



RIDGE

COMBINED DESK STUDY AND GROUND
CONDITION ASSESSMENT
TAN YARD BROW

JOHN STEPHENSON & CO
June 2024

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VERSION CONTROL

VERSION	DATE	DESCRIPTION	REPORT REFERENCE	CREATED	REVIEWED
01	17.06.2024	C-DTS&GCA	5025143-RDG-XX-ST-DOC-C-00GCA01	JT	BS

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1. INTRODUCTION

1.1. Brief

Ridge and Partners LLP (Ridge) was commissioned by John Stephenson & Co to undertake a Combined Desk Top Study and Interpretive Ground Investigation Report for land at Tan Yard Brow, Gorton (hereafter referred to as 'the site'). The report also includes an assessment of the slope along the northern site boundary. A site location plan is included as Figure 1.

Ridge were briefed to use information provided by the client to obtain an environmental database search relating to the site and carry out a walkover survey to assess and report on the findings with respect to potential ground contamination and potential associated future liabilities in accordance with guidance outlined in Land Contamination Risk Management (LCRM 2023), published by the Environment Agency.

The combined Contamination and Geotechnical Ground Investigation was undertaken to a) refine the contamination conceptual site model and risk assessment, and b) provide additional assessment of the materials present beneath the site and present characteristic parameters that should be used in design of all geotechnical facets of the proposed development.

This report is prepared in line with the agreed brief and is subject to report conditions shown in Appendix 1.

The Ridge Ground Investigation comprised the following:

- One 15m cable percussive borehole, which was backfilled with arisings upon completion.
- Two days windowless sample borehole drilling (10no.) with a tracked dynamic sampling rig. Three boreholes were installed with a 50mm diameter standpipe to allow groundwater gauging and gas monitoring (if required).
- Geotechnical and contamination laboratory analysis.
- Subsequent monitoring of groundwater in installed wells.

1.2. Proposals

Current proposals comprise two residential apartment blocks with associated car parking and areas of soft landscaping.

1.3. Legal Context and Methodology

Part IIA of the Environmental Protection Act provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment, but the regime does not take into account future uses. New developments are therefore controlled by the planning regime, with reference to the National Planning Policy Framework (NPPF, 2023), rather than directly by Part IIA of the Environmental Protection Act.

This report has been prepared in accordance with published Environment Agency guidance – Land Contamination Risk Management (LCRM, 2020), which supersedes CLR 11. CLR 11 adopted and refined the well-recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

LCRM advocates a tiered approach to risk assessment, as necessary. This document constitutes a Preliminary Risk Assessment under that guidance.

Further details regarding Legal Context and Methodology are included as Appendix 2.

1.4. End Use Classification

It is understood that the current proposed site use is residential apartments with communal soft landscaping, for the Preliminary Risk Assessment therefore the most sensitive end use classification will be applied – ‘residential without plant uptake’.

A change in the site use from the one currently proposed may result in the need for re-assessment of risk criteria, as such the conclusions and recommendations resulting from the risk assessment could change significantly.

1.5. Report Scope and Limitation

This report is based upon a review of historical and current information, a site walkover survey, geological and hydrogeological mapping, information from an environmental database search and the recent Ground Investigation data detailed herein. The assessment is based on the proposed end use outlined in Section 1.4.

The report presents an interpretation of the borehole and laboratory data provided by the Ridge Ground Investigation undertaken 3rd May to 7th May 2024. In addition, this report outlines the basic ground conditions encountered in the exploratory holes and the results of monitoring of installed wells.

This information has been collated, processed, and used to provide an interpretation of the ground conditions, with recommendations on any contamination issues and geotechnical-related design.

The recommendations and opinions expressed in this report are based on the strata observed in the exploratory holes, the results of the site and laboratory tests, and information obtained as part of the desk study or provided by others. Ridge takes no responsibility for conditions that have not been revealed by the exploratory holes, or which occur between them or for features which may be more widespread to those found.

Whilst efforts have been made to interpret the conditions between investigation locations, such information is only indicative, and liability cannot be accepted for its accuracy. Information provided from other sources is taken in good faith and Ridge cannot guarantee its accuracy.

The information contained in this report is intended for the use of John Stephens & Co and Ridge can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

2. SITE CONDITIONS

An engineer from Ridge visited on 3rd May 2024 to conduct a walkover survey of the site and the surrounding areas for the purpose of identifying any potential contamination or evidence of previous contaminative processes. The descriptions below relate to site conditions at the time of the inspection only.

A photographic log is included as Appendix 3.

2.1. Site Location

The site is centred on easting 389176 and northing 395945, within the centre of Gorton, in east Manchester. The centre of the site is situated at approximately 72m AOD (Above Ordnance Datum).

The site is an irregular shape with the longest axis north to south in the eastern area of the site of approximately 73m and approximately 38m east to west. The site has an area of 0.35ha.

2.2. Current Site Use

The site is currently vacant.

2.3. Access

The site is accessed through a gate in the northwestern corner of the site via Tan Yard Brow. Pedestrian access can also be gained in the south off Hyde Road

2.4. Structures

No permanent or temporary structures were observed on site.

2.5. Boundaries

The north, west and east site boundaries are bordered by steep vegetated slopes and a gate is present in the northwest of site. The southern boundary is demarcated by a dense area of trees and vegetation between the site and Hyde Road.

2.6. Topography

The site gently slopes down from the high point in the east side (74.0m AOD) to the low point west. The north-east and south-east corners are estimated to be 73.0m AOD and 74.0m AOD respectively, while the north-west and south-west corners are estimated at 70.0m AOD and 71.0m AOD respectively.

2.7. Surroundings

The site is surrounded on three sides by woodlands with the western boundary running along Tan Yard Brow. Immediately beyond this are builder's yards to the west and north. A railway embankment, with the line now replaced with a footpath is located directly to the east of the site. Hyde Road and mixed residential and commercial properties are situated to the south. Gore Brook Fountain and Gore Brook are present at the toe of the slope to the north of the site.

2.8. Trees & Vegetation

Mature deciduous and fir trees were observed to the north, east and south of site. Scrub was also observed along the northern and western site boundary.

2.9. Utilities

No evidence of utilities were observed on site.

2.10. Miscellaneous

Several concrete pads were observed across the site surface, anecdotal evidence suggests they remain from the sites former use as a coal yard.

Ridge was informed by the site owner that several 'paraffin' pumps were historically present in the vegetated area just south of the site boundary. Remnant structures were observed in this area.

2.11. Potential Sources of Contamination – Walkover Survey

Made ground was identified on site with possible brick, ash, clinker, coal and concrete.

3. SITE HISTORY AND HISTORICAL CONTAMINATIVE SOURCES

3.1. Review of Historical Maps

Ordnance Survey Maps provided within a Groundsure Report package have been obtained to provide details of the history of the site and surrounding areas. A chronological description of the maps is shown in the table below. The descriptions focus on potentially contaminative land uses within 50m and potentially infilled features within 250m of the development site boundary. Note, potential contaminative sources and features outside these distances from the site have been discussed only where they are considered to be relevant. Copies of the maps are included as Appendix 4.

MAPPING DATE (SCALE)		OBSERVATIONS	
		ON-SITE	OFF-SITE
1845-1849 (1:2,500) (1:10,560)	Site appears to be open fields		A tannery is noted 10m to the northwest of the site.
			Stockport Branch Canal is present 168m east of the site.
			Gorton Lower Reservoir is present 220m east of the site
1890-1908 (1:2,500) (1:10,560)	The majority of the site is undeveloped, the south of site appears to be associated with the adjacent Hyde Road Train Station. Two small structures are present in the southeast.		The site is located in a primarily residential area with some industry immediately to the north and east.
			Manchester Central Station Line and Hyde Road Station are present on a significant embankment adjacent to the eastern site boundary along with the station itself to the southeast. Sidings are present from 50m east of site on the opposite side of the embankment
1908-1933 (1:2,500) (1:10,560)	An embankment is now noted along the edge of the site and Tan Yard Brow. The 2no. buildings in the south of the site appear to have been demolished and replaced with 1no. larger structure.		The tannery/leather works 10m to the northwest has changed configuration with a possible area of infilling and tanks now shown.
1950 - 1952 (1:2,500) (1:10,560)	The north of the site is annotated as allotment gardens. The area in the south remains unchanged.		No significant changes.
1954 - 1970 (1:1,250)	Several additional unidentified buildings are present across the south of the site.		Tannery/leather works is no longer annotated, and a number of buildings have been

MAPPING DATE		OBSERVATIONS	
(SCALE)	ON-SITE	OFF-SITE	
(1:2,500) (1:10,560)		demolished. A remnant is now noted as a works which decreases in size by 1964 mapping.	
		Hyde Road Station and the associated railway line are no longer present from 1964 mapping.	
		Railway sidings associated with Hyde Road Station are no longer present to the east of the site from 1976 mapping.	
1970 – 1985 (1:10,000)	Onsite buildings are no longer present from 1982 mapping.	Stockport Branch Canal is no longer shown by 1974 mapping.	
		Buildings directly adjacent to the south of the site are no longer present from 1974 mapping.	
1985 – 2001 (1:1,250) (1:10,000)	No significant changes.	No significant changes.	
2001 – 2024 (1:10,000) (1:1,250)	No significant changes.	The wider area to the west of the site is annotated as 'works'.	

Table 3.1: Pertinent Features from the Historical Map Review

3.2. Review of Satellite Images

A review of publicly available satellite images has been carried out to provide information in relation to the site.

- The earliest image available for review (2001) shows the site to be vacant with an open area of grassy land and bound by mature trees. Surrounding the site to the north and west are builder's yards and Tan Yard Brow runs parallel to the site north to south. Hyde Road (A57) lies to the south of the site running parallel east to west. A footpath lies directly to the east of the site running north to south. Slightly further to the east are commercial developments alongside Gorton Reservoir, furthermore, a PureGym development appeared on satellite images from 2003.
- No significant changes noted in the 2003-2023 images.

3.3. Potential Sources of Contamination – Historical Map Review

Contaminant sources considered to present a potential risk to the site are detailed in the table below.

POTENTIAL SOURCES OF CONTAMINATION CONSIDERED A RISK TO THE SITE		
FEATURE	DISTANCE,	APPROX. DATES
Development and subsequent demolition of on-site structures.	On site	1892-1982
Former adjacent railway.	23m E	1892-1992
Allotment Gardens	On Site	1952-1954

Table 3.3: Potential Sources following Historical Map Review

Potential contamination sources not considered to represent a significant risk to the site are detailed in the table below. The features will not be considered further.

POTENTIAL SOURCES NOT CONSIDERED FURTHER	
FEATURE	JUSTIFICATION
Leather Works/Tannery.	Situated several metres below the site and downstream along Gore Brook
Stockport Branch Canal	Canal likely lined with puddled clay and set within glacial till. Infilled prior to 1974 and distance from site.

Table 3.3: Potential Sources not considered further

4. PHYSICAL SETTING

4.1. Geology and Hydrogeology

The following observations are taken from the British Geological Survey (BGS) GeoIndex (2024) and the Geo Insight Groundsure Report (Appendix 5).

The site is underlain by superficial geology of Devensian Till which in turn is underlain by bedrock geology of the Chester Formation.

Tables 4.1 and 4.2 below identify the expected composition of the published strata and associated aquifer classification.

SUPERFICIAL GEOLOGY	
Unit Name	Devensian Till
Geology Description	Till is unsorted and unstratified drift, generally over consolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier. It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton).
Aquifer	Secondary Undifferentiated
Aquifer Description	Assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and nonaquifer.

Table 4.1: Superficial Geology

BEDROCK GEOLOGY	
Unit Name	The Chester Formation
Geology Description	The formation comprises conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone. The conglomerates have a reddish-brown sandy matrix and consist mainly of pebbles of brown or purple quartzite, with quartz conglomerate and vein quartz. In these areas the formation generally fines upwards, from dominantly conglomerates at the base, to interbedded conglomerates and sandstones, with sandstone and pebbly sandstone predominant in the upper part, and rare mudstones.
Aquifer	Principal
Aquifer Description	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

Table 4.2: Bedrock Geology

4.1.1. Artificial Ground, Landslips and Faults

The site is between two parcels of Artificial Ground present on BGS mapping as Made Ground (Undivided) with the parcel to the east falling slightly within the site boundary.

There are no records of landslips and faults within 250m of the site.

4.1.2. Radon

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No Radon Protective Measures are considered necessary for new properties or extensions to existing ones.

4.1.3. Ground Workings and Mining

There are 47no. records of surface ground workings located within 250m of the site. The closest record refers to an unspecified pit located 69m to the east of the site. Other records in the vicinity of the site refer to unspecified ground workings, unspecified heaps and canals.

The Coal Authority indicate that Johnson Poole & Bloomer (JBP) have records which may contain information such as mining plans and mapping records held within their archive of mining activities that have occurred within 1km of the site, however, these records may also relate to non-mining records.

As the site is not within a Development High Risk Area and no planning condition relating to coal mining has been applied the above records have not been searched.

4.1.4. BGS Borehole Records

There are 15no. BGS borehole records within 250m of the site including 1no. record onsite. This borehole record refers to the Chorlton Brook 26 (ref: SJ89NE 472), dated 1992, and comprises the following:

- Topsoil of slightly gravelly clay with occasional roots to 0.60mbgl.
- MADE GROUND: sandy clay with occasional gravel to 1.60mbgl.
- CLAY with varying sand and occasional gravel to 3.40mbgl.

A deeper cable percussive borehole is situated 16m to the south-east of the site for Hyde Road Improvement (ref: SJ84NE89219591 669), dated to 1994, comprises the following:

- Varying MADE GROUND of predominantly clay and sand with gravel to 6.80mbgl.
- Clay with varying quantities of sand and gravel to 37.60mbgl.
- Sand bands between 27.00 to 28.10mbgl and 35.50 to 36.60mbgl.

4.1.5. Natural Ground Subsidence

The BGS has provided the following information as summarised in table 4.3 below.

PROCESS	RISK LEVEL	DETAILS
Landslides	Very Low in the west Low in the east	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.

PROCESS	RISK LEVEL	DETAILS
Collapsible Deposits	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.
Running Sands	Very Low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless
Shrink Swell Clay	Very Low	Ground conditions predominantly low plasticity.
Compressible Deposits	Negligible in the majority of the site, Very Low in north of the site.	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. Compressibility and uneven settlement problems are not likely to be significant on the site for most land uses
Ground Dissolution of Soluble Rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution.

Table 4.3: Ground Subsidence Records

4.1.6. BGS Estimated Background Soil Chemistry

Estimated background concentrations on site are as follows: arsenic 15-25mg/kg; cadmium 1.8mg/kg; chromium 60-90mg/kg; nickel 15-30mg/kg, lead 100-200mg/kg.

4.2. Hydrology

4.2.1. Surface Water Features

There are two surface water features are listed within 250m of the site consisting of Gore Brook which is located 10m north of site at its closest point and Gorton Lower Reservoir located 219m northeast. A pond is also noted on historical mapping 120m to the north of the site.

4.2.2. Flooding

The northwest corner of site is located within Flood Zone 2 (Fluvial /Tidal Models) and a Flood Zone 3 (Fluvial Models) is located 3m north west of the site boundary.

4.3. Controlled Waters

4.3.1. Abstraction Licenses

There are no abstractions within 500m of the site, inclusive of potable abstractions.

4.3.2. Source Protection Zones

There are no SPZs within 500m of the site boundary.

4.4. Designated Environmentally Sensitive Sites

There are no designated features within 500m of the site.

5. ENVIRONMENTAL RECORDS REVIEW

The following information has been obtained from public archive via the data supplier Groundsure or by direct application. The full Enviro Insight Groundsure Report is included as Appendix 5. The subsequent review focusses on records within 50m of the outlined development site for above ground features or within 250m for potentially infilled features, or those which are considered relevant to the proposed development. Ridge have not included data from Groundsure's own review of historical maps.

5.1. Groundsure Record Search

The following observations are taken from the British Geological Survey (BGS) GeoIndex (2023) and the Enviro Insight Report (Appendix 5).

5.1.1. Historical Industrial Land Uses

There are 91no. records relating to above ground land uses within 500m of the site including 5no. onsite records. A railway stations located onsite between 1890 to 1978. There are 9no. records relating to infilled features within 250m of the site, including 1no. onsite record referring to Made Ground. There are multiple pertinent records over 100m from the site. The leather works noted on site in 1938 seems unlikely based on historical records as no significant structures are present.

5.1.2. Historical Petrol Stations and Garages

There are no records of petrol stations within 500m of the site. There are 3no. records of historical garages 151-359m west present 1963-1992. Other features are more than 200m from the site boundary.

5.1.3. Historical Tank Database

There are 3no. records within 100m of the site boundary. All records relate to tanks and unspecified tanks located 30 northwest of the site dated 1922 to 1952.

5.1.4. Historical Energy Features

There are no records of historical energy features within 50m. Further records indicate the presence of electricity substations of varying distances.

5.1.5. Waste and Landfill

There are 5no. records of historical landfill Environment Agency/Natural Resource Wales records within 250m of the site. The closest record refers to Stockport Branch Canal, Greater Manchester located 168m to the east of the site.

5.1.6. Environmental Permits, Incidents, Registers and Consents

There are no pollution incidents with a major impact in proximity to the site.

5.1.7. Current Industrial Land Uses

There are 5no. recent or current industrial land uses within 250m of the site. The closest record refers to a mast for telecommunications located 17m south of the site. There are no pertinent records in proximity to the site.

5.2. Local Authority Consultation

5.2.1. Planning History

According to Manchester Council, two planning applications are associated with the property:

- 036109 – April 1990 – Erection of a hotel and associated facilities, 23 dwellings, business units (Class B1) and open space with vehicular access from Hyde Road and from Tan Yard Brow. Application rejected. No reports associated with this application were identified.
- 039823/00/CENTL3/91 – July 1991 – Erection of riding stables with associated facilities. Application permitted. No reports associated with this application were identified.

5.3. Potential Sources of Contamination – Records Review

No potential sources of contamination near the site have been identified within the records review.

Potential contamination sources not considered to represent a significant risk to the site are detailed below. These features will not be considered further within the risk assessment.

POTENTIAL SOURCES NOT CONSIDERED FURTHER	
FEATURE	JUSTIFICATION
Historical garage 151-359m from site.	Distance from site.
Historical tanks 30m NW	Topographically below the site by several metres and downstream along Gore Brook.
Stockport Branch Canal	Canal likely lined with puddled clay and set within glacial till. Infilled prior to 1974 and distance from site.

Table 5.2: Potential Sources not considered further.

6. PRELIMINARY CONCEPTUAL SITE MODEL

The preliminary conceptual site model represents an assessment of the current status of the site and the likelihood of a pollutant linkage for each identified potential combination of contaminant, pathway and receptor.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance¹) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

6.1. Potential Sources

It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site.

6.1.1. On-Site

- Development and subsequent demolition of on-site structures from circa 1892-1981 and onsite garden allotments circa 1950-1954, anecdotal use of the site as a coal yard.
 - Contaminants of concern (CoC) include those commonly identified in Made Ground (and coal) such as heavy metals, polycyclic aromatic hydrocarbons (PAHs) and asbestos. Asbestos formerly within fabric of structures may have been mixed with soils to create asbestos containing soils (ACS).
 - Although limited, there is considered to be some potential for ground gas. Ground gas potential will be dependent on the thickness and make-up of Made Ground beneath the site i.e. degradable and organic content.

6.1.2. Off-Site

- Railway directly to the east of the site, anecdotal evidence of paraffin pumps adjacent to the south:
 - Hydrocarbons from paraffin pumps.
 - Contaminants of concern (CoC) include ash fallout from steam trains such as heavy metals, polycyclic aromatic hydrocarbons (PAHs) and asbestos.

6.2. Pathways

The key environmental pathways and exposure routes by which potentially toxic substances can reach the identified potential receptors are considered to be:

6.2.1. Indirect

- Vertical and lateral migration of ground gas leading to accumulation in enclosed spaces.
- Vertical and lateral migration of organic and inorganic compounds through underlying geology.
- Windblown dust and fibres to adjacent receptors.

¹ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land". London HMSO.

- Surface run off.

6.2.2. Direct

- Inhalation of ground gases.
- Inhalation of vapours.
- Inhalation of contaminated dust.
- Ingestion of contaminated soil and/or soil derived dust.
- Dermal contact.
- Direct contact with services (potable water).

6.3. Receptors

Receptors that may be affected by the potential contamination are considered to be:

6.3.1. Human

- End users of the site.
- Offsite land users.
- Maintenance workers once the development is complete.

6.3.2. Environmental

- Principal aquifer – bedrock geology.
- Gore Brook located adjacent to the north of the site.

There are no environmentally sensitive sites within 500m of the site.

6.3.3. Structural

- Buildings.
- Potable water pipes.

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7. RISK ASSESSMENT

7.1. Risk Assessment Procedure

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the contamination source can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been undertaken with reference to BS 10175:2011+A1:2013 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, considering both the potential magnitude of the hazard and the sensitivity of the target, based on the categories given below.

CATEGORY	EXAMPLES
High	Residential with gardens/Groundwater Source Protection Zone
Medium	Residential without gardens/Principal/Secondary Aquifer/sensitive watercourse
Low	Commercial and industrial use/Undifferentiated Aquifer
Very Low	Maintenance workers using appropriate PPE/non classified water body

Table 7.1: Sensitivity of Receptor

CATEGORY	EXAMPLES
Gross Impact	Heavily contaminated gasworks or industrial site, hazardous waste landfill. Major spillages into controlled waters. Explosions causing building collapse.
Moderate Impact	Leaks and spills from fuel infrastructure (e.g. petrol stations) (not into controlled waters), domestic waste landfills, demolished buildings. Leaching of contaminants into a major or minor aquifer.
Slight Impact	Minor leaks and spills from fuel infrastructure, 'inert' waste landfills, pollution of non-classified ground water.

Table 7.2: Magnitude of Impact

MAGNITUDE OF IMPACT	SENSITIVITY OF RECEPTOR			
	High	Medium	Low	Very Low
Gross Impact	Severe	Medium	Mild	Minor
Moderate Impact	Medium	Mild	Minor	Minor
Slight Impact	Mild	Minor	Minor	Minor

Table 7.3: Level of severity of potential hazard

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

CATEGORY	EXAMPLES
High likelihood	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or
Likely	There is a pollutant linkage, and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollutant linkage, and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollutant linkage, but circumstances are such that it is improbable that an event would occur in the very long term.

Table 7.4: Classification of Probability

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

PROBABILITY OF RISK	SENSITIVITY OF RECEPTOR			
	Severe	Medium	Mild	Minor
High likelihood	Very High	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low likelihood	Moderate	Low/Moderate	Low	Very Low
Unlikely	Low/Moderate	Low	Very Low	Very Low

Table 7.5: Level of risk for potential hazard definition

The assessment is discussed below in terms of plausible pollutant linkages. A complete assessment of the pollutant linkages is presented in Table 7.6.

A description of these risk classifications and likely action required are given in CIRIA 552 as:

Very high risk – High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk – Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required, and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk – It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk – It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk – It is a low possibility that harm could arise to a designated receptor. In the event of such harm being realised it is not likely to be severe.

7.1.1. Preliminary Conceptual Model

The below assessment has been compiled based on the current site status.

SOURCE	PATHWAY	RECEPTOR	SEVERITY	LIKELIHOOD	RISK LEVEL
Historical on-site use	Direct contact, ingestion, and inhalation of impacted soils/ groundwater.	Residential end users	Medium	Likely	Moderate
		Offsite receptors	Medium	Likely	Moderate
	Windblown dust.	Maintenance workers	Medium	Unlikely	Low
	Vertical migration of contaminants through the underlying geology and/ or via overland flow.	Principal Aquifer – bedrock	Medium	Low likelihood	Low / Moderate*
		Gore Brook	Medium	Likely	Moderate
Ground Gas associated with Made Ground	Migration of ground gas through the underlying geology.	Residential end users Property	Severe	Unlikely	Low / Moderate*
	Inhalation of ground gas.	Offsite receptors	Severe	Unlikely	Low / Moderate*
Historical site use	Deterioration of potable water supply pipes.	Potable water pipe	Medium	Likely	Moderate

Table 7.6: Preliminary Conceptual Model

Note: *Moderate risk assumed at this stage until site investigation work has been carried out to further assess the potential risk.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Contamination

Following site, the reconnaissance and a review of available records, it is considered that there is sufficient information on the potential contaminative status of the site to allow conditional approval of a planning application, based on the proposed end use detailed in the PRA. The following contamination sources are considered to be potentially present:

- Heavy metals, PAHs and asbestos from the development and subsequent demolition of on-site structures from circa 1892-1981, onsite garden allotments circa 1954-1957 and anecdotal evidence of the sites use as a coal yard.
- Petroleum hydrocarbons from paraffin pumps anecdotally noted to the south of the site.
- A risk from ground gas may be present subject to the thickness and composition of made ground on site.

8.1.1. Risk Ratings

This level of risk is defined as the following – ‘Moderate risk – It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term’.

Therefore, given the risks identified, the following recommendations were made

8.2. Recommendations for Further Works

8.2.1. Site Investigation

Following the formulation of the risk assessment there was deemed to be the potential for unacceptable risks to identified receptors. Further investigation works were recommended in order to refine these risks.

The primary aim of the Site Investigation should be to assess the soil conditions across the site, mindful of the identified sources. The investigation should provide sufficient site coverage to assess the condition of the site as a whole. Soil samples should be gathered and submitted for laboratory analysis in order to characterise the encountered ground conditions. Monitoring wells should be installed across the site in order to permit water gauging and if required gas monitoring. Additionally, it will allow for subsequent groundwater monitoring and infiltration testing if deemed necessary.

The site investigation was also designed to provide meaningful geotechnical information to enable the design of the foundations of the proposed development.

8.3. Unexploded Ordnance (UXO) Risk Assessment

The site is located in a Moderate risk area for UXO. A Preliminary UXO Risk Assessment was ordered from 1st Line Defence which concluded the risk from UXO on site is not considered to be significantly elevated above the ‘background level’ for this area of Manchester in general and was recommended that no further research was undertaken. The report is included as Appendix 6.

9. FIELDWORK SUMMARY OF SCOPE AND RATIONALE

9.1. Site Management and Preparation

Suitably experienced Ridge staff supervised the intrusive investigation, which was undertaken 3rd May to 7th May 2024. Methods employed during the investigation were carried out in general accordance with statutory guidance including BS5930:2015+A1:2020 *Code of Practice for Site Investigations* and BS10175:2011+A1:2013 *Investigation of Potentially Contaminated Sites: Code of Practice*.

A photographic log is included as Appendix 3.

9.2. Utility Clearance

Relevant service plans were assessed prior to the start of investigation works. Each proposed location was carefully checked for services using the CAT and Genny system before excavation. Hand advanced starter pits were excavated to 1.20m bgl, prior to the drilling of each borehole, to allow inspection for buried services.

9.3. Rationale and Summary of Scope

The Site Investigation scope was devised by Ridge, based on information collated to date, and comprised the following:

- One 15m cable percussive borehole (CP101) drilled to a maximum depth of 15.15m. Upon completion, this borehole was backfilled using arisings.
- Two days windowless sample borehole drilling (WS101-WS110) to a maximum depth of 5.45mbgl using a tracked dynamic sampling rig. Three boreholes (WS101, WS105 & WS106) were installed with a 50mm diameter standpipe to allow groundwater gauging and (if required) gas monitoring.
- Geotechnical and contamination laboratory analysis.
- Two rounds of subsequent monitoring of groundwater levels and, if required, gas monitoring in installed wells.

9.3.1. Cable Percussive Boreholes

One cable percussive borehole (CP101) was advanced to a target depth of 15.15mbgl.

The primary objective was to allow logging of deep soils, *in situ* Standard Penetration/ U100 Tests, and to provide opportunity for collecting soil samples for subsequent laboratory analysis, within or close to proposed build footprints. Cable percussive locations were spread across the investigation area for coverage.

Upon completion, this borehole was backfilled with arisings.

9.3.2. Windowless Sample Boreholes

Ten windowless sample boreholes (WS101-110) were drilled on site as per Figure 3. The primary objective was to assess typical ground conditions across the site, and, in areas proposed as buildings.

The boreholes allowed the production of detailed engineers logs, recovery of samples for laboratory testing, and additionally allowed in situ Standard Penetration Testing to provide geotechnical parameters for future use.

Three of the boreholes (WS101, WS105 & WS106) were installed with 50mm diameter standpipes to allow groundwater gauging and, if required, gas monitoring.

9.3.3. Falling Head Tests

Three falling head tests were conducted within the boreholes installed with a gas and groundwater monitoring standpipe (WS101, WS105 & WS106) to allow calculation of the permeability of the superficial soils to be established.

9.3.4. Test Location Rationale

Rationale for each test location completed is detailed in the table below.

HOLE ID	RATIONALE	MAX DEPTH (MBGL)
CP101	Located in the centre site to provide information on the deeper strata	15.15
WS101 – WS110	Spread across the site to provide general coverage	5.45

Table 9.1: Test Location Rationale

The layout of the exploratory positions is presented in Figure 3. Engineering Logs are presented in Appendix 7.

9.4. Soil Sampling

All intrusive locations were logged, and visual or olfactory evidence of contamination noted in accordance with best practice.

Soil sampling of the near surface materials was undertaken to assess the contamination risks to human health and controlled waters. Samples were also removed at varying depth for geotechnical testing.

Samples were handled using a fresh pair of nitrile gloves. Equipment was cleaned between use at different test locations and different sampling depths to prevent cross-contamination. Selected samples were placed in sealable bags, sealed glass jars or plastic tubs (dependent on the exact laboratory requirement and analysis to be undertaken) and stored in a temperature-controlled environment before transit.

9.5. Groundwater Gauging

All installed monitoring wells (WS101, WS105 & WS106) were gauged on two occasions enable assessment of groundwater levels and the presence of any visual/ olfactory evidence of contamination of groundwater.

10. GROUND CONDITIONS ENCOUNTERED

10.1. Soil Conditions

10.1.1. Made Ground

Made Ground was identified at all locations from ground level to 1.50mbgl (WS103). Made Ground comprised of the following strata:

- Sandy gravelly Silt or silty Gravel of sandstone and mudstone with occasional fragments of brick, plastic, glass, clinker, coal, metal and timber to a maximum depth of 1.20mbgl.
- Gravelly sandy Clay with occasional fragments of brick.

10.1.2. Devensian Till Deposits

Devensian Till Deposits were identified in all test locations below Made Ground.

Heterogenous Clay was identified in all boreholes to a maximum depth of 5.45mbgl in the windowless sampling boreholes and 15.15mbgl in the cable percussive borehole.

Fine to medium Sand bands were also identified in some of the windowless sampling boreholes with various thickness and depths.

All windowless sample boreholes refused on very stiff Clays. The shallowest refusal was encountered in WS104 at 3.13mbgl.

10.1.3. Summary

The above natural soils are consistent with the published geology and findings of previous investigations.

Bedrock geology was not encountered during the site investigation.

10.2. Groundwater Conditions

10.2.1. Groundwater Strikes during Drilling

A summary of groundwater strikes noted during drilling is presented in the table below.

LOCATION	INITIAL STRIKE (MBGL)
WS101	4.45
WS102	5.45
WS107	2.10
WS108	~ 2.00 – 3.00
WS109	1.90

Table 10.1: Groundwater Strikes

10.2.2. Groundwater Levels during Monitoring

Results of the two rounds of groundwater level monitoring are detailed in the table below.

LOCATION	30/05/2024 (MBGL)	14/06/2024 (MBGL)
WS101	1.18	1.27
WS105	1.11	2.57
WS106	1.04	0.63

Table 10.2: Groundwater Levels

10.3. Visual/ Olfactory Evidence of Contamination

10.3.1. Soils

There was no further visual/ olfactory evidence of contamination noted other than anthropogenic materials discussed in sections above.

10.3.2. Groundwater

There was no evidence of contamination noted during groundwater gauging.

11. CONTAMINATION ASSESSMENT

11.1. Selection of Contaminants of Concern for Analysis

Based on the site history a testing suite including sulphates, asbestos, heavy metals, PAHs, TPH CWG, BTEX and MTBE was considered to be appropriate. TPHCWG testing was to confirm the presence or absence of hydrocarbon contamination associated with the offsite paraffin pumps.

11.2. Soil Assessment Methodology

Specific soil sample location and depth was chosen based on site coverage and where anthropogenic materials were identified, and where desk-based research has shown contaminants are more likely to present.

11.2.1. Generic Assessment Criteria

Ridge have undertaken a screen of the soil laboratory results using generic assessment criteria. Generic assessment criteria (GAC) are conservative contaminant concentration values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information.

In order to assess the soil analyses results with regard to potential human health risks, Ridge has adopted published guidance criteria widely referred to by professionals within the industry, which include the following:

- Suitable 4 Use Levels (S4ULs) Generic Assessment Criteria (GAC) developed by the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management Ltd. (LQM);
- Category 4 Screening Levels (C4SL) for lead, produced by CL:AIRE (2014); and
- The UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols, produced by the EA and Department of Environment, Food and Rural Affairs (2009).

Proposals indicate a residential use of the site with communal soft landscaping. Therefore, we have utilised the 'residential without consumption of home grown produce'.

Results were compared to most appropriate soil organic matter value unless otherwise stated. Values were always 'rounded down' to ensure assessments were conservative.

With regard to human health, the CLEA model states that, 'the contamination is assumed to be at or within 1.00m of the surface' (CLR10 pg10). It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway. Therefore, for the purposes of statistical analysis, data from the top 1.00m to 1.50m is used for assessment of risks to human health via direct contact pathways in accordance with the CLEA model, dependant on proposed future site levels.

11.3. Soil Assessment

11.3.1. General

Ten soil samples collected during the Ridge site investigation from Made Ground and shallow natural soils at various depths and locations were submitted to a UKAS accredited laboratory for analysis for a suite of analysis that included asbestos, heavy metals and PAHs. TPH CWG, BTEX and MTBE testing were carried out closest to where the offsite paraffin pumps were anecdotally identified.

Laboratory analysis certificates are included as Appendix 8.

Primarily, samples were obtained from worst case Made Ground, where anthropogenic constituents were at their most prevalent. A number of samples were obtained from shallow natural soils to show contaminants had not migrated from Made Ground vertically.

11.3.2. Organic Matter

Organic matter ranged from 2.30 – 39.60% in Made Ground.

11.3.3. Asbestos

Ten samples were tested for asbestos. One sample taken from WS104 at 0.30-0.40mbgl confirmed the presence of asbestos as amosite present in microscopic board. Further quantification testing of this sample revealed a value of 0.038%.

11.3.4. Heavy Metals

Results of testing for heavy metals which exceeded the relevant assessment criteria have been summarised below. The full results are included in Appendix 8

DETERMINAND	RESIDENTIAL WITHOUT PLANT UPTAKE		
	Max. Conc. (mg/kg)	GAC (mg/kg)	Exceedances of Screening Value
Arsenic	43	40	WS101-0.20-0.30 (43mg/kg)
Lead	455	310	WS101-0.20-0.30 (455mg/kg) WS101-0.50-0.60 (315mg/kg) WS102-0.10-0.20 (359mg/kg)

Table 11.1: Heavy Metal Results

The probability of heavy metal contamination posing a risk to receptors across the site is considered likely. With a medium consequence the risk is expected to be moderate, and remediation is recommended.

11.3.5. Polycyclic Aromatic Hydrocarbons (PAHs)

Results of testing for PAHs which exceeded the relevant assessment criteria have been summarised below.

DETERMINAND	RESIDENTIAL WITHOUT PLANT UPTAKE		
	Max. Conc. (mg/kg)	GAC (mg/kg) 1%/2.5%/6%	Exceedances of Screening Value
Naphthalene	33.70	2.3/5.6/13	WS101-0.20-0.30 (24.3mg/kg) WS102-0.10-0.20 (33.7mg/kg)
Benzo(a)anthracene	225	11/14/15	WS101-0.20-0.30 (218mg/kg) WS102-0.10-0.20 (195mg/kg) WS106-0.20-0.30 (48.8mg/kg) WS107-0.10-0.20 (225mg/kg)
Chrysene	194	30/31/32	WS101-0.20-0.30 (194mg/kg) WS107-0.10-0.20 (181mg/kg)
Benzo(b)fluoranthene	183	110/110/110	WS101-0.20-0.30 (183mg/kg) WS102-0.10-0.20 (143mg/kg) WS107-0.10-0.20 (162mg/kg)
Benzo(a)pyrene	160	5.3	WS101-0.20-0.30 (160mg/kg) WS102-0.10-0.20 (122mg/kg) WS104-0.30-0.40 (7.19mg/kg) WS106-0.20-0.30 (42.70mg/kg) WS107-0.10-0.20 (147mg/kg)
Indeno(1,2,3-cd)pyrene	59.90	45/46/46	WS101-0.20-0.30 (59.90mg/kg) WS102-0.10-0.20 (47.80mg/kg) WS107-0.10-0.20 (51.60mg/kg)
Dibenz(a,h)anthracene	13.70	0.31/0.32/0.32	WS101-0.20-0.30 (13.70mg/kg) WS102-0.10-0.20 (7.41mg/kg) WS104-0.30-0.40 (0.63mg/kg) WS106-0.20-0.30 (5.36mg/kg) WS107-0.10-0.20 (6.82mg/kg)

Table 11.2: PAH Results

Additional discussion of the PAH results is contained in Section 11.3.8.

The probability of PAH contamination posing a risk to receptors across the site is considered likely. With a medium consequence the risk is expected to be moderate, and remediation is recommended.

11.3.6. Total Petroleum Hydrocarbons (TPH)

Results have been compared to the relevant assessment criteria and no elevated TPHs were identified.

No visual or olfactory evidence of hydrocarbons were noted during the investigation works additionally the PID did not detect any elevated levels.

To examine the potential additivity of toxicological effects between the petroleum hydrocarbon fractions, a Hazard Index (HI) as described by the Environment Agency¹ technical report should be calculated for the samples. As no significant concentrations of petroleum hydrocarbons were identified in any of the soil samples this has not been undertaken.

The probability of hydrocarbon contamination posing a risk to receptors across the site is considered unlikely. With a medium consequence the risk is expected to be low, and no remediation is recommended.

11.3.7. BTEX and MTBE

Results have been compared to the relevant assessment criteria and no elevated BTEX or MTBE compounds were identified.

The probability of BTEX or MTBE contamination posing a risk to receptors across the site is considered unlikely. With a medium consequence the risk is expected to be low, and no remediation is recommended.

11.3.8. Discussion of Results

Results across the site appear to reflect observations made in the field i.e., Made Ground with coal, brick and clinker was observed across the entirety of the site. Considering the history of the site, elevated concentrations of heavy metals and PAHs especially alongside high Loss on Ignition (LOS) and Total Organic Carbon (TOC) are to be expected.

At the concentrations identified heavy metal and PAHs are considered to pose a potential risk to future site users (residents) in soft landscaped areas, where made ground may be exposed. The principal pathways are the ingestion pathways (soil and dust) and dermal contact.

The probability of PAH and metal contamination affecting site users via the above pathways is likely. With a medium consequence, the risk is considered moderate, and remediation is recommended.

In addition to the above elevated naphthalene was identified in WS101 and WS102 given the composition and distribution of the made ground on site the contamination is anticipated to be site wide. There is therefore a risk to site users via the inhalation of vapours.

The probability of vapours posing a risk to site users across the site is considered likely. With a medium consequence, the risk is expected to be moderate, and remediation is required.

Asbestos containing materials were identified in WS104 at 0.30-0.40mbgl relating to 0.038% amosite in microscopic board. To further assess the risk from this Ridge carried out a JIWG assessment of the asbestos in its current condition and location and the risks if that same material is encapsulated below a typical cover system for the proposed development. The assumed receptor in line with the proposed development was considered to be an infant under 5 with exposure in or within 10m of the area of disturbance based on >10 hours per day (residential) exposure.

The JIWG assessment indicated a 'High' ranking for asbestos risk at present. Based on this the probability is considered likely, with a medium consequence, the risk is considered to be moderate, and remediation is recommended.

Ridge then ran the assessment a second time based on the asbestos contamination being below a 450mm cover system with the asbestos containing material buried at shallow depth with potential be disturbed by excavations and the residual ranking was indicated to be 'Low' Based on this Ridge consider that remedial

options including removal from site, or a 'standard' cover system would be suitable to address the risks from asbestos on site.

The JIWG models are presented in Appendix 11.

11.4. Controlled Waters Assessment

A low to moderate risk to controlled waters was identified within the desk top study and testing was only recommended if a significant source of potentially mobile contamination was identified during investigation works.

Although elevated heavy metals and PAHs were identified on site it is considered likely that the source is coal and clinker noted within the near surface made ground which are in a form not readily soluble. The highest PAH values were detected in the south of the site furthest from the water course with soil testing not demonstrating significant exceedances in the locations close to Gore Brook. Additionally, there is a significant thickness of low permeability (extending to >15mbgl) clay below the site (Falling head tests demonstrated no significant transmissivity). This demonstrates an unlikely probability of onsite contamination affecting controlled waters. With a medium consequence the risk is anticipated to be low, and no remediation is required.

11.5. Gas Risk Assessment

Gas monitoring has not been carried out as part of this investigation as a risk of hazardous or ground gas was only identified if significant thicknesses of biodegradable or putrescible made ground were identified on site.

Made ground to a depth of 0.30-1.50mbgl with an average depth of 0.67mbgl was encountered across the site. In line with CL:AIRE Research Bulletin 172 where made ground is on average 1m or less and no significant organic / putrescible material is present, the site can be classified as Characteristic Situation 1 and no gas protection measures are required.

Ridge therefore confirm the probability of gas affecting receptors is unlikely. With a severe consequence, the risk is moderate to low. Given the composition and thickness of made round on site a low risk would be appropriate, and no remediation is required.

11.6. Waste Material

11.6.1. Identification of Hazardous Properties

Results from all soil samples that underwent the full contamination suite were input into a Soils Characterisation Assessment Tool (HazWaste Online) to identify whether soils on site had hazardous properties.

None of the samples returned hazardous properties.

The Haz-Waste Online output sheet is included as Appendix 9.

² CL:AIRE Research Bulletin (RB17) "A Pragmatic Approach to Ground Gas Risk Assessment" November 2012.

11.6.2. Waste Acceptance Criteria

The second part of the assessment process is a review of Waste Acceptance Classification (WAC) testing, which was carried out on two composite samples (WS102 – 0.60-0.70m + WS103 – 1.30-1.40m and WS109 – 0.20-0.30m + WS110 – 0.30-0.40m [typical of Made Ground]).

Made Ground soils were classified as suitable for disposal at **Hazardous** landfill due to loss on ignition and TOC % above the threshold for non-hazardous landfill. It is anticipated that this was due to the coal fragments observed within the made ground and consultation with waste disposal facilities is recommended.

It is recommended that further WAC testing is undertaken during groundworks to target specific waste being removed from site. Waste classification should be based on analyses that are representative of the particular waste load.

WAC testing certificates are included within Appendix 8.

12. GEOTECHNICAL TESTING AND ASSESSMENT

12.1. Introduction

This geotechnical assessment and the subsequent foundation design recommendations will use the findings of the investigation and the results of the in-situ and laboratory geotechnical testing carried out in the boreholes, and on representative samples of the materials encountered across the site.

This section discusses the key geotechnical characteristics of each encountered stratum as determined from field observations, in-situ and laboratory geotechnical testing.

The stratigraphy revealed during the ground investigation comprised Made Ground over Devensian Till Deposits to between 1.00m and 5.45m depth.

Please refer to Section 10 for further discussion on each stratum.

12.2. In – Situ Testing

12.2.1. Falling Head Testing

Falling head tests to assess the permeability of the ground. The tests were carried out in general accordance with guidance given in BS5930:2015 '*Code of Practice for Ground Investigations*' and BS22282 '*Geotechnical investigation and testing – Geohydraulic testing. Part 2: Water permeability tests in a borehole using open systems*'.

BS5930 indicates that if 'H₀' is taken as the groundwater 'Head' above baseline conditions following the addition of water at the start of the permeability test and 'H' is the measured groundwater 'Head' above baseline conditions at any given time during the test then the time taken to reach a head ratio (H/H₀) of 0.37 is used to calculate the permeability of the soils.

The tests were carried out in monitoring wells installed within the boreholes. Where slow progress was observed and H/H₀ of 0.37 was not reached, the permeability has not been calculated.

The boreholes were each monitored for a minimum of 3 hours. No appreciable drop in water levels was recorded during the monitoring period as such a permeability cannot be calculated.

12.2.2. Standard Penetration Testing (SPT)

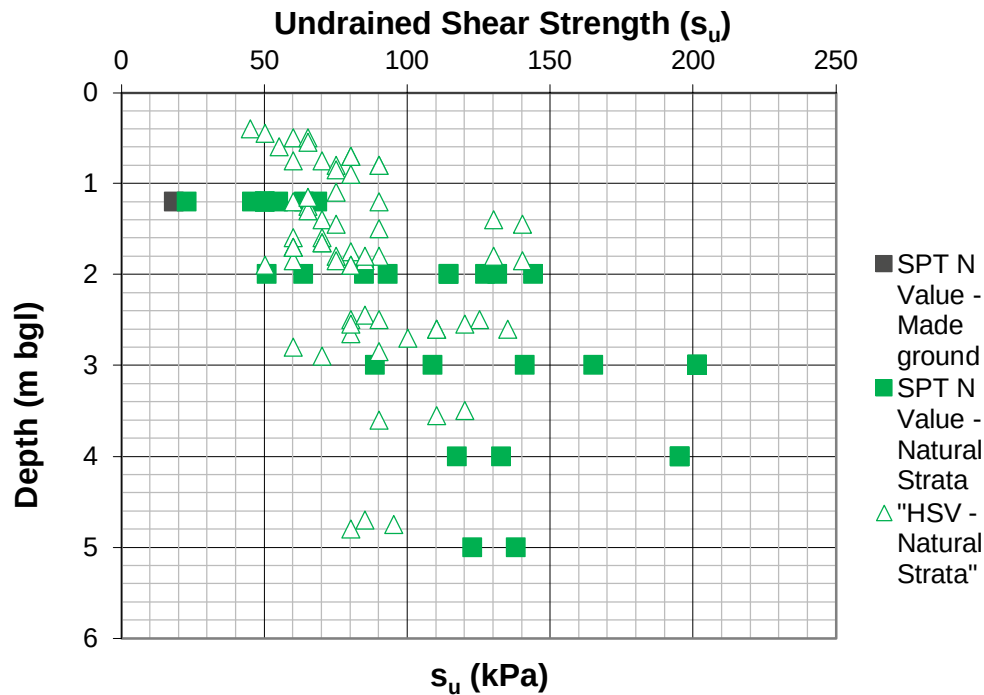
SPTs were completed throughout the drilling of all boreholes generally at 1.00m centres. SPT is an *in-situ* dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test is completed using a 63.5kg drop hammer weight, over a 750mm drop, measuring the blow counts for six, 75mm increments. The first two values are recorded as seating blows, with the remaining four values, added together to provide an 'N-value'.

The graph overleaf shows undrained shear strength based on SPT results in the predominantly cohesive strata.

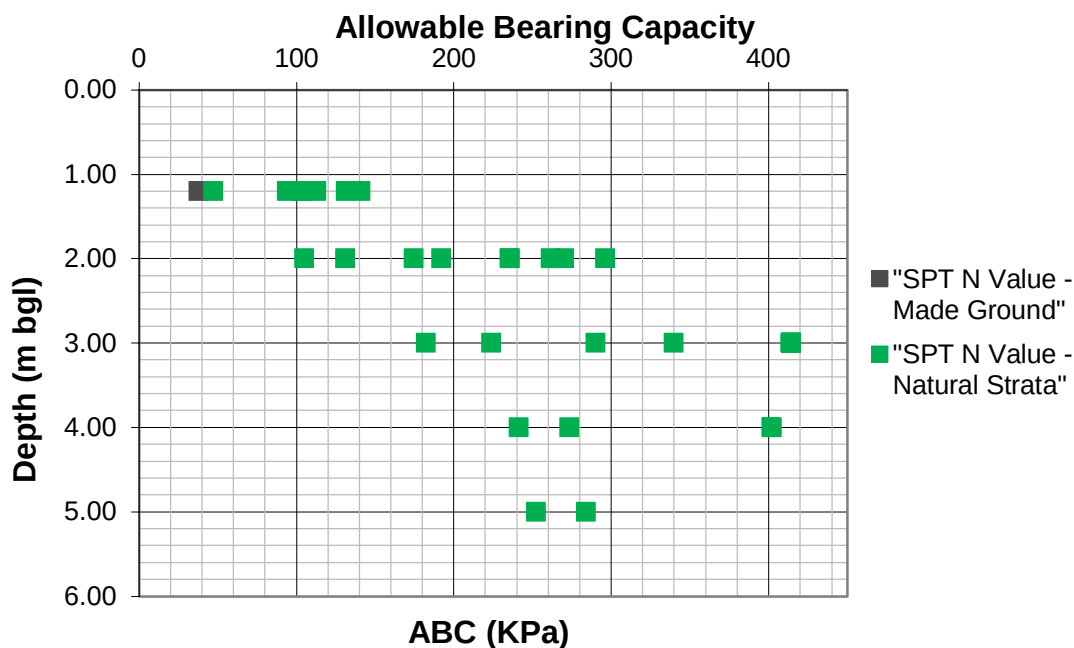
Only 1 SPT was carried out within the made ground due to the generally shallow depth of made ground across the site.

The majority of the SPT 'N' readings were collected within the Glacial Till. Average SPT 'N' results ranged from 13 at 1.20m, 27 at 2.00m, 42.5 at 3.00m. The graphs over leaf show a strong correlation with increasing depth and increasing soil strength.

Engineering logs showing the full test results are included in Appendix 7.



Graph 12.1: Undrained Shear Strength vs depth in cohesive strata



Graph 12.2: Allocable Bearing Capacity (ABC) vs depth in cohesive strata

12.3. Laboratory Testing

Details of the specific procedure used in each case are shown below in Table 12.1 and the geotechnical test certificates are presented in Appendix 8.

TEST	STANDARD (BS1377:1990) UNLESS OTHERWISE INDICATED	SCHEDULED
Moisture Content	Part 2: 3.2	16
Atterberg Limit Test	Part 2: 4.3 & 5.3	10
Unconsolidated Undrained Triaxial	Part 8	2

Table 12.2: Summary of Geotechnical Testing

12.3.1. Moisture Content & Atterberg tests

Ten samples underwent Moisture Content & Atterberg limits testing to determine the consistency limits and a further sixteen samples were scheduled for Moisture Content. The results are shown in Table 8.4 below.

SAMPLE ID	STRATA	MOISTURE CONT. W (%)	LIQUID LIMIT WL (%)	PLASTIC LIMIT WP (%)	425µM SIEVE (PASSING %)	PLASTICITY INDEX IP (%)	MODIFIED PLASTICITY INDEX (%)	CASAGRANDE CLASSIFICATION	VOLUME CHANGE POTENTIAL
WS102 1.10-1.20	Silty sandy slightly gravelly CLAY.	17.1	30	17	98	13	12.7	CL Low	Low
WS104 2.60-2.70	Silty sandy slightly gravelly clay	17.6	30	16	98	14	13.7	CL Low	Low
WS105 3.70-3.80	Silty sandy slightly gravelly clay	14.0	28	11	98	17	16.7	CL Low	Low
WS106 0.90-1.00	Silty slightly sandy slightly gravelly clay	23.6	52	21	99	31	30.7	CL High	Medium
WS108 1.20-1.30	Silty sandy slightly gravelly clay	18.5	32	15	98	17	16.7	CL Low	Low
WS108 1.80-	Silty sandy slightly	18.7	33	15	99	18	17.8	CL Low	Low

WS109 2.30- 2.60	Silty sandy slightly gravelly clay	20.0	35	18	99	17	16.8	CL Medium	Low
WS110 0.70- 0.80	Silty sandy slightly gravelly clay	17.7	31	15	98	16	15.7	CL Low	Low
WS111 1.90- 2.00	Silty sandy slightly gravelly clay	20.0	34	18	99	16	15.8	CL Low	Low
CP101 2.20 - 2.65	Silty sandy slightly gravelly clay	20.0	34	17	97	17	16.5	CL Low	Low

Table 12.3: Consistency Limits

The Atterberg limits testing returned the following results:

Low Plasticity - nine samples

Moderate Plasticity - one sample

In accordance with NHBC Guidance the Modified Plasticity Index translates to nine samples with Low volume change potential and one medium change potential. It should be noted that the one sample showing a medium volume change potential was located in the south of the site along the pedestrian access track well away from the proposed development footprints

12.3.2. pH/ Water Soluble Sulphate 2:1 extract

Testing carried out as part of the environmental testing showed pH values ranging from 7.3 to 8.1 and a maximum sulphate concentration of 51mg/l.

12.3.3. Unconsolidated Undrained Shear Strength

Two triaxial compression tests were carried out within CP101 at depths of 7.10 – 7.55 m bgl and 10.10 – 10.55m bgl which returned the following results.

SAMPLE ID	CELL PRESSURE (KPA)	FAILURE STRAIN (%)	RATE OF STRAIN (%/MIN)	CORRECTED DEVIATOR STRESS (KPA)	SHEAR STRENGTH CU (KPA)
CP101 7.10 – 7.55	142	11.0	2.0	846	423
CP101 10.10 – 10.55	202	14.5	2.0	290	145

Table 12.5: Undrained Shear Strength Results

12.4. Foundations

The ground investigation proved the expected general strata sequence comprising Made Ground, underlain by cohesive Glacial Till. The base of the superficial strata was not identified extending below the maximum investigation depth of 15.15mbgl. The made ground extended to a maximum thickness of 1.50mbgl with an average thickness of 0.67m.

The selection and design of foundations is beyond the scope of current instructions and is the responsibility of the designers of the proposed building. The following recommendations, deriving from observations made during the investigation and testing are provided to assist the design process.

12.4.1. Traditional foundations

Based on the medium to high SPT-N and hand shear vane values recorded in the glacial from 1.5mbgl it is generally considered to be suitable founding strata for low rise residential buildings.

Based on SPT and shear vane results an estimated safe bearing pressure of 100kPa is considered appropriate for traditional strip or trench-fill foundations from approximately 1.5mbgl.

In all cases foundations should extend through Made Ground and into the indigenous clay to penetrate at least 150mm at a minimum depth of 1.50m, below existing levels. Should higher allowable bearing capacities be required foundations may need to be deepened with an ABC of 130kPa achieved from 2.0mbgl.

The exception to this is WS101 where lower values were identified at 1.2 and 2.0mbgl however WS101 is located outside the proposed building footprint.

It should be acknowledged that the depth to undisturbed natural ground may be deeper in parts of the site where there are existing slabs are in place following grubbing out. Should 'soft' spots be identified they may need to be excavated out and replace with suitably compacted granular fill.

12.4.2. Ground improvement

Given the conditions present on site ground improvement technics are unlikely to be suitable.

12.4.3. Piled Foundations

Shallow 'mini' piled foundations set at least 5mbgl within the glacial till material should be suitable if significantly higher loadings than anticipated are required.

Specialist advice should be sought from a suitably qualified/experienced piling contractor with regards to allowable bearing capacities and settlement if this option is to be considered further.

12.5. Foundations – General

Other foundation solutions are available, and it will be necessary for a suitable risk assessment to be carried out by the foundations designer's at the appropriate time.

The above recommendations are based on interpolation of ground conditions between exploratory hole locations and interpretation should take the access restrictions at the time of investigation into account.

12.6. Floor slabs

The depth of made ground is generally on the limit of where a ground bearing floor slabs are recommended. A reduction in thickness of made ground may facilitate their use or alternatively a suspended floor (such as block and beam) may be appropriate.

12.7. Earthworks

Earthworks are anticipated in the northwest of the site with the infilling of the current access track and along the west of the site bordering Tan Yard Brow where a cut of the existing slope is anticipated

Modification of the site levels in proximity to the slope adjacent to the north of the site must take account of the stability of that slope during placement.

12.8. Buried Concrete

Buried concrete should be specified to comply with the findings of the testing carried out. Laboratory testing indicates that the ground conditions equate to DS1 AC1 and sulphate resistant concrete is not required.

12.9. Infiltration Drainage

Soakaway testing proved poor infiltration drainage with the clay below the site acting as an aquitard restricting the flow of groundwater.

13. SLOPE STABILITY ASSESSMENT

13.1. Scope

The aim of this assessment is to understand the stability of the existing slope along, and extending off, the sites northern boundary down towards Gore Brook.

13.2. Methodology

A slope stability assessment has been undertaken for the slope located along the northern edge of the site. The slope extends from the site boundary before towards Gore Brook to the north of the site. The assessment has been carried out on the current slope in its existing form and existing conditions.

Available geotechnical information including borehole logs from within the site boundary, geological maps and observations made during the investigation works have been used to assess the stability of the slope. The geometry and topography of the existing slope was obtained from the topographical survey provided.

Modelling has been carried out using CADs Geotechnical Reslope software at 3no locations in the east, midpoint and west of the slope. As shown on Plate 13.1.

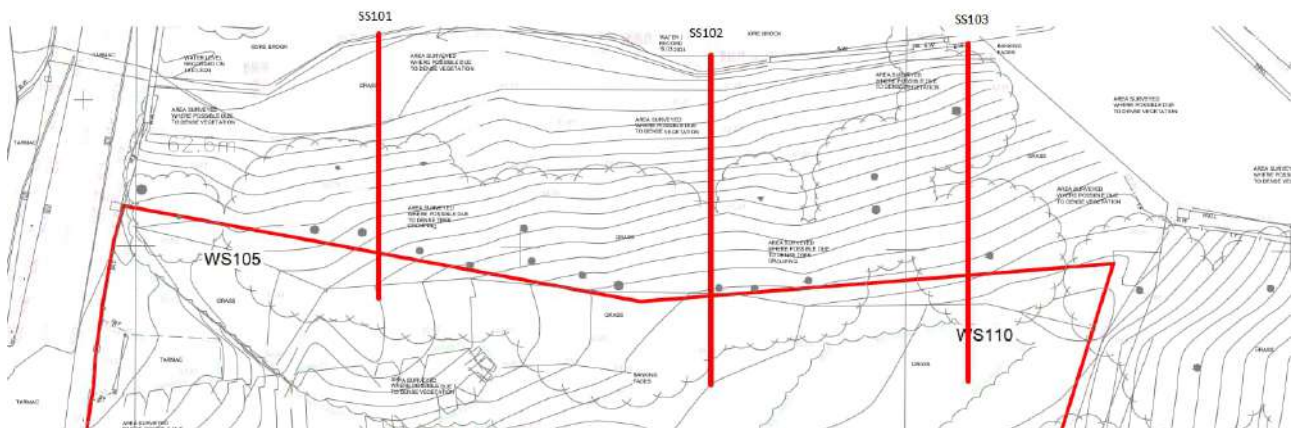


Plate 13.1: Slope Sections

13.3. Site Observations and Measurements

The existing slope was examined by the Ridge engineer for any signs of movement. A number of measurements were made of the slope angle across the slope at the top, middle and base of the slope.

The slope is densely vegetated with shrubs, brambles and trees ranging from saplings to mature and well established. No evidence of slope movement was observed during the inspection. The slope varied from 5m to approximately 8m in height while measurements taken indicated that the slope is currently resting at angles ranging from 28° to 30°.

No evidence of groundwater was noted on the slope.

13.4. Geotechnical Parameters

STRATUM	PARAMETER		SOURCE	VALUE
Glacial Till (cohesive units)	Unit Weight (kN/m ³)		Laboratory tests and BS8004	12-16kN/m ³
	Undrained Shear Strength	c_{uk} (kN/m ²)	Relationship with SPT and plasticity index	50-201kN/m ²
		ϕ_{uk} (°)		28-30°

A Minimal layer of made ground <0.25m thick was identified close to the crest of the slope as such it was not considered as part of the stability assessment.

13.5. Modelling

The slope was modelled in its present condition and then again with a load of 100kN/m² applied approximately 2.0m from the crest of the slope at the foundation depths proposed within this report to assess the impact of the proposed development on the slope. Modelling was carried out along the 3no. lines SS101, SS102 and SS103 shown on Plate 13.1. The modelling does not account for the presence of vegetation on the slope which will likely add to its stability.

SS101

The modelling shows the slope to be stable along this section with a lowest factor of safety of 1.03. This 'low' point is located outside the site boundary and is at shallow depth. Imposing a load of 100kN/m² at the anticipated foundation depth of 1.5mbgl did not impact upon the stability of the slope.

SS102

The modelling shows that the slope is stable on site, however a small near surface rotational failure with lowest stability factor of 0.97 is noted midway down the slope outside the site boundary. As this point is located outside the site boundary and is a shallow. Small scale potential failure it is not considered to be a risk to the site itself as the potential failure does not extend onto site. It is also considered likely that there is no physical evidence of this feature as the dense vegetation across the slope, including mature trees, is acting as an additional stabilising factor so no active failure is occurring. All other values are in excess of 1. Imposing a load of 100kN/m² at the anticipated foundation depth of 1.5mbgl did not impact upon the stability of the slope.

SS103

The modelling shows that the stable along this line of section with a lowest factor of safety of 1.05. This 'low' point is located outside the site boundary and is at shallow depth. Imposing a load of 100kN/m² at the anticipated foundation depth of 1.5mbgl did not impact upon the stability of the slope.

The output of the CADS Reslope modelling has been included for each section, both with and without load in Appendix 12

13.6. Conclusions

In its present condition the slope is considered to be stable in relation to the site. The modelling indicates that with an assumed load of 100kN/m², set as close as 2m from the crest of the slope, the proposed development will not impact the on the stability of the slope.

No consideration of the vegetation on the slope has been included at this stage, it is likely that the vegetation is bringing further stability to the slope. Consideration of the stability of the slope should be assessed if any vegetation is to be removed.

The slope has been assessed in its current condition, erosion of the toe of the slope by Gore Brook has not been accounted for in this assessment. It is considered unlikely that significant erosion will take place given the length and generally controlled nature of the watercourse i.e. emanates from Gore Brook Foundation adject to the northeast of the site and passes into a concrete bridge adjacent to the northwest of the site.

14. CONCEPTUAL SITE MODEL/ RISK ASSESSMENT

14.1. Sources

Following investigations conducted to date and screening of chemical analysis results, the following contaminant sources have been identified:

- Heavy metal and PAH contamination identified in the made ground across the site.
- Asbestos identified in 1no. location.
- Vapour contamination relating to naphthalene identified in the made ground across the site.

14.2. Updated Conceptual Site Model

The preliminary conceptual model from the Desk Top Survey has been updated and presented below. The Pollutant Linkage Assessment below relates to perceived current worst-case conditions on site, prior to the application of mitigation or remedial measures.

SOURCE	PATHWAY	RECEPTOR	SEVERITY	LIKELIHOOD	RISK LEVEL
Heavy Metals (lead and arsenic), PAHs and asbestos within Made Ground soils	Direct contact, ingestion, and inhalation of impacted soils, fibres and dusts.	Residential end users	Medium	Likely	Moderate
	Inhalation of vapours.	Maintenance workers and construction workers	Medium	Unlikely	Low
	Windblown dust.				
	Vertical migration of contaminants through the underlying geology and/ or via overland flow.	Principal Aquifer – bedrock	Medium	Unlikely	Low
		Gore Brook	Medium	Unlikely	Low
Ground Gas associated with Made Ground	Migration of ground gas through the underlying geology.	Residential end users Property	Severe	Unlikely	Low / Moderate*
	Inhalation of ground gas.	Offsite receptors	Severe	Unlikely	Low / Moderate*
PAHs within made ground soils	Deterioration of potable water supply pipes.	Potable water pipe	Medium	Likely	Moderate

Table 14.1: Pollutant Linkage Assessment

Note: *Low risk now considered appropriate as no significant source of ground/hazardous gas identified during the ground investigation works.

15. CONCLUSIONS AND RECOMMENDATIONS

15.1. Contamination

The design of the Site Investigation was based on the desk study and the contamination sources identified within.

Currently, as a worst case, a Moderate risk has been assessed for residential Site End Users; this relates to possible exposure to heavy metals (lead & arsenic), asbestos, PAHs and vapours (naphthalene) within the made ground present on site.

Based on this remediation is required, likely to include either removal or capping of made ground and inclusion of a vapour barrier within the proposed development. An asbestos management plan may also be required

15.1.1. Soft-Landscaping

Either removal of made ground to natural deposits or a capping layer is required to reduce risks to end users of the site. At this time allowance should be made for a 450mm thickness in soft landscaped areas.

If soils are imported to site these should be from a certified source. Imported topsoil and subsoil should ensure they do not have levels of common contaminants (such as heavy metals, PAHs and petroleum hydrocarbons) that exceed the applicable screening criteria.

15.1.2. Asbestos Mitigation During Construction Works

An asbestos management plan should be completed due to the presence of asbestos within the made ground.

15.1.3. Waste Removal

Soils have been classified as Hazardous across the site, generally due to the high organic matter content and loss on ignition. It is considered likely that this is as a result of coal fragments present within the made ground

We recommend further testing when removing portions of material from the site to allow appropriate classification – this may allow significant cost savings associated with waste disposal if those materials do not need to be disposed of as hazardous wastes.

15.2. Geotechnical

15.2.1. Foundations

Traditional foundations founded in the stiff to very stiff CLAY (glacial till) may be used for low-rise residential buildings. Foundations should be extended through Made Ground a minimum of 150mm into indigenous undisturbed clay. An estimated safe bearing pressure of 100kPa is considered appropriate traditional strip or trench-fill foundations up to 1m wide from approximately 1.5mbgl.

Foundations may need to be deepened where they clash with existing site features or foundations, it is noted some relic concrete was present on site, the depth of which has not been explored.

15.2.2. Groundwater

Shallow groundwater was not encountered during investigation works in any location.

15.2.3. Buried Concrete

Laboratory testing indicated that all samples were DS1 AC1.

15.2.4. Earthworks

Earthworks are anticipated in the northwest of the site with the infilling of the current access track and along the west of the site bordering Tan Yard Brow where a cut of the existing slope is anticipated

Modification of the site levels in proximity to the slope adjacent to the north of the site must take account of the stability of that slope during placement.

15.2.5. Soakaways

Soakaway testing did not produce favourable results with no significant fall in head during testing within boreholes therefore a permeability could not be calculated.

15.2.6. Floor Slabs

The depth of made ground is generally on the limit of where a ground bearing floor slabs are recommended. A reduction in thickness of made ground may facilitate their use or alternatively a suspended floor (such as block and beam) may be appropriate.

The thickness of made ground below existing concrete on site should be established to confirm floor slab design.

15.2.7. Further Geotechnical Investigation

No specific additional investigation works is recommended at this stage; however, it was noted during the investigation works that some concrete from previous site uses remains over a small area of the site. A watching brief should be maintained during the removal of these concrete slabs for any unexpected contamination (such as hydrocarbons). Should any unexpected contamination be identified Ridge should be consulted to determine if further testing or assessment is required.

FIGURE 1 - SITE LOCATION PLAN



Project:	Tan Yard Brow			Title:	Site Location Plan	
Job Number:	5025143	Client:	John Stephens & Co	Ridge and Partners LLP TEL: 01618339579 www.ridge.co.uk	2nd Floor, 100 Embankment, Cathedral Approach, Manchester M3 7FB	
Drawing:	5025143-Fig1	Revision:	-			
Drawn:	SD	Date:	April 2024			
Checked by:	BS	Scale:	NTS			

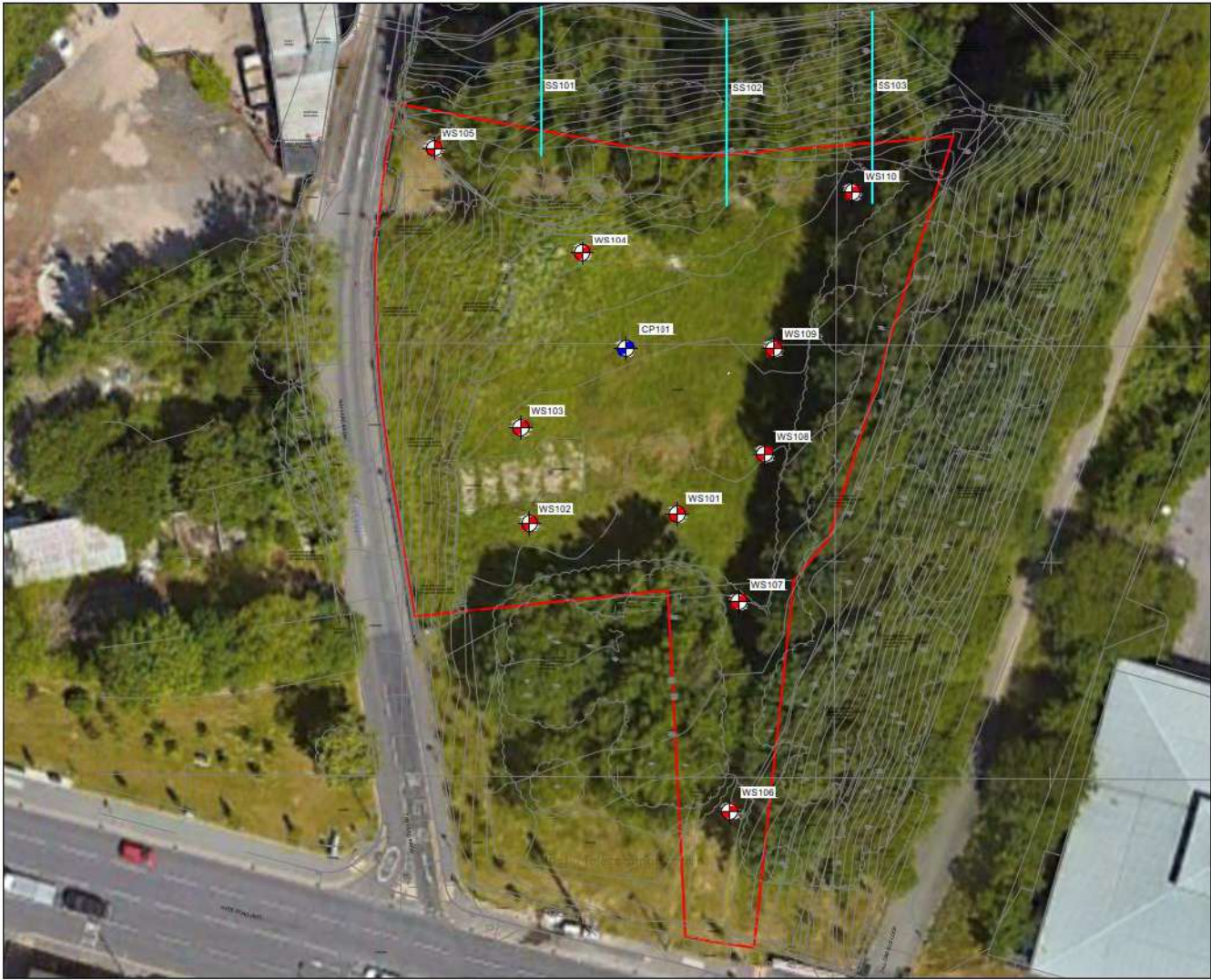
FIGURE 2 - DEVELOPMENT PLANS



Image taken from Equilibrium Architects R0863-01

Project:	Tan Yard Brow			Title:	Site Location Plan	
Job Number:	5025143	Client:	John Stephens & Co	Ridge and Partners LLP TEL: 01618339579 www.ridge.co.uk	2nd Floor, 100 Embankment, Cathedral Approach, Manchester M3 7FB	
Drawing:	5025143-Fig2	Revision:	-			
Drawn:	SD	Date:	June 2024			
Checked by:	BS	Scale:	NTS			

FIGURE 3 - TEST LOCATION PLAN



Key

Window Sample Borehole

Cable Percussive Borehole

Project:	Tan Yard Brow			Title:	Test Location Plan	
Job Number:	5025143	Client:	John Stephens & Co	Ridge and Partners LLP TEL: 01618339579 www.ridge.co.uk	2nd Floor, 100 Embankment, Cathedral Approach, Manchester M3 7FB	
Drawing:	5025143-Fig3	Revision:	-			
Drawn:	SD	Date:	April 2024			
Checked by:	BS	Scale:	NTS			

APPENDIX 1 - REPORT CONDITIONS

Report Conditions

This report is produced solely for the benefit of John Stephens & Co and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the Site.

This report is based on a visual Site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical Site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the Site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categorical assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ridge and Partners LLP. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the Site and adjacent Sites. The report concentrates on the Site as defined in the report and provides an opinion on surrounding Sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off Site intrusive investigations and monitoring.

APPENDIX 2 – LEGAL CONTEXT AND FRAMEWORK

Legal Context

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a regime for the control of specific threats to health or the environment from land contamination. In accordance with the Act and the statutory guidance document 'The Contaminated Land (England) Regulations 2000', the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only "contaminated land" where it appears to the Regulatory Authority, by reason of substances within or under the land, that:

"Significant harm is being caused, or there is a significant possibility of such harm being caused; or Pollution of controlled waters is being, or is likely to be, caused."

Inherent in this definition is the requirement for contamination risk assessment to be undertaken on a site-specific basis, as the potential for harm is determined by the Site's end use and its specific environmental setting. The guidance defines "risk" as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

While Part IIA of the Environmental Protection Act provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment, the regime does not take into account future uses. New developments are therefore controlled by the planning regime, with reference to the National Planning Policy Framework (NPPF, 2023), rather than directly by Part IIA of the Environmental Protection Act.

The NPPF is based on the principal that the site should be suitable for its new use, taking account of ground conditions, including from natural hazards or former activities and states that "Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner". The NPPF also links the planning and Part IIA regimes by stating that "after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990". Key components of the Part IIA regime, such as the definition of Contaminated Land and the associated risk-based assessment approach, are therefore considered to also be applicable to the planning regime.

Methodology

This report has been prepared in accordance with published Environment Agency guidance – Land Contamination Risk Management (LCRM, 2020), which supersedes CLR 11. CLR 11 adopted and refined the well-recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

In the context of land contamination, there are three essential elements to any risk:

A contaminant source – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.

A receptor – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.

A pathway – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage.

An important thread throughout the overall process of risk assessment is the need to formulate and develop a conceptual model for the site, which supports the identification and assessment of pollutant linkages. A conceptual model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

APPENDIX 3 – PHOTOGRAPHIC LOG

PHOTOGRAPHIC LOG



SITE: TAN YARD BROW
PROJECT NUMBER: 5025143

Photo No.	Date	
1	03/05/24	
Photo of Site entrance from Tan Yard Brow.		

Photo No.	Date	
2	03/05/24	
Photo of Cable Percussive Drilling Rig Setup.		

PHOTOGRAPHIC LOG



SITE: TAN YARD BROW
PROJECT NUMBER: 5025143

Photo No.	Date
3	03/05/24
Photo of Area of Hardstanding in the central area of the site.	



Photo No.	Date
4	03/05/24
Photo of Telecommunications Pylon Located on Hyde Road adjacent to the site.	



PHOTOGRAPHIC LOG

RIDGE

SITE: TAN YARD BROW

PROJECT NUMBER: 5025143

Photo No.	Date	
5	03/05/24	
Photo of the site entrance from Hyde Road.		

Photo No.	Date	
6	03/05/24	
Photo taken across site towards the woodland area in the central area of the site.		

PHOTOGRAPHIC LOG

RIDGE

SITE: TAN YARD BROW

PROJECT NUMBER: 5025143

Photo No.	Date	
7	03/05/24	
Photo of fly tipped material near the site entrance.		

Photo No.	Date	
8	03/05/24	
Photo of Gore Brook running adjacent to the site.		

PHOTOGRAPHIC LOG

RIDGE

SITE: TAN YARD BROW

PROJECT NUMBER: 5025143

Photo No.	Date	
9	03/05/24	
Photo of Hyde Road Aggregates directly opposite to the site along Tan Yard Brow.		

Photo No.	Date	
10	03/05/24	
Photo taken across the lower slope onsite along Tan Yard Brow.		

APPENDIX 4 – HISTORICAL MAPS

Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: County Series

Map date: 1892-1893

Scale: 1:2,500

Printed at: 1:2,500



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Edition 1893
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Surveyed 1892
Revised 1892
Edition N/A
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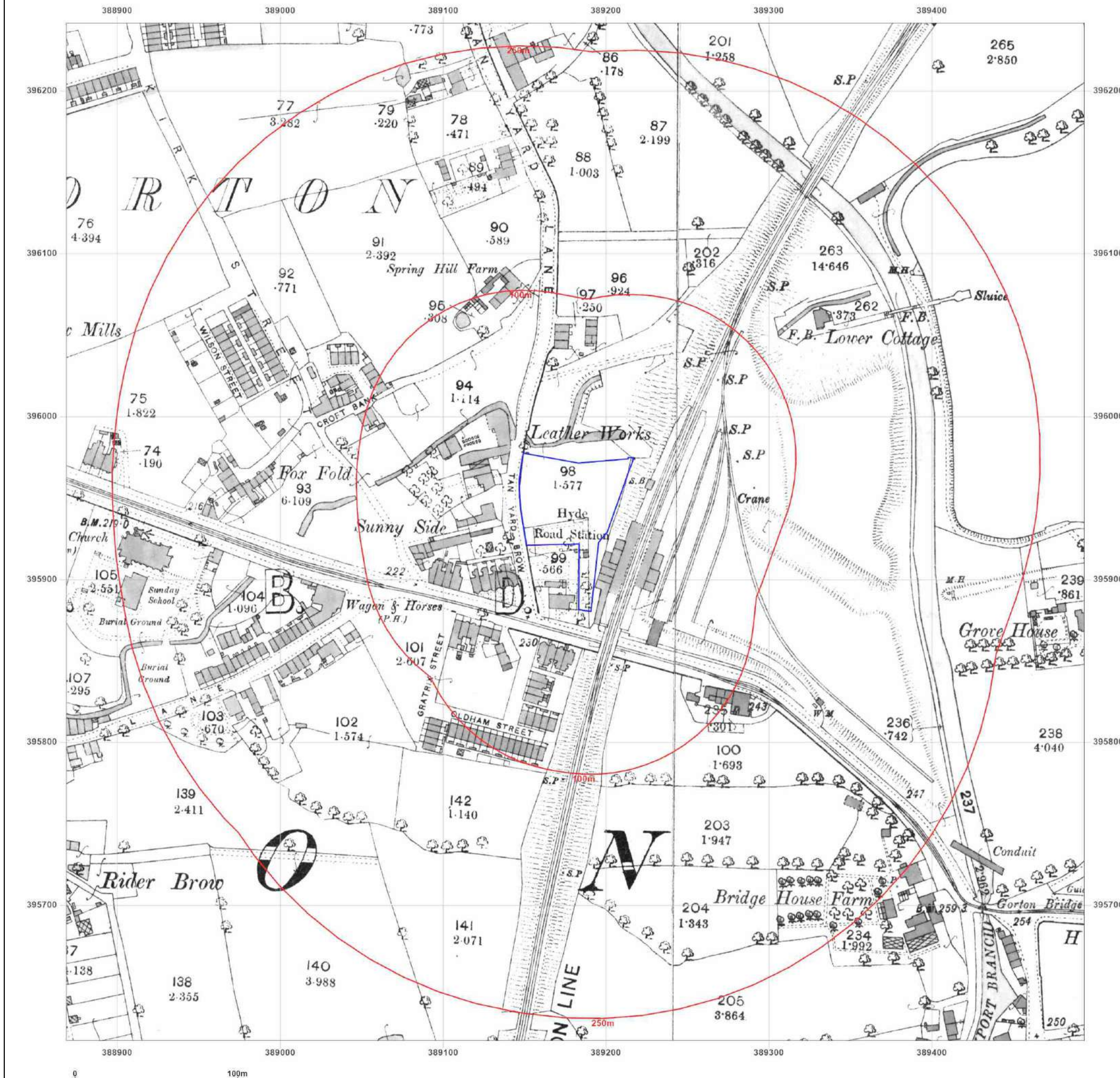


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Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: County Series

Map date: 1908

Scale: 1:2,500

Printed at: 1:2,500



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Edition 1908
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Surveyed 1908
Revised 1908
Edition N/A
Copyright N/A
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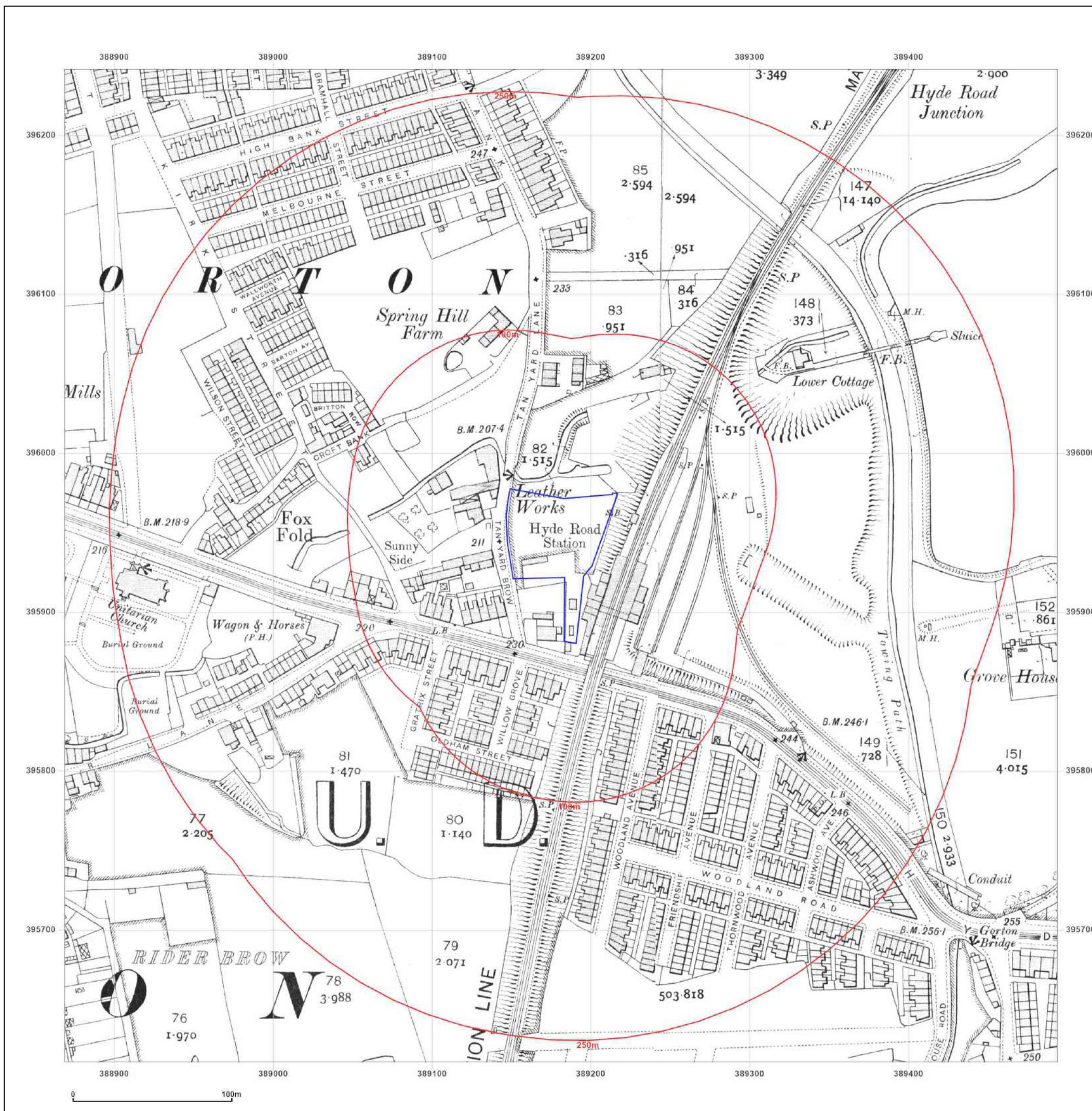


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Site Details:

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MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: County Series

Map date: 1922

Scale: 1:2,500

Printed at: 1:2,500



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Surveyed 1922
Revised 1922
Edition N/A
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Levelled N/A

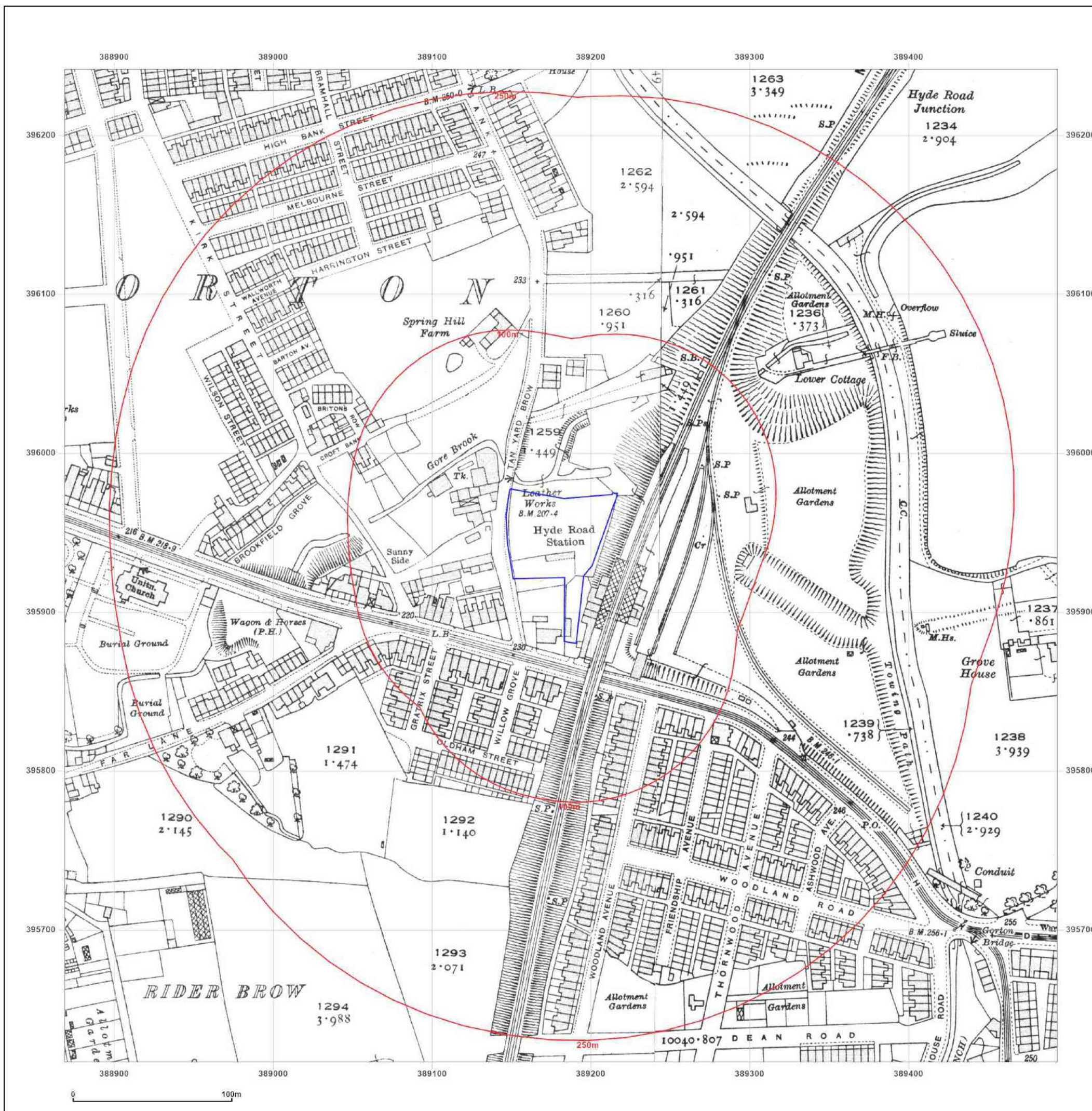


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Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: County Series

Map date: 1933-1934

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1873
Revised 1933
Edition N/A
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Levelled 1927

Surveyed 1934
Revised 1934
Edition N/A
Copyright N/A
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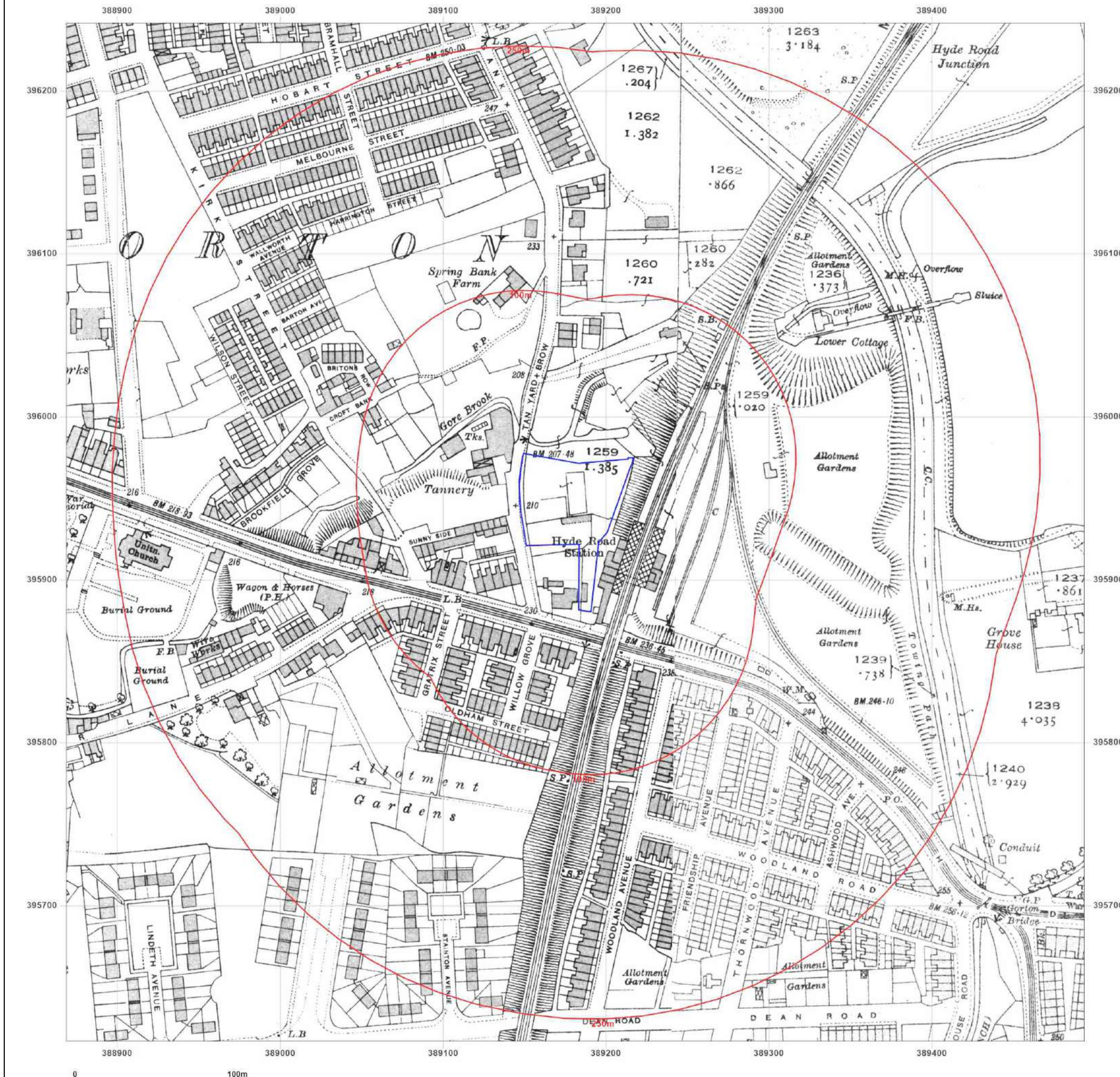


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Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1950-1952

Scale: 1:1,250

Printed at: 1:2,000



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

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

Surveyed 1952
Revised 1952
Edition N/A
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Production date: 10 April 2024

Map legend available at:
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Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1950-1952

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1950
Edition N/A
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Surveyed 1950
Revised 1950
Edition N/A
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Surveyed 1952
Revised 1952
Edition N/A
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Production date: 10 April 2024

Map legend available at:
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Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1951-1954

Scale: 1:1,250

Printed at: 1:2,000



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

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Revised N/A
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Site Details:

56, TAN YARD BROW,
MANCHESTER, M18 8UJ

Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1957-1960

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1950
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Surveyed 1952
Revised 1960
Edition N/A
Copyright 1960
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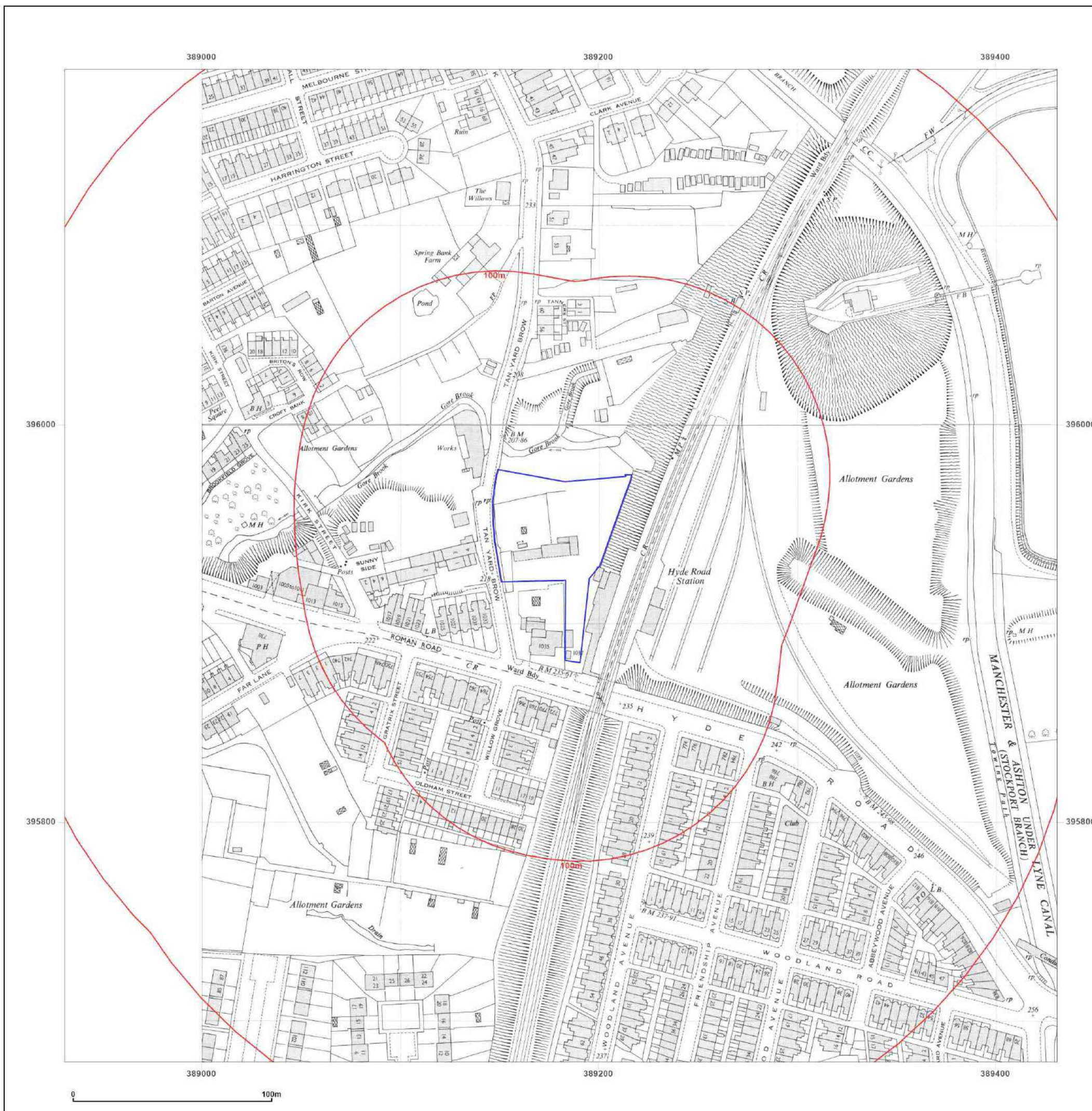


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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1958-1963

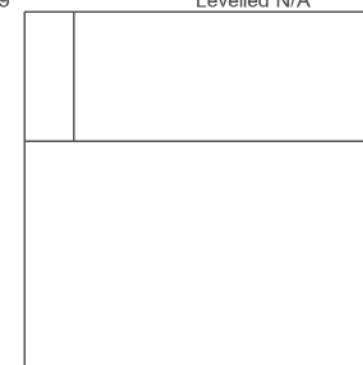
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Revised N/A
Edition N/A
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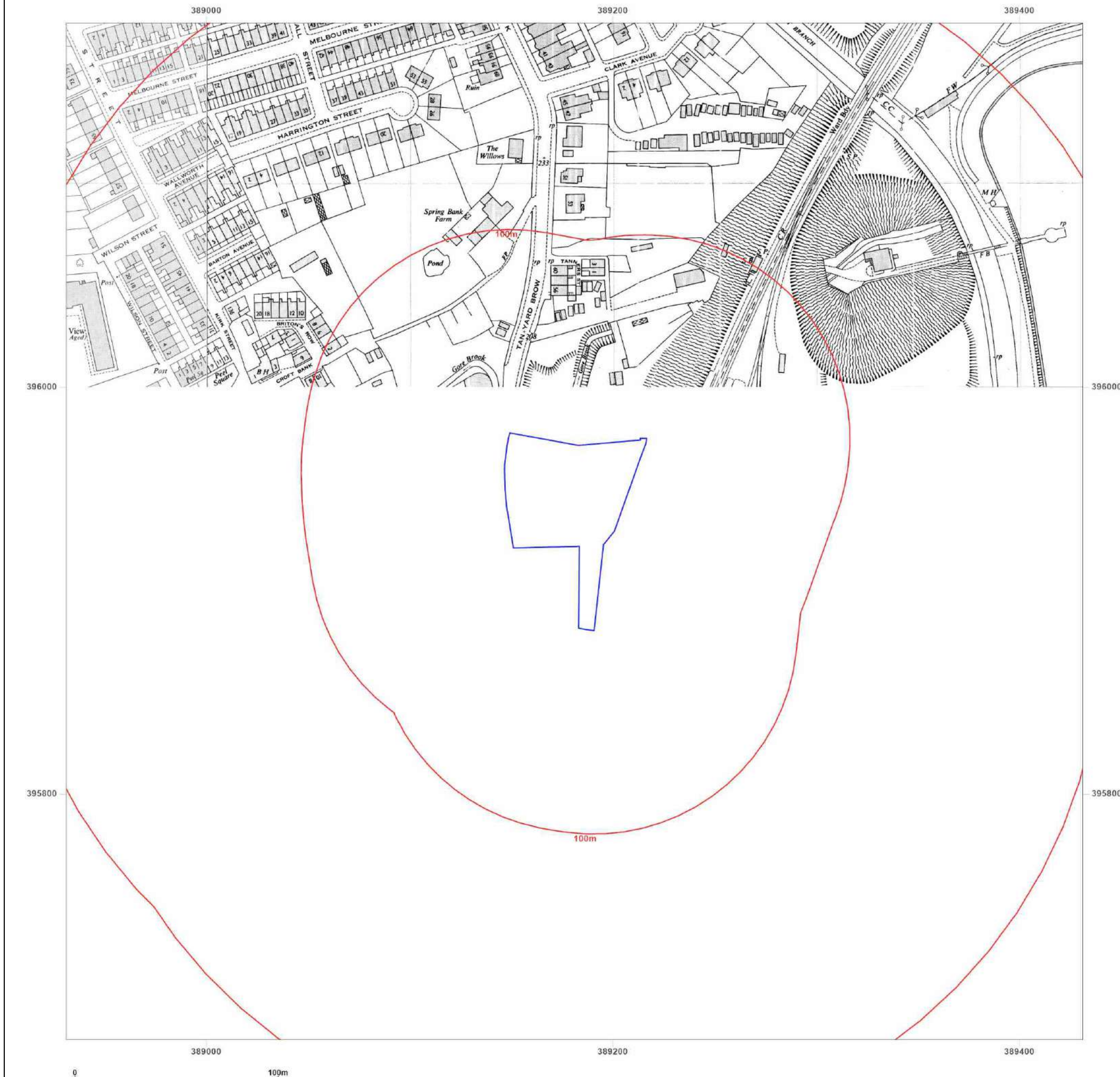


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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1981-1983

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1983
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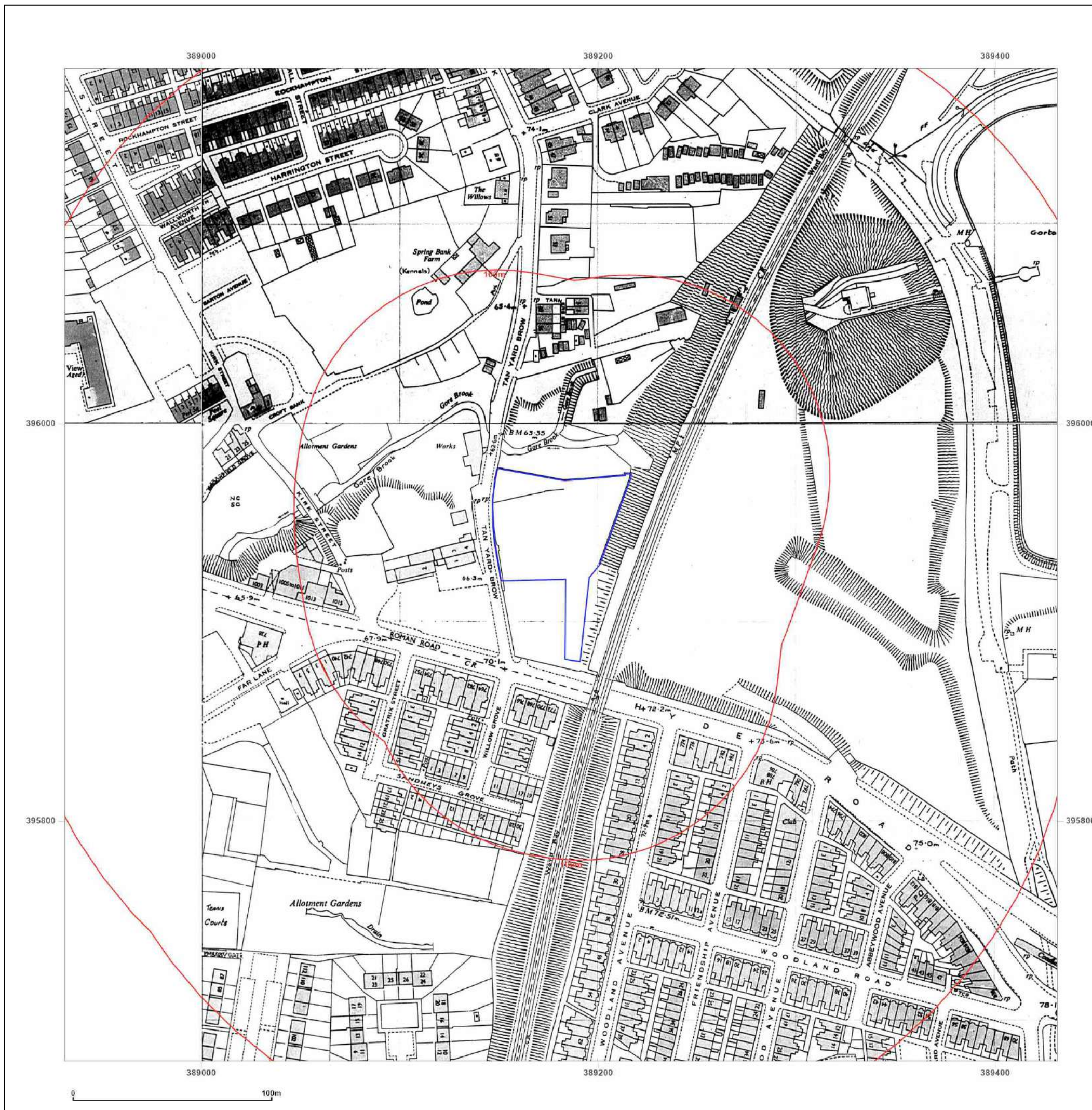


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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1983

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1989-1991

Scale: 1:1,250

Printed at: 1:2,000



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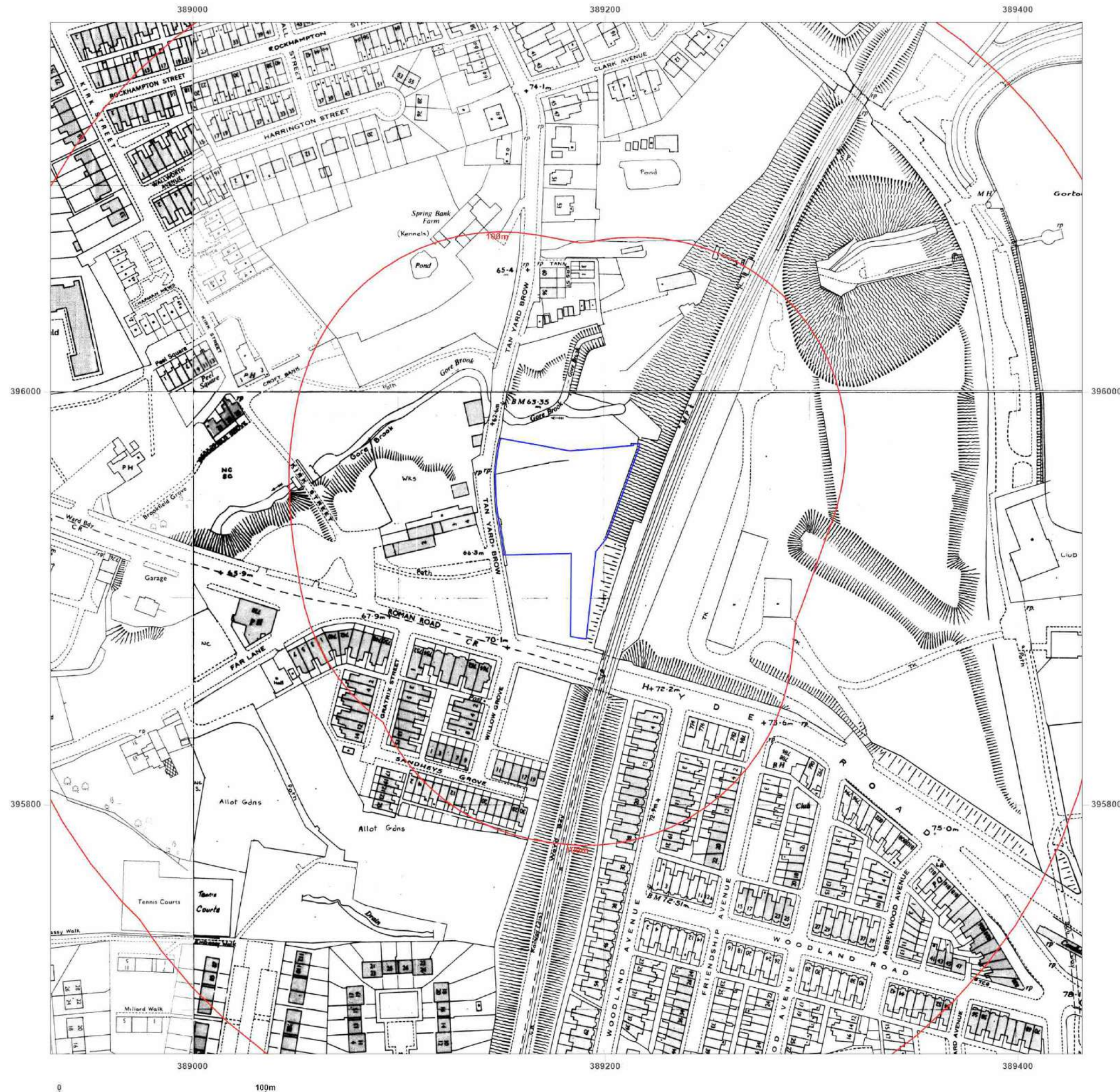


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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: National Grid

Map date: 1992

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



2003



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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: County Series

Map date: 1848-1849

Scale: 1:10,560

Printed at: 1:10,560



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Revised 1849
Edition 1849
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Edition 1848
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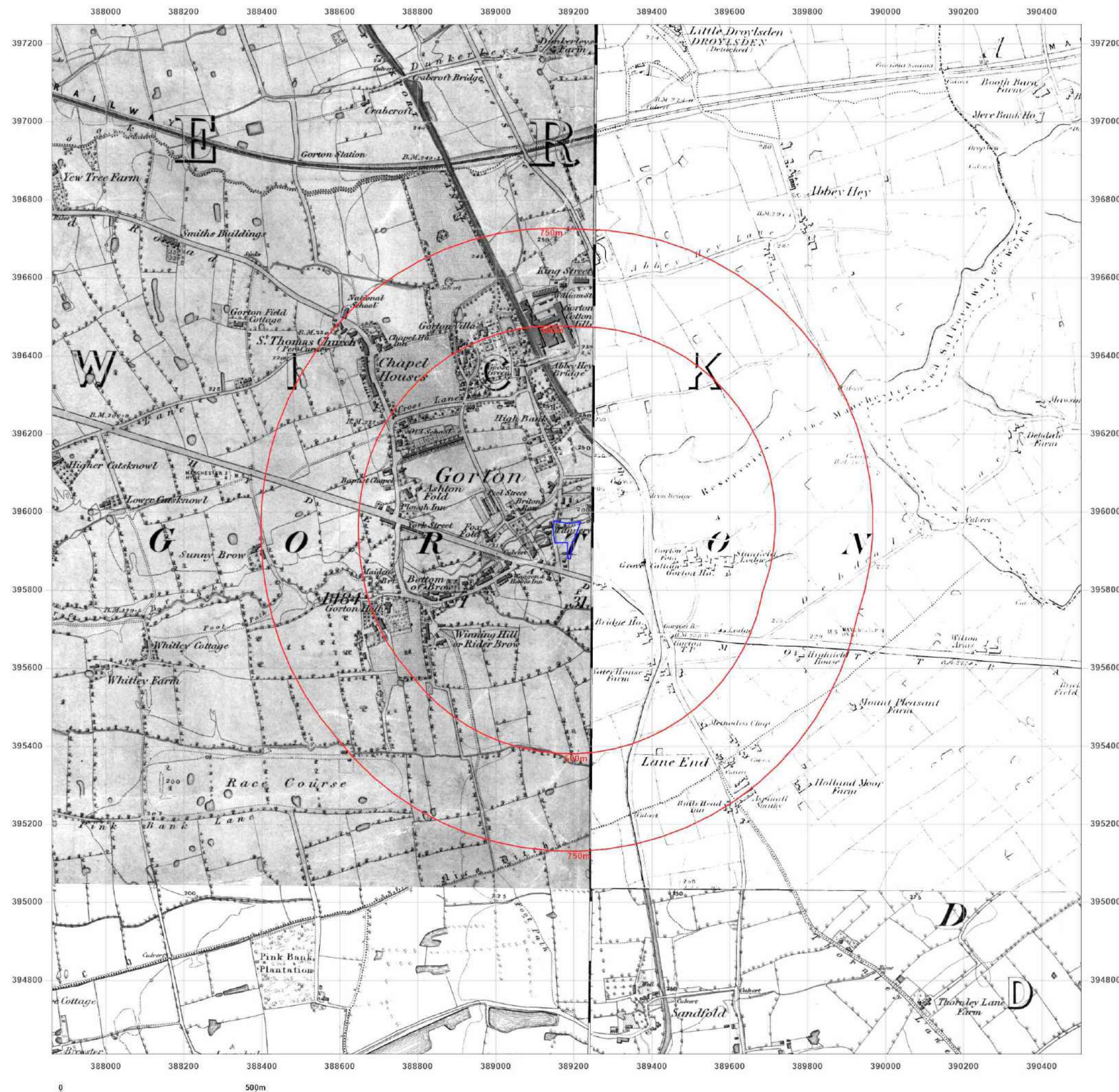


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Site Details:

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Client Ref: Tan Yard Brow PO - 627932
Report Ref: GS-ZS4-XUT-E93-PRY
Grid Ref: 389181, 395929

Map Name: County Series

Map date: 1890-1892

Scale: 1:10,560

Printed at: 1:10,560



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