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Cover Pages

Project	MMU Library Transformation Project
Subject	Use of MMU All Saints Library Transformation Project (previous project) planning documents
Project no	0065290
Date	5 September 2025

Revision	Description	Issued by	Date	Approved (signature)
01	For planning	TB	31/07/2025	PH
02	For planning – amended with comments from Deloitte	TB	08/08/2025	GM
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1 Desk study cover pages

1.1 Introduction

Buro Happold have been appointed by Manchester Metropolitan University (MMU) to provide technical planning support and advice for the proposed MMU Library Transformation Project. The site is located on the site existing All Saints Library, located in central Manchester on the All Sants Campus. The proposed development comprises demolition of a section of the existing building, as shown in Figure 1—1.

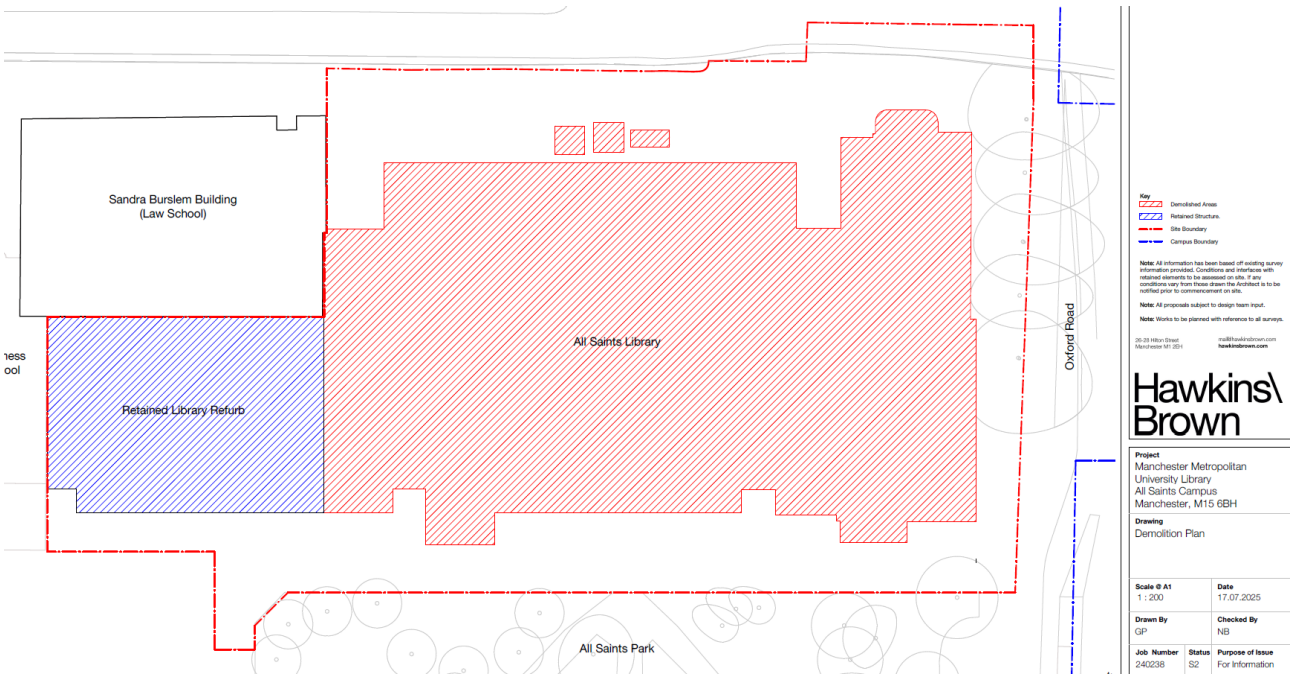


Figure 1—1 Demolition extent and development site boundary (extracted from 1350B-HBA-XX-01-DR-A-080103 (Rev. P04))

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1.2 Existing Project Reports

The following reports were undertaken as part of the original MMU Library Redevelopment project, with the Geoenvironmental Desk Study Report submitted as part of planning application 138424/FO/2023) approved on 16 February 2024. The approach for reliance on the reports submitted as part of the previous planning application was confirmed with Lisa Jones, Environmental Protection Officer for Manchester City Council on 14 July 2025.

- Buro Happold (BH). Geoenvironmental Desk Study Report. 1044B-BHE-XX-XX-RP-CG-000001. October 2023.
- Geotechnical Engineering Ltd. MMU, All Saints Library – Factual Ground Investigation Report. 37567. Dated November 2023.
- Geotechnical Engineering Ltd. Manchester Metropolitan University Library – Factual Ground Investigation Report. 37757. Dated December 2023.
- Buro Happold. Generic Quantitative Risk Assessment (GQRA). 1044B-BHE-XX-XX-RP-CG-0002. July 2024.
- A2 Site Investigation. MMU Factual Report. 51324-A2SI-XX-XX-RP-X-0001. Dated November 2024.

The desk study is proposed to be submitted as part of the planning application for this project for the following reasons:

- The desk study was completed in October 2023. The document is considered to be valid and suitable for use within the timeframes of acceptability for submission in this planning application for Manchester City Council.
- There have been no major changes to the site or the immediate vicinity since the desk study was completed, therefore:
    - The site history (Section 5.1) covers the demolition extent area and remains the same
    - The ground conditions (Section 4) and preliminary conceptual model (Section 6) beneath the site remain the same
    - The potential sources of contaminants (Section 6.3), receptors and pathways (Section 6.4) and risk assessment (Section 6.5) within the report remain the same.

A ground investigation was undertaken following recommendations in the desk study. The results are detailed within the GEL factual report (ref: 37567). The assessment of contamination was undertaken as part of the GQRA. The GQRA is also to be submitted as part of the planning application with the following evidence to support this:

- There has been no major changes to the site since the ground investigation and contamination assessment were undertaken.
- No elevated determinands above commercial thresholds were identified (Section 6.2).
- Owing to the ground conditions encountered and assessed risk based on the contamination assessment, the report recommends no formal Remediation Strategy is required. Earthworks activities shall be managed appropriately in line with good practice (Section 11.3) and in conjunction with the BH Earthworks Specification (1350B-BHE-XX-XX-SP-CG-000001).

1.3 Conclusions

The Geoenvironmental Desk Study, factual ground investigation reports and GQRA undertaken as part of the previous MMU Library redevelopment are suitable for submission within the planning application for the MMU Library Transformation Project. Therefore no further work is required to be undertaken for the demolition proposals to take place.

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Manchester Metropolitan University, All Saints Library Transformation Project

Geoenvironmental Desk Study Report

1044B-BHE-XX-XX-RP-CG-000001

053621

26 October 2023

Revision P04

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Revision	Description	Issued by	Date	Checked
P01	DRAFT – S2 For Information	LR	10/08/23	COH
P02	FINAL DRAFT – S2 For Information	LR	23/08/23	PH
P03	FINAL	PH	20/10/23	COH
P04	FINAL – new redline boundary	PH	26/10/23	COH

https://burohappold.sharepoint.com/sites/053621/05_Teams Files/Ground Engineering/Reports/Desk Study/1044B-BHE-XX-XX-RP-CG-000001 P04.docx

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author	**Pip Hunsworth**
date	**26th October 2023**
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date	**26th October 2023**

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1 Executive Summary

Objectives	The purpose of this Desk Study is to establish the environmental, geological, hydrological and hydrogeological conditions present at the Manchester Metropolitan University All Saints Library Transformation site that may result in potential contamination risks / ground related risks for existing and/or potential future uses. The overall aims of this report were (i) to inform the Client's understanding of potential ground-related risks associated with the proposed redevelopment and (ii) to provide evidence necessary to support the planning application.
Site Setting	The Site specifically relates to the proposed demolition of the eastern portion of the existing All Saints Library building (adjacent to footpath/Oxford Road) and build a new 12 No. storey building, and the refurbishment of the remaining building, plus a 2 No. storey rooftop extension located at the existing MMU All Saints Library, Manchester, M16 6BH, and is centred on the National Grid Reference (NGR) SJ 84225 97158. The site is approximately 400m south of Manchester Oxford Road Train Station. The site covers approximately 0.70 ha.
Geological Setting	It is anticipated that the site is underlain by a sequence of Made Ground, over Glacial Till in the northeast of the site, and Glaciofluvial deposits in the southwest of the site. Manchester Marls Formation and/or the Chester Pebble Beds Formations form the bedrock that underlies the Glacial deposits The BGS map indicates that the West Manchester Fault underlies the site and is downthrown to the northeast. It is considered that bedrock beneath the site is likely to be highly fractured.
History	The earliest maps for the site, record that the site has been developed since pre-1850's and has had various uses including a timber yard, depot and school. The site is presently occupied by the MMU All Saints Library, which was first recorded as a Manchester Polytechnic building in 1985.
Geoenvironmental Considerations	A number of potential sources of contamination in near surface ground have been identified relating to the previous / historic uses (Made Ground). Low/moderate risk were assessed to people (construction workers, future site users and off-site users) associated with this potential contamination. The initial risks associated with the possible presence of Unexploded Ordnance (UXO) were assessed as "Moderate". A detailed UXO risk assessment was commissioned by the Client and identifies the Site to be high-risk, with mitigation measures required to reduce the risk to as low as reasonably possible. It is recommended that prior to the commencement of development, data is obtained from a site-specific ground investigation and is assessed and presented in a report suitable for submission to the Local Planning Authority to address standard planning conditions. The report would include recommendations on the need for and scope of any further investigation (e.g. gap analysis) and / or more detailed risk assessment and / or requirements for remediation.
Geotechnical Considerations	Perched groundwater has been recorded within the Made Ground between 1.05-1.07m bgl (36.03-36.05 mAOD) in the vicinity of the site. Two groundwater levels have been identified on site. One within the Glaciofluvial deposits between 0.99-2.27m bgl (34.58-36.83 mAOD) and one within the Bedrock strata [CHESTER FORMATION/MANCHESTER MARL FORMATION] between 11.79-14.50 m bgl (24.15-26.12 mAOD). It is likely that groundwater will impact the proposed development, with possible water ingress into excavations due to perched groundwater conditions within the Made Ground. Localised sump pumping is considered sufficient to control such seepages. Any buried obstructions encountered during the demolition of the eastern portion of the building will need to be cropped down where they clash with new substructure. Utility plans should be obtained to understand where they are present onsite, and if any require re-routing.

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2 Introduction

2.1 General

This report presents the results of a Geotechnical and Geoenvironmental Desk Study for the Manchester Metropolitan University (MMU) All Saints Library (ASL) Transformation Project site prepared by Buro Happold on behalf of the Client. The purpose of this Study is to establish the environmental, geological, hydrological and hydrogeological conditions present at the site that may result in potential contamination risks for the proposed future use.

The site covers approximately 0.70 ha, M16 6BH, National Grid Reference (NGR) SJ 84225 97158. A summary of the existing site and immediate surrounding area is as below:

- Buildings associated with MMU;
- The Mancunian Way (elevated highway);
- Oxford Road;
- Commercial buildings; and
- All Saints' Park;

The approximate location of the site is shown below in Figure 2-1.



Figure 2-1: The MMU All Saints' Library site location plan. Image source www.streetmap.co.uk at 1:25,000 scale.

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2.2 Study Aims and Objectives

The overall aim of this study was to carry out a geoenvironmental and geotechnical assessment of the site in order to inform the Client's understanding of potential ground-related risks associated with the refurbishment of the existing building and proposed extension.

This report will provide information relevant to the redevelopment in accordance with the requirements of the National Planning Policy Framework (NPPF) [1]. The work was carried out in general accordance with the Model Procedures [2], the relevant British Standard [3], the Environment Agency Guiding Principles [4] and other current good practice guidance. The particular objectives were:

- To determine the historical and current use of the Site and its surroundings;
- To determine the nature of the ground conditions and the environmental sensitivity of the Site;
- To assess the potential location, nature and extent of any ground and groundwater contamination;
- To identify any geotechnical potential constraints;
- To assess the potential risks to people and the environment (natural and built) associated with ground contamination (solid, liquid or gas) both in the site's existing condition and for the proposed future use;
- To construct an initial Conceptual Site Model and carry out a preliminary contaminated land risk assessment, in general accordance with the EA/DEFRA Model Procedures [2];
- To prepare a report based upon all of the above suitable to inform the Client about potential risks related to ground conditions and also suitable to support a planning application in accordance with NPPF [1]
- To evaluate the potential need for and scope of any subsequent Site investigations and/or remedial action or design.

2.3 Information Sources

The principal sources of information for this desk study report include:

- Historical and current topographic maps,
- British Geological Survey (BGS) geological maps [5],
- BGS boreholes (Appendix B),
- Public register information,
- Groundsure report [6],
- Historic Ground Investigation reports, held by the client for sites in the immediate vicinity [7] [8].
- Information available from the Environment Agency website and other online sources.

This report is therefore based upon information obtained from third-party sources. The third-party data has been accepted as face value and has not been independently verified. Buro Happold can therefore give no warranty, representation or assurance as to the accuracy or completeness of such information.

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2.4 Competence

This work reported here was carried out by geoenvironmental scientists and engineers from Buro Happold. Buro Happold is a consulting engineering company that manages its work under various Quality Management Systems that are certified to ISO 9001. The work itself was carried out by the staff with relevant qualifications, training and experience. Technical elements of this report have been reviewed by a Chartered Geologist.

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3 Current land use and proposed development

3.1 Site Location

The site is located in the north of England in the city of Manchester, approximately 400 m south-southeast of Manchester Oxford Road Train Station and is centred on MMU All Saints Library, Manchester, M16 6BH, National Grid Reference (NGR) SJ 84225 97158. The site is relatively flat lying, with a gentle slope from 44 mAOD in the NE of the site to ~40.00mAOD in the SW of the site. The site comprises 0.70 ha occupied by the existing MMU All Saints Library and associated service yard, and a tree lined footpath. The site is bounded to the north by the elevated "Mancunian Way", Oxford Road to the east, All Saints Park to the south and MMU Business School to the west (refer to Figure 3-1).



Figure 3-1: Aerial Photograph of the site. and immediate surrounding area.

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3.2 Proposed development

At present, the proposal for development is to demolish the eastern portion of the existing All Saints Library building (adjacent to footpath/Oxford Road) and build a new 12 No. storey building, and the refurbishment of the remaining building (refer to Figure 3-2 and Figure 3-3).

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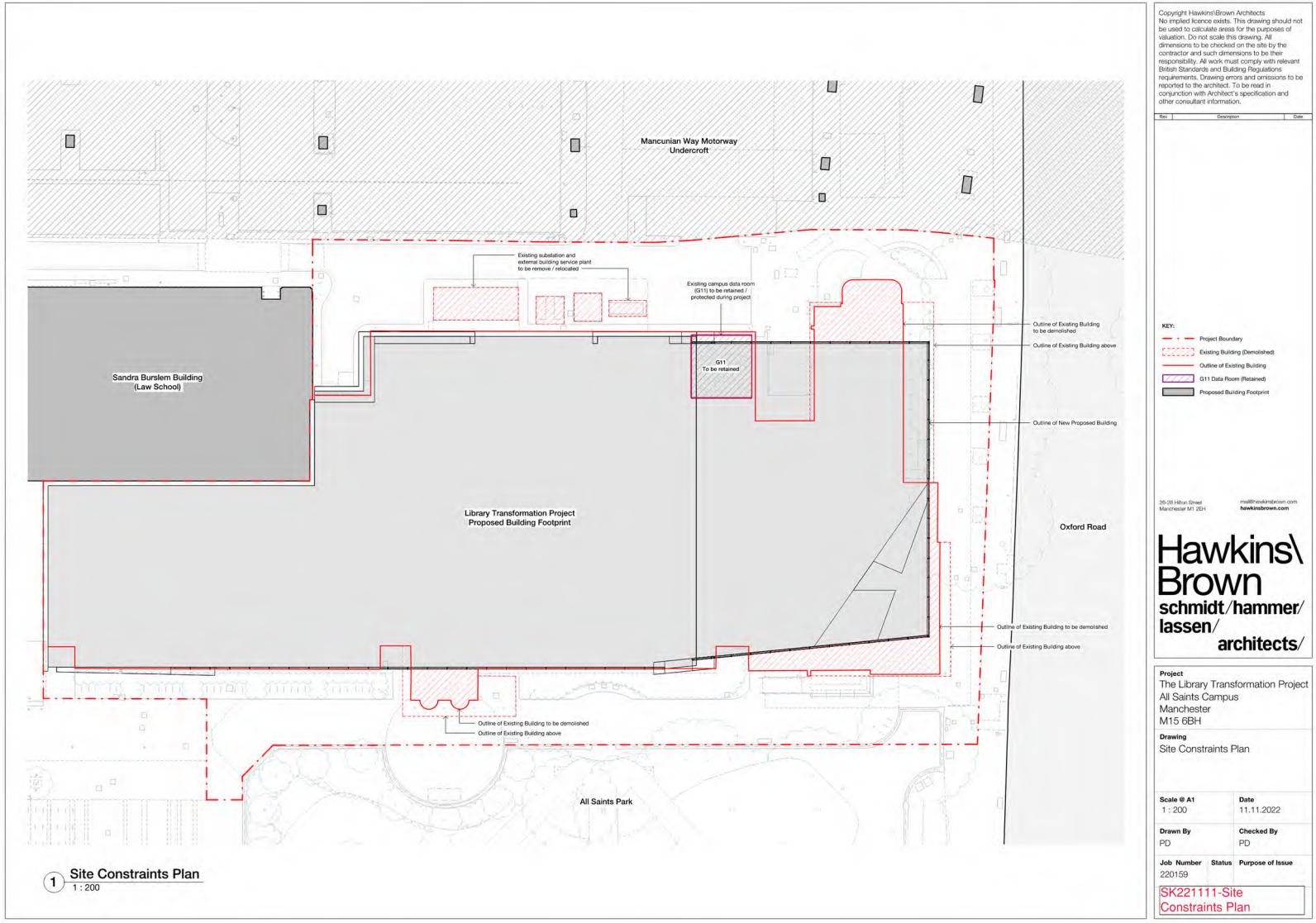


Figure 3-2: Architects Plan for the proposed building

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Figure 3-3: Architect's Impression of the All Saints Library Transformation

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3.3 Current site conditions

3.3.1 Layout and topography

The site is irregular in shape and is approximately 125 m in length (W-E) and is between 30 m and 65 m in width (N-S) with a total area of approximately 0.70 hectares (ha). It is currently occupied by the All Saints Library Building. The site is relatively flat lying with ground levels ranging from ~44.00 mAOD in the NE, gently sloping to 40.00 mAOD in the SW of the site. The Utility survey [9] suggests that the site is very congested with utilities in the footpaths. It may be necessary to protect the utilities during the construction work. Utilities may be required to be diverted in the northeast of the site where the section of the building is to be demolished and replaced with a new 12 No. storey building. The existing utility survey drawing is included as Appendix E.

3.4 Surrounding land use

The surrounding land uses are summarised below (within ~100m).

North: The Mancunian Way (elevated) with MMU Faculty of Science & Engineering beyond;

Northeast: Pavement, Oxford Road, with MMU buildings beyond;

East: Pavement, Oxford Road, with commercial buildings beyond;

South: All Saints Park;

Southwest: MMU buildings and St Augustine's Catholic Church; and

West: MMU Business School

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4 Environmental Setting

4.1 Published Geology

The anticipated Site geology has been determined with reference to the relevant 1:50 000 BGS Map [5] and Groundsure Report [6].

4.1.1 Artificial and Made Ground

The BGS 1:50,000 geological map [5] indicates that the site is not underlain by artificial and Made Ground, however due to the nature of the historic and current site-use, it is anticipated that Made Ground is likely to be present on the Site.

4.1.2 Superficial Geology

The BGS 1:50,000 geological map [5] indicates that the site is underlain by Glaciofluvial deposits (GFSDD-XSV) (Sand & Gravel) in the southwest of the site, and Till (TILLD-DMTN) in the northeast of the site. The total thickness of the superficial deposits is not recorded.

4.1.3 Solid Geology

The BGS 1:50,000 geological map [5] and the Groundsure Report [6] indicate that the drift deposits are underlain by the Permian Manchester Marl Formation – Mudstone (MM-MDST) in the northeast of the site, and the Triassic Chester Pebble Beds Formation – Sandstone (CPB-SDST) in the southwest of the site. The Manchester Marl Formation is comprised of *"red marl (calcareous mudstone and siltstone) with thin beds of fossiliferous marine limestone and dolomite; frequently sandy towards the top of the unit, local breccias and pebble beds present"*, whilst the Chester Formation comprises *"fine-to-coarse grained sandstone, commonly pebbly, with conglomerates and sporadic siltstones"*. The regional dip for the Chester Formation is recorded to be 8° to the southwest.

4.1.4 Structural Geology

The West Manchester Fault is recorded on-site and is downthrown to the northeast by approximately 50-80m.

4.2 Unpublished Geology

The anticipated ground conditions on-site has been determined with reference to the relevant BGS Borehole Logs (Appendix B), and the Curtins Ground Investigation Report [7] and Howley Energy & Water Ltd report [8] for sites in close proximity. A site-specific ground investigation has also been undertaken by Geotechnical Engineering Limited (GEL) for the site as directed by Buro Happold on behalf of the client. The ground conditions encountered during the ground investigation are summarised in Table 4-1.

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Table 4-1: Ground conditions encountered during the GEL site investigation

Depth to Top of Strata (m BGL)	Typical Thickness (m)	Generalized Description
0.00	>0.90-3.30	sandy GRAVEL of limestone AND soft slightly sandy gravelly CLAY AND Slightly clayey gravelly SAND. Gravel of brick, mudstone, sandstone, concrete & limestone [MADE GROUND]
0.90-3.30	absent-3.00	Medium dense clayey gravelly SAND AND Medium dense sandy GRAVEL. Of siltstone, sandstone & mudstone [GLACIOFLUVIAL]*
3.30-4.60	0.60-10.40	Firm to stiff slightly sandy gravelly CLAY. Gravel of mudstone, siltstone, sandstone and coal [GLACIAL TILL]
10.50-16.55	>15.00	very weak SILTSTONE AND very weak SANDSTONE AND Extremely weak Mudstone [MANCHESTER MARL FORMATION / CHESTER FORMATION]

Note: Groundwater strike was recorded in; BH01 at 2.30, WS01 and WS04 at 2.90, and WS02 and WS03 at 2.80m bgl.

*Glaciofluvial deposits were absent in WS02 and WS03.

In summary, the geology comprises Made Ground (reworked natural material) locally underlain by glaciofluvial deposits (medium dense clayey gravelly SAND/medium dense sandy GRAVEL), underlain by glacial till (firm to stiff slightly gravelly, slightly sandy CLAY, underlain by locally fractured due to faulting, red, yellow sandstone, part pebbly with subordinate red mudstone and siltstone.

4.2.1 BGS Boreholes

A summary of the BGS boreholes in Appendix B is presented in Table 4-3 below.

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Table 4-2 Summary of ground conditions encountered in the BGS boreholes.

BGS Reference	Location from site	Drilling method	Ground conditions (thickness m)	Groundwater
SJ89NW4180	90M SW	Unknown	Made Ground – 1.00 Alluvial deposits (possible Glaciofluvial) – 4.00 Glacial Till – 2.00 Red sandstone (Sherwood SDST) – 28.00 Marl (Manchester Marl) - ~36.00	
SJ89NW3795 (TP 1)	~60m E	Trial Pit	Made Ground – 2.10 Glaciofluvial – 1.80 Glacial Till - >0.10	2.10 (slight)
SJ89NW3796 (TP 2)	~60m E	Trial Pit	Made Ground – 1.90 Glaciofluvial – 1.10 Glacial Till - >0.80	No Water
SJ89NW3797 (TP3)	~60m E	Trial Pit	Made Ground – 2.10 Glaciofluvial – 1.70 Glacial Till - >0.20	3.50 (slow)
SJ89NW3797 (TP4)	~60m E	Trial Pit	Made Ground – 2.50 Glaciofluvial – 0.40 Glacial Till - >1.10	No Water

4.3 Coal Mining

The Groundsure report [6] states that the site is located in a coal mining area as defined by the Coal Authority. The Coal Authority [10] interactive map was also consulted which recorded that the site is in a Coal Mining Reporting area. A CON29M [11] report was obtained for the site and is summarised in section 4.3.1. A copy of the CON29M report is also included as Appendix D.

The BGS geological map [5] indicates that the shallowest coal bearing strata beneath the site (Pennine Upper Coal Measures Formation - PUCM) is likely to be >200 m below existing ground level.

4.3.1 CON29M

The Coal Authority report [11] indicates that the site is located in an area that has not been affected by past underground or opencast mining, nor that it is likely to be affected in the future. However, coal exists beneath the site (at significant depths) which could be worked in the future. No mine entries are known to the coal authority onsite or within 20 m of the site boundary.

4.4 Curtins Report [12]

An existing report on the ground conditions for a site to the east of the 1044B Library Building (MMU Institute of Sport Building). The summary below presents an initial appreciation of the baseline ground conditions from the report but this is subject to revision as more detail becomes available.

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The commission of the Curtins investigation was as summarised below:

- 5 No. window sample holes to a maximum depth of 5.45 mBGL,
- *In situ* SPT tests at 1m intervals
- Installation of groundwater and ground gas monitoring wells
- Post-fieldwork geotechnical and geoenvironmental laboratory testing
- Post-fieldwork monitoring visits.

Table 4-3 Summary of ground conditions encountered in the Curtins investigation (2019 GI).

Top of Strata (m bgl)	Description	Depth to top (m)	Thickness (m)
Made Ground	Tile and/or Macadam OVER Brown sandy, clayey, gravelly gravel. Grave of brick, mudstone, tarmac and glass.	0.00	0.40-3.20
Glacial Till	Firm to stiff gravelly sandy CLAY.**	1.20-3.20	0.00-4.15

*Groundwater strike was recorded in WS05 at 0.40 m bgl.

**BGS boreholes record glacial till to depth up to 9.20m bgl.

The Curtins report interpreted the below results from the ground investigation:

- Concrete classification within Made Ground and Glacial Till deposits is DS-2 AC-2.
- No soil chemical exceedances (8 No samples) against GACs commercial threshold.
- Ground gas classification for the site is CS-2 due to elevated CO2 concentrations recorded in one of the installations.
- Excavations deeper than 1.2 m may require side support particularly in granular deposits.

4.5 Howley Energy & Water Limited [8]

An existing report on the ground conditions for a site to the north of the 1044B Library Building (MMU John Dalton Building (JDB)). The summary below presents an initial appreciation of the baseline ground conditions from the report but this is subject to revision as more detail becomes available.

The purpose of the Howley Energy & Water Limited concept design and thermal risk assessment was to assess the geological and hydrogeological conditions for the JDB site, and is summarised below:

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Table 4-4 Summary of JDB ground conditions.

Top of Strata (m bgl)	Description	Depth to top (m)	Approximate thickness (m)
Made Ground	Building Rubble	0.00 (35m AOD)	2.00
Glacial Till	Firm to stiff gravelly sandy CLAY.**	2.00 (33 m AOD)	10.00
Chester Formation	Sandstone wit subordinate mudstone and siltstone. Locally fractured due to faulting	12.00 (23 m AOD)	25.00
Manchester Marls Formation	Red marls with thin limestone beds. Locally fractured due to faulting.	37.00 (-2 m AOD)	60.00
Collyhurst Sandstone Formation	Soft red sandstone. Locally fractured due to faulting	95.00 (-60 m AOD)	20.00
Warwickshire Group (Ardwick Group)	Siltstone, sandstone and mudstone	115.00	-
Middle Coal Measure	Mudstone and siltstone with interbedded sandstones and coal seams.	>115.00	-

4.6 Hydrogeology & Hydrology

The Glaciofluvial and Glacial Till deposits are classified as Secondary A Aquifers, defined as "*permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers*".

The Manchester Marl Formation is classified as a Secondary B Aquifer, defined as "*Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers*".

The Chester Formation is classified as a Principal Aquifer, defined as "*geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale*".

There are 3 No. active-groundwater abstractions recorded within1km of the site. The groundwater abstractions are namely:

Distance	Details	Date
20m SW	Heat Pump Manchester Metropolitan University Annual Volume (m3): 283,240	Start: 2014 Expiry: 2027
596m SW	Heat Pump Manchester Metropolitan University Annual Volume (m3): 274,115	Start: 2015 Expiry: 2027
956m W	Dewatering Renaker Build Ltd Annual Volume: 260,172	Start: 2021 Expiry: 2023

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There are a further 3 No. active groundwater abstractions recorded between 1 and 2km. The southwest portion of the site is located in a groundwater source protection zone.

There is a surface water body recorded 200m NE of the site, namely "*Ashton Canal/River Medlock*" which is an "*inland river not influenced by normal tidal action*".

There are no active surface water abstractions recorded within 2km of the site.

4.7 Flood Risk

The site is located within Flood Zone 1. The site is at risk of flooding defined as being less than 1 in 1000 years (0.1%) from rivers or sea.

4.8 Natural hazards

Regulatory data relating to ground stability for the Site is summarised in Table 4-5 below with the full information presented in Appendix C.

Table 4-5 Potential natural hazards based on BGS Groundsure data

Potential Hazard	Hazard Rating	
	Northeast	**Southwest**
Shrink swell	Very Low	Negligible
Landslide	Very Low	Very Low
Soluble Rocks	Negligible	Negligible
Compressible Ground	Negligible	Negligible
Collapsible Deposits	Very Low	Very Low
Running Sand	Very Low	Very Low

4.9 Radon

The Indicative Atlas of Radon for England and Wales [13] and the Groundsure report [6] indicates that the site is not a Radon Affected Area, as less than 1% of properties are above the Action Level. Therefore, no radon protective measures are necessary.

4.10 Unexploded ordnance (UXO)

A UXO Risk Map (included as Appendix A) was provided by Zetica, classifying the site as "moderate" risk. A detailed UXO desk study was commissioned by the client and is also provided in Appendix A, with the summary identifying the Site as high-risk, with further action required to reduce the risk from UXO to as low as reasonable possible (ALARP).

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5 Site Setting

5.1 Site History

The site history and that for the immediate surrounding area has been assessed using historical maps from 1851 to 2010. This history is summarised in Table 5-1 below. The maps are presented in Appendix C

Table 5-1: Summary of site history and history of the surrounding area

Historical Land Use		
OS Map Edition	**Site**	**Surrounding Area (within 100 m)**
1851 (1:1,056)	Timber Yards and unnamed terraced buildings recorded. Devonshire Street in S of site.	Terraced buildings (N & W), Stone Yard & Smithy (35 m E), Grosvenor Square & All Saints Church (20m S), Scotchy Church (40 m S).
1893 (1:2,500)	Timber Yards no longer recorded. Carriage & Tramway Depot now identified	Hotel (40 m N), School (70 m E), Bank (92 m SE), Chorlton Union Offices (90 m S), Infant School (50 m SW).
1908 (1:2,500)	No major recorded changes.	No major recorded changes.
1922 (1:2,500)	Carriage & Tramway Depot no longer recorded. School now recorded on location of former depot.	Hospital recorded (21 m S).
1932(1:2,500)	No major recorded changes.	Bank (20 m NE), Textile Machinery Works (45 m ENE), Hall (65 m ENE), Post Office (74 m E), Bakery (56 m E), Ladies Garment Manufacturer (75 m ESE). Union Offices now recorded as Public Assistance Offices (90m S).
1950 (1:2,500)	Loxford Street (formerly Devonshire Street).	Buildings no longer recorded (65m NE), All Saints Church no longer recorded (S), Lavatories & Children's playground recorded on Grosvenor Square (S), warehouse (SW).
1970 (1:2,500)	No major recorded changes	Mancunian Way (immediately N), John Dalton College of technology (50 m N), National Computer Centre (80 m NE).
1985 (1:2,500)	School replaced by Manchester Polytechnic Building (All Saints Building).	Loxford Tower (WSW), Union Office recorded as Ormond Building (90m S), Mandela Building (20 m E). Playground no longer recorded.
1992 (1:1,250)	No major recorded changes.	Bellhouse Building (SW).
2003 (1:1,250)	No major recorded changes.	No major recorded changes.

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5.2 Regulatory Data

Regulatory data relating to potentially contaminative uses is summarised in Table 5-2 below. This information was obtained from the Groundsure report [6].

Table 5-2 - Summary of Regulatory Data

Item	Location [on/off site]	Information	Potential to Impact
Environmental Permits, Incidents and Registers			
Licensed pollutant release (Part A(2)/B)	2 [250-500m]	The nearest record is for 316m W. Both records have "Historic" status.	No
Radioactive substance authorisations	6 [50-250m] 8 [250-500m]	The nearest record is 94 m W (last updated 2020).	No
Licensed discharges to controlled waters	6 [50-250m] 40 [250m-500m]	The nearest record was 82m W for cooling water and dated 2011.	No
Pollution Incidents (EA/NRM)	1 [326m N]	Oil and Fuel (2001) Water Impact: Category 4 (no impact) Land Impact: Category 4 (no impact) Air Impact: Category 4 (no impact)	No
Petrol stations	1 [50-250m]	The nearest record is 138m NW and is recorded as Obsolete.	No
None of the following were recorded within 500m of the site: Electric cables, gas pipelines, sites determined as contaminated land, control of major accident hazards (COMAH), Regulated explosive sites, Hazardous substances storage/usage, Historical licensed industrial activities (IPC), Licensed industrial activities (Part A(1)), Pollutant release to surface waters (red list), Pollutant release to public sewer, List 1 dangerous substances, List 2 dangerous substances, pollution inventory substances, pollution inventory waste transfers, pollution inventory radioactive waste.			
Landfill and Other Waste Sites			
Historical waste sites	5 [50m – 250m]	The records are for waste paper works between 197-205m NW. Last recorded in 1953.	No
Licensed waste sites	1 [250-500m]	277m NW for Terra Vac (UK) Ltd. Issue date 2002.	No
Waste exemptions	1 [on-site] 7 [0-50m] 4 [50-250m] 17 [250-500m]	On-site – disposal and waste treatment exemption (not a farm).	No.
The following industrial activities were recorded beyond 50m: active or recent landfill, historical landfill (BGS records), Historical landfill (LA/mapping records) and historical landfill (EA/NRW records).			
Current and Past Industrial Land Use			
Electrical Sub Station	On-site	Electric Features	Yes
Gantry	3m NW	Travelling Cranes & Gantries	No
Gantry	26m W	Travelling Cranes & Gantries	No
Gantry	43m NE	Travelling Cranes & Gantries	No
The following industrial activities were recorded beyond 50m: WSP Engineers, Electrical Sub Stations, Gantry, Compudos Ltd, Haadi Composite Woods, FM Laptop Repairs, Gantry, Euro Exim Ltd, Final Print, Territorial Army Centre, Gas Governor, Chimney & Manchester Business Centre.			

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Item	Location [on/off site]	Information	Potential to Impact
Points of Interest (Environmentally Sensitive Sites, visual, cultural, agricultural, habitat designations)			
Nitrate vulnerable zones	3 [500m-2000m]	>1000m N River Irk & Irwell / Man. Ship Canal	No.
SSSI Impact Risk Zones	1 [on-site]	It is considered the proposed development type does not require consultation for these matters.	No
None of the following were recorded within 2000 m of the site: Site of Special Scientific Interest (SSSI), Ramsar Sites, Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Nature Reserves (NNR), Local Nature Reserves (LNR), designated Ancient Woodland, Biosphere Reserves, Forest Parks, Marine Conservation Zones, Green Belt and Nitrate Sensitive Areas.			

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6 Preliminary Geoenvironmental Risk Assessment

6.1 General Approach

In the UK, the assessment of risk from contamination is based on consideration of the conceptual site model and follows the "source-pathway-receptor" approach. If one of these three elements (source, pathway or receptor) is absent, it is considered that there is no risk of harm. If, however, there is considered to be a linkage between any given source and any given receptor, then a risk-based approach is used to assess the significance or impact of the linkage. Risks are defined as the probability of an event occurring combined with the severity of the consequence of that event. Particularly, to assess the risks to site end users posed by any given source, the sensitivity of each receptor is considered. For example, the concentration of contamination acceptable at a site to be developed as a residential property with a garden used to grow vegetables and accessible to young children is set lower than that for a commercial site where soil is exposed only in minor areas of landscaping and the only long-term users of the site are adults. Similarly, a site overlying a Principal Aquifer supplying potable water will be considered more stringently than a site overlying an impermeable geology with only minor seepages of groundwater.

6.2 Conceptual site model

The potential risks posed to human health and the environment by ground contamination at this site have been evaluated by a generic quantitative risk assessment which incorporates the 'source-pathway-receptor' identification and assessment methodology in accordance with LCRM [14]. The risk assessment process therefore involves the identification of each source based on the information in this report, including any available existing ground investigation results together with the identification of relevant exposure pathway(s) and receptors. The potential risks to the receptors have been assessed by considering the potential effect of the source on the receptor as well as the likelihood of a pathway linking the two, i.e. a contaminant linkage as discussed above.

6.3 Sources

The potential contamination sources at the site have been identified from the review of regulatory data, historical maps and previous site investigations and are summarised in Table 6-1. The 'Contaminants of Concern' in this risk assessment are based primarily on information from this review of historical information and by reference to relevant Industry Profile reports ([15], [16]and [17]) and R&D 66 [18].

Table 6-1 Summary of potential sources of contamination

Potential Source	Location	Likely Age	Potential Contaminants of Concern
The site area current uses: made ground, electrical sub-station	On-site	Pre 1851 to present	Asbestos, heavy metals, organic and inorganic compounds, acids /alkalis, PCBs, PAHs, PCBs, TPHs, fuels and oils, organic solvents, stain protectors, phenols and ground gases.
The site area previous industrial uses: timber yard, carriage and tramway depot	On-site	Pre 1851 to 1893	Asbestos, heavy metals, organic and inorganic compounds, acids /alkalis, PCBs, PAHs, TPHs, fuels and oils, organic solvents, resins/adhesives, catalysts, sizing agents, binders and ground gases.

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Potential Source	Location	Likely Age	Potential Contaminants of Concern
Surrounding area current industrial uses: electrical sub-stations, Exo Exim Ltd -(UPV recycling).	Off-site	Unknown to present	Asbestos, heavy metals, organic and inorganic compounds, acids /alkalis, PAHs, PCBs, PFA TPHs, fuels and oils, organic solvents, rubber and rubber preservatives, vulcanising agents, anti-oxidants, stain protectors, solvents, Phenols and ground gases.
Surrounding area previous industrial uses: Textile machinery works	Off-site	1932 to 1950	Asbestos, heavy metals, organic and inorganic compounds, chlorinated inorganic compounds, sizing agents, water repellents, fire/flame retardants, soaps & detergents, pesticides, fuels and oils, and ground gases.

6.4 Pathways and receptors

The proposed development comprises an industrial scheme (see Section 3.2) and comprises the refurbishment of the existing building and a new build extension to the northeast. The presence of contamination (in soils, liquids or gases) has the potential to impact upon human and environmental receptors both in the short term (during construction) and in the long term (during use and occupation). The potential contamination sources at the site have been identified from the review of regulatory data, historical maps and previous site investigations and are summarised in Table 6-1. The 'Contaminants of Concern' in this risk assessment are based primarily on information from this review of historical information and by reference to relevant Industry Profile reports ([15], [16]and [17] R&D 66) .

Table 6-2 Summary table of receptors and potential pathways

Receptor		Pathway
Human Health	Investigation and construction workers	Direct/ dermal contact. Ingestion/ inhalation of soils. Inhalation of gas / vapour.
	Future site users / visitors (residents, guests, workers)	Direct/dermal contact. Inhalation of contaminated dusts, gas & vapour.
	Off site occupiers / visitors of neighbouring land	Inhalation of contaminated dusts.
Controlled Waters	River Medlock	Migration via permeable strata and preferential pathways (e.g. piling)
	Chester Formation: Principal Aquifer	Migration via permeable strata and preferential pathways (e.g. piling)
	Secondary Aquifers (Glacial deposits, Manchester Marl Formation)	Migration via permeable strata and preferential pathways (e.g. piling)
Building/Services	Buried concrete foundations. Potable water supply pipework	Direct contact / aggressive attack

6.5 Assessment of risk

The assessment of the level of risk for each of the potential contaminant linkages identified above is summarised in Table 6-3. The table lists the potential sources identified above. For each source, an assessment is made, receptor by receptor, as to the magnitude of the potential consequence (reflecting the potential severity of the hazard associated with that source and the sensitivity of the receptor).

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Consideration has also been given to the level of uncertainty associated with each of these potential sources. For example, some of the information is based on historical records. Where site specific information has been used the uncertainty is reduced, however it is also noted that no investigation can examine 100% of the ground and therefore some degree of uncertainty will remain. Because of this uncertainty, the identification of the sources is based upon a conservative assessment of the potential location, nature and extent of the source. The probability or likelihood of the hazard being realised is then assessed by consideration of the directness / integrity of the exposure pathway that could link the receptor to the source. The assigned level of risk is determined by the terms of consequence and probability in accordance with C552 [19]. The final column describes all of the factors considered in the assessment and presents the justification for the assessed level of risk.

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Table 6-3 - Preliminary Risk Assessment

Source		**Receptor**/ Pathway	**Risk assessment** (following CIRIA C552)			Comment on hazard realisation
Origin	Contaminants of concern		Consequence	Probability	Risk	
On-site: Made Ground, electric substation, historic timber yard & carriage and tramway depot	Asbestos, heavy metals, organic and inorganic compounds, acids /alkalis, PCBs, PAHs, TPHs, fuels and oils, organic solvents, stain protectors, phenols and ground gases.	**Description of the Source: The surrounding area of the site was first recorded to be developed in the 1950s.**				
		Future site users / visitors (employees, guests and maintenance) Direct / dermal contact. Inhalation of soils / dusts. Ingestion of contaminated water supplies. Migration and accumulation of hazardous gases.	Medium	Unlikely	**Low**	Proposed future use is for commercial (educational) use with soft and hard landscaping. Potential for dust generation, direct contact and ingestion. Exposure time is relatively limited. Mitigation of potential risks can be achieved by appropriate investigation / design and implementation of remediation / mitigation measures including encapsulation.
		Investigation and construction workers Direct / dermal contact. Ingestion / inhalation of contaminated soils, gases and vapours.	Medium	Low likelihood	**Moderate / Low**	Potential for exposure during investigations/ earthworks. Period of exposure dependent on construction timescales. Standard Health and Safety precautions likely to be used by workers. Mitigation of potential risks can be achieved by appropriate investigation and adoption of standard good construction practice.
		Off site occupiers / visitors of neighbouring land Inhalation of contaminated dusts.	Medium	Unlikely	**Low**	Large scale development, potential to impact surrounding visitors by dust generation. Increased potential during any earthworks. Mitigation of potential risks can be achieved by appropriate investigation and adoption of standard good construction practice.
		Degradation of Water quality **[Superficial Secondary A aquifer – Glacial Deposits]** **Migration via permeable strata**	Medium	Low likelihood	**Moderate / Low**	Potential for increased infiltration and promotion of leaching during development earthworks. Mitigation of potential risks could be achieved by appropriate investigation, risk assessment and design.
		Degradation of Water quality **[Bedrock Secondary B aquifer – Manchester Marl Formation]**	Medium	Unlikely	**Low**	Potential for increased infiltration and promotion of leaching during development earthworks. Mitigation of potential risks could be achieved by appropriate investigation, risk assessment and design.

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Source		**Receptor**/ Pathway	**Risk assessment** (following CIRIA C552)			Comment on hazard realisation
Origin	Contaminants of concern		Consequence	Probability	Risk	
		Degradation of Water quality [Bedrock Principal aquifer – Chester Pebble Beds Formation] Migration via permeable strata	Severe	Unlikely	**Moderate / Low**	Potential for increased infiltration and promotion of leaching during development earthworks. Mitigation of potential risks could be achieved by appropriate investigation, risk assessment and design.
		Buildings/services - permeation of water supply pipework, degradation of concrete Direct contact/, aggressive attack/ below ground structures	Medium	Unlikely	**Low**	Potential for direct contact on development site. Mitigation of potential risks can be achieved by appropriate investigation / design and implementation of appropriate design.

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7 Conclusions and Recommendations

7.1 Summary of geoenvironmental risks

7.1.1 Assessed risks

An Initial Conceptual Site Model has been determined and a Preliminary Risk Assessment with respect to ground contamination has been carried out for the site on the basis of the available data. The main sources of potential contamination have been identified and the potential risks have been qualitatively assessed. The assessment is based upon the site in its current condition, but it also includes consideration of the potential risks associated with any below ground works (e.g. site investigation or future foundation works etc.) and the potential future use. A summary of the potentially significant risks (i.e. greater than Low) is presented below.

Table 7-1 Summary of potential risks

Receptor	Source	Potential risk
Investigation and construction workers	Infilled land / Made Ground/ Demolition debris	Moderate/Low
Degradation of Water quality (Superficial Secondary A aquifer and bedrock Principal aquifer)	Infilled land / Made Ground/ Demolition debris	Moderate/Low

7.1.2 Recommendations

There are potential risks associated with the Site due to geology, site history, and land use in the surrounding area. Therefore it is recommended that an intrusive site investigation is completed. The aims and objectives of the investigation should combine geotechnical and geoenvironmental objectives.

The geoenvironmental aims will be to gain an understanding of:

- The presence, extent, and nature of any Made Ground/ fill materials,
- The ground gas regime,
- The shallow groundwater regime.

The investigation should identify the potential pathways and allow assessment of risk to sensitive receptors. This data will also inform any remediation/ mitigation requirements associated with the proposed development. To meet both the geotechnical and geoenvironmental aims and objectives above, the scope of the site investigation should include the following:

- Boreholes (of suitable frequency and depth) to determine the shallow and deep ground conditions. Boreholes should include monitoring installations to intercept ground gas and shallow groundwater,
- Trial pitting across the site with sampling of near surface soils,

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- *In situ* testing (SPTs, U100 samples)
- Geotechnical & chemical testing of representative soil and groundwater samples; and
- A ground gas and groundwater monitoring programme.

The data obtained from this investigation would be collated, assessed and presented in a report suitable for submission submitted to Manchester City Council. The report would include recommendations on the need for and scope of any remediation.

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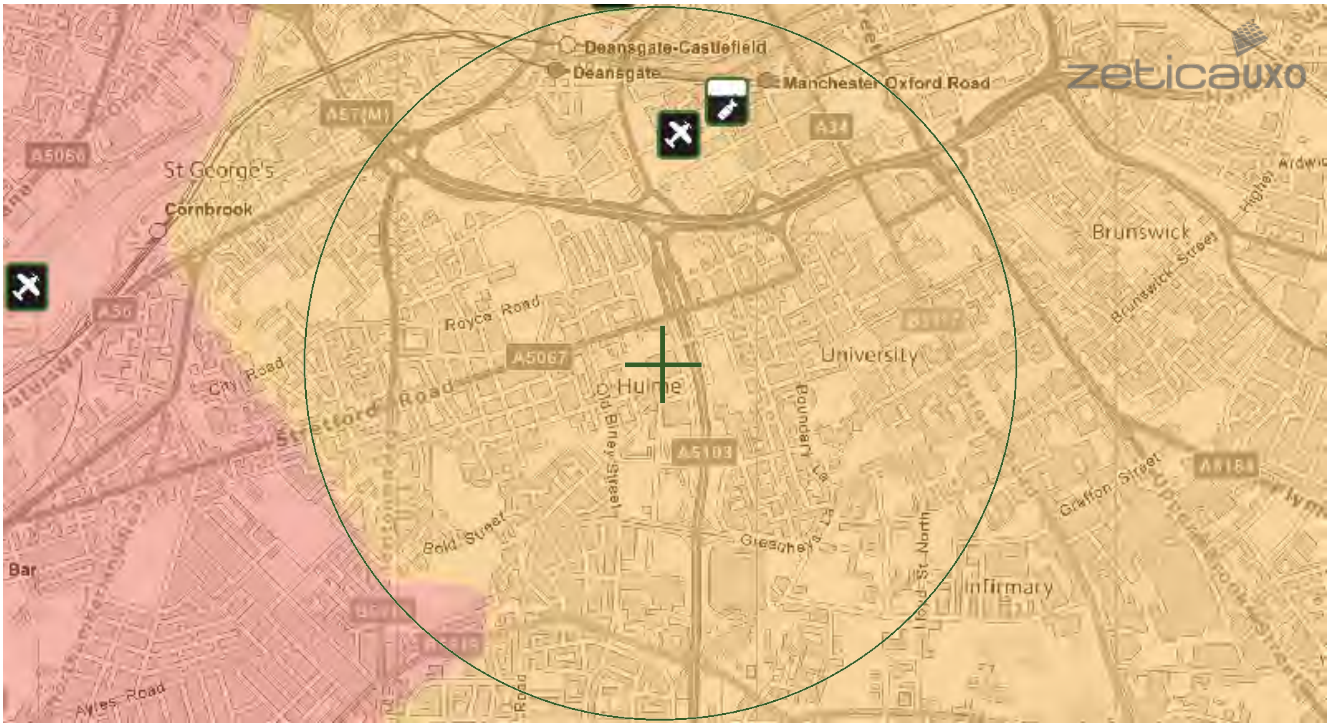
Appendix A UXO Risk Assessment

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UNEXPLODED BOMB RISK MAP

SITE LOCATION

Location: M15 6GX,
Map Centre: 383743,396697



LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary	**industry**	**UXO find**
transport	**dock**	**Luftwaffe targets**
utilities	**Bombing decoy**	**other**

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: **+44 (0) 1993 886682**

email: **uxo@zetica.com**

web: **www.zeticauxo.com**

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

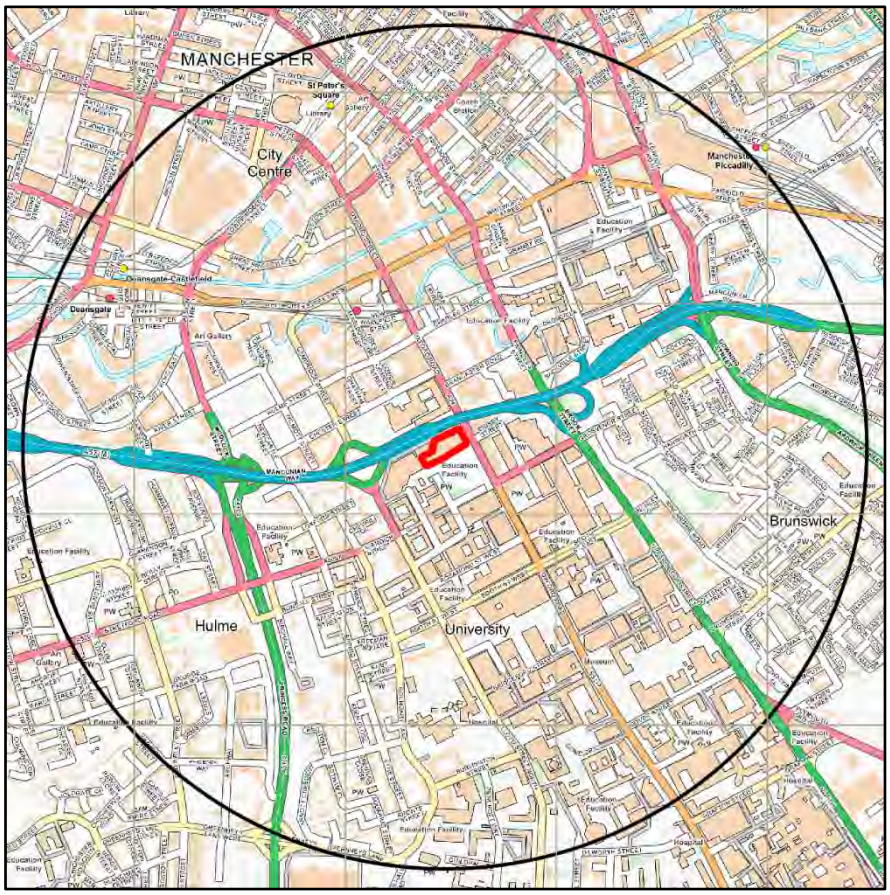
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*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment

Meeting the requirements of *CIRIA* C681 'Unexploded Ordnance (UXO) A Guide for the Construction Industry' Risk Management Framework



PROJECT NUMBER	10307	**ORIGINATOR**	G. Rogers
PROJECT	MMU All Saints Library	**REVIEWED BY**	B. Wilkinson
CLIENT	Buro Happold	**RELEASED BY**	L. Gregory
VERSION	1.0	**DATE**	24th March 2023
UXO RISK RATING	**HIGH** - This Study Site requires further action to reduce risk to ALARP during intrusive activities.		

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Acronyms and Abbreviations

AA	Anti-Aircraft
AAA	Anti-Aircraft Ammunition
ALARP	As Low As Reasonably Practicable
AOD	Above Ordnance Datum
ARP	Air Raid Precaution
AXO	Abandoned Explosive Ordnance
BD	Bomb Disposal
BDO	Bomb Disposal Officer
bgl	Below Ground Level
BGS	British Geological Survey
BH	Borehole
BPD	Bomb Penetration Depth
CDP	Cast Driven Piles
CFA	Continuous Flight Auger
CIRIA	Construction Industry Research and Information Association
CPT	Cone Penetration Testing
CS	County Series
EO	Explosive Ordnance
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
GI	Ground Investigation
GIS	Geographic Information Systems
GL	Ground Level
GP	General Purpose
GPS	Global Positioning Systems
HAA	Heavy Anti-Aircraft
HE	High Explosive
HO	Home Office
HSE	Health and Safety Executive
IB	Incendiary Bomb
kg	Kilograms
km	Kilometres
LAA	Light Anti-Aircraft
LCC	London County Council
LE	Low Explosive
LSA	Land Service Ammunition
m	Metres
MoD	Ministry of Defence
mm	Millimetres
NEQ	Net Explosive Quantity
NFF	National Filling Factory
NGR	National Grid Reference
OD	Ordnance Datum
OS	Ordnance Survey
PM	Parachute Mine
PoW	Prisoner of War
RADAR	Radio Detection And Ranging
RAF	Royal Air Force
RN	Royal Navy
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SAA	Small Arms Ammunition
TA	Territorial Army
TNT	Trinitrotoluene
UK	United Kingdom
UN	United Nations
USAAF	United States Army Air Force
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V Weapons	*Vergeltungswaffen* – Vengeance Weapons
WD	War Department
WWI	World War One
WWII	World War Two

EXECUTIVE SUMMARY

Study Site

The Client has defined the Study Site as "MMU All Saints Library" and it is centred on NGR 384236, 397159.

Potential Threat Sources

The most probable UXO threat is posed by WWII-era *German* HE bombs, whilst IBs and *British* AAA projectiles (which were used to defend against *German* bombing raids) pose a residual threat.

Risk Pathway

The Client has provided a number of documents relating to the proposed works at the Study Site. Initially, a GI campaign is proposed which will consist of shallow hand dug trial pits to 2m bgl – which are proposed to stay within the foundations of the existing structure – and deep boreholes to 30m bgl.

Subsequently, a redevelopment/construction phase is proposed. Specifically, the structures in the west Site will be refurbished rather than demolished and rebuilt. If proposed refurbishment works do not involve intrusive works, then a viable UXO risk pathway will not be generated by these activities.

The eastern half of the Site will be demolished, with a new structure built in its place. Such demolition and construction works may generate a UXO risk pathway and – in addition to the proposed GI works – have been subject to a risk assessment.

Risk Level

HIGH

Key Findings

During WWII, the Study Site was situated within *Manchester Country Borough*, which recorded six HE bomb strikes per 100 hectares, a "very low" level of bombing.

Luftwaffe aerial reconnaissance photography did not identify the Study Site as a primary bombing target. Nonetheless, such targets were recorded in the Study Site's immediate vicinity, *Whitworth Station Gas Works* was the closest of these targets to the Study Site (located 375m to the north-east of the Site).

ARP records associated with the Study Site identified one bomb strike on-site, which impacted in the south-west of the Study Site. In addition, further HE bomb strikes were recorded within the Site's immediate vicinity, the closest of these being 70m to the south-east.

An analysis of the official bomb damage mapping associated with the Study Site does not show any bomb damage within it, although numerous areas of bomb damage were documented nearby. The closest of these was 30m to the south within *Grovesnor Square*, with additional damage recorded 35m and 45m to the north-west on *Angle Street*. Additional areas of damage were recorded within the Site's vicinity.

Pre-WWII mapping (1938) associated with the Study Site shows that the Study Site was located within a densely developed urban area during WWII, and the Study Site itself consisted of a school and a paved roadway. Therefore, it is likely that footfall within the Study Site would have been relatively high throughout WWII. However, given that an HE bomb strike was recorded within the Site, combined with the recorded bomb damage in close proximity to the Study Site, it is possible that bomb damage debris may have concealed a UXB entry hole, causing it to have gone unnoticed.

The Study Site has undergone several phases of development post-WWII. Specifically, between 1951 and 1981 multiple residential properties, a roadway and the pre-existing school were demolished and cleared from the Study Site. By 1981, the existing multi-storey university building had been constructed which covers the majority of the Study Site. Consequently, it is considered likely that any UXO within post-war disturbed and developed ground would potentially have been discovered and removed. However, the potential for deep buried UXO to be present below any disturbed ground within any remaining areas of undisturbed ground is assessed to be extant. Given that the nature, locations and depths of the proposed works have not been communicated, 6 Alpha must assume that the proposed works may to extend into previously undisturbed ground.

EXECUTIVE SUMMARY (…continued)

Conclusions

As the Study Site and its immediate vicinity were subjected to bombing during WWII, the following risk mitigation measures are recommended as a minimum in order to reduce risks ALARP during intrusive works in **all previously undisturbed ground** (i.e., that which has not previously been excavated, probed, drilled or otherwise intrusively disturbed since it was potentially contaminated with UXO).

Recommended Risk Mitigation Measures Overview

"Open" Intrusive Works

Engineering Methodology	UXO Emergency Response Plan	UXO Safety and Awareness Briefing	On-Call EOD Engineer	Non-Intrusive Magnetometer Survey	EODE Watching Brief	Intrusive Magnetometer Survey	UXO Risk Rating (Post-Mitigation)
Trial Pits	✔	✔	✔	✘	✘	✘	ALARP
Excavations	✔	✔	✘	✘	✔	✘	
Trenching	✔	✔	✘	✘	✔	✘	

"Blind" Intrusive Works

Engineering Methodology	UXO Emergency Response Plan	UXO Safety and Awareness Briefing	On-Call EOD Engineer	Non-Intrusive Magnetometer Survey	EODE Watching Brief	Intrusive Magnetometer Survey	UXO Risk Rating (Post-Mitigation)
Boreholes	✔	✔	✘	✘	✘	✔	ALARP
Window Sampling	✔	✔	✘	✘	✘	✔	
Piling	✔	✔	✘	✘	✘	✔	

A full and detailed guide to the recommended risk mitigation measures is presented at Section 5 of this report.

For further information, please contact *6 Alpha Associates*:

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ASSESSMENT METHODOLOGY

Approach

6 Alpha Associates is an independent, specialist risk management consultancy practice, which has assessed the prospective UXO risk at this Study Site by employing a process advocated by *CIRIA*. The *CIRIA* guide for managing UXO risks in the construction industry (C681) not only represents industry best practice but has also been endorsed by the UK's *HSE*. *6 Alpha* were the lead technical author of the CIRIA C681 guide.

UXO hazards can be identified through the investigation of local and national archives associated with the Study Site, *MoD* archives, local historical sources, historical mapping as well as contemporary aerial photography (where it is available). Prospective hazards will have only been recorded if there is specific information that could reasonably place them within the boundaries of the Study Site. The amalgamation of information is then assessed within a Semi-Quantitative Risk Assessment (as per industry best practice outlined in CIRIA C681) in order to form the basis of a proportional UXO risk mitigation strategy in circumstances where the SQRA evidences that further action is necessary in order to reduce the UXO risk at the Study Site.

The assessment of UXO risk is a measure of the probability of UXO encounter and initiation and the consequence of an inadvertent UXO initiation; the former being a function of the identified hazard and proposed development methodology and the latter being a function of the type of hazard and the proximity of personnel (and/or other 'sensitive receptors', such as equipment) to the hazard. UXO risk is thus calculated using the following formula:

Risk (R) = Probability (P) x Consequence (C)

If intolerable UXO risks are identified, the methods of mitigation we have recommended are considered reasonable and sufficiently robust to reduce them to ALARP. We advocate the adoption of the ALARP legal principle because it is a key factor in efficiently and effectively ameliorating UXO risks. It also provides a ready means for assessing the Client's tolerability of UXO risk. In essence, the principle states that if the cost of reducing a risk significantly outweighs the benefit, then the risk may be considered tolerable. This does not mean that there is never a requirement for UXO risk mitigation, but that any mitigation must demonstrate that it is beneficial. Any additional mitigation that delivers diminishing benefits and that consume disproportionate time, money and effort are considered *de minimis* and thus unnecessary. Because of this principle, UXB and UXO risks will rarely be reduced to zero (nor need they be).

Important Notes

Although this report is up to date and accurate at the time of writing, *6 Alpha's* UXO threat databases are continually being populated and updated as and when additional information becomes available. Nonetheless, *6 Alpha* have exercised all reasonable care, skill and due diligence in providing this service and producing this report.

The assessment levels are also based upon our professional opinion and have been supported by our interpretation of historical records and third-party data sources. Wherever possible, *6 Alpha* has sought to corroborate and to verify the accuracy of all data we have employed, but we are not accountable for any inherent errors that may be contained in third party data sets (e.g., *National Archive* or other library sources), and over which *6 Alpha* cannot exercise control.

STAGE ONE – STUDY SITE LOCATION AND DESCRIPTION

Study Site

The Client has defined the Study Site as "MMU All Saints Library" and it is centred on NGR 384236, 397159, as presented at *Figures 1* and *2,* respectively.

Location Description (*Figure 1 & 2*)

The Study Site is situated within the *Greater Manchester* and totals an area of 0.24 hectares (ha).

Furthermore, the Study Site is bounded by:

- North: *Manchester Law School* and an area of hardstanding (car park).
- East: Areas of hardstanding.
- South: *All Saints Park* and areas of hardstanding.
- West: Areas of hardstanding and *MMU Faculty of Business and Law*.

Aerial Photography (2021) (*Figure 3*)

2021 aerial photography corroborates the information above and shows that the Study Site is situated within a densely developed urban area. The Study Site itself consists of a building known as *All Saints Library.*

Proposed Works (*Figure 4*)

The Client has provided a number of documents relating to the proposed works at the Study Site. Initially, a GI campaign is proposed which will consist of shallow hand dug trial pits to 2m bgl – which are proposed to stay within the foundations of the existing structure – and deep boreholes to 30m bgl.

Subsequently, a redevelopment/construction phase is proposed. Specifically, the structures in the west Site will be refurbished rather than demolished and rebuilt. If proposed refurbishment works do not involve intrusive works, then a viable UXO risk pathway will not be generated by these activities.

The eastern half of the Site will be demolished, with a new structure built in its place. Such demolition and construction works may generate a UXO risk pathway and – in addition to the proposed GI works – have been subject to a risk assessment at Page 13 of this document.

The locations of the proposed works are outlined at *Figure 4*.

Ground Conditions

It is important to establish the specific ground conditions in order to determine the maximum *German* UXB penetration depth as well as the potential for other types of munitions to be buried. It is also important to establish the provenance of made ground, where this is recorded as being part of the ground make-up, in order to accurately determine the ground levels at the time when UXO contamination may have occurred so as to accurately determine the average/maximum bomb penetration depths and subsequently to make appropriate recommendations aimed at reducing the risk to ALARP.

BGS borehole log "SJ89NW4180- Manchester Metropolitan University" (located in the Study Site's western sector), recorded the following strata:

Depth bgl (m)	Strata	Description
0.00m to 1.00m	Made Ground	N/A
1.00m to 5.00m	Alluvial Deposits	N/A
5.00m to 7.00m	Clay	Clay with sand horizons
7.00m to 28.00m	Sand	Soft red sand

STAGE TWO – REVIEW OF HISTORICAL DATASETS

Sources of Information Consulted

The following information sources have been employed in order to establish the nature and scope of the UXO threat:

1. *6 Alpha*'s *Azimuth* Database;
2. *Home Office* WWII Bomb Census Maps;
3. WWII and post-WWII aerial photography;
4. Official Abandoned Bomb Register;
5. Information gathered from the *National Archives* at *Kew*;
6. Historic UXO information provided by *33 Engineer Regiment* (Explosive Ordnance Disposal) at *Carver Barracks, Wimbish*.

Potential Sources of UXO Contamination - Overview

In general, there are several activities that might have contaminated a site with UXO, but the three most common ways are: legacy munitions from military training/exercises; deliberate or accidental dumping (AXO) and ordnance resulting from war fighting activities (also known as the Explosive Remnants of War (ERW)).

During WWII, the *Luftwaffe* undertook bombing campaigns all over the *UK* and although the *Luftwaffe* had designated primary bombing targets across the *UK*, their high-altitude night bombing was not accurate. There was also a period of indiscriminate bombing of civilian and industrial areas alike in *British* cities in an attempt to cripple the morale of the *British* people. As a result, thousands of buildings were damaged across industrial and residential areas and civilian fatalities were common. Bombs were also jettisoned over opportunistic targets and more rural locations were also attacked in this manner.

As the threat of invasion lingered over *Britain* during WWII, defensive actions were undertaken. The *British* and *Allied Forces* requisitioned large areas of land for military training and bomb storage (including HE bombs, naval shells, artillery and tank projectiles, explosives, LSA and SAA). Thousands of tonnes of these munitions were used for the *Allied Forces* weapon testing and military training alone. It has been estimated that at least 20 per cent of the *UK*'s land has been used for military training at some point.

The most common type of UXO discovered today in the *UK* is the aerially delivered high explosive (HE) bomb, which are comparatively thick-skinned and were dropped from *Luftwaffe* aircraft. If the bomb did not detonate when it was dropped, the force of impact enabled the UXO to penetrate the ground, often leaving behind it a UXB entry hole. These entry holes were not always apparent, and some went unreported, leaving the bomb buried and unrecorded. *British* AXO/LSA/SAA is also commonly encountered in areas that were formerly occupied by military forces (such as RAF airfields, military camps and/or military training areas). More rarely, additional forms of *German* UXO are occasionally discovered including *inter alia* Incendiary Bombs (IBs), and Anti-personnel (AP) bomblets and fragments of *V1* and *V2* rockets.

"The best practice guide for dealing with your UXO risks on land" (CIRIA publication C681) suggests that approximately 10 per cent of all munitions deployed during WWII failed to function as designed. ERW are therefore, still commonly encountered, especially whist undertaking construction and civil engineering groundwork.

Furthermore, in exceptional circumstances, UXO is discovered unexpectedly and without apparent rational explanation. There are several ways this might occur:

- When *Luftwaffe* aircraft wished to swiftly escape e.g., from an aerial attack, they would jettison some or all of their bombs and flee. This is commonly referred to as *tip and run* and it has resulted in bombs being found in unexpected locations;
- Transportation of aggregate containing munitions to an area that was previously free of UXO, usually related to construction activities employing material dredged from a contaminated offshore borrow site;
- *British* decoy sites were also constructed to deliberately cause incorrect targeting. For obvious reasons, such sites were often built in remote and uninhabited areas – few historical records concerning these sites are available.

WWII Bombing of *Greater Manchester*

Manchester's importance to the *British* war economy as an inland port, industrial centre, and aircraft manufacturer, meant the city and surrounding area represented a significant bombing target for the *Luftwaffe*. The first air raids occurred during August 1940 and continued until 1942.

The *Luftwaffe* bombing campaign of *Manchester* peaked between the 22nd and the 24th of December 1940 (the *Manchester,* or *Christmas, Blitz* as it was known) and involved over 400 aircraft delivering more than 460 tons of HE bombs and 37,000 IBs. Following this raid, approximately 65 warehouses, 200 business premises and 150 offices were destroyed or damaged with the *Manchester Cathedral*, the *Royal Exchange,* and the *Free Trade Hall* among the significant buildings damaged. An estimated 684 people were killed, and a further 2,364 people were injured.

WWII HE Bomb Density (*Figure 5*)

The Study Site was located within *Manchester County Borough,* which recorded six HE bombs per 100 hectares, a "very low" level of bombing.

WWII Luftwaffe Bombing Targets (*Figure 6*)

Prior to WWII, the *Luftwaffe* conducted numerous aerial photographic reconnaissance missions over *Britain*, recording key military, industrial and commercial targets for attack, in the event of war. In addition, logistics infrastructure and public services, such as railways, canals, power stations, reservoirs, water and gas works were also considered viable bombing targets.

Luftwaffe aerial reconnaissance photography did not identify the Study Site as a primary bombing target. Nonetheless, such targets were recorded in the Study Site's immediate vicinity and these were: *Whitworth Station Gas Works* (located 375m to the north-east of the Site), *Victoria University* (located 550m to the south-east) and *Victoria Station* (situated 685m to the north-west).

WWII HE Bomb Strikes (*Figure 7*)

During WWII, ARP wardens compiled detailed logs of bomb strikes across their respective districts. ARP records associated with the Study Site identified a single bomb strike on-site, which impacted in the south-west of the Study Site. In addition, a further four HE bomb strikes were recorded within the Site's immediate vicinity: 70m to the south-east, 125m to the south-west, 150m to the south-west and 190m to the south-south-east of the Study Site.

Furthermore, whilst IBs may have fallen within the Study Site, they were dropped in such large numbers that accurate record keeping was either non-existent or perfunctory. Nonetheless, numerous IB strikes were noted within 100m of the Study Site boundary: 15m to the north, 20m to the north-west, 25m to the north-west, 30m to the south, 85m to the south-west, 90m to the south-west, 95m to the west and 100m to the west.

In addition to IBs and HE bomb strikes, during the latter part of the war when aerial bombing had significantly declined, the main threat came from *V* type weapons. *V1* and *V2* rockets were thin-skinned, unmanned and inaccurate weapons. Despite this, there is no evidence to suggest that the Study Site (or its immediate vicinity) was subjected to rockets strikes during WWII.

The potential penetration depth of an UXB was dependent on a number of factors including but not restricted to those prior to striking the ground e.g. velocity and orientation of the UXB which in turn will be influenced on factors such as the release altitude from the aircraft and encounters with infrastructure during its fall; those encountered at the point of impact i.e. was the impact on concrete, grass, water etc. and finally, the below ground level conditions which were encountered such as infrastructure e.g. services, basements, foundations, and geology e.g. made ground, clay, sand, etc. Further, as the UXB penetrated the ground, it's velocity naturally slowed where, it either came to an abrupt stop e.g., against foundations or would continue for 10's of feet along a route of least resistance which often resulted in a curving of the trajectory back towards the surface. This is known as the "J Curve" effect and often resulted in a considerable horizontal off-set from the point of entry. This is often the reason why UXBs have been discovered against or under the foundations of buildings, which were present during WWII, or many meters from the point of impact.

WWII Bomb Damage (*Figure 8*)

An analysis of the official bomb damage mapping associated with the Study Site does not show any bomb damage within it, although numerous areas of bomb damage were documented nearby. The closest of these was 30m to the south within *Grovesnor Square*, with additional damage recorded 35m and 45m to the north-west on *Angle Street*. Additional areas of damage were recorded within the Site's vicinity and these are documented at *Figure 7.*

Abandoned Bombs

An examination of the official abandoned bomb records did not identify any abandoned bombs within 1,000m of the Study Site Boundary.

Records of WWII UXB Disposal Tasks

Civil defence records did not identify any UXB disposal tasks within *Manchester County Borough* from 1940-45, within 1,000m of the Study Site. However, it is known that these records are incomplete, some having been destroyed by *Luftwaffe* action during WWII.

Military Activity

There is no evidence to suggest that the Study Site has previously been occupied by military personnel. Therefore, it is considered unlikely that munitions were previously stored, located and/or fired from this Study Site during WWII.

WWII Site Use

The CS mapping prior to WWII (1938) shows that the Study Site was located within a densely developed urban area during WWII, and the Study Site itself consisted of a school and a paved roadway. Therefore, it is likely that footfall within the Study Site would have been relatively high throughout WWII. However, given that an HE bomb strike was recorded within the Site, combined with the recorded bomb damage in close proximity to the Study Site, it is possible that bomb damage debris may have concealed a UXB entry hole, causing it to have gone unnoticed.

Post-WWII UXO Encounters

An examination of the post-WWII BDO tasks associated with the Study Site has not identified any BDO operations within the Study Site itself, nor within 1,000m of the Study Site Boundary.

Sources of UXO Contamination

Given that a bomb strike was located on-site and that numerous bomb strikes were located in the immediate vicinity of the Study Site, the most likely source of UXO contamination is *German* aerially delivered ordnance, which ranges from small IBs through to large HE bombs (the latter forms the principal threat). Additional residual contamination may be present from *British* AAA projectiles (which were used to defend the UK against *German* bombing raids).

Post-WWII Study Site Development

Generally, the probability of encountering UXO in ground that has been disturbed since it may have been contaminated with UXO is considered to be remote (up to the depth below ground level previously disturbed by any intrusive works). Therefore, an understanding of the Study Site's previous development history is crucial when assessing the likelihood that UXO might be encountered at the Study Site.

Study Site Development History From an analysis of the CS and OS historical mapping associated with the Study Site, the following history can be deduced:	
Year	Analysis
1909 CS Map	The Study Site was located in a developed urban area and consisted of a roadway and multiple structures.
1923 CS Map	Several structures in the centre of the Site had been demolished and cleared, with a school constructed in their place.
1931-33 CS Map	Changes were not recorded at the Study Site.
1938 CS Map	Changes were not recorded at the Study Site.
1950-1951 OS Map	Changes were not recorded at the Study Site but there is evidence of the bomb damage experienced in the immediate vicinity.
1970 OS Map	Multiple residential structures and part of the roadway had been removed from the west of the Study Site.
1980-81 OS Map	The previous school building had been demolished and cleared from the centre of the Site. A university building had been constructed across the vast majority of the Study Site.
1985-87 OS Map	Changes were not recorded at the Study Site.
1993-94 OS Map	Changes were not recorded at the Study Site.
2003 Aerial Photography	Changes were not recorded at the Study Site.
2013 Aerial Photography	Changes were not recorded at the Study Site.
2023 Streetview Map	Changes were not recorded at the Study Site.

The Study Site history assessment is our best interpretation of the data available at the time of writing. Given that yearly revisions of neither CS and OS mapping, nor aerial photography, are available for analysis, there are gaps between the mapping revisions.

Consequently, it should not be assumed that any new structures and/or features that are labelled on a map revision were constructed, developed, installed or demolished in the exact year that the mapping illustrates the change. It is possible – and indeed likely – that the exact date of development occurred somewhere between the two closest mapping revisions. Specifically, this may be particularly relevant where there is a gap between pre- and post-WWII mapping, as it may not be clear whether structures were present during WWII or if they were constructed in the post-WWII period.

STAGE THREE – DATA ANALYSIS

Variable	Result	Comment
Was the area considered to be a primary bombing target during WWII?	✔	The closest documented bombing target was *Whitworth Station Gas Works* (located 375m to the north-east of the Site).
Was the Study Site or the immediate area bombed during WWII?	✔	ARP records identified one bomb strike on-site, with further bomb strikes documented in the wider area.
Did the Study Site or the immediate area experience bomb damage?	✔	Official bomb damage mapping recorded significant bomb damage in the area, the closest instance being 30m to the south within *Grovesnor Square*.
Would munitions have been manufactured, stored and/or fired from the Study Site previously?	✘	There is no evidence to suggest munitions were located or fired from this Study Site.
Was the ground undeveloped during WWII?	✘	The Study Site consisted of a school and a surfaced roadway.
Would the footfall have been high in the area?	✔	Given that a school was located on-site and residential housing in the immediate vicinity, it is likely that footfall would have been high.
Would a UXB entry hole have been observed during WWII?	✔	Given that an HE bomb strike was recorded on-site, with bomb damage documented in close proximity to the Site, it is possible that bomb damage debris may have concealed a UXB entry hole.
Has UXO been encountered previously at the Study Site?	✘	There have been no documented UXO encounters within 1,000m.
Have previous intrusive works removed the potential for UXO to be present?	✘	It is likely that any UXO within post-war disturbed and developed ground would potentially have been discovered and removed. However, the potential for a UXO encounter in areas of undisturbed ground remains extant.
Are proposed intrusive works likely to extend into previously undisturbed ground?	✔	The nature, locations and depths of the proposed works have not been communicated and therefore, *6 Alpha* must assume that they may to extend into previously undisturbed ground.
Is there potential for an unplanned encounter with UXO to occur during proposed intrusive works?	✔	Given that WWII bombing and bomb damage were recorded at the Study Site and/or nearby, it is considered possible for an unplanned encounter with UXO to occur.
Does the probability of a UXO encounter vary across the Study Site?	✔	The probability of encountering UXO within post-war disturbed and developed ground is considered to be remote. However, the probability of a UXO encounter within all previously undisturbed areas of the Study Site is extant.

N.B. The ✔ / ✘ symbology is intended to act only as a succinct visual indicator as to whether the data analysis has returned a positive (i.e., ✔) or negative (✘) answer to each question concerning the potential for UXO contamination at the Study Site.

STAGE FOUR – RISK ASSESSMENT

Threat Items

The most probable UXO threat items are *German* HE bombs, whilst IBs and *British* AAA projectiles pose a residual threat. The consequences of initiating *German* HE bombs are generally more severe than initiating IBs or AAA projectiles, and thus they pose the greatest prospective risk to intrusive works.

Bomb Penetration Depth

Considering the ground conditions (highlighted in Stage 1), the average BPD for a 250kg *German* HE bomb is assessed to be approximately 7m bgl, with the maximum BPD considered to be approximately 15m bgl. Although it is possible that the *Luftwaffe* deployed larger bombs in the area, their deployment was infrequent, and to use such larger (or the largest) bombs for BPD calculations are not justifiable on either technical or risk management grounds.

WWII *German* bombs have a greater penetration depth when compared to IBs and AAA projectiles, which are unlikely to be encountered at depths greater than 1m bgl. However, due to the "J Curve" and the potential for structures to impede the penetration into the ground, HE bombs have been discovered at much shallower depths than the average.

Risk Pathway

Given the types of UXO that might be present on-site, all types of aggressive intrusive engineering activities (i.e., investigative groundworks and construction methodologies) may generate a significant risk pathway. Whilst not all UXO encountered aggressively will initiate upon contact, such a discovery could lead to serious impact on the project especially in terms of critical injury to personnel, damage to equipment and project delay.

Prospective Consequences

Consequences of UXO initiation include:

1. Fatally injure personnel;
2. Severe damage to plant and equipment;
3. Deliver blast and fragmentation damage to nearby buildings;
4. Rupture and damage underground utilities/services.

Consequences of UXO discovery include:

1. Delay to the project and blight;
2. Disruption to local community/infrastructure;
3. The expenditure of additional risk mitigation resources and EOD clearance;
4. Incurring additional time and cost.

UXO RISK CALCULATION

Site Activities

Although there is some variation in the probability of encountering and initiating items of UXO when conducting different types of intrusive activities, a number of ground intrusive methodologies have been described for analysis at this Study Site. The consequences of initiating UXO vary greatly, depending upon, *inter alia* the mass of HE in the UXO and how aggressively it might be encountered. For this reason, *6 Alpha* has conducted separate risk rating calculations for each intrusive methodology that might be employed.

Risk Rating Calculation

6 Alpha's Semi-Quantitative Risk Assessment assesses and rates the risks posed by the most probable threat items when conducting a number of different activities on the site. UXO risk is determined by calculating the probability of encountering and initiating UXO and the consequences of an inadvertent UXO detonation.

UXO Risk Calculation Table – All Areas				
Activity	**UXO Threat Items**	**Probability (SH+EM=P)**	**Consequence (D+PSR=C)**	**UXO Risk (PxC=R)**
Trial Pits (within existing foundations, up to 2m bgl)	HE Bombs	1+2=3	3+3=6	3x6=18
	AAA Projectiles	1+2=3	3+1=4	3x4=12
	IBs	1+2=3	3+1=4	3x4=12
Window Sampling (up to 5m bgl)	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	1+3=4	3+1=4	4x4=16
	IBs	1+3=4	3+1=4	4x4=16
Boreholes (up to 30m bgl)	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	1+3=4	3+1=4	4x4=16
	IBs	1+3=4	3+1=4	4x4=16
Excavations	HE Bombs	2+2=4	3+3=6	4x6=24
	AAA Projectiles	1+2=3	3+1=4	3x4=12
	IBs	1+2=3	3+1=4	3x4=12
Trenching	HE Bombs	2+2=4	3+3=6	4x6=24
	AAA Projectiles	1+2=3	3+1=4	3x4=12
	IBs	1+2=3	3+1=4	3x4=12
Piling	HE Bombs	2+3=5	3+2=5	5x5=25
	AAA Projectiles	1+3=4	3+1=4	4x4=16
	IBs	1+3=4	3+1=4	4x4=16
Abbreviations – Site History (SH), Engineering Methodology (EM), Probability (P), Depth (D), Consequence (C), Proximity to Sensitive Receptors (PSR) and Risk Rating (RR).				

STAGE FIVE – RECOMMENDED RISK MITIGATION MEASURES

Do the ground conditions support a geophysical UXO survey?

Non-Intrusive Methods of Mitigation – Magnetometer results may be affected by ferro-magnetic contamination due to previous construction activities and made ground within the Study Site.

Intrusive Methods of Mitigation – Intrusive magnetometry may be effective on this Study Site, prior to boreholing and piling especially. However, any ferrous metal/red brick contamination in made ground/old foundations may affect the detection capability of the UXB survey equipment, as it passes through the contaminated layer especially. Nonetheless, beyond the contaminated strata such a survey should prove effective.

Mitigation Measures to Reduce Risk to 'ALARP'

Activity	Risk Mitigation Measures	Final Risk Rating
All Activities in All Areas	**1. Operational UXO Emergency Response Plan;** appropriate site management documentation should be held on-site to guide and plan for the actions which should be undertaken in the event of a suspected or real UXO discovery (this plan can be supplied by *6 Alpha*); **2. UXO Safety & Awareness Briefings;** the briefings are essential when there is a possibility of explosive ordnance encounter and are a vital part of the general safety requirement. All personnel working on the site should receive a briefing on the identification of a UXB, what actions they should take to keep people and equipment away from such a hazard and to alert site management. Information concerning the nature of the UXB threat should be held in the site office and displayed for general information on notice boards, both for reference and as a reminder for ground workers. The safety awareness briefing is an essential part of the *Health & Safety Plan* for the site and helps to evidence conformity with the principles laid down in the *CDM* regulations 2015 (this brief can be delivered directly, or in some cases remotely, by *6 Alpha*).	**ALARP**
Trial Pits within Existing Foundations up to 2m bgl	**3. On-Call Engineer;** An on-call EOD Engineer will be able to identify and/or advise on the appropriate course of action in the event of any suspicious and/or real UXO finds. 6 Alpha offer three tiers of immediate telephone and/or email response.	
Excavations and Trenching into Previously Undisturbed Ground	**4. EOD Engineer in the Watching Brief Role;** Where "open" intrusive works into previously undisturbed ground are proposed an EOD Engineer should be present in the UXO Watching Brief role to monitor ongoing "open" intrusive works to identify any suspicious items that may be UXB or UXO related (this service can be provided by *6 Alpha*).	
Window Sampling, Piling and Boreholing into Previously Undisturbed Ground	**5. Intrusive UXO Survey;** Where 'blind' intrusive works into previously undisturbed ground are proposed, an intrusive UXO survey (employing down-hole magnetometer or MagCone techniques) is strongly recommended. Such a survey should extend to the *assessed average bomb penetration depth* or to the maximum depth of the works, whichever is encountered first, or until geology is encountered through which it is assessed a UXB would not penetrate, to identify for signs of sub-surface anomalies which may model as the target UXO in advance of said works. (This service can be provided by *6 Alpha*).	

This assessment has been conducted partially based on the information provided by the Client, should the proposed works change then *6 Alpha* should be re-engaged to refine this risk assessment

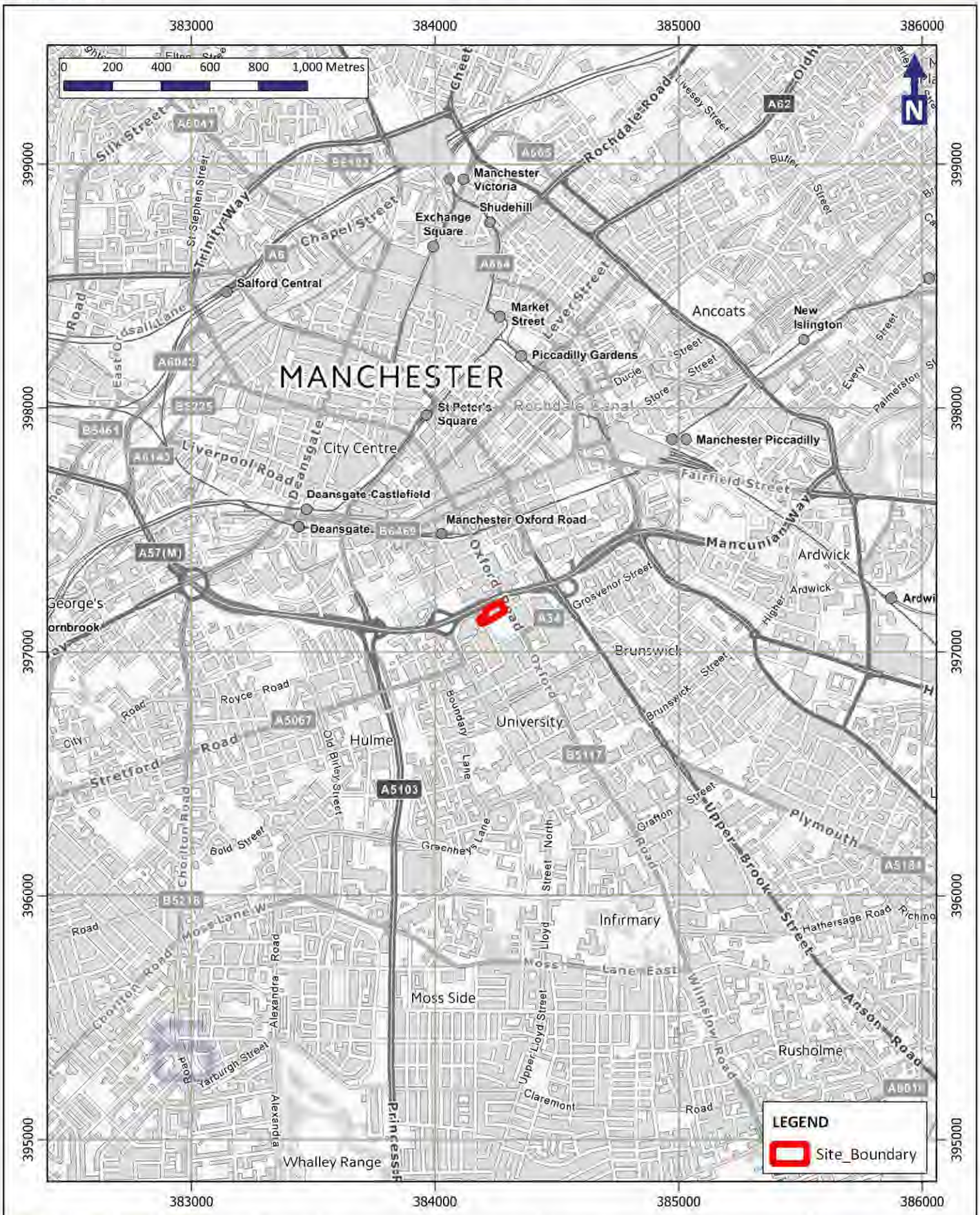
Report Figures

Figure One - Study Site Location

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Site Location

British National Grid



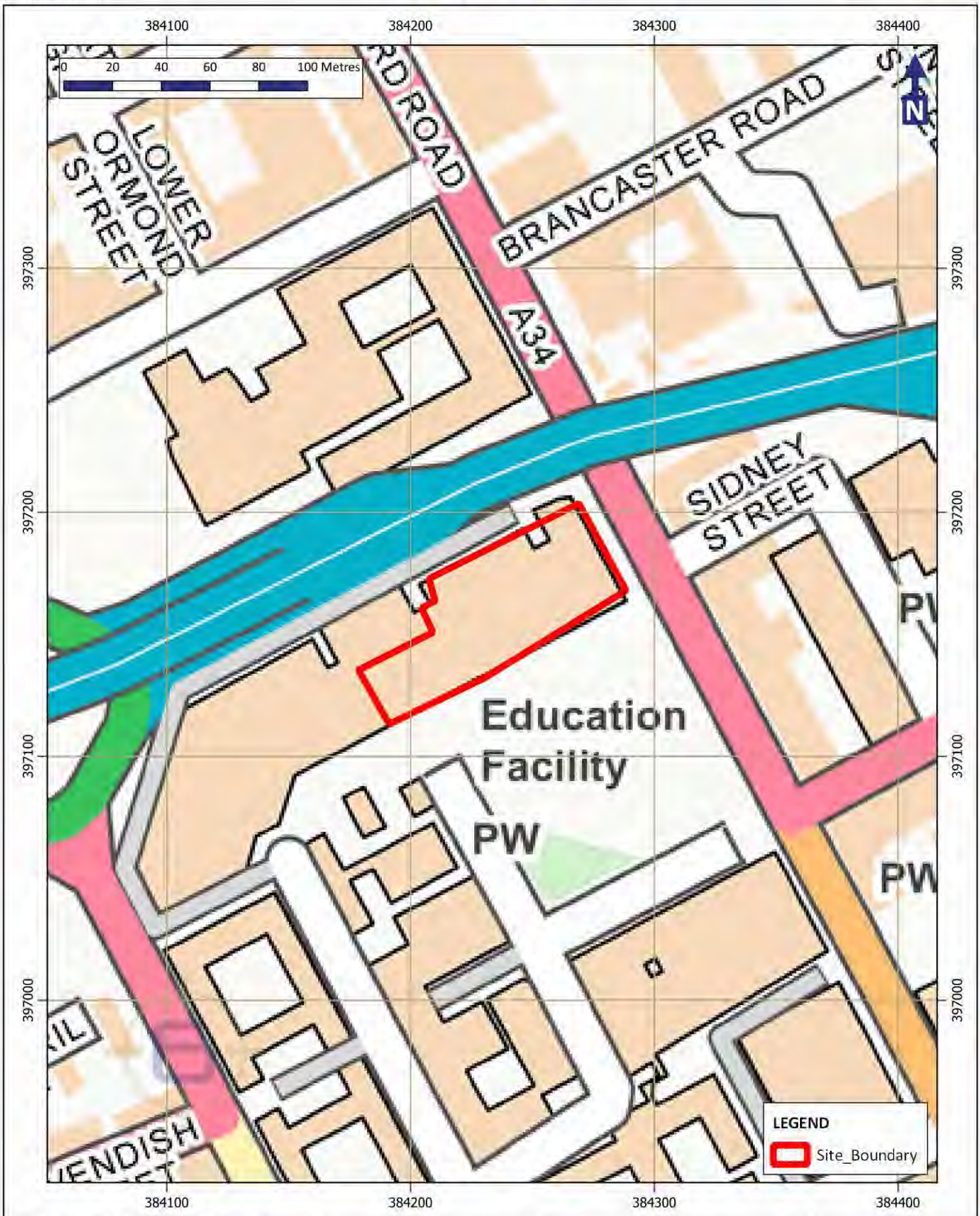
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Figure Two - Study Site Boundary

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Site Boundary

British National Grid



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Figure Three - Aerial Photography (2021)

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Aerial Photography (2021)

British National Grid



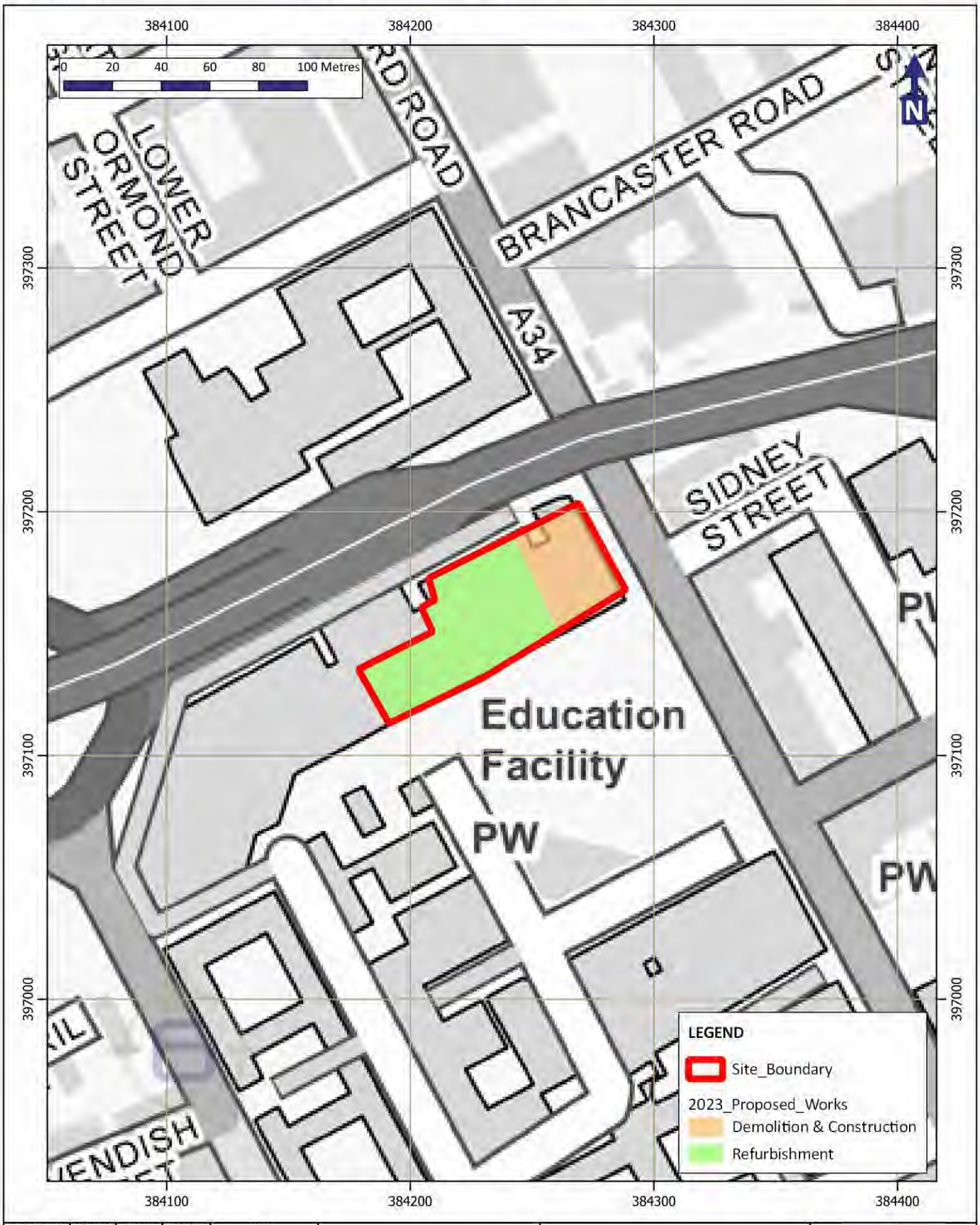
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Figure Four – 2023 Proposed Development Plans

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Proposed Development Plans

British National Grid



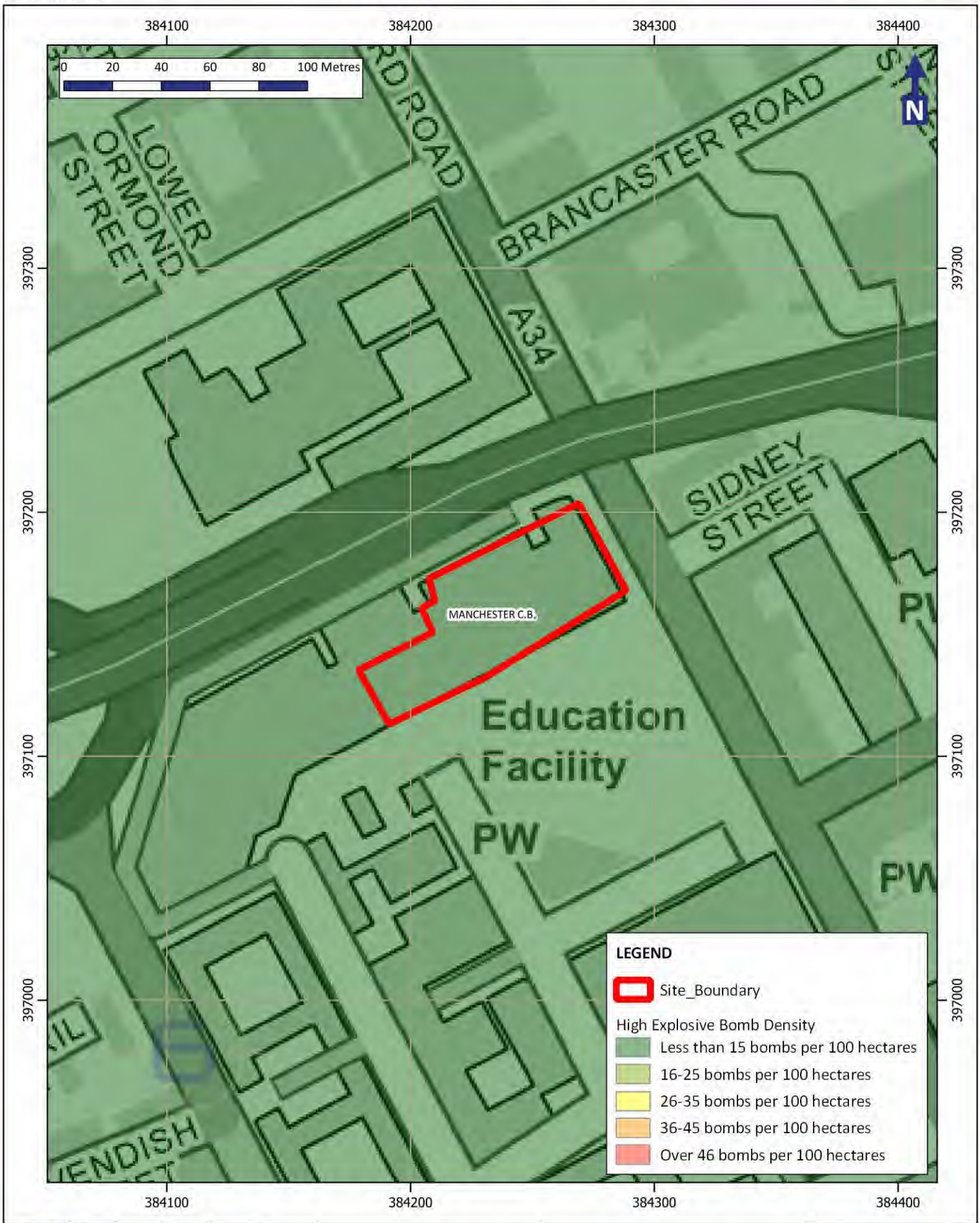
PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
10307	4	LG	BW	23/03/2023	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Figure Five - WWII High Explosive Bomb Density

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WWII High Explosive Bomb Density

British National Grid



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
10307	5	LH	LG	23/03/2023

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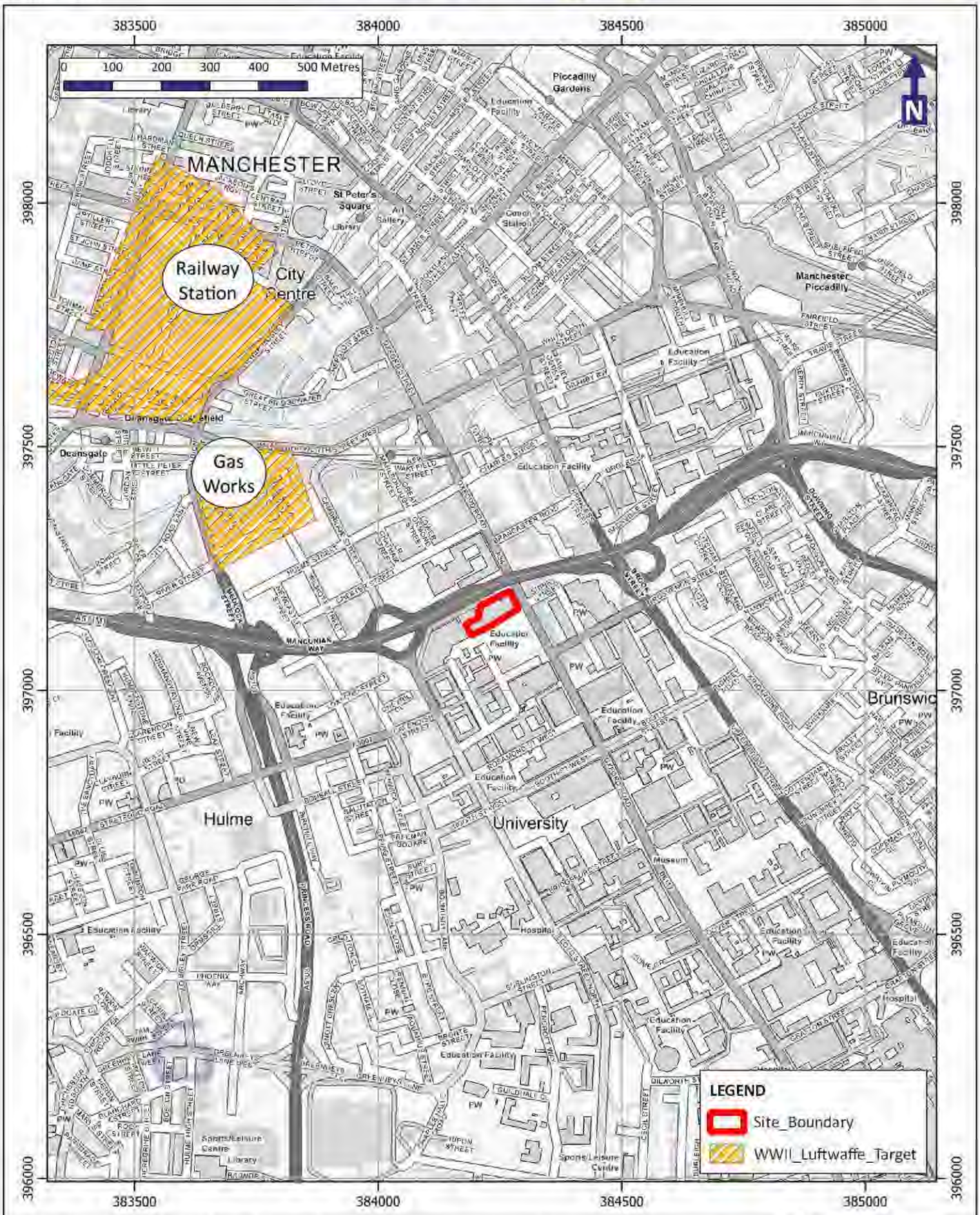
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Figure Six - WWII Luftwaffe Bombing Targets

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WWII Luftwaffe Bombing Targets

British National Grid



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
10307	6	LH	LG	23/03/2023	Contains Ordnance Survey data © Crown Copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha	alpha

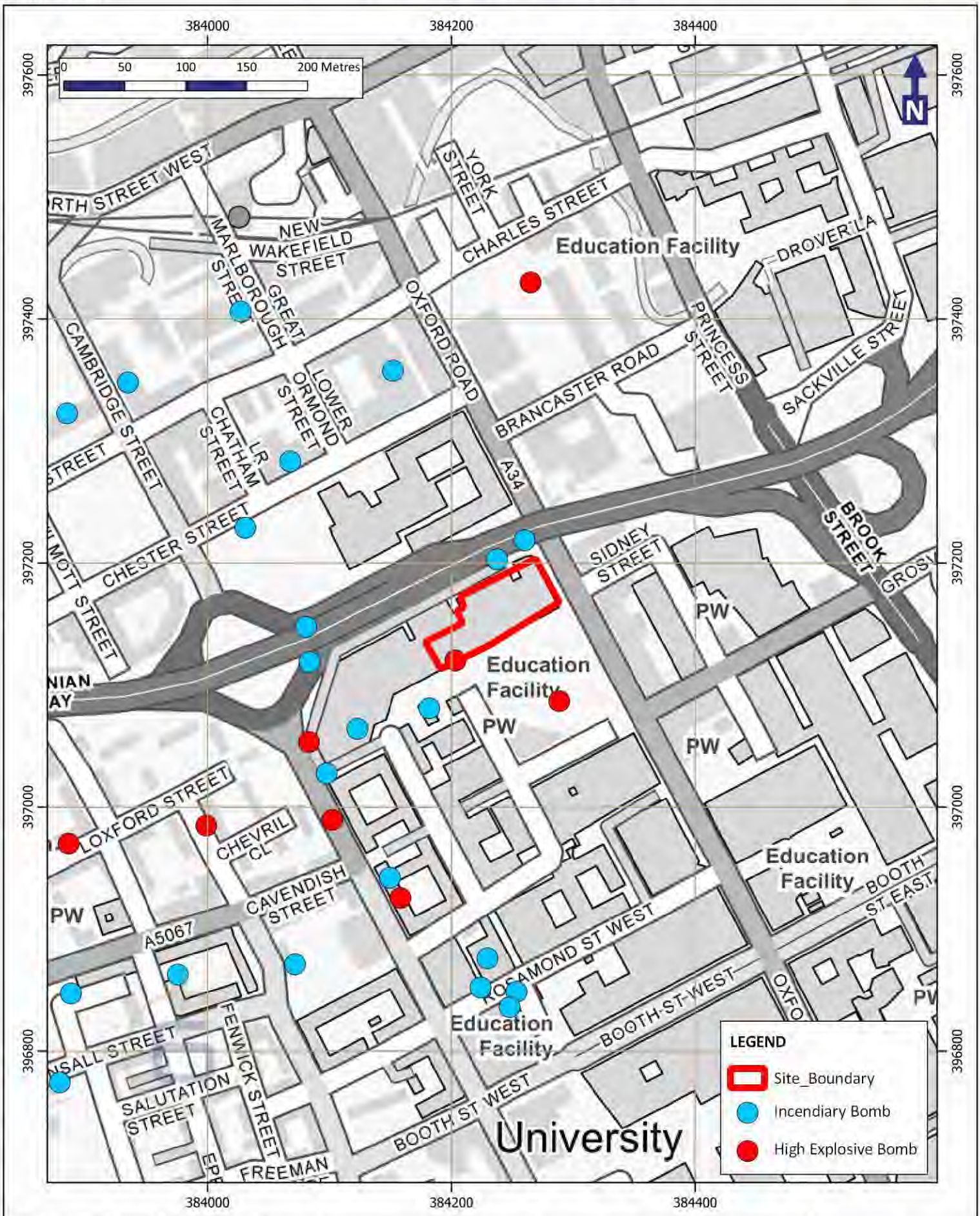
Figure Seven - WWII Consolidated Bomb Strikes

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WWII Consolidated Bomb Strikes

British National Grid

BOMB SEARCH



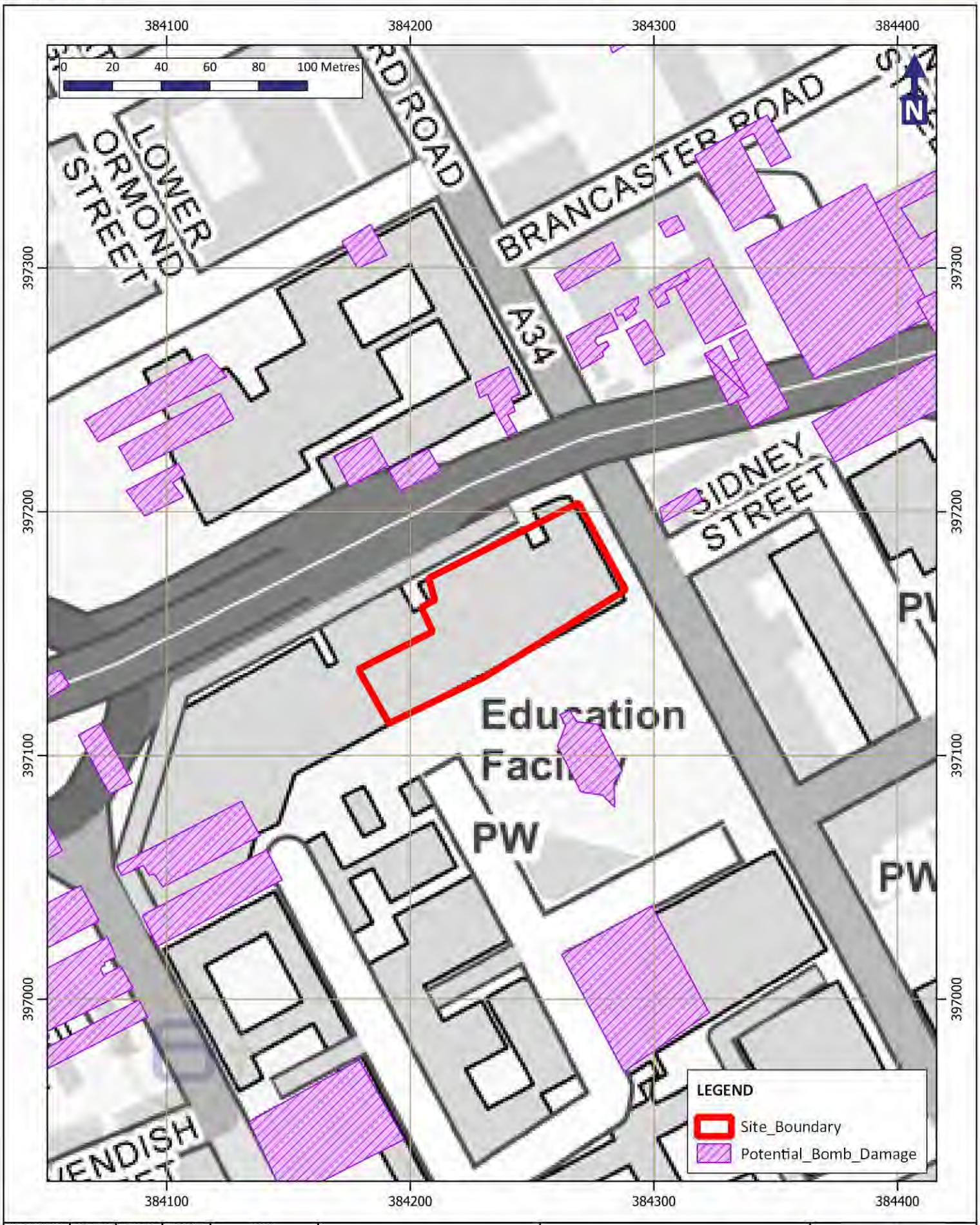
PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
10307	7	LG	BW	23/03/2023	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Figure Eight – Potential Bomb Damage

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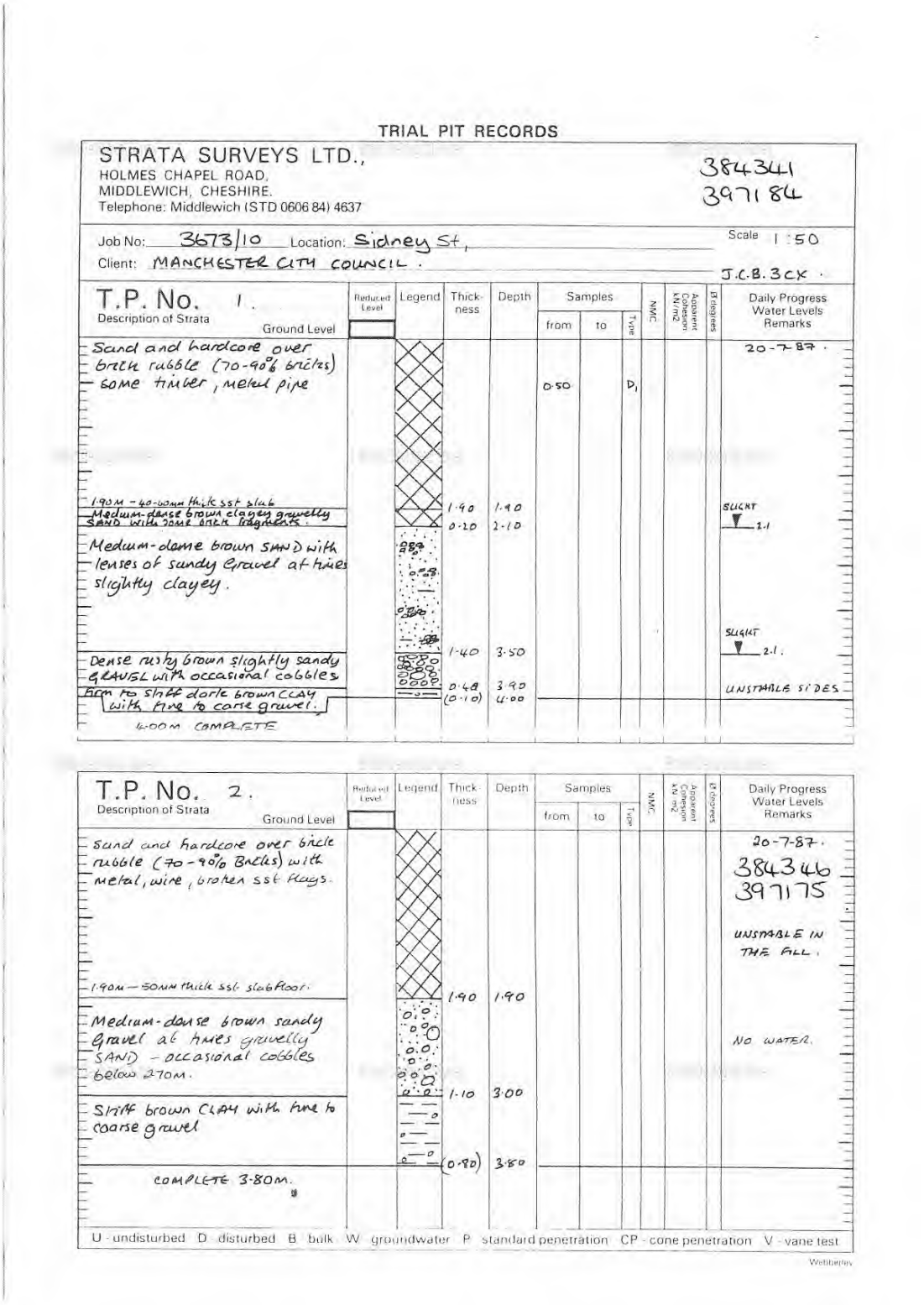
Potential Bomb Damage

British National Grid



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
10307	8	LH	LG	23/03/2023	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	alpha ASSOCIATES

Appendix B BGS Boreholes



TRIAL PIT RECORDS

STRATA SURVEYS LTD.,
HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE.
Telephone: Middlewich (STD 0606 84) 4637

384341
397184

Job No: 3673/10 Location: Sidney St, Scale 1:50
Client: MANCHESTER CITY COUNCIL. J.C.B. 3CX.

T.P. No. 1.
Description of Strata — Ground Level

Description of Strata	Reduced Level	Legend	Thickness	Depth	Samples from	Samples to	Samples Type	NMC	Apparent Cohesion kN/m2	Daily Progress Water Levels Remarks
Sand and hardcore over brick rubble (70-90% bricks) some timber, metal pipe					0.50		D			20-7-87.
1.90M - 40-60mm thick sst slab										
Medium-dense brown clayey gravelly SAND with some brick fragments.			1.90	1.90						SLIGHT 2.1
Medium-dense brown SAND with lenses of sandy gravel at times slightly clayey.			0.20	2.10						
			1.40	3.50						SLIGHT 2.1.
Dense rusty brown slightly sandy GRAVEL with occasional cobbles			0.40	3.90						UNSTABLE SIDES
firm to stiff dark brown CLAY with fine to coarse gravel.			(0.10)	4.00						
4.00M COMPLETE										

T.P. No. 2.
Description of Strata — Ground Level

Description of Strata	Reduced Level	Legend	Thickness	Depth	Samples from	Samples to	Samples Type	NMC	Apparent Cohesion kN/m2	Daily Progress Water Levels Remarks
Sand and hardcore over brick rubble (70-90% Bricks) with metal, wire, broken sst flags.										20-7-87. 384346 397175 UNSTABLE IN THE FILL.
1.90M - 50MM thick sst slab floor.			1.90	1.90						
Medium-dense brown sandy Gravel at times gravelly SAND - occasional cobbles below 2.70M.			1.10	3.00						NO WATER.
STIFF brown CLAY with fine to coarse gravel			(0.80)	3.80						
COMPLETE 3.80M.										

U - undisturbed D - disturbed B - bulk W - groundwater P - standard penetration CP - cone penetration V - vane test

Wellsprings

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TRIAL PIT RECORDS

STRATA SURVEYS LTD.,
HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE.
Telephone: Middlewich (STD 0606 84) 4637

384333
397180

Job No: 3673/10 Location: SIDNEY ST
Client: MANCHESTER CITY COUNCIL.
Scale 1:50
JCB 3CX.

T.P. No. 3.

Description of Strata	Reduced Level	Legend	Thickness	Depth	Samples from	Samples to	Samples Type	NMC	Apparent Cohesion kN/m2	Φ degrees	Daily Progress Water Levels Remarks
Ground Level											20.7.87.
Sand and hardcore over brick rubble (70-90% bricks) with some sandstone, timber, metal and ash.					0.50		D1				
Very loose black ashes, white ashes, linoleum, tiles and bricks. 1.40m - 50mm paint ssf slab floor - medium dense brown clayey sand with brick fill			1.60 0.20 0.20	1.60 1.80 2.10							UNSTABLE SIDES IN FILL MATERIAL.
Medium-dense to dense brown clayey silty gravelly SAND.			0.50	2.60							Brick foundations extend to 2.10m. buildings on Oxford Rd.
Medium-dense brown medium SAND with lenses of sandy GRAVEL.											SLOW 3.5
Dense rusty brown (wet) slightly sandy GRAVEL with cobbles			0.90	3.50	3.50		W1				
firm to stiff dark brown CLAY F-C Gravel			0.30 (0.20)	3.80 4.00	3.90		V1		350 kN/m2		
4.00m COMPLETE.											COHESION VALUE DERIVED BY MULTI- 1:340.

T.P. No. 4.

Description of Strata	Reduced Level	Legend	Thickness	Depth	Samples from	Samples to	Samples Type	NMC	Apparent Cohesion kN/m2	Φ degrees	Daily Progress Water Levels Remarks
Ground Level											20.7.87.
Sand and hardcore over brick rubble (70-90% bricks) with some timber, broken concrete and ash.											384338 397171
Slate covering SSI - slab floor 50-80mm thick			1.50	1.50							
Purple ASH.			0.15	1.65							
Soft brown sandy gravelly CLAY with ash and brick fragments. Cold drain encountered 2.20m) becomes less clayey			0.85	2.50							UNSTABLE SIDES IN ALL.
Medium-dense brown gravelly SAND			0.40	2.90							
Stiff dark brown CLAY. with fine to coarse gravel. - becomes slightly less stiff and slightly silty to silty at times					3.00		V1		121 115 118		NO WATER.
COMPLETE 4.00m.			(1.10)	4.00							

U - undisturbed D - disturbed B - bulk W - groundwater P - standard penetration CP - cone penetration V - vane test

Webberley

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Waterworks Engineers & Contractors

SJ89/262

BOREHOLE RECORD

British Geological Survey British Geological Survey British Geological Survey

Notification no.	080036
Location:	Manchester University, Lower Chatham Street
Stow No.	00095

Geological Classification	Description of Strata	Thickness (m)	Depth (m)
Sherwood Sandstone	Made ground	1	1
	Alluvial deposits	4	5
	Clay with sand horizons	2	7
	Soft red sand	21	28
	Sandstone, some marl	4	32
	Sandstone and grey clay	4	36
	Marl	1	37
	Gravel beds and marl	3.5	40.5
	Clay	5.5	46
	Clay and sandstone	26	72
	Rock/sandstone	5	77
	Sandstone	15	92

COMMENTS:-

British Geological Survey British Geological Survey British Geological Survey

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Appendix C Groundsure Report

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Groundsure
LOCATION INTELLIGENCE

Enviro+Geo Insight

ALL SAINTS CAMPUS, OXFORD ROAD, MANCHESTER, M15 6BH

Order Details

Date: 25/11/2022

Your ref: PO244532_MMU_Library

Our Ref: GS-9223729

Site Details

Location: 384240 397166

Area: 0.71 ha

Authority: Manchester City Council



Summary of findings p. 2

OS MasterMap site plan p.12

Aerial image p. 8

groundsure.com/insightuserguide

Contact us with any questions at:
info@groundsure.com
08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
13	1.1	Historical industrial land uses	0	1	13	80	-
17	1.2	Historical tanks	0	0	3	100	-
21	1.3	Historical energy features	0	0	3	39	-
23	1.4	Historical petrol stations	0	0	0	0	-
23	1.5	Historical garages	0	2	9	5	-
24	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
25	2.1	Historical industrial land uses	0	1	19	132	-
31	2.2	Historical tanks	0	0	10	174	-
38	2.3	Historical energy features	0	0	4	85	-
41	2.4	Historical petrol stations	0	0	0	0	-
42	2.5	Historical garages	0	3	30	15	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
44	3.1	Active or recent landfill	0	0	0	0	-
44	3.2	Historical landfill (BGS records)	0	0	0	0	-
45	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
45	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
45	3.5	Historical waste sites	0	0	5	0	-
46	3.6	Licensed waste sites	0	0	0	1	-
46	3.7	Waste exemptions	4	7	4	17	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
50	4.1	Recent industrial land uses	1	3	16	-	-
52	4.2	Current or recent petrol stations	0	0	1	0	-
52	4.3	Electricity cables	0	0	0	0	-
52	4.4	Gas pipelines	0	0	0	0	-
52	4.5	Sites determined as Contaminated Land	0	0	0	0	-

53	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
53	4.7	Regulated explosive sites	0	0	0	0	-
53	4.8	Hazardous substance storage/usage	0	0	0	0	-
53	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
53	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
54	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	0	0	2	-
54	**4.12**	**Radioactive Substance Authorisations**	0	0	6	8	-
56	**4.13**	**Licensed Discharges to controlled waters**	0	0	6	40	-
63	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
63	4.15	Pollutant release to public sewer	0	0	0	0	-
63	4.16	List 1 Dangerous Substances	0	0	0	0	-
63	4.17	List 2 Dangerous Substances	0	0	0	0	-
64	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	0	1	-
64	4.19	Pollution inventory substances	0	0	0	0	-
64	4.20	Pollution inventory waste transfers	0	0	0	0	-
64	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
65	**5.1**	**Superficial aquifer**	Identified (within 500m)				
67	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
69	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
70	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
70	5.5	Groundwater vulnerability- local information	None (within 0m)				
71	**5.6**	**Groundwater abstractions**	0	2	0	0	37
81	**5.7**	**Surface water abstractions**	0	0	0	0	2
82	5.8	Potable abstractions	0	0	0	0	0
82	**5.9**	**Source Protection Zones**	1	0	0	0	-
83	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
84	**6.1**	**Water Network (OS MasterMap)**	0	0	3	-	-

85	6.2	Surface water features	0	0	2	-	-
85	6.3	WFD Surface water body catchments	2	-	-	-	-
86	6.4	WFD Surface water bodies	0	0	1	-	-
86	6.5	WFD Groundwater bodies	1	-	-	-	-

Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
87	7.1	Risk of flooding from rivers and the sea	None (within 50m)				
87	7.2	Historical Flood Events	0	0	0	-	-
87	7.3	Flood Defences	0	0	0	-	-
88	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
88	7.5	Flood Storage Areas	0	0	0	-	-
89	7.6	Flood Zone 2	None (within 50m)				
89	7.7	Flood Zone 3	None (within 50m)				

Page	Section	Surface water flooding	
90	8.1	Surface water flooding	1 in 30 year, 0.1m - 0.3m (within 50m)

Page	Section	Groundwater flooding	
92	9.1	Groundwater flooding	Moderate (within 50m)

Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
93	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
93	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
93	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
93	10.4	Special Protection Areas (SPA)	0	0	0	0	0
94	10.5	National Nature Reserves (NNR)	0	0	0	0	0
94	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
94	10.7	Designated Ancient Woodland	0	0	0	0	0
94	10.8	Biosphere Reserves	0	0	0	0	0
95	10.9	Forest Parks	0	0	0	0	0
95	10.10	Marine Conservation Zones	0	0	0	0	0
95	10.11	Green Belt	0	0	0	0	0
95	10.12	Proposed Ramsar sites	0	0	0	0	0

95	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
96	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
96	10.15	Nitrate Sensitive Areas	0	0	0	0	0
96	**10.16**	**Nitrate Vulnerable Zones**	0	0	0	0	3
97	**10.17**	**SSSI Impact Risk Zones**	1	-	-	-	-
98	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
99	11.1	World Heritage Sites	0	0	0	-	-
100	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
100	11.3	National Parks	0	0	0	-	-
100	**11.4**	**Listed Buildings**	0	1	13	-	-
101	11.5	Conservation Areas	0	0	0	-	-
101	11.6	Scheduled Ancient Monuments	0	0	0	-	-
102	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
103	**12.1**	**Agricultural Land Classification**	Urban (within 250m)				
104	12.2	Open Access Land	0	0	0	-	-
104	12.3	Tree Felling Licences	0	0	0	-	-
104	12.4	Environmental Stewardship Schemes	0	0	0	-	-
104	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
105	13.1	Priority Habitat Inventory	0	0	0	-	-
105	13.2	Habitat Networks	0	0	0	-	-
105	13.3	Open Mosaic Habitat	0	0	0	-	-
105	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
106	**14.1**	**10k Availability**	Identified (within 500m)				
107	**14.2**	**Artificial and made ground (10k)**	0	1	1	1	-
108	**14.3**	**Superficial geology (10k)**	2	0	0	2	-

109	14.4	Landslip (10k)	0	0	0	0	-
110	14.5	Bedrock geology (10k)	2	0	0	0	-
111	14.6	Bedrock faults and other linear features (10k)	1	0	0	1	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
112	15.1	50k Availability	Identified (within 500m)				
113	15.2	Artificial and made ground (50k)	0	1	0	0	-
114	15.3	Artificial ground permeability (50k)	0	1	-	-	-
115	15.4	Superficial geology (50k)	2	0	0	2	-
116	15.5	Superficial permeability (50k)	Identified (within 50m)				
116	15.6	Landslip (50k)	0	0	0	0	-
116	15.7	Landslip permeability (50k)	None (within 50m)				
117	15.8	Bedrock geology (50k)	2	0	0	0	-
118	15.9	Bedrock permeability (50k)	Identified (within 50m)				
118	15.10	Bedrock faults and other linear features (50k)	1	0	0	1	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
119	16.1	BGS Boreholes	1	5	86	-	-
Page	Section	Natural ground subsidence					
124	17.1	Shrink swell clays	Very low (within 50m)				
125	17.2	Running sands	Very low (within 50m)				
126	17.3	Compressible deposits	Very low (within 50m)				
128	17.4	Collapsible deposits	Very low (within 50m)				
129	17.5	Landslides	Very low (within 50m)				
130	17.6	Ground dissolution of soluble rocks	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
132	18.1	Natural cavities	0	0	0	0	-
133	18.2	BritPits	0	0	0	0	-
133	18.3	Surface ground workings	0	0	0	-	-
133	18.4	Underground workings	0	0	0	0	0
133	18.5	Historical Mineral Planning Areas	0	0	0	0	-

133	18.6	Non-coal mining	0	0	0	0	0
134	**18.7**	**Mining cavities**	0	0	0	0	1
134	**18.8**	**JPB mining areas**	Identified (within 0m)				
135	**18.9**	**Coal mining**	Identified (within 0m)				
135	18.10	Brine areas	None (within 0m)				
135	18.11	Gypsum areas	None (within 0m)				
135	18.12	Tin mining	None (within 0m)				
135	18.13	Clay mining	None (within 0m)				

Page	Section	Radon					
136	**19.1**	**Radon**	Less than 1% (within 0m)				

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
137	**20.1**	**BGS Estimated Background Soil Chemistry**	3	0	-	-	-
137	**20.2**	**BGS Estimated Urban Soil Chemistry**	4	4	-	-	-
138	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
139	21.1	Underground railways (London)	0	0	0	-	-
139	21.2	Underground railways (Non-London)	0	0	0	-	-
139	21.3	Railway tunnels	0	0	0	-	-
139	21.4	Historical railway and tunnel features	0	0	0	-	-
139	21.5	Royal Mail tunnels	0	0	0	-	-
140	21.6	Historical railways	0	0	0	-	-
140	21.7	Railways	0	0	0	-	-
140	21.8	Crossrail 1	0	0	0	0	-
140	21.9	Crossrail 2	0	0	0	0	-
140	21.10	HS2	0	0	0	0	-

Recent aerial photograph



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2022. All Rights Reserved.

Capture Date: 22/04/2019

Site Area: 0.71ha

Recent site history - 2015 aerial photograph



Aerial photography supplied by Getmapping PLC. © Copyright Getmapping PLC 2022. All Rights Reserved.

Capture Date: 11/06/2015

Site Area: 0.71ha

Recent site history - 2009 aerial photograph



Capture Date: 02/06/2009

Site Area: 0.71ha

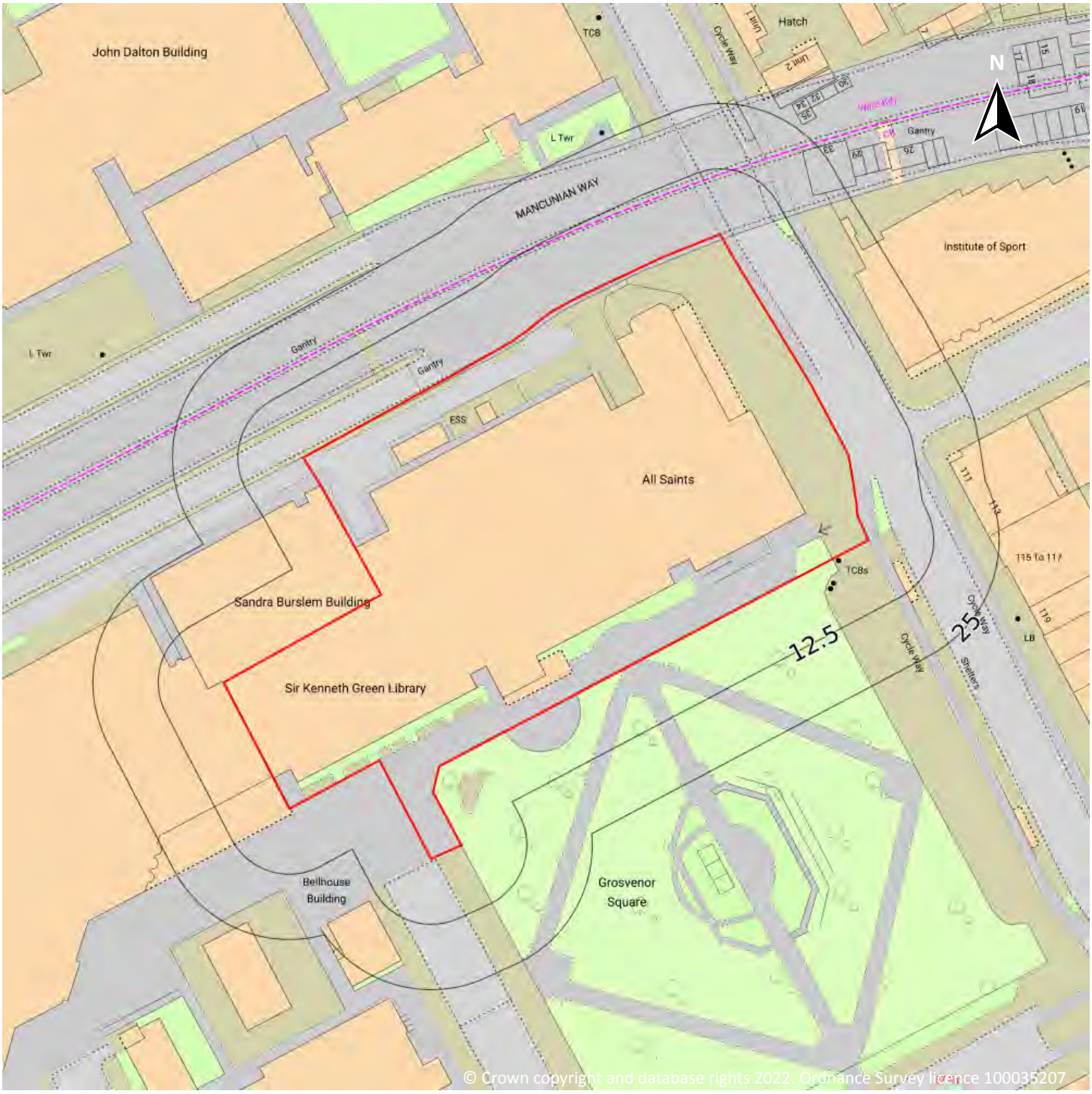
Recent site history - 2000 aerial photograph



Capture Date: 19/06/2000

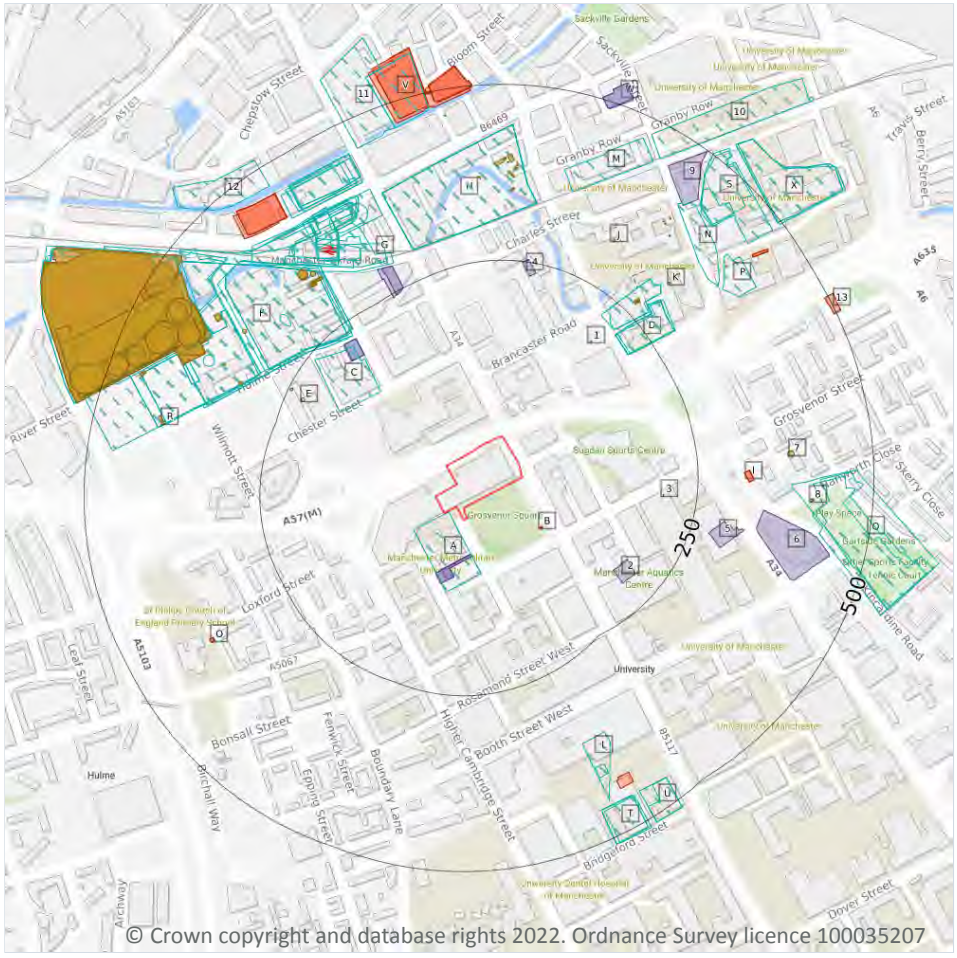
Site Area: 0.71ha

OS MasterMap site plan



Site Area: 0.71ha

1 Past land use



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1.1 Historical industrial land uses

Records within 500m	94

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
A	1m SW	Hospital	1971	834385

ID	Location	Land use	Dates present	Group ID
C	141m NW	Unspecified Mills	1916 - 1923	874195
D	213m NE	Unspecified Mills	1890	858454
D	213m NE	Unspecified Mills	1915	960133
D	213m NE	Unspecified Mills	1934 - 1938	967294
D	216m NE	Unspecified Mills	1923	975952
D	219m NE	Unspecified Works	1923	932223
D	220m NE	Unspecified Works	1915	929652
F	228m NW	Rubber Works	1916	915281
F	229m NW	Rubber Works	1923 - 1938	926915
F	233m NW	Unspecified Commercial/Industrial	1905	944072
F	233m NW	Unspecified Commercial/Industrial	1896	857423
F	236m NW	Unspecified Works	1985 - 1994	862878
F	236m NW	Unspecified Works	1978	976366
F	288m N	Railway Sidings	1905 - 1938	864885
H	292m N	Unspecified Mills	1916	861845
H	292m N	Unspecified Commercial/Industrial	1923	874542
H	292m N	Unspecified Commercial/Industrial	1905	968335
H	292m N	Unspecified Mills	1932 - 1938	989884
F	295m NW	Railway Sidings	1985 - 1994	928139
F	295m NW	Unspecified Works	1978	865006
F	295m NW	Unspecified Works	1985 - 1994	927569
F	296m NW	Rubber Works	1956	849382
F	298m NW	Unspecified Commercial/Industrial	1851 - 1896	849974
F	298m NW	Unspecified Tanks	1851	815405
F	311m NW	Railway Station	1905 - 1938	962635
F	313m NW	Railway Station	1956	923967
F	324m NW	Railway Station	1896	887032
F	329m NW	Railway Station	1971	960776

ID	Location	Land use	Dates present	Group ID
F	329m NW	Railway Station	1985	962611
F	329m NW	Railway Station	1978	981767
F	332m NW	Unspecified Tank	1896	825247
F	334m NW	Railway Station	1988 - 1994	912150
F	356m NW	Gas Works	1851	802208
F	359m NW	Tanks	1851	832185
L	360m SE	Unspecified Works	1916	830418
M	361m N	Unspecified Commercial/Industrial	1923	796719
F	361m NW	Unspecified Tank	1851	825246
N	368m NE	Unspecified Works	1915 - 1923	951103
P	376m NE	Unspecified Works	1915 - 1923	972915
F	376m NW	Railway Sidings	1896	989778
Q	382m E	Cemetery	1851	948454
F	382m NW	Unspecified Commercial/Industrial	1956	976686
F	387m NW	Unspecified Commercial/Industrial	1932 - 1938	872530
F	387m NW	Gas Works	1905 - 1923	927583
F	387m NW	Railway Building	1956	820261
F	388m NW	Gas Works	1985	894760
F	388m NW	Gas Works	1978	953907
F	389m NW	Unspecified Works	1971	976313
F	389m NW	Unspecified Tank	1851	987864
F	393m NW	Unspecified Tanks	1896	952761
F	393m NW	Unspecified Tanks	1956	991069
F	397m NW	Gasometer	1905 - 1923	889070
F	397m NW	Unspecified Tank	1932 - 1938	961454
L	399m S	Police Station	1971	832593
F	410m NW	Hospital	1923	848326
F	410m NW	Hospital	1916	938342

ID	Location	Land use	Dates present	Group ID
F	414m NW	Coal Wharf	1851	794097
Q	414m E	Cemetery	1890 - 1938	877404
F	414m NW	Hospital	1932 - 1938	949847
F	416m NW	Hospital	1956 - 1971	915521
F	416m NW	Hospital	1978	957282
F	418m NW	Gasometer	1978	909770
F	418m NW	Gasometer	1985	937412
F	418m NW	Unspecified Tank	1971	953873
S	422m NE	Iron Works	1890	822793
S	423m NE	Unspecified Works	1915 - 1923	954702
S	424m NE	Railway Sidings	1915 - 1923	959198
Q	424m E	Cemetery	1956	980504
F	427m NW	Unspecified Tank	1932 - 1938	893786
F	427m NW	Gasometer	1905 - 1923	961140
F	427m NW	Gasometer	1905 - 1923	856404
F	427m NW	Unspecified Tank	1932 - 1938	943763
10	453m NE	Unspecified Commercial/Industrial	1923	796723
F	456m W	Unspecified Tank	1932 - 1938	864386
F	456m W	Gasometer	1905 - 1923	911162
T	457m S	Corporation Yard	1915	882266
T	457m S	Corporation Yard	1934 - 1938	891984
11	457m N	Unspecified Commercial/Industrial	1923	796724
U	458m SE	Hospital	1934 - 1938	988396
T	459m SE	Corporation Yard	1923	894742
U	461m SE	Hospital	1915	978354
V	464m N	Electricity Station	1916 - 1923	992043
F	469m NW	Unspecified Works	1978	921026
12	471m NW	Corporation Yard	1905 - 1938	920120

ID	Location	Land use	Dates present	Group ID
F	472m NW	Unspecified Tank	1851	825227
F	473m W	Unspecified Tanks	1956	927953
F	480m W	Gasometer	1905 - 1923	967050
F	480m W	Unspecified Tank	1932 - 1938	989404
X	495m NE	Unspecified Mills	1934 - 1938	854159
X	495m NE	Unspecified Mills	1915	967472
X	496m NE	Unspecified Mills	1923	914258
F	499m W	Gasometer	1978	910445
F	499m W	Unspecified Tank	1971	973500

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**103**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
1	183m NE	Unspecified Tank	1891	115782
E	222m NW	Unspecified Tank	1948 - 1985	122344
E	244m NW	Unspecified Tank	1922	115781
D	266m NE	Unspecified Tank	1948	137703
D	267m NE	Unspecified Tank	1955	144222
D	267m NE	Tanks	1962 - 1969	129099
D	267m NE	Unspecified Tank	1950 - 1953	134156
G	313m NW	Unspecified Tank	1953	136354
G	313m NW	Unspecified Tank	1955	136262

ID	Location	Land use	Dates present	Group ID
F	313m W	Unspecified Tank	1893 - 1922	143428
F	317m NW	Unspecified Tank	1948 - 1953	135406
F	317m NW	Unspecified Tank	1955	123253
F	317m NW	Tanks	1950	106780
J	318m NE	Unspecified Tank	1891	115940
F	319m NW	Unspecified Tank	1955	135180
F	319m NW	Tanks	1953	106778
F	319m NW	Unspecified Tank	1948 - 1953	141893
K	321m NE	Tanks	1891	106779
F	321m NW	Unspecified Tank	1948 - 1953	145471
F	321m NW	Unspecified Tank	1955	135178
F	329m NW	Unspecified Tank	1922	115957
F	333m NW	Gasometer	1891 - 1908	131372
F	334m NW	Unspecified Tank	1893	115950
J	336m NE	Unspecified Tank	1891	115941
K	338m NE	Unspecified Tank	1891	115939
F	342m NW	Unspecified Tank	1893 - 1922	122317
F	345m NW	Unspecified Tank	1908	115778
H	347m N	Tanks	1891	106787
H	367m N	Tanks	1891	106782
H	368m N	Tanks	1891	106786
N	370m NE	Unspecified Tank	1891	115943
H	371m N	Unspecified Tank	1891	115958
F	378m NW	Gas Works	1922	148353
F	378m NW	Gas Works	1893 - 1908	148771
F	378m NW	Gas Works	1891	138194
7	379m E	Unspecified Tank	1954	115780
H	379m N	Unspecified Tank	1891	115948

ID	Location	Land use	Dates present	Group ID
N	380m NE	Unspecified Tank	1891	115945
N	381m NE	Unspecified Tank	1891	115942
F	381m NW	Unspecified Tank	1980 - 1990	133041
H	382m N	Unspecified Tank	1891	115959
F	382m NW	Gas Works	1948	138071
F	382m NW	Unspecified Tank	1969 - 1998	138462
H	384m N	Unspecified Tank	1891	115960
M	384m N	Unspecified Tank	1891	115946
H	385m N	Unspecified Tank	1891 - 1893	141146
F	387m NW	Unspecified Tank	1891 - 1893	137941
H	388m N	Unspecified Tank	1891	115961
H	389m N	Unspecified Tank	1891	115947
F	389m NW	Unspecified Tank	1987 - 1990	144099
N	390m NE	Unspecified Tank	1891	115944
H	390m N	Unspecified Tank	1891	115949
H	390m N	Unspecified Tank	1891	115962
F	390m NW	Disused Gas Holder Station	1985	108346
F	390m NW	Gas Holder Station	1980	144973
F	391m NW	Unspecified Tank	1969	140316
F	391m NW	Unspecified Tank	1963 - 1979	129031
F	391m NW	Gasometer	1948	144835
F	392m NW	Unspecified Tank	1953	128601
H	392m N	Tanks	1891	106792
H	393m N	Unspecified Tank	1893	115963
F	394m NW	Tanks	1932	107129
F	394m NW	Gasometers	1908 - 1922	124662
F	395m NW	Gasometer	1891 - 1893	138622
R	398m W	Unspecified Tank	1980 - 1985	135450

ID	Location	Land use	Dates present	Group ID
P	398m NE	Unspecified Tank	1889 - 1908	134036
R	401m W	Unspecified Tank	1948 - 1979	133333
8	410m E	Unspecified Tank	1948 - 1955	136552
F	421m NW	Unspecified Tank	1963 - 1979	138510
F	421m NW	Gasometer	1948	142120
F	421m NW	Gas Holder	1980 - 1985	125516
F	422m NW	Unspecified Tank	1953	134836
F	422m NW	Gasometer	1893 - 1969	136753
F	423m NW	Gasometer	1948	135973
F	423m NW	Unspecified Tank	1963 - 1979	148209
F	423m NW	Unspecified Tank	1953	127502
F	425m NW	Gasometer	1891	124584
F	426m NW	Gasometer	1891 - 1893	128004
F	428m NW	Unspecified Tank	1953 - 1985	147415
F	428m NW	Gasometer	1969	108524
F	430m NW	Unspecified Tank	1893	123594
F	441m W	Unspecified Tank	1893	125584
F	445m W	Gasometer	1891	108523
F	447m W	Unspecified Tank	1998	124573
F	449m W	Unspecified Tank	1948 - 1990	148192
F	455m W	Gasometer	1893	138389
F	455m W	Gasometer	1891	126443
V	462m N	Unspecified Tank	1891	115964
F	464m W	Unspecified Tank	1953 - 1985	140482
F	468m NW	Unspecified Tank	1891	133313
F	469m W	Unspecified Tank	1891 - 1893	143653
F	471m NW	Unspecified Tank	1891	115951
F	473m W	Unspecified Tank	1963 - 1979	128106

ID	Location	Land use	Dates present	Group ID
F	473m W	Gasometer	1893 - 1948	135717
F	475m NW	Unspecified Tank	1979	115952
F	475m NW	Tanks	1948	147005
F	475m W	Unspecified Tank	1953	136419
F	475m NW	Tanks	1953 - 1969	129358
F	476m NW	Unspecified Tank	1948 - 1979	131914
F	477m NW	Tanks	1979	106781
F	482m W	Unspecified Tank	1953 - 1979	147656
F	486m W	Unspecified Tank	1893	147070
F	486m NW	Tanks	1948 - 1979	124597

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	**42**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
B	75m SE	Electricity Substation	1990	62181
B	77m SE	Electricity Substation	1995 - 1998	84357
3	201m E	Electricity Substation	1987	62178
I	316m E	Electricity Substation	1984 - 1998	82529
I	316m E	Electricity Substation	1948 - 1970	67698
F	333m NW	Gasometer	1891 - 1908	84082
O	373m SW	Electricity Substation	1973 - 1997	85389
O	374m SW	Electricity Substation	1972	80664

ID	Location	Land use	Dates present	Group ID
F	378m NW	Gas Works	1893 - 1908	79545
F	378m NW	Gas Works	1922	81689
F	378m NW	Gas Works	1891	72601
F	382m NW	Gas Works	1948	66529
F	390m NW	Disused Gas Holder Station	1985	59539
F	390m NW	Gas Holder Station	1980	77508
F	391m NW	Gasometer	1948	64845
F	394m NW	Gasometers	1908 - 1922	65853
F	395m NW	Gasometer	1891 - 1893	71826
F	420m NW	Electricity Substation	1948 - 1999	65682
F	420m NW	Hydraulic Power Station	1932	78003
F	420m NW	Hydraulic Power Station	1948 - 1979	64692
F	421m NW	Hydraulic Power Station	1948 - 1973	64396
F	421m NW	Gasometer	1948	71445
F	421m NW	Gas Holder	1980 - 1985	70318
F	422m NW	Gasometer	1893 - 1969	68062
F	423m NW	Gasometer	1948	78274
F	425m NW	Gasometer	1891	67026
F	426m NW	Gasometer	1891 - 1893	80269
L	426m SE	Electricity Substation	1948 - 1951	84116
F	428m NW	Gasometer	1969	59717
P	437m NE	Electricity Substation	1970 - 1984	85141
P	438m NE	Electricity Substation	1968 - 1998	81695
F	445m W	Gasometer	1891	59716
F	455m W	Gasometer	1893	75823
F	455m W	Gasometer	1891	71699
F	467m W	Electricity Substation	1998	62182
V	469m N	Electricity Station	1908 - 1922	81883

ID	Location	Land use	Dates present	Group ID
F	473m W	Gasometer	1893 - 1948	65525
V	474m N	Electricity Station	1950 - 1955	66381
V	474m N	Electricity Station	1948	73425
V	483m N	Electricity Station	1955	77896
V	484m N	Electricity Station	1950	68267
13	495m NE	Electricity Substation	1968 - 1998	85157

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	**0**

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	**16**

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
A	49m S	Garage	1948	23136
A	50m S	Garage	1955	26713
A	50m S	Garage	1965	27197
A	62m S	Garage	1953	22930
A	63m S	Garage	1962	22634

ID	Location	Land use	Dates present	Group ID
2	185m SE	Garage	1962 - 1965	27390
C	196m NW	Garage	1962 - 1987	25909
C	197m NW	Garage	1968	21471
4	231m N	Garage	1948 - 1955	24945
G	244m NW	Garage	1948 - 1998	27861
G	245m NW	Garage	1955 - 1990	26377
5	277m E	Garage	1954	20302
6	341m E	Garage	1984 - 1998	27289
9	417m NE	Garage	1952 - 1955	26338
W	490m N	Garage	1948 - 1968	26993
W	490m N	Garage	1985 - 1990	27728

This data is sourced from Ordnance Survey / Groundsure.

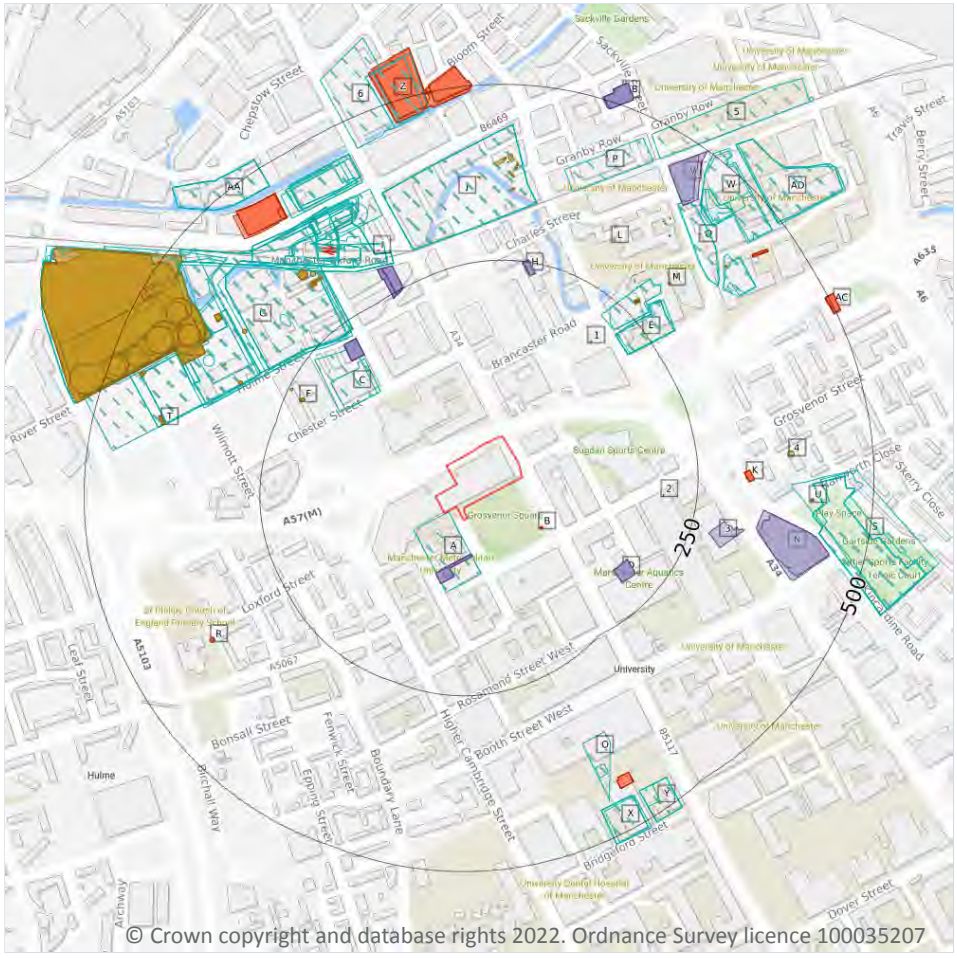
1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

2.1 Historical industrial land uses

Records within 500m	152

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
A	1m SW	Hospital	1971	834385
C	141m NW	Unspecified Mills	1916	874195
C	142m NW	Unspecified Mills	1923	874195

ID	Location	Land Use	Date	Group ID
E	213m NE	Unspecified Mills	1938	967294
E	213m NE	Unspecified Mills	1934	967294
E	213m NE	Unspecified Mills	1915	960133
E	213m NE	Unspecified Mills	1890	858454
E	216m NE	Unspecified Mills	1923	975952
E	219m NE	Unspecified Works	1923	932223
E	220m NE	Unspecified Works	1915	929652
G	228m NW	Rubber Works	1916	915281
G	229m NW	Rubber Works	1923	926915
G	233m NW	Rubber Works	1938	926915
G	233m NW	Rubber Works	1932	926915
G	233m NW	Unspecified Commercial/Industrial	1905	944072
G	233m NW	Unspecified Commercial/Industrial	1896	857423
G	236m NW	Unspecified Works	1988	862878
G	236m NW	Unspecified Works	1978	976366
G	236m NW	Unspecified Works	1985	862878
G	236m NW	Unspecified Works	1994	862878
G	288m N	Railway Sidings	1938	864885
G	288m N	Railway Sidings	1932	864885
G	288m N	Railway Sidings	1916	864885
G	288m N	Railway Sidings	1905	864885
G	288m N	Railway Sidings	1923	864885
J	292m N	Unspecified Mills	1938	989884
J	292m N	Unspecified Mills	1932	989884
J	292m N	Unspecified Mills	1916	861845
J	292m N	Unspecified Commercial/Industrial	1905	968335
J	292m N	Unspecified Commercial/Industrial	1923	874542
G	295m NW	Railway Sidings	1988	928139

ID	Location	Land Use	Date	Group ID
G	295m NW	Railway Sidings	1985	928139
G	295m NW	Railway Sidings	1994	928139
G	295m NW	Unspecified Works	1988	927569
G	295m NW	Unspecified Works	1978	865006
G	295m NW	Unspecified Works	1985	927569
G	295m NW	Unspecified Works	1994	927569
G	296m NW	Rubber Works	1956	849382
G	298m NW	Unspecified Commercial/Industrial	1896	849974
G	298m NW	Unspecified Tanks	1851	815405
G	310m NW	Unspecified Commercial/Industrial	1851	849974
G	311m NW	Railway Station	1938	962635
G	311m NW	Railway Station	1932	962635
G	311m NW	Railway Station	1916	962635
G	311m NW	Railway Station	1905	962635
G	311m NW	Railway Station	1923	962635
G	313m NW	Railway Station	1956	923967
G	324m NW	Railway Station	1896	887032
G	329m NW	Railway Station	1971	960776
G	329m NW	Railway Station	1978	981767
G	329m NW	Railway Station	1985	962611
G	332m NW	Unspecified Tank	1896	825247
G	334m NW	Railway Station	1988	912150
G	334m NW	Railway Station	1994	912150
G	356m NW	Gas Works	1851	802208
G	359m NW	Tanks	1851	832185
O	360m SE	Unspecified Works	1916	830418
P	361m N	Unspecified Commercial/Industrial	1923	796719
G	361m NW	Unspecified Tank	1851	825246

ID	Location	Land Use	Date	Group ID
Q	368m NE	Unspecified Works	1915	951103
Q	369m NE	Unspecified Works	1923	951103
Q	376m NE	Unspecified Works	1923	972915
G	376m NW	Railway Sidings	1896	989778
Q	378m NE	Unspecified Works	1915	972915
S	382m E	Cemetery	1851	948454
G	382m NW	Unspecified Commercial/Industrial	1956	976686
G	387m NW	Unspecified Commercial/Industrial	1938	872530
G	387m NW	Unspecified Commercial/Industrial	1932	872530
G	387m NW	Gas Works	1916	927583
G	387m NW	Gas Works	1905	927583
G	387m NW	Gas Works	1923	927583
G	387m NW	Railway Building	1956	820261
G	388m NW	Gas Works	1978	953907
G	388m NW	Gas Works	1985	894760
G	389m NW	Unspecified Works	1971	976313
G	389m NW	Unspecified Tank	1851	987864
G	393m NW	Unspecified Tanks	1896	952761
G	393m NW	Unspecified Tanks	1956	991069
G	397m NW	Gasometer	1916	889070
G	397m NW	Gasometer	1905	889070
G	397m NW	Unspecified Tank	1938	961454
G	397m NW	Unspecified Tank	1932	961454
G	397m NW	Gasometer	1923	889070
O	399m S	Police Station	1971	832593
G	410m NW	Hospital	1923	848326
G	410m NW	Hospital	1916	938342
G	414m NW	Coal Wharf	1851	794097

ID	Location	Land Use	Date	Group ID
S	414m E	Cemetery	1923	877404
S	414m E	Cemetery	1938	877404
S	414m E	Cemetery	1934	877404
S	414m E	Cemetery	1915	877404
S	414m E	Cemetery	1905	877404
S	414m E	Cemetery	1890	877404
G	414m NW	Hospital	1938	949847
G	414m NW	Hospital	1932	949847
G	416m NW	Hospital	1971	915521
G	416m NW	Hospital	1956	915521
G	416m NW	Hospital	1978	957282
G	418m NW	Unspecified Tank	1971	953873
G	418m NW	Gasometer	1978	909770
G	418m NW	Gasometer	1985	937412
W	422m NE	Iron Works	1890	822793
W	423m NE	Unspecified Works	1915	954702
W	424m NE	Unspecified Works	1923	954702
W	424m NE	Railway Sidings	1923	959198
S	424m E	Cemetery	1956	980504
G	427m NW	Gasometer	1916	961140
G	427m NW	Gasometer	1905	961140
G	427m NW	Unspecified Tank	1938	893786
G	427m NW	Unspecified Tank	1932	893786
G	427m NW	Gasometer	1923	961140
G	427m NW	Gasometer	1916	856404
G	427m NW	Gasometer	1905	856404
G	427m NW	Unspecified Tank	1938	943763
G	427m NW	Unspecified Tank	1932	943763

ID	Location	Land Use	Date	Group ID
G	427m NW	Gasometer	1923	856404
W	428m NE	Railway Sidings	1915	959198
5	453m NE	Unspecified Commercial/Industrial	1923	796723
G	456m W	Gasometer	1916	911162
G	456m W	Gasometer	1905	911162
G	456m W	Unspecified Tank	1938	864386
G	456m W	Unspecified Tank	1932	864386
G	456m W	Gasometer	1923	911162
X	457m S	Corporation Yard	1938	891984
X	457m S	Corporation Yard	1934	891984
X	457m S	Corporation Yard	1915	882266
6	457m N	Unspecified Commercial/Industrial	1923	796724
Y	458m SE	Hospital	1938	988396
Y	458m SE	Hospital	1934	988396
X	459m SE	Corporation Yard	1923	894742
Y	461m SE	Hospital	1915	978354
Z	464m N	Electricity Station	1923	992043
Z	467m N	Electricity Station	1916	992043
G	469m NW	Unspecified Works	1978	921026
AA	471m NW	Corporation Yard	1938	920120
AA	471m NW	Corporation Yard	1932	920120
AA	471m NW	Corporation Yard	1916	920120
AA	471m NW	Corporation Yard	1905	920120
AA	471m NW	Corporation Yard	1923	920120
G	472m NW	Unspecified Tank	1851	825227
G	473m W	Unspecified Tanks	1956	927953
G	480m W	Gasometer	1916	967050
G	480m W	Gasometer	1905	967050

ID	Location	Land Use	Date	Group ID
G	480m W	Unspecified Tank	1938	989404
G	480m W	Unspecified Tank	1932	989404
G	480m W	Gasometer	1923	967050
AD	495m NE	Unspecified Mills	1938	854159
AD	495m NE	Unspecified Mills	1934	854159
AD	495m NE	Unspecified Mills	1915	967472
AD	496m NE	Unspecified Mills	1923	914258
G	499m W	Unspecified Tank	1971	973500
G	499m W	Gasometer	1978	910445

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**184**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
1	183m NE	Unspecified Tank	1891	115782
F	222m NW	Unspecified Tank	1979	122344
F	222m NW	Unspecified Tank	1963	122344
F	222m NW	Unspecified Tank	1948	122344
F	222m NW	Unspecified Tank	1969	122344
F	222m NW	Unspecified Tank	1953	122344
F	223m NW	Unspecified Tank	1980	122344
F	223m NW	Unspecified Tank	1980	122344
F	223m NW	Unspecified Tank	1985	122344
F	244m NW	Unspecified Tank	1922	115781
E	266m NE	Unspecified Tank	1948	137703

ID	Location	Land Use	Date	Group ID
E	267m NE	Unspecified Tank	1955	144222
E	267m NE	Unspecified Tank	1955	144222
E	267m NE	Tanks	1969	129099
E	267m NE	Tanks	1962	129099
E	267m NE	Tanks	1968	129099
E	267m NE	Unspecified Tank	1950	134156
E	268m NE	Unspecified Tank	1953	134156
I	313m NW	Unspecified Tank	1953	136354
I	313m NW	Unspecified Tank	1955	136262
G	313m W	Unspecified Tank	1893	143428
G	313m W	Unspecified Tank	1922	143428
G	317m NW	Unspecified Tank	1953	135406
G	317m NW	Unspecified Tank	1955	123253
G	317m NW	Tanks	1950	106780
G	317m NW	Unspecified Tank	1948	135406
L	318m NE	Unspecified Tank	1891	115940
G	319m NW	Unspecified Tank	1955	135180
G	319m NW	Tanks	1953	106778
G	319m NW	Unspecified Tank	1953	141893
G	320m NW	Unspecified Tank	1948	141893
M	321m NE	Tanks	1891	106779
G	321m NW	Unspecified Tank	1953	145471
G	321m NW	Unspecified Tank	1955	135178
G	321m NW	Unspecified Tank	1955	135178
G	321m NW	Unspecified Tank	1948	145471
G	329m NW	Unspecified Tank	1922	115957
G	333m NW	Gasometer	1908	131372
G	333m NW	Gasometer	1891	131372

ID	Location	Land Use	Date	Group ID
G	334m NW	Unspecified Tank	1893	115950
L	336m NE	Unspecified Tank	1891	115941
M	338m NE	Unspecified Tank	1891	115939
G	342m NW	Unspecified Tank	1893	122317
G	342m NW	Unspecified Tank	1922	122317
G	345m NW	Unspecified Tank	1908	115778
J	347m N	Tanks	1891	106787
J	367m N	Tanks	1891	106782
J	368m N	Tanks	1891	106786
Q	370m NE	Unspecified Tank	1891	115943
J	371m N	Unspecified Tank	1891	115958
G	378m NW	Gas Works	1893	148771
G	378m NW	Gas Works	1922	148353
G	378m NW	Gas Works	1891	138194
4	379m E	Unspecified Tank	1954	115780
J	379m N	Unspecified Tank	1891	115948
Q	380m NE	Unspecified Tank	1891	115945
Q	381m NE	Unspecified Tank	1891	115942
G	381m NW	Unspecified Tank	1980	133041
G	381m NW	Unspecified Tank	1980	133041
G	381m NW	Unspecified Tank	1985	133041
G	381m NW	Unspecified Tank	1987	133041
G	381m NW	Unspecified Tank	1987	133041
G	381m NW	Unspecified Tank	1990	133041
J	382m N	Unspecified Tank	1891	115959
G	382m NW	Gas Works	1948	138071
G	382m NW	Unspecified Tank	1969	138462
G	382m NW	Unspecified Tank	1998	138462

ID	Location	Land Use	Date	Group ID
J	384m N	Unspecified Tank	1891	115960
G	384m NW	Gas Works	1908	148771
P	384m N	Unspecified Tank	1891	115946
J	385m N	Unspecified Tank	1893	141146
J	385m N	Unspecified Tank	1891	141146
G	387m NW	Unspecified Tank	1893	137941
G	388m NW	Unspecified Tank	1891	137941
J	388m N	Unspecified Tank	1891	115961
J	389m N	Unspecified Tank	1891	115947
G	389m NW	Unspecified Tank	1987	144099
G	389m NW	Unspecified Tank	1987	144099
G	389m NW	Unspecified Tank	1990	144099
Q	390m NE	Unspecified Tank	1891	115944
J	390m N	Unspecified Tank	1891	115949
J	390m N	Unspecified Tank	1891	115962
G	390m NW	Gas Holder Station	1980	144973
G	390m NW	Gas Holder Station	1980	144973
G	390m NW	Disused Gas Holder Station	1985	108346
G	391m NW	Unspecified Tank	1969	140316
G	391m NW	Unspecified Tank	1979	129031
G	391m NW	Unspecified Tank	1963	129031
G	391m NW	Gasometer	1948	144835
G	392m NW	Unspecified Tank	1953	128601
J	392m N	Tanks	1891	106792
J	393m N	Unspecified Tank	1893	115963
G	394m NW	Gasometers	1908	124662
G	394m NW	Gasometers	1922	124662
G	394m NW	Tanks	1932	107129

ID	Location	Land Use	Date	Group ID
G	395m NW	Gasometer	1893	138622
G	396m NW	Gasometer	1891	138622
T	398m W	Unspecified Tank	1980	135450
T	398m W	Unspecified Tank	1980	135450
T	398m W	Unspecified Tank	1985	135450
Q	398m NE	Unspecified Tank	1889	134036
Q	398m NE	Unspecified Tank	1908	134036
Q	398m NE	Unspecified Tank	1889	134036
T	401m W	Unspecified Tank	1979	133333
T	401m W	Unspecified Tank	1948	133333
T	401m W	Unspecified Tank	1969	133333
T	401m W	Unspecified Tank	1953	133333
U	410m E	Unspecified Tank	1954	136552
U	410m E	Unspecified Tank	1948	136552
U	411m E	Unspecified Tank	1955	136552
U	411m E	Unspecified Tank	1955	136552
U	411m E	Unspecified Tank	1950	136552
G	421m NW	Unspecified Tank	1979	138510
G	421m NW	Unspecified Tank	1963	138510
G	421m NW	Gasometer	1948	142120
G	421m NW	Gas Holder	1980	125516
G	421m NW	Gas Holder	1980	125516
G	421m NW	Gas Holder	1985	125516
G	422m NW	Gasometer	1969	136753
G	422m NW	Unspecified Tank	1953	134836
G	423m NW	Unspecified Tank	1979	148209
G	423m NW	Unspecified Tank	1963	148209
G	423m NW	Gasometer	1948	135973

ID	Location	Land Use	Date	Group ID
G	423m NW	Unspecified Tank	1953	127502
G	425m NW	Gasometer	1891	124584
G	426m NW	Gasometer	1891	128004
G	427m NW	Gasometer	1893	136753
G	427m NW	Gasometer	1893	128004
G	428m NW	Unspecified Tank	1980	147415
G	428m NW	Unspecified Tank	1985	147415
G	428m NW	Unspecified Tank	1979	147415
G	428m NW	Unspecified Tank	1963	147415
G	428m NW	Gasometer	1969	108524
G	428m NW	Unspecified Tank	1953	147415
G	430m NW	Unspecified Tank	1893	123594
G	441m W	Unspecified Tank	1893	125584
G	445m W	Gasometer	1891	108523
G	447m W	Unspecified Tank	1998	124573
G	449m W	Unspecified Tank	1980	148192
G	449m W	Unspecified Tank	1985	148192
G	449m W	Unspecified Tank	1987	148192
G	449m W	Unspecified Tank	1987	148192
G	449m W	Unspecified Tank	1990	148192
G	449m W	Unspecified Tank	1979	148192
G	449m W	Unspecified Tank	1948	148192
G	450m W	Unspecified Tank	1969	148192
G	450m W	Unspecified Tank	1953	148192
G	455m W	Gasometer	1893	138389
G	455m W	Gasometer	1891	126443
Z	462m N	Unspecified Tank	1891	115964
G	464m W	Unspecified Tank	1980	140482

ID	Location	Land Use	Date	Group ID
G	464m W	Unspecified Tank	1980	140482
G	464m W	Unspecified Tank	1985	140482
G	465m W	Unspecified Tank	1969	140482
G	465m W	Unspecified Tank	1953	140482
G	465m W	Unspecified Tank	1979	140482
G	465m W	Unspecified Tank	1963	140482
G	468m NW	Unspecified Tank	1891	133313
G	469m W	Unspecified Tank	1891	143653
G	469m W	Unspecified Tank	1893	143653
G	471m NW	Unspecified Tank	1891	115951
G	473m W	Unspecified Tank	1979	128106
G	473m W	Unspecified Tank	1963	128106
G	473m W	Gasometer	1948	135717
G	475m NW	Unspecified Tank	1979	115952
G	475m NW	Tanks	1948	147005
G	475m W	Unspecified Tank	1953	136419
G	475m NW	Tanks	1969	129358
G	475m NW	Tanks	1953	129358
G	476m NW	Unspecified Tank	1979	131914
G	476m NW	Unspecified Tank	1963	131914
G	476m NW	Unspecified Tank	1948	131914
G	476m W	Gasometer	1893	135717
G	476m NW	Unspecified Tank	1969	131914
G	476m NW	Unspecified Tank	1953	131914
G	477m NW	Tanks	1979	106781
G	482m W	Unspecified Tank	1953	147656
G	482m W	Unspecified Tank	1979	147656
G	482m W	Unspecified Tank	1963	147656

ID	Location	Land Use	Date	Group ID
G	486m W	Unspecified Tank	1893	147070
G	486m NW	Tanks	1969	124597
G	486m NW	Tanks	1953	124597
G	486m NW	Tanks	1979	124597
G	486m NW	Tanks	1948	124597

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**89**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
B	75m SE	Electricity Substation	1990	62181
B	77m SE	Electricity Substation	1995	84357
B	77m SE	Electricity Substation	1998	84357
2	201m E	Electricity Substation	1987	62178
K	316m E	Electricity Substation	1984	82529
K	316m E	Electricity Substation	1998	82529
K	316m E	Electricity Substation	1954	67698
K	316m E	Electricity Substation	1970	67698
K	316m E	Electricity Substation	1970	67698
K	316m E	Electricity Substation	1970	67698
K	316m E	Electricity Substation	1948	67698
K	316m E	Electricity Substation	1955	67698
K	316m E	Electricity Substation	1968	67698
K	316m E	Electricity Substation	1950	67698
K	316m E	Electricity Substation	1955	67698

ID	Location	Land Use	Date	Group ID
G	333m NW	Gasometer	1908	84082
G	333m NW	Gasometer	1891	84082
R	373m SW	Electricity Substation	1995	85389
R	373m SW	Electricity Substation	1997	85389
R	373m SW	Electricity Substation	1973	85389
R	374m SW	Electricity Substation	1972	80664
G	378m NW	Gas Works	1893	79545
G	378m NW	Gas Works	1922	81689
G	378m NW	Gas Works	1891	72601
G	382m NW	Gas Works	1948	66529
G	384m NW	Gas Works	1908	79545
G	390m NW	Gas Holder Station	1980	77508
G	390m NW	Gas Holder Station	1980	77508
G	390m NW	Disused Gas Holder Station	1985	59539
G	391m NW	Gasometer	1948	64845
G	394m NW	Gasometers	1908	65853
G	394m NW	Gasometers	1922	65853
G	395m NW	Gasometer	1893	71826
G	396m NW	Gasometer	1891	71826
G	420m NW	Electricity Substation	1996	65682
G	420m NW	Electricity Substation	1995	65682
G	420m NW	Electricity Substation	1994	65682
G	420m NW	Electricity Substation	1999	65682
G	420m NW	Hydraulic Power Station	1932	78003
G	420m NW	Hydraulic Power Station	1979	64692
G	420m NW	Electricity Substation	1979	65682
G	420m NW	Hydraulic Power Station	1948	64692
G	421m NW	Hydraulic Power Station	1951	64396

ID	Location	Land Use	Date	Group ID
G	421m NW	Electricity Substation	1951	65682
G	421m NW	Electricity Substation	1988	65682
G	421m NW	Hydraulic Power Station	1973	64396
G	421m NW	Electricity Substation	1973	65682
G	421m NW	Electricity Substation	1948	65682
G	421m NW	Hydraulic Power Station	1948	64396
G	421m NW	Gasometer	1948	71445
G	421m NW	Gas Holder	1980	70318
G	421m NW	Gas Holder	1980	70318
G	421m NW	Gas Holder	1985	70318
G	421m NW	Electricity Substation	1985	65682
G	422m NW	Gasometer	1969	68062
G	423m NW	Gasometer	1948	78274
G	425m NW	Gasometer	1891	67026
G	426m NW	Gasometer	1891	80269
O	426m SE	Electricity Substation	1948	84116
O	426m SE	Electricity Substation	1951	84116
O	427m SE	Electricity Substation	1949	84116
G	427m NW	Gasometer	1893	68062
G	427m NW	Gasometer	1893	80269
G	428m NW	Gasometer	1969	59717
Q	437m NE	Electricity Substation	1984	85141
Q	438m NE	Electricity Substation	1998	81695
Q	438m NE	Electricity Substation	1970	85141
Q	438m NE	Electricity Substation	1970	85141
Q	438m NE	Electricity Substation	1970	85141
Q	439m NE	Electricity Substation	1968	81695
G	445m W	Gasometer	1891	59716

ID	Location	Land Use	Date	Group ID
G	455m W	Gasometer	1893	75823
G	455m W	Gasometer	1891	71699
G	467m W	Electricity Substation	1998	62182
Z	469m N	Electricity Station	1922	81883
Z	471m N	Electricity Station	1908	81883
G	473m W	Gasometer	1948	65525
Z	474m N	Electricity Station	1955	66381
Z	474m N	Electricity Station	1948	73425
Z	474m N	Electricity Station	1950	66381
G	476m W	Gasometer	1893	65525
Z	483m N	Electricity Station	1955	77896
Z	484m N	Electricity Station	1950	68267
AC	495m NE	Electricity Substation	1984	85157
AC	495m NE	Electricity Substation	1998	85157
AC	496m NE	Electricity Substation	1968	85157
AC	496m NE	Electricity Substation	1970	85157
AC	496m NE	Electricity Substation	1970	85157
AC	496m NE	Electricity Substation	1970	85157

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	**0**

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	**48**

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
A	49m S	Garage	1948	23136
A	50m S	Garage	1955	26713
A	50m S	Garage	1955	26713
A	50m S	Garage	1965	27197
A	50m S	Garage	1965	27197
A	62m S	Garage	1953	22930
A	63m S	Garage	1962	22634
D	185m SE	Garage	1965	27390
D	185m SE	Garage	1965	27390
D	186m SE	Garage	1962	27390
C	196m NW	Garage	1985	25909
C	197m NW	Garage	1987	25909
C	197m NW	Garage	1969	25909
C	197m NW	Garage	1962	25909
C	197m NW	Garage	1965	25909
C	197m NW	Garage	1965	25909
C	197m NW	Garage	1968	21471
H	231m N	Garage	1948	24945
H	231m N	Garage	1953	24945
H	231m N	Garage	1955	24945
I	244m NW	Garage	1987	27861
I	244m NW	Garage	1969	27861
I	244m NW	Garage	1948	27861

ID	Location	Land Use	Date	Group ID
I	244m NW	Garage	1953	27861
I	244m NW	Garage	1962	27861
I	244m NW	Garage	1995	27861
I	244m NW	Garage	1998	27861
I	245m NW	Garage	1990	26377
I	245m NW	Garage	1985	26377
I	247m NW	Garage	1965	26377
I	247m NW	Garage	1965	26377
I	247m NW	Garage	1968	26377
I	247m NW	Garage	1955	26377
3	277m E	Garage	1954	20302
N	341m E	Garage	1998	27289
N	344m E	Garage	1984	27289
V	417m NE	Garage	1955	26338
V	419m NE	Garage	1952	26338
AB	490m N	Garage	1965	26993
AB	490m N	Garage	1965	26993
AB	490m N	Garage	1964	26993
AB	490m N	Garage	1948	26993
AB	490m N	Garage	1990	27728
AB	490m N	Garage	1990	27728
AB	490m N	Garage	1985	27728
AB	491m N	Garage	1955	26993
AB	491m N	Garage	1968	26993
AB	491m N	Garage	1950	26993

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	0

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	5

Waste site records derived from Local Authority planning records and high detail historical mapping.

Features are displayed on the Waste and landfill map on **page 44**

ID	Location	Address	Further Details	Date
D	197m NW	Site Address: N/A	Type of Site: Waste Paper Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1948
D	201m NW	Site Address: N/A	Type of Site: Waste Paper Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1953
D	201m NW	Site Address: N/A	Type of Site: Waste Paper Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1932

ID	Location	Address	Further Details	Date
D	201m NW	Site Address: N/A	Type of Site: Waste Paper Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1932
D	205m NW	Site Address: N/A	Type of Site: Waste Paper Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1953

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	**1**

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

Features are displayed on the Waste and landfill map on **page 44**

ID	Location	Details		
4	277m NW	Site Name: Terra Vac (uk) Ltd Site Address: Little Ireland Phase B, Great Marlborough Street, Manchester, M1 5NN Correspondence Address: Unit 7a, Whitwood Enterprise Park, Castleford, WF10 5PX	Type of Site: Mobile Plant Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: TER003 EPR reference: - Operator: Terra Vac (uk) Ltd Waste Management licence No: 50191 Annual Tonnage: 0	Issue Date: 17/06/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	**32**

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 44**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	**On site**	**ALL SAINTS, GROSVENOR SQUARE, MANCHESTER, M15 6BH**	**WEX228932**	**Disposing of waste exemption**	**Not on a farm**	**Depositing samples of waste for the purposes of testing or analysing them**
A	**On site**	**ALL SAINTS, GROSVENOR SQUARE, MANCHESTER, M15 6BH**	**WEX228932**	**Treating waste exemption**	**Not on a farm**	**Preparatory treatments (baling, sorting, shredding etc)**
A	**On site**	**ALL SAINTS, GROSVENOR SQUARE, MANCHESTER, M15 6BH**	**WEX083555**	**Disposing of waste exemption**	**Not on a farm**	**Depositing samples of waste for the purposes of testing or analysing them**
A	**On site**	**ALL SAINTS, GROSVENOR SQUARE, MANCHESTER, M15 6BH**	**WEX083555**	**Treating waste exemption**	**Not on a farm**	**Preparatory treatments (baling, sorting, shredding etc)**
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Storing waste exemption	Both agricultural and non-agricultural waste	Storage of waste in secure containers
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Storing waste exemption	Both agricultural and non-agricultural waste	Storage of waste in a secure place
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Treating waste exemption	Both agricultural and non-agricultural waste	Preparatory treatments (baling, sorting, shredding etc)
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Treating waste exemption	Both agricultural and non-agricultural waste	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Treating waste exemption	Both agricultural and non-agricultural waste	Mechanical treatment of end-of-life tyres
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Treating waste exemption	Both agricultural and non-agricultural waste	Recovery of scrap metal

ID	Location	Site	Reference	Category	Sub-Category	Description
B	29m E	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP/A001	Treating waste exemption	Non-Agricultural Waste Only	Manual treatment of waste
C	85m N	Circle Square Plot 14 - (Russells Construction Site), Brancaster Road, Manchester, M1 7ED	WEX144388	Treating waste exemption	Not on a farm	Screening and blending of waste
C	85m N	Circle Square Plot 14 - (Russells Construction Site), Brancaster Road, Manchester, M1 7ED	WEX144388	Using waste exemption	Not on a farm	Use of waste in construction
1	119m N	John Dalton Building Chester Street MANCHESTER M1 5GD	EPR/VF0005UT/A001	Disposing of waste exemption	Non-Agricultural Waste Only	Depositing samples of waste for the purposes of testing or analysing them
2	203m S	12, HIGHER CHATHAM STREET, MANCHESTER, M15 6ED	WEX196171	Using waste exemption	Not on a farm	Use of waste in construction
3	250m NE	-	WEX264013	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
5	314m SE	National Graphene Institute Booth Street East MANCHESTER M13 9SS	EPR/GE5751RU/A001	Using waste exemption	Non-Agricultural Waste Only	Use of waste in construction
6	345m SW	OXFORD COURT, FLAT D1, 2, BONSALL STREET, MANCHESTER, M15 6DG	WEX163913	Using waste exemption	Not on a Farm	Use of waste in construction
7	407m SE	OXFORD ROAD, MANCHESTER, M13 9GH	WEX281629	Treating waste exemption	Not on a farm	Aerobic composting and associated prior treatment
E	431m N	Bridgewater House 60 Whitworth Street MANCHESTER M1 6LT	EPR/NF0707MF/A001	Disposing of waste exemption	Non-Agricultural Waste Only	Deposit of waste from a railway sanitary convenience
E	431m N	LINEAR NETWORK: MAINLINE RAILWAY BETWEEN MANCHESTER AIRPORT AIRPORT AND BARROW-IN-FURNESS	EPR/BE5446FE/A001	Disposing of waste exemption	Non-Agricultural Waste Only	Deposit of waste from a railway sanitary convenience
F	453m SE	-	WEX285535	Treating waste exemption	Not on a farm	Aerobic composting and associated prior treatment
F	453m SE	-	WEX313299	Disposing of waste exemption	Not on a Farm	Depositing samples of waste for the purposes of testing or analysing them

ID	Location	Site	Reference	Category	Sub-Category	Description
F	453m SE	-	WEX322402	Using waste exemption	Not on a Farm	Spreading waste on non-agricultural land to confer benefit
G	461m SE	Michael Smith Building, OXFORD ROAD, MANCHESTER, M13 9PL	WEX029843	Treating waste exemption	Not on a farm	Treatment of kitchen waste in a wormery
G	461m SE	Michael Smith Building, OXFORD ROAD, MANCHESTER, M13 9PL	WEX029843	Using waste exemption	Not on a farm	Spreading waste on non-agricultural land to confer benefit
G	461m SE	OXFORD ROAD, MANCHESTER, M13 9PL	WEX034895	Using waste exemption	Not on a farm	Use of waste in construction
G	461m SE	OXFORD ROAD MANCHESTER M13 9PL	WEX006036	Storing waste exemption	Not on a farm	Storage of waste in a secure place
G	461m SE	OXFORD ROAD MANCHESTER M13 9PL	WEX006029	Treating waste exemption	Not on a farm	Preparatory treatments (baling, sorting, shredding etc)
G	461m SE	OXFORD ROAD MANCHESTER M13 9PL	WEX006497	Treating waste exemption	Not on a farm	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
G	461m SE	Michael Smith Building Oxford Road Manchester M13 9PL	EPR/XE5784LB/A001	Treating waste exemption	Non-Agricultural Waste Only	Treatment of kitchen waste in a wormery
G	461m SE	Michael Smith Building Oxford Road Manchester M13 9PL	EPR/XE5784LB/A001	Using waste exemption	Non-Agricultural Waste Only	Spreading waste on non-agricultural land to confer benefit

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



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4.1 Recent industrial land uses

Records within 250m	20

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 50**

ID	Location	Company	Address	Activity	Category
A	**On site**	**Electricity Sub Station**	**Greater Manchester, M15**	**Electrical Features**	**Infrastructure and Facilities**
A	3m NW	Gantry	Greater Manchester, M15	Travelling Cranes and Gantries	Industrial Features
A	26m W	Gantry	Greater Manchester, M1	Travelling Cranes and Gantries	Industrial Features

ID	Location	Company	Address	Activity	Category
1	43m NE	Gantry	Greater Manchester, M1	Travelling Cranes and Gantries	Industrial Features
2	51m E	The Woodwind Workshop	123, Oxford Road, Manchester, Greater Manchester, M1 7DU	Sports and Leisure Equipment Repair	Repair and Servicing
3	80m N	W S P	Oxford House Retail Unit A, Manchester Technology Centre, Oxford Road, Manchester, Greater Manchester, M1 7ED	Civil Engineers	Engineering Services
D	108m NE	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
4	112m S	Electricity Sub Station	Greater Manchester, M15	Electrical Features	Infrastructure and Facilities
D	116m NE	Electricity Sub Stations	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
D	122m NE	Gantry	Greater Manchester, M1	Travelling Cranes and Gantries	Industrial Features
5	129m E	Compudos Ltd	124, Grosvenor Street, Manchester, Greater Manchester, M1 7HL	Electrical Equipment Repair and Servicing	Repair and Servicing
C	131m W	Haadi Composite Woods	John Dalton Building, Chester Street, Manchester, Greater Manchester, M1 5GD	Wood Products Including Charcoal, Paper, Card and Board	Industrial Products
E	184m NW	F M Laptop Repairs	8a, Lower Ormond Street, Manchester, Greater Manchester, M1 5QF	Electrical Equipment Repair and Servicing	Repair and Servicing
7	193m NE	Gantry	Greater Manchester, M1	Travelling Cranes and Gantries	Industrial Features
F	198m E	Euro Exim Ltd	98, Grosvenor Street, Manchester, Greater Manchester, M1 7HL	Colours, Chemicals and Water Softeners and Supplies	Industrial Products
F	210m E	Final Print	Grosvenor Street, All Saints, Manchester, Greater Manchester, M1 7HL	Published Goods	Industrial Products
9	228m SW	Territorial Army Centre	Trainning Core University Barracks, Boundary Lane, Manchester, Greater Manchester, M15 6DH	Armed Services	Central and Local Government
10	239m NE	Gas Governor	Greater Manchester, M1	Gas Features	Infrastructure and Facilities
11	244m NW	Chimney	Greater Manchester, M1	Chimneys	Industrial Features

ID	Location	Company	Address	Activity	Category
G	250m N	Manchester Business Centre Ltd	60, Charles Street, Manchester, Greater Manchester, M1 7DF	Business Parks and Industrial Estates	Industrial Features

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	**1**

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 50**

ID	Location	Company	Address	LPG	Status
6	138m NW	OBSOLETE	2-4, Lower Ormond Street, Manchester, Greater Manchester, M1 5QF	Not Applicable	Obsolete

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	**0**

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	**0**

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	**0**

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	2

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 50**

ID	Location	Address	Details	
12	316m W	Dunlop Ltd, Cambridge St, M60 1PD	Process: Rubber Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified
16	481m W	Jessop & Baird Ltd, Hulme St, M15 6AL	Process: Coating Processes Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	14

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

Features are displayed on the Current industrial land use map on **page 50**

ID	Location	Address	Details	
C	94m W	Manchester Metropolitan University, John Dalton Building, Chester Street, Manchester, Greater Manchester, M1 5GD	Operator: Manchester Metropolitan University Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AC9688 Date of approval: 31/03/1991	Effective from: 31/03/1991 Last date of update: 01/01/2015 Status: Superseded By Variation
C	94m W	Manchester Metropolitan University, John Dalton Building, Chester Street, Manchester, Greater Manchester, M1 5GD	Operator: Manchester Metropolitan University Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AC9688 Date of approval: 16/10/1994	Effective from: 16/10/1994 Last date of update: 01/01/2015 Status: Superseded By Variation
C	94m W	Manchester Metropolitan University, John Dalton Building, Chester Street, Manchester, Greater Manchester, M1 5GD	Operator: Manchester Metropolitan University Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AC9688 Date of approval: 09/03/1995	Effective from: 09/04/1995 Last date of update: 01/01/2015 Status: Superseded By Variation

ID	Location	Address	Details	
C	94m W	Manchester Metropolitan University, John Dalton Building, Chester Street, Manchester, Greater Manchester, M1 5GD	Operator: Manchester Metropolitan University Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AC9688 Date of approval: 01/12/2003	Effective from: 01/01/2004 Last date of update: 01/01/2015 Status: Superseded By Variation
C	94m W	John Dalton Building, Chester Street, Manchester, M1 5GD	Operator: Manchester Metropolitan University Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: CA1464 Date of approval: 17/02/2006	Effective from: 17/03/2006 Last date of update: 01/01/2020 Status: Issued
C	94m W	John Dalton Building, Chester Street, Manchester, M1 5GD	Operator: Manchester Metropolitan University Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: BL0324 Date of approval: 23/05/2001	Effective from: 23/05/2001 Last date of update: 01/01/2020 Status: Issued
K	362m NE	Umist, Po Box 88, Sackville Street, Manchester, M60 1QD	Operator: Umist Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AC8878 Date of approval: 31/03/1991	Effective from: 31/03/1991 Last date of update: 01/01/2015 Status: Revoked/cancelled
K	362m NE	Umist, Po Box 88,sackville Street, Manchester, M60 1QD	Operator: Umist Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: AC8886 Date of approval: 06/03/2001	Effective from: 06/03/2001 Last date of update: 01/01/2015 Status: Revoked/cancelled
K	362m NE	Umist, Po Box 88, Sackville Street, Manchester, M60 1QD	Operator: Umist Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AG4009 Date of approval: 16/01/1995	Effective from: 16/02/1995 Last date of update: 01/01/2015 Status: Superseded By Variation
K	362m NE	Umist, Po Box 88, Sackville Street, Manchester, M60 1QD	Operator: Umist Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AG4009 Date of approval: 30/01/1997	Effective from: 25/02/1997 Last date of update: 01/01/2015 Status: Superseded By Variation
K	362m NE	Umist, Po Box 88, Sackville Street, Manchester, M60 1QD	Operator: Umist Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AG4009 Date of approval: 13/11/1997	Effective from: 11/12/1997 Last date of update: 01/01/2015 Status: Superseded By Variation

ID	Location	Address	Details	
K	362m NE	Umist, Po Box 88, Sackville Street, Manchester, M60 1QD	Operator: Umist Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: AG4009 Date of approval: 09/04/2002	Effective from: 06/05/2002 Last date of update: 01/01/2015 Status: Revoked/cancelled
M	452m NE	North Campus, Manchester, M1 3BU	Operator: The University of Manchester Type: Disposal Of Radioactive Waste (was Rsa60 Section 6). Permission number: BX8645 Date of approval: 02/09/2004	Effective from: 01/10/2004 Last date of update: 01/01/2020 Status: Issued
M	452m NE	North Campus, Manchester, M1 3BU	Operator: The University of Manchester Type: Keeping And Use Of Radioactive Materials (was Rsa60 Section 1). Permission number: BX8661 Date of approval: 01/10/2004	Effective from: 01/10/2004 Last date of update: 01/01/2020 Status: Issued

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m **46**

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 50**

ID	Location	Address	Details	
B	82m W	GSHP AT MANCHESTER METROPOLITAN UNI, MANCHESTER METROPOLITAN UNI, LOWER CHATHAM STREET, ., MANCHESTER, M15 6BH	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: EPRDP3526GN Permit Version: 1 Receiving Water: GROUNDWATERS	Status: NEW ISSUED UNDER EPR 2010 Issue date: 23/08/2010 Effective Date: 01/04/2011 Revocation Date: -
B	111m SW	GSHP AT MANCHESTER METROPOLITAN UNI, MANCHESTER METROPOLITAN UNI, LOWER CHATHAM STREET, ., MANCHESTER, M15 6BH	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: EPRDP3526GN Permit Version: 1 Receiving Water: GROUNDWATERS	Status: NEW ISSUED UNDER EPR 2010 Issue date: 23/08/2010 Effective Date: 01/04/2011 Revocation Date: -

ID	Location	Address	Details	
E	206m NW	CHESTER STREET CSO, JUNCTION OF CHESTER STREET/, LOWER OSMOND STREET, ., MANCHESTER, M1 5QF	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016983278 Permit Version: 1 Receiving Water: THE RIVER MEDLOCK	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 19/02/1999 Effective Date: 01/12/1999 Revocation Date: 08/07/2018
E	220m NW	LOWER ORMOMD ST/HULME ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0282 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 09/08/2019
E	221m NW	CHESTER STREET CSO, JUNCTION OF CHESTER STREET/, LOWER OSMOND STREET, ., MANCHESTER, M1 5QF	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016983278 Permit Version: 2 Receiving Water: THE RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 09/07/2018 Effective Date: 09/07/2018 Revocation Date: -
8	222m NE	BBC VEHICLE MAINTENANCE BASE SWO, PRITCHARD STREET, MANCHESTER, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991346 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 22/09/1994 Revocation Date: 22/09/1994
G	251m N	OXFORD RD, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0342 Permit Version: 1 Receiving Water: -	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 19/12/1999
G	263m N	OXFORD ROAD/GROSVENOR STREET CSO, 137 OXFORD ROAD, MANCHESTER, ., GREATER MANCHESTER, M1 7DZ	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0189 Permit Version: 4 Receiving Water: RIVER MEDLOCK VIA SWS	Status: VARIED UNDER EPR 2010 Issue date: 29/03/2021 Effective Date: 29/03/2021 Revocation Date: -
G	269m N	OXFORD ROAD/GROSVENOR STREET CSO, 137 OXFORD ROAD, MANCHESTER, ., GREATER MANCHESTER, M1 7DZ	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0189 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010

ID	Location	Address	Details	
G	269m N	OXFORD ROAD/GROSVENOR STREET CSO, 137 OXFORD ROAD, MANCHESTER, ., GREATER MANCHESTER, M1 7DZ	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0189 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 04/02/2016
G	269m N	OXFORD ROAD/GROSVENOR STREET CSO, 137 OXFORD ROAD, MANCHESTER, ., GREATER MANCHESTER, M1 7DZ	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0189 Permit Version: 3 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 05/02/2016 Effective Date: 05/02/2016 Revocation Date: 28/03/2021
G	269m N	OXFORD/NEW WAKEFILD ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0165 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/01/1995 Revocation Date: 31/03/1998
H	282m N	112-116 PRINCESS STREET, MANCHESTER, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991403 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 24/04/1989 Revocation Date: 31/03/1992
H	282m N	112-116 PRINCESS STREET, MANCHESTER, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991403 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1992 Revocation Date: 10/02/1993
H	282m N	112-116 PRINCESS STREET, MANCHESTER, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991403 Permit Version: 3 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 11/02/1993 Revocation Date: 01/11/1994
H	285m N	CHARLES STREET CSO, 7 CHARLES STREET, ., MANCHESTER, M1 7EN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0183 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010
H	285m N	CHARLES STREET CSO, 7 CHARLES STREET, ., MANCHESTER, M1 7EN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0183 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 31/03/2018

ID	Location	Address	Details	
H	285m N	CHARLES STREET CSO, 7 CHARLES STREET, ., MANCHESTER, M1 7EN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0183 Permit Version: 3 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 19/03/2018 Effective Date: 01/04/2018 Revocation Date: -
G	295m N	YORK ST/CHARLES ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0281 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 09/08/2019
H	297m N	CHARLES ST PRINCESS ST CSO 28116, 106 PRINCESS STREET, ., MANCHESTER, M1 6NG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0166 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010
H	297m N	CHARLES ST PRINCESS ST CSO 28116, 106 PRINCESS STREET, ., MANCHESTER, M1 6NG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0166 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 31/03/2018
H	297m N	WHITWORTH ST/SACKVILLE ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0253 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/01/1995 Revocation Date: 01/01/2017
G	298m N	MALLARD STREET/CHARLES STREET CSO, MALLARD STREET, MANCHESTER, ., GREATER MANCHESTER, M1 6EY	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982736 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 10/07/2020 Effective Date: 10/07/2020 Revocation Date: -
G	299m N	MALLARD STREET/CHARLES STREET CSO, MALLARD STREET, MANCHESTER, ., GREATER MANCHESTER, M1 6EY	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982736 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 30/09/1994 Revocation Date: 09/07/2020

ID	Location	Address	Details	
G	299m N	MEDLOCK ST(OFF CHARLES ST), MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0343 Permit Version: 1 Receiving Water: -	Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: - Effective Date: 01/01/1995 Revocation Date: 01/01/1995
H	300m N	CHARLES ST PRINCESS ST CSO 28116, 106 PRINCESS STREET, ., MANCHESTER, M1 6NG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0166 Permit Version: 3 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 21/03/2018 Effective Date: 01/04/2018 Revocation Date: -
H	302m N	PRINCESS ST/WHITWORTH ST CSO 282MN, 67 WHITWORTH ST, MANCHESTER, ., GREATER MANCHESTER, M1 6LQ	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982950 Permit Version: 2 Receiving Water: RIVER MEDLOCK VIA SWS	Status: VARIED UNDER EPR 2010 Issue date: 20/10/2020 Effective Date: 20/10/2020 Revocation Date: -
I	304m NE	MOUNT STREET/GREEK STREET CSO, MANCUNIAN WAY, (OPP TO GEORGE BEGG BUILDING), MANCHESTER, GREATER MANCHESTER, M1 7DN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0187 Permit Version: 3 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 05/02/2016 Effective Date: 05/02/2016 Revocation Date: 09/07/2020
H	307m N	PRINCESS ST/GRANBY ROW CS, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982956 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: CONSENT REVOKED - DISCHARGE CEASED (WRA 91, SCHED 10 & 6) Issue date: - Effective Date: 23/06/1995 Revocation Date: 31/03/1998
H	307m N	PRINCESS ST/WHITWORTH ST CSO 282MN, 67 WHITWORTH ST, MANCHESTER, ., GREATER MANCHESTER, M1 6LQ	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982950 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 23/06/1995 Revocation Date: 19/10/2020
J	309m NE	112-116 PRINCESS STREET, MANCHESTER, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991403 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 24/04/1989 Revocation Date: 31/03/1992

ID	Location	Address	Details	
J	309m NE	112-116 PRINCESS STREET, MANCHESTER, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991403 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01/04/1992 Revocation Date: 10/02/1993
I	310m NE	MOUNT STREET/GREEK STREET CSO, MANCUNIAN WAY, (OPP TO GEORGE BEGG BUILDING), MANCHESTER, GREATER MANCHESTER, M1 7DN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0187 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010
I	310m NE	MOUNT STREET/GREEK STREET CSO, MANCUNIAN WAY, (OPP TO GEORGE BEGG BUILDING), MANCHESTER, GREATER MANCHESTER, M1 7DN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0187 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 04/02/2016
I	334m NE	MOUNT STREET/GREEK STREET CSO, MANCUNIAN WAY, (OPP TO GEORGE BEGG BUILDING), MANCHESTER, GREATER MANCHESTER, M1 7DN	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0187 Permit Version: 4 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 10/07/2020 Effective Date: 10/07/2020 Revocation Date: -
I	379m NE	MOUNT ST/RUTLAND ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0287 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: -
14	398m SW	HULME WALK, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0362 Permit Version: 1 Receiving Water: -	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: -
L	414m NW	CAMBRIDGE STREET CSO 282D9, 1 CAMBRIDGE STREET, ., MANCHESTER, GREATER MANCHESTER, M1 5BW	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982721 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: - Effective Date: 15/11/1999 Revocation Date: 10/04/2018

ID	Location	Address	Details	
15	416m W	NEWCASTLE ST/CHESTER ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0361 Permit Version: 1 Receiving Water: -	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: -
L	425m NW	CAMBRIDGE STREET CSO 282D9, 1 CAMBRIDGE STREET, ., MANCHESTER, GREATER MANCHESTER, M1 5BW	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982721 Permit Version: 3 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 11/04/2018 Effective Date: 11/04/2018 Revocation Date: -
L	425m NW	LOWER CAMBRIDGE ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0285 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: - Effective Date: 01/01/1995 Revocation Date: 15/11/1999
L	425m NW	WILMOTT ST AT RIVER ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0184 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 18/10/1999
N	467m NW	GREAT BRIDGEWATER ST CSO (281WI), 80 GREAT BRIDGEWATER STREET, GREAT ANCOATS, MANCHESTER, GREATER MANCHESTER, M1 5JG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982707 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: VARIED UNDER EPR 2010 Issue date: 20/10/2020 Effective Date: 20/10/2020 Revocation Date: -
N	475m NW	GREAT BRIDGEWATER ST CSO (281WI), 80 GREAT BRIDGEWATER STREET, GREAT ANCOATS, MANCHESTER, GREATER MANCHESTER, M1 5JG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982707 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 30/09/1994 Revocation Date: 19/10/2020
N	475m NW	GREAT BRIDGEWATER ST CSO (281WI), 80 GREAT BRIDGEWATER STREET, GREAT ANCOATS, MANCHESTER, GREATER MANCHESTER, M1 5JG	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0252 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: - Effective Date: 01/01/1995 Revocation Date: 01/01/1995

ID	Location	Address	Details	
17	489m SW	HULME WALK/PRINCESS RD, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0363 Permit Version: 1 Receiving Water: -	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	1

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 50**

ID	Location	Details	
13	326m N	Incident Date: 12/07/2001 Incident Identification: 15886 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

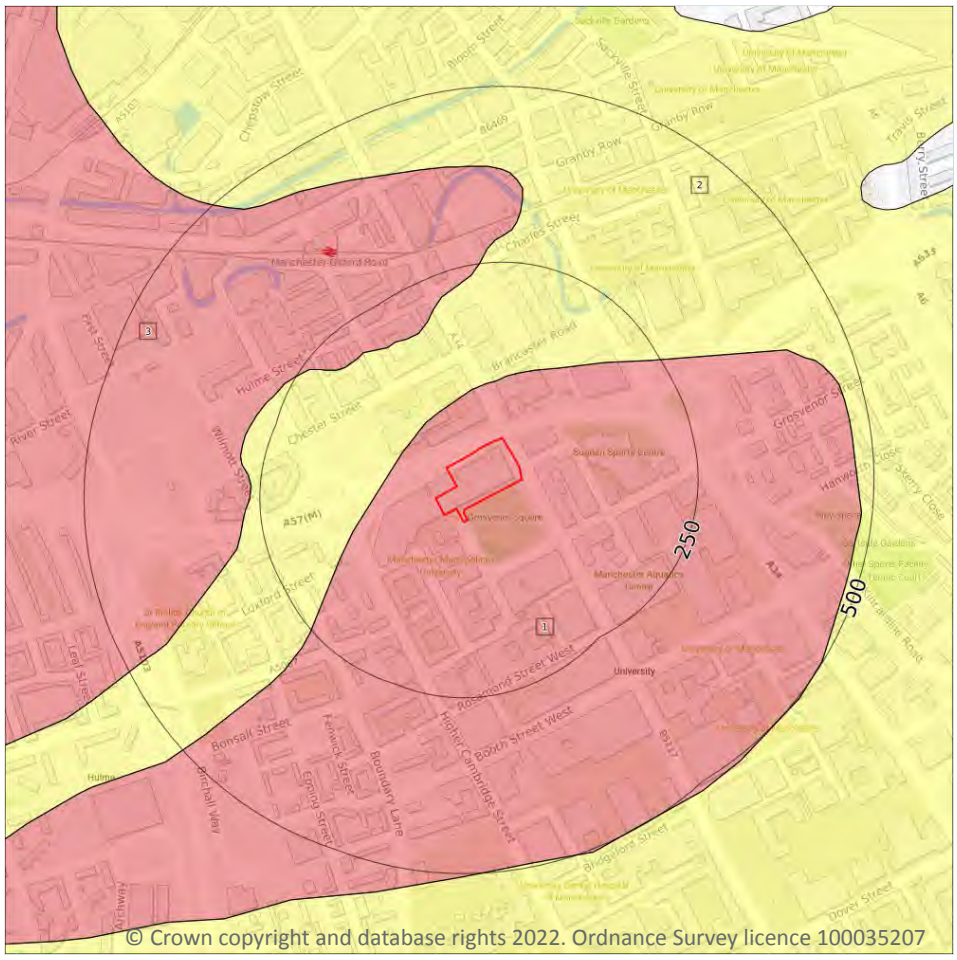
4.21 Pollution inventory radioactive waste

Records within 500m	0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive
- Unknown

5.1 Superficial aquifer

Records within 500m	3

Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 65**

ID	Location	Designation	Description
1	**On site**	**Secondary A**	**Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers**
2	63m NW	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

ID	Location	Designation	Description
3	185m NW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



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Site Outline

Search buffers in metres (m)

- Principal
- Secondary A
- Secondary B
- Secondary Undifferentiated
- Unproductive

5.2 Bedrock aquifer

Records within 500m **2**

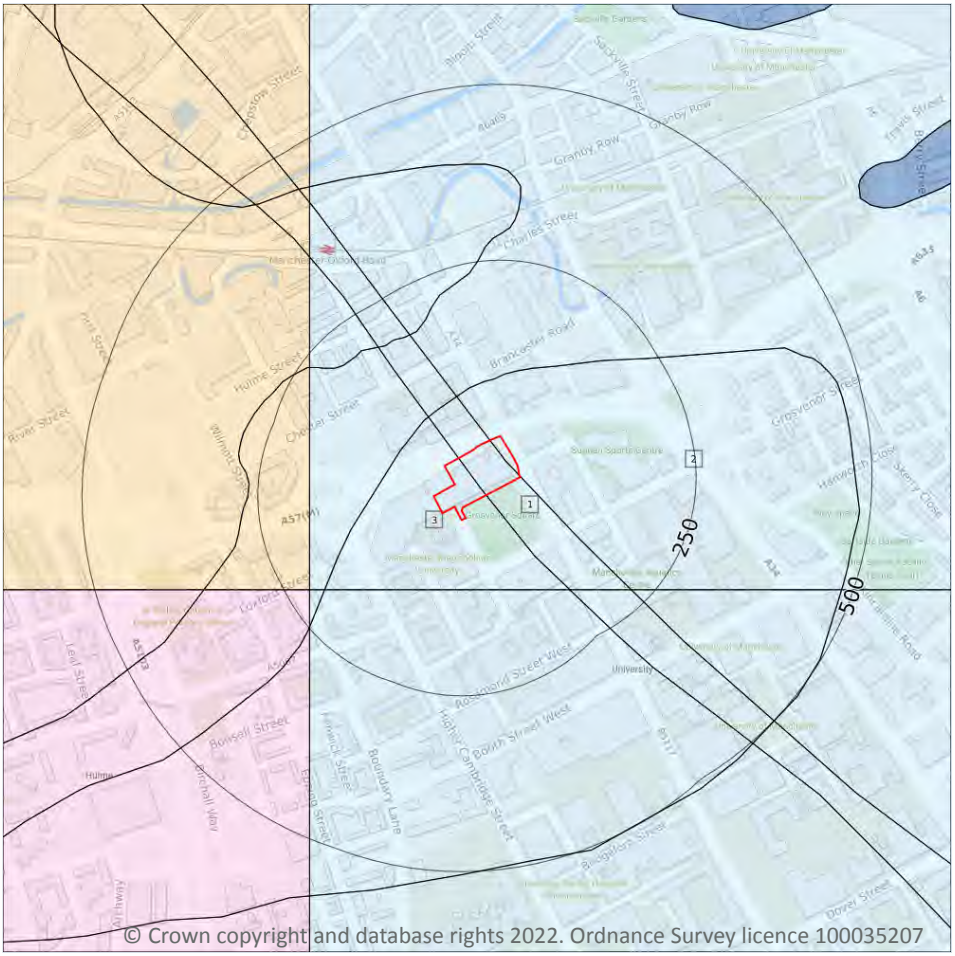
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 67**

ID	Location	Designation	Description
1	On site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	On site	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeablehorizons and weathering. These are generally the water-bearing parts of the former non-aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	3

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 69**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year	Vulnerability: Low Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Secondary Flow mechanism: Well connected fractures
2	On site	Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year	Vulnerability: Low Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures
3	On site	Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year	Vulnerability: Low Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	0

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

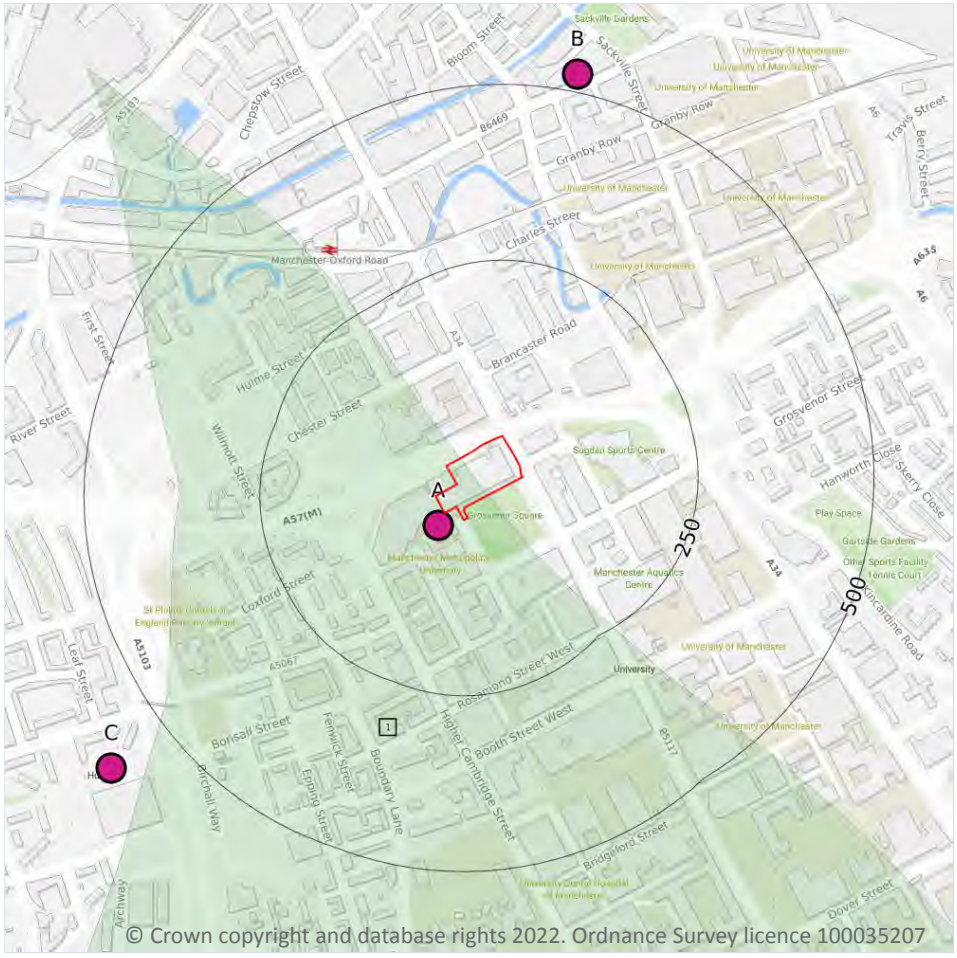
5.5 Groundwater vulnerability- local information

Records on site	0

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones



Site Outline

Search buffers in metres (m)

- Source Protection Zone 1 — Inner catchment
- Source Protection Zone 2 — Outer catchment
- Source Protection Zone 3 — Total catchment
- Source Protection Zone 4 — Zone of Special Interest
- Source Protection Zone 1c — Inner catchment - confined aquifer
- Source Protection Zone 2c — Outer catchment - confined aquifer
- Source Protection Zone 3c — Total catchment - confined aquifer
- Drinking water abstraction licences
- Drinking water abstraction licences — Polygon features
- Drinking water abstraction licences — Linear features
- Groundwater abstraction licence (point)
- Groundwater abstraction licence (area)
- Groundwater abstraction licence (linear)
- Surface Water Abstractions (point)
- Surface Water Abstractions (area)
- Surface Water Abstractions (linear)

5.6 Groundwater abstractions

Records within 2000m	39

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 71**

ID	Location	Details	
A	20m SW	Status: Active Licence No: NW/069/0006/003 Details: Heat Pump Direct Source: Ground Water - North West Region Point: BOREHOLE 1 AT LOWER CHATHAM STREET Data Type: Point Name: Manchester Metropolitan University Easting: 384180 Northing: 397091	Annual Volume (m^3): 283,240 Max Daily Volume (m^3): 1,532 Original Application No: NPS/WR/015264 Original Start Date: 04/04/2014 Expiry Date: 31/03/2027 Issue No: 2 Version Start Date: 04/04/2014 Version End Date: -
A	20m SW	Status: Active Licence No: NW/069/0006/003 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE 1 AT LOWER CHATHAM STREET Data Type: Point Name: Manchester Metropolitan University Easting: 384180 Northing: 397091	Annual Volume (m^3): 283,240 Max Daily Volume (m^3): 1,532 Original Application No: NPS/WR/015264 Original Start Date: 04/04/2014 Expiry Date: 31/03/2027 Issue No: 2 Version Start Date: 04/04/2014 Version End Date: -
B	525m N	Status: Historical Licence No: NW0690006001 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: BOREHOLES AT ORIGIN DEVELOPMENTS, MANCHESTER Data Type: Point Name: West Contracting Easting: 384378 Northing: 397733	Annual Volume (m^3): 139128 Max Daily Volume (m^3): 1010 Original Application No: - Original Start Date: 19/01/2009 Expiry Date: 31/03/2015 Issue No: 1 Version Start Date: 19/01/2009 Version End Date: -
B	525m N	Status: Historical Licence No: NW/069/0006/001 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: BOREHOLES AT ORIGIN DEVELOPMENTS, MANCHESTER Data Type: Point Name: West Contracting Easting: 384378 Northing: 397733	Annual Volume (m^3): 139128 Max Daily Volume (m^3): 1010 Original Application No: - Original Start Date: 19/01/2009 Expiry Date: 31/03/2015 Issue No: 1 Version Start Date: 19/01/2009 Version End Date: -

ID	Location	Details	
C	596m SW	Status: Active Licence No: NW/069/0004/003 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT MANCHESTER METROPOLITAN UNIVERSITY Data Type: Point Name: Manchester Metropolitan University Easting: 383715 Northing: 396746	Annual Volume (m^3): 274,115 Max Daily Volume (m^3): 751 Original Application No: NPS/WR/008077 Original Start Date: 20/09/2013 Expiry Date: 31/03/2027 Issue No: 1 Version Start Date: 01/01/2015 Version End Date: -
C	596m SW	Status: Active Licence No: NW/069/0004/003 Details: Heat Pump Direct Source: Ground Water - North West Region Point: BOREHOLE AT MANCHESTER METROPOLITAN UNIVERSITY Data Type: Point Name: Manchester Metropolitan University Easting: 383715 Northing: 396746	Annual Volume (m^3): 274,115 Max Daily Volume (m^3): 751 Original Application No: NPS/WR/008077 Original Start Date: 20/09/2013 Expiry Date: 31/03/2027 Issue No: 1 Version Start Date: 01/01/2015 Version End Date: -
-	799m N	Status: Historical Licence No: 2569007069 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT GEORGE ST, MANCHESTER" Data Type: Point Name: BRITISH TELECOM Easting: 384100 Northing: 398000	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 100 Version Start Date: 27/01/1971 Version End Date: -
-	799m N	Status: Historical Licence No: 2569007069 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT GEORGE ST, MANCHESTER Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC Easting: 384100 Northing: 398000	Annual Volume (m^3): 1100 Max Daily Volume (m^3): 860 Original Application No: - Original Start Date: 01/04/1984 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2007 Version End Date: -

ID	Location	Details	
-	956m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW8 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383224 Northing: 397225	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	961m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW9 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383223 Northing: 397253	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	976m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW10 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383211 Northing: 397276	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	986m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW11 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383204 Northing: 397298	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -

ID	Location	Details	
-	988m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW5 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383193 Northing: 397230	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	994m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW7 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383184 Northing: 397203	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	1011m E	Status: Historical Licence No: 2569006001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, BROADIE ST, ARDWICK, MANCHESTER" Data Type: Point Name: MOSELEY RUBBER CO LTD Easting: 385240 Northing: 397540	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 08/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 08/02/1966 Version End Date: -
-	1011m E	Status: Historical Licence No: 2569006001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, BROADIE ST, ARDWICK, MANCHESTER Data Type: Point Name: MOSELEY RUBBER CO LTD Easting: 385240 Northing: 397540	Annual Volume (m^3): 331858 Max Daily Volume (m^3): 909.2 Original Application No: - Original Start Date: 08/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 08/02/1966 Version End Date: -

ID	Location	Details	
-	1015m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW6 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383171 Northing: 397275	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	1020m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW4 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383159 Northing: 397210	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	1039m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW3 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383140 Northing: 397217	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	1067m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW2 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383113 Northing: 397230	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -

ID	Location	Details	
-	1097m W	Status: Active Licence No: NW/069/0006/010 Details: Dewatering Direct Source: Ground Water - North West Region Point: BOREHOLE PW1 CHESTER FORMATION AT CROWN STREET Data Type: Point Name: Renaker Build Ltd Easting: 383085 Northing: 397249	Annual Volume (m^3): 260,172 Max Daily Volume (m^3): 712.80 Original Application No: NPS/WR/034474 Original Start Date: 24/09/2021 Expiry Date: 31/03/2023 Issue No: 1 Version Start Date: 24/09/2021 Version End Date: -
-	1240m S	Status: Historical Licence No: 2569007007 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER" Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 16/08/1995 Version End Date: -
-	1240m S	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER" Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 16/08/1995 Version End Date: -
-	1240m S	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 31/12/2003 Version End Date: -

ID	Location	Details	
-	1240m S	Status: Historical Licence No: 2569007007 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS SIDE, MANCHESTER Data Type: Point Name: SCOTTISH COURAGE BREWING LTD Easting: 383900 Northing: 395900	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 31/12/2003 Version End Date: -
-	1240m S	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383900 Northing: 395900	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 23/11/2009 Version End Date: -
-	1240m S	Status: Historical Licence No: 2569007007 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383900 Northing: 395900	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: - Original Start Date: 15/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 23/11/2009 Version End Date: -
-	1241m S	Status: Active Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383865 Northing: 395909	Annual Volume (m^3): 227,000 Max Daily Volume (m^3): 900 Original Application No: NPS/WR/015793 Original Start Date: 15/02/1966 Expiry Date: - Issue No: 103 Version Start Date: 08/05/2014 Version End Date: -

ID	Location	Details	
-	1241m S	Status: Active Licence No: 2569007007 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES MOSS SIDE MANCHESTER Data Type: Point Name: Heineken UK Ltd Easting: 383865 Northing: 395909	Annual Volume (m^3): 227,000 Max Daily Volume (m^3): 900 Original Application No: NPS/WR/015793 Original Start Date: 15/02/1966 Expiry Date: - Issue No: 103 Version Start Date: 08/05/2014 Version End Date: -
-	1343m NW	Status: Historical Licence No: 2569007089 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: 2 BOREHOLES AT GARTSIDE STREET MANCHESTER Data Type: Line Name: HER MAJESTY'S COURT SERVICE Easting: 383335 Northing: 398310	Annual Volume (m^3): 200000 Max Daily Volume (m^3): 1179 Original Application No: - Original Start Date: 26/01/2005 Expiry Date: 31/03/2011 Issue No: 2 Version Start Date: 10/07/2008 Version End Date: -
-	1360m NW	Status: Historical Licence No: NW/069/0004/019 Details: Transfer Between Sources (Post Water Act 2003) Direct Source: Ground Water - North West Region Point: ST JOHNS MANCHESTER Data Type: Poly4 Name: Manchester Quays Development (MGY) Ltd Easting: 383094 Northing: 398099	Annual Volume (m^3): 543,120 Max Daily Volume (m^3): 1,488 Original Application No: - Original Start Date: 13/09/2019 Expiry Date: 31/12/2020 Issue No: 1 Version Start Date: 13/09/2019 Version End Date: -
-	1471m E	Status: Historical Licence No: NW/069/0004/005 Details: Heat Pump Direct Source: Ground Water - North West Region Point: AREA OF ABSTRACTION - LOWER CARBONIFEROUS LIMESTONE Data Type: Poly4 Name: G T Energy UK Limited Easting: 385729 Northing: 396778	Annual Volume (m^3): 2,049,840 Max Daily Volume (m^3): 8640 Original Application No: - Original Start Date: 17/01/2013 Expiry Date: 16/01/2037 Issue No: 2 Version Start Date: 11/06/2013 Version End Date: -

ID	Location	Details	
-	1587m N	Status: Historical Licence No: 2569007070 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT DIAL HOUSE, CHAPEL ST, SALFORD" Data Type: Point Name: BRITISH TELECOM Easting: 383700 Northing: 398700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 100 Version Start Date: 27/01/1971 Version End Date: -
-	1587m N	Status: Historical Licence No: 2569007070 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT DIAL HOUSE, CHAPEL ST, SALFORD Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC Easting: 383700 Northing: 398700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 27/01/1971 Expiry Date: - Issue No: 101 Version Start Date: 01/04/1984 Version End Date: -
-	1587m N	Status: Active Licence No: 2569007070 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT DIAL HOUSE CHAPEL STREET SALFORD Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC Easting: 383700 Northing: 398700	Annual Volume (m^3): 45 Max Daily Volume (m^3): 30 Original Application No: 2333 Original Start Date: 27/01/1971 Expiry Date: - Issue No: 101 Version Start Date: 01/04/2007 Version End Date: -
-	1588m SW	Status: Historical Licence No: 2569007009 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER" Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 07/10/2000 Version End Date: -

ID	Location	Details	
-	1588m SW	Status: Historical Licence No: 2569007009 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER" Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 07/10/2000 Version End Date: -
-	1588m SW	Status: Historical Licence No: 2569007009 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): 66826.2 Max Daily Volume (m^3): 372.772 Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 101 Version Start Date: 07/10/2000 Version End Date: -
-	1588m SW	Status: Historical Licence No: 2569007009 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, MOSS LANE WEST MANCHESTER Data Type: Point Name: HYDES BREWERY LTD Easting: 383220 Northing: 395850	Annual Volume (m^3): 66826.2 Max Daily Volume (m^3): 372.772 Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 103 Version Start Date: 19/07/2018 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	**2**

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 71**

ID	Location	Details	
-	1697m W	Status: Historical Licence No: 2569007053 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: "Surface, Non-Tidal - North West Region" Point: "R IRWELL AT IRWELL WORKS, ORDSALL LANE, SALFORD" Data Type: Point Name: CDS COMPUTER DESIGN SYSTEMS LTD Easting: 382500 Northing: 397400	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 22/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/11/1987 Version End Date: -
-	1697m W	Status: Historical Licence No: 2569007053 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Surface, Non-Tidal - North West Region Point: R IRWELL AT IRWELL WORKS, ORDSALL LANE, SALFORD Data Type: Point Name: CDS COMPUTER DESIGN SYSTEMS LTD Easting: 382500 Northing: 397400	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 22/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/11/1987 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	0

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	1

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

Features are displayed on the Abstractions and Source Protection Zones map on **page 71**

ID	Location	Type	Description
1	**On site**	**3**	**Total catchment**

This data is sourced from the Environment Agency and Natural Resources Wales.

5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



6.1 Water Network (OS MasterMap)

Records within 250m	3

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 84**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	206m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock

ID	Location	Type of water feature	Ground level	Permanence	Name
5	229m NW	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	River Medlock
7	235m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	**2**

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 84**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	**2**

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 84**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
1	**On site**	**River**	**Irwell / Manchester Ship Canal (Irk to confluence with Upper Mers**	**GB112069061452**	**Croal Irwell**	**Irwell**
2	**On site**	**River**	**Medlock (Lumb Brook to Irwell)**	**GB112069061152**	**Roch Irk Medlock**	**Irwell**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	2

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 84**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
4	208m NE	River	Medlock (Lumb Brook to Irwell)	GB112069061152	Moderate	Fail	Moderate	2019
-	1471m NW	River	Irwell / Manchester Ship Canal (Irk to confluence with Upper Mers	GB112069061452	Moderate	Fail	Moderate	2019

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	1

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 84**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
3	**On site**	**Manchester and East Cheshire Permo-Triassic Sandstone Aquifers**	**GB41201G101100**	**Poor**	**Poor**	**Poor**	**2019**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding

7.1 Risk of flooding from rivers and the sea

Records within 50m	0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m within the Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) models. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

Records within 250m	0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones

7.6 Flood Zone 2

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.7 Flood Zone 3

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



Site Outline

Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**1 in 30 year, 0.1m - 0.3m**
Highest risk within 50m	**1 in 30 year, 0.1m - 0.3m**

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 90**

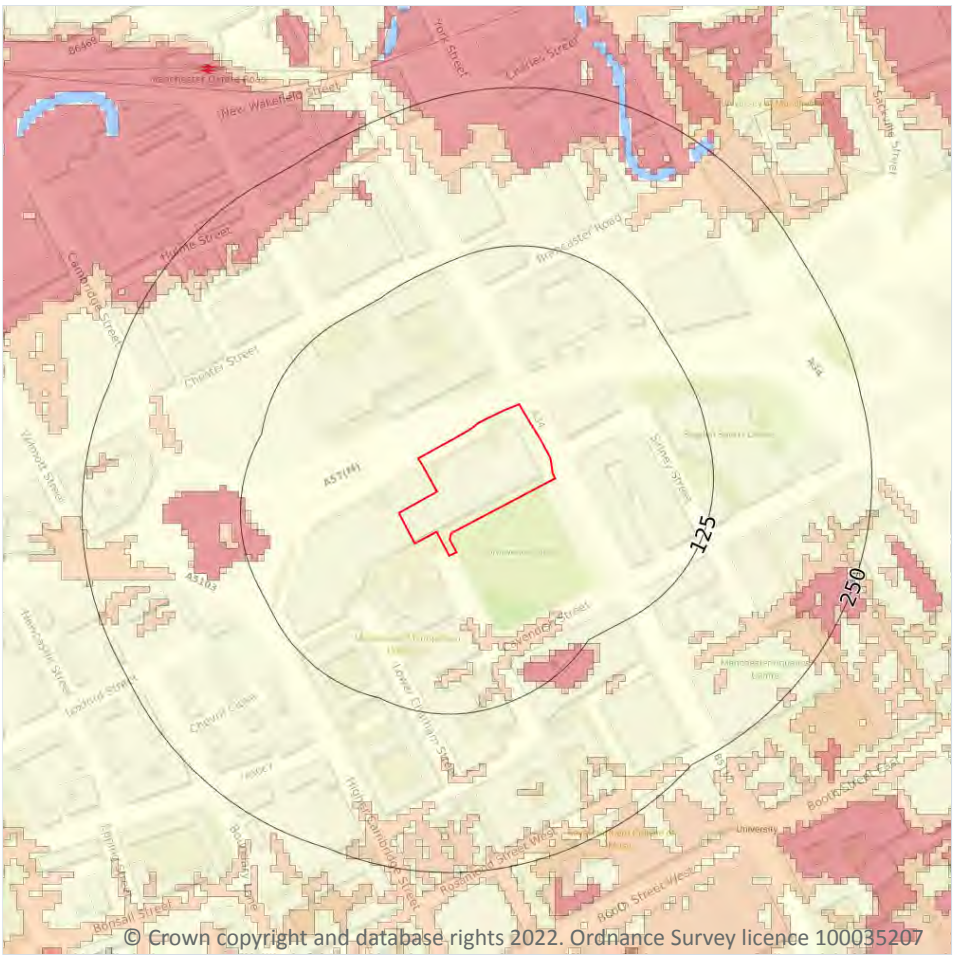
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Between 0.1m and 0.3m
1 in 250 year	Between 0.1m and 0.3m
1 in 100 year	Between 0.1m and 0.3m
1 in 30 year	Between 0.1m and 0.3m

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

High

Moderate - High

Moderate

Low

Negligible

9.1 Groundwater flooding

Highest risk on site	**Moderate**
Highest risk within 50m	**Moderate**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 92**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	0

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	0

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	0

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	0

Areas designated to prevent urban sprawl by keeping land permanently open.

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

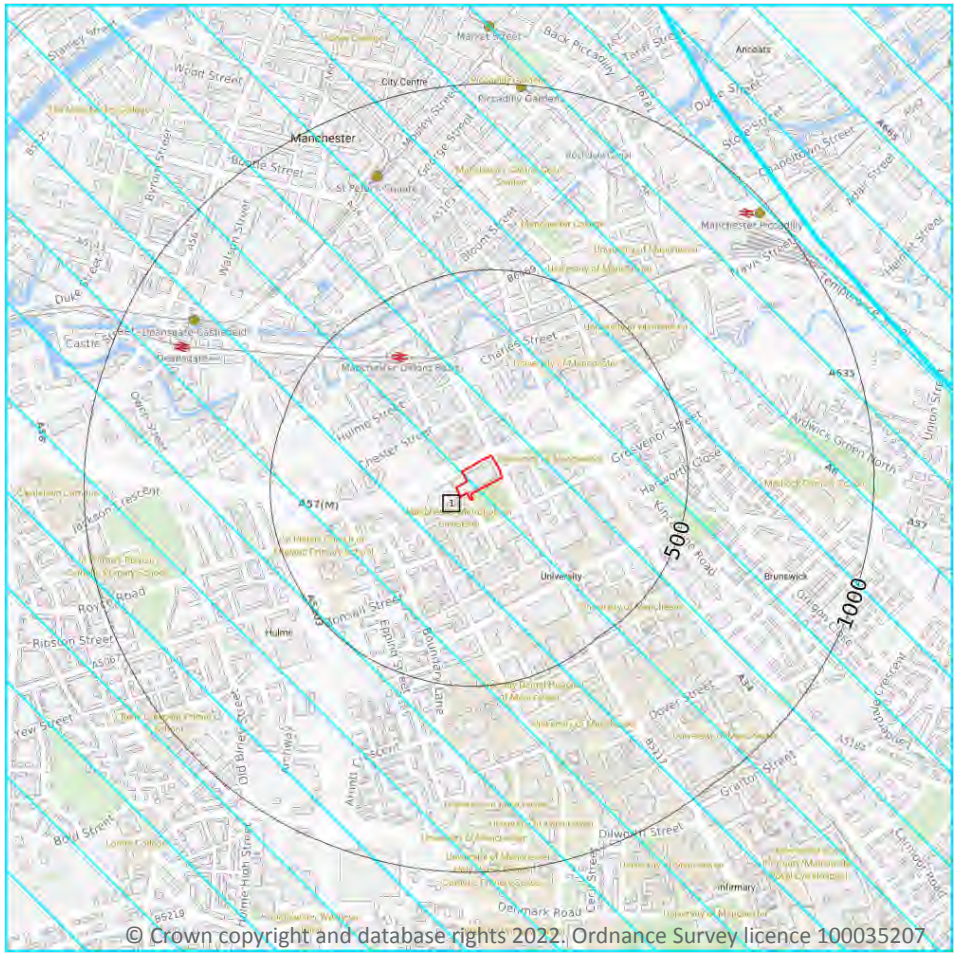
Records within 2000m	3

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

Location	Name	Type	NVZ ID	Status
1182m N	River Irk (Moston Brook to River Irwell) NVZ	Surface Water	638	Existing
1393m N	River Irk (Moston Brook to River Irwell) NVZ	Surface Water	638	Existing
1746m N	Irwell / Man. Ship Canal (Kearsley to Irlam Locks) NVZ	Surface Water	643	Existing

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units



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Site Outline

Search buffers in metres (m)

SSSI Impact Risk Zones

SSSI Units

- Not recorded
- Favourable
- Unfavourable - Recovering
- Unfavourable - No change
- Unfavourable - Declining
- Partially destroyed
- Destroyed

10.17 SSSI Impact Risk Zones

Records on site	1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 97**

ID	Location	Type of developments requiring consultation
1	On site	**Air pollution - Livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 4000m². Combustion - General combustion processes >50mw energy input. incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.**

This data is sourced from Natural England.

10.18 SSSI Units

Records within 2000m	0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations



11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	14

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 99**

ID	Location	Name	Grade	Reference Number	Listed date
1	21m SW	Former Manchester Ear Hospital, Hulme, Manchester, M15	II	1197922	03/10/1974
2	57m SW	Roman Catholic Church of St Augustine, Hulme, Manchester, M15	II	1392331	16/11/2007
3	71m S	ormond Building, Manchester Metropolitan University (Formerly Municipal offices), Hulme, Manchester, M15	II	1219718	03/10/1974
4	103m S	Grosvenor Building, Manchester Metropolitan University Faculty of Art and Design, Hulme, Manchester, M15	II	1293192	03/10/1974

ID	Location	Name	Grade	Reference Number	Listed date
5	106m NW	Dalton Statue in Forecourt of Dalton College, Deansgate, Manchester, M1	II	1197791	03/10/1974
6	114m SE	Former Town Hall Facade To Mabel Tylecote Building, Manchester Metropolitan University, Hulme, Manchester, M15	II	1283062	25/02/1952
7	121m S	Righton Building, Hulme, Manchester, M15	II	1197781	11/06/1991
A	126m SE	Former Grosvenor Picture Palace, Hulme, Manchester, M1	II	1218431	03/10/1974
A	127m SE	Adult Deaf and Dumb institute (Former), Hulme, Manchester, M1	II	1200839	03/10/1974
8	168m NW	Chatham Mill, Deansgate, Manchester, M1	II	1293040	11/03/1988
9	179m N	Dancehouse Theatre including Numbers 6-14, Deansgate, Manchester, M1	II	1384997	05/10/2000
10	210m E	94-98, Grosvenor Street, Hulme, Manchester, M1	II	1218404	13/05/1974
11	222m W	Mill On North East Corner of Junction With Chester Street, Deansgate, Manchester, M1	II	1197776	11/03/1988
12	230m E	Oddfellows Hall, Hulme, Manchester, M1	II	1200840	06/06/1994

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	**0**

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	**0**

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial

sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.7 Registered Parks and Gardens

Records within 250m	0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

12 Agricultural designations



Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 103**

ID	Location	Classification	Description
1	**On site**	**Urban**	-

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	0

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	0

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. The schemes identified may be historical schemes that have now expired, or may still be active.

This data is sourced from Natural England.

12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations

13.1 Priority Habitat Inventory

Records within 250m	0

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	0

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	0

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

13.4 Limestone Pavement Orders

Records within 250m	0

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



Site Outline

Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

14.1 10k Availability

Records within 500m	1

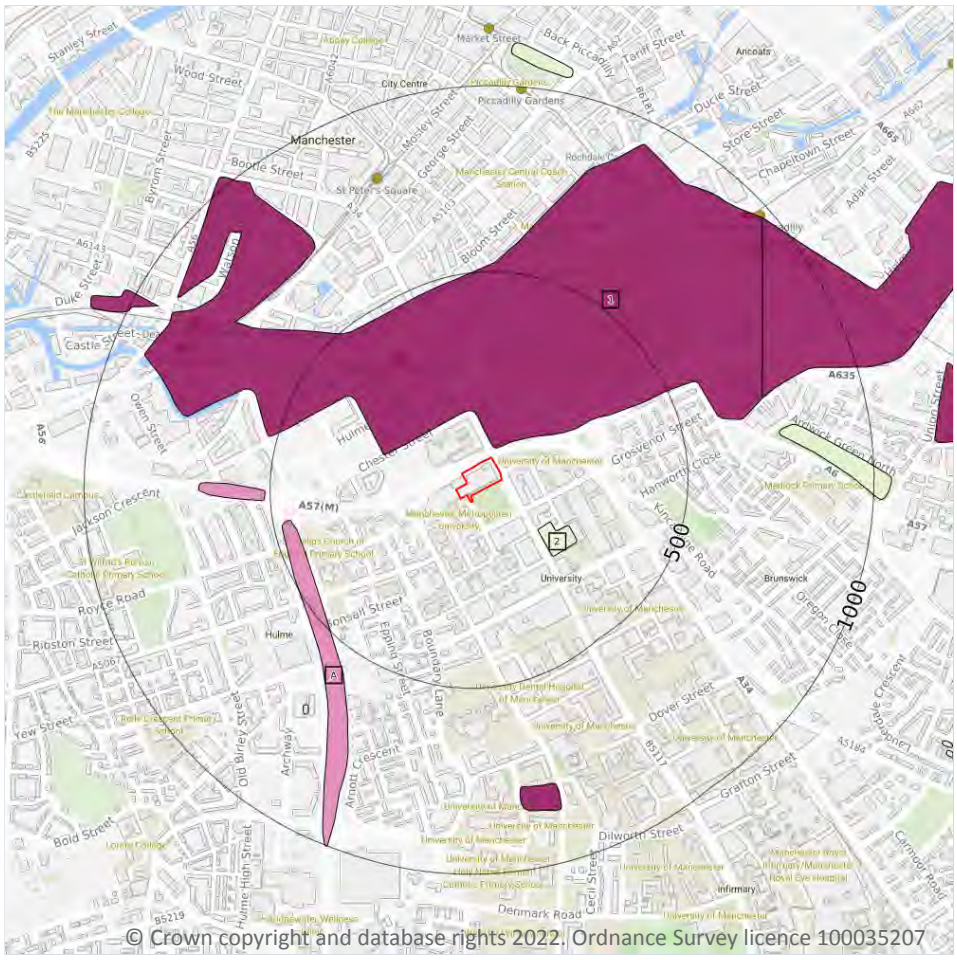
An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 106**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**No coverage**	**SJ89NW**

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground



Site Outline

Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

14.2 Artificial and made ground (10k)

Records within 500m	3

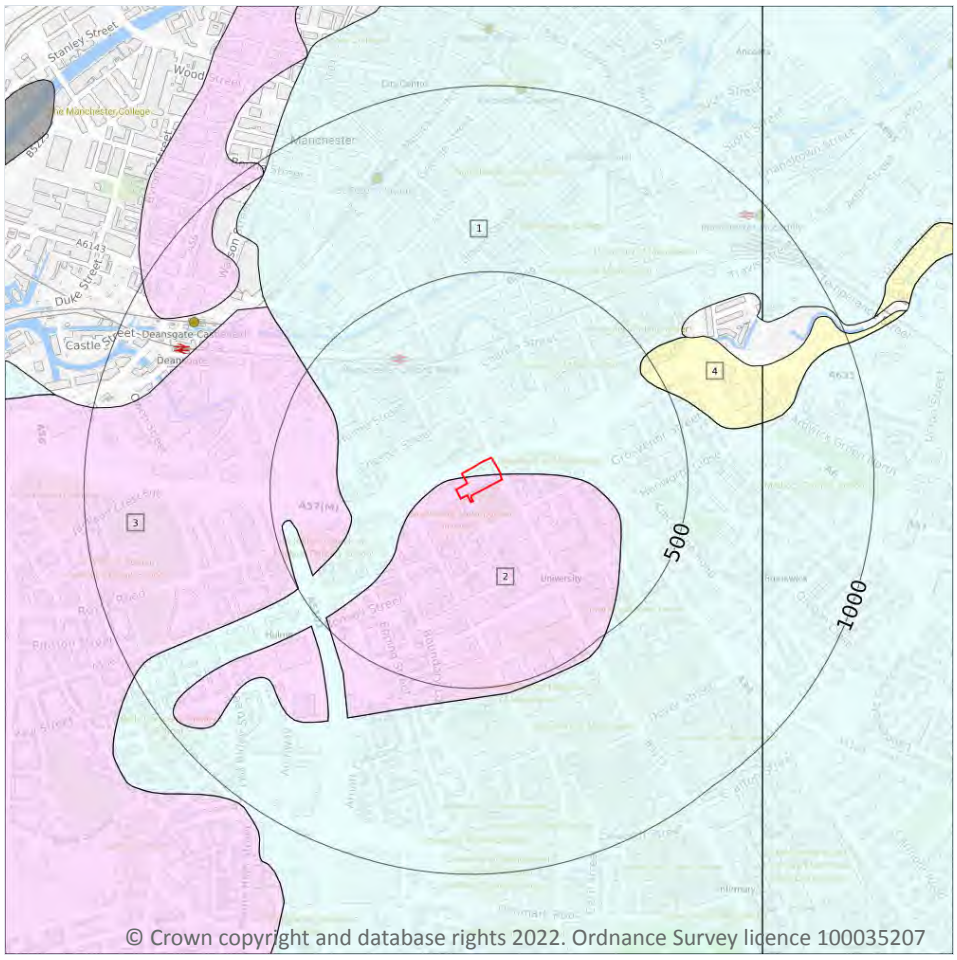
Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 107**

ID	Location	LEX Code	Description	Rock description
1	28m NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	166m SE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
A	439m W	WGR-VOID	Worked Ground (Undivided)	Void

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

14.3 Superficial geology (10k)

Records within 500m **4**

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 108**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**Till, Devensian - Diamicton**	**Diamicton**
2	**On site**	**GFSDD-XSV**	**Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel**	**Sand And Gravel**
3	290m W	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel

ID	Location	LEX Code	Description	Rock description
4	461m NE	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel

This data is sourced from the British Geological Survey.

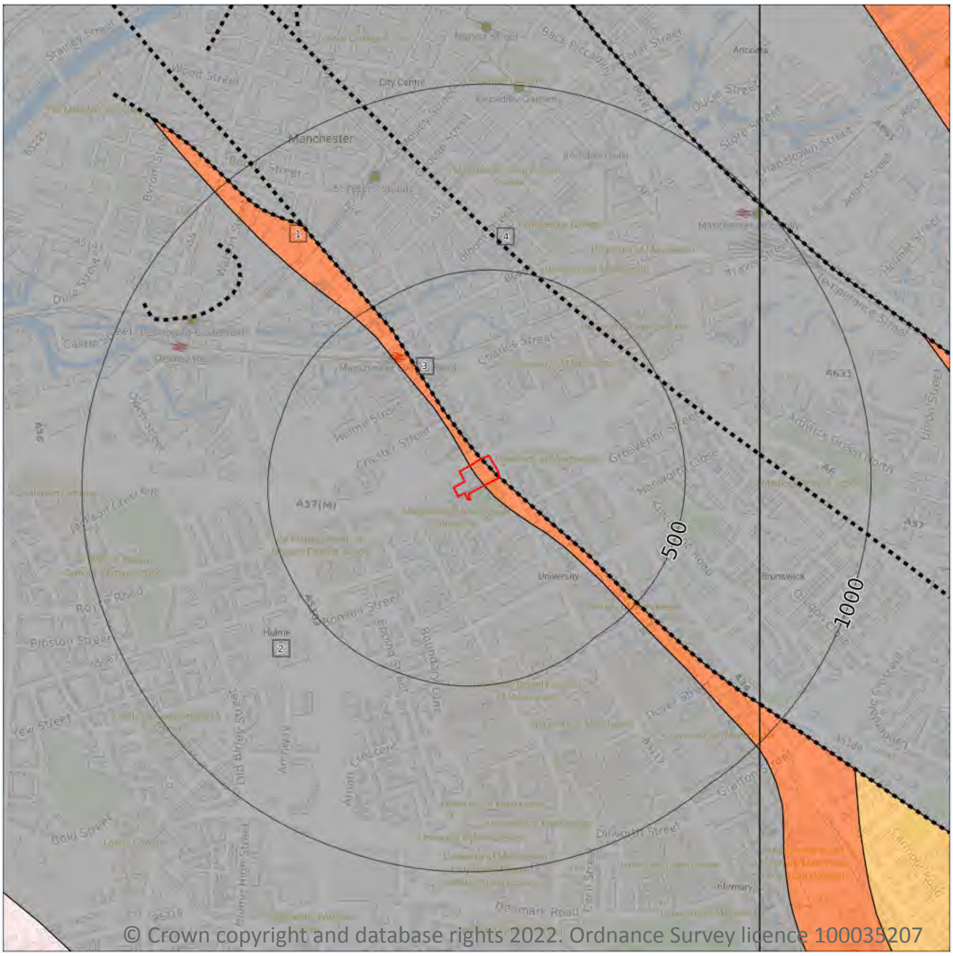
14.4 Landslip (10k)

Records within 500m	**0**

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



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Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m	2

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 110**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**MM-MDST**	**Manchester Marls Formation - Mudstone**	**Late Permian Epoch [Obsolete name]**
2	**On site**	**CPB-SDST**	**Chester Pebble Beds Formation - Sandstone**	**Early Triassic Epoch**

This data is sourced from the British Geological Survey.

14.6 Bedrock faults and other linear features (10k)

Records within 500m	2

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 110**

ID	Location	Category	Description
3	**On site**	**FAULT**	**Normal fault, inferred; crossmarks on downthrow side**
4	451m NE	FAULT	Normal fault, inferred; crossmarks on downthrow side

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability



Site Outline

Search buffers in metres (m)

Geological map tile

15.1 50k Availability

Records within 500m	1

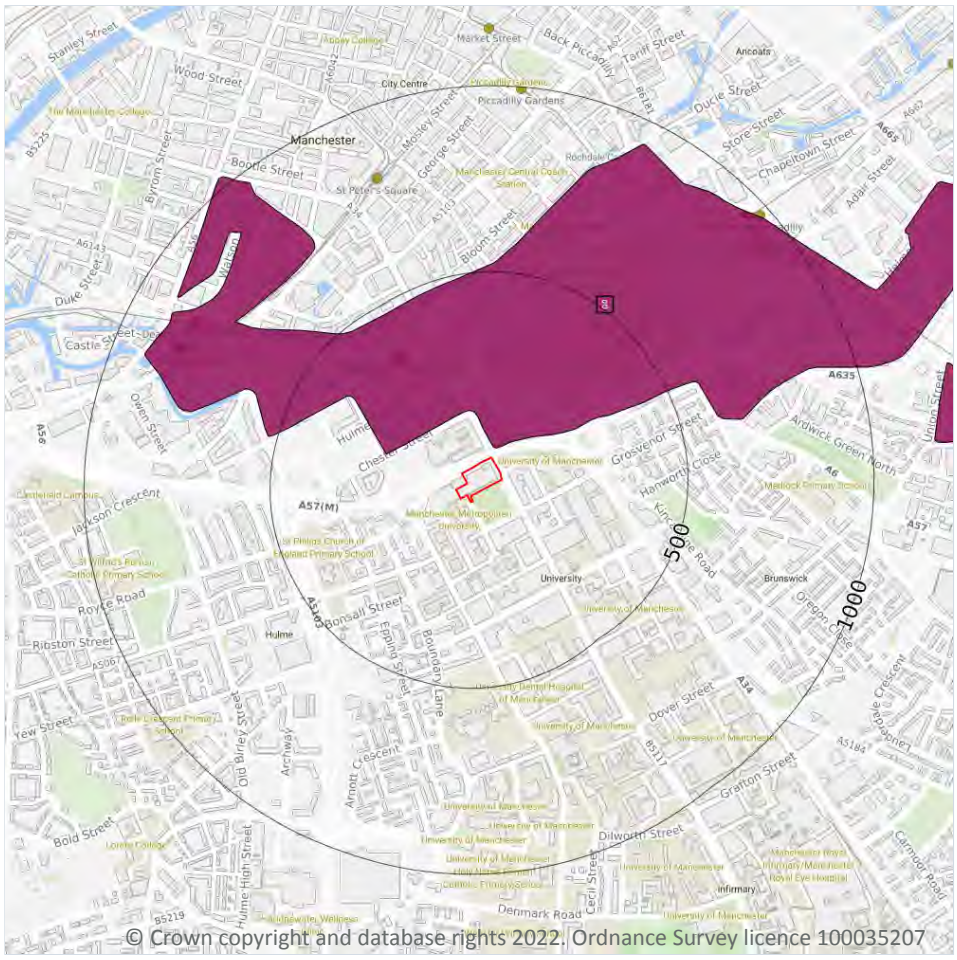
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 112**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	No coverage	Full	Full	No coverage	EW085_manchester_v4

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground



Site Outline

Search buffers in metres (m)

- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

15.2 Artificial and made ground (50k)

Records within 500m	1

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on **page 113**

ID	Location	LEX Code	Description	Rock description
1	28m NE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

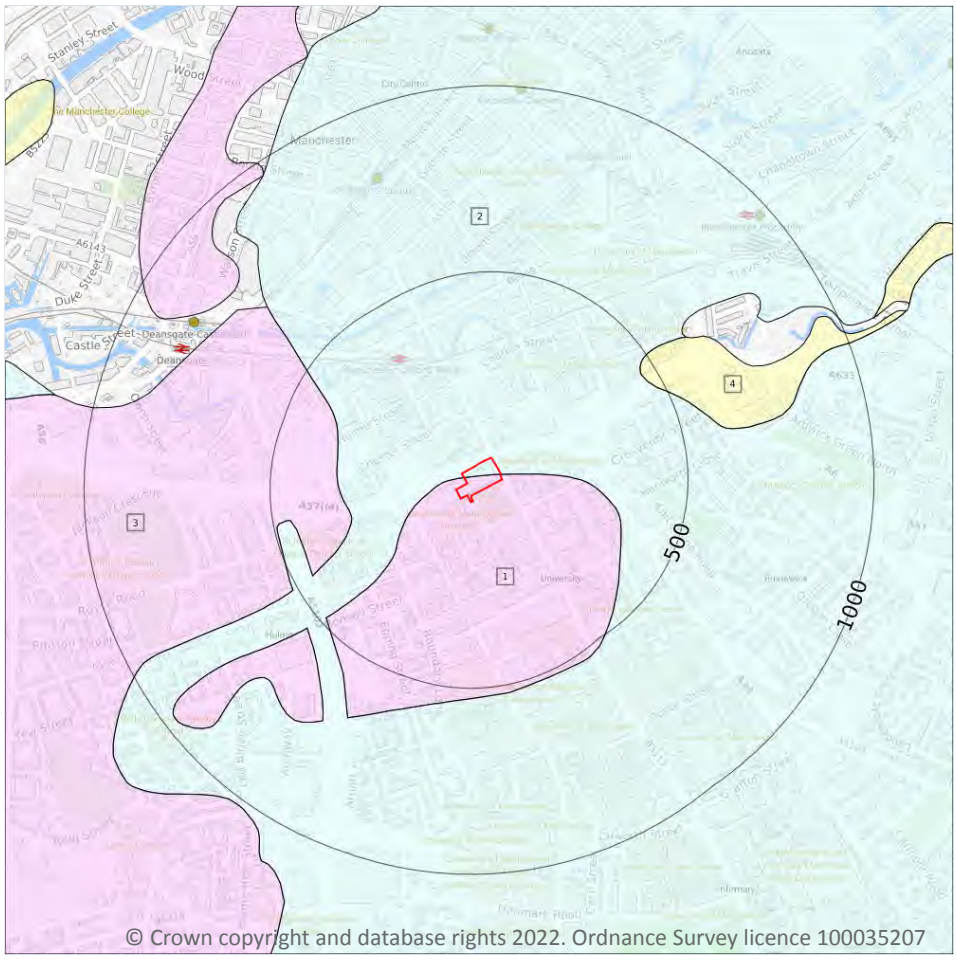
Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
28m NE	Mixed	Very High	Low

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



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Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m **4**

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 115**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**GFSDD-XSV**	**GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN**	**SAND AND GRAVEL**
2	**On site**	**TILLD-DMTN**	**TILL, DEVENSIAN**	**DIAMICTON**
3	290m W	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL

ID	Location	LEX Code	Description	Rock description
4	461m NE	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	**2**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Low**
On site	**Intergranular**	**Very High**	**High**

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	**0**

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

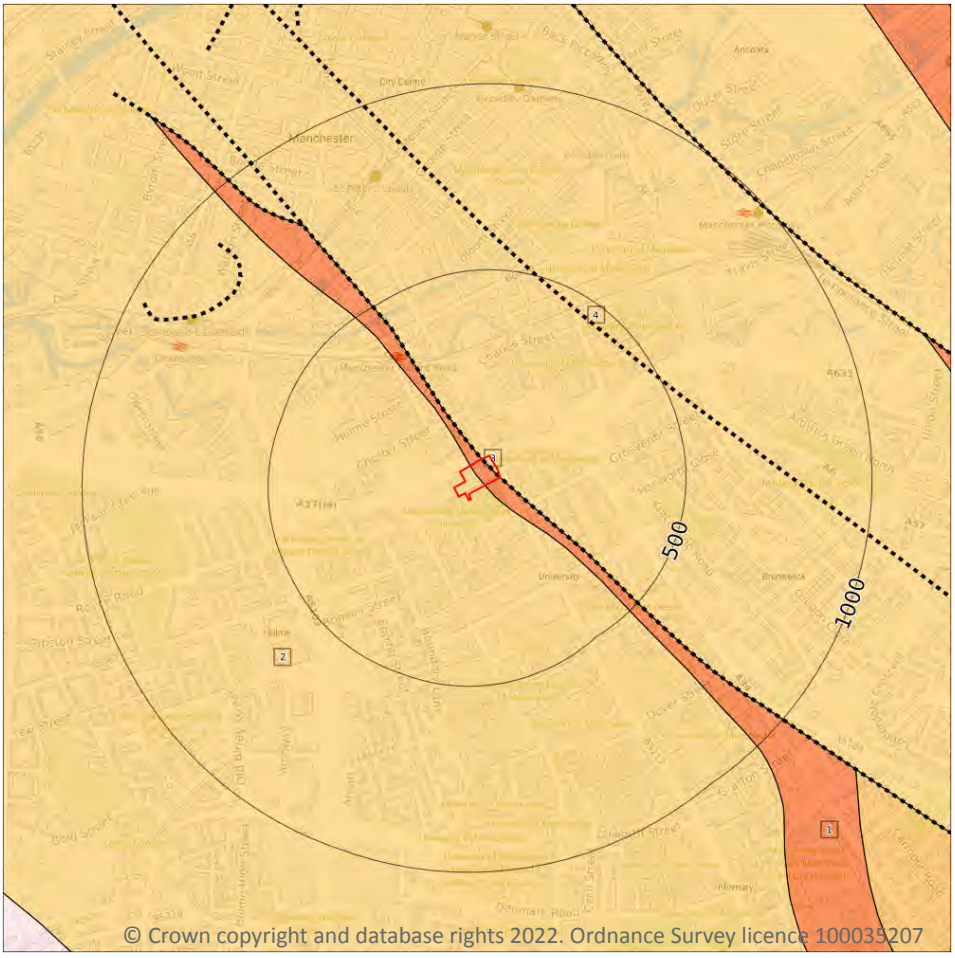
15.7 Landslip permeability (50k)

Records within 50m	**0**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



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Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m **2**

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 117**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**MM-MDST**	**MANCHESTER MARLS FORMATION - MUDSTONE**	**-**
2	**On site**	**CHES-SDST**	**CHESTER FORMATION - SANDSTONE**	**OLENEKIAN**

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	2

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Fracture**	**Low**	**Low**
On site	**Mixed**	**High**	**Moderate**

This data is sourced from the British Geological Survey.

15.10 Bedrock faults and other linear features (50k)

Records within 500m	2

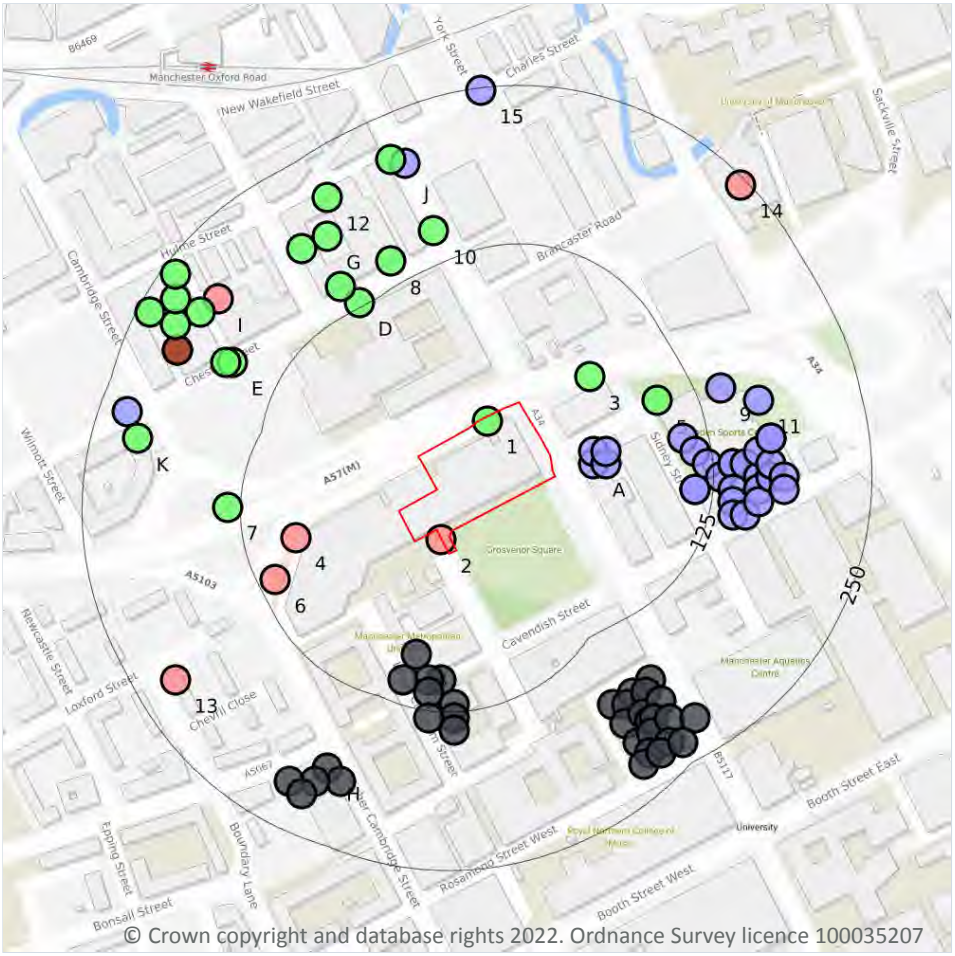
Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 117**

ID	Location	Category	Description
3	**On site**	**FAULT**	**Fault, inferred**
4	451m NE	FAULT	Fault, inferred

This data is sourced from the British Geological Survey.

16 Boreholes



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Site Outline

Search buffers in metres (m)

- Confidential
- 0 - 10m
- 10 - 30m
- 30m+
- Unknown

16.1 BGS Boreholes

Records within 250m	92

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on **page 119**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	**On site**	**384246 397204**	**MANCUNIAN WAY 9**	**11.58**	**N**	**1042496**
2	0m SW	384210 397110	MANCHESTER METROPOLITAN UNIVERSITY	92.0	N	18293103
A	32m E	384330 397170	SIDNEY STREET, TRIAL PIT SURVEY TP 4	4.0	N	15018267

ID	Location	Grid reference	Name	Length	Confidential	Web link
A	34m E	384330 397180	SIDNEY STREET, TRIAL PIT SURVEY TP 3	4.0	N	15018265
A	42m E	384340 397170	SIDNEY STREET, TRIAL PIT SURVEY TP 2	3.8	N	15018261
A	44m E	384340 397180	SIDNEY STREET, TRIAL PIT SURVEY TP 1	4.0	N	15018254
3	58m NE	384327 397239	MANCUNIAN WAY 10	18.29	N	1042497
B	83m S	384190 397020	MANCHESTER METRO' UNIVERS' TP 8	-	Y	N/A
4	84m W	384095 397112	MANCHESTER METROPOLITAN UNIVERSITY BH 3	107.0	N	18662697
5	95m E	384380 397220	YORK ST/SIDNEY ST.MANCHESTER	21.03	N	1045477
B	99m S	384210 397000	MANCHESTER METRO' UNIVERS' TP 5	-	Y	N/A
B	101m S	384200 397000	MANCHESTER METRO' UNIVERS' TP 7	-	Y	N/A
C	105m E	384400 397190	UMIST/MMU JOINT SPORTS FACILITY 4	10.0	N	1044210
B	106m S	384180 397000	MANCHESTER METRO' UNIVERS' TP 9	-	Y	N/A
B	110m S	384200 396990	MANCHESTER METRO' UNIVERS' TP 6	-	Y	N/A
C	111m E	384410 397150	UMIST/MMU JOINT SPORTS FACILITY 2	10.0	N	1044208
C	111m E	384410 397150	UMIST/MMU JOINT SPORTS FACILITY TP3	2.7	N	1044214
6	111m SW	384079 397079	MANCHESTER METROPOLITAN UNIVERSITY BH 2	100.0	N	18662695
C	112m E	384410 397180	UMIST/MMU JOINT SPORTS FACILITY TP6	2.7	N	1044217
B	119m S	384220 396980	MANCHESTER METRO' UNIVERS' TP 3	-	Y	N/A
C	121m E	384420 397170	YORK STREET LATUMIST CENTRE TP4	2.8	N	1045687
D	129m NW	384145 397297	MANCHESTER CORP. K.SEWER	10.06	N	1042247
B	129m S	384220 396970	MANCHESTER METRO' UNIVERS' TP 4	-	Y	N/A
B	130m S	384200 396970	MANCHESTER METRO' UNIVERS' TP 2	-	Y	N/A
C	130m E	384430 397160	YORK STREET LATUMIST CENTRE TP3	2.55	N	1045686
7	136m W	384041 397136	MANCUNIAN WAY 8	16.15	N	1042495
B	139m S	384220 396960	MANCHESTER METRO' UNIVERS' TP 1	-	Y	N/A
C	141m E	384440 397170	UMIST/MMU JOINT SPORTS FACILITY TP4	3.0	N	1044215
C	141m E	384440 397170	YORK STREET LATUMIST CENTRE TP6	2.85	N	1045689
C	141m E	384440 397150	YORK STREET LATUMIST CENTRE TP2	2.25	N	1045685
C	142m E	384440 397140	UMIST/MMU JOINT SPORTS FACILITY TP2	2.0	N	1044213

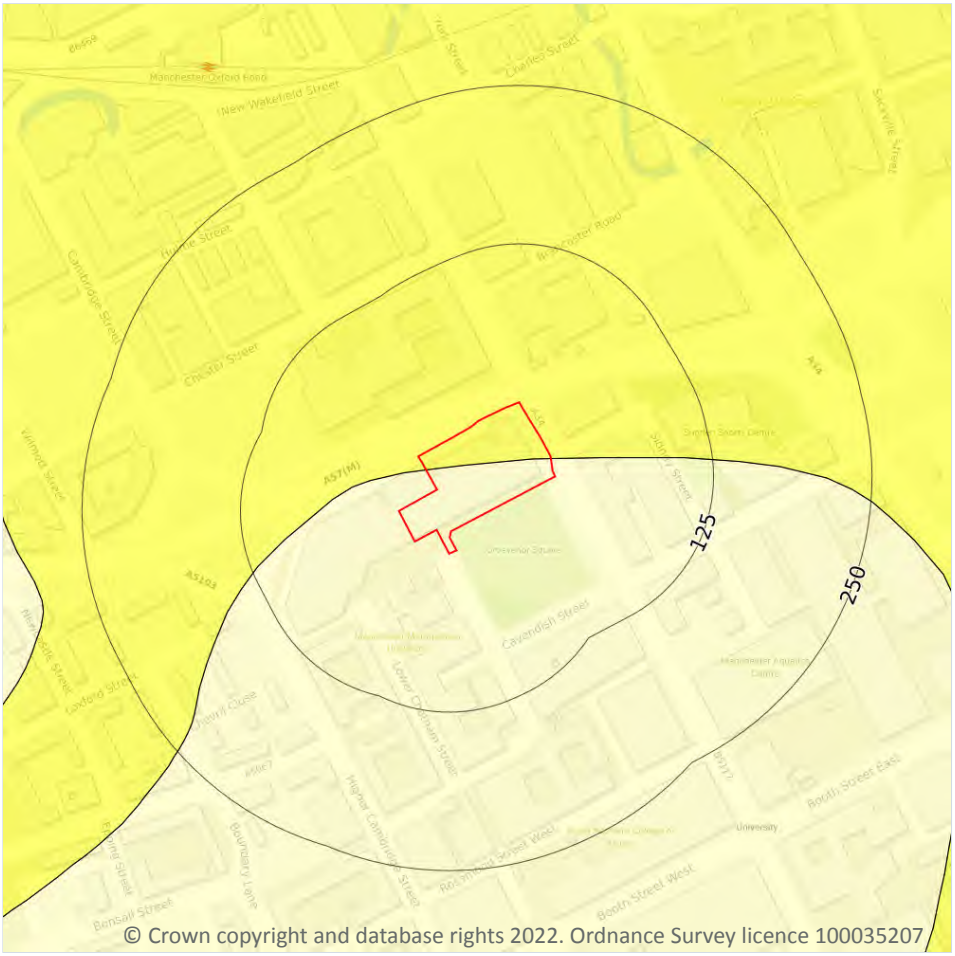
ID	Location	Grid reference	Name	Length	Confidential	Web link
C	144m E	384440 397130	YORK STREET LATUMIST CENTRE TP1	2.55	N	1045684
8	144m NW	384170 397330	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 506	15.0	N	1043418
9	144m E	384430 397230	YORK STREET LATUMIST CENTRE 1	9.7	N	1045683
D	147m NW	384130 397310	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 507	15.0	N	1043419
10	151m N	384204 397354	MANCHESTER CORP. K.SEWER	10.06	N	1042248
C	151m E	384450 397170	YORK STREET LATUMIST CENTRE TP9	2.75	N	1045692
C	153m E	384450 397130	YORK STREET LATUMIST CENTRE TP5	2.5	N	1045688
C	160m E	384460 397160	YORK STREET LATUMIST CENTRE TP8	2.9	N	1045691
C	161m E	384460 397150	UMIST/MMU JOINT SPORTS FACILITY 1	9.5	N	1044207
C	162m E	384460 397180	YORK STREET LATUMIST CENTRE TP13	2.2	N	1045696
C	162m E	384460 397140	YORK STREET LATUMIST CENTRE TP7	2.7	N	1045690
E	164m NW	384045 397250	MANCHESTER CORP. K.SEWER	10.06	N	1042246
E	169m NW	384040 397250	HULME STREET MANCHESTER 4	13.2	N	1043318
11	170m E	384460 397220	UMIST/MMU JOINT SPORTS FACILITY 5	10.0	N	1044211
C	170m E	384470 397160	YORK STREET LATUMIST CENTRE TP11	2.1	N	1045694
C	171m E	384470 397170	YORK STREET LATUMIST CENTRE TP12	2.6	N	1045695
C	173m E	384470 397190	UMIST/MMU JOINT SPORTS FACILITY TP5	2.7	N	1044216
C	173m E	384470 397190	UMIST/MMU JOINT SPORTS FACILITY 3	9.0	N	1044209
F	173m SE	384345 396980	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY 1	-	Y	N/A
F	177m SE	384375 397000	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY 2	-	Y	N/A
F	179m SE	384361 396989	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 9	-	Y	N/A
C	180m E	384480 397160	UMIST/MMU JOINT SPORTS FACILITY TP1	2.5	N	1044212
C	181m E	384480 397150	YORK STREET LATUMIST CENTRE TP10	2.95	N	1045693
F	181m SE	384356 396980	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 10	-	Y	N/A
F	184m SE	384371 396990	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 8	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
G	187m NW	384120 397350	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 509	15.32	N	1043421
G	188m NW	384100 397340	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 509A	16.0	N	1043422
F	191m SE	384355 396965	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 13	-	Y	N/A
H	192m SW	384120 396930	HIGHER CAMBRIDGE ST MANCHESTER TP 1	-	Y	N/A
F	196m SE	384369 396973	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 12	-	Y	N/A
F	196m SE	384383 396983	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 11	-	Y	N/A
H	198m SW	384130 396920	HIGHER CAMBRIDGE ST MANCHESTER TP 4	-	Y	N/A
I	201m NW	384034 397300	BINYON & FRYER'S, SUGAR WORKS, CHESTER STREET	163.53	N	1042400
F	203m SE	384374 396967	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY 3	-	Y	N/A
H	205m SW	384110 396920	HIGHER CAMBRIDGE ST MANCHESTER TP 5	-	Y	N/A
F	205m SE	384378 396969	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 7	-	Y	N/A
I	206m NW	384020 397290	HULME STREET MANCHESTER 5	12.0	N	1043319
I	207m W	384002 397260	DUNLOP RUBBER CO. 1 CAMBRIDGE STREET	-1.0	N	1042396
J	208m N	384181 397407	MANCHESTER CORP. K.SEWER	8.84	N	1042249
F	209m SE	384365 396950	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 6	-	Y	N/A
F	211m SE	384376 396958	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 5	-	Y	N/A
F	211m SE	384390 396969	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 4	-	Y	N/A
12	213m NW	384120 397380	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 508/508A	15.9	N	1043420
H	213m SW	384090 396920	HIGHER CAMBRIDGE ST MANCHESTER TP 2	-	Y	N/A
K	214m W	383970 397190	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0285 504	15.0	N	1043424
J	216m N	384170 397410	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 505	10.5	N	1043417

ID	Location	Grid reference	Name	Length	Confidential	Web link
H	218m SW	384100 396910	HIGHER CAMBRIDGE ST MANCHESTER TP 3	-	Y	N/A
13	218m SW	384000 397000	DYE WORKS OLD GARRATT MANCHESTER	98.76	N	1045463
I	218m NW	384000 397280	HULME STREET MANCHESTER 8	11.9	N	1043322
F	220m SE	384410 396970	OXFORD ROAD MANCHESTER TP1	-	Y	N/A
F	221m SE	384374 396942	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 3	-	Y	N/A
F	225m SE	384370 396933	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY 4	-	Y	N/A
F	227m SE	384390 396950	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 1	-	Y	N/A
F	227m SE	384383 396942	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY TP 2	-	Y	N/A
K	228m W	383962 397211	MANCHESTER CORP. K.SEWER	9.75	N	1042245
I	228m NW	384000 397300	HULME STREET MANCHESTER 7/7A	11.1	N	1043321
F	233m SE	384400 396950	SITE 3 MANCHESTER METROPOLITAN UNIVERSITY 5	-	Y	N/A
I	240m NW	384000 397320	HULME STREET MANCHESTER 6	10.4	N	1043320
I	240m NW	383980 397290	HULME STREET MANCHESTER 9	10.8	N	1043323
14	245m NE	384446 397390	DUNLOP RUBBER CO, BROOK STREET 2	76.5	N	1042402
15	248m N	384241 397465	MANCHESTER CORP. K.SEWER	6.71	N	1042250

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



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17.1 Shrink swell clays

Records within 50m	2

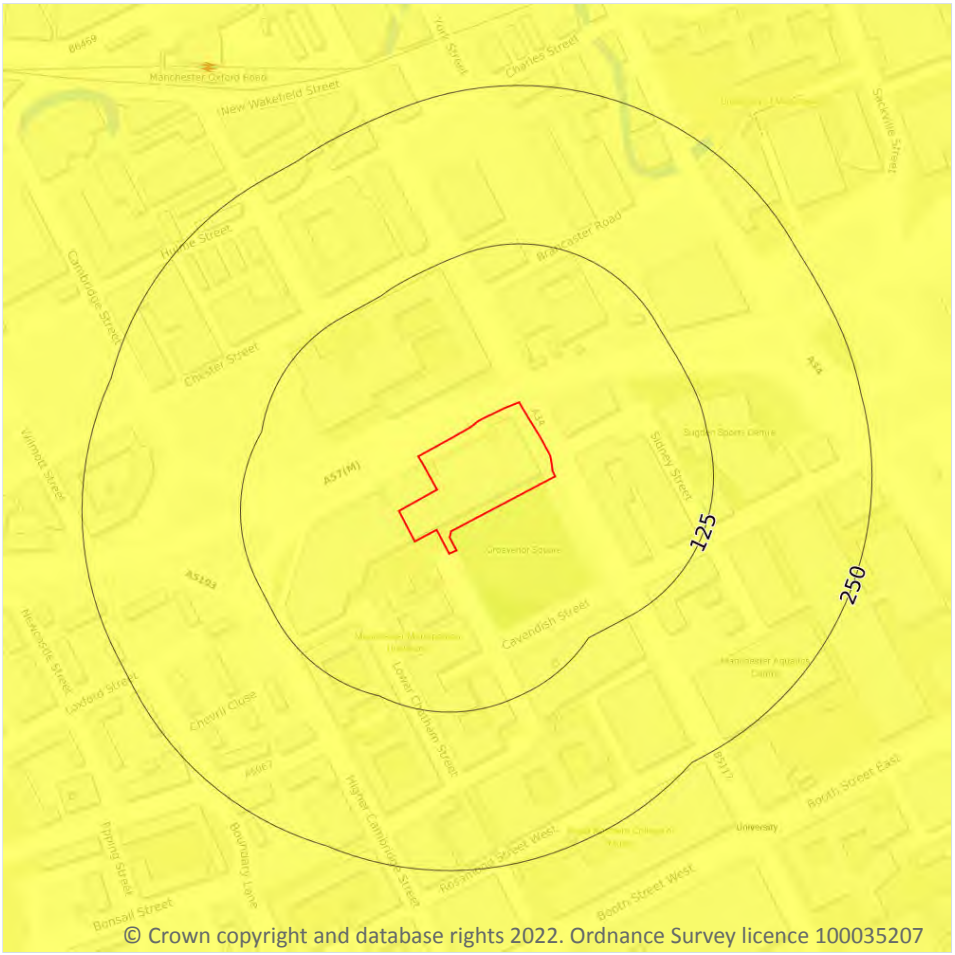
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 124**

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**
On site	**Very low**	**Ground conditions predominantly low plasticity.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.2 Running sands

Records within 50m	1

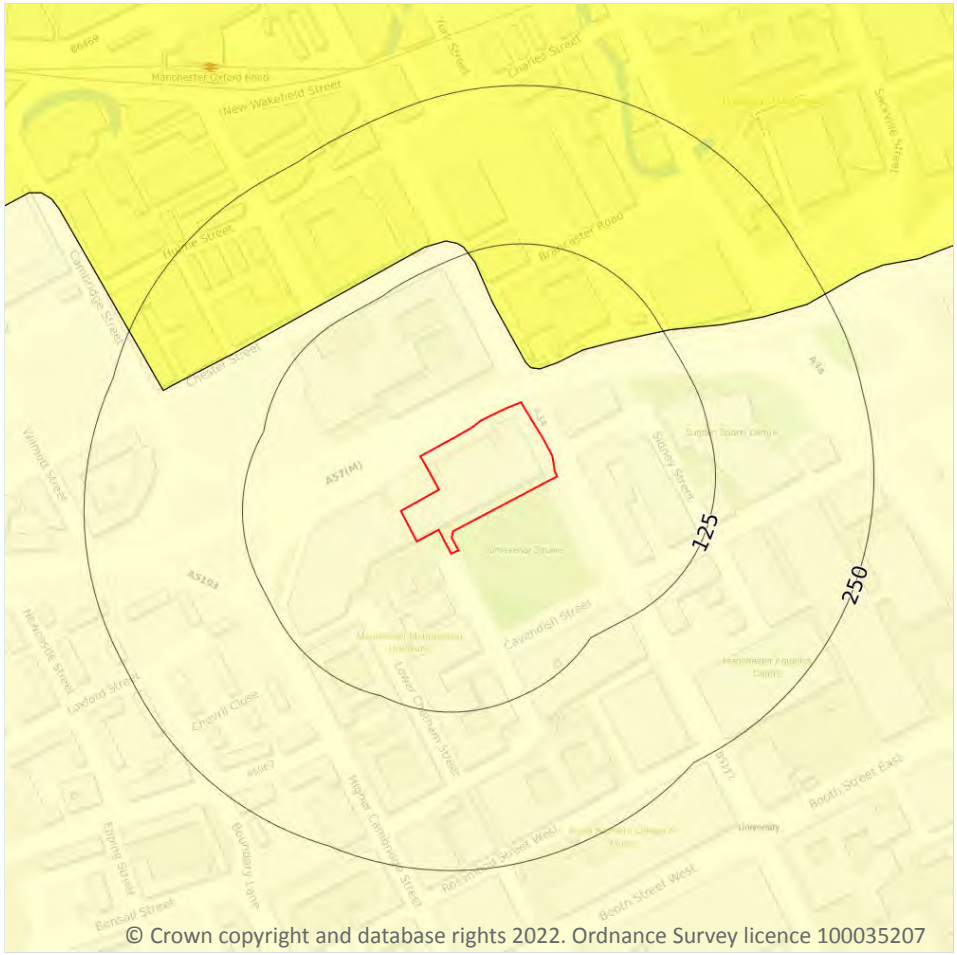
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 125**

Location	Hazard rating	Details
On site	**Very low**	**Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	2

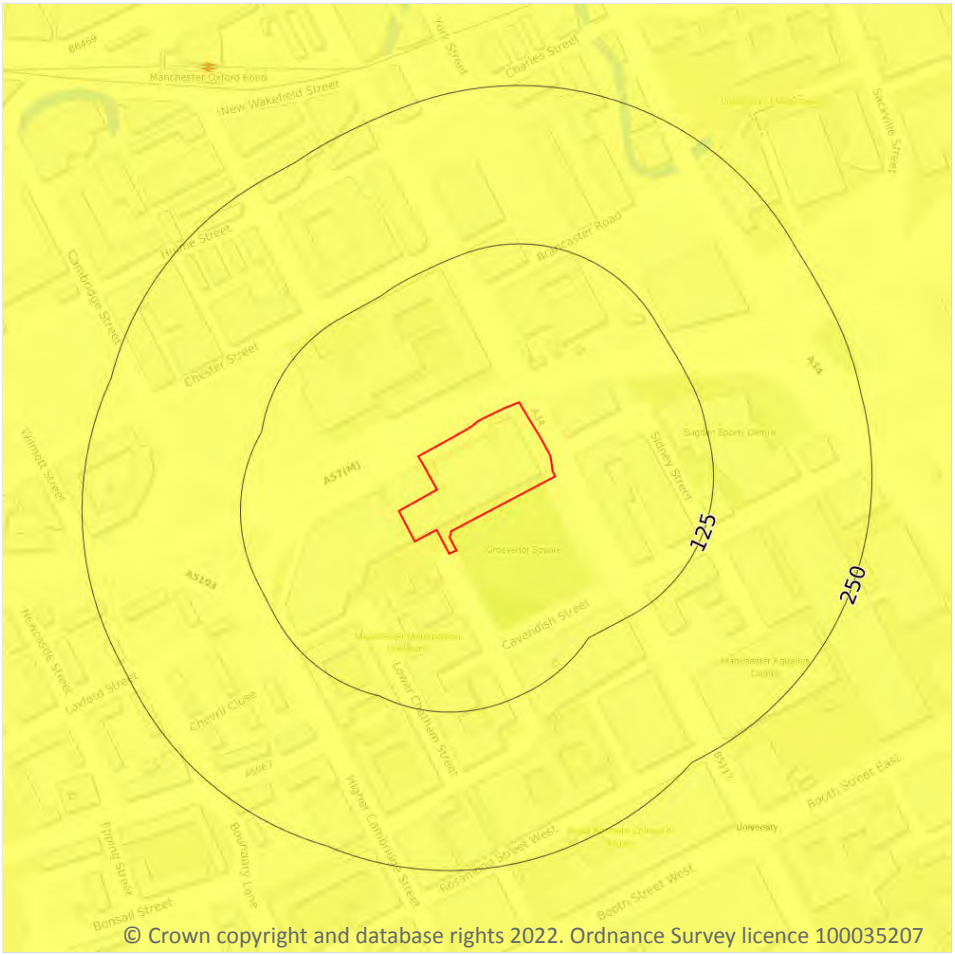
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 126**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**
28m NE	Very low	Compressibility and uneven settlement problems are not likely to be significant on the site for most land uses.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



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Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

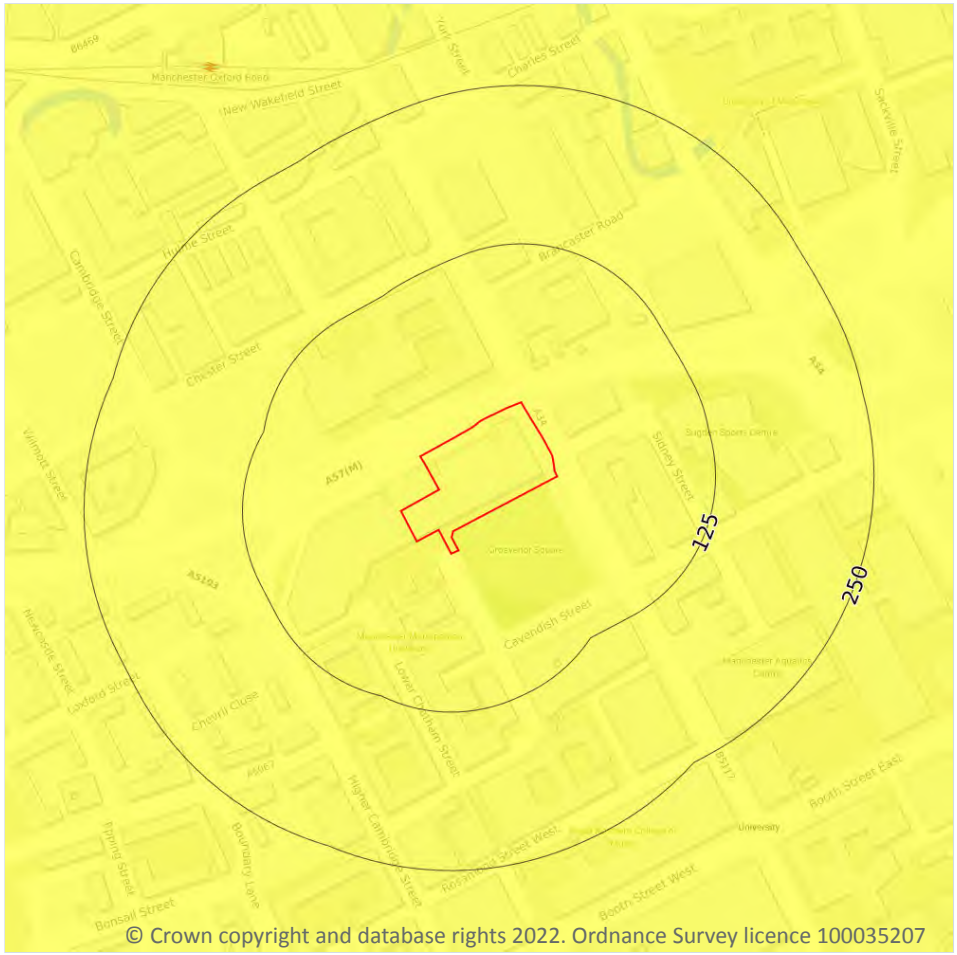
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 128**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 129**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	1

The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 130**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

18.2 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	0

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	1

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

Features are displayed on the Mining, ground workings and natural cavities map on **page 132**

ID	Location	Mine Address	Mineral	Data source	Publisher
3	603m E	Manchester, Greater Manchester	Firestone, Freestone, Hearthstone, Honestone, Ragstone, Sandstone, Scythestone, Silver Sand, Whetstone	'Underground Manchester - Secrets of the city revealed'	Willow Publishing

This data is sourced from Stantec UK Ltd.

18.8 JPB mining areas

Records on site	1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	**In addition to being located inside an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk.**

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	1

Areas which could be affected by past, current or future coal mining.

Location	Details
On site	**The site is located within a coal mining area as defined by the Coal Authority. A Consultants Coal Mining Report is recommended to further assess coal mining issues at the site. This can be ordered directly through Groundsure or your preferred search provider.**

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



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Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 136**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m **3**

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**
On site	**25 - 35 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m **8**

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
On site	**15**	**2.6**	**91**	**63**	**0.6**	**71**	**43**	**21**	**11**
On site	**16**	**2.8**	**132**	**91**	**0.6**	**71**	**51**	**21**	**13**
On site	**17**	**3**	**111**	**76**	**0.5**	**70**	**40**	**21**	**8**
On site	**18**	**3.2**	**202**	**139**	**0.7**	**72**	**62**	**23**	**16**

Location	Arsenic (mg/kg)	Bioaccessible Arsenic (mg/kg)	Lead (mg/kg)	Bioaccessible Lead (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Tin (mg/kg)
0m E	14	2.5	122	84	0.6	69	50	20	12
9m SW	19	3.3	98	67	0.5	68	38	22	9
15m NE	13	2.3	109	75	0.6	67	48	19	11
17m NW	15	2.6	116	80	0.6	75	41	22	7

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

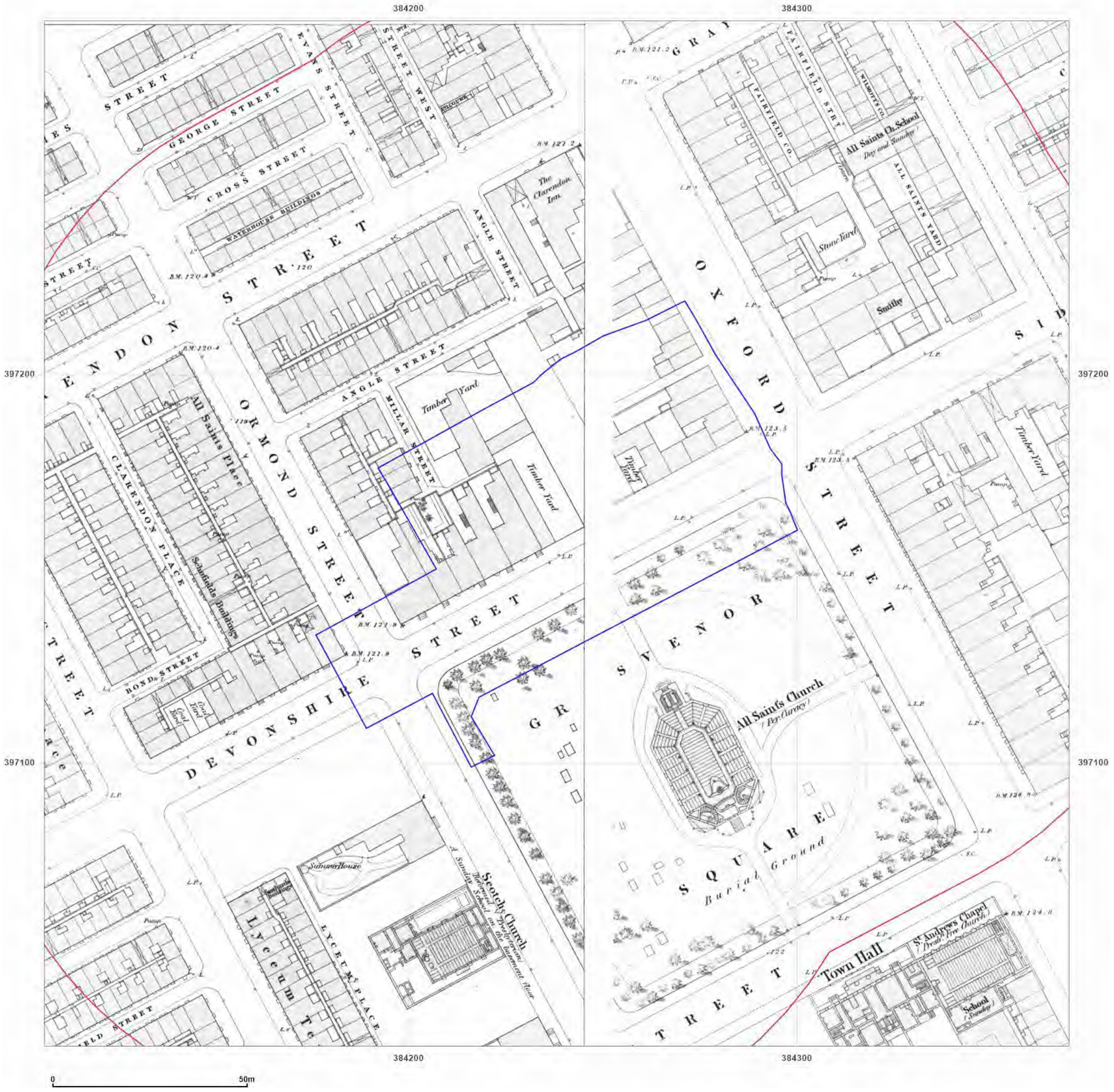
This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: https://www.groundsure.com/terms-and-conditions-jan-2020/.



Site Details:

ALL SAINTS CAMPUS, OXFORD ROAD, MANCHESTER, M15 6BH

Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

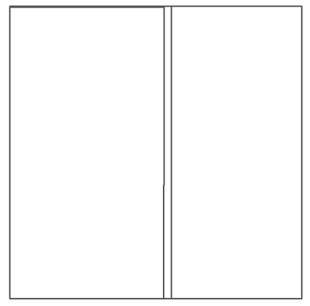
Map Name: 1056 Scale Town Plan

Map date: **1851**

Scale: 1:1,056

Printed at: 1:1,056

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Surveyed 1844
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

Surveyed 1849
Revised N/A
Edition 1851
Copyright N/A
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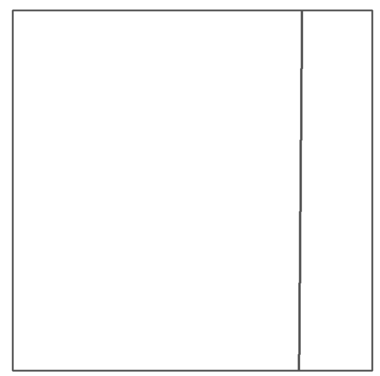
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Edition 1893
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Surveyed 1889
Revised N/A
Edition 1889
Copyright N/A
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1889-1893**

Scale: 1:2,500

Printed at: 1:2,500

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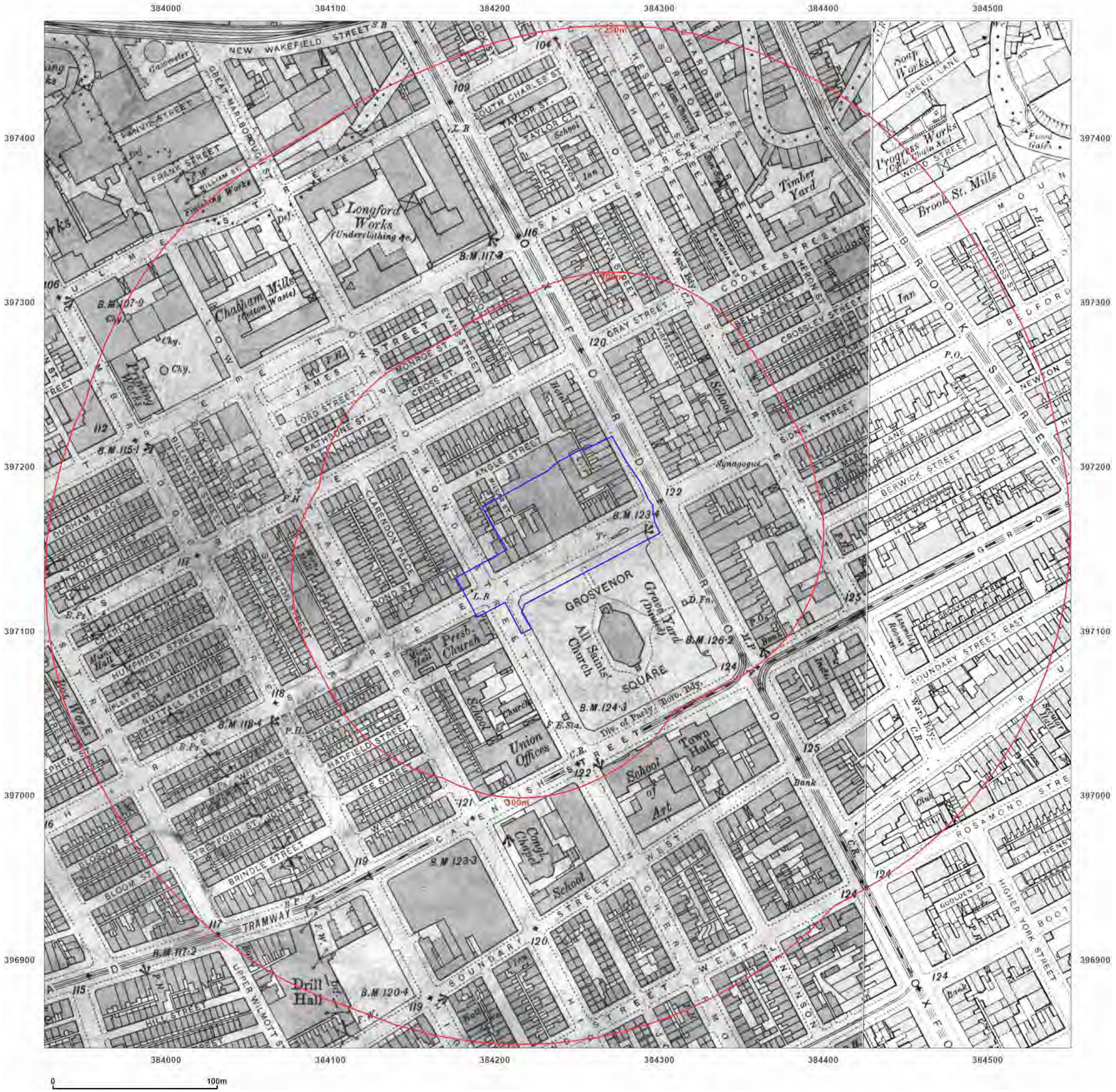
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1908**

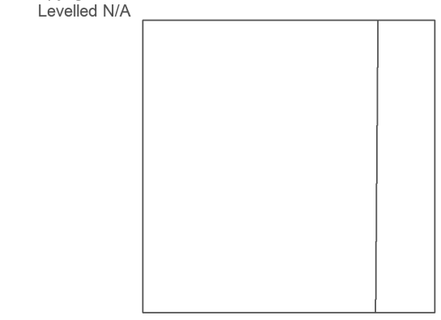
Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1891
Revised 1905
Edition 1908
Copyright N/A
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Surveyed 1891
Revised 1905
Edition 1908
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1922**

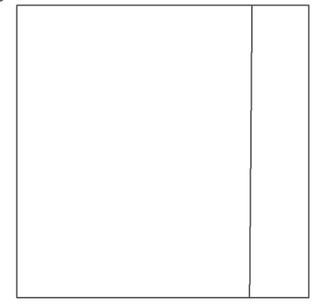
Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1922
Revised 1916
Edition 1922
Copyright N/A
Levelled 1915

Surveyed 1922
Revised 1916
Edition 1922
Copyright N/A
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1932**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled 1927

Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled 1927

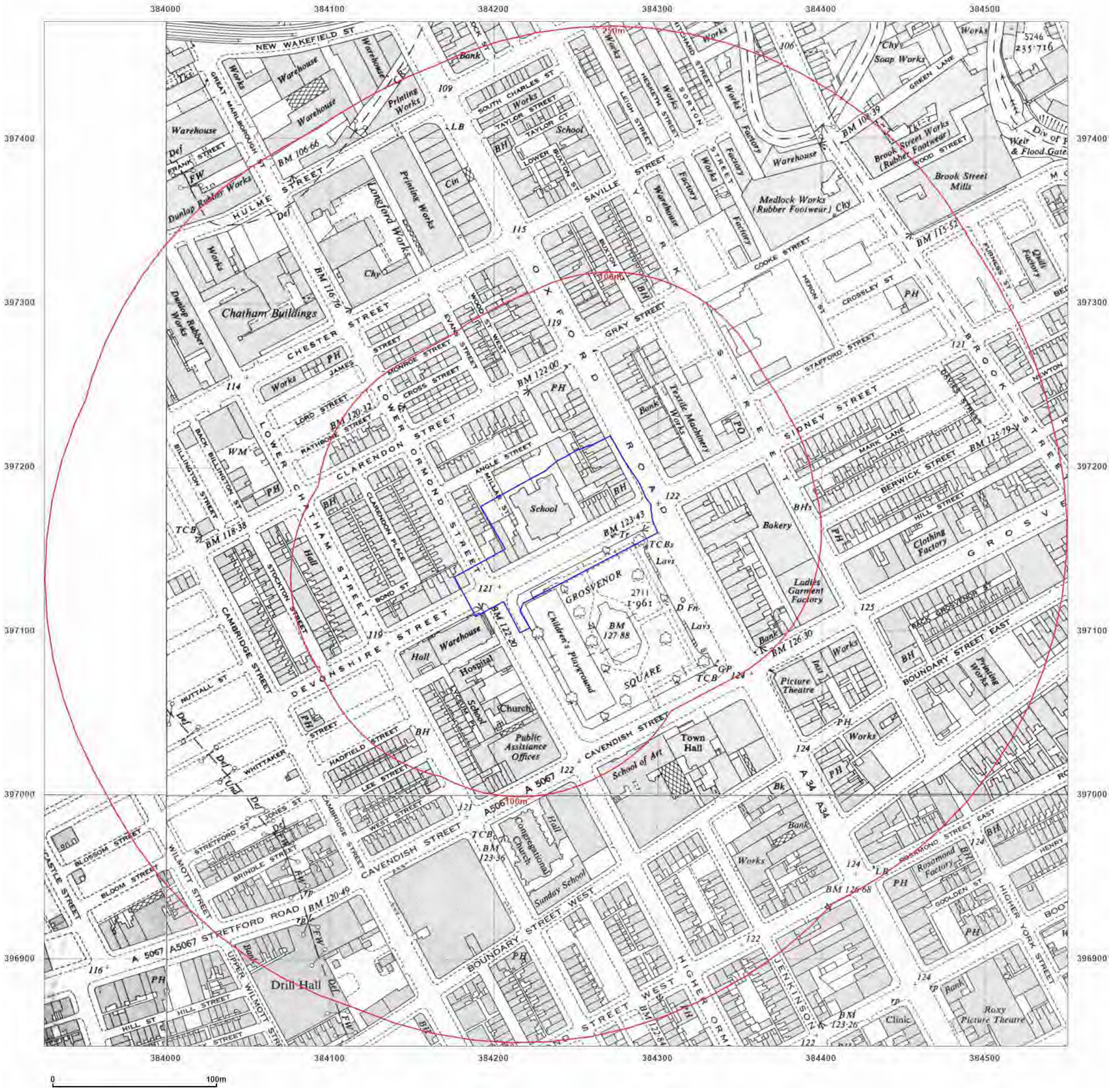
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1950**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1948
Revised 1948
Edition N/A
Copyright 1950
Levelled 1929

Surveyed 1949
Revised 1949
Edition N/A
Copyright 1950
Levelled 1927

Surveyed 1949
Revised 1949
Edition N/A
Copyright 1950
Levelled 1929

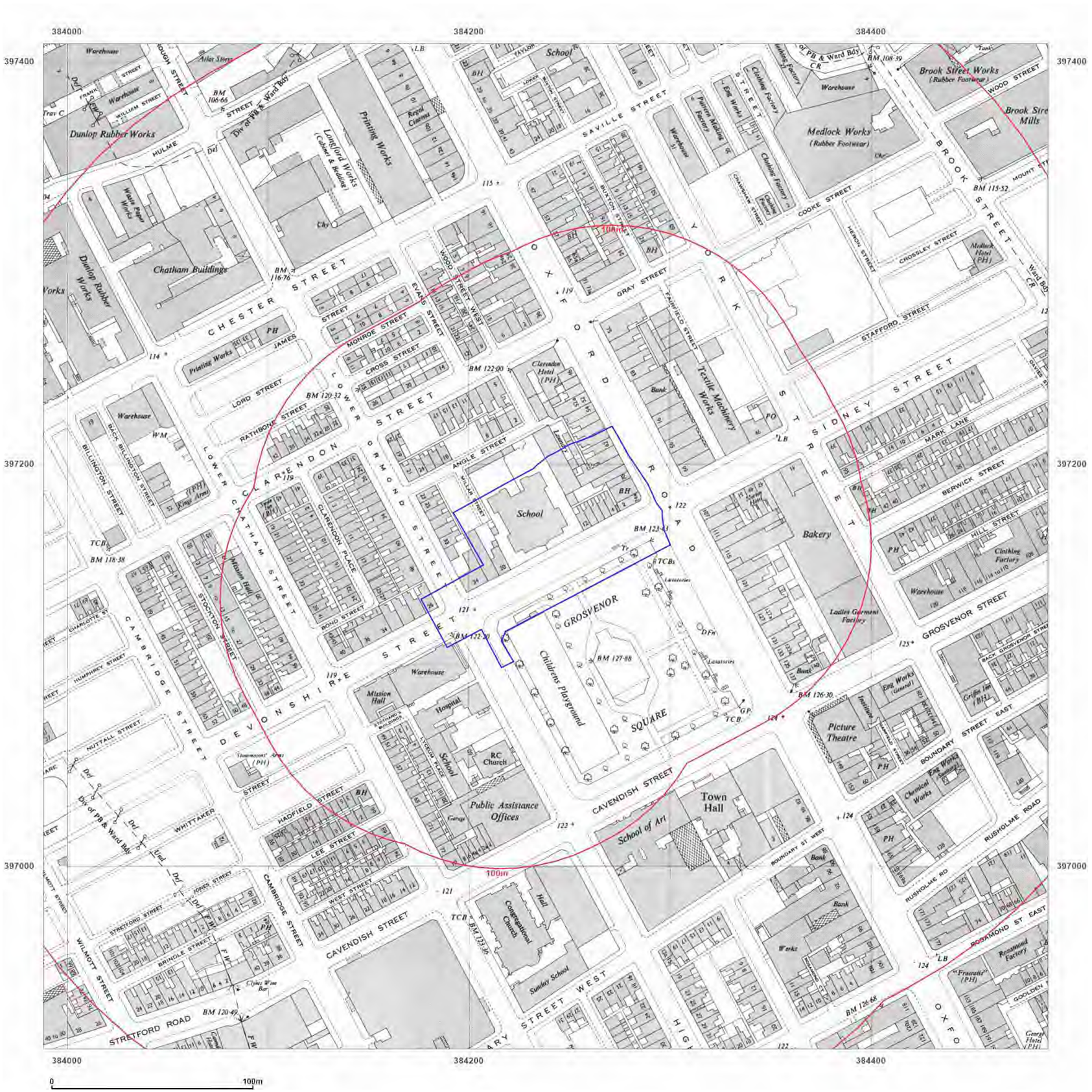
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1948-1953**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1948 Revised 1953 Edition N/A Copyright 1953 Levelled 1927	Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1927
Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1927	Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1927

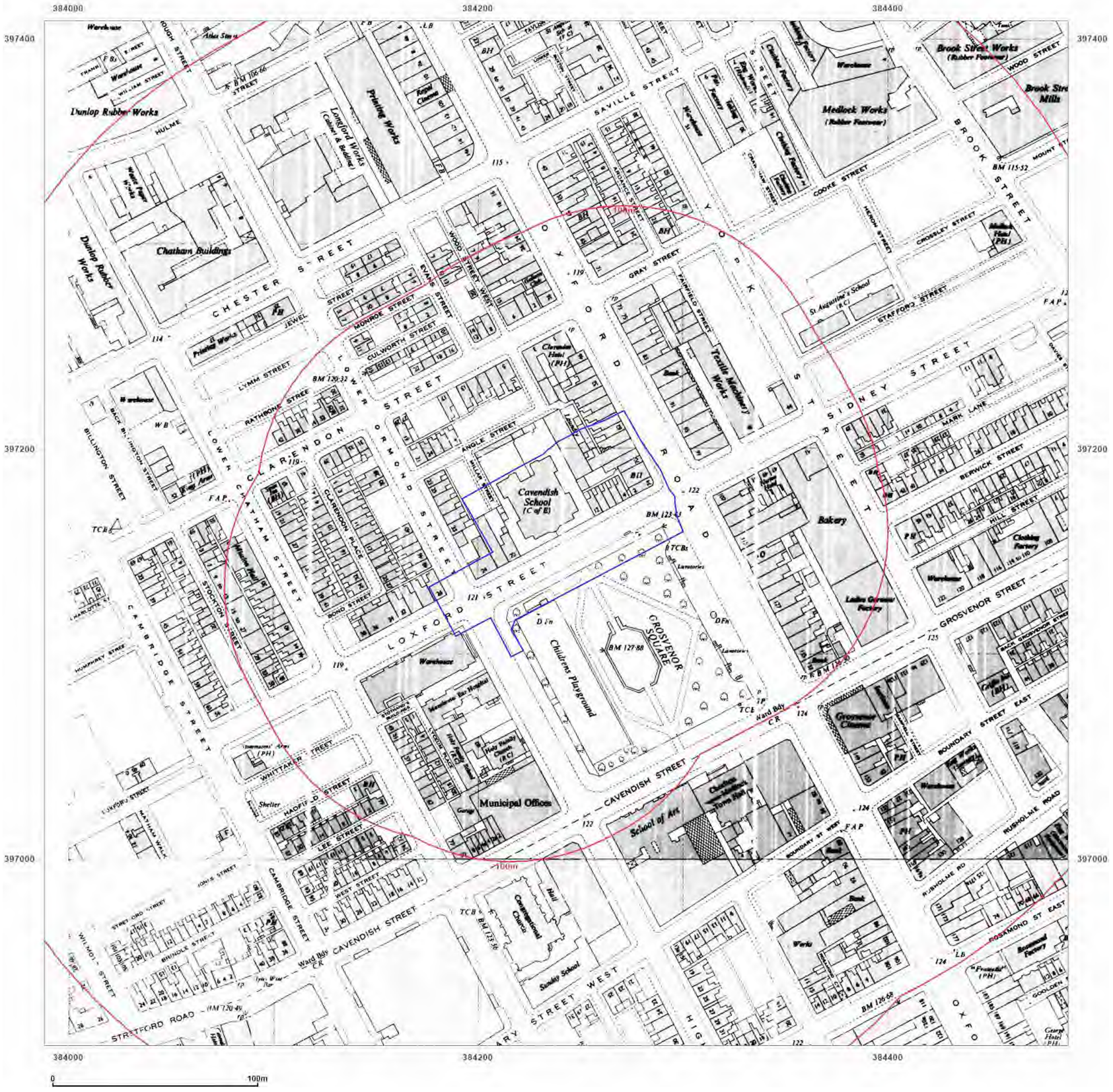
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1952-1954**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

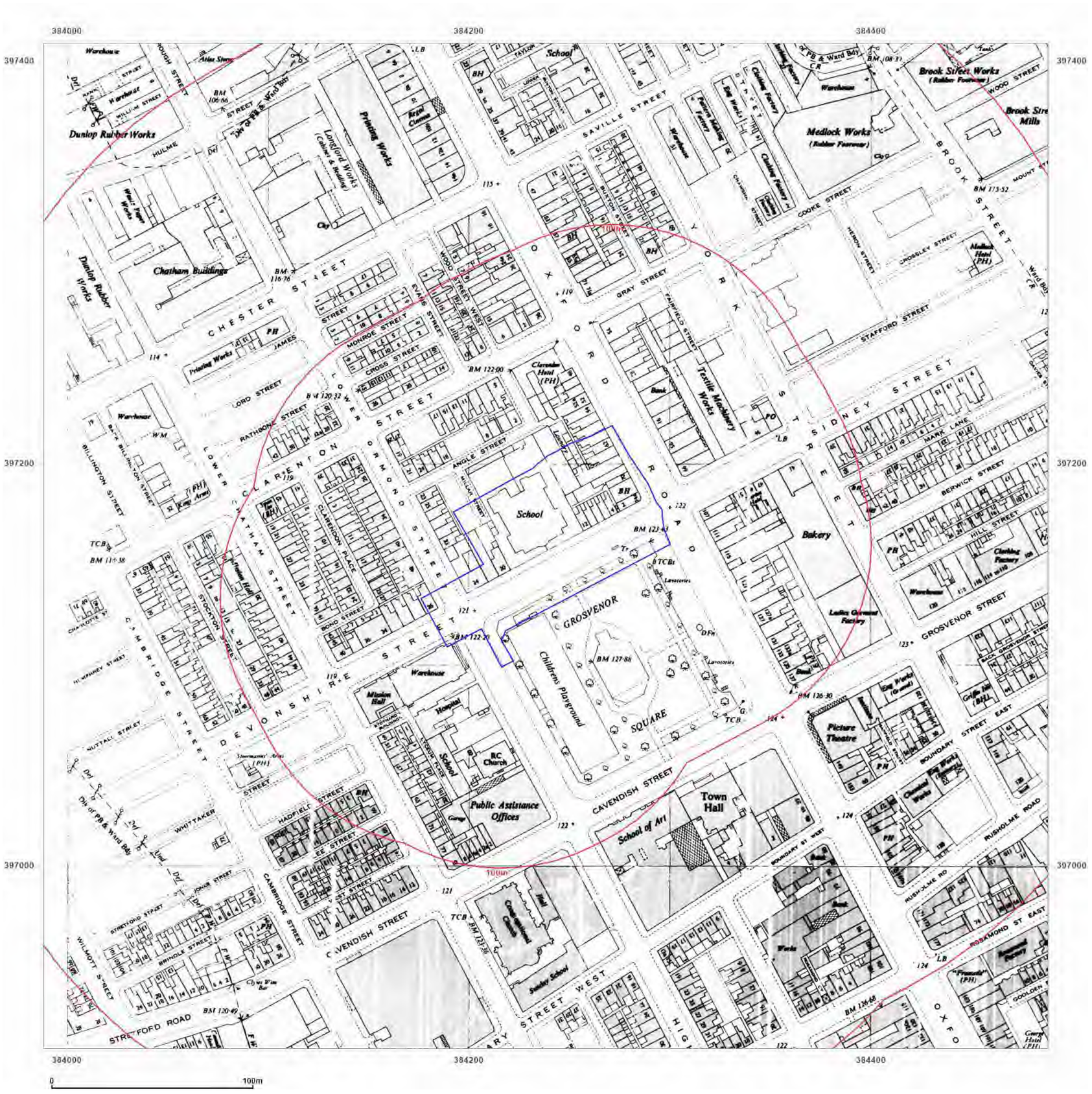
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1952-1954**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

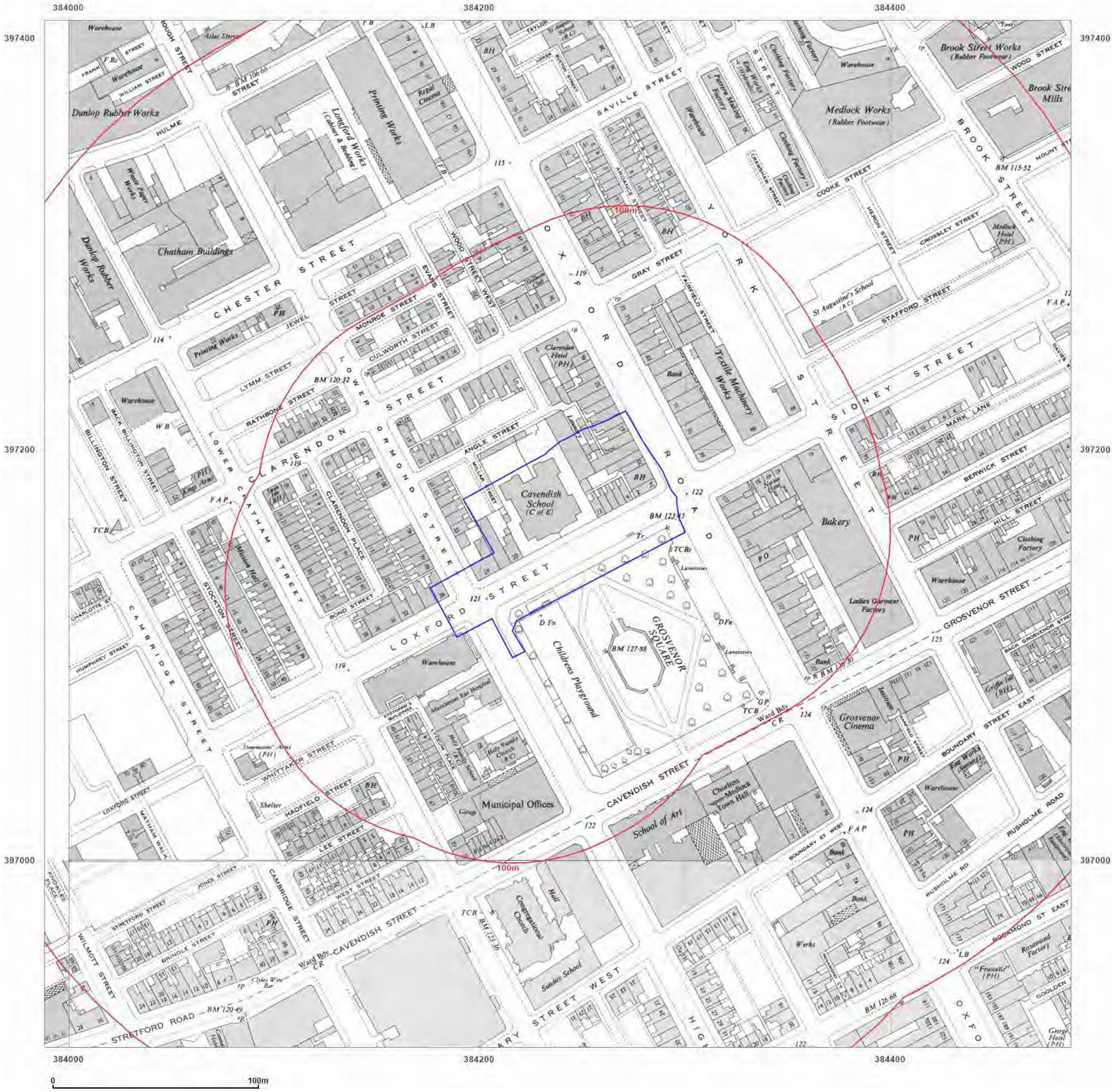
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1951-1955**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1948	Surveyed 1953
Revised 1955	Revised 1953
Edition N/A	Edition N/A
Copyright 1955	Copyright 1953
Levelled 1927	Levelled 1927
Surveyed 1951	
Revised 1951	
Edition N/A	
Copyright 1951	
Levelled 1927	

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1951-1955**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1953
Revised 1953
Edition N/A
Copyright N/A
Levelled 1929

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

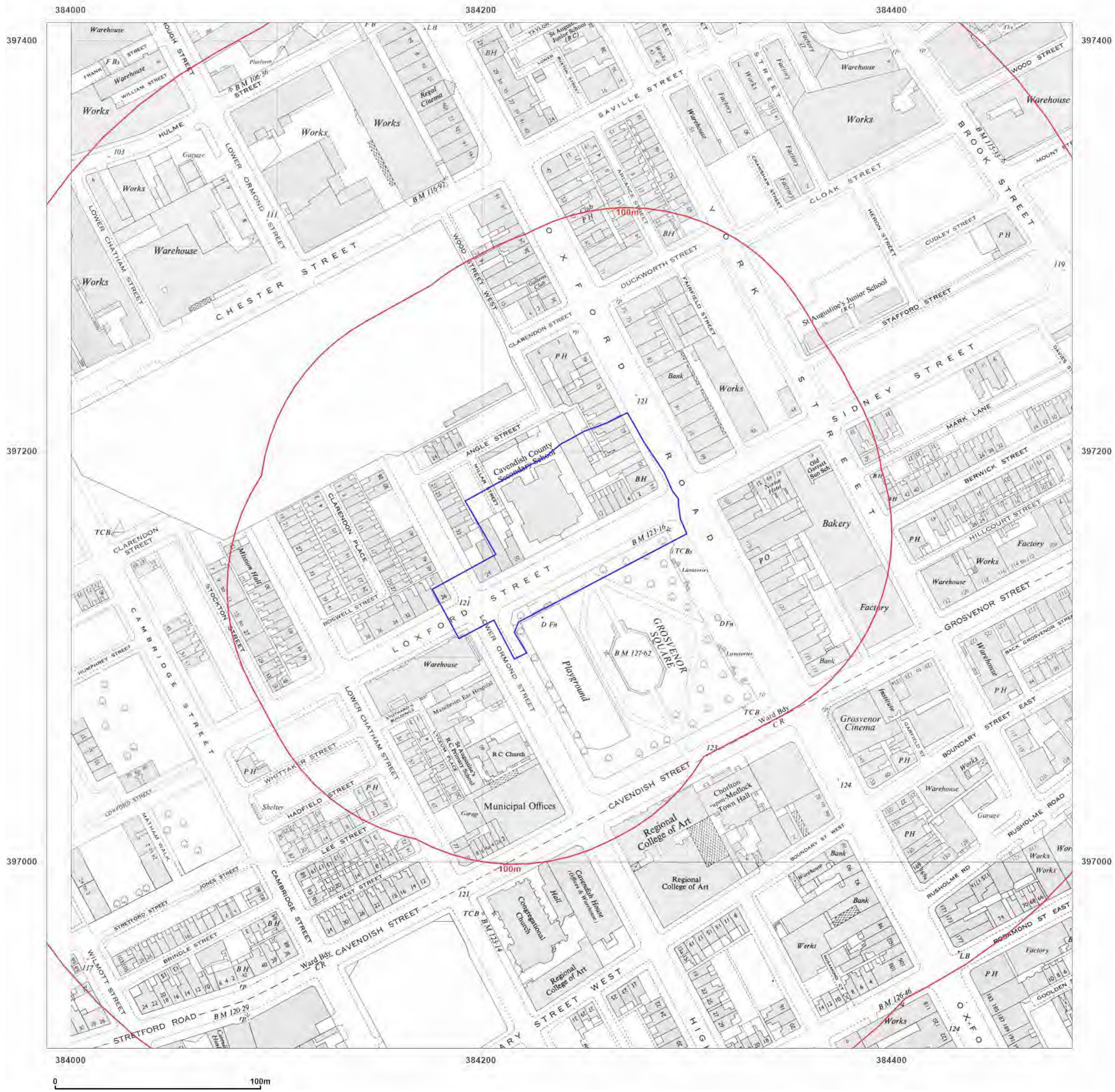
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1961-1962**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1948
Revised 1961
Edition N/A
Copyright 1962
Levelled 1958

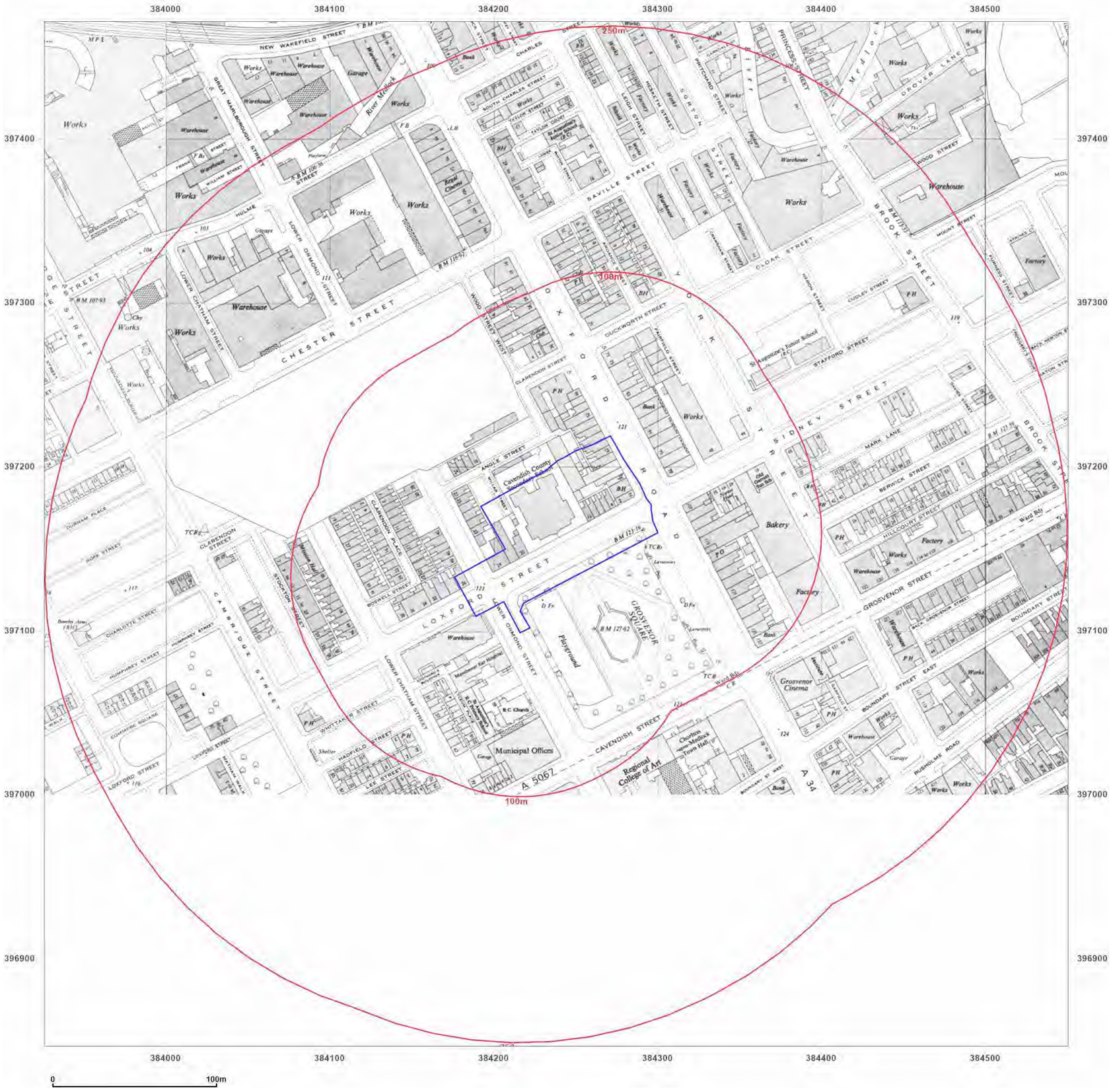
Surveyed 1948
Revised 1948
Edition N/A
Copyright 1961
Levelled 1958

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1965**

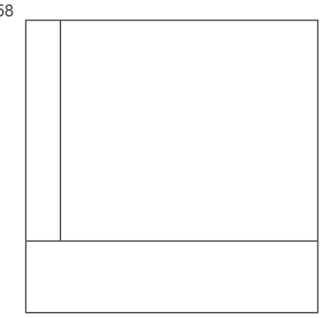
Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1963
Revised 1963
Edition N/A
Copyright 1965
Levelled 1958

Surveyed 1963
Revised 1963
Edition N/A
Copyright 1965
Levelled 1959



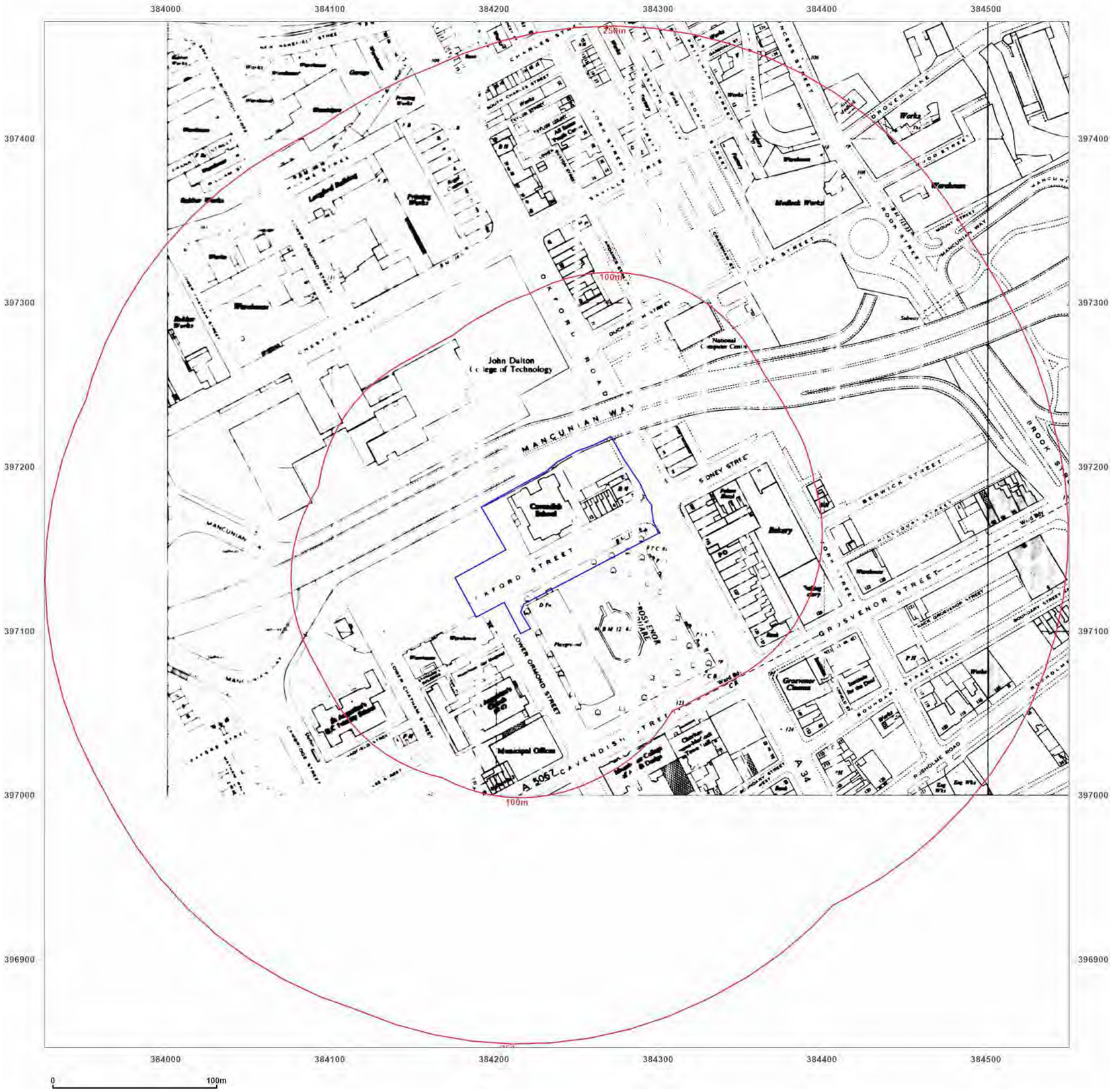
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

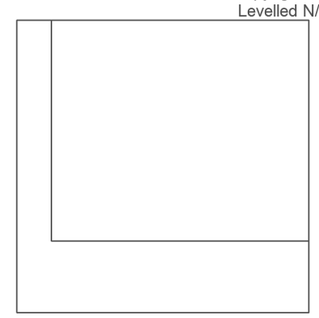
Map date: **1970**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed N/A
Revised N/A
Edition N/A
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1969-1974**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1948 Revised 1968 Edition N/A Copyright 1969 Levelled 1963	Surveyed 1948 Revised 1968 Edition N/A Copyright 1969 Levelled 1963
Surveyed 1948 Revised 1972 Edition N/A Copyright 1973 Levelled 1958	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A

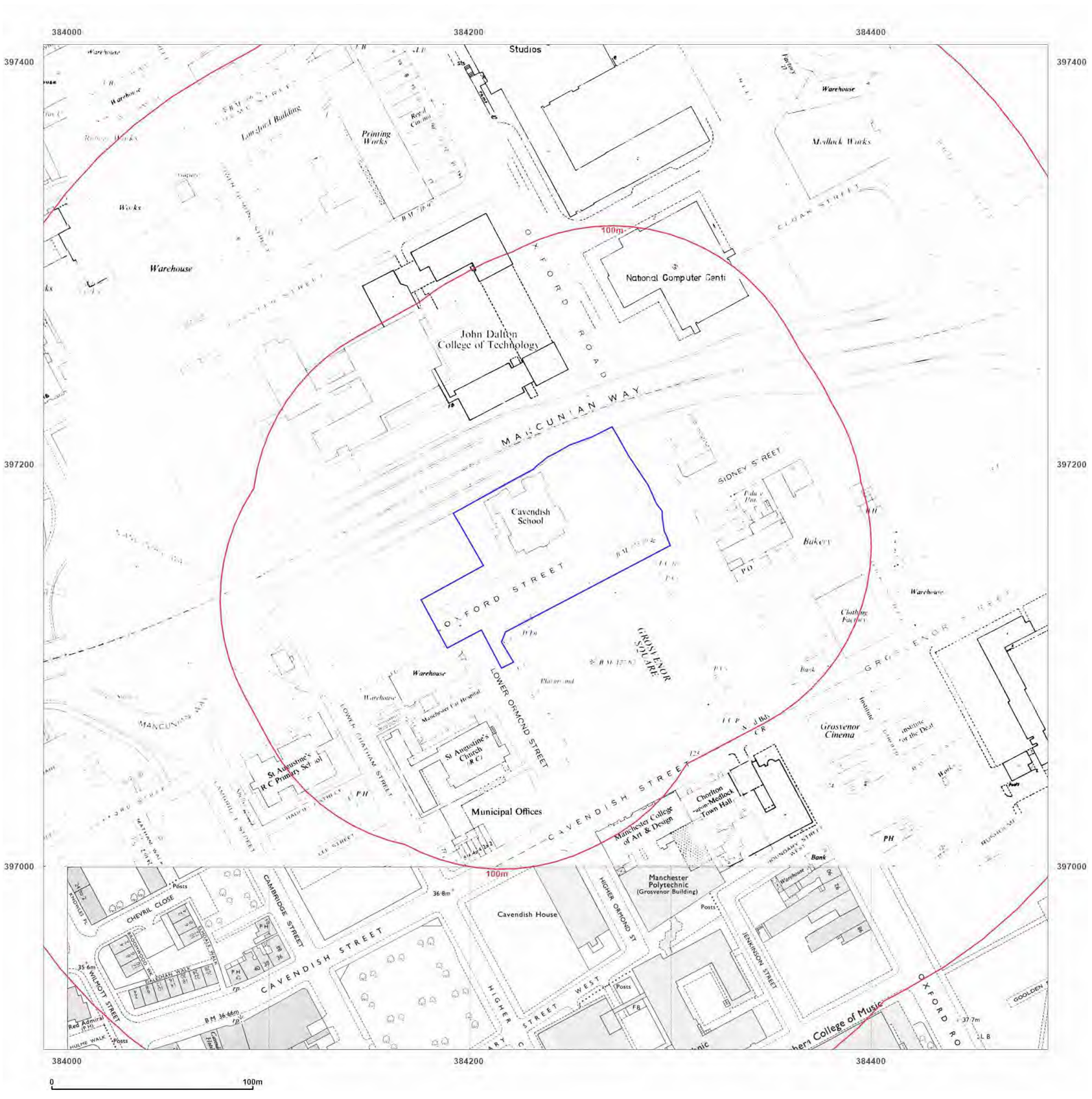
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1975-1980**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1980
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1975
Levelled N/A

Surveyed 1948
Revised 1975
Edition N/A
Copyright 1976
Levelled 1958

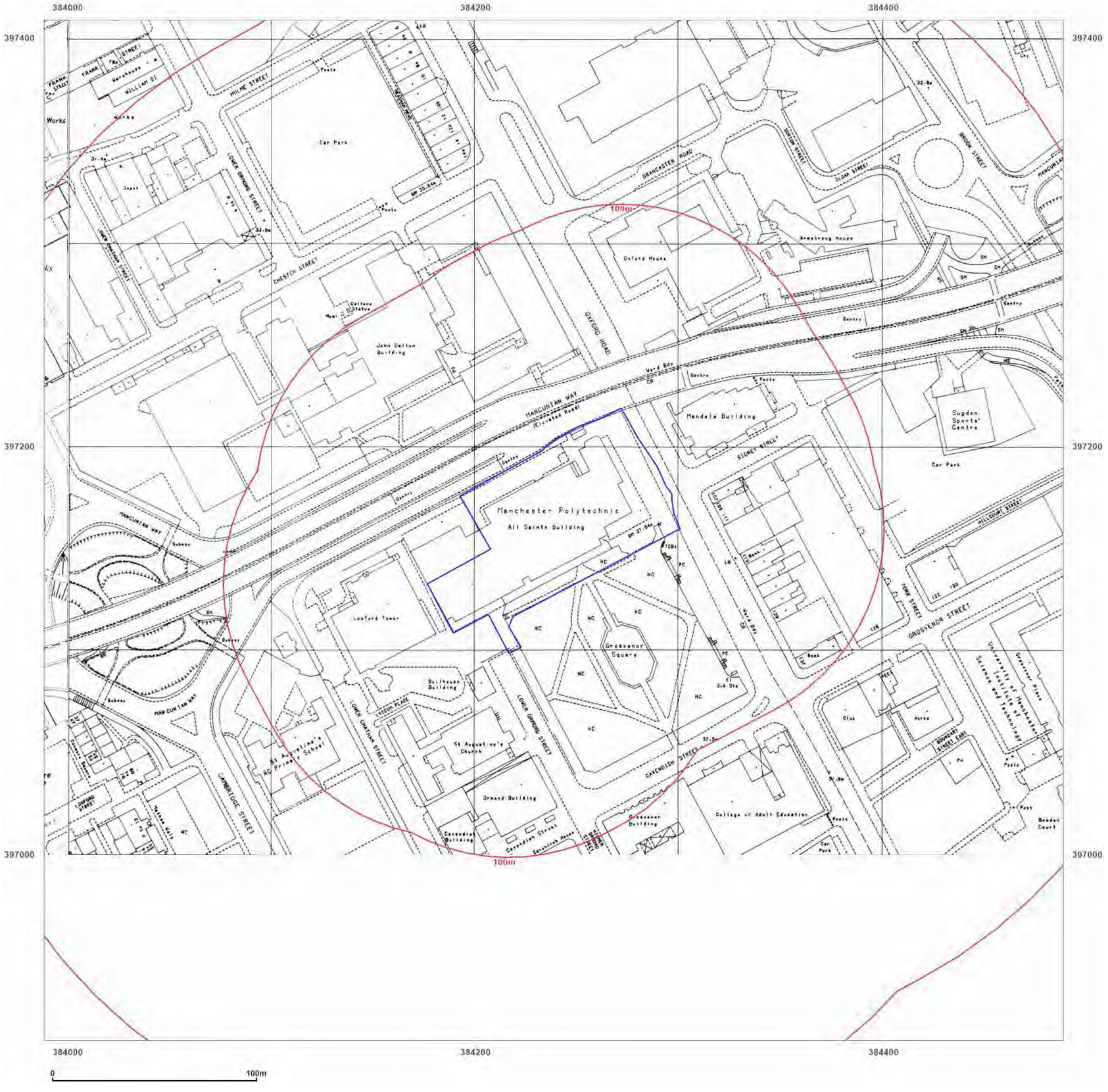
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1987-1990**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A	Surveyed 1948
Revised N/A	Revised 1985
Edition N/A	Edition N/A
Copyright 1987	Copyright 1990
Levelled 1963	Levelled N/A

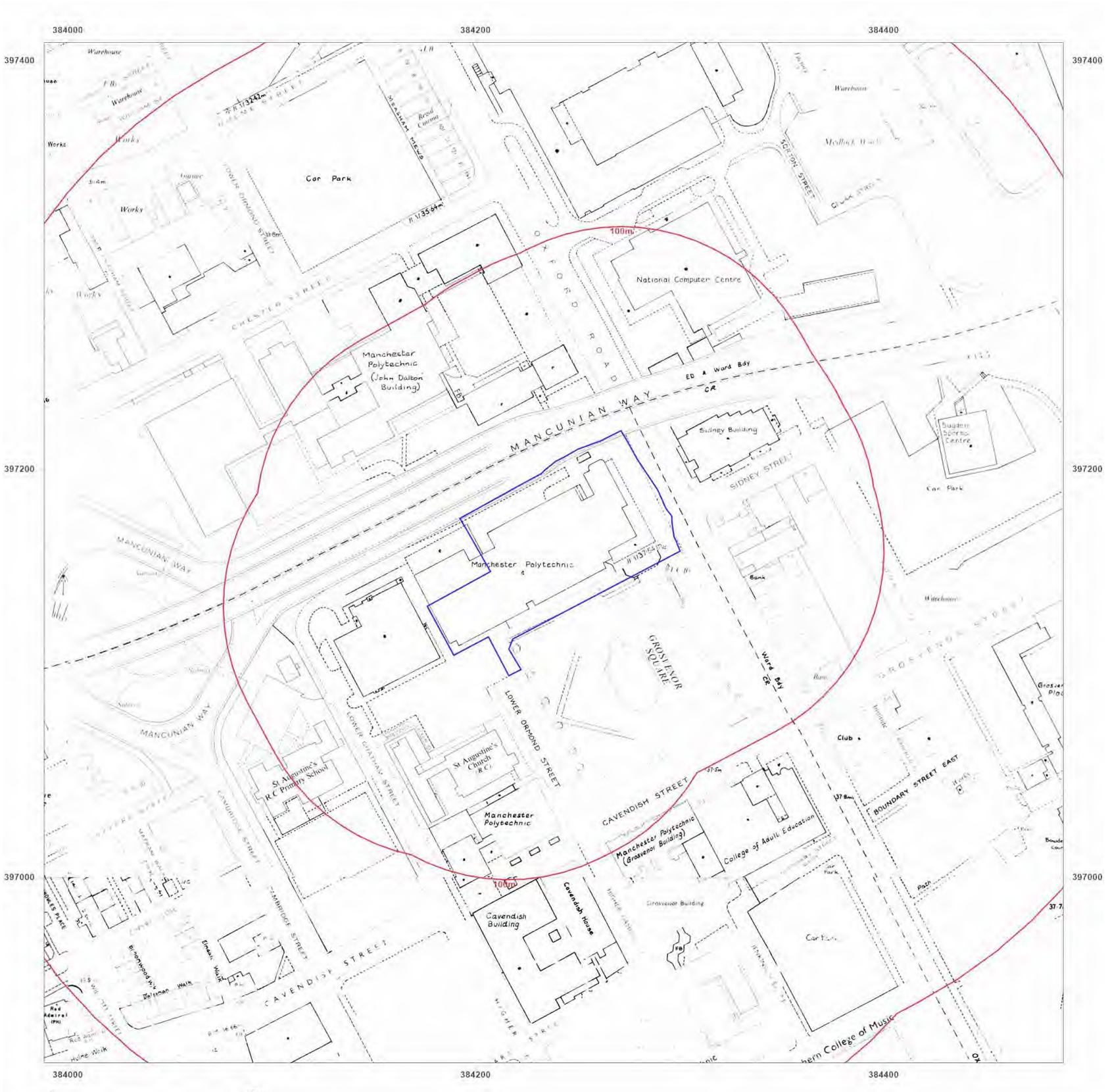
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1985-1990**

Scale: 1:1,250

Printed at: 1:2,000

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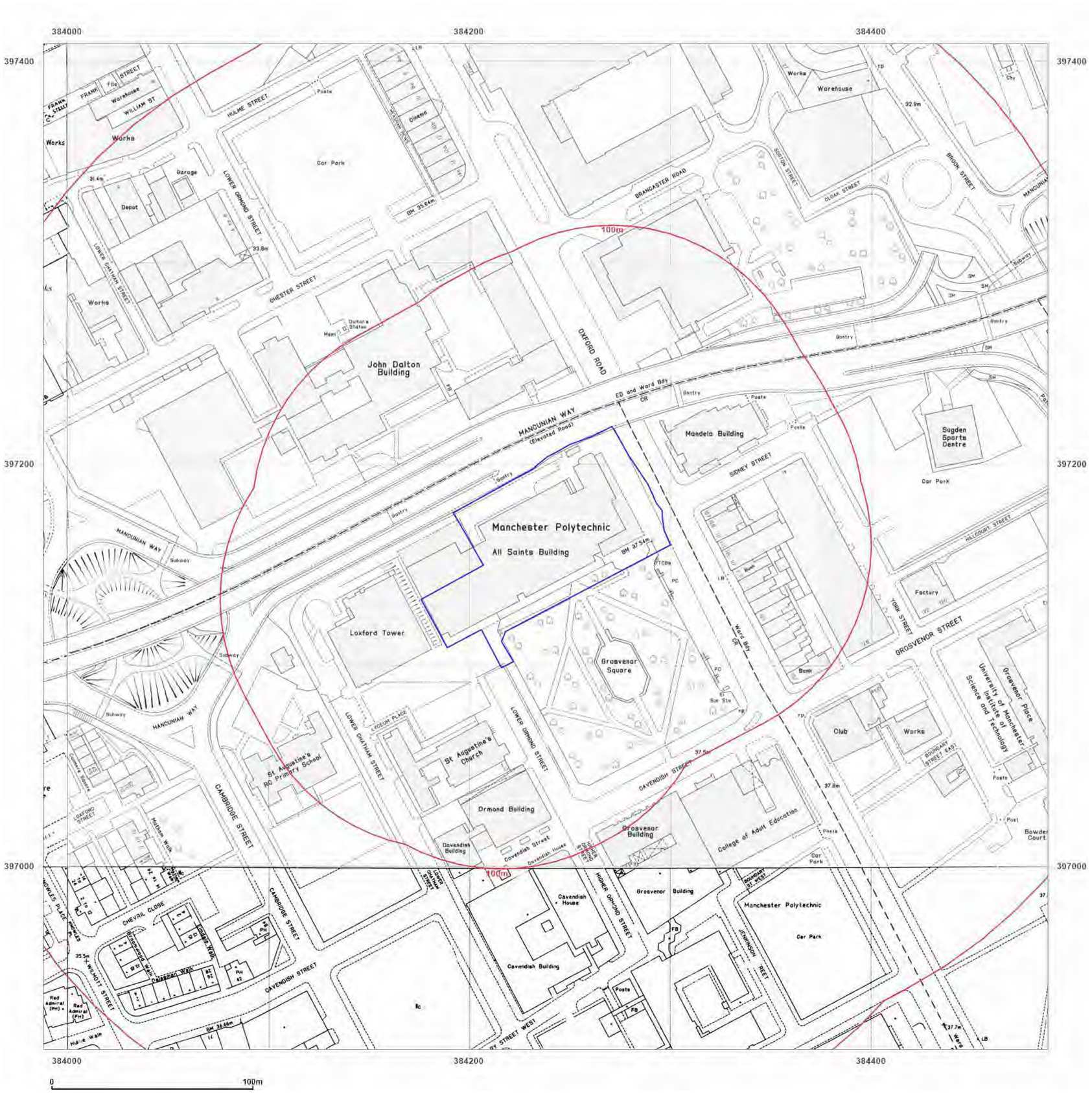
Surveyed N/A Revised N/A Edition N/A Copyright 1985 Levelled 1963	Surveyed N/A Revised N/A Edition N/A Copyright 1985 Levelled 1964
Surveyed 1948 Revised 1990 Edition N/A Copyright 1990 Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1987-1992**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1990-1995**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1963 Revised 1990 Edition N/A Copyright 1990 Levelled 1963	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A
Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A	Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A

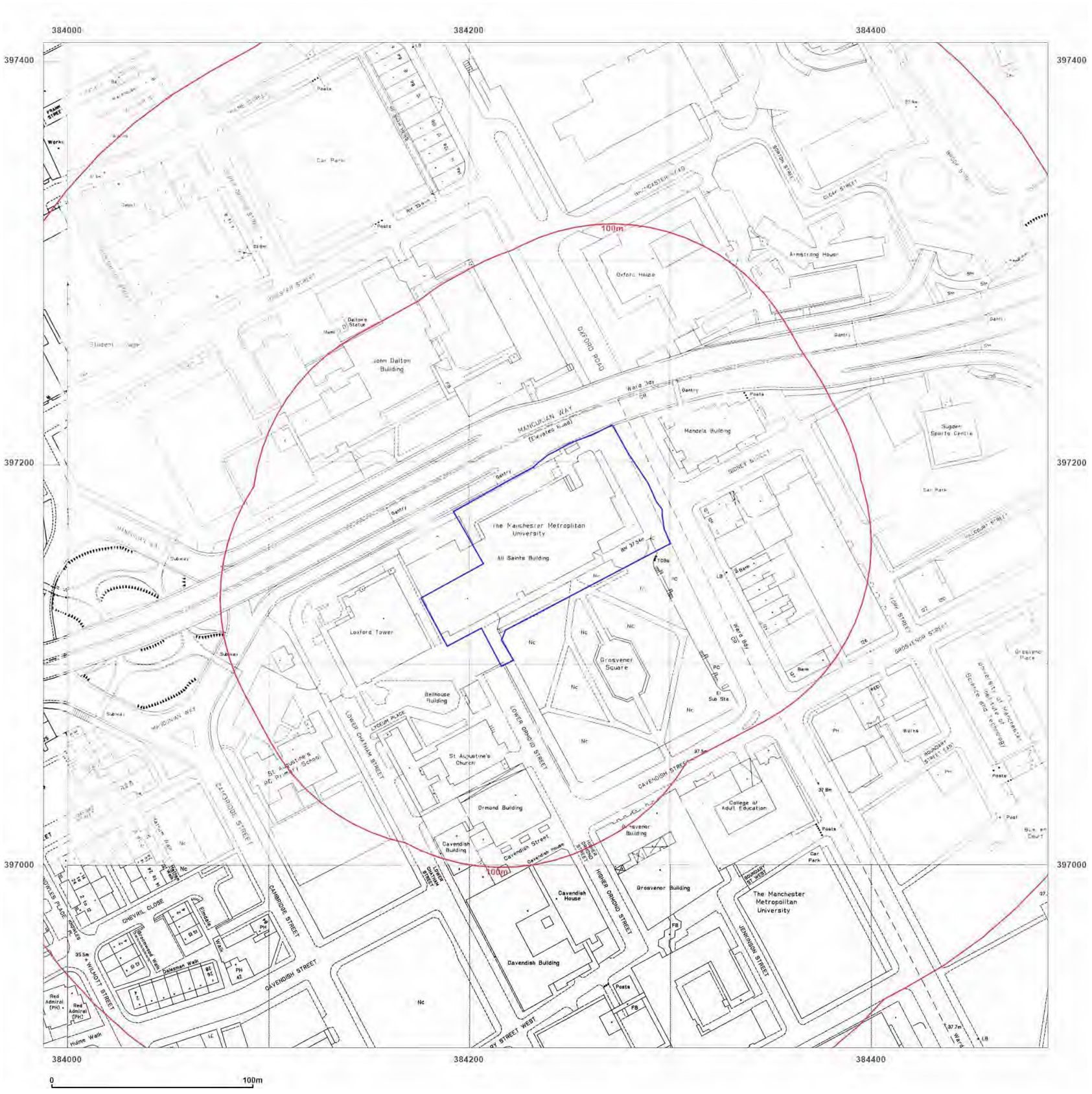
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Site Details:

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1992-1995**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A	Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A
Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A	Surveyed 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1995**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1995
Revised 1995
Edition N/A
Copyright 1995
Levelled N/A

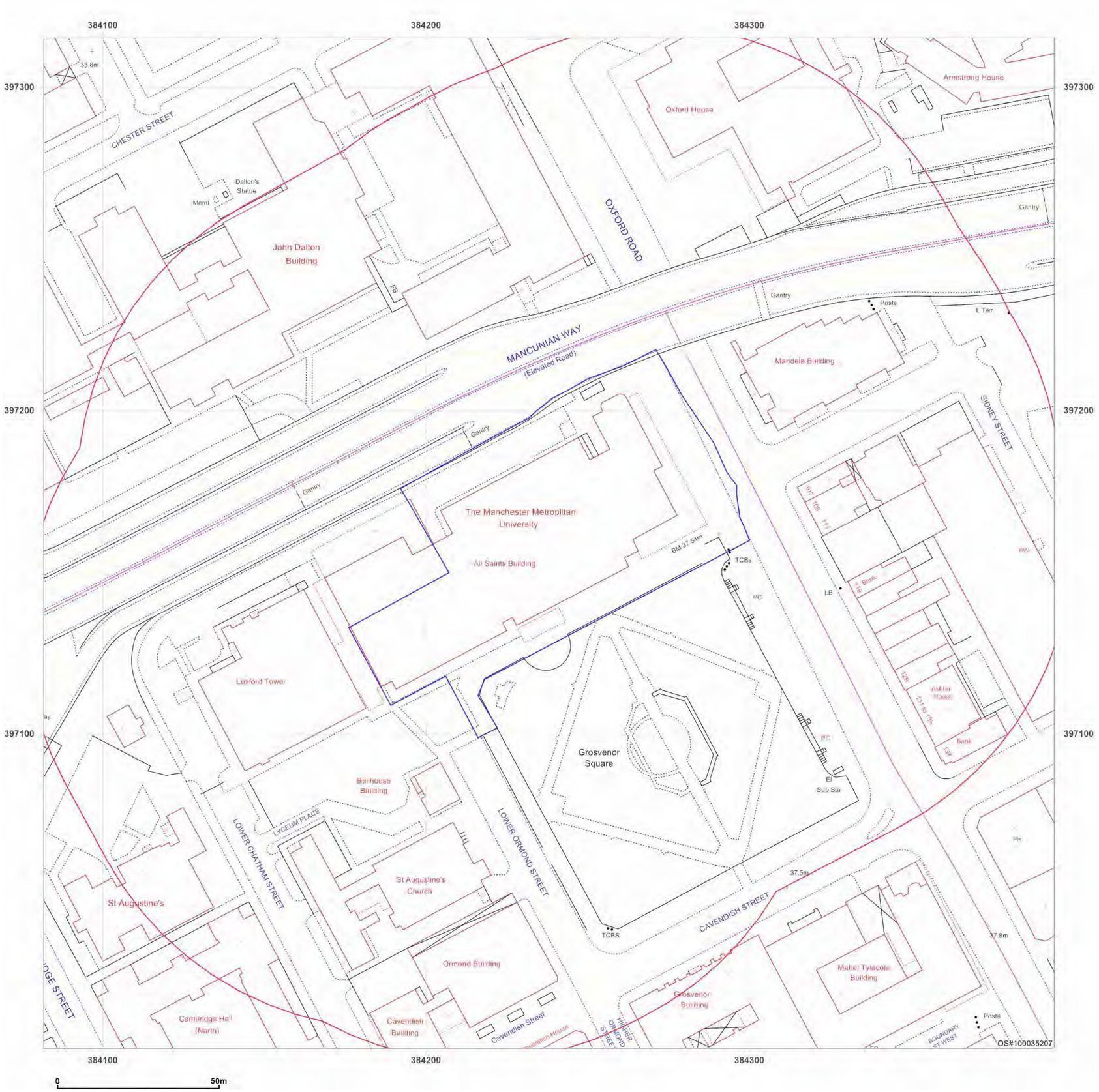
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

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2003

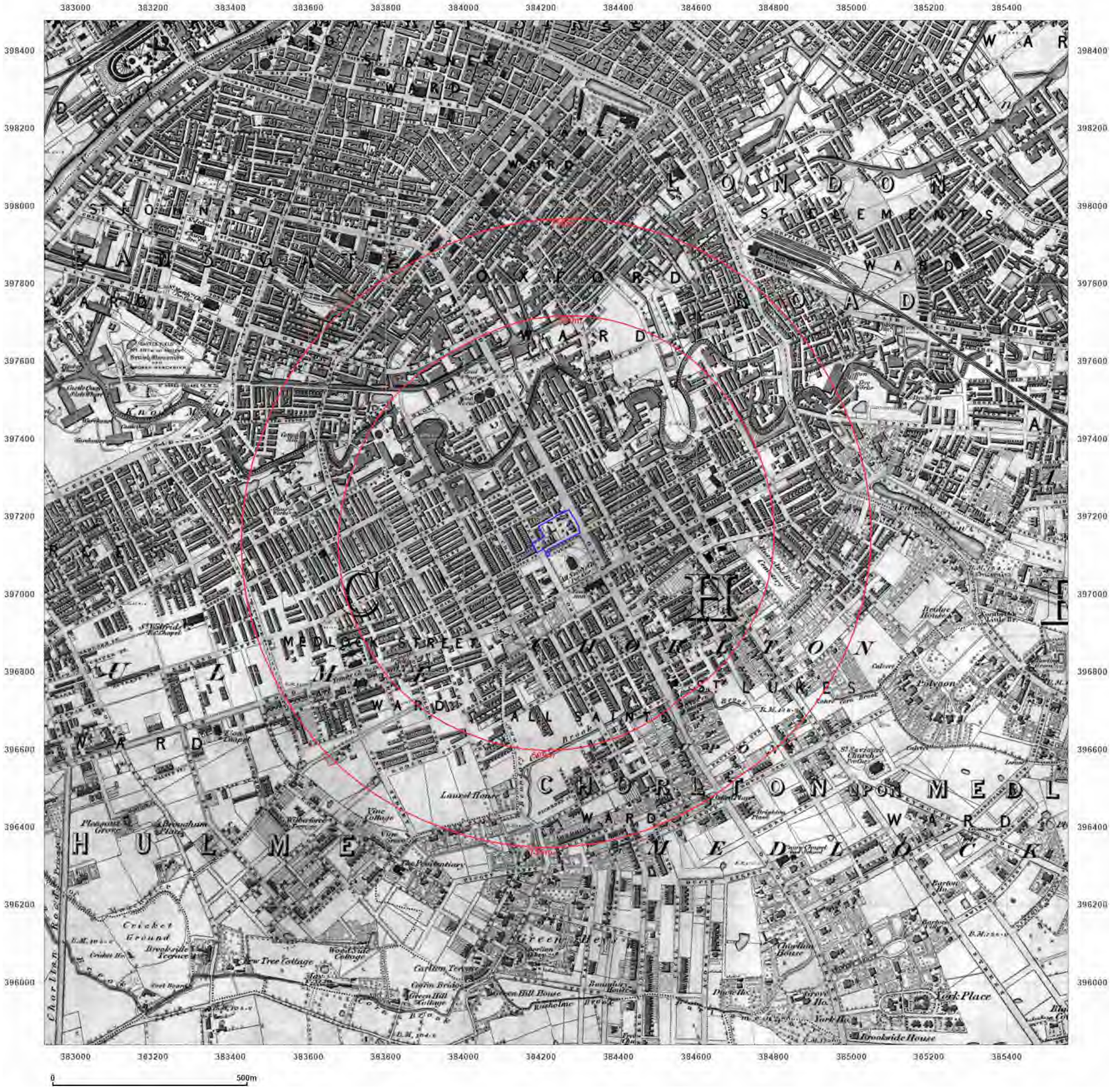
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1848**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1845
Revised N/A
Edition 1848
Copyright N/A
Levelled N/A

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1890-1894**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1889
Revised 1889
Edition 1894
Copyright N/A
Levelled N/A

Surveyed 1890
Revised 1890
Edition 1890
Copyright N/A
Levelled N/A

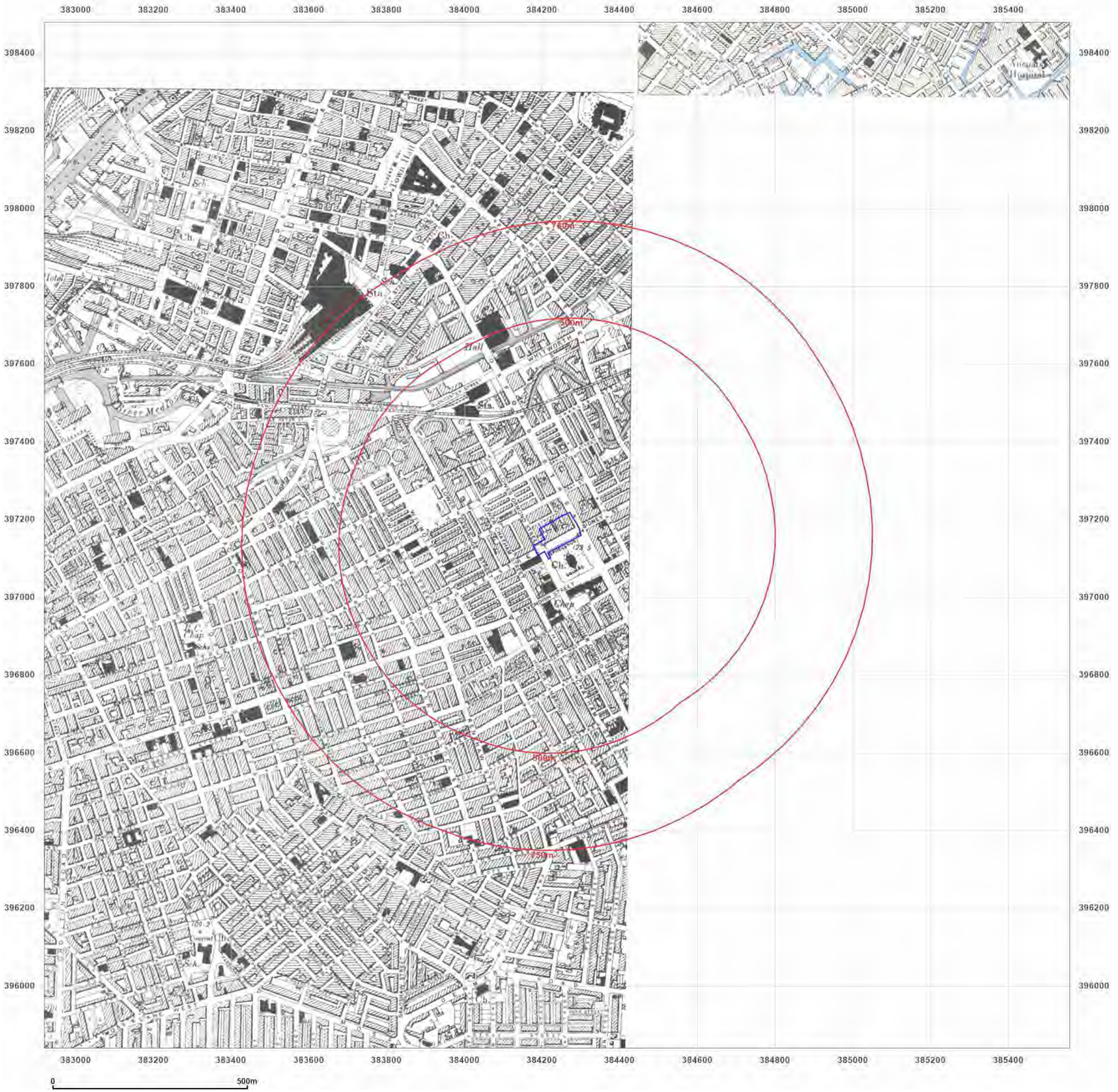
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Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

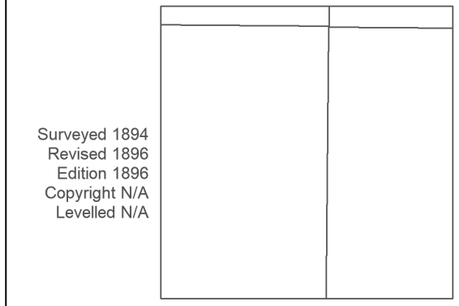
Map date: **1891-1896**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1891
Revised 1891
Edition 1891
Copyright N/A
Levelled N/A



Surveyed 1894
Revised 1896
Edition 1896
Copyright N/A
Levelled N/A

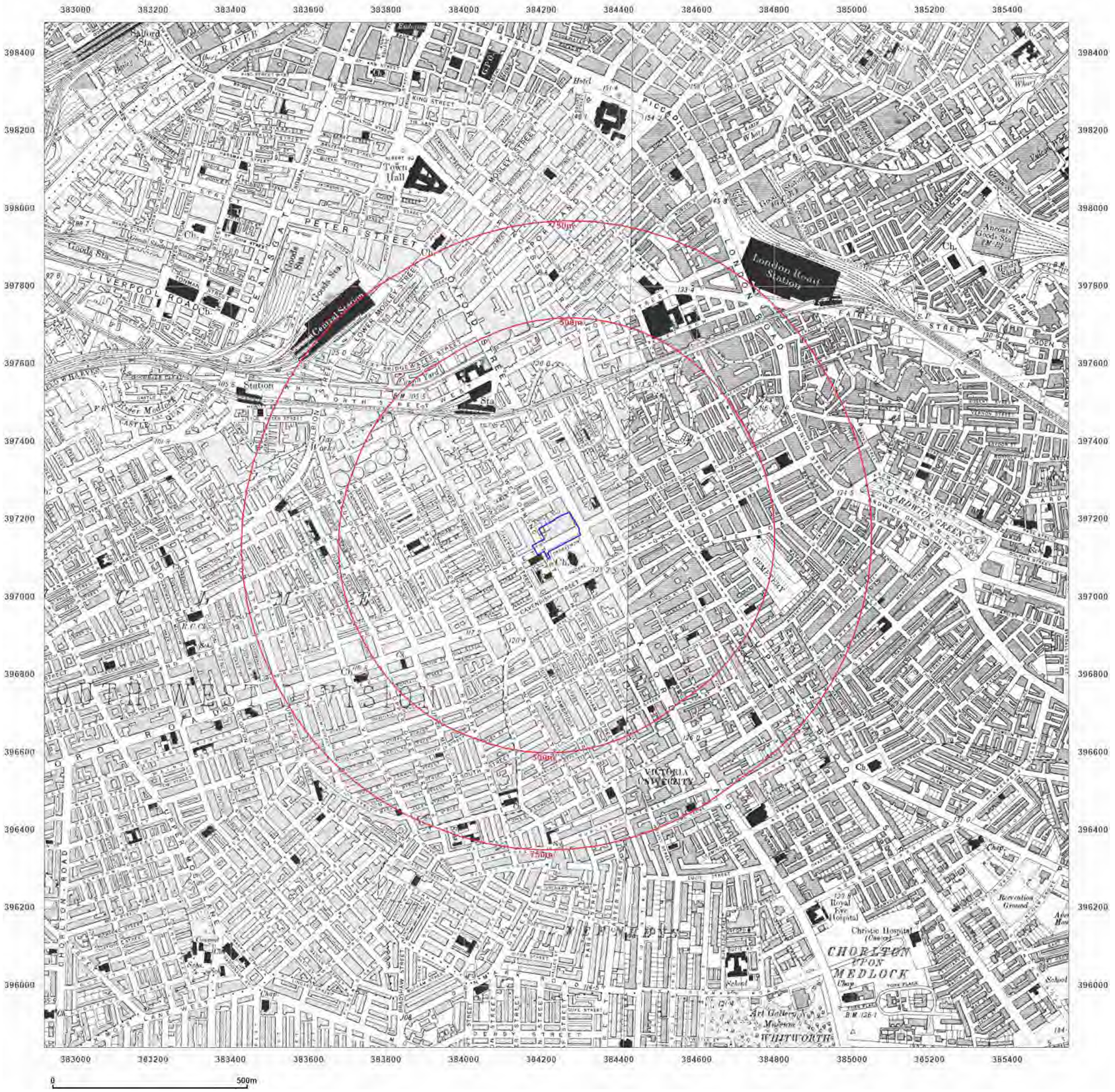
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1906
Edition 1906
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1906
Edition 1906
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A

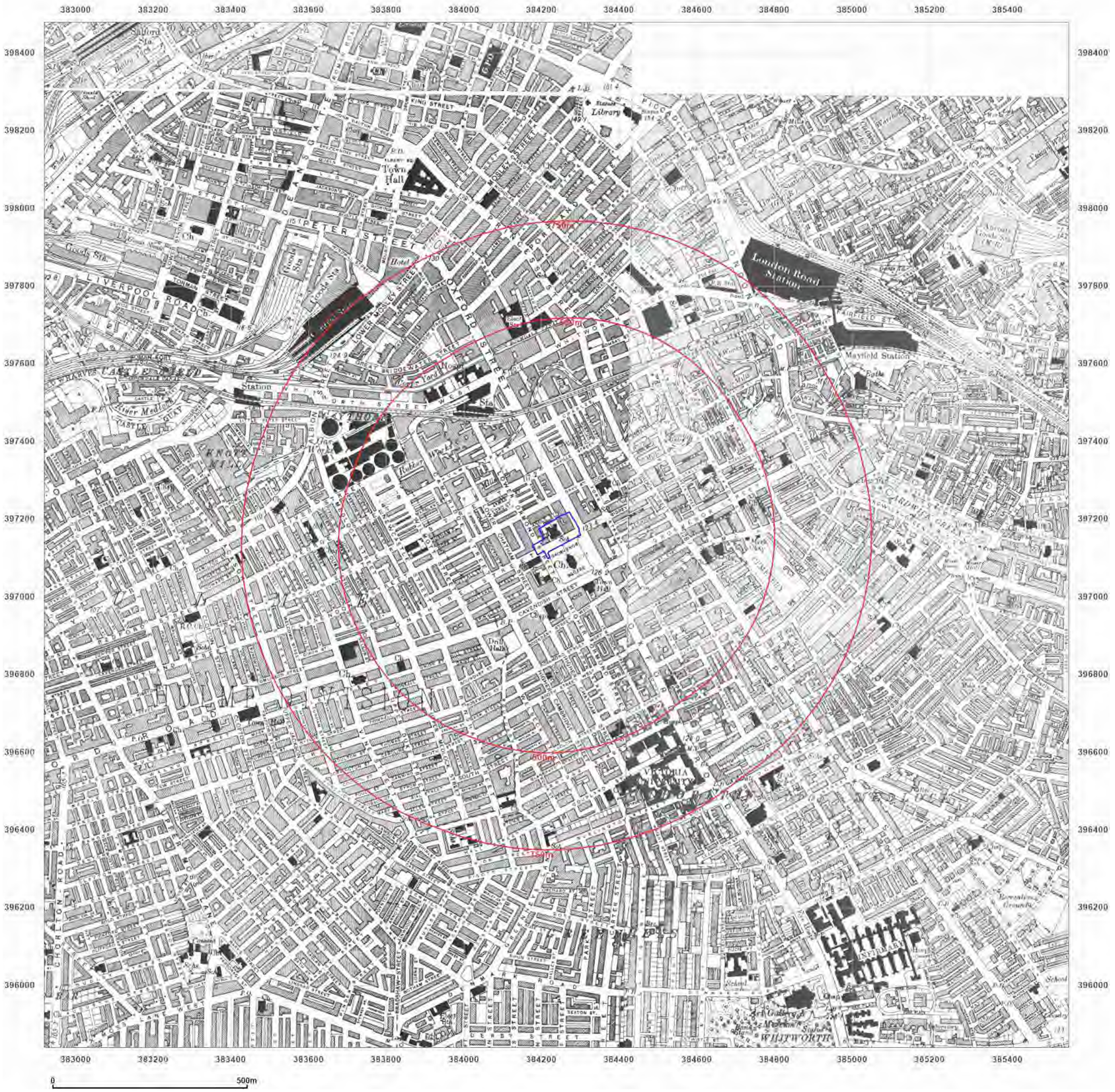
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1915
Edition 1923
Copyright N/A
Levelled 1915

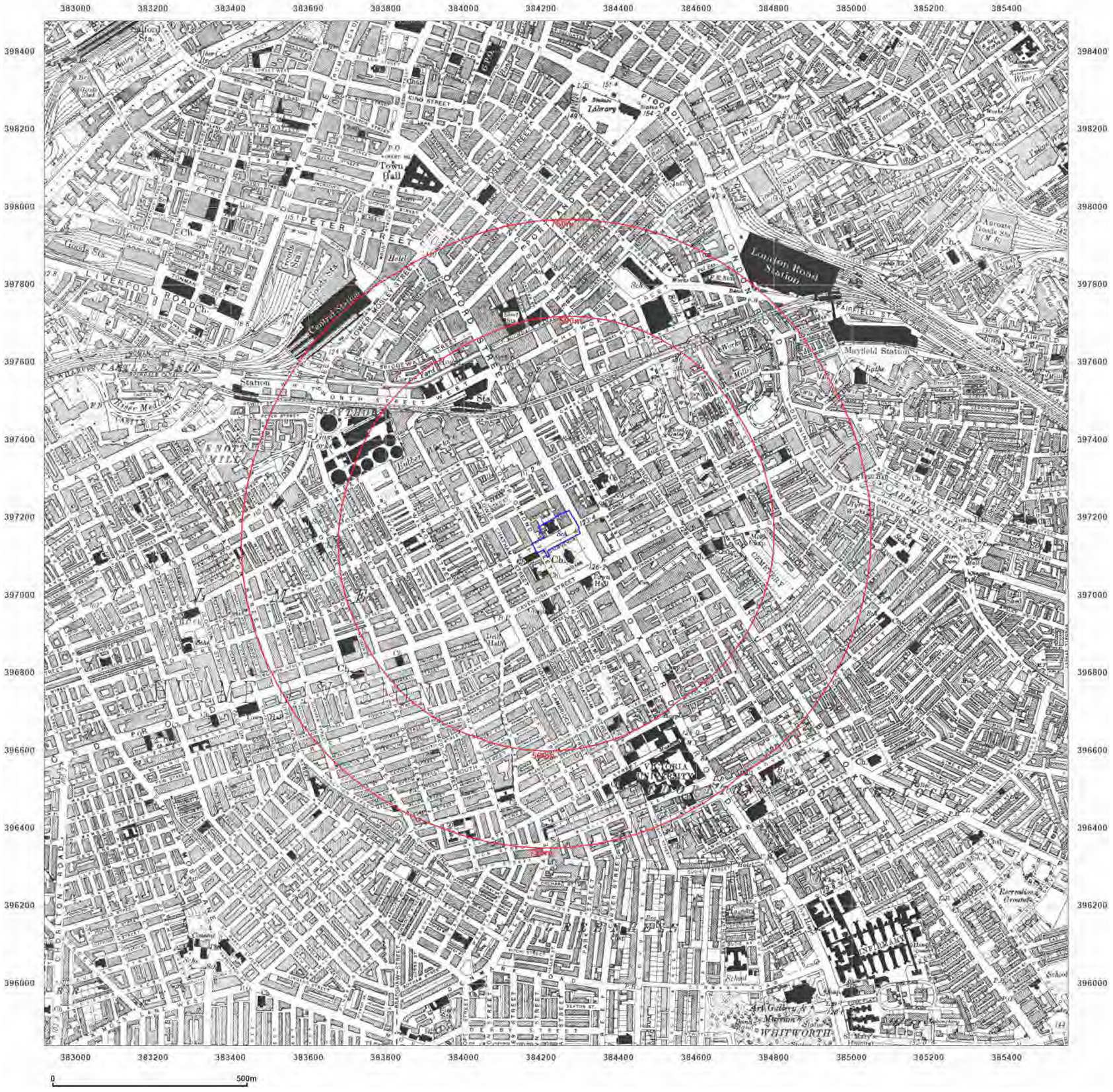
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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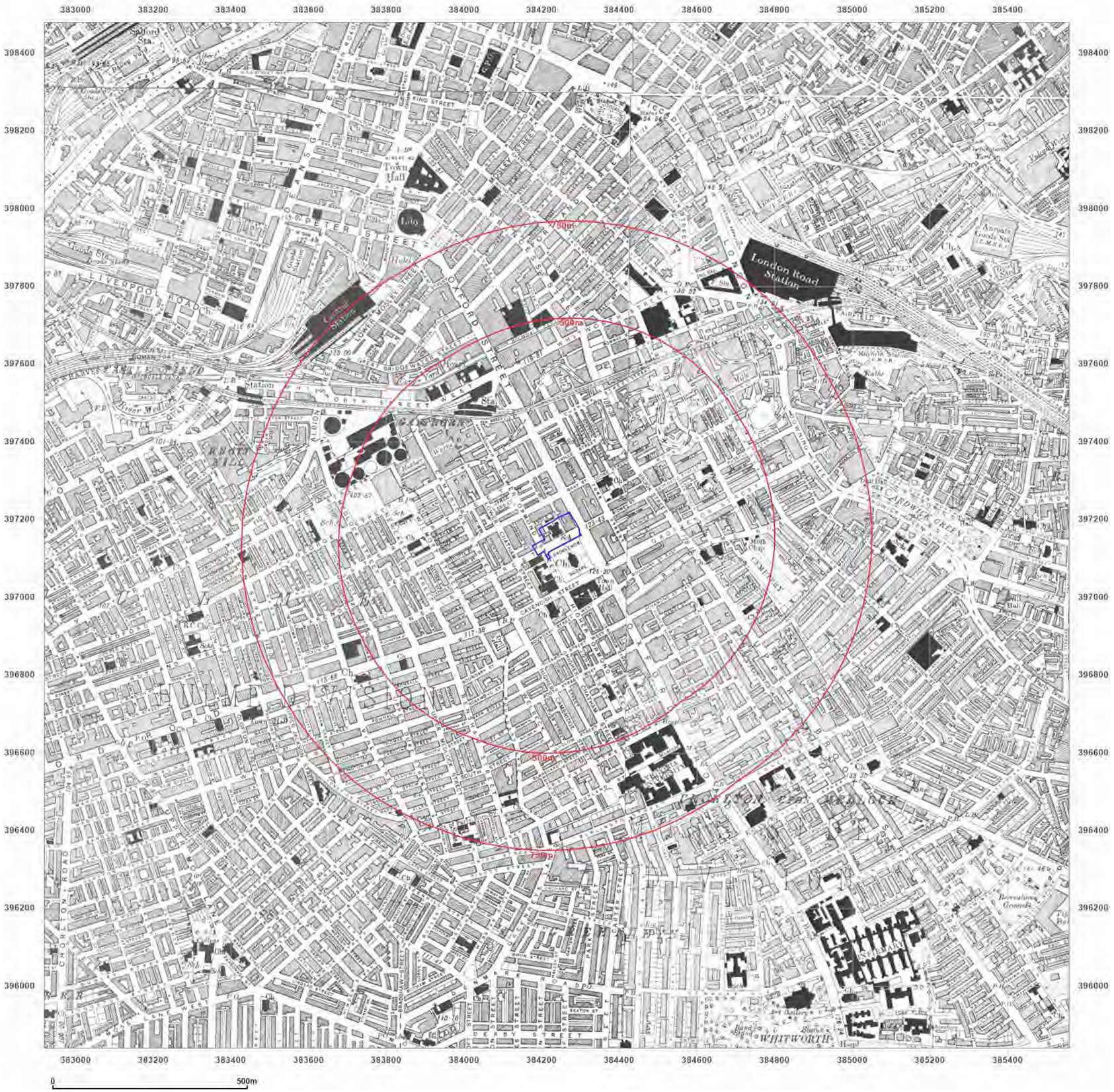
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1931-1934**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1844
Revised 1931
Edition 1931
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1933
Edition 1933
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1932
Edition 1932
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1934
Edition 1934
Copyright N/A
Levelled 1927

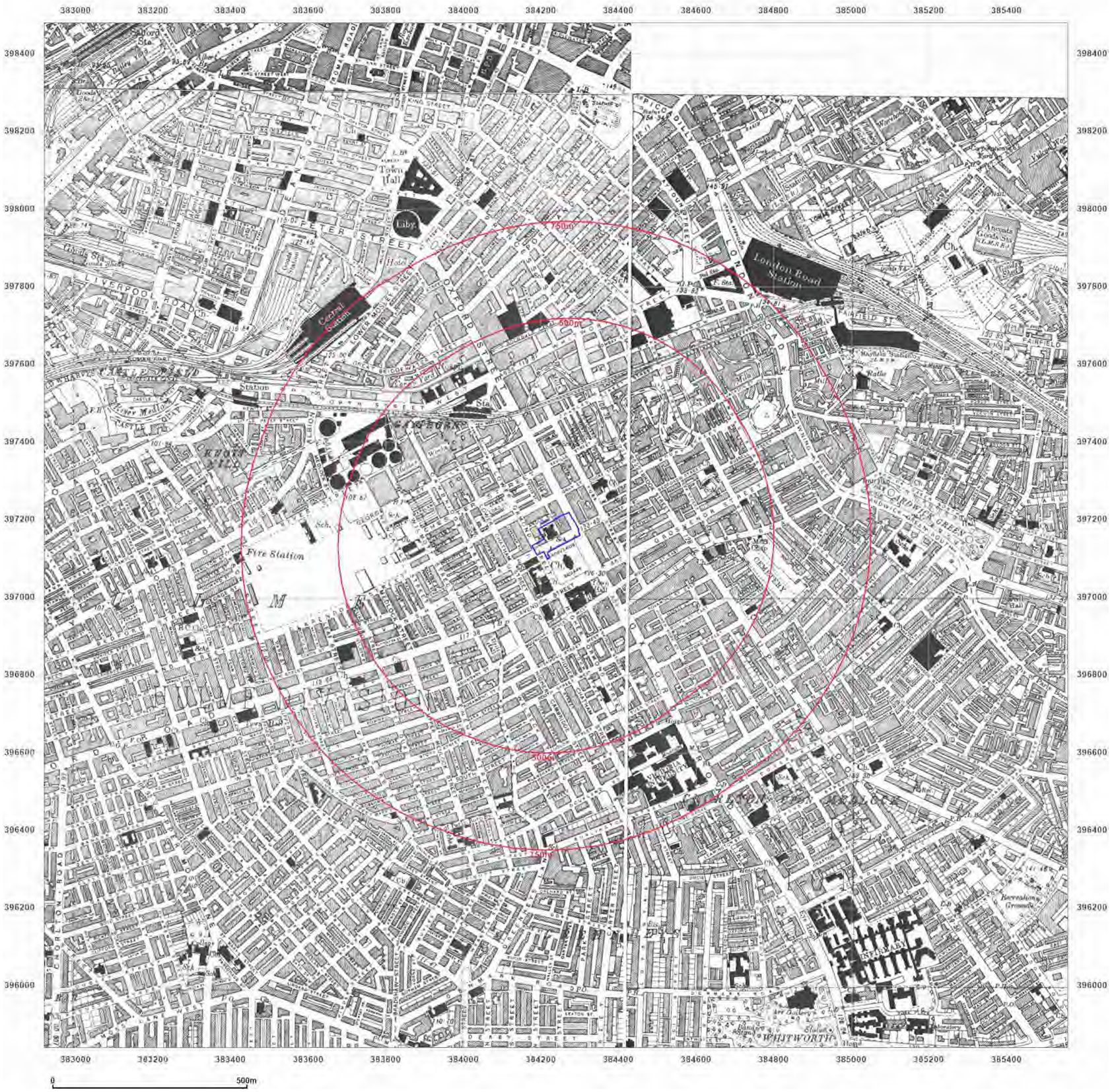
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

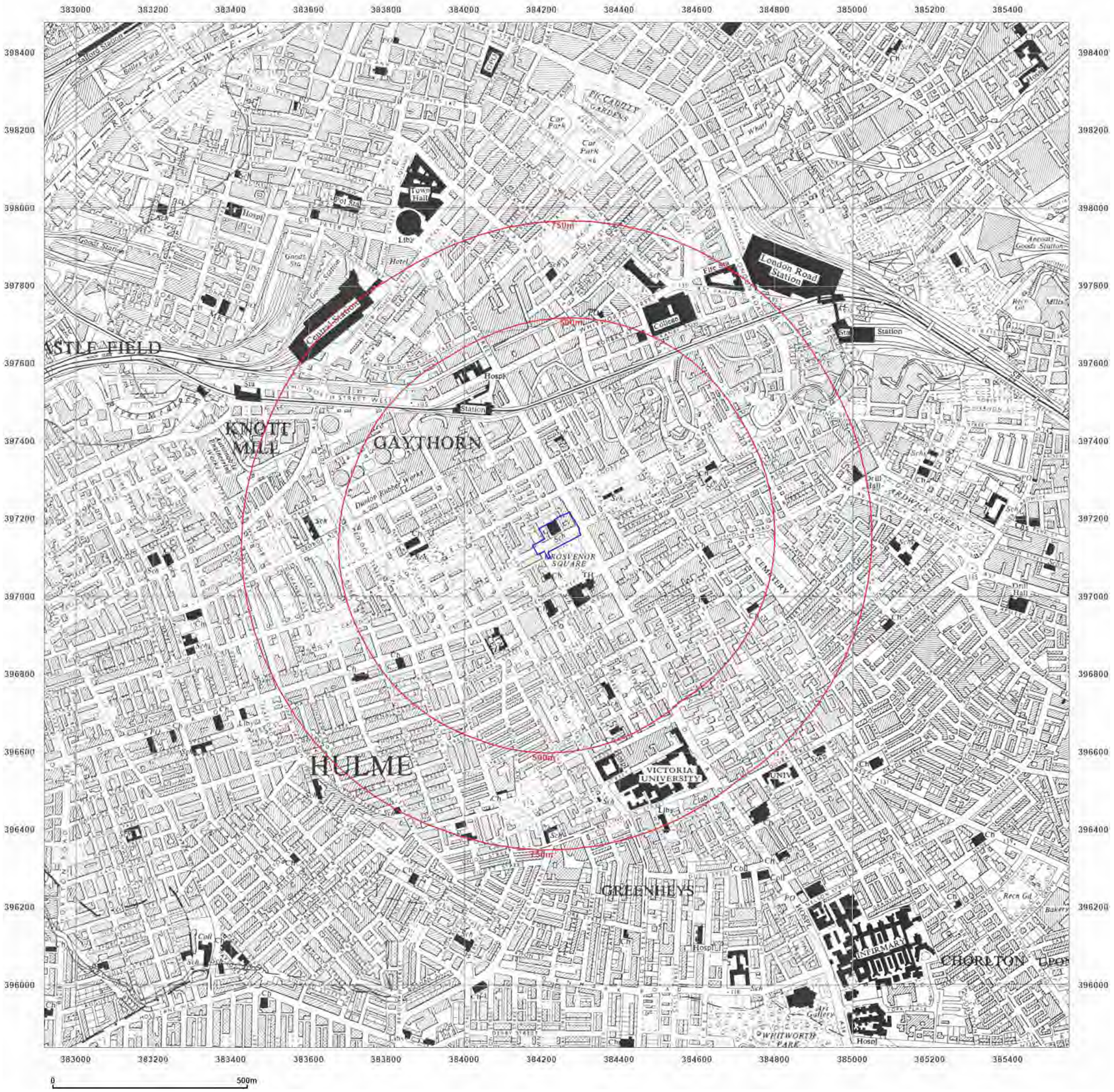
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: Provisional
Map date: **1956**
Scale: 1:10,560
Printed at: 1:10,560

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Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled N/A		Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled N/A

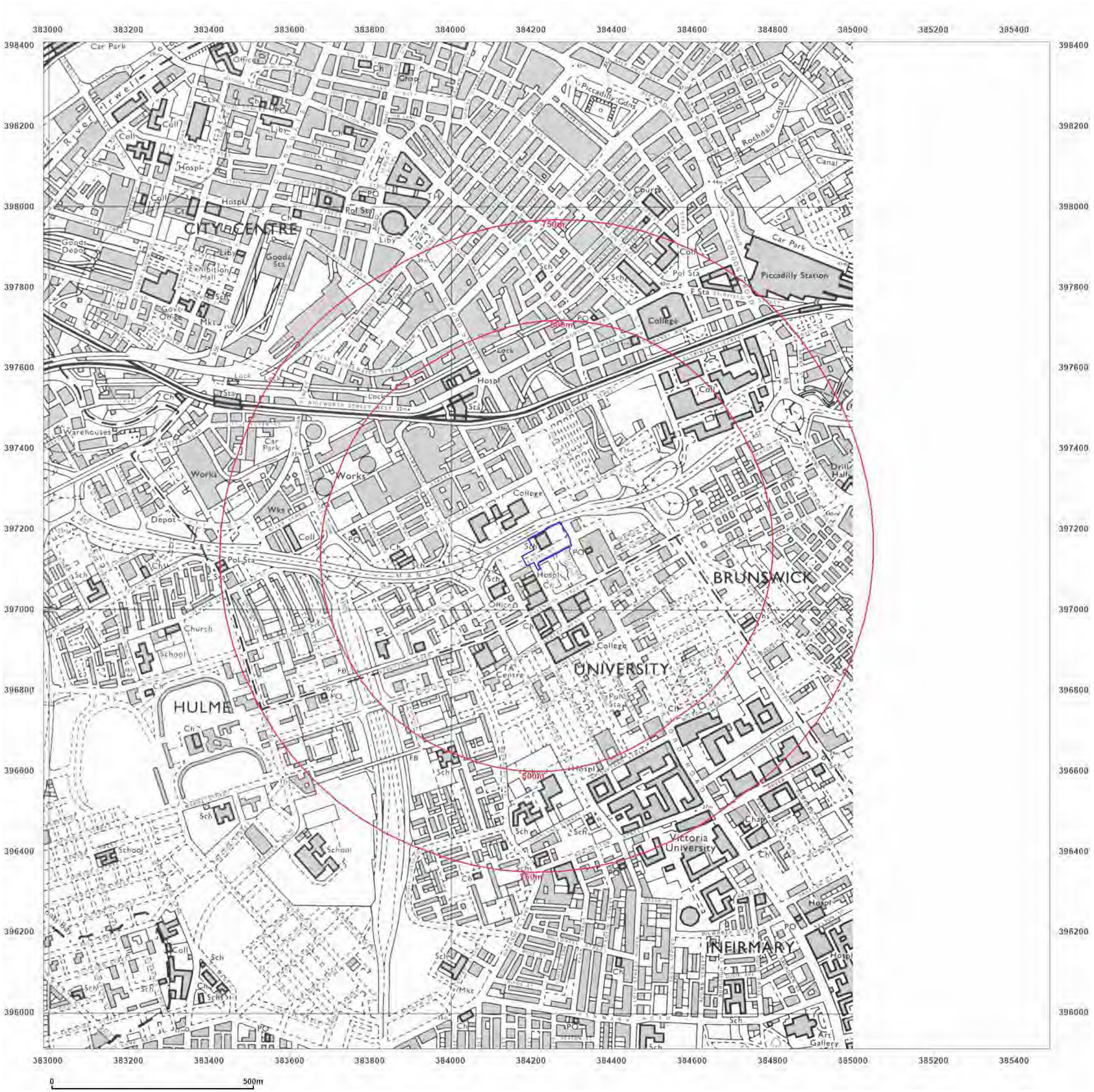
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1972**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1971
Revised 1972
Edition N/A
Copyright 1972
Levelled 1972

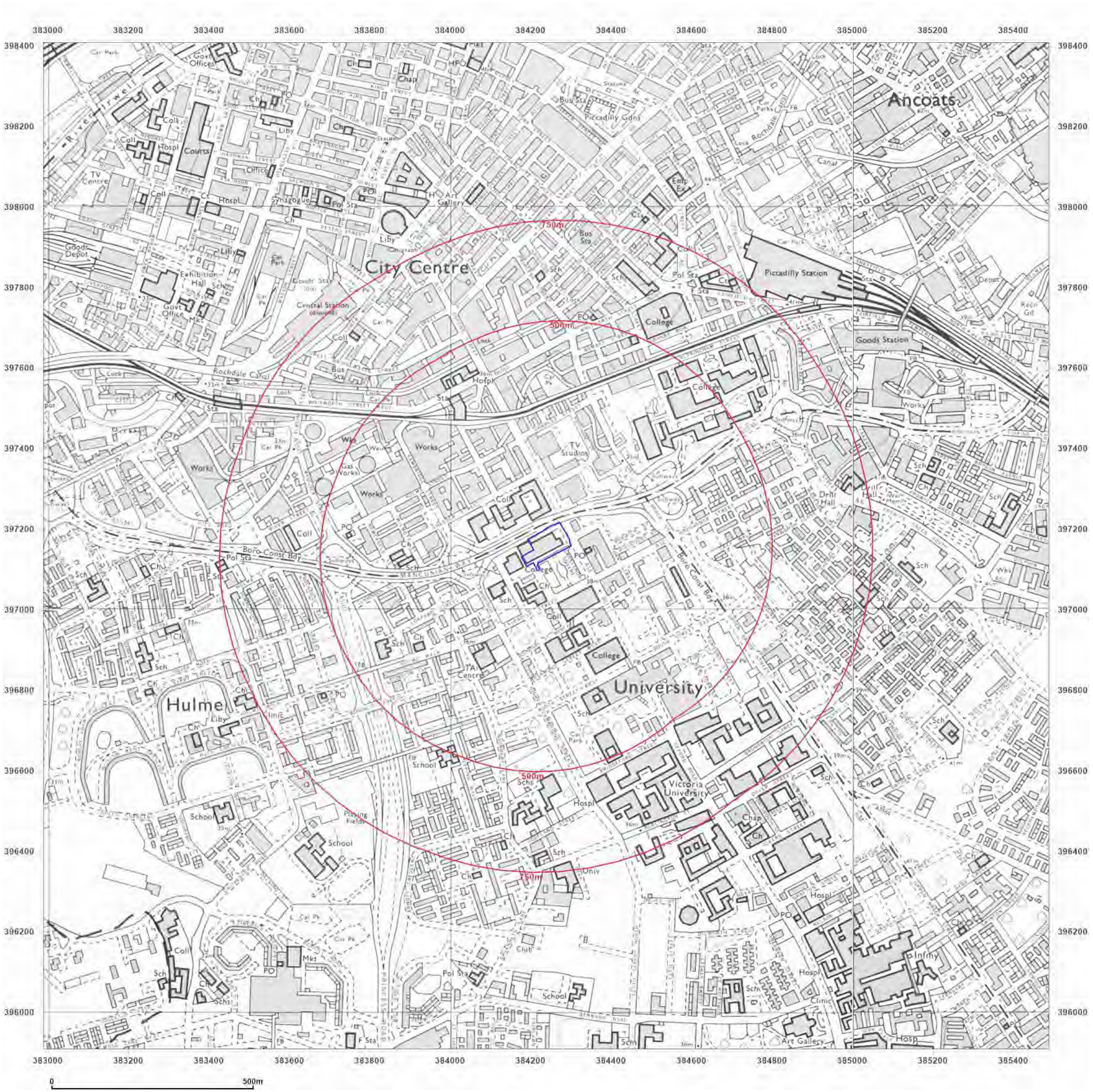
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1980-1981**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1976
Revised 1980
Edition N/A
Copyright 1980
Levelled 1976

Surveyed 1976
Revised 1980
Edition N/A
Copyright 1981
Levelled 1976

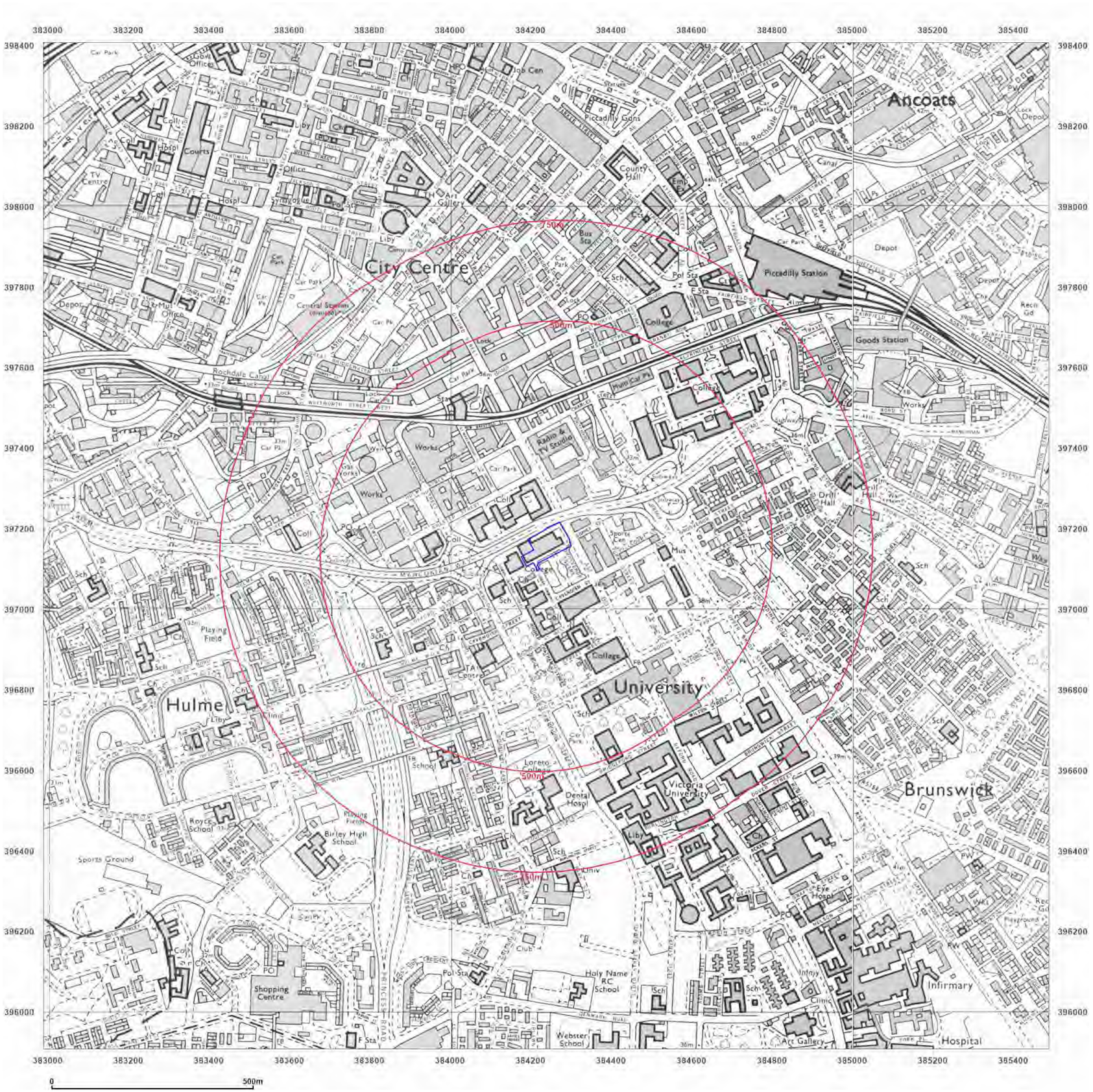
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1985**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1983 Revised 1985 Edition N/A Copyright 1985 Levelled 1981	Surveyed 1985 Revised 1985 Edition N/A Copyright 1985 Levelled 1981

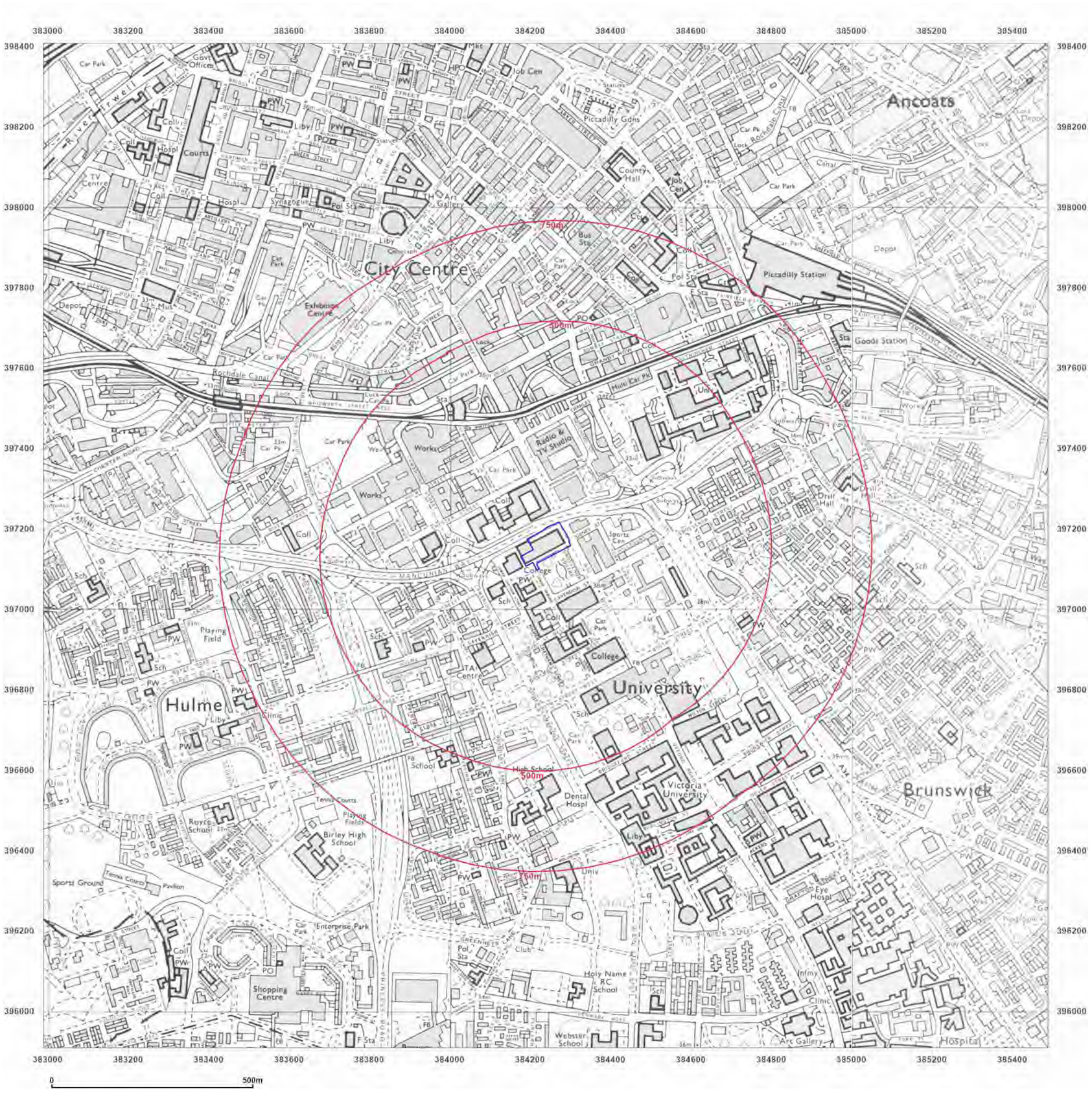
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1988-1991**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1986
Revised 1988
Edition N/A
Copyright 1988
Levelled 1981

Surveyed 1985
Revised 1991
Edition N/A
Copyright 1991
Levelled 1981

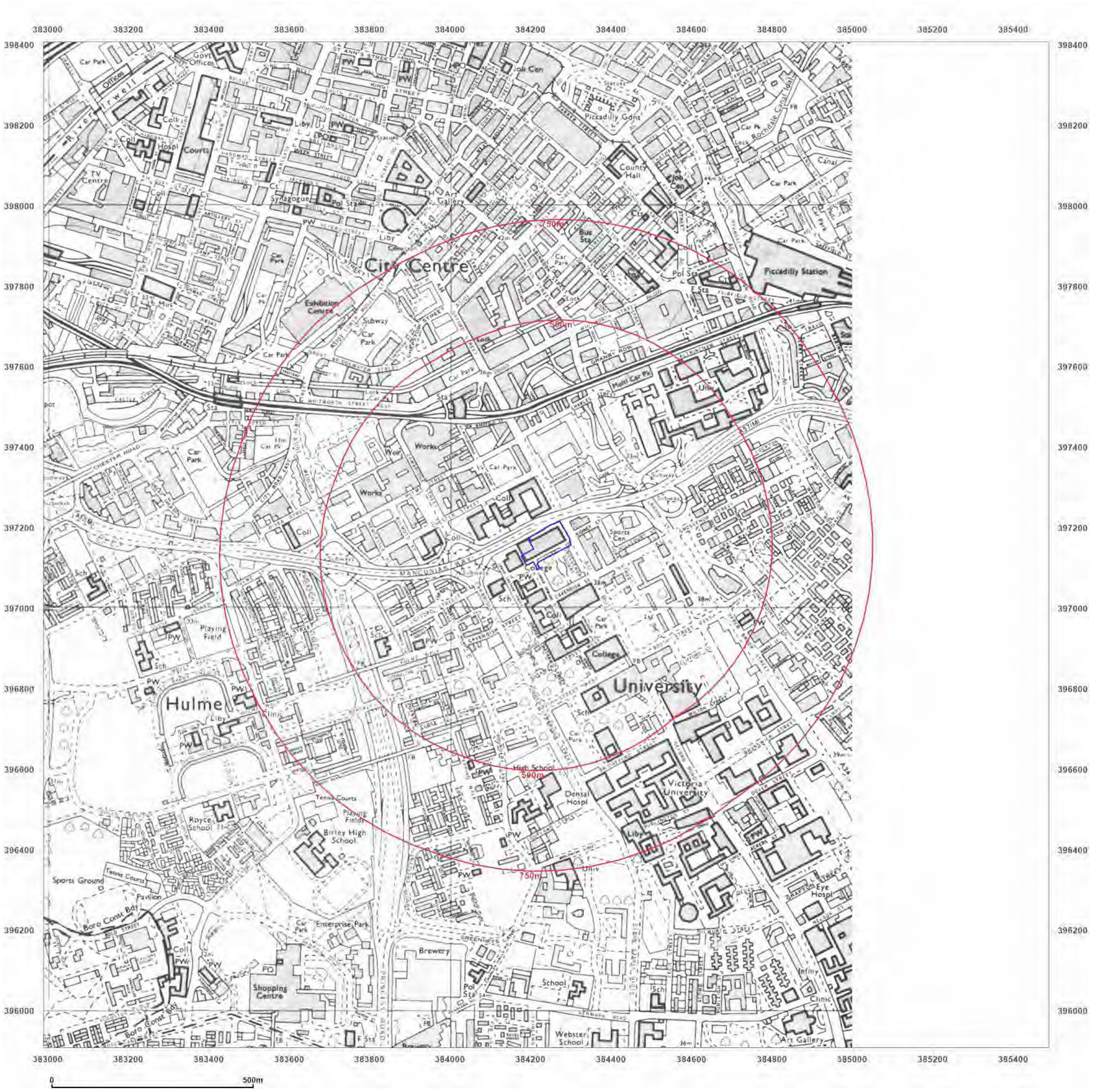
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **1994**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1986
Revised 1994
Edition N/A
Copyright 1994
Levelled 1981

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

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2001

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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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2010

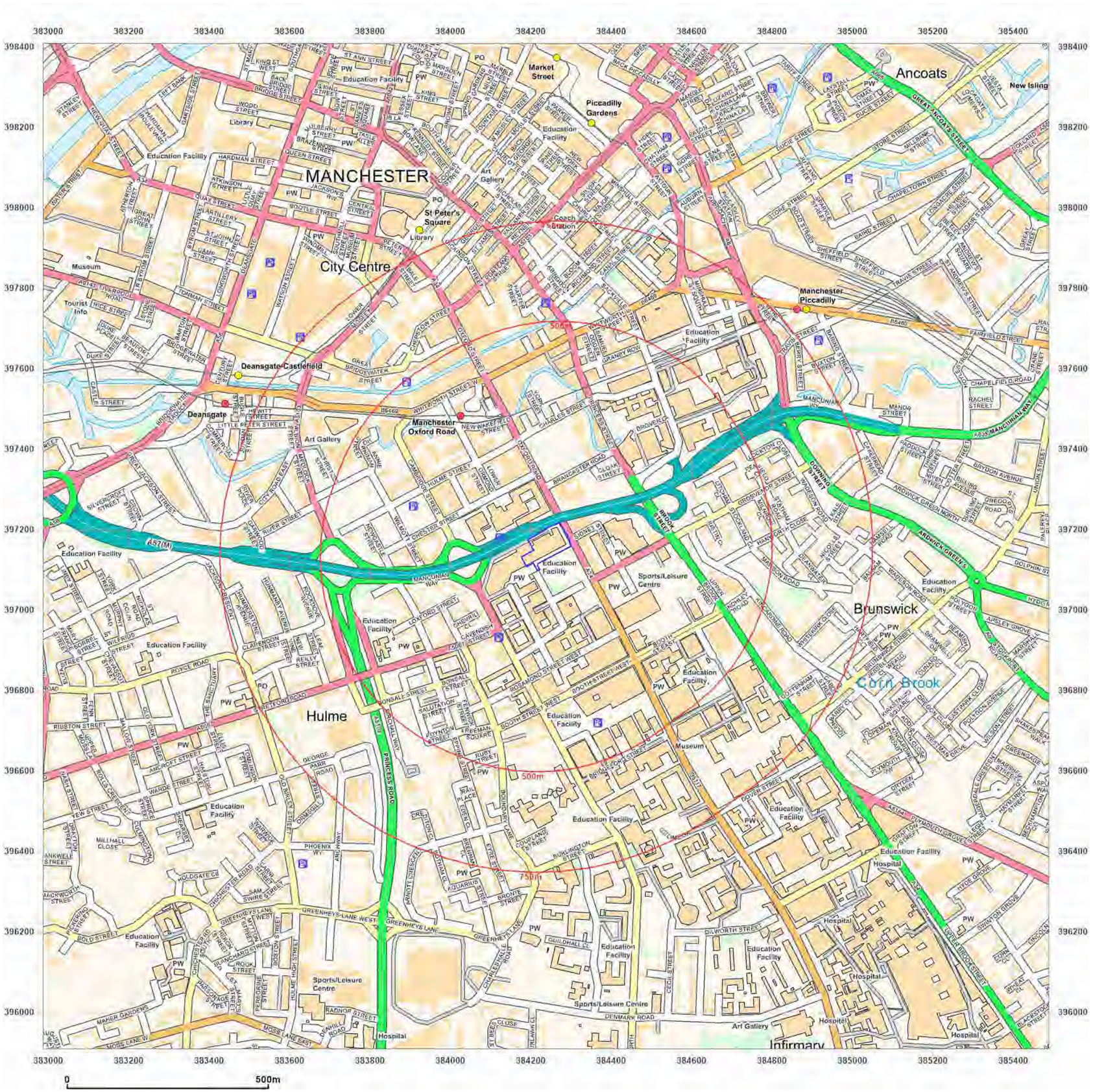
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Client Ref: PO244532_MMU_Library
Report Ref: GS-9223728
Grid Ref: 384238, 397159

Map Name: National Grid

Map date: **2022**

Scale: 1:10,000

Printed at: 1:10,000

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Appendix D CON29M

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The Coal Authority

CON29M
coal mining report

ALL SAINTS BUILDING AND CENTRAL BUILDING, OXFORD ROAD, MANCHESTER, M15 6BH

Known or potential coal mining risks

Future underground coal mining Page 4

Further action

No further reports from the Coal Authority are required. Further information on any next steps can be found in our Professional opinion.

For more information on our reports please visit www.groundstability.com

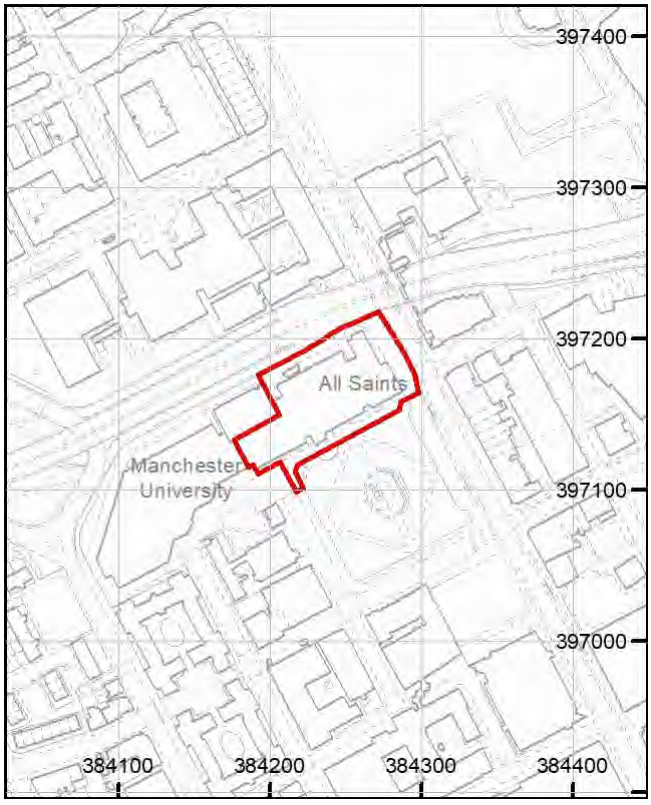
Professional opinion

According to the official mining information records held by the Coal Authority at the time of this search, evidence of, or the potential for, coal mining related features have been identified. It is unlikely that these features will impact on the stability of the enquiry boundary.

Enquiry boundary

Key

Approximate position of enquiry boundary shown



We can confirm that the location is **on the coalfield**

Map data

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Accessibility

If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email communications@coal.gov.uk.

Professional opinion

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

If you are looking to develop, or undertake works, within a coal mining development high risk area your Local Authority planning department may require a Coal Mining Risk Assessment to be undertaken by a qualified mining geologist or engineer. Should you require any additional information then please contact the Coal Authority on 0345 762 6848 or email cmra@coal.gov.uk.

Detailed findings

Information provided by the Coal Authority in this report is compiled in response to the Law Society's CON29M Coal Mining enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL.

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1 Past underground coal mining

The property is not within a surface area that could be affected by any past recorded underground coal mining.

2 Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3 Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4 Mine entries

There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

5 Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6 Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7 Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8 Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9 Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10 Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11 Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

12 Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13 Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14 Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Statutory cover

Coal mining subsidence

In the unlikely event of any coal mining related subsidence damage, the Coal Authority or the mine operator has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land or property in connection with lawful coal mining operations.

When the works are the responsibility of the Coal Authority, our dedicated public safety and subsidence team will manage the claim. The house or land owner ("the owner") is covered for these works under the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994). Please note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you believe your land or property is suffering from coal mining subsidence damage and you need more information on what to do next, please use the following link to our website which sets out what your rights are and what you need to consider before making a claim.
www.gov.uk/government/publications/coal-mining-subsidence-damage-notice-form

Coal mining hazards

Our public safety and subsidence team provide a 24 hour a day, 7 days a week hazard reporting service, to help protect the public from hazards caused by past coal workings, such as a mine shaft or shallow working collapse. To report any hazards please call 0800 288 4242. Further information can be found on our website: www.gov.uk/coalauthority.

Glossary

Key terms

adit - horizontal or sloped entrance to a mine

coal mining subsidence - ground movement caused by the removal of coal by underground mining

Coal Mining Subsidence Act 1991 - the Act setting out the duties of the Coal Authority to repair damage caused by coal mining subsidence

coal mining subsidence damage - damage to land, buildings or structures caused by the removal of coal by underground mining

coal seams - bed of coal of varying thickness

future opencast coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal from the surface

future underground coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal underground. Although it is unlikely, remaining coal reserves could create a possibility for future mining, which would be licensed by the Coal Authority

mine entries - collective name for shafts and adits

mine gas - reports of alleged mine gas emissions received by the Coal Authority within the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded

payments to owners of former copyhold land - historically, copyhold land gave rights to coal to the copyholder. Legislation was set up to allow others to work this coal, but they had to issue a notice and pay compensation if a copyholder came forward

shaft - vertical entry into a mine

site investigation - investigations of coal mining risks carried out with the Coal Authority's permission

stop notice - a delay to repairs because further coal mining subsidence damage may occur and it would be unwise to carry out permanent repairs

subsidence claim - a formal notice of subsidence damage to the Coal Authority since it was established on 31 October 1994

withdrawal of support - a historic notice informing landowners that the coal beneath their property was going to be worked

working facilities orders - a court order which gave permission, restricted or prevented coal mine workings

Appendix E Topographic and Utility Survey

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N

PLAN GRID NORTH

File Name: 524167-SDU_BCT.dwg

LEGEND

AC	AIR VALVE	BT	BT-A BT-A
AP	AP INSPECTION COVER	BT STAT RECORD	BT-A BT-A
CB	CONTROL BOX	CABLE DUCT	DU-A DU-A
CBT	CCTV CAMERA POST	CABLE DUCT STAT RECORD	DU-A DU-A
COM	COMMUNICATIONS COVER	CABLE TV	CA-A CA-A
CV	CABLE TV COVER	CABLE TV STAT RECORD	CA-A CA-A
DC	DRAIN CHANNEL	COOL	CO-A CO-A
DP	DOWN PIPE	COOL STAT RECORD	CO-A CO-A
EB	ELEC BOX	TELECOMS	TE-O TE-O
EIC	ELEC INSPECTION COVER	TELECOMS STAT RECORD	TE-O TE-O
EM	ELEC METER	EARTH ROD STRIP	EA-A EA-A
ES	EARTH STUD	EARTH ROD STRIP CLOSED	EA-A EA-A
EP	ELECTRICITY POLE	ELECTRIC	EL-A EL-A
FC	FIBRE OPTIC COVER LEVEL	ELEC STAT RECORD	EL-A EL-A
FH	FIRE HYDRANT	LAMP CAPPED	EL-A EL-A
G	GULLY	FUEL	FL-A FL-A
GLT	GROUND LIGHT	FUEL LINE	FL-A FL-A
GST	GAS TAP	FUEL LINE STAT RECORD	FL-A FL-A
GV	GAS VALVE	GPR DETECTOR LINE	GN-O GN-O
IC	INSPECTION COVER	MAINS GAS	GN-O GN-O
IL	INVERT LEVEL	MAINS GAS STAT RECORD	GN-O GN-O
HO	HYDRO OUTLET	MAINS WATER	WA-A WA-A
LP	LAMP POST	MAINS WATER STAT RECORD	WA-A WA-A
MH	MANHOLE	SEWER CR	SW-A SW-A
OP	OUTLET PIPE	SEWER CR STAT RECORD	SW-A SW-A
OP	OUTFALL PIPE	SEWER FM	SW-A SW-A
PC	PC VALVE	SEWER FM STAT RECORD	SW-A SW-A
PP	PETROL PUMP	SEWER SW	SW-A SW-A
RE	RODDING EYE	SEWER SW STAT RECORD	SW-A SW-A
SAP	SAMPLING POINT	TRAFFIC SIGNAL CABLE	TM-O TM-O
SDP	SOFFIT LEVEL	TRAFFIC SIGNAL CABLE STAT RECORD	TM-O TM-O
SV	STOP VALVE	UNIDENTIFIED TRACE	UT-A UT-A
TB	TELEPHONE CALL BOX	UNIDENTIFIED TRACE	UT-A UT-A
TL	TRAFFIC LIGHT	UNIDENTIFIED PIPE	UP-A UP-A
TLB	TRAFFIC LIGHT BOX	VEHICLE DETECTOR CABLE	TC-O TC-O
TP	TEST POINT/ PIPE	WATER BOUNDARY	WA-A WA-A
WM	WATER METER	SURVEY BOUNDARY	SU-A SU-A
WP	WATER POLE/ POST	UNIDENTIFIED UTILITY SURVEY	UT-A UT-A
WSP	WATER STOP TAP		Multiple Fill or Lines in Symbol
WSV	WATER STOP VALVE	QUALITY LEVEL	
EOT	END OF TRACE	A – Verification	
HA	HEAVILY OBSTRUCTED AREA	B1 – Horizontal/Vertical location using multiple techniques	
UTL	UNABLE TO LIFT	B2 – Horizontal/Vertical location using a single technique	
UTS	UNABLE TO SURVEY	B3 – Horizontal location using a single technique	
SC	SURVEY CONTROL	BA – Assumed route	
SL	SIGNAL LOSS	C – Site Reconnaissance	
BLK	BLOCKED	D – Desktop utility records search	
SCP	SURVEY CONTROL SPIKE		
MH	MICROPROP MH		
TMP	TEMPORARY MARK		
TOP	TOP OF KERB		
BM	BENCH MARK		
RL	FITTING FROM RECORDS		

NOTES:
All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

This Underground Utilities survey was conducted in compliance with the BSI PAS128:2014 standards.
Services linetypes display text indicating first an abbreviation of the services' function (e.g. BT = Electric Cables) followed by the Quality Level to which that service was located (eg. BA = Assumed route).

Quality Level descriptions shown in the above legend are for reference purposes only and are not intended as detailed descriptions.
For full Quality Level definitions, please consult the
BSI PAS 128:2014 standards document.

Lines annotated as GPR indicate a series of consistent subsurface anomalies located using the Ground Penetrating Radar and should be considered as Quality Level C. The nature of these anomalies could not be determine by non-invasive means. GPR lines that were identifiable as a service are shown as their respective service.

DISCLAIMER:

At SEP we use skilled and experienced staff, modern up to date techniques and top of the range electromagnetic and radar technology to locate and trace sub-surface utilities. However the performance of the equipment employed in non-invasive surveys can be adversely affected by factors outside the control of SEP. Therefore SEP cannot guarantee that all utilities present on site have been located. It is the responsibility of the Client to consult regional authority records and undertake trial digs where appropriate.

Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience interference. In such cases, services will be shown as a single, annotated line. The displayed depth will refer to the shallowest detected utility.

Successful tracing of non-conductive materials may be limited. Drainage gullies are due tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 2m deep may be accurate to +/-200mm) but this cannot be guaranteed. Depths shown usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey. It is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or rough/uneven ground.

Existing record information that was made available to SEP by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

Excavation in the vicinity of services shown should be carried out with due diligence (Ref. HSG47).

0 2m 4m 8m 12m 16m

SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

Client
Hawkins Brown Architects
159 St John Street
London
EC1V 4QJ

Project Title
Post processed GPR of Land at:
All Saints Library
Manchester Metropolitan University
All Saints Park
Manchester
M15 6BH

Surveyed	Drawn	Checked
L.Biggar	D.Shipton	B.Brady

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Jan 23	S24167-GPR	01	A0	--

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A2 Site Investigation

MMU

Factual Report

November 2024

A2SI-REP-001-00

51324-A2SI-XX-XX-RP-X-0001-01

Project Name	MMU
Project Number	51324
Client	Turner & Townsend
Document Name	Factual Report

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Document Reference	Status	Notes	Revision	Issued by	Date
51324-A2SI-XX-XX-RP-X-0001-00	First Issue	DRAFT	00	WT	04/10/2024
51324-A2SI-XX-XX-RP-X-0001-01	Second Issue	FINAL – Updated text in line with comments from Buro Happold, included material testing and foundation drawings.	01	WT	05/11/2024

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Appendices

Appendix A: Summary of Exploratory Holes

Appendix B: Exploratory Hole Location Plan

Appendix C: Exploratory Hole Logs

Appendix D: Material Laboratory Testing Results

Abbreviations

Abbreviation	Full name	Abbreviation	Full name
ACM	Asbestos-containing Material	PL	Plastic Limit
BGS	British Geological Survey	PI	Plasticity Index
BH	Borehole	PSD	Particle Size Distribution
BRE	Building Research Establishment	SGV	Soil Guideline Value
BSI	British Standards Institution	SOM	Soil Organic Matter
BS	British Standard	SPT	Standard Penetration Test
CIRIA	Construction Industry Research and Information Association	SPZ	Source Protection Zone
GAC	Generic Assessment Criteria	SVOC	Semi-volatile Organic Compounds
LL	Liquid Limit	TPH	Total Petroleum Hydrocarbon
m bgl	Metres Below Ground Level	UST	Underground Storage Tank
m OD	Metres Ordnance Datum	UXO	Unexploded Ordnance
PAH	Polycyclic Aromatic Hydrocarbons	VOC	Volatile Organic Compound
PCB	Polychlorinated Biphenyl	WAC	Waste Acceptance Criteria
PID	Photo Ionisation Detector		

1. Introduction

A2 Site Investigation (A2SI) were appointed to undertake a ground investigation at by Turner & Townsend, on behalf of the Client, Manchester Metropolitan University. The ground investigation was specified by A-squared Studio, who also acted as Investigation Supervisor. A previous ground investigation report was undertaken by 'Geotechnical Engineering Limited' under the reference '37757' and is referenced in this report. Along with this, a desk study was undertaken by Buro Happold under the reference '1044B-BHE-XX-XX-RP-CG-000001 Rev P04'. This first interim / draft issue of the report describes the work undertaken and presents the findings to date.

Note that material laboratory results were not available at the time of issuing this draft report. The testing is still ongoing and will be issued in a subsequent revision.

2. Site Location

The site is situated at Manchester Metropolitan University, M15 6BH, specifically on the south-western section of All Saints Library, as presented in Figure 2.1. The site is located at National Grid Reference TQ 84201 97122 and falls within the administrative boundaries of the Manchester City Council. The wider site is bounded to the north by Mancunian Way and to the east by Oxford Road To the south is All Saints Park, with the south-western corner being a pedestrianised area. The wider site consists of an occupied university library, All Saints Library. The works area consists of the south-western corner of All Saints Library, along the building wall to the pedestrianised area.

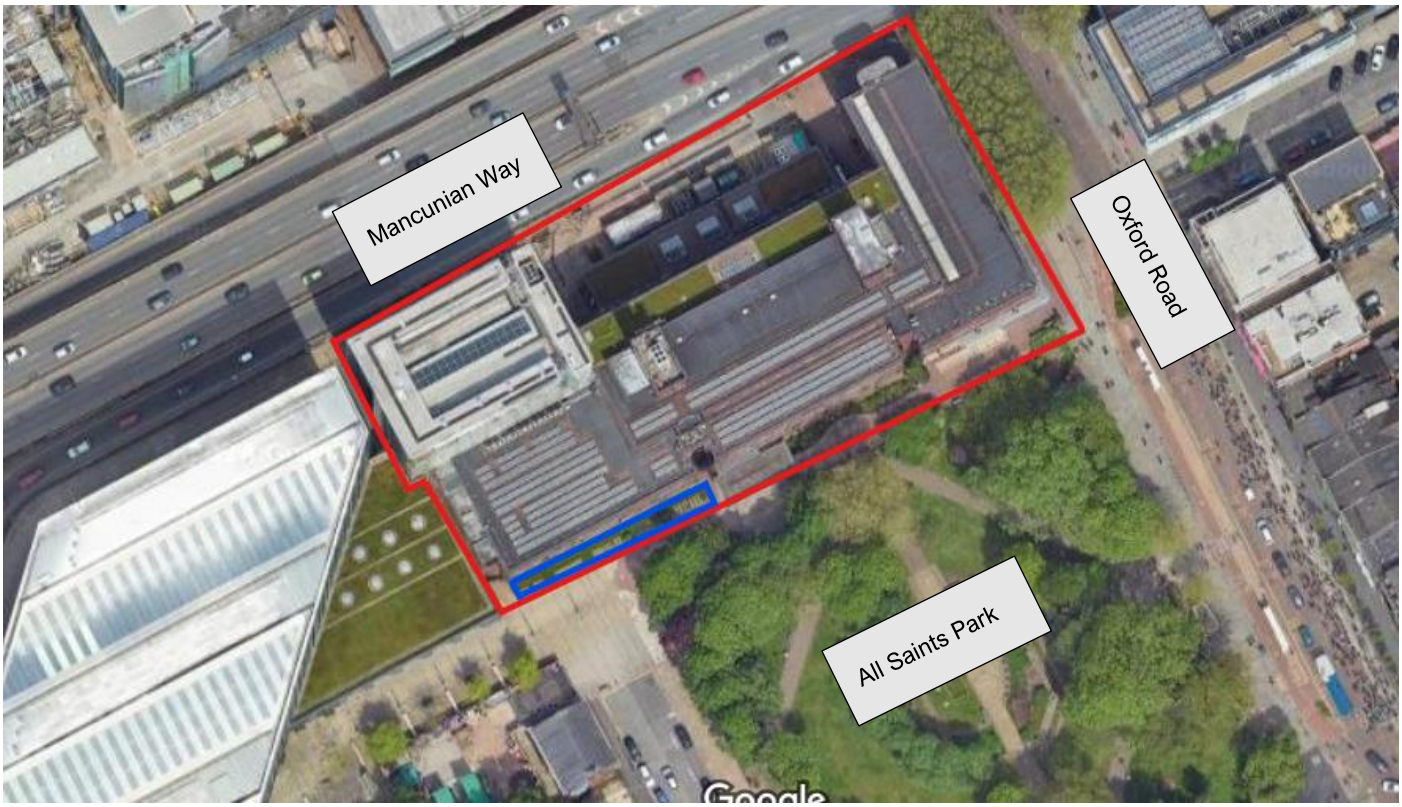


Figure 2.1 Site location (red) and works area (blue)

3. Proposed Development

At present, the proposal involves the demolition of the eastern portion of the existing All Saints Library building and build a new 12 No. storey building, and the refurbishment of the remaining building. It is understood that the aim is to reuse the existing pile foundations of the building.

4. Scope and Purpose of the Investigation

A2SI have been commissioned to undertake a site investigation at the site comprising:

- 3 No. rotary boreholes to 25.00m bgl utilising open coring methods.
- 3 No. hand-dug trial pits to investigate existing foundations, with 1 no. structural opening for rebar arrangements.
- 3 No. standpipe installations within the boreholes for parallel seismic investigation.
- Geotechnical in situ testing.
- Material laboratory testing.

4.1. Investigation Strategy

Table 4.1 summarises the strategy for the phases of the intrusive investigation.

Table 4.1 Summary of investigation strategy

Location ID	Method	Purpose/Comments
TP301 (B.H.B.4) TP302 (B.H.B.7) TP303 (B.H.B.8)	Hand dug trial pits using insultated hand tools.	To determine the existing foundation arrangement.
BH301 (B.H.B.4) BH302 (B.H.B.7) BH303 (B.H.B.8)	Boreholes to 25.00m bgl utilising open coring methods.	To determine the location of bedrock and to be used for parallel seismic investigation.

5. Anticipated Ground Conditions

Table 5.1 presents a review of available geological maps and memoirs, including the online British Geological Survey (BGS) "Geology Viewer", previous site investigations and other relevant data.

From analysing geological maps, it is suggested that the site is underlain by the superficial deposits of the Glaciofluvial Sheet Deposits and the bedrock of the Chester Formation.

The ground conditions of the site have been detailed in the report undertaken by 'Geotechnical Engineering Limited' under the reference '37767'. The position closest to the current phase of investigation is 'BH04A', which was taken approximately 30m west of the current investigation area. It should be noted that no formation names were given to the deposits encountered, except from shallow Made Ground and therefore, formation names have been assigned for the purpose of this report to the found geologies based on the descriptions provided. From 0.00-1.60m bgl, it was found that a mixture of Made Ground deposits were present, primarily consisting of reworked, soft clays with gravels of anthropogenic material and rock. A small section of soft clay, from 1.60-2.05m, is present following this, although this is not marked as Made Ground. Beneath this, the Glaciofluvial Sheet Deposits of sand grading to a gravel was encountered until 3.65m, with gravels of quartzite, mudstone, sandstone and siltstone. Following this, a stiff clay, which is likely Glacial Till, was encountered before encountering an extremely weak siltstone bedrock at 10.50m, marking the beginning of the Chester Formation. In this location, the geology phases back to a very stiff clay from 12.00m-13.35m, although this is not encountered in the other drilling locations as part of this ground investigation. Following this, the geology re-enters siltstone and mudstone till the completion of the hole. The specific depths from 'BH04A' are found in the table below.

Table 5.1 Anticipated geological sequence

Unit	Depth[1] (m bgl)	Thickness (m)	Description
Made Ground	0.00	1.60	Variable anthropogenic deposits
Glaciofluvial Sheet Deposits	1.60	1.50	Sand grading into gravels.
Glacial Till	3.65	6.35	Firm-very stiff clay.
Chester Formation	10.00	>30.00	Siltstone and mudstone (with rare interbedded clay encountered in BH04A)

1. Depths refer to top of stratum.

6. Limitations of Report

This report has been prepared in accordance with the specification provided by the client. The data reported relates to the specific locations where each exploratory hole was formed and may not represent the ground and groundwater conditions of the site as a whole. Furthermore, it should be considered that groundwater levels may vary throughout the year due to seasonal conditions and other influences such as flooding, leaking mains, storm drainage and foul water systems.

7. Standards

The site investigation, soil descriptions and laboratory testing were undertaken in accordance with following standards:

- AGS Assessment and Control of Asbestos Risk in Soil – Part 1: Protection of Personnel working on Ground Investigations, May 2021.
- BGS Geology Viewer: 2022. https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/. British Geological Survey.
- BGS GeoIndex: 2022. https://www.bgs.ac.uk/map-viewers/geoindex-onshore/. British Geological Survey.
- British Standards Institution BS 10175:2011+A2:2017, Investigation of potentially contaminated sites – code of practice.
- British Standards Institution BS 5930:2015+A1:2020, Code of practice for site investigations.
- British Standards Institution BS 1377-2:2022, Methods of test for soils for civil engineering purposes – Part 2: Classification tests and determination of geotechnical properties.
- British Standards Institution BS 1377-9:1990, Methods for test for soils for civil engineering purposes - In-situ tests.
- British Standards Institution BS 8576:2013 Guidance on investigations for ground gas - permanent gases and volatile organic compounds (VOCs).
- British Standards Institution BS EN ISO 14688-1:2018, Geotechnical investigation and testing – identification and classification of soil. Identification and description.
- British Standards Institution BS EN ISO 22475-1: 2021 : Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 Technical principles for execution.
- British Standards Institution BS EN ISO 5667-1:2023 Water quality. Sampling - Guidance on the design of sampling programmes and sampling techniques.
- Building Research Establishment (2005), BRE Special Digest 1: Concrete in aggressive ground.
- Norbury, D. (2010), Soil and Rock Description in Engineering Practice (Caithness: Whittles).
- UK Specification for Ground Investigation 3rd Edition, published by ICE Publishing (2022).

8. Ground Investigation Summary

8.1. Fieldwork Overview

The fieldwork was carried out between 16th August 2024 and 11th September 2024. A site walkover was conducted prior to the first day of the ground investigation and confirmed the anticipated layout of the site.

A detailed Unexploded Ordnance (UXO) Risk Assessment for the site was provided by the Client. The risk assessment was carried out by Alpha Associates in accordance with CIRIA C681 Guidelines: 'Unexploded Ordnance, a Guide for the construction Industry' (published in 2009) and is included in the previous Phase I Desk Study. The report's findings have concluded there to be a potential risk from buried Second World War UXOs on site, and that further research and possibly on site UXO mitigation supervision was required. A UXO specialist was in attendance during drilling of all exploratory locations. Mitigations included the use of downhole magnetometer clearance and safety briefing toolbox talks.

After reviewing all available service information and site reconnaissance, all locations were scanned using Ground Penetrating Radar (GPR) & Electromagnetic (CAT & Genny) techniques, to check for services within proximity to exploratory hole locations. All positions were surveyed to determine the National Grid coordinates.

The specific details of the investigation undertaken are discussed throughout Section 8 and comprised:

- 3 No. rotary boreholes up to 25.00m bgl using open coring methods.
- 3 No. hand-dug trial pits to investigate existing pile foundations with 1 no. structural opening for rebar arrangements.
- 3 No. standpipe installations within the boreholes for parallel seismic testing.
- Geotechnical in situ testing.
- Material laboratory testing.

All works were supervised by an experienced ground engineer.

An exploratory hole location plan and detailed exploratory hole logs are presented in Appendices A and C respectively. The coordinates and Ordnance Datum levels, which are presented on the exploratory logs, have been surveyed as part of the investigation

8.2. Rotary Boreholes

3 No. rotary boreholes were advanced to a maximum depth of 25.00m bgl. This was done utilizing a Camocchi 205 rig, advancing with a S-line geobore using open coring methods.

SPT testing was undertaken at alternate 1.50m intervals from the base of the inspection pit through all soils until the completion of the hole. The flush returns were regularly inspected and logged by the supervising engineer. For further details, please refer to Section 9.

A 90mm standpipe was installed upon the completion of all holes to be utilized for parallel seismic testing.

8.3. Trial Pits

A total of 3 no. hand excavated trial pits were completed to a maximum depth of 1.55m bgl to determine the extent and thickness of existing foundation structure. A summary of the findings is presented in Table 8.1.

TP301-TP303 was progressed using concrete breaking techniques and insulated hand digging tools. During excavation of TP301 (B.H.B.4), a 300mm thick concrete obstruction was encountered projecting from the wall. In consultation with the Client, it was agreed that a Hilti breaker could be used to get through this concrete. Along with this, two thinner concrete obstructions were encountered in TP302 (B.H.B.7) and TP303 (B.H.B.8), both measuring 80mm thick. The concrete extended furthest in TP301, extending 1.80m from the wall. In TP302 and TP303, this concrete only extended 700mm and 400mm respectively. Other than for breaking out concrete, all pits were used using insultated hand digging tools. All pits were able to verify the existing foundation arrangements, as shown within Appendix C.

Trial pits were backfilled with arisings and were topped with a pea gravel surfacing.

All soils encountered were logged on site.

Table 8.1 Trial Pit locations

Exploratory Hole Reference	General Findings	Bearing Stratum	Notes
TP301 (B.H.B.4)	Pile cap with 1170mm diameter, with pile diameter totalling 1050mm Pile encountered at 1070mm depth	Bedrock	No brickwork observed covering pile cap.

Exploratory Hole Reference	General Findings	Bearing Stratum	Notes
TP302 (B.H.B.7)	Pile cap with 1100mm diameter, with pile diameter totalling 1020mm Pile encountered at 900mm depth.	Bedrock	Brickwork and brick 'membrane' observed.
TP303 (B.H.B.8)	Pile cap with 1100mm diameter, with pile diameter totalling 1030mm Pile encountered at 850mm	Bedrock	Brickwork and brick 'membrane' observed.

8.4. Structural Openings

A total of 1 No. structural openings were undertaken within TP303 (B.H.B.8).

All structural openings were logged and sketched on site and selected locations were sampled for concrete for subsequent laboratory analysis. On completion, all coreholes was reinstated with Fosroc. The sketch of the structural opening location is presented in Appendix C.

9. Ground Conditions

As a part of the ground investigation, open hole methods were utilised when drilling. Due to this, all logs were produced using a mixture of logging hand pits, logging flush returns, SPT results in conjunction with the previous GI logs, undertaken by 'Geotechnical Engineering Limited' under the reference '37757'.

SPTs were undertaken in each borehole to help identify the boundary between soils and bedrock. The first SPT refusal at BH301 (B.H.B.4) occurred at 10.50m bgl, whilst a slightly deeper first refusal was encountered at 12.00m bgl within BH302 (B.H.B.7) and BH303 (B.H.B.8). These refusals indicate the transition from soils to bedrock at each location. From this, it can be concluded that the bedrock lies at 10.50m bgl at BH301 (B.H.B.4) and 12.00m bgl at BH302 (B.H.B7) and BH303 (B.H.B.8).

9.1. Groundwater

Due to the use of geobore drilling, any potential water strikes were masked by the addition of water to the hole and use of casing as the hole progressed. As a result, any instances were groundwater may have been present are not marked within this report.

10. In Situ Testing

10.1. Standard Penetration Testing

Standard Penetration Tests were completed in all boreholes. The tests were completed in accordance with BS EN ISO 22476-3.

Figure 10.1 presents the SPT/Cu versus Elevation plot for the site. Detailed SPT results are presented in Appendix C.

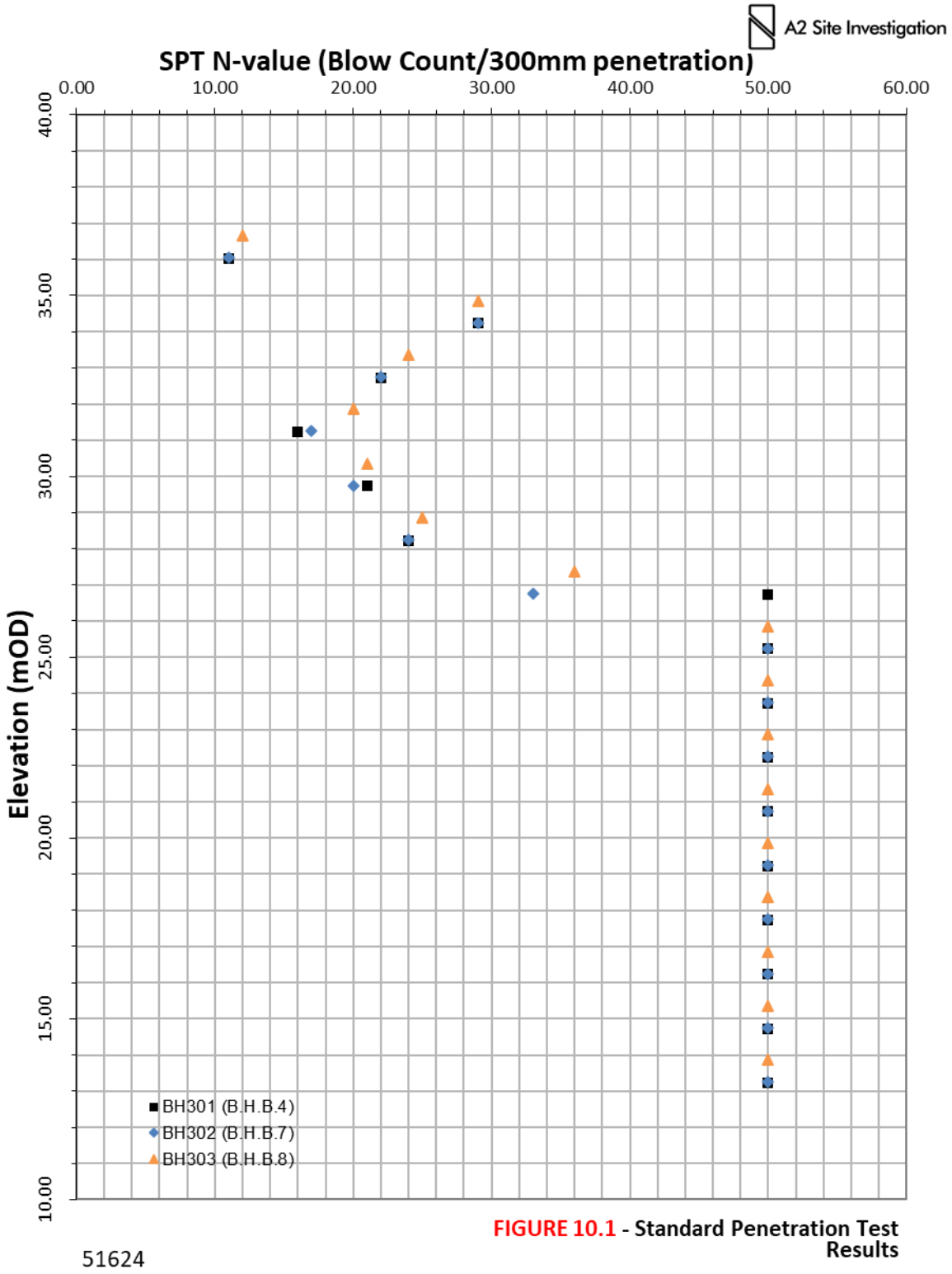


Figure 10.1 SPT versus Elevation plot

10.2. Parallel Seismic Testing

The parallel seismic technique operates by directing an elastic wave through a foundation from the surface and recording its arrival time at different depths below the surface. To perform the test a hydrophone is lowered down through a plastic pipe installed next to a pile in increments of 500mm and 1000mm. At each step, the top of the beam above the pile is struck, and the hydrophone records the resultant signal from the moment of impact. As the hydrophone descends, the signal will resolve itself, and the arrival time will

gradually increase linearly with the depth. A constant velocity is expected within a concrete pile; typically, this is faster than the velocity of the surrounding sedimentary deposits.

When the hydrophone reaches the base of the pile, the additional signal path is through soil, not steel or concrete, and the first arrival time (FAT) will increase at a greater rate (i.e. the signal takes longer to arrive). The depth of the foundation is determined by the depth at which the rate of first arrival changes, and analysis of the data allows determination of this inflection point and hence the depth to the toe of the pile.

Parallel seismic (PS) testing was conducted to estimate the depth to the toe at 3 No. pile locations. Each borehole was positioned within 2.20m of the target pile and a sealed HDPE 90mm ID pipe was installed to the base at 25.00m bgl. All installs were placed as close to the pile as possible, however, the install at BH302 (B.H.B.7) was emplaced further (2.20m) than the BH301 (B.H.B.4) (1.10m) and BH303 (B.H.B.8) (1.20m) due to live services in the area, making it unfeasible to drill closer to the foundation to avoid damaging said services. The pipe was filled with water and the volume surrounding the pipe backfilled with grout, which was introduced to the base of the borehole using a tremie pipe and grout pump.

Testing was carried out on the smooth flat surface of the pile cap above the pile within trial pits adjacent to the borehole. A vibration was induced by striking the top of pile cap with the hammer whilst the hydrophone was lowered in metre increments for the first test and half-metre increments for the second test.

The test data recovered from site and subsequent interpretation present a good correlation of V1 and V2 response speeds and subsequent intersection point showing pile toe depth.

The parallel seismic testing was repeated multiple times on each borehole position, beginning with BH301 (B.H.B.4) on 29th August, BH302 (B.H.B.7) on 3rd September, concluding with BH303 (B.H.B.8) on the 11th September. The results of the parallel seismic test results are summarised in Table 8.4 below.

Table 8.4 Parallel Seismic Survey

Pile Reference	BH301 (B.H.B.4)	BH302 (B.H.B.7)	BH303 (B.H.B.8)
Distance from install to pile (m)	1.10	2.20	1.20
Estimated Intersection (pile toe level (m OD))	20.93	21.25	20.46
Estimated Pile Length (m)	16.30	16.00	17.40

11. Laboratory Testing

11.1. Material Testing

Geotechnical laboratory testing was undertaken by Sandberg Limited, a United Kingdom Accreditation Service (UKAS) accredited laboratory, in accordance with relevant standards.

The following type and number of tests scheduled are presented in Table 11.1. The results are presented in Table 11.2 and detailed results will be presented in Appendix E once available.

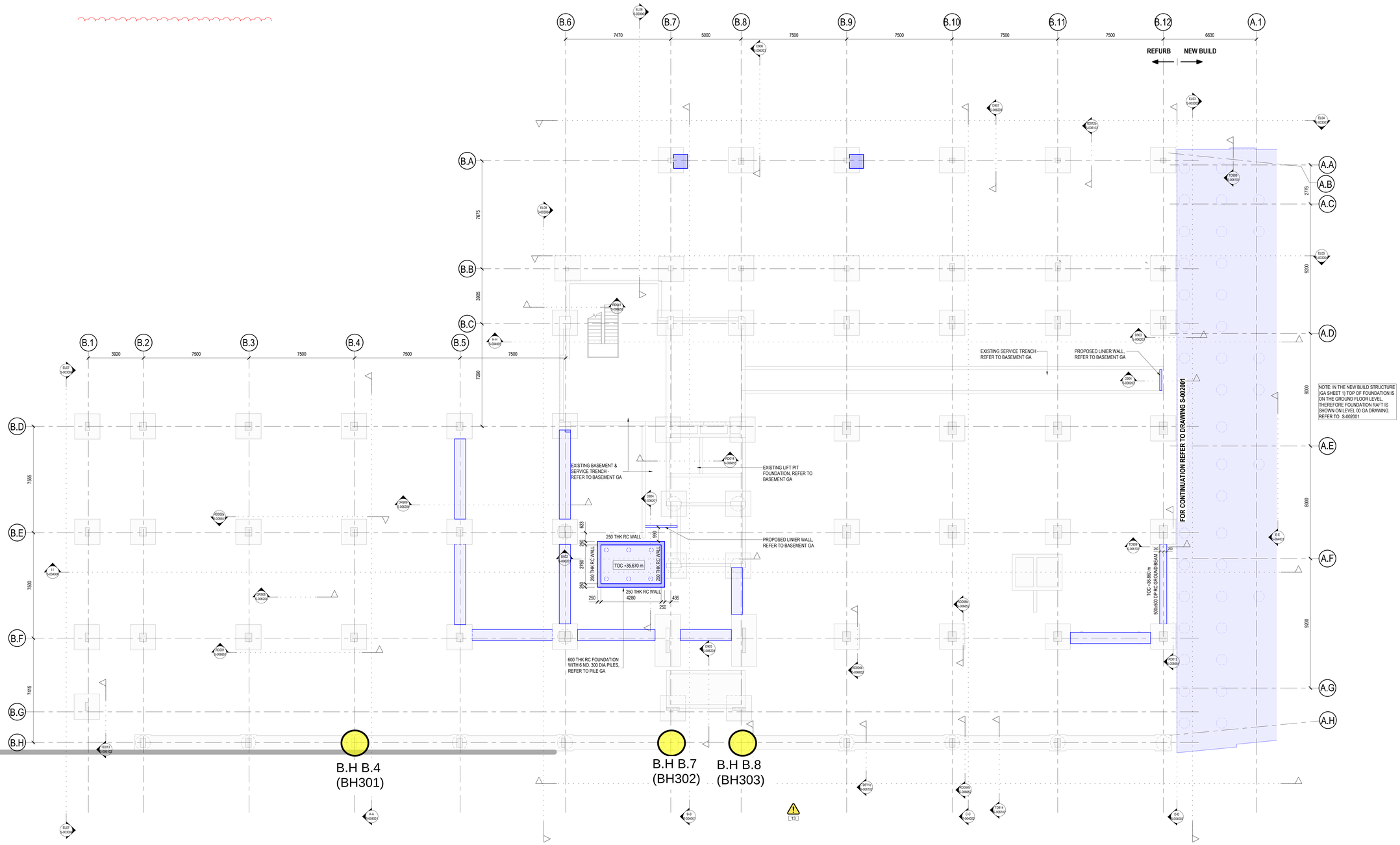
Table 11.1 Geotechnical laboratory testing summary

Test description	Number of tests
Portland Cement Content BS 1881 – 124: 2015	1
Sulphate Content BS 1881 Part 124:2015	3
Chloride Content BS 1881 Part 124:2015	3
Testing for the Presence of High Alumina Cement	3
Compressive Strength BS EN 12504-1:2019, BS EN 12390-7:2019, BS EN 12390-7:2019	3
Depth of Concrete Carbonation BRE IP 6/81	3

Appendix A: Summary of Exploratory Holes

Location ID	Location Type	Easting	Northing	Ground Level	Final Depth	Date Start	Date End
BH301 (B.H.B.4)	RO	384205.44	397120.15	37.23	25	22/08/2024	26/08/2024
BH302 (B.H.B.7)	RO	384225.05	397131.02	37.25	25	28/08/2024	29/08/2024
BH303 (B.H.B.8)	RO	384227.58	397133.88	37.86	25	30/08/2024	03/09/2024
TP301 (B.H.B.4)	TP	384205.44	397120.15	37.23	1.45	19/08/2024	22/08/2024
TP302 (B.H.B.7)	TP	384225.05	397131.02	37.25	1.40	22/08/2024	23/08/2024
TP303 (B.H.B.8)	TP	384227.58	397133.88	37.86	1.55	22/08/2024	23/08/2024

Appendix B: Exploratory Hole Location Plan



STRUCTURAL LEGEND

- EXISTING BEAM RETAINED
- EXISTING BRACING RETAINED
- EXISTING MOMENT CONNECTION
- EXISTING COLUMN RETAINED
- EXISTING SLAB RETAINED - CONSTRUCTION FORM VARIES, REFER TO SPAN ARROWS AND LABELS FOR SPECIFICATION
- EXISTING RISER
- EXISTING BEAM TO BE DEMOLISHED
- EXISTING COLUMN TO BE DEMOLISHED
- EXISTING SLAB OR STEELWORK DEMOLISHED
- -VB-
- -HB-
- NEW STEEL BEAM
- NEW VERTICAL BRACING
- NEW HORIZONTAL BRACING
- NEW MOMENT CONNECTION
- NEW COLUMN
- NEW SLAB - REFER TO SPAN ARROWS & LABELS FOR SPECIFICATION
- NEW METAL DECK - REFER TO SPAN ARROWS & LABELS FOR SPECIFICATION
- BWO / BWO (#) — NEW STEEL BEAM WITH WEB PENETRATION, REFER TO TYPICAL DETAIL: BWO - NO STIFF.: TD019 / S-006502; BWO (#) - STIFF.: TD020 / S-006502
- NEW RISER / SLAB VOID
- DENOTES TWO WAY SPANNING SLAB
- DENOTES ONE WAY SPANNING SLAB
- DENOTES ONE WAY SPANNING PRECAST SLAB
- DENOTES ONE WAY SPANNING METAL DECK
- (MJ) — MOVEMENT JOINT
- XX — HAZARD WARNING TRIANGLE FOR ALL HAZARD WARNINGS TRIANGLE REFER TO DRAWING 1044B-BHE-XX-XX-DR-S-000003

Parallel seismic test location

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DO NOT SCALE THIS DRAWING.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION.
1. CONSTRUCTION OF GROUND FLOOR INVOLVED EXCATIONS OF OVER 1.5M IN PLACES.
2. THERE ARE TWO EXISTING BASEMENT STRUCTURES, ONE BENEATH THE TOWER AND ONE BENEATH THE EXISTING. REFER TO BASEMENT PLANS FOR RETENTION & INFILL PROPOSALS. CONTRACTOR TO ENSURE STABILITY TO EXISTING BELOW GROUND STRUCTURES DURING CONSTRUCTION
3. REFER TO LATEST SITE INVESTIGATION INFORMATION
4. CONTRACTOR TO ENSURE TEMPORARY SHORING IS PUT FOR ALL CANTILEVER AND TRANSFER STRUCTURES DURING CONSTRUCTION.
5. CONTRACTOR TO ENSURE STABILITY OF EXISTING STRUCTURE THROUGH DEMOLITION AND STRENGTHENING WORKS.

MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.
1. DESIGN LIFE OF THE NEWBUILD ELEMENTS OF THE BUILDING ARE 50 YEARS.
2. DEMOLITION SEQUENCING WILL NEED TO ENSURE SAFE DEMOLITION OF CANTILEVER AND TRANSFER STRUCTURES.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH
   BASIS OF DESIGN: 1044B-BHE-ZZ-ZZ-RP-S-000200
   STEELWORK SPECIFICATION: 1044B-BHE-ZZ-ZZ-SP-S-001001
   CONCRETE SPECIFICATION: 1044B-BHE-ZZ-ZZ-SP-S-001002
   GENERAL NOTES DRAWINGS: 1044B-BHE-XX-XX-DR-S-000001
   MOVEMENTS AND TOLERANCES REPORT: 1044B-BHE-ZZ-ZZ-RP-S-000300
   WATERPROOFING PERFORMANCE SPECIFICATION: 1044B-BHE-ZZ-ZZ-SP-S-001003
2. LEVELS AND DIMENSIONS ON BURO HAPPOLD DRAWINGS ARE BASED ON ARCHIVE INFORMATION AND WILL DEPEND ON EXACT POSITION OF EXISTING STRUCTURE. TO BE VERIFIED ON SITE BY THE CONTRACTOR AND THE DESIGN TEAM WILL BE INFORMED OF ANY DISCREPANCY. DISCREPANCY WILL NEED TO BE REVIEWED AND MAY REQUIRE CHANGES TO THE DESIGN.
3. PROPOSED DESIGN AND LAYOUT BASED ON ARCHITECTURAL DRAWINGS
4. POSITIONING OF EXISTING BUILDING ELEMENTS TAKEN FROM SURVEY INFORMATION WHERE POSSIBLE. TO BE VERIFIED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
5. STRENGTHENING WORKS TO THE EXISTING HAVE BEEN DEVELOPED BASED ON SURVEY INFORMATION TO DATE. FOR FURTHER SURVEY WORK REQUIRED REFER TO 'INTRUSIVE SURVEY LOCATION PLAN V10_20240528'.
6. ALLOWANCE TO BE MADE FOR FIRE BOARDING TO ALL POST FIX STEEL - CONCRETE CONNECTIONS TO ACHIEVE 120 MINUTES FR.
7. BURO HAPPOLD'S STAGE 4 DESIGN IS BASED ON SURVEY INFORMATION RECEIVED TO DATE. DESIGN TO BE REVIEWED FOLLOWING RECEIPT OF CTS SURVEY INFORMATION EXPECTED JULY 2024.

NOTES ON LATERAL STABILITY SYSTEM

THE NEW BUILD AND REFURB SECTIONS OF THE BUILDING HAVE SEPARATE STABILITY SYSTEMS AND ARE SEPARATED BY A FULL HORIZONTAL MOVEMENT JOINT TO THE EAST OF GRIDLINE B-12. LATERAL STABILITY OF THE EXISTING BUILDING IS PROVIDED THROUGH FRAME ACTIONS OF THE COLUMNS AND SLABS. THE PROPOSED CONSTRUCTION SEQUENCE MUST BE ADHERED TO, TO ENSURE LATERAL STABILITY IT MAINTAINED THROUGHOUT DEMOLITION AND CONSTRUCTION PHASES AND IN THE FINAL CASE. LATERAL STABILITY OF THE NEW TOWER IS PROVIDED BY AN IN-SITU CONCRETE CORE WITH FLAT SLABS ACTING AS DIAPHRAGMS TO TRANSFER LATERAL LOADS TO THE CORE.
THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE BUILDING THROUGHOUT THE DEMOLITION AND CONSTRUCTION PHASES. TEMPORARY WORKS PROPOSALS AND RAMS SHOULD BE PROVIDED TO THE STRUCTURAL ENGINEER FOR REVIEW.

NOTES ON OUTLINE CONSTRUCTION SEQUENCE

FULL FOUNDATIONS AND SUPERSTRUCTURE STRENGTHENING WORKS ON GRIDLINE 12 SHOULD BE UNDERTAKEN BEFORE ANY DEMOLITION WORKS TO THE EXISTING BUILDING TO THE EAST OF GRIDLINE B-12 ARE UNDERTAKEN.
NO VOIDS CAN BE FORMED IN THE EXISTING BUILDING UNTIL THE STRENGTHENING WORKS REQUIRED HAVE BEEN INSTALLED - REFER TO PROPOSED GA'S.
THE CONSTRUCTION SEQUENCE OF THE OXFORD ROAD CANTILEVERS NEEDS TO ENSURE THAT THE SLABS SUPPORTED ON IT AND THE PRECAST FACADE ARE NOT INSTALLED UNTIL THE FULL STEEL CANTILEVER IS FULLY IN PLACE
CONSTRUCTION SEQUENCE NEEDS TO ENSURE THAT TRANSFER BEAMS HAVE REACHED ADEQUATE STRENGTH BEFORE STRIKING OF FORMWORK

ASSUMED GENERAL CONSTRUCTION SEQUENCE TO BE REVIEWED WITH MAIN CONTRACTOR (REFER TO DETAILS AND BASIS OF DESIGN FOR FURTHER DETAIL):

- STRENGTHENING WORKS TO GL B12 (INCLUDING GROUND BEAM, STEEL BEAMS AND BRACED BAY
- DEMOLITION OF BUILDING EAST OF GL B12
- TOWER CONSTRUCTION
- INSTALLATION OF COLUMN STRENGTHENING
- FLOOR STRENGTHENING BEAMS INSTALLED IN REFURB.
- * REFURB DEMOLITION WORKS (INCL. SLABS, INTERNAL WALLS/FINISHES, FACADE)
- CONSTRUCTION OF ADDITIONAL FLOORS/INFILLS
- CONSTRUCTION OF SECONDARY STRUCTURE

* SPECIFIC CONDITIONS TO BE WORKED THROUGH WITH MAIN CONTRACTOR - E.G. SINGLE TO DOUBLE HEIGHT COLUMNS REQUIRE COLUMN PROPPING AND SLAB REMOVAL LOCAL TO COLUMN TO ENABLE JACKETING TO BE INSTALLED. HOWEVER STEEL BEAMS FRAMING PERIMETER OF ATRIUM SLABS NEED TO BE INSTALLED PRIOR TO FULL SCALE SLAB DEMOLITION.

Rev	Description	Date	Drn	App'd
P03	STAGE 4 ISSUE	26.07.24	MK	EC
P02	STAGE 4 ISSUE	14.06.24	MK	EC
P01	STAGE 4 ISSUE	31.05.24	MK	EC

RIBA STAGE 4
Project Stage

S4 - FOR STAGE APPROVAL
Status of Drawing

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Client: *Manchester Metropolitan University*
Architect: *Hawkins\Brown & schmidt/hammer/lassen/*
Project: **The Library Transformation Project**
Drg Title: General Arrangement Proposed Foundation Level Sheet 2

Job No: 053621
Scale@ A0: 1 : 100
Drawn By: M Karpiuk
Checked By: E Conlin
Approved By: S Lonsdale
Drawing No.: 1044B-BHE-ZZ-FN-DR-S-001982
Revision: P03

Appendix C: Exploratory Hole Logs

A2 Site Investigation

Borehole Log

Project	Borehole No
Manchester Metropolitan University	BH301 (B.H.B.4)

Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 22/08/2024 End 26/08/2024	37.23	E 384205.44 N 397120.15	25.00

Client	Status
Manchester Metropolitan University	Final data

Standard Penetration Test Summary

Test Type	Depth Top	Depth Casing	Depth Water	Penetration Seating	Blows Main Total	Penetration Total	N Value	Reported Result
S	1.20	1.20	-	75		450	11	N=11 (1,2/2,3,2,4)
S	3.00	3.00	-	75		450	29	N=29 (5,5/6,6,8,9)
S	4.50	4.00	-	75		450	22	N=22 (3,6/5,7,5,5)
S	6.00	4.00	-	75		450	16	N=16 (7,7/3,4,4,5)
S	7.50	4.00	-	75		450	21	N=21 (4,4/4,6,6,5)
S	9.00	4.00	-	75		450	21	N=21 (3,3/3,5,6,7)
S	10.50	4.00	-	75		420		N=43 (3,5/43 for 275mm)
S	12.00	4.00	-	74		140		N=50 (25 for 74mm/50 for 65mm)
S	13.50	4.00	-	25		90		N=50 (25 for 25mm/50 for 60mm)
S	15.00	4.00	-	25		70		N=50 (25 for 25mm/50 for 47mm)
S	16.50	4.00	-	22		60		N=50 (25 for 22mm/50 for 40mm)
S	18.00	4.00	-	32		90		N=50 (25 for 32mm/50 for 59mm)
S	19.50	4.00	-	25		50		N=50 (25 for 25mm/50 for 25mm)
S	21.00	4.00	-	12		30		N=50 (25 for 12mm/50 for 21mm)
S	22.50	4.00	-	20		40		N=50 (25 for 20mm/50 for 24mm)
S	24.00	4.00	-	15		40		N=50 (25 for 15mm/50 for 21mm)

Installation / Instrument Details

Date	Instr. Type	To (m)	Response Zone (m)	Remarks
27/08/2024	SP	22.00	0.00-22.00	Parallel Seismic.

Chiselling

Depth (m)	Duration

Rotary Recovery

Depth Top (m)	TCR (%)

Water Added

From	To

Boring Progress and Backfill

Drilling Progress			Hole Diamater		Casing		Backfill	
Date	Time	Depth(m)	Depth(m)	Dia.(mm)	Depth (m)	Dia(mm)	Depth (m)	Backfill
21/08/2024	08:00	0.00			4.00	150	0.00 - 25.00	GROUT
21/08/2024	17:00	0.00						
22/08/2024	08:00	0.00						
22/08/2024	17:00	6.00						
23/08/2024	08:00	6.00						
23/08/2024	18:00	7.30						
27/08/2024	08:00	7.30						
27/08/2024	18:00	25.00						

Drilling Flush

Depth Top	Flush Return Max %	Flush Colour	Flush Type
1.50	90	Brown	Water
4.50	80	Red	Water
6.00	80	Brown	Water
7.50	85	Red	Water
9.00	80	Brown	Water
13.50	90	Red	Water

Water Observations

Date/Time	Depth Strike (m)	Depth Casing (m)	Time Elapsed (min)	Depth Sealed (m)	Rose To (m)

Borehole Summary

Depth (m)	Type	Date (Start - End)	Method
0.00 - 6.00	RC	21/08/2024 - 27/08/2024	Rotary Open Hole

General Remarks

1. Borehole scanned with GPR, CAT & Genny.

2. Hand excavated service pit to 1.20m

3. Parallel seismic testing undertaken to approximately 24.00m bgl using 90mm PVC pipe.

AGS	All dimensions in metres Scale 1:50	Contractor	A2 Site Investigation	Method	Rotary Open Hole	Logged by	Approved by
						JH	JE

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH301 (B.H.B.4)
Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 22/08/2024 End 26/08/2024	37.23	E 384205.44 N 397120.15	25.00
Client				Status
Manchester Metropolitan University				FINAL

Standard Penetration Test Summary

Test Type	Depth Top	Depth Casing	Depth Water	Penetration Seating	Blows Main Total	Penetration Total	N Value	Reported Result
S	1.20	1.20	-	75		450	11	N=11 (1,2/2,3,2,4)
S	3.00	3.00	-	75		450	29	N=29 (5,5/6,6,8,9)
S	4.50	4.00	-	75		450	22	N=22 (3,6/5,7,5,5)
S	6.00	4.00	-	75		450	16	N=16 (7,7/3,4,4,5)
S	7.50	4.00	-	75		450	21	N=21 (4,4/4,6,6,5)
S	9.00	4.00	-	75		450	21	N=21 (3,3/3,5,6,7)
S	10.50	4.00	-	75		420		N=43 (3,5/43 for 275mm)
S	12.00	4.00	-	74		140		N=50 (25 for 74mm/50 for 65mm)
S	13.50	4.00	-	25		90		N=50 (25 for 25mm/50 for 60mm)
S	15.00	4.00	-	25		70		N=50 (25 for 25mm/50 for 47mm)
S	16.50	4.00	-	22		60		N=50 (25 for 22mm/50 for 40mm)
S	18.00	4.00	-	32		90		N=50 (25 for 32mm/50 for 59mm)
S	19.50	4.00	-	25		50		N=50 (25 for 25mm/50 for 25mm)
S	21.00	4.00	-	12		30		N=50 (25 for 12mm/50 for 21mm)
S	22.50	4.00	-	20		40		N=50 (25 for 20mm/50 for 24mm)
S	24.00	4.00	-	15		40		N=50 (25 for 15mm/50 for 21mm)

Rotary Recovery

Depth Top (m)	TCR (%)	SCR (%)	RQD (%)

Drilling Flush

Depth Top	Flush Return Max %	Flush Colour	Flush Type
1.50	90	Brown	Water
4.50	80	Red	Water
6.00	80	Brown	Water
7.50	85	Red	Water
9.00	80	Brown	Water
13.50	90	Red	Water

General Remarks

1. Borehole scanned with GPR, CAT & Genny.
2. Hand excavated service pit to 1.20m
3. Parallel seismic testing undertaken to approximately 24.00m bgl using 90mm PVC pipe.
4. Open hole drilling technique utilised, only flush returns from drilling.
5. Logs produced using hand dug trial pits, SPTs, flush returns and previous GI.

AGS	All dimensions in metres Scale 1:50	Contractor	A2 Site Investigation	Method	Rotary Open Hole	Logged by	Approved by
						JH	JE

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH301 (B.H.B.4)
Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 22/08/2024 End 26/08/2024	37.23	E 384205.44 N 397120.15	25.00
Client				Status
Manchester Metropolitan University				FINAL

Boring Progress and Backfill

Drilling Progress			Hole Diameter		Casing		Backfill	
Date	Time	Depth (m)	Depth (m)	Dia. (mm)	Depth (m)	Dia. (mm)	Depth (m)	Backfill
21/08/2024	08:00	0.00			4.00	150	0.00 - 25.00	GROUT
21/08/2024	17:00	0.00						
22/08/2024	08:00	0.00						
22/08/2024	17:00	6.00						
23/08/2024	08:00	6.00						
23/08/2024	18:00	7.30						
27/08/2024	08:00	7.30						
27/08/2024	18:00	25.00						

Chiselling

Depth (m)	Duration

Water Added

From	To

Water Observations

Date/Time	Depth Strike (m)	Depth Casing (m)	Time Elapsed (min)	Depth Sealed (m)	Rose To (m)

Installation / Instrument Details

Date	Instr. Type	To (m)	Response Zone (m)	Remarks
27/08/2024	SP	22.00	0.00-22.00	Parallel Seismic.

Borehole Summary

Depth (m)	Type	Date (Start - End)	Method
0.00 - 6.00	RC	21/08/2024 - 27/08/2024	Rotary Open Hole

AGS	All dimensions in metres Scale 1:50	Contractor	A2 Site Investigation	Method	Rotary Open Hole	Logged by	Approved by
						JH	JE

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH301 (B.H.B.4)
Job No	**Start / End**	**Ground Level (mOD)**	**Co-Ordinates (Local Grid)**	**Depth (m)**
51324	Start 22/08/2024 End 26/08/2024	37.23	E 384205.44 N 397120.15	25.00
Client		**SPT Energy Ratio %**	**Sheet**	**Status**
Manchester Metropolitan University			Sheet 1 of 1	FINAL

SAMPLES & TESTS				Stratum Description	Depth (thickness)	Reduced Level	Water	Legend	Instrument / Backfill
Depth (m)	TCR SCR RQD	If	Test Result/ Samples						
				GRAVEL SURFACING.	0.00	37.22			
				(MADE GROUND)	(0.01)	37.08			
1.20			N=11 (1,2/2,3,2,4)	Firm brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to rounded fine to coarse brick, concrete, sandstone and mudstone.	0.01 (0.14) 0.15	36.53 36.33			
					(0.55)				
3.00			N=29 (5,5/6,6,8,9)	Firm yellowish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse brick concrete, glass, plastic, mudstone and sandstone. [MADE GROUND]	0.70 (0.20) 0.90				
4.50			N=22 (3,6/5,7,5,5)	Firm dark greyish brown slightly sandy gravelly CLAY with organic odour. Sand is fine to medium. Gravel is angular to subrounded fine to coarse brick, concrete and mudstone. [MADE GROUND]					
6.00			N=16 (7,7/3,4,4,5)	Firm brownish grey slightly sandy slightly gravelly silty CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse siltstone and mudstone. [TILL]	(9.60)				
7.50			N=21 (4,4/4,6,6,5)						
9.00			N=21 (3,3/3,5,6,7)						
10.50			N=43 (3,5/43 for 275mm)	Very weak reddish brown SILTSTONE. [CHESTER FORMATION]	10.50	26.73			
12.00			N=50 (25 for 74mm/50 for 65mm)						
13.50			N=50 (25 for 25mm/50 for 60mm)						
15.00			N=50 (25 for 25mm/50 for 47mm)						
16.50			N=50 (25 for 22mm/50 for 40mm)						
18.00			N=50 (25 for 32mm/50 for 59mm)		(14.50)				
19.50			N=50 (25 for 25mm/50 for 25mm)						
21.00			N=50 (25 for 12mm/50 for 21mm)						
22.50			N=50 (25 for 20mm/50 for 24mm)						
24.00			N=50 (25 for 15mm/50 for 21mm)						
				End of Borehole at 25.00m		12.23			

AGS REGISTERED USER 2024	All dimensions in metres Scale 1:50	Contractor: A2 Site Investigation	Method: Rotary Open Hole	Logged By: JH	Approved by: JE

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH302 (B.H.B.7)
Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 28/08/2024 End 29/08/2024	37.25	E 384225.05 N 397131.02	25.00
Client				Status
Manchester Metropolitan University				Final data

Standard Penetration Test Summary

Test Type	Depth Top	Depth Casing	Depth Water	Penetration Seating	Blows Main Total	Penetration Total	N Value	Reported Result
S	1.20	1.20	-	75		450	11	N=11 (1,2/2,3,2,4)
S	3.00	3.00	-	75		450	29	N=29 (5,5/6,6,8,9)
S	4.50	4.50	-	75		450	22	N=22 (3,6/5,7,5,5)
S	6.00	6.00	-	75		450	17	N=17 (7,7/3,4,5,5)
S	7.50	6.00	-	75		450	20	N=20 (4,4/4,6,5,5)
S	9.00	6.00	-	75		450	24	N=24 (4,5/5,6,6,7)
S	10.50	6.00	-	75		450	33	N=33 (4,6/7,8,8,10)
S	12.00	6.00	-	75		215		N=50 (25 for 120mm/50 for 95mm)
S	13.50	6.00	-	75		175		N=50 (25 for 75mm/50 for 100mm)
S	15.00	6.00	-	75		150		N=50 (25 for 75mm/50 for 75mm)
S	16.50	6.00	-	10		10		N=50 (25 for 10mm/50 for 0mm)
S	18.00	6.00	-	25		65		N=50 (25 for 25mm/50 for 40mm)
S	19.50	6.00	-	15		35		N=50 (25 for 15mm/50 for 20mm)
S	21.00	6.00	-	10		10		N=50 (25 for 10mm/50 for 0mm)
S	22.50	6.00	-	0		0		N=50 (25 for 0mm/50 for 0mm)
S	24.00	6.00	-	0		0		N=50 (25 for 0mm/50 for 0mm)

Installation / Instrument Details

Date	Instr. Type	To (m)	Response Zone (m)	Remarks
30/08/2024	SP	24.00	0.00-22.00	Parallel Seismic.

Chiselling

Depth (m)	Duration

Rotary Recovery

Depth Top (m)	TCR (%)

Water Added

From	To

Boring Progress and Backfill

Drilling Progress			Hole Diamater		Casing		Backfill	
Date	Time	Depth(m)	Depth(m)	Dia.(mm)	Depth (m)	Dia(mm)	Depth (m)	Backfill
28/08/2024	08:00	0.00			6.00	150	0.00 - 25.00	GROUT
28/08/2024	17:00	1.20						
29/08/2024	08:00	1.20						
29/08/2024	17:00	25.00						

Drilling Flush

Depth Top	Flush Return Max %	Flush Colour	Flush Type
0.00	100	Brown	Water
12.00	100	Red	Water

Water Observations

Date/Time	Depth Strike (m)	Depth Casing (m)	Time Elapsed (min)	Depth Sealed (m)	Rose To (m)

Borehole Summary

Depth (m)	Type	Date (Start - End)	Method
0.00 - 6.00	RC	28/08/2024 - 30/08/2024	Rotary Open Hole

General Remarks

1. Borehole scanned with GPR, CAT & Genny.

2. Hand excavated service pit to 1.20m

3. Parallel seismic testing undertaken to approximately 24.00m bgl using 90mm PVC pipe.

AGS	All dimensions in metres Scale 1:50	Contractor	A2 Site Investigation	Method	Rotary Open Hole	Logged by	Approved by
						JH	JE

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH302 (B.H.B.7)
Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 28/08/2024 End 29/08/2024	37.25	E 384225.05 N 397131.02	25.00
Client				Status
Manchester Metropolitan University				FINAL

Standard Penetration Test Summary

Test Type	Depth Top	Depth Casing	Depth Water	Penetration Seating	Blows Main Total	Penetration Total	N Value	Reported Result
S	1.20	1.20	-	75		450	11	N=11 (1,2/2,3,2,4)
S	3.00	3.00	-	75		450	29	N=29 (5,5/6,6,8,9)
S	4.50	4.50	-	75		450	22	N=22 (3,6/5,7,5,5)
S	6.00	6.00	-	75		450	17	N=17 (7,7/3,4,5,5)
S	7.50	6.00	-	75		450	20	N=20 (4,4/4,6,5,5)
S	9.00	6.00	-	75		450	24	N=24 (4,5/5,6,6,7)
S	10.50	6.00	-	75		450	33	N=33 (4,6/7,8,8,10)
S	12.00	6.00	-	75		215		N=50 (25 for 120mm/50 for 95mm)
S	13.50	6.00	-	75		175		N=50 (25 for 75mm/50 for 100mm)
S	15.00	6.00	-	75		150		N=50 (25 for 75mm/50 for 75mm)
S	16.50	6.00	-	10		10		N=50 (25 for 10mm/50 for 0mm)
S	18.00	6.00	-	25		65		N=50 (25 for 25mm/50 for 40mm)
S	19.50	6.00	-	15		35		N=50 (25 for 15mm/50 for 20mm)
S	21.00	6.00	-	10		10		N=50 (25 for 10mm/50 for 0mm)
S	22.50	6.00	-	0		0		N=50 (25 for 0mm/50 for 0mm)
S	24.00	6.00	-	0		0		N=50 (25 for 0mm/50 for 0mm)

Rotary Recovery

Depth Top (m)	TCR (%)	SCR (%)	RQD (%)

Drilling Flush

Depth Top	Flush Return Max %	Flush Colour	Flush Type
0.00	100	Brown	Water
12.00	100	Red	Water

General Remarks

1. Borehole scanned with GPR, CAT & Genny.
2. Hand excavated service pit to 1.20m
3. Parallel seismic testing undertaken to approximately 24.00m bgl using 90mm PVC pipe.
4. Open hole drilling technique utilised, only flush returns from drilling.
5. Logs produced using hand dug trial pits, SPTs, flush returns and previous GI.

AGS	All dimensions in metres Scale 1:50	Contractor	A2 Site Investigation	Method	Rotary Open Hole	Logged by	Approved by
						JH	JE

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH302 (B.H.B.7)
Job No	**Start / End**	**Ground Level (mOD)**	**Co-ordinates (Local Grid)**	**Depth (m)**
51324	Start 28/08/2024 End 29/08/2024	37.25	E 384225.05 N 397131.02	25.00
Client				**Status**
Manchester Metropolitan University				FINAL

Boring Progress and Backfill

Drilling Progress			Hole Diameter		Casing		Backfill	
Date	Time	Depth (m)	Depth (m)	Dia. (mm)	Depth (m)	Dia. (mm)	Depth (m)	Backfill
28/08/2024	08:00	0.00			6.00	150	0.00 - 25.00	GROUT
28/08/2024	17:00	1.20						
29/08/2024	08:00	1.20						
29/08/2024	17:00	25.00						

Chiselling

Depth (m)	Duration

Water Added

From	To

Water Observations

Date/Time	Depth Strike (m)	Depth Casing (m)	Time Elapsed (min)	Depth Sealed (m)	Rose To (m)

Installation / Instrument Details

Date	Instr. Type	To (m)	Response Zone (m)	Remarks
30/08/2024	SP	24.00	0.00-22.00	Parallel Seismic.

Borehole Summary

Depth (m)	Type	Date (Start - End)	Method
0.00 - 6.00	RC	28/08/2024 - 30/08/2024	Rotary Open Hole

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH302 (B.H.B.7)
Job No	Start / End	Ground Level (mOD)	Co-Ordinates (Local Grid)	Depth (m)
51324	Start 28/08/2024 End 29/08/2024	37.25	E 384225.05 N 397131.02	25.00
Client		SPT Energy Ratio %	Sheet	Status
Manchester Metropolitan University			Sheet 1 of 1	FINAL

SAMPLES & TESTS				Stratum Description	Depth (thickness)	Reduced Level	Water	Legend	Instrument / Backfill
Depth (m)	TCR SCR RQD	If	Test Result/ Samples						
				Soft brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to rounded fine to coarse brick, concrete and mudstone. [MADE GROUND/TOPSOIL]	0.00 (0.15) 0.15	37.10 36.87 36.77			
1.20			N=11 (1,2/2,3,2,4)		(0.23) 0.38	36.57 36.12			
				Soft brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to rounded fine to coarse of brick, concrete and mudstone. [MADE GROUND]	(0.10) 0.48 (0.20) 0.68				
3.00			N=29 (5,5/6,6,8,9)	Firm dark grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to medium brick and mudstone. [MADE GROUND]	(0.45) 1.13				
4.50			N=22 (3,6/5,7,5,5)	Medium dense orange clayey fine to coarse SAND. [MADE GROUND]					
6.00			N=17 (7,7/3,4,5,5)	Firm brownish grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick and mudstone. [MADE GROUND]	(10.87)				
7.50			N=20 (4,4/4,6,5,5)	Firm to stiff orangish grey slightly sandy silty CLAY. Sand is fine to medium. [TILL]					
9.00			N=24 (4,5/5,6,6,7)						
10.50			N=33 (4,6/7,8,8,10)						
12.00			N=50 (25 for 120mm/50 for 95mm)	Very weak reddish brown SILTSTONE (CHESTER FORMATION)	12.00	25.25			
13.50			N=50 (25 for 75mm/50 for 100mm)						
15.00			N=50 (25 for 75mm/50 for 75mm)						
16.50			N=50 (25 for 10mm/50 for 0mm)						
18.00			N=50 (25 for 25mm/50 for 40mm)		(13.00)				
19.50			N=50 (25 for 15mm/50 for 20mm)						
21.00			N=50 (25 for 10mm/50 for 0mm)						
22.50			N=50 (25 for 0mm/50 for 0mm)						
24.00			N=50 (25 for 0mm/50 for 0mm)						
				End of Borehole at 25.00m		12.25			

AGS REGISTERED USER 2024	All dimensions in metres Scale 1:50	Contractor: A2 Site Investigation	Method: Rotary Open Hole	Logged By: JH	Approved by: JE

A2 Site Investigation

Borehole Log

Project	Borehole No
Manchester Metropolitan University	BH303 (B.H.B.8)

Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 30/08/2024 End 03/09/2024	37.86	E 384227.58 N 397133.88	25.00

Client	Status
Manchester Metropolitan University	Final data

Standard Penetration Test Summary

Test Type	Depth Top	Depth Casing	Depth Water	Penetration Seating	Blows Main Total	Penetration Total	N Value	Reported Result
S	1.20	1.20	-	75		450	12	N=12 (1,3/3,3,2,4)
S	3.00	3.00	-	75		450	29	N=29 (5,4/5,6,8,10)
S	4.50	4.50	-	75		450	24	N=24 (3,6/5,7,5,7)
S	6.00	6.00	-	75		450	20	N=20 (5,6/3,3,7,7)
S	7.50	7.50	-	75		450	21	N=21 (4,4/5,6,5,5)
S	9.00	7.50	-	75		450	25	N=25 (4,5/6,7,5,7)
S	10.50	7.50	-	75		450	36	N=36 (4,6/8,8,8,12)
S	12.00	7.50	-	75		220		N=50 (25 for 115mm/50 for 100mm)
S	13.50	7.50	-	75		130		N=50 (25 for 75mm/50 for 90mm)
S	15.00	7.50	-	75		145		N=50 (25 for 75mm/50 for 70mm)
S	16.50	7.50	-	10		10		N=50 (25 for 10mm/50 for 0mm)
S	18.00	7.50	-	30		70		N=50 (25 for 30mm/50 for 50mm)
S	19.50	7.50	-	20		45		N=50 (25 for 20mm/50 for 25mm)
S	21.00	7.50	-	20		30		N=50 (25 for 20mm/50 for 10mm)
S	22.50	7.50	-	10		20		N=50 (25 for 10mm/50 for 10mm)
S	24.00	7.50	Dry	15		20		N=50 (25 for 15mm/50 for 5mm)

Boring Progress and Backfill

Drilling Progress			Hole Diamater		Casing		Backfill	
Date	Time	Depth(m)	Depth(m)	Dia.(mm)	Depth (m)	Dia(mm)	Depth (m)	Backfill
30/08/2024	08:00	0.00			7.50	150	0.00 - 25.00	GROUT
30/08/2024	17:00	0.00						
02/09/2024	08:00	0.00						
02/09/2024	17:00	25.00						
03/09/2024	08:00	25.00						
03/09/2024	17:00	25.00						

Water Observations

Date/Time	Depth Strike (m)	Depth Casing (m)	Time Elapsed (min)	Depth Sealed (m)	Rose To (m)

Borehole Summary

Depth (m)	Type	Date (Start - End)	Method
0.00 - 7.50	RC	30/08/2024 - 03/09/2024	Rotary Open Hole

General Remarks

1. Borehole scanned with GPR, CAT & Genny.

2. Hand excavated service pit to 1.20m

3. Parallel seismic testing undertaken to approximately 24.00m bgl using 90mm PVC pipe.

Installation / Instrument Details

Date	Instr. Type	To (m)	Response Zone (m)	Remarks
03/09/2024	SP	25.00	0.00-25.00	Parallel Seismic.

Chiselling

Depth (m)	Duration

Rotary Recovery

Depth Top (m)	TCR (%)

Water Added

From	To

Drilling Flush

Depth Top	Flush Return Max %	Flush Colour	Flush Type
0.00	100	Brown	Water
12.00	100	Red	Water

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH303 (B.H.B.8)
Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 30/08/2024 End 03/09/2024	37.86	E 384227.58 N 397133.88	25.00
Client				Status
Manchester Metropolitan University				FINAL

Standard Penetration Test Summary

Test Type	Depth Top	Depth Casing	Depth Water	Penetration Seating	Blows Main Total	Penetration Total	N Value	Reported Result
S	1.20	1.20	-	75		450	12	N=12 (1,3/3,3,2,4)
S	3.00	3.00	-	75		450	29	N=29 (5,4/5,6,8,10)
S	4.50	4.50	-	75		450	24	N=24 (3,6/5,7,5,7)
S	6.00	6.00	-	75		450	20	N=20 (5,6/3,3,7,7)
S	7.50	7.50	-	75		450	21	N=21 (4,4/5,6,5,5)
S	9.00	7.50	-	75		450	25	N=25 (4,5/6,7,5,7)
S	10.50	7.50	-	75		450	36	N=36 (4,6/8,8,8,12)
S	12.00	7.50	-	75		220		N=50 (25 for 115mm/50 for 100mm)
S	13.50	7.50	-	75		130		N=50 (25 for 75mm/50 for 90mm)
S	15.00	7.50	-	75		145		N=50 (25 for 75mm/50 for 70mm)
S	16.50	7.50	-	10		10		N=50 (25 for 10mm/50 for 0mm)
S	18.00	7.50	-	30		70		N=50 (25 for 30mm/50 for 50mm)
S	19.50	7.50	-	20		45		N=50 (25 for 20mm/50 for 25mm)
S	21.00	7.50	-	20		30		N=50 (25 for 20mm/50 for 10mm)
S	22.50	7.50	-	10		20		N=50 (25 for 10mm/50 for 10mm)
S	24.00	7.50	Dry	15		20		N=50 (25 for 15mm/50 for 5mm)

Rotary Recovery

Depth Top (m)	TCR (%)	SCR (%)	RQD (%)

Drilling Flush

Depth Top	Flush Return Max %	Flush Colour	Flush Type
0.00	100	Brown	Water
12.00	100	Red	Water

General Remarks

1. Borehole scanned with GPR, CAT & Genny.
2. Hand excavated service pit to 1.20m
3. Parallel seismic testing undertaken to approximately 24.00m bgl using 90mm PVC pipe.
4. Open hole drilling technique utilised, only flush returns from drilling.
5. Logs produced using hand dug trial pits, SPTs, flush returns and previous GI.

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH303 (B.H.B.8)
Job No	Start / End	Ground Level (mOD)	Co-ordinates (Local Grid)	Depth (m)
51324	Start 30/08/2024 End 03/09/2024	37.86	E 384227.58 N 397133.88	25.00
Client				Status
Manchester Metropolitan University				FINAL

Boring Progress and Backfill

Drilling Progress			Hole Diameter		Casing		Backfill	
Date	Time	Depth (m)	Depth (m)	Dia. (mm)	Depth (m)	Dia. (mm)	Depth (m)	Backfill
30/08/2024	08:00	0.00			7.50	150	0.00 - 25.00	GROUT
30/08/2024	17:00	0.00						
02/09/2024	08:00	0.00						
02/09/2024	17:00	25.00						
03/09/2024	08:00	25.00						
03/09/2024	17:00	25.00						

Chiselling

Depth (m)	Duration

Water Added

From	To

Water Observations

Date/Time	Depth Strike (m)	Depth Casing (m)	Time Elapsed (min)	Depth Sealed (m)	Rose To (m)

Installation / Instrument Details

Date	Instr. Type	To (m)	Response Zone (m)	Remarks
03/09/2024	SP	25.00	0.00-25.00	Parallel Seismic.

Borehole Summary

Depth (m)	Type	Date (Start - End)	Method
0.00 - 7.50	RC	30/08/2024 - 03/09/2024	Rotary Open Hole

A2 Site Investigation

Borehole Log

Project				Borehole No
Manchester Metropolitan University				BH303 (B.H.B.8)
Job No	Start / End	Ground Level (mOD)	Co-Ordinates (Local Grid)	Depth (m)
51324	Start 30/08/2024 End 03/09/2024	37.86	E 384227.58 N 397133.88	25.00
Client		SPT Energy Ratio %	Sheet	Status
Manchester Metropolitan University			Sheet 1 of 1	FINAL

SAMPLES & TESTS				Stratum Description	Depth (thickness)	Reduced Level	Water	Legend	Instrument / Backfill
Depth (m)	TCR SCR RQD	If	Test Result/ Samples						
				BRICK PAVING.	0.00	37.80			
				[MADE GROUND]	(0.06)	37.76			
1.20			N=12 (1,3/3,3,2,4)	Medium dense orangish brown slightly clayey fine to coarse SAND.	0.06	36.96			
				[MADE GROUND]	(0.04)				
				Firm dark greyish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick, concrete and mudstone.	0.10				
3.00			N=29 (5,4/5,6,8,10)	[MADE GROUND]	(0.80)				
				Firm to stiff orangish grey slightly sandy silty CLAY. Sand is fine to medium.	0.90				
4.50			N=24 (3,6/5,7,5,7)	[TILL]					
6.00			N=20 (5,6/3,3,7,7)		(11.10)				
7.50			N=21 (4,4/5,6,5,5)						
9.00			N=25 (4,5/6,7,5,7)						
10.50			N=36 (4,6/8,8,8,12)						
12.00			N=50 (25 for 115mm/50 for 100mm)	Very weak reddish brown SILTSTONE.	12.00	25.86			
				[CHESTER FORMATION]					
13.50			N=50 (25 for 75mm/50 for 90mm)						
15.00			N=50 (25 for 75mm/50 for 70mm)						
16.50			N=50 (25 for 10mm/50 for 0mm)						
18.00			N=50 (25 for 30mm/50 for 50mm)		(13.00)				
19.50			N=50 (25 for 20mm/50 for 25mm)						
21.00			N=50 (25 for 20mm/50 for 10mm)						
22.50			N=50 (25 for 10mm/50 for 10mm)						
24.00			N=50 (25 for 15mm/50 for 5mm)						
				End of Borehole at 25.00m		12.86			

AGS	All dimensions in metres Scale 1:50	Contractor	Method	Logged By	Approved by
		A2 Site Investigation	Rotary Open Hole	JH	JE

A2 Site Investigation

Trial Pit Log

Project: Manchester Metropolitan University				Trial Pit No: TP301 (B.H.B.4)
Job No: 51324	Start: 19/08/2024 End: 22/08/2024	Ground Level (mOD): 37.23	Co-Ordinates (Local Grid): E 384205.44 N 397120.15	Depth (m): 1.45
Client: Manchester Metropolitan University		Sheet: Sheet 1 of 1		Status: FINAL

SAMPLES & TESTS			Stratum Description	Depth (thickness)	Reduced Level	Water	Legend
Depth (m)	Type No	Test Result					
			GRAVEL SURFACING.	0.00	37.22		
			(MADE GROUND)	(0.01)			
			Firm brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to rounded fine to coarse brick, concrete, sandstone and mudstone.	0.01 (0.14) 0.15	37.08		
			Firm yellowish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse brick concrete, glass, plastic, mudstone and sandstone. [MADE GROUND]	(0.55)			
			Firm dark greyish brown slightly sandy gravelly CLAY with organic odour. Sand is fine to medium. Gravel is angular to subrounded fine to coarse brick, concrete and mudstone. [MADE GROUND]	0.70 (0.20)	36.53		
			Firm brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse siltstone and mudstone. (TILL)	0.90 (0.55)	36.33		
			End of Pit at 1.45m		35.78		

General Remarks

1. Trial pit scanned with GPR, CAT & Genny.
2. Hand excavated service pit to 1.20m.
3. BH301 (B.H.B.4) emplaced within TP301 (B.H.B.4).
4. Trial pit dimensions are 3100mm x 1500mm. Trial pit extended due to relict concrete extending from building wall.
5. Trial pit undertaken externally. Weather was overcast / raining.
6. Trial pit remained upright and stable.

AGS REGISTERED USER 2024	All dimensions in metres Scale 1:50	Contractor: A2 Site Investigation	Method: Insulated Hand Tools	Logged By: JH	Approved by: JE

A2 Site Investigation

Trial Pit Log

Project				Trial Pit No
Manchester Metropolitan University				TP302 (B.H.B.7)
Job No	Start / End	Ground Level (mOD)	Co-Ordinates (Local Grid)	Depth (m)
51324	Start 22/08/2024 End 23/08/2024	37.25	E 384225.05 N 397131.02	1.40
Client		Sheet		Status
Manchester Metropolitan University		Sheet 1 of 1		FINAL

SAMPLES & TESTS			Stratum Description	Depth (thickness)	Reduced Level	Water	Legend
Depth (m)	Type No	Test Result					
			Soft brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to rounded fine to coarse brick, concrete and mudstone. [MADE GROUND/TOPSOIL]	0.00 (0.15) 0.15	37.10		
			Soft brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to rounded fine to coarse of brick, concrete and mudstone. [MADE GROUND]	(0.23) 0.38	36.87		
			Firm dark grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to medium brick and mudstone. [MADE GROUND]	(0.10) 0.48	36.77		
			Medium dense orange clayey fine to coarse SAND. [MADE GROUND]	(0.20) 0.68	36.57		
			Firm brownish grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick and mudstone. [MADE GROUND]	(0.45)			
			Firm to stiff orangish grey slightly sandy silty CLAY. Sand is fine to medium. [TILL]	1.13 (0.22)	36.12		
			End of Pit at 1.40m		35.90		

General Remarks

1. Trial pit scanned with GPR, CAT & Genny.
2. Hand excavated service pit to 1.20m
3. BH302 (B.H.B.7) emplaced adjacent to TP301 (B.H.B.7).
4. Trial pit dimensions are 1350mm x 1400mm.
5. Trial pit undertaken externally. Weather was overcast / raining.
6. Trial pit remained upright and stable.

AGS	All dimensions in metres Scale 1:50	Contractor	Method	Logged By	Approved by
		A2 Site Investigation	Insulated Hand Tools	JH	JE

A2 Site Investigation

Trial Pit Log

Project				Trial Pit No
Manchester Metropolitan University				TP303 (B.H.B.8)
Job No	Start / End	Ground Level (mOD)	Co-Ordinates (Local Grid)	Depth (m)
51324	Start 22/08/2024 End 23/08/2024	37.86	E 384227.58 N 397133.88	1.55
Client		Sheet		Status
Manchester Metropolitan University		Sheet 1 of 1		FINAL

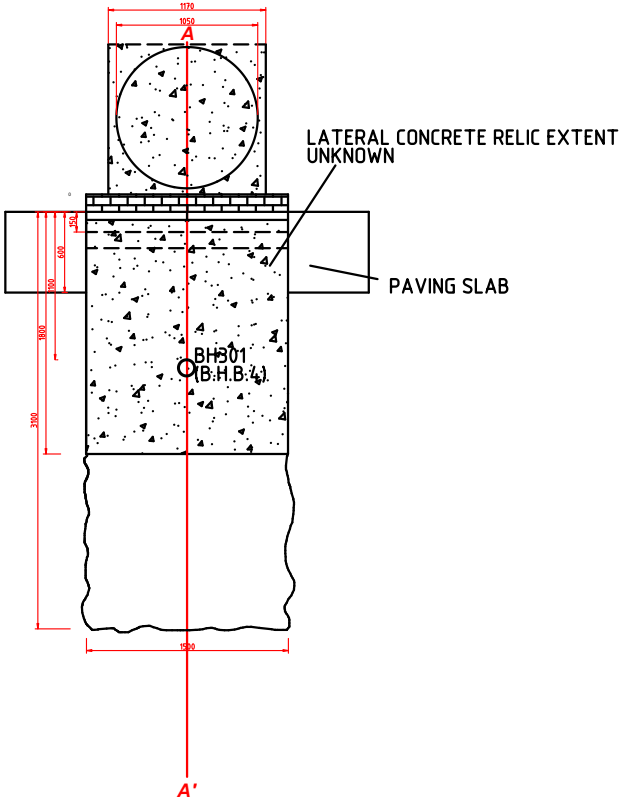
SAMPLES & TESTS			Stratum Description	Depth (thickness)	Reduced Level	Water	Legend
Depth (m)	Type No	Test Result					
			BRICK paving. [MADE GROUND]	0.00 (0.06)	37.80		
			Medium dense orangish brown slightly clayey fine to coarse SAND. [MADE GROUND]	0.06 (0.04)	37.76		
			Firm dark greyish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick, concrete and mudstone. (MADE GROUND)	0.10 (0.80)			
			Firm to stiff orangish grey slightly sandy silty CLAY. Sand is fine to medium. [TILL]	0.90 (0.60)	36.96		
			End of Pit at 1.55m		36.36		

General Remarks

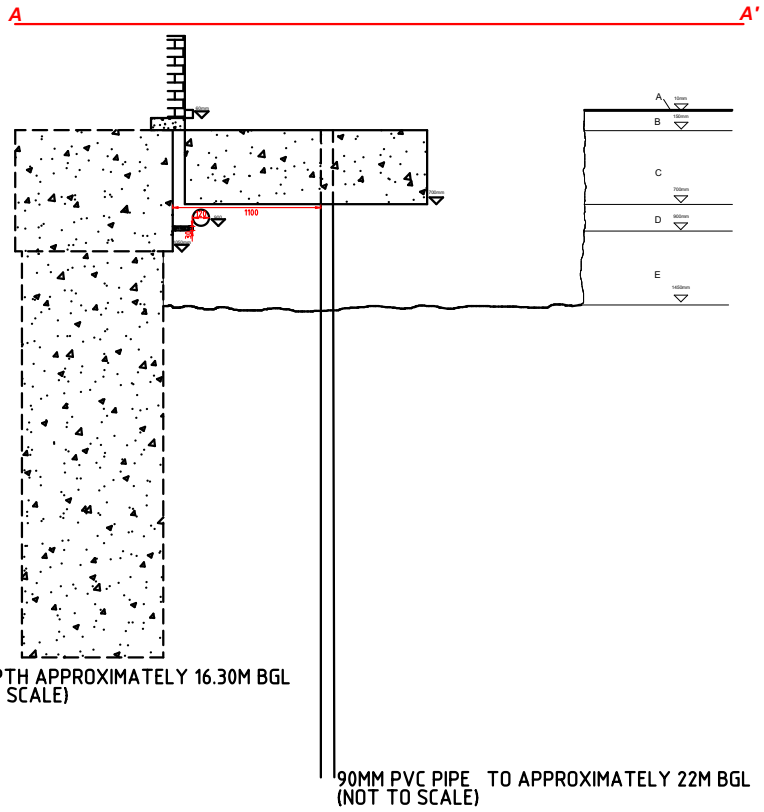
1. Trial pit scanned with GPR, CAT & Genny.
2. Hand excavated service pit to 1.20m
3. BH301 (B.H.B.4) emplaced within TP301 (B.H.B.4).
4. Trial pit dimensions are 1200mm x 1300mm.
5. Trial pit undertaken externally. Weather was overcast / raining.
6. Trial pit remained upright and stable.

AGS	All dimensions in metres Scale 1:50	Contractor	Method	Logged By	Approved by
		A2 Site Investigation	Insulated Hand Tools	JH	JE

TP301 PLAN VIEW



TP301 A-A' CROSS SECTION SKETCH



Geological log

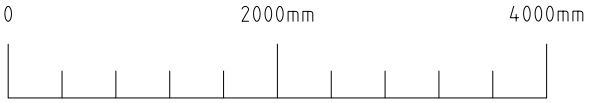
0.00 - 0.01 Gravel surfacing
[MADE GROUND]

0.01 - 0.15 Firm brown slightly sandy gravelly CLAY with frequent rootlets
Sand is fine to medium. Gravel is fine to coarse angular to rounded of brick, concrete, sandstone and mudstone.
[TOPSOIL - MADE GROUND]

0.15 - 0.70 Firm yellowish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded of brick concrete, glass, plastic, mudstone and sandstone.
[MADE GROUND]

0.70 - 0.90 Firm dark greyish brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded of brick, concrete and mudstone.
Organic odour noticed throughout.
[MADE GROUND]

0.90 - 1.45 Firm brownish grey slightly sandy, slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded of siltstone and mudstone.
[TILL]



Rev	Date	By	Chkd	Appd
00	27/09/24	AN	WT	WT

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Manchester Metropolitan University

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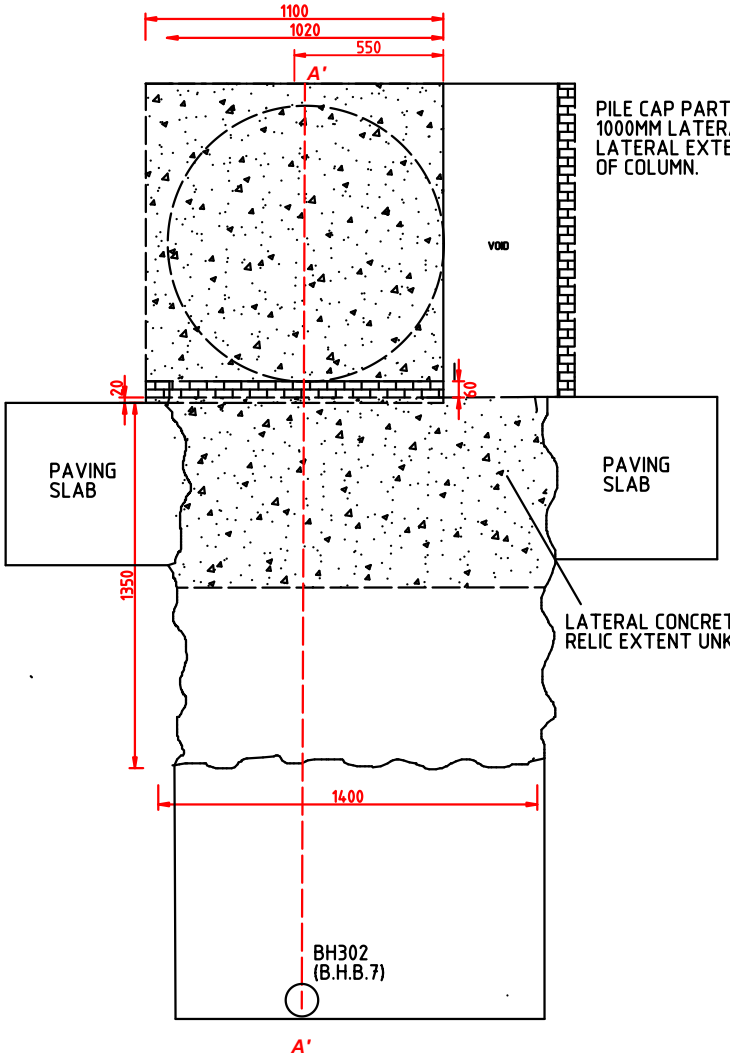
Drawing Title
TP301 (B.H.B.4)

A2SI Project Number
51324

Rev
00

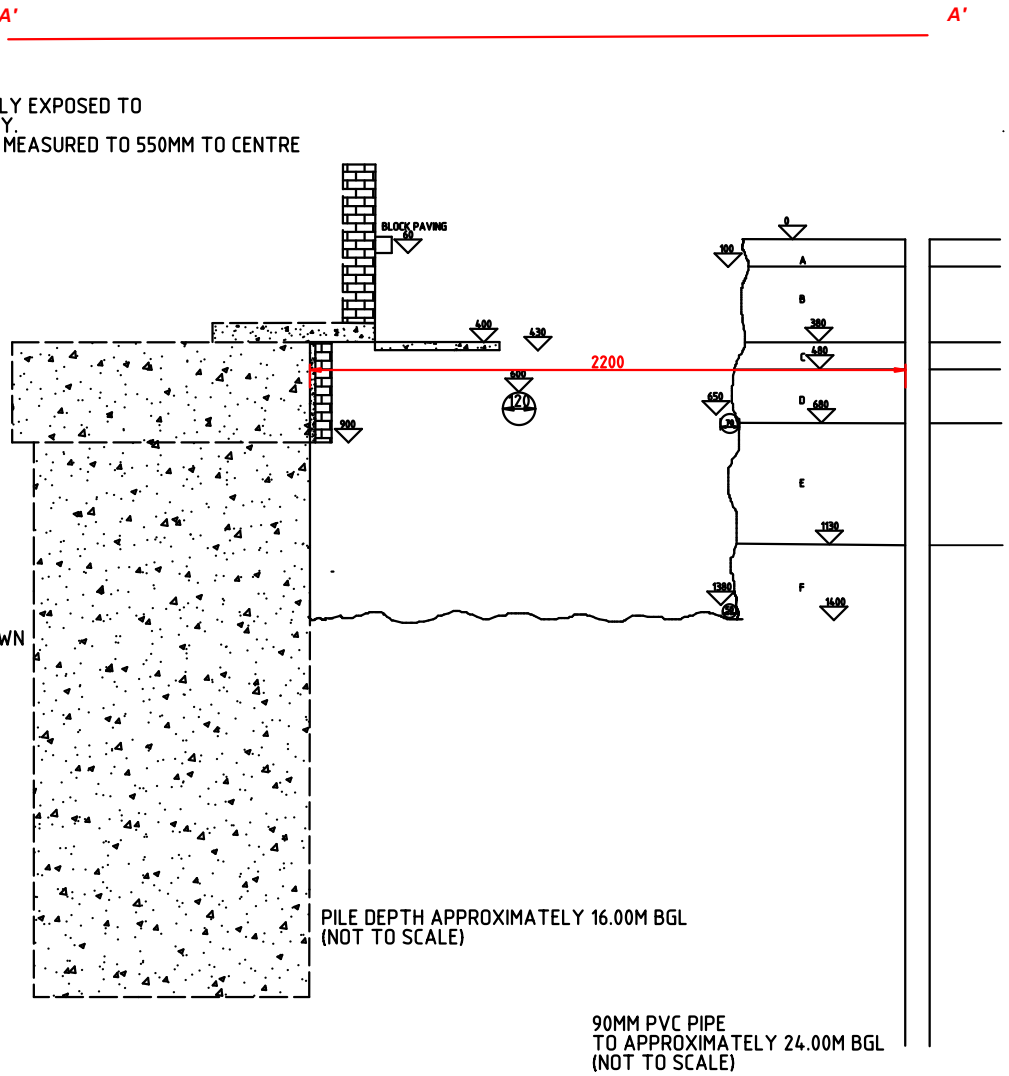
Drawing Number
51324-A2SI-XX-XX-DR-Y-0001-00

TP302 PLAN VIEW



PILE CAP PARTIALLY EXPOSED TO 1000MM LATERALLY.
LATERAL EXTENT MEASURED TO 550MM TO CENTRE OF COLUMN.

TP302 A-A' SKETCH



0 1000mm 2000mm

Geological log

A - 0.00 - 0.15 Soft brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is fine to coarse angular to rounded of brick, concrete and mudstone.
[TOPSOIL - MADE GROUND]

B - 0.15-0.38 Soft brown slightly sandy gravelly CLAY with frequent rootlets. Sand is fine to medium. Gravel is fine to coarse angular to rounded of brick, concrete and mudstone.
[MADE GROUND]

C - 0.38-0.48 - Firm dark grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium angular to subrounded brick and mudstone.
[MADE GROUND]

D - 0.48-0.68 - Medium dense orange clayey fine to coarse SAND
[MADE GROUND]

E - 0.68 - 1.13 - Firm brownish grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded brick and mudstone.
[MADE GROUND]

F - 1.13-1.35 - Firm to stiff mottled orange grey slightly sandy silty CLAY. Sand is fine to medium.
[TILL]

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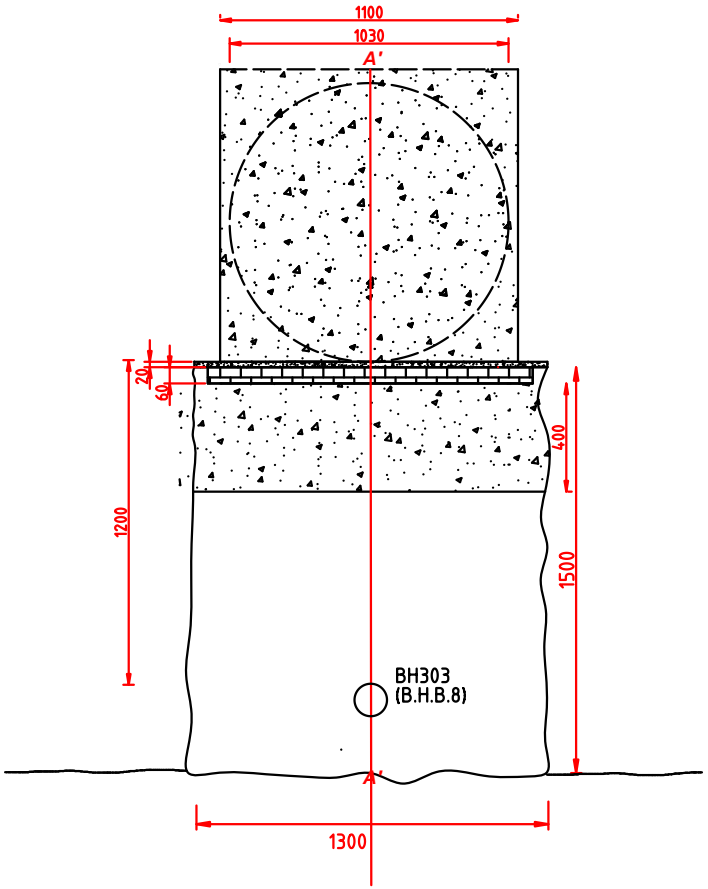
Project Title
MMU

Drawing Title
TP303 (B.H.B.8)

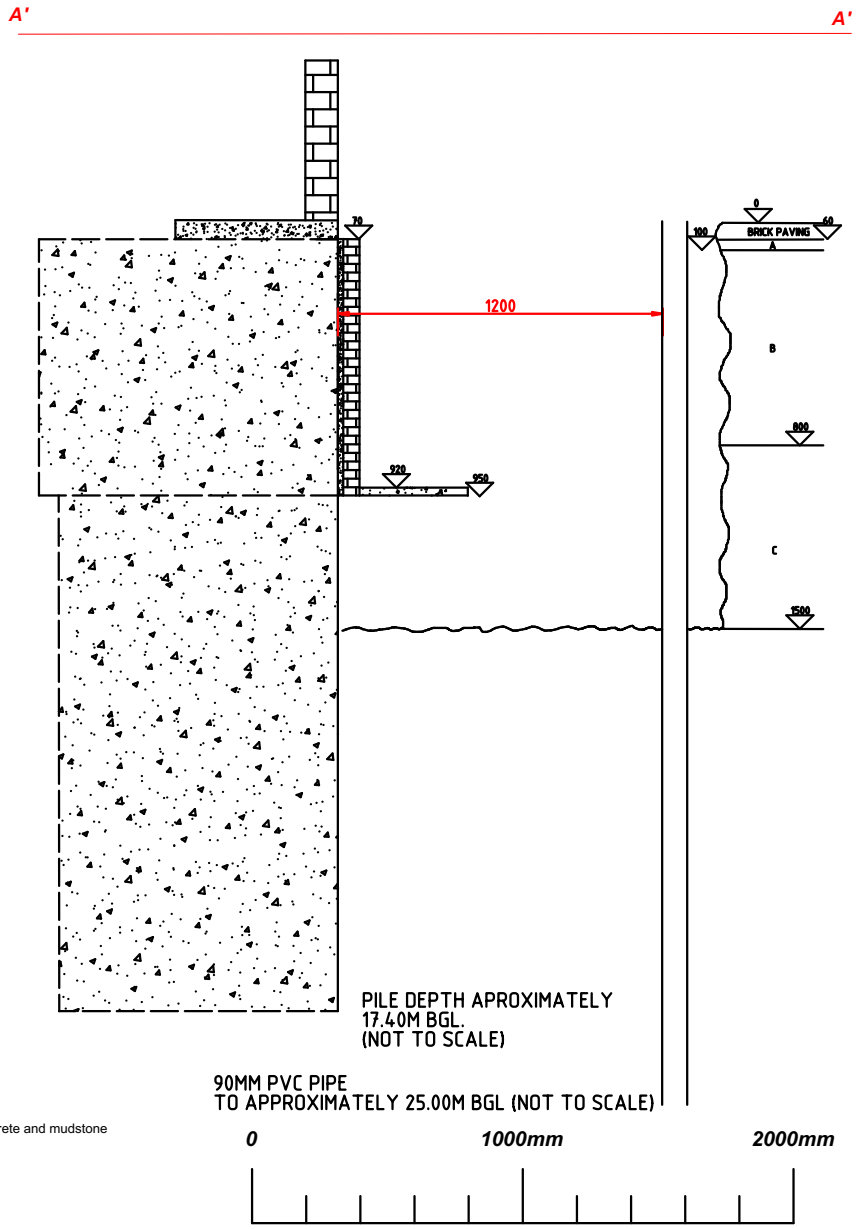
A2SI Project Number	Rev
51324	00

Drawing Number
51324-A2SI-XX-XX-DR-Y-0002-00

TP303 PLAN VIEW



TP303 A-A' SKETCH



Geological log

0.00-0.06 - BRICK PAVING

A - 0.06 - 0.10 Orangish brown slightly clayey fine to coarse SAND.
(MADE GROUND)

B - Firm dark greyish brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded brick, concrete and mudstone
(MADE GROUND)

C - 0.90-1.50 - Firm to stiff mottled orange grey slightly sandy silty CLAY. Sand is fine to medium.
[TILL]

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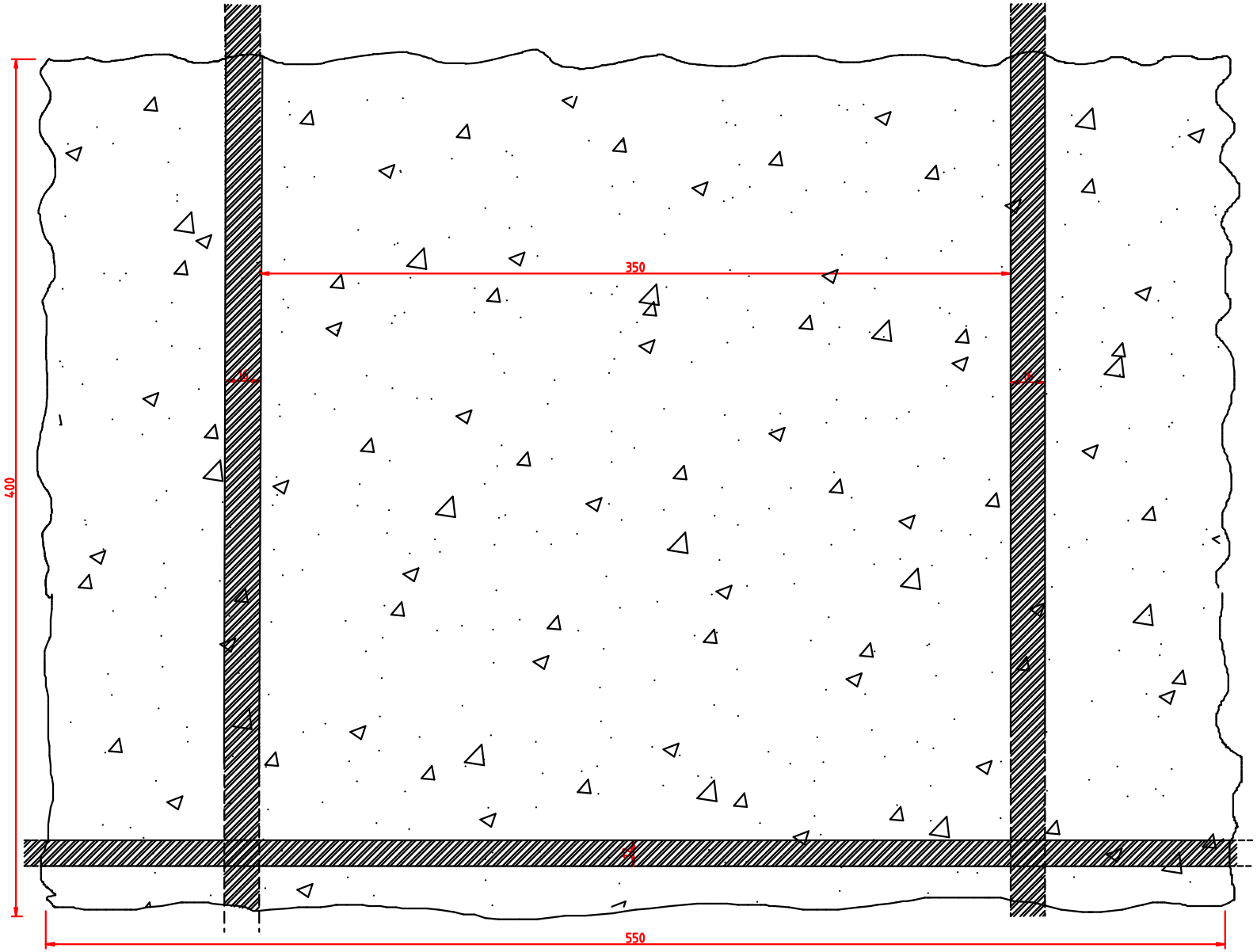
Drawing Title
TP303 (B.H.B.8)

A2SI Project Number	Rev
51324	00

Drawing Number
51324-A2SI-XX-XX-DR-Y-0003-00

100mm 200mm

TP303 (B.H.B.8) BREAKOUT SKETCH



Rev	Date	By	Chkd	Appd
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Client
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Project Title
MMU

Drawing Title
TP303 (B.H.B.8) Breakout

A2SI Project Number	Rev
51324	00

Drawing Number
51324-A2SI-XX-XX-DR-Y-0004-00

Appendix D: Material Laboratory Testing Results

SANDBERG

REPORT 78232/F

MMU

TESTING OF CONCRETE CORE SAMPLES

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web: www.sandberg.co.uk

REPORT 78232/F

MMU

TESTING OF CONCRETE CORE SAMPLES

A2 Site Investigation Ltd
1 Westminster Bridge Road
London
SE1 7XW

This report comprises:
Cover sheet
Contents page
4 pages of text
Figure 1 of 1 sheet
Table 1 of 1 sheet
Table 2 of 1 sheet
Table 3 of 1 sheet
Table 4 of 1 sheet
Table 5 of 1 sheet
Back page

For the attention of Will Thistleton

31 October 2024

Partners: N C D Sandberg D J Ellis M A Eden J D French C Morgan G S Mayers G C S Moor J Fagan
J H Dell Dr E D W Maclean M I Ingle A L Pitman J Glen Dr R M Harris G Lee
Senior Associates: R A Lucas D A Kinnersley Y N P Guellil P Bennett-Hughes T C Cosgrove J Morris A Sabra
Associates: K J Green J Gallagher N A Fetter E McPheat F Easthope E Krylowicz S R Kwincinski
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SANDBERG
CONSULTING ENGINEERS
INVESTIGATION INSPECTION
TESTING MATERIALS

REPORT 78232/F

MMU

TESTING OF CONCRETE CORE SAMPLES

Instructions: Project site code: 51324 - PO3907.

1. INTRODUCTION

Three nominal 70 mm diameter concrete core samples taken from the above project were received in our laboratory on 18 September 2024 and subjected to a programme testing in accordance with your instructions.

2. SAMPLES RECEIVED

Sandberg Reference	Site Reference	Sample Description	As received condition[1]
SE1801	TP301 (B.H.B.4) 0.0-0.30	69x320mm concrete core	all cores
SE1802	TP302 (B.H.B.7) 0.0-0.30	69x308mm concrete core	received
SE1803	TP303 (B.H.B.8) 0.0-0.30	69x326mm concrete core	sealed

A schedule of testing was supplied and is reproduced as Figure 1.

3. LABORATORY TEST METHODS AND TEST RESULTS

3.1 Depth of Concrete Carbonation

The three concrete core samples were each tested for depth of concrete carbonation. The carbonation tests were carried out in accordance with BS EN 14630:2006 using phenolphthalein indicator solution.

The results are given in Table 1.

---

[1] BS EN 12504-1:2019 'Testing concrete in structures, Part 1: Cored specimens - taking, examining and testing in compression' requires that cores taken for strength testing shall be surface dried with a dry cloth or paper towel and then placed in a sealed container to avoid moisture exchange with the environment. BS EN 13791:2019 'Assessment of insitu compressive strength in structures and precast concrete components' requires cores to be cured with sealed curing rather than water curing. This is primarily to ensure that the core to be tested is at a moisture condition similar to the in situ moisture condition.

3.2 Density and Compressive Strength of Concrete Cores

The concrete core samples were diamond sawn to give specimens with a length/diameter ratio in the range 0.90 to 1.10. The ends of each specimen were ground flat and the prepared specimen was used to determine as-received density and compressive strength in accordance with BS EN 12390-7:2019+AC:2020, BS EN 12504-1:2019 and BS EN 12390-3:2019.

The test results are given in Table 2.

3.3 Testing for the Presence of High-Alumina Cement

Representative portions from three of the concrete core samples were chemically analysed for insoluble residue, acid soluble alumina and acid soluble total iron in accordance with documented in house method 14.1. Inspection of the analyses results enabled the probable general type of cement present to be identified.

The analytical results are given in Table 3.

3.4 Determination of Chloride Content

Representative portions from all three of the concrete samples were each chemically analysed to determine acid soluble chloride content in accordance with documented in-house methods 14.8.

In the absence of information regarding the actual cement contents of the samples a mean value of 14%, by weight, has been assumed in accordance with the recommendation given in Building Research Establishment Information Paper IP 21/86. The approximate chloride ion contents, by weight of cement, were then calculated on the basis of this assumed value.

The analytical results and the calculated findings are given in Table 4.

3.5 Determination of Sulphate Content

Representative portions from all three of the concrete samples were each chemically analysed to determine the sulphate content in accordance with BS 1881-124:2015+A1:2021.

The analytical results are given in Table 4.

3.6 Determination of Cement Content

A representative portion taken from TP302 was tested for the Portland cement content in accordance with BS 1881-124:2015+A1:2021.

The result is given in Table 5.

4. FINDINGS

4.1 The carbonation depth and concrete strength test results are shown below:

Sandberg Reference	Site Reference	Depth of Carbonation Mean (mm)	Core compressive strength, MPa (N/mm^2)
SE1801	TP301	<1	49.2
SE1802	TP302	2	32.9
SE1803	TP303	<1	41.7

The test results are given as a 'core compressive strength' which provides a measure of the actual strength of the concrete as it presently exists in the structure and is the value that should be used for any assessment of insitu strength or quality in cases of doubt, in accordance with BS EN 13791:2019.

4.2 High Alumina Cement

The analytical data for the three samples analysed indicate that the cement present in each case is not high-alumina cement but is probably a Portland type.

4.3 Chloride Content

The chloride contents of the three samples was found ranged between 0.05% to 0.1% by mass of cement.

It is generally recognised that there is a threshold concentration of chloride ion which must be exceeded before significant corrosion of the embedded reinforcement occurs but this value is dependent on several factors such as cement type and source of the chloride ions. For comparative purposes current requirements for the manufacture of reinforced concrete are given in BS 8500-1:2023[2] which requires that normally manufactured concrete containing BS EN 197-1:2011[3] cement should have a chloride ion content not exceeding 0.40% by weight of cement unless it is exposed to significant amounts of external chloride, when the limit is 0.30% by weight of cement.

None of the results exceeded these limits.

4.4 Sulfate Content

The sulfate contents of the three (3) samples was found to be 1.6% to 2.2% by weight of cement and which is below the maximum limits of 3.5 %.

---

2 BS 8500-1:2023 Concrete. Complementary British Standard to BS EN 206. Method of specifying and guidance for the specifier'.

3 BS EN 197-1:2011 Incorporating corrigenda November 2011, October 2015 and February 2019 'Cement - Part 1: Composition, specifications and conformity criteria for common cements', which includes cements formerly referred to as OPC, RHPC, most blended cements (with pfa or ggbs). Note the limit for sulphate resisting Portland cements (CEM I-SR 0 or 3) is 0.20% by weight of cement.

4.5 **Cement Content**

The Calculate cement content of the sample analysed is 13.4% by mass of dry mass; and 311 kg/m^3 using the bulk density value of 2320kg/m^3.

This concludes the agreed programme of testing.

A2 Site Investigation Ltd
100 Westminster Bridge Road
London
SE1 7XW

for Sandberg LLP

Ahmad Sabra
Department Manager

For the attention of Will Thislteton

File:78232F Report.wpd

31 October 2024

SANDBERG

78232/F
Figure 1

SANDBERG SAMPLE CHAIN OF CUSTODY RECORD

No

5 Carpenters Place Clapham High Street London SW4 7TD	Client:	A2 Site Investigation	Date samples dispatched:		sheet of
	Address:	100 Westminster Bridge Road, London SE1 7XW	Samples delivered/collected by:	James Harper	
	client e-mail:	james.harper@a2-si.com, will.thistleton@a2-si.com	Scheduled by	james.harper@a2-si.com, will.thistleton@a2-si.com,	One project/site per sheet please
	Project/Site Name:	MMU	Turnaround time/date results due:	Standard	
	Project/Site Code:	51324			Client PO
	Contact Name:	James Harper			PO3868-Sandberg-01
	Schedule No:	1			

reception@i2analytical.com

Please indicate the analysis required for each sample by marking the boxes

Lab Use	BH or TP or Sample ID	Depth (m)	Date sample taken	Time sample taken	S- soil, W - water, L - leachate, O - other	no. of containers	Portland Cement Content BS 1881 - 124: 2015	Chloride Content BS	Sulphate Content BS 1	Testing for the Presence o	Compressive strength B	Petrographic examination	Depth of Concrete Carbonati							Sample Specific Notes/ Container types (Lab use Only)
	TP301 (B.H.B.4	0.00-0.30	22/08/2024		S			x	x	x	x		x							
	TP302 (B.H.B.7	0.00-0.30	22/08/2024		S		x	x	x	x	x		x							
	TP303 (B.H.B.8	0.00-0.30	23/08/2024		S			x	x	x	x		x							

Total no. of samples.

Possible Hazard Identification

Non-Hazard ☐ Hazardous ☐ Unknown ☐

Special instructions / QC, requirements & comments.

avg. transport temp.

hours in transport

Sample disposal (a fee may be assessed if samples are retained longer than 1 month) return to client ☐ disposal by lab ☐ archive for ☐ i2 QUOTE NO

LAB USE ONLY

Date received: time: by:

Date instructed: time: by:

Laboratory notes

MMU
TEST SCHEDULE

SANDBERG

UKAS TESTING
0262

78232/F

Table/Sheet
1/1

Date of Test
25/9/24

CONCRETE TEST RESULTS
DEPTH OF CARBONATION
BSEN 14630: 2006

Sandberg Sample Reference	Client Reference	Depth of Carbonation, Min mm	Depth of Carbonation, Max mm	Depth of Carbonation, Mean mm
SE1801	TP301	<1	<1	<1
SE1802	TP302	<1	4	2
SE1803	TP303	<1	<1	<1

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UKAS TESTING
0262

78232/F

Table/Sheet
2/1

Date of Test
26/9/24

CONCRETE TEST RESULTS
COMPRESSIVE STRENGTH AND DENSITY OF CORES

BS EN 12504-1:2019, BS EN 12390-3:2019 and BS EN 12390-7:2019+AC:2020

Sandberg Reference	SE1801	SE1802	SE1803
Site Mark/Client Reference	TP301 (B.H.B.4)	TP302 (B.H.B.7)	TP303 (B.H.B.8)
Details: - Location: MMU	0.0-0.30	0.0-0.30	0.0-0.30
- Date of coring	22/8/24	22/8/24	22/8/24
- Date received	18/9/24	18/9/24	18/9/24
Presence of abnormalities	None	None	None
Reinforcement, as received (diameter/distance)[1] mm	None	None	None
Reinforcement, prepared (diameter/distance)[1] mm	None	None	None
Aggregate, maximum nominal size mm	19	19	16
Condition on receipt	Sealed	Sealed	Sealed
Storage conditions	Lab Ambient Condition	Lab Ambient Condition	Lab Ambient Condition
Method of End preparation (Cap/Ground)	Ground	Ground	Ground
Actual Core Lengths - Core length, as received mm - Relation to length, as-received mm	 300-320 80-155	 295-308 80-155	 298-326 80-155
Mean Prepared Length mm	70	70	69
Mean Core Diameter d_m mm	69	69	69
Length/Diameter ratio of prepared specimen λ	1.01	1.01	1.00
Density[2] - As received kg/m³	2380	2320	2330
Exposure time before Test 16-24h	✓	✓	✓
Estimation of prepared core excess voidage %	0.5	2.5	1.0
Maximum Load at Failure kN	184	123	156
Compressive Strength[3] MPa (N/mm²) (Measured Core Strength)	49.2	32.9	41.7
Mode of Failure[4]	Normal	Normal	Normal
Deviations from standard		See footnote 5	
Remarks:			

1 Centre of bar to core end, before and after end preparation (eg. 20/100/40 = 20mm diameter bar, 100mm from the core end as-received and 40mm after end preparation).
2 Volume by measurement/water displacement, densities given to nearest 10kg/m³.
3 Compressive strength values given to nearest 0.1 MPa (N/mm²).
4 'Normal' (symmetrical failure) or otherwise as described.
5 Perpendicularity outside specified limits of ± 0.05mm. Result may not give true indication of core compressive strength.
ND = Not determined. NA = Not applicable.

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Table/Sheet

3/1 of 1

Date of Test

21-22/10/24

CONCRETE - CHEMICAL ANALYSIS
PRESENCE OF HIGH ALUMINA CEMENT

Documented In-house Methods 14.1

Sandberg reference	Client reference	Details	Chemical analysis, % by weight of sample			Cement Type indicated by DTA	Probable cement type
			Insoluble residue	Acid soluble alumina Al_2O_3	Acid soluble iron oxide Fe_2O_3		
SE1801	TP301(B.H.B.4)	Core	13.30	0.80	0.35	-	PC
SE1802	TP302(B.H.B.7)	Core	14.09	0.80	0.36	-	PC
SE1803	TP303(B.H.B.8)	Core	13.30	0.57	0.28	-	PC

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UKAS TESTING 0262

78232/F

Table/Sheet 4/1 of 1

Date of Test 21-22/10/24

CONCRETE - CHEMICAL ANALYSIS
DETERMINATION OF CHLORIDE AND SULPHATE CONTENTS

Documented In-house Methods 14.0 and 14.8 and BS 1881:Part 124:2015 + A1 : 2021(*)

Sandberg Reference	Location Reference	Cement content % by mass (assumed)	Chloride, Cl^- % by mass of		Sulphate SO_3* % by mass of		Remarks
			sample	cement	sample	cement	
SE1801	TP301 (B.H.B.4)	13.4	0.014	0.10	0.30	2.2	-
SE1802	TP302 (B.H.B.7)	13.4	0.007	0.05	0.29	2.2	-
SE1803	TP303 (B.H.B.8)	13.4	0.007	0.05	0.21	1.6	-

Notes : - = Not determined or not applicable.

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UKAS TESTING 0262

78232/F

Table/Sheet 5/1 of 1

Date of Test 21-22/10/24

ANALYSIS OF HARDENED CONCRETE

BS 1881:Part 124:2015 + A1 : 2021 and Documented In-house Methods(*)

Sandberg reference	**SE1802**			
Client reference	**TP302 (B.H.B.7)**			
Details	**Core**			
CHEMICAL ANALYSIS	**% by mass**			
Soluble silica, SiO_2*	**3.13**			
Acid soluble alumina, Al_2O_3*	**-**			
Acid soluble iron, Fe_2O_3*	**-**			
Acid soluble calcium, CaO	**47.50**			
Acid soluble potassium, K_2O	**-**			
Acid soluble sodium, Na_2O	**-**			
Acid soluble sulphate, SO_3	**-**			
Chloride, Cl^-*	**-**			

As received density, kg/m^3	**2320**			

Calculated Cement Content				
% by mass of dry mass	**13.4**			
kg/m^3	**311**	**0**	**0**	**0**
Aggregate/cement ratio	**6.2**	**??**	**??**	**??**

Sulphate % by mass of cement	**-**			
Chloride % by mass of cement	**-**			
Total alkalies % by mass of cement	**-**			
Probable cement type	**PC**			
Calculation route #	**A**			

Assumptions used in calculations	**SiO_2 %**	**CaO %**	**combined water**	
Aggregate	**0.5**	**0.0**	**-**	
Portland cement	**20.2**	**64.5**	**23**	

Calculation route: **A using soluble silica** **B using acid soluble calcium oxide**

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Where test results are given, the results and our conclusions relate only to the samples tested and apply to the sample(s) as received, except where sampling has been conducted by Sandberg LLP.

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Tests reported on sheets not bearing the UKAS mark in this report/certificate are not included in the UKAS accredited schedule for this laboratory.

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End of report.

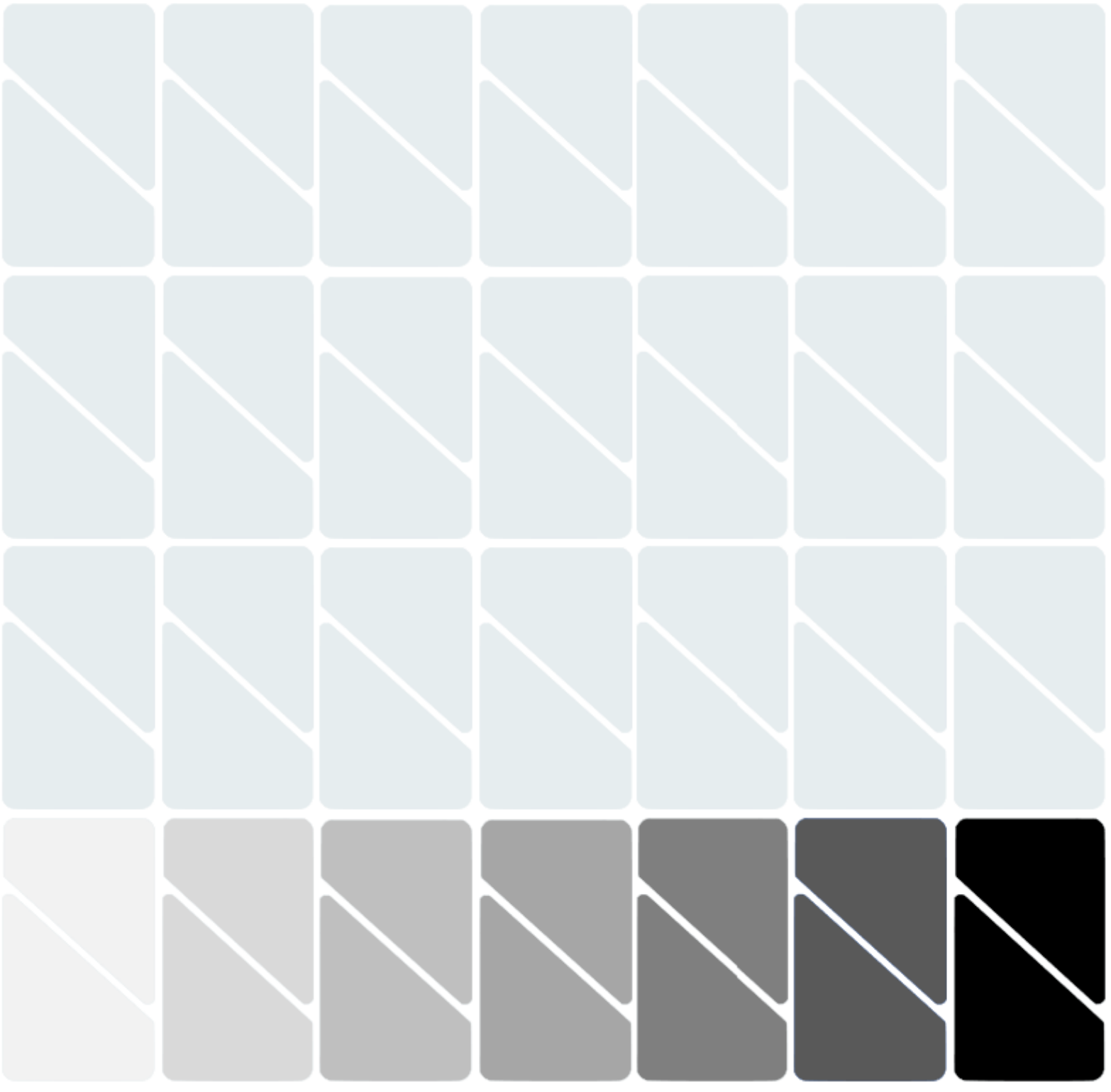
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A2 Site Investigation

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MANCHESTER METROPOLITAN UNIVERSITY

LIBRARY

FACTUAL GROUND INVESTIGATION REPORT

Prepared for MANCHESTER METROPOLITAN UNIVERSITY

Report Ref: 37757

Geotechnical Engineering Ltd
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MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

FACTUAL GROUND INVESTIGATION REPORT

Prepared for MANCHESTER METROPOLITAN UNIVERSITY

Report Ref: 37757

PROJECT: University Library development

CONSULTANT: Buro Happold

VOLUME - VERSION	STATUS	ORIGINATOR	CHECKER	APPROVED	DATE
1 of 1 – A	DRAFT	SP	JH	-	21/09/2023
1 of 1 – B	FINAL	SP	JH	JH	07/12/2023
ORIGINATOR			**APPROVER**		
					
S PHELPSTEAD Senior Engineering Geologist			J HANSON Director		

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2. SITE LOCATION AND GEOLOGY 1

3. GROUND INVESTIGATION 2

3.1 Fieldwork 2

3.2 Logging 3

3.3 Laboratory Testing 4

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FIGURES **Nos.**

EXPLORATORY HOLE LOCATION PLAN 1

APPENDICES

APPENDIX A FIELDWORK DATA

1. INTRODUCTION

It is proposed to replace the existing eastern wing of the Manchester Metropolitan University (MMU) All Saints Library Building with a new twelve storey building. In addition, construction of a two-storey roof extension and refurbishment works are proposed for the remainder of the existing All Saints Library Building.

Geotechnical Engineering Limited (GEL) was instructed by Buro Happold (The Consultant) acting on behalf of Manchester Metropolitan University (the Client) to carry out an investigation to determine the ground conditions.

The scope of works and terms and conditions of appointment were specified by the Consultant and GEL correspondence reference T34444, dated 27th June 2023. The investigation was carried out under the direction and part time supervision of the Consultant.

This report describes the investigation and presents the findings. An initial phase of ground investigation was undertaken at the site by GEL in April 2023, presented in GEL report ref: 37567.

2. SITE LOCATION AND GEOLOGY

The site is situated around the All Saints Library Building, within the Manchester Metropolitan University Campus, between All Saints Park and the A57, Mancunian Way overpass. The site address is All Saints Library, All Saints Park, Manchester M15 6BH and may be located by its National Grid co-ordinates SJ 84225 97158.

British Geological Survey (BGS) England and Wales (Manchester Sheet No. 85, 1:50,000, 2011 and SJ89NW, 1:10,000, 2004) and the BGS online geology (1:50,000) indicate the site is underlain by superficial deposits of Glaciofluvial Sheet Deposits, comprising sand and gravel in

the south of the site with Devensian Age Till deposits, comprising mixed size materials in the north of the site. The underlying bedrock geology is recorded as the Chester Formation (Chester Pebble Beds Formation), comprising sandstone, with the Manchester Marls Formation, comprising mudstone, recorded in the east of the site. A north-west to south-east striking fault, with downthrow side to the north-east, is also recorded on or adjacent to the north-east corner of the site.

3. GROUND INVESTIGATION

3.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015+A1:2020 during the period 24th July to 11th August and comprised six foundation inspection pits. Probe holes were internally drilled at two additional locations to delineate the extents of existing foundations.

The exploratory hole locations were selected by the Consultant and set out by this Company and are shown on Figure 1.

External trial pits, referenced ITP101, ITP102, ITP103 and ITP104 and internal trial pits ITP201 and ITP202 (Appendix A), were hand excavated to locate / uncover buried structures and foundation bases.

Surface hardstanding, where encountered, was penetrated by stitch drilling with 100mm diameter bolt down rotary core unit drilling methods.

Representative disturbed samples were taken and retained in a combination of plastic tubs, bags and amber glass jars and vials.

Photographs of the trial pit profile, structures exposed and spoil heap were taken and are presented separately digitally.

On completion all trial pits were backfilled with arisings compacted in suitable layers and the ground surface was reinstated.

Internal probe hole locations, referenced SD01 and SD02 (Appendix A), were rotary core drilled (100mm diam) using a bolt down coring unit to delineate the extents of existing foundations. Probe holes were also drilled in the vicinity of ITP202 to delineate the extents of excavation to uncover the foundation.

On completion, the probe holes were reinstated with concrete.

Samples for chemical analyses were dispatched daily from site directly to Derwentside Environmental Testing Services Limited (DETS) under a Chain of Custody. The remaining samples were brought to this Company's laboratory for storage.

3.2 Logging

The logging of soils was carried out by an Engineering Geologist in general accordance with BS5930:2015+A1:2020. A key to the exploratory hole logs is presented in Appendix A.

The trial pits were logged in situ. Detailed descriptions are given in the trial pit logs, Appendix A, along with details of sampling and in situ testing, groundwater ingress and relevant comments on stability. Sketches of the uncovered structures encountered and probe hole locations are presented with the trial pit logs.

3.3 Laboratory Testing

Laboratory testing was not undertaken as a part of this Contract.

GEOTECHNICAL ENGINEERING LIMITED

4. REFERENCES

British Standards Institution (2015): Code of practice for ground investigations. BS 5930:2015+A1:2020.



Notes
Reproduced from the digital data supplied by the Consultant.

KEY:

37567 (April 2023) Locations

= Borehole location

= Dynamic Probe test location

= Foundation inspection pit location

37757 (July/Aug 2023) locations

=Foundation inspection pit location

NOTE - POSITIONS ARE INDICATIVE ONLY.

Geotechnical Engineering Limited

EXPLORATORY HOLE LOCATION PLAN

Client: MANCHESTER METROPOLITAN UNIVERSITY

Site: MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Scale: 1 : 500 @ A3

CONTRACT	FIGURE
37757	1

APPENDIX A

FIELDWORK DATA

Geotechnical Engineering Limited

KEY TO EXPLORATORY HOLE LOGS

Sample type

D	Small disturbed	U	Undisturbed	L	Dynamic	ES	Environmental - soil	CS	Core subsample (prepared)
B	Bulk disturbed	UT	Undisturbed thin wall	C	Core	EW	Environmental - water	LS	Dynamic subsample (prepared)
LB	Large bulk disturbed	P	Piston	W	Water				

Test type

S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value

C SPT - Solid cone followed by uncorrected SPT 'N' Value

(*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration). Arrow length reflects test depth range.

H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal. Where the limit of the equipment is reached during a test, the reported value is the minimum recorded shear strength of the material.

M Mackintosh probe - number of blows to achieve 100mm penetration

Mx Mexe cone - average reading of equivalent CBR value in %

PP Pocket penetrometer - calculated reading in kPa

Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with isobutylene, using a 10.6eV bulb)

TR In situ thermal resistivity by needle probe in mK/W

Sample/core range/I_f

Dynamic sample

Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

$\overline{x}$ x = Total Core Recovery (TCR) as percentage of core run

y y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter

$\underline{z}$ z = Rock Quality Designation (RQD). The amount of solid core greater then 100mm expressed as percentage of core run

Where SPT has been carried out at the beginning of core run, disturbed section of core excluded from SCR and RQD assessment

I_f - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are also given. NI = non-intact core NA = not applicable NR = no recovery

Instrumentation

Piezometer

Perforated standpipe

Inclinometer

Extensometer

Backfill

Granular response zone

Bentonite seal

Cement/ bentonite grout

Soil backfill

Concrete

Cover

instru -ment Raised cover

instru -ment Stopcock cover

Stratum boundaries

Estimated boundary

Grading boundary

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015+A1:2020

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identified when, within the natural make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General comments

The process of drilling and sampling will inevitably lead to sample disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

Where provided, the stratigraphical names/geological rock units are for guidance only and may not be wholly accurate.

Geotechnical Engineering Limited

TRIAL PIT LOG

ITP101

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Sheet 1 of 1

Start Date 24 July 2023 Easting 384235 Scale 1:25

End Date 25 July 2023 Northing 397186 Ground Level 37.10mOD Depth 2.60 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Grey concrete paving slab (50mm) over light yellowish brown slightly gravelly fine to coarse SAND. Gravel is fine subrounded quartzite. (MADE GROUND)	0.10	37.00	
1D 1ES	0.20 - 0.30 0.20 - 0.30				Light yellowish brown sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.15	36.95	
					Light grey sandy angular to subrounded fine to coarse limestone and quartzite GRAVEL. (MADE GROUND)	0.35	36.75	
					Dark grey gravelly ashy fine to coarse SAND with rare fragments of wood and a medium angular brick cobble content. Gravel is angular to subrounded fine and medium slag, mudstone and brick. (MADE GROUND)			
					Brown silty gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse sandstone, mudstone and limestone. (MADE GROUND)	0.80	36.30	
2D 2ES	1.20 - 1.30 1.20 - 1.30							
3D 3ES	1.70 - 1.80 1.70 - 1.80				Dark grey clayey gravelly fine to coarse SAND with a medium angular brick cobble content. Gravel is angular and subangular fine to coarse brick, concrete, limestone and sandstone. (MADE GROUND)	1.65	35.45	
					Trial pit Completed at 2.60m	2.60	34.50	

Equipment: Pit excavated by Hand Tools.

Pit width x length: 0.85m x 1.50m with long side orientated 130°

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 2.60m.

AGS

CONTRACT	CHECKED
37757	JH

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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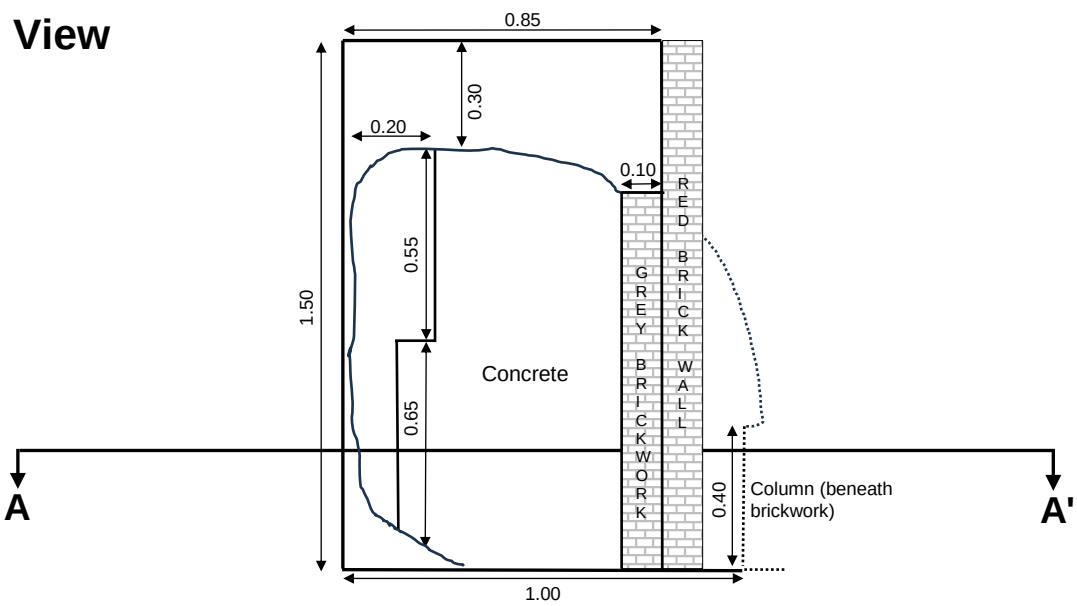
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

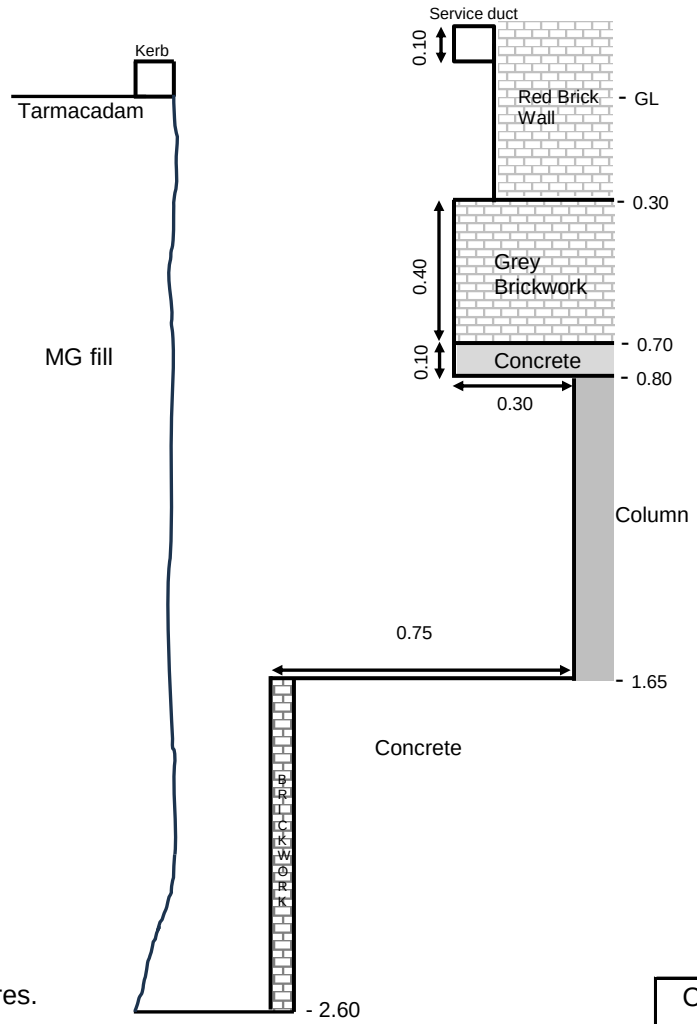
SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

ITP101

Plan View



Section A - A'



All measurements in metres.
Not to scale.

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TRIAL PIT LOG

ITP102

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Sheet 1 of 1

Start Date 27 July 2023 Easting 384262 Scale 1:25

End Date 27 July 2023 Northing 397153 Ground Level 37.50mOD Depth 1.90 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1D 1ES	0.20 0.20	0.30 0.30			Vegetation over soft to firm dark brown slightly gravelly sandy silty CLAY with a low angular concrete boulder content and frequent rootlets, roots (up to 10x10x30mm), litter (up to 5x10x50mm), underpants, needles (used) and faecal waste. Gravel is angular to subrounded concrete, brick, slag, sandstone and mudstone. (MADE GROUND)			
2D 2ES	0.50 0.50	0.60 0.60						
3D 3ES	1.00 1.00	1.10 1.10			Firm orangish brown mottled light bluish grey silty CLAY with frequent rootlets.	1.00	36.50	
					Trial pit Completed at 1.90m	1.90	35.60	

Equipment: Pit excavated by Hand Tools

Pit width x length: 1.20m x 1.50m with long side orientated 150°

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.90m.

CONTRACT	CHECKED
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EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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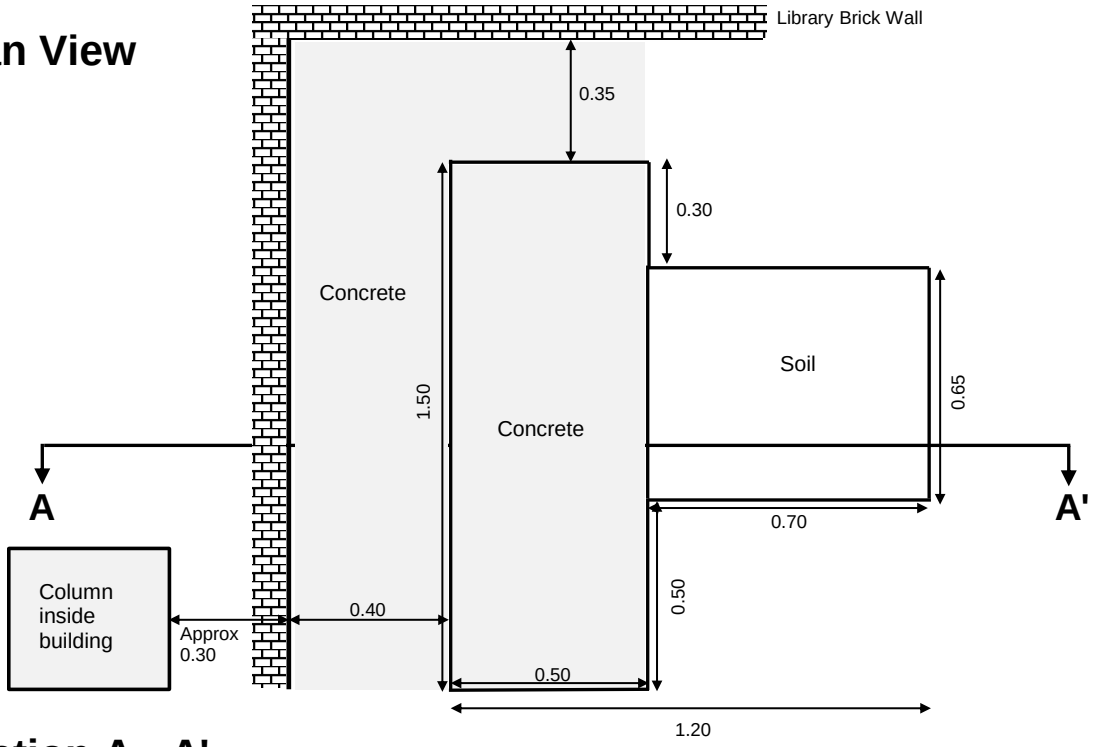
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSTIY

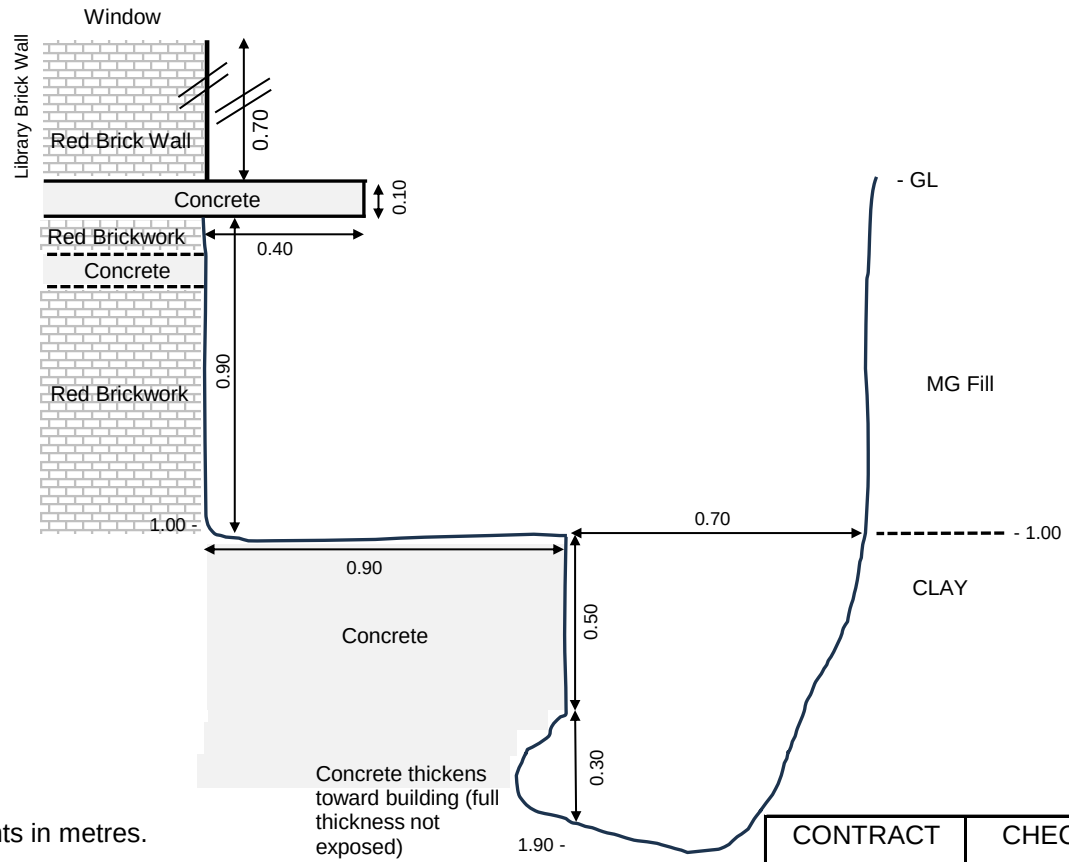
SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

ITP102

Plan View



Section A - A'



All measurements in metres.
Not to scale.

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TRIAL PIT LOG

ITP103

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Sheet 1 of 1

Start Date 25 July 2023 Easting 384253 Scale 1:25

End Date 27 July 2023 Northing 397195 Ground Level 37.10mOD Depth 2.00 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Reddish brown block paving (0.05m) over light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite. (MADE GROUND)	0.15	36.95	
					Dark grey gravelly ashy fine to coarse SAND. Gravel is angular to subrounded fine and medium coal, mudstone and brick. (MADE GROUND)	0.20	36.90	
					Light brown and grey clayey gravelly fine to coarse SAND locally sandy gravelly clay with a low angular brick and concrete cobble content. Gravel is fine to coarse angular to subrounded sandstone, brick and quartzite. (MADE GROUND)			
1D 1ES	1.20 - 1.30 1.20 - 1.30							
2D 2ES	1.50 - 1.60 1.50 - 1.60							
					1.80m: Gravel is angular to rounded.			
					Trial pit Completed at 2.00m	2.00	35.10	

Equipment: Pit excavated by Hand Tools.

Pit width x length: 1.20m x 1.70m with long side orientated 155°

Sidewall stability: Sidewalls began to spall at 2.00m.

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 2.00m.

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EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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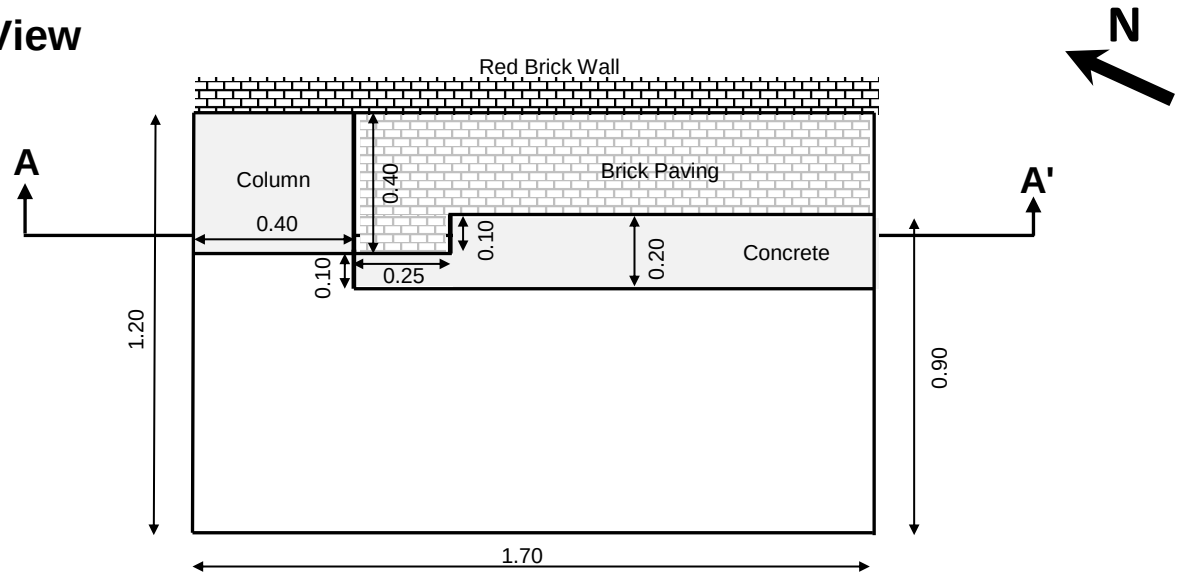
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSTIY

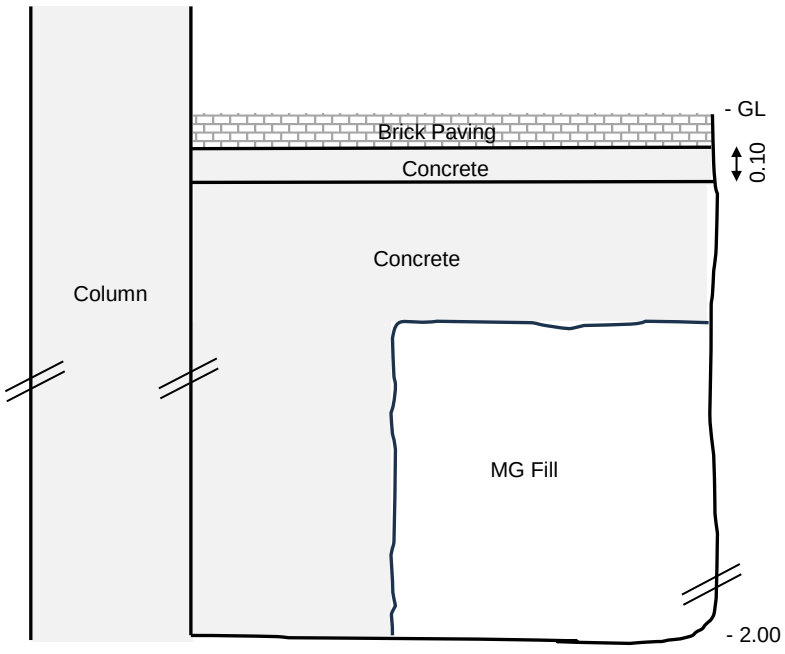
SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

ITP103

Plan View



Section A - A'



All measurements in metres.
Not to scale.

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TRIAL PIT LOG

ITP104

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Sheet 1 of 1

Start Date 26 July 2023 Easting 384268 Scale 1:25

End Date 26 July 2023 Northing 397198 Ground Level 37.15mOD Depth 0.20 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1D 1ES	0.10 - 0.20 0.10 - 0.20			Reddish brown brick paving (0.05m) over light brown slightly gravelly fine to coarse SAND. Gravel is angular and subangular quartzite. (MADE GROUND)	0.10	37.05	
				Light grey sandy angular and subangular fine to coarse limestone GRAVEL. (MADE GROUND)	0.20	36.95	
				Trial pit Completed at 0.20m			

Equipment: Pit excavated by Hand Tools

Pit width x length: 2.50m x 2.60m with long side orientated 160°

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 0.20m.

Remarks: Concrete surface exposed and edge traced beyond pillar.

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EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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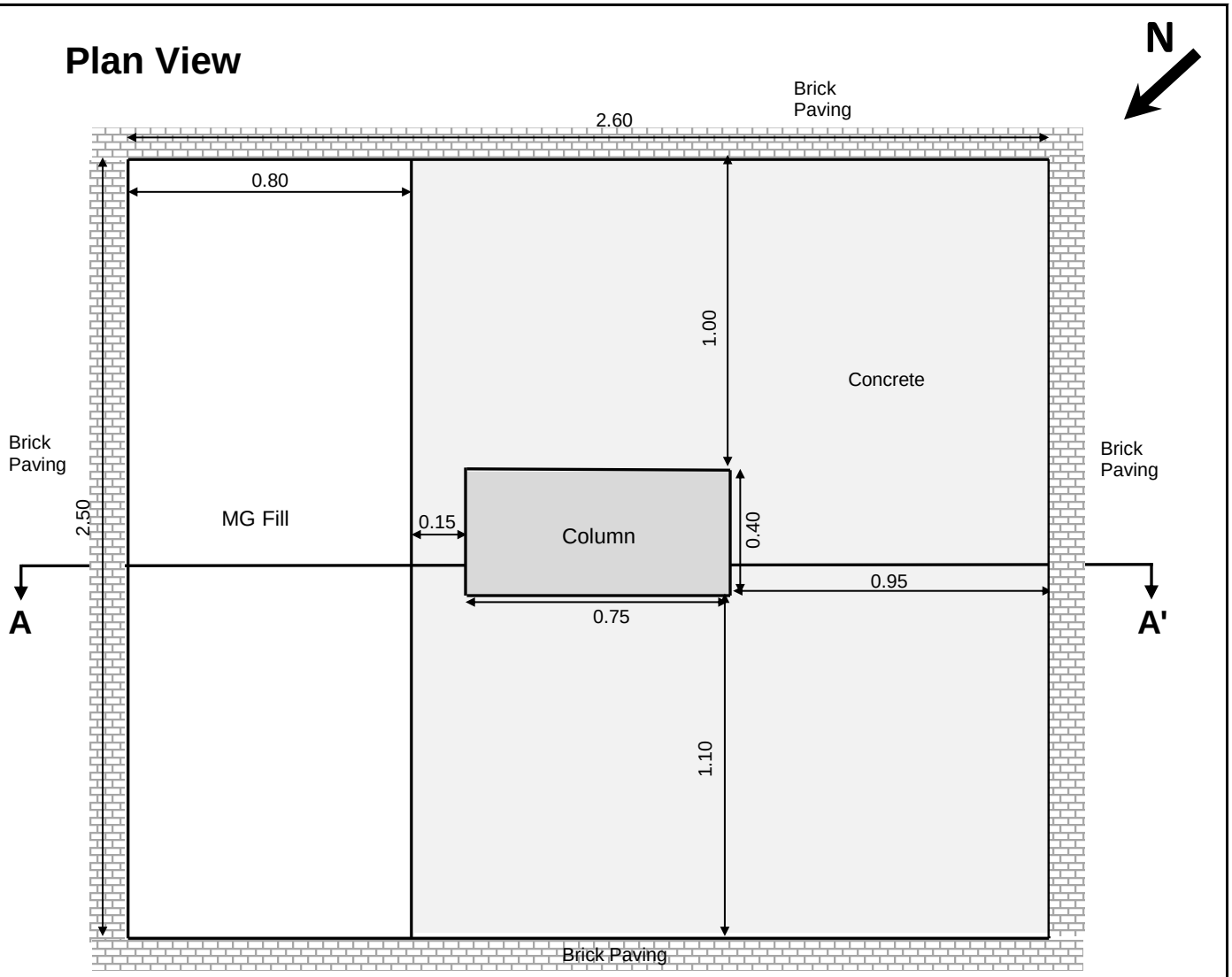
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSTIY

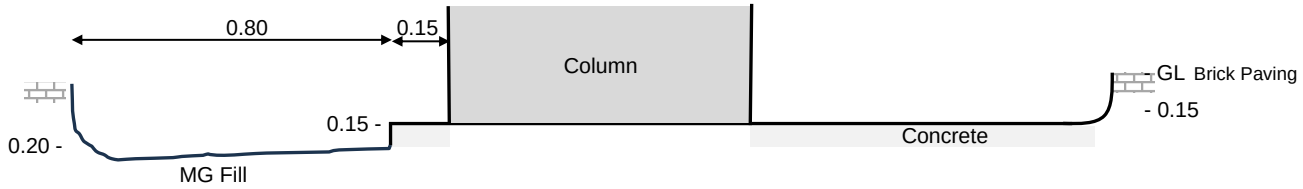
SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

ITP104

Plan View



Section A - A'



All measurements in metres.
Not to scale.

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TRIAL PIT LOG

ITP201

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Sheet 1 of 1

Start Date 25 July 2023

Scale 1:25

End Date 08 August 2023

Depth 1.70 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Carpet tiles over light reddish brown CONCRETE screed. (MADE GROUND)			
					Light grey reinforced CONCRETE. (MADE GROUND) 0.09m: Clear 2mm thick plastic sheeting. 0.16m: 25mm twisted steel reinforcement bar. 0.19m: 25mm twisted steel reinforcement bar. 0.30m: 15mm twisted steel reinforcement bar.	0.09		
1D 1ES	0.50 0.50	- 0.60 - 0.60			Greyish brown CONCRETE. (MADE GROUND)	0.36 0.44		
					Soft dark reddish brown and dark brown slightly sandy gravelly CLAY with a high angular and subangular brick, concrete and mudstone cobble content, a low angular and subangular concrete and sandstone boulder content and rare wood fragments (up to 50x30x20mm). Gravel is angular to subrounded fine to coarse brick, concrete, tarmacadam, ceramic, quartzite and mudstone. (MADE GROUND)			
2D 2ES	1.40 1.40	- 1.50 - 1.50						
					Trial pit Completed at 1.70m	1.70		

Equipment: Pit excavated by Hand tools.

Pit width x length: 1.00m x 1.30m with long side orientated 210°

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Concrete 0.00 - 0.15m. With 10mm grid reinforcement bar.
Gravel 0.15 - 0.30m.
Arisings 0.30 - 1.70m.

AGS

CONTRACT	CHECKED
37757	**JH**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

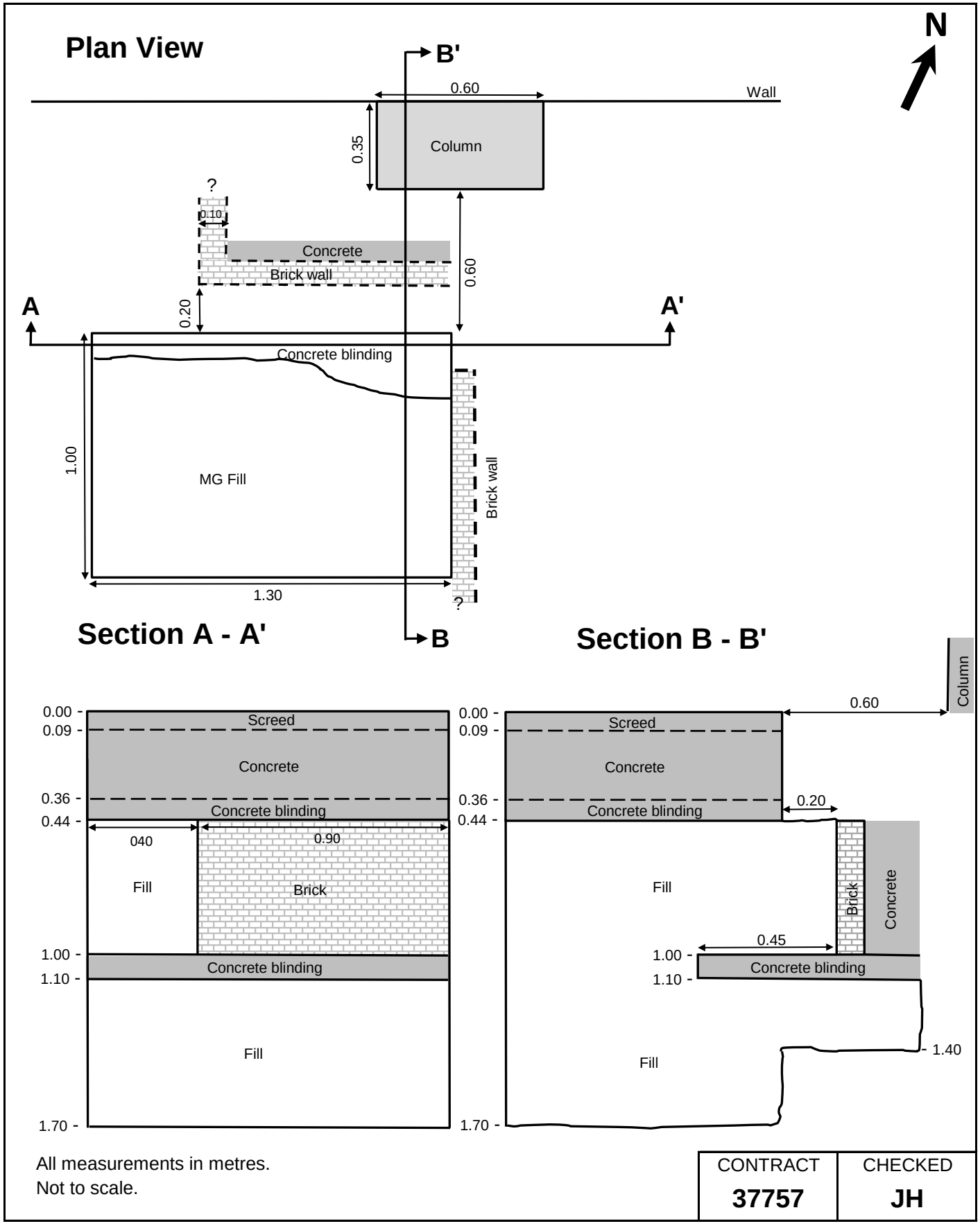
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TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

ITP201



All measurements in metres.
Not to scale.

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TRIAL PIT LOG

ITP202

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MANCHESTER METROPOLITAN UNIVERSITY LIBRARY

Sheet 1 of 1

Start Date 09 August 2023

Scale 1:25

End Date 11 August 2023

Depth 1.70 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Carpet tiles over light grey reinforced CONCRETE. (MADE GROUND) 0.10m: 15mm reinforcement bar 0.12m: 10mm reinforcement bar.	0.19		
					White polystyrene insulation foam. (MADE GROUND) 0.19m: Blue 2mm thick plastic sheeting.	0.53		
					Light grey reinforced CONCRETE. Dipping base from 0.90m (SW short edge) to 1.04m (NE short edge). (MADE GROUND) 0.60m: 10mm steel reinforcement bar. 0.76m: 25mm twisted steel reinforcement bar. 0.81m: 25mm twisted steel reinforcement bar.	1.10		
1D 1ES	1.20 - 1.40 1.20 - 1.40				Orangish brown and brown very gravelly fine to coarse SAND with a medium angular brick cobble content, rare roots (up to 15mm diam), rare rootlets and rare pockets of soft dark brown silty clay (up to 50x50x100mm).. Gravel is angular to subrounded fine to coarse quartzite, brick, concrete and sandstone. (MADE GROUND) 1.20 - 1.70m: Double skin of 100mm wide brick wall running NW/SE continuing beneath excavation.	1.40		
					Light grey CONCRETE blinding. (MADE GROUND)	1.45		
					Dark brown slightly gravelly fine to coarse SAND with a low angular brick cobble content. Gravel is angular to subrounded fine and medium siltstone and mudstone. (MADE GROUND)	1.70		
					Trial pit Completed at 1.70m			

Equipment: Pit excavated by Hand tools.

Pit width x length: 0.60m x 1.10m with long side orientated 068°

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Concrete 0.00 - 0.13m. with 10mm steel reinforcement grid.
Gravel 0.13 - 0.50m.
Arisings 0.50 - 1.70m.

AGS

CONTRACT	CHECKED
37757	JH

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

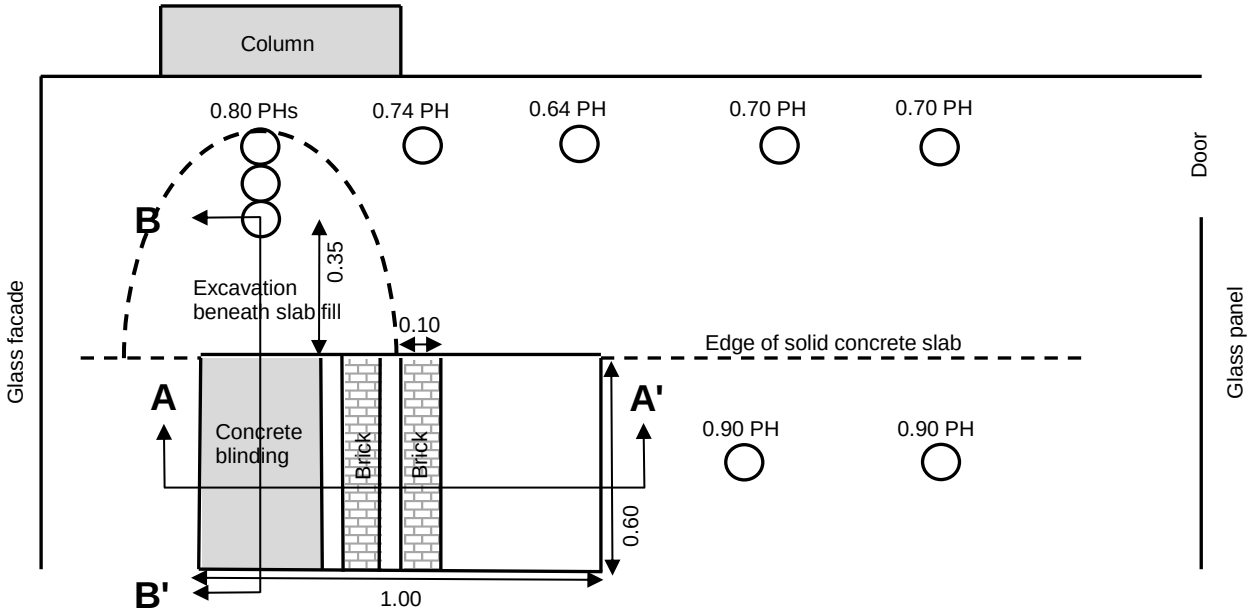
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSTIY

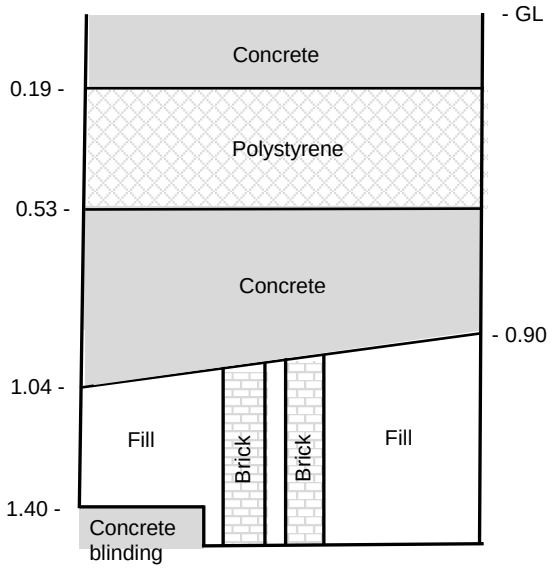
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ITP202

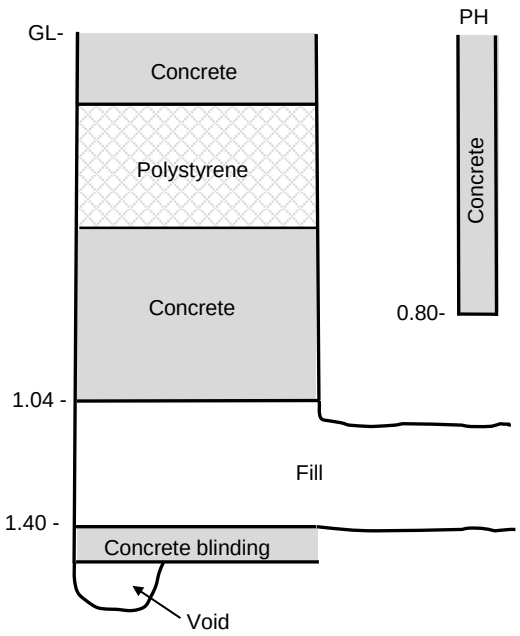
Plan View



Section A - A'



Section B - B'



PH = 100mm diam Pilot Hole
All measurements in metres.
Not to scale.

CONTRACT	CHECKED
37757	**JH**

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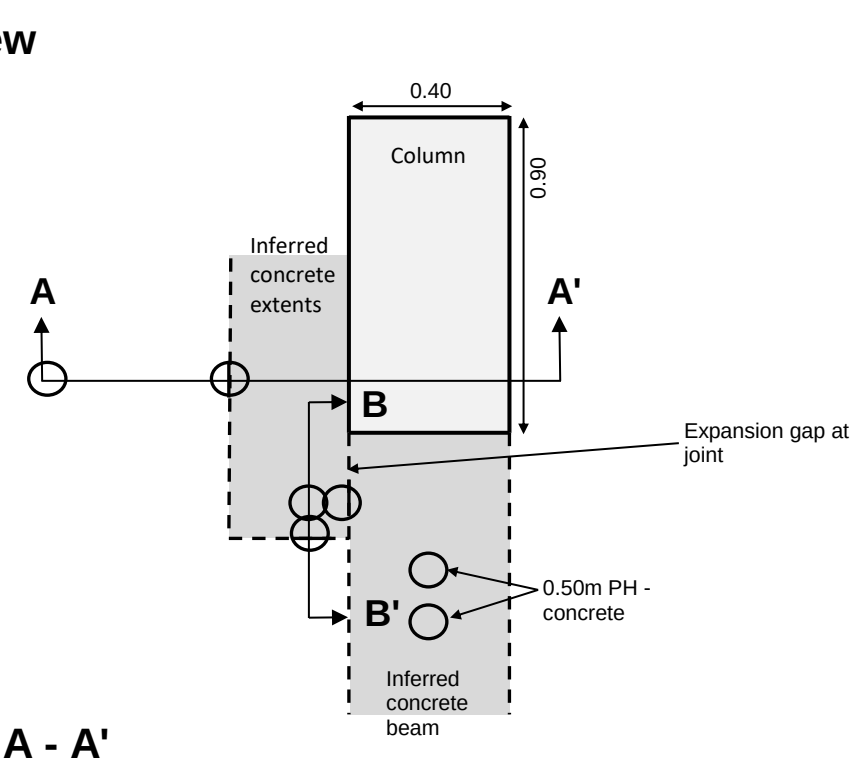
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CLIENT MANCHESTER METROPOLITAN UNIVERSTIY

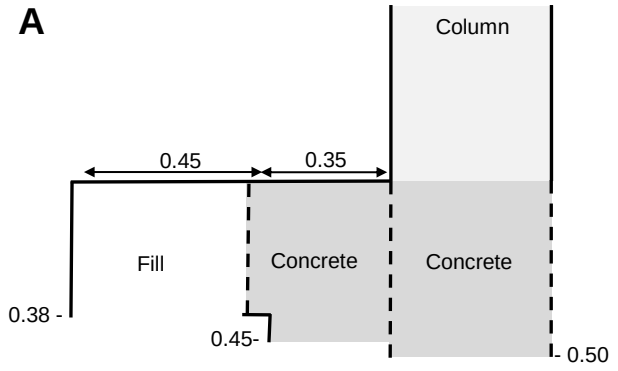
SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

SD01

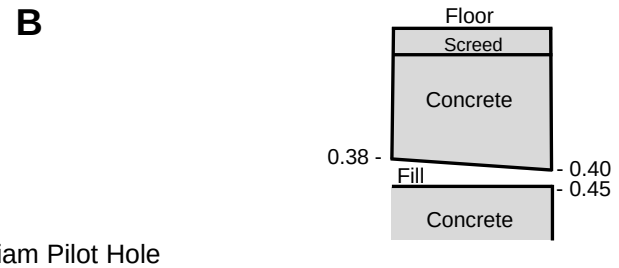
Plan View



Section A - A'



Section B - B'



○ 100mm diam Pilot Hole

All measurements in metres.

Not to scale.

CONTRACT	CHECKED
37757	**JH**

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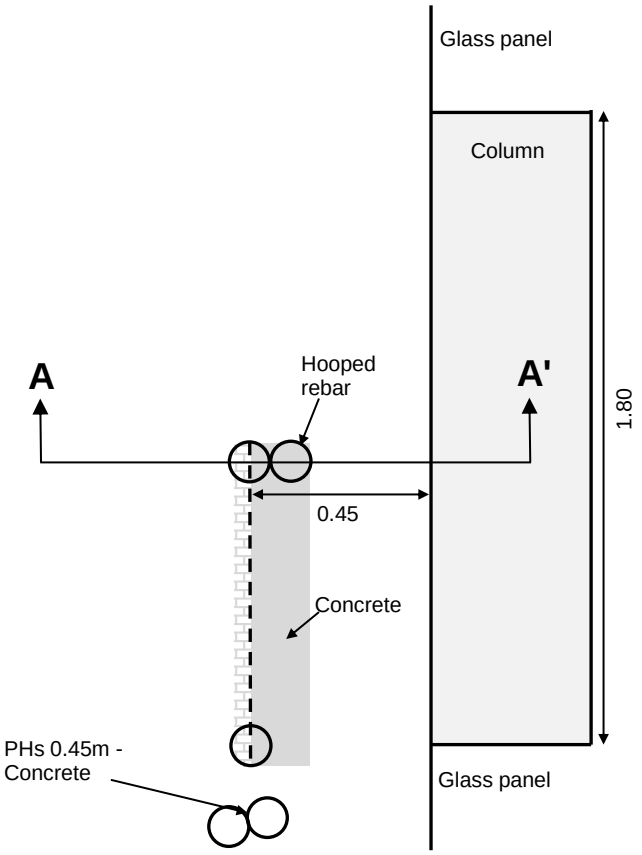
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSTIY

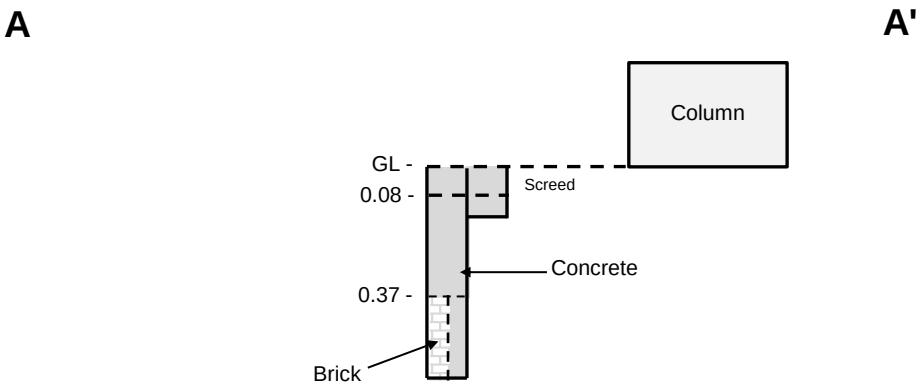
SITE MANCHESTER METROPOLITAN UNIVERSTIY LIBRARY

SD02

Plan View



Section A - A'



○ 100mm Pilot Hole

All measurements in metres.

Not to scale.

CONTRACT	CHECKED
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FACTUAL GROUND INVESTIGATION REPORT

Prepared for MANCHESTER METROPOLITAN UNIVERSITY

Report Ref: 37567

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FACTUAL GROUND INVESTIGATION REPORT

Prepared for MANCHESTER METROPOLITAN UNIVERSITY

Report Ref: 37567

PROJECT: All Saints Library Transformation

CONSULTANT: BURO HAPPOLD

VOLUME - VERSION	STATUS	ORIGINATOR	CHECKER	APPROVED	DATE
1 of 1 – A	DRAFT	DM	JH	-	15/06/2023
1 of 1 – B	FINAL	DM	JH	JH	01/11/2023

ORIGINATOR	APPROVER
	
DAVID MARSHALL SENIOR GEOENVIRONMENTAL ENGINEER	JOHN HANSON DIRECTOR

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The report has been prepared for the sole use and reliance by Manchester Metropolitan University. GEL accepts no liability as a result of the use or reliance of this report by any other parties.

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SITE PLAN 1

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APPENDIX B MONITOTING RESULTS

APPENDIX C LABORATORY TESTING

APPENDIX D CHEMICAL ANALYSES

1. INTRODUCTION

It is proposed to replace the existing eastern wing of the Manchester Metropolitan University (MMU) All Saints Library Building with a new 12 storey building. In addition, construction of a two-storey roof extension and refurbishment works are proposed for the remainder of the existing All Saints Library Building.

Geotechnical Engineering Limited (GEL) was instructed by Buro Happold (The Consultant) acting on behalf of Manchester Metropolitan University (the Client) to carry out an investigation to determine the ground conditions.

The scope of works and terms and conditions of appointment were specified by the Consultant and GEL correspondence reference T34109, dated 6th March 2023 with the bill of quantities revised on the 17th March 2023. The investigation was carried out under direction and part time supervision of the Consultant.

This report describes the investigation and presents the findings.

2. SITE LOCATION AND GEOLOGY

The site is situated around the All Saints Library Building, within the Manchester Metropolitan University Campus, between All Saints Park and the A57, Mancunian Way overpass. The site address is All Saints Library, All Saints Park, Manchester M15 6BH and may be located by its National Grid co-ordinates SJ 84225 97158.

British Geological Survey (BGS) England and Wales (Manchester Sheet No. 85, 1:50,000, 2011) and the BGS online geology (1:50,000) indicate the site is underlain by superficial deposits of Glaciofluvial Sheet Deposits, comprising sand and gravel in the south of the site with Devensian Age Till deposits, comprising mixed size materials in the north of the site. The underlying

bedrock geology is recorded as the Chester Formation (Chester Pebble Beds Formation), comprising sandstone, with the Manchester Marls Formation, comprising mudstone, recorded in the east of the site. A north-west to south-east striking fault, with downthrow side to the north-east, is also recorded on or adjacent to the north-east corner of the site.

3. GROUND INVESTIGATION

3.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015+A1:2020 during the period 3rd April to 21st April 2023 and comprised five dynamic sampling with rotary follow-on boreholes to a maximum depth of 30m, four windowless sample boreholes to a maximum depth of 5m and five foundation inspection pits to a maximum depth of 1.5m.

The exploratory hole locations were selected by the Consultant and set out by this Company and are shown on Figure 1. The ground level and co-ordinates at each exploratory hole were established by this Company using GPS techniques and are presented on the relevant exploratory hole log.

Based upon initial risk assessment and a detailed Unexploded Ordnance threat and risk assessment provided by the Consultant the site is considered to be in an area that is at high risk from unexploded ordnance. Based on the risk level the intrusive works were supported by on site monitoring by a UXO specialist from Brimstone Site Investigation Limited. Down hole magnetometer testing was also undertaken at regular intervals as the boreholes were advanced.

The boreholes, referenced BH01 to BH04 and BH04A (Appendix A), were formed using a track-mounted Geotechnical Pioneer Rig. Initially, where present, surface hardstanding was removed by thin wall water flush rotary coring, thereafter an inspection pit was hand

excavated at each borehole location to a depth of 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs, bags and amber glass jars and vials. BH04 was terminated upon completion of the inspection pit at 1.20m depth due to positive signals from the cable avoidance tool, the position was relocated and completed as BH04A.

Heavy duty dynamic sampling techniques were then employed to produce a continuous disturbed sample of 112mm nominal diameter (reducing to 97mm in BH04A as the borehole was advanced). The samples were recovered in semi-rigid plastic liner.

On refusal to dynamic sampling, borehole BH01 was continued to 16.05m by Geobor S wireline, rotary drilling techniques utilising a water/polymer flush. An inner barrel assembly, incorporating a semi-rigid plastic liner, is deployed down the borehole and is latched onto the outer barrel/casing to recover continuous cores of 102mm diameter. The outer barrel acts as the casing ensuring the hole is fully cased at all times. Due to issues with core recovery BH01 was continued from 16.05m utilising conventional drilling techniques as detailed below.

On refusal to dynamic sampling (or from 16.05m in BH01) the boreholes were continued by rotary core drilling techniques utlising a water/polymer flush. A double-tube swivel core barrel with semi-rigid plastic liner was utilised to recover a continuous sample of 120mm (reducing to 90mm in BH02) diameter.

The dynamic samples and rotary core were extracted horizontally from the sampler and core barrel respectively, the semi-rigid liner was cut to length and caps placed at each end to retain moisture content. All samples and core were retained in sequence in labelled, wooden coreboxes.

Standard penetration tests (SPT) were carried out in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel or a solid cone was used depending upon the materials

encountered and the split barrel samples retained in airtight plastic tubs. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. Detailed SPT results, together with the energy ratio (E_r), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

Boreholes were monitored for groundwater ingress as dynamic sampling proceeded. Upon encountering water, sampling was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each day's work and on completion of the borehole and are presented on the relevant log.

On completion dual installations were placed in BH01 to BH03 and BH04A. The lower installation comprised a slotted 19mm ID PVC tube set in a granular filter medium and sealed above (and below in BH02, BH03 and BH04A) with a bentonite plug. The upper installations consisted of a 50mm ID HDPE slotted tube set in a filter response zone of non-calcareous pea gravel. The installation was sealed above with a bentonite plug and accessed via a valve assembly. The installations were protected at the surface by a lockable stopcock cover set in concrete. Installation details are given on the relevant borehole log.

On completion, BH04 was backfilled with arisings and the surface reinstated.

The boreholes, referenced WS01 to WS04 (Appendix A), were formed using an Archway Dart rig. Initially, an inspection pit was hand excavated at each borehole location to a depth of 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs, bags and amber glass jars and vials. Dynamic sampling techniques were then employed to produce a continuous disturbed sample. The samples were recovered in semi-rigid plastic liner. The samples were extracted horizontally from the sampler, labelled

and caps placed each end to retain moisture, where recovery was limited samples were retained in plastic tubs to retain moisture.

Standard penetration tests (SPT) were carried out in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel sampler was used and the samples retained in airtight plastic tubs. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. Detailed SPT results, together with the energy ratio (E_r), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

Boreholes were monitored for groundwater ingress as dynamic sampling proceeded. Upon encountering water, sampling was temporarily stopped to allow the level to stabilise. Water levels were also recorded on completion of the borehole and are presented on the relevant log.

Falling head testing was carried out within two selected locations, due to the varying hole geometries and standing water levels one has been treated as a variable head permeability test and one as a small-scale soakaway (infiltration) test.

A variable head permeability test was carried out in WS01 in general accordance with the procedures given in BS EN ISO 22282-2:2012. The falling head test was carried out by topping up the borehole with clean water. The coefficient of permeability was calculated using the BS EN ISO 22282-2:2012 Hvorslev method. Intake factors have been derived from Hvorslev and are presented along with the results in Appendix A.

A small-scale soakaway test was attempted in WS03 in general accordance with BRE DG 365 (2016). The open borehole was partially filled with clean water and the fall in level recorded against time. The results are presented in Appendix A.

On completion combined gas/water monitoring standpipes were installed in WS02 and WS04. Each installation consisted of a 50mm ID HDPE slotted tube set in a filter response zone of non-calcareous pea gravel. The installation was sealed above and below with a bentonite plug and accessed via a valve assembly. The installations were protected at the surface by a lockable stopcock cover set in concrete. Installation details are given on the relevant borehole log.

On completion, WS01 collapsed to 3.00m, thereafter WS01 and WS03 were backfilled with bentonite pellets and the surface reinstated.

Dynamic probeholes, referenced DP01 and DP02 (Appendix A), were carried out using an Archway DART rig and operated in general accordance with the DPSH(B) specification given in BS EN ISO 22476-2:2005+A1:2011. Prior to testing hand dug service inspection pits (DP01 PIT and DP02 PIT) were excavated at each test location to a depth of 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs, bags and amber glass jars and vials. Testing then commenced from the base of the inspection pits using fixed cones were used along with 32mm diameter x 1.00m long driving rods. Probe depths were measured with respect to ground level and the number of blows, n_{10}, recorded for each 100mm penetration of the probe.

On completion, DP01 and DP02 (DP01 PIT and DP02 PIT) were backfilled with bentonite pellets and arisings and the surface reinstated.

Trial pits, referenced ITP01, ITP04B and ITP05 to ITP7 (Appendix A), were hand excavated to locate / uncover buried structures and foundation bases. Representative disturbed samples were taken and retained in a combination of plastic tubs, bags and amber glass jars and vials.

Photographs of the trial pit profile and spoil heap were taken and are presented in a separate photographic volume.

On completion all trial pits were backfilled with arisings compacted in suitable layers and the ground surface was reinstated.

Samples for chemical analyses were dispatched daily from site directly to Derwentside Environmental Testing Services Limited (DETS) under a Chain of Custody. The remaining samples were brought to this Company's laboratory for testing and storage.

3.2 Logging

The logging of soils and rocks was carried out by an Engineering Geologist in general accordance with BS5930:2015+A1:2020. A key to the exploratory hole logs is presented in Appendix A.

Detailed descriptions of the core and samples are given in the borehole logs, Appendix A, along with details of sampling, in situ testing, groundwater ingress, installations and relevant comments on drilling techniques.

Suitable core subsamples were selected during logging. The core was carefully logged and prepared prior to preserving the subsample by wrapping in clingfilm/tinfoil and coating with at least three layers of wax. The sample was further protected by a covering of waxed cheesecloth, labelled and transported horizontally in padded, wooden coreboxes.

Prior to logging, photographs of the core were taken and are presented in a separate photographic volume.

The trial pits were logged in situ to a depth of approximately 1.20m and thereafter from the surface. Detailed descriptions are given in the trial pit logs, Appendix A, along with details of sampling and in situ testing, groundwater ingress and relevant comments on stability and excavatability.

3.3 Monitoring

Following the main fieldwork period a programme of six gas and groundwater monitoring visits was carried out between 5th May 2023 and the 25th October 2023. During each visit water levels were recorded within all installed wells and ground gas monitoring was carried out on two wells specified by the Consultant.

Due to changes within recorded groundwater levels between visits, three additional groundwater monitoring visits were carried out in August 2023, a further ground gas monitoring visit carried out on the 27th September 2023 was aborted due to equipment malfunction, groundwater levels (only) for this visit are presented. Results are presented within Appendix B.

Water levels recorded within the installations are presented in Appendix B. Well development works were also undertaken on the 2nd June 2023; wells were developed by over-pumping until three times the saturated well volume of water had been removed. Purge records detailing the works carried out together with groundwater observations are presented in Appendix B.

Selected installations, WS02 and WS04, were monitored for gas flow and then tested for methane, carbon dioxide, oxygen, hydrogen sulphide, and carbon monoxide using a Gas Data GFM 435 or GFM 436 gas analyser.

The installations were also monitored for Volatile Organic Compounds (VOC's) using a MiniRAE Lite Portable Photo-Ionisation Detector (PID) with a 10.6eV gas discharge lamp. The detector uses an ultra violet light source to break down the chemicals into positive and negative ions (ionisation). The detector measures the charge of the ionised gas and converts the signal into current. The current is then amplified and displayed as "ppm"; after measurement the ions reform the original gas or vapour allowing it to be sampled. Subsequent readings are tabulated in Appendix B.

3.4 Laboratory Testing

Schedules of laboratory tests were prepared by the Consultant, the results are presented in Appendix C.

The natural water content was determined on ten selected samples in accordance with BS EN ISO 17892-1:2014.

Liquid limit and plastic limit tests were carried out on nine selected samples in accordance with BS EN ISO 17892-12:2018:5.3 & 5.5. An Atterberg line plot has also been presented.

Particle size distributions were determined in accordance with BS EN ISO 17892-4:2016 for six samples by wet sieving [5.2]. The fine fractions of one of these samples were further analysed by sedimentation using the pipette method [5.4]. The results are presented as grading curves.

Point load index tests were carried out on twenty-three selected lengths of core in accordance with ISRM (2007).

Seven rock cores were tested for their unconfined compressive strength in accordance with ISRM (2007).

The BRE SD1 (2005) suite of tests was carried out on nineteen samples by Derwentside Environmental Testing Services Limited (DETS) using in-house methods.

3.5 Chemical Analyses

Selected samples were despatched to Derwentside Environmental Testing Services Limited (DETS), where chemical analyses were carried out to in-house methods for a suite of contaminants. The results are presented in Appendix D.

GEOTECHNICAL ENGINEERING LIMITED

4. REFERENCES

British Standards Institution (2015): Code of practice for ground investigations. BS 5930:2015+A1:2020.

British Standards Institution (2012): Geotechnical investigation and testing. Field testing. Dynamic probing. BS EN ISO 22476-2:2005+A1:2011.

British Standards Institution (2012): Geotechnical investigation and testing. Field testing. Standard penetration test. BS EN ISO 22476-3:2005+A1:2011.

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British Standards Institution (2016): Geotechnical investigation and testing – Laboratory testing of soil. Part 4: Determination of particle size distribution. BS EN ISO 17892-4:2016.

British Standards Institution (2018): Geotechnical investigation and testing – Laboratory testing of soil. Part 12: Determination of liquid and plastic limits. BS EN ISO 17892-12:2018.

British Standards Institution (2016): Methods of test for soils for civil engineering purposes – Part 1: General requirements and sample preparation. BS1377-1:2016.

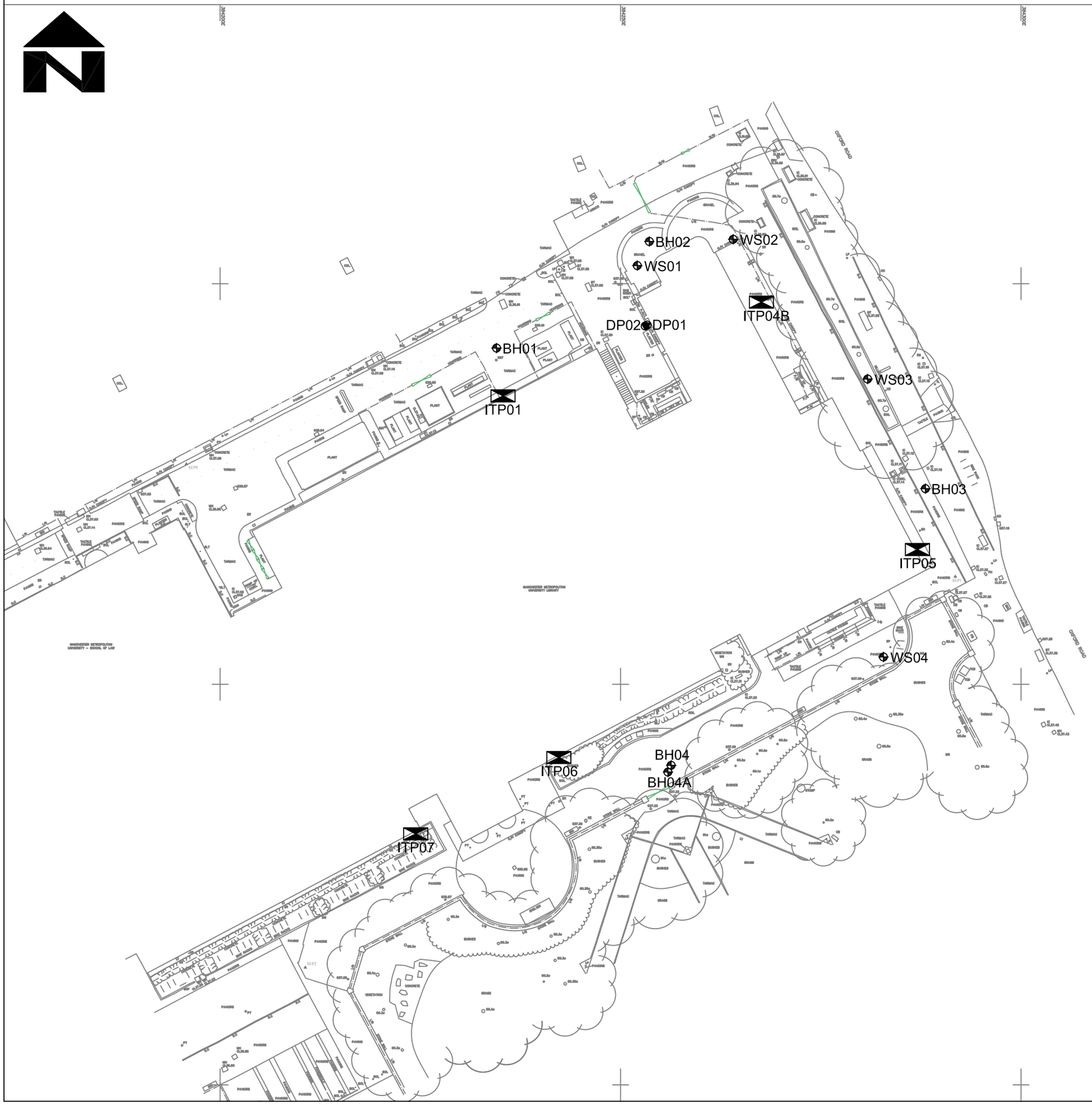
British Standards Institution (2012): Geotechnical investigation and testing - Geohydraulic testing Part 1: General rules. BS EN ISO 22282-1:2012.

British Standards Institution (2012): Geotechnical investigation and testing - Geohydraulic testing Part 2: Water permeability tests in a borehole using open systems. BS EN ISO 22282-2:2012.

Building Research Establishment (2016): Soakaway Design. Digest DG 365.

Building Research Establishment (2005): Concrete in aggressive ground. BRE Special Digest 1. Third Edition.

International Society for Rock Mechanics (2007). The complete ISRM suggested methods for rock characterization, testing and monitoring: 1974-2006, edited by R Ulusay & J A Hudson. Ankara, Turkey: Turkish National Group of the International Society for Rock Mechanics.



Notes
Reproduced from the digital data supplied by the Consultant.

KEY:

= Borehole location

= Dynamic Probe test location

= Foundation inspection pit location

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SITE PLAN

Client: MANCHESTER METROPOLITAN UNIVERSITY

Site: MMU: ALL SAINTS LIBRARY

Scale: 1 : 500 @ A3

CONTRACT	FIGURE
37567	1

APPENDIX A

FIELDWORK DATA

Geotechnical Engineering Limited

KEY TO EXPLORATORY HOLE LOGS

Sample type

D	Small disturbed	U	Undisturbed	L	Dynamic	ES	Environmental - soil	CS	Core subsample (prepared)
B	Bulk disturbed	UT	Undisturbed thin wall	C	Core	EW	Environmental - water	LS	Dynamic subsample (prepared)
LB	Large bulk disturbed	P	Piston	W	Water				

Test type

S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value

C SPT - Solid cone followed by uncorrected SPT 'N' Value

(*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration). Arrow length reflects test depth range.

H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal. Where the limit of the equipment is reached during a test, the reported value is the minimum recorded shear strength of the material.

M Mackintosh probe - number of blows to achieve 100mm penetration

Mx Mexe cone - average reading of equivalent CBR value in %

PP Pocket penetrometer - calculated reading in kPa

Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with isobutylene, using a 10.6eV bulb)

TR In situ thermal resistivity by needle probe in mK/W

Sample/core range/I_f

Dynamic sample

Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

x = Total Core Recovery (TCR) as percentage of core run

y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter

z = Rock Quality Designation (RQD). The amount of solid core greater then 100mm expressed as percentage of core run

Where SPT has been carried out at the beginning of core run, disturbed section of core excluded from SCR and RQD assessment

I_f - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are also given. NI = non-intact core NA = not applicable NR = no recovery

Instrumentation

Piezometer

Perforated standpipe

Inclinometer

Extensometer

Backfill

Granular response zone

Bentonite seal

Cement/ bentonite grout

Soil backfill

Concrete

Cover

Raised cover

Stopcock cover

Stratum boundaries

Estimated boundary

Grading boundary

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015+A1:2020

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identified when, within the natural make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General comments

The process of drilling and sampling will inevitably lead to sample disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

Where provided, the stratigraphical names/geological rock units are for guidance only and may not be wholly accurate.

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BOREHOLE LOG

BH01

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Sheet 1 of 4

Start Date 03 April 2023 Easting 384235 Scale 1:50

End Date 12 April 2023 Northing 397192 Ground Level 36.85mOD Depth 25.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.20		100					Dark grey TARMACADAM. (MADE GROUND)			
1B	0.20 - 0.40							Light grey slightly sandy angular to subangular fine to coarse limestone GRAVEL. (MADE GROUND)	0.20	36.65	
1ES	0.20 - 0.30										
2D	0.20 - 0.30										
2ES	0.60 - 0.70							Soft grey mottled reddish brown slightly sandy CLAY. (MADE GROUND)	0.60	36.25	
3B	0.60 - 0.80										
4D	0.60 - 0.70								0.90	35.95	
3ES	1.00 - 1.10							Medium dense reddish brown gravelly fine to coarse SAND with rare pockets (up to 5x5x8mm) of soft brown silty clay. Gravel is angular is subrounded fine to coarse quartzite, mudstone and sandstone.			
5B	1.00 - 1.20										
6D	1.00 - 1.10	Nil					S 13				
7D	1.20 - 1.65										
8L	1.20 - 1.70										
4ES	1.50 - 1.70										
9D	1.70 - 2.15	Nil					S 8	1.40 - 1.70m: Slightly gravelly.			
10L	1.70 - 2.20							1.70 - 2.30m: Loose, locally tending to very sandy gravel.			
11D	2.20 - 2.65	Nil					S 10				
12L	2.20 - 2.70				2.30				2.30	34.55	
13D	2.70 - 3.15	Nil					S 21	Medium dense brown and reddish brown clayey gravelly fine to coarse SAND with low subrounded sandstone and mudstone cobble content. Gravel is angular to rounded fine to coarse quartzite, sandstone and mudstone.			
14L	2.70 - 3.20										
5ES	2.70 - 2.90										
15D	3.20 - 3.65	3.20					S 47				
16L	3.20 - 3.70							Medium dense brown, grey and reddish brown slightly clayey sandy angular to subrounded fine to coarse mudstone, sandstone and limestone GRAVEL with a low angular mudstone cobble content.	3.20	33.65	
17D	3.70 - 4.15	3.70					S 10		3.50	33.35	
18L	3.70 - 4.20								3.70	33.15	
6ES	4.00 - 4.20							Dense brown clayey gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse quartzite, sandstone and mudstone.			
19D	4.20 - 4.65	4.20					S 13				
20L	4.20 - 4.70							Firm reddish brown slightly gravelly silty CLAY. Gravel is angular to rounded fine and medium quartzite, mudstone and sandstone.			
21D	4.70 - 5.15	4.20					S 16		4.70	32.15	
22L	4.70 - 5.20							Stiff greyish brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine and medium quartzite, mudstone, sandstone and rare coal.			
23L	5.20 - 6.20	5.00					S 28				
24D	6.00 - 6.10										
25L	6.20 - 7.20	5.00					S 20				
26D	7.00 - 7.10										
27D	7.20 - 7.65	5.00					S 19				
28L	7.20 - 8.20	7.20									
29D	8.00 - 8.10										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.20	Rotary Core	Geotechnical Pioneer Rig
0.20	1.20	Inspection Pit	Hand Tools
1.20	9.20	Windowless Sample	Geotechnical Pioneer Rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
2.30	Nil	2.30	20	Seepage

CASING DEPTH

DIAM (mm)	BASE (m)
168	7.20
140	16.05

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.20
128	9.20
146	25.05

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	2.40	Bentonite
2.40	3.50	Gravel
3.50	23.90	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
3.50	Standpipe (50mm) with geosock
25.00	Standpipe (19mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
03-04-2023 13:50	0.00	Nil	
03-04-2023 16:20	2.70	Nil	2.40
04-04-2023 07:30	2.70	Nil	Dry
04-04-2023 17:20	9.20	7.20	4.60
05-04-2023 07:50	9.20	7.20	4.30
05-04-2023 18:15	14.55	14.55	1.80

REMARKS

Polymer flush used 9.20-25.05m. Flush returns maintained throughout drilling.

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Start Date 03 April 2023 Easting 384235 Scale 1:50

End Date 12 April 2023 Northing 397192 Ground Level 36.85mOD Depth 25.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
30D 31L	8.20 - 8.65 8.20 - 9.20	7.20					S 21				
32D	9.00 - 9.10										
33D 34C	9.20 - 9.65 9.20 - 10.05	7.20	100	NA			S 30				
35D 36D 37C	9.95 - 10.05 10.05 - 10.50 10.05 - 11.05	10.05	100				S 26				
38D 39D 40C	10.95 - 11.05 11.05 - 11.40 11.05 - 12.05	11.05	60				S *75	Very stiff brown slightly gravelly sandy CLAY with frequent coarse gravel sized pockets of brown clayey sand. Gravel is angular to subrounded fine and medium mudstone, sandstone and limestone.	10.75	26.10	
41D 42C	12.05 - 12.42 12.05 - 13.05	12.05	90				S *68	Very stiff fissured reddish brown silty CLAY with rare light bluish grey pockets (up to 20mm diameter) of clayey silt. Fissures are 30° to 50° and 70° to 90° very closely spaced planar rough rarely polished. 12.05 - 12.15m: Frequent light bluish grey reduction spots.	12.05	24.80	
43D 44D 45C	12.90 - 13.00 13.05 - 13.30 13.05 - 14.05	13.05	100				S *150	Very stiff tending to extremely weak reddish brown silty CLAY with frequent randomly orientated tabular fine to coarse gravel sized mudstone lithorelicts and rare light grey pockets (up to 5mm diameter) of silt and fine sand.	12.75	24.10	
46D 47C	14.05 - 14.39 14.05 - 14.55	14.05	100				S *79				
48C	14.55 - 15.05	14.55									
49D 50C	15.05 - 15.28 15.05 - 16.05	15.05	65				S *167				

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
9.20	25.05	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
23.90	25.05	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
06-04-2023 08:15	14.55	14.55	3.90
06-04-2023 11:50	16.05	16.05	4.00
11-04-2023 11:15	16.05	16.05	3.90
11-04-2023 17:00	25.05	16.05	5.60

REMARKS

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Start Date 03 April 2023 Easting 384235 Scale 1:50

End Date 12 April 2023 Northing 397192 Ground Level 36.85mOD Depth 25.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
51D	16.05 - 16.31	16.05	100				S *136				
52C	16.05 - 17.55		37								
			27					16.35 - 16.55m: Slightly sandy.			
				NI				Extremely weak reddish brown locally light bluish grey fine SANDSTONE disintegrated to gravelly fine sand. Gravel is angular fine to coarse fine sandstone.	16.55	20.30	
53D	16.95 - 17.05							16.85 - 17.05m: Bluish grey, gravel is angular fine and medium fine sandstone.	17.15	19.70	
				90				Extremely weak and very weak reddish brown interbedded fine SANDSTONE, MUDSTONE and SILTSTONE locally disintegrated to gravelly fine sand. Gravel is angular fine to coarse mudstone, siltstone and sandstone lithorelicts. Rare locally frequent light bluish grey silt and fine sand reduction spots (up to 5x5x10mm). Fractures are randomly orientated locally subhorizontal medium, locally extremely and very closely spaced planar rough frequently infilled with up to 10mm of reddish brown silty clay and fine sand.			
				250							
54C	17.55 - 19.05	16.05	100	NA							
			60								
			40	NI							
				70							
				80							
55CS	18.60 - 18.95			280							
				350				17.55 - 17.75m: Thin bed of slightly sandy gravelly silty clay. Gravel is angular fine to coarse mudstone and siltstone lithorelicts.			
56C	19.05 - 20.55	16.05	100	NI				17.85 - 18.40m: Fractures are randomly orientated extremely closely and very closely spaced planar rough.			
			73	120							
			53	280							
57D	19.75 - 19.85										
58C	20.55 - 22.05	16.05	100								
			77	NI							
			60	200							
				430							
59CS	21.35 - 21.55							21.35 - 21.45m: 70° planar rough fracture.			
								Extremely weak and very weak, locally weak reddish brown SILTSTONE with rare light bluish grey reduction spots (up to 50mmx 50mm x 70mm) and medium spaced very thin beds of gravelly silty clay. Gravel is angular fine and medium siltstone and mudstone lithorelicts. Fractures are subhorizontal medium spaced locally randomly orientated very closely spaced planar rough frequently infilled with gravelly silty clay.	21.65	15.20	
60C	22.05 - 23.55	16.05	100								
61CS	22.17 - 22.47		87								
			73	NI							
				250							
				550				21.75 - 22.00m: 70° planar rough fracture.			
62C	23.55 - 25.05	16.05	97					23.55m: Becoming weak.			
63CS	23.70 - 24.03		90								
			83								

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Start Date 03 April 2023 Easting 384235 Scale 1:50

End Date 12 April 2023 Northing 397192 Ground Level 36.85mOD Depth 25.05 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
									Borehole Completed at 25.05m	25.05	11.80	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Start Date 12 April 2023 Easting 384254 Scale 1:50

End Date 17 April 2023 Northing 397205 Ground Level 37.20mOD Depth 31.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.00 - 0.20							Grey tabular angular medium and coarse slate GRAVEL (0.05m) over brown and dark grey slightly gravelly silty fine and medium SAND with rare pockets (up to 5mm diameter) of grey silty clay. Gravel is angular fine and medium brick, mudstone, sandstone, concrete and limestone. (MADE GROUND)	0.30	36.90	
1ES	0.10 - 0.20										
2D	0.10 - 0.20										
2ES	0.50 - 0.60								0.70	36.50	
3B	0.50 - 0.70										
4D	0.50 - 0.60										
3ES	1.00 - 1.10							Dark grey and reddish brown gravelly fine to coarse SAND with frequent angular brick cobbles. Gravel is angular fine to coarse brick and concrete. (MADE GROUND)	1.25	35.95	
5B	1.00 - 1.20										
6D	1.00 - 1.10	Nil					S 12				
7D	1.20 - 1.65										
8L	1.20 - 1.70										
4ES	1.50 - 1.70							Soft brown, light grey and yellowish brown slightly sandy locally sandy slightly gravelly silty CLAY. Gravel is angular fine and medium mudstone.	1.80	35.40	
9D	1.70 - 2.15	Nil					S 16				
10L	1.70 - 2.20										
11D	2.20 - 2.65	Nil					S 9	Medium dense light grey, light brown and yellowish brown slightly gravelly clayey fine SAND. Gravel is angular to rounded fine and medium mudstone, sandstone and siltstone.			
12L	2.20 - 2.70										
13D	2.70 - 3.15	Nil					S 16	Loose and medium dense brown slightly clayey gravelly locally very gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse mudstone, sandstone and siltstone.			
14L	2.70 - 3.20										
5ES	3.00 - 3.20										
15L	3.20 - 3.70	3.20					S 31	3.00 - 3.20m: Pocket (50x50x100mm) of brown fine and medium sand.	3.30	33.90	
								3.20 - 3.30m: Rare subangular quartzite and mudstone cobbles.			
16D	3.70 - 4.15	3.20					S 23	Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subrounded fine sandstone, mudstone, coal and siltstone.			
17L	3.70 - 4.20										
6ES	4.00 - 4.20										
18D	4.20 - 4.65	4.20					S 24	3.30 - 3.70m: Fissures are randomly orientated extremely and very closely spaced planar smooth stained orangish brown.			
19L	4.20 - 4.70										
20D	4.70 - 5.15	4.20					S 14	4.50 - 6.00m: Firm.			
21L	4.70 - 5.20										
22D	5.20 - 5.65	4.20					S 13				
23L	5.20 - 6.20										
24D	6.00 - 6.10										
25D	6.20 - 6.65	4.20					S 17				
26L	6.20 - 7.20	6.20									
27D	7.00 - 7.10							6.90m: Very thin bed of gravelly sand. Gravel is angular to subrounded fine and medium mudstone, sandstone and siltstone.			
28D	7.20 - 7.65	6.20					S 19				
29L	7.20 - 8.20										

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HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand Tools
1.20	10.20	Windowless Sample	Geotechnical Pioneer Rig
10.20	31.20	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
240	2.15
168	10.20

BARREL DIAMETER

DIAM (mm)	BASE (m)
128	10.20
146	23.70
116	31.20

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	6.00	Bentonite
6.00	10.00	Gravel
10.00	20.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
10.00	Standpipe (50mm) with geosock
24.50	Standpipe (19mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
12-04-2023 14:00	0.00	Nil	
12-04-2023 15:30	1.20	Nil	Dry
13-04-2023 07:50	1.20	Nil	0.70
13-04-2023 17:00	8.20	6.20	3.90
14-04-2023 08:30	8.20	6.20	2.30
14-04-2023 11:30	10.20	10.20	2.70

REMARKS

Polymer flush used 10.20-31.20m. Flush returns maintained throughout drilling.

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Start Date 12 April 2023 Easting 384254 Scale 1:50

End Date 17 April 2023 Northing 397205 Ground Level 37.20mOD Depth 31.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
30D	8.20 - 8.65	6.20					S 20				
31L	8.20 - 9.20	7.65									
32D	9.20 - 9.65	7.65					S 23				
33L	9.20 - 10.20										
34D	10.20 - 10.58	7.65	78				S *65	Very stiff brown slightly gravelly very sandy CLAY. Gravel is angular to rounded fine to coarse sandstone and mudstone.	10.20	27.00	
35C	10.20 - 11.20	10.20									
36D	10.90 - 11.00										
37D	11.20 - 11.65	10.20	100				S 33	Stiff brownish red slightly gravelly CLAY with very closely spaced very thin beds of stiff reddish brown very sandy clay. Gravel is subrounded fine mudstone and sandstone.	11.15	26.05	
38C	11.20 - 12.20								11.80	25.40	
39D	12.10 - 12.20							Very stiff indistinctly fissured brownish red sandy CLAY with frequent pockets (up to 50mm diam) of brownish red fine and medium sand and frequent subangular fine and medium gravel sized mudstone lithorelicts.			
40D	12.20 - 12.54	10.20	100				S *79	11.80 - 11.85m: Pockets (up to 50mm diameter) of light grey silty fine sand.	12.45	24.75	
41C	12.20 - 13.20		17					12.00 - 12.05m: Very thin bed of brownish red silty fine sand.			
			17					Brownish red clayey silty fine SAND.			
42D	13.10 - 13.20			NI				12.45 - 12.50m: Very thin bed of brownish red silty fine sand.	13.05	24.15	
43D	13.20 - 13.37	10.20	100	100			S *214	12.55 - 12.65m: Thin bed of light brownish yellow sandy silt.			
44C	13.20 - 14.70		47	170				Very weak reddish brown silty fine SANDSTONE. Fractures are horizontal planar stepped.	13.50	23.70	
			14	NI				13.20 - 13.40m: Drilling disturbed. Recovered as reddish brown silty fine sand.			
								Extremely weak brownish red MUDSTONE disintegrated to very stiff clay bound subangular fine and medium gravel.	14.20	23.00	
				30				Very weak brownish red SILTSTONE. Fractures are subhorizontal and 60° very closely and closely spaced planar smooth.			
45D	14.50 - 14.60			75							
46C	14.70 - 16.20	10.20		110				14.90 - 15.05m: Light greyish green.			
			100					Brownish red clayey silty fine SAND.	15.05	22.15	
			84					Weak brownish red SILTSTONE thinly and medium interbedded with very weak brownish red MUDSTONE. Fractures are subhorizontal, locally subvertical extremely closely to medium spaced planar smooth locally infilled (up to 10mm) with reddish brown silt.	15.50	21.70	
			55								
				NA							
				20							
				120							
				190							

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HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
20.00	25.00	Gravel
25.00	31.20	Bentonite

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-04-2023 10:00	10.20	10.20	3.10
15-04-2023 16:00	23.70	10.20	3.40
17-04-2023 09:20	23.70	10.20	8.20
17-04-2023 14:15	31.20	10.20	3.80

REMARKS

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Start Date 12 April 2023 Easting 384254 Scale 1:50

End Date 17 April 2023 Northing 397205 Ground Level 37.20mOD Depth 31.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
47D	16.10 - 16.20										
48C	16.20 - 17.70	10.20	100 61 22	NI 30 70							
				350				16.60 - 16.95m: Medium bed of moderately weak brownish red fine and medium sandstone with a subvertical undulating rough fracture.			
49D	17.00 - 17.10			NI				17.05 - 17.25m: Disintegrated to brownish red silty fine sand.			
				NI				Very weak brownish red MUDSTONE with frequent pockets (up to 50mm diameter) of light greyish green sand. Fractures are subhorizontal, 45° and 60° extremely closely to closely spaced planar smooth.	17.25	19.95	
				50 110					17.60	19.60	
50C	17.70 - 19.20	10.20	93 93 87	NI 250 650				Very weak reddish brown SILTSTONE with rare light bluish grey pockets (up to 10x10x20mm) of sandy silt. Fractures are subhorizontal and 50° to 70° medium spaced locally very closely spaced planar rough infilled with sandy silt.			
51CS	18.38 - 18.63										
52C	19.20 - 20.70	10.20	97 87 80					19.05 - 19.45m: Very weak reddish brown sandstone locally disintegrated to gravelly fine sand. Gravel is angular fine to coarse sandstone.			
53CS	20.45 - 20.70										
54C	20.70 - 22.20	10.20	100 93 93	70 300 1600				Very weak locally weak reddish brown SILTSTONE with rare light bluish grey reduction spots (up to 10mm diameter). Fractures are subhorizontal and 50° medium to widely spaced planar rough.	20.90	16.30	
55C	22.20 - 23.70	10.20	100 100 90								
56CS	22.98 - 23.30										
57C	23.70 - 25.20	10.20	100 93	NI 300							

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Start Date 12 April 2023 Easting 384254 Scale 1:50

End Date 17 April 2023 Northing 397205 Ground Level 37.20mOD Depth 31.20 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				80	NI 300 600							
58C	25.20	26.70	10.20	100 93 93					25.55 - 26.15m: Medium bed of very weak reddish brown fine sandstone. 26.10m: Very thin bed of extremely weak light bluish grey sandstone locally disintegrated to gravelly silty sand.			
59C	26.70	28.20	10.20	97 97 87					26.70 - 27.10m: Subvertical undulating rough fracture.			
60CS	27.32	27.65							27.30m: Subhorizontal fracture disintegrated to silty fine sand. 27.32 - 27.65m: UCS test result indicates weak.			
61C	28.20	29.70	10.20	100 93 93					28.00 - 28.20m: Two intersecting 70° undulating rough fractures.			
					NA					28.90	8.30	
62CS	29.08	29.41			700				Extremely weak thinly interlaminated to thinly interbedded reddish brown MUDSTONE and SILTSTONE with rare locally frequent light bluish grey reduction spots (up to 10mm diameter). Fractures are subhorizontal to 10° extremely closely to closely spaced planar smooth locally stained light bluish grey. 28.90 - 29.70m: With very thin beds of mudstone disintegrated to very stiff clay.			
63C	29.70	31.20	10.20	100 100 100	NI 180 300							
64CS	30.38	30.67										
									Borehole Completed at 31.20m	31.20	6.00	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Sheet 1 of 4

Start Date 18 April 2023 Easting 384288 Scale 1:50

End Date 20 April 2023 Northing 397174 Ground Level 37.20mOD Depth 25.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10		100					Brown block paving (0.10m) over light grey slightly clayey sandy angular and subangular fine to coarse limestone GRAVEL. (MADE GROUND)			
1B	0.10 - 0.30										
1ES	0.10 - 0.20										
2D	0.10 - 0.20								0.45	36.75	
3B	0.45 - 0.60							0.30m: 3mm thick black plastic mesh (approx 25mm grid size).	0.60	36.60	
2ES	0.50 - 0.60							Dark grey and black very sandy angular and subangular fine clinker, concrete, and rare brick GRAVEL with rare fragments (up to 5x20x30mm) of ceramic. (MADE GROUND)			
4D	0.50 - 0.60										
3ES	1.00 - 1.20										
5B	1.00 - 1.20				1.20		S 16				
6D	1.00 - 1.10		Nil						1.30	35.90	
7D	1.20 - 1.65							Firm light brown, dark grey and greenish grey sandy gravelly CLAY with a low subrounded sandstone and mudstone cobble content and pockets (up to 30mm x 50mm x 100mm) of clayey gravelly fine and medium sand. Gravel is angular to rounded fine to coarse sandstone, mudstone, concrete and clinker. (MADE GROUND)			
8L	1.20 - 1.70										
10L	1.70 - 2.20		Nil				S 17				
9D	1.70 - 2.15										
4ES	2.00 - 2.20										
11D	2.20 - 2.65		Nil				S 15				
12L	2.20 - 2.70							Medium dense brown and orangish brown slightly clayey gravelly locally slightly gravelly fine and medium SAND. Gravel is angular to rounded fine to coarse quartzite, sandstone, mudstone and siltstone.			
13D	2.70 - 3.15		Nil				S 15	2.50 - 2.60m: Thin bed of brown fine and medium sand.			
14L	2.70 - 3.20										
15L	3.20 - 3.70	3.20					S 39	3.20 - 3.70m: Dense.			
16L	3.70 - 4.20	3.70					S 34		3.70	33.50	
17D	4.20 - 4.65	4.20					S 32	Dense grey, reddish brown and brown slightly clayey sandy angular to rounded fine to coarse mudstone, sandstone and siltstone GRAVEL.			
18L	4.20 - 4.70								4.30	32.90	
19D	4.70 - 5.15	4.20					S 12	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine and medium mudstone, sandstone, siltstone and coal.			
20L	4.70 - 5.20										
21D	5.20 - 5.65	4.20					S 14				
22L	5.20 - 6.20										
23D	6.00 - 6.10										
24D	6.20 - 6.65	4.20					S 14				
25L	6.20 - 7.20										
26D	7.00 - 7.10										
27D	7.20 - 7.65	6.20					S 17	7.20m: Becomes stiff.			
28L	7.20 - 8.20										
29D	8.00 - 8.10										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand tools
1.20	9.20	Windowless Sample	Geotechnical Pioneer Rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
1.20	Nil	1.11	20	Seepage

CASING DEPTH

DIAM (mm)	BASE (m)
168	7.70

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
128	9.20
146	25.20

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	2.00	Bentonite
2.00	4.00	Gravel
4.00	16.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
4.00	Standpipe (50mm) with geosock
19.50	Standpipe (19mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
18-04-2023 13:20	0.00	Nil	
18-04-2023 17:30	6.20	4.20	3.50
19-04-2023 07:50	6.20	4.20	2.80
19-04-2023 16:50	21.20	7.70	4.80
20-04-2023 07:45	21.20	7.70	8.10
20-04-2023 12:45	25.20	7.70	

REMARKS

Polymer flush used 9.20-25.20m. Flush returns maintained throughout drilling.

CONTRACT	CHECKED
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BOREHOLE LOG

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Start Date 18 April 2023 Easting 384288 Scale 1:50

End Date 20 April 2023 Northing 397174 Ground Level 37.20mOD Depth 25.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
30D	8.20 - 8.65	6.20					S 25				
31L	8.20 - 9.20										
32D	9.00 - 9.10										
33D	9.20 - 9.65	7.70	100	NA			S 28				
34C	9.20 - 10.20										
35D	10.00 - 10.10							Very stiff brown and reddish brown slightly gravelly sandy silty CLAY. Gravel is subangular to rounded fine to coarse sandstone, mudstone, siltstone and coal.	9.90	27.30	
36D	10.20 - 10.55	7.70	100				S *75				
37C	10.20 - 11.20										
38D	11.00 - 11.10										
39D	11.20 - 11.54	7.70	70				S *79	11.20 - 12.10m: With medium beds of reddish brown clayey fine sand. 11.20 - 12.20m: Drilling disturbed.			
40C	11.20 - 12.20										
41D	12.00 - 12.10										
42D	12.20 - 12.54	7.70	60				S *81	12.20 - 13.10m: Limited recovery. Fines washed away. Recovered as reddish brown and light brownish grey clayey fine sand.			
43C	12.20 - 13.70										
44D	13.40 - 13.50										
45C	13.70 - 15.20		100 0 0					Very stiff fissured reddish brown silty CLAY locally tending to extremely weak mudstone. Fissures are randomly orientated extremely closely and very closely spaced planar smooth frequently polished.	13.55	23.65	
				NI				Extremely weak reddish brown SILTSTONE disintegrated to claybound fine and medium gravel sized siltstone and mudstone lithorelicts. Rare light bluish grey reduction spots (up to 10mm diameter).	14.70	22.50	
46D	15.00 - 15.10										
47C	15.20 - 16.70		100 63 23	NI 60 170				Extremely weak and very weak reddish brown thinly interlaminated to thinly interbedded SILTSTONE, MUDSTONE and SANDSTONE. Fractures are subhorizontal to 20° and 40° to 60° extremely closely to closely spaced planar smooth, locally rough.	15.50	21.70	
48D	16.00 - 16.10										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
9.20	25.20	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
16.00	20.00	Gravel
20.00	25.20	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)

REMARKS

CONTRACT	CHECKED
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Start Date 18 April 2023 Easting 384288 Scale 1:50

End Date 20 April 2023 Northing 397174 Ground Level 37.20mOD Depth 25.20 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
									16.40 - 16.70m: Medium bed of very weak fractured reddish brown fine sandstone locally disintegrated to gravelly sand.			
49C	16.70	18.20		100 87 87	NI 200 350				Very weak and weak reddish brown SILTSTONE. Fractures are subhorizontal to 20° medium spaced planar rough infilled with up to 5mm of silty clay. Strength reduced to extremely weak up to 10mm either side of fractures.	16.90	20.30	
50CS	17.32	17.67							Very weak reddish brown fine SANDSTONE. Fractures are 50° to 70° medium and closely spaced planar rough.	17.70	19.50	
51C	18.20	19.70		100 84 67	NI 150 460				18.20 - 18.90m: Subvertical undulating rough fracture.			
52CS	19.38	19.51							18.90 - 18.95m: Disintegrated to slightly clayey gravelly fine sand.			
53C	19.70	21.20		83 70 70	NI 200 370				19.60 - 19.65m: Disintegrated to slightly clayey gravelly fine sand.	19.70	17.50	
									Very weak becoming weak reddish brown SILTSTONE. Fractures are subhorizontal closely and medium spaced and 40° to 60° medium spaced planar smooth.			
54CS	20.63	21.00							19.70 - 19.90m: Medium bed of extremely weak mudstone disintegrated to claybound fine to coarse gravel sized mudstone lithorelicts. (Possibly drilling disturbance).			
55C	21.20	22.20		100 90 75								
56CS	21.35	21.75										
57C	22.20	23.70		100 97 73								
58CS	23.30	23.63			100 170 330				Moderately weak and weak reddish brown fine SANDSTONE. Fractures are subhorizontal to 20° medium spaced planar rough.	23.25	13.95	
59C	23.70	25.20		100 73								

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Start Date 18 April 2023 Easting 384288 Scale 1:50

End Date 20 April 2023 Northing 397174 Ground Level 37.20mOD Depth 25.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			67					24.15 - 24.45m: Subvertical undulating rough fracture. 24.45 - 24.65m: Sandstone is light bluish grey mottled reddish brown.			
				450				Extremely weak reddish brown MUDSTONE tending to very stiff silty CLAY. No fractures observed.	24.75	12.45	
								Borehole Completed at 25.20m	25.20	12.00	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

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Sheet 1 of 1

Start Date 17 April 2023 Easting 384256 Scale 1:50

End Date 17 April 2023 Northing 397140 Ground Level 37.20mOD Depth 1.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10		100					Reddish brown block paving (0.10m) over light brownish grey clayey sandy angular and subangular fine to coarse limestone and mudstone GRAVEL. (MADE GROUND)			
1B	0.10 - 0.20								0.40	36.80	
1ES	0.10 - 0.20							Dark grey and dark brown slightly gravelly sandy silty CLAY with a moderate organic odour. Gravel is angular to subrounded fine to coarse sandstone, mudstone, siltstone, limestone, brick and concrete. Rare fragments (up to 10x30x40mm) of ceramic. (MADE GROUND)			
2D	0.10 - 0.20										
2ES	0.40 - 0.50										
3B	0.40 - 0.50										
4D	0.40 - 0.50										
3ES	1.00 - 1.10								1.00	36.20	
5B	1.00 - 1.20										
6D	1.00 - 1.10								1.20	36.00	
								0.40m: Woven geotextile membrane.			
								Soft brown and orangish brown slightly gravelly sandy locally very sandy silty CLAY with frequent pockets (up to 20x20x20mm) of brown silty clay. Gravel is angular to rounded fine to coarse quartzite, sandstone, mudstone and siltstone (MADE GROUND)			
								Borehole Completed at 1.20m			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand tools

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	1.20	Arisings

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
17-04-2023 12:45	0.00	Nil	
17-04-2023 14:15	1.20	Nil	Dry

REMARKS

Hole terminated at 1.20m due to CAT signal at base of the pit, relocated to BH04A.

CONTRACT	CHECKED
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BOREHOLE LOG

BH04A

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Sheet 1 of 4

Start Date 17 April 2023 Easting 384256 Scale 1:50

End Date 21 April 2023 Northing 397139 Ground Level 37.20mOD Depth 29.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				100					Reddish brown block paving (0.10m) over light brownish grey clayey sandy angular and subangular fine to coarse limestone and mudstone GRAVEL. (MADE GROUND)	0.40	36.80	
									Dark grey and dark brown slightly gravelly sandy silty CLAY with a moderate organic odour. Gravel is angular to subrounded fine to coarse sandstone, mudstone, siltstone, limestone, brick and concrete. Rare fragments (up to 10x30x40mm) of ceramic. (MADE GROUND)	1.00	36.20	
1B	1.30	1.50								1.30	35.90	
2D	1.30	1.40										
1ES	1.40	1.50	Nil					C 4	Soft brown and orangish brown slightly gravelly sandy locally very sandy silty CLAY with frequent pockets (up to 20mm diameter) of brown silty clay. Gravel is angular to rounded fine to coarse quartzite, sandstone, mudstone and siltstone. (MADE GROUND)	1.60	35.60	
3L	1.50	2.50								2.05	35.15	
4L	2.50	3.00	Nil					C 17	Soft dark brown, grey and orangish brown slightly gravelly sandy silty CLAY with a moderate organic odour. Gravel is angular to subrounded fine to coarse quartzite, sandstone, mudstone and siltstone. (MADE GROUND)			
2ES	3.00	3.20	Nil					C 15	Soft orangish brown and brown mottled light grey and reddish brown slightly sandy silty CLAY.			
5L	3.00	3.50										
6L	3.50	4.00	3.50					C 21	Medium dense brown and orangish brown clayey gravelly fine to coarse SAND grading to sandy GRAVEL. Gravel is angular to rounded fine to coarse quartzite, mudstone, sandstone and siltstone.	3.65	33.55	
3ES	4.00	4.20	4.00					C 18	Stiff, locally firm brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine and medium sandstone, mudstone, siltstone and coal.			
7L	4.00	4.50										
8L	4.50	5.00	4.50					C 20				
10L	5.00	6.00	4.50					S 20				
9D	5.00	5.45										
11D	5.90	6.00										
12D	6.00	6.45	5.00					S 15				
13L	6.00	7.00										
14D	6.90	7.00										
15L	7.00	8.00	6.50					S 14				
16D	7.80	7.90										
17D	8.00	8.45	6.50					S 22				

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.50	Inspection Pit	Hand tools
1.50	9.00	Windowless Sample	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
168	8.50

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
128	8.00
113	9.00
146	29.50

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	2.00	Bentonite
2.00	3.00	Gravel
3.00	14.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
3.00	Standpipe (50mm) with geosock
24.50	Standpipe (19mm)

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
17-04-2023 15:20	0.00	Nil	
17-04-2023 16:00	1.20	Nil	Dry
18-04-2023 08:00	1.20	Nil	Dry
18-04-2023 16:45	9.45	6.50	1.00
19-04-2023 09:00	9.45	6.50	3.00
19-04-2023 16:40	24.50	8.50	1.70

REMARKS

Water flush used 9.00-29.50m. Flush returns maintained throughout drilling.

CONTRACT	CHECKED
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BOREHOLE LOG

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Start Date 17 April 2023 Easting 384256 Scale 1:50

End Date 21 April 2023 Northing 397139 Ground Level 37.20mOD Depth 29.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18L	8.00 - 9.00										
19D	8.80 - 8.90										
20D 21C	9.00 - 9.45 9.00 - 10.00	6.50	50	NA			S 26	9.00 - 10.00m: Drilling disturbed, limited recovery.			
22D 23C	10.00 - 10.45 10.00 - 11.00	8.50	100 0 0				S 30				
				NI				Extremely weak reddish brown SILTSTONE locally disintegrated to gravelly silt with rare locally frequent light bluish grey reduction spots (up to 5mm diameter). Gravel is angular fine to coarse siltstone lithorelicts. 10.50 - 11.00m: Rare pockets (up to 20x30x30mm) of yellowish brown silty fine sand.	10.50	26.70	
24D	10.80 - 10.90										
25D 26C	11.00 - 11.38 11.00 - 12.00	8.50	100 0 0				S *65				
27D	11.80 - 11.90										
28C	12.00 - 13.00	8.50	100 6 0	NA			C *52	Very stiff fissured reddish brown silty CLAY with rare light bluish grey reduction spots (up to 10x10x30mm). Fissures are randomly orientated extremely closely and very closely spaced planar smooth frequently polished.	12.00	25.20	
29D	12.80 - 12.90										
30C	13.00 - 14.50	8.50	93 70 63				C *200	12.95 - 13.00m: Thin bed of very weak reddish brown mottled light bluish grey siltstone.			
31CS	13.40 - 13.66			NI 250 400				Very weak reddish brown SILTSTONE with rare locally frequent light bluish grey reduction spots (up to 10mm diameter). Fractures are subhorizontal medium spaced planar rough.	13.35	23.85	
32C	14.50 - 16.00		100 97 97	NI 120 240				Very weak tending to weak subhorizontal very thinly to very thickly bedded reddish brown locally mottled bluish grey SILTSTONE with rare locally frequent light bluish grey reduction spots (up to 10x15x10mm). Fractures are subhorizontal to 25° and 75° to subvertical extremely closely to medium spaced planar rough.	14.50	22.70	
33C	16.00 - 17.50							Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
9.00	29.50	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
14.00	25.00	Gravel
25.00	29.50	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
20-04-2023 08:00	23.50	8.50	2.30
20-04-2023 15:40	0.00	Nil	

REMARKS

AGS

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BOREHOLE LOG

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Start Date 17 April 2023 Easting 384256 Scale 1:50

End Date 21 April 2023 Northing 397139 Ground Level 37.20mOD Depth 29.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			93 83 77	NI 120 320							
34C	17.50 - 19.00		100 97 91	NI 150 500							
35C	19.00 - 20.50		90 87 87	NI 100 430							
36C	20.50 - 22.00		100 93 80	NI 300 470				20.55 - 21.75m: Fractures are subhorizonatal to 10° extremely close and very closely spaced planar smooth.			
37C	22.00 - 23.50		100 90 80	NI 150 290				Extremely weak reddish brown locally bluish grey SANDSTONE thickly interlaminated and very thinly interbedded with mudstone and with frequent light bluish grey reduction spots (up to 15mm diameter). Fractures are subhorizontal to 45° extremely closely and very closely spaced planar smooth.	21.75	15.45	
38C	23.50 - 25.00		80 63 60					Extremely weak thickly interbedded to widely interbedded reddish brown locally bluish grey SANDSTONE, MUDSTSTONE and SILTSTONE with frequent light bluish grey reduction spots (up to 100x120x30mm) and with frequent subhorizontal thickly laminae of light bluish grey mottled reddish brown sandstone and siltstone. Fractures are subhorizontal to 45° and 55° to subvertical extremely closely spaced to widely spaced planar smooth and rough. 22.05 - 22.30m: Medium bed of weak reddish brown SILTSTONE.	22.05	15.15	

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Start Date 17 April 2023 Easting 384256 Scale 1:50

End Date 21 April 2023 Northing 397139 Ground Level 37.20mOD Depth 29.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
					NI 100 250							
39C	25.00	26.50		100 83 63					24.65 - 24.70m: Thin lamination of reddish brown bluish grey mottled SANDSTONE			
40C	26.50	28.00		97 43 40								
					NI				27.10 - 27.60m: Reddish brown disintegrated gravelly fine SAND. Gravel is subangular to rounded fine to coarse sandstone.			
					50 150 670				27.60 - 27.85m: Extremely weak reddish brown SILTSTONE and MUDSTONE and SANDSTONE.			
41C	28.00	29.50		100 100 88								
									Borehole Completed at 29.50m	29.50	7.70	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
37567	**JH**

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STANDARD PENETRATION TEST



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borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH01	1.20		1.65	Nil	Dry	2	3	75	75	4	3	4	2	75	75	75	75	S	13	68
BH01	1.70		2.15	Nil	Dry	3	2	75	75	2	2	2	2	75	75	75	75	S	8	68
BH01	2.20		2.65	Nil	Dry	2	2	75	75	3	2	3	2	75	75	75	75	S	10	68
BH01	2.70		3.15	Nil	2.30	2	3	75	75	5	4	6	6	75	75	75	75	S	21	68
BH01	3.20		3.65	3.20	0.00	2	4	75	75	6	15	14	12	75	75	75	75	S	47	68
BH01	3.70		4.15	3.70	0.00	2	2	75	75	3	2	2	3	75	75	75	75	S	10	68
BH01	4.20		4.65	4.20	1.20	3	2	75	75	2	3	4	4	75	75	75	75	S	13	68
BH01	4.70		5.15	4.20	1.80	1	2	75	75	3	4	4	5	75	75	75	75	S	16	68
BH01	5.20		5.65	5.00	0.00	5	5	75	75	5	12	7	4	75	75	75	75	S	28	68
BH01	6.20		6.65	5.00	2.10	2	3	75	75	3	5	6	6	75	75	75	75	S	20	68
BH01	7.20		7.65	5.00	4.90	2	2	75	75	3	4	5	7	75	75	75	75	S	19	68
BH01	8.20		8.65	7.20	3.10	2	3	75	75	3	5	6	7	75	75	75	75	S	21	68
BH01	9.20		9.65	7.20	4.30	4	6	75	75	5	7	9	9	75	75	75	75	S	30	68
BH01	10.05		10.50	10.05	0.90	2	3	75	75	5	5	7	9	75	75	75	75	S	26	68
BH01	11.05		11.40	11.05	0.60	4	15	75	75	21	19	10		75	75	50		S	75	68
BH01	12.05		12.42	12.05	3.30	3	3	75	75	9	13	28		75	75	70		S	68	68
BH01	13.05		13.30	13.05	3.60	7	16	75	75	31	19			75	25			S	150	68
BH01	14.05		14.39	14.05	2.60	8	15	75	75	16	20	14		75	75	40		S	79	68
BH01	15.05		15.28	15.05	3.40	5	20	75	60	40	10			75	15			S	167	68
BH01	16.05		16.31	16.05	3.70	12	12	75	75	28	22			75	35			S	136	68

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
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STANDARD PENETRATION TEST



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borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH02	1.20		1.65	Nil	0.70	2	2	75	75	2	4	3	3	75	75	75	75	S	12	68
BH02	1.70		2.15	Nil	1.00	1	3	75	75	4	3	4	5	75	75	75	75	S	16	68
BH02	2.20		2.65	Nil	2.00	3	3	75	75	2	3	2	2	75	75	75	75	S	9	68
BH02	2.70		3.15	Nil	2.30	2	2	75	75	2	2	4	8	75	75	75	75	S	16	68
BH02	3.20		3.65	3.20	0.00	2	2	75	75	5	7	11	8	75	75	75	75	S	31	68
BH02	3.70		4.15	3.20	1.20	3	3	75	75	3	7	6	7	75	75	75	75	S	23	68
BH02	4.20		4.65	4.20	0.00	6	10	75	75	10	5	4	5	75	75	75	75	S	24	68
BH02	4.70		5.15	4.20	2.20	2	2	75	75	2	3	4	5	75	75	75	75	S	14	68
BH02	5.20		5.65	4.20	2.80	1	2	75	75	2	3	3	5	75	75	75	75	S	13	68
BH02	6.20		6.65	4.20	3.60	2	2	75	75	3	3	5	6	75	75	75	75	S	17	68
BH02	7.20		7.65	6.20	2.80	2	2	75	75	3	5	6	5	75	75	75	75	S	19	68
BH02	8.20		8.65	6.20	3.70	2	2	75	75	4	4	6	6	75	75	75	75	S	20	68
BH02	9.20		9.65	7.65	3.40	3	4	75	75	6	6	5	6	75	75	75	75	S	23	68
BH02	10.20		10.58	7.65	4.30	2	2	75	75	5	13	29	3	75	75	75	5	S	65	68
BH02	11.20		11.65	10.20	1.90	3	7	75	75	5	6	9	13	75	75	75	75	S	33	68
BH02	12.20		12.54	10.20	2.10	6	8	75	75	10	25	15		75	75	40		S	79	68
BH02	13.20		13.37	10.20	2.30	13	12	75	25	50				70				S	214	68
BH03	1.20		1.65	Nil	1.11	1	1	75	75	3	4	5	4	75	75	75	75	S	16	68
BH03	1.70		2.15	Nil	1.15	3	5	75	75	5	4	4	4	75	75	75	75	S	17	68
BH03	2.20		2.65	Nil	1.20	2	3	75	75	4	3	4	4	75	75	75	75	S	15	68

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
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STANDARD PENETRATION TEST



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borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive		test drive								test type	N	energy ratio %
						blows	pen (mm)	blows				pen (mm)						
BH03	2.70		3.15	Nil	1.40	1 3	75 75	2	3	5	5	75	75	75	75	S	15	68
BH03	3.20		3.65	3.20	0.80	8 9	75 75	13	9	10	7	75	75	75	75	S	39	68
BH03	3.70		4.15	3.70	0.90	5 6	75 75	7	11	10	6	75	75	75	75	S	34	68
BH03	4.20		4.65	4.20	0.30	2 6	75 75	9	9	6	8	75	75	75	75	S	32	68
BH03	4.70		5.15	4.20	1.30	1 2	75 75	3	2	3	4	75	75	75	75	S	12	68
BH03	5.20		5.65	4.20	2.90	1 2	75 75	3	3	3	5	75	75	75	75	S	14	68
BH03	6.20		6.65	4.20	3.50	1 1	75 75	2	3	4	5	75	75	75	75	S	14	68
BH03	7.20		7.65	6.20	2.40	2 1	75 75	3	3	5	6	75	75	75	75	S	17	68
BH03	8.20		8.65	6.20	3.20	3 4	75 75	5	6	6	8	75	75	75	75	S	25	68
BH03	9.20		9.65	7.70	3.20	3 3	75 75	6	6	7	9	75	75	75	75	S	28	68
BH03	10.20		10.55	7.70	3.30	6 16	75 75	17	17	16		75	75	50		S	75	68
BH03	11.20		11.54	7.70	4.90	2 8	75 75	14	20	16		75	75	40		S	79	68
BH03	12.20		12.54	7.70	2.00	2 3	75 75	13	24	13		75	75	35		S	81	68
BH04A	1.50		1.95	Nil	Dry	1	150	1	0	1	2	75	75	75	75	C	4	
BH04A	2.50		2.95	Nil	Dry	3 3	75 75	3	4	4	6	75	75	75	75	C	17	
BH04A	3.00		3.45	Nil	3.00	2 4	75 75	5	3	3	4	75	75	75	75	C	15	
BH04A	3.50		3.95	3.50	1.00	3 17	75 75	10	5	3	3	75	75	75	75	C	21	
BH04A	4.00		4.45	4.00	1.00	1 3	75 75	3	5	5	5	75	75	75	75	C	18	
BH04A	4.50		4.95	4.50	1.00	2 3	75 75	4	5	5	6	75	75	75	75	C	20	
BH04A	5.00		5.45	4.50	1.00	1 2	75 75	5	5	5	5	75	75	75	75	S	20	

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
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STANDARD PENETRATION TEST

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borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH04A	6.00		6.45	5.00	1.00	1	2	75	75	3	3	4	5	75	75	75	75	S	15	
BH04A	7.00		7.45	6.50	1.00	1	2	75	75	2	3	4	5	75	75	75	75	S	14	
BH04A	8.00		8.45	6.50	1.00	1	3	75	75	3	5	6	8	75	75	75	75	S	22	
BH04A	9.00		9.45	6.50	1.00	2	3	75	75	4	6	7	9	75	75	75	75	S	26	
BH04A	10.00		10.45	8.50	1.70	2	4	75	75	5	6	8	11	75	75	75	75	S	30	
BH04A	11.00		11.38	8.50	1.70	4	8	75	75	10	15	20	5	75	75	75	5	S	65	
BH04A	12.00		12.44	8.50	1.70	4	5	75	75	9	10	14	17	75	75	75	65	C	52	
BH04A	13.00		13.23	8.50	1.70	5	19	75	75	50				75				C	200	

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
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BOREHOLE LOG

WS01

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SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 04 April 2023 Easting 384252 Scale 1:50

End Date 05 April 2023 Northing 397202 Ground Level 37.00mOD Depth 5.45 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1D	0.20								Dark greyish brown gravelly fine to coarse SAND with a low angular brick and sandstone cobble content. Gravel is angular to subrounded fine to coarse sandstone, mudstone, brick and quartzite. (MADE GROUND)			
1ES	0.20											
2B	0.20	0.70										
3D	0.50											
2ES	0.60											
4B	0.80	1.20								0.80	36.20	
3ES	1.10								Firm light grey mottled reddish brown slightly sandy slightly gravelly silty CLAY with frequent lenses of light grey sand. Gravel is angular fine and medium brick. (MADE GROUND)			
5D	1.20	1.65	Nil					S 12				
L	1.20	2.00								1.35	35.65	
6D	1.50								Medium dense becoming loose light brown mottled reddish brown slightly silty slightly gravelly fine to coarse SAND with rare pockets of slightly sandy clay and rare wood fragments. Gravel is subangular to subrounded fine to coarse quartzite and mudstone.			
7B	1.80	2.40										
8D	2.00	2.45	Nil					S 9				
L	2.00	3.00	2.00									
9B	2.40	3.00								2.40	34.60	
10D	2.50								Medium dense reddish brown silty very sandy subangular to subrounded fine to coarse quartzite, sandstone and mudstone GRAVEL.			
						2.90						
11D	3.00	3.45	3.00					S 11				
L	3.00	4.00										
12D	4.00	4.45	3.00					S *55				
13D	4.00		4.00									
L	4.00	5.00										
14B	4.30	5.00								4.30	32.70	
15D	4.50								Stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine and medium quartzite and mudstone.			
			5.00					S 24				
									No recovery.	5.00	32.00	
									Borehole Completed at 5.45m	5.45	31.55	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand tools
1.20	5.00	Windowless Sample	DART rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
2.90	Nil	2.60	20	

CASING DEPTH

DIAM (mm)	BASE (m)
115	5.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
87	5.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.30	Arisings
0.30	3.00	Bentonite
3.00	5.45	Arisings

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
04-04-2023 10:00	0.00	Nil	
04-04-2023 17:00	5.00	5.00	
05-04-2023 08:00	5.00	5.00	
05-04-2023 09:45	5.45	5.00	

REMARKS

Falling head test carried out at 3.00m depth, results presented separately. On completion borehole collapsed 5.45-3.00m.

CONTRACT	CHECKED
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BOREHOLE LOG

WS02

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 04 April 2023 Easting 384264 Scale 1:50

End Date 05 April 2023 Northing 397206 Ground Level 37.15mOD Depth 5.45 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.20	1.00							Reddish brown block paving (0.05m) over light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite. (MADE GROUND)	0.10	37.05	
1ES	0.20									0.15	37.00	
2ES	0.60								Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.25	36.90	
2D	0.70											
3D	1.20	1.65	Nil					S 12	Dark grey gravelly ashy fine to coarse SAND. Gravel is angular to subrounded fine and medium coal, mudstone and brick. (MADE GROUND)			
3ES	1.20		1.20									
L	1.20	2.00							Medium dense dark greyish brown gravelly fine to coarse SAND with a low angular brick and slag cobble content and rare pockets of soft brown slightly sandy clay. Gravel is angular to subrounded fine to coarse sandstone, mudstone, limestone, brick and quartzite. (MADE GROUND)			
4ES	1.70								2.00 - 2.45m: Loose.			
4D	2.00	2.45	2.00					S 8				
L	2.00	3.00							2.40 - 3.00m: With a high angular brick and slag cobble content.			
5D	2.40											
6B	2.70	3.30				2.80			2.70 - 3.30m: Becoming silty			
7D	3.00	3.45	3.00					S 34				
L	3.00	4.00										
8D	3.50								Firm greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine and medium quartzite and mudstone.	3.30	33.85	
9B	3.70	4.00										
10D	4.00	4.45	3.00					S 15	Medium dense brown silty gravelly fine to coarse SAND. Gravel is subangular and subrounded fine to coarse quartzite and sandstone.	4.00	33.15	
L	4.00	5.00										
15B	4.60	4.80							Firm becoming stiff greyish brown slightly sandy slightly gravelly CLAY. sand is fine to coarse, gravel is fine to medium subangular to subrounded of quartzite and sandstone	4.60	32.55	
16D	4.80											
17D	5.00	5.45	3.00					S 26				
									Borehole Completed at 5.45m	5.45	31.70	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand tools
1.20	5.45	Windowless Sample	DART rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
2.80	2.00	2.70	20	

CASING DEPTH

DIAM (mm)	BASE (m)
115	3.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
87	5.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.30	Concrete
0.30	0.40	Gravel
0.40	1.00	Bentonite
1.00	2.00	Gravel
2.00	5.45	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
2.00	Standpipe (50mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
04-04-2023 12:30	0.00	Nil	
04-04-2023 14:30	1.20	Nil	Dry
05-04-2023 09:40	1.20	Nil	Dry
05-04-2023 16:00	5.45	3.00	

REMARKS

AGS

CONTRACT	CHECKED
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BOREHOLE LOG

WS03

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Sheet 1 of 1

Start Date 07 April 2023 Easting 384281 Scale 1:50

End Date 07 April 2023 Northing 397188 Ground Level 37.10mOD Depth 3.45 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.00	1.20							Dark brown sand with frequent gravel size tree bark fragments (20mm) over light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.35	36.75	
1ES	0.20											
2D	0.30											
3B	0.35	0.85							Brown and grey gravelly fine to coarse SAND with a medium angular brick cobble content. Gravel is angular and subangular fine and medium brick, ceramic, concrete, slag and sandstone. (MADE GROUND)			
2ES	0.60											
4D	0.90											
5D	1.00	1.45	Nil					S 6				
L	1.00	2.00										
3ES	1.20											
6D	1.50											
7D	2.00	2.39	Nil					S *61				
L	2.00	3.00										
8D	2.50											
9D	2.85					2.80				2.85	34.25	
10D	3.00	3.44	Nil					S *52	Very stiff light brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse quartzite and sandstone.			
									Borehole Completed at 3.45m	3.44	33.66	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand tools
1.20	3.45	Windowless Sample	DART

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
2.80	Nil	2.80	20	

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)
87	3.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	1.20	Arisings
1.20	3.44	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
07-04-2023 09:00	0.00	Nil	
07-04-2023 16:00	3.45	Nil	

REMARKS

Falling head test carried out at 3.00m depth, results presented separately.

CONTRACT	CHECKED
37567	JH

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BOREHOLE LOG

WS04

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

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Sheet 1 of 1

Start Date 06 April 2023 Easting 384283 Scale 1:50

End Date 06 April 2023 Northing 397153 Ground Level 37.10mOD Depth 5.45 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.20								Reddish brown block paving (0.05m) over reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite. (MADE GROUND)	0.30	36.80	
1B	0.30	0.80							Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.40	36.70	
2ES	0.60								Very soft dark grey mottled light grey sandy gravelly CLAY. Gravel is angular to subrounded fine and medium coal, ceramic, mudstone and brick. (MADE GROUND)			
2D	0.90											
3D	1.20	1.65	Nil					S 4				
3ES	1.20		1.20									
L	1.20	2.00										
4D	1.50								Loose dark greyish brown gravelly fine to coarse SAND with a low angular brick and slag cobble content and rare pockets of soft brown slightly sandy clay. Gravel is angular and subrounded fine to coarse sandstone, mudstone, limestone, brick and quartzite. (MADE GROUND)	1.50	35.60	
4ES	1.70								1.50 - 2.85m: Becoming light brown mottled grey. No cobbles. Gravel is angular to very angular of sandstone slag and limestone.			
5D	2.00	2.45	2.00					S 4				
L	2.00	3.00										
6D	2.50											
7D	2.85					2.90				2.85	34.25	
8D	3.00	3.45	3.00					S 14	Medium dense reddish brown silty gravelly fine to coarse SAND. Gravel is subangular and subrounded fine to coarse quartzite, mudstone and sandstone.			
L	3.00	4.00										
9B	3.30	4.00							3.70 - 4.00m: Clayey			
10D	4.00	4.45	3.00					S 20				
L	4.00	5.00										
11D	4.30											
12D	4.60								Firm becoming stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular and subrounded fine and medium quartzite and mudstone.	4.60	32.50	
13D	5.00	5.45	3.00					S 23				
									Borehole Completed at 5.45m	5.45	31.65	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand tools
1.20	5.45	Windowless Sample	DART

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
2.90	2.00	2.80	20	

CASING DEPTH

DIAM (mm)	BASE (m)
115	3.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
87	5.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.30	Concrete
0.30	0.40	Gravel
0.40	1.00	Bentonite
1.00	2.00	Gravel
2.00	5.45	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
2.00	Standpipe (50mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
06-04-2023 07:40	0.00	Nil	
06-04-2023 12:00	5.45	3.00	

REMARKS

AGS

CONTRACT	CHECKED
37567	JH

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STANDARD PENETRATION TEST



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borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
WS01	1.20		1.65	Nil	Dry	2	2	75	75	3	3	3	3	75	75	75	75	S	12	67
WS01	2.00		2.45	Nil	Dry	3	3	75	75	3	2	2	2	75	75	75	75	S	9	67
WS01	3.00		3.45	3.00	2.65	2	3	75	75	3	2	3	3	75	75	75	75	S	11	67
WS01	4.00		4.43	3.00	NR	7	9	75	75	12	14	14	10	75	75	75	50	S	55	67
WS01	5.00		5.45	5.00	NR	3	4	75	75	6	6	7	5	75	75	75	75	S	24	67
WS02	1.20		1.65	Nil	Dry	2	2	75	75	3	2	3	4	75	75	75	75	S	12	67
WS02	2.00		2.45	2.00	Dry	2	3	75	75	2	3	2	1	75	75	75	75	S	8	67
WS02	3.00		3.45	3.00	NR	6	4	75	75	8	8	9	9	75	75	75	75	S	34	67
WS02	4.00		4.45	3.00	NR	4	3	75	75	3	4	3	5	75	75	75	75	S	15	67
WS02	5.00		5.45	3.00	NR	3	4	75	75	6	6	7	7	75	75	75	75	S	26	67
WS03	1.00		1.45	Nil	Dry	1	1	75	75	2	2	1	1	75	75	75	75	S	6	70
WS03	2.00		2.39	Nil	Dry	2	2	75	75	2	0	39	8	75	75	75	15	S	61	70
WS03	3.00		3.44	Nil	NR	3	5	75	75	3	12	15	20	75	75	75	65	S	52	70
WS04	1.20		1.65	Nil	Dry	0	0	75	75	1	1	1	1	75	75	75	75	S	4	67
WS04	2.00		2.45	2.00	Dry	1	1	75	75	1	1	1	1	75	75	75	75	S	4	67
WS04	3.00		3.45	3.00	NR	4	4	75	75	4	3	3	4	75	75	75	75	S	14	67
WS04	4.00		4.45	3.00	NR	3	4	75	75	4	5	5	6	75	75	75	75	S	20	67
WS04	5.00		5.45	3.00	NR	4	4	75	75	5	6	6	6	75	75	75	75	S	23	67

notes:

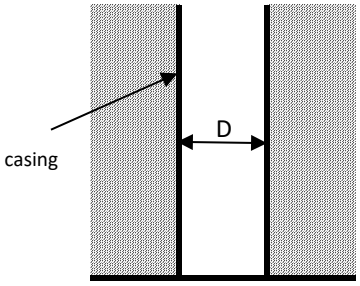
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
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PERMEABILITY TEST - INTAKE FACTORS

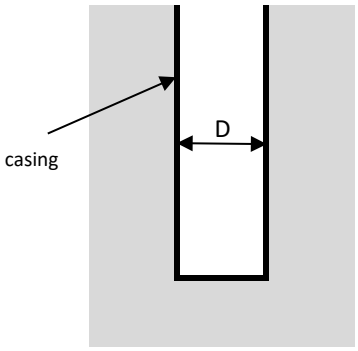
A



$F=2D$

Soil flush with bottom at impervious boundary

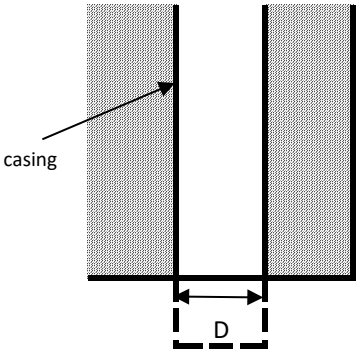
B



$F=2.75D$

Soil flush with bottom in uniform soil

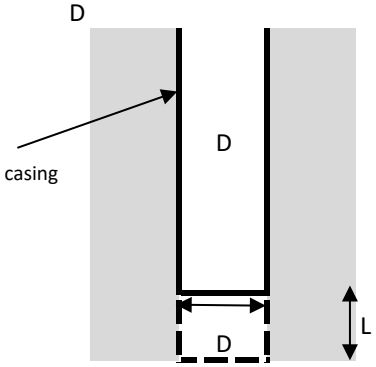
C



$$F=\frac{2\pi L}{\ln\left[\frac{2L}{D}+\sqrt{1+\left(\frac{(2L)^2}{D}\right)}\right]}$$

Well point or hole extended at impervious boundary

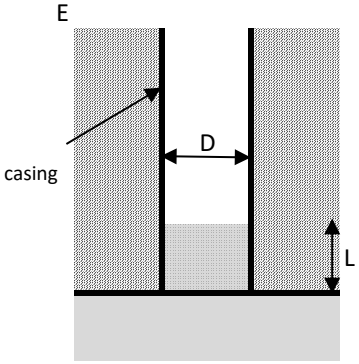
D



$$F=\frac{2\pi L}{\ln\left[\frac{L}{D}+\sqrt{\left(1+(L/D)^2\right)}\right]}$$

Well point or hole extended in uniform soil

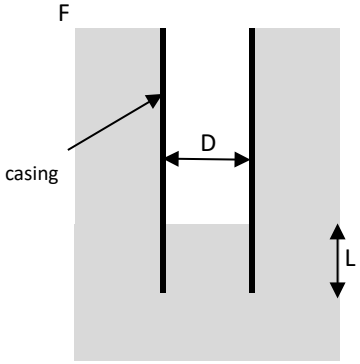
E



$$F=\frac{2D}{1+\left(\left(\frac{8}{\pi}\right)\left(\frac{L}{D}\right)\right)}$$

Soil in casing with bottom at impervious boundary

F



$$F=\frac{2.75D}{1+\left(\left(\frac{11}{\pi}\right)\left(\frac{L}{D}\right)\right)}$$

Soil in casing with bottom in uniform soil

REMARKS

Expressions come from Hvorlsev.

BS EN ISO 22282-2:2012 recommends the use of intake factors given above for the Hvorlsev method variable head test.

BS EN ISO 22282-2:2012 reports equation D as suitable for the Velocity method variable head test where $1.2 < L/D < 10$.

BS EN ISO 22282-2:2012 refers to a simpler version of Equation D for $L/D > 10$, however Equation D will still apply for $L/D > 10$.

Equation D may be used for tests using piezometer tips.

Cases A and B tend to measure the mean permeability of the soil; C and D the horizontal permeability; E and F the vertical permeability.

Where the horizontal permeability is much greater than the vertical, all tests tend to measure the former.

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PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE **WS01**

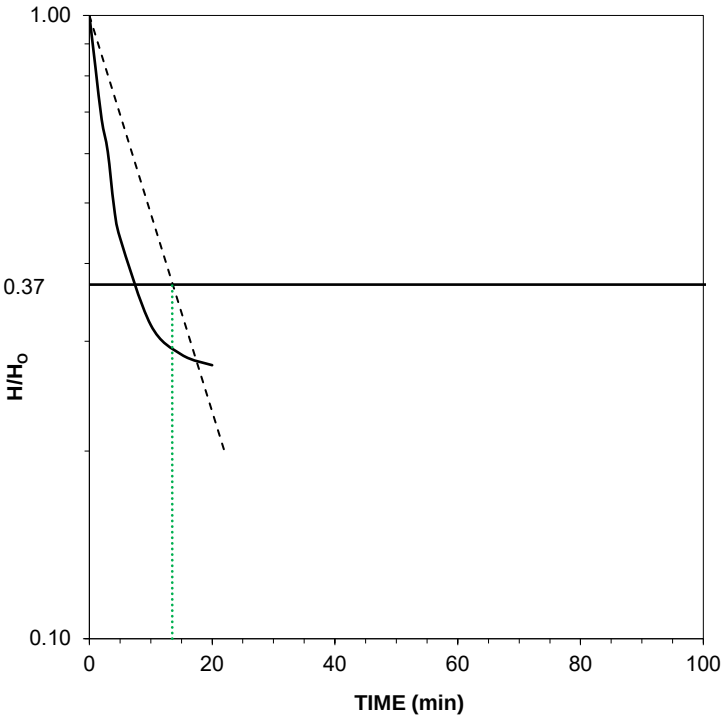
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DEPTH RECORD

DEPTH OF BOREHOLE	3.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.10 m
DEPTH TO BASE OF CASING	3.00 m	INTERNAL DIAMETER OF CASING	0.10 m
TEST INTERVAL	0.00 m		
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	2.65 m	DATE	04/04/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.00	1.74	0.91	1.00
1.00	1.90	0.75	0.82
2.00	2.03	0.62	0.68
3.00	2.10	0.55	0.60
4.00	2.20	0.45	0.49
5.00	2.25	0.40	0.44
10.00	2.36	0.29	0.32
15.00	2.39	0.26	0.29
20.00	2.40	0.25	0.27



Hvorslev method $$k = \frac{A}{FT}$$

Velocity graph method $$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* **B**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of casing, A	**0.0082** m^2	Cross sectional area of casing, A		**0.0082** m^2
Intake factor*, F	**0.281** m	Intake factor*, F		**0.281** m
Time lag, T	**810** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**3.6E-05** ms^{-1}	**Permeability, k**		**--** ms^{-1}

REMARKS

Test Operator: IR

Test data after 20 minutes appears to be influenced by disturbance or other factor and is considered to be unrepresentative and is not presented.

* See intake factors key sheet

CONTRACT	CHECKED
37567	**DM**

IR DM

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SOAKAWAY TEST

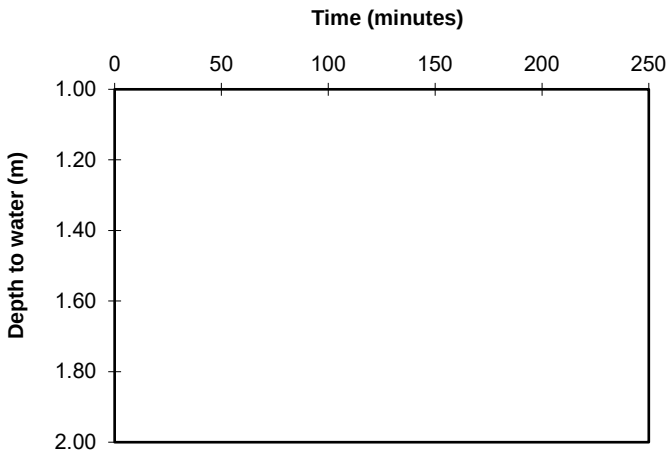
CLIENT MANCHESTER METROPOLITAN UNIVERSITY
SITE MMU, ALL SAINTS LIBRARY BOREHOLE **WS03**
DATE 07/04/2023

TEST 1

DIAMETER	0.10	m
DEPTH	3.00	m
WATER LEVEL	Dry	
FILL LEVEL	2.90	m
v_{p75-25}		m^3
a_{p50}		m^2
t_{p75-25}		min

soil infiltration rate, *f* **ms^{-1}**

Borehole collapsed to 2.75m upon adding water.

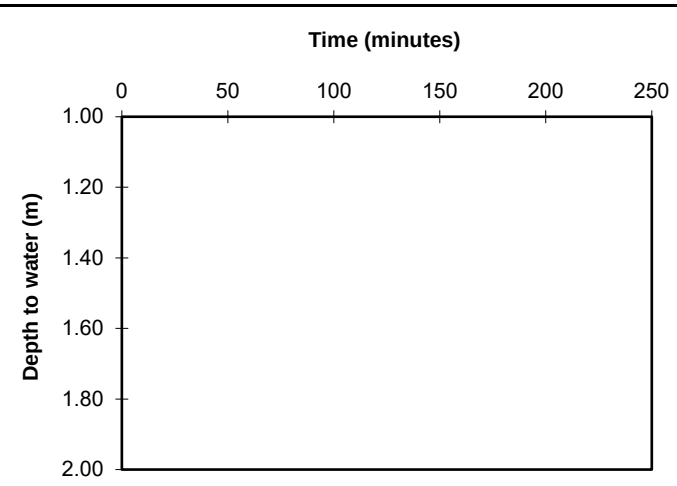


TEST 2

DIAMETER	0.10	m
DEPTH	2.75	m
WATER LEVEL	Dry	
FILL LEVEL	-	m
v_{p75-25}		m^3
a_{p50}		m^2
t_{p75-25}		min

soil infiltration rate, *f* **ms^{-1}**

Unable to effect rise in water level due to rapid infiltration

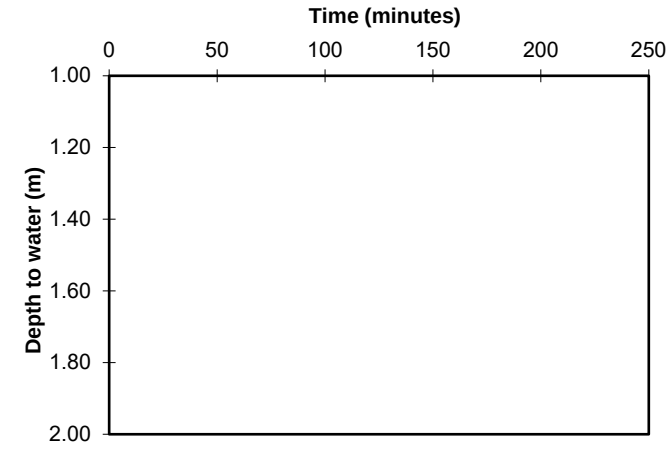


TEST 3

DIAMETER		m
DEPTH	2.75	m
WATER LEVEL	Dry	
FILL LEVEL	-	m
v_{p75-25}		m^3
a_{p50}		m^2
t_{p75-25}		min

soil infiltration rate, *f* **ms^{-1}**

Unable to effect rise in water level due to rapid infiltration



Remarks Test carried out in accordance with BRE DG 365 (2016) but on a small scale

CONTRACT	CHECKED
37567	**JH**

AB / JH

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TRIAL PIT LOG

DP01 PIT

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SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 05 April 2023 Easting 384253 Scale 1:25

End Date 05 April 2023 Northing 397195 Ground Level 37.10mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Reddish brown block paving (0.05m) over light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite. (MADE GROUND)	0.15	36.95	
1B	0.20	0.60			Dark grey gravelly ashy fine to coarse SAND. Gravel is angular to subrounded fine and medium coal, mudstone and brick. (MADE GROUND)	0.20	36.90	
1ES	0.20							
2D	0.40				Light brown and grey slightly silty gravelly fine to coarse SAND with a low angular brick cobble content . Gravel is fine to coarse angular to subrounded sandstone, brick and quartzite. (MADE GROUND)			
2ES	0.60							
3B	0.70	1.20			0.60 - 1.20m: Becoming clayey to very clayey			
4D	0.90							
					Trial pit Completed at 1.20m	1.20	35.90	

Equipment: Pit excavated by Hand tools

Pit width x length: 0.30m x 0.30m

Sidewall stability:

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.20m.

Remarks: Dynamic probe test carried out from base of pit, results reported seperately.

CONTRACT	CHECKED
37567	JH

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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DYNAMIC PROBE RESULTS

DP01

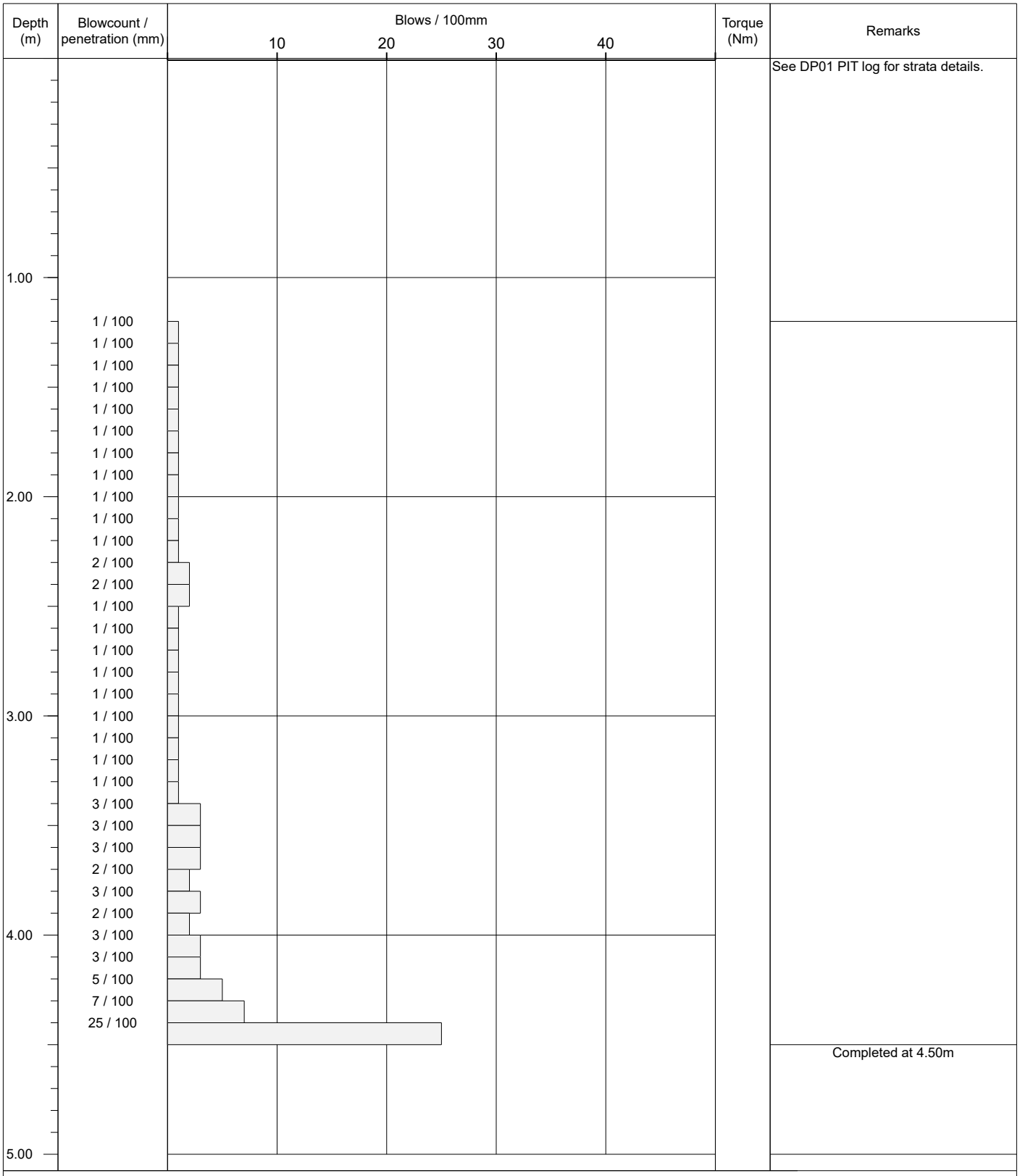
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SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Date 05 April 2023 Easting 384253 Scale 1:25

Northing 397195 Ground Level 37.10mOD Depth 4.50 m



Method: Undertaken in accordance with BS EN ISO 22476-2

Probe type: Superheavy (63.5kg hammer mass/750mm drop)

CONTRACT	CHECKED
37567	JH

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TRIAL PIT LOG

DP02 PIT

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 05 April 2023 Easting 384253 Scale 1:25

End Date 05 April 2023 Northing 397195 Ground Level 37.15mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Reddish brown block paving over light brown slightly gravelly fine to coarse SAND. Gravel is fine subrounded quartzite. (MADE GROUND)	0.15	37.00	
					Dark grey gravelly ashy fine to coarse SAND. Gravel is fine and medium angular to subrounded coal, mudstone and brick (MADE GROUND)	0.20	36.95	
					Light brown and grey slightly silty gravelly fine to coarse SAND with a low angular brick cobble content. Gravel is fine to coarse angular to subrounded sandstone, brick and quartzite. (MADE GROUND) 0.70 - 1.20m: Becoming clayey to very clayey			
					Trial pit Completed at 1.20m	1.20	35.95	

Equipment: Pit excavated by Hand tools

Pit width x length: 0.30m x 0.30m

Sidewall stability:

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.20m.

Remarks: Dynamic probe test carried out from base of pit, results reported seperately.

CONTRACT	CHECKED
37567	JH

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

DYNAMIC PROBE RESULTS

DP02

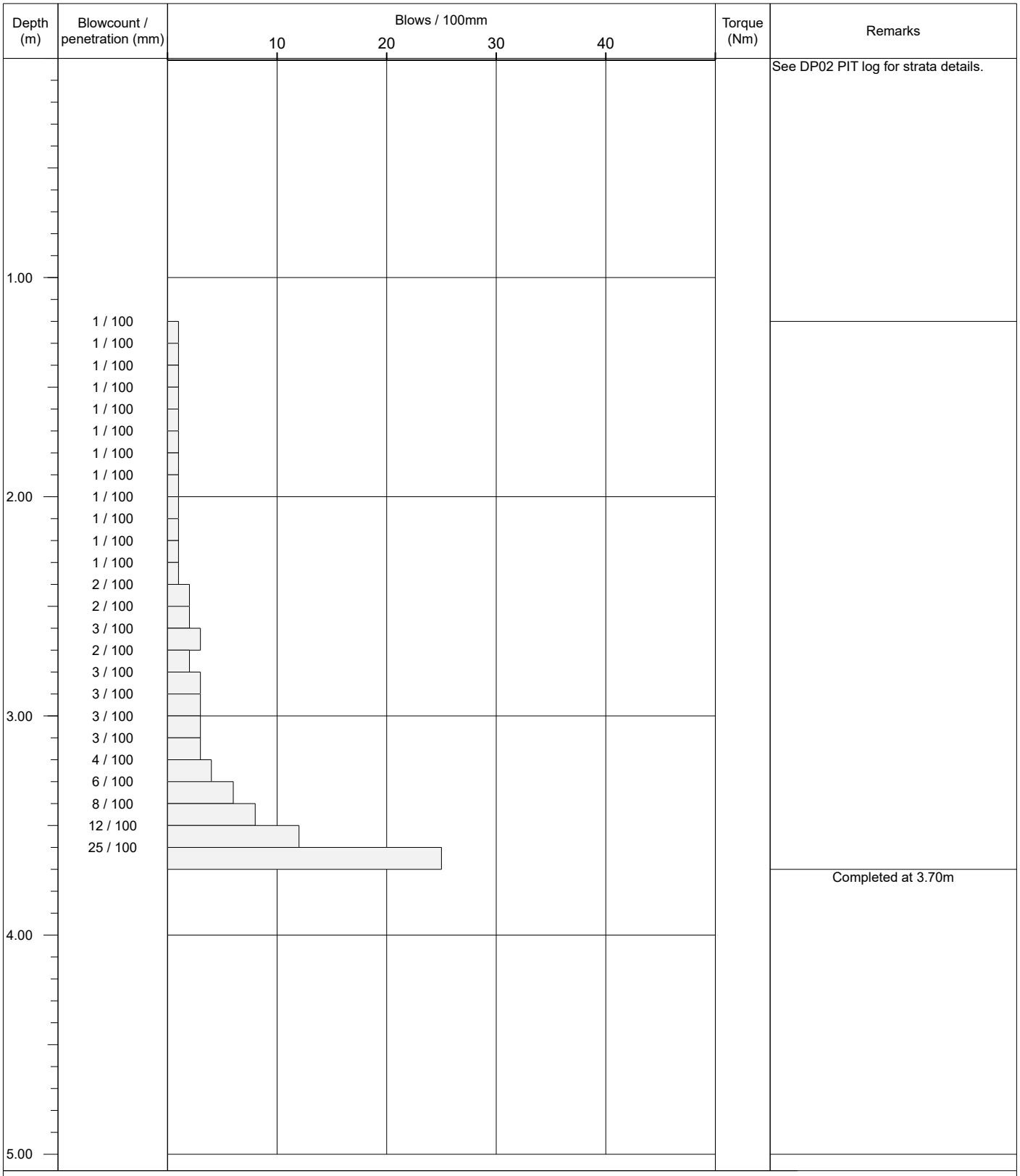
CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Date 05 April 2023 Easting 384253 Scale 1:25

Northing 397195 Ground Level 37.15mOD Depth 3.70 m



Method: Undertaken in accordance with BS EN ISO 22476-2

Probe type: Superheavy (63.5kg hammer mass/750mm drop)

CONTRACT	CHECKED
37567	JH

Geotechnical Engineering Limited

TRIAL PIT LOG

ITP01

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 13 April 2023 Easting 384235 Scale 1:25

End Date 14 April 2023 Northing 397186 Ground Level 37.10mOD Depth 1.50 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.15				Grey concrete paving slabs (0.05m) over light yellowish brown slightly gravelly fine to coarse SAND. Gravel is fine subrounded quartzite. (MADE GROUND)	0.10	37.00	
1B	0.20	0.35			Light yellowish brown sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.15	36.95	
2D	0.40				0.10m: Vertical black corrugated plastic pipe (200mm diameter) in south east of pit. No services or other features present (pipe empty), final depth not recorded. Removed to allow excavation.	0.35	36.75	
3B	0.40	0.80						
2ES	0.60				Light grey sandy angular to subrounded fine to coarse limestone and quartzite GRAVEL (possibly partially cemented). (MADE GROUND)			
4D	0.70				Dark grey gravelly ashy fine to coarse SAND with rare fragments of wood and a medium angular brick cobble content. Gravel is angular to subrounded fine and medium slag, mudstone and brick. (MADE GROUND)	0.80	36.30	
5B	0.90	1.40			0.70 - 0.80m: With a high cobble content.			
3ES	1.20				Yellowish brown silty gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse sandstone, mudstone and limestone. (MADE GROUND)			
6D	1.30							
					Trial pit Completed at 1.50m	1.50	35.60	

Equipment: Pit excavated by Hand tools

Pit width x length: 0.87m x 0.90m

Sidewall stability: Stable

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.50m.

CONTRACT	CHECKED
37567	JH

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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TRIAL PIT LOG

ITP04B

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SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 12 April 2023 Easting 384268 Scale 1:25

End Date 12 April 2023 Northing 397198 Ground Level 37.15mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Reddish brown block paving (0.05m) over light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite. (MADE GROUND)	0.10	37.05	
1B	0.20	0.60			Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.20	36.95	
1ES	0.20				Light grey CONCRETE. (MADE GROUND)			
2D	0.40				0.40m: 10mm diameter reinforcing bar.			
2ES	0.65							
3B	0.70	1.20			Greyish brown slightly silty gravelly fine to coarse SAND with a low angular brick and concrete cobble content and rare pockets of soft to firm brown mottled yellowish light brown slightly sandy clay. Gravel is angular and subangular fine to coarse brick, concrete and sandstone. (MADE GROUND)	0.65	36.50	
4D	0.90							
3ES	1.20				Trial pit Completed at 1.20m	1.20	35.95	

Equipment: Pit excavated by Hand tools and hydraulic breaker

Pit width x length: 0.30m x 0.40m

Sidewall stability: Stable

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.20m.

AGS

CONTRACT	CHECKED
37567	JH

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

ITP05

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 18 April 2023 Easting 384287 Scale 1:25

End Date 18 April 2023 Northing 397167 Ground Level 37.20mOD Depth 0.60 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B	0.05	0.13			Reddish brown block paving (0.05m) over light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite. (MADE GROUND)	0.13	37.07	
1ES	0.15				Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.20	37.00	
2D	0.20				Black plastic geogrid over light grey CONCRETE (MADE GROUND)	0.45	36.75	
2ES	0.50				Reddish brown slightly silty gravelly fine to coarse SAND. Gravel is subangular and subrounded fine to coarse quartzite and sandstone. (MADE GROUND)	0.60	36.60	
3D	0.60				Soft light brown sandy CLAY.	0.65	36.55	
					Trial pit Completed at 0.60m			

Equipment: Pit excavated by Hand tools and hydraulic breaker

Pit width x length: 0.80m x 1.54m

Sidewall stability: Stable

Groundwater: Not encountered

Backfill: Arisings 0.00 - 0.65m.

CONTRACT	CHECKED
37567	**JH**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

ITP06

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SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 13 April 2023 Easting 384242 Scale 1:25

End Date 14 April 2023 Northing 397141 Ground Level 37.25mOD Depth 1.10 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10				Yellowish brown concrete paving slabs (0.05m) over reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite and sandstone. (MADE GROUND)	0.10	37.15	
					0.00 - 0.20m: SOUTH SIDE OF PIT: Vegetation over soft sandy slightly gravelly silty CLAY with rare fine to coarse gravel sized fragments of plastic and wood. (1ES taken of this material).	0.27 0.35	36.98 36.90	
1B	0.40 - 0.50							
2D	0.40							
3B	0.50 - 1.00				Light yellowish brown poorly cemented CONCRETE (lean mix). (MADE GROUND)	0.52	36.73	
4D	0.50				Dark grey slightly gravelly ashy fine to coarse SAND with a low angular brick cobble content. Gravel is angular fine to medium slag and mudstone. (MADE GROUND)			
2ES	0.60				Grey slightly sandy angular medium and coarse limestone GRAVEL. (MADE GROUND)			
3ES	1.00				Dark grey locally clayey gravelly ashy fine to coarse SAND with rare fragments of plastic and a low locally medium angular brick and concrete cobble content. Gravel is angular to subrounded fine and medium slag, sandstone and brick. (MADE GROUND)	1.10	36.15	
5B	1.00 - 1.10				0.60 - 1.10m: SOUTH SIDE OF PIT: Soft brown slightly sandy CLAY.			
6D	1.10				0.85m: 120mm diameter black cast iron pipe (running parallel to building).			
					Trial pit Completed at 1.10m			

Equipment: Pit excavated by Hand tools

Pit width x length: 0.75m x 1.14m

Sidewall stability: Stable

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.10m.

CONTRACT	CHECKED
37567	**JH**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

ITP07

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

Sheet 1 of 1

Start Date 18 April 2023 Easting 384224 Scale 1:25

End Date 20 April 2023 Northing 397131 Ground Level 37.25mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B	0.10	0.30			Light grey concrete paving slabs (0.05m) over reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine quartzite and sandstone. (MADE GROUND)	0.10	37.15	
1ES	0.20							
2D	0.30				Light brown gravelly fine to coarse SAND with a low angular brick and concrete cobble content. Gravel is angular to subrounded fine to coarse quartzite, sandstone and slag. (MADE GROUND)	0.27 0.35	36.98 36.90	
2ES	0.50							
3B	0.50	0.80			Grey slightly sandy angular medium to coarse limestone GRAVEL. (MADE GROUND)			
4D	0.70				Greyish brown silty slightly gravelly fine to coarse SAND with a low angular brick cobble content. Gravel is angular to subrounded fine to coarse mudstone, sandstone and brick. (MADE GROUND)			
3ES	0.90				0.60 - 0.70m: Red angular brick cobbles adjacent to building.			
					0.70 - 1.00m: Soft slightly sandy brown CLAY adjacent to building.	1.00	36.25	
5B	1.10				0.85m: 120mm diameter black perforated cast iron pipe (running parallel to building).	1.10	36.15	
6D	1.20				Light grey CONCRETE. (MADE GROUND)	1.20	36.05	
					Soft light brown mottled reddish brown slightly sandy CLAY. (MADE GROUND)			
					Trial pit Completed at 1.20m			

Equipment: Pit excavated by Hand tools

Pit width x length: 0.85m x 1.04m

Sidewall stability: Unstable

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.20m.

CONTRACT	CHECKED
37567	**JH**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

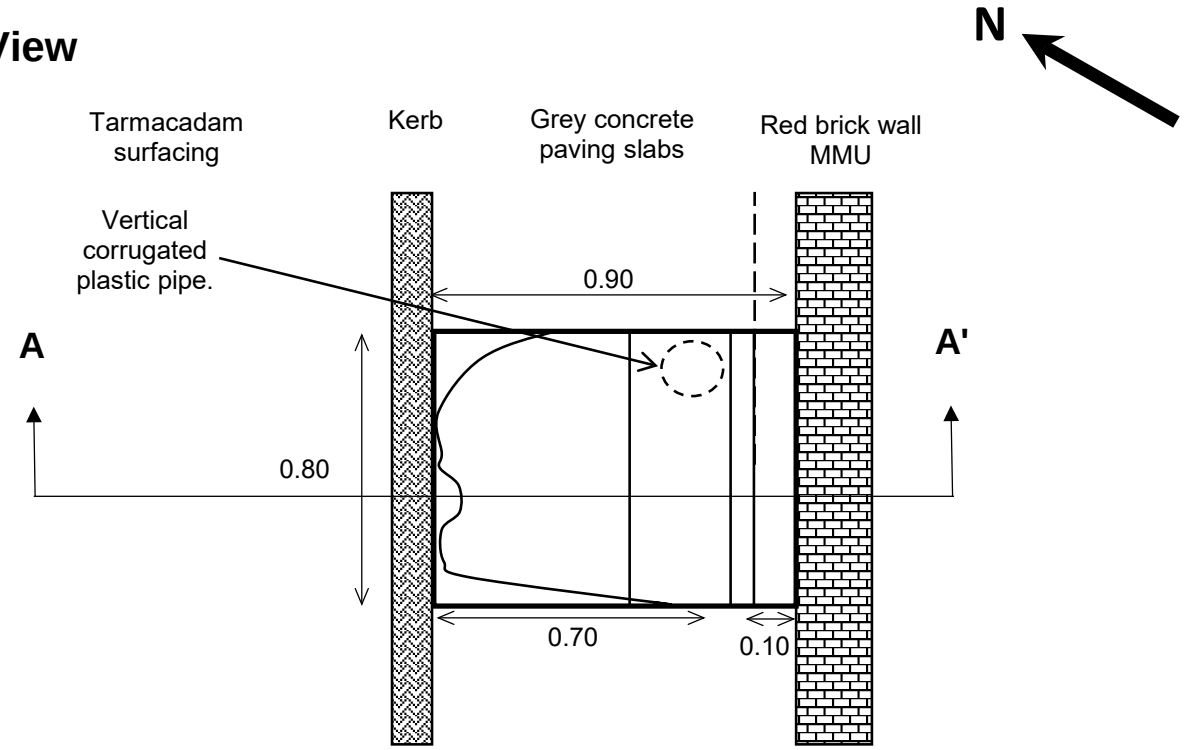
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

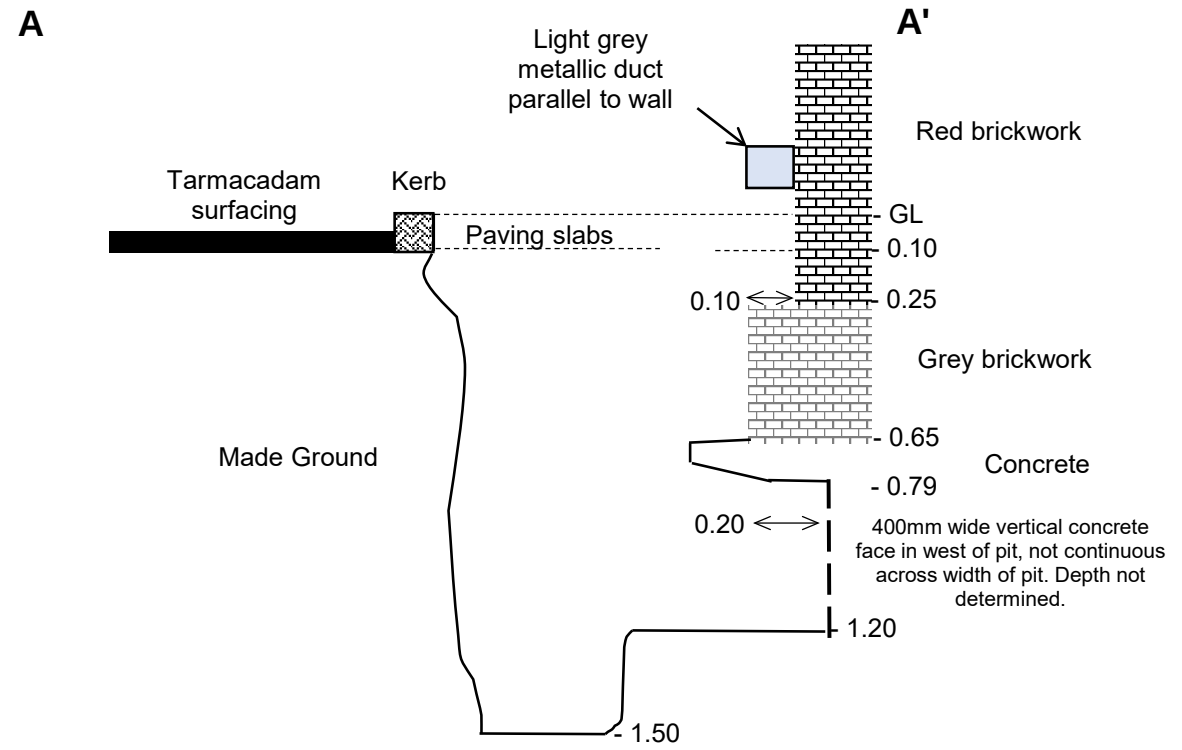
SITE MMU, ALL SAINTS LIBRARY

ITP01

Plan View



Section A - A'



All measurements in metres.
Not to scale.

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

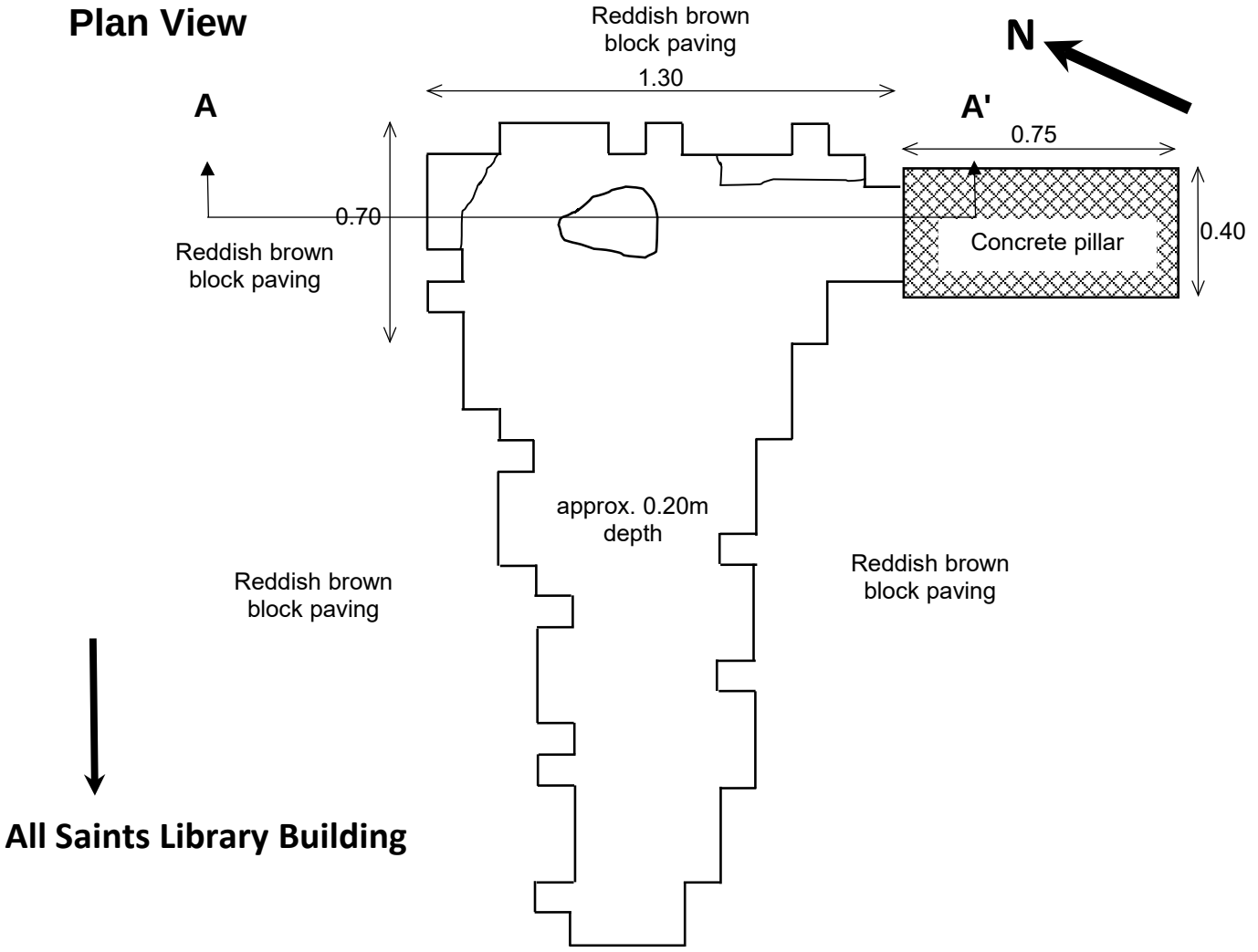
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

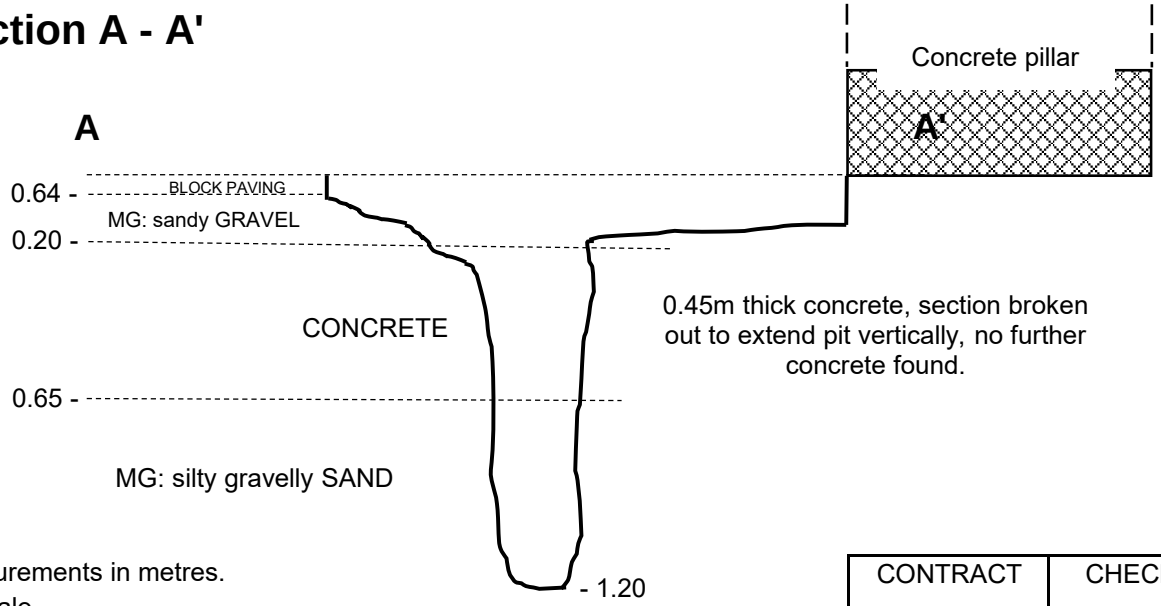
SITE MMU, ALL SAINTS LIBRARY

ITP04B

Plan View



Section A - A'



All measurements in metres.
Not to scale.

CONTRACT	CHECKED
37567	**JH**

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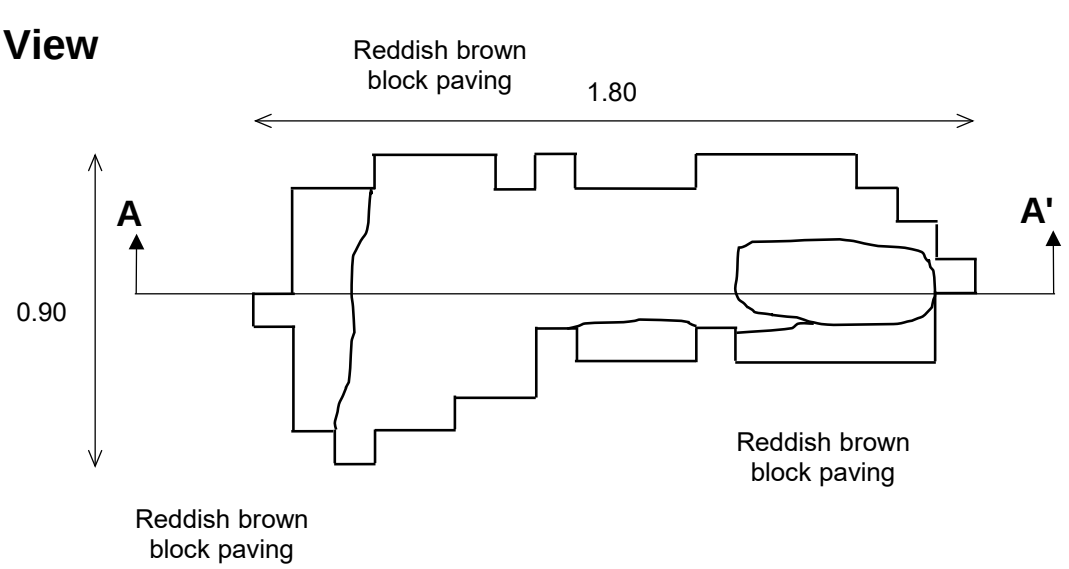
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

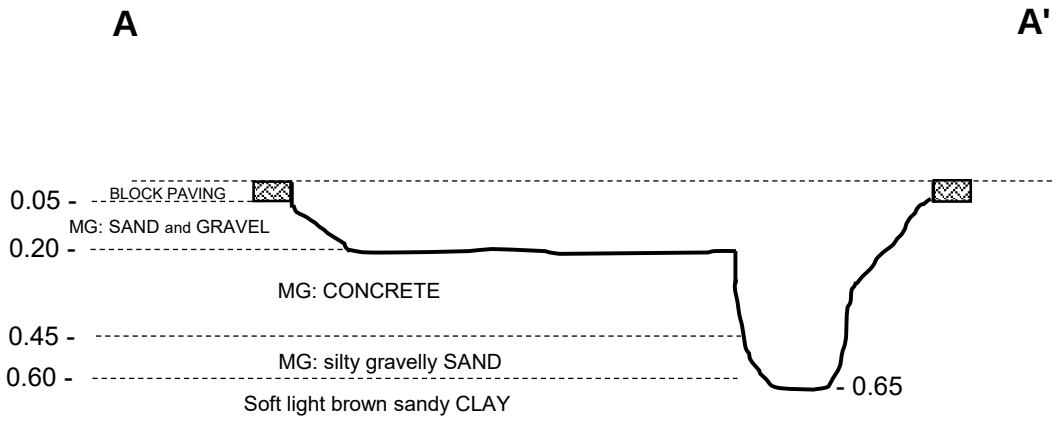
ITP05

Plan View



All Saints Library Building

Section A - A'



All measurements in metres.
Not to scale.

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

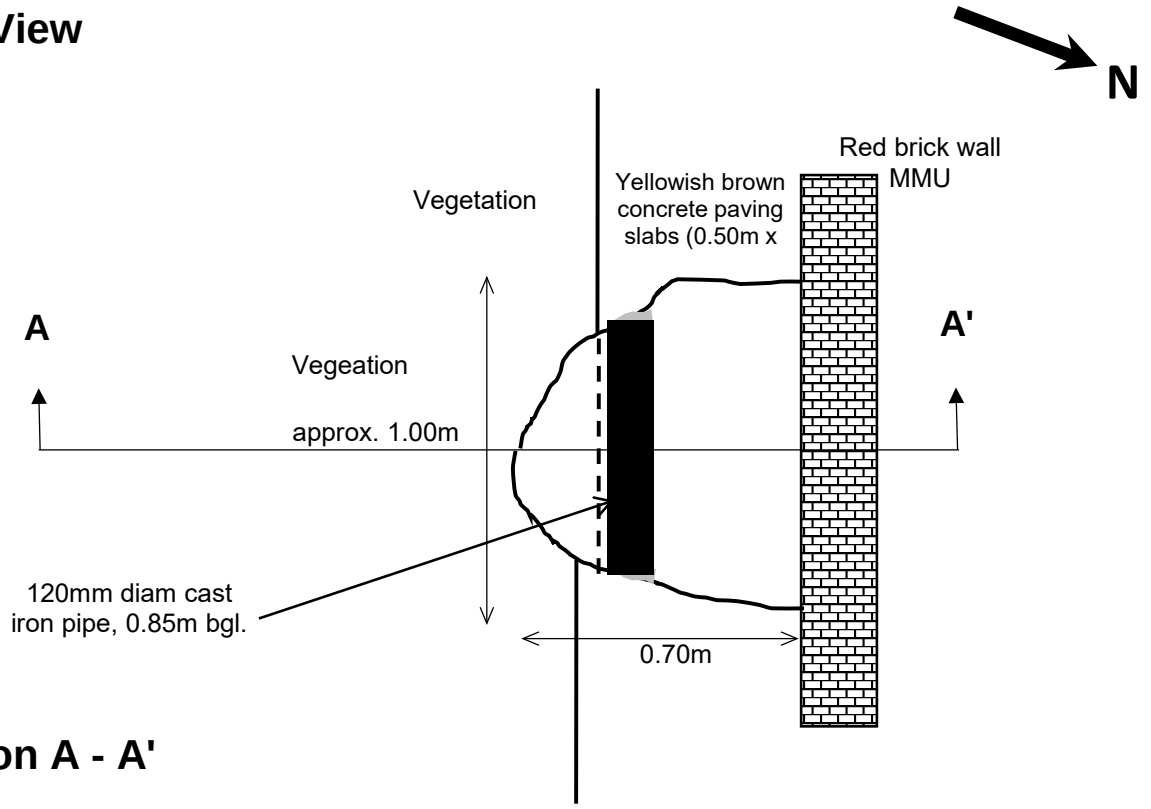
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

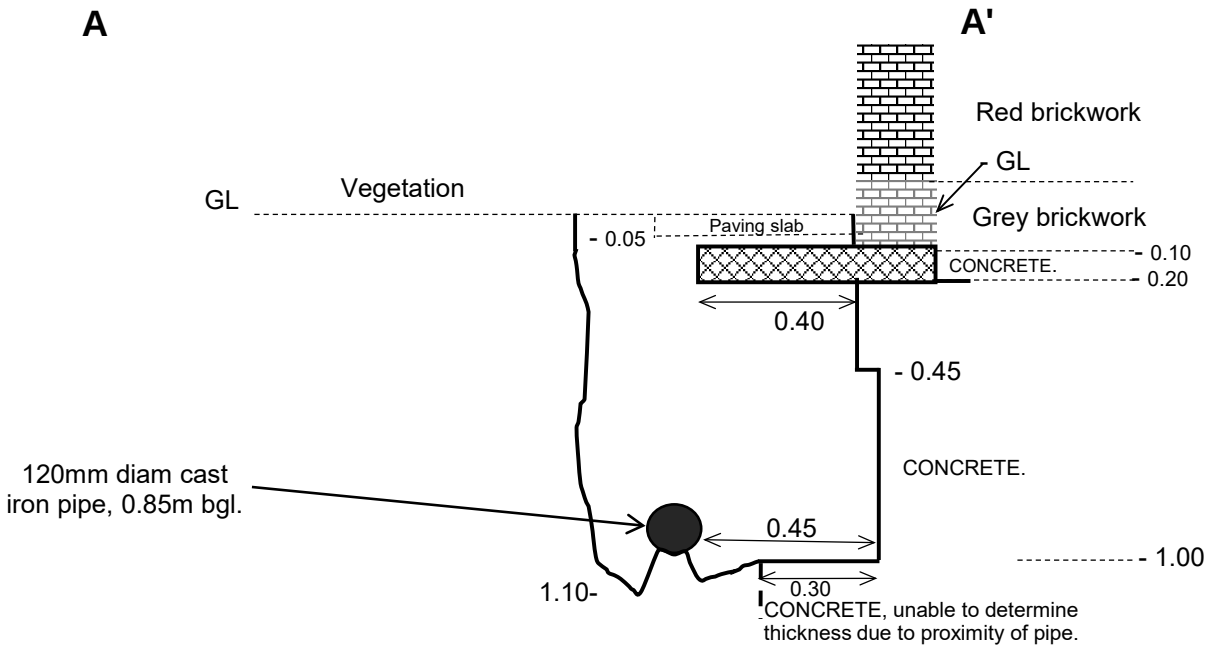
SITE MMU, ALL SAINTS LIBRARY

ITP06

Plan View



Section A - A'



All measurements in metres.
Not to scale.

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

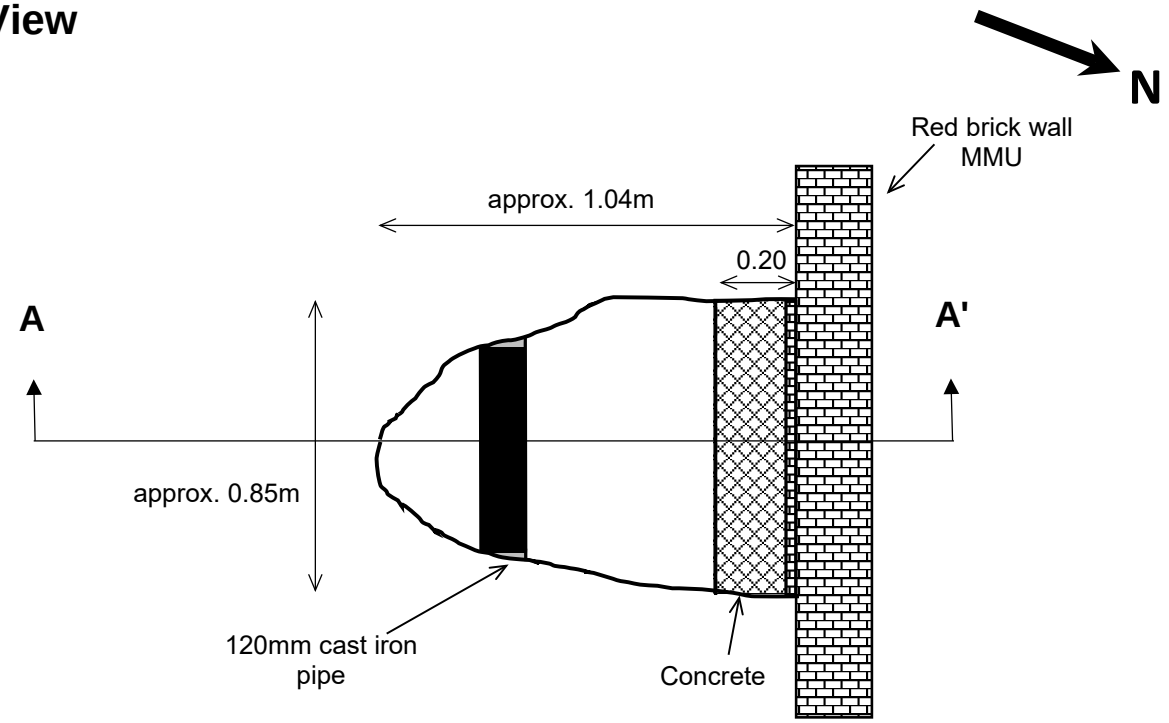
TRIAL PIT DETAIL

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

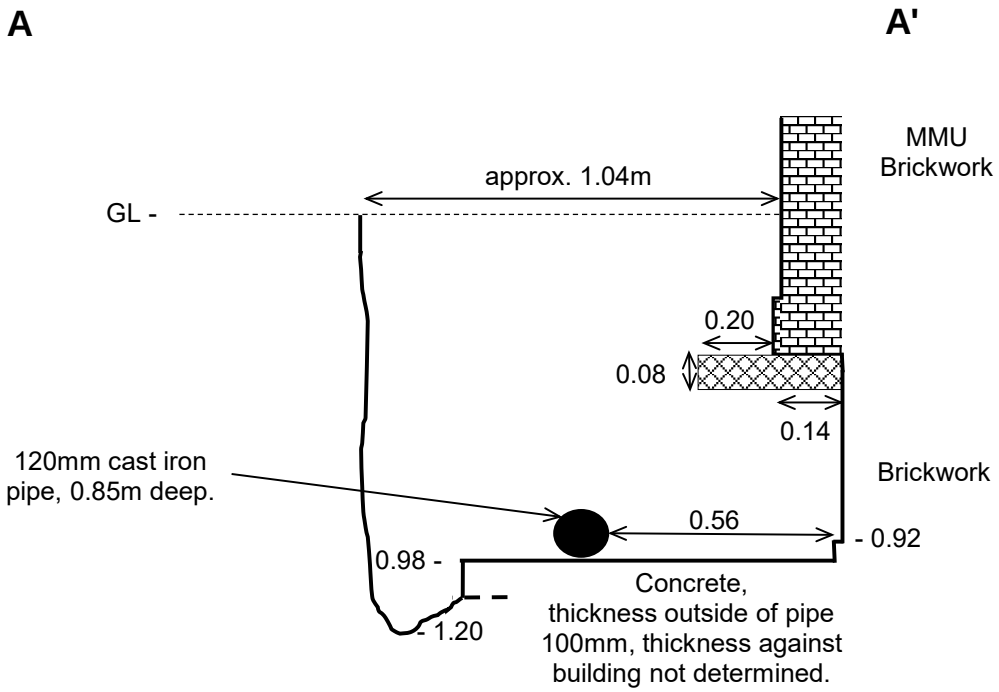
SITE MMU, ALL SAINTS LIBRARY

ITP07

Plan View



Section A - A'



All measurements in metres.
Not to scale.

CONTRACT	CHECKED
37567	**JH**

APPENDIX B

MONITORING RESULTS

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH01**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: SHALLOW

PURGING

Well depth from ground level	3.50	m	Length of water column in filter pack	1.10	m
Well inner diameter	50	mm	Volume of water in well & filter pack	8.8	litres*
Borehole/filter pack diameter	168	mm	Volume of water in pipework	3.2	litres
Top of filter pack	2.40	m	Volume of water to purge	29.7	litres**
Base of filter pack	3.50	m	Start time	9:22:00	
Filter pack length	1.10	m	Finish time	10:05:00	
Depth to water from ground level	0.78	m	Depth to water after purging	2.27	m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	25	27				
Time	09:22	09:46	10:03				
Observations	Reddish brown, silty, no odour	Reddish brown becoming clear, slightly silty, no odour	clear, no silt, no odour				
						Total volume removed in litres	27

Submersible pump

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Submersible pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	DM

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH01**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: DEEP

PURGING

Well depth from ground level	25.00	m	Length of water column in filter pack	1.15	m
Well inner diameter	19	mm	Volume of water in well & filter pack	6.0	litres*
Borehole/filter pack diameter	146	mm	Volume of water in pipework	3.4	litres
Top of filter pack	23.90	m	Volume of water to purge	21.4	litres**
Base of filter pack	25.05	m	Start time	10:15:00	
Filter pack length	1.15	m	Finish time	10:25:00	
Depth to water from ground level	11.80	m	Depth to water after purging	13.67	m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	22					
Time	10:15	10:25					
Observations	Reddish brown, silty, no odour	Clear, no odour, no silt					
						Total volume removed in litres	22

GENERAL DATA

Weather:	sunny, dry
Air temp °C	19
Purging equipment:	Inertial pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH02**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: Shallow

PURGING

Well depth from ground level	10.00	m	Length of water column in filter pack	4.00	m
Well inner diameter	50	mm	Volume of water in well & filter pack	32.1	litres*
Borehole/filter pack diameter	168	mm	Volume of water in pipework	9.6	litres
Top of filter pack	6.00	m	Volume of water to purge	105.9	litres**
Base of filter pack	10.00	m	Start time	10:36:00	
Filter pack length	4.00	m	Finish time	11:14:00	
Depth to water from ground level	1.10	m	Depth to water after purging	3.65	m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	25	50	75	100	106	
Time	10:36	10:48	10:56	11:04	11:12	11:14	
Observations	Reddish brown, no odour, silty	Reddish brown, no odour, silty	Reddish brown becoming light reddish brown, no odour, silty	Light reddish brown becoming clear, no odour, no silt	clear, no odour, no silt	clear, no odour, no silt	
						Total volume removed in litres	106

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Submersible pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	DM

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH02**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: Deep

PURGING

Well depth from ground level	24.50	m	Length of water column in filter pack	5.00	m
Well inner diameter	19	mm	Volume of water in well & filter pack	26.1	litres*
Borehole/filter pack diameter	146	mm	Volume of water in pipework	2.2	litres
Top of filter pack	20.00	m	Volume of water to purge	80.5	litres**
Base of filter pack	25.00	m	Start time	11:16:00	
Filter pack length	5.00	m	Finish time	11:40:00	
Depth to water from ground level	12.38	m	Depth to water after purging	14.62	m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	25	50	75	81		
Time	11:16	11:25	11:30	11:36	11:40		
Observations	Reddish brown, no odour, silty	Reddish brown, no odour, silty	Light reddish brown, no odour, slightly silty	clear , no odour, no silt	clear, no odour, no silt		
						Total volume removed in litres	81

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Inertial pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH03**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: Shallow

PURGING

Well depth from ground level	4.00	m	Length of water column in filter pack	2.00	m
Well inner diameter	50	mm	Volume of water in well & filter pack	16.0	litres*
Borehole/filter pack diameter	168	mm	Volume of water in pipework	2.0	litres
Top of filter pack	2.00	m	Volume of water to purge	50.2	litres**
Base of filter pack	4.00	m	Start time	11:48:00	
Filter pack length	2.00	m	Finish time	12:10:00	
Depth to water from ground level	0.96	m	Depth to water after purging		m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	25	49				
Time	11:48	11:57	12:10				
Observations							
						Total volume removed in litres	49

GENERAL DATA

Weather:	Sunny, Dry
Air temp °C	19
Purging equipment:	Submersible pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH03**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: Deep

PURGING

Well depth from ground level	19.50	m	Length of water column in filter pack	4.00	m
Well inner diameter	19	mm	Volume of water in well & filter pack	20.9	litres*
Borehole/filter pack diameter	146	mm	Volume of water in pipework	1.1	litres
Top of filter pack	16.00	m	Volume of water to purge	63.7	litres**
Base of filter pack	20.00	m	Start time	12:15:00	
Filter pack length	4.00	m	Finish time	12:31:00	
Depth to water from ground level	12.13	m	Depth to water after purging	14.36	m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	25	50	64			
Time	12:15	12:21	12:28	12:31			
Observations	Reddish brown, no odour, silty	Reddish brown becoming light reddish brown, no odour, silty	Reddish brown becoming clear, no odour,low silt becoming no silt	Clear, no odour, no silt			
						Total volume removed in litres	64

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Inertial pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	DM

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH04A**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: Shallow

PURGING

Well depth from ground level	3.00	m	Length of water column in filter pack	1.00	m
Well inner diameter	50	mm	Volume of water in well & filter pack	8.0	litres*
Borehole/filter pack diameter	168	mm	Volume of water in pipework	1.9	litres
Top of filter pack	2.00	m	Volume of water to purge	26.0	litres**
Base of filter pack	3.00	m	Start time	12:45:00	
Filter pack length	1.00	m	Finish time	13:02:00	
Depth to water from ground level	1.03	m	Depth to water after purging		m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	25	26				
Time	12:45	13:01	13:02				
Observations	Reddish brown, silty, no odour	Reddish brown becoming clear, no silt, no odour	clear, no silt, no odour				
						Total volume removed in litres	26

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Submersible pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **BH04A**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation: Deep

PURGING

Well depth from ground level	24.50	m	Length of water column in filter pack	11.00	m
Well inner diameter	19	mm	Volume of water in well & filter pack	57.4	litres*
Borehole/filter pack diameter	146	mm	Volume of water in pipework	0.3	litres
Top of filter pack	14.00	m	Volume of water to purge	172.6	litres**
Base of filter pack	25.00	m	Start time	13:05:00	
Filter pack length	11.00	m	Finish time	13:45:00	
Depth to water from ground level	12.95	m	Depth to water after purging	15.73	m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	50	75	100	125	150	173
Time	13:05	13:15	13:21	13:29	13:35	13:42	13:45
Observations	Reddish brown, silty, no odour	Reddish brown becoming light reddish brown, silty, no odour	Light reddish brown, silty, no odour	Clear,no silt, no odour	Clear,no silt, no odour	Clear,no silt, no odour	Clear , no silt, no odour
						Total volume removed in litres	173

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Inertial pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **WS02**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation:

PURGING

Well depth from ground level	2.00	m	Length of water column in filter pack	0.96	m
Well inner diameter	50	mm	Volume of water in well & filter pack	4.3	litres*
Borehole/filter pack diameter	115	mm	Volume of water in pipework		litres
Top of filter pack	1.00	m	Volume of water to purge	12.9	litres**
Base of filter pack	2.00	m	Start time	13:50:00	
Filter pack length	1.00	m	Finish time	13:55:00	
Depth to water from ground level	1.04	m	Depth to water after purging		m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	13					
Time	13:50	13:55					
Observations	Reddish brown, silty, no odour	Light reddish brown becoming clear, no silt, no odour					
						Total volume removed in litres	13

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Submersible pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

WELL PURGE RECORD

CLIENT MANCHESTER METROPOLITAN UNIVERSITY BOREHOLE No. **WS04**

SITE MMU, ALL SAINTS LIBRARY DATE 02/06/2023

Purging/testing carried out by: LFE Well Designation:

PURGING

Well depth from ground level	2.00	m	Length of water column in filter pack	0.93	m
Well inner diameter	50	mm	Volume of water in well & filter pack	4.2	litres*
Borehole/filter pack diameter	115	mm	Volume of water in pipework		litres
Top of filter pack	1.00	m	Volume of water to purge	12.5	litres**
Base of filter pack	2.00	m	Start time	14:00:00	
Filter pack length	1.00	m	Finish time	14:10:00	
Depth to water from ground level	1.07	m	Depth to water after purging		m

**Assuming a filter pack porosity of 30%* ***Based on three times well volume*

Note purging should continue until the following conditions are met:

1) Well water is reasonably clear

2) Removal of at least three well volumes or evacuation of all available water from well

3) During pumping ensure pH, conductivity, redox potential and temperature readings have stabilised.

FIELD MEASUREMENTS

Parameter	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	
No. of Litres Removed	0	13					
Time	14:00	14:10					
Observations	Reddish brown, silty, no odour	Light reddish brown becoming clear, no silt, no odour					
						Total volume removed in litres	13

GENERAL DATA

Weather:	Sunny, dry
Air temp °C	19
Purging equipment:	Submersible pump
Equipment ID	
Surge Technique:	
Water Description:	

REMARKS

CONTRACT	CHECKED
37567	**DM**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH01**

INSTALLED PIPE DEPTH (m) 25.00

PIPE DIAMETER (mm) 19

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2023 11:00											11.70	
16/05/2023 11:00											11.79	
02/06/2023 10:15											11.80	
20/06/2023 11:20											12.01	
06/07/2023 11:00											12.02	
03/08/2023 14:20											11.30	
09/08/2023 22:10											11.31	
11/08/2023 22:45											11.37	
27/09/2023 10:26											11.20	
25/10/2023 13:07											11.05	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH01**

INSTALLED PIPE DEPTH (m) 3.50

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2023 11:03											0.50	
16/05/2023 10:36											0.90	
02/06/2023 09:22											0.78	
20/06/2023 11:22											0.54	
06/07/2023 11:02											0.67	
03/08/2023 14:21											2.38	
09/08/2023 22:11											2.39	
11/08/2023 22:46											2.43	
27/09/2023 10:26											2.30	
25/10/2023 13:08											2.42	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH02**

INSTALLED PIPE DEPTH (m) 10.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2023 11:20											1.08	
16/05/2023 11:26											1.08	
02/06/2023 10:36											1.10	
20/06/2023 10:30												Unable to access well, van parked over cover.
06/07/2023 11:22											1.10	
03/08/2023 14:51											0.10	Cover damaged, surface water ingress. Cover sealed.
09/08/2023 22:21											1.12	Cover damaged, but sealed against water ingress.
11/08/2023 22:51											1.36	Cover damaged, but sealed against water ingress.
27/09/2023 10:15											4.20	
25/10/2023 12:45												Well flooded.

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH02**

INSTALLED PIPE DEPTH (m) 24.50

PIPE DIAMETER (mm) 19

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2023 11:15											12.39	
16/05/2023 11:38											12.42	
02/06/2023 11:16											12.38	
20/06/2023 10:30												Unable to access well, van parked over cover.
06/07/2023 11:20											12.32	
03/08/2023 14:50											0.00	Cover damaged, surface water ingress. Cover sealed.
09/08/2023 22:20											0.00	Cover damaged, but sealed against water ingress.
11/08/2023 22:50											0.00	Cover damaged, but sealed against water ingress.
27/09/2023 10:15												Dry
25/10/2023 12:46												Well flooded.

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH03**

INSTALLED PIPE DEPTH (m) 19.50

PIPE DIAMETER (mm) 19

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2023 11:45											12.10	
16/05/2023 12:11											12.08	
02/06/2023 12:15											12.13	
20/06/2023 10:25											12.34	
06/07/2023 12:05											12.12	
03/08/2023 15:20											2.20	
09/08/2023 23:05											2.25	
11/08/2023 23:15											2.30	
27/09/2023 09:15											2.45	
25/10/2023 13:17											2.51	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH03**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/04/2023 12:45											0.40	
05/05/2023 11:47											0.37	
16/05/2023 11:52											0.99	
02/06/2023 11:48											0.96	
20/06/2023 10:27											1.02	
06/07/2023 12:10											1.01	
03/08/2023 15:21											3.00	
09/08/2023 23:06											3.07	
11/08/2023 23:16											3.10	
27/09/2023 09:15											3.10	
25/10/2023 13:18											3.09	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH04A**

INSTALLED PIPE DEPTH (m) 24.50

PIPE DIAMETER (mm) 19

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/04/2023 17:15											14.50	
05/05/2023 12:20											12.92	
16/05/2023 12:51											12.89	
02/06/2023 12:50											12.95	
20/06/2023 10:10											13.05	
06/07/2023 12:30											12.65	
03/08/2023 15:30											10.28	
09/08/2023 22:50											10.17	
11/08/2023 23:05											10.08	
27/09/2023 08:41											10.05	
25/10/2023 13:23											9.98	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **BH04A**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/04/2023 17:15											1.00	
05/05/2023 12:25											0.99	
16/05/2023 12:30											1.02	
02/06/2023 12:38											1.03	
20/06/2023 10:12											1.06	
06/07/2023 12:32											1.05	
03/08/2023 15:31											2.81	
09/08/2023 22:51											2.93	
11/08/2023 23:06											2.91	
27/09/2023 08:41											2.95	
25/10/2023 13:24												Dry

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS02**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2023 00:00												Not monitored
16/05/2023 12:14	1018 / 0.00	14										
16/05/2023 12:15										0.0		
16/05/2023 12:15										0.0		
16/05/2023 12:16										0.0		
16/05/2023 12:16										0.0		
16/05/2023 12:17										0.0		
16/05/2023 12:17										0.0		
16/05/2023 12:18										0.0		
16/05/2023 12:18										0.0		
16/05/2023 12:19										0.0		
16/05/2023 12:19										0.0		
16/05/2023 12:20										0.0		
16/05/2023 12:25			1.4	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:25			1.4	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:26			1.4	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:26			1.4	0.0	20.1	0.0	0.0	0.0	0.0			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS02**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
16/05/2023 12:27			1.5	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:27			1.5	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:28			1.5	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:28			1.5	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:29			1.5	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:29			1.5	0.0	20.1	0.0	0.0	0.0	0.0			
16/05/2023 12:31											1.06	
02/06/2023 13:40											1.04	
20/06/2023 10:50	1003 / 0.00	16								0.0		
20/06/2023 10:51										0.0		
20/06/2023 10:52										0.0		
20/06/2023 10:53										0.0		
20/06/2023 10:54										0.0		
20/06/2023 10:55										0.0		
20/06/2023 10:56										0.0		
20/06/2023 10:57										0.0		
20/06/2023 10:58										0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS02**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/06/2023 11:00			0.0	0.0	20.7	0.0	0.0	0.0	1.1			
20/06/2023 11:01			0.0	0.0	20.4	0.0	0.0	0.0	1.4			
20/06/2023 11:02			0.0	0.0	20.3	0.0	0.0	0.0	2.0			
20/06/2023 11:03			0.1	0.0	20.3	0.0	0.0	0.0	2.0			
20/06/2023 11:04			0.2	0.0	20.2	0.0	0.0	0.0	2.0			
20/06/2023 11:05			0.3	0.0	20.0	0.0	0.0	0.0	1.9			
20/06/2023 11:06			0.7	0.0	19.7	0.0	0.0	0.0	1.9			
20/06/2023 11:07			0.7	0.0	19.6	0.0	0.0	0.0	1.6			
20/06/2023 11:08			0.7	0.0	19.6	0.0	0.0	0.0	1.6			
20/06/2023 11:09			0.7	0.0	19.6	0.0	0.0	0.0	1.6			
20/06/2023 11:11											1.07	
06/07/2023 10:50	1009 / 0.00	16										
06/07/2023 10:51										0.0		
06/07/2023 10:52										0.0		
06/07/2023 10:53										0.0		
06/07/2023 10:54										0.0		
06/07/2023 10:55										0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS02**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
06/07/2023 10:59			0.0	0.0	18.9	0.0	0.0	0.0	1.1			
06/07/2023 11:00			0.0	0.0	19.2	0.0	0.0	0.0	1.4			
06/07/2023 11:01			0.0	0.0	19.6	0.0	0.0	0.0	2.0			
06/07/2023 11:02			0.1	0.0	19.9	0.0	0.0	0.0	2.0			
06/07/2023 11:03			0.2	0.0	20.1	0.0	0.0	0.0	2.3			
06/07/2023 11:04			0.3	0.0	20.0	0.0	0.0	0.0	1.8			
06/07/2023 11:05			0.5	0.0	20.0	0.0	0.0	0.0	1.7			
06/07/2023 11:06			0.5	0.0	20.0	0.0	0.0	0.0	1.7			
06/07/2023 11:07			0.5	0.0	20.0	0.0	0.0	0.0	1.7			
06/07/2023 11:08			0.5	0.0	20.0	0.0	0.0	0.0	1.7			
06/07/2023 11:10											1.06	
03/08/2023 14:30												Dry
03/08/2023 14:31	1004 / 0.00	19								0.0		
03/08/2023 14:32										0.0		
03/08/2023 14:33										0.0		
03/08/2023 14:34										0.0		
03/08/2023 14:35										0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS02**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
03/08/2023 14:37			0.8	0.0	18.9	0.0	0.0	0.0	0.3			
03/08/2023 14:38			0.8	0.0	18.8	0.0	0.0	0.0	0.2			
03/08/2023 14:39			0.8	0.0	18.9	0.0	0.0	0.0	0.1			
03/08/2023 14:40			0.8	0.0	18.9	0.0	0.0	0.0	0.1			
03/08/2023 14:41			0.8	0.0	19.0	0.0	0.0	0.0	0.0			
09/08/2023 22:30												Dry
11/08/2023 22:55												Dry
27/09/2023 10:38												Dry
25/10/2023 12:51	994 / 0.00	9										
25/10/2023 12:52										0.0		GFM436 S/N 13074
25/10/2023 12:53										0.0		GFM436 S/N 13074
25/10/2023 12:54										0.0		GFM436 S/N 13074
25/10/2023 12:55										0.0		GFM436 S/N 13074
25/10/2023 12:56										0.0		GFM436 S/N 13074
25/10/2023 12:58			0.7	0.0	19.7	0.0	0.0	0.0	0.1			GFM436 S/N 13074
25/10/2023 12:59			0.8	0.0	19.7	0.0	0.0	0.0	0.1			GFM436 S/N 13074
25/10/2023 13:00			0.8	0.0	19.7	0.0	0.0	0.0	0.0			GFM436 S/N 13074

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS02**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
25/10/2023 13:01			0.8	0.0	19.7	0.0	0.0	0.0	0.0			GFM436 S/N 13074
25/10/2023 13:02			0.8	0.0	19.7	0.0	0.0	0.0	0.0			GFM436 S/N 13074
25/10/2023 13:03												Dry
25/10/2023 13:41	991 / 0.00	9										
25/10/2023 13:42										0.0		GFM436 S/N 12715
25/10/2023 13:43										-0.1		GFM436 S/N 12715
25/10/2023 13:44										0.0		GFM436 S/N 12715
25/10/2023 13:45										0.0		GFM436 S/N 12715
25/10/2023 13:46										0.0		GFM436 S/N 12715
25/10/2023 13:48			0.3	0.0	19.4	0.0	0.0	0.0	0.0			GFM436 S/N 12715
25/10/2023 13:49			0.2	0.0	19.4	0.0	0.0	0.0	0.0			GFM436 S/N 12715
25/10/2023 13:50			0.2	0.0	19.4	0.0	0.0	0.0	0.0			GFM436 S/N 12715
25/10/2023 13:51			0.2	0.0	19.4	0.0	0.0	0.0	0.0			GFM436 S/N 12715
25/10/2023 13:52			0.2	0.0	19.4	0.0	0.0	0.0	0.0			GFM436 S/N 12715

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS04**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/05/2022 00:00												Not monitored
16/05/2023 12:29	1020 / 0.00	14										
16/05/2023 12:30										0.0		
16/05/2023 12:30										0.0		
16/05/2023 12:31										0.0		
16/05/2023 12:31										0.0		
16/05/2023 12:32										0.0		
16/05/2023 12:32										0.0		
16/05/2023 12:33										0.0		
16/05/2023 12:33										0.0		
16/05/2023 12:34										0.0		
16/05/2023 12:34										0.0		
16/05/2023 12:45			1.7	0.0	18.7	0.0	0.0	0.0	0.1			
16/05/2023 12:45			1.8	0.0	18.9	0.0	0.0	0.0	0.1			
16/05/2023 12:46			2.0	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:46			1.5	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:47			1.6	0.0	18.9	0.0	0.0	0.0	0.0			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS04**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
16/05/2023 12:47			1.3	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:48			1.3	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:48			1.3	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:49			1.3	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:49			1.3	0.0	18.9	0.0	0.0	0.0	0.0			
16/05/2023 12:51											1.05	
02/06/2023 14:00											1.07	
20/06/2023 12:00	1003 / 0.00	14										
20/06/2023 12:01										0.0		
20/06/2023 12:02										0.0		
20/06/2023 12:03										0.0		
20/06/2023 12:04										0.0		
20/06/2023 12:05										0.0		
20/06/2023 12:10			1.0	0.0	20.1	0.0	0.0	0.0	1.8			
20/06/2023 12:11			1.0	0.0	19.2	0.0	0.0	0.0	1.9			
20/06/2023 12:12			0.9	0.0	18.7	0.0	0.0	0.0	1.8			
20/06/2023 12:13			0.8	0.0	20.1	0.0	0.0	0.0	2.0			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS04**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/06/2023 12:14			0.8	0.0	20.1	0.0	0.0	0.0	1.6			
20/06/2023 12:18											1.06	
06/07/2023 12:00	1010 / 0.00	14										
06/07/2023 12:01										0.0		
06/07/2023 12:02										0.0		
06/07/2023 12:03										0.0		
06/07/2023 12:04										0.0		
06/07/2023 12:05										0.0		
06/07/2023 12:06										0.0		
06/07/2023 12:08			1.1	0.0	19.3	0.0	0.0	0.0	2.0			
06/07/2023 12:09			1.0	0.0	19.3	0.0	0.0	0.0	1.8			
06/07/2023 12:10			1.0	0.0	19.2	0.0	0.0	0.0	1.8			
06/07/2023 12:11			0.9	0.0	18.7	0.0	0.0	0.0	1.8			
06/07/2023 12:12			0.8	0.0	18.7	0.0	0.0	0.0	1.8			
06/07/2023 12:13			0.8	0.0	18.7	0.0	0.0	0.0	1.6			
06/07/2023 12:14			0.7	0.0	18.7	0.0	0.0	0.0	1.5			
06/07/2023 12:15			0.7	0.0	18.7	0.0	0.0	0.0	1.5			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS04**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
06/07/2023 12:16			0.7	0.0	18.7	0.0	0.0	0.0	1.5			
06/07/2023 12:17			0.7	0.0	18.7	0.0	0.0	0.0	1.5			
06/07/2023 12:18											1.06	
03/08/2023 15:05											1.95	
03/08/2023 15:06	1003 / 0.00	19								0.0		
03/08/2023 15:07										0.0		
03/08/2023 15:08										0.0		
03/08/2023 15:09										0.0		
03/08/2023 15:10										0.0		
03/08/2023 15:12			0.7	0.0	15.8	0.0	0.0	0.0	0.2			
03/08/2023 15:13			0.7	0.0	15.5	0.0	0.0	0.0	0.1			
03/08/2023 15:14			0.7	0.0	15.5	0.0	0.0	0.0	0.1			
03/08/2023 15:15			0.8	0.0	15.5	0.0	0.0	0.0	0.0			
03/08/2023 15:16			0.8	0.0	15.4	0.0	0.0	0.0	0.0			
09/08/2023 23:00											1.95	
11/08/2023 23:10											1.95	
27/09/2023 09:25												Dry

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS04**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
25/10/2023 12:25	995 / 0.00	9										Weather: crisp and sunny.
25/10/2023 12:26										0.0		GFM436 S/N 13074
25/10/2023 12:27										0.0		GFM436 S/N 13074
25/10/2023 12:28										0.0		GFM436 S/N 13074
25/10/2023 12:29										0.0		GFM436 S/N 13074
25/10/2023 12:30										0.0		GFM436 S/N 13074
25/10/2023 12:32			0.0	0.0	19.7	0.0	0.0	0.0	0.3			GFM436 S/N 13074
25/10/2023 12:33			0.0	0.0	19.7	0.0	0.0	0.0	0.3			GFM436 S/N 13074
25/10/2023 12:34			0.0	0.0	19.7	0.0	0.0	0.0	0.2			GFM436 S/N 13074
25/10/2023 12:35			0.0	0.0	19.7	0.0	0.0	0.0	0.3			GFM436 S/N 13074
25/10/2023 12:36			0.0	0.0	19.8	0.0	0.0	0.0	0.2			GFM436 S/N 13074
25/10/2023 12:37												Dry
25/10/2023 13:26	992 / 0.00	9										Weather: crisp and sunny.
25/10/2023 13:27										0.0		GFM436 S/N 12715
25/10/2023 13:28										-0.1		GFM436 S/N 12715
25/10/2023 13:29										0.0		GFM436 S/N 12715
25/10/2023 13:30										0.0		GFM436 S/N 12715

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: MANCHESTER METROPOLITAN UNIVERSITY

SITE: MMU, ALL SAINTS LIBRARY

LOCATION ID **WS04**

INSTALLED PIPE DEPTH (m) 2.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
25/10/2023 13:31										0.0		GFM436 S/N 12715
25/10/2023 13:33			0.0	0.0	19.7	0.0	0.0	0.0	0.2			GFM436 S/N 12715
25/10/2023 13:34			0.0	0.0	19.7	0.0	0.0	0.0	0.1			GFM436 S/N 12715
25/10/2023 13:35			0.0	0.0	19.7	0.0	0.0	0.0	0.0			GFM436 S/N 12715
25/10/2023 13:36			0.0	0.0	19.7	0.0	0.0	0.0	0.0			GFM436 S/N 12715
25/10/2023 13:37			0.0	0.0	19.7	0.0	0.0	0.0	0.0			GFM436 S/N 12715

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37567	**JH**

APPENDIX C

LABORATORY TESTING

2718

GEOTECHNICAL ENGINEERING LIMITED

Version No.	2
Reason for update	See remarks
Page No.	1 of 25
Date of Issue	15/06/2023

For the attention of Jack Palmer / David Marshall

TEST REPORT

PROJECT/SITE	MMU, ALL SAINTS LIBRARY	Samples received	17/04/2023
GEL REPORT NUMBER	37567	Schedule received	05/05/2023
Your ref/PO:		Testing commenced	11/05/2023
Test report refers to	Schedule 1	Status	Final

SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION (S) denotes testing was subcontracted		QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5, Water Content		10	YES
BS EN ISO 17892-12:2018, Liquid & Plastic Limits		9	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve		6	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette		1	YES
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock		7	YES
ISRM: Suggested Methods: 2007: Point Load Strength Test		23	YES
BRE SD1 Suite	(S)	19	YES/NO

General Remarks

This report may not be partially reproduced without written permission from this laboratory.

The results reported relate to samples received in the laboratory and the items tested.

Additional point load results added - BH01 22.17m, BH02 20.45m & 30.38m, BH03 19.38m, BH04A 13.40m

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Approved Signatories:

W Jones (Laboratory Manager) J Hanson (Director)

T Best (Deputy Laboratory Manager) N Parry (Director)

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
BH01	26D	7.00	7.00	15.0	BXE	11	32	15	17	Brown slightly sandy slightly gravelly CLAY
BH01	39D	11.05	11.05	9.5	BYE	11	21	13	8	Brown slightly gravelly sandy CLAY
BH02	22D	5.20	5.20	16.3	BYE	9	32	16	16	Brown slightly sandy slightly gravelly CLAY
BH03	39D	11.20	11.20	14.1	E					Reddish brown SAND
BH04A	9D	5.00	5.00	18.8	BXE	5	36	16	20	Brown slightly gravelly slightly sandy CLAY
BH04A	22D	10.00	10.00	15.8	BYE	8	34	16	18	Brown slightly sandy sightly gravelly CLAY
BH04A	29D	12.80	12.80	15.4	BXE	7	45	22	23	Pinkish brown mottled grey slightly gravelly slightly sandy silty CLAY
WS01	14B	4.30	4.30	16.0	BXE	15	33	15	18	Brown slightly sandy slightly gravelly CLAY
WS03	9D	2.85	2.85	30.2	BXE	13	44	21	23	Brown slightly sandy slightly gravelly CLAY
WS04	13D	5.00	5.00	17.7	BYE	6	39	18	21	Brown sligtly gravelly slightly sandy CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation

A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (60°C)
E - oven dried (105°C)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

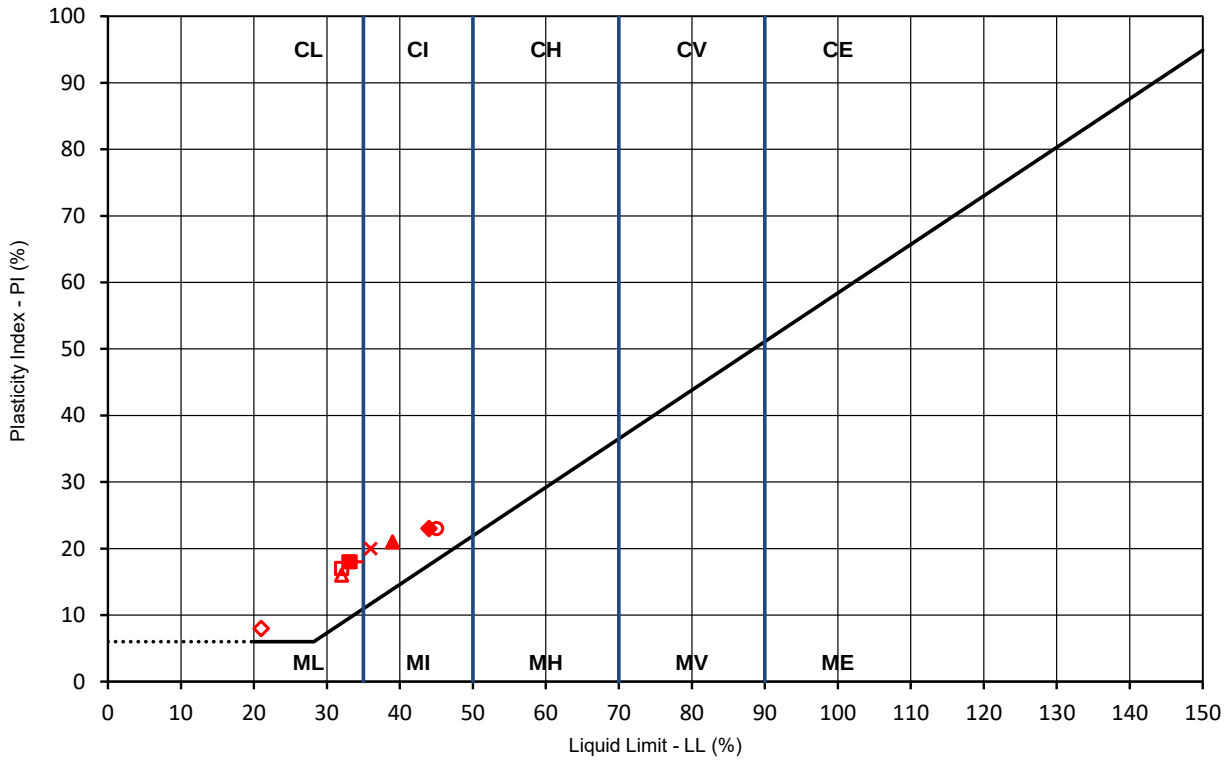
CONTRACT	CHECKED
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ATTERBERG LINE PLOT

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH01	7.00	32	15	17	
◇	BH01	11.05	21	13	8	
△	BH02	5.20	32	16	16	
×	BH04A	5.00	36	16	20	
+	BH04A	10.00	34	16	18	
○	BH04A	12.80	45	22	23	
■	WS01	4.30	33	15	18	
◆	WS03	2.85	44	21	23	
▲	WS04	5.00	39	18	21	

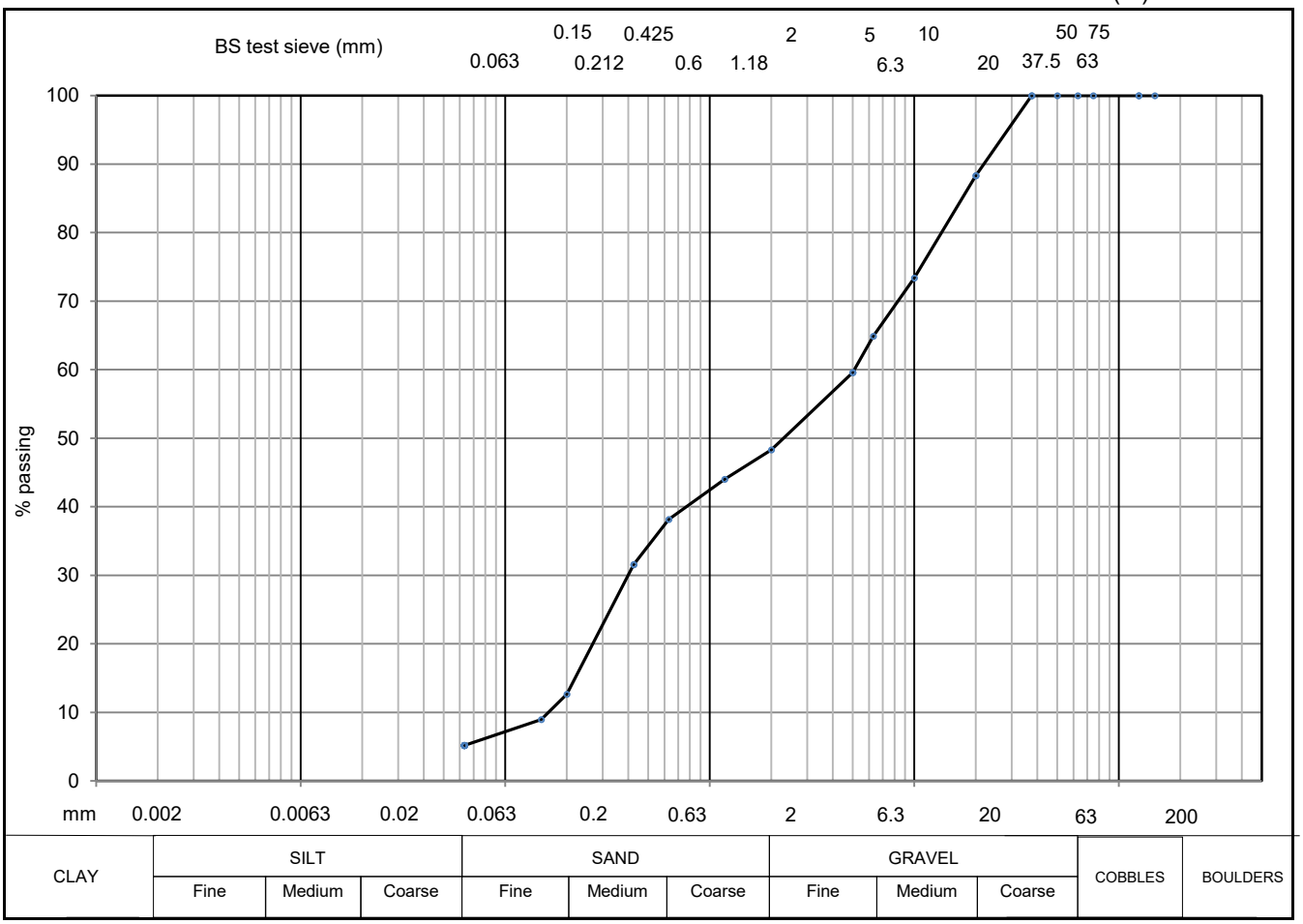
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	MANCHESTER METROPOLITAN UNIVERSITY	BH/TP No.	BH01
SITE	MMU, ALL SAINTS LIBRARY	SAMPLE No./TYPE	10L
		SAMPLE DEPTH (m)	1.70
DESCRIPTION	Brown slightly clayey very sandy GRAVEL	SPECIMEN TOP (m)	1.70
		SPECIMEN BASE (m)	2.20



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	5
SAND	43
GRAVEL	52
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	88
10	73
6.3	65

BS test sieve (mm)	% passing
5	60
2	48
1.18	44
0.63	38
0.425	32
0.2	13
0.15	9
0.063	5

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

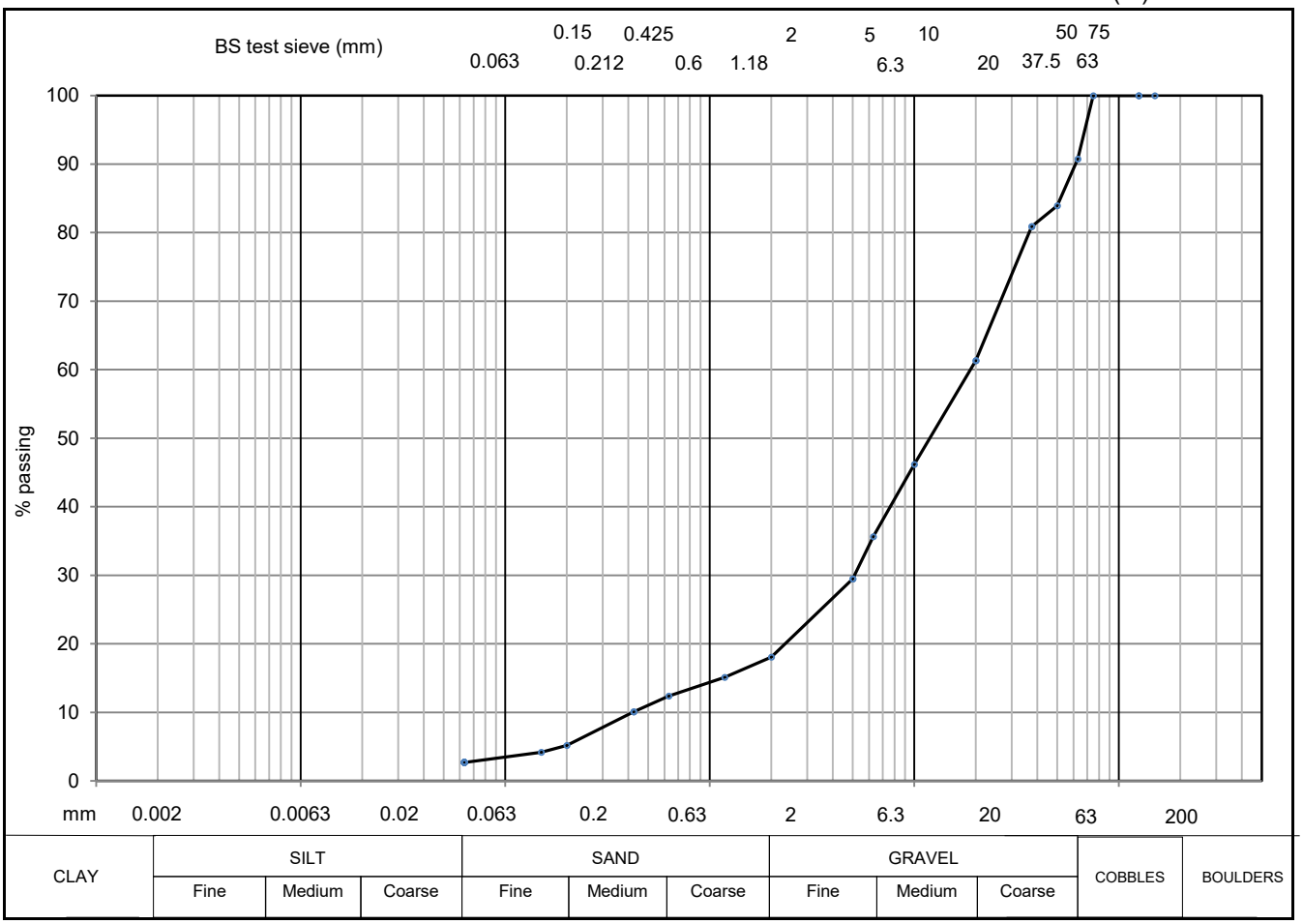
CONTRACT	CHECKED
37567	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	MANCHESTER METROPOLITAN UNIVERSITY	BH/TP No.	BH01
SITE	MMU, ALL SAINTS LIBRARY	SAMPLE No./TYPE	16L
		SAMPLE DEPTH (m)	3.20
DESCRIPTION	Brown slightly clayey sandy GRAVEL with medium cobble content	SPECIMEN TOP (m)	3.20
		SPECIMEN BASE (m)	3.70



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	3
SAND	15
GRAVEL	73
COBBLE & BOULDER	9
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	29	20	
75	100	2	18	6	
63	91	1.18	15	2	
50	84	0.63	12		
37.5	81	0.425	10		
20	61	0.2	5		
10	46	0.15	4		
6.3	36	0.063	3		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

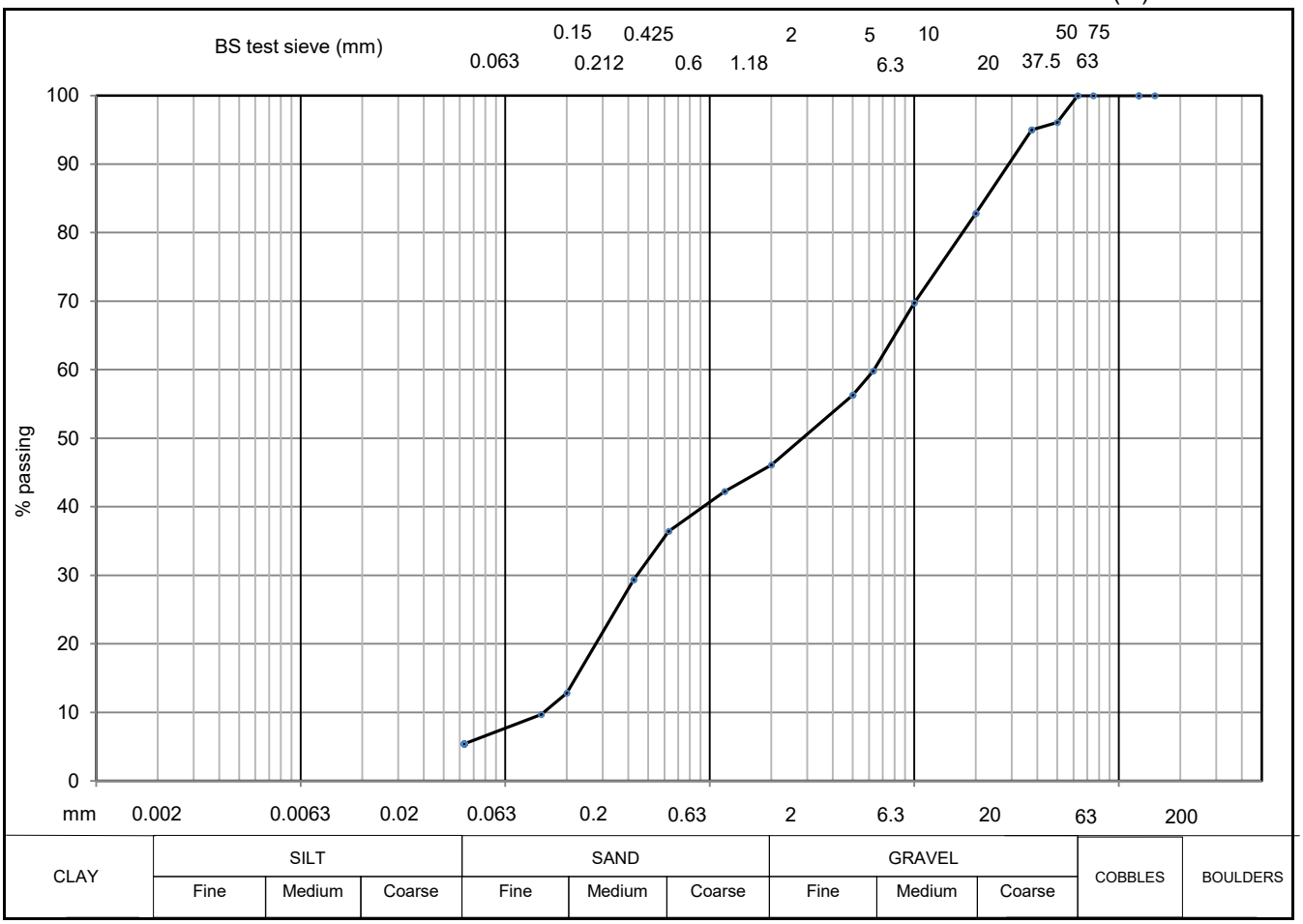
CONTRACT	CHECKED
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Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	MANCHESTER METROPOLITAN UNIVERSITY	BH/TP No.	BH02
SITE	MMU, ALL SAINTS LIBRARY	SAMPLE No./TYPE	12L
		SAMPLE DEPTH (m)	2.20
DESCRIPTION	Brown slightly clayey very gravelly SAND	SPECIMEN TOP (m)	2.20
		SPECIMEN BASE (m)	2.70



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	5
SAND	41
GRAVEL	54
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	56	20	
75		2	46	6	
63	100	1.18	42	2	
50	96	0.63	36		
37.5	95	0.425	29		
20	83	0.2	13		
10	70	0.15	10		
6.3	60	0.063	5		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

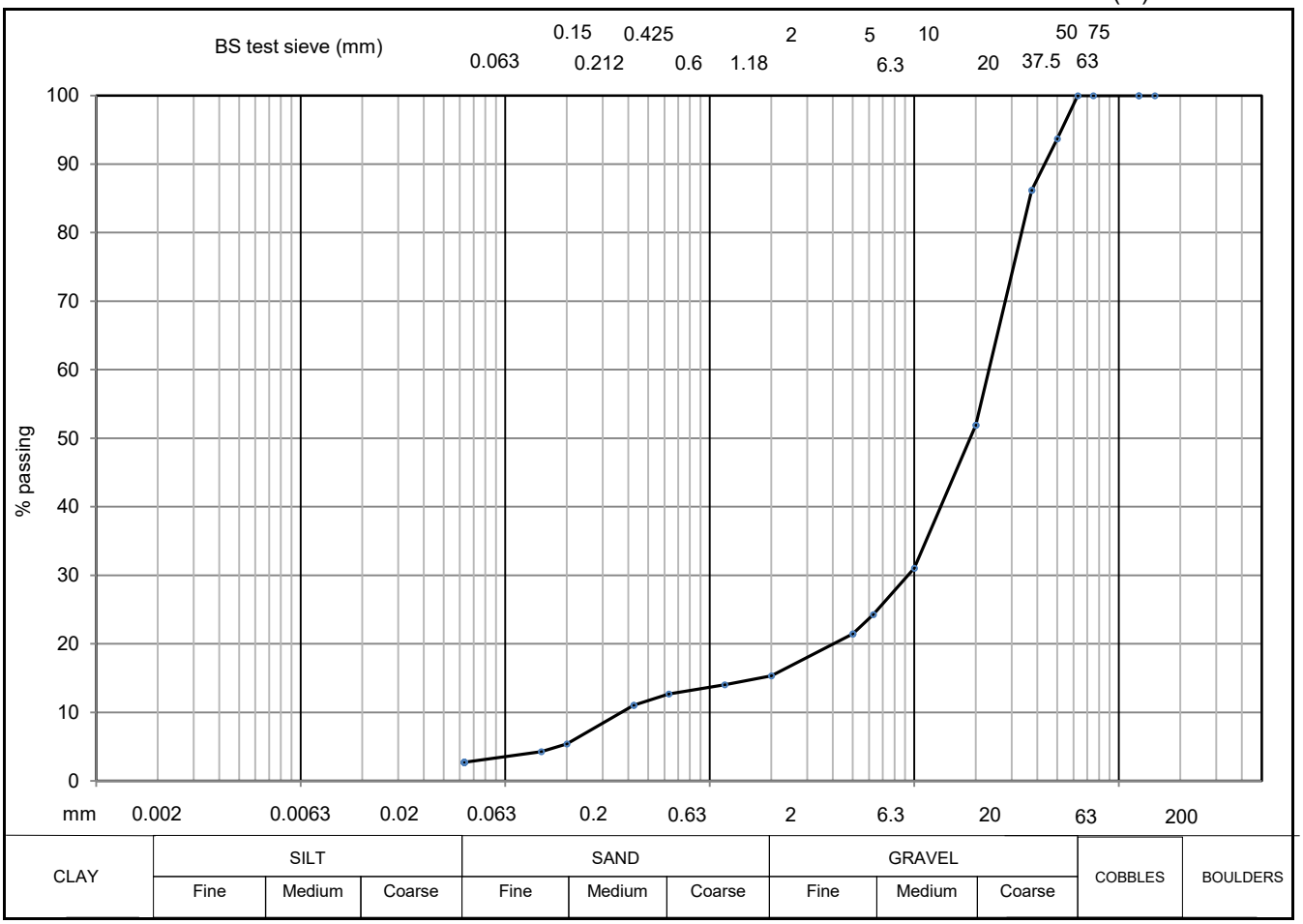
CONTRACT	CHECKED
37567	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	MANCHESTER METROPOLITAN UNIVERSITY	BH/TP No.	BH03
SITE	MMU, ALL SAINTS LIBRARY	SAMPLE No./TYPE	16L
		SAMPLE DEPTH (m)	3.70
DESCRIPTION	Brown slightly clayey sandy GRAVEL	SPECIMEN TOP (m)	3.70
		SPECIMEN BASE (m)	4.20



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	3
SAND	13
GRAVEL	85
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	21	20	
75		2	15	6	
63	100	1.18	14	2	
50	94	0.63	13		
37.5	86	0.425	11		
20	52	0.2	5		
10	31	0.15	4		
6.3	24	0.063	3		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

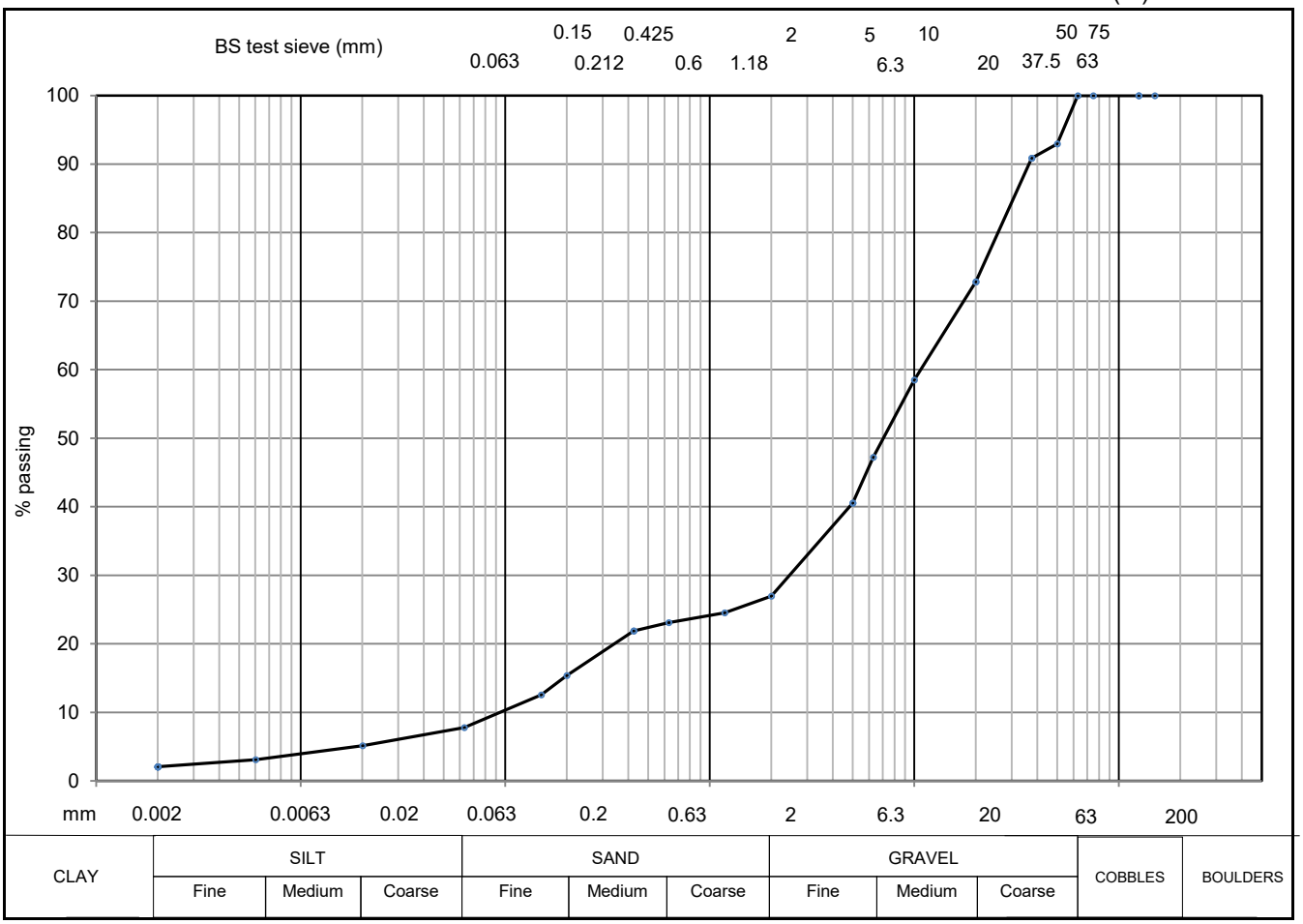
CONTRACT	CHECKED
37567	**WNJ**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	MANCHESTER METROPOLITAN UNIVERSITY	BH/TP No.	BH04A
SITE	MMU, ALL SAINTS LIBRARY	SAMPLE No./TYPE	4L
		SAMPLE DEPTH (m)	2.50
DESCRIPTION	Brown clayey sandy GRAVEL	SPECIMEN TOP (m)	2.50
		SPECIMEN BASE (m)	3.00



soil type	% fraction
CLAY	2
SILT	6
SILT & CLAY	8
SAND	19
GRAVEL	73
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	41	20	5
75		2	27	6	3
63	100	1.18	25	2	2
50	93	0.63	23		
37.5	91	0.425	22		
20	73	0.2	15		
10	58	0.15	13		
6.3	47	0.063	8		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

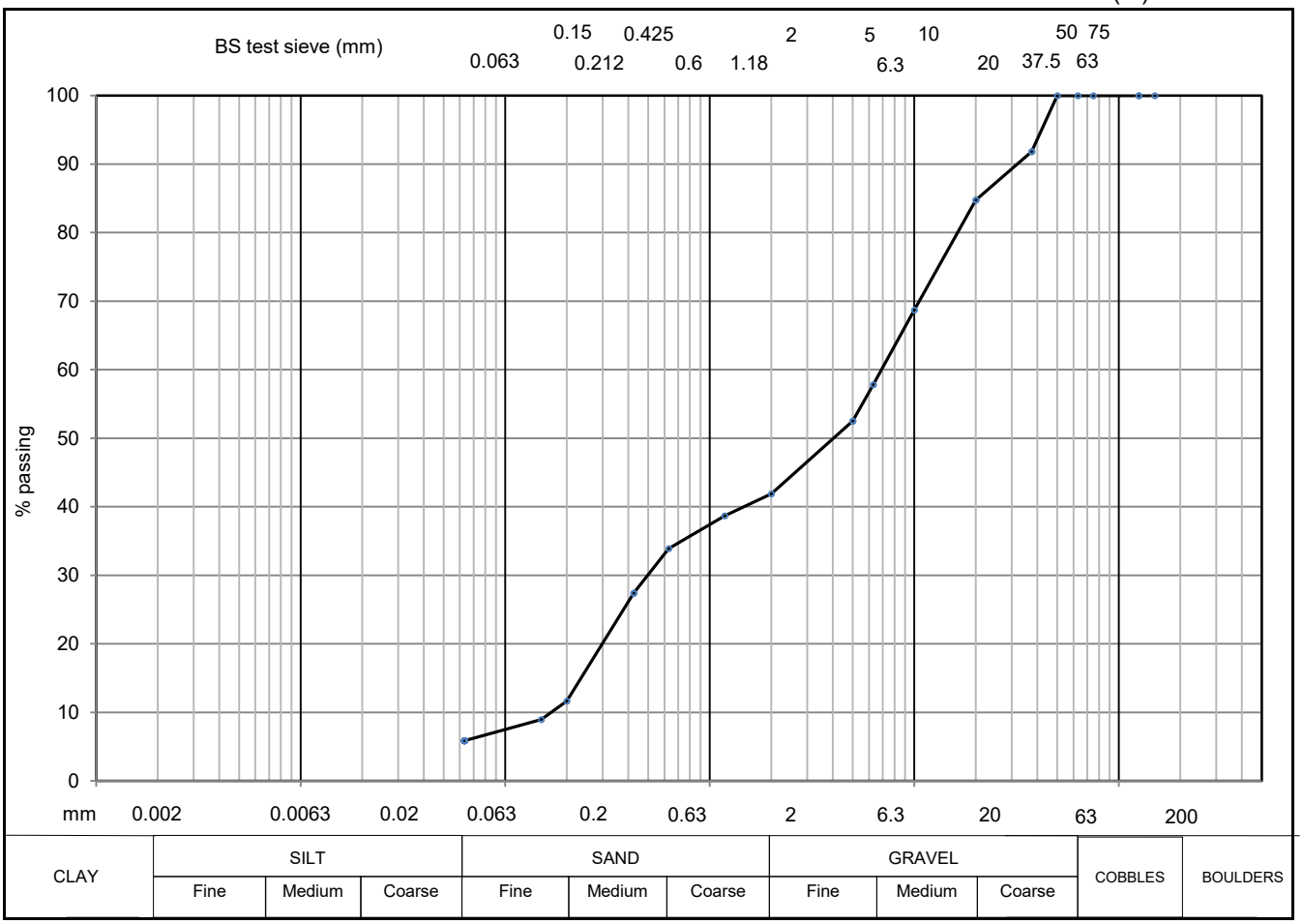
CONTRACT	CHECKED
37567	**WNJ**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	MANCHESTER METROPOLITAN UNIVERSITY	BH/TP No.	WS01
SITE	MMU, ALL SAINTS LIBRARY	SAMPLE No./TYPE	9B
		SAMPLE DEPTH (m)	2.40
DESCRIPTION	Brown clayey very sandy GRAVEL	SPECIMEN TOP (m)	2.40
		SPECIMEN BASE (m)	3.00



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	6
SAND	36
GRAVEL	58
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing
150	
75	
63	
50	100
37.5	92
20	85
10	69
6.3	58

BS test sieve (mm)	% passing
5	52
2	42
1.18	39
0.63	34
0.425	27
0.2	12
0.15	9
0.063	6

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

CONTRACT	CHECKED
37567	**WNJ**

Geotechnical Engineering Limited

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
BH01	55CS	18.60	18.60	116.3	299.9	2.58	7.9	2.40	20	02:32	4.60	Reddish brown SANDSTONE, N, Sh.
BH01	63CS	23.70	23.70	116.6	278.9	2.39	9	2.37	20	02:51	5.15	Reddish brown mottled grey SILTSTONE, N, Ax. H/D ratio falls outside ISRM specification
BH02	60CS	27.32	27.32	116.9	300.4	2.57	6.9	2.42	20	03:52	8.45	Reddish brown SILTSTONE, N, Ax.
BH03	50CS	17.32	17.32	116.8	296.5	2.54	6.4	2.38	20	04:39	8.38	Reddish brown SILTSTONE, N, Sh.
BH03	54CS	20.63	20.63	116.5	294.7	2.53	5.9	2.41	20	03:45	8.46	Brown SILTSTONE, N, AxCa.
BH03	56CS	21.35	21.35	116.3	303.8	2.61	7.8	2.39	20	03:11	7.90	Reddish brown SILTSTONE, N, AxCa.
BH03	58CS	23.30	23.30	116.2	297.8	2.56	10.4	2.29	20	03:40	14.52	Brown SANDSTONE, N, Sh.

general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:

moisture condition	sample storage	failure mode
N - natural moisture content	U - not wrapped	Ax - axial cleavage
F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
S - soaked	W - waxed	Sh - shear
P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
		Ot - other

CONTRACT	CHECKED
37567	**WNJ**

Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH01	16.00	I	X	P	90	30	30	0.30	58.63	0.09	1.07	0.09	Pinkish brown MUDSTONE
BH01	22.17	D	Y	N		50	120	1.02	120.00	0.07	1.48	0.11	Reddish brown SILTSTONE
BH01	22.17	A	X	N	120		70	1.43	103.42	0.13	1.39	0.19	Reddish brown SILTSTONE
BH01	22.55	D	Y	P		50	110	0.74	110.00	0.06	1.43	0.09	Reddish brown SILTSTONE
BH01	22.55	A	X	P	110		50	0.70	83.68	0.10	1.26	0.13	Reddish brown SILTSTONE
BH01	24.05	D	Y	P		45	120	0.34	120.00	0.02	1.48	0.04	Reddish brown SILTSTONE
BH01	24.05	A	X	P	120		45	0.29	82.92	0.04	1.26	0.05	Reddish brown SILTSTONE
BH02	30.22	D	Y	P		40	110	0.37	110.00	0.03	1.43	0.04	Reddish brown SILTSTONE
BH02	30.22	A	X	P	110		40	0.39	74.85	0.07	1.20	0.08	Reddish brown SILTSTONE
BH02	30.38	D	Y	N		60	120	0.44	120.00	0.03	1.48	0.05	Brown SILTSTONE
BH02	30.38	A	X	N	120		70	1.02	103.42	0.10	1.39	0.13	Brown SILTSTONE
BH02	16.00	D	Y	P		45	120	0.53	120.00	0.04	1.48	0.05	Reddish brown SILTSTONE
BH02	16.00	A	X	P	120		45	1.52	82.92	0.22	1.26	0.28	Reddish brown SILTSTONE
BH02	17.95	I	X	P	110	40	60	0.74	91.67	0.09	1.31	0.12	Reddish brown SILTSTONE
BH02	20.45	D	Y	N		30	120	1.68	120.00	0.12	1.48	0.17	Reddish brown SILTSTONE
BH02	20.45	A	X	N	120		60	2.58	95.75	0.28	1.34	0.38	Reddish brown SILTSTONE
BH02	21.25	D	Y	P		50	116	0.63	116.00	0.05	1.46	0.07	Reddish brown SILTSTONE
BH02	21.25	A	X	P	116		50	1.30	85.93	0.18	1.28	0.22	Reddish brown SILTSTONE
BH02	22.55	I	X	P	116	50	60	0.37	94.14	0.04	1.33	0.06	Reddish brown SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37567**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH03	10.40	I	X	P	80	40	60	7.94	78.18	1.30	1.22	1.59	Light grey SANDSTONE
BH03	16.20	I	Y	P	116	60	100	0.71	121.53	0.05	1.49	0.07	Reddish brown SANDSTONE
BH03	19.38	D	Y	N		60	120	3.10	120.00	0.22	1.48	0.32	Reddish brown SANDSTONE
BH03	19.38	A	X	N	120		70	1.96	103.42	0.18	1.39	0.25	Reddish brown SANDSTONE
BH03	19.50	D	Y	P		60	120	4.42	120.00	0.31	1.48	0.46	Reddish brown SANDSTONE
BH03	19.50	A	X	P	120		60	2.96	95.75	0.32	1.34	0.43	Reddish brown SANDSTONE
BH03	21.75	D	Y	P		40	120	1.96	120.00	0.14	1.48	0.20	Reddish brown SILTSTONE
BH03	21.75	A	X	P	120		40	1.93	78.18	0.32	1.22	0.39	Reddish brown SILTSTONE
BH03	23.60	I	X	N	116	55	70	2.08	101.68	0.20	1.38	0.28	Brown SANDSTONE
BH04A	13.40	D	Y	N		60	120	0.89	120.00	0.06	1.48	0.09	Reddish brown SILTSTONE
BH04A	13.40	A	X	N	120		70	1.00	103.42	0.09	1.39	0.13	Reddish brown SILTSTONE
BH04A	14.70	D	Y	P		70	116	0.19	116.00	0.01	1.46	0.02	Reddish brown SILTSTONE
BH04A	14.70	A	X	P	116		70	0.20	101.68	0.02	1.38	0.03	Reddish brown SILTSTONE
BH04A	18.05	D	Y	P		60	116	0.41	116.00	0.03	1.46	0.04	Brown SILTSTONE
BH04A	18.05	A	X	P	116		60	0.42	94.14	0.05	1.33	0.06	Brown SILTSTONE
BH04A	21.30	D	Y	P		60	120	0.28	120.00	0.02	1.48	0.03	Light grey SILTSTONE
BH04A	21.30	A	X	P	120		60	0.75	95.75	0.08	1.34	0.11	Light grey SILTSTONE
BH04A	26.20	D	Y	P		70	120	3.25	120.00	0.23	1.48	0.33	Brown SILTSTONE
BH04A	26.20	A	X	P	120		70	2.45	103.42	0.23	1.39	0.32	Brown SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37567**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT MANCHESTER METROPOLITAN UNIVERSITY

SITE MMU, ALL SAINTS LIBRARY

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH04A	29.15	D	Y	P		60	120	0.24	120.00	0.02	1.48	0.02	Reddish brown SILTSTONE
BH04A	29.15	A	X	P	120		60	1.70	95.75	0.19	1.34	0.25	Reddish brown SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37567**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

Certificate of Analysis

Certificate Number	23-12114	*Issued:*	02-Jun-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-12114
Client Reference	37567
Order No	6851
Contract Title	MMU, ALL ALL SAINTS LIBRARY
Description	12 Soil samples.
Date Received	19-May-23
Date Started	23-May-23
Date Completed	02-Jun-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-12114
Client Ref 37567
Contract Title MMU, ALL ALL SAINTS LIBRARY

			Lab No	2175434	2175435	2175436	2175437	2175438	2175439	2175440	2175441	2175442	2175443	2175444	2175445
			.Sample ID	BH01	BH01	BH01	BH02	BH02	BH02	BH02	BH02	BH03	BH03	BH03	BH03
			Depth	1.70-2.20	7.00-7.10	22.05-23.55	2.20-2.70	5.20-5.65	14.70-16.20	20.70-22.20	29.70-31.20	3.70-4.20	11.20-11.54	18.20-19.70	23.30-23.63
			Other ID	L10	D26	C60	L12	D22	C46	C54	C63	L16	D39	C51	CS58
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**												
Metals															
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Inorganics															
pH	DETSC 2008#		pH	8.3	7.5	8.8	8.1	8.4	8.7	7.8	8.6	9.0	8.7	8.4	8.8
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	1.0	6.8	4.6	5.1	8.1	6.0	2.0	7.0	3.4	3.7	5.0	4.4
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.0	1.2	< 1.0	< 1.0	< 1.0	< 1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	< 10	49	11	13	69	10	11	< 10	< 10	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	< 0.01	0.09	< 0.01	< 0.01	0.10	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.02	0.04	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 23-12114
Client Ref 37567
Contract MMU, ALL ALL SAINTS LIBRARY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2175434	BH01 1.70-2.20 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175435	BH01 7.00-7.10 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175436	BH01 22.05-23.55 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175437	BH02 2.20-2.70 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175438	BH02 5.20-5.65 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175439	BH02 14.70-16.20 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175440	BH02 20.70-22.20 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175441	BH02 29.70-31.20 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175442	BH03 3.70-4.20 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175443	BH03 11.20-11.54 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175444	BH03 18.20-19.70 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175445	BH03 23.30-23.63 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	

Key: P-Plastic G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Information in Support of the Analytical Results

Our Ref 23-12114
Client Ref 37567
Contract MMU, ALL ALL SAINTS LIBRARY

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Certificate of Analysis

Certificate Number	23-12112	*Issued:*	02-Jun-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-12112
Client Reference	37567
Order No	6851
Contract Title	MMU, ALL ALL SAINTS LIBRARY
Description	6 Soil samples.
Date Received	19-May-23
Date Started	23-May-23
Date Completed	02-Jun-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

ilac-MRA

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-12112
Client Ref 37567
Contract Title MMU, ALL ALL SAINTS LIBRARY

				Lab No	2175420	2175421	2175422	2175423	2175424	2175425
				.Sample ID	BH04A	BH04A	BH04A	WS01	WS03	WS04
				Depth	2.50-3.00	10.00-10.45	20.50-22.00	2.40-3.00	3.00-3.44	3.00-3.45
				Other ID	L4	D22	C36	B9	D10	D8
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Metals										
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l		< 10	< 10	< 10	< 10	< 10	< 10
Inorganics										
pH	DETSC 2008#		pH		8.0	8.5	9.0	8.3	10.1	8.2
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l		< 10	< 10	< 10	< 10	< 10	< 10
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l		59	8.0	5.3	18	17	14
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l		4.0	< 1.0	< 1.0	< 1.0	4.0	< 1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l		16	44	10	17	80	23
Sulphur as S, Total	DETSC 2320	0.01	%		< 0.01	0.08	< 0.01	0.01	0.03	0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%		0.01	0.05	0.01	0.01	0.07	0.02

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 23-12112
Client Ref 37567
Contract MMU, ALL ALL SAINTS LIBRARY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2175420	BH04A 2.50-3.00 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175421	BH04A 10.00-10.45 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175422	BH04A 20.50-22.00 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175423	WS01 2.40-3.00 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175424	WS03 3.00-3.44 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2175425	WS04 3.00-3.45 SOIL	11/05/23	PG	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	

Key: P-Plastic G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-18048-1
Initial Date of Issue:	06-Jun-2023
Re-Issue Details:	
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37567 MMU, All Saints Library

Quotation No.:		**Date Received:**	31-May-2023
Order No.:	6924	**Date Instructed:**	31-May-2023
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	06-Jun-2023
Date Approved:	06-Jun-2023		

Approved By:



Details:	Stuart Henderson, Technical Manager

Results - Soil

Project: 37567 MMU, All Saints Library

Client: Geotechnical Engineering Ltd			**Chemtest Job No.:**		23-18048
Quotation No.:			**Chemtest Sample ID.:**		1647809
Order No.: 6924			Client Sample Ref.:		3
			Sample Location:		ITP05
			Sample Type:		SOIL
			Top Depth (m):		0.60
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Moisture	N	2030	%	0.020	13
pH (2.5:1)	N	2010		4.0	[A] 8.0
Magnesium (Water Soluble)	N	2120	g/l	0.010	[A] < 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	[A] < 0.010
Total Sulphur	U	2175	%	0.010	[A] 0.044
Chloride (Water Soluble)	U	2220	g/l	0.010	[A] 0.12
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	[A] 0.029

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1647809	3		ITP05		A	Plastic Tub 1000g

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX D

CHEMICAL ANALYSES

Certificate of Analysis

Certificate Number	23-08609	*Issued:*	20-Apr-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-08609
Client Reference	37536
Order No	37536/DO
Contract Title	MMU
Description	2 Soil samples, 4 Leachate samples.
Date Received	12-Apr-23
Date Started	12-Apr-23
Date Completed	20-Apr-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-08609
Client Ref 37536
Contract Title MMU

			Lab No	2154520	2154521
			.Sample ID	BH01	WS02
			Depth	0.60-0.70	1.10-1.20
			Other ID	ES1	ES2
			Sample Type	ES	ES
			Sampling Date	03/04/2023	04/04/2023
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg	5.0	11
Barium	DETSC 2301#	1.5	mg/kg	43	280
Beryllium	DETSC 2301#	0.2	mg/kg	0.3	0.7
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.4	0.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.7
Chromium	DETSC 2301#	0.15	mg/kg	15	14
Copper	DETSC 2301#	0.2	mg/kg	11	49
Lead	DETSC 2301#	0.3	mg/kg	9.9	230
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l	< 10	< 10
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.96
Nickel	DETSC 2301#	1	mg/kg	8.1	17
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	21	26
Zinc	DETSC 2301#	1	mg/kg	26	100
Inorganics					
pH	DETSC 2008#		pH	8.5	9.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.2
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	1.3	0.8
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10	< 10
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	140	21
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l	< 5.00	6.6
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	47	170
Sulphur as S, Total	DETSC 2320	0.01	%	< 0.01	0.06
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.02	0.17
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 23-08609
Client Ref 37536
Contract Title MMU

			Lab No	2154520	2154521
			.Sample ID	BH01	WS02
			Depth	0.60-0.70	1.10-1.20
			Other ID	ES1	ES2
			Sample Type	ES	ES
			Sampling Date	03/04/2023	04/04/2023
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	0.04
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.47
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.07
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.77
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.73
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.25
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	0.29
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.24
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.20
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.09
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	3.4
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	5.0

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-08609
Client Ref 37536
Contract Title MMU
Sample Id BH01 ES1 0.60-0.70

Sample Numbers 2154520 2154522 2154523
Date Analysed 20/04/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	0.8	3	5	6
DETSC2003# Loss On Ignition	%		n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC2008# pH	pH Units		n/a	>6	n/a
DETS073* Acid Neutralisation Capacity (pH4)	mol/kg		n/a	TBE	TBE
DETS073* Acid Neutralisation Capacity (pH7)	mol/kg		n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	13	3.3	0.026	0.047	0.5	2	25
DETSC 2306 Barium as Ba	13	7.1	0.03	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	0.047	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	14	3.1	0.03	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	16	5.9	0.032	0.074	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	0.018	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	1.5	14	< 0.02	0.12	0.5	10	30
DETSC 2306 Nickel as Ni	1	0.69	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	5.4	2.4	0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.78	4.1	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.96	1.5	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	14	2.9	0.028	0.046	4	50	200
DETSC 2055 Chloride as Cl	110000	14000	220	283.1	800	15,000	25,000
DETSC 2055* Fluoride as F	140	110	0.28	1.14	10	150	500
DETSC 2055 Sulphate as SO4	18000	8500	36	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	250000	110000	500	1308.7	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	16000	12000	32	126	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	8.4	7.3
DETSC 2009 Conductivity uS/cm	351.0	151.0
* Temperature*	14.0	18.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.111

Stage 1

Volume of Leachant L2*	0.192
Volume of Eluate VE1*	0.165

Stage 2

Volume of Leachant L8*	0.886
Volume of Eluate VE2*	0.836

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-08609
Client Ref 37536
Contract Title MMU
Sample Id WS02 ES2 1.10-1.20

Sample Numbers 2154521 2154524 2154525
Date Analysed 20/04/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	3.1	3	5	6
DETSC2003# Loss On Ignition	%		n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	1.9	100	n/a	n/a
DETSC2008# pH	pH Units		n/a	>6	n/a
DETS073* Acid Neutralisation Capacity (pH4)	mol/kg		n/a	TBE	TBE
DETS073* Acid Neutralisation Capacity (pH7)	mol/kg		n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	5.3	5.2	0.011	0.052	0.5	2	25
DETSC 2306 Barium as Ba	27	17	0.05	0.19	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	3.8	2	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	5.8	4.8	0.012	0.05	2	50	100
DETSC 2306 Mercury as Hg	0.12	0.075	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	4.8	1.5	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	5.9	5.6	0.01	0.056	0.5	10	50
DETSC 2306 Antimony as Sb	4.8	2	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.9	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	2.5	2	0.005	0.021	4	50	200
DETSC 2055 Chloride as Cl	11000	1500	22	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	500	200	1	2.49	10	150	500
DETSC 2055 Sulphate as SO4	17000	6100	34	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	100000	53000	200	607.3	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	2900	5200	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	8.1	8.1
DETSC 2009 Conductivity uS/cm	148.0	75.6
* Temperature*	15.0	18.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.123

Stage 1

Volume of Leachant L2*	0.23
Volume of Eluate VE1*	0.203

Stage 2

Volume of Leachant L8*	0.987
Volume of Eluate VE2*	0.94

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

Summary of Asbestos Analysis
Soil Samples

Our Ref 23-08609
Client Ref 37536
Contract Title MMU

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2154520	BH01 ES1 0.60-0.70	SOIL	NAD	none	Vicky Convery
2154521	WS02 ES2 1.10-1.20	SOIL	NAD	none	Vicky Convery

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-08609
Client Ref 37536
Contract MMU

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2154520	BH01 0.60-0.70 SOIL	03/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2154521	WS02 1.10-1.20 SOIL	04/04/23	GJ 250ml, GJ 60ml, PT 1L x2	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2154522	BH01 0.60-0.70 LEACHATE	03/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
2154523	BH01 0.60-0.70 LEACHATE	03/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
2154524	WS02 1.10-1.20 LEACHATE	04/04/23	GJ 250ml, GJ 60ml, PT 1L x2		
2154525	WS02 1.10-1.20 LEACHATE	04/04/23	GJ 250ml, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C5-C35	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C5-C35	EH_CU+HS_1D_AR
TPH Ali/Aro Total C5-C35	EH_CU+HS_1D_Total
TPH (C10-C40)	EH_1D_Total

End of Report

Certificate of Analysis

Certificate Number	23-09394	*Issued:*	02-May-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-09394
Client Reference	37567
Order No	37567/JP
Contract Title	MMU ALL SAINTS LIBRARY
Description	1 Soil sample, 1 Leachate sample.
Date Received	20-Apr-23
Date Started	20-Apr-23
Date Completed	02-May-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-09394
Client Ref 37567
Contract Title MMU ALL SAINTS LIBRARY

Lab No	2159075
.Sample ID	ITP04B
Depth	1.10-1.20
Other ID	
Sample Type	ES
Sampling Date	12/04/2023
Sampling Time	1510

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	9.6
Barium	DETSC 2301#	1.5	mg/kg	180
Beryllium	DETSC 2301#	0.2	mg/kg	0.6
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.3
Chromium	DETSC 2301#	0.15	mg/kg	13
Copper	DETSC 2301#	0.2	mg/kg	49
Lead	DETSC 2301#	0.3	mg/kg	180
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l	12
Mercury	DETSC 2325#	0.05	mg/kg	0.25
Nickel	DETSC 2301#	1	mg/kg	15
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	22
Zinc	DETSC 2301#	1	mg/kg	110
Inorganics				
pH	DETSC 2008#		pH	9.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2
Organic matter	DETSC 2002#	0.1	%	2.1
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	14
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l	3.1
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	1200
Sulphur as S, Total	DETSC 2320	0.01	%	0.18
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.56

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo).

Summary of Chemical Analysis
Soil Samples

Our Ref 23-09394
Client Ref 37567
Contract Title MMU ALL SAINTS LIBRARY

Lab No	2159075
.Sample ID	ITP04B
Depth	1.10-1.20
Other ID	
Sample Type	ES
Sampling Date	12/04/2023
Sampling Time	1510

Test	Method	LOD	Units	
Petroleum Hydrocarbons				
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo).

Summary of Chemical Analysis
Soil Samples

Our Ref 23-09394
Client Ref 37567
Contract Title MMU ALL SAINTS LIBRARY

Lab No	2159075
.Sample ID	ITP04B
Depth	1.10-1.20
Other ID	
Sample Type	ES
Sampling Date	12/04/2023
Sampling Time	1510

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	0.13
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.05
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.31
Fluorene	DETSC 3303	0.03	mg/kg	0.24
Phenanthrene	DETSC 3303#	0.03	mg/kg	2.3
Anthracene	DETSC 3303	0.03	mg/kg	0.44
Fluoranthene	DETSC 3303#	0.03	mg/kg	2.9
Pyrene	DETSC 3303#	0.03	mg/kg	3.0
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	1.3
Chrysene	DETSC 3303	0.03	mg/kg	1.3
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	1.1
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.39
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.97
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.34
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.12
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.39
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	15
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo).

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-09394
Client Ref 37567
Contract Title MMU ALL SAINTS LIBRARY
Sample Id ITP04B 1.10-1.20
Sample Numbers 2159075 2159076
Date Analysed 02/05/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	2.8	3	5	6
DETSC 2003# Loss On Ignition	%	4.1	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	370.0	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	58.0	100	n/a	n/a
DETSC 2008# pH	pH Units	9.3	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l 10:1	Amount Leached* mg/kg LS10	WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
DETSC 2306 Arsenic as As	2.9	0.029	0.5	2	25
DETSC 2306 Barium as Ba	11	0.11	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.94	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	3.5	0.035	2	50	100
DETSC 2306 Mercury as Hg	0.028	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	2.5	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	5.1	0.05	0.5	10	50
DETSC 2306 Antimony as Sb	1	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	1.1	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	2	0.02	4	50	200
DETSC 2055 Chloride as Cl	3200	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	180	1.8	10	150	500
DETSC 2055 Sulphate as SO4	39000	390	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	91000	910	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	5400	54	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	7.4
DETSC 2009 Conductivity uS/cm	130.0
* Temperature*	16.0

Mass of Sample Kg*	0.110
Mass of dry Sample Kg*	0.098

Stage 1

Volume of Leachant L2*	0.97
Volume of Eluate VE1*	0.92

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

Summary of Asbestos Analysis
Soil Samples

Our Ref 23-09394
Client Ref 37567
Contract Title MMU ALL SAINTS LIBRARY

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2159075	ITP04B 1.10-1.20	SOIL	NAD	none	Michael Kay

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-09394
Client Ref 37567
Contract MMU ALL SAINTS LIBRARY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2159075	ITP04B 1.10-1.20 SOIL	12/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2159076	ITP04B 1.10-1.20 LEACHATE	12/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C5-C35	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C5-C35	EH_CU+HS_1D_AR
TPH Ali/Aro Total C5-C35	EH_CU+HS_1D_Total
TPH (C10-C40)	EH_1D_Total

End of Report

Certificate of Analysis

Certificate Number	23-10515	*Issued:*	15-May-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-10515
Client Reference	37567
Order No	37567/JP
Contract Title	MMU All Saints Library
Description	2 Soil samples, 4 Leachate samples.
Date Received	03-May-23
Date Started	03-May-23
Date Completed	15-May-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-10515
Client Ref 37567
Contract Title MMU All Saints Library

			Lab No	2165558	2165559
			.Sample ID	BH03	BH04A
			Depth	1.00-1.20	1.30-1.40
			Other ID	ES3	ES1
			Sample Type	ES	ES
			Sampling Date	18/04/2023	17/04/2023
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg	8.9	
Barium	DETSC 2301#	1.5	mg/kg	52	
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	< 0.2	
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	
Chromium	DETSC 2301#	0.15	mg/kg	25	
Copper	DETSC 2301#	0.2	mg/kg	24	
Lead	DETSC 2301#	0.3	mg/kg	22	
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l		< 10
Mercury	DETSC 2325#	0.05	mg/kg	0.09	
Nickel	DETSC 2301#	1	mg/kg	27	
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	
Vanadium	DETSC 2301#	0.8	mg/kg	33	
Zinc	DETSC 2301#	1	mg/kg	45	
Inorganics					
pH	DETSC 2008#		pH	7.9	7.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	
Organic matter	DETSC 2002#	0.1	%	1.2	
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l		< 10
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l		130
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l		< 1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	35	23
Sulphur as S, Total	DETSC 2320	0.01	%		0.02
Sulphate as SO4, Total	DETSC 2321#	0.01	%		0.03
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 23-10515
Client Ref 37567
Contract Title MMU All Saints Library

			Lab No	2165558	2165559
			.Sample ID	BH03	BH04A
			Depth	1.00-1.20	1.30-1.40
			Other ID	ES3	ES1
			Sample Type	ES	ES
			Sampling Date	18/04/2023	17/04/2023
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-10515
Client Ref 37567
Contract Title MMU All Saints Library
Sample Id BH03 ES3 1.00-1.20

Sample Numbers 2165558 2165560 2165561
Date Analysed 15/05/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	1.6	3	5	6
DETSC 2003# Loss On Ignition	%	2.9	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	7.9	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	2	0.82	0.004	0.01	0.5	2	25
DETSC 2306 Barium as Ba	6.5	7.1	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	0.084	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	2.3	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	13	3.3	0.026	0.049	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	1.5	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	1.3	0.58	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.29	0.76	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.95	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	1.7	6	0.003	0.053	4	50	200
DETSC 2055 Chloride as Cl	5900	1800	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	130	< 100	0.26	0.22	10	150	500
DETSC 2055 Sulphate as SO4	14000	3400	28	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	77000	14000	154	246.1	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	6000	5200	12	53.3	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.6	6.3
DETSC 2009 Conductivity uS/cm	111.0	19.4
* Temperature*	18.0	17.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.125

Stage 1

Volume of Leachant L2*	0.234
Volume of Eluate VE1*	0.21

Stage 2

Volume of Leachant L8*	0.997
Volume of Eluate VE2*	0.94

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-10515
Client Ref 37567
Contract Title MMU All Saints Library
Sample Id BH04A ES1 1.30-1.40

Sample Numbers 2165559 2165562 2165563
Date Analysed 15/05/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	1.8	3	5	6
DETSC 2003# Loss On Ignition	%	4.2	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	7.3	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	2.9	1.3	0.006	0.016	0.5	2	25
DETSC 2306 Barium as Ba	15	2.6	0.03	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	1.5	0.34	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	6.1	3.8	0.012	0.042	2	50	100
DETSC 2306 Mercury as Hg	0.012	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	2.6	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	0.51	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	4	0.52	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	1.8	0.45	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.73	0.29	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	4.5	1.5	0.009	0.02	4	50	200
DETSC 2055 Chloride as Cl	87000	10000	174	225.9	800	15,000	25,000
DETSC 2055* Fluoride as F	260	100	0.52	1.26	10	150	500
DETSC 2055 Sulphate as SO4	6700	2500	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	250000	33000	500	684.7	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	9900	5200	19.8	59.7	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.4	6.3
DETSC 2009 Conductivity uS/cm	357.0	46.9
* Temperature*	18.0	17.0

Mass of Sample Kg*	0.130
Mass of dry Sample Kg*	0.116

Stage 1

Volume of Leachant L2*	0.219
Volume of Eluate VE1*	0.19

Stage 2

Volume of Leachant L8*	0.93
Volume of Eluate VE2*	0.87

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Summary of Asbestos Analysis
Soil Samples

Our Ref 23-10515
Client Ref 37567
Contract Title MMU All Saints Library

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2165558	BH03 ES3 1.00-1.20	SOIL	NAD	none	Barry Kelly

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-10515
Client Ref 37567
Contract MMU All Saints Library

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2165558	BH03 1.00-1.20 SOIL	18/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2165559	BH04A 1.30-1.40 SOIL	17/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Ammonia Aqueous Extract (3 days), BTEX (14 days), Total Sulphur ICP (7 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), EPH/TPH (14 days)	
2165560	BH03 1.00-1.20 LEACHATE	18/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
2165561	BH03 1.00-1.20 LEACHATE	18/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
2165562	BH04A 1.30-1.40 LEACHATE	17/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
2165563	BH04A 1.30-1.40 LEACHATE	17/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C5-C35	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C5-C35	EH_CU+HS_1D_AR
TPH Ali/Aro Total C5-C35	EH_CU+HS_1D_Total
TPH (C10-C40)	EH_1D_Total

End of Report

Certificate of Analysis

Certificate Number	23-10635	*Issued:*	16-May-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-10635
Client Reference	37567
Order No	37567/JP
Contract Title	MMU All Saints Library
Description	3 Soil samples, 2 Leachate samples.
Date Received	04-May-23
Date Started	04-May-23
Date Completed	16-May-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-10635
Client Ref 37567
Contract Title MMU All Saints Library

	Lab No	2166344	2166345	2166346
	.Sample ID	WS03	WS04	DCP01
	Depth	1.20	1.20	0.60
	Other ID	ES3	ES3	ES2
	Sample Type	ES	ES	ES
	Sampling Date	06/04/2023	06/04/2023	05/04/2023
	Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	5.0	1.2	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	11	10	3.6
Barium	DETSC 2301#	1.5	mg/kg	690	55	290
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.6	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.2	0.2
Chromium	DETSC 2301#	0.15	mg/kg	18	14	8.3
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	57	67	16
Lead	DETSC 2301#	0.3	mg/kg	740	77	35
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l		< 10	< 10
Manganese	DETSC 2301#	20	mg/kg	310	300	340
Mercury	DETSC 2325#	0.05	mg/kg	0.46	0.23	0.17
Molybdenum	DETSC 2301#	0.4	mg/kg	1.2	1.0	0.7
Nickel	DETSC 2301#	1	mg/kg	10	11	9.3
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	23	21	14
Zinc	DETSC 2301#	1	mg/kg	200	34	49
Inorganics						
pH	DETSC 2008#		pH	8.1	7.8	8.7
Cyanide, Total	DETSC 2130#	0.1	mg/kg	1.0	0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	3.0	2.9	2.2
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l		< 10	< 10
Ammoniacal Nitrogen as NH3	DETSC 2119	0.5	mg/kg	2.7	4.4	1.7
Ammoniacal Nitrogen as NH4	DETSC 2119	0.5	mg/kg	2.8	4.6	1.8
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l		33	15
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l		< 1.0	1.4
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	110	25	27
Sulphide	DETSC 2024*	10	mg/kg	37	< 10	28
Sulphur as S, Total	DETSC 2320	0.01	%	0.07	0.03	0.02
Sulphate as SO4, Total	DETSC 2321#	0.01	%		0.04	0.04
Petroleum Hydrocarbons						
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	140	50	34
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	0.3	1.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	0.2	0.3	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	1.6	1.4	0.5

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 23-10635
Client Ref 37567
Contract Title MMU All Saints Library

			Lab No	2166344	2166345	2166346
			.Sample ID	WS03	WS04	DCP01
			Depth	1.20	1.20	0.60
			Other ID	ES3	ES3	ES2
			Sample Type	ES	ES	ES
			Sampling Date	06/04/2023	06/04/2023	05/04/2023
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Pyrene	DETSC 3301	0.1	mg/kg	1.5	1.5	0.4
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.8	0.8	0.2
Chrysene	DETSC 3301	0.1	mg/kg	0.8	0.7	0.3
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	0.5	0.3	0.2
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.3	0.2	0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	0.7	0.7	0.3
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.6	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.4	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.4	< 0.1	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	8.1	7.0	2.0
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-10635
Client Ref 37567
Contract Title MMU All Saints Library
Sample Id WS04 ES3 1.20

Sample Numbers 2166345 2166347 2166348
Date Analysed 16/05/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	1.6	3	5	6
DETSC 2003# Loss On Ignition	%	3.2	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	50.0	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	7.0	100	n/a	n/a
DETSC 2008# pH	pH Units	7.8	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	4.1	2.5	0.008	0.028	0.5	2	25
DETSC 2306 Barium as Ba	16	6.8	0.03	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.77	0.29	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	8.9	5.4	0.018	0.06	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	5.5	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	2	1.6	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	1.3	0.23	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.55	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	< 1.3	< 1.3	< 0.002	< 0.01	4	50	200
DETSC 2055 Chloride as Cl	32000	2900	64	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	220	< 100	0.44	0.37	10	150	500
DETSC 2055 Sulphate as SO4	5400	2300	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	160000	35000	320	558.3	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	6400	6200	12.8	62.3	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.7	7.1
DETSC 2009 Conductivity uS/cm	222.0	49.2
* Temperature*	17.0	18.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.120

Stage 1

Volume of Leachant L2*	0.22
Volume of Eluate VE1*	0.2

Stage 2

Volume of Leachant L8*	0.96
Volume of Eluate VE2*	0.91

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

Summary of Asbestos Analysis
Soil Samples

Our Ref 23-10635
Client Ref 37567
Contract Title MMU All Saints Library

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2166344	WS03 ES3 1.20	SOIL	Chrysotile	Chrysotile present as fibre bundles	Ben Rose
2166345	WS04 ES3 1.20	SOIL	NAD	none	Ben Rose
2166346	DCP01 ES2 0.60	SOIL	NAD	none	Ben Rose

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-10635
Client Ref 37567
Contract MMU All Saints Library

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2166344	WS03 1.20 SOIL	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Ammonia (3 days), Total Sulphur ICP (7 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2166345	WS04 1.20 SOIL	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Ammonia Aqueous Extract (3 days), BTEX (14 days), Total Sulphur ICP (7 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2166346	DCP01 0.60 SOIL	05/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Ammonia Aqueous Extract (3 days), Mercury (28 days), Total Sulphur ICP (7 days), Naphthalene (14 days), Organic Matter (Manual) (28 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2166347	WS04 1.20 LEACHATE	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
2166348	WS04 1.20 LEACHATE	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
EPH (C10-C40)	EH_1D_Total
TPH (C10-C40)	EH_1D_Total

End of Report

Certificate of Analysis

Certificate Number	23-11729	*Issued:*	24-May-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-11729
Client Reference	37567
Order No	37567/JP
Contract Title	MMU All Saints Library
Description	One Soil sample.
Date Received	04-May-23
Date Started	18-May-23
Date Completed	24-May-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Asbestos Analysis

Samples

Our Ref 23-11729
Client Ref 37567
Contract Title MMU All Saints Library

Lab No	Sample ID	Sample Location	Material Type	Result	Comment*	Analyst

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 23-11729
Client Ref 37567
Contract Title MMU All Saints Library

Lab No	2172942
.Sample ID	WS03
Depth	1.20
Other ID	ES3
Sample Type	ES
Sampling Date	06/04/2023
Sampling Time	

Test	**Method**	**Units**	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.005**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.005
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	844.47
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	na
% Chrysotile bundles in sample		Mass %	0.005
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Chrysotile fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
denotes deviating sample

Information in Support of the Analytical Results

Our Ref 23-11729
Client Ref 37567
Contract MMU All Saints Library

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2172942	WS03 1.20 SOIL	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Certificate of Analysis

Certificate Number	23-12081	*Issued:*	05-Jun-23

Client Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucester
GL2 4NF

Our Reference	23-12081
Client Reference	37567
Order No	37567/JP
Contract Title	MMU All Saints Library
Description	3 Soil samples.
Date Received	04-May-23
Date Started	23-May-23
Date Completed	05-Jun-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-12081
Client Ref 37567
Contract Title MMU All Saints Library

	Lab No	2175270	2175271	2175272
	.Sample ID	WS03	WS04	DCP01
	Depth	1.20	1.20	0.60
	Other ID	ES3	ES3	ES2
	Sample Type	ES	ES	ES
	Sampling Date	06/04/2023	06/04/2023	05/04/2023
	Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Petroleum Hydrocarbons						
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 23-12081
Client Ref 37567
Contract MMU All Saints Library

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2175270	WS03 1.20 SOIL	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days)	
2175271	WS04 1.20 SOIL	06/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days)	
2175272	DCP01 0.60 SOIL	05/04/23	GJ 250ml x2, GJ 60ml x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days)	

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C5-C35	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C5-C35	EH_CU+HS_1D_AR
TPH Ali/Aro Total C5-C35	EH_CU+HS_1D_Total

End of Report

BURO HAPPOLD

MMU Library Transformation Project

Specification for Earthworks

1350B-BHE-XX-XX-SP-CG-000001

0065290

12 June 2025

Revision P01

Demolition Tender

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Revision	Description	Issued by	Date	Checked
P01	Earthwork Specification – Draft for agreement with the Local Authority. Demolition Tender	TB	12/06/2025	PH

https://burohappold.sharepoint.com/sites/Buildings-Structures-GroundEngineering/Test/UK Specifications/Earthworks/Specification for Earthworks P01.docx

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author	**Tom Beeson**
date	**12/06/2025**
approved	**Pip Hunsworth**
signature	
date	**12/06/2025**

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3 Series 600 Specification Appendices **46**

Appendix A Contamination Procedures & Documentation

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1 Introduction

1.1 General

The site is located in the north of England in the city of Manchester, approximately 400 m south-southeast of Manchester Oxford Road Train Station and is centred on MMU All Saints Library, Manchester, M16 6BH, National Grid Reference (NGR) SJ 84225 97158. The existing MMU All Saints Library occupies the area with an associated service yard to the north and various pedestrian footpaths around the building. The area of the site is ~0.70 hectares and it is bounded by the elevated "Mancunian Way" to the north, Oxford Road to the east, All Saints Park to the south and MMU Business School to the west. The topography is relatively flat lying at 37 mAOD, with recorded elevations between 37.20 mAOD in the east and 36.90 mAOD in the west. A site location plan is included below.

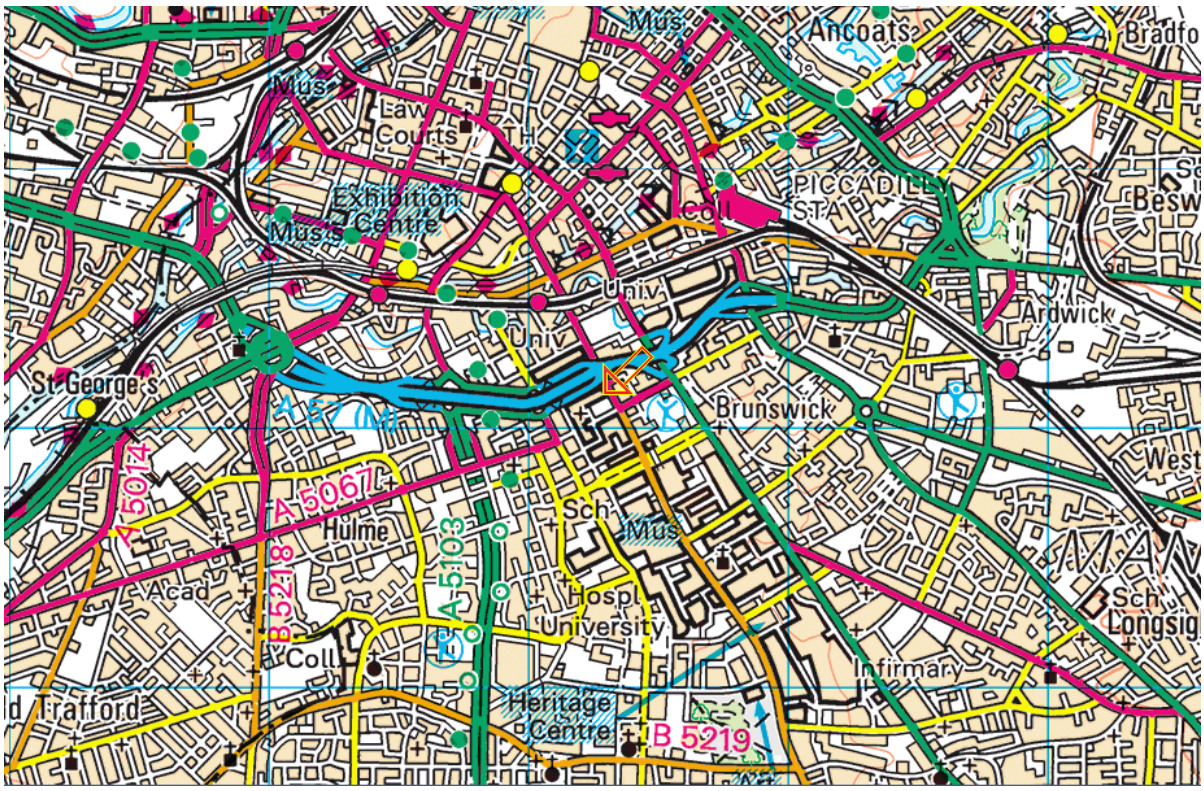


Figure 1—1 Site Location Plan

At present, the proposal is to demolish the eastern portion of the existing All Saints Library building (adjacent to Oxford Road) and build a new 6 No. storey building plus roof. The remaining part of the building to be retained is proposed to be refurbished.

The proposed development is situated in an area identified as being at 'high' risk from unexploded ordnance (UXO) as detailed in the relevant Zetica UXB (Unexploded Bomb) risk map for the site. A Detailed Unexploded Ordnance (UXO) Risk Assessment was undertaken by 6 Alpha on behalf of the Client. The conclusion of the UXO Risk Assessment was that the site is 'high' risk therefore UXO mitigation is required during intrusive activities.

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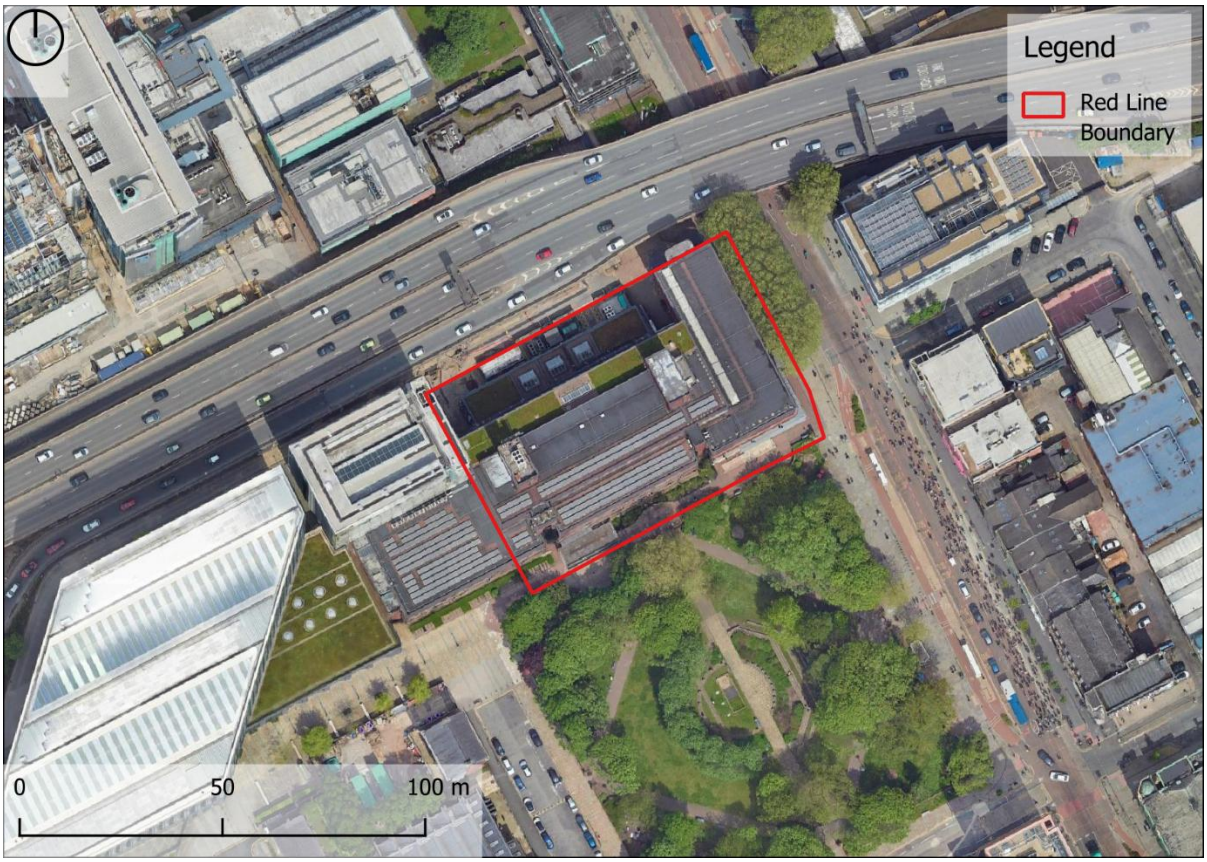


Figure 1—2 Aerial Photograph

1.2 Earthworks Scope

Further details of the scope of works and roles and responsibilities are as defined by the Supervisor and Project Manager and in the Contract Documents.

The works covered by this specification include but are not limited to the following items:

- Remodelling of the site topography and associated landscaping;
- Removal of existing hardstanding and obstructions as required;
- Use of site won material to achieve cut and fill balance as far as practicable;
- Forming bulk, pit, trench and surface area excavations (excluding those for services);
- Filling holes and excavations (excluding those for services);
- Making up levels by filling in bulk or in layers, including hardcore, but excluding capping layers or sub-bases to roads and paving;
- Structural filling works to underside of substructure;
- Final trimming to final formation levels.

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Topsoil in soft landscaped areas and/or tree pits, build-ups beneath slabs (e.g. MOT / Type 1) and road pavement build-ups are not covered by this specification.

1.3 Ground Conditions

The anticipated geology based on existing ground investigation information is summarised in Table 1-1.

Table 1-1: Summary of ground conditions encountered during site specific ground investigation undertaken by Geotechnical Engineering Ltd

Depth to Top of Strata (m BGL)	Typical Thickness (m)	Generalised Description
0.00	0.9-3.3	Sandy gravel of Limestone And Soft slightly sandy gravelly CLAY And Slightly clayey gravelly SAND. Gravel of brick, mudstone, sandstone concrete & limestone. [MADE GROUND]
0.9-3.3	1.6-3.0	Medium dense clayey gravelly SAND. Gravel is angular to subrounded mudstone and sandstone. And Medium dense sandy GRAVEL of angular to subrounded siltstone, sandstone & mudstone. [GLACIOFLUVIAL]
3.3-4.6	0.6-10.4	Firm to stiff slightly sandy gravelly CLAY. Gravel of angular to subrounded mudstone, siltstone, sandstone & coal. [GLACIAL TILL]
10.5-16.5	>15 (thickness not proven)	Extremely weak to weak brownish red SILTSTONE And Very weak brownish red MUDSTONE And Extremely weak reddish brown interbedded SILTSTONE, SANDSTONE & MUDSTONE. Fractures are very close to medium spaced, planar smooth and rough, infilled up to 10mm with clay. [MANCHESTER MARLS FORMATION]

Note: Groundwater strikes were recorded in a number of boreholes and window samples, ranging between 2.3m to 2.9m bgl within the Made Ground and Glaciofluvial deposits where it overlies cohesive Glacial Till. The following post-sitework groundwater monitoring levels were recorded:

Made Ground / Till – 36m AOD

Glaciofluvial Deposits – 35-36m AOD

Chester Formation / Manchester Marls – 24-26m AOD

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2 Particular Specification

2.1 General

The earthworks shall be undertaken in accordance with:

- MCHW - Series 600 of the Specification for Highway Works (Vol 1), 2009 and;
- BS6031 Code of Practice for Earthworks, 2009;

Where a conflict exists this specification shall take precedence.

2.2 Submission of information

At time of tendering the Contractor shall submit details of the methods proposed which shall include, but not be limited to, the following:

Submittals at Tender stage:

- Outline method statements covering the proposed scope of work.
- Demonstration of Contractor's competence (including but not limited to team CVs, project experience, delivery of similar schemes, experience with envisaged ground conditions).
- Define any additional ground investigation scope required to carry out the works.

Submittals at 15 days prior to commencement of the works:

- Detailed method statements.
- Any temporary works design.
- Instrumentation and monitoring proposals.

Submittals during the works:

- Weekly progress reports.
- Excavation/construction records as per specification requirements.
- Records of recorded features (known and unknown).
- Records of monitoring.
- Geotechnical laboratory test results.
- Contamination test results.

Submittals following completion of the works:

- Survey of *as-built* levels, detailing areas and depths of cut and fill including drawings and supporting records including material volumes and types re-used on site, details and volumes of materials imported and any materials sent off site to landfill.

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- Clear hand-over plan and documentation.
- Certification for all imported/exported materials (as a result of excavation and filling operations).
- Works completion *close-out* report (including design, construction and health, safety & welfare summary).

All submittals are subject to review (or approval as necessary) by the Supervisor and Project Manager.

2.3 Contractor Obligations

a) The Contractor is responsible for any material disposal, undertaken in accordance with any local regulations/ guidelines/ legislation.

b) Inspection and acceptance of materials, Contract Drawings, and workmanship by the Supervisor, does not in any way relieve the Contractor of their responsibilities under the Contract. The works are to be executed as specified and in accordance with good practice. No changes are permitted without written approval.

c) The Contractor is to review the details of this specification and consider the times required for testing, preparation of samples, and approval of information by the supervisor. Allowance for this is to be included in the contract programme.

d) The Contractor shall allow for all necessary test pieces, testing, trials and attendance to demonstrate compliance with the requirements of this specification. The results of all testing required under the specification shall be submitted to the Supervisor.

e) All publications referred to in this document are to be issues current at the date of invitation to tender.

f) The following materials are specifically precluded from all specifications pertaining to works carried out under this contract:

i. High alumina cement or concrete;

ii. Woodwool slabs as permanent shuttering;

iii. Calcium chloride in admixtures for use in reinforced concrete;

iv. Asbestos in any form;

v. Sea dredged aggregates for use in reinforced concrete unless otherwise instructed by the Project Manager;

vi. Calcium silicate bricks;

vii. Urea formaldehyde;

viii. Hazardous, aggressive or unstable materials:

Do not import or use fill materials which would, either in themselves or in combination with other materials, liquids, vapours and/or gases, give rise to a health hazard, damage to building structures or instability in the filling.

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The Contractor shall ensure that these substances are not incorporated into the works. If the Contractor is unable to comply, the supervisor and Contract Administrator shall be informed in writing immediately.

Other unsuitable materials include: material from marshes or bogs, peat, logs, stumps, slurry, mud, perishable material (including wood fragments), material susceptible to spontaneous combustion, material in a frozen condition, clays of liquid limit exceeding 90 or plasticity index exceeding 65, material with excessive moisture content, and materials containing any plaster, wood, organic material or rubbish.

g) If/ where unrecorded features are encountered, the Contractor shall inform the Supervisor immediately. The Contractor shall survey and document any unrecorded features prior to agreeing clearance action with the Supervisor.

h) The Contractor's attention is drawn to the nature and extent of the materials present on site. It is anticipated that some of the material will be suitable for reuse as part of the permanent works construction. The Contractor shall be responsible for the selection, separation and processing as appropriate for reuse in the permanent works or temporary works as appropriate. The Contractor is also responsible for the disposal of unsuitable material.

i) The Contractor shall implement best practice and industry accepted methods to mitigate the risk related to presence of buried unexploded ordnance (UXO) during excavation works. The Contractor's attention is drawn to the site risk associated with UXO as highlighted in the 6 Alpha Limited "Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment, MMU ASL". The Contractor should familiarize themselves with the available UXO associated information detailed therein.

j) The Contractor shall coordinate any particular requirements or concerns with the Supervisor in a timely fashion.

k) Stockpiling of excavated and/or demolished arisings and materials:

- All stockpiling operations are subject to strict approval by the Supervisor. The Contractor shall liaise with the Supervisor during the tender period in order to coordinate the strategy for stockpiling, movement of material around the development and removal of material from site where necessary (to be included in the Tender for review by the Supervisor). The Contractor is responsible for compliance with all relevant legislation and guidance (also including but not limited to liaison with relevant authorities and stakeholders, requirements for permitting, licensing or certification). If appropriate material movements may be covered under a CLARE code of practice Material Management Plan and therefore will fall outside the waste regime.
- Materials that are recovered during the Contractors works shall be separated and placed into temporary stockpiles.
- Materials that are identified as contaminated shall be stockpiled separately on sheeting to prevent cross contamination.
- Any material identified as grossly contaminated by visual and/or olfactory means is to be removed directly from site or stockpiled separately on impermeable sheeting with measures to prevent any contaminated run-off.

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l) The Contractor shall coordinate and agree their intended site set-up, space requirements and mobilisation with the Supervisor and Contract administrator. The Contractor shall also review site access routes and related constraints with the Supervisor and Contract administrator in order to inform their method statements and site logistics proposals.

m) The Contractor shall obtain sufficient information relating to existing services in order to inform their works (means, methods and mitigation measures, as required). The Contractor shall liaise with the Supervisor and Contract administrator as required in order to satisfy themselves with the adequacy and appropriateness of available utilities and services information. Under no circumstances shall any private or public mains, pipes, cables or other apparatus be disturbed in any way without the written consent of the Contract administrator and the local authority, public undertaking or service facility stakeholder concerned.

The contractor shall be responsible for the collection, treatment (if required) and discharge of pumped water from the excavation. The contractor will be responsible for obtaining and complying with the requirements of any licences required for the disposal of pumped water.

2.4 Site Management

2.4.1 TRAFFIC SAFETY AND CONTROL

Controls: Provide, erect and maintain all such traffic signs, barriers and control signals as may be necessary in accordance with the recommendations of Chapter 8 of the Traffic Signs Manual or such other General Directions as are current at the time of execution of the works.

- Where the particular circumstances are not covered by these recommendations submit proposals for approval
- Compliance with this clause does not relieve the Contractor of any other obligations under the Contract or under the relevant provision of the Highway Acts.

Coordination: For works on the Public Highway the Contractor is to co-ordinate their activities with the Highway Authority and to be responsible for obtaining all necessary permits and approvals. Any charges for reinstatement of the Highway are to be met by the Contractor.

Submission by contractor: After consultations with the appropriate authority submit a programme showing the scheme of traffic management. Thereafter provide such further details and information as required by the Contract Administrator (CA).

- No work affecting the public highway is to be started until all traffic control measures are agreed as being fully operational.

Equipment: Unless otherwise specified all traffic signs to comply with BS 873, and Statutory Instruments SI 2002/3113. In addition

- All traffic signs to be kept clean and legible at all times and to be repositioned, covered, or removed as required.
- All adjacent public highways and trafficked/ pedestrian routes to be kept clear of all construction debris. Tracked vehicles are not to travel over public highways without permission of the CA.

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Making good: Any damage caused to public highways and trafficked/pedestrian routes to be made good as directed by the CA.

2.4.2 TEMPORARY DIVERSION OF TRAFFIC

General:

Construct temporary diversion ways wherever:

- the works interfere with existing public or private roads or where there is a public or private right of way.
- the standard of construction and lighting and the width of the diversion route to be agreed with the CA.
- Construct diversion ways in advance of any interference with existing ways. Maintain in such a way as to provide adequately for traffic flows.
- Where any temporary diversion works affect Public Highways the Contractor is responsible for obtaining all necessary Statutory Authority approvals.

The provisions of this clause do not apply to any temporary access or other works that the contractor may construct for their sole usage.

2.4.3 SERVICES

Privately owned services: If any privately owned service (water, electricity, drainage etc.) passing through the site is affected by the works the contractor to provide a satisfactory alternative service and notify the CA of the measures proposed.

Statutory undertakers' services: Verify the positions of all mains, sewers etc and take all measures required by the Statutory Undertaker or Public Authority for the support and full protection of all items concerned.

Liability: The Contractor is responsible for any costs of breakage, damage and interruption of supply. Confirm with the CA that appropriate insurance is held.

Accommodation works: The relocation and/or replacement of fences, walls, accesses etc. to properties bounding the site to be completed in an expeditious manner and within a time as approved by the CA. Give the CA at least 10 day's notice before starting the works.

2.4.4 NOISE, SECURITY

Noise: Comply with the general recommendations of BS 5228 together with any specific requirements described in the Contract Documents.

Security: Erect and maintain temporary fencing as required by the CA. Access in the fencing to be agreed by the CA and/or occupiers of adjacent properties.

- Temporary fencing is to remain in position until it is replaced by permanent fencing or completion of the works. Submit proposals to the CA.
- Regularly inspect all temporary fencing and make good any defects
- If temporary fencing must be removed for any part of the works reinstate it as soon as possible. In the interim provide patrols so as to preclude unauthorised entry into the site.

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2.5 List of Amendments, Additions and Substitute Clauses to Series 600 Specification

601 Definitions (addition):

The following definitions of earthworks materials shall apply to all clauses of the Specification in which reference is made to the defined classes of materials:

i. Unless and until defined by the Landscape Architect, "Topsoil" shall mean the top layer of soil that can support vegetation;

ii. "Soil" shall mean natural or artificial material without inherent cementing with Uniaxial Compressive Strength less than 0.5MPa;

iii. "Rock" shall mean natural or artificial material with inherent cementing or structure and with a Uniaxial Compressive Strength greater than 0.5MPa;

The following definition shall apply to all clauses of the Specification where reference is made to "Supervisor".

iv. "Supervisor (or Overseeing Organisation)" shall be as defined in the Contract Documents.

Excavation (addition):

Blinding surfaces to receive sheet overlays or concrete to have sufficient sand, fine gravel, PFA or other approved fine material applied to fill interstices and provide a close smooth surface.

Permissible deviation on surface level: +0/-25 mm.

612 Compaction of Fills (amendment):

Sub-clause 12 to be replaced with:

The Contractor shall submit the following to the Supervisor for approval at least 7 working days before

commencement of compaction.

i. The values of maximum dry density and the optimum moisture content obtained in accordance with BS1377: Part 4, as appropriate for each of the fills the Contractor intends to use (where within any Class of material fill contains material having different maximum dry densities and optimum moisture contents each shall be identified in order to monitor the compacted density);

ii. A graph of density plotted against moisture content from which each of the values in (i) above, the maximum dry density and optimum moisture content, where determined, and, for cohesive material, a plot of the 5% air voids curve to be included for each material. For stabilised materials the 10% air voids line is also required;

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iii. Where the proposed fill material is not suitable for compaction testing in the laboratory due to its coarse grading, the contractor shall carry out field tests in order to determine the dry density/moisture content relationship;

iv. Where small quantities are to be imported the Contractor may submit a method statement for approval to the Supervisor and Contract administrator. This shall detail his proposed method of compaction for the range of soil types the Contractor proposes for use as fill, where the Contractor shall compact with plant operating as if only the material which requires the greater compactive effort is being compacted. Wherever practicable, different classes of soil shall be placed separately, and if necessary stockpiled and not mixed or layered together without the approval of the engineer. Records of different soil classes used and where they are placed as part of the permanent works shall be kept.

General Requirements (addition):

1. Ground Investigation

A Desk Study has been prepared for the planning application (Report Ref. 1044B-BHE-XX-XX-RP-CG-000001).

A ground investigation was undertaken in connection with the proposed development during April 2023 by Geotechnical Engineering Limited, with borehole logs and associated laboratory testing provided within the factual reports (report references 37567 and 37757). A2 Site Investigation Limited were appointed to undertake a parallel seismic investigation to assess existing pile lengths, undertaken in 2024 (51324-A2SI-XX-XX-RP-X-0001-01) The contractor should make themselves familiar with both the Geotechnical Engineering Ltd factual report and the A2 Site Investigation Ltd report.

Other reports reviewed as part of the RIBA Stage 2 works include the following:

- Howley Energy & Ltd, Ground Source Energy Concept Design and Thermal Risk Assessment, March 2023
- Curtins, Ground Investigation Report for 99 Oxford Road, November 2019

2. UXO

The Contractor's attention is drawn to the site risk associated with UXO as highlighted in the 6 Alpha "Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment, MMU ASL". The Contractor should familiarize themselves with the available UXO associated information detailed therein.

3. Site Features of Archaeological Interest

Before starting work the Contractor shall verify which areas of the site, if any, are subject to specific archaeological requirements, e.g. archaeological watching brief prior excavation etc.

4. Trees

Before starting work the Contractor shall verify which trees, shrubs and hedges are to be removed. Cut down, grub up main roots and fill voids with approved material. Dispose of all wood.

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5. Undergrowth

Clear site of bushes, scrub and undergrowth. Grub up and dispose of large roots.

6. Japanese Knotweed

None envisaged to be on site.

Japanese Knotweed is an invasive, non-native plant species. The Wildlife and Countryside Act (1981) made it illegal to spread Japanese Knotweed and guidance on the management of Japanese Knotweed on development sites is given in the Environment Agency's (EA) code of practice, 2001.

The Contractor is responsible for ensuring that Japanese Knotweed is not spread across the site. There are a variety of methods available for treating infested areas including spraying with herbicides or digging, spraying and removal to landfill. The Client is responsible for selecting a method of treatment and obtaining approval for the selected method from the Local Authority.

6. Site Clearance

Clear site of all rubbish, debris and vegetation before stripping topsoil. The compaction of topsoil should be avoided.

7. Site Access and Working Area

Access to the site and the Contractor's working area will be shown on the drawings. The Contractor shall provide:

- All necessary signs, safety measures and watchmen to ensure security and safe operation of their traffic.
- All necessary servicing for their own offices, stores, workshops, etc.
- Access routes for the Employer and other contractors as shown on the drawings.

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Table 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
GENERAL GRANULAR FILL	1	A	–	Well graded Granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i), (ii) and (iv) in next column, shall not apply to chalk). Recycled aggregate. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates); A (construction and demolition recycling industries); B1 (municipal incinerator bottom ash (MIBA)); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) E (non ferrous steel industry – except E2 molybdenum slag) G (mining and quarry industry)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	1	A	–
							(ii) uniformity coefficient	See Note 5	10	–				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(v) IDD	Clause 634	–	App 6/1				

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Table 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
GENERAL GRANULAR FILL	1	B	–	Uniformly graded granular material	General Fill	Any material, or combination of materials, other than chalk. Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except chalk); A (construction and demolition recycling industries); B1 (municipal incinerator bottom ash (MIBA)); C1 (coal fly ash) C4 (coal bottom ash) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) E (non ferrous steel industry – except E2 molybdenum slag) F (foundry industry) G (mining and quarry industry) H1 (dredge spoil sand)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	1	B	–
							(ii) uniformity coefficient	See Note 5	–	10				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc+2%				

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	1	C	–	Coarse granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i) and (ii) in next column, shall not apply to chalk). Recycled aggregate. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) G (mining and quarry industry)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	1	C	–
							(ii) uniformity coefficient	See Note 5	5	–				
							(iii) Los Angeles coefficient	Clause 635	–	50				

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Table 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
GENERAL COHESIVE FILL	2	A	–	Wet cohesive material	General Fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 1 except for materials with liquid limit greater than 50, determined by BS 1377: Part 2, only deadweight tamping or vibratory tamping rollers or grid rollers shall be used.	2	A	–
							(ii) plastic limit (PL)	BS 1377: Part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	PL -4%	App 6/1				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
	2	B	–	Dry cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	2	B	–
							(ii) plastic limit (PL)	BS 1377: Part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	PL -4%				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(v) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				

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	2	C	–	Stony cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377: part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	2	C	–
							(ii) plastic limit (PL)	BS 1377: part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				
							(iv) MCV	Clause 632	Optimum mc -2%	–				
							(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	–				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
GENERAL COHESIVE FILL	2	D	–	Silty cohesive material	General Fill	Any material, or combination of materials, other than chalk	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	2	D	–
							(ii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc+2%				
							(iii) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(iv) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
	2	E	–	Reclaimed pulverised fuel ash cohesive material	General Fill	Reclaimed material from lagoon or stockpile containing not more than 20% furnace bottom ash	(i) mc	BS 1377: Part 2 See Note 4	To enable compaction to Clause 612		End product 95% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method)	2	E	–
							(ii) bulk density	BS 1377: Part 9	App 6/1	App 6/1				

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GEN CHALK FILL	3	–	–	Chalk	General Fill	Chalk and associated materials all designated as Class 3 in the Contract	(i) mc	BS 1377: Part 2 See Note 4	–	Optimum mc +2%	Tab 6/4 Method 4, or Method 1 if required in App 6/1. All types of vibratory rollers of Categories over 1800 kg shall not be used	3	–	–
							(ii) IDD	Clause 634	App 6/1	App 6/1				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FIL	6	A	–	Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil or any combination thereof. (Properties (i) and (ii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	No compaction	6	A	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity	See Note 5	10	–				
							(iii) SMC of chalk index	Clause 634	–	20%				
							(iv) plasticity index	BS 1377: Part 2	Non-plastic					

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L	6	B	–	Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. (Properties (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	6	B	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) plasticity index	BS 1377: Part 2	Non-plastic					
							(iii) Los Angeles coefficient	Clause 635	–	50				
							(iv) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				

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Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED GRANULAR FILL	6	C	–	Selected uniformly graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, spoil, slag or any combination thereof. (Property (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	6	C	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity coefficient	See Note 5	–	10				
							(iii) plasticity index	BS 1377: Part 2	Non-plastic					
							(iv) Los Angeles coefficient	Clause 635	–	50				
							(v) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc+2%				

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Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED GRANULAR FI	6	E	–	Selected granular material (Class 9A)	For stabilisation with cement to form capping	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock. (Properties (i), (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) G (mining and quarry industry – except G2 (black coal shale))	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Not applicable	6	E	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) mc	BS 1377: Part 2 See Note 4	-	Optimum mc +2%				
							(iii) liquid limit	BS 1377: Part 2	–	45				
							(iv) plasticity index	BS 1377: Part 2	–	20				
							(v) organic matter	BS 1377: Part 3	–	App 6/1				
							(vi) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	3000 mg/l as SO_4				
							(vii) oxidisable sulfides (OS) content	BS EN 1744-1 Clause 13	–	0.6% as SO_4				
							(viii) SMC of chalk	Clause 634	–	20%				
	6	F	1	Selected granular material (fine grading)	Capping	Any material, or combination of materials – including recycled aggregates with not more than 50% by mass of recycled bituminous	(i) grading	BS 1377: Part 2 (On site materials only)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F	1

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L L						planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F4 and comply with the requirements for that material.	(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc - 2%	Optimum mc				
							(iv) Los Angeles coefficient	Clause 635	–	60				
							(v) Class Ra (asphalt) content	Clause 710	–	50%				
							(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%				

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							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	F	2	Selected granular material (coarse grading)	Capping	Any material, or combination of materials including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock. Property (i) in the next column shall not apply to chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F5 and comply with the requirements for that material.	(i) grading	BS 1377: Part 2 (On site materials only)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F	2
							(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–					
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc - 2%	Optimum mc				
							(iv) Los Angeles coefficient	Clause 635	–	50				
							(v) Class Ra (asphalt) content	Clause 710	–	50%				
							(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%				
	6	F	3	Selected granular material	Capping	Any material, or combination of materials with not less than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock.	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6 Maximum Compacted layer thickness shall be 200mm	6	F	3
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) optimum mc	Clause 613	–	–				

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						Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from the following source codes, see Notes 8, 9 and 10: A1 (reclaimed asphalt) A4 (mixed recycled aggregate) Aggregates from source code A4 shall contain at least 50% of constituents in Class Ra (bituminous materials).	(iii) mc	Clause 613 See Note 4	Optimum mc -2%	Optimum mc				
							(iv) Class Ra (asphalt) content	Clause 710	50%	–				
							(v) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	10%				

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	N	–	Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	N	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity coefficient	See Note 5	10	–				
							(iii) Los Angeles coefficient	Clause 635	–	40				
							(iv) undrained shear parameters (c and Ø)	Clause 633	App 6/1	–				
							(v) effective angle of internal friction (Ø') and effective cohesion (c')	Clause 636	App 6/1	–				
							(vi) permeability	Clause 640	App 6/1	–				
							(vii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2	Optimum mc +2				
							(viii) MCV	Clause 632	Optimum mc -2	Optimum mc +2				
							(ix) slope stability test (where required in App 6/6)	Clause 610	App 6/6					

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED GRANULAR FILL	6	P	–	Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	P	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity coefficient	See Note 5	5	–				
							(iii) IDD of chalk	Clause 634	–	App 6/1				
							(iv) Los Angeles coefficient	Clause 635	–	60				
							(v) undrained shear parameters (c and Ø)	Clause 633	App 6/1	–				
							(vi) effective angle of internal friction (Ø') and effective cohesion (c')	Clause 636	App 6/1	–				
							(vii) permeability	Clause 640	App 6/1	–				
							(viii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2	Optimum mc +2				
							(ix) MCV	Clause 632	Optimum mc -2	Optimum mc +2				
							(x) slope stability test (where required in App 6/6)	Clause 610	App 6/6					

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TABLE 6/1: (02/16) Acceptable Earthworks Materials: Classification and Compaction Requirements (See footnotes) (continued)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED COHESIVE FILL	7	A	–	Selected cohesive material	Fill to structures	Any material or combination of materials, other than argillaceous rock and materials designated as Class 3 in the Contract. If chalk is used it shall form 100% of constituents. (Properties (i) and (iii) shall not apply to chalk.) (Properties (vii) and (viii) may be increased to 54% and 31% respectively for Lias Clay only and subject to the requirements of contract specific Appendix 6/6)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	End product: 100% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method) or a dry density corresponding to 5% air voids at field mc whichever is lower	7	A	–
							(ii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2	Optimum mc +2				
							(iii) MCV	Clause 632	Optimum mc -2	Optimum mc +2				
							(iv) undrained shear parameters (c and Ø)	Clause 633	App 6/1	App 6/1				
							(v) effective angle of internal friction (Ø') and effective cohesion (c')	Clause 636	App 6/1	App 6/1				
							(vi) IDD of chalk	Clause 634	App 6/1	App 6/1				
							(vii) liquid limit	BS 1377: Part 2	–	45				
							(viii) plasticity index	BS 1377: Part 2	–	25				

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Footnotes to Table 6/1

1	(02/16) App = contract specific Appendix
2	(02/16) Tab = Table
3	(02/16) Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in contract specific Appendix 6/1 shall apply. Where contract specific Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
4	(02/16) Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 where the material is a soil or BS EN 1097-5 where the material is required to conform to a harmonised European Standard.
5	(02/16) Uniformity coefficient is defined as the ratio of the particle diameters D_{60} to D_{10} on the particle-size distribution curve, where: D_{60} = particle diameter at which 60% of the soil by weight is finer D_{10} = particle diameter at which 10% of the soil by weight is finer
6.	(02/16) The limiting values for Class U1B material are given in contract specific Appendix 6/14 and contract specific Appendix 6/15.
7	(02/16) For works in Wales see sub-Clause 601.21W.
8	(02/16) Where material source codes are referenced these are as listed in Table 6/7.
9	(02/16) Where materials are required to be aggregates conforming to BS EN 13242 materials certificated as being compliant with BS EN 13285 are acceptable for use provided that they meet all the specification requirements and the Declaration of Performance for constituent parts to BS EN 13242 are provided to the Overseeing Organisation.
10	(02/16) Materials shall comply with the current Environmental Regulations at the time of use. Reference shall be made to Annex ZA (informative) of BS EN 13242.

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TABLE 6/2: (02/17) Grading Requirements for Acceptable Earthworks Materials Other Than Classes 6F4, 6F5 and 6S

Percentage by Mass Passing the Size Shown																					
Class	**Size (mm)**		**Size (mm) BS Series**													**Size (microns) BS Series**				**Size (micr-ons)**	**Class**
	500	**300**	**125**	**90**	**75**	**37.5**	**28**	**20**	**14**	**10**	**6.3**	**5**	**3.35**	**2**	**1.18**	**600**	**300**	**150**	**63**	**2**	
1A		100	95-100																<15		1A
1B			100																<15		1B
1C	100		10-95													0-25			15		1C
2A & 2B			100											80-100					15-100		2A & 2B
2C			100											15-80					15-80		2C
2D			100																80-100	0-20	2D
6A	100									0-100		0-85				0-45			0-5		6A
6B	100		0-10																		6B
6C			100			0-100					0-100		0-35	0-10		0-2					6C
6D										100		89-100		60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock			6D
6E & 6R			100	85-100						25-100						10-100				<15	6E & 6R
6F1					100	75-100				40-95		30-85				10-50			<15		6F1
6F2			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F2
6F3			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F3
6H								100				60-100			15-45	0-25		0-5			6H
6I & 6J			100		85-100				25-100					15-100		9-100			<15		6I & 6J
6K								100											0-10		6K
6L										100		89-100		60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock			6L

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TABLE 6/2: (02/17) Grading Requirements for Acceptable Earthworks Materials (continued)

Percentage by Mass Passing the Size Shown																					
Class	**Size (mm)**		**Size (mm) BS Series**													**Size (microns) BS Series**				**Size (micr-ons)**	**Class**
	500	**300**	**125**	**90**	**75**	**37.5**	**28**	**20**	**14**	**10**	**6.3**	**5**	**3.35**	**2**	**1.18**	**600**	**300**	**150**	**63**	**2**	
6M					100														0-10		6M
6N & 6P					100														<15		6N & 6P
6S					100									60-100		30-90		4-45	0-16		6S
7A					100														15-100		7A
7C			100		85-100				83100					80-100		60-100			15-45	0-20	7C
7D			100		85-100				40-90					15-79		15-75			15-45	0-20	7D
7E					100		95-100												15-100		7E
7F			100																15-100		7F
7I					100		95-100												15-100		7I

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TABLE 6/3: (02/16) Limits of Material Properties of Fill for Use With Metal Components in Reinforced Soil and Anchored Earth Structures for Class 6H, 6I, 6J, 7C and 7D Materials

Reinforcing Element Material	Properties of Fill								
	pH Value		Max Chloride Ion Content %	Max Organic Content %	Max Water Soluble (WS) Sulfate Content mg/l as SO_4	Maximum Oxidisable Sulfides (OS) Content % as SO_4	Minimum Restivity Ohm.cm	Minimum Redox Potential volts	Microbial Activity Index
	Min	Max							
Galvanised Steel	5	10	0.02	0.2	300	0.06	5000	0.40	Less than 5
Stainless Steel	5	10	0.025	0.2	600	0.12	3000	0.35	

NOTES:

1. (02/16) A method of calculating the Microbial Activity Index may be obtained by reference to TRRL Contractor Report 54 'Soil Corrosivity Assessment'.
2. (02/16) The corrosion potential of frictional fill shall be assessed from resistivity, pH, chloride, water soluble sulfate and oxidisable sulfides tests. For cohesive soil it will be necessary to test additionally for organic content. Should either organic content or sulfate be in excess of the specified levels, then tests shall also be included for Redox Potential and Microbial Activity Index.
3. (02/16) The water soluble sulfate content and oxidisable sulfides content shall be determined in accordance with the methods described in BS EN 1744-1 clause 10, 11 and 13.
4. (02/16) Methods of test (except for Microbial Activity Index, water soluble sulfate content and oxidisable sulfides content) are given in BS 1377: Part 3.

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TABLE 6/4: (02/16) Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (This Table is to be read in conjunction with sub-Clause 612.10)

Type of Compaction Plant	Ref No	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N	D	N	D	N	D	N	D	N	N for D = 110mm	N for D = 150mm	N for D = 250mm
Smoothed wheeled roller (or vibratory roller operating without vibration)		Mass per metre width of roll:													
	1	over 2100 kg up to 2700 kg	125	8	125	10	125	10*	175	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 2700 kg up to 5400	125	6	125	8	125	8*	200	4	Unsuitable		16	Unsuitable	Unsuitable
	3	kg over 5400 kg	150	4	150	8	Unsuitable		300	4	unsuitable		8	16	Unsuitable
Grid roller		Mass per metre width of roll:													
	1	over 2700 kg up to 5400 kg	150	10	Unsuitable		150	10	250	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 5400 kg up to 8000 kg	150	8	125	12	Unsuitable		325	4	Unsuitable		20	Unsuitable	Unsuitable
	3	over 8000 kg	150	4	150	12	Unsuitable		400	4	Unsuitable		12	20	Unsuitable
Deadweight tamping roller		Mass per metre width of roll:													
	1	over 4000 kg up to 6000 kg	225	4	150	12	250	4	350	4	Unsuitable		12	20	Unsuitable
	2	over 6000 kg	300	5	200	12	300	4	400	4	Unsuitable		8	12	20
Pneumatic-tyred roller		Mass per wheel:													
	1	over 1000 kg up to 1500 kg	125	6	Unsuitable		150	10*	240	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 1500 kg up to 2000 kg	150	5	Unsuitable		Unsuitable		300	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	3	over 2000 kg up to 2500 kg	175	4	125	12	Unsuitable		350	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	4	over 2500 kg up to 4000 kg	225	4	125	10	Unsuitable		400	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	5	over 4000 kg up to 6000 kg	300	4	125	10	Unsuitable		Unsuitable		Unsuitable		12	Unsuitable	Unsuitable
	6	over 6000 kg up to 8000 kg	350	4	150	8	Unsuitable		Unsuitable		Unsuitable		12	Unsuitable	Unsuitable
	7	over 8000 kg up to 12000 kg	400	4	150	8	Unsuitable		Unsuitable		Unsuitable		10	16	Unsuitable
	8	over 12000 kg	450	4	175	6	Unsuitable		Unsuitable		Unsuitable		8	12	Unsuitable

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Vibratory tamping roller		Mass per metre width of a vibrating roll:											
	1	over 700 kg up to 1300 kg	100	12	100	12	150	12	100	10	Unsuitable	Unsuitable	Unsuitable	Unsuitable
	2	over 1300 kg up to 1800 kg	125	12	125	12	175	12*	175	8	Unsuitable	12	Unsuitable	Unsuitable
	3	over 1800 kg up to 2300 kg	150	12	150	12	200	12*	Unsuitable		Unsuitable	8	12	Unsuitable
	4	over 2300 kg up to 2900 kg	150	9	150	9	250	12*	Unsuitable		400	5	6	10	Unsuitable
	5	over 2900 kg up to 3600 kg	200	9	200	9	275	12*	Unsuitable		500	6	6	10	Unsuitable
	6	over 3600 kg up to 4300 kg	225	9	225	9	300	12*	Unsuitable		600	6	4	8	Unsuitable
	7	over 4300 kg up to 5000 kg	250	9	250	9	300	9*	Unsuitable		700	6	3	7	12
	8	over 5000 kg	275	9	275	9	300	7*	Unsuitable		800	6	3	6	10

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TABLE 6/4: (02/16) Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (This Table is to be read in conjunction with sub-Clause 612.10) (continued)

Type of Compaction Plant	Ref No	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N	D	N	D	N	D	N	D	N	N for D = 110mm	N for D = 150mm	N for D = 250mm
Vibratory roller		Mass per metre width of vibratory roll:													
	1	over 270 kg up to 450 kg			75	16	150	16	Unsuitable		Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 450 kg up to 700 kg			75	12	150	12	Unsuitable		Unsuitable		Unsuitable	Unsuitable	Unsuitable
	3	over 700 kg up to 1300 kg	100	12	125	10	150	6	125	10	Unsuitable		16	Unsuitable	Unsuitable
	4	over 1300 kg up to 1800 kg	125	8	150	8	200	10*	175	4	Unsuitable		6	16	Unsuitable
	5	over 1800 kg up to 2300 kg	150	4	150	4	225	12*	Unsuitable		Unsuitable		4	6	12
	6	over 2300 kg up to 2900 kg	175	4	175	4	250	10*	Unsuitable		400	5	3	5	11
	7	over 2900 kg up to 3600 kg	200	4	200	4	275	8*	Unsuitable		500	5	3	5	10
	8	over 3600 kg up to 4300 kg	225	4	225	4	300	8*	Unsuitable		600	5	2	4	8
	9	over 4300 kg up to 5000 kg	250	4	250	4	300	6*	Unsuitable		700	5	2	4	7
	10	over 5000 kg	275	4	275	4	300	4*	Unsuitable		800	5	2	3	6
Vibrating plate compactor		Mass per m^2 of base plate:													
	1	over 880 kg up to 1100 kg	Unsuitable		Unsuitable		75	6	Unsuitable		Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 1100 kg up to 1200 kg	Unsuitable		75	10	100	6	75	10	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	3	over 1200 kg up to 1400 kg	Unsuitable		75	6	150	6	150	8	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	4	over 1400 kg up to 1800 kg	100	6	125	6	150	4	Unsuitable		Unsuitable		8	Unsuitable	Unsuitable
	5	over 1800 kg up to 2100 kg	150	6	150	5	200	4	Unsuitable		Unsuitable		5	8	Unsuitable
	6	over 2100 kg	200	6	200	5	250	4	Unsuitable		Unsuitable		3	8	12
Vibro-tamper		Mass:													
	1	over 50 kg up to 65 kg	100	3	100	3	150	3	125	3	Unsuitable		4	8	Unsuitable
	2	over 65 kg up to 75 kg	125	3	125	3	200	3	150	3	Unsuitable		3	6	12
	3	over 75 kg up to 100 kg	150	3	150	3	225	3	175	3	Unsuitable		2	4	10
	4	over 100 kg	225	3	200	3	225	3	250	3	Unsuitable		2	4	10

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Power rammer		Mass:										
	1	100 kg up to 500 kg	150	4	150	6	Unsuitable	200	4	Unsuitable	5	8	Unsuitable
	2	over 500 kg	275	8	275	12	Unsuitable	400	4	Unsuitable	5	8	14
Dropping-weight compactor		Mass of rammer over 500 kg weight drop:											
	1	over 1 m up to 2 m	600	4	600	8	450	8	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
	2	over 2 m	600	2	600	8	Unsuitable		Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

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TABLE 6/4: (02/16) Method Compaction for Earthworks Materials: Plant and Methods (Method 7) (This Table is to be read in conjunction with sub-Clause 612.10) (Continued)

Type of Compaction Plant	Ref~ No.	Category	Method 7	
			N for D = 150 mm	N for D = 250mm
Smooth wheeled roller (or vibratory roller operating without vibration)		Mass per metre width of roll:		
	1	Over 2100 kg up to 2700 kg	Unsuitable	Unsuitable
	2	Over 2700 kg up to 5400 kg	Unsuitable	Unsuitable
	3	Over 5400 kg	12	Unsuitable
Grid roller		Mass per metre width of roll:		
	1	Over 2700 kg up to 5400 kg	Unsuitable	Unsuitable
	2	Over 5400 kg up to 8000 kg	16	Unsuitable
	3	Over 8000 kg	8	Unsuitable
Deadweight tamping roller		Mass per metre width of roll:		
	1	Over 4000 kg up to 6000 kg	4	8
	2	Over 6000 kg	3	6
Pneumatic-tyred roller		Mass per wheel:		
	1	Over 1000 kg up to 1500 kg	Unsuitable	Unsuitable
	2	Over 1500 kg up to 2000 kg	12	Unsuitable
	3	Over 2000 kg up to 2500 kg	6	Unsuitable
	4	Over 2500 kg up to 4000 kg	5	Unsuitable
	5	Over 4000 kg up to 6000 kg	4	16
	6	Over 6000 kg up to 8000 kg	Unsuitable	8
	7	Over 8000 kg up to 12000 kg	Unsuitable	4
	8	Over 12000 kg	Unsuitable	4
Vibratory tamping roller		Mass per metre width of vibrating roll:		
	1	Over 700 kg up to 1300 kg	Unsuitable	Unsuitable
	2	Over 1300 kg up to 1800 kg	Unsuitable	Unsuitable
	3	Over 1800 kg up to 2300 kg	16	Unsuitable
	4	Over 2300 kg up to 2900 kg	12	Unsuitable
	5	Over 2900 kg up to 3600 kg	10	Unsuitable
	6	Over 3600 kg up to 4300 kg	8	16
	7	Over 4300 kg up to 5000 kg	7	14
	8	Over 5000 kg	6	12
Vibratory roller		Mass per metre width of vibrating roll:		
	1	Over 270 kg up to 450 kg	Unsuitable	Unsuitable
	2	Over 450 kg up to 700 kg	Unsuitable	Unsuitable
	3	Over 700 kg up to 1300 kg	Unsuitable	Unsuitable
	4	Over 1300 kg up to 1800 kg	Unsuitable	Unsuitable
	5	Over 1800 kg up to 2300 kg	12	Unsuitable
	6	Over 2300 kg up to 2900 kg	10	Unsuitable
	7	Over 2900 kg up to 3600 kg	10	Unsuitable
	8	Over 3600 kg up to 4300 kg	8	Unsuitable
	9	Over 4300 kg up to 5000 kg	8	Unsuitable
	10	Over 5000 kg	6	12

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Vibratory plate compactor		Mass per m^2 of base plate:		
	1	Over 880 kg up to 1100 kg	Unsuitable	Unsuitable
	2	Over 1100 kg up to 1200 kg	Unsuitable	Unsuitable
	3	Over 1200 kg up to 1400 kg	Unsuitable 10	Unsuitable
	4	Over 1400 kg up to 1800 kg	8	Unsuitable
	5	Over 1800 kg up to 2100 kg	6	Unsuitable
	6	Over 2100 kg		Unsuitable
Vibro-tamper		Mass:		
	1	Over 50 kg up to 65 kg	Unsuitable	Unsuitable
	2	Over 65 kg up to 75 kg	Unsuitable	Unsuitable
	3	Over 75 kg up to 100 kg	Unsuitable	Unsuitable
	4	Over 100 kg	8	Unsuitable
Power rammer		Mass:		
	1	100 kg up to 500 kg	8	Unsuitable
	2	Over 500 kg	6	10
Dropping weight compactor		Mass of rammer over 500 kg height drop:		
	1	Over 1 m up to 2m	Unsuitable	Unsuitable
	2	Over 2 m	Unsuitable	Unsuitable

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TABLE 6/5: (02/16) Imported Onto Site Grading Requirements for Class 6 Acceptable Earthworks Materials

Percentage by Mass Passing the Size Shown																				
Class	**Size (mm)**		**Size (mm) BS EN 933-2 Series**													**Size (microns) BS EN 933-2 Series**				**Class**
	500	**300**	**125**	**80**	**63**	**40**	**31.5**	**20**	**16**	**10**	**8**	**6.3**	**4**	**2**	**1**	**500**	**250**	**125**	**63**	**0**
6A	100									0-100		0-85				0-45			0-5	6A
6B	100		0-10																	6B
6C			100			0-100						0-100	0-35	0-10		0-2				6C
6D										100			85-100	60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock		6D
6E & 6R			100	85-100						25-100						10-100			<15	6E & 6R
6F3			100	75-99		50-90		30-75		15-60				0-35					0-12	6F3
6F4					100		75-99		50-90		30-75		15-60		0-35				<15	6F4
6F5			100	75-99		50-90		30-75		15-60				0-35					0-12	6F5
6H								100				60-100			15-45	0-25		0-5		6H
6I & 6J			100	85-100					25-100					15-100		9-100			<15	6I & 6J
6K								100											0-10	6K
6L										100			85-100	60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock		6L
6M				100															0-10	6M
6N & 6P				100															<15	6N & 6P
6S					100									60-100		30-90		8-45	0-16	6S

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3 Series 600 Specification Appendices

Appendix 6/1: Requirements for Acceptability and Testing of Earthworks Materials

Acceptable limits for fills are defined in Table 6/1 of this specification. Fill used for forming any construction platform required shall comply with Class 1A, 1B or other such materials proposed by the Contractor which when placed and compacted shall perform as a stable platform for trafficking by piling plant and ready mix concrete trucks without damaging the underlying formation.

The Contractor shall be responsible for determining the Class and acceptability of the material to be used for filling. The contractor shall be responsible for acceptability testing which shall be undertaken by an approved independent testing organisation at frequencies given in the table below. All testing shall be undertaken by accredited NAMAS or equivalent approved geotechnical and chemical analysis laboratories to be paid for by the Contractor. The Contractor shall allow sufficient time in their programme for the required testing.

Class / Use	Test	Frequency
General Granular Fill	Grading	1 test / 500m^3
General Cohesive Fill	Grading	1 test / 500m^3
	mc/MCV/PL	1 test / 200m^3
Structural Granular Fill	Grading	1 test / 250m^3
	Shear box	1 test / 1000m^3
	Permeability	1 test / 1000m^3
Imported Fill	ICRCL Contamination Suite Table 3 Groups A&B. See also App 6/15 requirements	1 test / 250 tonnes

Appendix 6/2: Requirements for Dealing with Class U2 Unacceptable Material.

1. The Contractor is responsible for disposal.

2. A 'watching-brief' should be maintained during all stages of the work (included trial pitting) to remain vigilant to possibility of hitherto undetected areas of contamination.

Where materials that appear to be contaminated (either visually or on the basis of odour) are encountered during the excavation works, the Contractor shall inform the Supervisor immediately to obtain further instruction. The Contractor shall be responsible for carrying out laboratory testing to enable the materials to be classified for hazard assessment and waste disposal purposes, and for disposal to suitably licensed tip if unsuitable to remain on site. Test methods and appropriate assessment criteria for chemical analysis shall be as required by the relevant authority or otherwise agreed with the Supervisor.

The Contractor shall maintain records and copies of assignment notes and duty of care documentation for all materials disposed of off-site and shall submit copies on completion of the work.

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Appendix 6/3: Requirements for Excavation, Deposition and Compaction

1. Earthworks requirements are defined in the relevant contract drawings. For general working conditions and contract specific requirements refer to the Contract Documents:

2. Proposed Levels of Formation

Refer to Contract Drawings. Permissible deviations from formation levels:

- Embankments and cuttings: ±50mm;

3. Constraints on excavation phasing.

At tender stage the Contractor shall produce an Enabling Works Plan which clearly shows the phasing of the bulk excavation with respect to the other specific Enabling Works.

4. Cut slopes

The Contractor is to ensure that the slopes of all cuttings are such that stability and safety are maintained at all times. Any temporary cuttings should be identified in the Contractor's method statements, and slope angles agreed in advance with the Contract Supervisor.

5. Groundwater

Groundwater strikes were recorded in the Made Ground and superficial deposits before drilling with water commenced between 2.30 – 2.90 m BGL (34.55 – 34.10 m AOD).

Post field work monitoring has been completed between May and August 2023. The data indicates groundwater within the:

- Made Ground / Glacial Till at ~36 m AOD
- Glaciofluvial deposits at ~35-36 m AOD – possibly hydraulically connected to the Made Ground
- Chester Formation / Manchester Marls Formation at ~24-26 m AOD

During the works groundwater must be controlled to ensure no flooding of the site or degradation of excavated materials or exposed slopes.

6. Working Platform

It is currently envisaged that the permanent works will place some reliance on the presence of the working platform and so it is to be left in place. The platform is to be designed by the Contractor and the Contractor shall provide this design to the Engineer for review ahead of start on site. The bearing capacity shall be validated on site through a programme of plate load tests. These shall be undertaken on a 25m grid and utilise a minimum 600mm diameter plate. The required bearing capacity is a minimum of 150kPa and settlement at this load shall be limited to 5mm, not withstanding the requirements of the platform during construction. Testing is to be undertaken after required pre slab construction preparations are complete, i.e. debris removal and formation preparation.

Appendix 6/4: Requirements for Class 3 Material

Not used.

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Appendix 6/6: Fill to structures and fill above Structural Foundations

This specification is in respect of the permanent works only.

1. First Layer of Compacted Filling

To be of suitable hard granular material thoroughly compacted to 150 mm thickness.

2. Protection of Compacted Filling

The Contractor shall be responsible for making good any damage to the compacted fill.

3. Deterioration of Fill Materials

If the material to be deposited as fill subsequently reaches a condition where it cannot be compacted to the requirements of this specification the Contractor shall:

- make good by removing the material from site until it is in a suitable condition for reuse and/or replace with suitable material; or
- make good the material by mechanical or chemical means; or
- cease work until the physical condition of the material is such that it can be compacted as described in this specification.

4. Blinding

Surfaces to receive sheet overlays or concrete to have sufficient sand, fine gravel, PFA or other approved fine material applied to fill interstices and provide a close smooth surface.

- Permissible deviations on surface level: +0/-25 mm.

Appendix 6/8: Topsoiling, Grass Seeding and Turfing

Please refer to Landscape Architect's specification.

Appendix 6/12: Instrumentation and Monitoring

Not used.

Appendix 6/14: Limiting Values for Pollution of Controlled Waters

Not used.

Appendix 6/15: Limiting Values for Harm to Human Health and the Environment

Site won material re-use criteria

Please refer to Appendix 6/1 for testing requirements. For all site won, imported recycled fill and greenfield/manufactured soils, testing shall be carried out to demonstrate that no contaminant listed in **Table 3-1**, **Table 3-2**, or **Table 3-3** is in excess of its Trigger Concentration. This testing shall be carried out at a rate of **1 test per 250m^3 of placed fill material**.

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For all crushed hardcore, stone and brick, testing shall be carried out to demonstrate that no contaminant listed in **Table 3-1**, **Table 3-2**, or **Table 3-3** is in excess of its Trigger Concentration. This testing shall be carried out at a rate of 1 test per 1000m^3 of placed fill material.

In addition, any materials arising or imported that appear suspect in terms of contamination based on either appearance or smell shall be stockpiled separately and tested for the contaminant suites listed in **Table 3-1**, **Table 3-2**, or **Table 3-3** in addition to any other appropriate contaminant as indicated by appearance or by smell and either accepted into the Works or disposed of off-site as appropriate.

Note: All laboratory contamination testing shall be carried out in a UKAS and MCerts accredited laboratory, in accordance with the standards and procedures defined by MCerts.

Fill materials must not contain any contaminant in the suite listed in **Table 3-1** below that is in excess of the Specified Trigger Concentration:

Table 3-1 Material reuse criteria – general

Determinand	**Site Won Material and Imported Material Concentration (mg/kg)**
Asbestos	See Note *
Cyanide	16,000
Arsenic	640
Cadmium	190
Copper	68,000
Chromium (total)	8,600
Chromium (VI)	33
Lead	2330
Mercury	26
Zinc	670,000
Nickel	980
pH	5<pH<9
Polycyclic Aromatic Hydrocarbons (USEPA 16)	See Table 3-2
Selenium	12,000
TPH	See Table 3-3
Phenol Index	1,300

*Site won material: free fibres <0.1% and no cement bound asbestos. Imported material: none detectable.

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Note 1: Values used are all C4SL's or S4UL's: with the exception of free cyanide (BH Generic Assessment Criteria – GAC).

- Commercial and Industrial Land Use for site won material and imported materials placed at any depth (subject to agreement with local authority)

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Table 3-2 Material reuse criteria – hydrocarbons

Determinand		Site Won Material and Imported Material Concentration (mg/kg)
Aliphatic	C5-C6	12,000
	C6-C8	40,000
	C8-C10	11,000
	C10-C12	47,000
	C12-C16	90,000
	C16-C21	1,800,000
	C21-C35	1,800,000
Aromatic	C5-C7	86,000
	C7-C8	180,000
	C8-C10	17,000
	C10-C12	34,000
	C12-C16	38,000
	C16-C21	28,000
	C21-C35	28,000
Benzene		90
Ethylbenzene		27,000
Toluene		180,000
Xylene		2,620

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Table 3-3 Material reuse criteria – PAHs

Determinand	Site Won Material Placed <1m Depth and Imported Material Concentration (mg/kg)
Naphthalene	1,100
Acenaphythylene	100,000
Acenaphthene	100,000
Fluorene	71,000
Phenanthrene	23,000
Anthracene	540,000
Fluoranthene	23,000
Pyrene	54,000
Benzo(a)anthracene	180
Chrysene	350
Benzo(b)fluoranthene	45
Benzo(k)fluoranthene	1,200
Benzo(a)pyrene	36
Indendo(123-cd)pyrene	510
Dibenzo(ah)anthracene	3.6
Benzo(ghi)perylene	4,000

Soluble sulphate content (SO4) of imported materials for filling under concrete slabs or within 1m of substructures must not exceed 0.50g/l when tested BS 1377:Part 3, Clause 5 using a 2:1 water-soil extract.

Other unsuitable materials include: material from marshes or bogs, peat, logs, stumps, slurry, mud and perishable material, material susceptible to spontaneous combustion, material in a frozen condition, clays of liquid limit exceeding 80% and/or plasticity index exceeding 55, material with excessive moisture content.

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Appendix A Contamination Procedures & Documentation

The Contractor's attention is drawn to the reports, which outlines the existing historical site investigations in the surrounding area. It should be noted that unexpected or previously unrecorded contamination 'hot spots' may still be present, and that the Validation Strategy outlined below must be followed by the Contractor.

A1 Validation Strategy

As soon as practicable after the completion of the groundworks and removal of any anticipated or unexpected 'hot spots' a **Validation Report** shall be prepared and submitted by the Contractor and agreed with the relevant Local Authority Planning Development Department

The validation strategy shall be as follows:

- All materials should be stockpiled separately to allow their material/chemical properties to be assessed and their re-use potential appraised against the reuse criteria outlined in Appendix 6/15.
- All placed fill material, both site won and imported, is to be validated for the suite of chemicals detailed in Appendix 6/15 at the frequency required in Appendix 6/1.
- Anticipated areas of elevated concentrations or 'hot spots' shall be excavated and removed to at least 1.00m beyond any visual or olfactory (odorous) indication of contamination. As a minimum, 5 No. samples will be required (four sides and base) but for larger 'hot spots' sample spacing should not exceed 10m with the requisite increase in number of samples.
- Samples of the surrounding soil will be taken from the excavation formed and tested for the suite of determinands listed in Appendix 6/15 in addition to any other appropriate contaminant as indicated by appearance or by smell.
- If the chemical concentrations of the soil samples are less than the concentrations recorded in Appendix 6/15 or other appropriate guidance in respect of other appropriate contaminant, the elevated concentrations or 'hot spot' can be considered to have been removed and no further remedial action is required.
- If the chemical concentrations of the soil samples are greater than the concentrations recorded in Appendix 6/15, further excavation is required and the sequence of sampling and testing should be repeated. Incremental excavation and testing should continue until the chemical concentrations encountered are less than the concentrations recorded in Appendix 6/15 or other appropriate guidance in respect of other appropriate contaminant.
- During this procedure, the following information should be collected and recorded:
    - The exact extent of each phase of excavation should be recorded using 3D topographical surveying techniques.
    - The exact position and depth of each sample taken should be recorded using 3D topographical surveying techniques.
    - The samples should be given a unique reference number.
    - The laboratory testing results for each unique sample shall be recorded.

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- A photographic record of each phase of excavation and sampling will be collected and recorded.
- A general photographic record of the works should also be collected and recorded to provide a general record of the nature and characteristics of the materials encountered and/or laid to form formations etc. Where practicable, the photographic record should be cross referenced with any chemical testing available for the material type.

A validation report should be prepared, comprising substantiating completion documentation to include type of documentation listed above and photographic records in addition to Environmental Protection Act 1990 Section 34 Duty of Care documentation relating to waste disposal of the material removed from site.

A2 Validation Documentation Requirements

The following documentation shall be prepared by the Contractor and submitted to the relevant Local Authority Planning Development Department.

- Plan or plans showing earthworks movement of materials on site (cut and fill) and imported if appropriate. This is to include confirmation of the volumes of each material placed (i.e. volume of site won and volume of imported).
- Plan or plans showing the location of any 'hot spots' located, if any, or confirmation that none were encountered.
- Plan or plans showing location of chemical testing undertaken as appropriate plus supporting information.
- Plan or plans showing surface finishes and thickness of build-ups, topsoil or clean cover as appropriate.
- Plan or plans showing the location of any hotspots encountered during service trench excavation, if any, and plan sections of remedial measures undertaken for water pipe provision.
- Appropriate records of material removed from site including testing records.
- Appropriate records of material imported to site including testing records.
- Appropriate records of topsoil imported to site including testing records.
- Appropriate photographic records of the earthworks plus any specific areas of interest ('hotspots', tanks etc).
- Appropriate photographic records demonstrating the required thickness of material has been placed in soft landscaped areas.
- Records of any water control of groundwater that may have been contaminated, if any, or confirmation that none were encountered.
- Other records, if appropriate, not included in above summary.
- A statement confirming the earthworks was undertaken in accordance with this specification.

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BURO HAPPOLD

Manchester Metropolitan University, All Saints Library Transformation Project

Generic Quantitative Risk Assessment

1044B-BHE-XX-XX-RP-CG-0002

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3 July 2024

Revision P01

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Revision	Description	Issued by	Date	Checked
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Executive Summary

Background	The purpose of this Study is to describe the environmental, geological, hydrological and hydrogeological conditions present at the Site and assesses the potential ground contamination risks associated with the proposed development. The proposed development comprises the demolition of the eastern portion of the existing All Saints Library (adjacent to footpath/Oxford Road) and build a new 12 No. storey building. The remainder of the building is to be retained and refurbished.
Site Setting	The Site covers approximately 0.70 ha, M16 6BH, National Grid Reference (NGR) SJ 84225 97158. The area in the immediate vicinity comprises existing MMU buildings, the Mancunian Way (elevated highway), Oxford Road, commercial buildings, All Saints' Park.
History	The site has a limited site history: Timber Yard / Terraced housing, Carriage & Tramway Depot then Manchester Polytechnic Building (All Saints Building).
Geological Setting	The natural geology beneath the Site comprises Glaciofluvial deposits and Glacial Till in turn underlain by bedrock of the Chester Formation / Manchester Marls Formation. These natural strata are overlain by Made Ground encountered to varying depths (0.90 – 3.30mbgl). Typically, Made Ground consisted of macadam/paving slabs over gravelly clay or gravelly sand, with gravel consisting of limestone, brick, concrete, clinker, sandstone and siltstone.
Site Investigation	An intrusive site investigation was carried out on site between 2023/2024 with a programme of post-field monitoring completed in October 2023. The investigation was completed in two phases and comprised four cable percussive with rotary follow-on boreholes to a maximum depth of 31.20mbgl, four windowless sample holes, two dynamic probe holes, nine external foundation inspection pits, two internal foundation inspections pits and two locations of slab investigation to determine slab thicknesses.
Contamination Risk Assessment	Seven soil samples were scheduled for chemical analysis. No concentrations above commercial / industrial thresholds were recorded for any inorganic and organic determinands. Asbestos was screened for all samples, one sample recorded chrysotile fibres at 0.005%. Groundwater was not sampled and tested during the ground investigation, however given no exceedances of commercial thresholds were observed within the soil samples, it is assumed that similar concentrations are likely within the groundwater. The ground gas regime has been assessed as Characteristic Situation 1 (Low Risk). Therefore, no mitigation is required to protect against potentially hazardous ground gas accumulation. Waste characterisation showed that the Made Ground was classified as Non-Hazardous Waste.
Conclusions and Recommendations	No significant geoenvironmental risks have been identified which would require further investigation prior to the enabling works / construction. The potential risks to the Contractors workforce engaged in earthworks, are capable of mitigation by the adoption of an appropriate good standard of health, safety and hygiene regime. However, there is a potential for contamination to be present and not to have been encountered by this investigation, in particular in areas not investigated. This potential for unforeseen contamination should be taken into account in the contractor's method statements etc. for any below ground works. Any suspect materials should be sampled and subject to chemical analysis and appropriate recommendations regarding the need for and scope of any remedial actions sought from an appropriate specialist. Based on the findings of the ground investigation, the proposed works being carried out can be completed under CDM regulations without the need for a formal Remediation Strategy. In order to demonstrate the works are completed in line with CDM regulations, a short report will be prepared that collates all the evidence to demonstrate standard good construction practice was implemented, spoil was appropriately disposed of, and no unexpected contamination was encountered. This will be the responsibility of the Principal Contractor undertaking the works and shall be documented within their Health and Safety File upon completion of the proposed works.

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1 Introduction

1.1 Background and commission

This report presents the results of a ground investigation (GI) and associated Generic Quantitative Risk Assessment (GQRA) for the Manchester Metropolitan University (MMU) All Saints Library (ASL) Transformation Project and is prepared by Buro Happold on behalf of MMU. The report establishes the environmental, geological, hydrological and hydrogeological conditions at the Site and assesses the potential ground contamination risks for the proposed works.

The Site boundary is indicated by the red line in Figure 1—1. Planning was granted for the proposed development (ref: Decision Notice 138424/FO/2023).

The Site covers approximately 0.70 ha, M16 6BH, National Grid Reference (NGR) SJ 84225 97158. The area in the immediate vicinity comprises existing MMU buildings, the Mancunian Way (elevated highway), Oxford Road, commercial buildings, All Saints' Park. The approximate location of the Site is shown below in Figure 1—1.

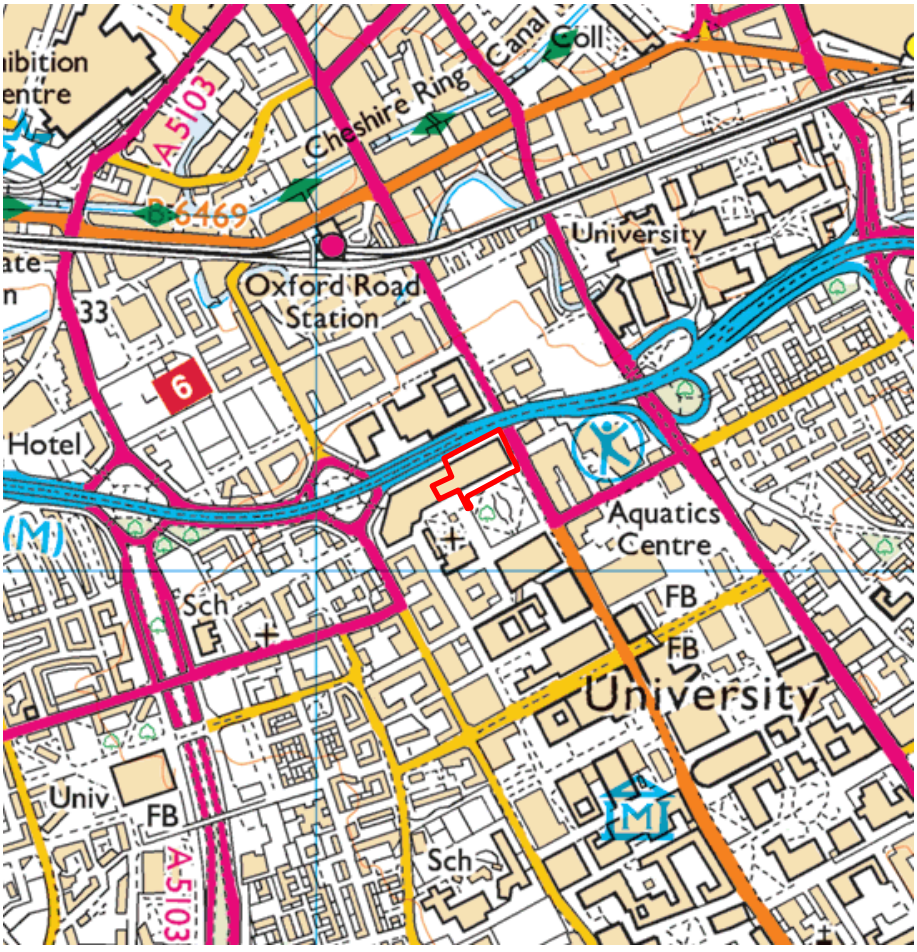


Figure 1—1 The MMU All Saints' Library site location plan. Image source www.streetmap.co.uk at 1:25,000 scale.

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1.2 Aims and objectives

The aim of the GI was to assess the geological, geotechnical and geoenvironmental conditions for the Site. This report considers the geoenvironmental aspects of the investigation, describes the Conceptual Site Model (CSM) and presents a generic quantitative assessment of contamination related risks associated with the proposed works using data obtained from both GIs.

1.3 Scope of works

To achieve the above aims, the objectives of the investigations at the Site were to provide information on the following:

- Ground model and groundwater regime;
- Location, nature and extent of contamination within the Made Ground and underlying natural strata;
- Ground gas and vapour regime to enable an outline assessment of the potential risks associated with hazardous gases and vapours.

The objectives of the report are:

- To identify any constraints associated with the ground and / or below ground infrastructure on the basis of available general information;
- To assess potential risks to people and the environment (natural and built) associated with ground contamination (solid, liquid or gas); and
- To provide recommendations and outline scope, if necessary for further works such as intrusive ground investigation and / or remedial action or design.

This report also provides information relevant for the proposed development in accordance with the requirements of the National Planning Policy Framework (NPPF) [1] and also with respect to potential liability under Part 2a of the Environmental Protection Act 1990 [2]. The work was carried out in general accordance with the Environment Agency (EA) Land Contamination Risk Management (LCRM) [3], the relevant British Standards (BS) [4] and [5], the EA Guiding Principles for Land Contamination (GPLC) [6], Groundwater Protection Policy [7] and other current good practice guidance.

1.4 Information sources

The principal source of historic information was taken from the MMU Desk Study [8]. This report is therefore based upon information obtained from these third-party sources, together with data obtained from the recent GI (undertaken between December 2023 and February 2024, Section 2.1 refers). The third-party data has been accepted at face value and has not been independently verified. Buro Happold can therefore give no warranty, representation or assurance as to the accuracy or completeness of such information.

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1.5 Competencies

Buro Happold is a consulting engineering company that manages its work under various Quality Management Systems that are certified to ISO 9001. The work itself was carried out by the staff with relevant qualifications, training and experience. Technical elements of this report have been reviewed by a Chartered Geologist.

1.6 Limitations

The scope and design of the ground investigation has reflected the site area, known history of Site use and the results of previous studies and investigations. The live site area, obstructions and presence of multiple utilities routes were significant constraints to the exploratory hole locations. On this basis the spacing and the sampling analysis for this investigation are considered to have provided a reasonable level certainty about the ground conditions. However, some parts of the Site have not been subject to recent intrusive GI due to the presence of existing operational buildings and infrastructure.

No investigation, however comprehensive, can be expected to determine absolutely the nature and variation of all the geology or contamination which could be present on any site. There will always be an element of uncertainty about the ground conditions including contamination. This potential for currently undetected contamination or variations in geology, together with the gaps in the investigation set out above, must therefore be taken into account not only in the risk assessment presented here but also in consideration of future development activities, for example, health and safety planning, financial planning and risk management and in the implementation of the below ground works during construction.

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2 Site Setting

2.1 Information sources

The Site setting has been informed from various sources of information listed below, it is recommended that the reader is fully cognisant with the original reports detailed below:

- Buro Happold (BH) Geoenvironmental Desk Study Report - Manchester Metropolitan University, All Saints Library Transformation Project. 2023 [9]
- Geotechnical Engineering Limited (GEL) Factual Ground Investigation Reports (Phase 1 / Phase 2) - MMU, All Saints Library. 2023. Ref: 37567/ 37757 [10] [11]

2.2 Site history

The following summary of the Site history has been derived from the BH Desk Study [9]. information.

Table 2—1 Site history

Historical Land Use		
OS Map Edition	**Site**	**Surrounding Area (within 100 m)**
1851 (1:1,056)	Timber Yards and unnamed terraced buildings recorded. Devonshire Street in S of site.	Terraced buildings (N & W), Stone Yard & Smithy (35 m E), Grosvenor Square & All Saints Church (20m S), Scotchy Church (40 m S).
1893 (1:2,500)	Timber Yards no longer recorded. Carriage & Tramway Depot now identified	Hotel (40 m N), School (70 m E), Bank (92 m SE), Chorlton Union Offices (90 m S), Infant School (50 m SW).
1908 (1:2,500)	No major recorded changes.	No major recorded changes.
1922 (1:2,500)	Carriage & Tramway Depot no longer recorded. School now recorded on location of former depot.	Hospital recorded (21 m S).
1932(1:2,500)	No major recorded changes.	Bank (20 m NE), Textile Machinery Works (45 m ENE), Hall (65 m ENE), Post Office (74 m E), Bakery (56 m E), Ladies Garment Manufacturer (75 m ESE). Union Offices now recorded as Public Assistance Offices (90m S).
1950 (1:2,500)	Loxford Street (formerly Devonshire Street).	Buildings no longer recorded (65m NE), All Saints Church no longer recorded (S), Lavatories & Children's playground recorded on Grosvenor Square (S), warehouse (SW).
1970 (1:2,500)	No major recorded changes	Mancunian Way (immediately N), John Dalton College of technology (50 m N), National Computer Centre (80 m NE).
1985 (1:2,500)	School replaced by Manchester Polytechnic Building (All Saints Building).	Loxford Tower (WSW), Union Office recorded as Ormond Building (90m S), Mandela Building (20 m E). Playground no longer recorded.
1992 (1:1,250)	No major recorded changes.	Bellhouse Building (SW).
2003 (1:1,250)	No major recorded changes.	No major recorded changes.

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2.3 Proposed development

The proposed development comprises the demolition of the eastern portion of the existing All Saints Library (adjacent to footpath/Oxford Road) and build a new 12 No. storey building. The remainder of the building is to be retained and refurbished.



Figure 2—1 Architect's Impression of the All Saints Library Transformation

2.4 Anticipated ground model

The geological map indicates that superficial deposits that directly underlie the site comprise: Till in the northeast portion of the site and Glaciofluvial deposits the southwest. Bedrock underlying the superficial deposits comprises: the Permian Manchester Marls Formation (MM-MDST) in the northeast of the site, and the Triassic Chester Formation (CHES-SDST) in the southwest. The West Manchester Fault is recorded in the east of the site, trending from NNW-SSE. It is downthrown by an unknown magnitude to the northeast.

The GEL GI P1 records the geology as Made Ground (reworked natural material) locally underlain by glaciofluvial deposits (medium dense clayey gravelly SAND/medium dense sandy GRAVEL), underlain by glacial till (firm to stiff slightly gravelly, slightly sandy CLAY). The bedrock comprises reddish brown siltstone and sandstone with some mudstone (Chester Formation / Manchester Marl Formation).

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2.5 Unexploded ordnance

The Zetica UXO Risk Map classifies the site as “moderate” risk. A detailed UXO desk study was completed by a specialist UXO consultant [11] which identified the Site as high-risk. Further action is required during construction to reduce the risk from UXO to as low as reasonable possible (ALARP).

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3 Preliminary Risk Assessment

3.1 Preliminary Conceptual Site Model

The Preliminary Conceptual Site Model is described in the BH DS [9], summarised in Table 3—1 overleaf. The potential contamination sources are associated with the current and former uses of the Site.

The receptors relevant to the current project are human health (construction workers, site neighbours), controlled waters (Principal Aquifer) and the built environment (including soft landscaping).

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Table 3—1 Summary of preliminary risk assessment

Source		**Receptor**/ Pathway	**Risk assessment** (following CIRIA C552)			Comment on hazard realisation
Origin	Contaminants of concern		Consequence	Probability	Risk	
On-site: Made Ground, electric substation, historic timber yard & carriage and tramway depot	Heavy metals, PAHs, asbestos, TPHs	**Description of the Source:** The site has a limited site history: Timber Yard / Terraced housing, Carriage & Tramway Depot then Manchester Polytechnic Building (All Saints Building). Limited Made Ground expected.				
		Future site users / visitors (employees, guests and maintenance) Direct / dermal contact. Inhalation of soils / dusts. Ingestion of contaminated water supplies. Migration and accumulation of hazardous gases.	Medium	Unlikely	**Low**	Proposed future use is for commercial (educational) use with soft and hard landscaping. Potential for dust generation, direct contact and ingestion. Exposure time is relatively limited. Mitigation of potential risks can be achieved by appropriate investigation / design and implementation of remediation / mitigation measures including encapsulation.
		Investigation and construction workers Direct / dermal contact. Ingestion / inhalation of contaminated soils, gases and vapours.	Medium	Low likelihood	**Moderate / Low**	Potential for exposure during investigations/ earthworks. Period of exposure dependent on construction timescales. Standard Health and Safety precautions likely to be used by workers. Mitigation of potential risks can be achieved by appropriate investigation and adoption of standard good construction practice.
		Off site occupiers / visitors of neighbouring land Inhalation of contaminated dusts.	Medium	Unlikely	**Low**	Large scale development, potential to impact surrounding visitors by dust generation. Increased potential during any earthworks. Mitigation of potential risks can be achieved by appropriate investigation and adoption of standard good construction practice.

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Source		**Receptor**/ Pathway	**Risk assessment** (following CIRIA C552)			Comment on hazard realisation
Origin	Contaminants of concern		Consequence	Probability	Risk	
		Degradation of Water quality [Superficial Secondary A aquifer – Glacial Deposits] **Migration via permeable strata**	Medium	Low likelihood	**Moderate / Low**	Potential for increased infiltration and promotion of leaching during development earthworks. Mitigation of potential risks could be achieved by appropriate investigation, risk assessment and design.
		Degradation of Water quality [Bedrock Secondary B aquifer – Manchester Marl Formation]	Medium	Unlikely	**Low**	Potential for increased infiltration and promotion of leaching during development earthworks. Mitigation of potential risks could be achieved by appropriate investigation, risk assessment and design.
		Degradation of Water quality [Bedrock Principal aquifer – Chester Formation] Migration via permeable strata	Severe	Unlikely	**Moderate / Low**	Potential for increased infiltration and promotion of leaching during development earthworks. Mitigation of potential risks could be achieved by appropriate investigation, risk assessment and design.
		Buildings/services - permeation of water supply pipework, degradation of concrete Direct contact/, aggressive attack/ below ground structures	Medium	Unlikely	**Low**	Potential for direct contact on development site. Mitigation of potential risks can be achieved by appropriate investigation / design and implementation of appropriate design.

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4 Ground Investigation

4.1 Objectives

The scope of the GI was designed to meet the aims and objectives set out in Section 1. The investigation was designed and desk-based supervised by Buro Happold with contractor services provided by GEL. It should be noted the geotechnical aspects of the project will not be reported within this document.

4.2 Investigation scope

The scope of the Phase 2 and 2 GEL GI works is included below. Extracts of the exploratory hole location plans are provided in Figure 4—1 and Figure 4—2. The first phase of the GI comprised:

- 4 No. combined cable percussive boreholes with rotary core drilling (to maximum depth of 30 m BGL) to prove the geological succession, to allow assessment of the deeper ground conditions and to allow the installation of instrumentation (BH01-BH04, BH04A)
- 2 No. days of window sampling to allow an assessment of the near surface ground conditions across the entire site, to allow the installation of instrumentation and to determine any ground contamination in respect of end use, health and safety considerations in addition to waste disposal categorization (WS01-WS04).
- A series of hand excavated trial pits (ITP01, ITP04B, ITP05-ITP07) to:
    - Obtain foundation details/geometry of the foundations of structures onsite (e.g. retaining walls)
    - Determine the strength/composition of the bearing stratum at existing foundation formation
    - Sampling to allow an assessment of the near surface ground conditions across the entire site, and to determine any ground contamination in respect of end use, health and safety considerations in addition to waste disposal categorization
- Two Dynamic Probe Holes (DP01-DP02) to establish if the basement foundation at this location stepped out away from the building which could pose a risk to future piling works
- Permeability testing
    - Variable head permeability test (WS01)
    - Falling head test (small scale soakaway testing - WS03). Note this test did not work due to borehole collapse after adding water.
- Geotechnical laboratory testing to determine the physical properties and characteristics of the ground mass for foundation design purposes
- Chemical laboratory testing to allow an assessment of any ground contamination in respect of end use, health and safety considerations in addition to waste disposal categorization
- Installation of gas and groundwater monitoring wells in each exploratory hole to allow appropriate ground gas and groundwater monitoring to be undertaken

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- Programme of gas and groundwater monitoring to allow the ground gas and groundwater conditions beneath the site to be assessed.

Phase 2 comprised:

- 4 No. external hand excavated trial pits (ITP101 – ITP104) to:
    - Obtain foundation details/geometry of the foundations of structures onsite (e.g. retaining walls)
    - Determine the strength/composition of the bearing stratum at existing foundation formation
- 2 No. internal trial pits (ITP201-ITP202) to:
    - Obtain foundation details/geometry of the foundations of structures onsite (e.g. retaining walls)
    - Determine the strength/composition of the bearing stratum at existing foundation formation
- 2 No. locations of stitch drilling to prove slab thickness.

Please refer to DN01 Summary of foundation investigation works [12] and impact on foundation design for full details.

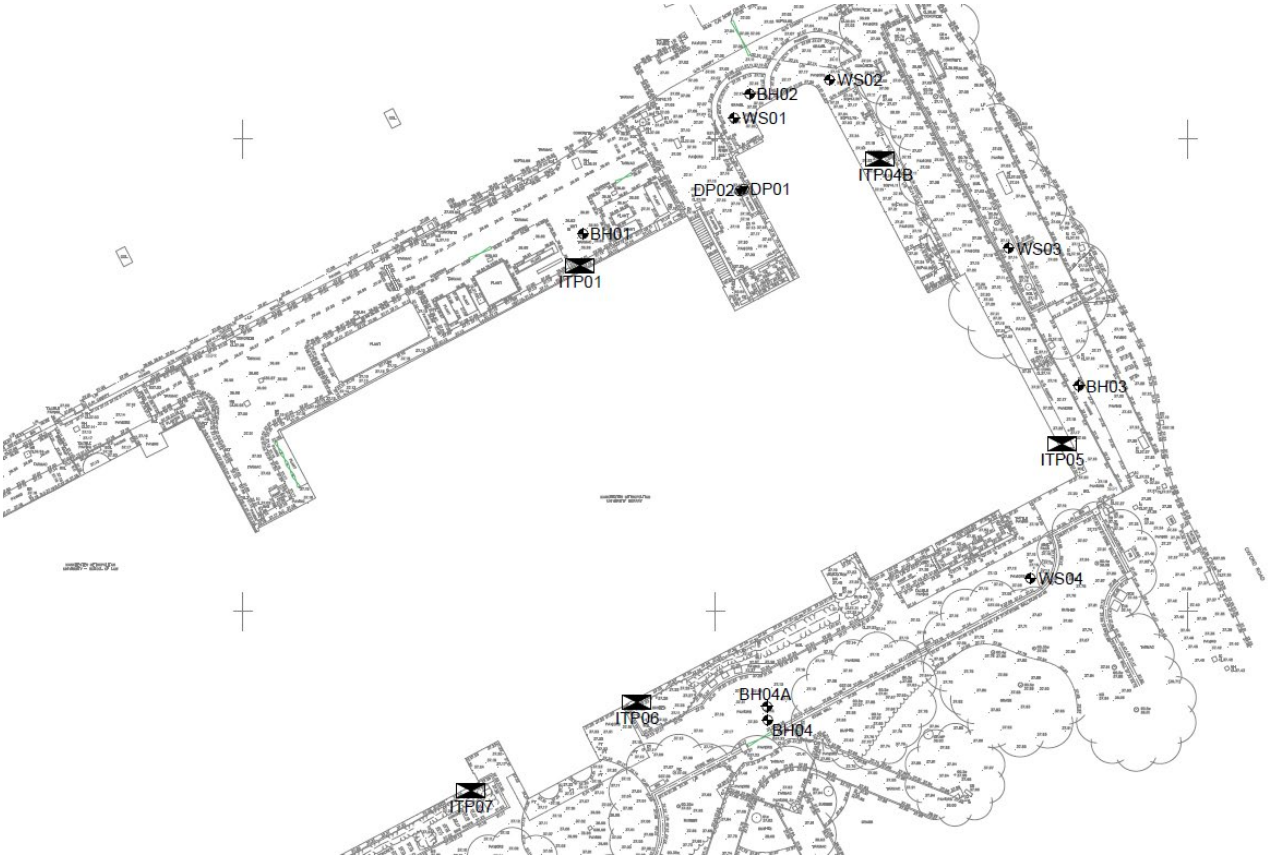


Figure 4—1 Extract of Exploratory Hole Location Plan (Phase 1)

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Figure 4—2 Extract of Exploratory Hole Location Plan (Phase 2)

4.3 Encountered ground conditions

The ground conditions comprise Made Ground, overlying Glaciofluvial deposits and Glacial Till in turn underlain by bedrock of the Chester Formation / Manchester Marls Formation.

Table 4—1 Encountered ground conditions

Depth From (m BGL)		Thickness (M)		Strata Description
Min	Max	Min	Max	
0.00	0.00	0.90	3.30	Sandy GRAVEL of limestone (hardcore) / Soft to firm brown / grey slightly sandy gravelly CLAY with gravel of sandstone, mudstone, brick, concrete & clinker. Rare fragments of ceramic. / Medium dense dark grey slightly clayey gravelly SAND. Gravel of brick, mudstone, sandstone, concrete & limestone [MADE GROUND]
0.90	3.30	1.60	3.00	Medium dense brown / reddish brown clayey gravelly SAND / Medium dense brown / grey / reddish brown sandy GRAVEL of siltstone, sandstone & mudstone [GLACIOFLUVIAL]

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Depth From (m BGL)		Thickness (M)		Strata Description
3.30	4.60	0.59	10.40	Firm to stiff grey / brown slightly sandy gravelly CLAY with gravel of mudstone, siltstone, sandstone and coal [GLACIAL TILL]
10.50	16.55	>15		Very weak SILTSTONE / Very weak SANDSTONE / Extremely weak MUDSTONE [CHESTER FORMATION / MANCHESTER MARLS FORMATION]

4.3.1 Visual / olfactory evidence of contamination

No evidence of widespread and / or gross contamination was encountered during the GEL GI's.

4.4 Groundwater

Groundwater monitoring was carried out as part of the GEL P1 GI. Monitoring commenced following the completion of the fieldwork and comprised a six-week monitoring programme.

Groundwater strikes were recorded in the Made Ground and superficial deposits before drilling with water commenced between 2.30 – 2.90 m BGL (34.55 – 34.10 m AOD). Post field work monitoring was completed between May and August 2023. The data indicates groundwater within the:

- Made Ground / Glacial Till at ~36 m AOD
- Glaciofluvial deposits at ~35-36 m AOD – possibly hydraulically connected to the Made Ground
- Chester Formation / Manchester Marls Formation at ~24-26 m AOD

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5 Geoenvironmental Risk Assessment Criteria

5.1 Soil risk assessment criteria

In order to perform a Generic Quantitative Risk Assessment (GQRA), the soil and gas test results will be compared (see Sections 6 to 8 respectively) with available Soil Guideline Values (SGVs), Category 4 Screening Values (C4SLs), and Buro Happold and other industry Generic Assessment Criteria (GAC), the details of which are presented in Appendix A.

5.1.1 Risks to human health

Chronic: For human health risk assessment, soil results will be assessed using GACs, C4SLs and SGVs for the Contaminated Land Exposure Assessment (CLEA) residential without plant uptake and commercial land use scenarios. The residential and commercial land use scenarios are applied to give context to the data and to provide indicative upper and lower bounds for discussion purposes only. The commercial land use is considered to be the most appropriate scenario against which the data is to be compared to establish suitability for use, along with the acute exposure thresholds noted below.

Acute: For acute risks to human health, soil results will be assessed using the SoBRA Acute Generic Criteria (AGAC) [12]. These AGACs have been derived for seven determinands: arsenic, benzene, cadmium, free cyanide, phenol, trichloroethylene (TCE) and vinyl chloride (VC). Lead was also considered but due to the limited toxicological data available, no threshold was determined. The exposure scenarios modelled are:

- General public exposure (or trespasser) via a single large dose (or potentially sum of several smaller doses over a short duration) of a 1-2 year old female child (averaged across ages of 0 – 6 years).
- Occupational exposure of female adult commercial / industrial worker exposed to contaminated soil during their work, such as construction, utility, site investigation or remediation worker over the working day.

Acute exposure has been defined and modelled based on an irregular (i.e. not repeated) exposure of up to 24 hours duration based on the assumption lasting for 30 minutes or less.

For determinands other than the seven modelled by SoBRA, maximum concentrations (not the average concentration which is relevant to chronic / long term risk) were considered. Comparison of maximum concentrations are made with the other GACs and other screening values which provides a conservative benchmark for such short term risks (as the values are based on long term exposure).

5.1.2 Plant health (phytotoxicity)

It is not anticipated that direct planting will take place within the material currently on Site. However, as a conservative approach and in case of future planting, soil test results indicating phytotoxicity are assessed using the BS Specification for Topsoil (BS 3882) [13].

5.1.3 Risks to below ground structures

The water industry and several water utility companies have published guidance regarding the construction of new water supply pipework on Brownfield sites [14], but there is no universally accepted guidance (or contaminant thresholds). The most recent guidance published by Water UK [15] has been adopted as best practice but is not mandatory.

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5.2 Ground gas risk assessment criteria

Ground gas data obtained from the Site will be used to assess the risks to the Site with reference to CIRIA C665 [16], National House Building Council (NHBC) guidance [17] and BS 8485 [18]. Consideration to both methane (CH4) and carbon dioxide (CO2) concentrations as well as flow rates will be given. The borehole hazardous gas flow rate (Qhg) is calculated (as the product of gas concentration multiplied by flow rate) for each monitoring location at each monitoring event. If the data set is considered comprehensive and presentative and consistent with the CSM, the site characteristic Gas Screening Value (GSV) will be the maximum Qhg. If the data set is temporally or spatially limited, a plausible worst case condition should be determined (based upon maximum concentration and maximum flow rate from relevant monitoring wells) and this worst case Qhg will be adopted to determine the site characteristic GSV [Noe – BS8485 advises that this worst case scenario should be adopted only if it is prudent and reasonable to do so and that it would not result in unnecessarily conservative assessment and recommendations]. The site characteristic GSV for both methane and carbon dioxide is then used to determine the characteristic gas situation (CS). Further consideration of the appropriateness of the CS is given by reference to additional factors (e.g. recorded maximum concentrations and flow rates). Once this check is complete, the CS (and hazard potential) is confirmed, in turn enabling the identification of the need for the scope of gas protection measures.

5.2.1 Soil vapour

Soil vapour has not been assessed at the Site as the concentrations of volatile determinands in soil or groundwater (e.g. benzene and naphthalene) were not found to be present in concentrations that may pose a risk to human health at the Site.

5.3 Waste Classification

In order to determine the likely waste classification, soil test results have been assessed using the EA Technical Guidance WM3 [19].

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6 Analytical Results for Soil

6.1 Analytical scope for soil

Seven soil chemical tests were carried out as part of the GEL P1 GI within the Made Ground. No results are above the relevant commercial threshold.

Table 6—1 below presents the laboratory testing suites used for soil during the GI. The analytical test results for contaminants in soils are presented full in Appendix B.

Table 6—1 Laboratory testing suites for soil

Suite reference	Contaminant Analysis Suite
Made Ground Soil Analysis Suite	pH, CLEA metals suite, total cyanide, total mercury, speciated PAHs, phenol, TPH (total), Soil Organic Matter, asbestos screen, BTEX, hexavalent chromium, water soluble sulphate

6.2 Made Ground – Chronic Risks

6.2.1 Inorganic determinands

All seven samples of Made Ground were analysed for inorganic determinands. The full screening assessment and factual data is presented in Appendix B. All samples recorded inorganic contaminant concentrations below commercial thresholds. Lead was elevated above residential without plant uptake threshold in one sample (WS03 at 1.20mbgl, 740mg/kg) and above residential with plant update in one sample (WS02 at 1.1mbgl, 230mg/kg).

6.2.2 Organic determinands

Four samples of Made Ground were analysed for BTEX (benzene, toluene, ethyl benzene and xylene) which recorded BTEX contaminant concentrations below both residential and commercial thresholds.

All samples of Made Ground were analysed for PAHs. Concentrations were compared with relevant screening values for human health risk assessment; Table 6—2 presents a summary, with the full screening assessment and factual data in Appendix B. One PAH exceedance occurred when compared to the more conservative residential (without plant uptake) threshold, however, is well below the relevant threshold for commercial.

Table 6—2 Concentrations of PAHs (mg/kg)

Determinand	No. of samples	GAC (No. of samples exceeding GAC). SGV; C4SL		Value
		Residential without plant uptake	Commercial / Industrial	
Naphthalene	7	2.3 (0)	190 (0)	
Acenaphthylene	7	2900 (0)	83000 (0)	
Acenaphthene	7	3000 (0)	84000 (0)	
Fluorene	7	2800 (0)	63000 (0)	
Phenanthrene	7	1300 (0)	22000 (0)	
Anthracene	7	31000 (0)	520000 (0)	

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Determinand	No. of samples	GAC (No. of samples exceeding GAC). SGV; C4SL		Value
		Residential without plant uptake	Commercial / Industrial	
Fluoranthene	7	1500 (0)	23000 (0)	
Pyrene	7	3700 (0)	54000 (0)	
Chrysene	7	30 (0)	350 (0)	
Benzo[b]fluoranthene	7	3.9 (0)	44 (0)	
Benzo[k]fluoranthene	7	110 (0)	1200 (0)	
Benzo[a]pyrene	7	3.2 (0)	35 (0)	
Indeno[123-cd]pyrene	7	45 (0)	500 (0)	
Dibenzo[ah]anthracene	7	0.31 (1)	3.5 (0)	0.4
Benzo[ghi]perylene	7	360 (0)	3900 (0)	

6.2.3 pH in Made Ground

The measurement of soil pH was recorded between 7.8 – 9.4. The slightly alkaline results are potentially related to concrete fragments present within the Made Ground.

6.2.4 Asbestos

All samples were also screened for Asbestos Containing Material (ACM). ACM was recorded in 1 out of 7 No. soil samples - WS03 at 1.20 m BGL (chrysotile bundles in sample). Detailed gravimetric quantification has been carried out which records the percentage within the sample as 0.005%. This is well below the Hazardous Waste Threshold of 0.1%, and the risk is considered to be low assuming good construction methodologies to minimise dust during construction are undertaken.

6.3 Natural strata

No gross contamination was recorded on site and no soil chemical tests had any determinands above commercial thresholds. No samples of natural material were therefore tested.

6.4 Acute risk to human health

All samples were compared against the SoBRA Acute Generic Assessment Criteria [12] for both adult receptors and the more sensitive child receptor. Both samples returned no contamination concentrations exceeding the relevant thresholds.

6.5 Phytotoxicity risk

Analysis was carried out for copper, nickel and zinc on all samples. Table 6—3 provides a summary of the screening. No exceedances were recorded for phytotoxicity.

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Table 6—3 Concentrations of copper, nickel and zinc (mg/kg)

Determinand	No. of samples	Screening threshold (No. of samples exceeding)	Maximum	Minimum
Copper	2	200 (0)	49	11
Nickel	2	110 (0)	27	8.1
Zinc	2	300 (0)	200	34

6.6 Risk to below ground structures

The desk study identified potential risks to buried services (potable water supply pipework) and the potential for contamination to permeate any plastic water supply pipework laid directly in contaminated ground. The data for the shallow Made Ground has been discussed in some detail in Section 6.2 with respect to human health assessment criteria. Some of the determinands assessed in that section (particular organic compounds) have the potential to impact not only human health but also to affect below ground water supply. This is because there is potential for particular organic contaminants to permeate plastic pipes and taint water supply if those pipes are laid in contact with contaminated soils. Owing to the nature of the works, it is not known what depths any below ground water supply pipework may be placed therefore the Made Ground sample has been used within the assessment.

6.6.1 Data assessment [Water UK]

Table 6—4 Summary of results using Water UK thresholds

Test Group	Determinand used	Total No. of samples	Polyethylene (PE) threshold (No. exceeding)	Metal Pipes / Barrier Pipes	Max.
EC5-EC10 aliphatic and aromatic hydrocarbons	Aliphatic and Aromatic C5-C10	7	2 (0)	Pass	Less than LOD
EC10-EC16 aliphatic and aromatic hydrocarbons	Aliphatic and Aromatic C10-C16	7	10 (0)	Pass	Less than LOD
EC16-EC40 aliphatic and aromatic hydrocarbons	Aliphatic and Aromatic C16-C35	7	500 (0)	Pass	Less than LOD
Total BTEX + MTBE		7	0.1 (0)	Pass	<0.01

Note 1 Threshold: For wrapped steel corrosive if pH<7 and conductivity >400uS/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity >400uS/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

6.6.2 Summary

This assessment includes indicates that PE, PVC and copper pipes laid within the Made Ground may be appropriate for potable water supply at the Site. Further testing should be undertaken during the enabling works along pipe routes to confirm if barrier pipes are required, unless otherwise agreed with the utility company.

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7 Analytical Results for Groundwater

No groundwater testing has been undertaken as no exceedances above commercial thresholds were identified within the soil tested. No gross contamination was recorded in the GEL GI's.

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8 Analytical Results for Ground Gas and Characterisation

8.1 General

Five rounds of gas monitoring have been undertaken at the Site between 16th May and 25th October 2023. Monitoring was undertaken at two locations both within the Made Ground – WS02 and WS04.

8.2 Monitoring regime

Ground gas data obtained from the Site will be used to assess the potential risks associated with the proposed development with reference to CIRIA C665, NHBC and BS 8485. Accordingly, consideration is given to both methane (CH4) and carbon dioxide (CO2) concentrations as well as flow rates. The borehole hazardous gas flow rate (Qhg) is defined as the product of the gas concentration and the flow rate. This Qhg value is calculated for both gases from each monitoring location and for each monitoring event. A GSV is then designated after consideration of all of these data taking into account issues such as reliability, borehole construction, peak and steady flows, temporal and spatial shortages etc. The GSV is then considered (with other parameters) to define a CS which broadly identifies the level of hazard associated with the ground gas regime.

8.3 Monitoring Data

Please refer to Table 8—1 and Table 8—2 for the ground gas monitoring data.

8.3.1 Response zone

The response zones installed is reflective of the Made Ground.

WS02's response zone was between 1-2mbgl. No groundwater was encountered during drilling however, during monitoring groundwater was recorded in the installation making it 'mostly flooded'.

WS04's response zone was between 1-2mbgl. No groundwater was encountered during drilling however, during monitoring groundwater was recorded in the installation making it 'mostly flooded'.

8.3.2 Atmospheric conditions

Monitoring was carried out on a total of five different occasions post-fieldwork. Atmospheric pressures were recorded by the field instrument and weather data obtained from the meteorological office. The maximum atmospheric pressure recorded on the days of monitoring was 1018mb and the minimum was 994mb.

Table 8—1 Ground gas monitoring data (WS02)

No. of readings	Response Zone (mbgl)	Depth to water (mbgl)	Condition of response zone	Strata	Max flow rate (l/hr)	Peak methane (%)	Peak carbon dioxide (%)	Min oxygen (%)	Peak carbon monoxide (ppm)	Peak hydrogen sulphide (ppm)
5	1.00 – 2.00	1.06-1.07	Mostly flooded	MG	0	<0.1	1.5	18.9	Not recorded	<1

*Made Ground

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Table 8—2 Ground gas monitoring data (WS04)

No. of readings	Response Zone (mbgl)	Depth to water (mbgl)	Condition of response zone	Strata	Max flow rate (l/hr)	Peak methane (%)	Peak carbon dioxide (%)	Min oxygen (%)	Peak carbon monoxide (ppm)	Peak hydrogen sulphide (ppm)
5	1.00 – 2.00	1.05-1.95	Mostly flooded	MG*	0	<0.1	2	15.4	Not recorded	<1

*Made Ground

8.3.3 Data description

There were no elevated concentrations of methane above the guideline threshold of 1%. All boreholes on all occasions recorded concentrations of methane below the limit of detection (<0.1%).

No elevated concentrations of carbon dioxide above the guideline threshold of 5% were recorded throughout monitoring.

A slightly depleted concentration of oxygen, 15.4%, was recorded in WS04 recorded on one visit on 3rd August 2023. The next visit the recorded oxygen level was 19.7%.

Concentrations of carbon monoxide and hydrogen sulphide were recorded below the limit of detection (<1ppm) on all occasions.

8.4 Assessment of ground gas regime

The monitoring data described above has been assessed in accordance with CIRIA 665 [16] and BS 8485 [18]. In accordance with this guidance the reliability of this data and thus characterisation of the ground gas regime is influenced by several factors described below.

- There is a sufficient set of monitoring data from the recent GI to enable an assessment of the ground gas regime. A total of five return monitoring visits were carried out within both boreholes with a total of 10 readings obtained. Five readings are considered reliable for assessment.
- The monitoring data is generally consistent with the nature and extent of the source (Made Ground).
- The monitoring has been carried out during steady to rising and falling atmospheric pressure conditions.
- There were no elevated concentrations of methane above the guideline threshold of 1%. The monitoring data recorded concentrations of methane below the limit of detection on all occasions.
- No elevated concentrations of carbon dioxide above the guideline threshold of 5% were recorded throughout monitoring.
- The recorded gas flow rates were consistently low at 0l/hr.

The calculated worst gas screening value (GSV) for CO2 and CH4 (maximum concentrations x maximum flow rate) have been determined as both falling within Characteristic Situation 1.

On the basis of all of the above, the hazardous ground gas regime on Site is considered to fall within Characteristic Situation 1 (CS1).

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9 Waste management

9.1 Introduction

The proposed development will likely involve limited earthworks where some material will likely require removal from the Site. The following section provides a preliminary waste classification for costing purposes. The assessment rationale is presented in Appendix D.

9.2 Preliminary Waste Classification

9.2.1 Code of Waste

The most applicable codes for the material on Site (Made Ground) are 17 05 03 and 17 05 04. These are mirror codes that will require further assessment to classify. Uncontaminated natural soils would be classified as Inert (17 05 04).

9.2.2 Chemical composition of waste

Seven samples of Made Ground have been used in this analysis. All samples from the Made Ground are classified as Non Hazardous by Haz-Waste Online.

Based on the above, in the Made Ground, all samples were classified as 17 05 04 (soils and stones not mentioned in 17 05 03, e.g. non-hazardous). The above information provides a preliminary assessment for off-site disposal to non-hazardous landfill or treatment facilities. If the waste is to be disposed of to a hazardous or inert landfill, the waste will need to meet the relevant WAC criteria.

Visible fragments of suspect asbestos containing materials were not recorded during the ground investigation. A total of seven samples were screened (subject to microscopic examination) for asbestos. One sample in WS03 at 1.20mbgl detected chrysotile fibres which was quantified as 0.005%).

9.2.3 Disposal to landfill

A total of 5 samples were scheduled for Waste Acceptance Criteria (WAC). Four samples recorded concentrations of all determinands that met the Inert Waste Landfill criteria. One sample recorded a concentration of Total Organic Carbon marginally elevated above the Inert Waste Landfill criteria of 3% but is suitable for Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill.

Location ID	Depth (mbgl)	Waste Acceptance Criteria Results
BH01	0.6-0.7	Meets Inert Waste Landfill
WS02	1.1-1.2	Exceeds Inert Waste Landfill, meets Stable Non-Reactive: 3.1% Total Organic Carbon
ITP04B	1.1-1.2	Meets Inert Waste Landfill
BH03	1-1.2	Meets Inert Waste Landfill
BH04A	1.3-1.4	Meets Inert Waste Landfill

In addition to the above, Total Organic Carbon (TOC) testing was scheduled on all seven soil samples. All samples recorded concentrations of TOC below the Inert Waste Landfill criteria (i.e. below or at 3%).

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9.3 Concluding comments

Notwithstanding this preliminary assessment, it is the earthwork contractor's responsibility, in association with the operator and / or owner of the landfill to classify the materials for disposal in line with current guidance. Landfill waste acceptance criteria (WAC) leachate testing and classification prior to disposal to landfill should be undertaken to confirm the waste classification of the natural soils.

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10 Geoenvironmental risk assessment

10.1 General approach

In the UK, the assessment of risk from contamination follows the source-pathway-target approach. If one of these three elements is absent it is considered that there is no risk of harm. If, however, there is considered to be a linkage between any given source any given target / receptor then a risk-based approach is used to assess the significance or impact of any such linkage.

Source	The contaminants that have the potential to negatively affect human health and / or the health of the environment (ie the hazard).
Pathway	The potential route by which a receptor may come into contact with the source.
Receptor	The specific group of human beings or aspect of the environment (eg controlled waters) that could be affected by the source.

Risks are defined as the probability of an event occurring combined with the severity of the consequence of that event occurring. Particularly, to assess the risk to site end users posed by any given source, the sensitivity of each receptor is considered. For example, the concentration of contamination acceptable at a site to be developed as a residential property, with a garden used to grow vegetables and accessible to young children, is set lower than that for a commercial site where soil is exposed in minor areas of landscaping and the only long-term users of the site are adults. Similarly, a site overlying a major aquifer supplying potable water to a large population will be considered more stringently than a site overlying an impermeable geology with only minor seepages of groundwater.

10.2 Climate change

It is accepted that the climate is changing and that this will affect future weather patterns. The Environment Agency [6] requires factoring climate change into risk assessments and remedial solutions. The British Standard 'Adaption to Climate Change – Principles, Requirements and Guidelines' [20] states that 'climate change impacts shall be assessed comprehensively…including…contamination' and should focus 'upon understanding the implications of future climate change trends and climate events over the full lifespan of a decision'. The National Planning Policy Framework [1] requires new development to contribute to 'mitigating and adapting to climate change' and to 'minimise vulnerability and increase resilience' to the range of impacts arising from climate change.

The changes to weather patterns in the UK may include: an increase in warmer weather; an increase in the frequency and intensity of rainfall events; and an increase in the duration or frequency of dry spells in the summer. Such events are also likely to become more extreme. There is the potential for these scenarios to impact upon potential contaminant migration pathways in particular with respect to both hazardous ground gas and contaminated groundwater via permeable strata, during both construction and operation of the proposed development. As ground conditions at the proposed development may be vulnerable to extreme weather events due to climate change during the demolition, construction and operation phases, these potential impacts have been considered in the risk assessment.

10.3 Conceptual Site Model (CSM)

The potential risks posed to human health and the environment by ground contamination at this Site have been evaluated by a generic quantitative risk assessment which incorporates the 'source-pathway-receptor' identification and assessment methodology in accordance with the Land Contamination Risk Management [3]. The risk assessment

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process therefore involves the identification of each source based on the Site setting information and GI results and the identification of the relevant exposure pathway and each potential receptor. The potential risks to the receptors are then assessed by considering the potential effect of the source on the receptor as well as the likelihood of a pathway linking the two, i.e. a contaminant linkage as discussed above. The conceptual site model has been considered with respect to the proposed development.

10.4 Contamination sources

Potential contamination sources from former uses of the Site have been identified following a review of Site setting and desk study information and from information gained during the GI. The potential sources of contamination and associated contaminants of concern are listed in Table 10—1.

The ground gas regime has been assessed as CS1, therefore it is not considered a source of contamination and has not been assessed further.

Table 10—1 Principal potential sources of contamination at the Site

Potential source	Location	Likely Age	Potential contaminants of concern
Made Ground (soil) from previous site uses.	On site	>100 years	Heavy metals, PAHs, asbestos, TPHs

10.5 Pollutant linkages

Site-specific pathway receptor linkages have been identified for the Site in Table 10—2 with respect to the sources outlined above the proposed development.

Table 10—2 Receptors and pathways

Receptor		Pathway
Human health	Earthwork contractors engaged with proposed development	Direct contact and dermal uptake, soil and dust ingestion and inhalation
	Users of neighbouring land (during enabling works and construction)	Soil and dust inhalation during enabling works and construction
	Future site users / visitors	Direct contact and dermal uptake, soil ingestion
Controlled Waters	Secondary A Aquifer (Superficial deposits)	Leaching and migration of potential contamination via preferential pathways
	Principal Aquifer (Chester Formation)	Leaching and migration of potential contamination via preferential pathways
Built environment	Water supply network	Direct contact with contaminated soils
Flora	Areas of soft landscaping located directly over Made Ground materials.	Root uptake from underlying contaminated materials

Based on the results of the intrusive GI and the preliminary conceptual site model, the geoenvironmental risk assessment is presented in Table 10—3 below.

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Table 10—3 Results of Geoenvironmental Risk Assessment

Source		**Receptor**/ Pathway	**Risk assessment** (following CIRIA C552)			Comment on hazard realisation
Origin	Contaminants of concern		Consequence	Probability	Risk	
On-site: Made Ground, electric substation, historic timber yard & carriage and tramway depot	Heavy metals, PAHs, asbestos, TPHs	**Description of the Source:** The site has a limited site history: Timber Yard / Terraced housing, Carriage & Tramway Depot then Manchester Polytechnic Building (All Saints Building). Limited Made Ground expected. The recent ground investigation encountered: Made Ground to between 0.90-3.30mbgl, underlain by superficial deposits of Glaciofluvial and Glacial Till, in turn underlain by bedrock of the Chester Formation / Manchester Marls. No samples tested recorded elevated determinands above commercial thresholds with and the majority below residential without plant uptake thresholds. ACM fibres were recorded in one sample (WS03 at 1.20mbgl, quantified as 0.005%).				
		Human health impacts to future Site users / visitors Direct contact with contaminated materials within soft landscaped areas. Soil ingestion.	Minor	Unlikely	**Low**	The majority of the Site will be occupied by the proposed development or and/or hardstanding, preventing direct contact with contaminants. Potential for exposure in areas of soft landscaping directly onto Made Ground. In limited areas of soft landscaping it is anticipated that suitable soil materials (thickness and quality) will be imported.
		Investigation and construction workers Direct contact with contaminated materials during construction. Soil ingestion.	Medium	Low likelihood	**Moderate / Low**	Low levels of contamination recorded during GI. Potential for contractors to be exposed to minimally contaminated soils during earthworks. Exposure time will be relatively limited. Implementation of standard good practice and Health and Safety precautions including dust control and PPE will mitigate risks.
		Human health impacts to users of neighbouring land Soil and dust inhalation during earthworks	Medium	Unlikely	**Low**	Potential to impact surrounding visitors by dust generation. Increased potential during any earthworks. Exposure time will be relatively limited. Implementation of standard good practice and Health and Safety precautions including dust control will mitigate risks.
		Degradation of Water quality in Superficial Secondary A aquifer – Glacial Deposits	Medium	Low likelihood	**Low**	Low levels of contamination recorded during GI. Enhanced potential for infiltration during earthworks following hardstanding and drainage removal through preferential pathways. Leachability likely to be low.

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Source		**Receptor**/ Pathway	**Risk assessment** (following CIRIA C552)			Comment on hazard realisation
Origin	Contaminants of concern		Consequence	Probability	Risk	
		Degradation of Water quality in bedrock Secondary B aquifer – Manchester Marl Formation	Medium	Unlikely	**Low**	Low levels of contamination recorded during GI. Enhanced potential for infiltration during earthworks following hardstanding and drainage removal through preferential pathways. Leachability likely to be low.
		Degradation of Water quality in bedrock Principal aquifer – Chester Formation	Medium	Unlikely	**Low**	Low levels of contamination recorded during GI. Enhanced potential for infiltration during earthworks following hardstanding and drainage removal through preferential pathways. Leachability likely to be low.

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11 Conclusions

11.1 Risk assessment

The geology encountered during the 2023/2024 GI consists of a maximum thickness of 3.30m of Made Ground, underlain by ~7m of superficial deposits followed by the Chester Formation / Manchester Marls Formation (sandstone bedrock). The Made Ground has been considered as a potential source of contamination due to the Site history and recorded slightly elevated concentrations of some contaminants above the residential without plant uptake threshold. These have the potential to impact people and the environment. The following risk has been identified as below:

Table 11—1 Identified risks and proposed mitigation

Receptor (source and pathway)	Risk before mitigation	Proposed mitigation	Risk after mitigation
Human Health – contractors engaged in proposed development	Moderate / Low	Standard good practice and Health and safety precautions including dust control and PPE implemented to mitigate risks.	Low

11.2 Concluding remarks

Below the hardstanding across the majority of the Site, the Made Ground included approximately 3.30m of mixed constituents (cohesive and granular), with gravels comprising concrete, brick, clinker, sandstone and siltstone.

Seven soil samples were scheduled for chemical analysis. No concentrations of any inorganic and organic determinands were recorded above commercial / industrial thresholds. Lead was slightly elevated above the residential without plant uptake threshold in one sample (WS03 at 1.20mbgl, 740mg/kg) and above the residential with plant update threshold in one sample (WS02 at 1.1mbgl, 230mg/kg). One sample returned concentrations of Dibenzo[ah]anthracene above the residential without plant uptake threshold. All other samples were below the commercial thresholds.

Asbestos was screened as part of the chemical testing analysis, with chrysotile asbestos fibres detected in one sample in WS03 (quantification 0.005%).

The ground gas regime has been assessed as Characteristic Situation 1, therefore no mitigation is required to protect against potentially hazardous ground gas accumulation.

Limited waste characterisation has been carried out to inform the preliminary waste assessment. All samples are classified as non-hazardous waste. It is the earthwork contractor's responsibility, in association with the operator and / or owner of the landfill to classify the materials for disposal in line with current guidance.

The landscaping proposals at the Site generally comprise hardstanding with planters. If any areas of soft landscaping are proposed, they should incorporate suitable thicknesses of imported sub-soil and topsoil materials, which are also required for horticultural purposes.

A detailed UXO risk assessment concluded that the risks associated with UXO is high therefore further actions are required during any intrusive works for the proposed development. Please refer to the 6Alpha report for full details.

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11.3 Recommendations

No formal Remediation Strategy is required for the Site owing to the encountered ground conditions, proposed works and assessed risks, however the activities should be managed appropriately in line with standard good practice. These are outlined within Section 12.

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12 Remedial Approach

12.1 General

It is understood that a contractor (i.e. the Principal Contractor under Construction (Design and Management) Regulations 2015 (CDM 2015)) will be appointed to undertake the demolition aspects, complete minimal groundworks and install the substructure.

There are no significant risks identified at the Site. Slightly elevated concentrations of lead and Dibenzo[ah]anthracene were recorded in two samples, however these were all below the relevant commercial land use criteria. Asbestos fibres were detected at the Site in one sample from the GEL P1 GI. Upon quantification, this was 0.005% which is well below the Hazardous Waste threshold of 0.1%.

12.2 Remedial approach

12.2.1 Protection of earthwork contractors

The potential for direct contact and dust inhalation (including asbestos fibres) during the enabling works and any subsequent below ground work will be mitigated by a combination of the measures set out below. The measures comprise;

- Avoid below ground excavations / earthworks not required for proposed development.
- Ensuring awareness of the potential for contamination in the earthworks - workforce engaged in any below ground works by the provision of briefing and Site induction including description of the potential for and the nature of potential contaminants and setting out the provisions being implemented on Site.
- Soils excavated should be segregated during excavation based on visual and olfactory evidence of contamination, and stockpiled separately.
- Appropriate asbestos awareness training for all staff carrying out excavation works due to the asbestos containing material and fibres encountered in one sample from the GEL P1 GI (0.005%).
- A 'Watching Brief' to be undertaken during excavation of Made Ground materials.
- Providing an appropriate level of personal protective equipment (PPE) and ensuring that this is worn at all times;
- Ensuring that supplementary PPE that may become necessary (eg RPE) are immediately available to be used if required;
- Ensuring a good standard of hygiene with the consumption of food and drink permitted only in designated areas. Smoking will not be permitted on Site;
- Unforeseen contamination – addressed within the contractors Construction & Environmental Management Plan and the project earthworks specification;
- Suitable surface water control measures in place;

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- Ensuring good construction practice (including appropriate mitigation measures) is followed during excavation and any below ground works to prevent the generation and the migration of dusts created by below ground works and other construction activities; and
- In the unlikely event of a requirement for entry into below ground confined spaces, precautions will be adopted to accord with HSE guidance and regulations.

Once the proposed development is complete it is anticipated that the majority of the Made Ground will have been encapsulated by hardstanding. This significantly reduces the ongoing risk from direct contract or dust inhalation.

12.2.2 Protection of surrounding Site users / visitors

The potential for dust inhalation (including asbestos fibres) during earthworks will be mitigated by ensuring good construction practice to prevent the generation and the migration of dusts created by below ground work activities.

The Control of Asbestos Regulations (CAR) 2012 requires actions to ensure the protection of workers and general public from asbestos exposures resulting from work activities. The Contractor is required to put in place appropriate measures to deal with dust and the identified contamination during the works. This is particularly important when moving Made Ground soils which may contain asbestos.

Once the proposed development is complete it is anticipated that the majority of the Made Ground will have been encapsulated by hardstanding. This significantly reduces the ongoing risk from direct contact or dust inhalation.

12.2.3 Unforeseen contamination encountered

The GI data does not indicate the presence of widespread and / or gross contamination. However, there is potential that unforeseen contamination may be present in the Site which may be encountered during the enabling works and construction of the proposed development. The potential risks related to any such contamination will be mitigated by the following management regime;

1. The Contractor's toolbox talk will alert the construction workforce to the potential for such unforeseen contamination. Encountering any such unforeseen contamination will require immediate cessation of excavation and notification of the Contractor's Site Manager and the Engineer;

2. In the event of any such unforeseen contamination being encountered, an appropriately qualified environmental specialist will be contacted and will visit the Site as soon as practicable (but within a minimum of 48 hours) to determine the need for and scope of any remedial action. Proposals for any such action (investigation, analysis, monitoring or remedial action) will be discussed and agreed with the local authority (and EA if appropriate prior to implementation.

3. Adherence to the project earthworks specification.

12.2.4 Spoil disposal

To manage waste and off-site disposal routes and costs, soils should be segregated by the Contractor during excavation. It is important to segregate soils to maximise sustainability and disposal or re-use options and provide a cost benefit. The Contractor will need to be able to demonstrate this and provide a method statement for how it will approach the management of waste soil and other material.

The majority Made Ground at the Site is likely to be classified as Non-Hazardous Waste. Notwithstanding this preliminary assessment, it is the earthworks contractor's responsibility, in association with the operator and / or owner

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of the landfill to classify any such materials for disposal in line with current guidance. Landfill waste acceptance criteria (WAC) leachate testing and classification prior to disposal to landfill should be undertaken to confirm the waste classification. Where materials are retained for re-use on Site, these will require segregation and separate stockpiling away from any contaminated arisings. The material will need to meet the appropriate chemical and geotechnical requirements as set out in the Earthworks specification. Where soft landscaping is proposed, materials will need to meet the relevant horticultural requirements.

Natural uncontaminated soil arisings will be classified as Inert Waste.

Excavated materials may need to be temporarily stockpiled whilst awaiting disposal. The materials should be stockpiled in accordance with the following, in addition to any other good practice or legal requirements:

In order to minimise waste disposal costs, soils excavated should be segregated during excavation based on visual and olfactory evidence of contamination, and stockpiled separately.

All stockpiles will be placed in an impermeable area of the Site (e.g. concrete in good condition with no surface water drains), covered with impermeable sheeting and secured.

12.2.5 Obstructions

Due to the development history of the Site area and proposed Improvement Works, encountering sub-surface obstructions from former structures cannot be discounted. Photographs and logs with measurements will be required before removal to record such features and to delineate the extent, size and orientation of previous building foundations, other historic obstructions or redundant buried structures.

12.2.6 Soft landscaping

The landscaping proposals at the Site generally comprise hardstanding with some potential areas of soft landscaping (above ground planters). If any areas of soft landscaping are proposed, they should incorporate suitable thicknesses of imported subsoil and topsoil materials, which are also required for horticultural purposes.

12.2.7 Areas not investigated

It is broadly considered, that based on the Site history, the material in areas not investigated will be similar to those encountered within the surrounding area. However, it is recommended that a 'Watching Brief' is completed by suitably qualified environmental personnel during any excavations to confirm the nature of this material. Where materials present potential contamination, the remedial approach outlined above within Section 12.2.3 (unexpected contamination) is implemented.

12.3 Verification / Completion

Based on the findings of the GI, it is recommended that the proposed works to be carried can be completed under CDM regulations without the need for a formal Remediation Strategy. In order to demonstrate the works are completed in line with CDM regulations, a short report will be prepared that collates all the evidence to demonstrate standard good construction practice was implemented, spoil was appropriately disposed of, and no unexpected contamination was encountered. This will be the responsibility of the Principal Contractor undertaking the works and shall be documented within their Health and Safety File upon completion of the proposed works.

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Appendix A Contamination Risk Assessment Criteria

A.1 Introduction

A risk-based approach is used for the assessment of contamination, requiring identification of a contaminant source, a receptor and a realistic pathway via which the contaminant may reach the receptor. The key receptors considered in this assessment are site end-users, construction workers and controlled waters. In order to perform a generic quantitative risk assessment, the soil test results have been compared with available Soil Guideline Values (SGVs), Category 4 Screening Levels (C4SLs), BuroHappold and other industry Generic Assessment Criteria (GAC).

A.2 General Contaminants

Analytical data derived from the investigation has been put into context by comparison with published guidance or derived thresholds values. Current UK guidance published thresholds comprise SGVs and C4SLs, which are available for a limited number of determinands (Reference. 1 to Reference. 9) and land uses. For contaminants without published SGVs or C4SLs or where soil conditions are different to those assumed for the published guideline values (6% soil organic matter content and sandy loam soil), GACs have been derived. The derivation of GACs has been carried out based on published statutory guidance documents (Reference. 10, Reference. 11 and Reference. 12) and with consideration of the most sensitive receptors in the respective CLEA standard land- uses scenarios (the 0 to 6 year old child for the residential with plant uptake ($Resi_1$) and residential without plant uptake ($Resi_2$) scenarios and the adult for the commercial/ industrial land-use scenario) using the software model "CLEA 1.06" and "CLEA 1.071" and associated handbook (Reference. 13, Reference. 14 and Reference. 15). Contaminant specific model input values have been selected as prescribed by the Environment Agency SGV reports (Reference. 1 to Reference. 7). In the absence of SGV reports, contaminant specific input values have been selected as suggested by SC050021/SR7 (Reference. 16) and / or the LQM reports (Reference. 17 and Reference. 18) and/or the EIC/AGS report (Reference. 19).

A.3 Lead

Assessment criteria for Lead have been adopted as derived and detailed in the C4SL documents (Reference. 8).

A.4 Mercury

Assessment criteria for mercury is based on the published threshold SGV (Reference. 7) and the S4UL (Reference. 18), these have been produced for elemental, inorganic and methyl mercury. Inorganic mercury is the most common form of mercury in the environment. It is recommended by the Environment Agency that elemental and methyl mercury are used as thresholds where the Desk Study has identified a potential source otherwise inorganic mercury should be used. Concentrations of elemental mercury will also be considered where concentrations are notably higher than 'natural' background concentrations (e.g. 20mg/kg).

A.5 Nickel

Following the report by the European Food Safety Authority (EFSA) in February 2015 (Reference. 21) the Environment Agency withdrew the Soil Guideline Value (SGV) for nickel and its supporting reports. The Environment Agency have no plans to update the documents or produce any new SGV reports. Following the publication of the EFSA report, LQM advised that the TDI for oral pathways proposed by EFSA was more appropriate than the value previously used. Accordingly LQM issued a revised S4UL value for nickel which has been adopted here.

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A.6 Chromium

Assessment criteria for chromium is based on the published threshold LQM value (Reference. 17 and Reference. 18) and have been produced for chromium III (trivalent) and chromium VI (hexavalent). Chromium III is the most common form of chromium in the environment, chromium VI is produced by the oxidation of chromium III through industrial processes. Therefore chromium VI should only be assessed where the Desk Study has identified a potential source otherwise chromium III should be used.

A.7 Statistical Analysis

Where individual concentrations of contaminants have been found exceeding assessment criteria, the data of the specific contaminant was analysed statistically in line with the 'Guidance on Comparing Soil Contaminant Data with Critical Concentrations' (Reference. 20). Where the distribution of data for particular determinands showed evidence of non-normality, the 95% upper confidence limits (US95) were calculated using the Chebychev Theorem in accordance with this guidance (Reference. 20).

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Appendix B Soil Data

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BURO HAPPOLD

Project: MMU - Library
Project Number: 052621
Date: Jun-2024

Asbestos

Asbestos Screen	No. Samples	No. samples detected	No. samples ND	% of samples detect
	7	0	0	
Asbestos Quantification	No. Quants	No. samples <0.001%	No. samples >0.001% <0.01%	No. samples >0.01%
	1	0	1	0

Human Health

Soil Organic Matter 1%
N/A = no screening criteria available

No. samples exceeding

		Residential with Uptake	Residential without Uptake	Commercial	Residential with Uptake	Residential without Uptake	Commercial	No Tests	No <LOD	Min	Max	Location of Maximum
Cyanide	mg/kg	4.6	760	16000				6	2	0.10	1.00	WS03 1.2mbgl
Free Cyanide	mg/kg	4.6	760	16000				5	5			
Arsenic	mg/kg	37	40	640				7		3.60	11.00	WS02 1.1-1.2mbgl
Barium	mg/kg	N/A	1300	22000				7		43.00	690.00	WS03 1.2mbgl
Beryllium	mg/kg	1.7	1.7	12				4		0.30	0.80	BH03 1-1.2mbgl
Boron	mg/kg	290	11000	240000				7	3	0.40	0.80	WS02 1.1-1.2mbgl
Cadmium	mg/kg	26	149	410				7		0.10	0.70	WS02 1.1-1.2mbgl
Chromium	mg/kg	910	910	8600				7		8.30	25.00	BH03 1-1.2mbgl
Copper	mg/kg	2400	7100	68000				7		11.00	67.00	WS04 1.2mbgl
Lead	mg/kg	200	310	2330	2	1		7		9.90	740.00	WS03 1.2mbgl
Mercury (elemental)	mg/kg	1.2	1.2	58				7	1	0.09	0.96	WS02 1.1-1.2mbgl
Nickel	mg/kg	130	180	980				7		8.10	27.00	BH03 1-1.2mbgl
Selenium	mg/kg	250	430	12000				7	7			
Vanadium	mg/kg	410	1200	9000				7		14.00	33.00	BH03 1-1.2mbgl
Zinc	mg/kg	3700	40000	730000				7		26.00	200.00	WS03 1.2mbgl
TPH	mg/kg	N/A	N/A	N/A				7	4	34.00	140.00	WS03 1.2mbgl
Benzene	mg/kg	0.087	0.38	27				4	4			
Toluene	mg/kg	130	869	869				4	4			
Ethyl Benzene	mg/kg	47	83	518				4	4			
m/p Xylenes	mg/kg	56	79	576								
o Xylenes	mg/kg	60	88	478								
Xylenes	mg/kg	56	79	576				4	4			
MTBE	mg/kg	N/A	N/A	N/A				4	4			
Naphthalene	mg/kg	2.3	2.3	190				7	6	0.13	0.13	ITP04B 1.1-1.2mbgl
Acenaphthylene	mg/kg	170	2900	83000				7	6	0.05	0.05	ITP04B 1.1-1.2mbgl
Acenaphthene	mg/kg	210	3000	84000				7	5	0.05	0.31	ITP04B 1.1-1.2mbgl
Fluorene	mg/kg	170	2800	63000				7	5	0.04	0.24	ITP04B 1.1-1.2mbgl
Phenanthrene	mg/kg	95	1300	22000				7	3	0.30	2.30	ITP04B 1.1-1.2mbgl
Anthracene	mg/kg	2400	31000	520000				7	3	0.07	0.44	ITP04B 1.1-1.2mbgl
Fluoranthene	mg/kg	280	1500	23000				7	2	0.50	2.90	ITP04B 1.1-1.2mbgl
Pyrene	mg/kg	620	3700	54000				7	2	0.40	3.00	ITP04B 1.1-1.2mbgl
Benzo[a]anthracene	mg/kg	7.2	11	170				7	2	0.20	1.30	ITP04B 1.1-1.2mbgl
Chrysene	mg/kg	15	30	350				7	2	0.29	1.30	ITP04B 1.1-1.2mbgl
Benzo[b]fluoranthene	mg/kg	2.6	3.9	44				7	2	0.20	1.10	ITP04B 1.1-1.2mbgl
Benzo[k]fluoranthene	mg/kg	77	110	1200				7	2	0.08	0.39	ITP04B 1.1-1.2mbgl
Benzo[a]pyrene	mg/kg	2.2	3.2	35				7	2	0.20	0.97	ITP04B 1.1-1.2mbgl
Indeno[123-cd]pyrene	mg/kg	27	45	500				7	4	0.08	0.60	WS03 1.2mbgl
Dibenzo[ah]anthracene	mg/kg	0.24	0.31	3.5	1	1		7	5	0.12	0.40	WS03 1.2mbgl
Benzo[ghi]perylene	mg/kg	320	360	3900				7	4	0.09	0.40	WS03 1.2mbgl
Total USEPA 16 PAHs	mg/kg	N/A	N/A	N/A				7	2	2.00	15.00	ITP04B 1.1-1.2mbgl
Aliphatic C5 - C6	mg/kg	42	42	3200				7	7			
Aliphatic C6 - C8	mg/kg	100	100	7800				7	7			
Aliphatic C8 - C10	mg/kg	27	27	2000				7	7			
Aliphatic C10 - C12	mg/kg	130	130	9700				7	7			
Aliphatic C12 - C16	mg/kg	1100	1100	59000				7	7			
Aliphatic C16 - C21	mg/kg	65000	65000	1600000				7	7			
Aliphatic C21 - C35	mg/kg	65000	64000	1600000				7	7			
Total Aliphatic	mg/kg	N/A	N/A	N/A				7	7			
Aromatic C5 - C7	mg/kg	70	370	26000				7	7			
Aromatic C7 - 8	mg/kg	130	860	56000				7	7			
Aromatic C8 - C10	mg/kg	34	47	3500				7	7			
Aromatic C10 - 12	mg/kg	74	250	16000				7	7			
Aromatic C12 - C16	mg/kg	140	1800	36000				7	7			
Aromatic C16 - C21	mg/kg	260	1900	28000				7	7			
Aromatic C21 - C35	mg/kg	1100	1900	28000				7	7			
Total Aromatic	mg/kg	N/A	N/A	N/A				7	7			
Total Aliphatic and Aromatic	mg/kg	N/A	N/A	N/A				7	7			

Appendix C Ground Gas Data

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Gas Risk Assessment Spreadsheet

Data entered by: 03/07/2024

Site Name: MMU Library
Job Number: 53621

Methodology based on Wilson et al, 2006, Assessing Risks Posed by Hazardous Ground Gases to Buildings, CIRIA Report C665

Step 1: Summary of Monitoring Data

Table 1

Borehole	Maximum Flow rate (l/hr)	Minimum flow rate (inc Negative) (l/hr)	Peak Methane concentrations* (%)	Peak Carbon Dioxide concentrations* (%)	Minimum Oxygen concentrations (%)	Peak Carbon Monoxide concentrations (ppm)	Peak Hydrogen Sulphide concentrations (ppm)
WS02	0	0	0.0	1.5	18.9		0
WS04	0	0	0.0	2	15.4		0
Worst Case Example+	0	0	0	2	15.4	0	0

*Using 0.05% instead of 0% as this is half the minimum detection limit of the monitoring instrument used
+ Using highest concentration and highest flow rate

Situation A: All other development excluding low rise housing with gardens

Ref. 1 defines gas screening value (GSV) of gas = Chg/100 x q
Where: C_{hg} = hazardous gas concentrations (% v/v)
q = flow rate (litres/hour)

Table 2

Borehole	Peak CH4 GSV (l/hr)	CH4 GSV for peak gas concentration and flow rate (Table 8.5 - Ref. 1)	Peak CO2 GSV (l/hr)	CO2 GSV for peak gas concentration and flow rate (Table 8.5 - Ref. 1)
WS02	0.0000	1	0.0000	1
WS04	0.0000	1	0.0000	1
Worst Case Example+	0.0000	1	0.0000	1

Lower limit (l/hr)		Upper limit (l/hr)
0	1	0.07
0.07	2	0.7
0.7	3	3.5
3.5	4	15
15	5	70
70	6	

Based on Wilson *et al*, 1999, Reliability and Risk in Gas Protection Design

Situation B: Low rise housing with gardens

Ref. 1 defines gas screening value (GSV) of gas = Chg/100 x q
Where: C_{hg} = hazardous gas concentrations (% v/v)
q = flow rate (litres/hour)

Table 3

Borehole	CH4 Peak GSV (l/hr)	CH4 GSV for peak gas concentration and flow rate (Table 8.7 - Ref. 1)	CO2 Peak GSV (l/hr)	CO2 GSV for peak gas concentration and flow rate (Table 8.7 - Ref. 1)
WS02	0.00	Green	0	Green
WS04	0.00	Green	0	Green
Worst Case Example+	0.00	Green	0.00	Green

CH4

Lower limit (l/hr)	Upper limit (l/hr)		Typical Maximum
0	Green	0.16	1
0.16	Amber 1	0.63	5
0.63	Amber 2	1.56	20
1.56	Red		

CO2

Lower limit (l/hr)	Upper limit (l/hr)		Typical Maximum
0	Green	0.78	5
0.78	Amber 1	1.56	10
1.56	Amber 2	3.13	30
3.13	Red		

Based on Boyle and Witherington, 2006, Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present, Incorporating 'Traffic Lights'

Ref. 1: Wilson et al, 2007, Assessing Risks Posed by Hazardous Ground Gases to Buildings, CIRIA Report C665

Appendix D Preliminary Waste Classification (HazWaste Online)

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Buro Happold

HazWasteOnline™

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

YOLWB-13W9W-BZHMP

Job name

MMU library

Description/Comments

Project

0052621

Site

MMU Library

Classified by

Name:
Geoffrey Perrett
Date:
03 Jul 2024 10:34 GMT
Telephone:
020 7927 9700

Company:
Buro Happold
71 Newman Street
London
W1T 1PD

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: -

Course	Date
Hazardous Waste Classification	-

Purpose of classification

2 - Material Characterisation

Address of the waste

MMU Library **Post Code** N/A

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Redevelopment of site leading to excess soils generation

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of foundations and earthworks

Description of the waste

Made Ground

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	BH01	0.6-0.7	Non Hazardous		3
2	WS02	1.1-1.2	Non Hazardous		5
3	BH03	1-1.2	Non Hazardous		7
4	ITP04B	1.1-1.2	Non Hazardous		9
5	WS03	1.2	Non Hazardous		11
6	WS04	1.2	Non Hazardous		14
7	DCP01	0.6	Non Hazardous		16

Related documents

#	Name	Description
1	2022 Geoff	waste stream template used to create this Job

Report

Created by: Geoffrey Perrett

Created date: 03 Jul 2024 10:34 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	18
Appendix B: Rationale for selection of metal species	19
Appendix C: Version	20

Classification of sample: BH01

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
BH01
Sample Depth:
0.6-0.7 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		5 mg/kg	1.32	6.602 mg/kg	0.00066 %		
2	barium { barium oxide }		215-127-9	1304-28-5		43 mg/kg	1.117	48.01 mg/kg	0.0048 %		
3	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.3 mg/kg	2.775	0.833 mg/kg	0.0000833 %		
4	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		0.4 mg/kg	3.22	1.288 mg/kg	0.000129 %		
5	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.1 mg/kg	1.142	0.114 mg/kg	0.0000114 %		
6	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				15 mg/kg	2.27	34.05 mg/kg	0.0034 %		
7	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		11 mg/kg	1.126	12.385 mg/kg	0.00124 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	9.9 mg/kg	1.56	15.442 mg/kg	0.00099 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		8.1 mg/kg	2.976	24.108 mg/kg	0.00241 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<**LOD**
11	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		21 mg/kg	1.785	37.489 mg/kg	0.00375 %		
12	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		26 mg/kg	2.774	72.128 mg/kg	0.00721 %		
13	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.1 mg/kg	1.884	<0.188 mg/kg	<0.0000188 %		<**LOD**
14	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
16		ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
17		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
18		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
19		TPH (C6 to C40) petroleum group				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
				TPH									
20		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
21		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-917-1	208-96-8									
22		acenaphthene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-469-6	83-32-9									
23		fluorene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-695-5	86-73-7									
24		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-581-5	85-01-8									
25		anthracene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			204-371-1	120-12-7									
26		fluoranthene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-912-4	206-44-0									
27		pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			204-927-3	129-00-0									
28		benzo[a]anthracene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
29		chrysene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
30		benzo[b]fluoranthene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
31		benzo[k]fluoranthene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
32		benzo[a]pyrene; benzo[def]chrysene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
33		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
34		dibenz[a,h]anthracene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
35		benzo[ghi]perylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-883-8	191-24-2									
36		pH				8.5	pH		8.5	pH	8.5 pH		
				PH									
37		phenol				<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0259 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS02

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
WS02	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
1.1-1.2 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11	mg/kg	1.32	14.524	mg/kg	0.00145 %		
2	barium { barium oxide }		215-127-9	1304-28-5		280	mg/kg	1.117	312.622	mg/kg	0.0313 %		
3	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.7	mg/kg	2.775	1.943	mg/kg	0.000194 %		
4	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
5	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7	mg/kg	1.142	0.8	mg/kg	0.00008 %		
6	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				14	mg/kg	2.27	31.78	mg/kg	0.00318 %		
7	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		49	mg/kg	1.126	55.169	mg/kg	0.00552 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	230	mg/kg	1.56	358.757	mg/kg	0.023 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17	mg/kg	2.976	50.597	mg/kg	0.00506 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5	mg/kg	1.405	<0.703	mg/kg	<0.0000703 %		**<LOD**
11	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		26	mg/kg	1.785	46.415	mg/kg	0.00464 %		
12	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		100	mg/kg	2.774	277.415	mg/kg	0.0277 %		
13	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.2	mg/kg	1.884	0.377	mg/kg	0.0000377 %		
14	benzene	601-020-00-8	200-753-7	71-43-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
16	●	ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
17		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
18		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
19	●	TPH (C6 to C40) petroleum group				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
				TPH									
20		naphthalene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
21	●	acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-917-1	208-96-8									
22	●	acenaphthene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
			201-469-6	83-32-9									
23	●	fluorene				0.04	mg/kg		0.04	mg/kg	0.000004 %		
			201-695-5	86-73-7									
24	●	phenanthrene				0.47	mg/kg		0.47	mg/kg	0.000047 %		
			201-581-5	85-01-8									
25	●	anthracene				0.07	mg/kg		0.07	mg/kg	0.000007 %		
			204-371-1	120-12-7									
26	●	fluoranthene				0.77	mg/kg		0.77	mg/kg	0.000077 %		
			205-912-4	206-44-0									
27	●	pyrene				0.73	mg/kg		0.73	mg/kg	0.000073 %		
			204-927-3	129-00-0									
28		benzo[a]anthracene				0.25	mg/kg		0.25	mg/kg	0.000025 %		
		601-033-00-9	200-280-6	56-55-3									
29		chrysene				0.29	mg/kg		0.29	mg/kg	0.000029 %		
		601-048-00-0	205-923-4	218-01-9									
30		benzo[b]fluoranthene				0.24	mg/kg		0.24	mg/kg	0.000024 %		
		601-034-00-4	205-911-9	205-99-2									
31		benzo[k]fluoranthene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
		601-036-00-5	205-916-6	207-08-9									
32		benzo[a]pyrene; benzo[def]chrysene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-032-00-3	200-028-5	50-32-8									
33	●	indeno[123-cd]pyrene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
			205-893-2	193-39-5									
34		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
35	●	benzo[ghi]perylene				0.09	mg/kg		0.09	mg/kg	0.000009 %		
			205-883-8	191-24-2									
36	●	pH				9.4	pH		9.4	pH	9.4 pH		
				PH									
37		phenol				5	mg/kg		5	mg/kg	0.0005 %		
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.104 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH03

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:		LoW Code:	
BH03		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:			
1-1.2 m		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		8.9	mg/kg	1.32	11.751	mg/kg	0.00118 %		
2	barium { barium oxide }		215-127-9	1304-28-5		52	mg/kg	1.117	58.058	mg/kg	0.00581 %		
3	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.8	mg/kg	2.775	2.22	mg/kg	0.000222 %		
4	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<0.2	mg/kg	3.22	<0.644	mg/kg	<0.0000644 %		<**LOD**
5	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2	mg/kg	1.142	0.228	mg/kg	0.0000228 %		
6	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				25	mg/kg	2.27	56.75	mg/kg	0.00568 %		
7	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		24	mg/kg	1.126	27.021	mg/kg	0.0027 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	22	mg/kg	1.56	34.316	mg/kg	0.0022 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		27	mg/kg	2.976	80.359	mg/kg	0.00804 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5	mg/kg	1.405	<0.703	mg/kg	<0.0000703 %		<**LOD**
11	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		33	mg/kg	1.785	58.911	mg/kg	0.00589 %		
12	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		45	mg/kg	2.774	124.837	mg/kg	0.0125 %		
13	benzene	601-020-00-8	200-753-7	71-43-2		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
14	toluene	601-021-00-3	203-625-9	108-88-3		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
15	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]											
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
17		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane											
		603-181-00-X	216-653-1	1634-04-4		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
18	●	TPH (C6 to C40) petroleum group											
				TPH		<10	mg/kg		<10	mg/kg	<0.001 %		<**LOD**
19		naphthalene											
		601-052-00-2	202-049-5	91-20-3		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
20	●	acenaphthylene											
			205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
21	●	acenaphthene											
			201-469-6	83-32-9		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
22	●	fluorene											
			201-695-5	86-73-7		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
23	●	phenanthrene											
			201-581-5	85-01-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
24	●	anthracene											
			204-371-1	120-12-7		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
25	●	fluoranthene											
			205-912-4	206-44-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
26	●	pyrene											
			204-927-3	129-00-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
27		benzo[a]anthracene											
		601-033-00-9	200-280-6	56-55-3		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
28		chrysene											
		601-048-00-0	205-923-4	218-01-9		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
29		benzo[b]fluoranthene											
		601-034-00-4	205-911-9	205-99-2		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
30		benzo[k]fluoranthene											
		601-036-00-5	205-916-6	207-08-9		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
31		benzo[a]pyrene; benzo[def]chrysene											
		601-032-00-3	200-028-5	50-32-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
32	●	indeno[123-cd]pyrene											
			205-893-2	193-39-5		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
33		dibenz[a,h]anthracene											
		601-041-00-2	200-181-8	53-70-3		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
34	●	benzo[ghi]perylene											
			205-883-8	191-24-2		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
35	●	pH											
				PH		7.9	pH		7.9	pH	7.9 pH		
36		phenol											
		604-001-00-2	203-632-7	108-95-2		<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		<**LOD**
										Total:	0.0454 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: ITP04B

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
ITP04B	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
1.1-1.2 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.6 mg/kg	1.32	12.675 mg/kg	0.00127 %		
2	barium { barium oxide }		215-127-9	1304-28-5		180 mg/kg	1.117	200.971 mg/kg	0.0201 %		
3	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		0.6 mg/kg	2.775	1.665 mg/kg	0.000167 %		
4	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		0.7 mg/kg	3.22	2.254 mg/kg	0.000225 %		
5	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.3 mg/kg	1.142	0.343 mg/kg	0.0000343 %		
6	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				13 mg/kg	2.27	29.51 mg/kg	0.00295 %		
7	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		49 mg/kg	1.126	55.169 mg/kg	0.00552 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	180 mg/kg	1.56	280.767 mg/kg	0.018 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		15 mg/kg	2.976	44.644 mg/kg	0.00446 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		**<LOD**
11	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		22 mg/kg	1.785	39.274 mg/kg	0.00393 %		
12	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		110 mg/kg	2.774	305.156 mg/kg	0.0305 %		
13	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.2 mg/kg	1.884	0.377 mg/kg	0.0000377 %		
14	benzene	601-020-00-8	200-753-7	71-43-2		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		**<LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		toluene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
16	●	ethylbenzene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
17		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
18		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
19	●	TPH (C6 to C40) petroleum group				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
				TPH									
20		naphthalene				0.13	mg/kg		0.13	mg/kg	0.000013 %		
		601-052-00-2	202-049-5	91-20-3									
21	●	acenaphthylene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
			205-917-1	208-96-8									
22	●	acenaphthene				0.31	mg/kg		0.31	mg/kg	0.000031 %		
			201-469-6	83-32-9									
23	●	fluorene				0.24	mg/kg		0.24	mg/kg	0.000024 %		
			201-695-5	86-73-7									
24	●	phenanthrene				2.3	mg/kg		2.3	mg/kg	0.00023 %		
			201-581-5	85-01-8									
25	●	anthracene				0.44	mg/kg		0.44	mg/kg	0.000044 %		
			204-371-1	120-12-7									
26	●	fluoranthene				2.9	mg/kg		2.9	mg/kg	0.00029 %		
			205-912-4	206-44-0									
27	●	pyrene				3	mg/kg		3	mg/kg	0.0003 %		
			204-927-3	129-00-0									
28		benzo[a]anthracene				1.3	mg/kg		1.3	mg/kg	0.00013 %		
		601-033-00-9	200-280-6	56-55-3									
29		chrysene				1.3	mg/kg		1.3	mg/kg	0.00013 %		
		601-048-00-0	205-923-4	218-01-9									
30		benzo[b]fluoranthene				1.1	mg/kg		1.1	mg/kg	0.00011 %		
		601-034-00-4	205-911-9	205-99-2									
31		benzo[k]fluoranthene				0.39	mg/kg		0.39	mg/kg	0.000039 %		
		601-036-00-5	205-916-6	207-08-9									
32		benzo[a]pyrene; benzo[def]chrysene				0.97	mg/kg		0.97	mg/kg	0.000097 %		
		601-032-00-3	200-028-5	50-32-8									
33	●	indeno[123-cd]pyrene				0.34	mg/kg		0.34	mg/kg	0.000034 %		
			205-893-2	193-39-5									
34		dibenz[a,h]anthracene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
		601-041-00-2	200-181-8	53-70-3									
35	●	benzo[ghi]perylene				0.39	mg/kg		0.39	mg/kg	0.000039 %		
			205-883-8	191-24-2									
36	●	pH				9.3	pH		9.3	pH	9.3 pH		
				PH									
37		phenol				<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0898 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS03

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
WS03	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:		
1.2 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		0.005 mg/kg		0.005 mg/kg	0.0000005 %		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11 mg/kg	1.32	14.524 mg/kg	0.00145 %		
3	barium { barium oxide }		215-127-9	1304-28-5		690 mg/kg	1.117	770.389 mg/kg	0.077 %		
4	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		0.6 mg/kg	3.22	1.932 mg/kg	0.000193 %		
5	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.5 mg/kg	1.142	0.571 mg/kg	0.0000571 %		
6	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				18 mg/kg	2.27	40.86 mg/kg	0.00409 %		
7	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		57 mg/kg	1.126	64.176 mg/kg	0.00642 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	740 mg/kg	1.56	1154.263 mg/kg	0.074 %		
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		10 mg/kg	2.976	29.763 mg/kg	0.00298 %		
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		**<LOD**
11	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		23 mg/kg	1.785	41.059 mg/kg	0.00411 %		
12	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		200 mg/kg	2.774	554.829 mg/kg	0.0555 %		
13	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides,					1 mg/kg	1.884	1.884 mg/kg	0.000188 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
		ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }											
		006-007-00-5											
14		TPH (C6 to C40) petroleum group				140	mg/kg		140	mg/kg	0.014 %		
				TPH									
15		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
16		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
17		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
18		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
19		phenanthrene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			201-581-5	85-01-8									
20		anthracene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			204-371-1	120-12-7									
21		fluoranthene				1.6	mg/kg		1.6	mg/kg	0.00016 %		
			205-912-4	206-44-0									
22		pyrene				1.5	mg/kg		1.5	mg/kg	0.00015 %		
			204-927-3	129-00-0									
23		benzo[a]anthracene				0.8	mg/kg		0.8	mg/kg	0.00008 %		
		601-033-00-9	200-280-6	56-55-3									
24		chrysene				0.8	mg/kg		0.8	mg/kg	0.00008 %		
		601-048-00-0	205-923-4	218-01-9									
25		benzo[b]fluoranthene				0.5	mg/kg		0.5	mg/kg	0.00005 %		
		601-034-00-4	205-911-9	205-99-2									
26		benzo[k]fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-036-00-5	205-916-6	207-08-9									
27		benzo[a]pyrene; benzo[def]chrysene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		601-032-00-3	200-028-5	50-32-8									
28		indeno[123-cd]pyrene				0.6	mg/kg		0.6	mg/kg	0.00006 %		
			205-893-2	193-39-5									
29		dibenz[a,h]anthracene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
		601-041-00-2	200-181-8	53-70-3									
30		benzo[ghi]perylene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
			205-883-8	191-24-2									
31		pH				8.1	pH		8.1	pH	8.1 pH		
				PH									
32		phenol				<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		<LOD
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.241 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because No evidence of free product in soils. Soils present with natural moisture content. Unlikely to be flammable.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.014%)

Classification of sample: WS04

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS04
Sample Depth:
1.2 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10 mg/kg	1.32	13.203 mg/kg	0.00132 %		
2	barium { barium oxide }		215-127-9	1304-28-5		55 mg/kg	1.117	61.408 mg/kg	0.00614 %		
3	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<0.2 mg/kg	3.22	<0.644 mg/kg	<0.0000644 %		<LOD
4	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.228 mg/kg	0.0000228 %		
5	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				14 mg/kg	2.27	31.78 mg/kg	0.00318 %		
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		67 mg/kg	1.126	75.435 mg/kg	0.00754 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	77 mg/kg	1.56	120.106 mg/kg	0.0077 %		
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		11 mg/kg	2.976	32.739 mg/kg	0.00327 %		
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
10	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		21 mg/kg	1.785	37.489 mg/kg	0.00375 %		
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		34 mg/kg	2.774	94.321 mg/kg	0.00943 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				0.1 mg/kg	1.884	0.188 mg/kg	0.0000188 %		
13	TPH (C6 to C40) petroleum group			TPH		50 mg/kg		50 mg/kg	0.005 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			205-917-1	208-96-8									
16		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			201-469-6	83-32-9									
17		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			201-695-5	86-73-7									
18		phenanthrene				1.1	mg/kg		1.1	mg/kg	0.00011 %		
			201-581-5	85-01-8									
19		anthracene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			204-371-1	120-12-7									
20		fluoranthene				1.4	mg/kg		1.4	mg/kg	0.00014 %		
			205-912-4	206-44-0									
21		pyrene				1.5	mg/kg		1.5	mg/kg	0.00015 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.8	mg/kg		0.8	mg/kg	0.00008 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
			205-883-8	191-24-2									
30		pH				7.8	pH		7.8	pH	7.8 pH		
				PH									
31		phenol				<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		<**LOD**
		604-001-00-2	203-632-7	108-95-2									
										Total:	0.0483 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because No evidence of free product in soils. Soils present with natural moisture content. Unlikely to be flammable.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.005%)

Classification of sample: DCP01

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
DCP01
Sample Depth:
0.6 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		3.6 mg/kg	1.32	4.753 mg/kg	0.000475 %		
2	barium { barium oxide }		215-127-9	1304-28-5		290 mg/kg	1.117	323.787 mg/kg	0.0324 %		
3	boron { diboron trioxide }	005-008-00-8	215-125-8	1303-86-2		<0.2 mg/kg	3.22	<0.644 mg/kg	<0.0000644 %		<LOD
4	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.228 mg/kg	0.0000228 %		
5	chromium { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				8.3 mg/kg	2.27	18.841 mg/kg	0.00188 %		
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		16 mg/kg	1.126	18.014 mg/kg	0.0018 %		
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	35 mg/kg	1.56	54.594 mg/kg	0.0035 %		
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		9.3 mg/kg	2.976	27.679 mg/kg	0.00277 %		
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
10	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		14 mg/kg	1.785	24.993 mg/kg	0.0025 %		
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		49 mg/kg	2.774	135.933 mg/kg	0.0136 %		
12	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.1 mg/kg	1.884	<0.188 mg/kg	<0.0000188 %		<LOD
13	TPH (C6 to C40) petroleum group			TPH		34 mg/kg		34 mg/kg	0.0034 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
15		acenaphthylene											
			205-917-1	208-96-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
16		acenaphthene											
			201-469-6	83-32-9		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
17		fluorene											
			201-695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
18		phenanthrene											
			201-581-5	85-01-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
19		anthracene											
			204-371-1	120-12-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
20		fluoranthene											
			205-912-4	206-44-0		0.5	mg/kg		0.5	mg/kg	0.00005 %		
21		pyrene											
			204-927-3	129-00-0		0.4	mg/kg		0.4	mg/kg	0.00004 %		
22		benzo[a]anthracene											
		601-033-00-9	200-280-6	56-55-3		0.2	mg/kg		0.2	mg/kg	0.00002 %		
23		chrysene											
		601-048-00-0	205-923-4	218-01-9		0.3	mg/kg		0.3	mg/kg	0.00003 %		
24		benzo[b]fluoranthene											
		601-034-00-4	205-911-9	205-99-2		0.2	mg/kg		0.2	mg/kg	0.00002 %		
25		benzo[k]fluoranthene											
		601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.1	mg/kg	0.00001 %		
26		benzo[a]pyrene; benzo[def]chrysene											
		601-032-00-3	200-028-5	50-32-8		0.3	mg/kg		0.3	mg/kg	0.00003 %		
27		indeno[123-cd]pyrene											
			205-893-2	193-39-5		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
28		dibenz[a,h]anthracene											
		601-041-00-2	200-181-8	53-70-3		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
29		benzo[ghi]perylene											
			205-883-8	191-24-2		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
30		pH											
				PH		8.7	pH		8.7	pH	8.7 pH		
31		phenol											
		604-001-00-2	203-632-7	108-95-2		<0.3	mg/kg		<0.3	mg/kg	<0.00003 %		**<LOD**
										Total:	0.0628 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because No evidence of free product in soils. Soils present with natural moisture content. Unlikely to be flammable.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0034%)

Appendix A: Classifier defined and non GB MCL determinands

- **barium oxide** (EC Number: 215-127-9, CAS Number: 1304-28-5)

Description/Comments: Data from ECHA's C&L Inventory Database, Sigma Aldrich SDS dated 6/2/20
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/88825
Data source date: 02 Apr 2020
Hazard Statements: Acute Tox. 3; H301 , Skin Corr. 1B; H314 , Eye Dam. 1; H318 , Acute Tox. 1; H332

- **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

barium {barium oxide}

No evidence of sources of Barium or metal processing on site.

beryllium {beryllium oxide}

Reasonable case CLP species based on hazard statements/molecular weight. Industrial sources include: most common (non alloy) form, used in ceramics (edit as required)

boron {diboron trioxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case scenario

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

vanadium {divanadium pentaoxide; vanadium pentoxide}

Worst Case Scenario

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2024.158.6092.11254 (06 Jun 2024)
HazWasteOnline Database: 2024.158.6092.11254 (06 Jun 2024)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
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