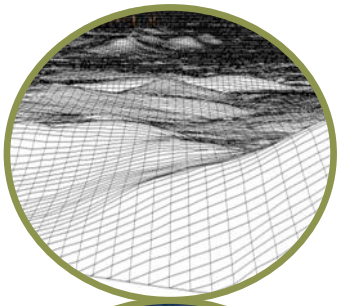
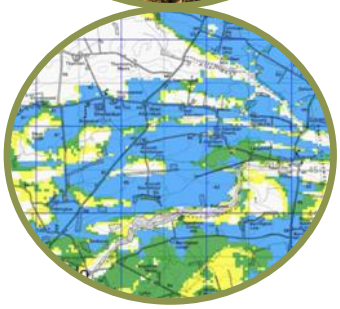
15A Well Walk, London
Basement Impact Assessment - Screening





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SHF.1047.001.R.001.B

November 2012

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SITE INFORMATION

Basement Impact Assessment

Site:	15A Well Walk, London, NW3 1BY
For:	Morwenna Lawson
Ref:	SHF.1047.001.R.001.B
Status:	Final
Date:	November 2012
Author:	Steve Rhodes **Technical Director** - BSc (Hons), MSc, DIC, CEng, CGeol, MIMMM, FGS, MIEnvSc.
Reviewer:	Richard Hamilton **Principal Engineer**- BSc (Hons), MSc.

1.0 INTRODUCTION

Background

1.1 Enzygo Limited have been commissioned to undertake a Basement Impact Assessment in relation to the proposed construction of a basement to an existing residential property.

1.2 In accordance with Policy DP27 of the Camden Local Development Framework a Basement Impact Assessment is required.

1.3 In accordance with Camdem Planning Guidance CPG 4 the initial stage undertaken is a Screening Assessment in order to identify what, if any further assessment is required to support the planning application for the proposed development.

Objectives

1.4 The objectives of this document are:

- Undertake a preliminary review of available information on the site and the proposed development, including a Desk Study.
- Review the risks posed by the proposed basement construction to the existing building, neighbouring buildings and the environment;
- Screen out those risks which can be dismissed, and
- Identify areas where further assessment should be undertaken (Scoping).

1.5 In preparing this Screening Assessment the procedures set out in the following documents have been used:

- Camden Planning Guidance CPG 4;
- Camden Development Policies; and
- Camden Geological, Hydrogeological and Hydrological Study.

1.6 It is recommended that this Screening Assessment is provided to the Local Planning Authority in accordance with the relevant guidance documents.

Sources of Information

1.7 Background information was sought from the following sources.

- Geological records;
- Available borehole records;
- Groundsure Geo-insight

- Historical Maps; and
- Proposed Construction details provided by Francis Birch Architects.

2.0 SITE SETTING

Site Description

2.1 The site comprises an existing five storey residential property including an attic conversion and basement. The building is bordered to the east by similar attached residential property called 17 Well Walk, which also includes a basement. To the west is a pedestrian walk way (Well Passage) which gives access to 15 Well Walk. To the south is Well Walk, which is vehicular road.

2.2 The road (Well Walk) appears to be approximately 1m lower than the ground level to the north and is separated from it by a stone wall. Ground level rises northwards at a batter of approximately 1 in 10 and from a visual inspection of photographs Well Walk appears to be at a similar elevation to the basement for flat 15A. Well Walk is separated from no 15 by a pedestrian footpath and grassed strip which appears to be approximately 10m wide.

2.3 Number 15 is accessed from Well Passage with a communal entrance way and stairwell giving access to the flats. Details of the existing property are shown on Drawing JL.2011.001.D01 prepared by Francis Birch Architects.

2.4 To the rear of the property is a garden. Directly adjacent to the rear of the property is a lower terrace comprising a patio area at the level of the existing basement and which the existing basement leads out on to. The lower patio extends the full width of the plot and is approximately 2m long. To the north of the lower patio is an intermediate 1.5m high retaining wall. To the north of this is a higher patio area. A perimeter retaining wall is present around the garden area which also forms the garden wall. Both walls appear to be of brick construction.

2.5 Details of the site location and layout are included in the Design and Access Statement within Appendix A.

Site History

2.6 Desk study information, including historical maps are included in Appendix A. A review of historical maps show the site to be occupied by a building in 1870. The surrounding land is shown to be mixed industrial and residential development. Chalybeate spring is shown approximately 10m south of the site.

2.7 By 1893 the building has been extended and is shown to have its current footprint. No further development to the site is shown although the surrounding area shows increased density of development over time.

2.8 By 1915 Chalybeate Spring is shown as Chalybeate Well indicating that groundwater levels feeding the spring have reduced. The well is still currently present although no details of water levels were available.

2.9 No infill development associated with bomb damage is evident from historical maps for this or the nearby properties. As such the presence of Made Ground at the site is not considered likely.

Ground Conditions

2.10 The British Geological Survey (BGS) indicates that the site is underlain by Claygate Member comprising sand, silt and clay. The Claygate Member is the upper horizon of the London Clay which this material grades in to with depth. No drift deposits or Made Ground/landfill are shown below or adjacent to the site.

2.11 A well record was obtained from the British Geological Survey for a borehole located approximately 15m south east of the site. The borehole record is included in Appendix A and shows ground conditions to comprise Made Ground over 1.5m of sand. Below this is approximately 8m of clay.

Groundwater

2.12 Records held by the Environment Agency show the site to be underlain by a Secondary Aquifer which is consistent with the Claygate Member.

2.13 The available borehole records inspected did not identify groundwater within the shallow sand layer but encountered seepages within the underlying clay. Groundwater within the shallow sand layer is likely to be seasonally dependant.

2.14 A review of available information indicates that the Chalybeate spring is one of several springs and wells developed during the Victorian era due to the high iron content of the groundwater. These wells are no longer used for potable water and the significance of groundwater resources is for base-flow to surface water courses in the general area.

2.15 With the exception of the Chalybeate Spring/Well no springs are shown on the historical plans close to the site indicating that shallow groundwater is not present. This is consistent with the well record from the nearby borehole.

Hydrology

2.16 No surface watercourses are present on or within the vicinity of the site. The site is not at risk of fluvial and/or tidal sources and has a 'low probability' of flooding as the site is located within the Environment Agency's Flood Zone 1 with less than a 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

2.17 In the Technical Guidance to the National Planning Policy Framework (NPPF) (Table 1) appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in Table 2 and 3 of the Technical Guidance to the NPPF, the proposed development is classified as 'more vulnerable'.

2.18 Table 3 of the Technical Guidance to the NPPF state that 'more vulnerable' uses are appropriate within Flood Zone 1.

Geotechnical Risks

2.19 An assessment of geotechnical risks has been undertaken using information contained within the Geo-Insight report, a copy of which is included in Appendix A. Risks identified are summarised in the following table:

Ground Hazard	**Risk Designation (Groundsure)**
Coal or Other Mining	None Identified
Collapsible Ground	Negligible
Compressible Ground	Very Low
Ground Dissolution	None Identified
Landslide	Very Low
Running Sand	Very Low
Swelling / Shrinking Clay	Moderate

2.18 The moderate swelling/shrinkage potential is likely to be associated with the London Clay which underlies the Claygate Beds.

3.0 PROPOSED DEVELOPMENT

3.1 Details of the proposed development is shown on Drawing JL.2011.001.D04 prepared by Francis Birch Architects and the Design and Access Statement.

3.2 Development will comprise:

- Extensive development within the existing building;
- Excavation of the upper terrace within the back garden down to the level of the lower terrace.
- Extension of the basement into the rear garden occupying the area of the existing upper and lower terraces.
- Construction of a new garden terrace on the basement extension roof.

3.3 The works will involve the excavation of a section of soil from below the upper terrace r a depth of approximately 2m. The reduced level excavation will require construction of a new basement wall together with under pinning of the existing perimeter wall.

3.4 The method of construction is to use 1m wide reinforced concrete underpin sections. The works will involve excavating a series of small sections alongside and below the existing foundations and the works will incorporate temporary stability measures where required

3.5 Each excavation will be separated by existing soil and the existing foundation will be used to span over the excavation areas. Where appropriate props will be used to provide additional support during construction.

3.6 The intention is to cast the under pin sections in situ incorporating reinforcement linked to the existing perimeter wall.

3.7 Once the under pin sections have cured the remaining soils will be gradually excavated and underpin sections installed.

3.8 The basement will incorporate a new basement floor slab which will be cast against underpin foundations to create the basement box.

4.0 ASSESSMENT OF RISK

General

4.1 Policy DP27 – Basement and Lightwells, of the Local Development Plan requires an assessment of the scheme's impact on drainage, flooding, groundwater conditions and structural stability, where appropriate. The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability. This requires the following:

- maintain the structural stability of the building and neighbouring properties;
- avoid adversely affecting drainage and run-off or causing other damage to the water environment;
- avoid cumulative impacts upon structural stability or the water environment in the local area;
- avoid harm the amenity of neighbours;
- protect important archaeological remains.

4.2 This screening assessment will review risks posed to:

- Structural Stability of the building and neighbouring property;
- Land stability;
- Groundwater impacts and groundwater flooding; and
- surface water flooding

4.3 These are discussed in the sections below:

Structural Stability

4.4 As the building is attached to neighbouring property (Number 17) it is considered that the stability risk to 15 Well Walk are the same as to the neighbouring property. The following structural stability risks have been assessed.

4.5 Foundation bearing capacity failure (ultimate limit state conditions) are not considered a significant risk as the site is underlain by Claygate Beds, the properties of which are reasonably well understood. Deepening the foundations will increase the bearing capacity of the soils as these become stiffer/denser with depth and also there are greater restoring

moments on the foundations from the overlying soils. Bearing pressures are not expected to increase as the additional wall loading from the basement will be offset by the net stress reduction of the soil removed by the underpinning process. The basement slab is shown to be ground bearing and so live loading will be applied to the formation. This risk is therefore screened out.

4.6 Differential settlement between 15 and 17 Well Walk has been considered. It is considered that no significant net additional stress will be applied at the foundation formation level and as such differential settlement between the party walls and adjoining walls should not be a risk. This is therefore screened out.

4.7 Whilst a mature tree is present within the rear garden of the property and the soils are considered to be of medium shrinkability the deepening of the foundations to below 3.5m bgl should take them below the zone of influence. As such risks from clay heave and desiccation are not considered significant and are screened out.

4.8 Consideration has been given to the risk of basement heave due to stress relief. As the basement excavation is only 2m deeper than existing and the Claygate Beds are likely to be stiff/dense with a corresponding low consolidation/heave potential. As such the risk to the basement floor slab is not considered significant and is screened out.

4.9 The proposed basement wall will have lateral earth pressure applied by the adjacent soils and also an element of surcharge load from the adjacent foundation. The basement walls will need to be designed to accommodate this lateral load and to prevent rotation. The risk should be addressed through the structural design and cannot be screened out.

4.10 It is considered that the greatest risk to structural stability is during construction. Excavation of the under pin sections will be within Claygate Beds. A structural engineer has been appointed by the Client to assess the construction stage stability.

4.11 Underpinning relies on the existing foundations to support the retaining wall over the excavation before the underpin section has been cast and cured. This is reasonable and commonly used approach and the structural engineer appointed to the project will assess the existing foundations.

Land Stability

4.12 Current ground levels appear to slope at a batter of 1 (vertical) to 10 (horizontal). This slope batter should not cause any significant concerns for land instability and this is supported by

the Groundsure information which confirms a 'Very Low' risk of landslides with no landslides being recorded on or adjacent to the site. As such the risk from land instability such as landslides resulting from the proposed works are not considered likely. As such this risk is screened out.

Groundwater Impacts

4.13 A review of the geological and other records indicate a potential risk of shallow groundwater, although this cannot be confirmed.

4.14 If shallow groundwater is present there may be a requirement to include design measures within the basement to address the risk such as tanking of the basement and allowing for hydrostatic pressure behind the basement wall. Given that there is no evidence of groundwater ingress in to the current basement and that the extension will be no deeper this is considered a low risk but it cannot be screened out.

4.15 The basement extension will be no wider and no deeper than the existing basement and there is no basement to the west of the site. Therefore, it is considered that the basement extension will not have any significant impact on groundwater flow as any shallow perched water will still be able to flow around the structure.

4.16 Shallow groundwater is no longer used for potable supply and as such there is not considered to be any significant adverse impact from the basement extension. This risk is therefore screened out.

Surface Flow and Flooding

4.17 A review of the surface flow and flooding indicates that there is no potential risk from this source.

4.18 The site is shown on Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study as not being located within the catchment of the pond chains on Hampstead Heath.

4.19 The proposed development will result in a reduction in the proportion of hard surfaced / paved external areas due to the introduction of a sedum green roof on the study room. The hard surfaced / paved external areas will be reduced by 5.12m^2 (size of green roof is 3.2m x 1.6m). This will result in a decrease in surface water runoff from the developed site as the introduction of a green roof will allow a proportion of rainfall to infiltrate.

4.20 The surface water flow routes will not be materially changed from the existing route. The profile of the inflows (instantaneous and long-term) of surface water received by adjacent properties or downstream watercourses will not be altered.

4.21 The quality of the surface water being received by adjacent properties or downstream will not be altered and may be improved due to the introduction of a green roof. Foul and surface water will be discharged to the public sewer network.

4.22 The site is not shown on Figure 15 of the Camden Geological, Hydrogeological and Hydrological Study as being at risk of surface water flooding. Therefore, as advised with the Camden Planning Guidance CPG 4 a Flood Risk Assessment is not required.

Summary of Risk Screening

Risk	Assessment	Screening	Comments
Structural Stability			
Foundation bearing capacity	Dismissed	Screened out	No significant net increased load.
Differential settlement	Dismissed	Screened out	No significant net increased load.
Desiccation/heave	Dismissed	Screened out	Trees are not close to the basement.
Heave on the basement floor slab	Dismissed	Screened out	Limited excavation in stiff clay and thick slab.
Lateral load on the basement wall.	Low	Scoping required	Walls to be re-enforced and anchored top and bottom by the floor slabs.
Temporary stability of excavations	Low	Scoping required	See Section 5
Temporary stability of the existing foundations.	Low	Scoping required	See Section 5
Land Stability			
Land slide	Dismissed	Screened out	No risks identified.
Groundwater			
Shallow inflow	Very low	Scoping required	See Section 5
Impact on Resource	Dismissed	Screened out	Basement extension will not prevent groundwater flow.
Flood Risk			
Surface Flow and Flooding	Dismissed	Screened out	Hard surfaced / paved external areas reduced due to the incorporation of a green roof.

Recommendations

4.23 It is recommended that this Screening Assessment is submitted to the Local Planning Authority in accordance with the recommendations of Camdem Planning Guidance CPG 4. A Scoping Assessment is provided in the following Section.

5.0 SCOPING STUDY

General

5.1 It is considered that this Screening Assessment includes sufficient information for a Phase I Desk Study to not be required as it includes a review of available information.

5.2 It is considered that the following areas require further assessment:

Ground Investigation

5.3 It is recommended that a limited ground investigation is undertaken to the rear of the property to confirm the ground conditions, existing retaining wall foundation construction and groundwater regime. The investigation should comprise:

- Two boreholes advanced using window sampler techniques to confirm the ground conditions and allow soil properties to be obtained for the structural design of the retaining wall.
- Install and monitor standpipes to confirm whether shallow groundwater is present and its depth such that the structural design of the retaining wall can be finalised.

5.4 Two hand excavated pits were excavated as part of an Arborcultural Survey to confirm the foundations to the existing retaining walls. A copy of the survey is included in Appendix A. This information may be used by the structural engineer in the design of the underpinning works.

5.5 Coring of the existing perimeter wall has been undertaken to confirm its construction. This shows the wall to comprise 225mm of brickwork.

Structural Design of the Retaining Walls

5.6 Design of the proposed retaining walls will be undertaken by the structural engineer to ensure that the walls can accommodate the lateral earth pressure from the adjacent soils.

Temporary Excavation Stability

5.7 A methodology will be prepared by the structural engineer for undertaking the under pinning works, including risk assessment and mitigation measures such as temporary support.

Temporary Foundation Stability

5.8 An assessment of the existing foundations and their ability to carry the structural loads prior to the underpin sections being cast and cured should be undertaken by the structural engineer.

APPENDIX A SUPPORTING INFORMATION

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Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **2012**

Scale: 1:10,000

Printed at: 1:10,000

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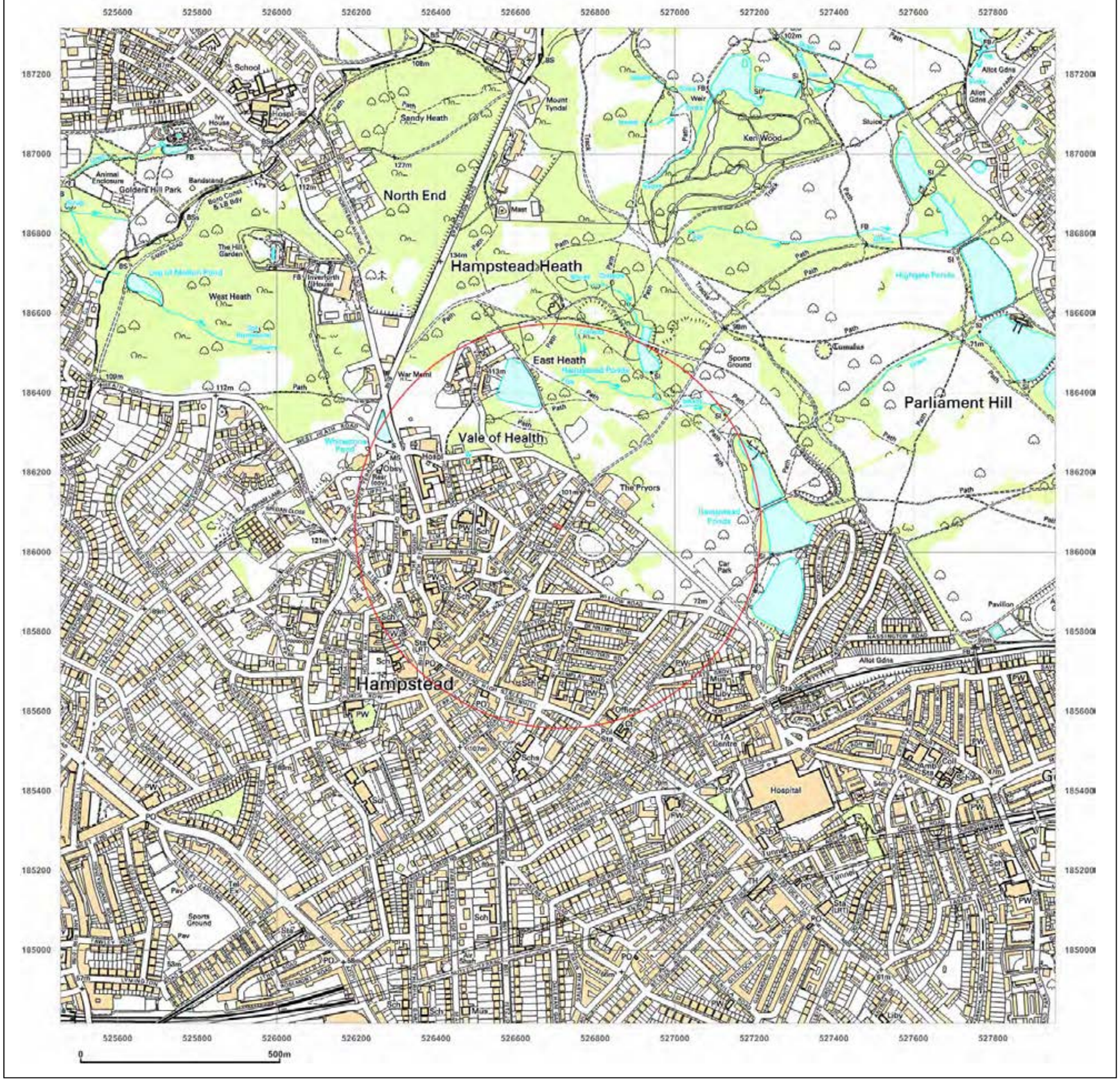

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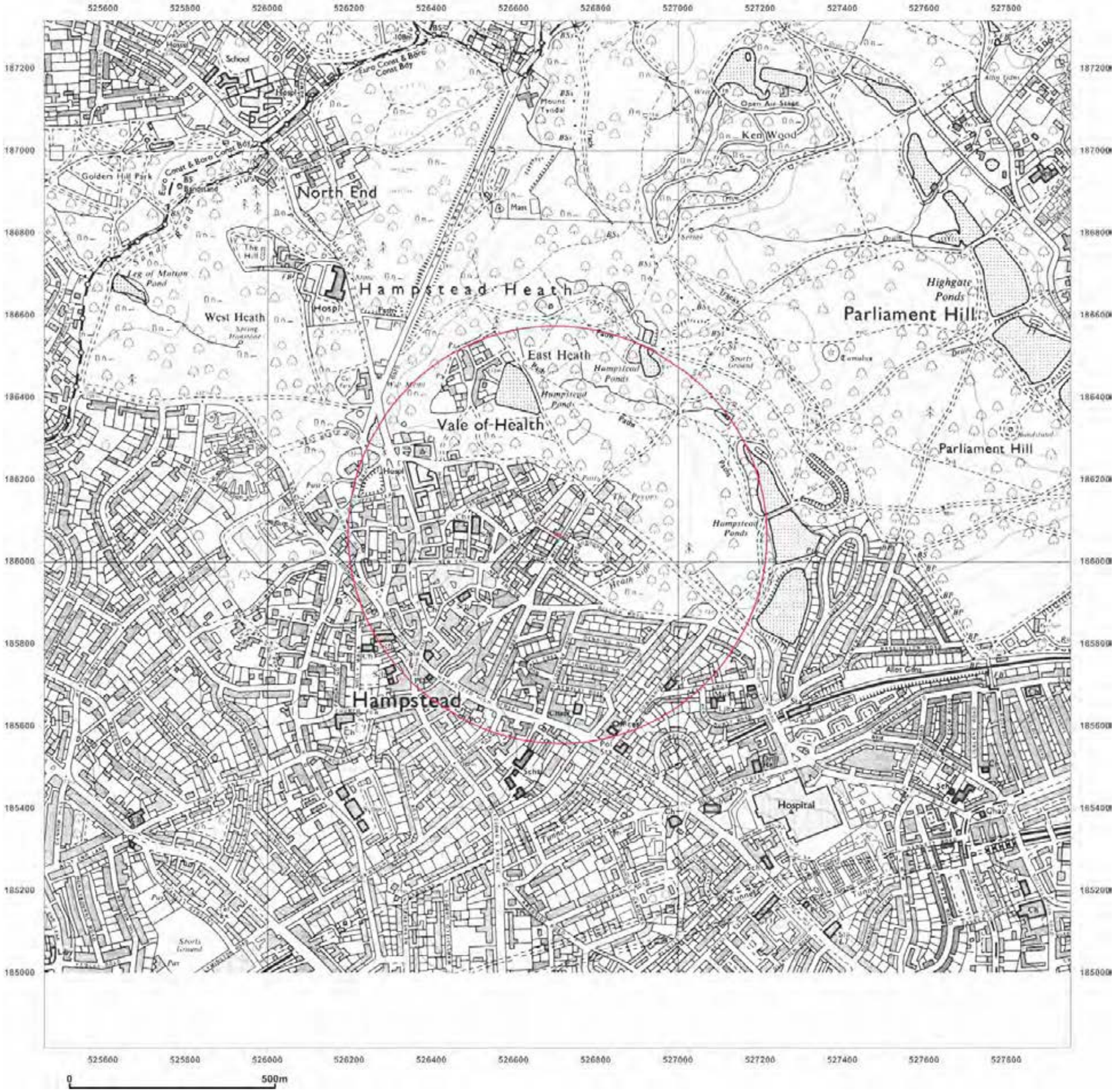

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Revised 1995
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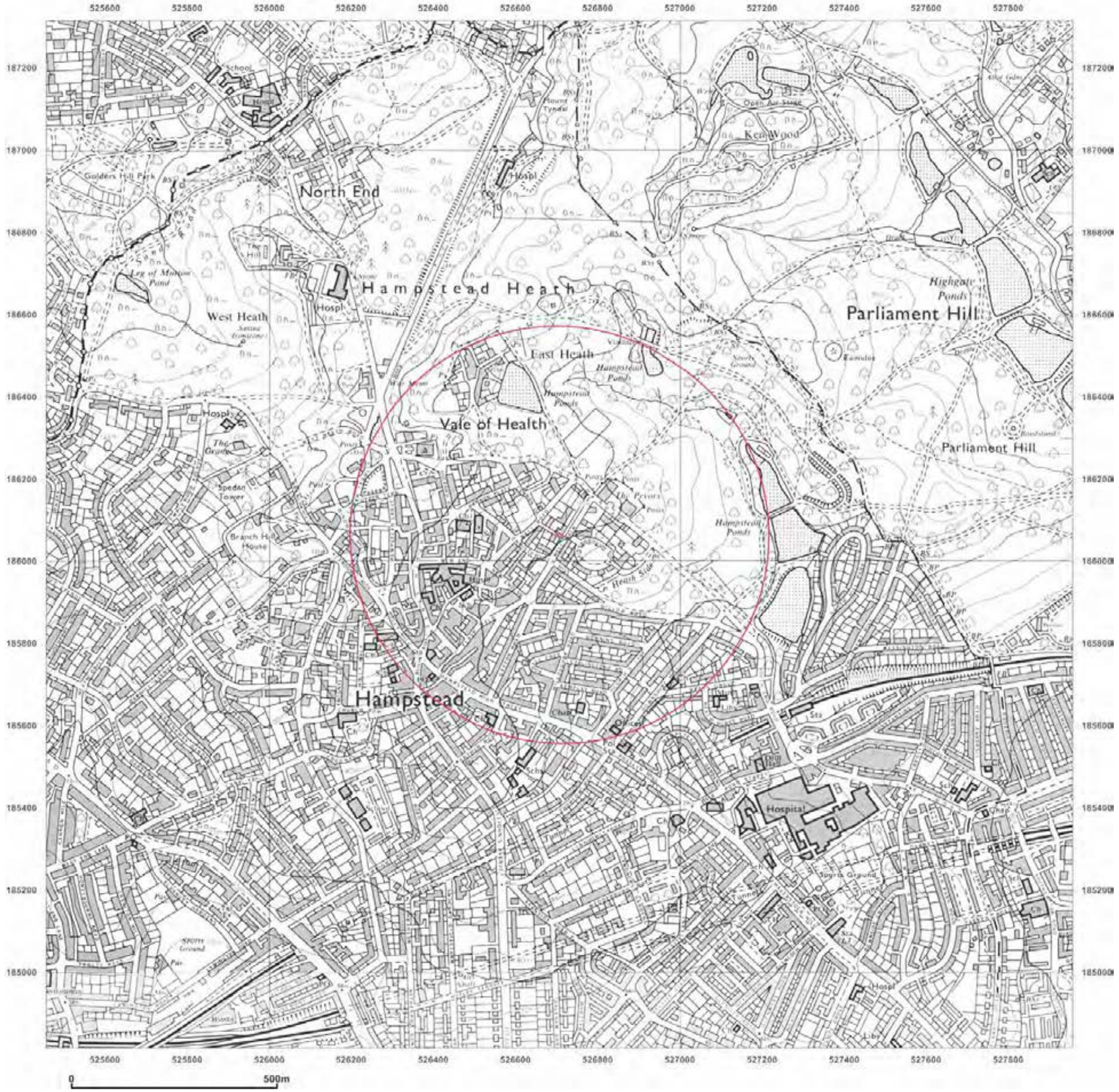

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Map date: **1973-1974**

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Surveyed 1974
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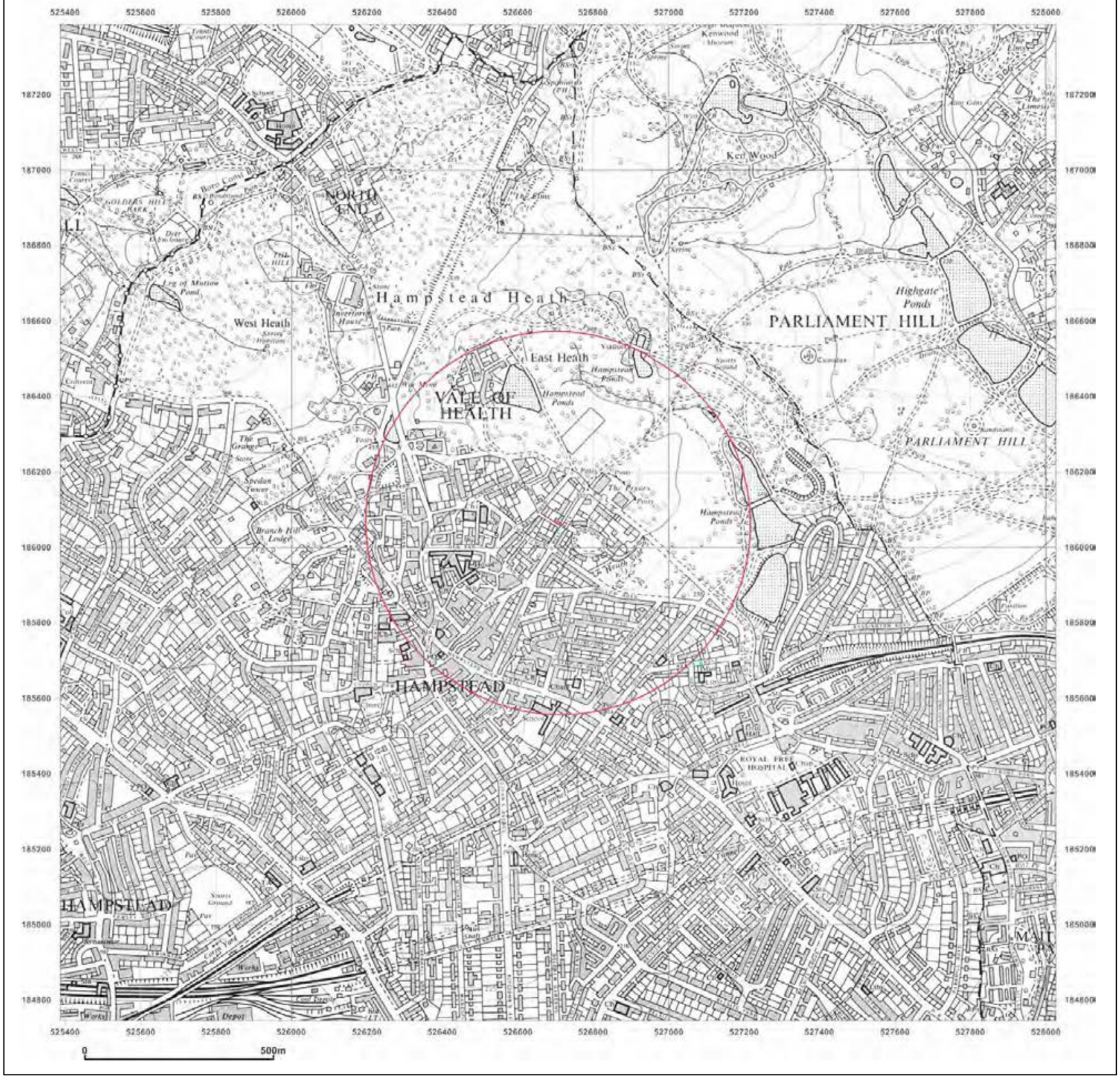

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Surveyed 1965
Revised 1965
Edition N/A
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Surveyed 1968
~~Revised 1968~~
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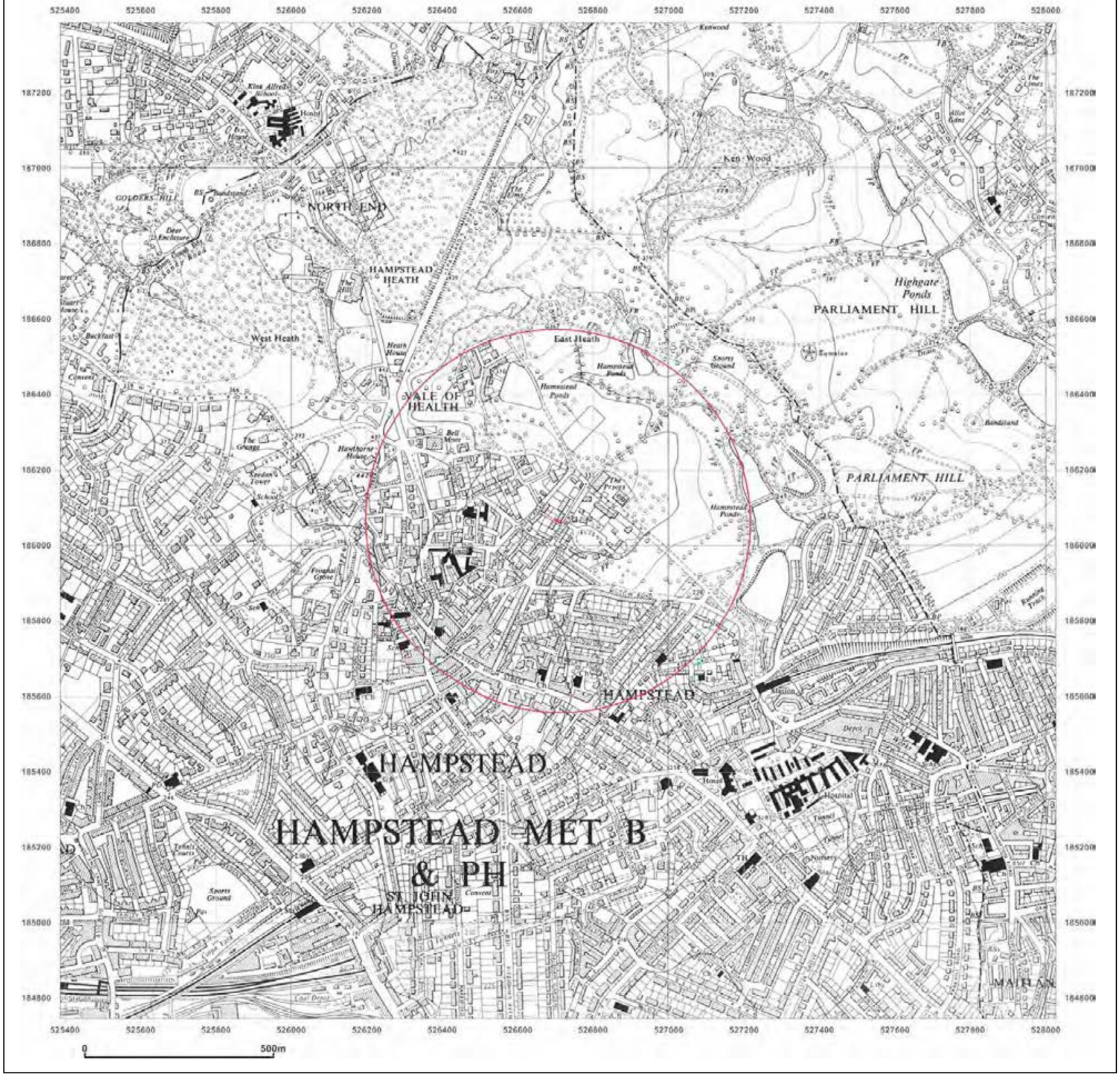

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Edition N/A
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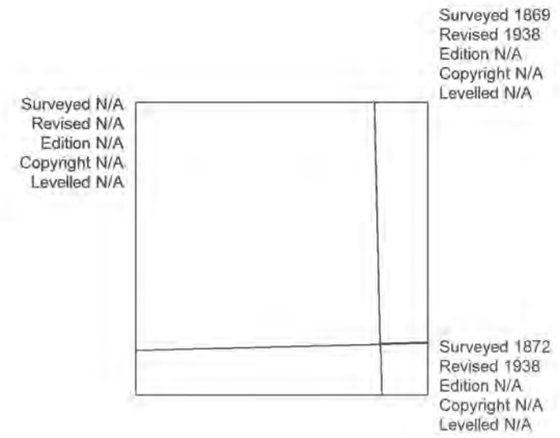

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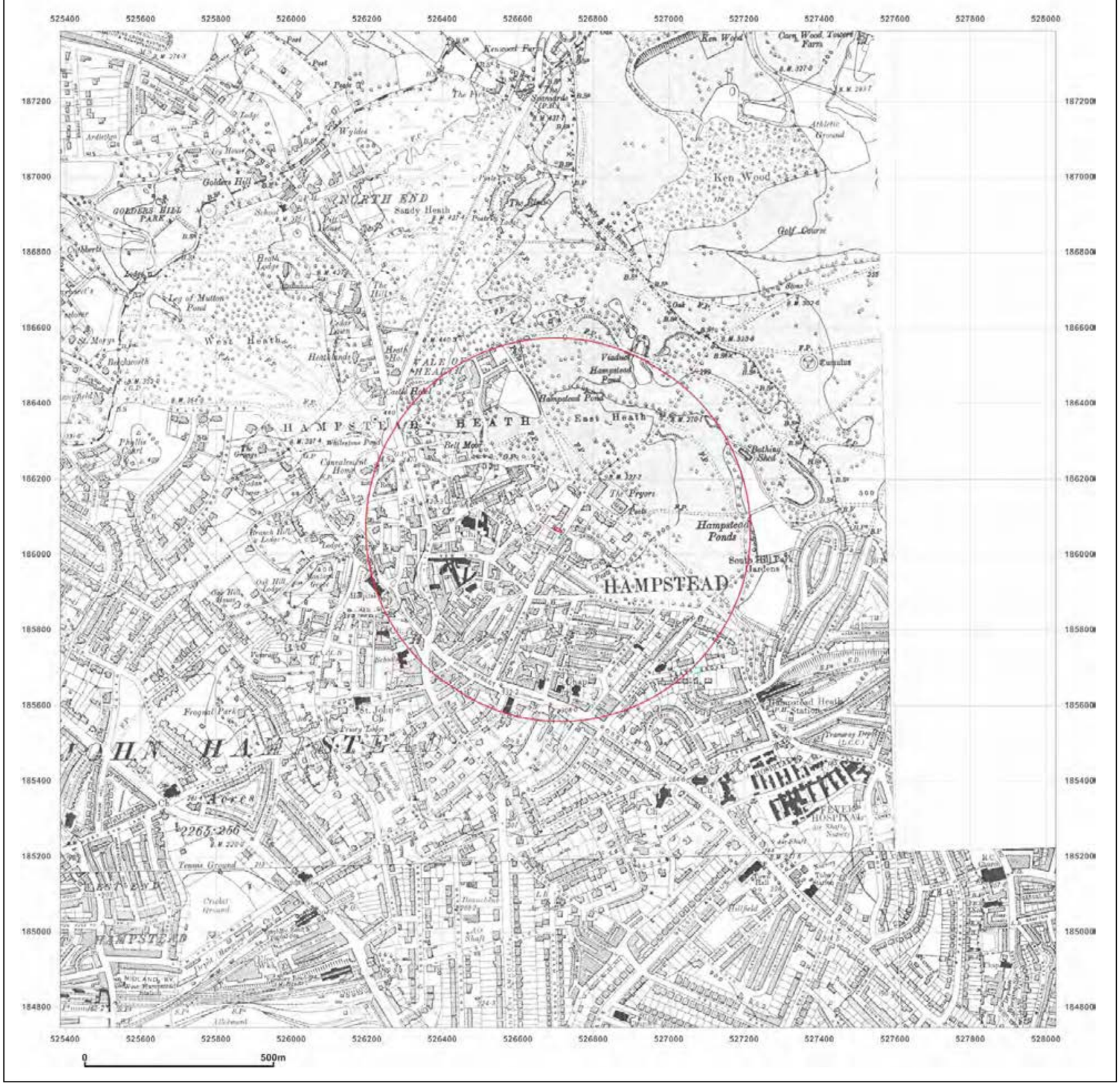

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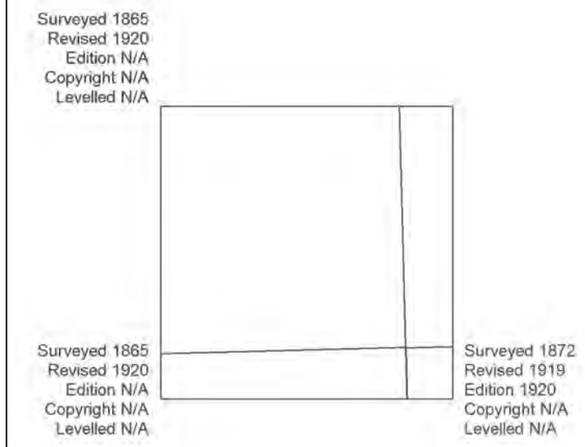

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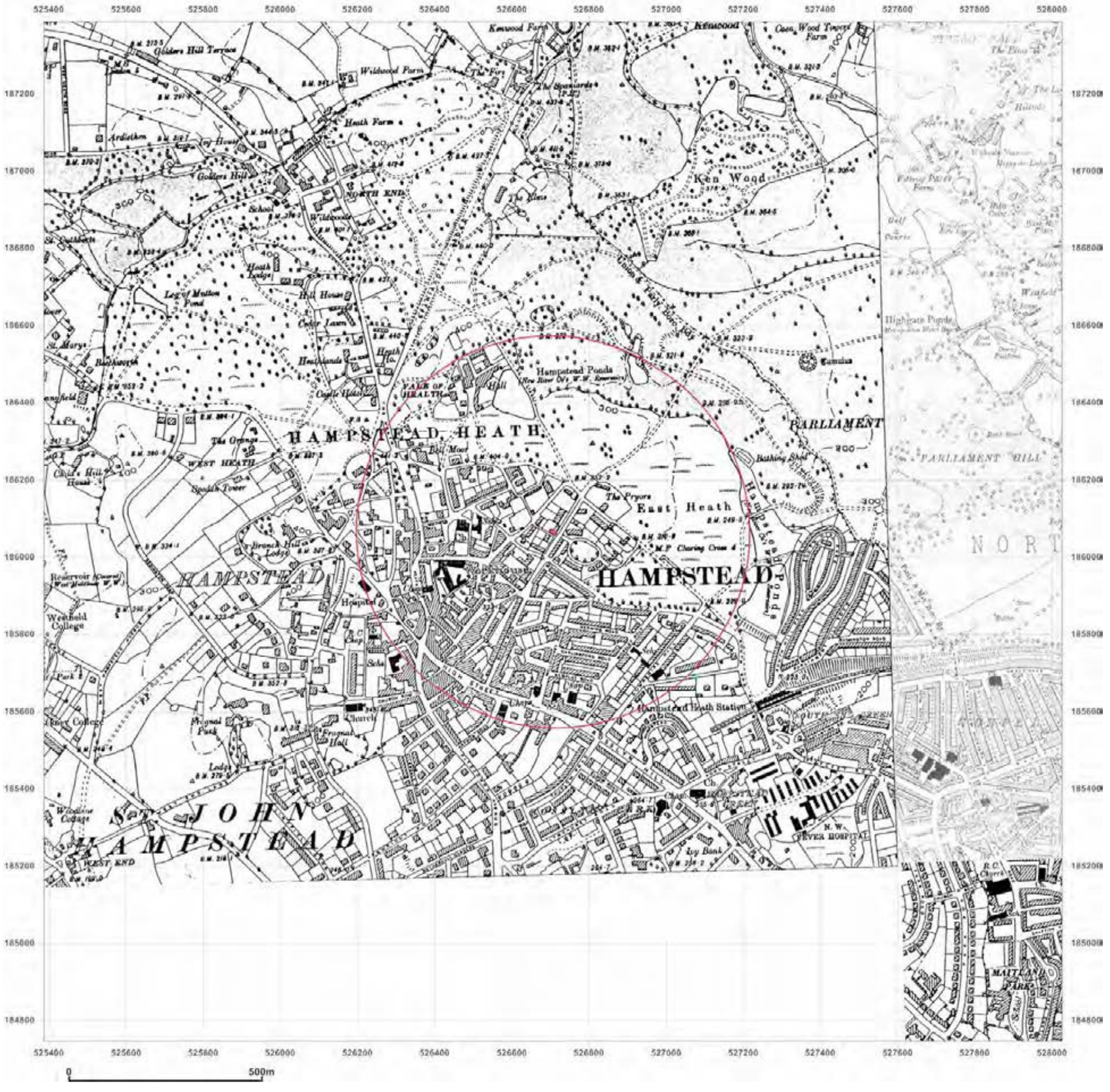

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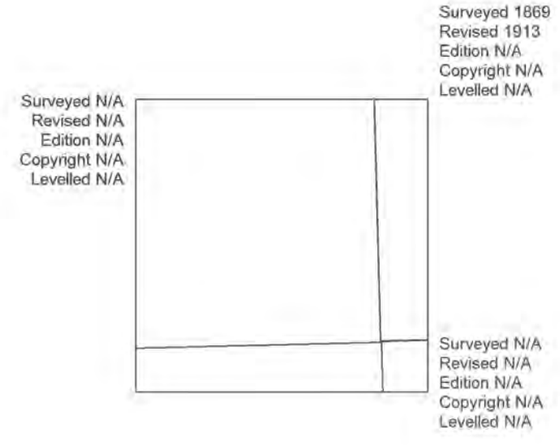

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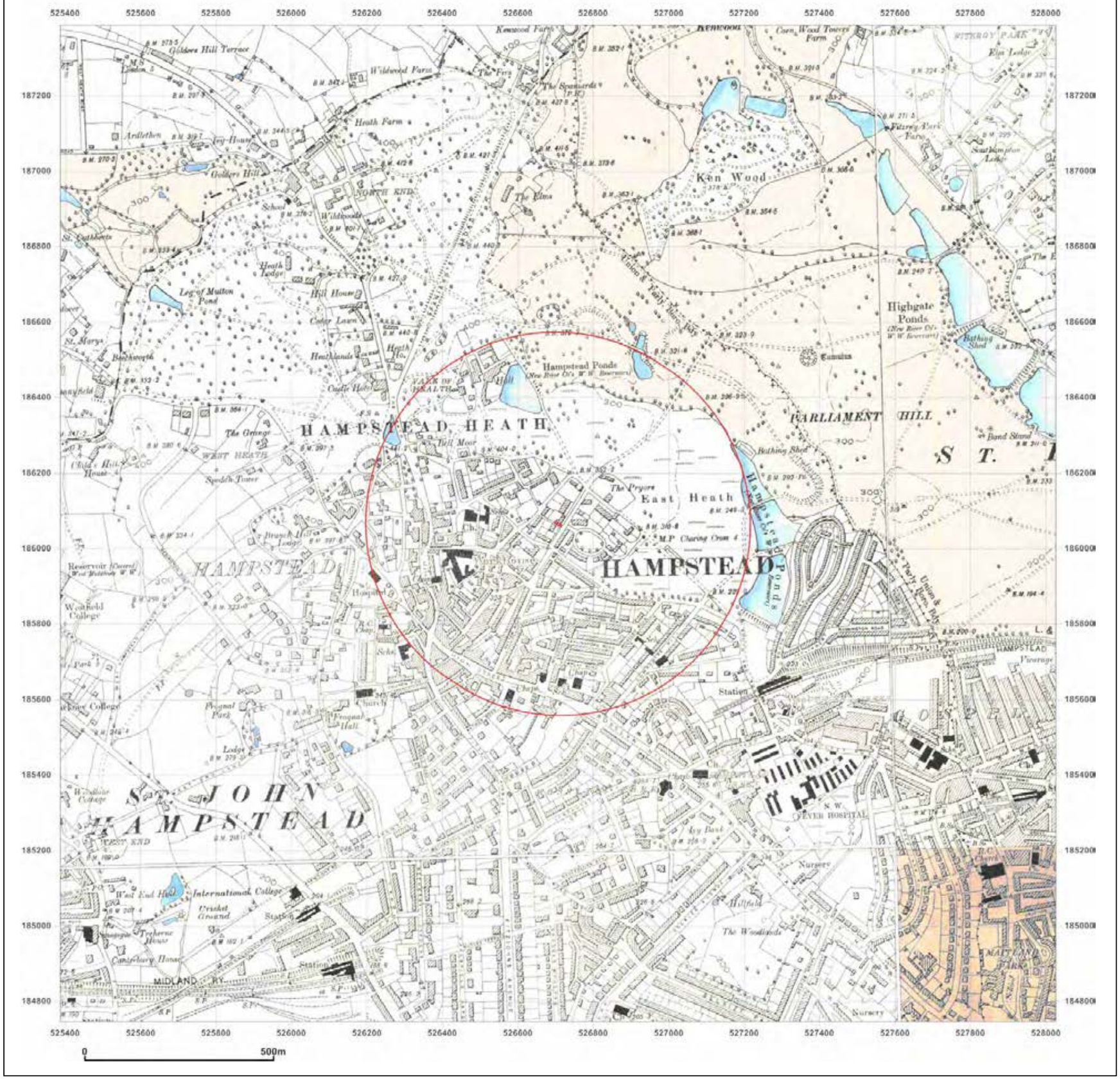
To view map legend click here *Legend*



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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: County Series

Map date: **1894**

Scale: 1:10,560

Printed at: 1:10,560

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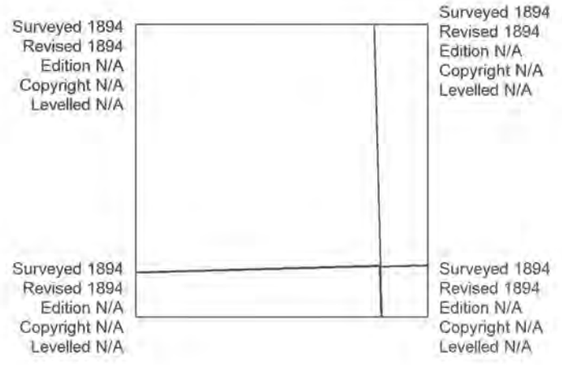

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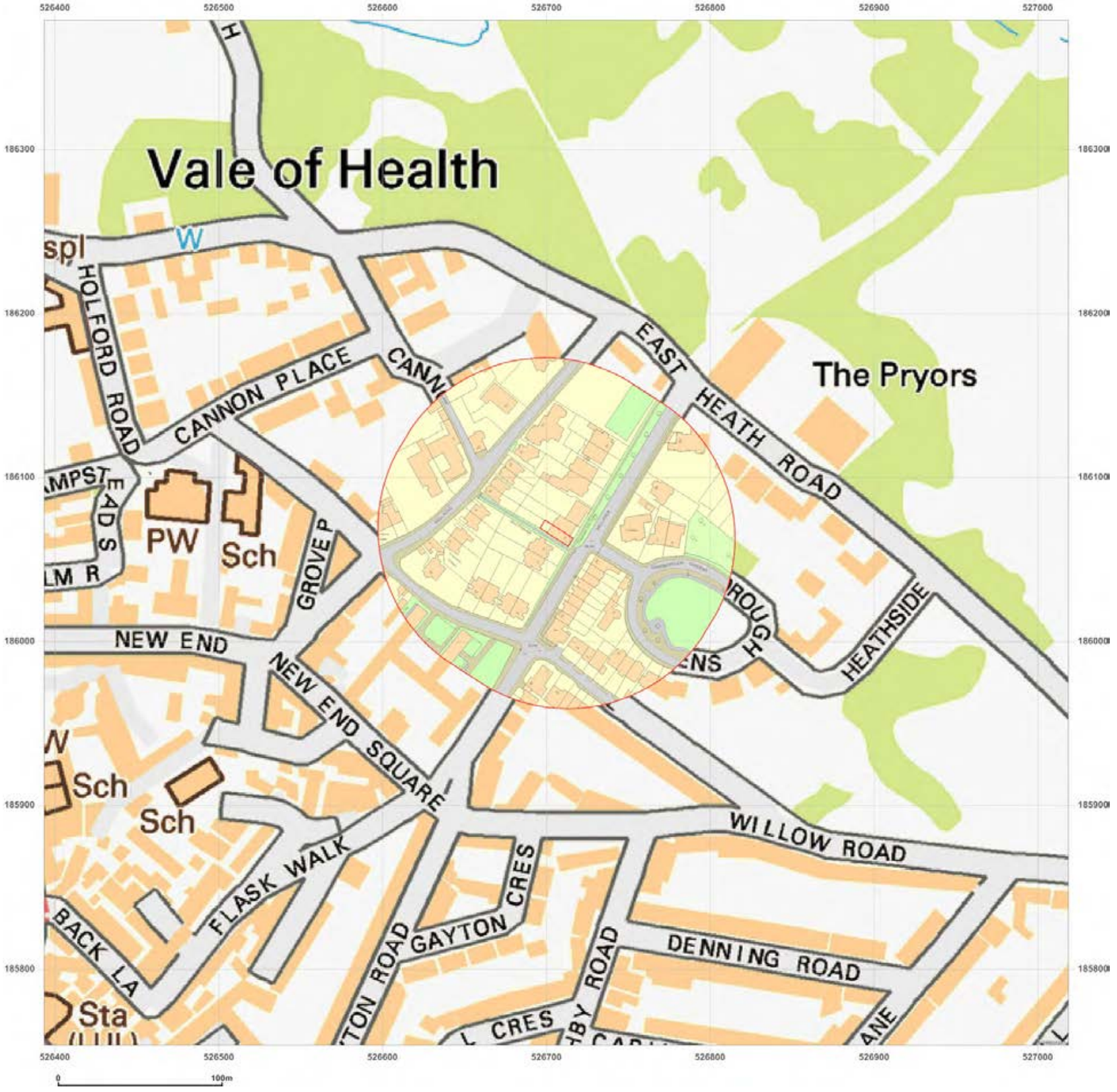

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: MasterMap

Map date: **2012**

Scale: 1:1,250

Printed at: 1:2,500

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Site Details:

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Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1986-1991**

Scale: 1:1,250

Printed at: 1:2,500

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Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A	Surveyed 1975 Revised 1986 Edition N/A Copyright 1986 Levelled 1975	Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A
Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A

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Site Details:

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Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1987-1991**

Scale: 1:1,250

Printed at: 1:2,500

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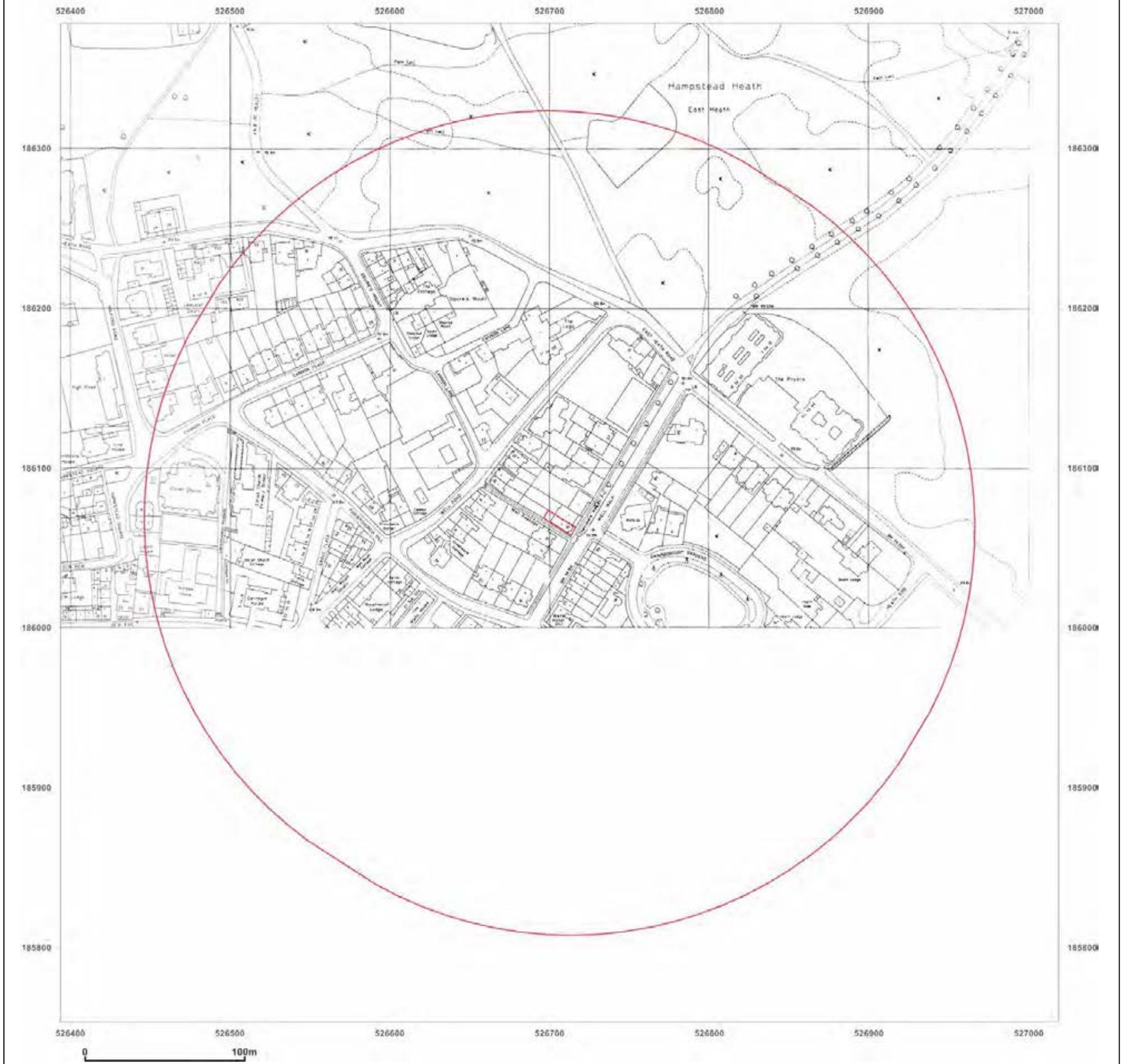

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1991**

Scale: 1:1,250

Printed at: 1:2,500

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

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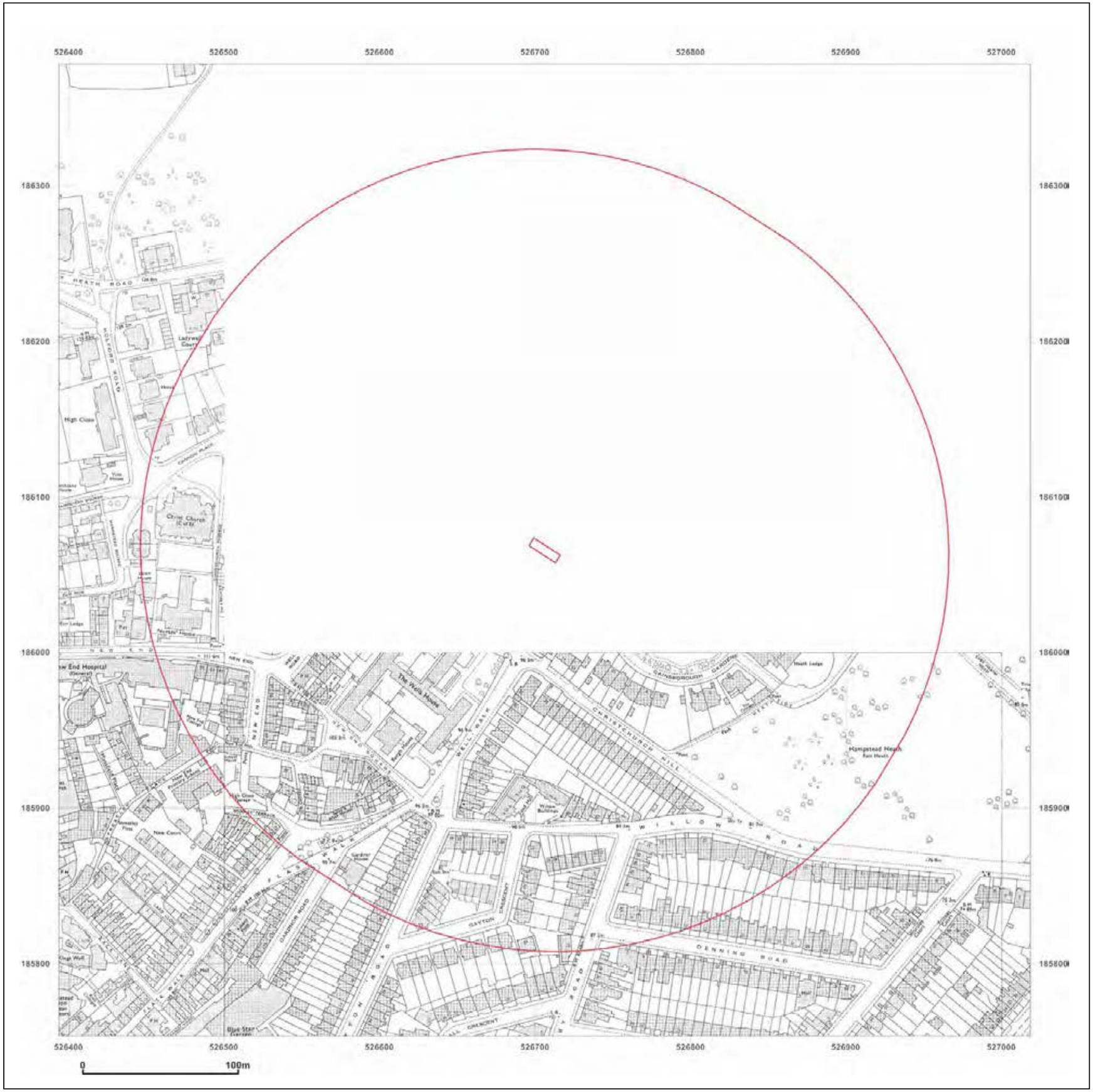

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1972-1974**

Scale: 1:1,250

Printed at: 1:2,500

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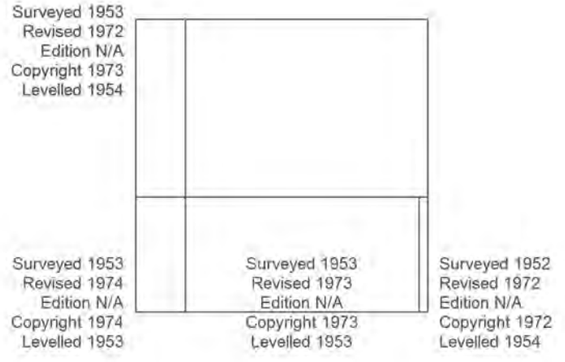

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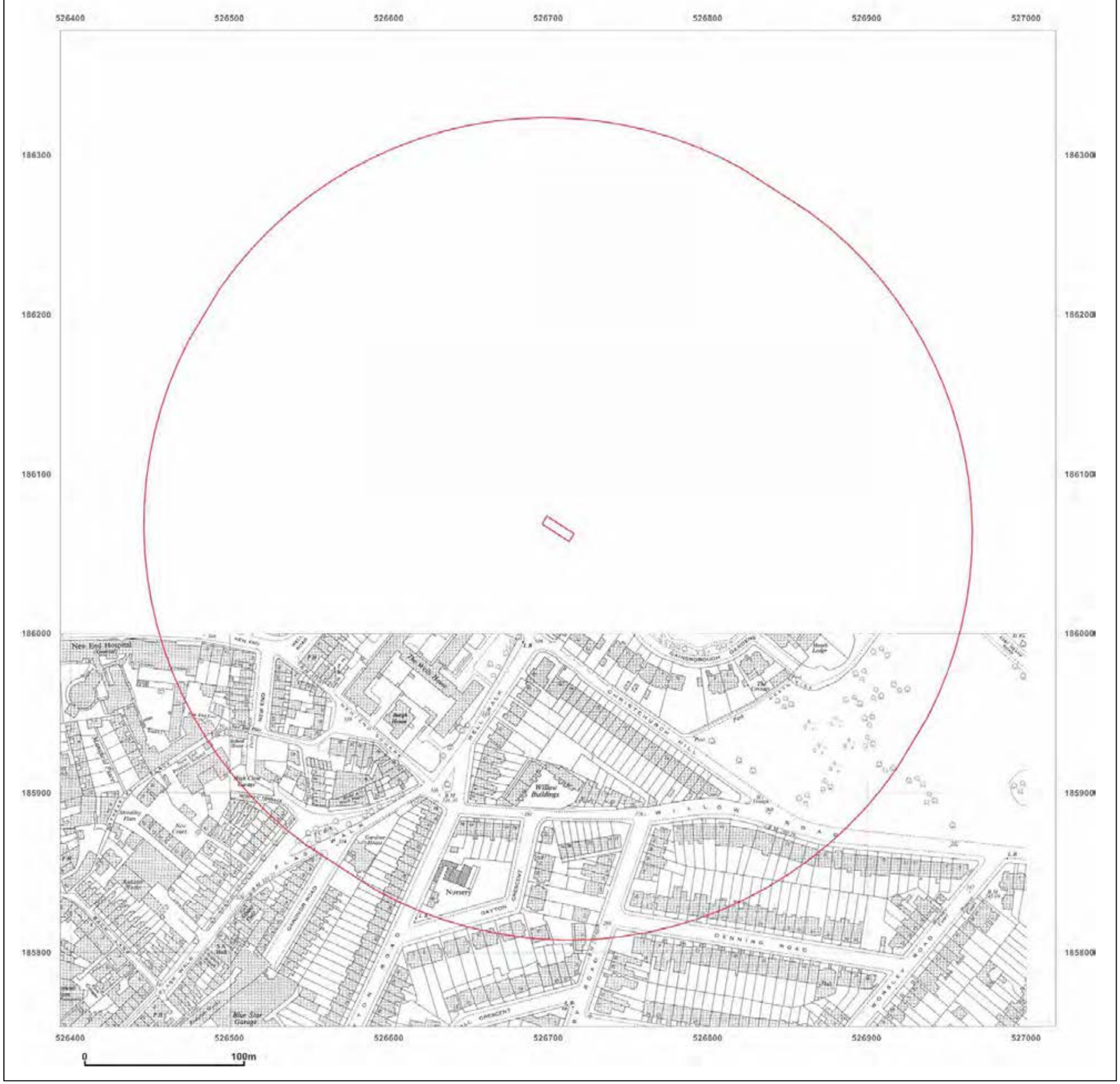

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1966**

Scale: 1:1,250

Printed at: 1:2,500

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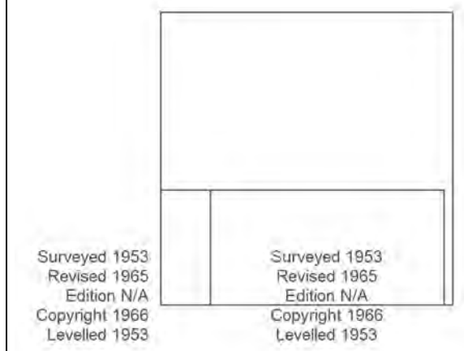

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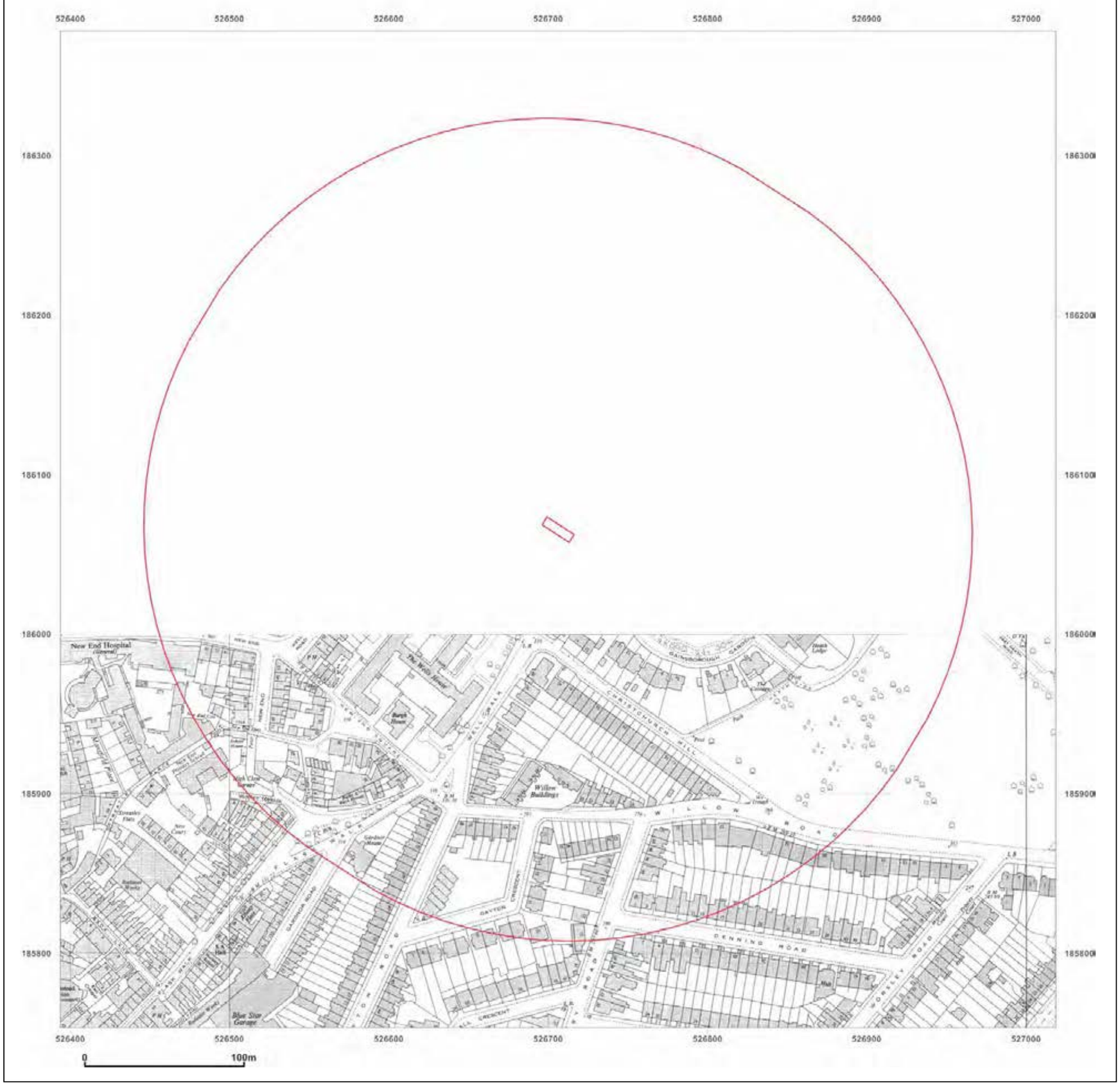

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1965**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1965
Revised 1965
Edition N/A
Copyright 1970
Levelled 1954

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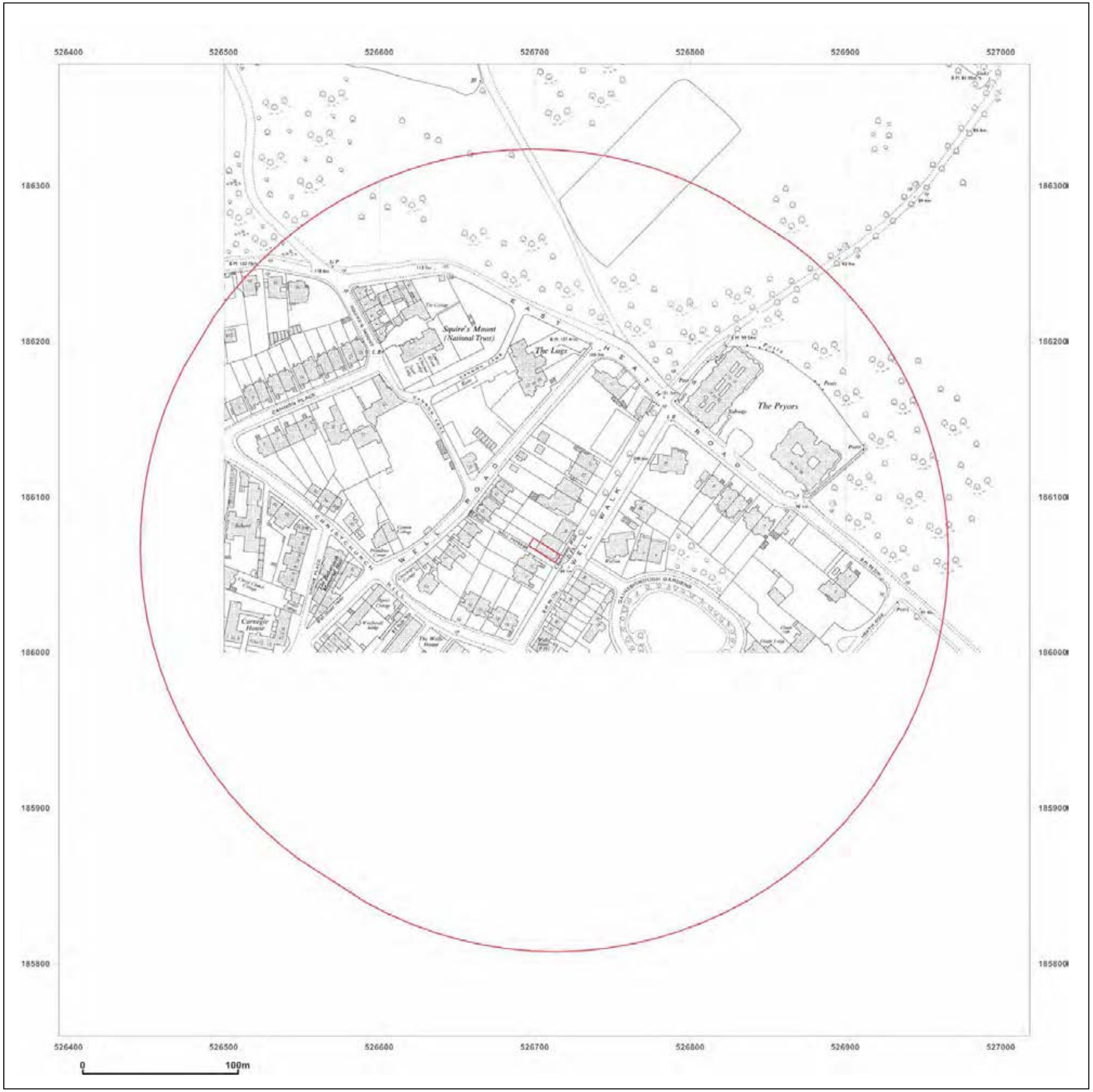

emapsite™

Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1954**

Scale: 1:1,250

Printed at: 1:2,500

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Surveyed 1953
Revised 1953
Edition N/A
Copyright 1954
Levelled 1933

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Production date: 07 November 2012

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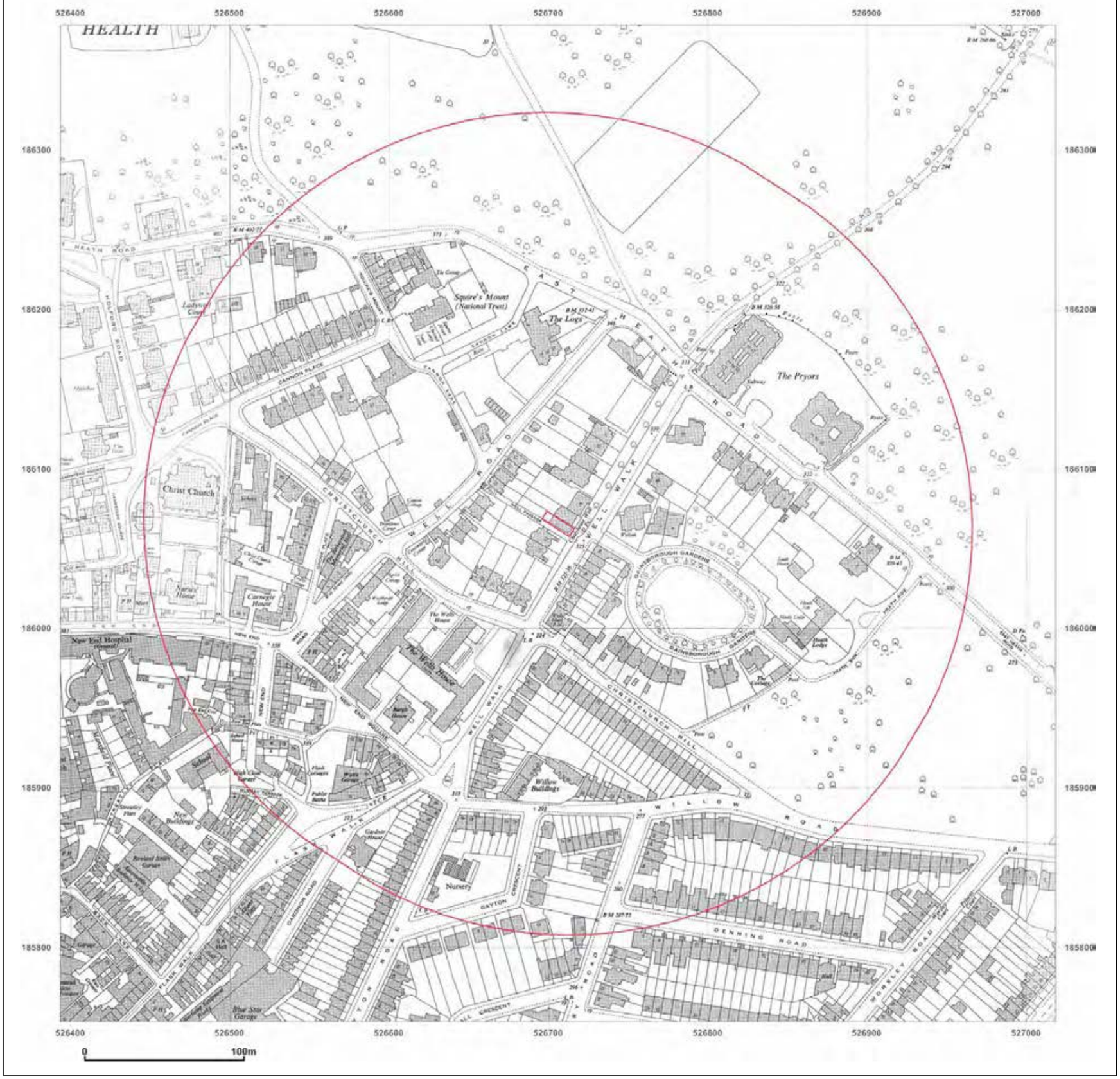

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1952-1953**

Scale: 1:1,250

Printed at: 1:2,500

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Surveyed 1953 Revised 1953 Edition N/A Copyright N/A Levelled 1933	Surveyed 1953 Revised 1953 Edition N/A Copyright N/A Levelled 1933	Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1933
Surveyed 1953 Revised 1953 Edition N/A Copyright N/A Levelled 1933	Surveyed 1953 Revised 1953 Edition N/A Copyright N/A Levelled 1933	Surveyed 1952 Revised 1952 Edition N/A Copyright N/A Levelled 1933

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Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1952-1953**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1953
Revised 1953
Edition 1954
Copyright N/A
Levelled 1933

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

Surveyed 1953
Revised 1953
Edition 1955
Copyright N/A
Levelled 1933

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Revised 1953
Edition 1954
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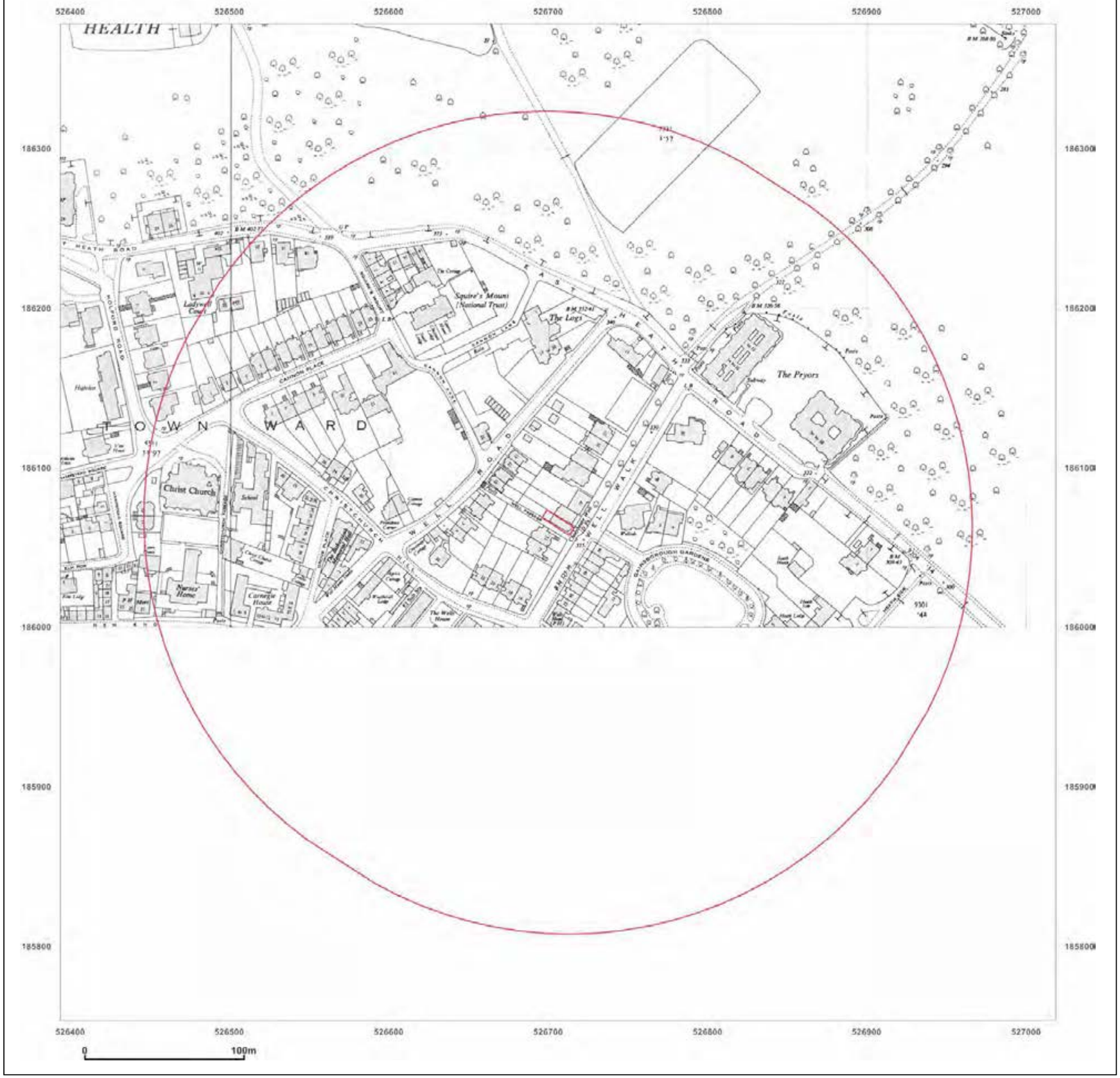

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: National Grid

Map date: **1953**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1953
Revised 1953
Edition 1954
Copyright N/A
Levelled 1933

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Site Details:

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Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: County Series

Map date: **1915**

Scale: 1:2,500

Printed at: 1:2,500

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

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Site Details:

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Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: County Series

Map date: **1896**

Scale: 1:2,500

Printed at: 1:2,500

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

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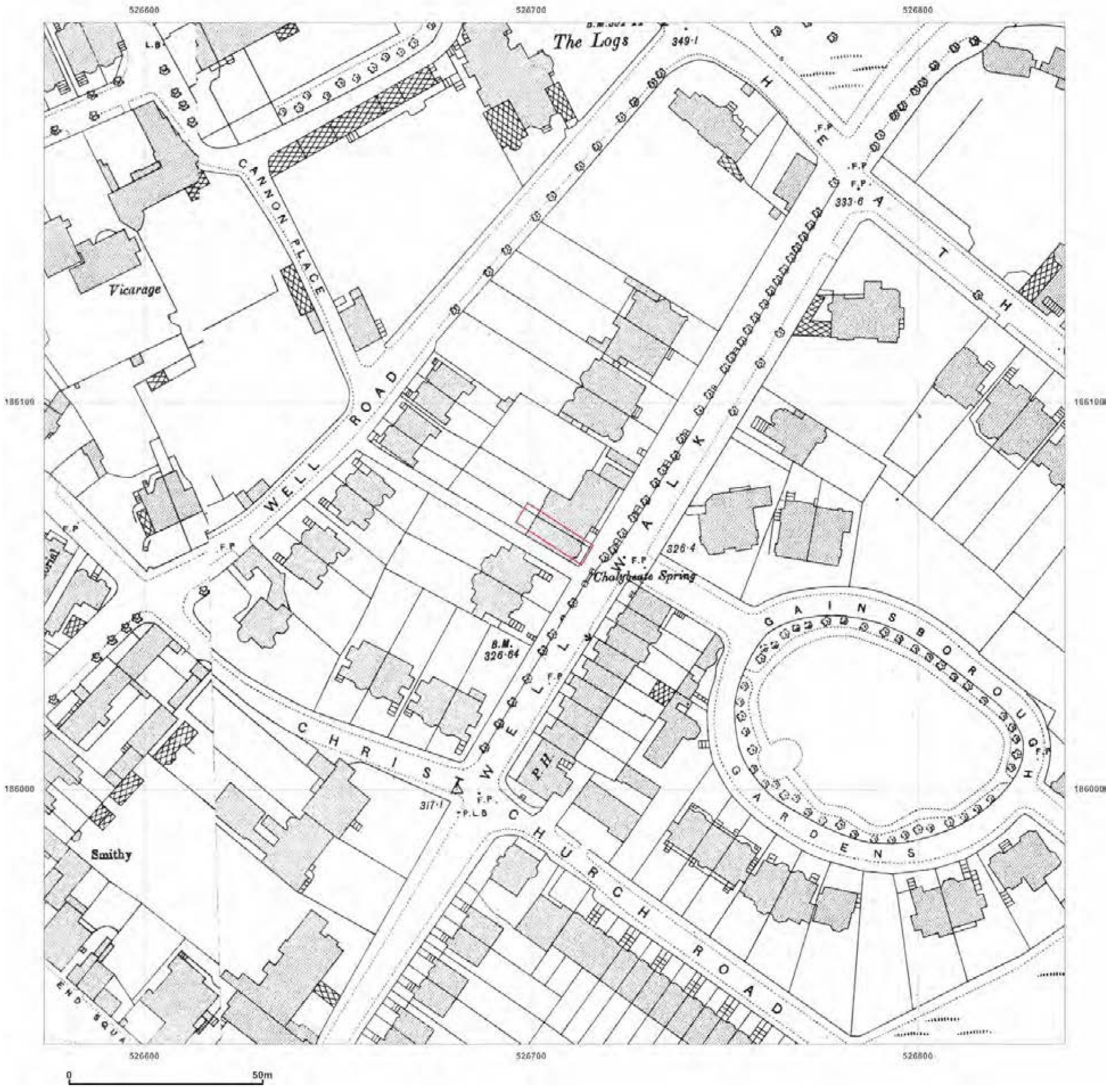

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: 1056 Scale Town Plan

Map date: **1893**

Scale: 1:1,056

Printed at: 1:1,056

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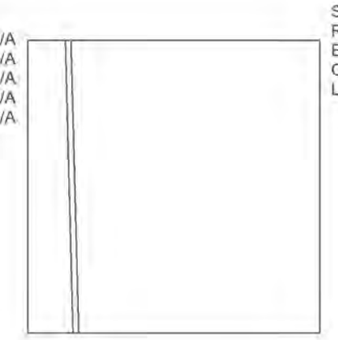
Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



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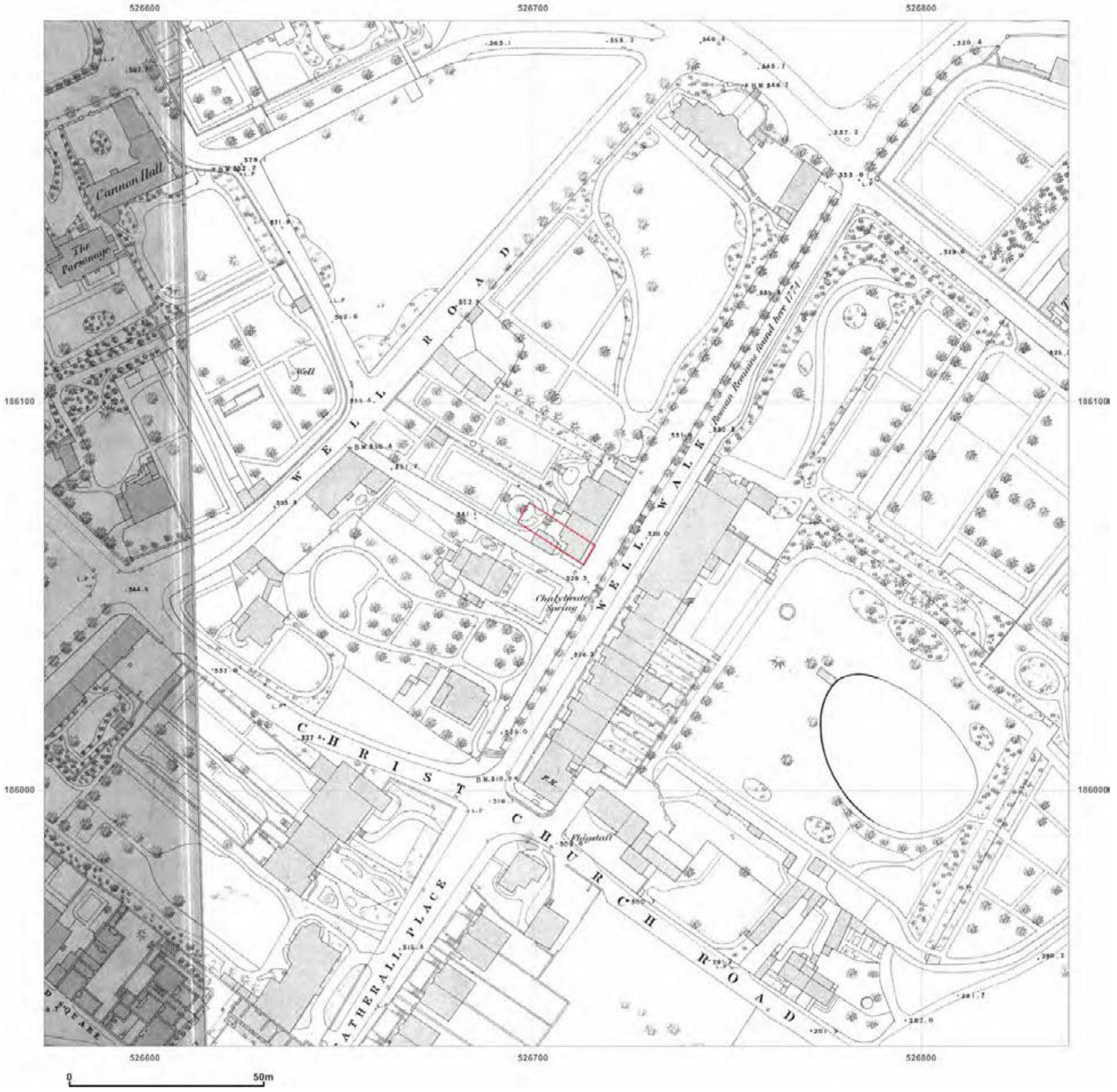

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: 1056 Scale Town Plan

Map date: **1871**

Scale: 1:1,056

Printed at: 1:1,056

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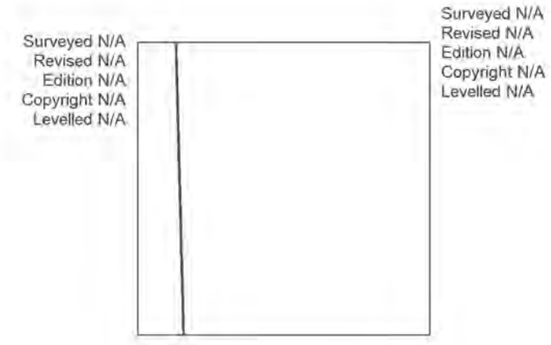

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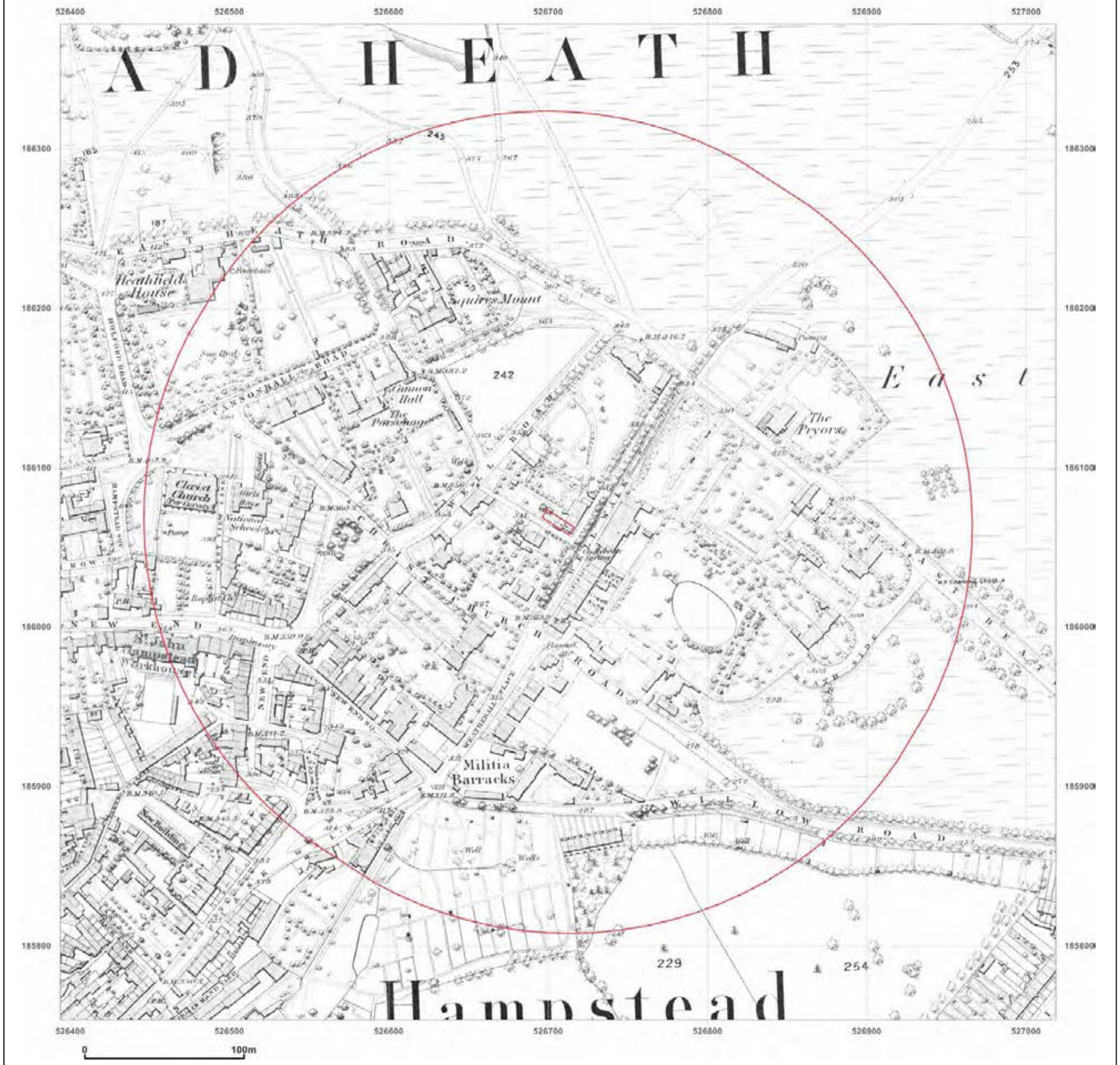

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: County Series

Map date: **1870**

Scale: 1:2,500

Printed at: 1:2,500

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Revised N/A
Edition N/A
Copyright N/A
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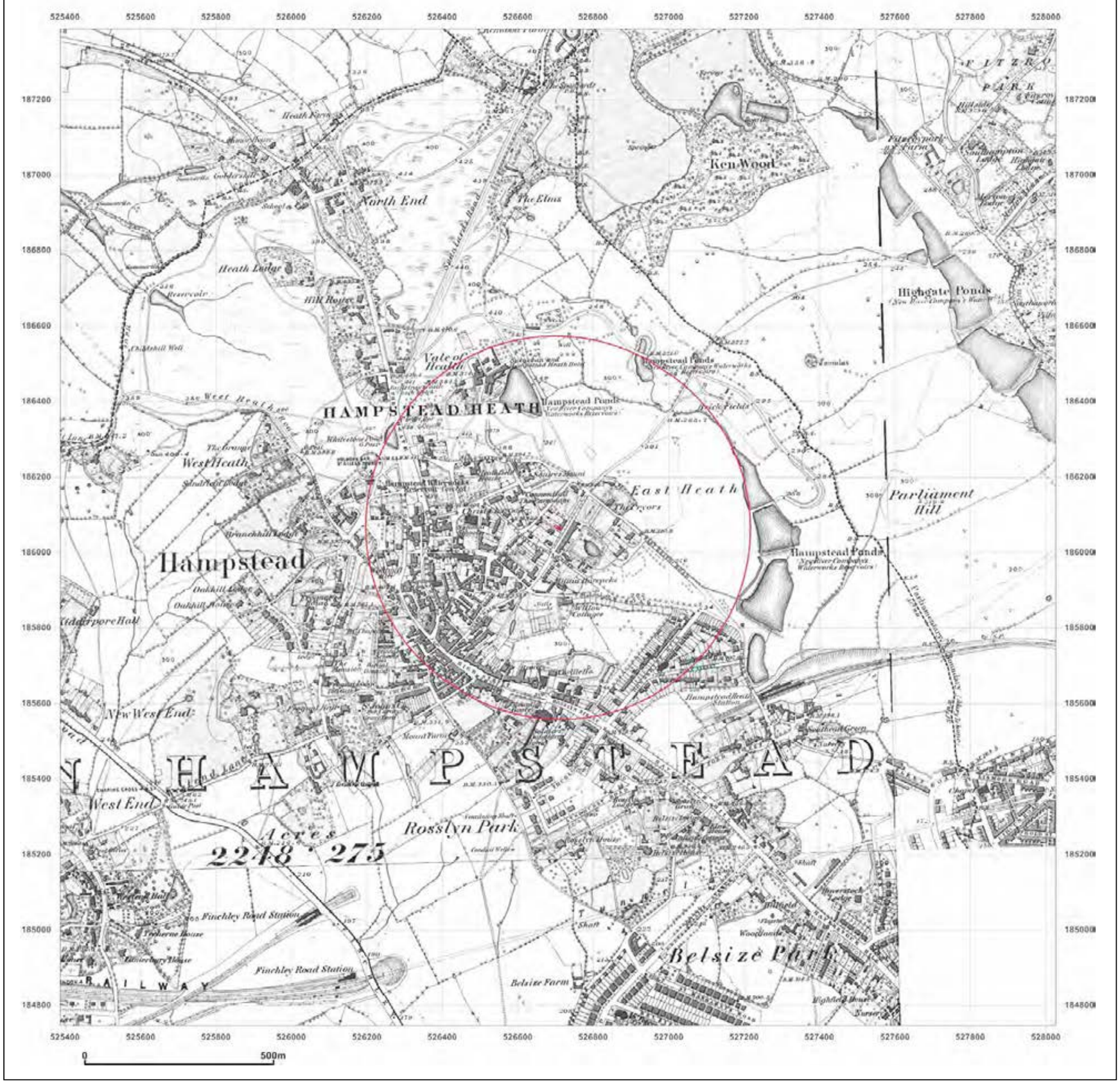

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Site Details:

nw3 1by

Client Ref: EMS_184856_271064
Report Ref: EMS-184856_271064
Grid Ref: 526706, 186066

Map Name: County Series

Map date: **1865-1869**

Scale: 1:10,560

Printed at: 1:10,560

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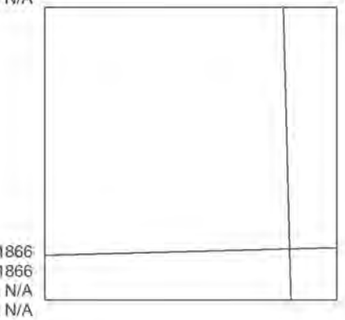
Surveyed 1865
Revised 1865
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1869
Revised 1869
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1866
Revised 1866
Edition N/A
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EmapSite
Masdar House,
Eversley, RG27 0RP

Report Reference:	EMS-184856_271065
Your Reference:	EMS_184856_271065
Report Date	Nov 7, 2012
Report Delivery Method:	Email - pdf

GroundSure GeoInsight

Address: nw3 1by

Dear Sir/Madam,

Thank you for placing your order with GroundSure. Please find enclosed the **GroundSure GeoInsight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
GroundSure GeoInsight

GroundSure GeoInsight

Address: nw3 1by

Date: Nov 7, 2012

Report Reference: EMS-184856_271065

Your Reference: EMS_184856_271065

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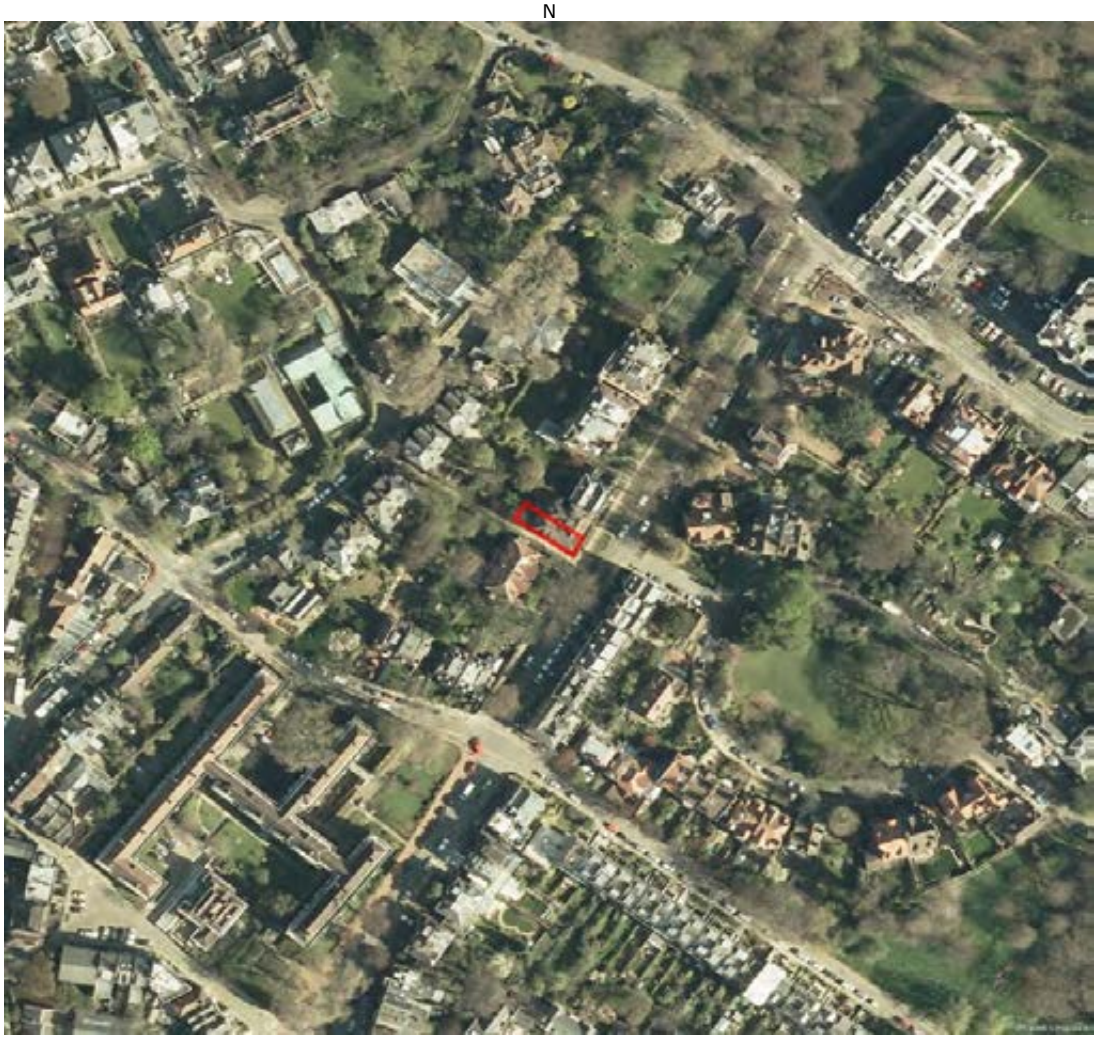
Aerial Photograph of Study Site

NW N NE



W E

SW S SE

Site Name: nw3 1by
Grid Reference: 526706,186066
Size of Site: 0.01 ha

Overview of Findings

The GroundSure GeoInsight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and GroundSure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary
1. Geology	**Description**
1.1 Artificial Ground,	
1.1.1 Is there any Artificial Ground /Made Ground present beneath the study site?*	No
1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology & Landslips	
1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	No
1.2.2 Are there any records relating to permeability of superficial geology within the study site* boundary?	No
1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
1.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No
1.3 Bedrock, Solid Geology & Faults	
1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
1.3.2 Are there any records relating to permeability of bedrock within the study site* boundary?	Yes
1.3.3 Are there any records of faults within 500m of the study site boundary?	No
1.3.4 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level
1.3.5 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary

* This includes an automatically generated 50m buffer zone around the site

Source:Scale 1:50,000 BGS Sheet No:256

2. Ground Workings	on-site	0-50	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	0	1	1	-	-
2.2 Historical Underground Workings Features from Small Scale Mapping	0	0	0	0	14
2.3 Current Ground Workings	0	0	0	0	0

3. Mining, Extraction & Natural Cavities	on-site	0-50	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	5
3.2 Coal Mining	0	0	0	0	0
3.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
3.4 Non-Coal Mining*	0	0	0	0	0
3.5 Non–Coal Mining Cavities	0	0	0	0	0
3.6 Natural Cavities	0	0	0	0	0
3.7 Brine Extraction	0	0	0	0	0
3.8 Gypsum Extraction	0	0	0	0	0
3.9 Tin Mining	0	0	0	0	0
3.10 Clay Mining	0	0	0	0	0

*This includes an automatically generated 50m buffer zone around the site

4. Natural Ground Subsidence	on-site*	0-50	51-250	251-500	501-1000
4.1 Shrink-Swell Clay	Moderate	-	-	-	-
4.2 Landslides	Very Low	-	-	-	-
4.3 Ground Dissolution of Soluble Rocks	Null	-	-	-	-
4.4 Compressible Deposits	Negligible	-	-	-	-
4.5 Collapsible Deposits	Very Low	-	-	-	-
4.6 Running Sand	Very Low	-	-	-	-

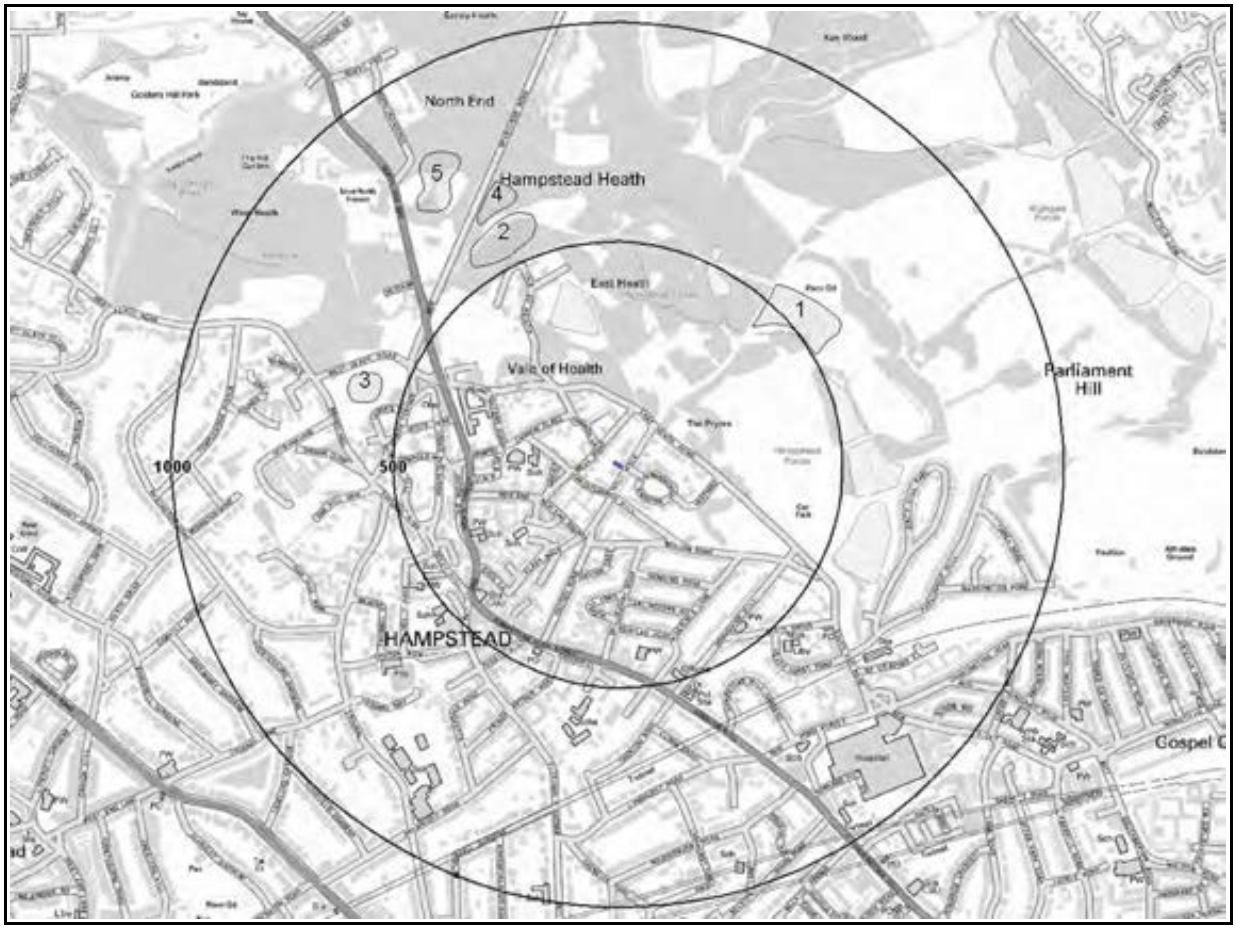
* This includes an automatically generated 50m buffer zone around the site

5. Borehole Records	on-site	0-50	51-250	251-500	501-1000
5.1 BGS Recorded Boreholes	0	1	5	-	-

6. Estimated Background Soil Chemistry	on-site	0-50	51-250	251-500	501-1000
6.1 Records of Background Soil Chemistry	1	0	0	-	-

1.1 Artificial Ground Map

NW N NE



W E

SW S SE

Artificial Ground Legend

Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Worked Ground (undivided)

Infilled Ground

Disturbed Ground (undivided)

Landscaped Ground (undivided)

Reclaimed Ground

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:256

1.1.1 Artificial/Made Ground

Are there any records of Artificial/Made Ground within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	434.0	NE	WGR-OPEN	WORKED GROUND (UNDIVIDED)	VOID

1.1.2 Permeability of Artificial Ground

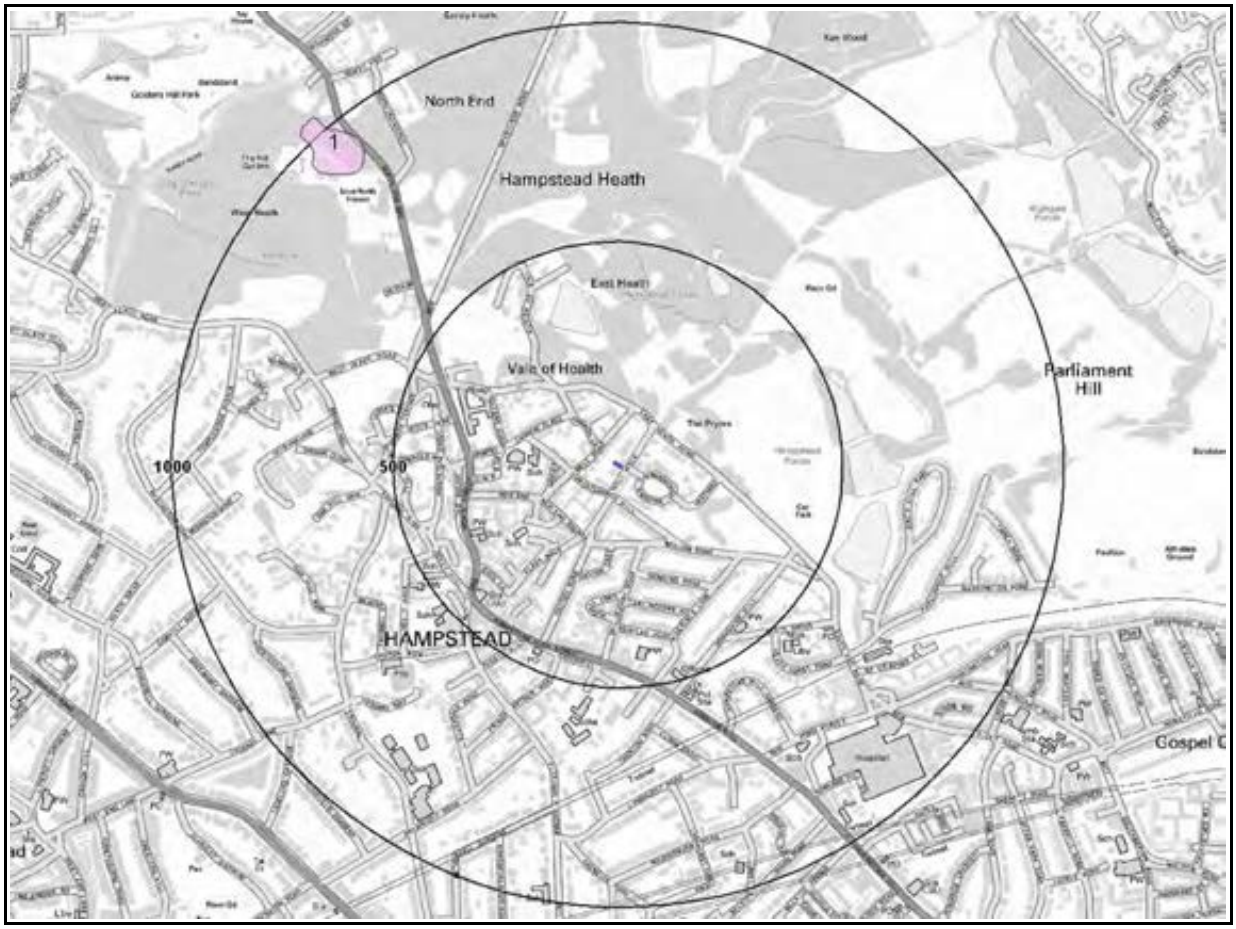
Are there any records relating to permeability of artificial ground within the study site* boundary? No

Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site.

1.2 Superficial Deposits and Landslips Map

NW N NE



W E

SW S SE

Superficial and Landslips Legend

Site Outline

500
1000
Search Buffers (m)

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/Drift Geology

Are there any records of Superficial Deposits/Drift Geology within 500m of the study site boundary? No

Database searched and no data found.

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site* boundary? No

Database searched and no data found.

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

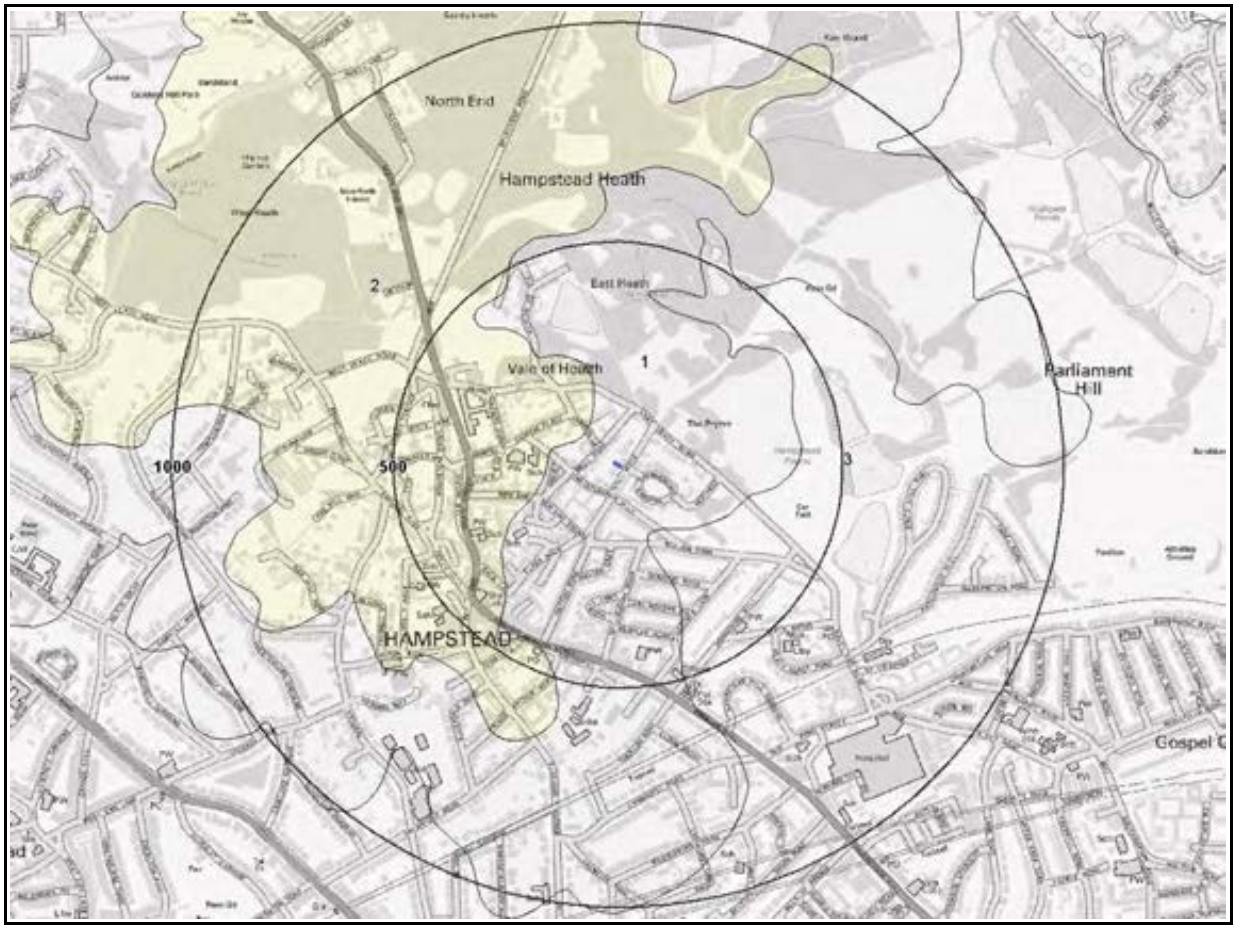
Are there any records relating to permeability of landslips within the study site* boundary? No

Database searched and no data found.

*This includes an automatically generated 50m buffer zone around the site.

1.3 Bedrock and Faults Map

NW N NE



W E

SW S SE

Bedrock & Faults Deposits Legend

Site Outline

500
1000
Search Buffers (m)

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:256

1.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	CLGB-CLSS	Claygate Member - Clay, Silt And Sand	Eocene
2	93.0	NW	BGS-SAND	Bagshot Formation - Sand	Eocene
3	159.0	SE	LC-CLSS	London Clay Formation - Clay, Silt And Sand	Eocene

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary? Yes

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	High	Very Low

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3.4 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level

1.3.5 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?

No radon protective measures are necessary

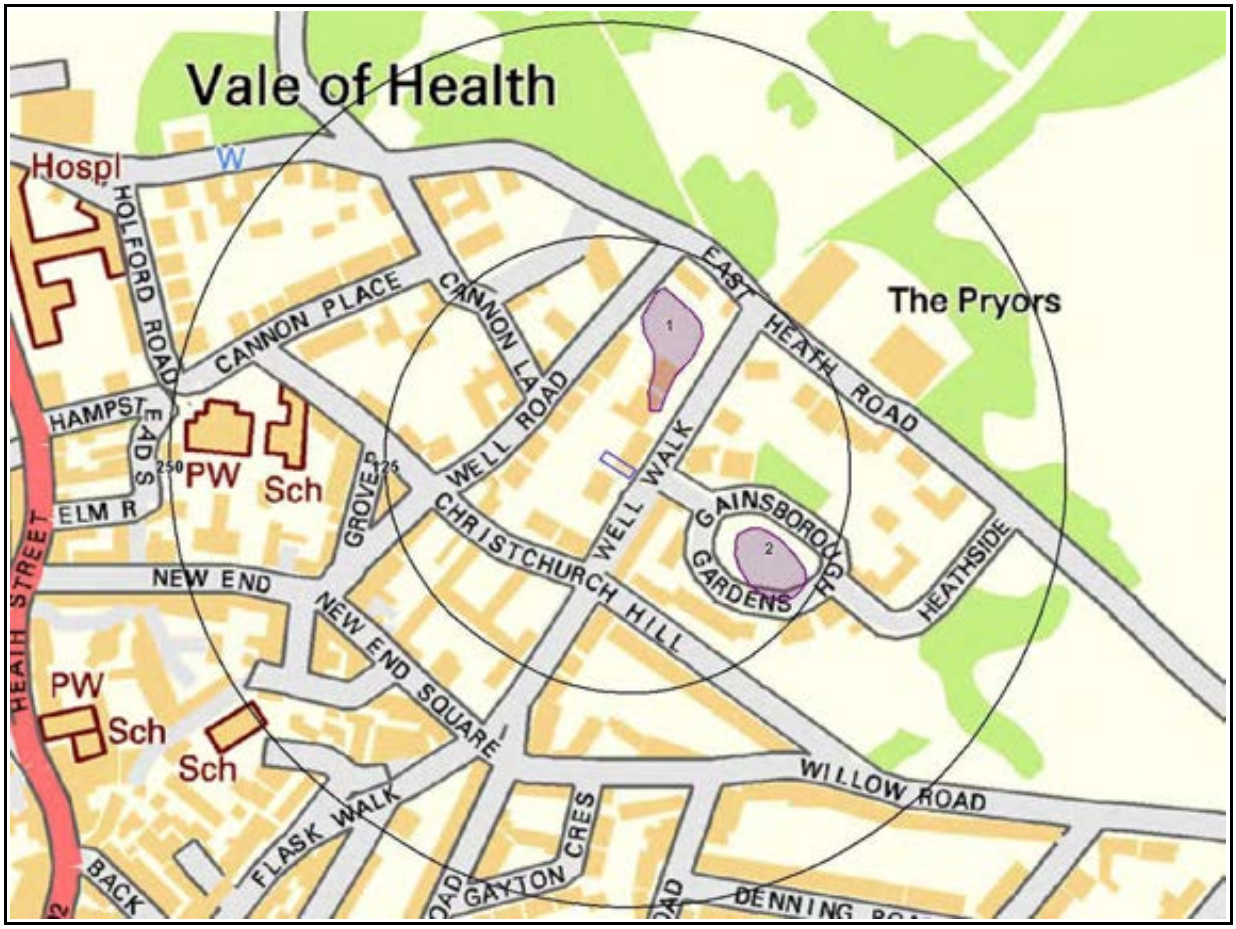
* This includes an automatically generated 50m buffer zone around the site.

2. Ground Workings Map

NW N NE

W E

SW S SE



Ground Workings Legend

Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

2. Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on GroundSure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
1	34.0	NE	526738,186133	Gravel Pit	1865
2	70.0	SE	526795,186008	Pond	1865

2.2 Historical Underground Workings Features derived from Historical Mapping

This data is derived from the GroundSure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
Not shown	619.0	SE	526647,185330	Tunnel	1995
Not shown	619.0	SE	526647,185330	Tunnel	1974
Not shown	619.0	SE	526647,185330	Tunnel	1965
Not shown	619.0	SE	526845,185427	Tunnel	1958
Not shown	766.0	S	526591,185300	Ventilating Shaft	1865
Not shown	938.0	S	527029,185170	Tunnel	1958
Not shown	938.0	S	527029,185170	Tunnel	1995
Not shown	938.0	S	527029,185170	Tunnel	1974
Not shown	938.0	S	527029,185170	Tunnel	1965
Not shown	955.0	SW	526240,185137	Tunnel	1958
Not shown	985.0	S	526706,185071	Air Shaft	1920
Not shown	991.0	SE	527274,185237	Air Shaft	1940
Not shown	992.0	SE	527277,185236	Air Shaft	1912
Not shown	993.0	SE	527282,185240	Air Shaft	1920

2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? **No**

Database searched and no data found.

3. Mining, Extraction & Natural Cavities Map

NW N NE

W E

SW S SE

Mining, Extraction & Natural Cavities Legend

3.Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from GroundSure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? **Yes**

The following Historical Mining information is provided by Groundsure :

ID	Distance (m)	Direction	NGR	Details	Date
Not shown	766.0	S	526591,185 300	Ventilating Shaft	1865
Not shown	985.0	S	526706,185 071	Air Shaft	1920
Not shown	991.0	SE	527274,185 237	Air Shaft	1940
Not shown	992.0	SE	527277,185 236	Air Shaft	1912
Not shown	993.0	SE	527282,185 240	Air Shaft	1920

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? **No**

The following information provided by JPB is not represented on Mapping:

Database searched. No results found.

3.4 Non – Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.5 Non – Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.7 Brine Extraction

This dataset provides information from the Brine Compensation Board which has been discontinued and is now covered by the Coal Authority.

Are there any Brine Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level. More detailed information on potential Tin Mining may be found in Section 3.4 – Non-Coal Mining Hazards.

Are there any Tin Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.10 Clay Mining

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? **No**

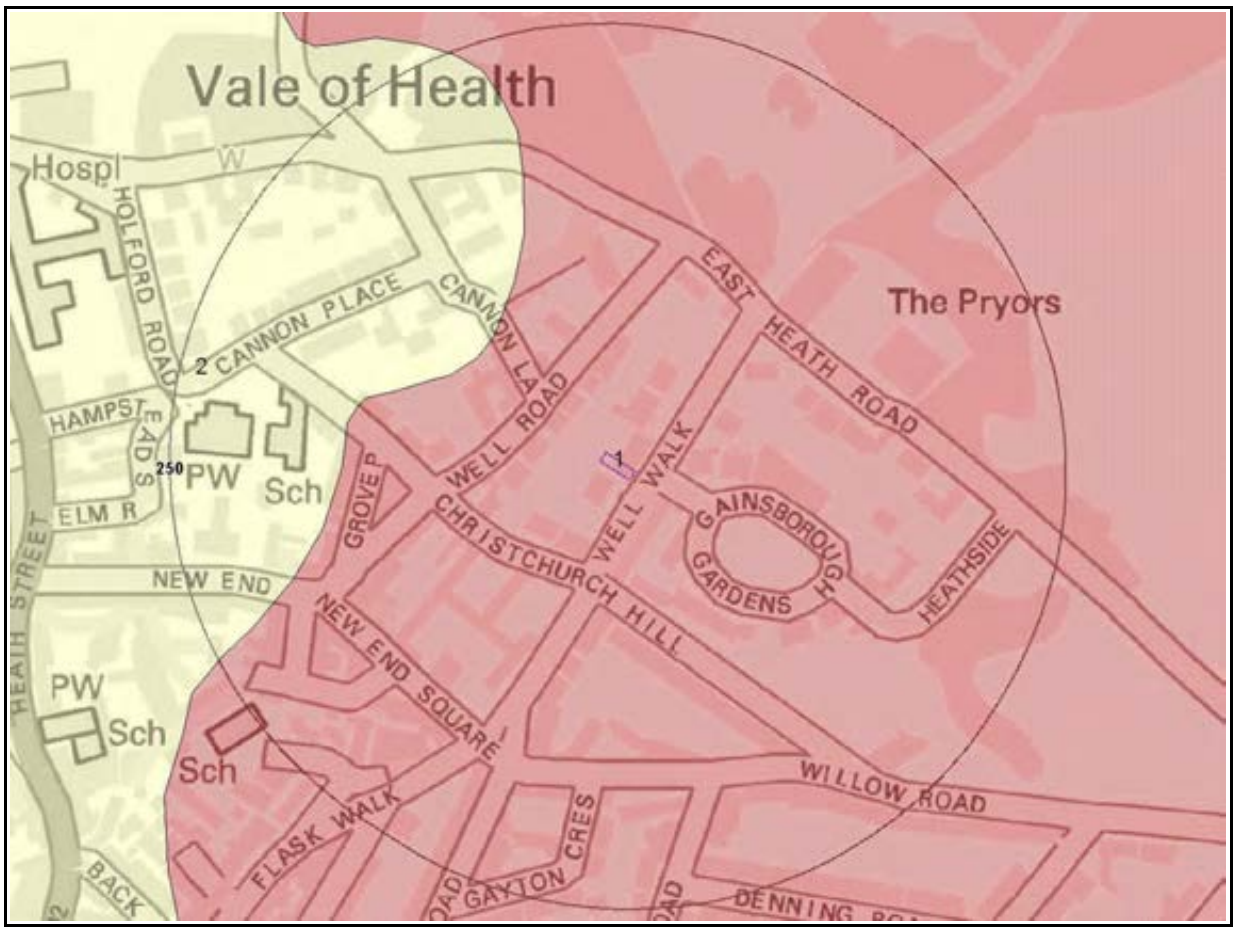
Database searched and no data found.

4. Natural Ground Subsidence
4.1 Shrink-Swell Clay Map

NW N NE

W E

SW S SE



Shrink-Swell Clay Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

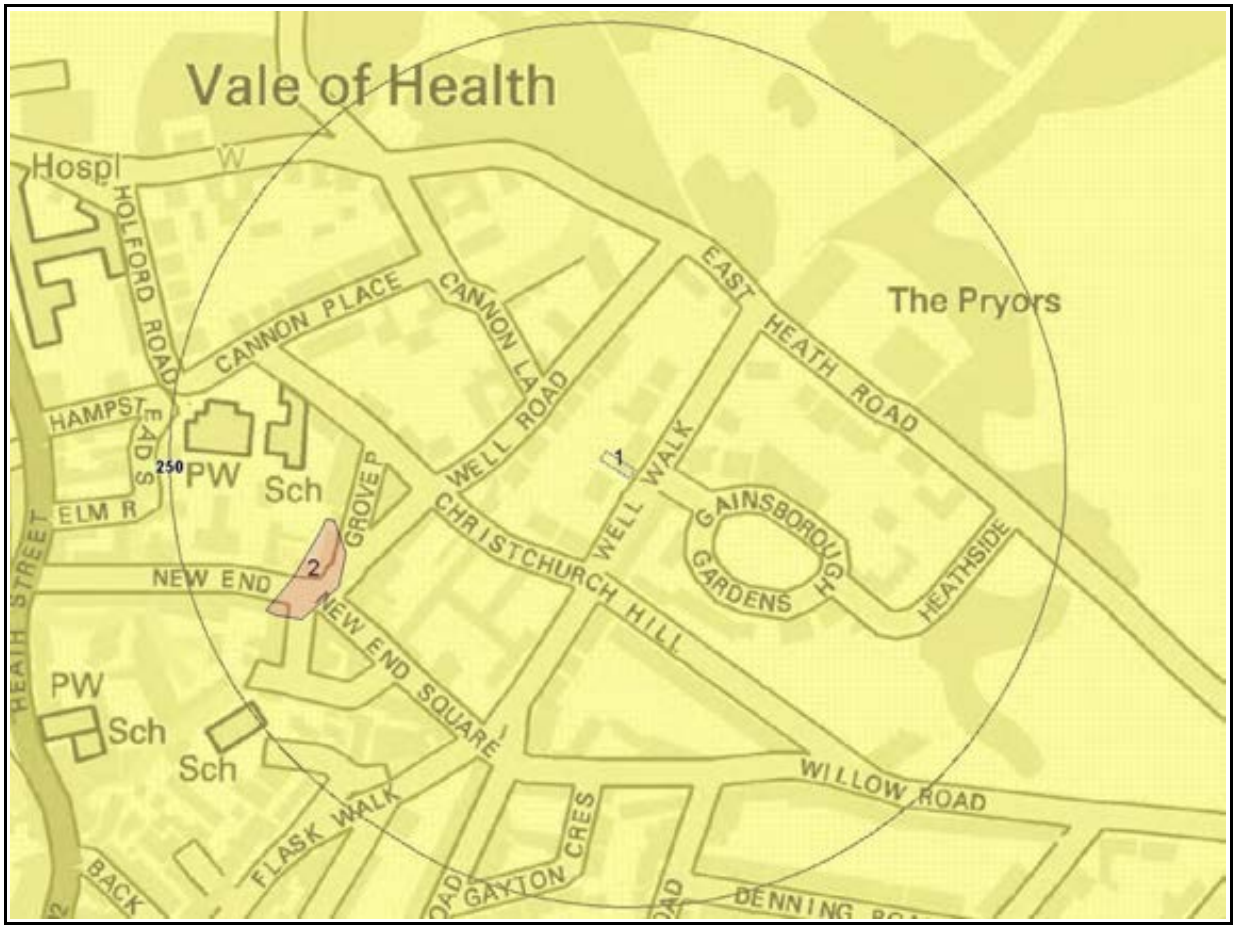
Low
Moderate
High

4.2 Landslides Map

NW N NE

W E

SW S SE



Landslides Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

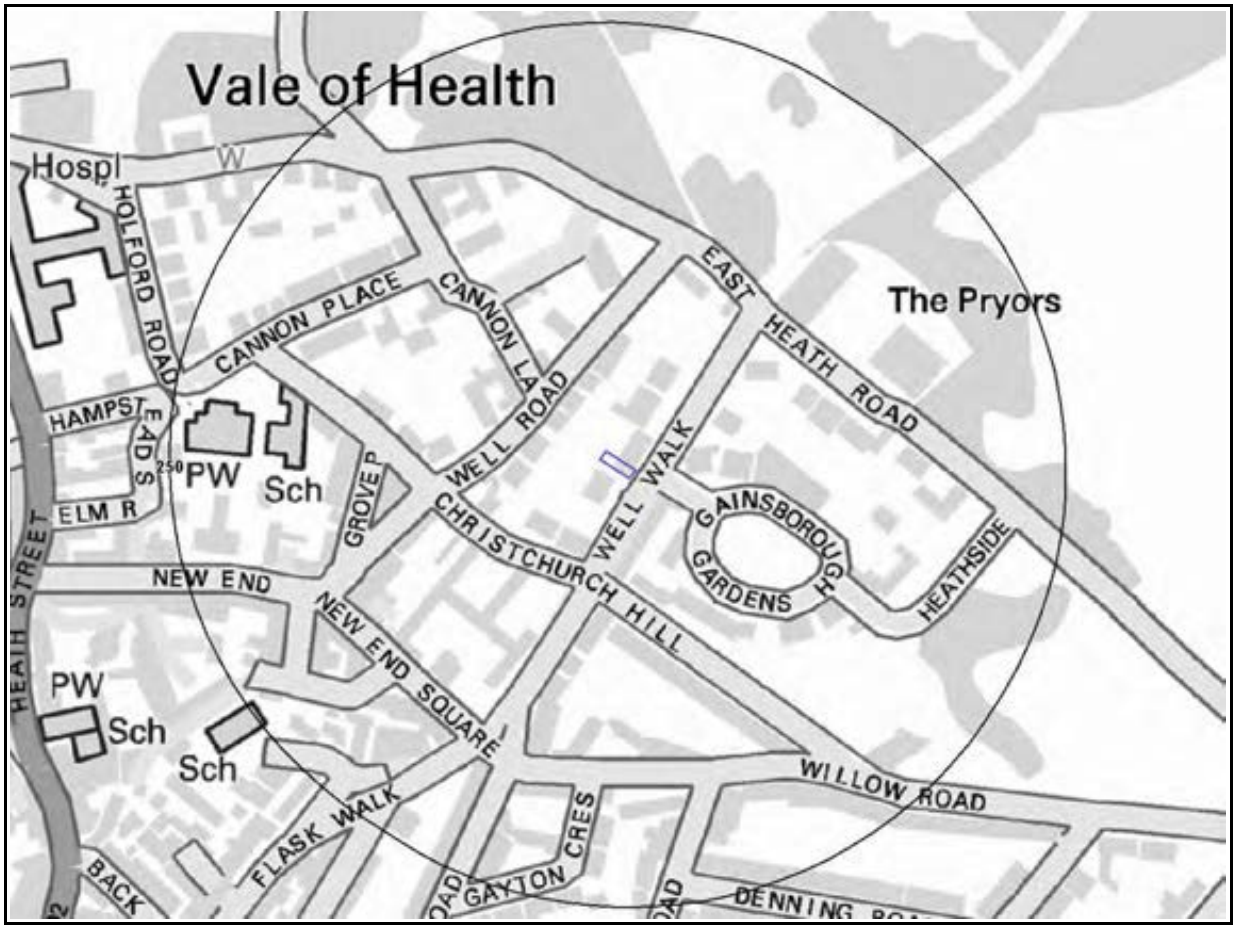
Low
Moderate
High

4.3 Ground Dissolution Soluble Rocks Map

NW N NE

W E

SW S SE



Ground Dissolution Soluble Rocks Legend

Enabled by Ordnance Survey

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

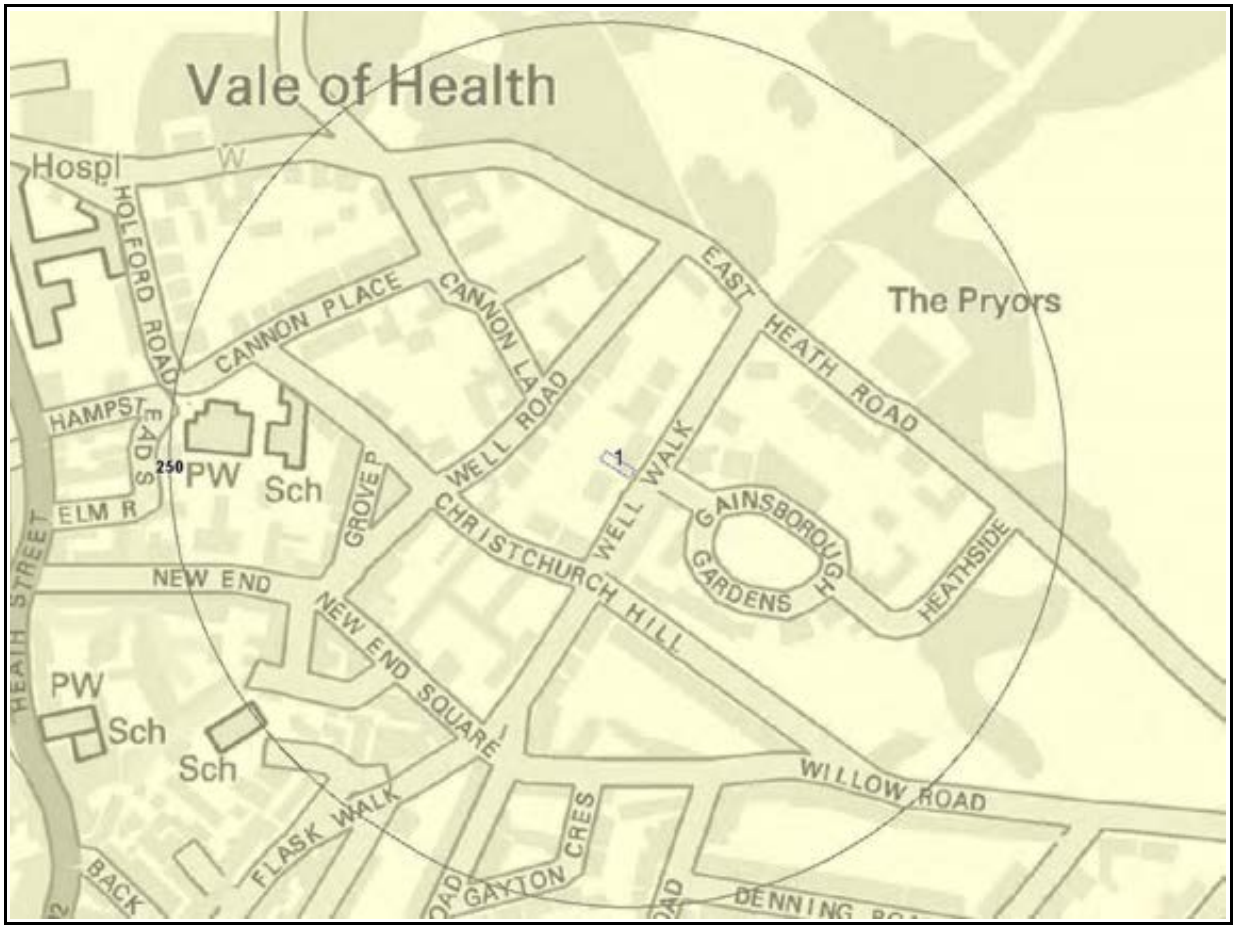
Low
Moderate
High

4.4 Compressible Deposits Map

NW N NE

W E

SW S SE



Compressible Deposits Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

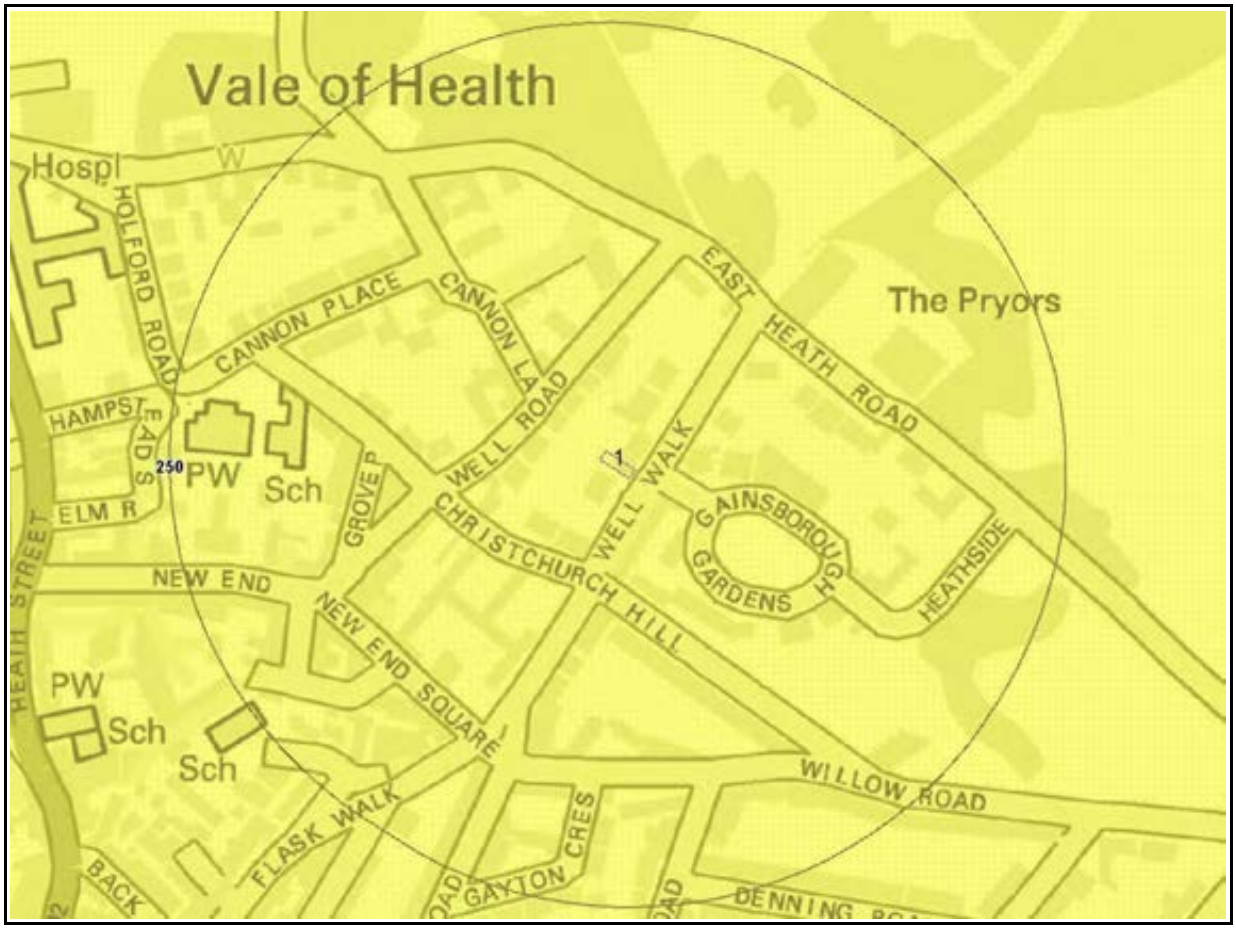
Low
Moderate
High

4.5 Collapsible Deposits Map

NW N NE

W E

SW S SE



Collapsible Deposits Legend

Site Outline

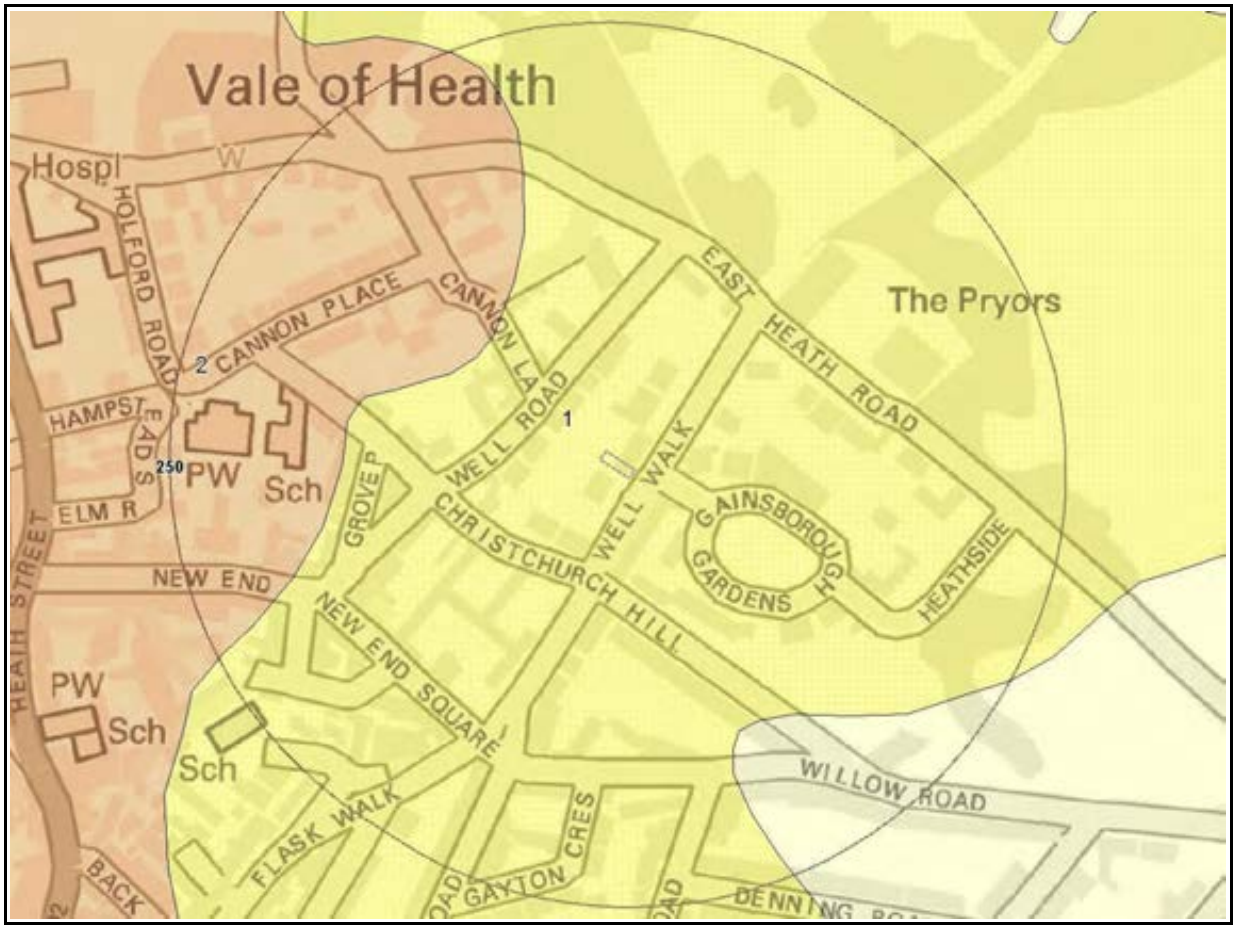
125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.6 Running Sand Map

NW N NE



W E

SW S SE

Running Sand Legend

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site* boundary? Moderate

4.1 Shrink – Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m) *	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate	Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

4.3 Ground Dissolution of Soluble Rocks

The following Soluble Rocks information provided by the British Geological Survey:

Distance (m)*	Direction	Hazard Rating	Details
0.0	On site	Null-Negligible	Soluble rocks are not present in the search area. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

4.4 Compressible Deposits

The following Compressible Ground information provided by the British Geological Survey:

*This includes an automatically generated 50m buffer zone around the study site boundary.

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

4.5 Collapsible Deposits

The following Collapsible Rocks information is provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

4.6 Running Sands

The following Running Sands information is provided by the British Geological Survey:

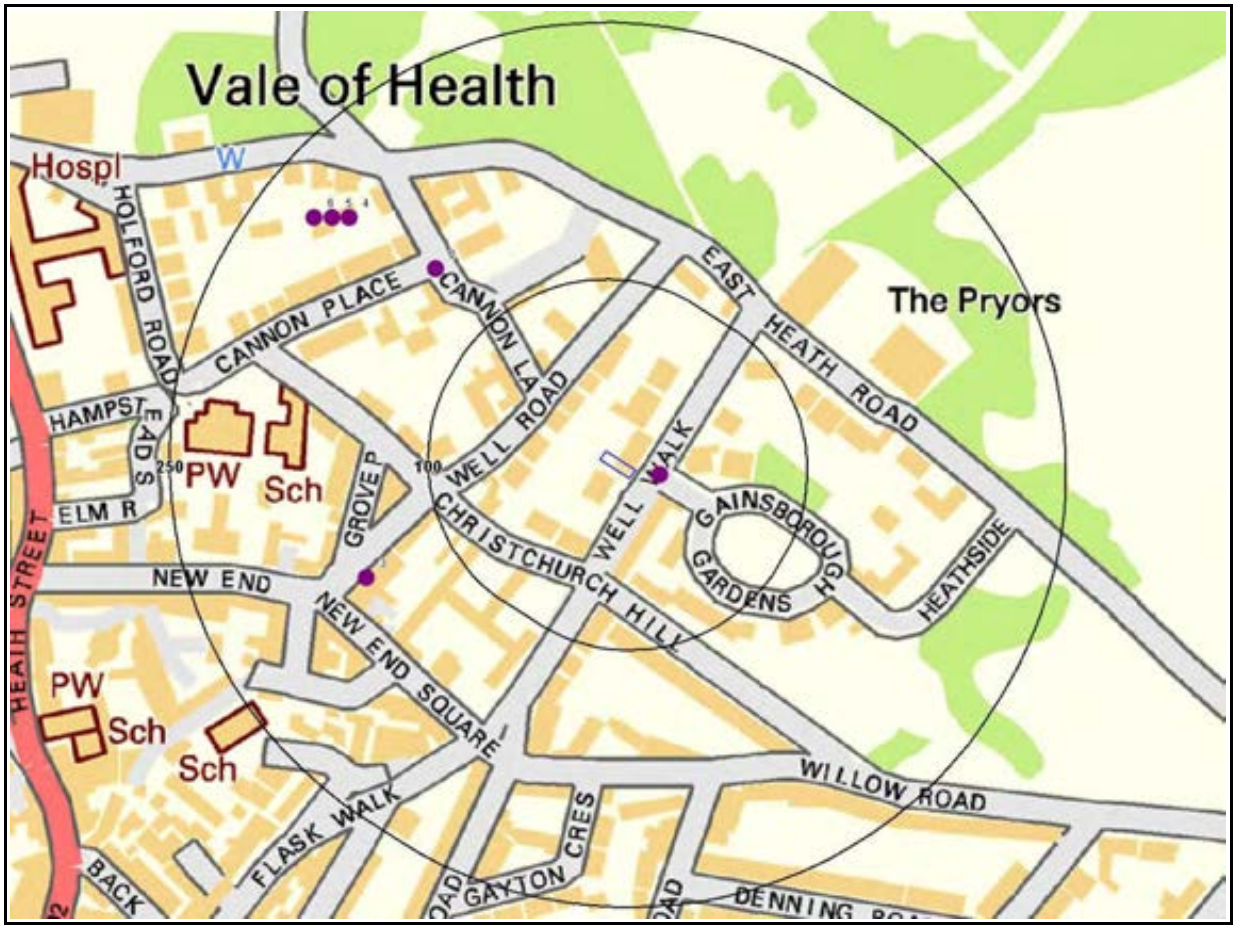
ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5. Borehole Records Map

NW N NE

W E

SW S SE



Borehole Records Legend

Site Outline

Borehole Locations

125
250
Search Buffers (m)

5.Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: **6**

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length (m)	Borehole Name
1	14.0	E	526730,186060	TQ28NE97	12.19	HAMPSTEAD HEATH 10
2	145.0	NW	526600,186180	TQ28NE96	12.19	HAMPSTEAD HEATH 9
3	153.0	SW	526560,186000	TQ28NE98	12.19	HAMPSTEAD HEATH 11
4	202.0	NW	526550,186210	TQ28NE419	1.0	EAST HEATH ROAD HAMPSTEAD TP1
5	209.0	NW	526540,186210	TQ28NE418	15.0	EAST HEATH ROAD HAMPSTEAD 1
6	217.0	NW	526530,186210	TQ28NE420	1.1	EAST HEATH ROAD HAMPSTEAD TP2

Additional online information is available for the following boreholes listed above:

#1: http://scans.bgs.ac.uk/sobi_scans/boreholes/590685
#2: http://scans.bgs.ac.uk/sobi_scans/boreholes/590684
#3: http://scans.bgs.ac.uk/sobi_scans/boreholes/590686
#4: http://scans.bgs.ac.uk/sobi_scans/boreholes/18389597
#5: http://scans.bgs.ac.uk/sobi_scans/boreholes/18389585
#6: http://scans.bgs.ac.uk/sobi_scans/boreholes/18389601

6.Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary: 1

For further information on how this data is calculated and limitations upon its use, please see the GroundSure GeoInsight User Guide, available on request.

			Estimated Geometric Mean Soil Concentrations (mg/kg)				
Distance (m)*	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	London	No data	No data	No data	No data	No data

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

7. Contacts

EmapSite
Telephone: 0118 9736883
sales@emapsite.com

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

British Gypsum
British Gypsum Ltd, East Leake, Loughborough, Leicestershire, LE12 6HX
Tel: www.british-gypsum.com

The Coal Authority
200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848
DX 716176 Mansfield 5 www.coal.gov.uk

Johnson Poole & Bloomer Limited
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Tel: +44 (0) 1384 262 000
Email: enquiries.gs@jpb.co.uk
Website: www.jpb.co.uk

Ordnance Survey
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Tel: 08456 050505

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Tel: +44 (0)118 950 0761 E-mail: reading@pba.co.uk

Acknowledgements

Standard Terms and Conditions

1 Definitions

In these conditions unless the context otherwise requires:

"Beneficiary" means the Client or the customer of the Client for whom the Client has procured the Services.

"Commercial" means any building which is not Residential.

"Commission" means an order for Consultancy Services submitted by a Client.

"Consultancy Services" mean consultancy services provided by GroundSure including, without limitation, carrying out interpretation of third party and in-house environmental data, provision of environmental consultancy advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

"Contract" means the contract between GroundSure and the Client for the performance of the Services which arises upon GroundSure's acceptance of an Order or Commission and which shall incorporate these conditions, the relevant GroundSure User Guide, proposal by GroundSure and the content of any subsequent report, and any agreed amendments in accordance with clause 11.

"Client" means the party that submits an Order or Commission.

"Data Provider" means any third party providing Third Party Content to GroundSure.

"Data Report" means reports comprising factual data with no professional interpretation in respect of the level of likely risk and/or liability available from GroundSure.

"GroundSure" means GroundSure Limited, a company registered in England and Wales under number 03421028 and whose registered office is at Greater London House, Hampstead Road, London NW1 7EJ.

"GroundSure Materials" means all materials prepared by GroundSure as a result of the provision of the Services, including but not limited to Data Reports, Mapping and Risk Screening Reports.

"Intellectual Property" means any patent, copyright, design rights, service marks, moral rights, data protection rights, know-how, trade mark or any other intellectual property rights.

"Mapping" an historical map or a combination of historical maps of various ages, time periods and scales available from GroundSure.

"Order" means an order form submitted by the Client requiring Services from GroundSure in respect of a specified Site.

"Order Website" means online platform via which Orders may be placed.

"Report" means a Risk Screening Report or Data Report for commercial or residential property available from GroundSure relating to the Site prepared in accordance with the specifications set out in the relevant User Guide.

"Residential" means any building used as or suitable for use as an individual dwelling.

"Risk Screening Report" means one of GroundSure's risk screening reports, comprising factual data with interpretation in respect of the level of likely risk and/or liability, excluding **"Consultancy Services"**.

"Services" means the provision of any Report, Mapping or Consultancy Services which GroundSure has agreed to carry out for the Client/Beneficiary on these terms and conditions in respect of the Site.

"Site" means the landsite in respect of which GroundSure provides the Services.

"Third Party Content" means any data, database or other information contained in a Report or Mapping which is provided to GroundSure by a Data Provider.

"User Guide" means the relevant current version of the user guide, available upon request from GroundSure.

2 Scope of Services

2.1 GroundSure agrees to carry out the Services in accordance with the Contract and to the extent set out therein.

2.2 GroundSure shall exercise all the reasonable skill, care and diligence to be expected of experienced environmental consultants in the performance of the Services.

2.3 The Client acknowledges that it has not relied on any statement or representation made by or on behalf of GroundSure which is not set out and expressly agreed in the Contract.

2.4 Terms and conditions appearing on a Client's order form, printed stationery or other communication, including invoices, to GroundSure, its employees, servants, agents or other representatives or any terms implied by custom, practice or course of dealing shall be of no effect and these terms and conditions shall prevail over all others.

2.5 If a Client/Beneficiary requests insurance in conjunction with or as a result of the Services, GroundSure shall use reasonable endeavours to procure such insurance, but makes no warranty that such insurance shall be available from insurers or offered on reasonable terms. GroundSure does not endorse or recommend any particular insurance product, policy or insurer. Any insurance purchased shall be subject solely to the terms of the policy issued by insurers and GroundSure will have no liability therefor. The Client/Beneficiary should take independent advice to ensure that the insurance policy requested and/or offered is suitable for its requirements.

2.6 GroundSure's quotations/proposals are valid for a period of 30 days only. GroundSure reserves the right to withdraw any quotation at any time before GroundSure accepts an Order or Commission. GroundSure's acceptance of an Order or Commission shall be effective only where such acceptance is in writing and signed by GroundSure's authorised representative or where accepted via GroundSure's Order Website.

3 The Client's obligations

3.1 The Client shall ensure the Beneficiary complies with and is bound by the terms and conditions set out in the Contract and shall provide that Groundsure may in its own right enforce such terms and conditions against the Beneficiary pursuant to the Contracts (Rights of Third parties) Act 1999. The Client shall be liable for all breaches of the Contract by the Beneficiary as if they were breaches by the Client. The Client shall be solely responsible for ensuring that the Report/Mapping ordered is appropriate and suitable for the Beneficiary's needs.

3.2 The Client shall (or shall procure that the Beneficiary shall) supply to GroundSure as soon as practicable and without charge all information necessary and accurate relevant data including any specific and/or unusual environmental information relating to the Site known to the Client/Beneficiary which may pertain to the Services and shall give such assistance as GroundSure shall reasonably require in the performance of the Services (including, without limitation, access to a Site, facilities and equipment as agreed in the Contract).

3.3 Where Client/Beneficiary approval or decision is required, such approval or decision shall be given or procured in reasonable time as not to delay or disrupt the performance of any other part of the Services.

3.4 The Client shall not and shall not knowingly permit the Beneficiary to, save as expressly permitted by these terms and conditions, re-sell, alter, add to, amend or use out of context the content of any Report, Mapping or, in respect of any Services, information given by GroundSure. For the avoidance of doubt, the Client and Beneficiary may make the Report, Mapping or GroundSure's findings available to a third party who is considering acquiring the whole or part of the Site, or providing funding in relation to the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.5 The Client is responsible for maintaining the confidentiality of its user name and password if using GroundSure's internet ordering service and accepts responsibility for all activity that occurs under such account and password.

4 Reliance

4.1 Upon full payment of all relevant fees and subject to the provisions of these terms and conditions, the Client and Beneficiary are granted an irrevocable royalty-free licence to access the information contained in a Report, Mapping or in a report prepared by GroundSure in respect of or arising out of Consultancy Services. The Services may only be used for the benefit of the Client and those persons listed in clauses 4.2 and 4.3.

4.2 In relation to Data Reports, Mapping and Risk Screening Reports, the Client shall be entitled to make Reports available to (i) the Beneficiary, (ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate), (iv) the first purchaser or first tenant of the Site (v) the professional advisers and lenders of the first purchaser or tenant of the Site. Accordingly GroundSure shall have the same duties and obligations to those persons in respect of the Services as it has to the Client and those persons shall have the benefit of any of the Client's rights under the Contract as if those persons were parties to the Contract. For the avoidance of doubt, the limitations of GroundSure's liability as set out in clauses 7 and 11.6 shall apply.

4.3 In relation to Consultancy Services, reliance shall be limited to the Client, Beneficiary and named parties on the Report.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise agreed in writing with GroundSure, any other party considering the information supplied by GroundSure as part of the Services, including (but not limited to) insurance underwriters, does so at their own risk and GroundSure has no legal obligations to such party unless otherwise agreed in writing.

4.5 The Client shall not and shall not knowingly permit any person (including the Beneficiary) who is provided with a copy of any Report, (except as permitted herein or by separate agreement with GroundSure) to,: (a) remove, suppress or modify any trade mark, copyright or other proprietary marking from the Report or Mapping; (b) create any product which is derived directly or indirectly from the data contained in the Report or Mapping; (c) combine the Report or Mapping with, or incorporate the Report or Mapping into any other information data or service; or (d) re-format or otherwise change (whether by modification, addition or enhancement) data or images contained in the Report or Mapping.

4.6 Notwithstanding clause 4.5, if the Client acts in a professional capacity, it may make reasonable use of a Report and/or findings made as a result of Consultancy Services to advise Beneficiaries. However, GroundSure shall have no liability in respect of any opinion or report given to such Beneficiaries by the Client or a third party.

5 Fees and Disbursements

5.1 GroundSure shall charge the Client fees at the rate and frequency specified in the Contract together, in the case of Consultancy Services, with all proper disbursements incurred by GroundSure in performing the Services. For the avoidance of doubt, the fees payable for the Services are as set out in GroundSure's written proposal, Order Website or Order acknowledgement form. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services.

5.2 Unless GroundSure requires prepayment, the Client shall promptly pay all fees disbursements and other monies due to GroundSure in full without deduction, counterclaim or set off together with such value added tax or other tax as may be required within 30 days from the date of GroundSure's invoice or such other period as may be agreed in writing between GroundSure and the Client (**"Payment Date"**). GroundSure reserves the right to charge interest which shall accrue on a daily basis from 30 days after the date of Payment Date until the date of payment (whether before or after judgment) at the rate of five per cent per annum above the Bank of England base rate from time to time.

5.3 In the event that the Client disputes the amount payable in respect of GroundSure's invoice it shall notify GroundSure no later than 28 days after the date thereof that it is in dispute. In default of such notification the Client shall be deemed to have agreed the amount thereof. As soon as reasonably practicable following receipt of a notification in respect of any disputed invoice, a member of the management team at GroundSure shall contact the Client and the parties shall use all reasonable endeavours to resolve the dispute.

6 Intellectual Property and Confidentiality

6.1 Subject to the provisions of clause 4.1, the Client and the Beneficiary hereby acknowledge that all Intellectual Property in the Services and Content are and shall remain owned by either GroundSure or the Data Providers and nothing in these terms purports to transfer or assign any rights to the Client or the Beneficiary in respect of the Intellectual Property.

6.2 The Client shall acknowledge the ownership of the **Third Party** Content where such **Third Party** Content is incorporated or used in the Client's own documents, reports, systems or services whether or not these are supplied to a third party.

6.3 Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client acknowledges that the proprietary rights subsisting in copyright, database rights and any other intellectual property rights in respect of any data and information contained in any Report are and shall remain (subject to clause 11.1) the property of GroundSure and/or any third party that has supplied data or information used to create a Report, and that these conditions do not purport to grant, assign or transfer any such rights in respect thereof to a Client and/or a Beneficiary.

6.5 The Client shall (and shall procure that any recipients of the Report as permitted under clause 4.2 shall):

(i) not remove, suppress or modify any trademark, copyright or other proprietary marking belonging to GroundSure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;
(iii) not create any product or report which is derived directly or indirectly from the data contained in the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);
(iv) not combine the Services with or incorporate such Services into any other information data or service; and
(v) not reformat or otherwise change (whether by modification, addition or enhancement), data contained in the Services (save that those acting in a professional capacity to the Beneficiary shall not be in breach of this clause 6.5(v) where such reformatting is in the normal course of providing advice based upon the Services),
in each case of parts (iii) to (v) inclusive, whether or not such product or report is produced for commercial profit or not.

6.6 The Client and/or Beneficiary shall and shall procure that any party to whom the Services are made available shall notify GroundSure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

6.8 Save as otherwise set out in these terms and conditions, any information provided by one party ("**Disclosing Party**") to the other party ("**Receiving Party**") shall be treated as confidential and only used for the purposes of these terms and conditions, except in so far as the Receiving Party is authorised by the Disclosing Party to provide such information in whole or in part to a third party.

7 Liability

THE CLIENT'S ATTENTION IS DRAWN TO THIS PROVISION

7.1Subject to the provisions of this clause 7, GroundSure shall be liable to the Beneficiary only in relation to any direct losses or damages caused by any negligent act or omission of GroundSure in preparing the GroundSure Materials and provided that the Beneficiary has used all reasonable endeavours to mitigate any such losses.

7.2GroundSure shall not be liable for any other losses or damages incurred by the Beneficiary, including but not limited to:
(i) loss of profit, revenue, business or goodwill, losses relating to business interruption, loss of anticipated savings, loss of or corruption to data or for any special, indirect or consequential loss or damage which arise out of or in connection with the GroundSure Materials or otherwise in relation to a Contract;
(ii) any losses or damages that arise as a result of the use of all or part of the GroundSure Materials in breach of these terms and conditions or contrary to the terms of the relevant User Guide;
(iii) any losses or damages that arise as a result of any error, omission or inaccuracy in any part of the GroundSure Materials where such part is based on any Third Party Content or any reasonable interpretation of Third Party Content. The Client accepts, and shall procure that any other Beneficiary shall accept, that it has no claim or recourse to any Data Provider in relation to Third Party Content; and/or
(iv) any loss or damage to a Client's computer, software, modem, telephone or other property caused by a delay or loss of use of GroundSure's internet ordering service.

7.3 GroudSure's total liability in contract, tort (including negligence or breach of statutory duty), misrepresentation, restitution or otherwise, arising in connection with the GroundSure Materials or otherwise in relation to the Contract shall be limited to £10 million in total (i) for any one claim or (ii) for a series of connected claims brought by one or more parties.

7.4 For the duration of the liability periods set out in clauses 7.5 and 7.6 below, GroundSure shall maintain professional indemnity insurance in respect of its liability under these terms and conditions provided such insurance is readily available at commercially viable rates. GroundSure shall produce evidence of such insurance if reasonably requested by the Client. A level of cover greater than GroundSure's current level of cover may be available upon request and agreement with the Client.

7.5 Any claim under the Contract in relation to Data Reports, Mapping and Risk Screening Reports, must be brought within six years from the date when the Beneficiary became aware that it may have a claim and in no event may a claim be brought twelve years or more after completion of such a Contract. For the avoidance of doubt, any claim in respect of which proceedings are notified to GroundSure in writing prior to the expiry of the time periods referred to in this clause 7.5 shall survive the expiry of those time periods provided the claim is actually commenced within six months of notification.

7.6 Any claim under the Contract in relation to Consultancy Services, must be brought within six years from the date the Consultancy Services were completed.

7.7 he Client accepts and shall procure that any other Beneficiary shall accept that it has no claim or recourse to any Data Provider or to GroundSure in respect of the acts or omissions of any Data Provider and/or any Third Party Content provided by a Data Provider.

7.8 Nothing in these terms and conditions:
(i) excludes or limits the liability of GroundSure for death or personal injury caused by GroundSure's negligence, or for fraudulent misrepresentation; or
(ii) shall affect the statutory rights of a consumer under the applicable legislation.

8 GroundSure right to suspend or terminate

8.1 In the event that GroundSure reasonably believes that the Client or Beneficiary as applicable has not provided the information or assistance required to enable the proper performance of the Services, GroundSure shall be entitled on fourteen days written notice to suspend all further performance of the Services until such time as any such deficiency has been made good.

8.2 GroundSure may additionally terminate the Contract immediately on written notice in the event that:
(i)the Client shall fail to pay any sum due to GroundSure within 28 days of the Payment Date; or
(ii)the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an Administration Order made against it or if a Receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or
(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or
(iv)the Client or the Beneficiary breaches any material term of the Contract (including, but not limited to, the obligations in clause 4) incapable of remedy or if remediable, is not remedied within 14 days of notice of the breach.

9 Client's Right to Terminate and Suspend

9.1 Subject to clause 10.2, the Client may at any time after commencement of the Services by notice in writing to GroundSure require GroundSure to terminate or suspend immediately performance of all or any of the Services.

9.2 The Client waives all and any right of cancellation it may have under the Consumer Protection (Distance Selling) Regulations 2000 (as amended) in respect of the Order of a Report/Mapping. This does not affect the Beneficiary's statutory rights.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination or any suspension of the Services, GroundSure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client/Beneficiary any property of the Client/ Beneficiary in GroundSure's possession or control.

10.2 In the event of termination/suspension of the Contract under clauses 8 or 9, the Client shall pay to GroundSure all and any fees payable in respect of the performance of the Services up to the date of termination/suspension. In respect of any Consultancy Services provided, the Client shall also pay GroundSure any additional costs incurred in relation to the termination/suspension of the Contract.

11 General

11.1 The mapping contained in the Services is protected by Crown copyright and must not be used for any purpose outside the context of the Services or as specifically provided in these terms.

11.2 GroundSure reserves the right to amend these terms and conditions. No variation to these terms shall be valid unless signed by an authorised representative of GroundSure.

11.3 No failure on the part of GroundSure to exercise and no delay in exercising, any right, power or provision under these terms and conditions shall operate as a waiver thereof.

11.4 Save as expressly provided in clauses 4.2, 4.3, 6.3 and 11.5, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.

11.5 The Secretary of State for Communities and Local Government acting through Ordnance Survey may enforce breach of clause 6.1 of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

11.6 GroundSure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:
(i) the Client or Beneficiary's failure to provide facilities, access or information;
(ii) fire, storm, flood, tempest or epidemic;
(iii) Acts of God or the public enemy;
(iv) riot, civil commotion or war;
(v) strikes, labour disputes or industrial action;
(vi) acts or regulations of any governmental or other agency;
(vii) suspension or delay of services at public registries by Data Providers; or
(viii) changes in law.

11.7 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

11.8 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email and on the second working day after the day of posting if sent by first class post.

11.9 The Contract constitutes the entire contract between the parties and shall supersede all previous arrangements between the parties.

11.10 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

11.11 These terms and conditions shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with these terms and conditions shall be subject to the exclusive jurisdiction of the English courts.

11.12 If the Client or Beneficiary has a complaint about the Services, notice can be given in any format eg writing, phone, email to the Compliance Officer at GroundSure who will respond in a timely manner.

TQ 28 NE 197

8673, 8606.

OF.10

RECORD OF BOREHOLE No. OF10

WELL WALK,
HAMPSTEAD HEATH

No. : 481

Boring : Shell & Auger

Started : 21-5-65

Borehole Dia : 6"

Casing : 6" to 35'0

Ground Level : 326.87'

Casing	Water Level	Samples Depth	Type	No.	Strata Legend	Strata Depth	Thickness	Description of Strata
							4'0	MADE GROUND + Topsoil (dark brown poorly sorted clayey sand and red brick rubble)
		2'6	b	1				
						4'0		
		5'0	U	2			5'6	Mottled brown + grey loose fine SAND and softish grey clay (= silty sandy clay)
		7'6	b	3				
						9'6		
		10'6	U	4				Dark grey soft/firm micaceous silty sandy CLAY
		12'6	b	5			6'0	
		15'0	U	6		15'0		
		17'6	b	7				
		20'0	U	8				Stiff dark grey micaceous silty CLAY
		22'6	b	9				
		25'0	U	10			20'0	
		27'6	b	11				
		30'0	U	12				
		32'6	b	13				
		35'0	U	14		35'0		Medium dense micaceous silty SAND
		37'6	b	15			5'0	
35'0	35'0	40'0	U	16		40'0		

Borehole Complete

Water first met at 20'0
Piezometer installed at 25'0

Foundation Engineering Ltd.

Rootcause
Arboriculture

3 Church Street,
Waltham Abbey,
Essex, EN9 1DX

BS 5837:2012 Tree Survey & Arboricultural Impact

Address: 15a Well Walk, Hampstead, London

Site Surveyed by Peter Holloway

Report prepared by
Peter Holloway BSc(Hons) FArborA CEnv

Date 20th October 2012

Report Prepared for John & Morwenna Lawson

Table of Contents

1. Introduction

1.1 Instructions:

I am instructed by Mr Francis Birch on behalf of Mr John Lawson and Mrs Morwenna Lawson.

My brief is:

- To carry out a Tree Survey in accordance with the British Standard 5837:2012, *Trees in relation to construction – Recommendations.*

- To Produce and **Arboricultural Implications Assessment** of the proposal.

2. Documents

2.1 I was provided with the following documents:

i. Existing site plans and section JL 2011 001 D01, March 2011.
ii. Proposed site plans and section JL 2011 002 D04, March 2011.
iii. Existing site plans and section JL 2011 001 D01 annotated with proposed trial hole locations. Undated.

3. Scope of this report

3.1 This report includes:

i. Standard BS5837 Methodology (Appendix 1)
ii. Tree Survey Data (Appendix 2)
iii. Existing Site Plan with Tree Constraints Plan & Proposed Site (Arboricultural Impact Assessment Plan) (Appendix 3)
iv. Trial Hole evaluation (Appendix 4).

3.2 The trees were surveyed from ground level using the visual tree assessment method. No detailed tree examinations were undertaken during the survey.

3.3 I looked at the site planning decision history on the Camden Council Planning Applications web site and I do not believe that any trees at the site are protected by Tree Preservation Orders. However, I the site is within the Hampstead conservation area. The status of tree protection should be confirmed and the correct procedures followed before undertaking any tree pruning or tree removal work.

3.4 I have not included an assessment of shading by trees as a tree constraint. The Proposed extension is within a basement well on the North West side of the four story house. The proposed building will be shaded by the existing building and it will be in direct shade from the Lime tree T1 in the afternoon.

3.5 The tree positions were taken from site measurements and superimposed on the existing site layout (2.1.i). I included all the trees that I thought could be affected directly or indirectly by the proposal.

3.6 The Wildlife and Countryside Act 1981(as amended), the Conservation (natural habitats etc.) Regulations 1994, and the Countryside and Rights of Way Act 2000 provide protection for many species of animal that live in trees. This includes birds and bats. I did not see any protected species in the trees during my survey. If any tree works affect protected species then this could be a criminal offence.

4. Site visit and data collection

4.1 I carried out the site visit on 9th August 2012. I met Mr Francis Birch on site but I was not accompanied during the tree survey.

4.2 The site contains a an end of terrace four storey property plus roof conversions including the basement flat (15a) There is a rear garden that slopes down to the house, so the basement flat is a part below ground level at the front and below ground level at the rear. The front garden is really a light well for front bay windows of the basement flat.

4.3 The soil is likely to be Clay Gate Beds (Clay Gate Member) overlying London Clay as indicated on British Geological Survey Sheet 256 North London: Bedrock and Superficial Deposits Edition (NERC 2006). Clay Gate Member is an interbedded fine grained sand, silt and clay (www.bgs.ac.uk). Judging from the trial hole excavation I did not see any evidence of clay, only fine sand.

5. Tree Survey

5.1 Tree survey method

The methodology for the tree survey is described in Appendix 1.

5.2 Appraisal of trees surveyed

5.2.1 I recorded all the trees in the rear garden. There were no trees in adjacent property that might be affected by works within the site. I recorded 5 trees that could be affected by construction work within the site. There were some smaller shrubs that I did not include in the survey. The tree survey was carried out in accordance with BS5837:2012.

5.2.2 The quality of the trees is summarised in Table 2 below.

Tree Quality	**A High**	**B Moderate**	**C Low**	**U Unsuitable for retention**
Tree number	None	T1	T2, T3,T4 & T5	None
Total Quantity	0	1	4	0

Table 2: Tree quality category

5.3 I did not observe any significant defects that require remedial tree work at present.

6. Trial Hole results

6.1 The trial hole results are included in Appendix 4.

6.2 Two roots were discovered in Trial Pit 1 (TP1). One was 20mm in diameter and one was 40mm in diameter. The species of root was not known but if they came from the Lime tree they had grown through the wall and would need to be removed to repair the wall. Nor roots could be seen growing beneath the wall or wall foundation.

6.3 No roots were discovered in Trial Pit 2 (TP2).

6.4 There were a number of small white roots from the ivy in the surface soil of both trial pits.

6.5 The sub-soil in the trial holes from approximately 300mm deep was sandy and saturated at the bottom of the pits. Water was rising to within 50cm of the top of the pit indicating that it was waterlogged. The pits needed to be bailed out to be inspected.

6.6 I doubt whether the two roots discovered were from the Lime tree because I could not see how they could have grown through the wall. I suspect that they may have originated from a shrub in the raised bed that is no longer present. A pile of spoil and the walls prevented me tracing the origins of these roots.

7. Arboricultural Impact Appraisal

7.1 The proposal consists of constructing a rear extension on the north side of the building. There are no proposed changes to the garden levels in the rear garden.

7.2 The extension could affect trees, particularly T1, and so a trial hole was excavated to see if any roots were present where construction is proposed. Two roots were found in one of the trial holes as detailed in section 6. There is some doubt that they are Lime tree roots but if they are Lime roots their removal will not have a significant effect on the trees health or longevity and if they have grown through the wall they would have to be sacrificed to repair the wall in any case.

7.3 As a result of the trial hole excavations I have shown a modified RPA on the drawing in Appendix 3. This demonstrates that the proposal will not have any direct impact on the trees in the garden.

7.4 The proposed work could have an indirect affect on the trees and their roots and so there will need to be precautions to prevent any damage to trees and their roots during demolition of the existing walls and structures and constructing the new retaining walls and other structures.

7.5 I have assumed that all construction work will be carried out by hand. All construction and demolition must take place within the footprint of the proposed construction. If working space is required in the rear garden then ground protection and fencing will be required to prevent compaction and contamination of the ground that the trees are rooting in. If any machinery is required, assuming it is practical, then more substantial tree protection measures may be required if it needs to be operated outside of the footprint of the existing building and basement patio area.

7.6 I am not aware of any changes to the hard or soft landscaping within the retained part of the garden that could affect the trees.

8. Conclusions

8.1 The existing retaining walls in the rear garden have acted as a root barrier and so no significant roots are expected within the proposed construction site.

8.2 The proposed construction will not have a direct impact on the trees in the rear garden.

8.3 Construction access is expected to be through the existing building and not via the alley or rear garden. All construction work will be carried out by hand as access for large machinery is severely limited. Therefore indirect impacts of working space and construction will be minimal and can be controlled with fencing and ground protection.

8.4 As far as I am aware existing services will be used and no new services are proposed that would require excavations within the RPAs of retained trees.

9. References

9.1 British Standard 5837: 2012 'Trees in relation to design, demolition and construction – Recommendations' April 2012.

10. Appendix 1 Standard Methodology

A.1 Survey

A1.1 All my observations were from ground level without detailed investigations and I measured tree stem diameters where possible and estimated height and crown spread by pacing and using a clinometer. I do not normally have access to trees outside the boundaries and so my observations and comments on these trees are based on the visual assessment made from within the site or the surrounding public highway.

A.1.2 All data was captured on a PC survey tablet using Excel software. I surveyed all trees objectively without reference to any design proposals supplied or suggested by the client. The trees were located using the topographical survey supplied. If the topographical plan did not include all relevant trees, they would be added in their approximate positions.

A.1.3 As suggested in the BS 5837:2012 all single stem trees with a stem diameter of less than 75 mm at 1.5 m above ground level were excluded from the survey as they are not deemed to be of significant size to be included in any survey. Multi stemmed trees were measured near ground level or just above the root flare.

A.1.4 Trees and shrubs are living organisms whose health and condition can change rapidly, for this reason the BS 5837 grades, along with any conclusions or tree management recommendations can only remain valid for a period of 12 months.

A.1.5 Where possible trees were assessed as individual specimens, however, where there were trees that formed distinctive groups of the same species within the landscape they can be assessed and graded as groups.

A.1.6 Trees on or adjacent to development sites are a material consideration that may have a significant impact on the future development and use of the site.

A.2 Use of survey data

A.2.1 The British Standard 5837:2012 provides 'guidance on the principles to be applied to achieve a satisfactory juxtaposition of trees... with structures'.

A.2.2 The tree survey with minimum requirements of BS5837 is enclosed in the appendices of this report.

A.2.3 The tree survey data is used to produce a Tree Constraints Plan. The Tree Constraints Plan shows the crown spreads and retention categories of all the trees within the surveyed area.

A.2.4 The British Standard 5837:2012 Trees in relation to construction – Recommendations, provides guidance and specifies measures to be adopted in order to avoid or minimise damage to trees retained on or in proximity to construction sites. One of the key recommendations is that a Root Protection Area (RPA) should be established around each retained tree. The RPA is calculated as an area equivalent to a circle with a radius 12 times the stem diameter measured at 1.5 metres above ground level for a single stem tree. In order to prevent disturbance or contamination of the RPA they are usually enclosed by robust fencing.

A.2.5 Circular Root Protection Areas (RPAs) can be adjusted by an arboriculturalist by taking into account obstructions for root growth, including building foundations, retaining walls, metalled roads, topography, Soil type and tolerance of individual trees.

A.2.6 The Tree Constraints Plan can include data on shading by trees. The method within BS5837 involves drawing an arc equivalent to the height of the tree (and future growth) from northwest to east indicating shadow during the main part of the day. However, this is only applied when specifically requested. Daylight studies by specialists provide more detailed information and would normally be recommended.

A.2.7 The British Standard recommends that trees within categories A-C (where A is highest quality) are a material consideration in the development process. Category U trees are trees that will not be expected to exist for long enough to justify their consideration in the planning process. The tree categories are used with the number 1, 2, or 3, which is shown in Table 1. These signify whether the justification for the category was made based on mainly arboricultural values, mainly landscape values or mainly cultural/conservation values respectively. The tree categories are shown on the tree constraints plan by colour coding. Category A trees are green, category B trees are blue, category C are grey and category U are dark red.

A.2.8 It is important to recognise that tree roots are particularly vulnerable during any adjacent construction operations. Tree roots grow where conditions are most favourable, this tends to be near the soil surface, for this reason the majority of tree roots grow in the upper 600mm of the soil. This means that operations during construction such as shallow excavations, soil compaction by heavy plant or machinery or contamination by substances such as cement, diesel or other chemicals, even water in excess, can be damaging to the root system.

A.2.9 The presence of surrounding walls, roads and retaining walls can affect the root distribution of trees within and around the site. Normally when a Root Protection Area is adjusted its shape is changed but the total area is maintained.

A.2.10 Approved tree work should be carried out in accordance with BS 3998:1989 by suitably qualified and experienced professional tree surgeons. Under no circumstances shall site personnel undertake any tree pruning operations. All tree works should also take into consideration The Wildlife and Countryside Act 1981(as amended), the Conservation (natural habitats etc.) Regulations 1994, and the Countryside and Rights of Way Act 2000 protected species of flora and fauna.

A.2.11 If the site is within a conservation area then the local authority will need to be notified of your intention to prune the tree which they can prevent by making a Tree reservation Order. Some forms of tree work are exempt from this requirement and tree works directly required to accommodate a development that has planning permission would be exempt. However, to avoid error I would always recommend notifying the local authority to avoid costly mistakes.

A.2.12 If individual trees are protected by Tree Preservation Orders then written consent is required for tree pruning or tree removal except for a few exemptions and also if the work is directly required to accommodate a development which has planning permission. As above, I would always recommend applying for consent rather than assuming that works are exempt from requiring consent.

11. Appendix 2 Table 1 'Tree data'

Tree Table

Key to Tree Table

Tree number: the number used in the table corresponds to Figures 1.

Species: the Common and Botanical names of each tree.

Height and **branch spread** are estimated listed in metres.

Stem diameter has been measured at 1.5m above ground level (a.g.l.). It is listed in the table in mm.

Code

*	= multi-stemmed from below 1.5m a.g.l. and therefore measured in accordance with BS5837:2012
#	= estimated stem diameter

Height of crown above ground level (a.g.l.): gives an indication of whether the crown extends to the ground, or has low hanging branches. The height of the lowest branch and its direction will also be recorded.

Age class: this refers to the age of the individual tree relating to the average life expectancy of each species in a similar environment.

Y - young
SM – Semi-mature
EM – Early mature
M - mature
OM - over mature

General observations

Physiological condition: general state of health of the tree, good (G), fair (F), poor (P) or dead (D).

Structural condition: Any defects/ habits/previous management of note.

Remaining contribution in years: has been estimated by taking the age of the tree away from an estimate of the total number of years the tree may live for in those conditions, it has been banded as recommended in BS5837:2012.

Retention category: each tree is given a category from the guidance in BS 5837:2012

Table 1	15 Well Walk, Hampstead, London															9th October 2012	
Tree Number	Tree Name (species)		Height (m)	Estimated dimensions			Crown constraints			North west (m)	South east (m)	North east (m)	South west (m)	Age class	Observations		Remaining contribution years	Tree Category
	Common	Botanical		Calculated Stem Diameter (mm)	Number of Stems	Root Protection Area (Radius, m)	Crown height m	Lowest branch m	Direction lowest branch						Summary of Physiological condition	Structural Condition & General comments		
T1	Common Lime	Tilia x europaea	11	520	1	6.24	6m	5m	E	2.5	2.5	2.5	3	M	G	Originally pollarded at 3m a.g.l. Regrown to 6m pollard. The crown subsequently regrown to 9m pollard and then at current height. Crown reduced Spring 2012.	20 to 40	B1
T2	Common Lime	Tilia x europaea	5	420	1	5.04	2.5	3	E	1	0.5	1	1	M	G	Originally pollarded at 2m above ground level, then at 3m and now at current height. Topped spring 2012	20 to 40	C1
T3	Common Lime	Tilia x europaea	5	530	1	6.36	3.5	3	E	1	0.5	0.5	1	M	G	Possibly Pollarded at 3m a.g.l. When young but not clear anymore. Tree topped Spring 2012. Some chainsaw damage during ivy removal in the past but occluded now.	20 to 40	C1
T4	Apple	Malus sp.	6	241	2	2.89	2	1.5	S	2.5	3.5	3.5	3	M	G	Fork 1.5m a.g.l. Crown reduced to 3.5m high in the past. Reduced to 5m a.g.l more recently	20 to 40	C1
T5	Common Yew	Taxus baccata	5	190	1	2.28	2.2	2.5	S	2	2.5	3	2	Y	G	Forks 1.4m a.g.l. but bifurcation appressed and conjoined to 2.1m. Branch pegs from crown lifting, Fork grafts again at 3m a.g.l.	40+	C1

12. Appendix 3 Existing & Proposed Site Plan with Tree Constraints

N

TREE CATEGORY A B C U

CIRCULAR ROOT PROTECTION AREA (RPA)

ADJUSTED (AVAILABLE) RPA.
BOUNDARY WITHIN SITE

15a Well Walk Hampstead
Existing and Proposed Site
Peter Holloway 20 Oct 2012
Scale 1:100/A3

0 1 2 3 4 5
meters

existing site

15a Well Walk

Store (below ground)

Patio

Wall

Raised bed.

T1 T2 T3 T4 T5

Proposed site

15a Well Walk

Bathroom

extension

Stairs

Lightwell

Study

Corridor

T1 T2 T3 T4 T5

13. Appendix 4 Trial Hole Investigations

A3.1 The plan of the trial hole excavations is attached at A3.4.

A3.2 Two trial holes were excavated at the most suitable location at the base of the retaining wall adjacent to Lime tree T1. It was not possible to excavate for roots along the whole length of the wall as it would undermine support for the foundations.

A.3.3 Photographs of trial holes.

P1: Trial Pit 1 showing two roots high retaining wall at top.

P2: Annotated Photo of TP1

P3: Trial Pit 2 showing ivy roots near the surface.

A3.4 Plan and cross section of Trial Hole results.

EXISTING STORE

T1

N

TRIAL HOLE PLAN

15a
Well Walk

Patio (decking)

Wall

TP1

TP2

Raised bed

(ivy and climbing plants)

WALL CROSS SECTION

NATURAL SOIL

FOUNDATION

ROOTS

TRIAL HOLE CROSS SECTION

15a Well Walk, Hampstead

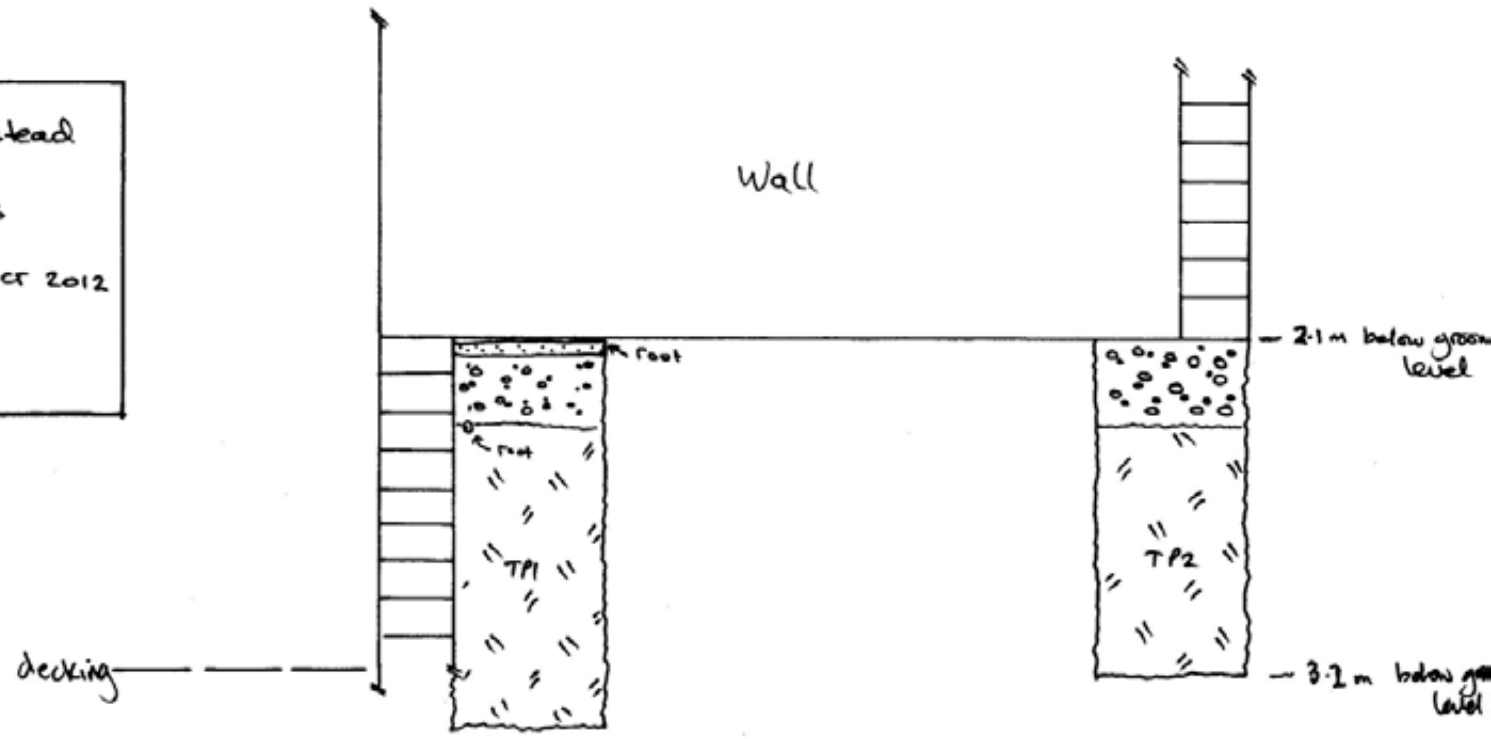
Trial Hole Drawings

Peter Holloway 20 OCT 2012

SCALE 1:25/A3

0 25 50 75 100

CM



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