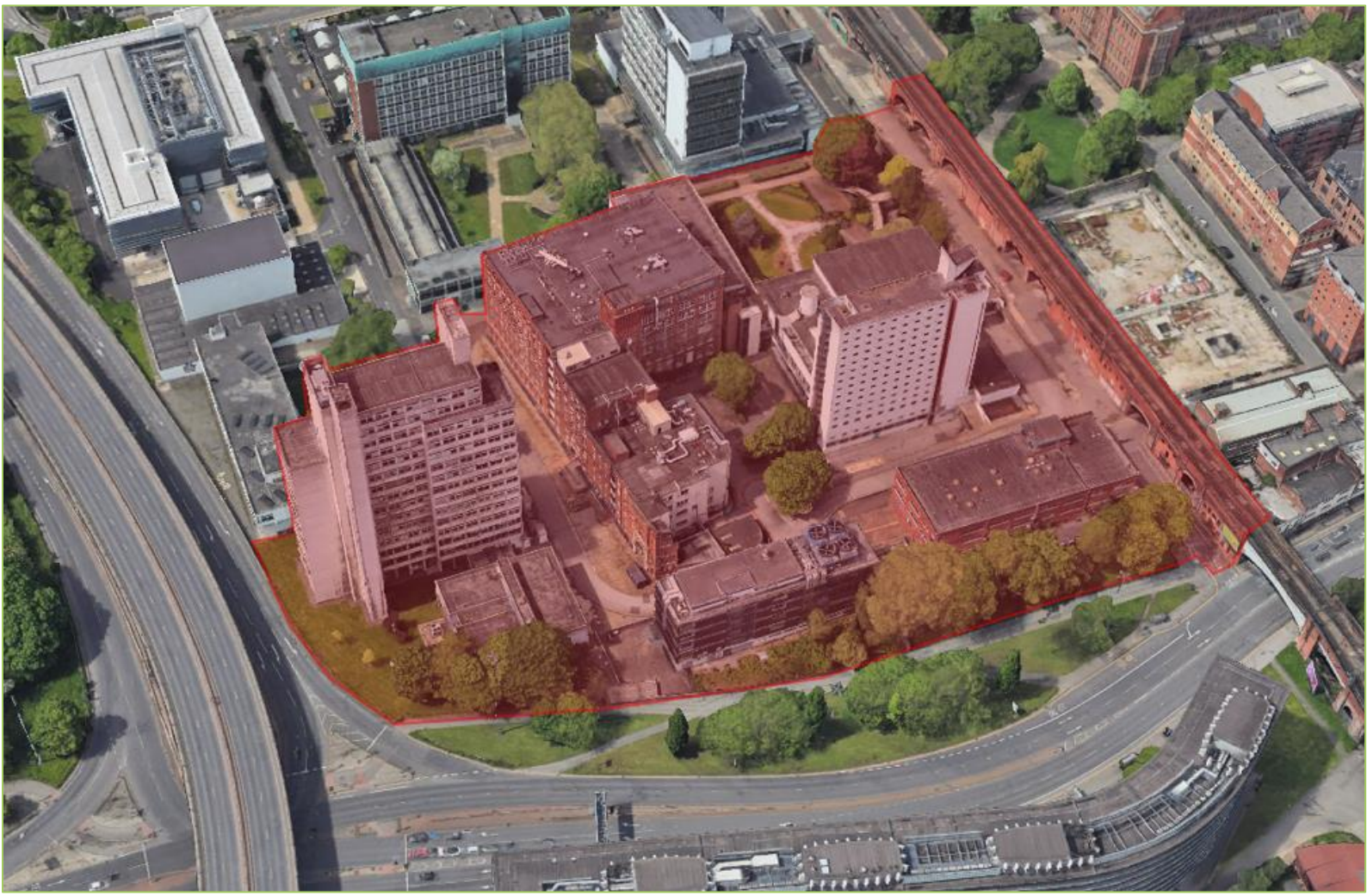
Sister – Plot C and Enabling Works Area

Phase 1 Desk Study and Data Review

31 January 2025

Prepared For

ID Manchester Limited



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Phase 1 Desk Study and Data Review

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1. Introduction

Civic Earth Limited was appointed on 1 December 2023 by ID Manchester Limited (the Client) to undertake a Phase 1 Desk Study, data review and preliminary risk assessment for the proposed redevelopment of Plot C, Plot E and Plot F. The plots form part of the wider Sister masterplan development area (herein referred to as the "wider Sister area") which is currently split into seven development zones, as illustrated in Plate 1.

Plot C will include the first new builds on the wider Sister area and is the largest development plot. Whilst the detailed design is still being developed, the development of Plot C will likely be split into two distinct stages; a demolition and enabling stage, and a new build stage. The enabling stage may include the works to the south of Plot C (Plots E and/or F) and as such, it has been assumed in this report that the enabling works area may include up to all of Plots E and F, as illustrated in Plate 2.

Plate 1: Sister Indicative Masterplan Plots

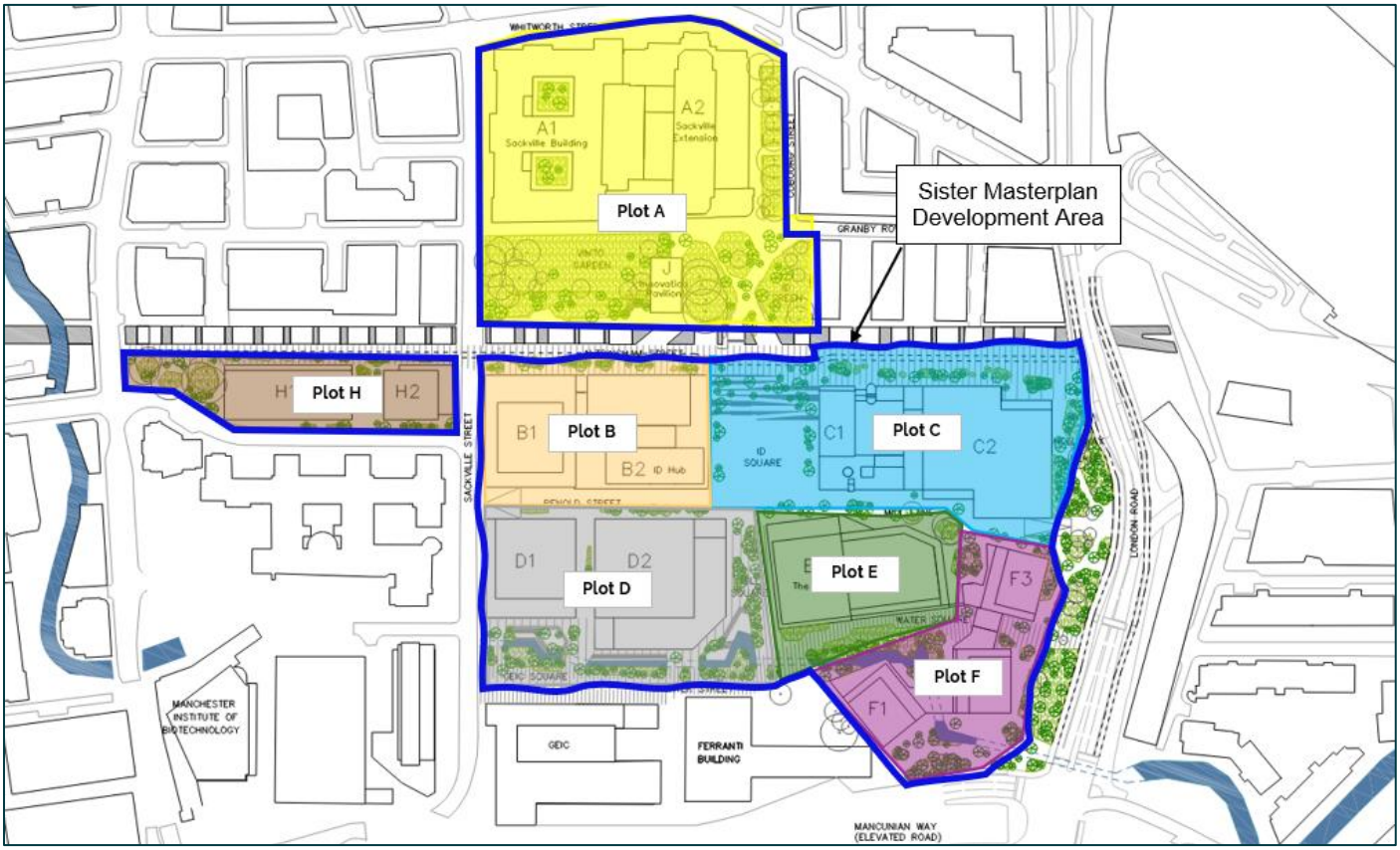
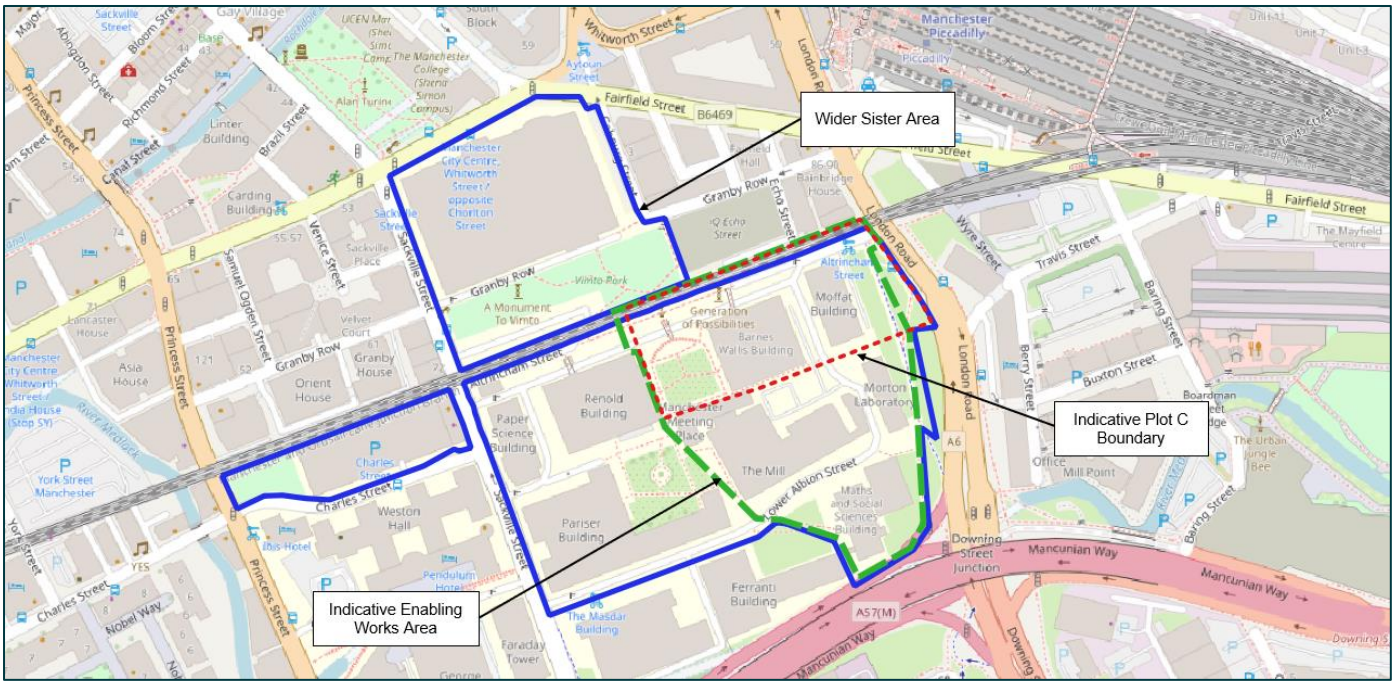


Plate 2: Indicative Boundary of Enabling Works Area (©OpenStreetMap Contributors)



The following reports have previously been produced for the wider Sister area and have been provided to Civic Earth for review:

- Arup (2019) *University of Manchester North Campus. Ground Conditions Desk Study*. November 2019. Reference UNMC-ARUP-ZZ-XX-RP-CG-0001. Revision 2[1].
- Allied Exploration & Geotechnics Limited (2020) *ID Manchester. Preliminary Ground Investigation.* April 2020. Reference NW1588[2].
- 1st Line Defence (2022) *Detailed Unexploded Ordnance (UXO) Risk Assessment.* April 2022. Reference DA14968-00[3].
- Arup (2022) *ID Manchester. Preliminary Ground Investigation Interpretative Report*. November 2022. Reference SISTER00-ARP-ZZ-ZZ-RP-ZZ-00001. Revision 3[4].

In addition, the following reports have been provided for the off-site Graphene Engineering Innovation Centre which is located on the University of Manchester (UoM) campus to the southwest of the wider Sister development area:

- Geotechnics (2015) The Graphene Engineering Innovation Centre – GEIC. Factual Report. July 2015. Reference PN153337[5].
- Ramboll (2015) Graphene Engineering Innovation Centre. Ground Investigation Report. August 2015. Reference 61033768-GIR, Revision 01[6].
- Ramboll (2015) The Graphene Engineering Innovation Centre - GEIC. Contaminated Land Interpretative Report. August 2015. Reference 61033768-CLIR, Revision 02[7].

[1] Arup (2019) *University of Manchester North Campus. Ground Conditions Desk Study*. November 2019. Reference UNMC-ARUP-ZZ-XX-RP-CG-0001. Revision 2.

[2] Allied Exploration & Geotechnics Limited (2020) *ID Manchester. Preliminary Ground Investigation.* April 2020. Reference NW1588.

[3] 1st Line Defence (2022) *Detailed Unexploded Ordnance (UXO) Risk Assessment.* April 2022. Reference DA14968-00.

[4] Arup (2022) *ID Manchester. Preliminary Ground Investigation Interpretative Report*. November 2022. Reference SISTER00-ARP-ZZ-ZZ-RP-ZZ-00001. Revision 3.

[5] Geotechnics (2015) The Graphene Engineering Innovation Centre – GEIC. Factual Report. July 2015. Reference PN153337.

[6] Ramboll (2015) Graphene Engineering Innovation Centre. Ground Investigation Report. August 2015. Reference 61033768-GIR, Revision 01.

[7] Ramboll (2015) The Graphene Engineering Innovation Centre - GEIC. Contaminated Land Interpretative Report. August 2015. Reference 61033768-CLIR, Revision 02.

The aim of this report is to evaluate potential human health, environmental and geotechnical risks and constraints associated with the proposed development of Plot C and the Enabling Works area, including:

- Information obtained from a review of available historical mapping and a recent environmental disclosure report for Plot C and the Enabling Works area, and the previous site investigations and reports outlined above;
- A summary of the anticipated ground conditions and associated geotechnical and geoenvironmental constraints based on review of available published and unpublished sources and previous site investigation data;
- A preliminary qualitative contamination source-pathway-receptor risk assessment based on the available desk study information, previous site investigation data and the current proposed redevelopment plans; and
- Recommendations for site investigation and further assessment, if required, to inform the enabling works and detailed design of Plot C.

For completeness and to inform the assessment presented herein, an overview of the historical development, ground conditions and geoenvironmental and geotechnical risks and constraints for the wider Sister area is also provided.

This document is intended to support the planning application for Plot C and to inform the scope for further site investigation. It is assumed that ecological, flooding and archaeological desk studies/assessments will be undertaken by others and fall outside the scope of this report.

2. Site Context

2.1 Site Location

As outlined in Section 1, Plot C and the Enabling Works area forms part of the wider Sister area and is located on the UoM's former North Campus, which occupies land between Fairfield Street, London Road, Mancunian Way and Princess Street. Plot C falls within the north of the Enabling Works area. The indicative boundaries of Plot C, Enabling Works area and wider Sister area are illustrated in Plate 2 above.

The approximate postcode for the centre of the wider Sister area is M1 3AL. The National Grid coordinates for the approximate centre of Plot C are 384707E, 397648N and Plot C is approximately 2.1ha in size. The Enabling Works area is approximately 2ha in size and the wider Sister area is approximately 7.38 ha in size (approximately 4.58ha excluding the Enabling Works area).

2.2 Site Description

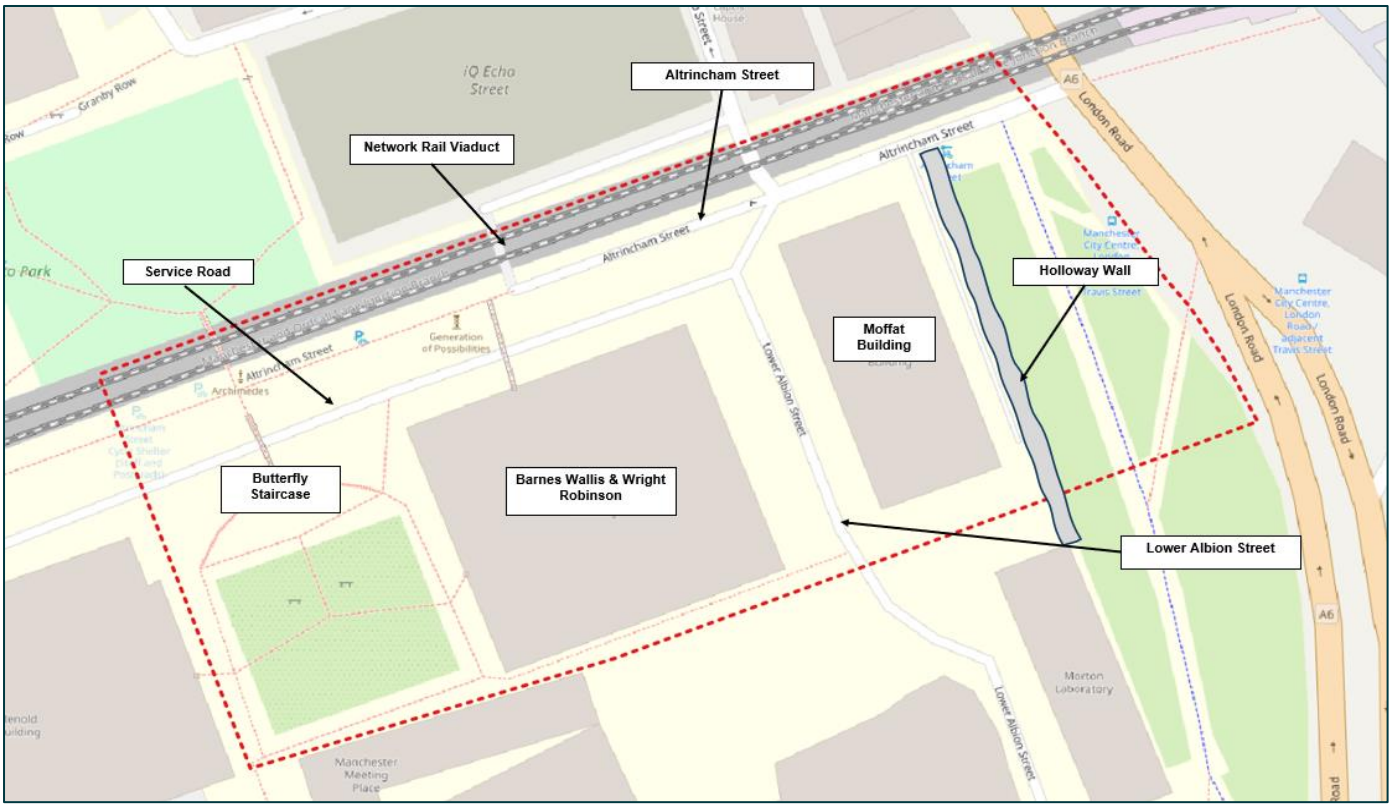
A site walkover was carried out to the external areas of Plot C, the Enabling Works area and the wider Sister area on 12 December 2023 by an engineer from Civic Earth. Full details of the site walkover are included in the site walkover record and photographs included in Appendix A.

Plot C is approximately rectangular in shape and is predominantly occupied by the former UoM Barnes Wallis, Wright Robinson and Moffat buildings in the centre and east of Plot C. A square garden area is present in the west of Plot C, and a second area of soft landscaping in the east of Plot C. The Butterfly Staircase is present in the northwest of Plot C leading from the gardens up to Altrincham Street which runs approximately east-west in the north of Plot C. An operational Network Rail (NR) viaduct, a Grade II listed structure, is located in the north of Plot C in an east-west orientation. A series of vaults are present beneath Altrincham Street. A section of the Grade II Listed Holloway Wall is present in the east of Plot C. The Plot C layout is illustrated in Plate 3.

With reference to the Arup report[4] and observations during the site walkover survey, basements (or part basements) are understood to be present within the UoM buildings. The buildings are surrounded by areas of hardstanding and access roads including Altrincham Street in the north of Plot C (in an east-west orientation), Service road (in an east-west orientation) directly to the south of Altrincham Street and Lower Albion Street which passes between the Wright Robinson and Moffat buildings heading to the south of Plot C.

Ground level in the north of Plot C, at the base of the NR viaduct (i.e. at Altrincham Street level), ranges from approximately +38.9mOD in the east to approximately +36.8mOD in the west. Service Road ranges in level from +33.1mOD in the east, down to +32.9mOD and rising again to approximately +36.5mOD in the west. A raised walkway also links Altrincham Street to the Barnes Wallis and Wright Robinson buildings. Plot C slopes upwards from the south of Lower Albion Street to the base level of the viaduct.

Plate 3: Plot C Layout



With reference to the building survey reports completed for Plot C[8], the Barnes Wallis, Wright Robinson and Moffat buildings are described as follows:

- **Barnes Wallis** – a three storey building with basement constructed in the 1960s and previously used as conferencing facilities with commercial kitchen as well as computer labs, study space and former nightclub. A previous asbestos survey for the building identified asbestos containing materials (ACMs) "throughout the property, ranging from very low to high risk". The basement houses the plant room. The foundations are assumed to be reinforced concrete pads beneath the column positions and an access tunnel is present beneath the building providing access to maintain the steam network (see Section 2.6) which serves the majority of the wider UoM campus buildings.
- **Wright Robinson** – a 14 storey building with basement level (shared with the Barnes Wallis building) constructed in the 1960s. The building previously provided student accommodation. A previous asbestos survey for the building identified "extensive ACMs throughout the property". The foundations are assumed to be piled foundations beneath column positions and an access tunnel for the steam network is present below the building.
- **Moffat Building** – a two storey building with basement level, believed to have been constructed in the 1960s. The building was previously occupied by the "Campus Vision Centre" including a combination of offices, lab spaces, consultation rooms and lecture theatre, and later by Balfour Beatty and Laing O'Rourke as temporary site offices for nearby site works. A previous asbestos survey for the building identified ACMs "throughout the property" where the asbestos identified ranges from "very low to high risk". The plant room is located at roof level and a boiler room is located within the basement. The foundations are assumed to comprise reinforced concrete pads beneath column positions with strip foundations supporting the external walls, and an access tunnel for the steam network is present beneath the building.

Information from the UoM has been provided to Civic Earth on the possible residual contaminants associated with the previous building uses, which states that the use of contaminants (e.g. mercury, lead, radioactive substances) was not carried out within the Barnes Wall, Wright Robinson or Moffat buildings. Each of the buildings were identified to have asbestos within the building fabric, and it is noted in the building survey reports that the UoM actively managed the

[8] CBRE (2020) The University of Manchester. Building Survey Report. January 2020. Version 1.

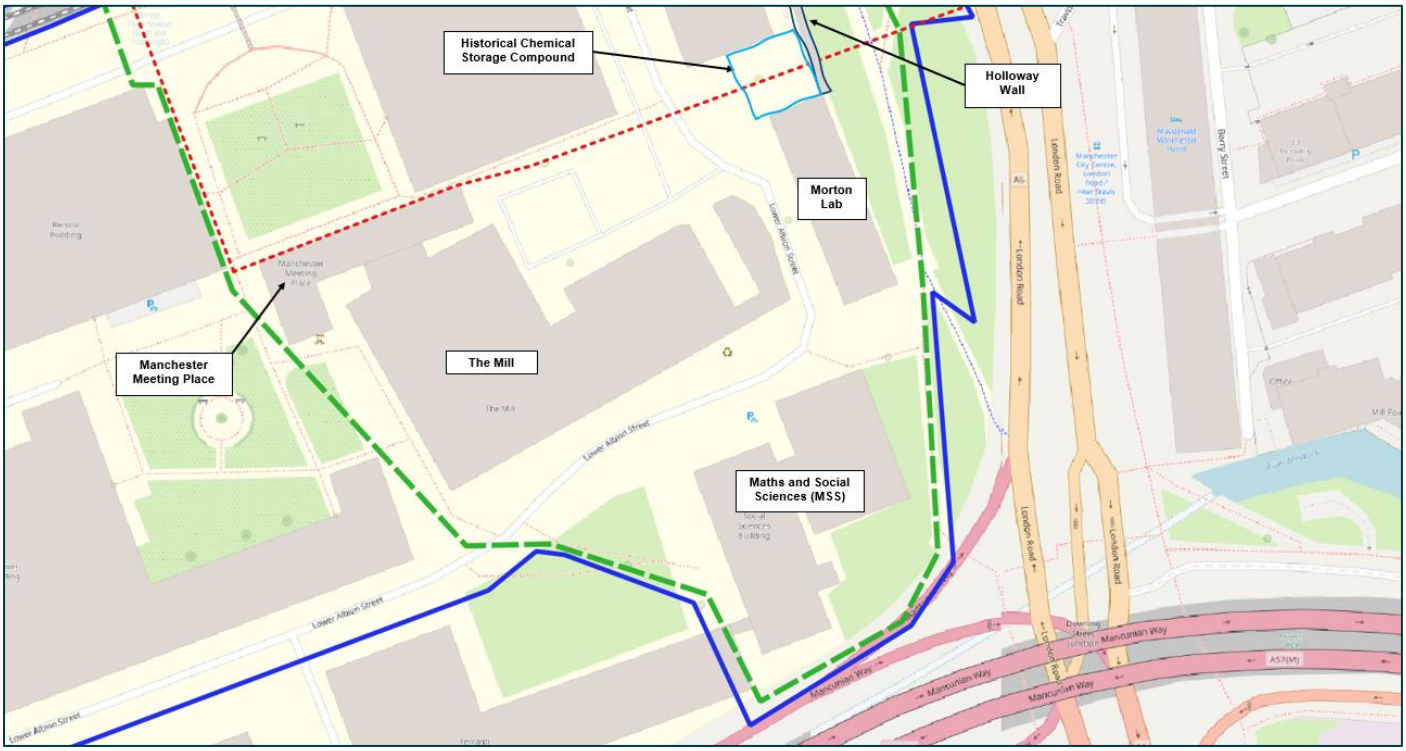
asbestos in the buildings.

2.3 Enabling Works Area Description

The Enabling Works area is irregular in shape and is predominantly occupied by former UoM buildings; Morton Laboratory in the east, Maths and Social Science (MSS) in the south, the Mill across the centre and Manchester Meeting Place (MMP) in the west. With reference to the Arup report[4] and observations during the site walkover survey, basements (or part basements) are understood to be present beneath the buildings.

Several electrical substations and gas and chemical storage areas were observed across the area during the walkover which were predominantly empty or well maintained. Of note, signage on the empty external storage compound to the north of Morton Laboratory indicated previous storage of flammable materials. Areas of soft landscaping are also present around the area. Ground level typically ranges in ground level between +37mOD and +33mOD. The existing layout of the Enabling Works area is illustrated in Plate 4.

Plate 4: Enabling Works Layout



With reference to the building survey reports completed for the Enabling Works area[8], the Morton Laboratory, MSS, MMP and the Mill are described as follows:

- **Morton Laboratory** – a six storey structure constructed c.1965 and previously used as research and laboratory facilities. A previous asbestos survey for the building identified ACMs "throughout the property" where the asbestos identified ranges from "very low to high risk". The building was historically referred to as the "Chemical Building". The building foundations are assumed comprise capped concrete piles and ring beam. The building is serviced by the wider Sister steam system with steam boiler at ground level.
- **MSS** – a 15 storey building including basement level constructed c.1970 and used as teaching rooms, lecture theatres, offices, laboratory space, computer rooms, common areas and breakout space. The MSS is adjoined by a two storey structure used as laboratory space and plant rooms. A previous asbestos survey for the building identified ACMs "throughout the property" where the asbestos identified ranges from "very low to high risk". Plant is predominantly present in the basement with smaller plant rooms at higher levels. The building foundations are assumed to comprise piled foundations.
- **MMP** – a four storey building constructed in 1960 and used as conferencing facilities with commercial kitchen. The building foundations are anticipated to comprise reinforced concrete pads beneath the column positions. An access tunnel is present beneath the building providing access to maintain the steam network which serves the majority of the wider UoM campus buildings. The plant room is located within the basement.

- **The Mill** – a seven storey building constructed c.1920 and used as a teaching, laboratory and office facility. A previous asbestos survey for the building identified ACMs "throughout the property" where the asbestos identified ranges from "very low to high risk". The plant room is located on the 6th floor. The building foundations are anticipated to comprise strip footings with reinforced concrete pads beneath the external walls with load bearing internal walls and columns.

Information from the UoM on the possible residual contaminants associated with the previous building uses outlines that general chemicals, oils, mercury and lead were used within Morton Laboratory and the Mill, with one part of the Mill used as an animal unit prior to the university's use of the building. It was noted that if present, traces of these potential residual contaminants would likely be in sink traps and drains, lab benches, ventilation extraction equipment, storage cabinets and areas with wooden/parquet flooring. Each of the buildings were also identified to have asbestos within the building fabric. In addition, the use of radioactive substances was noted in the Mill, Morton Laboratory and MSS; however, the UoM state that they expect trace levels of radiation, if detectable at all. The UoM also state that there have been no contamination events in the laboratories in the last five years and there is no information to suggest otherwise in the UoM records for earlier years.

2.4 Wider Sister Area Description

The wider Sister area can be divided into three zones; the zone to the north of the Network Rail viaduct (Plot A), the central zone between the Enabling Works area and Sackville Street (Plots B and D), and the zone to the west of Sackville Street (Plot H). A summary of the three zones is provided below and photographs from the walkover are included in Appendix A.

- **North Zone –** The Grade II Listed Sackville Building occupies the north of the wider Sister area with areas of soft landscaping present to the east of the building. With reference to the Arup report[4] and observations during the site walkover, the Sackville Building has a basement level and the building is gas fed with boilers within basement plant rooms with backup heating oil tanks also understood to be present in the plant rooms. Granby Row, an access road, is located to the south of the Sackville Building beyond which is Vimto Park in the southern part of this zone. A small area of car parking / hardstanding is located along the south of the zone. The car park has a one way system with access from Altrincham Street to the south of the Network Rail viaduct, through an archway of the viaduct and then exits onto Sackville Street. A brick retaining wall is present along the south of Vimto Park with the car park approximately 1.8m lower than Vimto Park. Access from the eastern extent of the park to Altrincham Street to the south is also present via steps which pass below one of the viaduct arches. A storage area for liquid nitrogen was observed within the east of the car park area and a Cadent gas infrastructure building within the west of the car park area. The zone is bounded to the north by Fairfield Street (B6469), to the west by Sackville Street and to the east by Cobourg Street. Current ground level of the north zone ranges from approximately +40.5m above ordnance Datum (mOD) to +39.5mOD around the Sackville Building, +40.0mOD to +38.5mOD east to west along Granby Row, +40.5mOD to +38.2mOD east to west along Vimto Park and +37.9mOD to +37.5mOD along the car park in the south of the zone.
- **Central Zone** – Predominantly occupied by former UoM buildings including the Paper Science (also referred to as James Lightwell), Renold and Pariser buildings. Areas of hard standing (including car parking and access roads) and soft landscaping are present between the UoM buildings. The central zone is bounded to the north by the Network Rail Viaduct with Altrincham Street directly to the south of the viaduct, to the east by the Enabling Works area, to the south by the UoM Graphene Engineering Innovation Centre and Ferranti Building and to the west by Sackville Street. Ground level typically ranges between +37mOD and +33mOD; Altrincham Street level ranges from approximately +38mOD in the east to approximately +36mOD in the west.
- **West Zone** – Predominantly occupied by Charles Street Car Park with commercial units in the east and an area of soft landscaping in the west. Ground level typically ranges between approximately +36.5mOD in the east to +34.0 in the west.

Information provided by the UoM outlines that potential residual contaminants associated with the former use of the Sackville Street, Pariser and Paper Science buildings include general chemicals, carbon dust, oils, metal particulates, mercury, lead, concrete and silica dust and radioactive substances, with the use of bleach in the hydro labs within the Pariser building. Asbestos is also noted to be within the building fabric. With respect to the historical use of radioactive substances, the UoM state that they expect only trace levels of radiation, if detectable at all. The UoM also state that there have been no contamination events in the labs in the last five years and there is no information to suggest otherwise in the UoM records for earlier years.

2.5 Network Rail Assets

As outlined in Section 2.2, an operational NR viaduct bounds the north of Plot C in an east-west orientation. The viaduct is a Grade II listed structure. With reference to publicly available information on the Manchester City Council planning portal[9], investigation of the NR viaduct foundations was carried out at the adjacent IQ Students Echo Street development by Curtins Consulting Limited as part of the site investigation works[10]. Two foundation inspection pits were extended to a depth of 3.65m below ground level (mbgl) adjacent to the viaduct piers and the underside of the foundation was not encountered. It is noted that no ground level has been provided on the trial pit records.

In addition, Network Rail owned vaults are present beneath Altrincham Street (in addition to a number of other vaults understood to be owned by the UoM). Access to the vaults for inspection has not been possible to date.

2.6 Utilities and Drainage

An extensive network of below ground utilities, understood to be both privately owned and publicly owned, is present across the wider Sister area[1,11]. A brief summary of the assets is provided below:

- **Steam** – a university-owned heat distribution network serves most of the key existing buildings. It is understood that steam is generated in the Sackville Street Building via three gas fired steam boilers and is distributed around the wider Sister area via a ring main in a below ground services tunnel. The steam ring main is 6" in diameter (10" outside diameter over insulated covering) and the condensate main is 4" in diameter (6.5" outside diameter over insulated covering).
- **Gas** – a Cadent gas supply enters the wider Sister area via Sackville Street and passes in front of the off-site Graphene and Ferranti buildings, to the south of the wider Sister area. A gas governor is located to the south of Vimto Park, as observed during the Civic Earth site walkover. The gas governor is thought to only provide gas to the Sackville Street building and not the wider network[11]. In addition to the Cadent gas supply, a private gas network also exists. Gas is understood to be distributed around the wider Sister area in the below ground services tunnel which also distribute the steam supply.
- **Potable Water** – United Utilities (UU) potable water mains are located below the highways surrounding the wider Sister area. Water is distributed around the wider Sister area via a private ring main located within the below ground services tunnel.
- **UoM Services Tunnel –** understood to comprise a reinforced concrete tunnel, approximately 2m high and 1.8m wide with racks on one side that holds the services, that passes around the wider Sister area. The tunnel is accessed via the plant rooms for the buildings.
- **BT "Guardian" Tunnel –** a telecommunications tunnel that runs through the wider Sister area in an approximate north-northwest to south-southeast orientation. With reference to the Arup reports[1,4], the tunnel was constructed in 1954 and drawings indicate that the tunnel lies at a level of approximately +6.5mOD. The tunnel is identified to be approximately 2.3m wide and 2.8m tall. Anecdotal evidence suggests that the exterior wall of the tunnel is formed of 10 inches to 26 inches of reinforced concrete[4].

2.7 Charles Street Culverted Watercourse / Shooters Brook

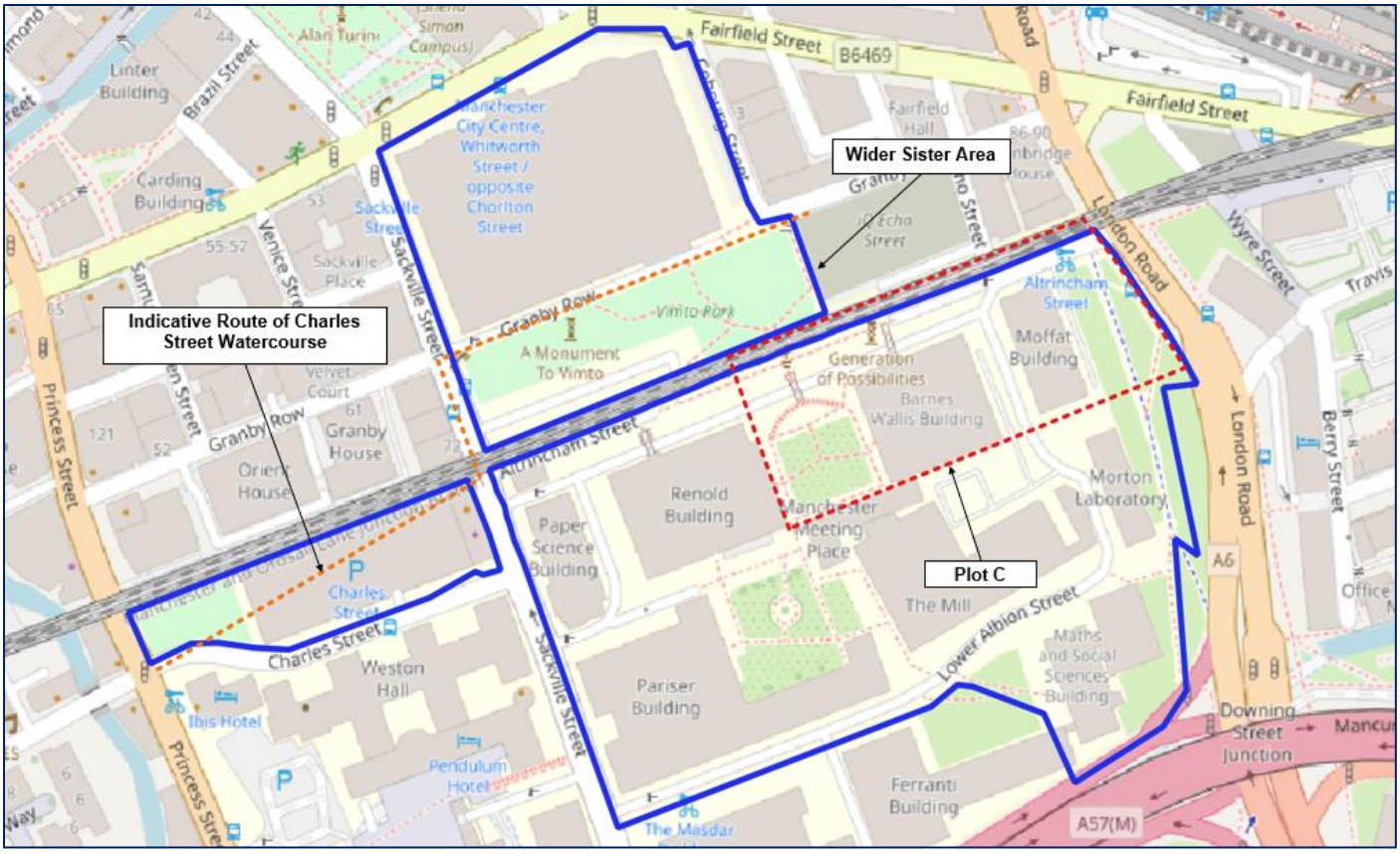
A culverted watercourse (possibly a sewer), referred to as the "Charles Street Culverted Watercourse" or "Shooters Brook", has been identified within the Arup report[4] which passes beneath the Charles Street Car Park in the west zone (Plot H) of the site. The watercourse is identified to travel below Granby Row in Plot A, south down Sackville Street passing below the Network Rail viaduct, then south-southwest beneath Charles Street Car Park before discharging into the River Medlock at Charles Street bridge.

[9] https://pa.manchester.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=RU2QJQBC03O00

[10] Curtins (2023) Echo Street, Manchester. Phase 2 Site Investigation. Reference 065374-CUR-00-XX-RP-GE-80002-P03. 27 April 2023.

[11] Arup (2022) ID Manchester – Masterplan. Utilities & Drainage. Reference SISTER00-ARP-ZZ-XX-RP-CV-10001. P02. 11 November 2022.

Plate 5. Indicative Route of Charles Street Culverted Watercourse

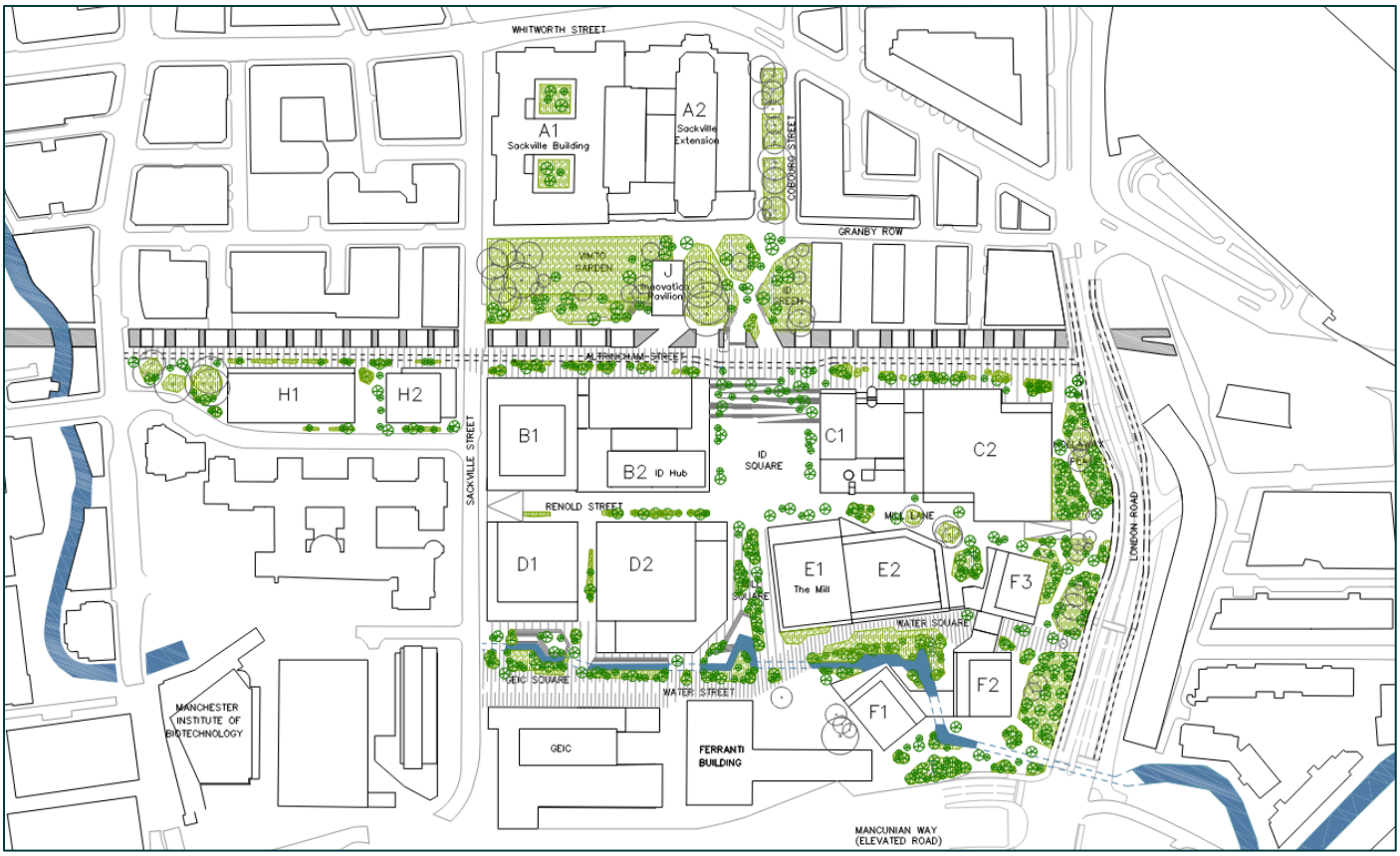


2.8 Proposed Development

It is understood that the current proposals for the redevelopment of Plot C include the demolition of existing structures and the construction of two commercial-led buildings. The proposals will also include works to the Holloway Wall, the change of use of the railway arches to retail and food/beverage uses, and the creation of a new public square, access and other associated works.

At this stage, development proposals for the Enabling Works area to the south of Plot C have not been progressed. However, for the basis of this report it is assumed that Plots E and F will possibly include a mixed commercial and residential development. As noted in Section 1, the introduction of a new river channel, linked to the River Medlock, onto the wider Sister area is being considered, although yet to be explored in detail. The conceptual development layout for the wider Sister masterplan is illustrated in Plate 6.

Plate 6: Landscape Concept Plan (SLA Drawing IDM00-SLA-LA-ZZ-DR-LA-00001)



3. Historical Development

3.1 Sources of Information

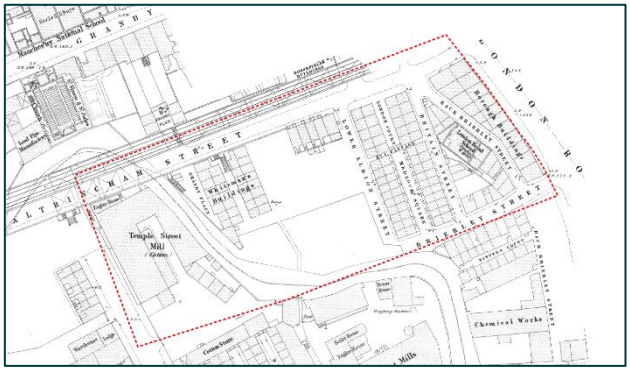
The historical development of Plot C, Enabling Works area and wider Sister area has been traced from Ordnance Survey mapping (included in Appendix B) and historical satellite mapping included in the Groundsure Enviro + Geo Insight report (included in Appendix C). In addition, pertinent information on Plot C's history contained within the Arup desk study review[1] has been included.

3.2 Plot C Historical Development

Earliest available mapping dated 1848 indicates the River Medlock meandering across the west of Plot C. The 1851 mapping included within the Groundsure Enviro + Geo Insight report only has partial coverage of Plot C; however, full coverage of Plot C is publicly available from the National Library of Scotland online archives[12]. Temple Street is indicated in a north-south orientation adjacent to the west of Plot C and Altrincham Street in its present day position. Railway lines are also present in the north of Plot C in their present day location. *Temple Street Mill (Cotton) is* present in the west of Plot C with a *Boiler* and *Engine House* in the northwest corner of the mill. Residential properties are present across the centre and east of Plot C as well as a school.

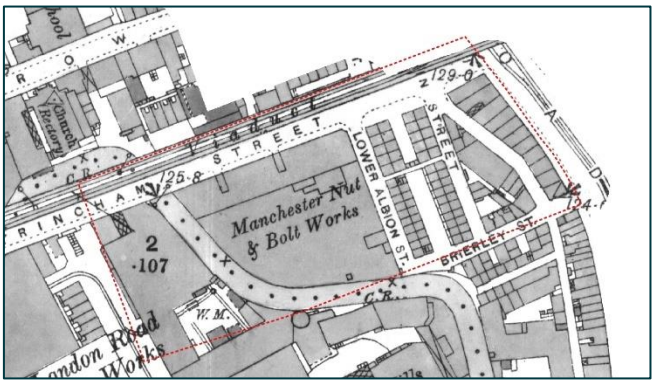
1848 – 1:10,560

1851 – 1:1,056[12]

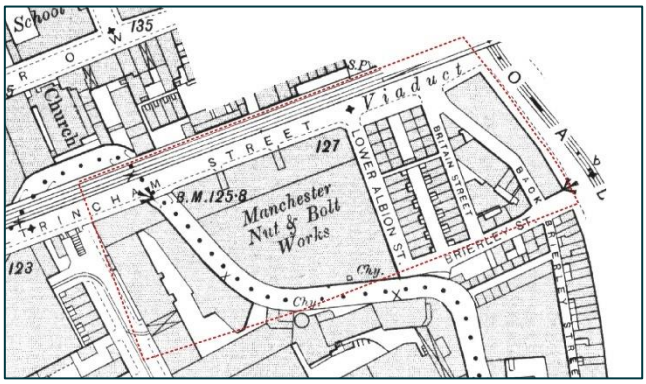


By 1889-1893 *Manchester Nut & Bolt Works* is indicated on the northern bank of the River Medlock in the centre of Plot C and *London Road Iron Works* encroaches onto the west of Plot C on the west bank of the River Medlock in the northwest of Plot C. Residential properties are still indicated in the east of Plot C. No significant changes are noted on mapping of 1908 and 1922 with the exception of *London Road Iron Works* now identified as a smaller *Iron Foundry*.

1889 – 1:2,500



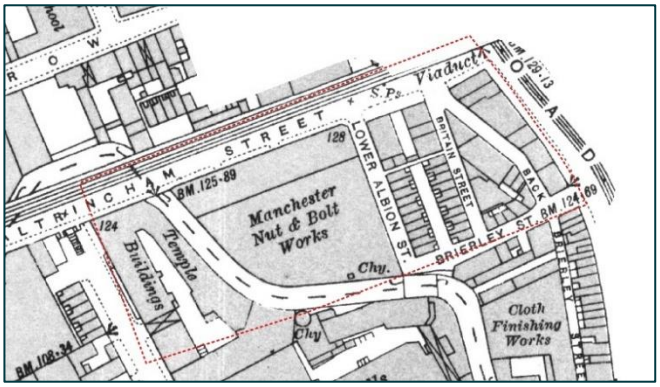
1908 – 1:2,500



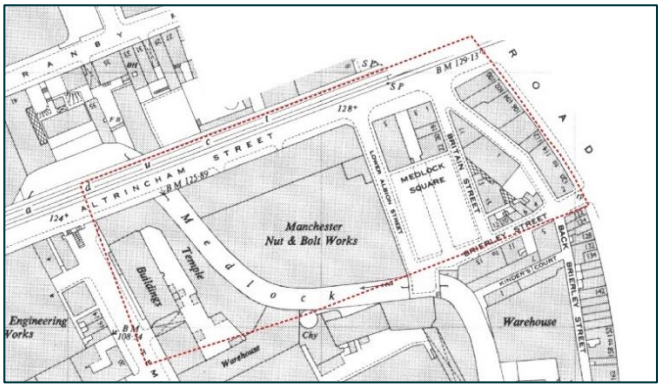
No significant changes are noted on mapping dated 1932 with the exception *Temple Buildings* which are indicated in the west of Plot C. Mapping dated 1948-1950 indicates a *Warehouse* in the west of Plot C. By 1955-1956, a number of the residential structures towards the centre of Plot C are no longer indicated, potentially associated with bomb damage during the Second World War.

[12] https://maps.nls.uk/view/231273906

1932 – 1:2,500

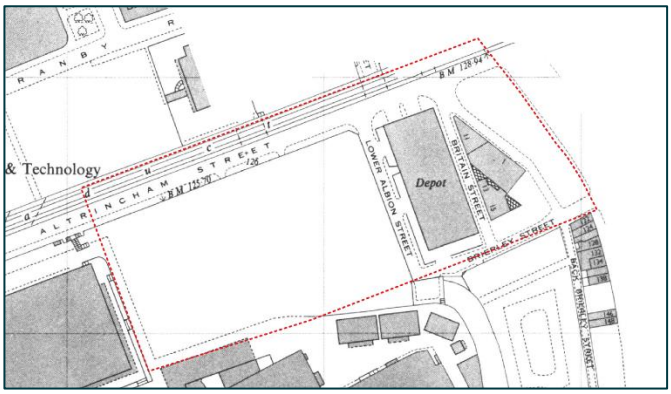


1955 – 1:2,500

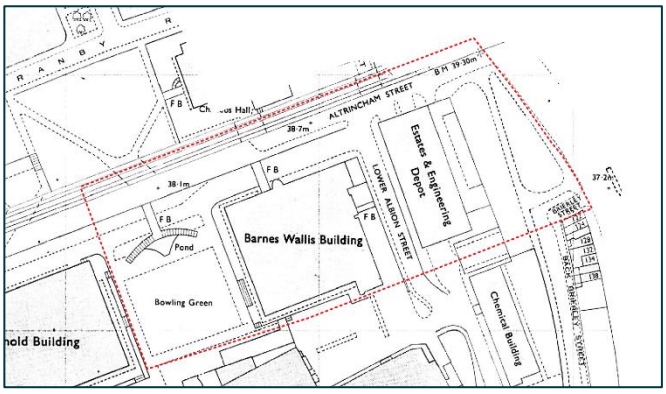


By 1965, Plot C has been extensively redeveloped. The central and eastern areas of Plot C have been cleared and are open space, and a *Depot* is indicated in the east of Plot C in the present day Moffat Building position. The River Medlock is also no longer indicated to flow in its original location, "disappearing" from the historical mapping to the southeast of the wider Sister area and "reappearing" to the southwest of the Enabling Works area on mapping dated 1965. By 1968 the Butterfly Staircase is indicated in its present day layout with the Barnes Wallis building (and Wright Robinson building) indicated from c.1984. Plot C remained in a similar layout until the present day.

1965 – 1:2,500



1984 – 1:1,250



3.3 Enabling Works Area Historical Development

The historical development of the central and southern parts of the Enabling Works area only is summarised below, noting that the historical development of the northern part of the Enabling Works area is summarised in Section 2.2.

Earliest available mapping dated 1848 indicates the River Medlock meandering across the Enabling Works area from the northwest corner to the southeast corner. A *Chemical Works* is indicated in the east of the area, and *Ardwick Bridge Chemical Works* (*Vitriol Chambers, Store Rooms, Solution of Tin House*, *Cylinder House* and *Garancine Works* (dye works using sulphuric acid to extract dye from madder roots)*)* encroaches onto the south of the area.

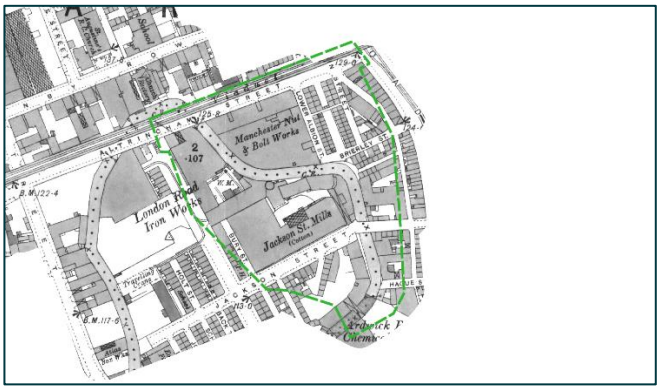
A *Boiler House* and *Engine House* are also indicated adjacent to *Jackson Street Mills (Cotton)* which is located across the centre of the Enabling Works area. A cylindrical feature, possible a tank or a chimney, is located at the eastern end of the mills. A *Retort House* is present to the north of the mills adjacent to the River Medlock and a *Tank* to the west of the *Retort House*. The historical mapping does not formerly identify a *Gas Works* within the Enabling Works area or the wider Sister area, nor does it identify the presence of *Gasometers* or other gas works related infrastructure. Therefore, it is considered likely that the retort house was associated with the cotton mill identified within the area and may have been used for local gas production rather than town gas works. A *Joiners Shop and Nitrate of Soda Works* is located between the mill and *Ardwick Chemical Works.*

1848 – 1:10,560

1851 – 1:1,05612

By 1889-1893, *Jackson Street Mills* have expanded in size and *Ardwick Bridge Chemical Works* is identified as disused. No significant changes are noted on mapping of 1908 and 1922 with the exception of *London Road Iron Works* now identified as a smaller off-area *Iron Foundry* and *Ardwick Bridge Chemical Works* is no longer identified.

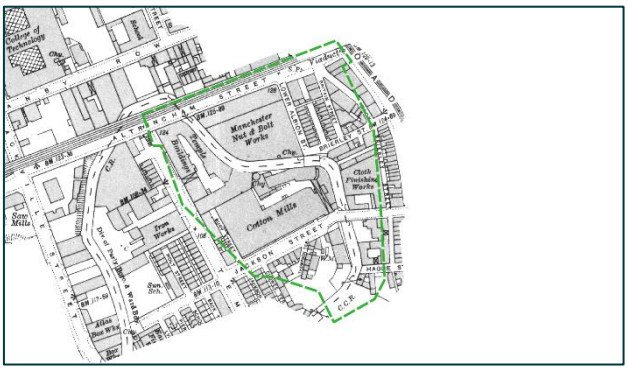
1889 – 1:2,500



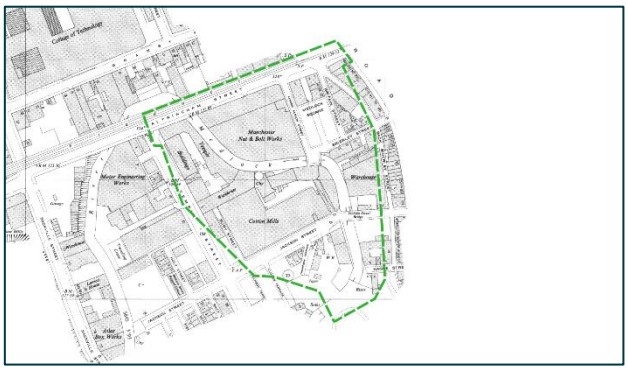
1908 – 1:2,500

By 1932, a *Cloth Finishing Works* has been constructed in the east of the Enabling Works area across the footprint of the former *Chemical Works.* Mapping dated 1948-1950 indicates the *Cloth Finishing Works* are now identified as disused. *Sinks and a Tipper* are indicated in the southeast corner of the area as well as a circular *Tank*. By 1955-1956, a *Ruin* is also indicated in the southeast of the rea, potentially associated with bomb damage during the Second World War, and the disused *Cloth Finishing Works* are now indicated to be a *Warehouse*.

1932 – 1:2,500



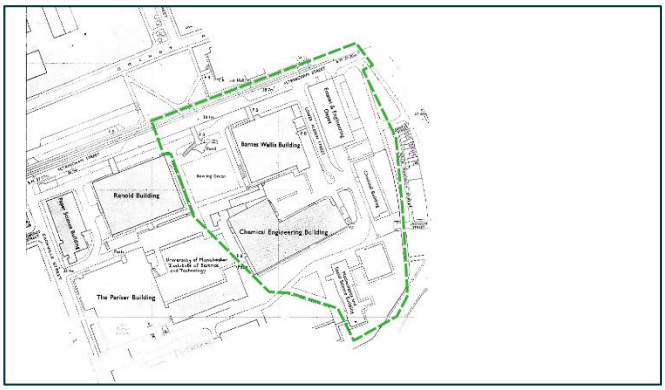
1955 – 1:2,500



By 1965, the Enabling Works area has been extensively redeveloped and Manchester Meeting Place and The Mill are indicated in their present day layout, albeit not labelled as the university buildings. The River Medlock is also no longer indicated to flow in its original location, “disappearing” from the historical mapping to the southeast of the wider Sister area and “reappearing” to the southwest of the Enabling Works area on mapping dated 1965. By 1968 the Morton Laboratory is indicated in its present day layout and the MSS Building is indicated from 1974. The area remained in a similar layout until the present day.

1965 – 1:2,500

1984 – 1:2,500



3.4 Wider Sister Masterplan Historical Development

A summary of the historical development of the wider Sister area is provided in the following sections.

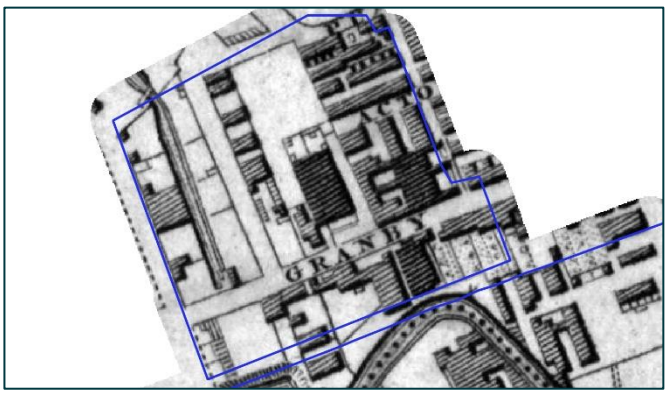
3.4.1 North Zone

Earliest available mapping dated 1848 and 1851 indicates that the centre and east of the zone are occupied by *St. Augustine's R.C. Capel, Chapel Yard, Slaughter House, Manchester National School* and residential properties. The northwest of the zone is occupied by *Coal, Timber and Slate Wharves* and *Cotton Store* with a canal oriented north-south between the wharves, feeding from Rochdale Canal to the north. The southwest of the zone is occupied by *Timber Yards, Granby Row Chapel, St. Simon & St. John's Church* and a *Lead Pipe Manufactory*. The zone is bound to the west by Zara Street, to the north by Pump Street and Coburg Street to the east. Railway lines are located along the south boundary of the zone in their present day position. Mapping of 1889-1893 indicates that the northwest of the zone is occupied by medium to large sized structures with two rectangular glasshouses. Rifle Street is indicated in a north-south orientation towards the centre of the zone, extending two thirds into the zone from the north with Granby Street perpendicular to the southern end of Rifle Street. The northeast of the zone, to the east of Rifle Street, is occupied by residential properties, a *Timber Yard*, open areas, a school and a church. The south of the zone, to the south of Granby Street, is occupied by small to large sized structures including small glasshouses and a church.

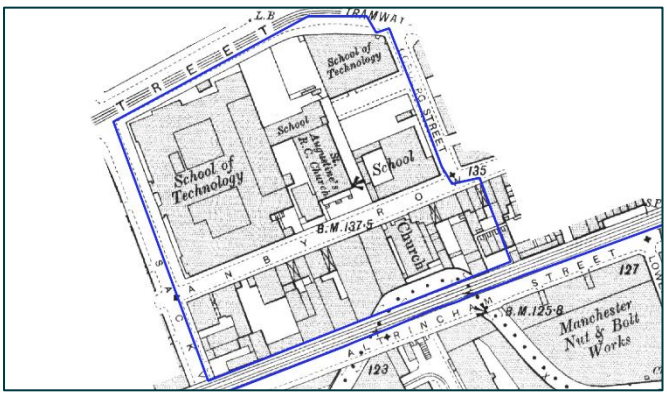
By 1908, the northwest of the zone has been redeveloped into a School of Technology and the residential properties in the northeast of the zone have been demolished and redeveloped into structures associated with the School of Technology. The south of the zone remains predominantly unchanged. Mapping of 1922 indicates the church and school within the centre of the zone has been cleared as well as some structures in the south of the zone; further clearance of buildings in the south of the zone is indicated on mapping of 1932.

The north of the zone, to the north of Granby Street, was redeveloped into College of Technology by 1955-1956 where the building has a similar outline to the present day Sackville Building. The south of the zone remained predominantly unchanged until 1964-1965 when the zone was cleared and indicated as open space / gardens. The College of Technology was later indicated as College of Science and Technology from 1964-1965. The zone remained predominantly unchanged until 1981-1985 when the northeast of the College of Science and Technology was demolished and replaced by gardens which remain unchanged to the present day.

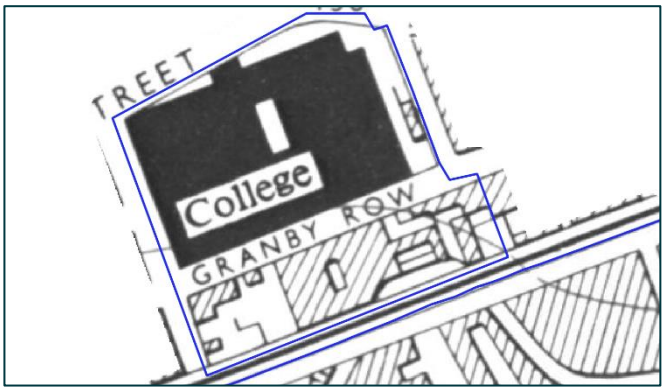
1848 – 1:10,560



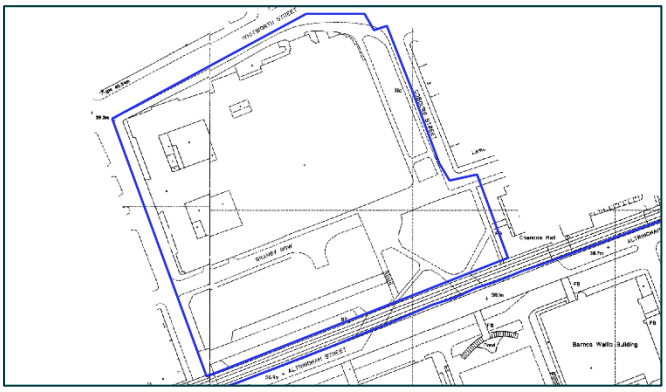
1908 – 1:2,500



1956 – 1:10,560



1994/1995 – 1:1,250



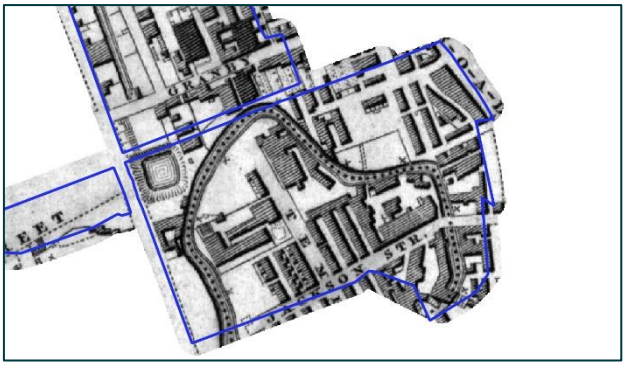
3.4.2 Central Zone

Earliest available mapping dated 1848 and 1884 indicates the River Medlock meandering across the zone from the southwest corner to the northeast corner of the zone. A *Reservoir* is indicated in the northwest corner of the zone with numerous large industrial structures across the zone associated with *Iron Works*. By 1889-1893 the railway lines adjacent to Altrincham Street are indicated in the north of the zone; the *Reservoir* is no longer indicated suggesting it has been removed or infilled. By 1908, the layout of the zone has changed and a large industrial building is indicated in the north of the zone, an *Iron Foundry* in the centre of the area and residential properties in the south of the zone. *Atlas Box Works* is indicated in the southwest corner of the zone.

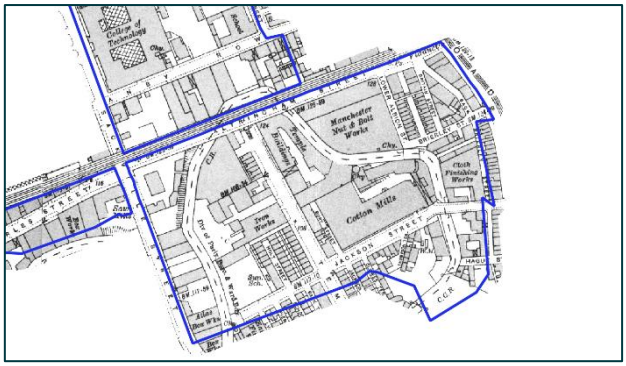
Mapping dated 1948-1950 indicates *Mills* adjacent to the west of the zone and *Motor Engineering Works* to the north of the *Iron Foundry*. A *Garage* is indicated on mapping dated 1956 in the west of the zone. By 1965, the zone has been extensively redeveloped and the Paper Science, Pariser and Renold buildings are indicated in their present day layout, albeit not labelled as the university buildings. The River Medlock is also no longer indicated to flow in its original location. The zone remained in a similar layout until the present day.

Information provided by the UoM outlines that potential residual contaminants associated with the former use of the Pariser and Paper Science buildings include concrete dust, silica dust, glass fibre, general chemicals, oils, metal particulates, mercury, lead and radioactive substances. Asbestos was noted to be within the buildings' fabrics. With respect to the historical use of radioactive substances, the UoM note that they expect trace levels of radiation, if detectable at all. The UoM also state that there have been no contamination events in the last five years and there is no information to suggest otherwise in the UoM records for earlier years.

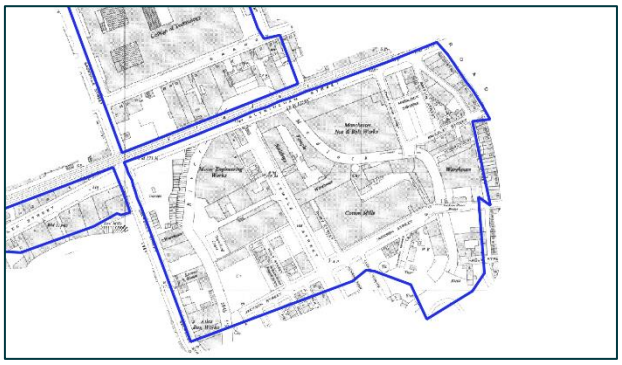
1848 – 1:10,560



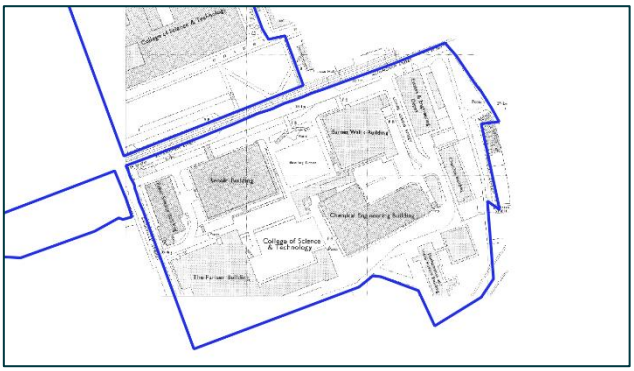
1932 – 1:2,500



1955 – 1:2,500



1971 – 1:2,500

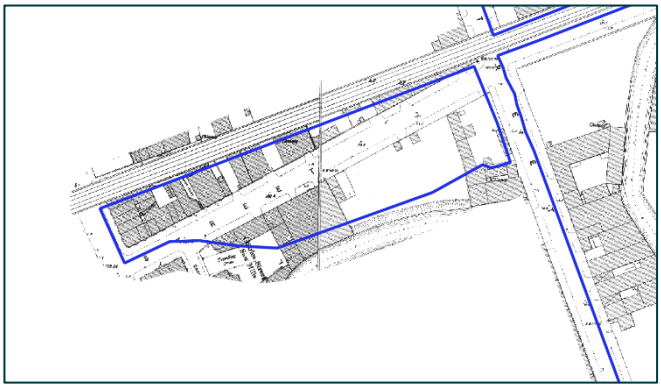


3.4.3 West Zone

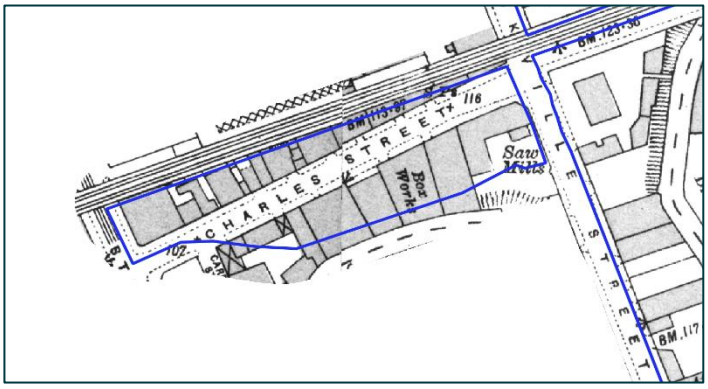
Earliest available mapping dated 1851 indicates that the zone is occupied with various small to medium sized structures with Charles Street dissecting the zone in an approximately southwest-northeast orientation. Railway lines are located along the south boundary of the zone in their present day position. A small access route identified as Squire Court is indicated on mapping dated 1891 towards the centre of the zone and *Saw Mills* are indicated to encroach onto the southeast of the zone in 1889-1893. The River Medlock is located approximately 10m south of the zone. The west and southeast of the zone were redeveloped by 1922 with larger, potentially industrial, structures now indicated. By 1932, one of the structures in the southeast is indicated as a *Box Works* and the *Saw Mills* has relocated to the southeast corner of the zone. An embankment sloping down towards the River Medlock is indicated in the southeast of the zone. The zone remained relatively undeveloped until 1963-1968 when the land to the south of Charles Street has been cleared. The River Medlock has been diverted and is no longer indicated to the south of the zone.

Mapping of 1984-1985 indicates the zone in its present day layout with a *Multi Car Park* located across the majority of the zone with landscaped area in the west and bank and public house in the east. Charles Street now runs along the southern boundary of the zone.

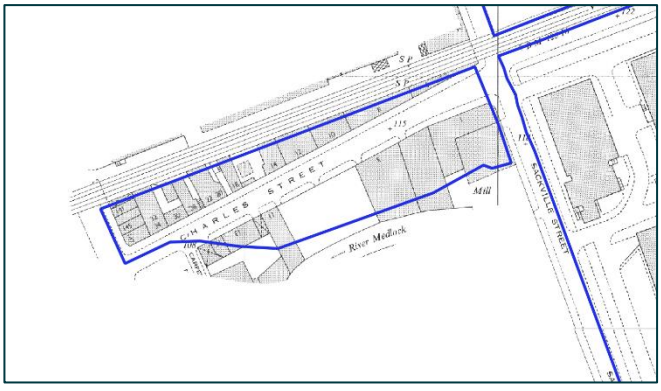
1891-1893 – 1:2,500



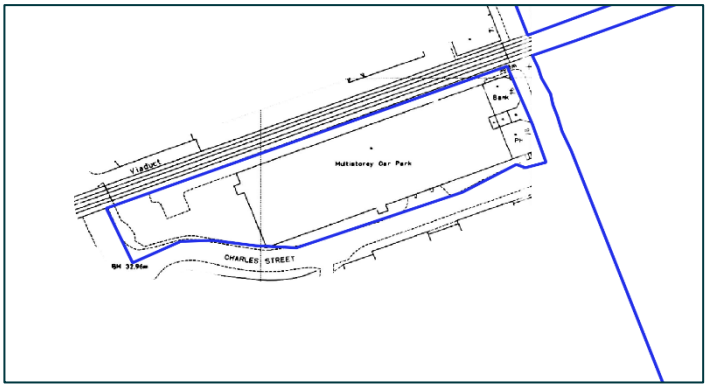
1932 – 1:1,250



1964 – 1:2,500



1992-1995 – 1:1,250



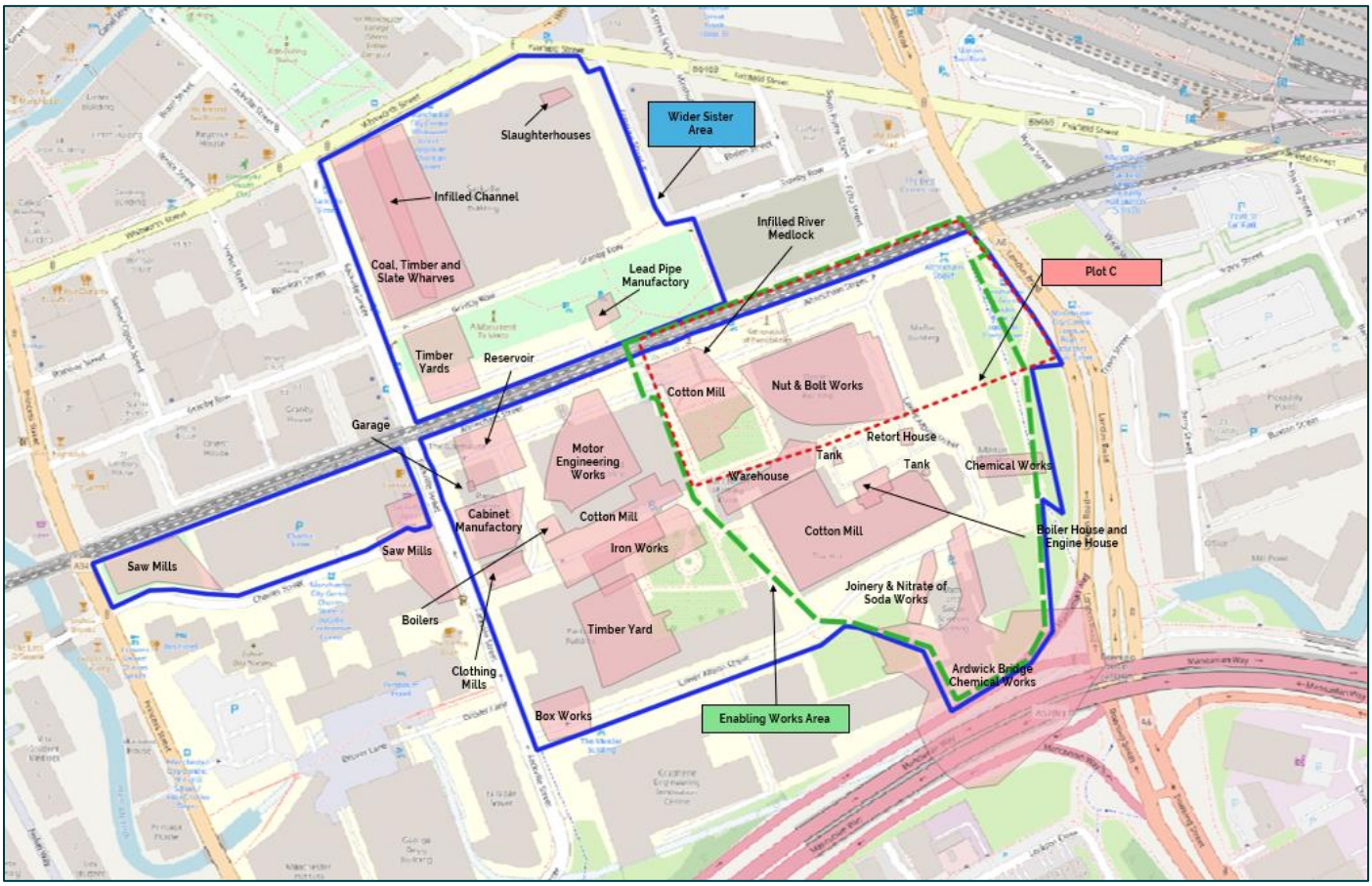
3.5 Off-Site History

The earliest available mapping dated 1848 indicates Plot C to be located within an area of combined residential and industrial use. *London Road Railway Station* is indicated approximately 250m northeast of Plot C and a *Cotton Mill* and *Dye Works* are indicated approximately 250m east of Plot C. From the 1850s until the mid-1960s, a large number of significant industrial activities are indicated within 250m of Plot C including *Cotton Mills, Wharves, Medlock Oil Works, Engineering Works, Soap Works, East India Printing Works, Old Garratt Dye Works, Iron Foundries, Saw Mills, Smithy, Boiler Houses, Rubber Works, Printing Works, Tanks, Zara Mills (Wadding), Warehouses* and *Timber Yards* to the northwest, west and southwest of Plot C, and *Cotton Mills, Ardwick Print Works/Dye Works, Timber Yards* and *Adwick Chemical Works* to the northeast, east and southeast. From the mid-1960s, the scale of industrial activities in the area began to reduce with their progressive redevelopment into commercial and residential structures.

3.6 Summary of Historical Development

In summary, earliest available mapping indicates that Plot C, Enabling Works area and the wider Sister area were historically occupied by residential / smaller structures and various significant industrial activities including a *Chemical Works, Iron Foundry, Cotton Mill, Nut and Bolt Works, Motor Engineering Works, Cloth Finishing Works, Tank, Sawmill, Chimneys* and *Store Rooms, Solution of Tin House,* and *Cylinder House* (which was associated with the predominantly off-site *Ardwick Bridge Chemical Works).* Plot C continued to have heavy industrial use until the mid-1960s when Plot C was extensively redeveloped into UoM facilities. The locations of the pertinent historical industrial activities within Plot C and the wider Sister masterplan development area are illustrated in Plate 7.

Plate 7: Pertinent Historical Industrial Activities identified on Historical Mapping within Wider SISTER Area



3.7 Unexploded Ordnance

A detailed unexploded ordnance (UXO) risk assessment has been previously carried out for the wider Sister area by 1st Line Defence[3]. The report is included in Appendix D and concludes that the wider Sister area is considered to be at a low to moderate risk from UXO (see Plate 8). Plot C is identified to be within an area of low risk whilst the rest of the Enabling Works area is identified to be within an area of moderate risk from UXO. The report outlines that the wider Sister area sustained serval bomb strikes, two of which were on the Sackville Building in August 1940 and June 1041. The southern part of the wider Sister area also sustained a series of strikes and damage to properties.

The report recommended that UXO safety awareness briefings are provided and a UXO Risk Management Plan put in place prior to all intrusive works. It was also recommended that an intrusive magnetometer probe survey is carried out at any proposed pile positions within the moderate risk zone, and a watching brief is carried out by an EOD engineer during excavation of all open excavations and magnetometer survey of all site investigation borehole locations within the moderate risk zone down to the maximum bomb penetration depth. It is noted that the maximum bomb penetration depth has not been outlined within the report; however, based on Civic Earth's experience in the local area, this depth is typically specified as the top of the competent sandstone bedrock.

Plate 8: Extract from 1st Line Defence Detailed UXO Risk Assessment

4. Anticipated Ground Conditions

4.1 Published BGS Geology

With reference to the British Geological Survey (BGS)[13] website, BGS Sheet 85[14] and the Groundsure Enviro + Geo Insight report obtained for the wider Sister area (see Appendix C), the majority of the wider Sister area is anticipated to be underlain by Till (Diamicton) with Alluvium present in the southwest of the Enabling Works area (see Plate 9). It is noted however that Alluvium may be present across a wider area due to the historical route of the River Medlock. The superficial deposits are underlain by the Chester Formation (Sandstone) (see Plate 10). Two northwest-southeast trending faults in the bedrock are located approximately 300m northeast and southwest of the wider Sister area, with a northwest-southeast trending normal fault passing through the central zone of the wider Sister area, approximately 50m to 100m west of the site and Enabling Works area, downthrown to the east.

Plate 9: Superficial Deposits (based on excerpt from Groundsure Enviro + Geo Insight Report)

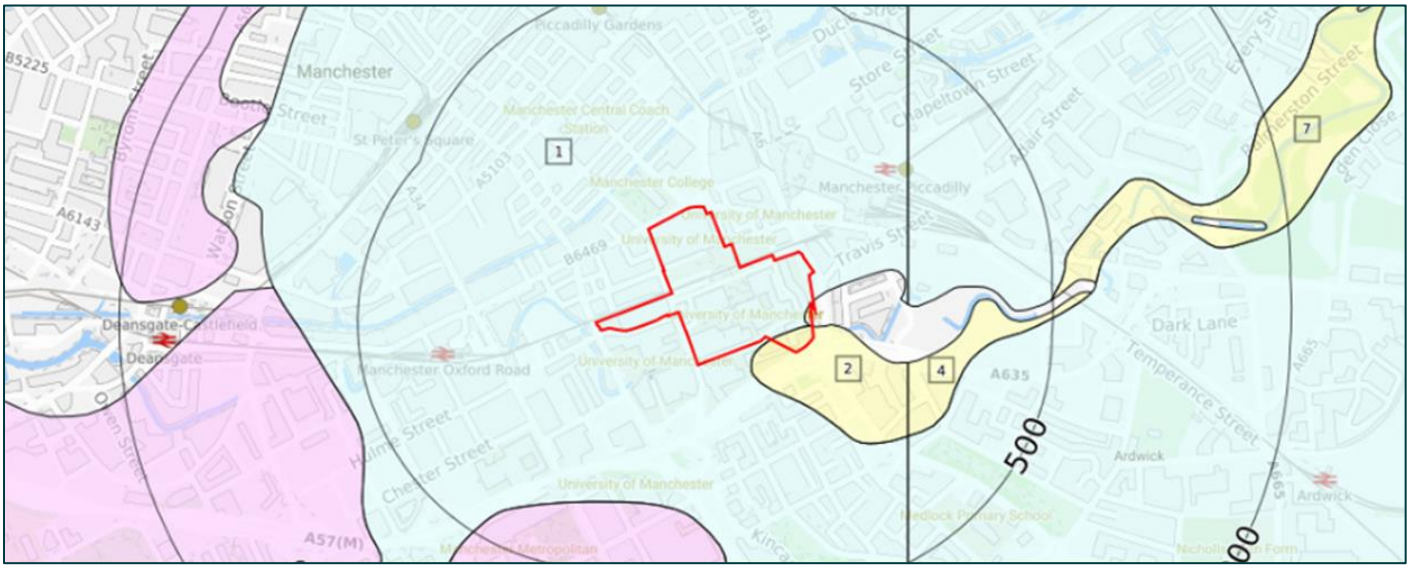
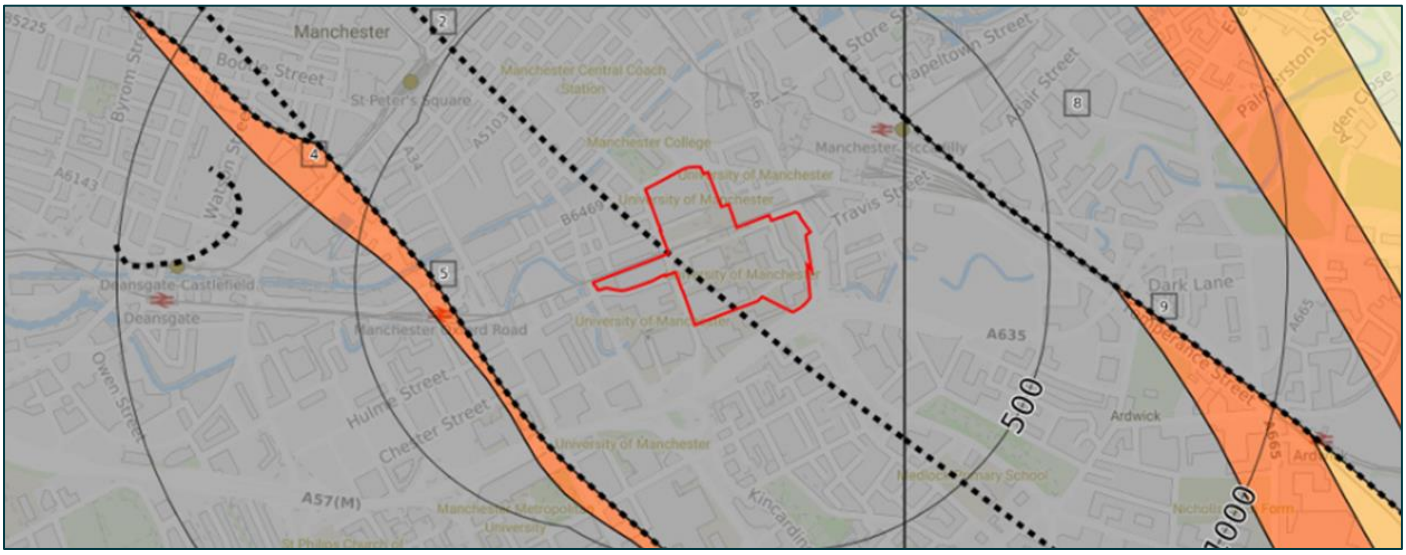


Plate 10: Bedrock Geology (based on excerpt from Groundsure Enviro + Geo Insight Report)



With reference to the BGS Lexicon[11], the geological units can be described as follows:

- **Alluvium**: soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel.

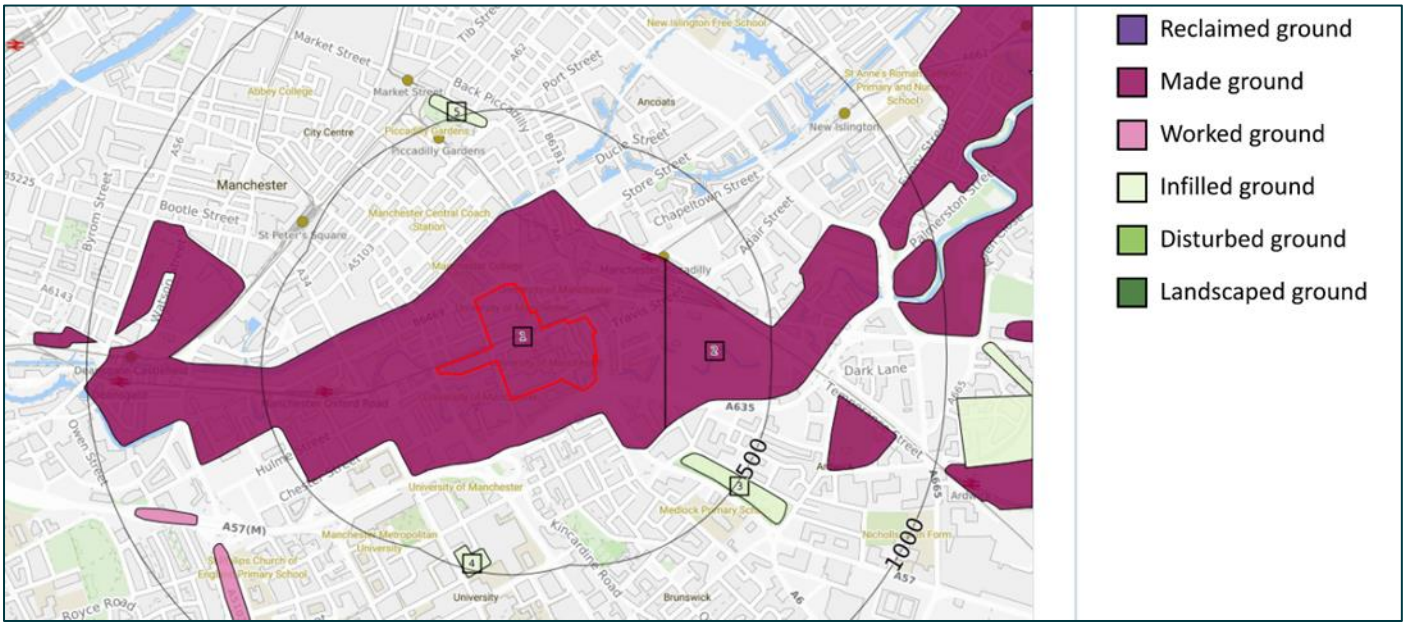
[13] British Geological Survey (BGS), www.bgs.ac.uk (06 November 2023)

[14] BGS (2011) *Manchester, Sheet 85. Solid and Drift.* 1:50,000.

- **Till**: unsorted and unstratified drift, generally over-consolidated material, consisting of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.
- **Chester Formation (Sandstone)**: conglomerates and reddish brown, cross-bedded pebbly sandstones with subordinate beds of red-brown mudstone. It is noted that the Chester Formation was previously referred to as the Chester Pebble Beds Formation (as indicated on BGS Sheet 85). The Chester Formation forms part of the Sherwood Sandstone Group.

With reference to the Groundsure Enviro + Geo Insight report obtained for the wider Sister area (see Appendix C), deposits of artificial Made Ground (undivided) are present across the site and wider Sister area as illustrated in Plate 11.

Plate 11: Excerpt from Groundsure Enviro + Geo Insight Report illustrated Worked Ground / Made Ground



4.2 Unpublished BGS Geology

There are 20 historical BGS records available for review within the wider Sister area, as illustrated in Section 16 of the Groundsure Enviro + Geo Insight reports (Appendix C). The ground conditions typically encountered a variable thickness of Made Ground overlying superficial deposits of clayey silt, gravel and sand, stiff brown silty and sandy clay and clayey marl. The superficial deposits were underlain by red sand, red rock sand and red sandstone (assumed to be the weathered and 'fresh' Chester Formation). Copies of the BGS records are included in Appendix E.

4.3 Surface Mining and Ground Workings

There are no records for historical surface ground workings within the wider Sister area. There are five records relating off-site surface ground workings including an unspecified wharf, ponds, unspecified ground workings, unspecified wharf and canal. There are no records of underground workings on or within 250m of wider Sister area.

The wider Sister area is located within a Coal Mining Area as defined by the Coal Authority; however, Plot C nor wider Sister area is not located within a Development High Risk Area[15]. There are no records of mining cavities within 250m of the wider Sister area.

4.4 Hydrology and Hydrogeology

The Environment Agency (EA) has produced an aquifer designation system consistent with the requirements of the Water Framework Directive. The designations have been set for superficial and bedrock geologies and are based on the importance of aquifers for potable water supply and their role in supporting surface water bodies and wetland ecosystems. The superficial deposits of Alluvium and Till are designated as Secondary Undifferentiated aquifers. The

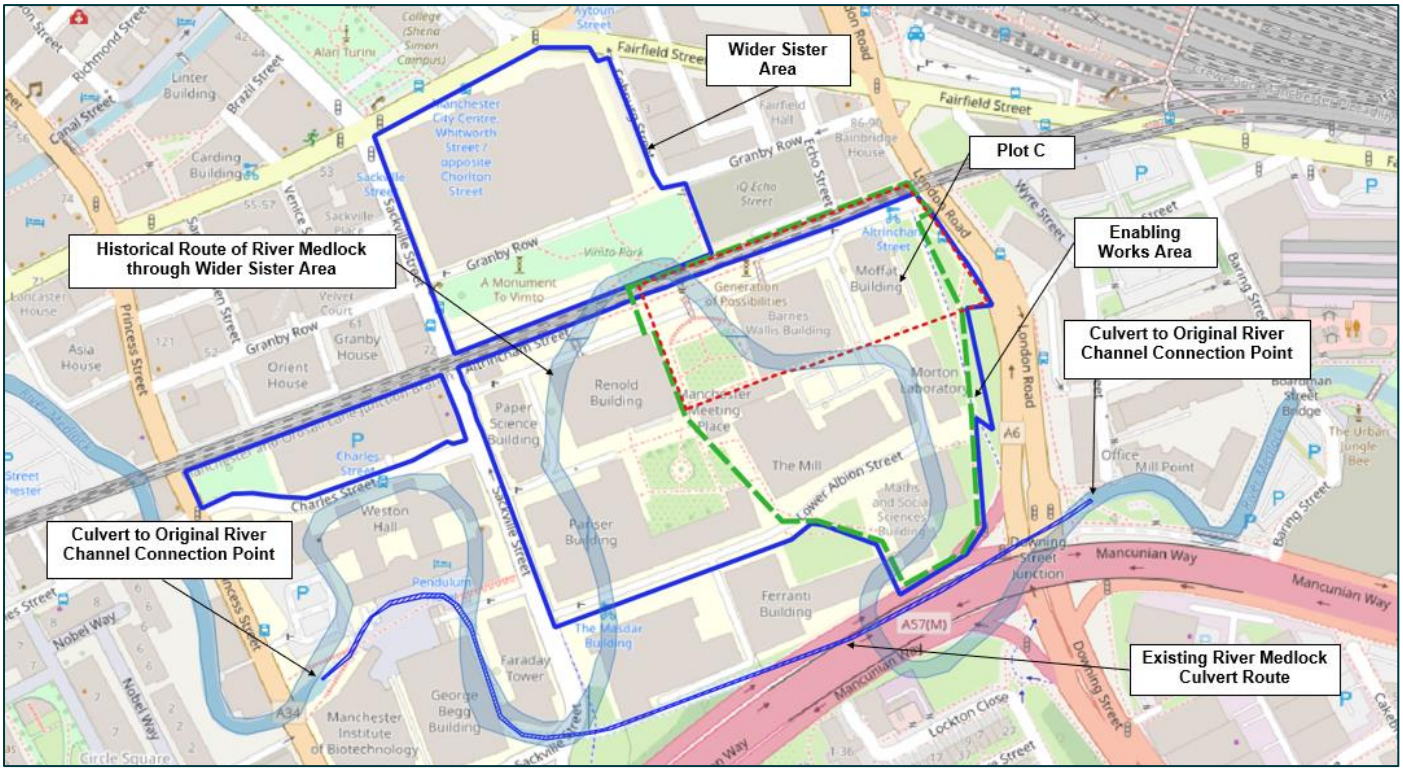
[15] Coal Authority Interactive Map Viewer (https://mapapps2.bgs.ac.uk/coalauthority/home.html) Accessed 12 January 2024.

underlying Chester Formation sandstone bedrock is designated as a Principal aquifer.

The wider Sister area is not located within a groundwater Source Protection Zone (SPZ). There are eight records for groundwater abstraction points within 1km of the wider Sister area. The records relate to historical abstraction points for non-evaporative cooling and general cooling, and active abstraction points for general use relating to Secondary Category (Medium Loss) and heat pump.

Following the River Medlock's historical diversion into a culvert, the river no longer flows within the wider Sister area boundary and is understood to be currently located within a culvert to the south of the wider Sister area. The river culvert is generally orientated east-west and flows west/southwest. Regional groundwater flow direction is anticipated to be towards the southwest. The indicative routes of the historical River Medlock route and the existing River Medlock culvert are illustrated in Plate 12.

Plate 12. Indicative Routes of Historical River Medlock Channel and Existing River Medlock Culvert



4.5 Ground Hazards

The risks associated with potential geological hazards within 50m of the wider Sister area have been assessed using the Enviro + Geo Insight report (Appendix C) and are summarised in Table 1.

Table 1: Geological Hazards

Hazard	Risk
Shrink-swell clays	Negligible to very low
Running Sands	Very low
Compressive Deposits	Very low
Collapsible Deposits	Negligible to very low
Landslides	Very low
Ground Dissolution	Negligible

As outlined in Section 3.4, a historical reservoir was identified in the central zone of the wider Sister area and a historical channel / elongated reservoir identified in the northwest of the northern zone. These features are assumed to have been historically backfilled and may present an area of potential compressible or collapsible deposits.

It is noted that the Groundsure Geo + Enviro Insight report identifies a record for a ground cavity / sinkhole incident on Mancunian Way 400m east of Plot C. The record is dated August 2016 and identified as 12m in diameter and 'opened in torrential downpours, possible former culvert collapse'. The road has since been repaired and the road is operational.

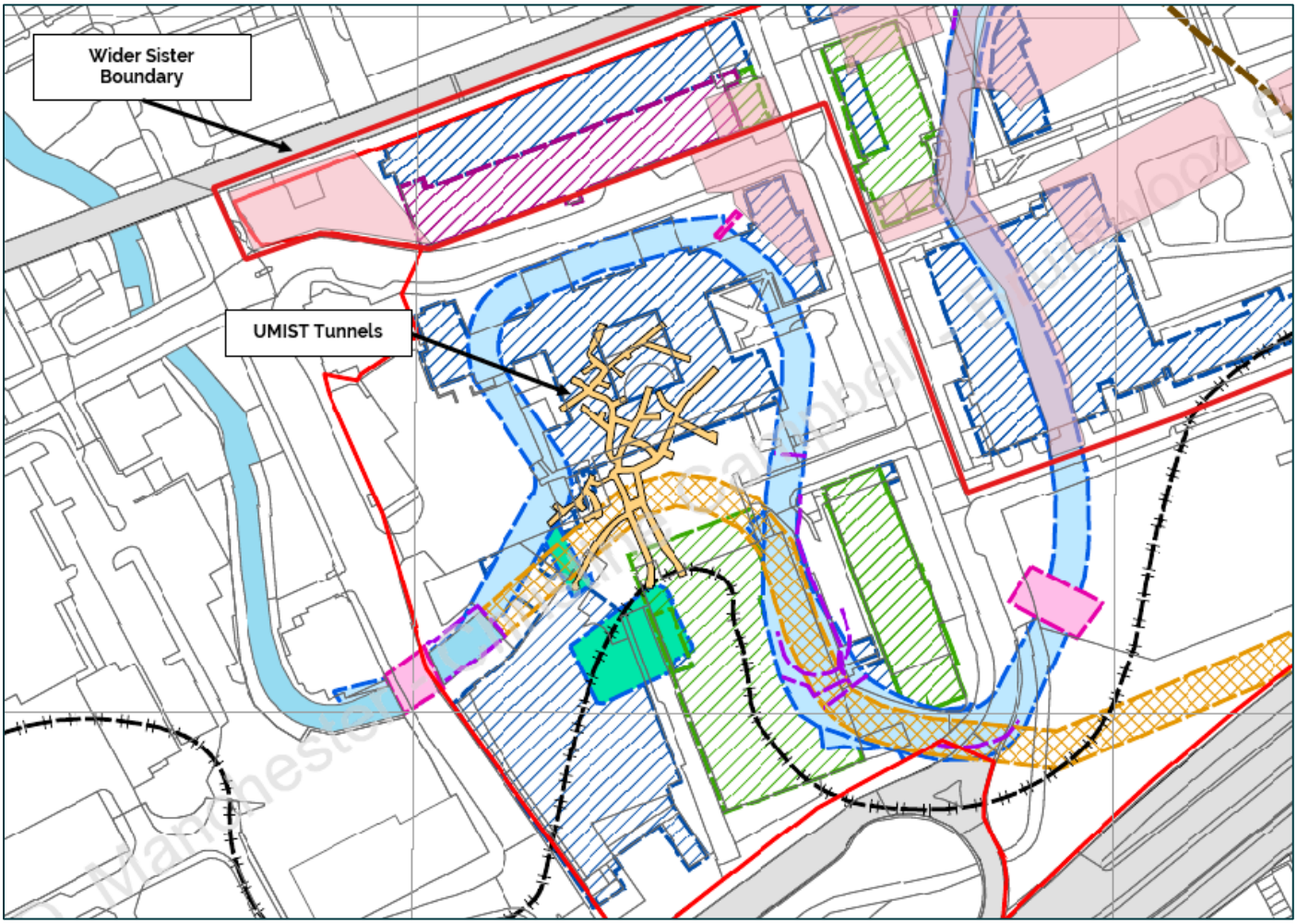
4.6 Railway Infrastructure and Tunnels

A record for a railway tunnel is identified within the Groundsure Geo + Enviro Insight report 150m northeast of Plot C and there are seven records relating to historical railway sidings, tramway sidings and railways within the wider Sister area. There are five records of abandoned railways approximately 190m east of Plot C.

It is noted that the Groundsure Geo + Enviro Insight report identifies four records relating to HS2 for bridges and viaducts; however, it is noted that the status is listed as 'scheduled for cancellation'.

The Arup desk study[1] and Ground Investigation Report[4] make reference to a series of off-site underground tunnels which historically acted as an underground reservoir connecting the River Medlock with nearby mills and the Garratt Print Works/Dye Works, currently referred to as the UMIST tunnels. The indicative location of the tunnels is outlined in Plate 13.

Plate 13. Excerpt from Arup 'Geotechnical Constraints' Drawing UMNC-ARUP-ZZ-XX-DR-CG-002 P01.



5. Environmental Setting

5.1 Environmental Disclosure Report

The Groundsure Enviro + Geo Insights report (included in Appendix C) has been used to provide information on the environmental setting of Plot C, the Enabling Works area and wider Sister area to assist in identifying possible sources of ground contamination. A summary of the pertinent records generally within 250m from the wider Sister area is provided below in Table 2. For full details the Groundsure Enviro + Geo Insights reports should be referred to. The records generally reflect the key pertinent features identified on the historical mapping. It is noted that the distances stated are approximate.

In addition to the information provided within the environmental disclosure report, as outlined in Section 2, information from the UoM outlines that general chemicals, oils, mercury and lead were used within the university's buildings within the Enabling Works area, with one part of the Mill used as an animal unit prior to the university's use of the building. The use of general chemicals, carbon dust, oils, metal particulates, mercury, lead, concrete and silica dust, bleach and radioactive substances were used within the university's buildings across the rest of the wider Sister area. In addition, asbestos was noted to be present within the buildings. The information from the UoM stated that if present, traces of these potential residual contaminants would likely be in sink traps and drains, lab benches, ventilation extraction equipment, storage cabinets and areas with wooden/parquet flooring. With respect to the historical use of radioactive substances, the UoM state that they expect only trace levels of radiation, if detectable at all. The UoM also state that there have been no contamination events in the labs in the last five years and there is no information to suggest otherwise in the UoM records for earlier years.

Table 2: Summary of Pertinent Information from the Environmental Disclosure Report

Environmental Record	Record Details	Distance from Site, Enabling Works Area and Wider Sister Area
Historical Industrial Land Uses	1 record identified relating to unspecified works. 3 records identified relating to unspecified works and unspecified mills. 1 record for unspecified commercial/industrial land use. 5 records for iron works, unspecified works and railway sidings. 27 records up to 50m from the wider Sister area relating to unspecified works, mills, commercial/industrial, wharf, police station, railway sidings, ice works and fire station. An addition 79 records between 50m and 250m from the wider Sister area including due works, goods sheds, grain store and electricity substation.	On-site Enabling Works Area North Zone Central Zone Various
Historical Tanks	1 record for an unspecified tank on site between 1952 and 1955. 74 records for off-site unspecified tanks, tanks and gas meter testing station within 250m of the wider Sister area.	Enabling Works Area Various
Historical Energy Features	4 records identified between 10m and 100m of the wider Sister area relating to electricity substations. 9 records relating to off-site electricity substations and gas meter testing station identified between 100m and 250m of the wider Sister area.	10m S (x2), 70m SE, 95m N Various
Historical Garages	1 record for a historical garage between 1952 and 1955. 18 records relating to off-site historical garages and historical motor repair works within 250m of the wider Sister area.	Central Zone Various
Historical or Active Landfills	No records identified within 250m of the wider Sister area.	-
Historical Waste Sites	No records identified within 250m of the wider Sister area.	-
Licensed Waste Sites	No records identified within 250m of the wider Sister area.	-

Environmental Record	Record Details	Distance from Site, Enabling Works Area and Wider Sister Area
Waste Exemptions	2 records identified within 150m of the wider Sister area relating to treatment of kitchen waste in a wormery and sorting and de-nurturing of controlled drugs for disposal. A further 5 records identified between 150m and 250m of the wider Sister area relating to deposit of waste from a railway sanitary convenience, use of waste in construction and screening and blending of waste.	70m NE, 130m SW 205m W, 240m SW
Recent Industrial Land Uses	1 record of published goods at Wright Robinson Hall (Manchester University Press). 6 records of industrial land uses between 30m and 100m of the wider Sister area relating to travelling cranes and gantries, engineering services, demolition services, water pumping station and electricity substation. A further 30 records identified between 100m and 250m of the wider Sister area including electricity substations, distribution/haulage, photographic and optical equipment, moorings and unloading facilities, gas governor, railway stations, vehicle repair and servicing, civil engineers, vehicle hire, construction tool hire and rental, unspecified works/factories, bus depot and business parks.	On site 35m E, 65m N, 70-80m E Various
Current or Recent Petrol Stations	No records identified within 250m of the wider Sister area.	-
Licensed Pollutant Releases	No records identified within 250m of the wider Sister area.	-
Radioactive Substance Authorisations	2 records relating to the disposal of radioactive waste and keeping and use of radioactive materials at the UoM North Campus. It is understood from correspondence with the Environment Agency (see Section 5.3) that applications have been made to request surrender of these permits. 6 records for keeping and use of radioactive material and disposal of radioactive waste at Umist, PO Box 88, Sackville Street.	Central Zone 45m SW
Licensed Discharge Consent to Controlled Waters	26 records of off-site licensed discharge consents identified between 25m and 100m of the wider Sister area relating to sewer storm overflow, miscellaneous discharges of surface water into the River Medlock and Dukes Tunnel. A further 21 records identified between 100m and 250m of the wider Sister area relating to sewer storm overflow.	Various Various
Pollution Incidents to Controlled Waters	1 record of contaminated water (urban run-off) causing a minor impact to controlled waters.	135m E
Environmental Designations	Plot C is located within an SSSI Impact Risk Zone – further details are included within the Groundsure Enviro + Geo Insights report.	-

5.2 Radon

The environmental disclosure report has identified that the wider Sister area does not lie within a Radon Affected Area as less than 1% of properties are estimated to have a radon level at or above the action level. No radon protective measures are therefore considered necessary. It is noted however that if basements are proposed which shall be occupied or part occupied, current guidance requires monitoring for radon, irrespective of the initial risk assessment.

5.3 Regulatory Consultation

Consultation with the Environment Agency (EA) has been carried out in February and March 2024, with Revision P01 of this report and the historical Arup reports[1,2,4] submitted for a preliminary review by the EA. In addition, proposed

scopes of site investigation were also submitted for review[16],[17]. The consultation review response from the EA is included in Appendix F and this report has been updated in line with the EA's recommendations.

[16] Civic Earth (2024) ID Manchester – Enabling Works Area and Plot C Proposed Site Investigation. Reference 51019-CE-XX-XX-R-G-4001 P03. 20 February 2024.

[17] Civic Earth (2024) ID Manchester - New River Channel Proposed Site Investigation. Reference 51019-CE-XX-XX-R-G-4002 P04. 20 February 2024.

6. Previous Investigations

6.1 Introduction

A previous ground investigation, referred to as a preliminary ground investigation, has been undertaken across the wider Sister area by Allied Exploration and Geotechnics (AEG)[2] under the direction of Arup between October and December 2019. The following sections summarise the information obtained from the previous AEG investigation and Arup assessments at Plot C, Enabling Works area and the wider Sister area. It is noted that the data has not been independently verified by Civic Earth.

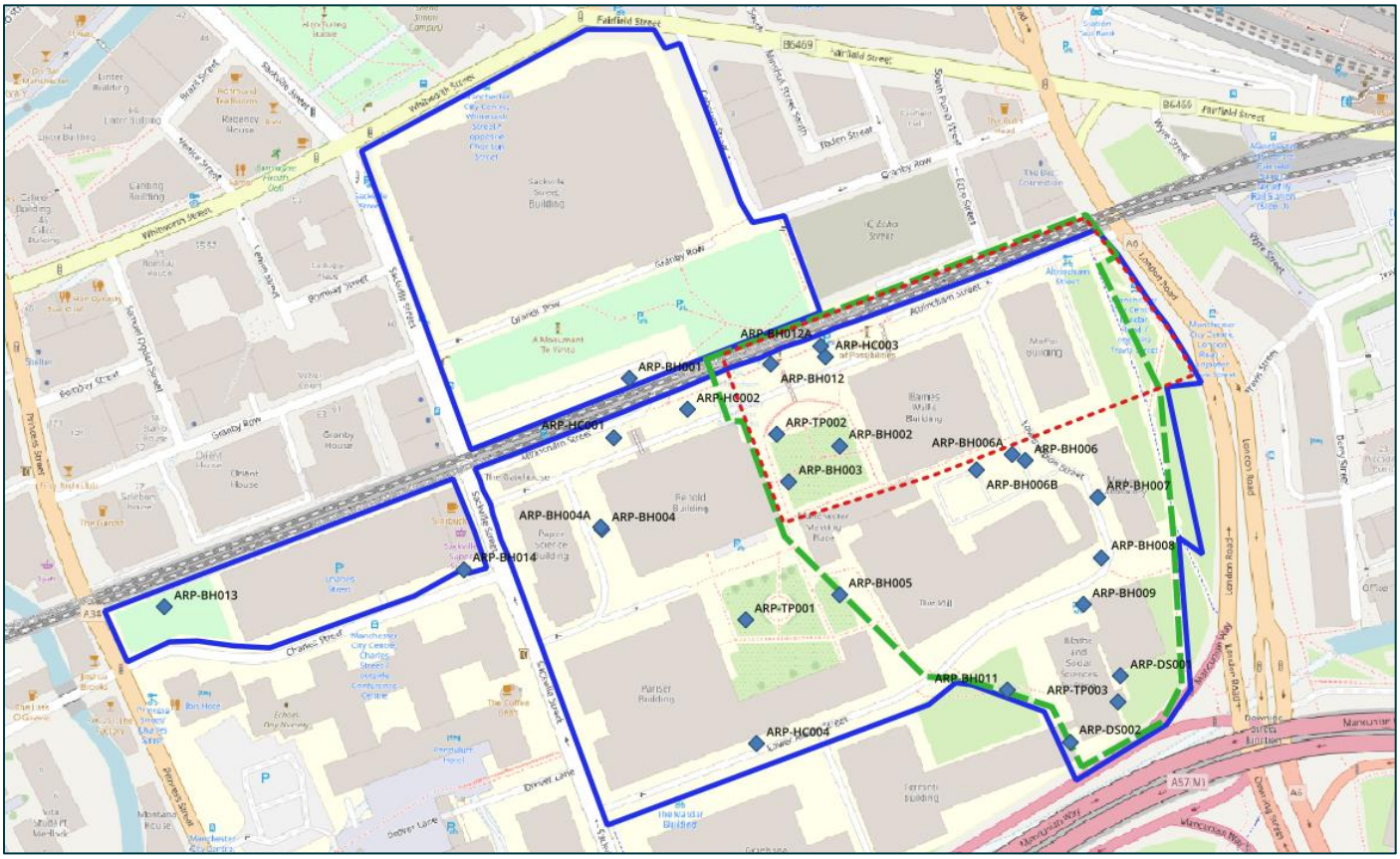
6.2 Summary of Site Works

The objectives of the preliminary investigation were to obtain information on the depth to the sandstone bedrock (in particular in proximity to the BT Guardian Tunnel), investigate the infill material within the former River Medlock channel, investigate the potential for contamination within the plots of the former chemical works, investigate the material being retained behind Altrincham Street retaining wall, and determine infiltration potential in parts of the wider Sister area not underlain by low permeability glacial till.

The ground investigation comprised the following works (the approximate locations based on the AEG report are illustrated in Plate 14:

- 17 Nr. cable percussion or combined cable percussion/rotary boreholes (ARP-BH001 to ARP-BH014, ARP-BH004A, ARP-BH006A, ARP-BH006B and ARP-BH012A) to depths between 0.35mbgl and 21.50mbgl;
- 2 Nr. dynamic sample boreholes (ARP-DS001 and ARP-DS002) to depths between 9.30mbgl and 9.90mbgl;
- 3 Nr. machine excavated trial pits (ARP-TP001 to ARP-TP003);
- 4 Nr. four horizontal core holes (ARP-HC001 to ARP-HC004); and
- 4 Nr. rounds of post-investigation groundwater and ground gas monitoring.

Plate 14: Exploratory Hole Plan of AEG Exploratory Holes (Site in Red, Enabling Works Area in Green; Wider Sister Area in Blue)



A summary of the AEG exploratory hole final depths, levels and rationale for termination is provided in Table 3. A

summary of the AEG monitoring installations is provided in Table 4. It is noted that the following boreholes were positioned to target the historical infilled channel of the River Medlock; ARP-BH002, ARP-BH004/4A, ARP-BH006/6A/6B, ARP-BH007, ARP-BH008, ARP-DS001 and ARP-DS002. The following exploratory holes were positioned to target the historical chemical works within the east and south of the Enabling Works area; ARP-BH007, ARP-BH008, ARP-BH009, ARP-BH011, ARP-DS001, ARP-DS002 and ARP-TP003.

Table 3: Summary of AEG Exploratory Hole Details

Reference	Location	Ground Level (mOD)	Base Depth (mbgl)	Base Level (mOD)	Details
ARP-BH001	North Zone	37.81	15.50	22.31	Advanced to required depth.
ARP-BH002	Site	33.27	4.00	29.27	Terminated due to refusal.
ARP-BH003	Site	33.10	5.40	27.70	Terminated due to refusal.
ARP-BH004	Central Zone	34.22	14.00	20.22	Advanced to required depth.
ARP-BH004A	Central Zone	34.19	4.00	30.19	Advanced to required depth.
ARP-BH005	Enabling Works Area	33.42	21.50	11.92	Advanced to required depth.
ARP-BH006	Enabling Works Area	33.97	1.60	32.37	Terminated due to obstruction.
ARP-BH006A	Enabling Works Area	34.00	1.30	32.70	Terminated due to concrete obstruction.
ARP-BH006B	Enabling Works Area	33.50	0.70	32.80	Terminated due to concrete obstruction.
ARP-BH007	Enabling Works Area	34.68	13.60	21.08	Advanced to required depth.
ARP-BH008	Enabling Works Area	34.05	6.50	27.55	Advanced to required depth.
ARP-BH009	Enabling Works Area	34.20	4.80	29.40	Terminated due to refusal.
ARP-BH011	Enabling Works Area	34.05	13.00	21.05	Advanced to required depth.
ARP-BH012	Site	38.15	0.35	37.80	Terminated due to concrete obstruction.
ARP-BH012A	Site	38.27	10.80	27.47	Advanced to required depth.
ARP-BH013	West Area	33.08	16.50	16.58	Advanced to required depth.
ARP-BH014	West Area	35.71	10.50	25.21	Advanced to required depth.
ARP-DS001	Enabling Works Area	34.22	9.30	24.92	Advanced to required depth.
ARP-DS002	Enabling Works Area	34.09	9.90	24.19	Advanced to required depth.
ARP-TP001	Central Zone	33.21	2.60	30.61	Terminated due to instability of trial pit.
ARP-TP002	Site	32.85	2.80	30.05	Advanced to required depth.
ARP-TP003	Enabling Works Area	34.24	3.00	31.24	Advanced to required depth.
ARP-HC001	Central Zone	34.34	2.00*	N/A	Advanced to required length.
ARP-HC002	Central Zone	34.31	2.00*	N/A	Advanced to required length.
ARP-HC003	Site	34.77	2.00*	N/A	Advanced to required length.
ARP-HC004	Central Zone	31.63	0.46*	N/A	Terminated due to unsuitable material.

*metres extended horizontally
Exploratory holes that encountered obstructions or terminated due to refusal highlighted grey.

Table 4: Summary of AEG Monitoring Installation Details

Reference	Target Stratum	Top of Response Zone (mbgl)	Base of Response Zone (mbgl)	Top of Response Zone (mOD)	Base of Response Zone (mOD)
ARP-BH001	Chester Sandstone	10.00	15.50	27.81	22.31
ARP-BH002	Made Ground	0.50	3.00	30.07	29.27
	Made Ground / Chester Sandstone	3.20	4.00	32.77	30.27
ARP-BH004	Chester Sandstone	11.00	14.00	23.22	20.22
ARP-BH004A	Made Ground	1.00	4.00	33.19	30.19
ARP-BH005	Chester Sandstone	18.50	21.50	14.92	11.92
ARP-BH007	Chester Sandstone	10.60	13.60	24.08	21.08
ARP-BH008	Made Ground / Chester Sandstone	0.30	6.50	33.75	27.55
ARP-BH009	Made Ground	0.50	1.70	33.70	32.50
ARP-BH011	Chester Sandstone	6.00	13.00	24.05	21.05
ARP-BH012A	Made Ground	2.00	6.00	36.27	32.27
ARP-BH013	Chester Sandstone	11.00	16.50	22.08	16.58
ARP-DS001	Made Ground	2.00	4.00	32.22	30.22
ARP-DS002	Chester Sandstone	8.15	9.90	25.94	24.19

6.3 Ground Conditions

A review of the ground conditions encountered within the Enabling Works area during the AEG investigation has been carried out and a summary is provided in Table 5.

Table 5: Summary of AEG Ground Conditions within Enabling Works Area (including Plot C)

Stratum	Depth to Top of Stratum (mbgl) [mOD]	Typical Thickness (m)
Grass over dark brown to black slightly silty to silty occasionally gravelly sand. Sand is fine to medium. Gravel is subangular to angular fine to coarse of sandstone and limestone. Rootlets noted. *Encountered in ARP-BH005 and ARP-TP003 only.* **[TOPSOIL]**	0.00 [34.24 to 33.42]	0.25 to 0.30
Tarmac / concrete / paving slabs / granite and tar cobble set over soft to firm brown to grey black sandy occasionally slightly gravelly clay / loose to medium dense multicoloured (brown, yellow, red, black, grey) clayey to very clayey cobbly sandy to very sandy gravel / sand and gravel / gravelly sand / gravelly silt. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of sandstone, wood, glass, glass bottles, plastic, ceramic, iron, limestone, ash, brick and clinker. Cobbles are subangular of sandstone, brick and concrete. Frequent rootlets noted. **[MADE GROUND]**	0.00 to 0.30 [38.27 to 32.85]	0.35 to 8.40 (1.20 to 4.60)*
Medium dense light to dark brown clayey very sandy GRAVEL / black silty GRAVEL. Gravel is subrounded to subangular fine to coarse of sandstone, quartz and siltstone. Sand is fine to coarse. *Encountered in ARP-BH005 and ARP-DS001 only.* **[ALLUVIUM]**	1.50 to 4.40 [31.92 to 29.82]	1.60 to 4.50

Stratum	Depth to Top of Stratum (mbgl) [mOD]	Typical Thickness (m)
Medium dense to very dense red clayey gravelly to very gravelly SAND. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of sandstone. Occasionally loose to medium dense. *Encountered in ARP-BH002, ARP-BH003, ARP-BH007, ARP-BH011 and ARP-BH012A only.* **[POSSIBLE WEATHERED CHESTER SANDSTONE FORMATION]**	3.70 to 8.40 [29.87 to 28.28]	0.30 to 2.10
Red to red brown SANDSTONE / extremely weak to weak, rarely medium strong, red brown fine to coarse grained SANDSTONE, distinctly weathered to destructured. Localised dark red and black surface staining. Frequently recovered as sand. *Not encountered in ARP-BH002, ARP-BH003, ARP-BH006/6A/6B, ARP-BH012, ARP-TP002 and ARP-TP003.* **[CHESTER SANDSTONE FORMATION]**	3.10 to 10.40 [30.32 to 25.32]	Proven to 21.50mbgl [11.92mOD]

*Typical thickness range excluding exploratory holes where obstructions were encountered within the Made Ground or limited in excavation depth (ARP-TP002 and ARP-TP003). Thicker Made Ground (between 6.3m and 8.4m) encountered in boreholes ARP-BH007, ARP-BH008, ARP-BH012A and ARP-DS002) which are considered likely to reflect the position of the infilled historical route of the River Medlock.

A review of the AEG exploratory holes undertaken on the wider Sister area has also been carried out to consider the ground conditions in the context of the wider Sister area ground model. A summary of the ground conditions encountered across the remainder of the wider Sister area is provided in Table 6.

Table 6: Summary of AEG Ground Conditions across Wider Sister Area excluding Plot C and Enabling Works Area

Stratum	Depth to Top of Stratum (mbgl) [mOD]	Typical Thickness (m)
Tarmac / reinforced concrete over soft to firm yellow brown to grey black sandy gravelly clay / multicoloured (brown, yellow, black, grey) sandy gravel / clayey sandy to very sandy gravel / gravel and cobbles. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of sandstone, glass, limestone, coal, brick and clinker. Cobbles are subangular of sandstone, brick and concrete. **[MADE GROUND]**	0.00 [37.81 to 33.08]	1.40 to 7.00
Medium dense to very dense light brown to yellow brown orange clayey cobbly slightly gravelly to very gravelly SAND / silty SAND / GRAVEL AND COBBLES. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of sandstone, quartz and siltstone. Cobbles are rounded of sandstone. *Not encountered in ARP-BH001 and ARP-BH004A.* **[ALLUVIUM]**	1.40 to 7.00 [31.81 to 27.22]	1.00 to 3.60
Red brown SAND / very dense red clayey slightly gravelly SAND with occasional clay pockets. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of sandstone. *Encountered in ARP-BH001, ARP-BH013 and ARP-BH014 only.* **[POSSIBLE WEATHERED CHESTER SANDSTONE FORMATION]**	4.40 to 9.40 [33.41 to 25.08]	1.10 to 2.50
Red SANDSTONE / extremely weak to weak, rarely medium strong, red fine to coarse grained SANDSTONE, distinctly weathered to destructured. Localised dark red and black surface staining. Inclusions of fine to medium quartz and quartzite. *Encountered in ARP-BH001, ARP-BH004 and ARP-BH0013.* **[CHESTER SANDSTONE FORMATION]**	6.00 to 10.50 [31.81 to 22.58]	Proven to 16.50mbgl [16.58mOD]

6.4 Retaining Walls Investigations

A total of four horizontal core hole investigations were conducted as part of the AEG investigation, three core holes to investigate the Altrincham Street retaining wall (ARP-HC001 to ARP-HC003) and one core hole to investigate the retaining wall for the ramp to the basement of the Pariser building (ARP-HC004).

The Altrincham Street horizontal cores were extended 2m into the retaining wall and the construction of the retaining wall was found to comprise a "strong orange red brick with moderately strong, light grey mortar"[4] which, as the core holes progressed into the wall, became poorly bonded mortar. The full thickness of the wall was not proven; however, borehole ARP-BH012A which was located above core hole ARP-HC003 and 4.7m north of the retaining wall encountered Made Ground from ground level to a depth of 10.40mbgl which was considered to demonstrate that at that position, the Altrincham Street retaining wall is at least 2m in thickness, but less than 4.7m in thickness.

The Pariser building basement ramp retaining wall core hole was extended 0.46m into the wall. The construction of the retaining wall was found to comprise "extremely strong light grey concrete with 5mm diameter reinforcing bars" to 0.42m into the wall, followed by hardcore and gravel behind the retaining wall[4].

6.5 Groundwater Conditions

Distinct groundwater strikes were not encountered during the AEG ground investigation within Plot C, the Enabling Works area or the wider Sister area; however, it is noted that the addition of water during the drilling process may have obscured groundwater strikes.

Two groundwater monitoring rounds were carried out during the AEG site investigation on 22 November and 3 December 2019 at the installations that had been completed at the time of the monitoring rounds. A total of four groundwater monitoring rounds were carried out by AEG post-completion of the site investigation. Two groundwater bodies were recorded during the monitoring rounds:

- Perched water within the Made Ground: 32.29mOD to 28.54mOD (2.60mbgl and 5.99mbgl); and
- Principal aquifer within the Chester Sandstone Formation: 31.68mOD and 24.39mOD (3.00mbgl to 9.8mbgl).

The groundwater monitoring results suggested that the Principal aquifer flows northeast/east to southwest/west across the wider Sister area, with a groundwater level of approximately 29mOD recorded in the east and a groundwater level of approximately 27.5mOD recorded in the west. However, limited groundwater data is available for review and it is noted there are numerous below ground obstructions across the wider Sister area in terms of basement levels, historical foundations and existing foundations which could impact the groundwater regime.

6.6 Ground Contamination

The AEG report states that no visual and olfactory signs of potential contamination were recorded by AEG during the site investigation[2].

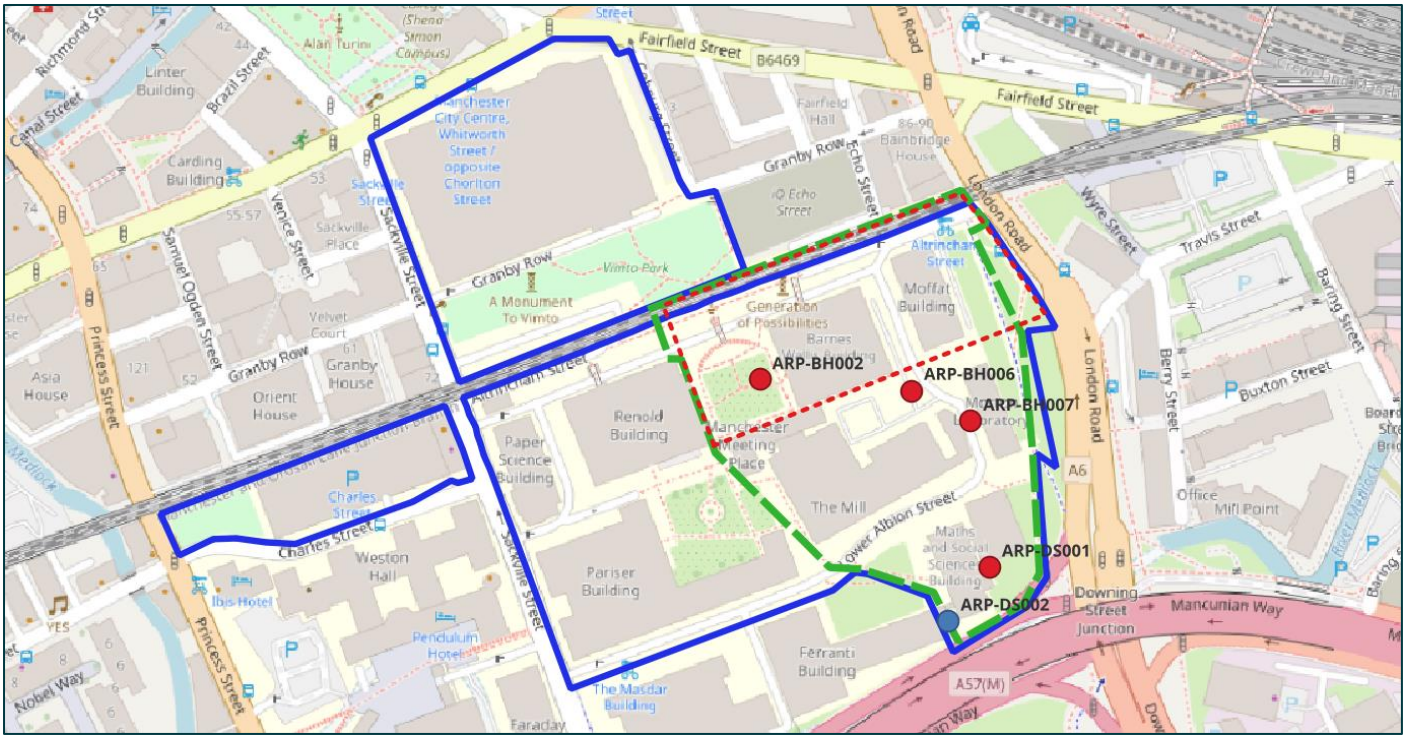
An assessment of soil contamination was carried out by Arup[4] where the soil chemical analysis results from the AEG site investigation were assessed against a 'Commercial' end use criteria on the basis that the underlying assumptions for commercial generic assessment criteria (GAC) include "human exposure to soil/water/gas contaminants during outdoor lunches". Arup assumed that future residents of the proposed flats would have a similar exposure to this and the assumption is based on limited exposure to soils (i.e. no gardens) and elevated positions i.e. high-rise apartments. Arup considered that the use of residential end use GACs would be too conservative and not representative of contaminant exposure pathways for the finished development.

It was outlined that the chemical assessment identified a single sample where a contaminant exceeded the human health commercial GAC; an elevated concentration of lead (2,400mg/kg) recorded against a commercial GAC of 2,300mg/kg at borehole ARP-DS002 at 0.80mbgl which is located within the footprint of the historical Ardwick Bridge chemical works. In addition, asbestos was positively identified in four out of 28 Made Ground soil samples analysed for asbestos:

- ARP-BH002 at 1.0mbgl – 'small bundle' of amosite at <0.001% by weight;
- ARP-BH006 at 1.2mbgl – 'small bundle' of amosite at <0.001% by weight;
- ARP-BH007 at 3.3mbgl – chrysotile at 0.192% by weight;
- ARP-DS001 at 0.6mbgl – 'bundle' of amosite at 0.001% by weight;

The locations where elevated lead and asbestos was identified by Arup are illustrated in Plate 15.

Plate 15: Made Ground Contamination identified by Arup



Notes: Red = Asbestos, Blue = Lead

Arup summarised that the preliminary investigation provided soil chemical data for some areas of the wider Sister area "with the highest potential for contamination (chemical works, infill of the River Medlock) and concluded that based on the data collected, a large proportion of the soils would be suitable for re-use within a predominantly commercial scheme. Arup also noted that a clean capping layer would likely be required due to the presence of asbestos in the Made Ground. However, it was noted that this conclusion would require validation through further site investigation[4]. It is noted that, depending on the final development proposals, it may be necessary to re-assess the data against alternative and sufficiently protective assessment criteria, which could result in further exceedances and requirement for remediation and consideration of how and where soils can be reused within the development.

6.7 Groundwater Contamination

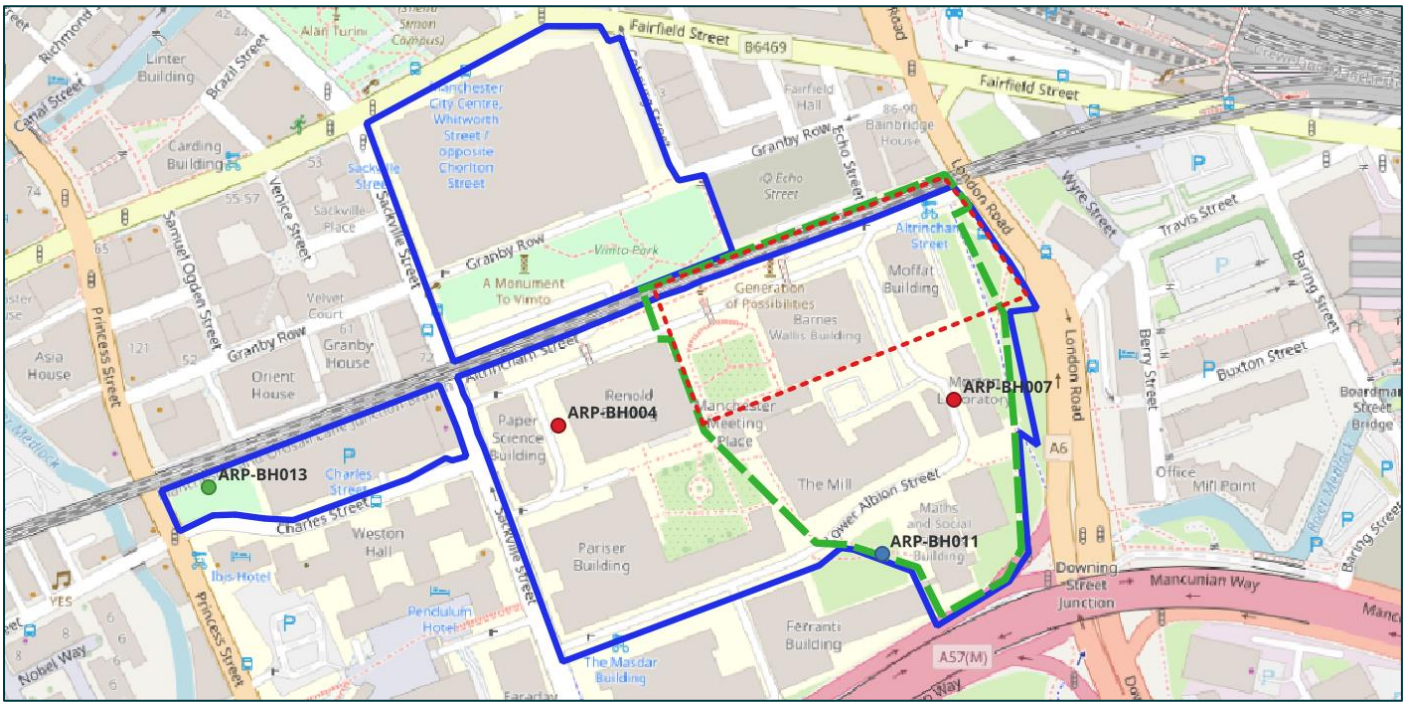
An assessment of groundwater contamination in the Principal aquifer was carried out by Arup[4] where the water chemical analysis results obtained from the AEG site investigation from six boreholes were assessed against Arup's controlled waters generic assessment criteria (GWGAC), which are based on the Environmental Quality Standards (EQS) (2015) and Drinking Water Standards (DWS) (2016). The Arup assessment outlines that several inorganic compounds (arsenic, cadmium, chromium, copper, manganese, nickel and zinc) were detected at concentrations above the CWGAC; however, the compounds were considered to be trace metals typical of mineral cements within local aquifers. A comparison of the AEG chemical data relative to aquifer baseline data was subsequently undertaken and Arup concluded that the metal concentrations were found to be within baseline ranges and considered to be naturally occurring, and therefore not considered further within their assessment.

The following concentrations were also identified by Arup which exceeded the CWGAC:

- Elevated concentration of lead (3,100µg/l against a CWGAC of 1.2µg/l) at borehole ARP-BH011. The borehole is located within the footprint of the historical Ardwick Chemical Works and an elevated concentration of lead was detected in the Made Ground at borehole ARP-DS001 which is also located within the footprint of the historical Ardwick Chemical Works.
- Elevated concentration of selenium (22µg/l against a CWGAC of 10µg/l) at borehole ARP-BH013. The borehole is located within the footprint of historical Saw Mills.
- Elevated concentrations of naphthalene (4.9µg/l against a CWGAC of 2.0µg/l) and fluoranthene (0.1µg/l against a CWGAC of 0.0063µg/l) at borehole ARP-BH004.
- Elevated concentration of fluoranthene (0.09µg/l against a CWGAC of 0.0063µg/l) at borehole ARP-BH007.

The locations where elevated contamination was identified by Arup are illustrated in Plate 14. Naphthalene and fluoranthene are grouped as polycyclic aromatic hydrocarbons (PAHs).

Plate 14: Principal Aquifer Contamination identified by Arup



Notes: Red = PAHs, Blue = Lead, Green = Selenium

Arup concluded that leaching of Made Ground soils is considered to be the most likely cause of the elevated groundwater concentrations and that the soils are likely to be discrete. It was considered that leaching will be reduced in the final development due to incorporation of buildings and hardstanding and therefore delineation of the identified soil sources and excavation and placement of the soils in appropriate areas of the development was considered appropriate. Extensive groundwater remediation was not considered to be required to mitigate the risks to controlled waters; however, it was recommended that further sampling and assessment is undertaken to confirm concentrations and inform further risk assessment.

It is noted that no leachate analysis was undertaken as part of the Arup assessment and there is considered to be a risk of leachable contaminants being present within the Made Ground which may pose a potential risk to controlled waters. The Arup soil assessment undertaken with respect to the risks to human health was based on a commercial end use, where the GAC adopted are very high in some cases, and whilst only a single location of elevated lead was identified to exceed the GAC, soil contaminants may be present at concentrations which present a potential risk to controlled waters. Review of Arup's soil screening assessment in Appendix C of their report[4] indicates the following contaminants where concentrations have been recorded within the soil analysis results which may present a risk to controlled waters:

- Chromium (up to 210mg/kg);
- Zinc (up to 620mg/kg);
- Copper (up to 440mg/kg);
- Arsenic (up to 87mg/kg);
- Lead (up to 2,400mg/kg);
- Total PAHs (up to 120mg/kg); and
- Naphthalene (up to 5.7mg/kg).

In addition, review of the groundwater assessment data in Appendix D of the Arup report has revealed some inconsistencies with the CWGAC presented with confusion between EQS and DWS criteria, and errors with orders of magnitude. Re-assessment of the groundwater data has therefore been carried out by Civic Earth to confirm where elevated concentrations have been recorded and are summarised in Table 7 (EQS) and Table 8 (DWS). The inorganic compounds (arsenic, cadmium, chromium, copper, manganese, nickel and zinc) have been omitted from the tables in

consideration of Arup's conclusion that the metal concentrations were found to be within baseline ranges and considered to be naturally occurring.

The results of the Civic Earth assessment highlight that in addition to the elevated concentrations of lead, naphthalene and fluoranthene identified by Arup in boreholes ARP-BH004, BH007 and BH011, elevated concentrations of total cyanide against the EQS and DWS have been recorded in boreholes ARP-BH011 and ARP-BH013 and an elevated concentration of ammoniacal nitrogen against the DWS in borehole ARP-BH004. An acidic pH has also been recorded in borehole ARP-BH011.

The Civic Earth assessment tables are included in Appendix G and the locations identified in Table 7 and Table 8 are illustrated in Plate 14.

Table 7. Summary of Arup Groundwater Contaminant Exceedances against EQS

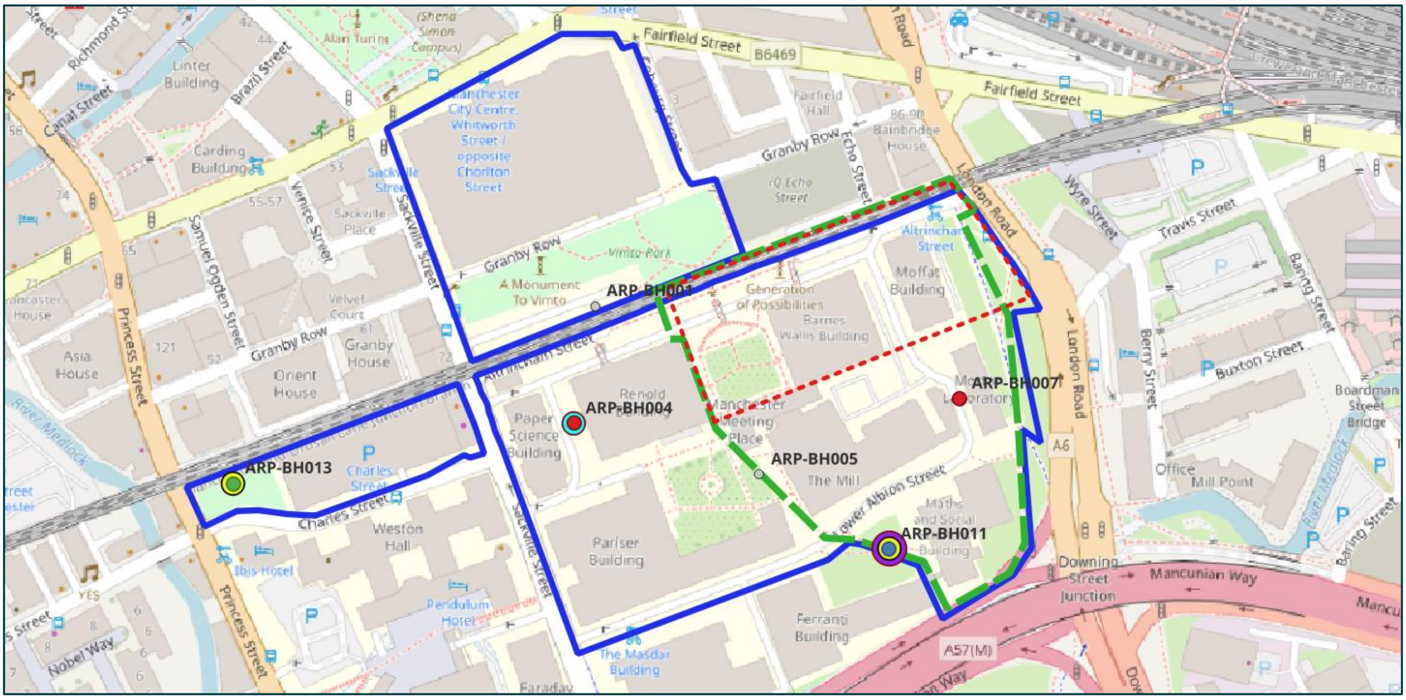
Contaminant	Location	EQS (µg/l) [Annual Average]	EQS (µg/l) [Max. Allowable]	Concentration (µg/l)
Lead (Bioavailable)	ARP-BH011	1.2	14	1,550
Total Cyanide	ARP-BH011 ARP-BH013	1	5	1,000 78
Fluoranthene	ARP-BH004 ARP-BH007	0.0063	0.12	0.1 0.09
Naphthalene	ARP-BH004	2	130	4.9
pH	ARP-BH011	*	6.0 to 9.0	4.8

Exceedances against the Annual Average only are highlighted orange with exceedances against the Annual Average and Maximum Allowable are highlighted blue.

Table 8. Summary of Arup Groundwater Contaminant Exceedances against DWS

Contaminant	Location	DWS (µg/l)	Concentration (µg/l)
Lead	ARP-BH011	10	1,550
Selenium	ARP-BH013	10	22
Total Cyanide	ARP-BH011 ARP-BH013	50	1,000 78
Ammoniacal Nitrogen	ARP-BH004	500	530
pH	ARP-BH011	6.5 to 9.0	4.8

Plate 14: Principal Aquifer Contamination identified by Civic Earth



Notes: Red = PAHs, Blue = Lead, Green = Selenium, Yellow = Total Cyanide, Light Blue = Ammoniacal Nitrogen, Purple = pH, Grey = sample location with no exceedances recorded.

6.8 Ground Gas

Ground gas monitoring of the Made Ground was carried out by AEG across the wider Sister area included four monitoring rounds in boreholes ARP-BH002 (dual installation), ARP-BH004A, ARP-BH008, ARP-BH009, ARP-BH012A and ARP-DS001. The monitoring was carried out in rising and falling pressure systems, with atmospheric pressures recorded between 997mbar and 1031mbar.

A ground gas risk assessment was carried out by Arup in accordance with CIRIA C665[18] and BS 8485[19] to estimate the level of risk posed to future site users. Arup concluded that based on the maximum methane (<0.1%v/v) and carbon dioxide (0.1%v/v to 1.3%v/v) concentrations at each individual borehole and the maximum flow rates (0.0l/hr) at each individual borehole, the wider Sister area would be characterised as Characteristic Situation (CS) 1.

6.9 Waste Characterisation

A preliminary waste characterisation was undertaken by Arup using the HazWasteOnline screening tool to assess the hazardous properties of the Made Ground soil samples. None of the soil samples were classified as hazardous material; however, it was noted that asbestos was detected in four of the Made Ground soil samples and where asbestos has been quantified as greater than 0.1% (as it has been in borehole ARP-BH007 at 3.3mbgl at 0.192%), this material would be classified as hazardous.

Arup concluded that a low proportion of Made Ground soils at the wider Sister area are likely to be classified as hazardous waste and this is as a result of asbestos above the hazardous waste threshold. It was therefore considered that "most of the Made Ground" is likely to be classified as non-hazardous but requires further investigation to confirm this conclusion.

18 CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings. C665.

19 British Standard (2015) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings. BS 8485:2015+A1:2019.

7. Summary of Ground Model

Based on the ground conditions encountered during the AEG site investigation in 2019, the Enabling Works area, including Plot C, is anticipated to be underlain by a considerably variable thickness of Made Ground. The Made Ground encountered during the AEG investigation was found to be variable in composition with both cohesive and granular horizons recorded, with frequent cobbles of sandstone, brick and concrete recorded within the deposits. The Made Ground was typically recorded to range between 1.2m and 5.8m in thickness, with increased thicknesses between 6.3m and 8.4m recorded in boreholes ARP-BH004, ARP-BH007, ARP-BH008, ARP-BH0012A and ARP-DS002 which are considered to reflect the historically infilled River Medlock channel. Obstructions up to 1.6mbgl were also encountered in the Made Ground in boreholes ARP-BH006/6A/6B and ARP-BH012.

Superficial deposits of Alluvium were encountered below the Made Ground in boreholes ARP-BH004, ARP-BH005, ARP-BH013, ARP-BH014, ARP-DS001 and ARP-TP001 and typically comprised medium dense to very dense, light brown to yellow brown orange, clayey and occasionally silty, cobbly, gravelly to very gravelly sands. The gravels typically comprised subangular to rounded sandstone, quartz and siltstone whilst the cobbles were recorded to be rounded cobbles of sandstone. The upper surface of the Alluvium was recorded between 1.50mbgl and 4.40mbgl (31.92mOD to 29.82mOD) within the Enabling Works area and between 1.40mbgl to 7.00mbgl (31.81mOD to 27.22mOD) across the rest of the wider Sister area. The presence of Alluvium across the area investigated by AEG is not unexpected despite published geological mapping showing the Alluvium limited to the south of Plot C, as the River Medlock historically meandered across the wider Sister area. However, Made Ground deposits were recorded to directly overlie the bedrock in the majority of boreholes, suggesting that the previous development of the wider Sister area has resulted in the removal of the superficial deposits (Alluvium and/or Glacial Till) above the bedrock.

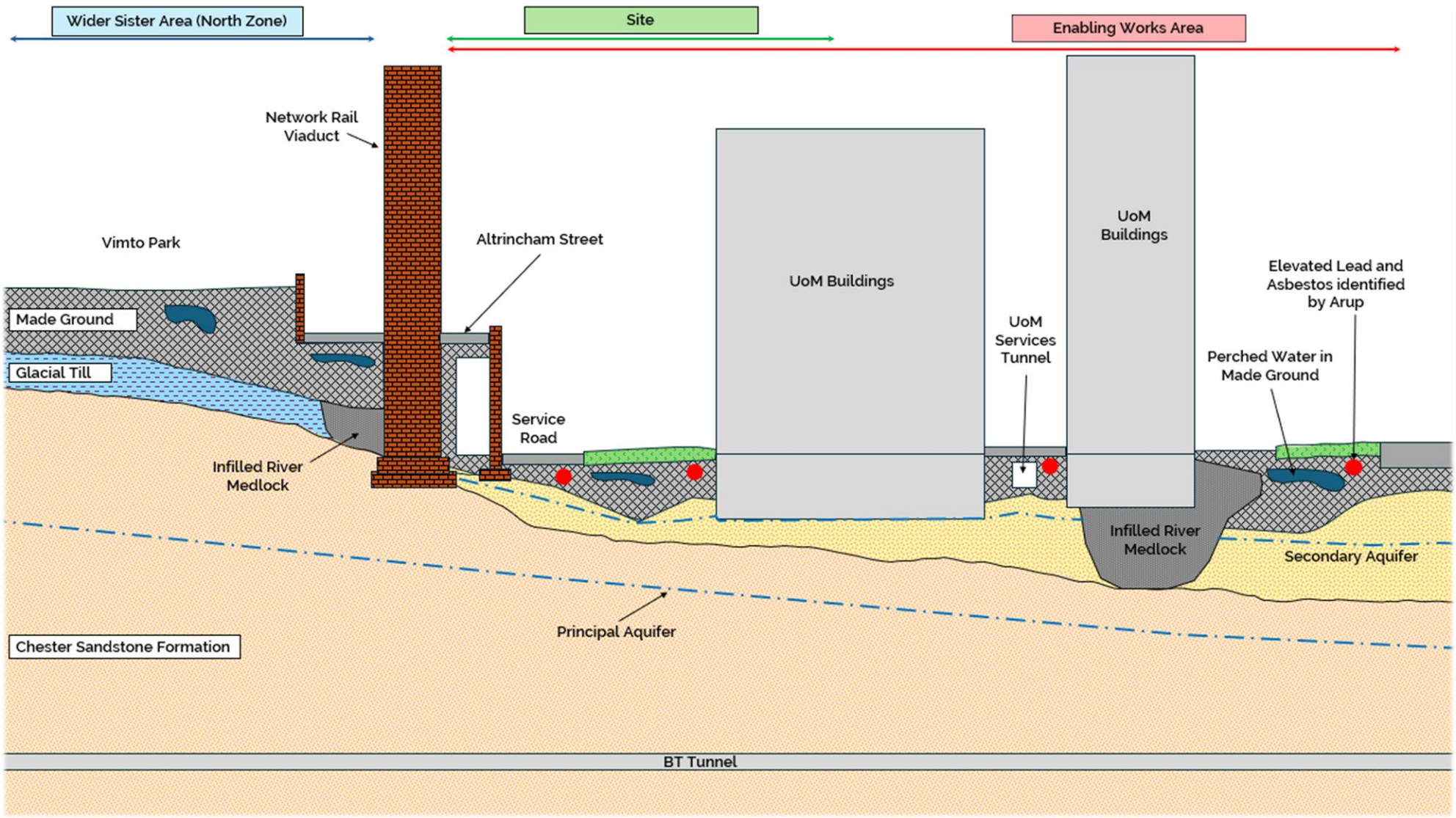
Superficial deposits of Glacial Till are not considered to have been encountered during the AEG investigation within the wider Sister area. Based on Civic Earth's experience on the local geology and exploratory hole records from the adjacent Graphene Innovation Centre[6] and Echo Street site investigations[9], the Glacial Till typically comprises deposits of stiff, brown, sandy, silty, gravelly clay with cobbles. It is noted that the Arup report states that Glacial Till was encountered to the north of the former River Medlock channel, with a thickness of 4.2m to 7.2m, however, material correlating to the anticipated composition of the Glacial Till has not been identified by Civic Earth during the review of records related to boreholes to the north of the historical river channel.

The bedrock of the Chester Sandstone Formation was encountered either directly below the Made Ground or below the Alluvium between 3.70mbgl and 8.40mbgl (29.87mOD and 28.28mOD) within the Enabling Works area and between 4.40mbgl and 9.40mbgl (33.41mOD to 25.08mOD) across the rest of the wider Sister area. A possible weathered horizon of the bedrock was recorded in localised boreholes which was typically described as medium dense to very dense, red, clayey, gravelly sand. Distinguishment of this material from the overlying Alluvium has been made based on the red colouring of the sand compared to the typically orange-brown colouring of the Alluvium. The horizons of possible weathered bedrock ranged in thickness between >0.3m to 2.5m. The competent bedrock of the Chester Sandstone Formation was encountered between 3.10mbgl and 10.40mbgl (30.32mOD and 25.32mOD) within the Enabling Works area and between 6.00mbgl and 10.50mbgl (31.81mOD and 22.58mbgl) across the rest of the wider Sister area. The bedrock typically comprised extremely weak to weak, rarely medium strong, red to red-brown, fine to coarse grained sandstone. The bedrock was recorded to be distinctly weathered to destructured with localised dark red and black surface staining.

Groundwater was recorded within the Made Ground between (2.60mbgl and 5.99mbgl (32.29mOD and 28.54mOD). Based on the composition of the Made Ground, the water is considered likely to be representative of perched within the granular horizons of the Made Ground. Groundwater was recorded within the Principal aquifer within the Chester Sandstone Formation between 3.00mbgl and 9.8mbgl (31.68mOD and 24.39mOD) and indicated to flow towards the southwest/west across the wider Sister area. However, limited groundwater data is available for review and it is noted that there are numerous below ground obstructions including basement levels, historical foundations and existing foundations, along with the historical route of the River Medlock and underground services, which may be impacting the groundwater regime.

An illustrative cross section of the ground conditions at the Enabling Works area is provided in Plate 16.

Plate 16: Illustrative Ground Model Cross Section (Northwest to Southeast, Not to Scale)



7.1 Limitations of Existing Site Investigation

Following a review of the AEG and Arup investigation data, the following limitations and data gaps have been identified for Plot C and the Enabling Works area:

- Only limited site investigation has been carried out to obtain information on the wider ground model outside of the historical River Medlock channel route. No site investigation has been carried out in the east of Plot C and central area of the Enabling Works area and only limited investigation has been carried out within the footprints of historical industries.
- No deeper investigation of the bedrock sandstone has been carried out within the footprint of the proposed Plot C structures to inform foundation design.
- No investigation of existing foundations or retaining walls has been carried out to inform the extent of 'grubbing out' that will be required during de-construction and to obtain information where structures are to be retained and re-purposed.
- No groundwater monitoring and sampling/chemical analysis has been carried out of the perched water and only limited groundwater monitoring and sampling/chemical analysis has been carried out of the Principal aquifer.
- Limited ground gas monitoring has been carried out to inform the requirement for ground gas protection measures in the proposed development, including within the footprint of the proposed Plot C structures.
- Only limited chemical analysis of soil samples has been carried out to assess material suitability in terms of risks to human health, controlled waters and material re-use. No chemical analysis of the natural strata underlying the Made Ground was undertaken as part of the Arup investigation.
- No leachate testing of the Made Ground soils has been carried out to inform the assessment of potential risks to controlled waters from potentially contaminated Made Ground soils.
- No further investigation has yet been carried at the 'hotspots' of contamination identified by Arup within the Made Ground soils and Principal aquifer to delineate the extent of the contamination.
- No investigation has yet been carried out in proximity to the UoM historical drainage runs around buildings where possible residual contamination has been noted by the university.

It is noted that similar limitations also apply to the wider Sister area where only limited site investigation data is available; additional site investigation would be required to allow a robust conceptual ground model to be developed for the wider Sister area.

7.2 Limitations of Existing Human Health Risk Assessment

It is noted that the assessment of the risks to human health undertaken by Arup assumed a commercial end use. Based the currently proposed masterplan for the wider Sister area (typically a combination of commercial units and residential units), a commercial end use may not be sufficiently protective for the assessment as the commercial GAC considers the risks to an adult receptor only. It is therefore recommended that the risks to human health from soil contaminants are assessed against criteria that are more reflective of the proposed development i.e. residential without home grown produce consumption (i.e. no private gardens), commercial and/or public open space in a residential area.

8. Preliminary Risk Assessment

8.1 Introduction

Historical contamination of land may present harm to human health and the environment. Current UK legislation stipulates that the risk associated with potential land contamination is assessed and remediated, if necessary. Under the Town and Country Planning Act 1990 (as amended), potential land contamination is a "material planning consideration" together with the National Planning Policy Framework[20] (revised in July 2023), which means that a planning authority must consider contamination when they prepare development plans or consider individual applications for planning permission. It is the responsibility of the developer to carry out the remediation where it is required and satisfy the Local Authority that the remediation has been carried out as agreed.

Additionally, Part 2A of the Environmental Protection Act 1990 requires that a significant source-pathway-receptor linkage exists to determine a site as contaminated land. This means that there has to be a contaminant present, a receptor that could be harmed by this contaminant, and a pathway linking the two. Part 2A deals with the contamination risk from a site in its current use, however, the planning system requires that the proposed use is considered. Where remediation is carried out under the planning system, it should be ensured that the subject site is in such a condition that it would still not meet the definition of contaminated land under Part 2A.

8.2 Preliminary Conceptual Site Model

A preliminary conceptual model (CSM) has been compiled for Plot C and Enabling Works area, and a second CSM for the wider Sister area, with respect to the proposed development to identify the potential sources of contamination and the associated potential contaminant linkages. This model also informs the potential need for further investigation at Plot C and Enabling Works area, and the wider Sister area.

8.2.1 Potential Sources

Potential contamination sources can include both current and historical activities on site, within the Enabling Works area and within the wider Sister area and off-site in the surrounding area. The potential sources outlined in Table 9 have been identified at Plot C, the Enabling Works area and wider Sister area.

Table 9: Potential Sources

Hazard	Description
Historical and current land uses – Plot C	Historical industrial uses include a cotton mill and nut and bolt works. These historical industries could be potential sources of a wide range of contaminants including heavy metals, hydrocarbons, chlorinated solvents and polychlorinated biphenyls (PCBs).
Historical and current land uses – Enabling Works Area	Historical industrial uses including chemical works, Ardwick Bridge chemical works, joinery, nitrate of soda works, cotton mill, tanks, retort house (considered likely to be associated with local gas production for the cotton mill) and warehouse. These historical industries could be potential sources of a wide range of contaminants including heavy metals, hydrocarbons, ammoniacal nitrogen, chlorinated solvents and polychlorinated biphenyls (PCBs). Historical UoM uses include research and laboratory spaces where potential residual contaminants have been identified by the UoM to include general chemicals, oils, mercury and lead and there is potential for leakage of contaminants from university drainage or disposal of laboratory chemicals on site. Radioactive substances were also identified as having been used; however, it is understood that detection levels are expected to be at trace levels, if detectable at all.

[20] Ministry of Housing, Communities and Local Government (2023). National Planning Policy Framework.

Hazard	Description
Historical and current land uses – wider Sister area	Historical industrial land uses including; slaughterhouses, coal, timber and slate wharves, lead pipe manufactory and timber yards (North Zone); motor engineering works, cabinet manufactory, cotton mill, iron works, box works, timber yard, garage, boilers and clothing mill (Central Zone); and saw mills (West Zone). These historical industries could be potential sources of a wide range of contaminants including heavy metals, hydrocarbons, chlorinated solvents and polychlorinated biphenyls (PCBs). It is understood that no de-construction / new buildings are proposed in this area and therefore it is considered that if contamination is present associated with the historical slaughter houses, it is unlikely to be disturbed. Historical UoM uses include research and laboratory spaces where potential residual contaminants have been identified by the UoM to include concrete and silica dust, glass fibre, metal particulates, general chemicals, oils, mercury and lead. There is potential for leakage of contaminants from university drainage or disposal of laboratory chemicals on site. Radioactive substances were also identified as having been used; however, it is understood that detection levels are expected to be at trace levels, if detectable at all. Current uses include the Charles Street multistorey car park in the west zone which could be a potential source of hydrocarbons and heavy metals.
Made Ground – Plot C, Enabling Works Area and wider Sister area	Potential for Made Ground to be present due to Plot C, Enabling Works area and wider Sister areas' historical development, which could be a potential source of a wide range of contaminants including heavy metals, hydrocarbons and asbestos. Previous AEG site investigation encountered variable thicknesses of Made Ground across the Enabling Works area and wider Sister area. Previous Arup assessment identified an elevated concentration of lead in the south of the Enabling Works area (when assessed against a commercial end use) and asbestos within four Made Ground soil samples. In addition, elevated concentrations of chromium, zinc, copper, arsenic and PAHs were also noted in the Made Ground soils which may present a leachable risk to controlled waters. Potential for variable thickness of Made Ground along historical route of the River Medlock, a historical channel in the northwest of the North Zone and a reservoir in the northwest of the Central Zone.
Ground gases / vapour	Made Ground and Alluvium can be a source of ground gas where an appreciable organic content is present. If present, degradation of hydrocarbons/organic chemicals can also produce organic vapours and ground gases, as well as the potential for vaporisation of mercury if present in soils.
Groundwater	Perched water in the Made Ground, Secondary (undifferentiated) aquifers in the superficial Alluvium and Glacial Till (if present) may be a source of contamination resulting from impacts from the previous on and off-site sources. Potential contaminants in water would be similar to those potentially present in the soils, as discussed above.

8.2.2 Potential Pathways

The potential migration pathways that may be present are outlined in Table 10.

Table 10: Potential Pathways

Hazard	Description
Ingestion and inhalation	Contamination within the Made Ground and/or shallow natural soils can result in the ingestion or inhalation of contaminated soils (and asbestos fibres if present) where soil is exposed and inhalation of ground gases/vapours.
Direct / dermal contact	Direct/dermal contact with contaminated soils or shallow groundwater can result in the uptake of contaminants through the skin (where soil is exposed) or permeation of contaminants through structures.
Root uptake	Uptake of phytotoxic contaminants by plants and vegetation within areas of soft landscaping.
Lateral and vertical migration	Leaching from potential contamination in the soils may impact the water in the Made Ground, underlying Secondary Undifferentiated aquifers (Alluvium and Glacial Till (if present)), underlying Principal aquifer (Chester Sandstone Formation) and surface water receptors (River Medlock).
Ground gas / vapour migration	Lateral migration of ground gases and/or vapours through the soil matrix could lead to accumulation within buildings, posing a risk of asphyxiation or explosion.
Drainage and services	Could provide a preferential pathway for dissolved phase contaminant migration and/or ground gases/vapour transport.
Foundations (shallow, piled)	Could provide a preferential pathway for dissolved phase contaminant migration and/or ground gases/vapour transport.

8.2.3 Potential Receptors

The potential receptors have been identified based on the proposed commercial and residential end use of Plot C, Enabling Works area and wider Sister area, and are outlined in Table 11.

Table 11: Potential Receptors

Hazard	Risk, if source and pathway present
Future site users	Users and occupiers are considered to be at risk from possible contamination associated within shallow soils and groundwater, if source and pathway are present.
Construction workers	Considered to be at risk from potential contamination within soils and groundwater during groundworks. Such persons are likely to be in close contact with potentially contaminated materials on site associated with the current and historical uses of the site and surrounding area.
Off-site residents	Potentially at risk from potential contaminants in wind-blown dust and potential odours/vapours generated during development works.
Controlled waters	Surrounding aquifers: Secondary Undifferentiated aquifers of the Alluvium and Glacial Till (if present) and Principal aquifer of the Chester Sandstone Formation). Existing local surface waters: River Medlock and culverted Charles Street / Shooters Brook watercourse. Proposed local surface waters: Proposed new river channel in south of wider Sister area. The above controlled waters are potentially at risk from the leaching and vertical/lateral migration of contaminants from potentially contaminated soils and groundwater. Migration anticipated to be reduced by cohesive horizons in the Alluvium and Glacial Till (if present).
Buildings / Infrastructure / services	Potentially at risk from ground gas migration, aggressive ground conditions and contaminants that may permeate through underground services such as water supply pipes.
Plants and vegetation	Primarily at risk from phototoxic contaminants such as boron, copper, nickel and zinc.

8.2.4 Preliminary Risk Assessments

Preliminary qualitative risk assessments have been undertaken for Plot C and Enabling Works area, and the wider Sister area based on the findings of the conceptual site model and the potential contaminant linkages that may exist at Plot C in accordance with the October 2020 Land Contamination Risk Management Guidance (LCRM)[21]. The magnitude of the risks associated with potential contaminant linkages has been assessed using criteria broadly based on those presented in CIRIA Report C552[22], and are summarised in Table 12 (site and Enabling Works area) and Table 13 (wider Sister area). The risk assessment methodology is presented in Appendix H and an illustrative conceptual site model is presented in Plate 17.

[21] Environment Agency (2020). Land Contamination Risk Management (LCRM).

[22] CIRIA (2001) Contaminated Land Risk Assessment. A guide to good practice. C552.

Table 12: Site and Enabling Works Area Preliminary Qualitative Risk Assessment

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
Explosive/ asphyxiating gases/vapours from underlying soils (Made Ground and Alluvium) and potential on and off-site sources (including historical retort house, tanks, nitrate of soda works, nut and bolt works, university lab use including mercury and solvents, chemical works)	Migration of gases and vapours through the surface via permeable soils and drainage & services	Internal building spaces & future occupiers	Medium	Low likelihood	Moderate/low	Variable thicknesses of Made Ground recorded during AEG site investigation including increased thicknesses along route of former River Medlock. Preliminary ground gas monitoring indicates a low risk. *However, further assessment of underlying geology and ground gas monitoring recommended to assess ground gas regime including investigation within footprints of pertinent historical industries (retort house, nut and bolt works, UoM buildings with laboratories).*
Organic/ inorganic contaminants within underlying soils and perched groundwater within the Made Ground from historical on and off-site sources (including historical retort house, tanks, nut and bolt works, university lab uses including mercury and solvents, chemical works, nitrate of soda works)	Direct/indirect ingestion of soil and dust, inhalation of particle vapours and asbestos fibres and dermal contact	Construction workers	Medium	Likely	Moderate	Potential for shallow soils to be impacted with asbestos and/or contaminants. Arup identified an elevated concentration of lead and asbestos recorded during AEG investigation. Risk would be mitigated by use of appropriate PPE. *Further chemical analysis and assessment of shallow soils required to assess risk.*
		Future site users	Medium	Likely	Moderate	Potential for shallow soils to be impacted with asbestos and/or contaminants. Arup identified elevated concentration of lead and asbestos recorded during AEG investigation. Hardstanding and/or buildings are proposed across large areas which will act as a barrier between receptor and potential contamination within underlying soils. Likely soft landscaping will require growth medium to mitigate potential risks. Assessment of risk from potential vapour intrusion into buildings required. *Chemical analysis and assessment of shallow soils required to assess risk.*
		Off-site residents	Medium	Low likelihood	Moderate/low	Potential for shallow soils to be impacted with asbestos and/or contaminants, elevated lead concentration and asbestos recorded during AEG investigation. It is assumed that appropriate practices will be adopted to prevent dust generation during construction e.g., dampening down and covering stockpiles etc.
	Direct contact with underground structures and services	Buildings and structures, buried services	Mild	Likely	Moderate/low	Buried concrete to be designed as appropriate for ground conditions. Potential for contamination within Made Ground where new buried water supply pipes will be laid. *Chemical assessment of soils required to assess risk.*

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
	Root uptake	Plants and vegetation	Minor	Likely	Low	Potential for shallow soils to be impacted with asbestos and/or contaminants. It is assumed that a suitable growth medium will be required for new areas of soft landscaping to mitigate risks to receptors. *Chemical analysis and assessment of shallow soils required to assess risk.*
	Vertical and lateral migration, via historical UoM drainage runs, pathways created during construction activities	Shallow Secondary Undifferentiated aquifer (*Glacial Till / Alluvium*)	Medium	Likely	Moderate	Potential for contaminants within the soil to leach to the underlying aquifer within superficial deposits. Proposed buildings and hardstanding across large areas of the site will limit leaching potential. In addition, cohesive horizons within Made Ground may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Principal aquifer (Chester Formation)	Medium	Likely	Moderate	Potential for contaminants within the soil to leach to the underlying aquifer within bedrock. Elevated concentrations of lead, selenium, ammoniacal nitrogen and PAHs plus acidic pH conditions recorded within Principal aquifer during AEG site investigation. Proposed buildings and hardstanding across large areas will limit leaching potential. In addition, cohesive horizons within overlying superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Local surface water bodies (*Existing Culverted River Medlock and Charles Street Watercourse*)	Mild	Low likelihood	Low	Potential for shallow soils and perched water to be impacted with contaminants based on historical and current site use. However, it is understood that the existing culverts are brick/concrete lined which would mitigate migration of potential contaminants into the culvert. In addition, buildings and hardstanding across large areas of the site and Enabling Works area will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Local surface water bodies *(New River Medlock Open Channel)*	Mild	Likely	Moderate/low	Potential for shallow soils and perched water to be impacted with contaminants based on historical and current site use. The construction methodology of the new channel e.g. lined or unlined is currently unknown and therefore there may a potential pathway for contaminant migration. However, it is noted that buildings and hardstanding across large areas of the

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
						site and Enabling Works area will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
Organic / inorganic contaminants within shallow groundwater aquifers (Alluvium / Glacial Till (if present)) from historical on and off-site sources (including historical retort house, tanks, nut and bolt works, university lab uses including mercury and solvents, chemical works, nitrate of soda works)	Direct contact and ingestion of contaminated groundwater	Future site users	Medium	Unlikely	Low	Hardstanding, buildings and formal landscaping is proposed across the site which will limit the exposure to future site users. Construction workers may come into contact with shallow water during excavation works; however, contact between future site users/off-site residents and shallow aquifer considered unlikely. *Assessment of groundwater profile and contamination is required to assess risk.*
		Construction workers	Medium	Low likelihood	Moderate/low	
		Off-site residents	Medium	Unlikely	Low	
	Inhalation of vapours	Future site users	Medium	Low likelihood	Moderate/low	Potential for elevated hydrocarbon concentrations in shallow groundwater from historical tanks and chemical works and potential for mercury vapours from historical use and disposal of mercury within UoM laboratories. *Assessment of groundwater profile and contamination is required to assess risk.*
	Lateral migration	Local surface water bodies *(Existing Culverted River Medlock and Charles Street Watercourse*)	Mild	Low likelihood	Low	Potential for shallow water to be impacted with contaminants based on historical and current site use. However, it is understood that the existing culverts are concrete/brick lined which would mitigate migration of potential contaminants into the culvert. In addition, buildings and hardstanding across large areas of Plot C and Enabling Works area will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Local surface water bodies *(New River Medlock Open Channel)*	Mild	Likely	Moderate/low	Potential for shallow water to be impacted with contaminants based on historical and current site use. The construction methodology of the new channel e.g. lined or unlined is currently unknown and therefore there may a potential pathway for contaminant migration. However, it is noted that buildings and hardstanding across large areas of the site and Enabling Works area will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
	Vertical migration, pathways created during construction	Principal aquifer (Chester	Medium	Low likelihood	Moderate/low	Potential for contaminants within the shallow groundwater to migrate to underlying bedrock aquifer.

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
	activities	Formation)				Elevated concentrations of lead and PAHs recorded within Principal aquifer during AEG site investigation. Considered likely that the presence of buildings and hardstanding and cohesive horizons of superficial deposits will limit potential for vertical migration of potential contaminants to bedrock aquifer in these areas. *Assessment of groundwater profile and contamination is required to assess risk, piling works risk assessment recommended to assess risk.*
	Direct contact with underground services	Buildings and structures	Mild	Likely	Moderate/low	Buried concrete to be designed as appropriate for ground conditions. *Assessment of groundwater profile and contamination is required to assess risk.*

Plate 17. Illustrative Conceptual Site Model

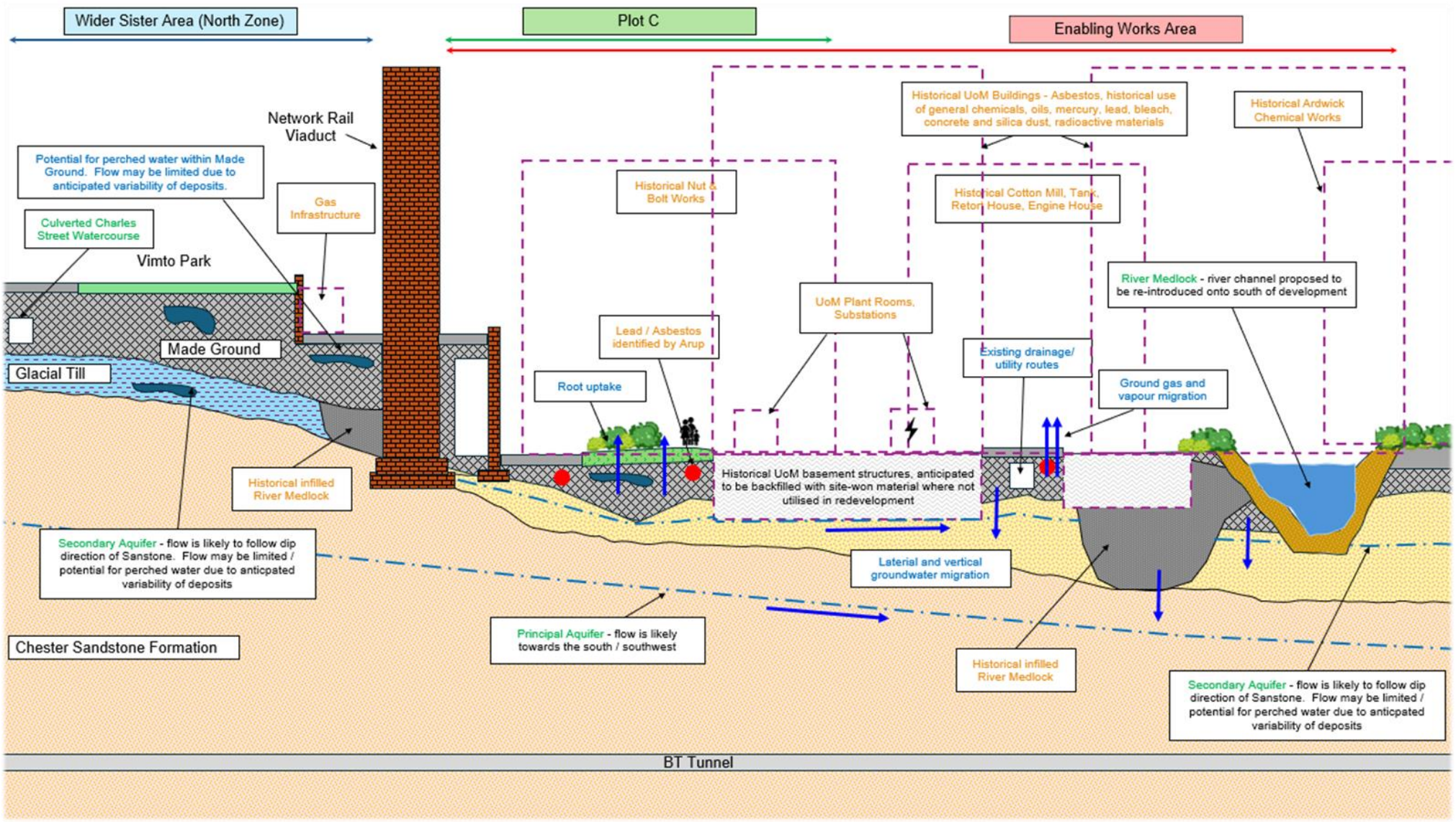


Table 13: Wider Sister Area Preliminary Qualitative Risk Assessment

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
Explosive/ asphyxiating gases/vapours from underlying soils (Made Ground and Alluvium) and potential on and off-site sources (including engineering works, infilled reservoir and River Medlock, wharves, iron works, cotton mills, university lab use including mercury and solvents)	Migration of gases and vapours through the surface via permeable soils and drainage & services	Internal building spaces & future occupiers	Medium	Low likelihood	Moderate/low	Variable thicknesses of Made Ground recorded during AEG site investigation including increased thicknesses along route of former River Medlock. Preliminary ground gas monitoring indicates a low risk. *However, further assessment of underlying geology and ground gas monitoring recommended to assess ground gas regime.*
Organic/ inorganic contaminants within underlying soils and perched groundwater within the Made Ground from potential on and off site sources (including engineering works, infilled reservoir and River Medlock, wharves, iron works, cotton mills, university lab use including mercury and solvents)	Direct/indirect ingestion of soil and dust, inhalation of particle vapours and asbestos fibres and dermal contact	Construction workers	Medium	Likely	Moderate	Potential for shallow soils to be impacted with asbestos and/or contaminants. Risk would be mitigated by use of appropriate PPE. *Further chemical analysis and assessment of shallow soils required to assess risk.*
		Future site users	Medium	Likely	Moderate	Potential for shallow soils to be impacted with asbestos and/or contaminants. Hardstanding and/or buildings are proposed across large areas which will act as a barrier between receptor and potential contamination within underlying soils. Likely soft landscaping will require growth medium to mitigate potential risks. Assessment of risk from potential vapour intrusion into buildings required. *Chemical analysis and assessment of shallow soils required to assess risk.*
		Off-site residents	Medium	Low likelihood	Moderate/low	Potential for shallow soils to be impacted with asbestos and/or contaminants. Assumes that appropriate site practices are adopted to prevent dust generation during construction e.g., dampening down and covering stockpiles etc.
	Direct contact with underground structures and services	Buildings and structures, buried services	Mild	Likely	Moderate/low	Buried concrete to be designed as appropriate for ground conditions. Potential for contamination within Made Ground where new buried water supply pipes will be laid. *Chemical assessment of soils required to assess risk.*
	Root uptake	Plants and vegetation	Minor	Likely	Low	Potential for shallow soils to be impacted with asbestos and/or contaminants. It is assumed that a suitable growth medium will be required for new areas of soft landscaping to mitigate risks to receptors. *Chemical analysis and assessment of shallow soils*

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
						required to assess risk.
	Vertical and lateral migration, via historical UoM drainage runs, pathways created during construction activities	Shallow Secondary Undifferentiated aquifer (*Glacial Till / Alluvium*)	Medium	Likely	Moderate	Potential for contaminants within the soil to leach to the underlying aquifer within superficial deposits. Proposed buildings and hardstanding across large areas of the site will limit leaching potential. In addition, cohesive horizons within Made Ground may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Principal aquifer (Chester Formation)	Medium	Likely	Moderate	Potential for contaminants within the soil to leach to the underlying aquifer within bedrock. Elevated concentrations of lead, selenium and PAHs recorded within Principal aquifer during AEG site investigation. Proposed buildings and hardstanding across large areas will limit leaching potential. In addition, cohesive horizons within overlying superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Local surface water bodies (*Existing Culverted River Medlock and Charles Street Watercourse*)	Mild	Low likelihood	Low	Potential for shallow soils and perched water to be impacted with contaminants based on historical and current site use. However, it is understood that the existing culverts are brick/concrete lined which would mitigate migration of potential contaminants into the culverts. In addition, buildings and hardstanding across large areas will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
		Local surface water bodies *(New River Medlock Open Channel)*	Mild	Likely	Moderate/low	Potential for shallow soils and perched water to be impacted with contaminants based on historical and current site use. The construction methodology of the new channel e.g. lined or unlined is currently unknown and therefore there may a potential pathway for contaminant migration. However, it is noted that proposed buildings and hardstanding will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
Organic / inorganic	Direct contact and ingestion	Future site users	Medium	Unlikely	Low	Hardstanding, buildings and formal landscaping is

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
contaminants within shallow groundwater aquifers (Alluvium / Glacial Till (if present))	of contaminated groundwater	Construction workers	Medium	Low likelihood	Moderate/low	proposed which will limit the exposure to future site users. Construction workers may come into contact with shallow water during excavation works; however, contact between future site users/off-site residents and shallow aquifer considered unlikely. *Assessment of groundwater profile and contamination is required to assess risk.*
		Off-site residents	Medium	Unlikely	Low	
	Inhalation of vapours	Future site users	Medium	Low likelihood	Moderate/low	Potential for elevated hydrocarbon concentrations in shallow groundwater from historical garage within the area. *Assessment of groundwater profile and contamination is required to assess risk.*
	Lateral migration	Local surface water bodies (*Existing Culverted River Medlock and Charles Street Watercourse*)	Mild	Low likelihood	Low	Potential for contaminants within the groundwater to migrate to local surface water bodies. However, it is understood that the existing culverts are brick/concrete lined which would mitigate migration of potential contaminants into the culverts. In addition, the presence of hardstanding and buildings across the proposed development will limit leaching potential and therefore mobilisation of contaminants into groundwater. In addition, cohesive horizons of Glacial Till (if present) and Alluvium would likely limit migration of groundwater. *Assessment of groundwater profile and contamination is required to assess risk.*
	Lateral migration	Local surface water bodies *(New River Medlock Open Channel)*	Mild	Likely	Moderate/low	Potential for shallow soils and perched water to be impacted with contaminants based on historical and current site use. The construction methodology of the new channel e.g. lined or unlined is currently unknown and therefore there may a potential pathway for contaminant migration. However, it is noted that proposed buildings and hardstanding will limit leaching potential. In addition, cohesive horizons within Made Ground and superficial deposits may mitigate migration of contaminants. *Analysis and assessment of soils and groundwater required to assess risk.*
	Vertical migration, pathways created during construction activities	Principal aquifer (Chester Formation)	Medium	Low likelihood	Moderate/low	Potential for contaminants within the shallow groundwater to migrate to underlying bedrock aquifer. Elevated concentrations of selenium, lead and PAHs recorded within Principal aquifer during AEG site investigation. Considered likely that the presence of buildings and hardstanding and cohesive horizons of superficial deposits will limit potential for vertical migration of potential contaminants to bedrock aquifer in these areas. *Assessment of groundwater profile*

Potential Source/Medium	Potential Exposure Route	Potential Receptor	Severity	Probability	Risk Rating	Comments
						and contamination is required to assess risk, piling works risk assessment recommended to assess risk.
	Direct contact with underground services	Buildings and structures	Mild	Likely	Moderate/low	Buried concrete to be designed as appropriate for ground conditions. *Assessment of groundwater profile and contamination is required to assess risk.*

9. Geotechnical Preliminary Risk Assessment

Based on the desk study review of the ground model for the proposed development of Plot C, the Enabling Works area and wider Sister area, the potential geotechnical risks are outlined in Table 14 below.

Table 14: Preliminary Geotechnical Risk Assessment

Geotechnical Hazard	Impacted Location	Consequence and Impacted Parties	Risk Rating	Comments
Third party infrastructure – BT Tunnel and NR Viaduct	Wider Sister Area	Access restrictions for ground investigation, below ground obstruction, damage to third party infrastructure	High	BT 'Guardian' Tunnel passes beneath the wider Sister area. Exact construction and diameter of BT Tunnel is currently unknown and confirmation should be sought from the asset owner / managing agent for details on the design and location of the tunnel. Investigation required to obtain geotechnical data on ground conditions in proximity to the tunnel location including below lower level of tunnel to inform ground movement analysis where proposed structures are within the tunnel's zone of influence. Operational NR Viaduct located to the north of the site/ Enabling Works area. Foundation depth and construction is currently unknown. Investigation recommended to investigate foundation depth, construction and founding strata to inform potential ground movement analysis and proposed service tunnel design.
Unexploded Ordnance	Plot C, Enabling Works Area & Wider Sister	Damage to infrastructure, utilities and loss of life	Moderate	With reference to the detailed UXO risk assessment, the majority of the wider Sister area is indicated to be within an area at low risk from UXO however the south of wider Sister and the south of the wider Sister area are indicated to be within an area of moderate risk from UXO. On-site UXO mitigation measures will be required during intrusive site investigation works, earthworks and construction works where a moderate risk has been identified as set out in the 1st Line Defence report.
Third party infrastructure – Charles Street culverted watercourse	Wider Sister Area	Access restrictions for ground investigation, below ground obstruction, damage to third party infrastructure	Moderate	Watercourse is indicated to travel beneath Charles Street Car Park in the wider Sister area. The position and dimensions of the feature are unknown. Investigation recommended to identify the position, construction, size and nature of the feature prior to development of West Zone.
Historical and existing buildings and structures, retaining walls, voids	Plot C, Enabling Works Area & Wider Sister	Access restrictions for ground investigation, and below ground obstructions including existing and historical foundations and retaining structures.	Moderate	Existing and historical structures and foundations including the UoM services tunnel, infilled River Medlock channel (on-site), historical bridges over historical River Medlock route, former basements, historical reservoir (Central Area) and foundations of previous buildings and existing retaining walls e.g. Altrincham Street, will need to be grubbed out if they are unable to be reused. Obstructions may affect activities such as piling, excavations and earthworks as well as the design and construction of new structures. Hard material could potentially be processed and reused as engineered fill. Depending on formation levels, voids will need to be backfilled with engineered fill. In addition, the existing and historical structures and foundations provide a constraint for ground investigation. Investigation required to investigate construction details of retaining walls, existing structures to be retained, and presence / absence of historical structures.
Variable thickness of Made Ground and superficial deposits	Plot C, Enabling Works Area & Wider Sister	Damage to proposed infrastructure through settlement, insufficient bearing capacity, potential for differential settlement	Moderate	Various construction and demolition of buildings and below ground infrastructure, land reprofiling and backfilling of the River Medlock has historically taken place across the site, Enabling Works area and wider Sister area and there is therefore the potential for a variable thickness of Made Ground that will need to be considered in terms of foundation and pavement design as well as compression / heave associated with the cohesive deposits.

Geotechnical Hazard	Impacted Location	Consequence and Impacted Parties	Risk Rating	Comments
				Potential for variable thickness and composition of Alluvium, Glacial Till (if present) and weathered sandstone bedrock that will need to be considered. Investigation required to obtain geotechnical data on underlying ground conditions to determine geotechnical design parameters for proposed structures, pavements, car parks and roads.
Aggressive ground conditions	Plot C, Enabling Works Area & Wider Sister	Structural damage to foundations	Moderate	Investigation recommended to obtain soil and groundwater samples for sulphate and pH analysis, to allow concrete design assessment to be undertaken.
Site gradient / topography	Plot C, Enabling Works Area & Wider Sister	Design of site redevelopment / cut and fill strategy, earthworks design, retaining structures, potential for differential settlement, material re-use strategy	Moderate	Plot C and the wider Sister area gradient and tiered nature will need consideration with respect to the cut and fill strategy / re-profiling of the site to create a level platform for buildings. Consideration will need to be given to the design of foundations, floor slabs and pavement design. Site levels and earthworks design to consider options to minimise off-site disposal through material re-use on site subject to appropriate waste management regulations and procedures. Investigation of bedrock recommended to assess excavatability of sandstone where cut into bedrock is required.
Unknown ground and groundwater conditions	Plot C, Enabling Works Area & Wider Sister	Damage to infrastructure, unsafe or uneconomic design, reduced bearing capacity of shallow foundations / piled foundations.	Moderate/low	The superficial deposits and bedrock are anticipated to be variable based on AEG site investigation data. Limited assessment of groundwater model has been carried out to date. Investigation of shallow and deep soils and groundwater level required to obtain information for geotechnical design.
Shallow groundwater	Plot C, Enabling Works Area & Wider Sister	Reduced bearing capacity, groundwater entering excavations during construction	Moderate/low	Limited investigation of groundwater model has been carried out to date. Excavations may extend into shallow water table which may require dewatering during construction. Investigation of shallow groundwater conditions required to confirm groundwater profile.

10. Conclusions and Recommendations

10.1 Conclusions

This Phase 1 Desk Study and data review has been undertaken to evaluate the potential risks to human health and the environment, and to identify potential geotechnical constraints associated with the proposed development of the site, Enabling Works area and the wider Sister area based on available information.

The preliminary qualitative risk assessment indicates that there is generally a low to moderate risk to the identified receptors from potential contamination associated with the current and former uses of Plot C, Enabling Works area, wider Sister area and surrounding areas, and potential Made Ground associated with the former development of the area.

In addition, the assessment has identified a number of potential geotechnical constraints associated with the anticipated underlying ground conditions, including the potential for below ground obstructions, third party infrastructures, variable thickness of Made Ground and superficial deposits, historical and existing structures such as basements, UoM services tunnel, NR viaduct, foundations and retaining walls, and risk of UXO to potential intrusive investigation works and/or construction works.

10.2 Recommendations

Following a review of the AEG and Arup investigation data and the desk study information, the following limitations and data gaps have been identified for Plot C and Enabling Works area:

- Only limited site investigation has been carried out to obtain information on the wider ground model outside of the historical River Medlock channel route. No site investigation has been carried out in the east of Plot C and central area of the Enabling Works area and only limited investigation has been carried out within the footprints of historical industries.
- No deeper investigation of the bedrock sandstone has been carried out within the footprint of the proposed Plot C structures to inform foundation design.
- No investigation of existing foundations or retaining walls has been carried out to inform the extent of ‘grubbing out’ that will be required during de-construction and to obtain information where structures are to be retained and re-purposed.
- No groundwater monitoring and sampling/chemical analysis has been carried out of the perched water and only limited groundwater monitoring and sampling/chemical analysis has been carried out of the Principal aquifer.
- Limited ground gas monitoring has been carried out to inform the requirement for ground gas protection measures in the proposed development, including within the footprint of the proposed Plot C structures.
- Only limited chemical analysis of soil samples has been carried out to assess material suitability in terms of risks to human health, controlled waters and material re-use. No chemical analysis of the natural strata underlying the Made Ground was undertaken as part of the Arup investigation.
- No leachate testing of the Made Ground soils has been carried out to inform the assessment of potential risks to controlled waters from potentially contaminated Made Ground soils.
- No further investigation has yet been carried at the ‘hotspots’ of contamination identified by Arup within the Made Ground soils and Principal aquifer to delineate the extent of the contamination.
- No investigation has yet been carried out in proximity to the UoM historical drainage runs around buildings where possible residual contamination has been noted by the university.

It is noted that similar limitations also apply to the wider Sister area where only limited site investigation data is available; further investigation is recommended to allow a robust conceptual ground model to be developed for the wider Sister area.

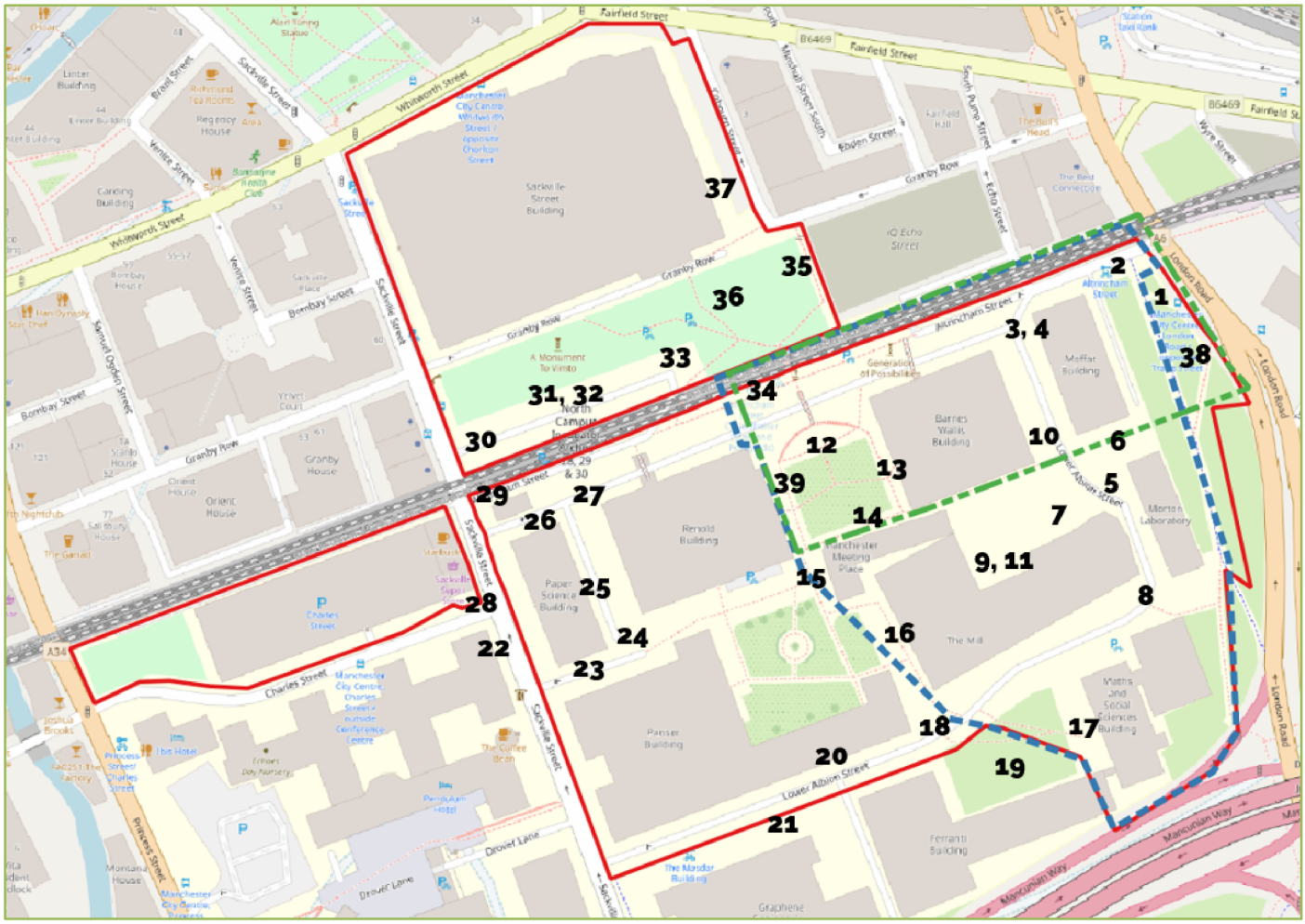
In addition, it is noted that the assessment of the risks to human health undertaken by Arup assumed a commercial end use. Based the currently proposed masterplan for Plot C (typically a combination of commercial units and residential units), a commercial end use may not be sufficiently protective for the assessment as the commercial GAC considers the risks to an adult receptor only. It is therefore recommended that the risks to human health from soil contaminants are assessed against criteria that are more reflective of the proposed development i.e. residential without home grown

Appendix A

Site Walkover Record and Photographs

Project Name:	**ID Manchester**		
Address:	UoM North Campus, Altrincham Street	Job Number:	51019
Date:	12 December 2023	Engineer:	KP
Weather:	Overcast, light drizzle		

Photo Location Plan



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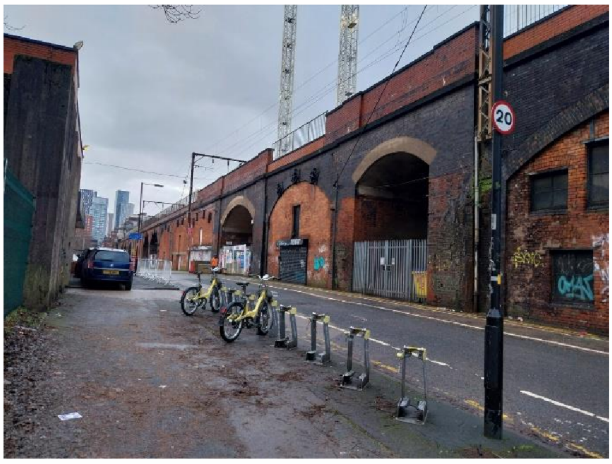
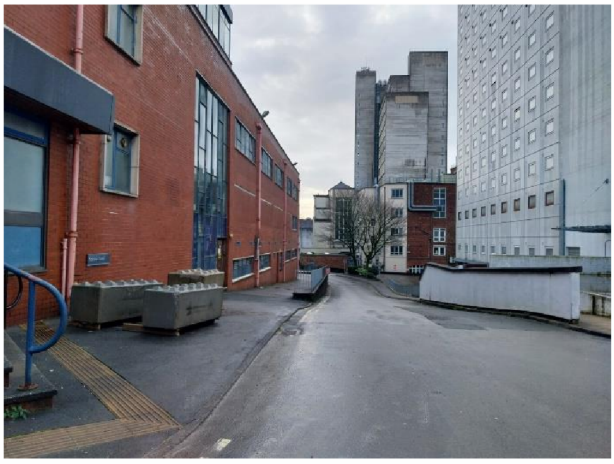
Site Photos

1. Grade II Listed Holloway's Wall, facing south



2. Access to site from London Road, facing west



3. Lower Albion Street and Moffat, facing south

4. Rear of Wright Robinson and The Mill, facing south

5. Morton Laboratory, facing southeast

6. Flammable chemical storage area, north of Morton

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Site Photos

7. Rear of The Mill, facing west

8. Front of The Mill and Service Road, facing west

9. The Mill electrical substation

10. Rear of Wright Robinson, facing north

11. Liquid gas storage cage at The Mill, facing west

12. Butterfly Staircase, facing north

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Site Photos

13. Front of Barnes Wallis, facing east

14. Manchester Meeting Place, facing south

15. Open space to west of MMP, facing south

16. Western elevation of The Mill, facing southeast

17. Maths and Social Science, facing southeast

18. Lower Albion Street, facing southwest

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Site Photos

19. Landscaped area to west of MSS, facing east

20. Basement access to Pariser building, facing west

21. Off-site Graphene Engineering building, facing southwest

22. Paper Science Building, facing east

23. Access between Pariser and Paper Science, facing east

24. Access between Paper Science and Renold, facing north

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Site Photos

25. Electrical substation to rear of Paper Science, facing north

26. The Gatehouse, facing west

27. Service Road, facing east

28. Charles Street Car Park, facing west

29. Altrincham Street and NR Viaduct, facing east

30. Car Park and gas governor, to north of NR Viaduct, facing east

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Site Photos

31. Vimto Gardens retaining wall, facing east

32. Cracking of Vimto Gardens retaining wall, facing north

33. Liquid nitrogen storage cage, facing north

34. Open area between Renold and Barnes Wallis, facing south

35. Sackville Street Building and gardens, facing north

36. Vimto Gardens, facing west

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Site Photos

37. West of Sackville Street building, facing north

38. Landscaped area to east of Morton/Moffat, facing south

39. Renold Building, facing west

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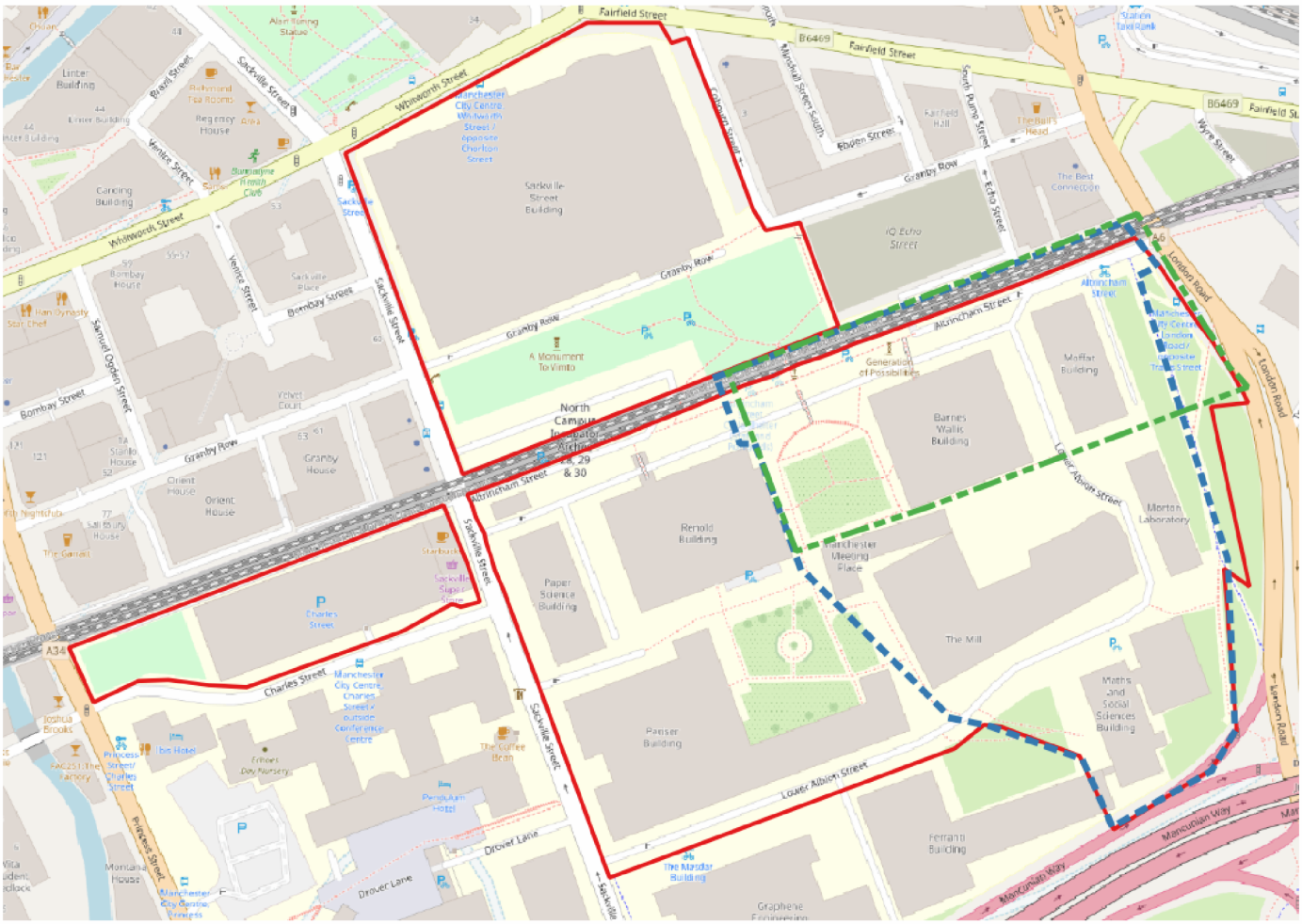
Project Name:	**ID Manchester**		
Address:	UoM North Campus, Altrincham Street	Job Number:	51019
Date:	12 December 2023	Engineer:	KP
Weather:	Overcast, light drizzle		

Site Layout Plan



Site Access

Pedestrian Access	Generally good access across external areas of wider IDM area.
Vehicular Access	Generally good access with numerous access roads around external areas of wider IDM area.
Parking Arrangements	Good availability of parking across wider IDM area.

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Restrictions	Access restrictions from eastern end of Altrincham Street due to adjacent construction works. Barriers for entry into access roads for site. Holloway's Wall and east grass area of site fenced off with heras fencing. No internal access to buildings during site walkover or external compound areas.
Access for Site Investigation (Drilling Rigs, Excavators etc.)	Generally good – some step level changes may result in difficult access to some areas.
Surface Covering	
Type of Cover	Predominantly tarmac and concrete with some areas of paving. Main soft landscaped areas in north (Vimto Park), west of Charles Street Car Park, central area and east area.
Quality of Cover	Generally, appears to be of good quality.
Evidence of Existing Boreholes	None observed but previous SI has been carried out within the site by AEG.
Topography	
Flat / Sloping / Stepped etc.	North of Network Rail viaduct slopes gently to south, with a retaining wall (approx. 2m high) between Vimto Gardens and car park (car park at lower level). Area slopes down beneath NR viaduct to Altrincham Street. Up to approx. 5m retaining wall along Altrincham Street with Service Road at bottom of wall. Service Road slopes upwards to east and west access points. Main area to south of NR viaduct is generally flat with gentle slopes except northeast corner which is higher in level (at street level). Retaining wall (Holloway's Wall) along east of site with grass area in east at higher level to Moffat/Morton ground level. Refer to site topographical survey for detailed levels.
Evidence of Subsistence	Minor cracks in retaining wall at Vimto Park observed.
Significant Slopes	In east and west of Service Road and from south of site up to Mancunian Way.
Local Depressions	None observed.
Vegetation	
Trees	Various mature trees observed within soft landscaped areas towards centre of wider IDM area, in Vimto Park and within eastern area.
Other Vegetation	General shrubs and bushes observed.
Signs of Stressed Vegetation / Poor Growth / Disease	None observed.
Services	

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Location and Details of Manhole Covers, Wells, Marker Pegs, Utility Scar Features, Overhead Services	Numerous manhole covers and evidence of services around site. Refer to site utilities survey for detailed information.
Buildings and Structures	
Number, Height, Construction Material, Roof Construction Material	Within site – Barnes Wallis, Wright Robinson and Moffat buildings. Rest of Enabling Works area – Morton Laboratory, MSS, Manchester Meeting Place and the Mill. Wider IDM area – Pariser, Paper Science, Renold, Charles Street Car Park, Sackville Street and The Gatehouse.
Current Uses	Predominantly unoccupied – formerly university buildings. Currently used as 'meanwhile' buildings for commercial use.
Presence of Potential Asbestos Containing Material (ACM)	No internal access to buildings; however, understood that asbestos surveys have confirmed presence of ACM within building fabric. Asbestos surveying in progress notices observed during walkover.
Existing Foundations	Uknown – anticipated to be a combination of piled foundations and shallow pad foundations based on age of buildings.
Existing Basements / Cellars	Basements observed at majority of buildings.
Surface Water and Groundwater	
Evidence of Flooding	None observed.
Evidence of High Water Table	None observed.
Rivers, Springs, Wells, Ponds, Ditches, Streams (incl. Flow Direction and Size)	None observed.
Potential Sources of Contamination	
Fly Tipped Material	None observed.
Evidence of Filled Ground	None observed.
Evidence of Tanks (USTs, ASTs, Interceptors, Pipework) incl. Fuel Spillages	None observed.
Stored Substances	Evidence of now disused / empty storage units. Caged area for storage of liquid nitrogen observed adjacent to Vimto Park and flammable chemicals between Morton Laboratory and Moffat building. A container of 'mixture of gases' was observed in a secure cage adjacent to The Mill.
Electricity Substations	Small substations observed adjacent to the Paper Science Building and near The Mill,

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Surrounding Land Use	
Residential / Commercial / Industrial incl. Type of Industry / Commercial Activity	Major highways to south and east, combination of commercial and residential to the west and north including University of Manchester campus to west.
Railways / Viaducts / Bridges	Network Rail viaduct present in east-west orientation through northern part of wider IDM area.
Tunnels	It is understood that voids / empty spaces are present between the archways below Altrincham Street. In addition, it is understood that the UoM utilities pass around the wider IDM area in a below ground services tunnel.
Other Comments	

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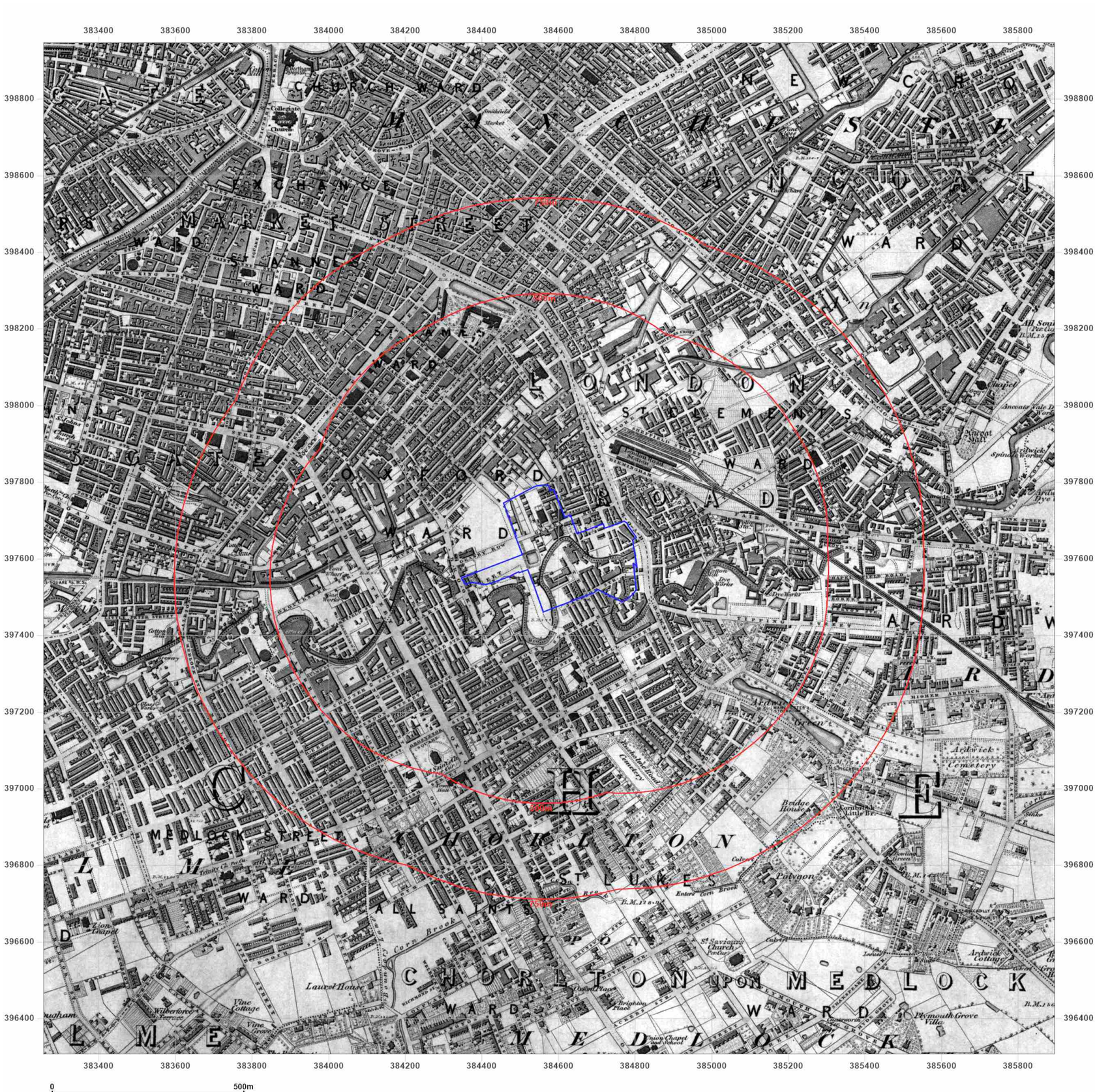
Appendix B

Historical Maps



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THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

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Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

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
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Map legend available at:
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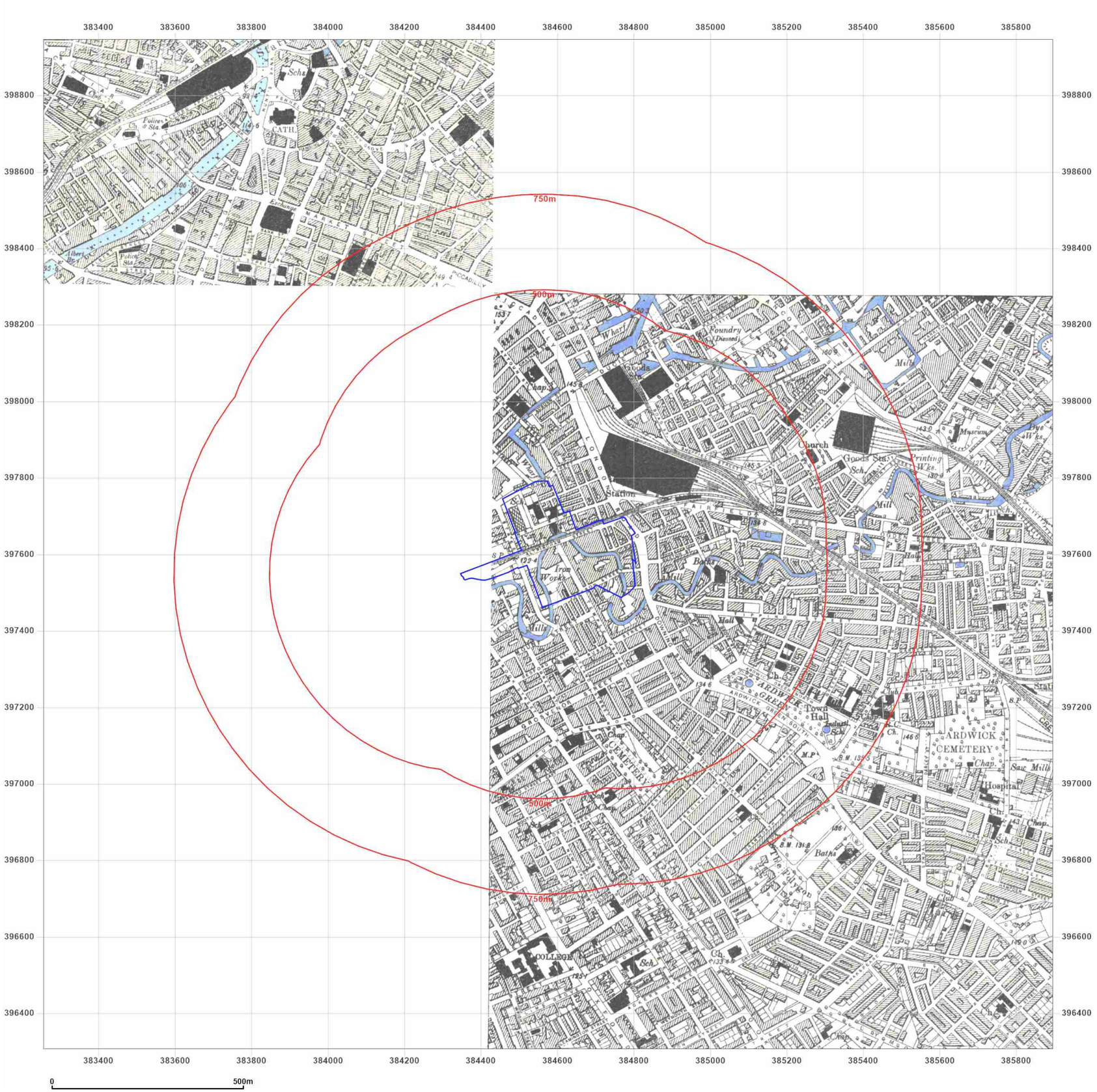

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Site Details:

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Surveyed 1889
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Edition 1894
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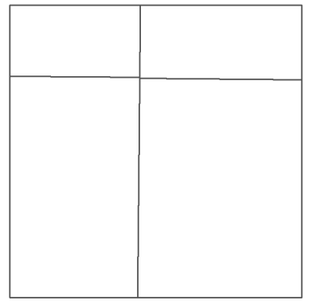

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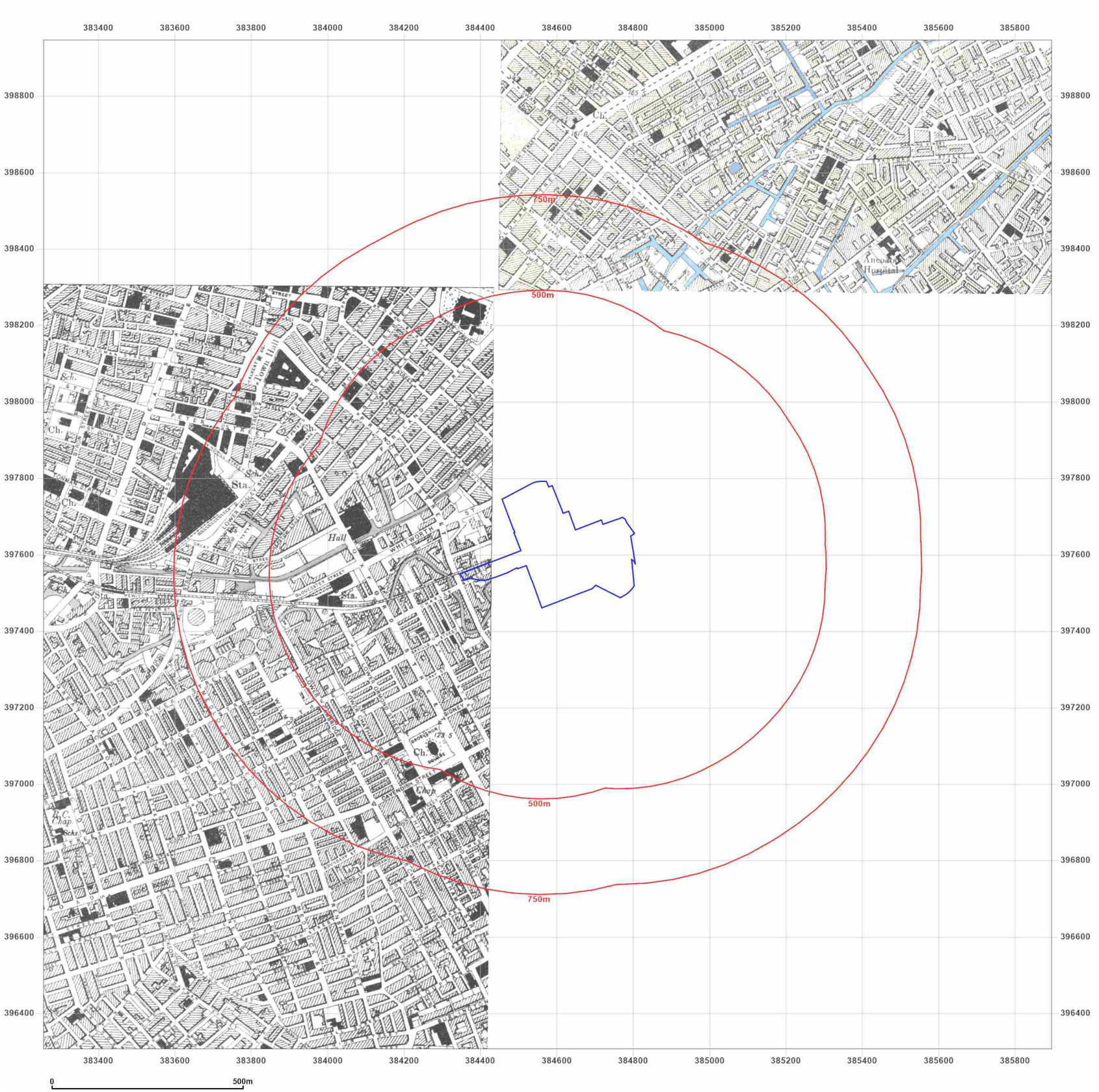

Groundsure INSIGHTS

Site Details:

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Grid Ref: 384575, 397626

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Surveyed 1891
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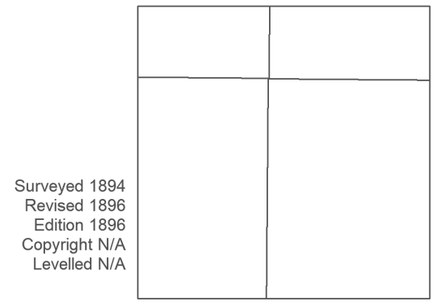

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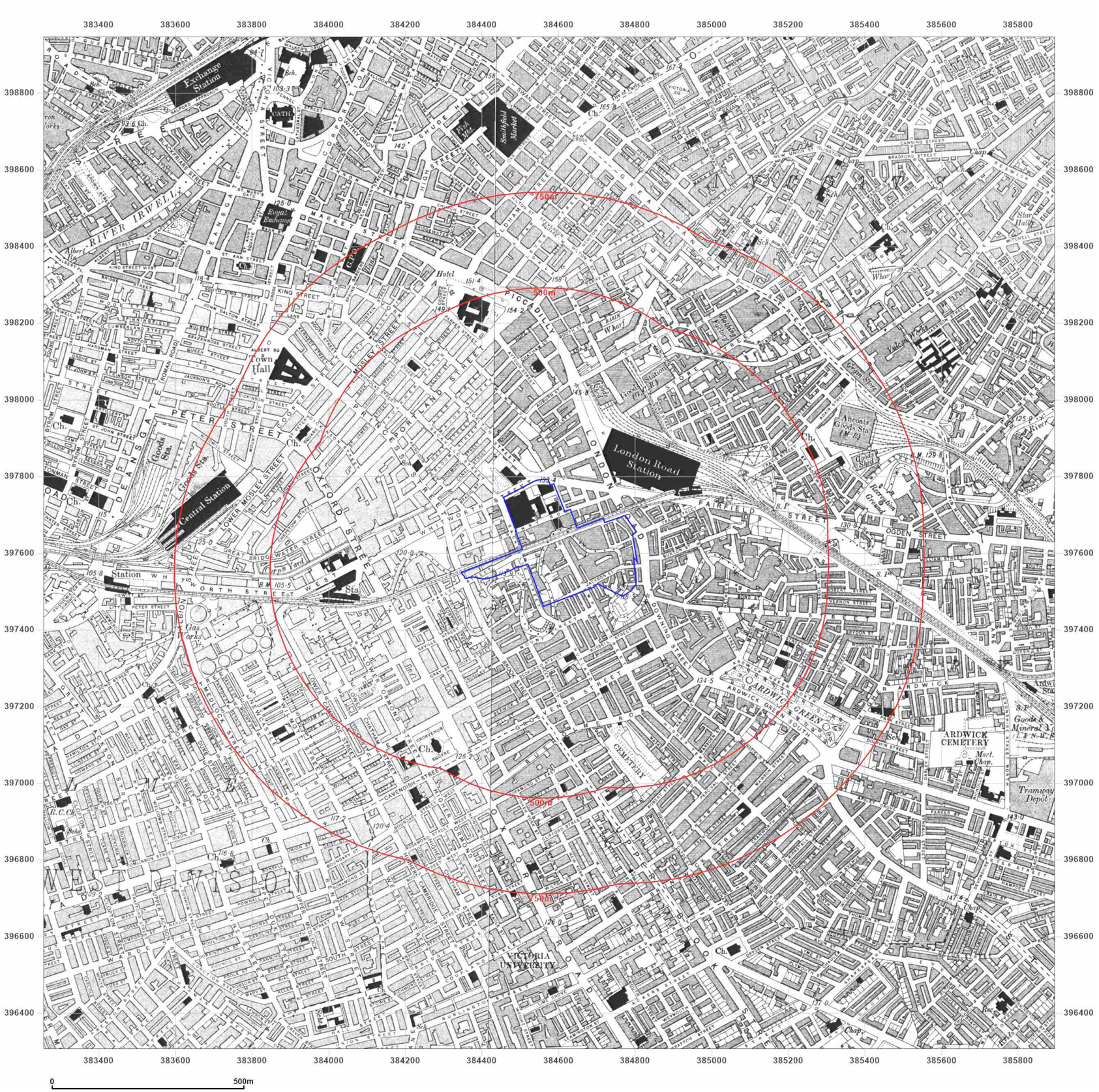

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: County Series

Map date: **1905-1906**

Scale: 1:10,560

Printed at: 1:10,560

N
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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
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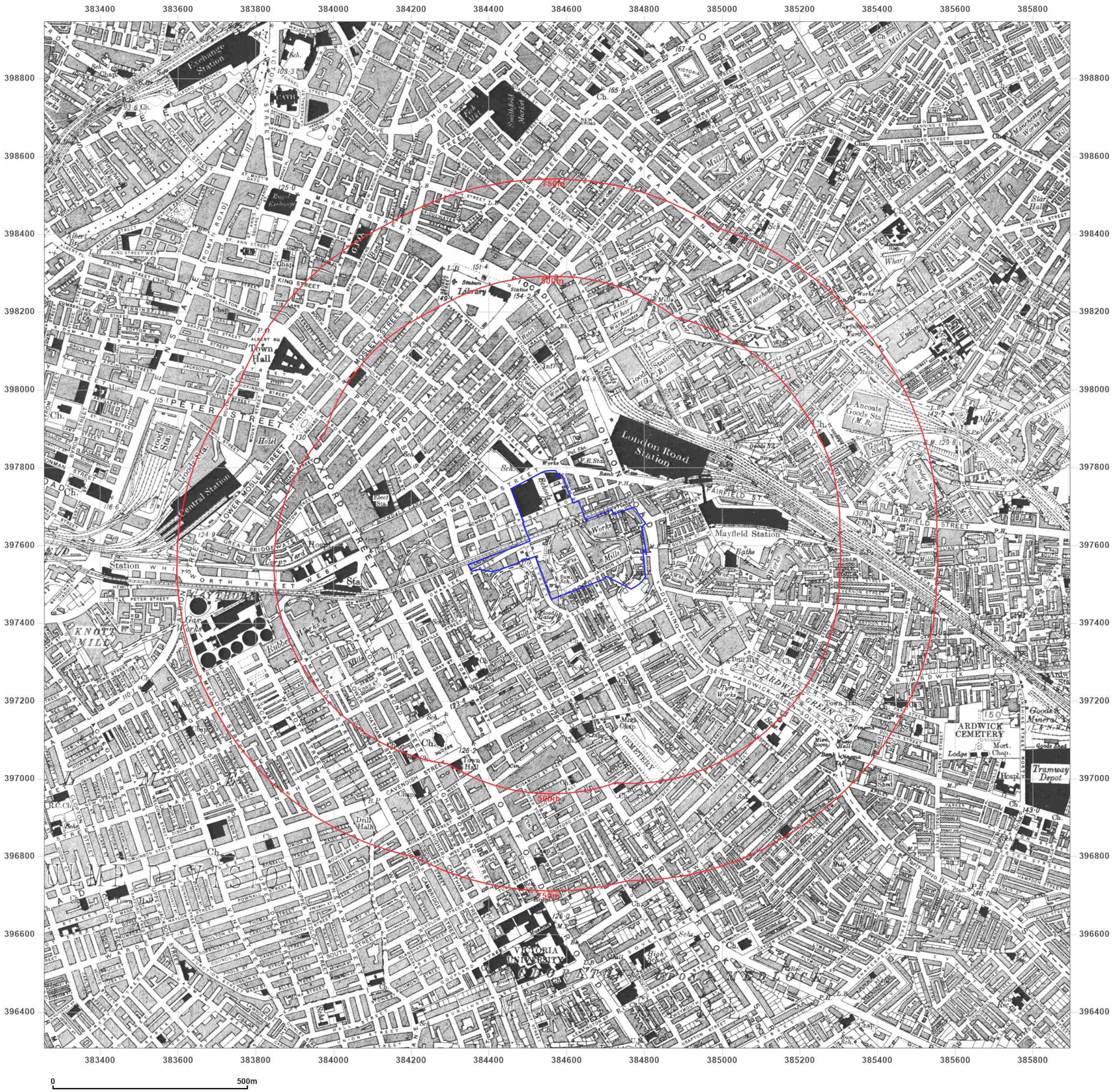

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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

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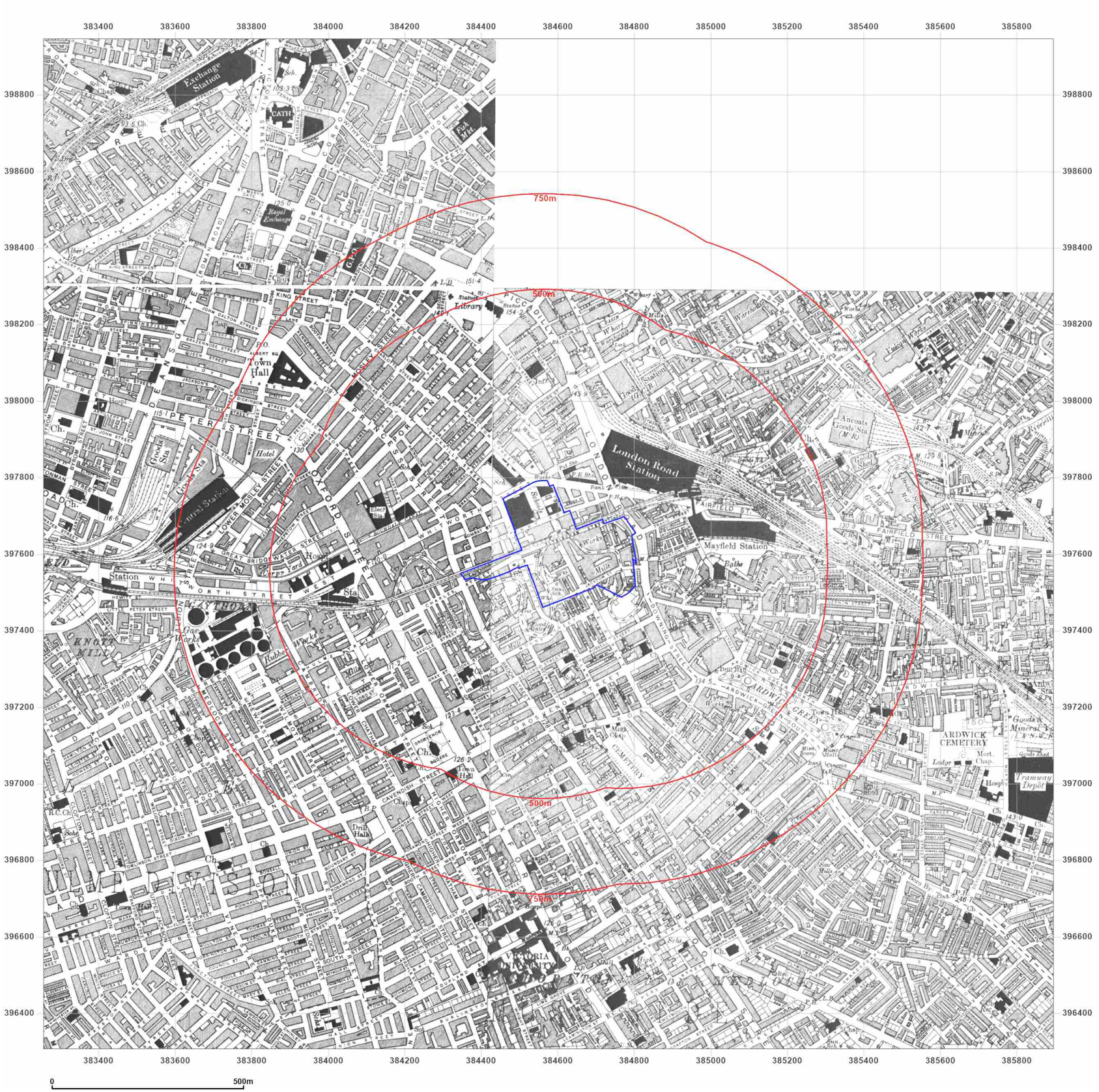

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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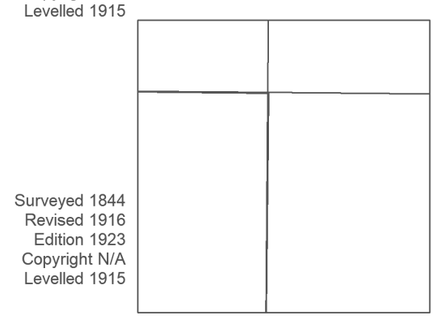
Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915



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Revised 1916
Edition 1923
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Surveyed 1844
Revised 1915
Edition 1923
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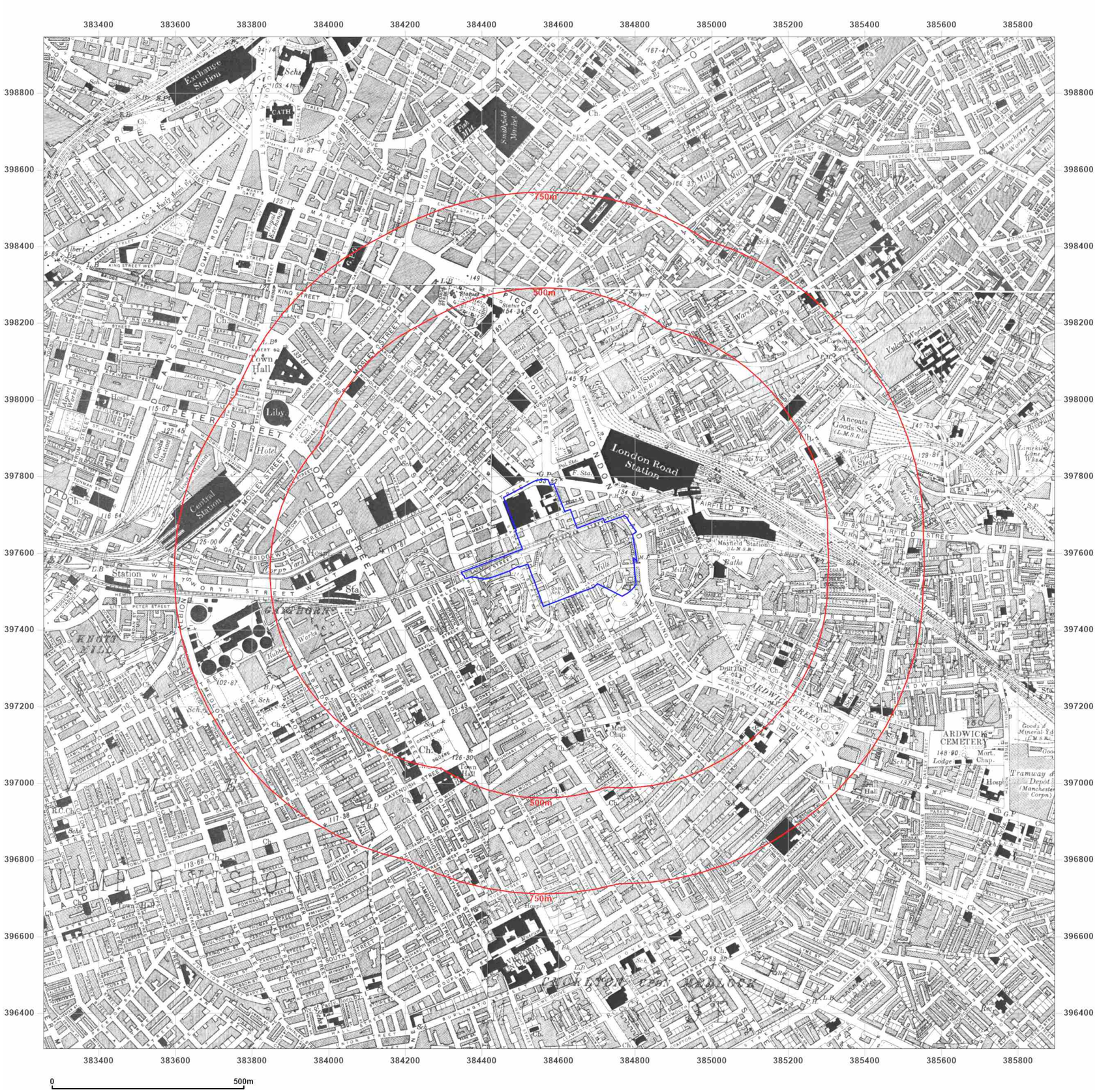

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: County Series

Map date: **1931-1934**

Scale: 1:10,560

Printed at: 1:10,560

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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
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Revised 1934
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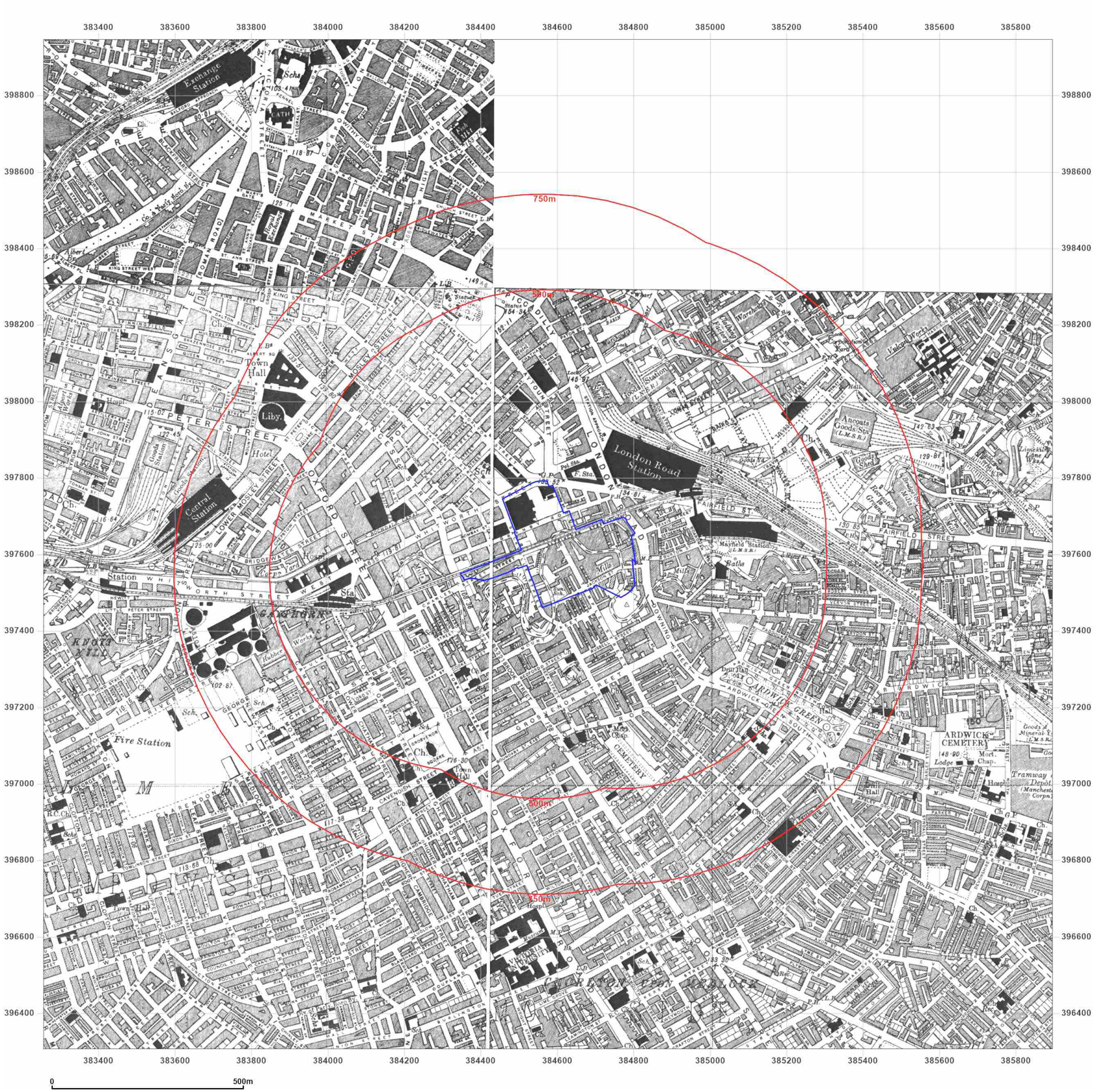

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

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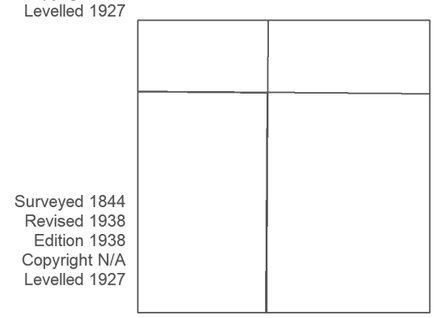
Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927



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Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

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Revised 1938
Edition 1938
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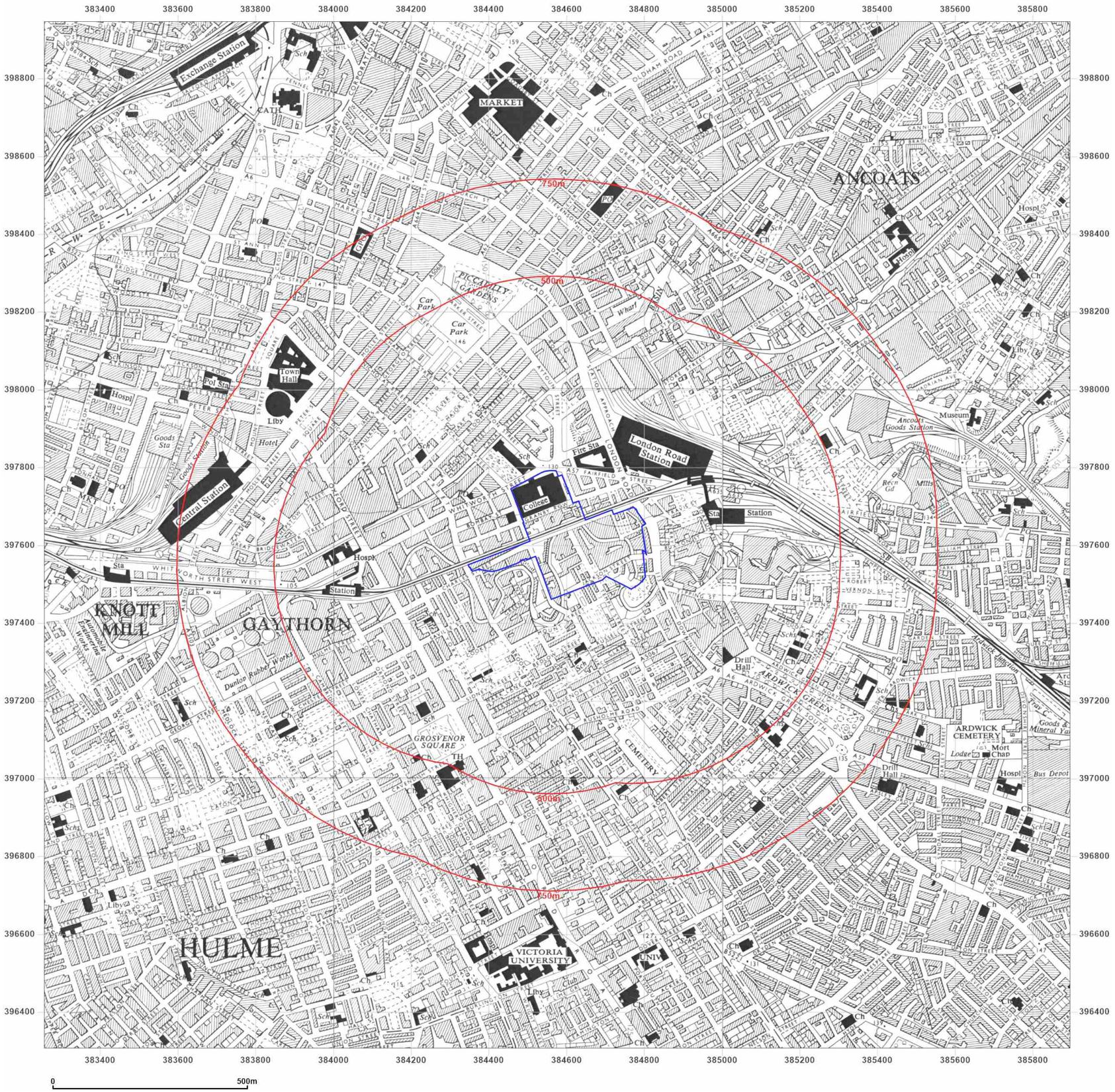

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: Provisional

Map date: **1956**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1956
Revised 1956
Edition N/A
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Revised 1956
Edition N/A
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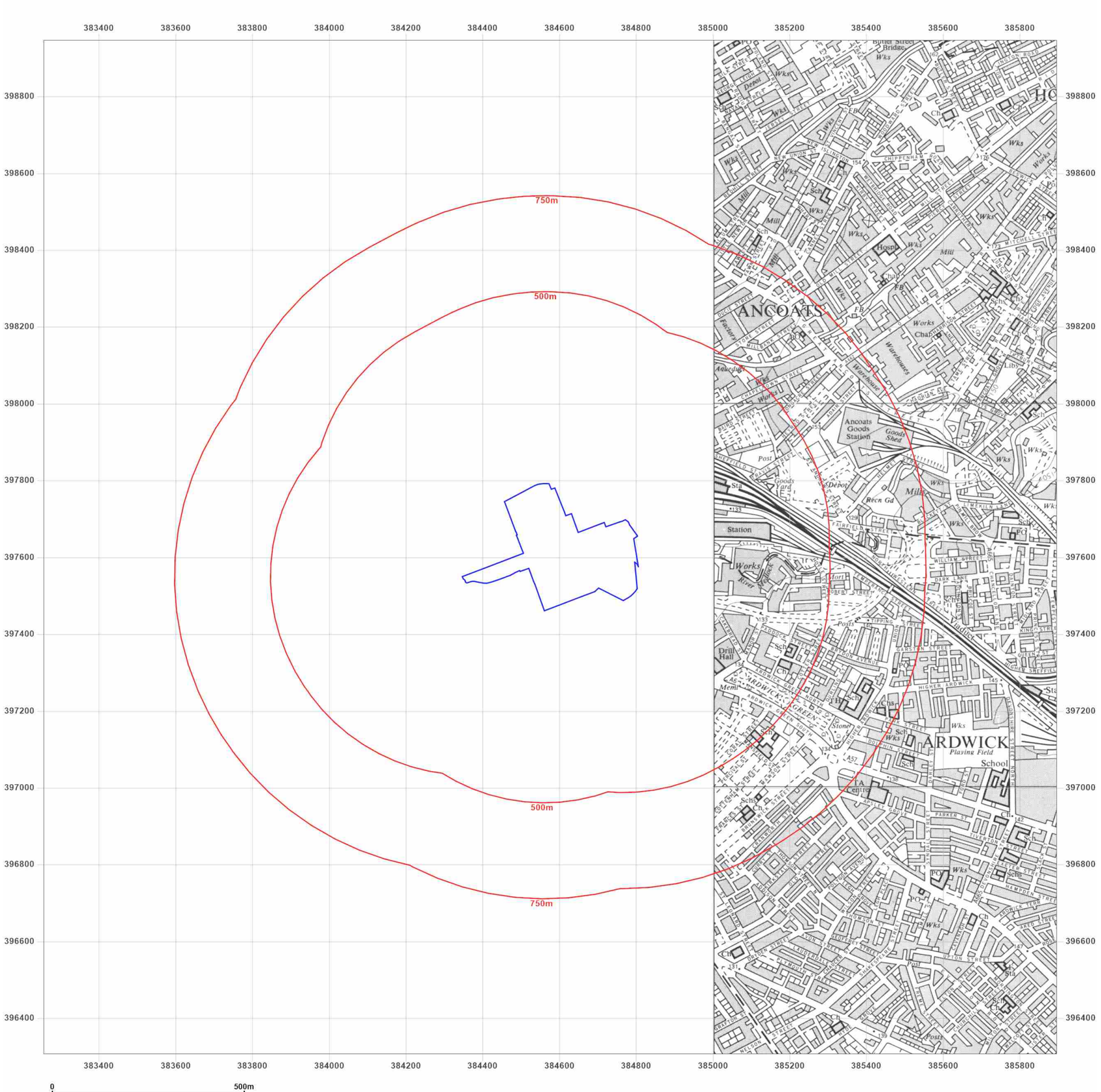

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: Provisional
Map date: **1968**
Scale: 1:10,560
Printed at: 1:10,560

N
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Surveyed 1968
Revised 1968
Edition N/A
Copyright 1968
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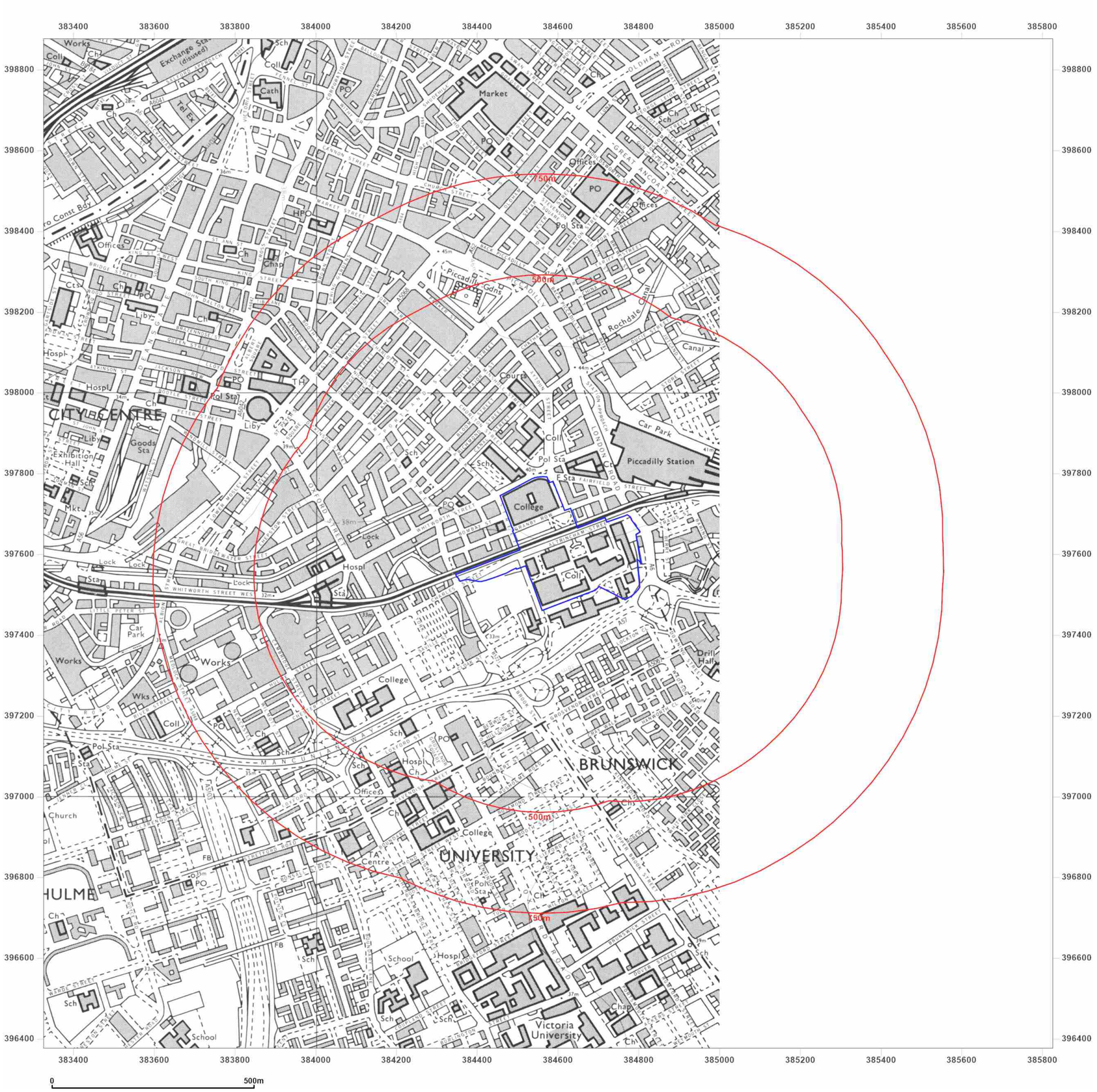

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: National Grid

Map date: **1972**

Scale: 1:10,000

Printed at: 1:10,000

N
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Revised 1972
Edition N/A
Copyright 1972
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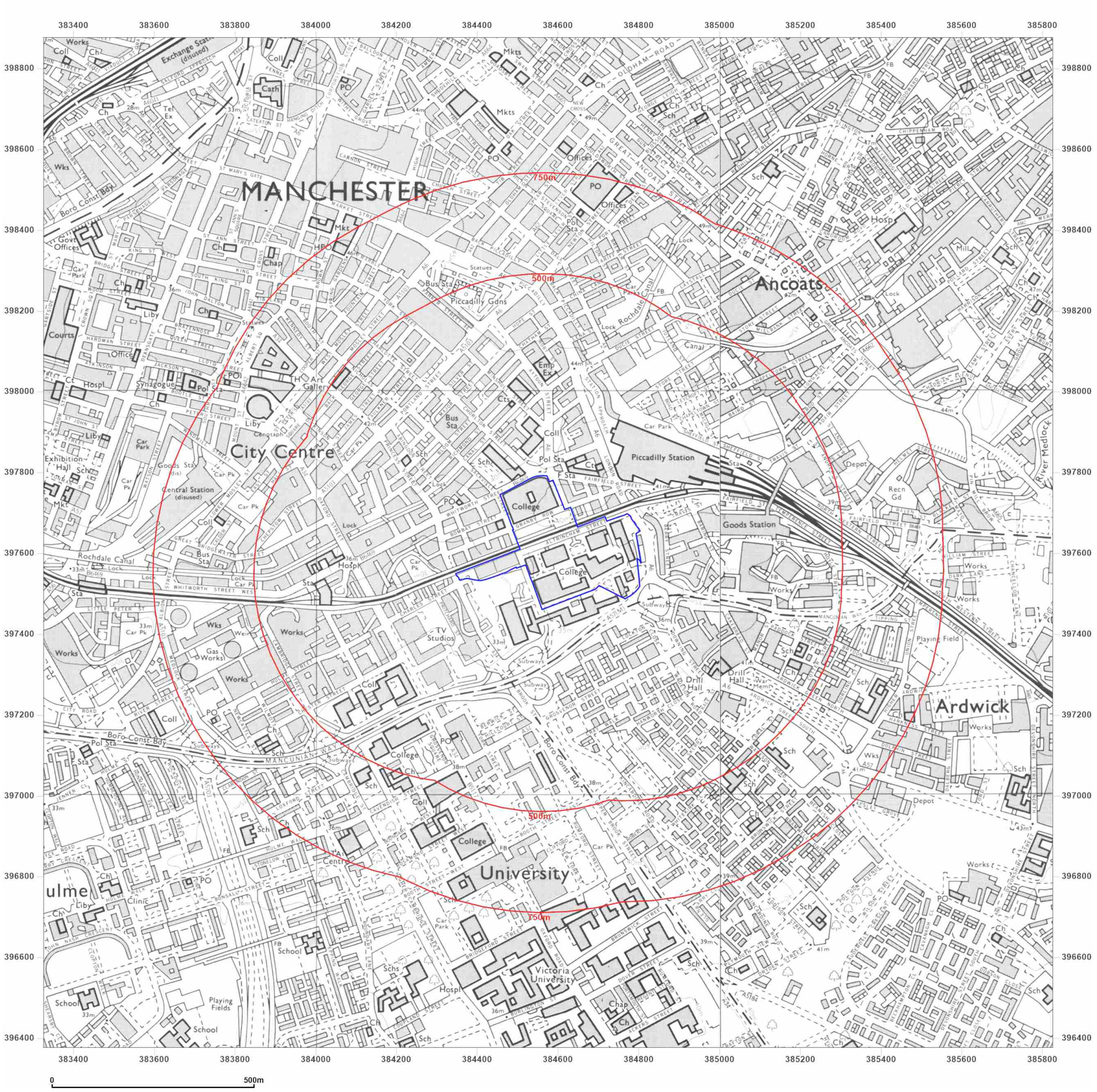

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

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: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: National Grid

Map date: **1985**

Scale: 1:10,000

Printed at: 1:10,000

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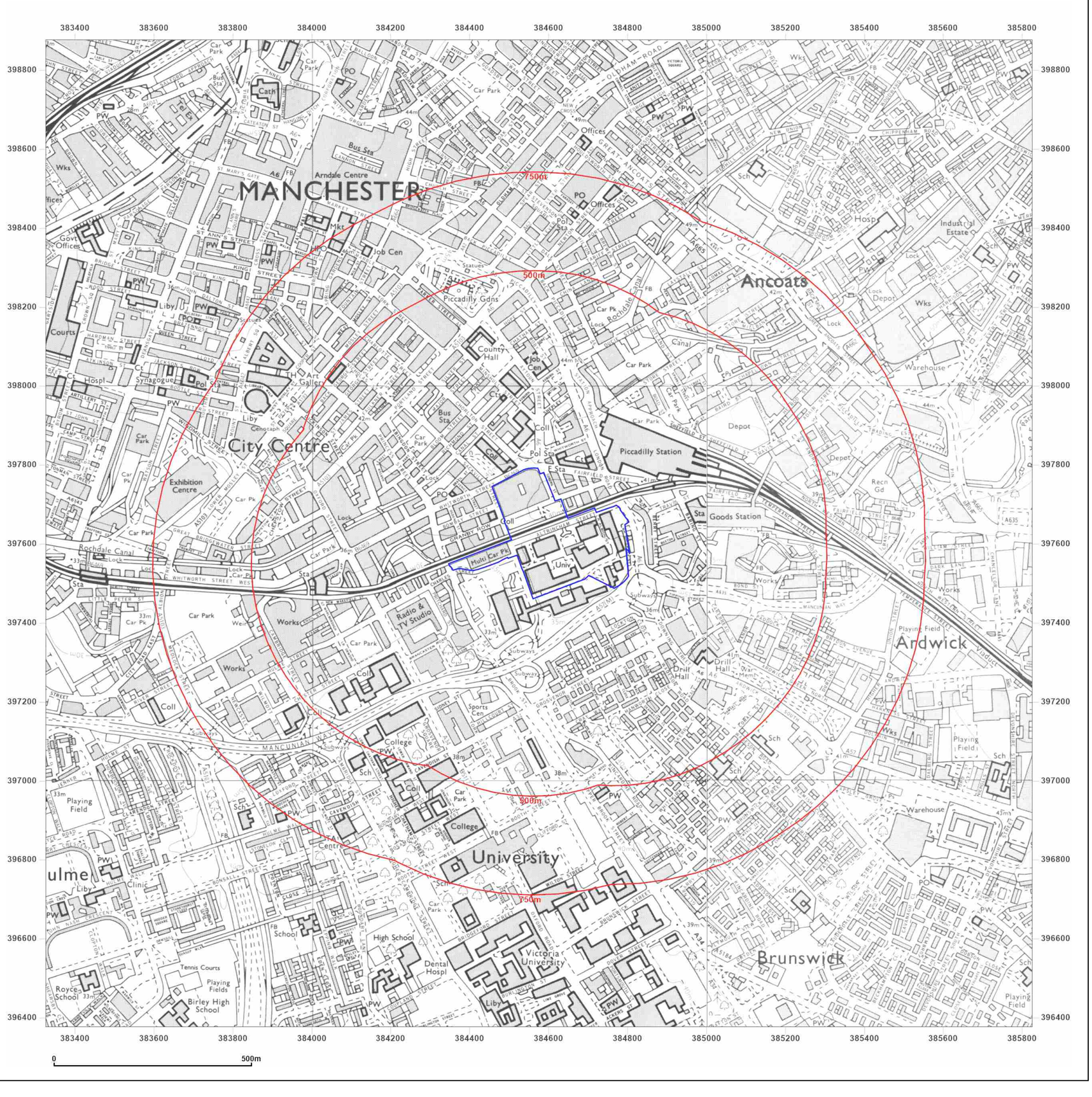

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

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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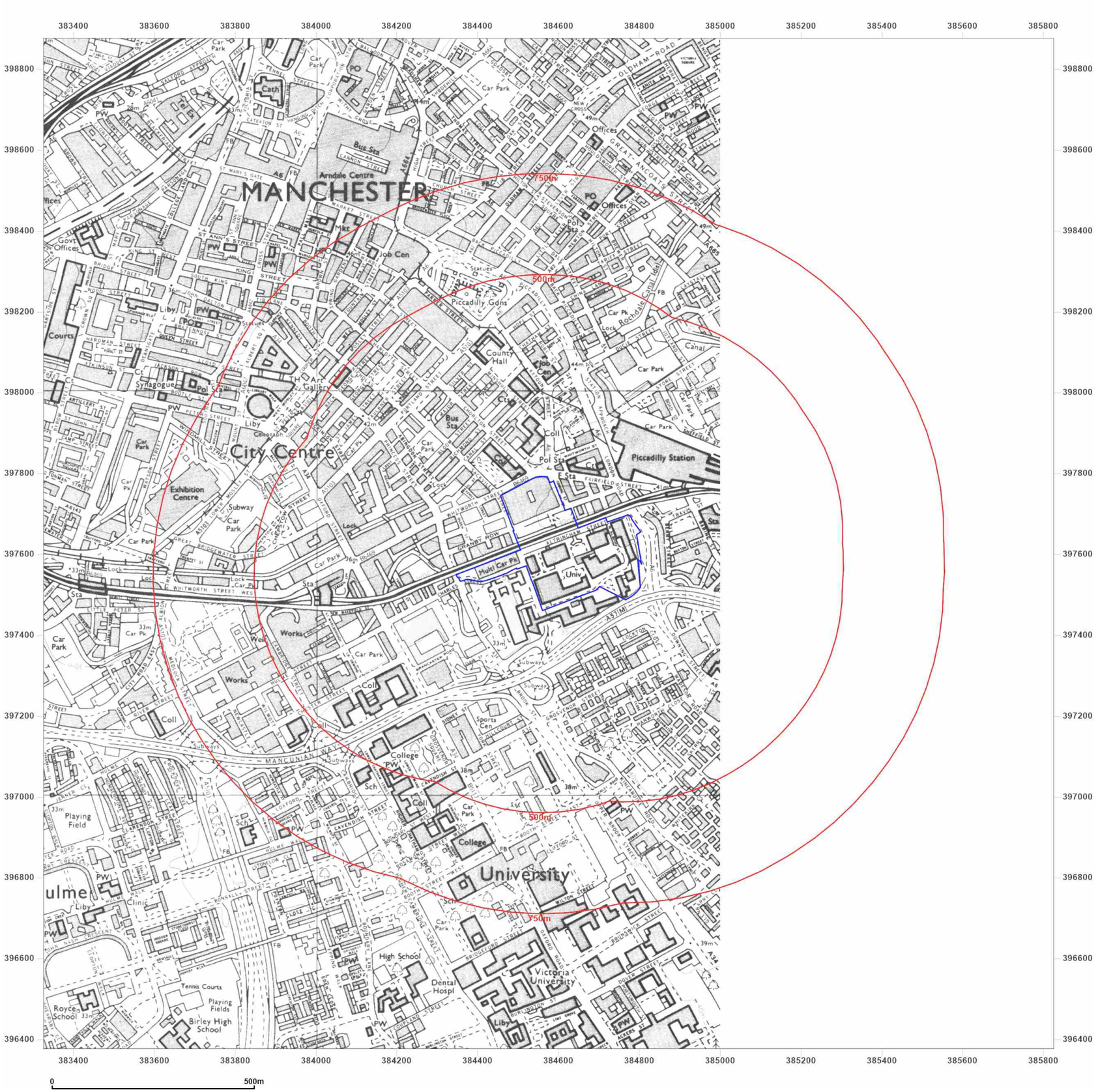

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

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
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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

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: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

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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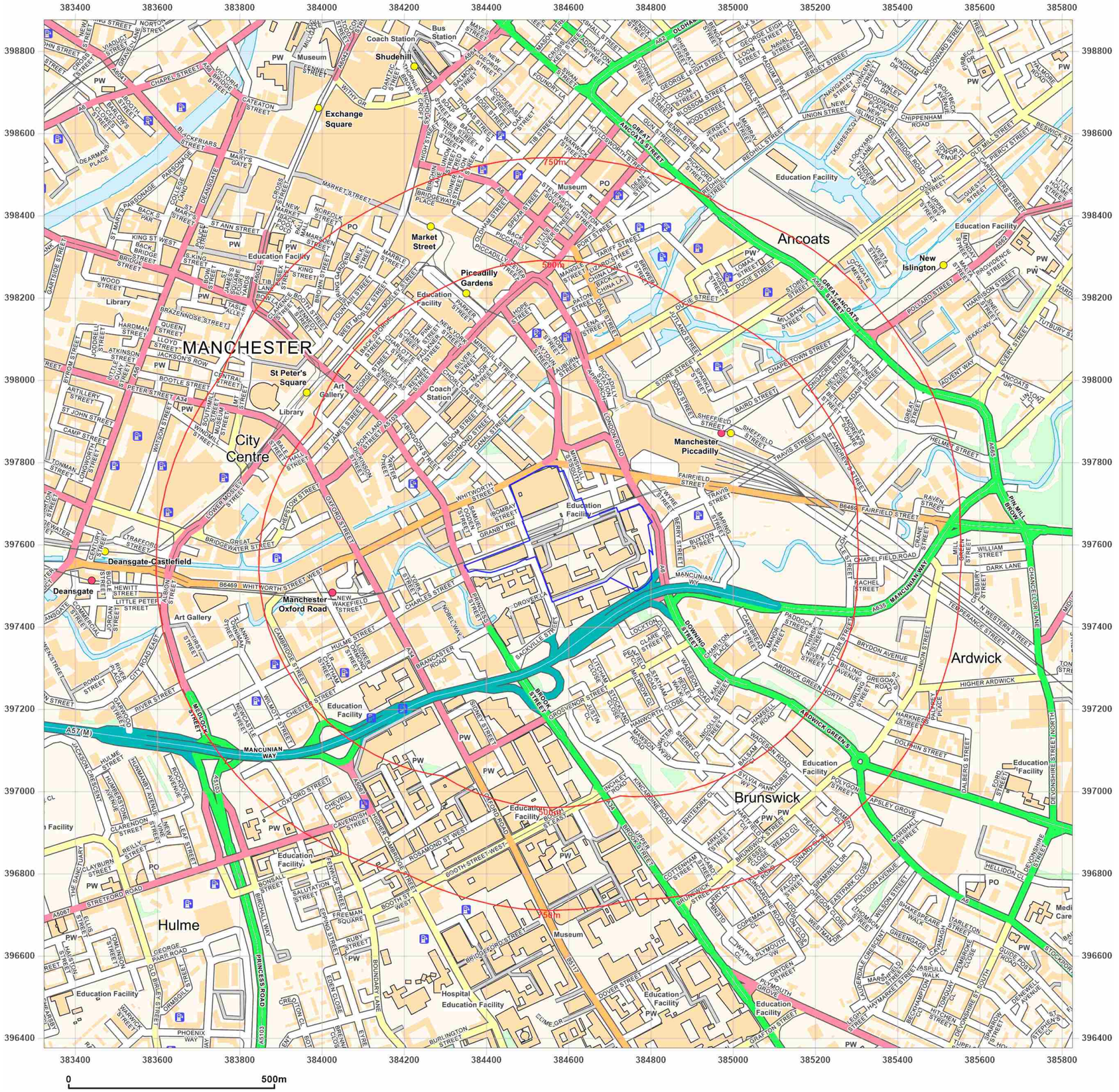

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4
Grid Ref: 384575, 397626

Map Name: National Grid

Map date: **2023**

Scale: 1:10,000

Printed at: 1:10,000

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2023

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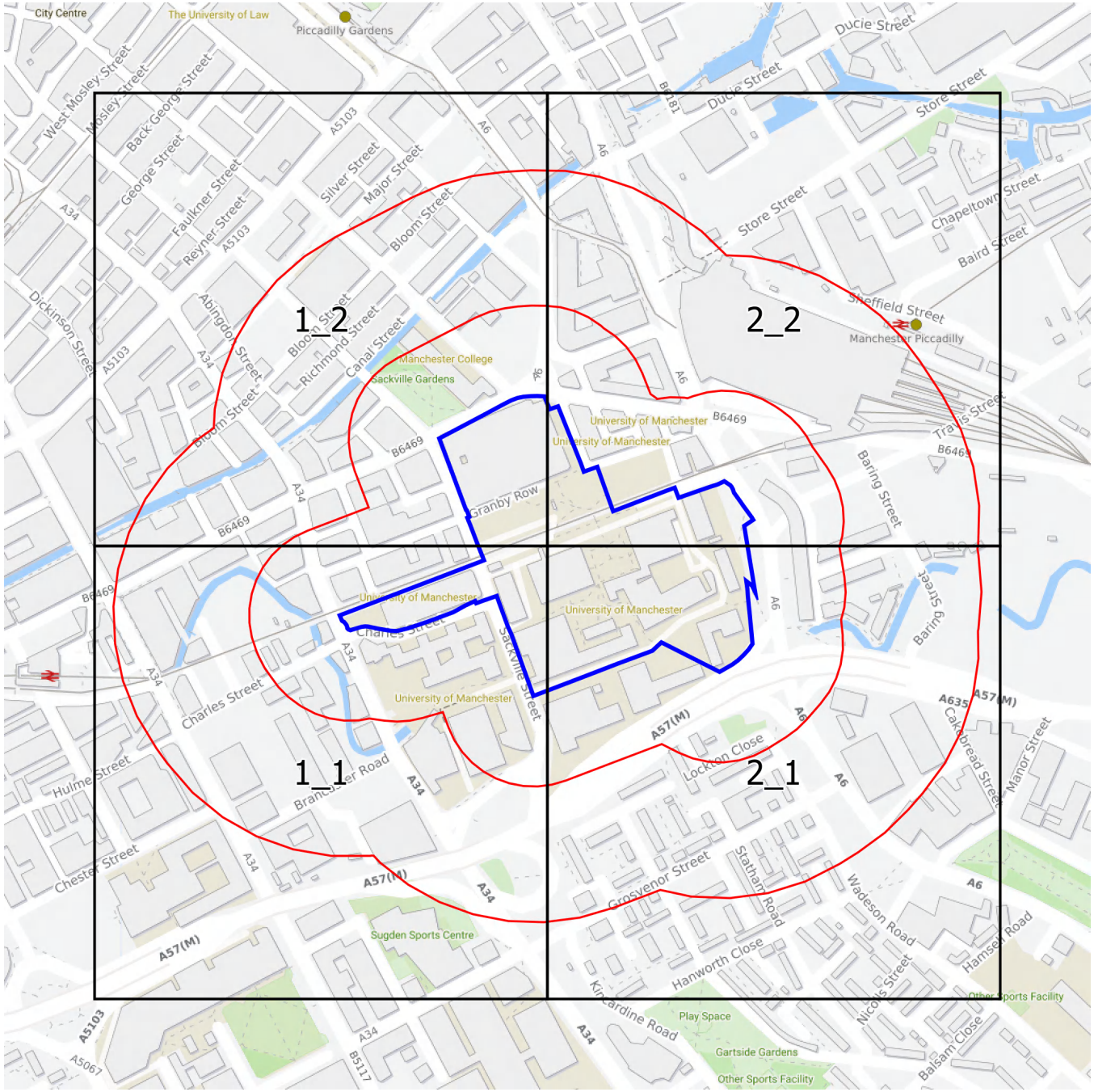

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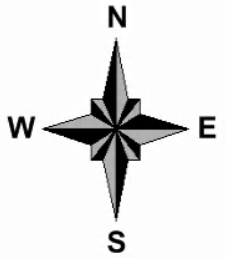
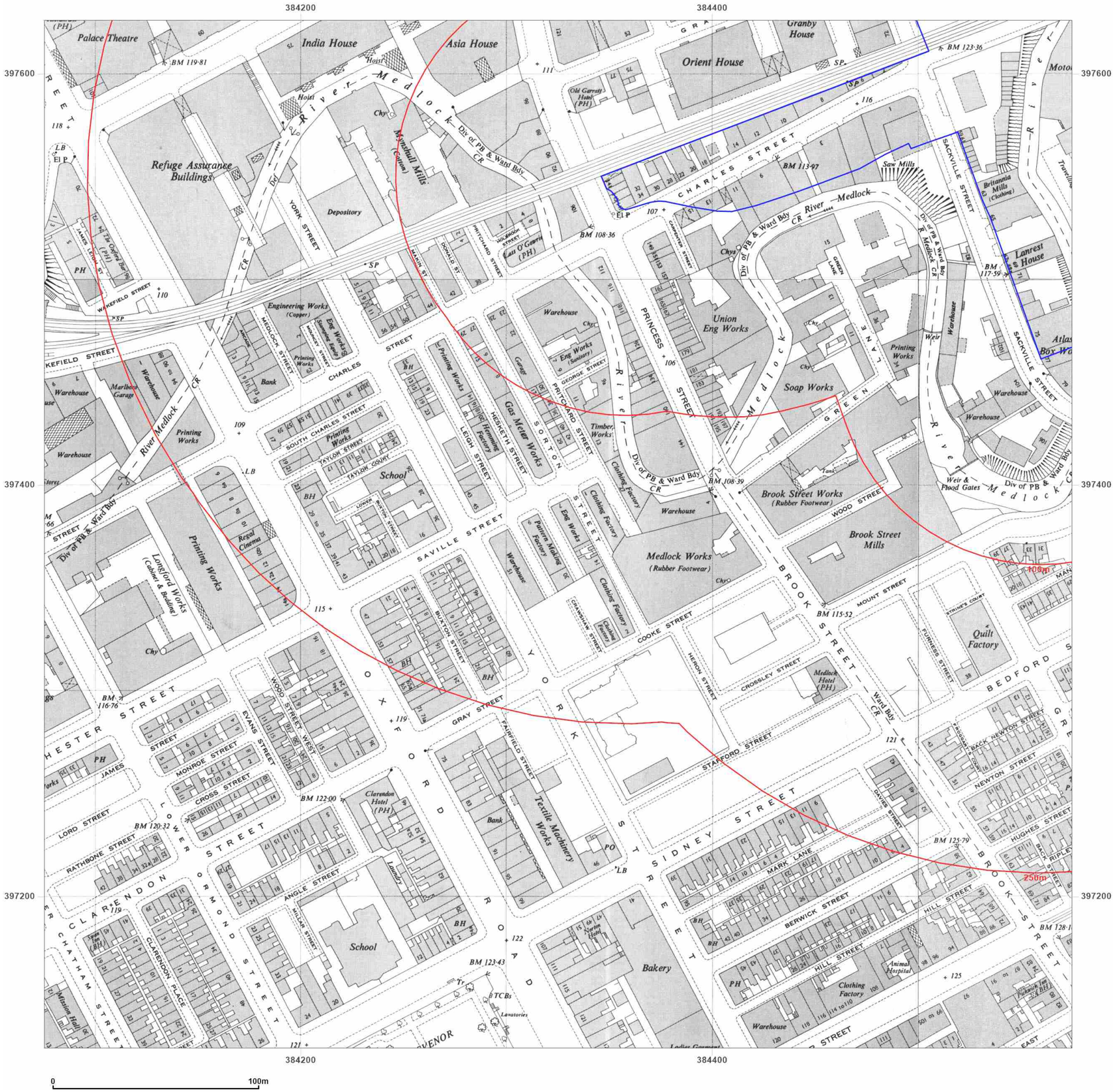
1:1,250 Scale Grid Index





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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1948**
Scale: 1:1,250
Printed at: 1:2,000

N W E S

Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1929	Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1929
Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1927	Surveyed 1948 Revised 1948 Edition N/A Copyright 1948 Levelled 1929

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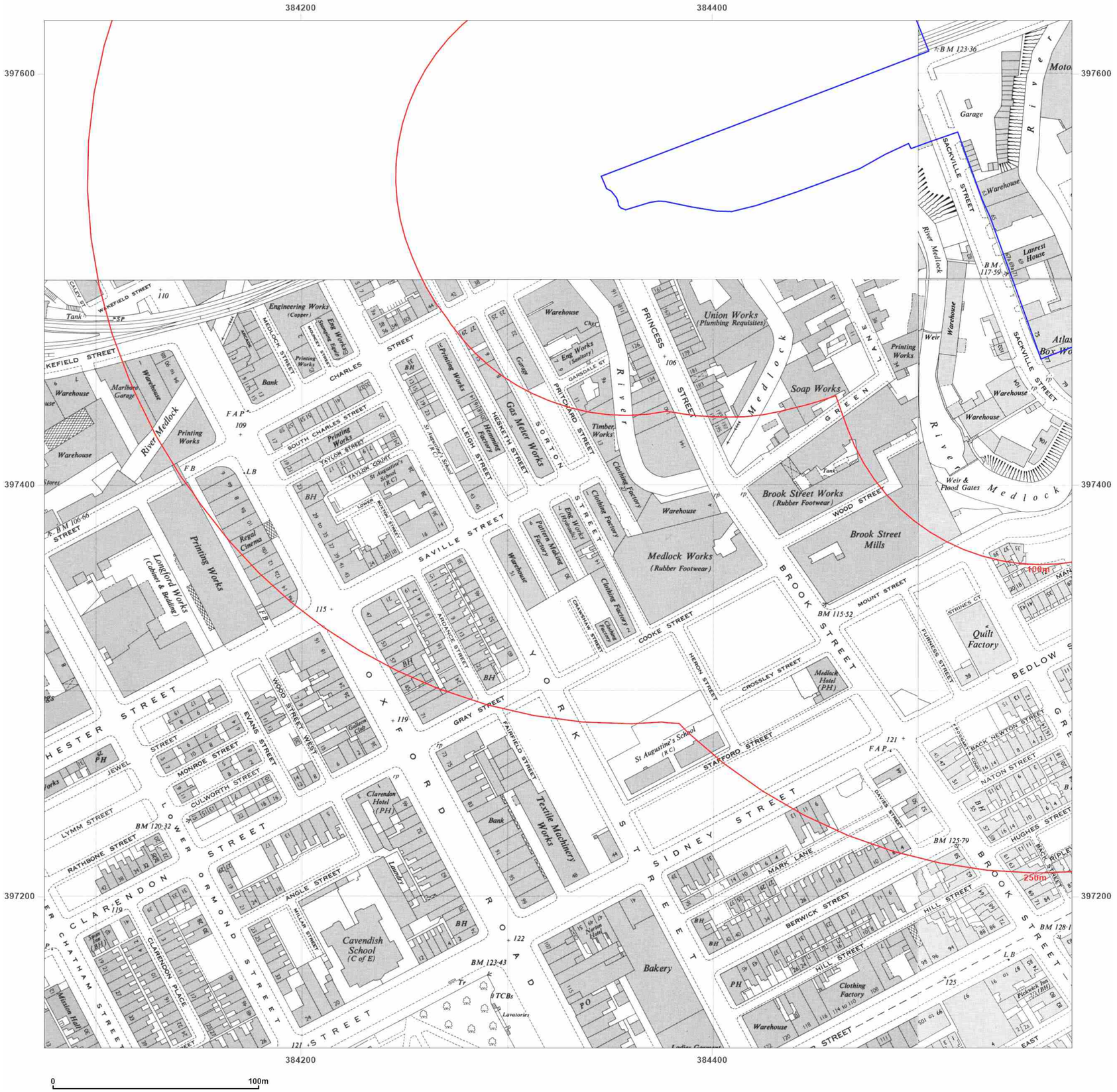

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1952-1954**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed 1953
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Edition N/A
Copyright 1952
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Surveyed 1953 Revised 1953 Edition N/A Copyright 1953 Levelled 1927	Surveyed 1954 Revised 1954 Edition N/A Copyright 1954 Levelled 1929

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1954**
Scale: 1:1,250
Printed at: 1:2,000

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

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Revised N/A
Edition N/A
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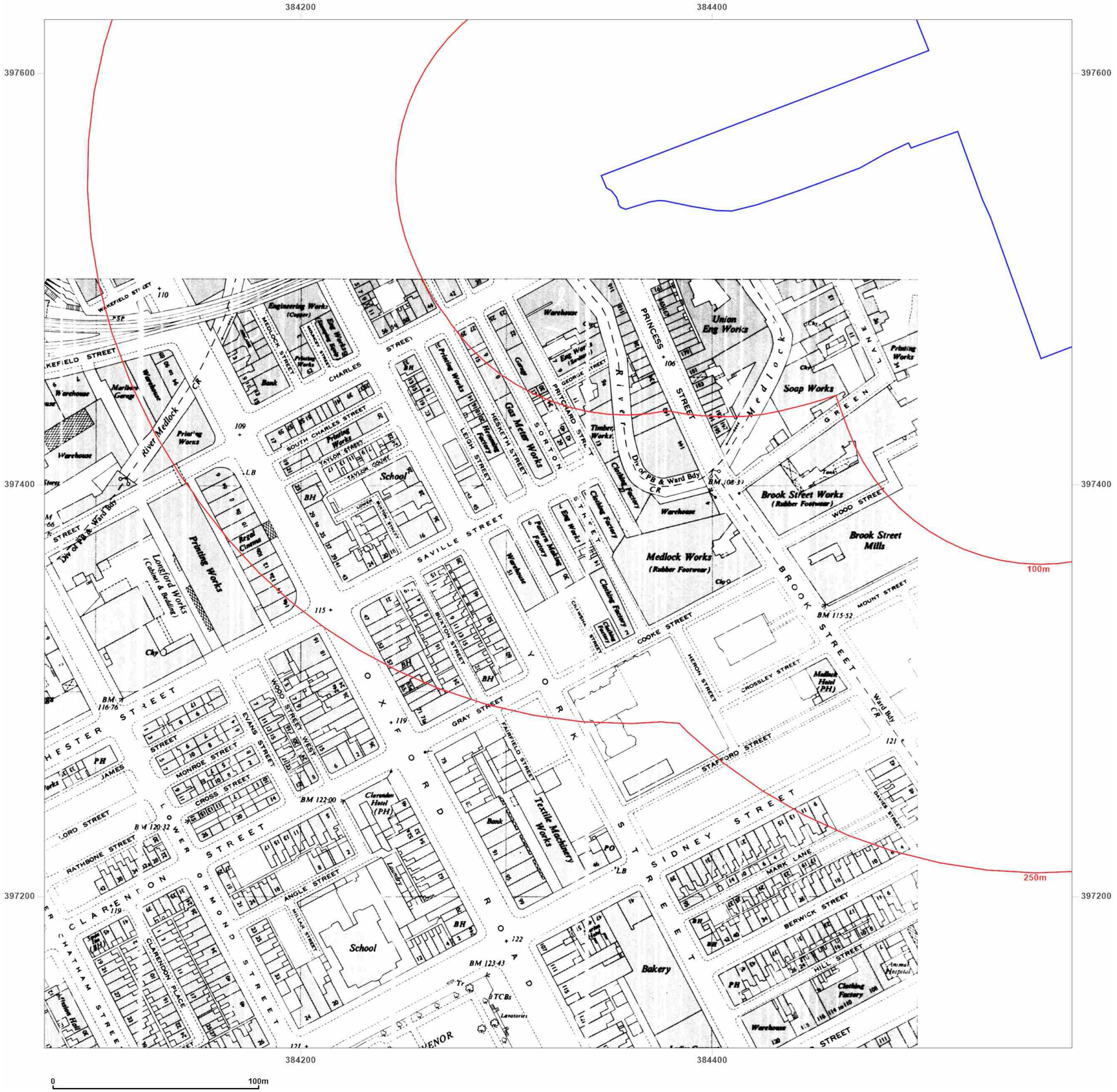

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1954**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1962-1964**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948
Revised 1963
Edition N/A
Copyright 1964
Levelled 1958

Surveyed 1963
Revised 1963
Edition N/A
Copyright 1964
Levelled 1959

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

Surveyed 1948
Revised 1963
Edition N/A
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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1969-1971**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed 1948
Revised 1970
Edition N/A
Copyright 1971
Levelled 1964

Surveyed 1948 Revised 1968 Edition N/A Copyright 1969 Levelled 1963	Surveyed 1948 Revised 1968 Edition N/A Copyright 1970 Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1970-1975**
Scale: 1:1,250
Printed at: 1:2,000

N
W E
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Surveyed N/A	Surveyed 1948
Revised N/A	Revised 1968
Edition N/A	Edition N/A
Copyright 1975	Copyright 1970
Levelled N/A	Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1984-1985**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed N/A Revised N/A Edition N/A Copyright 1985 Levelled 1963	Surveyed 1964 Revised 1984 Edition N/A Copyright 1984 Levelled 1964
Surveyed N/A Revised N/A Edition N/A Copyright 1985 Levelled 1964	Surveyed 1964 Revised 1984 Edition N/A Copyright 1984 Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid

Map date: **1987-1992**

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 1948 Revised 1985 Edition N/A Copyright 1987 Levelled 1964	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

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 1995 Revised 1995 Edition N/A Copyright 1995 Levelled N/A
Surveyed 1948 Revised 1985 Edition N/A Copyright 1990 Levelled N/A	

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1992-1995**
Scale: 1:1,250
Printed at: 1:2,000

N W E S

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

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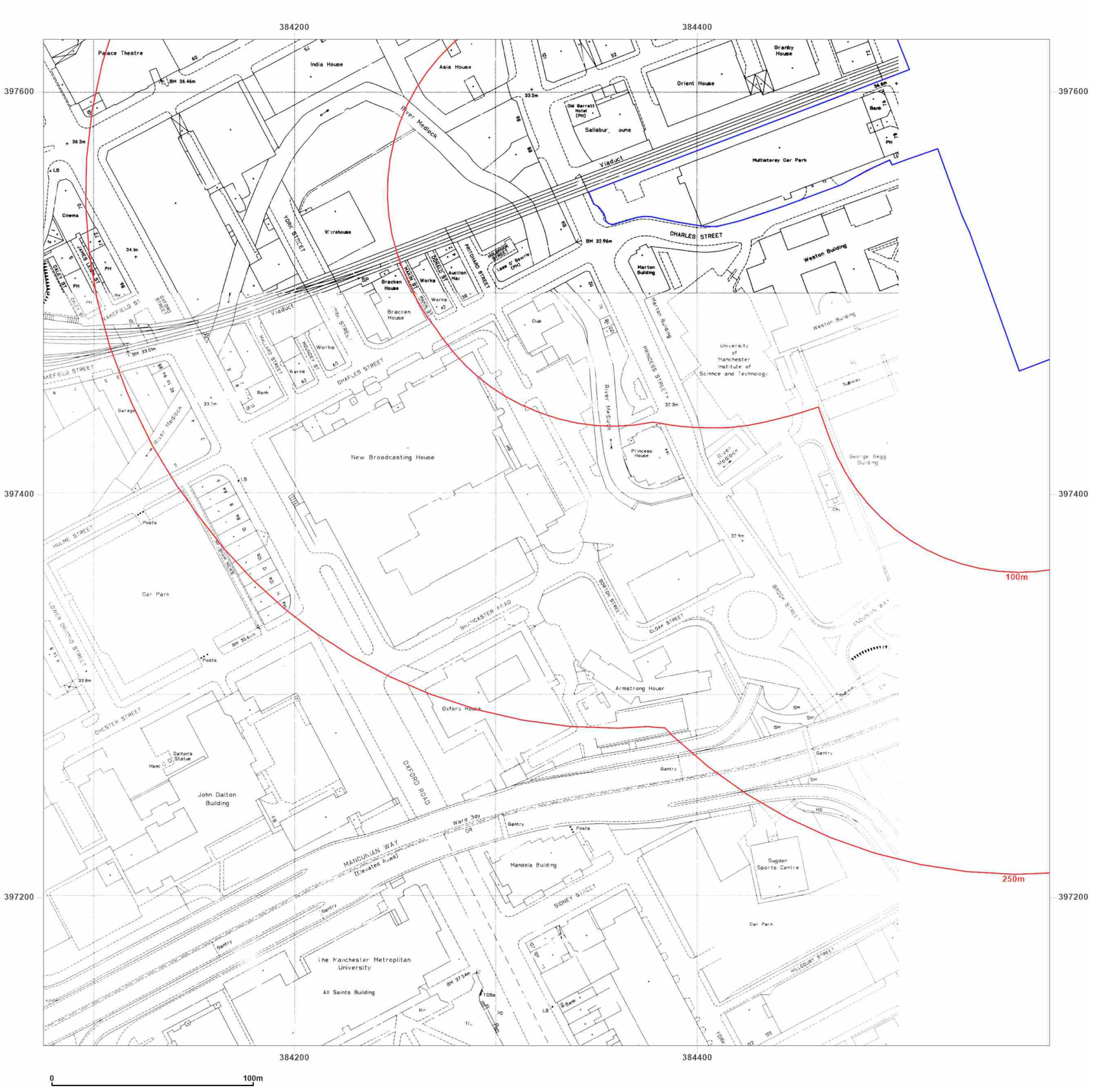

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1994-1995**
Scale: 1:1,250
Printed at: 1:2,000

N
W E
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Surveyed N/A
Revised 1994
Edition N/A
Copyright 1994
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: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_1
Grid Ref: 384325, 397376

Map Name: National Grid
Map date: **1994-1995**
Scale: 1:1,250
Printed at: 1:2,000

N
W E
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Surveyed N/A
Revised 1994
Edition N/A
Copyright 1994
Levelled N/A

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1948**
Scale: 1:1,250
Printed at: 1:2,000

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

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

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

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

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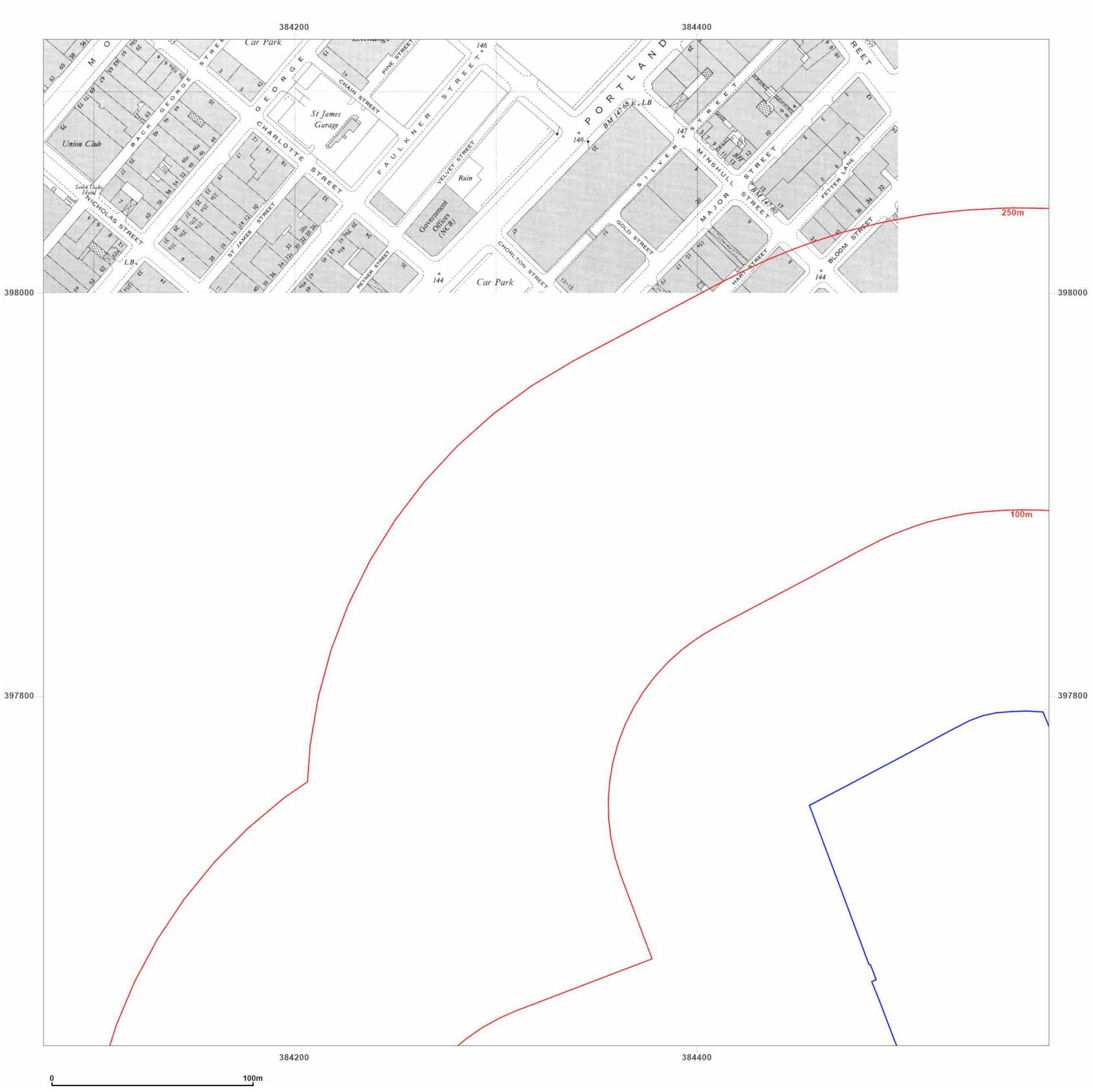

Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1953**
Scale: 1:1,250
Printed at: 1:2,000

N
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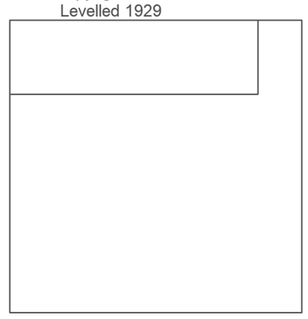
Surveyed 1951
Revised 1951
Edition N/A
Copyright 1953
Levelled 1929



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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1951-1954**
Scale: 1:1,250
Printed at: 1:2,000

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

Surveyed 1948
Revised 1953
Edition 1954
Copyright N/A
Levelled N/A

Surveyed 1953
Revised 1953
Edition N/A
Copyright 1952
Levelled 1929

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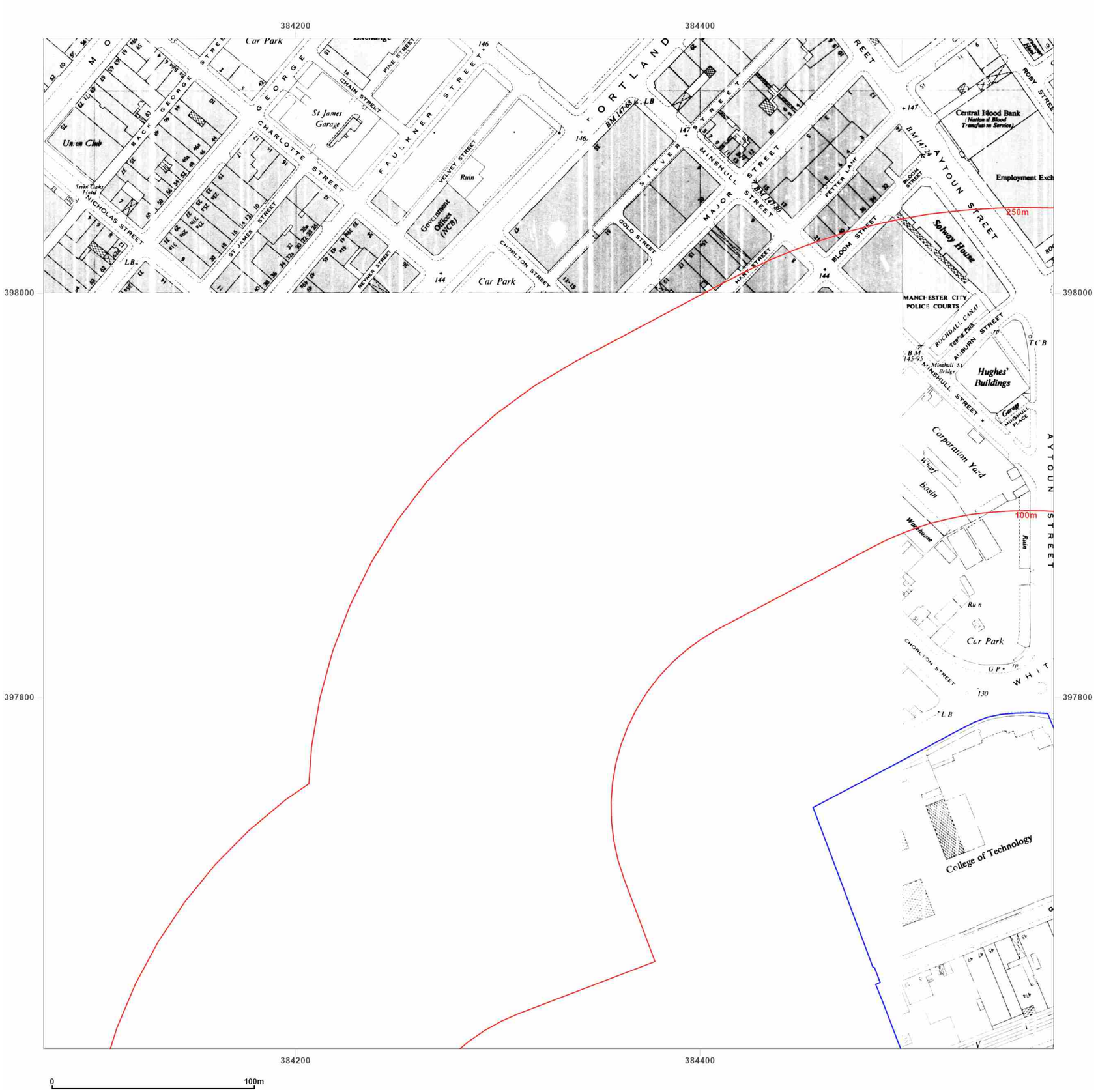

Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1951-1954**
Scale: 1:1,250
Printed at: 1:2,000

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

Surveyed 1948
Revised 1953
Edition 1954
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: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid

Map date: **1960-1964**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1953
Revised 1953
Edition N/A
Copyright 1960
Levelled 1929

Surveyed 1948 Revised 1963 Edition N/A Copyright 1964 Levelled 1958	Surveyed 1963 Revised 1963 Edition N/A Copyright 1964 Levelled 1959

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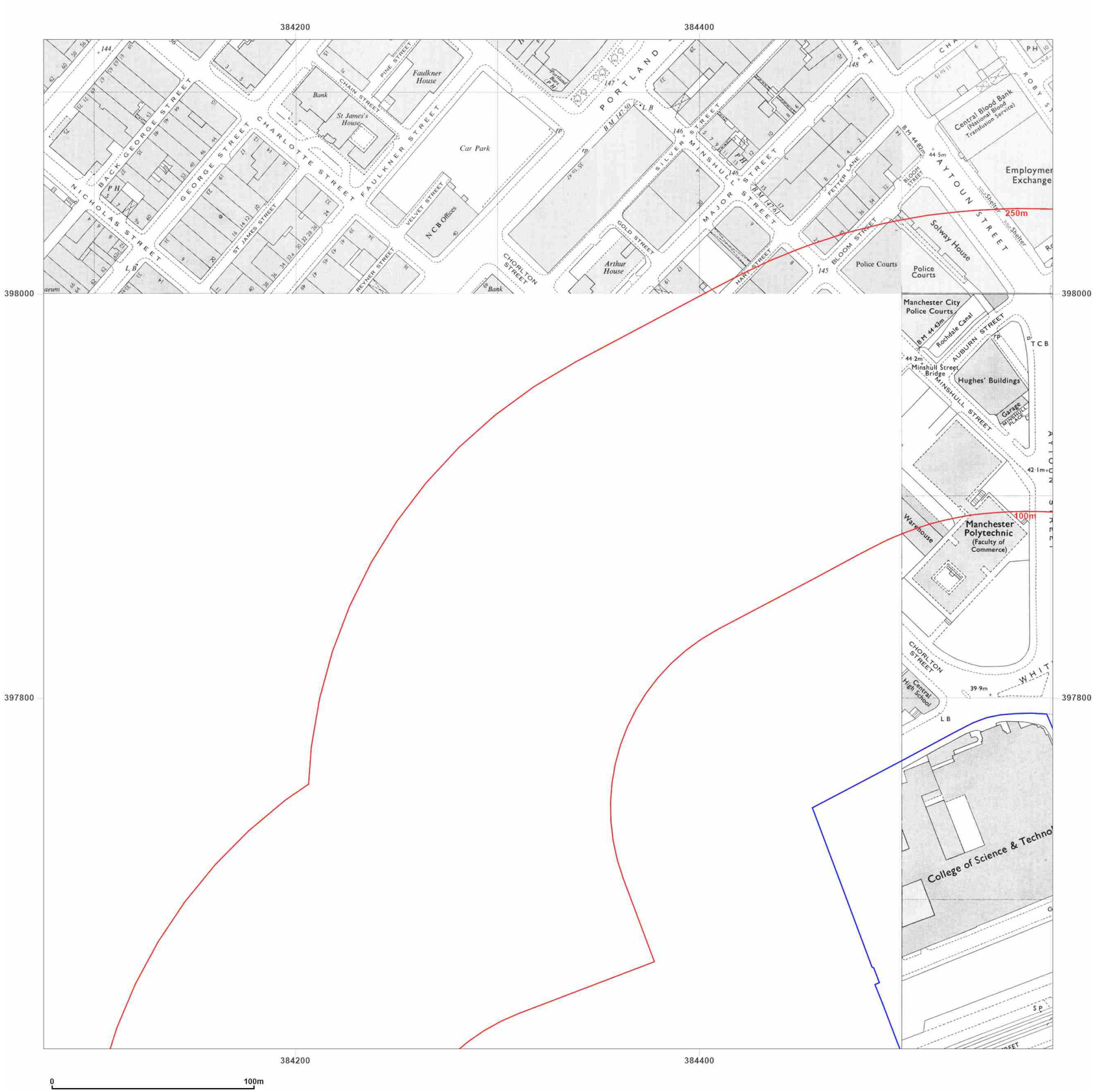

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1968-1971**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed 1948
Revised 1967
Edition N/A
Copyright 1968
Levelled 1964

Surveyed 1948
Revised 1970
Edition N/A
Copyright 1971
Levelled 1964

Surveyed 1948
Revised 1970
Edition N/A
Copyright 1971
Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1971-1980**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1980
Levelled 1964

Surveyed 1948
Revised 1970
Edition N/A
Copyright 1971
Levelled 1964

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1984-1986**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948 Revised 1985 Edition N/A Copyright 1986 Levelled 1964		Surveyed N/A Revised N/A Edition N/A Copyright 1985 Levelled N/A
Surveyed N/A Revised N/A Edition N/A Copyright 1985 Levelled 1963		Surveyed 1964 Revised 1984 Edition N/A Copyright 1984 Levelled 1964

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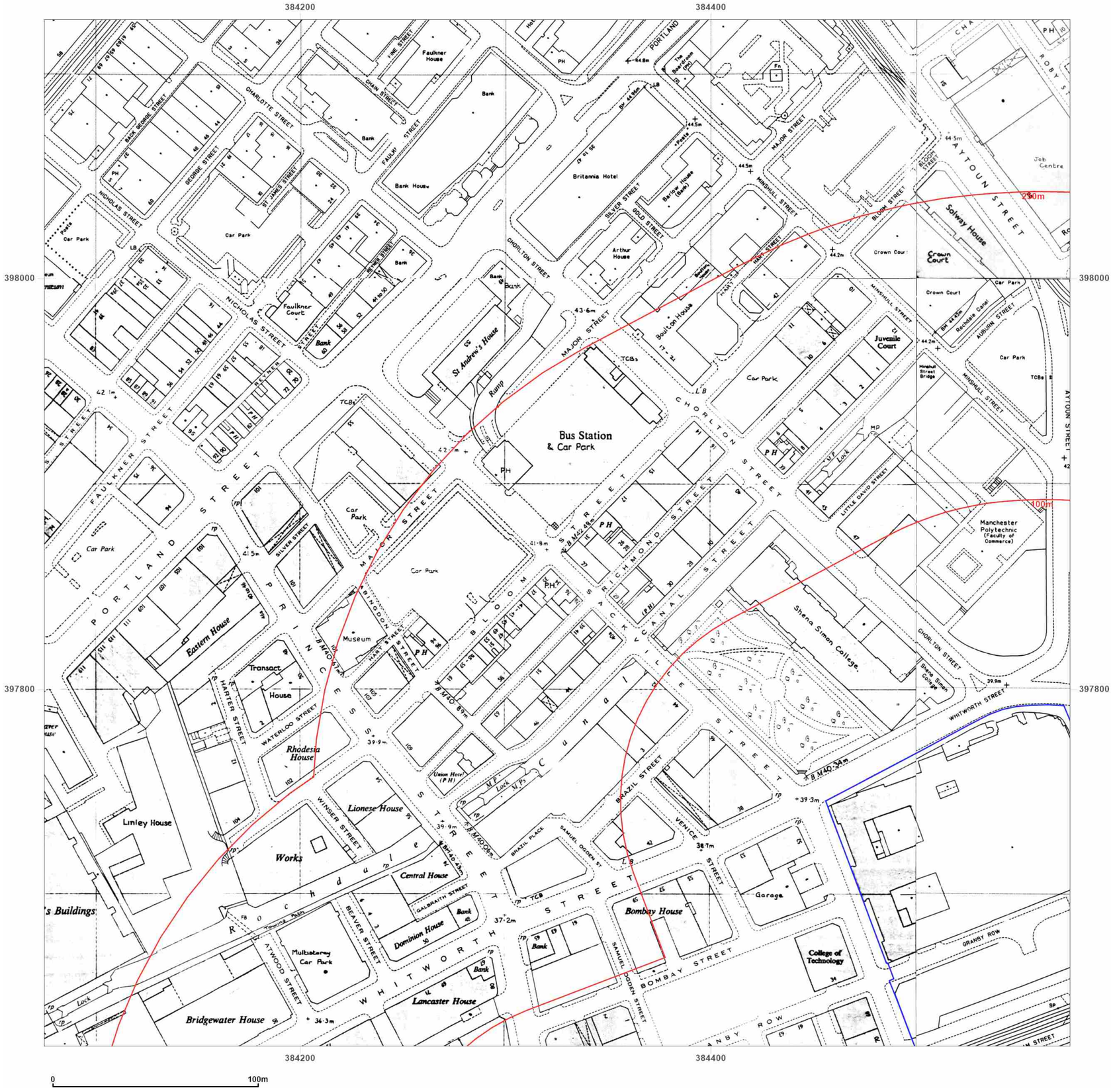

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1990-1992**
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 1963 Revised 1990 Edition N/A Copyright 1990 Levelled 1963
Surveyed 1963 Revised 1990 Edition N/A Copyright 1990 Levelled 1963	Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1994**
Scale: 1:1,250
Printed at: 1:2,000

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

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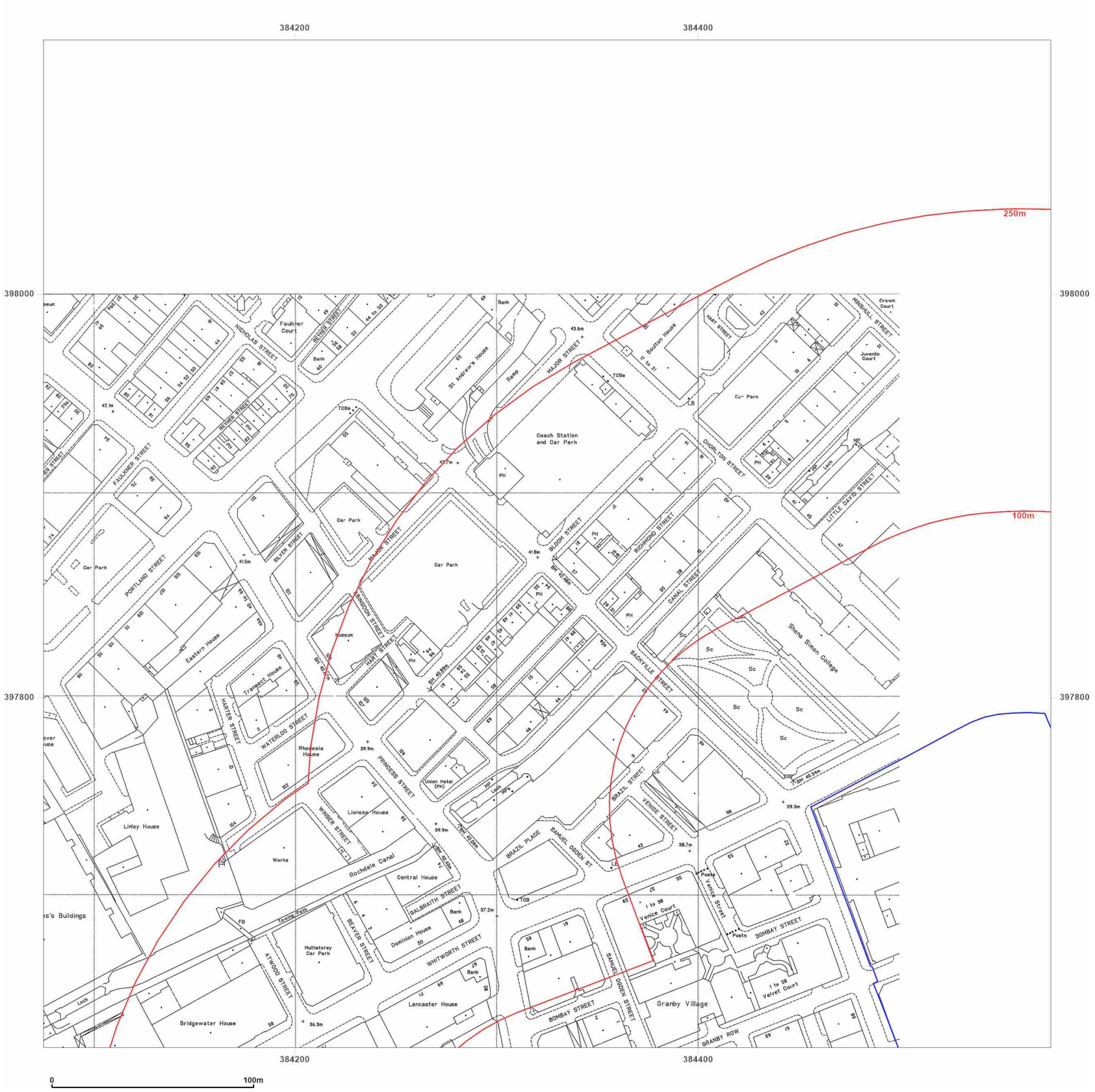

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1994**
Scale: 1:1,250
Printed at: 1:2,000

N
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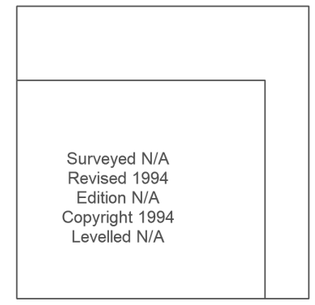

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1990-1995**
Scale: 1:1,250
Printed at: 1:2,000

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

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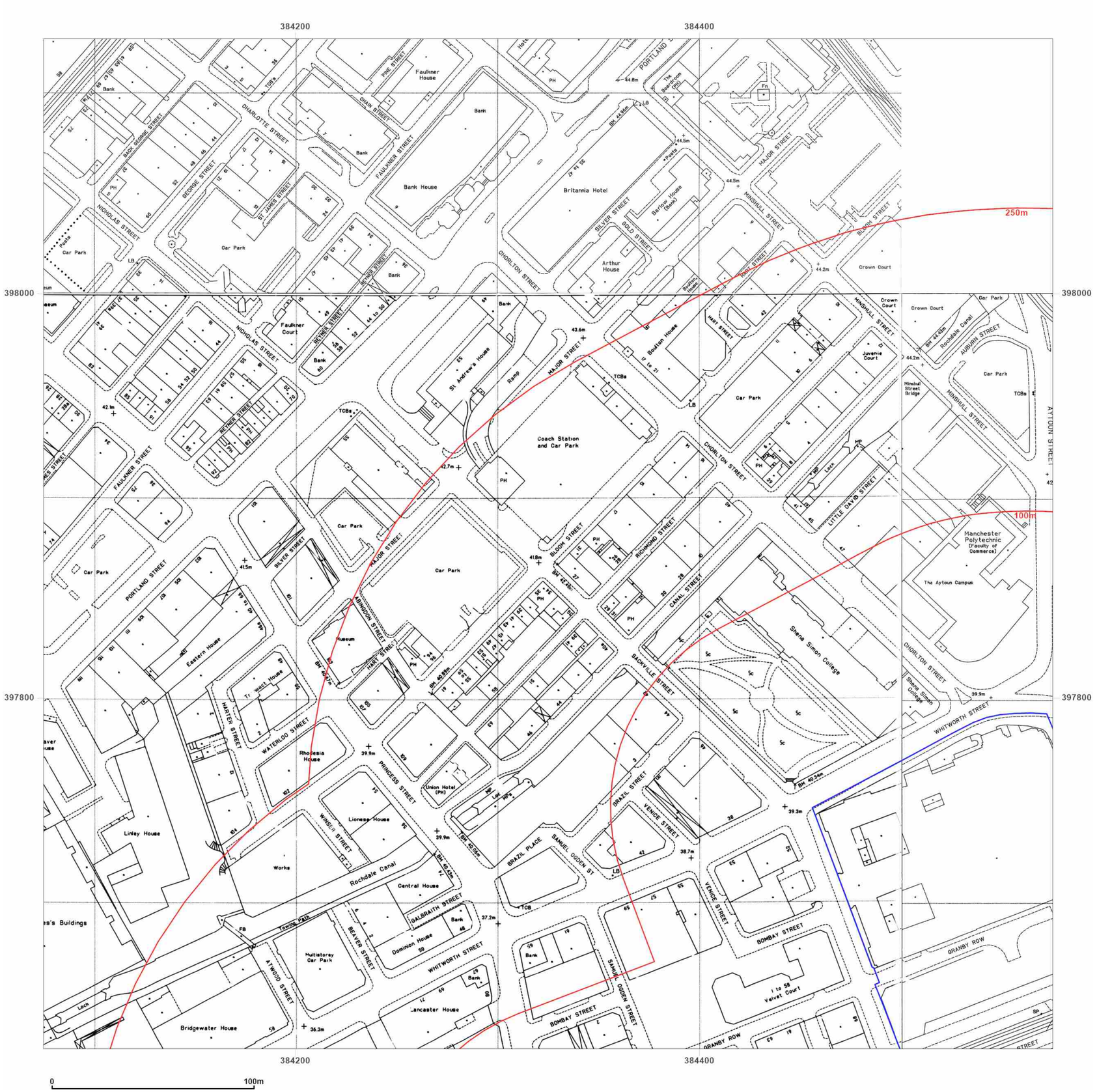

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_1_2
Grid Ref: 384325, 397876

Map Name: National Grid
Map date: **1992-1995**
Scale: 1:1,250
Printed at: 1:2,000

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

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

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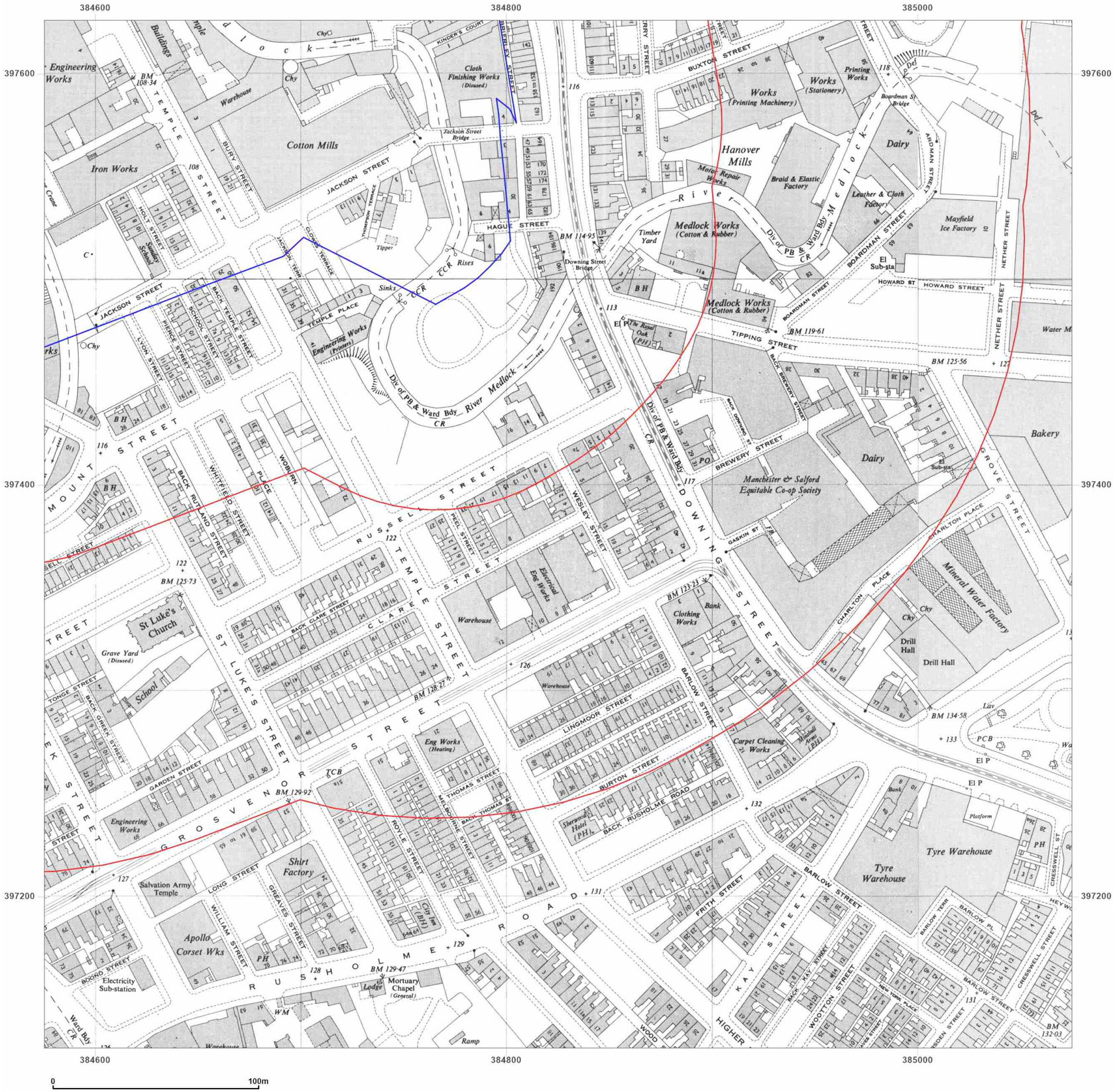

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Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1948**
Scale: 1:1,250
Printed at: 1:2,000

N W E S

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

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

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

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid

Map date: **1952-1954**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed 1953
Revised 1953
Edition N/A
Copyright 1952
Levelled 1929

Surveyed 1954 Revised 1954 Edition N/A Copyright 1954 Levelled 1929		Surveyed 1948 Revised 1953 Edition N/A Copyright 1953 Levelled 1929

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1954**
Scale: 1:1,250
Printed at: 1:2,000

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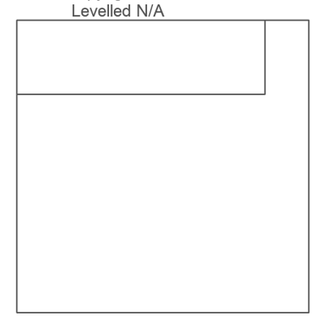
Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1960-1964**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1963 Revised 1963 Edition N/A Copyright 1964 Levelled 1959	Surveyed 1948 Revised 1962 Edition N/A Copyright 1963 Levelled 1959
Surveyed 1948 Revised 1963 Edition N/A Copyright 1964 Levelled 1959	Surveyed 1948 Revised 1959 Edition N/A Copyright 1960 Levelled 1959

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1970**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948
Revised 1968
Edition N/A
Copyright 1970
Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1970**
Scale: 1:1,250
Printed at: 1:2,000

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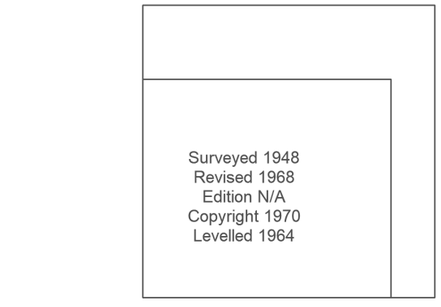

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1969-1974**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948 Revised 1970 Edition N/A Copyright 1971 Levelled 1964	Surveyed N/A Revised N/A Edition N/A Copyright 1974 Levelled N/A
Surveyed 1948 Revised 1968 Edition N/A Copyright 1970 Levelled 1964	Surveyed 1968 Revised 1968 Edition N/A Copyright 1969 Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1976-1977**
Scale: 1:1,250
Printed at: 1:2,000

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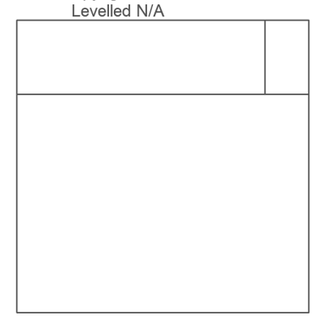
Surveyed N/A
Revised N/A
Edition N/A
Copyright 1976
Levelled N/A

Surveyed 1948
Revised 1976
Edition N/A
Copyright 1977
Levelled 1964



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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1984-1986**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1964 Revised 1984 Edition N/A Copyright 1984 Levelled 1964	Surveyed 1964 Revised 1985 Edition N/A Copyright 1985 Levelled 1964
Surveyed 1964 Revised 1984 Edition N/A Copyright 1984 Levelled 1964	Surveyed 1964 Revised 1986 Edition N/A Copyright 1986 Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1991-1992**
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 1964 Revised 1991 Edition N/A Copyright 1991 Levelled 1964
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: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1992-1995**
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

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

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_1
Grid Ref: 384825, 397376

Map Name: National Grid
Map date: **1994-1995**
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

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

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Revised 1995
Edition N/A
Copyright 1995
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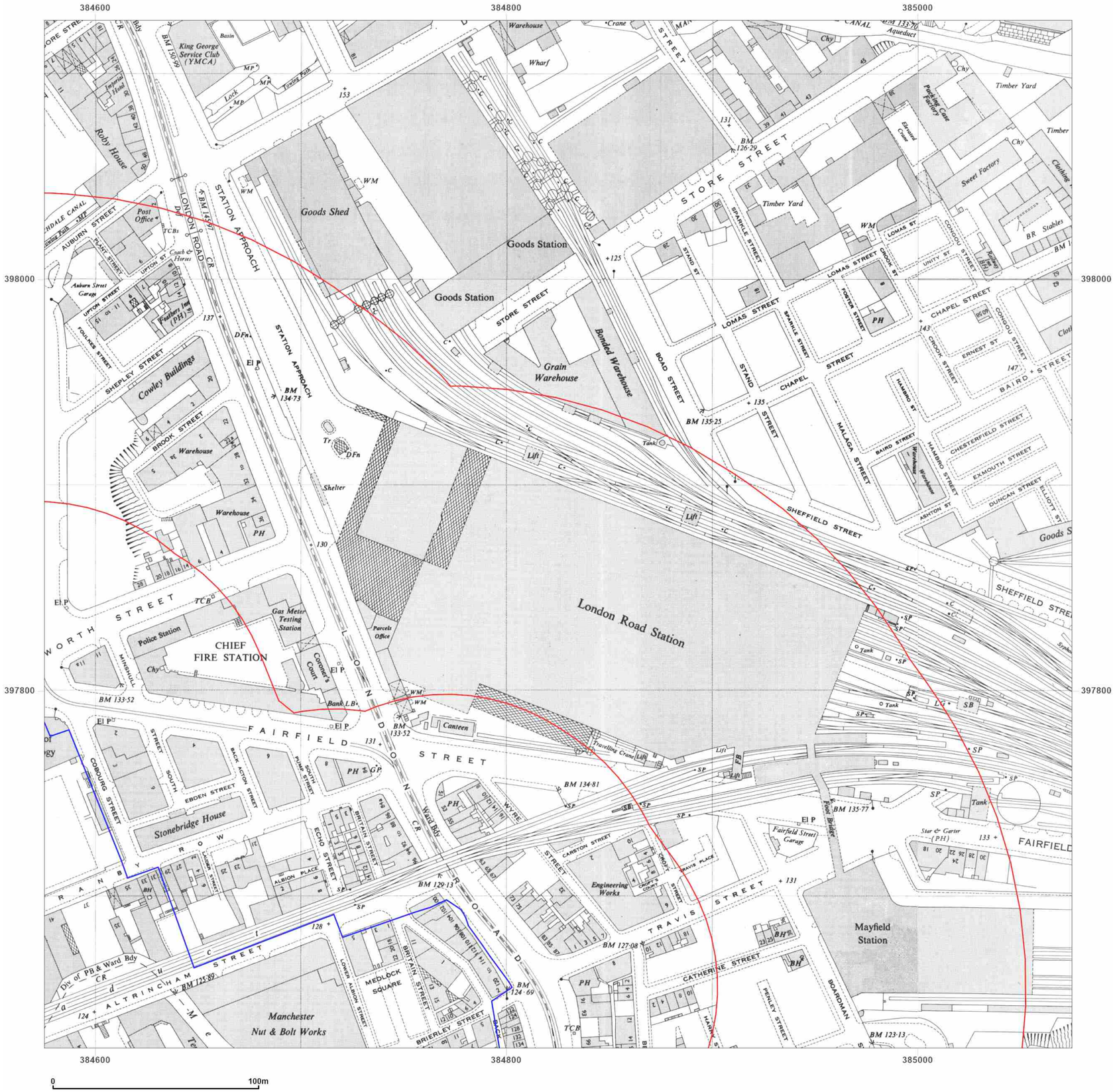

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1948**
Scale: 1:1,250
Printed at: 1:2,000

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

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

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid

Map date: **1954**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1948
Revised 1953
Edition 1954
Copyright N/A
Levelled N/A

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1952-1955**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed 1948
Revised 1953
Edition 1954
Copyright N/A
Levelled N/A

Surveyed 1948
Revised 1955
Edition N/A
Copyright 1955
Levelled 1929

Surveyed 1953
Revised 1953
Edition N/A
Copyright 1952
Levelled 1929

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1960-1964**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1953
Revised 1953
Edition N/A
Copyright 1960
Levelled 1929

Surveyed 1963 Revised 1963 Edition N/A Copyright 1964 Levelled 1959	Surveyed 1948 Revised 1962 Edition N/A Copyright 1963 Levelled 1959

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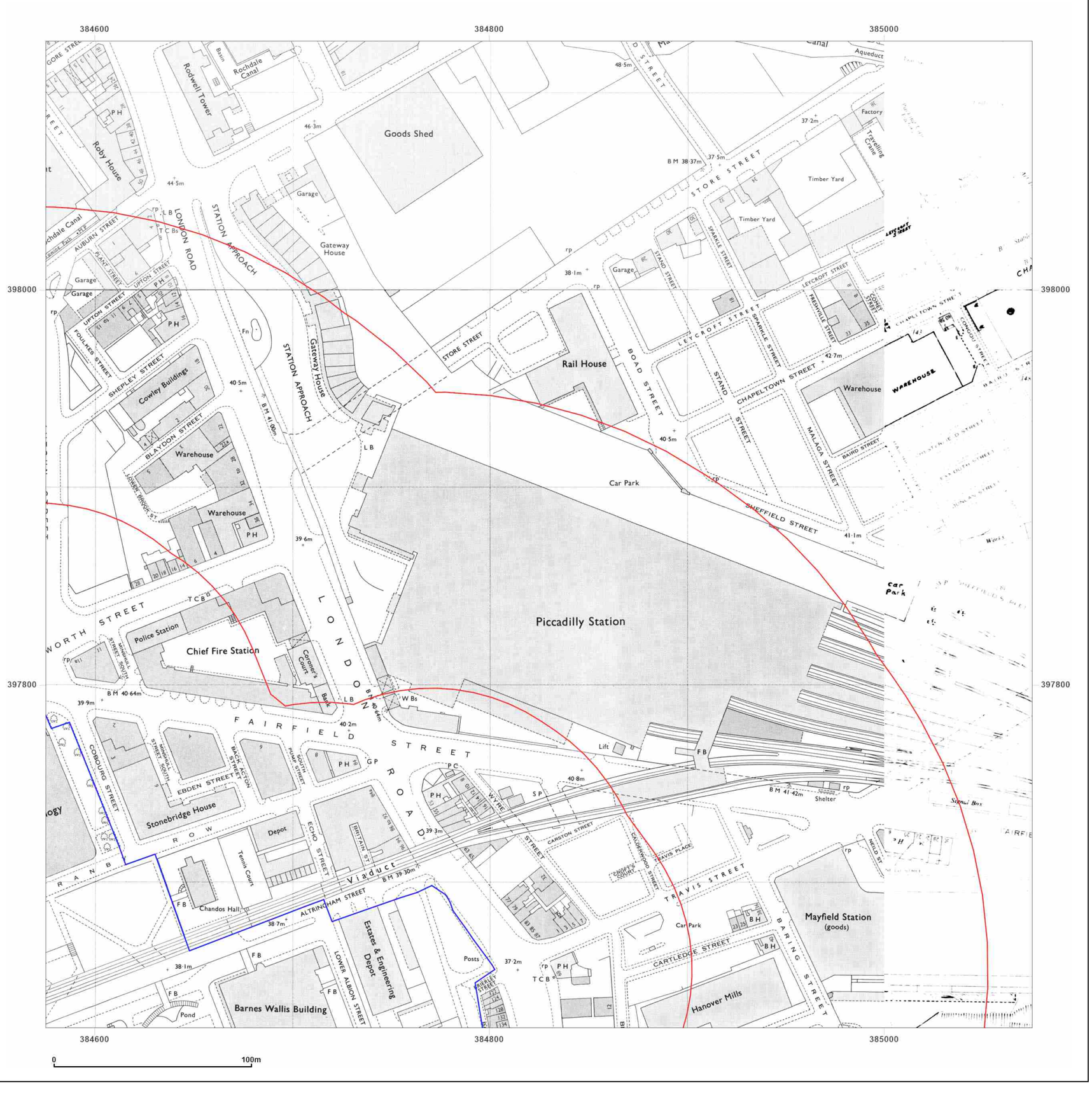

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1971-1974**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948 Revised 1970 Edition N/A Copyright 1971 Levelled 1964	Surveyed N/A Revised N/A Edition N/A Copyright 1974 Levelled N/A
Surveyed 1948 Revised 1970 Edition N/A Copyright 1971 Levelled 1964	Surveyed N/A Revised N/A Edition N/A Copyright 1974 Levelled N/A

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1971-1978**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948 Revised 1970 Edition N/A Copyright 1971 Levelled 1964	Surveyed N/A Revised N/A Edition N/A Copyright 1978 Levelled 1964
Surveyed N/A Revised N/A Edition N/A Copyright 1976 Levelled N/A	Surveyed 1948 Revised 1976 Edition N/A Copyright 1977 Levelled 1964

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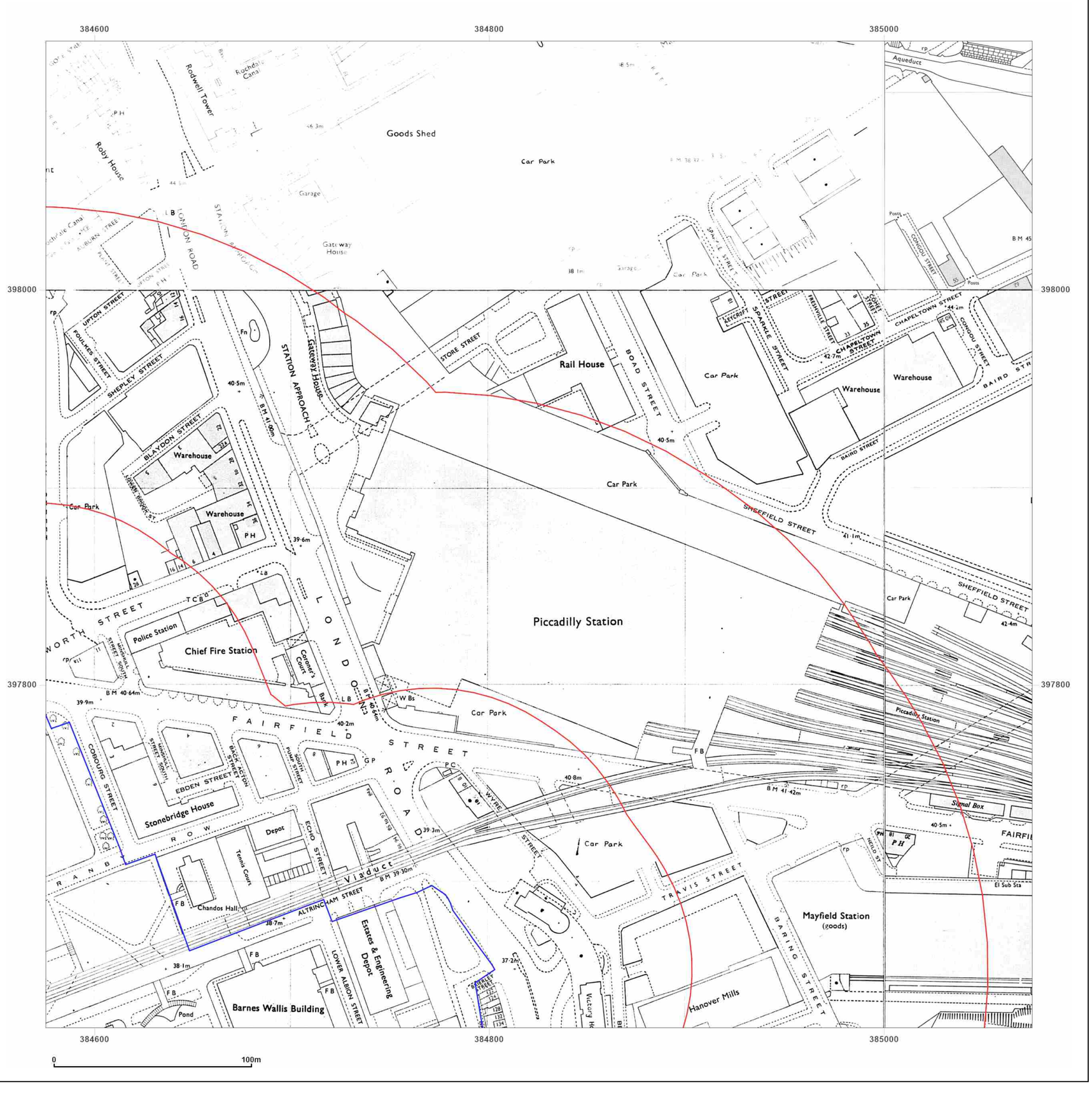

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1981-1985**
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 N/A	Surveyed 1948 Revised 1980 Edition N/A Copyright 1981 Levelled 1964
Surveyed 1964 Revised 1984 Edition N/A Copyright 1984 Levelled 1964	Surveyed 1964 Revised 1985 Edition N/A Copyright 1985 Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1988-1992**
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 1964 Revised 1988 Edition N/A Copyright 1988 Levelled 1964
Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A	Surveyed 1964 Revised 1991 Edition N/A Copyright 1991 Levelled 1964

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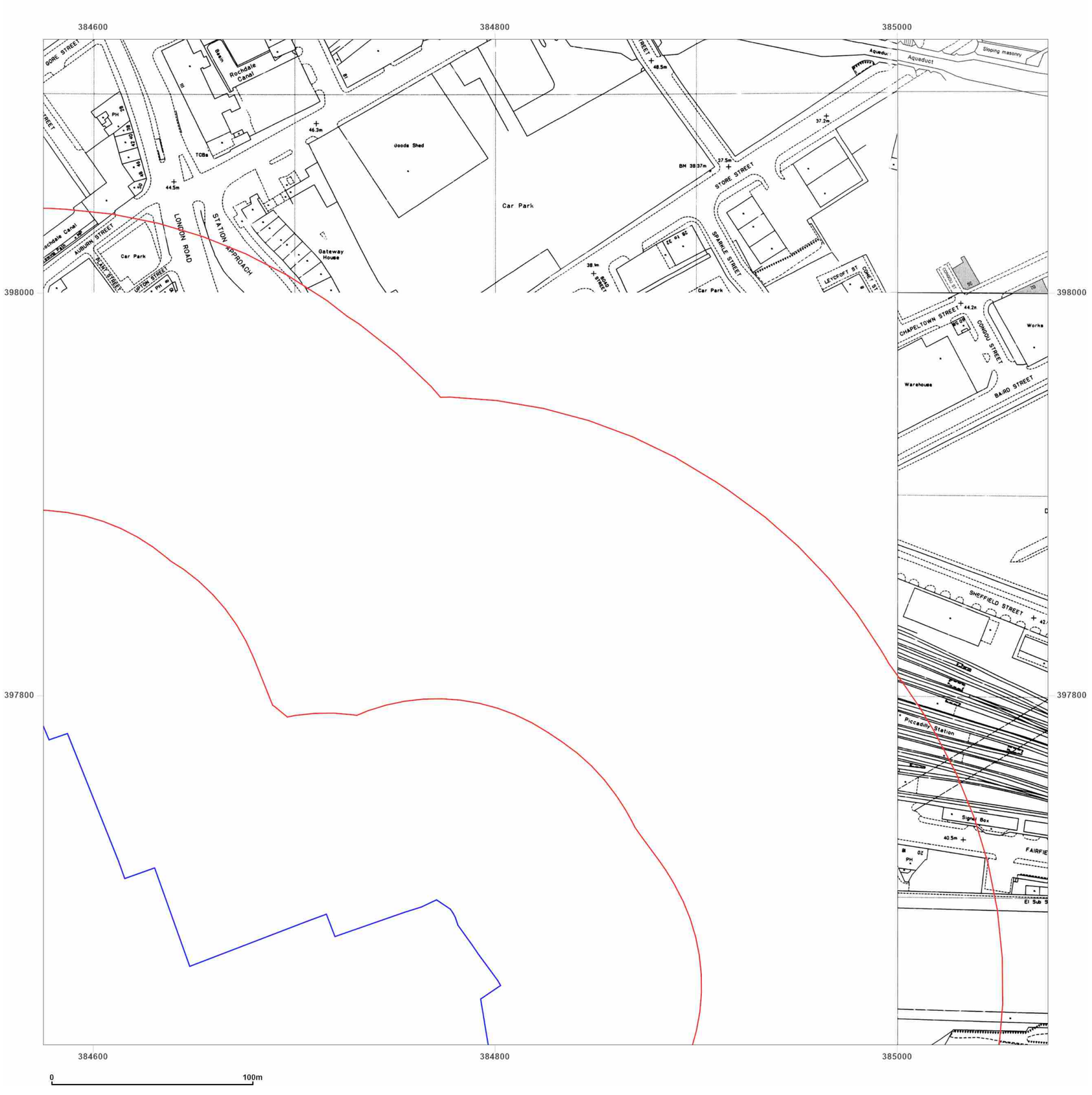

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1989-1992**
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 1948 Revised 1989 Edition N/A Copyright 1989 Levelled N/A
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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1991-1995**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1948
Revised 1980
Edition N/A
Copyright 1991
Levelled N/A

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

Surveyed 1994
Revised 1994
Edition N/A
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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_1250_2_2
Grid Ref: 384825, 397876

Map Name: National Grid
Map date: **1992-1995**
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 1995
Revised 1995
Edition N/A
Copyright 1995
Levelled N/A

Surveyed 1994
Revised 1994
Edition N/A
Copyright 1994
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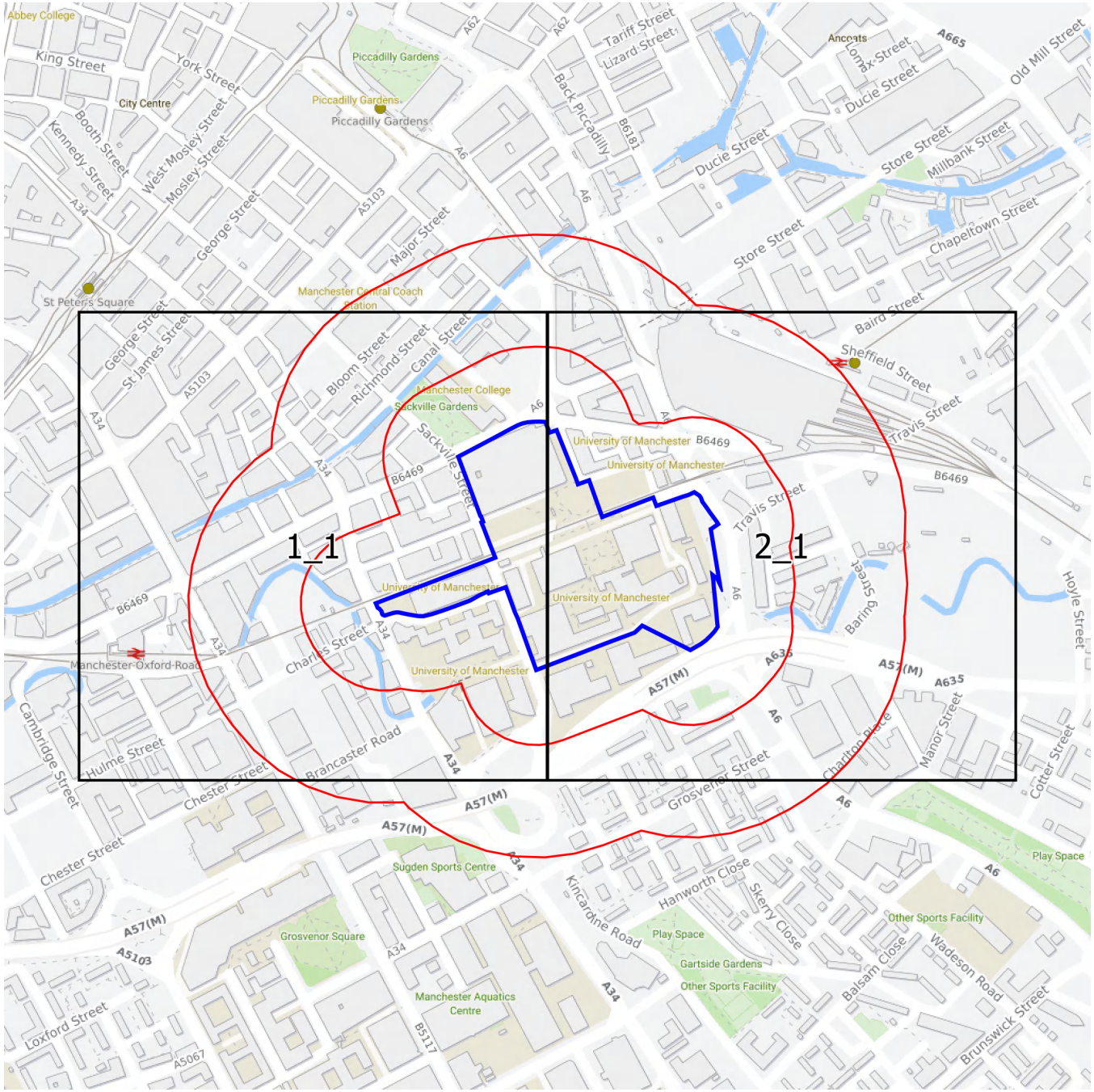

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1:2,500 Scale Grid Index

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Surveyed 1849
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

Surveyed 1849
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

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Site Details:

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: 1056 Scale Town Plan
Map date: **1851**
Scale: 1:1,056
Printed at: 1:1,056

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: County Series Town Plan
Map date: **1891**
Scale: 1:500
Printed at: 1:1,000

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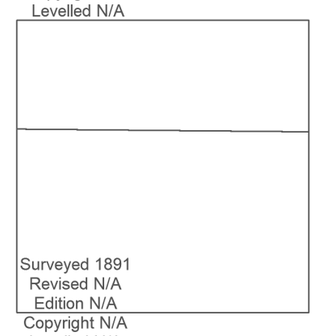
Surveyed 1891
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: County Series
Map date: **1889-1893**
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1893
Revised N/A
Edition 1893
Copyright N/A
Levelled N/A

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

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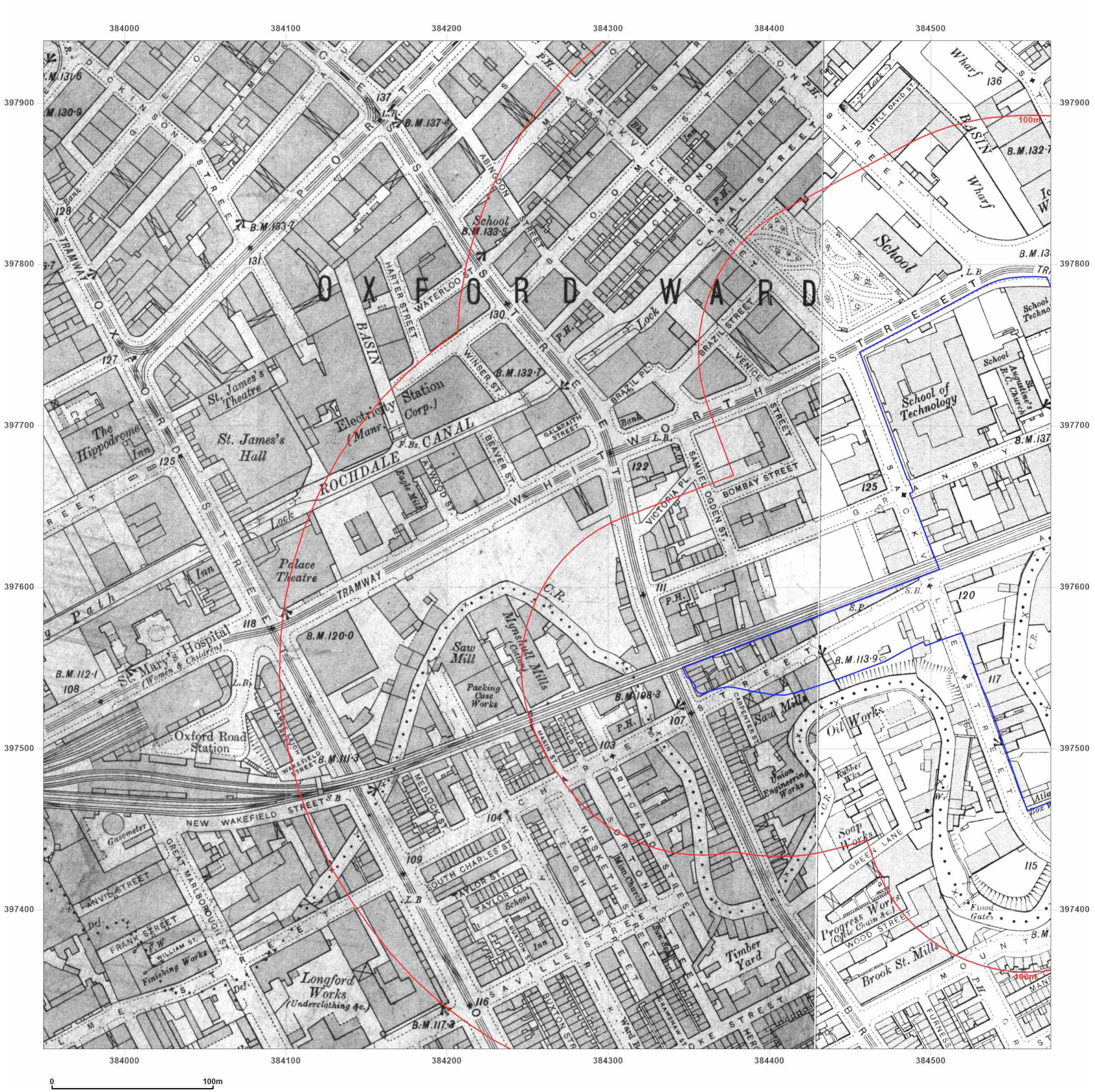

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: County Series
Map date: **1908**
Scale: 1:2,500
Printed at: 1:2,500

N W E S

Surveyed 1891
Revised 1905
Edition 1908
Copyright N/A
Levelled N/A

Surveyed 1891
Revised 1905
Edition 1908
Copyright N/A
Levelled N/A

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: County Series
Map date: **1922**
Scale: 1:2,500
Printed at: 1:2,500

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

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: County Series
Map date: **1932**
Scale: 1:2,500
Printed at: 1:2,500

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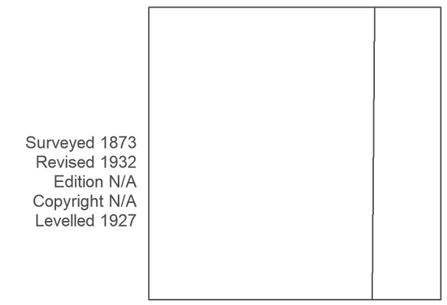

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: National Grid
Map date: **1948-1950**
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1948	Surveyed 1948
Revised 1948	Revised 1948
Edition N/A	Edition N/A
Copyright 1949	Copyright 1950
Levelled 1927	Levelled 1929

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: National Grid

Map date: **1955-1956**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1953
Revised 1953
Edition N/A
Copyright 1957
Levelled 1927

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: National Grid

Map date: **1964-1965**

Scale: 1:2,500

Printed at: 1:2,500

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

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: National Grid

Map date: **1963-1968**

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 1968
Revised 1968
Edition N/A
Copyright 1970
Levelled 1964

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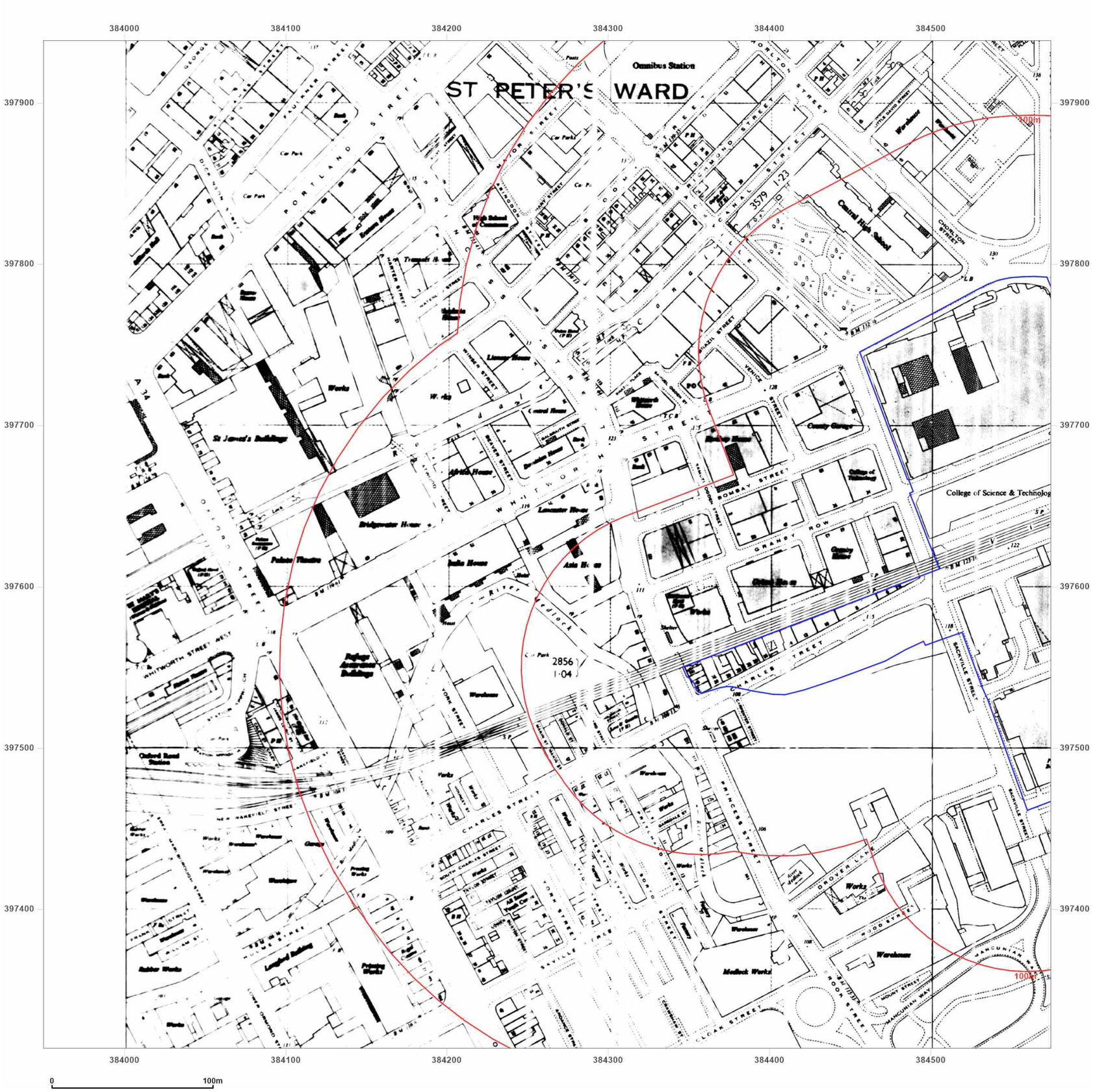

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_1_1
Grid Ref: 384262, 397626

Map Name: National Grid

Map date: **1970**

Scale: 1:2,500

Printed at: 1:2,500

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

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: 1056 Scale Town Plan
Map date: **1851**
Scale: 1:1,056
Printed at: 1:1,056

N
W E
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Surveyed 1849
Revised N/A
Edition 1851
Copyright N/A
Levelled N/A

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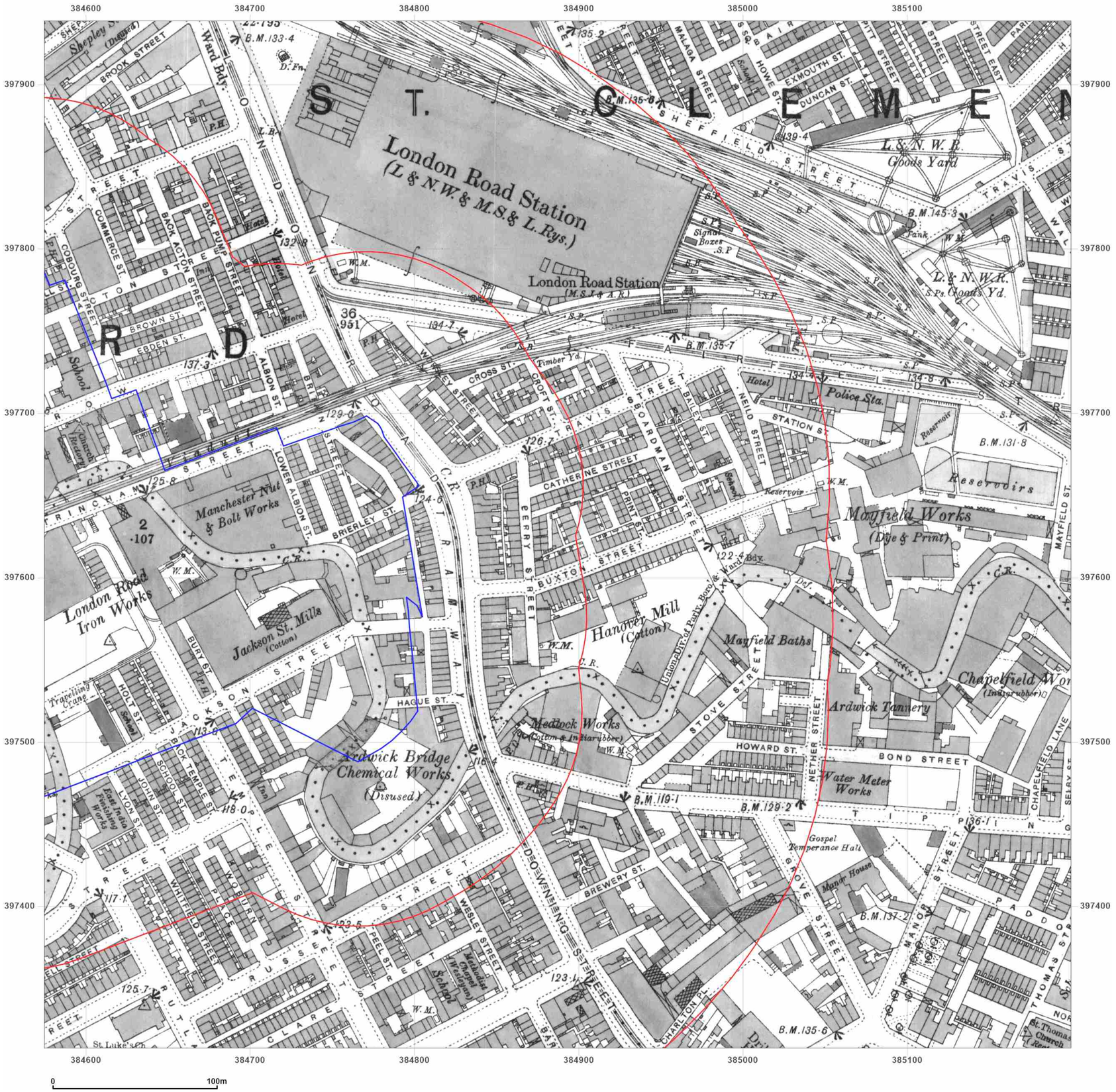

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: County Series
Map date: **1889**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
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Surveyed 1889
Revised N/A
Edition 1889
Copyright N/A
Levelled N/A

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: County Series Town Plan
Map date: **1891**
Scale: 1:500
Printed at: 1:1,000

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

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

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

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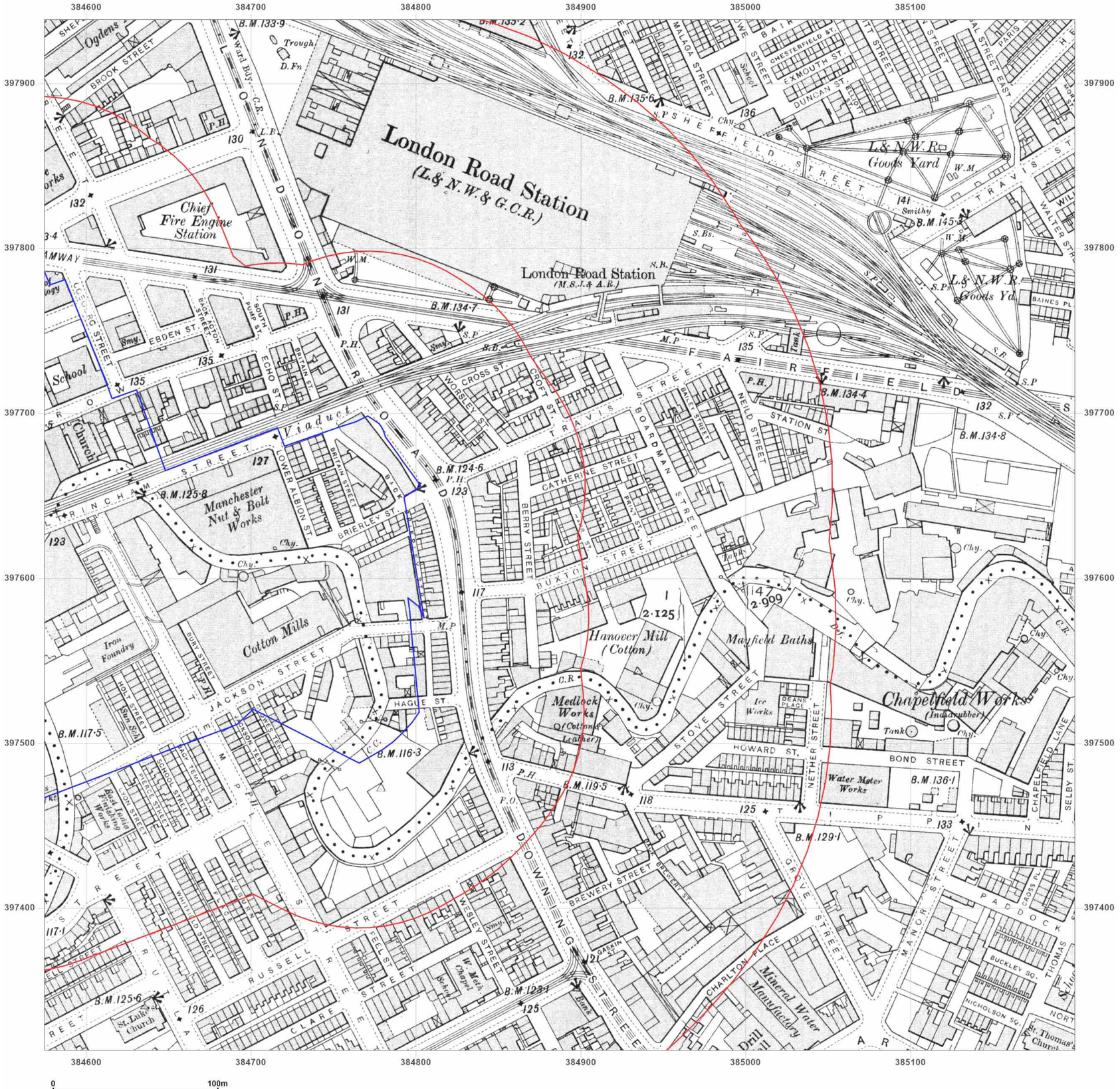

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: County Series
Map date: **1908**
Scale: 1:2,500
Printed at: 1:2,500

N
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Surveyed 1891
Revised 1905
Edition 1908
Copyright N/A
Levelled N/A

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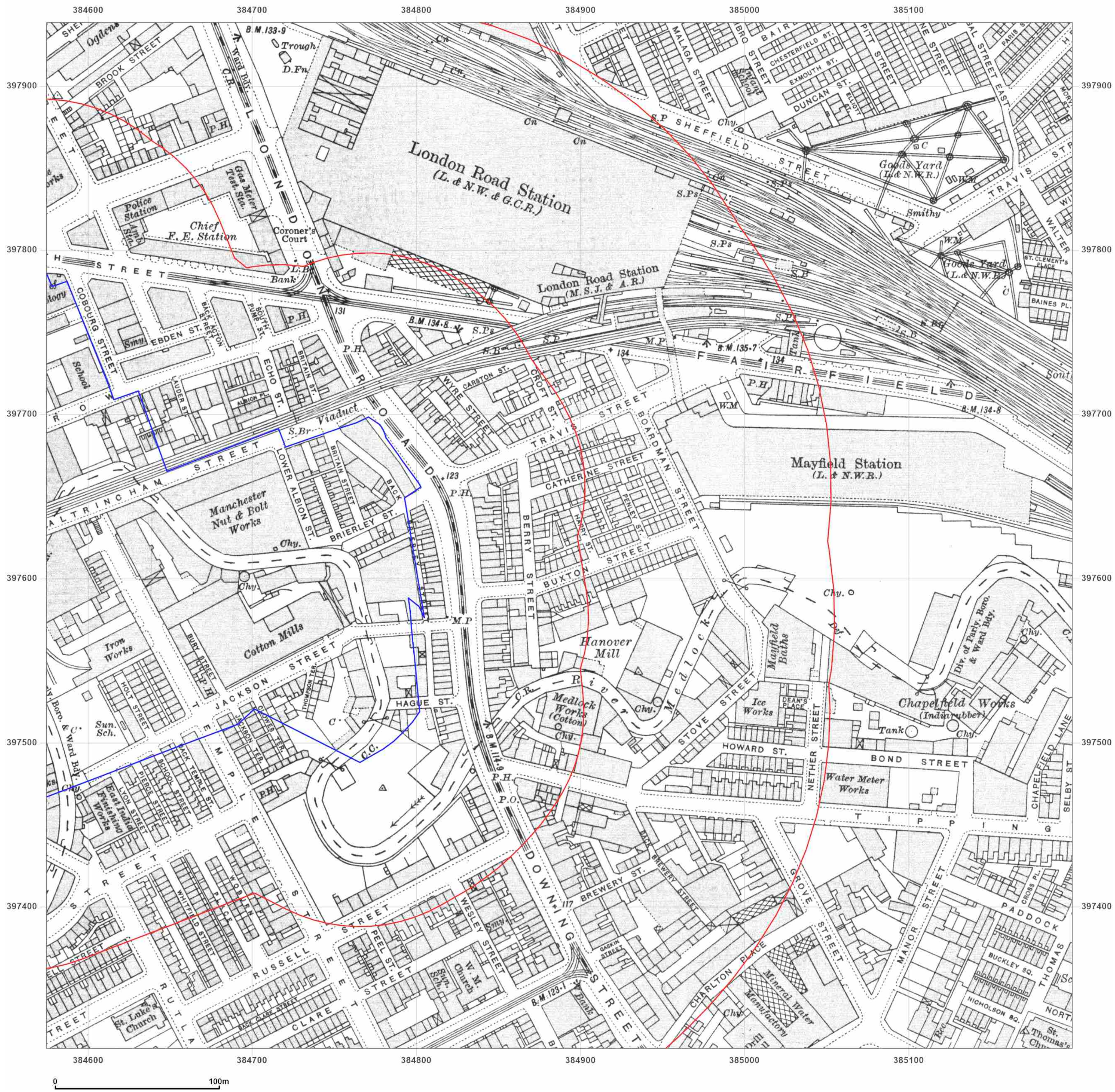

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: County Series

Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

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

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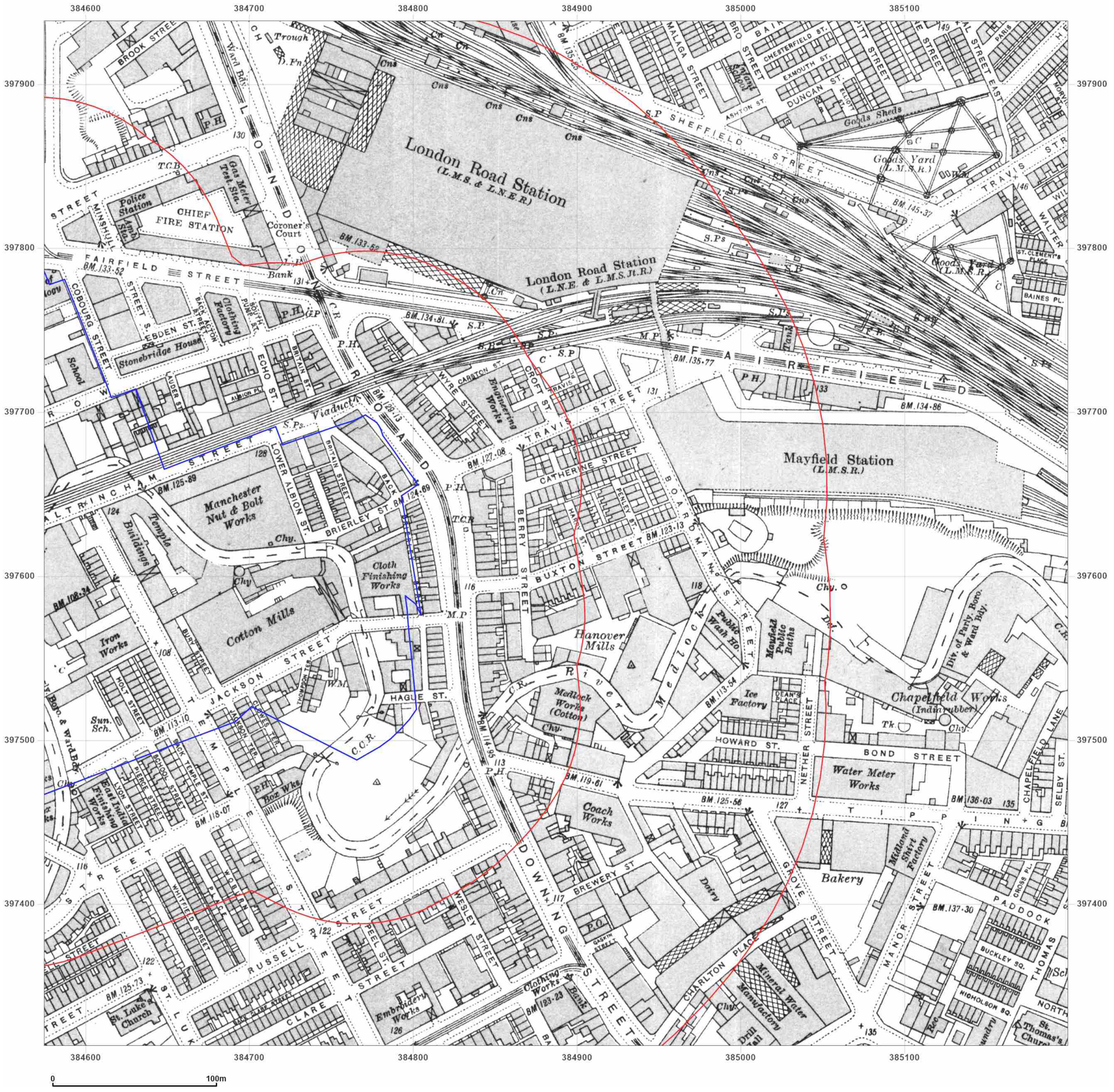

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: County Series

Map date: **1932**

Scale: 1:2,500

Printed at: 1:2,500

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

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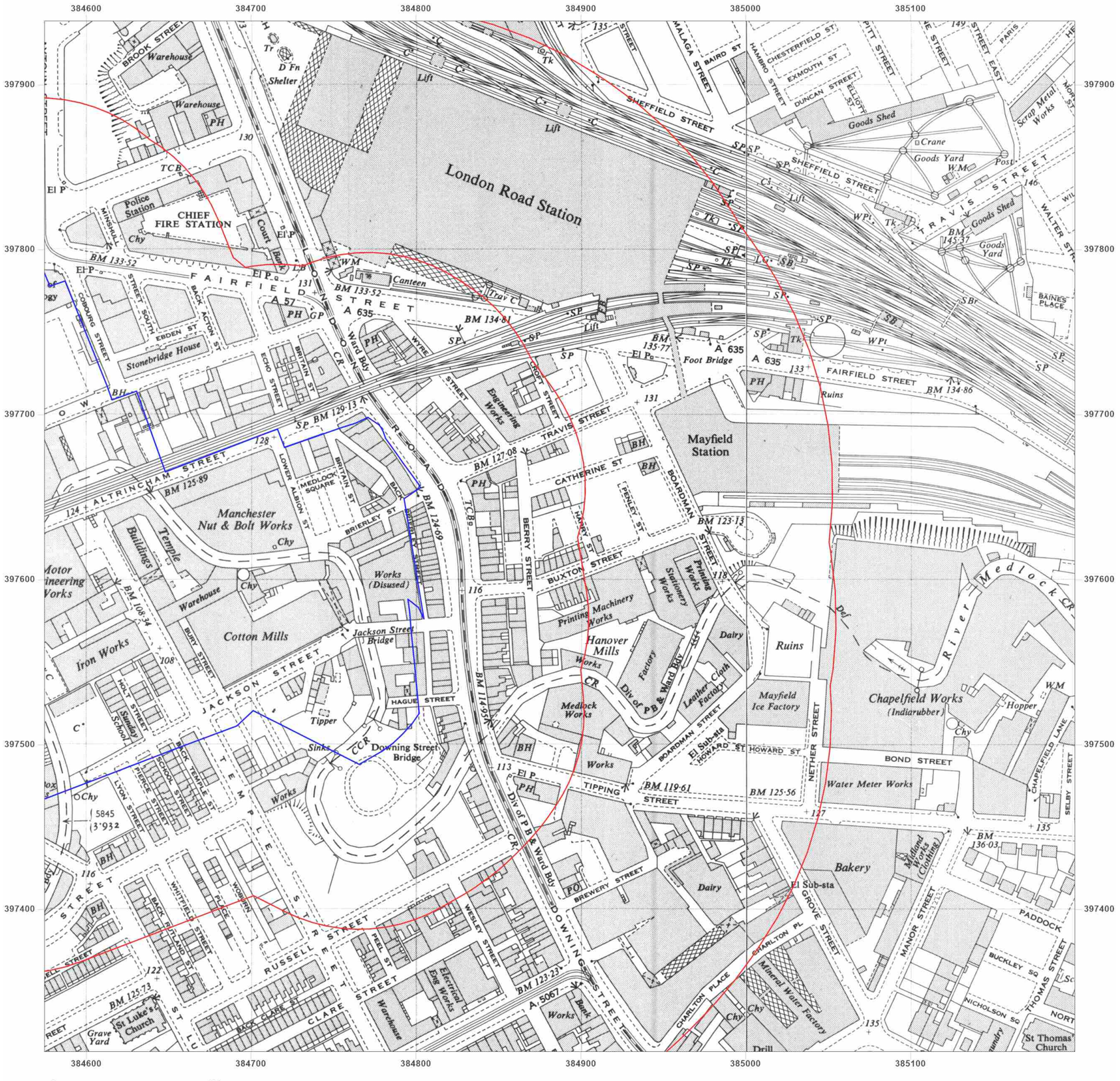

Surveyed 1948
Revised 1948
Edition N/A
Copyright 1950
Levelled 1929

Surveyed 1948
Revised 1948
Edition N/A
Copyright 1949
Levelled 1929

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: National Grid
Map date: **1948-1950**
Scale: 1:2,500
Printed at: 1:2,500

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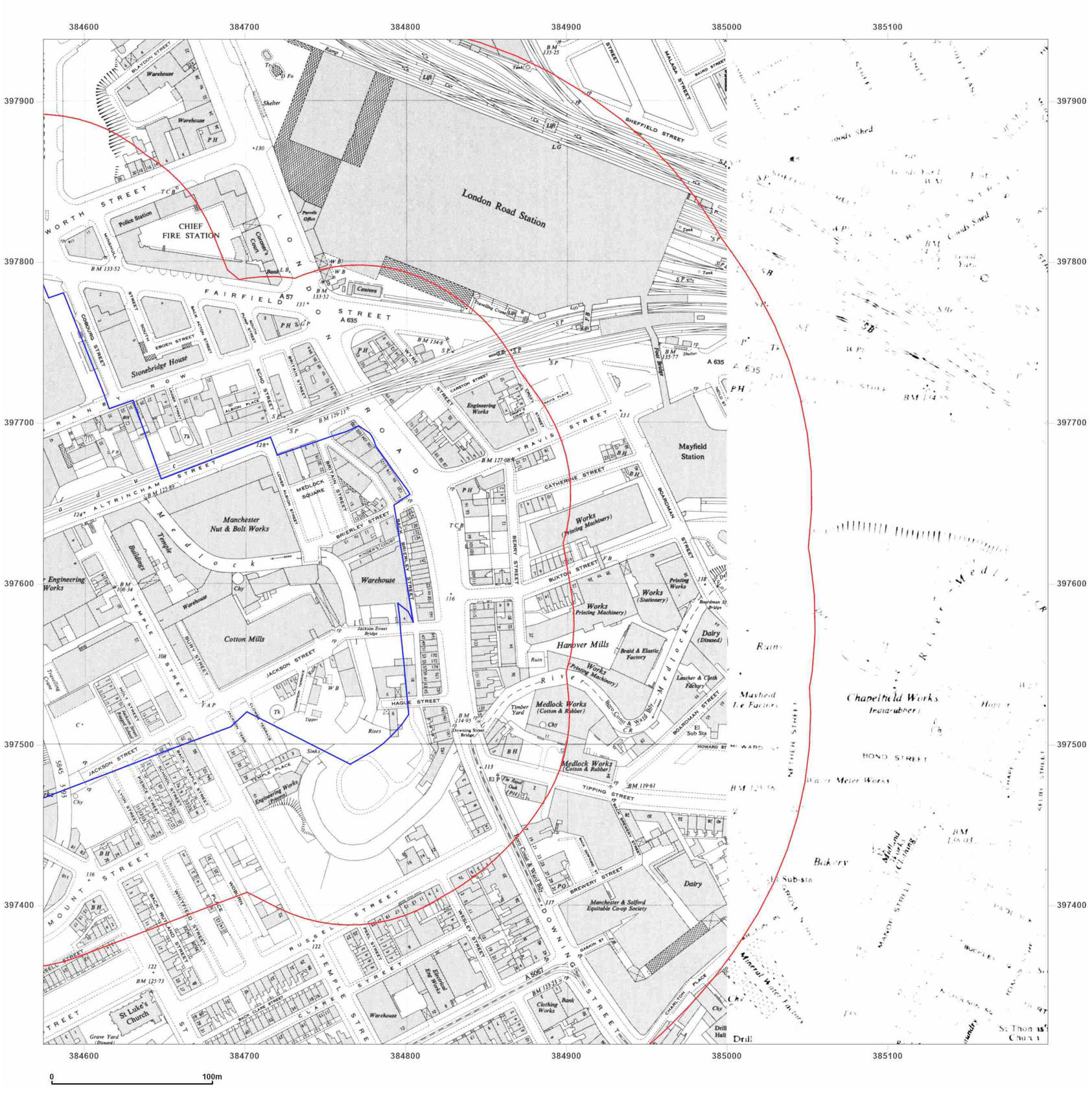

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: National Grid

Map date: **1950-1955**

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 1948 Edition 1950 Copyright N/A Levelled N/A

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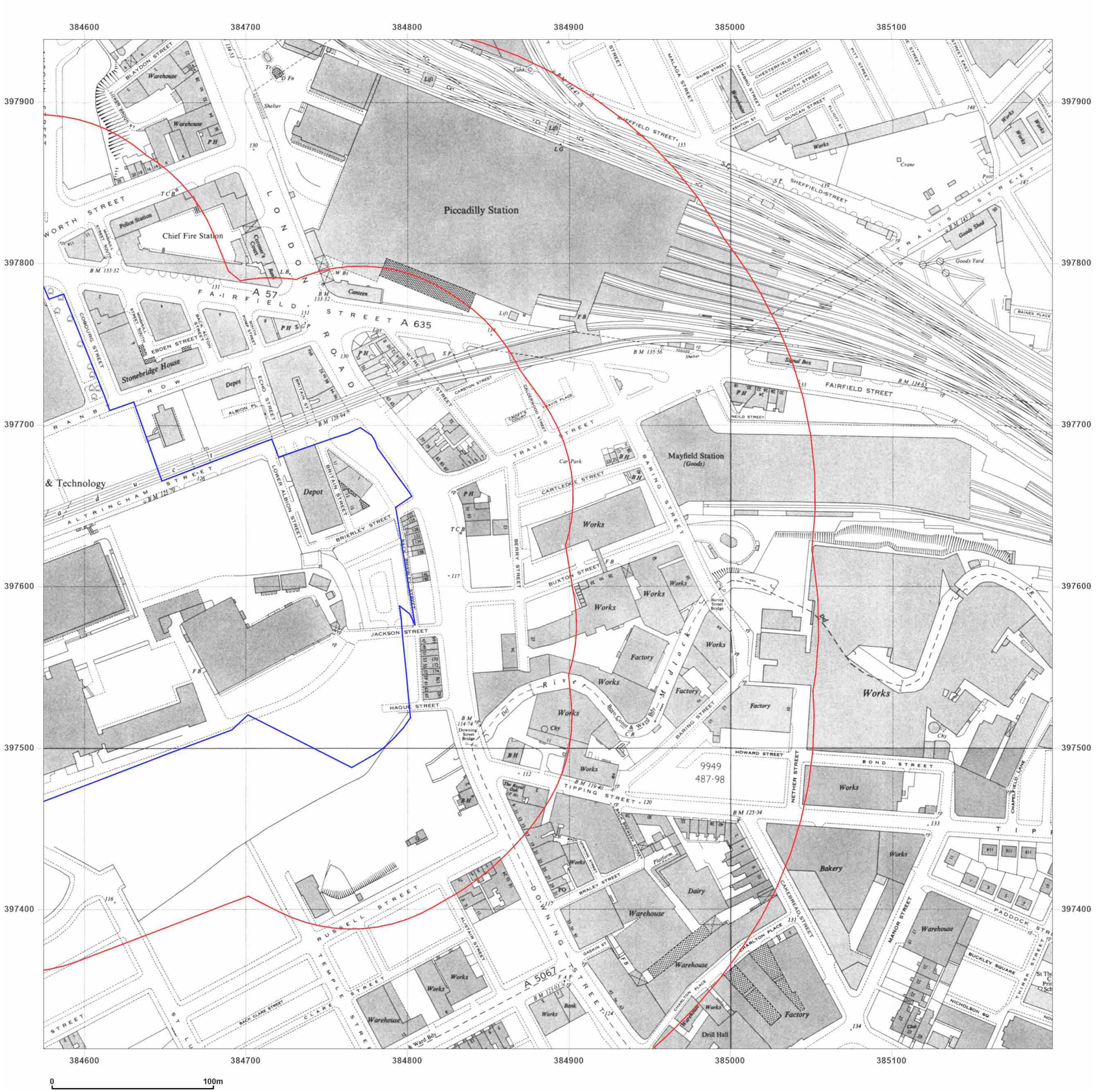

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: National Grid

Map date: **1965**

Scale: 1:2,500

Printed at: 1:2,500

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

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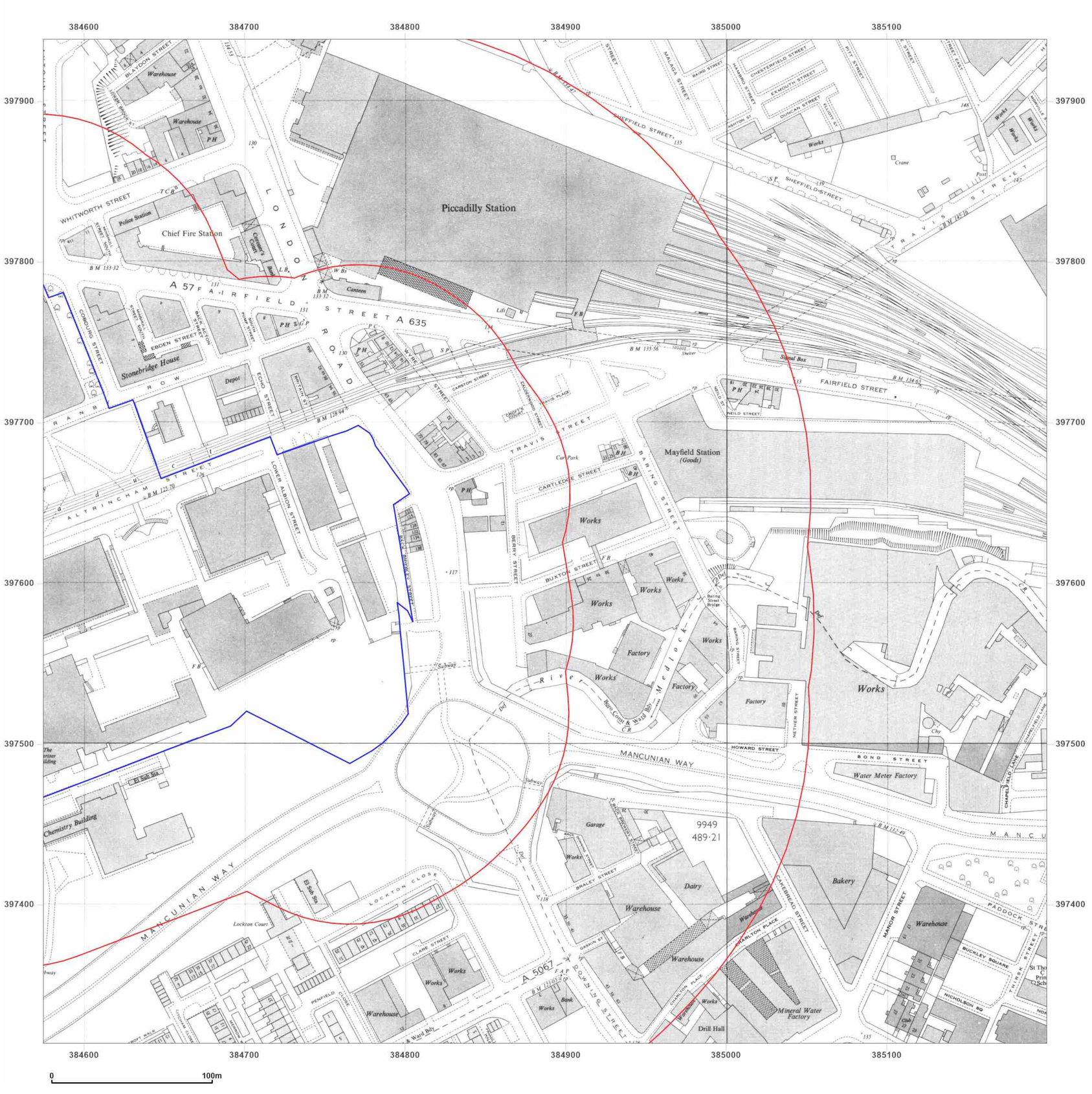

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

Map Name: National Grid

Map date: **1968**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1968
Revised 1968
Edition N/A
Copyright 1970
Levelled 1964

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_LS_2_1
Grid Ref: 384887, 397626

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
Copyright N/A
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
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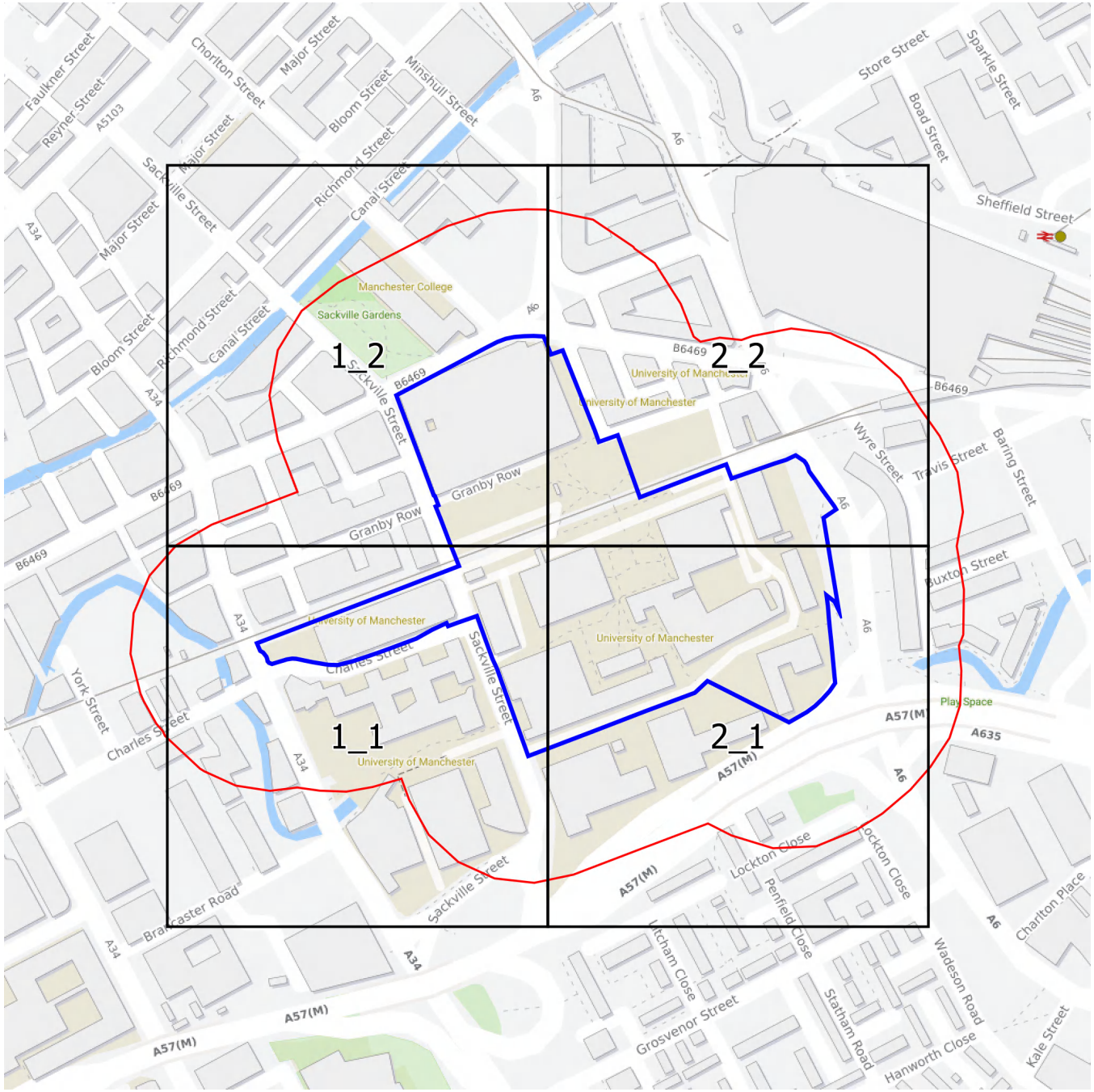

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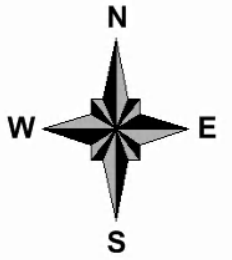

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Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_Landline_1_1
Grid Ref: 384425, 397476

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: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_Landline_1_2
Grid Ref: 384425, 397776

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

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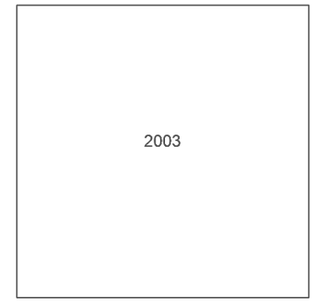

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Production date: 20 December 2023

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www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_Landline_2_1
Grid Ref: 384725, 397476

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

N
W E
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2003

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Production date: 20 December 2023

Map legend available at:
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Groundsure INSIGHTS

Site Details:

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Client Ref: 51019
Report Ref: GS-HY9-X9N-Y4U-4G4_Landline_2_2
Grid Ref: 384725, 397776

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

N
W E
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2003

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Production date: 20 December 2023

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Appendix C

Groundsure Enviro + Geo Insight Report

Groundsure
LOCATION INTELLIGENCE

Enviro+Geo
Insight

THE UNIVERSITY OF MANCHESTER, SACKVILLE STREET, MANCHESTER, M1 3AL

Order Details

Date: 20/12/2023

Your ref: 51019

Our Ref: GS-WMF-IWB-AR5-25A

Site Details

Location: 384630 397614

Area: 7.38 ha

Authority: Manchester City Council ↗

Summary of findings p. 2 >

OS MasterMap site plan p.14 >

Aerial image p. 9 >

groundsure.com/insightuserguide ↗

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Certified B Corporation

Summary of findings

Page	Section	Past land use >	On site	0-50m	50-250m	250-500m	500-2000m
15 >	1.1 >	Historical industrial land uses >	10	27	78	85	-
23 >	1.2 >	Historical tanks >	1	11	63	46	-
27 >	1.3 >	Historical energy features >	0	2	10	19	-
29	1.4	Historical petrol stations	0	0	0	0	-
29 >	1.5 >	Historical garages >	1	2	16	22	-
31	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
32 >	2.1 >	Historical industrial land uses >	15	41	121	130	-
44 >	2.2 >	Historical tanks >	2	15	82	83	-
50 >	2.3 >	Historical energy features >	0	6	24	53	-
54	2.4	Historical petrol stations	0	0	0	0	-
54 >	2.5 >	Historical garages >	2	10	38	48	-
Page	Section	Waste and landfill >	On site	0-50m	50-250m	250-500m	500-2000m
58	3.1	Active or recent landfill	0	0	0	0	-
58	3.2	Historical landfill (BGS records)	0	0	0	0	-
59	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
59	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
59 >	3.5 >	Historical waste sites >	0	0	0	9	-
60 >	3.6 >	Licensed waste sites >	0	0	0	8	-
63 >	3.7 >	Waste exemptions >	0	0	7	24	-
Page	Section	Current industrial land use >	On site	0-50m	50-250m	250-500m	500-2000m
66 >	4.1 >	Recent industrial land uses >	0	2	35	-	-
69 >	4.2 >	Current or recent petrol stations >	0	0	0	1	-
69	4.3	Electricity cables	0	0	0	0	-
69	4.4	Gas pipelines	0	0	0	0	-
70	4.5	Sites determined as Contaminated Land	0	0	0	0	-

70	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
70	4.7	Regulated explosive sites	0	0	0	0	-
70	4.8	Hazardous substance storage/usage	0	0	0	0	-
70	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
71	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
71 >	4.11 >	Licensed pollutant release (Part A(2)/B) >	0	0	0	1	-
71 >	4.12 >	Radioactive Substance Authorisations >	2	6	0	6	-
73 >	4.13 >	Licensed Discharges to controlled waters >	0	17	30	6	-
81	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
81	4.15	Pollutant release to public sewer	0	0	0	0	-
81	4.16	List 1 Dangerous Substances	0	0	0	0	-
82	4.17	List 2 Dangerous Substances	0	0	0	0	-
82 >	4.18 >	Pollution Incidents (EA/NRW) >	0	0	3	4	-
83	4.19	Pollution inventory substances	0	0	0	0	-
83	4.20	Pollution inventory waste transfers	0	0	0	0	-
83	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology >	On site	0-50m	50-250m	250-500m	500-2000m
84 >	5.1 >	Superficial aquifer >	Identified (within 500m)				
86 >	5.2 >	Bedrock aquifer >	Identified (within 500m)				
88 >	5.3 >	Groundwater vulnerability >	Identified (within 50m)				
89	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
89	5.5	Groundwater vulnerability- local information	None (within 0m)				
90 >	5.6 >	Groundwater abstractions >	0	0	2	6	51
105 >	5.7 >	Surface water abstractions >	0	0	0	0	2
106 >	5.8 >	Potable abstractions >	0	0	0	0	9
109 >	5.9 >	Source Protection Zones >	0	0	0	1	-
109	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology >	On site	0-50m	50-250m	250-500m	500-2000m
110 >	6.1 >	Water Network (OS MasterMap) >	2	3	13	-	-

112 >	6.2 >	Surface water features >	0	3	10	-	-
112 >	6.3 >	WFD Surface water body catchments >	1	-	-	-	-
113 >	6.4 >	WFD Surface water bodies >	1	0	1	-	-
113 >	6.5 >	WFD Groundwater bodies >	1	-	-	-	-
Page	Section	River and coastal flooding >	On site	0-50m	50-250m	250-500m	500-2000m
114 >	7.1 >	Risk of flooding from rivers and the sea >	High (within 50m)				
115 >	7.2 >	Historical Flood Events >	0	0	2	-	-
115	7.3	Flood Defences	0	0	0	-	-
115	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
116	7.5	Flood Storage Areas	0	0	0	-	-
117 >	7.6 >	Flood Zone 2 >	Identified (within 50m)				
118 >	7.7 >	Flood Zone 3 >	Identified (within 50m)				
Page	Section	Surface water flooding >					
119 >	8.1 >	Surface water flooding >	1 in 30 year, Greater than 1.0m (within 50m)				
Page	Section	Groundwater flooding >					
121 >	9.1 >	Groundwater flooding >	High (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
122	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
122	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
122	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
122	10.4	Special Protection Areas (SPA)	0	0	0	0	0
123	10.5	National Nature Reserves (NNR)	0	0	0	0	0
123	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
123	10.7	Designated Ancient Woodland	0	0	0	0	0
123	10.8	Biosphere Reserves	0	0	0	0	0
124	10.9	Forest Parks	0	0	0	0	0
124	10.10	Marine Conservation Zones	0	0	0	0	0
124	10.11	Green Belt	0	0	0	0	0
124	10.12	Proposed Ramsar sites	0	0	0	0	0

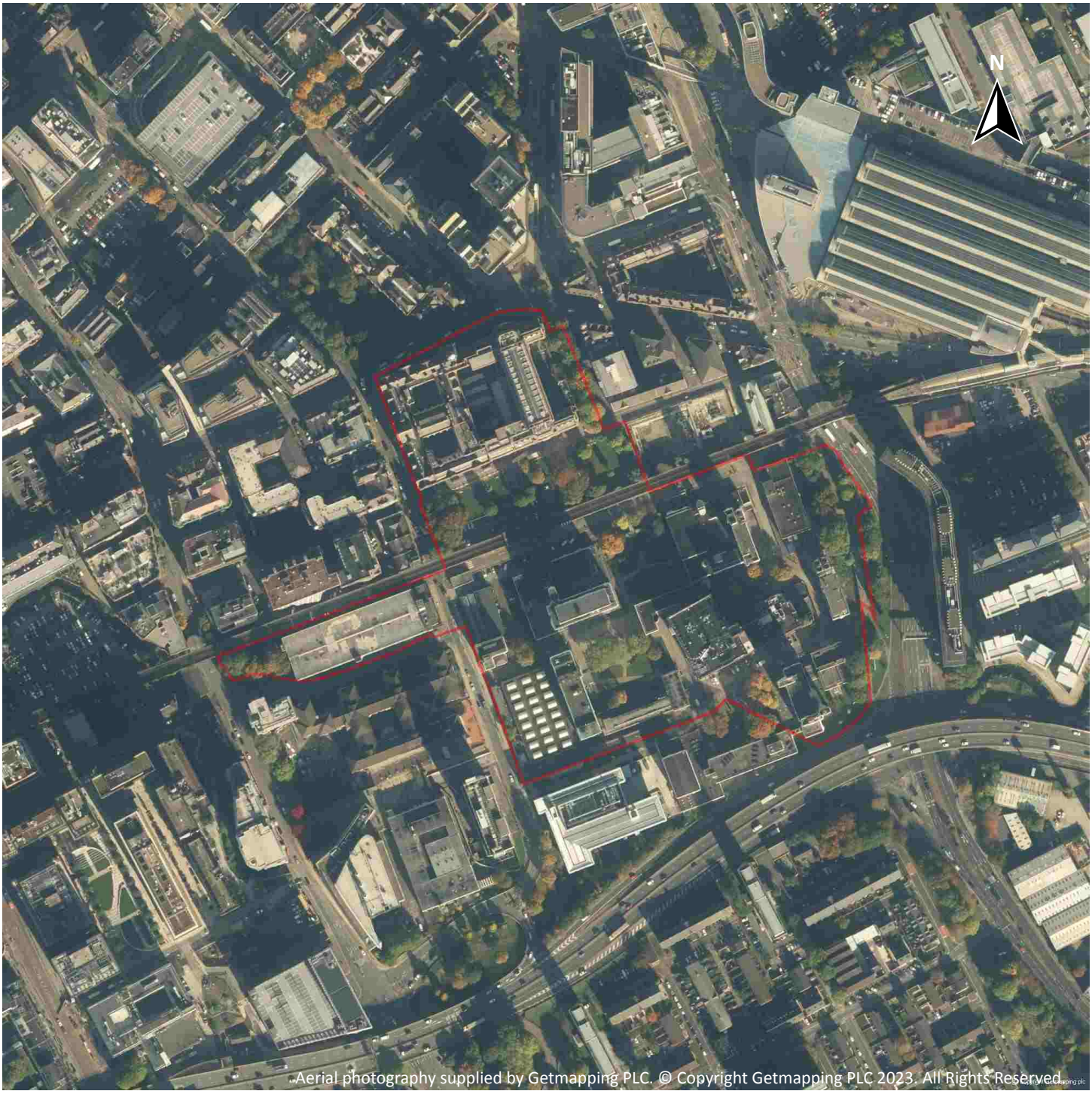
124	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
125	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
125	10.15	Nitrate Sensitive Areas	0	0	0	0	0
125 >	10.16 >	Nitrate Vulnerable Zones >	0	0	0	0	4
126 >	10.17 >	SSSI Impact Risk Zones >	1	-	-	-	-
127	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations >	On site	0-50m	50-250m	250-500m	500-2000m
128	11.1	World Heritage Sites	0	0	0	-	-
129	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
129	11.3	National Parks	0	0	0	-	-
129 >	11.4 >	Listed Buildings >	2	3	41	-	-
131 >	11.5 >	Conservation Areas >	1	0	0	-	-
132	11.6	Scheduled Ancient Monuments	0	0	0	-	-
132	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations >	On site	0-50m	50-250m	250-500m	500-2000m
133 >	12.1 >	Agricultural Land Classification >	Urban (within 250m)				
134	12.2	Open Access Land	0	0	0	-	-
134	12.3	Tree Felling Licences	0	0	0	-	-
134	12.4	Environmental Stewardship Schemes	0	0	0	-	-
134	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
135	13.1	Priority Habitat Inventory	0	0	0	-	-
135	13.2	Habitat Networks	0	0	0	-	-
135	13.3	Open Mosaic Habitat	0	0	0	-	-
135	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
136 >	14.1 >	10k Availability >	Identified (within 500m)				
137 >	14.2 >	Artificial and made ground (10k) >	1	0	1	3	-
139 >	14.3 >	Superficial geology (10k) >	2	0	2	3	-

140	14.4	Landslip (10k)	0	0	0	0	-
141 >	14.5 >	Bedrock geology (10k) >	1	0	1	3	-
142 >	14.6 >	Bedrock faults and other linear features (10k) >	1	0	0	4	-
Page	Section	**Geology 1:50,000 scale >**	On site	0-50m	50-250m	250-500m	500-2000m
143 >	15.1 >	50k Availability >	Identified (within 500m)				
144 >	15.2 >	Artificial and made ground (50k) >	1	0	0	0	-
145 >	15.3 >	Artificial ground permeability (50k) >	1	0	-	-	-
146 >	15.4 >	Superficial geology (50k) >	2	0	0	2	-
147 >	15.5 >	Superficial permeability (50k) >	Identified (within 50m)				
147	15.6	Landslip (50k)	0	0	0	0	-
147	15.7	Landslip permeability (50k)	None (within 50m)				
148 >	15.8 >	Bedrock geology (50k) >	1	0	0	2	-
149 >	15.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
149 >	15.10 >	Bedrock faults and other linear features (50k) >	1	0	0	2	-
Page	Section	**Boreholes >**	On site	0-50m	50-250m	250-500m	500-2000m
150 >	16.1 >	BGS Boreholes >	20	19	117	-	-
Page	Section	**Natural ground subsidence >**					
159 >	17.1 >	Shrink swell clays >	Very low (within 50m)				
160 >	17.2 >	Running sands >	Very low (within 50m)				
161 >	17.3 >	Compressible deposits >	Very low (within 50m)				
162 >	17.4 >	Collapsible deposits >	Very low (within 50m)				
163 >	17.5 >	Landslides >	Very low (within 50m)				
164 >	17.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				
Page	Section	**Mining and ground workings >**	On site	0-50m	50-250m	250-500m	500-2000m
166	18.1	BritPits	0	0	0	0	-
167 >	18.2 >	Surface ground workings >	0	2	12	-	-
167	18.3	Underground workings	0	0	0	0	0
168	18.4	Underground mining extents	0	0	0	0	-
168	18.5	Historical Mineral Planning Areas	0	0	0	0	-

168	18.6	Non-coal mining	0	0	0	0	0
168 >	18.7 >	JPB mining areas >	Identified (within 0m)				
169	18.8	The Coal Authority non-coal mining	0	0	0	0	-
169	18.9	Researched mining	0	0	0	0	-
169	18.10	Mining record office plans	0	0	0	0	-
169	18.11	BGS mine plans	0	0	0	0	-
170 >	18.12 >	Coal mining >	Identified (within 0m)				
170	18.13	Brine areas	None (within 0m)				
170	18.14	Gypsum areas	None (within 0m)				
170	18.15	Tin mining	None (within 0m)				
170	18.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes >	On site	0-50m	50-250m	250-500m	500-2000m
171	19.1	Natural cavities	0	0	0	0	-
172 >	19.2 >	Mining cavities >	0	0	0	1	0
172 >	19.3 >	Reported recent incidents >	0	0	0	1	-
173	19.4	Historical incidents	0	0	0	0	-
173	19.5	National karst database	0	0	0	0	-
Page	Section	Radon >					
174 >	20.1 >	Radon >	Less than 1% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
176 >	21.1 >	BGS Estimated Background Soil Chemistry >	7	3	-	-	-
177 >	21.2 >	BGS Estimated Urban Soil Chemistry >	17	10	-	-	-
178 >	21.3 >	BGS Measured Urban Soil Chemistry >	0	1	-	-	-
Page	Section	Railway infrastructure and projects >	On site	0-50m	50-250m	250-500m	500-2000m
179	22.1	Underground railways (London)	0	0	0	-	-
179	22.2	Underground railways (Non-London)	0	0	0	-	-
180 >	22.3 >	Railway tunnels >	0	0	1	-	-
180 >	22.4 >	Historical railway and tunnel features >	8	19	82	-	-
184	22.5	Royal Mail tunnels	0	0	0	-	-

184 >	22.6 >	Historical railways >	0	0	5	-	-
185 >	22.7 >	Railways >	3	10	70	-	-
188	22.8	Crossrail 1	0	0	0	0	-
188	22.9	Crossrail 2	0	0	0	0	-
188 >	22.10 >	HS2 >	0	0	0	4	-

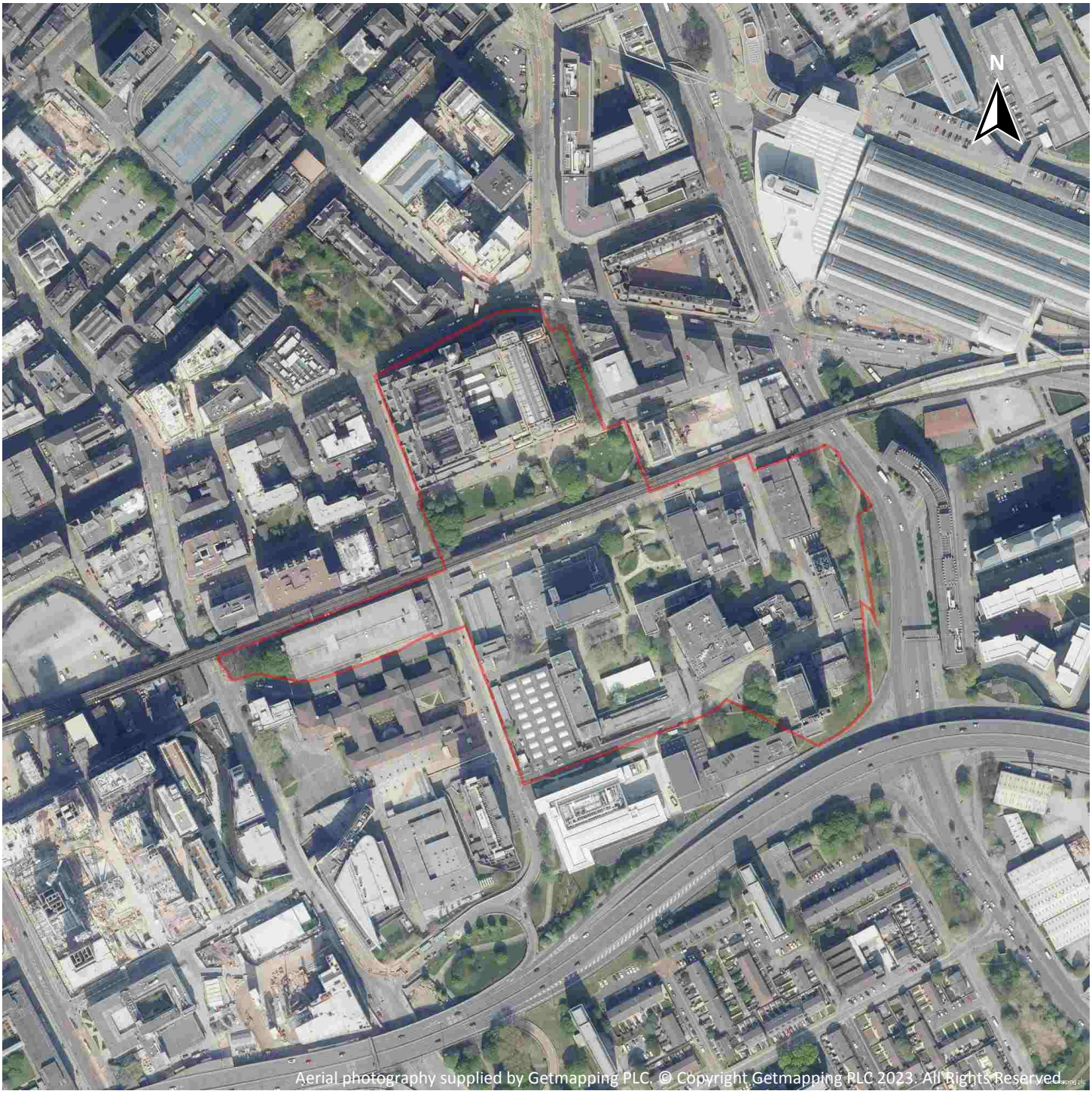
Recent aerial photograph



Capture Date: 18/10/2022

Site Area: 7.38ha

Recent site history - 2019 aerial photograph



Capture Date: 22/04/2019

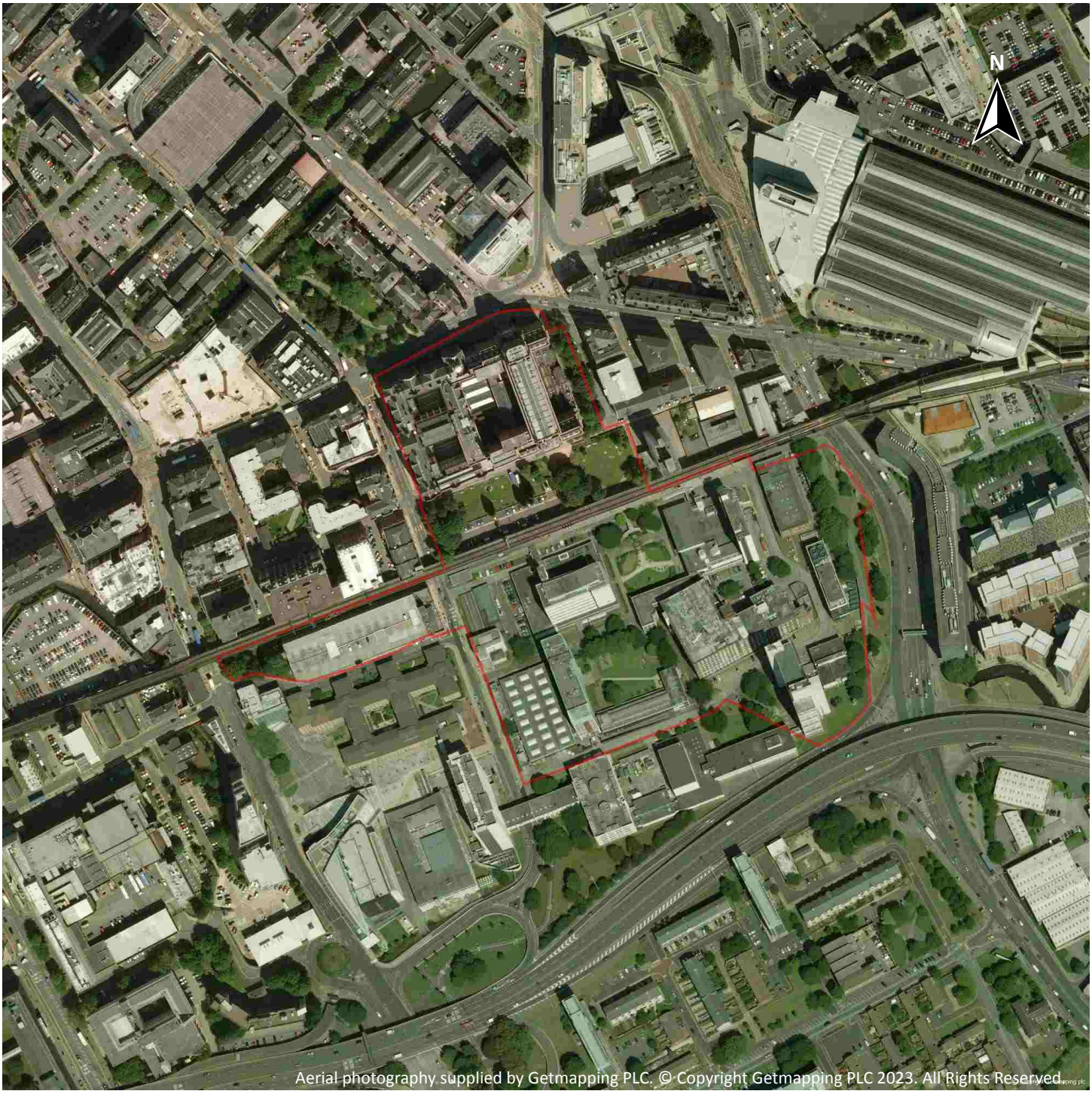
Site Area: 7.38ha

Recent site history - 2015 aerial photograph

Capture Date: 11/06/2015

Site Area: 7.38ha

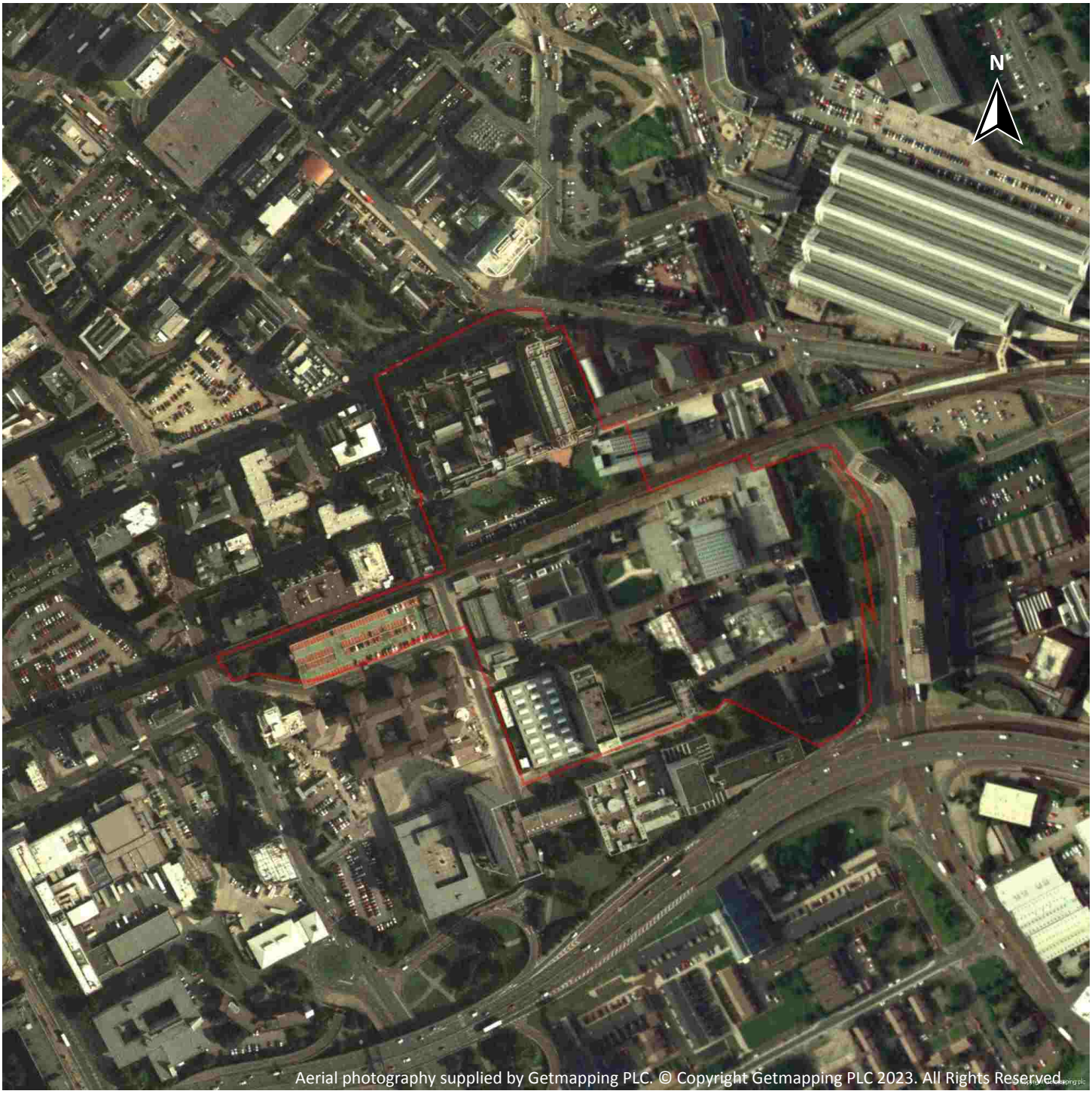
Recent site history - 2009 aerial photograph



Capture Date: 02/06/2009

Site Area: 7.38ha

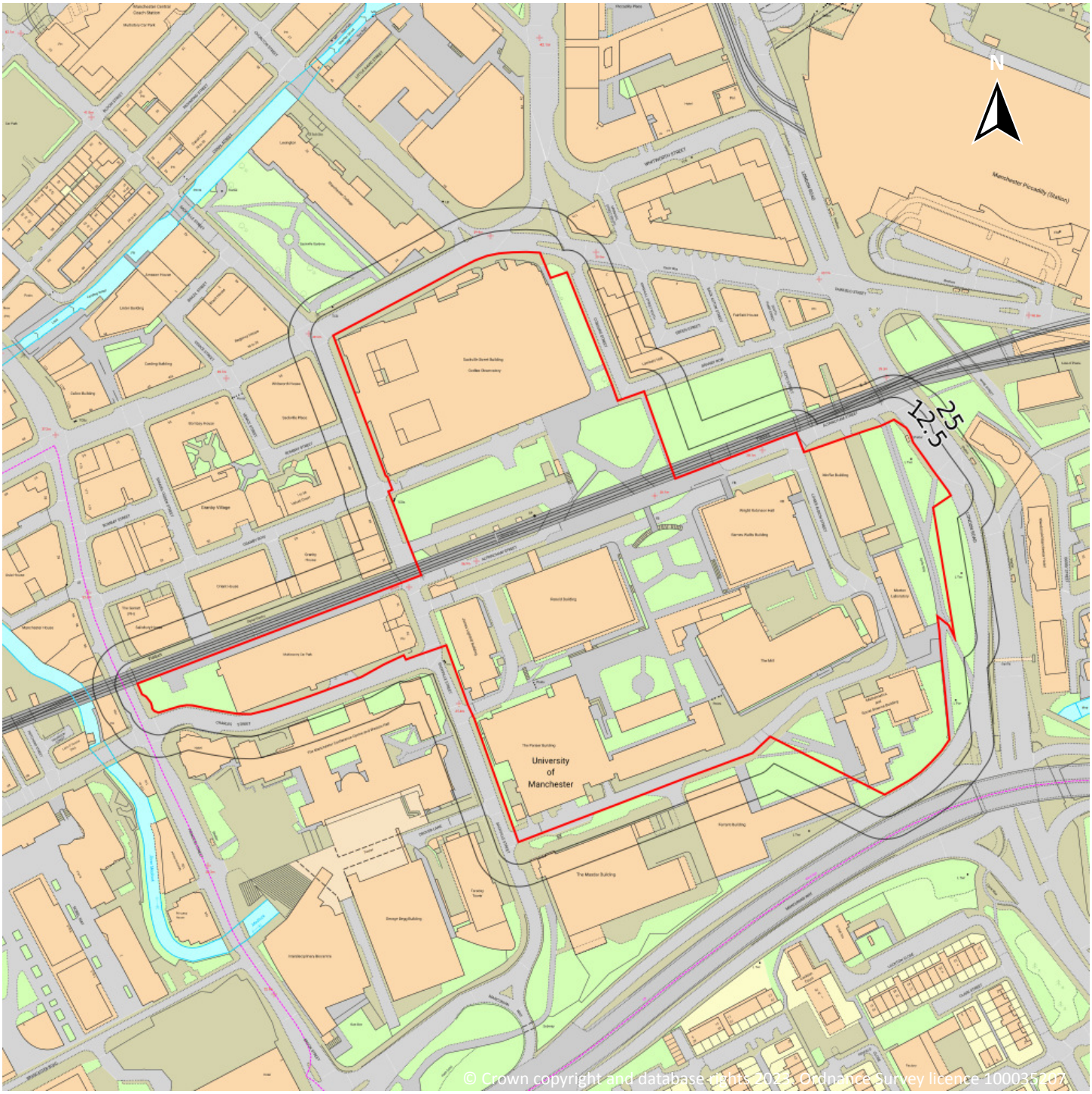
Recent site history - 2000 aerial photograph



Capture Date: 27/06/2000

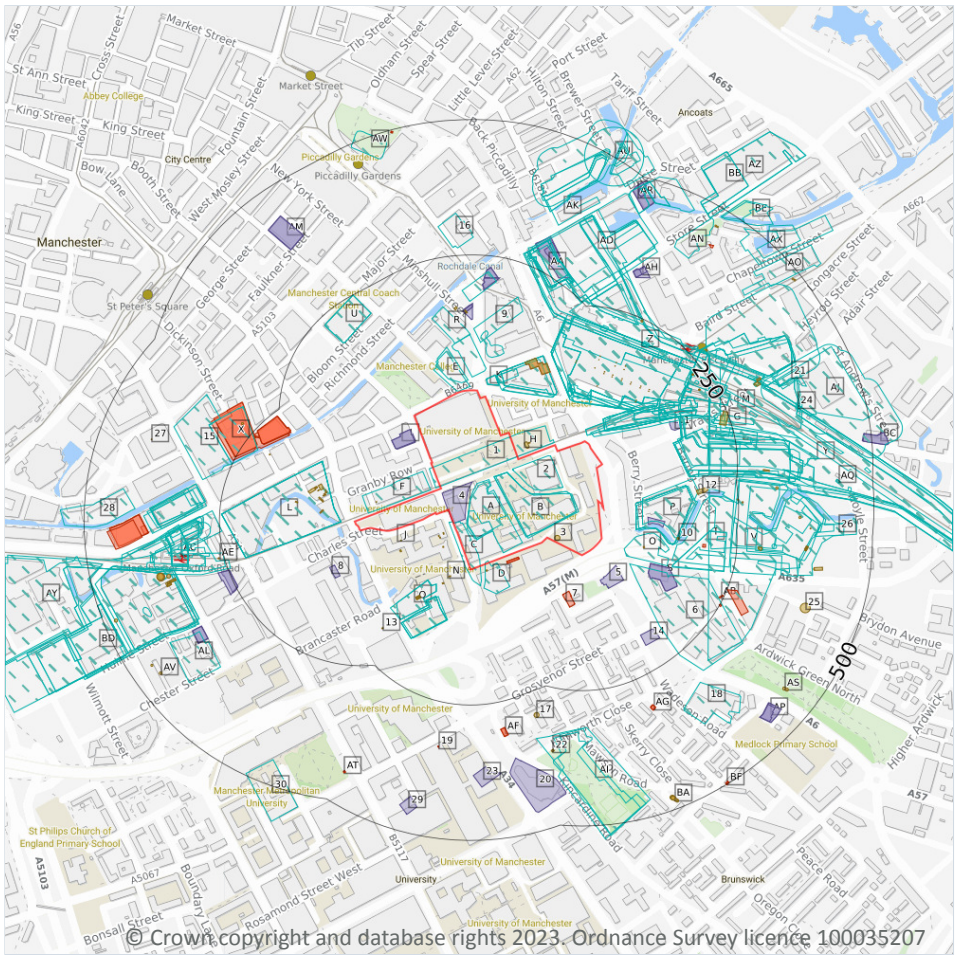
Site Area: 7.38ha

OS MasterMap site plan



Site Area: 7.38ha

1 Past land use



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

1.1 Historical industrial land uses

Records within 500m	200

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 15 >**

ID	Location	Land use	Dates present	Group ID
1	**On site**	**Unspecified Commercial/Industrial**	**1923**	**796723**

ID	Location	Land use	Dates present	Group ID
2	**On site**	**Unspecified Works**	**1915 - 1923**	**934829**
A	**On site**	**Iron Works**	**1890**	**822793**
A	**On site**	**Unspecified Works**	**1915 - 1923**	**954702**
A	**On site**	**Railway Sidings**	**1915 - 1923**	**959198**
B	**On site**	**Unspecified Mills**	**1934 - 1938**	**854159**
B	**On site**	**Unspecified Mills**	**1923**	**914258**
B	**On site**	**Unspecified Mills**	**1915**	**967472**
C	**On site**	**Unspecified Works**	**1915 - 1923**	**951103**
D	**On site**	**Unspecified Works**	**1915 - 1923**	**972915**
E	2m NW	Unspecified Wharf	1890	826601
F	5m W	Unspecified Commercial/Industrial	1923	796719
G	12m NE	Railway Sidings	1915	849007
G	12m NE	Railway Sidings	1934 - 1938	899923
E	16m N	Ice Works	1915	808540
G	17m NE	Railway Sidings	1890 - 1905	979002
K	23m N	Police Station	1985 - 1994	879174
K	23m N	Police Station	1971	907595
K	23m N	Police Station	1978	978804
E	25m N	Unspecified Works	1923	830436
L	26m W	Unspecified Mills	1916	861845
L	26m W	Unspecified Commercial/Industrial	1923	874542
L	26m W	Unspecified Commercial/Industrial	1905	968335
L	26m W	Unspecified Mills	1932 - 1938	989884
G	31m NE	Railway Sidings	1923	879517
K	32m N	Fire Station	1934 - 1938	857211
K	35m N	Fire Engine Station	1915 - 1923	869627
K	37m N	Police Station	1915 - 1923	846961
G	38m NE	Railway Sidings	1994	844263

ID	Location	Land use	Dates present	Group ID
G	38m NE	Railway Sidings	1971	884730
M	38m NE	Railway Sidings	1985 - 1988	878187
M	38m NE	Railway Sidings	1978	900007
K	41m N	Fire Station	1985 - 1994	864327
K	41m N	Fire Station	1978	872224
K	41m N	Fire Station	1956 - 1971	924791
G	44m NE	Railway Sidings	1956	950162
O	46m SE	Unspecified Works	1915 - 1923	861369
P	60m E	Unspecified Mill	1915	857457
P	60m E	Unspecified Mill	1934	945749
P	60m E	Unspecified Mills	1938	979357
P	60m E	Unspecified Mills	1890	989407
P	62m E	Unspecified Mill	1923	919594
E	67m N	Unspecified Ground Workings	1934 - 1938	906423
Q	69m SW	Unspecified Works	1915	929652
6	69m SE	Unspecified Commercial/Industrial	1923	847885
Q	69m SW	Unspecified Works	1923	932223
G	70m NE	Railway Buildings	1923	833658
P	73m E	Cotton Mill	1851	797897
G	77m NE	Railway Station	1985 - 1994	890876
G	77m NE	Railway Station	1971	897274
G	77m NE	Railway Station	1978	897926
G	77m NE	Railway Station	1923	941202
G	77m NE	Railway Station	1890 - 1905	959335
Q	78m SW	Unspecified Mills	1923	975952
Q	81m SW	Unspecified Mills	1890	858454
Q	81m SW	Unspecified Mills	1915	960133
Q	81m SW	Unspecified Mills	1934 - 1938	967294

ID	Location	Land use	Dates present	Group ID
G	82m NE	Railway Stations	1915	887476
G	82m NE	Railway Stations	1934 - 1938	900032
G	89m NE	Railway Station	1956	935665
R	89m N	Unspecified Wharf	1915 - 1923	848098
9	89m N	Unspecified Mill	1915 - 1923	946972
G	95m NE	Railway Building	1985 - 1994	978063
G	95m NE	Railway Building	1978	955370
G	95m NE	Railway Building	1971	985873
K	99m N	Police Station	1934 - 1938	903287
T	136m SE	Dye Works	1851	833960
G	140m E	Railway Station	1923	871349
T	140m SE	Unspecified Works	1923	968971
T	141m SE	Unspecified Works	1915	858353
G	147m E	Railway Station	1956	949532
G	151m E	Railway Station	1988 - 1994	979216
G	156m NE	Railway Station	1851	942543
R	165m N	Unspecified Works	1915 - 1923	898319
G	168m NE	Railway Sidings	1851	923729
U	186m NW	Bus Station	1978	884077
U	186m NW	Bus Station	1985 - 1994	952978
G	194m E	Railway Building	1934 - 1938	983618
V	196m E	Unspecified Commercial/Industrial	1956	930471
W	196m E	Unspecified Works	1968	976597
G	198m E	Goods Station	1978	858349
G	198m E	Railway Station	1956	989397
G	199m E	Railway Building	1915	940308
G	200m E	Railway Station	1968	981899
Y	204m E	Railway Sidings	1968	889807

ID	Location	Land use	Dates present	Group ID
Z	206m NE	Railway Building	1934 - 1938	893266
G	206m NE	Railway Building	1905 - 1938	893315
G	207m E	Railway Building	1956 - 1968	855450
Z	208m NE	Railway Building	1905 - 1923	924355
G	208m E	Railway Building	1978	874711
G	216m E	Police Station	1851	832592
G	217m E	Railway Building	1915 - 1938	865882
G	220m E	Goods Station	1985 - 1991	980310
X	222m W	Electricity Station	1916 - 1923	992043
G	224m E	Railway Building	1956	917214
AA	225m N	Railway Building	1890	820433
G	225m NE	Railway Building	1923	820444
Y	228m E	Railway Sidings	1985 - 1991	932616
G	229m E	Railway Station	1978	851643
G	229m E	Railway Station	1968	921332
G	230m NE	Railway Buildings	1923	833663
AA	233m N	Goods Shed	1915	885654
AA	233m N	Goods Shed	1934 - 1938	924820
G	233m NE	Grain Store	1915 - 1923	946860
G	235m E	Railway Building	1968 - 1978	934108
G	236m NE	Railway Building	1938	820435
AA	236m N	Goods Shed	1905	923774
AA	236m N	Goods Shed	1923	979300
V	240m E	Unspecified Works	1915 - 1923	967647
V	242m E	Unspecified Works	1915 - 1923	979112
W	244m E	Unspecified Works	1978	980989
AC	244m W	Railway Sidings	1905 - 1938	864885
AD	245m N	Unspecified Commercial/Industrial	1956	796797

ID	Location	Land use	Dates present	Group ID
AC	246m W	Gas Works	1851	802208
AD	248m NE	Goods Station	1890 - 1938	979048
AC	250m W	Railway Sidings	1985 - 1994	928139
15	251m W	Unspecified Commercial/Industrial	1923	796724
G	253m NE	Railway Building	1956	820448
16	264m N	Infirmary	1915 - 1923	975872
AC	267m W	Tanks	1851	832185
V	267m E	Unspecified Works	1985 - 1991	854217
G	269m NE	Goods Yard	1934 - 1938	929364
G	272m NE	Goods Yard	1915 - 1923	898838
G	274m NE	Unspecified Depot	1991	962321
AC	275m W	Railway Station	1956	923967
AC	275m W	Hospital	1916	938342
AC	278m W	Hospital	1956 - 1971	915521
AC	278m W	Hospital	1978	957282
AC	279m W	Railway Station	1988 - 1994	912150
AC	282m W	Hospital	1923	848326
AC	282m W	Hospital	1932 - 1938	949847
AC	282m W	Railway Building	1956	820261
AC	282m W	Railway Station	1896	887032
AC	284m W	Railway Station	1905 - 1938	962635
V	285m E	Dye Works	1851	833959
G	287m E	Railway Building	1923	820449
AC	290m W	Coal Wharf	1851	794097
V	291m E	Unspecified Tank	1915 - 1923	921963
V	292m E	Unspecified Station	1991	843724
AC	311m W	Railway Station	1971	960776
AC	311m W	Railway Station	1985	962611

ID	Location	Land use	Dates present	Group ID
AC	311m W	Railway Station	1978	981767
G	313m NE	Railway Building	1923	820447
V	315m E	Unspecified Tank	1915 - 1923	968563
18	317m SE	Tyre Works	1915 - 1923	987255
G	318m E	Smithy	1915	843312
AI	318m S	Cemetery	1851	948454
AI	320m S	Cemetery	1956	980504
AJ	322m E	Unspecified Depot	1985	849011
AI	326m S	Cemetery	1890 - 1938	877404
AJ	331m E	Goods Yard	1968	811695
AC	336m W	Railway Sidings	1896	989778
AC	337m W	Unspecified Works	1985 - 1994	862878
AC	337m W	Unspecified Works	1978	976366
AK	340m N	Unspecified Warehouse	1923	807197
AC	341m W	Rubber Works	1916	915281
AC	342m SW	Unspecified Commercial/Industrial	1896	857423
AC	347m W	Rubber Works	1923 - 1938	926915
AC	347m W	Unspecified Commercial/Industrial	1905	944072
AL	348m SW	Unspecified Mills	1916 - 1923	874195
AK	357m N	Unspecified Warehouses	1915	933374
AK	357m N	Unspecified Warehouses	1934 - 1938	964840
21	358m E	Smithy	1923	843313
AC	361m W	Unspecified Tank	1896	825247
AK	362m N	Unspecified Wharf	1956	971868
AK	371m N	Unspecified Wharf	1890 - 1923	976213
24	372m E	Railway Building	1923	820446
AK	378m N	Unspecified Wharf	1934	971276
AN	389m NE	Unspecified Ground Workings	1851	800647

ID	Location	Land use	Dates present	Group ID
26	393m E	Brewery	1915 - 1923	932621
Y	397m E	Railway Buildings	1923	833659
AO	398m NE	Unspecified Works	1968	830437
28	406m W	Corporation Yard	1905 - 1938	920120
AC	413m W	Unspecified Tanks	1851	815405
AQ	432m E	Railway Building	1923	820268
AR	432m NE	Unspecified Wharf	1915	900362
AR	432m NE	Unspecified Wharf	1934 - 1938	933593
AU	446m N	Unspecified Wharf	1923	869878
AQ	453m E	Railway Building	1923	820267
30	454m SW	Hospital	1971	834385
AW	455m N	Unspecified Pit	1956	840494
AQ	456m E	Railway Building	1923	820266
AX	457m NE	Unspecified Works	1923	970752
AR	458m NE	Unspecified Wharf	1923	938827
AU	465m NE	Unspecified Mills	1915 - 1923	891864
AU	470m N	Unspecified Wharf	1934 - 1938	892116
AX	471m NE	Unspecified Works	1968	872464
AY	473m W	Unspecified Commercial/Industrial	1956	976686
AZ	473m NE	Unspecified Disused Foundry	1890	794069
AZ	473m NE	Clothing Foundry	1905	817104
BB	477m NE	Clothing Factory	1934 - 1938	898959
BB	477m NE	Clothing Factory	1915	930283
AY	478m W	Unspecified Commercial/Industrial	1851 - 1896	849974
BD	483m SW	Unspecified Works	1978	865006
BD	483m SW	Unspecified Works	1985 - 1994	927569
BE	484m NE	Unspecified Workshop	1923	811070
AQ	485m E	Railway Building	1923	820269

ID	Location	Land use	Dates present	Group ID
BE	485m NE	Unspecified Works	1915	830439
BD	485m SW	Rubber Works	1956	849382
AU	487m N	Unspecified Wharf	1915	974633

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**121**

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 15 >**

ID	Location	Land use	Dates present	Group ID
3	**On site**	**Unspecified Tank**	**1952 - 1955**	**131015**
D	11m S	Unspecified Tank	1889 - 1908	134036
H	13m NE	Unspecified Tank	1952 - 1955	134489
F	19m W	Unspecified Tank	1891	115946
H	20m NE	Unspecified Tank	1891	115938
J	23m SW	Unspecified Tank	1891	115941
C	23m SW	Unspecified Tank	1891	115944
C	32m SW	Unspecified Tank	1891	115945
C	33m SW	Unspecified Tank	1891	115943
C	33m SW	Unspecified Tank	1891	115942
N	39m SW	Unspecified Tank	1891	115939
J	39m SW	Unspecified Tank	1891	115940
N	55m SW	Tanks	1891	106779
L	61m W	Tanks	1891	106787
L	69m W	Tanks	1891	106786

ID	Location	Land use	Dates present	Group ID
L	72m W	Unspecified Tank	1891	115948
L	73m W	Unspecified Tank	1891	115958
L	74m W	Unspecified Tank	1891 - 1893	141146
L	74m W	Unspecified Tank	1891	115959
L	77m W	Unspecified Tank	1891	115947
O	78m SE	Unspecified Tank	1908	115937
L	79m W	Unspecified Tank	1891	115949
L	84m W	Unspecified Tank	1891	115962
L	88m W	Unspecified Tank	1891	115961
L	93m W	Unspecified Tank	1891	115960
L	93m W	Tanks	1891	106792
L	93m W	Unspecified Tank	1893	115963
K	96m N	Gas Meter Testing Station	1948	120722
G	104m NE	Unspecified Tank	1891	115926
Q	106m SW	Tanks	1962 - 1969	129099
Q	106m SW	Unspecified Tank	1950 - 1953	134156
Q	106m SW	Unspecified Tank	1955	144222
Q	106m SW	Unspecified Tank	1948	137703
L	111m W	Tanks	1891	106782
G	116m NE	Unspecified Tank	1891	115936
G	119m NE	Unspecified Tank	1891	115934
G	129m NE	Unspecified Tank	1891	115925
G	130m NE	Unspecified Tank	1891	115923
G	131m NE	Unspecified Tank	1891	115927
G	133m NE	Unspecified Tank	1891	115921
G	133m NE	Unspecified Tank	1891	115924
G	134m NE	Unspecified Tank	1891	115928
G	134m NE	Unspecified Tank	1891	115929

ID	Location	Land use	Dates present	Group ID
G	136m NE	Unspecified Tank	1891	115922
G	138m NE	Unspecified Tank	1891	115932
10	139m E	Unspecified Tank	1889	148976
G	140m NE	Unspecified Tank	1891	115931
R	143m N	Unspecified Tank	1891	115913
G	143m NE	Unspecified Tank	1891	115933
G	146m NE	Unspecified Tank	1891	115916
G	147m NE	Unspecified Tank	1891	115935
G	149m NE	Unspecified Tank	1891	115915
G	150m NE	Unspecified Tank	1891	115917
R	150m N	Unspecified Tank	1891	115912
G	150m NE	Unspecified Tank	1891	115930
G	151m NE	Unspecified Tank	1891	115920
G	153m NE	Unspecified Tank	1891	115914
G	157m NE	Unspecified Tank	1891	115918
G	158m NE	Unspecified Tank	1891	115919
G	159m NE	Unspecified Tank	1891	115911
12	175m E	Tanks	1908	106791
13	179m SW	Unspecified Tank	1891	115782
X	199m W	Unspecified Tank	1891	115964
G	225m NE	Unspecified Tank	1950	138252
G	225m NE	Unspecified Tank	1952	132557
G	225m NE	Unspecified Tank	1948	148859
G	226m NE	Unspecified Tank	1955	145130
G	229m E	Unspecified Tank	1889 - 1948	131020
G	230m NE	Unspecified Tank	1950	137983
G	231m NE	Unspecified Tank	1952	145936
G	231m NE	Unspecified Tank	1948	146075

ID	Location	Land use	Dates present	Group ID
G	231m NE	Unspecified Tank	1955	134554
G	231m NE	Unspecified Tank	1955	139148
Z	244m NE	Unspecified Tank	1948 - 1965	147696
W	248m E	Unspecified Tank	1889	115861
W	256m E	Unspecified Tank	1889	128594
AE	259m W	Unspecified Tank	1955	136262
AE	260m W	Unspecified Tank	1953	136354
X	273m W	Unspecified Tank	1891	115965
G	277m NE	Unspecified Tank	1889	115910
V	289m E	Unspecified Tank	1908 - 1932	126576
17	290m S	Unspecified Tank	1954	115780
G	298m E	Tanks	1891	106790
G	317m E	Unspecified Tank	1889 - 1891	148142
G	321m E	Unspecified Tank	1889	146095
G	325m E	Unspecified Tank	1948	139263
AC	348m W	Unspecified Tank	1955	135180
AC	348m W	Unspecified Tank	1948 - 1953	141893
AC	348m W	Tanks	1950	106780
AC	355m W	Unspecified Tank	1922	115957
AC	358m W	Unspecified Tank	1955	123253
AC	358m W	Unspecified Tank	1948 - 1953	135406
AC	358m W	Unspecified Tank	1955	135178
AC	359m W	Unspecified Tank	1948 - 1953	145471
V	362m E	Unspecified Tank	1889	115860
22	362m S	Unspecified Tank	1948 - 1955	136552
AC	364m W	Tanks	1953	106778
AC	366m W	Gasometer	1891 - 1908	131372
AC	367m W	Unspecified Tank	1893	115950

ID	Location	Land use	Dates present	Group ID
V	375m E	Unspecified Tank	1994 - 1995	127686
V	375m E	Unspecified Tank	1998	139377
V	376m E	Tanks	1986	106784
V	377m E	Unspecified Tank	1977	131017
V	378m E	Unspecified Tank	1985 - 1991	147872
V	384m E	Unspecified Tank	1889	136012
25	388m E	Unspecified Tank	1995	115783
V	395m E	Unspecified Tank	1986 - 1998	129197
27	404m W	Unspecified Tank	1891	115956
AS	433m SE	Unspecified Tank	1932	146824
AS	438m SE	Unspecified Tank	1889 - 1922	141568
AV	450m SW	Unspecified Tank	1948 - 1985	122344
AV	456m SW	Unspecified Tank	1922	115781
AN	464m NE	Unspecified Tank	1908	115909
AN	464m NE	Unspecified Tank	1889	132358
BA	473m SE	Tanks	1984	107104
BA	474m SE	Unspecified Tank	1968	126329
AC	475m W	Unspecified Tank	1893 - 1922	122317
BA	475m SE	Unspecified Tank	1970	125809
AO	483m NE	Unspecified Tank	1908	115862
BA	484m SE	Unspecified Tank	1968 - 1970	129664
AO	485m NE	Unspecified Tank	1889	115863

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	31

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 15 >**

ID	Location	Land use	Dates present	Group ID
D	10m S	Electricity Substation	1968 - 1998	81695
D	10m S	Electricity Substation	1970 - 1984	85141
7	71m SE	Electricity Substation	1968 - 1998	85157
K	96m N	Gas Meter Testing Station	1948	63684
T	187m E	Electricity Substation	1948 - 1955	83723
X	200m W	Electricity Station	1908 - 1922	81883
X	202m W	Electricity Station	1955	77896
X	204m W	Electricity Station	1948	73425
X	204m W	Electricity Station	1950	68267
X	228m W	Electricity Station	1950 - 1955	66381
AB	241m SE	Electricity Substation	1948 - 1953	79861
AB	249m SE	Electricity Substation	1986 - 1998	78252
AB	251m SE	Electricity Substation	1948	62177
G	265m E	Electricity Substation	1977 - 1994	69582
AF	298m S	Electricity Substation	1948 - 1970	67698
AF	298m S	Electricity Substation	1984 - 1998	82529
AG	305m SE	Electricity Substation	1984 - 1998	72632
AG	306m SE	Electricity Substation	1968 - 1970	75637
19	331m S	Electricity Substation	1987	62178
AC	366m W	Gasometer	1891 - 1908	84082
AC	382m W	Hydraulic Power Station	1948 - 1979	64692
AC	382m W	Electricity Substation	1948 - 1999	65682
AC	382m W	Hydraulic Power Station	1948 - 1973	64396
AC	394m W	Hydraulic Power Station	1932	78003
AN	427m NE	Electricity Substation	1992 - 1997	71274
AT	438m SW	Electricity Substation	1990	62181

ID	Location	Land use	Dates present	Group ID
AT	439m SW	Electricity Substation	1995 - 1998	84357
AW	494m N	Electricity Substation	1986 - 1995	72406
BF	496m SE	Electricity Substation	1986	81305
BF	496m SE	Electricity Transformer	1968 - 1969	74844
BF	497m SE	Electricity Substation	1995 - 1998	75649

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	**41**

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 15 >**

ID	Location	Land use	Dates present	Group ID
4	**On site**	**Garage**	**1952 - 1955**	**26338**
I	14m NW	Garage	1948 - 1968	26993
I	16m NW	Garage	1985 - 1990	27728
5	52m SE	Garage	1954	27186
8	81m SW	Garage	1948 - 1955	24945
P	85m E	Motor Repair Works	1948	20582

ID	Location	Land use	Dates present	Group ID
S	101m SE	Garage	1968	23424
S	101m SE	Garage	1970	26227
R	131m N	Garage	1968 - 1984	24849
R	143m N	Garage	1955 - 1965	25421
R	143m N	Garage	1948 - 1971	25857
11	144m E	Garage	1948	20318
14	182m SE	Garage	1984	20316
R	186m N	Garage	1948	24212
R	187m N	Garage	1971	22467
R	208m N	Garage	1971	23089
R	209m N	Garage	1948 - 1971	25009
AE	246m W	Garage	1955 - 1990	26377
AE	247m W	Garage	1948 - 1998	27861
AA	257m N	Garage	1990	23753
AA	270m N	Garage	1971	20840
AA	277m N	Garage	1971	21466
AH	317m NE	Garage	1971	22068
AH	317m NE	Garage	1971	23059
AH	317m NE	Garage	1953 - 1967	26856
AL	341m SW	Garage	1962 - 1987	25909
AL	342m SW	Garage	1968	21471
20	358m S	Garage	1984 - 1998	27289
23	365m S	Garage	1954	20302
AM	382m NW	Garage	1948 - 1953	24294
AM	382m NW	Garage	1953 - 1965	27406
AP	431m SE	Garage	1960	21337
AP	431m SE	Garage	1965	25849
AP	432m SE	Garage	1953	21434

ID	Location	Land use	Dates present	Group ID
29	433m S	Garage	1962 - 1965	27390
AR	440m NE	Garage	1953 - 1967	27482
AR	441m NE	Garage	1971	22847
AR	463m NE	Garage	1960	22202
AR	463m NE	Garage	1971	20877
BC	483m E	Garage	1963 - 1991	25171
BC	484m E	Garage	1965 - 1968	26504

This data is sourced from Ordnance Survey / Groundsure.

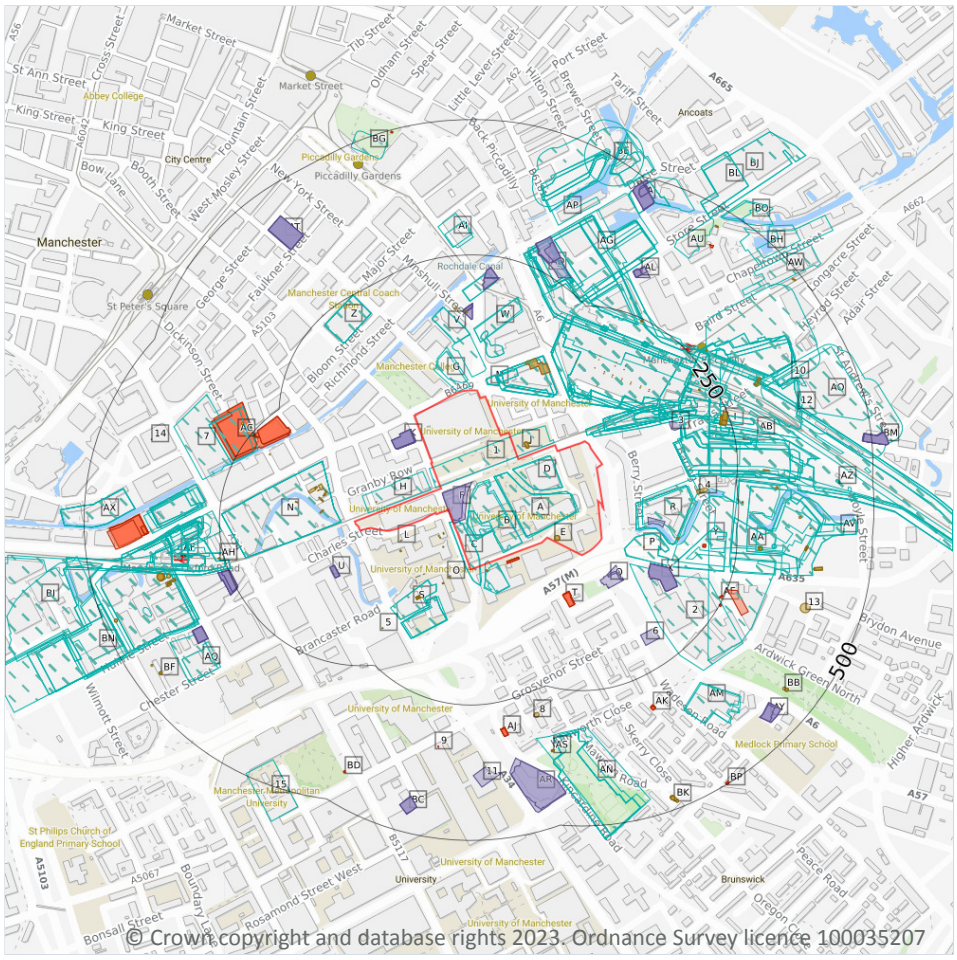
1.6 Historical military land

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



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2.1 Historical industrial land uses

Records within 500m	307

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 32 >**

ID	Location	Land Use	Date	Group ID
1	**On site**	**Unspecified Commercial/Industrial**	**1923**	**796723**
A	**On site**	**Unspecified Mills**	**1938**	**854159**
A	**On site**	**Unspecified Mills**	**1934**	**854159**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Mills**	**1915**	**967472**
A	**On site**	**Unspecified Mills**	**1923**	**914258**
B	**On site**	**Unspecified Works**	**1915**	**954702**
B	**On site**	**Railway Sidings**	**1915**	**959198**
B	**On site**	**Iron Works**	**1890**	**822793**
B	**On site**	**Unspecified Works**	**1923**	**954702**
B	**On site**	**Railway Sidings**	**1923**	**959198**
C	**On site**	**Unspecified Works**	**1915**	**951103**
C	**On site**	**Unspecified Works**	**1923**	**951103**
C	**On site**	**Unspecified Works**	**1923**	**972915**
D	**On site**	**Unspecified Works**	**1915**	**934829**
D	**On site**	**Unspecified Works**	**1923**	**934829**
G	2m NW	Unspecified Wharf	1890	826601
H	5m W	Unspecified Commercial/Industrial	1923	796719
C	7m S	Unspecified Works	1915	972915
I	12m NE	Railway Sidings	1938	899923
I	12m NE	Railway Sidings	1934	899923
I	12m NE	Railway Sidings	1915	849007
G	16m N	Ice Works	1915	808540
I	17m NE	Railway Sidings	1905	979002
I	17m NE	Railway Sidings	1890	979002
M	23m N	Police Station	1971	907595
M	23m N	Police Station	1988	879174
M	23m N	Police Station	1978	978804
M	23m N	Police Station	1985	879174
M	23m N	Police Station	1994	879174
G	25m N	Unspecified Works	1923	830436
N	26m W	Unspecified Mills	1938	989884

ID	Location	Land Use	Date	Group ID
N	26m W	Unspecified Mills	1932	989884
N	26m W	Unspecified Mills	1916	861845
N	26m W	Unspecified Commercial/Industrial	1905	968335
N	26m W	Unspecified Commercial/Industrial	1923	874542
I	31m NE	Railway Sidings	1923	879517
M	32m N	Fire Station	1938	857211
M	32m N	Fire Station	1934	857211
M	35m N	Fire Engine Station	1923	869627
M	36m N	Fire Engine Station	1915	869627
M	37m N	Police Station	1923	846961
M	38m N	Police Station	1915	846961
I	38m NE	Railway Sidings	1971	884730
I	38m NE	Railway Sidings	1988	878187
I	38m NE	Railway Sidings	1978	900007
I	38m NE	Railway Sidings	1985	878187
I	38m NE	Railway Sidings	1994	844263
M	41m N	Fire Station	1971	924791
M	41m N	Fire Station	1956	924791
M	41m N	Fire Station	1988	864327
M	41m N	Fire Station	1978	872224
M	41m N	Fire Station	1985	864327
M	41m N	Fire Station	1994	864327
I	44m NE	Railway Sidings	1956	950162
P	46m SE	Unspecified Works	1923	861369
P	47m SE	Unspecified Works	1915	861369
R	60m E	Unspecified Mills	1938	979357
R	60m E	Unspecified Mill	1934	945749
R	60m E	Unspecified Mill	1915	857457

ID	Location	Land Use	Date	Group ID
R	60m E	Unspecified Mills	1890	989407
R	62m E	Unspecified Mill	1923	919594
G	67m N	Unspecified Ground Workings	1938	906423
G	67m N	Unspecified Ground Workings	1934	906423
S	69m SW	Unspecified Works	1915	929652
2	69m SE	Unspecified Commercial/Industrial	1923	847885
S	69m SW	Unspecified Works	1923	932223
I	70m NE	Railway Buildings	1923	833658
R	73m E	Cotton Mill	1851	797897
I	77m NE	Railway Station	1971	897274
I	77m NE	Railway Station	1988	890876
I	77m NE	Railway Station	1978	897926
I	77m NE	Railway Station	1985	890876
I	77m NE	Railway Station	1994	890876
I	77m NE	Railway Station	1905	959335
I	77m NE	Railway Station	1890	959335
I	77m NE	Railway Station	1923	941202
S	78m SW	Unspecified Mills	1923	975952
S	81m SW	Unspecified Mills	1938	967294
S	81m SW	Unspecified Mills	1934	967294
S	81m SW	Unspecified Mills	1915	960133
S	81m SW	Unspecified Mills	1890	858454
I	82m NE	Railway Stations	1938	900032
I	82m NE	Railway Stations	1934	900032
I	82m NE	Railway Stations	1915	887476
I	89m NE	Railway Station	1956	935665
V	89m N	Unspecified Wharf	1923	848098
W	89m N	Unspecified Mill	1923	946972

ID	Location	Land Use	Date	Group ID
W	89m N	Unspecified Mill	1915	946972
V	90m N	Unspecified Wharf	1915	848098
I	95m NE	Railway Building	1971	985873
I	95m NE	Railway Building	1988	978063
I	95m NE	Railway Building	1978	955370
I	95m NE	Railway Building	1985	978063
I	95m NE	Railway Building	1994	978063
M	99m N	Police Station	1938	903287
M	99m N	Police Station	1934	903287
Y	136m SE	Dye Works	1851	833960
I	140m E	Railway Station	1923	871349
Y	140m SE	Unspecified Works	1923	968971
Y	141m SE	Unspecified Works	1915	858353
I	147m E	Railway Station	1956	949532
I	151m E	Railway Station	1988	979216
I	151m E	Railway Station	1994	979216
I	156m NE	Railway Station	1851	942543
V	165m N	Unspecified Works	1923	898319
V	165m N	Unspecified Works	1915	898319
I	168m NE	Railway Sidings	1851	923729
Z	186m NW	Bus Station	1988	952978
Z	186m NW	Bus Station	1978	884077
Z	186m NW	Bus Station	1985	952978
Z	186m NW	Bus Station	1994	952978
I	194m E	Railway Building	1938	983618
I	194m E	Railway Building	1934	983618
AA	196m E	Unspecified Commercial/Industrial	1956	930471
AA	196m E	Unspecified Works	1968	976597

ID	Location	Land Use	Date	Group ID
I	198m E	Goods Station	1978	858349
I	198m E	Railway Station	1956	989397
AB	198m E	Railway Sidings	1956	950162
I	199m E	Railway Building	1915	940308
I	200m E	Railway Station	1968	981899
AB	204m E	Railway Sidings	1968	889807
I	206m NE	Railway Building	1938	893266
I	206m NE	Railway Building	1934	893266
I	206m NE	Railway Building	1938	893315
I	206m NE	Railway Building	1934	893315
I	207m E	Railway Building	1968	855450
I	207m E	Railway Building	1956	855450
I	208m NE	Railway Building	1915	893315
I	208m NE	Railway Building	1905	893315
I	208m NE	Railway Building	1923	893315
I	208m NE	Railway Building	1915	924355
I	208m NE	Railway Building	1905	924355
I	208m NE	Railway Building	1923	924355
I	208m E	Railway Building	1978	874711
AB	208m E	Railway Sidings	1978	900007
I	216m E	Police Station	1851	832592
I	217m E	Railway Building	1938	865882
I	217m E	Railway Building	1934	865882
I	217m E	Railway Building	1915	865882
I	219m E	Railway Building	1923	865882
I	220m E	Goods Station	1985	980310
I	220m E	Goods Station	1991	980310
AC	222m W	Electricity Station	1916	992043

ID	Location	Land Use	Date	Group ID
I	224m E	Railway Building	1956	917214
AD	225m N	Railway Building	1890	820433
AC	225m W	Electricity Station	1923	992043
I	225m NE	Railway Building	1923	820444
AB	228m E	Railway Sidings	1985	932616
AB	228m E	Railway Sidings	1991	932616
I	229m E	Railway Station	1978	851643
I	229m E	Railway Station	1968	921332
I	230m NE	Railway Buildings	1923	833663
AD	233m N	Goods Shed	1938	924820
AD	233m N	Goods Shed	1934	924820
AD	233m N	Goods Shed	1915	885654
I	233m NE	Grain Store	1923	946860
I	235m E	Railway Building	1978	934108
I	235m E	Railway Building	1968	934108
I	236m NE	Railway Building	1938	820435
I	236m NE	Grain Store	1915	946860
AD	236m N	Goods Shed	1905	923774
AD	236m N	Goods Shed	1923	979300
AA	240m E	Unspecified Works	1915	967647
AA	240m E	Unspecified Works	1923	967647
AA	242m E	Unspecified Works	1915	979112
AA	242m E	Unspecified Works	1923	979112
AA	244m E	Unspecified Works	1978	980989
AF	244m W	Railway Sidings	1938	864885
AF	244m W	Railway Sidings	1932	864885
AF	244m W	Railway Sidings	1916	864885
AF	244m W	Railway Sidings	1905	864885

ID	Location	Land Use	Date	Group ID
AF	244m W	Railway Sidings	1923	864885
AG	245m N	Unspecified Commercial/Industrial	1956	796797
AF	246m W	Gas Works	1851	802208
AG	248m NE	Goods Station	1905	979048
AG	248m NE	Goods Station	1890	979048
AG	248m NE	Goods Station	1923	979048
AF	250m W	Railway Sidings	1988	928139
AF	250m W	Railway Sidings	1985	928139
AF	250m W	Railway Sidings	1994	928139
7	251m W	Unspecified Commercial/Industrial	1923	796724
AG	252m NE	Goods Station	1938	979048
AG	252m NE	Goods Station	1934	979048
AG	252m NE	Goods Station	1915	979048
I	253m NE	Railway Building	1956	820448
AI	264m N	Infirmary	1923	975872
AI	266m N	Infirmary	1915	975872
AF	267m W	Tanks	1851	832185
AA	267m E	Unspecified Works	1985	854217
AA	267m E	Unspecified Works	1991	854217
I	269m NE	Goods Yard	1938	929364
I	269m NE	Goods Yard	1934	929364
I	272m NE	Goods Yard	1915	898838
I	273m NE	Goods Yard	1923	898838
I	274m NE	Unspecified Depot	1991	962321
AF	275m W	Railway Station	1956	923967
AF	275m W	Hospital	1916	938342
AF	278m W	Hospital	1971	915521
AF	278m W	Hospital	1956	915521

ID	Location	Land Use	Date	Group ID
AF	278m W	Hospital	1978	957282
AF	279m W	Railway Station	1988	912150
AF	279m W	Railway Station	1994	912150
AF	282m W	Hospital	1923	848326
AF	282m W	Hospital	1938	949847
AF	282m W	Hospital	1932	949847
AF	282m W	Railway Building	1956	820261
AF	282m W	Railway Station	1896	887032
AF	284m W	Railway Station	1938	962635
AF	284m W	Railway Station	1932	962635
AF	284m W	Railway Station	1916	962635
AF	284m W	Railway Station	1905	962635
AF	284m W	Railway Station	1923	962635
AA	285m E	Dye Works	1851	833959
I	287m E	Railway Building	1923	820449
AF	290m W	Coal Wharf	1851	794097
AA	291m E	Unspecified Tank	1915	921963
AA	291m E	Unspecified Tank	1923	921963
AA	292m E	Unspecified Station	1991	843724
AF	311m W	Railway Station	1971	960776
AF	311m W	Railway Station	1978	981767
AF	311m W	Railway Station	1985	962611
I	313m NE	Railway Building	1923	820447
AA	315m E	Unspecified Tank	1915	968563
AA	315m E	Unspecified Tank	1923	968563
AM	317m SE	Tyre Works	1915	987255
I	318m E	Smithy	1915	843312
AN	318m S	Cemetery	1851	948454

ID	Location	Land Use	Date	Group ID
AM	320m SE	Tyre Works	1923	987255
AN	320m S	Cemetery	1956	980504
AO	322m E	Unspecified Depot	1985	849011
AN	326m S	Cemetery	1923	877404
AN	326m S	Cemetery	1938	877404
AN	326m S	Cemetery	1934	877404
AN	326m S	Cemetery	1915	877404
AN	326m S	Cemetery	1905	877404
AN	326m S	Cemetery	1890	877404
AO	331m E	Goods Yard	1968	811695
AF	336m W	Railway Sidings	1896	989778
AF	337m W	Unspecified Works	1988	862878
AF	337m W	Unspecified Works	1978	976366
AF	337m W	Unspecified Works	1985	862878
AF	337m W	Unspecified Works	1994	862878
AP	340m N	Unspecified Warehouse	1923	807197
AF	341m W	Rubber Works	1916	915281
AF	342m SW	Unspecified Commercial/Industrial	1896	857423
AF	347m W	Rubber Works	1938	926915
AF	347m W	Rubber Works	1932	926915
AF	347m W	Unspecified Commercial/Industrial	1905	944072
AQ	348m SW	Unspecified Mills	1916	874195
AF	348m W	Rubber Works	1923	926915
AQ	350m SW	Unspecified Mills	1923	874195
AP	357m N	Unspecified Warehouses	1938	964840
AP	357m N	Unspecified Warehouses	1934	964840
AP	357m N	Unspecified Warehouses	1915	933374
10	358m E	Smithy	1923	843313

ID	Location	Land Use	Date	Group ID
AF	361m W	Unspecified Tank	1896	825247
AP	362m N	Unspecified Wharf	1956	971868
AP	371m N	Unspecified Wharf	1905	976213
AP	371m N	Unspecified Wharf	1890	976213
AP	371m N	Unspecified Wharf	1923	976213
12	372m E	Railway Building	1923	820446
AP	378m N	Unspecified Wharf	1934	971276
AP	378m N	Unspecified Wharf	1915	976213
AU	389m NE	Unspecified Ground Workings	1851	800647
AV	393m E	Brewery	1915	932621
AV	394m E	Brewery	1923	932621
AB	397m E	Railway Buildings	1923	833659
AW	398m NE	Unspecified Works	1968	830437
AX	406m W	Corporation Yard	1938	920120
AX	406m W	Corporation Yard	1932	920120
AX	406m W	Corporation Yard	1916	920120
AX	406m W	Corporation Yard	1905	920120
AX	406m W	Corporation Yard	1923	920120
AF	413m W	Unspecified Tanks	1851	815405
AZ	432m E	Railway Building	1923	820268
BA	432m NE	Unspecified Wharf	1938	933593
BA	432m NE	Unspecified Wharf	1934	933593
BA	432m NE	Unspecified Wharf	1915	900362
BE	446m N	Unspecified Wharf	1923	869878
AZ	453m E	Railway Building	1923	820267
15	454m SW	Hospital	1971	834385
BG	455m N	Unspecified Pit	1956	840494
AZ	456m E	Railway Building	1923	820266

ID	Location	Land Use	Date	Group ID
BH	457m NE	Unspecified Works	1923	970752
BA	458m NE	Unspecified Wharf	1923	938827
BE	465m NE	Unspecified Mills	1923	891864
BE	468m NE	Unspecified Mills	1915	891864
BE	470m N	Unspecified Wharf	1938	892116
BE	470m N	Unspecified Wharf	1934	892116
BH	471m NE	Unspecified Works	1968	872464
BI	473m W	Unspecified Commercial/Industrial	1956	976686
BJ	473m NE	Clothing Foundry	1905	817104
BJ	473m NE	Unspecified Disused Foundry	1890	794069
BL	477m NE	Clothing Factory	1938	898959
BL	477m NE	Clothing Factory	1934	898959
BL	477m NE	Clothing Factory	1915	930283
BI	478m W	Unspecified Commercial/Industrial	1896	849974
BN	483m SW	Unspecified Works	1988	927569
BN	483m SW	Unspecified Works	1978	865006
BN	483m SW	Unspecified Works	1985	927569
BN	483m SW	Unspecified Works	1994	927569
BO	484m NE	Unspecified Workshop	1923	811070
AZ	485m E	Railway Building	1923	820269
BO	485m NE	Unspecified Works	1915	830439
BI	485m SW	Unspecified Commercial/Industrial	1851	849974
BN	485m SW	Rubber Works	1956	849382
BE	487m N	Unspecified Wharf	1915	974633

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	182

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 32 >**

ID	Location	Land Use	Date	Group ID
E	**On site**	**Unspecified Tank**	**1955**	**131015**
E	**On site**	**Unspecified Tank**	**1952**	**131015**
C	11m S	Unspecified Tank	1889	134036
C	11m S	Unspecified Tank	1908	134036
C	11m S	Unspecified Tank	1889	134036
J	13m NE	Unspecified Tank	1952	134489
J	13m NE	Unspecified Tank	1955	134489
J	13m NE	Unspecified Tank	1955	134489
H	19m W	Unspecified Tank	1891	115946
J	20m NE	Unspecified Tank	1891	115938
L	23m SW	Unspecified Tank	1891	115941
C	23m SW	Unspecified Tank	1891	115944
C	32m SW	Unspecified Tank	1891	115945
C	33m SW	Unspecified Tank	1891	115943
C	33m SW	Unspecified Tank	1891	115942
O	39m SW	Unspecified Tank	1891	115939
L	39m SW	Unspecified Tank	1891	115940
O	55m SW	Tanks	1891	106779
N	61m W	Tanks	1891	106787
N	69m W	Tanks	1891	106786
N	72m W	Unspecified Tank	1891	115948
N	73m W	Unspecified Tank	1891	115958
N	74m W	Unspecified Tank	1891	141146

ID	Location	Land Use	Date	Group ID
N	74m W	Unspecified Tank	1891	115959
N	75m W	Unspecified Tank	1893	141146
N	77m W	Unspecified Tank	1891	115947
P	78m SE	Unspecified Tank	1908	115937
N	79m W	Unspecified Tank	1891	115949
N	84m W	Unspecified Tank	1891	115962
N	88m W	Unspecified Tank	1891	115961
N	93m W	Unspecified Tank	1891	115960
N	93m W	Tanks	1891	106792
N	93m W	Unspecified Tank	1893	115963
M	96m N	Gas Meter Testing Station	1948	120722
I	104m NE	Unspecified Tank	1891	115926
S	106m SW	Tanks	1968	129099
S	106m SW	Tanks	1969	129099
S	106m SW	Tanks	1962	129099
S	106m SW	Unspecified Tank	1953	134156
S	106m SW	Unspecified Tank	1955	144222
S	106m SW	Unspecified Tank	1955	144222
S	106m SW	Unspecified Tank	1950	134156
S	106m SW	Unspecified Tank	1948	137703
N	111m W	Tanks	1891	106782
I	116m NE	Unspecified Tank	1891	115936
I	119m NE	Unspecified Tank	1891	115934
I	129m NE	Unspecified Tank	1891	115925
I	130m NE	Unspecified Tank	1891	115923
I	131m NE	Unspecified Tank	1891	115927
I	133m NE	Unspecified Tank	1891	115921
I	133m NE	Unspecified Tank	1891	115924

ID	Location	Land Use	Date	Group ID
I	134m NE	Unspecified Tank	1891	115928
I	134m NE	Unspecified Tank	1891	115929
I	136m NE	Unspecified Tank	1891	115922
I	138m NE	Unspecified Tank	1891	115932
Y	139m E	Unspecified Tank	1889	148976
Y	139m E	Unspecified Tank	1889	148976
I	140m NE	Unspecified Tank	1891	115931
V	143m N	Unspecified Tank	1891	115913
I	143m NE	Unspecified Tank	1891	115933
I	146m NE	Unspecified Tank	1891	115916
I	147m NE	Unspecified Tank	1891	115935
I	149m NE	Unspecified Tank	1891	115915
I	150m NE	Unspecified Tank	1891	115917
V	150m N	Unspecified Tank	1891	115912
I	150m NE	Unspecified Tank	1891	115930
I	151m NE	Unspecified Tank	1891	115920
I	153m NE	Unspecified Tank	1891	115914
I	157m NE	Unspecified Tank	1891	115918
I	158m NE	Unspecified Tank	1891	115919
I	159m NE	Unspecified Tank	1891	115911
4	175m E	Tanks	1908	106791
5	179m SW	Unspecified Tank	1891	115782
AC	199m W	Unspecified Tank	1891	115964
I	225m NE	Unspecified Tank	1950	138252
I	225m NE	Unspecified Tank	1952	132557
I	225m NE	Unspecified Tank	1948	148859
I	226m NE	Unspecified Tank	1955	145130
I	229m E	Unspecified Tank	1908	131020

ID	Location	Land Use	Date	Group ID
I	229m E	Unspecified Tank	1922	131020
I	229m E	Unspecified Tank	1932	131020
I	230m NE	Unspecified Tank	1950	137983
I	230m E	Unspecified Tank	1891	131020
I	231m NE	Unspecified Tank	1952	145936
I	231m NE	Unspecified Tank	1948	146075
I	231m NE	Unspecified Tank	1955	139148
I	231m NE	Unspecified Tank	1955	134554
I	233m E	Unspecified Tank	1889	131020
I	233m E	Unspecified Tank	1889	131020
I	236m E	Unspecified Tank	1948	131020
I	237m E	Unspecified Tank	1948	131020
I	244m NE	Unspecified Tank	1965	147696
I	244m NE	Unspecified Tank	1965	147696
I	244m NE	Unspecified Tank	1950	147696
I	244m NE	Unspecified Tank	1964	147696
I	244m NE	Unspecified Tank	1952	147696
I	244m NE	Unspecified Tank	1948	147696
I	245m NE	Unspecified Tank	1955	147696
AA	248m E	Unspecified Tank	1889	115861
AA	256m E	Unspecified Tank	1889	128594
AA	256m E	Unspecified Tank	1889	128594
AH	259m W	Unspecified Tank	1955	136262
AH	260m W	Unspecified Tank	1953	136354
AC	273m W	Unspecified Tank	1891	115965
I	277m NE	Unspecified Tank	1889	115910
AA	289m E	Unspecified Tank	1932	126576
8	290m S	Unspecified Tank	1954	115780

ID	Location	Land Use	Date	Group ID
AA	291m E	Unspecified Tank	1908	126576
AA	291m E	Unspecified Tank	1922	126576
I	298m E	Tanks	1891	106790
I	317m E	Unspecified Tank	1891	148142
I	320m E	Unspecified Tank	1889	148142
I	321m E	Unspecified Tank	1889	146095
I	321m E	Unspecified Tank	1889	146095
I	325m E	Unspecified Tank	1948	139263
I	325m NE	Unspecified Tank	1948	139263
AF	348m W	Unspecified Tank	1955	135180
AF	348m W	Unspecified Tank	1948	141893
AF	348m W	Unspecified Tank	1953	141893
AF	348m W	Tanks	1950	106780
AF	355m W	Unspecified Tank	1922	115957
AF	358m W	Unspecified Tank	1955	123253
AF	358m W	Unspecified Tank	1948	135406
AF	358m W	Unspecified Tank	1953	135406
AF	358m W	Unspecified Tank	1955	135178
AF	358m W	Unspecified Tank	1955	135178
AF	359m W	Unspecified Tank	1953	145471
AF	359m W	Unspecified Tank	1948	145471
AA	362m E	Unspecified Tank	1889	115860
AS	362m S	Unspecified Tank	1954	136552
AS	362m S	Unspecified Tank	1948	136552
AS	362m S	Unspecified Tank	1955	136552
AS	362m S	Unspecified Tank	1955	136552
AS	363m S	Unspecified Tank	1950	136552
AF	364m W	Tanks	1953	106778

ID	Location	Land Use	Date	Group ID
AF	366m W	Gasometer	1891	131372
AF	366m W	Gasometer	1908	131372
AF	367m W	Unspecified Tank	1893	115950
AA	375m E	Unspecified Tank	1995	127686
AA	375m E	Unspecified Tank	1998	139377
AA	376m E	Unspecified Tank	1994	127686
AA	376m E	Tanks	1986	106784
AA	377m E	Unspecified Tank	1977	131017
AA	378m E	Unspecified Tank	1985	147872
AA	378m E	Unspecified Tank	1991	147872
AA	384m E	Unspecified Tank	1889	136012
AA	384m E	Unspecified Tank	1889	136012
13	388m E	Unspecified Tank	1995	115783
AA	395m E	Unspecified Tank	1995	129197
AA	395m E	Unspecified Tank	1998	129197
AA	396m E	Unspecified Tank	1986	129197
14	404m W	Unspecified Tank	1891	115956
BB	433m SE	Unspecified Tank	1932	146824
BB	438m SE	Unspecified Tank	1889	141568
BB	438m SE	Unspecified Tank	1908	141568
BB	438m SE	Unspecified Tank	1922	141568
BB	438m SE	Unspecified Tank	1889	141568
BF	450m SW	Unspecified Tank	1969	122344
BF	450m SW	Unspecified Tank	1953	122344
BF	450m SW	Unspecified Tank	1979	122344
BF	450m SW	Unspecified Tank	1963	122344
BF	450m SW	Unspecified Tank	1948	122344
BF	451m SW	Unspecified Tank	1980	122344

ID	Location	Land Use	Date	Group ID
BF	451m SW	Unspecified Tank	1980	122344
BF	451m SW	Unspecified Tank	1985	122344
BF	456m SW	Unspecified Tank	1922	115781
AU	464m NE	Unspecified Tank	1908	115909
AU	464m NE	Unspecified Tank	1889	132358
AU	464m NE	Unspecified Tank	1889	132358
BK	473m SE	Tanks	1984	107104
BK	474m SE	Unspecified Tank	1968	126329
AF	475m W	Unspecified Tank	1893	122317
AF	475m W	Unspecified Tank	1922	122317
BK	475m SE	Unspecified Tank	1970	125809
BK	475m SE	Unspecified Tank	1970	125809
BK	475m SE	Unspecified Tank	1970	125809
AW	483m NE	Unspecified Tank	1908	115862
BK	484m SE	Unspecified Tank	1968	129664
BK	484m SE	Unspecified Tank	1970	129664
BK	484m SE	Unspecified Tank	1970	129664
BK	484m SE	Unspecified Tank	1970	129664
AW	485m NE	Unspecified Tank	1889	115863

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**83**

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 32 >**

ID	Location	Land Use	Date	Group ID
C	10m S	Electricity Substation	1968	81695

ID	Location	Land Use	Date	Group ID
C	10m S	Electricity Substation	1970	85141
C	10m S	Electricity Substation	1970	85141
C	10m S	Electricity Substation	1970	85141
C	10m S	Electricity Substation	1998	81695
C	11m S	Electricity Substation	1984	85141
T	71m SE	Electricity Substation	1968	85157
T	71m SE	Electricity Substation	1970	85157
T	71m SE	Electricity Substation	1970	85157
T	71m SE	Electricity Substation	1970	85157
T	72m SE	Electricity Substation	1984	85157
T	72m SE	Electricity Substation	1998	85157
M	96m N	Gas Meter Testing Station	1948	63684
Y	187m E	Electricity Substation	1950	83723
Y	188m E	Electricity Substation	1952	83723
Y	188m E	Electricity Substation	1948	83723
Y	188m E	Electricity Substation	1955	83723
Y	188m E	Electricity Substation	1955	83723
AC	200m W	Electricity Station	1908	81883
AC	200m W	Electricity Station	1922	81883
AC	202m W	Electricity Station	1955	77896
AC	204m W	Electricity Station	1948	73425
AC	204m W	Electricity Station	1950	68267
AC	228m W	Electricity Station	1955	66381
AC	229m W	Electricity Station	1950	66381
AE	241m SE	Electricity Substation	1948	79861
AE	241m SE	Electricity Substation	1953	79861
AE	249m SE	Electricity Substation	1995	78252
AE	249m SE	Electricity Substation	1998	78252

ID	Location	Land Use	Date	Group ID
AE	250m SE	Electricity Substation	1986	78252
AE	251m SE	Electricity Substation	1948	62177
I	265m E	Electricity Substation	1977	69582
I	265m E	Electricity Substation	1994	69582
I	266m E	Electricity Substation	1985	69582
I	266m E	Electricity Substation	1991	69582
AJ	298m S	Electricity Substation	1954	67698
AJ	298m S	Electricity Substation	1970	67698
AJ	298m S	Electricity Substation	1970	67698
AJ	298m S	Electricity Substation	1970	67698
AJ	298m S	Electricity Substation	1948	67698
AJ	298m S	Electricity Substation	1955	67698
AJ	298m S	Electricity Substation	1968	67698
AJ	298m S	Electricity Substation	1950	67698
AJ	298m S	Electricity Substation	1955	67698
AJ	298m S	Electricity Substation	1984	82529
AJ	300m S	Electricity Substation	1998	82529
AK	305m SE	Electricity Substation	1984	72632
AK	306m SE	Electricity Substation	1968	75637
AK	306m SE	Electricity Substation	1970	75637
AK	306m SE	Electricity Substation	1970	75637
AK	306m SE	Electricity Substation	1970	75637
AK	308m SE	Electricity Substation	1998	72632
9	331m S	Electricity Substation	1987	62178
AF	366m W	Gasometer	1891	84082
AF	366m W	Gasometer	1908	84082
AF	382m W	Hydraulic Power Station	1979	64692
AF	382m W	Electricity Substation	1979	65682

ID	Location	Land Use	Date	Group ID
AF	382m W	Hydraulic Power Station	1948	64692
AF	382m W	Hydraulic Power Station	1951	64396
AF	382m W	Electricity Substation	1951	65682
AF	382m W	Electricity Substation	1988	65682
AF	382m W	Hydraulic Power Station	1973	64396
AF	382m W	Electricity Substation	1973	65682
AF	382m W	Electricity Substation	1948	65682
AF	382m W	Hydraulic Power Station	1948	64396
AF	382m W	Electricity Substation	1996	65682
AF	382m W	Electricity Substation	1995	65682
AF	382m W	Electricity Substation	1994	65682
AF	382m W	Electricity Substation	1999	65682
AF	383m W	Electricity Substation	1985	65682
AF	394m W	Hydraulic Power Station	1932	78003
AU	427m NE	Electricity Substation	1992	71274
AU	427m NE	Electricity Substation	1997	71274
BD	438m SW	Electricity Substation	1990	62181
BD	439m SW	Electricity Substation	1995	84357
BD	439m SW	Electricity Substation	1998	84357
BG	494m N	Electricity Substation	1995	72406
BG	495m N	Electricity Substation	1986	72406
BP	496m SE	Electricity Substation	1986	81305
BP	496m SE	Electricity Transformer	1969	74844
BP	496m SE	Electricity Transformer	1968	74844
BP	497m SE	Electricity Substation	1995	75649
BP	497m SE	Electricity Substation	1998	75649

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	98

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 32 >**

ID	Location	Land Use	Date	Group ID
F	**On site**	**Garage**	**1955**	**26338**
F	**On site**	**Garage**	**1952**	**26338**
K	14m NW	Garage	1955	26993
K	14m NW	Garage	1968	26993
K	14m NW	Garage	1950	26993
K	15m NW	Garage	1964	26993
K	15m NW	Garage	1948	26993
K	15m NW	Garage	1965	26993
K	15m NW	Garage	1965	26993
K	16m NW	Garage	1990	27728
K	16m NW	Garage	1990	27728
K	16m NW	Garage	1985	27728
Q	52m SE	Garage	1954	27186
Q	57m SE	Garage	1954	27186
U	81m SW	Garage	1955	24945
U	81m SW	Garage	1953	24945

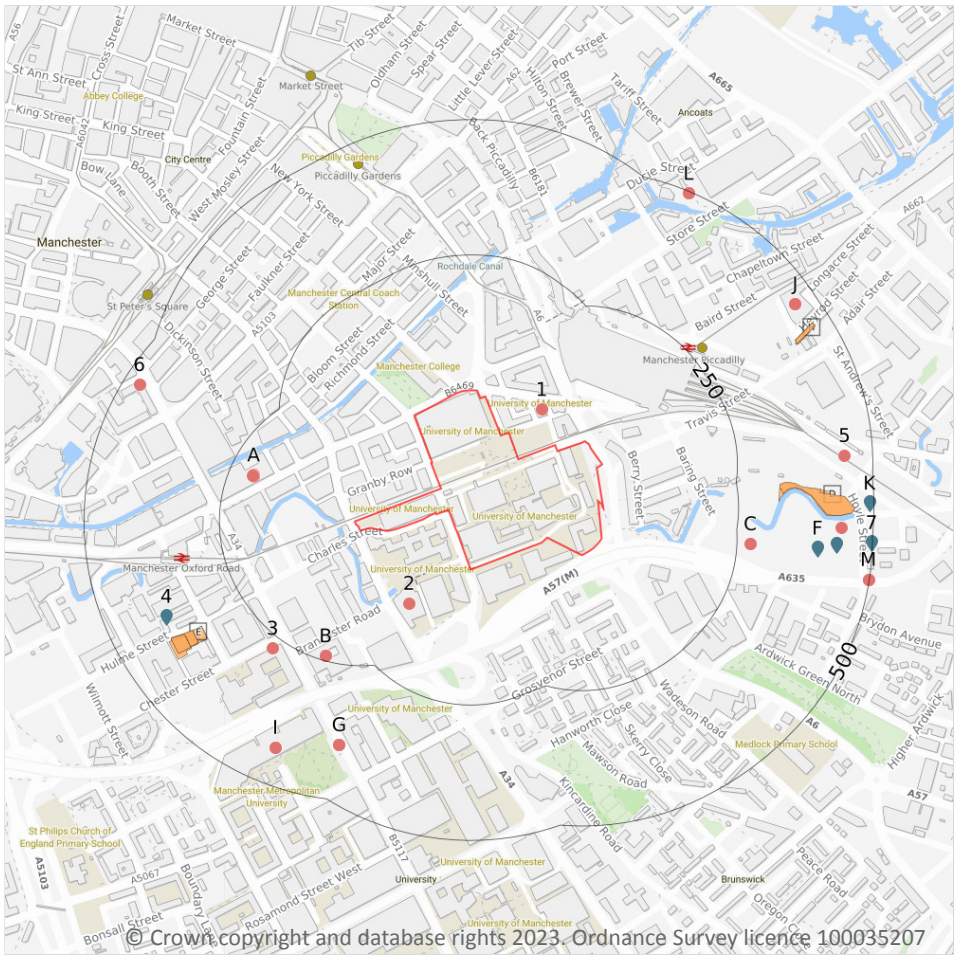
ID	Location	Land Use	Date	Group ID
U	81m SW	Garage	1948	24945
R	85m E	Motor Repair Works	1948	20582
X	101m SE	Garage	1968	23424
X	101m SE	Garage	1970	26227
X	101m SE	Garage	1970	26227
X	101m SE	Garage	1970	26227
V	131m N	Garage	1984	24849
V	131m N	Garage	1968	24849
V	143m N	Garage	1965	25421
V	143m N	Garage	1964	25857
V	143m N	Garage	1971	25857
V	143m N	Garage	1952	25857
V	143m N	Garage	1948	25857
3	144m E	Garage	1948	20318
V	144m N	Garage	1955	25421
6	182m SE	Garage	1984	20316
V	186m N	Garage	1948	24212
V	187m N	Garage	1971	22467
V	208m N	Garage	1971	23089
V	209m N	Garage	1971	25009
V	209m N	Garage	1948	25009
AH	246m W	Garage	1955	26377
AH	247m W	Garage	1990	26377
AH	247m W	Garage	1985	26377
AH	247m W	Garage	1995	27861
AH	247m W	Garage	1998	27861
AH	247m W	Garage	1987	27861
AH	247m W	Garage	1969	27861

ID	Location	Land Use	Date	Group ID
AH	247m W	Garage	1948	27861
AH	247m W	Garage	1953	27861
AH	247m W	Garage	1962	27861
AH	247m W	Garage	1965	26377
AH	247m W	Garage	1965	26377
AH	247m W	Garage	1968	26377
AD	257m N	Garage	1990	23753
AD	270m N	Garage	1971	20840
AD	277m N	Garage	1971	21466
AL	317m NE	Garage	1971	22068
AL	317m NE	Garage	1971	23059
AL	317m NE	Garage	1960	26856
AL	317m NE	Garage	1953	26856
AL	317m NE	Garage	1953	26856
AL	317m NE	Garage	1953	26856
AL	317m NE	Garage	1965	26856
AL	317m NE	Garage	1967	26856
AQ	341m SW	Garage	1985	25909
AQ	342m SW	Garage	1987	25909
AQ	342m SW	Garage	1969	25909
AQ	342m SW	Garage	1962	25909
AQ	342m SW	Garage	1965	25909
AQ	342m SW	Garage	1965	25909
AQ	342m SW	Garage	1968	21471
AR	358m S	Garage	1998	27289
AR	365m S	Garage	1984	27289
11	365m S	Garage	1954	20302
AT	382m NW	Garage	1948	24294

ID	Location	Land Use	Date	Group ID
AT	382m NW	Garage	1953	24294
AT	382m NW	Garage	1953	27406
AT	382m NW	Garage	1953	27406
AT	382m NW	Garage	1965	27406
AY	431m SE	Garage	1960	21337
AY	431m SE	Garage	1965	25849
AY	431m SE	Garage	1965	25849
AY	432m SE	Garage	1953	21434
BC	433m S	Garage	1962	27390
BC	433m S	Garage	1965	27390
BC	433m S	Garage	1965	27390
BA	440m NE	Garage	1953	27482
BA	440m NE	Garage	1953	27482
BA	440m NE	Garage	1953	27482
BA	440m NE	Garage	1965	27482
BA	440m NE	Garage	1967	27482
BA	441m NE	Garage	1971	22847
BA	463m NE	Garage	1960	22202
BA	463m NE	Garage	1971	20877
BM	483m E	Garage	1977	25171
BM	483m E	Garage	1963	25171
BM	483m E	Garage	1985	25171
BM	483m E	Garage	1991	25171
BM	484m E	Garage	1965	26504
BM	484m E	Garage	1965	26504
BM	484m E	Garage	1968	26504

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	9

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 58 >**

ID	Location	Address	Further Details	Date
D	324m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1994
D	327m E	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1991
E	341m SW	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

ID	Location	Address	Further Details	Date
E	359m SW	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
E	359m SW	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
E	375m SW	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
E	376m SW	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
H	422m NE	Site Address: N/A	Type of Site: Scrap Metal Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1948
H	422m NE	Site Address: N/A	Type of Site: Scrap Metal Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1948

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

3.6 Licensed waste sites

Records within 500m	**8**

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

Features are displayed on the Waste and landfill map on **page 58 >**

ID	Location	Details		
4	389m W	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
F	398m E	Site Name: Ardwick Auto Spares Site Address: 2, Hoyle Street, Ardwick, Manchester, M12 6HG Correspondence Address: -	Type of Site: Metal Recycling Site (mixed MRS's) Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ADO001 EPR reference: EA/EPR/AP3092CD/A001 Operator: Donnelly Mr. A. Waste Management licence No: 53582 Annual Tonnage: 310	Issue Date: 11/10/1996 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Suspended
F	398m E	Site Name: Ardwick Auto Spares Site Address: 2, Hoyle Street, Ardwick, Manchester, Manchester, M12 6HG Correspondence Address: -	Type of Site: Metal Recycling Site (mixed MRS's) Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 649159 EPR reference: EA/EPR/AP3092CD Operator: A Donnelly Waste Management licence No: 53582 Annual Tonnage: 310	Issue Date: 11/10/1996 Effective Date: 11/10/1996 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Revoked
F	433m E	Site Name: Aggregate Recycling Yard Site Address: Hoyle Trading Estate, Hoyle Street, Manchester, M12 6HL Correspondence Address: -	Type of Site: Treatment of waste to produce soil 75,000 tpy Size: >= 25000 tonnes 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: DEL043 EPR reference: EA/EPR/CB3601KL/A001 Operator: E Delaney Demolition Ltd Waste Management licence No: 402157 Annual Tonnage: 74999	Issue Date: 26/02/2015 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued

ID	Location	Details		
F	433m E	Site Name: Aggregate Recycling Yard Site Address: Hoyle Trading Estate, Hoyle Street, Manchester, Manchester, M12 6HL Correspondence Address: -	Type of Site: Treatment of waste to produce soil 75,000 tpy Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 646258 EPR reference: EA/EPR/CB3601KL Operator: E Delaney Demolition Limited Waste Management licence No: 402157 Annual Tonnage: 0	Issue Date: 26/02/2015 Effective Date: 26/02/2015 Modified: - Surrendered Date: 26/02/2015 Expiry Date: - Cancelled Date: - Status: Surrendered
K	491m E	Site Name: City Excavations Aggregate Yard Site Address: Hoyle Street, Hoyle Trading Estate, Manchester, M12 6JL Correspondence Address: -	Type of Site: Inert & excavation Waste TS + treatment Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CIT060 EPR reference: EA/EPR/CB3905MR/A001 Operator: City Excavations Ltd Waste Management licence No: 402399 Annual Tonnage: 75000	Issue Date: 01/06/2015 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued
K	491m E	Site Name: City Excavations Aggregate Yard Site Address: Hoyle Street, Hoyle Trading Estate, Manchester, Manchester, M12 6JL Correspondence Address: -	Type of Site: Inert & excavation Waste TS + treatment Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 626993 EPR reference: EA/EPR/CB3905MR Operator: City Excavations Limited Waste Management licence No: 402399 Annual Tonnage: 0	Issue Date: 01/06/2015 Effective Date: 01/06/2015 Modified: - Surrendered Date: 01/06/2015 Expiry Date: - Cancelled Date: - Status: Surrendered
7	498m E	Site Name: Pye Metals Ltd Site Address: Temperance Street, Ardwick, Manchester, Manchester, M12 6HS Correspondence Address: -	Type of Site: Metal Recycling Site (mixed MRS's) Size: 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: 633765 EPR reference: EA/EPR/AP3992CN Operator: Pye Metals Limited Waste Management licence No: 53583 Annual Tonnage: 1733	Issue Date: 11/10/1996 Effective Date: 11/10/1996 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired

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

3.7 Waste exemptions

Records within 500m	31

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 58 >**

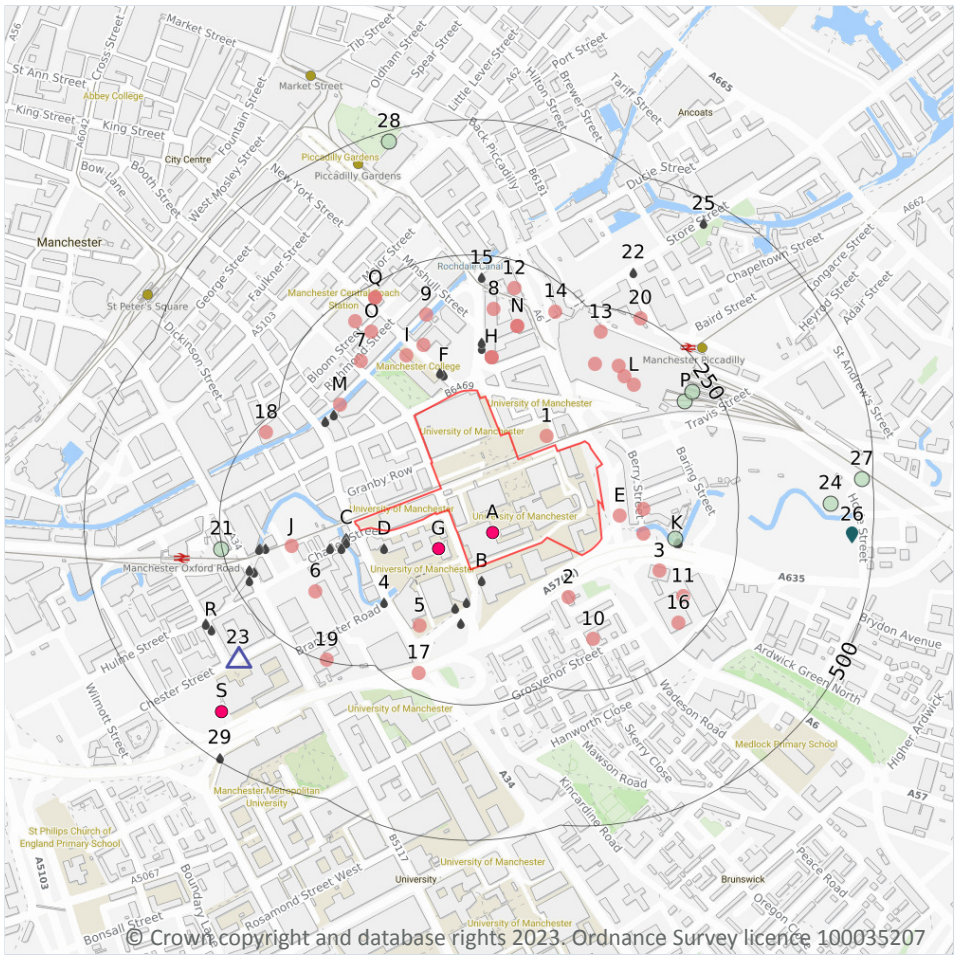
ID	Location	Site	Reference	Category	Sub-Category	Description
1	69m NE	Michael Smith Building, Dover Street, Manchester, M13 9PL	WEX086269	Treating waste exemption	Not on a farm	Treatment of kitchen waste in a wormery
2	130m SW	-	WEX264013	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
A	205m W	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
A	205m W	-	WEX371670	Disposing of waste exemption	Not on a farm	Deposit of waste from a railway sanitary convenience
A	207m W	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
B	242m SW	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
B	242m SW	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
3	273m SW	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
C	274m E	Unit 5, Bond Street, Manchester, M12 6HW	WEX149573	Using waste exemption	Not on a farm	Use of waste in construction
C	274m E	Unit 5, Bond Street, Manchester, M12 6HW	WEX149573	Using waste exemption	Not on a farm	Use of waste in the construction of entertainment or educational installations etc

ID	Location	Site	Reference	Category	Sub-Category	Description
G	399m SW	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
G	399m SW	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
G	399m SW	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)
G	399m SW	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
G	399m SW	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
G	399m SW	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Treating waste exemption	Both agricultural and non-agricultural waste	Recovery of scrap metal
G	399m SW	Transfer Station Europa Gate Manchester M17 1DU	EPR/DF0804PP /A001	Treating waste exemption	Non-Agricultural Waste Only	Manual treatment of waste
I	432m SW	ALL SAINTS, GROSVENOR SQUARE, MANCHESTER, M15 6BH	WEX228932	Treating waste exemption	Not on a farm	Preparatory treatments (baling, sorting, shredding etc)
I	432m SW	ALL SAINTS, GROSVENOR SQUARE, MANCHESTER, M15 6BH	WEX083555	Treating waste exemption	Not on a farm	Preparatory treatments (baling, sorting, shredding etc)
I	432m SW	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

ID	Location	Site	Reference	Category	Sub-Category	Description
I	432m SW	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
F	441m E	Hoyle Street Mancunian Way Manchester Manchester M12 6HL	EPR/MF0306EV/A001	Storing waste exemption	Non-Agricultural Waste Only	Storage of waste in a secure place
5	448m E	-	WEX363538	Disposing of waste exemption	Not on a farm	Deposit of waste from a railway sanitary convenience
J	460m NE	RG Group Project Offices, Portugal Street East, Manchester, M1 2WX	WEX326647	Using waste exemption	Not on a farm	Use of waste in construction
J	460m NE	1, PORTUGAL STREET EAST, MANCHESTER, M1 2WX	WEX337872	Using waste exemption	Not on a farm	Use of waste in construction
6	471m W	OXFORD HOUSE, 16, OXFORD STREET, MANCHESTER, M1 5AE	WEX331634	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
L	495m NE	Hale Motorway Maintenance Compound, Wilmslow Road Roundabout, Hale, Altrincham, WA15 8XL	WEX303269	Storing waste exemption	Not on a Farm	Storage of waste in a secure place
L	495m NE	Hale Motorway Maintenance Compound, Wilmslow Road Roundabout, Hale, Altrincham, WA15 8XL	WEX303269	Storing waste exemption	Not on a Farm	Storage of waste in secure containers
L	495m NE	M56 JUNCTION 6, WILMSLOW ROAD, RINGWAY, ALTRINCHAM, WA15 8XL	WEX302364	Treating waste exemption	Not on a Farm	Treatment of waste aerosol cans
M	498m E	-	WEX367773	Treating waste exemption	Not on a farm	Screening and blending of waste
M	498m E	-	WEX239223	Treating waste exemption	Not on a farm	Screening and blending of waste

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

4 Current industrial land use



4.1 Recent industrial land uses

Records within 250m	37

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on page 66 >

ID	Location	Company	Address	Activity	Category
1	21m NE	Manchester University Press	Wright Robinson Hall, Altrincham Street, Manchester, Greater Manchester, M1	Published Goods	Industrial Products
E	34m E	Gantry	Greater Manchester, M1	Travelling Cranes and Gantries	Industrial Features

ID	Location	Company	Address	Activity	Category
H	67m N	Quality Lab	5, Piccadilly Place, Manchester, Greater Manchester, M1 3BR	Industrial Engineers	Engineering Services
H	67m N	Manchester Demolition	5, Piccadilly Place, Manchester, Greater Manchester, M1 3BR	Demolition Services	Construction Services
E	74m E	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
E	77m E	Pump House	Greater Manchester, M1	Water Pumping Stations	Industrial Features
2	82m SE	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
I	105m NW	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
I	108m NW	United Global	47, Chorlton Street, Manchester, Greater Manchester, M1 3FY	Distribution and Haulage	Transport, Storage and Delivery
3	122m SE	Calumet Photographic	Unit 4 Downing Street Industrial Estate, Charlton Place, Manchester, Greater Manchester, M12 6HH	Photographic and Optical Equipment	Household, Office, Leisure and Garden
J	126m W	D C Motor Engineers	Arch 45 at 5a, York Street, Piccadilly, Manchester, Greater Manchester, M1 7DE	Vehicle Repair, Testing and Servicing	Repair and Servicing
L	137m NE	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
M	139m NW	Landing Stage	Greater Manchester, M1	Moorings and Unloading Facilities	Water
5	140m SW	Gas Governor	Greater Manchester, M1	Gas Features	Infrastructure and Facilities
6	140m SW	Quantum Leap Healthcare	Flat 101 7, Nobel Way, Manchester, Greater Manchester, M1 7FU	Medical Equipment, Supplies and Pharmaceuticals	Industrial Products
N	140m N	Arup	3, Piccadilly Place, Manchester, Greater Manchester, M1 3BN	Civil Engineers	Engineering Services
N	140m N	Global Commercial Projects Ltd	3, Piccadilly Place, Manchester, Greater Manchester, M1 3BN	Office and Shop Equipment	Industrial Products
L	140m NE	Manchester Piccadilly Rail Station	Greater Manchester, M1	Railway Stations, Junctions and Halts	Public Transport, Stations and Infrastructure
7	142m NW	Fleet Angel	29-31, Sackville Street, Manchester, Greater Manchester, M1 3LZ	Vehicle Repair, Testing and Servicing	Repair and Servicing

ID	Location	Company	Address	Activity	Category
L	144m NE	Piccadilly (Manchester Metrolink)	Greater Manchester, M1	Tram, Metro and Light Railway Stations and Stops	Public Transport, Stations and Infrastructure
L	153m NE	Excess Baggage Company	3, Manchester Piccadilly Station, Piccadilly South, Manchester, Greater Manchester, M60 7RA	Container and Storage	Transport, Storage and Delivery
8	154m N	Sixt	4c, Piccadilly Place, Manchester, Greater Manchester, M1 3BN	Vehicle Hire and Rental	Hire Services
9	156m NW	Landing Stage	Greater Manchester, M1	Moorings and Unloading Facilities	Water
10	156m SE	Factory	Greater Manchester, M1	Unspecified Works Or Factories	Industrial Features
O	174m NW	Sports Fashion Distribution UK Ltd	Richmond House 15, Bloom Street, Manchester, Greater Manchester, M1 3HZ	Distribution and Haulage	Transport, Storage and Delivery
11	184m SE	Industrial Estate	Greater Manchester, M12	Business Parks and Industrial Estates	Industrial Features
12	201m N	Sixt	2, Piccadilly Place, Manchester, Greater Manchester, M1 3BN	Vehicle Hire and Rental	Hire Services
13	204m NE	Hertz Car Hire	Piccadilly Station, Boad Street, Manchester, Greater Manchester, M1	Vehicle Hire and Rental	Hire Services
14	204m N	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
O	205m NW	Coach Station	Greater Manchester, M1	Bus and Coach Stations, Depots and Companies	Public Transport, Stations and Infrastructure
16	208m SE	Speedy Hire Plc	Unit 1-3 Downing Street Industrial Estate, Charlton Place, Ardwick, Manchester, Greater Manchester, M12 6HH	Construction and Tool Hire	Hire Services
17	213m SW	Gantry	Greater Manchester, M1	Travelling Cranes and Gantries	Industrial Features
Q	226m NW	Broome & Wellington	Boulton House 17-21, Chorlton Street, Manchester, Greater Manchester, M1 3HY	Medical Equipment, Supplies and Pharmaceuticals	Industrial Products
Q	226m NW	Newsco Insider Ltd	Eighth Floor Boulton House 17-21, Chorlton Street, Manchester, Greater Manchester, M1 3HY	Published Goods	Industrial Products

ID	Location	Company	Address	Activity	Category
18	232m W	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities
19	247m SW	W S P	Oxford House Retail Unit A, Manchester Technology Centre, Oxford Road, Manchester, Greater Manchester, M1 7ED	Civil Engineers	Engineering Services
20	250m NE	Electricity Sub Station	Greater Manchester, M1	Electrical Features	Infrastructure and Facilities

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 66 >**

ID	Location	Company	Address	LPG	Status
23	326m SW	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	1

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 66 >**

ID	Location	Address	Details	
26	462m E	Tj Stafford Ltd, Hoyle Street, Ardwick, M12 6HG	Process: Other Mineral 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 66 >**

ID	Location	Address	Details	
A	**On site**	**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**

ID	Location	Address	Details	
A	**On site**	**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**
G	43m SW	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
G	43m SW	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
G	43m SW	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
G	43m SW	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
G	43m SW	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
G	43m SW	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
S	421m SW	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

ID	Location	Address	Details	
S	421m SW	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
S	421m SW	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
S	421m SW	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
S	421m SW	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
S	421m SW	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

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

4.13 Licensed Discharges to controlled waters

Records within 500m	**53**

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 66 >**

ID	Location	Address	Details	
B	27m S	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: -
C	29m W	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
C	29m W	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
C	33m W	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: -
D	33m SW	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
D	33m SW	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
C	33m W	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: -

ID	Location	Address	Details	
C	35m W	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
C	35m W	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
C	35m W	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
F	40m NW	CHORLTON STREET CSO 281J2, CHORLTON STREET, MANCHESTER, GREATER MANCHESTER, M1 3HW	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0162 Permit Version: 2 Receiving Water: DUKES TUNNEL	Status: VARIED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 04/02/2016
F	40m NW	CHORLTON STREET CSO 281J2, CHORLTON STREET, MANCHESTER, GREATER MANCHESTER, M1 3HW	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0162 Permit Version: 1 Receiving Water: DUKES TUNNEL	Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01/01/1995 Revocation Date: 02/09/2010
F	46m NW	CHORLTON STREET CSO 281J2, CHORLTON STREET, MANCHESTER, GREATER MANCHESTER, M1 3HW	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0162 Permit Version: 3 Receiving Water: DUKES TUNNEL	Status: VARIED UNDER EPR 2010 Issue date: 05/02/2016 Effective Date: 05/02/2016 Revocation Date: 10/04/2018
F	46m NW	CHORLTON STREET CSO 281J2, CHORLTON STREET, MANCHESTER, GREATER MANCHESTER, M1 3HW	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0162 Permit Version: 4 Receiving Water: SHOOTERS BROOK TRIB RVR MEDLOC	Status: VARIED UNDER EPR 2010 Issue date: 11/04/2018 Effective Date: 11/04/2018 Revocation Date: -

ID	Location	Address	Details	
C	49m W	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
C	49m W	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
C	49m W	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: -
B	60m S	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: -
C	65m W	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
C	65m W	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
C	65m W	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
B	77m S	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

ID	Location	Address	Details	
B	77m S	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
H	78m N	MINSHULL ST/WHITWORTH ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0355 Permit Version: 1 Receiving Water: -	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 01/01/1995 Revocation Date: 18/07/2014
H	88m N	AYTOUN ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982630 Permit Version: 1 Receiving Water: SHOOTERS BROOK	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 30/09/1994 Revocation Date: 30/10/2018
H	88m N	AYTOUN ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0318 Permit Version: 1 Receiving Water: SHOOTERS BROOK	Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: - Effective Date: 01/01/1995 Revocation Date: 01/01/1995
B	102m S	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
4	133m SW	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
K	138m E	MANCUNIAN WAY CSO, MANC WAY SLIP ROAD, MANCHESTER, M12 6HH	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982729 Permit Version: 2 Receiving Water: RIVER MEDLOCK	Status: MODIFIED - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: - Effective Date: 30/11/1999 Revocation Date: 28/03/2021

ID	Location	Address	Details	
K	142m E	MANCUNIAN WAY CSO, MANC WAY SLIP ROAD, MANCHESTER, M12 6HH	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982729 Permit Version: 3 Receiving Water: RIVER MEDLOCK VIA SWS	Status: VARIED UNDER EPR 2010 Issue date: 29/03/2021 Effective Date: 29/03/2021 Revocation Date: -
M	149m NW	GSHP SERVING ORIGIN DEVELOPMENT, 56 PRINCESS STREET, MANCHESTER, M1 6JA	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: NPSWQD004449 Permit Version: 3 Receiving Water: GROUNDWATER	Status: SURRENDERED UNDER EPR 2010 Issue date: 28/10/2011 Effective Date: 01/04/2013 Revocation Date: 03/10/2014
M	149m NW	GSHP SERVING ORIGIN DEVELOPMENT, 56 PRINCESS STREET, MANCHESTER, M1 6JA	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: NPSWQD004449 Permit Version: 1 Receiving Water: GROUNDWATER	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 05/03/2009 Effective Date: 01/04/2009 Revocation Date: 15/04/2009
M	149m NW	GSHP SERVING ORIGIN DEVELOPMENT, 56 PRINCESS STREET, MANCHESTER, M1 6JA	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: NPSWQD004449 Permit Version: 2 Receiving Water: GROUNDWATER	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 16/04/2009 Effective Date: 16/04/2009 Revocation Date: 31/03/2013
M	165m W	GSHP SERVING ORIGIN DEVELOPMENT, 56 PRINCESS STREET, MANCHESTER, M1 6JA	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: NPSWQD004449 Permit Version: 1 Receiving Water: GROUNDWATER	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 05/03/2009 Effective Date: 01/04/2009 Revocation Date: 15/04/2009
M	165m W	GSHP SERVING ORIGIN DEVELOPMENT, 56 PRINCESS STREET, MANCHESTER, M1 6JA	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: NPSWQD004449 Permit Version: 2 Receiving Water: GROUNDWATER	Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 16/04/2009 Effective Date: 16/04/2009 Revocation Date: 31/03/2013
M	165m W	GSHP SERVING ORIGIN DEVELOPMENT, 56 PRINCESS STREET, MANCHESTER, M1 6JA	Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: NPSWQD004449 Permit Version: 3 Receiving Water: GROUNDWATER	Status: SURRENDERED UNDER EPR 2010 Issue date: 28/10/2011 Effective Date: 01/04/2013 Revocation Date: 03/10/2014

ID	Location	Address	Details	
J	173m W	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
J	183m W	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
J	183m W	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
J	184m W	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: -
15	208m N	AYTOUN ST/AUBURN ST, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0370 Permit Version: 1 Receiving Water: -	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 01/01/1995 Revocation Date: 27/03/2015
J	208m W	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: -
J	215m W	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

ID	Location	Address	Details	
J	215m W	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
J	215m W	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
J	215m W	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
J	224m W	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
22	324m NE	STORE STREET, ANCOATS, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01MAN0371 Permit Version: 1 Receiving Water: -	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 01/01/1995 Revocation Date: 05/12/2014
R	331m SW	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
R	332m SW	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: -

ID	Location	Address	Details	
R	334m SW	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
25	457m NE	STORE STREET, ANCOATS, MANCHESTER, GREATER MANCHESTER	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982994 Permit Version: 1 Receiving Water: RIVER MEDLOCK	Status: SURRENDERED UNDER EPR 2010 Issue date: - Effective Date: 23/06/1995 Revocation Date: 28/11/2022
29	494m 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: -

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	7

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 66 >**

ID	Location	Details	
K	135m E	Incident Date: 17/01/2003 Incident Identification: 131596 Pollutant: Contaminated Water Pollutant Description: Urban Run-Off	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
P	192m NE	Incident Date: 08/03/2001 Incident Identification: 96 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
P	214m NE	Incident Date: 30/05/2001 Incident Identification: 6998 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
21	251m W	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)
24	419m E	Incident Date: 31/07/2001 Incident Identification: 20628 Pollutant: Pollutant Not Identified Pollutant Description: Not Identified	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
27	480m E	Incident Date: 30/05/2001 Incident Identification: 7029 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)

ID	Location	Details	
28	480m N	Incident Date: 12/02/2002 Incident Identification: 57989 Pollutant: Pollutant Not Identified Pollutant Description: Not Identified	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) 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.

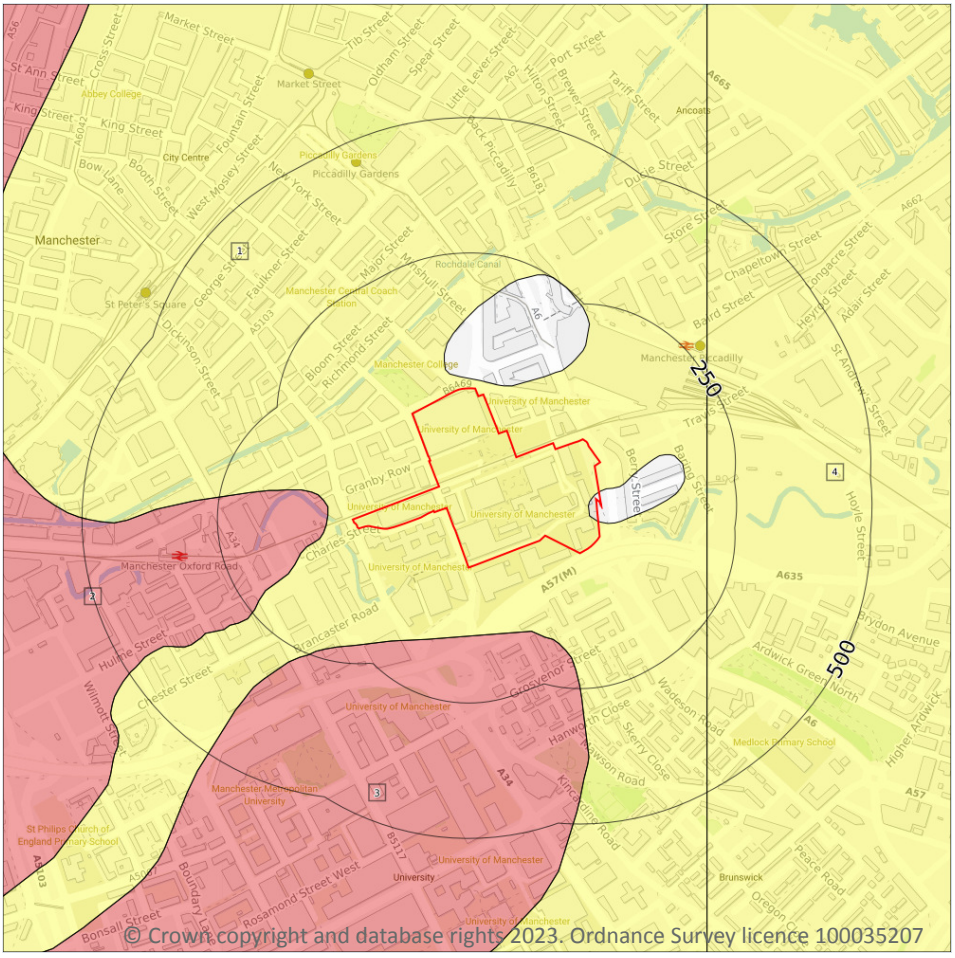
4.21 Pollution inventory radioactive waste

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



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Site Outline

Search buffers in metres (m)

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

5.1 Superficial aquifer

Records within 500m	4

Aquifer status of groundwater held within superficial geology.

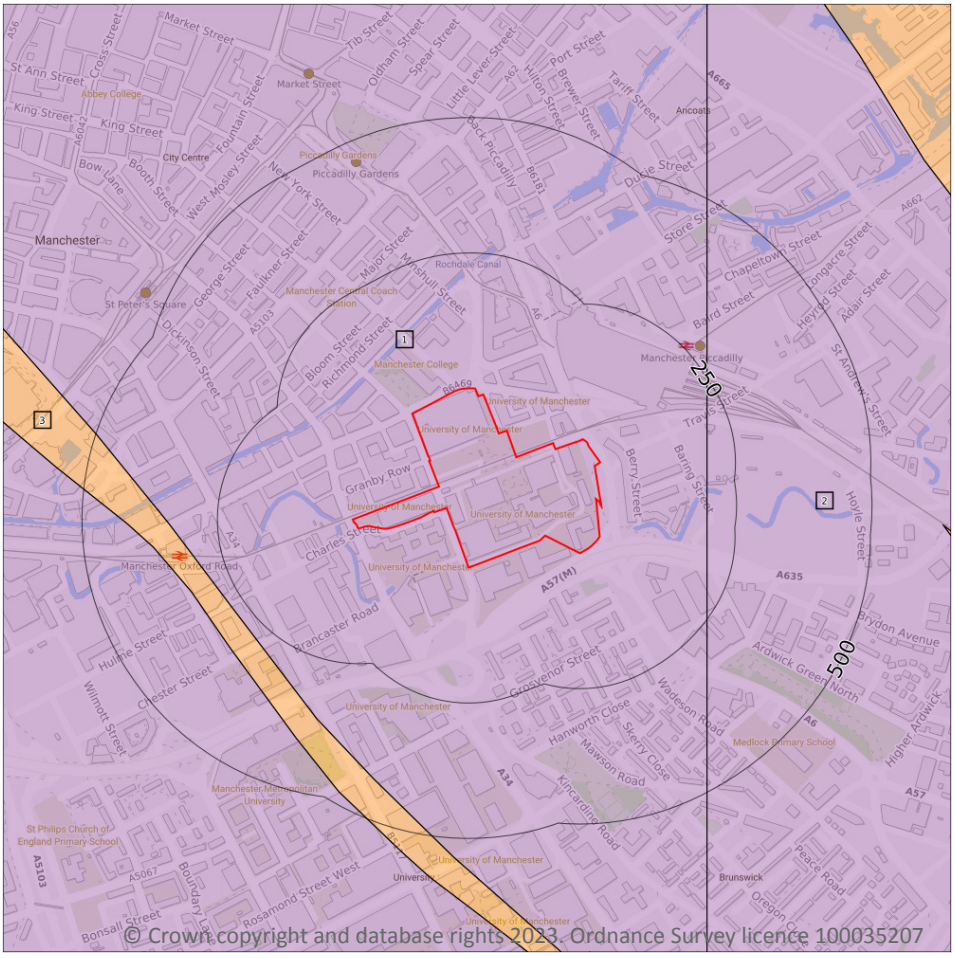
Features are displayed on the Hydrogeology map on **page 84 >**

ID	Location	Designation	Description
1	**On site**	**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**
2	47m W	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

ID	Location	Designation	Description
3	126m S	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
4	195m E	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

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

Bedrock aquifer



Site Outline

Search buffers in metres (m)

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

5.2 Bedrock aquifer

Records within 500m	3

Aquifer status of groundwater held within bedrock geology.

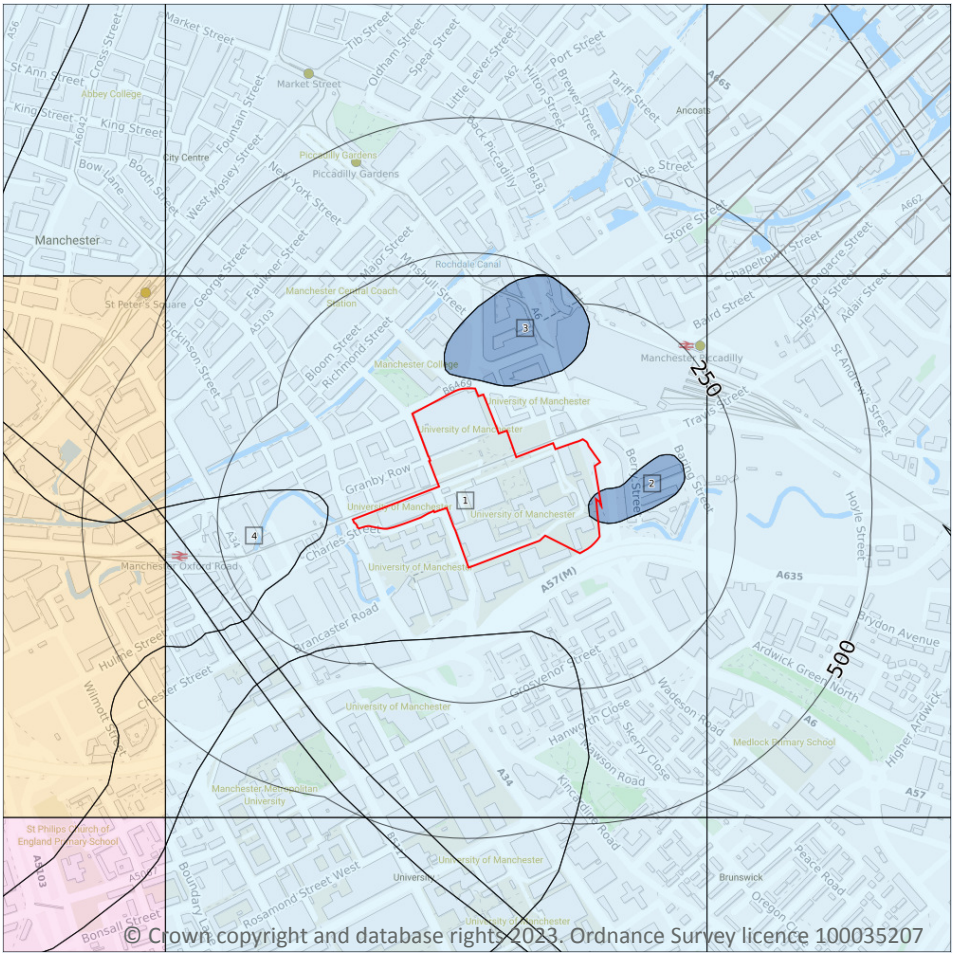
Features are displayed on the Bedrock aquifer map on **page 86 >**

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	195m E	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

ID	Location	Designation	Description
3	274m SW	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	4

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 88 >**

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: Principal Flow mechanism: Well connected fractures**
2	**On site**	**Summary Classification: Principal bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer**	**Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year**	**Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: >90% Recharge potential: Low**	**Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures**
3	16m N	Summary Classification: Principal bedrock aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, No Superficial Aquifer	Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year	Vulnerability: - Aquifer type: - Thickness: 3-10m Patchiness value: >90% Recharge potential: Low	Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures
4	46m W	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.

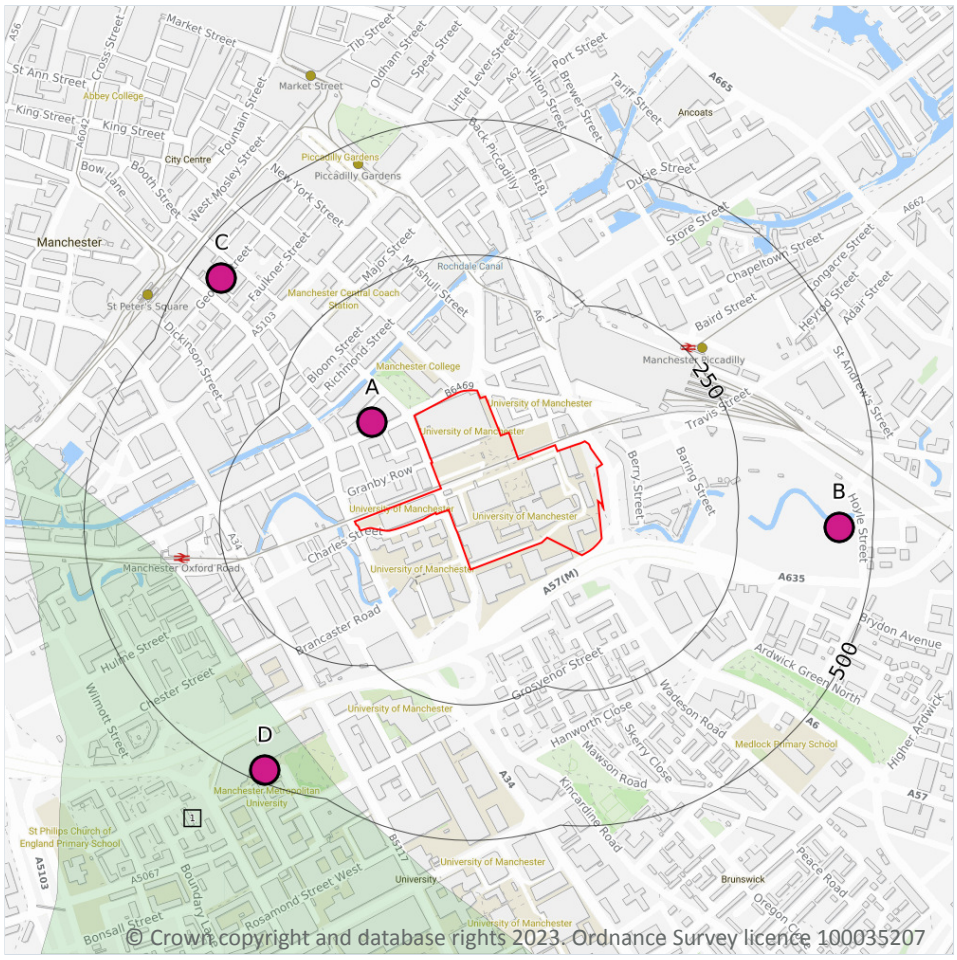
5.5 Groundwater vulnerability- local information

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



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- 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	59

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 90 >**

ID	Location	Details	
A	78m NW	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: -
A	78m NW	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: -
B	436m 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: -
B	436m 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	
C	437m NW	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: -
C	437m NW	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: -
D	477m 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): 283240 Max Daily Volume (m^3): 1532 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: -
D	477m 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): 283240 Max Daily Volume (m^3): 1532 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: -

ID	Location	Details	
-	1016m 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): 274115 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: -
-	1016m 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): 274115 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: -
-	1161m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1167m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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	
-	1168m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1169m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1181m W	Status: Active Licence No: NW/069/0004/021 Details: Heat Pump Direct Source: Ground Water - North West Region Point: CHESTER FORMATION AT SCIENCE MUSEUM (A) Data Type: Point Name: Science Museum Group Easting: 383198 Northing: 397829	Annual Volume (m^3): 346000 Max Daily Volume (m^3): 1728 Original Application No: NPS/WR/035329 Original Start Date: 31/03/2023 Expiry Date: 31/03/2024 Issue No: 1 Version Start Date: 31/03/2023 Version End Date: -
-	1186m SE	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): 2049840 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	
-	1196m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1206m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1212m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1217m NW	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: -

ID	Location	Details	
-	1217m NW	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: -
-	1217m NW	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: -
-	1226m 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: -
-	1234m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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	
-	1238m W	Status: Active Licence No: NW/069/0004/021 Details: Heat Pump Direct Source: Ground Water - North West Region Point: CHESTER FORMATION AT SCIENCE MUSEUM (B) Data Type: Point Name: Science Museum Group Easting: 383143 Northing: 397845	Annual Volume (m^3): 346000 Max Daily Volume (m^3): 1728 Original Application No: NPS/WR/035329 Original Start Date: 31/03/2023 Expiry Date: 31/03/2024 Issue No: 1 Version Start Date: 31/03/2023 Version End Date: -
-	1251m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1273m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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: -
-	1296m W	Status: Historical 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): 260172 Max Daily Volume (m^3): 712.8 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	
-	1306m W	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): 543120 Max Daily Volume (m^3): 1488 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: -
-	1574m NW	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 2 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 2 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1596m NW	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -

ID	Location	Details	
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 3 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 3 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 1 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 1 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1695m SW	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: -

ID	Location	Details	
-	1695m SW	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: -
-	1695m SW	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: -
-	1695m SW	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: -
-	1695m SW	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: -

ID	Location	Details	
-	1695m SW	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: -
-	1698m SW	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): 227000 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: -
-	1698m SW	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): 227000 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: -
-	1960m N	Status: Active Licence No: 2569004011 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT DERBY BREWERY, CHEETHAM, MANCHESTER 3 Data Type: Point Name: JOSEPH HOLT LTD Easting: 384100 Northing: 399700	Annual Volume (m^3): 45460 Max Daily Volume (m^3): 181.84 Original Application No: 0423 Original Start Date: 17/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/02/1966 Version End Date: -

ID	Location	Details	
-	1960m N	Status: Active Licence No: 2569004011 Details: Process Water Direct Source: Ground Water - North West Region Point: BOREHOLE AT DERBY BREWERY, CHEETHAM, MANCHESTER 3 Data Type: Point Name: JOSEPH HOLT LTD Easting: 384100 Northing: 399700	Annual Volume (m^3): 45460 Max Daily Volume (m^3): 181.84 Original Application No: 0423 Original Start Date: 17/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/02/1966 Version End Date: -
-	1960m N	Status: Historical Licence No: 2569004011 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT DERBY BREWERY, CHEETHAM, MANCHESTER 3" Data Type: Point Name: JOSEPH HOLT LTD Easting: 384100 Northing: 399700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/02/1966 Version End Date: -
-	1960m N	Status: Historical Licence No: 2569004011 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT DERBY BREWERY, CHEETHAM, MANCHESTER 3" Data Type: Point Name: JOSEPH HOLT LTD Easting: 384100 Northing: 399700	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 17/02/1966 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 90 >**

ID	Location	Details	
-	1852m 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: -
-	1852m 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 **9**

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.

Features are displayed on the Abstractions and Source Protection Zones map on **page 90 >**

ID	Location	Details	
-	1574m NW	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -

ID	Location	Details	
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 2) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1574m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 2 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383820 Northing: 399190	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1596m NW	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 3) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

ID	Location	Details	
-	1596m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 3 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383830 Northing: 399220	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: "Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services" Direct Source: Ground Water - North West Region Point: "BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER" Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 09/08/2000 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE (NO 1) AT PREMISES, STRANGEWAYS, MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -
-	1614m NW	Status: Historical Licence No: 2569004023 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE NUMBER 1 AT PREMISES STRANGEWAYS MANCHESTER Data Type: Point Name: INTERBREW UK LTD Easting: 383850 Northing: 399250	Annual Volume (m^3): 500000 Max Daily Volume (m^3): 2500 Original Application No: - Original Start Date: 18/02/1966 Expiry Date: - Issue No: 102 Version Start Date: 01/01/2004 Version End Date: -

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 90 >**

ID	Location	Type	Description
1	317m SW	3	Total catchment

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

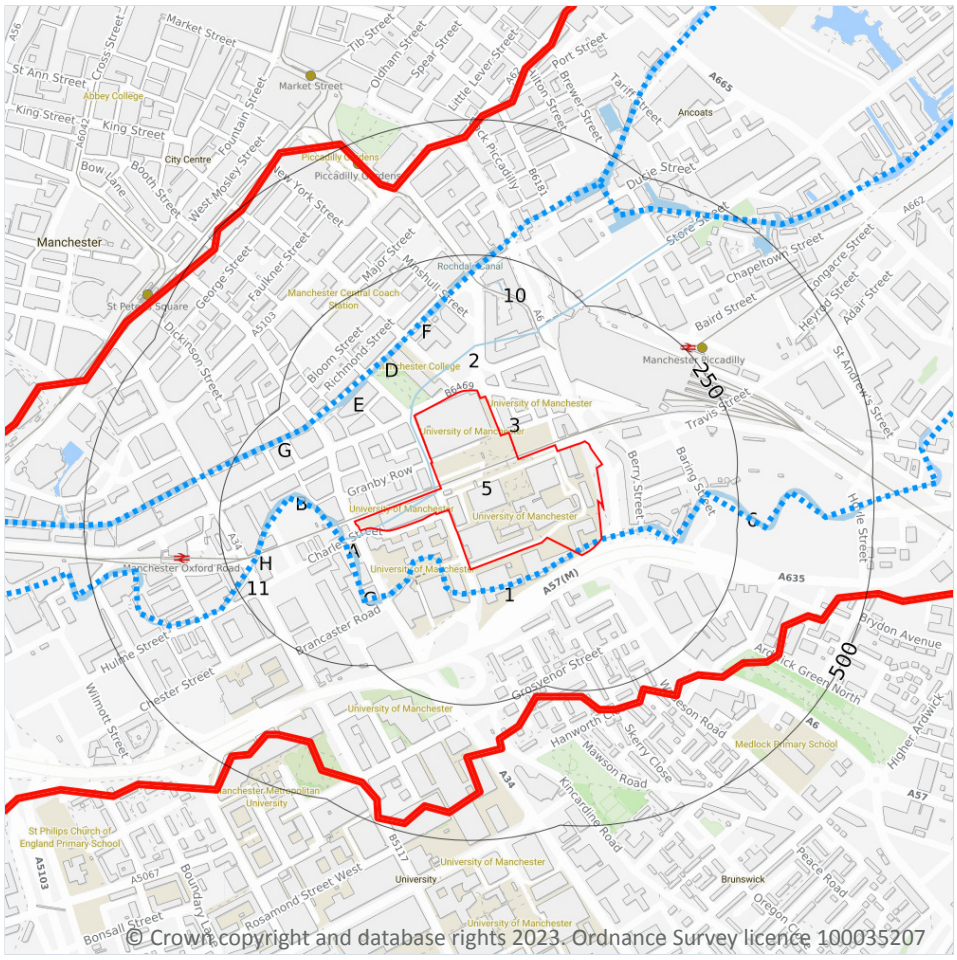
5.10 Source Protection Zones (confined aquifer)

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



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Site Outline

Search buffers in metres (m)

Water Network (OS MasterMap)

Surface water features (wider than 5m)

Surface water features (narrower than 5m)

WFD River, canal and surface water transfer water bodies

WFD Lake water bodies

WFD Transitional and coastal water bodies

WFD Surface water body catchments boundaries

WFD Groundwater body boundaries

6.1 Water Network (OS MasterMap)

Records within 250m	18

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 110 >**

ID	Location	Type of water feature	Ground level	Permanence	Name
1	**On site**	**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
2	**On site**	**Inland river not influenced by normal tidal action.**	**On ground surface**	**Watercourse contains water year round (in normal circumstances)**	**-**
B	31m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
A	35m W	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	River Medlock
C	38m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
6	61m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
D	110m NW	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
E	119m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
E	124m NW	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
F	141m NW	Lock or flight of locks. An enclosure in a canal or navigable river with gates and sluices at either end.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
E	146m NW	Lock or flight of locks. An enclosure in a canal or navigable river with gates and sluices at either end.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
F	149m NW	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
G	165m W	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
H	188m W	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
10	188m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
11	194m W	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	River Medlock
F	211m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal
F	225m N	Canal. A manmade watercourse for inland navigation.	On ground surface	Watercourse contains water year round (in normal circumstances)	Rochdale Canal

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	**13**

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 110 >**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	**1**

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 110 >**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
3	**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 110 >**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
4	**On site**	**River**	**Medlock (Lumb Brook to Irwell)**	**GB112069061152**	**Moderate**	**Fail**	**Moderate**	**2019**
F	116m NW	Canal	Rochdale Canal, western section	GB71210517	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

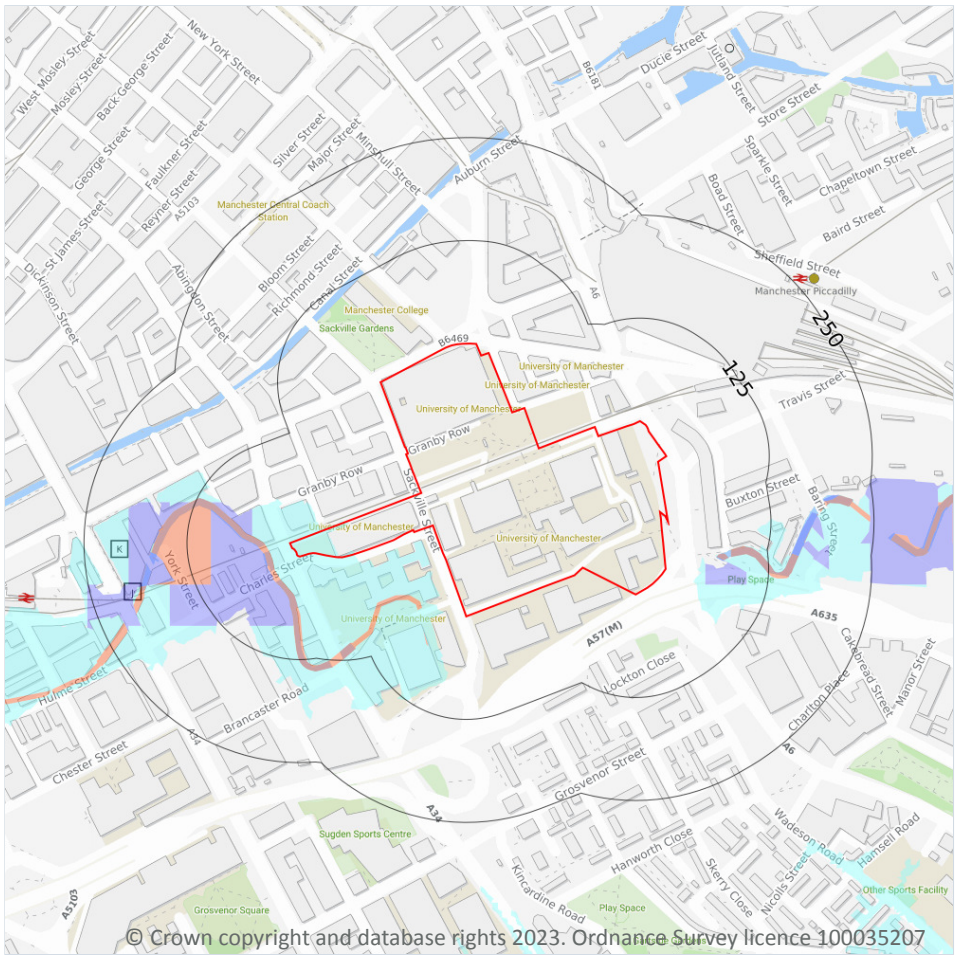
Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 110 >**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
5	**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



Site Outline

Search buffers in metres (m)

River and coastal flooding:

- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Areas Benefiting from Flood Defences
- Flood Defences

7.1 Risk of flooding from rivers and the sea

Records within 50m	16

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).

Features are displayed on the River and coastal flooding map on **page 114 >**

Distance	Flood risk category
On site	**Low**
0 - 50m	High

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

7.2 Historical Flood Events

Records within 250m	**2**

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.

Features are displayed on the River and coastal flooding map on **page 114 >**

ID	Location	Event name	Date of flood	Flood source	Flood cause	Type of flood
J	198m W	Ea01326_30 July 2002_River Medlock_Manchester	2002-07-30 2002-07-31	Ordinary watercourse	Unknown	No data
K	205m W	Ea01326_21 January 2008_River Medlock_Manchester	2008-01-21 2008-01-22	Main river	Unknown	Fluvial

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.

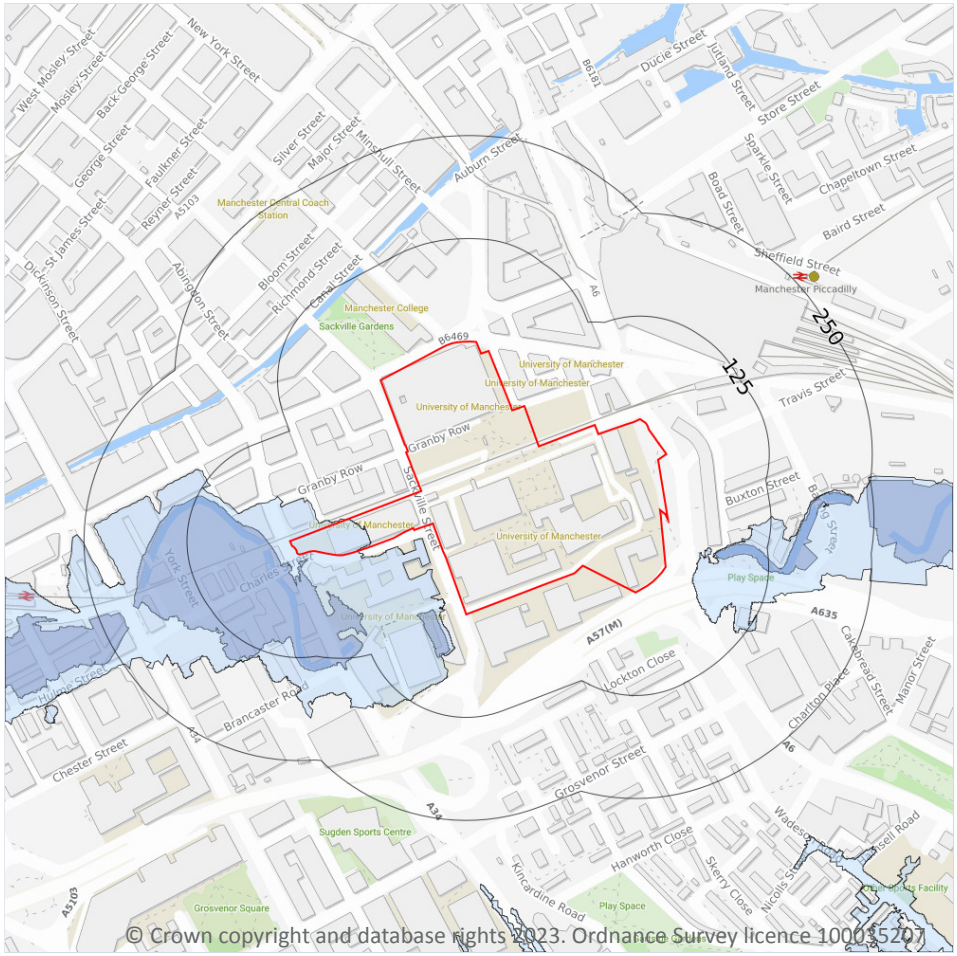
7.5 Flood Storage Areas

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	1

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.

Features are displayed on the River and coastal flooding map on **page 114 >**

Location	Type
On site	**Zone 2 - (Fluvial /Tidal Models)**

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

7.7 Flood Zone 3

Records within 50m	1

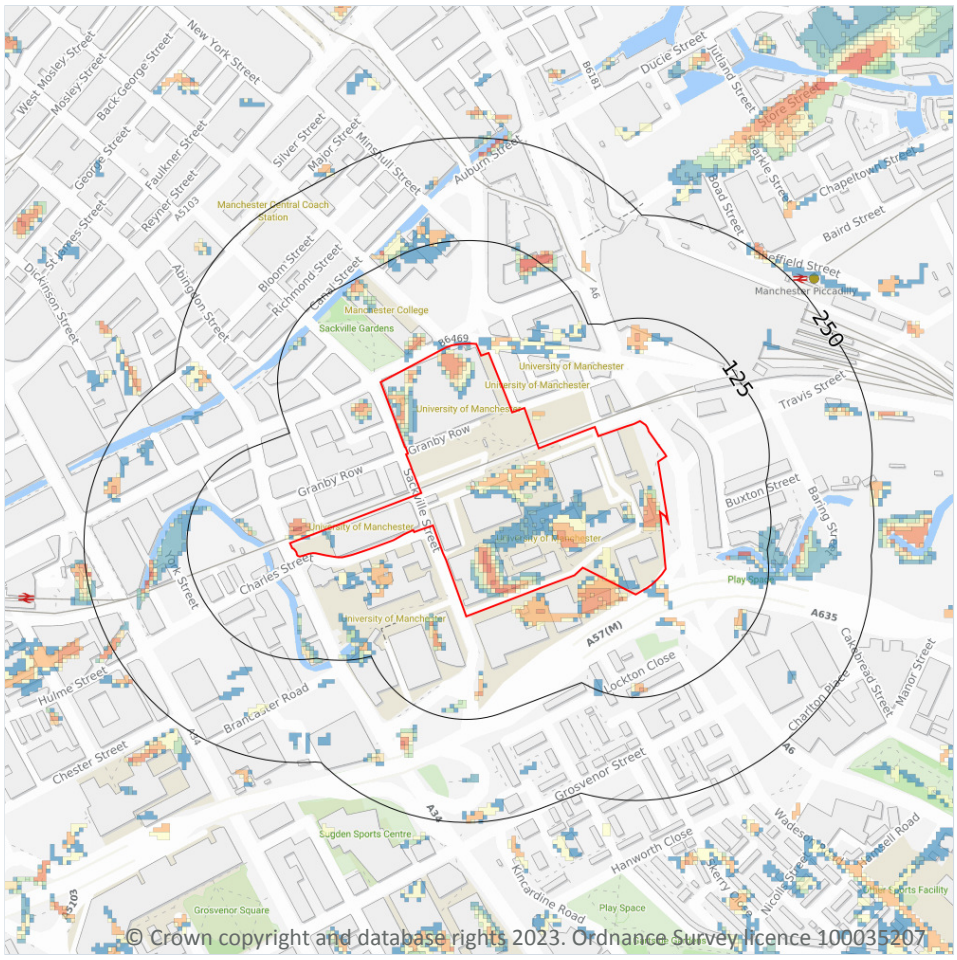
Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

Features are displayed on the River and coastal flooding map on **page 114 >**

Location	Type
8m W	Zone 3 - (Fluvial Models)

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, Greater than 1.0m**
Highest risk within 50m	**1 in 30 year, Greater than 1.0m**

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 119 >**

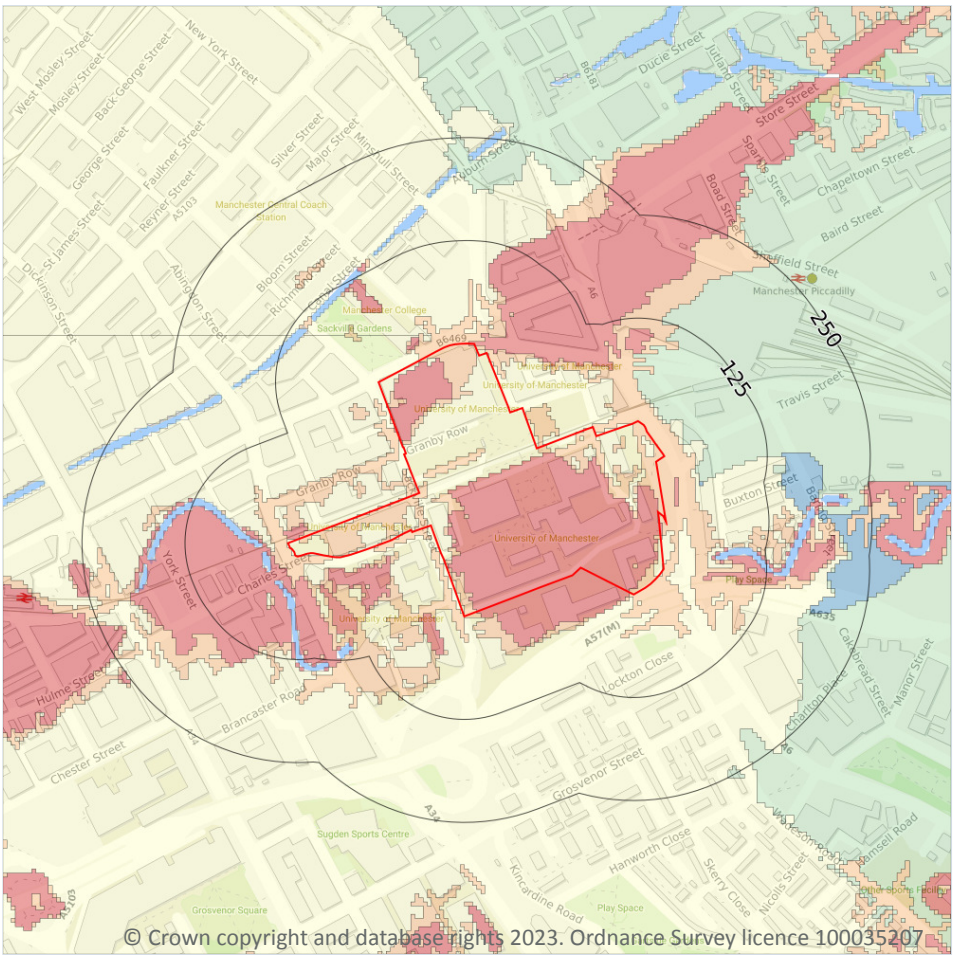
The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

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	Greater than 1.0m
1 in 250 year	Greater than 1.0m
1 in 100 year	Greater than 1.0m
1 in 30 year	Greater than 1.0m

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



9.1 Groundwater flooding

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

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 121 >**

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

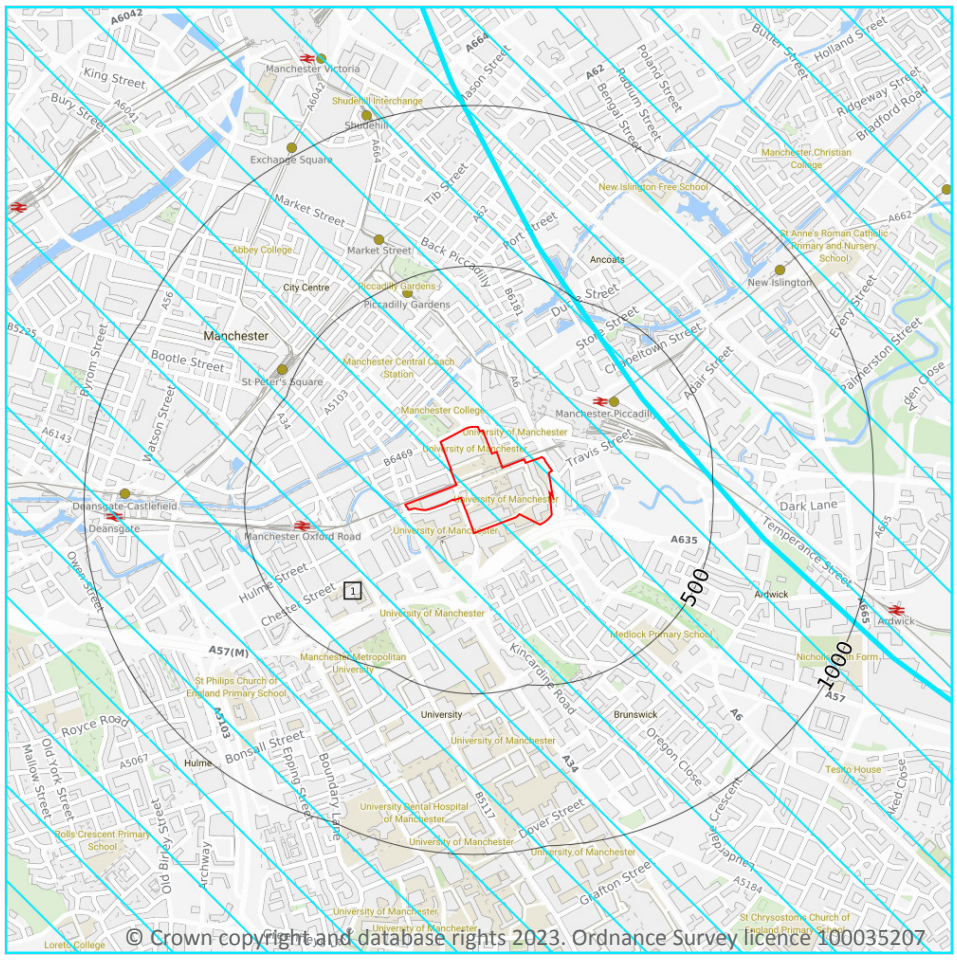
Records within 2000m	4

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
626m N	River Irk (Moston Brook to River Irwell) NVZ	Surface Water	638	Existing
925m NW	River Irk (Moston Brook to River Irwell) NVZ	Surface Water	638	Existing
1328m NW	Irwell / Man. Ship Canal (Kearsley to Irlam Locks) NVZ	Surface Water	643	Existing
1863m 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 126 >**

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.

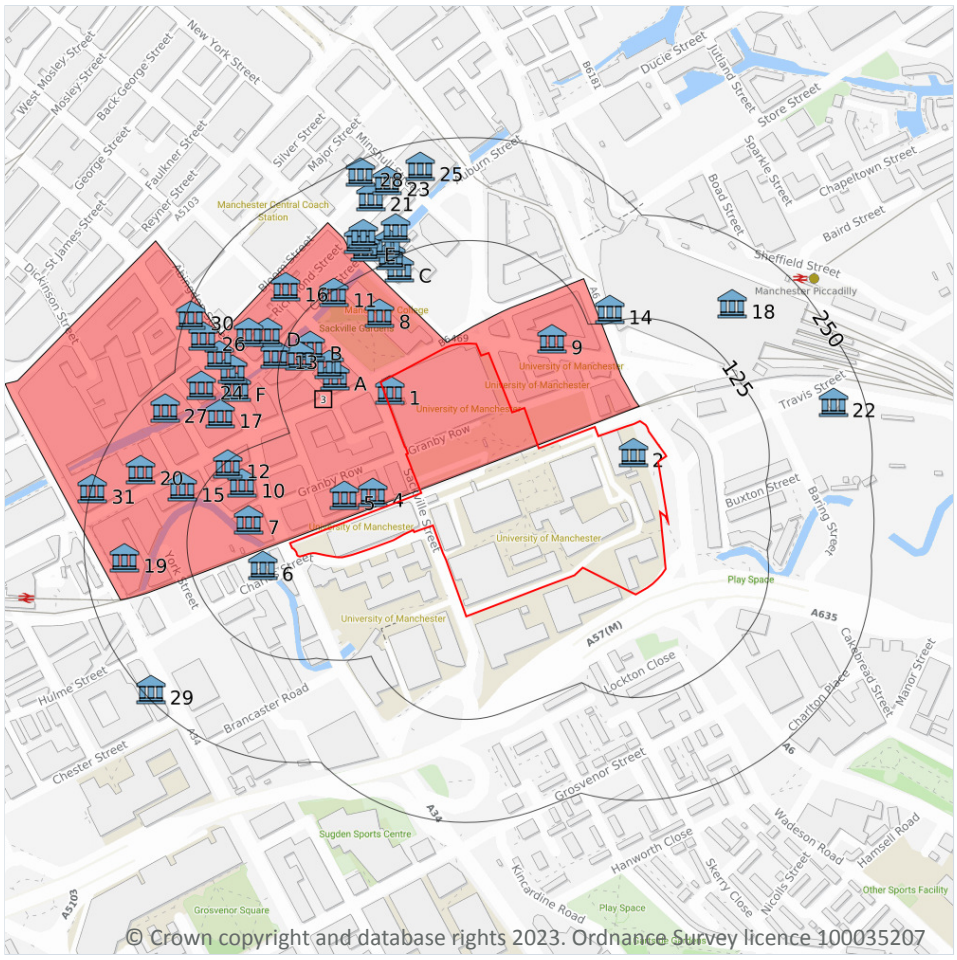
10.18 SSSI Units

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	46

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 128 >**

ID	Location	Name	Grade	Reference Number	Listed date
1	**On site**	**Institute Of Science And Technology (University Of Manchester)**	**II**	**1247609**	**03/10/1974**
2	**On site**	**Sculptural Wall**	**II**	**1400857**	**10/06/2011**
4	22m W	Granby House	II	1218253	03/10/1974
5	31m W	Orient House	II	1200838	20/06/1988
6	41m W	Lass O Gowrie Public House	II	1293175	06/06/1994

ID	Location	Name	Grade	Reference Number	Listed date
A	56m NW	Regency House With Barclays Bank	II	1254835	06/06/1994
7	58m W	Manchester House	II	1270897	06/06/1994
A	66m NW	46, Sackville Street	II	1247608	06/06/1994
8	74m NW	The Shena Simon Sixth-Form College	II	1270607	06/06/1994
9	78m N	Police And Fire Station	II*	1197918	03/10/1974
10	94m W	Asia House	II*	1247432	03/10/1974
B	96m NW	42 And 44, Sackville Street	II	1270791	03/10/1974
B	103m NW	3, Brazil Street	II	1283077	06/06/1994
C	112m NW	Minshull House	II	1283092	08/05/1990
11	123m NW	Rochdale Canal Boundary Wall To Canal Between Sackville Street And Chorlton Street	II	1270837	06/06/1994
12	123m W	Lancaster House	II*	1254887	03/10/1974
C	131m NW	Mintierna House	II	1197759	06/06/1994
13	133m NW	Boundary Wall To Rochdale Canal Between Princess Street And Sackville Street Rochdale Canal Boundary Wall To Canal Street Between Princess Street And Sackville Street	II	1247555	06/06/1994
14	140m NE	Former Goods Offices To Piccadilly Station	II	1197919	06/06/1994
C	145m NW	Rochdale Canal Lock Number 86, To East Of Chorlton Street	II	1247481	06/06/1994
15	148m W	India House (Including Attached Wrought Iron Gateway Linked To Lancaster House)	II*	1254836	03/10/1974
D	150m NW	51 And 53, Richmond Street	II	1270835	06/06/1994
E	154m NW	39, Chorlton Street	II	1283091	06/06/1994
C	157m NW	Rochdale Canal Boundary Wall To Canal Between Chorlton Street And Minshull Street	II	1247478	06/06/1994
16	164m NW	27, Sackville Street	II	1247607	06/06/1994
E	166m NW	The Churchill Public House	II	1197758	06/06/1994
E	169m NW	9, Richmond Street	II	1247476	06/06/1994
D	171m NW	Former Warehouse	II	1431770	19/01/2016
F	175m W	Rochdale Canal Lock Number 87, To East Of Princess Street, With Cast Iron Footbridge Beside Street	II	1247580	06/06/1994
17	179m W	Central House	II	1247389	03/10/1974

ID	Location	Name	Grade	Reference Number	Listed date
F	180m NW	New Union Public House	II	1247444	03/10/1974
18	181m NE	Train Shed And Undercroft At Manchester Piccadilly Station	II	1283014	06/06/1994
F	198m NW	109, Princess Street	II	1270914	03/10/1974
19	202m W	Former Refuge Assurance Company Offices	II*	1271429	03/10/1974
20	202m W	Bridgewater House	II	1270606	06/06/1994
21	205m NW	11, Bloom Street	II	1208005	06/06/1994
22	213m E	Star And Garter Public House	II	1200827	20/06/1988
23	214m N	Minshull House	II	1197926	06/06/1994
24	218m W	Lionesse House	II	1247387	06/06/1994
25	221m N	City Police Courts	II*	1219894	03/10/1974
26	223m NW	Brazil House	II	1270871	03/10/1974
27	223m W	Former Electricity Power Station	II	1255031	06/06/1994
28	238m NW	8, Minshull Street (See Details For Further Address Information)	II	1219858	06/06/1994
29	241m SW	Dancehouse Theatre Including Numbers 6-14	II	1384997	05/10/2000
30	244m NW	103, Princess Street	II*	1247391	11/05/1972
31	249m W	The Palace Theatre	II	1271227	08/06/1977

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

11.5 Conservation Areas

Records within 250m	**1**

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.

Features are displayed on the Visual and cultural designations map on **page 128 >**

ID	Location	Name	District	Date of designation
3	**On site**	**Whitworth Street and Princess Street**	**Manchester**	**01/09/1974**

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.

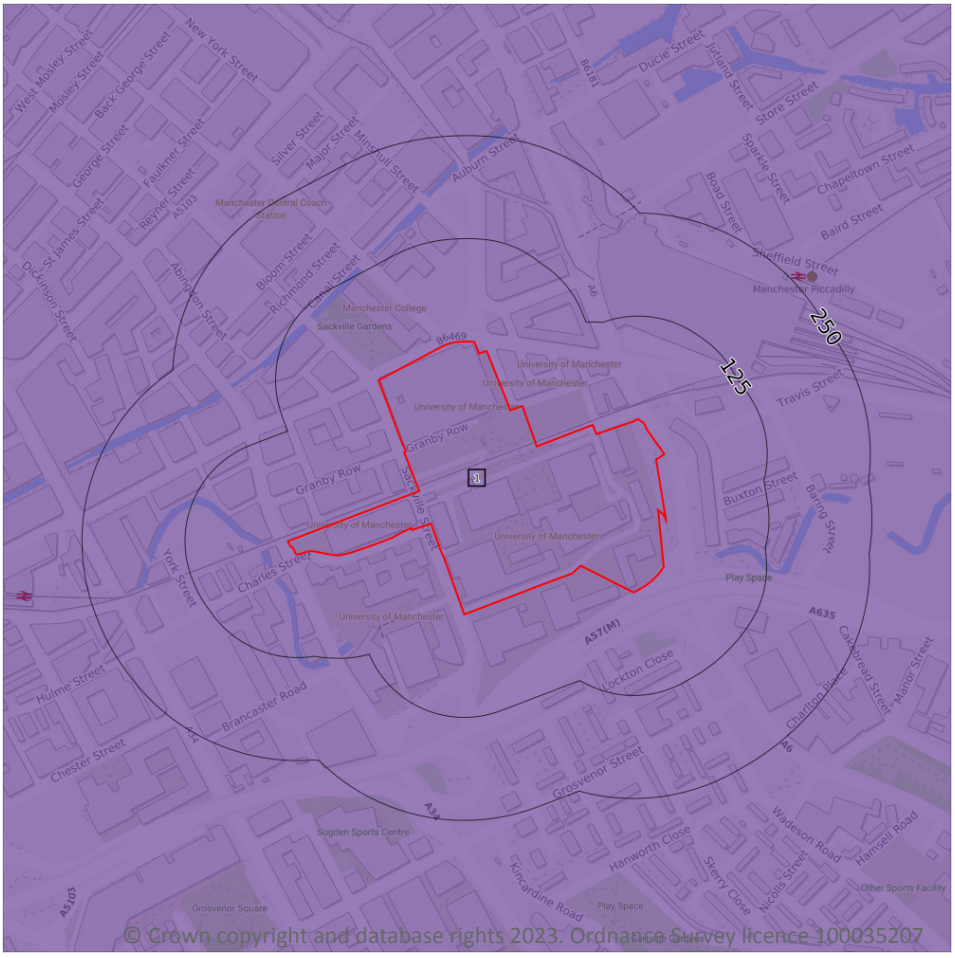
11.7 Registered Parks and Gardens

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 133 >**

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.

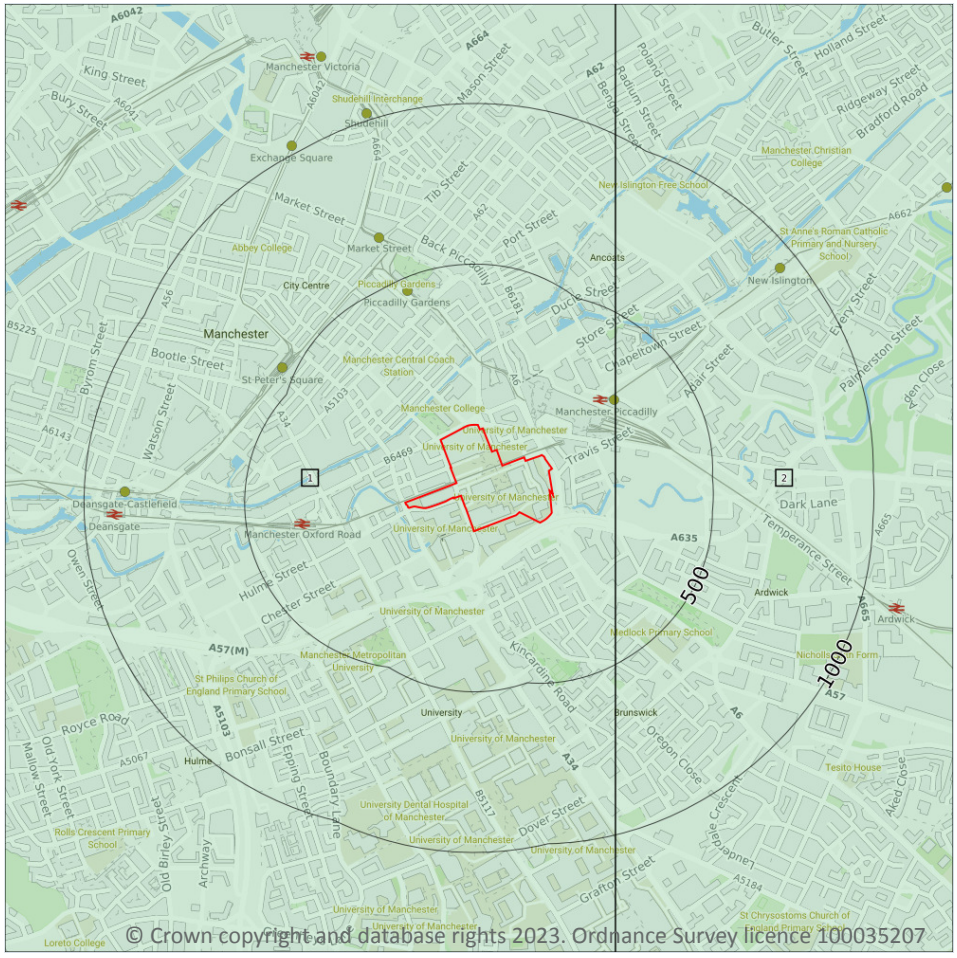
13.4 Limestone Pavement Orders

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	2

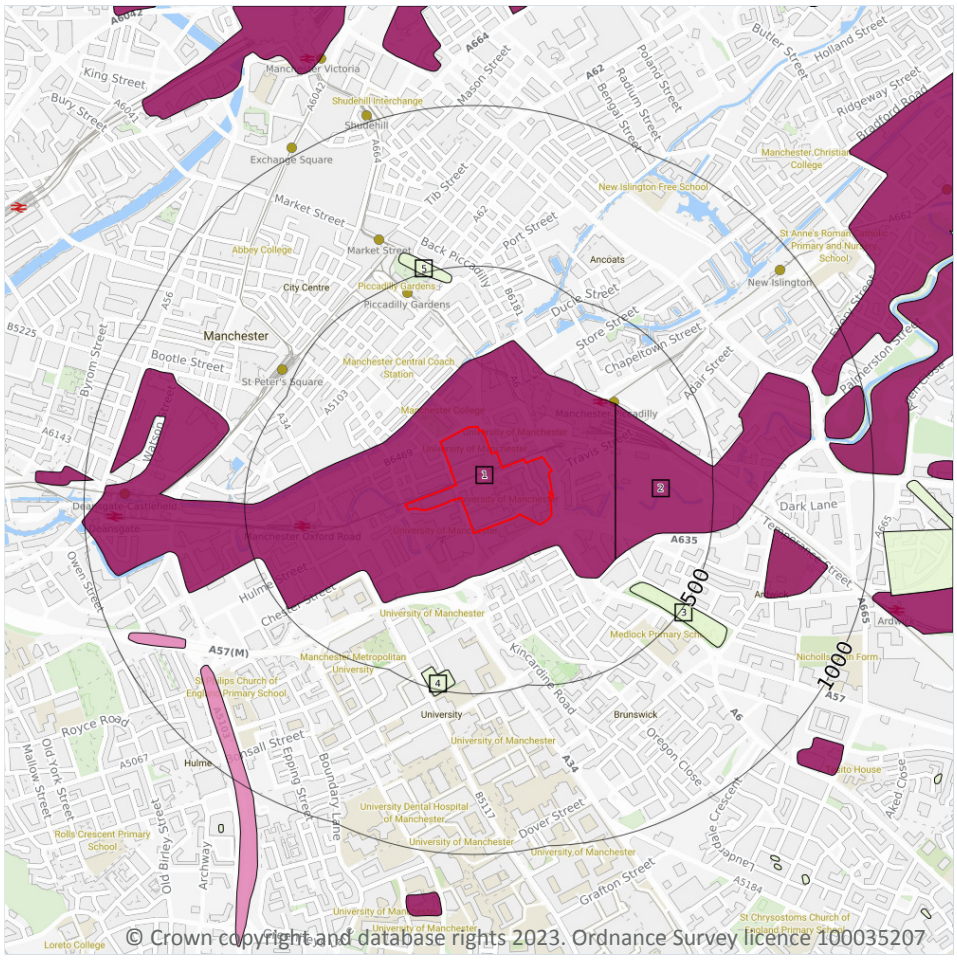
An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 136 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**No coverage**	**SJ89NW**
2	195m E	Full	Full	Full	Full	SJ89NE

This data is sourced from the British Geological Survey.

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



14.2 Artificial and made ground (10k)

Records within 500m	5

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.

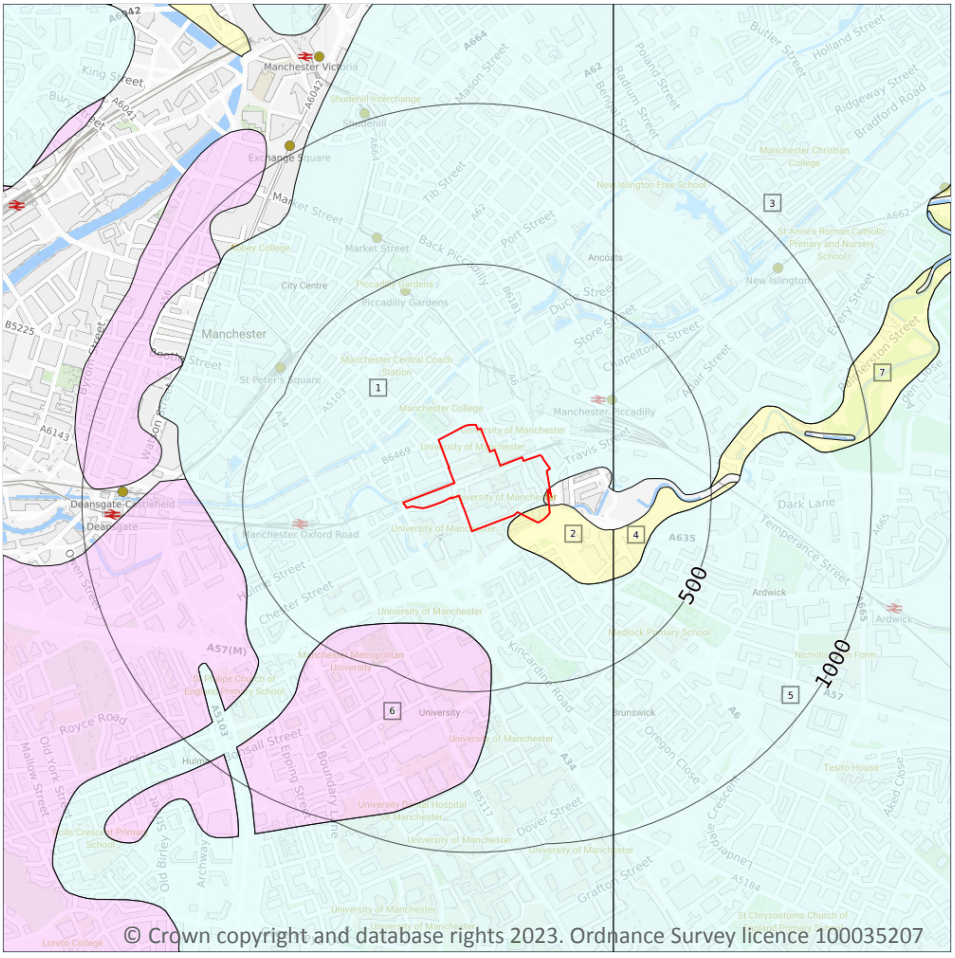
Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 137 >**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**MGR-ARTDP**	**Made Ground (Undivided)**	**Artificial Deposit**
2	195m E	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
3	333m SE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	434m S	WMGR-ARTDP	Infilled Ground	Artificial Deposit

ID	Location	LEX Code	Description	Rock description
5	454m N	WMGR-ARTDP	Infilled Ground	Artificial Deposit

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 **7**

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 139 >**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**Till, Devensian - Diamicton**	**Diamicton**
2	**On site**	**ALV-XCZSV**	**Alluvium - Clay, Silt, Sand And Gravel**	**Clay, Silt, Sand And Gravel**
3	196m E	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton

ID	Location	LEX Code	Description	Rock description
4	205m E	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel
5	285m SE	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
6	305m S	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel
7	496m E	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel

This data is sourced from the British Geological Survey.

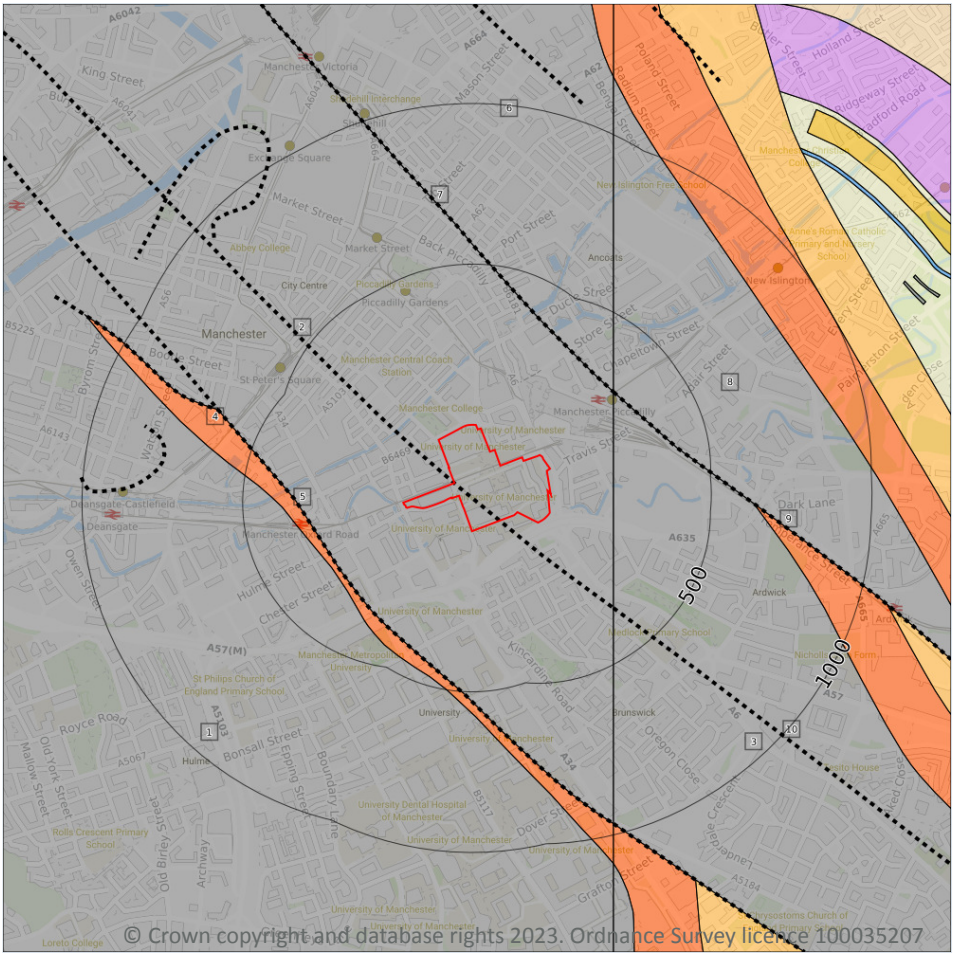
14.4 Landslip (10k)

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



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 **5**

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 141 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CPB-SDST**	**Chester Pebble Beds Formation - Sandstone**	**Early Triassic Epoch**
3	195m E	CPB-SDST	Chester Pebble Beds Formation - Sandstone	Early Triassic Epoch
4	278m SW	MM-MDST	Manchester Marls Formation - Mudstone	Late Permian Epoch [Obsolete name]

ID	Location	LEX Code	Description	Rock age
6	299m NE	CPB-SDST	Chester Pebble Beds Formation - Sandstone	Early Triassic Epoch
8	300m NE	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	**5**

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 141 >**

ID	Location	Category	Description
2	**On site**	**FAULT**	**Normal fault, inferred; crossmarks on downthrow side**
5	278m SW	FAULT	Normal fault, inferred; crossmarks on downthrow side
7	299m NE	FAULT	Normal fault, inferred; crossmarks on downthrow side
9	300m NE	FAULT	Normal fault, inferred; crossmarks on downthrow side
10	351m SE	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

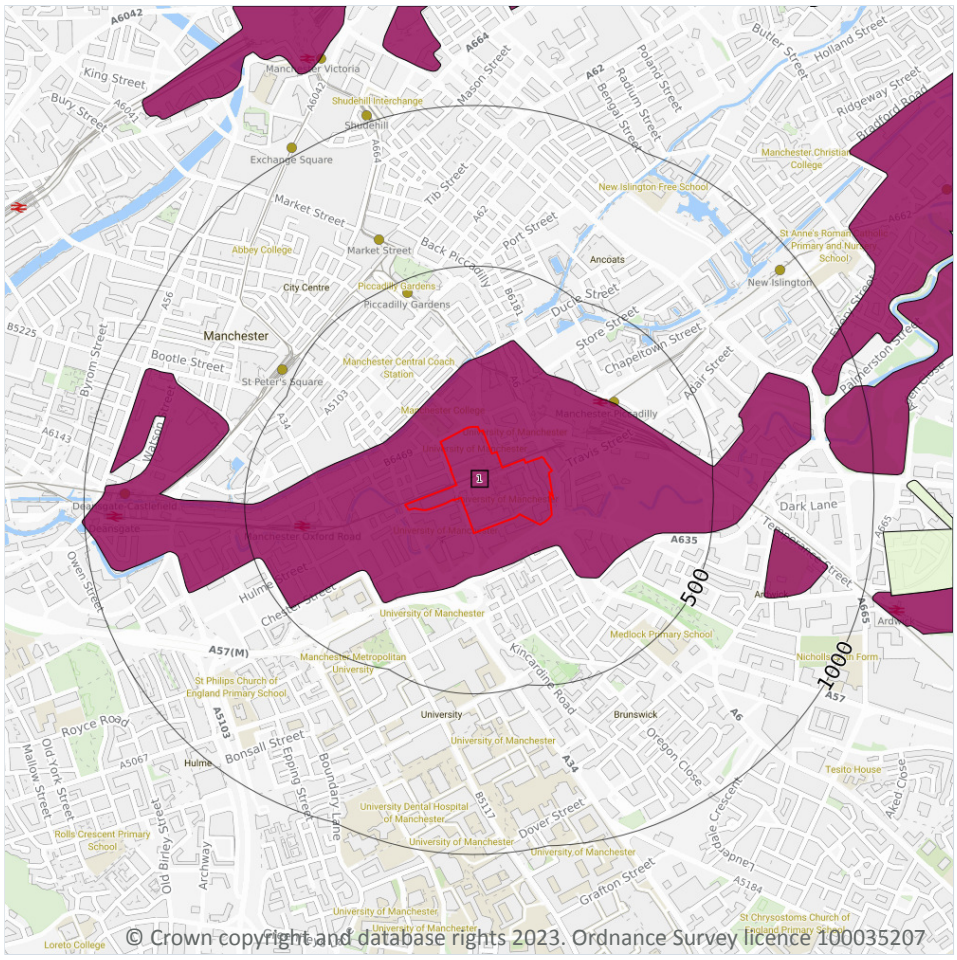
An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 143 >**

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



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 144 >**

ID	Location	LEX Code	Description	Rock description
1	On site	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

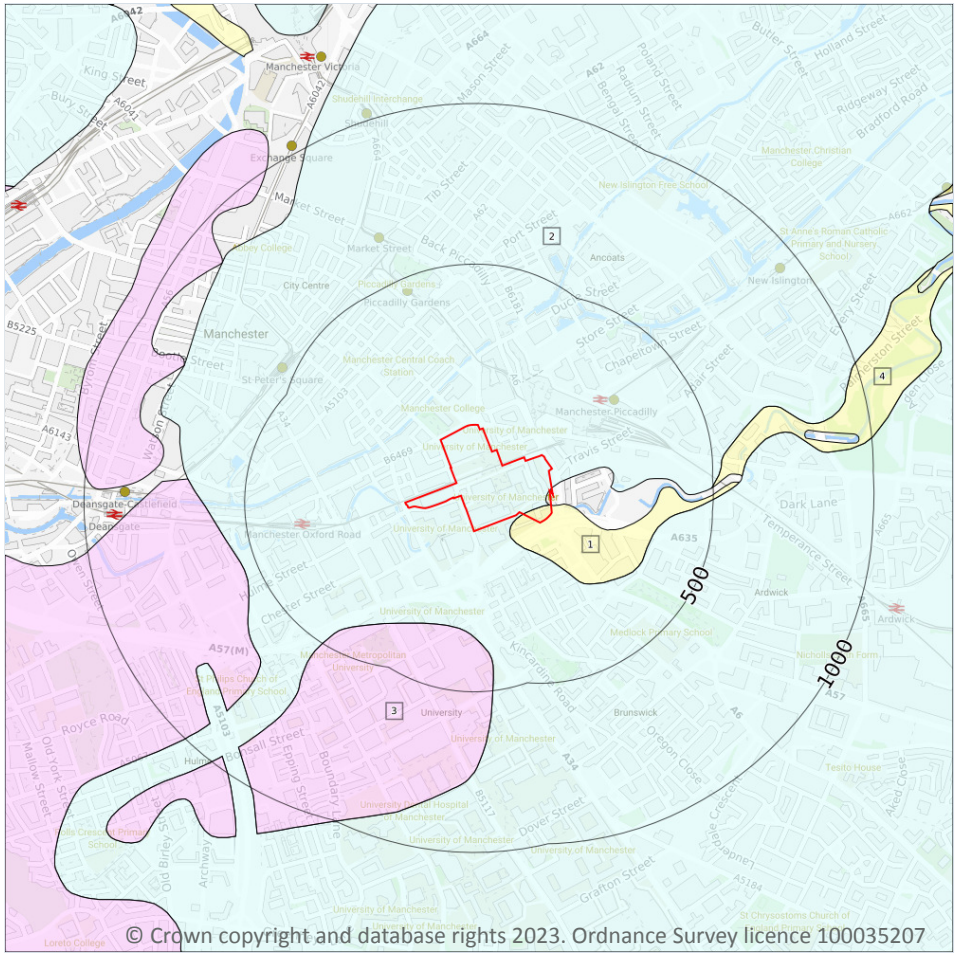
Records within 50m	1

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
On site	**Mixed**	**Very High**	**Low**

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



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 146 >**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**ALV-XCZSV**	**ALLUVIUM**	**CLAY, SILT, SAND AND GRAVEL**
2	**On site**	**TILLD-DMTN**	**TILL, DEVENSIAN**	**DIAMICTON**
3	305m S	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL

ID	Location	LEX Code	Description	Rock description
4	496m E	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	**Intergranular**	**High**	**Very Low**
On site	**Mixed**	**High**	**Low**

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.

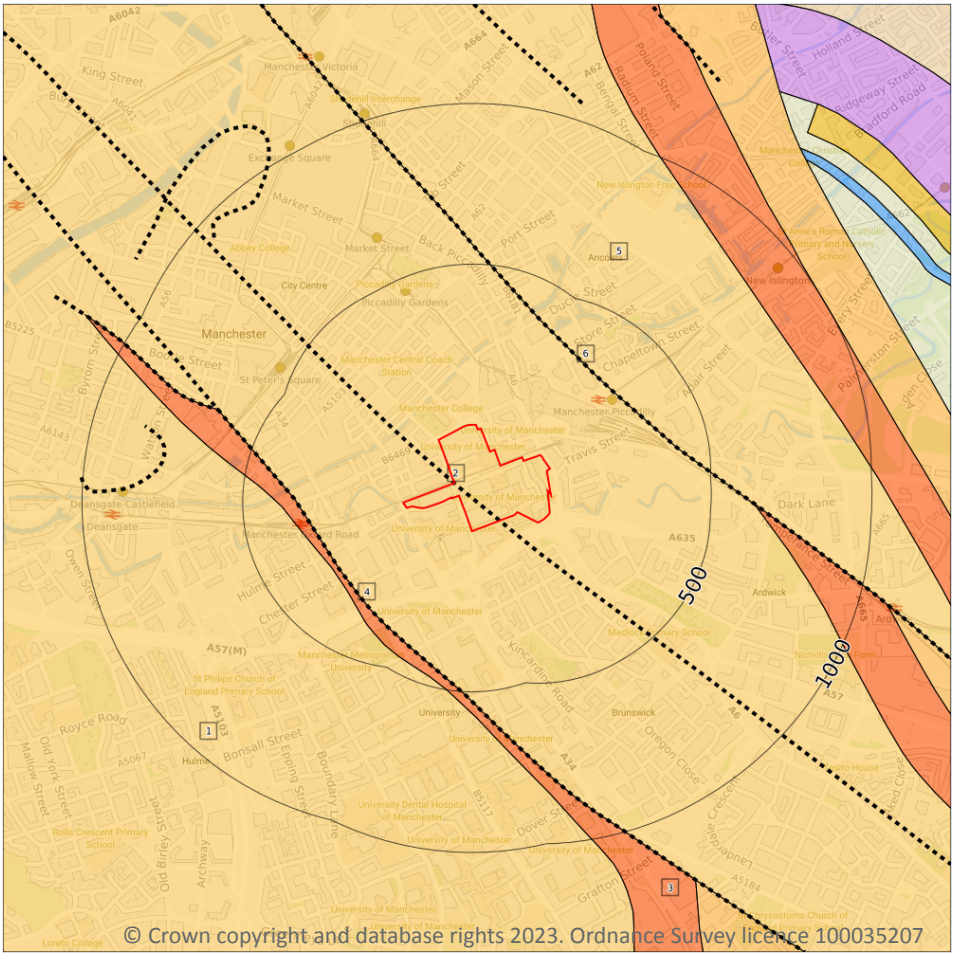
15.7 Landslip permeability (50k)

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 **3**

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 148 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CHES-SDST**	**CHESTER FORMATION - SANDSTONE**	**OLENEKIAN**
3	278m SW	MM-MDST	MANCHESTER MARLS FORMATION - MUDSTONE	-
5	299m NE	CHES-SDST	CHESTER FORMATION - SANDSTONE	OLENEKIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock 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 bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
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	3

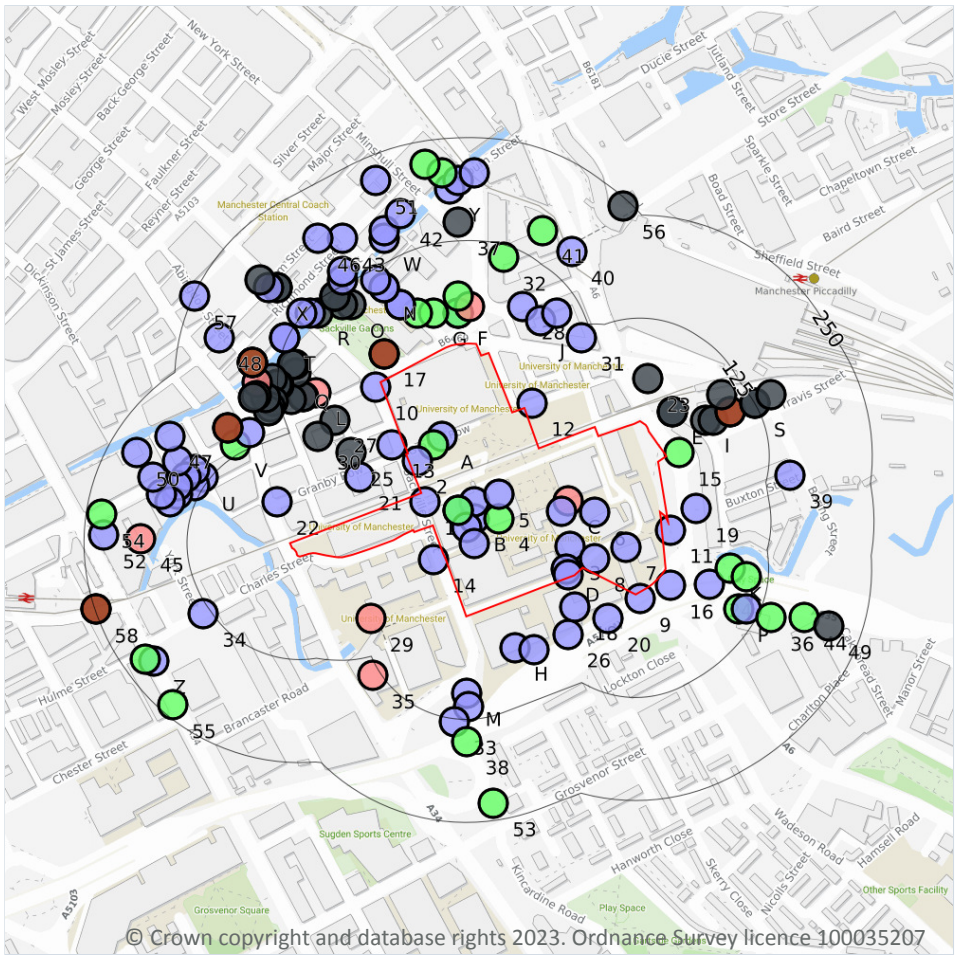
Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 148 >**

ID	Location	Category	Description
2	**On site**	**FAULT**	**Fault, inferred**
4	278m SW	FAULT	Fault, inferred
6	299m NE	FAULT	Fault, inferred

This data is sourced from the British Geological Survey.

16 Boreholes



16.1 BGS Boreholes

Records within 250m	156

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 150 >**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	On site	384510 397600	SACKVILLE STREET 3	8.12	N	1043693 ↗
2	On site	384500 397650	GRANBY ROW UMIST CAMPUS 1	8.9	N	1043355 ↗

ID	Location	Grid reference	Name	Length	Confidential	Web link
3	On site	384686 397546	MANCHESTER CORP. L SEWER	5.49	N	1042155 ↗
4	On site	384600 397580	MANCHESTER COLLEGE A	15.24	N	1045830 ↗
5	On site	384600 397610	MANCHESTER COLLEGE X	7.62	N	1045837 ↗
6	On site	384716 397588	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT 2	2.13	N	19952928 ↗
7	On site	384754 397545	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT 3	3.66	N	19952929 ↗
8	On site	384716 397532	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT 4	3.66	N	19952930 ↗
A	On site	384530 397680	GRANBY ROW / WHITWORTH STREET 2	8.0	N	1045813 ↗
A	On site	384520 397670	GRANBY ROW UMIST CAMPUS 2	13.3	N	1043356 ↗
B	On site	384570 397580	MANCHESTER COLLEGE C	5.18	N	1045832 ↗
B	On site	384570 397600	MANCHESTER COLLEGE D	7.16	N	1045833 ↗
B	On site	384550 397590	MANCHESTER COLLEGE F	3.96	N	1045835 ↗
B	On site	384560 397570	MANCHESTER COLLEGE G	7.62	N	1045836 ↗
B	On site	384570 397550	MANCHESTER COLLEGE B	8.99	N	1045831 ↗
B	On site	384550 397590	MANCHESTER COLLEGE E	10.36	N	1045834 ↗
C	On site	384684 397602	BOYD DAWKINS, JACKSON STREET MILL	68.88	N	1042403 ↗
C	On site	384675 397589	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT 1	3.05	N	19952918 ↗
D	On site	384681 397519	MANCHESTER CORP. L SEWER	6.1	N	1042154 ↗
D	On site	384683 397512	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT 5	3.35	N	19952931 ↗

ID	Location	Grid reference	Name	Length	Confidential	Web link
9	7m SE	384771 397483	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT D	7.16	N	19952936 ↗
10	8m NW	384450 397740	SACKVILLE STREET 1	7.5	N	1043691 ↗
11	11m E	384808 397566	MANCHESTER CORP. CORNER OF JACKSON STREET	6.71	N	1042159 ↗
12	11m N	384640 397720	GRANBY ROW / WHITWORTH STREET 1A	8.0	N	1045812 ↗
13	13m W	384470 397670	SACKVILLE STREET 2	8.6	N	1043692 ↗
14	14m SW	384520 397530	SACKVILLE STREET 4	6.25	N	1043694 ↗
15	16m E	384818 397660	MANCHESTER CORP. CORNER OF TRAVIS STREET	10.06	N	1042160 ↗
16	17m SE	384808 397499	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT E	5.94	N	19952937 ↗
17	28m NW	384460 397780	HIGH SCHOOL MANCHESTER OB	-1.0	N	1045473 ↗
E	36m NE	384810 397710	NATIONAL EXPRESS COACH STATION TP 1	-	Y	N/A
E	36m NE	384810 397710	NATIONAL EXPRESS COACH STATION 2	-	Y	N/A
18	36m SE	384692 397473	MANCHESTER CORP. SOUTH OF LONDON ROAD STATION	7.62	N	1042153 ↗
19	37m E	384839 397592	MANCHESTER CORP. L SEWER	6.71	N	1042156 ↗
F	38m N	384550 397830	MANCHESTER METROPOLITAN UNIVERSITY TP1	4.1	N	1043372 ↗
F	38m N	384550 397830	MANCHESTER METROPOLITAN UNIVERSITY 2	11.4	N	1043370 ↗
20	41m SE	384732 397459	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT C	7.93	N	19952935 ↗
21	45m W	384430 397630	GRANBY ROW / WHITWORTH STREET 3	9.43	N	1045814 ↗
F	45m N	384564 397837	MANCHESTER PURE ICE WORKS, WHITWORTH STREET	108.05	N	1042397 ↗
G	45m NW	384520 397830	MANCHESTER METROPOLITAN UNIVERSITY 3	14.6	N	1043371 ↗

ID	Location	Grid reference	Name	Length	Confidential	Web link
22	52m W	384330 397600	GRANBY ROW / WHITWORTH STREET 4	10.0	N	1045815 ↗
23	52m NE	384780 397750	NATIONAL EXPRESS COACH STATION 1	-	Y	N/A
G	54m NW	384500 397830	CANAL STREET SEWER RENEWAL SCHEME 6	11.0	N	1045632 ↗
24	57m SE	384855 397500	MANCUNIAN WAY 12	6.1	N	1042499 ↗
H	57m S	384619 397423	MANCHESTER CORP. SOUTH OF LONDON ROAD STATION	7.92	N	1042152 ↗
F	58m N	384550 397850	MANCHESTER METROPOLITAN UNIVERSITY 1	10.6	N	1043369 ↗
25	64m W	384420 397660	GRANBY VILLAGE MANCHESTER 3	-	Y	N/A
26	64m S	384683 397440	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT B	5.94	N	19952934 ↗
I	64m E	384850 397700	NATIONAL EXPRESS COACH STATION 3	-	Y	N/A
H	67m S	384642 397421	MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY RIVER MEDLOCK CULVERT A	4.88	N	19952932 ↗
27	68m W	384400 397700	GRANBY VILLAGE MANCHESTER 2	-	Y	N/A
28	70m N	384628 397838	MANCHESTER CORP. NEAR LONDON ROAD STATION	9.14	N	1042143 ↗
G	72m NW	384480 397840	CANAL STREET SEWER RENEWAL SCHEME 10	5.2	N	1045642 ↗
G	72m NW	384480 397840	CANAL STREET SEWER RENEWAL SCHEME 9	7.2	N	1045641 ↗
I	72m E	384860 397700	NATIONAL EXPRESS COACH STATION TP 2	-	Y	N/A
J	74m N	384650 397820	LONDON ROAD FIRE STATION MANCHESTER 2	6.0	N	1043349 ↗
K	78m E	384880 397520	LOWER MEDLOCK UCSO'S C/1 SITE 0308 525	12.4	N	1044224 ↗
L	79m NW	384378 397733	ORIGIN DEVELOPMENT, BH 2 (ABH)	90.0	N	18108077 ↗
29	80m SW	384444 397459	DUNLOP RUBBER CO, BROOK STREET	63.55	N	1042401 ↗
M	93m S	384560 397368	MANCHESTER CORP. SOUTH OF LONDON ROAD STATION	8.23	N	1042151 ↗

ID	Location	Grid reference	Name	Length	Confidential	Web link
30	94m W	384380 397680	GRANBY VILLAGE MANCHESTER 1	-	Y	N/A
I	94m E	384880 397710	FAIRFIELD STREET MANCHESTER OB	-1.0	N	1045474 ↗
L	95m NW	384363 397728	PRINCESS STREET, MANCHESTER BH105	-	Y	N/A
J	96m N	384670 397830	LONDON ROAD FIRE STATION MANCHESTER 3	5.5	N	1043350 ↗
L	97m NW	384361 397728	PRINCESS STREET, MANCHESTER TP105	-	Y	N/A
I	98m NE	384870 397730	NATIONAL EXPRESS COACH STATION TP 3	-	Y	N/A
K	99m E	384900 397510	LOWER MEDLOCK UCSO'S C/1 SITE 0308 520	25.47	N	1044221 ↗
N	99m NW	384460 397860	CANAL STREET SEWER RENEWAL SCHEME 8	6.6	N	1045640 ↗
N	99m NW	384460 397860	CANAL STREET SEWER RENEWAL SCHEME 5	6.3	N	1045631 ↗
O	100m NW	384420 397840	SACKVILLE GARDENS T2	-	Y	N/A
P	101m SE	384890 397470	LOWER MEDLOCK UCSO'S C/1 SITE 0308 227	12.0	N	1044220 ↗
Q	104m NW	384353 397757	PRINCESS STREET, MANCHESTER TP106	-	Y	N/A
O	105m NW	384410 397840	SACKVILLE GARDENS 1	-	Y	N/A
Q	106m NW	384352 397767	PRINCESS STREET, MANCHESTER TP101	-	Y	N/A
Q	109m NW	384349 397767	PRINCESS STREET, MANCHESTER BH101	-	Y	N/A
M	110m S	384563 397352	MANCUNIAN WAY 11	8.53	N	1042498 ↗
P	110m SE	384900 397470	LOWER MEDLOCK UCSO'S C/1 SITE 0308 522	1.9	N	1044222 ↗
L	110m W	384348 397725	PRINCESS STREET, MANCHESTER TP110	-	Y	N/A
31	110m NE	384700 397800	LONDON ROAD FIRE STATION MANCHESTER 1	6.0	N	1043348 ↗
32	110m N	384605 397897	AYTOUN STREET MULTI-STOREY CAR PARK. 1-4	10.97	N	1042480 ↗
N	113m NW	384450 397870	CANAL STREET SEWER RENEWAL SCHEME 7	4.6	N	1045639 ↗
R	113m NW	384380 397830	SACKVILLE GARDENS 3	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
O	118m NW	384400 397850	SACKVILLE GARDENS T1	-	Y	N/A
O	118m NW	384400 397850	SACKVILLE GARDENS 2	-	Y	N/A
R	120m NW	384370 397830	CANAL STREET SEWER RENEWAL SCHEME 3	6.0	N	1045635 ↗
L	123m NW	384333 397742	PRINCESS STREET, MANCHESTER BH102	-	Y	N/A
S	125m E	384910 397720	NATIONAL EXPRESS COACH STATION 4	-	Y	N/A
S	125m E	384910 397720	NATIONAL EXPRESS COACH STATION TP 4	-	Y	N/A
L	126m NW	384330 397743	PRINCESS STREET, MANCHESTER TP102	-	Y	N/A
R	128m NW	384360 397830	CANAL STREET SEWER RENEWAL SCHEME 3	7.1	N	1045629 ↗
T	128m NW	384340 397800	CANAL STREET SEWER RENEWAL SCHEME 2	5.8	N	1045634 ↗
T	128m NW	384340 397800	CANAL STREET SEWER RENEWAL SCHEME 1	5.8	N	1045633 ↗
33	128m S	384545 397334	MANCHESTER CORP. SOUTH OF LONDON ROAD STATION	9.45	N	1042150 ↗
L	131m NW	384325 397750	PRINCESS STREET, MANCHESTER TP107	-	Y	N/A
O	131m NW	384410 397870	CANAL STREET SEWER RENEWAL SCHEME 4	4.7	N	1045636 ↗
L	132m W	384326 397723	PRINCESS STREET, MANCHESTER TP109	-	Y	N/A
U	133m W	384240 397630	INDIA HOUSE WHITWORTH STREET 4	4.5	N	1045678 ↗
34	134m W	384241 397465	MANCHESTER CORP. K.SEWER	6.71	N	1042250 ↗
35	134m SW	384446 397390	DUNLOP RUBBER CO, BROOK STREET 2	76.5	N	1042402 ↗
U	135m W	384230 397620	INDIA HOUSE WHITWORTH STREET 1	5.5	N	1045675 ↗
V	137m W	384280 397670	GRANBY ROW / WHITWORTH STREET 5A	15.0	N	1045816 ↗
L	137m W	384322 397715	PRINCESS STREET, MANCHESTER TP104	-	Y	N/A
L	140m W	384320 397711	PRINCESS STREET, MANCHESTER BH104	-	Y	N/A
O	140m NW	384410 397880	CANAL STREET SEWER RENEWAL SCHEME 2	6.7	N	1045628 ↗

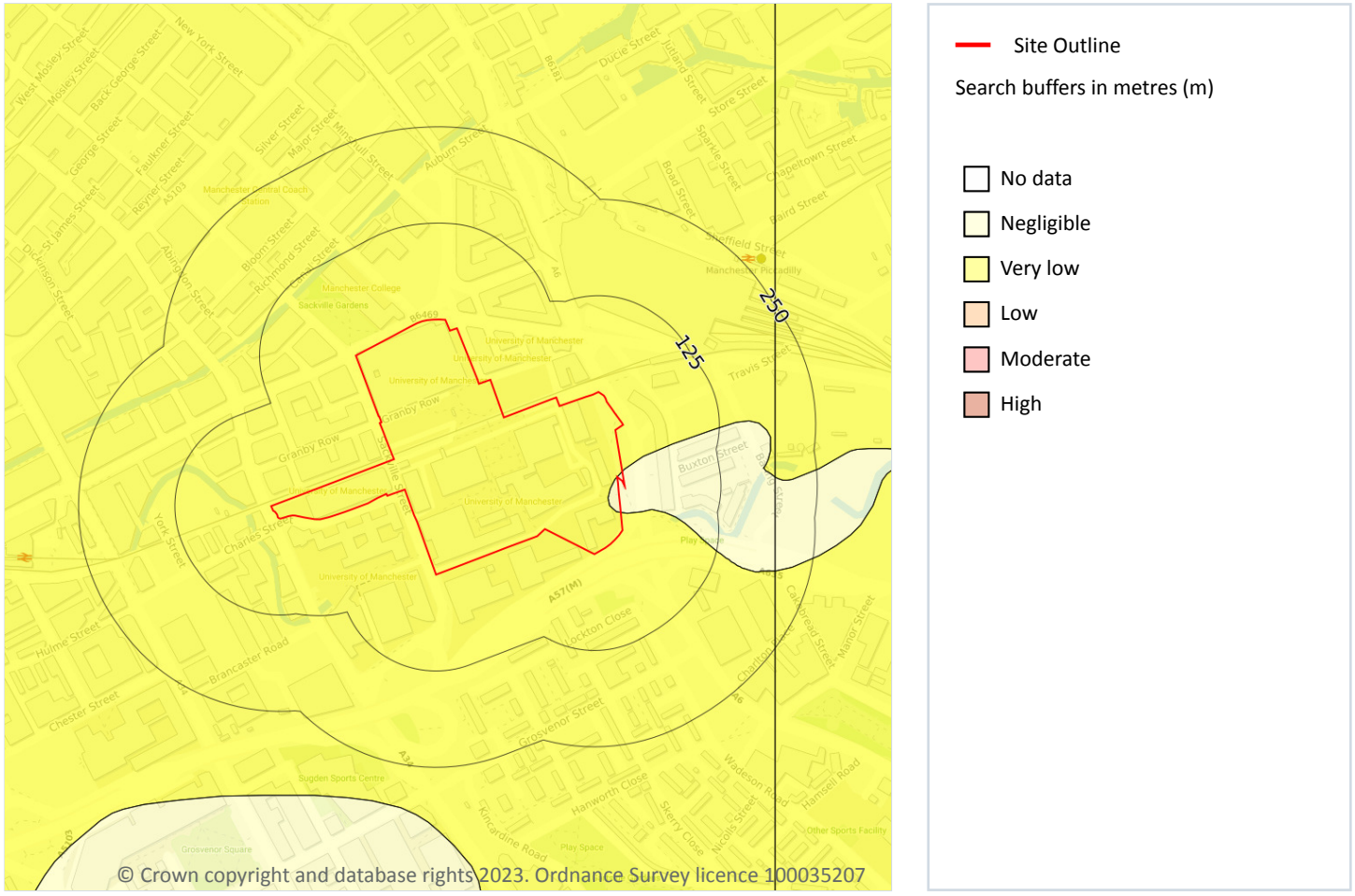
ID	Location	Grid reference	Name	Length	Confidential	Web link
36	141m SE	384930 397460	LOWER MEDLOCK UCSO'S C/1 SITE 0308 523	25.2	N	1044223 ↗
L	141m W	384316 397727	PRINCESS STREET, MANCHESTER TP108	-	Y	N/A
V	143m W	384297 397685	MANCHESTER CORP. SHOOTERS BROOK RELIEF SEWER	7.62	N	1042252 ↗
U	147m W	384230 397640	INDIA HOUSE WHITWORTH STREET 5	4.3	N	1045679 ↗
S	147m E	384930 397730	NATIONAL EXPRESS COACH STATION TP 5	-	Y	N/A
37	148m N	384550 397940	MINSHULL STREET MAIN DRAINAGE	-	Y	N/A
U	149m W	384210 397610	INDIA HOUSE WHITWORTH STREET 2	6.5	N	1045676 ↗
U	149m W	384220 397630	INDIA HOUSE WHITWORTH STREET 6	4.6	N	1045680 ↗
L	150m NW	384306 397746	ORIGIN DEVELOPMENT, BH 1 (RECHARGE)	90.0	N	18108076 ↗
38	151m S	384560 397310	MANCHESTER CORP. CORNER OF GREEK STREET	12.19	N	1042158 ↗
L	152m W	384305 397729	PRINCESS STREET, MANCHESTER TP103	-	Y	N/A
W	152m NW	384460 397920	CANAL STREET SEWER RENEWAL SCHEME 5	4.2	N	1045637 ↗
39	152m E	384953 397633	MANCHESTER CORP. L SEWER	7.62	N	1042157 ↗
U	153m W	384210 397620	INDIA HOUSE WHITWORTH STREET 7	6.5	N	1045681 ↗
U	154m W	384200 397600	INDIA HOUSE WHITWORTH STREET 3	6.7	N	1045677 ↗
L	156m W	384301 397727	PRINCESS STREET, MANCHESTER BH103	-	Y	N/A
L	158m NW	384300 397770	BLOOM STREET/ABINGDON STREET 7	10.5	N	1045709 ↗
L	158m NW	384300 397770	NO DETAILS	-1.0	N	1042456 ↗
V	159m W	384270 397690	GALBRAITH STREET MANCHESTER OB	-1.0	N	1045470 ↗
40	159m N	384688 397904	MANCHESTER CORP. NEAR LONDON ROAD STATION	8.84	N	1042144 ↗

ID	Location	Grid reference	Name	Length	Confidential	Web link
41	160m N	384652 397930	MANCHESTER CORP. NEAR LONDON ROAD STATION	10.06	N	1042145 ↗
W	161m NW	384460 397930	CANAL STREET SEWER RENEWAL SCHEME 6	4.0	N	1045638 ↗
U	167m W	384190 397610	INDIA HOUSE WHITWORTH STREET 8	7.5	N	1045682 ↗
U	169m W	384210 397650	WHITWORTH ST MANCHESTER 4	7.1	N	1042857 ↗
X	170m NW	384330 397860	SACKVILLE STREET / BLOOM STREET 2	-	Y	N/A
X	170m NW	384330 397860	SACKVILLE STREET / BLOOM STREET 1	-	Y	N/A
42	171m N	384480 397950	CANAL STREET SEWER RENEWAL SCHEME 1	5.5	N	1045627 ↗
43	176m NW	384410 397920	CANAL STREET SEWER RENEWAL SCHEME 4A	5.5	N	1045630 ↗
X	178m NW	384320 397860	BLOOM STREET/ABINGDON STREET 4	8.7	N	1045706 ↗
44	178m SE	384970 397460	LOWER MEDLOCK UCSO'S C/1 SITE 0308 525A	25.4	N	1044225 ↗
45	181m W	384165 397556	REFUGE ASSURANCE CO LTD, OXFORD ROAD	30.78	N	1042398 ↗
U	184m W	384180 397630	WHITWORTH ST MANCHESTER 3	7.5	N	1042856 ↗
Y	188m N	384540 397980	AYTOUN STREET MANCHESTER BH3	2.4	N	1045731 ↗
46	190m NW	384380 397920	BLOOM STREET/ABINGDON STREET 3	8.95	N	1045705 ↗
X	192m NW	384310 397870	SACKVILLE STREET / BLOOM STREET 3	-	Y	N/A
47	195m W	384200 397680	WHITWORTH ST MANCHESTER 2	7.3	N	1042855 ↗
Y	198m N	384550 397990	AYTOUN STREET MANCHESTER BH2	5.1	N	1045730 ↗
48	203m NW	384260 397800	BLOOM STREET/ABINGDON STREET 6	1.2	N	1045708 ↗
Y	208m N	384570 398000	AYTOUN STREET MANCHESTER BH1	4.0	N	1045729 ↗

ID	Location	Grid reference	Name	Length	Confidential	Web link
Y	209m N	384530 398000	MANCHESTER FGC/3235. 3	15.0	N	1042546 ↗
49	210m SE	385000 397450	LOWER MEDLOCK ECSO'S C/1 SITE 0308 525B	-	Y	N/A
50	216m W	384160 397660	WHITWORTH ST MANCHESTER 1	7.3	N	1042854 ↗
Z	216m SW	384181 397407	MANCHESTER CORP. K.SEWER	8.84	N	1042249 ↗
51	220m NW	384450 397990	BLOOM STREET/ABINGDON STREET 2	8.0	N	1045704 ↗
Y	222m N	384510 398010	MANCHESTER FGC/3235. 2	18.0	N	1042545 ↗
Z	223m SW	384170 397410	LOWER MEDLOCK UCSO'S CONTRACT 1 MAN 0342 505	10.5	N	1043417 ↗
52	226m W	384120 397560	REFUGE ASS.CO.OXFORD ST.MANCHESTER	7.7	N	1045495 ↗
53	229m S	384593 397235	MANCHESTER CORP. SOUTH OF LONDON ROAD STATION	12.19	N	1042149 ↗
54	231m W	384118 397585	MANCHESTER CORP. D.SEWER	11.58	N	1042251 ↗
55	236m SW	384204 397354	MANCHESTER CORP. K.SEWER	10.06	N	1042248 ↗
56	242m N	384750 397960	MANCHESTER INTERNATIONAL TRADE CENTRE TP 9	-	Y	N/A
57	249m NW	384230 397850	BLOOM STREET/ABINGDON STREET 5	9.05	N	1045707 ↗
58	249m W	384110 397470	OXFORD ROAD STATION MANCHESTER OB	-1.0	N	1045467 ↗

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



17.1 Shrink swell clays

Records within 50m	2

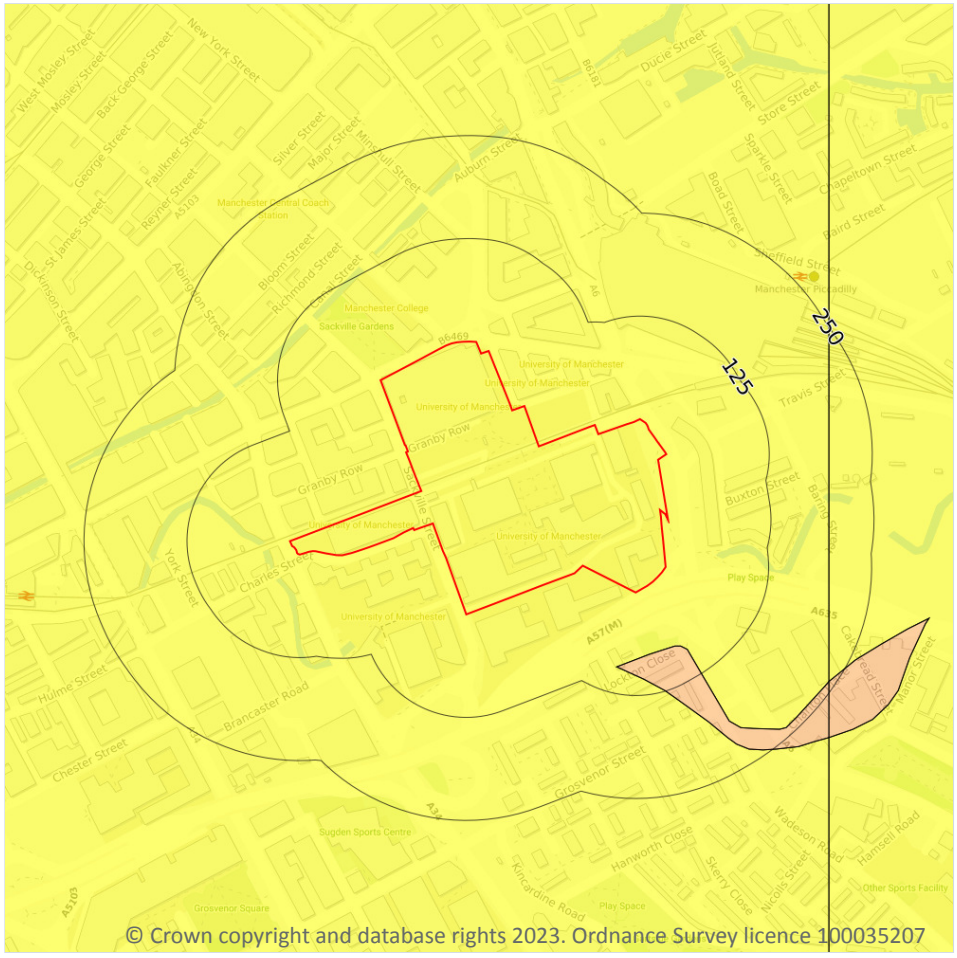
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and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

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 159 >**

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

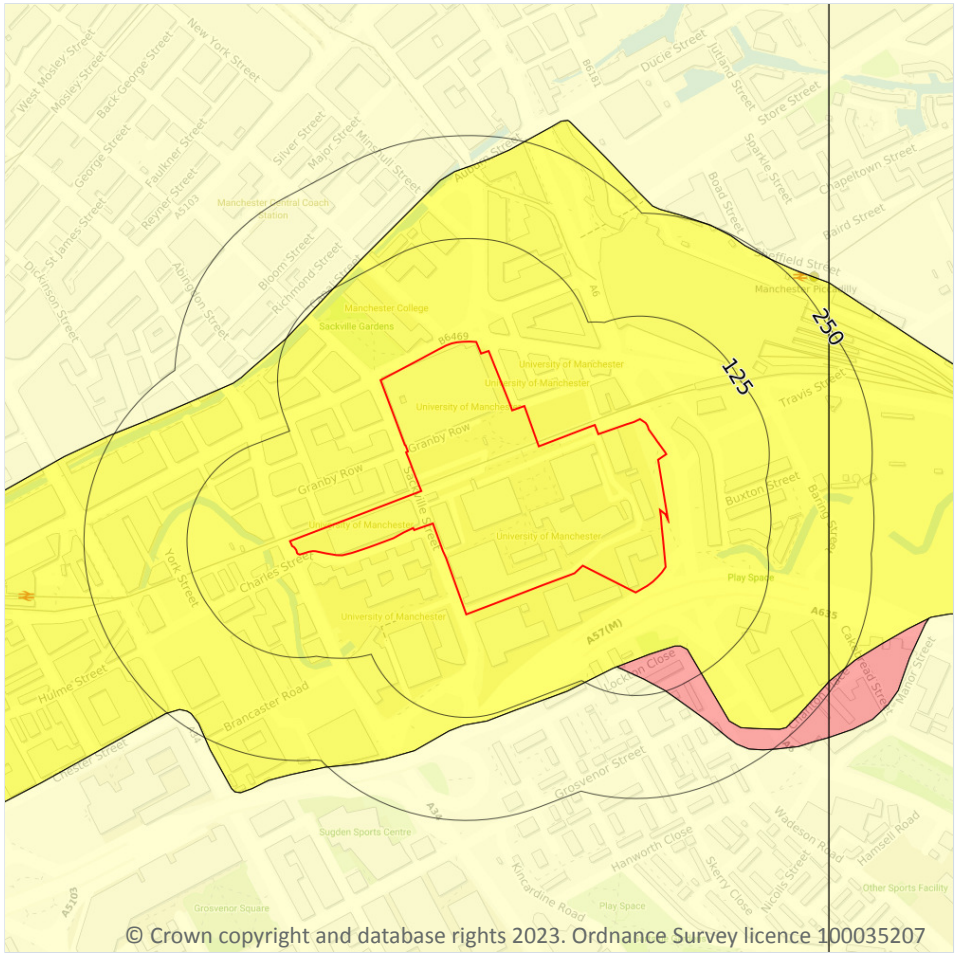
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 160 >**

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	1

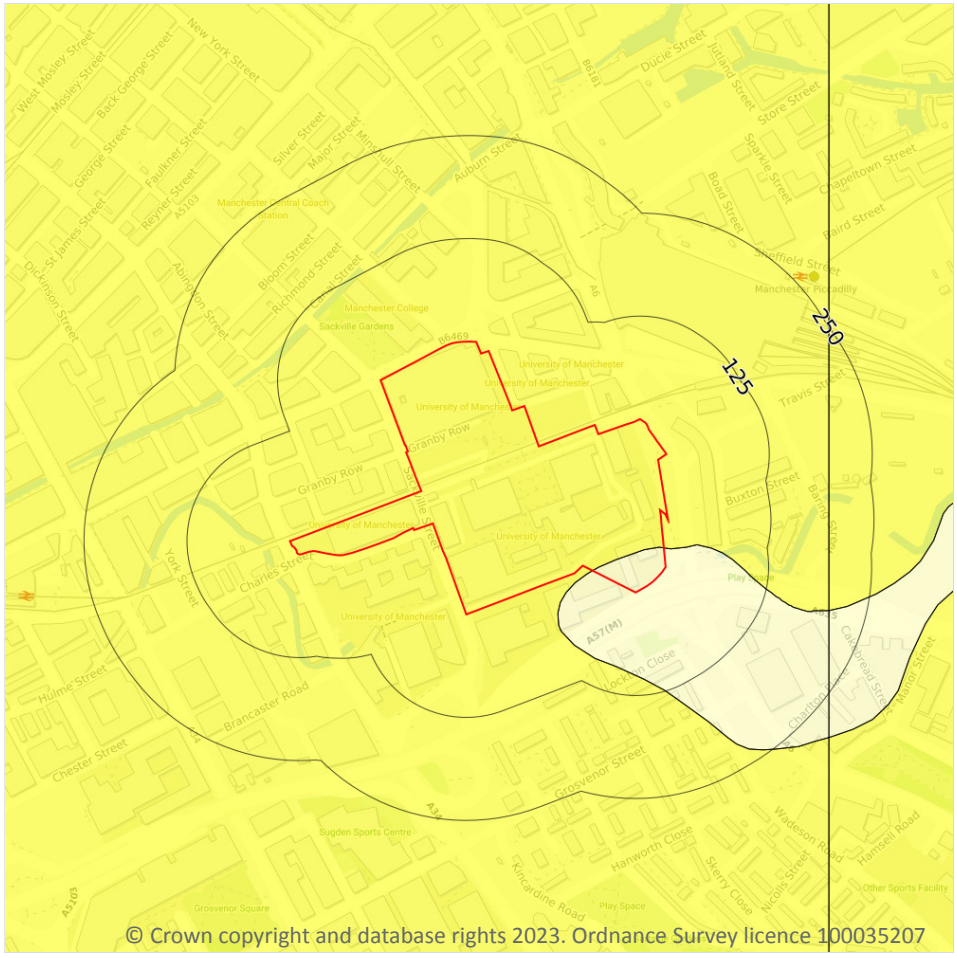
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 161 >**

Location	Hazard rating	Details
On site	**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



Site Outline

Search buffers in metres (m)

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

17.4 Collapsible deposits

Records within 50m	2

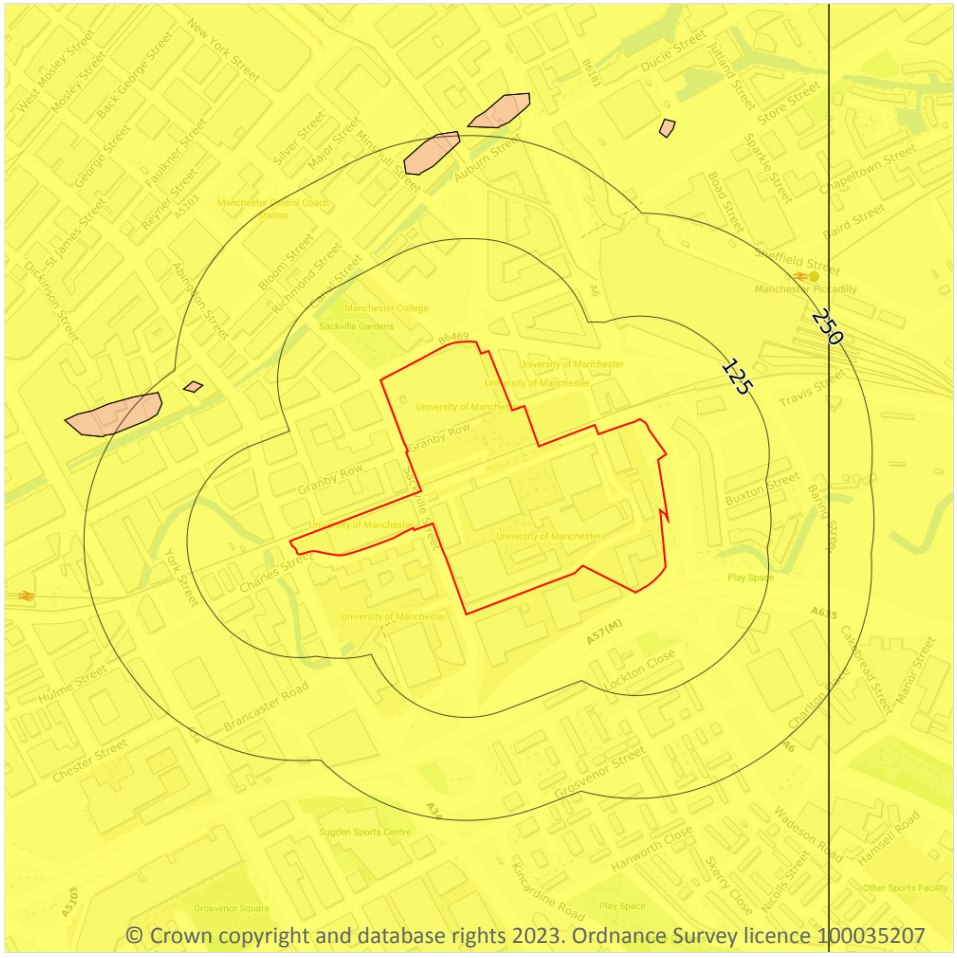
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 162 >**

Location	Hazard rating	Details
On site	**Negligible**	**Deposits with potential to collapse when loaded and saturated are believed not to be present.**
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

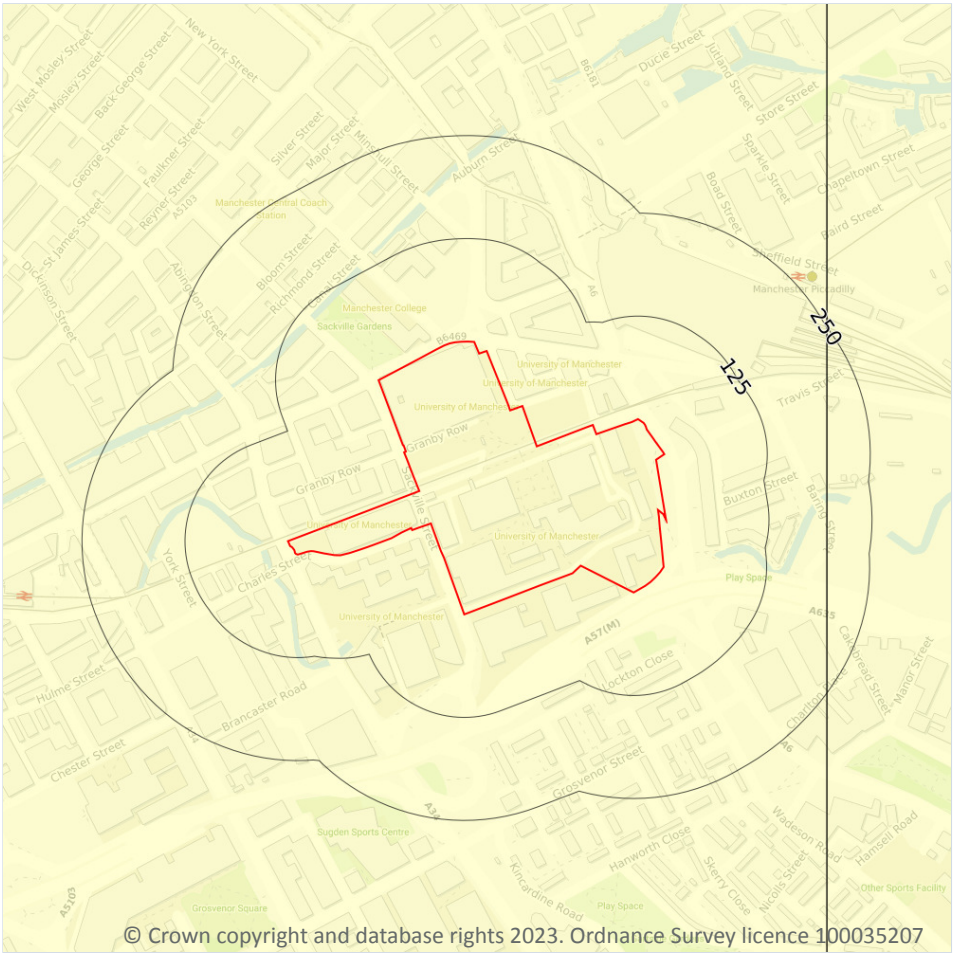
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 163 >**

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 164 >**

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 and ground workings

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18.1 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.

18.2 Surface ground workings

Records within 250m	14

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.

Features are displayed on the Mining and ground workings map on **page 166 >**

ID	Location	Land Use	Year of mapping	Mapping scale
1	2m NW	Unspecified Wharf	1890	1:10560
A	7m N	Ponds	1890	1:10560
B	67m N	Unspecified Ground Workings	1938	1:10560
B	67m N	Unspecified Ground Workings	1934	1:10560
A	89m N	Unspecified Wharf	1923	1:10560
A	90m N	Unspecified Wharf	1915	1:10560
C	104m NW	Canal	1938	1:10560
C	104m NW	Canal	1932	1:10560
C	104m NW	Canal	1916	1:10560
C	104m NW	Canal	1905	1:10560
C	104m NW	Canal	1923	1:10560
D	108m NW	Canal	1896	1:10560
2	108m NW	Canal	1956	1:10560
D	108m NW	Canal	1988	1:10000

This is data is sourced from Ordnance Survey/Groundsure.

18.3 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.

18.4 Underground mining extents

Records within 500m	0

This data identifies underground mine workings that could present a potential risk, including adits and seam workings. These features have been identified from BGS Geological mapping and mine plans sourced from the BGS and various collections and sources.

This data is sourced from 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 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.

18.8 The Coal Authority non-coal mining

Records within 500m	0

This data provides an indication of the potential zone of influence of recorded underground non-coal mining workings. Any and all analysis and interpretation of Coal Authority Data in this report is made by Groundsure, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be the copyright of the Coal Authority and permission should be sought from Groundsure prior to any re-use.

This data is sourced from The Coal Authority.

18.9 Researched mining

Records within 500m	0

This data indicates areas of potential mining identified from alternative or archival sources, including; BGS Geological paper maps, Lidar data, aerial photographs (from World War II onwards), archaeological data services, websites, Tithe maps, and various text/plans from collected books and reports. Some of this data is approximate and Groundsure have interpreted the resultant risk area and, where possible, specific areas of risk have been captured.

This data is sourced from Groundsure.

18.10 Mining record office plans

Records within 500m	0

This dataset is representative of Mining Record Office and/or plan extents held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

18.11 BGS mine plans

Records within 500m	0

This dataset is representative of BGS mine plans held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

18.12 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.

18.13 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.

18.14 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.15 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

18.16 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 Ground cavities and sinkholes

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19.1 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.

19.2 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 Ground cavities and sinkholes map on **page 171 >**

ID	Location	Mine Address	Mineral	Data source	Publisher
2	411m SE	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.

19.3 Reported recent incidents

Records within 500m	1

This data identifies sinkhole information gathered from media reports and Groundsure's own records. This data goes back to 2014 and includes relative accuracy ratings for each event and links to the original data sources. The data is updated on a regular basis and should not be considered a comprehensive catalogue of all sinkhole events. The absence of data in this database does not mean a sinkhole definitely has not occurred during this time.

Features are displayed on the Ground cavities and sinkholes map on **page 171 >**

ID	Location	Name	Date	Cause	Estimated diameter	Description	Accuracy
1	400m E	Mancunian Way, Ardwick ↗	01/08/2016	Unclassified	12m	Opened in torrential downpours. Possible former culvert collapse.	10m

This data is sourced from Groundsure.

19.4 Historical incidents

Records within 500m	0

This dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Dene holes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. Shakeholes are an alternative name for suffusion sinkholes, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park.

Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

This data is sourced from Groundsure.

19.5 National karst database

Records within 500m	0

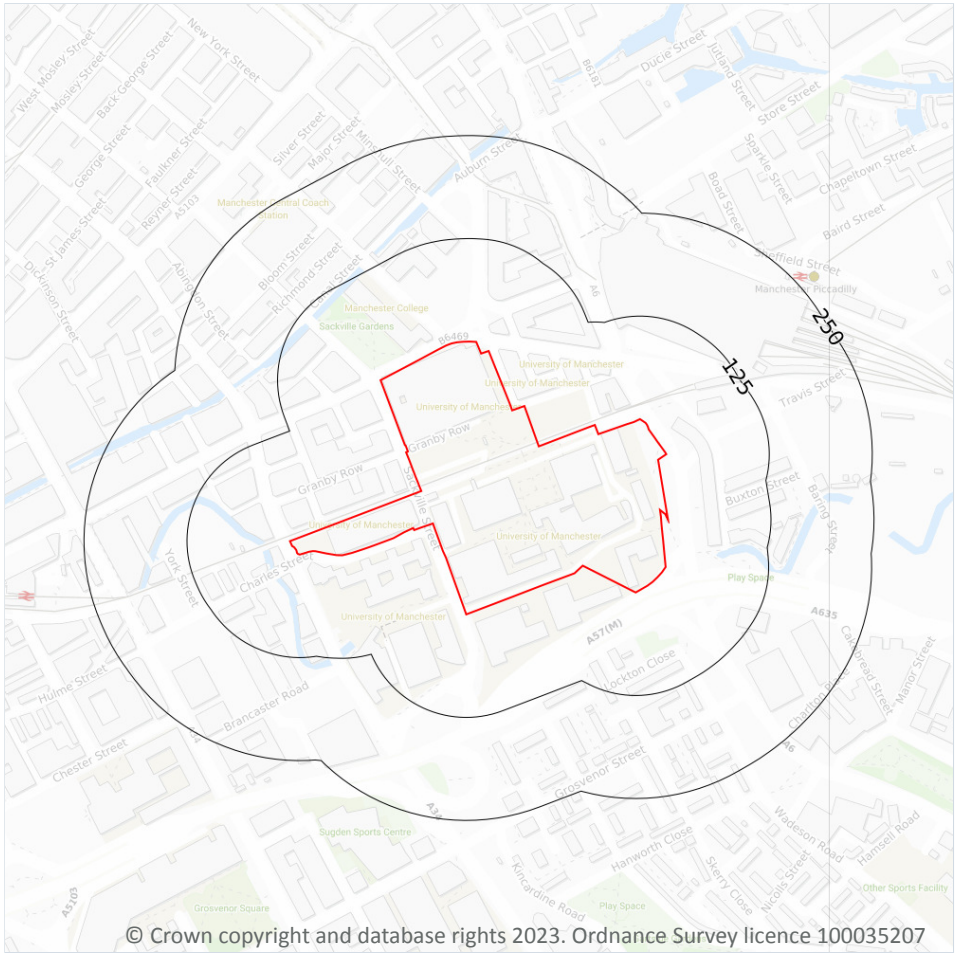
This is a comprehensive database of national karst information gathered from a wide range of sources. BGS have collected data on five main types of karst feature: Sinkholes, stream links, caves, springs, and incidences of associated damage to buildings, roads, bridges and other engineered works.

Since the database was set up in 2002 data covering most of the evaporite karst areas of the UK have now been added, along with data covering about 60% of the Chalk, and 35% of the Carboniferous Limestone outcrops. Many of the classic upland karst areas have yet to be included. Recorded so far are: Over 800 caves, 1300 stream sinks, 5600 springs, 10,000 sinkholes.

The database is not yet complete, and not all records have been verified. The absence of data does not mean that karst features are not present at a site. A reliability rating is included with each record.

This data is sourced from the British Geological Survey.

20 Radon



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%

20.1 Radon

Records on site	1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 174 >**

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

This data is sourced from the British Geological Survey and UK Health Security Agency.

21 Soil chemistry

21.1 BGS Estimated Background Soil Chemistry

Records within 50m	10

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	**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	**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**	**15 mg/kg**
16m N	25 - 35 mg/kg	No data	100 - 200 mg/kg	60 - 120 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 mg/kg
33m SW	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
47m W	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

This data is sourced from the British Geological Survey.

21.2 BGS Estimated Urban Soil Chemistry

Records within 50m	27

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	**18**	**3.2**	**142**	**98**	**0.5**	**76**	**31**	**23**	**7**
On site	**20**	**3.5**	**95**	**65**	**0.3**	**80**	**27**	**24**	**5**
On site	**20**	**3.5**	**92**	**63**	**0.2**	**81**	**26**	**24**	**5**
On site	**22**	**3.8**	**122**	**84**	**0.6**	**76**	**41**	**25**	**9**
On site	**22**	**3.8**	**141**	**97**	**0.6**	**77**	**38**	**24**	**8**
On site	**22**	**3.8**	**120**	**82**	**0.5**	**80**	**31**	**24**	**7**
On site	**23**	**4**	**89**	**61**	**0.2**	**83**	**26**	**24**	**5**
On site	**23**	**4**	**87**	**60**	**0.2**	**85**	**26**	**24**	**4**
On site	**26**	**4.6**	**90**	**62**	**0.2**	**87**	**26**	**24**	**4**
On site	**26**	**4.6**	**74**	**51**	**0.3**	**87**	**25**	**25**	**4**
On site	**26**	**4.6**	**71**	**49**	**0.3**	**92**	**25**	**23**	**4**
On site	**27**	**4.7**	**103**	**71**	**0.4**	**82**	**29**	**26**	**6**
On site	**27**	**4.7**	**84**	**58**	**0.2**	**92**	**26**	**23**	**4**
On site	**28**	**4.9**	**145**	**100**	**0.6**	**79**	**35**	**28**	**7**
On site	**28**	**4.9**	**86**	**59**	**0.2**	**90**	**26**	**24**	**4**
On site	**31**	**5.4**	**93**	**64**	**0.3**	**82**	**28**	**29**	**5**
On site	**33**	**5.8**	**124**	**85**	**0.5**	**77**	**33**	**31**	**7**
2m NE	28	4.9	66	45	0.3	94	25	22	4
7m N	27	4.7	86	59	0.2	77	26	26	5
10m SE	21	3.7	85	58	0.3	82	26	25	5
22m NE	27	4.7	60	41	0.3	93	24	23	4
23m N	24	4.2	68	47	0.3	82	25	23	4

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)
27m W	27	4.7	126	87	0.6	76	40	27	8
27m NW	33	5.8	110	76	0.5	78	32	31	6
33m SW	17	3	137	94	0.6	73	41	22	9
33m SW	17	3	113	78	0.6	72	43	22	9
46m W	20	3.5	98	67	0.6	71	41	23	9

This data is sourced from the British Geological Survey.

21.3 BGS Measured Urban Soil Chemistry

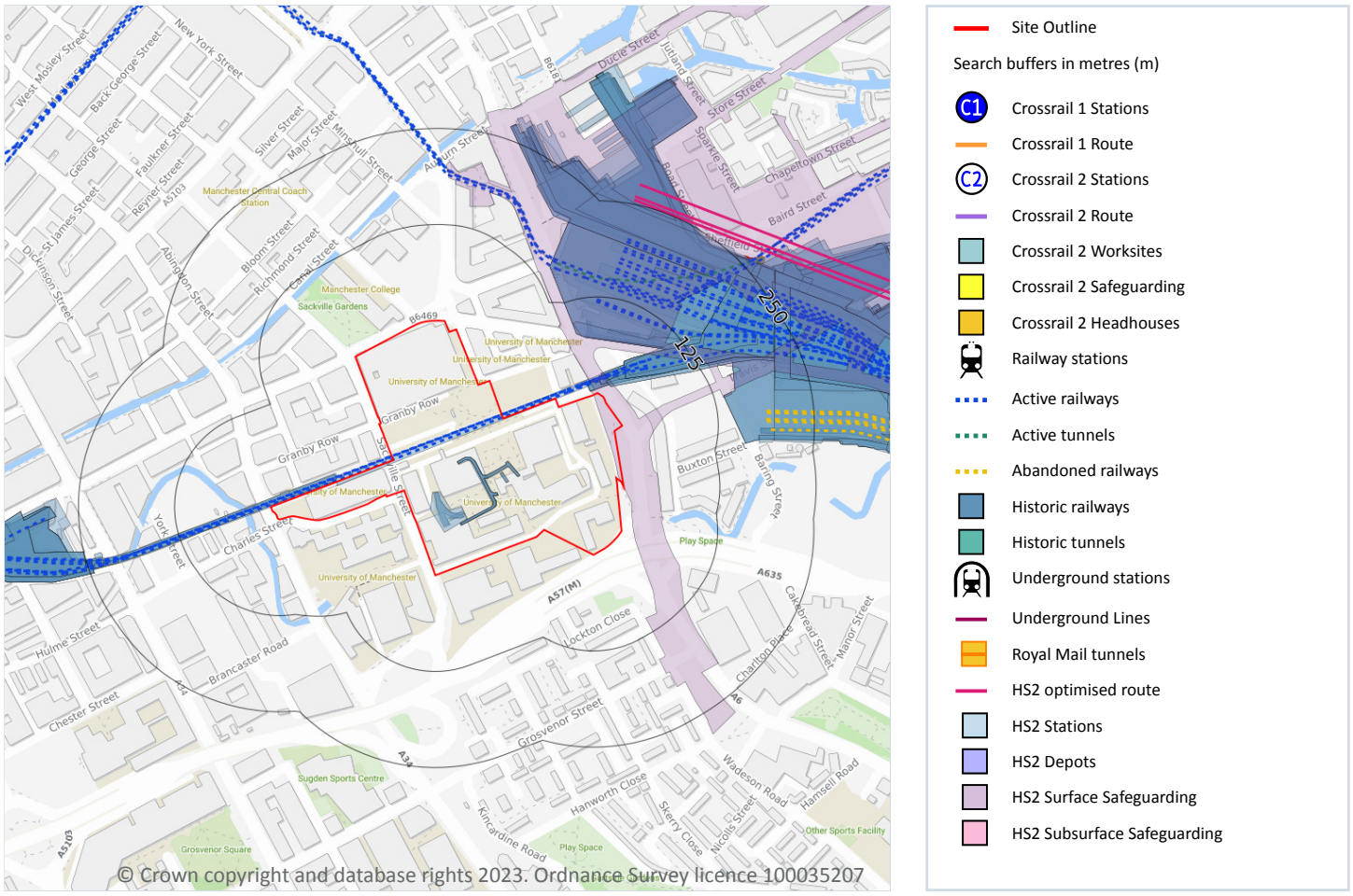
Records within 50m	**1**

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.

Location	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Tin (mg/kg)	Sample Type
42m NE	27.7	1.0	94.4	79.8	22.2	189.4	21.4	Topsoil

This data is sourced from the British Geological Survey.

22 Railway infrastructure and projects



22.1 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.

22.2 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.

22.3 Railway tunnels

Records within 250m	1

Railway tunnels taken from contemporary Ordnance Survey mapping.

Features are displayed on the Railway infrastructure and projects map on **page 179 >**

Location	Type
149m NE	Railway Tunnel

This data is sourced from the Ordnance Survey.

22.4 Historical railway and tunnel features

Records within 250m	109

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.

Features are displayed on the Railway infrastructure and projects map on **page 179 >**

Location	Land Use	Year of mapping	Mapping scale
On site	**Railway Sidings**	**1889**	**2500**
On site	**Railway Sidings**	**1908**	**2500**
On site	**Railway Sidings**	**1922**	**2500**
On site	**Tramway Sidings**	**1891**	**500**
On site	**Railways**	**1893**	**-**
On site	**Railway**	**1889**	**-**
On site	**Railway Sidings**	**1915**	**10560**
On site	**Railway Sidings**	**1923**	**10560**
2m W	Railway	1922	-
2m W	Railway	1932	-
5m NE	Railway Sidings	1889	2500
5m NE	Railway Sidings	1908	2500
5m NE	Railway Sidings	1922	2500

Location	Land Use	Year of mapping	Mapping scale
5m NE	Railway Sidings	1932	2500
12m NE	Railway Sidings	1938	10560
12m NE	Railway Sidings	1934	10560
12m NE	Railway Sidings	1915	10560
17m NE	Railway Sidings	1905	10560
17m NE	Railway Sidings	1890	10560
20m NE	Railway Sidings	1955	2500
31m NE	Railway Sidings	1923	10560
38m NE	Railway Sidings	1971	10000
38m NE	Railway Sidings	1988	10000
38m NE	Railway Sidings	1978	10000
38m NE	Railway Sidings	1985	10000
38m NE	Railway Sidings	1994	10000
44m NE	Railway Sidings	1956	10560
70m NE	Railway Sidings	1889	2500
70m NE	Railway Sidings	1908	2500
71m NE	Railway Sidings	1922	2500
71m NE	Railway Sidings	1932	2500
72m NE	Railway Sidings	1891	500
78m NE	Railway Sidings	1950	2500
80m NE	Railway Sidings	1955	2500
95m NE	Railway Sidings	1955	2500
126m NE	Railway Sidings	1891	500
129m NE	Railway Sidings	1984	1250
130m NE	Railway Sidings	1971	1250
130m NE	Railway Sidings	1964	1250
130m NE	Railway Sidings	1968	2500
131m NE	Railway Sidings	1995	1250

Location	Land Use	Year of mapping	Mapping scale
147m NE	Railway Sidings	1891	500
155m NE	Railway Sidings	1965	2500
168m NE	Railway Sidings	1851	10560
171m NE	Railway Sidings	1971	1250
171m NE	Railway Sidings	1964	1250
174m NE	Railway Sidings	1891	500
177m E	Railway Sidings	1922	2500
177m E	Railway Sidings	1932	2500
180m E	Railway Sidings	1984	1250
180m E	Railway Sidings	1950	2500
181m E	Railway Sidings	1971	1250
181m E	Railway Sidings	1948	1250
181m E	Railway Sidings	1964	1250
181m E	Railway Sidings	1952	1250
192m NE	Railway Sidings	1950	2500
192m NE	Railway Sidings	1948	1250
192m NE	Railway Sidings	1952	1250
197m E	Railway Sidings	1948	1250
198m E	Railway Sidings	1956	10560
200m NE	Railway Sidings	1891	500
201m NE	Railway Sidings	1995	1250
202m E	Railway Sidings	1891	500
203m NE	Railway Sidings	1971	1250
203m NE	Railway Sidings	1964	1250
204m E	Railway Sidings	1968	10560
208m NE	Railway Sidings	1964	1250
208m E	Railway Sidings	1978	10000
208m NE	Railway Sidings	1950	2500

Location	Land Use	Year of mapping	Mapping scale
209m NE	Railway Sidings	1948	1250
209m NE	Railway Sidings	1952	1250
210m W	Railway Sidings	1965	2500
213m NE	Railway Sidings	1995	1250
214m NE	Railway Sidings	1971	1250
214m NE	Railway Sidings	1964	1250
221m E	Railway Sidings	1948	2500
223m N	Railway Sidings	1891	500
225m NE	Railway Sidings	1995	1250
225m NE	Railway Sidings	1950	2500
225m NE	Railway Sidings	1948	1250
225m NE	Railway Sidings	1952	1250
226m NE	Railway Sidings	1971	1250
226m NE	Railway Sidings	1964	1250
228m E	Railway Sidings	1985	10000
228m E	Railway Sidings	1991	10000
229m W	Railway Sidings	1955	2500
233m NE	Railway Sidings	1891	500
236m NE	Railway Sidings	1995	1250
237m NE	Railway Sidings	1971	1250
237m NE	Railway Sidings	1964	1250
241m W	Railway Sidings	1968	2500
243m N	Railway Sidings	1953	2500
243m N	Railway Sidings	1948	1250
243m N	Railway Sidings	1960	1250
244m N	Railway Sidings	1953	2500
244m W	Railway Sidings	1938	10560
244m W	Railway Sidings	1932	10560

Location	Land Use	Year of mapping	Mapping scale
244m W	Railway Sidings	1916	10560
244m W	Railway Sidings	1905	10560
244m W	Railway Sidings	1923	10560
244m N	Railway Sidings	1965	2500
244m W	Railway Sidings	1891	500
244m E	Railway Sidings	1891	500
246m W	Railway Sidings	1893	2500
246m W	Railway Sidings	1908	2500
246m W	Railway Sidings	1922	2500
246m W	Railway Sidings	1932	2500
246m NE	Railway Sidings	1995	1250
247m NE	Railway Sidings	1971	1250

This data is sourced from Ordnance Survey/Groundsure.

22.5 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.

22.6 Historical railways

Records within 250m	5

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

Features are displayed on the Railway infrastructure and projects map on **page 179 >**

Location	Description
187m E	Abandoned

Location	Description
187m E	Abandoned
188m E	Abandoned
189m E	Abandoned
189m E	Abandoned

This data is sourced from OpenStreetMap.

22.7 Railways

Records within 250m	**83**

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

Features are displayed on the Railway infrastructure and projects map on **page 179 >**

Location	Name	Type
On site	**Manchester and Ordsall Lane Junction Branch**	**rail**
On site	**Manchester and Ordsall Lane Junction Branch**	**rail**
On site	**Not given**	**Multi Track**
14m NE		rail
14m NE	Manchester and Ordsall Lane Junction Branch	rail
17m NE	Not given	Single Track
18m NE	Manchester and Ordsall Lane Junction Branch	rail
24m NE	Manchester and Ordsall Lane Junction Branch	rail
25m W		rail
26m NE	Manchester and Ordsall Lane Junction Branch	rail
34m NE	Manchester and Ordsall Lane Junction Branch	rail
45m NE	Manchester and Ordsall Lane Junction Branch	rail
45m NE	Not given	Single Track
57m NE	Not given	Single Track
64m NE	Manchester and Ordsall Lane Junction Branch	rail
96m W		rail
110m NE	Crewe and Manchester Piccadilly Line	rail

Location	Name	Type
113m NE	Crewe and Manchester Piccadilly Line	rail
134m NE		light_rail
135m NE		light_rail
139m NE	Crewe and Manchester Piccadilly Line	rail
142m NE		light_rail
143m NE		light_rail
143m N		light_rail
144m NE	Crewe and Manchester Piccadilly Line	rail
146m W		rail
148m N	Not given	Multi Track
150m NE		light_rail
150m N		light_rail
154m NE	Crewe and Manchester Piccadilly Line	rail
155m NE	Crewe and Manchester Piccadilly Line	rail
157m N		light_rail
157m N	Not given	Multi Track
157m NE	Crewe and Manchester Piccadilly Line	rail
159m NE	Not given	Single Track
160m NE	Crewe and Manchester Piccadilly Line	rail
161m NE		light_rail
161m NE		light_rail
168m NE	Crewe and Manchester Piccadilly Line	rail
172m NE		rail
172m NE	Crewe and Manchester Piccadilly Line	rail
174m NE	Crewe and Manchester Piccadilly Line	rail
174m NE	Not given	Multi Track
175m NE	Crewe and Manchester Piccadilly Line	rail
176m N	Not given	Multi Track

Location	Name	Type
181m N	Not given	Multi Track
181m NE		light_rail
184m NE		light_rail
184m NE	Crewe and Manchester Piccadilly Line	rail
188m NE	Hope Valley Line	rail
193m N		light_rail
197m NE	Crewe and Manchester Piccadilly Line	rail
200m W		rail
201m NE	Crewe and Manchester Piccadilly Line	rail
202m W		rail
202m W		rail
205m N	Metrolink	light_rail
205m NE	Not given	Multi Track
206m NE	Crewe and Manchester Piccadilly Line	rail
208m W	Not given	Multi Track
208m W	Not given	Multi Track
209m NE	Crewe and Manchester Piccadilly Line	rail
216m NE	Not given	Multi Track
217m NE	Not given	Multi Track
217m NE	Crewe and Manchester Piccadilly Line	rail
220m E	Not given	Single Track
220m NE	Crewe and Manchester Piccadilly Line	rail
222m NE	Not given	Multi Track
226m W	Not given	Multi Track
227m E	Crewe and Manchester Piccadilly Line	rail
228m NE	Not given	Multi Track
229m NE	Crewe and Manchester Piccadilly Line	rail
229m NE	Not given	Multi Track

Location	Name	Type
230m E	Not given	Single Track
231m W		rail
231m W		rail
232m NE	Hope Valley Line	rail
237m NE	Not given	Multi Track
238m NE	Not given	Multi Track
240m NE	Crewe and Manchester Piccadilly Line	rail
243m NE	Crewe and Manchester Piccadilly Line	rail
247m NE	Not given	Multi Track
248m W	Not given	Multi Track

This data is sourced from Ordnance Survey and OpenStreetMap.

22.8 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.

22.9 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.

22.10 HS2

Records within 500m	4

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.

Features are displayed on the Railway infrastructure and projects map on **page 179 >**

Location	Track Type	Speed (mph)	Speed (km/h)	Status
251m NE	Bridge/Viaduct	50mph	80kph	Section is scheduled for cancellation
256m NE	Bridge/Viaduct	50mph	80kph	Section is scheduled for cancellation
273m NE	Bridge/Viaduct	50mph	80kph	Section is scheduled for cancellation
486m E	Bridge/Viaduct	50mph	80kph	Section is scheduled for cancellation

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 ↗.

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Appendix D

Detailed UXO Risk Assessment

1ST LINE DEFENCE

Detailed Unexploded Ordnance (UXO) Risk Assessment

Project Name	ID Manchester
Client	NX Consulting
Site Address	Land at the University of Manchester, Manchester, M1 7JR
Report Reference	DA14968-00
Date	8th April 2022
Originator	AB

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Executive Summary

Site Location and Description

The overall site comprises four distinct areas within the City of Manchester. For the purposes of this report, these shall hereafter be referred to as Site A, Site B, Site C and Site D.

Recent aerial photography shows that the majority of the site area is occupied by large buildings associated with the University of Manchester, as well as some commercial structures and small areas of open green space.

Site A is situated to the north of Site B, C and D. It is bound by Whitworth Street to the north, Coburg Street and Chandos Hall to the east, raised railway tracks and Altrincham Street to the south, and Sackville Street to the west. It is occupied by the Sackville Street Building, Granby Row, and Vimto Park.

Site B is situated west of Site C. It is bound by raised railway tracks and Granby Row to the north, Sackville Street to the east, Charles Street to the south, and Princess Street to the west. It is occupied by a large multi-storey car-park structure and open hard-standing space.

Site C, the largest site, is situated adjacent to Site B, to the east of Sackville Street; it is bound by Altrincham Street, raised railway tracks and Site A to the north, Site D to the east, with large commercial structures and Mancunian Way situated to the south. It is occupied by multiple structures associated with the University of Manchester, including the Renold Building and The Mill, plus open space, footpaths and roadway including Lower Albion Street.

Site D is directly east of Site C, bound by Altrincham Street to the north and London Road to the east and south; it is a small area of open green space with an intersecting footpath.

The site as a whole is approximately centred on the OS grid reference: **SJ 84592 97595.**

Proposed Works

Information provided by the client suggests that the works will involve the large scale demolition of a number of existing buildings, with the site to be redeveloped for a general commercial and residential mix with associated areas of car parking, public open space, parks, and event squares. The Sackville Building is to be redeveloped with a hotel and commercial office space.

Geology and Bomb Penetration Depth

The British Geological Survey (BGS) map shows the bedrock geology of the site to be underlain by the Chester Formation – sandstone, of the Triassic Epoch. The superficial deposits are comprised of Till, Devensian – Diamicton, of the Quarternary period.

Site-specific geotechnical information was not available to 1st Line Defence at the time of the production of this report. An assessment of maximum bomb penetration depth can be made once such data becomes available, or by a UXO specialist during on-site support.

It should be noted that the maximum depth that a bomb could reach may vary across a site and will be largely dependent on the specific underlying geological strata and its density.

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UXO Risk Assessment

1st Line Defence has assessed that the risk from unexploded German and anti-aircraft unexploded ordnance is not homogenous across the site of proposed works: see **Annex N** for risk mapping of the area. The southern section of Site C has been assessed as of **Medium Risk** from UXO contamination, whilst Site A, Site B, and Site D, as well as the remaining areas Site C, have been given a **Low Risk**. There is also an assessed **Low Risk** from Allied unexploded ordnance across the site area. This assessment is based on the following factors:

German Risk:

- The overall site comprises four distinct areas within the City of Manchester; for the purposes of this report, these areas are referred to as Site A, Site B, Site C and Site D.
- During WWII, the site area was located within the County Borough of Manchester, which according to official Home Office bombing statistics sustained an overall low density of bombing. This comprised a total of 738 items of ordnance across the 27,255 acre district. Although Manchester was not targeted to the same extent as cities such as London and Birmingham, it was subject to several major raids, the worst of which is often referred to as the 'Christmas Blitz'.
- Bomb plot and damage mapping obtained from the University of Manchester shows several bomb strikes occurred within the bounds of Site A and Site C. Site A reportedly sustained one HE strike at the College of Technology on the 31st August 1940, and one fire bomb on the 1st/2nd June 1941. Site C sustained one direct HE strike to the south on Temple Street, dating from the 22nd – 24th December 1940, and a second HE strike at the Cotton Mills on Jackson Street; additional strikes were recorded beyond the bounds of Site C to the south, including one directly adjacent to the border. This mapping also recorded damage within Site A and Site C: partial damage to the College of Technology and the Cotton Mills, correlating with the aforementioned bomb strikes, in addition to demolished structures within Site C between Clowes Terrace and Thompson Terrace to the south, and adjacent to the southern boundary between Jackson Street and Lyon Street. In contrast, no incidents of bombing or damage were recorded on or adjacent to either Site B or Site D.
- War damage reports also outlined damage to properties within Site C, along Clowes Terrace, Holt Street, Jackson Street, Jackson Terrace, Temple Street, Thompson Street and School Street; this correlates with the incidents / damage outlined on the previously discussed bomb mapping. This is further supported by areas of clearance evident on both post-war OS mapping and RAF aerial photography, whereby pre-war structures are no longer present, instead occupied by areas of rough open ground. Clearance can be an indication that buildings on site sustained severe bomb damage and were subsequently demolished.
- It is likely that a high level of access was permissible on each site at the outbreak of WWII, and that specific post-raid inspections were carried out in the area, given the sites location in an urban area of Manchester, with various structures and roadways situated on site. However, access to certain areas of Site C may have been significantly reduced following the recorded bomb strikes and severe damage identified, which may have led to ground conditions obstructive to the discovery of UXO, such as rubble and debris. These areas were predominately situated within the southern section of Site C.
- Access may also have been reduced for a period within part of Site A, due to the aforementioned bomb damage and bomb strike at the College of Technology. However, this level of damage is understood to have been relatively minor and to have been swiftly resolved. This is confirmed by a local historical account which states: “the building suffered no lasting damage – shattered windows were replaced and demolished rooms were quickly restored”. Any reduction of access in this area is therefore anticipated to be more minor and shorter in comparison to the aforementioned damaged areas of Site C.
- After considering the information presented above, 1st Line Defence has assessed that the risk from unexploded German air-delivered ordnance is not homogenous across the site: see **Annex N** for risk mapping of the area. The southern section of Site C has been assessed as of **Medium** risk from UXO contamination, given the recorded bomb strikes and clear evidence of significant bomb damage across large parts of this area, which likely resulted in conditions obstructive to the discovery of UXO. The remainder of the combined site footprint has been assessed as at a **Low Risk** from unexploded German air-delivered ordnance. No evidence could be found within any of the consulted sources to suggest that Site B, Site D and the remaining area of Site C were subject to either bombing or bomb damage.
- Site A is recorded to have sustained one HE bomb strike and one ‘fire bomb strike’ at the location of the former College of Technology (now the Sackville Building). However, these incidents are recorded to have resulted in limited damage and do not appear to have had any major impact on either the condition or usage of this area, which remained in use by the college for the duration of the war. It has therefore been possible to lower the risk that UXB’s could have fallen unnoticed within this area on this occasion. The risk is not considered high enough to warrant proactive risk mitigation measures, however UXO awareness briefings are recommended as a sensible minimum precaution for intrusive ground works.

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UXO Risk Assessment

Allied Risk:

- There is no evidence that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA. The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding aerial delivered ordnance.

Post-War Redevelopment:

- Extensive post-war redevelopment has occurred within the site area; the majority of the pre-war infrastructure and roadways have since been demolished and redeveloped, and the River Medlock which previously ran through the site has since been diverted/infilled. The majority of the site is now home to large buildings and open space associated with the University of Manchester.
- The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth

Recommended Risk Mitigation Measures

The following risk mitigation measures are recommended to support the proposed works at ID Manchester:

All Works

- UXO Risk Management Plan
- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

Medium Risk Areas

Open Intrusive Works (trial pits, service pits, open excavations, shallow foundations etc.)

- UXO Specialist On-site Support

Boreholes and Piled Foundations

- Intrusive Magnetometer Survey of all borehole and pile locations/clusters down to maximum bomb penetration depth.

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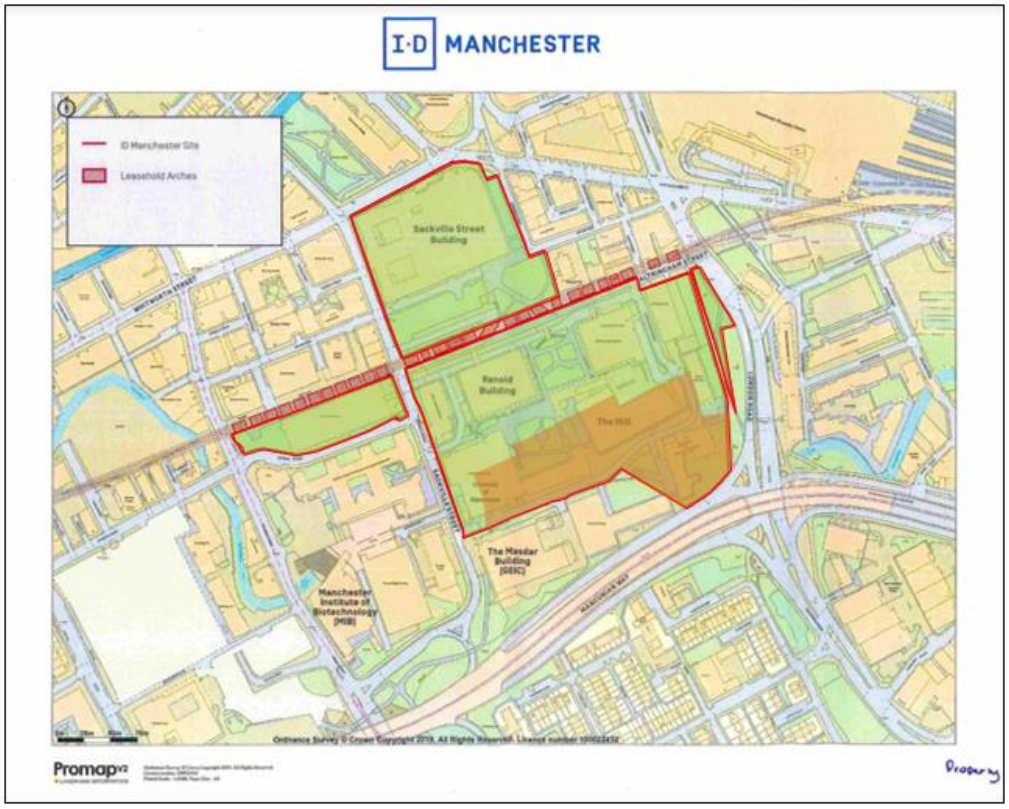
German UXO Risk Map



For indicative purposes – not to scale.
Please note that this assessed risk map may not take into account all post-war redevelopment/excavations on site.

Low Risk

Medium Risk

1st Line Defence Risk Mitigation Services:

All Areas of the Site:

- Site Specific Unexploded Ordnance Awareness Briefings – a service recommended to all personnel conducting intrusive works.
- UXO Risk Management Plan

Medium Risk Areas of the site:

Open Intrusive Works (trial pits, service pits, open excavations, shallow foundations etc.)

- UXO Specialist On-site Support

Boreholes and Piled Foundations

- Intrusive Magnetometer Survey of all borehole and pile locations/clusters down to maximum bomb penetration depth.

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Glossary

Abbreviation	Definition
AA	Anti-Aircraft
AFS	Auxiliary Fire Service
AP	Anti-Personnel
ARP	Air Raid Precautions
DA	Delay-action
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
FP	Fire Pot
GM	G Mine (Parachute mine)
HAA	Heavy Anti-Aircraft
HE	High Explosive
IB	Incendiary Bomb
JSEODOC	Joint Services Explosive Ordnance Disposal Operation Centre
LAA	Light Anti-Aircraft
LCC	London County Council
LRRB	Long Range Rocket Bomb (V-2)
LSA	Land Service Ammunition
NFF	National Filling Factory
OB	Oil Bomb
PAC	Pilotless Aircraft (V-1)
PB	Phosphorous Bomb
PM	Parachute Mine
POW	Prisoner Of War
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RFC	Royal Flying Corps
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SA	Small Arms
SAA	Small Arms Ammunition
SD2	Anti-personnel “Butterfly Bomb”
SIP	Self-Igniting Phosphorous
U/C	Unclassified bomb
UP	Unrotated Projectile (rocket)
USAAF	United States Army Air Force
UX	Unexploded
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	Flying Bomb (Doodlebug)
V-2	Long Range Rocket
WAAF	Women’s Auxiliary Air Force
X	Exploded

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Detailed Unexploded Ordnance (UXO) Risk Assessment

Site: ID Manchester
Client: NX Consulting

1. Introduction

1.1. Background

1st Line Defence has been commissioned by NX Consulting to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for the works proposed at ID Manchester.

Buried UXO can present a significant risk to construction works and development projects. The discovery of a suspect device during works can cause considerable disruption to operations as well as cause unwanted delays and expense.

UXO in the UK can originate from three principal sources:

1. Munitions resulting from wartime activities including German bombing in WWI and WWII, long range shelling, and defensive activities.
2. Munitions deposited as a result of military training and exercises.
3. Munitions lost, burnt, buried or otherwise discarded either deliberately, accidentally, or ineffectively.

This report will assess the potential factors that may contribute to the risk of UXO contamination. If an elevated risk is identified at the site, this report will recommend appropriate mitigation measures, in order to reduce the risk to as low as is reasonably practicable. Detailed analysis and evidence will be provided to ensure an understanding of the basis for the assessed risk level and any recommendations.

This report complies with the guidelines outlined in *CIRIA C681*, 'Unexploded Ordnance (UXO) A Guide for the Construction Industry.'

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2. Method Statement

2.1. Report Objectives

The aim of this report is to conduct a comprehensive assessment of the potential risk from UXO at ID Manchester. The report will also recommend appropriate site and work-specific risk mitigation measures to reduce the risk from explosive ordnance during the envisaged works to a level that is as low as reasonably practicable.

2.2. Risk Assessment Process

1st Line Defence has undertaken a five-step process for assessing the risk of UXO contamination:

1. The likelihood that the site was contaminated with UXO.
2. The likelihood that UXO remains on the site.
3. The likelihood that UXO may be encountered during the proposed works.
4. The likelihood that UXO may be initiated.
5. The consequences of initiating or encountering UXO.

In order to address the above, 1st Line Defence has taken into consideration the following factors:

- Evidence of WWI and WWII German aerial delivered bombing as well as the legacy of Allied occupation.
- The nature and conditions of the site during WWII.
- The extent of post-war development and UXO clearance operations on site.
- The scope and nature of the proposed works and the maximum assessed bomb penetration depth.
- The nature of ordnance that may have contaminated the proposed site area.

2.3. Sources of Information

Every reasonable effort has been made to ensure that relevant evidence has been consulted and presented in order to produce a thorough and comprehensible report for the client. To achieve this the following, which includes military records and archive material held in the public domain, have been accessed:

- The National Archives and Manchester Central Library.
- Historical mapping datasets.
- Historic England National Monuments Record.
- Relevant information supplied by NX Consulting.
- Available material from 33 Engineer Regiment (EOD) Archive (part of 29 Explosive Ordnance and Disposal and Search Group).
- 1st Line Defence's extensive historical archives, library and UXO geo-datasets.
- Open sources such as published books and internet resources.

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3. Background to Bombing Records

3.1. General Considerations of Historical Research

This desktop assessment is based largely upon analysis of historical evidence. Every reasonable effort has been made to locate and present significant and pertinent information. 1st Line Defence cannot be held accountable for any changes to the assessed risk level or risk mitigation measures, based on documentation or other data that may come to light at a later date, or which was not available to 1st Line Defence during the production of this report.

It is often problematic and sometimes impossible to verify the completeness and accuracy of WWII-era records. As a consequence, conclusions as to the exact location and nature of a UXO risk can rarely be quantified and are, to a degree, subjective. To counter this, a range of sources have been consulted, presented and analysed. The same methodology is applied to each report during the risk assessment process. 1st Line Defence cannot be held responsible for any inaccuracies or the incompleteness in available historical information.

3.2. German Bombing Records

During WWII, bombing records were generally gathered locally by the police, Air Raid Precaution (ARP) wardens and military personnel. These records typically contained information such as the date, the location, the amount of damage caused and the types of bombs that had fallen during an air raid. This information was made either through direct observation or post-raid surveys. The Ministry of Home Security Bomb Census Organisation would then receive this information, which was plotted onto maps, charts, and tracing sheets by regional technical officers. The collective record set (regional bomb census mapping and locally gathered incidents records) would then be processed and summarised into reports by the Ministry of Home Security Research and Experiments Branch. The latter were tasked with providing the government 'a complete picture of air raid patterns, types of weapons used and damage caused- in particular to strategic services and installations such as railways, shipyards, factories and public utilities.'[1]

The quality, detail and nature of record keeping could vary considerably between provincial towns, boroughs and cities. No two areas identically collated or recorded data. While some local authorities maintained records with a methodical approach, sources in certain areas can be considerably more vague, dispersed, and narrower in scope. In addition, the immediate priority was mostly focused on assisting casualties and minimising damage at the time. As a result, some records can be incomplete and contradictory. Furthermore, many records were even damaged or destroyed in subsequent air raids. Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are therefore not always reliable. Whereas records of attacks on military or strategic targets were often maintained separately and have not always survived.

3.3. Allied Records

During WWII, considerable areas of land were requisitioned by the War Office for the purpose of defence, training, munitions production and the construction of airfields. Records relating to military features vary and some may remain censored. Within urban environments datasets will be consulted detailing the location of munition production as well as wartime air and land defences. In rural locations it may be possible to obtain plans of military establishments, such as airfields, as well as training logs, record books, plans and personal memoirs. As with bombing records, every reasonable effort will be made to access records of, and ascertain any evidence of, military land use. However, there are occasions where such evidence is not available, as records may not be accessible, have been lost/destroyed, or simply were not kept in the first place.

[1] http://www.nationalarchives.gov.uk/help-with-your-research/research-guides/bomb-census-survey-records-1940-1945/.

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4. UK Regulatory Environment and Guidelines

4.1. General

There is no formal obligation requiring a UXO risk assessment to be undertaken for construction projects in the UK, nor is there any specific legislation stipulating the management or mitigation of UXO risk. However, it is implicit in the legislation outlined below that those responsible for intrusive works (archaeology, site investigation, drilling, piling, excavation etc.) should undertake a comprehensive and robust assessment of the potential risks to employees and that mitigation measures are implemented to address any identified hazards.

4.2. CDM Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) define the responsibilities of parties involved in the construction of temporary or permanent structures.

The CDM 2015 establishes a duty of care extending from clients, principle co-ordinators, designers, and contractors to those working on, or affected by, a project. Those responsible for construction projects may therefore be accountable for the personal or proprietary loss of third parties, if correct health and safety procedure has not been applied.

Although the CDM does not specifically reference UXO, the risk presented by such items is both within the scope and purpose of the legislation. It is therefore implied that there is an obligation for parties to:

- Provide an appropriate assessment of potential UXO risks at the site (or ensure such an assessment is completed by others).
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks presented by the project.
- Ensure the preparation of a suitably robust emergency response plan.

4.3. The 1974 Health and Safety at Work etc. Act

All employers have a responsibility under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, to ensure the health and safety of their employees and third parties, so far as is reasonably practicable and conduct suitable and sufficient risk assessments.

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4.4. CIRIA C681

In 2009, the Construction Industry Research and Information Association (CIRIA) produced a guide to the risk posed by UXO to the UK construction industry (CIRIA C681). CIRIA is a neutral, independent and not-for-profit body, linking organisations with common interests and facilitating a range of collaborative activities that help improve the industry.

The publication provides the UK construction industry with a defined process for the management of risks associated with UXO from WWI and WWII aerial bombardment. It is also broadly applicable to the risks from other forms of UXO that might be encountered. It focuses on construction professionals' needs, particularly if there is a suspected item of UXO on site, and covers issues such as what to expect from a UXO specialist. The guidance also helps clients to fulfil their legal duty under CDM 2015 to provide designers and contractors with project specific health and safety information needed to identify hazards and risks associated with the design and construction work. This report conforms to this CIRIA guidance and to the various recommendations for good practice referenced therein. It is recommended that this document is acquired and studied where possible to allow a better understanding of the background to both the risk assessment process and the UXO issue in the UK in general.

4.5. Additional Legislation

In the event of a casualty resulting from the failure of an employer/client to address the risks relating to UXO, the organisation may be criminally liable under the Corporate Manslaughter and Corporate Homicide Act 2007.

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5. The Role of Commercial UXO Contractors and The Authorities

5.1. Commercial UXO Specialists

The role of a UXO Specialist (often referred to as UXO Consultant or UXO Contractor) such as 1st Line Defence, is defined in CIRIA C681 as the provision of expert knowledge and guidance to the client on the most appropriate and cost-effective approach to UXO risk management at a site.

The principal role of UXO Specialists is to provide the client with an appropriate assessment of the risk posed by UXO for a specific project, and identify and carry out suitable methodology for the mitigation of any identified risks to reduce them to an acceptable level.

The requirement for a UXO Specialist should ideally be identified in the initial stages of a project, and it is recommended that this occur prior to the start of any detailed design. This will enable the client to budget for expenditure that may be required to address the risks from UXO, and may enable the project team to identify appropriate techniques to eliminate or reduce potential risks through considered design, without the need for UXO specific mitigation measures. The UXO Specialist should have suitable qualifications, levels of competency and insurances.

Please note 1st Line Defence has the capability to provide a complete range of required UXO risk mitigation services, in order to reduce a risk to as low as reasonably practicable. This can involve the provision of both ground investigation, and where appropriate, UXO clearance services.

5.2. The Authorities

The police have a responsibility to co-ordinate the emergency services in the event of an ordnance-related incident at a construction site. Upon inspection they may impose a safety cordon, order an evacuation, and call the military authorities Joint Services Explosive Ordnance Disposal Operation Centre (JSEODOC) to arrange for investigation and/or disposal. Within the Metropolitan Police Operational Area, SO15 EOD will be tasked to any discovery of suspected UXO. The request for Explosive Officer (Expo) support is well understood and practiced by all Metropolitan Boroughs. The requirement for any additional assets will then be coordinated by the Expo if required.

In the absence of a UXO specialist, police officers will usually employ such precautionary safety measures, thereby causing works to cease, and possibly requiring the evacuation of neighbouring businesses and properties.

The priority given to the police request will depend on the EOD teams' judgement of the nature of the UXO risk, the location, people and assets at risk, as well as the availability of resources. The speed of response varies; authorities may respond immediately or in some cases it may take several days for the item of ordnance to be dealt with. Depending on the on-site risk assessment the item of ordnance may be removed from the site and/or destroyed by a controlled explosion.

Following the removal of an item of UXO, the military authorities will only undertake further investigations or clearances in high-risk situations. If there are regular UXO finds on a site the JSEODOC may not treat each occurrence as an emergency and will recommend the construction company puts in place alternative procedures, such as the appointment of a commercial contractor to manage the situation.

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6. The Site

6.1. Site Location

The overall site comprises four distinct areas within the City of Manchester. For the purposes of this report, these shall hereafter be referred to as Site A, Site B, Site C and Site D.

Site A is situated to the north of Site B, C and D. It is bound by Whitworth Street to the north, Coburg Street and Chandos Hall to the east, raised railway tracks and Altrincham Street to the south, and Sackville Street to the west.

Site B is situated west of Site C. It is bound by raised railway tracks and Granby Row to the north, Sackville Street to the east, Charles Street to the south, and Princess Street to the west.

Site C is situated adjacent to Site B, to the east of Sackville Street; it is bound by Altrincham Street, raised railway tracks, and Site A to the north, Site D to the east, with large commercial structures and Mancunian Way situated to the south.

Site D is directly east of Site C, bound by Altrincham Street to the north and London Road to the east and south.

The site is approximately centred on the OS grid reference: **SJ 84592 97595.**

Site location maps are presented in **Annex A**.

6.2. Site Description

Recent aerial photography shows that the majority of the site area is occupied by large buildings associated with the University of Manchester, as well as some commercial structures and small areas of open green space.

Site A is occupied by the Sackville Street Building, Granby Row, and Vimto Park, and Site B is occupied by a large multi-storey car-park structure and open hard-standing space. Site C, the largest site, is occupied by multiple structures associated with the University of Manchester, including the Renold Building and The Mill, plus open space, footpaths and roadway including Lower Albion Street. Site D is a small area of open green space with an intersecting footpath.

A recent aerial photograph and site plan are presented in **Annex B** and **Annex C** respectively.

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7. Scope of the Proposed Works

7.1. General

Information provided by the client suggests that the works will involve the large scale demolition of a number of existing buildings, with the site to be redeveloped for a general commercial and residential mix with associated areas of car parking, public open space, parks, and event squares. The Sackville Building is to be redeveloped with a hotel and commercial office space.

8. Ground Conditions

8.1. General Geology

The British Geological Survey (BGS) map shows the bedrock geology of the site to be underlain by the Chester Formation – sandstone, of the Triassic Epoch. The superficial deposits are comprised of Till, Devensian – Diamicton, of the Quarternary period.

8.2. Site Specific Geology

Site-specific geotechnical data was not provided by the client during the production of this report.

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9. Site History

9.1. Introduction

The purpose of this section is to identify the composition of the site pre and post-WWII. It is important to establish the historical use of the site, as this may indicate the site's relation to potential sources of UXO as well as help with determining factors such as the land use, groundcover, likely frequency of access and signs of bomb damage.

9.2. Ordnance Survey Historical Maps

Relevant historical maps were obtained for this report and are presented in **Annex D.** See below for a summary of the site history shown on acquired mapping.

Pre-WWII		
Date	**Scale**	**Description**
1922	1:2,500	This OS mapping from 1922 shows the pre-war composition of each side footprint. Site A is shown to be occupied by a number of structures of various sizes, including those labelled *College of Technology* and *School*. *Granby Row* runs through the centre of the site; the site also features areas of open ground, and a portion of the *River Medlock* to the south. It is bound by *Whitworth Street* to the north, *Coburg Street* to the east, railway viaduct, the *River Medlock*, and *Altrincham Street* to the south, and *Sackville Street* to the west. It is situated to the north of Sites B, C and D. Site B is occupied by several small structures, including a *Box Works* and *Saw Mills; Charles Street* roadway runs through the centre of the site. It is bound by the railway viaduct to the north, *Sackville Street* to the east, the *River Medlock* to the south, with *Carpenter Street* and *Princess Street* to the west. Site C is a large area occupied by multiple structures of varying sizes, several roadways, and a significant portion of the *River Medlock*. Structures within the site boundary include the *Atlas Box Works*, an *Iron Works,* a *Sunday School,* the *Temple Buildings, Cotton Mills*, the *Manchester Nut & Bolt Works,* and the *Cloth Finishing Works.* Roadways on site included *Holt Street, Temple Street, Jackson Street, Jackson Terrace, Clowes Terrace, Thompson Terrace, Lower Albion Street, Brierley Street, Britain Street,* and *Hague Street.* The site is bound by *Altrincham Stree*t, the railway and Site A to the north, and Site D to the east. Additional structures and roadways are situated to the south, including *Back Temple St, School Street, Pierce Street, Lyon Street,* with *Sackville Street* and Site B to the west. Site D is a small site, occupied by several structures, *Back Albion Street*, and *Brierley Street*. It is bound by *Altrincham Street* to the north, *London Road* to the east, small structures to the south and Site C to the west.
1938	1:10,560	Though of a lower quality, this mapping shows the composition of the site more immediately prior to WWII. The majority of each site remains the same as per the previous map edition; however some change is evident on Site A, whereby an area previously occupied by a *School* is now shown to be occupied by additional open ground.

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Post-WWII		
Date	**Scale**	**Description**
1948	1:1,250	This OS mapping shows the composition of the site immediately post-war, with some changes evident. Site A is shown to be occupied by several structures, including the *College of Technology* structures seen on previous mapping, There are some changes to the layout of structures on site, with some new structures under construction. Site B remains largely the same, with minor changes to the layout of structures. Site C is still densely populated by several structures, roadways and the River Medlock. Features labelled on site include *Britannia Mills (Clothing), Lanrest House, Atlas Box Works, Motor Engineering Works, Iron Works, Travelling Crane, Sunday School, Temple Buildings, Warehouse, Cotton Mills, Manchester Nut & Bolt Works,* and the *Cloth Finishing Works (Disused)*. Several changes are evident to the site, including multiple areas of clearance; missing properties are evident to the south on *Holt Street, Temple Street, Bury Street, Jackson Street, Jackson Terrace, Clowes Terrace,* and *Thompson Terrace*. Additional clearance is present to the north of this on *Temple Street*, and an area to the north-east adjacent to *Lower Albion Street* and *Britain Street* has been cleared and labelled as *Medlock Square*. Site D remains largely the same, occupied by small structures and roadway,
1965	1:2,500	This OS mapping shows how the site area has been redeveloped by 1965. Site B appears to remain largely the same; the other site boundaries appear to have seen significant redevelopment, and the section of the *River Medlock* on-site has been infilled. Site A still features the *College of Science and Technology*, though all other structures have been cleared; Site C has significantly altered in composition, with many of the original structures and roadways having been cleared and redeveloped into new large structures also associated with the *College of Science and Technology*; Site D has largely been cleared of structures. Significant clearance is also present to the south.

9.3. Pre-WWII Photography of the Site

Pre-WWII aerial photography has been obtained from the Aerofilms collection available from *Britain From Above*. This imagery provides a view of the site in 1937 (see **Annex E**). See below for a description:

Title of Photograph	Comments
The city between the Central Railway Station and Manchester Piccadilly Station, Manchester, August 1937	This oblique aerial imagery from 1937 shows the composition of the site prior to the outbreak of WWII. The site is situated within a heavily urban area, densely populated by multiple structures of varying size and nature, with multiple roadways.

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10. Introduction to German Aerial Delivered Ordnance

10.1. General

During WWI and WWII, the UK was subjected to bombing which often resulted in extensive damage to city centres, docks, rail infrastructure and industrial areas. The poor accuracy of WWII targeting technology and the nature of bombing techniques often resulted in neighbouring areas to targets sustaining collateral damage.

In addition to raids which concentrated on specific targets, indiscriminate bombing of large areas also took place. This occurred most prominently in the London 'Blitz', though affected many other towns and cities. As discussed in the following sections, a proportion of the bombs dropped on the UK did not detonate as designed. Although extensive efforts were made to locate and deal with these UXBs at the time, many still remain buried and can present a potential risk to construction projects.

The main focus of research for this section of the report will concern German aerial delivered ordnance dropped during WWII, although WWI bombing will also be considered.

10.2. Generic Types of WWII German Aerial Delivered Ordnance

To provide an informed assessment of the hazards posed by any items of unexploded ordnance that may remain in situ on site, the table below provides information on the types of German aerial delivered ordnance most commonly used by the Luftwaffe during WWII. Images and brief summaries of the characteristics of these items of ordnance are listed in **Appendices i-iii**.

Generic Types of WWII German Aerial Delivered Ordnance		
Type	**Frequency**	**Likelihood of detection**
High Explosive (HE) bombs	In terms of weight of ordnance dropped, HE bombs were the most frequently deployed by the Luftwaffe during WWII.	Although efforts were made to identify the presence of unexploded ordnance following an air raid, often the damage and destruction caused by detonated bombs made observation of UXB entry holes impossible. The entry hole of an unexploded bomb can be as little as 20cm in diameter and was easily overlooked in certain ground conditions (see **Annex F**). Furthermore, ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded smaller bomb. UXBs therefore present the greatest risk to present–day intrusive works.
1kg Incendiary bombs (IB)	In terms of the number of weapons dropped, small IBs were the most numerous. Millions of these were dropped throughout WWII.	IBs had very limited penetration capability and in urban areas would often have been located in post-raid surveys. If they failed to initiate and fell in water, on soft vegetated ground, or bombed rubble, they could easily go unnoticed.
Large Incendiary bombs (IB)	These were not as common as the 1kg IBs, although they were more frequently deployed than PMs and AP bomblets.	If large IBs did penetrate the ground, complete combustion did not always occur and in such cases they could remain a risk to intrusive works.
Aerial or Parachute mines (PM)	These were deployed less frequently than HE and IBs due to size, cost and the difficulty of deployment.	If functioning correctly, PMs would generally have had a slow rate of descent and were very unlikely to have penetrated the ground. Where the parachute failed, mines would have simply shattered on impact if the main charge failed to explode. There have been extreme cases when these items have been found unexploded. However, in these scenarios, the ground was either extremely soft or the munition fell into water.
Anti-personnel (AP) bomblets	These were not commonly used and are generally considered to pose a low risk to most works in the UK.	SD2 bomblets were packed into containers holding between 6 and 108 submunitions. They had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.

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10.3. Failure Rate of German Aerial Delivered Ordnance

It has been estimated that 10% of WWII German aerial delivered HE bombs failed to explode as designed. Reasons for why such weapons might have failed to function as designed include:

- Malfunction of the fuze or gain mechanism (manufacturing fault, sabotage by forced labour or faulty installation).
- Many were fitted with a clockwork mechanism that could become immobilised on impact.
- Failure of the bomber aircraft to arm the bombs due to human error or an equipment defect.
- Jettisoning the bomb before it was armed or from a very low altitude. This most likely occurred if the bomber aircraft was under attack or crashing.

From 1940 to 1945, bomb disposal teams reportedly dealt with a total of 50,000 explosive items of 50kg, over 7,000 anti-aircraft projectiles and 300,000 beach mines. Unexploded ordnance is still regularly encountered across the UK, see press articles in **Annex G**.

10.4. UXB Ground Penetration

An important consideration when assessing the risk from a UXB is the likely maximum depth of burial. There are several factors which determine the depth that an unexploded bomb will penetrate:

- Mass and shape of bomb.
- Height of release.
- Velocity and angle of bomb.
- Nature of the ground cover.
- Underlying geology.

Geology is perhaps the most important variable. If the ground is soft, there is a greater potential of deeper penetration. For example, peat and alluvium are easier to penetrate than gravel and sand, whereas layers of hard strata will significantly retard and may stop the trajectory of a UXB.

10.4.1. The J-Curve Effect Principle

J-curve is the term used to describe the characteristic curve commonly followed by an aerial delivered bomb dropped from height after it penetrates the ground. Typically, as the bomb is slowed by its passage through underlying soils, its trajectory curves towards the surface. Many UXBs are found with their nose cone pointing upwards as a result of this effect. More importantly, however, is the resulting horizontal offset from the point of entry. This is typically a distance of about one third of the bomb's penetration depth, but can be higher in certain conditions (see **Annex F**).

10.4.2. WWII UXB Ground Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by bomb disposal (BD) teams. Conclusions were drawn predicting the likely average and maximum depths of penetration of different sized bombs in different geological strata.

For example, the largest common German bomb (500kg) had a likely concluded penetration depth of 6m in sand or gravel but 11m in clay. The maximum observed depth for a 500kg bomb was 11.4m and for a 1,000kg bomb 12.8m. Theoretical calculations suggested that significantly greater penetration depths were probable.

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10.4.3. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site of proposed works the following parameters have been used:

- WWII geology – Chester Formation.
- Impact angle and velocity – 10-15° from vertical and 270 metres per second.
- Bomb mass and configuration – The 500kg SC HE bomb, without retarder units or armour piercing nose (this was the largest of the common bombs used against Britain).

It has not been possible to determine maximum bomb penetration capabilities at this stage due to the limitations of site-specific geotechnical information provided for the purpose of this report. An assessment can be made once further information becomes available or by a UXO Specialist on-site, where required.

10.5. V-Weapons

Hitler's 'V-weapon' campaign began from mid-1944. It used newly developed unmanned cruise missiles and rockets. The V-1, known as the *flying bomb* or *pilotless aircraft*, and the V-2, a long range rocket, were launched from bases in Germany and occupied Europe. A total of 9,251 V-1s and 1,115 V-2s were recorded in the United Kingdom.

Although these weapons caused considerable damage, their range was limited by their position of deployment across Europe and as a result the vast majority of V-weapon strikes were directed against targets in the south-east of England, predominantly in the London Boroughs and Home Counties. This limitation of capability meant targets in Manchester were generally too far to be considered for V-weapon strikes by the Luftwaffe.

The risk from V-weapons is therefore considered negligible and will not be further addressed in this report.

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11. The Likelihood of Contamination from German Aerial Delivered UXBs

11.1. World War I

During WWI Britain was targeted and bombed by Zeppelin Airships as well as Gotha and Giant fixed-wing aircraft. The objective of these raids was to unnerve the British public, to destroy strategic targets and to ultimately attempt to coerce Britain's capitulation from the war. A WWI map of air raids and naval bombardments across the UK was consulted, see **Annex H**. This source does not record any WWI bombing incidents to have affected Manchester.

WWI bombs were generally smaller and dropped from a lower altitude than those used in WWII. This resulted in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons there is a limited risk that UXBs passed undiscovered in the urban environment. When combined with the relative infrequency of attacks and an overall low bombing density, the risk from WWI UXBs is considered low and will not be further addressed in this report.

11.2. World War II Bombing of Manchester

The Luftwaffe's main objective for the attacks on Britain was to inhibit the country's economic and military capability. To achieve this they targeted airfields, depots, docks, warehouses, wharves, railway lines, factories, and power stations. As the war progressed the Luftwaffe bombing campaign expanded to include the indiscriminate bombing of civilian areas in an attempt to subvert public morale.

During WWII the site was located within the County Borough of Manchester, which sustained an overall low-moderate density of bombing, as represented by bomb density data figures below. Manchester and the wider area were not targeted to the same extent as cities such as London and Birmingham, however it was subject to several major raids. The first raid on the city was in September 1940, but the worst came in December 1940, often referred to as the 'Christmas Blitz', whereby the city was raided for two consecutive nights which resulted in an estimated 684 people losing their lives, and more than 2,000 being injured.[2] The city was home to a significant number of important targets, such as the docks, Manchester Central Station, and Gaythorn Gas Works; see Luftwaffe target mapping and imagery in **Annex I**. The site itself is visible on this Luftwaffe target mapping, in close proximity to London Road Station, which is marked as a target.

Records of bombing incidents in the civilian areas of Manchester were typically collected by Air Raid Precautions wardens and collated by Civil Defence personnel. Some other organisations, such as port and railway authorities, maintained separate records. Records would be in the form of typed or hand written incident notes, maps and statistics. Bombing data was carefully analysed, not only due to the requirement to identify those parts of the country most needing assistance, but also in an attempt to find patterns in the Germans' bombing strategy in order to predict where future raids might take place.

Records of bombing incidents are presented in the following sections.

[2] *https://www.iwm.org.uk/history/the-manchester-blitz*

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11.3. WWII Home Office Bombing Statistics

The following table summarises the quantity of German aerial delivered bombs (excluding 1kg incendiaries and anti-personnel bombs) dropped on the County Borough of Manchester between 1940 and 1945.

Record of German Ordnance Dropped on the County Borough of Manchester		
Area Acreage		**27,321**
Weapons	High Explosive Bombs (all types)	712
	Parachute Mines	18
	Oil Bombs	7
	Phosphorus Bombs	0
	Fire Pot	0
	Pilotless Aircraft (V-1)	1
	Long Range Rockets (V-2)	0
Total		**738**
Number of Items per 1,000 acres		**27.1**

Source: Home Office Statistics
This table does not include UXO found during or after WWII.

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the risk relating to IBs is lesser than that relating to larger HE bombs, they were similarly designed to inflict damage and injury. Anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. Although Home Office statistics did not record these types of ordnance, both should not be overlooked when assessing the general risk to personnel and equipment.

11.4. University of Manchester Bomb and Damage Map

A local map showing bomb strikes and the extent of resulting bomb damage was obtained from the University of Manchester Library. This map was compiled during/following WWII by Manchester Council's City Architect's Department. The section showing the area of the site is described in the table below and presented in **Annex J**.

University of Manchester Library Bomb Map – Annex J	
Date Range	**Comments**
1940-1944	Site A – one HE bomb strike is recorded on the College of Technology, dating from 31/8/1940. One fire bomb is recorded at the centre of the site, labelled as occurring on 1-2/6/1941. A section of the college building appears to have been recorded as partially damaged. Site B – no direct incidents of bombing are recorded on or adjacent to the site. Site C – two HE bomb strikes occurred directly within the site boundary. One HE is recorded along the southern border of the site, on Temple Street; this is dated as 22-24/12/40. The second is recorded over the Cotton Mills on Jackson Street, dated 1-2/6/41; a section of the Cotton Mills are recorded as partially damaged. Additional strikes are recorded to the south of the boundary of Site C – the closest was recorded directly adjacent to the site, over a structure which has been labelled as a demolished building off Jackson Street. Two additional strikes were recorded approximately 50m to the south, over Temple Street. All three of these strikes are dated as 22-4/12/40. Site D – no direct incidents are recorded on or adjacent to the site.

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11.5. Interactive 'Christmas Blitz' Bomb Map

A local bomb map, compiled by the Manchester Evening News and utilising data from the Commonwealth and War Graves Commission, was consulted during the production of this report. This map, named the Manchester Christmas Blitz Map, shows the locations of civilian deaths in Greater Manchester between 22nd and 24th December 1940. During this two day period, a reported 800 people were killed as a result of air raids.[3]

As this map only records bombs which resulted in fatalities, it is not considered a comprehensive account of Christmas bombing raids. The closest fatal bomb strike to the site occurred approximately 120m to the south of Site C. A section of the map showing the site and its surroundings is presented in **Annex K**.

11.6. Region 10 Bomb Census Reports

Bomb census reports compiled by the Research and Experiments Branch of the Ministry of Home Security during WWII were consulted at The National Archives. These reports recorded information such as the date, time, type and damage caused by bomb incidents for a selected time period in Region 10 (the 'North West') and are therefore not often comprehensive.

No reference to the site has been found in this record set.

11.7. Manchester Air Raid Damage Files

Written ARP Incident Records were obtained from The National Archives. This record was compiled by local Air Raid Precaution (ARP) personnel and volunteers during the war and records the location, date and time of bombing raids within Manchester, as well as the types of bomb used and the damage caused. It is also not considered to be comprehensive and only appears to cover selected incidents.

This record set was checked, and no references to the site were found within it.

[3] *https://www.manchestereveningnews.co.uk/news/greater-manchester-news/manchester-blitz-bomb-sites-map-10465447*

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11.8. War Damage to Housing / Property Cards

Written records were obtained from the Manchester Central Library, covering war damage to housing and property across specific streets in Manchester. The coverage of this record set is not considered to be comprehensive. Records were found in relation to damage sustained on streets situated within the site area; specifically, records covering damage within Site B and Site C were found. A transcript of the relevant written records is presented in the table below, and example imagery of these entries are presented in **Annex L**.

War Damage to Housing – Annex L1 – L2		
Date	**Location**	**Comments**
Incident date: unknown. Date of inspection: 10/4/42	Jackson Street	Nos. 17, 18, 19, 21, 23, 25, 27. Damage classification – B. *Jackson Street is situated within the bounds of Site C.*
	Jackson Terrace	Nos. 1, 3, 5, 7. Damage classification – B. *Jackson Terrace is situated on the southern border of Site C.*
	Temple Street	Nos. 23, 25, 27, 29, 75, 77. Damage classification – B. *Nos 23 and 25 were situated on the southern border of Site C.*
Incident date: 1/6/41 Date of inspection: 2/6/41	Clowes Terrace	Nos. 7, 9, 11, 13, 15. Damage classification – CB. *Situated adjacent to the southern boundary of Site C.*
	Holt Street	Nos. 1, 3 & 5, 7, 9, 11, 13, 15, 17. Nos. 2, 4, 6, 8. Damage classification – D & E. *Situated within the bounds of Site C.*
	Jackson Street	No. 5. Damage classification – CA. Thompson Terrace – Nos. 7, 9, 11, 13, 15, 17, 19. Damage – CB / B. Clowes Terrace – Nos. 21, 23. Damage – B. Jackson Terrace – Nos. 25, 27. Damage – B. Temple Street – Nos. 35, 37, 39, 42, 43. Damage – D & E. *Situated within the bounds of Site C.*
	Jackson Terrace	Nos. 1, 3, 5, 7, 9, 11, 13, 15. *Damage Classification – CB.* *Jackson Terrace is situated on the southern border of Site C.*
	Temple Street	Nos. 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 52, 54, 56. Damage classification – D & E. Nos. 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39. Damage classification – CB / D & E *Nos. 14 – 34 and 19 – 23 were situated within the bounds of Site C.*
	Thompson Terrace	Nos. 5 and 7. Damage classification – CB. *Situated within the bounds of Site C.*
	School Street	No. 2, 4, 6, 8, 10, 12, 14, 16, 18. Damage classification – D & E. No. 1, 3, 5, 7, 9. Damage classification – D & E. *Nos. 1/2 School Street were situated on the southern border of Site C.*

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War Damage to Property – Annex L3		
Date	**Location**	**Comments**
22.12.1940	A&P Stevens, 12 Charles Street, off Sackville Street, C-on-M.	Description of Property: Workshop Type of Bomb: HE Indication of Damage: No damage to walls, floors or contents. No danger. Damage to roof caused by blast. Type of Damage: C (a) *This incident occurred within the bounds of Site B.*
22/23.12.1940	Oxford Road, Grosvenor St, Downing St, Whitworth St Butterworth Clifford TC. Timber Merchants. 1a Charles Street, C. on M.	Description of Property: Timber Yard Type of Bomb: HE Indication of Damage: Generally, no damage. Slight damage to roof and partition wall. Type of Damage: D *This incident occurred within the bounds of Site B.*
1/2.6.41	1 Charles Street, Manchester	Description of Property: Warehouse & Offices. Type of Bomb: HE Indication of Damage: No damage to roof, walls, floor. Blast damage to windows. Type of Damage: E *This incident occurred within the bounds of Site B.*
1/2.6.41	Butterworth Clifford & Co., 1 Charles Street, Manchester	Description of Property: Saw mills & offices. Type of Bomb: HE Indication of Damage: No damage to roof, walls, floor. Blast damage to windows. Type of Damage: E *This incident occurred within the bounds of Site B.*

11.9. 'Luftwaffe Over Manchester: The Blitz Years 1940 – 1944'

Luftwaffe Over Manchester: The Blitz Years 1940 – 1944, by Peter Smith, was consulted during the production of this report; this source provides greater detail of air raids and bombing incidents which occurred in Manchester during the Blitz.

This source identifies an incident of bombing which reportedly occurred directly within the boundary of Site A on the 31st August 1940, see below:

> *One bomb fell through the glass roof of the College of Technology in Whitworth Street, blowing out many windows amongst other damage.*

This corroborates with the incident of bombing outlined within Site A on the Manchester Bomb and Damage Map discussed in Section 11.4.

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11.10. 'Blitz Britain; Manchester and Salford'

Blitz Britain; Manchester and Salford, by Graham Phythian, was consulted during the production of this report. This source included a copy of the Manchester Emergency Committees Log of Bombing Incidents 22-24 December 1940, providing details of incidents which occurred during the Christmas Blitz'. Within this source, no reference to the site could be found.

11.11. Online Sources: University of Manchester

Various online sources were consulted during the production of this report, in order to ascertain the wartime history of specific buildings and areas of the site footprint which may have sustained incidents of bombing or damage. One such source was the University of Manchester website, in which a brief history of the Sackville Street building was outlined; this building is situated within Site A and was previously known as the College of Technology. The below extract addresses the bomb which fell on the College in August 1940:[4]

> *During the Second World War, in the summer of 1940, the building suffered a direct bomb hit – a bomb crashed straight through the South West Corner of the Chemistry Laboratory and exploded in the Senior Common Room. Thanks to its sturdy construction, the Sackville Street Building suffered no lasting damage – shattered windows were replaced and demolished rooms were quickly restored.*
>
> *Students and staff played an integral role during wartime; the College was used by various ministries and armed forces for technological investigation. During this time various new advances were developed and manufactured within the building in order to aid the war effort, including a deep sea hydrophone to counter the submarine threat to shipping, instruments to measure the permeability of airship fabrics and a high-frequency alternator to power aircraft radios.*
>
> *In 1927 plans had been drawn up to extend the Sackville Street Building. The construction had started in 1938 but was significantly slowed by the Great Depression and the Second World War; the expansion was finally finished in 1957.*

[4] https://www.manchester.ac.uk/discover/history-heritage/history/buildings/sackville-street/

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11.12. WWII-Era Aerial Photography

WWII-era aerial photography for the site area was obtained from the National Monuments Record Office (Historic England). This photography provides a record of the potential composition of the site during the war, as well as its condition immediately following the war (**see Annex M**).

WWII-Era Aerial Photography	
Date	**Description**
7th May 1946 **Annex M1**	This RAF aerial photography shows the south-eastern corner of Site C in May 1946. The site is shown to feature areas of clearance, whereby pre-war housing appears to have been removed, as well as areas of rough open ground.
16th May 1948 **Annex M2 – M4**	RAF aerial imagery of the site taken in May 1948 is presented in **Annex M2 – M4**, showing the condition of each site area post-WWII: • Site A is shown to be occupied by several large structures; the College of Technology is present to the north, with some construction work / rough ground evident in the east. Structures and open ground are present to the south of Granby Street. Given the ground cover, any signs of damage are difficult to determine. • Site B is shown to be occupied by Charles Street, with numerous structures on either side of the roadway. No obvious signs of damage are evident across the majority of the site, although some small potential areas of clearance and roofing repairs are visible. • Site C is occupied by the River Medlock, several roadways, various buildings of different sizes / purposes, and several open spaces. Several areas of clearance are evident, particularly within the southern sector adjacent to Jackson Street, whereby properties appear to have been removed. • Site D is shown to be occupied by structures and a small roadway, which appear to remain undamaged. A visual overlay highlighting bomb damage and features of note is presented in **Annex M4.**

11.13. Abandoned Bombs

A post air-raid survey of buildings, facilities, and installations would have included a search for evidence of bomb entry holes. If evidence of an entry hole was encountered, Bomb Disposal Officer Teams would normally have been requested to attempt to locate, render safe, and dispose of the bomb. Occasionally, evidence of UXBs was discovered but due to a relatively benign position, access problems, or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an 'abandoned bomb'.

Given the inaccuracy of WWII records, and the fact that these bombs were 'abandoned', their locations cannot be considered definitive or the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

1st Line Defence holds no records of officially registered abandoned bombs at or near the site of the proposed works.

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11.14. Bomb Disposal Tasks

The information service from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (now part of 29 EOD & Search Group) is currently facing considerable delay. It has therefore not been possible to include any updated official information regarding bomb disposal/clearance tasks with regards to this site. A database of known disposal/clearance tasks has been referred to which does not make reference to such instances occurring within the site of proposed works. If any relevant information is received at a later date, NX Consulting will be advised.

11.15. Evaluation of German Aerial Delivered UXO Records

Factors	Conclusion
Density of Bombing *It is important to consider the bombing density when assessing the possibility that UXBs remain in an area. High bombing density could allow for error in record keeping due to extreme damage caused to the area.*	During WWII the site was located within the County Borough of Manchester, which according to official Home Office bombing statistics sustained an overall low density of bombing, this comprised a total of 738 items of ordnance across the 27,255 acre district. Although Manchester was not targeted to the same extent as cities such as London and Birmingham, it was subject to several major raids, the worst of which is often referred to as the 'Christmas Blitz'. Bomb plot and damage mapping obtained from the University of Manchester shows several incidents of bombing occurred within the site area. Site A reportedly sustained one HE bomb strike at the College of Technology (now the Sackville Street building), dating 31/8/1940, and one fire bomb was recorded on the 1-2/6/1941. In addition, Site C reportedly sustained two direct HE bomb strikes. One HE is recorded along the southern border of the site, on Temple Street; this is dated as 22-4/12/40. The second is recorded over the Cotton Mills on Jackson Street, dated 1-2/6/41; a section of the Cotton Mills are recorded as partially damaged. In addition to these, further strikes are recorded to the south of Site C; including one recorded directly adjacent to the border. Meanwhile, no direct incidents of bombing were recorded on or adjacent to Site B or Site D. Written records covering the area were limited; no reference could be found to aforementioned bomb incidents on-site within available bomb census reports and air raid damage files. However, war damage reports covering specific streets in Manchester recorded damage to structures within the site area as a result of HE bombing. Reference to the site was also made within published sources, with the *Luftwaffe Over Manchester: The Blitz Years 1940 – 1944,* by Peter Smith, referencing a bomb falling through the glass roof of the College of Technology in Whitworth Street, 'blowing out many windows amongst other damage', on the 31st August 1940; this correlates with the aforementioned bomb mapping as well as online sources.
Damage *If buildings or structures on a site sustained bomb or fire damage, any resulting rubble and debris could have obscured the entry holes of unexploded bombs dropped during the same or later raids. Similarly, a high explosive bomb strike in an area of open agricultural land will have caused soil disturbance, increasing the risk that a UXB entry hole would be overlooked.*	Bomb plot and damage mapping obtained from the University of Manchester recorded partial damage to the College of Technology, within Site A, as well as to the Cotton Mills, within Site C. This map also recorded demolished structures within Site C, between Clowes Terrace and Thompson Terrace, along the southern boundary. Further demolished properties were present just south of the border, adjacent to Jackson Street & Lyon Street. In addition to this, a comparison of pre- and post-WWII OS mapping reveals areas of clearance within Site C, whereby pre-war structures are no longer present. Missing properties are evident to the south on Holt Street, Temple Street, Bury Street, Jackson Street, Jackson Terrace, Clowes Terrace, and Thompson Terrace. Additional clearance is present

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	to the north of this on Temple Street, and an area to the north-east adjacent to Lower Albion Street and Britain Street has been cleared and labelled as Medlock Square. These areas of clearance are also evident within post-WWII RAF aerial photography, dating from 1946 and 1948, alongside areas of open rough ground in places. Clearance can be an indication that buildings on site sustained bomb damage and were subsequently demolished, although it can also be the result of other factors, such as planned redevelopment. War damage reports outlined damage to properties within Site C; along Clowes Terrace, Holt Street, Jackson Street, Jackson Terrace, Temple Street, Thompson Street and School Street. This correlates with the incidents / damage outlined on the previously discussed mapping and aerial photography.
Ground Cover *The nature of the ground cover present during WWII would have a substantial influence on any visual indication that may indicate UXO being present.*	It is anticipated that the ground cover on each site would have been largely favourable to the detection of UXO at the outbreak of WWII, given that each site was densely occupied by various structures, both industrial and residential, and multiple roadways. However, recorded bombing incidents and subsequent damage caused may have led to ground conditions obstructive to the discovery of UXO in some areas, due to the resulting rubble and debris likely left on site. In addition, it is not possible to entirely discount that items of UXO could have fallen unobserved in the various areas of open ground present on-site. The entry hole of a 50kg UXB can be as little as 20cm in diameter – much smaller for items such as 1kg incendiary bombs – and can be easily overlooked in such conditions.
Access Frequency *UXO in locations where access was irregular would have a greater chance of passing unnoticed than at those that were regularly occupied. The importance of a site to the war effort is also an important consideration as such sites are likely to have been both frequently visited and subject to post- raid checks for evidence of UXO.*	It is likely that a high level of access was permissible on each site at the outbreak of WWII, and that specific post-raid inspections were carried out in this area, given that each site was densely occupied by various structures and roadways, located in an urban area of Manchester. Frequent access improves the likelihood that signs of UXO would have been noticed and reported. However, following the recorded bombing incidents and damage to the site area, it is likely that access may have significantly reduced in these areas, increasing the likelihood that evidence of UXO may have gone unnoticed and unreported.
Bomb Failure Rate	There is no evidence to suggest that the bomb failure rate in the locality of the site would have been dissimilar to the 10% normally used.
Abandoned Bombs	1st Line Defence holds no records of abandoned bombs at or within the site vicinity.
Bombing Decoy sites	1st Line Defence could find no evidence of bombing decoy sites within the site vicinity.
Bomb Disposal Tasks	1st Line Defence could find no evidence of bomb disposal tasks within the site boundary and immediate area.

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12. Introduction to Allied Ordnance

12.1. General

Many areas across the UK may be at risk from Allied UXO because of both wartime and peacetime military use. Typical military activities and uses that may have led to a legacy of military UXO at a site include former minefields, home guard positions, anti-aircraft emplacements, training and firing ranges, military camps, as well as weapons manufacture and storage areas.

Although land formerly used by the military was usually subject to clearance before returned to civilian use, items of UXO are sometimes discovered and can present a potential risk to construction projects.

It should be highlighted that there is no evidence that the site formerly had any military occupation or usage that could have led to contamination with such items of Allied ordnance. Despite this, urban areas, such as the location of the site, can be at risk from buried unexploded anti-aircraft projectiles fired during WWII – as addressed below.

12.2. Defending the UK From Aerial Attack

During WWII the War Office employed a number of defence tactics against the Luftwaffe from bombing major towns, cities, manufacturing areas, ports and airfields. These can be divided into passive and active defences (examples are provided in the table below).

Active Defences	Passive Defences
• Anti-aircraft gun emplacements to engage enemy aircraft. • Fighter aircraft to act as interceptors. • Rockets and missiles were used later during WWII.	• Blackouts and camouflaging to hinder the identification of Luftwaffe targets. • Decoy sites were located away from targets and used dummy buildings and lighting to replicate urban, military, or industrial areas. • Barrage balloons forced enemy aircraft to greater altitudes. • Searchlights were often used to track and divert adversary bomber crews during night raids.

Active defences such as anti-aircraft artillery present a greater risk of UXO contamination than passive defences. Unexploded ordnance resulting from dogfights and fighter interceptors is rarely encountered and difficult to accurately qualify.

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12.2.1. Anti-Aircraft Artillery (AAA)

During WWII three main types of gun sites existed: heavy anti-aircraft (HAA), light anti-aircraft (LAA) and 'Z' batteries (ZAA). If the projectiles and rockets fired from these guns failed to explode or strike an aircraft they would descend back to land. The table below provides further information on the operation and ordnance associated with these type of weapons.

Anti-Aircraft Artillery				
Item	**Description**			
HAA	These large calibre guns such as the 3.7" QF (Quick Firing) were used to engage high flying enemy bombers. They often fired large HE projectiles, which were usually initiated by integral fuzes, triggered by impact, area, time delay or a combination of aforementioned mechanisms.			
LAA	These mobile guns were intended to engage fast, low flying aircraft. They were typically rotated between locations on the perimeters of towns and strategically important industrial works. As they could be moved to new positions with relative ease when required, records of their locations are limited. The most numerous of these were the 40mm Bofors gun which could fire up to 120 x 40mm HE projectiles per minute to over 1,800m.			
Variations in HAA and LSA Ammunition	**Gun type**	**Calibre**	**Shell Weight**	**Shell Dimensions**
	3.0 Inch	76mm	7.3kg	76mm x 356mm
	3.7 Inch	94mm	12.7kg	94mm x 438mm
	4.5 Inch	114mm	24.7kg	114mm x 578mm
	40mm	40mm	0.9kg	40mm x 311mm
Z-AA	The three inch unrotated rocket/projectile known as the UP-3 had initially been developed for the Royal Navy. The UP-3 was also used in ground-based single and 128-round launchers known as ''Z'' batteries. The rocket, containing a high explosive warhead was often propelled by cordite.			

The conditions in which anti-aircraft projectiles may have fallen unnoticed within a site area are analogous to those regarding aerial delivered ordnance. Unexploded anti-aircraft projectiles could essentially have fallen indiscriminately anywhere within range of the guns. The chance of such items being observed, reported and removed during the war depends on factors such as land use, ground cover, damage and frequency of access – the same factors that govern whether evidence of a UXB is likely to have been noted. More information about these factors with regards to this particular site can be found in the German Aerial Delivered Ordnance section of this report.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at **Appendix iv**.

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13. The Likelihood of Contamination from Allied Ordnance

13.1. Introduction

There are several factors that may serve to either affirm, increase, or decrease the level of risk within a site with a history of military usage. Such factors are typically dependent upon the proximity of the proposed area of works to training activities, munition productions and storage, as well as its function across the years.

This section will examine the history of the proposed site and assess to what degree, if any, the site could have become contaminated as a result of the military use of the surrounding area.

13.2. Evaluation of Contamination Risk from Allied UXO

1st Line Defence has considered the following potential sources of Allied ordnance contamination:

Sources of Allied UXO Contamination	Conclusion
Military Camps *Military camps present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training.*	1st Line Defence could find no evidence of a military camp within the site.
Anti-Aircraft Defences *Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.*	1st Line Defence could find no evidence of Anti-Aircraft defences such as a HAA or LAA gun emplacement occupying or bordering the site. The closest HAA was located approximately 2.85km north-west of the site, in the vicinity of Lower Broughton. Despite this distance the maximum effective range of an AA projectile can be up to 15km. The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are analogous to those regarding German aerial delivered ordnance.
Home Guard Activity *The Home Guard regularly undertook training and ordnance practice in open areas, as well as burying ordnance as part of anti-invasion defences.*	Evidence of Home Guard activity is often difficult to locate, owing to the ad-hoc nature of Home Guard activity within each local area. Such training was often conducted on a small scale at the discretion of individual commanders and as such was seldom recorded officially. As such, no positive evidence could be found to confirm the presence of HG units within proximity to the site.
Defensive Positions *Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.*	There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.
Training or firing ranges *Areas of ordnance training saw historical ordnance usage in large numbers, often with inadequate disposal of expended and live items. The presence of these ranges significantly impact on the risk of encountering items of ordnance in their vicinity.*	No evidence of training or firing ranges could be found within the site or surrounding area.

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Defensive Minefields *Minefields were placed in strategic areas to defend the country in the event of a German invasion. Minefields were not always cleared with an appropriate level of vigilance.*	There is no evidence of defensive minefields affecting the site.
Ordnance Manufacture *Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.*	No information of ordnance being stored, produced, or disposed of within the proposed site could be found.
Military Related Airfields *Military airfields present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training or bombing practice.*	The site was not situated within the perimeters or vicinity of a military airfield.

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14. The Likelihood of UXO Contamination Summary

The following table assesses the likelihood that the site was contaminated by items of German aerial delivered and Allied ordnance. Factors such as the risk of UXO initiation, remaining, and encountering will be discussed later in the report.

UXO Contamination Summary	
Quality of the Historical Record	The research has evaluated pre- and post-WWII Ordnance Survey maps, pre-WWII oblique aerial photography, Luftwaffe target mapping, University of Manchester bomb and damage map, an interactive 'Christmas Blitz' map, bomb census reports and air raid damage files, published sources including Peter Smiths 'Luftwaffe Over Manchester: The Blitz Years 1940 – 1944' and Graham Phythian's 'Blitz Britain; Manchester and Salford', damage cards for housing and properties, and post-WWII aerial photography. The record set is of generally mixed quality; while there are a number of record sets available for consultation, they are not considered to be comprehensive, and do not always corroborate each other.
German Aerial Delivered Ordnance	• The overall site comprises four distinct areas within the City of Manchester; for the purposes of this report, these areas are referred to as Site A, Site B, Site C and Site D. • During WWII, the site area was located within the County Borough of Manchester, which according to official Home Office bombing statistics sustained an overall low density of bombing. This comprised a total of 738 items of ordnance across the 27,255 acre district. Although Manchester was not targeted to the same extent as cities such as London and Birmingham, it was subject to several major raids, the worst of which is often referred to as the 'Christmas Blitz'. • Bomb plot and damage mapping obtained from the University of Manchester shows several bomb strikes occurred within the bounds of Site A and Site C. Site A reportedly sustained one HE strike at the College of Technology on the 31st August 1940, and one fire bomb on the 1st/2nd June 1941. Site C sustained one direct HE strike to the south on Temple Street, dating from the 22nd – 24th December 1940, and a second HE strike at the Cotton Mills on Jackson Street; additional strikes were recorded beyond the bounds of Site C to the south, including one directly adjacent to the border. This mapping also recorded damage within Site A and Site C: partial damage to the College of Technology and the Cotton Mills, correlating with the aforementioned bomb strikes, in addition to demolished structures within Site C between Clowes Terrace and Thompson Terrace to the south, and adjacent to the southern boundary between Jackson Street and Lyon Street. In contrast, no incidents of bombing or damage were recorded on or adjacent to either Site B or Site D. • War damage reports also outlined damage to properties within Site C, along Clowes Terrace, Holt Street, Jackson Street, Jackson Terrace, Temple Street, Thompson Street and School Street; this correlates with the incidents / damage outlined on the previously discussed bomb mapping. This is further supported by areas of clearance evident on both post-war OS mapping and RAF aerial photography, whereby pre-war structures are no longer present, instead occupied by areas of rough open ground. Clearance can be an indication that buildings on site sustained severe bomb damage and were subsequently demolished. • It is likely that a high level of access was permissible on each site at the outbreak of WWII, and that specific post-raid inspections were carried out in the area, given the sites location in an urban area of Manchester, with various structures and roadways situated on site. However, access to certain areas of Site C may have been significantly reduced following the recorded bomb strikes and severe damage identified, which may have led to ground conditions obstructive to the discovery of UXO, such as rubble and debris. These areas were predominately situated within the southern section of Site C.

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	• Access may also have been reduced for a period within part of Site A, due to the aforementioned bomb damage and bomb strike at the College of Technology. However, this level of damage is understood to have been relatively minor and to have been swiftly resolved. This is confirmed by a local historical account which states: "the building suffered no lasting damage – shattered windows were replaced and demolished rooms were quickly restored". Any reduction of access in this area is therefore anticipated to be more minor and shorter in comparison to the aforementioned damaged areas of Site C. • After considering the information presented above, 1st Line Defence has assessed that the risk from unexploded German air-delivered ordnance is not homogenous across the site: see **Annex N** for risk mapping of the area. The southern section of Site C has been assessed as of **Medium** risk from UXO contamination, given the recorded bomb strikes and clear evidence of significant bomb damage across large parts of this area, which likely resulted in conditions obstructive to the discovery of UXO. The remainder of the combined site footprint has been assessed as at a **Low Risk** from unexploded German air-delivered ordnance. No evidence could be found within any of the consulted sources to suggest that Site B, Site D and the remaining area of Site C were subject to either bombing or bomb damage. • Site A is recorded to have sustained one HE bomb strike and one 'fire bomb strike' at the location of the former College of Technology (now the Sackville Building). However, these incidents are recorded to have resulted in limited damage and do not appear to have had any major impact on either the condition or usage of this area, which remained in use by the college for the duration of the war. It has therefore been possible to lower the risk that UXB's could have fallen unnoticed within this area on this occasion. The risk is not considered high enough to warrant proactive risk mitigation measures, however UXO awareness briefings are recommended as a sensible minimum precaution for intrusive ground works.
Allied Ordnance	• There is no evidence that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA. The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding aerial delivered ordnance.

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15. The Likelihood that UXO Remains

15.1. Introduction

It is important to consider the extent to which any explosive ordnance clearance (EOC) activities or extensive ground works have occurred on site. This may indicate previous ordnance contamination or reduce the risk that ordnance remains undiscovered.

15.2. UXO Clearance

1st Line Defence has found no evidence in the public domain or within internal records that any official ordnance clearance operations have taken place on site. Note however that we have not received confirmation of this fact from the 33 EOD Regiment Archive (now part of 29 EOD & Search Group). It should also be noted that in addition to 29 EOD & Search Group archival information, 1st Line Defence also do not currently have access to data that may be relevant including 5131(BD)SQN Archive, SD Training Technical Advisory Section (TAS) and MACA Records (bomb disposal callouts).

If such information is available at a later date, it is recommended that it be reviewed as it will assist with understanding both levels and types of contamination likely to be present, and may indicate risk reduction in certain areas.

15.3. Post-War Redevelopment

Extensive post-war redevelopment has occurred within the site area; the majority of the pre-war infrastructure and roadways have since been demolished and redeveloped, and the River Medlock which previously ran through the site has since been diverted/infilled. The majority of the site is now home to large buildings and open space associated with the University of Manchester.

The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.

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16. The Likelihood of UXO Encounter

16.1. Introduction

For UXO to pose a risk at a site, there should be a means by which any potential UXO might be encountered on that site.

The likelihood of encountering UXO on the site of proposed works would depend on various factors, such as the type of UXO that might be present and the intrusive works planned on site. In most cases, UXO is more likely to be present below surface (buried) than on surface.

In general, the greater the extent and depth of intrusive works, the greater the risk of encountering. The most likely scenarios under which items of UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations.

Generally speaking, the risk of encountering any type of UXO will be minimal for any works planned within the footprint and down to the depth of post-war foundations and excavations.

16.2. Encountering Aerial Delivered Ordnance

Since an aerial delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth, there is a chance that such an item (if present) could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level as well as at depth.

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17. The Likelihood of UXO Initiation

17.1. Introduction

UXO does not spontaneously explode. Older UXO devices will require an external event/energy to create the conditions for detonation to occur. The likelihood that a device will function can depend on a number of factors including the type of weaponry, its age and the amount of energy it is struck with.

17.2. Initiating Aerial Delivered Ordnance

Unexploded bombs do not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur.

In recent decades, there have been a number of incidents in Europe where Allied UXBs have detonated, and incidents where fatalities have resulted. There have been several hypotheses as to the reason why the issue is more prevalent in mainland Europe – reasons could include the significantly greater number of bombs dropped by the Allied forces on occupied Europe, the preferred use by the Allies of mechanical rather than electrical fuzes, and perhaps just good fortune. The risk from UXO in the UK is also being treated very seriously in many sectors of the construction industry, and proactive risk mitigation efforts will also have affected the lack of detonations in the UK.

There are certain construction activities which make initiation more likely, and several potential initiation mechanisms must be considered:

UXB Initiation	
Direct Impact	Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
Re- starting the Clock	A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.
Friction Impact	The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge.

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18. Consequences of Initiation/Encounter

18.1. Introduction

The repercussions of the inadvertent detonation of UXO during intrusive ground works, or if an item or ordnance is interfered with or disturbed, are potentially profound, both in terms of human and financial cost. A serious risk to life and limb, damage to plant and total site shutdown during follow-up investigations are potential outcomes. However, if appropriate risk mitigation measures are put in place, the chances of initiating an item of UXO during ground works is comparatively low.

The consequences of encountering UXO can be particularly notable in the case of high-profile sites (such as airports and train stations) where it is necessary to evacuate the public from the surrounding area. A site may be closed for anything from a few hours to a week with potentially significant cost in lost time. It should be noted that even the discovery of suspected or possible item of UXO during intrusive works (if handled solely through the authorities), may also involve significant loss of production.

18.2. Consequences of Detonation

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

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19. 1st Line Defence Risk Assessment

19.1. Risk Assessment Stages

Taking into account the quality of the historical evidence, the assessment of the overall risk from unexploded ordnance is based on the following five considerations:

1. That the site was contaminated with unexploded ordnance.
2. That unexploded ordnance remains on site.
3. That such items will be encountered during the proposed works.
4. That ordnance may be initiated by the works operations.
5. The consequences of encountering or initiating ordnance.

19.2. Assessed Risk Level

1st Line Defence has assessed that the risk from unexploded German and anti-aircraft unexploded ordnance is not homogenous across the site of proposed works: see **Annex N** for risk mapping of the area. The southern section of Site C has been assessed as of **Medium Risk** from UXO contamination, whilst Site A, Site B, and Site D, as well as the remaining areas Site C, have been given a **Low Risk**. There is also an assessed **Low Risk** from Allied unexploded ordnance across the site area.

Medium Risk Areas – Southern Section of Site C:

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs			✓	
German Incendiary Bombs			✓	
Anti-Aircraft Artillery Projectiles			✓	
Allied Land Service and Small Arms Ammunition		✓		

Low Risk – Site A, Site B, Northern Section of Site C and Site D:

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs		✓		
German 1kg Incendiary Bombs		✓		
Anti-Aircraft Artillery Projectiles		✓		
Allied Land Service and Small Arms Ammunition		✓		

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Please note – although the risk from unexploded ordnance on this site has been assessed as 'Low' across the majority of the site, this does not mean there is 'no' risk of encountering UXO within these areas. This report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified throughout this report. Our reports take a common-sense and practical approach to the assessment of risk, and we strive to be reasonable and pragmatic in our conclusions.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk where necessary. The mitigation measures outlined in the next section are recommended as a minimum precaution to alert ground personnel to the history of the site, what to look out for, and what measures to take in the event that a suspect item is encountered. It should also be noted that the conclusions of this report are based on the scope of works outlined in the 'Proposed Works' section of this report. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.

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20. Proposed Risk Mitigation Methodology

20.1. General

The following risk mitigation measures are recommended to support the proposed works at ID Manchester:

Type of Work	Recommended Mitigation Measure
All Works	• **UXO Risk Management Plan** It is recommended that a site-specific plan for the management of UXO risk be written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc. Contact 1st Line Defence for help/more information. • **Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.** As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.
Shallow Intrusive Works/Open Excavations **(Medium Risk Areas)**	• **Unexploded Ordnance (UXO) Specialist Presence on Site to support shallow intrusive works** When on site the role of the UXO Specialist would include: • Monitoring works using visual recognition and instrumentation, including immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by the ground workers on site. • Providing UXO awareness briefings to any uninformed staff and advise staff of the need to modify working practices to take account of the ordnance risk. • To aid incident management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard.
Borehole/Piles **(Medium Risk Areas)**	• **Intrusive Magnetometer Survey of all borehole and pile locations down to a maximum bomb penetration depth:** 1st Line Defence can deploy a range of intrusive magnetometer techniques to clear pile locations. The appropriate technique is influenced by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed.

In making this assessment and recommending these risk mitigation measures, if known, the works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified or additional intrusive engineering works be considered, 1st Line Defence should be consulted to see if a re-assessment of the risk or mitigation recommendations is necessary.

1st Line Defence Limited **8th April 2022**

This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

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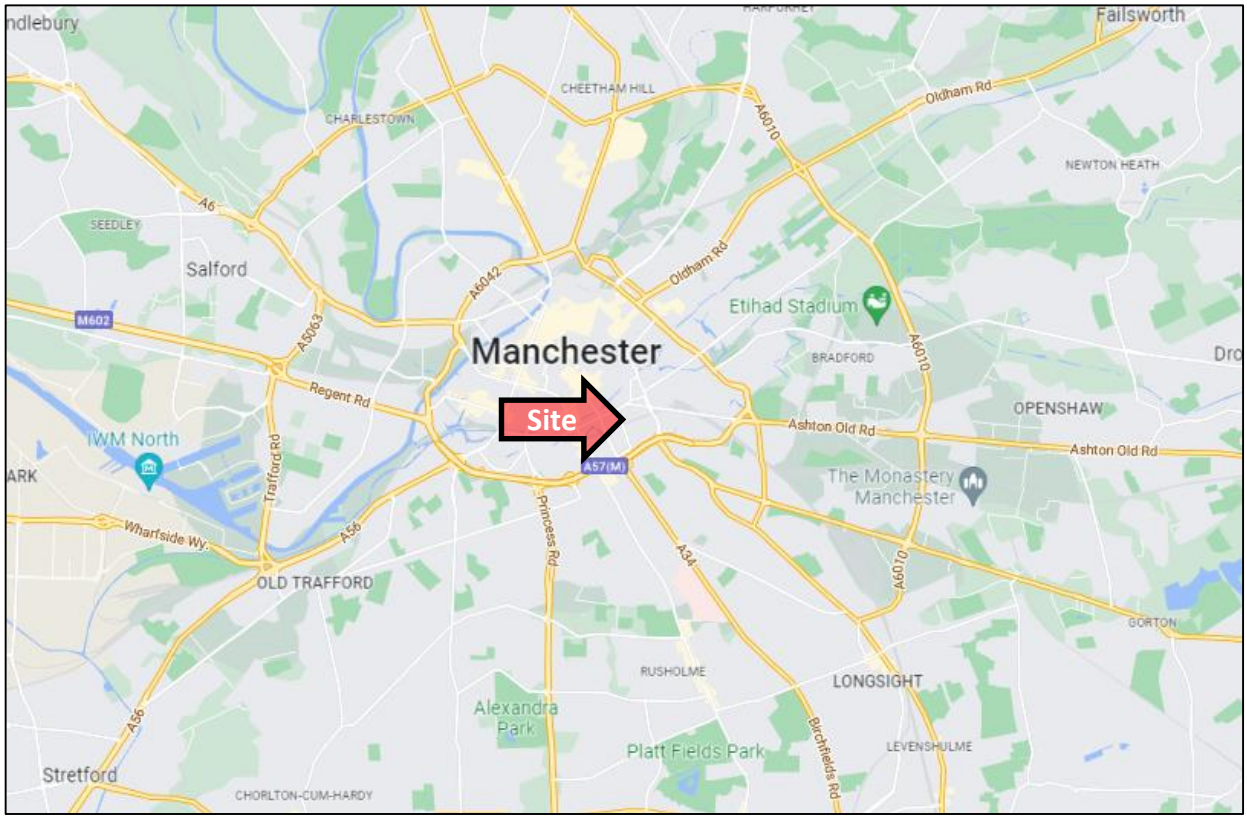
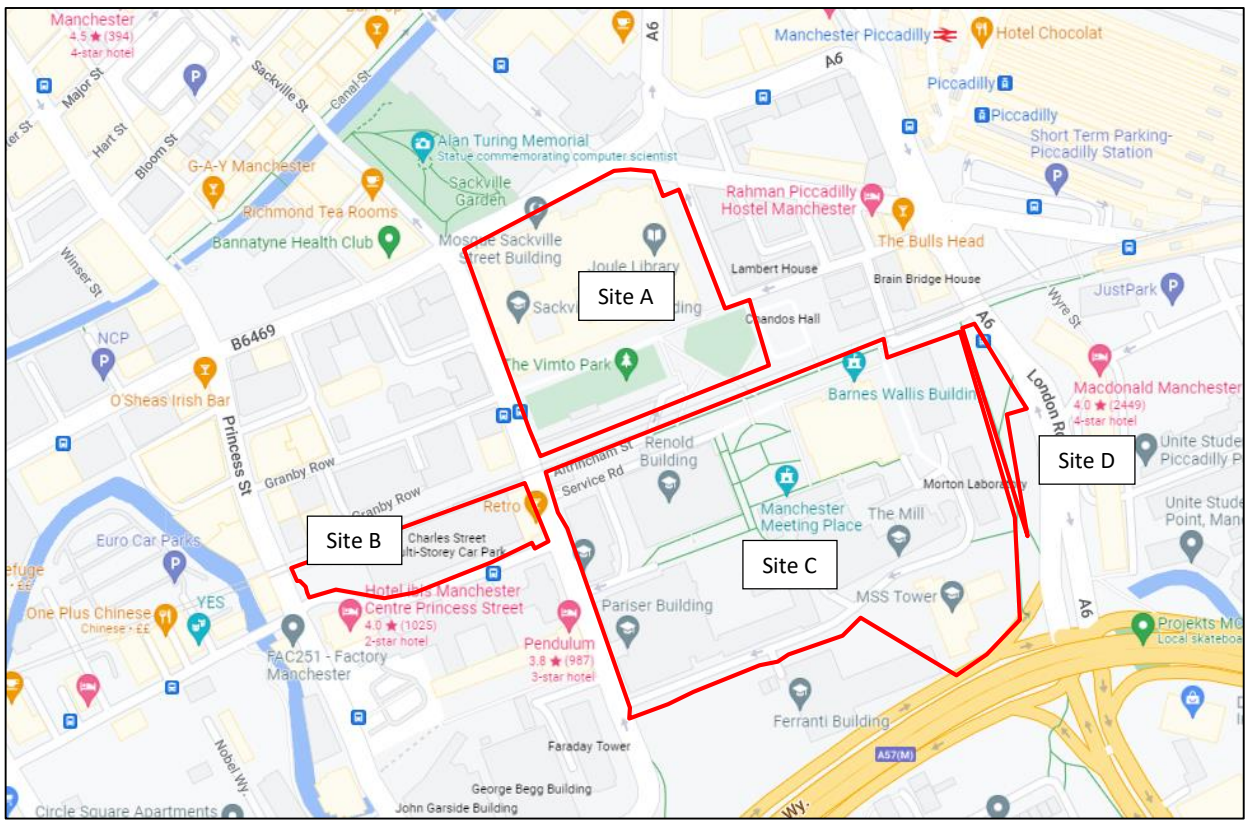
Site Location Maps

Annex: **A**





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Client:	**NX Consulting**	**Approximate site boundary**	N
Project:	**ID Manchester**		
Ref:	**DA14968-00**	Source: Google Maps	

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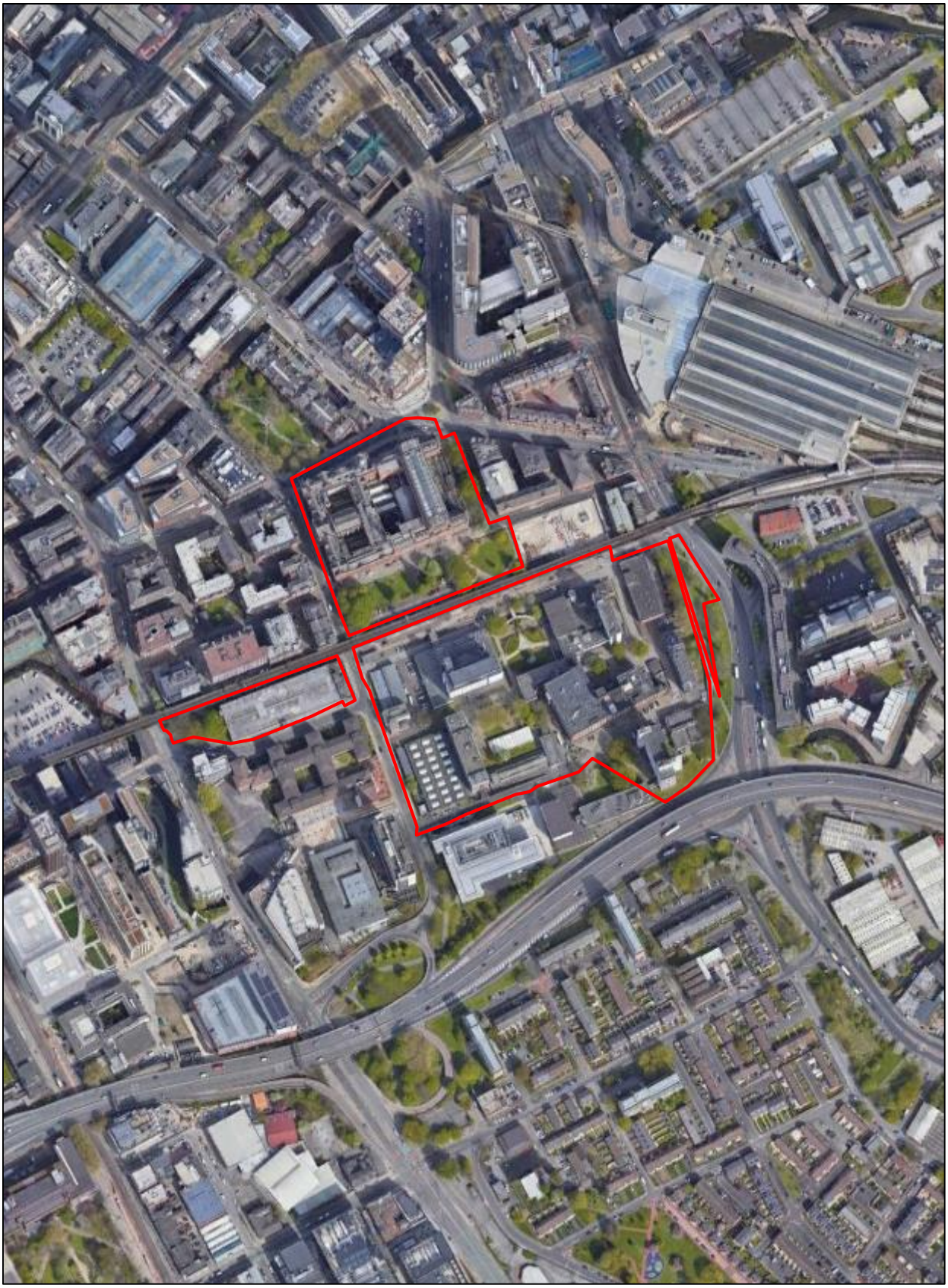
Recent Aerial Photography

Annex: **B**



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Source: Google Earth ™ Mapping Services

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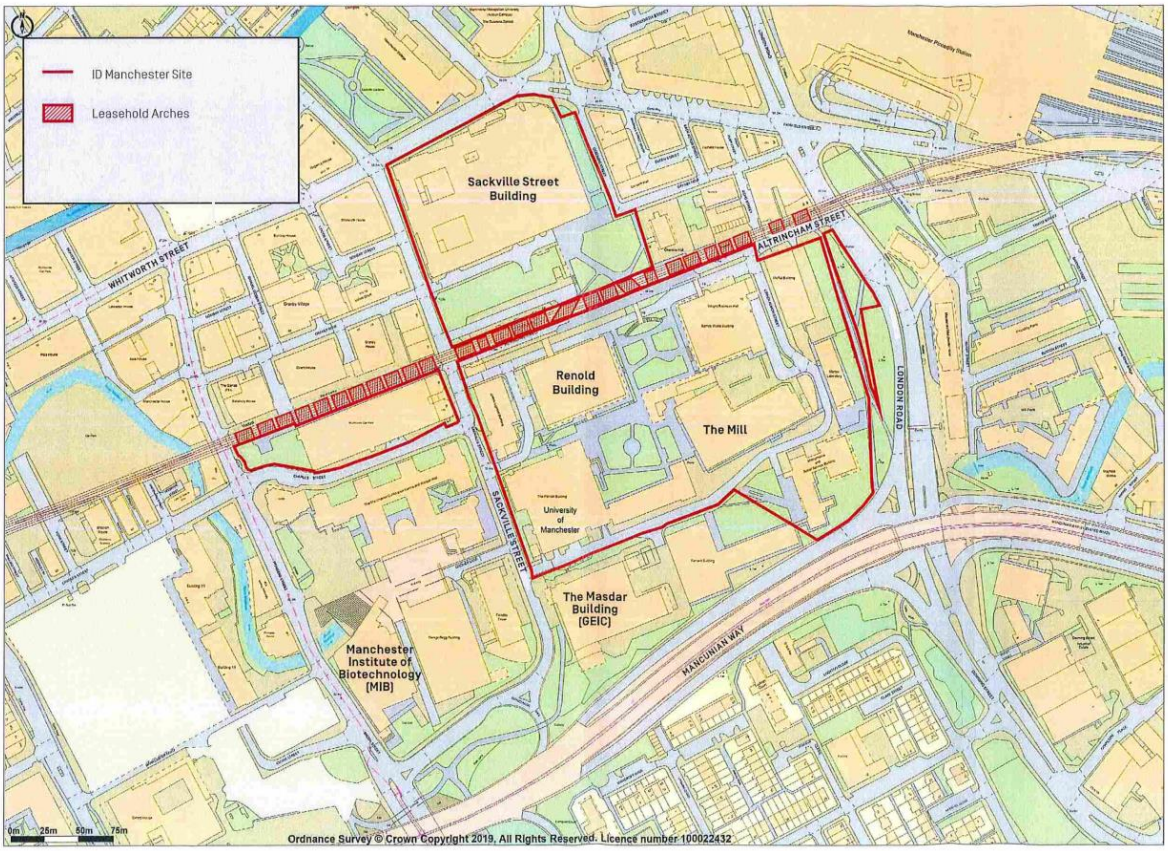
Client Provided Site Plan

Annex: **C**

I·D MANCHESTER



Promap V2 LANDMARK INFORMATION

Property

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1922 Historical Map

Annex: D1

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1938 Historical Map

Annex: **D2**

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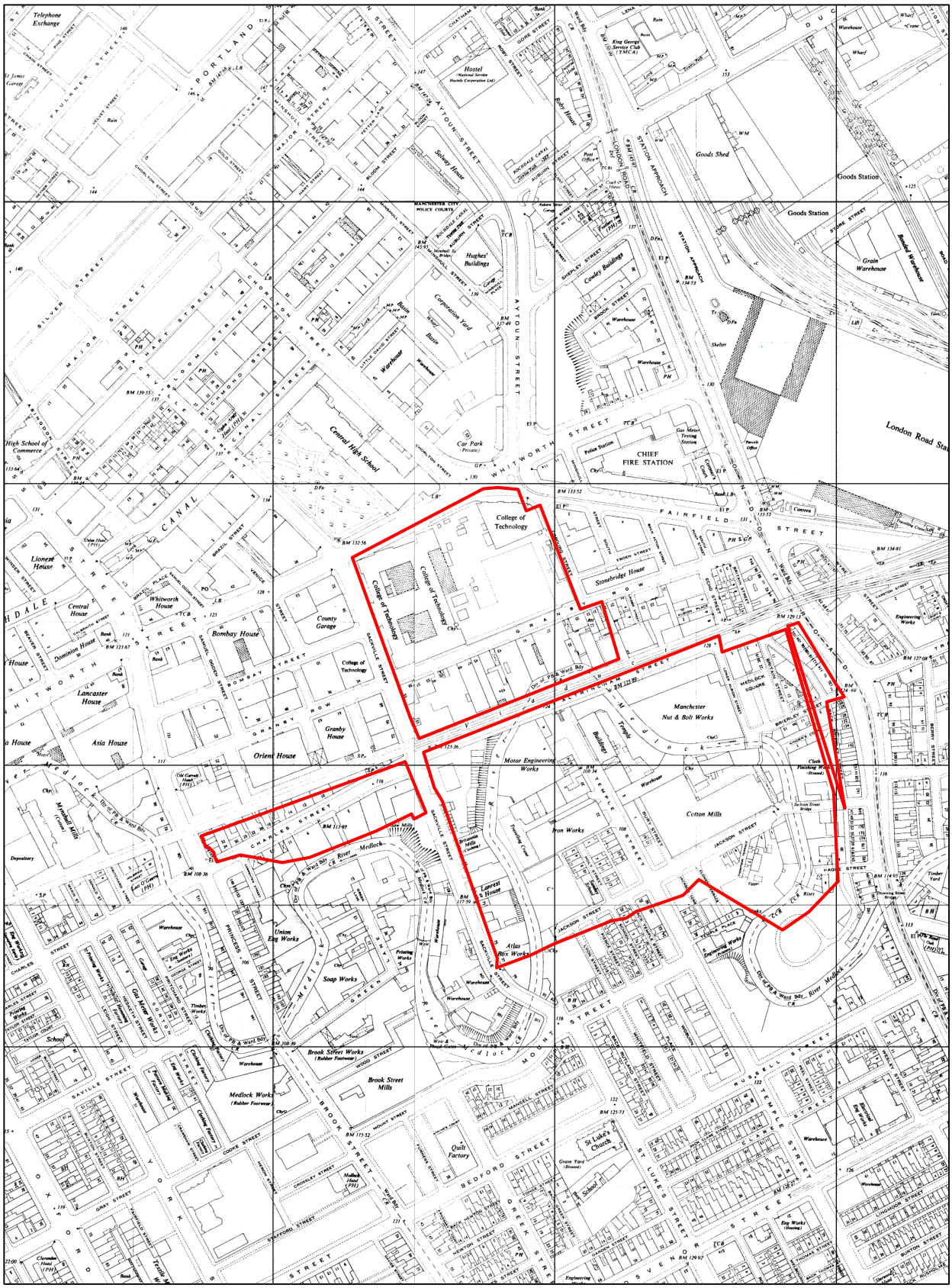
1948 Historical Map

Annex: D3



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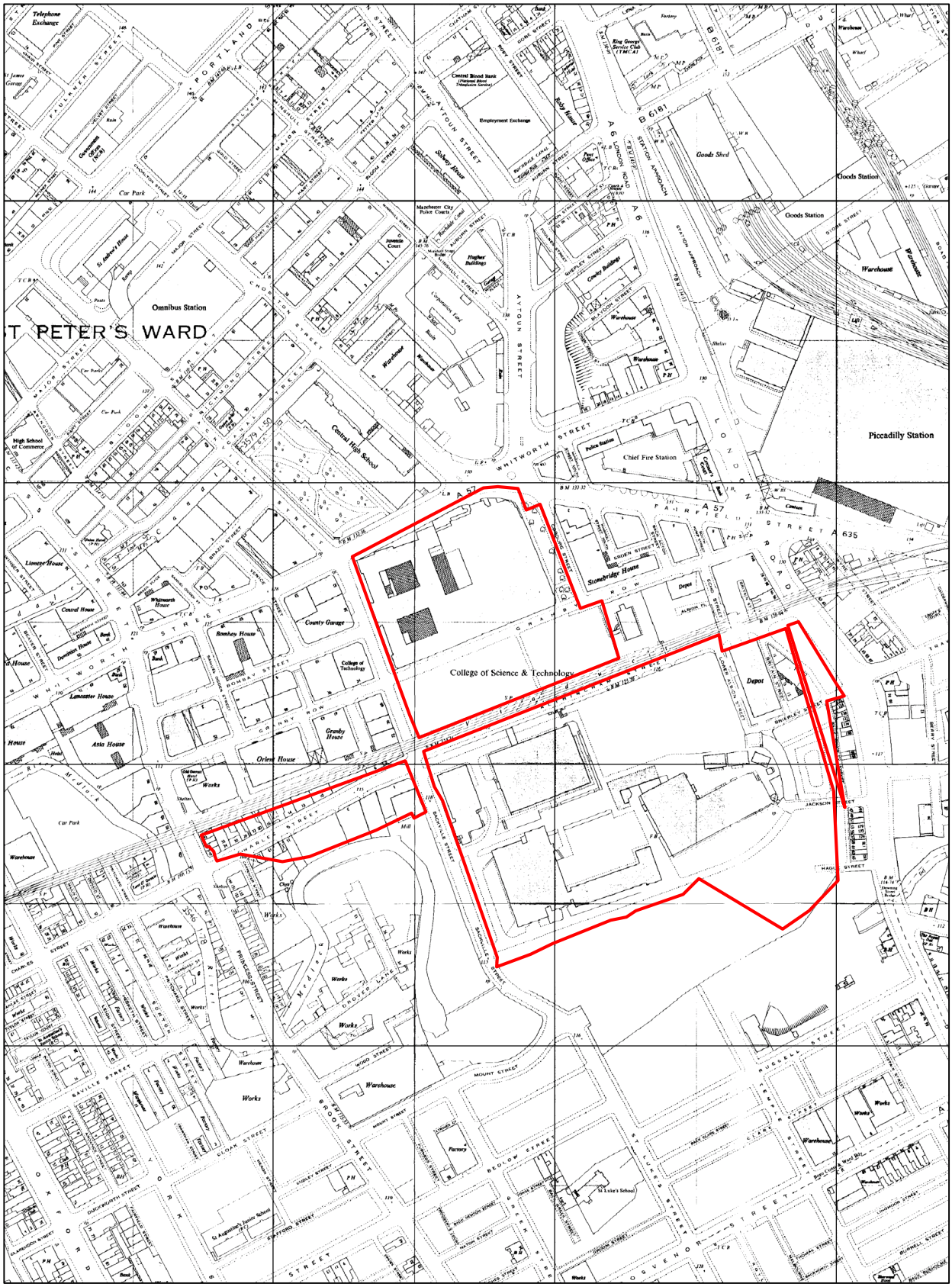
1965 Historical Map

Annex: D4



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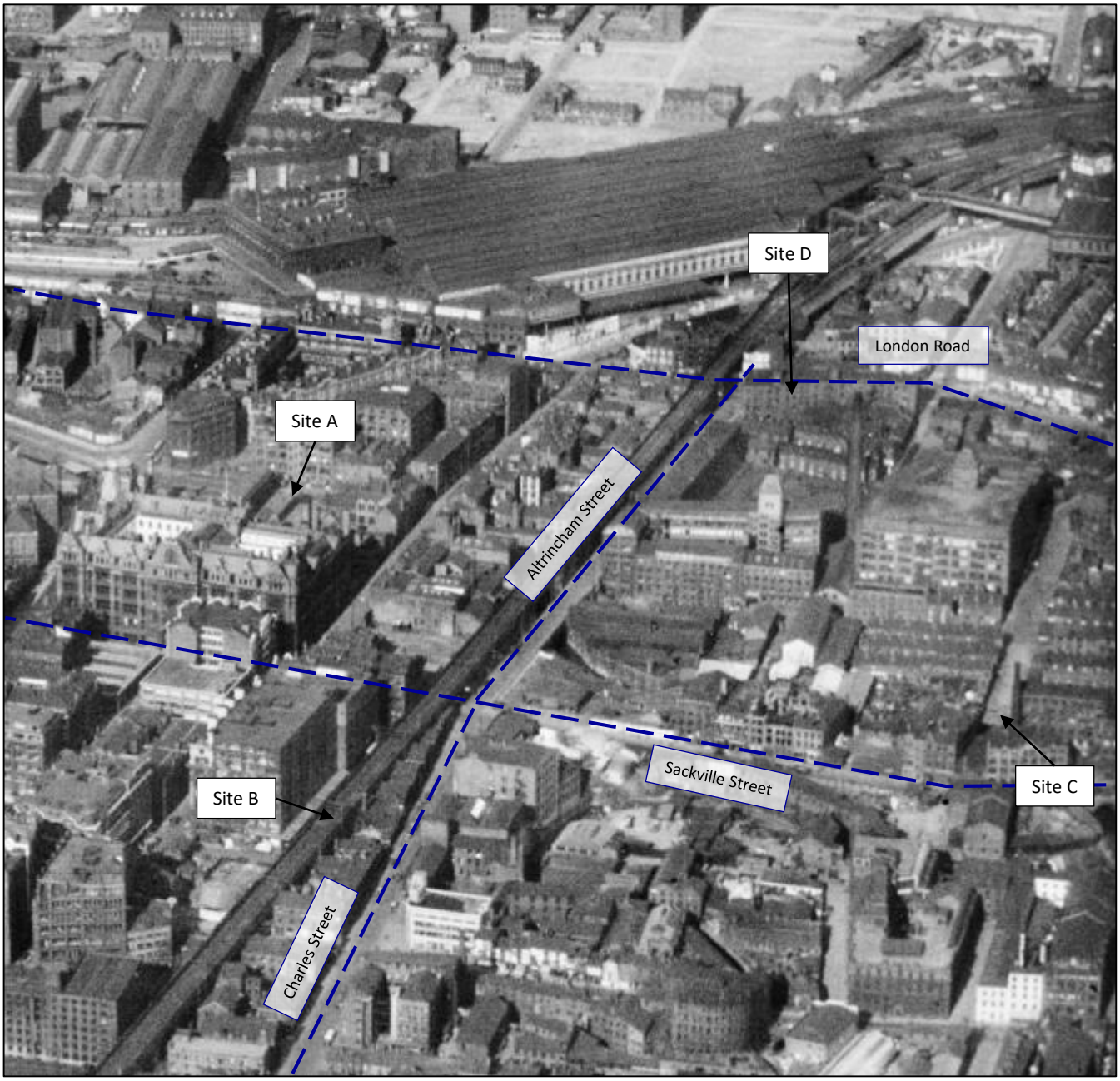

The city between the Central Railway Station and Manchester Piccadilly Station, Manchester, August 1937

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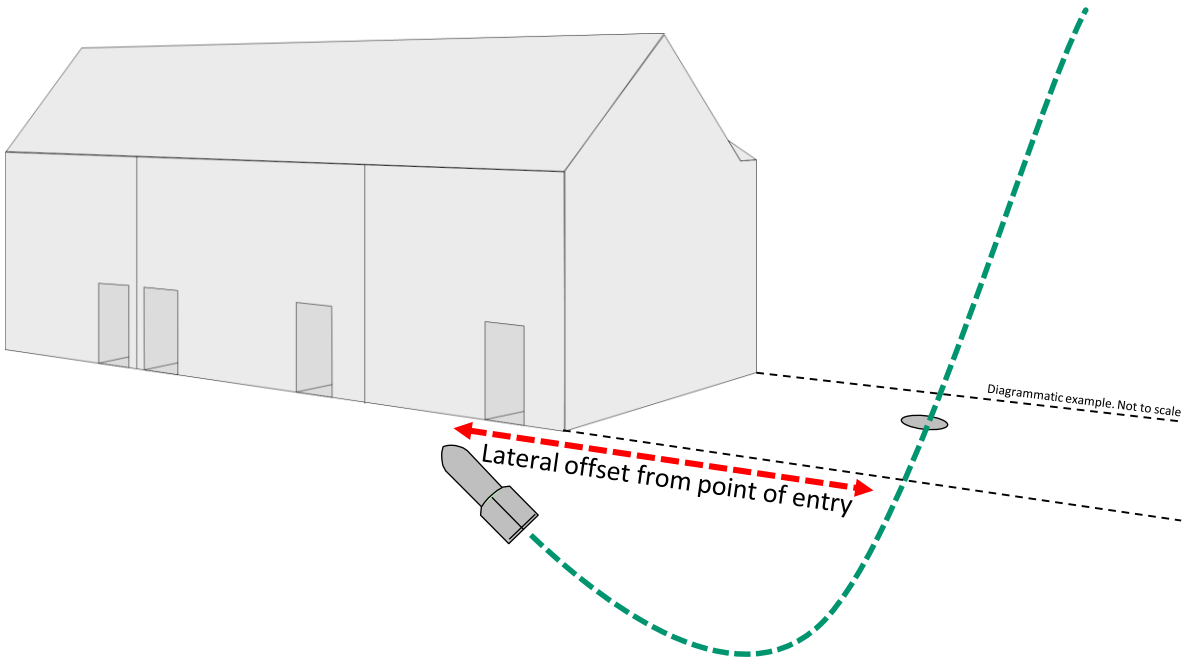
Example of UXO Entry Hole / The 'J-curve' Effect Principle



Top: J-curve Effect - Due to angle of entry, unexploded bombs would often end their trajectory at a lateral offset from point of entry, often ending up beneath adjacent extant structures/sites. The photograph above shows 250kg bomb found in Bermondsey pointing upwards, demonstrating 'J-curve'

One of the most common scenarios for UXO going unnoticed was when a UXB fell into a 'bomb site' (such as the area shown **Top Left**), the entry hole of the bomb obscured by any debris and rubble present. Note that the entry hole of a 50kg UXB could be as little as 20cm in diameter (**Left**).

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BBC NEWS

Bermondsey bomb: World War Two device safely removed

An unexploded World War Two bomb found in south London has been driven away safely under police and Army escort.

The 500lb (250kg) device was found on a building site in Grange Walk, Bermondsey on Monday.

March 2015

BBC NEWS

Bethnal Green WW2 bomb: Experts remove unexploded device

An unexploded World War Two bomb that prompted the evacuation of 700 people in east London has been made safe and removed by the military.

Families spent the night in a school hall after the 500lb bomb was found in the basement of a building site on Temple Street, in Bethnal Green, on Monday afternoon.

A 200m (650ft) exclusion zone was set up around the device.

August 2016

BBC NEWS

Bath WW2 bomb scare: Device defused, police say

A 500lb World War Two bomb found on the site of a former school in Bath has been defused and made safe.

The discovery of the bomb on Thursday **led to the evacuation of hundreds of homes** and many road closures in the Lansdown area of the city.

A cordon around the site was lifted on Friday evening, more than 24 hours after residents were asked to leave their homes.

May 2016

BBC NEWS

London City Airport reopens after WW2 bomb moved

London City Airport has reopened after an unexploded 500kg World War Two bomb was safely moved from the area.

The device was discovered at the King George V Dock on Sunday during planned work at the east London airport.

All flights were cancelled on Monday after an exclusion zone was put in place, **with the closure affecting up to 16,000 passengers and nearby residents being evacuated from their homes.**

May 2015

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Examples of Unexpected Detonation of WWII Bombs

Annex: **G2**

BASF has confirmed that an explosive device, most likely a World War II-era bomb, caused the blast that left one person injured Tuesday at a plant construction site in Germany.

The explosion was reported at BASF's Ludwigshafen toluene diisocyanate (TDI) plant, which recently broke ground for a 300,000 metric tons per year TDI production plant and other construction to expand its facilities.

BASF Provides Some Details

Responding to a request from *PaintSquare News* for more information on Wednesday (Feb. 27), BASF's manager of media relations and corporate communications Europe, Ursula von Stetten, wrote in an email, "So here [are] the facts: The detonation took place at 10:00 a.m. One person was injured; the injury is not serious. He will be kept in the hospital for some days.

"Cause of the detonation was an explosive device, presumably a bomb deriving from the Second World War. The device detonated when grounding work was done. No details on [a] delay [are] available. At the moment, the exact circumstances of the incident are [being] evaluated."

1st March 2013

SPIEGEL ONLINE

Blast Kills One

World War II Bomb Explodes on German Motorway

A highway construction worker in Germany accidentally struck an unexploded World War II bomb, causing an explosion which killed him and wrecked several passing cars.

A World War II bomb has exploded during construction work on a German highway, killing one worker and injuring several motorists who were driving past, police said.

The worker had been cutting through the road surface near the south-western town of Aschaffenburg when his machine struck the bomb and triggered it. Police said they weren't sure yet what type of bomb it was. "The explosion seems to have been too small for it to have been an aircraft bomb," a police spokesman said.

23rd October 2006

WWII bomb injures 17 at Hattingen construction site

Seventeen people were injured on Friday when a construction crew unwittingly detonated a buried World War II-era bomb in Hattingen.

An excavator apparently drove over a 250-kilogramme (550 pound) American bomb, damaging surrounding buildings. Most of the injured suffered auditory trauma from the blast, and the excavator operator suffered injuries to his hands, police in the German state of North Rhine-Westphalia said.

"The hole was astoundingly small for such a large bomb full of so many explosives," Armin Gebhard, head of the Arnsberg department for military ordnance removal, told The Local. "But of course it damaged all the surrounding buildings too. We are really happy it wasn't worse."

19th September 2013

BBC NEWS

World War II bomb kills three in Germany

A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

The blast happened an hour before the defusing operation was due to start.

Officials said the three men who died were experienced sappers, or combat engineers, who over 20 years had defused up to 700 bombs.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

2nd June 2010

June 2006

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Examples of Land Service Ammunition finds in the UK

Annex: G3

Unexploded Second World War bomb discovered under Somerset footpath

By Western Daily Press | Posted: January 21, 2014

The unexploded bomb was found in Somerset

Comments (0)

An unexploded bomb dropped in Britain during the Second World War has finally been discovered – underneath a popular footpath in Somerset.

23 August 2014 Last updated at 15:01

Unexploded WW2 bomb found at Kenfig Pool, Bridgend

Dean Smith believes the shell was made in Germany

Bomb experts have been called to a south Wales nature reserve after an unexploded World War Two shell was discovered by a walker in Bridgend.

Dean Smith, 38, of Pyle, was walking near Kenfig Pool on Saturday when he saw a fin sticking out of the sand.

He reached down to pick it up, but ending up falling and landed with the 2ft-long (0.6m) bomb on top of him.

The site has been cordoned off by police and the Royal Logistics Corps will carry out a controlled explosion.

Related Stories

'Panic' as dog nearly thrown grenade

WW2 bomb found at wind farm exploded

WWII bomb found in kitchen cupboard

Mortar thought to be from WWII found on Oshawa's Camp-X grounds

August 24, 2016 | 5:42 am

What is believed to be a World War II mortar has been discovered in south Oshawa. A man out in Intrepid Park, the site of the Camp-X Second World War training grounds, discovered the round with his metal detector on Tuesday evening. Durham police are held the scene overnight awaiting military officials from Trenton to come and properly detonate the mortar.

Unexploded bomb found in farmer's field

17 May 2010

A live Second World War mortar shell was blown up by Army experts after a farmer found it in his field.

The discovery was made in the field alongside the A20 between Folkestone and Dover.

The mortar shell, which was around a foot long and 3in in diameter, was around 50ft from the main road.

The farmer alerted police and PC Trevor Moody and PCSO Michelle Brady went to the field.

PC Moody contacted the Army who sent in a bomb disposal unit.

An Army officer confirmed the live shell was from the Second World War and was packed with high explosives.

They moved it a safe distance away from the A20 and carried out a controlled explosion.

PC Moody said: "Given that we live in an area that saw much action during the Second World War, it is not uncommon for us to be alerted about unexploded bombs."

The incident was on Thursday.

Click here for more news from Kent.

Royal Navy bomb disposal experts remove a World War Two shell discovered in a nature reserve

- A World War Two bomb was discovered in a Plymouth nature reserve
- Amateur metal detector found the shell and partially dug it up
- Royal Navy experts carried the explosive away before disposing of it

By VALERIE EDWARDS FOR MAILONLINE

PUBLISHED: 01:29, 13 January 2016 | **UPDATED:** 09:51, 13 January 2016

Share 338 shares 10 View comments

A World War Two bomb was reportedly found at Efford Nature Reserve in Plymouth after a member of the public was metal detecting and partially dug it up.

The Royal Navy Bomb Disposal team was called in to remove the bomb and police have closed off Military Lane, with the possibility of Military Road also being closed.

Police were called at around 1.30pm yesterday after what appeared to be a shell was discovered and partially dug up near Military Lane, Efford.

Holiday beach cordoned off after landslip sends more than a THOUSAND Second World War bombs and rockets tumbling onto the sands

- Bad weather led to ground movement which exposed the huge arsenal at Mappleton, East Riding
- A dog walker stumbled across the deadly find on Saturday and 15 controlled explosions were carried out
- Rockets, mortar bombs and 25-pounder bombs were recovered after they were fired into the cliffs by RAF aircraft during the war
- Most of the devices were dummy rounds used for bombing practice but contain enough explosives to cause terrible injuries

© Jonathan Pow

Bomb Beach Alley: Rockets were found after a landslide on Mappleton beach in 2012

Army bomb disposal team called to Blacksole Bridge in Herne Bay

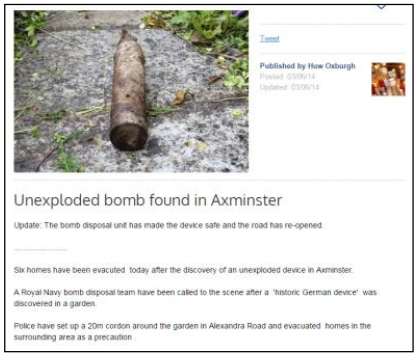
by Aidan Barlow abarlow@thekmgroup.co.uk 08 July 2015

It was like a scene from Dad's Army when Army bomb disposal experts found wartime explosives made by the Home Guard in makeshift bottles.

A team was called to the Blacksole Bridge in Herne Bay after the wartime bombs were found.

The team from the Royal Logistics Corps set up a 30 metre exclusion zone for pedestrians around the railway embankment after the suspected homemade phosphorous bombs were found.

The scene at Blacksole Bridge after wartime explosives were found in the railway cutting



Tweet

Published by Huw Oxburgh

Posted: 03/06/14

Updated: 03/06/14

Unexploded bomb found in Axminster

Update: The bomb disposal unit has made the device safe and the road has re-opened.

Six homes have been evacuated today after the discovery of an unexploded device in Axminster.

A Royal Navy bomb disposal team have been called to the scene after a 'historic German device' was discovered in a garden.

Police have set up a 20m cordon around the garden in Alexandra Road and evacuated homes in the surrounding area as a precaution.

Storms and floods unearth unexploded wartime bombs

By Claire Marshall

BBC environment correspondent

There has been a dramatic increase in the number of wartime bombs unearthed because of the winter storms and flooding.

Bomb disposal teams in the South West have dealt with double the number of unexploded ordnance than in the same period last year.

Since mid December, the Royal Navy's Southern Dive Unit has recovered or disposed of 244 items of ordnance.

During the same period last year, they dealt with just 108 items.

The storms have uncovered a lethal past

Almost 70 years after the end of WWII, one legacy of that conflict continues to turn up on beaches and harbours around Britain.

Unexploded shells, bombs and mines continue to be discovered every year, and the Royal Navy's Southern Dive Unit is tasked with making these devices safe.

Its area of responsibility stretches for some 2,250km (1,400 miles). It begins from the highwater mark in Hull and proceeds seaward to the territorial limit, and then runs clockwise around the British Isles - including the Isle of Wight, Channel Islands, and Isles of Scilly - to finish in Liverpool.

Related Stories

Ancient trees revealed by storms

Land Service Ammunition (LSA) resulting from historic military activity is commonly encountered across the UK by the public and construction industry alike. Such finds are much more common in rural areas than in urban environments, and can often be anticipated in areas such as former RAF stations or ranges. However, many such items are encountered entirely by surprise where the landowner or developer has no knowledge of any previous military use of the land.

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Source: Various news sources

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INDEPENDENT

News > UK > Home News

Manchester city centre evacuated over 'unexploded tank cartridge'

Military bomb disposal team called in to remove device

Chris Baynes | Wednesday 24 October 2018 15:49 |

Police were forced to evacuate a number of buildings in Manchester city centre after an unexploded tank cartridge was found.

A military bomb disposal team was called in after the shell was uncovered on a building site in New Quay Street.

Greater Manchester Police (GMP) closed surrounding roads and told people to leave nearby flats and offices, including the former studios of Granada Television.

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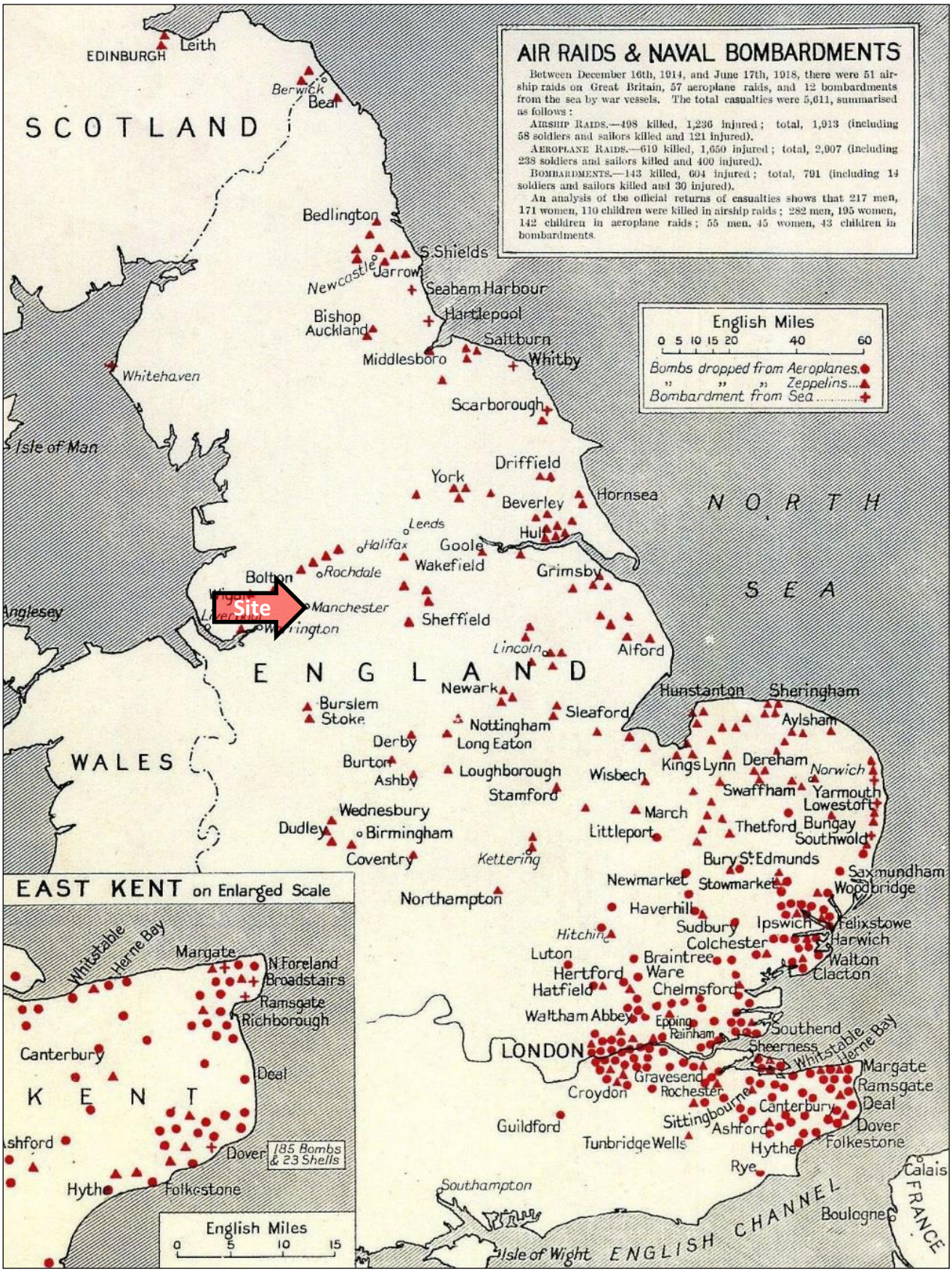
WWI Map of Air Raids and Naval Bombardments

Annex: H



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Source: J. Morris, *German Air Raids on Britain*

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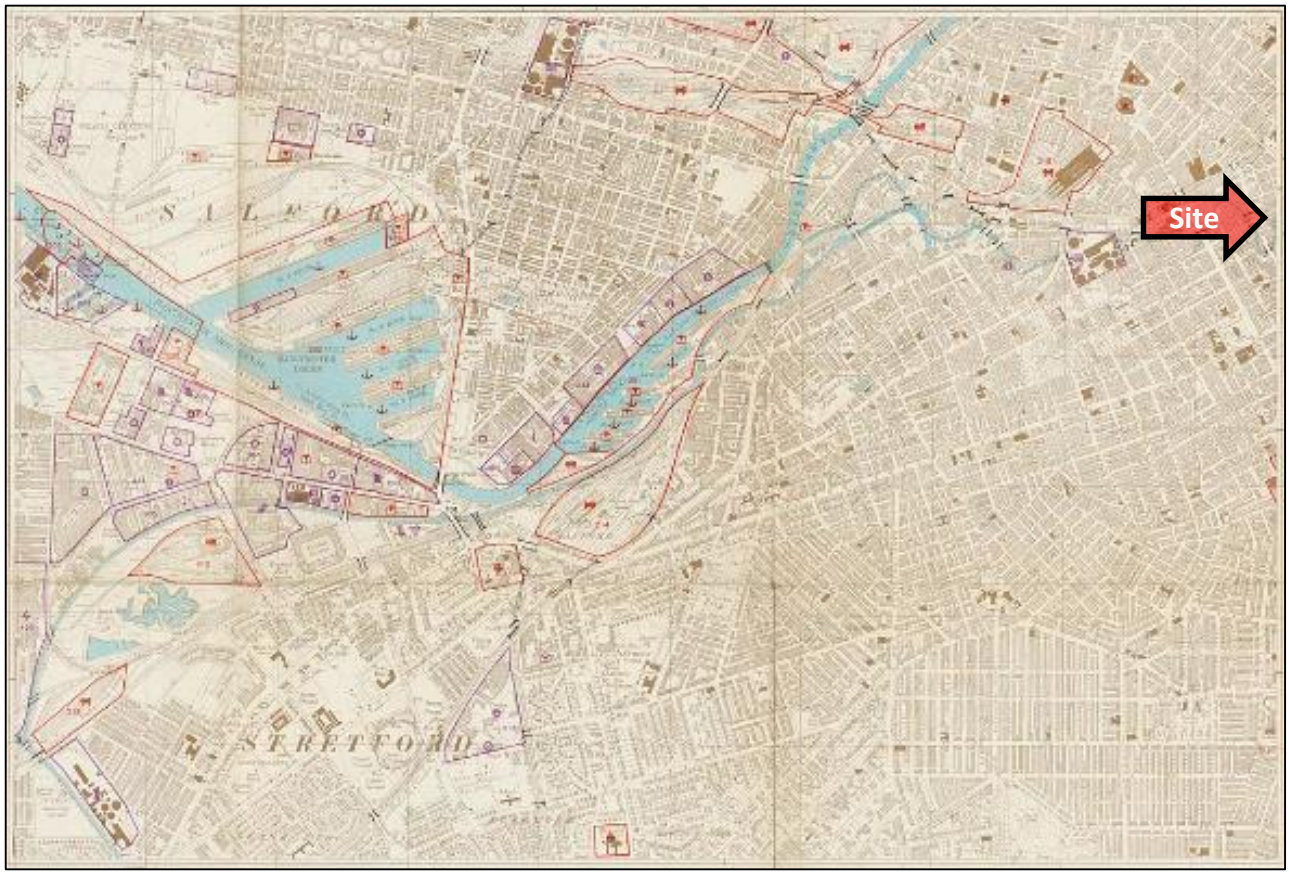
Luftwaffe Target Mapping

Annex: I1



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Source: Nigel J. Clarke, "Adolf Hitler's Home Counties Holiday Snaps"

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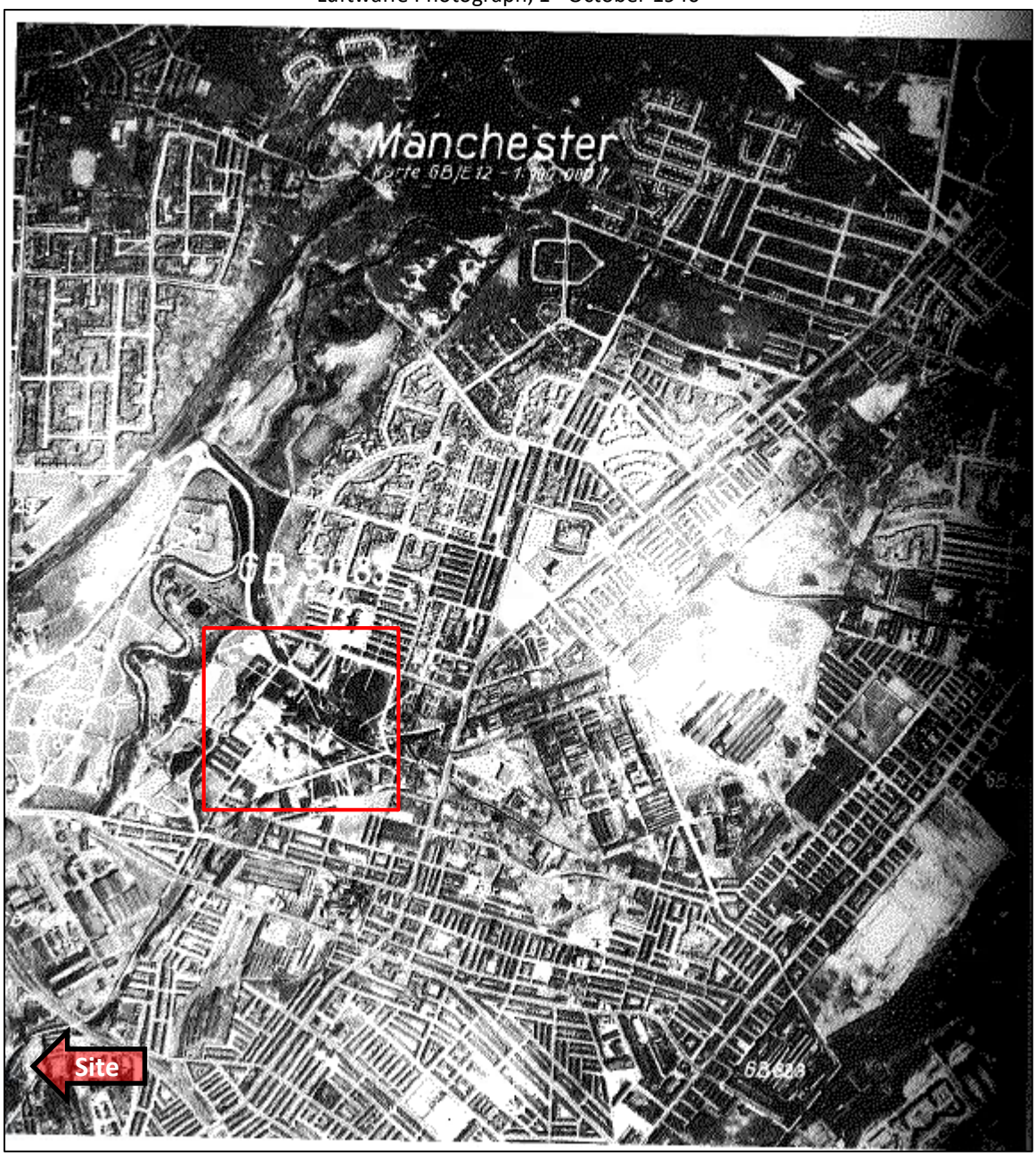
Luftwaffe Photograph, 1st October 1940



Manchester - Clayton
Red boxed area – gas works
GB 823 & GB 5083 – Designated Luftwaffe targets

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Source: Nigel J. Clarke, "Adolf Hitler's Home Counties Holiday Snaps"

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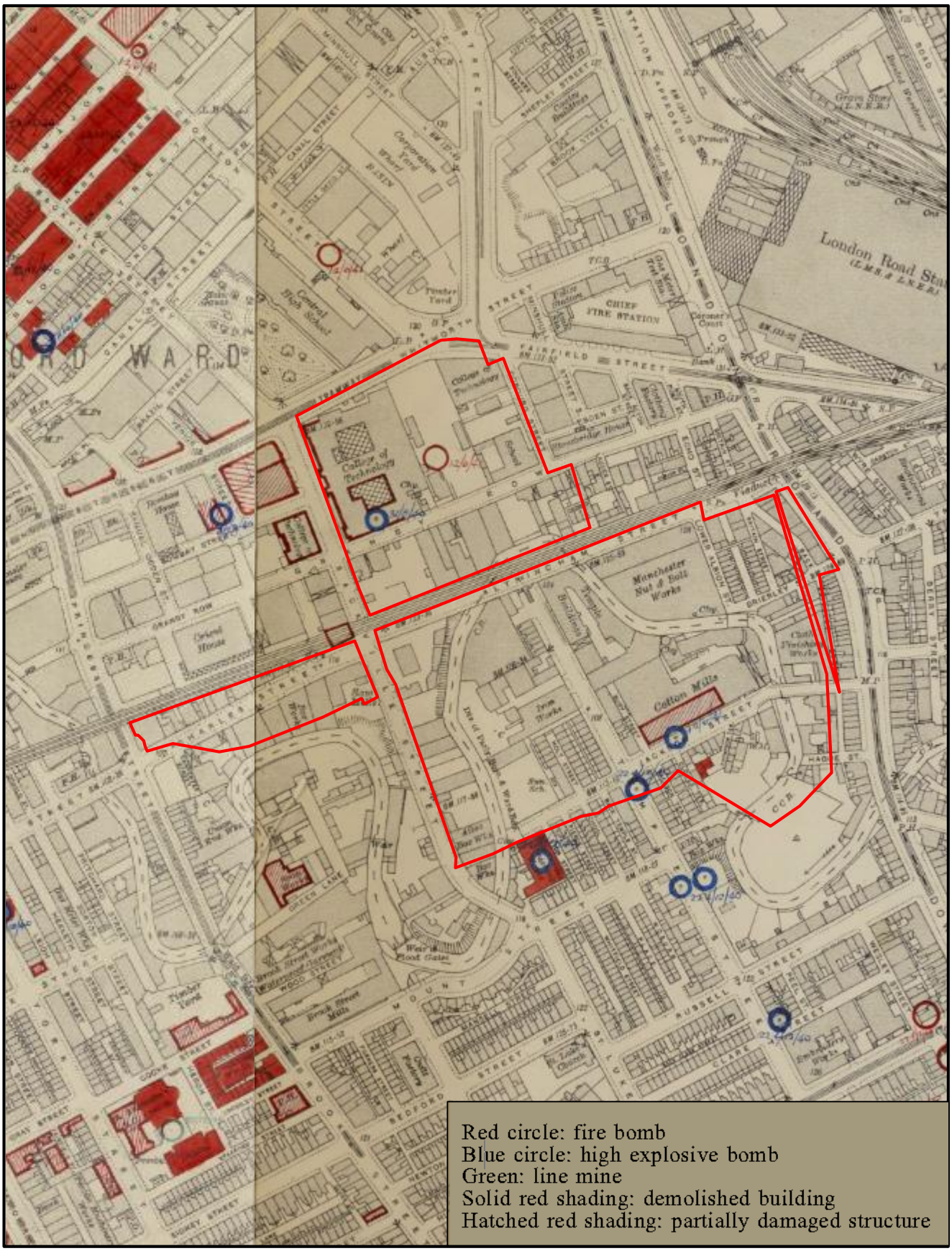
Manchester Blitz Bomb Mapping

Annex: J



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Ref: **DA14968-00**

Source: The National Archives, Kew

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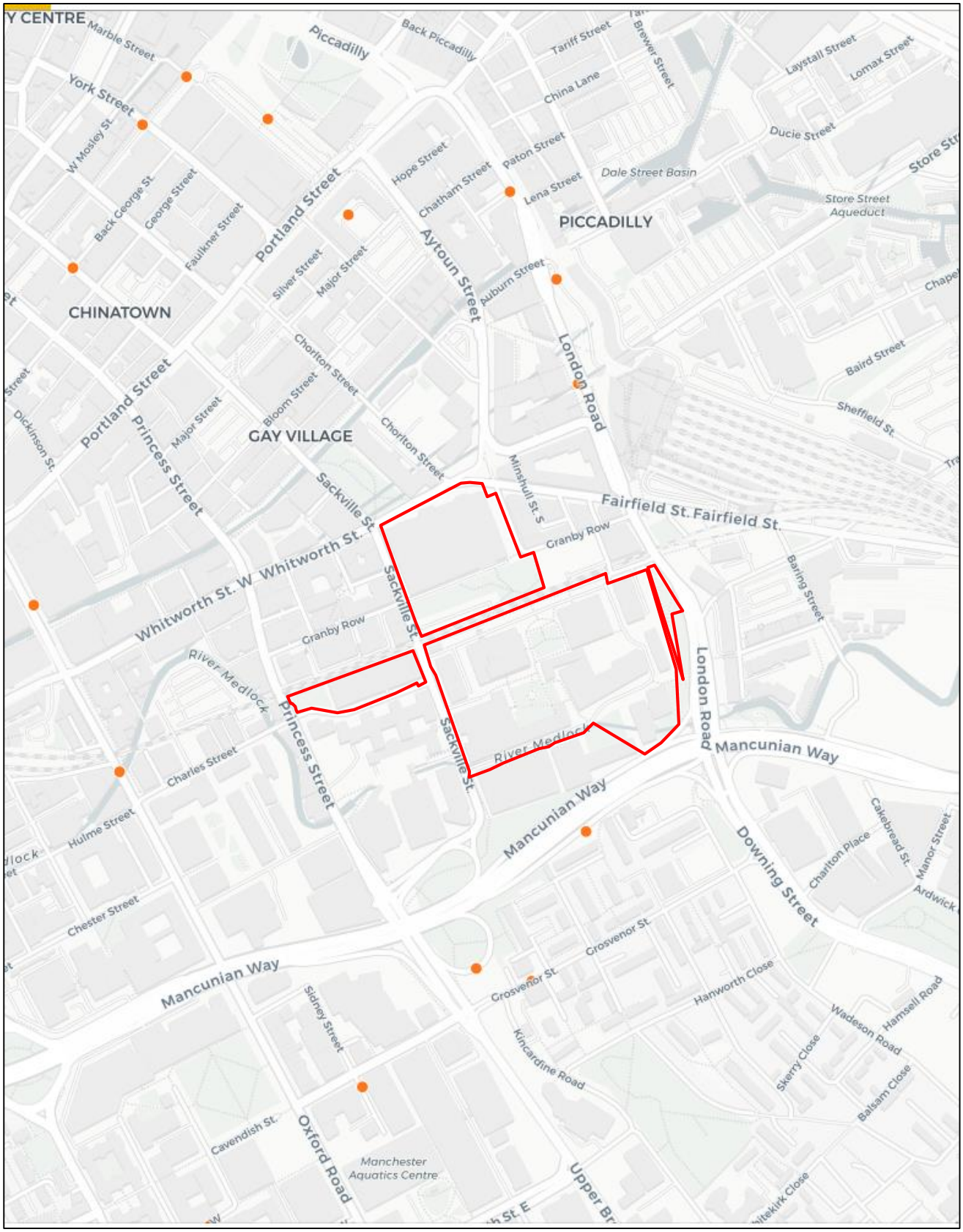
Interactive Manchester Bomb Map

Annex: K



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Source: Manchester Evening News

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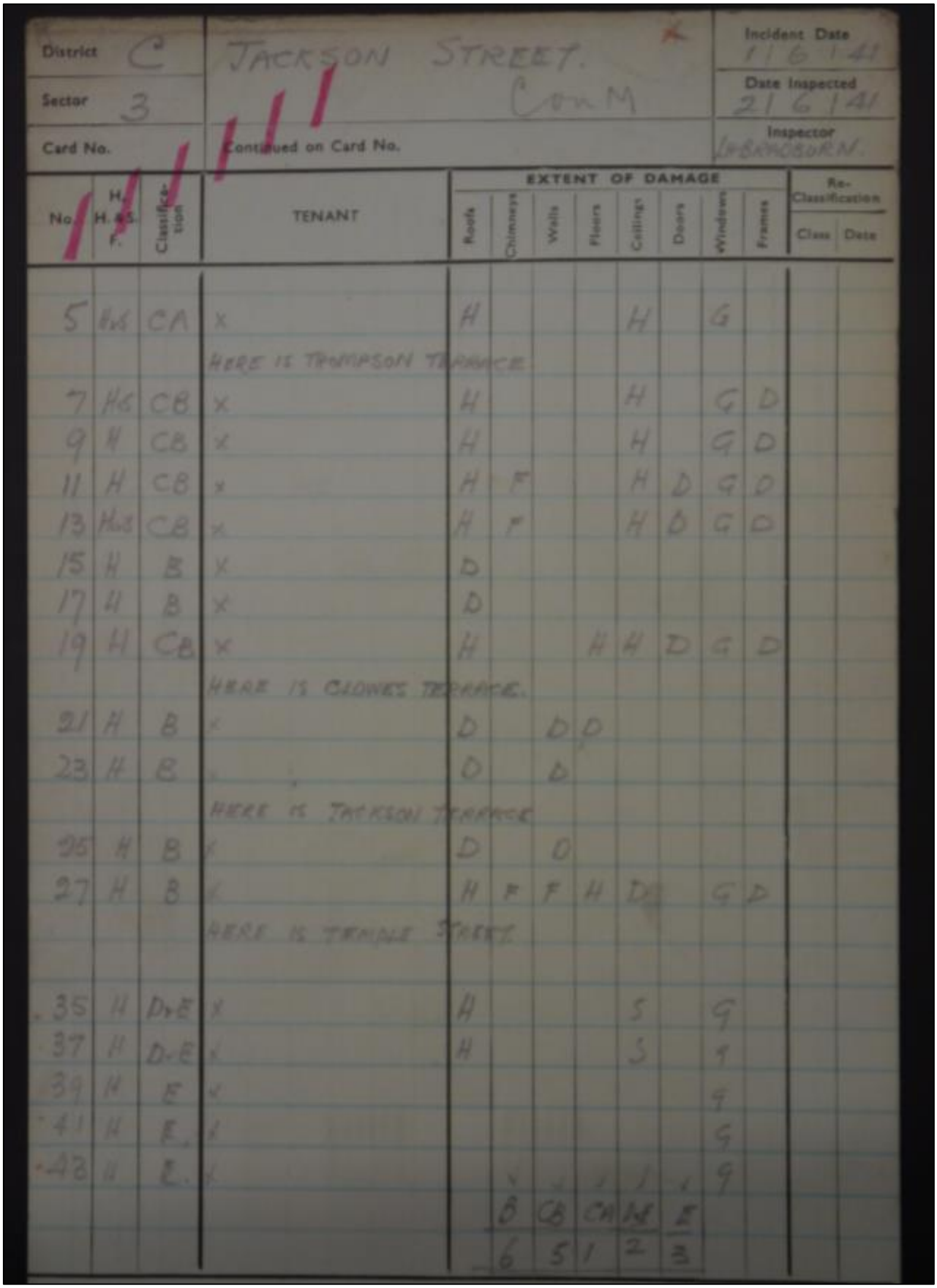

District C
Sector 3
Card No.
JACKSON STREET. Con M
Continued on Card No.
Incident Date 11 6 41
Date Inspected 21 6 41
Inspector [illegible]

No.	H. & S. F.	Classification	TENANT	EXTENT OF DAMAGE: Roofs	Chimneys	Walls	Floors	Ceilings	Doors	Windows	Frames	Re-Classification: Class	Date
5	HW	CA	x	H				H		G			
			HERE IS THOMPSON TERRACE										
7	HG	CB	x	H				H		G	D		
9	H	CB	x	H				H		G	D		
11	H	CB	x	H	F			H	D	G	D		
13	HW	CB	x	H	F			H	D	G	D		
15	H	B	x	D									
17	H	B	x	D									
19	H	CB	x	H			H	H	D	G	D		
			HERE IS CLOWES TERRACE.										
21	H	B	x	D		D	D						
23	H	B	x	D		D							
			HERE IS JACKSON TERRACE										
25	H	B	x	D		D							
27	H	B	x	H	F	F	H	D		G	D		
			HERE IS TEMPLE STREET										
35	H	D-E	x	H				S		G			
37	H	D-E	x	H				S		G			
39	H	E	x							G			
41	H	E	x							G			
43	H	E	x							G			
					x	x	x	1	1	G			
					B	CB	CA	H	E				
					6	5	1	2	3				

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District C | TEMPLE STREET. | Incident Date 1/6/41

Sector 3 | Date Inspected 21/6/41

Card No. | Continued on Card No. | Inspector L.H. BRADBURN

No.	H. H. & S. F.	Classification	TENANT	EXTENT OF DAMAGE: Roofs	Chimneys	Walls	Floors	Ceilings	Doors	Windows	Frames	Re-Classification: Class	Date
14	H	D.E	MRS. SWINDELLS.						D.	G	D.		
16	H		X EMPTY. NIL.										
18.	H	D.E	X						D	G	D.		
20-22			ENGINEERS WORKS										
24	H	D.E.	MR CHEETHAM.	S				S		G.			
26	H	D.E	X	S.				S.		G.			
28	H	D.E	MCKEW.	S.				S		G.			
30.	H.	D.E	CANTEEN FOR RUBERY OWEN & CHESHAM.										
32	H	D.E	MR DOCKER.	S.				S.		G.			
34	H	D.E	MR CUNNINGHAM.	S				S		G.			
			=										
			=										
52	H.S	D.E	WHITTLE	S.						G.			
54	H.	D.E.	X	S.						G			
56	H	D.E	X SILK.	S				D		G.			

CODE REFERENCE

D = Demolished | F = Fractured | G = Glazing | H = Holed
O = Off or Displaced | P = Plastering | S = Slight | U = Unsafe

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Ref: **DA14968-00** | Source: Manchester Central Library

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5014 [4578]

CITY OF MANCHESTER
CITY ARCHITECT'S DEPARTMENT
RETURN OF WAR DAMAGE TO PROPERTY

FOR OFFICE USE ONLY
PART 3 SHEET No. 694

LOCATION	DIST.	DATE	22/12/40
12 Charles St & Sackville St north side b-on-M.		TYPE BOMB	HE
		GRID No.	✓

IF ESSENTIAL BLDG. STATE TYPE

* DESCRIPTION OF PROPERTY	FULL ADDRESS AND LOCALITY
Workshop.	A & P. Stevens 12 Charles St. off Sackville St. b-on-M.

INDICATION OF EXTENT OF DAMAGE

ROOF	WALLS	FLOORS	* GENERALLY
Extensive Damage Flats, Glass etc.	No Damage	No Damage.	Flats Glass Damaged caused by Blast.

DAMAGE TO CONTENTS	INDICATION OF DANGEROUS STATE IF ANY
Nil.	No Danger.

* TYPE OF DAMAGE	DATE	TIME	INSPECTOR
C(a)	28/1/42		J. Renshaw

[4578]

CITY OF MANCHESTER
CITY ARCHITECT'S DEPARTMENT
RETURN OF WAR DAMAGE TO PROPERTY

FOR OFFICE USE ONLY
PART SHEET No. ✓

OWNER	OCCUPIER	DATE	1/2-6-41
Butterworth Clifford & Co 1 Charles Street		TYPE BOMB	HE
		GRID No	

IF ESSENTIAL BLDG. STATE TYPE

* DESCRIPTION OF PROPERTY	FULL ADDRESS AND LOCALITY
Sawmills & Offices	Butterworth, Clifford & Co 1 Charles Street, Manchester.

INDICATION OF EXTENT OF DAMAGE

ROOF	WALLS	FLOORS	* GENERALLY
No damage	No damage	No damage	Blast damage to Windows

DAMAGE TO CONTENTS	INDICATION OF DANGEROUS STATE IF ANY

TYPE OF DAMAGE	DATE	TIME	INSPECTOR
E	27-7-41		G Feak

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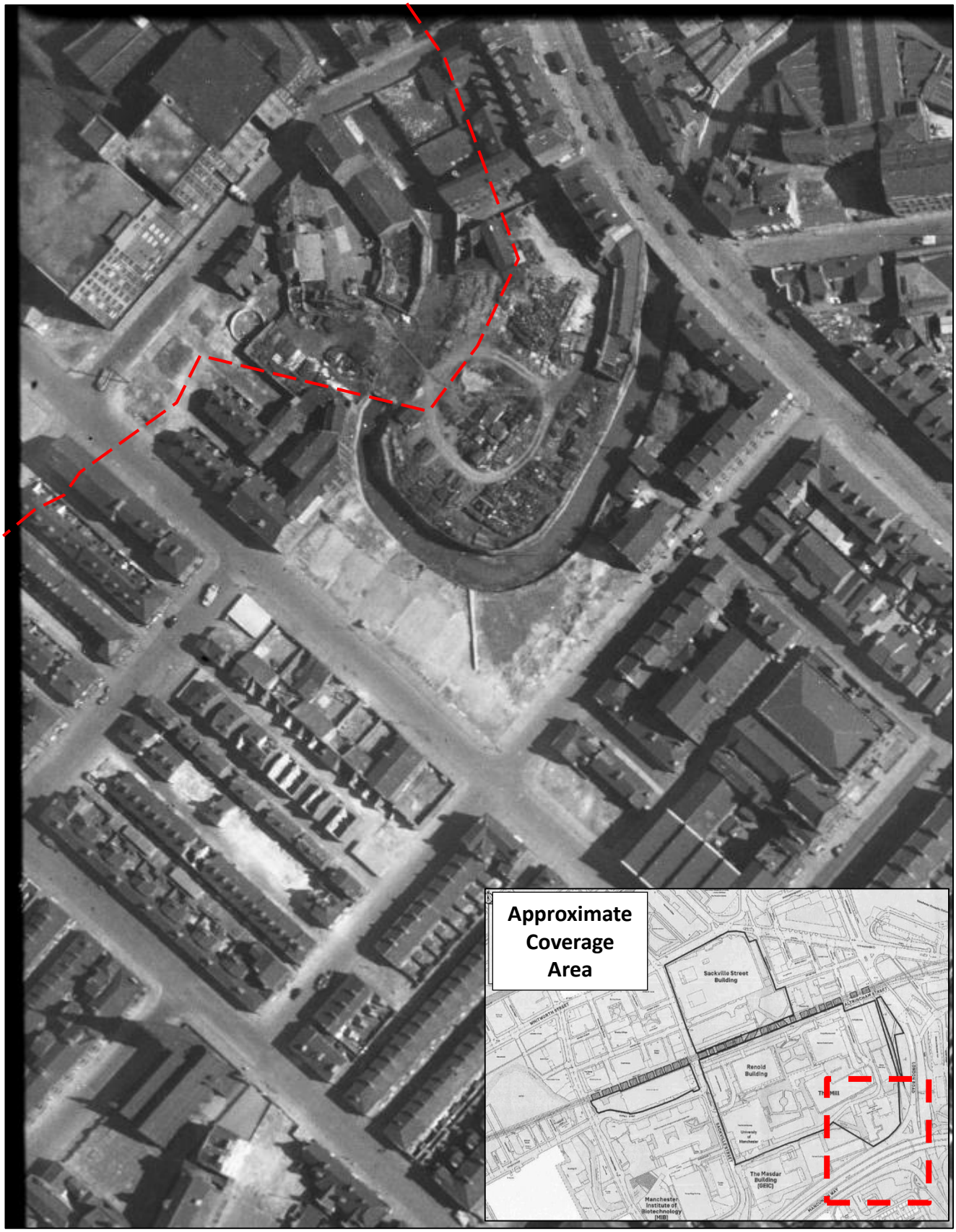
RAF Aerial Photography 7th May 1946

Annex: **M1**



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Source: National Monuments Record Office (Historic England)

Approximate site boundary

N

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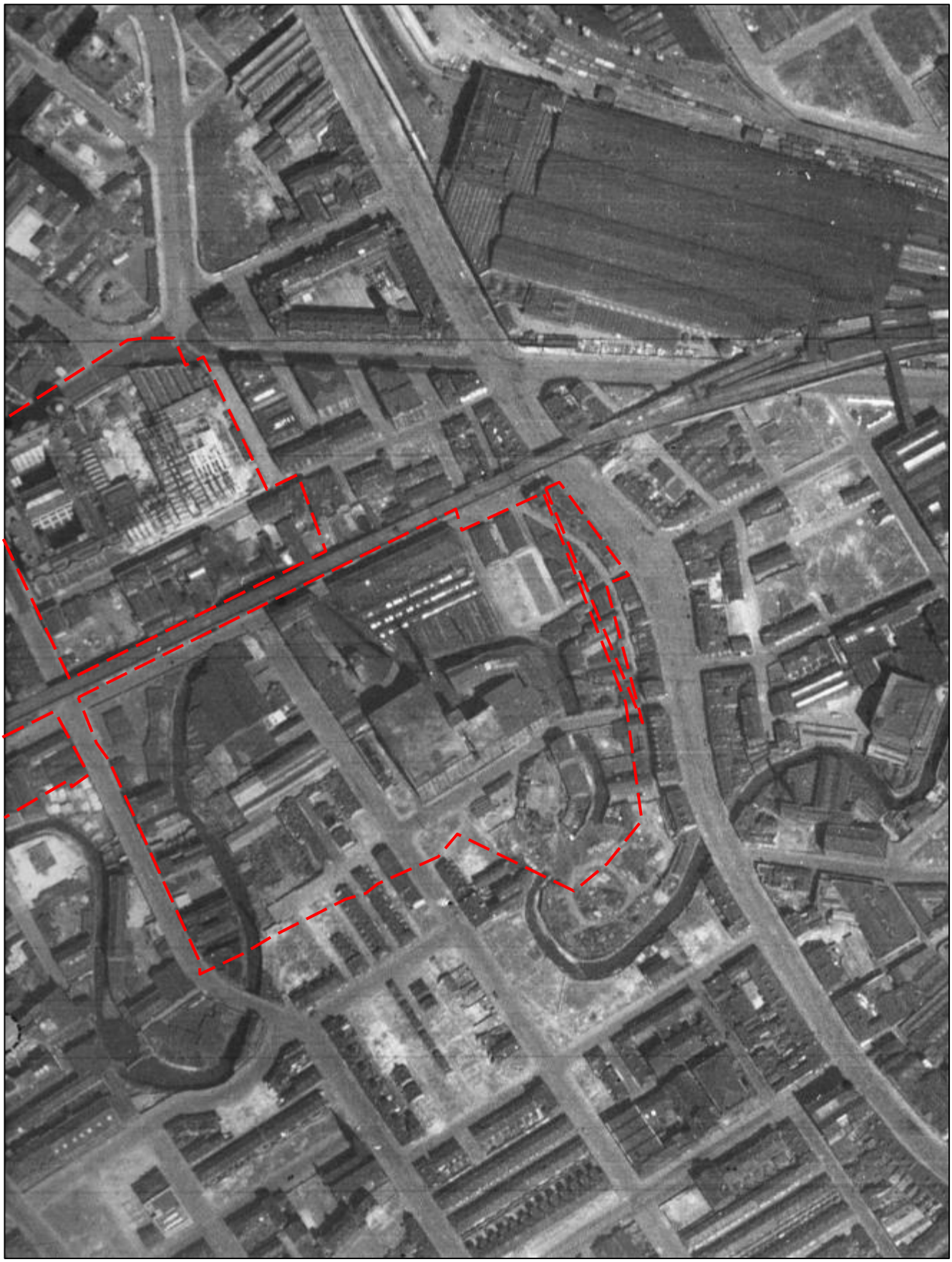
RAF Aerial Photography 16th May 1948

Annex: **M2**



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Project: **ID Manchester**

Ref: **DA14968-00**

Source: National Monuments Record Office (Historic England)

Approximate site boundary

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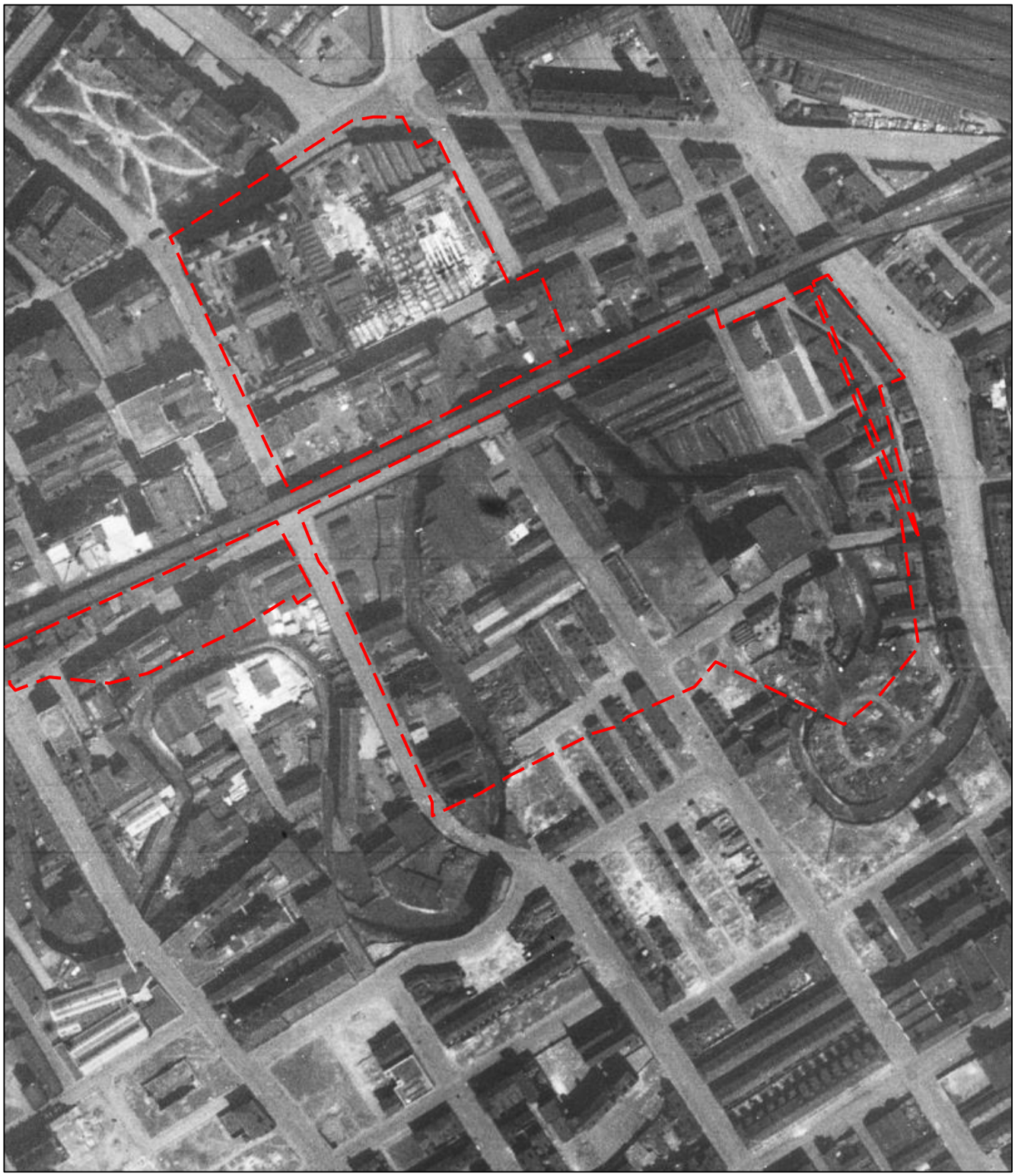
RAF Aerial Photography 16th May 1948

Annex: **M3**



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Project: **ID Manchester**

Ref: **DA14968-00**

Source: National Monuments Record Office (Historic England)

Approximate site boundary

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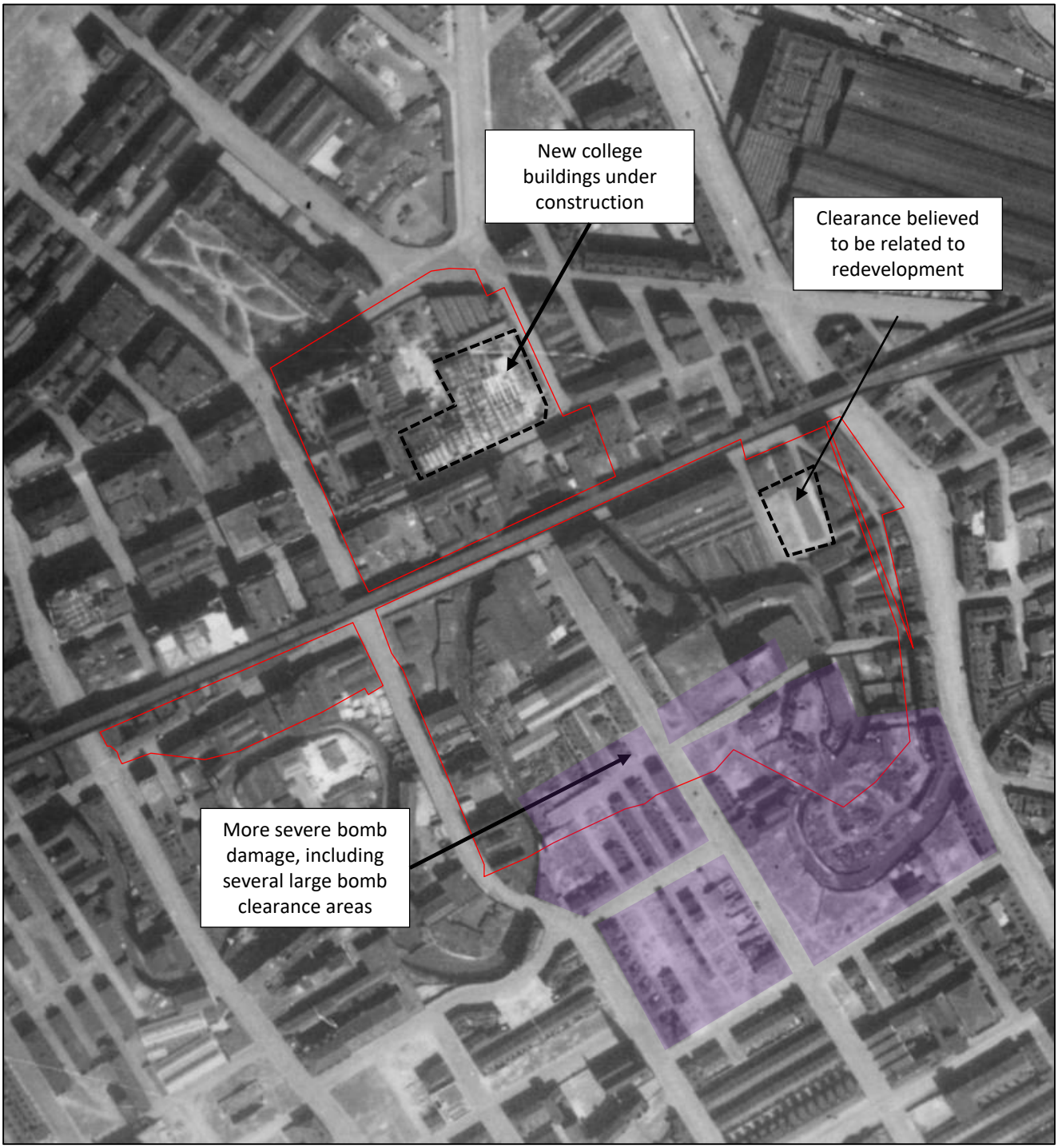
RAF Aerial Photography 16th May 1948 – Damage Overlay

Annex: **M4**



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Approximate site boundary

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Project: **ID Manchester**

Ref: **DA14968-00**

Source: National Monuments Record Office (Historic England)

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German UXO Risk Map – Historical Imagery Overlay

Annex: **N1**

For indicative purposes – not to scale.
Please note that this assessed risk map may not take into account all post-war redevelopment/excavations on site.

Low Risk

Medium Risk

All Risk Areas:

- Site Specific Unexploded Ordnance Awareness Briefings to all personnel conducting intrusive works
- UXO Risk Management Plan

Medium Risk Area:

- Unexploded Ordnance (UXO) Specialist Presence on Site to support shallow intrusive works
- Intrusive Magnetometer Survey of all Borehole and pile locations down to a maximum bomb penetration depth

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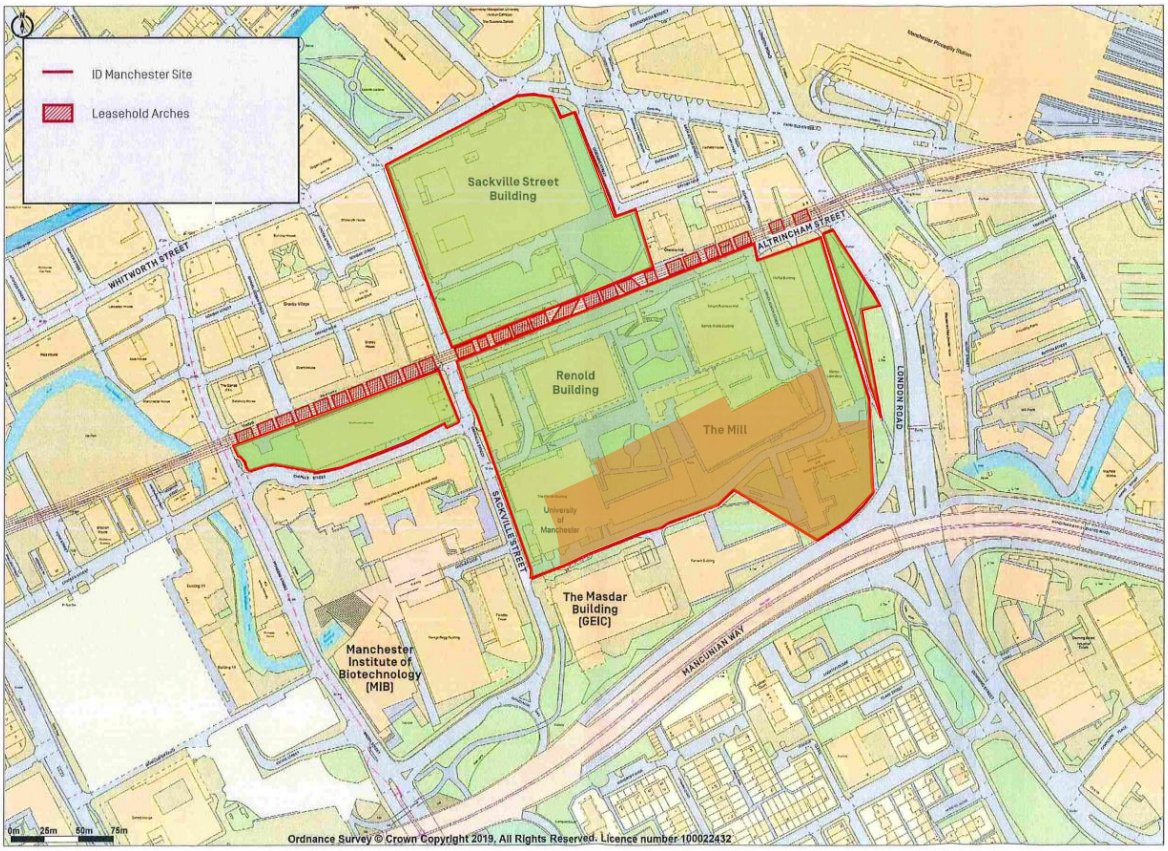
German UXO Risk Map – Site Plan Overlay

Annex: **N2**

I·D MANCHESTER



For indicative purposes – not to scale.
Please note that this assessed risk map may not take into account all post-war redevelopment/excavations on site.

Low Risk

Medium Risk

All Risk Areas:

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Source: 1st Line Defence

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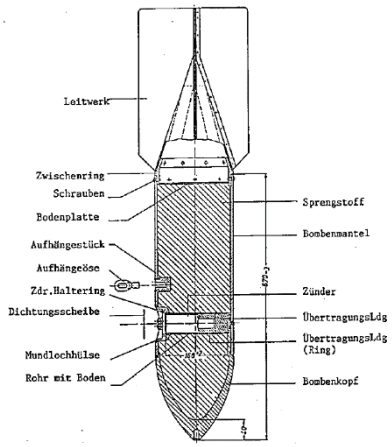
Examples of German Bombs - HE

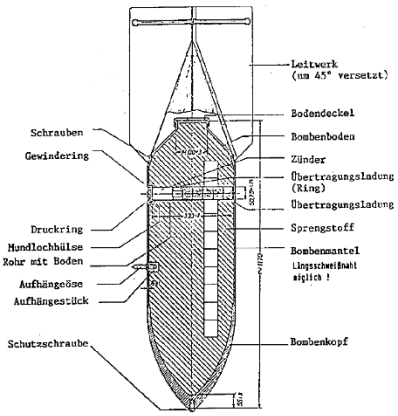
SC 50kg

Bomb Weight	40-54kg (110-119lb)
Explosive Weight	c25kg (55lb)
Fuze Type	Impact fuze/electro-mechanical time delay fuze
Bomb Dimensions	1,090 x 280mm (42.9 x 11.0in)
Body Diameter	200mm (7.87in)
Use	Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.



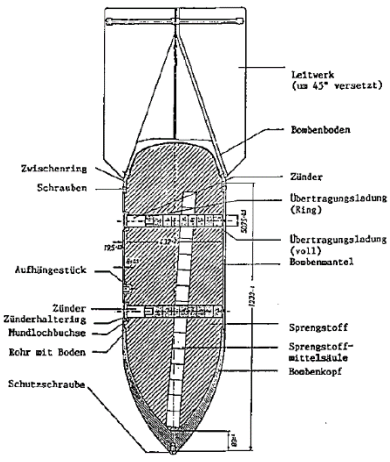
SC 250kg

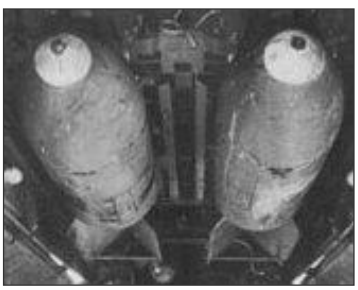
Bomb Weight	245-256kg (540-564lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.
Remarks	It could be carried by almost all German bomber aircraft, and was used to notable effect by the Junkers Ju-87 Stuka (Sturzkampfflugzeug or dive-bomber).



SC 500kg

Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, trialene. Bombs recovered with Trialen filling have cylindrical paper wrapped pellets 1-15/16 in. in length and diameter forming





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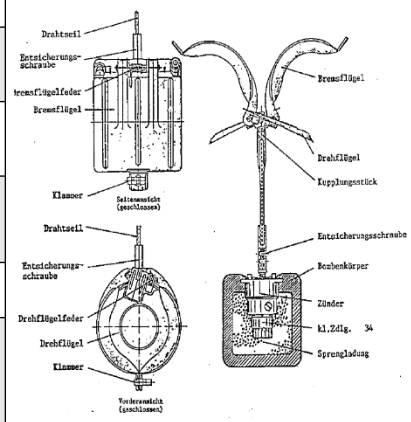
Examples of German Bombs - HE, AP and Parachute Mines

SD2 Butterfly Bomb

Bomb Weight	2kg (4.41lb)
Explosive Weight	7.5oz (212.6 grams) of TNT surrounded by a layer of bituminous composition.
Fuze Type	41 fuze (time) , 67 fuze (clockwork time delay) or 70 fuze (anti-handling device)
Bomb Dimensions	Length 240 mm Width 140 mm Height 310 mm
Body Diameter	3in (7.62 cm) diameter, 3.1in (7.874) long
Use	It was designed as an anti-personnel/fragmentation weapon. They were delivered by air, being dropped in containers that opened at a predetermined height, thus scattering the bombs.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

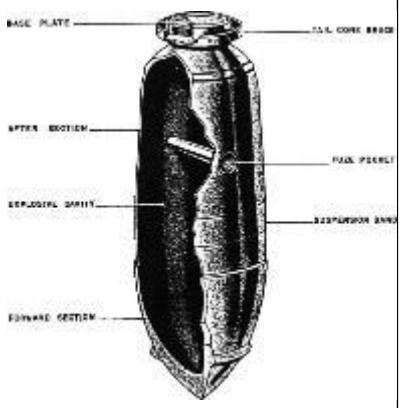


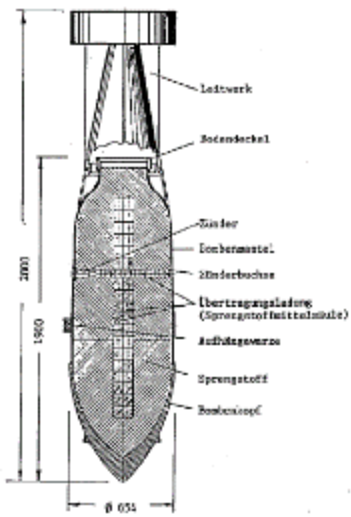
Parachute Mine (Luftmine B / LMB)

Bomb Weight	987.017kg (2176lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Impact/ Time delay / hydrostatic pressure fuze
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against civilian, military and industrial targets. Designed to detonate above ground level to maximise damage to a wider area.
Remarks	Parachute Mines were normally carried by HE 115 (Naval operations), HE 111 and JU 88 aircraft types. Deployed a parachute when dropped in order to control its descent.

SC 1000kg

Bomb Weight	996-1061kg (1,058-1,146lb)
Explosive Weight	530-620kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Filling	Mixture of 40% amatol and 60% TNT, but when used as an anti-shipping bomb it was filled with Trialen 105, a mixture of 15% RDX, 70% TNT and 15% aluminium powder.
Bomb Dimensions	2800 x 654mm (77 x 25.2in)
Body Diameter	654mm (18.5in)
Use	SC type bombs are General Purpose Bombs used primarily for general demolition work. Constructed of parallel walls with comparatively heavy noses. They are usually of three piece welded construction





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Source: Various sources

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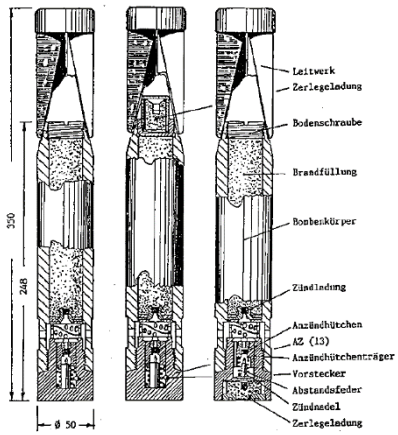
Examples of German Bombs - Incendiary

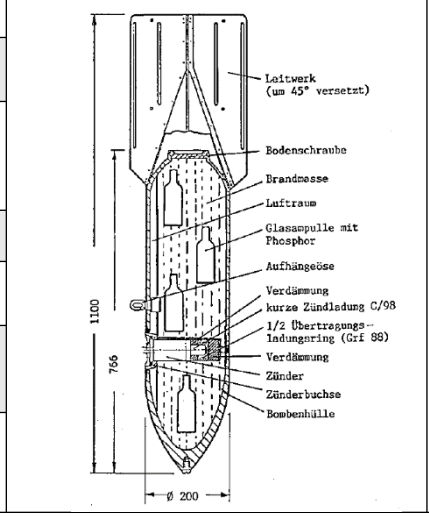
1kg Incendiary Bomb

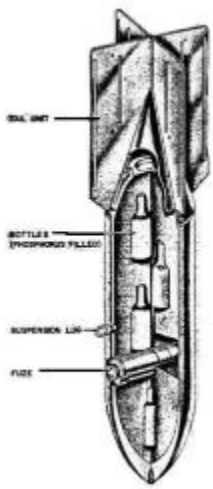
Bomb Weight	1.0 and 1.3kg (2.2 and 2.87lb)
Explosive Weight	680gm (1.3lb) Thermite
Fuze Type	Impact fuze
Bomb Dimensions	350 x 50mm (13.8 x 1.97in)
Body Diameter	50mm (1.97in)
Use	As incendiary – dropped in clusters against towns and industrial complexes
Remarks	Magnesium alloy case. Sometimes fitted with high explosive charge. The body is a cylindrical alloy casting threaded internally at the nose to receive the fuze holder and fuze.



C50 A Incendiary Bomb

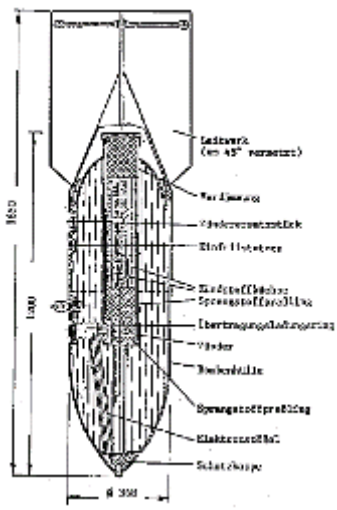
Bomb Weight	c41kg (90.4lb)
Explosive Weight	0.03kg (0.066lb)
Incendiary Filling	12kg (25.5lb) liquid filling with phosphor igniters in glass phials. Benzine 85%; Phosphorus 4%; Pure Rubber 10%
Fuze Type	Electrical impact fuze
Bomb Dimensions	1,100 x 280mm (43.2 x 8in)
Use	Against all targets where an incendiary effect is to be expected
Remarks	Early fill was a phosphorous/carbon disulphide incendiary mixture





Flam C-250 Oil Bomb

Bomb Weight	125kg (276lb)
Explosive Weight	1kg (2.2lb)
Fuze Type	Super-fast electrical impact fuze
Filling	Mixture of 30% petrol and 70% crude oil
Bomb Dimensions	1,650 x 512.2mm (65 x 20.2in)
Body Diameter	368mm (14.5in)
Use	Often used for surprise attacks on living targets, against troop barracks and industrial installations. Thin casing – not designed for ground penetration



1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
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Email: info@1stlinedefence.co.uk
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Client: **NX Consulting**

Project: **ID Manchester**

Ref: **DA14968-00**

Source: Various sources

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Examples of Anti-Aircraft Projectiles

QF 3.7 Inch WWII Anti-Aircraft Projectile

Projectile Weight	28lb (12.6 kg)
Explosive Weight	2.52lbs
Fuze Type	Mechanical Time Fuze
Dimensions	3.7in x 14.7in (94mm x 360mm)
Rate of Fire	10 to 20 rounds per minute
Use	High Explosive Anti-Aircraft projectile. 4.5in projectiles were also used in this role.
Ceiling	30,000ft to 59,000ft

40mm Bofors Projectile

Projectile Weight	1.96lb (0.86kg)
Explosive Weight	300g (0.6lb)
Fuze Type	Proximity and Mechanical Time Fuze
Rate of Fire	120 rounds per minute
Projectile Dimensions	40mm x 310mm (1.6in x 12.2in)
Ceiling	23,000ft (7000m)

Unrotated Projectile (UP) – Z Battery

Projectile Weight	84lb (24.5kg)
Warhead Weight	4.28lb (1.94kg)
Warhead	Aerial Mine with a No. 700 / 720 fuze
Filling	High Explosive
Dimensions	1930mm x 82.6mm (76 x 3.25in)
Use	As a short range rocket-firing anti-aircraft weapon developed for the Royal Navy. It was used extensively by British ships during the early days of World War II. The UP was also used in ground-based single and 128-round launchers known as Z Batteries.

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1ST LINE DEFENCE

Appendix E

BGS Records

(621) Wt. 50 S.33 2000 6/22 Gp. 147 M.R.Co.Ltd.

27

SJ 89 NW 12 - 15 2

SECTION OF Manholes in Drawer, cont.

Maps: One-inch ..... Six-inch 104 S.E.W County Lancashire.

Height above O.D. ..... Latitude ..... Longitude .....

Communicated by ..... Date of sinking .....

Made by ..... Dip of Strata .....

		Thickness.			Depth from Surface.		
		METRES.			METRES.		
12 No. 6.	Corner of Jackson St. & Temple St.						
	Soil	0·61	2	-	0·61	2	-
	Coloured sandy silt.	2·44	8	-	3·05	10	-
	Red sand rock.	3·05	10	-	6·10	20	-
13 No. 7.	Near Jackson Street Bridge.						
	Filling	0·91	3	-	0·91	3	-
	Clayey Marl.	1·98	6	6	2·90	9	6
	Ballast.	0·61	2	-	3·51	11	6
	Red sand rock.	1·98	6	6	5·49	18	-
14 No. 8.	Near London Road — Buxton St. corner.						
	Filling	2·13	7	-	2·13	7	-
	Old roadway.	0·61	2	-	2·74	9	-
	Red sand rock.	3·96	13	-	6·71	22	-
15 No. 10.	Corner of Boardman Road & Buxton St.						
	Filling	1·52	5	-	1·52	5	-
	Red sand rock.	6·10	20	-	7·62	25	-

British Geological Survey

(621) Wt. 50 S.33 2000 6/22 Gp. 147 M.R.Co.Ltd.

27

SJ 89 NW 12 - 15 2

SECTION OF Manholes in Drawer, cont.

Maps: One-inch ..... Six-inch 104 S.E.W County Lancashire.

Height above O.D. ..... Latitude ..... Longitude .....

Communicated by ..... Date of sinking .....

Made by ..... Dip of Strata .....

		Thickness.			Depth from Surface.		
		METRES.			METRES.		
12 No. 6.	Corner of Jackson St. & Temple St.						
	Soil	0·61	2	–	0·61	2	–
	Coloured sandy silt.	2·44	8	–	3·05	10	–
	Red sand rock.	3·05	10	–	6·10	20	–
13 No. 7.	Near Jackson Street Bridge.						
	Filling	0·91	3	–	0·91	3	–
	Clayey Marl.	1·98	6	6	2·90	9	6
	Ballast.	0·61	2	–	3·51	11	6
	Red sand rock.	1·98	6	6	5·49	18	–
14 No. 8.	Near London Road – Buxton St. corner.						
	Filling	2·13	7	–	2·13	7	–
	Old roadway.	0·61	2	–	2·74	9	–
	Red sand rock.	3·96	13	–	6·71	22	–
15 No. 10.	Corner of Boardman Road & Buxton St.						
	Filling	1·52	5	–	1·52	5	–
	Red sand rock.	6·10	20	–	7·62	25	–

British Geological Survey

(621) Wt. 599)—S.33 2000 6 22 Gp. 147 M.R. Ltd.

SJ 89 NW 249

SECTION OF Borehole at Jackson's Hill, Manchester. (Boyd Dawkins)

Maps: One-inch 85. Six-inch 104 S.E. W½ County Lancashire

Height above O.D. 110 feet. Latitude Longitude

Communicated by Professor Boyd Dawkins. Date of sinking

Made by Dip of Strata

Hickling's No. 77.
Trans. Inst. Min. Eng. Vol. LIV. 1918.

SJ 89 NW 17

	Thickness.			Depth from Surface.		
Filled up earth	5·18	17	–	5·18	17	–
Gravel	1·34	4	6	6·55	22	6
Red sandstone.	62·41	204	9	68·96	226	3

Chemicals in water.
Temperature high not altered by pumping

App III: Hickling puts 3st. in Bunter.

SJ89NW 8450 9765 1161

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location UMIST Granby Row
Job No. 7763 Project Ref:

Borehole No. BH1
Sheet 1 of 1.

Client UMIST

Equipment and methods light cable percussion
Casing Diameter (mm) 150
Casing Depth (m) 7.50

Drilled by GW
Ground level m AOD
Co-ordinates E N
Date 15/08/94

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	Type & No	SPT N Value Cu	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							MADE GROUND (Loose black and red sandy fine to coarse gravel of ash and red brick)	(2.00)		
nil			1.20	1.65	S 1	8.0				
			1.70	1.70	D 1			2.00		
2.20			2.20	2.50	U 1		MADE GROUND (Firm brown slightly sandy clay with some fine and medium gravel of red brick and sandstone)	(0.40) 2.40		
			2.70	2.70	D 2		MADE GROUND (Medium dense brown black sandy fine to coarse gravel of red brick and ash)	(1.40)		
3.00			3.40	3.85	S 2	19				
			4.00	4.00	D 3		Very stiff brown slightly sandy CLAY with a little fine and medium gravel	3.80		
4.00			4.40	4.85	U 2	214		(0.80)		
4.00			4.80	5.30	B 3	107	Very dense brown clayey fine and medium SAND with a little to some fine and medium gravel	4.60		
			4.80	5.25	S 3					
								(2.40)		
6.00			6.00	6.45	S 4	57				
			6.50	7.00	B 2			7.00		
7.20			7.20	7.65	S 5	100	Very dense red brown silty fine and medium SAND with a band of firm brown sandy clay at 8.70m			
			8.00	8.50	B 3			(1.90)		
7.50			8.60	8.90	S 6	150				
		-(15/08)-						8.90		
							Borehole complete			

Remarks
1) Inspection pit 1.00m x 1.00m x 1.20m (2 hrs)
2) No groundwater encountered

Field Records column RHS U100 blows
Scale 1:50

Logged by	Date
MSW	09/09
Checked by	
Approved by	
FIG No.	

British Geological Survey

SJ89NW 8452 9767. 1162

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location UMIST Granby Row
Job No. 7763 Project Ref:

Borehole No. BH2
Sheet 1 of 2.

Client
UMIST

Equipment and methods light cable percussion
Casing Diameter (mm) 150
Casing Depth (m) 9.50

Drilled by GW
Ground level m AOD
Co-ordinates E N
Date 16/08/94

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value Cu	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							MADE GROUND (200mm of topsoil over firm brown clay with much fine to coarse gravel of brick ash and concrete)			
nil			1.20	1.65	U 1			(3.00)		
			1.80	1.80	D 1					
2.20			2.20	2.65	S 1	14				
			2.80	2.80	D 2			3.00		
3.00			3.20	3.65	U 2	347	Very stiff brown very sandy CLAY with a little fine gravel			
			3.70	3.70	D 3					
4.20			4.20	4.65	U 3	258				
			4.80	4.80	D 4			(4.20)		
5.70			5.70	6.15	S 2	88				
			6.40	6.40	D 5					
6.90			6.90	7.35	S 3	170				
			7.50	7.95	B 1		Very dense brown clayey fine and medium SAND with a little fine gravel	7.20		
8.40			8.40	8.85	S 4	140		(1.80)		
9.20			9.20	9.65	U 4	70	Firm stiff below 9.60m brown slightly sandy CLAY with a little fine and medium gravel	9.00		
9.20		-(16/08)-	9.70	10.15	S 5	38	(Continued.....)			

Remarks
1) Inspection pit 1.00m x 1.00m x 1.20m (2 hrs)
2) No ground water encountered

Logged by MSW Date 09/09
Checked by
Approved by

Field Records column RHS U100 blows
Scale 1:50

FIG No.

British Geological Survey

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

SJ89NW 8451 9760 1499

INVESTIGATION FOR Main Drainage | DATE COMMENCED 24.7.85.

TION Sackville Street REF: | BORING METHOD Cable Percussive

HOLE No. 3 (Sheet 1 of 2) | BORING DIAMETER 150 mm.

REFERENCE | SCALE: 1:50 approx.

E	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION From	To	No. of Blows
			0.05		Bituminous Surfacing				
			0.15		Setts				
			0.30		Concrete				
					Clayey ashes, cinders, brick pieces, sand, stones soft and firm silty and sandy CLAY Made Ground	D1	0.5		
						D2	1.25		
						P3	1.65	1.95	6
						D4	2.10		
						P5	2.65	2.95	8
						D6	3.10		
						P7	3.65	3.95	4
						D8	4.2		
						P9	4.65	4.95	8
						D10	5.20		
						P11	5.65	5.95	8
						D12	6.10		
			6.40						
			7.20		Medium dense silty and gravelly SAND	P13	6.75	7.05	24

OBSERVATIONS DURING BORING

OF ENTRY	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)
ved			

WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION

DATE	WATER LEVEL	DEPTH OF CASING

REMARKS: -

E TEST KEY

D – DISTURBED SAMPLE B – BULK SAMPLE U – UNDISTURBED SAMPLE
P – SPT SAMPLE W – WATER SAMPLE

WHERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N – VALUE)

PTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

KS

Trial hole excavated to 1.50m below ground level

* SPT sample P16 proved 69 blows for 115mm within the initial 150MM penetration.

British Geological Survey

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

SJ 8453 9768

SITE INVESTIGATION FOR	Main Drainage	DATE COMMENCED	8.12.83
LOCATION	Granby Row REF:	BORING METHOD	S.S. Multi-Drill
BOREHOLE No.	2 (Sheet 1 of 2)	BORING DIAMETER	150mm
GRID REFERENCE		SCALE:	1:50 approx.

DATE	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION From	To	No. of Blows	Legend
8.12.83			0.1		Bituminous Surfacing					
			0.25		Setts					
			0.5		Hardcore, clay, cinders etc. Made Ground					
					Very stiff brown silty and sandy CLAY with grey fissures and stone inclusions with occasional lenses of silt and sand.	D1	0.5			
						D2	0.6			
						U1	1.0	1.45		
						D3	1.70			
						U2	2.0	2.45		
						D4	2.5			
						U3	3.0	3.45		
						D5	3.5			
						U4	4.0	4.45		
						D6	4.5			
						U5	5.0	5.45		
						D7	5.5			
8.12.83	4.80	Dry	5.70							
9.12.83		Dry	6.00		Brown silty fine/medium gravelly SAND	D8	5.80			
						P1	5.90	6.125	50	
					Very dense red/brown fine/ medium SAND with clay lenses	B1	6.5			
						P2	6.9	7.125	50	

COMMERCIAL IN CONFIDENCE

British Geological Survey

WATER OBSERVATIONS DURING BORING

DEPTH OF WATER ENTRY (m)	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)

WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION

DATE	WATER LEVEL	DEPTH OF CASING

REMARKS:–

SAMPLE TEST KEY

D – DISTURBED SAMPLE
P – SPT SAMPLE
B – BULK SAMPLE
W – WATER SAMPLE
U – UNDISTURBED SAMPLE

NOTE: WHERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N – VALUE)

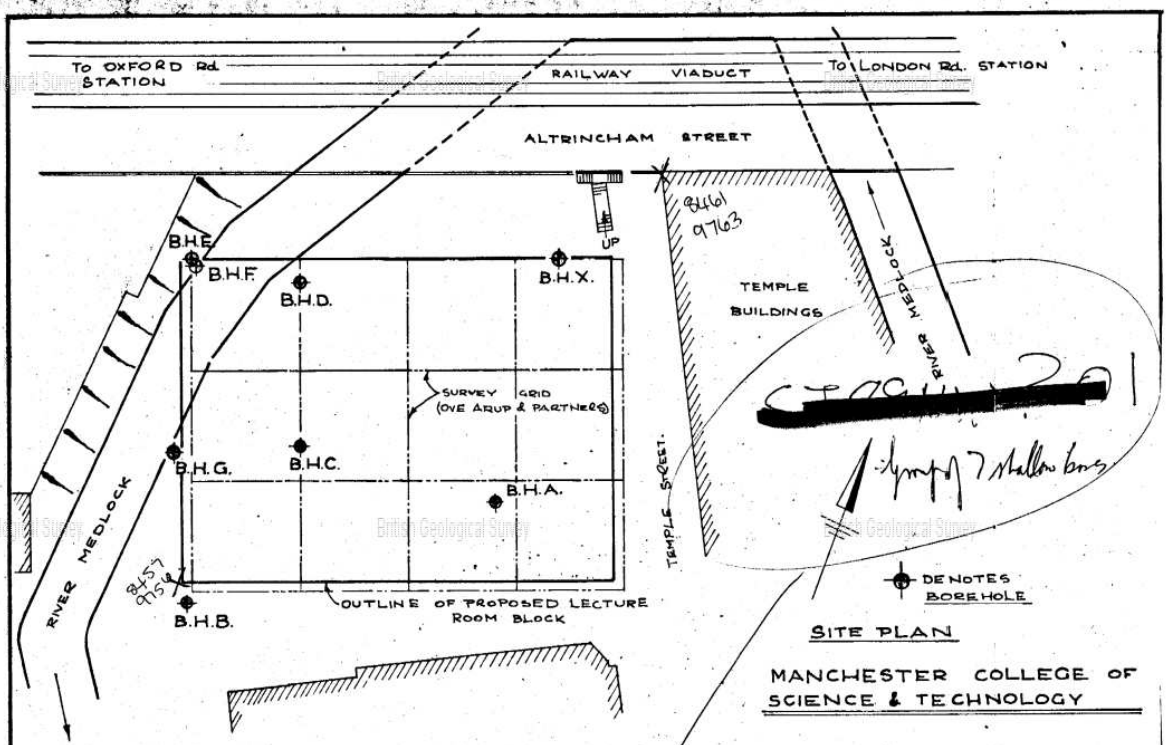
ALL DEPTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

REMARKS

Trial hole excavated to 1.0m below ground level.
Borehole backfilled on completion, no final overnight standing water level observed
SPT samples P1 and P2 recorded 50 blows for 225mm penetration including the initial 150mm penetration.
SPT sample P3 recorded 50 blows for 220mm penetration including the initial 150mm penetration.

M/c 5931

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

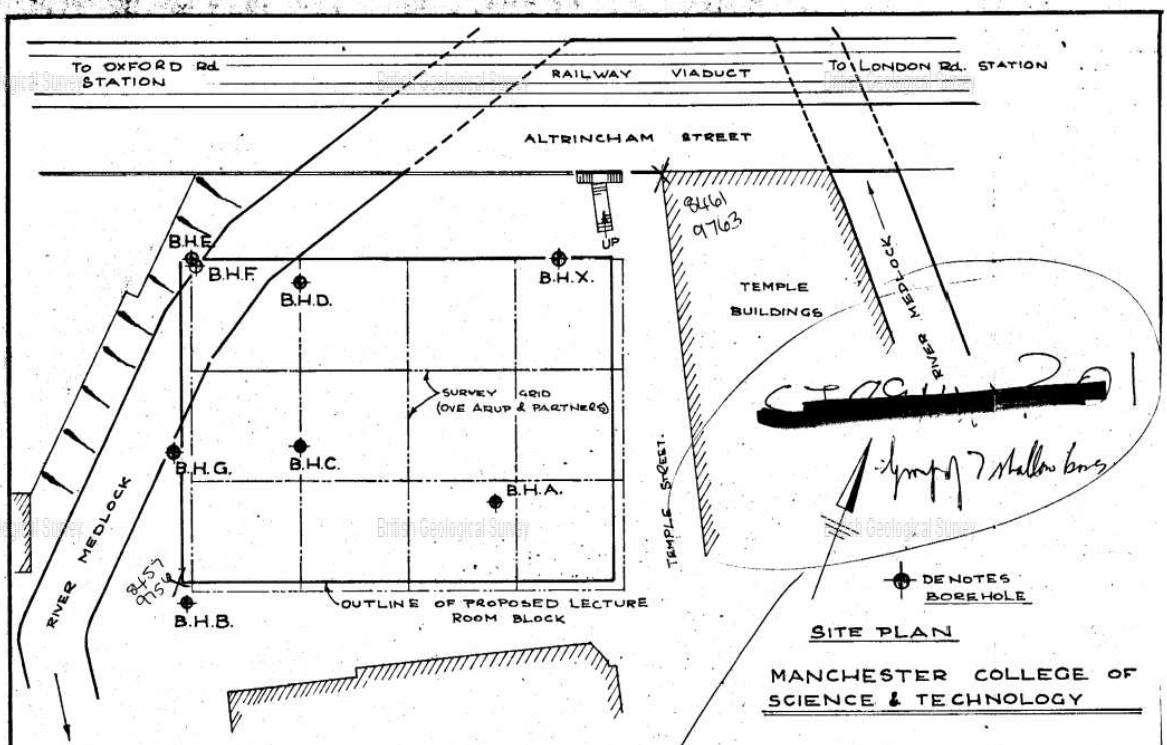
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

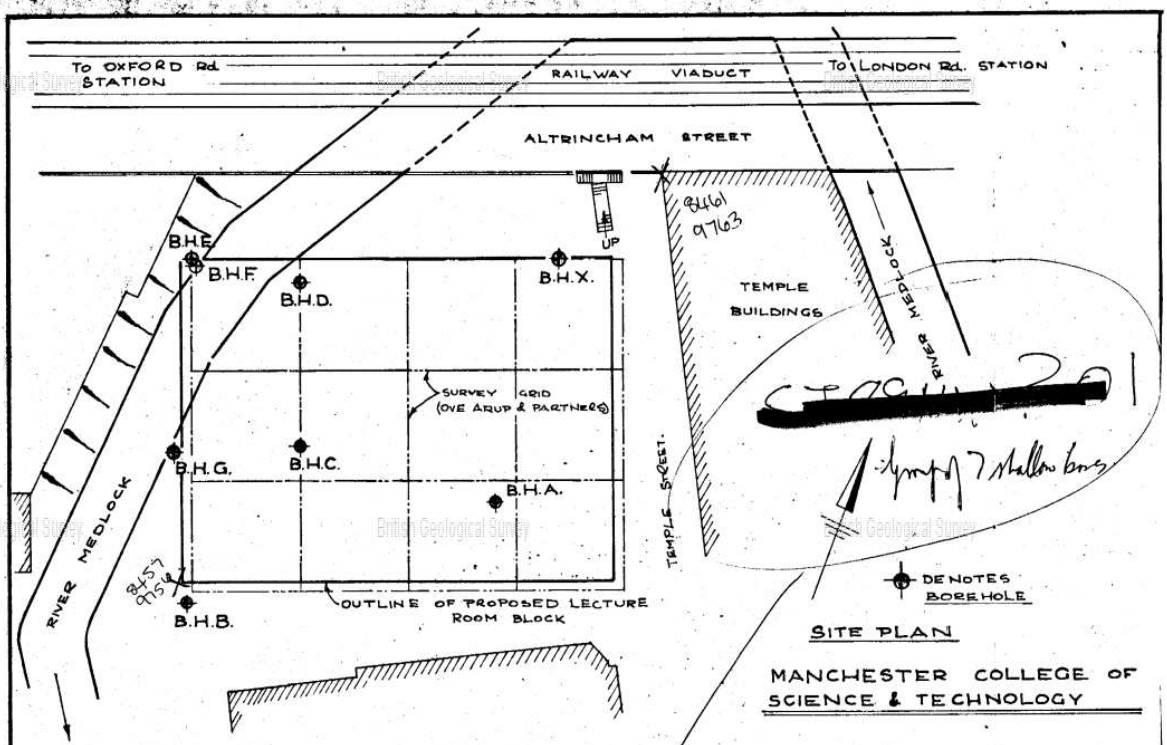
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

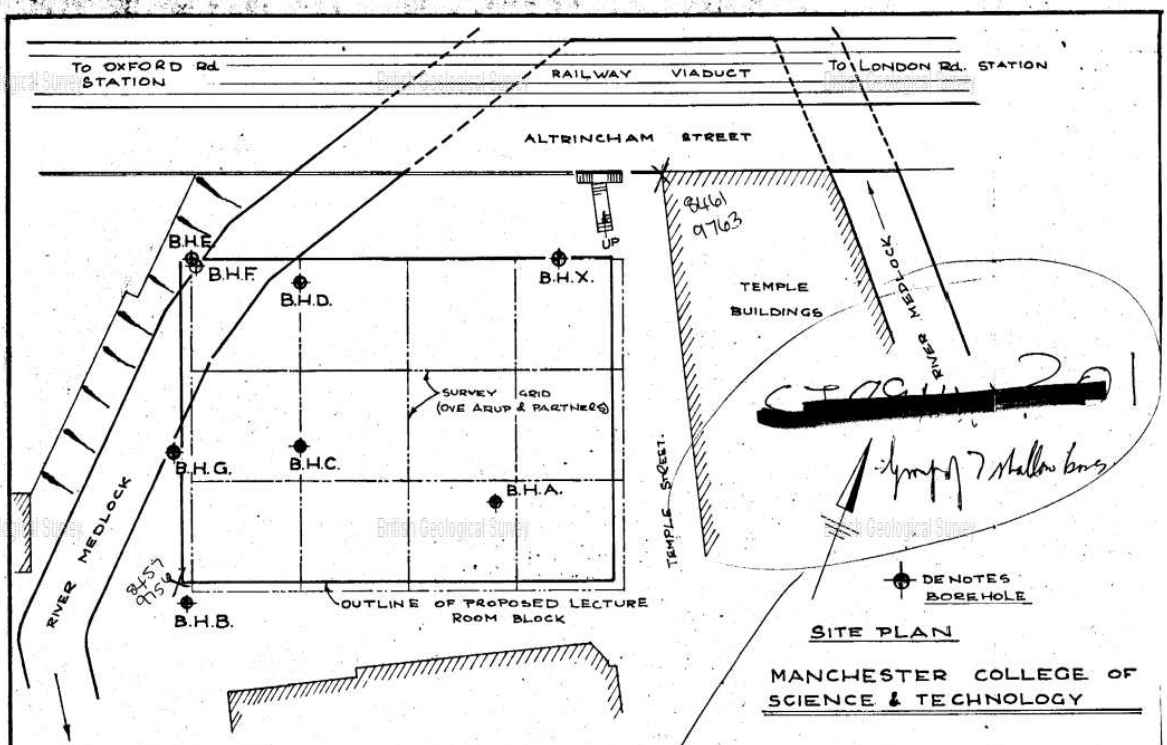
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

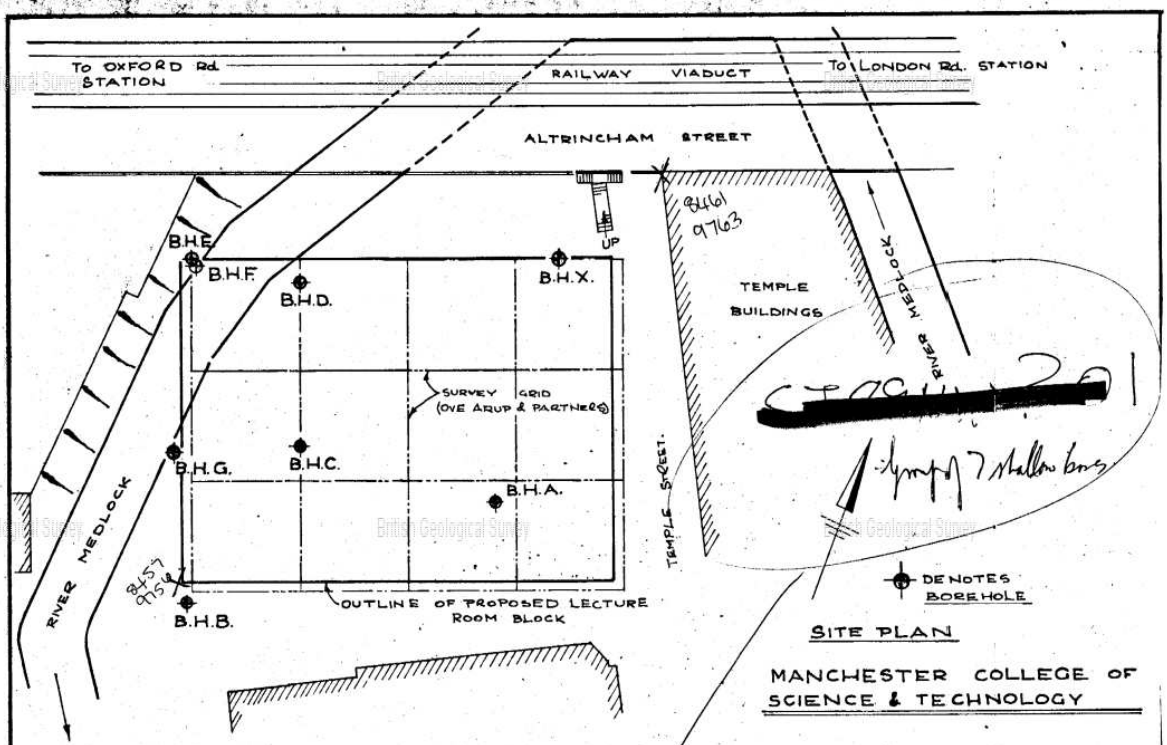
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

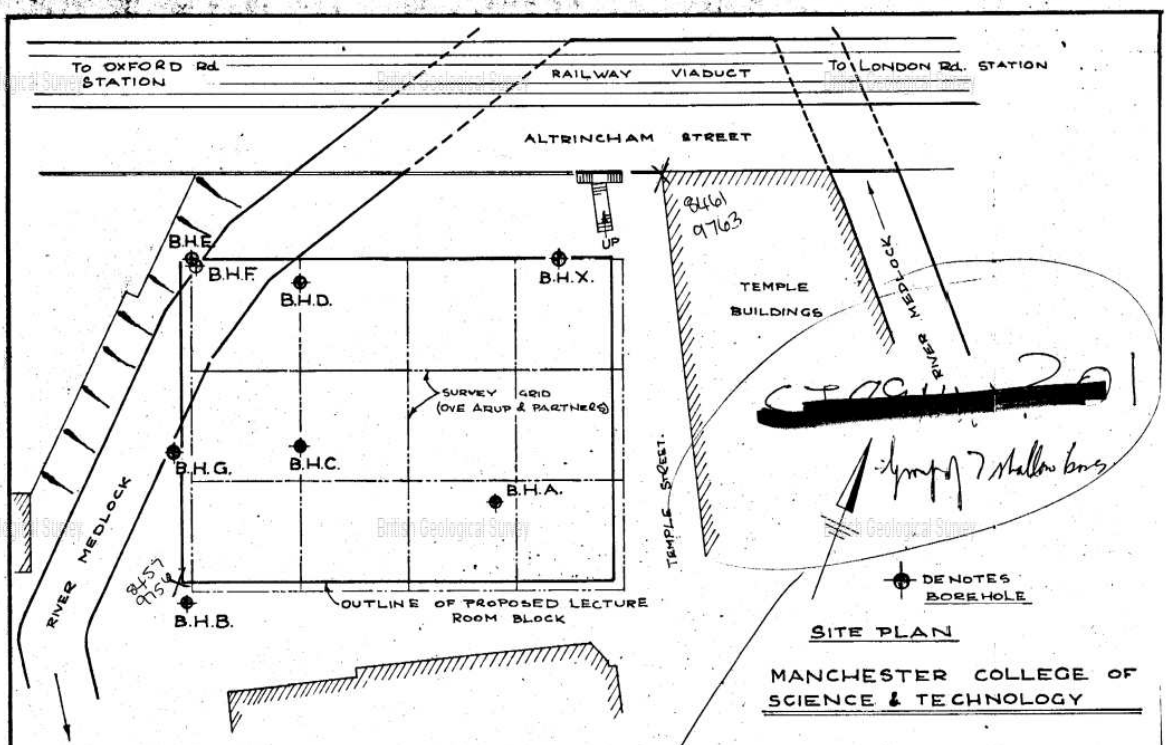
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

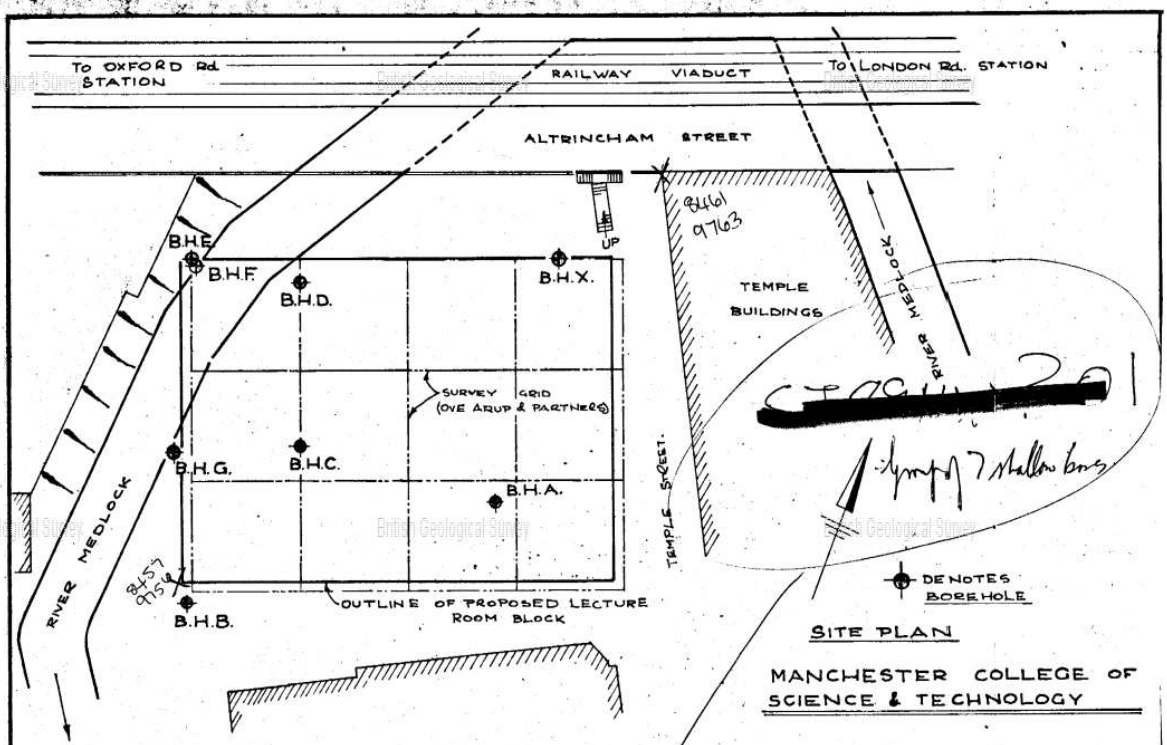
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

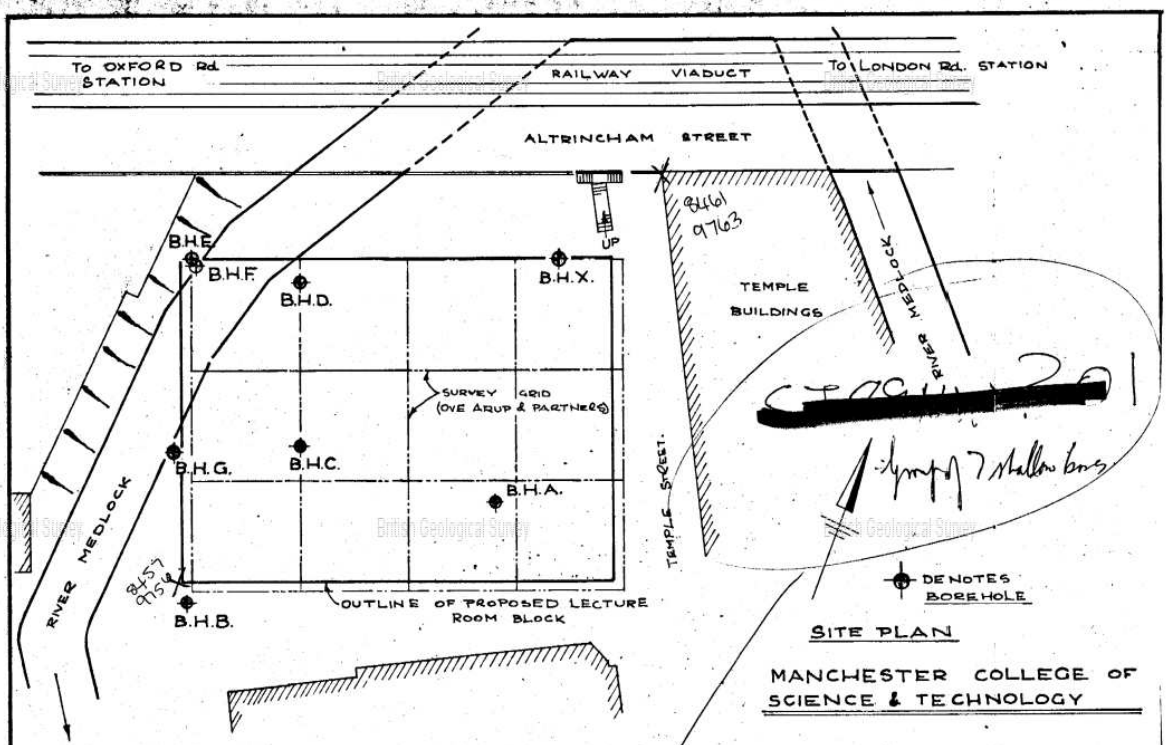
SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89NW 3636 - 3643



SITE PLAN

MANCHESTER COLLEGE OF SCIENCE & TECHNOLOGY

RECORD OF BOREHOLES

8455 9759

BOREHOLE A

8460 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.46	1'-0"	FILL BRICK RUBBLE AND ASHES
5.03 (+107.2 O.D.)	16'-6"	BROWN CLAYEY SAND AND SILTY SAND WITH GRAVEL, COBBLES, PARTICLES OF SLAG AND COAL. (PRESUMED FILL).
15.24	50'-0"	RED SANDSTONE WITH NEAR HORIZONTAL CURRENT BEDDING AND OCCASIONAL GRAVEL

SJ89NW 3637

BOREHOLE B

8457 9755

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
3.96	13'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.55 (+108.6 O.D.)	21'-6"	BROWN CLAYE AND SILTY SAND WITH GRAVEL, COBBLES, AND PARTICLES OF SLAG AND ASHES. (PRESUMED FILL).
8.99	29'-6"	RED SANDSTONE WITH NEAR HORIZONTAL BEDDING AN OCCASIONAL GRAVEL.

SJ89NW 3638

BOREHOLE C

8457 9758

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.07	3'-6"	FILL. (BRICK RUBBLE AN ASHES).
4.87 (+108.6 O.D.)	14'-0"	BROWN CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
5.18	17'-0"	RED SANDSTONE

SJ89NW 3639

BOREHOLE D

8457 9760

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.22	4'-0"	FILL. (BRICK RUBBLE AND ASHES).
6.09 (+108.6 O.D.)	21'-6"	BROWN CLAYEY SAND WITH GRAVEL, COBBLES AND PARTICLES OF SLAG. (PRESUMED FILL).
7.16	23'-6"	RED SANDSTONE

BOREHOLE E

SJ89NW 3640

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
5.94	19'-6"	FILL. (BRICK RUBBLE ASHES, COAL, CLAY SAND AND GRAVEL).
8.53 (+116.8 O.D.)	28'-0"	GREY CLAYEY SAND WITH PARTICLES OF COAL AND SLAG. (PRESUMED FILL
10.86	34'-0"	RED SANDSTONE

8460 9761

BOREHOLE X

SJ89NW 3643

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
1.89	5'-0"	FILL. (CLAY WITH BRICK RUBBLE ASHES)
3.96 (+106.8 O.D.)	13'-0"	BROWN SILTY SAND WITH GRAVEL AND PARTICLES OF COAL AND SLAG. (PRESUMED FILL).
7.62	25'-0"	RED SANDSTONE

SJ89NW 3641

BOREHOLE F

8453 9759

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.91	3'-0"	FILL. (BRICK RUBBLE CLAY).
3.35 (+112.0 O.D.)	11'-0"	RIVER WALL (SANDSTONE MASONRY).
3.96	13'-0"	CLAYEY SILT.

SJ89NW 3642

BOREHOLE G

8456 9757

GROUND LEVEL	DEPTH	DESCRIPTION OF STRATA
0.76	2'-6"	FILL. (BRICK RUBBLE, CLAY).
3.20 (+106.8 O.D.)	10'-6"	RIVER WALL. (SANDSTONE MASONRY)
5.49	18'-0"	SILT.
6.71	22'-0"	GRAVEL AND SAND
7.62	25'-0"	RED SANDSTONE

SJ89 NW 365

BOREHOLES

COLLEGE OF SCIENCE & TECHNOLOGY

315

RIVER MEDLOCK CULVERT

(For location see Plan)

Strata	Thickness	Metres	Depth	Metres
Borehole No.1				
Concrete	6"	0·15	6"	0·15
Sand and stones	8' 0"	2·44	8'6"	2·59
Red sand	6"	0·15	9'0"	2·74
Rock sand	1' 0"	0·31	10'0"	3·05
Borehole No.2				
Tarmac	6"	0·15	6"	0·15
Stone Sets	6"	0·15	1'0"	0·31
Made ground	5' 0"	1·52	6'0"	1·83
Rock sand	1' 0"	0·31	7'0"	2·13
Borehole No.3				
Bricks, Sand and Stones.	11' 0"	3·35	11'0"	3·35
Hard Sandstone	1' 0"	0·31	12'0"	3·66
Borehole No.4				
Brown silt.	3' 6"	1·07	3'6"	1·07
Sand and gravel.	5' 6"	1·68	9'0"	2·74
Red sand.	1' 0"	0·31	10'0"	3·05
Red rock sand. (Layer of boulders on top of rock)	2' 0"	0·61	12'0"	3·66
Borehole No.5				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (very hard from 7'6" to 9'0" with boulders)	4' 0"	1·22	9'0"	2·74
Red rock sand.	2' 0"	0·61	11'0"	3·35
Borehole No.A				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (Moist at 8'6")	4' 6"	1·37	9'6"	2·90
Stiff boulder clay	1'0"	0·31	10'6"	3·20
Red sand	3' 6"	1·07	14'0"	4·27

SJ89 NW 365

BOREHOLES

COLLEGE OF SCIENCE & TECHNOLOGY

315

RIVER MEDLOCK CULVERT

(For location see Plan)

Strata	Thickness	Metres	Depth	Metres
Borehole No.1				
Concrete	6"	0·15	6"	0·15
Sand and stones	8' 0"	2·44	8'6"	2·59
Red sand	6"	0·15	9'0"	2·74
Rock sand	1' 0"	0·31	10'0"	3·05
Borehole No.2				
Tarmac	6"	0·15	6"	0·15
Stone Sets	6"	0·15	1'0"	0·31
Made ground	5' 0"	1·52	6'0"	1·83
Rock sand	1' 0"	0·31	7'0"	2·13
Borehole No.3				
Bricks, Sand and Stones.	11' 0"	3·35	11'0"	3·35
Hard Sandstone	1' 0"	0·31	12'0"	3·66
Borehole No.4				
Brown silt.	3' 6"	1·07	3'6"	1·07
Sand and gravel.	5' 6"	1·68	9'0"	2·74
Red sand.	1' 0"	0·31	10'0"	3·05
Red rock sand. (Layer of boulders on top of rock)	2' 0"	0·61	12'0"	3·66
Borehole No.5				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (very hard from 7'6" to 9'0" with boulders)	4' 0"	1·22	9'0"	2·74
Red rock sand.	2' 0"	0·61	11'0"	3·35
Borehole No.A				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (Moist at 8'6")	4' 6"	1·37	9'6"	2·90
Stiff boulder clay	1'0"	0·31	10'6"	3·20
Red sand	3' 6"	1·07	14'0"	4·27

SJ89 NW 365

BOREHOLES

COLLEGE OF SCIENCE & TECHNOLOGY

315

RIVER MEDLOCK CULVERT

(For location see Plan)

Strata	Thickness	Metres	Depth	Metres
Borehole No.1				
Concrete	6"	0·15	6"	0·15
Sand and stones	8' 0"	2·44	8'6"	2·59
Red sand	6"	0·15	9'0"	2·74
Rock sand	1' 0"	0·31	10'0"	3·05
Borehole No.2				
Tarmac	6"	0·15	6"	0·15
Stone Sets	6"	0·15	1'0"	0·31
Made ground	5' 0"	1·52	6'0"	1·83
Rock sand	1' 0"	0·31	7'0"	2·13
Borehole No.3				
Bricks, Sand and Stones.	11' 0"	3·35	11'0"	3·35
Hard Sandstone	1' 0"	0·31	12'0"	3·66
Borehole No.4				
Brown silt.	3' 6"	1·07	3'6"	1·07
Sand and gravel.	5' 6"	1·68	9'0"	2·74
Red sand.	1' 0"	0·31	10'0"	3·05
Red rock sand. (Layer of boulders on top of rock)	2' 0"	0·61	12'0"	3·66
Borehole No.5				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (very hard from 7'6" to 9'0" with boulders)	4' 0"	1·22	9'0"	2·74
Red rock sand.	2' 0"	0·61	11'0"	3·35
Borehole No.A				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (Moist at 8'6")	4' 6"	1·37	9'6"	2·90
Stiff boulder clay	1'0"	0·31	10'6"	3·20
Red sand	3' 6"	1·07	14'0"	4·27

SJ89 NW 365

BOREHOLES

COLLEGE OF SCIENCE & TECHNOLOGY

315

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Borehole No.1				
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Borehole No.2				
Tarmac	6"	0·15	6"	0·15
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Made ground	5' 0"	1·52	6'0"	1·83
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Sand and gravel.	5' 6"	1·68	9'0"	2·74
Red sand.	1' 0"	0·31	10'0"	3·05
Red rock sand. (Layer of boulders on top of rock)	2' 0"	0·61	12'0"	3·66
Borehole No.5				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (very hard from 7'6" to 9'0" with boulders)	4' 0"	1·22	9'0"	2·74
Red rock sand.	2' 0"	0·61	11'0"	3·35
Borehole No.A				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (Moist at 8'6")	4' 6"	1·37	9'6"	2·90
Stiff boulder clay	1'0"	0·31	10'6"	3·20
Red sand	3' 6"	1·07	14'0"	4·27

SJ89 NW 365

BOREHOLES

COLLEGE OF SCIENCE & TECHNOLOGY

315

RIVER MEDLOCK CULVERT

(For location see Plan)

Strata	Thickness	Metres	Depth	Metres
Borehole No.1				
Concrete	6"	0·15	6"	0·15
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Red sand	6"	0·15	9'0"	2·74
Rock sand	1' 0"	0·31	10'0"	3·05
Borehole No.2				
Tarmac	6"	0·15	6"	0·15
Stone Sets	6"	0·15	1'0"	0·31
Made ground	5' 0"	1·52	6'0"	1·83
Rock sand	1' 0"	0·31	7'0"	2·13
Borehole No.3				
Bricks, Sand and Stones.	11' 0"	3·35	11'0"	3·35
Hard Sandstone	1' 0"	0·31	12'0"	3·66
Borehole No.4				
Brown silt.	3' 6"	1·07	3'6"	1·07
Sand and gravel.	5' 6"	1·68	9'0"	2·74
Red sand.	1' 0"	0·31	10'0"	3·05
Red rock sand. (Layer of boulders on top of rock)	2' 0"	0·61	12'0"	3·66
Borehole No.5				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (very hard from 7'6" to 9'0" with boulders)	4' 0"	1·22	9'0"	2·74
Red rock sand.	2' 0"	0·61	11'0"	3·35
Borehole No.A				
Silt	5' 0"	1·52	5'0"	1·52
Sand and stones (Moist at 8'6")	4' 6"	1·37	9'6"	2·90
Stiff boulder clay	1'0"	0·31	10'6"	3·20
Red sand	3' 6"	1·07	14'0"	4·27

SJ89NW 1162

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location UMIST Granby Row
Job No. 7763 Project Ref:

Borehole No. BH2
Sheet 2 of 2.

Client: UMIST

Equipment and methode: light cable percussion
Casing Diameter (mm) 150
Casing Depth (m) 9.50

Drilled by GW
Ground level m AOD
Co-ordinates E N
Date 16/08/94

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS: Depth (m) from	to	SAMPLE Type & No.	SPT N Value Cu	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							(....cont.)			
			10.50	10.50	D 6			(3.50)		
9.50			11.20	11.65	U 5	129				
			12.00	12.00	D 7					
								12.50		
							Very dense red brown fine and medium sand with occasional medium gravel of rounded quartz (Completely weathered SANDSTONE)	(0.80)		
			13.10	13.55	S 6	108				
		-(17/08)-						13.30		
							Borehole complete			

Remarks

Field Records column RHS U100 blows
Scale 1:50

Logged by	Date
Checked by	
Approved by	
FIG No.	

British Geological Survey

SJ89NW

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

1499

NVESTIGATION FOR	Main Drainage	DATE COMMENCED	24.7.85.
TION	Sackville Street REF:	BORING METHOD	Cable Percussive
HOLE No.	3(sheet 2 of 2)	BORING DIAMETER	150 MM
REFERENCE		SCALE:	1:50 approx.

E	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION From	SAMPLE DEPTH PENETRATION To	No. of Blows	Legend
					Medium dense to dense red/brown fine/medium grained SANDSTONE	B14	7.2	7.5		
						P15	7.65	7.95	27	
						P16	8.0	8.12	69*	
85.	8.0	Dry	8.12							

British Geological Survey

OBSERVATIONS DURING BORING

OF NTRY	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)

WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION

DATE	WATER LEVEL	DEPTH OF CASING

REMARKS: -

TEST KEY

D - DISTURBED SAMPLE B - BULK SAMPLE U - UNDISTURBED SAMPLE
P - SPT SAMPLE W - WATER SAMPLE

HERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED ENETRATION IS GIVEN (NOT N - VALUE)

THS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

KS

MANCHESTER CITY COUNCIL

CITY ENGINEER AND SURVEYORS DEPARTMENT

SJ89NW/36/9

SITE INVESTIGATION FOR	Main Drainage	DATE COMMENCED	8.12.83
LOCATION	Granby Row REF:	BORING METHOD	S.S. Multi-Drill
BOREHOLE No.	2 (Sheet 2 of 2)	BORING DIAMETER	150mm
GRID REFERENCE		SCALE:	1:50 approx.

DATE	CASING DEPTH (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW GL	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH PENETRATION From	SAMPLE DEPTH PENETRATION To	No. of Blows	Legend
9.12.83			8.00		Very dense fine/medium SAND (Weathered Sandstone)	D9 P3	7.4 7.8	8.02	50	

COMMERCIAL IN CONFIDENCE

WATER OBSERVATIONS DURING BORING				WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION		
DEPTH OF WATER ENTRY (m)	ESTIMATED SEE PAGE	STANDING LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)	DATE	WATER LEVEL	DEPTH OF CASING

REMARKS:–

SAMPLE TEST KEY

D – DISTURBED SAMPLE B – BULK SAMPLE U – UNDISTURBED SAMPLE
P – SPT SAMPLE W – WATER SAMPLE

NOTE: WHERE FULL 0.3 PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N – VALUE)

ALL DEPTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

REMARKS

M/c 5931

Appendix F

Environment Agency Consultation Response

Bruntwood Sci Tech
Union, 2-10 Albert Square
Manchester
M2 6LW

Our ref: SO/2023/123476/03-L01
Your ref: ID Manchester

Date: 07 March 2024

FAO: ID Manchester (IDM) Project Team / Civic Earth

Dear IDM Project Team,

ENVPAC/1/GMC/00486 - ENVIRONMENT AGENCY / BRUNTWOOD SCI TECH - PROJECT ID MANCHESTER (IDM) CHARGEABLE PLANNING AGREEMENT

PRELIMINARY PHASE 1 SITE INVESTIGATION REPORTING / INTRUSIVE GROUND INVESTIGATION PROPOSALS REVIEW & ASSOCIATED DISCUSSION MEETING; RELATING TO 'PHASE 2' (PLOT C) ENABLING WORKS AND NEW RIVER CHANNEL CREATION PROPOSAL

LAND OFF SACKVILLE STREET, MANCHETSER, M1 3NJ

Thank you again for requesting preliminary review and engagement with the Environment Agency (EA) in relation to preliminary ground investigation and assessment work undertaken, and further intended, for the ID Manchester strategic development site.

As agreed and advised within project correspondence issued to the IDM Project Team (email 29/02/2024), further to initial preliminary technical review discussions held on the 29th February 2024 between Civic Earth (Kirsty Poore and Dan Mathews) and the EA's handling contaminated land officer (Sarah Budworth), please find detailed within this letter written review commentary for following IDM project reporting submitted / prepared by Civic Engineers:

I. Phase 1 Desk Study and Data Review. Phase 2 (Plot C), ID Manchester. Report Ref: 51019-CE-XX-XX-R-G-1001. Revision P01. Prepared by Civic Earth. Dated 20th February 2024.

II. Proposed Site Investigation Scope. ID Manchester - New River Channel Proposed Site Investigation. Doc Ref: 51019-CE-XX-XX-R-G-4002 P04. Prepared by Civic Earth. Issued 20th February 2024.

III. Proposed Site Investigation Scope. ID Manchester – Enabling Works Area and Plot C Proposed Site Investigation. Doc Ref: UNMC-ARUP-ZZ-XX-RP-CG-0004 P03. Prepared by Civic Earth. Issued 20th February 2024.

For awareness, for the purpose of assessment of the Civic Earth reporting (i-iii), we advise that review and assessment of the the reports has been undertaken with consideration to relevant previous/ initial site investigation reporting undertaken for the IDM Manchester development site and provided to the EA under separate file transfer (issued 28/02/2024). We note these additional reports to be as follows:

IV. Preliminary Ground Investigation Interpretive Report & Final Factual Report. ID Manchester. Report Ref: UNMC-ARUP-ZZ-XX-RP-CG-0004. Issue 2. Dated 16th April 2020.

V. Preliminary Ground Investigation Interpretive Report. ID Manchester. Report Ref: IDM00-ARP-ZZ-ZZ-RP-00001. Revision P03. Issued 11th November 2022.

Further to the above, please be aware that EA review of above reports has been undertaken with regards to matters associated with the protection of controlled waters only. To ensure matters associated with the protection of human health are fully addressed as part of the proposed development, we advise consultation with Manchester City Councils' Environmental Health (EH) Department is sought where appropriate (e.g. post early-mid 2024 intrusive ground investigation completion). Both the EA and EH Department will be consulted in relation to land contamination upon formal planning submission(s). Therefore, pre-application consultation with both parties is advised (de-risking of project). We are able to assist with engagement into Manchester's EH department where required.

To facilitate this review, we have utilised ~20 hours of chargeable planning agreement ENVPAC/1/GMC/00486 (~81.5 hours currently remaining).

Please find detailed below EA review commentary provided by the EA's handling Contaminated Land Officer, Sarah Budworth, with associated **advisory actions** for further reporting iteration / update.

***

EA Review Commentary Item (I) – Phase 1 Desk Study

EA Review (I): General Note(s)

We note report is currently specific to 'Plot C' of the IDM site as well as the enabling works area defined as 'Phase 2 Enabling Works', covering the spatial area of Plots C, E and F.

As part of the technical meeting held Civic (29th February 2024) we have advise that greater clarity is created as part of the final iteration of the Phase 1 report in relation to the various of the site being assessed/characterised. We suggest the final iteration of the report clearly references which plots are 'in focus' as part of its narrative to generate consistency and aid overall regulatory review.

Wider to the contents of this report, we advise the IDM project team that careful consideration should be given to naming convention whereby the utilisation of the phrase 'Phase' is concerned. As example, it may be appropriate to only use numerical terminology for Phase whereby this contains several plots rather than being interchangeable with an alphabetical plot reference.

EA Review (I): Environmental / Geological Site Setting – Plot C

For Plot C, the report notes the site environmental setting is drift comprising glacial till, overlying a bedrock of Chester Formation Sandstone, formally classified as a Secondary Undifferentiated aquifer and Principal aquifer respectively.

A check of records confirms the site is not located within a Groundwater Source Protection Zone. The nearest known / licensed groundwater abstraction is located 670m south west of the site, servicing a heat pump.

The nearest known watercourse is Shooters Brook (the Charles Street Culverted Watercourse) located 120m west of Plot C beneath Sackville Street and falling within the wider IDM area. Shooters Brook flows in culvert from the Ashton Canal, situated to northeast of the site IDM and connects into the River Medlock west of the IDM site.

Further to the Shooters Brook, River Medlock, a designated 'main river', is present in culvert ~120m south of Plot C and adjacent to southern boundary of the IDM site, flowing east to west. It is noted that historically the River Medlock meandered through the central area of the IDM site. In virtue of this, it's noted that alluvium may be found associated with the former river alignment and made ground will be present, associated with the infilling of the former meander bend.

Two Radioactive Substance Authorisations are registered within spatial area 'Plot D' and adjacent to the southwestern corner of 'Plot C'. A check of EA held records confirms these to be BX8661 and BX8645 held by Manchester University. From internal correspondence (07/03/2024) we are aware that applications have now been made to request surrender of these permits.

Based on the information received, the primary controlled waters receptor for 'Plot C' is considered to be the underlying sandstone Principal aquifer.

<u>EA Review (I): Environmental / Geological Site Setting – Wider Enabling Works Area' (Plot E and F)</u>

For the wider 'Enabling Works Area' (Plots E and F), situated to the south of 'Plot C', the desk study confirms environmental setting is drift comprising glacial till in the northern half of the site and alluvium in the southern half of the site, classified as Secondary undifferentiated aquifers. As per the instance 'Plot C' is noted this glacial till and alluvium overlies the Chester Formation Sandstone (bedrock), classified as a Principal aquifer.

As per the section above, the site is not located within a groundwater source protection zone or in close proximity to any known groundwater abstraction.

The River Medlock (WFD waterbody and statutory main river) is present in sub-surface culvert situated on the southern site boundary, flowing from east to west. The River Medlock formerly meandered through the ID Manchester development area and alluvium may be found associated with the former river alignment as well as made ground backfill.

The primary controlled waters receptors for the Enabling Works Area are considered to be the Secondary undifferentiated drift aquifer, the Principal aquifer and the River Medlock.

It is provisionally noted that the infilled river channel may present a source of contamination , subject to the nature of made ground utilised in infilling this feature. Infilling may have also altered shallow groundwater conditions/flow characteristics.

Cont/d..

EA Review (I): Site History and Contamination Risk – 'Plot C'

It is noted the site history for the 'Plot C' spatial areas includes the following historic potentially contaminating land uses:

- Infilled river channel (made-ground)
- Mills with boiler and engine house
- Engineering works
- Warehousing and depot of unknown type
- University land use since the 1960's. University land uses not specified in current iteration of the desk study report.

EA Review (I) - Site History and Contamination Risk – Wider Enabling Works Area (Plot E and F)

The site history includes the following potentially contaminating land uses for the enabling works area (Plots E and F):

- Infilled former river channel
- Chemical works in the east and Ardwick Bridge Chemical Works encroaching onto southern site (both in Plot F) with Vitriol Chambers (sulphuric acid), Store Rooms, Solution of Tin House (unclear if this is solutions for pigments/dyes or associated with the production of tributyl tin), Cylinder House and Garancine Works (dye works using sulphuric acid to extract dye from madder roots)
- Jackson Street Cotton Mills with boiler house and engine house - located in the centre of the site.
- A retort house , present to the north of the mill, and a tank west of the retort house - the retort house does not appear to be associated with a town gas works and the report concludes is likely to have been used for local gas production for use in the mill.
- A joiners shop and nitrate of soda works is located between the mill and Ardwick Bridge Chemical Works.
- A cloth finishing works is present by 1932 in the east of the site (Plot F) - in the area which was formerly chemical works, this becomes a warehouse by 1955-56.
- A rectangular feature labelled "tipper" is located in the southeast corner of the site along with a tank by 1948-50.
- University land use since the 1960's. Former university land uses not specified in the current iteration of desk study report.
- By 1968 the Morton Laboratory is present.
- The BT Guardian tunnel is present beneath the ID Manchester site.

EA Review (I): Site Characterisation / Initial Contamination Risk Conclusion(s) – Plot C, E, F / Enabling Works Phase

As per the above summaries for Plot C, E and F, the site history presented within the current iteration of the Civic Earth Desk Study report is considered by the EA to be presently incomplete in virtue of limited details regarding university land use since the 1960's until recent. In particular, the Morton Laboratory (Plot C / Plot F area) is noted as having flammable materials store external to the building, consideration of potential risk of loss to ground from drainage associated with the laboratory is advised.

Advisory Action [1] - Undertake/ provide an assessment of whether the university land use has the potential to have resulted in contamination being present in soil and groundwater on the site.

Cont/d..

Infilled ground on site poses a ‘moderate risk’ of contamination which could risk mobilisation to impact controlled waters.

Industrial land uses such as mills, works, boiler and engine houses, retort house for gas production, chemical works and tanks pose a ‘high risk’ of contamination which could be mobilised to impact controlled waters.

EA Review (I): Previous Site Investigations Commentary Associated Considerations

It is noted that the following previous site investigations have been conducted at the site:

- Arup (2019) University of Manchester North Campus. Ground Conditions Desk Study. November 2019. Reference UNMC-ARUP-ZZ-XX-RP-CG-0001. Revision 2.

- Preliminary Ground Investigation Interpretive Report & Final Factual Report. ID Manchester. Report Ref: UNMC-ARUP-ZZ-XX-RP-CG-0004. Issue 2. Dated 16th April 2020.

- Preliminary Ground Investigation Interpretive Report. ID Manchester. Report Ref: IDM00-ARP-ZZ-ZZ-RP-00001. Revision P03. Issued 11th November 2022.

- Allied Exploration & Geotechnics Limited (2020) ID Manchester. Preliminary Ground Investigation. April 2020.

- 1st Line Defence (2022) Detailed Unexploded Ordnance (UXO) Risk Assessment. April 2022.

Previous Arup site investigation reporting has identified the infilled river channel and the Ardwick Bridge Chemical Works as the highest potential for contamination on site. From our own (EA review), further to Arup’s assessment, we consider other ‘high risk’ contamination areas to be associated with following former site uses: engineering works, fuel storage, gas production, university laboratory chemical storage/ disposal/drainage and, depending on the fuel type(s)utilised, potentially the university plant rooms utilised within the universities steam network.

Its noted that in 2020 the following exploratory work was carried out in the enabling works area (Plots E and F) including the western half of Plot C:

- 17 cable percussion boreholes or CP with rotary follow on.
- 2 dynamic sample boreholes
- 3 trial pits
- 4 horizontal core holes to investigate retaining walls
- 4 rounds of groundwater and gas monitoring.

13 Monitoring wells were installed targeting made ground and sandstone. Ground conditions within the enabling works area were found to consist of:

- Made ground (cohesive and granular) encountered in all locations 0.35 to 8.40m thick in the former river channel with typical thickness upto 4.6m across the site.
- Alluvium (gravelly sand) encountered in centre, east and west of site, 1.6 to 4.5m thick.
- Weathered sandstone encountered at 3.7 to 8.4 mbgl.

Cont/d..

- Sandstone encountered at 3.1 to 10.4m bgl and proven to 21.5m bgl (11.92mAOD)

Glacial till was not encountered within the enabling works area where made ground was generally found to lie directly onto the sandstone.

Soils analysis of made ground was screened against commercial land use GAC)which are noted as very high in some cases). Therefore, it is consider there is the risk of leachable contaminants being present in made ground deposits which do pose a risk to controlled waters (despite not showing as exceedences in the human health based soil screening).

Since the previous site investigations were carried out, the proposal to introduce a surface watercourse channel feature to the development has been made. Therefore, future soil and shallow groundwater analysis will need to take account of the risk to an onsite surface water receptor in addition to the aquifers and River Medlock in its current alignment.

Soils assessment against commercial land use human health GAC showed exceedance for lead at 2400mg/kg in area of the Ardwick Bridge Chemical works and asbestos in several locations across the site.
Inspection of the soil screening assessment in Arup 2020 Issue 2 report, Appendix C shows that, in several locations, within made ground elevated concentrations were found of:

- chromium (upto 210mg/kg)
- zinc (upto 620mg/kg)
- copper (upto 440mg/kg)
- arsenic (upto 87mg/kg)
- lead (upto2400mg/kg)
- PAHs (upto120mg/kg)
- naphthalene (upto 5.7mg/kg)

Associated with the above, its noted that no soil leaching tests have been conducted as part of previous site investigation undertaken.

Groundwater monitoring identified perched water within the made ground between 32.29m AOD and 28.54m AOD with groundwater encountered in the sandstone between 31.68m AOD and 24.39mAOD.

Groundwater flows were inferred to be northeast/ east to southwest/west across the site enabling works area. Groundwater level in the east was 29m AOD and 27.5m AOD in the west. Local groundwater levels and flow directions are thought to be influenced by below ground obstructions with groundwater flow across the whole of the ID Manchester site appearing to be southwest/west.

Groundwater samples were collected from 6 monitoring wells in the sandstone in January 2020. Groundwater chemical analyses were compared to an Arup GWAC. Arsenic, cadmium, chromium, copper, lead, manganese, nickel, selenium and lead were detected at concentrations above the CWGAC but were considered to be within the range of the BGS aquifer baseline report for background groundwater quality.

Inspection of the Arup 2020 report shows that these controlled waters screening criteria are based on 2015 WFD EQS and Drinking Water standards 2016. We note that the GAC and Source are occasionally wrong in the screening tables, either the DWS value

being stated to be an EQS or the EQS value in ug/l being stated in the wrong magnitude. For example cyanide EQS is 1ug/l but the table has stated it to be 0.001ug/l.

The report notes that lead concentration in groundwater upto 3100ug/l and selenium upto 22ug/l were found in BH011 in the footprint of the Ardwick Chemical Works.

Inspection of the groundwater screening in Arup 2020 Issue 2 Appendix D shows that cyanide was also elevated in BH011 at 1000ug/l and acidic groundwater conditions were measured in BH011 with a pH of 4.8.

Advisory Action [2] In virtue of the above observations, we recommend that the previous site investigation raw data and screening assessment is re-inspected prior to finalisation of the design for further site investigation proposed for 2024.

Section 6.7 of the report concludes that contaminant leaching from soils is likely to be responsible for the elevated groundwater concentrations of lead found in the location of the former Ardwick Bridge Chemical Works. Therefore, there is potentially a complete pollutant linkage from shallow soils to groundwater in the Principal aquifer present here which will require further exploration and assessment. Investigation work is required in order to identify and delineate unsaturated zone sources and the extent of impacted groundwater within Plot F.

We acknowledge the Civic Earth desk study recognises the limitations of the exploratory site investigation works carried out in 2020 and as such the proposed site investigation works for 2024 will be designed to address currently data gaps as best possible whilst university campus buildings remain undemolished. In virtue of the obstruction of university campus buildings, further post demolition site investigation is likely to be required, to complete the full site characterisation of the IDM site / enabling works phase and comprehensive assessment of potential risk to controlled waters.

<u>EA Review (I): Civic Earth Preliminary Risk Assessment Work Commentary</u>

Table 7 ‘Potential Sources’ currently lacks detail on the sources associated with the university land use since the 1960s. Furthermore, the table does not include identification of the risk of leakage from university drains or disposal of laboratory chemicals on site due to university science activities.

Advisory Action [3] - Assessment of historic university drainage plans should be undertaken. The Phase 1 desk study report should then updated in accordance with initial assessment/review identifying whether and, if possible, where a potential risk is considered possible from the drainage network.

In association with Action [3] above, it is noted that post initial review of university drainage plans, it may prove necessary to conduct further assessment to understand drainage network condition if sufficient records do not already exist i.e. any potential points of contamination seepage.

In similar vein to the above, it is noted that the risk from university plant rooms is not presently well understood by the EA and will require further detail in due course in order to determine whether these features present a material risk of soil and groundwater contamination. As above, historic/condition records may prove useful in this regard.

The Ardwick Bridge Chemical Works consisted of a variety of process buildings including a solutions of tin house. Based on the lack of information as to what kind of tin

Cont/d..

solution, it may be prudent to carry out soil/groundwater analysis for tributyl tin in this area of the site.

The PRA lacks details in terms of sources such as the onsite gasworks, boiler houses and engineering works. With a focus on made ground and the Ardwick Bridge Chemical Works.

Advisory Action [4]:

In conjunction with Action [1], as necessary, update the preliminary risk assessment with additional details of the university land uses) and associated potential contaminants

AND

Update the preliminary risk assessment with further detail on the specific contaminants associated with former gasworks and chemical works land use; in accordance with the DoE Industry Profiles and information from historical mapping (e.g. retort house associated with local gas production and features such as Solutions of Tin house at Ardwick Bridge Chemical Works).

Based on the information received there is considered to be a high potential for contaminants to be present in soil and groundwater at this site. Table 8 has identified that piled foundations could provide potential preferential pathways for contaminant migration to the underlying aquifer. In light of this, in due course, a foundation risk assessment will be required. However, it envisage that this can form part of pre-commencement conditional requirements if desired by the IDM project team.

Table 9 potential receptors: Shooters Brook (Charles Street Culverted Watercourse) will need to be considered as a surface water receptor for the western half of the ID Manchester development area.

Advisory Action [5]: For wider/ future risk assessment associated with Plots A, B, D and H, Shooters Brook will need to be considered as a potential surface water receptor.

With respect to assessing the risks to groundwater. The default compliance point distance for groundwater resource protection from the contaminant source is 50 metres for:

- all hazardous substances in all aquifers for contaminants already in the groundwater, or from inputs from soils and the unsaturated zone which can't be prevented
- non-hazardous pollutants in groundwater with strategic resource potential.
  Based on the information received the Principal aquifer is considered to be highly sensitive in this site location due to the shallow depth to rockhead and granular nature of the drift that has been identified on site.
  Table 10 Preliminary Risk Assessment: The assessment has considered the following controlled waters receptors for Plot C and the Enabling Works area:
- Glacial till and alluvium Secondary undifferentiated aquifers
- Chester Formation Sandstone Principal aquifer
- River Medlock in existing culvert
- New River Medlock open channel to be constructed on site.

The Preliminary Risk Assessment has recognised the potential for contaminants in soil

Cont/d..

to leach to the underlying aquifers. The report states that proposed buildings and hardstanding will reduce infiltration. However if subsequent development proposals include an intention to utilise infiltration drainage (e.g. rain garden features) ,further soil analysis and leaching tests will be required to assess risk of mobilisation of contaminants. Infiltration drainage will not be permitted should a risk to controlled waters be identified and the EA will seek the placement of a control condition upon any planning permission granted should either a) final drainage details be reserved (as part of planning condition or otherwise) b) whereby infiltration drainage is not clearly ruled out by the IDM project team as part of formal planning submissions.

The Preliminary Risk Assessment states that cohesive horizons within overlying superficial deposits may mitigate migration of contaminants. However, the preliminary site investigation found cohesive glacial till to be absent from 'Plot C' and the wider Enabling Works area. In addition to this, we note the depth to rockhead is shallow (between 3-10m bgl) and therefore if cohesive drift is subsequently found to be present the thickness and lateral extent of the cohesive drift is unlikely to be sufficient to be considered to be protective of the Principal aquifer.

We welcome the fact the Preliminary Risk Assessment undertaken has offer initial assessment of the risk to the new river channel for ingress of contaminants. It is noted that if the new river channel if not impermeable lined, this may also present a driving head for leaching and mobilisation of contaminants in the shallow soils to the underlying aquifers.

In relation Plate 15 'Illustrative Conceptual Site Model', the potential receptors list states the groundwater receptor is Secondary A aquifer, this should be rectified as part of final iteration of the Desk Study report. As above sections of this letter, groundwater receptors are identified as Secondary Undifferentiated aquifers and Principal aquifer. We note the drawing correctly identifies the separate aquifer.

Advisory Action [6]: Complete uniformity check of desk study report prior to final iteration finalisation.

In relation to Section 10 'Conclusion and Recommendations', **the EA are satisfied that the limitations of the previous site investigation works have been recognised and that further soil, soil leaching and groundwater analysis is proposed for the whole site in order to complete the characterisation of the site and assess the risk to controlled waters**. See our comments above for recommended actions to complete / finalise the desk study report.

**

EA Review Commentary Item II - Proposed Site Investigations New River Channel

The site investigation proposals are noted to include the following actions relevant to further assessing and understanding risk to controlled water receptors :

- Geoenvironmental investigation of soil and groundwater conditions along the proposed river channel route
- Investigation of groundwater regime along route of new channel feature
- Infiltration testing of soils
- Groundwater level monitoring using data loggers for a period of 12 months.
- Soils analysis, soil leaching tests and groundwater analysis are proposed for a broad range of contaminants which could be associated with the historical industrial land uses.

Cont/d..

- Groundwater monitoring wells to be installed in made ground, drift and sandstone.
- Groundwater sampling is proposed for 2 occasions.
- Groundwater level monitoring will be carried out six times, over 3 months, with 5 continuous groundwater level loggers proposed for wells in the sandstone for a period of six months.

Based on the EA's current understanding of historic site usage, the soil, soil leaching and groundwater analytical suites proposed appear, in principle, to be appropriate to the general historical industrial land uses known for this site. However, we note that the analytical suites proposed have been based on the current iteration of the desk study report which will require modification / revision with respect to potentially contaminative land uses during the land use by the university. Further to this, there also uncertainty regarding what kind of solutions of tin were being produced at the Ardwick Bridge Chemical works. Therefore analysis for TBT in this area of the site appears to be warranted, unless further information comes to light that discounts this possibility.

SVOC/VOC analysis has been proposed for the soils analysis but has not been included in the proposed groundwater analytical suite. For a site with such a complex industrial site history as this we would expect, as a minimum, at least one round of groundwater sampling to include a check for SVOC/VOC presence.

Advisory Action [7]: Subject to further desk study evaluation, ensure that the analytical suites for soil and groundwater analysis are appropriate and include all the contaminants of concern associated with the former university land use and the Ardwick Bridge Chemical Works.

Groundwater level monitoring should ideally be carried out for a sufficient period of time to gather summer and winter groundwater levels to investigate the effect of seasonality on groundwater levels.

**

EA Review Commentary (III) – Proposed Site Investigations Enabling Works Area and Plot C

The site investigation proposals for this area of the site are noted to include the following actions relevant to assessing the risk to controlled waters:

- Geoenvironmental investigation of infilled River Medlock channel
- Geoenvironmental investigation of shallow soils (made ground and drift) across the whole site.
- Groundwater levels in shallow and deeper geology.
- Infiltration testing of shallow soils
- Targeting of potentially contaminative historical industries on site
- Post demolition site investigation of currently inaccessible areas due to buildings
- Soils analysis, soil leaching tests and groundwater analysis are proposed for a broad range of contaminants which could be associated with the historical industrial land uses.
- Groundwater monitoring wells to be installed in made ground, drift and sandstone.
- Groundwater sampling is proposed for 2 occasions.
- Groundwater level monitoring will be carried out six times over 3 months with 5 continuous groundwater level loggers proposed for wells in the sandstone for a period of six months.

Cont/d..

Cable percussion/rotary boreholes are proposed to investigate the made ground and superficial deposits and prove the depth to bedrock with rotary follow on specified for obtaining information on the bedrock sandstone and for installation of groundwater monitoring wells in the sandstone.

We note that should assessment of contaminant migration within the sandstone aquifer be required (for example, the preliminary site investigation 2020 identified groundwater contaminated with elevated concentrations of lead and cyanide in the southern half of the enabling works area) that coring of the sandstone may be required in order to provide sufficient information relating to the local aquifer hydraulic properties for plume modelling. The propose rotary drilling will not provide cores for analysis.

Advisory Action [8]: Consider the need for sandstone cores for hydraulic property assessment should a groundwater contaminant plume be suspected / identified.

The targeting of locations where contamination is suspected should also include university drainage runs and chemical stores such as those from the Morton Laboratory.

Advisory Action [9]: As appropriate, ensure that the proposed site investigation takes account of the potential for loss of contaminants to ground from university associated land uses such as laboratory drains and chemical storage.

Based on the EA's current understanding of historic site usage, the soil, soil leaching and groundwater analytical suites proposed appear, in principle to be appropriate to the general historical industrial land uses known for this site. However, we note that the analytical suites proposed have been based on the current iteration of the desk study report which will require modification / revision with respect to potentially contaminative land uses during the land use by the university. Further to this, there also uncertainty regarding what kind of solutions of tin were being produced at the Ardwick Bridge Chemical works. Therefore analysis for TBT in this area of the site appears to be warranted, unless further information comes to light that discounts this possibility.

SVOC/VOC analysis has been proposed for the soils analysis but has not been included in the proposed groundwater analytical suite. For a site with such a complex industrial site history as this we would expect , as a minimum, at least one round of groundwater sampling to include a check for SVOC/VOC presence.

Advisory Action [10]: Subject to further desk study evaluation, ensure that the analytical suites for soil and groundwater analysis are appropriate and include all the contaminants of concern associated with the former university land use and the Ardwick Bridge Chemical Works.

The alignment of the anticipated/proposed watercourse on site has not been shown in Plate 2 'Indicative Proposed Exploratory Hole Locations', we recommend that consideration is given to additional soil leaching tests along this alignment to ensure the protection of both the proposed surface water and the underlying aquifers.

Where the proposed new river channel passes through the former Ardwick Bridge Chemical Works, which was found to have shallow soil and corresponding groundwater contamination during the preliminary site investigation works 2020, there is a high risk of mobilisation of historical soil and groundwater contamination.

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Advisory Action [11]: Consider whether additional soil leaching tests are required/appropriate in relation to the anticipated / proposed new river alignment.

Groundwater level monitoring should ideally be carried out for a sufficient period of time, to gather summer and winter groundwater levels and to investigate the effect of seasonality on groundwater levels.

Should significantly elevated contaminant concentrations be observed in soil and/or groundwater at the site, then we would we expect further site investigation to be carried out in order to delineate the source area and any associated groundwater plume.

**

We hope that the IDM project team finds the contents of this review letter beneficial to the preparation of further iteration of the Phase 1 desk study and subsequent finalisation of proposed intrusive site investigations. However, should you have any queries or questions regarding the contents of this letter, then please do not hesitate to get in contact with us to discuss these further. Similarly, for the benefit of future assessment and review work, we would welcome understanding from the IDM project team as to how/if the EA Advisory Actions detailed above have been realised.

Yours sincerely,

Mr Andy Davies
Green Growth Team Project Manager & Planning Advisor

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End

Appendix G

Controlled Waters Assessment of Arup Data

CIVIC EARTH

Table A: Controlled Waters Data Assessment - Potential Risks to Groundwater (Freshwater) from Dissolved Phase Contaminants							
Water Body		**Principal Aquifer**				**No. Samples**	6
Determinand	**EQS (µg/l) [Annual Average]**	**EQS (µg/l) [Max. Allowable]**	**Min recorded (µg/l)**	**Max recorded (µg/l)**	**Bioavailble Concentration (µg/l)**	**No. Samples exceeding EQS**	**Notes**
Arsenic	50	*	0.54	15	-	0 of 6	A
Beryllium	*	15	0.2	0.5	-	0 of 6	J
Boron	2,000	*	-	-	-	-	H
Cadmium	0.25	1.5	0.04	0.38	-	2 of 6	A
Chromium (III)	4.7	32	0.32	9	-	1 of 6	A
Chromium (VI)	3.4	*	-	-	-	-	A
Copper	1.0	*	0.5	2.4	0.06 to 0.35	0 of 6	A
Lead	1.2	14	0.12	3100	0.05 to 1550	1 of 6	A, B
Manganese	123.0	*	5	2600	4.2 to 142.71	1 of 6	H
Mercury	*	0.07	<0.01	<0.01	-	0 of 6	A
Nickel	4	34	1	8.6	0.19 to 3.75	0 of 6	A, B
Tin	25	*	<0.4	<0.4	-	0 of 6	H
Vanadium	20	*	0.6	1.3	-	0 of 6	H
Zinc	12.3	*	3.9	45	2.00 to 23.13	1 of 6	A, E
Total Phenols	7.7	46	<2	<2	-	0 of 6	A
Total Cyanide	1	5	<40	1000	-	2 of 6	F
Free Cyanide	1	5	-	-	-	-	A
Total TPH	*	10	<10	<10	-	0 of 6	K
Anthracene	0.1	0.1	<0.01	0.08	-	0 of 6	A
Benzo(a)pyrene	0.00017	0.27	<0.01	<0.01	-	0 of 6	A
Benzo(b)fluoranthene	*	0.017	<0.01	<0.01	-	0 of 6	A, G
Benzo(k)fluoranthene	*	0.017	<0.01	<0.01	-	0 of 6	A, G
Benzo(ghi)perylene	*	0.0082	<0.01	<0.01	-	0 of 6	A, G
Fluoranthene	0.0063	0.12	<0.01	0.1	-	2 of 6	A
Naphthalene	2	130	<0.05	4.9	-	1 of 6	A
Benzene	10	50	<1	<1	-	0 of 6	A
Toluene	74	380	<1	<1	-	0 of 6	A
Ammoniacal Nitrogen as N	*	750	<15	530	-	0 of 6	I
pH	*	6.0 to 9.0	4.8	7	-	1 of 6	H
Hardness (mg $CaCo_3$/l)	*	*	39.6	420	-	-	

Notes:

* No assessment criteria defined.

A. EQS outlined within Water Framework Directive 2015

B. Freshwater Annual Average EQS value for bioavailable fraction for lead, copper, nickel and zinc. Bioavailable fraction assessed using UKTAG Metal Bioavailability Tool (MBAT).

C. PAH is sum concentration of four PAH compounds [benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

D. Cadium EQS based on hardness of 200mg CaCo3/l or more. Average hardness recorded of >200mg CaCo3/l

E. Zinc EQS based on 10.9µg/l plus ambient background concentration for 1.4µg/l for all other freshwaters.

F. EQS for free cyanide stated for total cyanide. Laboratory limit of detection for total cyanide is 1 µg/l (the EQS for free cyanide). If total cyanide is present, analysis for free cyanide is carried out.

G. The annual average EQS in water refer to the concentration of benzo(a)pyrene, on the toxicity of which they are based. Benzo(a)pyrene can be considered as a marker for the other PAHs.

H. Environment Agency Freshwaters Specific Pollutants and Operational Environmental Quality Standards

I. Based on a 'moderate' quality river (Water Framework Directive 2015).

J. Dutch Indication Level of Serious Contamination

CIVIC EARTH

Table B: Controlled Waters Data Assessment - Potential Risks to Drinking Water from Dissolved Phase Contaminants						
Water Body		**Principal Aquifer**			**No. Samples**	6
Determinand	**Drinking Water Value (µg/l)**	**Min recorded (µg/l)**	**Max recorded (µg/l)**	**Bioavailble Concentration (µg/l)**	**No. Samples exceeding EQS**	**Notes**
Arsenic	10	0.54	15	-	1 of 6	A
Boron	1,000	-	-	-	-	A
Cadmium	5	0.04	0.38	-	0 of 6	A
Chromium	50	0.32	9	-	0 of 6	A
Copper	2,000	0.5	2.4	0.06 to 0.35	0 of 6	A, B
Lead	10	0.12	3100	0.05 to 1550	1 of 6	A, B
Mercury	1	<0.01	<0.01	-	0 of 6	A
Nickel	20	1	8.6	0.19 to 3.75	0 of 6	A, B
Selenium	10	0.81	22	-	1 of 6	A
Zinc	5,000	3.9	45	2.00 to 23.13	0 of 6	A, B
Total Phenols	0.5	<2	<2	-	0 of 6	D
Total Cyanide	50	<40	1000	-	2 of 6	A
Total TPH	10	<10	<10	-	0 of 6	D
TPH Aliphatic EC5-6	15,000	<0.1	2.7	-	0 of 6	G
TPH Aliphatic EC>6-8	15,000	<0.1	<0.1	-	0 of 6	G
TPH Aliphatic EC>8-10	300	<0.1	9.7	-	0 of 6	G
TPH Aliphatic EC>10-12	300	<0.1	<0.1	-	0 of 6	G
TPH Alipihatic EC>12-16	300	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>5-7	10	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>7-8	700	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>8-10	300	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>10-12	90	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>12-16	90	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>16-21	90	<0.1	<0.1	-	0 of 6	G
TPH Aromatic EC>21-35	90	<0.1	<0.1	-	0 of 6	G
PAH	0.1	<0.04	<0.04	-	0 of 6	A, C
Benzo(a)pyrene	0.01	<0.01	<0.01	-	0 of 6	A
Benzene	1	<1	<1	-	0 of 6	A
Toluene	700	<1	<1	-	0 of 6	E
Ethylbenzene	300	<1	<1	-	0 of 6	E
p & m-xylene	500	<1	<1	-	0 of 6	E, F
o-xylene	500	<1	<1	-	0 of 6	E, F
Ammoniacal Nitrogen as N	500	<15	530	-	1 of 6	A
pH	6.5 to 9.5	4.8	7	-	1 of 6	A
Total Sulphate (mg SO_4/l)	250	-	-	-	-	A
Hardness (mg $CaCo_3$/l)	-	39.6	420	-	-	-

Notes:

* No assessment criteria defined.

A. DWV outlined within the Water Supply (Water Quality) Regulations 2018.

B. Bioavailable fraction assessed using UKTAG Metal Bioavailability Tool (MBAT).

C. PAH is sum concentration of four PAH compounds [benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

D. DWV outlined within the Water Supply (Water Quality) Regulations 1989.

E. WHO Guidelines for Drinking Water Quality, 4th Edition 2017.

F. DWV for p-xylene stated; DWV for o-xylene is 500µg/l.

G. WHO Petroleum Products in Drinking Water, 2008

Appendix H

Risk Assessment Methodology

Civic Earth Risk Assessment Methodology

Civic Earth's risk assessment methodology is based on the CIRIA C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice[1].

The assessment approach is to quantify the potential risk at Phase 1 Stage via risk estimation and risk evaluation. This defines the overall risk category that can be used to identify likely actions to address the potential risk or undertake further risk evaluation.

The methodology is a qualitative approach and is undertaken for each identified potential contaminant linkage (source-pathway-receptor) identified for the site in accordance with the October 2020 Land Contamination Risk Management Guidance (LCRM)[2].

The methodology requires the classification of the following:

- The magnitude of the consequence (severity) of a risk occurring; and
- The magnitude of the probability (likelihood) of a risk occurring.

The potential consequences of contamination risks occurring at a site are classified in accordance with Table 1 below, which is based on CIRIA guidance[1].

Table 1: Classification of Consequence Ratings

Classification	Definition of Consequence	Examples
Severe	Short-term (acute) risks to human health. Short-term (acute) risk of pollution of sensitive water resource or ecosystem Catastrophic damage to crops/ building/ property/ infrastructure, including off-site soils	High concentration of cyanide on the surface of an informal recreation area Major spillage of contaminants from site into controlled waters Explosion causing building collapse
Medium	Long-term (chronic) risks to human health Long-term (chronic) pollution of sensitive water resource Significant change in an ecosystem/contamination of off-site soils	Concentrations of a contaminant on site exceeding the generic or site specific assessment criteria Leaching of contaminants from a site into a major or minor aquifer Death of species within a designated nature reserve
Mild	Pollution of non-sensitive water resource Significant damage to crops/ buildings/ property /infrastructure Damage to an ecosystem or sensitive buildings/structures/services	Pollution of a non-classified groundwater Damage to a building rendering it unsafe to occupy (e.g. foundation damage resulting in instability)
Minor	Easily preventable non-permanent effects Harm, although not necessarily significant harm, which may result in financial loss or expenditure resolve Easily repairable effects of damage to building/ structures/ services	Presence of contamination at concentrations which require the use of personal protective equipment during site work Loss of plants in a landscaping scheme/discolouration of concrete

The potential probability of the risks being realised are classified in accordance with the ratings set out in Table 2, which are based on CIRIA guidance[1]. It should be noted that where a potential contaminant linkage has not been identified the likelihood is considered to be negligible.

[1] CIRIA, (2001). Contaminated Land Risk Assessment. A Guide to Good Practice. CIRIA C552.

[2] Environment Agency (2020). *Land Contamination Risk Management (LCRM)*.

Table 2: Classification of Probability Ratings

Classification	Definition of Consequence
High likelihood	There is a contaminant linkage and an event that either appears very likely in the short term and almost inevitable in the long term, or there is evidence at the receptor that an event has occurred
Likely	There is a contaminant linkage and all the elements are present in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term
Low likelihood	There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place and is less likely in the short term
Unlikely	There is a contaminant linkage but circumstances are such that it is improbable that an event would occur even in the very long term

In accordance with C552, the risk classifications for each potential contaminant linkage are classified in accordance with the matrix of consequence and probability set out in Table 3. The definitions for the risk classifications are presented in Table 4.

Table 3: Risk Classification Matrix

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

Table 4: Risk Classification Definitions

Classification	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from the identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, is likely to result in substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from the identified hazard. Realisation of the risk is likely to result in substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
Moderate	It is possible that harm could arise to a designated receptor from the identified hazard. However, it is either relatively unlikely that such harm would be severe or if any harm were to occur it is more than likely that the harm would be relatively mild. Urgent investigation (if not already undertaken) is normally required to clarify the potential risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from the identified hazard, but it is considered likely that this harm, if realised, would at worse normally be mild.
Very Low	There is a low possibility that harm could arise to a designated receptor from the identified hazard. In the event of such harm being realised it is not likely to be severe.

produce consumption (i.e. no private gardens), commercial and/or public open space in a residential area.

It is therefore recommended that an intrusive ground investigation is undertaken to address the above data gaps so that the risks from contamination can be assessed and a remediation strategy developed, to inform material management decisions in terms of material re-use / off-site disposal and to obtain parameters for the geotechnical design of the project, such as foundation, floor slab and pavement design.