



CHRISTIE EXTENSION, THE CHRISTIE, WILMSLOW ROAD
MANCHESTER

PHASE I SITE APPRAISAL (DESK STUDY)
FOR
THE CHRISTIE NHS FOUNDATION TRUST C/O
ALAN JOHNSTON PARTNERSHIP LTD

Project Ref:
P10197

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Prepared for:
The Christie NHS Foundation Trust c/o
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This report has been prepared in accordance with GRM's Accredited Quality Procedures.

If you have any queries regarding this report please contact the project manager in the first instance.

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Issue	Description of Revision		Signature
REV A (December 2022)	Updated information from client		<i>S. Singh</i>
Rev B (January 2023)	Amended UXO report included in appendices		<i>C. Mortimer</i>



TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	PHASE I DESK STUDY AND SITE OBSERVATIONS	2
3	PHASE I CONCEPTUAL SITE MODEL.....	13
4	CONTAMINATION / REMEDIATION RECOMMENDATIONS	14
5	PRELIMINARY GEOTECHNICAL ASSESSMENT	14
6	FURTHER INVESTIGATION	16
7	CONCLUSIONS.....	16

APPENDICES

Data Sources, Standard Limitations	Appendix A
Site Location Plan provided by Client	Appendix B
Site Location and Boundary Plan	Appendix C
Site Features Plan / General Site Photographs	Appendix D
Historical OS Maps	Appendix E
Preliminary UXO report (ref PA 8933a-01)	Appendix F
Environmental Data Report	Appendix G

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Alan Johnston Partnership (Client's Agent) on behalf of The Christie NHS Foundation Trust (Client) to undertake a Phase I Site Appraisal (desk study). The desk study and site inspection form Phase I of the assessment and allow the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that require targeted investigation.

This site appraisal is intended to provide information that will assist decision making by identifying potential ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

It is understood the site is to be developed with a three-storey extension to the existing Critical Care Unit (CCU) located within the northern area. The proposed extension will contain a new stair / lift core that will connect to the existing CCU.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of the Phase I Site Appraisal (desk study) are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.
- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY AND SITE OBSERVATIONS

2.1 INFORMATION SOURCES

In addition to the general sources of information listed in Appendix A (i) the Client has supplied the following information that has been used in the assessment of the site:

- Site Location Plan which details the application boundary (red line) and client ownership boundary (blue line), presented in Appendix B.
- Utilities Plans of the site and surrounding area.
- Proposed Development Layout.

Two previous reports relating to the redevelopment of the Paterson Building located to the east of the site, have been reviewed and relevant information has been used in the assessment.

- Desk study report titled “Geotechnical and Geoenvironmental desk study” for Interserve Construction Limited, prepared by ARUP, ref: 263083-00, dated August 2018.
- Factual report titled “Ground Investigation Report” for Interserve Construction Limited, prepared by CC Geotechnical Ltd (CCG) commissioned by ARUP, ref: CCG-C-18-10614, dated April 2019.

2.2 SITE DESCRIPTION

2.2.1 Geographical Setting

The site is located within the southern area of the Christie NHS Foundation Trust hospital complex and is approximately 5.5km south of Manchester City Centre. The National Grid Reference (NGR) for the approximate centre of the site is SJ 848 924. A Site Location and Boundary Plan is presented in Appendix C.

The northern and western boundaries are formed by the existing hospital complex, the eastern boundary by the Paterson Building and the southern boundary by Oak Road.

The topography of the site and local surrounding area is generally flat at an approximate elevation of 35m AOD (based on the previous Desk Study of the adjacent Paterson Building). There is a concrete ramp leading into the CCU that is approximately 42cm high, 2m wide and 10m in length. The topography of the regional area dips gently down towards the west.

2.2.2 Site Inspection Observations

The Site Features Plan/General Site Photographs presented in Appendix D illustrate the salient observations made during a site inspection on 6th December 2022.

The southern area of the site is within a site compound for Integrated Health Project (IHP) associated with the ongoing development works in other areas within the Christie hospital complex. The northern area is formed by the current CCU and an access road leading through an underpass of the building. The site covers an area of approximately 0.13 hectares.

The central site area contains a ramp access for theatre deliveries to the existing CCU, a turnstile pedestrians' access for the site compound and a secure material storage facility. The facility is used to store plastic crates, signposts and trolleys. The southern site area is currently occupied with multi-storey site cabins for IHP. There are stairs for access to the site cabins located immediately west of the storage facility. There is also a bin store to the east of the turnstile. The remaining site area to the west of the stairs in the central site area is currently unused but is blocked off to the west by wooden fences associated with the IHP compound.

The site is covered with concrete hardstanding. There are potentially live buried services present below the site based on the provided Utilities Plan. The plan records drainage, electric and water and potential unidentified services within and nearby the site.

There are no trees present on site. The nearest trees to the site are semi-mature located approximately 15m south, east and west of the site. There is an ongoing redevelopment project of the Paterson Building located east of the site. It is understood that the previous building was demolished prior to the construction of a new hospital building which is currently taking place. There is also an electricity substation adjacent to a building enclosing a transformer located 40m south east of the site. Given their distances, they are unlikely to impact the proposed development area.

Significant Features identified during site inspection:
Existing site compound (including stairs and material storage facility), restricted access and nearby buildings – constraint for surveys / ground investigation.
Existing services and buildings – general hazard for proposed development.
Nearby trees (>15m from site) – significant deepening of foundations due to tree influence is not expected.

2.3 HISTORICAL DEVELOPMENT OF THE SITE

A review of the available historical Ordnance Survey (OS) maps gives an insight into the development of the site and can highlight potential hazards. Extracts of the maps reviewed are provided in Appendix E.

The summary below identifies the significant features identified on the historical mapping data considered likely to have the potential to affect the site.

Date from and to	Identified On-site Hazard	Identified Off-site Hazard
1849	The site is developed with Oak House Farm, and its main building is present across the site.	The surrounding area is used as access to Oak House including other unlabelled buildings in the area. Two ponds are present approximately 80m and 170m south west of the site associated with Oak House and a large pond 80m east.
1881	The farm is no longer present, and the site is developed with a residential building.	The nearby buildings are no longer present and replaced with residential buildings. The ponds to the south west are no longer noted. The large pond located east is labelled as fish pond.
1892	No significant changes.	The fish pond is no longer recorded and is replaced by a road.
1934	No significant changes.	The Christie Hospital complex is recorded 100m to the north west.
1957	No significant changes.	The hospital building has slightly expanded.
1974-1975	The residential building is no longer noted, and the site now forms part of an undeveloped area within the Christie Hospital complex.	The hospital complex has expanded southwards, with a new extension to the buildings noted 40m north and 20m east of the site within the area of the previous Paterson Building. An electricity substation is noted 40m south east.
1988-1992	No significant changes.	A building, likely for the transformer, is developed adjacent to the substation.
2002	No significant changes.	The Paterson Building has slightly expanded to the east.

2010	The hospital has expanded further, and the building is now located within the northern site area as the new CCU. The ramped access within the central area is constructed for the newly extended hospital building.	The southern section of the previous Paterson Building has extended to the west and now joins with the rest of the hospital.
2020 (aerial imagery)	IHP compound, cabins and storage facility, are recorded across the southern area.	The Paterson Building is no longer present and is being redeveloped.

Historic information has been reviewed from the ARUP desk study report for the redevelopment of Paterson Building. Relevant information has been extracted regarding the previous and proposed redevelopment of the Paterson Building and summarised below:

- The previous Paterson Building was constructed in phases since 1966. It underwent a four-storey extension in 1974 and a single storey extension to the east in the early 1990s.
- There was a one storey basement underlying most of the ground floor footprint of the previous Paterson Building.
- The Critical Care Unit (CCU) was opened in December 2006 and was structurally independent of the Paterson Building.
- The previous Paterson Building was founded on a mixture of pad and strip footings, with the southern end of the building, which extended over the original basement, founded on piles.
- The building is currently being redeveloped likely due to the fire damage sustained in April 2017.
- It is understood that the new Paterson Building will be a medium-rise research building with a single-storey basement extending to around 4m below ground level (bgl).
- The proposed new basement was anticipated to be larger than the previous basement and likely extending to bedrock.

Significant Features identified on OS Maps:

Previous buildings onsite and adjacent hospital complex (constructed pre-2000s) – potential for made ground, deepened foundations / source of ground gas and soil contamination including asbestos.

Redevelopment of Paterson Building adjacent to the site – potential sources of soil contamination.

Potential backfilled ponds offsite – potential source of ground gas but given age of backfill, unlikely to be a significant risk.
CCU Hospital Building proposed to be extended (constructed post-2000s) – asbestos unlikely to be present within buildings.

2.4 UNEXPLODED ORDNANCE

GRM have obtained a Preliminary UXO Desk Study for this site. The report has summarised that pre and post-WWII OS mapping recorded residential structures within and immediately adjacent to the site boundary that remained mostly unchanged. In addition, the County Borough of Manchester sustained an overall low density of bombing. Two local bomb plot maps for Manchester do not record any bomb strike on or within the direct surroundings, with the closest recorded strike approximately 200m to the north west.

Therefore, the preliminary assessment recommended that no further action is required. A copy of the preliminary UXO report is presented in Appendix F.

Significant Features UXO risk:
No further action required.

2.5 ANTICIPATED GEOLOGY

The BGS Geological Sheet for this area shows the site to be underlain by:

- Superficial Till deposits comprising diamicton.
- Solid geology of Chester Pebble Beds Formation of the Sherwood Sandstone Group is present below the site. Wilmslow Sandstone Formation is indicated to subcrop circa 95m north east of the site.
- The solid geology is indicated to be dipping down at a shallow angle (nearest direction indicated at 3°) towards the south south west.
- The site is not indicated to be affected by faulting.

There are no available nearby BGS boreholes. However, the previous desk study by ARUP suggests there have been numerous desk studies and ground investigations for Christie Hospital. The most recent ground investigation was for the redevelopment of Paterson Building undertaken by CCG on behalf of ARUP, which has been used to inform the likely ground conditions below the site.

Their investigation suggests the site to the east was underlain by made ground of 0.3m to 2.2m thickness comprising topsoil or subbase over typically brown gravelly sand or sandy gravel with concrete, brick and sandstone. Made ground was recorded to be underlain by medium dense gravelly sand or sandy clay with sandstone gravels which could potentially be the superficial Till. Below this, weathered sandstone bedrock was encountered from depths of between 2.2m and 3.5m bgl. The sandstone was typically

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recorded as very weak reddish brown, fine to medium grained thickly laminated sandstone which became less weathered with depth.

The investigation by CCG around the basement revealed the presence of limited made ground containing inert demolition rubble. In addition, the ARUP Desk Study report suggests the proposed new basement is anticipated to be larger than the previous basement and to extend to the bedrock, requiring the removal of the made ground. As such, there is no significant risk of ground gas from the adjacent redevelopment given that infilling of the previous basement was unlikely to be required.

Based on the site history and previous investigation of the adjacent area, made ground can be expected due to the demolition of former buildings.

Significant Features identified from geological data:
Cohesive strata – deepened foundations.
Potential for variable strata – geotechnical hazard for foundations.
Made ground – potential source of soil contamination / ground gas and geotechnical hazard.
Potential for shallow bedrock (circa 2m depth) – excavation constraint.

2.6 HYDROGEOLOGICAL INFORMATION

Detailed records of the groundwater level from the nearby BGS borehole record are not available. From the recent CCG Ground Investigation groundwater was only encountered at c.4m bgl during monitoring in Spring 2019.

The Environment Agency has classified the underlying superficial strata (Till) as a Secondary Undifferentiated Aquifer and the underlying bedrock (onsite Chester Pebble Beds) as a Principal Aquifer.

The site is not recorded to be within a Source Protection Zone. There are no recorded groundwater abstraction licences within 500m of the site.

Limited detailed information regarding the depths to groundwater is available; however, the groundwater level is likely to be subject to seasonal variations. Information available at this stage suggests potentially deep groundwater table in the Chester Pebble Beds and a flow direction to the south west following the regional topographic dip.

A potential risk to the underlying Principal and Secondary Undifferentiated Aquifers cannot be discounted at this stage given that a potential source of contamination is identified (made ground associated with previous development of the hospital). However, it is considered that the migration pathway would be restricted given that the site is currently and proposed to be predominantly covered with hardstanding and below the footprint of the extension.

Significant Features identified from hydrogeological data:

Principal / Secondary Undifferentiated Aquifers – potential receptor for site derived contamination (restricted migration pathway due to hardstanding).
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Groundwater anticipated around 4m bgl - dewatering for deep excavations may be required / potential flooding risk.

2.7 HYDROLOGICAL INFORMATION

There are no surface water features within 250m of the site. In addition, there are no surface water abstraction licences or recorded surface water pollution incidents within 500m of the site.

Significant Features identified from hydrological data:
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None identified.

2.8 FLOOD RISK

The flood risk maps suggest there is no risk from river flooding. The site is not recorded to be within 250m of an indicative fluvial floodplain associated with a Zone 2 and Zone 3 flood risk zone. The site is indicated to be at a negligible risk from surface water flooding. However, there is a 1 in 100 - year chance of surface water flooding occurring within 50m of the site.

The site is indicated to be at a moderate risk of groundwater flooding. A Phase II ground investigation would provide information on the local groundwater regime so that the risk can be assessed by the project's infrastructure engineer. Any risk associated with the groundwater regime should be catered for within the development infrastructure design.

Significant Flood Risk Features identified:
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Groundwater flood risk – to be confirmed with ground investigation and assessed by infrastructure engineer.
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2.9 MINING

2.9.1 Coal

The site is not within an area recorded to require a Coal Authority mining report, and shallow coal is not recorded beneath the site. Therefore, the risk from coal mining is considered to be negligible.

2.9.2 Brine

The site is not within the area defined by the Brine Compensation Board and the geology is not suitable for such extraction.

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2.9.3 Gypsum

The site is not within an area where gypsum extraction is recorded to have occurred and the geology is not suitable for such workings.

2.9.4 Oil And Gas

GRM have conducted an on-line search, which has shown that the Oil and Gas Authority does not record the site to be within an on-shore licence area or Hydrocarbon Field. Any future prospecting activities will require consideration of the surrounding areas current hospital end use, which is likely to make exploration socially and commercially unacceptable.

Significant Mining Risks:
None identified.

2.10 QUARRYING

There is no evidence of any non-coal mineral extraction having taken place within the site area. There are nearby backfilled ponds that are recorded as potential non-coal mining activities, but these are very limited in extent and were backfilled by the 1880s.

Significant Quarrying Risks:
None identified.

2.11 MINERAL RESOURCE PROTECTION

Whilst GRM can comment on the geological considerations regarding Mineral Resources, a legal expert should be commissioned concerning Mineral and Manorial Rights.

The BGS Mineral Resources Map for Greater Manchester indicates there are no resources below the site. However, the Glaciofluvial Deposits, located circa 95m south west of the site are indicated to be a potential resource of sands and gravels. However, the previous ground investigation report of the adjacent site did not record any sands and gravels associated with these deposits.

Furthermore, the BGS onshore maps also suggest the site does not lie within areas that can potentially be exploited for resources. The Greater Manchester Mineral Safeguarding Map, extracted from the Joint Minerals Plan dated April 2013, indicates the site is not located within or close by any mineral safeguarding areas. Any future opencast activities will require consideration of the site's location and current proposed end use, which is likely to make removal socially and commercially unacceptable.

Overall, it is considered that the site is not underlain by significant and easily exploitable reserves of mineral resources. In addition to a very small development footprint, the existing hospital buildings would have already sterilised any mineral resource present below the site. As such, a detailed Mineral Risk Assessment is unlikely to be required.

Mineral Risk Assessment:

Further assessment unlikely required – to be confirmed following intrusive ground investigation.

2.12 ENVIRONMENTAL INFORMATION

An Environmental Report has been acquired for the site. The full report is presented in Appendix G. A summary of the relevant information not included elsewhere in this report is presented below:

- Historic motor garages, dating back to 1957, were identified approximately 20m and 80m south of the site. The garage located 70m south is still active, however given their distances, they are unlikely to be significant risks.
- There are two recorded waste exemptions noted near the site. One is located 140m north east of the site for storing waste in a secure place and the other is located 148m north west of the site for sorting controlled drugs for disposal. Both are likely to be associated with Christie Hospital and appropriately controlled. Therefore, they are not considered to be significant risks.

Based on the above, no significant environmental hazards, that are considered likely to pose a potential risk to the site, have been identified from the available information.

Significant Features identified from Environmental data:

None identified.

2.13 ARCHAEOLOGY

Archaeological information has not been sought as part of this desk study. However, the Applicant has engaged with GMAAS prior to the submission of this planning application who advised that it is most unlikely that the proposed extension to the Christie Hospital will have any impact on archaeological remains. This area has been subject to archaeological studies previously, and these have confirmed that there is a negligible potential for archaeological remains to survive intact.

Archaeological Hazards:

None identified.

2.14 INVASIVE PLANT SPECIES/ECOLOGY

GRM is not a specialist in this topic and has not conducted such a survey; however, we will endeavour to report easily recognisable issues such as Japanese Knotweed, Giant Hogweed, badger sets etc, when seen on site. No such issues were observed during the walkover undertaken by GRM.

An Ecology Statement is submitted in support of the planning application, which included a site walkover, and details that the proposals are confined to an area of hardstanding adjacent to existing built form. The adjacent buildings which would adjoin the extension were found to have no bat roost potential, and no value for any other protected or priority fauna. For this reason, it is determined that the 'site' has no ecological value, and the proposals would not have any adverse impact on protected or priority fauna.

Invasive Plant Species/Ecological Hazards:
None identified.

2.15 RADON ASSESSMENT

The Health and Safety Executive (HSE) requires that if radon concentrations in air exceed 300 Bqm⁻³ in the workplace then mitigation measures may be required to reduce levels. The level of 300 Bqm⁻³ in the workplace is considered to be analogous to the level of 200 Bqm⁻³ in the home, due to the reduced exposure time in the former.

Based on the report 'Radon in Homes in England: 2016 Data Report' (Ref: PHE-CRCE-032) published by Public Health England (PHE), the average radon concentration in dwellings in the rural and metropolitan county of Greater Manchester is 25 Bqm⁻³, with the highest value recorded at 740 Bqm⁻³. Of the 760 dwellings tested, six recorded radon levels in excess of 200 Bqm⁻³. The recently updated radon potential map also suggests the site is within an area where the potential for homes to exceed the action level of 200 Bqm⁻³ is less than 1%.

Therefore, it is considered that radon protective measures are not required for the proposed extension to the hospital building.

Radon Hazard:
None identified.

2.16 SUMMARY OF POTENTIAL GEOTECHNICAL/GENERAL HAZARDS

Potential geotechnical/general hazards have been identified in earlier sections and are summarised below.

Potential Hazard	Potential Consequence	Action
Existing site compound and restricted access	Ground investigation / survey constraint	Inform relevant parties for removing materials / fences for access
Live services	Danger to personnel	Inform relevant parties for disconnection / diversion
Previous buildings and potential for made ground	Deepened foundations/buried structures	Ground investigation
Variable strata	Deepened foundations	Ground investigation
Shrinkable clay	Deepened foundations	Ground investigation / plasticity testing
Shallow bedrock (c.2m depth)	Excavation constraint	Ground Investigation
Groundwater anticipated around 4m bgl	Excavation hazard	Dewatering may be required for deep excavations
Site within moderate groundwater flood risk	Flood risk	Ground Investigation / consideration during design

Potential sources, pathways and receptors are summarised in the Phase I Conceptual Model in Section 3, which is based on current relevant guidance, the principles of which are set out in Appendix A (iii).

2.17 CONTAMINANTS OF CONCERN

In addition to the general contaminants listed in Appendix A (ii), the following site specific contaminants have been identified:

- Asbestos associated with previous building and adjacent hospital complex (constructed pre-2000s).

3 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Level of Risk
Potentially contaminated made ground associated with previous development.	Indoor and outdoor inhalation of soil dust, the ingestion of, and dermal contact with, contaminated soil and soil dust (assuming limited pathway due to proposed hardstanding).	End users.	Low.
		Construction and Maintenance Workers.	
Made ground.	Inhalation of ground gas.	End users.	Very low.
Asbestos associated with potential made ground.	Inhalation of asbestos fibres.	Construction and Maintenance Workers.	Low.

CONTROLLED WATERS			
Potentially contaminated made ground associated with previous development.	Leaching of contaminants and vertical migration to the groundwater (assuming limited pathway due to proposed hardstanding).	Principal Aquifer (Chester Pebble Beds Formation). Secondary Undifferentiated Aquifer (Till).	Low.

4 CONTAMINATION / REMEDIATION RECOMMENDATIONS

It is envisaged, based on the proposed development outline, that the majority of the site will be covered with hardstanding and the proposed extension, limiting the contamination risk to human health and controlled waters. Therefore, the overall risk to human health and controlled waters is considered to be low. The risk from ground gases is considered to be very low for the proposed development.

Prior to development a ground investigation will be required, the scope of which is outlined in Section 6. At this stage, based on the desk study information available, it is considered unlikely that remedial measures will be required.

5 PRELIMINARY GEOTECHNICAL ASSESSMENT

It should be noted that the following comments and recommendations are based on the findings of this desk study which may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). Prior to development a ground investigation will be required to confirm the initial recommendations outlined below, the scope of which is outlined in Section 6. However, at this stage based on the desk based information available it is considered:

- The ground conditions are likely to comprise made ground overlying sand and/or clay strata. Sandstone is expected to be present at depth of c. 2.0m.
- At this stage, given that deep made ground may be present and due to the potential risk of undermining current structures by open excavations and time factors / level of disruptions involved with excavating traditional or pad foundations, together with three storey building loads and in order to minimise differential settlement between the extension and the existing structure, Continuous Flight Auger (CFA) piles should be allowed for to mitigate the risk of vibration to nearby structures.
- Due to the use of piles and anticipated made ground, a suitable reinforced floor slab should be used.
- Overly aggressive ground conditions are not expected, and standard concrete should be suitable.
- Given the site constraints, it is anticipated that the existing drainage system will be reused.
- Given the generally flat topography of the site, slope stability issues are not anticipated. The use of piles will prevent loading of any adjacent basement structures.
- Groundwater is anticipated to be present around 4.0m depth. Should excavations be required at such depths, dewatering should be allowed for.
- Should excavation beyond 2m depth be required then breaking out of rock will potentially be necessary.

- Given the anticipated shallow geology, CBR values of between <2% and 5% are considered likely.

6 FURTHER INVESTIGATION

A Phase II ground investigation is recommended to determine more accurately the effect of the identified hazards on the development. Initially, this should include:

- A ground investigation designed to BS10175:2011 and BS5930:2015 and comprising window sampling will be required to confirm existing ground conditions and collect samples for analysis. Deep cable percussion and rotary cored boreholes are required for pile design.
- Chemical analysis of soils followed by risk assessment so that the risk to human health and controlled waters can be determined.
- Based on the Phase I Conceptual Model (Section 3) the ground gas risk has been assessed as very low. A ground gas investigation designed to current guidance will be required to determine the ground gas regime beneath the site and allow any necessary mitigation measures to be recommended. At this stage allowance for four weekly visits over one month should be made to assess potential liabilities.
- Geotechnical soils testing of the founding strata to assess its character and suitable grades of buried concrete.

Following your review of this document, a copy of it should be submitted to the Planning Department of the Local Authority for comment and approval prior to any ground investigation works being undertaken, as this is often a condition of planning.

7 CONCLUSIONS

This Phase I Site Appraisal has shown the site is suitable for the proposed development, assuming compliance with all the recommendations contained within this report.



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GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: <http://www.bgs.ac.uk/data/mapViewers/home.html>
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2015), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| · Arsenic | · Copper | · Water soluble sulphate |
| · Cadmium | · Nickel | · PAH (polycyclic aromatic hydrocarbons) |
| · Chromium | · Zinc | |
| · Lead | · Phenols | |
| · Mercury | · cyanide (total) | |
| · Selenium | · pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2015)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

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Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii **RISK TO SITE WORKERS – GENERAL COMMENTS**

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii **CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY**

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier 1 Screening values.

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ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations

etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv **GEOTECHNICAL ASSESSMENT – SOAKAWAYS**

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi **GEOTECHNICAL ASSESSMENT – FOUNDATIONS**

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.



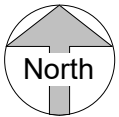
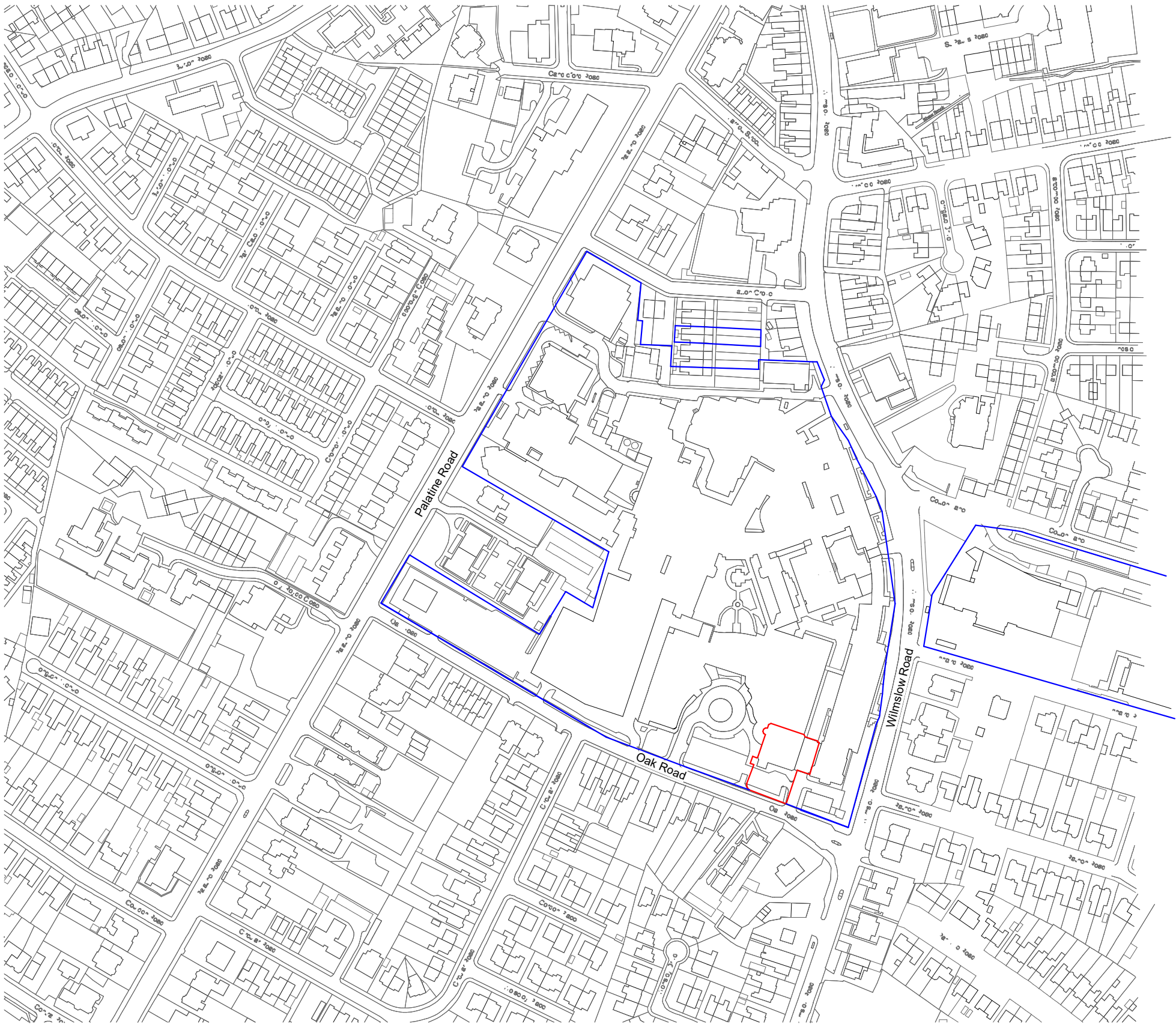
The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



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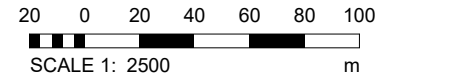
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NOTES:

- Application Boundary (Approx. 1266m²)
- Site Boundary / Client Ownership

P03	BW	Red line updated to suit Land Registry Plans	13/12/22
P02	CLS	Red line boundary updated to include upper floors	07/12/22
P01	MJC	First Issue	04/11/22
Rev	By	Description	Date



The Cruck Barn, Duxbury Park, Chorley, Lancashire. PR7 4AT
t: 01257 260070 f: 01257 260071

Client Name:
The Christie NHS Foundation Trust

Site Name:
The Christie, Wilmslow Road, Manchester

Project Name:
TIF Wards

Drawing Title:
Site Location Plan

Project No: 8283-002	Sheet Size: A3	Scale: 1 : 2500	
Drawn by: SK	Checked by: CLS	Approved by: NW	Revision: P03

Suitability: Issued for Planning	Status: S4
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Drawing Number:
Project Code / Orig / Vol / Level / Type / Disc / System-Number
CHRCCW-GDA-V4-S1-DR-A-9901

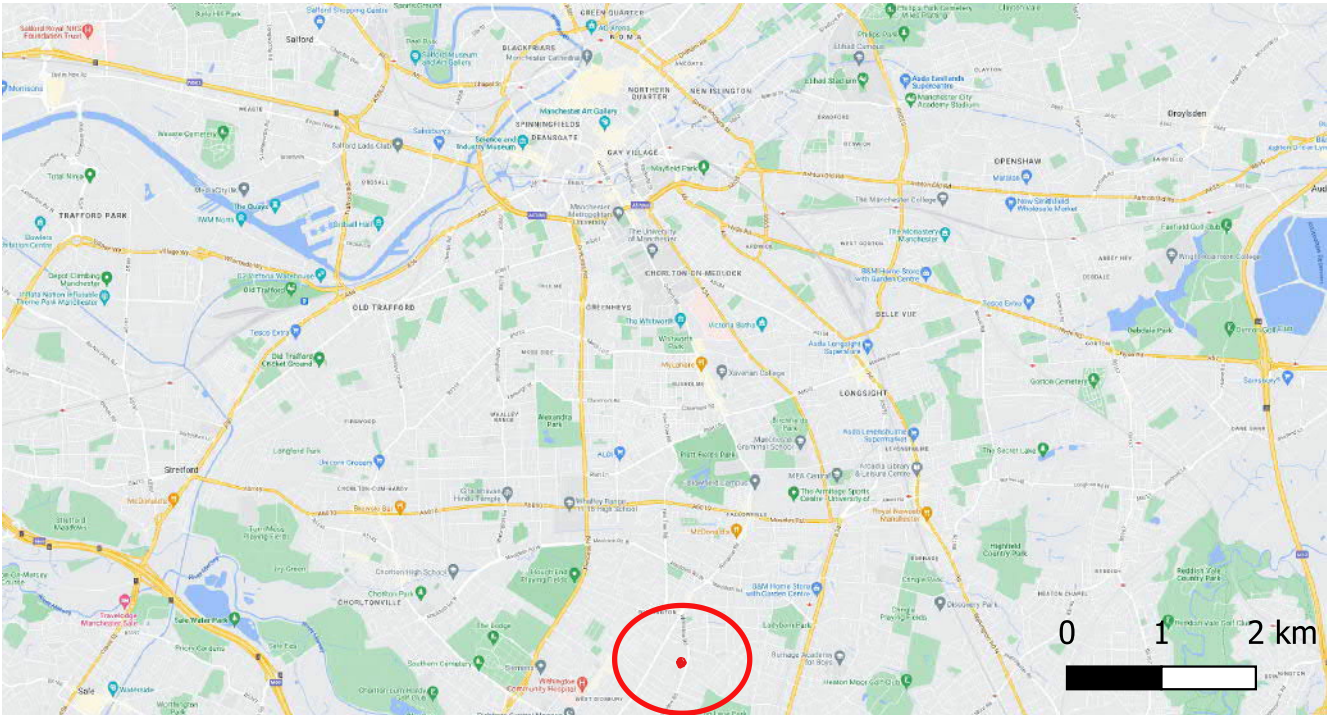
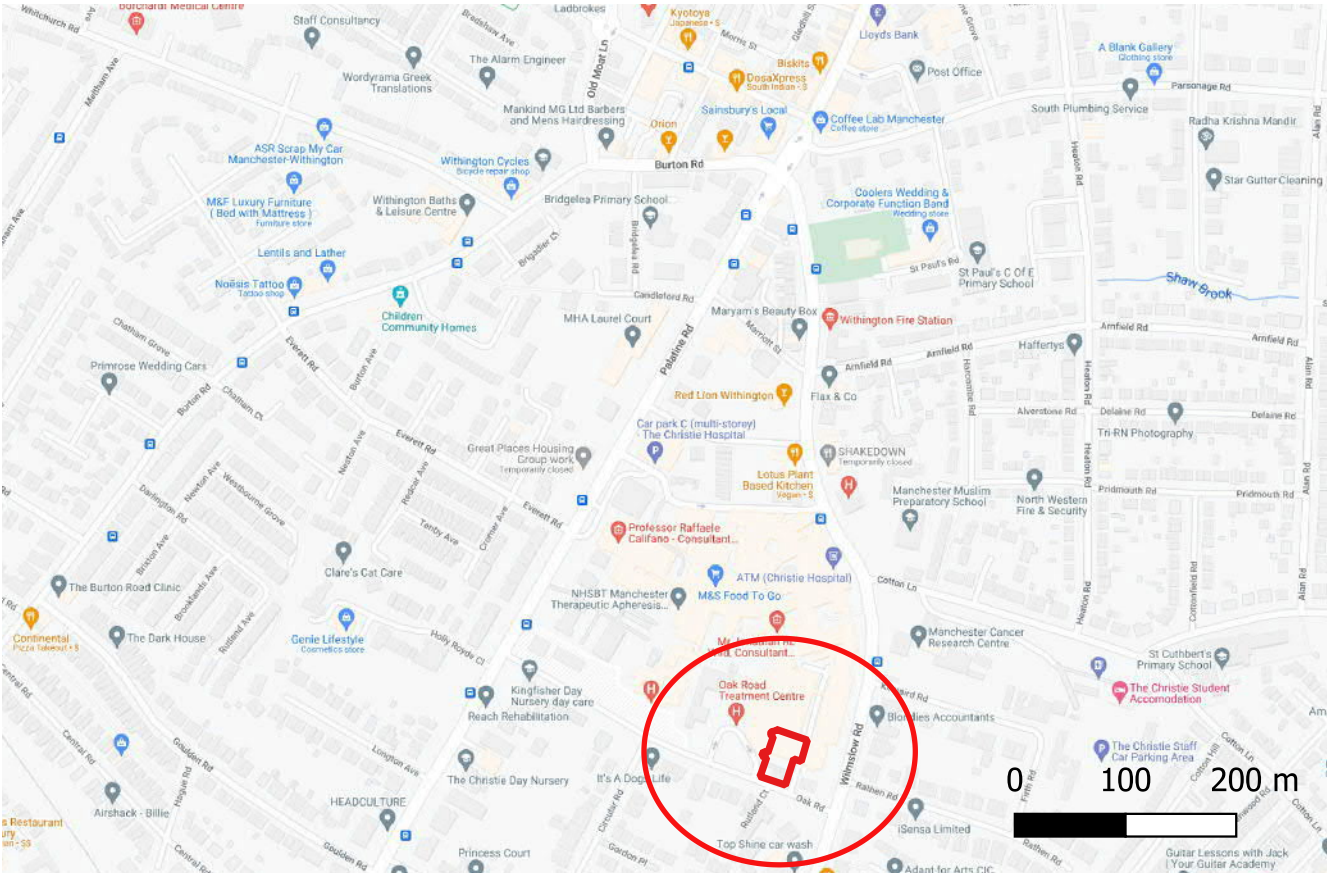
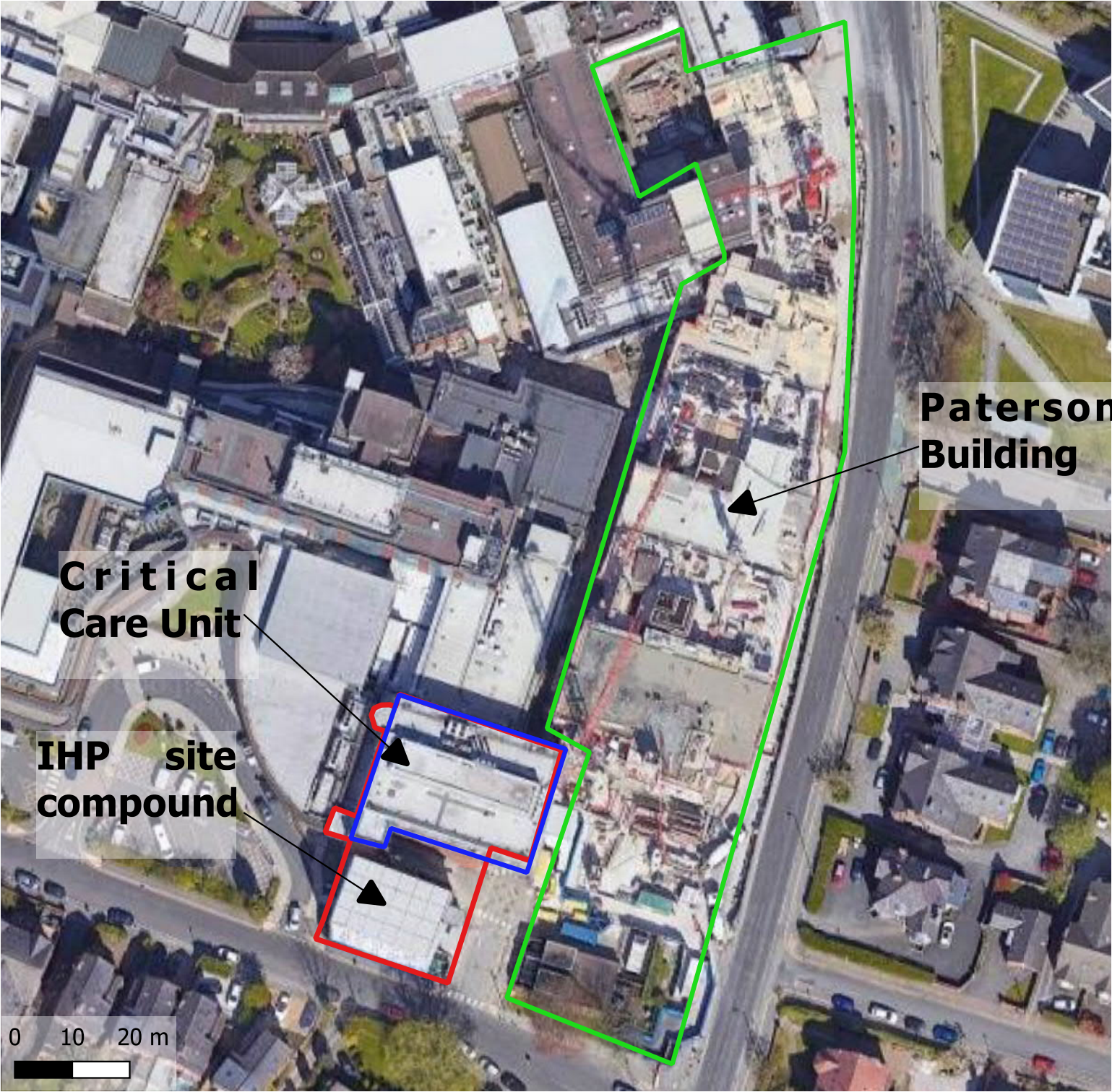


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- Legend
- Site Boundary
 - Hospital Buildings
 - Critical Care Unit
 - Paterson Building



NOTES:

CLIENT:	THE CHRISTIE NHS FOUNDATION TRUST C/O AJP
PROJECT:	CHRISTIE EXTENSION, THE CHRISTIE, WILMSLOW ROAD, MANCHESTER
TITLE:	SITE LOCATION AND BOUNDARY PLAN

PROJECT No:	P10197	DATE:	DEC 2022	DESIGN/DRAWN:	SS
DRAWING NUMBER:	01	ISSUE:	FINAL		
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Legend

- Site Boundary
- Site features
 - Concrete Ramp
 - Turnstile access
 - Material Storage Facility
 - Bin storage area
 - Stairs for site cabins
 - Wooden barriers around site cabins
 - Nearby trees



NOTES:

CLIENT:	THE CHRISTIE NHS FOUNDATION TRUST C/O AJP
PROJECT:	CHRISTIE EXTENSION, THE CHRISTIE, WILMSLOW ROAD, MANCHESTER
TITLE:	SITE FEATURES PLAN

PROJECT No:	P10197	DATE:	DEC 2022	DESIGN/DRAWN:	SS
DRAWING NUMBER:		02		ISSUE:	FINAL
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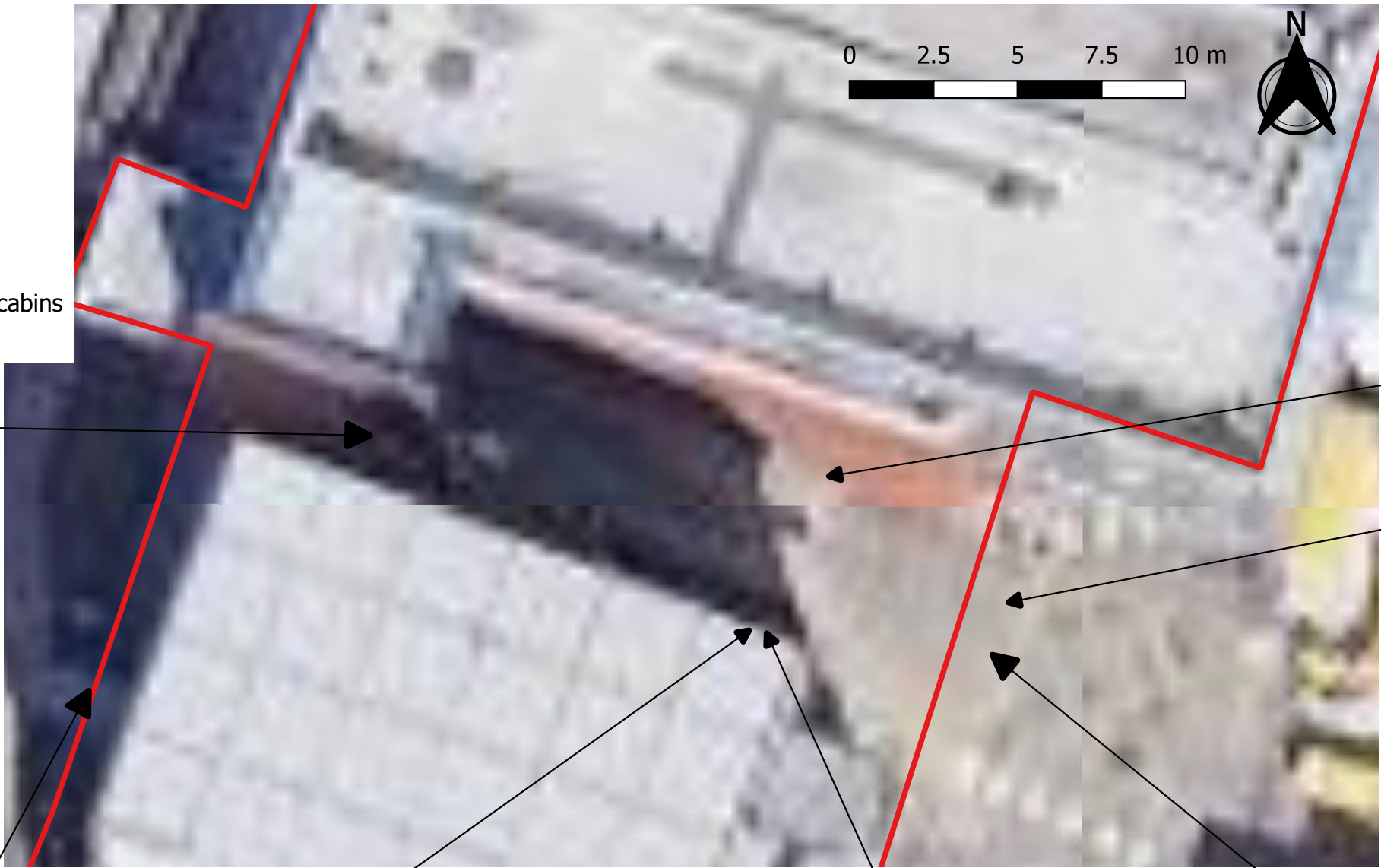
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Legend

- Site Boundary
- Site features
 - Concrete Ramp
 - Turnstile access
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 - Bin storage area
 - Stairs for site cabins
 - Wooden barriers around site cabins
 - Nearby trees



View to the west - wooden fence.



View to the east - concrete ramp for deliveries to CCU



View to the east - bin storage area



View to the east - IHP site cabins



View from above facing east - secure storage facility



View towards west - gated storage facility



View to the west - bin storage area

NOTES:

CLIENT:	THE CHRISTIE NHS FOUNDATION TRUST C/O AJP
PROJECT:	CHRISTIE EXTENSION, THE CHRISTIE, WILMSLOW ROAD, MANCHESTER
TITLE:	GENERAL SITE PHOTOGRAPHS

PROJECT No:	P10197	DATE:	DEC 2022	DESIGN/DRAWN:	SS
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Site Details:

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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: County Series

Map date: 1881

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1881
Revised N/A
Edition 1881
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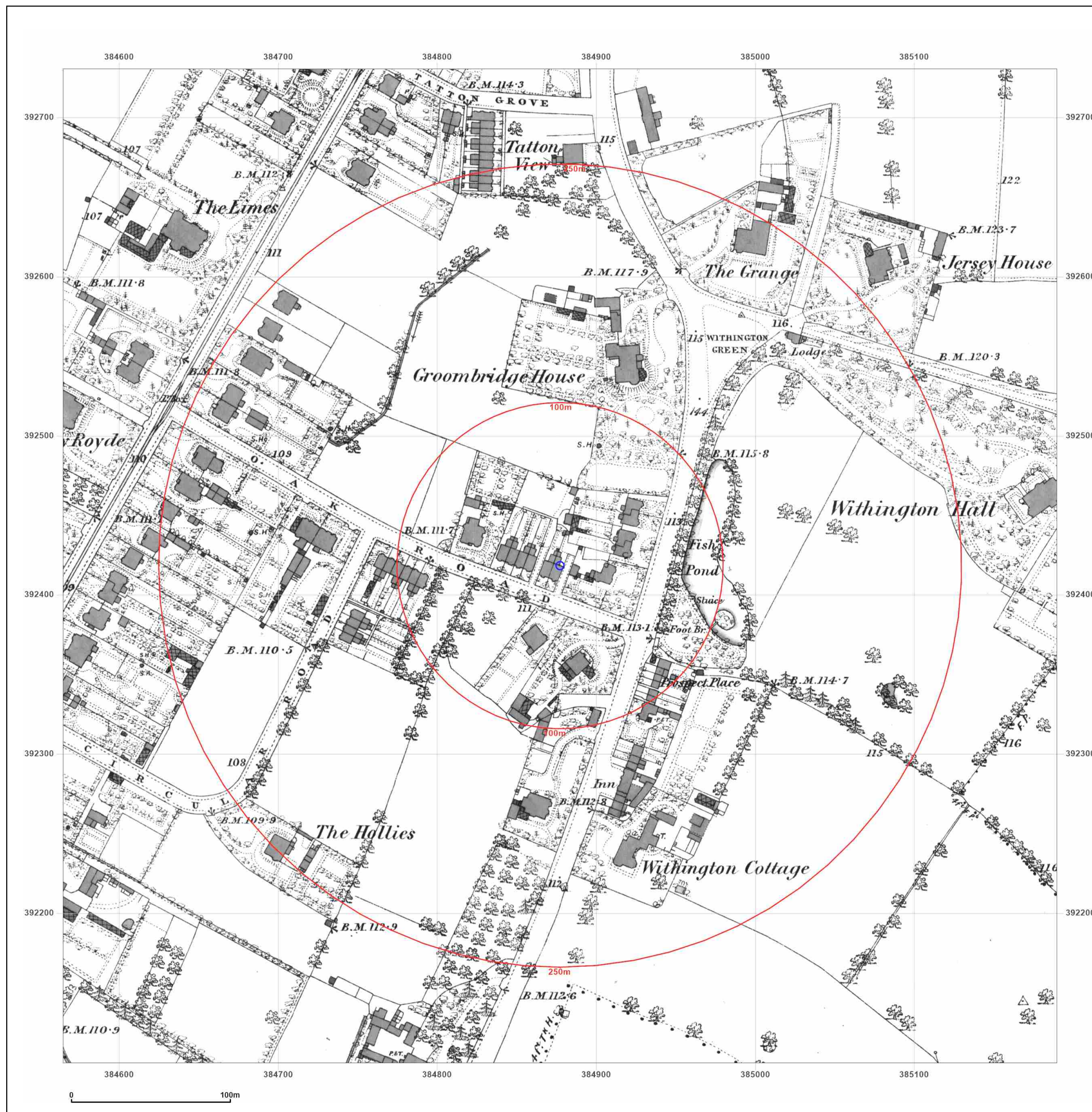


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Report Ref: EMS-829515_1066393
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Map Name: County Series

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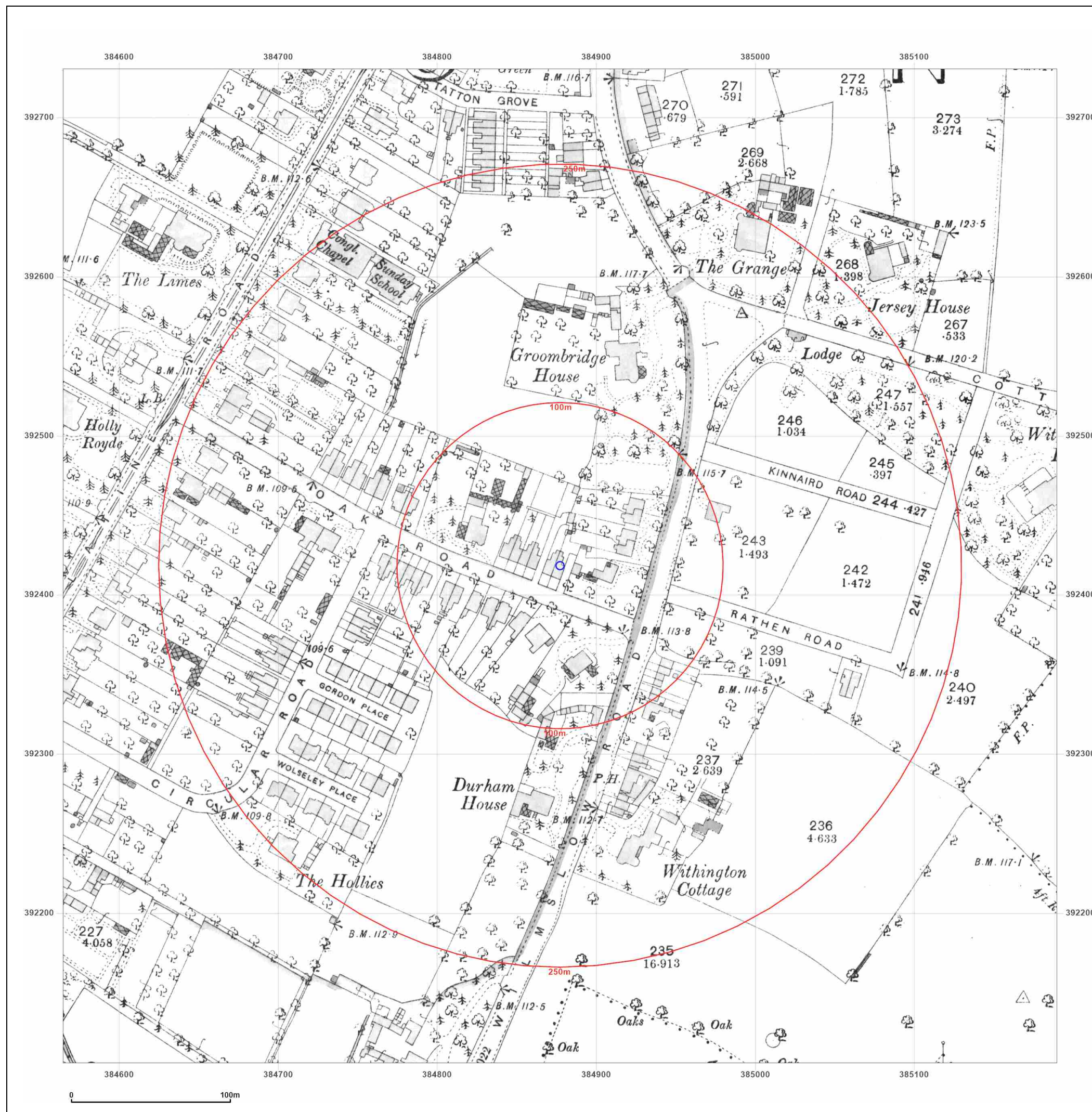


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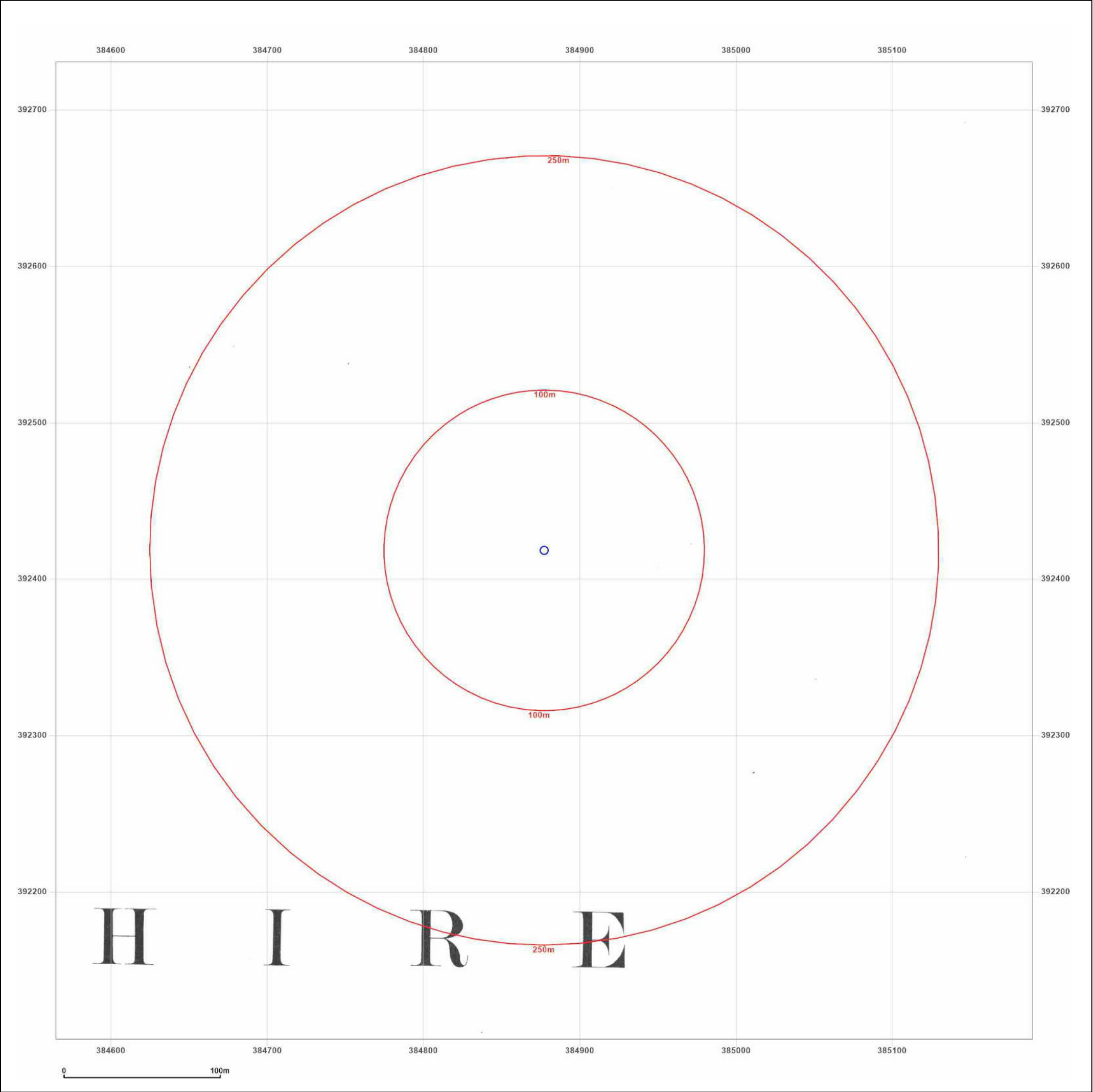
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Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: County Series

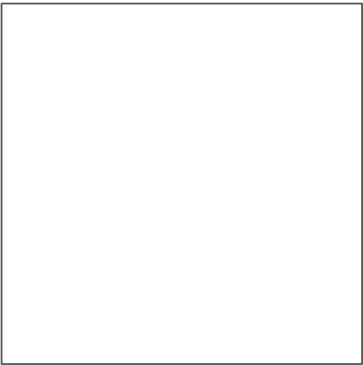
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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: County Series
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Scale: 1:2,500
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Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: County Series

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Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1873
Revised 1934
Edition N/A
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Site Details:
Christie Hospital, Wilmslow Road, Manchester, M20 4BX

Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid
Map date: 1957
Scale: 1:1,250
Printed at: 1:2,000

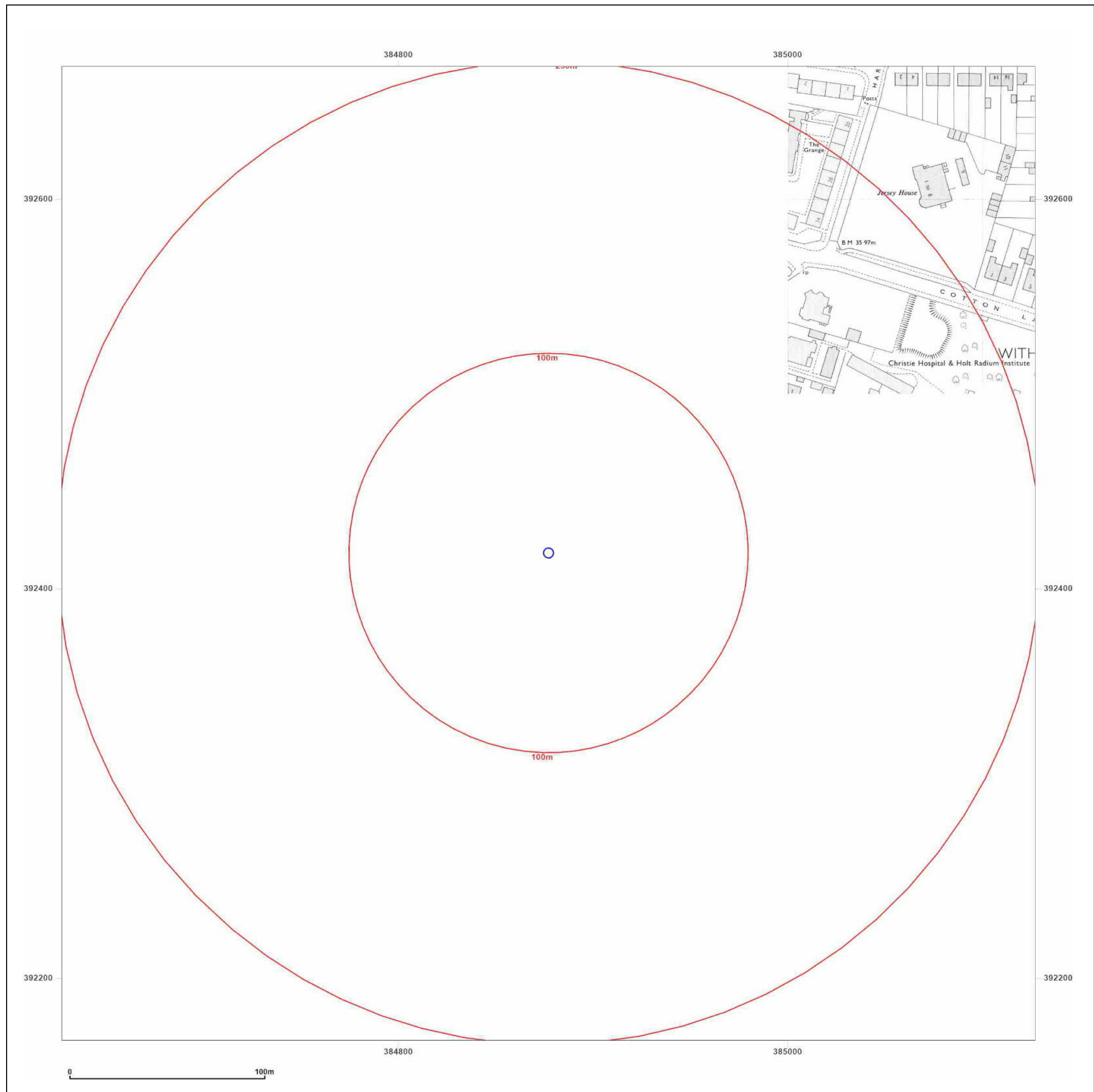
Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1927	Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1948
Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1927	Surveyed 1957 Revised 1957 Edition N/A Copyright 1957 Levelled 1949

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Site Details:

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Road, Manchester, M20 4BX

Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid

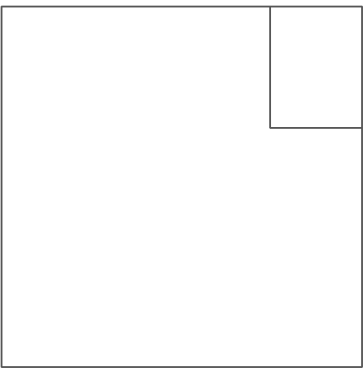
Map date: 1958

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1957
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Edition N/A
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Site Details:

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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid

Map date: 1958-1959

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1957
Revised 1957
Edition N/A
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Levelled 1948

Surveyed 1957
Revised 1957
Edition N/A
Copyright 1959
Levelled 1949



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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid
Map date: 1974-1975
Scale: 1:1,250
Printed at: 1:2,000

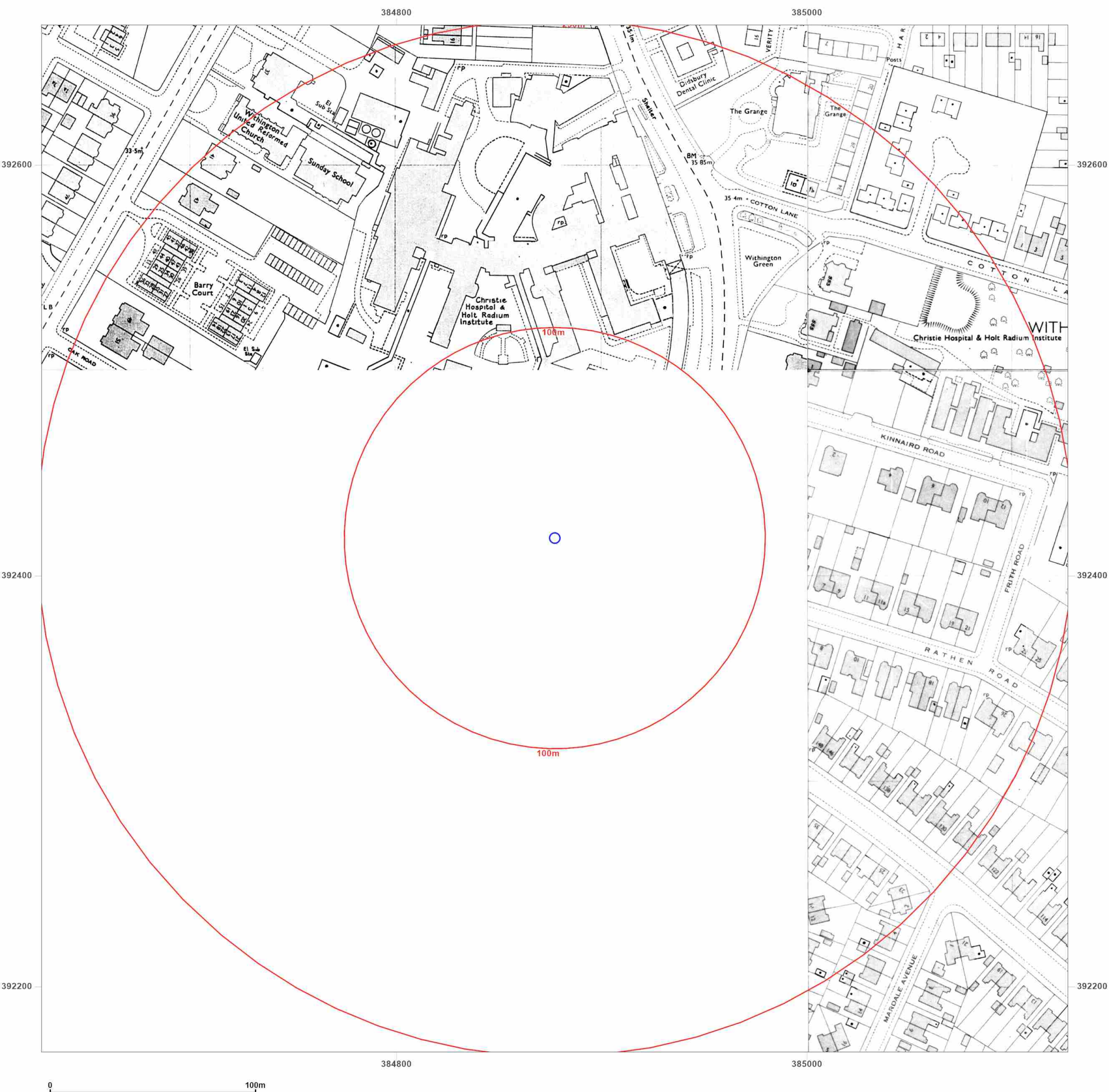
Surveyed 1957 Revised 1973 Edition N/A Copyright 1974 Levelled 1958	
Surveyed 1957 Revised 1973 Edition N/A Copyright 1974 Levelled 1958	Surveyed 1957 Revised 1974 Edition N/A Copyright 1975 Levelled 1958

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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid
Map date: 1982-1984
Scale: 1:1,250
Printed at: 1:2,000

Surveyed 1958 Revised 1984 Edition N/A Copyright 1984 Levelled 1958	Surveyed 1958 Revised 1982 Edition N/A Copyright 1982 Levelled 1958
	Surveyed 1958 Revised 1982 Edition N/A Copyright 1982 Levelled 1958

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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

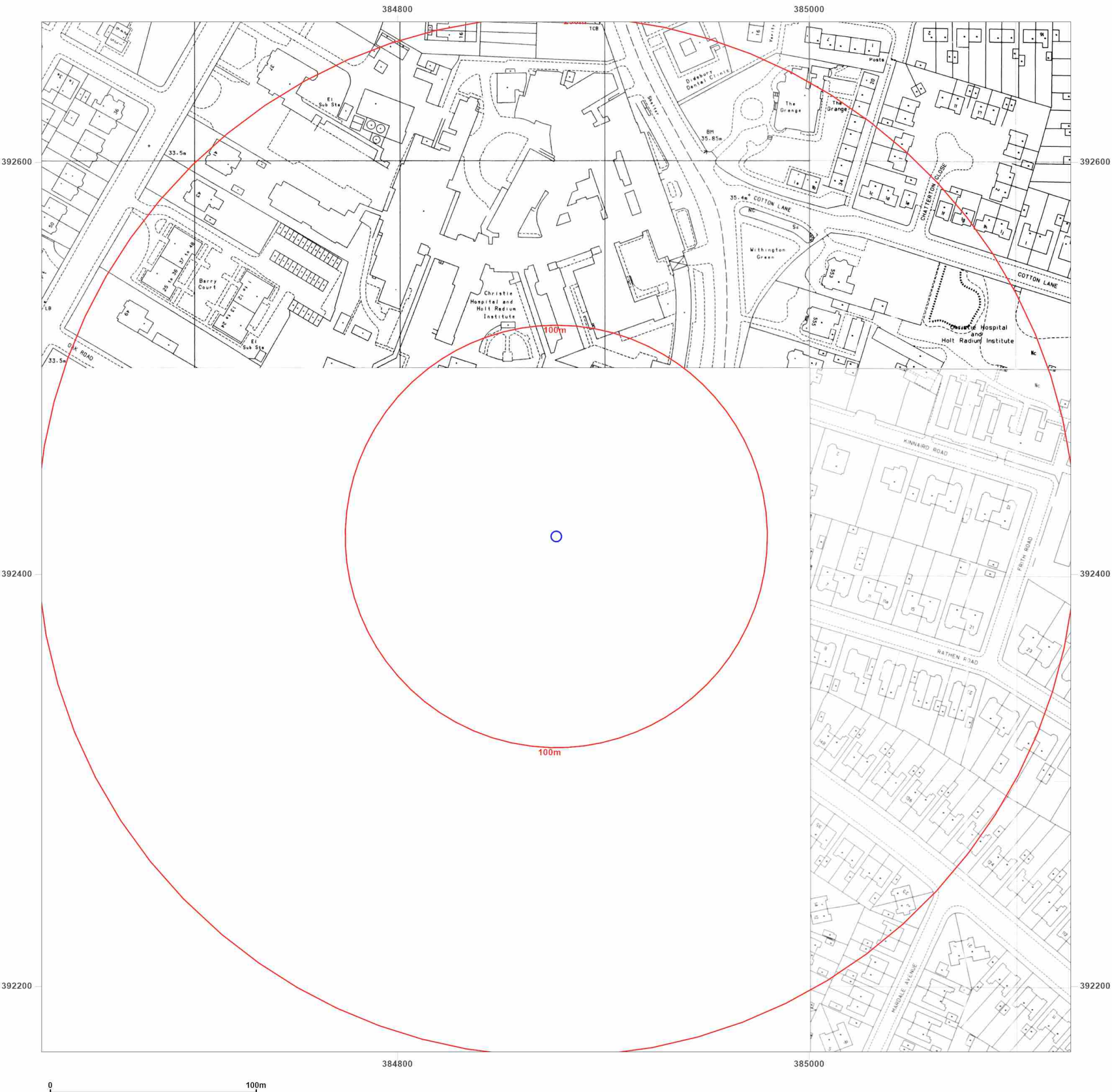
Map Name: National Grid
Map date: 1988-1992
Scale: 1:1,250
Printed at: 1:2,000



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

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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

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



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



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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid

Map date: 1992-1993

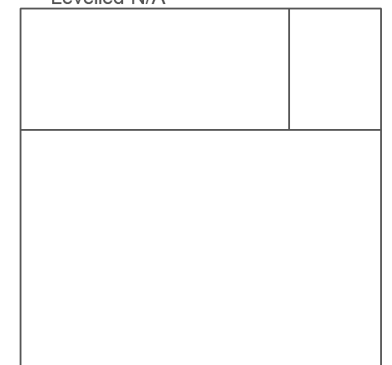
Scale: 1:1,250

Printed at: 1:2,000



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Surveyed 1992
Revised 1992
Edition N/A
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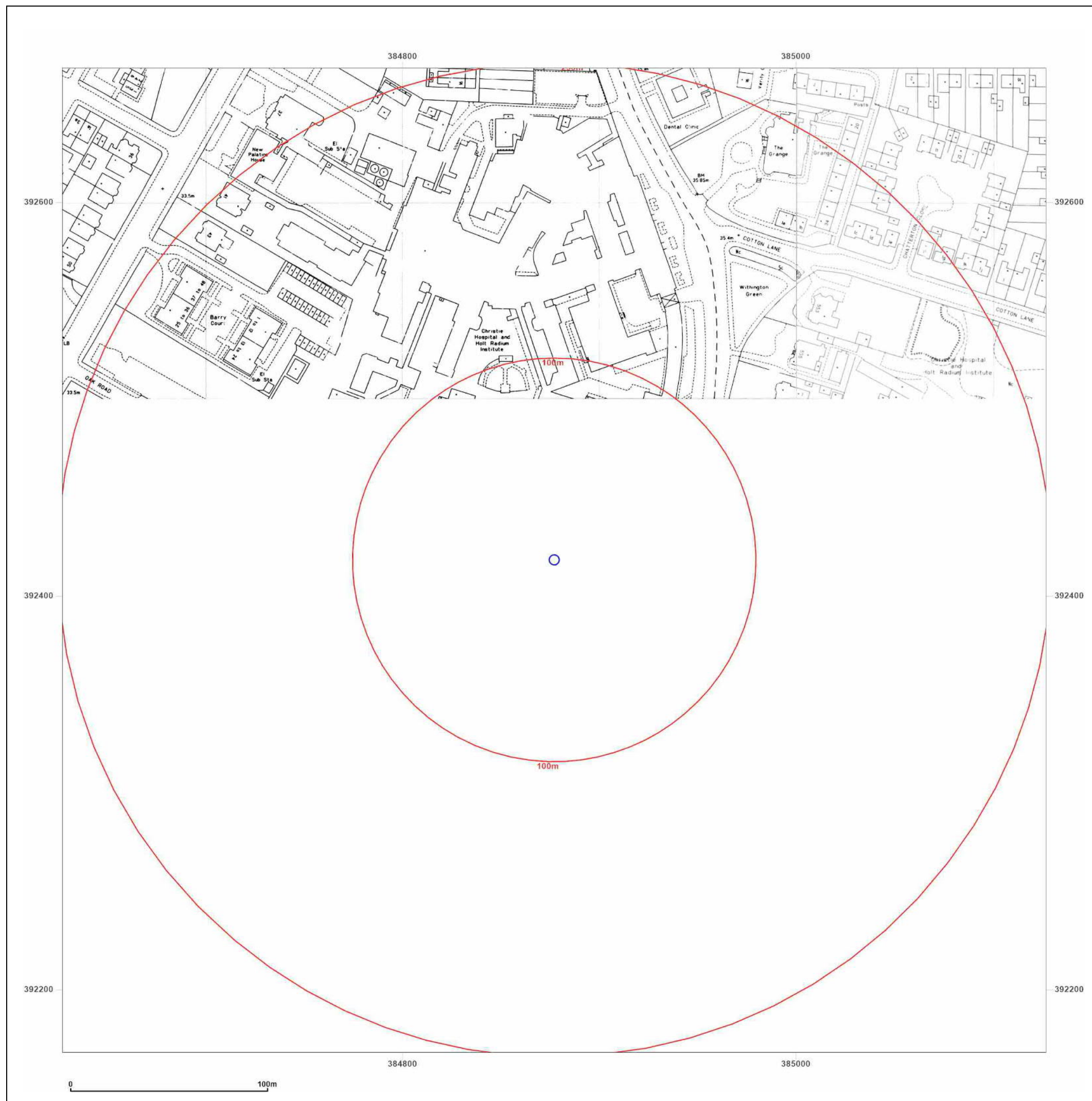


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Site Details:

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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: National Grid

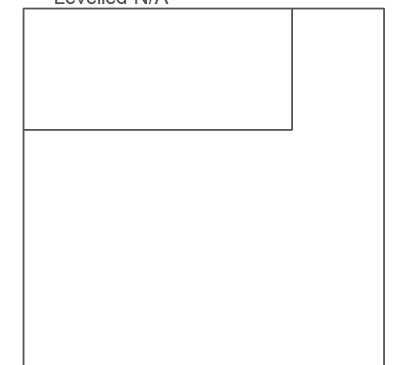
Map date: 1993

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1993
Revised 1993
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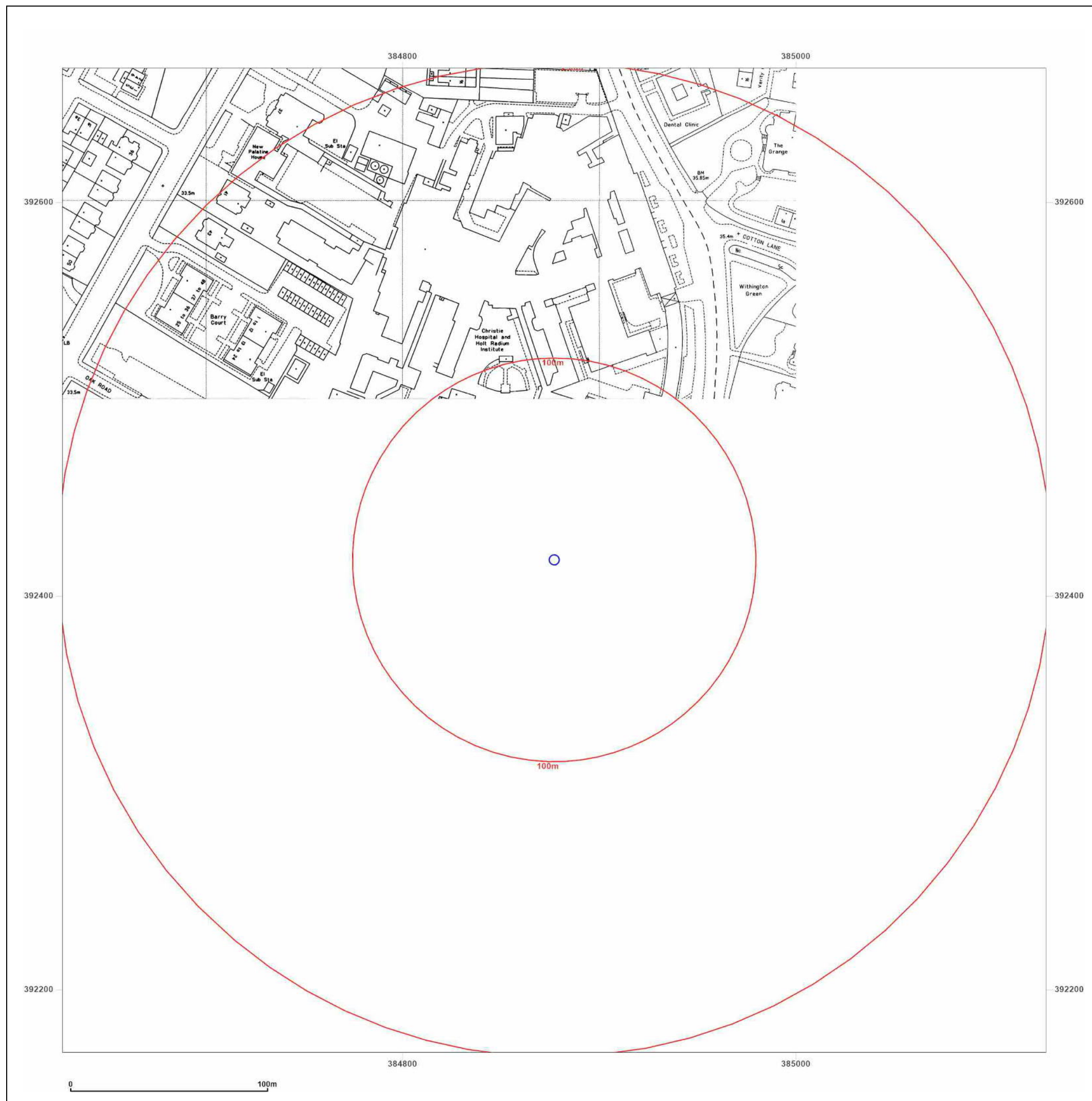


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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



2003



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Client Ref: EMS_829515_1026107
Report Ref: EMS-829515_1066393
Grid Ref: 384877, 392418

Map Name: County Series

Map date: 1849

Scale: 1:10,560

Printed at: 1:10,560



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Edition 1849
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