



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

TE1885-TE-00-XX-RP-GE-004-V02

16012-TRE-BRY-XXX-RP-EN-000004 REV.P02

21 MAY 2025

FINAL

Prepared for:

Wilmott Dixon on behalf of Transport
for Greater Manchester

Prepared by: Stuart Milne

Tier Environmental Ltd

Chester	London	Manchester	Bromsgrove	Bristol	Sheffield
HQ Telephone 01244 684900			Telephone 01925 818388		
Website: www.tieruk.com			Email: environmental@tieruk.com		
Tier Environmental is a trading name of Tier Environmental Ltd. Registered in England and Wales no 05441804					

DOCUMENT CONTROL

Report No. :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Report Status:	FINAL
Project Engineer:	Stuart Milne
Date of Issue:	21/05/2025

This report has been prepared by Tier with all reasonable skill, care and diligence, within the best practice and guidance current at the time of issue within the scope of works which have been agreed with the client. This report is confidential to the client and Tier accepts no responsibility whatsoever to third parties to whom this report, or any part thereof is made presented, unless this is formally agreed in writing by a Director of Tier Environmental Ltd before any reliance is made. Any such party relies upon the report at their own risk. Tier disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Version No.	Description of Issue / Revision	Date of Issue	Author	Reviewed By	Approved By
1	FINAL	16/05/2025	Stuart Milne	Adiran Read	Adrian Read
2	Updated with soakaway testing results	21/05/2025	Stuart Milne	Adiran Read	Adrian Read



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : i of vii
Engineer: Stuart Milne
Date: 21/05/2025

CONTENTS

1.	INTRODUCTION.....	1
1.1.	Proposed Development	1
1.2.	Previous Reports	1
1.3.	Objectives	2
1.4.	Assumptions.....	2
2.	SITE DETAILS AND DESCRIPTION	4
3.	PREVIOUS INVESTIGATION FINDINGS	6
4.	PRELIMINARY CONCEPTUAL SITE MODEL.....	9
4.1.	Uncertainties.....	9
5.	FIELDWORK.....	12
5.1.	Scope of Ground Investigation.....	12
5.2.	Geoenvironmental Testing	13
5.3.	Geotechnical Testing.....	14
6.	GROUND CONDITIONS	16
6.1.	Strata Descriptions.....	16
6.2.	Obstructions.....	18
6.3.	Visual and Olfactory Evidence of Contamination	19
6.4.	Groundwater Observations During Fieldwork	19
6.5.	Groundwater Monitoring.....	20
7.	PRELIMINARY GEOTECHNICAL ASSESSMENT.....	21
7.1.	Determination of pH and Water-Soluble Sulphate.....	21
7.2.	Geotechnical Parameters.....	25
7.3.	Soakaways.....	29
7.4.	Earthworks.....	29
7.5.	Groundworks, Excavation Stability and Groundwater Dewatering	30
8.	HUMAN HEALTH RISK ASSESSMENT.....	31
8.1.	Data Interpretation Approach	31
8.2.	Selection of Generic Assessment Criteria (GAC)	31
8.3.	Human Health Risk Assessment.....	32
8.4.	TPH Assessment	35
8.5.	Utilities	38
8.6.	Construction and Maintenance Workers.....	38
9.	CONTROLLED WATERS RISK ASSESSMENT.....	40



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No :	ii of vii
Engineer:	Stuart Milne
Date:	21/05/2025

9.1.	Introduction	40
9.2.	Controlled Waters Environment Conceptual Site Model Summary	40
9.3.	Soil Leachate Testing.....	40
10.	REVISED CONCEPTUAL SITE MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES	42
11.	PRELIMINARY WASTE MATERIALS CLASSIFICATION AND WASTE DISPOSAL ROUTE DETERMINATION	45
11.1.	Introduction	45
11.2.	Preliminary Waste Materials Classification and Waste Disposal Route Determination	46
11.3.	Materials Re-Use.....	48
12.	CONCLUSIONS AND RECOMMENDATIONS	49
12.1.	Conclusions	49
12.2.	Recommendations	50
13.	REGULATORY APPROVALS	51
14.	REFERENCES	52
15.	GLOSSARY OF TERMS	55

TABLES

Table 2.1 Current Site Overview.	4
Table 3.1 Report Review Summary	6
Table 4.1 Preliminary Assessment of Potential Pollutant Linkages (Continued on Next Page).	10
Table 5.1 Scope of Ground Investigation and Rationale	12
Table 5.2 Scope of Monitoring Installations	13
Table 5.3 Schedule of Chemical Testing for Human Health Risk Assessment and Preliminary Waste Soils Assessment.	13
Table 5.4 Schedule of Chemical Testing for Controlled Waters Risk Assessment.	14
Table 5.5 Geotechnical Laboratory Testing Schedule.	14
Table 6.1 Underground Services / Obstructions Summary Table	19
Table 6.2 Visual and/or Olfactory Evidence of Contamination Summary	19
Table 6.3 Field Observations of Groundwater.	19
Table 6.4 Groundwater Monitoring Results Summary	20
Table 7.1 Assessment for Potential Sulphide Bearing (e.g. Pyritic) Ground	24
Table 7.2 Oxidisable Sulphides Calculations	24
Table 7.3 Results of Soil pH Testing and Water-Soluble Sulphate Determination.....	25
Table 7.4 Soil Classification Test Results for Cohesive Soils.....	26



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : iii of vii
Engineer: Stuart Milne
Date: 21/05/2025

Table 8.1 Measured Concentrations of Potential Contaminants of Concern Reported in Excess of the Respective GACs.....	33
Table 8.2 Measured Concentrations of Potential Contaminants of Concern Reported in Excess of the Laboratory Method Detection Limit	37
Table 8.3 Summary of Asbestos Assessment	38
Table 9.1 Summary of Measured Concentrations of Soil Leachate Potential Contaminants of Concern in Excess of WQS Values	40
Table 10.1 Revised Assessment of Potential Pollutant Linkages (Continued on Next Page).	43
Table 11.1 Preliminary Materials Waste Classification and Waste Disposal Route Determination	47
Table 11.2 Preliminary Asphalt Materials Waste Classification.....	47

FIGURES

Figure 2.1 Recent Aerial Photograph from Groundsure	5
Figure 7.1 Site Location Plotted on Principal Sulphate and Sulphide Bearing Strata in England and Wales (Extracted from BRE SD1).....	22
Figure 7.2 Site Location Plotted Relative to Coal Mining Areas of Great Britain (Extracted from BRE SD1)	23
Figure 7.3 Reported SPT-N Value vs Depth.....	28
Figure 8.1 Jones Environmental Laboratory (now Element Deeside) PAH Double Ratio Plot Guidance ...	34
Figure 8.2 PAH Double Ratio Plot: Benzo(a)anthracene/Chrysene and Fluoranthene/Pyrene	35

APPENDICES

Appendix A - Drawings
Appendix B - Exploratory Hole Logs
Appendix C - Geoenvironmental Soil Laboratory Results
Appendix D - Geotechnical In Situ Fieldwork and Laboratory Results
Appendix E - Groundwater and Gas Monitoring Results & Gas Analyser Calibration Certificate
Appendix F - Previous Site Investigation Report (Available as a Separate Document)
Appendix G - Definitions of Terms Used in Qualitative and Quantitative Risk Assessments
Appendix H - Human Health Assessment Criteria
Appendix I - Controlled Waters Risk Assessment
Appendix J - Assessment Criteria Applied for Ground Gas
Appendix K - Chemical and Geotechnical Test Sampling
Appendix L - Coal Tar Containing Asphalt Considerations
Appendix M - Complying With Control of Asbestos Regulations 2012



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : iv of vii
Engineer: Stuart Milne
Date: 21/05/2025

EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Wilmott Dixon on behalf of Transport for Greater Manchester to undertake a Ground Investigation of Bury Interchange. The purpose of the investigation was to determine the nature and extent of soil, bedrock and groundwater beneath the site for the purposes of environmental and geotechnical assessment.
Proposed land use	The Bury Interchange project comprises two phases: 1. Southern Access - construction of a new pedestrian footbridge with access between Union Square, the existing Metrolink platform and Pyramid Park to enable Bury Tram Stop to continue operating during Phase 2 works. This phase of work also includes refurbishing the existing Metrolink platforms including replacement of the existing platform canopy and enhanced passenger amenities/facilities. 2. Bury Interchange - demolition and replacement of the existing Interchange Building. A planning application for the second phase comprising the interchange is to be prepared for an anticipated submission in early-to-mid 2026.
Site location and surrounding land uses	The site is located at Bury Interchange, Bury, BL9 0AY. The site comprises an active railway station (Bury Interchange) and line of track running south. The application site is bounded by Pyramid Park/Market Street to the east, East Lancashire railway line to the south, Duke Street/Knowsley Place to the west and Bury Interchange to the north (platforms located below interchange building and associated road infrastructure including Angouleme Way). The site comprises three distinct elements: 1. Knowsley Place/Union Square (west of Metrolink) - Premier Inn, offices and Q park 2. Metrolink corridor and platform 3. Pyramid Park (east of Metrolink) - vacant park which is subject to planning permission (LPA ref. 70903/Full) for comprehensive remediation. There is also a small area of the existing surface car park to the west of the interchange building which is identified for the location of a temporary contractor compound. In terms of the wider interchange (second phase of the scheme), this part of the site is bounded by Kay Gardens to the north, Haymarket Street to the west and Angouleme Way to the south.
Site history	The site comprises principally of railway infrastructure including goods sheds and rail lines from 1851 to circa 1976. The site is within an area of shallow earthworks in an 'L' shape from the Old Opera House circa 80m north and extending eastwards in conjunction with the railway lines, with the far north of the site at a higher level with an embankment down to the good sheds and railway level. Major redevelopment by 1980 sees removal of existing buildings, infilling of some land, and construction of the current station and rail layout. The wider site sees a new road layout and redevelopment of land adjacent to the site. The surrounding area has comprised industrial uses including a timber yard and warehouse 80m west of the site and woollen mill from earliest records, and notably an abattoir immediately west from 1851 which expands through to 1976 when it is no longer shown. By 1957 the land to the north of the site has been redeveloped with the expansion of the Market Hall with an open market immediately north, which are removed by 1973 for a car park. A second phase of redevelopment by 1976 sees construction of the approximately present-day layout. By 2013, disused land to the west of the site (now known as union square) is undergoing development into a hotel and offices. Pyramid Park The proposed new Southern Access footbridge lands on to the Pyramid Park site. Bury Council, as applicant, has recently secured full planning permission (LPA ref. 70903/Full) for the remediation of the Pyramid Park site and construction of a new vehicular access road. The Pyramid Park site was formerly a railway station and sidings before being reclaimed as public open space in the 1970s. Planning permission was subsequently granted in December 2024 subject to a suite of planning conditions. The remediation of the site is the first phase in advance of the Council procuring a developer to progress with a residential scheme (subject to separate planning application in due course).
Potential contaminative features	Made Ground associated with historic land uses as railway sidings and goods sheds with potential for associated tank features, and a predominantly off-site abattoir. The Department of the Environment Industry Profile for animal processing works, for the adjacent and partly on-site historic abattoir, suggest pathogens, solvents, bleaches and fuel oils as potential contaminants associated with this industry. Consideration has been given to the widespread redevelopment of the local area from the mid 1970 including construction of a new road (Angouleme Way) and car park within the historic abattoir site whereby a degree of Made Ground removal or remediation may have taken place though no records can confirm this. Local Authority landfill records show a known landfill centred at E 380314 ,N 410400 on the provided plan, which places it within the western boundary of the site, now known as union square. This is understood to be filled with inert



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : v of vii
Engineer: Stuart Milne
Date: 21/05/2025

	subsoil as part of a Reclamation scheme in 1973 and since redeveloped in late 2000s and early 2010s as a hotel, offices and car park with remedial measures.
Mining and quarrying	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report (CON29M) was ordered to further assess coal mining issues at the site. The report is contained within Appendix C. Results of this report do not indicate the site is at risk from past coal mining activity. Coal was recorded in BH-P2-205 from 18.50-18.30m bgl. The layer was recorded to be intact and no loss of flush or evidence of broken ground was recorded during drilling works suggesting this is not a worked seam.
Previous investigations	Two previous reports have been produced by Tier Environmental for the site and referenced below: - Preliminary Risk Assessment Report For Bury Interchange Phase 1 (Report Ref: TE1885-TE-00-XX-RP-GE-001-V02 dated 1st April 2025) - Preliminary Risk Assessment Report For Bury Interchange Phase 2 (Report Ref: TE1885-TE-00-XX-RP-GE-002-V02 dated 1st April 2025) A Detailed UXO Desk Study was completed by EOD Contracts Ltd (Ref: EOD/24/24140/DTS, dated November 2024) for the combined Phase 1 and Phase 2 site boundaries.
Fieldwork	The investigation was supervised by a Tier Environmental Geo-environmental Engineer and took place conducted between 26th March and 3rd April 2025. The investigation comprised: 2 No. hand dug pits TP-P2-101 and TP-P2-103) to depths of between 1.00m and 1.10m bgl. 16 No. window sample boreholes (WS-P2-101 to WS-P2-111) to depths between 1.25m and 4.45m bgl. 2 No. cable percussive boreholes with rotary follow on (BH-P2-104 and BH-P2-105) to depths of between 20.30- 25.70m bgl 5 No. machine excavated trial pits (TP-P2-102, TP-P2-104, TP-P2-106 – 108) to depths of between 1.00- 3.00m bgl 1 No. Soakaway pit (SA-P2-101) to 2.30m bgl
Laboratory testing	Samples of soil and soil leachate were submitted for analysis of a range of metal, other inorganic and organic components including asbestos. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	The site is underlain by Made Ground of either a gravelly Clay or clayey sandy Gravel to depths of typically between 1.25m and 2.00m bgl though locally up to 5.70m bgl in BH-P2-104 in the west, and some shallower horizons in the south east of the site to between 0.27m and 0.40m bgl. Natural soils of Till overlying bedrock of the Lower Pennine Coal Measures was recorded where depth was achieved through the Made Ground and predominantly comprised very high strength Clays. In-situ testing broadly recorded refusal values of SPT N of >50.
Foundations	Given the encountered ground conditions within locally deep Made Ground, and the nature of the proposed development, the most likely foundation solution would be pads within natural soils though at present site levels this would be at depths of >2.00m bgl. A micro piled solution could also be considered to bear loads onto competent ground beyond the base of recorded Made Ground, and consultation should be sought from a local contractor. Foundation design should be refined based on any proposed site level changes inclusive of remove of the pyramid mounds.
Sulphate class	It is considered that a Design Sulphate Class of DS-2 and ACEC Class AC-2 is appropriate for buried concrete design purposes within Made Ground and within natural soils. Groundwater sulphate classification will be ascertained as part of future site wider groundwater sampling that shall be conducted upon completion of the remaining ground investigation works within the northern part of the wider site area.
Contamination – human health	Localised PAH exceedances were identified during sensitivity analysis when comparing against Generic Assessment Criteria (GACs) protective of a more conservative Public Open Space park land use. Following further qualitative assessment of the provenance of those PAHs it was concluded that as they appeared to be attributable to natural coal that they would be unlikely to represent a potential risk to the end users. On this basis, it is not considered that the site represents a potential risk to end-users. Of the 20 No. of Made Ground samples submitted for asbestos screening, 5 No. were reported to contain asbestos in the form of chrysotile and locally amosite fibre bundles, returned with quantification of <0.001% w/w suggesting trace level of asbestos.
Contamination – controlled waters	Superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Pennine Lower Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is an artificial lake within a park circa 100m east of the site, in land east of Market Street, though this not considered to be in hydraulic conductivity with local groundwater, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : vi of vii
Engineer: Stuart Milne
Date: 21/05/2025

	Measured leachable concentrations of nickel, iron and anthracene have been reported only marginally in excess of the WQS protective of the controlled waters environment by the same order of magnitude or up to 1 order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the historical commercial / industrial heritage of the wider area surrounding the site, the absence of a continuous groundwater body beneath the site, the Low/Moderate sensitivity of the controlled waters environment, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations and the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the exceedances are not considered to pose a risks to controlled water receptors. Measured soil leachate concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective WQS protective of the controlled waters environment by between 2 No. orders of magnitude and 3 No. orders of magnitude. Subsequent sensitivity analysis has demonstrated that measured soil leachate concentrations of fluoranthene and / or benzo(a)pyrene have been reported only marginally in excess of the respective Maximum Allowable Concentrations (MAC) EQS values for Inland Surface Waters by the same order of magnitude / by up to one order of magnitude. As such, and in the absence of viable 'bioaccumulation in fish and consumption of fish by humans' scenario and given the reasonings outline above, it is therefore considered that the reported soil leachate concentrations of fluoranthene and benzo(a)pyrene are unlikely to present a potential risk to the controlled waters environment.
Gas protection	Given the nature of the proposed development and the absence of any proposed enclosed spaces, ground gas protection measures are not required for this proposed element of the development. A detailed ground gas risk assessment will be undertaken during future proposed investigations for other development phases.
Radon requirements	Basic radon protection measures are not currently required for the proposed development on this site. In addition to the above, basements represent areas that are more at risk because the walls are in contact with the ground as well as the floor. This, coupled with reduced natural ventilation below ground level, increases the risk of elevated radon levels. All basements are therefore considered under BR 211 to be at increased risk of elevated levels of radon regardless of geographic location. Currently, no basements or converted cellars / basements are proposed for the development and therefore no additional consideration of potential increased risk needs to be made; however, this should be revisited in the event that the proposals change to include for a basement.
Other issues	Consideration should be given to anecdotal evidence of historic unrecorded tunnels within close vicinity to the site, though there is no evidence these features intercept the Phase 1 site boundary and no evidence of any tunnels was identified during the site investigation works.
Waste soils classification	Basic waste characterisation has determined that Made Ground soils are non-hazardous aside from the sample at SA-P2-10 at 0.80m bgl, in Made Ground of black compacted gravelly Sand (asphalt layer) which is hazardous for Iron (III) oxide. The results of WAC tests have confirmed that: - SA-P2-101 at 0.80m bgl would need to be treated prior to acceptance to a hazardous waste landfill due to elevated TOC and loss on ignition that exceeds the hazardous waste landfill threshold. - WS-P2-106 at 0.70-1.00m bgl would be suitable for disposal to a non-hazardous landfill due to TOC and Sum PAHs in excess of inert landfill threshold, and asbestos at <0.001% w/w. - BH-P2-105 at 1.70-2.00m bgl would be suitable for disposal to a non-hazardous landfill due to TOC in excess of inert landfill threshold, and asbestos at <0.001% w/w. - TP-P2-104 at 0.80m bgl would be suitable for disposal to a non-hazardous landfill due to TOC in excess of inert landfill threshold. - TP-P2-101 at 0.30m bgl would be suitable for disposal to a non-hazardous landfill due to Sum PAHs in excess of inert landfill threshold. - TP-P2-106 at 0.10m bgl, WS-P2-101 at 0.45-0.60m bgl would be suitable for disposal as inert waste. It is anticipated that natural soils will be suitable for disposal to an inert landfill.
Materials re-use	Subject to volumetric cut and fill requirements the majority of Made Ground materials and all of natural soil materials and may be considered chemically suitable for potential re-use subject to careful management and placement of materials and in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). Suitability for re-use would also be subject to confirmation of the geotechnical suitability depending on whether the materials are to be re-used in load bearing areas. This would need to be detailed in a supporting document. Please note that any previously landfilled or mining waste materials may not be appropriately subject to consideration under DoWCoP and may not be re-used under DoWCoP unless sufficient lines of evidence and agreement with the local Environment Agency Waste Team can be sought beforehand.



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : vii of vii
Engineer: Stuart Milne
Date: 21/05/2025

	In addition, Section 11.3 of this report includes statements with respect to re-use of excavated and stockpiled clean naturally occurring soils within the site and re-use on other sites. These statements are designed to provide a clear intention to reuse any clean, naturally occurring soils derived from future excavations at this site (which may also include temporary future stockpiling these materials).
Further works	• Completion of an Asbestos DQRA to determine suitability for re-use of low-level asbestos impacted soils within the development. • Intrusive works across the wider site area should be undertaken and should adhere to the Site Investigation Scope produced by Renaissance (Dated October 2024) presented in drawing BURY-REN-XX-XX-SK-S-01000-P03 and 01001-P03.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 1 of 56
Engineer: Stuart Milne
Date: 21/05/2025

1. INTRODUCTION

Tier Environmental was commissioned by Wilmott Dixon on behalf of Transport for Greater Manchester, to undertake a ground investigation for an area of land referred to as Pyramid Park and Union Square, Bury Interchange, located at Bury, BL9 0AY (the “site”).

The title of this report is in accordance with that described in the Land Contamination Risk Management guidance (available at <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>) which has superseded CLR 11:

Stage 1:

- LCRM Tier 2 Generic Quantitative Risk Assessment Report

1.1. Proposed Development

Under current proposals the development will comprise the construction of a new Transport Interchange in Bury Town Centre. The Bury Interchange project comprises two phases:

- 1. Southern Access - construction of a new pedestrian footbridge with access between Union Square, the existing Metrolink platform and Pyramid Park to enable Bury Tram Stop to continue operating during Phase 2 works. This phase of work also includes refurbishing the existing Metrolink platforms including replacement of the existing platform canopy and enhanced passenger amenities/facilities.
- 2. Bury Interchange - demolition and replacement of the existing Interchange Building.

A planning application for the second phase comprising the interchange is to be prepared for an anticipated submission in early-to-mid 2026.

As such, in accordance with the ‘Updated technical background to the CLEA model’ (Environment Agency, 2009) and ‘Suitable 4 Use Levels’ (LQM / CIEH 2015) the proposed generic land use for this development is commercial, acknowledging the proposed development as a new walkway for station access. In this context, we consider the use of commercial land use GACs to be a reasonable and appropriately conservative default scenario, especially when the actual exposure frequency and duration for public users will be less than that assumed for the default commercial worker.

Given the unknown extent of both proposed earthworks and intended areas of soft landscaping, we have taken an additional step of conducting sensitivity analysis by comparing the reported concentrations against Public Open Space (POS) Park GACs. We recognise that areas of soft landscaping present a slightly higher potential for soil contact, particularly if members of the public utilise the area as a ‘park’, which may be beyond an exposure frequency of commercial landscapers/maintenance workers. To account for this, a sensitivity analysis has also been carried out using POS Park GACs, which are based on young children playing daily in parks — a highly conservative scenario.

1.2. Previous Reports

A Detailed UXO Desk Study was completed by EOD Contracts Ltd (Ref: EOD/24/24140/DTS, dated November 2024) for the combined Phase 1 and Phase 2 site boundaries, this is contained within Appendix I.

The following third part reports were provided for review:



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 2 of 56
Engineer: Stuart Milne
Date: 21/05/2025

- A Factual Report on Site Investigation for Land at Townside Fields, Bury, by Dunelm Geotechnical and Environmental on behalf of Campbell Reith (Ref: M1062/01, dated April 2022)
- A Geoenvironmental Appraisal of land at Bury Market, for Bury Council, by ID Geoenvironmental Ltd (Ref: 5237-G-R001 Rev A, dated August 2022).
- A Factual Report for Pyramid Park, Bury, by Geotechnics on behalf of Campbell Reith (Ref: PN234595, dated February 2024)

The above factual reports for Townside Fields/Pyramid Park are collated in the following produced by Campbell Reith, which were available on the Bury Council planning portal:

- A Geotechnical and Geoenvironmental Desk Study Report, by Campbell Reith (Ref: 13819-CRG-XX-XX-RP-LQ-0001, dated March 2022).
- A Phase 2 Interpretive Report (Contamination), by Campbell Reith (Ref: 13819-CRG-XX-XX-RP-LQ-0002, dated July 2022).
- A Land Quality Statement by Campbell Reith (Ref: 14111-CRH-XX-XX-RP-LQ-0001, dated April 2024)
- A Remediation Strategy and Quality Statement by Campbell Reith (Ref: 14111-CRH-XX-XX-RP-LQ-0001-P02, dated November 2024)

Tier Environmental reviewed the above as part of a Preliminary Risk Assessment Report for the Phase 1 Area (Ref: 16012-TRE-BRY-XXX-RP-EN-000001 Rev. P02, dated April 2025).

1.3. Objectives

Taking into account the proposed development of the site, the objectives of this appraisal were:

- To determine the historical and current land use.
- To establish the environmental setting of the site.
- To evaluate whether past mining or other extractive industries could have an influence on the site.
- To determine current ground and groundwater conditions.
- To determine the potential risks to human health and the wider environment.
- To provide a preliminary waste soils classification.
- To determine potential risks posed to the site from hazardous ground gases and / or vapours.
- Provide preliminary outline remedial measures to manage any identified risks.
- To provide preliminary geotechnical parameters to inform foundation recommendations.

1.4. Assumptions

The following assumptions are made in this report:

- It is assumed that ground levels will not change significantly from those described in this report or as shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.
- The ground investigation has been designed with due consideration of known or suspected constraints (including underground services and access constraints).
- Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
- The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not been classified in accordance with BS3882:2015.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 3 of 56
Engineer: Stuart Milne
Date: 21/05/2025

- The use of the terms 'shallow' and 'deep' within this report (from a geotechnical perspective) assume *typically* between ground level to circa 3.00m below ground level (bgl) for 'shallow' and greater than 3.00m bgl regarded as 'deep';
- The comments and opinions presented in this report are based on the findings of the desk study, review of third party information, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report.
- Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

This report has been prepared for the sole use of Wilmott Dixon on behalf of Transport for Greater Manchester. No other third party may rely upon or reproduce the contents of this report without the written approval of Tier Environmental. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk and the authors do not owe them any Duty of Care or Skill.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 4 of 56
Engineer: Stuart Milne
Date: 21/05/2025

2. SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Pyramid Park And Union Square, Bury Interchange
Site address	Bury Interchange, Bury, BL9 0AY. A site location plan is included as Drawing No. TE1885-TE-00-XX-RP-001-V01 within Appendix A. The application site is bounded by Pyramid Park/Market Street to the east, East Lancashire railway line to the south, Duke Street/Knowsley Place to the west and Bury Interchange to the north (platforms located below interchange building and associated road infrastructure including Angouleme Way). The site comprises three distinct elements: 1. Knowsley Place/Union Square (west of Metrolink) - Premier Inn, offices and Q park 2. Metrolink corridor and platform 3. Pyramid Park (east of Metrolink) - vacant park which is subject to planning permission (LPA ref. 70903/Full) for comprehensive remediation. There is also a small area of the existing surface car park to the west of the interchange building which is identified for the location of a temporary contractor compound.
National Grid Reference (NGR)	380399 410392
Approximate site area	0.92 ha
Site shape	The site is an irregular elongate shape.
Current land use on the site	The site forms part of Bury Interchange station, with station and platform buildings in the north of the site, and railway lines extending south through the beyond site. Underground service drawings have not been provided to Tier Environmental; however, there remains a potential for such features to be present beneath the site.
Surrounding land uses	The site is set within a mixed commercial and residential area with the wider Bury Interchange to the north, car parking and commercial buildings including a hotel to the west and Bury College and a disused park to the east.
General topography and ground levels	The track level of the Phase 1 area is at approximately 86m AOD. The site is within a cutting with levels to the west at 91.4m AOD and to the east circa 94m AOD; the overpass is at circa 95m AOD.

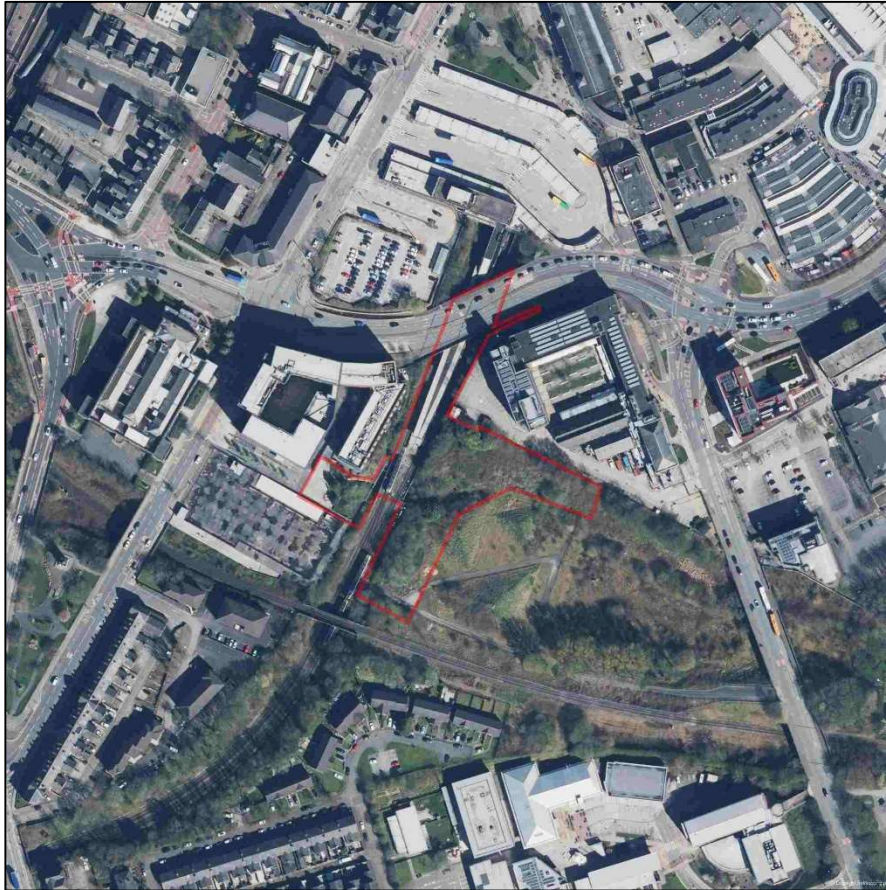
An aerial photograph (from the Groundsure report) of the site and site boundary is shown below. Please note that the works completed as part of this report pertain solely to the area shown below.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 5 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Figure 2.1 Recent Aerial Photograph from Groundsure





GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 6 of 56
Engineer: Stuart Milne
Date: 21/05/2025

3. PREVIOUS INVESTIGATION FINDINGS

A Detailed UXO Desk Study was completed by EOD Contracts Ltd (Ref: EOD/24/24140/DTS, dated November 2024) for the combined Phase 1 and Phase 2 site boundaries, this is contained within Appendix I.

The following third part reports were provided for review:

- A Factual Report on Site Investigation for Land at Townside Fields, Bury, by Dunelm Geotechnical and Environmental on behalf of Campbell Reith (Ref: M1062/01, dated April 2022)
- A Geoenvironmental Appraisal of land at Bury Market, for Bury Council, by ID Geoenvironmental Ltd (Ref: 5237-G-R001 Rev A, dated August 2022).
- A Factual Report for Pyramid Park, Bury, by Geotechnics on behalf of Campbell Reith (Ref: PN234595, dated February 2024)

The above factual reports for Townside Fields/Pyramid Park are collated in the following produced by Campbell Reith, which were available on the Bury Council planning portal:

- A Geotechnical and Geoenvironmental Desk Study Report, by Campbell Reith (Ref: 13819-CRG-XX-XX-RP-LQ-0001, dated March 2022).
- A Phase 2 Interpretive Report (Contamination), by Campbell Reith (Ref: 13819-CRG-XX-XX-RP-LQ-0002, dated July 2022).
- A Land Quality Statement by Campbell Reith (Ref: 14111-CRH-XX-XX-RP-LQ-0001, dated April 2024)
- A Remediation Strategy and Quality Statement by Campbell Reith (Ref: 14111-CRH-XX-XX-RP-LQ-0001-P02, dated November 2024)

Tier Environmental reviewed the above as part of a Preliminary Risk Assessment Report for the Phase 1 Area (Ref: 16012-TRE-BRY-XXX-RP-EN-000001 Rev. P02, dated April 2025) which is summarised below.

Table 3.1 Report Review Summary

Site history	The site comprises principally of railway infrastructure including goods sheds and rail lines from 1851 to circa 1976. The site is within an area of shallow earthworks in an 'L' shape from the Old Opera House circa 80m north and extending eastwards in conjunction with the railway lines, with the far north of the site at a higher level with an embankment down to the good sheds and railway level. Major redevelopment by 1980 sees removal of existing buildings, infilling of some land, and construction of the current station and rail layout. The wider site sees a new road layout and redevelopment of land adjacent to the site. The surrounding area has comprised industrial uses including a timber yard and warehouse 80m west of the site and woollen mill from earliest records, and notably an abattoir immediately west from 1851 which expands through to 1976 when it is no longer shown. By 1957 the land to the north of the site has been redeveloped with the expansion of the Market Hall with an open market immediately north, which are removed by 1973 for a car park. A second phase of redevelopment by 1976 sees construction of the approximately present-day layout. By 2013, disused land to the west of the site (now known as union square) is undergoing development into a hotel and offices. Pyramid Park The proposed new Southern Access footbridge lands on to the Pyramid Park site. Bury Council, as applicant, has recently secured full planning permission (LPA ref. 70903/Full) for the remediation of the Pyramid Park site and construction of a new vehicular access road. The Pyramid Park site was formerly a railway station and sidings before being reclaimed as public open space in the 1970's. Planning permission was subsequently granted in December 2024 subject to a suite of planning conditions. The remediation of the site is the first phase in advance of the Council procuring a developer to progress with a residential scheme (subject to separate planning application in due course).
---------------------	---



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 7 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Potential contaminative features identified	Made Ground associated with historic land uses as railway sidings and goods sheds with potential for associated tank features, and a predominantly off site abattoir. The Department of the Environment Industry Profile for animal processing works, for the adjacent and partly on-site historic abattoir, suggest pathogens, solvents, bleaches and fuel oils as potential contaminants associated with this industry. Consideration has been given to the widespread redevelopment of the local area from the mid 1970 including construction of a new road (Angouleme Way) and car park within the historic abattoir site whereby a degree of Made Ground removal or remediation may have taken place though no records can confirm this. Local Authority landfill records show a known landfill centred at E 380314 ,N 410400 on the provided plan, which places it within the western boundary of the site, now known as union square. This is understood to be filled with inert subsoil as part of a Reclamation scheme in 1973 and since redeveloped in late 2000s and early 2010s as a hotel, offices and car park with remedial measures.
Mining and quarrying	The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report (CON29M) was ordered to further assess coal mining issues at the site. The report is contained within Appendix C. Results of this report do not indicate the site is at risk from past coal mining activity.
Previous investigations referenced in the report	Third party reporting for land to the east of the site, associated with the market redevelopment, and for land within Pyramid Park (planning permission ref. 70903/Full - approved December 2024) in the southeast of the site, have been reviewed. A series of ground investigations and desk studies for each site area were completed. No potential contaminants of concern were recorded within the market area for the proposed continued commercial land use. Asbestos in the form of fibre bundles of amosite or chrysotile were recorded in 8 no. samples of Made Ground in Pyramid Park, in addition to Made Ground with elevated PAH compounds, hydrocarbon odours, and inclusions of clinker, ash, coal and slag within or adjacent to the pyramid structures.
Geology, hydrogeology and hydrology	Superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Pennine Lower Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is an artificial lake within a park circa 100m east of the site, in land east of Market Street, though this not considered to be in hydraulic conductivity with local groundwater, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate.
Potential contaminative features	Made Ground associated with historic land uses as railway sidings and goods sheds with potential for associated tank features, and a predominantly off site abattoir. The Department of the Environment Industry Profile for animal processing works, for the adjacent and partly on-site historic abattoir, suggest pathogens, solvents, bleaches and fuel oils as potential contaminants associated with this industry. Consideration has been given to the widespread redevelopment of the local area from the mid 1970 including construction of a new road (Angouleme Way) and car park within the historic abattoir site whereby a degree of Made Ground removal or remediation may have taken place though no records can confirm this. Local Authority landfill records show a known landfill centred at E 380314 ,N 410400 on the provided plan, which places it within the western boundary of the site, now known as union square. This is understood to be filled with inert subsoil as part of a Reclamation scheme in 1973 and since redeveloped in late 2000s and early 2010s as a hotel, offices and car park with remedial measures.
Ground gases	A sand pit was recorded 30m west of the north of the site from 1849, and a reservoir 50m south, infilled by 1891 and 1976 respectively. The site itself has been subject to significant earthworks, most recently in circa 1973-1976 when the old railway cuttings are infilled, likely associated with the BSG records identifying the site to be underlain by 'worked ground'. On site and nearby landfill records for other railway cuttings indicate use of 'inert' waste, notable in the west of the site in the 1970s during the wider redevelopment cycle. Gas generation potential for any on and off-site sources is considered to be relatively low.
Other issues	Consideration should be given to anecdotal evidence of historic unrecorded tunnels within close vicinity to the site, though there is no evidence these features intercept the Phase 1 site boundary.
Further works	Intrusive works should adhere to the Site Investigation Scope produced by Renaissance (Dated October 2024) presented in drawing BURY-REN-XX-XX-SK-S-01000-P03 and 01001-P03.
Waste Soils Classification	Based on the history of the site and the anticipated potential contaminants of concern it is considered possible that hazardous waste soil materials may be present beneath some areas of the site; however, this will be subject to confirmatory investigation, sampling, laboratory analysis and waste classification in accordance with the Guidance on the Classification and Assessment of Waste (WM3).



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 8 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Materials re-use considerations

Subject to volumetric fill requirements and a future assessment of suitability of re-use (both chemically and geotechnically), some materials may be considered for potential re-use in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). Please note that any previously landfilled or mining waste materials may not be appropriately subject to consideration under DoWCoP and may not be re-used under DoWCoP unless sufficient lines of evidence and agreement with the local Environment Agency Waste Team can be sought beforehand.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No :	9 of 56
Engineer:	Stuart Milne
Date:	21/05/2025

4. PRELIMINARY CONCEPTUAL SITE MODEL

Based on the information provided in the previous sections of this report a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants of concern present at the site, reference has also been made to Defra and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Table 4.1 below. The terms used in the preliminary qualitative risk assessment are defined in Appendix G.

4.1. Uncertainties

The following uncertainties exist in the preliminary conceptual model:

- The presence of any features unrecorded by the historic maps.
- Any unrecorded geological features.
- Any unrecorded pollution events during the site's history.



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 10 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 4.1 Preliminary Assessment of Potential Pollutant Linkages (Continued on Next Page).

Justification / Comments
- From 1849 the site is shown to be part of gardens and a bowling green, with a few small buildings spread across site. By 1851 through to 1891 the site is shown to have railway infrastructure including a central shed and rail lines. The site is within an area of shallow earthworks in an 'L' shape from the Old Opera House circa 80m north and extending eastwards in conjunction with the railway lines, with the far north of the site at a higher level with an embankment down to the good sheds and railway level. The sheds and sidings have expanded slightly by 1930 and cattle pens are recorded in the east and north of the site adjacent to an adjacent abattoir, which possibly expands into site by 1957. The site remains broadly unchanged until circa 1976-1980 when there is major redevelopment including removal of the goods sheds and railway sidings, and replaced with a main north-south rail line is through a new cutting in the centre of the site with Bury Interchange station positioned in the northern half of the site. A road overpass, Angouleme Way, passes through the north of the site. Pyramid Park, a public park to the east of the site, encroaches within the site boundary. The site and immediate surrounding land were subject to earthworks through the mid-1970s with regrading/infilling of land of the former railway cuttings. A subway is shown passing from Townside Field to the west of the tracks from the early 1980s. The site remains broadly unchanged to present day. - From earliest records the site is surrounded by a timber yard and warehouse 80m west of the site and woollen mill. Buildings to the west of the north of the site are labelled as abattoirs from 1851 which expands through to 1976 when it is no longer shown. By 1910 wider railway infrastructure has expanded with a new line branching south west and further residential expansion is noted from 100m south of the site. By 1930 a bakery is located 130m east of the site and by 1938 Bury Technical College has been constructed immediately east of the north of the site. Post war aerial photography records indicate an area or housing circa 100m east of the site is derelict land and could possibly be associated with bomb damage. By 1957 the land to the north of the site has been redeveloped with the expansion of the Market Hall with an open market immediately north, which are removed by 1973 for a car park. A new road layout is constructed between 1973 and 1976 and buildings associated with Bury Interchange replace the carpark by the late 1970s. By 1976 the railway sidings to the east of the site have been broadly removed and redeveloped into 'Townside Field' a public park, with a lake, later named Pyramid Park. By 2013 the land to the west of the site is undergoing development into flats (union square) and the park (pyramid park) is disused. - The Department of the Environment Industry Profile for animal processing works, for the adjacent and partly on-site historic abattoir, suggest pathogens, solvents, bleaches and fuel oils are potential contaminants associated with this industry. Consideration has been given to the widespread redevelopment of the local area from the mid 1970 including construction of a new road (Angouleme Way) and car park within the historic abattoir site whereby a degree of Made Ground removal or remediation <i>may</i> have taken place though no records can confirm this. The current layout also contains railway infrastructure including possible electrical components and sources of PolyChlorinated Biphenyls (PCBs). With respect to risk from pathogens, under normal environmental conditions, it is often assumed that most pathogens are no longer viable after 1–2 years in the soil and after 20+ years of dormancy, the biological risk is likely to be negligible and so hasn't been considered further. - Superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Middle Pennine Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is a lake within a park circa 100m east of the site though this not considered to be in hydraulic conductivity with local groundwater and has been dry since 2013, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate. - The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report (CON29M) does not indicate the site is at risk from past coal mining activity. A sand pit was recorded 30m west of the north of the site from 1849, and a reservoir 50m south, infilled by 1891 and 1976 respectively. The site itself has been subject to significant earthworks, most recently in circa 1973-1976 when the old railway cuttings are infilled, likely associated with the BSG records identifying the site to be underlain by 'worked ground'. It should be noted than the current layout comprises a new railway cutting. Nearby and on-site landfill records for other railway cuttings indicate use of 'inert' waste. Bury Council also provided records for a landfill in Townside Fields (in the west of the site) filled with inert subsoil as part of a Reclamation scheme in 1973 and since redeveloped in late 2000s and early 2010s as a hotel, offices and car park with remedial measures. Gas generation potential for any on and off-site sources is considered to be relatively low. - The site is not located within an ecologically sensitive area, notwithstanding the SBI Grade B and SSSI Impact Zone.



GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 11 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
Anticipated widespread Made Ground across the site associated with historic land uses including railway sidings, goods sheds, part of an abattoir in the north of the site, and earthworks associated with landfilling records associated with the infilling of railway cuttings in the east and west of the site.	Metals PAHs pH Hexavalent chromium Acids Alkalis	Direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Likely	Moderate Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial)	Medium	Unlikely	Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary A Aquifer associated with Devensian Till and Glacifluvial Deposits	Medium	Low Likelihood	Moderate / Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Chester Formation Sandstone	Medium	Unlikely	Low Risk
	Naphthalene (a semi-volatile PAH) TPH / BTEX / MTBE VOCs / SVOCs Phenols PolyChlorinated Biphenyls (PCBs) Cyanides Glycols Coal tar Free phase product	Vapour inhalation, direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Likely	Moderate Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial)	Medium	Unlikely	Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary A Aquifer associated with Devensian Till and Glacifluvial Deposits	Medium	Low Likelihood	Moderate / Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Chester Formation Sandstone	Medium	Unlikely	Low Risk
	Asbestos	(Dust migration and) dust inhalation	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Likely	Moderate Risk
Made Ground located beneath the site including landfilling understood to be inert waste.	Hazardous ground gasses (methane, carbon dioxide, hydrogen sulphide, carbon monoxide and depleted oxygen)	Inhalation (indoor and outdoor)	Future site users (commercial)	Severe	Unlikely	Moderate / Low Risk
			Adjacent site users (commercial)	Medium	Unlikely	Low Risk
			Construction, site investigation, demolition and future maintenance workers	Severe	Unlikely	Moderate / Low Risk
		Migration of hazardous ground gases from beneath the site to adjacent sites along services or other preferential conduits	Adjacent site users (commercial)	Medium	Unlikely	Low Risk
		Migration of ground gas / explosion	Buildings and services	Severe	Unlikely	Moderate / Low Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix G.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 12 of 56
Engineer: Stuart Milne
Date: 21/05/2025

5. FIELDWORK

The information contained in this report is limited to areas of land accessible during the ground investigation within the site boundary, as indicated on the site plan, presented in Appendix A as Drawing No.TE1885-TE-00-DR-GE-007-V01.

Tier Environmental scoped the intrusive ground investigation using guidance presented in:

- BS 10175:2011+A2:2017;
- Land Contamination Risk Management (LCRM) - <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>;
- BS 5930:2015+A1:2020;
- BS EN 1997:2004 and 2007.

Tier Environmental's standard strata description criteria are compliant with the above guidance.

5.1. Scope of Ground Investigation

The ground investigation was conducted between 26th March and 3rd April 2025 and was supervised by a suitably qualified Tier Environmental engineer. Table 5.1 below provides a summary of the exploratory holes completed and rationale. Exploratory hole locations are presented on Drawing No. TE1885-TE-00-DR-GE-007-V01.

Table 5.1 Scope of Ground Investigation and Rationale

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depths (m bgl)	Rationale
Trial pits	TP-P2-102; TP-P2-104; TP-P2-106 - 108	1.00-3.00m bgl	To confirm the shallow ground conditions across the site, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Window sample boreholes	WS-P2-101-107; WS-P2-109-111	1.25-4.45m bgl	To confirm the shallow ground conditions across the site, conduct <i>in situ</i> geotechnical tests, facilitate soil sampling for geotechnical and geoenvironmental parameters and installation of gas/groundwater monitoring wells.
Cable percussion and Rotary boreholes	BH-P2-104 BH-P2-105	20.30- 25.70m bgl	To confirm the deep ground conditions across the site, conduct <i>in situ</i> geotechnical tests, facilitate soil sampling for geotechnical and geoenvironmental parameters and installation of gas/groundwater monitoring wells.
Hand dug pits	TP-P2-101 TP-P2-103	1.00-1.10m bgl	To confirm the shallow ground conditions across the site, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Soakaway pits	SA-P2-101	2.30m bgl	To assess the infiltration characteristics of the underlying soils for the purpose of surface water drainage, including determination of soil permeability, identification of groundwater presence or perched water tables and to inform suitability and sizing of sustainable drainage systems.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 13 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 5.2 Scope of Monitoring Installations

Exploratory Hole Location	Strata Targeted	Slotted Response Zone (m bgl)	Rationale
BH-P2-104	Bedrock	13.00-25.00m	Targeting deeper groundwater body.
BH-P2-105	Bedrock	6.00-20.00	Targeting deeper groundwater body.
WS-P2-106	Made Ground	1.00-3.00	Targeting shallow Made Ground gas source
WS-P2-107	Made Ground	1.00-2.00	Targeting shallow Made Ground gas source
WS-P2-109E	Made Ground	1.00-2.00	Targeting shallow Made Ground gas source
WS-P2-110	Made Ground	1.00-4.00	Targeting shallow Made Ground gas source
WS-P2-111	Made Ground	0.50-1.00	Targeting shallow Made Ground gas source

Depths and accurate descriptions of strata and groundwater observations made during investigation works, together with details of the samples recovered, are presented on the Engineer's exploratory hole records in Appendix B.

5.2. Geoenvironmental Testing

Sampling and QA/QC protocols are presented in Appendix K. Tier Environmental's schedule of chemical laboratory testing is presented in Table 5.3. and Table 5.4. The testing was carried out by Element Materials Technology, a UKAS and MCerts (where appropriate for soils analysis) accredited laboratory.

Human Health and Preliminary Waste Classification Laboratory Testing

Based upon the conclusions of the preliminary risk assessment, Tier Environmental scheduled chemical laboratory testing on selected soil samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of potential contaminants of concern in the Made Ground;
- Determine the chemical composition and properties of the shallow natural soils;
- Undertake a *preliminary* soils waste classification and waste disposal route determination.

Table 5.3 Schedule of Chemical Testing for Human Health Risk Assessment and Preliminary Waste Soils Assessment.

Laboratory analysis	Asphalt	MG11	MG2	MG3	MG4	MG5
Tier Environmental soil suite*	0	6	2	2	1	0
Additional metals (Mn, B, Fe)	0	6	2	2	1	0
Asbestos screen	0	12	3	3	2	1
Speciated TPH / BTEX / MTBE	0	3	1	1	0	0
VOCs / SVOCs	0	3	1	1	0	0
PCBs	0	3	1	1	0	0
Total, free and complex cyanides	0	6	2	2	1	0
Organochlorine and Organophosphorus Pesticides	0	1	0	0	0	0



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 14 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Laboratory analysis	Asphalt	MG11	MG2	MG3	MG4	MG5
Acid Herbicides	0	1	0	0	0	0
Triazine Group (inc. atrazine and simazine)	0	1	0	0	0	0
Ammoniacal Nitrogen as N	0	6	2	2	1	0
Waste Acceptance Criteria (WAC)	0	5	1	2	1	0
Coal tar suite	1	0	0	0	0	0

*For definition of Tier Environmental analytical suites, please see Appendix K. NA - not applicable.

Controlled Waters Laboratory Testing

Based upon the conclusions of the preliminary risk assessment, Tier Environmental scheduled chemical laboratory testing on selected soil leachate samples. The purpose of the testing was to determine the concentration and spatial distribution of potential leachable contaminants of concern in the Made Ground;

Table 5.4 Schedule of Chemical Testing for Controlled Waters Risk Assessment.

Laboratory analysis	MG3	MG4
Tier Environmental leachate suite*	1	1
Leachate: Additional metals (Mn, B, Fe), TPH CWG, pH, Free, Total and Complex Cyanide & Ammoniacal Nitrogen as N	1	1

*For definition of Tier Environmental analytical suites, please see Appendix K. NA - not applicable.

5.3. Geotechnical Testing

Geotechnical laboratory testing was scheduled by Tier Environmental on selected samples as presented in Table 5.5. The testing was performed by Murray Rix Laboratories, a UKAS accredited laboratory. Test certificates including details of appropriate testing standards are presented in Appendix D and discussed in Section 7, below.

Table 5.5 Geotechnical Laboratory Testing Schedule.

Test	Stratum type	Number of tests	Rationale
1. Classification			
Moisture content & Atterberg limit	Made Ground	8	a) Volume change potential.
	Mudstone	1	b) Plasticity assessment (comply with Eurocode 7 description) c) Consistency Index. d) Determine soil type (e.g., clay/silt). e) Use as an empirical guide to soil shear strength
Particle size distribution (wet/dry sieve)	Made Ground	2	a) Classify soils for earthworks purposes.
	Till (Clay)	3	b) Establish type of soil (comply with Eurocode 7 description).
Particle size distribution (sedimentation)	Till (Clay)	1	
2. Chemical tests			
BRE SD1 Suite	Made Ground	5	Determine correct class of concrete for both natural and made ground with specific tests for
	Till (Clay)	3	



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 15 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Test	Stratum type	Number of tests	Rationale
	Mudstone	3	sites potentially containing sulphides (e.g., pyrites) or at low ph.
Calorific Value	Mudstone	1	
3. Compaction			
2.5 kg rammer dry density/moisture content relationship test	Made Ground	1	Establish maximum dry density and optimum moisture content of materials to assess suitability for reuse within earthworks
	Till (Clay)	1	
4 .Compressibility			
One-dimensional consolidation	Till (Clay)	1	Determine the long term consolidation behaviour of cohesive soils.
5. Shear strength (total stress)			
Unconsolidated undrained triaxial (“quick undrained triaxial”)	Till (Clay)	1	Quantitative means of determining undrained shear strength of soils for: a) use in bearing capacity calculations; b) modelling the short term behaviour of slopes and retaining structures; c) pile design; d) determining suitability of cohesive materials for vibro-replacement ground improvement techniques.
Unconsolidated undrained triaxial - multistage	Till (Clay)	1	
6. Rock Testing			
Point Load Test	Mudstone	8	Quantitative or index means of determining rock strength for: a) use in bearing capacity calculations; b) pile design c) Suitability of pile types during boring through rock
Unconfined Compressive Strength Testing	Mudstone	3	



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 16 of 56
Engineer: Stuart Milne
Date: 21/05/2025

6. GROUND CONDITIONS

The following section provides a summary of the ground conditions encountered during the ground investigation including strata profile, obstructions and visual / olfactory evidence of contamination. Exploratory hole logs are provided in Appendix B.

6.1. Strata Descriptions

Made Ground – Hardstanding

Concrete	
Locations encountered	WS-P2-101 to 103, BH-P2-104
Depths encountered from top of stratum (range)	Ground level to 0.20m bgl
Depths encountered to base of stratum (range)	0.42m to 0.55m bgl
Thickness (range)	0.25m to 0.55m
Spatial location on site	Encountered in the west within the pavilion, under the tramway and on walkways. Overlain by block paving in 3 No. locations.
Asphalt	
Locations encountered	WS-P2-111, SA-P2-101
Depths encountered from top of stratum (range)	Ground level to 0.75m bgl
Depths encountered to base of stratum (range)	0.15m to 1.30m bgl
Thickness (range)	0.15m to 0.55m
Spatial location on site	Along the central walkway.

Made Ground – MG1

Locations encountered	WS-P2-101 to 110, BH-P2-104, 105, TP-P2-104 to 107, TP-WS-P2-108, SA-P2-101
Depths encountered from top of stratum (range)	Ground Level to 3.10m bgl
Depths encountered to base of stratum (range)	0.27m to 5.70m bgl
Thickness (range)	0.27m to 3.40m
Spatial location on site	Widespread across the site, thickest in the area of the walkway.
General description	Typically a brown to grey gravelly silty variably sandy Clay with slag, clinker, brick, limestone and concrete, and variable cobble content of brick, sandstone and concrete.

Made Ground – MG2

Locations encountered	WS-P2-104 to 105C, WS-P2-109E to 110, BH-P2-104 to 105, TP-P2-101 to 103
Depths encountered from top of stratum (range)	Ground level to 2.70m bgl
Depths encountered to base of stratum (range)	0.90m to 3.10m bgl



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 17 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Thickness (range)	0.30m to 1.00m
Spatial location on site	Encountered within the walkway and paved parking area, locally within the pavilion.
General description	Orange brown to brown and locally black clayey sandy Gravel of brick, coal, mudstone, clinker, concrete and sandstone.

Made Ground – MG3

Locations encountered	BH-P2-105, TP-P2-101, TP-P2-103, SA-P2-101
Depths encountered from top of stratum (range)	Ground level
Depths encountered to base of stratum (range)	0.12m to 0.50m bgl
Thickness (range)	0.12m to 0.50
Spatial location on site	Located mainly in the paved parking area, and locally in the eastern walkway and pavilion.
General description	Dark greyish brown slightly gravelly, clayey Snad with brick, mudstone and other mixed lithologies.

Made Ground – MG4

Locations encountered	WS-P2-101, WS-P2-111
Depths encountered from top of stratum (range)	0.15m to 0.42m bgl
Depths encountered to base of stratum (range)	0.60m to 2.25m bgl
Thickness (range)	0.18m to 2.25m
Spatial location on site	Recorded thickest under the tramway in the centre of the site.
General description	A subbase type material of grey clayey sandy Gravel of sandstone and limestone.

Made Ground – MG5

Locations encountered	TP-WS-P2-108
Depths encountered from top of stratum (range)	2.35m bgl
Depths encountered to base of stratum (range)	2.60m bgl
Thickness (range)	0.25m
Spatial location on site	Located in one area of the walkway
General description	Dark grey sandy Silt with organic odour.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 18 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Drift Deposits – DD1

Till - Clay	
Locations encountered	WS-P2-104, 107, 109E, BH-P2-104, BH-P2-105, TP-P2-102, 106, TP-WS-P2-108
Depths encountered from top of stratum (range)	0.27m to 13.70m bgl
Depths encountered to base of stratum (range)	>1.50m to 15.20m bgl
Thickness (range)	>0.40m to 7.30m
Spatial location on site	Anticipated to underly the entire site
General description	Brownish grey variably sandy and gravelly Clay where the gravel is sandstone and quartzite.

Drift Deposits – DD2

Till - Gravel	
Locations encountered	BH-P2-104, BH-P2-105, TP-P2-107
Depths encountered from top of stratum (range)	0.40m to 13.00m bgl
Depths encountered to base of stratum (range)	1.00m to 14.70m bgl
Thickness (range)	>0.60m to 2.40m
Spatial location on site	Interbedded within the wider cohesive Till
General description	Very dense lightly brown clayey Gravel of sandstone and cobble of sandstone.

Bedrock – BR1

Lower Pennine Coal Measures	
Locations encountered	BH-P2-104, BH-P2-105
Depths encountered from top of stratum (range)	9.50m to 15.20m bgl
Depths encountered to base of stratum (range)	25.70m to 30.00m bgl
Thickness (range)	>10.50m to >20.50m (base not proven)
Spatial location on site	Anticipated to underly the entire site
Description of dip	Not determined
Voids / recovery	Good recovery throughout
General description	Generally weak to extremely weak thinly laminated dark grey Mudstone, with hard grey Sandstone from circa 20-26m bgl in BH-P2-105. Initially weathered from 15.20m to 16.20m bgl in BH-P2-104.

6.2. Obstructions

The following potential underground Services / obstructions were encountered during the ground investigation works.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 19 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 6.1 Underground Services / Obstructions Summary Table

Exploratory Hole Location	Location on Site	Depths recorded from (m bgl)	Depth of Base of Feature (m bgl)	General description and comments
TP-P2-104	East/Central	1.40	1.60	Brick wall and paving slabs recorded
TP-P2-107	East/Central	1.00	N/A	Service
WS-P2-109A	East	0.80	ND	Concrete cobble
WS-P2-109B	East	0.76	ND	Concrete cobble
WS-P2-109C	East	0.62	ND	Concrete cobble
WS-P2-109D	East	0.38	ND	Concrete cobble
WS-P2-109E	East	0.60	0.90	Large concrete cobble

ND Not Determined

6.3. Visual and Olfactory Evidence of Contamination

A summary of visual and/or olfactory evidence of contamination noted during Tier Environmental investigations is summarised in Table 6.2 below:

Table 6.2 Visual and/or Olfactory Evidence of Contamination Summary

Exploratory Hole Location	Depth Range (m bgl) Encountered From	Depth Range (m bgl) Encountered To	Location on Site	Description
WS-P2-109E	1.30	2.00	East	Strong hydrocarbon odour
SA-P2-101	0.60	0.75	East	Slight organic odour associated with timber
	0.75	1.30	East	Slight hydrocarbon odour

6.4. Groundwater Observations During Fieldwork

Table 6.3 below provides a summary of the groundwater observations during the fieldworks. Further information of groundwater observed is presented in the exploratory hole logs in Appendix B.

Table 6.3 Field Observations of Groundwater.

Exploratory hole	Strike (m bgl)	Rise in groundwater after 20 mins. (m bgl)	Formation	Observations
BH-P2-104	13.00	Undetermined	Granular Till	Rose to ground level overnight
BH-P2-105	7.50	No rise	Cohesive Till	None
	9.50	8.50	Mudstone	None
SA-P2-101	1.40	No rise	Made Ground	Seepage
WS-P2-103	Ground level	-	Made Ground	Flowing out at surface
WS-P2-104	1.80	No rise	Made Ground	None
WS-P2-110	3.70	No rise	Made Ground	None
WS-P2-111	0.60	No rise	Made Ground	None



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 20 of 56
Engineer: Stuart Milne
Date: 21/05/2025

6.5. Groundwater Monitoring

Table 6.4 below provides a summary of the groundwater monitoring results conducted to date. In total, 1 No. visit has been carried out on the 4th April 2025.

Table 6.4 Groundwater Monitoring Results Summary

Exploratory hole	Response Zone	Depth range (m bgl)	Formation
BH-P2-104	13.00-25.00m	12.29	Till
BH-P2-105	6.00-20.00	7.31	Till
WS-P2-111	0.50-1.00	0.78	Made Ground
WS-P2-109E	1.00-2.00	1.13	Made Ground
WS-P2-110	1.00-4.00	Dry	N/A
WS-P2-106	1.00-3.00	Dry	N/A
WS-P2-107	1.00-2.00	Dry	N/A



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 21 of 56
Engineer: Stuart Milne
Date: 21/05/2025

7. PRELIMINARY GEOTECHNICAL ASSESSMENT

7.1. Determination of pH and Water-Soluble Sulphate

Consideration of Chloride and Nitrate

In accordance with BRE SD1 for ground suspected of containing mineral acids of industrial origin, a determination must be made as to whether Chloride (Cl) and Nitrate (NO₃) need to be analysed. In the event that they do, and elevated concentrations of Cl and NO₃ are reported, this may indicate that hydrochloric and nitric acids (HCl and HNO₃) are present. The effect of these acids on concrete is likely to be similar to that of sulfuric acid; so, for classification purposes, their chemically equivalent sulphate concentration should be calculated and added to any actual soluble sulphate present (as SO₄ mg/l) in the respective samples: SO₄ equivalent of Cl = Cl x 1.35mg/l SO₄ equivalent of NO₃ = NO₃ x 0.77mg/l.

Firstly a determination has been made as to whether a significant number of reported pH values are lower than pH 5.5. If they are, then amounts of chloride and nitrate (NO₃) should also be determined (in mg/l) in addition to sulphate content.

The conclusion of this assessment is that a significant number of pH values are not lower than pH 5.5 and so no further consideration of Chloride (Cl) and Nitrate (NO₃) needs to be conducted.

Consideration of Magnesium Levels

In accordance with BRE SD1, when the water soluble sulphate concentration or groundwater sulphate concentration is greater than 3000mg/l, an additional consideration of the level of magnesium is required.

In this instance, no reported concentrations of water soluble sulphate have been reported above 3,000mg/l and therefore no further consideration of magnesium has been made.

In accordance with BRE SD1, there is no need to take magnesium levels into account for natural ground – the ‘m’ suffix Design Sulphate Classes only apply to brownfield locations. This is because, in natural ground conditions in the UK, magnesium levels are invariably well below values that may significantly affect concrete.

Sulphide Bearing / Pyritic Ground Assessment

In accordance with ‘Concrete in aggressive ground’ Special Digest 1:2005 (Third Edition), Tier Environmental has first sought to establish whether the site lies within an area where pyrite bearing natural ground exists that could result in additional sulphate being converted from sulphides (particularly pyrite) during enabling works, earthworks and/or construction activities.

Firstly, the site location has been plotted on the extracted figure from BRE SD1 that shows the Principal Sulphate and Sulphide Bearing Strata in England and Wales, as shown on Figure 7.1 below.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 22 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Figure 7.1 Site Location Plotted on Principal Sulphate and Sulphide Bearing Strata in England and Wales (Extracted from BRE SD1)

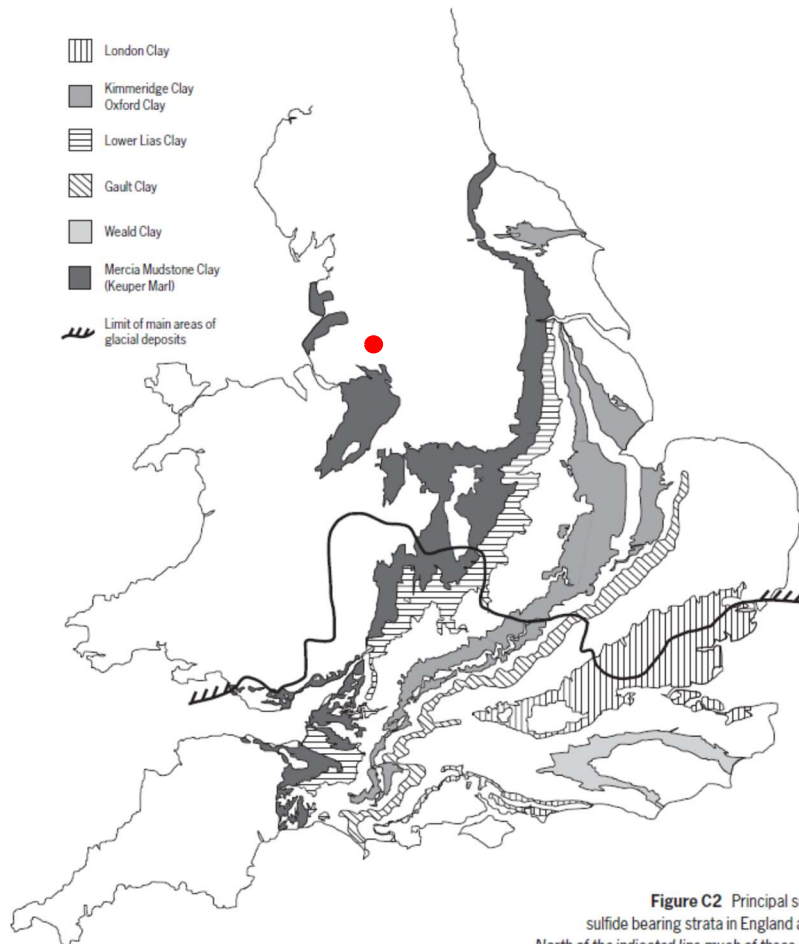


Figure C2 Principal sulfate and sulfide bearing strata in England and Wales
North of the indicated line much of these strata are covered by glacial deposits which, if partly derived from the indicated strata, may also contain sulfates and sulfides

Secondly, an assessment has been made of the site's location relative to coal mining areas of Great Britain on the figure below. This has been done because these represent areas where sulphate bearing coal mining wastes and metal processing slags are most likely to be encountered.



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 23 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Figure 7.2 Site Location Plotted Relative to Coal Mining Areas of Great Britain (Extracted from BRE SD1)

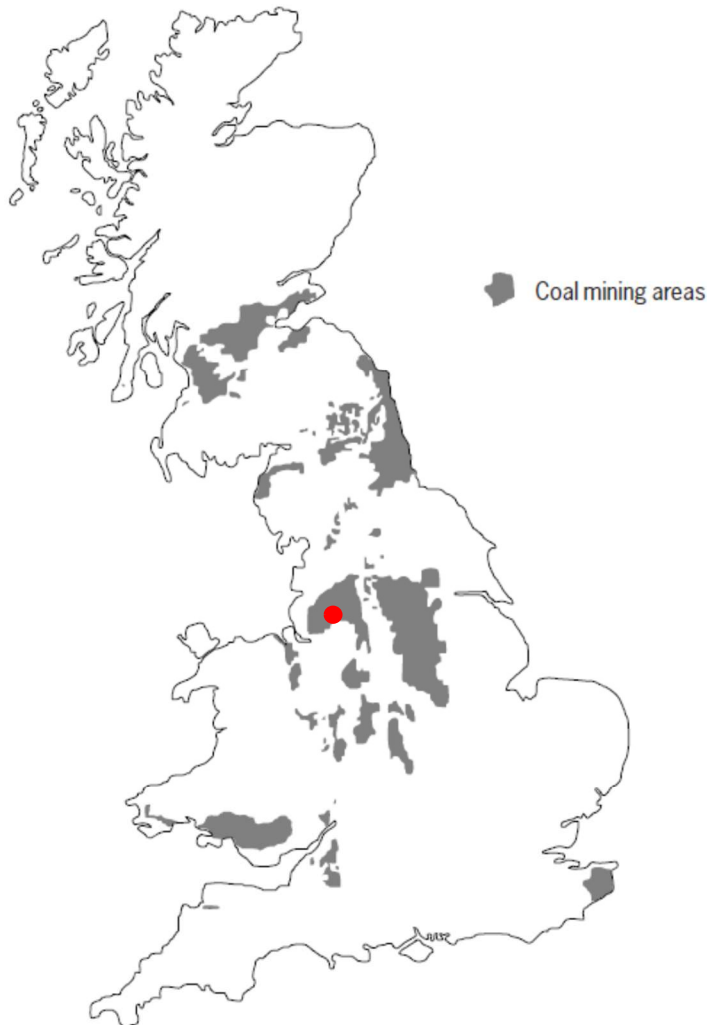


Figure C3 Coal mining areas of
Great Britain where sulfate bearing, coal mining wastes
and metal processing slags are most likely to be encountered

The table below has been developed to determine whether, based on the above assessment whether there is a possibility of sulphides in the ground (e.g. pyritic ground):



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 24 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 7.1 Assessment for Potential Sulphide Bearing (e.g. Pyritic) Ground

Question 1:	Question 2:	Question 3 (only relevant if answer to Question 2 is 'Yes'):	Question 4:	Conclusion of Assessment for Potential Sulphide Bearing Ground
From Figure 7.1, Does the Site Lie Within a Principal Sulphate and Sulphide Bearing Area?	From Figure 7.1, Does the Site Lie <u>North</u> of the Black Line Indicating Extent of Glacial Deposits ?	Is it considered that the Glacial Deposits beneath the Site are Derived from Principal Sulphate and Sulphide Bearing Strata (even if the answer to Question 1 is 'No')?	From Figure 7.2, Does the Site Lie Within a Coal Mining Area?	
No	Yes	No	Yes	The conclusion of the assessment is that there <u>is</u> the potential for sulphide (e.g. pyritic) bearing ground and further assessment of this is required in accordance with BRE SD-1.

Oxidisable Sulphides Calculation

The table below has been prepared in order to further assess, based on the laboratory data, whether there is likely to be pyrite present which may oxidise if the ground is disturbed:

Table 7.2 Oxidisable Sulphides Calculations

Exploratory Hole Location	Depth (m bgl)	Total Sulphur (TS) Concentration (%)	Calculated Total Potential Sulphate (TPS) (%)*	Acid-Soluble Sulfate (AS) Concentration (%)	Calculated Oxidisable Sulphides (OS) (%)#
Made Ground					
WS-P2-105C	0.50-0.70	0.11	0.33	0.07	0.26
WS-P2-106	0.70-1.00	0.04	0.12	0.03	0.09
WS-P2-107	0.30-0.50	0.03	0.09	0.03	0.06
BH-P2-105	1.70-2.00	0.12	0.36	0.06	0.3
WS-P2-110	1.30-1.50	0.02	0.06	0.02	0.04
BH-P2-104	1.10-1.30	0.17	0.51	0.36	0.15
Drit Deposits					
WS-P2-104	3.50-3.90	0.05	0.15	0.02	0.13
WS-P2-109E	2.50-3.00	0.04	0.12	0.02	0.1
BH-P2-105	8.10-8.50	0.16	0.48	0.03	0.45
Bedrock					
BH-P2-104	13.70-14.00	0.15	0.45	0.03	0.42

Note: * TPS = 3 x total sulphur (TS % S). # OS = TPS - AS

Conclusion

A determination has been made as to whether the calculated Oxidisable Sulphides (%) are “*greater than 0.3% for a significant number of samples*”, in accordance with BRE SD1. The conclusion of this assessment is that a significant number of the natural samples are in excess of 0.3% with respect to calculated Oxidisable Sulphides (%).

On this basis, this does indicate pyrite is present which may oxidise if ground is disturbed.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 25 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Design Sulphate Classification

Representative samples of the soils encountered during the Tier Environmental ground investigations, were tested to determine their pH and concentrations of water-soluble sulphate (SO_4^{2-}). The results are presented in Appendix C and summarised in Table 7.3 below. It is assumed that the site is a 'brownfield' site, and the groundwater is 'mobile' in accordance with BRE SD1.

The conclusion of the assessment is that a DS-2 and ACEC Class AC-2 is appropriate for buried concrete design purposes within Made Ground and natural soils, with due consideration of the sub-sections above (which include consideration of chloride, nitrate, magnesium and potential for sulphide bearing (e.g. pyritic) ground).

Whilst no evidence of gross hydrocarbon contamination has been observed at the site, it is a concrete specialist should review the TPH results and ground conditions summary within this report to ensure appropriate concrete design against retardation / degradation due to hydrocarbons.

Table 7.3 Results of Soil pH Testing and Water-Soluble Sulphate Determination

Exploratory Hole Location	Depth (m bgl)	pH	Water-soluble sulphate (mg/l)	Design sulphate class	ACEC sulphate class
Made Ground					
WS-P2-105C	0.50-0.70	7.97	105.6	>10 No. samples so mean of the highest 20% samples used as the characteristic value: 659 mg/l DS-2	>10 No. samples so mean of the lowest 20% samples used as the characteristic value: 7.3 AC-2
WS-P2-106	0.70-1.00	8.18	6.2		
WS-P2-107	0.30-0.50	8.21	15.2		
BH-P2-105	1.70-2.00	7.52	60.4		
SA-P2-101	0.80	7.06	94.9		
TP-P2-104	0.80	7.86	16.9		
TP-P2-106	0.10	7.42	48		
TP-P2-101	0.30	7.96	24.3		
WS-P2-101	0.45-0.60	10.12	1344.8		
WS-P2-110	1.30-1.50	8.06	19.4		
BH-P2-104	1.10-1.30	11.4	455		
BH-P2-104	3.20-3.50	10.14	179.9		
Till					
WS-P2-104	3.50-3.90	8.41	39.3	<5 No. results so highest value used: 39.3 DS-1 TPS value of 0.48% increase to DS-2	<5 No. results so lowest value used: 7.5 AC-1 TPS value of 0.48% increase to AC-2
WS-P2-109E	2.50-3.00	8.48	27.1		
BH-P2-105	8.10-8.50	7.5	29.5		
Mudstone					
BH-P2-104	13.70-14.00	7.18	20.4	<5 No. results so highest value used: 20.4 DS-1 TPS value of 0.45% increase to DS-2	<5 No. results so lowest value used: 7.18 AC-1 TPS value of 0.45% increase to AC-2

ACEC - Aggressive Chemical Environment for Concrete (see BRE, 2005).

7.2. Geotechnical Parameters

The data obtained during the Ground Investigation has been assessed for the recorded soil and rock types in order to provide characteristic values in order to aid the final foundation design.



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 26 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 7.4 Soil Classification Test Results for Cohesive Soils

Exploratory hole	Depth (m bgl)	Stratum	MC (%)	LL (%)	PL (%)	PI (%) (Modified)	Class	Volume Change Potential	Consistency Index
BH-P2-104	2.30	Made Ground	34.8	42	16	20.02	Medium	Medium	0.27
BH-P2-104	4.50-4.95	Made Ground	14.7	36	13	18.86	Medium	Low	0.92
BH-P2-105	1.20	Made Ground	15.9	39	14	17	Medium	Low	0.92
BH-P2-105	9.80	Weathered bedrock	13.3	35	13	18.75	Low	Low	0.98
WS-P2-106	1.20	Made Ground	20.5	40	15	21.5	Medium	Medium	0.78
WS-P2-107	2.00	Made Ground	12.8	38	13	20	Medium	Medium	1.00
WS-P2-110	1.20	Made Ground	14.8	37	13	20.16	Medium	Medium	0.92
WS-P2-110	3.00	Made Ground	11.0	34	12	15.18	Low	Low	1.04

ND - Not determined; MC - Moisture content, LL - Liquid limit, PL - Plastic limit, PI - Plasticity index.

Consistency index (CI) is obtained from Atterberg limits and is allowed by Eurocode 7 as a scientific means of determining consistency of clays over and above an engineer merely sticking a thumb in ($CI = (LL - mc)/PI$).



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 27 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Soil Classification

Cohesive Soils

Moisture content and Atterberg Limit testing was undertaken on samples from cohesive material at the site. Of the 7 No. tests completed within cohesive Made Ground soils, results indicate low to medium plasticity clays with a low to medium volume change potential. The 1 No. natural soil tested, within the weathered bedrock, recorded a low plasticity and low volume change potential.

A total of 3 No. samples of cohesive Till soils were subjected to Particle Size Distribution and Hydrometer Sedimentation analysis. The result of these tests indicates the material was predominantly classified as a silty slightly sandy slightly gravelly CLAY. The results show the material is relatively homogenous.

Granular Soils

A total of 2 No. samples of granular Made Ground were submitted for Particle Size Distribution tests. The result of these tests indicates the material was predominantly classified as a silty sandy GRAVEL or a silty SAND & GRAVEL. The results show the material is relatively homogenous.

Shear Strength Parameters

Total stress undrained triaxial tests were performed on the natural clay strata encountered within the exploratory holes. Results record a shear strength of 213kPa for a sample at 3.00m bgl within the Till soils.

Standard Penetration Tests (SPT) were carried out in all of the boreholes. The undrained shear strength of the natural clay strata tested has been estimated using the relationship developed by Stroud, where:

$$C_u = f_1 \times \text{SPT N60 value}$$

The value of f_1 is dependent on the Plasticity Index (Ip). By using the moderately conservative Plasticity Index of 20%, a characteristic value of $f_1 = 5$ has been derived.

Results from 22 No. SPT N values in the natural clay strata indicate shear strengths of between 30-250kPa suggesting low to very high strength.

Density Parameters

The results of Standard Penetration Tests undertaken within the granular Made Ground are also considered to be very variable. Whilst the majority indicate very dense soils with $N=50$ between 1.20m and 2.00m bgl, 3 No. locations record values of $N=18$ to $N=24$ between the same depth range. Notably, 9 No. exploratory hole locations refused within Made Ground soils.

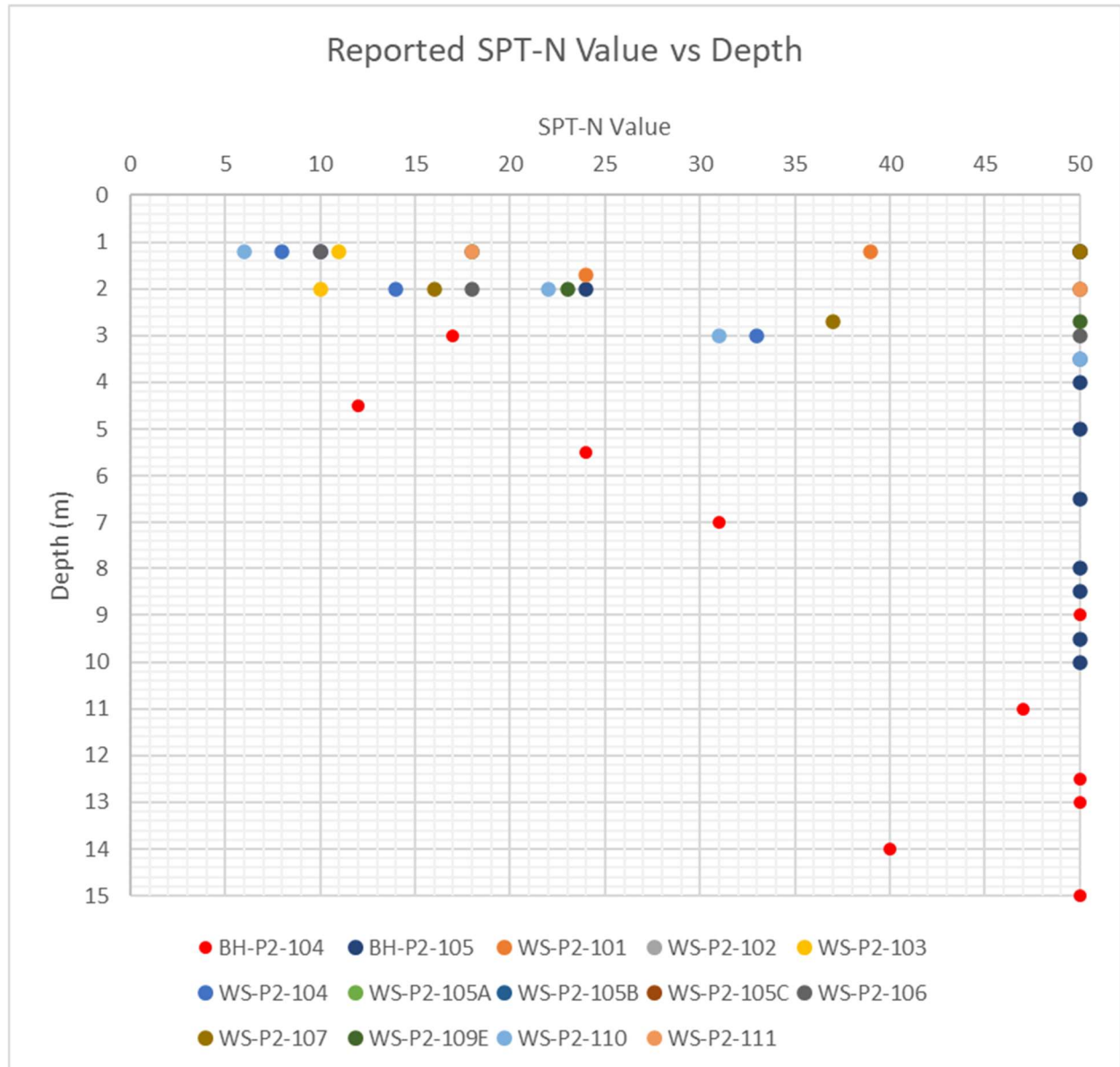
Figure 7.3 overleaf presents the recorded SPT-N value against depth for each borehole. Results within the natural soils recorded values of between $N=31$ to $N=50$ suggesting very high strength cohesive soils, and very dense granular soils where these were locally encountered.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
 Page No : 28 of 56
 Engineer: Stuart Milne
 Date: 21/05/2025

Figure 7.3 Reported SPT-N Value vs Depth



Rock Classification

Point Load Tests

Point Load testing was performed on a number of rock core samples with both axial and diametric testing being undertaken. Results show considerable variation but little increase with depth. Point load test data indicates axial I_{s50} values in the top 10m of sandstone rock strata are in the range of 0.03MPa to 0.22MPa for the 8 No. tests that were performed.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 29 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Unconfined Compressive Strength Tests

UCS testing was performed on 3 No. rock core samples which were recovered as intact pieces with a length which was at least 2 times the diameter of the core. Results ranged between 0.8-1.1 N/mm².

Foundation Recommendations

The site is underlain by Made Ground of either a gravelly Clay or clayey sandy Gravel to depths of typically between 1.25m and 2.00m bgl though locally up to 5.70m bgl in BH-P2-104 in the eastern walkway, and some shallower horizons in the south east of the site to between 0.27m and 0.40m bgl.

Natural soils of Till overlying bedrock of the Lower Pennine Coal Measures were recorded where depth was achieved through the Made Ground and predominantly comprised very high strength Clays. In-situ testing broadly recorded refusal values of SPT N of >50.

Given the encountered ground conditions within locally deep Made Ground, and the nature of the proposed development, the most likely foundation solution would be pads within natural soils though at present site levels this would be at depths of >2.00m bgl. A micro piled solution could also be considered to bear loads onto competent ground beyond the base of recorded Made Ground, and consultation should be sought from a local contractor. Foundation design should be refined based on any proposed site level changes inclusive of removal of the pyramid mounds.

7.3. Soakaways

Soakaway testing was completed in one location (SA-P2-101) to assess the infiltration characteristics of the underlying soils to inform suitability and sizing of sustainable drainage systems. The trial pit was excavated to 2.30m bgl, backfilled with gravel, and filled with clean potable water to a depth of 0.71m bgl. The reduction in water level was then measured over time, via a standpipe, for a period of 1650 minutes to a level of 1.41m bgl. As the 75% effective depth was not achieved within the test period, no infiltration rate could be calculated, and it is estimated that it would take 37 hours to drain. It should be noted only one test cycle was completed.

Results are included in Appendix D

7.4. Earthworks

Compaction data has been assessed by comparing the results against criteria commonly used in earthworks to achieve an adequate density for engineered fills. The criteria indicate whether the samples could achieve in excess of 95% of Maximum Dry Density (MDD – a requirement often included in highways specifications) and whether they could be compacted to less than 5% air voids ratio (a requirement applied where raft foundations are to be adopted).

The results of compaction testing undertaken on samples of Made Ground indicate that it could be recompacted to achieve >95% of MDD and <5% air voids. Based upon the results obtained, the Made Ground could be used as an engineered fill, subject to other suitability considerations. It should be noted that suitability for compaction is highly dependent on the initial moisture content of the material to be compacted. Some processing of the material (including screening and crushing of unsuitable elements) may be required during the enabling works phase to remove over-sized or unsuitable material, such as metal, plastic, fabric and timber. Where Made Ground is to be reused as an engineered fill, it would be sensible to select granular fills only and subject them to a confirmatory testing regime where they were required to achieve a compaction specification as a structural fill.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 30 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Construction plant should be provided with an adequate working platform in line with the requirements of BRE report, "BR 470: Working Platforms for Tracked Plant". Again, further advice should be sought from the temporary works designer.

7.5. Groundworks, Excavation Stability and Groundwater Dewatering

In our opinion, there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural soils should be assumed to be unstable. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 097 (1983) should be made to establish suitable means of support or battering of excavation sides.

It is recommended that all excavations to greater than 1.20 metres depth, or for shallower excavations where groundwater is encountered above this level are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle. Standing groundwater levels of between 0.78m and 12.29m bgl were encountered in the boreholes during monitoring. Should groundwater seepages occur, and water accumulate in shallow excavations it should be able to be removed by pumping from a filtered sump. However, groundwater control by more robust means, such as well pointing, may be required locally.

It should be noted that should deep basements be constructed as part of the development then we would recommend that the standpipes are monitored for groundwater levels for an extended period of time and take into consideration seasonal variations and periods of very wet weather to measure the fluctuation of the standing water levels. It should be noted that groundwater inflows and levels are likely to be subject to seasonal and climatic variations.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 31 of 56
Engineer: Stuart Milne
Date: 21/05/2025

8. HUMAN HEALTH RISK ASSESSMENT

Results of chemical analysis are presented in full in Appendix C.

8.1. Data Interpretation Approach

The analytical data obtained were reviewed for completeness and consistency. The data for each sample type was then compiled, screened against the Generic Assessment Criteria (GACs) for a commercial and public open space (park) land use and those potential contaminants of concern which were found to exceed the GACs were then subjected to detailed analysis as described below.

Previously, it was possible for results from soil (and leachate) samples to be subject to statistical assessment in accordance with a 2008 guidance document (CL:AIRE / CIEH Guidance on Comparing Soil Contamination Data with a Critical Concentration). This guidance has now been withdrawn and replaced with the following document:

- Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration (CL:AIRE 2020)

The purpose behind statistical assessment is ultimately to determine whether concentrations of contaminants are at levels that present potential risk to the future site users (and the wider environment if the statistical assessment is conducted on leachate test results).

The new guidance places even greater emphasis and reliance on the desk study being carried out first, appropriately detailed sampling strategies, collection and testing of samples for contamination and use of appropriate screening criteria.

The guidance requires an increased number of criteria to be met before a robust statistical assessment can be conducted and introduces the principle of the Central Limit Theorem (CLT); a key tool of statistics that is used in the comparison of confidence intervals with the critical concentration. A common 'rule of thumb' is that the CLT will apply provided your sample size is between 20 and 50.

On this basis, Tier Environmental considers that statistical assessment in accordance with the CL:AIRE 2020 guidance may not be applied in this instance given that the number of samples obtained is below 20 No. for any given identified soil population.

Due consideration of the ground conditions, distinct identifiable populations of soil and proposed development layout has been undertaken and, where appropriate, laboratory results associated with discrete populations or 'hotspots' have been assessed separately.

8.2. Selection of Generic Assessment Criteria (GAC)

In short, for the majority of the contaminants of concern, LQM/CIEH Sutable 4 Use Levels (S4ULs) published in 2015 have been adopted as GACs for a commercial and public open space (park) land use; however, further details on the hierarchal approach for the selection of the GACs used as screening criteria for this assessment is provided in Appendix H.

The current human health risk assessment applied GACs derived for a commercial land use scenario acknowledging the proposed development as a new walkway for station access. In this context, we consider the use of commercial land use GACs to be a reasonable and appropriately conservative default scenario, especially when the actual exposure frequency and duration for public users will be less than that assumed for the default commercial worker.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 32 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Given the unknown extent of both proposed earthworks and intended areas of soft landscaping, we have taken an additional step of conducting sensitivity analysis by comparing the reported concentrations against Public Open Space (POS) Park GACs. We recognise that areas of soft landscaping present a slightly higher potential for soil contact, particularly if members of the public utilise the area as a 'park', which may be beyond an exposure frequency of commercial landscapers/maintenance workers. To account for this, a sensitivity analysis was carried out using POS Park GACs, which are based on young children playing daily in parks — a highly conservative scenario.

These values are considered as appropriate screening criteria as they incorporate updated assumption exposures derived for the production of C4SLs but within the context of deriving screening criteria above which assessment of the risks or remedial action may be needed (i.e. within the context of the planning regime rather than Part 2A context for which C4SLs were derived).

For those potential contaminants of concern where the selected GAC is dependent on Soil Organic Matter content (SOM), an assumed SOM of 1% has been selected based on the reported Total Organic Carbon (TOC) concentrations (which have been converted to SOM by dividing by a conversion factor of 0.58). It should be noted; however, that for any soil samples where the TOC may be artificially driven by the presence of petroleum hydrocarbons, that these TOC results have been removed from the data set when determining an appropriate characteristic SOM. For this purpose, Tier Environmental have notionally considered that any TOC results from soil samples where the measured total TPH concentration exceeds 500mg/kg should be removed.

8.3. Human Health Risk Assessment

No measured concentrations of potential contaminants of concern have been reported in excess of the respective GACs protective of human health for a commercial land use.

The comparison against the more stringent POS (Park) criteria has recorded measured concentrations of the following contaminants of concern in excess of the respective GACs:



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 33 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 8.1 Measured Concentrations of Potential Contaminants of Concern Reported in Excess of the Respective GACs

Contaminant of Concern	Exploratory Hole Location	Depth (m bgl)	Soil Population	Units	Measured Concentration	GAC	Comments
PAHs							
Benzo(a)pyrene	WS-P2-106	0.70-1.00	MG1	mg/kg	19.87	11	Tier have conducted further analysis in the form of PAH Double Ratio Plots, which revealed the PAHs to be coal derived when compared to the Jones Environmental Laboratory (now Element Deeside) guidance presented in Figure 8.1 with further discussion overleaf.
	TP-P2-101	0.30	MG3	mg/kg	16.64		
Dibenzo(ah)anthracene	WS-P2-106	0.70-1.00	MG1	mg/kg	2.31	1.1	
	TP-P2-101	0.30	MG3	mg/kg	2.46		
Benzo(b)fluoranthene	WS-P2-106	0.70-1.00	MG1	mg/kg	22.08	13	
	TP-P2-101	0.30	MG3	mg/kg	18.1		



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 34 of 56
Engineer: Stuart Milne
Date: 21/05/2025

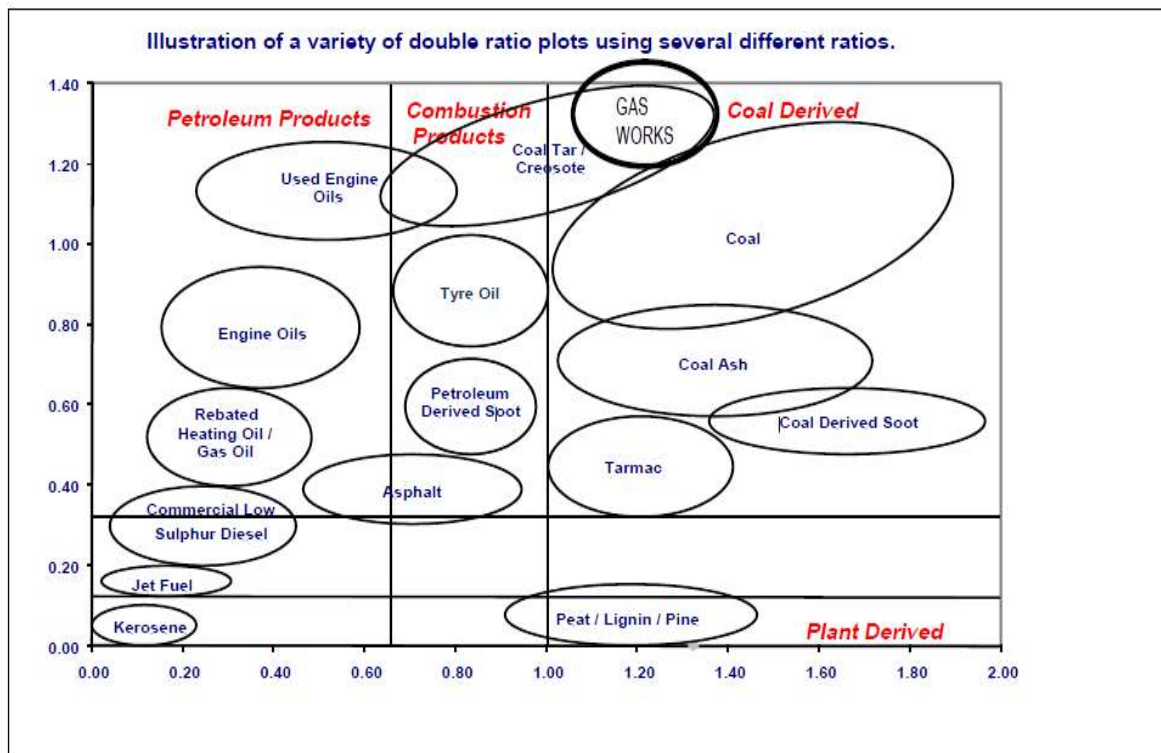
Localised Impacts

Measured localised concentrations of select PAHs including benzo(a)pyrene, dibenzo(ah)anthracene, and benzo(b)fluoranthene have been reported in excess of the GAC protective of human health for a POS (Park) land use.

Due to the presence of fine coal fragments noted within the Made Ground, further analysis was undertaken by Tier Environmental in the form of PAH Double Ratio Plots in Figure 8.2, which revealed the PAHs to be coal derived when compared to the Jones Environmental Laboratory (now Element Deeside) guidance presented in Figure 8.1 below.

The forensic assessment confirms the provenance of the PAHs as derived from possible coal inclusions observed and recorded within a number of exploratory holes. Coal is a common naturally occurring rock present as a bedrock unit within the Pennine Lower Coal Measures Formation, and widely distributed within natural drift strata of glacial origin within the north of England. Coal fragments have significantly reduced exposure pathways compared to petroleum and combustion derived PAHs such as ash and clinker. Coal fragments will not have the same form of exposure pathways as the fines within general soils and would not be inhaled as dusts. This is one of the primary exposure pathways within CLEA for combustion and petroleum derived PAHs within shallow soils. It is therefore considered that, with the reduced exposure pathways, the natural coal inclusions are considered to not pose a significant risk to any future residents (primary human health receptors).

Figure 8.1 Jones Environmental Laboratory (now Element Deeside) PAH Double Ratio Plot Guidance

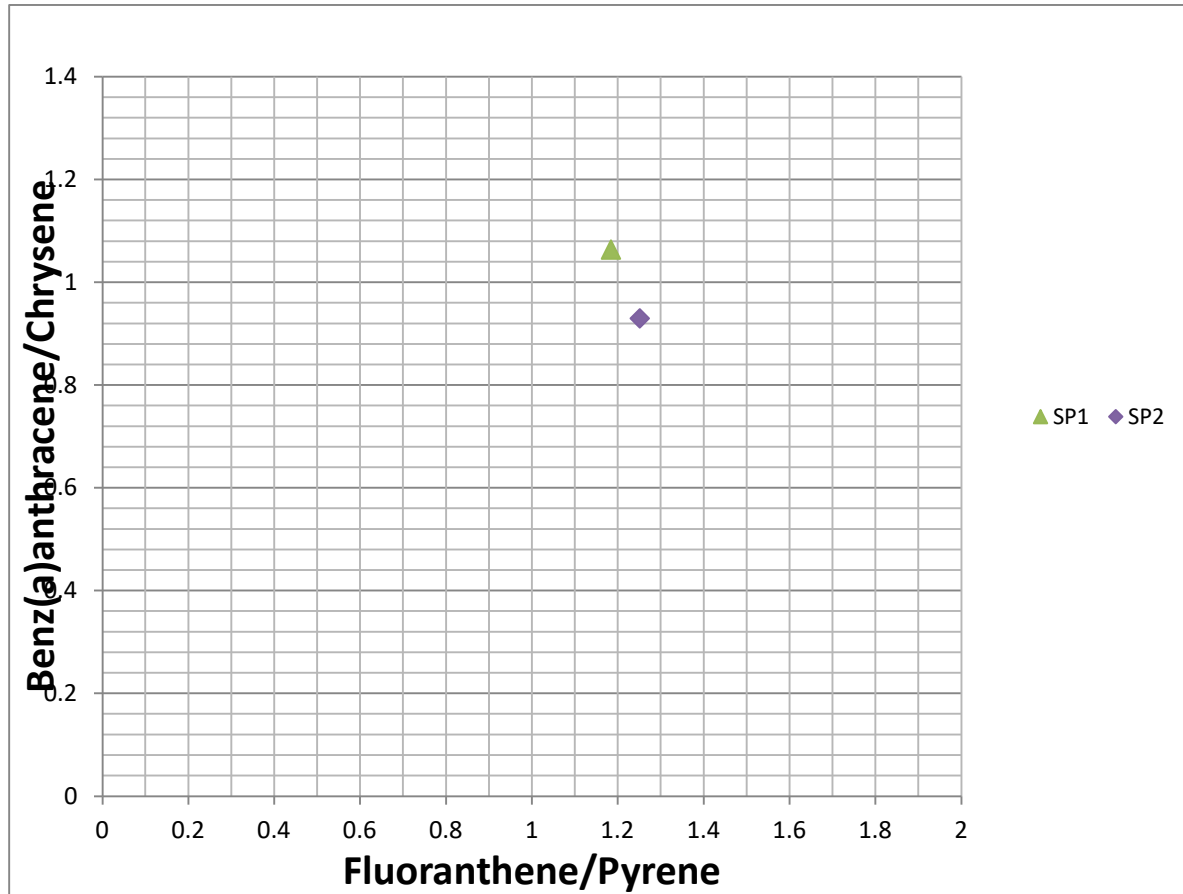




GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 35 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Figure 8.2 PAH Double Ratio Plot: Benzo(a)anthracene/Chrysene and Fluoranthene/Pyrene



8.4. TPH Assessment

In accordance with the 'The LQM/CIEH S4ULs for Human Health Risk Assessment' (2015), in order to consider the additive effects of all the hydrocarbon fractions, the LQM/CIEH S4ULs should be used to calculate an individual Hazard Quotient (HQ) for each fraction. The HQs can then be added to form a Hazard Index (HI) for petroleum hydrocarbon. Where the HI exceeds unity this can indicate a potentially significant risk to human health. Due consideration has also been given of 'The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils' (reference: Science Report P5-080/TR3, Environment Agency, dated 2005) which states ""Depending on circumstances, where a [GAC] is exceeded the site assessment can proceed to a site-specific risk assessment and/or directly to remediation. However, even where SGVs for individual fractions are not exceeded, potential additivity of toxicological effects between the fractions means that a significant possibility of significant harm could exist.....Where the HI exceeds unity, this can indicate a potentially significant risk to human health and the investigation proceeds to the next stage (remediation or further assessment)"".

In order to conduct ""further assessment"", Tier Environmental has considered the text included in the Environment Agency 2005 document that states ""Fractions exhibiting different toxicological properties might be excluded from the hazard index"". Calculating separate hazard indices for different TPH fractions is a recognized and legitimate approach supported by the TPHCWG guidance and other regulatory frameworks. It allows for a more accurate assessment of potential health risks, given the varied properties of the hydrocarbon fractions.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 36 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Tier Environmental has therefore considered the following fractions separately owing to their toxicological relevance and risk-based prioritisation:

- Aliphatic (ali) C8-C16 Fraction: This range includes hydrocarbons that are relatively more volatile and may present a risk through inhalation exposure, dermal contact, and ingestion. This fraction is often considered when evaluating the potential for acute and chronic health effects due to its intermediate volatility and mobility
- Aromatic (aro) C8-C16 and C16-C35 Fractions: Aromatic hydrocarbons are generally more toxic than aliphatic hydrocarbons. The C8-C16 range includes lighter aromatics, which can be more volatile and potentially more hazardous in terms of inhalation risk. The C16-C35 range includes heavier, less volatile aromatics, which may present different exposure risks, primarily through soil ingestion or dermal contact."

The hazard index calculated considering the additive effects of all the hydrocarbon fractions does not exceed 1. Therefore, it is considered that TPH does not present a risk to human health for the proposed land use for either a commercial or POS park scenario.

Measured Potential Contaminant of Concern Concentrations without Publicly Available GACs

Table 8.2 summarises the measured concentrations of potential contaminants of concern have been reported in excess of the laboratory method detection limit for which there are no current publicly available GACs and provides qualitative commentary / discussion as to whether they may represent a potential risk to human health with due consideration of the Conceptual Site Model.



**GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE**

Report No : 16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No : 37 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 8.2 Measured Concentrations of Potential Contaminants of Concern Reported in Excess of the Laboratory Method Detection Limit

Contaminant of Concern	Exploratory Hole Location	Depth (m bgl)	Soil Population	Units	Measured Concentration	Comments
VOCs/SVOCs						
1,3,4-Trimethylbenzene	BH-P2-104	1.10-1.30	MG1	mg/kg	0.008	An assessment has been made of VOCs/SVOCs for which there are publicly available GACs. Comparison of reported measured concentrations of 2-methylnaphthalene, 1,3,4-Trimethylbenzene, and dibenzofuran are all below residential and industrial RSL and/or appropriate Dutch Intervention values.
2-Methylnaphthalene	BH-P2-105	1.70-2.00	MG1	mg/kg	0.124	
	TP-P2-104	0.80	MG2	mg/kg	0.057	
Carbazole	BH-P2-104	1.10-1.30	MG1	mg/kg	0.062	Preliminary research has indicated that for carbazole, Texas PCLs are the only up-to-date numerical soil criteria published for carbazole as a discrete analyte. No other national scheme now carries carbazole values. Most agencies streamlined their tables to the 16-PAH set or rely on indicator compounds (BaP), and heterocyclic PAHs such as carbazole were removed. The maximum reported carbazole concentration of 0.317mg/kg is below the Texas residential PCL value of 230 mg/kg. On the basis of the above and the discussion included within our report, it is not considered that the measured concentrations of potential contaminants of concern reported (for which there are no UK-based publicly available GACs) represent a potential risk to the proposed end-users. In addition, given the absence of viable indoor air due to the nature of the proposed development, there is not considered to be a viable vapour inhalation pathway.
	BH-P2-105	1.70-2.00	MG1	mg/kg	0.317	
	TP-P2-104	0.80	MG2	mg/kg	0.084	
Dibenzofuran	BH-P2-104	1.10-1.30	MG1	mg/kg	0.111	
	BH-P2-105	1.70-2.00	MG1	mg/kg	0.279	
	TP-P2-104	0.80	MG2	mg/kg	0.073	
	BH-P2-104	1.10-1.30	MG1	mg/kg	0.11	



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 38 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Asbestos

Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g. asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments and / or fibres are present in the soil at the site. The asbestos assessment commenced on site with inspection of the Made Ground by our suitably qualified supervising engineer for the presence of bulk ACMs.

During the fieldwork no suspected ACMs were identified.

Of the 20 No. of Made Ground samples submitted for asbestos screening, 5 No. were reported to contain asbestos. Those positive identifications are summarised in Table 8.3, below.

Table 8.3 Summary of Asbestos Assessment

Exploratory Hole Location	Depth (m bgl)	Location on Site Description	Soil Population	Asbestos Type	Quantification (% w/w)
Asbestos in Soil Samples					
WS-P2-106	0.70-1.00	East/North	MG1	Chrysotile fibre bundles	<0.001%
BH-P2-105	1.70-2.00	East/Central	MG1	Chrysotile and amosite fibre bundles	<0.001%
WS-P2-104	1.00-1.50	East/Central	MG1	Chrysotile and amosite fibre bundles	<0.001%
WS-P2-102	0.50-1.00	West	MG1	Chrysotile fibre bundles	<0.001%
WS-P2-110	0.30-0.50	East/North	MG1	Chrysotile fibre bundles	<0.001%

Whilst asbestos has been reported during the ground investigation works, the measured concentrations have been reported <0.001% w/w i.e. at 'trace' levels which are unlikely to trigger requirements during earthworks / construction works in accordance Control of Asbestos Regulations 2012. However, in the event that previously unidentified asbestos is identified during future earthworks / construction works at concentrations above 0.001% w/w (i.e. above 'trace' levels), the Control of Asbestos Regulations 2012 should be adhered to. A summary of complying with CAR: risk assessments, licensing and training is therefore provided in Appendix M.

8.5. Utilities

It is recommended that the results of the chemical testing and details of the proposed remedial works are provided to the appropriate utility companies to determine the necessity for service protection.

8.6. Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g., HSE, 1991; CIRIA, 1996).

On the basis of the results obtained, the following potential exposure risks to construction and maintenance workers have been highlighted:



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No :	39 of 56
Engineer:	Stuart Milne
Date:	21/05/2025

- Chrysotile and amosite asbestos fibre bundles within Made Ground soils.

Whilst asbestos has been reported during the ground investigation works, the measured concentrations have been reported <0.001% w/w i.e. at 'trace' levels which are unlikely to trigger requirements during earthworks / construction works in accordance Control of Asbestos Regulations 2012. However, in the event that previously unidentified asbestos is identified during future earthworks / construction works at concentrations above 0.001% w/w (i.e. above 'trace' levels), the Control of Asbestos Regulations 2012 should be adhered to. A summary of complying with CAR: risk assessments, licensing and training is therefore provided in Appendix M.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 40 of 56
Engineer: Stuart Milne
Date: 21/05/2025

9. CONTROLLED WATERS RISK ASSESSMENT

9.1. Introduction

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, samples of soil leachate have been submitted for laboratory chemical analysis as per the summary presented in Table 5.4 within this report. Analytical data from soil leachate sample testing undertaken by Tier Environmental have been evaluated against Water Quality Standard (WQS) values appropriate to the Conceptual Site Model.

In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the WQS values that are relevant to the site and a judgment has been made against the most stringent of those relevant standards. Further details are provided, along with the approach for selection of TPH / BTEX WQS values, in Appendix I.

In some instances, the laboratory method detection limit is greater than the appropriate WQS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to potentially represent a possible significant risk to controlled waters.

9.2. Controlled Waters Environment Conceptual Site Model Summary

Superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Pennine Lower Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is an artificial lake within a park circa 100m east of the site though this not considered to be in hydraulic conductivity with local groundwater, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate.

9.3. Soil Leachate Testing

Table 9.1 below summarises the measured concentrations of contaminants of concern from soil leachate samples at the site that have been reported in excess of the respective WQS values.

Table 9.1 Summary of Measured Concentrations of Soil Leachate Potential Contaminants of Concern in Excess of WQS Values

Potential Contaminant of Concern	Units	LoD*	WQS	Maximum concentration	No. samples >WQS	Exploratory Hole Location	Depth (m bgl)	Soil Population
Nickel	µg/l	<2	4	8	1 of 2	SA-P2-101	0.80	MG1
Iron	µg/l	<20	1	100	2 of 2	SA-P2-101	0.80	MG1 and MG4
Anthracene	µg/l	<0.005	0.1	0.294	2 of 2	SA-P2-101	0.80	MG1
Fluoranthene	µg/l	<0.005	0.0063	1.61	2 of 2	SA-P2-101	0.80	MG1 and MG4
Benzo(a)pyrene	µg/l	<0.005	0.00017	0.824	2 of 2	SA-P2-101	0.80	MG1 and MG4

* LOD= Laboratory Method Limit of Detection

Measured leachable concentrations of nickel, iron and anthracene have been reported only *marginally* in excess of the WQS protective of the controlled waters environment by the same order of magnitude or up to 1 order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the historical commercial / industrial heritage of the wider area surrounding the site, the absence of a continuous groundwater body beneath the site, the Low/Moderate sensitivity of the controlled waters environment as



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No :	41 of 56
Engineer:	Stuart Milne
Date:	21/05/2025

described in Section 9.2 above, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations and the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the exceedances are not considered to pose a risks to controlled waters.

Measured soil leachate concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective WQS protective of the controlled waters environment by between 2 No. orders of magnitude and 3 No. orders of magnitude. Further specific consideration of the reported soil leachate concentrations of fluoranthene and benzo(a)pyrene concentrations have been made.

The EQS values for fluoranthene and benzo(a)pyrene are derived assuming bioaccumulation in fish and ultimately consumption of the fish by humans which is an exposure scenario that is not viable for this site given the absence of a nearby viable surface water body where this will scenario be realised.

Subsequent sensitivity analysis has demonstrated that measured soil leachate concentrations of fluoranthene and / or benzo(a)pyrene have been reported only *marginally* in excess of the respective Maximum Allowable Concentrations (MAC) EQS values for Inland Surface Waters by the same order of magnitude / by up to one order of magnitude. As such, and in the absence of viable 'bioaccumulation in fish and consumption of fish by humans' scenario and given the reasonings outline above, it is therefore considered that the reported soil leachate concentrations of fluoranthene and benzo(a)pyrene are unlikely to present a potential risk to the controlled waters environment.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No :	16012-TRE-BRY-XXX-RP-EN- 000004 REV.P02
Page No :	42 of 56
Engineer:	Stuart Milne
Date:	21/05/2025

10. REVISED CONCEPTUAL SITE MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES

The preliminary combined conceptual site model and conceptual exposure model, developed from the desk study information and presented in Section 0, has been revised in light of the ground investigation and the chemical analysis results presented above in Table 10.1, below.

A revised qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 43 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 10.1 Revised Assessment of Potential Pollutant Linkages (Continued on Next Page).

Justification / Comments
- The site is underlain by Made Ground of either a gravelly Clay or clayey sandy Gravel to depths of typically between 1.25m and 2.00m bgl though locally up to 5.70m bgl in BH-P2-104 in the eastern walkway, and some shallower horizons in the south east of the site to between 0.27m and 0.40m bgl. Natural soils of Till overlying bedrock of the Lower Pennine Coal Measures was recorded where depth was achieved through the Made Ground and predominantly comprised very high strength Clays. In-situ testing broadly recoded refusal values of SPT N of >50. - No measured soil concentrations of potential contaminants of concern have been reported in excess of Generic Assessment Criteria (GACs) protective of human health appropriate to the proposed land use. On this basis, it is not considered that the site represents a potential risk to end-users. - Of the 20 No. of Made Ground samples submitted for asbestos screening, 5 No. were reported to contain asbestos in the form of chrysotile and locally amosite fibre bundles, returned with quantification of <0.001% w/w suggesting trace level of asbestos. - Superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Pennine Lower Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is an artificial lake within a park circa 100m east of the site, in land east of Market Street, though this not considered to be in hydraulic conductivity with local groundwater, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate. - Measured leachable concentrations of nickel, iron and anthracene have been reported only marginally in excess of the WQS protective of the controlled waters environment by the same order of magnitude or up to 1 order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the historical commercial / industrial heritage of the wider area surrounding the site, the absence of a continuous groundwater body beneath the site, the Low/Moderate sensitivity of the controlled waters environment, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations and the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the exceedances are not considered to pose a risks to controlled waters. - Measured soil leachate concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective WQS protective of the controlled waters environment by between 2 No. orders of magnitude and 3 No. orders of magnitude. Subsequent sensitivity analysis has demonstrated that measured soil leachate concentrations of fluoranthene and / or benzo(a)pyrene have been reported only marginally in excess of the respective Maximum Allowable Concentrations (MAC) EQS values for Inland Surface Waters by the same order of magnitude / by up to one order of magnitude. As such, and in the absence of viable 'bioaccumulation in fish and consumption of fish by humans' scenario and given the reasonings outline above, it is therefore considered that the reported soil leachate concentrations of fluoranthene and benzo(a)pyrene are unlikely to present a potential risk to the controlled waters environment. - Given the nature of the proposed development and the absence of any proposed enclosed spaces, ground gas protection measures are not required for this proposed element of the development. - Basic radon protection measures are not currently required for the proposed development on this site.



GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 44 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
Asbestos fibre bundles in Made Ground	Asbestos (Chrysotile and amosite)	(Dust migration and) dust inhalation	Future site users (Public Open Space – Park)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (Public Open Space – Park)	Medium	Unlikely	Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix G.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 45 of 56
Engineer: Stuart Milne
Date: 21/05/2025

11. PRELIMINARY WASTE MATERIALS CLASSIFICATION AND WASTE DISPOSAL ROUTE DETERMINATION

11.1. Introduction

If the site is to be redeveloped and materials are disposed off site, the material exported from the site to Landfill should be hauled by a register waste carrier in accordance with Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005.

There will be requirement for the waste producer to provide appropriate Waste Acceptance Criteria (WAC) testing of the Soils for disposal to ensure that the soils are appropriately classified and that the landfill is licensed to receive such soils. Mixing of hazardous and non-hazardous waste is not permitted. For any hazardous wastes, a consignment note shall be completed, signed, and retained by all parties involved. The consignment note shall state the volume of waste, a physical description of the material and statement of its chemical composition. The waste consignment notes shall be kept by the contractor for a period of at least two years. For non-hazardous wastes, a Waste Transfer Note (WTN) shall be completed. The WTN should be signed and a copies should be kept by the contractor for a period of at least two years. Finally, consignment notes and WTNs shall be shown to an enforcement officer from the local council or the Environment Agency, if asked.

Approach to Assessing Hazard Properties

Flammability and Oxidisability

For any samples flagged as possessing hazardous properties flammability and oxidisability, for which there are no thresholds, Tier Environmental has used professional judgment and on-site observations to decide whether the waste soil, as a whole, is likely to be flammable or oxidising. It should be noted that flammability/oxidisability alone are unlikely to result in a hazardous classification for waste soil.

Worst Case Metal Compounds

The choice of an appropriate worst case metal compound in soil has been made on the basis of the available lines of evidence. For example, if laboratory chemical analysis has demonstrated that no measured concentrations of hexavalent chromium have been reported in excess of the laboratory method detection limit, there it would be regarded as evidence of an absence of a soil source of hexavalent chromium. In such an instance, the worst case metal chromates may be replaced in favour of the next worst case metal compound.

pH

For samples that have been determined as hazardous based on pH alone and cement/concrete has been identified in the sample, Tier Environmental may assume that the high pH was due to the crushing process in the laboratory and is not representative of the waste as a whole. If further detailed determination of this is required then Tier Environmental recommend that such assessment is carried out on these results in a manner described in the AGS Waste Classification for Soils – A Practitioners' Guide (dated 2019):

- Consideration of the acid/alkali reserve to be conducted (as described in WM3 Appendix C4 and C8).
- If large enough, the cement/concrete fraction may be separated manually before testing. Waste concrete from construction and demolition which doesn't contain hazardous substances is non-hazardous (LoW code 17-01-01).
- If cement/concrete has been identified in the sample, a second analysis may be conducted on an 'as received' sample, avoiding the need for crushing before testing. The high pH is typically associated with the finer fractions of cement. If the 'as received' sample has an



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 46 of 56
Engineer: Stuart Milne
Date: 21/05/2025

acceptable pH, this provides additional confidence that the high pH was due to the crushing process and is not representative of the waste as a whole.

Asbestos

With respect to asbestos, If the waste contains fibres that are free and dispersed then the waste will be hazardous if the waste as a whole contains 0.1% w/w or more asbestos in accordance with WM3. If the waste contains any identifiable pieces of suspected asbestos containing material (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then these pieces must be assessed separately. The waste is hazardous if the concentration of asbestos in the piece of asbestos containing material is 0.1% w/w or more. The waste shall then be regarded as a mixed waste and classified accordingly.

The following codes will then be assigned to the asbestos waste as appropriate:

- 17 06 05* Construction material containing asbestos.
- 17 06 01* Insulation material containing asbestos.

17 06 05* would normally be used in preference to 17 06 01* for the asbestos in asbestos contaminated soil and stones in accordance with WM3.

Tier Environmental Geoenvironmental engineers hold up to date UKATA Asbestos Awareness training certificates in order to demonstrate 'competence' that is required as described in WM3.

Flammable Liquid Waste

Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As such, in those instances where materials are classified as hazardous based on this alone and no free phase product is encountered, it is considered that the materials may be regarded as being non-hazardous. Please note that the table below includes a column to show whether free phase product has been encountered within the sample location.

11.2. Preliminary Waste Materials Classification and Waste Disposal Route Determination

Tier Environmental have assessed the chemical results in terms of basic waste characterisation of materials on site. This provides a preliminary assessment of whether a material is potentially non-hazardous or hazardous waste. In addition, Waste Acceptance Criteria (WAC) testing has been carried out on selected samples with a determination made as to the appropriate waste disposal route in each case.

The results of this preliminary assessment are summarised in the following table.

Natural Soils / Bedrock

Representative samples of natural soils have not been obtained during the investigation.

It is likely that any natural soils (that are not impacted by any known contamination from shallow Made Ground, or unexpected contamination) would be suitable for disposal to an inert waste landfill. It is recommended that the landfill is approached to confirm this position prior to off-site disposal. Otherwise, additional testing will be required to confirm the waste disposal route for natural soils beneath the site.



GROUND INVESTIGATION REPORT FOR BURY
INTERCHANGE – PYRAMID PARK AND UNION
SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 47 of 56
Engineer: Stuart Milne
Date: 21/05/2025

Table 11.1 Preliminary Materials Waste Classification and Waste Disposal Route Determination

Exploratory Hole Location	Sample Depth (m bgl)	Simplified Description of the Sample	Basic Waste Characterisation Result	If 'Potentially Hazardous': Is it Possible to Demonstrate the Material is Non-Hazardous?	If the material is Hazardous – What is the Driver for Hazardous Waste Classification?	Asbestos Presence, Type and Quantification	WAC Sample Available?	Soil Waste Disposal Route Determination
WS-P2-106	0.70-1.00	Made Ground: Dark brown slightly sandy gravelly Clay.	Non-Hazardous	N/A	N/A	<0.001% w/w chrysotile fibre bundles	Yes	Non-hazardous landfill due to TOC and Sum PAHs in excess of inert landfill threshold.
BH-P2-105	1.70-2.00	Made Ground: Dark greyish brown gravelly Clay.	'Potentially hazardous' but can be downgraded to non-hazardous (see next column for details).	Yes. Driven by 'HP 3(i): Flammable "flammable liquid waste"' (hazard statement: Flam. Liq. 3; H226 "Flammable liquid and vapour."). However, Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As no free phase product was encountered, it is considered that the materials above may be regarded as being non-hazardous .	N/A	<0.001% w/w chrysotile and amosite fibre bundles	Yes	Non-hazardous landfill due to TOC in excess of inert landfill threshold.
SA-P2-101	0.80	Made Ground: Black compacted gravelly Sand (asphalt layer)	Hazardous	N/A	Iron (III) oxide	None detected	Yes	WAC testing indicates that the materials would need to be treated prior to acceptance to a hazardous waste landfill due to elevated TOC and loss on ignition that exceeds the hazardous waste landfill threshold.
TP-P2-104	0.80	Made Ground: Dark greyish brown sandy gravelly Clay.	'Potentially hazardous' but can be downgraded to non-hazardous (see next column for details).	Yes. Driven by 'HP 3(i): Flammable "flammable liquid waste"' (hazard statement: Flam. Liq. 3; H226 "Flammable liquid and vapour."). However, Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As no free phase product was encountered, it is considered that the materials above may be regarded as being non-hazardous .	N/A	None detected	Yes	Non-hazardous landfill due to TOC in excess of inert landfill threshold.
TP-P2-106	0.10	Made Ground: Dark brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	Yes	Suitable for disposal as inert waste
TP-P2-101	0.30	Made Ground: Dark brown silty gravelly Sand.	Non-Hazardous	N/A	N/A	None detected	Yes	Non-hazardous landfill due to Sum PAHs in excess of inert landfill threshold.
WS-P2-101	0.45-0.60	Made Ground: Dark grey clayey sandy Gravel.	Non-Hazardous	N/A	N/A	None detected	Yes	Suitable for disposal as inert waste
BH-P2-104	1.10-1.30	Made Ground: Dark greyish brown sandy gravelly Clay.	'Potentially hazardous' but can be downgraded to non-hazardous (see next column for details).	Yes. Driven by 'HP 3(i): Flammable "flammable liquid waste"' (hazard statement: Flam. Liq. 3; H226 "Flammable liquid and vapour."). However, Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As no free phase product was encountered, it is considered that the materials above may be regarded as being non-hazardous .	N/A	None detected	Yes	Suitable for disposal as inert waste
BH-P2-104	3.20-3.50	Made Ground: Greyish brown sandy Clay.	Non-Hazardous	N/A	N/A	None detected	No	No WAC sample obtained.

Table 11.2 Preliminary Asphalt Materials Waste Classification

Exploratory Hole Location	Sample Depth (m bgl)	Is the sample Representative of 'Black Top' (Road Surface) Waste?	Coal Tar Concentration (%)	Concentration of Benzo(a)pyrene	Benzo(a)pyrene Units (µg/kg or mg/kg)	Does the Reported Concentration of Benzo(a)pyrene exceed 50ppm (50mg/kg)	If Coal Tar Concentration Greater Than, or Equal To, 0.1%: Is Concentration of Benzo(a)pyrene less than 0.005% of the Concentration of the Coal Tar?	Asphalt Waste Classification
WS-P2-111	0.0-0.15	Yes	<0.1	234	µg/kg	No	No	The coal tar concentration is <0.1% and the benzo(a)pyrene concentration is <50 ppm (mg/kg), therefore the asphalt would be classed as NON-HAZARDOUS WASTE in accordance with WM3. The non-hazardous EWC code 17 03 02 (bituminous mixtures other than those mentioned in 17 03 01), therefore applies.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 48 of 56
Engineer: Stuart Milne
Date: 21/05/2025

11.3. Materials Re-Use

Subject to volumetric fill requirements and a future assessment of suitability of re-use (both chemically and geotechnically), some materials may be considered for potential re-use in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). Please note that any previously landfilled or mining waste materials may not be appropriately subject to consideration under DoWCoP and may not be re-used under DoWCoP unless sufficient lines of evidence and agreement with the local Environment Agency Waste Team can be sought beforehand.

Re-Use of Excavated and Stockpiled Clean Naturally Occurring Soils on Other Sites

In addition, Tier Environmental are aware that CL:AIRE is classing stockpiled clean, naturally occurring soils as waste, unless their final destination is identified in a Materials Management Plan, before they are excavated. However, Tier Environmental consider that any clean naturally occurring soils arising from enabling works, earthworks or construction activities would be regarded as an asset and the default assumption for this site (prior to excavation and stockpiling) is not the intention to discard these materials where they may be reasonably re-used on this, or another, development site. Stockpiling is a recognised, recommended means of safely storing soils. Whilst there may be advantages to leaving soils in-situ, stripping topsoil and subsoil prior to earthworks is a routine construction activity. Tier Environmental consider that it is not unreasonable to state that in the event that the developer owns another site where the construction phase is ongoing, soils can be transferred between their sites as an owned product and never become waste.

The above paragraph above is therefore considered a clear intention to reuse any clean, naturally occurring soils derived from excavations at this site (which may also include temporary stockpiling these materials). It is considered; however, that in addition to this the following must be adhered to:

- Reuse does need to occur within a 'reasonable' timeframe (12 No. months); and,
- If soils are transferred to a third party (another developer), there needs to be some contractual agreement in place, as in this situation it is important to have something in place confirming that surplus soils are required by the third party.

Re-Use of Excavated and Stockpiled Clean Naturally Occurring Soils Within The Site They Are Excavated From

Further to the above, where soils are naturally occurring, uncontaminated and re-used on the site they are excavated from, they fall outside of the Waste Framework Directive (WFD) i.e. they will not be classified as a waste. Currently the CL:AIRE Definition of Waste Code of Practice states the following which appears to support this position: *"If the material is waste an Environmental Permit will be required to lawfully deposit or re-use it unless the material is "uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated", which is excluded from waste regulation by the Waste Framework Directive (2008)."*



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 49 of 56
Engineer: Stuart Milne
Date: 21/05/2025

12.CONCLUSIONS AND RECOMMENDATIONS

12.1. Conclusions

- The site is underlain by Made Ground of either a gravelly Clay or clayey sandy Gravel to depths of typically between 1.25m and 2.00m bgl though locally up to 5.70m bgl in BH-P2-104 in the eastern walkway, and some shallower horizons in the south east of the site to between 0.27m and 0.40m bgl. Natural soils of Till overlying bedrock of the Lower Pennine Coal Measures was recorded where depth was achieved through the Made Ground and predominantly comprised very high strength Clays. In-situ testing broadly recoded refusal values of SPT N of >50.
- Given the encountered ground conditions within locally deep Made Ground, and the nature of the proposed development, the most likely foundation solution would be pads within natural soils though at present site levels this would be at depths of >2.00m bgl. A micro piled solution could also be considered. Foundation design should be refined based on any proposed site level changes inclusive of remove of the pyramid mounds.
- It is considered that a Design Sulphate Class of DS-2 and ACEC Class AC-2 is appropriate for buried concrete design purposes within Made Ground and natural soils,
- No measured soil concentrations of potential contaminants of concern have been reported in excess of Generic Assessment Criteria (GACs) protective of human health appropriate to the proposed land use. On this basis , it is not considered that the site represents a potential risk to end-users.
- Of the 20 No. of Made Ground samples submitted for asbestos screening, 5 No. were reported to contain asbestos in the form of chrysotile and locally amosite fibre bundles, returned with quantification of <0.001% w/w suggesting trace level of asbestos.
- Superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Pennine Lower Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is an artificial lake within a park circa 100m east of the site, in land east of Market Street, though this not considered to be in hydraulic conductivity with local groundwater, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate.
- Measured leachable concentrations of nickel, iron and anthracene have been reported only marginally in excess of the WQS protective of the controlled waters environment by the same order of magnitude or up to 1 order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the historical commercial / industrial heritage of the wider area surrounding the site, the absence of a continuous groundwater body beneath the site, the Low/Moderate sensitivity of the controlled waters environment, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations and the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the exceedances are not considered to pose a risks to controlled waters.
- Measured soil leachate concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective WQS protective of the controlled waters environment by between 2 No. orders of magnitude and 3 No. orders of magnitude. Subsequent sensitivity analysis has demonstrated that measured soil leachate concentrations of fluoranthene and / or benzo(a)pyrene have been reported only marginally in excess of the respective Maximum Allowable Concentrations (MAC) EQS values for Inland Surface Waters by the same order of magnitude / by up to one order of magnitude. As such, and in the absence of viable 'bioaccumulation in fish and consumption of fish by humans' scenario and given the reasonings outline above, it is therefore considered that the reported soil leachate concentrations of fluoranthene and benzo(a)pyrene are unlikely to present a potential risk to the controlled waters environment.
- Given the nature of the proposed development and the absence of any proposed enclosed spaces, ground gas protection measures are not required for this proposed element of the development.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 50 of 56
Engineer: Stuart Milne
Date: 21/05/2025

- Basic radon protection measures are not currently required for the proposed development on this site.
- Basic waste characterisation has determined that Made Ground soils are non-hazardous aside from the sample at SA-P2-10 at 0.80m bgl, in Made Ground of black compacted gravelly Sand (asphalt layer) which is hazardous for Iron (III) oxide.
- The results of WAC tests have confirmed that:
 - WS-P2-106 at 0.70-1.00m bgl would be suitable for disposal to a non-hazardous landfill due to TOC and Sum PAHs in excess of inert landfill threshold, and asbestos at <0.001% w/w.
 - BH-P2-105 at 1.70-2.00m bgl would be suitable for disposal to a non-hazardous landfill due to TOC in excess of inert landfill threshold, and asbestos at <0.001% w/w.
 - SA-P2-101 at 0.80m bgl would need to be treated prior to acceptance to a hazardous waste landfill due to elevated TOC and loss on ignition that exceeds the hazardous waste landfill threshold.
 - TP-P2-104 at 0.80m bgl would be suitable for disposal to a non-hazardous landfill due to TOC in excess of inert landfill threshold.
 - TP-P2-101 at 0.30m bgl would be suitable for disposal to a non-hazardous landfill due to Sum PAHs in excess of inert landfill threshold.
 - TP-P2-106 at 0.10m bgl, WS-P2-101 at 0.45-0.60m bgl would be suitable for disposal as inert waste.

12.2. Recommendations

- Completion of an Asbestos DQRA to determine suitability for re-use of low-level asbestos impacted soils within the development.
- Intrusive works across the wider site area should be undertaken and should adhere to the Site Investigation Scope produced by Renaissance (Dated October 2024) presented in drawing BURY-REN-XX-XX-SK-S-01000-P03 and 01001-P03.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No :	51 of 56
Engineer:	Stuart Milne
Date:	21/05/2025

13.REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval prior to undertaking any works on site.

It is recommended that conditions placed on any planning permission are discharged prior to commencement of site works.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No :	16012-TRE-BRY-XXX-RP-EN-000004 REV.P02
Page No :	52 of 56
Engineer:	Stuart Milne
Date:	21/05/2025

14. REFERENCES

- BRE BR211 (2015). Radon: Guidance on Protective Measures for New Dwellings. IHS BRE Press, Bracknell.
- BRE SD1 (2005). Concrete in Aggressive Ground. Special Digest 1 (revised edition). IHS BRE Press, Bracknell.
- BRE 414 (2001) Protective measures for housing on gas-contaminated land. BRE.
- BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites - Code of Practice. British Standards Institution, London.
- BS EN 1997-1:2004 Eurocode 7. Geotechnical Design. General Rules. British Standards Institution, London.
- BS EN 1997-2:2007 Eurocode 7. Geotechnical Design. Ground Investigation and Testing. British Standards Institution, London.
- BS5930:2015+A12020 Code of practice for ground investigations BSI
- BS EN ISO 17892-1-12:2018 Geotechnical investigation and testing BSI
- BS EN ISO 14688-1:2018 Geotechnical Investigation and Testing. Identification and Classification of Soil. Identification and Description. British Standards Institution, London.
- BS EN ISO 14688-2:2018 Geotechnical Investigation and Testing. Identification and Classification of Soil. Principles for a Classification. British Standards Institution, London.
- BS EN ISO 14689-1:2018 Geotechnical Investigation and Testing. Identification and Classification of Rock. Identification and Description. British Standards Institution, London.
- BS8485 2015 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases in new buildings. British Standards
- BS85762013 Guidance on investigations for ground gas – permanent gases and volatile organic compounds (VOCs). BSI,
- CIRIA Rep R 97 (2001) Trenching Practice. Report 097, 2nd edition, CIRIA, London.
- CIRIA Rep R 149 (1995a) Protecting Development from Methane. Report 149, CIRIA, London.
- CIRIA Rep R 150 (1995b) Methane Investigation Strategies. Report 150, CIRIA, London.
- CIRIA Rep R 151 (1995c) Interpreting Measurement of Gas in the Ground Report 151, CIRIA, London.
- CIRIA Rep R 152 (1995d) Risk Assessment for Methane and Other Gases from the Ground. Report 152, CIRIA, London.
- CIRIA Rep R 132 (1996) A Guide for Safe Working on Contaminated Sites. Report 132, CIRIA, London.
- CIRIA C552 (2001) Contaminated land risk assessment. A guide to good practice (report no. C552).
- CIRIA C665 (2007) Assessing the risks posed by hazardous gases to buildings CIRIA, London



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 53 of 56
Engineer: Stuart Milne
Date: 21/05/2025

CIRIA C748 (2014) Guidance on the use of plastic membranes as VOC barriers, CIRIA, London

CIRIA C735 (2014) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases. CIRIA.

CIRIA C681 (2009) Unexploded ordnance (UXO) A guide for the construction industry (C681)

CIRIA C785 (2019) Unexploded ordnance (UXO) risk management guide for land-based projects (C785)

CIRIA C758D (2019) Abandoned mine workings manual (C758D)

Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Code of Practice (version 2).

Department of Environment Food and Rural Affairs (DEFRA) (2012) Environmental Protection Act 1990:Part 2A Contaminated Land Statutory Guidance (report no. PB13735).

Environment Agency (2000) Technical Aspects of Site Investigation. Report P5-065/TR, Environment Agency, Bristol.

Environment Agency (2002) Guidance on Monitoring Landfill Leachate, Groundwater and Surface Water. Report LFTGN02, Environment Agency, Bristol.

Environment Agency (2007) Evaluation of Models for Predicting Plant Uptake of Chemicals from Soil. Report SC050021/SR, Environment Agency, Bristol.

Environment Agency (2006) Remedial Targets Methodology - Hydrogeological Risk Assessment for Land Contamination (report no.ea/br/e/std/vr10thanni).

Environment Agency (2008) Science Report SC050021/SR7 Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values.

Environment agency, 2007. Inter-laboratory comparison of in vitro bioaccessibility measurements for arsenic lead and nickel in soil, Science Report SC040060/SR2.

Environment Agency, 2009 Human health toxicological assessment of contaminants in soil (Science Report Final SC050021/SR2)

Environment Agency (2015) Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (1st edition).European Union (1998) Drinking Water Directive (Council Directive 98/83/EC).

Gibbons, R. (1994) Statistical Methods for Groundwater Monitoring. Wiley, New York.

Groundsure Report 2021 GSIP-2021-10752-4061

Highways Agency (2006) Design of Pavement Foundations. Document HD 25/IAN 73/06.

HSE (1991) Protection of Workers and the General Public During the Development of Contaminated Land. HMSO, London.

HSE (2005) Occupational Exposure Limits. HSE report EH40/2005, HMSO, London.



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 54 of 56
Engineer: Stuart Milne
Date: 21/05/2025

ICRCL (1986) Notes on the Fire Hazards of Contaminated Land. Guidance Note 61/84, 2nd Edition, Interdepartmental Committee on the Redevelopment of Contaminated Land, London.

Jeffries, J. (2009). A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA). Project SC050021/ Technical Review 1. Bristol: Environment Agency

Land Contamination Risk Management (LCRM) Environment Agency October 2020 <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm> .

LQM/CIEH Ltd (2015) S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.

NHBC (2007) Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present (report no .04).

NRA (1994) Protocol for a Leaching Test to Assess the Leaching Potential for Soils from Contaminated Sites. R&D Note 181.

SoBRA (2017) Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater – Version 1.0.

The Water Framework Directive, (Standards and Classification) Directions (England and Wales).

UK Water Industry Research (2010) Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (report no. 10/WM/03/21)

WHO (2000) Air Quality Guidelines for Europe. 2nd edition, WHO Regional Office for Europe, Copenhagen.

World Health Organisation (2017) Guidelines for Drinking Water Quality (4th edition).

Britain From Above - <https://britainfromabove.org.uk/en/image/WPW060399>

<http://www.warstateandsociety.com/Bombing-Britain>

<https://www.epa.gov/pfas/basic-information-pfas>

UK Maps of Radon, <http://www.ukradon.org/information/ukmaps>

Health and Safety Executive (2015) Construction (Design and Management) Regulations.

Coal Authority Interactive Map Viewer, <http://mapapps2.bgs.ac.uk/coalauthority/home.html>

BGS Geology of Britain Viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>



GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 55 of 56
Engineer: Stuart Milne
Date: 21/05/2025

15.GLOSSARY OF TERMS

ACEC	Aggressive Chemical Environment for Concrete (classification)
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
Designated location	Site (and the ecosystem on that site) protected under national or international legislation. A potential ecological receptor to be considered as part of the assessment of land contamination. Example designated locations include SSSIs (q.v.), SACs (q.v.), national nature reserves, Ramsar sites and bird special protection areas.
DQA	Data Quality Assessment
DQO	Data Quality Objective
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
K _{ow}	Octanol-water partition coefficient
LEL	Lower Explosive Limit
LL	Liquid Limit
LoD	Limit of Detection (analytical)
LoQ	Limit of Quantification (analytical)
Mean Value Test	Statistical test (described in the CIEH Guidance) to estimate the mean value of a normally distributed population of data at a given level of confidence. Normally for contaminated land assessment, the 95th percentile (referred to as the 95%UCL or US95) is applied as a reasonable but conservative estimate of the mean concentration for comparison with the relevant assessment criteria.
Maximum Value Test	Statistical test (described in the CIEH Guidance) to identify whether an elevated concentration within a normally distributed data set forms part of the underlying population from which it has been sampled or whether it is an outlier (such as a localised area of contamination) that merits further consideration.
MC	Moisture Content
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
PI	Plasticity Index
PID	Photoionisation Detector
PL	Plastic Limit
ppm	Parts per million
ppmv	Parts per million by volume
QA	Quality Assurance
QC	Quality Control
SAC	Special Area of Conservation
SOM	Soil Organic Matter

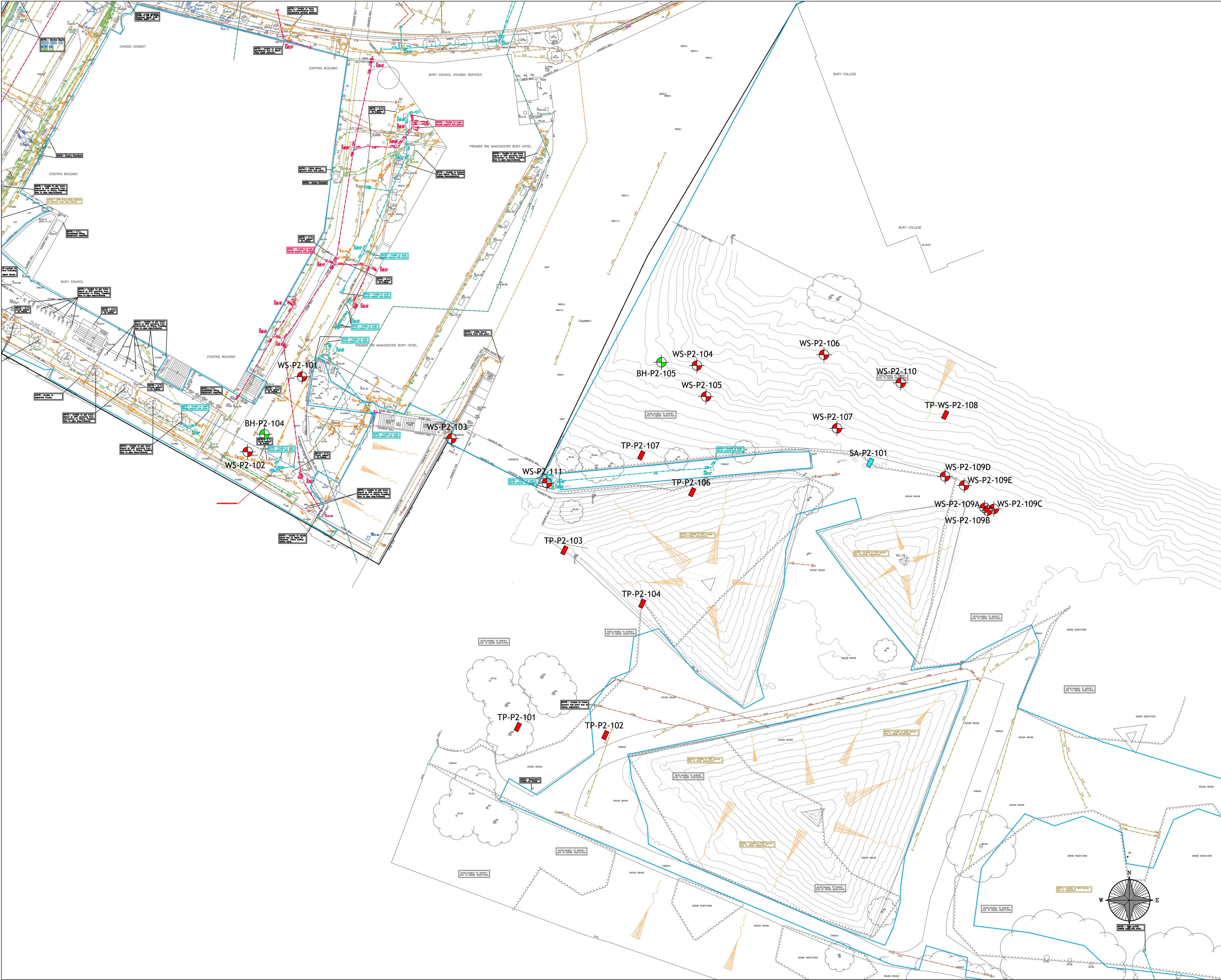


GROUND INVESTIGATION REPORT FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

Report No : 16012-TRE-BRY-XXX-RP-EN-
000004 REV.P02
Page No : 56 of 56
Engineer: Stuart Milne
Date: 21/05/2025

SPT	Standard Penetration Test
SPZ	Source Protection Zone (see Appendix I)
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95 th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX A - DRAWINGS



DO NOT SCALE

NOTES

CABLE PERCUSSIVE BORE HOLE WITH ROTARY FOLLOW ON TO DEFINE ROCK QUALITY

WINDOW SAMPLE

TRIAL PITS TO ESTABLISH NATURE OF FOUNDATIONS OF RETAINED STRUCTURES

SOAKAWAY LOCATION

P1	25.03.2025	CS	ISSUED FOR INFORMATION	AR	AR
REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS: INFORMATION

Tier Environmental Ltd.
Unit 5 Office Village
Sandpiper Court
Chester Business Park
Chester | CH4 9QZ
t: 01925 818 388

CLIENT:
WILLMOTT DIXON CONSTRUCTION

PROJECT:
BURY INTERCHANGE

TITLE:
PROPOSED EXPLORATORY HOLE LOCATION PLAN

SCALE: 1:1000	CHECKED: AR	APPROVED: AR
CAD FILE: -	DESIGN/DRAWN: CS	DATE: 25.03.2025

PROJECT No: TE1885	DRAWING No: TE1885-TE-00-XX-DR-GE-006-V02	REV: p2
--------------------	---	---------

APPENDIX B - EXPLORATORY HOLE LOGS



Rotary Core Log

Borehole No.

BH-P2-104

Sheet 1 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description							
				TCR	SCR	RQD											
		0.50 - 0.80	ES				0.20	92.24		MADE GROUND: Orangish brown PAVING MADE GROUND	1 -						
							0.45	91.99		MADE GROUND: Light grey CONCRETE, rebar at 0.45m crossing south west to north east and south east to north west - 2 layers MADE GROUND							
		0.80	D				0.90	91.54		MADE GROUND: Dark grey, slightly clayey, very sandy GRAVEL with moderate cobble content. Sand is fine to coarse, gravel is fine to coarse, subangular to angular of sandstone, brick and concrete. Cobble is of sandstone and brick. MADE GROUND							
										MADE GROUND: Very stiff, dark greyish brown, slightly sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of sandstone, mudstone, brick and concrete. MADE GROUND							
		1.10 - 1.30 1.20 1.20 - 1.55	ES SPTL S D				2.20	90.24		MADE GROUND: Greyish brown, clayey GRAVEL. Gravel is angular to subangular, fine to coarse of mudstone, brick and concrete. MADE GROUND	2 -						
		2.30 2.30 - 2.60 2.30 - 2.60	SPTL S B ES														
		3.20 3.20 - 3.50 3.20 - 3.65	SPTL S ES D									3.10	89.34	MADE GROUND: Stiff, locally firm greyish brown, very slightly sandy CLAY. Gravel is subangular to subrounded, fine to coarse of mudstone, brick and other lithologies. Sand is medium to coarse. Occasional black staining and vegetation throughout. MADE GROUND	3 -		
		4.50 4.50 - 4.95	SPTL S D								4 -						

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Rotary Core Log

Borehole No.

BH-P2-104

Sheet 2 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		5.50 5.50 - 5.70 5.50 - 5.95	SPTL S ES D				5.70	86.74		Firm to stiff, dark greyish brown, gravelly, silty CLAY. Gravel is subrounded to subangular, fine to medium of quartz, sandstone and coal TILL	6
		7.00 7.00 - 7.45	SPTL S D								7
		7.50 - 7.80	B								8
		8.40 - 8.85	U								
		8.90	D								9
		9.30 9.30 - 9.60	SPTL S D				9.30	83.14			
		Continued on next sheet									

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Rotary Core Log

Borehole No.

BH-P2-104

Sheet 3 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		11.00 11.00 - 11.45	SPTL S D								11
		11.50 - 11.80	B								12
		12.40 12.40 - 12.55	SPTL S D								
		13.00 13.00 - 13.15 13.00 - 13.40	SPTL S D ES				13.00	79.44		Very dense, light brown, clayey GRAVEL with moderate cobble content. Gravel is subrounded to subangular, fine to coarse of sandstone. Cobble is subangular of sandstone.	13
		13.70 - 14.00 13.70 - 14.00	D ES				13.70	78.74		Stiff, becoming very stiff, dark grey, gravelly CLAY. Gravel is subangular, medium to coarse of mudstone.	14
		14.10 14.10 - 14.40	SPTL S D								15
Continued on next sheet											

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Rotary Core Log

Borehole No.

BH-P2-104

Sheet 4 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		15.10 15.10 - 15.30	SPTL S D				15.20 15.35	77.24 77.09		Dark grey MUDSTONE	16
		15.50 - 15.60	C							Very weathered, thinly laminated, dark grey, very fine grained MUDSTONE with rare plant fossils. Discontinuities are subhorizontal to subvertical, extremely close to very closely spaced, undulating smooth, planar smooth to planar rough, extremely weak wall strength. Tight to partly open and clean.	
		15.50 - 17.00		100	65	63	16.20	76.24		Very weak, thinly laminated dark grey, very fine grained MUDSTONE. Discontinuities are subhorizontal to subvertical, extremely close to closely spaced, stepped smooth, planar smooth to undulating smooth. Weak wall strength. Tight to partly open and clean	17
		17.00 - 18.50		100	85	79				Very weak, thinly cross laminated, dark grey, very fine grained MUDSTONE. Discontinuities are subhorizontal to subvertical, very closely to medium spaced, undulating rough and planar rough, very weak wall strength. Tight to slightly open and clean.	
		18.70 - 18.80	C				18.35	74.09		Extremely weak, thinly laminated, dark grey, very fine grained MUDSTONE. Discontinuities are subhorizontal, very closely to medium spaced. Undulating rough and planar rough. Extremely weak wall strength. Tight to moderately wide and	19
		19.00	D							Continued on next sheet	
		18.50 - 20.00		100	60	68	19.60	72.84		Continued on next sheet	20
										Continued on next sheet	
										Continued on next sheet	
										Continued on next sheet	

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Rotary Core Log

Borehole No.

BH-P2-104

Sheet 5 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		20.00 - 21.40		100	70	64	21.40	71.04		infilled with clay.	21
		22.10 21.40 - 23.00	D	100	49	16				Extremely weak, thinly laminated, light grey MUDSTONE. Subrounded to subrounded, close to medium spaced, undulating rough, planar smooth, extremely weak wall strength, tight to partially open and clean.	22
		22.50 - 22.60	C				22.80	69.64		Weak, thinly laminated, dark grey MUDSTONE. Subrounded to subvertical, very close to close spacing, undulating rough, planar smooth, weak wall strength, tight and clean.	23
							23.00	69.44		Extremely weak, thinly laminated, light grey MUDSTONE. Subrounded to subvertical, very close to close spacing. Undulating rough, planar smooth, very weak wall strength, tight to partially open and clean.	
		23.00 - 24.50		80	68	21	24.20	68.24		Weak, thinly laminated, dark grey MUDSTONE. Subrounded to subvertical, very close to close spacing, undulating rough, planar smooth, weak wall strength, tight and clean.	24
Continued on next sheet											25

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Rotary Core Log

Borehole No.
BH-P2-104

Sheet 6 of 6

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380328.46 - 410382.07	Hole Type CP+RC
Location: Manchester		Level: 92.44	Scale 1:25
Client: Willmott Dixon		Dates: 01/04/2025 -	Logged By JL + AM

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		25.20 - 25.30	C								
		24.50 - 25.70		60	42	12					
		25.70	D				25.50 25.70	66.94 66.74		Extremely weak, thinly laminated, light grey MUDSTONE. Subrounded to subvertical, very close to close spacing. Undulating rough, planar smooth, very weak wall strength, tight to partially open and clean. End of borehole at 25.70 m	26 27 28 29 30

Remarks
1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.







Borehole Log

Borehole No.
BH-P2-104

Sheet 2 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		5.50 5.50 5.50 - 5.70 5.50 - 5.95	SPTL S ES D	N=24 (4,5/5,6,6,7)	5.70	86.74		Firm to stiff, dark greyish brown, gravelly, silty CLAY. Gravel is subrounded to subangular, fine to medium of quartz, sandstone and coal TILL	6
		7.00 7.00 7.00 - 7.45	SPTL S D	N=31 (5,5/7,7,8,9)				Stiff, light brown, mottled orange, sandy CLAY. Sand is fine to medium. Gravel is angular to subangular, fine to coarse of sandstone. TILL	7
		7.50 - 7.80	B						8
		8.40 - 8.85	U						9
		8.90	D						9
		9.30 9.30 9.30 - 9.60	SPTL S D	50 (10,13/50 for 125mm)	9.30	83.14		Stiff, light brown, mottled orange, sandy CLAY. Sand is fine to medium. Gravel is angular to subangular, fine to coarse of sandstone. TILL	10

Continued on next sheet

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-104

Sheet 3 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		11.00 11.00	SPTL S	N=47 (6,8/8,10,17,12)	13.00	79.44			11					
		11.00 - 11.45	D											
		11.50 - 11.80	B											
		12.40 12.40	SPTL S	50 (25 for 70mm/50 for 85mm)										
		12.40 - 12.55	D											
		13.00 13.00	SPTL S	50 (25 for 105mm/50 for 90mm)				Very dense, light brown, clayey GRAVEL with moderate cobble content. Gravel is subrounded to subangular, fine to coarse of sandstone. Cobble is subangular of sandstone.						
		13.00 - 13.15 13.00 - 13.40	D ES											
		13.70 - 14.00 13.70 - 14.00	D ES	50 (5,5/50 for 180mm)				Stiff, becoming very stiff, dark grey, gravelly CLAY. Gravel is subangular, medium to coarse of mudstone.						
		14.10 14.10	SPTL S											
		14.10 - 14.40	D											
					</									

Continued on next sheet

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-104

Sheet 4 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

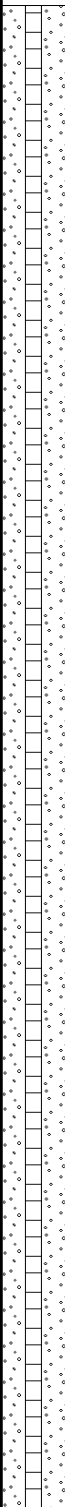
Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		15.10	SPTL	50 (35 for 115mm/50 for 85mm)	15.20	77.24		Dark grey MUDSTONE	16
		15.10							
		15.10 - 15.30	D		15.35	77.09		Very weathered, thinly laminated, dark grey, very fine grained MUDSTONE with rare plant fossils. Discontinuities are subhorizontal to subvertical, extremely close to very closely spaced, undulating smooth, planar smooth to planar rough, extremely weak wall strength. Tight to partly open and clean.	16
		15.50 - 15.60	C						
					16.20	76.24		Very weak, thinly laminated dark grey, very fine grained MUDSTONE. Discontinuities are subhorizontal to subvertical, extremely close to closely spaced, stepped smooth, planar smooth to undulating smooth. Weak wall strength. Tight to partly open and clean	17
								Very weak, thinly cross laminated, dark grey, very fine grained MUDSTONE. Discontinuities are subhorizontal to subvertical, very closely to medium spaced, undulating rough and planar rough, very weak wall strength. Tight to slightly open and clean.	18
		18.70 - 18.80	C		18.35	74.09			
								Extremely weak, thinly laminated, dark grey, very fine grained MUDSTONE. Discontinuities are subhorizontal, very closely to medium spaced. Undulating rough and planar rough. Extremely weak wall strength. Tight to moderately wide and	19
		19.00	D						
					19.60	72.84			20

Continued on next sheet

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-104

Sheet 5 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								infilled with clay.	21
		22.10	D		21.40	71.04		Extremely weak, thinly laminated, light grey MUDSTONE. Subrounded to subrounded, close to medium spaced, undulating rough, planar smooth, extremely weak wall strength, tight to partially open and clean.	22
		22.50 - 22.60	C						
					22.80	69.64		Weak, thinly laminated, dark grey MUDSTONE. Subrounded to subvertical, very close to close spacing, undulating rough, planar smooth, weak wall strength, tight and clean.	23
					23.00	69.44		Extremely weak, thinly laminated, light grey MUDSTONE. Subrounded to subvertical, very close to close spacing. Undulating rough, planar smooth, very weak wall strength, tight to partially open and clean.	
					24.20	68.24		Weak, thinly laminated, dark grey MUDSTONE. Subrounded to subvertical, very close to close spacing, undulating rough, planar smooth, weak wall strength, tight and clean.	24
								Continued on next sheet	25

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-104

Sheet 6 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380328.46 - 410382.07

Hole Type
CP+RC

Location: Manchester

Level: 92.44

Scale
1:25

Client: Willmott Dixon

Dates: 01/04/2025 -

Logged By
JL + AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		25.20 - 25.30	C						
		25.70	D		25.50 25.70	66.94 66.74			
								Extremely weak, thinly laminated, light grey MUDSTONE. Subrounded to subvertical, very close to close spacing. Undulating rough, planar smooth, very weak wall strength, tight to partially open and clean. End of borehole at 25.70 m	26 27 28 29 30

Remarks

1) Groundwater ingress encountered at 13.00m bgl rose to ground level overnight 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-105

Sheet 1 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380400.32 - 410395.10

Hole Type
WS

Location: Manchester

Level: 88.10

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D	N=10 (1,2/2,2,3,3)	0.40	87.70		MADE GROUND: Dark greyish brown, slightly gravelly, slightly clayey SAND. Gravel is subangular to subrounded, fine to medium of brick and mudstone and other mixed lithologies. MADE GROUND	1
		1.00	D					MADE GROUND: Firm, dark greyish brown, gravelly CLAY. Gravel is fine to coarse, angular to subangular of brick, mudstone and mixed lithologies. MADE GROUND	
		1.20	SPTL						
		1.20	S						
		1.70 - 2.00	B	N=24 (4,5/5,6,6,7)	2.10	86.00		turning stiff at 1.60m	2
		1.70 - 2.00	ES						
		2.10	SPTL					MADE GROUND: Medium dense, light orangish brown, clayey, slightly sandy GRAVEL. Gravel is fine to coarse, angular to subangular of brick and mixed lithologies. MADE GROUND	
		2.10 - 2.55	S						
		2.40 - 2.80	ES						
		3.00 - 3.05	U	N=50 (8,10/50 for 245mm)	2.90	85.20		Stiff, dark brown, gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone.	3
		3.70	D					turning very stiff at 3.60m	
		3.70 - 4.00	B						
		4.20	SPTL					Very dense, dark greyish brown, clayey GRAVEL. Gravel is angular to subangular, fine to coarse of mudstone.	
		4.20 - 4.60	S		4.10	84.00			4
		4.60 - 4.90	B						
		Continued on next sheet							5

Remarks

1) Groundwater ingress encountered at 9.50m rising to 8.50m after 20mins and 7.50m no rise. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-105

Sheet 2 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380400.32 - 410395.10

Hole Type
WS

Location: Manchester

Level: 88.10

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		5.20 5.20 - 5.60	SPTL S	50 (7,8/50 for 220mm)					6
		6.50 6.50 - 6.90 6.90 - 7.20	SPTL S B	N=50 (6,9/50 for 275mm)	6.50	81.60		Very stiff, greyish brown, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.	7
		8.10 8.10 - 8.50 8.50 - 8.70	SPTL S B	50 (8,11/50 for 220mm)				turning light grey at 7.80m	8
		8.70 8.70 - 8.90	SPTL S	24 (51 for 115mm/24 for 85mm)				Turning stiff at 8.70m	9
		9.60 9.80 - 9.95	SPTL S	12 (63 for 145mm/12 for 10mm)	9.50	78.60		Very weak, thinly laminated, dark grey MUDSTONE. Discontinuities are subhorizontal to subvertical, very closely to closely spaced, planar smooth, undulating smooth, very weak wall strength, partly open to open, tight infilling with clay. Weathered to a clay along	10
								Continued on next sheet	

Remarks

1) Groundwater ingress encountered at 9.50m rising to 8.50m after 20mins and 7.50m no rise. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.

BH-P2-105

Sheet 3 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380400.32 - 410395.10

Hole Type
WS

Location: Manchester

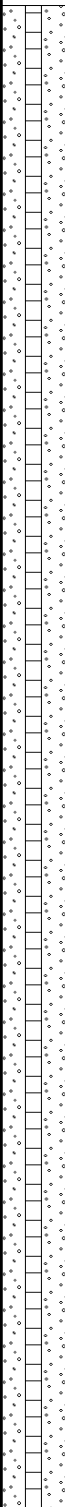
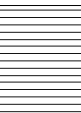
Level: 88.10

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.10 10.10	B	50 (25 for 50mm/50 for 50mm)	10.40	77.69		discontinuity, plane up to 5mm penetration	
		10.10 - 10.20	SPTL S					Very weak, thinly laminated grey MUDSTONE. Discontinuities are subhorizontal to subvertical, closely spaced, planar smooth, undulation rough, weak wall strength, partial open infilled with clay.	
		10.70 - 10.80	C		11.00	77.10		Very weak, thinly laminated, light grey MUDSTONE. Discontinuities are subhorizontal to subvertical, closely to medium spaced planar smooth, undulating rough, very weak wall strength, partially open and clean.	11
		11.10 - 11.20	C		11.30	76.80		Very weak, thinly laminated, light grey MUDSTONE. Discontinuities are subhorizontal to subvertical, very closely spaced, planar smooth, undulating rough, very weak wall strength, partial open and clean.	12
		11.50 - 11.80	U						
		12.10 - 12.20	C						13
					12.80	75.30		Extremely weak, thinly laminated grey MUDSTONE. Discontinuities are subhorizontal to subvertical, very closely, planar rough, undulating rough. Extremely weak strength, partial open and clean.	
		13.10 - 13.25	C						14
		14.20 - 14.30	C		14.30	73.80		Extremely weak, thinly laminated, light grey MUDSTONE. Discontinuities are subhorizontal to subvertical. Extremely close, planar smooth, undulating rough, very weak wall strength, partially open and clean.	15
		14.90 - 15.00	C						

Continued on next sheet

Remarks

1) Groundwater ingress encountered at 9.50m rising to 8.50m after 20mins and 7.50m no rise. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-105
Sheet 4 of 6
Hole Type
WS
Scale
1:25
Logged By
JL

Project Name: Bury Interchange

Project No.
TE1885

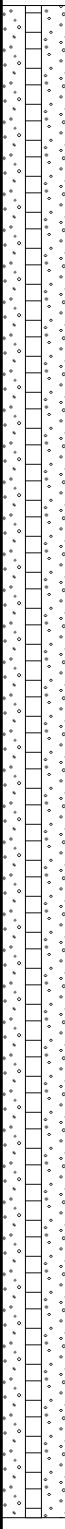
Co-ords: 380400.32 - 410395.10

Location: Manchester

Level: 88.10

Client: Willmott Dixon

Dates: 27/03/2025 -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		15.50 - 15.75	C		15.80	72.30		Very weak, thinly laminated grey MUDSTONE. Discontinuities are subhorizontal to subvertical, extremely close, planar rough, undulating smooth, weak wall strength, partially open infilled with clay.	16
		17.50 - 17.60	C		17.30	70.80		Very weak, thinly laminated, light grey MUDSTONE. Discontinuities are subhorizontal to subvertical, very close, planar rough to undulating smooth, weak wall strength partially open and clean.	17
		17.90 - 18.10	U						18
		18.60	D		18.50	69.60		Extremely weak, thinly laminated, dark greyish black COAL. Discontinuities are subhorizontal, very close, planar rough to undulating smooth, very weak wall strength. Partially open and clean.	19
					18.80	69.30		Very weak, thinly laminated, light grey MUDSTOE. Discontinuities are subhorizontal to subvertical, very close, planar smooth to undulating smooth, weak wall strength, partially open and clean.	
		19.40 - 19.50	C						20
					20.00	68.10		Continued on next sheet	

Remarks

1) Groundwater ingress encountered at 9.50m rising to 8.50m after 20mins and 7.50m no rise. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-105
Sheet 5 of 6
Hole Type
WS
Scale
1:25
Logged By
JL

Project Name: Bury Interchange
Project No. TE1885
Co-ords: 380400.32 - 410395.10
Location: Manchester
Level: 88.10
Client: Willmott Dixon
Dates: 27/03/2025 -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		20.30	D		20.30	67.80		Hard grey MUDSTONE and siltstone with fractures.	
								Hard grey SANDSTONE	
									21
									22
									23
									24
									25

Remarks
1) Groundwater ingress encountered at 9.50m rising to 8.50m after 20mins and 7.50m no rise. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
BH-P2-105

Sheet 6 of 6

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380400.32 - 410395.10

Hole Type
WS

Location: Manchester

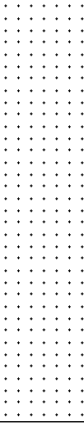
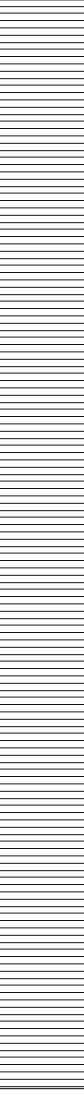
Level: 88.10

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					26.40	61.70			26
								Hard grey fractured MUDSTONE	27
									28
									29
					30.00	58.10		End of borehole at 30.00 m	30

Remarks
1) Groundwater ingress encountered at 9.50m rising to 8.50m after 20mins and 7.50m no rise. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination.





Borehole Log

Borehole No.
SA-P2-101
Sheet 1 of 1
Hole Type
WS
Scale
1:25
Logged By
SE

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380438.29 - 410376.95

Location: Manchester

Level: 86.92

Client: Willmott Dixon

Dates: 27/03/2025 -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.12	86.80		MADE GROUND: Grass over brown, slightly clayey, slightly gravelly SAND. Gravel is fine to coarse, angular to subrounded of brick and sandstone. Black terrain layer at base.	1
								MADE GROUND	
		0.80	ES		0.75	86.17		MADE GROUND: Dark brown, sandy, gravelly CLAY with low to medium cobble content of subangular to subrounded, brick, sandstone, quartzite and concrete. Gravel is fine to coarse, angular to subrounded of brick, concrete, sandstone and occasional mudstone and timber.	
								MADE GROUND	
								Slight organic odour around 0.60m bgl associated with timber.	
								MADE GROUND: Black, compacted friable, gravelly SAND (weathered asphalt layer). Gravel is fine to medium, angular to subangular of asphalt and occasional limestone. Slight hydrocarbon odour.	
		1.35	ES		1.30	85.62		MADE GROUND	2
								MADE GROUND: Sandy, slightly ashy, gravelly of fine to coarse, subangular to subrounded of mixed lithologies including sandstone, quartzite, occasional brick and slag.	
		1.55	ES		1.50	85.42		MADE GROUND	
					1.65	85.27		MADE GROUND	
								Wet around 1.40m to 1.50m bgl	
								MADE GROUND: Stiff / friable, orangish brown, sandy, slightly gravelly CLAY. Gravel is fine to coarse, subangular of brick, limestone, sandstone, quartzite and rare cobbles of brick	3
					2.30	84.62		MADE GROUND	
								Stiff / friable orangish brown, mottled yellowish brown, sandy, gravelly CLAY. Gravel is fine to medium, subangular of sandstone.	4
								End of borehole at 2.30 m	
									5

Remarks

1) Groundwater ingress encountered as seepage from 1.40m to 1.50m bgl 2) Terminated at max reach of excavator in stiff material 3) Hydrocarbon odour between 0.75m to 1.30m. Organic odour associated with timber at 0.60m. 4) Backfilled with gravel.





Trial Pit Log

Trialpit No
TP-P2-101
Sheet 1 of 1

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380374.33 - 410329.04 Level: 88.06	Date 01/04/2025
Location: Manchester	Dimensions (m): Depth 1.00		Scale 1:25
Client: Willmott Dixon			Logged JL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30 0.40 - 1.00	ES B		0.40	87.66		MADE GROUND: Dark brown, slightly silty, gravelly SAND. Sand is fine to medium, gravel is subrounded to rounded, fine to coarse of mudstone, brick and plastic. Moderate organic content. Turning light brown at 0.40m MADE GROUND	
	0.70	ES					MADE GROUND: Light brown, sandy GRAVEL. Sand is fine to medium. Gravel is subrounded to subangular, fine to coarse of mudstone, brick and other lithologies. MADE GROUND	
				1.00	87.06		End of pit at 1.00 m	1
								2
								3
								4
								5

Remarks: 1) No groundwater ingress encountered 2) Terminated due to hard digging 3) Backfilled with arisings in approximate order of excavation.

Stability: Stable





Trial Pit Log

Trialpit No
TP-P2-102
Sheet 1 of 1

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380390.22 - 410327.62 Level: 86.30	Date 27/03/2025
Location: Manchester	Dimensions (m): Depth 2.20		Scale 1:25
Client: Willmott Dixon			Logged SE

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					MADE GROUND: Grass over, dark brown, clayey, sandy GRAVEL of mixed lithologies including fine to coarse, angular to subrounded of brick, concrete, sandstone, rare plastic and occasional wiring. Black terrain at base. MADE GROUND	
	0.60 0.60	B ES		0.55	85.75		MADE GROUND: Dark brownish black, slightly clayey, sandy GRAVEL of fine to coarse, angular to subangular mixed lithologies including brick, sandstone, concrete, quartzite and occasional ash/slag. MADE GROUND	
	1.10 1.10	B ES	HVR=150 HVR=130 HVR=150 HVR=150	1.00	85.30		Stiff, dark greyish brown, slightly sandy, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of sandstone and quartzite. Occasional cobbles of sandstone from 1.00m bgl. TILL	1
				2.20	84.10		End of pit at 2.20 m	2
								3
								4
								5

Remarks: 1) No groundwater ingress encountered 2) Terminated due to slow progress in stiff clay 3) Occasional ash / slag in MG 0.55m to 1.00m bgl 4) Backfilled with arisings in approximate order of excavation.

Stability: Stable





Trial Pit Log

Trialpit No
TP-P2-103
Sheet 1 of 1

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380382.74 - 410361.09 Level: 88.33	Date 01/04/2025
Location: Manchester		Dimensions (m): Depth 1.10	Scale 1:25
Client: Willmott Dixon			Logged JL

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES					MADE GROUND: Light brown, slightly silty, gravelly SAND. Sand is fine to medium, gravel is subangular to subrounded, fine to coarse concrete, brick, mudstone and plastic. MADE GROUND	
	0.50 - 1.10	B		0.50	87.83		MADE GROUND: Light greyish brown, sandy GRAVEL. Sand is fine to medium, gravel is fine to coarse, subangular to subrounded of brick, concrete, mudstone and other lithologies. MADE GROUND	1
	0.90	ES		1.10	87.23		End of pit at 1.10 m	2
								3
								4
								5

Remarks: 1) No groundwater ingress encountered 2) Terminated due to hard digging 3) Backfilled with arisings in approximate order of excavation.

Stability:





Trial Pit Log

Trialpit No
TP-P2-104
Sheet 1 of 1

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380396.85 - 410351.37 Level: 86.99	Date 27/03/2025
Location: Manchester	Dimensions (m): Depth 2.30		Scale 1:25
Client: Willmott Dixon			Logged JL + AM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES					MADE GROUND: Grass over dark brown, sandy, slightly gravelly CLAY. Gravel is fine to coarse, angular to subrounded of brick, sandstone and quartzite. Frequent roots and rootlets. MADE GROUND	
	0.80 0.80	B ES		0.70	86.29		MADE GROUND: Dark greyish brown, sandy, gravelly CLAY. Gravel is fine to coarse, angular to subrounded of brick, sandstone and rare glass. MADE GROUND	1
				1.60	85.39		<u>Brick wall and concrete paving slabs at 1.40m to 1.60m</u> Firm to stiff, dark grey, slightly sandy, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite. TILL	2
			HVR=150 HVR=130	2.30	84.69		<u>Occasional cobbles of sandstone from 2.00m</u> End of pit at 2.30 m	5

Remarks: 1) No groundwater ingress encountered 2) Terminated due to slow progress 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings in approximate order of excavation.

Stability: Stable





Trial Pit Log

Trialpit No
TP-P2-106
Sheet 1 of 1

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380405.92 - 410371.66 Level: 85.24	Date 27/03/2025
Location: Manchester	Dimensions (m): Depth 1.50		Scale 1:25
Client: Willmott Dixon	0.8		Logged SE

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.27	84.96		MADE GROUND: Grass over dark brown, sandy, gravelly CLAY. Gravel is fine to medium, subangular to subrounded of brick, sandstone, quartzite and rare glass and metal. Occasional roots and rootlets. (TOPSOIL)
	0.70 0.70	B ES	HVR=88 HVR=106 HVR=72 HVR=104 HVR=150 HVR=146	1.50	83.74		MADE GROUND Firm, brownish grey CLAY with occasional subrounded cobbles of sandstone. TILL
							End of pit at 1.50 m

1
2
3
4
5

Remarks: 1) No groundwater ingress encountered 2) Terminated at max reach of excavator 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings in approximate order of excavation.

Stability: Stable





Trial Pit Log

Trialpit No
TP-P2-107
Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380396.74 - 410378.27
Level: 83.57

Date
26/03/2025

Location: Manchester

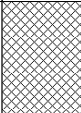
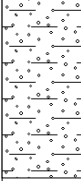
Dimensions (m):

Depth
1.00

Scale
1:25

Logged
AM

Client: Willmott Dixon

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.00 - 0.40	ES					MADE GROUND: Firm, dark grey, gravelly, silty CLAY with moderate cobble content. Gravel is fine to coarse, angular to subangular of brick, clinker, sandstone, mudstone and quartzite MADE GROUND	
	0.50 - 1.00 0.50 - 1.00	B ES		0.40 1.00	83.17 82.57		Orangish brown, slightly sandy, very clayey GRAVEL. Sand is fine to coarse, gravel is fine to coarse, subrounded of mudstone and sandstone. TILL	
							End of pit at 1.00 m	1
								2
								3
								4
								5

Remarks: 1) No groundwater ingress encountered 2) Terminated due to service 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings in approximate order of excavation.

Stability:

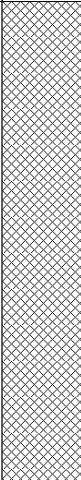
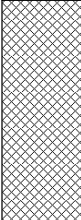
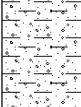




Trial Pit Log

Trialpit No
TP-P2-108
Sheet 1 of 1

Project Name: Bury Interchange	Project No. TE1885	Co-ords: 380451.71 - 410385.59 Level: 90.34	Date 27/03/2025
Location: Manchester	Dimensions (m): Depth 3.00 2.6 		Scale 1:25
Client: Willmott Dixon			Logged SE

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES					MADE GROUND: Dark brown, sandy, slightly gravelly CLAY. Gravel is fine to coarse, angular to subangular of brick and sandstone. Large boulder of brick at 0.40m bgl, occasional cobbles of sandstone below. Boulder of concrete in eastern pit wall between 1.20m to 1.60m bgl. MADE GROUND	1
	1.60	B		1.60	88.74		MADE GROUND: Firm / friable dark brown, mottled orangish brown, sandy, slightly gravelly CLAY. Gravel is fine to coarse, angular of brick and sandstone. Rare fabric and whole bricks. MADE GROUND	2
	2.40	ES		2.35	87.98		Damp, blackish dark grey, sandy SILT with slight organic odour. <i>Pocket of damp black sandy SILT / CLAY in south east corner at 2.40m</i>	
				2.60	87.74		Stiff, dark brownish grey, slightly sandy, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of sandstone and quartzite. Occasional cobbles of sandstone and quartzite. TILL	3
				3.00	87.34		End of pit at 3.00 m	5

Remarks: 1) No groundwater ingress encountered 2) Terminated due to slow progress in stiff clay 3) Slight organic odour between 2.35m to 2.60m bgl 4) Backfilled with arisings in approximate order of excavation.

Stability: Stable





Borehole Log

Borehole No.
WS-P2-101

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380335.29 - 410392.49

Hole Type
WS

Location: Manchester

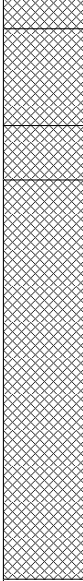
Level: 92.02

Scale
1:25

Client: Willmott Dixon

Dates: 28/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description					
		Depth (m)	Type	Results									
		0.45 - 0.60	ES		0.10	91.92		MADE GROUND: Orangish brown granite PAVING	1				
					MADE GROUND								
					MADE GROUND: Light grey CONCRETE. 10-15mm rebar								
					MADE GROUND								
		0.80 - 1.20	ES		0.42	91.60		MADE GROUND: Dark grey, clayey, sandy GRAVEL. Sand is fine to coarse, gravel is angular to subangular, fine to coarse of sandstone and limestone (subbase)					
					0.60	91.42		MADE GROUND					
					MADE GROUND: Stiff, greyish brown, very gravelly, slightly sandy, silty CLAY. Sand is medium to coarse, gravel is angular to subrounded, fine to coarse of brick, mudstone, coal and clinker.								
					MADE GROUND								
		1.20 1.20 1.20	D SPTL S	N=39 (3,3/3,6,9,21)									
		1.70 1.70 1.70	D SPTL S	24 (25,26/24 for 70mm)									
												End of borehole at 1.92 m	2
									3				
									4				
									5				

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.





Borehole Log

Borehole No.
WS-P2-102
Sheet 1 of 1
Hole Type
WS
Scale
1:25
Logged By
AM

Project Name: Bury Interchange
Project No. TE1885
Co-ords: 380325.43 - 410378.89
Location: Manchester
Level: 92.50
Client: Willmott Dixon
Dates: 28/03/2025 -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.50 - 1.00	ES		0.10	92.40		MADE GROUND: Orangish brown granite PAVING	1	
					0.43	92.07		MADE GROUND		
								MADE GROUND: Light grey CONCRETE. 10-15mm rebar		
		1.20	SPTL	50 (25 for 50mm/50 for 20mm)	1.28	91.22		MADE GROUND		
1.20	S	MADE GROUND: Stiff becoming very stiff, greyish brown, very gravelly, slightly sandy, silty CLAY. Sand is medium to coarse, gravel is angular to subrounded, fine to coarse of brick, mudstone, coal and clinker. Moderate cobble content of brick and concrete.								
		1.27	SPTL	50 (25 for 20mm/50 for 10mm)					2	
		1.27	S							
										3
									4	
									5	

Remarks
1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3)Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.





Borehole Log

Borehole No.
WS-P2-103

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380362.31 - 410381.31

Hole Type
WS

Location: Manchester

Level: 82.08

Scale
1:25

Client: Willmott Dixon

Dates: 28/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.55 - 1.00	ES		0.55	81.53		MADE GROUND: Light grey CONCRETE MADE GROUND	
		1.20 1.20 1.20	D SPTL S	N=11 (2,3/3,2,3,3)				MADE GROUND: Firm, orangish brown, slightly sandy, very gravelly CLAY. Sand is fine to coarse, gravel is fine to coarse, subangular to subrounded of mudstone, limestone, concrete and sandstone MADE GROUND	1
		2.00 2.00 2.00	D SPTL S	N=10 (2,3/3,2,2,3)					2
					2.95	79.13		End of borehole at 2.95 m	3
									4
									5

Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater ingress encountered at ground level flowing out at surface. 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with bentonite





Probe Log

Borehole No.
WS-P2-103 DP

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380362.31 - 410381.31

Hole Type
DP

Location: Manchester

Level: 82.08

Scale
1:25

Client: Willmott Dixon

Dates: 28/03/2025 -

Logged By

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
1					
2					
3	3 3 3 3 3 3 3 3 2 3 3 7 8 10 23				
4	17				
5					

Remarks
DP FOLLOW ON

Fall Height

Cone Base Diameter

Hammer Wt

Final Depth 3.90

Probe Type DPSH-B

Log Scale 1:25





Borehole Log

Borehole No.

WS-P2-104

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380406.74 - 410394.51

Hole Type
WS

Location: Manchester

Level: 88.10

Scale
1:25

Client: Willmott Dixon

Dates: 26/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	ES		0.20	87.90		MADE GROUND: Soft, dark brown, slightly gravelly, very sandy CLAY. Sand is fine to medium, gravel is medium to coarse, subangular of brick, glass, ceramic and quartzite MADE GROUND	1
		1.00 - 1.50	ES					MADE GROUND: Firm, dark grey, gravelly, silty CLAY with moderate cobble content. Gravel is fine to coarse, angular to subangular of brick, clinker, sandstone, mudstone and quartzite MADE GROUND	
		1.20	D						
		1.20	SPTL						
		1.20	S	8 (1,1/8 for 225mm)					
								Rare wood fragments between 1.50m and 1.80m	
		2.00	D						2
		2.00	SPTL						
		2.00	S	N=14 (4,4/5,3,3,3)	2.30	85.80		MADE GROUND: Medium dense, light orangish brown, clayey, sandy GRAVEL. Sand is medium to coarse. Gravel is fine to coarse, angular of brick. MADE GROUND	
		2.50 - 2.90	ES						
		3.00	D		2.90	85.20		Stiff, dark brown, gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of quartzite, sandstone and coal TILL	3
		3.00	SPTL						
		3.00	S	N=33 (5,6/7,7,9,10)					
		3.50	SPTL						
		3.50	S	50 (15 for 145mm/50 for 155mm)					
		3.50 - 3.90	D						
		3.50 - 3.90	ES		3.90	84.20			4
								End of borehole at 3.90 m	5

Remarks

1) Hand dug pit to 1.20m bgl 2) Water strike at 1.80m no rise after 20mins. 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.





Borehole Log

Borehole No.
WS-P2-105A

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380408.40 - 410388.90

Hole Type
WS

Location: Manchester

Level: 87.63

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.54	87.09		MADE GROUND: Soft, dark brown, slightly gravelly, very sandy CLAY. Sand is fine to medium, gravel is medium to coarse, subangular of brick, glass, ceramic and quartzite MADE GROUND	1
								MADE GROUND: Very dense, black, very sandy GRAVEL. Sand is fine to coarse, gravel is fine to medium, angular to subangular of coal, mudstone and clinker. MADE GROUND	
		1.20 1.20 1.20	D SPTL S	50 (25 for 20mm/50 for 30mm)	1.25	86.38		End of borehole at 1.25 m	
									2
									3
									4
									5

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.





Borehole Log

Borehole No.
WS-P2-105B

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: -

Hole Type
WS

Location: Manchester

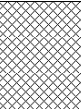
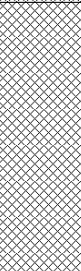
Level:

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.36			MADE GROUND: Soft, dark brown, slightly gravelly, very sandy CLAY. Sand is fine to medium, gravel is medium to coarse, subangular of brick, glass, ceramic and quartzite	1
								MADE GROUND MADE GROUND: Very dense, black, very sandy GRAVEL. Sand is fine to coarse, gravel is fine to medium, angular to subangular of coal, mudstone and clinker. MADE GROUND	
		1.20 1.20 1.20	D SPTL S	50 (25 for 30mm/50 for 20mm)	1.25				
								End of borehole at 1.25 m	2
									3
									4
									5

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.





Borehole Log

Borehole No.
WS-P2-105C

Sheet 1 of 1

Hole Type
WS

Scale
1:25

Logged By
AM

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: -

Location: Manchester

Level:

Client: Willmott Dixon

Dates: 27/03/2025 -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.30	ES	51 (10,18/51 for 225mm)	0.56			MADE GROUND: Soft, dark brown, slightly gravelly, very sandy CLAY. Sand is fine to medium, gravel is medium to coarse, subangular of brick, glass, ceramic and quartzite MADE GROUND	1
		0.50 - 0.70	ES					MADE GROUND: Very dense, black, very sandy GRAVEL. Sand is fine to coarse, gravel is fine to medium, angular to subangular of coal, mudstone and clinker. MADE GROUND	
		1.20 1.20 1.20	D SPTL S						
					1.55			End of borehole at 1.55 m	2
									3
									4
									5

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings 6) DP FOLLOW ON





Borehole Log

Borehole No.
WS-P2-106

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380429.74 - 410396.46

Hole Type
WS

Location: Manchester

Level: 90.61

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.30	ES					MADE GROUND: Firm, locally soft, dark brown, slightly sandy, very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of slag, clinker and glass. Cobble is of sandstone and brick. MADE GROUND	1
		0.70 - 1.00	ES						
		1.20 1.20 1.20	D SPTL S	N=10 (3,2/2,2,3,3)					
		1.70 - 2.00	ES		1.60	89.01		MADE GROUND: Stiff, dark grey, gravelly, silty CLAY. Gravel is fine to coarse, angular to subangular of limestone, brick, clinker and quartzite. Rare vegetation throughout. MADE GROUND	2
		2.00 2.00 2.00	D SPTL S	N=18 (2,2/4,5,4,5)					
		3.00 3.00 3.00	D SPTL S	N=50 (5,9/50 for 295mm)					3
					3.40	87.21		End of borehole at 3.40 m	4
									5

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Installed and backfilled





Borehole Log

Borehole No.

WS-P2-107

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380432.10 - 410383.15

Hole Type
WS

Location: Manchester

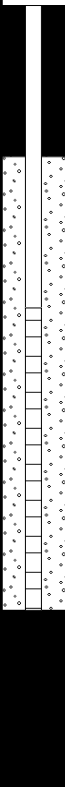
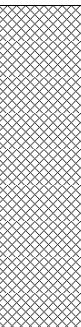
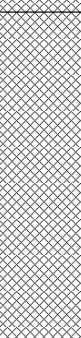
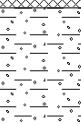
Level: 87.46

Scale
1:25

Client: Willmott Dixon

Dates: 27/03/2025 -

Logged By
AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 - 0.50	ES					MADE GROUND: Soft, dark brown, slightly gravelly, very sandy CLAY. Sand is fine to medium, gravel is medium to coarse, subangular of brick, glass, ceramic and quartzite MADE GROUND	1
		1.20 1.20 1.20	D SPTL S	N=50 (12,8/50 for 275mm)	1.10	86.36		MADE GROUND: Stiff, dark brown, slightly gravelly, very sandy CLAY with low cobble content. Sand is coarse. Gravel is fine to coarse, subangular to angular of sandstone, coal, brick and clinker. Cobble is of sandstone. MADE GROUND	2
		2.00 2.00 2.00 2.20 - 2.50	D SPTL S ES	N=16 (2,3/3,3,4,6)	2.20	85.26		Firm becoming stiff, dark brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, mudstone and coal. TILL	
		2.60 2.70	SPTL S	N=37 (6,8/9,9,9,10)	2.60	84.86		End of borehole at 2.60 m	3
									4
									5

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater ingress encountered 3) Terminated on refusal 4) No visual or olfactory evidence of contamination 5) Installed and backfilled





Probe Log

Borehole No.
WS-P2-107 DP

Sheet 1 of 1

Project Name: Bury Interchange

Project No.
TE1885

Co-ords: 380432.10 - 410383.15

Hole Type
DP

Location: Manchester

Level: 87.46

Scale
1:25

Client: Willmott Dixon

Dates: -

Logged By

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
1					
2					
3					
4	5	10	10	13	
				14	
				16	
		20			
5					

Remarks
DP FOLLOW ON

Fall Height

Cone Base Diameter

Hammer Wt

Final Depth 3.80

Probe Type DPSH-B

Log Scale 1:25

