

Manchester Airport Building 402

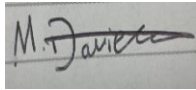
Phase 1 Tier 1 Geo-environmental and geotechnical
Assessment

Threadneedle Curtis Ltd

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1. Introduction

1.1 Terms of Appointment

On the instructions of Threadneedle Curtis Ltd (the Client), AECOM Infrastructure and Environment UK Limited (AECOM) has carried out a Phase 1 Geotechnical and Geo-environmental Desk Study of the site known as Building 402, associated with and located at Manchester Airport.

1.1.1 Background and Proposed Development

The report has been produced on the assumption that the site redevelopment will consist of a single large warehouse unit, which will primarily be used for logistics and distribution purposes. The single warehouse unit will comprise of 4 sub-units, each unit will be self-contained with approximately 10% of the floor space being used as offices.

Unit 2a will have an area of c.37,000 ft², Unit 2b and Unit 2c will both have an area of c.16,000 ft² and Unit 2d will have an area of c.21,000 ft². These areas include the office space on the 1st floor. Hardstanding areas associated with the units are to be implemented within the south east of the site. These will comprise loading areas for HGVs and parking bays for both cars and HGVs. Access will be provided via a new access road from Avro Way which forms part of the redevelopment on the site adjacent to the south east boundary (occupied by Building 401). On the south west perimeter of the site, landscaping is to be undertaken, following the removal of vegetation.

It should be noted that although the ultimate development form stretches over 2 sites (currently occupied by Building 401, 402) the proposed developments detailed here only relate to the Building 402 site and proposed units 2a, 2b, 2c and 2d for which this Desk Study has been produced.

The proposed development is depicted by drawing 020598-RPS-SI-XX-DR-A-9076 P01 (Option 10) (Proposed Overall Site Plan Option 10) is included as Appendix A

The development of the site is anticipated to require the following stages:

- Demolition of the existing building 402 on the site;
- Site earthworks, including excavation levelling and landscaping for external areas;
- Potential localised remediation of soils;
- Installation of services and site drainage; and
- Construction of the new building and associated infrastructure.

AECOM are privy to a number of existing reports with relevant geo-environmental information pertaining to the vicinity of the site. These include:

- Project Quantum Report No: MAN-19 60592411, – High level desk study and walkover (AECOM 2019);
- Manchester Airport, Proposed DNATA Site: Geotechnical & Geo-environmental Technical note on Ground Investigation (AECOM, January 2019);
- and
- Manchester Airport Bus Depot Relocation, Wilmslow: Factual Report on Ground Investigation Report No: F6042-16, (ESG, February 2017)

1.2 Report Objectives

The primary objectives of this report are to:

- determine whether potentially contaminative uses have taken place within, or in close proximity to, the site which could have led to the contamination of underlying soils or groundwater; and
- to understand the effects of the geological conditions and site activities on the geotechnical properties for site redevelopment.

This Phase 1 Tier 1 report is prepared to advise on site conditions under the requirements of Town and Country Planning Act 1990 (as amended), the National Planning Policy Framework (2012) and considers the potential implications of Part 2A of the Environmental Protection Act 1990 (Part 2A) and the associated Contaminated Land (England) Regulations 2006 and Contaminated Land Statutory Guidance (2012).

This report has been prepared in general accordance with the technical guidance and procedures described in the UK Government guidance Land Contamination: Risk Management (2021) and its predecessor, British Standard (BS) 5930:2015 (as amended) Code of Practice for Site Investigations (BSI), BS:EN 1997 Eurocode 7 – Geotechnical Design (BSI) and BS 10175:2011 (as amended) Investigation of Potentially Contaminated Sites – Code of Practice (BSI), to:

- Describe the geology, hydrogeology and shallow mining potential;
Describe the environmental setting/ sensitivity and current/ historical land use of the site and surrounding area;
- Summarise the history of the site;
- Summarise the underlying geology and hydrogeology;
- Summarise the findings of any historical ground investigation work;
- Provide an initial Conceptual Site Model (CSM) for the prevailing ground conditions;
- Using the source-pathway-receptor model present a preliminary qualitative risk assessment of potential land contamination risks to human (chronic), environmental, or controlled water receptors from contamination sources on or in the vicinity of the site, via transport pathways;
- Present a preliminary qualitative evaluation of potential geotechnical issues; and
- Identify the potential need for further intrusive ground investigation and potential need for remediation works. The purpose of such to substantiate the findings of the preliminary risk assessment and thereby refine the CSM.

1.3 Sources of Information

This report has been prepared using a combination of published records from publicly available sources (e.g. British Geological Survey (BGS), Environment Agency, Defra). As part of this assessment a site-specific Groundsure Report has been acquired, including published environmental, geological and hydrogeological data and mapping, and historical mapping for the area.

In addition, information provided by the Client, and from other sources such as the previous reports at or in the vicinity of the site as noted in Section 5, the Local Authority Environmental Health / Contaminated Land Officer, and observations made during the site reconnaissance have also been reviewed where available.

Specific information sources are referenced throughout the document and a bibliography is included in Section 14 of the report.

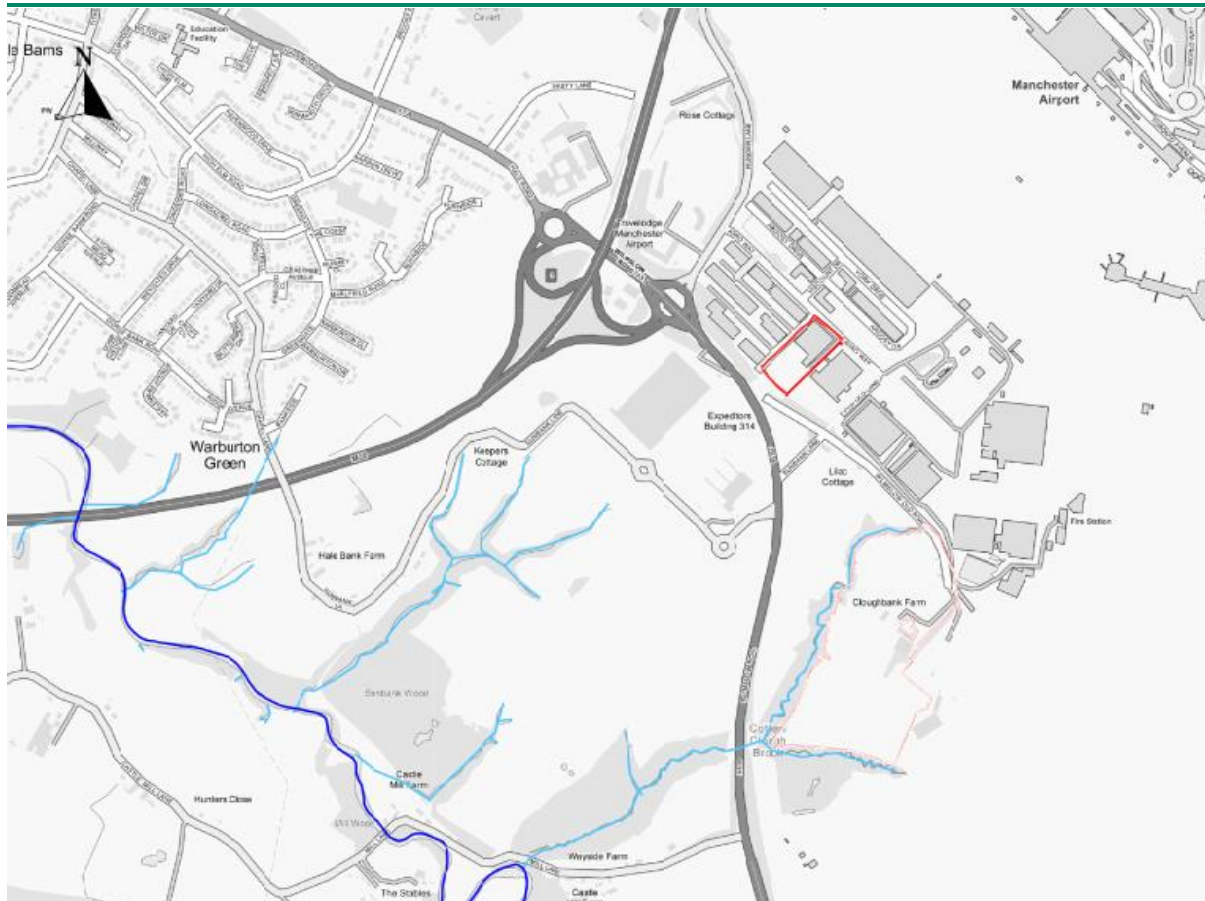
2. Site Setting

2.1 Location

The site is located at 402 Avro Way, Manchester (M90 5AF), approximately 100m northwest of the junction of Avro Way and Pinfold Lane and is centred on National Grid Reference 380839 384912. The site is within Manchester Airport's landside western commercial and industrial development c.14km south of Manchester City Centre.

A site location plan is provided as **Plate 2-1** below.

Plate 2-1 Site Location



Site Location (red)

2.2 Description and Setting

The site covers an area of approximately 1.59 hectares and the drawing which defines the site red line boundary and overlays the proposed end is provided as 020598-RPS-SI-XX-DR-A-9076 P01 (Option 10) 020598-RPS-SE-XX-DR-A-9074 P01 (Proposed Overall Site Plan Option 0910) is included as Appendix A.

The site is broadly rectangular in shape orientated northeast to southwest and is predominantly level with ground elevations ranging from c.68m Above Ordnance Datum (AOD) to c.69m AOD.

A large area of the site (~0.4 Ha.) is occupied by the current Manchester Airport Group (MAG) Building 402. This building is currently being used by 'LSG SkyChefs', who utilise the premises for food preparation and logistics/distribution operations with supporting office space.

Lorry access and loading bays are present on the southwest side of the building with a lorry parking area. Notably this area contains a refuelling area with associated tank. A tarmac hard standing carpark occupies the

southwest area of the site. An electrical substation is located adjacent to the south eastern site boundary, on the south eastern perimeter of the site.

Immediately adjacent to the northern and western site boundaries is a grass verge with some vegetation, denser on the western perimeter. Immediately adjacent south of the site lies dense woodland. Beyond the verge to the north of the site is Avro Way, immediately east of the site a joint access road for Building 402 and Building 401 is found, beyond which MAG Building 401 sits derelict. To the west another access road with commercial and industrial units beyond.

Relevant features immediately surrounding the site are summarised in Table 2.1.

Table 2.2.1. Features Surrounding the Site

Direction	Summary
North East	Immediately adjacent to the site is a grass verge which gently rises to Avro Way. Beyond the road is car parking for a series of offices to the north of the site. Further from the site is a large warehouse building, which oversees the transfer from land to airside of goods.
South East	Immediately adjacent to the site is an access road used for both access to this site and to the adjacent site (MAG 401). Beyond this road is MAG Building 401 with associated large areas for parking. MAG Building 401 is currently believed to be vacant. Although, it is understood that Building 401 was previously used by the current occupiers of Building 402. The hardstanding area associated with Building 401 is believed to be currently used as a MAG Bus Depot. Building 401 has much associated car parking areas. Beyond this is Pinfold Lane.
South West	Dense woodland lies immediately adjacent to the site, beyond which is a narrow dead-ended road named Wilmslow Old Road, which allows access to the 'Romper' public house. Beyond this the A538 wraps around large warehouse buildings further southwest from the site.
North West	Immediately adjacent to the site is an access road, shared between Building 402 and other MAG buildings. These other MAG buildings beyond the access road are presumed to be used for office space, warehouse space, distribution and logistical operations. Numerous hardstanding areas are associated with structures including access roads, parking and loading bays. Some warehouses contain hazardous materials.

3. Geological and Environmental Setting

3.1 Introduction

The environmental setting including the topography, geology, hydrogeology and hydrology are the key factors that influence the way in which contaminants in the soil or groundwater can be transported on or off site, and also the way in which contamination can affect applicable receptors including controlled waters and users of the site.

The environmental setting of the Site has been assessed by making reference to the information sources detailed in Section 14.

3.2 Geology and Soils

3.2.1 Published Geology & Exploratory Hole Records

AECOM has reviewed publicly available information. The published 1:50,000 and 1:63,000 geological maps of the area produced by the BGS (Sheet 98, Stockport, Drift, 1971 and Sheet 98, Stockport, Solid, 1977) and reference to the GeoIndex online mapping portal. These indicate the site is underlain by the geological succession summarised in Table 3.1.

The 1:10,000 map extracts included in the Groundsure Report have also been considered. Extracts of the superficial deposit and bedrock maps are included as part of the Groundsure Geo-Insight Report (Appendix B).

Table 3.3.1. Geological Succession from Published Mapping

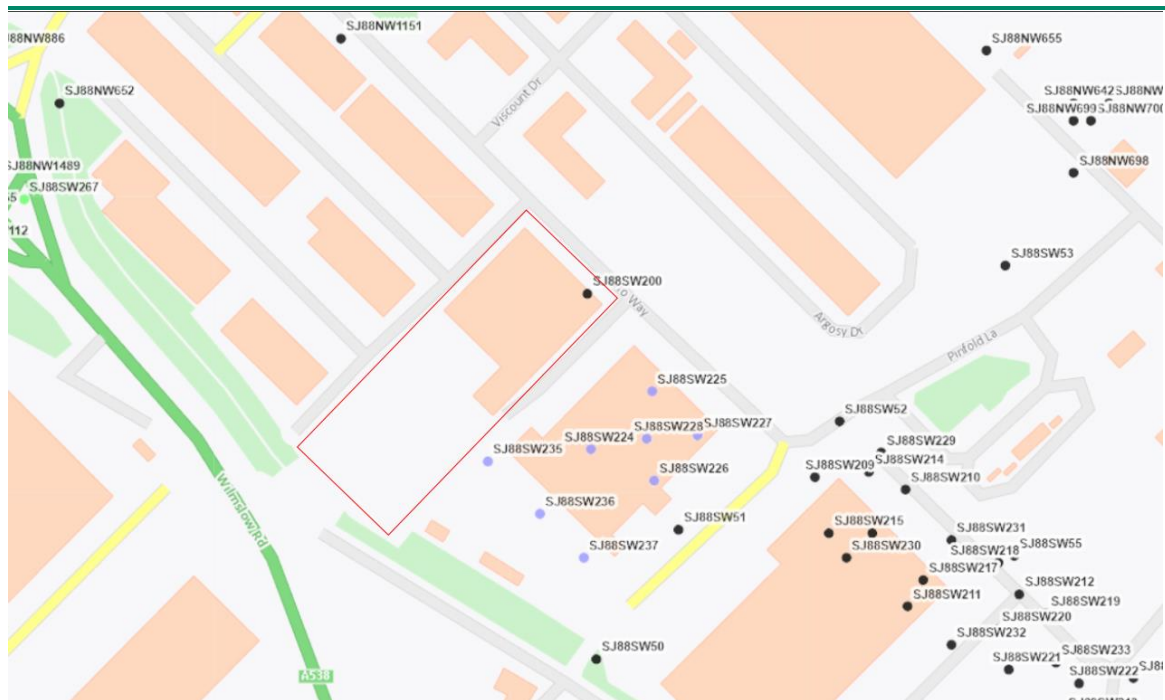
Age	Group	Geological Stratum	Stratum	Description
Quaternary - Devensian	N/A	Diamicton Till	Superficial Deposits*	A wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary.
Triassic	Sidmouth Mudstone Formation	Bolin Mudstone Member	Bedrock	Upper: laminated reddish-brown and greenish-grey mudstone with siltstones. Lower: structureless and laminated, dominantly reddish-brown mudstone. (Within the lower part of the member, a unit termed the 'Lower Keuper Sandstone' has been recognised in the Stockport area. This unit closely resembles the Tarporley Siltstone Formation of adjacent areas.)

**While anticipated due to the developed nature of the site, no artificial deposits are recorded on the geological mapping*

Source: bgs.ac.uk (BGS Lexicon of Named Rock Units)

The BGS maintains an archive of historical exploratory hole records throughout the UK. AECOM has searched the database and those which are considered to provide useful information on the ground profile at the site, have been referenced in producing this report. The extract below shows those boreholes recorded by the BGS around the site area. The black boreholes are not publicly available, leaving 8 no. boreholes located within 100m of the site which may be publicly available. Of these only 3 have online records which are freely available (SJ88SW235, SJ88SW236 and SJ88SW237). Plate 3-1 shows the locations of the boreholes from BGS Geoindex.

Presented in Table 3.2 is a summary of these boreholes, with full copies of the exploratory hole records included as Appendix C. Relevant information from the records is considered as part of the Preliminary Ground Model in Section 8.

Plate 3-1 Screenshot of relevant exploratory hole locations from BGS GeoIndex Viewer, Site shown by red line boundary**Table 3.2 Geological Succession from BGS Borehole Logs**

Borehole	Made Ground mbgl (Thickness m)	Description	Superficial Deposits mbgl (Thickness m)	Description Summary
SJ88SW235 (BH6)	0.60 (0.60)	Soft medium brown CLAY with stones and broken tarmac.	4.00 (3.40)	Very soft becoming stiff with depth, mottled brown and grey CLAY.
SJ88SW236 (BH7)	1.20 (1.20)	Loose concrete, brick, stone, tarmac and CLAY over reinforced concrete below which is hardcore fill (possibly old runway).	4.00 (2.80)	Firm to stiff, dark reddish brown slightly marly CLAY.
SJ88SW237 (BH8)	0.70 (0.70)	Soft to firm dark brown and black silty CLAY.	4.00 (3.30)	Firm to stiff mottled brown and grey CLAY becoming stiff and marly at 1.3mbgl.

Note: mbgl = metres below ground level.

3.2.2 Soils and Soil Chemistry

Information obtained from Soilsclapes online mapping¹ describes the soils within the vicinity of the site as slowly permeable, seasonally wet, slightly acid but base-rich, loamy and clayey soils (Soilsclapes Classification 18). These soils have impeded drainage, draining typically to stream networks, and have moderate fertility.

¹ (<http://www.landis.org.uk/soilsclapes/>: Accessed 07/02/2022)

Natural England reports the Agricultural Land Use Classification for land in England. Information obtained from the Natural England² reports the Agricultural Land Use Classification to be good to moderate (Grade 3).

However, it is noted that the location of the site lies within the footprint of Manchester Airport and its associated infrastructure. The site and surrounding area are predominantly given over to industrial use. As such, it is considered that the ground conditions at the site are unlikely to relate to the soils and agricultural land classifications of the wider area as noted above.

The BGS Soil Chemistry datasets provide indicative information on regional concentrations of five potentially harmful elements (PHEs): arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb) in soil, as presented within the Groundsure Report. Elevated concentrations of these PHEs can exist because of natural geological conditions or possible anthropogenic contamination. The following BGS estimated soil chemistry levels are attributed to the vicinity of the site based on the geometric mean concentrations of available data (presented in Table 3.3).

Table 3.3 Estimated Soil chemistry

Potentially Harmful Element	Estimated geometric mean concentration (mg/kg)
Arsenic	15
Cadmium	1.8
Chromium	60-90
Lead	100
Nickel	15

3.2.3 Ground Stability Records

Table 3.4 shows the variable risk of ground stability hazards across the site, taken from the Groundsure report:

Table 3.4 Ground Stability Records

Hazard Type	Hazard Potential
Collapsible Ground Stability	Deposits with potential to collapse when loaded and saturated are unlikely to be present.
Compressible Ground Stability	Compressible strata are not thought to be present
Ground Dissolution Stability	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.
Landslide Ground Stability	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.
Running Sand Ground Stability	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.
Shrinking or Swelling Clay Ground Stability	Ground conditions predominantly low plasticity.

3.2.4 Mining and Mineral Extraction

3.2.4.1 Aggregate/Mineral Quarrying and Mining

The Groundsure report presents publicly available information on mining and quarrying operations, past and present that have taken place within 250m of the site.

The Groundsure report checks databases held by The British Geological Survey, The Coal Authority, Mining Searches UK, Kaolin and Ball Clay Association (UK), Stantec UK Ltd, Johnson Poole and Bloomer, Cheshire

² website (<https://naturalengland-defra.opendata.arcgis.com/datasets/provisional-agricultural-land-classification-alc-england/explore?location=53.363392%2C-2.288148%2C18.00> : Accessed 07/02/2022)

Brine Subsidence Compensation Board and British Gypsum; as well as records of surface and ground workings identified from Ordnance Survey and Groundsure mapping.

Of those databases and mapping only one entry is noted within 250m of the site. A surface ground working named as a 'pond' was noted 200m East of the site located within the area of landscaping at the southern side of Pinfold Lane within the area of the large airport fuel depot.

The Groundsure data identifies no other features within 250m of the site. Within 250m to 500m from the site the only features recorded relate to other small surface ground workings.

3.2.4.2 Coal Mining

Reference to the Coal Authority Interactive Map indicates the following in relation to the site:

- The site is within a surface coal resource area;
- Areas of known probable past shallow coal mine workings are not indicated at the site;
- The site is not within a High-Risk Development Area; and
- There are no mine entries on or within 1km of the site.

Surface Coal Resource Areas are defined as coal resources capable of being extracted by surface mining methods, often referred to as 'opencast'. This information is used by Local Planning Authorities as part of the duty to safeguard minerals from unnecessary sterilisation and is derived from Coal Authority and British Geological Survey data.

It should be noted that Surface Coal Resource Area is very broad, covering the Liverpool and Greater Manchester Area, and extending as far south as Birmingham. With no surface features recorded in the site vicinity relating to open cast coal mining and as the site is not within a 'High Risk Development Area' for coal mining, a site-specific Coal Mining Risk Assessment is not recommended at this stage. However, this would be subject to review dependent upon any future ground investigation data.

3.2.4.3 Instability from Salt and Brine Extraction

The Project area is located within an area defined as the Cheshire Brine Compensation District. Potential ground instability as a result of historical brine pumping is considered unlikely at the site because:

- The site is not underlain by the Northwich Halite Member (the soluble strata from which brine was formerly extracted) located approximately 2.5km south of the site; and
- The site is not located within the consultation areas for where historical brine extraction is understood to have taken place as defined by the Cheshire Brine Subsidence Compensation Board Compensation District & Consultation Areas³.

3.2.5 Radon

The Groundsure report indicates that the site is not within a radon affected area. The site is identified as having less than 1% of properties above the UK 'Action Level'. This classification identifies no specific radon protective measures are likely to be considered necessary for the proposed development.

3.3 Hydrogeology

3.3.1 Aquifer Classification

The Environment Agency's Groundwater Protection Policy adopts aquifer designations that are consistent with the Water Framework Directive. Definitions of the various aquifer types can be found on the Environment Agency section of the gov.uk website. The following classifications are taken from this system:

3.3.2 Superficial Aquifers

The Devensian Glacial Till is classified as a Secondary Undifferentiated Aquifer. These designations are described by the EA as being 'assigned in cases where it has not been possible to attribute either category A or B

³ Available at: <http://www.cheshirebrine.com/wp-content/uploads/2018/05/Cheshire-Brine-Subsidence-Compensation-Board-Compensation-District-and-Consultation-Areas.pdf>

to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'.

3.3.3 Bedrock Aquifers

The Bollin Mudstone Member is classified as a Secondary B Aquifer. These are described by the EA as 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.

3.3.4 Groundwater Vulnerability

The Environment Agency's Groundwater Vulnerability Mapping available from the online Defra Magic Mapping (magic.defra.gov.uk) identifies the groundwater vulnerability to pollution of an area. All associated terminology/definitions can be found on the Environment Agency section of the gov.uk website.

The Magic Mapping shows the site and surrounding area to have a 'medium to low' classification for groundwater vulnerability. However, the Groundsure Report (Source: British Geological Survey and the Environment Agency) breaks this down by aquifer; and identifies both the superficial and bedrock aquifers to be of low vulnerability.

It is probable therefore that the soils and Devensian Glacial deposits are able to attenuate vertical migration of pollutants to the deeper Secondary B Aquifer consisting of the Bollin Mudstone Member.

3.3.5 Source Protection Zones

In terms of identifying the risk of contamination from potential polluting activities in a given area to groundwater sources (e.g. wells, boreholes, and springs) used for supplying public drinking water, the EA identifies Source Protection Zones (SPZ).

These show the extent of a groundwater source catchment and are divided into three zones, definitions of which can be found on the Environment Agency section of the gov.uk website.

The mapping produced by the EA and supplied both within the Groundsure report and EA mapping from Magic Maps, indicates that the site is not within a SPZ.

The nearest SPZ is c.6.5km south east of site. The EA mapping from Magic Maps also identifies that the site is not within a Drinking Water Safeguard Zone for either surface water or groundwater.

3.3.6 Licensed Groundwater Abstractions

No Licensed Groundwater Abstractions have been identified within 2km of the site.

AECOM has contacted the local authority (Greater Manchester City Council Council) for details of private water supplies and ground water abstractions. According to their records there are no abstractions registered under the Private Water Supply Regulations within 500m of the site.

Records of the correspondence are included as Appendix D.

3.3.7 Risk of Flooding from Groundwater

The Groundsure Report identifies that the risk of flooding from Groundwater both onsite and within 50m are considered to be 'Low' based upon a 1 in 100-year return period and a 5m Digital Terrain Model (DTM).

The Low risk identified is considered to present a limited potential for groundwater flooding to occur at the site.

3.4 Hydrology

3.4.1 Surface Water Courses and Drainage

There are no ponds, streams, or drainage ditches on or adjacent to the site. The site is however understood to be included within Manchester Airports drainage and fire management systems.

The site lies close to the boundary of two Water Framework Directive (WFD) surface water body catchments. To the northeast of this boundary, including the site area, is within the catchment of Timperley Brook. To the southwest of this boundary the area is within the River Bollin (River Dean to Ashley Mill) catchment.

The nearest Water Framework Directive-relevant surface watercourse/feature to the site is the River Bollin, which is approximately 1150m southwest of the site. Although, it should be noted that Cotterill Clough Brook is located approximately 350m southeast of the site and flows in a south-westerly direction into the River Bollin. It is significant to note that Cotterill Clough is designated as a Special Site of Scientific Interest.

Table 3.5 summarises the surface water quality information available for the watercourses of the two catchments associated with the site.

Table 3.5 Surface Water Quality

Surface Water Feature	GQA (Chemical)	GQA (Ecological)	Distance (m)	Upstream / Downstream of Site
Bollin (River Dean to Ashley Mill)/ Cotterill Clough Brook	Fail	Moderate	1150m SW/ 350m SE	Downstream
Timperley Brook	Fail	Moderate	2236m NW	Downstream

It should be noted, as above, that the site is understood to be included within Manchester Airports drainage system and fire management areas. As such, it is unlikely that in its current state the surface waters of the site would be in connection to the nearby water courses. In this area it is understood that the drainage waters from the airport pass through a monitoring and filtration system before being outlet ultimately to the River Bollin.

3.4.2 Licensed Surface Water Abstractions

No surface water abstractions have been identified within 1km of the site.

AECOM has contacted the local authority (Greater Manchester City Council Council) for details of private water supplies and ground water abstractions. As of the time of writing this report no response has been received for records held by the local council.

Records of the correspondence are included as Appendix D.

3.4.3 Risk of Flooding from Surface Water

The indicative floodplain map for the area, published by the Environment Agency and included within the Groundsure report, shows that the site does not lie within a Flood Zone. Therefore, the site is not considered to be susceptible to fluvial/marine flooding.

The Groundsure Report presents surface water flood mapping which highlights the highest risk onsite is a 1 in 30 year risk of 0.1m-0.3m flooding. The area with this designation is focused on a small area towards the northeast of Building 402, possibly associated with the basement.

Based on the Groundsure Report and EA mapping, the site is considered not to be at risk of significant and extensive surface water flooding as a result of extreme rainfall events.

Further assessment on risk of surface water flooding and the proposed drainage for the development which will mitigate risk is to be found within the following reports which should be read in conjunction with this report:

- AECOM (2022), Building 402 Redevelopment, Level 2 Flood Risk Assessment; and
- AECOM (2022), Building 402 Drainage Strategy.

4. Historical & Planned Development

4.1 Historical Ordnance Survey Mapping & Aerial Photographs

Historical Ordnance Survey (OS) maps of the Site and the wider environs were provided in the Groundsure Report (scales 1:1,250, 1:2,500, 1:10,560 and 1:10,000) and these are reviewed in this section. Copies of these maps are presented within the Groundsure Report included as Appendix B. Reference has also been made to historical aerial imagery available via Google Earth Pro and the Groundsure Report.

The historical Ordnance Survey (OS) maps obtained with the Groundsure report date between 1877 and 2022.

Table 4.1 presents a summary of the main features present on and within approximately 250m radius of the Site boundary. AECOM notes that only indicative map scales are provided. Where dates are stated, these refer to the dates of maps on which the features are present, have changed use or are no longer annotated, and do not necessarily refer to the exact dates of existence of a particular feature. Development that may have occurred between map editions is recorded as occurring on the latter published map, hence there are some limitations to the accuracy to the date of development unless supplementary evidence is available. This is particularly pertinent to the interwar years and the site where development and activity related to Royal Airforce and other military operations is not shown.

Table 4.1 Summary of Historical Mapping

Date (Scale)	Key Features on-site	Key Features off site within 250m
1877 (1:2,500)	- Partial map only covers northeast area of the site. - The northeast area of the site is undeveloped and assumed to be used for agricultural purposes. - A small track (footpath) runs through the site in a northeast to southwest direction.	- Limited coverage, coverage confined to the land northeast of the site. - A road is present (Yewtree Lane), lined by trees c.175m northeast of the site, with a northwest to southeast trend. - Some small buildings present c. 220m northeast of the site. - Land northeast of the site is assumed to be agricultural with field boundaries and paths/tracks. - Pond c.230m NE of the site.
1881 (1:2,500)	- The NE area of the site is absent from the map. - The rest of the site is assumed to be agricultural land, with a track striking NE-SW through the site. The track appears to connect more substantial roads at each end of the site (off-site). - Site appears to be cut into three similar sized segments by field boundaries running NW to SE.	- NE land beyond the site is absent from mapping. - Land use predominantly agricultural with associated field boundaries and tracks/ paths. - Ponds are noted; c.100m NW, c. 120m SE, c.130m S, c. 180m S, c.80m SW, c. 150m SW. - The track on-site meets a road running past the south western boundary of the site. This road meets Pinfold Lane at a crossroads c.120m SE of the site. - The Red Lion Inn (Romper's) and the All Saints' Church are in the same position as they are currently (c.130m SE of site). - A smithy is noted attached to the inn. - Oak Farm located 120m west of the site. - A large pond associated with the 'Grange' is c.220m east of the site.
1898 (1:2,500)	Southernmost field boundary is no longer present.	- Square pond/ reservoir associated with Oak Farm. - Pond c.100m NW, pond c.120m SE of site no longer present.
1899 (1:10,560)	No notable change.	No notable change.
1909 (1:2,500)	- No notable change. - Apart from the track now being described as a footpath through site.	- Pond c.100m NW reappeared. - Pond c.80m SW has been removed.
1910 (1:10,560)	No notable change.	No notable change.
1935 (1:2,500)	Partial map doesn't cover the site	- Map only covers the western area off-site. - No notable change in this area.
1938 (1:10,560)	No notable change.	No notable change
1954 (1:10,560)	Majority of the site is occupied by a series of looped hardstanding areas associated with the Ringway Airport	- The smith is now absent. - The pond c.180m S of the site has gone.

Date (Scale)	Key Features on-site	Key Features off site within 250m
	(Manchester Airport). Likely used for taxing aircraft.	- The road adjacent to the SW border of the site has been named 'A538, Wilmslow Road'. - Two hangars associated with Ringway (Manchester) Airport are now identified c. 150m SE of the site.
1967 (1:10,560)	Partial map does not cover site.	Partial map, although no visible changes.
1968 (1:1,250)	No notable change.	- Ringway Airport now referred to as Manchester Airport - Peters Croft appeared next to the church around 120m SE of the site. - V.H.F Receiver Station appeared c.110m west of the site. - Ponds c.100m NW and c.120m SE been removed. - Tank installed next to one of the hangars c.175m SE of site. - Expansion of Oak Farm
1969 (1:2,500)	No notable change.	- Pond c.200m SW of site. - Lilac Cottage built c.240m SE of site.
1974 (1:1,250)	No notable change.	Partial map, although no notable changes detected.
1981 (1:10,000)	No notable change.	- Wilmslow Road is now Wilmslow Old Road. - A new larger Wilmslow Road now curves past the site c.10m west, running N to S. - The new Wilmslow Road meets a roundabout c.250m west of the site, where the M56 is joined. - The pond associated with the 'Grange' NE of the site is absent.
1987 (1:1,250)	No notable changes.	- Building appears present immediately adjacent SE of the site (where Building 401 currently resides). - The building has lorry entrances and access roads, along with associated hardstanding. - Cargo Centre is now present c.20m NE of the site, associated warehouses, and hardstanding areas. - The Cargo Centre extends to the NW where the buildings which are now along Argosy Drive have been built. - Avro Way has appeared immediately adjacent to the NE of the site boundary. - Elongated building added to one of the hangars. - Two ponds associated with the wireless station present c.100m NW of the site. - Tank and Electric substation associated with the Cargo Centre c.90/100m NE of the site. - Electrical substation is noted c.50m SE of the site, associated with large Building.
1990 (1:10,000)	No notable changes.	- No notable changes. - Except the roads c.100m NW of the site, associated with the Cargo Centre have been named; Argosy Drive and Viscount Drive.
1992 (1:1,250)	No notable changes.	No notable changes.
1995 (1:1,250) 1995 (1:10,000)	- Building 402 is now present with associated infrastructure including hardstanding in the SW portion of the site and associated access roads. - An electrical substation is present on site.	- Embankment is present along Wilmslow Road - Building immediately adjacent SE of the site has been extended to the SW and NW. - Substation c.50m SE of site no longer noted. - Site (Building 401) adjacent to the SE of the site is broadly the same as is at present. - Office building present c.90m north of site.
2001 (1:10,000)	No notable changes.	- Wireless station c.100m NW absent and associated ponds absent. - Three large buildings appeared to the NW of the site, used for logistics, distribution and office space presumably. - One of the Hangars to the East of the site is no longer present.

Date (Scale)	Key Features on-site	Key Features off site within 250m
2003 (1:1,250)	No notable changes.	C.80m NW of the site a tank is situated.
2010 (1:10,000)	Building 402 has been extended to the SW.	- C.250m SE of the site where the hangar was since reported as absent, a carpark has been installed. - More warehouse buildings have appeared c.200m NW of the site.
2022 (1:10,000)	Building 402 has been further extended NE.	- Hangars no longer present to the SE of the site. - Oak Farm is no longer present. Two very large warehouses replace this with associated roads and parking.
Aerial Photography 2000 to 2021	- Fuel tank present in the hardstanding area SW of Building 402. - Between 2005 and 2010 the hardstanding car park furthest SW on site was extended to incorporate the whole width of the site. - No other notable differences.	- From 2019 the site which previously housed the hangars is being used as a very large hardstanding carpark. 2013 to 2016 a large hardstanding carpark was introduced c.220m S of the site, just south of the Church.

4.2 Planning Authority Records

Planning Reference 131892/FO/2021 on the Manchester City Planning Portal relates to the planning submission for development of Building 401. Information from the desk study related to this site is summarised in this report in Section 5.

Online planning application records on the Manchester City Council Website are available to the public. Those planning applications within 250m of the site are solely for the development of the World Logistics Hub, including specific applications for a number of the large warehouse buildings and general applications for the wider development.

It should be noted that a portion of Manchester Airports developments are considered permitted development and as such do not necessarily require planning applications with the council and therefore would not be recorded in this register.

4.3 Records from MAG

AECOM reviewed Manchester Airport Groups 'Our History' page on their website (A summary of findings that may relate to the Building 402 site are summarised in Table 4.2 below.

Table 4.2 MAG Records

Date	Details of Development
1935	Building of Ringway Airport, now known as Manchester Airport
1938	Ringway Airport opens
1939-1945	Ringway Airport becomes an engineering hub for military aircraft in WW2. Troops trained on the site.
1969	Runway extended to 2745m.
1986	World Freight Terminal opens.

4.4 Unexploded Ordnance Risk

4.4.1 Wartime Land-use

Based on a review of historical maps, the site was located within part of what was later Manchester Airport during wartime Britain. The site was occupied by aircraft storage and hard standing attached to the runway and taxiing layout at the time. According to the Project Quantum Report MAN-18 the site was thought to be used for storage of RAF aircraft during the war.

It should be noted that Ringway Airport became a military engineering hub for aircraft during WW2 and troops were trained at the airport.

The site was located near to wartime sites of interest, which include military bases, ports, or industrial centres, notably the airport and as such a risk of potential unexploded ordnance (UXO) is considered to be present.

4.4.2 Post War Development

No immediate redevelopment within the area is noted in the post-war years, which could potentially indicate redevelopment as a consequence of bomb damage.

4.4.3 Unexploded Ordnance Mapping

The regional UXO mapping published by Zetica (Appendix D) shows that the site lies within a zone classified as having a low risk of UXO. In areas with a low risk of UXO, it is estimated that 15 bombs failed to explode within an area of 1,000 acres.

However, the site is within the vicinity of Manchester Airport with a Luftwaffe Target noted c.250m SE of the site which appears to be associated with historical airport buildings which are understood to have manufactured planes.

In addition, it is understood from the historic mapping that the site was used as a taxiing and storage area for aircraft around wartime in Britain, these aircraft were likely for military use.

Based on the findings of this initial assessment, AECOM recommends that a detailed UXO Assessment is undertaken prior to the commencement of any intrusive investigation.

5. Review of Historical Reports

5.1 ESG Factual Report on Ground Investigation (Feb 2017)

The 2017 ESG factual report produced for BAM construction summarises a ground investigation undertaken by Jacobs in June 2016.

The ground investigation comprised three concrete cores (CC1-CC3), four window sample boreholes (WS1-WS4) and three dynamic cone probes (DCP1-DCP3).

The borehole logs for the window samples indicated a Made Ground thickness of 0.8-1.0mbgl typically comprising 0.1m of macadam over orange/ brown Sand to 0.7mbgl in WS1 and WS2, over reworked Clay to 1.0m. WS3 and WS4 identified a thinner sand layer underlain by a black ashy gravel over the reworked clays extending to 0.8mbgl. WS4 also noted a type 1 sub-base style gravel below the macadam.

All four locations encountered Glacial Till below the Made Ground extending to the base of the boreholes at a maximum of 4.45mbgl. The Glacial Till comprised orangish brown CLAY described as firm to stiff, increasing in stiffness with depth. WS3 noted no recovery and a light brown sand between 3.8mbgl and 4.2mbgl. Thin sand bands of less than 5cm were also noted in the CLAY above.

Three boreholes drilled to 4mbgl encountered groundwater which rose to depths between 3.9mbgl and 3.4mbgl. Some limited waters and seepage were noted at around 1mbgl within the Made Ground.

DCP and Concrete cores identified concrete up to a thickness of 0.35m. It should be noted that based on BGS borehole and anecdotal evidence, it is considered likely that the original aircraft taxi and storage hard standing is present below the current hard standing in some areas of the site. The potential for two layers of concrete should be factored into any further ground investigation or development.

5.2 Project Quantum Site Assessment (Feb 2019)

The overall objective of Project Quantum was to produce holistic executive summary reports for assets of the airport site. For each asset an asset fact file based upon a site walkover and workshop with MAG staff as well as publicly available data.

Building 402 was classified as asset MAN-18, for which the walkover assessment was undertaken on 03/12/2018. It should be noted that this assessment was for Building 402 only and not the current redline boundary of the site provided as part of this brief, however off-site descriptions were included which covered the current site area.

It is noted that the site contains an indoor below ground storage tank for waste food grease, storage of corrosive chemicals in boiler room and an outdoor caged area containing waste cooking oil drums for off-site disposal.

The Report notes that the workshop identified that the site was likely used for the storage of RAF aircraft during WW2.

A diesel tank is noted in the car park of the asset as a potential source of contamination. An electric substation is also noted 63m away from the asset (Building 402) but is thought to be within the current site boundary.

A gas meter and cooling unit located adjacent to the building feeds into the asset.

The report includes a preliminary risk assessment chiefly comprising a tabulated preliminary conceptual model (CM) and risk assessment. The findings of this risk assessment identified the site to be of Low Risk.

5.3 Historical Reports for DNATA Warehouse Site

The plot to the southeast of the site, beyond the MAG Building 401 site, is currently occupied by DNATA warehouse completed 2019. Prior to this the site was occupied by Hangar 3 and a storage yard which was itself previously Hangar 5. A number of reports have been undertaken on the DNATA site and surrounding area. These are briefly summarised below:

5.3.1 Arcadis Geraghty & Miller International Inc. Hangar 3 Fuelling Farm, Tier 1 Environmental Assessment Report. (June 2003)

Arcadis Geraghty & Miller International Inc., Hangar 3 Fuelling Farm, Tier 1 Environmental Assessment Report. June 2003. Report Number: 919120003.

An environmental assessment of the Hangar 3 fuelling farm consisted of an intrusive investigation and groundwater monitoring. Olfactory evidence of contamination was identified in the area surrounding the tank farm, which had no visible drainage around the fuelling area. It was reported that gas oil Tank 1 had split earlier in 2003.

Light Non-aqueous Phase Liquid (LNAPL) was encountered in BH2 between 1.0mbgl and 1.3mbgl, and was indicative of a diesel fuel source within the Made Ground. Results of the site investigation indicated that the soil had been impacted by hydrocarbons with BH2 exceeding the action level set in the report. Groundwater at BH2 was impacted by naphthalene. Contamination was reported to be localised within the Made Ground surrounding the underground storage tank (UST).

5.3.2 Scott Wilson, Hangar 5 Site Interpretive Geo-Environmental Assessment on Ground Investigation (March 2005)

Scott Wilson, Hangar 5 Site, Manchester Airport, Interpretive Geo-Environmental Assessment on Ground Investigation. March 2005. Report Number: D107899/07.1/INT/H5/01.

An intrusive investigation of the ground conditions in the vacant land directly northeast of historical Hangar 3, comprised of various trial pit locations and window samples.

The area was considered to present a moderate risk to controlled waters based on elevated concentrations of copper, sulphide, sulphate, ammoniacal nitrogen, polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH) within groundwater sampled from the superficial Glacial Till.

Ground conditions agreed with the published geology comprising of Made Ground to a maximum depth of 0.95mbgl. Superficial geology of Glacial Till was encountered to a proven depth of 3.40mbgl. Bedrock of weathered mudstone was observed from 1.90mbgl to 3.90mbgl. Perched groundwaters were encountered within the superficial Glacial Till, however consistent groundwaters were not encountered laterally across the site during the investigation.

5.3.3 OPUS International Consultants (UK) Ltd., Hangar 3 Fuelling Farm, Supplementary Environmental Investigation (Feb 2013)

OPUS International Consultants (UK) Ltd., Hangar 3 Fuelling Farm, Manchester Airport, Supplementary Environmental Investigation. February 2013. Report Number: J-W0364_R1.

An intrusive environmental investigation of the ground conditions at historical Hangar 3, to assess potential contamination within the vicinity of the UST.

The report concluded that there was significant hydrocarbon contamination within the Made Ground. Soil contamination was present within all of the exploratory wells undertaken. However, it was not present in all of the deeper groundwater samples and was therefore considered to be limited in extent to the soil contamination 'hotspot' surrounding the USTs.

5.3.4 URS Proposed Motor Transport Building, Geotechnical & Geo-Environmental Desk Study (Nov 2013)

URS, Manchester Airport Proposed Motor Transport Building, Geotechnical & Geo-Environmental Desk Study Report. November 2013, Report Number: 47066850/MTB/MARP007.

An investigation into the geotechnical and geo-environmental conditions for a proposed motor transport building located in the current vacant land adjacent to Hangar 3.

The report highlighted the current at the time of the report (2013) and historical environmental conditions surrounding the site and used the information to populate a conceptual site model for the proposed development. The risk for contamination of deeper groundwaters was considered likely due to the nature of the superficial geology comprising permeable layers of sand and silt. The remaining risks to construction workers, current and future land users, and development infrastructure were considered low to moderate / low.

5.3.5 URS Proposed Motor Transport Building, Geo-Environmental & Geotechnical Interpretative Report (March 2014).

URS, Manchester Airport Proposed Motor Transport Building, Geo-Environmental & Geotechnical Interpretative Report. March 2014. Report Number: 47066850/MTB/MARP002.

An interpretive report of the intrusive ground investigation for the proposed motor transport building located in the current vacant land adjacent to Hangar 3. The investigation comprised of 3 No. boreholes, 14 No. window samples and 12 No. dynamic cone penetrometer holes.

The report identified that where Made Ground was encountered, it was not considered a suitable bearing stratum for future structural foundations due to the heterogeneity of the material under a ground bearing capacity of 100kN/m². Varying CBR values were determined for pavement design, dependant on the underlying geology and subgrade thickness. A UST and refuelling island had been identified on site, however AECOM (formally URS) de-commissioned and removed the UST and associated contaminated soils in August 2014.

Results obtained from soil analysis indicated no significant exceedances of contaminants at the site, with the exception of asbestos containing materials (ACMs), it was therefore considered that contaminants posed a low risk in terms of chronic exposure to receptors. Trace amounts of amosite and crocidolite asbestos were obtained from 2 of 15 soils samples taken within the Made Ground.

Groundwater was observed at depths ranging from 0.80mbgl and 3.70mbgl across three separate monitoring rounds. Elevated levels of copper, selenium, phenol, and sulphate were interpreted from the groundwater samples obtained and deemed a potential risk to controlled waters. The potential for groundwater migration was considered to be minimal due to the perched nature of the groundwater bodies encountered and the presence of significant thicknesses of discontinuous clays.

The geology encountered throughout the geotechnical investigation comprised of Made Ground to a depth of 1.20mbgl, superficial deposits ranging from 0.20mbgl to 7.70mbgl, and bedrock of weathered mudstone ranging from 3.70mbgl to 8.00mbgl.

5.3.6 URS Former Re-Fuelling Depot, Verification Report (Nov 2014)

URS, Manchester Airport Former Re-Fuelling Depot, Verification Report. November 2014. Report Number: 47066850.

A verification report for the remediation of the historical Hangar 3 refuelling area.

A total of 5 USTs were removed, with associated pipework and saturated soils which were removed from the areas surrounding the tanks to a depth of 5mbgl. 20 No. soil samples were obtained from the excavation to verify that impacted soils had been delineated and successfully removed. The analysed verification samples reported concentrations of contaminants below the remediation target levels set for the project. The excavation was backfilled with engineered fill to a highway specification.

Impacted soils were noted to extend beneath the roadway to the southwest along the line of pipework, although determining the extent of the contamination was beyond the proposed scope, and it was therefore not removed as part of the remediation process. No significant thickness of LNAPL was identified during the investigation and as such the potential for migration of contamination within these soils post remediation was considered limited.

5.3.7 Brownfield Solutions Ltd HV Cable, Factual Environmental Report (May 2017)

Brownfield Solutions Ltd., Manchester Airport HV Cable, Factual Environmental Report. May 2017. Report Number: LC/C3450/6933.

A factual Environmental Investigation carried out by Brownfield Solutions Ltd. to determine the ground conditions for the installation of a high voltage electricity cable directly underneath the DNATA site. The investigation comprised of several window sample boreholes positioned on the periphery of the historic maintenance hangar, however samples taken were not screened against any specific criteria. The report indicated the potential presence of PAHs in borehole WS102A, located on the north west boundary of the site and Pinfold Lane. No other olfactory or gross contamination evidence was present.

Made Ground was encountered in all exploratory wells to a depth of 1.75m, comprised of macadam surfacing over limestone and brick subbase. Superficial geology was only encountered in WS101 and WS103, with bedrock encountered in WS103 at a depth of 1.05m. Perched groundwater was encountered within the Made Ground at a depth of 0.20m.

5.3.8 AECOM, Manchester Airport, Proposed DNATA Site: Geotechnical & Geo-environmental Technical Note on Ground Investigation (2019)

AECOM undertook a ground investigation and interpretive assessment which is summarised in the above titled report. The DNATA site is located to the south east of the site and ground conditions are expected to be similar. pertinent points are summarised below:

A ground investigation was undertaken at the historical Hangar site as requested by Manchester Airport Group. Three cable percussion boreholes were completed to final excavation depths of 11.85m bgl. Eight window sampling boreholes were excavated at depths ranging from 2.30m to 4.50m bgl. All of the twelve exploratory locations were hand dug to 1.2m bgl, excluding WS01, WS07 and BH03A due to perched water at shallow depths.

The proposed ground model comprises Made Ground over Glacial Clay, Glacial Sand and Mercia Mudstone. The weathered Mercia Mudstone is classified as Grade II. Made Ground is present locally to a maximum proven depth of 0.7m bgl at WS02. It is recommended that any Made Ground present is excavated and replaced with suitable granular fill to prevent differential settlement of this area in the long term. The foundations for structures must be taken to below any Made Ground present. The Mercia Mudstone was encountered between 3.2 and 7.0m bgl and proven to a maximum depth of 11.85m bgl.

The groundwater table has been assumed to lie at a depth of between 3.30m bgl and 3.77m bgl in the Glacial Clay with shallow perched groundwater also present at a depth of between 0.45m bgl and 1.96m bgl. Localised perched groundwater was also recorded at WS05. It is recommended that where encountered shallow groundwater should be drained or pumped off site during works and permeant drainage installed to manage the perched water. Local pumping may also be required to lower the water table close to excavations.

Visual olfactory evidence of contamination was identified whilst on site. This was solely at WS05, black staining was visible and hydrocarbon odours were identified. Based on the concentrations of contaminants reported from the soil, leachate and water samples collected from the site alongside the permeability of strata on site, the potential risks to human health and controlled waters are not considered to be unacceptable.

Both shallow and deep foundations are considered suitable, depending on the proposed structure and loading. Spread foundations are considered competent for lightly loaded structures founded on the firm to very stiff Glacial Clay. For heavily loaded structures, piles are acceptable, with combined friction and end bearing CFA piles socketed into the Mercia Mudstone the most satisfactory.

The pavement for the site will be founded on Glacial Clay. Following the guidance in IAN 73, CBR values of 3% and 4% were determined for thin and thick designs respectively. The value of 4% for thick construction is considered to be most appropriate for use on the airfield. For any Glacial Sand present, a CBR of 5% can be used for design. In-situ testing should be undertaken at pavement formation level to ensure subgrade is suitable for construction, if not further excavations should be undertaken until the founding stratum achieves the required bearing capacity. The levels should then be brought up to those required using compacted engineered fill.

6. Regulated Activities and Statutory Consultation

6.1 Introduction

The key relevant features that characterise the site and surrounding area are summarised in this section, along with an indication of the risk to the land quality of the site.

Information on groundwater and surface water abstractions is detailed in Section 3.3.4 and 3.4.2 and is not repeated here.

Generally, any regulated activities within 250 m of the site could, depending upon their nature, represent potential off-site sources of contamination. Whilst a 500 m search area was generally adopted this section places emphasis on those activities present within 250 m.

6.2 Regulated Processes

Table 6.1 summarises information on regulated processes contained in the Groundsure Report (Appendix B). The report collates data from a variety of sources including the Environment Agency (EA) and the British Geological Survey (BGS). All data suppliers are referenced in the report.

Reference to the Groundsure report indicates no records for the following within 500m of the site: Historical Licences Industrial Activities (IPCs), Licenced Industrial Part A Activities/Releases, Red List Pollutant Releases, Releases to Public Sewers, Pollution Incidents (EA/NRW), Pollution Inventory Substances, Pollution Inventory Waste Transfers, Regulated Explosive Sites, Radioactive substance authorisations, Pollution inventory radioactive waste, List 1 Dangerous Substances or List 2 Dangerous Substances.

Table 6.1 Summary of Regulatory Information

Subject	Details			Distance	Details
	On site	0-250m	250-500m		
Licenced Discharges to Controlled Waters	0	0	11	333m NE to 336m NE	Manchester Airport has held numerous licences for discharges to the River Bollin from the site drainage and containment system. These are all revoked.
				431m SE	The Romper PS Public House holds the other active consent for Sewage and trade combined discharge to the River Bollin.
				439m SE	Manchester Airport has held numerous licences for discharges to the River Bollin from the site drainage and containment system. These are all revoked.
Licensed Pollutant Release (Part A(2)/B)	0	1	2	208m SE	FIs Aerospace Ltd - Respraying of Road Vehicles (Historic)
				340m SE	Airline Services Limited, Hangar 4 Western Maintenance Area – Dry Cleaning (Historic)
				294m S	BP Airport City, BP Airport City SF Connect - Unloading of Storage Petrol into Storage at Service Stations (Current)
Control of Major Accident Hazards (COMAH)	0	1	0	214m SE	Air BP Limited current COMAH site – COMAH Lower Tier Operator
Hazardous Substance Storage/ usage	0	0	3	284m SE	2 entries: Air BP Ltd - Storage of Jet fuel A1
				322m E	Shell UK Ltd – Hazardous Substances Consent for Storage of Aviation AVGAS

Source: Groundsure Report

6.3 Licensed Waste Management Facilities

The Groundsure report provides details of waste facilities within 500m of the site based upon data from the Environment Agency, British Geological Survey, Ordnance Survey/ Groundsure records and mapping, and Local Authority records.

With reference to the above data the Groundsure report identified no recorded licensed waste management facilities or landfilling operations, past and present, within 500m of the site.

The report does identify nine waste exemptions 'Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit'.

One waste exemption was reported on-site held by BAM Construction for Use of Waste in Construction. This indicates that recycled material of unknown original could have been used in the construction of the site for instance as engineering fill.

Five other waste exemptions also were related to the use of waste in construction or wood cutting and pulverising in relation to construction works. The other three are related to Hale Depot/ Hale Motorway Maintenance Compound for storage of waste in secure containers and treatment of waste aerosol cans.

It should be noted that as part of the Project Quantum review of buildings associated with the airport, most of the of the buildings reviewed by their nature as commercial / industrial premises have some storage of potentially contaminative materials. The security of these storage facilities is monitored by the airport.

With reference to the historical data there have clearly been demolition and construction activities both in the vicinity of the site and onsite and therefore the presence of Made Ground should not be overlooked.

6.4 Industrial Land Use

The Groundsure Report collates data on potentially contaminative active and inactive industrial land uses, tanks, fuel station entries, Points of Interest, Gas Pipelines and Underground Electrical Cables within 500m of the site, that may have the potential to have caused contamination.

Various active and inactive entries for these land uses have been identified on or within the vicinity of the site. Table 6.2 summarises those entries that may have the potential to have caused contamination within a search radius of 250 m of the Site.

Table 6.2 Potentially Contaminative Industrial Land Use on and Within 250 m of the Site

Subject	Location	Details
Historic Industrial Land Uses	On-Site	Airport – 2no entries 1989, 1995
	Off-Site	72m SE Smithy 1938
		76m SE Smithy 1899-1910
		93m SE Airport 1953
		99m NW Wireless Station 1989
		116m SE Unspecified Commercial/ Industrial 1974
		153m W Unspecified Tank 1989
		198m E Airport 1967
Historic Tanks	On-Site	198m E Airport 1974-1975
		No Entries
	Off-Site	78m SE Unspecified Tank 1987-1995
		154m W Unspecified Tank 1987
		173m SE Unspecified Tank 1968-1987
		221m N Tanks 1995
Recent Industrial Land Uses	On-Site	222m N Tanks 1990-1991
		Electrical Sub Station – Electrical Features
	Off-Site	Alpha LSG – Aeroplanes (Catering)
		47m NW Mapcargo – Distribution and Haulage
		47m NW Air Menzies International – Distribution and Haulage
		50m N Evolution Logistics – Distribution and Haulage
		50m N E M S Cargo – Distribution and Haulage

Subject	Location	Details
		50m N Atlantic Pacific Global Logistics – Distribution and Logistics 50m N Air Sea Worldwide Airlines and Airline Services 50m N R & M Developments Ltd – Civil Engineers 50m N A Z Freight Services Ltd – Airlines and Airline Services 54m NW Tranzfast Logistica UK Ltd – Airlines and Airline Services 54m NW Red Head International – Distribution and Haulage 54m NW D B Schenker – Distribution and Haulage 55m N Future Forwarding – Distribution and Haulage 55m N Puma Cargo Ltd – Distribution and Haulage 55m N A I T Worldwide Logistics Ltd – Airlines and Airline Services 55m N C B I Global Freight Management – Distribution and Haulage 55m N Maurice Ward Group – Distribution and Haulage 82m NE Tank – Tanks (Generic) 85m NW Tanks – Tanks (Generic) 94m NE Air Canada – Distribution and Haulage 97m NE N N R Global Logistics – Distribution and Haulage 98m NE Davies Turner Plc – Distribution and Haulage 98m NE T Q Express – Airlines and Airline Services 98m NE Warme Heating Ltd – Industrial Repairs and Servicing 99m NE Electricity Sub Station – Electrical Features 99m NE Select Euro Transport – Distribution and Haulage 104m W Electrical Sub Station – Electrical Features 107m NE Vantec World Transport Manchester – Distribution and Haulage 115m W Electricity Sub Station – Electrical Features 128m N A F I – Airlines and Airline Services 131m W Masts (Telecommunication) – Telecommunications Features 138m N S O S Air Cargo Ltd – Distribution and Haulage 138m N Blacksmith Freight Services – Distribution and Haulage 138m N Fedex Trade Networks – Airlines and Airline Services 138m N Trilogy Freight – Distribution and Haulage 145m SW Electricity Sub Station – Electrical Features 161m W Tanks – Tanks (Generic) 178m SE Tank- Tanks (Generic) 181m NW Alpha LSG – Aeroplanes 189m SW Electricity Sub Station – Electrical Features 196m NE Singapore Airlines Cargo – Distribution and Haulage 196m NE Air Liaison – Airlines and Airline Services 196m NE Omni Airline Services – Distribution and Haulage 196m NE Globe Air Cargo – Airlines and Airline Services 196m NE Dunwoody Airline – Distribution and Haulage 196m NE Airline Cargo Management Ltd – Airlines and Airline Services 220m N Trilogy Freight – Distribution and Haulage 226m N Tank – Tanks (Generic) 229m NW Freightair Services – Airlines and Airline Services 229m NW Heritage International Freight – Distribution and Haulage 236m NE Electricity Sub Station – Electrical Features
	On-Site	No Entries
Historic Energy Features	Off-Site	43m SE Electricity Sub Station 1987 85m NE Electricity Sub Station 1987-1991 86m NE Electricity Sub Station 1995 234m NE Electricity Sub Station 1992 234m NE Electricity Sub Station 1987 239m E Electricity Sub Station 1987-1990 241m E Electricity Sub Station 1987-1996
	On-Site	No Entries

Subject	Location	Details
Fuel Station and Garage Entries	Off-Site	No Entries
Gas Pipelines* ¹	On-Site	No Entries
	Off-Site	No Entries
Underground Electrical Cables	On-Site	No Entries
	Off-Site	No Entries

6.5 Greystar UK Aviation Fuel Pipeline

While not identified in the Groundsure Report potentially due to sensitivity, it is known that the main pressurised fuel line to the airport is indicative to run adjacent to Pinfold Lane. Its extents are shown as per Appendix E.

6.6 Sensitive Land Uses

The Groundsure Report and Defra Magic Mapping identify adjacent sensitive land uses based upon factors such as Sites of Special Scientific Interest (SSSI), Environmentally Sensitive Areas, Areas of Outstanding Natural Beauty, World Heritage sites, Nature Reserves, National Parks, Nitrate Sensitivity Areas/Vulnerability Zones, and Special Protection Areas.

The Groundsure Sensitive Land Use Map and Magic Maps indicate that the site is not within an area of sensitive land use. However, the site is located within the area of four SSSI impact risk zones.

The nearest SSSI for which the site is in the impact risk zone is Cotterill Clough 426m south of the site.

The impact risk zone is described in the Groundsure Report as being '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.'

Due to the developed nature of this area and as the site is located within the airport and captured within its drainage system it is unlikely that there is notable potential for the development to impact upon the SSSI of Cotterill Clough.

No nitrate sensitive areas or nitrate vulnerable zones are located within 2km of the study site.

7. Preliminary Ground Model

Based on the review of published geological and hydro-geological information, the three historical borehole records available which have been reviewed, and the previous ground investigation data included in the ESG Factual Report; the ground conditions within the site are tentatively considered to comprise the following sequence presented in Table 8.1.

Table 7.1 Preliminary Ground Model

Geology			Groundwater	
Stratum	Typical Description	Anticipated Thickness of Strata (m)	Anticipated Depth of Strata	
Made Ground (Hard Standing)	Thin macadam or Concrete Hard Standing	Macadam c.0.1m Concrete c0.35m with potential for second deeper layer below.	Surface	n/a
Made Ground	Shallow Made Ground, predominantly hardcore fill or ashy gravels over Clay fill and reworked natural Clay.	c.1m	c. 0.15m bgl	Potential for perched groundwater within Made Ground.
Superficial Strata (Glacial Till)	Orangish brown and grey CLAY with some sand bands.	c.4.5m	c. 1m bgl	Groundwater encountered at 4mbgl at nearby boreholes at the DNATA site.
Bedrock (Bollin Mudstone Member)	Mudstones	From previous ground investigations to the SE of the site, it has been proven that the bedrock is relatively shallow at between c.3.5 mbgl to 7m bgl The full thickness of the Bollin Mudstone Member has not been proven.	c. 3.5 – 7m bgl	It is not anticipated that significant amounts of groundwater shall be encountered.

7.1 Groundwater

The borehole logs from the ESG Report identify perched groundwater at c. 1mbgl within the Made Ground at two of the four window samples. All four window samples identified groundwater at c. 4mbgl within the superficial deposits which ties in with the sand bands identified within one of the boreholes at this depth.

Wider ground investigations from the Hangar 3 and 5 sites identified laterally discontinuous sand bands within the superficial deposits some of which contained perched waters including where these overlay the bedrock.

7.2 Preliminary Ground Gas Risk Assessment

A review of the preliminary ground model has indicated that Made Ground is likely circa 1m in depth and predominantly comprising macadam/hardcore fill overlying reworked clay fill. Superficial deposits are indicated to be orangish brown and grey clay with some sandy bands (Glacial Till). As such the probability of encountering significant quantities of deleterious organic matter is Low. Therefore, it is thought that the site likely has a low gassing potential with respect to methane, carbon dioxide, carbon monoxide and hydrogen sulphide.

However, this assessment should be revisited following a ground investigation as the ground model is developed. Contamination may also exist with the potential to create vapours which may be a risk to human health/property.

8. Initial Conceptual Site Model

8.1 Introduction

This section is aimed at identifying possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. It is based on the proposed site redevelopment which will comprise a single warehouse with associated infrastructure as identified in Section 1.1.

8.2 Assessment Framework

The Site, in terms of potential land contamination, will be regulated by the Local Authority Manchester City Council under the Town and Country Planning Act 1990 (as amended), taking account of the National Planning Policy Framework 2019, with the Environment Agency, Natural England and English Heritage acting as potential statutory consultees.

Environmental liabilities can arise through provisions contained within statutory legislation including Part 2A of the EPA 1990, the Environmental Damage (Prevention and Remediation) Regulations 2009, the Water Resources Act 1991, the Groundwater Regulations 2009 and the Water Act 2003.

Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Statutory Guidance to Part 2A (2012) and Land Contamination: Risk Management (LCRM).

The “suitable for use” approach is adopted for the assessment of contaminated land where remedial measures are undertaken where unacceptable risks to human health or the environment are realised taking into account the use (or proposed use) of the land in question and the environmental setting. The proposed end-use for the Site is a commercial logistics development to comprise a warehouse with self-contained subunits, office space and hardstanding areas for parking and loading of HGVs.

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- **Source:** hazardous substance that has the potential to cause adverse impacts; and
- **Pathway:** route whereby a hazardous substance may come into contact with the receptor: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- **Receptor:** target that may be affected by contamination: examples include human occupants/ users of site, water resources (surface waters or groundwater), or structures.

For a risk to be present, there must be a relevant/ viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

The following sections details the ICSM which has been developed for the Site with a view to assessing the potential risks/ liabilities and constraints associated with the Site in its current condition prior to any proposed redevelopment. Risks associated with the proposed redevelopment have also been assessed based on a commercial future land use scenario, including any potential sources of contamination, potential receptors and potential contaminant pathways identified during this desk-based assessment.

8.3 Sources of Potential Contamination

8.3.1 On-Site

The historical mapping indicates the site to have been occupied by farmland with a footpath crossing the area. By 1954 (between 1938 and 1954) the majority of the site was occupied by areas of hardstanding areas associated with the Ringway Airport (Later Manchester Airport). These are assumed to be for taxiing and aircraft storage and operational during WW2.

The current Building 402 first appears on OS mapping during period 1992-1995 and expanded over the years to the present layout with associated hardstanding and infrastructure incorporated.

Building 402 is currently used by the company LSG Skycheffs for the storage and manufacture of airline foods. Other buildings in the area are known to use generators onsite. The Building 401 site adjacent is the former home to LSG Skycheffs and is now understood to be inactive but is thought to still contain refrigeration and air conditioning units. It should be noted that an electrical substation is present within the site boundary and a fuel tank is also present in the hardstanding carpark to the south of building 402.

Based on the above the following potential sources of contamination may be found at the proposed development site:

- *Made Ground associated with the development of Building 402 and associated infrastructure.*
- *Made Ground associated with the former aircraft standing areas.*
- *Current electrical substation onsite (potentially disused) and other electrical housing across site.*
- *Building 402 refrigeration and air-conditioning equipment.*
- *Building 402 potential generators onsite.*
- *Diesel fuel storage tanks above ground in car park south of Building 402.*
- *Potential spillage and leaks of fuels and oils from vehicles using hardstanding areas.*
- *Waste food oil trap in basement could leak, along with barrels containing waste food oil in caged area next to building awaiting disposal off-site.*
- *Corrosive chemical storage in boiler room.*

8.3.2 Off-Site

A review of the current and historical information indicates development off-site with the potential to act as sources of contamination effecting the site this including Building 401 immediately to the south east of the site with associated infrastructure which, includes an electrical substation. Other warehouse units with associated hardstanding areas and an associated above ground tank (although this is thought to be used for firewater) are located to the north west of the site. Former Hangars 3 and 5 are located in the current position of the DNATA building 150m to the south east of the site, beyond Building 401, Former Hangar 3 is known to have contained a refuelling depot which has historically leaked and undergone remediation to some extent; parking for the Cargo Centre to the north and Avro Way runoff. It should be noted however that Building 401 and Hangars 3 and 5 are thought to be down hydraulic gradient from the site. There may also have been leaks and spillages from the operation of the aviation fuel pipeline thought to be located beneath Pinfold Lane.

Based on the above the following potential sources of contamination may be found at the proposed development site:

- *Leaks and spillages of cooling oils from transformers in the electrical substation to the south east of the site associated with Building 401.*
- *Made Ground associated with the development of Building 401 and indeed the warehouse facilities to the NW.*
- *Made Ground associated with the former aircraft standing areas.*
- *Leaks and spillages from disused refrigeration and air-conditioning units in Building 401*
- *Diesel fuel storage in above ground tanks to the SE in the hardstanding area associated with Building 401 (MAG Bus Depot), along with AdBlue tanks.*

- *Spillages and leaks of fuels/ oils in MAG Bus Depot, the hardstanding areas associated with Building 401 and indeed the hardstanding areas associated with the warehouses to the NW of the site.*
- *Made Ground and hydrocarbon spills associated with the former Hangars 3 and 5, along with surrounding areas.*
- *Leaks and spillages of hydrocarbons from the aviation fuel pipeline toward Manchester Airport on Pinfold Lane*
- *Runoff of potential spills of fuels and oils from Avro Way.*
- *Contamination from storage of hazardous materials/ chemicals in the warehouses NW of the site.*
- *Above ground tank which is thought to contain diesel c.85m NW of the site.*

8.3.3 Summary of potential sources

With reference to the DoE Industry Profile including for Airports; Road vehicle fuelling, service and repair; Table 8.1 indicates the potential contaminants that may be associated with the current land use.

Table 8.1 Potential Sources of Contamination

Source Reference	Location	Potential Associated Contaminants of Potential Concern (CoPC) Sources
S1	On Site	Building 402 including associated chemical storage, grease storage, and diesel tank. Heavy metals, Total Petroleum Hydrocarbons (TPH), Semi-volatile Organic Compounds (VOCs), Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), phenols, sulphate, ammoniacal nitrogen, asbestos, asbestos containing materials (ACMs), Ground gases including carbon dioxide and methane. Electricals: polychlorinated biphenyl (PCB). Greases / cooking fats
S2	On Site	Former aircraft standing / taxing area Heavy metals, PAH, TPH (including aviation kerosene and gasoline, gas oil and diesel) SVOCs, VOCs, acids, alkalis, glycols (e.g. Antifreeze and de-icing agents), organic solvents, fire-fighting agents/foam forming products, washing agents, cleaners and lubricants, solvents (e.g. paints and thinners). Phosphoric acid, corrosion inhibitors, PCBs and ACMs Ground gases including carbon dioxide and methane.
S3	On Site	Electrical substation and electrical housings. Heavy metals, PCBs
S4	On Site	Hardstanding area for cars and HGVs. Heavy metals, organics, inorganics, PAH, TPH, SVOCs, VOCs, solvents, glycols (e.g. Anti-freeze), fuel additives (AdBlue) and detergents. Ground gases including carbon dioxide and methane.
S5	Off Site	Electrical Substation associated with Building 401 Heavy metals, PCBs
S6	Off Site	Made Ground – Building 401 including refrigeration and air-con units, and electrical generators Heavy metals, Total Petroleum Hydrocarbons (TPH), Semi-volatile Organic Compounds (VOCs), Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), phenols, sulphate, ammoniacal nitrogen, asbestos, asbestos containing materials (ACMs),

Source Reference	Location	Potential Sources	Associated Contaminants of Potential Concern (CoPC)
			Ground gases including carbon dioxide and methane. Electricals: polychlorinated biphenyl (PCB), Refrigeration and air-con: Organics, solvents, hydrocarbons (eg. Acrylonitrile.) Ground gases including carbon dioxide and methane.
S7	Off Site	MAG Bus depot including vehicle wash, and fuel and AdBlue storage tanks.	Heavy metals, organics, inorganics, PAH, TPH, SVOCs, VOCs, solvents, glycols (e.g. Anti-freeze), fuel additives (AdBlue) and detergents. Ground gases including carbon dioxide and methane.
S8	Off Site	Made ground associated with current and past land uses of the surrounding airport infrastructure including Hangar 5 and Hangar 3 inc refuelling depot and foul water pump.	Heavy metals, PAH, TPH (including aviation kerosene and gasoline, gas oil and diesel) SVOCs, VOCs, acids, alkalis, glycols (e.g. Antifreeze and de-icing agents), organic solvents, fire-fighting agents, washing agents, cleaners and lubricants, solvents (e.g. paints and thinners). Phosphoric acid, corrosion inhibitors, PCBs, and ACMs. Ground gases including carbon dioxide and methane.
S9	Off Site	Made Ground below warehouses NW of site and associated diesel tanks, chemical storage and generators	Heavy metals, Total Petroleum Hydrocarbons (TPH), Semi-volatile Organic Compounds (VOCs), Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), phenols, sulphate, ammoniacal nitrogen, asbestos, asbestos containing materials (ACMs), Ground gases including carbon dioxide and methane. Electricals: polychlorinated biphenyl (PCB),
S10	Off Site	Leaks and spillages from the operation of the aviation fuel pipeline on Pinfold Lane.	Total Petroleum Hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs)

8.4 Potential Receptors

8.4.1 On-Site Receptors

Potential on-site receptors have been identified as follows:

Human Health

- Future construction and maintenance workers⁴
- Future site visitors
- Future site users (commercial)

Water Environment

⁴ This report and the preliminary risk assessment included does not consider acute linkages for construction and maintenance workers. AECOM anticipates that these acute linkages will be managed by appropriate health and safety measures.

- Shallow aquifer within the superficial Glacial Till deposits is classified as a Secondary Undifferentiated aquifer.
- The deep aquifer within the Bollin Mudstone Member is classified as a Secondary B aquifer.

Buildings & Infrastructure

- Concrete foundations
- Building structures
- Underground services
- Gas/ damp membranes

8.4.2 Off-Site Receptors

Potential off-site receptors have been identified as follows:

Human Health

- Adjacent site users (commercial)

Water Environment

- The shallow aquifer within the superficial Glacial Till deposits is classified as a Secondary Undifferentiated aquifer.
- The deep aquifer within the Bollin Mudstone Member is classified as a Secondary B aquifer.
- The nearest surface water feature, Cotteril Clough Brook, located c.350m SE of the site.

8.4.3 Summary of Potential Receptors

Potential receptors associated with the potential development are shown on Table 9.2:

Table 8.2 Potential Receptors

Receptor Reference	Receptor	Description
R1	Human Health: Acute	Future site users – Site visitors.
R2	Human Health: Chronic	Future site users – workers at the site.
R3	Human Health: Acute	Adjacent site users – workers and road users (During construction phase).
R4	Water Environment: Superficial Aquifer	Secondary Undifferentiated Aquifer in the Superficial Glacial Till.
R5	Water Environment: Bedrock Aquifer	Secondary B Aquifer in the Bollin Mudstone Member .
R6	Water Environment: Surface waters	Cotteril Clough Brook 350m SE of the site.
R7	Flora	Plants, trees, and landscaping.
R8	Buildings & Infrastructure: Concrete	Future proposed foundations and services at the site may be impacted by contamination in the ground. Concrete foundations can be corroded if perched groundwaters or leachates have high sulphate levels and/ or acidity.
R9	Buildings & Infrastructure: Structures	Proposed structures may be impacted by accumulation of ground gases.
R10	Buildings & Infrastructure: Services	Potable water supply pipes and other service may be impacted by contamination in the ground. Toxic and corrosive contaminants can migrate through water supply pipes.
R11	Buildings & Infrastructure: Gas/ damp membranes	Potential for hydrocarbons in soils and ground waters may deteriorate membranes.

8.5 Potential Pathways

8.5.1 On-Site Pathways

On-site pathways include direct contact, ingestion and dermal absorption of soil and inhalation of soil particles and soil vapour derived from soils, spillage / loss and run off from surface of site, leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater, lateral migration of impacted shallow groundwater to surface water features off-site, vertical migration of shallow impacted groundwater to deeper groundwater, direct contact of buried concrete, services and pipes with contaminated soils and the migration of hazardous gases and chemicals via permeable strata.

8.5.2 Off-Site Pathways

Off-site pathways include migration and leaching of hazardous gases and chemicals via permeable unsaturated strata, contact with shallow impacted groundwater travelling horizontally offsite, migration of CoPC via underground drainage/ sewers (including granular backfilling materials) and spillage/loss/runoff.

8.5.3 Summary of Potential Pathways

Potential pathways associated with the proposed development are shown in Table 9.3:

Table 8.3 Potential Pathways

Pathway Reference	Receptor	Description
P1	Human Health	Direct Pathway: Direct contact, dermal absorption, or ingestion of soil/groundwater.
P2	Human Health	Indirect Pathway: Inhalation of soil particulates derived from soils.
P3	Human Health	Indirect Pathway: Inhalation of soil vapour derived from soils or groundwater
P4	Human Health	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion)
P5	Water Environment: Groundwater	Indirect Pathway: Leaching of chemicals and vertical / lateral migration via permeable unsaturated strata to shallow and/ or deep groundwater
P6	Water Environment: Groundwater	Indirect Pathway: Vertical migration of impacted shallow groundwater to the deeper Secondary B aquifer.
P7	Water Environment: Groundwater/ surface water	Indirect Pathway: Lateral migration of impacted groundwater to off-site surface water.
P8	Water environment: Surface water	Indirect pathway: Migration via underground drainage / sewers (including granular backfilling materials), spillage / loss / run-off from the surface direct to receiving water.
P9	Buildings & Infrastructure: Concrete	Direct Pathway: Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate).
P10	Buildings & Infrastructure: Supply pipes	Direct Pathway: Direct contact of services and supply pipes with contaminated soils.
P11	Buildings & Infrastructure: Structures	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches.
P12	Buildings & Infrastructure: Gas/ damp membranes	Indirect Pathway: Potential for hydrocarbons in soils and ground waters may deteriorate membranes.
P13	Ecosystems: Flora.	Direct pathway: Direct contact with contaminated soils.

9. Preliminary Contaminated Land Risk Assessment

9.1 Risk Assessment Principles

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on LCRM.

For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessments of risks associated with each of these contaminant linkages are discussed in the following sections.

Using criteria broadly based on those presented in the National House Building Council/Environment Agency/Chartered Institute of Environmental Health publication R&D 66 (NHBC/EA/CIEH, 2008), the magnitude of the risk associated with potential contamination at the Site has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity);
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table 10.1.

9.2 Risk Assessment Framework

Table 9.1 Description of Severity of Risk

Term	Description
Severe	– Highly elevated concentrations likely to result in significant harm to human health. – Catastrophic damage to crops, buildings or property (e.g. by explosion). – Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects of water quality. – Major damage to aquatic or other ecosystems.
Medium	– Elevated concentrations which could result in significant harm to human health. – Significant damage to crops, buildings or property (e.g. damage to building rendering it unsafe). – Equivalent to EA Category 2 pollution incident including significant effect on water quality. – Significant damage to aquatic or other ecosystems.
Mild	– Exposure to human health unlikely to lead to significant harm. – Minor damage to crops, buildings or property (e.g. surface spalling to concrete). – Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality. – Minor or short-lived damage to aquatic or other ecosystems.
Minor	– No measurable effect on humans. – Repairable effects of damage to buildings, structures and services. – Equivalent to insubstantial pollution incident with no observed effect on water quality of ecosystems.

The probability of the risk occurring is classified according to the criteria in Table 10.2.

Table 9.2 Likelihood of Risk Occurrence

Likelihood	Explanation
High	Contaminant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 10.3.

Table 9.3 Risk based on Comparison of Likelihood and Severity

		Severity			
Likelihood		SEVERE	MEDIUM	MILD	MINOR
	HIGH	Very High	High	Moderate	Low
	LIKELY	High	Moderate	Moderate/Low	Low
	LOW	Moderate	Moderate/Low	Low	Very Low
	UNLIKELY	Moderate/Low	Low	Very Low	Very Low

9.3 LCRM Assessment of Risk

In 2019, the UK government issued new guidance on the evaluation and management of contaminated land, *Land Contamination: Risk Management*. Current contaminated land guidance in LCRM (2021) categorises risk at Stage 1 Tier 1 (i.e. PRA) as follows:

- Acceptable;
- Unacceptable.

However, no framework for assessing the risk has been published to accompany the guidance, so the CIEH & NHBC R&D 66 assessment framework constitutes best practice in this regard. To align the risk rankings in Section 10.2 with the LCRM rankings and with the Part 2A definitions, the following matrix has been utilised. This conversion is demonstrated in Table 10.4 below:

Table 9.4 Conversion to LCRM Risk Categories

	Acceptable	Unacceptable
Very Low		
Low		
Moderate/Low		
Moderate*		
High		
Very High		

* This risk category spans both acceptable and unacceptable. This is intentional as it is this risk band that tends to have the greatest level of uncertainty associated with it. Acceptability will be dependent on site-specific circumstances and level of confidence in the available evidence.

For a risk to be unacceptable, the contaminant linkage should be associated with at least a “medium” severity as defined in Table A4.3 in Annex 4 of R&D66 and the probability should (in the majority of cases) be at least “likely” as defined in Table A4.4 of R&D66.

These risk categories represent the level of risk as it is currently understood from the information available at this time.

9.4 Preliminary Risk Assessment

An ICM illustrating plausible contaminant linkages has been formulated for this site. The qualitative preliminary risk assessment of the possible linkages of the above sources (S1 to S9), transport pathways (P1 to P11) and receptors (R1 to R12) are provided in Table 10.5.

The level of risk is determined based on the current condition of the Site (i.e. the effects of mitigation measures are not included).

The preliminary risk assessment undertaken within this section does not consider acute linkages for construction and maintenance workers. AECOM anticipates that these acute linkages will be managed by appropriate health and safety measures.

Table 9.5 Potential Sources, Pathways and Receptors

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Potential Risk (LCRM)	Linkage Reference	Justification
On-Site sources of CoPCs Made Ground and potential contaminants associated with Building 402, former aircraft standings, electrical substation , diesel tanks, chemical storage, grease storage and parking. (S1, S2, S3, S4)	Direct contact, dermal absorption, or ingestion of soil/groundwater (P1) Indirect Pathway: Inhalation of soil particulates derived from soils (P2)	Human Health: Acute: Future site visitors (R1)	Medium	Low Likelihood	Moderate/Low Risk	Acceptable	L1	The site is currently occupied by Building 402 which is used for the storage and manufacture of food, with associated hardstanding areas for parking. The majority of the site is covered in hardstanding areas or buildings. Based on the current site use and the proposed development it is unlikely in its current or future state to allow dermal contact with, or ingestion of, CoPCs within the soils except in areas of soft landscaping. The risk of dermal contact and ingestion shall be greatest during the construction phase. As with all construction works the Principal Contractor will need to comply with the CDM 2015 regulations and, therefore, the workforce should be appropriately protected from exposure to potential contaminants during construction.
		Human Health: Chronic: Future site users (R2)						
	Inhalation of Soil/Groundwater Vapour (P3)	Adjacent site users – workers and road users (During construction phase) (R3)	Medium	Unlikely	Low Risk	Acceptable	L2	See L1 – For adjacent site users the risk of dermal contact and ingestion of wind-blown soils shall be greatest during the construction phase. As with all construction works the Principal Contractor will need to comply with the CDM 2015 regulations and, therefore, the workforce should be appropriately protected from exposure to potential contaminants during construction. This should include damping down and dust suppression during earthworks.
		Human Health: Acute: Future site visitors (R1)	Medium	Unlikely	Low Risk	Acceptable	L3	Land uses have been identified which have the potential to leave volatile compounds in ground. Vapours make leak into current and future buildings through hardstanding.
		Human Health: Chronic: Future site users (R2)						
		Adjacent site users – workers and road users (During construction phase) (R3)	Mild	Unlikely	Very Low Risk	Acceptable	L4	As per L3 there may be releases of vapours during construction, however the distance between receptor and the source reduces the assessed severity.
	Migration of hazardous gases/vapours into confined spaces (Human Health) (P4)	Human Health: Acute: Future site visitors (R1)	Medium	Unlikely	Low Risk	Acceptable	L5	The preliminary ground gas risk assessment has assumed a low gassing potential for the site. pragmatic approach with robust site data available. As the site is proposed to be one large warehouse, split into four large units, with regular ventilation from regular use of access doors, the potential for gas build up in the main warehouse floor areas would be relatively limited however the building will include confined spaces and service ducts, offices and other areas where the accumulation of hazardous gases and vapours would be more likely but still considered to be low.
		Human Health: Chronic: Future site users (R2)						
	Leaching of chemicals and vertical / lateral migration via permeable unsaturated strata to shallow groundwater (P5)	Buildings & Infrastructure: Structures, Services & Membranes (R9, R10, R11)	Medium	Unlikely	Low Risk	Acceptable	L6	See L4: The potential for the accumulation of hazardous gases within confined spaces within the buildings and infrastructure have the potential to develop a risk of explosion. This given the assumed gassing potential is considered unlikely to occur and only of medium severity.
		Shallow groundwater – Secondary un-differentiated Aquifer (R3)						
	Leaching of chemicals and vertical / lateral migration via permeable unsaturated strata to shallow groundwater (P5)	Shallow groundwater – Secondary un-differentiated Aquifer (R3)	Medium	Low Likelihood	Moderate/Low Risk	Acceptable	L7	It is anticipated that potential CoPCs may be present on-site associated with the potential sources identified within the iCSM. These CoPCs are considered to have the potential to leach to sub strata. The limited ground investigation data available adjacent to the site identified a variably granular / cohesive Made Ground to c.1mbgl over a predominantly cohesive glacial till. The till is identified as orangish brown and grey firm to stiff Clay, however shallow sand bands are noted c.3.5-4.0mbgl. The wider ground investigations from previous reports are known to identify more extensive sand bands both shallower and deeper than those identified adjacent to the site. These are understood to be laterally discontinuous over larger areas.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Potential Risk (LCRM)	Linkage Reference	Justification
								Seepage and limited groundwater strikes were identified c.1mbgl at the base of the Made Ground. Further groundwater strikes were identified at all four ESG window samples at c.4.0mbgl coinciding with the deeper sand bands. While the superficial deposits are predominantly cohesive the presence of sand bands known to be more extensive in the wider area, and shallow perched groundwaters, it is considered possible (although of low likelihood) that vertical migration of contaminants could occur between the Made Ground, shallow natural soils and into the shallow aquifer.
	Vertical migration of impacted shallow groundwater to the deeper secondary B aquifer (P6)	Deep Groundwater Secondary B aquifer of the Bollin Mudstone Member (R4)	Medium	Low Likelihood	Moderate/Low Risk	Acceptable	L9	See L7: While the ground investigation adjacent to site has not identified bedrock, it is understood to comprise weathered mudstones over more competent mudstone bedrock. The underlying bedrock is noted to be of 'low permeability with migration of water only taking place along 'fractures or granular lenses'. While it is possible that granular lenses are present in the bedrock which may be in contact with granular lenses within the superficial deposits; the predominantly cohesive nature of the two strata are considered likely to inhibit vertical migration to the underlying aquifer.
	Lateral migration of impacted groundwater off-site to surface water (P7)	Surface Waters, Cotteril Clough (R5)	Medium	Unlikely	Low Risk	Acceptable	L10	It is possible that there could be lateral migration of contaminated ground water with potential impacts to off-site surface waters including Cotteril Clough Brook c. 350m SE. However, it is acknowledged that the superficial deposits underlying the site are predominantly cohesive clays with lower permeability and as such the potential for migration over this distance would be limited. It is possible however, should more extensive sand bands be present on site, that there could be an increased risk for migration.
	Lateral migration of surface waters / shallow ground waters via underground drainage / sewers (including granular backfilling materials), spillage / loss / run-off from the surface direct to surface water (P8)	Surface Waters, Cotteril Clough (R5)	Medium	Unlikely	Low Risk	Acceptable	L11	It is considered unlikely that there should be lateral migration of contaminated surface and shallow groundwater via existing services and runoff with potential impacts to off-site surface waters including Cotterill Clough 350m SE. The site is located within the Manchester Airport drainage system. Waters going to drains are monitored as part of the airports environmental procedures and treated if required before being released to surface water.
	Direct contact of buried concrete with contaminated soils (P9) Direct contact of services and supply pipes with contaminated soils (P10) Indirect Pathway: Potential for hydrocarbons in soils and ground waters may deteriorate membranes (P12)	Buildings & Infrastructure: Structures, Concrete, Services and Gas Membranes (R8, R9 R10, R11)	Mild	Low Likelihood	Low Risk	Acceptable	L12	Due to the potentially contaminative land uses over the course of the site's development history, it is possible for buried concrete and services and supply pipes associated with the development to come into contact with contaminants such as sulphate and hydrocarbons. Aggressive ground conditions can pose a risk to underground structures, services, and concrete foundations.
	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches (P11)	Buildings & Infrastructures (Structures and services (R9, R10)	Medium	Unlikely	Low Risk	Acceptable	L13	See L6
	P13 – Direct contact with contaminated soils	R7 – Flora & fauna	Mild	Low	Low Risk	Acceptable	L14	Contaminants may be present onsite which may present a risk to ecological receptors such as flora or fauna. However, the proposed development is understood to include only limited soft landscaping and as such the risk is considered Low. It is recommended that for landscaped areas a suitable growing medium is utilised either imported or site won. Environmental chemical analysis of site soils as part of an intrusive ground investigation could support the use of site won materials should this be required.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Potential Risk (LCRM)	Linkage Reference	Justification
Off-Site sources of CoPCs Made Ground and contamination associated with current and historic surrounding land uses, including Building 401, associated substation, and MAG Bus depot including vehicle wash, and fuel and AdBlue storage tanks. Warehouses to the NW with associated chemical storage and diesel tanks and the wider airport infrastructure including Hangar 3 and 5. (S5,S6,S7,S8,S9,S10)	Direct contact, dermal absorption, or ingestion of soil/groundwater (P1)	Human Health: Acute: Future site visitors (R1)	Medium	Unlikely	Low Risk	Acceptable	L15	There is the potential for CoPCs to be present within near surface Made Ground and contaminated shallow soils and groundwater if the CoPCs were to migrate onsite and contaminate site materials. As with L1: Due to the site and wider area being predominantly commercial/ industrial in use with limited landscaping or bare soils, the likelihood of direct contact is considered unlikely, and the risk is considered low. This would potentially differ should future development works be undertaken on the surrounding sites. However, as with all construction works the Principal Contractor will need to comply with the CDM 2015 regulations and, therefore, the workforce should be appropriately protected from exposure to potential contaminant during construction and mitigation measures be in place for off site migrations of wind-blown materials.
	Indirect Pathway: Inhalation of soil particulates/vapours derived from soils/groundwater (P2)	Human Health: Chronic: Future site users (R2)						
	Migration of hazardous gases/vapours into confined spaces (P4)	Human Health: Chronic: Future site users (R2)	Medium	Unlikely	Low Risk	Acceptable	L16	There is the potential for hazardous gases / vapours to migrate onsite from the sources identified offsite. However due to the assumed low permeability of the glacial till, migration of gases and vapours is assumed to be attenuated. Therefore it is considered to be Low Risk.
		Buildings & Infrastructure: Structures, Services & Membranes (R9, R10, R11)	Medium	Unlikely	Low Risk	Acceptable	L17	
	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches (P11)	Buildings & Infrastructures (Structures and services (R9, R10)	Medium	Unlikely	Low Risk	Acceptable		
	Leaching of chemicals and vertical / lateral migration via permeable unsaturated strata to shallow and/ or deep groundwater (P5)	Secondary Undifferentiated Aquifer in superficial Glacial Till (R3)	Medium	Low	Moderate/Low Risk	Acceptable	L19	There is the potential for CoPCs derived from off-site sources to migrate onsite within groundwater laterally and then vertical into deeper groundwater. Whilst it is more probable for migration of contaminants from more proximal sources such as the storage tank at Building 401, aviation fuel pipe on Pinfold Lane or the warehouses to the north west, low permeability of the strata means that overall the likelihood of this occurring is considered to be low. PCBs associated with the electrical substation to the south east of the site may be present onsite due to the proximity to the boundary. But the likelihood is also considered low due to the low mobility of PCBs .
	Vertical migration of impacted shallow groundwater to the deeper secondary B aquifer (P6)	Deep Groundwater Secondary B aquifer of the Bollin Mudstone Member (R4)						

9.5 Discussion of Acute Risk to Future Construction Workers & Off-Site Receptors.

AECOM understands that the proposed development works will be undertaken in compliance with Construction Design and Management (CDM) 2015 regulations.

Prior to work commencing, a health and safety risk assessment should be carried out by the appointed Principal Contractor / developed in accordance with current health and safety regulations. This assessment should cover potential risks to construction staff, permanent site staff and the local population. Based on the findings of this risk assessment, appropriate mitigation measures should be implemented during the construction period.

The greatest potential for generation of dust will be during the Site works and therefore dust generation should be kept to a minimum in accordance with general best practice, as outlined in, for example, 'Environmental Good Practice on Site', CIRIA Publication C692 to reduce this risk.

The risk to construction workers during the excavation and construction phases in terms of potential exposure to high concentrations of contaminants is considered to be low given the historic and current land uses identified at the Site. Should gross contamination be identified during the construction phase, then this may pose a potential acute risk to construction works. In addition, due to the age of the building present onsite it is possible that asbestos or ACM may be present onsite which poses its own acute risks. It is likely to be able to be effectively managed through good health and safety practices and protocols. Adoption of appropriate dust suppression techniques would also mitigate the degree of potential particulate migration off-site.

10. Waste Management & Potential Reuse of Site-Won Material

10.1 Initial Assessment of Probable Waste Generation

Based upon the proposed redevelopment, it is probable that general construction and soil waste will be generated for the site as part of the development.

10.2 Initial Assessment of Probable Material Available for Reuse

Based on the proposed redevelopment, the earthworks design would likely include cut and fill works, cut / fill balance, and an investigation of the potential for the re-use of site won materials during the earthworks.

10.3 Outline Recommendations

It would be prudent to undertake a hazardous waste assessment on samples collected during any future ground investigations, to determine the classification of soils for any off-site disposal and to determine the chemical suitability of soils for consideration for re-use as site won materials. This initial assessment could support the determination of costings for disposal of site generated soils if they are unsuitable for use.

11. Review of Geotechnical Risk and Preliminary Engineering Assessment

11.1 Geotechnical Risk

A preliminary geotechnical risk register is given in Appendix F which describes the main ground related hazards on the site (excluding ground contamination) and mitigation measures which may be implemented to eliminate or reduce the risk by means of further investigation or during the design.

11.1.1 The most significant risks are:

1. Former foundations and voids associated with former developments may have implications for surface/foundation stability and settlement, especially under increased loading from structures or earthworks.
2. Any existing Made Ground is unlikely to provide a suitable founding stratum for structural foundations and potentially unsuitable for pavement. Although ground investigation will be required to confirm this. The extent and characteristics of the Made Ground should be investigated most notably beneath the current structures.
3. While the current limited ground investigation data and Groundsure Report identified firm to stiff shallow natural strata and negligible compressibility of underlying strata; should the presence of weak and compressible soils be identified onsite these may pose a risk of excessive total or differential settlement of foundations.
4. Where ground may be required to be re-graded, the material will require classification for re-use. Glacial Till is a highly variable material and will need classification for re-use.
5. While the site is broadly level and it is anticipated that the proposed development would not require notable slopes or embankments, should these be required slope stability of embankments and cuttings should be assessed. The long-term settlement of raised areas should be assessed, if excessive total and differential settlement are a concern for the proposed area of the scheme.
6. High, perched or variable ground water levels may impact earthworks, causing instability in excavations, cuttings, and temporary works. The current limited ground investigation onsite has identified perched groundwater within Made Ground and the superficial deposits.
7. Unknown/ unrecorded buried structures are a risk. It is known that a partial sub-basement is beneath Building 402.
8. Potential obstructions to piling or drilling from boulders in the Glacial Till, previous underground structures , foundations, buried former runway or variable rock head level and into variable properties of rock.
9. Striking underground services during ground investigation or construction.
10. Chemically aggressive ground conditions.

11.1.2 To mitigate these risks, it is recommended that:

1. A thorough ground investigation is carried out including a more extensive UXO survey for the scheme and in areas where buildings are proposed. Dependent upon the nature of the foundations and potential for basements, it may be prudent to undertake the investigations post demolition of the above ground structures at the site.
2. The extent of, and potentially highly variable thickness of, Made Ground, weak and compressible materials or soils, should be assessed during a ground investigation and foundations should be placed on a suitable bearing stratum below any Made Ground or weak and compressible soil. It may require excavation and replacement, or treatment for new hardstanding areas.
3. The ground conditions should be characterised below structures by a ground investigation. A variety of foundations may be required to support the design loads including shallow spread, with or without soft ground replacement with engineered fill, and deep piles.
4. For pavement design, the proposed sub-grade level for access roads/car parks should be confirmed prior to construction. Any soft ground or unsuitable materials should be excavated out and replaced with engineering fill, before starting any pavement construction works.
5. Where ground is to be regraded, testing should be carried to assess its suitability for reuse.

6. An investigation into the groundwater levels including seasonal variation is recommended prior to commencement of any detailed earthworks or foundation design.
7. Slope stability assessment should be undertaken for detailed earthworks design. The long-term settlement of raised areas should be assessed, if excessive total and differential settlement are a concern for the proposed area of the scheme.
8. Establish site procedures to be undertaken in the event underground services are encountered, including risk assessment and method statement. Ensure any existing services are identified and fully traced prior to commencement of GI and construction works.
9. Ground investigation for the proposed site extents and any likely structure locations to reduce risk of potential obstructions.
10. Carrying out PAS128 surveys and using cable avoidance tools prior to breaking ground. Obtain and assess up to date service and utility plans for the site. Dig a hand-dug pit to 1.2mbgl, using insulated hand tools, prior to drilling.
11. Chemical testing of soil to BRE requirements to support selection of underground materials.

11.2 Preliminary Engineering Assessment

11.2.1 Foundations

Subject to the findings of a ground investigation and detailed design, for lightly loaded structures with little concern for excessive total and differential settlement, the underlying firm to stiff Glacial deposits may be suitable for the use of shallow spread foundations, founded within this formation. Although, some softer more compressible Glacial Till may be present at shallower depths. Therefore, if this is encountered shallow foundations could still be an option, following the excavation of such 'soft spots' and replacement with suitable compacted engineered fill, providing a suitable founding material. However, if extensive 'soft spot' treatment is required, this may not be viable, and consideration may have to be given to alternative solutions.

The bearing resistance of foundation stratum and indeed engineered fill, and the settlement tolerance of the proposed structures will need to be considered at detailed design for the suitability of any shallow spread foundations. In general, foundations should be located within natural ground beneath any fill, Made Ground, highly compressible soil, and below the depth of effect of variations due to vegetation, seasonal and climatic change. As mentioned earlier, depending on the depth to suitable bearing strata and the viability of excavation and 'soft spot' replacement with engineered fill, piled foundations may be considered.

Piled foundations may need consideration for more heavily loaded structures and for economical and construction reasons as mentioned above, along with practicality. Although, piles may encounter boulders with the Glacial Till, obstruction from underground structures/ foundations, obstructions included in the Made Ground such as reinforced concrete and variable rock head level, these should be taken into consideration.

For light to moderate loads, the ground conditions are expected to be suitable for the use of traditional shallow spread foundations founded within the superficial formation. Piled foundations may be considered for structures located in close proximity to existing trees or for more heavily loaded structures. It should be noted that piled foundations could provide a preferential pathway for perched water to enter the Mudstone aquifer.

Where structures are located within influencing distance of any existing or future trees, reference should be made to Chapter 4.2 of NHBC's Standards.

11.2.2 Ground Floor Slabs

The potential use of ground bearing floor slabs would be determined following the ground investigation. In principal footings should be taken below the Made Ground if it is to remain partially insitu and at least 0.1m into the underlying natural stratum if it is deemed suitable.

11.2.3 Excavations

Where excavations for foundations, earthworks, and drainage and are required, stability of excavated areas should be considered. Close or continuous support will be required for any manned entry to excavations.

Shallow groundwater may be encountered and may require groundwater control during excavation. Detailed information regarding the groundwater regime will be available following the ground investigation and subsequent monitoring.

11.2.4 Soakaways and Infiltration Drainage

The ground conditions are unlikely to be suitable for the use of soakaways, where cohesive Glacial Till or cohesive materials are present, due to their low permeability. The suitability of the geological strata for infiltration drainage solutions could be confirmed via ground investigation. It is probable however that rainwater drainage will be required to be stored for later use, attenuated in tanks or sealed water features for later use or discharged to sewers/drains.

12. Conclusions

The following is a summary of the review of the information sources listed in Section 1.3:

The site is located at 402 Avro Way, Manchester (M90 5AF), approximately 100m northwest of the junction of Avro Way and Pinfold Lane and is centred on National Grid Reference 380839 384912 and covers an area of approximately 1.9 hectares.

- The superficial strata are indicated to comprise cohesive Glacial Till comprising clays with sand bands. The bedrock is of the Bollin Mudstone Member and is anticipated to comprise weathered mudstones over more competent mudstone with depth. The superficial strata are anticipated to be relatively thin with the bedrock anticipated at c.4.5m – 7.5mbgl based upon wider historic ground investigations.
- Made Ground is anticipated on site based on current and historical land use at the site including: Hardstanding areas for taxing aircraft, Building 402 was constructed by 1995 expanding over a few years. Additionally, Made Ground was identified in ground investigations adjacent to the site.
- The superficial deposits are noted as a secondary undifferentiated aquifer and the bedrock a secondary B aquifer. Groundwater was identified in the limited ground investigations around the site, to be present perched within the Made Ground and Superficial Glacial Till associated with granular sand lenses.

12.1 Geo-environmental Risks Review

Onsite potential sources of contamination have been identified through this desk study review including:

- Potentially contaminated Made Ground and shallow natural soils and groundwater associated with past and current land use/development;
- Ground gases: methane and carbon dioxide generated from Made Ground and naturally occurring strata;
- Soil vapours: volatile organic compounds may be present emanating from soil/groundwater sources of
- Asbestos associated with Made Ground and the current structures;
- Potential presence of UXO

Offsite sources of contamination have also been identified and include:

- Potentially contaminated groundwater associated with current and historical land use and development;
- Ground gases and soil/groundwater vapours migrating from offsite sources.

12.2 Geotechnical Risks and issues

Potential geotechnical hazards identified include:

- Any existing Made Ground is unlikely to provide a suitable founding stratum for structural foundations and potentially unsuitable for pavement. Made Ground is likely in most areas of the site based on nearby intrusive investigations and site current/past use. The extent and characteristics of the Made Ground will need to be investigated further, notably within the footprint of the current Building 402 and across the footprint of the proposed building;
- Potentially unsuitable ground for pavement construction;
- High, perched, or variable ground water levels which may impact earthworks, causing instability in excavations, cuttings and temporary works;
- Potential obstructions to piling or drilling from boulders in the Glacial Till deposits, previous underground structures or foundations;
- Striking underground services/utilities during intrusive investigations or construction;
- Chemically aggressive ground conditions;
- Soil shrink and swell with associated effects on pavements and/or foundations from any trees retained or removed as part of landscaping within the proposed development; and

- Glacial Till may be unsuitable as a bearing stratum for foundations if loads are high and the firm clay doesn't provide the suitable bearing capacity.

13. Recommendations

Once the layout and nature of the development are finalised a ground investigation should be undertaken in order to inform the detailed design of the development.

The geo-environmental investigation should be designed with due consideration of the requirements of BS 10175:2017.

The geotechnical elements of the investigation should be designed with consideration of BS EN 1997-1:2004, BS EN 1997-2:2007 (Eurocode 7: Geotechnical Design – Parts 1 and 2) and BS 5930:1999.

In summary, key objectives to be addressed by the investigation include:

- Confirmation of the ground (and groundwater) conditions and validation of the CSM;
- Chemical status of Made Ground and natural soils for the purpose of risk assessment to human health, groundwater and for preliminary waste classification;
- Chemical status of groundwater in order to determine risks to controlled waters;
- Ground gas monitoring to determine the potential risks to the proposed development and surrounding properties;
- Identification of geotechnical design parameters for earthworks and preliminary foundation design, including a BRE assessment; and
- Confirmation of infiltration characteristics.

By undertaking an intrusive ground investigation, an assessment of the ground and groundwater profiles may be carried out and the geotechnical and geo-environmental risks associated with the site made. This will allow a refined risk assessment and CM to be developed in accordance with LCRM methodology. The investigation will allow a quantitative assessment as to whether any of the potential risks identified in this study are present and are of material concern to the development.

Due to the location of the site within the wider operating areas of the airport during WWII and its use as aeroplane standing, it is recommended that the Client commissions a specialist UXO report in advance of any future intrusive site works or development. The report should be prepared with cognisance of CIRIA publication C681 (Stone et al., 2009). In addition, it is considered likely that the former aeroplane hard standing is still present in some area of the site below the current level, and as such any proposed ground investigation should take into account the potential for two thicknesses of overlying hard standing.

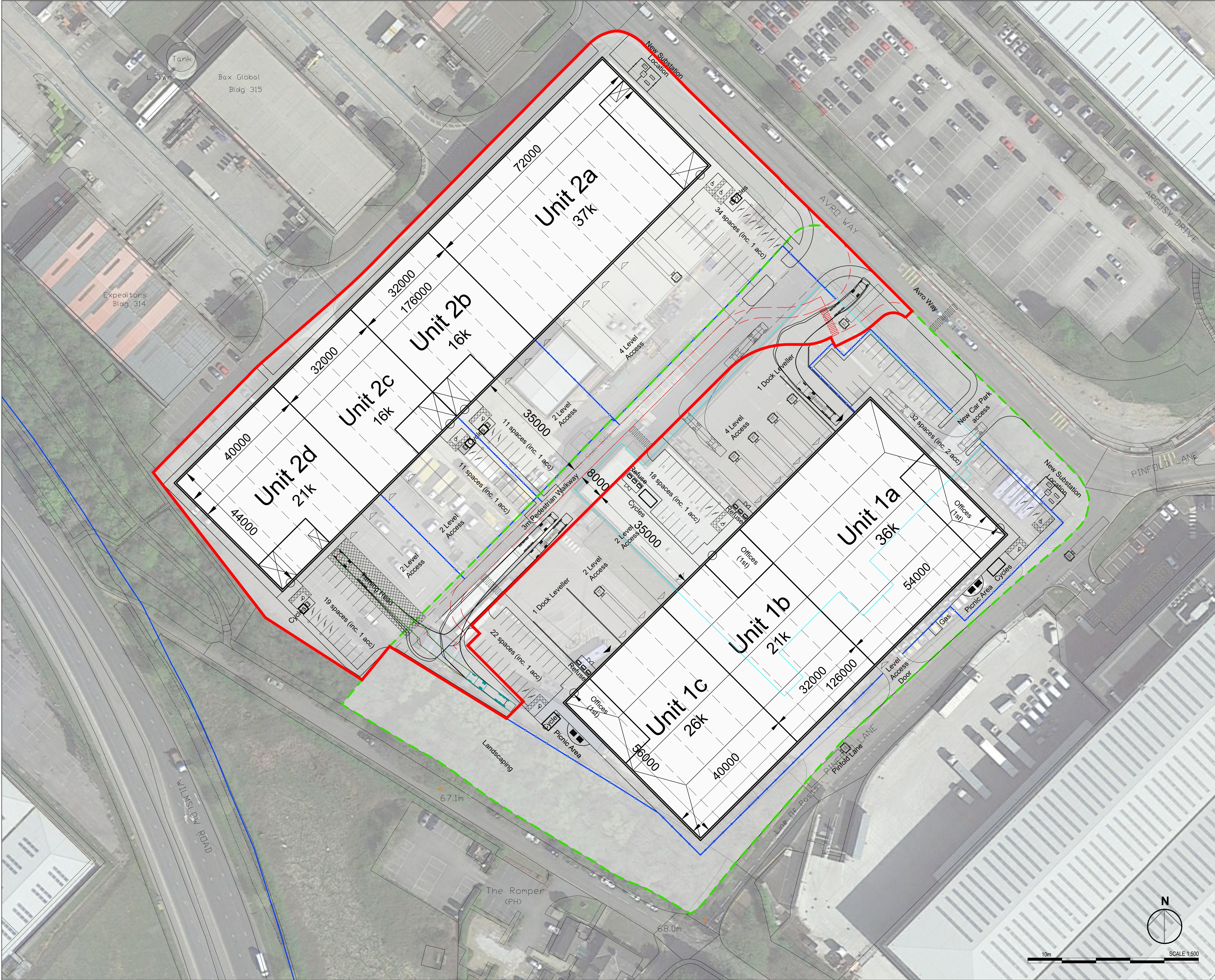
Additionally, before any intrusive investigation is to occur the relevant procedures in terms of identifying and mapping services and utilities should be undertaken, See Section 12.1 for further guidance. Special attention should be given to the location, and if necessary, safe positive identification of the aviation fuel pipeline feeding Manchester Airport which is believed to lie on Pinfold Lane.

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Appendix A Proposed Development Drawings



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Key

Overall Site 1.45Ha 3.605acres

Schedule of Accommodation	
Unit 2a (10% Offices)	c.37k
Unit 2b (10% Offices)	c.16k
Unit 2c (10% Offices)	c.16k
Unit 2d (10% Offices)	c.21k
Overall Total	8,604 sqm 92,613 sqft

All areas include offices at 1st floor

Please note: all retaining wall locations are subject to engineering design

P01	First Issue	LL	MJH	16/02/22
Rev	Description	By	Ckd	Date



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Client



COLUMBIA
THREADNEEDLE
INVESTMENTS

Project

MAG, Building 401, Manchester Airport

Title

Proposed Overall Site Plan Option 10

RPS Project Number	Scale @ A1	Date Created
NK020598	1:500	16/02/22
Task Team Manager	Information Author	Task Information Manager
KRP	LL	MJH
Status	S2 (Suitable for Information)	
Document Number	020598-RPS-SI-XX-DR-A-9076	Revision
Project Code - Originator - Zone - Level - Type - Role - Drawing Number		P01
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Appendix B Groundsure Report

Site Details:

ALPHA FLIGHT SERVICES,
BUILDING 402, AVRO WAY,
MANCHESTER, M90 5AF

Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: County Series

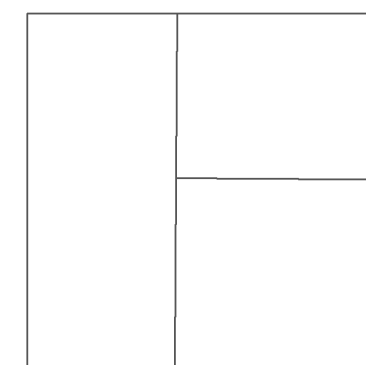
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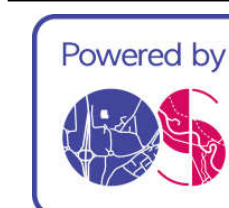
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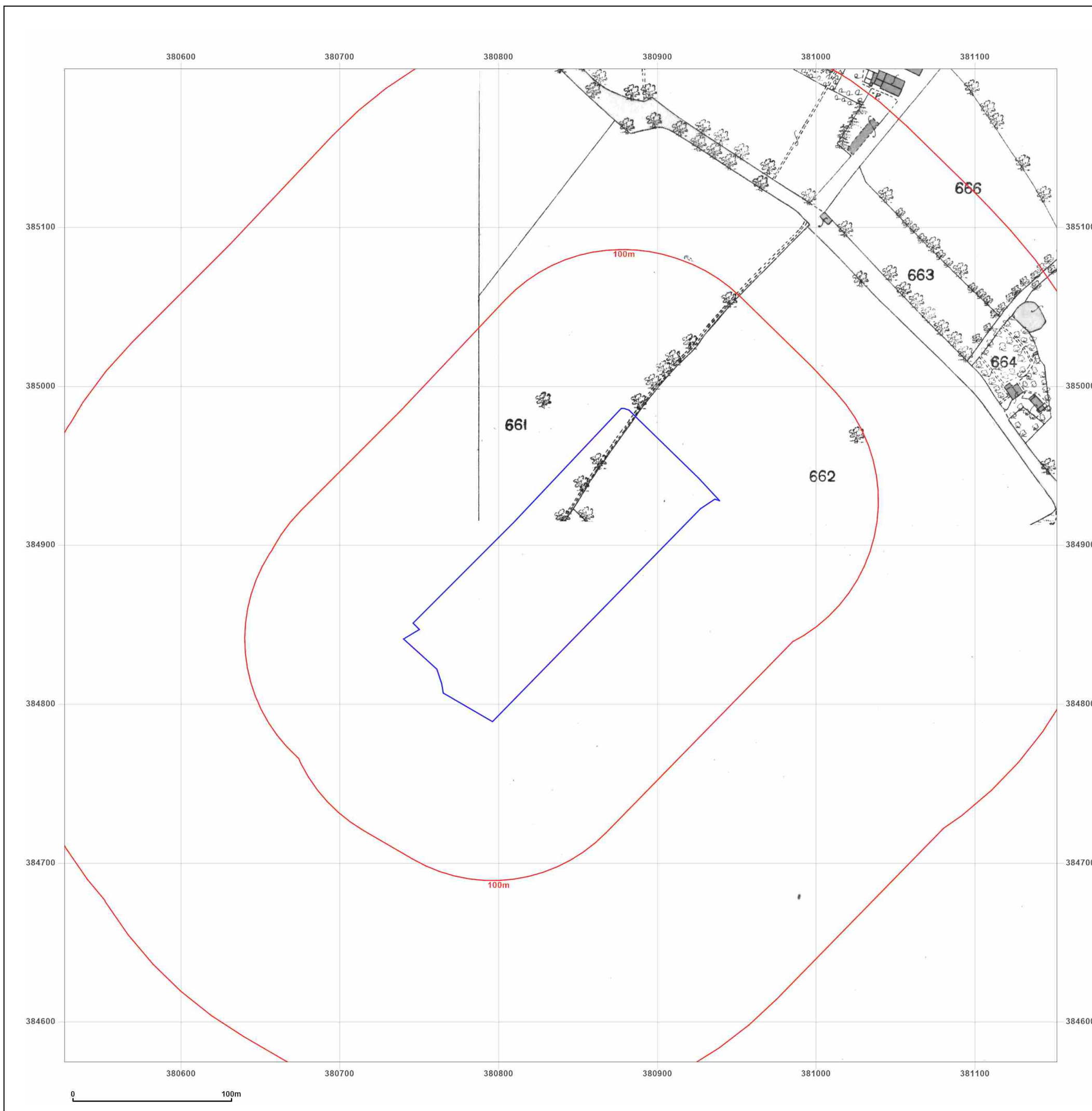


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Site Details:

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BUILDING 402, AVRO WAY,
MANCHESTER, M90 5AF

Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

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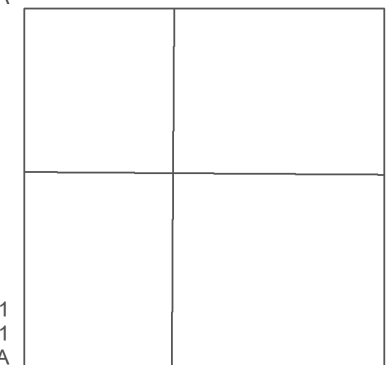


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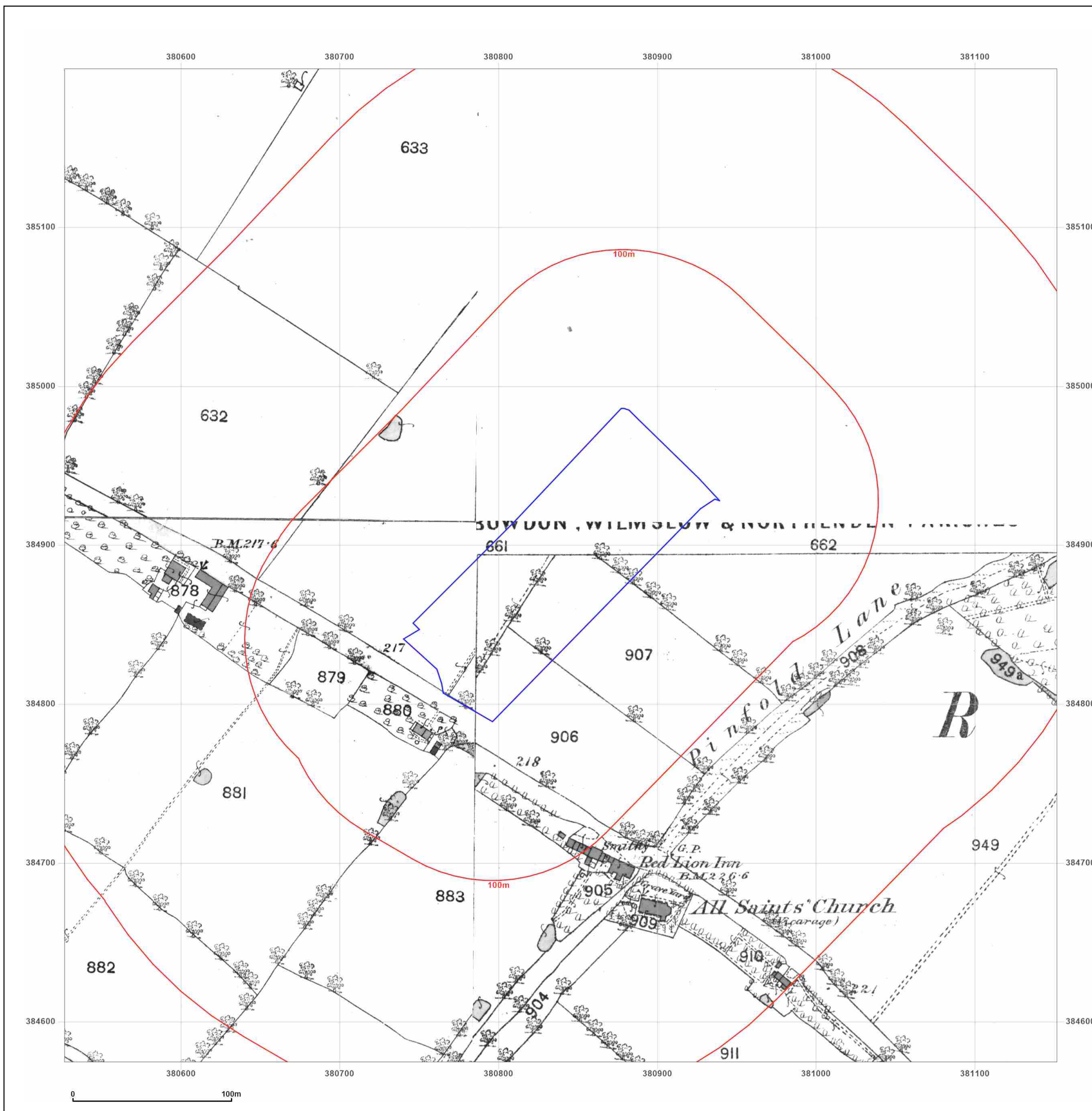


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Site Details:

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Report Ref: GS-8497500
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Map Name: County Series

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Copyright N/A
Levelled N/A

Surveyed 1877
Revised 1897
Edition 1898
Copyright N/A
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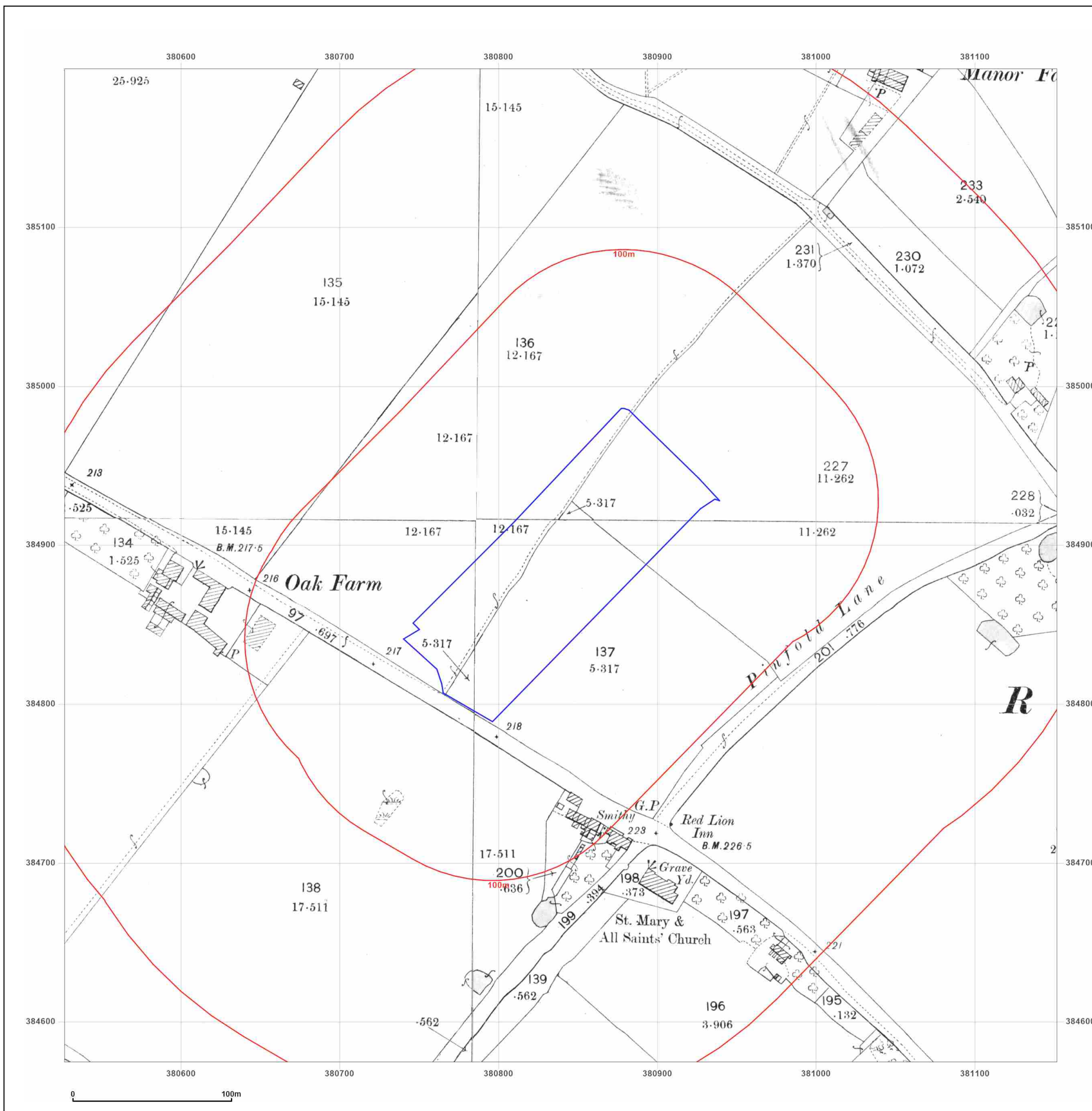


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Site Details:

ALPHA FLIGHT SERVICES,
BUILDING 402, AVRO WAY,
MANCHESTER, M90 5AF

Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: County Series

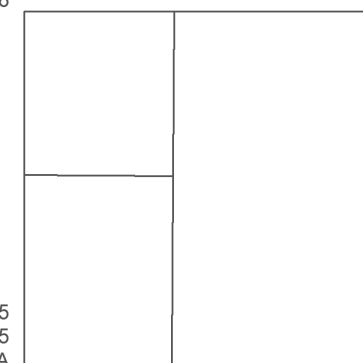
Map date: 1935

Scale: 1:2,500

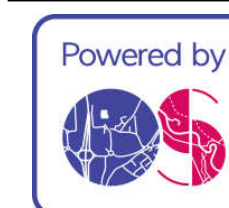
Printed at: 1:2,500



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Revised 1935
Edition N/A
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Levelled 1926



Surveyed 1935
Revised 1935
Edition N/A
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Levelled 1926

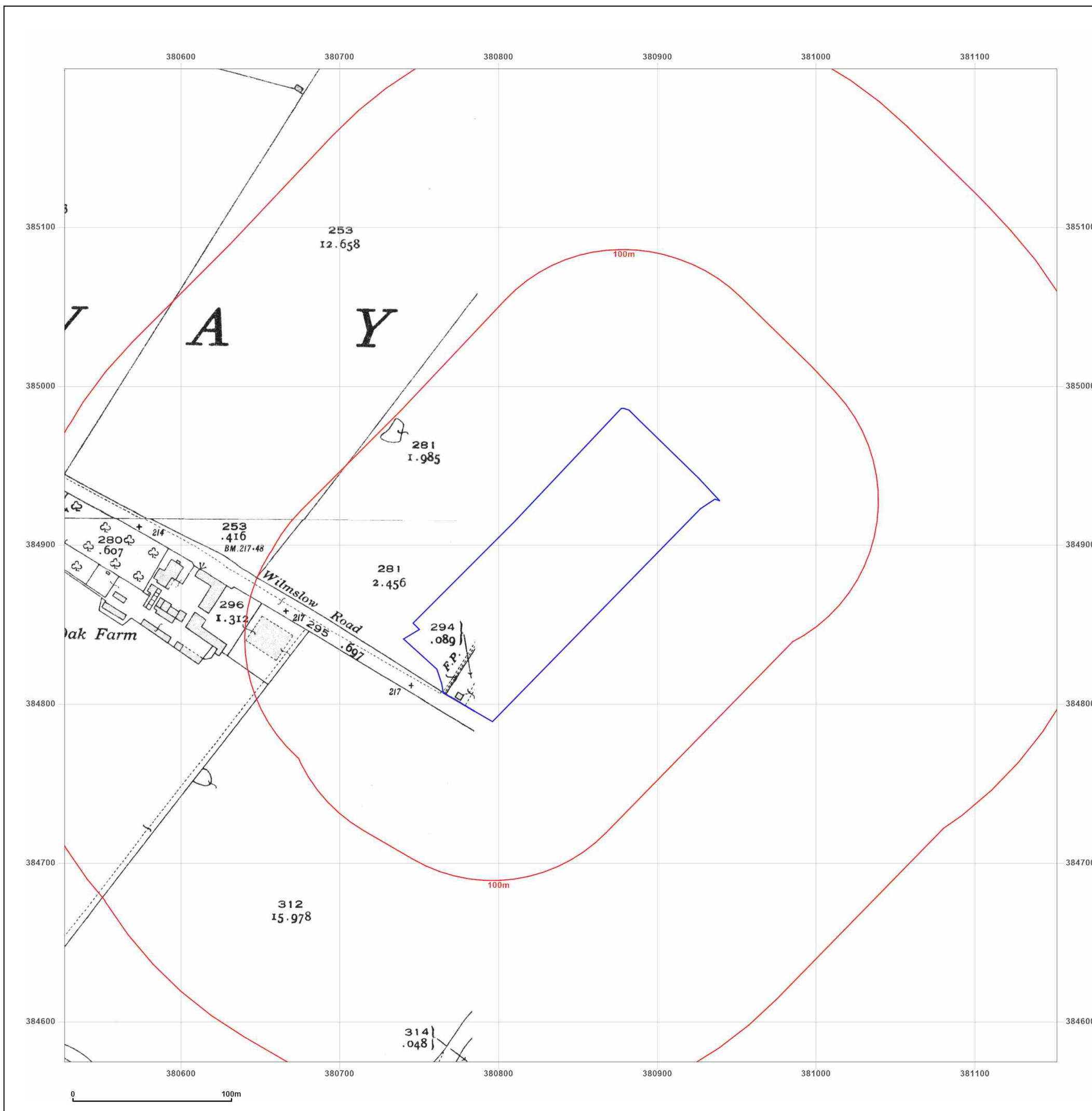


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Site Details:

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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

Map date: 1963-1968

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
Copyright 1963
Levelled 1959

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

Surveyed 1968
Revised 1968
Edition N/A
Copyright 1968
Levelled 1959

Surveyed 1968
Revised 1968
Edition N/A
Copyright 1968
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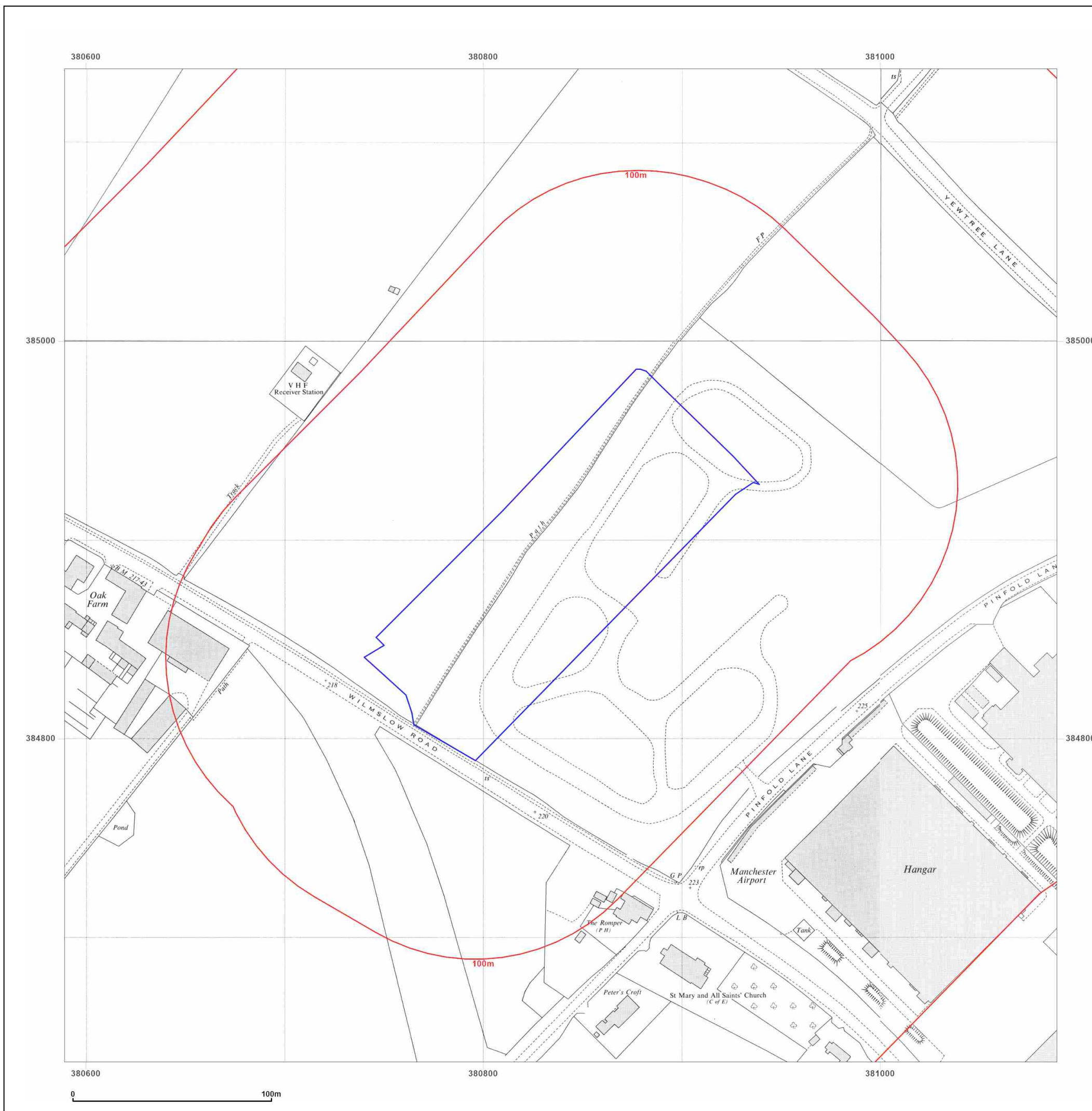


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Site Details:

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MANCHESTER, M90 5AF

Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

Map date: 1973-1974

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

Map date: 1987

Scale: 1:1,250

Printed at: 1:2,000

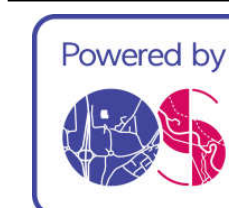


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Revised 1987
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Edition N/A
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Revised 1987
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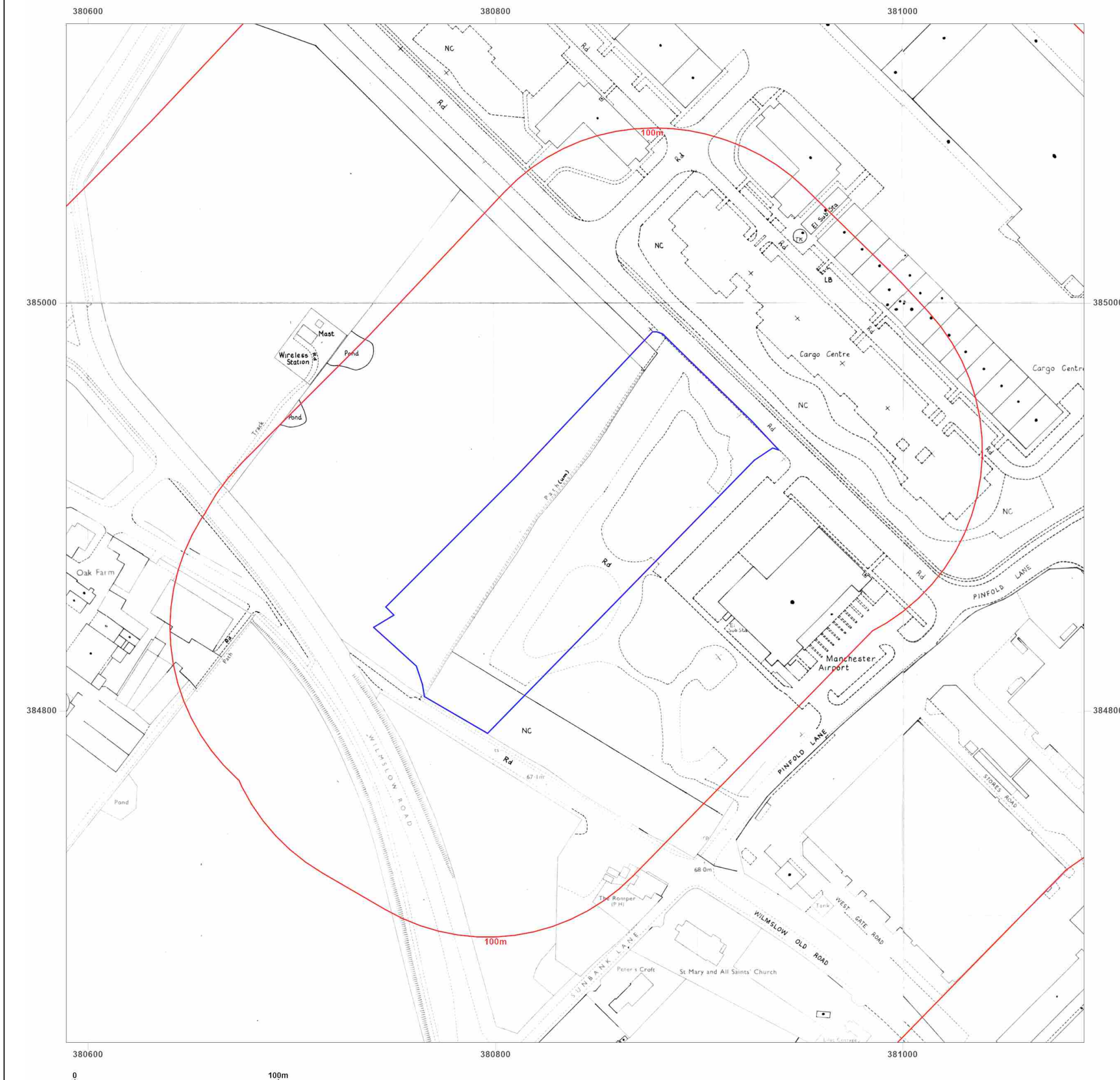


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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

Map date: 1990-1992

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1992
Edition N/A
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Edition N/A
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Revised 1990
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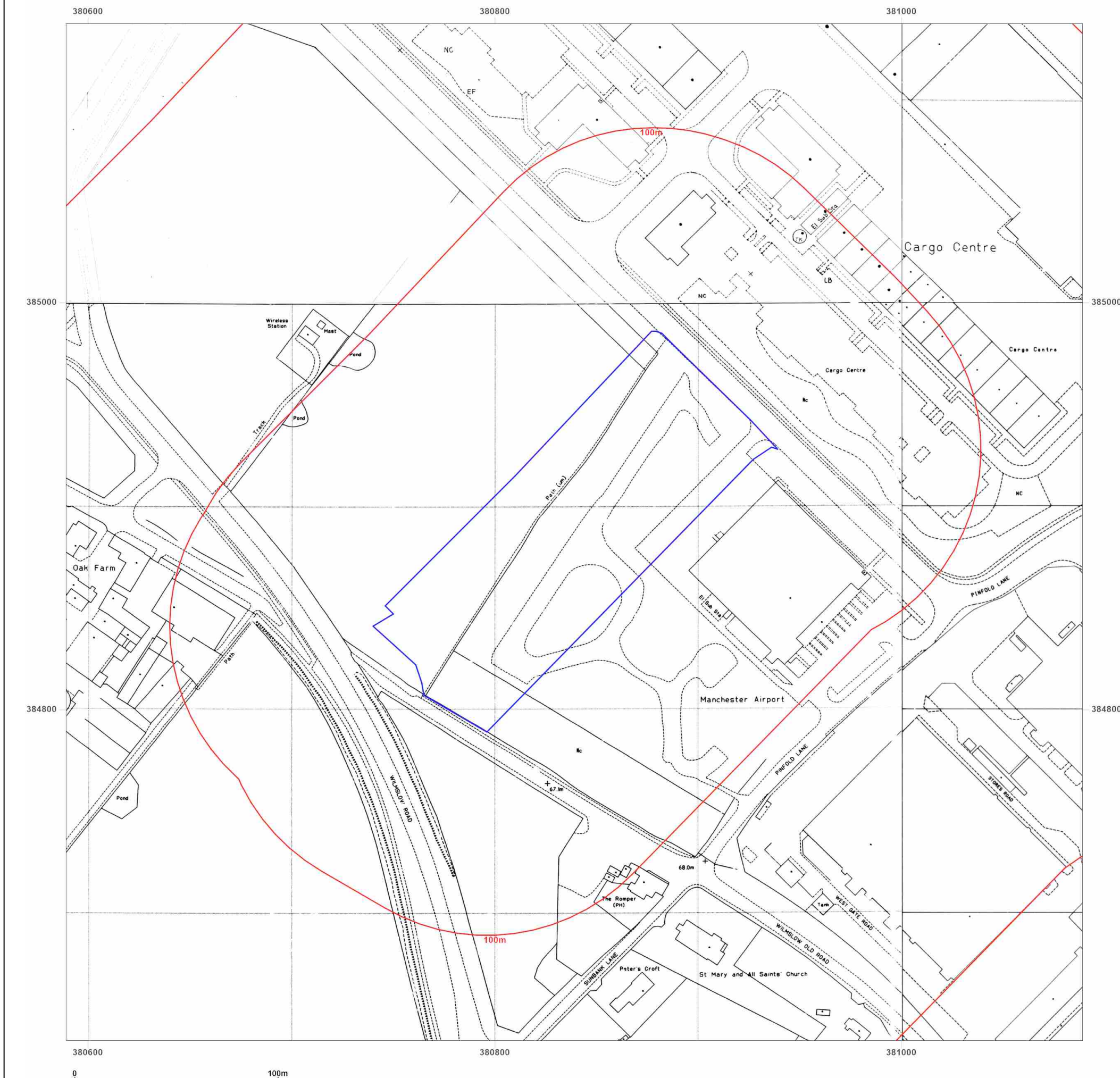


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Site Details:

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MANCHESTER, M90 5AF

Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

Map date: 1992-1995

Scale: 1:1,250

Printed at: 1:2,000



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

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Revised 1995
Edition N/A
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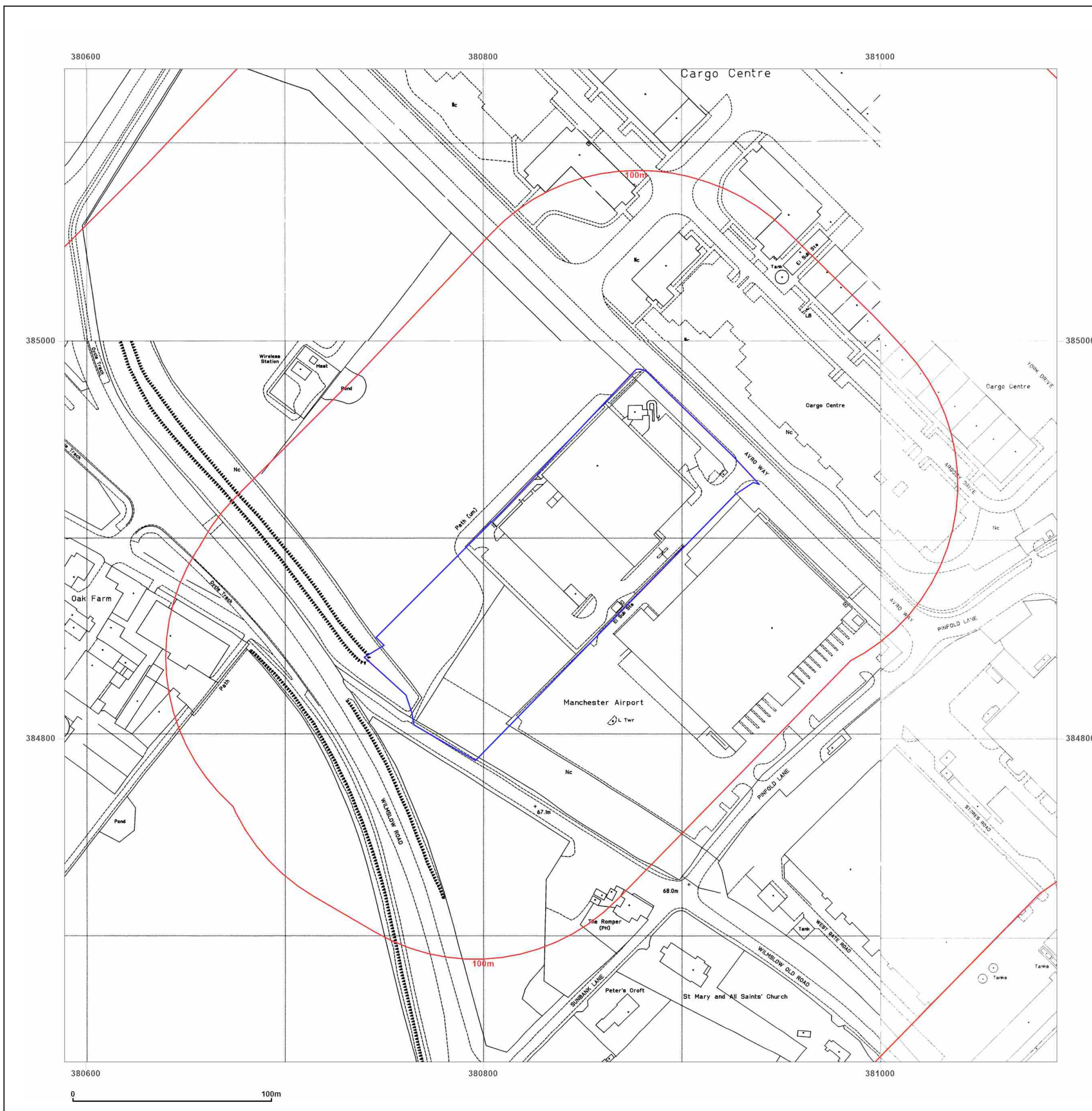


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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

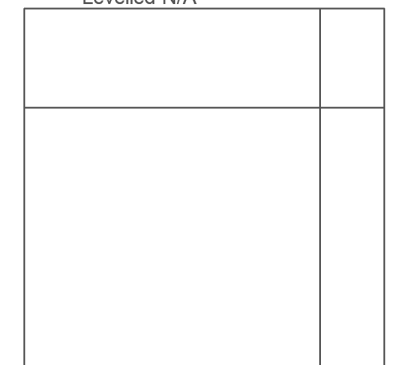
Map date: 1995

Scale: 1:1,250

Printed at: 1:2,000



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

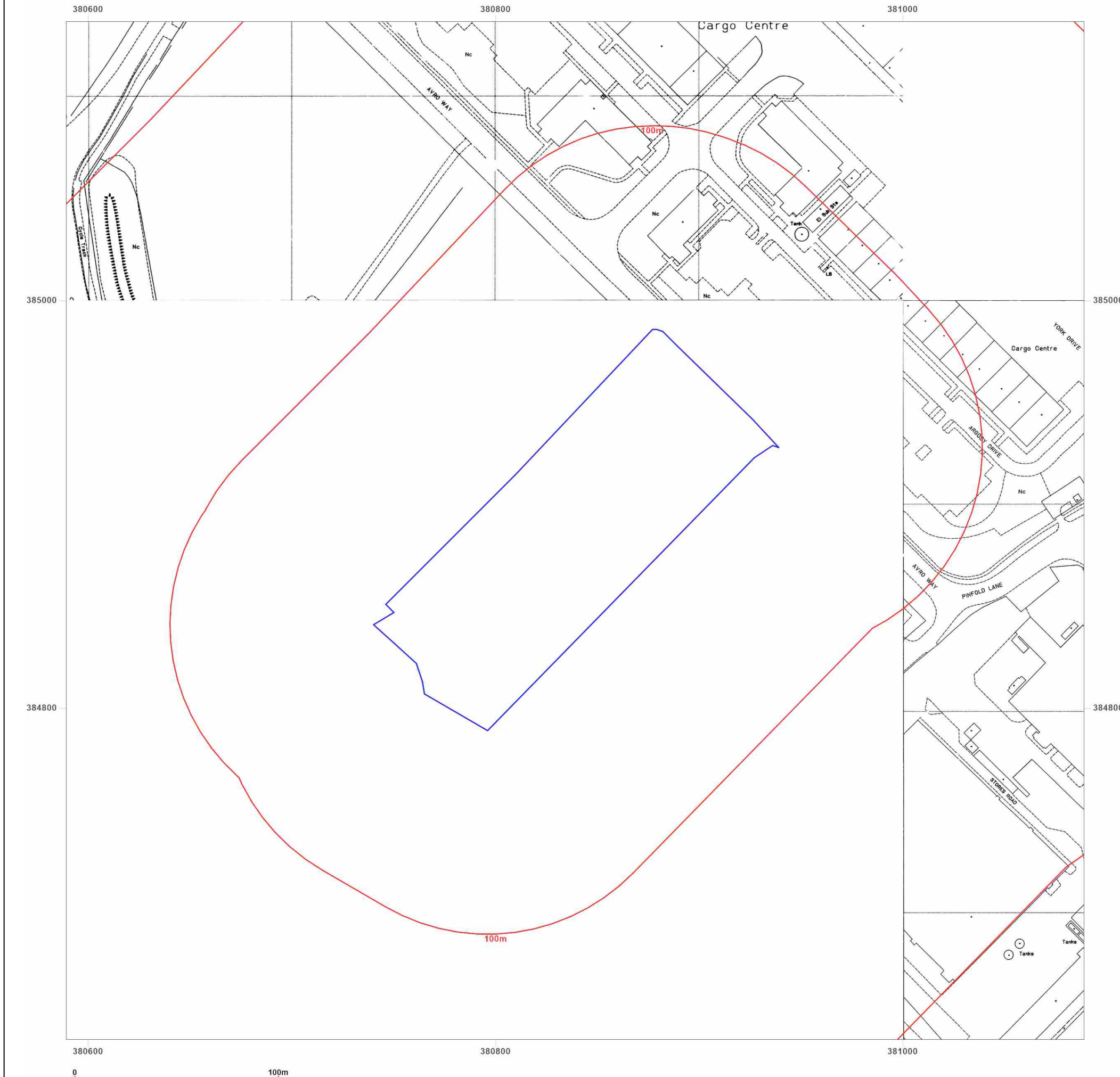


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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: National Grid

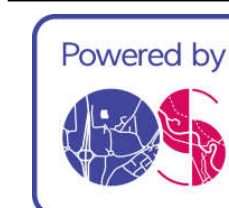
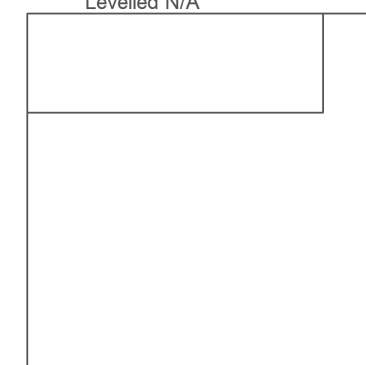
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Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
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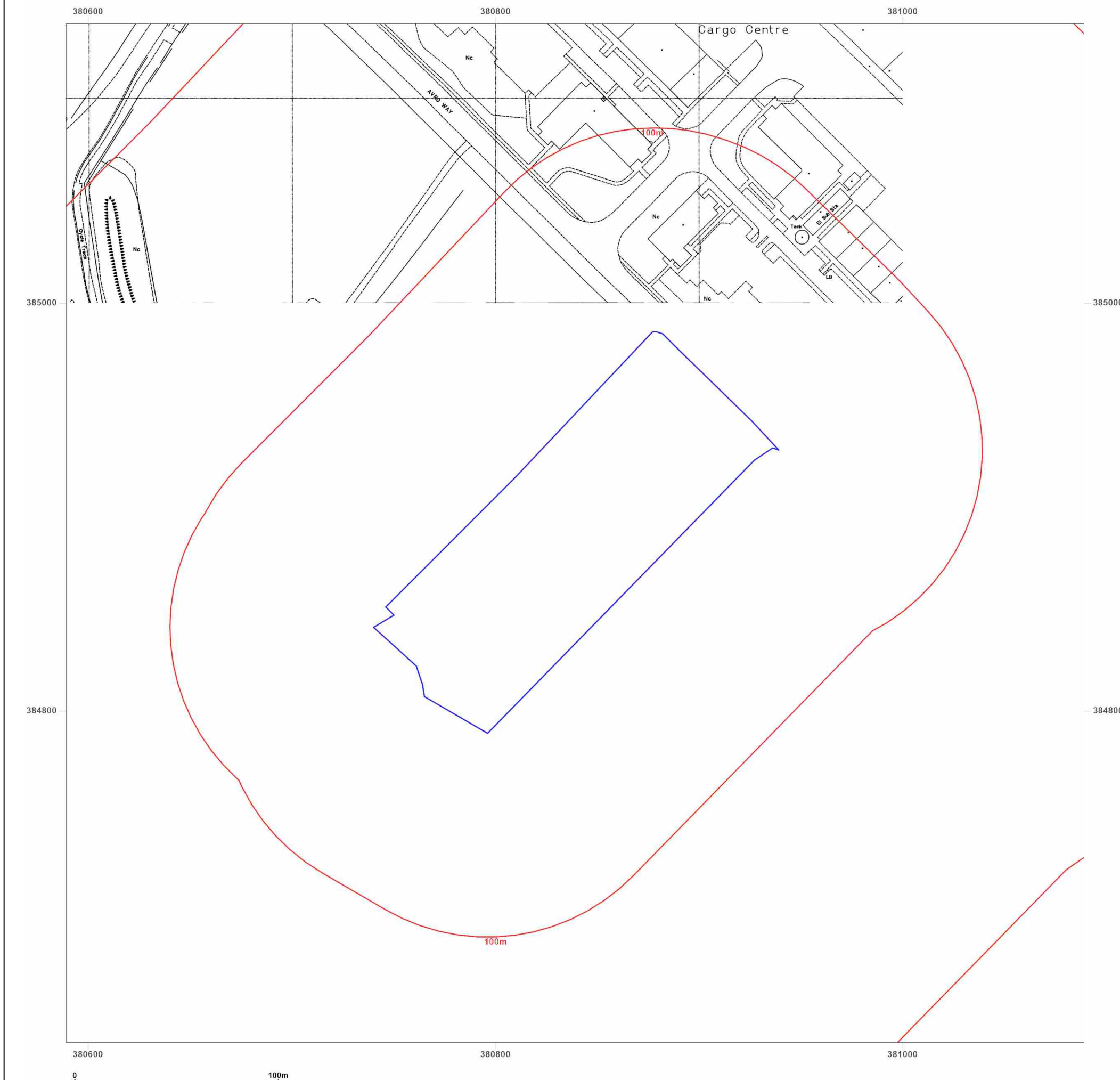


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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



2003



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Client Ref: MAG_-_Building_402_60663052
Report Ref: GS-8497500
Grid Ref: 380839, 384887

Map Name: County Series

Map date: 1899

Scale: 1:10,560

Printed at: 1:10,560



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