

**PHASE 1 DESK STUDY
ROSE FARM, ISTEAD RISE
GRAVESEND
ESQUIRE DEVELOPMENTS
DS-25046-25-77
NOVEMBER 2025**

IDOM



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EXECUTIVE SUMMARY

A Tier 1 Preliminary Risk Assessment was requested by Esquire Developments. The purpose of the assessment was to identify any contaminative or geotechnical issues associated with former land use at *Rose Farm, Istead Rise, Gravesend* which might impact on the site redevelopment.

SITE DETAILS					
Approximate Area (ha)	Centred on OSGB Eastings, Northings	Previous Use(s)	Current Use	Proposed Use	
8.09	563183, 169689	Agricultural	Agricultural: Farm	Residential development of 154 dwellings	

TIER 1 NON-INTRUSIVE INVESTIGATION												
Geology			Groundwater Aquifer		Surface Water	Radon	Flood Risk					
Made Ground	Superficial	Solid	Superficial	Solid	Surface Water	Radon	Flood Risk					
Localised deposits of made ground may exist, particularly near the southeast boundary and near farm structures	Superficial deposits of Head comprising clay, silt and gravel	Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation	N/A	Principal Aquifer: SPZ1, SPZ2 and SPZ3	No surface water within 250 m of the site	The site lies within an area designated RnC2	Rivers and sea: very low					
							Surface water: locally high risk but no significant risk on majority of the site					
							Groundwater: low					
Contamination												
Source ▶ Pathway ▶ Receptor					Risk Rating							
Heavy metals, hydrocarbons and asbestos may pose a risk to future residents via ingestion, inhalation and dermal pathways. Hydrocarbons could pose a risk to the principal aquifer via leaching,					Moderate Low / Moderate							

RECOMMENDATIONS		
Intrusive Investigation	Geotechnical	Other
<ul style="list-style-type: none"> The drilling of boreholes and excavation of machine dug trial pits to investigate the presence or absence of potentially contaminated soils and groundwater at the site. Environmental sampling of the soil and water quality on site. Installation of hazardous gas / vapour and groundwater monitoring standpipes with a programme of monitoring. 	<ul style="list-style-type: none"> Geotechnical assessments for foundation, road and drainage design. 	<ul style="list-style-type: none"> Pre-demolition assessment for asbestos-containing materials in existing structures. A UXO desk study is recommended to establish the site-specific risk from UXO.

SECTION 1 INTRODUCTION

- 1.1 Esquire Developments proposes to develop an area of land located at Rose Farm, Istead Rise, Gravesend, DA13 9HJ for residential development purposes. The proposed development comprises demolition of 64 Downs Road and erection of up to 154No. residential dwellings (including affordable housing), with all matters reserved except for access. Creation of a new access from Downs Road.
- 1.2 A site location plan and proposed development plan are presented in Appendix 1.
- 1.3 IDOM Merebrook Limited (IDOM) has been commissioned by Esquire Developments to undertake a Tier 1 Preliminary Risk Assessment and to advise on the geo-environmental implications of the redevelopment of the site for the proposed end use.
- 1.4 The objectives of the investigation are to:
 - i. Assess the presence and significance of any potential sources of contamination at the site;
 - ii. Identify potential receptors at the site;
 - iii. Identify and assess plausible pathways between potential contaminant sources and receptors;
 - iv. Make a qualitative assessment of any identified risks and develop an initial site conceptual model; and
 - v. Determine if further assessment of any identified potential contaminant linkages is required.
- 1.5 A Tier 1 Preliminary Risk Assessment (Non-intrusive Investigation) has been undertaken for the subject site.
- 1.6 This report presents the findings of the Tier 1 Preliminary Risk Assessment and provides an interpretation of the geo-environmental conditions that exist at the site. The contaminative status of the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment. This report follows LCRM (Land Contamination Risk Management) guidance to ascribe a conservative qualitative appraisal of the hazards associated with the site.
- 1.7 This report has been prepared for Esquire Developments for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Esquire Developments and IDOM as to the extent to which the findings may be appropriate for their use.

SECTION 2 TIER 1 (NON-INTRUSIVE INVESTIGATION)

2.1 INTRODUCTION

2.1.1 The non-intrusive investigation has been conducted with reference to the documents and sources detailed in Table 1 below:

Table 1: Published data and information sources

Source Data - Other					
Radon: guidance on protection measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects) 2023 edition		BGS Geology of Britain 1:50,000 online maps			
Environment Agency online surface water flood maps		UK National Air Quality Archive, online			
Source data - Groundsure Data					
Ordnance Survey (OS) historical maps scaled at 1:10,560, 1:10,000, 1:2,500 and 1:1,250 dated 1865 - 2010					
Past land use	Agricultural designations	River and coastal flooding	Mining and ground workings		
Waste and landfill	Habitat designations	Surface water flooding	Ground cavities and sinkholes		
Current industrial land use	Geology	Groundwater flooding	Radon		
Hydrogeology	Boreholes	Environmental designations	Soil chemistry		
Hydrology	Natural ground subsidence	Visual and cultural designations	Railway infrastructure and projects		

2.1.2 The above sources are all authoritative and it is believed that they are reasonably reliable. However, independent verification of the information supplied has not necessarily been carried out and IDOM cannot be held liable for inaccuracies or deficiencies in the information.

2.2 SITE LOCATION AND SETTING

2.2.1 The site is located at Rose Farm, Istead Rise, Gravesend, DA13 9HJ.

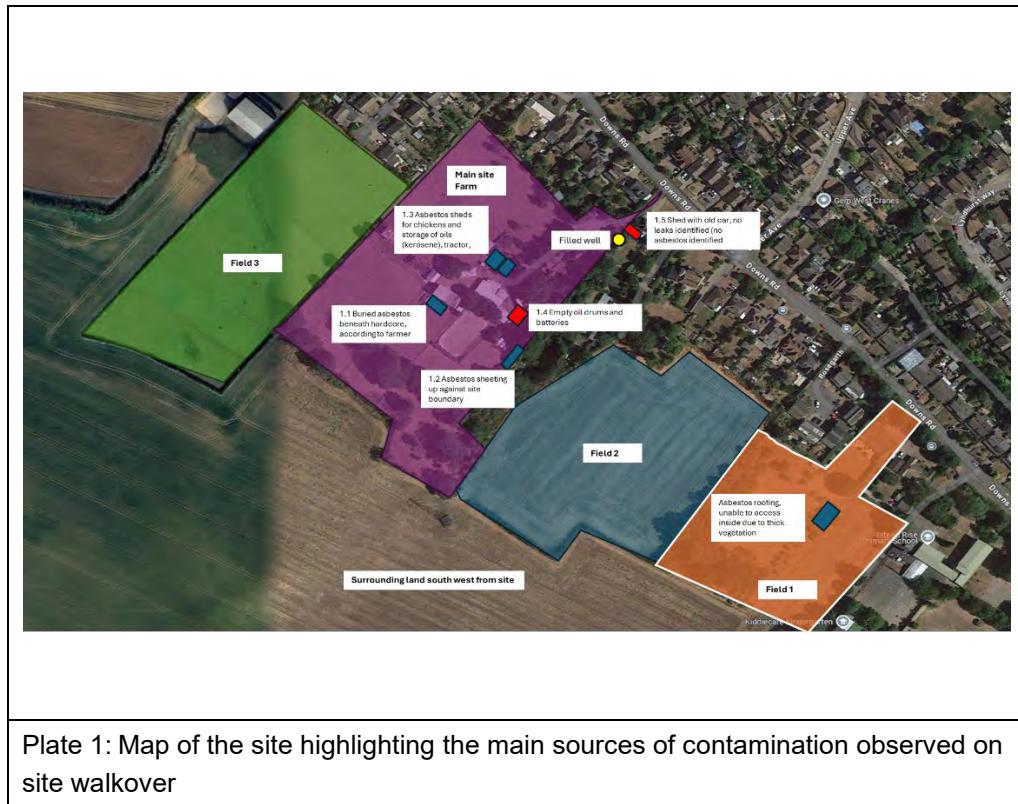
2.2.2 The site occupies an area of approximately 8.09 hectares located at National Grid Reference 563183, 169689 presented in Appendix 1 of this report.

2.2.3 The site is bounded by undeveloped land extending to the south. There are residential dwellings to the north fronting Downs Road. There are further residential buildings to the west and a school to the east of the site. The site is generally level.

2.2.4 An IDOM engineer undertook a site walkover on the 28th February 2025. Below is a summary of the findings of the walkover and a photograph appendix is included in Appendix 4 of this report.

2.2.5 The main site comprises a farm situated in the central western field with three additional fields as indicated in Plate 1 below. Field 1 is located the southeasternmost of the site where a suspected asbestos roofing shed was identified. No contamination sources were observed in fields 2 and 3. The primary sources of contamination were observed in the main farm site and comprised the following sources of contamination:

- i. Shed with suspected asbestos-containing materials;
- ii. Suspected asbestos sheeting;
- iii. Suspected buried asbestos;
- iv. Oil drums and batteries;
- v. Oil (kerosene) storage



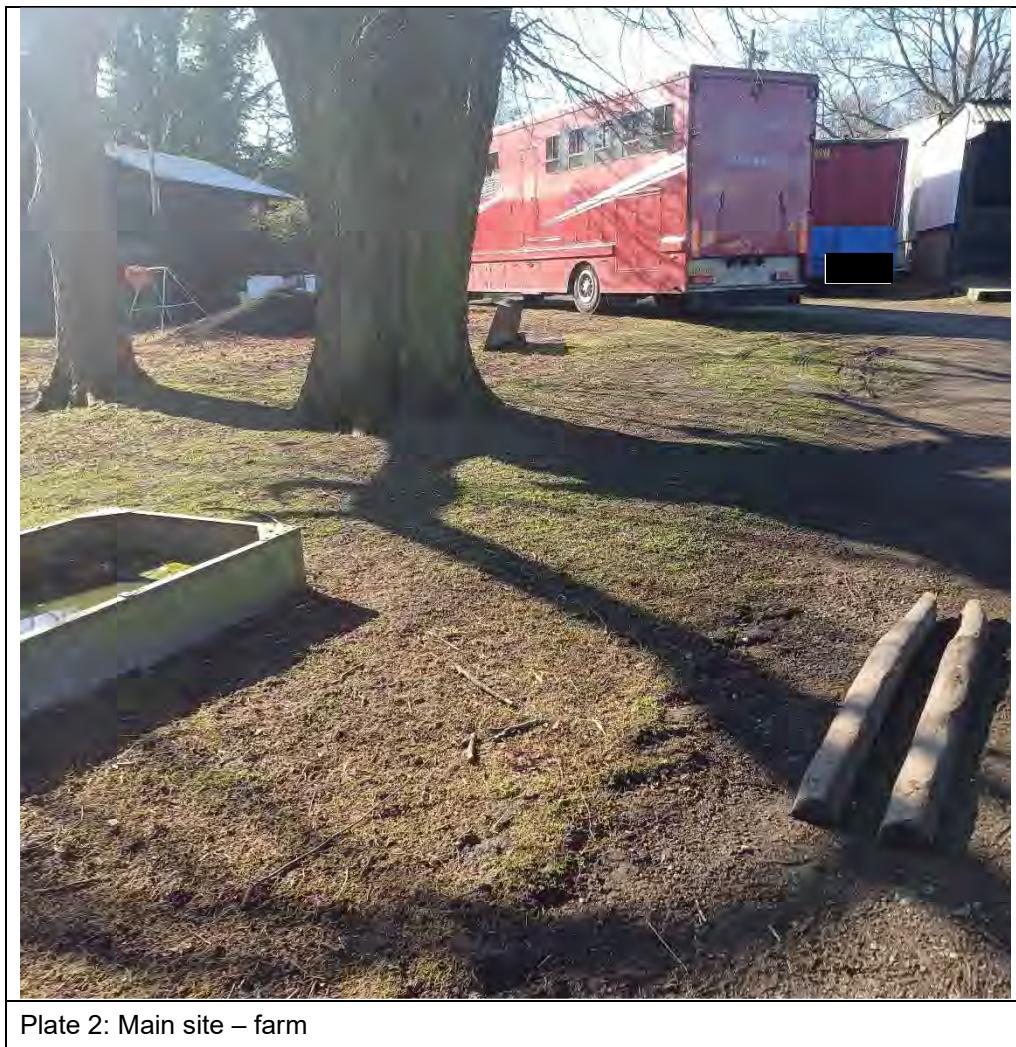




Plate 3: Main site – farm with suspected asbestos shed



Plate 4: Suspected asbestos shed



Plate 5: Filled well present on main site



Plate 6: Suspected asbestos cementitious sheeting on main site



Plate 7: Oil storage



Plate 8: Empty oil drum



Plate 9: Shed with potential asbestos roofing located in field 1 (inaccessible due to thick vegetation).

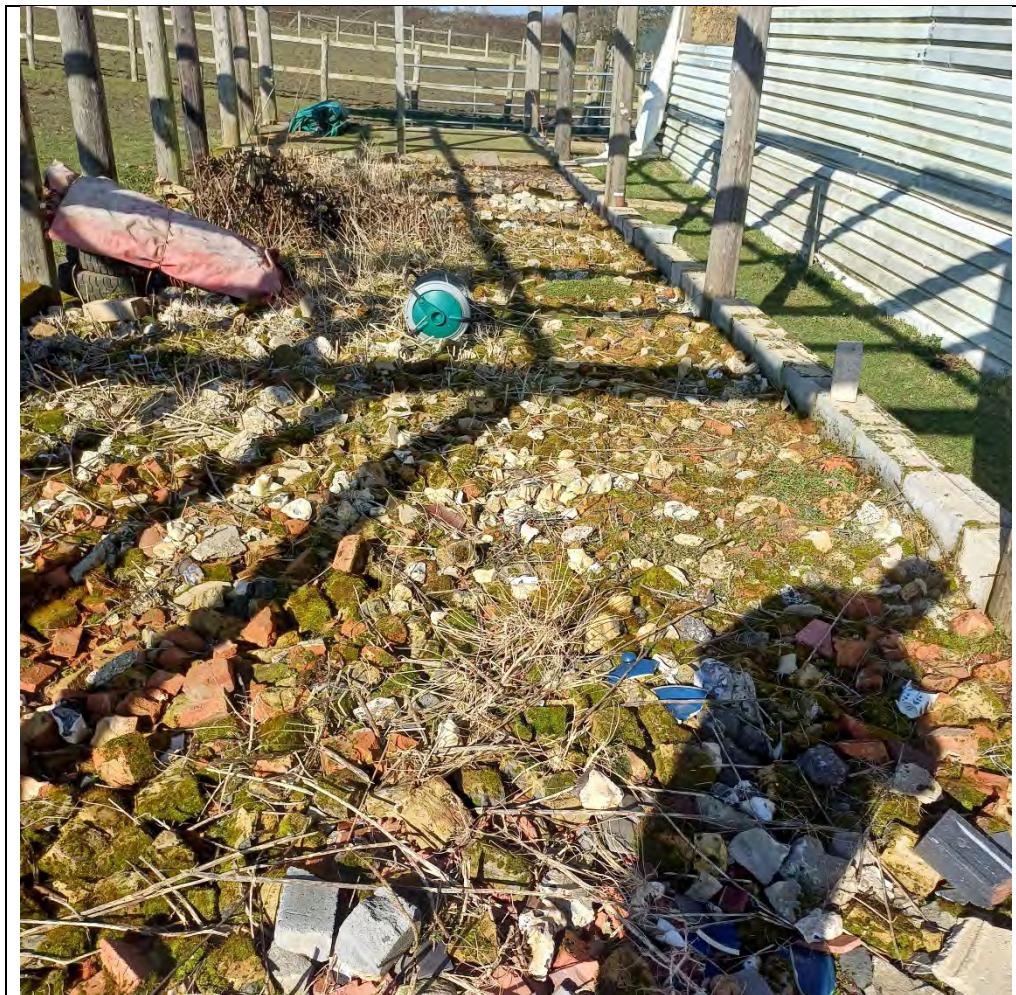


Plate 10: Suspected buried asbestos on main site.



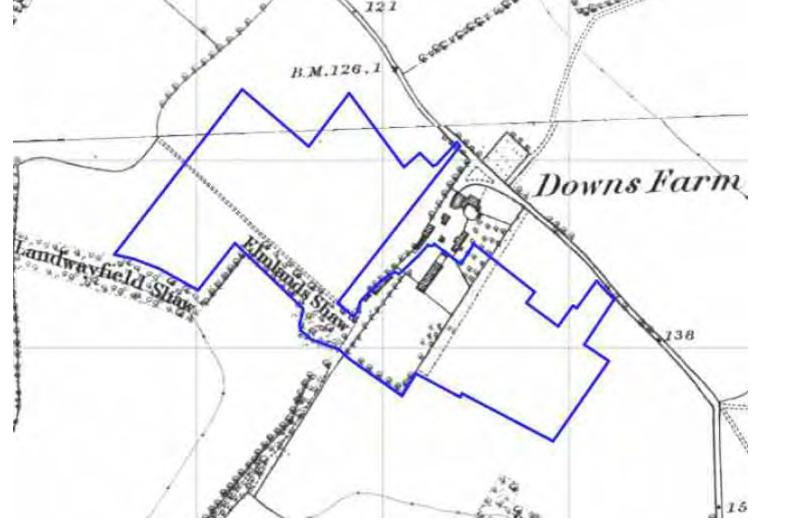
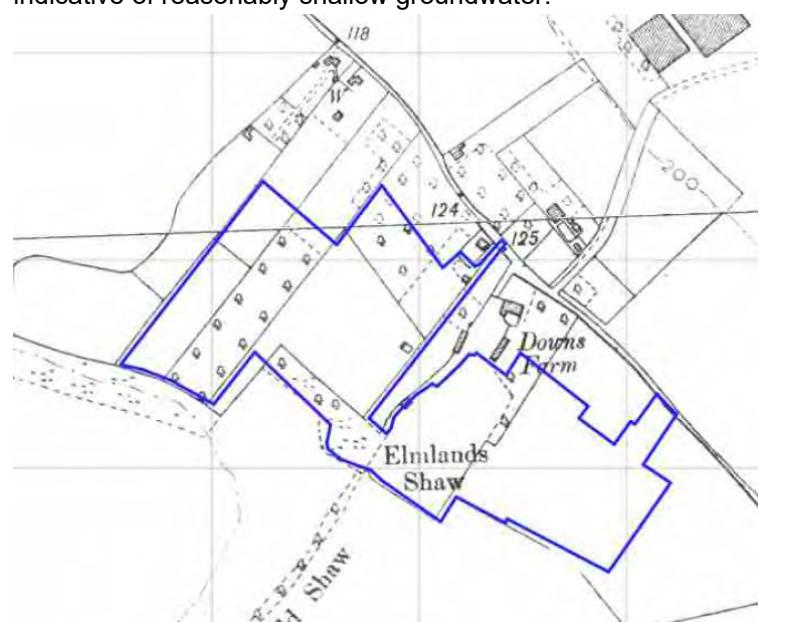
Plate 11: Battery storage

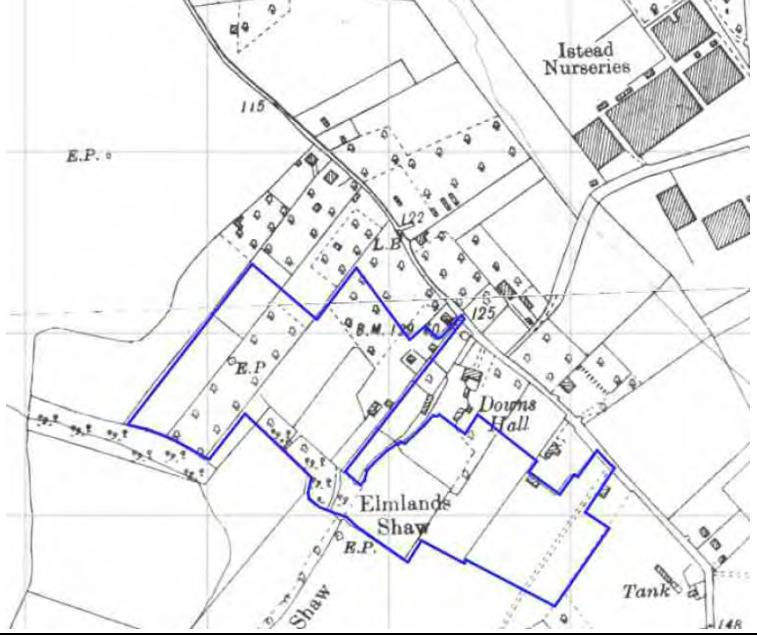
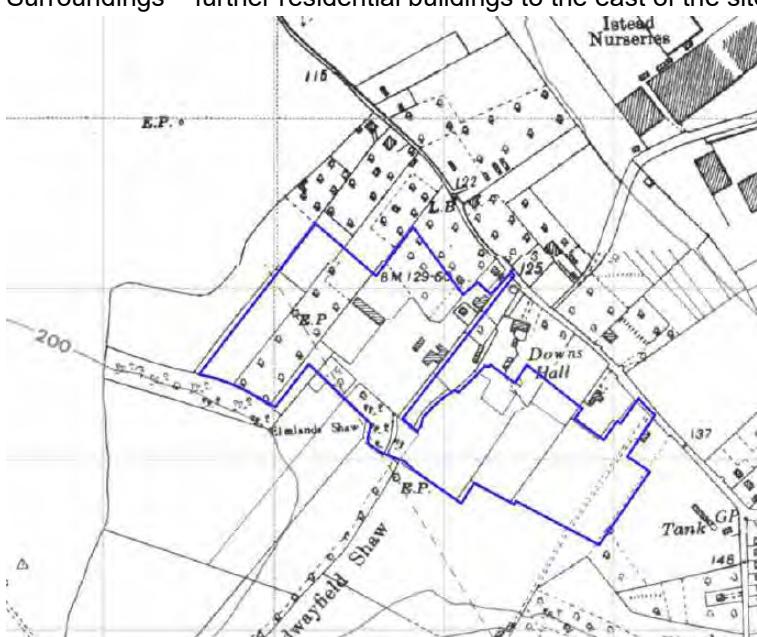
2.3 SITE HISTORY

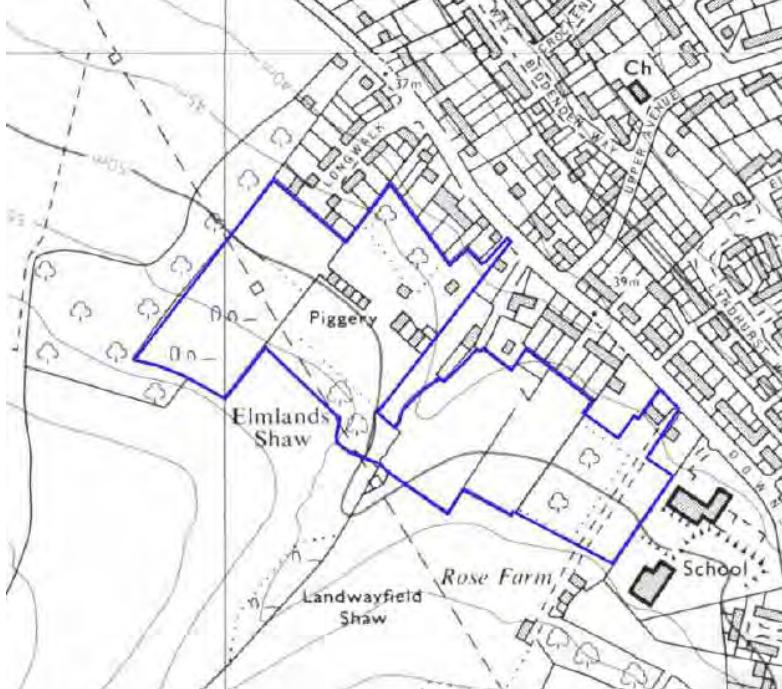
2.3.1 The site history, based on a review of the historic and current maps, dating from 1865 to 2025 is summarised in Table 2 below. Potentially contaminative land uses are shown in **bold**. Copies of key maps used in this review are provided in Appendix 2.

Table 2: Summary of the key features shown on historic maps

Data Source	Site / Surroundings
1865 – 1867 (1:2,500 and 1:10,560 scale).	Site – the site is mostly undeveloped farmland associated with the off-site Downs Farm. Two buildings (peripheral part of Downs Farm) are present in the centre-north of the site. A small area of woodland, possibly orchard is associated with the farm. A strip of woodland labelled <i>Elmlands Shaw</i> is present on the south of the site.

Data Source	Site / Surroundings
	 <p>Surroundings – the site is surrounded mostly by farmland and strips of woodland (referred to by the local term, Shaw) along field boundaries. A small <i>Old Chalk Pit</i> is located approximately 100 m west of site.</p>
1907 (1:10,560 scale).	<p>Site – Strips of Orchard are located on the north and west of the site. The earlier farm building on the site is no longer marked however two new small structures are present.</p> <p>Surroundings – Other than some small areas of orchard planting adjacent to the site, there are no major changes in the immediate vicinity. There are two commercial-scale buildings (later labelled as nurseries) located approximately 220 m northeast of the site. A well is noted approximately 120 m north of the site which may be indicative of reasonably shallow groundwater.</p> 

Data Source	Site / Surroundings
1931 (1:10,560 scale).	<p>Site – There are no major changes to the site although there are additional small structures present.</p> <p>Surroundings – The commercial buildings to the northeast of the site have expanded and are now labelled as Istead Nurseries. Tank present approximately 100 m east of the site. Sewage Tanks approximately 330 m southeast. Water Works approximately 400 m southeast.</p> 
1938 – 1939 (1:10,560 scale).	<p>Site – three unspecified buildings on site. Overhead electricity services appear to cross the site.</p> <p>Surroundings – further residential buildings to the east of the site.</p> 

Data Source	Site / Surroundings
1965 – 1966 (1:10,560 scale).	<p>Site – no significant changes on site, although a further area of orchard planting has occurred on the east of the site. The elongate building on site is labelled as a Piggery.</p> <p>Surroundings – residential buildings to the north of the site are now present adjacent to site to approximately 500 m. The former nursery has been replaced by residential development.</p>
1968 (1:2,500 scale).	<p>Site – The Piggery remains. Orchards are present on the east and west of the site.</p> <p>Surroundings – further infill residential development has occurred.</p>
1971 – 1973 (1:10,000 scale).	<p>Site – no significant changes on site.</p> <p>Surroundings – further infill residential development has occurred. to the north of the site. A school is now present adjacent to the east of the site.</p> 
1977 – 1979 (1:10,000 scale).	<p>Site – No major changes.</p> <p>Surroundings – Further infill residential development to the north.</p>
2001 (1:10,000 scale).	<p>Site – no significant changes on site.</p> <p>Surroundings – no major changes in the immediate vicinity.</p>
2010 (1:10,000 scale).	<p>Site – no significant changes on site.</p> <p>Surroundings – no major changes in the immediate vicinity.</p>
2025 (1:10,000 scale).	<p>Site – road present on site.</p> <p>Surroundings – school adjacent to site is designated as Education Facility and is now one building instead of two separate buildings. North of the site comprises mostly of residential buildings and most south and southwest of the site within 500 m radius comprise of undeveloped land.</p>

2.3.2 In summary, historic plans show:

- i. The site has not undergone major development and comprises mostly farm land / buildings with some evidence of livestock usage (in the form of a piggery) and several small areas of orchard;
- ii. Residential buildings have been constructed from 1931 to present adjacent to the north of the site.

2.3.3 A small chalk pit was labelled 100 m west of the site in the late 19th century. Whilst this is not indicative of contamination, it is suggestive of local extraction of chalk strata.

2.3.4 Given the nature of the historical mapping process (scale, representation of conditions at discrete time intervals frequency etc.), any such maps and plans may not provide a comprehensive account of a site's history. Identification of pertinent land uses and associated potentially contaminative activities, may therefore be absent from mapping records.

2.4 GEOLOGY

2.4.1 There is made ground mapped off-site to the southeast which encroaches onto the southeastern boundary of the site as shown in Figure 1 below. The area appears to correspond to the off-site school complex.



2.4.2 The majority of the site is underlain by superficial deposits of Head comprising clay, silt, sand and gravel. However, drift deposits are largely absent from the southern edge of the site as shown in Figure 2 below.



2.4.3 The site is underlain by bedrock of the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated) – Chalk.

2.4.4 There are no records of historic borehole logs from the British Geological Survey within 250 m.

2.5 BACKGROUND SOIL CHEMISTRY

2.5.1 Data published by the BGS indicates the following background chemistry concentrations can be expected at the site:

- i. Arsenic – 25 – 35 mg/kg;
- ii. Lead – 100 mg/kg;
- iii. Bioaccessible Lead – 60 mg/kg;
- iv. Cadmium – 1.8 mg/kg;
- v. Chromium – 60 – 90 mg/kg;
- vi. Nickel – 15 – 30 mg/kg.

2.5.2 These heavy metal concentrations are not indicative of significant contamination.

2.6 HYDROGEOLOGY

2.6.1 The superficial geology (where present) is designated as Secondary Undifferentiated aquifer. Records from Groundsure indicate that the superficial aquifer has high vulnerability on site.

2.6.2 The bedrock deposits on site are designated as Principal Aquifer. Records from Groundsure indicate that the bedrock aquifer has high vulnerability on site and within 50 m.

2.6.3 The site includes several categories of groundwater Source Protection Zone as shown in Figure 3:

- i. Source Protection Zone 1 Inner Catchment;
- ii. Source Protection Zone 2 Outer Catchment;
- iii. Source Protection Zone 3 Total Catchment.

2.6.4 There are two records of groundwater abstractions located within 1 km of the site:

- i. Southern Water Services Ltd, Southern Region Groundwater, Potable Water Supply – Direct (Active), located 365 m southeast;
- ii. Southern Water Services Plc, Southern Region Groundwater, Transfer between sources (Historical), located 365 m southeast.

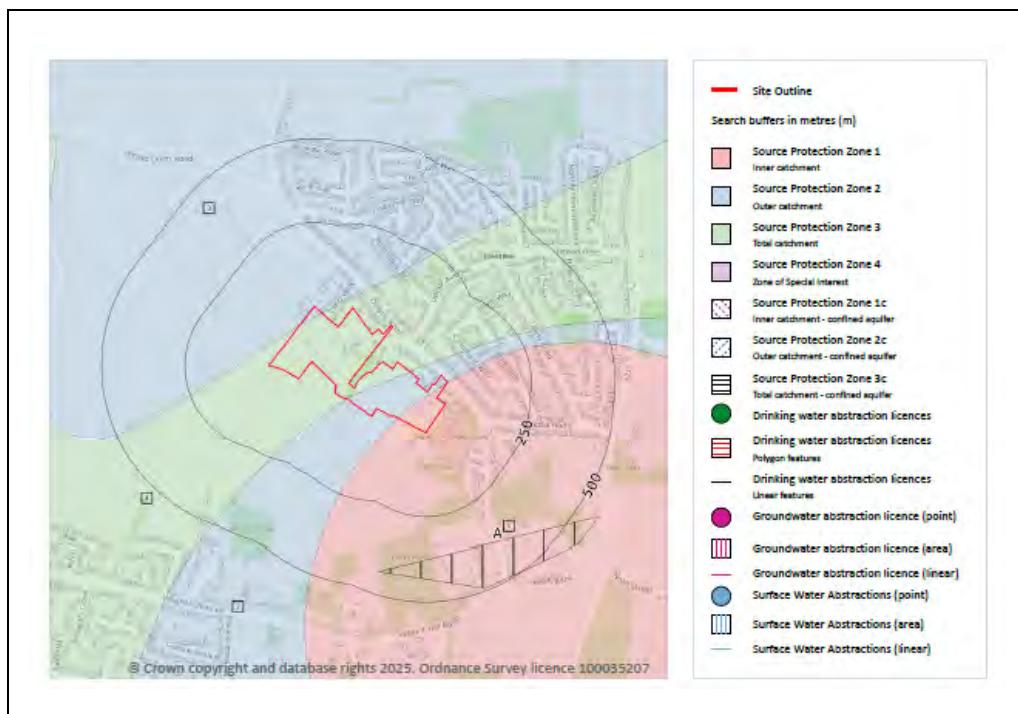


Figure 3: Abstraction and source protection zones

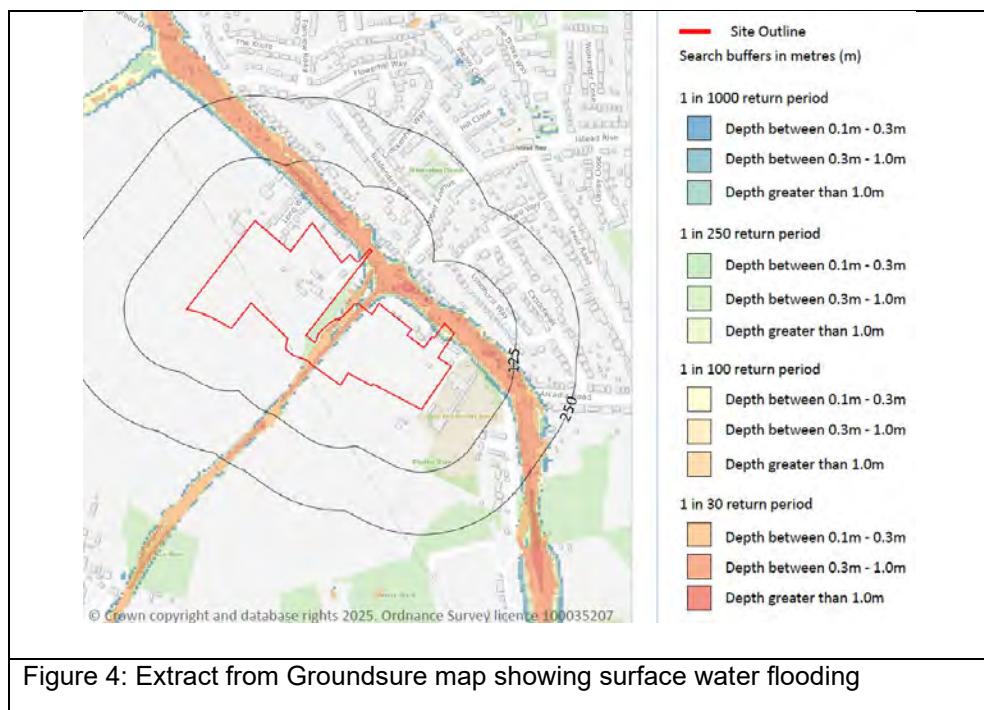
2.7 HYDROLOGY

- 2.7.1 There are no surface water bodies within 250 m of the site.
- 2.7.2 The site forms part of the Lower Medway Coastal Catchment and is expected to drain to the sea, rather than a freshwater body.

- 2.7.3 There are no licensed surface water abstractions located within 2 km of the site.

2.8 FLOODING

- 2.8.1 The site is not indicated to be in an area benefitting from flood defences. Historical flood events are not indicated to have occurred on the site. The risk of flooding, based on Risk of Flooding from Rivers and Sea (RoFRaS) models is indicated to be very low.
- 2.8.2 Environment Agency Flood Zone information is used within the planning system to help determine whether flood risk assessments are required for development. Flood Zones do not take into account any flood defences. The site is designated as Flood Zone 1.
- 2.8.3 Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events. The mapping indicates that a strip of the site is at high risk from surface water flooding but the majority of the site is not at significant risk.



2.8.4 Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Modelling shows the site lies in an area that is at low risk of groundwater flooding.

2.8.5 The maximum identified flood risks in each category are summarised in Table 3 below:

Table 3: Summary of flood risk

Risk of Flooding from Rivers and Sea (RoFRaS)	Environment Agency Flood Zone	Surface Water Flooding	Groundwater Flooding
Very Low The chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year	Zone 1 – little or no risk with an annual probability of flooding from rivers and the sea of less than 0.1%	Locally high risk, but no significant risk on majority of site	low

2.9 CURRENT SITE ISSUES

2.9.1 Potentially significant environmental issues have been investigated within relevant distances of the site, based on the database of records supplied by Groundsure. These relate to the following searches:

- i. Water discharge or pollution incidents within 250 m of the site;
- ii. Waste management sites within 250 m of the site;
- iii. Statutory authorisations within 50 m of the site;
- iv. Trades of possible contaminative use within 50 m of the site;
- v. Special protection or conservation areas within 50 m of the site; and
- vi. Any other relevant issues.

2.9.2 Potentially significant environmental issues identified by the above searches are summarised in Table 4.

Table 4: Potentially significant environmental issues

Environmental Category	Description
Water discharge or pollution incidents within 250 m	There are no records of water discharge or pollution incidents within 250 m.
Waste management sites within 250 m	There are no records of waste management sites within 250 m.

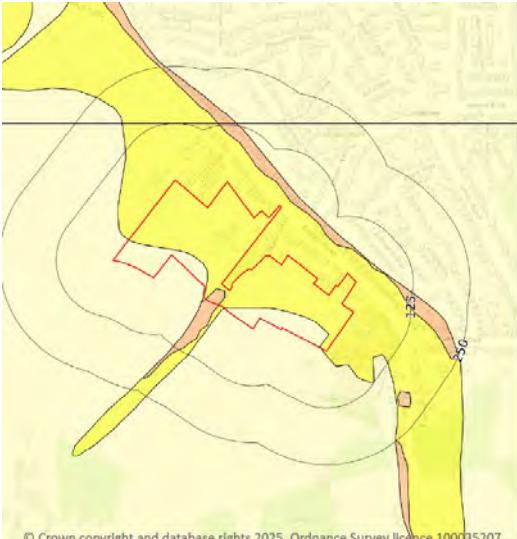
Environmental Category	Description
	There are several waste exemptions in the area surrounding the site, however these are for low-risk activities which are not considered to pose a risk to the site.
Statutory authorisations within 50 m	There are no statutory authorisations records within 50 m.
Trades of possible contaminative use within 50 m	<p>There is one trade directory entry of possible contaminative use on site:</p> <ul style="list-style-type: none"> i. An electricity pylon is located on the northwest of the site with the overhead line passing over the site. <p>There are two trades of possible contaminative use within 50 m:</p> <ul style="list-style-type: none"> i. A further pylon is located 19 m south of the site; ii. A tank is located 43 m southeast of the site, however this is a modern feature associated with the adjacent school and would be expected to be managed to a good condition.
Special protection or conservation areas within 50 m	<p>The following are present on site:</p> <ul style="list-style-type: none"> i. London Green Belt (Gravesend) ii. SSSI Impact Risk Zone iii. Nitrate Vulnerable Zones – Groundwater (North Kent) <p>The following are present within 50 m:</p> <ul style="list-style-type: none"> i. Listed Buildings – Downs Hall located 39 m northeast of the site.
Agricultural land classification within 250 m	The site is classified as Grade 3 – good to moderate quality agricultural land.

2.10 INDICATIVE GROUND STABILITY HAZARDS

2.10.1 Table 5 summarises the identified natural ground subsidence hazard ratings.

Table 5: Summary of natural ground subsidence hazards

Type	Hazard rating
Shrink swell clays	Mostly very low coincident with head deposit, elsewhere negligible hazard
Running sands	Mostly very low coincident with head deposit, elsewhere negligible hazard
Compressible deposits	Negligible most of the site. Very low along the eastern site

Type	Hazard rating
	boundary coincident with the mapped made ground
Collapsible deposits	Very low
Landslides	<p>Mostly very low where head deposits are present. A small area of low hazard rating although no built development is proposed in this low-lying area. Other areas underlain by chalk have a negligible hazard rating.</p> 
Ground dissolution of soluble rocks	Very low (chalk areas) to low (head deposits)

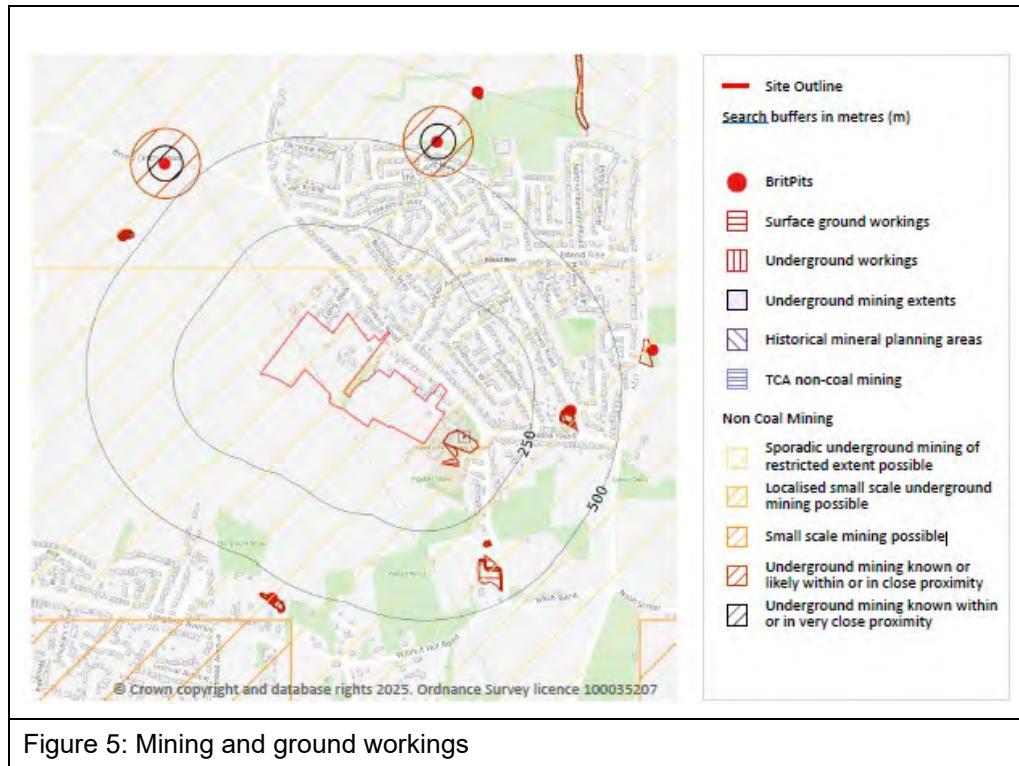
2.11 MINING, GROUND WORKINGS AND NATURAL CAVITIES

2.11.1 There are no specific records of mining features on the subject site. There are records of ground working activities in the vicinity that may potentially influence the site:

- i. There is one recorded BritPits (British Pits) located 360 m east of the site relating to a historical chalk extraction pit;
- ii. There are four records of surface ground workings approximately 40 m east of the site. These all relate to unspecified heaps that are coincident with the adjacent school site;
- iii. There are no records of underground workings;
- iv. The site is noted to be in an area where there has been some localised chalk extraction. The Groundsure report states that underground mine workings are uncommon, although the geology is similar to that worked elsewhere.

Potential for difficult ground conditions is unlikely and is at a level where they need not be considered.

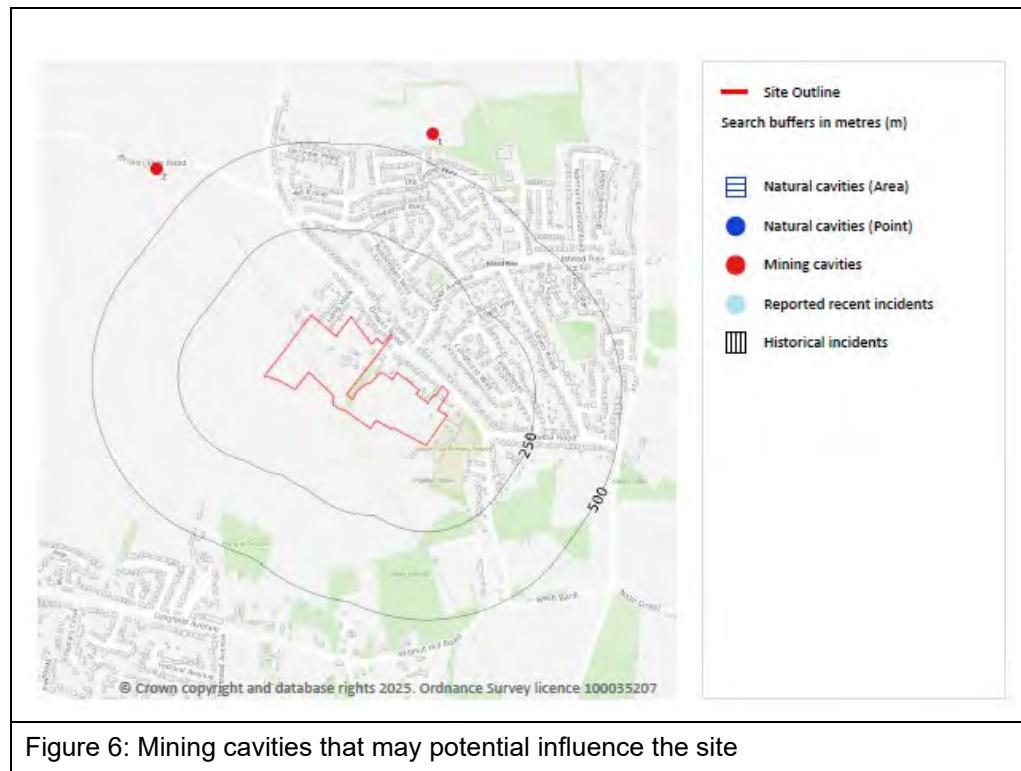
2.11.2 Figure 5 indicates the location of mining and ground workings that may potentially influence the site.



2.11.3 There are no records of natural cavities on site, however there are records of natural cavities in the wider vicinity:

- i. There are three records of mining cavities (chalk pits) within 1 km radius of the site, with the closest record located 579 m north.

Figure 6 indicates the location of ground workings and natural cavities that may potentially influence the site.



2.12 RADON GAS

2.12.1 The licensed Radon Potential Dataset for the site has been consulted. The Radon Potential is shown in six discrete Radon Classes (RnC1 to RnC6) as set out in Table 6. The Radon Class is defined as a percentage probability range of dwellings exceeding the Radon Action Level.

Table 6: Radon classes, risk and mitigation

Radon Class (probability range)	General Risk	Affected Area ?	Building Control Regulations (England and Wales)
1 (0 to <1%)	low	No	No *
2 (1 to <3%)	medium	Yes	No *
3 (3 to <5%)		Yes	Yes - Basic
4 (5 to <10%)		Yes	Yes - Basic
5 (10 to <30%)	high	Yes	Yes - Full
6 (30 to 100%)		Yes	Yes - Full

* Fitting radon protection in new buildings might be considered if there is a high risk location such as a routinely occupied basement

2.12.2 The licensed Radon Potential Dataset has been obtained from Groundsure which illustrates the 25 m tiled mapping and is provided in Appendix 3. This data is the highest resolution radon dataset available for the UK, produced to a 50 m accuracy.

This data has been pre-buffered to account for the relative accuracy and other uncertainties, so no additional buffering on site is required.

2.12.3 The site-specific Radon Potential Dataset and Guidance issued by the Buildings Research Establishment (BRE-211) indicates that:

- i.* The site lies within an area designated RnC2 and no radon protection measures are required under the Building Control Regulations.

2.13 UXO

2.13.1 Regional Unexploded Bomb Risk Maps published by Zetica have been consulted which show high risk. The site is mostly undeveloped, therefore a UXO Desk Study and Risk Assessment is recommended to confirm the risk rating.

2.14 PROTECTED HABITAT

2.14.1 Information from environmental designations dataset was obtained from a review of the Groundsure online data viewer to identify any ecological receptors that might be relevant to the contamination risk assessment for the site. There is traditional orchard on site although this appears to be removed by the proposed redevelopment. No other relevant receptors have been identified.

2.15 ARCHAEOLOGICAL SITES AND ANCIENT MONUMENTS

2.15.1 Information from the visual and cultural designations dataset was obtained from a review of the Groundsure online data viewer to identify any archaeological, historic building or historic site receptors that might be relevant to the contamination risk assessment for the site. The following are considered to be potentially relevant receptors:

- i.* Downs Hall (Listed Building) located 39 m northeast of site.

2.16 PREVIOUS INVESTIGATIONS

2.16.1 No known previous investigation data exists for the site.

2.17 PLANNING HISTORY

2.17.1 Publicly available online planning records were searched on Gravesham Borough Council website and also on Kent County Council website for the adjacent school site. No relevant information on ground conditions was identified in the application documents. The subject site was refused permission (ref: 19630428) for residential development in the 1960s. The original planning application for the adjacent school could not be identified so no further information has been identified with regard to the "made ground" mapped at the school and encroaching on the subject site boundary.

SECTION 3 PRELIMINARY CONCEPTUAL SITE MODEL

3.1 A preliminary conceptual site model (CSM) has been developed from the findings of the desk study and site reconnaissance. The CSM has been developed using the framework established in Part IIA of the *Environmental Protection Act 1990* and detailed in:

- i.* Environment Agency guidance *Land Contamination Risk Management* published on gov.uk; and
- ii.* BS EN ISO 21365:2020 - Soil quality – Conceptual site models for potentially contaminated sites.

3.2 The desk study and site reconnaissance has identified the following potentially significant sources of contamination:

- i.* Localised areas of historical orchard which may have been subject to the application of pesticides (such as the organochlorine pesticide DDT or in earlier years, compounds containing lead and arsenic or PAH were used). Whilst pesticides are often present in such cases, in our experience, any residues are typically at very low levels;
- ii.* Numerous small-scale farm structures (including a piggery) which may be associated with localised made ground (which can often contain heavy metals, polycyclic aromatic hydrocarbons and asbestos) and the buildings themselves may include asbestos-containing materials. There was anecdotal evidence during the site walkover of asbestos-containing materials in the ground;
- iii.* Wider historical farm uses may also have given rise to localised contamination with fuels / oils but this would be expected to be localised. Made ground can also sometimes be found in trackways and gateways associated with the historical placement of aggregate to improve trafficability;
- iv.* The southeastern edge of the site is mapped as made ground, although this appears to be related to the redevelopment of the adjacent school and may not be indicative of impact on the subject site. Intrusive investigation would be required to confirm this.

3.3 The following receptors have been considered:

- i.* Present site users;
- ii.* Future residents/users;
- iii.* Construction workers;
- iv.* Plants used in landscaping;
- v.* Potable water supply pipework;

- vi. The general public and adjacent site users;
- vii. Controlled waters; and
- viii. Protected habitats.

3.4 The following migration pathways are considered to be potentially viable:

- i. inhalation of dust generated from contaminated soils;
- ii. inhalation of organic vapours is considered to be unlikely but could occur if any localised spillages of hydrocarbons have occurred;
- iii. inhalation of airborne asbestos fibres through disturbance of asbestos contaminated soils and / or asbestos containing materials;
- iv. inhalation of radon generated through radioactive decay of uranium;
- v. inhalation of hazardous ground gas generated from potentially putrescible soils;
- vi. inhalation of other hazardous materials;
- vii. direct ingestion of contaminated soils;
- viii. ingestion of produce grown on site;
- ix. dermal exposure to contaminated soils;
- x. direct contact of plants with soils containing phytotoxic concentrations of heavy metals;
- xi. direct contact of contaminated made ground soils with permeable plastic potable water supply pipes;
- xii. vertical and horizontal migration of mobile soil contaminants to groundwater.

3.5 The following source receptor pathways are not potentially viable:

- i. migration of mobile soil contaminants to surface waters due to the absence of receptors;
- ii. horizontal migration of mobile soil contaminants to protected habitats due to the absence of receptors.

3.6 The preliminary CSM is presented in Table 7 below.

Table 7: Preliminary Conceptual Site Model

POTENTIAL CONTAMINANT SOURCE	RELEASE MECHANISM	PATHWAY	EXPOSURE ROUTE	RECEPTOR						
				Present Site Users / General Public	Future Residents / Site Users	Construction Workers	Future Planting	Water Supply Pipes	Adjacent Site Users	Controlled Waters
Surface Water		Aquifer		Protected Habitat						
SOIL (HEAVY METALS AND HYDROCARBONS)	DUST	AIR	INHALATION	✓	✓	✓			✓	
	DIRECT	DIRECT	INGESTION	✓	✓	✓				✗
	DIRECT	DIRECT	DERMAL EXPOSURE	✓	✓	✓				✗
	DIRECT	DIRECT SOIL / SEDIMENT	DIRECT CONTACT / UPTAKE				✓	✓		✗
	PLANT UPTAKE	GARDEN FRUIT AND VEGETABLES	INGESTION	✓	✓					
	INFILTRATION / LEACHING	GROUNDWATER FLOW	DIRECT							✓
	RUNOFF	SURFACE WATER FLOW	DIRECT						✗	✗
MADE GROUND (ASBESTOS)	FIBRE RELEASE	AIR	INHALATION	✓	✓	✓			✓	
SOIL (CHALK / PUTRESCIBLE)	GAS FROM DECOMPOSITION	AIR	INHALATION	✓	✓	✓			✓	
SOIL (VOC)	VAPOUR FROM VOLATILISATION	AIR	INHALATION	✓	✓	✓			✓	
GROUNDWATER (DISSOLVED CONTAMINANTS)	DIRECT	BASEFLOW TO SURFACE WATER	DIRECT						✗	✗
URANIUM IN UNDERLYING STRATA	RADON FROM RADIOACTIVE DECAY	AIR	INHALATION	✓	✓	✓				

✗ SOURCE → PATHWAY → RECEPTOR NOT COMPLETE AND NO FURTHER ACTION REQUIRED

✓ SOURCE → PATHWAY → RECEPTOR COMPLETE AND FURTHER ACTION REQUIRED

SECTION 4 TIER 1 PRELIMINARY RISK ASSESSMENT

4.1 INTRODUCTION

4.1.1 Risk from contamination has been assessed using the source-pathway-receptor and pollutant linkage methodology, whereby a risk can only exist if all elements of: source, pathway and receptor, are present.

4.1.2 The level of risk considers the likelihood of the risk occurring and the severity of the potential consequence of that risk using the approach outlined in Appendix 5. As illustrated in Table 8, this Tier 1 preliminary risk assessment combines the likelihood and severity of the risk using a Risk Assessment Matrix approach as recommended by CIRIA C552, 2001 and updated in *Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66* published by NHBC, EA and CIEH (2008).

Table 8: Risk assessment matrix (after CIRIA C552 and R&D66)

		MAGNITUDE OF POTENTIAL CONSEQUENCE (SEVERITY) OF RISK			
		SEVERE	MEDIUM	MILD	MINOR
LIKELIHOOD OF RISK	HIGH LIKELIHOOD	Very High Risk	High Risk	Moderate Risk	Low Risk
	LIKELY	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	LOW LIKELIHOOD	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	UNLIKELY	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

4.1.3 For each full pollutant linkage identified in the conceptual model, a risk rating has been assigned and presented in the proceeding sections.

4.2 SOIL CONTAMINATION (HEAVY METALS, HYDROCARBONS, PESTICIDES)

4.2.1 The Groundsure Report indicates the presence of made ground encroaching onto the southeastern edge of the site. This map feature appears to be associated with the development of the adjacent school, however no further information was available. This made ground (if present) has the potential to contain contaminants including heavy metals and polycyclic aromatic hydrocarbons. There is also potential for localised made ground associated with small-scale structures and any trackways / gateways on the subject site which might contain similar contaminants. Spillages of fuels / oils may also have occurred from localised uses. If these soils are present in soft landscaped areas in the future development, then exposure to contaminants would be possible.

4.2.2 There is also potential for low level impact of site soils with pesticides, which could also pose a risk if present in soft landscaped areas, although in our experience pesticide residues are typically at very low concentrations.

4.2.3 The types of contamination envisaged are considered unlikely to be particularly mobile in the environment and are therefore not considered to be likely to leach at significant quantities into groundwater. If any mobile contamination is encountered, then risks to the sensitive chalk aquifer should be assessed further.

4.2.4 Table 9 below summarises the level of risk assigned to each receptor from soil contamination:

Table 9: Risks from soil contamination (heavy metals, hydrocarbons and pesticides)

Receptor	Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
The general public and present site users	dust inhalation	unlikely	medium	LOW
	direct ingestion	unlikely	medium	LOW
	dermal exposure	unlikely	mild	VERY LOW
Residents of future development	dust inhalation	likely	medium	MODERATE
	direct ingestion	likely	medium	MODERATE
	dermal exposure	likely	medium	MODERATE
	ingestion of fruit / vegetables	likely	medium	MODERATE
Construction workers	dust inhalation	low likelihood	minor	VERY LOW
	direct ingestion	low likelihood	minor	VERY LOW

Receptor		Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
		dermal exposure	low likelihood	minor	VERY LOW
Future planting		direct uptake of phytotoxic metals	low likelihood	mild	LOW
Water supply pipes		direct contact leading to corrosion / permeation	low likelihood	mild	LOW
Adjacent site users		fugitive dust inhalation	low likelihood	minor	VERY LOW
Controlled waters	Aquifer	infiltration / leaching	low likelihood	medium	MODERATE / LOW

4.1 SOIL CONTAMINATION (ASBESTOS)

4.1.1 Asbestos is likely to be present in the localised infilled made ground on site and in the structures currently on-site.

4.1.2 The risk of significant fibre release and airborne exposure to current and future site residents, and the general public is considered to be very low. It is also unlikely that fugitive dust containing significant amounts of asbestos fibres will affect any adjacent site users.

4.1.3 Construction workers are at greatest risk of exposure through handling of soils and materials that may contain asbestos however these risks are properly dealt with via health and safety protocols on asbestos management.

4.1.4 Table 10 below summarises the level of risk assigned to each receptor from asbestos contamination of soils:

Table 10: Risks from soil contamination (asbestos)

Receptor	Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
The general public and present site users	inhalation of airborne fibres generated from dry soils	unlikely	medium	LOW
Residents of future development		likely	medium	MODERATE
Construction workers		likely	minor	LOW
Adjacent site users		unlikely	mild	VERY LOW

4.2 HAZARDOUS GAS

4.2.1 Desk study suggests that there may be localised areas of made ground on site, however it is considered unlikely that these would contain a significant putrescible

fraction. It is considered unlikely that made ground would present a credible source of ground gas, however it would be prudent to confirm this by site investigation, including positions on the southeastern boundary of the site where there is made ground mapped adjacent to the school.

4.2.2 The underlying chalk could be a source of carbon dioxide ground gas due to natural weathering processes, however, recent NHBC guidance¹ suggests that due to the extremely slow rate of degradation in all normal circumstances, chalk is not a credible sources of hazardous gas emissions.

4.2.3 Table 11 below summarises the level of risk assigned to each receptor from hazardous gas generation:

Table 11: Risks from hazardous gas

Receptor	Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
The general public and present site users (outdoors)	decomposition of chalk / putrescible made ground generating hazardous gas that can migrate by diffusion or advection via cracks in foundations / utility trenches / service penetrations. Outdoor inhalation in confined excavations.	unlikely	minor	VERY LOW
Residents of future development		unlikely	medium	LOW
Construction workers		unlikely	minor	VERY LOW
Adjacent site users		unlikely	minor	VERY LOW

4.3 VAPOUR

4.3.1 It is unlikely that there would be any significant source of contaminant vapours on the site. The only situation where this might occur is if there were relatively recent fuel spillages with a volatile fraction and any risk would be localised.

4.3.2 Table 12 below summarises the level of risk assigned to each receptor from vapour generation:

Table 12: Risks from soil vapour

Receptor	Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
The general public and present site users	Volatilisation of VOCs from contaminated soil	unlikely	minor	VERY LOW

¹ NHBC 2023 Hazardous Ground Gas Essential Guide for Housebuilders

Receptor	Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
Residents of future development	generating vapours that can migrate by diffusion or advection via cracks in foundations / utility trenches / service penetrations.	unlikely	mild	VERY LOW
Construction workers	Outdoor inhalation in confined excavations / localised spills.	unlikely	minor	VERY LOW
Adjacent site users / general public		unlikely	minor	VERY LOW

4.4 RADON

4.4.1 The site lies within an area designated RnC2 and therefore the overall risk to future residents is low. No radon protection is required in new dwellings.

4.4.2 Table 13 below summarises the level of risk assigned to each receptor from radon:

Table 13: Risks from radon

Receptor	Pathway / Exposure	Likelihood of Risk	Severity of Risk	Overall Risk Rating
The general public and present site users	Radon generated through decay of uranium in underlying rocks then migration by diffusion through overlying permeable strata and advection into properties via cracks in foundations / utility trenches / service penetrations.	unlikely	minor	VERY LOW
Residents of future development		low likelihood	mild	LOW
Construction workers		unlikely	minor	VERY LOW

SECTION 5 COMBINED CSM AND RISK ASSESSMENT

5.1 The preliminary Conceptual Site Model and Tier 1 Preliminary Risk Assessment have been combined to present the overall risk ratings assigned to each identified source ► pathway ► receptor and is presented in Table 14.

Table 14: Combined Preliminary Conceptual Site Model and Tier 1 Risk Assessment

POTENTIAL CONTAMINANT SOURCE	RELEASE MECHANISM	PATHWAY	EXPOSURE ROUTE	RECEPTOR							
				Present Site Users / General Public	Future Residents / Site Users	Construction Workers	On-Site Planting	Water Supply Pipes	Adjacent Site Users / General Public	Controlled Waters	
										Surface Water	Aquifer
SOIL (HEAVY METALS AND HYDROCARBONS)	DUST	AIR	INHALATION	LOW	MODERATE	VERY LOW			VERY LOW		
	DIRECT	DIRECT	INGESTION	LOW	MODERATE	VERY LOW					
	DIRECT	DIRECT	DERMAL EXPOSURE	VERY LOW	MODERATE	VERY LOW					
	DIRECT	DIRECT	DIRECT CONTACT / UPTAKE				LOW	LOW			
	PLANT UPTAKE	GARDEN FRUIT AND VEGETABLES	INGESTION	X	MODERATE						
	INFILTRATION / LEACHING	GROUNDWATER FLOW	DIRECT								MODERATE / LOW
	RUNOFF	SURFACE WATER FLOW	DIRECT							X	
MADE GROUND (ASBESTOS)	FIBRE RELEASE	AIR	INHALATION	LOW	MODERATE	LOW			VERY LOW		
SOIL (CHALK / PUTRESCIBLE)	GAS FROM DECOMPOSITION	AIR	INHALATION	VERY LOW	LOW	VERY LOW			VERY LOW		
SOIL (VOC)	VAPOUR FROM VOLATILISATION /	AIR	INHALATION	VERY LOW	VERY LOW	VERY LOW			VERY LOW		
GROUNDWATER (DISSOLVED CONTAMINANTS)	DIRECT	BASEFLOW TO SURFACE WATER	DIRECT							X	
URANIUM IN UNDERLYING STRATA	RADON FROM RADIOACTIVE DECAY	AIR	INHALATION	VERY LOW	LOW	VERY LOW					

X SOURCE ► PATHWAY ► RECEPTOR NOT COMPLETE AND NO FURTHER ACTION REQUIRED

SECTION 6 CONCLUSIONS AND RECOMMENDATIONS

- 6.1 A Tier 1 Preliminary Risk Assessment has been undertaken for up to 154 proposed residential buildings on an area of land located at Rose Farm, Istead Rise, Gravesend, DA13 9HJ.
- 6.2 Other than the farm buildings, no significant development has taken place on site, however, localised deposits of made ground may be present which may contain contaminants which could pose a risk to health if they are to remain in soft landscaped areas. Localised spillages of fuels / oils may have also occurred.
- 6.3 The identified potential contaminant linkages will require intrusive site investigation to obtain more information and to undertake a Tier 2 generic quantitative risk assessment.
- 6.4 The investigation should include testing of topsoil and subsoil and should include a general spread of positions as well as targeting former structures and the southeastern edge of the site where made ground was mapped.
- 6.5 Whilst there is little evidence for a credible source of ground gas, site investigation should determine the presence /absence of putrescible materials in any made ground and confirmatory ground gas monitoring may be required.
- 6.6 It is considered unlikely that any significant quantities of mobile contamination (such as hydrocarbons) would be encountered. However, if any mobile contamination is discovered by the site investigation, then risks to the sensitive chalk aquifer should be assessed further.

SECTION 7 OTHER RECOMMENDATIONS

- 7.1 The intrusive site investigation should include geotechnical assessment of the natural strata for foundation, road and drainage design.
- 7.2 A pre-demolition asbestos survey should be undertaken on the remaining building(s) present on site.
- 7.3 A UXO desk study is recommended to establish the site-specific risk from UXO.
- 7.4 The site is in Environment Agency Flood Zone 1. The site is over 1 ha and therefore a flood risk assessment is likely be required.
- 7.5 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statutes.
- 7.6 It is recommended that this report is submitted to the regulators (Local Authority EHO and Planners, Environment Agency Planning Liaison) for approval prior to commencement of the works.

APPENDIX 1

- Site Location Plan
- Proposed Development Plan

Esquire Developments



Proposed Residential Development, Istead Rise

0 10 20 30 40 50 100m
Scale 1:1000

NOTES:
Do Not Scale.
Report all discrepancies, errors and omissions.
Verify all dimensions on site before commencing any work on site or preparing shop drawings.
All materials, components and workmanship are to comply with the relevant British Standards, Codes of Practice, and appropriate manufacturers recommendations that from time to time shall apply.
For all specialist work, see relevant drawings.
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Rev Date Description

Project Title
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Istead Rise

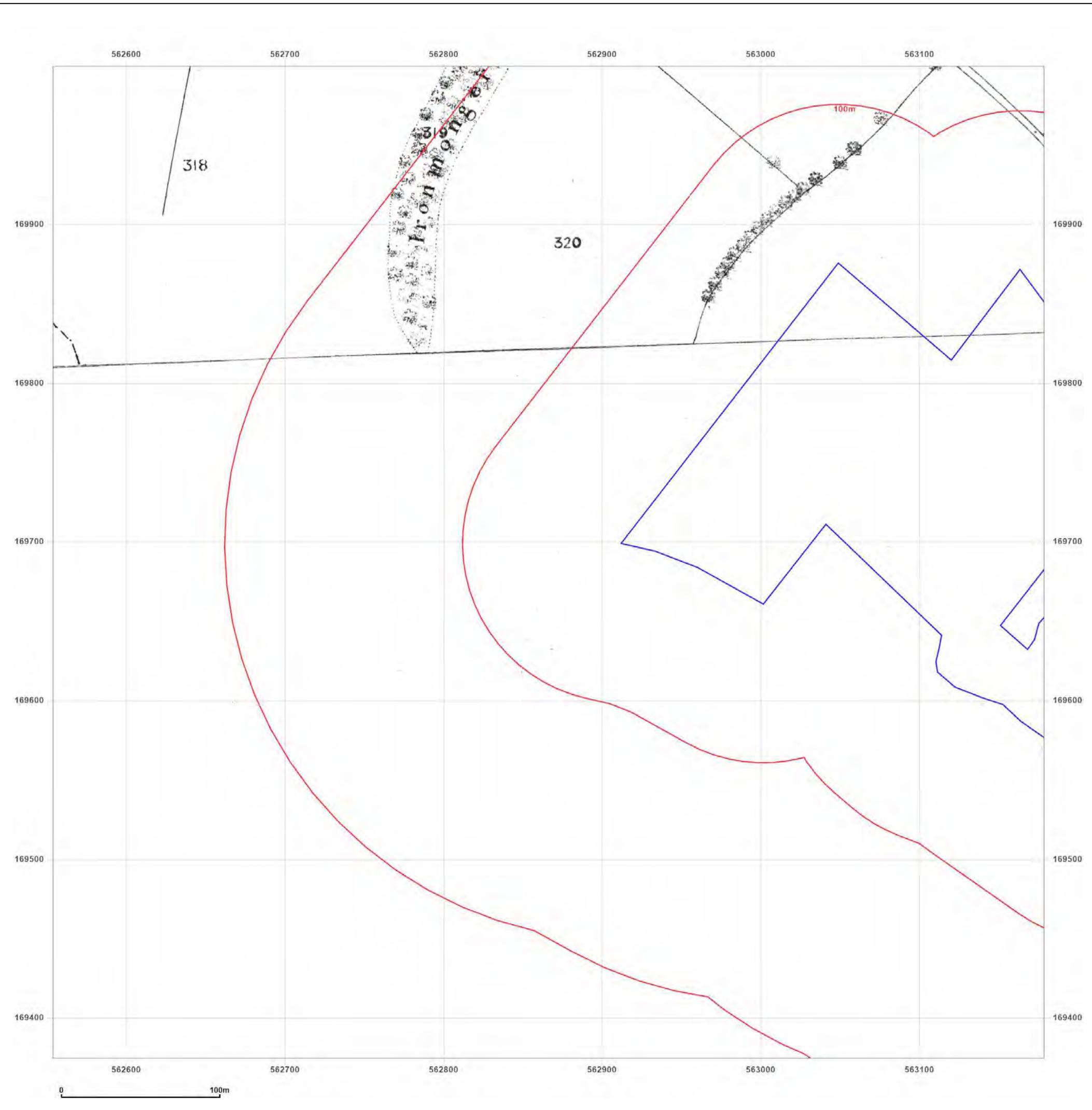
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JS
Date
December 24
Checked by
TWM

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1 Kinsbourne Court, Luton Road,
Harpden, Hertfordshire AL5 3BL
01582 765102
8, Disney Street
London SE1 1JF
0203 597 6112
CANTERBURY LONDON HARPENDEN

Drawing Number
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Revision

APPENDIX 2 ▪ Historical Plans



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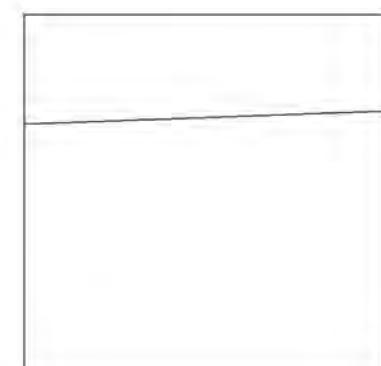
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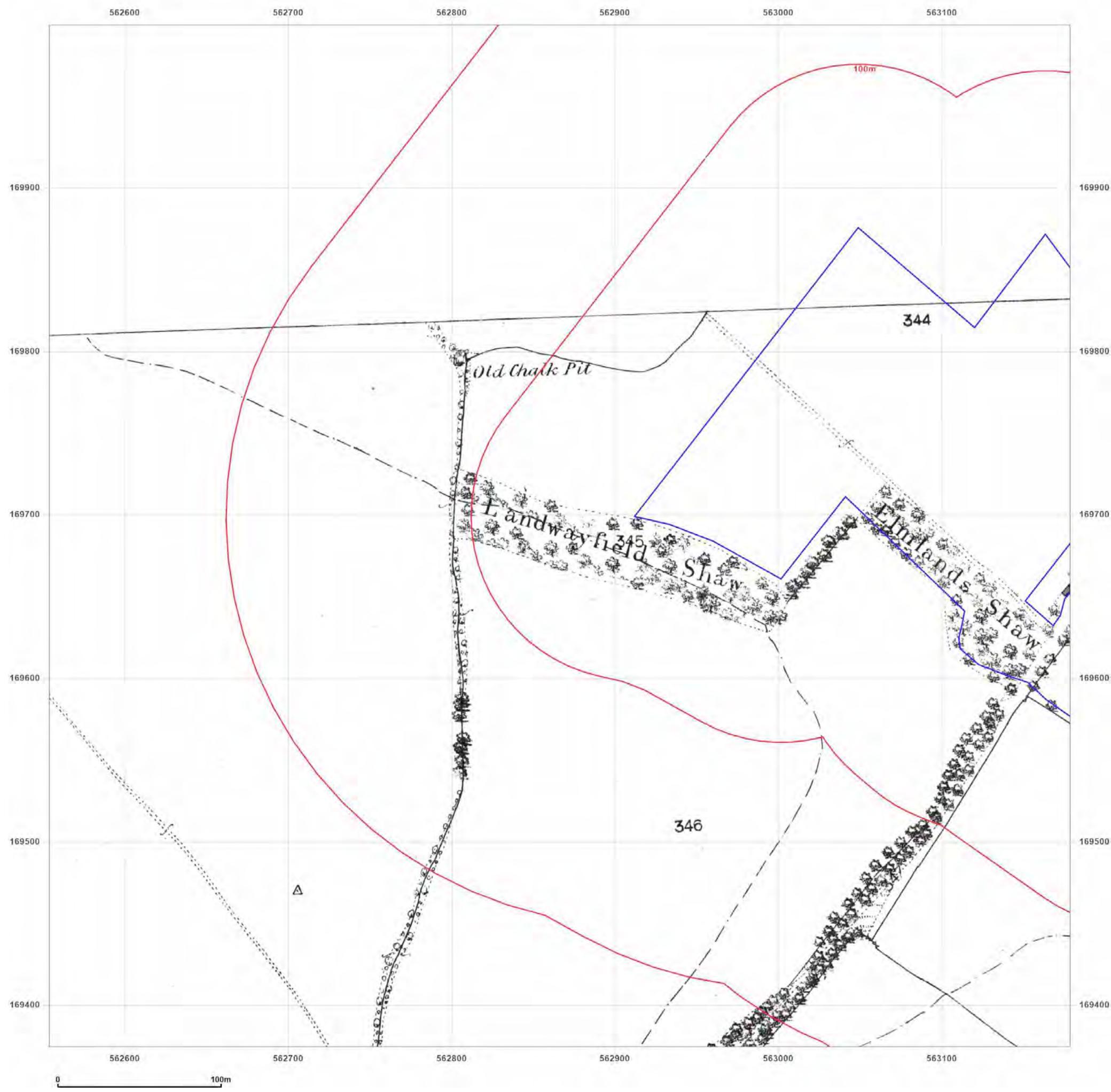


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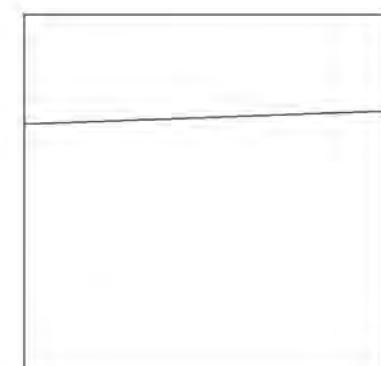
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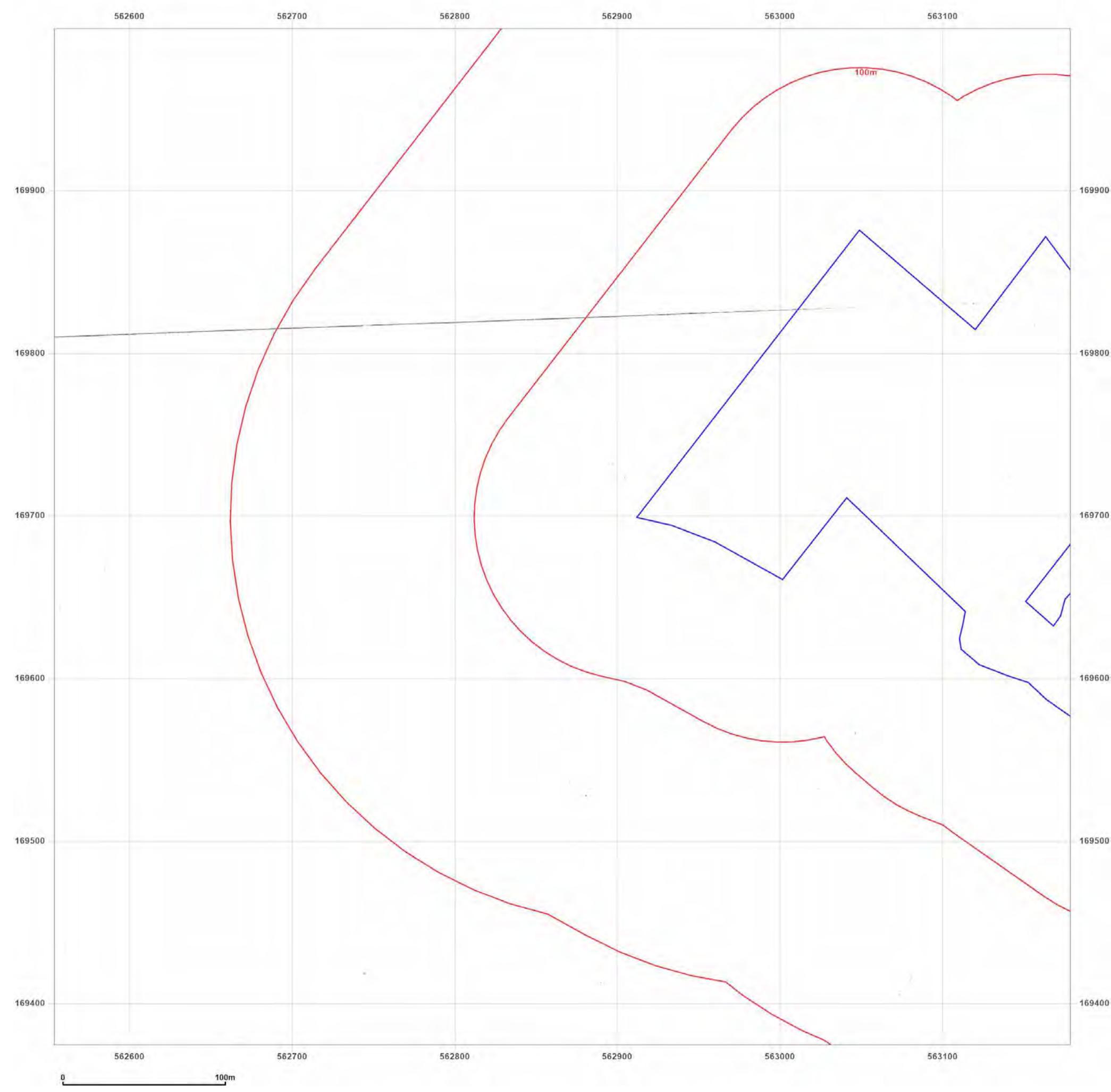


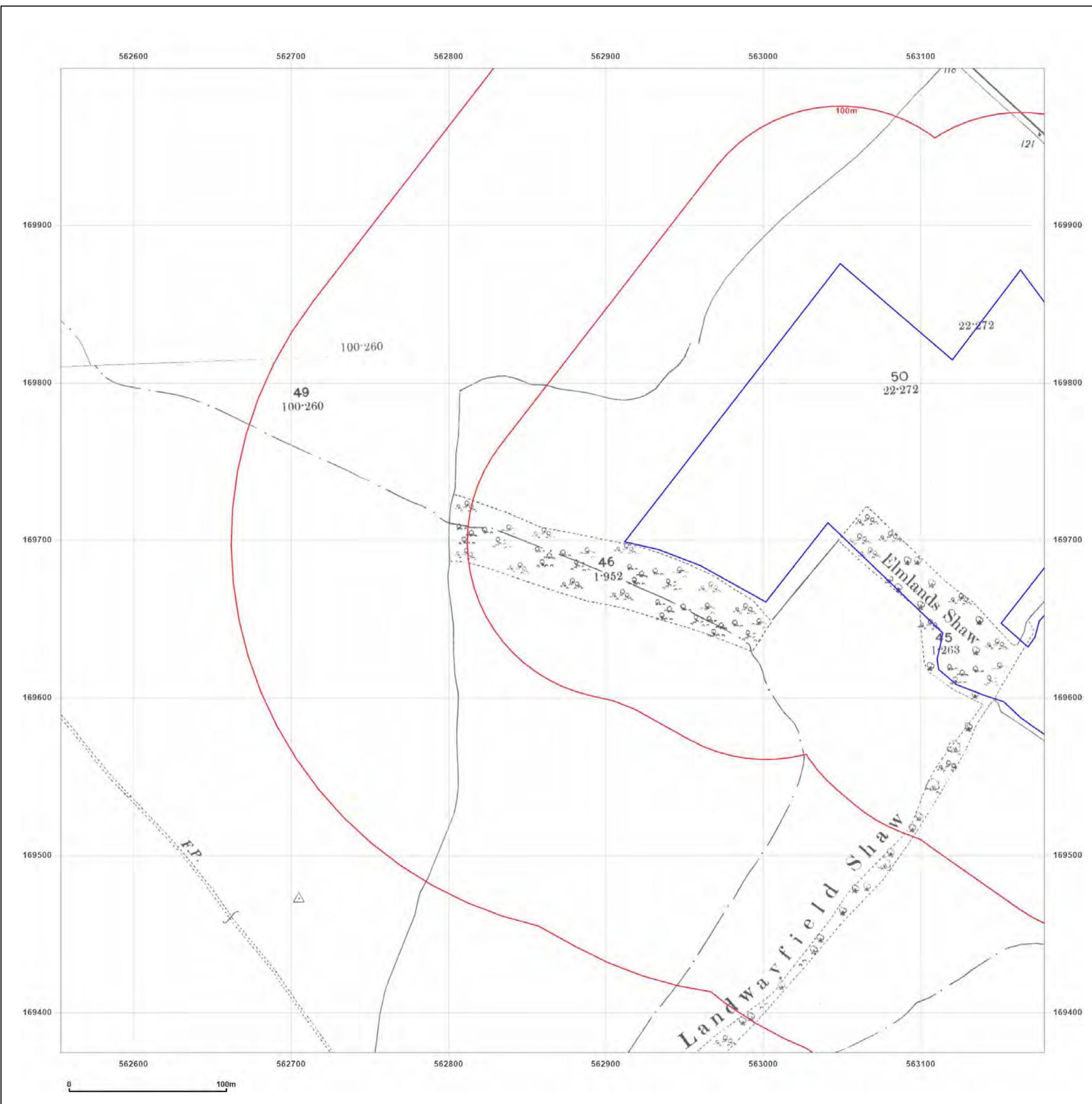
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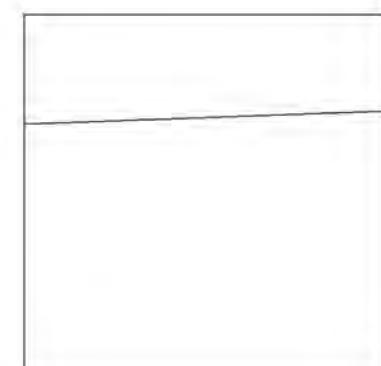


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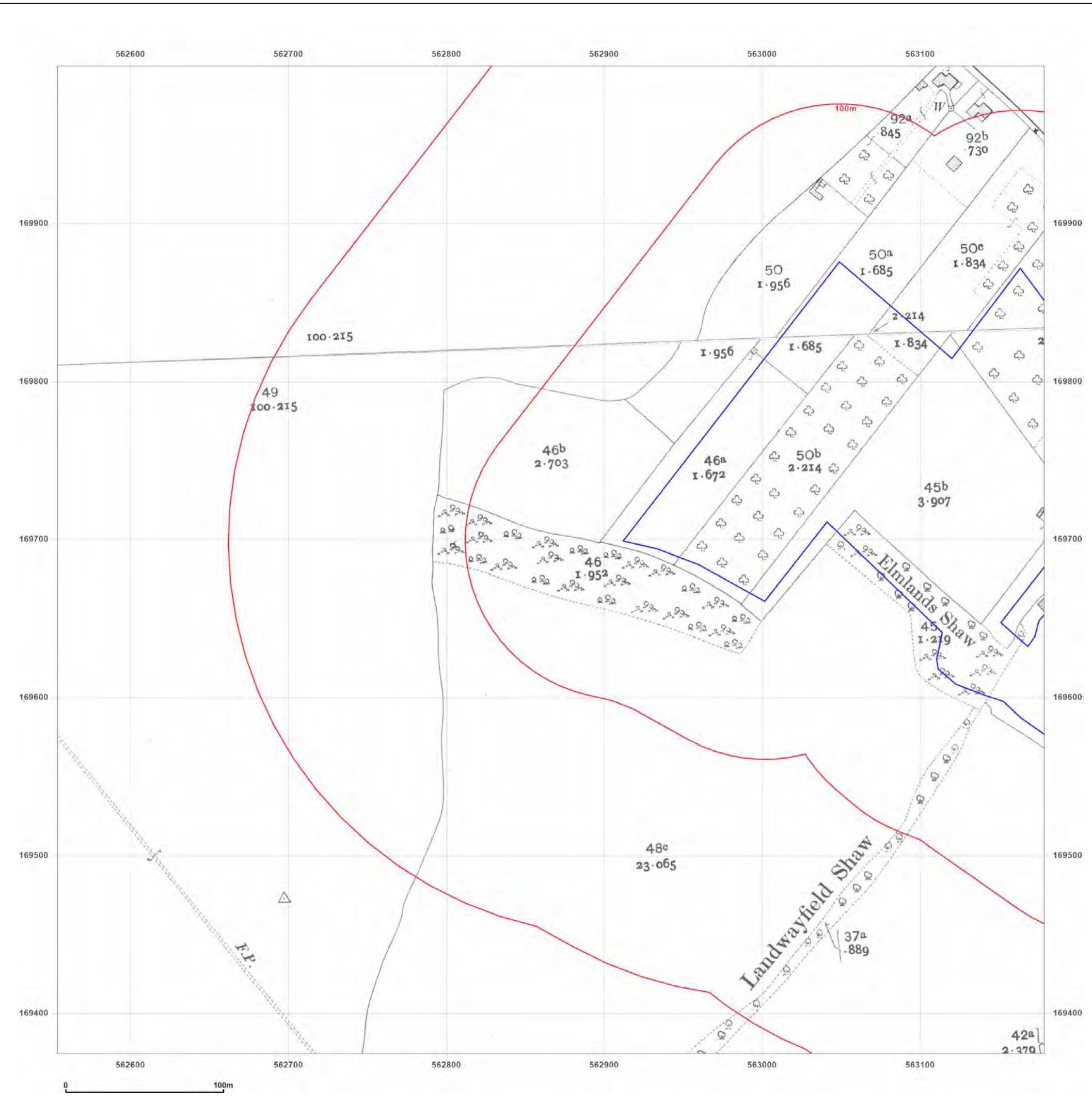


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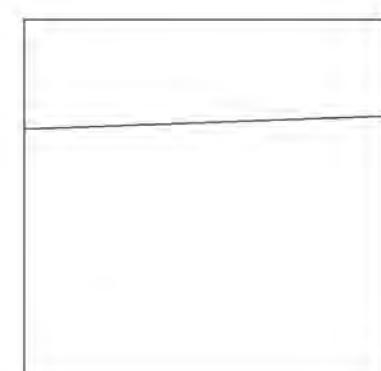


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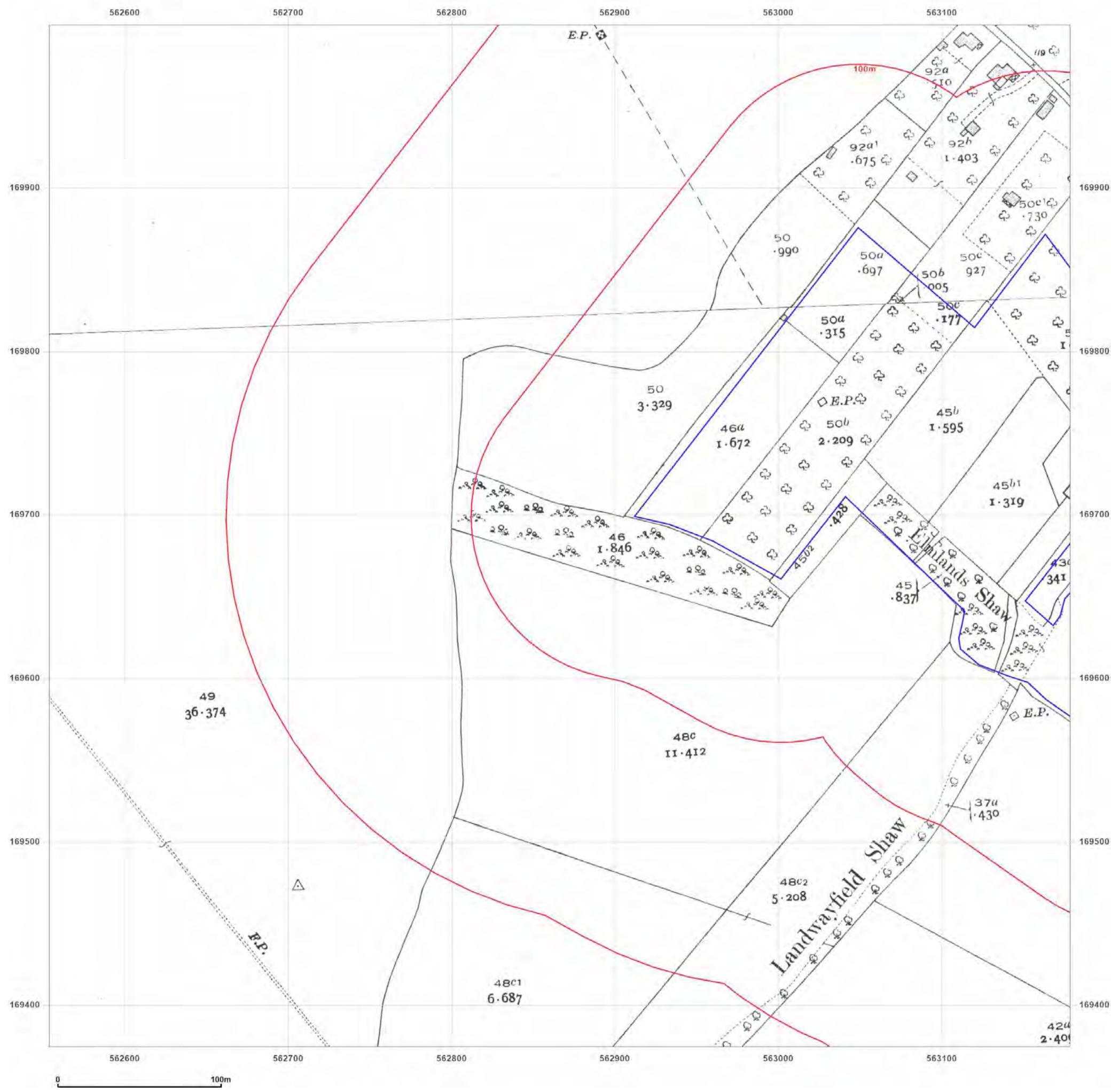


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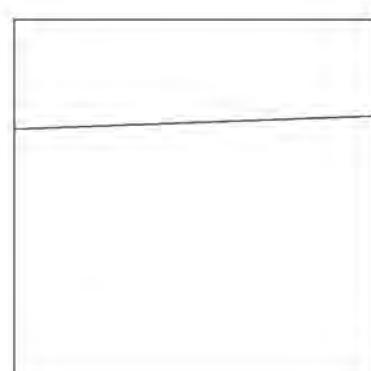


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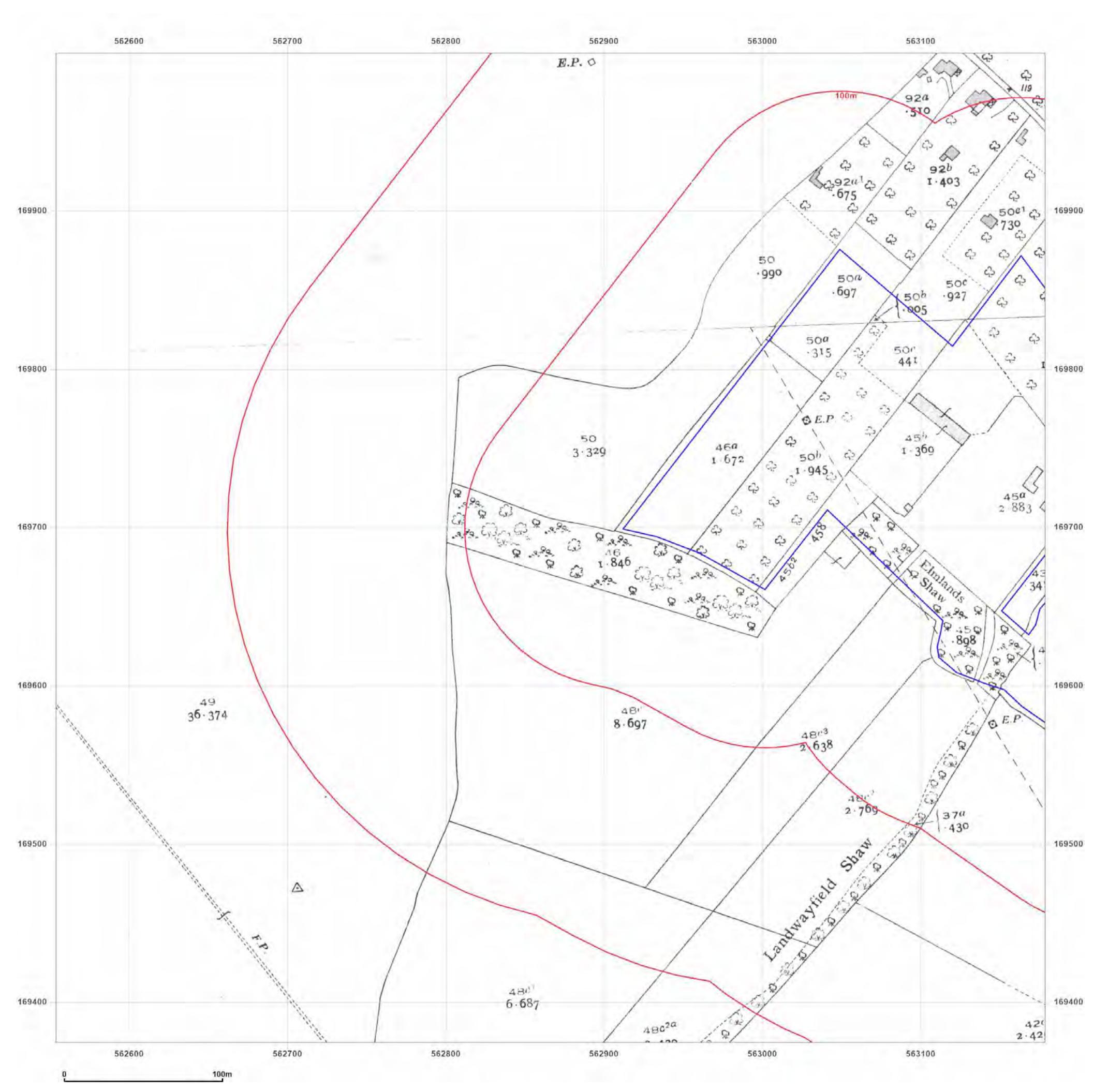


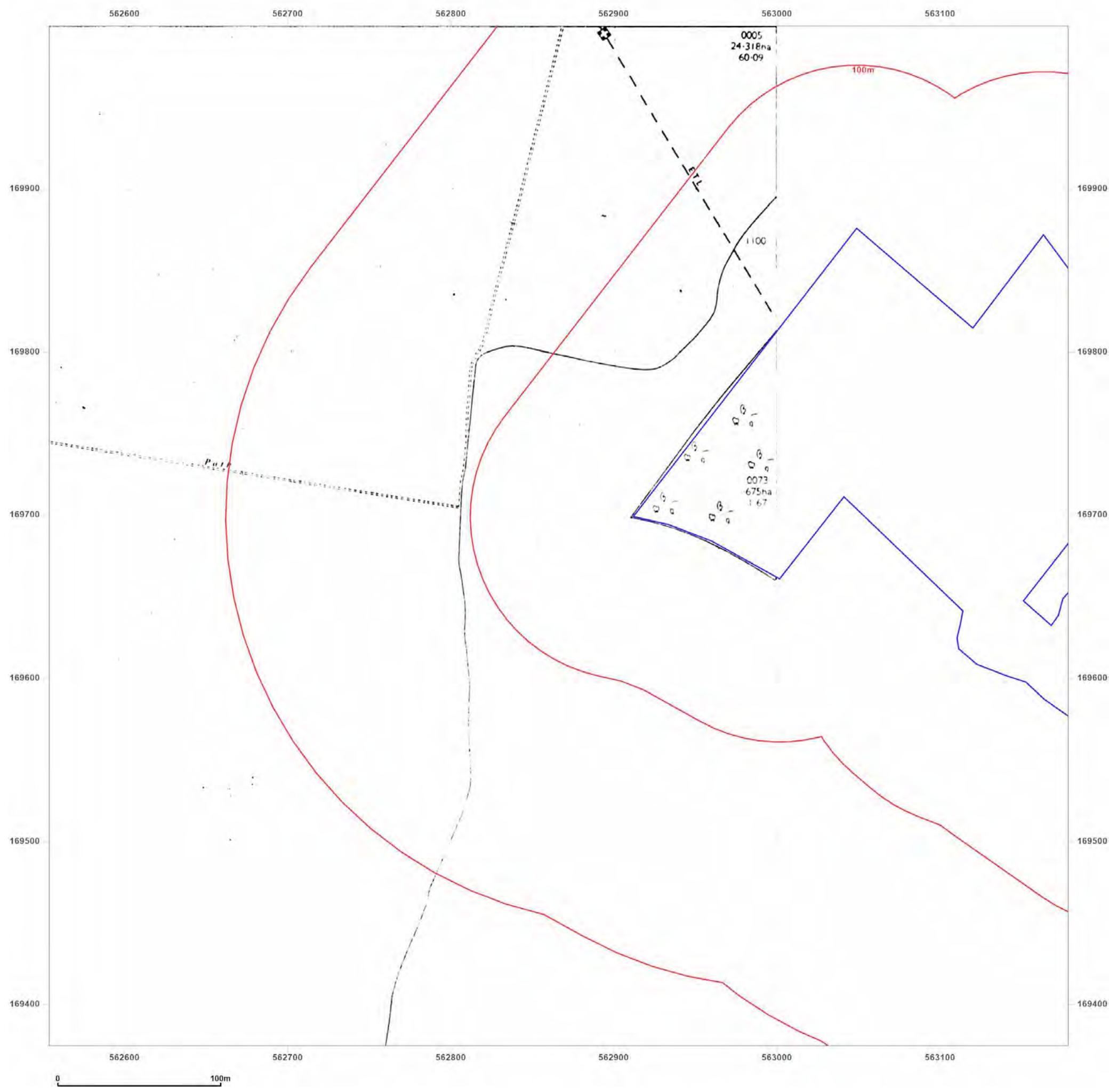
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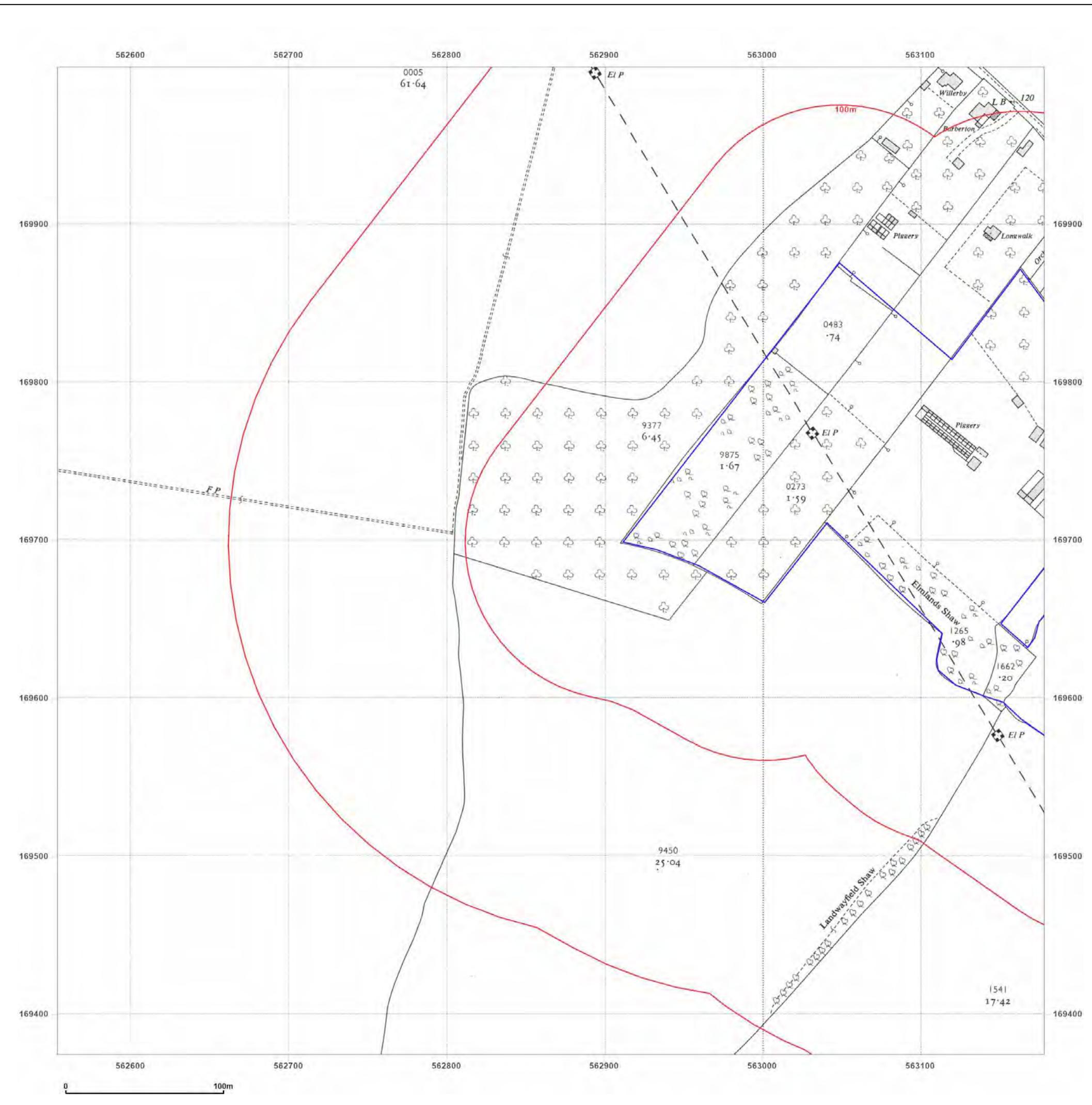


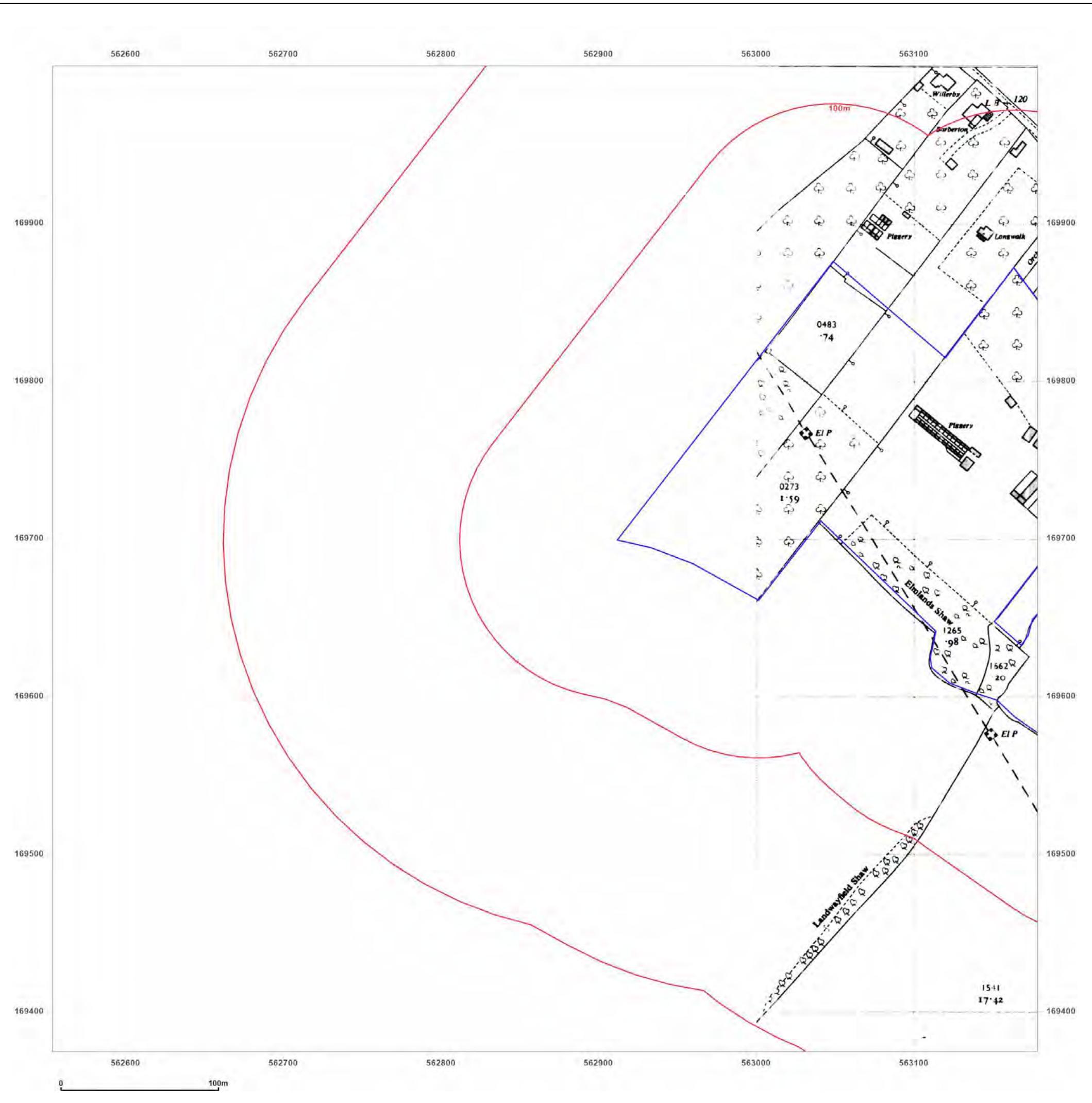
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 Levelled N/A

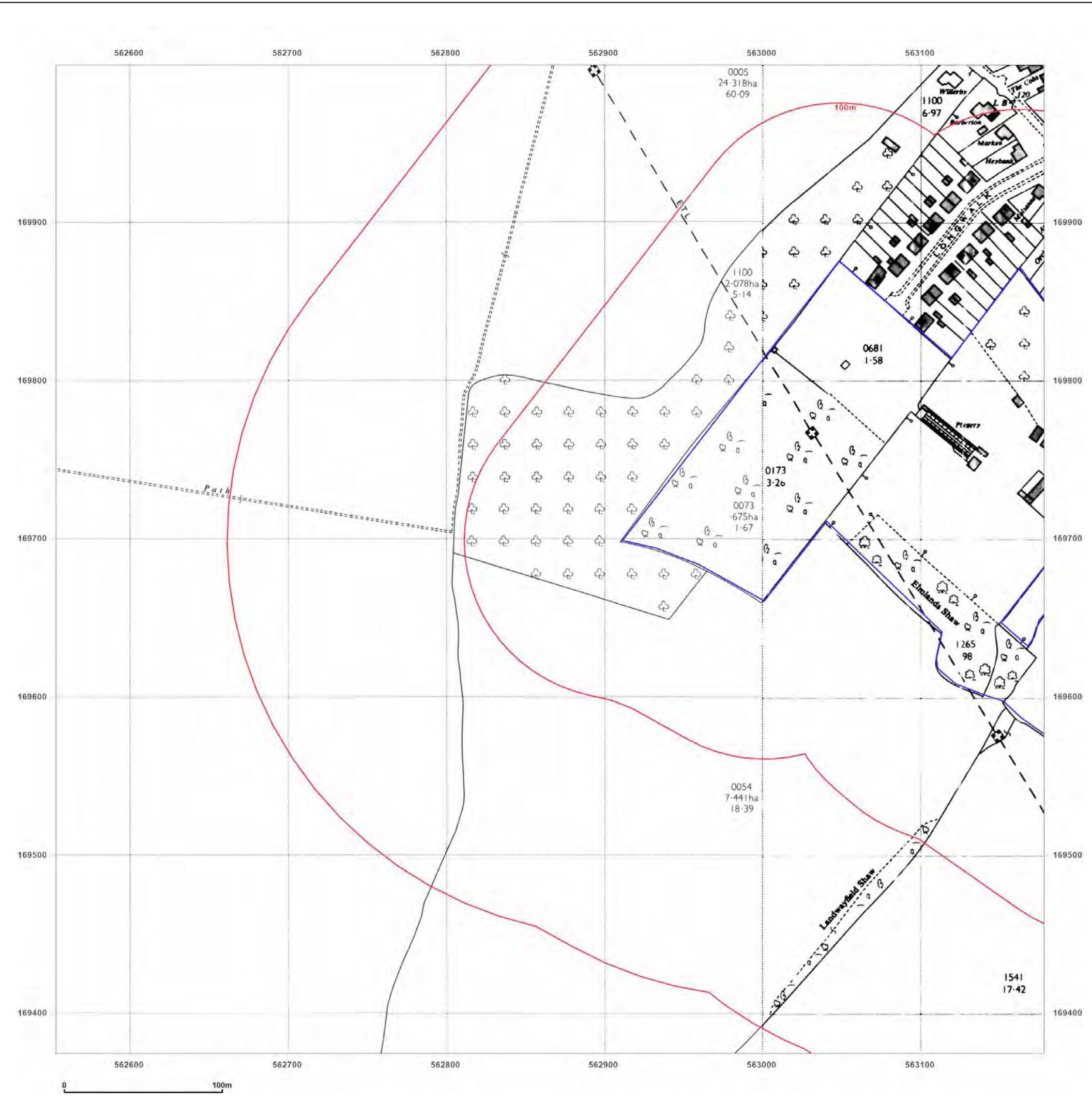


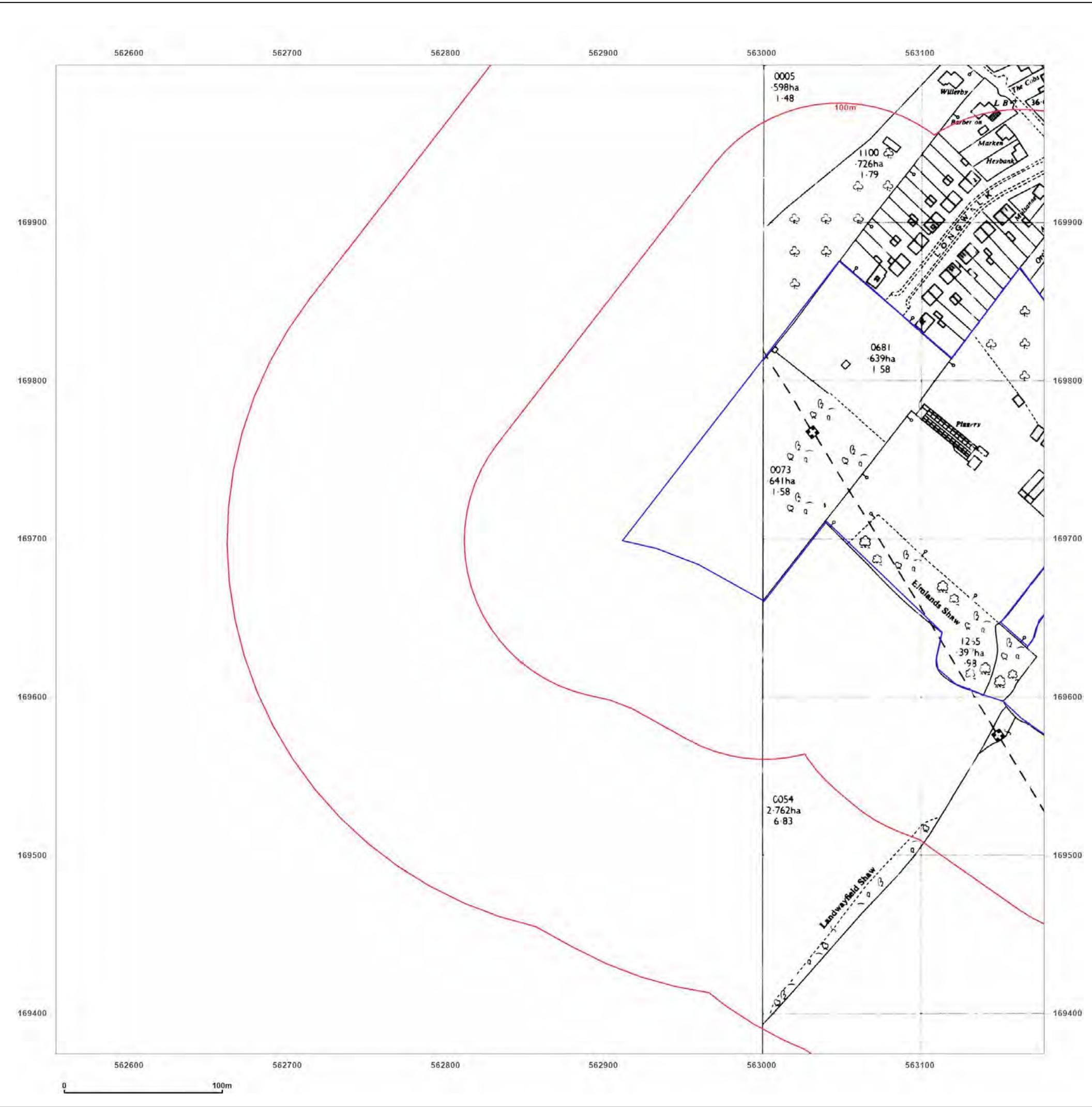
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Site Details:

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KENT, DA13 9JE

Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_1_1
Grid Ref: 562866, 169687

Map Name: National Grid

Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1967
 Revised 1967
 Edition N/A
 Copyright 1968
 Levelled 1952

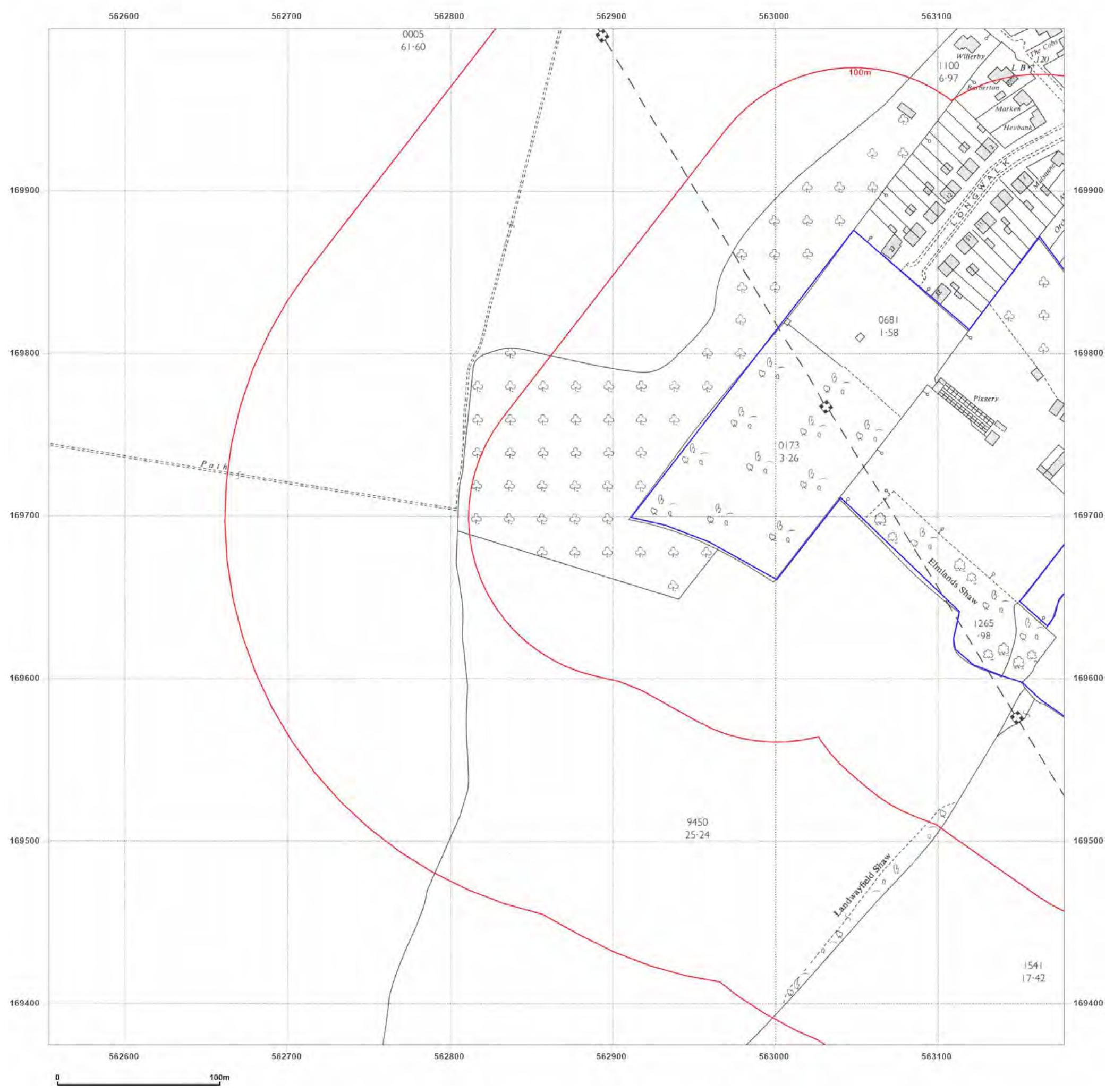


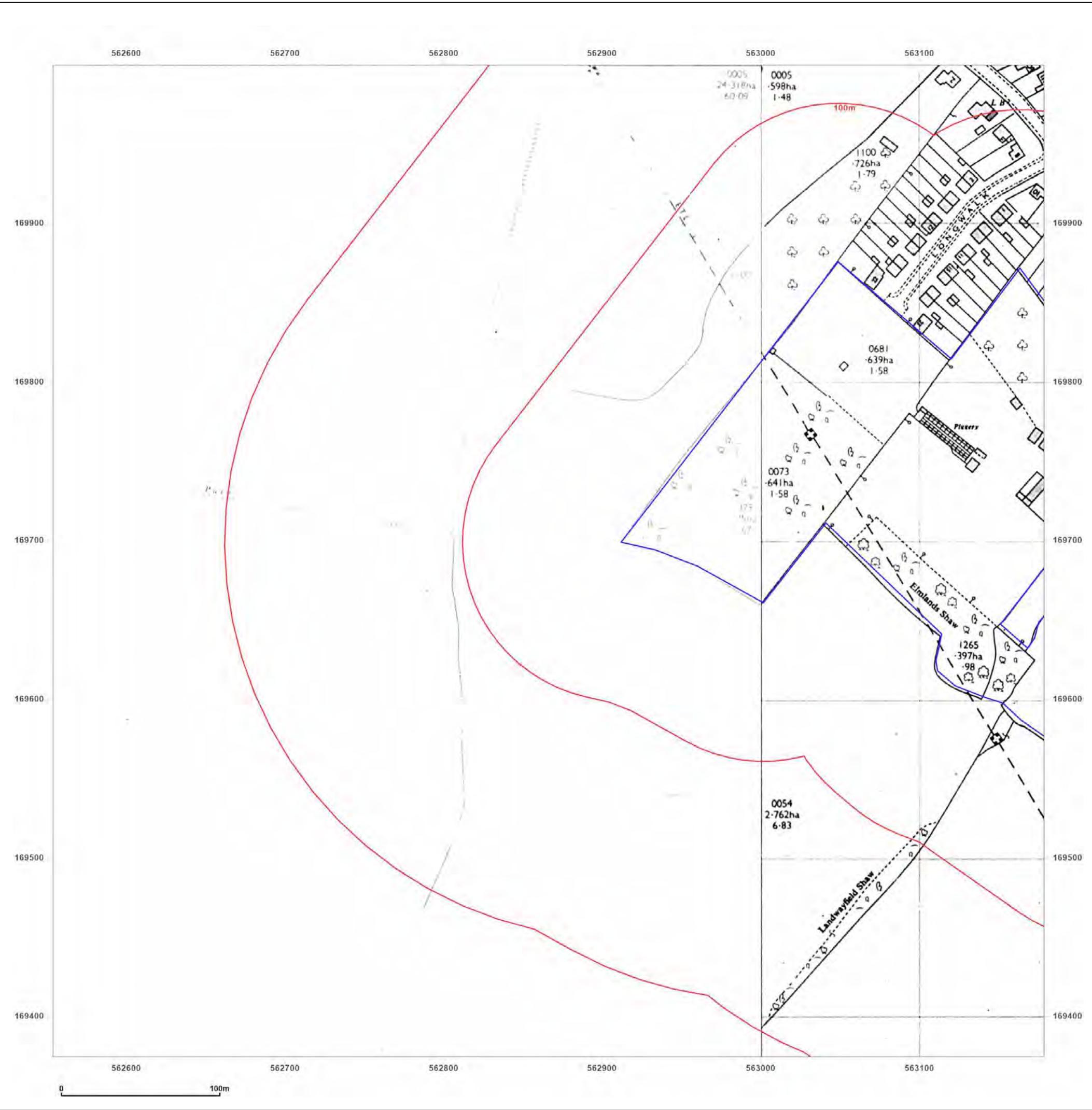
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Site Details:

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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_1_1
Grid Ref: 562866, 169687

Map Name: National Grid

Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1983
 Revised 1983
 Edition N/A
 Copyright 1984
 Levelled 1952

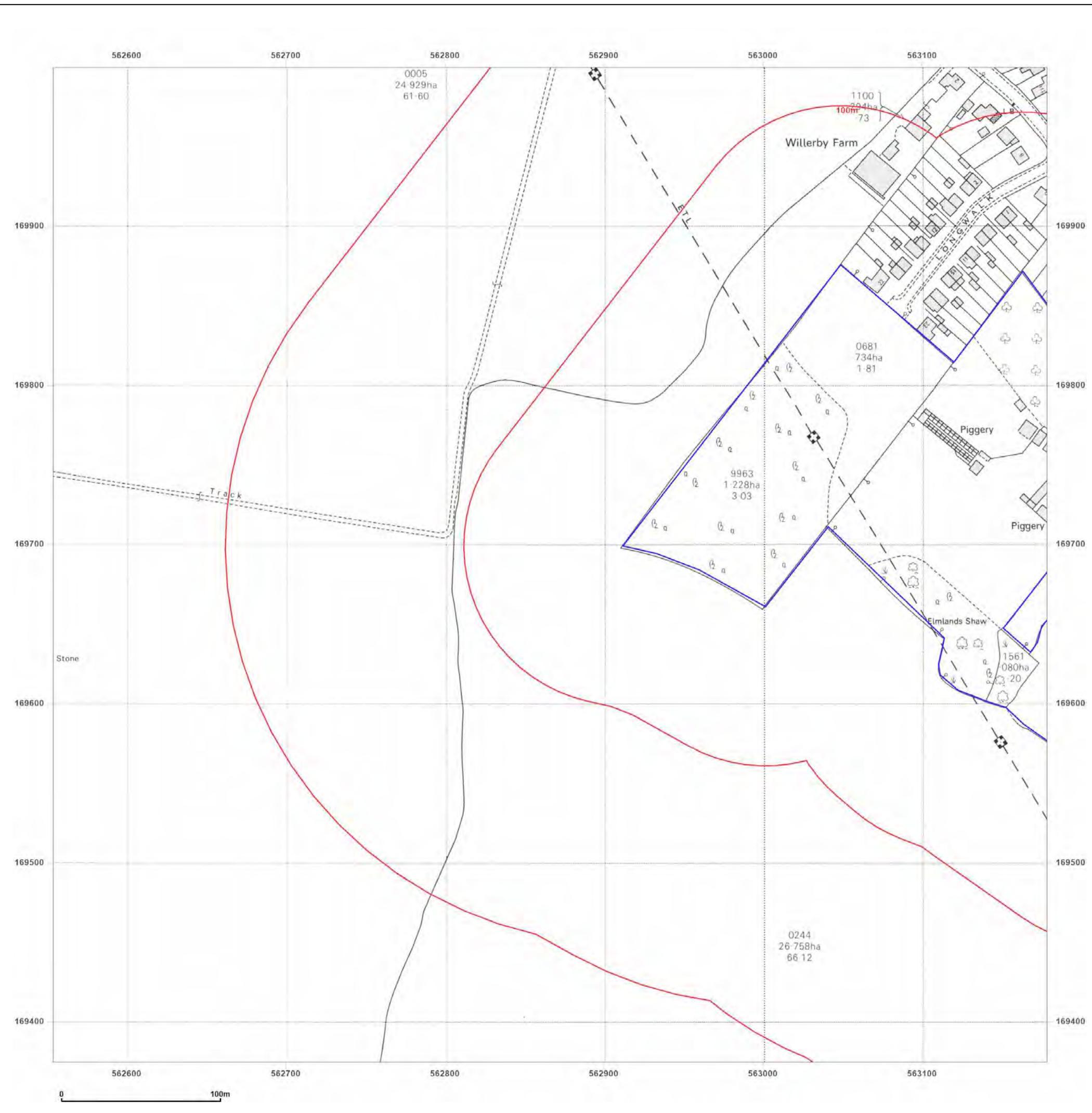


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Site Details:

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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_1_1
Grid Ref: 562866, 169687

Map Name: National Grid



Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1983
 Revised 1983
 Edition N/A
 Copyright 1984
 Levelled 1983

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

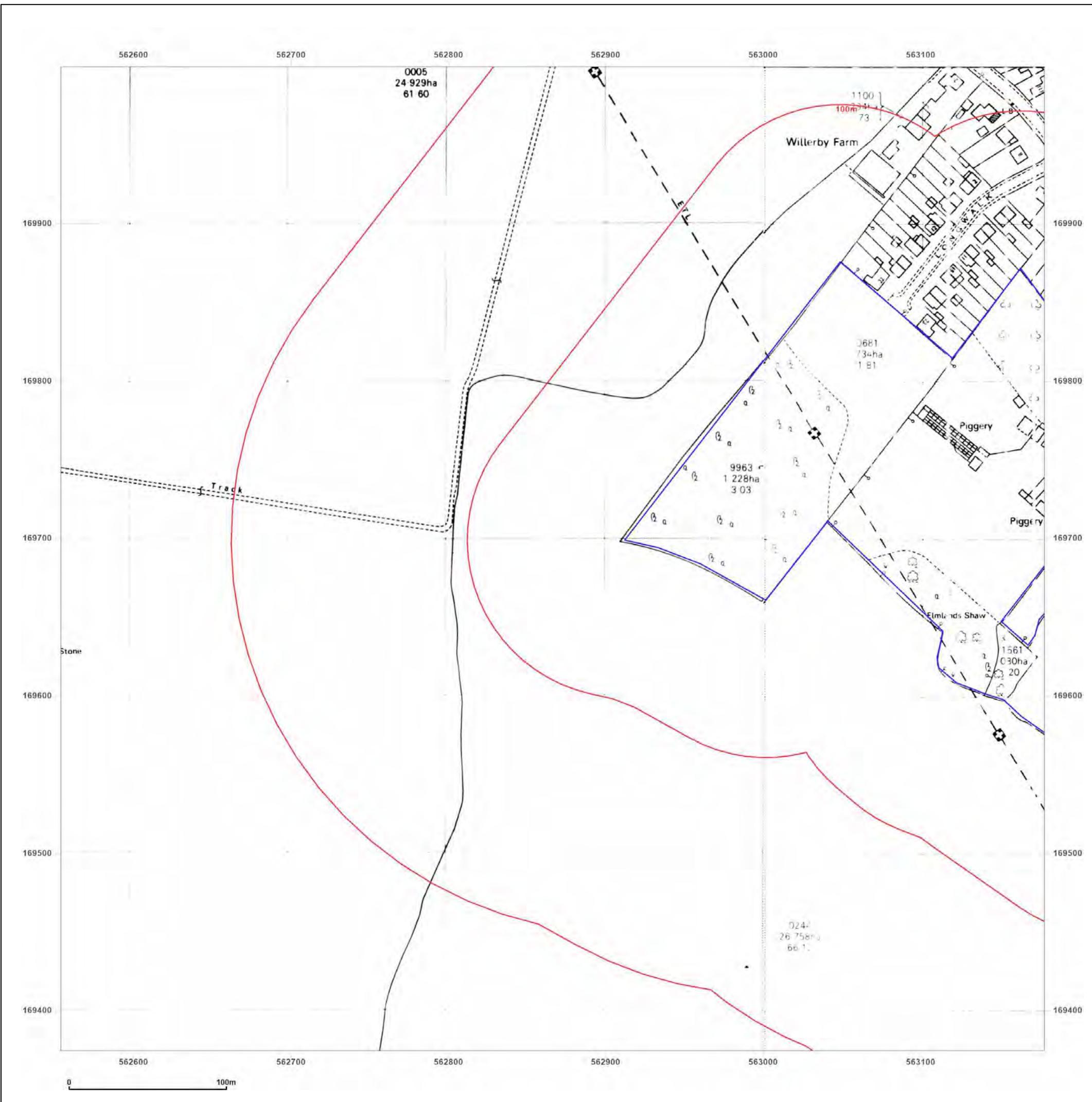


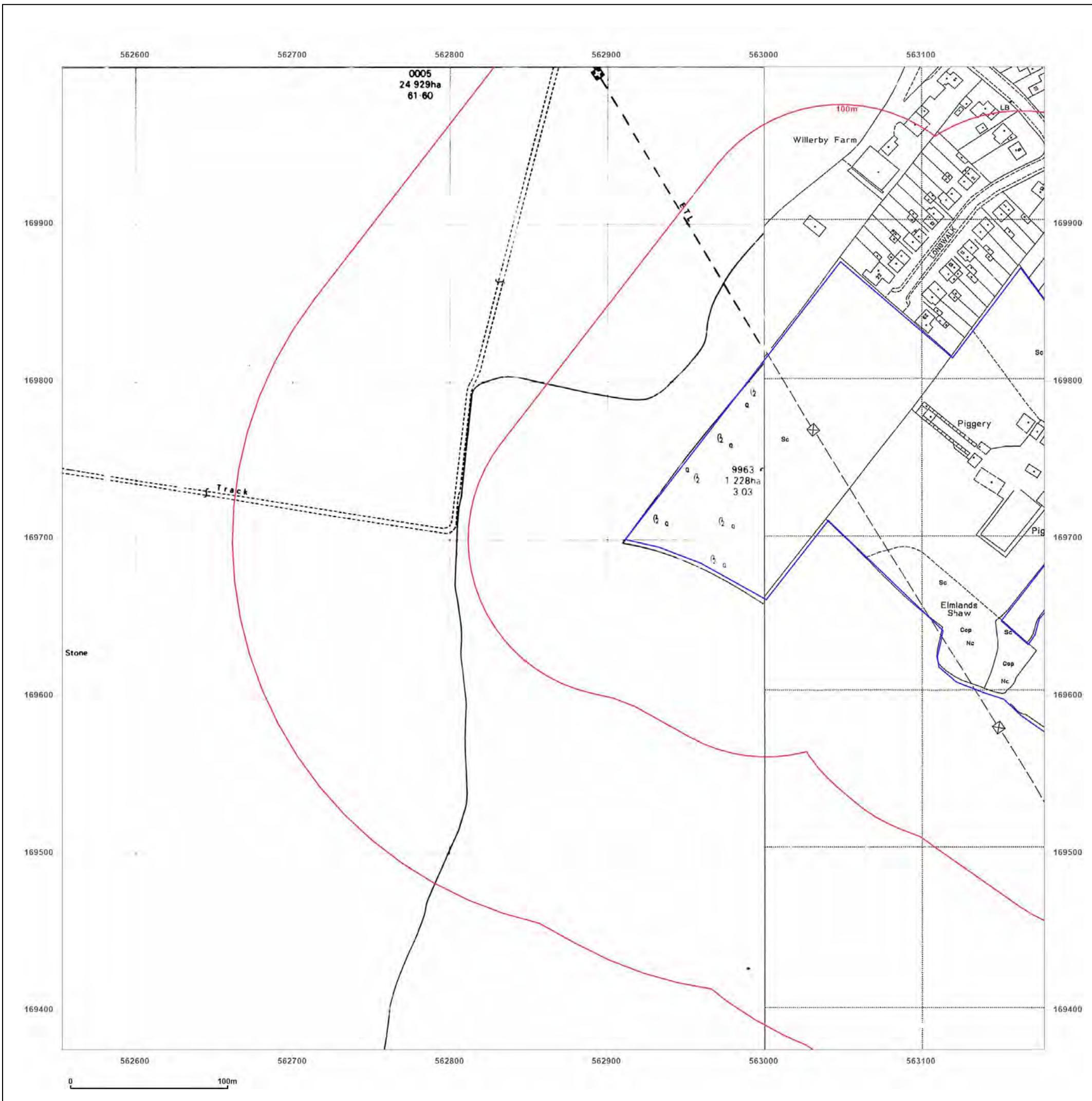
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Site Details:

Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_1_1
Grid Ref: 562866, 169687

Map Name: National Grid

Map date: 1990-1995

Scale: 1:2 500

Printed at: 1:2 500



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

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

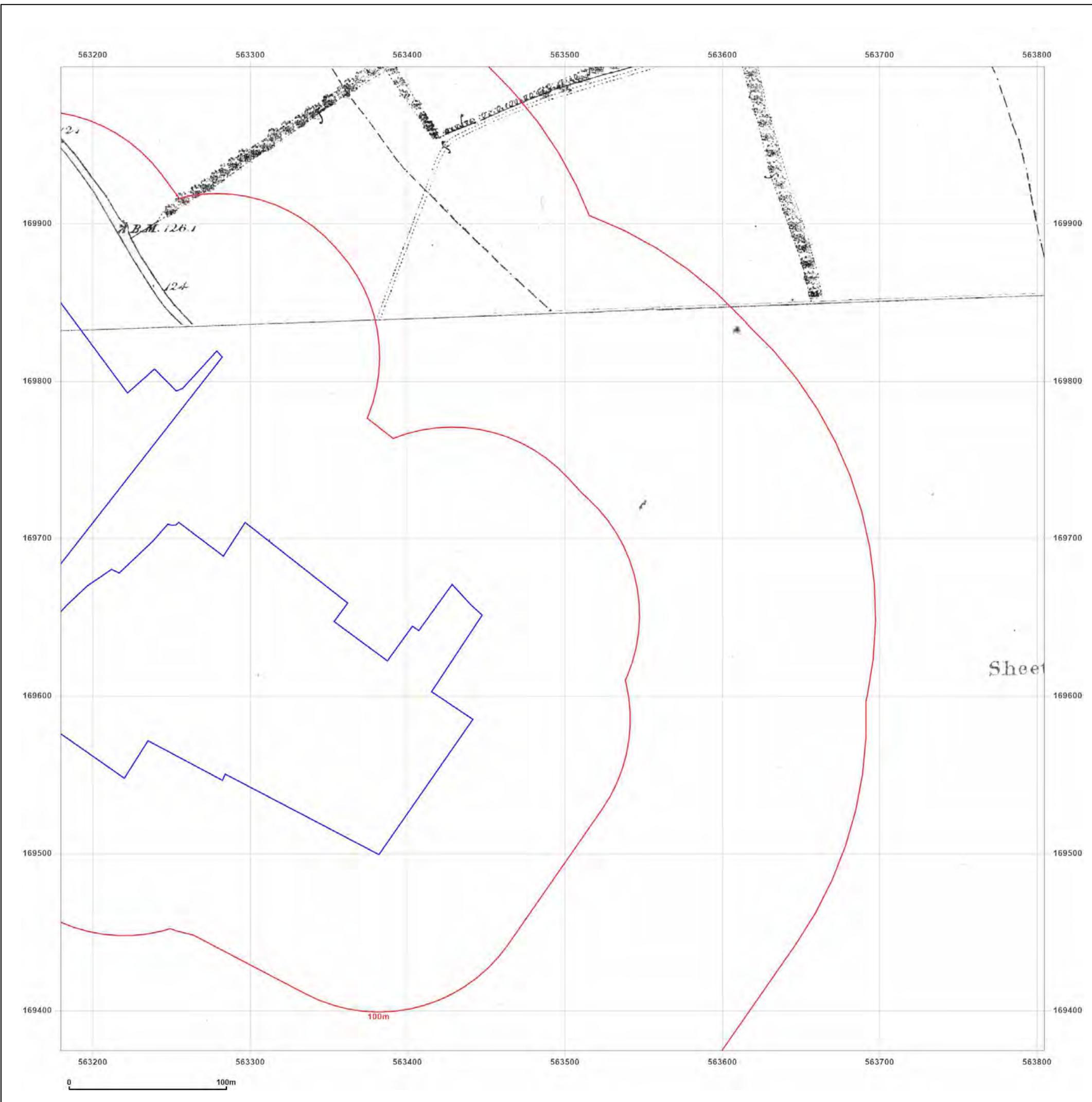


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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: County Series

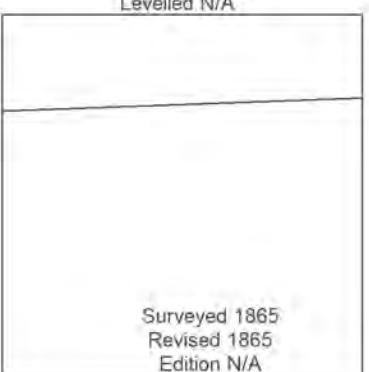
Map date: 1865

Scale: 1:2,500

Printed at: 1:2,500



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



Sheet

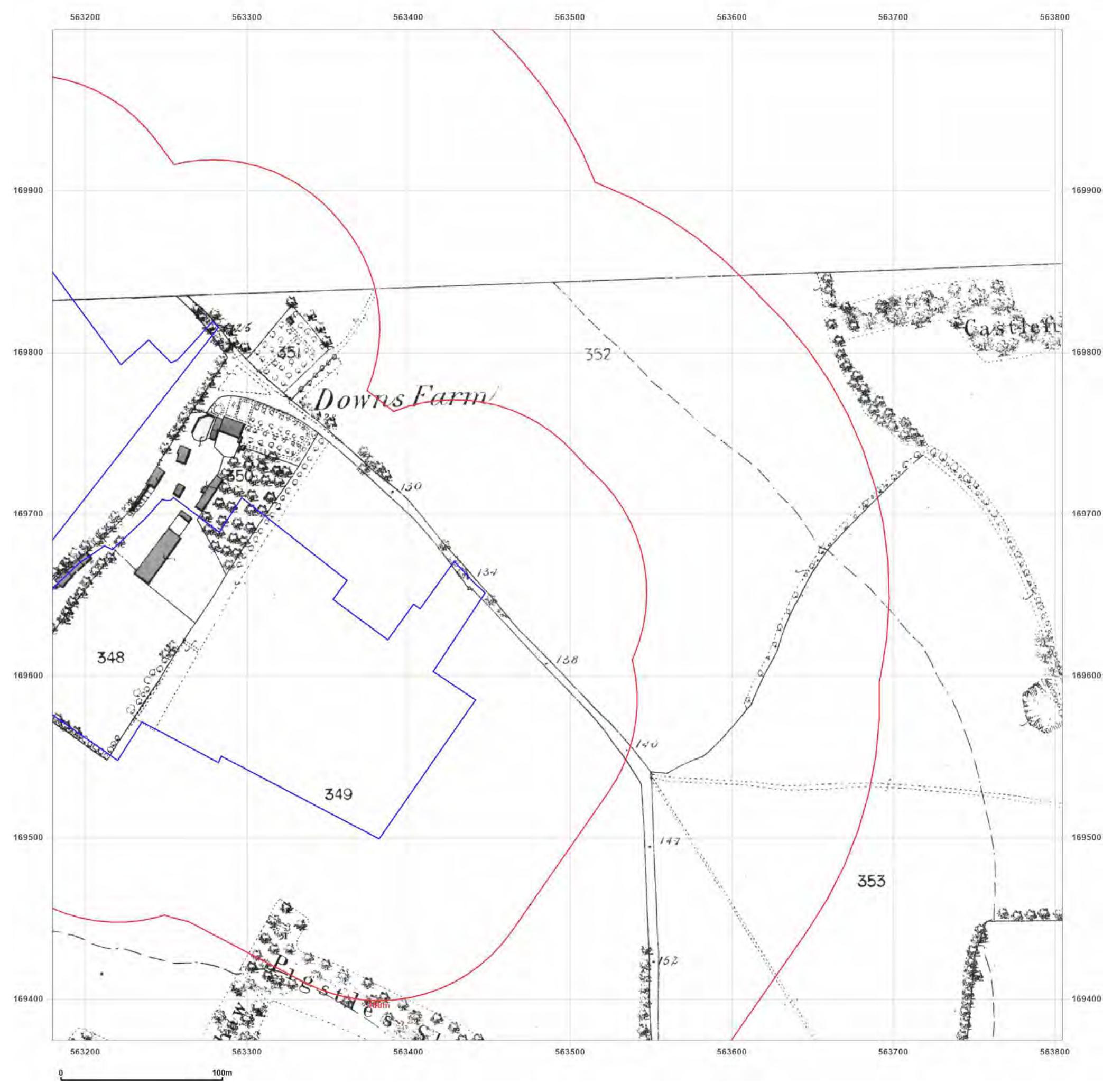


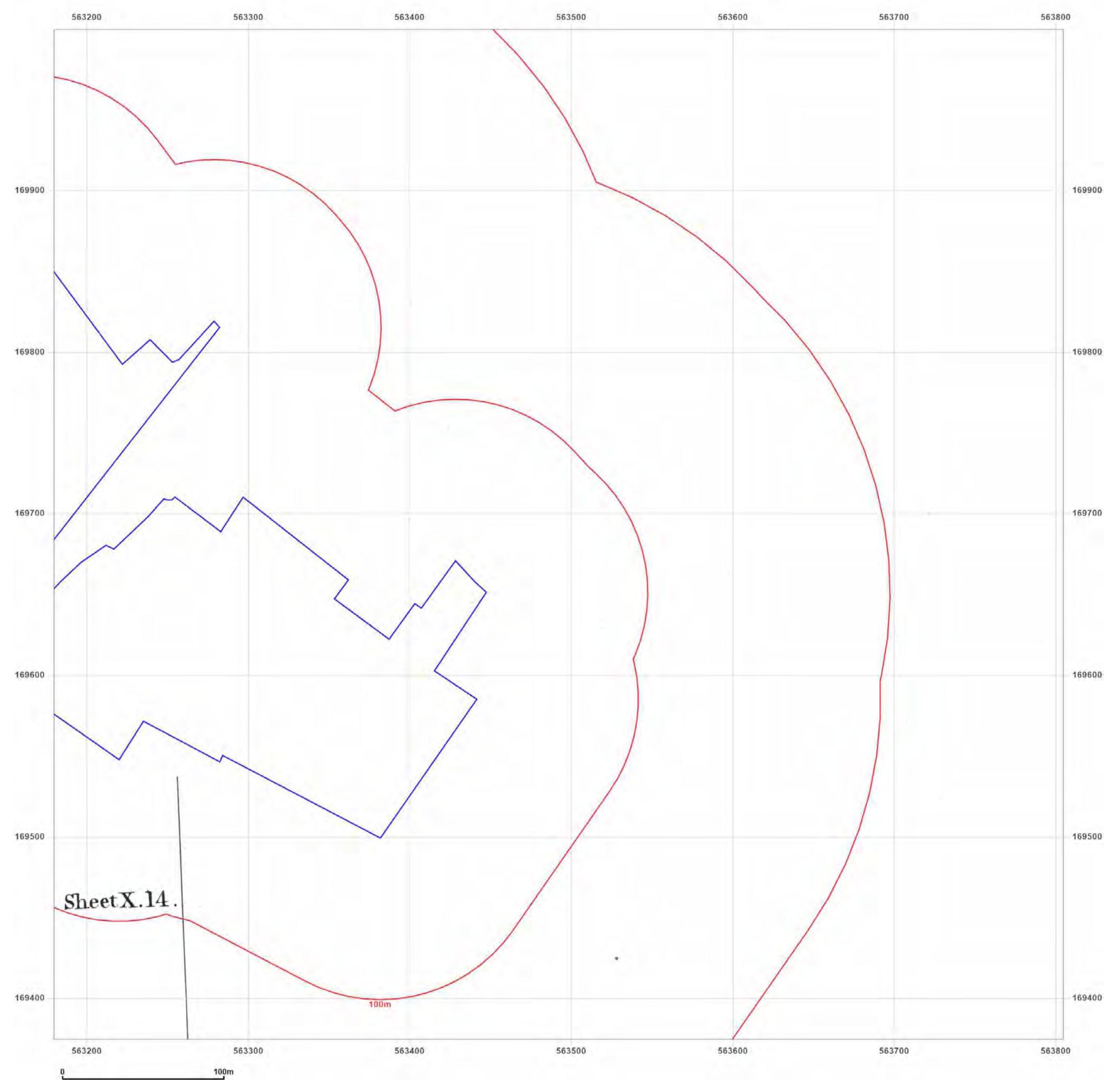
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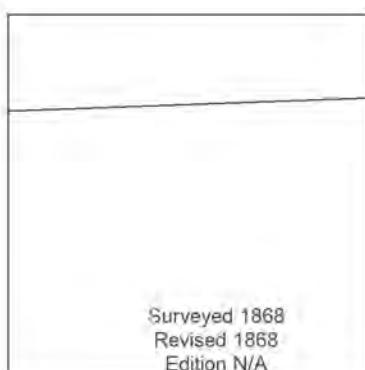
Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: County Series

Map date: 1868

Scale: 1:2,500

Printed at: 1:2,500

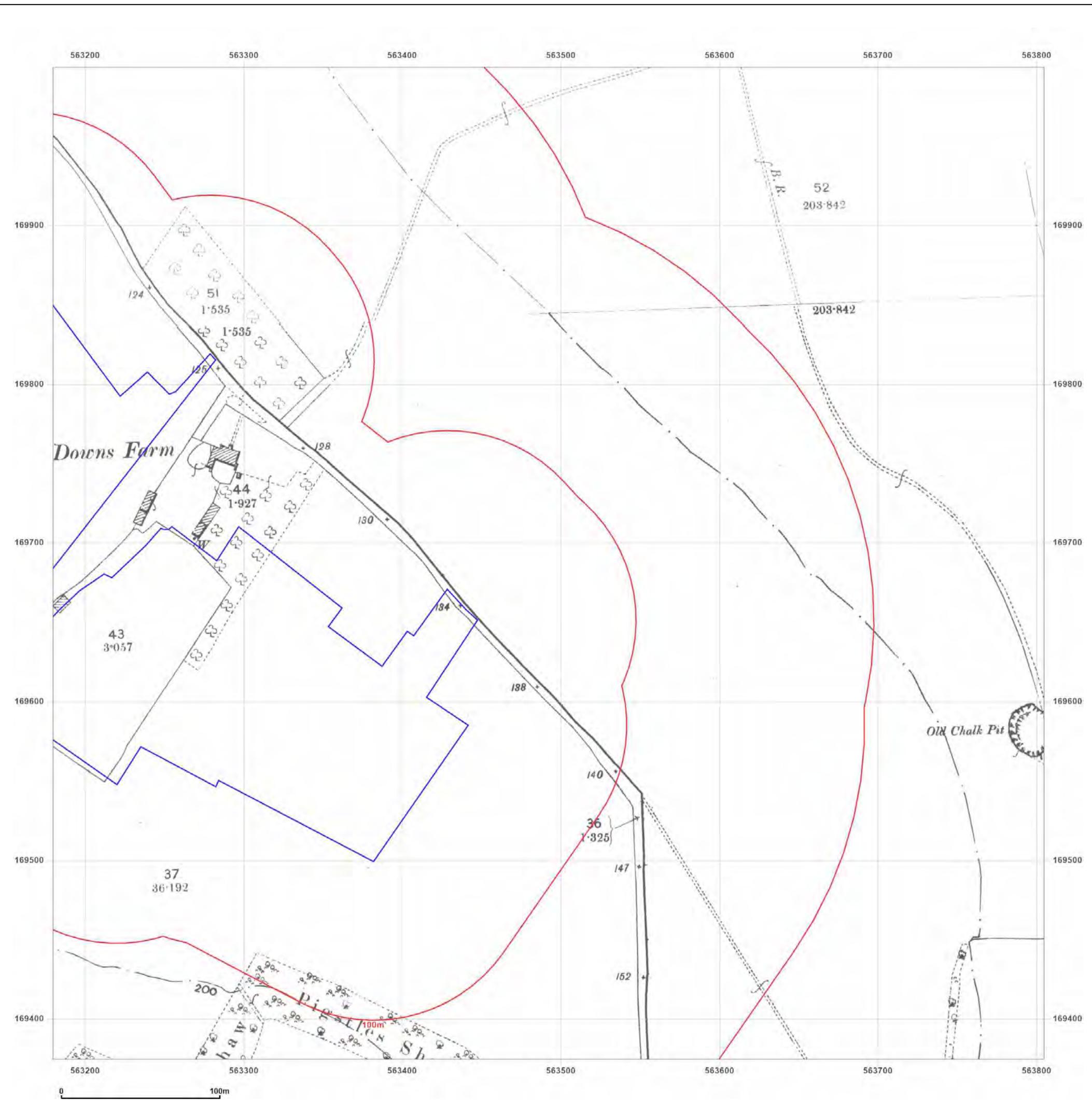


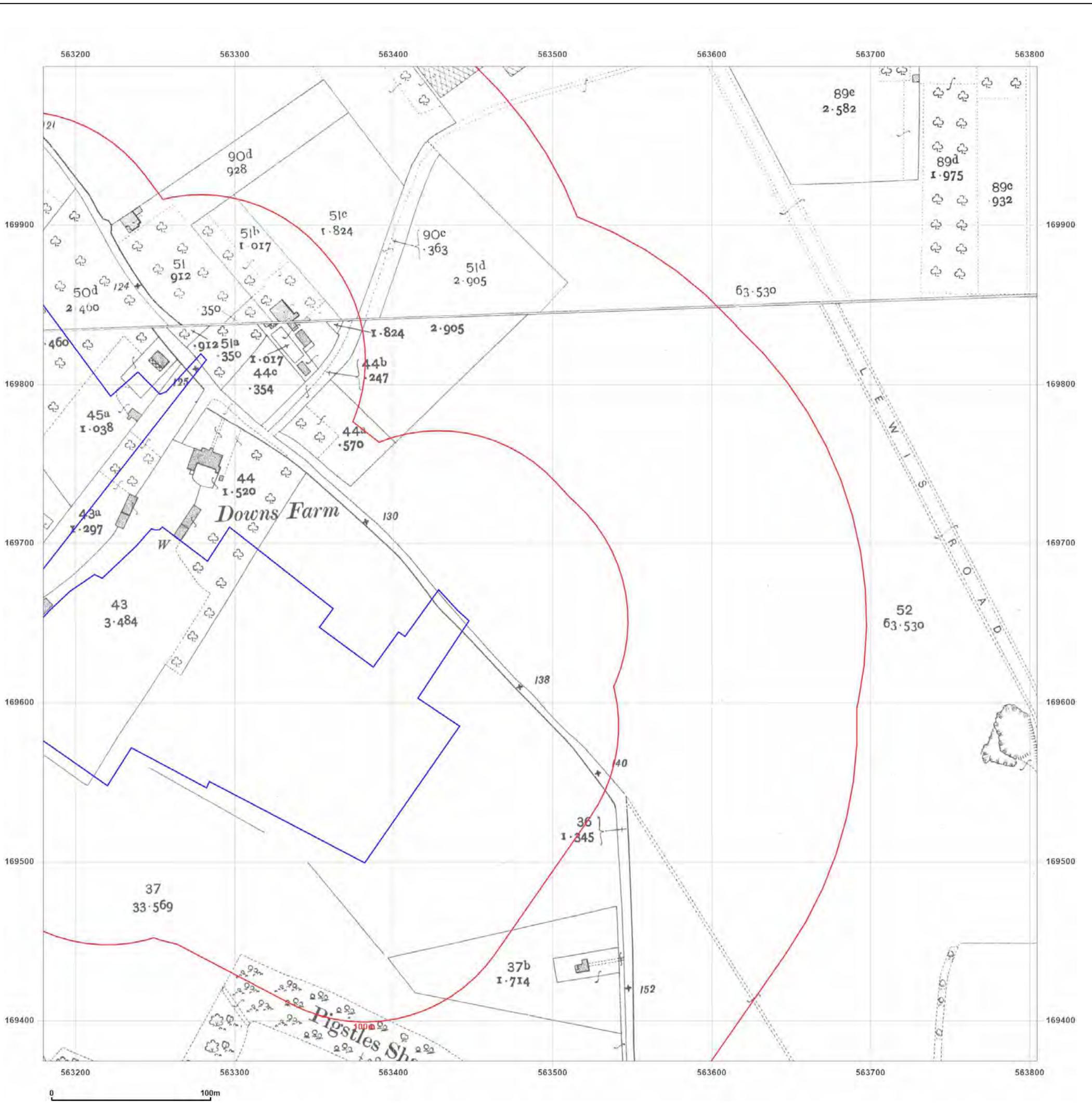
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Site Details:

100
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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: County Series

Map date: 1908

Scale: 1:2,500

Printed at: 1:2,500



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

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



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: County Series

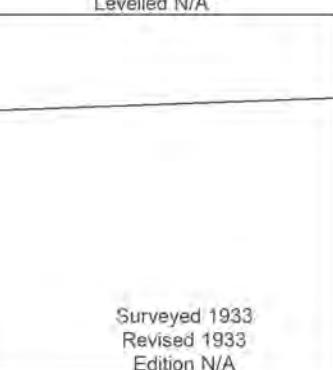
Map date: 1933-1938

Scale: 1:2,500

Printed at: 1:2,500



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

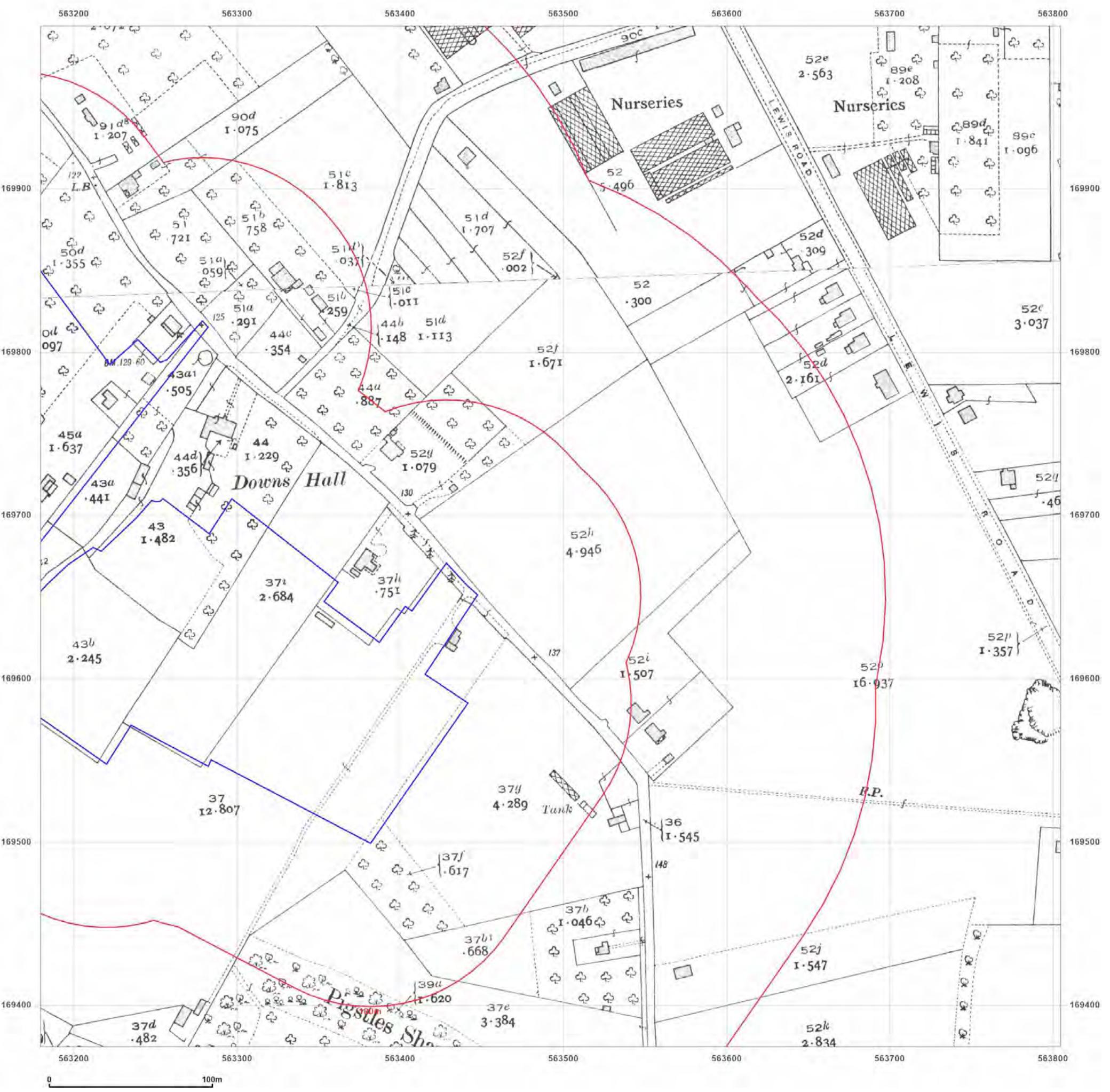


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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: County Series

Map date: 1933-1938

Scale: 1:2,500

Printed at: 1:2,500



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

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



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid

Map date: 1961

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1960
 Revised 1960
 Edition N/A
 Copyright 1961
 Levelled 1952



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid



Map date: 1961

Scale: 1:2,500

Printed at: 1:2,500

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



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid



Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500

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



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid

Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500



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



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid

Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1967
 Revised 1967
 Edition N/A
 Copyright 1968
 Levelled 1952



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid



Map date: 1978

Scale: 1:2,500

Printed at: 1:2,500

Surveyed 1952
 Revised 1978
 Edition N/A
 Copyright 1978
 Levelled 1952



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid

Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1983
 Revised 1983
 Edition N/A
 Copyright 1984
 Levelled 1952



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Client Ref: 25-185-MM-25046
Report Ref: HMD-155-KEZ-ZEC-9M8-F75_LS_2_1
Grid Ref: 563492, 169687

Map Name: National Grid



Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500

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



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