GRAVEN HILL, D1 SITE, BICESTER

Ground Conditions Summary Report

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1 INTRODUCTION

1.1 Background

1.1.1 RPS Consulting Services Ltd (RPS) has been commissioned by Graven Hill Purchaser Ltd (the Client) to produce a Ground Conditions Summary Report for a parcel of land in the southern area of the former MoD Graven Hill site, Bicester (herein referred to as the 'Assessment Site').

1.1.2 The Client is currently planning to submit an outline planning application for the redevelopment of the Assessment Site as a logistics hub. The location of the Assessment Site is shown on Drawing JER9528-001 and the proposed parameters plan is included within Appendix A.

1.1.3 This report has been developed to support the outline planning application and assesses the ground conditions at the Assessment Site with respect to contamination risks in relation to the proposed commercial development.

1.2 Objectives

1.2.1 The objectives of this report are to:

- Determine the likely existing ground conditions and site sensitivity, including contamination, geological, hydrogeological and hydrological conditions, through a review of available reports in relation to ground conditions at the Assessment Site;
- Identify the potential for contamination sources to be present in relation to historical activities at the Assessment Site;
- Undertake a review of environmental information and available ground investigation information;
- Identify potential contamination pathways and the presence of sensitive receptors at and in the vicinity of the Assessment Site;
- Present a Conceptual Site Model (CSM) that identifies any potential pollutant linkages at the Assessment Site;
- Undertake a risk assessment that determines potential levels of risk to human health and controlled waters with respect to contamination, based upon a proposed commercial development scenario; and
- Determine the requirement for additional ground investigation and / or remediation to support development of the Assessment Site.

1.3 Sources of Information

1.3.1 The following sources of information were used to inform this report and, where not authored by RPS, have been assumed to be accurate and reliable:

- RPS, Graven Hill, Bicester – Ground Conditions Assessment, February 2021 (RPS, 2021a);
- RPS, Graven Hill, Bicester – Ground Conditions Assessment, EL1 Area, February 2021 (RPS, 2021b);
- RPS, Graven Hill, Bicester – Ground Investigation Review, February 2021 (RPS, 2021c);
- Envirocheck Data Report, purchased in February 2021 and included within Appendices B and C;
- Internet mapping tools including British Geological Survey (BGS) and magic.gov.uk;

- Entec, March 2011 – Additional Sites 1 & 2 Adjacent Sites D&E, DSDC Bicester – Land Quality Assessment (including Bactec UXO report) (Entec, 2011);
- Entec, May 2010 – Sites D&E, DSDC Bicester – Land Quality Assessment Phase 1 (Entec, 2010a);
- Entec, September 2010, DSDC Bicester – Land Quality Assessment Phase 2 (including information on a luminised dial discovery) (Entec, 2010b);
- Waterman Group. Ground Investigation (Interpretative) Report, Project D1 Employment Land, Graven Hill, Bicester, November 2020 (Draft) (Waterman, 2020);
- Conversations with Waterman Group at the time of the production of the Ground Conditions Assessments referenced above.

1.4 Limitations of Report

1.4.1 This report is based upon the information available at the time of production, as detailed within Section 1.3, and the study area is limited to the boundaries shown on Drawing JER9528-001. Should the proposed redevelopment plans change or the study boundary be amended, the scope and findings of this report may require review.

1.5 Report Structure

1.5.1 The remainder of this report is structured as follows:

Section 2	Site Description and Environmental Setting
Section 3	Ground Investigation and Risk Assessment
Section 4	Conceptual Site Model
Section 5	Conclusions and Recommendations

2 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

2.1 Introduction

2.1.1 The following section provides background information on the Assessment Site including site history, geology, hydrogeology and hydrology. The presented information is based on a review of available information as detailed within Section 1.3.

2.2 Site Location and Description

Site Location

2.2.1 The Assessment Site is located approximately 1.5 km to the south of Bicester, Oxfordshire, with a grid reference for the approximate centre of SP59149 19793. The Assessment Site occupies an area of approximately 30 Ha.

2.2.2 The Assessment Site is bound to the north by Graven Hill Wood, to the east by agricultural land with the village of Ambrosden beyond, the west by MoD barracks and land believed to be under the ownership of the MoD, and to the south by railway lines and a solar farm.

Site Description

2.2.3 The Assessment Site currently comprises five large former MoD warehouse buildings, surrounded by areas of hardstanding, roads, soft landscaping and trees. Railway lines connect the warehouse buildings with a railway line that runs to the north from the north-east corner of the Assessment Site. A number of other smaller outbuildings and storage containers (overground and underground) are present throughout the Assessment Site. All the buildings are disused and a number of the buildings and areas of hardstanding are in various states of disrepair.

2.2.4 The Assessment Site slopes gently to the south and rises to the north towards Graven Hill Wood.

2.3 Site History

2.3.1 The Ordnance Survey records included within Appendix B do not indicate any development of the Assessment Site until at least 1966, however historical mapping reviewed by Entec (Entec, 2010a) states that the Assessment Site was first developed between 1941 and 1943 as a military depot, including the storage of vehicles and equipment prior to the D Day landings in 1944. Prior to this, the Assessment Site comprised agricultural land and woodland. Following the end of the Second World War, the Assessment Site was used for the storage of military hardware and the processing of ammunition containers.

2.3.2 Historical mapping indicates a similar post-war site layout to that present in 2010 / 11, when Entec undertook their studies at the Assessment Site. No further changes to the site layout are understood to have taken place since.

2.4 Geology

Overview

2.4.1 British Geological Survey (BGS) information indicates that the bedrock underlying the Assessment Site comprises mudstones of the Peterborough Member, part of the Oxford Clay Formation of

Jurassic Age. BGS information also indicates that the Peterborough Member is underlain by sandstone and siltstone of the Jurassic Kellaway Sand Member.

2.4.2 Superficial deposits are recorded to be absent from much of the Assessment Site with Alluvium (comprising clay, silt, sand and gravel) recorded to be present close to the south-western boundary.

2.4.3 The following subsections provide an overview of the ground conditions encountered during previous ground investigations undertaken at the Assessment Site, principally by Waterman Group (Waterman, 2020), as summarised in Section 3.2.

Made Ground

2.4.4 The ground investigations have identified Made Ground to be present over much of the Assessment Site. The thickness of the stratum was typically of the order of 0.5 – 1.0 m in thickness, but locally reported to be up to 1.8 m in thickness. The composition of the Made Ground was noted to be variable across the Assessment Site, comprising:

- Hardstanding construction (tarmac or concrete) ranging in thickness between 0.2 – 0.55 m;
- Ballast over ash comprising coarse gravel underlain by soft and firm clay with some ash and granite, ranging in thickness between 0.3 – 0.7 m;
- Topsoil comprising firm dark brown slightly sandy clay with occasional brick and clinker fragments, ranging in thickness between 0.1 – 0.4 m;
- Made Ground soils comprising black slightly sandy clayey gravel of ash, clinker and brick, ranging in thickness between 0.3 – 0.45 m; and
- Made Ground soils comprising firm brown mottled grey slightly sandy slightly gravelly clay with occasional rootlets and gypsum crystals, ranging in thickness between 0.15 – 0.2 m.

Superficial Geology

2.4.5 Underlying the Made Ground, localised areas of soft organic clay including occasional pockets of peat were identified during the ground investigation, ranging in thickness between 0.15 – 1.1 m. It is considered that these deposits may be indicative of localised areas of Alluvium.

Bedrock Geology

2.4.6 Stratum consistent with the Peterborough Member was encountered directly underlying the Made Ground, or Alluvium (where identified), typically comprising firm and stiff, locally soft, orangish brown mottled grey clays underlain by firm to stiff and stiff dark green grey slightly sandy clay.

2.4.7 The base of the Peterborough Member was not proven and a maximum thickness of 6.4 m was recorded during the Waterman Group ground investigation. Available BGS borehole logs indicate the Peterborough Member to be at least 9.5 m in thickness in the vicinity of the Assessment Site.

2.5 Hydrogeology

Aquifer Designations and Groundwater Vulnerability

2.5.1 The Peterborough Member is classified by the Environment Agency as an Unproductive stratum. These are formations that are generally regarded as containing insignificant quantities of groundwater. The presence of a substantial thickness of Peterborough Member mudstones will likely act as an aquitard and severely inhibit the downward migration of groundwater present within the shallow Made Ground / superficial deposits. The underlying Kellaway Sands Member is

classified as a Secondary A aquifer and comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.

2.5.2 The Alluvium indicated close to the south-western boundary is classified as a Secondary A Aquifer by the Environment Agency.

2.5.3 The Envirocheck Report (Appendix C) indicates that the Alluvium is classified as both a high and medium vulnerability secondary aquifer.

Groundwater Source Protection Zones (SPZ)

2.5.4 The Assessment Site does not lie within a groundwater SPZ.

Groundwater Abstractions

2.5.5 The Envirocheck Report does not report any licensed groundwater abstractions within 1 km of the Assessment Site.

Groundwater Occurrence and Levels

2.5.6 The ground investigation undertaken by Waterman Group (Waterman, 2020) encountered groundwater strikes at variable depths ranging between 0.45 and 4.8 mbgl, either within the Made Ground or within the upper horizons of the Peterborough Member. The majority of the strikes were recorded as seepages although a fast inflow was noted within borehole BH813 at a depth of 4.8 mbgl, rising to 3.3 mbgl in 15 minutes, suggesting a lens of more granular material to be present at this location.

2.5.7 A programme of groundwater monitoring undertaken within boreholes BH812, BH813 and BH815 following completion of the ground investigation, encountered standing water at depths ranging between 1.05 and 2.73 mbgl, with BH815 noted to be dry during one monitoring visit.

2.5.8 Waterman Group concluded that the variability in groundwater strikes and levels was suggestive of a discontinuous perched groundwater system within the Made Ground and near surface clays (Peterborough Member) due to the presence of low permeability cohesive clays within the upper horizons of the Peterborough Member. Waterman Group further concluded that the natural groundwater table is likely to lie at depth, below the Peterborough Member. It is considered that groundwater is likely to be present within the underlying Kellaway Sands, classified as a Secondary A Aquifer by the Environment Agency.

2.6 Hydrology

Surface Waters

2.6.1 The nearest surface water feature is reported by Entec (Entec, 2010a) to be the Langford Brook, situated approximately 1.5 km to the north of the Assessment Site. The surface water quality of the Langford Brook at two locations at the closest points to the site is reported to be rated by the Environment Agency as chemical grade ‘D’ (fair) and biological grade ‘B’ (good) at one location and chemical grade ‘C’ (fairly good) and biological grade ‘B’ (good) at the second location.

2.6.2 A series of field drains are also recorded to be present approximately 1 km to the west of the Assessment Site. The Envirocheck report records a number of surface water drains to be present along the southern boundary of the Assessment Site and further drains lying close to the south-eastern boundary. Furthermore, additional surface water drains are recorded approximately 1 km to the south-west of the Assessment Site and Gagle Brook is recorded approximately 1 km to the west.

Discharge Consents

2.6.3 The Envirocheck Report records 2 no. discharge consents to be present within the boundaries of the Assessment Site, in relation to Thames Water sewerage pumping stations.

Surface Water Abstractions

2.6.4 The Envirocheck Report does not report any licensed surface water abstractions within 1 km of the Assessment Site.

2.6.5 Internet mapping tools (magic.gov.uk) indicates that the central and eastern parts of the Assessment Site are situated within a non-statutory Drinking Water Safeguard Zone for surface water.

2.7 Waste Management Facilities

2.7.1 There are no records of landfill sites within the vicinity of the Assessment Site, although the Envirocheck Report does indicate an area of potentially infilled land 27 m to the north. A review of the Ordnance Survey maps suggest that this feature is likely to be a backfilled pond and it is considered unlikely that this will impact on land quality at the Assessment Site.

2.8 Pollution Incidents

2.8.1 A substantiated pollution incident involving oils is reported in the Envirocheck Report to have occurred in April 2003, 17 m to the north of the Assessment Site. Given the time that has elapsed since, it is unlikely that there is a residual impact to the Assessment site.

2.9 COMAH and Hazardous Substance Consents

2.9.1 The Envirocheck Report does not identify any COMAH sites or Hazardous Substance Consents within 1 km of the Assessment Site.

2.9.2 Furthermore, there are no active IPPC (environmental permits) within the Assessment Site boundaries, the closest lying approximately 250 m to the east, in relation to poultry farming.

2.10 Conservation Areas and Sensitive Land Use

2.10.1 Natural England data indicates that there are no ecologically sensitive sites, that constitute environmental receptors as defined within Table 1 of the DEFRA Environmental Protection Act 1990: Part 2A - Contaminated Land Statutory Guidance (2012), located within a 1km radius of the site.

2.10.2 Gravenhill Wood, designated as an ancient and semi-natural woodland, is situated 278 m to the north of the Assessment Site.

2.11 Summary of Contamination Sources

2.11.1 A review of the available reports, supplemented by a site walkover undertaken by RPS in June 2020, suggests that there are limited historical and current potential contamination sources present at the Assessment Site. The relevant contamination sources identified from the available information sources within the site boundaries are:

- Two small diesel / oil tanks and associated pipework to the north of D2;

- Railway lines present throughout the site that historically allowed rail access to the larger buildings present at the site (D1, D2, D4, D7 and D5);
- A stockpile of ash ballast present to the south-east of D7, derived from the upgrade of the substantial portion of the railway network in 2007 – it is understood that this stockpile is to be removed from site during site development and is therefore not considered further within this report;
- Substations / transformers situated adjacent to the larger site buildings (D1, D2, D4, D7 and D5);
- Forklift maintenance and washdown areas (D11 / D12);
- Several small 'old' and 'new' fuel tanks located in the vicinity of the fire station, D1, D2, D4 and D7; and
- Residual asbestos lagging to be present in shallow soils in close proximity to the above ground heating system, as a consequence of potentially poor asbestos removal practices.

2.11.2 The location of the referenced buildings is shown on Drawing JER9528-002.

3 GROUND INVESTIGATION AND RISK ASSESSMENT

3.1 Introduction

3.1.1 This section provides a summary of the ground investigation works known to have been undertaken at the Assessment Site and provides a summary of potential risks to human health and controlled waters, based upon the findings of the ground investigations.

3.2 Overview of Ground Investigations

3.2.1 A limited scope of ground investigation was undertaken by Entec in 2010 (Entec, 2010b and 2011) and comprised drilling of two window sample boreholes to a maximum depth of 4.8 m in the vicinity of the diesel / oil tanks to the north of building D2.

3.2.2 A more detailed investigation of the Assessment Site was undertaken by Geotechnics under the overall direction of Waterman Group in July / August 2020, as part of a larger investigation of the wider Graven Hill site. The scope of the ground investigation in relation to the Assessment Site targeted a number of the contamination sources detailed in Section 2.11 and comprised the following:

- Thirteen cable percussive boreholes (BH801 – BH804, BH807 – BH809, BH812 – BH815 and BH818 – BH819) to depths of up to 6.60 metres below ground level (mbgl);
- Installation of 50 mm ground gas monitoring wells within three of the cable percussive boreholes (BH812, BH813 and BH815);
- Thirty-nine machine excavated trial pits (TP801 – TP839) to depths of between 0.4 and 4.5 mbgl, including the completion of hand shear strength tests;
- Seven road cores and inspection pits (CC801, RC804 – RC809) to a depth of 1.2 mbgl, with a single location being extended to 5.0 mbgl using window sampling drilling techniques;
- Four in-situ CBR tests using TRL DCP techniques;
- Soakaway testing in eight trial pits;
- Obtaining disturbed and undisturbed soil samples from the exploratory holes from both contamination and geotechnical laboratory analysis;
- Obtaining one groundwater sampling from trial pit TP830 for contamination laboratory analysis;
- Obtaining twenty seven sediment samples from the existing ditch network for contamination laboratory analysis; and
- Completion of six rounds of ground gas and groundwater level monitoring between 31st July and 28th September 2020.

3.2.3 The ground investigation locations are shown on Drawing JER9528-003.

3.2.4 During the Waterman Group investigation, visual or olfactory evidence of contamination was only identified at two locations (trial pits TP827 and TP831), both at shallow depth within trial pits comprising a hydrocarbon odour. The impacted soils were sampled and scheduled for appropriate laboratory analysis.

3.3 Human Health Risk Assessment

3.3.1 A total of 44 no. soil samples from the Waterman Group ground investigation were scheduled for chemical laboratory analysis for a variable suite of inorganic and organic contaminants and asbestos fibres. The results of the analysis were compared against published generic screening criteria for a commercial end use scenario. All of the analysis results were found to be below the appropriate screening criteria, with the exception of six samples lying at shallow depth, where elevated concentrations of PAH compounds were identified as detailed in Table 3-1 below.

Table 3-1 Summary of Elevation Soil Concentrations

Ground Investigation Location	Stratum	Contaminant	'Accepted Level' in Waterman Group Report*	Contaminant Concentration (mg/kg)
RC810 (0.15m)	Made Ground – black gravelly subbase, including slag and brick	Benzo(b)fluoranthene	44	130
		Benzo(a)pyrene	35	100
		Dibenzo(ah)anthracene	3.6	11
TP826 (0.06m)	Macadam road surfacing	Benzo(b)fluoranthene	44	92
		Benzo(a)pyrene	35	90
		Dibenzo(ah)anthracene	3.6	5.8
TP827 (0.08m)	Macadam road surfacing	Benzo(b)fluoranthene	44	100
		Benzo(a)pyrene	35	97
		Dibenzo(ah)anthracene	3.6	5.8
TP838 (0.1m)	Macadam road surfacing	Naphthalene	190	450
		Benzo(a)fluoranthene	44	85
		Benzo(a)pyrene	35	100
		Dibenzo(ah)anthracene	3.6	5.9
TP837 (0.15m)	Macadam road surfacing	Naphthalene	190	240
		Benzo(b)fluoranthene	44	98
		Benzo(a)pyrene	35	110
		Dibenzo(ah)anthracene	3.6	7
TP822 (0.15m)	Made Ground – black gravelly sand subbase, including slag and brick	Benzo(a)anthracene	170	180
		Benzo(b)fluoranthene	44	120
		Benzo(a)pyrene	35	130
		Dibenzo(ah)anthracene	3.6	13

* Suitable 4 Use Level (S4UL) for commercial end use scenario

3.3.2 The elevated concentrations of PAH from four of the six samples (from trial pits TP826, TP827, TP837 and TP838) were attributed by Waterman Group to the presence of coal tars within surface macadam samples. The other two elevated PAH concentrations, from road core RC810 and trial pit TP822, were identified in soil samples taken directly beneath macadam at both locations and the elevated concentrations may be attributable to the presence of coal tars in the surface macadam.

3.3.3 Asbestos (amosite) fibres were identified within a single sample of railway ballast from trial pit TP804 at a depth of 0.5 m.

3.3.4 The risk assessment undertaken by Waterman Group concluded that risks to construction workers were low, but locally medium risk, where elevated concentrations of PAH were identified and from the localised presence of asbestos in trial pit TP804.

3.3.5 The risk assessments undertaken by Entec (Entec 2010b and 2011) reported that contamination risks to human health receptors were typically low based upon a commercial redevelopment scenario.

3.3.6 Based upon the findings of the ground investigation, it is considered that the elevated concentrations of PAH and the presence of asbestos are localised in extent and are not indicative of widespread contamination at the Assessment Site.

3.4 Controlled Waters Risk Assessment

3.4.1 No groundwater samples were obtained from the monitoring wells for chemical analysis during the monitoring programme undertaken as part of the Waterman Group ground investigation.

3.4.2 Concentrations of TPH analysed from a groundwater sample obtained from trial pit TP830 were all below the laboratory limit of detection.

3.4.3 The risk assessment undertaken by Waterman Group concluded that risks to controlled waters were minimal on the basis of low contaminant concentrations in soil and the minimal amount of Made Ground overlying the Peterborough Member.

3.4.4 The risk assessments undertaken by Entec (Entec, 2010b and 2011) reported that contamination risks to controlled waters receptors were typically low based upon a commercial redevelopment scenario.

3.5 Ground Gas Risk Assessment

3.5.1 The ground gas monitoring programme undertaken following completion of the Waterman Group ground investigation identified a maximum carbon dioxide concentration of 9.9% by volume (within borehole BH812). Concentrations of methane and hydrogen sulphide were all recorded below the detection limit of the gas analyser used and no measurable gas flows were detected within the monitoring wells. A maximum carbon monoxide concentration of 7 parts per million (ppm) was also identified during the monitoring.

3.5.2 The ground gas risk assessment undertaken by Waterman Group concluded that the gas monitoring results are indicative of a Characteristic Situation 1 (no ground gas protection measures required in new structures), although consideration should be given to increasing the classification to Characteristic Situation 2 based upon the single carbon dioxide concentration of 9.9% identified within borehole BH812. For a Characteristic Situation 2, ground gas protection measures in line with the requirements of BS8485 would be required in new structures and could include incorporation of an appropriate gas resistant membrane.

3.6 Unexploded Ordnance (UXO)

3.6.1 A Bactec UXO report included within the Entec Desk Study (Entec, 2011) concluded that there was a low level of risk from German high explosive unexploded bombs, British anti-aircraft artillery, German incendiaries and anti-personnel bombs and a low / medium level of risk from land service and small arms ammunition. The Bactec report recommended explosive ordnance safety briefings and the provision of unexploded ordnance site safety instructions during the site investigation works at the site proposed by Entec at the time.

3.6.2 No suspected items of UXO are known to have been encountered during ground investigations at the Assessment Site and based upon available information, risks from the presence of UXO contamination are considered to be low.

3.7 Radiological Contamination

3.7.1 A DSTL radiological assessment obtained by Entec (Entec, 2020b) indicated that there was a moderate likelihood of radiological contamination being present across the former MoD site, however Entec concluded that, based upon the evidence, potential development risks for a commercial / industrial end use were considered to be moderate / low. Furthermore, in situ radiological surveys of the D6 / D9 Made Ground area, to the north of the EL1 area (Entec, 2010b and 2011), did not indicate elevated levels of radioactivity within the soil.

3.7.2 Radiological monitoring during the Waterman Group ground investigation did not identify any elevated levels of radioactivity within the soil and thus risks from radiological contamination are considered to be low.

4 CONCEPTUAL SITE MODEL

4.1 Introduction

4.1.1 In line with the requirements of LCRM guidance (EA, 2021), a Conceptual Site Model (CSM) is presented within this section and takes consideration of information obtained from the desk based sources, including the ground investigation information, and the site walkover undertaken by RPS in June 2020. The CSM has been developed to assess potential contamination sources, pathways, receptors and potential contaminants linkages identified at the Assessment Site.

4.2 Potential Contamination Sources

4.2.1 A number of localised contamination sources have been identified at the Assessment Site, relating the former use of the Assessment Site as an MoD Depot. A number of these sources have been assessed by ground investigations undertaken to date at the Assessment Site and indicate that only localised areas of contamination are present based on a commercial end-use scenario:

- Localised areas of PAH contamination, potentially related to the presence of coal tars within the road surface; and
- A localised area of asbestos within railway ballast.

4.2.2 There is potential for other localised areas of contamination to be present at the Assessment Site, associated with contamination sources that have not been fully investigated e.g. railway lines. Notwithstanding this however, it is considered unlikely that widespread significant contamination is present within soil and groundwater at the Assessment Site in the context of a commercial end-use scenario.

4.2.3 Ground gas monitoring undertaken as part of the Waterman Group ground investigation has indicated that a Characteristic Situation 2 should be considered for the Assessment Site, based upon elevated concentrations of carbon dioxide recorded within borehole BH812.

4.2.4 Available information indicates that UXO and radiological contamination risks are low at the Assessment Site, however the potential for localised areas of UXO or radiological contamination cannot be ruled out.

4.3 Potential Contamination Pathways

4.3.1 Based upon a proposed commercial redevelopment scenario, the following potential exposure pathways are considered to be present:

- Human Exposure Pathways:
  - Ingestion of soil and dust;
  - Dermal contact with soil and dust;
  - Indoor and outdoor inhalation of volatile contaminants present within soil and groundwater;
  - Inhalation of asbestos fibres;
  - Permeation of contamination into potable water supply pipelines;
  - Migration and accumulation of ground gas within new structures.
- Controlled Water Pathways:
  - Leaching of contaminants in soils by infiltrating rainfall and migration, or direct migration of contaminants into groundwater;

– Migration of contaminated perched groundwater to surface water features.

4.4 Potential Receptors

4.4.1 Potential key receptors that may be at risk from contamination in soils and groundwater at the Assessment Site include the following:

- Future site users, based upon a proposed commercial redevelopment scenario;
- Groundwater within the Kellaway Sand Member, underlying the Peterborough Member;
- Surface water within the drainage ditches close to the southern boundary of the Assessment Site.

4.4.2 Shallow perched groundwater is not considered to be a potential receptor given the groundwater classification as Unproductive Strata, rather perched groundwater is considered to be a pathway for contamination migration as stated in Section 4.3.

4.4.3 Construction workers have not been included within this assessment as a potential receptor, as it has been assumed that the implementation of suitable measures in line with the Construction (Design and Management) Regulations (CDM) will manage potential risks to construction workers.

4.5 Conceptual Site Model and Risk Assessment

4.5.1 Table 4-1 below provides a summary of the CSM, detailing potential contaminant linkages present at the Assessment Site taking into account all of the sources, pathways and receptors detailed above. The table also provides a contamination risk level to the identified receptors for each contaminant linkage, taking into account the known ground conditions at the Assessment Site and the proposed commercial development. Levels of risk have been assigned on the basis of the definitions provided below:

- **Low risk** - it is considered unlikely that issues within the category will give rise to significant harm to identified receptors
- **Moderate risk** - it is possible, but not certain that issues within the category will give rise to significant harm to receptors
- **High risk** - there is a high potential that issues within the category will give rise to significant harm to identified receptors

Table 4-1 Conceptual Site Model and Risk Assessment

Potential Contamination Source	Contaminants of Concern	Potential Pathway	Receptor	Qualitative Risk Rating	Comments
On site sources • Localised sources from historical activities • Known localised areas of PAH and asbestos contamination	Metals, hydrocarbons, solvents	Inhalation / dermal contact / ingestion of soil / dust	Future Site Users	Low / Moderate	A number of sources of potential contamination have been identified at the Assessment Site and available ground investigation information has typically identified low concentrations of contaminants with respect to a commercial end use. Several localised areas of PAH contamination have been identified that potentially pose a risk to human health without the implementation of remedial measures.
		Leaching of contamination / direct migration	Groundwater	Low	No areas of gross contamination have been identified at the Assessment Site, and laboratory analysis indicates that the potential for soil to act as a contamination source to impact groundwater is limited. A substantial thickness of low permeability mudstone (Peterborough Member) is present underlying the Assessment Site and will likely afford protection to the underlying Kellaway Sands Member. Furthermore, available information also indicates that the Assessment Site is of low sensitivity, given the lack of stratum that could be considered as holding large quantities of groundwater and the absence of groundwater abstractions in the vicinity of the Assessment Site.
		Migration of contaminated groundwater	Surface Water	Low	Shallow perched groundwater has been identified at the Assessment Site, however ground investigation information suggests it may be discontinuous in nature and therefore has limited migration potential. Furthermore, no areas of gross contamination have been identified at the Assessment Site, and laboratory analysis indicates that the potential for soil to act as a contamination source is limited.
	Hydrocarbons, solvents	Indoor and outdoor inhalation of vapours from soil / groundwater	Future Site Users	Low	No elevated concentrations of volatile hydrocarbons / solvents have been identified during the ground investigations undertaken at the Assessment Site. Naphthalene contamination has been identified in soil samples, believed to be associated with coal tars in the road construction, however the very localised nature of these occurrences is considered unlikely to pose a risk to human health.
		Permeation into potable water supply pipes		Moderate	Concentrations of volatile hydrocarbons / solvents identified during the ground investigations undertaken at the Assessment Site are typically low. Elevated naphthalene concentrations have however been identified in soil samples, believed to be associated with coal tars in the road construction, albeit in localised areas. The potential for water supply pipes to be impacted by hydrocarbons / solvents will require a more detailed assessment and agreement with the local water service provider.

Potential Contamination Source	Contaminants of Concern	Potential Pathway	Receptor	Qualitative Risk Rating	Comments
	Asbestos	Inhalation of fibres	Future Site Users	Moderate	Asbestos has been identified within a single sample of ballast at the Assessment Site and without remediation is considered to pose a potential risk to future end users. Made Ground is known to be present across the Assessment Site and given the industrial history and RPS' experience of similar sites, there is a possibility that asbestos could be present within the shallow soils at other locations.
Made Ground – Generation of Ground Gas	Harmful ground gas including methane and carbon dioxide	Migration and accumulation in new structures	Future Site Users	Low / Moderate	No significant sources of ground gas generation have been identified at the Assessment Site, although localised areas of peaty Alluvium have been identified by the Waterman Group ground investigation. The ground gas risk assessment undertaken by Waterman Group suggests a Characteristic Situation 2 should be considered for the Assessment Site and basic ground gas protection measures would be required within new structures.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

5.1.1 RPS was commissioned to provide a Ground Conditions Summary Report to support the outline planning application for redevelopment of Assessment Site as a logistics hub. The assessment included a review of published information and previous ground investigation reports, and a site walkover undertaken by RPS in June 2020.

5.1.2 Based upon the available information, RPS developed a Conceptual Site Model to assess potential contamination linkages present at the Assessment Site.

5.1.3 The following sections provide a summary of the key findings of the assessments and recommendations for additional work to further characterise the ground conditions at the Assessment Site.

5.2 Conclusions

5.2.1 Based upon the available information widespread contamination in the context of a commercial development is not believed to be present across the Assessment Site, nor has gross contamination been identified. The key findings of the assessments are summarised below:

- The Assessment Site was first developed as a military depot between 1941 and 1943 including the storage of vehicles and equipment prior to the D Day landings in 1944. Prior to this, the site comprised agricultural land and woodland. Following the end of the Second World War, the site was used for the storage of military hardware and the processing of ammunition containers and information indicates that the site layout has remained the same since;
- The Assessment Site is underlain by a variable horizon of Made Ground, typically ranging between 0.5 – 1.0 m in thickness, locally up to 1.8 m in thickness;
- Localised areas of potential Alluvium comprising soft organic clay were identified during the ground investigation, ranging in thickness between 0.15 – 1.1 m;
- The Peterborough Member is present underlying the Made Ground / Alluvium across the Assessment Site. Available information indicates that the stratum is at least 9.50 m in thickness;
- The Peterborough Member (classified as Unproductive Stratum by the Environment Agency) is considered to act as an aquitard, inhibiting downward migration of shallow perched groundwater into the underlying Kellaway Sands, classified as a Secondary A aquifer. Alluvium indicated to be present adjacent to the southern boundary of the Assessment Site is classified as a Secondary A aquifer;
- Ground investigations have indicated a shallow discontinuous perched groundwater system is present beneath the Assessment Site;
- A number of localised potential contamination sources have been identified at the Assessment Site, associated with hydrocarbon storage, railway lines, substations / transformers, vehicle maintenance and washing, asbestos and Made Ground soils;
- The conceptual site model has concluded that contamination risks to sensitive receptors associated with the proposed redevelopment of the site for a continued commercial end use are typically low, with the exception of:
    - Low / moderate risks to future site users from the presence of localised areas of PAH contamination;

- Moderate risks to future site users from the presence of asbestos within the shallow soils and from the permeation of hydrocarbons / solvents into water supply pipes; and
- Low / moderate risks to future site users from the presence of ground gas.

5.3 Recommendations

5.3.1 Whilst ground investigations have been undertaken to characterise the ground conditions at the Assessment Site, it is recommended that additional ground investigation is undertaken to support a detailed planning application for redevelopment. These investigations should seek to characterise the ground conditions in relation to each of the contamination sources identified, including targeting gaps in the ground investigation information, to allow quantitative risk assessments to be completed with respect to human health and controlled waters, and to determine the requirement for any remedial works to be undertaken to support site redevelopment.

5.3.2 Localised areas of PAH and asbestos contamination have been identified at the Assessment Site and remedial effort is considered necessary to manage potential contamination risks. Such remedial works could include source removal or capping and are not considered to be onerous and are easily compatible with standard construction practices. Furthermore, available information indicates that basic ground gas protection measures will be required in new structures in accordance with BS8485 (BSI, 2019). Any remedial measures to be implemented should be detailed in a Remediation Strategy / Construction Environmental Management Plan (CEMP) and agreed with the Local Authority prior to implementation.

5.3.3 Standard polymeric utility pipes may be unsuitable for the proposed development. Barriers may be required for new underground utilities, or service pipes laid in dedicated trenches and backfilled with clean, inert material. Requirements for buried utility pipes should be assessed in more detail and confirmed with service providers before the development stage.

5.3.4 As previously mentioned, there is potential for contamination to be present across the Assessment Site associated with contamination sources that have not been investigated, or in areas of previously unidentified contamination. The risk assessment presented within this report will require review once any additional ground investigations have been undertaken. Suitable procedures for managing areas of previously unidentified contamination during the construction phase should be detailed within the Remediation Strategy / CEMP.

REFERENCES

BSI, 2019. British Standard 8485:2015+A1:2019 - Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings, January 2019.

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(Entec, 2011) Entec – Additional Sites 1 & 2 Adjacent Sites D&E, DSDC Bicester – Land Quality Assessment (including Bactec UXO report), March 2011.

RPS, 2021a. RPS, Graven Hill, Bicester – Ground Conditions Assessment, 16 February 2021.

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Waterman, 2020. Waterman Infrastructure and Environment Ltd, Ground Investigation (Interpretative Report, Project D1 Employment Land, Graven Hill, Bicester, Draft, November 2020.

Drawing 1 JER9528-001 – Site Location Plan

Drawing 2 JER9528-002 – Building References

Drawing 3 JER9528-003 – Ground Investigation Locations

Notes
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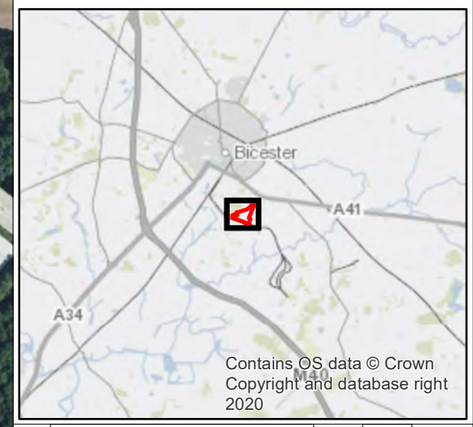
Legend

Assessment Site Boundary



Rev	Description	By	CB	Date

MAKING COMPLEX EASY

20 Western Avenue, Milton Park, Abingdon, Oxfordshire, OX14 4SH
T: +44(0)1235 821 888 E: rpsox@rpsgroup.com

Client: Graven Hill Purchaser LLC

Project: Graven Hill, Bicester

Title: Site Location Plan

Status	Drawn By	PM/Checked By
ISSUE	RD	GM
Project Number	**Scale @ A3**	**Date Created**
JER9528	1:4,000	APR 2022

Figure Number: **JER9528-001**

Rev: **-**

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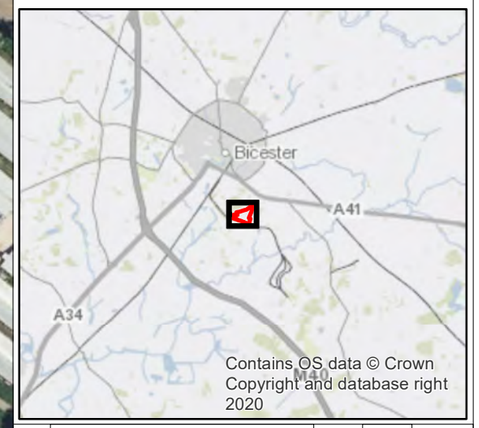
Legend

Assessment Site Boundary



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Client: Graven Hill Purchaser LLC

Project: Graven Hill, Bicester

Title: Building References

Status	Drawn By	PM/Checked By
ISSUE	RD	GM
Project Number	**Scale @ A3**	**Date Created**
JER9528	1:3,500	APR 2022

Figure Number: **JER9528-002**

Rev: -

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Legend

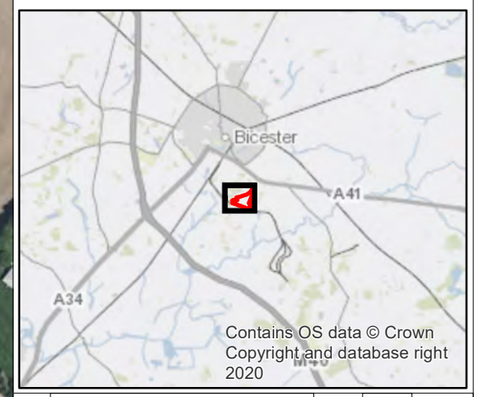
Assessment Site Boundary

Waterman Group Ground Investigation - 2020

- Cable Percussive Boreholes
- Road Cores
- Trial Pits

Entec Ground Investigation - 2010

- Window Sample Boreholes



Rev	Description	By	CB	Date

MAKING COMPLEX EASY

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Client: Graven Hill Purchaser LLC

Project: Graven Hill, Bicester

Title: Ground Investigation Locations

Status	Drawn By	PM/Checked By
ISSUE	RD	GM
Project Number	**Scale @ A3**	**Date Created**
JER9528	1:3,750	APR 2022

Figure Number: **JER9528-003**

Rev: -

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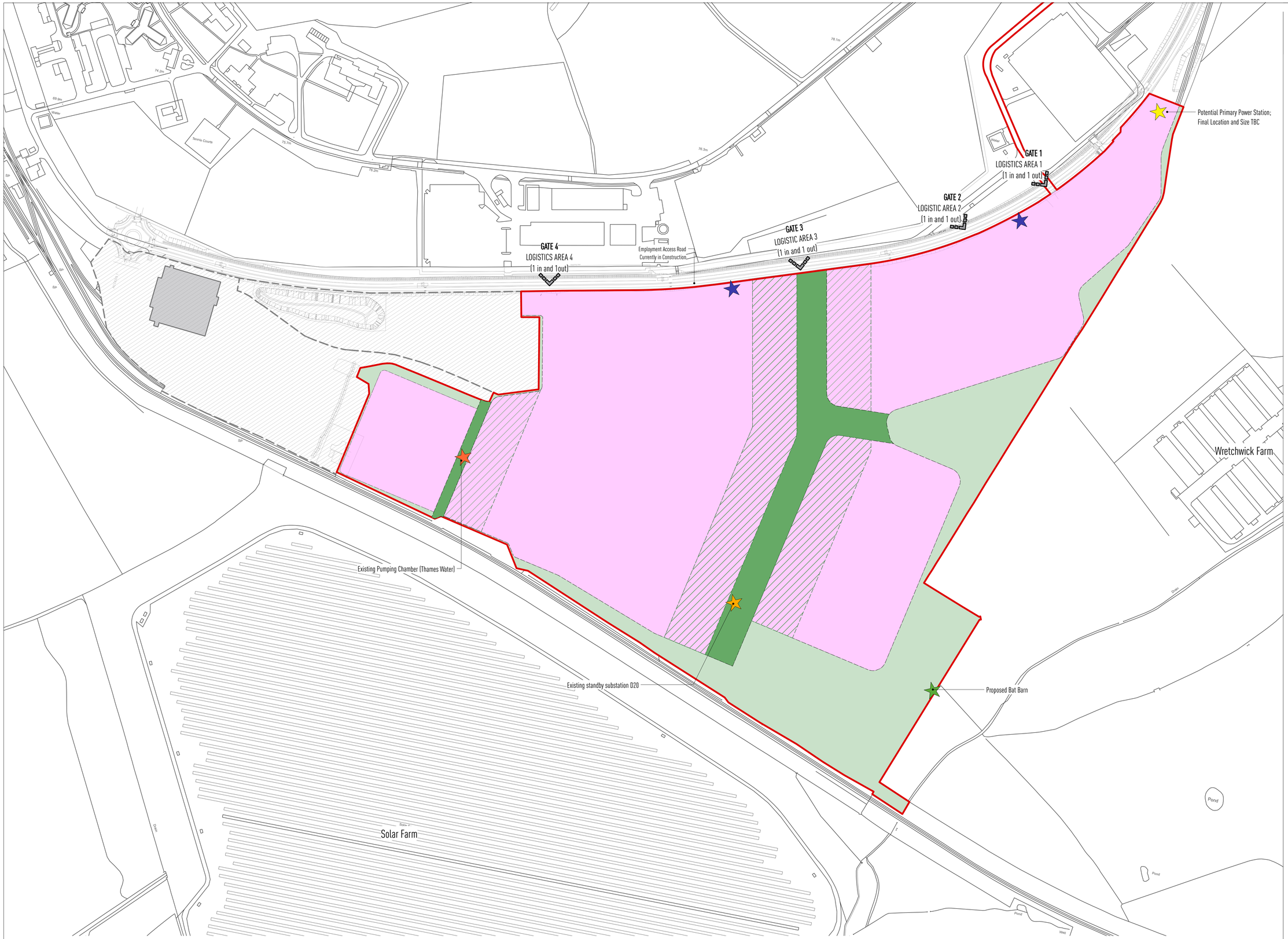
Appendix A
PARAMETERS PLAN



KEY

- Site Boundary
- Extent of Employment Allocated Land
- Structural Landscape planting including Existing woodlands, Proposed Amenity and Sustainable Drainage System (SuDS)
- Indicative route of Green fingers/ wildlife corridors; Final location /extent to be determined at Reserved Matters Stage
- Parameter of Green fingers/ wildlife corridors; Final location /extent to be determined at Reserved Matters Stage
- Development Area; including roads, parking and service yards; Max. 20m Ridge Height Details at Reserved Matters Stage 227,511m2 (2,448,908 ft2)
- Existing D20 Substation
- Existing Thames Water Pumping Station
- New Sub-stations (as part of EAR Dev.)
- New Bat Barn
- Indicative location for Potential Primary Power Station

Refer to 410_S-50 Indicative Proposed Plan and ABA's Transport Report for detailed Gate/ Entrance Layout

PROPOSED LAYOUT PARAMETER PLAN_

0m 40m 100m 200m 400m

Rev	Date	Description
P2	10/05/2022	FOR COMMENTS
P1	09/05/2022	FOR DISCUSSION

Revisions

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Client: Graven Hill Purchaser Ltd

Project: Graven Hill D1 Site, Bicester

Project No.: 410

Drawing Title: PROPOSED LAYOUT PARAMETER PLAN

Status	Drawn	Checked
PRELIMINARY	JH	GO
Scale		Date
1:2000 @A1		MAY 2022
Drawing Number		Revision
410_S-51		P2

Appendix B
ORDNANCE SURVEY MAPS

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

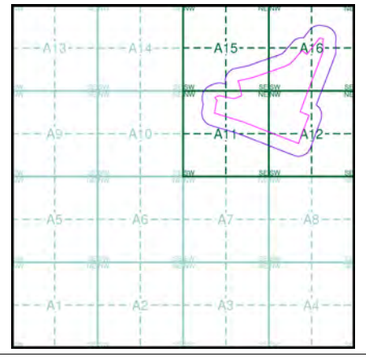
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Mud
Sand
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

rps

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Oxfordshire	1:10,560	1884 - 1885	2
Buckinghamshire	1:10,560	1900	3
Oxfordshire	1:10,560	1900	4
Oxfordshire	1:10,560	1923	5
Buckinghamshire	1:10,560	1923	6
Historical Aerial Photography	1:10,560	1947	7
Buckinghamshire	1:10,560	1952	8
Oxfordshire	1:10,560	1952	9
Ordnance Survey Plan	1:10,000	1955	10
Ordnance Survey Plan	1:10,000	1966	11
Ordnance Survey Plan	1:10,000	1970	12
Ordnance Survey Plan	1:10,000	1981 - 1988	13
Ordnance Survey Plan	1:10,000	1993 - 1996	14
10K Raster Mapping	1:10,000	1999	15
10K Raster Mapping	1:10,000	2006	16
VectorMap Local	1:10,000	2020	17

Historical Map - Slice A



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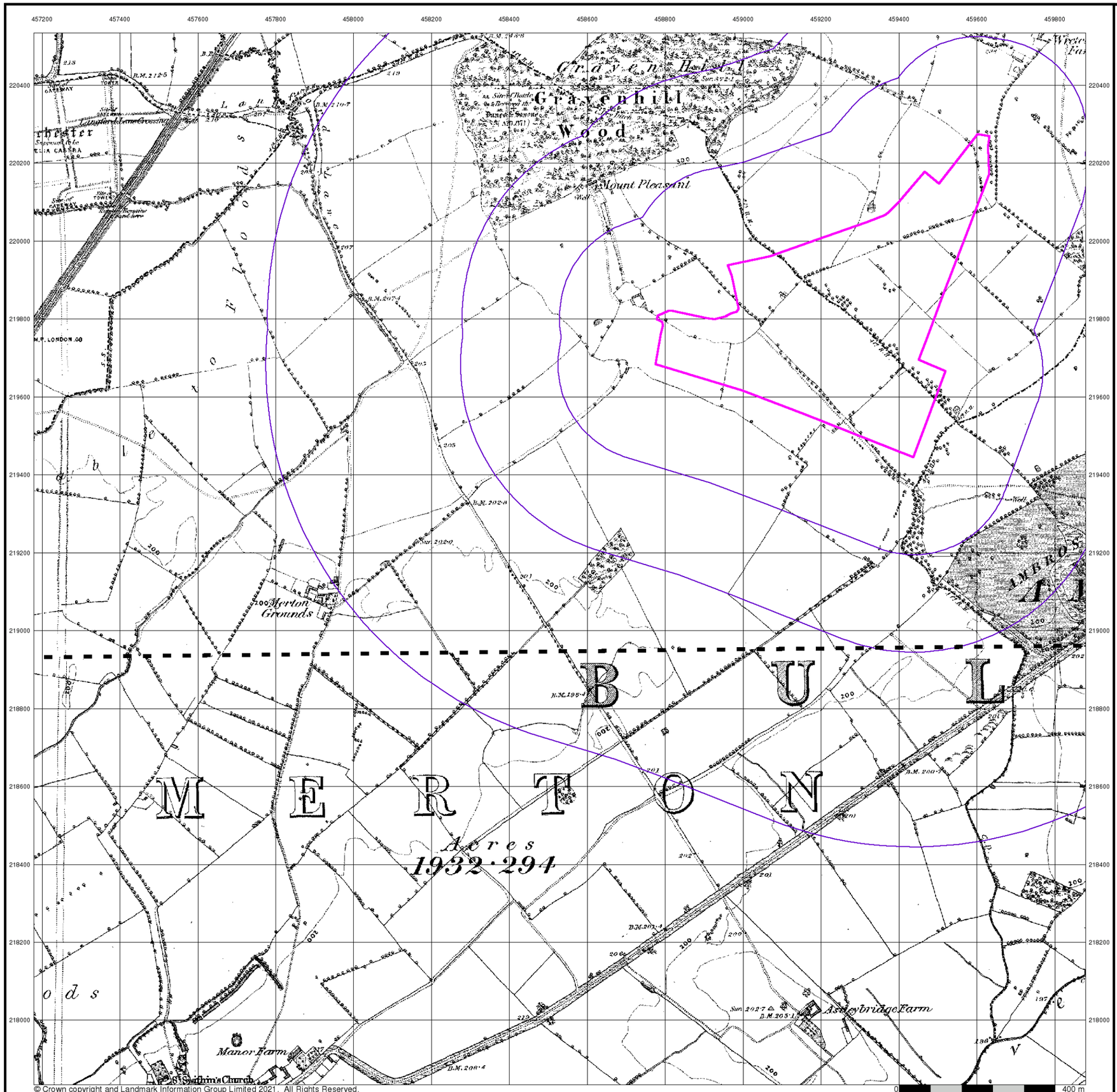

Oxfordshire

Published 1884 - 1885

Source map scale - 1:10,560

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Map Name(s) and Date(s)

02300
1885
1:10,560

02800
1884
1:10,560

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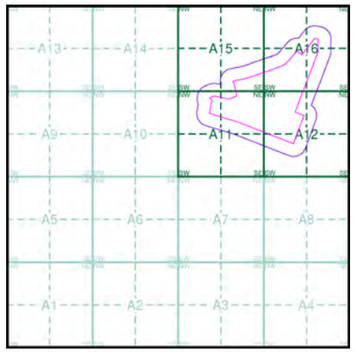

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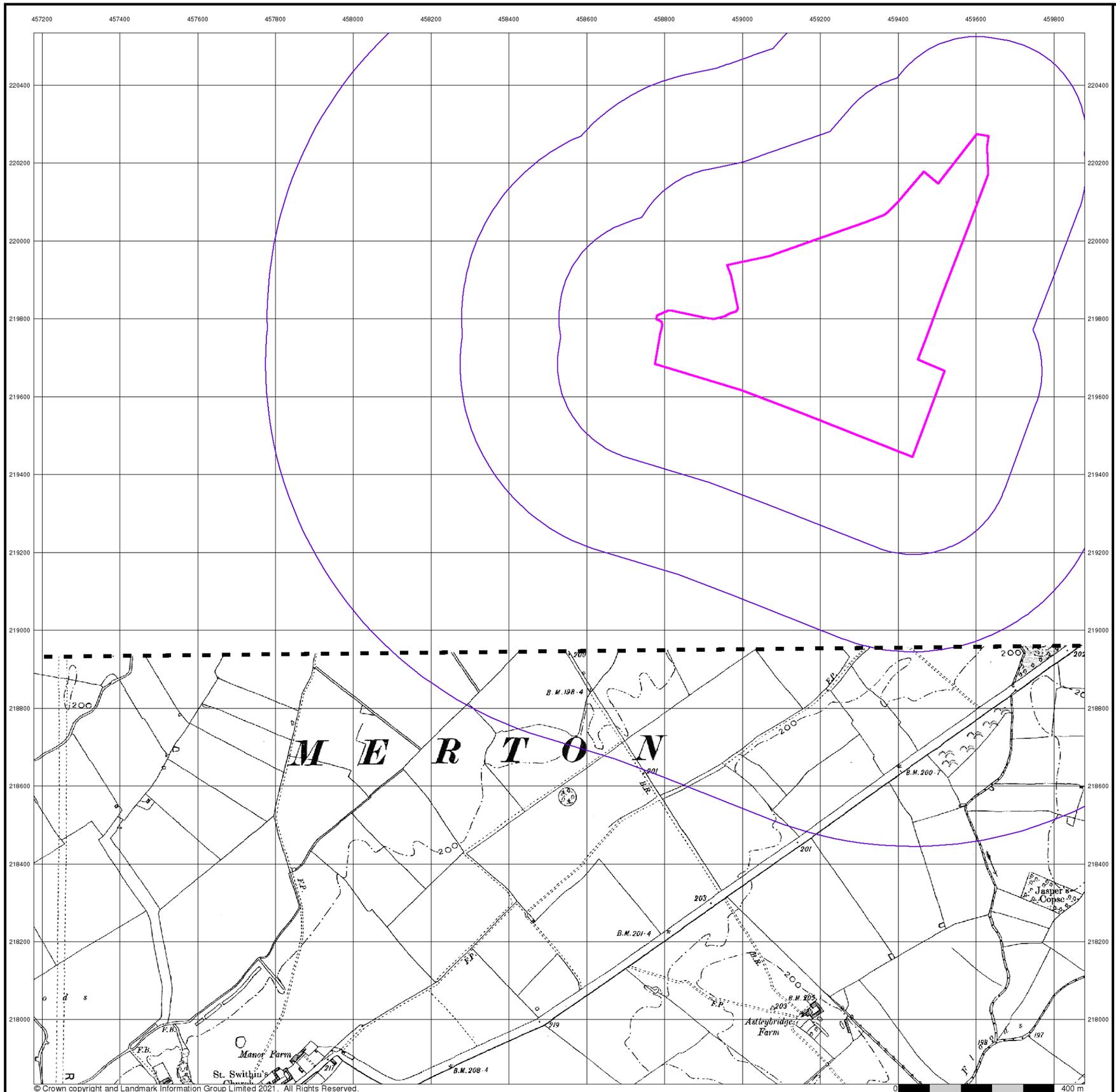

Buckinghamshire

Published 1900

Source map scale - 1:10,560

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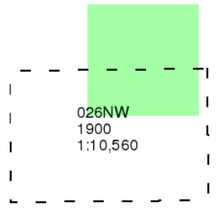

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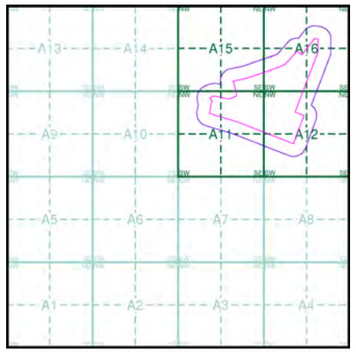

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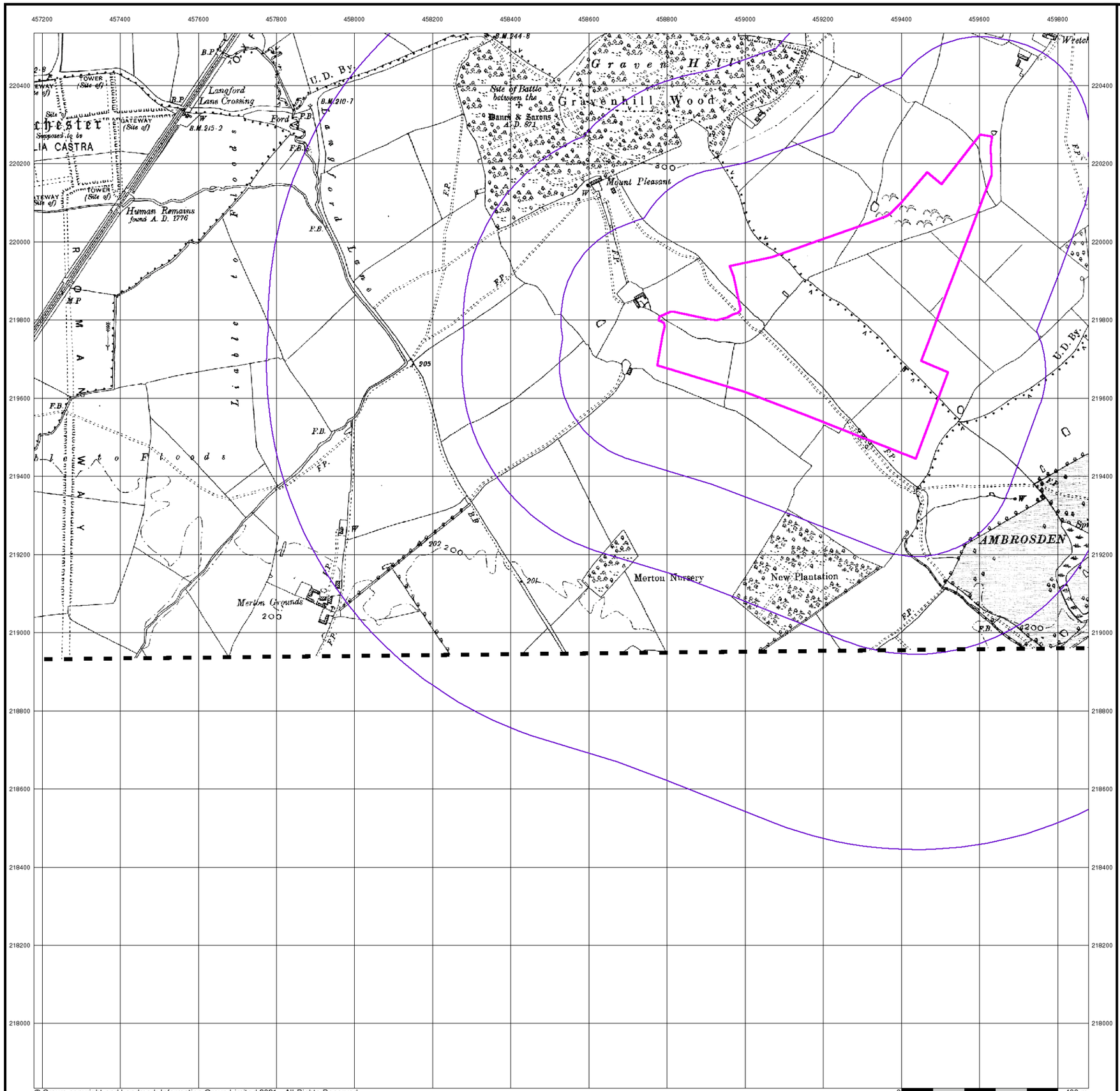

Oxfordshire

Published 1900

Source map scale - 1:10,560

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Map Name(s) and Date(s)

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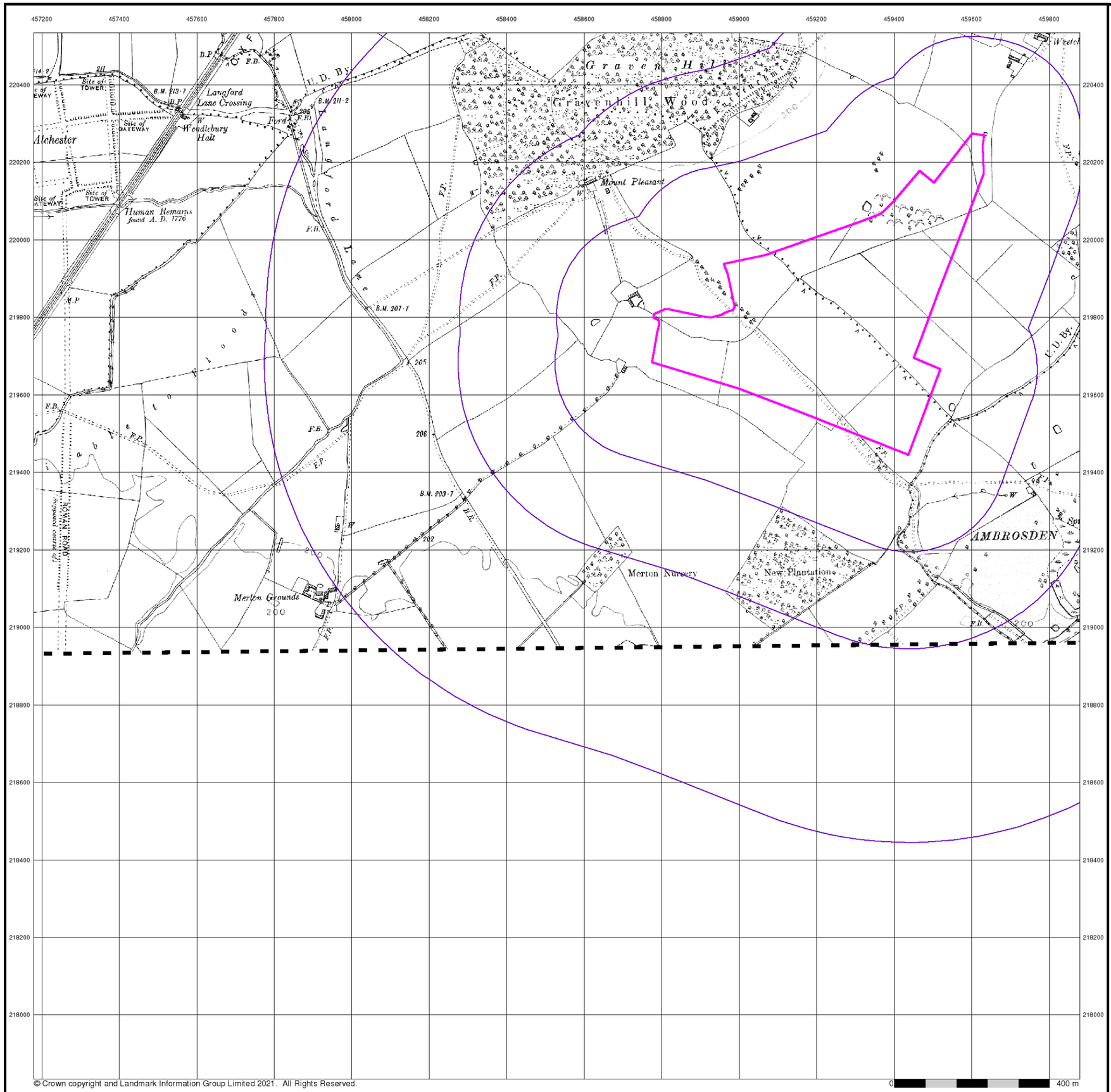

Oxfordshire

Published 1923

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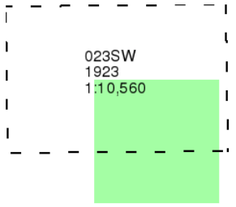

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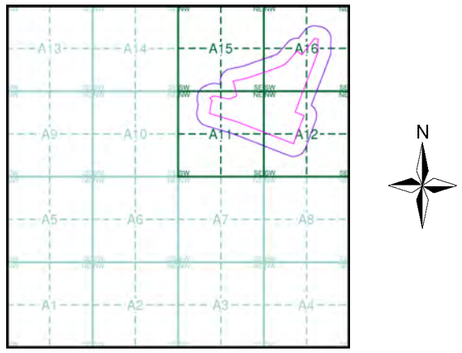

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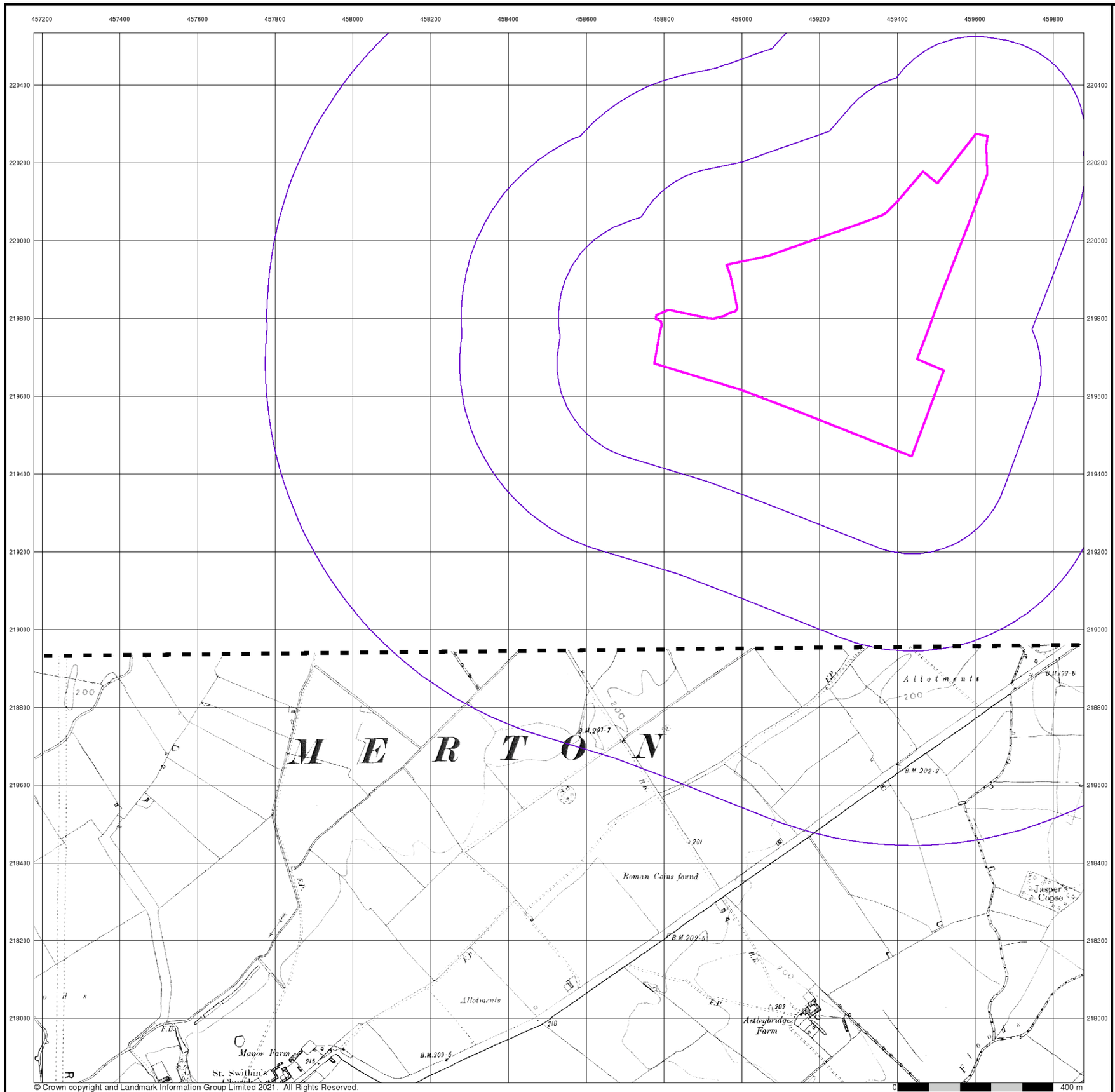

Buckinghamshire

Published 1923

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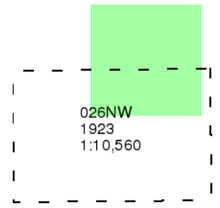
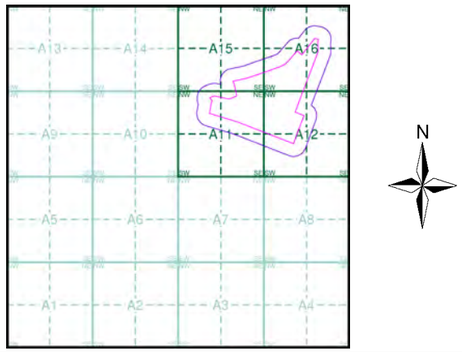


Historical Map - Slice A



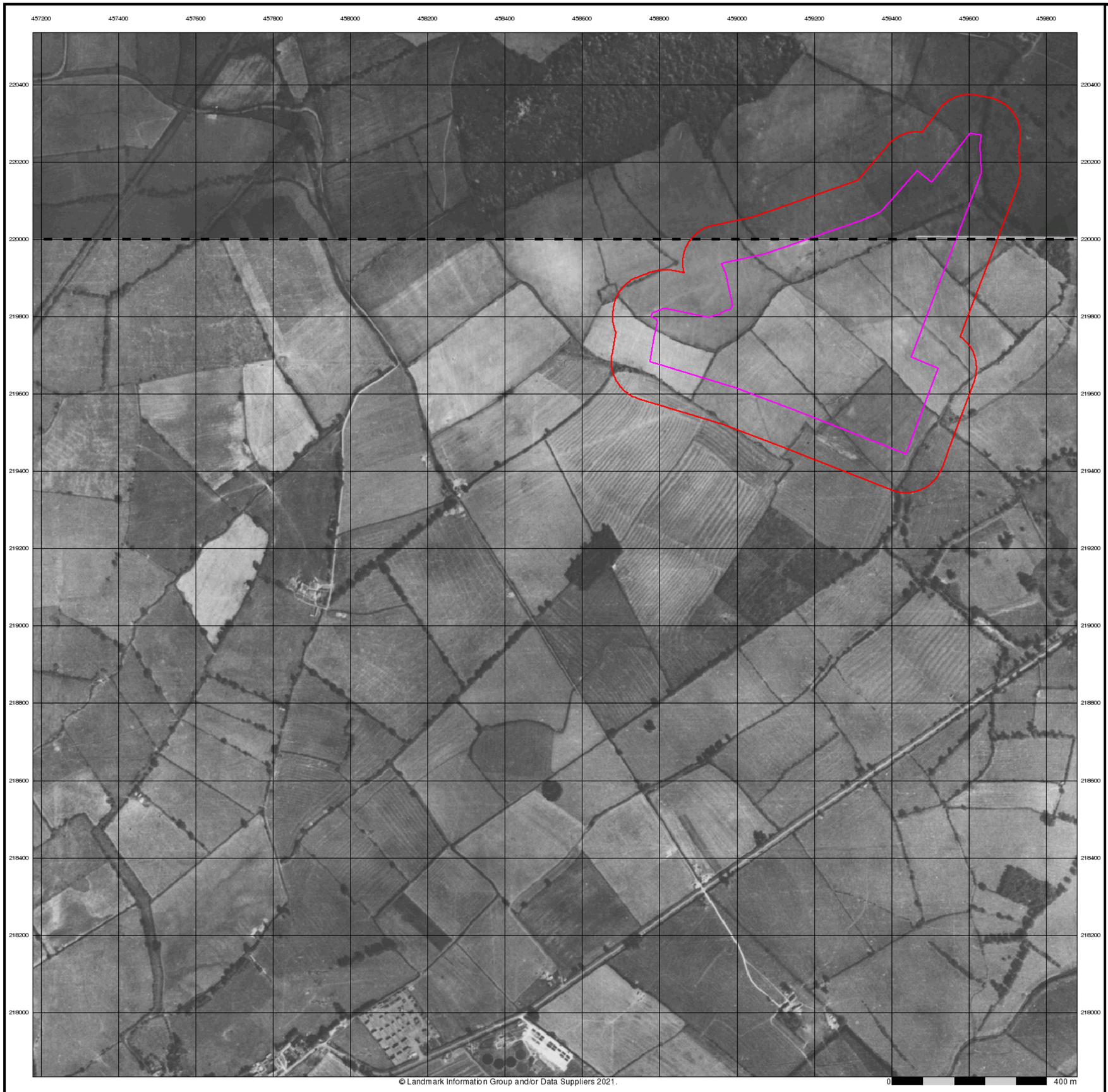
Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

Site Details

Site at, Bicester, Oxfordshire

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Historical Aerial Photography

Published 1947

Source map scale - 1:10,560

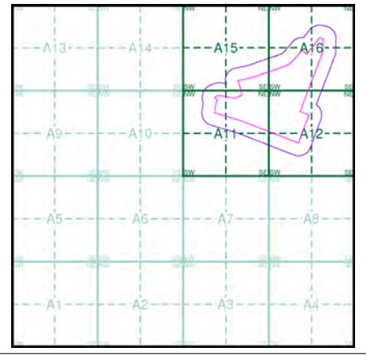
The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

Map Name(s) and Date(s)

SP52SE
1947
1:10,560

SP51NE
1947
1:10,560

Historical Aerial Photography - Slice A



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
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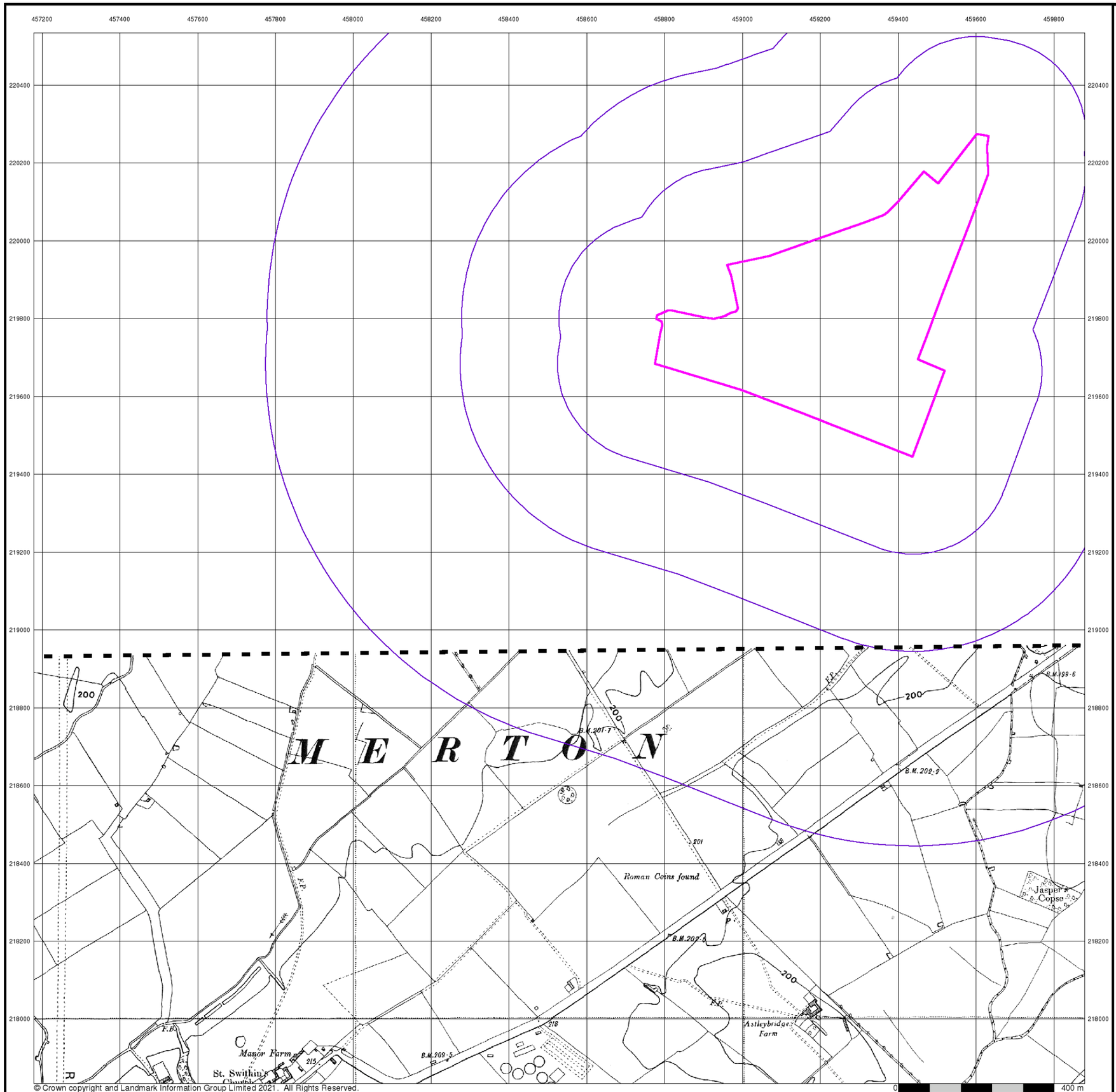


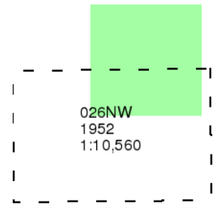
Buckinghamshire

Published 1952

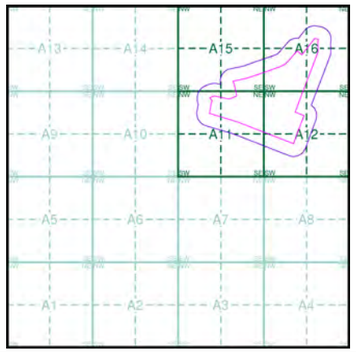
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

Site Details

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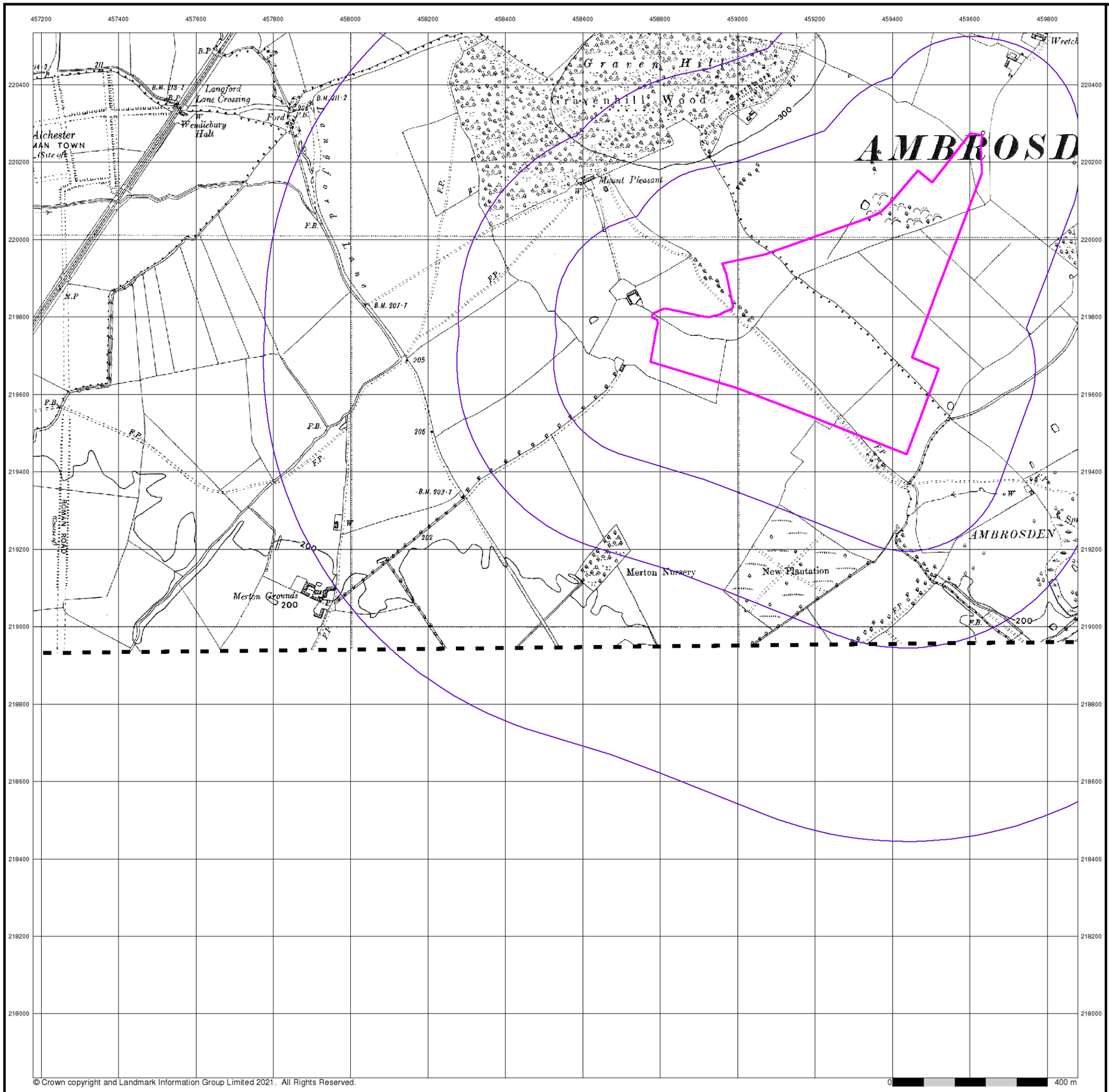

Oxfordshire

Published 1952

Source map scale - 1:10,560

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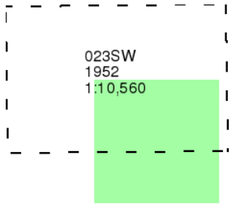
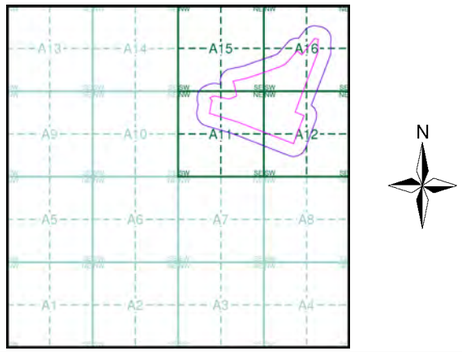
Map Name(s) and Date(s)



Historical Map - Slice A



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Order Number:	273271963_1_1
Customer Ref:	JER8747
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Site Area (Ha):	31.76
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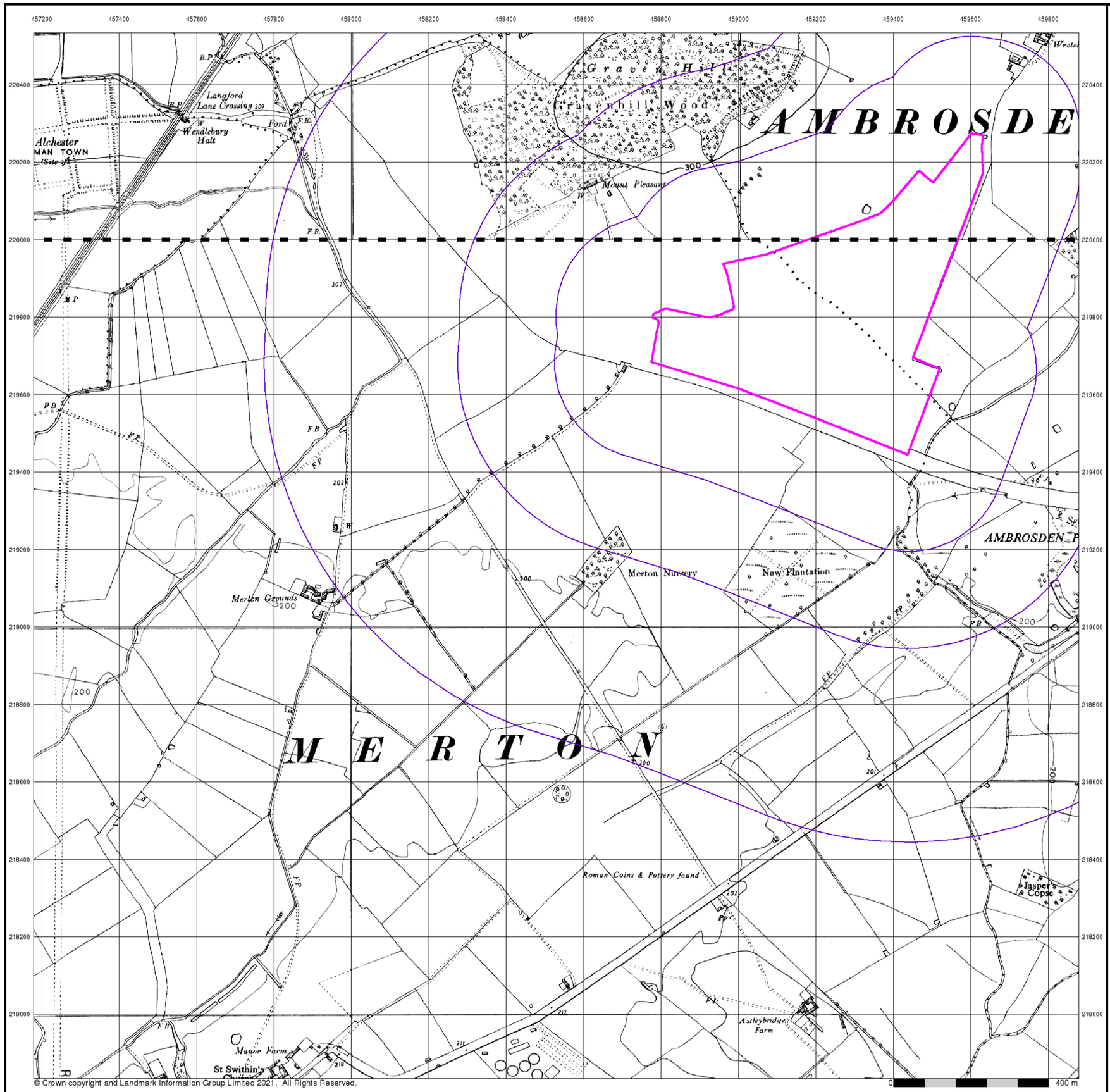


Ordnance Survey Plan

Published 1955

Source map scale - 1:10,000

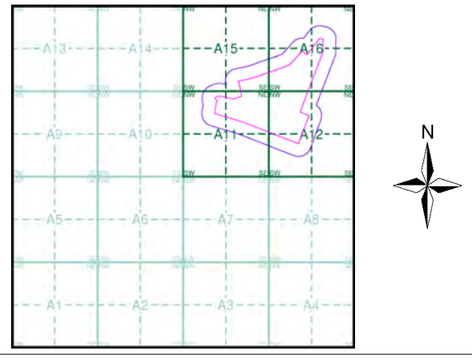
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SP52SE
1955
1:10,560

SP51NE
1955
1:10,560

Historical Map - Slice A



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

Site Details

Site at, Bicester, Oxfordshire

Landmark INFORMATION GROUP
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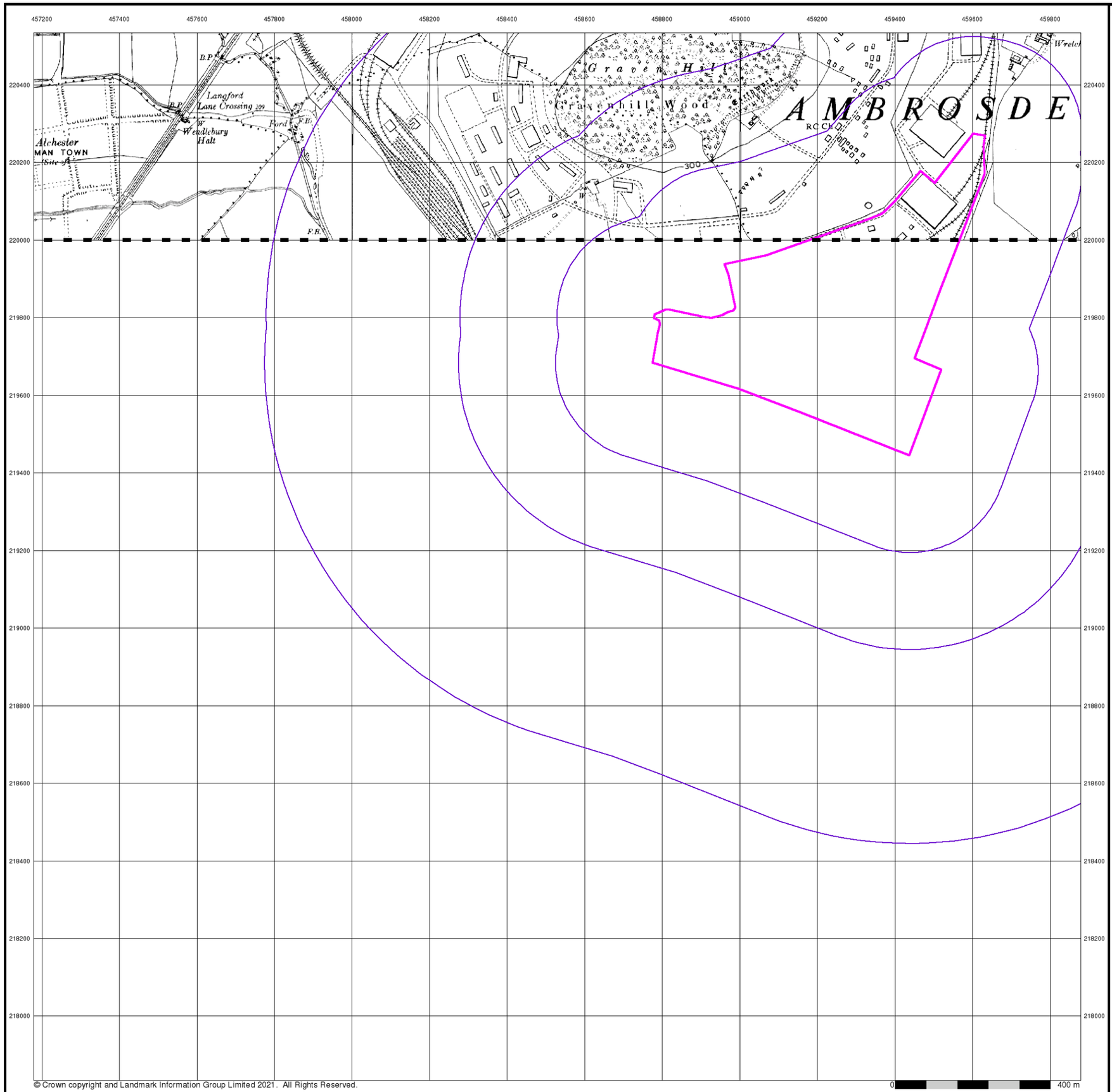


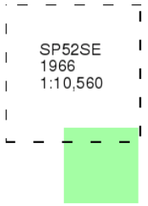
Ordnance Survey Plan

Published 1966

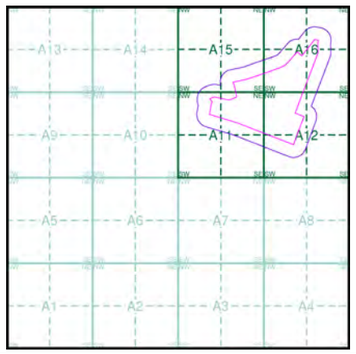
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

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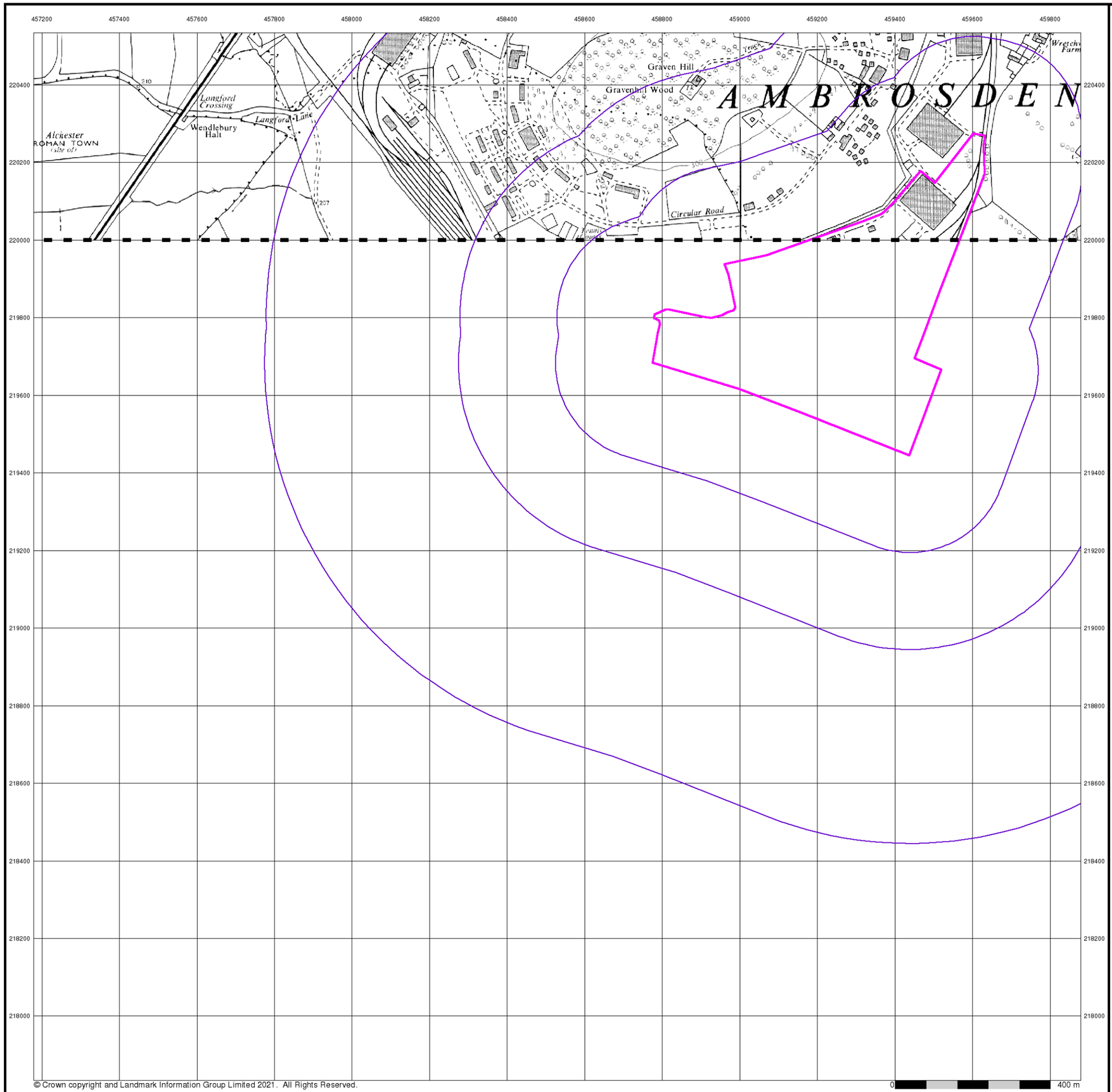


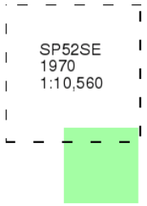
Ordnance Survey Plan

Published 1970

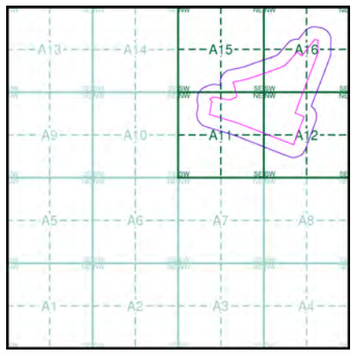
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



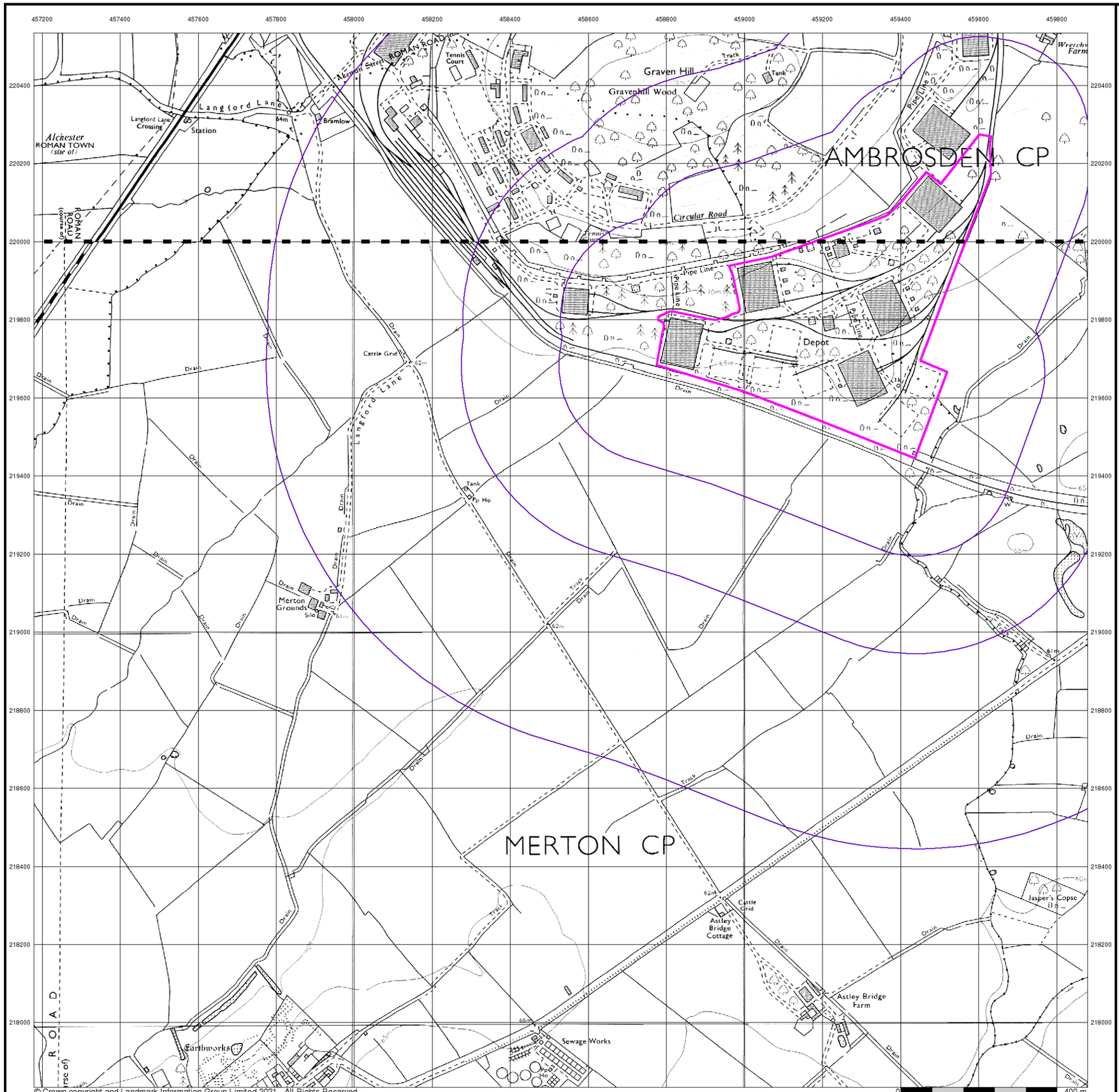
Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

Site Details

Site at, Bicester, Oxfordshire

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Ordnance Survey Plan

Published 1981 - 1988

Source map scale - 1:10,000

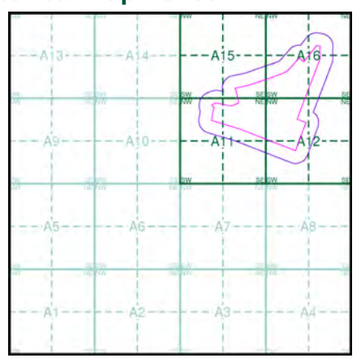
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SP52SE
1988
1:10,000

SP51NE
1981
1:10,000

Historical Map - Slice A



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

Site Details

Site at, Bicester, Oxfordshire

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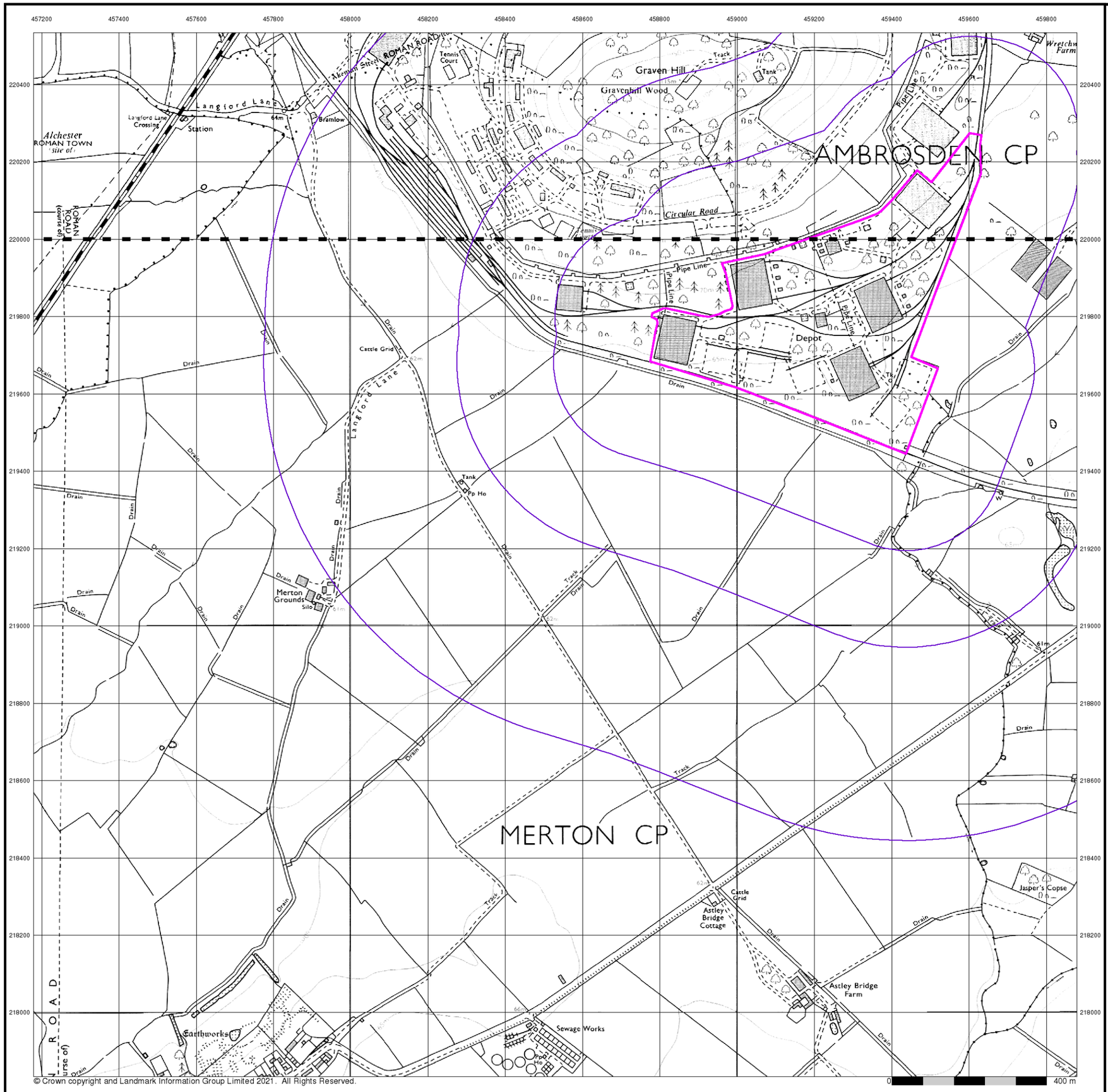


Ordnance Survey Plan

Published 1993 - 1996

Source map scale - 1:10,000

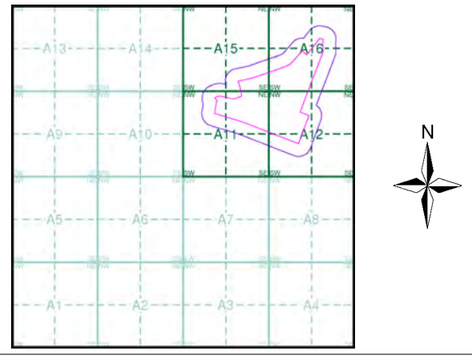
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SP52SE
1996
1:10,000

SP51NE
1993
1:10,000

Historical Map - Slice A



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	1000

Site Details

Site at, Bicester, Oxfordshire

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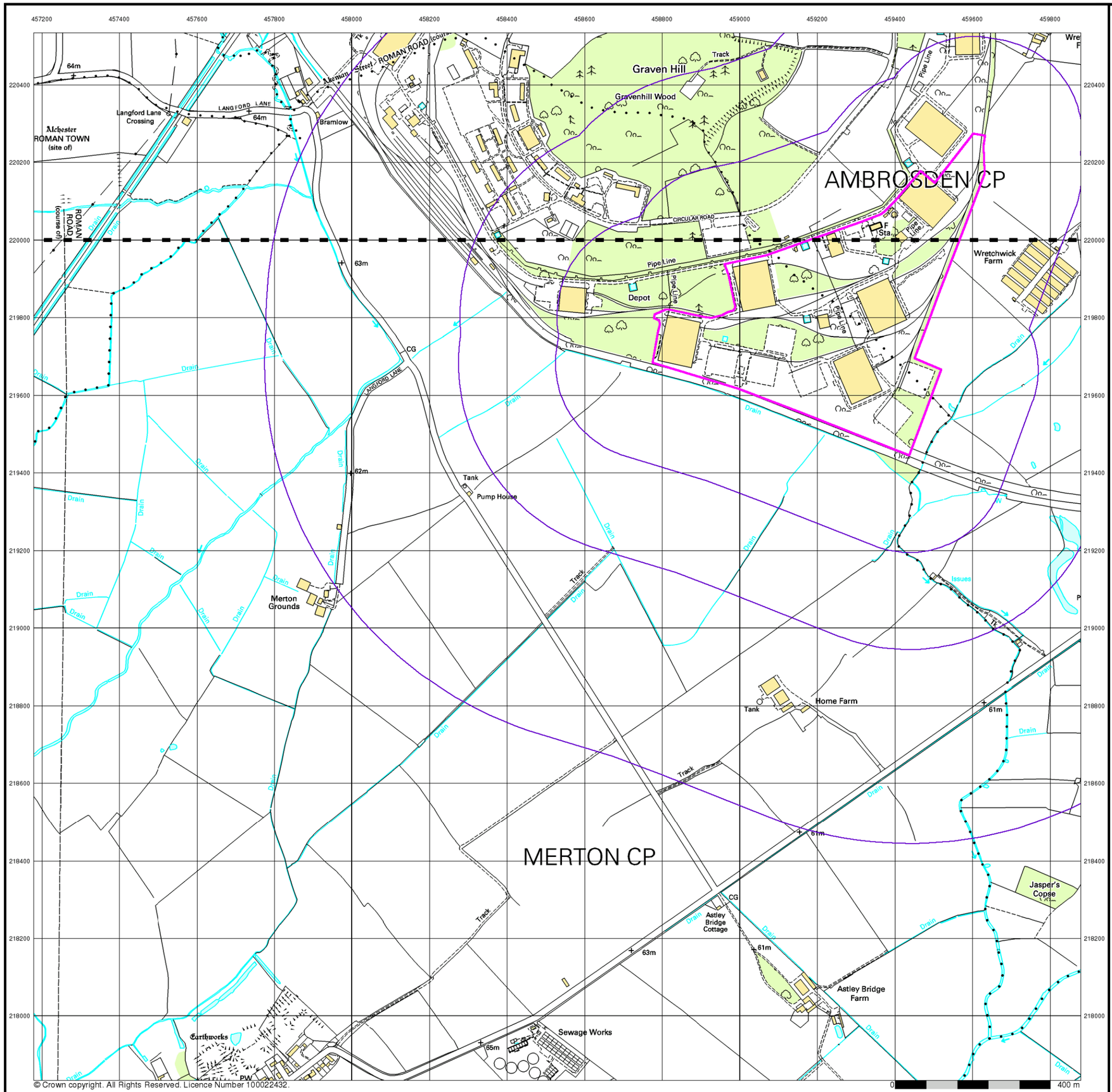


10k Raster Mapping

Published 1999

Source map scale - 1:10,000

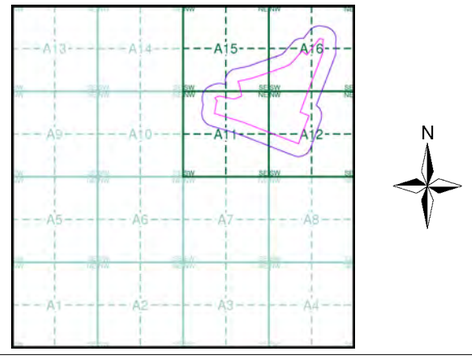
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

SP52SE
1999
1:10,000

SP51NE
1999
1:10,000

Historical Map - Slice A



Order Details

Order Number:	273271963_1_1
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Slice:	A
Site Area (Ha):	31.76
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Site Details

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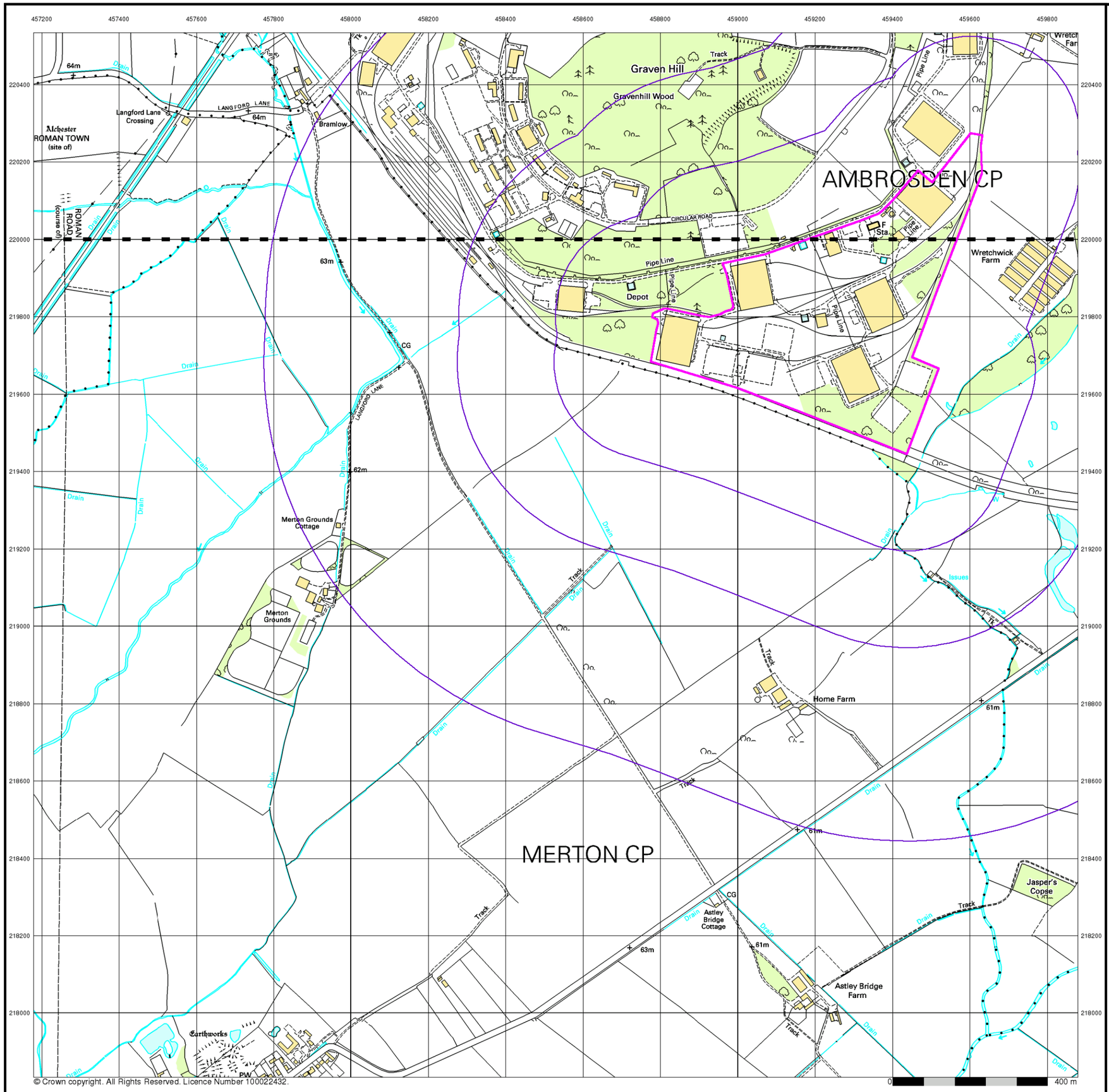


10k Raster Mapping

Published 2006

Source map scale - 1:10,000

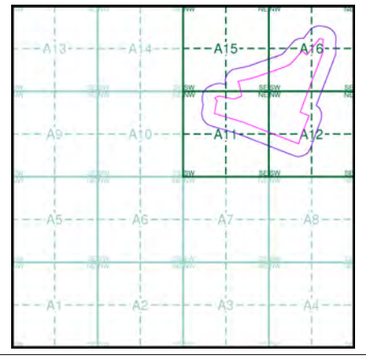
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

SP52SE
2006
1:10,000

SP51NE
2006
1:10,000

Historical Map - Slice A



Order Details

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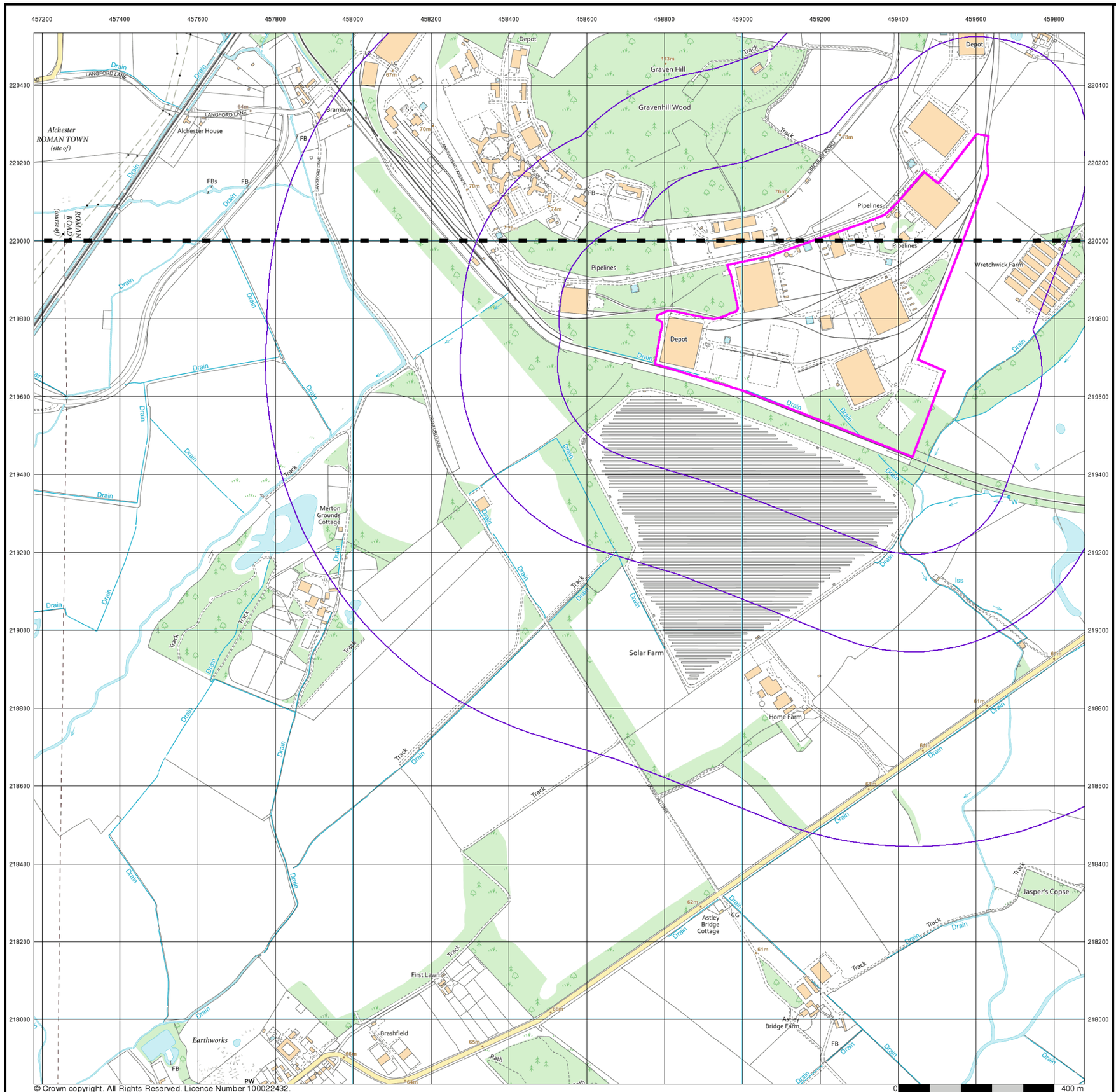


VectorMap Local

Published 2020

Source map scale - 1:10,000

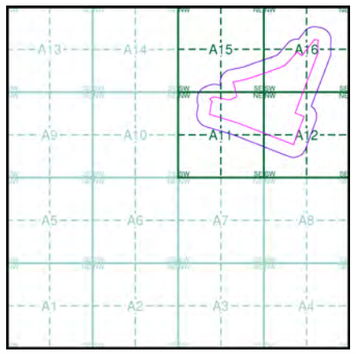
VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

SP52SE
2020
Variable

SP51NE
2020
Variable

Historical Map - Slice A



Order Details

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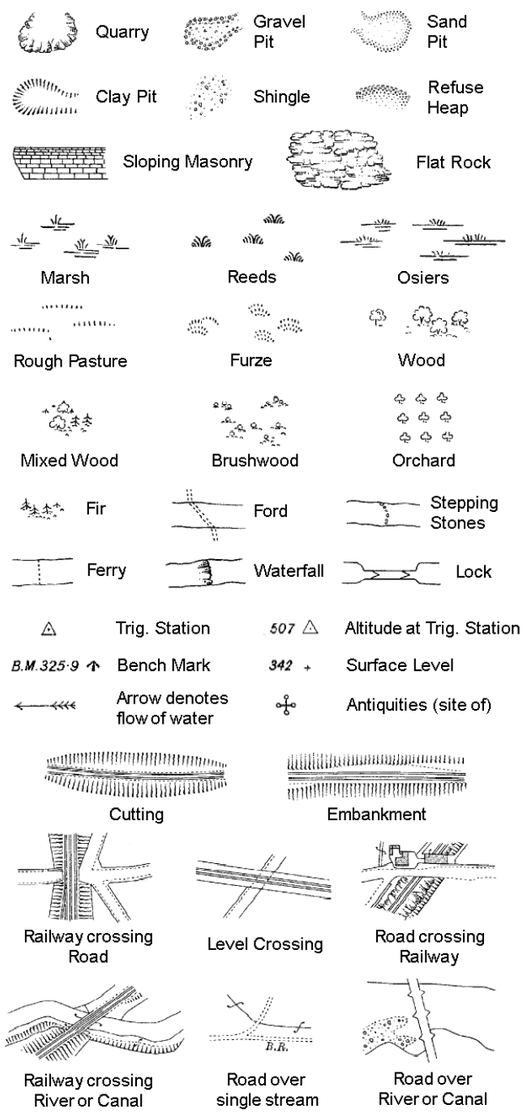
Historical Mapping Legends

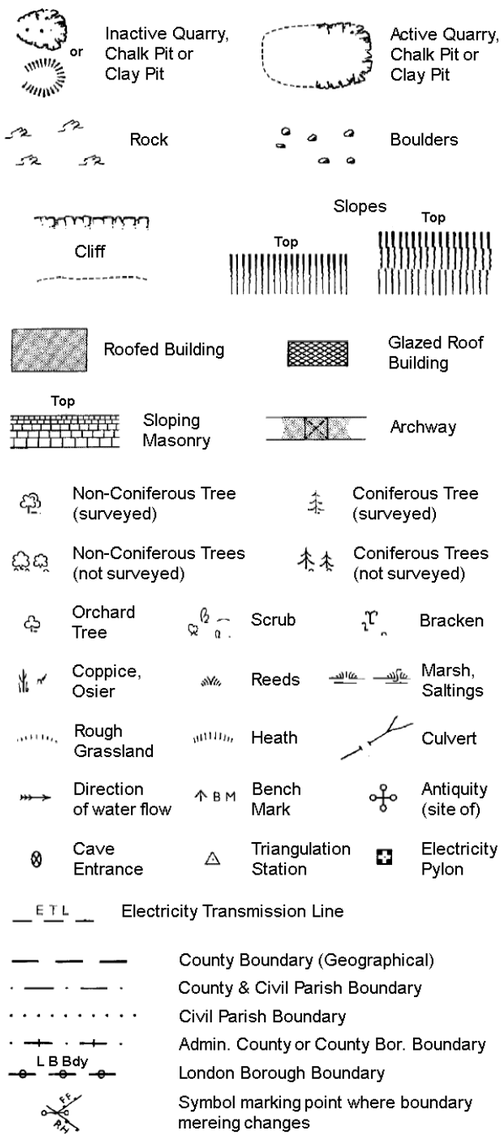
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy.
County Borough Boundary (England)
Co. Burgh Bdy.
County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

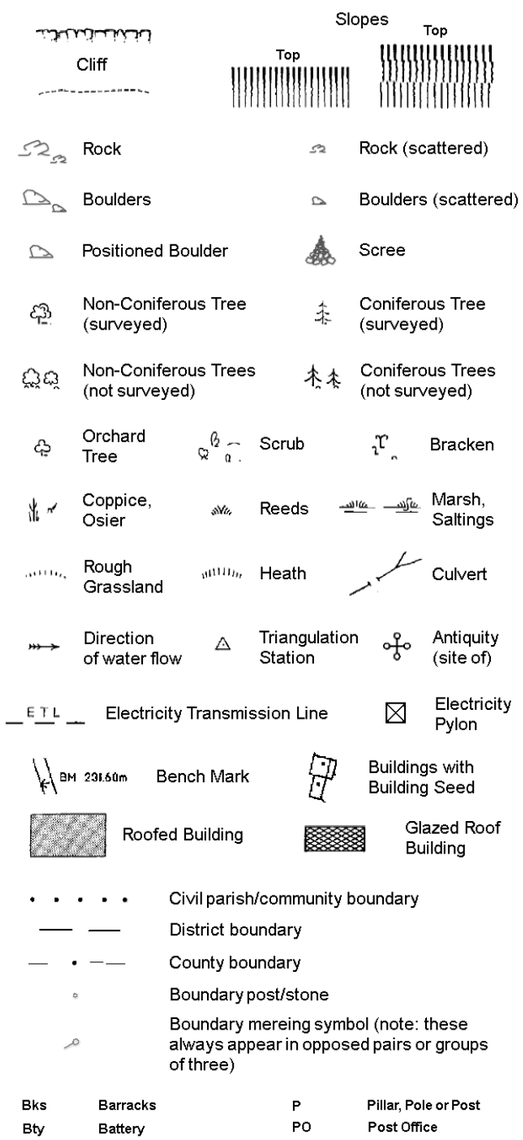
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy
London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

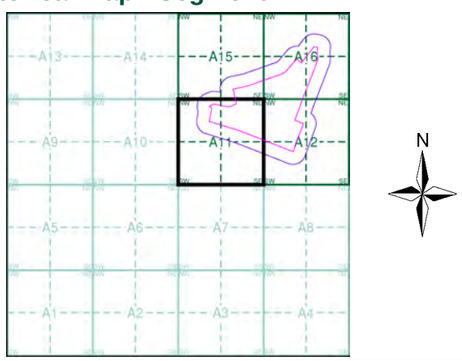
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

rps

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Oxfordshire	1:2,500	1875	2
Oxfordshire	1:2,500	1899	3
Oxfordshire	1:2,500	1922	4
Ordnance Survey Plan	1:2,500	1978	5
Large-Scale National Grid Data	1:2,500	1994	6
Historical Aerial Photography	1:2,500	1999	7

Historical Map - Segment A11



Order Details

Order Number: 273271963_1_1
Customer Ref: JER8747
National Grid Reference: 458920, 219580
Slice: A
Site Area (Ha): 31.76
Search Buffer (m): 100

Site Details

Site at, Bicester, Oxfordshire

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

458600 458800 459000 459200

219800 219600 219400 219200

24 44 43 45 42

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0 100 m

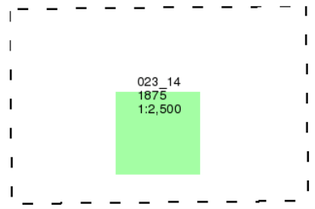
Oxfordshire

Published 1875

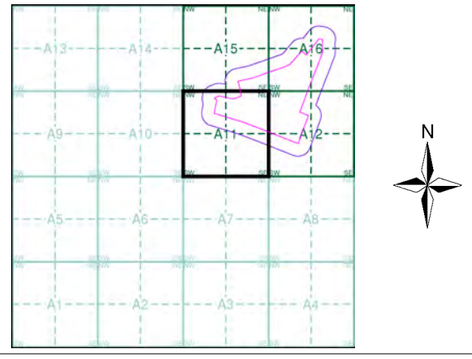
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



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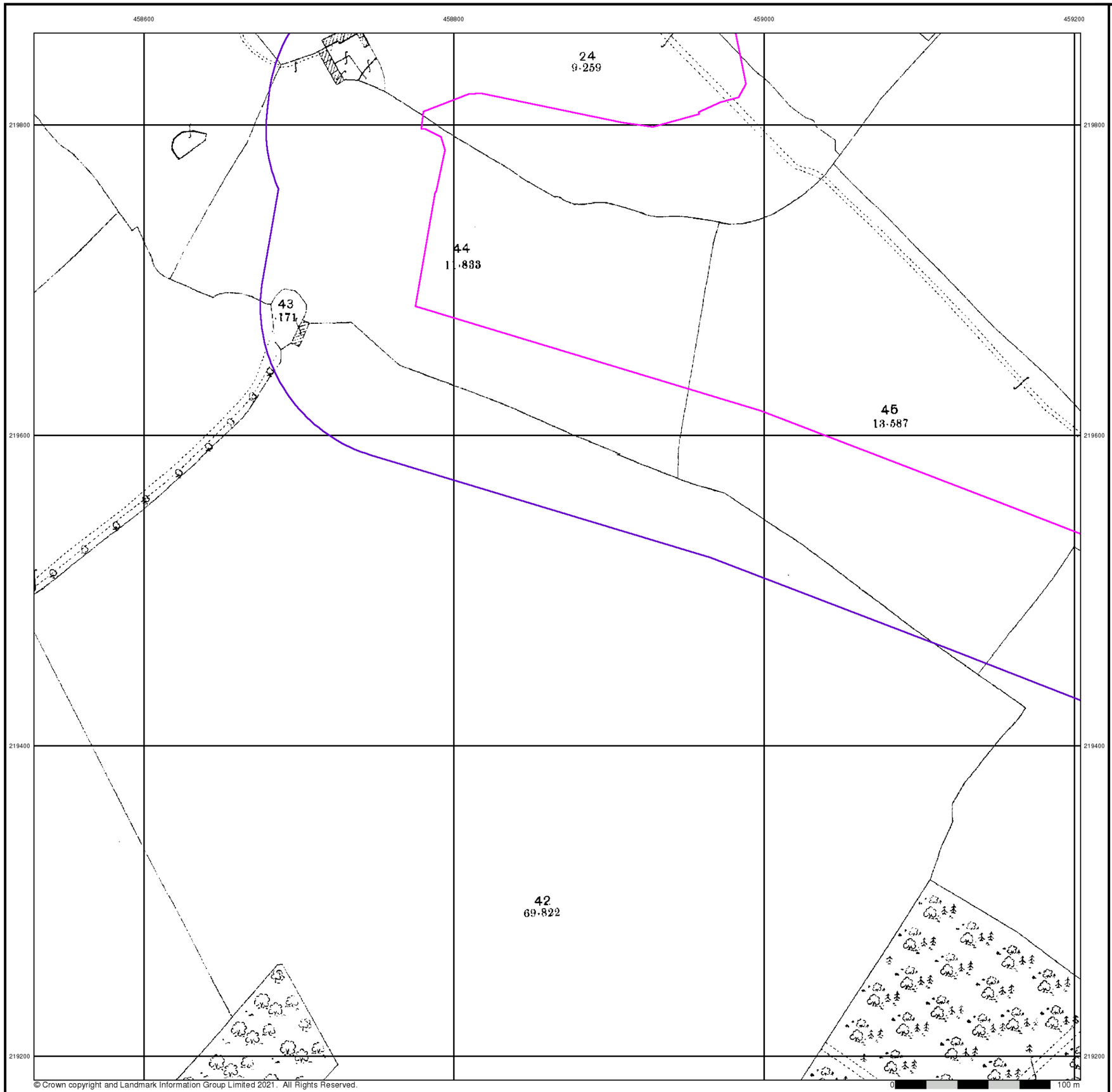

Oxfordshire

Published 1899

Source map scale - 1:2,500

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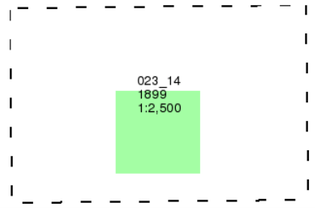
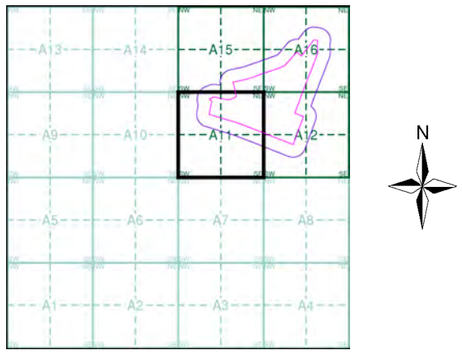


Historical Map - Segment A11



Order Details

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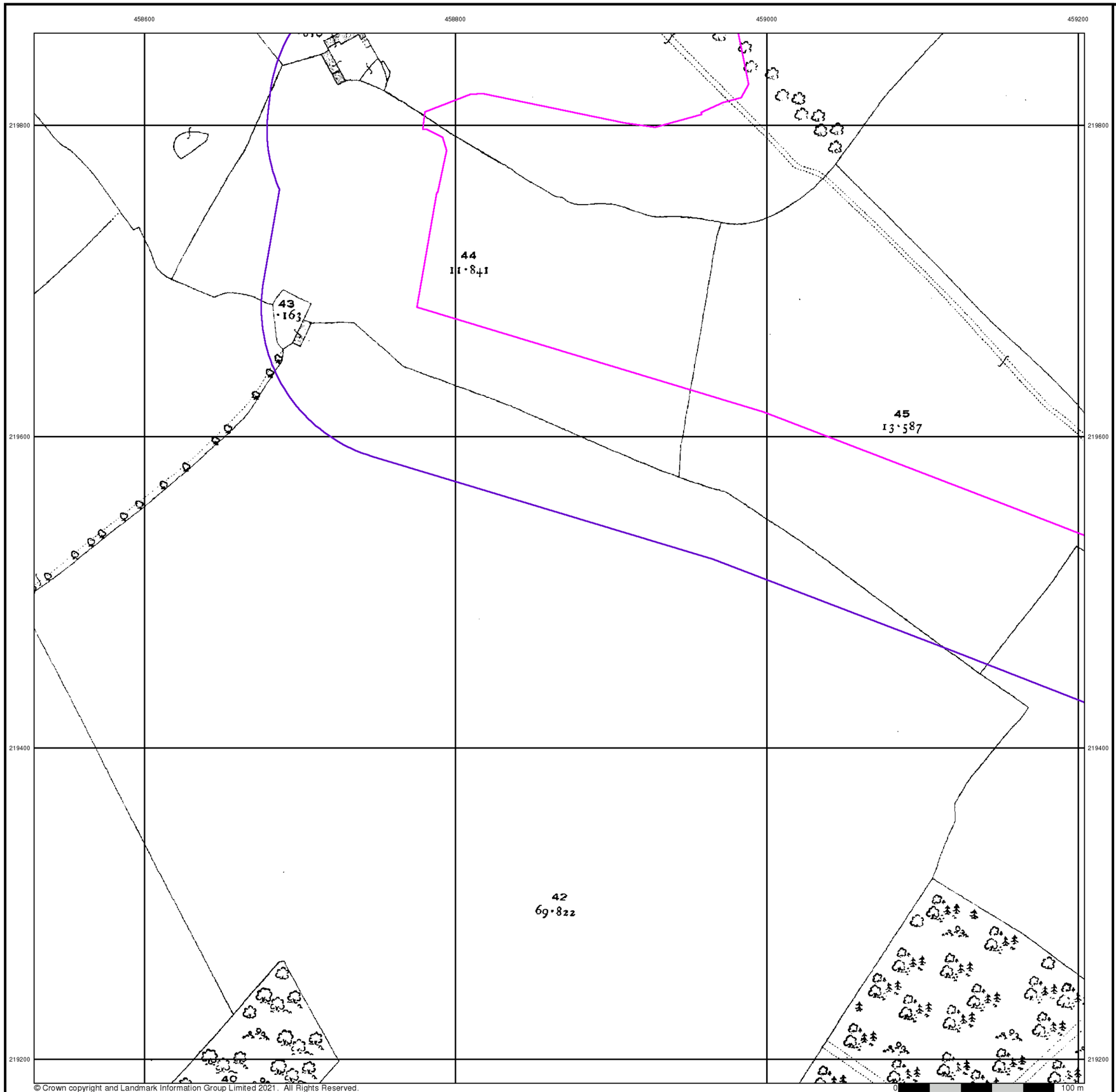

Oxfordshire

Published 1922

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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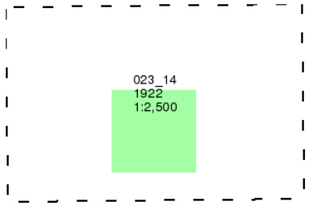
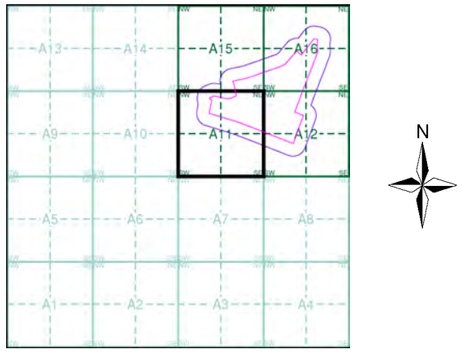


Historical Map - Segment A11



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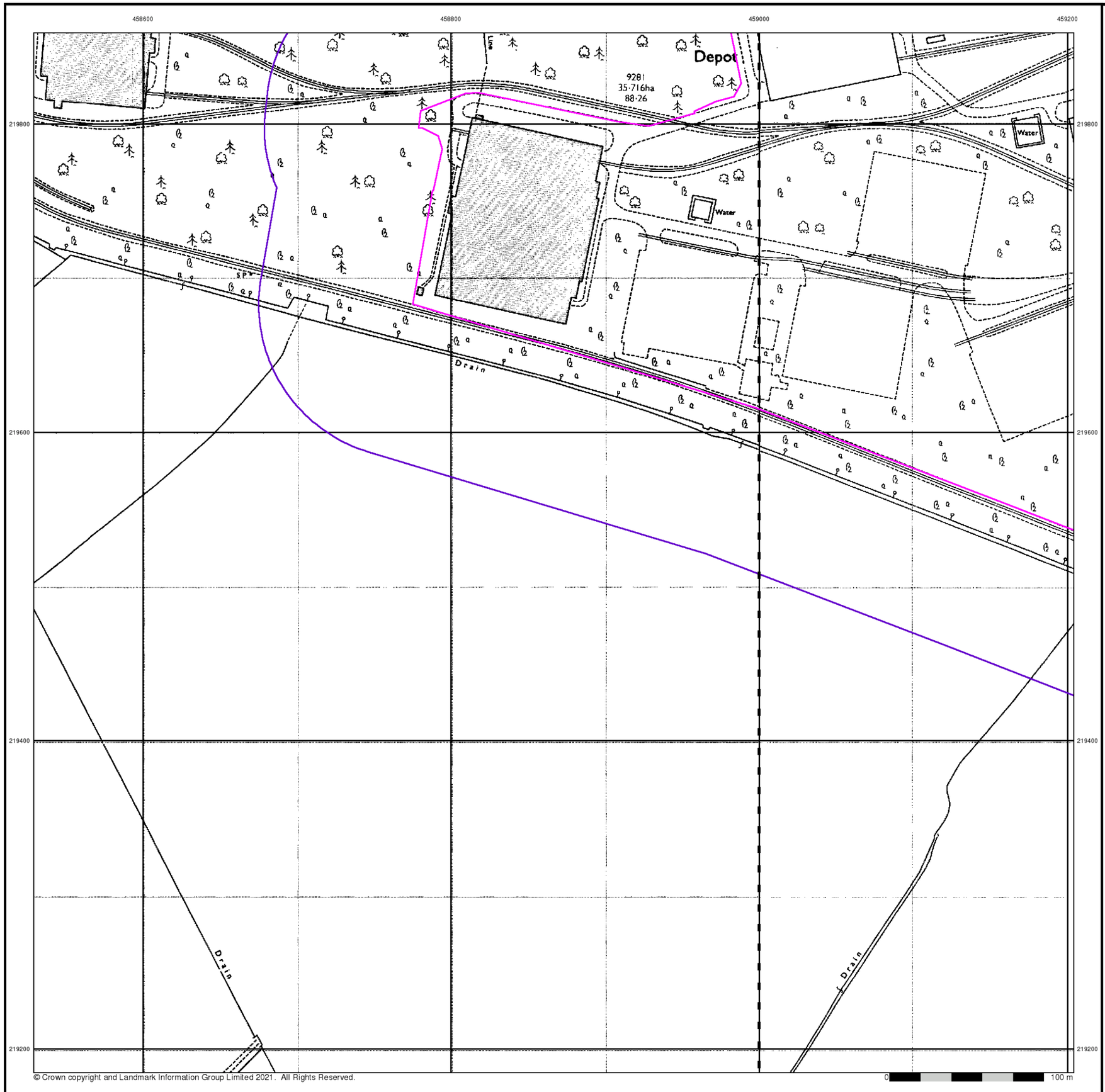


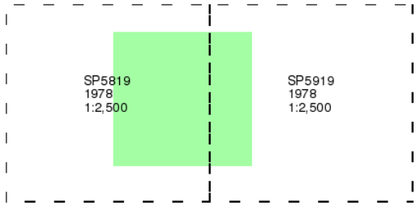
Ordnance Survey Plan

Published 1978

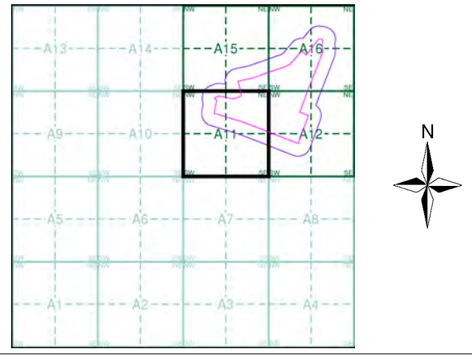
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



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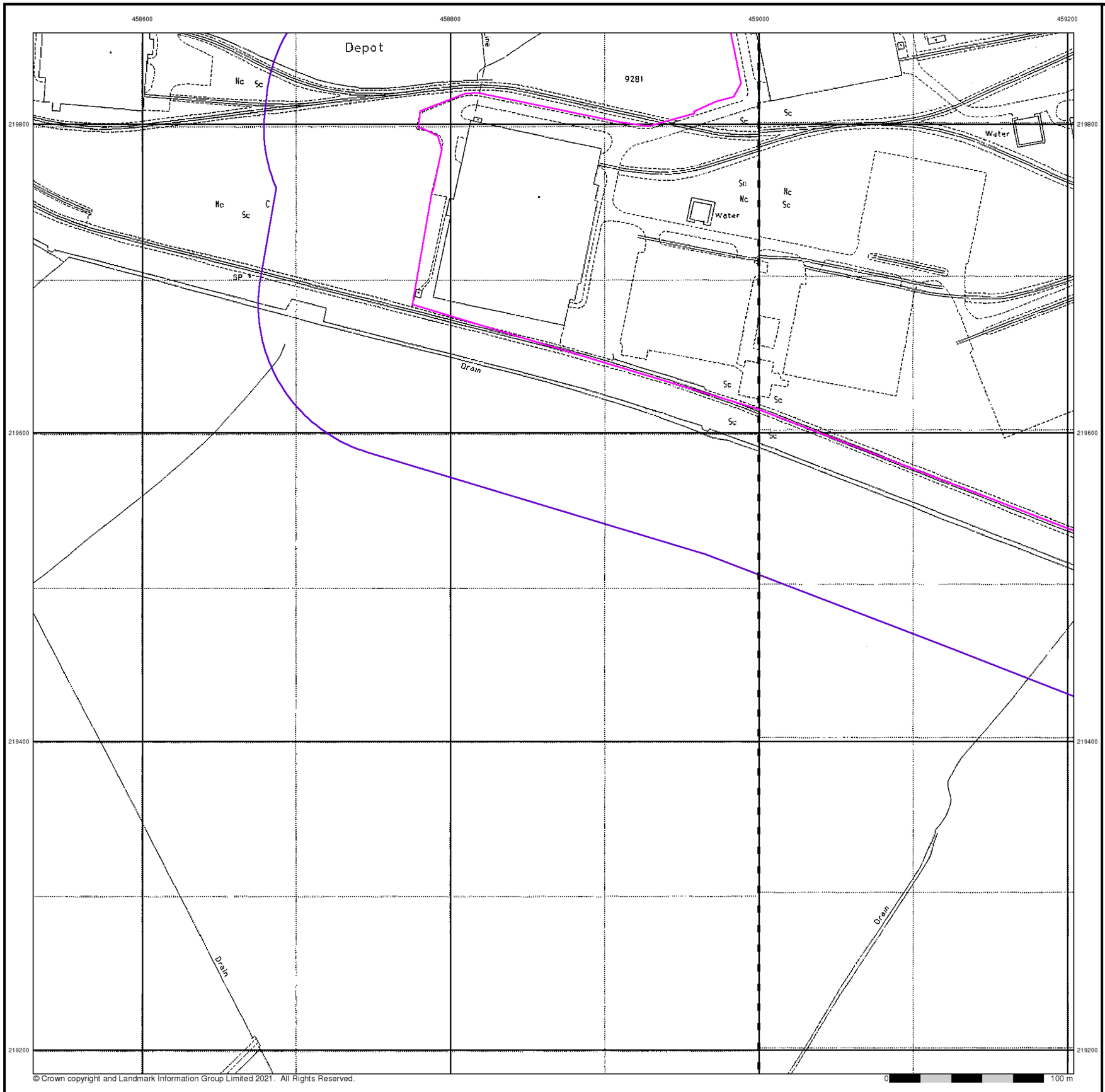


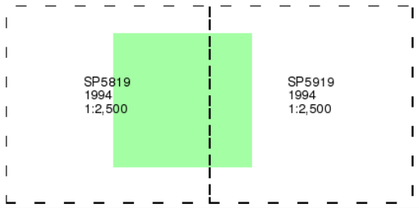
Large-Scale National Grid Data

Published 1994

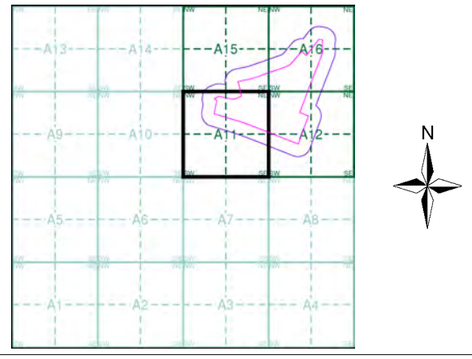
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A11



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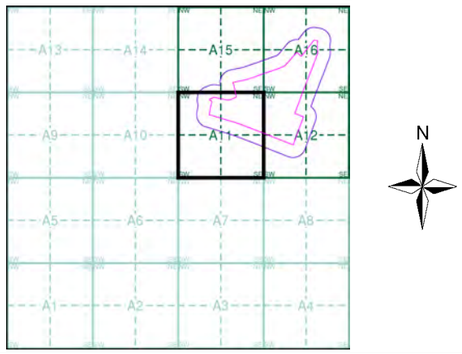
Historical Aerial Photography

Published 1999

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A11



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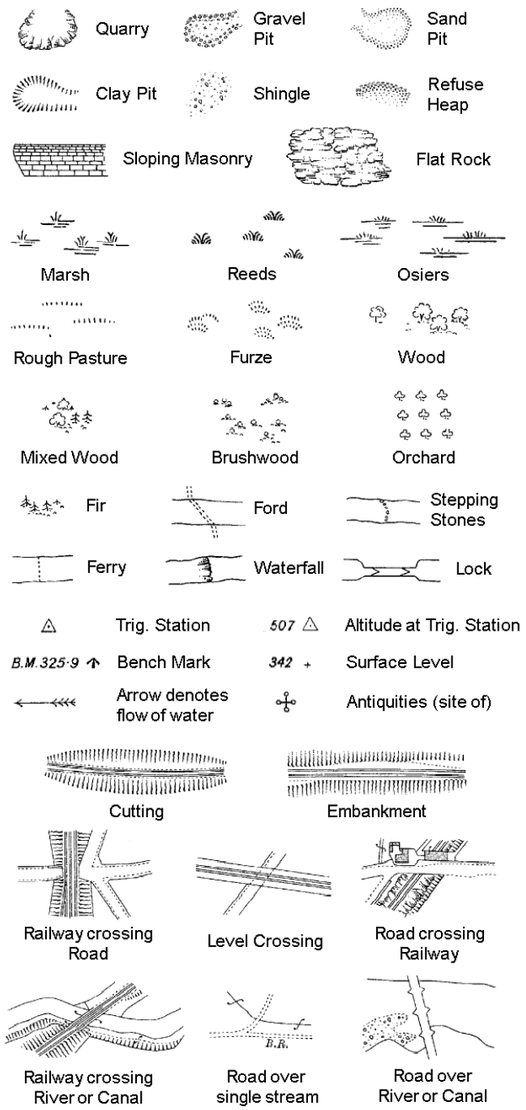
Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)

County & Civil Parish Boundary

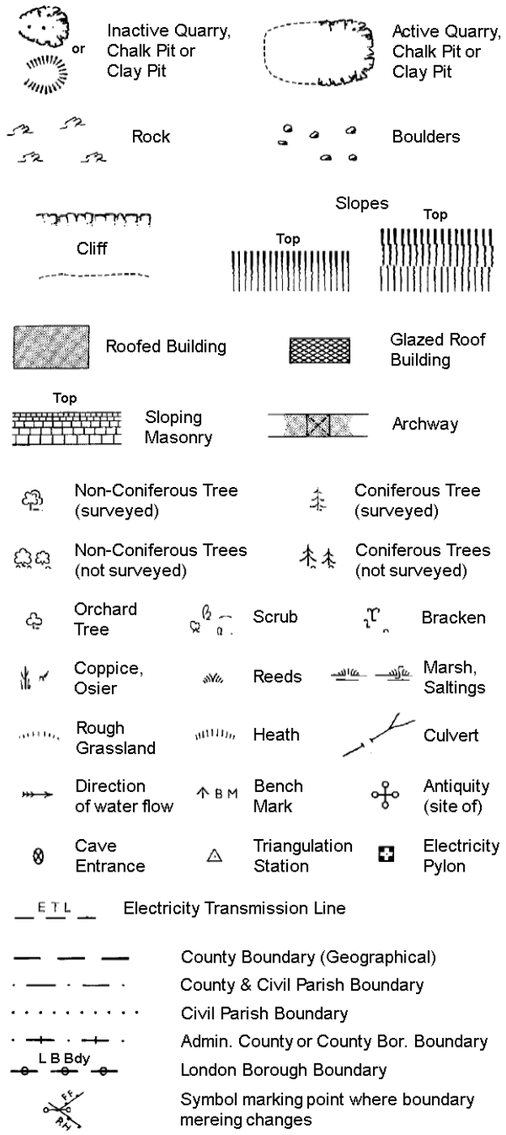
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
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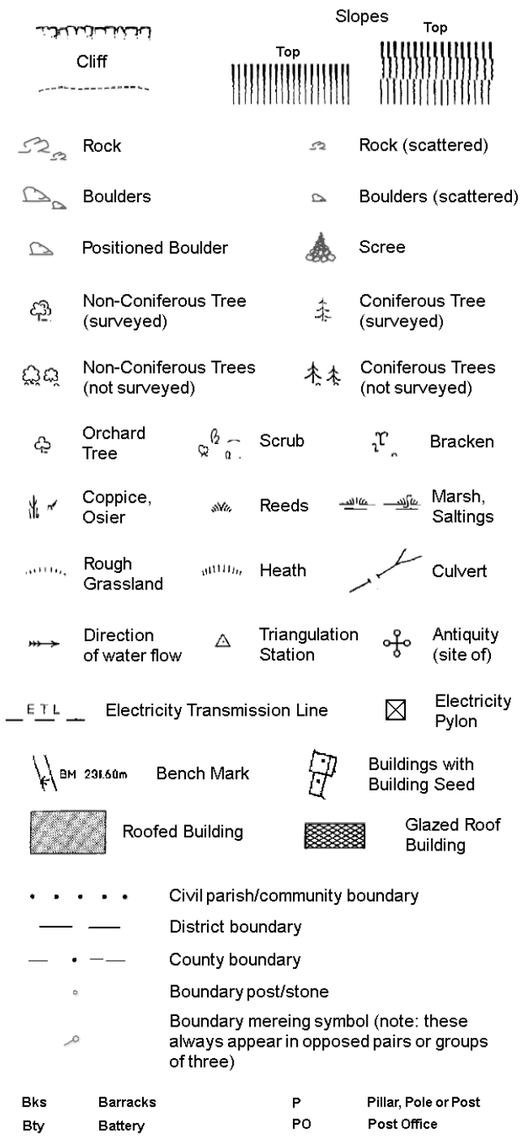
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
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Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
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MP, MS	Mile Post or Mile Stone	W	Well

rps

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
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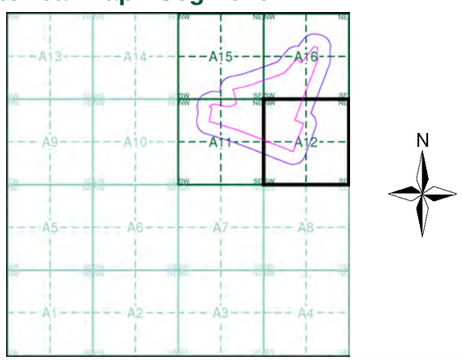
Large-Scale National Grid Data	1:2,500	1994	6
Historical Aerial Photography	1:2,500	1999	7

Historical Map - Segment A12



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
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Search Buffer (m):	100

Site Details

Site at, Bicester, Oxfordshire

Landmark INFORMATION GROUP

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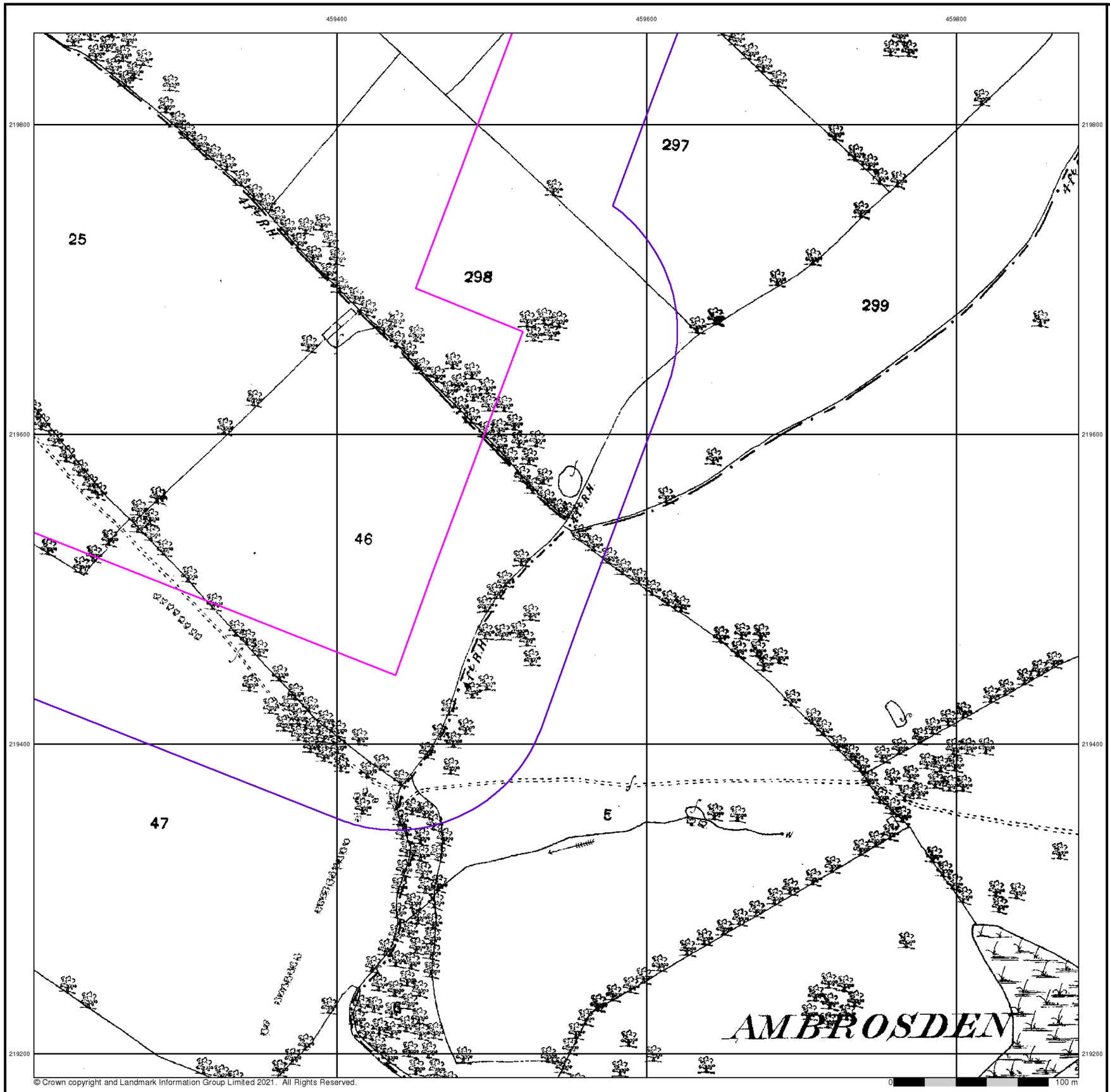

Oxfordshire

Published 1875

Source map scale - 1:2,500

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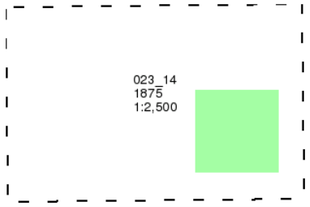
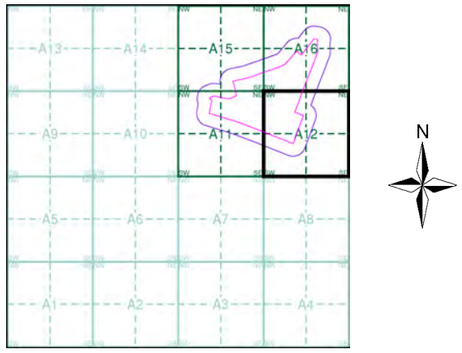
Map Name(s) and Date(s)



Historical Map - Segment A12



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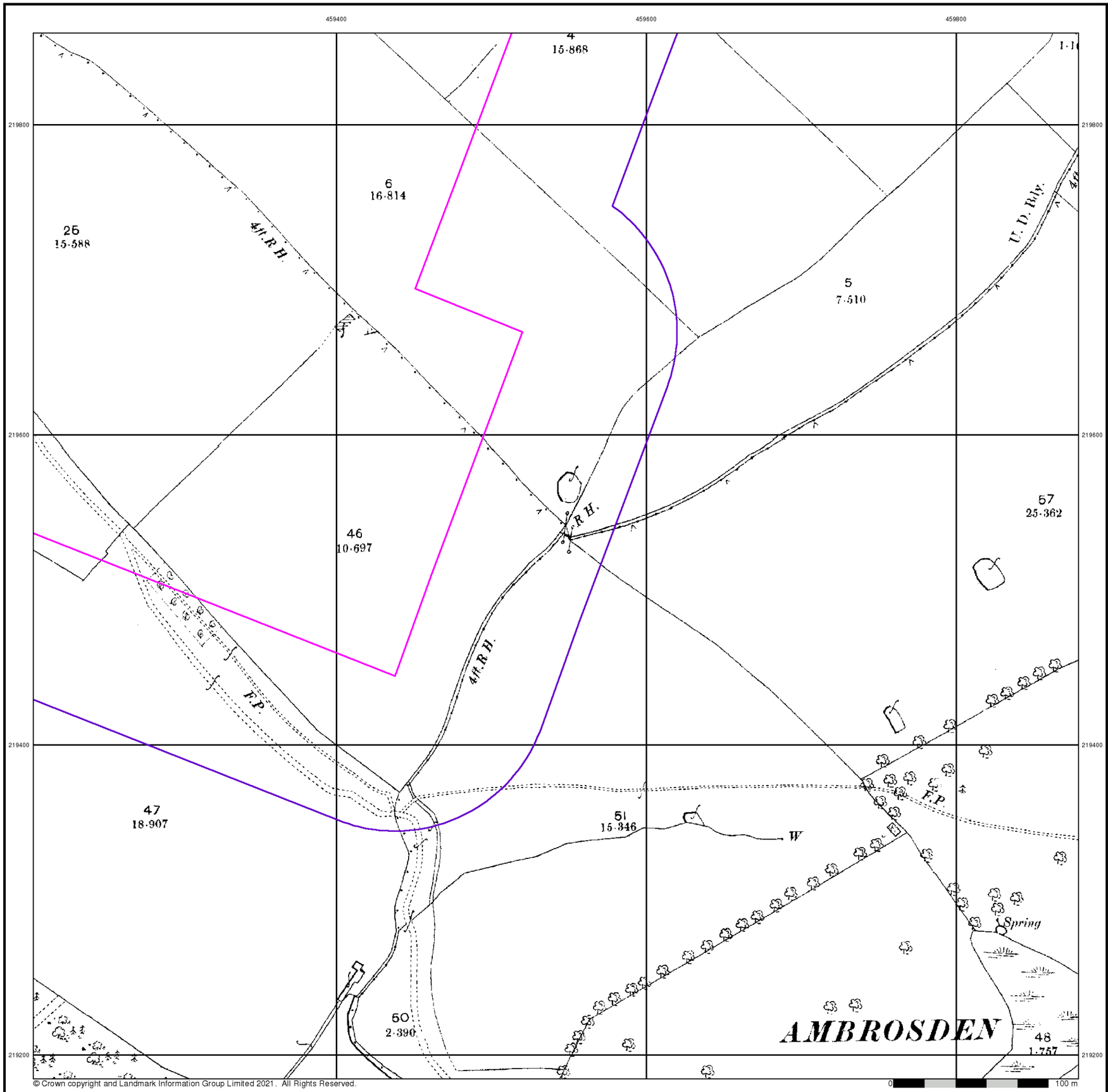

Oxfordshire

Published 1899

Source map scale - 1:2,500

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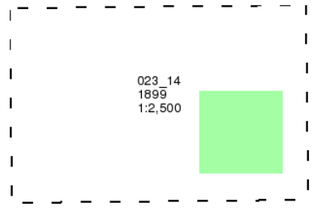
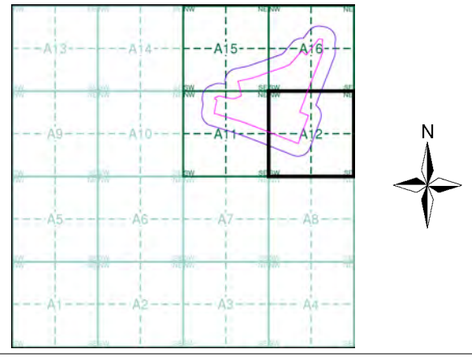


Historical Map - Segment A12



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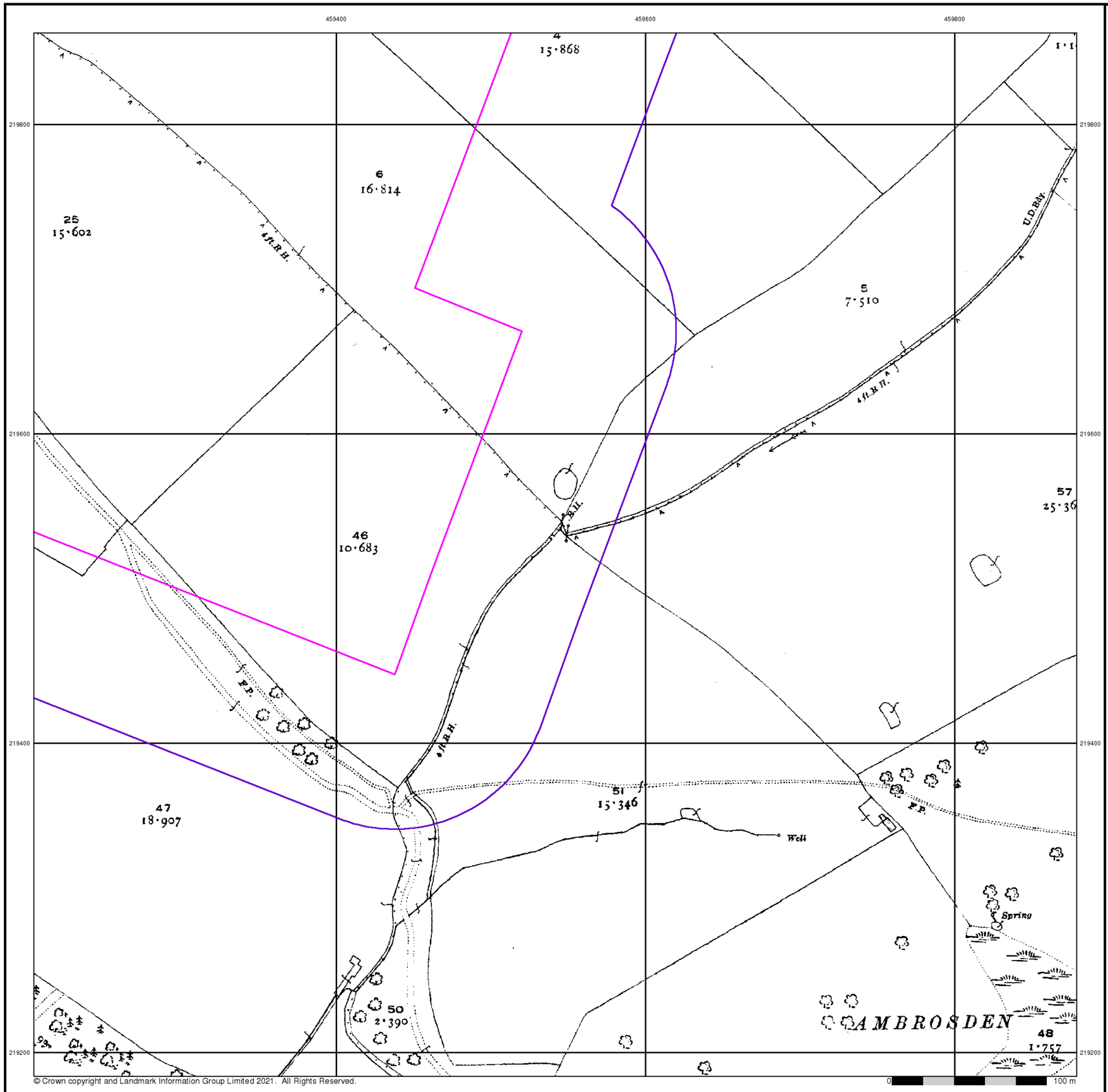


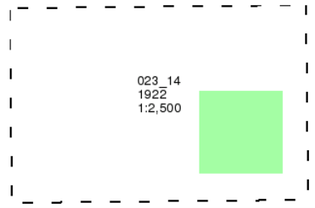
Oxfordshire

Published 1922

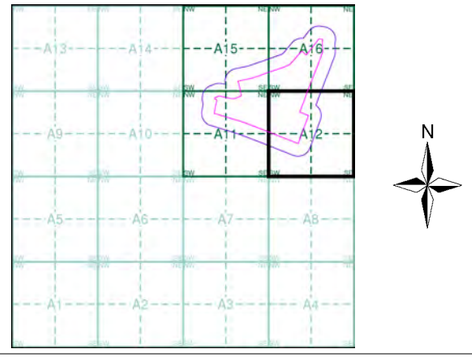
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A12



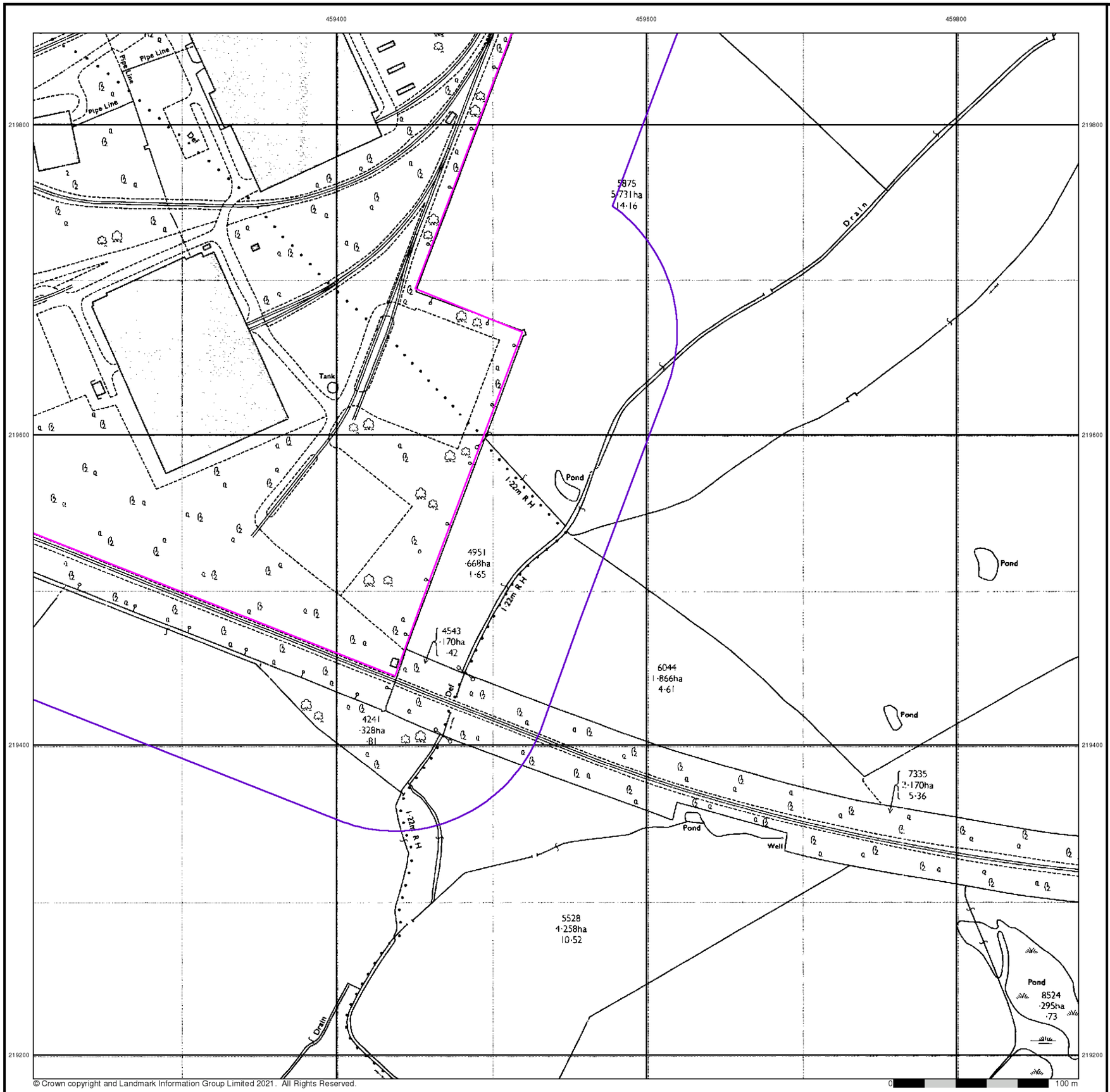
Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
National Grid Reference:	458920, 219580
Slice:	A
Site Area (Ha):	31.76
Search Buffer (m):	100

Site Details

Site at, Bicester, Oxfordshire

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



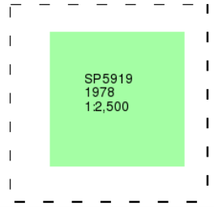
Ordnance Survey Plan

Published 1978

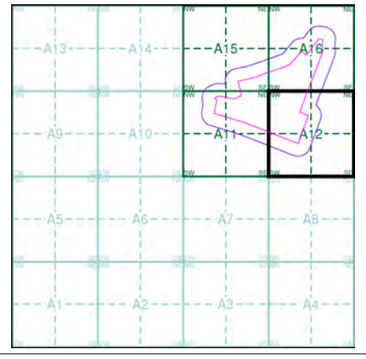
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A12



Order Details

Order Number:	273271963_1_1
Customer Ref:	JER8747
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Slice:	A
Site Area (Ha):	31.76
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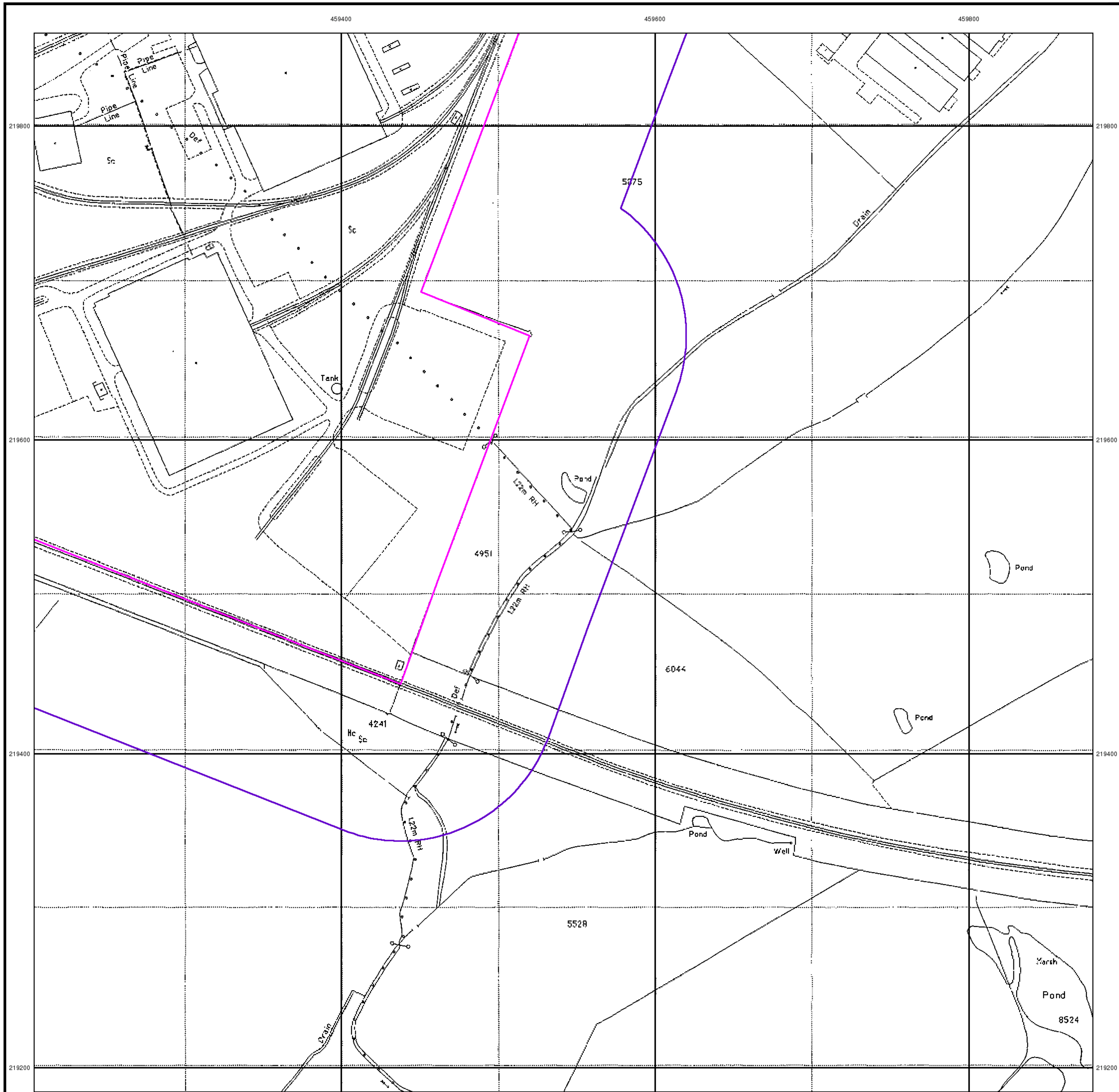


0 100 m

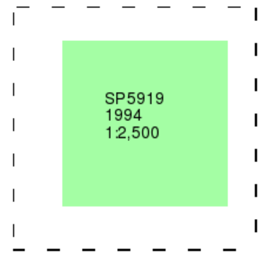
Large-Scale National Grid Data

Published 1994

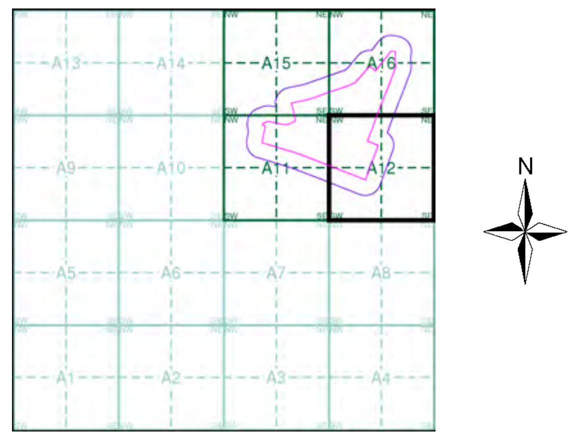
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A12



Order Details

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National Grid Reference: 458920, 219580
Slice: A
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