19/03330/8	19/03330/10	19/03330/11	19/03330/13	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4136	BH4153	BH4153	BH4158	BH4169	BH4169	BH4177						
Depth to Top	1.10	0.50	0.90	0.40	0.70	1.20	0.65						
Depth To Bottom													
Date Sampled	26-Mar-19	26-Mar-19	26-Mar-19	26-Mar-19	27-Mar-19	27-Mar-19	28-Mar-19						
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Soil - ES	Solid - Fines						
Sample Matrix Code	8	8	4A	8	4A	4A	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	NAD	-	NAD	-	-	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	-	N/A	-	-	N/A						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/3	19/03330/5	19/03330/6	19/03330/8	19/03330/10	19/03330/11	19/03330/13	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4136	BH4153	BH4153	BH4158	BH4169	BH4169	BH4177			
Depth to Top	1.10	0.50	0.90	0.40	0.70	1.20	0.65			
Depth To Bottom										
Date Sampled	26-Mar-19	26-Mar-19	26-Mar-19	26-Mar-19	27-Mar-19	27-Mar-19	28-Mar-19			
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Soil - ES	Solid - Fines			
Sample Matrix Code	8	8	4A	8	4A	4A	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	-	0.09	0.06	0.20	-	-	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	-	0.15	0.05	0.14	-	-	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	-	0.64	0.27	0.73	-	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	-	1.46	1.07	2.34	-	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	-	1.30	0.88	2.47	-	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	-	2.48	1.38	4.05	-	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	-	0.68	0.34	1.18	-	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	-	0.65	0.38	1.16	-	-	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	-	2.07	1.28	2.89	-	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	-	0.27	0.10	0.48	-	-	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	-	2.47	1.82	3.76	-	-	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	-	0.07	0.03	0.16	-	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	-	0.96	0.52	1.74	-	-	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	-	0.32	0.24	0.44	-	-	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	<0.03	-	1.14	0.54	1.98	-	-	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	-	2.20	2.09	3.69	-	-	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	-	16.9	11.1	27.4	-	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/3	19/03330/5	19/03330/6	19/03330/8	19/03330/10	19/03330/11	19/03330/13	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4136	BH4153	BH4153	BH4158	BH4169	BH4169	BH4177						
Depth to Top	1.10	0.50	0.90	0.40	0.70	1.20	0.65						
Depth To Bottom													
Date Sampled	26-Mar-19	26-Mar-19	26-Mar-19	26-Mar-19	27-Mar-19	27-Mar-19	28-Mar-19						
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Soil - ES	Solid - Fines						
Sample Matrix Code	8	8	4A	8	4A	4A	8						
TPH CWG													
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/3	19/03330/5	19/03330/6	19/03330/8	19/03330/10	19/03330/11	19/03330/13	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4136	BH4153	BH4153	BH4158	BH4169	BH4169	BH4177						
Depth to Top	1.10	0.50	0.90	0.40	0.70	1.20	0.65						
Depth To Bottom													
Date Sampled	26-Mar-19	26-Mar-19	26-Mar-19	26-Mar-19	27-Mar-19	27-Mar-19	28-Mar-19						
Sample Type	Solid - Fines	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Soil - ES	Solid - Fines						
Sample Matrix Code	8	8	4A	8	4A	4A	8						
P-18-0076 Suite E3													
Ali >C35-C44 <sub>A</sub>	<0.1	-	3.0	651	35.6	-	-				mg/kg	0.1	A-T-023s
Aro >C35-C44 <sub>A</sub>	<0.1	-	3.8	329	10.4	-	-	mg/kg	0.1	A-T-023s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/14	19/03330/15	19/03330/17	19/03330/18	19/03330/21	19/03330/22	19/03330/24	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4177	BH4177	BH4188	BH4188	BH4194	BH4194	BH4197			
Depth to Top	0.80	1.30	0.60	1.20	0.80	1.10	0.50			
Depth To Bottom										
Date Sampled	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19			
Sample Type	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Solid - Fines	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	4A	8	4A	8	8	8			
% Stones >10mm <sub>A</sub>	<0.1	10.5	<0.1	14.7	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH <sub>D</sub> <sup>M#</sup>	7.88	7.37	10.26	7.02	8.57	7.31	8.71	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	9.58	4.14	6.17	20.4	4.65	21.2	0.44	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	<5	<5	6	9	8	7	<5	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	10	5	11	25	9	33	<1	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	1.3	1.3	2.1	2.1	0.9	2.7	<0.5	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	0.8	0.9	0.7	1.4	0.8	1.4	<0.5	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	138	80	89	212	83	420	26	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	44	22	44	17	56	26	31	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	33	29	31	48	43	98	8	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	52	43	40	48	44	72	28	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	1	<1	1	2	2	2	1	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	46	26	65	49	57	64	48	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	82	84	69	90	92	374	54	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	0.6	0.8	<0.1	-	-	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	2.9	-	3.2	3.5	0.9	-	-	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	3.3	-	5.4	9.9	1.2	-	-	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	2.1	-	41.8	43.9	16.9	-	-	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	8.3	-	51.1	58.0	19.1	-	-	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	-	0.3	0.4	<0.1	-	-	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	1.7	-	2.2	2.0	0.5	-	-	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	2.1	-	1.8	4.6	1.2	-	-	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	3.2	-	5.7	27.4	4.5	-	-	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	7.0	-	10.0	34.3	6.3	-	-	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	15.4	-	61.0	92.4	25.3	-	-	mg/kg	0.1	A-T-023s



Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/14	19/03330/15	19/03330/17	19/03330/18	19/03330/21	19/03330/22	19/03330/24	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4177	BH4177	BH4188	BH4188	BH4194	BH4194	BH4197						
Depth to Top	0.80	1.30	0.60	1.20	0.80	1.10	0.50						
Depth To Bottom													
Date Sampled	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19						
Sample Type	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Solid - Fines	Solid - Fines	Solid - Fines						
Sample Matrix Code	8	4A	8	4A	8	8	8						
Asbestos in Soil (inc. matrix) ^													
Asbestos in soil <sup>#</sup>	-	NAD	-	NAD	-	-	-						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	N/A	-	N/A	-	-	-						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/14	19/03330/15	19/03330/17	19/03330/18	19/03330/21	19/03330/22	19/03330/24	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4177	BH4177	BH4188	BH4188	BH4194	BH4194	BH4197						
Depth to Top	0.80	1.30	0.60	1.20	0.80	1.10	0.50						
Depth To Bottom													
Date Sampled	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19						
Sample Type	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Solid - Fines	Solid - Fines	Solid - Fines						
Sample Matrix Code	8	4A	8	4A	8	8	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	-	NAD	-	NAD	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	-	N/A	-	N/A	N/A	N/A						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/14	19/03330/15	19/03330/17	19/03330/18	19/03330/21	19/03330/22	19/03330/24	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH4177	BH4177	BH4188	BH4188	BH4194	BH4194	BH4197			
Depth to Top	0.80	1.30	0.60	1.20	0.80	1.10	0.50			
Depth To Bottom										
Date Sampled	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19			
Sample Type	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Solid - Fines	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	4A	8	4A	8	8	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	0.03	<0.01	0.06	0.10	0.04	-	-	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.01	<0.01	<0.01	0.03	<0.01	-	-	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	0.12	0.03	0.21	0.33	0.11	-	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	0.38	0.08	0.66	1.07	0.43	-	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	0.39	0.07	0.56	1.13	0.33	-	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	0.65	0.15	0.90	1.87	0.52	-	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	0.20	<0.05	0.28	0.47	0.15	-	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	0.23	<0.07	0.29	0.53	0.17	-	-	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	0.54	0.16	0.79	1.36	0.49	-	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.07	<0.04	0.10	0.20	<0.04	-	-	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	0.58	0.12	1.14	1.48	0.73	-	-	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	0.02	<0.01	0.04	0.07	0.02	-	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	0.28	0.05	0.38	0.72	0.20	-	-	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	0.13	<0.03	0.30	0.29	0.19	-	-	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	0.38	0.08	0.73	0.98	0.47	-	-	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	0.53	0.12	0.96	1.34	0.62	-	-	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	4.54	0.86	7.40	12	4.47	-	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/14	19/03330/15	19/03330/17	19/03330/18	19/03330/21	19/03330/22	19/03330/24	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4177	BH4177	BH4188	BH4188	BH4194	BH4194	BH4197						
Depth to Top	0.80	1.30	0.60	1.20	0.80	1.10	0.50						
Depth To Bottom													
Date Sampled	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19						
Sample Type	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Solid - Fines	Solid - Fines	Solid - Fines						
Sample Matrix Code	8	4A	8	4A	8	8	8						
TPH CWG													
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-				mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.05	-	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	mg/kg	0.01	A-T-022s			

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Client Project Ref: 314Q-1

Lab Sample ID	19/03330/14	19/03330/15	19/03330/17	19/03330/18	19/03330/21	19/03330/22	19/03330/24	Units	Limit of Detection	Method ref			
Client Sample No													
Client Sample ID	BH4177	BH4177	BH4188	BH4188	BH4194	BH4194	BH4197						
Depth to Top	0.80	1.30	0.60	1.20	0.80	1.10	0.50						
Depth To Bottom													
Date Sampled	28-Mar-19	28-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19	27-Mar-19						
Sample Type	Solid - Fines	Soil - ES	Solid - Fines	Soil - ES	Solid - Fines	Solid - Fines	Solid - Fines						
Sample Matrix Code	8	4A	8	4A	8	8	8						
P-18-0076 Suite E3													
Ali >C35-C44 <sub>A</sub>	<0.1	-	<0.1	<0.1	<0.1	-	-				mg/kg	0.1	A-T-023s
Aro >C35-C44 <sub>A</sub>	<0.1	-	<0.1	2.4	<0.1	-	-	mg/kg	0.1	A-T-023s			

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Client Project Ref: 314Q-1

Lab Sample ID	19/03330/26	19/08560/8	19/08560/9	19/08560/12	19/08560/13	19/08560/14	19/08560/15	Units	Limit of Detection	Method ref
Client Sample No		BH4532ES03	BH4532ES04	BH4540ES03	BH4540ES01	BH4540ES03	BH4540ES02			
Client Sample ID	BH4197	BH4532	BH4532	BH4533	BH4540	BH4540	BH4540			
Depth to Top	0.90	0.30	0.65	0.30	0.30	0.55	0.60			
Depth To Bottom										
Date Sampled	27-Mar-19	08-Sep-19	10-Sep-19	08-Sep-19	09-Jul-19	10-Sep-19	10-Sep-19			
Sample Type	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Soil - ES			
Sample Matrix Code	8	8	7	8	8	8	4ABE			
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	22.0	% w/w	0.1	A-T-044
pH <sub>D</sub> <sup>M#</sup>	7.98	8.48	7.22	8.77	9.28	9.23	8.05	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	<1	-	<1	-	-	-	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	<0.2	-	<0.2	-	-	-	<0.2	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	10.9	-	7.48	-	-	-	9.83	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	48	-	<5	-	-	-	9	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	29	<1	27	<1	<1	11	37	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	1.5	-	1.1	-	-	-	1.0	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	<1.0	-	1.9	-	-	-	<1.0	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	1.4	-	2.4	-	-	-	2.2	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	214	22	146	6	37	51	159	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	53	19	31	11	15	12	26	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	142	5	50	3	4	6	120	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	<0.17	-	<0.17	-	-	-	<0.17	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	57	18	40	9	12	10	30	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	2	-	3	-	-	-	2	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	55	-	67	-	-	-	43	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	108	75	110	29	69	57	63	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	0.01	-	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	0.8	<0.1	-	<0.1	<0.1	<0.1	-	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	2.0	2.3	-	<0.1	<0.1	<0.1	-	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	9.2	144	-	0.3	38.2	<0.1	-	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	104	3170	-	35.3	1090	<0.1	-	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	116	3320	-	35.7	1120	<0.1	-	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	0.01	-	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	-	<0.1	<0.1	<0.1	-	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	2.8	0.4	-	<0.1	<0.1	<0.1	-	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	7.1	19.4	-	<0.1	7.1	<0.1	-	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	31.5	175	-	<0.1	73.8	<0.1	-	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	41.5	195	-	<0.1	80.9	<0.1	-	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	158	3510	-	35.7	1200	<0.1	-	mg/kg	0.1	A-T-023s



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Client Project Ref: 314Q-1

Lab Sample ID	19/03330/26	19/08560/8	19/08560/9	19/08560/12	19/08560/13	19/08560/14	19/08560/15	Units	Limit of Detection	Method ref			
Client Sample No		BH4532ES03	BH4532ES04	BH4540ES03	BH4540ES01	BH4540ES03	BH4540ES02						
Client Sample ID	BH4197	BH4532	BH4532	BH4533	BH4540	BH4540	BH4540						
Depth to Top	0.90	0.30	0.65	0.30	0.30	0.55	0.60						
Depth To Bottom													
Date Sampled	27-Mar-19	08-Sep-19	10-Sep-19	08-Sep-19	09-Jul-19	10-Sep-19	10-Sep-19						
Sample Type	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Soil - ES						
Sample Matrix Code	8	8	7	8	8	8	4ABE						
Asbestos in Soil (inc. matrix) ^													
Asbestos in soil <sup>#</sup>	-	-	NAD	-	-	-	NAD			A-T-045			
Asbestos ACM - Suitable for Water Absorption Test?	-	-	N/A	-	-	-	N/A						

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Lab Sample ID	19/03330/26	19/08560/8	19/08560/9	19/08560/12	19/08560/13	19/08560/14	19/08560/15	Units	Limit of Detection	Method ref			
Client Sample No		BH4532ES03	BH4532ES04	BH4540ES03	BH4540ES01	BH4540ES03	BH4540ES02						
Client Sample ID	BH4197	BH4532	BH4532	BH4533	BH4540	BH4540	BH4540						
Depth to Top	0.90	0.30	0.65	0.30	0.30	0.55	0.60						
Depth To Bottom													
Date Sampled	27-Mar-19	08-Sep-19	10-Sep-19	08-Sep-19	09-Jul-19	10-Sep-19	10-Sep-19						
Sample Type	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Soil - ES						
Sample Matrix Code	8	8	7	8	8	8	4ABE						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	NAD	-	NAD	NAD	NAD	-			A-T-045			
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	-	N/A	N/A	N/A	-						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/26	19/08560/8	19/08560/9	19/08560/12	19/08560/13	19/08560/14	19/08560/15	Units	Limit of Detection	Method ref
Client Sample No		BH4532ES03	BH4532ES04	BH4540ES03	BH4540ES01	BH4540ES03	BH4540ES02			
Client Sample ID	BH4197	BH4532	BH4532	BH4533	BH4540	BH4540	BH4540			
Depth to Top	0.90	0.30	0.65	0.30	0.30	0.55	0.60			
Depth To Bottom										
Date Sampled	27-Mar-19	08-Sep-19	10-Sep-19	08-Sep-19	09-Jul-19	10-Sep-19	10-Sep-19			
Sample Type	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Soil - ES			
Sample Matrix Code	8	8	7	8	8	8	4ABE			
<b>PAH-16MS</b>										
Acenaphthene <sub>A</sub> <sup>M#</sup>	0.05	<0.01	0.03	<0.01	<0.01	<0.01	0.05	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.04	<0.01	0.02	<0.01	<0.01	<0.01	0.03	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	0.51	<0.02	0.10	0.03	<0.02	<0.02	0.17	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	0.54	<0.04	0.27	<0.04	<0.04	<0.04	0.55	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	0.39	<0.04	0.21	<0.04	<0.04	<0.04	0.45	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	1.09	0.31	0.60	<0.05	<0.05	<0.05	1.29	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	0.19	<0.05	0.19	<0.05	<0.05	<0.05	0.25	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	0.24	0.08	0.20	<0.07	<0.07	<0.07	0.41	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	0.89	<0.06	0.43	<0.06	<0.06	<0.06	0.72	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.08	<0.04	0.04	<0.04	<0.04	<0.04	0.08	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	1.38	<0.08	0.49	0.08	<0.08	<0.08	1.13	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	0.04	<0.01	0.03	<0.01	<0.01	<0.01	0.03	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	0.27	<0.03	0.21	<0.03	<0.03	<0.03	0.34	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	0.26	<0.03	0.11	<0.03	<0.03	<0.03	0.18	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	0.97	0.05	0.41	0.07	0.05	0.06	0.63	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	1.09	0.10	0.47	<0.07	<0.07	<0.07	0.93	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	8.03	0.54	3.81	0.18	<0.08	<0.08	7.24	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/26	19/08560/8	19/08560/9	19/08560/12	19/08560/13	19/08560/14	19/08560/15	Units	Limit of Detection	Method ref
Client Sample No		BH4532ES03	BH4532ES04	BH4540ES03	BH4540ES01	BH4540ES03	BH4540ES02			
Client Sample ID	BH4197	BH4532	BH4532	BH4533	BH4540	BH4540	BH4540			
Depth to Top	0.90	0.30	0.65	0.30	0.30	0.55	0.60			
Depth To Bottom										
Date Sampled	27-Mar-19	08-Sep-19	10-Sep-19	08-Sep-19	09-Jul-19	10-Sep-19	10-Sep-19			
Sample Type	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Soil - ES			
Sample Matrix Code	8	8	7	8	8	8	4ABE			
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.05	<0.05	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	-	<0.05	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/03330/26	19/08560/8	19/08560/9	19/08560/12	19/08560/13	19/08560/14	19/08560/15	Units	Limit of Detection	Method ref			
Client Sample No		BH4532ES03	BH4532ES04	BH4540ES03	BH4540ES01	BH4540ES03	BH4540ES02						
Client Sample ID	BH4197	BH4532	BH4532	BH4533	BH4540	BH4540	BH4540						
Depth to Top	0.90	0.30	0.65	0.30	0.30	0.55	0.60						
Depth To Bottom													
Date Sampled	27-Mar-19	08-Sep-19	10-Sep-19	08-Sep-19	09-Jul-19	10-Sep-19	10-Sep-19						
Sample Type	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Soil - ES						
Sample Matrix Code	8	8	7	8	8	8	4ABE						
P-18-0076 Suite E3													
Ali >C35-C44 <sub>A</sub>	<0.1	-	-	-	-	-	-	mg/kg	0.1	A-T-023s			
Aro >C35-C44 <sub>A</sub>	0.4	-	-	-	-	-	-	mg/kg	0.1	A-T-023s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/08560/16	19/09026/1	19/09026/2	19/10954/22	19/10954/23	19/10954/24	19/10954/27	Units	Limit of Detection	Method ref
Client Sample No	BH4541ES01	BH4530ES01	BH4531ES01	BH4509ES02	BH4509ES03	BH4512ES02	BH4520ES02			
Client Sample ID	BH4541	BH4530	BH4531	BH4509	BH4509	BH4512	BH4520			
Depth to Top	0.75	0.90	0.75	0.70	0.90	0.40	0.60			
Depth To Bottom										
Date Sampled	10-Sep-19			11-Nov-19	11-Nov-19	11-Nov-19	11-Nov-19			
Sample Type	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	8	8	7	8	8			
% Stones >10mm <sub>A</sub>	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH <sub>D</sub> <sup>M#</sup>	7.92	8.32	5.67	8.18	8.56	9.03	9.34	pH	0.01	A-T-031s
Cyanide (total) <sub>A</sub> <sup>M#</sup>	-	-	-	-	<1	-	-	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC <sub>A</sub>	-	-	-	-	<0.2	-	-	mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	-	-	-	-	1.84	-	-	% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	-	-	-	-	<5	-	-	mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	54	2	<1	27	3	<1	<1	mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	-	-	-	-	<0.5	-	-	mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	-	-	-	-	<1.0	-	-	mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	-	-	-	-	<0.5	-	-	mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	151	49	86	151	29	85	11	mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	45	39	21	44	11	50	48	mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	115	18	21	230	25	33	7	mg/kg	1	A-T-024s
Mercury <sub>D</sub>	-	-	-	-	<0.17	-	-	mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	37	66	37	45	22	30	40	mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	-	-	-	-	<1	-	-	mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	-	-	-	-	11	-	-	mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	154	110	76	161	60	80	27	mg/kg	5	A-T-024s
Ali >C8-C10 <sub>A</sub> <sup>#</sup>	<0.05	0.10	0.09	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	2.2	6.3	-	-	-	-	mg/kg	0.1	A-T-023s
Ali >C12-C16 <sub>A</sub> <sup>#</sup>	<0.1	4.6	13.8	-	-	-	-	mg/kg	0.1	A-T-023s
Ali >C16-C21 <sub>A</sub> <sup>#</sup>	7.1	4.2	9.4	-	-	-	-	mg/kg	0.1	A-T-023s
Ali >C21-C35 <sub>A</sub> <sup>#</sup>	64.9	3.3	6.3	-	-	-	-	mg/kg	0.1	A-T-023s
Total Aliphatics <sub>A</sub>	72.0	14.3	35.9	-	-	-	-	mg/kg	0.1	A-T-023s
Aro >C8-C9 <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C9-C10 <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C10-C12 <sub>A</sub> <sup>#</sup>	<0.1	<0.1	<0.1	-	-	-	-	mg/kg	0.1	A-T-023s
Aro >C12-C16 <sub>A</sub> <sup>#</sup>	0.6	<0.1	1.1	-	-	-	-	mg/kg	0.1	A-T-023s
Aro >C16-C21 <sub>A</sub> <sup>#</sup>	4.9	<0.1	1.0	-	-	-	-	mg/kg	0.1	A-T-023s
Aro >C21-C35 <sub>A</sub> <sup>#</sup>	24.6	<0.1	<0.1	-	-	-	-	mg/kg	0.1	A-T-023s
Total Aromatics <sub>A</sub>	30.1	<0.1	2.0	-	-	-	-	mg/kg	0.1	A-T-023s
TPH (Ali & Aro) <sub>A</sub>	102	14.3	38.0	-	-	-	-	mg/kg	0.1	A-T-023s



Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/08560/16	19/09026/1	19/09026/2	19/10954/22	19/10954/23	19/10954/24	19/10954/27	Units	Limit of Detection	Method ref
Client Sample No	BH4541ES01	BH4530ES01	BH4531ES01	BH4509ES02	BH4509ES03	BH4512ES02	BH4520ES02			
Client Sample ID	BH4541	BH4530	BH4531	BH4509	BH4509	BH4512	BH4520			
Depth to Top	0.75	0.90	0.75	0.70	0.90	0.40	0.60			
Depth To Bottom										
Date Sampled	10-Sep-19			11-Nov-19	11-Nov-19	11-Nov-19	11-Nov-19			
Sample Type	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	8	8	7	8	8			
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil <sup>#</sup>	-	-	-	-	NAD	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	-	-	-	N/A	-	-			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/08560/16	19/09026/1	19/09026/2	19/10954/22	19/10954/23	19/10954/24	19/10954/27	Units	Limit of Detection	Method ref			
Client Sample No	BH4541ES01	BH4530ES01	BH4531ES01	BH4509ES02	BH4509ES03	BH4512ES02	BH4520ES02						
Client Sample ID	BH4541	BH4530	BH4531	BH4509	BH4509	BH4512	BH4520						
Depth to Top	0.75	0.90	0.75	0.70	0.90	0.40	0.60						
Depth To Bottom													
Date Sampled	10-Sep-19			11-Nov-19	11-Nov-19	11-Nov-19	11-Nov-19						
Sample Type	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines						
Sample Matrix Code	8	8	8	8	7	8	8						
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	NAD	NAD	NAD	-	NAD	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	-	N/A	N/A						

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/08560/16	19/09026/1	19/09026/2	19/10954/22	19/10954/23	19/10954/24	19/10954/27	Units	Limit of Detection	Method ref
Client Sample No	BH4541ES01	BH4530ES01	BH4531ES01	BH4509ES02	BH4509ES03	BH4512ES02	BH4520ES02			
Client Sample ID	BH4541	BH4530	BH4531	BH4509	BH4509	BH4512	BH4520			
Depth to Top	0.75	0.90	0.75	0.70	0.90	0.40	0.60			
Depth To Bottom										
Date Sampled	10-Sep-19			11-Nov-19	11-Nov-19	11-Nov-19	11-Nov-19			
Sample Type	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	8	8	7	8	8			
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	0.08	<0.01	<0.01	0.12	0.01	0.05	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.06	<0.01	<0.01	0.08	0.02	0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	0.28	<0.02	<0.02	0.84	0.02	0.10	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	0.95	<0.04	<0.04	0.89	<0.04	0.14	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	0.86	<0.04	<0.04	0.86	<0.04	0.11	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	1.60	<0.05	<0.05	1.36	<0.05	0.16	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	0.55	<0.05	<0.05	0.63	<0.05	0.10	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	0.53	<0.07	<0.07	0.43	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	1.02	<0.06	<0.06	1.06	0.09	0.23	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.14	<0.04	<0.04	0.17	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	1.78	<0.08	<0.08	1.60	<0.08	0.54	<0.08	mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	0.06	<0.01	<0.01	0.18	0.08	0.05	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	0.66	<0.03	<0.03	0.75	<0.03	0.10	<0.03	mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	0.38	<0.03	<0.03	0.18	0.04	0.04	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	1.00	0.03	0.05	1.06	0.24	0.34	0.03	mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	1.46	<0.07	<0.07	1.39	<0.07	0.34	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	11.4	<0.08	<0.08	11.6	0.50	2.31	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/08560/16	19/09026/1	19/09026/2	19/10954/22	19/10954/23	19/10954/24	19/10954/27	Units	Limit of Detection	Method ref
Client Sample No	BH4541ES01	BH4530ES01	BH4531ES01	BH4509ES02	BH4509ES03	BH4512ES02	BH4520ES02			
Client Sample ID	BH4541	BH4530	BH4531	BH4509	BH4509	BH4512	BH4520			
Depth to Top	0.75	0.90	0.75	0.70	0.90	0.40	0.60			
Depth To Bottom										
Date Sampled	10-Sep-19			11-Nov-19	11-Nov-19	11-Nov-19	11-Nov-19			
Sample Type	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines	Solid	Solid - Fines	Solid - Fines			
Sample Matrix Code	8	8	8	8	7	8	8			
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.05	0.02	0.02	<0.05	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 <sub>A</sub>	-	-	-	7	-	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 <sub>A</sub> <sup>M#</sup>	-	-	-	7	-	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 <sub>A</sub> <sup>M#</sup>	-	-	-	35	-	2	<1	mg/kg	1	A-T-055s
Ali >C16-C21 <sub>A</sub> <sup>M#</sup>	-	-	-	62	-	10	<1	mg/kg	1	A-T-055s
Ali >C21-C35 <sub>A</sub>	-	-	-	324	-	145	75	mg/kg	1	A-T-055s
Total Aliphatics <sub>A</sub>	-	-	-	433	-	156	75	mg/kg	1	A-T-055s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 <sub>A</sub>	-	-	-	8	-	1	<1	mg/kg	1	A-T-055s
Aro >C10-C12 <sub>A</sub> <sup>M#</sup>	-	-	-	12	-	1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 <sub>A</sub>	-	-	-	56	-	3	2	mg/kg	1	A-T-055s
Aro >C16-C21 <sub>A</sub> <sup>M#</sup>	-	-	-	107	-	9	1	mg/kg	1	A-T-055s
Aro >C21-C35 <sub>A</sub> <sup>M#</sup>	-	-	-	128	-	38	5	mg/kg	1	A-T-055s
Total Aromatics <sub>A</sub>	-	-	-	311	-	54	8	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) <sub>A</sub>	-	-	-	744	-	210	84	mg/kg	1	A-T-055s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	<0.05	<0.01	<0.01	<0.05	-	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02				
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534				
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45				
Depth To Bottom										
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19				
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines				
Sample Matrix Code	8	7	8	8	8	8				
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		% w/w	0.1	A-T-044
pH <sub>D</sub> <sup>M#</sup>	6.91	7.39	8.74	8.68	9.17	8.70		pH	0.01	A-T-031s
Cyanide (free) <sub>A</sub> <sup>M#</sup>	-	-	-	-	-	<1		mg/kg	1	A-T-042sFCN
Cyanide (complex) <sub>A</sub> <sup>M#</sup>	-	-	-	-	-	<1		mg/kg	1	A-T-042sCCN
Cyanide (total) <sub>A</sub> <sup>M#</sup>	-	<1	<1	-	<1	<1		mg/kg	1	A-T-042sTCN
Thiocyanate <sub>A</sub>	-	-	-	-	-	<5		mg/kg	5	A-T-041s
Phenols - Total by HPLC <sub>A</sub>	-	<0.2	<0.2	-	<0.2	<0.2		mg/kg	0.2	A-T-050s
Total Organic Carbon <sub>D</sub> <sup>M#</sup>	-	16.4	0.46	-	0.11	0.04		% w/w	0.03	A-T-032s
Antimony <sub>D</sub>	-	<5	<5	-	<5	<5		mg/kg	5	A-T-024s
Arsenic <sub>D</sub> <sup>M#</sup>	10	28	<1	<1	<1	<1		mg/kg	1	A-T-024s
Beryllium <sub>D</sub> <sup>#</sup>	-	2.0	<0.5	-	<0.5	0.7		mg/kg	0.5	A-T-024s
Boron (water soluble) <sub>D</sub> <sup>M#</sup>	-	5.1	1.7	-	<1.0	<1.0		mg/kg	1	A-T-027s
Cadmium <sub>D</sub> <sup>M#</sup>	-	1.2	<0.5	-	<0.5	0.8		mg/kg	0.5	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	74	511	51	13	9	17		mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	33	21	8	7	10	9		mg/kg	1	A-T-024s
Chromium (hexavalent) <sub>D</sub>	-	-	-	-	-	<1		mg/kg	1	A-T-040s
Lead <sub>D</sub> <sup>M#</sup>	32	406	6	7	5	3		mg/kg	1	A-T-024s
Mercury <sub>D</sub>	-	<0.17	<0.17	-	<0.17	<0.17		mg/kg	0.17	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	52	53	7	8	8	10		mg/kg	1	A-T-024s
Selenium <sub>D</sub> <sup>M#</sup>	-	1	<1	-	<1	<1		mg/kg	1	A-T-024s
Vanadium <sub>D</sub> <sup>M#</sup>	-	41	21	-	38	27		mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	83	318	36	36	32	43		mg/kg	5	A-T-024s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref			
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02							
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534							
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45							
Depth To Bottom													
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19							
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines							
Sample Matrix Code	8	7	8	8	8	8							
Asbestos in Soil (inc. matrix) ^													
Asbestos in soil <sup>#</sup>	-	NAD	-	-	-	-				A-T-045			
Asbestos ACM - Suitable for Water Absorption Test?	-	N/A	-	-	-	-							

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref			
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02							
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534							
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45							
Depth To Bottom													
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19							
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines							
Sample Matrix Code	8	7	8	8	8	8							
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sup>†</sup>	NAD	-	NAD	NAD	-	NAD							A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	-	N/A	N/A	N/A	N/A							

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02				
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534				
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45				
Depth To Bottom										
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19				
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines				
Sample Matrix Code	8	7	8	8	8	8				
<b>PAH-16MS</b>										
Acenaphthene <sub>A</sub> <sup>M#</sup>	0.31	0.19	0.05	<0.01	<0.01	0.01		mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	0.25	<0.01	0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	2.73	0.17	0.11	0.03	0.02	<0.02		mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	4.39	0.23	0.28	<0.04	<0.04	0.07		mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	3.14	0.14	0.22	<0.04	<0.04	0.06		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	3.29	0.19	0.55	0.15	<0.05	0.07		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	1.66	0.09	0.16	<0.05	<0.05	<0.05		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	1.36	<0.07	0.16	<0.07	<0.07	<0.07		mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	3.84	0.26	0.27	<0.06	<0.06	0.08		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	0.47	<0.04	<0.04	<0.04	<0.04	<0.04		mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	8.38	0.82	0.64	0.08	<0.08	0.13		mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	0.97	0.24	0.05	0.02	<0.01	0.01		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	1.91	0.11	0.16	<0.03	<0.03	0.04		mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	0.18	0.05	0.04	<0.03	<0.03	0.05		mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	7.19	0.23	0.41	0.11	0.04	0.09		mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	6.80	0.99	0.65	0.12	<0.07	0.12		mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	46.9	3.71	3.76	0.51	<0.08	0.73		mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02				
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534				
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45				
Depth To Bottom										
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19				
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines				
Sample Matrix Code	8	7	8	8	8	8				
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10 <sub>A</sub>	2	144	<5	<5	<1	<1		mg/kg	1	A-T-055s
Ali >C10-C12 <sub>A</sub> <sup>M#</sup>	4	19	<5	<5	<1	<1		mg/kg	1	A-T-055s
Ali >C12-C16 <sub>A</sub> <sup>M#</sup>	10	24	8	10	<1	<1		mg/kg	1	A-T-055s
Ali >C16-C21 <sub>A</sub> <sup>M#</sup>	18	48	143	118	7	<1		mg/kg	1	A-T-055s
Ali >C21-C35 <sub>A</sub>	129	1270	3740	2320	117	20		mg/kg	1	A-T-055s
Total Aliphatics <sub>A</sub>	160	-	3890	2450	123	20		mg/kg	1	A-T-055s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10 <sub>A</sub>	4	165	<5	<5	1	1		mg/kg	1	A-T-055s
Aro >C10-C12 <sub>A</sub> <sup>M#</sup>	6	50	<5	<5	<1	<1		mg/kg	1	A-T-055s
Aro >C12-C16 <sub>A</sub>	25	42	<5	<5	1	1		mg/kg	1	A-T-055s
Aro >C16-C21 <sub>A</sub> <sup>M#</sup>	115	119	25	27	4	2		mg/kg	1	A-T-055s
Aro >C21-C35 <sub>A</sub> <sup>M#</sup>	353	989	59	40	11	7		mg/kg	1	A-T-055s
Total Aromatics <sub>A</sub>	501	-	84	67	17	11		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) <sub>A</sub>	661	-	3970	2510	141	31		mg/kg	1	A-T-055s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02				
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534				
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45				
Depth To Bottom										
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19				
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines				
Sample Matrix Code	8	7	8	8	8	8				
SVOC										
Hexachlorobenzene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Diethyl phthalate <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Dimethyl phthalate <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Dibenzofuran <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Carbazole <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Butylbenzyl phthalate <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate <sub>A</sub>	-	<5000	-	-	-	-		µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
4-Nitrophenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
3+4-Methylphenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
4-Chloro-3-methylphenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2-Nitrophenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2-Methylphenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2-Chlorophenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2,6-Dinitrotoluene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2,4-Dinitrotoluene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2,4-Dimethylphenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2,4-Dichlorophenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2,4,6-Trichlorophenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2,4,5-Trichlorophenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2-Chloronaphthalene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
2-Methylnaphthalene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Phenol <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Pentachlorophenol (SVOC) <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
n-Dioctylphthalate <sub>A</sub>	-	<5000	-	-	-	-		µg/kg	500	A-T-052s
n-Dibutylphthalate <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Nitrobenzene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s
Isophorone <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954  
 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref			
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02							
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534							
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45							
Depth To Bottom													
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19							
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines							
Sample Matrix Code	8	7	8	8	8	8							
Hexachloroethane <sub>A</sub>	-	<1000	-	-	-	-					µg/kg	100	A-T-052s
Hexachlorocyclopentadiene <sub>A</sub>	-	<1000	-	-	-	-					µg/kg	100	A-T-052s
Perylene <sub>A</sub>	-	<1000	-	-	-	-		µg/kg	100	A-T-052s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02				
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534				
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45				
Depth To Bottom										
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19				
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines				
Sample Matrix Code	8	7	8	8	8	8				
VOC										
Dichlorodifluoromethane <sub>A</sub>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Chloromethane <sub>A</sub>	-	<10	-	-	-	-		µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene) <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Bromomethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Chloroethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Trichlorofluoromethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,1-Dichloroethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Carbon Disulphide <sub>A</sub> <sup>#</sup>	-	2	-	-	-	-		µg/kg	1	A-T-006s
Dichloromethane <sub>A</sub>	-	<5	-	-	-	-		µg/kg	5	A-T-006s
trans 1,2-Dichloroethene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,1-Dichloroethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
cis 1,2-Dichloroethene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
2,2-Dichloropropane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Bromochloromethane <sub>A</sub> <sup>#</sup>	-	<5	-	-	-	-		µg/kg	5	A-T-006s
Chloroform <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,1,1-Trichloroethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,1-Dichloropropene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Carbon Tetrachloride <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,2-Dichloroethane <sub>A</sub> <sup>#</sup>	-	<2	-	-	-	-		µg/kg	2	A-T-006s
Benzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Trichloroethene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,2-Dichloropropane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Dibromomethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Bromodichloromethane <sub>A</sub> <sup>#</sup>	-	<10	-	-	-	-		µg/kg	10	A-T-006s
cis 1,3-Dichloropropene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Toluene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
trans 1,3-Dichloropropene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,1,2-Trichloroethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
1,3-Dichloropropane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s
Tetrachloroethene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref			
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02							
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534							
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45							
Depth To Bottom													
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19							
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines							
Sample Matrix Code	8	7	8	8	8	8							
Dibromochloromethane <sub>A</sub> <sup>#</sup>	-	<3	-	-	-	-					µg/kg	3	A-T-006s
1,2-Dibromoethane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-					µg/kg	1	A-T-006s
Chlorobenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,1,1,2-Tetrachloroethane <sub>A</sub>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
Ethylbenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
m & p Xylene <sub>A</sub> <sup>#</sup>	-	2	-	-	-	-		µg/kg	1	A-T-006s			
o-Xylene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
Styrene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
Bromoform <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
Isopropylbenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,1,2,2-Tetrachloroethane <sub>A</sub>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,2,3-Trichloropropane <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
Bromobenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
n-Propylbenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
2-Chlorotoluene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,3,5-Trimethylbenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
4-Chlorotoluene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
tert-Butylbenzene <sub>A</sub> <sup>#</sup>	-	<2	-	-	-	-		µg/kg	2	A-T-006s			
1,2,4-Trimethylbenzene <sub>A</sub> <sup>#</sup>	-	2	-	-	-	-		µg/kg	1	A-T-006s			
sec-Butylbenzene <sub>A</sub> <sup>#</sup>	-	1	-	-	-	-		µg/kg	1	A-T-006s			
4-Isopropyltoluene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,3-Dichlorobenzene <sub>A</sub>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,4-Dichlorobenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
n-Butylbenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,2-Dichlorobenzene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,2-Dibromo-3-chloropropane (DCBP) <sub>A</sub>	-	<2	-	-	-	-		µg/kg	2	A-T-006s			
1,2,4-Trichlorobenzene <sub>A</sub>	-	<3	-	-	-	-		µg/kg	3	A-T-006s			
Hexachlorobutadiene <sub>A</sub> <sup>#</sup>	-	<1	-	-	-	-		µg/kg	1	A-T-006s			
1,2,3-Trichlorobenzene <sub>A</sub>	-	<3	-	-	-	-		µg/kg	3	A-T-006s			

Envirolab Job Number: 19/02000, 19/02160, 19/02772, 19/02950, 19/03330, 19/09026, 20/00032, 20/00033, 19/02401, 19/08560 and 19/10954 Client Project Name: Transpennine Route Upgrade Zone 4 Tranche 2

Client Project Ref: 314Q-1

Lab Sample ID	19/10954/28	19/10954/29	20/00032/1	20/00032/2	20/00032/3	20/00033/1		Units	Limit of Detection	Method ref
Client Sample No	BH4520ES03	BH4521ES02	BH4534ES01	BH4535ES01	BH4536ES01	BH4534ES02				
Client Sample ID	BH4520	BH4521	BH4534	BH4535	BH4536	BH4534				
Depth to Top	0.80	0.50	0.30	0.30	0.30	0.45				
Depth To Bottom										
Date Sampled	11-Nov-19	11-Nov-19	16-Dec-19	16-Dec-19	16-Dec-19	17-Dec-19				
Sample Type	Solid - Fines	Solid	Solid - Fines	Solid - Fines	Solid - Fines	Solid - Fines				
Sample Matrix Code	8	7	8	8	8	8				
TPH UKCWG										
Ali >C35-C44 <sub>A</sub>	-	182	-	-	-	-		mg/kg	1	A-T-055s
Total Aliphatics <sub>A</sub>	-	1680	-	-	-	-		mg/kg	1	A-T-055s
Aro >C35-C44 <sub>A</sub>	-	243	-	-	-	-		mg/kg	1	A-T-055s
Total Aromatics <sub>A</sub>	-	1610	-	-	-	-		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44) <sub>A</sub>	-	3290	-	-	-	-		mg/kg	1	A-T-055s

## **REPORT NOTES**

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The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

Analytical results reflect the quality of the sample at the time of analysis only.

Opinions and interpretations expressed are outside the scope of our accreditation.

If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

### **Soil chemical analysis:**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

### **TPH analysis of water by method A-T-007:**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

### **Electrical Conductivity of water by Method A-T-037:**

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

### **Asbestos:**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

### **Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

### **Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

### **Key:**

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

## FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 20/04287  
**Issue Number:** 1  
**Date:** 10 June, 2020

**Client:** BAM Ritchies Warrington  
Unit 5  
Taurus Park  
Europa Boulevard  
Warrington  
UK  
WA5 7ZT

**Project Manager:** Jamie Hogg / Simon Fell  
**Project Name:** Transpennine Route Upgrade SI GI  
**Project Ref:** 314Q-1  
**Order No:** TBC  
**Date Samples Received:** 12/05/20  
**Date Instructions Received:** 29/05/20  
**Date Analysis Completed:** 08/06/20

**Prepared by:**



Sophie France  
Client Service Manager

**Approved by:**



Holly Neary-King  
Administration & Client Services Supervisor

Envirolab Job Number: 20/04287

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 314Q-1

Lab Sample ID	20/04287/1	20/04287/2	20/04287/3	20/04287/5	20/04287/6	20/04287/7		Units	Limit of Detection	Method ref
Client Sample No	BH4506ES01	BH4506ES02	BH4507ES01	BH4508ES01	BH4508ES02	BH4528ES01				
Client Sample ID	BH4506	BH4506	BH4507	BH4508	BH4508	BH4528				
Depth to Top	0.30	0.70	0.30	0.30	0.60	0.30				
Depth To Bottom										
Date Sampled	12-May-20	12-May-20				12-May-20				
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8				
% Stones >10mm <sub>A</sub>	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
pH <sub>D</sub> <sup>M#</sup>	8.73	8.52	9.27	8.81	8.33	8.73		pH	0.01	A-T-031s
Arsenic <sub>D</sub> <sup>M#</sup>	<1	5	<1	<1	<1	<1		mg/kg	1	A-T-024s
Copper <sub>D</sub> <sup>M#</sup>	20	108	47	41	96	23		mg/kg	1	A-T-024s
Chromium <sub>D</sub> <sup>M#</sup>	46	21	39	14	36	12		mg/kg	1	A-T-024s
Lead <sub>D</sub> <sup>M#</sup>	8	153	6	20	85	7		mg/kg	1	A-T-024s
Nickel <sub>D</sub> <sup>M#</sup>	33	17	33	8	39	9		mg/kg	1	A-T-024s
Zinc <sub>D</sub> <sup>M#</sup>	31	124	52	52	106	28		mg/kg	5	A-T-024s

Envirolab Job Number: 20/04287

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 314Q-1

Lab Sample ID	20/04287/1	20/04287/2	20/04287/3	20/04287/5	20/04287/6	20/04287/7		Units	Limit of Detection	Method ref			
Client Sample No	BH4506ES01	BH4506ES02	BH4507ES01	BH4508ES01	BH4508ES02	BH4528ES01							
Client Sample ID	BH4506	BH4506	BH4507	BH4508	BH4508	BH4528							
Depth to Top	0.30	0.70	0.30	0.30	0.60	0.30							
Depth To Bottom													
Date Sampled	12-May-20	12-May-20				12-May-20							
Sample Type	Solid - Fines												
Sample Matrix Code	8	8	8	8	8	8							
Bulk Fibre ID in Solid Fines													
Bulk Fibre Identification in Solid Fines <sub>D</sub> <sup>f</sup>	NAD	NAD	NAD	NAD	NAD	NAD							A-T-045
Asbestos ACM - Suitable for Water Absorption Test? <sub>D</sub>	N/A	N/A	N/A	N/A	N/A	N/A				A-T-045			

Envirolab Job Number: 20/04287

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 314Q-1

Lab Sample ID	20/04287/1	20/04287/2	20/04287/3	20/04287/5	20/04287/6	20/04287/7		Units	Limit of Detection	Method ref
Client Sample No	BH4506ES01	BH4506ES02	BH4507ES01	BH4508ES01	BH4508ES02	BH4528ES01				
Client Sample ID	BH4506	BH4506	BH4507	BH4508	BH4508	BH4528				
Depth to Top	0.30	0.70	0.30	0.30	0.60	0.30				
Depth To Bottom										
Date Sampled	12-May-20	12-May-20				12-May-20				
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8				
PAH-16MS										
Acenaphthene <sub>A</sub> <sup>M#</sup>	<0.01	0.03	<0.01	<0.01	0.03	<0.01		mg/kg	0.01	A-T-019s
Acenaphthylene <sub>A</sub> <sup>M#</sup>	<0.01	0.03	<0.01	<0.01	0.02	<0.01		mg/kg	0.01	A-T-019s
Anthracene <sub>A</sub> <sup>M#</sup>	<0.02	0.12	<0.02	0.02	0.12	<0.02		mg/kg	0.02	A-T-019s
Benzo(a)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	0.31	<0.04	0.06	0.42	<0.04		mg/kg	0.04	A-T-019s
Benzo(a)pyrene <sub>A</sub> <sup>M#</sup>	<0.04	0.33	<0.04	0.06	0.46	<0.04		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.05	0.43	<0.05	0.07	0.51	<0.05		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene <sub>A</sub> <sup>M#</sup>	<0.05	0.24	<0.05	<0.05	0.29	<0.05		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene <sub>A</sub> <sup>M#</sup>	<0.07	0.16	<0.07	<0.07	0.20	<0.07		mg/kg	0.07	A-T-019s
Chrysene <sub>A</sub> <sup>M#</sup>	<0.06	0.42	<0.06	0.07	0.49	<0.06		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene <sub>A</sub> <sup>M#</sup>	<0.04	0.05	<0.04	<0.04	0.07	<0.04		mg/kg	0.04	A-T-019s
Fluoranthene <sub>A</sub> <sup>M#</sup>	<0.08	0.57	<0.08	0.11	0.66	<0.08		mg/kg	0.08	A-T-019s
Fluorene <sub>A</sub> <sup>M#</sup>	<0.01	0.02	<0.01	<0.01	0.02	<0.01		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene <sub>A</sub> <sup>M#</sup>	<0.03	0.27	<0.03	0.05	0.34	<0.03		mg/kg	0.03	A-T-019s
Naphthalene <sub>A</sub> <sup>M#</sup>	<0.03	0.06	<0.03	<0.03	0.06	<0.03		mg/kg	0.03	A-T-019s
Phenanthrene <sub>A</sub> <sup>M#</sup>	0.04	0.29	<0.03	0.08	0.37	0.05		mg/kg	0.03	A-T-019s
Pyrene <sub>A</sub> <sup>M#</sup>	<0.07	0.54	<0.07	0.10	0.64	<0.07		mg/kg	0.07	A-T-019s
Total PAH-16MS <sub>A</sub> <sup>M#</sup>	<0.08	3.87	<0.08	0.62	4.70	<0.08		mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/04287

Client Project Name: Transpennine Route Upgrade SI GI

Client Project Ref: 314Q-1

Lab Sample ID	20/04287/1	20/04287/2	20/04287/3	20/04287/5	20/04287/6	20/04287/7		Units	Limit of Detection	Method ref
Client Sample No	BH4506ES01	BH4506ES02	BH4507ES01	BH4508ES01	BH4508ES02	BH4528ES01				
Client Sample ID	BH4506	BH4506	BH4507	BH4508	BH4508	BH4528				
Depth to Top	0.30	0.70	0.30	0.30	0.60	0.30				
Depth To Bottom										
Date Sampled	12-May-20	12-May-20				12-May-20				
Sample Type	Solid - Fines									
Sample Matrix Code	8	8	8	8	8	8				
TPH CWG										
Ali >C5-C6 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10 <sub>A</sub>	<1	2	<1	<1	4	<1		mg/kg	1	A-T-055s
Ali >C10-C12 <sub>A</sub> <sup>M#</sup>	<1	4	<1	1	12	<1		mg/kg	1	A-T-055s
Ali >C12-C16 <sub>A</sub> <sup>M#</sup>	<1	5	<1	2	21	<1		mg/kg	1	A-T-055s
Ali >C16-C21 <sub>A</sub> <sup>M#</sup>	1	7	<1	4	21	15		mg/kg	1	A-T-055s
Ali >C21-C35 <sub>A</sub>	11	210	5	247	93	396		mg/kg	1	A-T-055s
Total Aliphatics <sub>A</sub>	12	229	5	254	153	411		mg/kg	1	A-T-055s
Aro >C5-C7 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8 <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10 <sub>A</sub>	<1	2	<1	2	3	1		mg/kg	1	A-T-055s
Aro >C10-C12 <sub>A</sub> <sup>M#</sup>	<1	3	<1	2	3	<1		mg/kg	1	A-T-055s
Aro >C12-C16 <sub>A</sub>	1	5	<1	2	7	1		mg/kg	1	A-T-055s
Aro >C16-C21 <sub>A</sub> <sup>M#</sup>	2	12	<1	5	14	6		mg/kg	1	A-T-055s
Aro >C21-C35 <sub>A</sub> <sup>M#</sup>	4	59	3	18	44	19		mg/kg	1	A-T-055s
Total Aromatics <sub>A</sub>	7	81	3	29	71	27		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) <sub>A</sub>	19	311	8	283	224	438		mg/kg	1	A-T-055s
BTEX - Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s
MTBE <sub>A</sub> <sup>#</sup>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-022s

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### **Soil chemical analysis:**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

### **TPH analysis of water by method A-T-007:**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

### **Electrical Conductivity of water by Method A-T-037:**

Results greater than 12900µS/cm @ 25°C / 1155µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

### **Asbestos:**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

### **Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

### **Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

### **Key:**

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable Sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

### Appendix

#### 4 Calibration Certificates



... everything gas detection

## Certificate of Calibration

Customer: Bam Ritchies

Instrument: MiniRAE Lite

Job: Pre-Sale, Test & Calibration

Serial number: 595-003408

Fleet Number: N/A

Certificate no: 003408/151118

Next calibration due date: 15.11.2019

Tested on: 15.11.2018

Calibrated for: VOC

<u>Applied Gas Concentration:</u>	<u>Cylinder Reference:</u>	<u>Initial Sensor Reading</u>	<u>Final Sensor Reading</u>	<u>Accuracy Limits</u>
Isobutylene 100ppm	AGG2061-7-2	99.1ppm	99.8ppm	+/- 10%

The Instrument has been calibrated after Re-Zeroing & Introducing Span Calibration Gas, using gas that is traceable to national standards and has been prepared in accordance with BS EN ISO6145-6:2008

Calibration Engineer: Michael Stronach

Sign: 



## CERTIFICATE OF CALIBRATION

Date of Calibration: 5th March 2019	Certificate Number: 00321706	Page 1 of 3
Date of issue: 5th March 2019		

<b>Acc No</b>	BAM001	<b>Manufacturer</b>	IMPACT TEST EQUIPMENT
<b>Customer</b>	BAM Ritchies EUROPA BOULEVARD WARRINGTON	<b>Description</b>	Hand Vane Tester
<b>Engineer</b>	K.Mistry	<b>Model</b>	SL810
<b>Our Ref</b>	395433	<b>Serial No</b>	931
		<b>Asset No</b>	BRW009
		<b>Order No</b>	RIT 168 138 168

<u>CONDITION OF INSTRUMENT</u>	<u>YES/NO</u>
The instrument was adjusted	Y
The instrument was repaired	Y

### ADDITIONAL COMMENTS

### STABILITY

The readings given for the equipment detailed above are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

### ACCREDITATIONS

This calibration was conducted in accordance with the BMS of BS EN ISO 9001:2015 and as per our accreditation to BS EN ISO/IEC 17025:2005.

### PROCEDURE

UIS procedure CP7.7.10

### ENVIRONMENT

The ambient conditions throughout the test were 20 °C ± 2 °C, 45 %rh ± 20 %rh.

### TRACEABILITY

The test equipment used is traceable to National Standards. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95%.

### TEST EQUIPMENT USED

<u>Asset No.</u>	<u>Description</u>	<u>Certificate No.</u>	<u>Expiry date</u>
ID347	ETS 10N.m	235668	14/FEB/2020
ID1123	Digital Calliper	UKAS 53489	20/AUG/2020



# CERTIFICATE OF CALIBRATION

Date of Calibration: 5th March 2019  
 Date of issue: 5th March 2019

Certificate  
 Number: 00321706

Page 2 of 3

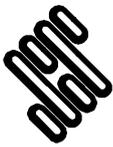
Calculated for the 33mm blades as per BS 1377.

Div	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
kPa	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	5	5	5	5	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9
Div	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
kPa	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	14	14	14	14	15	15	15	16	16	16	16	17	17	17	18	18	18	18	19	19
Div	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
kPa	19	19	19	20	20	20	20	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	27	27	27	28	28	28
Div	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
kPa	28	28	29	29	29	29	30	30	30	31	31	31	31	32	32	32	32	33	33	33	33	34	34	34	35	35	35	36	36	36	37	37	37	37	

Calculated for the 19mm blades as per BS 1377.

Div	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
kPa	1	3	4	6	7	9	10	12	13	15	16	18	19	21	22	24	25	27	28	30	31	33	34	35	37	38	40	41	43	44	46	47	49	50	52
Div	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
kPa	53	55	56	58	59	61	62	64	65	67	68	70	71	72	74	75	77	78	80	81	83	84	86	87	89	90	92	93	95	96	98	99	101	102	104
Div	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
kPa	105	106	108	109	111	112	114	115	117	118	120	121	123	124	126	127	129	130	132	133	135	136	138	139	141	142	143	145	146	148	149	151	152	154	155
Div	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
kPa	157	158	160	161	163	164	166	167	169	170	172	173	175	176	177	179	180	182	183	185	186	188	189	191	192	194	195	197	198	200	201	203	204	206	207

**Ground Investigation Report : 151667-TSA-W3-MVL3-DM3-X-MF-  
702098  
(Bore holes: BH4113)**



BOREHOLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Borehole: <b>BH4113</b>	
Contract Ref: <b>764781</b>		Start: <b>23.11.20</b>	Ground Level (m AOD): <b>89.13</b>	National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>	Sheet: <b>1 of 21</b>
End: <b>04.12.20</b>					

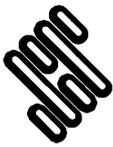
Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
0.00-0.20	1	C										MADE GROUND: Strong bluish grey light grey mottled brown CONCRETE 60-70% aggregate of angular to rounded fine to coarse sandstone 10% small voids. (MADE GROUND)	88.93	0.20	
0.20-0.30	101	ES										MADE GROUND: Dark brown slightly clayey sandy silty angular to subangular fine to coarse GRAVEL of brick, sandstone and mudstone. Sand is fine to coarse. (MADE GROUND)	88.83	0.30	
0.20-0.30	2	B													
0.30-0.55	102	ES													
0.30-0.55	3	B													
0.55-0.60	4	D									MADE GROUND: Dark brown sandy slightly clayey silty subangular to subrounded fine to coarse (primarily fine) GRAVEL of brick, sandstone and occasional mudstone. Sand is fine to coarse. (MADE GROUND)	(1.70)			
0.65-0.70	6	D													
0.70-1.00	7	B													
1.00-1.20	8	B													
1.20-1.65	9	SPT	N=7								Window run 110mm dia (100% rec)	87.13	2.00		
1.20-1.80	10	B													
1.20-1.65	9	DSPT													
1.80-2.00	11	D									Extremely weak to very weak dark grey distinctly weathered MUDSTONE with iron staining on some surfaces recovered as non-intact angular to subangular medium to coarse GRAVEL of mudstone (PENNINE LOWER COAL MEASURES FORMATION)	(2.65)			
2.00-3.00	12	SPT	25,5/50 for 60mm												
2.00-2.15	12	DSPT													
2.20-3.00	13	C													
3.00-4.50	14	C													
3.00-4.50															

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Boring Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth				
23/11/20	07:00	0.00	None	N/R	-	1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation. 2. Concrete cored to 0.20m depth. Inspection pit hand dug from 0.20m to 1.20m depth. 3. Borehole drilled using dynamic sampling techniques to 2.00m depth then extended using rotary coring techniques to 40.50m depth using a T6-116 barrel producing a nominal core diameter of 90mm. Water used as flush			
24/11/20	07:00	0.00	None	N/R	-				
24/11/20	16:30	2.00	None	N/R	1.65				
25/11/20	08:00	2.00	2.00	N/R	0.97				
25/11/20	16:30	3.00	3.00	N/R	0.65				
26/11/20	09:00	3.00	3.00	N/R	1.21				
26/11/20	16:30	8.50	5.00	N/R	1.13				
27/11/20	08:00	8.50	5.00	N/R	1.38				
Method Used: <b>Dynamic sampling + Rotary Cored</b>								All dimensions in metres	
Plant Used: <b>Comacchio GEO 300</b>								Scale: <b>1:20</b>	
Drilled By: <b>Thomas Shutter</b>				Logged By: <b>EClarkson</b>		Checked By:			







BOREHOLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Borehole: <b>BH4113</b>
Contract Ref: <b>764781</b>	Start: <b>23.11.20</b> End: <b>04.12.20</b>	Ground Level (m AOD): <b>89.13</b>	National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>	Sheet: <b>4 of 21</b>

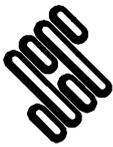
Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
11.00-12.50	21	C		100	83	60	NI 82					... 9.18m-9.26m: subvertical fracture.			
11.00-12.50								350					... 9.40m-9.50m: non-intact recovered as fine gravel.	77.93	11.20
11.37-11.48	47	C										Very weak thinly laminated grey mottled black partially weathered SILTSTONE with black organic material. Fractures are medium spaced subhorizontal and subvertical undulating rough open up to 5mm infilled with gravel of siltstone with yellowish brown clay on surfaces. (PENNINE LOWER COAL MEASURES FORMATION)	(1.00)		
11.72-11.91	48	C		90	67	49	NI 47	100% return Water (Grey)						76.93	12.20
12.50-14.00	22	C										... 9.91m-9.95m: fracture infilled with gravelly clay.			
12.50-14.00													Weak thinly to thickly laminated grey partially weathered fine grained SANDSTONE and grey partially weathered SILTSTONE. Fractures are closely to medium spaced subhorizontal undulating rough tight clean and open 2mm with clay on surfaces. (PENNINE LOWER COAL MEASURES FORMATION)		
12.50-12.65	49	C		90	90	49	10 72	100% return Water (Grey)				... 10.90m-11.20m: grading down to mudstone.			
14.00-15.50	23	C										Extremely weak to very weak dark grey partially weathered MUDSTONE. Fractures are very closely spaced to closely spaced planar smooth tight and open up to 10mm infilled with gravel of mudstone with greenish brown clay on surfaces. (PENNINE LOWER COAL MEASURES FORMATION)	(3.05)		
14.00-15.50															... 12.00m-12.10m: non-intact recovered as

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Boring Progress and Water Observations						General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	

All dimensions in metres      Scale: **1:20**

Method Used: <b>Dynamic sampling + Rotary Cored</b>	Plant Used: <b>Comacchio GEO 300</b>	Drilled By: <b>Thomas Shotton</b>	Logged By: <b>EClarkson</b>	Checked By: <b>AGS</b>
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BOREHOLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Borehole: <b>BH4113</b>
Contract Ref: <b>764781</b>	Start: <b>23.11.20</b> End: <b>04.12.20</b>	Ground Level (m AOD): <b>89.13</b>	National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>	Sheet: <b>5 of 21</b>

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
14.79-14.96	50	C		100	90	63	10 72 260	100% return Water (Grey)				subangular fine to medium gravel of mudstone with iron staining on surfaces. Medium strong thinly to thickly laminated light grey partially weathered fine to medium SANDSTONE with thin beds of grey siltstone. Fractures are closely spaced subhorizontal planar rough open up to 5mm with no infill and horizontal planar rough with iron staining on surfaces.	73.88	15.25	.....
15.50-17.00	24	C		100	93	49	10 58 260	100% return Water (Grey)				(PENNINE LOWER COAL MEASURES FORMATION) ... 12.40m-12.50m: assumed zone of core loss possibly due to presence of weaker more weathered material. ... 12.70m-15.00m: very thinly to thinly laminated sandstone and siltstone. ... 13.00m-13.25m: weathered with colour change to orangish reddish brown. ... 14.20m-14.60m: sandstone becoming fine to coarse. ... 14.20m-14.80m: subvertical fracture undulating rough open up to 2mm. Very weathered on fracture surfaces causing orangish brown colour change and infilled with fine to medium gravel of weathered sandstone.			xxxxxx
17.00-18.50	25	C		100	93	59	30 200 400	100% return Water (Grey)				Weak thickly laminated to very thinly laminated to thinly bedded grey partially weathered SILTSTONE interbedded with dark grey MUDSTONE. Fractures are subhorizontal closely to medium spaced planar smooth tight and undulating rough open up to 5mm infilled with gravel of siltstone.			xxxxxx
17.18-17.31	51	C													xxxxxx
17.78-17.93	52	C													xxxxxx

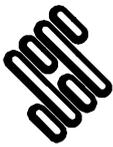
Boring Progress and Water Observations						General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	
All dimensions in metres						Scale: <b>1:20</b>
Method Used: <b>Dynamic sampling + Rotary Cored</b>	Plant Used: <b>Comacchio GEO 300</b>	Drilled By: <b>Thomas Shotton</b>	Logged By: <b>EClarkson</b>	Checked By:		

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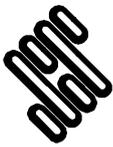
Contract: <b>TRU - West of Leeds - Batch 1</b>			Client: <b>Transpire Alliance</b>			Borehole: <b>BH4113</b>			
Contract Ref: <b>764781</b>		Start: <b>23.11.20</b>	Ground Level (m AOD): <b>89.13</b>		National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>		Sheet: <b>9 of 21</b>		
End: <b>04.12.20</b>									

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
29.00-30.50 (0:58)	33	C		95	95	86			(00:42)						
29.00-30.50					97	97	83			(00:58)					(6.10)
30.50-32.00 (0:52)	34	C		100	100	100	20 240 920	40% return Water (Grey)	(00:52)						
30.50-32.00					100	100	89			(00:49)					
32.00-33.50 (0:49)	35	C													
32.00-33.50															

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Boring Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth		
All dimensions in metres						Scale:	<b>1:20</b>
Method Used:	<b>Dynamic sampling + Rotary Cored</b>		Plant Used:	<b>Comacchio GEO 300</b>		Drilled By:	<b>Thomas Shutter</b>
						Logged By:	<b>EClarkson</b>
						Checked By:	





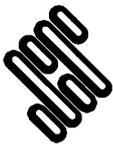
BOREHOLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Borehole: <b>BH4113</b>
Contract Ref: <b>764781</b>	Start: <b>23.11.20</b> End: <b>04.12.20</b>	Ground Level (m AOD): <b>89.13</b>	National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>	Sheet: <b>10 of 21</b>

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
33.50-35.00 (1:15)	36	C		100	100	89	20 240 920	40% return Water (Grey)	(00:49)			Strong light grey thinly to thickly laminated fine to medium grained SANDSTONE with dark grey siltstone laminae. Fractures are very closely to widely spaced subhorizontal, planar, smooth, tight and undulating, rough to open up to 5mm with clay on some surfaces. (PENNINE LOWER COAL MEASURES FORMATION)	56.43	32.70	
35.00-36.50 (0:59)	37	C		100	100	99	NI 120 280	80% return Water (Grey)	(01:15)			... 35.00m-35.70m: grain size decreasing to fine grained sandstone.  ... 35.70m-37.00m: interbedded sandstone and siltstone.		(4.30)	

Boring Progress and Water Observations						General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	
All dimensions in metres						Scale: <b>1:20</b>
Method Used: <b>Dynamic sampling + Rotary Cored</b>	Plant Used: <b>Comacchio GEO 300</b>			Drilled By: <b>Thomas Shutter</b>	Logged By: <b>EClarkson</b>	Checked By:

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BOREHOLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Borehole: <b>BH4113</b>
Contract Ref: <b>764781</b>	Start: <b>23.11.20</b> End: <b>04.12.20</b>	Ground Level (m AOD): <b>89.13</b>	National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>	Sheet: <b>11 of 21</b>

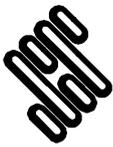
Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thick ness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
36.50-38.00 (1:13)	38	C		100	100	97		40% return Water (Grey)	(00:59)				52.13	37.00	
38.00-39.50 (1:03)				90	90	78	NI 120 280	50% return Water (Dark Grey)	(01:13)		Medium strong thinly laminated dark grey partially weathered MUDSTONE with siltstone laminae. Fractures are closely spaced subhorizontal, planar, smooth, tight and planer rough, open to 3mm with clay on surfaces. (PENNINE LOWER COAL MEASURES FORMATION)				
38.00-39.50 (1:03)	39	C		100	100	98			(01:03)					(3.50)	
39.50-40.50				100	90	80									

Boring Progress and Water Observations						General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	

All dimensions in metres      Scale: **1:20**

Method Used: <b>Dynamic sampling + Rotary Cored</b>	Plant Used: <b>Comacchio GEO 300</b>	Drilled By: <b>Thomas Shotton</b>	Logged By: <b>EClarkson</b>	Checked By:	
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GINT LIBRARY\_V8\_07.GLB LibVersion: v8\_07\_001 PrivVersion: v8\_07 | Log COMPOSITE LOG - A4P | 764781 - TRANSPIRE BATCH 1.GPJ - v8\_07.  
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BOREHOLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Borehole: <b>BH4113</b>
Contract Ref: <b>764781</b>	Start: <b>23.11.20</b> End: <b>04.12.20</b>	Ground Level (m AOD): <b>89.13</b>	National Grid Co-ordinate: <b>E:414277.6 N:416949.2</b>	Sheet: <b>12 of 21</b>

Depth (m)	Samples & Testing			Mechanical Log				Flush Returns & Details	Drill Time (hh:mm)	Backfill & Instrumentation	Water	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	No	Type	Results	TCR (%)	SCR (%)	RQD (%)	If (mm)								
(0:45) 39.50-40.50	40	C		100	90	80	Ni 120 280	50% return Water (Dark Grey)	(00:45)			... 39.95m-40.03m: subvertical fracture stepped, smooth, infilled with medium to coarse gravel of mudstone with clay on surfaces.	48.63	40.50	
Borehole terminated at 40.50m depth.															

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Boring Progress and Water Observations						General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	
All dimensions in metres						Scale: <b>1:20</b>
Method Used: <b>Dynamic sampling + Rotary Cored</b>	Plant Used: <b>Comacchio GEO 300</b>			Drilled By: <b>Thomas Shotton</b>	Logged By: <b>EClarkson</b>	Checked By:

**Ground Investigation Report : 151667-TSA-W3-MVL3-DM3-X-MF-  
702322**

**(Bore holes: BH4510, BH4510A, BH4510B, BH4511, BH4513, BH4513A,  
BH4513B, BH4516, BH4517, BH4523 and BH4524)**



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4510</b>
Contract Ref: <b>764781</b>	Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.31</b>	National Grid Co-ordinate: <b>E:414293.1 N:416832.5</b>	Sheet: <b>1 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails -0.25 m above ground level.	89.31	0.00		
0.10-0.30 0.10-0.30 0.10-0.30	1 101 2	B ES D	1xT+1xJ+1xV			MADE GROUND: Grey subangular to subrounded medium GRAVEL of sandstone with occasional coarse gravel of granite. (CLEAN BALLAST) (MADE GROUND)	88.91	0.40		
Window sample hole terminated at 0.40m depth due to refusal of barrel.										

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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
17/11/19	05:50	0.40	-		Dry	1. Position located between platforms at Huddersfield Station at 25 miles 1265 yards. 2. Height of rails 0.25 m above ground level. 3. Scanned with CAT and Genny prior to drilling. 4. Hand dug Inspection pit terminated at 0.40m due to pit wall collapse and CAT signal from base of pit. 5. Borehole backfilled with arisings upon completion.	
All dimensions in metres						Scale:	<b>1:25</b>
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Competitor 130</b>		Drilled By:	<b>Tom Saxton</b>
						Logged By:	<b>PRowlay</b>
						Checked By:	<b>MS</b>



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4510</b>
Contract Ref: <b>764781</b>	Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.31</b>	National Grid Co-ordinate: <b>E:414293.1 N:416832.5</b>	Sheet: <b>2 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						

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Drilling Progress and Water Observations						General Remarks							
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)					6. Inspection Pit remained dry and stable during excavation.			
						All dimensions in metres		Scale:	<b>1:25</b>				
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Competitor 130</b>		Drilled By:	<b>Tom Saxton</b>		Logged By:	<b>PRowlay</b>	Checked By:	<b>MS</b>	



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4510A</b>
Contract Ref: <b>764781</b>	Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.21</b>	National Grid Co-ordinate: <b>E:414296.3 N:416856.8</b>	Sheet: <b>1 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.20 m above ground level.	89.21	0.00		
	0.10-0.30	1	B			MADE GROUND: Dark grey subangular coarse GRAVEL of granite. (CLEAN BALLAST) (MADE GROUND)		(0.40)		
	0.10-0.30	2	D				... from 0.30m, slightly sandy (SLIGHTLY DIRTY BALLAST)	88.81	0.40	
						Window sample hole terminated at 0.40m depth due to refusal of barrel.				

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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. Position located in the 4 ft of the Huddersfield Line at 25 miles 1265 yards. 2. Height of rails 0.20 m above ground level. 3. Scanned with CAT and Genny prior to drilling. 4. Inspection pit hand dug to 0.40m depth. 5. Window sample hole terminated at 0.40m depth due to CAT signal at base of pit. 6. Borehole backfilled with arisings upon completion. 7. Inspection Pit remained dry and stable during excavation.	
Method Used: <b>Tracked window sampling</b>						All dimensions in metres	
Plant Used: <b>Archway Competitor 130</b>						Scale: <b>1:25</b>	
Drilled By: <b>Tom Saxton</b>						Logged By: <b>PROwlay</b>	
Checked By: <b>AGS</b>						Checked By: <b>MS</b>	

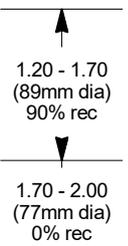


**WINDOW SAMPLE LOG**

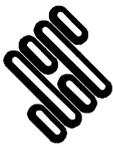
Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4510B</b>
Contract Ref: <b>764781</b>	Start: <b>14.04.21</b> End: <b>14.04.21</b>	Ground Level (m AOD): <b>89.10</b>	National Grid Co-ordinate: <b>E:414292.3 N:416826.3</b>	Sheet: <b>1 of 4</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.18m above ground level.	89.10	0.00		
	0.00-0.45	1	B			MADE GROUND: Clean ballast over black sandy clayey angular to subangular fine to coarse GRAVEL of igneous lithologies and brick. Sand is fine to coarse of ash like material. (VERY DIRTY BALLAST) (MADE GROUND)	88.65	0.45		
	0.60	101	ES			MADE GROUND: Soft black sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone and brick fragments. Occasional igneous lithologies. (MADE GROUND)	87.90	1.20		
	0.80-1.20	2	B			MADE GROUND: Dark brownish black with brown staining sandy angular to subangular fine to coarse GRAVEL of mudstone. Sand is fine to coarse. (MADE GROUND)	87.40	1.70		
						Window sample hole terminated at 1.70m depth on barrel refusal.				

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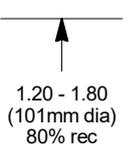
Drilling Progress and Water Observations						General Remarks					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)						
14/04/21			-			1. Position located in the 6ft between UP and DOWN MVL3 Line at 25 miles 1265 yards. 2. Height of rails 0.181m above ground level. 3. Scanned with CAT and Genny prior to drilling. 4. Inspection pit hand dug to 1.20m depth. 5. Borehole backfilled with arisings upon completion. 6. Window sample hole terminated at 1.70m depth.					
14/04/21		2.00	-	77	Dry						
All dimensions in metres						Scale:	<b>1:25</b>				
Method Used:	<b>Hand held window sampling</b>		Plant Used:	<b>Hand held window sampler</b>		Drilled By:	<b>Robert Foster</b>	Logged By:	<b>Frenvoize</b>	Checked By:	<b>AGS</b>



**WINDOW SAMPLE LOG**

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4511</b>	
Contract Ref: <b>764781</b>		Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.11</b>	National Grid Co-ordinate: <b>E:414275.1 N:416838.0</b>	Sheet: <b>1 of 2</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.21 m above ground level.	89.11	0.00		
	0.00-0.50	1	B			MADE GROUND: Greenish grey angular to subangular coarse GRAVEL of igneous rocks. (CLEAN BALLAST). (MADE GROUND)	89.01	0.10		
	0.20	2	D							
	0.50-1.20	101 3	ES B	1xT+1xJ+1xV		MADE GROUND: Dark grey to black fine to coarse ashy SAND and subangular to subrounded fine to coarse GRAVEL of mixed lithologies (mostly igneous) with low cobble content of sub-angular concrete and sandstone to 0.35m. (DIRTY BALLAST). (MADE GROUND)		(1.10)		
	1.00	4	D							
	1.20-1.65	5	SPT	N=12		MADE GROUND: Greyish black slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mixed lithologies including sandstone and dirty ballast. (VERY DIRTY BALLAST) (MADE GROUND)	87.91	1.20		
	1.20	102	ES	1xT+1xJ+1xV						
	1.20-1.40	6	D			Extremely weak dark grey fissile MUDSTONE. (PENNINE LOWER COAL MEASURES FORMATION)	87.46	1.65		
	1.40-1.65	7	D							
	1.65-1.80	8	B			Window sample hole terminated at 2.00m depth on SPT refusal.	87.11	2.00		
	1.80-2.00	9	SPT	20,5/35,15 for 25mm						



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Drilling Progress and Water Observations						General Remarks
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)	
17/11/19	04:00	0.00	-	400	Dry	1. Position located in the CESS adjacent to passenger loop at Huddersfield Station at 25 miles 1265 yards. 2. Height of rails 0.21 m above ground level. 3. Scanned with CAT and Genny prior to excavation. 4. Inspection pit hand dug to 1.20m depth. No groundwater encountered. 5. Backfilled with ballast upon completion. 6. SPT hammer JT01-2018 (E <sub>r</sub> = 64.00%) used.
17/11/19	05:00	2.00	1.80	101	Dry	

All dimensions in metres Scale: **1:25**

Method Used: <b>Tracked window sampling</b>	Plant Used: <b>Archway Dart 239</b>	Drilled By: <b>Robert Foster</b>	Logged By: <b>GGoldthorpe</b>	Checked By: <b>AGS</b>
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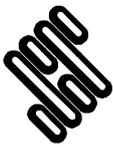
WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4513</b>
Contract Ref: <b>764781</b>	Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>86.64</b>	National Grid Co-ordinate: <b>E:414305.1 N:416863.3</b>	Sheet: <b>1 of 2</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.20 m above ground level.	86.64	0.00		
	0.10-0.30	1	B			MADE GROUND: Grey subangular coarse GRAVEL of granite. (CLEAN BALLAST) (MADE GROUND)	86.54	0.10		
	0.10-0.30	101	ES	1xT+1xJ+1xV					(0.30)	
	0.10-0.30	2	D					86.24	0.40	
	0.40-0.60	102	ES	1xT+1xJ+1xV		MADE GROUND: Grey subangular medium to coarse GRAVEL of granite and other mixed lithorelicts. (DIRTY BALLAST) (MADE GROUND)	86.04	0.60		
	0.40-0.60	3	D							
MADE GROUND: Dark brownish grey sandy very clayey subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. (MADE GROUND)										
. . . at 0.60m, obstruction. Window sample hole terminated at 0.60m depth due to obstruction.										

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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
17/11/19	17:00	0.60	-		Dry	1. Position located in the 10 ft between platforms. 2. Height of rails 0.20 m above ground level. 3. Scanned with CAT and Genny prior to drilling. 4. Inspection pit hand dug to 0.60m depth. Window sample refused on Inspection pit. 5. Borehole backfilled with arisings upon completion. 6. No groundwater encountered.	
All dimensions in metres						Scale:	<b>1:25</b>
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Competitor</b>		Drilled By:	<b>Robert Foster</b>
						Logged By:	<b>PRowlay</b>
						Checked By:	<b>AGS</b>

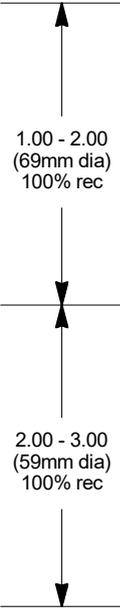


**WINDOW SAMPLE LOG**

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4513 A</b>	
Contract Ref: <b>764781</b>		Start: <b>24.10.21</b> End: <b>24.10.21</b>	Ground Level (m AOD): <b>86.64</b>	National Grid Co-ordinate: <b>E:414305.1 N:416863.3</b>	Sheet: <b>1 of 4</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						0.21 m above ground level.	86.64	0.00		
	0.00-0.45 0.00-0.45	1 101	B ES			MADE GROUND: Grey angular to subangular fine to coarse GRAVEL of igneous lithologies (CLEAN BALLAST) (MADE GROUND)	86.19	0.45		
	0.45-0.86 0.45-0.86	102 2	ES B			MADE GROUND: Grey to black very sandy slightly clayey subangular to angular fine to coarse GRAVEL of igneous lithologies. Sand is fine to coarse. (DIRTY BALLAST). (MADE GROUND)		(0.75)		
	1.00-1.45 1.00	1 3	SPT DSPT	N=8			85.44	1.20		
	1.20-1.48	103	ES			MADE GROUND: Brown and black slightly sandy angular to subangular fine to medium GRAVEL. Sand is fine to medium (MADE GROUND)	85.16	1.48		
	2.00-2.45 2.00 2.10-2.45	2 4 5	SPT DSPT D	N=42		... at 1.40 m becomes slightly clayey MADE GROUND: Firm orangish brown and black slightly sandy CLAY. Sand is medium. (MADE GROUND)		(1.06)		
	2.54-3.00	105	ES			MADE GROUND: Very stiff dark brown and dark grey slightly sandy gravelly CLAY. Gravel is angular to subangular of claystone and sandstone. Sand is fine to medium. (MADE GROUND)	84.10	2.54		
	3.00-3.45 3.00	3 6	SPT DSPT	N=48				(0.91)		
						Window Sample terminated at 3.45m on SPT refusal.	83.19	3.45		

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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. Position located at ground level between platform 1/2 and 7 in the MVL3 Line at 25 miles 1288 yards. 2. Height of rails 0.21 m above ground level. 3. Scanned with CAT and Genny prior to drilling 4. Backfilled with bentonite and arising on completion 5. SPT hammer DART384-2021 ( $E_r = 76.00\%$ ) used.	
Method Used: <b>Tracked window sampling</b>						All dimensions in metres	
Plant Used: <b>Archway Competitor</b>						Scale: <b>1:25</b>	
Drilled By: <b>???</b>						Logged By: <b>LBrown</b>	
Checked By: <b>AGS</b>						Checked By: <b>AGS</b>	



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4513 B</b>
Contract Ref: <b>764781</b>	Start: <b>24.10.21</b> End: <b>24.10.21</b>	Ground Level (m AOD): <b>86.64</b>	National Grid Co-ordinate: <b>E:414305.1 N:416863.3</b>	Sheet: <b>1 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.21 m above ground level.	86.64	0.00		
	0.00-0.45 0.00-0.45	1 101	B ES			MADE GROUND: Grey subangular to angular fine to coarse (mostly fine grained) GRAVEL of igneous lithologies. (DIRTY BALLAST) (MADE GROUND)	86.19	0.45		
	0.45-0.86 0.45-0.86	102 2	ES B			MADE GROUND: Grey to black very sandy slightly clayey subangular to angular fine to coarse GRAVEL of igneous lithologies. Sand is fine to coarse (MADE GROUND)  ... at 0.80 m depth wood fragments. Window sample terminated at 0.86 m depth on possible old sleeper.	85.78	0.86		

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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. Position located at ground level between platform 1/2 and 4 in the MVL3 Line at approximately at 25 miles 1288 yards. 2. Height of rails 0.21 m above ground level. 3. Scanned with CAT and Genny prior to drilling 4. Backfilled with bentonite on completion	
All dimensions in metres						Scale:	<b>1:25</b>
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Competitor</b>		Drilled By:	<b>???</b>
						Logged By:	<b>LBrown</b>
						Checked By:	<b>MS</b>



**WINDOW SAMPLE LOG**

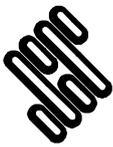
Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4516</b>
Contract Ref: <b>764781</b>	Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.37</b>	National Grid Co-ordinate: <b>E:414308.0 N:416878.6</b>	Sheet: <b>1 of 2</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.20 m above ground level.	89.37	0.00		
	0.00-0.35	1	B				89.02	0.35		
	0.00-0.35	2	B							
	0.35-0.65	3	B							
	0.35-0.65	4	B							
	0.80	5	D							
	1.00-1.40	6	B	N=41						
	1.00-1.45	7	SPT							
	1.40-1.80	8	SPT	7,10/11,10,15,13 for 25mm						
						MADE GROUND: Dark greyish black slightly clayey slightly sandy very angular to angular coarse GRAVEL of granite. Hydrocarbon odour present. (DIRTY BALLAST) (MADE GROUND)				
						MADE GROUND: Dark grey clayey silty slightly sandy very angular to angular coarse GRAVEL of granite. Sand is fine to coarse. Slight hydrocarbon odour. (VERY DIRTY BALLAST) (MADE GROUND)				
						Dark grey MUDSTONE. Recovered as stiff dark brown black friable slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse. (PENNINE LOWER COAL MEASURES FORMATION)				
						Dark grey slightly clayey silty very sandy angular fine to coarse, predominantly fine GRAVEL of mudstone. Sand is fine to coarse, predominantly coarse. (PENNINE LOWER COAL MEASURES FORMATION)				
						Extremely weak dark grey MUDSTONE. Recovered as very stiff slightly sandy slightly gravelly silty CLAY. (PENNINE LOWER COAL MEASURES FORMATION) ... 1.40m - 1.80m, recovered as mudstone.				
						Window sample hole terminated at 1.80m depth on SPT refusal.				



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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
17/11/19	04:30	0.00	-	400		1. Position located at ground level at Huddersfield Station at 25 miles 1334 yards. 2. Height of rails 0.20 m above ground level. 3. Scanned with CAT and Genny prior to drilling. 4. Inspection pit hand dug to 1.00m depth. 5. Water seepage/damp between 1.00m and 1.40m. 6. Backfilled with bentonite pellets on completion. 7. SPT hammer 110.49-2019 (E <sub>r</sub> = 89.00%) used.  All dimensions in metres      Scale: <b>1:25</b>	
17/11/19	05:30	1.80	1.00	89			
Method Used: <b>Tracked window sampling</b>							
Plant Used: <b>Archway Competitor 130</b>							
Drilled By: <b>Josh Parratt</b>							
Logged By: <b>RLaw</b>							
Checked By: <b>AGS</b>							



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4517</b>	
Contract Ref: <b>764781</b>		Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.07</b>	National Grid Co-ordinate: <b>E:414332.7 N:416928.0</b>	Sheet: <b>1 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.21 m above ground level.	89.07	0.00		
	0.00-0.30	1	B			MADE GROUND: Dark grey black slightly clayey slightly sandy very angular to angular GRAVEL of granite. Sand is fine to coarse. Hydrocarbon odour present. (DIRTY BALLAST) (MADE GROUND)		(0.30)		
	0.00-0.30	2	B					88.77	0.30	
	0.30-0.60	3	B							
	0.30-0.60	4	B					88.57	0.50	
	0.60	5	D			MADE GROUND: Dark grey clayey silty slightly sandy very angular to angular coarse GRAVEL of granite. Sand is fine to coarse. Slight hydrocarbon odour present. (VERY DIRTY BALLAST) (MADE GROUND)	88.37	0.70		
	0.70	101	ES	1xT+1xJ+1xV						
	0.80-1.00	7	B							
	0.90	6	D			MADE GROUND: Firm friable dark grey slightly sandy slightly gravelly organic CLAY. Gravel is very angular to subangular fine to coarse of granite and ballast. Sand is fine to coarse. (MADE GROUND)		(0.80)		
	1.20-1.65	1	SPT	N=12						
	1.30-1.50	9	D			POSSIBLE MADE GROUND: Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. (MADE GROUND)	87.57	1.50		
	1.50-1.70	10	D							
	1.75-2.00	11	D			... at 1.30m, becoming black slightly sandy clay with a faint hydrocarbon odour. Soft to firm light brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone lithorelicts. Sand is fine to coarse. (WEATHERED MUDSTONE)	87.07	2.00		
	2.00-2.45	2	SPT	N=28						
	2.00-2.70	13	D			... at 1.75m, becoming firm to stiff orangish brown gravelly clay. Gravel is angular to subangular fine to medium of mudstone lithorelicts. Light brown slightly clayey slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is angular fine and coarse, predominantly coarse of mudstone.		(0.70)		
	2.70-3.00	14	D							
	3.00-3.35	3	SPT	10,13/15,20,15 for 50mm		Very stiff CLAY to extremely weak orangish grey brown MUDSTONE. Recovered as slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular fine to coarse of mudstone. ... at 2.70m, becoming extremely weak blackish brown indistinctly laminated fissile mudstone.	86.37	2.70		
							85.72	3.35		

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Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
17/11/19	06:30	3.35	1.00	89		1. Position located at ground level in Platform in Huddersfield Station at 25 miles 1334 yards. 2. Height of rails 0.21 m above ground level. Unable to take coordinates inside the station. 3. Scanned with CAT and Genny prior to excavation. 4. Inspection pit hand dug to 1.20m depth. Water seepage at 1.50m. 5. Backfilled with bentonite upon completion.	
All dimensions in metres						Scale:	<b>1:25</b>
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Competitor</b>		Drilled By:	<b>Josh Parratt</b>
						Logged By:	<b>RLaw</b>
						Checked By:	<b>AGS</b>



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4517</b>
Contract Ref: <b>764781</b>	Start: <b>17.11.19</b> End: <b>17.11.19</b>	Ground Level (m AOD): <b>89.07</b>	National Grid Co-ordinate: <b>E:414332.7 N:416928.0</b>	Sheet: <b>2 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						<p>. . . 2.90m - 3.00m, becoming orange and blackish brown, oxidation of clay.</p> <p>Window sample hole terminated at 3.35m depth due to SPT refusal.</p>				

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Drilling Progress and Water Observations						General Remarks						
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)							
						6. SPT hammer 110.49-2019 ( $E_r = 89.00\%$ ) used.						
						All dimensions in metres	Scale: <b>1:25</b>					
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Competitor</b>		Drilled By:	<b>Josh Parratt</b>	Logged By:	<b>RLaw</b>	Checked By:	<b>MG</b>	



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4523</b>	
Contract Ref: <b>764781</b>		Start: <b>11.11.19</b>	Ground Level (m AOD): <b>30.68</b>	National Grid Co-ordinate: <b>E:414383.9 N:417035.6</b>	Sheet: <b>1 of 3</b>
End: <b>11.11.19</b>					

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
						Height of rails 0.21m above ground level.	30.68	0.00		
	0.00-0.40	1	B	1xT+1xJ+1xV		MADE GROUND: Light grey very angular to subangular medium to coarse GRAVEL of limestone and granite. (SLIGHTLY DIRTY BALLAST)	30.28	0.40		
	0.10	101	ES							
	0.40-0.70	2	B	N=16		MADE GROUND: Dark blackish brown slightly sandy clayey ashy very angular to subangular fine to coarse GRAVEL of sandstone and brick. Sand is fine to coarse.	29.68	1.00		
	1.00-1.45	3	SPT							
	1.00-1.45	4	DSPT	N=10		MADE GROUND: Dark brown clayey very angular to subrounded fine to coarse GRAVEL of sandstone, brick, limestone and clinker.	28.23	2.45		
	1.00-2.00	5	B							
	2.00-2.45	6	SPT	N=4		MADE GROUND: Light orangish brown slightly gravelly CLAY. Gravel is very angular to angular fine to coarse of brick, sandstone, mudstone and clinker-like material.	26.68	4.00		
	2.00-2.45	7	DSPT							
	2.30-3.00	8	B							
	3.00-3.45	9	SPT							
	3.00-3.45	10	DSPT							
	3.00-4.00									
Window sample hole terminated at 4.00m depth due likely obstruction causing shoe damage to window sample barrel.										

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)
11/11/19		4.00	-	92	-

General Remarks	
1. Position located at ground level in 4ft of UP main Huddersfield Line at 25 miles 1482 yards. Moved from the 6ft to the 4ft to avoid a drainage pipe running parallel with the rails in the 6ft. 2. Height of rails 0.21m above ground level. 3. Scanned with CAT and Genny prior to commencement. 4. Groundwater strike encountered at 1.00m depth. 5. Inspection pit dug to 1.00m. Terminated early due to hard obstruction in the pit,	
All dimensions in metres	Scale: <b>1:25</b>

Method Used: <b>Tracked window sampling</b>	Plant Used: <b>Archway Dart 239</b>	Drilled By: <b>Tom Saxton</b>	Logged By: <b>BUsher</b>	Checked By: <b>MS</b>	
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WINDOW SAMPLE LOG

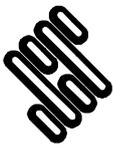
Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4523</b>
Contract Ref: <b>764781</b>	Start: <b>11.11.19</b> End: <b>11.11.19</b>	Ground Level (m AOD): <b>30.68</b>	National Grid Co-ordinate: <b>E:414383.9 N:417035.6</b>	Sheet: <b>2 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						

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Drilling Progress and Water Observations						General Remarks
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)	
						unable to dig through with hand tools. 6. Backfilled with bentonite and ballast on completion. 7. SPT hammer DART384-2019 ( $E_r = 68.00\%$ ) used.
All dimensions in metres						
Method Used:	<b>Tracked window sampling</b>		Plant Used:	<b>Archway Dart 239</b>		Drilled By: <b>Tom Saxton</b> Logged By: <b>BUsher</b> Checked By: <b>MS</b>





**WINDOW SAMPLE LOG**

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4524</b>
Contract Ref: <b>764781</b>	Start: <b>27.10.19</b> End: <b>27.10.19</b>	Ground Level (m AOD): <b>88.07</b>	National Grid Co-ordinate: <b>E:414395.1 N:417085.1</b>	Sheet: <b>1 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						
	0.00-0.40	1	B			MADE GROUND: Dark grey very sandy angular to subangular medium to coarse GRAVEL of granite with a low cobble content. Sand is fine to coarse. Cobbles are subangular of granite. (VERY DIRTY BALLAST)	87.57	0.50		
	0.60-1.00 0.70	2 101	B ES	1xT+1xJ+1xV		MADE GROUND: Dark brown, grey and orangish red sandy clayey ashy angular to subangular fine to coarse GRAVEL of burnt shale and ash.	86.87	(0.70)		
	1.20-1.65 1.20-1.35 1.35-2.00	1 4 5	SPT D B	N=5		MADE GROUND: Soft dark brown grey orangish slightly gravelly sandy ashy CLAY. Sand is fine to coarse. Gravel is subangular of burnt shale and mudstone.	86.72	1.35		
	1.60		HP	c <sub>u</sub> =50/25		MADE GROUND: Soft to firm brown and grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of mudstone, sandstone and burnt shale.		(1.10)		
	1.90 2.00-2.45 2.00	2 6	SPT DSPT	N=13		Window sample hole terminated at 2.45m depth due to an obstruction.	85.62	2.45		

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Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)
27/10/19		2.00	2.00	116	Dry

General Remarks	
<ol style="list-style-type: none"> <li>Position located at ground level in 10 FOOT of the MVL3 between the Down Main and Down Loop Up Huddersfield lines at 25 miles 1572 yards.</li> <li>Height of rails 0.20m above ground level.</li> <li>Scanned with CAT and Genny prior to commencement.</li> <li>Inspection pit hand dug to 1.20m depth.</li> <li>No groundwater encountered.</li> <li>Backfilled with bentonite and arisings on completion.</li> </ol>	
All dimensions in metres	Scale: <b>1:25</b>
Method Used: <b>Inspection pit + Tracked window sampling</b>	Plant Used: <b>Premier 110</b>
Drilled By: <b>Andrew Cookson</b>	Logged By: <b>SHunt</b>
Checked By: <b>AGS</b>	



WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4524</b>
Contract Ref: <b>764781</b>	Start: <b>27.10.19</b> End: <b>27.10.19</b>	Ground Level (m AOD): <b>88.07</b>	National Grid Co-ordinate: <b>E:414395.1 N:417085.1</b>	Sheet: <b>2 of 3</b>

Progress Window Run	Samples / Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
	Depth	No	Type	Results						

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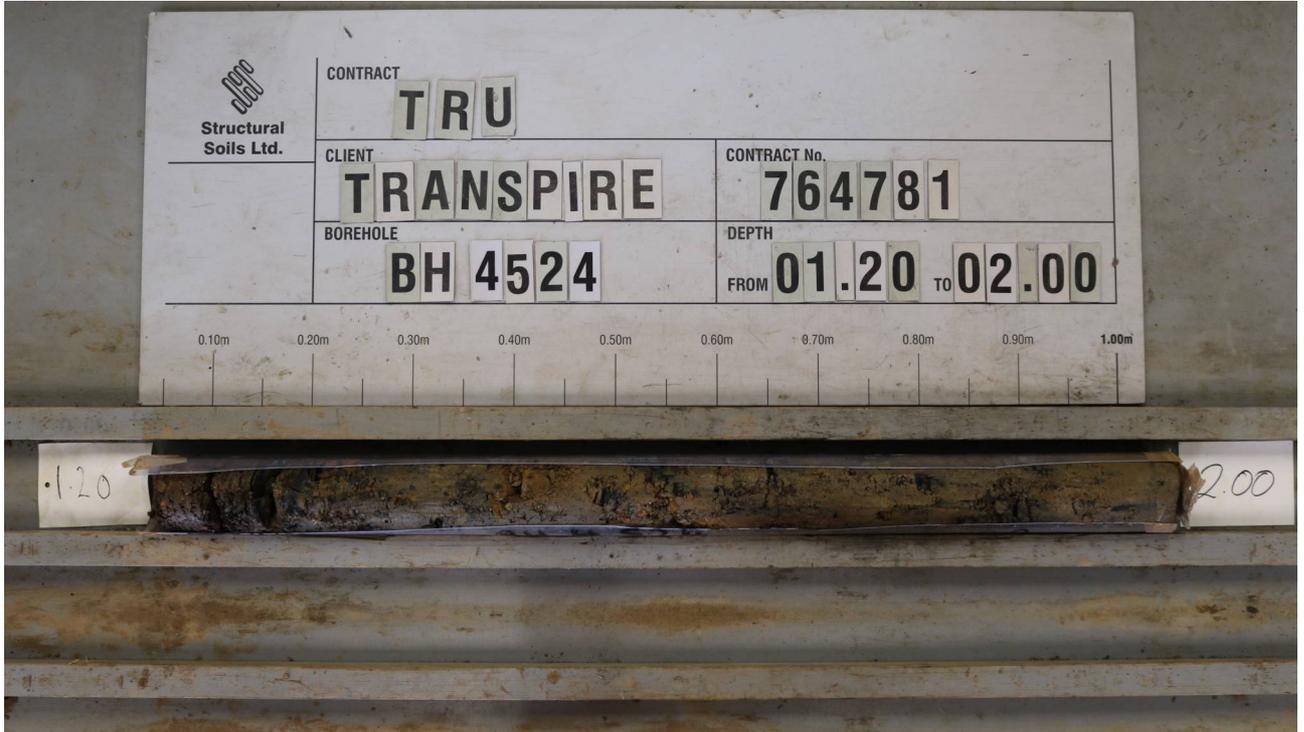
Drilling Progress and Water Observations						General Remarks						
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)							
						7. SPT hammer 110.71.AC-2020 ( $E_r = 81.00\%$ ) used.						
All dimensions in metres						Scale:		<b>1:25</b>				
Method Used:	<b>Inspection pit + Tracked window sampling</b>		Plant Used:	<b>Premier 110</b>		Drilled By:	<b>Andrew Cookson</b>		Logged By:	<b>Shunt</b>	Checked By:	<b>AGS</b>





WINDOW SAMPLE LOG

Contract: <b>TRU - West of Leeds - Batch 1</b>		Client: <b>Transpire Alliance</b>		Window Sample: <b>BH4524</b>
Contract Ref: <b>764781</b>	Start: <b>27.10.19</b> End: <b>27.10.19</b>	Ground Level (m AOD): <b>88.07</b>	National Grid Co-ordinate: <b>E:414395.1 N:417085.1</b>	Sheet: <b>3 of 3</b>



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Method Used: <b>Inspection pit + Tracked window sampling</b>	Plant Used: <b>Premier 110</b>	Drilled By: <b>Andrew Cookson</b>	Logged By: <b>Shunt</b>	Checked By: <b>M6</b>	
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## **APPENDIX C – DEFINITIONS OF RISK PROBABILITY AND CONSEQUENCE**

## APPENDIX C – DEFINITIONS OF RISK PROBABILITY AND CONSEQUENCE

The assessment of risks related to the identified potential contamination linkages is based on the methodology presented in the National House Building Council/Environment Agency report R&D66<sup>1</sup> (that follows the principles presented in CIRIA’s C552<sup>2</sup>), which provide guidance on the development and application of a consequence and probability matrix for land contamination risk assessment. Definitions of probability, consequence and the risk classification matrix adopted for this assessment are provided in the tables below.

Although R&D66 was produced to inform residential developments, the methodology and criteria for assessing contamination risks is applicable to other types of developments and provides more detailed classification descriptions than C552.

### Classification of probability

Classification	Definition of the probability of harm/pollution occurring
High Likelihood	The pollutant linkage exists, and it is very likely to result in harm/pollution in the short term, and/or will almost inevitably result in harm/pollution in the long term, and/or there is current evidence of harm/pollution. Likelihood is defined as more likely than not and meets the definition of ‘significant possibility’ under Part 2A of the Environmental Protection Act (EPA)1990.
Likely	The source, pathway and receptor exist for the pollutant linkage and it is probable that harm/pollution will occur. Circumstances are such that harm/pollution is not inevitable, but possible in the short term and likely over the long term. Likelihood is defined as reasonably possible and meets the definition of ‘significant possibility’ under Part 2A of EPA 1990.
Low Likelihood	The source, pathway and receptor exist, and it is possible that harm/pollution could occur. Circumstances are such that harm/pollution is by no means certain in the long term and less likely in the short term.
Unlikely	The source, pathway and receptor exist for the pollutant linkage, but it is improbable that harm/pollution will occur even in the long term.

### Definition of consequence

Classification	Definition of consequence
<b>Human health receptors – site end use or other more sensitive receptor</b>	
Severe	Acute damage to human health based on the effects on the critical human health receptor. Concentrations of contaminants above appropriate site-specific assessment criteria. Harm meets definition of ‘significant harm’ under Part 2A of EPA 1990.
Medium	Chronic damage to human health based on the effects on the critical human health receptor. Concentrations of contaminants above appropriate site-specific assessment criteria. Harm meets definition of ‘significant harm’ under Part 2A of EPA 1990.
Mild	No appreciable impact on human health based on the potential effects on the critical human health receptor. Concentrations of contaminants above generic assessment criteria but below appropriate site-specific assessment criteria.
Minor	No appreciable impact on human health based on the effects on the critical human health receptor. Concentrations of contaminants below appropriate generic assessment criteria.

<sup>1</sup> National House Building Council (NHBC) and EA report R&D66 – guidance for the safe development of housing on land effected by contamination, 2008

<sup>2</sup> Construction Industry Research and Information Association (CIRIA) C552 – Contaminated Land Risk Assessment – A Guide to Good Practice 2001

Classification	Definition of consequence
<b>Controlled water receptors</b>	
Severe	Pollution of a Principal aquifer within a source protection zone or potable supply characterised by a breach of drinking water standards. Pollution of a surface water course characterised by a breach of an Environmental Quality Standards (EQS) at a statutory monitoring location or resulting in a change in General Quality Assessment (GQA) grade of river reach. Discharge of a List I or List II substance to groundwater. Pollution meets Part 2A definition.
Medium	Pollution of a Principal aquifer outside a source protection zone or a Secondary A aquifer characterised by a breach of drinking water standards. Pollution of an industrial groundwater abstraction or irrigation supply that impairs its function. Substantial pollution but insufficient to result in a change in the GQA grade of river reach. Pollution meets Part 2A definition.
Mild	Low levels of pollution of a Principal aquifer outside a source protection zone or an industrial abstraction, or pollution of a Secondary aquifer. Low levels of pollution insufficient to result in a change in the GQA grade of river reach, pollution of a surface water course without a quality classification.
Minor	No appreciable pollution, or pollution of a low sensitivity receptor such as a non-aquifer or a surface water course without a quality classification.
<b>Property receptors – buildings, foundations and services</b>	
Severe	Catastrophic damage to buildings, such as explosion. Catastrophic failure of foundations and services. Substantial damage to a Scheduled Monument significantly impairing the by reason of which the monument is scheduled. Harm meets definition of 'significant harm' under Part 2A of EPA 1990.
Medium	Substantial damage to buildings and foundations rendering the structures unsafe. Substantial damage to services impairing their function. Significant damage to a Scheduled Monument significantly impairing the reason of which the monument is scheduled. Harm meets definition of 'significant harm' under Part 2A of EPA 1990.
Mild	Significant damage to buildings and foundations but not resulting in them being unsafe for occupation. Damage to services but not sufficient to impair their function. Damage to a Scheduled Monument but no significant impairment to the reason of which the monument is scheduled.
Minor	Easily repairable damage to buildings, foundations and services.

### Classification of consequence

Classification	Definition of risk
Very High Risk	There is a high probability that severe harm may arise to a designated receptor or there is evidence that severe harm to a designated receptor is currently happening. This risk is likely to result in a substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not already undertaken) is required, and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	It is possible that harm may arise to a designated receptor. It is either relatively unlikely that any such harm will be severe, or if any harm were to occur, it is more likely that the harm will be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.

Classification	Definition of risk
Low Risk	It is possible that harm will arise to a designated receptor, but it is likely that this harm will be mild. Further investigation is not necessarily required and should be considered to confirm that there is no unanticipated contamination present.
Very Low Risk	The possibility of harm to the designated receptor is either not plausible or, if the possibility of harm is plausible, risk is considered to be very unlikely with attenuation along the exposure pathway. Further investigation is not necessarily required and may be considered to confirm that there is no unanticipated contamination present.

The following table provides the qualitative risk matrix, based on CIRIA guidance, in which the likelihood or probability of each contaminant linkage being realised is ranked against the severity of the consequences. The result is the relative risk classification, the results of which can inform the due diligence process and allow prioritisation of any further assessments or the implementation of risk management measures.

### Qualitative Risk Matrix

Risk Matrix	Severity of Consequence			
	Severe	Medium	Mild	Minor
High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

## APPENDIX D – GQRA SCREENING SHEETS

## **Soil Screening Sheets**

TRU

Assessment Criteria : Commercial - 1% SOM Sand

Use MRL Values?

Constituent	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedances	Locations of Exceedances	Location		BH4115ES01		BH4115ES03		BH4509ES03		BH4521ES02		BH4694ES02		18/05005/4	
									Sample ID	Zone	TP4011	BH4113	BH4115A	BH4115A	BH4509	BH4510B	BH4521	BH4694	BH4524	TP4014		
									Depth													
									Date													
									Strata													
Asbestos ACM Suitable for Water Absorption Test?			No SSV	10	-	-	0			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asbestos in soil			No SSV	10	-	-	0			NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Arsenic	mg/kg	1	635	10	2	28	0			20	19	5	2	3	11	28	25	4	10			
Antimony	mg/kg	5	4650	10	<5	6	0			6	<5	<5	<5	<5	<5	<5	5	<5	<5			
Beryllium	mg/kg	0.5	14	10	<0.5	2.6	0			2	1.1	2.6	1.6	<0.5	1.1	2	1.6	1.5	1.2			
Boron (water soluble)	mg/kg	1	No SSV	10	<1	5.1	0			<1	<1	2	1.6	<1	<1	5.1	<1	<1				
Cadmium	mg/kg	0.5	410	10	<0.5	2.3	0			2.1	1.6	0.8	1.4	<0.5	1.4	1.2	2.3	1.5	0.8			
Chromium	mg/kg	1	208000	10	11	144	0			144	15	21	35	11	18	21	25	25	26			
Chromium (hexavalent)	mg/kg	1	49.1	5	<1	<1	0			<1	<1	<1	<1	<1	<1	<1	<1	<1				
Copper	mg/kg	1	106000	10	29	511	0			161	123	80	49	29	90	511	197	125	86			
Lead	mg/kg	1	2310	10	25	406	0			220	181	46	34	25	93	406	168	30	217			
Mercury	mg/kg	0.17		10	<0.17	0.49	0			0.32	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.49	<0.17	<0.17			
Nickel	mg/kg	1	1770	10	13	56	0			56	33	13	44	22	35	53	46	35	32			
Selenium	mg/kg	1	13000	10	<1	2	0			<1	<1	<1	<1	<1	<1	1	2	<1	<1			
Vanadium	mg/kg	1	7490	10	11	66	0			66	24	52	33	11	24	41	46	26	29			
Zinc	mg/kg	5	1100000	10	60	674	0			674	142	126	130	60	312	318	204	69	114			
Total Organic Carbon	% w/w	0.03	No SSV	10	1.36	16.9	0			10.7	16.9	6.61	2.44	1.84	4.36	16.4	14.8	1.36	6.42			
pH	pH	0.01	No SSV	10	6.6	8.56	0			7.84	8.46	8.5	6.6	8.56	7.5	7.39	7.22	8.23	7.68			
Cyanide (complex)	mg/kg	1	No SSV	5	<1	<1	0			<1	<1	<1	<1	<1	<1	<1	<1	<1				
Cyanide (free)	mg/kg	1	373	5	<1	<1	0			<1	<1	<1	<1	<1	<1	<1	<1	<1				
Cyanide (total)	mg/kg	1	No SSV	10	<1	<1	0			<1	<1	<1	<1	<1	<1	<1	<1	<1				
Acenaphthene	mg/kg	0.01	83600	9	0.01	5.33	0			4.24	5.33	0.1	0.13	0.01	0.19	0.07	0.01	0.22				
Acenaphthylene	mg/kg	0.01	No SSV	9	<0.01	0.1	0			0.06	0.1	0.04	0.04	0.02	<0.01	0.02	0.01	0.02				
Anthracene	mg/kg	0.02	535000	9	<0.02	6.01	0			6.01	5.04	0.12	0.08	0.02	0.17	0.29	<0.02	0.3				
Benzo(a)anthracene	mg/kg	0.04	BaP Surrogate	9	<0.04	11.3	0			9.87	11.3	0.21	0.1	<0.04	0.23	0.48	<0.04	0.66				
Benzo(a)pyrene	mg/kg	0.04	76.3	9	<0.04	8.21	0			5.92	8.21	0.15	0.11	<0.04	0.14	0.46	<0.04	0.93				
Benzo(b)fluoranthene	mg/kg	0.05	BaP Surrogate	9	<0.05	9.81	0			6.71	9.81	0.22	0.17	<0.05	0.19	0.6	<0.05	1.14				
Benzo(ghi)perylene	mg/kg	0.05	BaP Surrogate	9	<0.05	3.78	0			2.48	3.78	0.1	0.07	<0.05	0.09	0.25	<0.05	0.47				
Benzo(k)fluoranthene	mg/kg	0.07	BaP Surrogate	9	<0.07	3.7	0			2.21	3.7	0.15	<0.07	<0.07	<0.07	0.22	<0.07	0.47				
Chrysene	mg/kg	0.06	BaP Surrogate	9	<0.06	10.7	0			9.04	10.7	0.26	0.25	0.09	0.26	0.53	<0.06	0.78				
Dibenzo(ah)anthracene	mg/kg	0.04	BaP Surrogate	9	<0.04	0.79	0			0.7	0.79	<0.04	<0.04	<0.04	<0.04	0.08	<0.04	0.14				
Fluoranthene	mg/kg	0.08	72200	9	<0.08	29.1	0			22.1	29.1	0.45	0.3	<0.08	0.82	0.92	<0.08	1.29				
Fluorene	mg/kg	0.01	66500	9	<0.01	3.89	0			3.55	3.89	0.19	0.25	0.08	0.24	0.04	<0.01	0.17				
Indeno[1,2,3-cd]pyrene	mg/kg	0.03	BaP Surrogate	9	<0.03	4.79	0			3.16	4.79	0.12	0.08	<0.03	0.11	0.31	<0.03	0.45				
Naphthalene	mg/kg	0.03	90.1	8	<0.03	3.99	0				3.99	0.16	0.11	0.04	0.05	0.09	<0.03	0.39				
Phenanthrene	mg/kg	0.03	No SSV	9	<0.03	27.6	0			24.9	27.6	0.55	0.31	0.24	0.23	0.69	<0.03	1.41				
Pyrene	mg/kg	0.07	54100	9	<0.07	24.6	0			20.4	24.6	0.45	0.35	<0.07	0.99	0.83	<0.07	1.25				
TPH aliphatic C5-C6	mg/kg	0.01	4490	7	<0.01	<0.05	0			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01				
TPH aliphatic C6-C8	mg/kg	0.01	10400	7	<0.01	<0.05	0			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01				
TPH aliphatic C8-C10	mg/kg	1	1370	6	<0.01	144	0			<0.01	2	<10	24		144		<0.01	<0.01				
TPH aliphatic C10-C12	mg/kg	1	7900	7	<0.1	49	0			<0.1	4	<10	49	1	19		<0.1	<0.1				
TPH aliphatic C12-C16	mg/kg	1	34000	7	<0.1	231	0			<0.1	10	15	231	8	24		<0.1	<0.1				
TPH aliphatic C16-C21	mg/kg	1	3620000	7	<0.1	289	0			<0.1	12	26	289	11	48		<0.1	<0.1				
TPH aliphatic C21-C35	mg/kg	1	3620000	7	<0.1	1270	0			<0.1	27	404	522	20	1270		<0.1	<0.1				
TPH aliphatic C35-C44	mg/kg	1	No SSV	7	<0.1	335	0			<0.1	19	134	335	8	182		<0.1	<0.1				
TPH aromatic C5-C7 (Benzene)	mg/kg	0.01	12.5	7	<0.01	<0.05	0			<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01				
TPH aromatic C7-C8 (Toluene)	mg/kg	0.01	27900	7	<0.01	<0.05	0			<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01				
TPH aromatic C8-C9	mg/kg		No SSV	2	<0.01	<0.01	0			<0.01							<0.01	<0.01				
TPH aromatic C9-C10	mg/kg		No SSV	2	<0.01	<0.01	0			<0.01							<0.01	<0.01				
TPH aromatic C8-C10	mg/kg	1	2210	5	1	165	0				2	11	16	1	165							
TPH aromatic C10-C12	mg/kg	1	12300	7	0.8	50	0			9.5	6	18	24	1	50			0.8				
TPH aromatic C12-C16	mg/kg	1	41300	7	1.2	141	0			25.8	34	60	141	4	42			1.2				
TPH aromatic C16-C21	mg/kg	1	28400	7	0.5	168	0			97.8	154	96	168	8	119			0.5				
TPH aromatic C21-C35	mg/kg	1	28400	7	1.4	989	0			150	417	241	139	28	989			1.4				
TPH aromatic C35-C44	mg/kg	1	No SSV	7	<0.1	243	0			3	18	151	115	4	243			<0.1				
Total Aliphatics	mg/kg	1	No SSV	7	<0.1	1680	0			<0.1	73	580	1450	50	1680			<0.1				
Total Aromatics	mg/kg	1	No SSV	7	3.9	1610	0			284	630	576	602	47	1610			3.9				
Benzene	mg/kg	0.01	12.5	9	<0.01	<0.05	0			<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	<0.01				
Ethyl Benzene	mg/kg	0.01	7660	9	<0.01	<0.05	0			<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	<0.01				
m & p Xylene	mg/kg	0.01	No SSV	9	<0.01	<0.05	0															

TRU

Assessment Criteria : **Commercial - 1% SOM Sand**

Use MRL Values?

	Unit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedances	Location										
							18/04637/1		BH4115ES01	BH4115ES03	BH4509ES03		BH4521ES02	BH4694ES02		18/05005/4	
							Sample ID	TP4011	BH4113	BH4115A	BH4115A	BH4509	BH4510B	BH4521	BH4694	BH4524	TP4014
							Depth	0.4m	0.3m	0.3m	0.95m	0.9m	0.6m	0.5m	0.7m	0.7m	1m
							Date	28/05/2018	01/12/2020	06/12/2020	06/12/2020	11/11/2019	27/04/2021	11/11/2019	27/12/2020	27/10/2019	01/06/2018
							Strata										
Toluene	mg/kg	0.01	27900	9	<0.01	<0.05	0										
MTBE	mg/kg	0.01	3140	5	<0.01	<0.05	0										
Total phenol	mg/kg	0.2	No SSV	10	<0.2	<0.2	0										
1,1,1,2Tetrachloroethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,1,1Trichloroethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,1,2,2Tetrachloroethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,1,2Trichloroethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,1Dichloroethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,1Dichloroethene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,1Dichloropropene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,2,3Trichlorobenzene	mg/kg	0.003	No SSV	1	<0.003	<0.003	0										
1,2,3Trichloropropane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,2,4Trichlorobenzene	mg/kg	0.003	No SSV	1	<0.003	<0.003	0										
1,2,4Trimethylbenzene	mg/kg	0.001	No SSV	1	0.002	0.002	0										
1,2Dibromo3chloropropane (DCBP)	mg/kg	0.002	No SSV	1	<0.002	<0.002	0										
1,2Dibromoethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,2Dichlorobenzene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,2Dichloroethane	mg/kg	0.002	No SSV	1	<0.002	<0.002	0										
1,2Dichloropropane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,3,5Trimethylbenzene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,3Dichlorobenzene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,3Dichloropropane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
1,4Dichlorobenzene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
2,2Dichloropropane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
2,4,5Trichlorophenol	mg/kg	0.1	No SSV	1	<1	<1	0										
2,4,6Trichlorophenol	mg/kg	0.1	No SSV	1	<1	<1	0										
2,4Dichlorophenol	mg/kg	0.1	No SSV	1	<1	<1	0										
2,4Dimethylphenol	mg/kg	0.1	No SSV	1	<1	<1	0										
2,4Dinitrotoluene	mg/kg	0.1	No SSV	1	<1	<1	0										
2,6Dinitrotoluene	mg/kg	0.1	No SSV	1	<1	<1	0										
2Chloronaphthalene	mg/kg	0.1	No SSV	1	<1	<1	0										
2Chlorophenol	mg/kg	0.1	No SSV	1	<1	<1	0										
2Chlorotoluene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
2Methylnaphthalene	mg/kg	0.1	No SSV	1	<1	<1	0										
2Methylphenol	mg/kg	0.1	No SSV	1	<1	<1	0										
2Nitrophenol	mg/kg	0.1	No SSV	1	<1	<1	0										
3+4Methylphenol	mg/kg	0.1	No SSV	1	<1	<1	0										
4Chloro3methylphenol	mg/kg	0.1	No SSV	1	<1	<1	0										
4Chlorotoluene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
4Isopropyltoluene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
4Nitrophenol	mg/kg	0.1	No SSV	1	<1	<1	0										
Bis(2chloroethoxy)methane	mg/kg	0.1	No SSV	1	<1	<1	0										
Bis(2chloroethyl)ether	mg/kg	0.1	No SSV	1	<1	<1	0										
Bis(2chloroisopropyl)ether	mg/kg	0.1	No SSV	1	<1	<1	0										
Bis(2ethylhexyl)phthalate	mg/kg	0.5	No SSV	1	<5	<5	0										
Bromobenzene	mg/kg	0.001	42.1	1	<0.001	<0.001	0										
Bromochloromethane	mg/kg	0.005	No SSV	1	<0.005	<0.005	0										
Bromodichloromethane	mg/kg	0.01	0.854	1	<0.01	<0.01	0										
Bromoform	mg/kg	0.001	327	1	<0.001	<0.001	0										
Bromomethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
Butylbenzyl phthalate	mg/kg	0.1	No SSV	1	<1	<1	0										
Carbazole	mg/kg	0.1	No SSV	1	<1	<1	0										
Carbon Disulphide	mg/kg	0.001	10.9	1	0.002	0.002	0										
Carbon Tetrachloride	mg/kg	0.001	14.8	1	<0.001	<0.001	0										
Chlorobenzene	mg/kg	0.001	502	1	<0.001	<0.001	0										
Chloroethane	mg/kg	0.001	436	1	<0.001	<0.001	0										
Chloroform	mg/kg	0.001	45.2	1	<0.001	<0.001	0										
Chloromethane	mg/kg	0.01	0.452	1	<0.01	<0.01	0										
cis 1,2Dichloroethene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
cis 1,3Dichloropropene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
Dibenzofuran	mg/kg	0.1	No SSV	1	<1	<1	0										
Dibromochloromethane	mg/kg	0.003	9.27	1	<0.003	<0.003	0										
Dibromomethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
Dichlorodifluoromethane	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
Dichloromethane	mg/kg	0.005	109	1	<0.005	<0.005	0										
Diethyl phthalate	mg/kg	0.1	108000	1	<1	<1	0										
Dimethyl phthalate	mg/kg	0.1	No SSV	1	<1	<1	0										
Ethylbenzene	mg/kg	0.001	7660	1	<0.001	<0.001	0										
Hexachlorobenzene	mg/kg	0.1	No SSV	1	<1	<1	0										
Hexachlorobutadiene	mg/kg	0.001	No SSV	1	<0.001	<0.001	0										
Hexachlorocyclopentadiene	mg/kg	0.1	No SSV	1	<1	<1	0										



Assessment Criteria :		Public Open Space (Parks) - 1% SOM Sand																			
Use MRL Values?																					
Constituent	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedances	Locations of Exceedances	Location		18/04637/1										
									Sample ID	Zone	TP4011	BH4113	BH4115A	BH4115A	BH4509	BH4510B	BH4521	BH4694	BH4524	TP4014	
										Depth	18/05005/4										
										Date	18/05005/4										
										Strata	18/05005/4										
Asbestos ACM Suitable for Water Absorption Test?			No SSV	10	-	-	0				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asbestos in soil			No SSV	10	-	-	0				NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Arsenic	mg/kg	1	168	10	2	28	0				20	19	5	2	3	11	28	25	4	10	10
Antimony	mg/kg	5	3090	10	<5	6	0				6	<5	<5	<5	<5	<5	<5	5	<5	<5	<5
Beryllium	mg/kg	0.5	61	10	<0.5	2.6	0				2	1.1	2.6	1.6	<0.5	1.1	2	1.6	1.5	1.2	1.2
Boron (water soluble)	mg/kg	1	No SSV	10	<1	5.1	0				<1	<1	2	1.6	<1	<1	5.1	<1	<1	<1	<1
Cadmium	mg/kg	0.5	882	10	<0.5	2.3	0				2.1	1.6	0.8	1.4	<0.5	1.4	1.2	2.3	1.5	0.8	0.8
Chromium	mg/kg	1	83500	10	11	144	0				144	15	21	35	11	18	21	25	25	26	26
Chromium (hexavalent)	mg/kg	1	251	5	<1	<1	0				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Copper	mg/kg	1	45200	10	29	511	0				161	123	80	49	29	90	511	197	125	86	86
Lead	mg/kg	1	1340	10	25	406	0				220	181	46	34	25	93	406	168	30	217	217
Mercury	mg/kg	0.17		10	<0.17	0.49	0				0.32	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.49	<0.17	<0.17	<0.17
Nickel	mg/kg	1	804	10	13	56	0				56	33	13	44	22	35	53	46	35	32	32
Selenium	mg/kg	1	2550	10	<1	2	0				<1	<1	<1	<1	<1	<1	1	2	<1	<1	<1
Vanadium	mg/kg	1	1550	10	11	66	0				66	24	52	33	11	24	41	46	26	29	29
Zinc	mg/kg	5	201000	10	60	674	0				674	142	126	130	60	312	318	204	69	114	114
Total Organic Carbon	% w/w	0.03	No SSV	10	1.36	16.9	0				10.7	16.9	6.61	2.44	1.84	4.36	16.4	14.8	1.36	6.42	6.42
pH	pH	0.01	No SSV	10	6.6	8.56	0				7.84	8.46	8.5	6.6	8.56	7.5	7.39	7.22	8.23	7.68	7.68
Cyanide (complex)	mg/kg	1	No SSV	5	<1	<1	0					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cyanide (free)	mg/kg	1	34	5	<1	<1	0					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cyanide (total)	mg/kg	1	No SSV	10	<1	<1	0				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	mg/kg	0.01	28600	9	0.01	5.33	0				4.24	5.33	0.1	0.13	0.01		0.19	0.07	0.01	0.22	0.22
Acenaphthylene	mg/kg	0.01	No SSV	9	<0.01	0.1	0				0.06	0.1	0.04	0.04	0.02		<0.01	0.02	0.01	0.02	0.02
Anthracene	mg/kg	0.02	150000	9	<0.02	6.01	0				6.01	5.04	0.12	0.08	0.02		0.17	0.29	<0.02	0.3	0.3
Benzo(a)anthracene	mg/kg	0.04	BaP Surrogate	9	<0.04	11.3	0				9.87	11.3	0.21	0.1	<0.04		0.23	0.48	<0.04	0.66	0.66
Benzo(a)pyrene	mg/kg	0.04	21.4	9	<0.04	8.21	0				5.92	8.21	0.15	0.11	<0.04		0.14	0.46	<0.04	0.93	0.93
Benzo(b)fluoranthene	mg/kg	0.05	BaP Surrogate	9	<0.05	9.81	0				6.71	9.81	0.22	0.17	<0.05		0.19	0.6	<0.05	1.14	1.14
Benzo(ghi)perylene	mg/kg	0.05	BaP Surrogate	9	<0.05	3.78	0				2.48	3.78	0.1	0.07	<0.05		0.09	0.25	<0.05	0.47	0.47
Benzo(k)fluoranthene	mg/kg	0.07	BaP Surrogate	9	<0.07	3.7	0				2.21	3.7	0.15	<0.07	<0.07		<0.07	0.22	<0.07	0.47	0.47
Chrysene	mg/kg	0.06	BaP Surrogate	9	<0.06	10.7	0				9.04	10.7	0.26	0.25	0.09		0.26	0.53	<0.06	0.78	0.78
Dibenzo(ah)anthracene	mg/kg	0.04	BaP Surrogate	9	<0.04	0.79	0				0.7	0.79	<0.04	<0.04	<0.04		<0.04	0.08	<0.04	0.14	0.14
Fluoranthene	mg/kg	0.08	20200	9	<0.08	29.1	0				22.1	29.1	0.45	0.3	<0.08		0.82	0.92	<0.08	1.29	1.29
Fluorene	mg/kg	0.01	19600	9	<0.01	3.89	0				3.55	3.89	0.19	0.25	0.08		0.24	0.04	<0.01	0.17	0.17
Indeno[1,2,3-cd]pyrene	mg/kg	0.03	BaP Surrogate	9	<0.03	4.79	0				3.16	4.79	0.12	0.08	<0.03		0.11	0.31	<0.03	0.45	0.45
Naphthalene	mg/kg	0.03	623	8	<0.03	3.99	0					3.99	0.16	0.11	0.04		0.05	0.09	<0.03	0.39	0.39
Phenanthrene	mg/kg	0.03	No SSV	9	<0.03	27.6	0				24.9	27.6	0.55	0.31	0.24		0.23	0.69	<0.03	1.41	1.41
Pyrene	mg/kg	0.07	15100	9	<0.07	24.6	0				20.4	24.6	0.45	0.35	<0.07		0.99	0.83	<0.07	1.25	1.25
TPH aliphatic C5-C6	mg/kg	0.01	109000	7	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01		<0.01	<0.05		<0.01	<0.01	<0.01
TPH aliphatic C6-C8	mg/kg	0.01	163000	7	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01		<0.01	<0.05		<0.01	<0.01	<0.01
TPH aliphatic C8-C10	mg/kg	1	9720	6	<0.01	144	0				<0.01	2	<10	24			144			<0.01	<0.01
TPH aliphatic C10-C12	mg/kg	1	17700	7	<0.1	49	0				<0.1	4	<10	49		1	19			<0.1	<0.1
TPH aliphatic C12-C16	mg/kg	1	23800	7	<0.1	231	0				<0.1	10	15	231		8	24			<0.1	<0.1
TPH aliphatic C16-C21	mg/kg	1	864000	7	<0.1	289	0				<0.1	12	26	289		11	48			<0.1	<0.1
TPH aliphatic C21-C35	mg/kg	1	864000	7	<0.1	1270	0				<0.1	27	404	522		20	1270			<0.1	<0.1
TPH aliphatic C35-C44	mg/kg	1	No SSV	7	<0.1	335	0				<0.1	19	134	335		8	182			<0.1	<0.1
TPH aromatic C5-C7 (Benzene)	mg/kg	0.01	139	7	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01		<0.01	<0.05			<0.01	<0.01
TPH aromatic C7-C8 (Toluene)	mg/kg	0.01	69900	7	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01		<0.01	<0.05			<0.01	<0.01
TPH aromatic C8-C9	mg/kg		No SSV	2	<0.01	<0.01	0				<0.01									<0.01	<0.01
TPH aromatic C9-C10	mg/kg		No SSV	2	<0.01	<0.01	0				<0.01									<0.01	<0.01
TPH aromatic C8-C10	mg/kg	1	5140	5	1	165	0					2	11	16		1	165				
TPH aromatic C10-C12	mg/kg	1	8260	7	0.8	50	0					6	18	24		1	50				0.8
TPH aromatic C12-C16	mg/kg	1	10600	7	1.2	141	0					25.8	34	60	141		4	42			1.2
TPH aromatic C16-C21	mg/kg	1	7870	7	0.5	168	0					97.8	154	96	168		8	119			0.5
TPH aromatic C21-C35	mg/kg	1	7870	7	1.4	989	0					150	417	241	139		28	989			1.4
TPH aromatic C35-C44	mg/kg	1	No SSV	7	<0.1	243	0					3	18	151	115		4	243			<0.1
Total Aliphatics	mg/kg	1	No SSV	7	<0.1	1680	0				<0.1	73	580	1450		50	1680			<0.1	<0.1
Total Aromatics	mg/kg	1	No SSV	7	3.9	1610	0					284	630	576	602		47	1610			3.9
Benzene	mg/kg	0.01	139	9	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01	<0.05		<0.05	<0.01	<0.01	<0.01	<0.01
Ethyl Benzene	mg/kg	0.01	21400	9	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01	<0.05		<0.05	<0.01	<0.01	<0.01	<0.01
m & p Xylene	mg/kg	0.01	No SSV	9	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01	<0.05		<0.05	<0.01	<0.01	<0.01	<0.01
o Xylene	mg/kg	0.01	9560	9	<0.01	<0.05	0				<0.0										





Assessment Criteria :		Commercial - 1% SOM Sand																					
<input type="checkbox"/> Use MRL Values?																							
Constituent	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedances	Locations of Exceedances	Location		BH4506ES0	BH4506ES0	18/04254/2	BH4111ES0	BH4112ES0	BH4507ES0	BH4508ES0	BH4508ES0	BH4509ES0	BH4512ES0	BH4520ES0	BH4520ES0	
									Sample ID	Sample ID	TP4010	BH4111	BH4112	BH4507	BH4508	BH4508	BH4509	BH4512	BH4520	BH4520	BH4522		
										0.3m	0.7m	0.55m	0.3m	0.25m	0.3m	0.3m	0.6m	0.7m	0.4m	0.6m	0.8m	0.3m	
										12/05/2020	12/05/2020	29/05/2018	03/03/2019	16/03/2019	12/05/2020	12/05/2020	12/05/2020	09/11/2019	09/11/2019	09/11/2019	09/11/2019	08/03/2021	
										Strata													
										Zone													
Asbestos ACM Suitable for Water Absorption Test?			No SSV	13	-	-	0				N/A	N/A											
Asbestos in soil			No SSV	13	-	-	0				NAD	NAD											
Arsenic	mg/kg	1	635	13	<1	27	0				<1	5	<1	<1	6	<1	<1	<1	27	1	<1	10	<1
Antimony	mg/kg	5	4650	3	<5	<5	0						<5	<5									<5
Beryllium	mg/kg	0.5	14	3	<0.5	<0.5	0						<0.5	<0.5									<0.5
Boron (water soluble)	mg/kg	1	No SSV	3	<1	<1	0						<1	<1									<1
Cadmium	mg/kg	0.5	410	3	1.1	2.5	0						1.3	2.5									1.1
Chromium	mg/kg	1	208000	13	8	50	0				46	21	35	13	8	39	14	36	44	50	48	33	17
Chromium (hexavalent)	mg/kg	1	49.1	1	<1	<1	0																<1
Copper	mg/kg	1	106000	13	11	184	0				20	108	16	24	44	47	41	96	151	85	11	74	184
Lead	mg/kg	1	2310	13	5	230	0				8	153	30	5	5	6	20	85	230	33	7	32	9
Mercury	mg/kg	0.17		5	<0.17	<0.17	0				0	0	<0.17	<0.17	<0.17								<0.17
Nickel	mg/kg	1	1770	13	6	52	0				33	17	10	8	6	33	8	39	45	30	40	52	7
Selenium	mg/kg	1	13000	3	<1	<1	0						<1	<1									<1
Vanadium	mg/kg	1	7490	3	29	79	0						29	60									79
Zinc	mg/kg	5	1100000	13	27	161	0				31	124	44	32	71	52	52	106	161	80	27	83	90
Total Organic Carbon	% w/w	0.03	No SSV	3	<0.03	0.3	0						0.29	0.3									<0.03
pH		0.01	No SSV	13	6.91	9.54	0				8.73	8.52	9.19	9.12	9.17	9.27	8.81	8.33	8.18	9.03	9.34	6.91	9.54
Cyanide (complex)	mg/kg	1	No SSV	1	<1	<1	0																<1
Cyanide (free)	mg/kg	1	373	1	<1	<1	0																<1
Cyanide (total)	mg/kg	1	No SSV	3	<1	<10	0						<1	<10									<1
Acenaphthene	mg/kg	0.01	83600	13	<0.01	0.31	0				<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.03	0.12	0.05	<0.01	0.31	0.01	
Acenaphthylene	mg/kg	0.01	No SSV	13	<0.01	0.25	0				<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.02	0.08	0.01	<0.01	0.25	0.01	
Anthracene	mg/kg	0.02	535000	13	<0.02	2.73	0				<0.02	0.12	0.1	<0.02	<0.02	<0.02	0.02	0.12	0.84	0.1	<0.02	2.73	<0.02
Benzo(a)anthracene	mg/kg	0.04	BaP Surrogate	13	<0.04	4.39	0				<0.04	0.31	0.28	<0.04	<0.04	<0.04	0.06	0.42	0.89	0.14	<0.04	4.39	<0.04
Benzo(a)pyrene	mg/kg	0.04	76.3	13	<0.04	3.14	0				<0.04	0.33	0.26	<0.04	<0.04	<0.04	0.06	0.46	0.86	0.11	<0.04	3.14	<0.04
Benzo(b)fluoranthene	mg/kg	0.05	BaP Surrogate	13	<0.05	3.29	0				<0.05	0.43	0.3	<0.1	<0.05	<0.05	0.07	0.51	1.36	0.16	<0.05	3.29	<0.05
Benzo(ghi)perylene	mg/kg	0.05	BaP Surrogate	13	<0.05	1.66	0				<0.05	0.24	0.15	<0.05	<0.05	<0.05	<0.05	0.29	0.63	0.1	<0.05	1.66	<0.05
Benzo(k)fluoranthene	mg/kg	0.07	BaP Surrogate	13	<0.07	1.36	0				<0.07	0.16	0.13	<0.14	<0.07	<0.07	<0.07	0.2	0.43	<0.07	<0.07	1.36	<0.07
Chrysene	mg/kg	0.06	BaP Surrogate	13	<0.06	3.84	0				<0.06	0.42	0.29	<0.06	<0.06	<0.06	0.07	0.49	1.06	0.23	<0.06	3.84	<0.06
Dibenzo(ah)anthracene	mg/kg	0.04	BaP Surrogate	13	<0.04	0.47	0				<0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	0.07	0.17	<0.04	<0.04	0.47	<0.04
Fluoranthene	mg/kg	0.08	72200	13	<0.08	8.38	0				<0.08	0.57	0.63	<0.08	<0.08	<0.08	0.11	0.66	1.6	0.54	<0.08	8.38	<0.08
Fluorene	mg/kg	0.01	66500	13	<0.01	0.97	0				<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.18	0.05	<0.01	0.97	<0.01
Indeno[1,2,3-cd]pyrene	mg/kg	0.03	BaP Surrogate	13	<0.03	1.91	0				<0.03	0.27	0.16	<0.03	<0.03	<0.03	0.05	0.34	0.75	0.1	<0.03	1.91	<0.03
Naphthalene	mg/kg	0.03	90.1	13	<0.03	0.18	0				<0.03	0.06	<0.03	<0.03	<0.03	<0.03	0.06	0.18	0.04	<0.03	0.18	<0.03	
Phenanthrene	mg/kg	0.03	No SSV	13	<0.03	7.19	0				0.04	0.29	0.18	<0.03	<0.03	<0.03	0.08	0.37	1.06	0.34	0.03	7.19	0.04
Pyrene	mg/kg	0.07	54100	13	<0.07	6.8	0				<0.07	0.54	0.55	<0.07	<0.07	<0.07	0.1	0.64	1.39	0.34	<0.07	6.8	<0.07
TPH aliphatic C5-C6	mg/kg	0.01	4490	12	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
TPH aliphatic C6-C8	mg/kg	0.01	10400	12	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
TPH aliphatic C8-C10	mg/kg	1	1370	12	<0.01	7	0				<1	2	<0.01	<0.01	<1	<1	4	7	<1	<1	2	<1	<1
TPH aliphatic C10-C12	mg/kg	1	7900	12	<0.1	12	0				<1	4	<0.1	<0.1	<1	1	12	7	<1	<1	4	<1	<1
TPH aliphatic C12-C16	mg/kg	1	34000	12	<0.1	35	0				<1	5	<0.1	<0.1	<1	2	21	35	2	<1	10	1	<1
TPH aliphatic C16-C21	mg/kg	1	3620000	12	<0.1	62	0				1	7	<0.1	36.5	<1	4	21	62	10	<1	18	14	<1
TPH aliphatic C21-C35	mg/kg	1	3620000	12	<0.1	2430	0				11	210	<0.1	2430	5	247	93	324	145	<1	129	535	<1
TPH aliphatic C35-C44	mg/kg	1	No SSV	4	<0.1	102	0				0	0	<0.1									102	<0.1
TPH aromatic C5-C7 (Benzene)	mg/kg	0.01	12.5	12	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
TPH aromatic C7-C8 (Toluene)	mg/kg	0.01	27900	12	<0.01	<0.05	0				<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
TPH aromatic C8-C9	mg/kg		No SSV	6	<0.01	3	0				<1	2	<0.01	<0.01		2	3						
TPH aromatic C9-C10	mg/kg		No SSV	2	<0.01	<0.01	0						<0.01	<0.01									
TPH aromatic C8-C10	mg/kg	1	2210	6	<1	8	0				<1	2						8	<1	<1	<1	1	1
TPH aromatic C10-C12	mg/kg	1	12300	12	<0.1	12	0				<1	3	<0.1	<0.1		<1	2	3	12	1	<1	6	2
TPH aromatic C12-C16	mg/kg	1	41300	12	<0.1	56	0				1	5	<0.1	<0.1	<1	2	7	56	3	2	25	2	2
TPH aromatic C16-C21	mg/kg	1	28400	12	<0.1	115	0				2	12	<0.1	12.3	<1	5	14	107	9	1	115	6	6
TPH aromatic C21-C35	mg/kg	1	28400	12	<0.1	353	0				4	59	<0.1	309	3	18	44	128	38	5	353	15	15

**Leachate Screening Sheets**

Assessment Criteria :										Drinking Water Standard England and Wales/WHO	
CaCO (mg/l):		0.00		pH		7.19					
Calcium (mg/l):		83.00		DOC (mg/l)		4.50		Catchment area: Ouse, Humber			
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location		
									Sample ID	Zone	
									BH4115ES01		
									BH4115A	BH4510B	
									Depth	0.3m	0.6m
									Date		
									Strata		
Antimony	mg/l	0.001	0.005	2	0.003	0.004	0			0.004	0.003
Arsenic	mg/l	0.001	0.01	2	<0.001	0.003	0			0.003	<0.001
Chromium	mg/l	0.001	0.05	2	<0.001	<0.001	0			<0.001	<0.001
Cyanide (total)	mg/l	0.01	0.05	2	<0.005	<0.005	0			<0.005	<0.005
Lead	mg/l	0.001	0.01	2	0.005	0.006	0			0.005	0.006
Magnesium	mg/l	1	N/A	2	1	1	0			1	
mercury	mg/l	0.0001	0.001	2	<0.0001	<0.0001	0			<0.0001	
Nickel	mg/l	0.001	0.02	2	0.001	0.001	0			0.001	
selenium	mg/l	0.001	0.01	2	<0.001	<0.001	0			<0.001	
Vanadium	mg/l	0.001	N/A	2	0.003	0.003	0			0.003	
Zinc	mg/l	0.001	3	2	0.014	0.014	0			0.014	
Total PAH 16MS	mg/l	-	No WSV	2	0.00006	0.00022	0			0.00006	0.00022
Sulphate	mg/l	1	250	2	17.45	19.85	0			19.85	17.45

Assessment Criteria :		Freshwater EQS									
CaCO (mg/l):		0.00		pH		7.19					
Calcium (mg/l):		83.00		DOC (mg/l)		4.50		Catchment area:		Ouse, Humber	
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location	BH4115ES01	
									Sample ID	BH4115A	BH4510B
									Depth	0.3m	0.6m
									Date		
									Strata		
									Zone		
Antimony	mg/l	0.001	N/A	2	0.003	0.004	0			0.004	0.003
Arsenic	mg/l	0.001	0.05	2	<0.001	0.003	0			0.003	<0.001
Chromium	mg/l	0.001	See Cr VI as first pass	2	<0.001	<0.001	0			<0.001	<0.001
Cyanide (total)	mg/l	0.01	N/A	2	<0.005	<0.005	0			<0.005	<0.005
Lead	mg/l	0.001	0.0012	2	0.005	0.006	2	BH4115ES01, BH4115A, 0.3m; BH4510B, 0.6m		0.005	0.006
Magnesium	mg/l	1	N/A	2	1	1	0			1	
mercury	mg/l	0.0001	0.00007	2	<0.0001	<0.0001	0			<0.0001	
Nickel	mg/l	0.001	0.004	2	0.001	0.001	0			0.001	
selenium	mg/l	0.001	N/A	2	<0.001	<0.001	0			<0.001	
Vanadium	mg/l	0.001	0.02	2	0.003	0.003	0			0.003	
Zinc	mg/l	0.001	0.0138	2	0.014	0.014	1	BH4115ES01, BH4115A, 0.3m		0.014	
Total PAH 16MS	mg/l	-	No WSV	2	0.00006	0.00022	0			0.00006	0.00022
Sulphate	mg/l	1	400	2	17.45	19.85	0			19.85	17.45

## **Groundwater Screening Sheet**

Assessment Criteria :		Drinking Water Standard England and Wales/WHO													
CaCO (mg/l):		0.00	pH		0.00										
Calcium (mg/l):		0.00	DOC (mg/l)		0.00		Catchment area: Ouse, Humber								
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location	GWBH-BH4114 1.70	GWBH-BH4114 1.80	GWBH-BH4689 8.00	GWBH-BH4691 2.80	GWBH-BH4691 3.60	GWBH-BH5082 7.20
									Sample ID	BH4114	BH4114	BH4689	BH4691	BH4691	BH5082
									Depth	1.7m	1.8m	8m	2.8m	3.6m	7.2m
									Date	16/11/2021	2021-08-24	2021-08-24	2021-11-16	2021-08-24	2021-11-16
									Strata						
									Zone						
Antimony	mg/l	0.001	0.005	6	<0.001	<0.005	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (dissolved)	mg/l	0.001	0.01	6	<0.001	0.014	1	GWBH-BH4691 2.80, BH4691, 2.8m	<0.001	<0.001	<0.001	<0.001	0.014	0.002	0.004
Beryllium	mg/l	0.001	0.012	6	0.001	<0.005	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Cadmium (dissolved)	mg/l	0.0002	0.005	6	0.00018	0.0113	1	GWBH-BH4691 2.80, BH4691, 2.8m	<0.002	0.00018	0.00023	0.0113	0.00033	0.00033	0.0006
Calcium (dissolved)	mg/l	1	No WSV	6	46	208	0		64	70	65	208	46	49	49
Chromium (dissolved)	mg/l	0.001	0.05	6	<0.001	0.016	0		<0.001	<0.001	0.004	0.016	0.002	0.002	0.014
Copper (dissolved)	mg/l	0.001	2	6	0.002	0.332	0		0.002	0.009	0.009	0.332	0.018	0.025	0.025
Lead (dissolved)	mg/l	0.001	0.01	6	<0.001	0.335	3	GWBH-BH4691 2.80, BH4691, 2.8m; GWBH-BH4691 3.60, BH4691, 3.6m; GWBH-BH5082 7.20, BH5082, 7.2m	<0.001	0.007	0.003	0.335	0.018	0.017	0.017
Manganese (dissolved)	mg/l	0.001	0.05	6	0.384	18.3	6	GWBH-BH4114 1.70, BH4114, 1.7m; GWBH-BH4114 1.80, BH4114, 1.8m; GWBH-BH4689 8.00, BH4689, 8m; GWBH-BH4691 2.80, BH4691, 2.8m; GWBH-BH4691 3.60, BH4691, 3.6m; GWBH-BH5082 7.20, BH5082, 7.2m	0.384	2.72	3.77	18.3	4.66	4.15	4.15
Mercury (dissolved)	mg/l	0.00005	0.001	6	<<0.00005	<0.0005	0		<0.0001	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.0001
Nickel (dissolved)	mg/l	0.001	0.02	6	0.003	0.08	1	GWBH-BH4691 2.80, BH4691, 2.8m	0.003	0.004	0.005	0.08	0.016	0.012	0.012
Selenium (dissolved)	mg/l	0.001	0.01	6	<0.001	0.026	1	GWBH-BH4691 2.80, BH4691, 2.8m	<0.001	<0.001	<0.001	0.026	<0.001	0.006	0.006
Vanadium (dissolved)	mg/l	0.001	No WSV	6	0.001	0.02	0		<0.001	<0.001	0.001	0.02	0.003	0.007	0.007
Zinc (dissolved)	mg/l	0.002	3	6	0.001	0.367	0		0.001	0.009	0.011	0.367	0.027	0.046	0.046
Ammoniacal nitrogen	mg/l	0.02	0.39	6	0.13	0.92	1	GWBH-BH4114 1.80, BH4114, 1.8m	0.37	0.92	0.14	0.31	0.13	0.18	0.18
Cyanide (complex)	mg/l	0.01	0.05	6	<0.005	<0.005	0		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide (free)	mg/l	0.01	See Cyanide (total)	6	<0.005	<0.005	0					<0.005	<0.005	<0.005	<0.005
Cyanide (total)	mg/l	0.01	0.05	6	<0.005	<0.005	0			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
DOC	mg/l	0.2	No WSV	6	2.1	7.4	0		7.4	2.1	3.1	6.1	6.4	2.1	2.1
Chloride	mg/l	1	250	6	7	68	0		21	46	68	7	8	51	51
Hardness Total	mg/l CaCO3	2	No WSV	6	166	822	0		186	210	219	822	187	166	166
pH	pH	0.01	6.5-9.5	6	6.6	7.72	0		7.12	7.63	7.72	6.74	7.37	6.6	6.6
Sulphate	mg/l	1	250	6	17	63	0			28	63		17		17
Acenaphthene	mg/l	0.001	See BaP	6	<0.00001	0.00352	0		<0.001	<0.001	<0.001	<0.00001	<0.001	0.00352	0.00352
Acenaphthylene	mg/l	0.001	See BaP	6	<0.00001	<0.001	0		<0.001	<0.001	<0.001	<0.00001	<0.001	0.00008	0.00008
Anthracene	mg/l	0.001	See BaP	6	<0.00001	<0.001	0		<0.001	<0.001	<0.001	<0.00001	<0.001	0.00021	0.00021
Benzo(a)anthracene	mg/l	0.001	See BaP	6	<0.00001	<0.001	0		0.00002	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Benzo(a)pyrene	mg/l	0.001	0.00001	6	0.00001	<0.001	0		0.00001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Benzo(b)fluoranthene	mg/l	0.001	See PAH Sum of 4	6	<0.00001	<0.001	0		0.00002	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Benzo(ghi)perylene	mg/l	0.001	See PAH Sum of 4	6	0.00001	<0.001	0		0.00001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Benzo(k)fluoranthene	mg/l	0.001	See PAH Sum of 4	6	<<0.00001	<0.001	0		<0.001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Chrysene	mg/l	0.001	See BaP	6	0.00001	<0.001	0		0.00002	<0.001	<0.001	<0.00001	<0.001	0.00001	0.00001
Dibenzo(a,h)anthracene	mg/l	0.001	See BaP	6	<0.00001	<0.001	0		<0.00001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Fluoranthene	mg/l	0.001	See BaP	6	<0.00001	<0.001	0		0.00002	<0.001	<0.001	<0.00001	<0.001	0.00055	0.00055
Fluorene	mg/l	0.001	See BaP	6	0.00001	0.00298	0		0.00002	<0.001	0.00001	<0.00001	0.00005	0.00298	0.00298
Indeno(123-cd)pyrene	mg/l	0.001	See PAH Sum of 4	6	<<0.00001	<0.001	0		<0.001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Naphthalene	mg/l	0.001	See BaP	6	0.00001	<0.001	0		0.00001	<0.001	<0.001	<0.00001	<0.001	<0.001	<0.001
Phenanthrene	mg/l	0.001	See BaP	6	0.00001	<0.001	0		0.00003	<0.001	0.00001	<0.00001	0.00004	0.00017	0.00017
Phenol	mg/l	0.001	0.05	6	<0.00001	<0.001	0		0.00003	<0.00001	<0.001	<0.001	<0.001	<0.001	<0.001
Aliphatic TPH >C5-C6	mg/l	0.001	15	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aliphatic TPH >C6-C8	mg/l	0.001	15	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aliphatic TPH >C8-C10	mg/l	0.005	0.3	6	<0.005	0.011	0		<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005
Aliphatic TPH >C10-C12	mg/l	0.005	0.3	6	<0.005	0.049	0		<0.005	<0.005	<0.005	<0.005	0.049	<0.005	<0.005
Aliphatic TPH >C12-C16	mg/l	0.005	0.3	6	<0.005	0.223	0		<0.005	0.009	<0.005	<0.005	0.223	<0.005	<0.005
Aliphatic TPH >C16-C21	mg/l	0.005	N/A	6	<0.005	0.247	0		<0.005	0.013	<0.005	<0.005	0.247	0.007	0.007
Aliphatic TPH >C21-C35	mg/l	0.005	N/A	6	<0.005	0.077	0		<0.005	0.016	<0.005	<0.005	0.077	0.006	0.006
Aliphatic TPH >C35-C44	mg/l	0.005	N/A	6	<0.005	0.007	0		<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005
Aromatic TPH >C5-C7	mg/l	0.001	0.01	6	<<0.001	<0.005	0		<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aromatic TPH >C7-C8	mg/l	0.001	0.7	6	<<0.001	<0.005	0		<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aromatic TPH >C8-C10	mg/l	0.005	0.3	6	<0.005	0.018	0		0.007	<0.005	<0.005	<0.005	0.018	<0.005	<0.005
Aromatic TPH >C10-C12	mg/l	0.005	0.09	6	<0.005	0.027	0		0.027	<0.005	<0.005	<0.005	0.017	<0.005	<0.005
Aromatic TPH >C12-C16	mg/l	0.005	0.09	6	<0.005	0.095	1	GWBH-BH4691 3.60, BH4691, 3.6m	0.048	0.015	<0.005	<0.005	0.095	<0.005	<0.005
Aromatic TPH >C16-C21	mg/l	0.005	0.09	6	0.007	0.097	1	GWBH-BH4691 3.60, BH4691, 3.6m	0.039	0.012	0.007	0.097	0.097	0.009	0.009
Aromatic TPH >C21-C35	mg/l	0.01	0.09	6	<0.005	0.035	0		<0.005	0.01	<0.01	<0.01	0.035	<0.01	<0.01
Aromatic TPH >C35-C44	mg/l	0.005	N/A	6	<0.005	0.009	0		<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005
Total Aliphatics	mg/l	0.005	No WSV	6	<0.005	0.614	0		<0.005	0.038	<0.005	<0.005	0.614	0.013	0.013
Total Aromatics	mg/l	0.01	No WSV	6	<0.01	0.271	0		<0.005	0.037	<0.01	<0.01	0.271	<0.01	<0.01
Total PAH 16MS	mg/l	0.00001	No WSV	6	<0.00001	0.00784	0		<0.00001	<0.00001	0.00007	<0.00001	0.00014	0.00784	0.00784
Benzene	mg/l	0.001	0.001	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
EthylBenzene	mg/l	0.001	0.3	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
m & p Xylene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o Xylene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/l	0.001	0.7	6	<0.0										

Assessment Criteria :		Drinking Water Standard England and Wales/WHO													
CaCO (mg/l):	0.00	pH	0.00												
Calcium (mg/l):	0.00	DOC (mg/l)	0.00	Catchment area: Ouse, Humber											
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location	GWBH-BH4114 1.70	GWBH-BH4114 1.80	GWBH-BH4689 8.00	GWBH-BH4691 2.80	GWBH-BH4691 3.60	GWBH-BH5082 7.20
									Sample ID	BH4114	BH4114	BH4689	BH4691	BH4691	BH5082
								Depth	1.7m	1.8m	8m	2.8m	3.6m	7.2m	
								Date	16/11/2021	2021-08-24	2021-08-24	2021-11-16	2021-08-24	2021-11-16	
								Strata							
								Zone							
PCB BZ 156	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
PCB BZ 157	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
PCB BZ 167	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
PCB BZ 169	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
PCB BZ 189	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
PCB BZ 77	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
PCB BZ 81	mg/l	0	No WSV	6	<0.000001	<0.000001	0		<0.000001						<0.000001
1,1,1,2-Tetrachloroethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,1,1-Trichloroethane	mg/l	0.001	N/A	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,1,2-Trichloroethane	mg/l	0.001	N/A	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,1-Dichloroethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,1-Dichloroethene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,1-Dichloropropene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene	mg/l	0.003	No WSV	6	<0.003	<0.003	0		<0.003	<0.003	<0.003		<0.003	<0.003	<0.003
1,2,3-Trichloropropane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane	mg/l	0.002	0.001	6	<0.002	<0.002	0		<0.002	<0.002	<0.002		<0.002	<0.002	<0.002
1,2-Dibromoethane	mg/l	0.001	0.0004	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,2-Dichlorobenzene	mg/l	0.001	1	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,2-Dichloroethane	mg/l	0.002	0.003	6	<0.002	<0.002	0		<0.002	<0.002	<0.002		<0.002	<0.002	<0.002
1,2-Dichloropropane	mg/l	0.001	0.04	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,3-Dichlorobenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,3-Dichloropropane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
1,4-Dichlorobenzene	mg/l	0.001	0.3	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,2-Dichloropropane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,4,5-Trichlorophenol	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,4,6-Trichlorophenol	mg/l	0.001	0.2	6	0	0	0								
2,4,6-Trichlorophenol (w)	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,4-Dichlorophenol	mg/l	0.001	N/A	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,4-Dimethylphenol	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,4-Dinitrotoluene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2,6-Dinitrotoluene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2-Chloronaphthalene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2-Chlorophenol	mg/l	0.001	0.3	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2-Chlorotoluene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2-Methylnaphthalene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2-Methylphenol	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
2-Nitrophenol	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
3+4-Methylphenol	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
4-Bromophenyl phenyl ether	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
4-Chloro-3-methylphenol	mg/l	0.001	N/A	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
4-Chlorotoluene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
4-Isopropyltoluene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
4-Nitrophenol	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Bis(2-chloroethoxy)methane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Bis(2-chloroethyl)ether	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Bis(2-chloroisopropyl)ether	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Bis(2-ethylhexyl)phthalate	mg/l	0.01	No WSV	6	<0.01	<0.01	0		<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Bromobenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Bromochloromethane	mg/l	0.005	No WSV	6	<0.005	<0.005	0		<0.005	<0.005	<0.005		<0.005	<0.005	<0.005
Bromodichloromethane	mg/l	0.01	See Trihalomethanes	6	<0.01	<0.01	0		<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Bromoform	mg/l	0.001	See Trihalomethanes	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Bromomethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Butylbenzyl phthalate	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Carbazole	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Carbon Disulphide	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Carbon Tetrachloride	mg/l	0.001	0.004	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Chlorobenzene	mg/l	0.001	N/A	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Chloroethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Chloroform	mg/l	0.001	See Trihalomethanes	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Chloromethane	mg/l	0.01	No WSV	6	<0.01	<0.01	0		<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
cis 1,2-Dichloroethene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
cis 1,3-Dichloropropene															

Assessment Criteria :		Drinking Water Standard England and Wales/WHO													
CaCO (mg/l):		0.00	pH	0.00											
Calcium (mg/l):		0.00	DOC (mg/l)	0.00		Catchment area: Ouse, Humber									
Constituents	Unit	Limit of Detection	Generic Assessment Criteria	Number of Samples	Minimum Value	Maximum Value	Number of Exceedences	Locations of Exceedences	Location	GWBH-BH4114 1.70	GWBH-BH4114 1.80	GWBH-BH4689 8.00	GWBH-BH4691 2.80	GWBH-BH4691 3.60	GWBH-BH5082 7.20
									Sample ID	BH4114	BH4114	BH4689	BH4691	BH4691	BH5082
									Depth	1.7m	1.8m	8m	2.8m	3.6m	7.2m
									Date	16/11/2021	2021-08-24	2021-08-24	2021-11-16	2021-08-24	2021-11-16
									Strata						
									Zone						
Dichlorodifluoromethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	mg/l	0.005	0.02	6	<0.005	<0.005	0		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Diethyl phthalate	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dimethyl phthalate	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/l	0.001	0.3	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachlorobenzene	mg/l	0.001	0.00005	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachlorobenzene SVOC	mg/l	0.001	No WSV	6	0	0	0								
Hexachlorobutadiene	mg/l	0.001	0.0006	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachlorocyclopentadiene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachloroethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isophorone	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
m & p Xylene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-butylbenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Dibutylphthalate	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Dioctylphthalate	mg/l	0.01	No WSV	6	<0.01	<0.01	0		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrobenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Nitroso-n-dipropylamine	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-propylbenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	mg/l	0.001	See Xylenes (total)	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Pentachlorophenol (SVOC)	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Pentachlorophenol SVOC	mg/l	0.001	No WSV	6	0	0	0								
Perylene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene	mg/l	0.001	See BaP	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Pyrene (w)	mg/l	0.00001	No WSV	6	<0.00001	0.00032	0		0.00003	<0.00001	0.00003	<0.00001	<0.00001	<0.00001	0.00032
Resorcinol (w)	mg/l	0.01	No WSV	6	<0.01	<0.01	0								<0.01
sec-Butylbenzene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene	mg/l	0.001	0.02	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	mg/l	0.002	No WSV	6	<0.002	<0.002	0		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tetrachloroethene	mg/l	0.001	0.01 (sum of TCE & PCE)	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thiocyanate (w)	mg/l	0.1	No WSV	6	0.1	0.1	0					<0.1	<0.1	<0.1	0.1
Toluene	mg/l	0.001	0.7	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans 1,2-Dichloroethene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans 1,3-Dichloropropene	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	mg/l	0.001	0.01 (sum of TCE & PCE)	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane	mg/l	0.001	No WSV	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	mg/l	0.001	0.0005	6	<0.001	<0.001	0		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenols (w)	mg/l	0.01	No WSV	6	<0.01	<0.01	0								<0.01

## **Groundgas Screening Sheet**

Project:

TRU Huddersfield Station

Bore hole	Date	Oxygen (% v/v)		Methane (% v/v)		Carbon Dioxide (% v/v)		Flow (l/hr)		H <sub>2</sub> S ppm	CO ppm	Pressure (during round)	DTW (m bgl)	DTB (m bgl)	Deposits Screened	Top of response zone (m bgl)	Response zone flooded?	Qhg (calculated using max conc. and steady state flow)	
		Min	Max	Max	Steady	Max	Steady	Max	Steady									Methane	Carbon Dioxide
BH4113	11/02/2021	14.6	20.9	0	0	1.8	0.1	0	0.1	0	1	NR	NR	NR	Made Ground & PLCM (mudstone)	1.5	No	0.000	0.004
	18/02/2021	15.5	20.8	0	0	1.8	0.1	0.1	0	0	0	NR	NR	NR		1.5	No		
	04/03/2021	10.1	20.9	0	0	4.4	0.1	0	0	0	0	NR	NR	NR		1.5	No		
	29/03/2021	10.4	20.9	0	0	4.4	0.1	0	0	0	0	NR	NR	NR		1.5	No		
BH4114	19/08/2021	0.6	13.3	0.3	0.3	2.4	2.3	0	0	0	0	1004	1.8	6.8	Made Ground, Clay and PLCM (mudstone)	0.8	No	0.005	0.007
	14/10/2021	18.1	21	1.6	0.4	1.7	0.5	0.1	0	0	0	1013	1.8	6.8		0.8	No		
	11/11/2021	17	19.5	0.9	0.8	1.5	0.8	0.1	0.1	0	0	1011	1.7	6.8		0.8	No		
	25/02/2022	19.3	21.4	0.9	0.9	0.4	0.2	0.4	0.3	0	0	1011	1.6	6.8		0.8	No		
BH4117	04/04/2022	21	21	0.7	0.7	0.2	0.2	0.2	0.1	0	0	996	3.5	8	Made Ground, silt, clay & PLCM (sandstone)	5	Yes	0.002	0.009
	09/05/2022	14.6	16.1	0.8	0.8	4.5	4.4	0.2	0.2	0	1	1014	3.5	8		5	Yes		
BH4689	19/08/2021	0.3	18.4	0.8	0.5	0.2	0.1	1.1	0.3	0	18	1004	5.6	8	PLCM – mudstone, siltstone & coal seam	1.5	No	0.021	0.002
	14/10/2021	0.9	21	1.6	0.4	0.6	0.1	0.7	0.1	0	30	1013	6	8		1.5	No		
	11/11/2021	0.9	21	1.6	0.4	0.6	0.1	0.7	0.1	0	30	1011	6	8		1.5	No		
	25/02/2022	0.1	21	7	0.5	0.8	0.2	0.2	-0.1	0	1	1011	5	8		1.5	No		
BH4691	19/08/2021	2.5	19.4	3.2	0.6	3.6	0.1	0.3	0.1	0	0	1004	2.7	5	Made Ground (HC odour) & PLCM	1	No	0.013	0.014
	14/10/2021	12.2	20.1	0.4	0.4	3.5	1	0	0	0	0	1013	3	5		1	No		
	11/11/2021	20	20.2	0.9	0.9	0.3	0.3	0.2	0.1	0	0	1011	2.8	5		1	No		
	25/02/2022	21.5	21.6	1	0.9	0.2	0.2	0.4	0.4	0	0	1011	2.25	5		1	No		
BH4693	19/08/2021	14	20.4	0.4	0.3	5.1	4.5	0.1	0	0	0	1004	DRY	10	Made Ground and clay	1.5	No	0.003	0.015
	14/10/2021	17.4	20.9	0.5	0.4	3.1	0.1	0.1	0	0	0	1013	DRY	NR		1.5	No		
	11/11/2021	15.6	20.9	0.9	0.9	4.8	0.2	0.1	0.1	0	0	1011	DRY	15		1.5	No		
	25/02/2022	21.3	21.5	1	0.9	0.3	0.2	0.3	0.3	0	0	1011	NR	10		1.5	No		
BH5082	19/08/2021	8.6	19.6	0.3	0.3	2.2	2	0.1	0	1	0	1004	6.9	10	PLCM – siltstone & sandstone	1.5	No	0.003	0.007
	14/10/2021	18.9	21	0.4	0.4	1	0.1	0.1	0	0	0	1013	7.3	10		1.5	No		
	11/11/2021	20.3	20.3	0.8	0.8	0.1	0.1	0.1	0	0	0	1011	6.7	10		1.5	No		
	25/02/2022	21.1	21.1	1	1	0.2	0.2	0.3	0.3	0	0	1011	5.3	10		1.5	No		

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