



# Pump and Bloors Farm, Rainham

**Phase 1 Ground Conditions Assessment  
(Contamination and Geotechnical)**

On behalf of **AC Goatham & Son**

Project Ref: 44538/3501 | Rev: 01 | Date: October 2018

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## Document Control Sheet

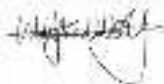

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## Summary

This report presents a Phase 1 Ground Condition Assessment (Contamination and Geotechnical) for the proposed residential redevelopment of a parcel of land around Pump Farm and Bloors Farm, Rainham, Medway, Kent.

**Site Location** The site is located within the village of Lower Rainham, Kent. The site is approximately 51.8 hectares in area and mostly comprises agricultural land and associated farm outbuildings.

**Ground Conditions** The available geological data indicates that the Site is underlain by Superficial Head deposits in part with a thinning sequence of Thanet Formation overlying the Seaford Chalk Formation forming the bedrock strata below. Groundwater is anticipated to be at an elevation of between around 4m and 2mAOD, i.e. between 18-20m bgl within the Seaford Chalk Formation which has been identified as being a Principal Aquifer

The Lower Twydall Chalk Pit landfill, a closed inert filled landfill is located to the immediate west of the site. The presence of other areas of made ground at the site are limited in nature and restricted to areas of previous development principally associated with farm outbuildings, access roads or structures that exist on the site.

**Preliminary Geo-Environmental Assessment** Based on the proposed end use of the site as residential with a primary school, retirement village, and recreational areas, the findings of a qualitative risk assessment carried out to assess hazards and constraints posed by the existing site conditions to the proposed development are summarised in the following table.

Table A Summary of the preliminary geoenvironmental assessment

Potential Receptor	Risk Assessment	Description
Construction Workers	<b>Low</b>	The risk to site workers is expected to be Low provided appropriate protective clothing and equipment are worn, and good standards of hygiene are adopted to prevent prolonged skin contact, inhalation and ingestion of soils.
Future Users	<b>Low</b>	The risk to future site users is estimated as Low with very localised areas of possible contamination/landgas associated with historic or current land use.
Buildings	<b>Very Low</b>	The risk to buildings is estimated to be Very Low. This is a result of the buildings being classified as being replaceable and because it is assessed that there is a low possibility that harm could impact this receptor.
Groundwater	<b>Low</b>	The site is underlain by a Principal Aquifer (Seaford Chalk Formation), but it's not located within any Source Protection Zone area. The risk to groundwater is considered to be Low.

Ground investigation is advised at a later stage to inform both the geotechnical design of foundations / infrastructure and also to confirm the absence of contamination. It is recommended therefore that any future ground investigation at the site will incorporate some basic contamination testing, and land gas monitoring in proximity to the Lower Twydall Landfill site to support the conclusions of this study.

It is considered very unlikely that the local planning authority will designate the site as Contaminated Land under Part 2A of the Environmental Protection Act 1990.

Preliminary Ground Stability Risk Assessment A review of potential geological hazards has identified the risk of land instability or potentially adverse foundation conditions to be present, in general, to be **High**. This is due to the **High** risk of solution features associated with the dissolution of the Seaford Chalk Formation underlying the site.

***The summary contains an overview of the key findings and conclusions. However, no reliance should be placed on any part of the summary until the whole of the report has been read.***



# 1 Introduction

## 1.1 Preamble

Peter Brett Associates LLP (PBA) has been instructed by AC Goatham & Son (the Client) to undertake a Phase 1 Ground Condition Assessment for a parcel of agricultural land associated with Pump Farm and Bloors Farm in Rainham, Medway, Kent.

This report presents a Phase 1 ground conditions assessment comprising a desk study, site walkover, Tier 1 preliminary qualitative contamination risk assessment, and preliminary ground stability assessment. The report has been prepared to support a planning application for the development of the Site suitable for predominantly residential development.

The assessments review readily available information in order to assess the existing ground conditions on the site and the potential for contamination to be present associated with previous and present uses of the site and the surrounding areas. This enables a qualitative assessment to be made of the geoenvironmental constraints such that informed decisions on the proposed development can be made and the risk and hazards associated with existing or potential future contamination and instability of the ground be identified.

It should be noted that the Phase 1 is a land condition assessment and does not purport to be an ecological, flood risk or archaeological survey.

## 1.2 Objectives

The National Planning Policy Framework (NPPF) (DCLG, 2018) stipulates that planning policies and decisions should ensure that “a site is suitable for its proposed use taking account of ground conditions and any risk arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)”; and that “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is available to inform these assessments”.

The objective of this report is to identify the likely ground conditions at the site and to assess whether there are significant geoenvironmental, and stability hazards associated with the existing ground conditions that require management (remediation or mitigation) to enable development or as part of the subsequent use of the site. In addition, the report includes advice on likely requirements for foundations, and infrastructure, to assess with the conceptual design of the proposed development.

## 1.3 Scope of Work

The scope of work undertaken by PBA comprises:

- A review and collation of readily available geological, hydrogeological and aquifer vulnerability maps; geological information and historical Ordnance Survey maps.
- A walkover survey to examine the existing condition of the Site and surrounding area.
- A qualitative Tier 1 risk assessment utilising a Conceptual Site Model to identify 'source – pathway - receptor' linkages to assess the potential risk and hazards, if any, associated with existing or potential future contamination in the ground.

- A ground stability assessment of the risk of subsidence arising from artificial cavities; natural cavities; and potential adverse foundation conditions.

This report presents a review of the acquired information, together with the development of a Preliminary Conceptual Site Model (CSM) and the associated Tier 1 contaminated land and ground stability risk assessment.

## 1.4 Methodology and Report Format

### Assessment of Ground Conditions - Contamination

UK legislation on contaminated land from historical activities is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the 1990 Act by section 57 of the Environment Act 1995).

The Regulations and Statutory Guidance that accompanied the Act, including the Contaminated Land (England) Regulations 2006, have been revised with the issue of the Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and the Contaminated Land Statutory Guidance for England 2012.

Under the NPPF, the broad approach, concepts and principles behind land contamination management advocated by the Part 2A regime are applied to the determination of planning applications. Guidance on ground condition assessment is given in CLR 11 Model Procedures for the Management of Contaminated Land (EA, 2004), that sets out a process based on a tiered risk assessment with increasing level of detail required to progress through the tiers.:

- Stage 1 = risk assessment
- Stage 2 = options appraisal and
- Stage 3 = implementation of remedial strategy

Risk assessment is undertaken in a phased manner with the three tiers being:

- Tier 1 – “preliminary risk assessment” – a qualitative assessment forming part of a Phase 1 report,
- Tier 2 – “generic risk assessment” - a quantitative assessment using published criteria to screen Site specific ground condition data forming part of a Phase 2 report and
- Tier 3 – “detailed risk assessment” – a quantitative assessment involving the generation of Site specific assessment criteria (SSAC).

The underlying principle is the evaluation of *pollutant linkages* in order to assess whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements:

- A source of contamination or hazard that has the potential to cause harm or pollution;
- A pathway for the hazard to move along / generate exposure; and
- A receptor which is affected by the hazard.

For each potential pollutant linkage identified the risk is estimated through consideration of the magnitude of the potential consequences and the likelihood or probability of an event occurring.

This report is divided into chapters identifying potential sources (hazard identification), potential pathway and receptor identification, and risk estimation and assessment.

The PBA methodology for ground condition assessment (contamination) is presented in **Appendix A**.

## Ground Instability

National Planning Policy Framework (NPPF) Clause 178 requires that 'a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability'. The preliminary stability assessment includes for example, where relevant, a review of geological hazards for the Site such as natural and man-made (mining) cavities, landslide, cambering and block movement, collapsible and compressible soils, running sand, and subsidence and heave due to volumetric change in the ground.

The preliminary ground stability assessment methodology adopted by PBA follows the guidance on preliminary land stability assessment given in the Planning Practice Guidance for Land Stability published by the Department for Communities and Local Government (DCLG 2014). The guidance requires, at least, a desk based study and a site inspection visit by an appropriately qualified person. Available published geological information has been obtained and reviewed, together with data acquired from public databases. A site walkover with direct inspection of the site and surrounding land was also carried out in conjunction with the desk study.

The desk-based study comprises a review of existing readily available published sources of geological, geomorphological, hydrogeological and /or mining information on the Site and its surroundings and a historical review including mapping and aerial imagery, if appropriate.

The site inspection is undertaken to assess the presence of potential instability features on site. The objective of a ground stability assessment is to identify the likely ground conditions of a defined site and assess the information to identify potential issues that may have associated geotechnical liabilities or other ground engineering constraints that could affect the site development. This includes potential subsidence arising from artificial cavities, natural cavities - coal and non-coal (underground) mining / extraction activities, adverse foundation conditions (ranging from soft weak sediments to hard strong rocks), and landslides and slope instability.

## 1.5 Sources of Information

The following sources of information were used in the preparation of this report:

- Landmark was commissioned to provide historical maps and an EnviroCheck computerised data search. The historical maps are presented in **Appendix B** and the EnviroCheck report is presented in **Appendix C**. *Note: This report is divided into four areas which cover the site; 1, 2, 3, and 4 representing the south-west, south-east, north-west, and north-east quadrants respectively. Therefore, the appendices are numerically labelled according to the area they cover.*
- PBA walkover inspection – Selected key photographs are presented in **Appendix D**;
- Information published by the British Geological Survey (BGS) from 1:50,000 scale geological maps and 1: 126,720 scale hydrogeological maps;
- Historical borehole records held by the BGS as accessed via their website, [www.bgs.ac.uk/data/boreholescans/home.html](http://www.bgs.ac.uk/data/boreholescans/home.html); the historical borehole logs are presented in **Appendix E**;

- Environment Agency website “What’s in Your Back Yard?”, <http://maps.environment-agency.gov.uk>;
- The National Artificial and Natural Cavities Database managed and enhanced by PBA.
- MAGIC website <http://www.magic.gov.uk> which provides authoritative geographic information about the natural environment from across government. The information covers rural, urban, coastal, and marine environments across Great Britain. It is presented in an interactive map which can be explored using various mapping tools.
- Third-party reports on the environmental monitoring of the Lower Twydall Chalk Pit landfill site, obtained from the Environment Agency. Key extracts from the third-party monitoring reports are included in **Appendix F**.
- Unexploded Bomb risk map from Zetica UXO (<https://zeticauxo.com/downloads-and-resources/risk-maps/>).

Attention is drawn to the Essential Guidance for Report Readers included in **Section 7** of this report.

## 2 Land Use Information

### 2.1 Introduction

This section presents a summary of historical and current land uses on and immediately adjacent to the site. Land use is used to inform the hazard identification element of the risk assessment.

### 2.2 Site Location and Description

The site is situated in the village of Lower Rainham, approximately 3.0km to the east of the town of Gillingham, Kent. The subject site is centred at National Grid Reference TQ 809 674 with the nearest postcode being ME8 7AT.

The site is located between Lower Rainham Road to the north, with associated agricultural land and residential development, and the South Eastern (Chatham to Sittingbourne) Railway line to the south. The River Medway estuary lies approximately 600m to the north of the site.

Within this report the site has been divided principally as two main parcels of land, divided by Pump Lane which traverses north south through the subject site. The first area, termed "Pump Farm", is bounded by Pump Lane to the east and Lower Twydall Lane to the west. The second area, termed "Bloors Farm", is bounded by Lower Bloors Lane to the west and Pump Lane to the east.

A site location is presented in **Figure 1**, with the division of land parcels shown on **Figure 2**.

### 2.3 Topography

The general topography falls from a highest elevation of approximately 30m above Ordnance Datum (AOD) adjacent to the railway line on the southern edge of the site falling to circa 13m AOD on the northern boundary. Pump Lane, which runs roughly through the middle of the site, lies in a narrow shallow valley. The former Lower Twydall Chalk Quarry and associated access road leading to Lower Rainham Road also lie within a shallow valley feature.

### 2.4 Historical Land Use

The history of the development of the site and the surrounding area has been obtained from a number of readily available historical Ordnance Survey (OS) maps. Copies of the extracts from both the historical and current OS maps are presented in **Appendix B** (LM, 2018).

#### Pump Farm

The earliest available historical OS maps is dated 1869. The site is located a rural setting near the Medway Estuary. The site is shown comprising agricultural land with a number of orchards present on site. A hedge and ditch boundary is also shown running north to south through the centre of the site. The land surrounding the site is occupied by agricultural land with several farms scattered throughout the area. For example, Twydall and York Farms are located on the western side of the area. The site is bordered to the east and south by Pump Lane and by the South Eastern and Chatham Railway respectively.

A number of chalk pits are also present to the south of the site alongside Pump Lane and Twydall Lane.

By 1909 the excavation works at the Lower Twydall Chalk Pit, closest to the site have commenced, while the smaller chalk pits further to the south of the site appear to be disused.

By 1932 the Lower Twydall Chalk Pit has been expanded further to its current layout and extent. OS mapping suggests that the pit was excavated to a level of circa 5m AOD i.e. approximately 15m at its greatest depth on the southern edge. A number additional quarries are now present alongside the railway about 750 m to the west of the site. While the area immediately surrounding the site remains generally unchanged, significant residential development has occurred in Rainham, about 1000m to the south of the site.

Between the late 1930s and the early 1960s further large scale residential development is shown immediately south of the site in Twydall and to the east in East Rainham.

The historical aerial photograph of the area taken from Google Earth and dated December 1940, shows the Lower Twydall Chalk Pit to be disused and covered with overgrown vegetation.

By 1967 a small building labelled as 'Nursery' exists on the north-eastern part of the site, while a residential structure labelled as Winston is present adjacent to the northern site boundary. Small scale residential development has also occurred along Pump Lane. Additionally, the discovery of flint implements is made in the Lower Twydall Chalk Pit.

By 1974 small scale residential development has also occurred along Lower Rainham Road, immediately to the north of the site.

The historical aerial photograph of the area taken from Google Earth and dated December 1990, shows Pump Farm to exist on the eastern part of the site.

The historical aerial photographs of the area taken from Google Earth and dated between May 2007 and July 2013, show the backfilling and associated earthworks at the former Twydall Chalk Pit. The site's Closure Report (GES 2014a) obtained from the Environment Agency, indicates that the restoration of the site was completed in March 2013, with the site restored currently to a rough open ground (intended to be "restored to agriculture") with a slightly raised domed profile above the surround ground level (maximum level of 25.97mAOD as of January 2015,) (GES 2015).

## Bloors Farm

The earliest historical OS map is dated 1869. The site is composed of orchards extending from the northern border, along the Lower Rainham Road, to a public bridleway that cuts the site approximately in half along the east-west axis. To the south of this path the site appears to be open agricultural land. The land surrounding the Bloors Farm area of the site is occupied by further agricultural land, several farms, and a few small chalk pits to the south (**Section 2.4.1**). Pump Farm appears on the western border of the site on Pump Lane. A small linear settlement is present along Lower Rainham Road to the north. Additionally, Motleyhill Docks appears approximately 2km to the north-east of the site on the River Medway.

By 1880 the building of Queen Court appears around 200m to the east of the site. From 1894 the small chalk pit around 100m to the south of the site appears to be disused. Additionally, an area labelled as 'Brick Field' appears approximately 150m north of the area along with a Wharf. The Brick Field returns to an orchard by 1896. However, from 1966 there is the gradual expansion of the Wharf with the development of a spoil heap, which then becomes a scrap metal yard by 1989. Furthermore, by 1896 a Quay is present approximately 200m to the north-east of the site.

The OS maps from 1897 show that the orchard has expanded south beyond the public bridleway to fill the majority of the site. A disused quarry is also situated around 400m to the south of the area.

The OS map from 1909 shows an area labelled as 'Nursery' present along the southern boundary along with allotment gardens at the south-east corner of the site. Two other nurseries are also present along the eastern boundary of the site.

By 1931 a chalk pit is now present in East Rainham about 400m south-east of the site, which is disused by 1961. A large Chalk Pit is also present approximately 400m east of the site, along Berengrave Lane, which is disused by 1974 and then becomes a nature reserve by 1985. By 1931 there is an apparent large expansion of the settlements at Rainham, Berengrave Lane, and Lower Rainham to the south, east, and north respectively. In 1932 the Motelyhill docks area reveals the development of the Rochester and Chatham Joint Sewerage Board sewage works, which continues to expand up to 1985. Additionally, by 1931 a series of nurseries are established along Berengrave Lane which become the Berengrave Nursery by 1969, and finally expand to form the Bloors Land Community Woodland along the eastern border of the site by 2018.

The OS Map from 1961 labels the discovery of Dark Age coins east of Plumb lane towards the north of the site. By 1989 most of the orchard north of the site has been removed, Bloors Farm is also first labelled on the northern border of the site.

Historical aerial photography from Google Earth shows the marked expansion of the area of orchard and potential intensification of agricultural activity over the site between December 1960 and December 1990. Additionally, by July 2013 a water tank is marked as being present on the eastern boundary of the site.

Google Earth images from April 2015 show the demolition of two agricultural outbuildings towards the north of the site, near Lower Rainham Road. This area is subsequently redeveloped by May 2018 into a series of three buildings with a paved area and garden around each building. At the time of the site walkover, whilst the principal structures had been created, the area of land to the immediate south of the new buildings remains as a general builders' yard, and a large stockpile of wooden crates/pallets (associated with fruit picking) are shown to the east of the buildings.

## 2.5 Current Land Use – On site

The current land use information is based on a walkover inspection undertaken by an Engineer from PBA on the 7<sup>th</sup> September 2018. Key pertinent photographs taken during the site walkover are presented in **Appendix D**. The layout of the site, locations of photographs, and salient notes from the walkover are presented as **Figure 2**.

### Pump Farm

This area of the site can be accessed off Pump Lane via a tarmac surfaced track. The area comprises agricultural land currently occupied by a series of orchards, divided by hedgerows forming wind-breaks about 2m to 3m high separating each field. Surface laid small diameter water irrigation pipes were observed in most of the rows of trees in the orchards, with associated pipe control chambers generally in the corners of each discrete field.

Principal access tracks within the orchard appear to be constructed from a mixture of gravel, scalping, and crushed brick/concrete materials.

The Pump Farm area also contains a number of associated agricultural buildings, and temporary caravans utilised by itinerant labour on the north-eastern part of the site.

Two discrete farm buildings located at the farm are both used to store farming equipment/materials (large portal framed structure with steel corrugated sides and roof), and a smaller but longer wooden fruit processing shed. The temporary caravans are located to the north and west of the main storage shed, with a free-standing LPG gas tank at the eastern end

servicing this accommodation. A skip containing general waste is also located in the forecourt of Pump Farm.

Two chemical storage sheds, a large water tank and a number of metal barrels labelled as farm oils, herbicide, and fuel, were noted alongside the main storage building. Whilst access to the main store was not possible during the site walkover, the client has advised that a fuel tank is also located within the main farm building; and that the tank is fully bunded and is placed on hardstanding.

## Bloors Farm

The Bloors Farm area of the Site can currently be accessed through two gates which exit onto Pump Lane, and another gate in the north-east corner of the site that opens onto Lower Bloors Lane. The use and layout of this area of the Site is very similar to the Pump Farm area (outlined above), consisting of an orchard divided by hedgerows. Across the Bloors Farm area there are also several locations where crates/pallets are stored, for harvesting the crops.

The Bloors Farm area is bisected by a public bridleway (GB6A) along the east west axis. A series of three residential buildings are present towards the north of the area, built after 2013. The south-west corner of this site remains a storage area for tiles and construction waste.

The access track to these buildings appears to be constructed from demolition rubble, possibly derived from the previous buildings on site, or imported to the site to form a hard-surfaced track. Within the crushed brick and concrete material there were very localised minor inclusions of what could possibly be asbestos containing materials (ACMs) in the form of small fragments of cement sheeting/board.

A large segmental steel circular water storage tank, sited upon a concrete plinth, is present along the eastern boundary of the Bloors Farm area. This location also contains a borehole used for water abstraction for irrigation purposes and a large steel shipping container. Pipework was observed connecting the water storage tank, borehole and container. The client has advised that the container houses pumping equipment used for the irrigation pumping system, and that no chemicals are stored within.

## 2.6 Surrounding land

### Pump Farm

The land surrounding the Pump Farm area of the site is generally agricultural and residential in use. An orchard and corn field borders the site to the north and west respectively. A concrete slab (approximately 30m long and 15m wide) is present immediately south-east of Pump Farm and appears to be used for the storage of treated wooden poles and scrap metal. Residential buildings are located around York Farm to the west of the site and along lower Rainham road to the north-west.

The Pump Farm residential complex, comprising a number of two-storey converted barns, is located immediately to the east of the site along Pump Lane. The Chatham Railway line borders the site to the south with the town of Rainham located immediately beyond.

The Lower Twydall Chalk Pit (landfill) was observed immediately to the west-northwest of the Site. During the walkover, the section of the landfill bordering the Site was observed covered in overgrown vegetation, with no evidence of vegetation dieback.

### Bloors Farm

The surrounding land consists of residential and greenfield areas. Allotment gardens border the south-east corner of the Site. Residential properties are located along Lower Rainham Road to



the north, Pump Lane to the north-west, and Lower Bloors Lane to the east. Ongoing construction is occurring to the north of the site along Lower Rainham Road, believed to be associated with residential development, which has also recently occurred to the immediate north of Lower Rainham Road, adjacent to the Three Mariners Public House.

The Chatham Railway line borders the Site to the south with the town of Rainham located immediately beyond.

## 2.7 Visually Identified Utilities

A below ground foul sewer cuts across the northern portion of the site. A manhole associated with this sewer is set in a concrete plinth near Pump Farm. This sewer appears to continue across the Bloors farm site area, with a similarly constructed concrete plinth and covers observed towards the north-western corner of the site.

Another manhole is present in the south-east corner of the site. Additionally, a set of two manholes occurs along the eastern boundary of the area. During a site walkover flowing water could be heard through the manholes, accompanied by a slight foul odour, suggesting that this is a foul water sewer.

Off site, along Pump Lane, there are multiple manholes and gas mains covers. Additionally, a manhole is located in the corner of a concrete slab located south-east of Pump Farm, near the boundary with Pump Lane. A substation is also located along the eastern boundary near Pump Farm.

## 2.8 Proposed Development

It is understood that the Client is seeking to establish circa 1250 dwellings with a primary school and retirement village. The development is divided between five 'areas' which also incorporates a central 'village green', various 'green corridors' and equipped playgrounds, and a community orchard. A copy of the proposed development Masterplan is displayed in **Appendix G**.

## 3 Environmental Setting

### 3.1 Introduction

Information on the environmental setting is presented in this Section and the data is used to inform the stability assessment in **Section 4** and the Contamination Risk Assessment presented in **Section 5**.

### 3.2 Geology

The publicly available geological data from the British Geological Survey (BGS) for the general site area was reviewed for the purpose of this report.

#### Geological Map

The 1:50,000 scale geological map of the area, Sheet 272 Chatham (BGS, 1977), indicates that the site is underlain Thanet Beds comprising pale yellow-brown, fine grained sand. These strata are in turn underlain by the Cretaceous age Seaford Chalk Formation comprising firm white chalk with flint seams. The Thanet Sand is mapped locally as an outlier and thins to the northern, western and eastern boundaries of the site, but it's shown extending beneath the railway line to the south. Superficial Head Deposits comprising clay, silt and gravel are mapped as being present locally to the north of the site, principally in areas not overlain by Thanet Sand. In particular Head Deposits are found within the narrow shallow valley feature occupied by Pump Lane.

#### Historical Records

A number of publicly available borehole and trial pit logs in the general vicinity of the site have been viewed to ascertain the likely thicknesses of deposits.

In addition, borehole records obtained as part of the review of information on the Lower Twydall Chalk Pit Landfill (GES, 2014a), provided borehole records of monitoring boreholes installed to the perimeter of the site. Copies of such are included for reference in **Appendix F1**.

Table 3.1 below presents a summary of such:

Table 3.1 Summary of ground conditions from BGS historical exploratory hole logs.

Strata	Base level (m bgl)	Typical Description
Topsoil	0.3 - 0.5	n/a
Head Deposits	0.5 - 3.0	Loam. Locally thinning at northern boundary and probably absent to south of site.
Thanet Beds	2.0 - 6.0	Stiff or very stiff, brown sandy CLAY with gravel and occasional roots. Locally thinning to north of site.
Seaford Chalk Formation	>16.70	Firm chalk with fragments of hard chalk and flint.

Groundwater levels recorded in close proximity to the Lower Twydall Chalk Pit landfill, taken from the 2015 annual monitoring report (GES, 2015), are presented graphically in **Appendix F1**. Results from the continuation of the groundwater monitoring program, taken from the 2016 annual interpretive report (GES, 2016) and the 2017 annual interpretive report (GES, 2017), are presented graphically in **Appendix F2**.

During 2015 Groundwater levels ranged between 3.33mAOD and 3.99mAOD in the up-gradient borehole BH1 (to the south of the landfill site) and between 1.99mAOD and 2.14mAOD in the furthest down-gradient borehole BH3a, to the north of the landfill site closest to Lower Rainham Road. Up-gradient levels were on average approximately 1.5m greater than down-gradient.

Groundwater level in the immediately down-gradient boreholes of the landfill, BH2B and BH6 ranged between 2.49mAOD and 2.80mAOD, and 2.14mAOD and 2.46mAOD respectively.

During 2016 and 2017 Groundwater levels ranged between 2.85 mAOD and 3.71mAOD in the up-gradient borehole BH1 (to the south of the landfill site) and between 1.53mAOD and 2.08mAOD in the furthest down-gradient borehole BH3a, to the north of the landfill site closest to Lower Rainham Road. Up-gradient levels were on average 1.0m and 1.5m greater than down-gradient levels in 2016 and 2017 respectively.

Groundwater levels in the immediately down-gradient boreholes of the landfill, BH2B and BH6, ranged between 1.87mAOD and 2.25mAOD and 1.73mAOD and 2.28mAOD during 2016 and 2017 respectively.

### 3.3 Radon

Radon is a naturally occurring radioactive gas and emanated from certain geological formations to varying degrees, depending on the type, porosity and permeability. The EnviroCheck report indicates the site is located in an area where between 1% and 3% of the properties are above the Action Level. According to BRE BR211 (BRE, 2007), dwellings at this location do not require radon protection measures.

### 3.4 Environmental and Industrial Setting

Information on the industrial setting of the site is presented in the EnviroCheck report (LM, 2018) and reproduced in **Appendix C**. The results of the database search are summarised on the following table and discussed in the following sections.

Table 3.2 Summary of environmental and industrial setting

Data Type	Number on Site <sup>(1)</sup>	Number within 250m of Site <sup>(1)</sup>
<b>Waste Regulation</b>		
Landfill Sites	0 (0)	1 (0)
Licensed Waste Management Facilities	0 (0)	2 (0)
<b>Statutory Permits/Authorisations</b>		
Pollution Prevention and Control <sup>(2)</sup>	0 (0)	1 (1)
Radioactive Substance Authorisations	0 (0)	0 (0)
Planning Hazardous Substances	0 (0)	0 (0)
COMAH Sites <sup>(3)</sup> and NIHHS Sites <sup>(4)</sup>	0 (0)	0 (0)
<b>Potential Contaminative Uses</b>		
Fuel Stations	0 (0)	0
Trade Directory	0	5 (15)
Discharge Consents	0 (1)	4 (4)
<b>Pollution Records</b>		
Pollution Incidents to Controlled Waters	0	6

Data Type	Number on Site <sup>(1)</sup>	Number within 250m of Site <sup>(1)</sup>
Sites Determined as Contaminated Land	0	0
<p><b>Note:</b></p> <ol style="list-style-type: none"> <li>1) Numbers in brackets denotes number of authorisations, licences or permits that are lapsed, revoked, cancelled, superseded, defunct, surrendered, not applicable, withdrawn or not yet started.</li> <li>2) Includes Integrated Pollution Controls, Integrated Pollution Prevention and Control, Local Authority Integrated Pollution Prevention and Control and Local Authority Pollution Prevention and Control permits.</li> <li>3) COMAH denotes Control of Major Accident Hazards</li> <li>4) NIHHS denotes Notification of Installations Handling Hazardous Substances</li> </ol>		

### 3.5 Landfill Sites

The EnviroCheck Report contains a record of two landfill sites within 250m of the site:

- Licence Number: 210049. Name: 'Lower Twydall Chalk Pit'. Category: Inert landfill. Licence Holder: Kent Land Reclamation Ltd.
- Licence Number: Unknown. Name: 'Pump Lane'. Category: Inert Waste. Licence Holder: Unknown.

#### Lower Twydall Chalk Pit

Lower Twydall Chalk Pit is an historical landfill adjacent to the site. This comprises a former chalk pit approximately 200m long and 100m wide, excavated during the first half of the 1900s to a maximum depth of around 15 m bgl. After completion of chalk extraction, the site operator, Kent Land Reclamation Limited (KLR) in-filled the resultant void, using inert waste soils generated by the local construction industry. Activities were undertaken under the auspices of Environmental Permit No FP3630LC. (GES, 2014a).

The monitoring infrastructure on the site comprises four in-waste monitoring points and four external perimeter wells, located in the natural chalk geology surrounding the site. The site layout is included in **Appendix F**. Infilling has now been completed and the site has been restored with a rough open grassland with sporadic small bushes. The site entered the Closure Phase in 2014 and is now covered under permit EPR/3309GK/V003. The landfill was subsequently restored and entered closure under permit EPR/BB3309GK/V003.

A number of third-party monitoring reports on the Lower Twydall Chalk Pit landfill site were reviewed as part of this desk study (GES; 2013, 2014b, 2015, 2016, and 2017). The latest available monitoring data indicate that ground gases concentrations on the perimeter are relatively low (all below the trigger levels), with methane concentrations recorded as 0%, and carbon dioxide levels ranging from 0.8% to 3.2%. Graphical representations of the landfill gas concentrations are presented in **Appendix F2**. These results are broadly consistent with the previous monitoring results from 2015 (see **Appendix F1**).

Additionally, for both in-waste and perimeter gas measurements, no changes in differential pressure or flow were observed between the 2016 and 2017 reports. Furthermore, no substantial changes occurred in the down-gradient water chemistry between 2016 and 2017 with the elevated total organic carbon recorded in 2017 attributed to an offside incident.

Comments concerning groundwater monitoring from GES (2015) and GES (2017) are very similar. The GES (2017) report concludes that:

*“Water quality remained in line with previous monitoring periods, with all parameters below the trigger levels throughout the monitoring period. No significant upward trends are noticed in any parameters measured.*

*Elevated TOC concentration identified in all monitoring points in August 2017 decreased throughout the remaining review period. As such it is considered that this is attributable to an incident that occurred off site.*

*Groundwater composition down-gradient is generally the same as up-gradient, with variations throughout the monitoring period reflected in all boreholes. As such it is not considered that the site currently poses a risk to groundwater.”*

Graphical representations of the groundwater quality concentrations recorded in GES (2015) are presented in **Appendix F1**. Groundwater quality concentration graphs from GES (2017) and GES (2016) are presented in **Appendix F2**.

## Pump Lane

This landfill is located approximately 150m to the south of the site, at the end of Pump Lane and adjacent to Beechings Way. The area currently comprises a small mounded grassed area with a number of mature trees, providing public open space to the adjoining residential development.

The landfill is believed to have been a historical chalk pit infilled with inert waste prior to the construction of the residential area. Given the scale of the landfill, its age and likely composition and proximity to existing development, it is not considered as representing a significant risk to the proposed development, and is not taken forward as a potential offsite source of contamination.

## 3.6 Discharge Consents

The EnviroCheck Report records one historic discharge consent located on the site:

- Reference A00468: Active from 1<sup>st</sup> April 1991 until 23<sup>rd</sup> May 2016. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary (River Medway).
- Reference Unknown: additional discharge consent for Southern Water Serviced Ltd. This may be a duplicate of the consent outlined above, however insufficient information is provided.

The EnviroCheck Report records four currently active historic discharge consent located within 250m of the site:

- Reference D00098: Active from 1<sup>st</sup> April 1991. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary.
- Reference A00467: Active from 1<sup>st</sup> April 1991. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary (River Medway).
- Reference A00468: Active from 27<sup>th</sup> March 2017. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary (River Medway).
- Reference A00136: Active from 22<sup>nd</sup> June 1998. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary (River Medway).

The EnviroCheck Report records four historic discharge consents located within 250m of the site:

- Reference A00466: Active from 1<sup>st</sup> April 1991 until 23<sup>rd</sup> May 2016. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary (River Medway).
- Reference A00465: Active from 1<sup>st</sup> April 1991 until 17<sup>th</sup> July 1998. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary.
- Reference A00463: Active from 1<sup>st</sup> April 1991 until 17<sup>th</sup> July 1998. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary.
- Reference D00097: Active from 1<sup>st</sup> April 1991 until 17<sup>th</sup> July 1998. Operator: Southern Water Services Ltd. Discharge: public sewage/storm sewage overflow into saline estuary.
- Reference Unknown: additional discharge consent for Southern Water Serviced Ltd. This may be a duplicate of the consent outlined above, however insufficient information is provided.

### 3.7 Pollution Prevention and Control

The EnviroCheck Report records two cases of Pollution Prevention and Control within 250m of the site:

- Permit Reference: UP3337UD (originally: FP3630LC). Name: Kent Land Reclamation Ltd. Activity: Waste Landfilling. Location: Lower Twydall Chalk Pit. Status: Revoked.
- Permit Reference: P/B/058. Name: Hidsons Ltd. Activity: Waste oil burners. Location: Manor Farm Barn, Lower Rainham Road. Status: Permitted.

### 3.8 Pollution Incidents to Controlled Waters

The EnviroCheck Report records six pollution incidents within 250m of the site:

- Reference 92T197: Date: 6<sup>th</sup> May 1992. Pollutant: Surcharged Sewage. Severity: Category 3 (Minor Incident). Location: North West of Bloors Wharf.
- Reference 93T126: Date 29th July 1993. Treated Effluent. Severity: Category 3 (Minor Incident). Location: Cowstead Lane Strom Water Outfall, Lower Rainham.
- Reference 92T505: Date: 4<sup>th</sup> February 1993. Pollutant: Surcharged Sewage. Severity: Category 2 (Significant Incident). Location: Cowstead Lane, Lower Rainham.
- Reference 92T443: Date: 24th December 1992. Pollutant: Treated Effluent. Severity: Category 2 (Significant Incident). Location: Cowstead Lane, Lower Rainham.
- Reference 92T528: Date: 6th February 1993. Pollutant: Surcharged Sewage. Severity: Category 2 (Significant Incident). Location: Cowstead Lane, Lower Rainham.
- Reference 92T510: Date: 9th February 1993. Pollutant: Surcharged Sewage. Severity: Category 2 (Significant Incident). Location: Cowstead Lane, Lower Rainham.

### 3.9 Hydrogeology

The site does not lie within a Groundwater Source Protection Zone. The Thanet Beds covering much of the site are classified as a Secondary A aquifer. These are permeable layers capable of supporting water supplies at a local scale, and occasionally forming an important source of base flow to rivers. The Seaford Chalk Formation is classified as a Principal Aquifer. These are layers of rock that have high intergranular and/or fracture permeability, and generally provide high level of water storage. They may support water and/or river flow on a strategic scale.

The Head Deposits to the north of the site are classified as a Secondary (Undifferentiated) aquifer. These are strata displaying a wide range of water permeability and storage that may yield groundwater on local scale and provide base flow to rivers, but has yet to be classified in either Group A or B.

The regional groundwater flow is expected to be directed to the north – northeast towards the Medway Estuary. This is confirmed by the groundwater monitoring data presented in the GES 2015 report. See **Section 3.5** above.

The available groundwater levels recorded immediately north of the site (downgradient) (GES, 2015) indicate that groundwater levels are between about 4m and 2mAOD, which correspond to the inferred groundwater level for the northern part of the site based on the available historical borehole records.

### 3.10 Groundwater Abstractions

The EnviroCheck report lists a single active abstraction licence within 250m of the site (Licence number: 9/40/02/0093/Gr). This is operated by Mr C. J. Lyon for general farming and domestic use.

#### Pump Farm

There are no registered abstractions on site. However, the client has advised that a borehole is located at the rear of the main storage building associated with Pump Farm and is used for irrigation purposes. We have been advised that the well has been advanced to circa 50m depth (i.e. within the Seaford Chalk Formation) and that a pump has been installed to circa 40m depth. No rate of abstraction was given, but given that it is unregistered it is assumed that the rate of abstraction is less than 20m<sup>3</sup>/day.

#### Bloors Farm

There are no registered abstractions on site. However, during the walkover a borehole was observed towards the eastern boundary of the site. This appears to be part of the irrigation system for the orchard.

### 3.11 Hydrology

The EnviroCheck report lists three surface water features within 250m, these appear as a river network or water features. Additionally, the Medway Estuary lies approximately 500m to the north of the site, which is classified as a Ramsar site and Site of Special Scientific Interest. The Medway is tidal in nature at this point.

The online EA Flood Map for Planning (<https://flood-map-for-planning.service.gov.uk/>) shows the site is located in Flood Zone 1. Furthermore, the site is mostly within an area with limited potential for groundwater flooding to occur according to BGS Flood GFS Data. However, small areas of the site have the potential for groundwater flooding of property situated below ground level and for groundwater flooding to occur at the surface within the site, and more extensively within 250m of the northern boundary of the site.

During the site walkover, it was observed that the elevation of the orchard along the northern boundary, of the Pump Farm site, is below that of the Lower Rainham Road. Therefore, there is the potential for drainage water to pond at this location. Furthermore, there is no evidence of any drainage ditch, either on site or along the Lower Rainham Road.

### **3.12 Ecological Systems**

A study of the EnviroCheck report and the interactive ecological maps on the MAGIC website (<http://magic.gov.uk/home.htm>) indicates that the Medway Estuary and Marshes is classified as a Site of Specific Scientific Interest (SSSI), RAMSAR site, Marine Nature Reserve, and Special Protection Area. This is an area noted for its important intertidal habitat for a number of migratory bird species (JNCC, 2008).

Additionally, the Riverside Country Park and Berengrave Nature Reserve (listed as a local nature reserve) are located roughly 500m north west and east of the site respectively.

It should be noted the statement regarding ecological systems does not purport to be a formal assessment and this aspect may require a separate commission. The presence of a protected species (if applicable) requires a Site-specific survey and is outside the scope of this report.

### **3.13 Ancient Monuments and Historical Buildings**

According to the MAGIC website there are no scheduled monuments, registered battlefields, registered parks or gardens, or world heritage sites within 500m of the site. However, a building at Pump Farm is listed as a grade II listed building, along with two buildings near Bloors Place, and three others along Lower Rainham road (along the northern boundary of the site). Additionally, there is also a grade II\* listed building at Bloors Place.

Historical OS Maps from 1961 and 1967 also label the discovery of Dark Age coins east of Plump Lane and flint implements in the Lower Twydall Chalk Pit respectively.

It should be noted the statement regarding historical building and ancient monuments does not purport to be a formal assessment and this aspect may require a separate commission.



## 4 Ground Stability Assessment

### 4.1 Introduction

In accordance with the requirements of the National Planning Policy Framework (DCLG, 2018), the potential for the proposed development to contribute to or to be adversely affected by land instability has been assessed. Accordingly, consideration is given below to the potential risk of subsidence arising from Artificial Cavities; Natural Cavities; Slope Instability and Potential Adverse Foundation Conditions arising from existing ground conditions across the Site, as identified by the desk study.

### 4.2 Geological Hazards

An assessment of potential geological hazards that may give rise to contamination pathways, instability or adverse foundation or construction conditions as supplied by the British Geological Survey (BGS) from their National Geoscience Information Service (NGIS) are presented in the EnviroCheck Report reproduced in **Appendix C**. The generic assessment is generated automatically based on digital geological maps and the scope and the accuracy is limited by the methods used to create the dataset and is therefore only indicative for the search area.

The information contained in the EnviroCheck report has been reviewed and where considered necessary reassessed considering the specific information available for the site. The modified assessment of the potential for geological hazards to be present on the site is summarised in **Table 4.1** below:

Table 4.1 Summary of Geological Hazards from third party report.

Description	On-Site	PBA Comment
Coal Mining Affected Areas	<b>Not in Coal Mining Area</b>	PBA Agree with this assessment.
Collapsible Ground Stability Hazards	<b>Very Low</b>	PBA Agree with this assessment.
Compressible Ground Stability Hazards	<b>No Hazard</b>	PBA does not agree with this assessment, as there are Head Deposits that may locally include lenses of clay, or other compressible material. However, it is recognised that Head Deposits may be absent from the majority of the site or limited in thickness and as such the hazard is assessed to be <b>Very Low</b> .
Dissolution Hazard	<b>High</b>	PBA Agree with this assessment.
Landslide Ground Stability	<b>Low</b>	PBA Agree with this assessment.
Running Sand	<b>Moderate</b>	PBA does not agree with this assessment. The potential for internal erosion of the granular soil is generally associated with a high groundwater table. The available historical borehole records indicate that the groundwater level is expected to be between about 15m and 20m bgl. As such the hazard is assessed to be <b>Very Low</b> .
Shrinking or Swelling Clay	<b>Low/Very Low</b>	PBA Agree with this assessment.

## 4.3 Natural and Artificial Cavities

### Natural Cavities

The national Natural and Mining Cavities Database maintained and updated by PBA has been searched for relevant natural and mining cavity records.

A search of the PBA Natural Cavities Database indicated that there are 8 natural cavities recorded within 2000m of the centre of the site. The nearest recorded natural cavity is located around 50m north of the western sector of the site and is comprised of three solution pipes. Details of the recorded natural cavities are given in the table below.

Table 4.2 Details of the natural cavities records within 2000m from the site centre.

Approx. NGR	Approx. distance from site centre (m)	Recorded Location	Geology	Natural Cavity Details	Source
TQ 80420 6770	500 W	South of Manor Court, Lower Rainham, Gillingham, Kent	<b>Superficial Geology:</b> Head  <b>Solid:</b> Chalk Group, Thanet Sand Formation	3 x Solution Pipes	British Geological Survey
TQ 811 666	900 SE	Bloors Lane/ Mayfield Close Area, Lower Rainham, Gillingham, Kent	<b>Superficial Geology:</b> Head  <b>Solid:</b> Chalk Group	3 x Solution Pipes	<i>Dines, H.G., Holmes, S. C. A. And Robbie, J. A., 1954. Geology of the country around Chatham. British Geological Survey Memoir (Sheet 272). HMSO, London.</i>
TQ 800 665	1300 SW	A2 Watling Street Area, Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	3 x Solution Pipes	<i>Dines, H.G., Holmes, S. C. A. And Robbie, J. A., 1954. Geology of the country around Chatham. British Geological Survey Memoir (Sheet 272). HMSO, London.</i>
TW 798 681	1300 NW	Lower Twydall area, Gillingham, Kent	<b>Solid:</b> Chalk Group, Thanet Sand Formation	Solution Pipe	<i>Whitaker, W., 1872. The geology of the London Basin, Volume 4, Part 1., HMSO, London. British Geological Society Memoir (Sheet 220, 221, 240)</i>
TQ 796 675	1300 W	Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	6 x Solution Pipes	<i>Whitaker, W., 1872. The geology of the London Basin, Volume 4, Part 1., HMSO, London. British Geological Society Memoir (Sheet 220, 221, 240)</i>
TQ 8145 6607	1500 SE	Holding Street, Rainham, Gillingham, Kent	<b>Solid:</b> Chalk Group, Thanet Sand Formation	Sinkhole Solution Pipe	Gillingham Borough Council

Approx. NGR	Approx. distance from site centre (m)	Recorded Location	Geology	Natural Cavity Details	Source
TQ 8130 6583	1700 SSE	School, Orchard Street, Gillingham, Kent	<b>Solid:</b> Chalk Group, Thanet Sand Formation	Sinkhole Solution Pipe	<i>Gillingham Borough Council</i>
TQ 8183 6588	1800 SE	A2 High Street, Rainham, Gillingham, Kent	<b>Solid:</b> Chalk Group, Thanet Sand Formation	Sinkhole Solution Pipe	<i>Gillingham Borough Council</i>

The risk associated with dissolution features in the chalk has been assessed as **High** for solution pipes and sinkholes. Such features are formed by dissolution of chalk (a carbonate rock) by rain (which is slightly acidic).

Solution pipes are karstic features that develop along sub-vertical joints during down movement of rain water through the rock, whilst sinkholes develop over solution pipes that have widened and caused down movement soils at the surface. Sinkholes are often associated with surface depressions. Solution cavities are associated with sub-horizontal solution widened bedding planes in the Chalk caused by the movement of slightly acidic groundwater through the rock.

These features can be several meters in diameter and depth and are often infilled by very loose or weak superficial soils with voids present. These can present a ground stability hazard, especially if infiltration and drainage patterns are introduced by development, and the downwards movement of infill materials is re-activated. Structures, roads and services within and immediately adjacent to such features may suffer from settlement and structural damage with time, and sudden collapse known as sinkholes can occur. Solution cavities at depth might have an adverse impact on foundations built within or just above such features.

## Mining Cavities

A search of the PBA Mining Cavities Database indicated that there are 14 recorded mining cavities within 2000m of the site centre. The nearest recorded mining cavity is located approximately 329m south of the site centre.

Table 4.3 Details of the artificial non-coal mining cavities records within 2000m of the site centre.

Approx. NGR	Approx. distance from site centre (m)	Recorded Location	Geology	Natural Cavity Details	Source
TQ 8068 6683	600 SSW	Rainham Mark Grammar School, Pump Lane, Gillingham, Kent	<b>Solid:</b> Chalk Group	Denehole Shaft Collapse on 13 February 2014- Suspected Chalk Workings	Peter Brett Associates LLP
TQ 802 671	810 SW	Crundale Road/ Milsted Road, Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	Possible Shaft/ Crown Hole Collapse	<i>Gillingham Borough Council</i>

Approx. NGR	Approx. distance from site centre (m)	Recorded Location	Geology	Natural Cavity Details	Source
TQ 803 668	900 SW	Woodchurch Crescent/Begonia Avenue, Twydall, Gillingham, Kent	<b>Superficial Geology:</b> Head <b>Solid:</b> Chalk Group	Possible Shaft/ Crown Hole Collapse	<i>Gillingham Borough Council</i>
TQ 816 668	1000 SE	Adjacent to Berengrave Lane, Lower Rainham, Gillingham, Kent	<b>Superficial Geology:</b> Head <b>Solid:</b> Chalk Group	Shaft/ Crown Hole Collapse(s)	<i>Gillingham Borough Council</i>
TQ 806665	1000 SSW	Danson Way/Langdale Close, Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	Possible Shaft/ Crown Hole Collapse	<i>Gillingham Borough Council</i>
TQ 805 665	1100 SSW	Vicinity of Langdale Close, Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	Shaft Collapse- Probably Chalkwell	<i>Chelsea Speleological Society Volume 10 (pg. 87) and Volume 15 (pg. 26-27)</i>
TQ 799 668	1200 SW	Romany Road Twydall, Gillingham, Kent	<b>Superficial Geology:</b> Head <b>Solid:</b> Chalk Group	Possible Shaft/ Crown Hole Collapse	<i>Gillingham Borough Council</i>
TQ 795 676	1400 NW	South of Beachings Way, Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	Possible Shaft/ Crown Hole Collapse	<i>Gillingham Borough Council</i>
TQ 797 666	1500 SW	Vicinity of Twydall Lane/Eastcourt Lane, Twydall, Gillingham, Kent	<b>Superficial Geology:</b> Head <b>Solid:</b> Chalk Group	Denehole	<i>Chelsea Speleological Society Volume 23 (pg. 45-46 and 51)</i>
TQ 797 664	1600 SW	Adjacent to Hoath Way, Twydall, Gillingham, Kent	<b>Superficial Geology:</b> Head <b>Solid:</b> Chalk Group	Possible Shaft/Crown Hole Collapse	<i>Gillingham Borough Council</i>
TQ 796 665	1600 SW	Centred at Junction A2 London Road/Hoath Way, Twydall, Gillingham, Kent	<b>Solid:</b> Chalk Group	Multiple 'Sappers' Tunnel Complexes	<i>Applied Geology Ltd</i>

Approx. NGR	Approx. distance from site centre (m)	Recorded Location	Geology	Natural Cavity Details	Source
TQ 797 665	1600 SW	Twydall land/A2 London Road, Twydall, Gillingham, Kent	<b>Superficial Geology:</b> Head  <b>Solid:</b> Chalk Group	Multiple Deneholes	<i>Chelsea Speleological Society Volume 10 (pg. 63) &amp; Gillingham Borough Council</i>
TQ 823 666	1600 ESE	Twyford Close, Finwell Road, Rainham, Kent	<b>Solid:</b> Chalk Group	Adit Entry Pillar & Stall Chalk Mine	<i>Chelsea Speleological Society Volume 16 (pg. 8)</i>
TQ 817 659	1800 SE	High Street, Rainham, Gillingham, Kent	<b>Solid:</b> Chalk Group, Thanet Sand Formation	Shaft Collapse- Probable Well	<i>Chelsea Speleological Society Volume 10 (pg. 86))</i>

The potential for mining cavities to be present at the site is assessed to be **High**. The available non-coal mining database indicates that several shafts associated with chalk mining are recorded in the town area to the south of the site. Given the inferred low groundwater level in the chalk, and largely agricultural setting of the site, prior to the establishment of the Lower Twydall Chalk Pit, earlier smaller historic mine shafts associated with chalk extraction might be present on site.

Additionally, the EnviroCheck report records two mining instabilities located on site (NGR: 580319, 167232 and 581779, 167183). The evidence recorded is labelled as conclusive rock mining, with the source being Ove Arup and Partners.

#### 4.4 Surface Quarrying

The historical OS maps indicate that an historical surface chalk quarry is present along the western site boundary, associated with Lower Twydall Chalk Pit. This void has subsequently been backfilled as a landfill. Further details are given in **Section 3.5** above. In addition, there are a number of other smaller historical chalk pits recorded in the general vicinity of the site, each of which has been subsequently backfilled in whole or part, and incorporated with built development.

The database and published records reviewed during the desk study have identified no other records of quarrying within the site itself. The risk to development arising from further but now infilled surface quarrying occurrence at the site is considered to be **Low**.

#### 4.5 Slope Instability

The latest OS map records the ground level to be at about 30mAOD on the southern boundary of the site, falling gently to the northeast to about 10mAOD along Lower Rainham Road. During the site walkover, it was apparent that the Pump Farm Site contains a clear break in slope, with a steepening slope towards the Lower Twydall Chalk Pit Landfill site.

The stability of the existing slopes on site is likely to be controlled by the near surface materials which are likely to comprise principally clay, silt and sand associated with the Head Deposits or clayey sand where the Thanet Beds are at surface. The natural slopes on site are considered to be generally stable.

The former quarry at Lower Twydall Chalk Pit has been backfilled and as such no open steep chalk faces remain.

The risk of slope instability is therefore considered to be **Low**.

#### 4.6 Unexploded Ordnance

The unexploded ordnance (UXB) hazard and risk mitigation map prepared by Zetica Ltd indicates that the risk for UXBs to be present on the site is **Moderate**.

Given this risk it would be recommended a UXO threat Assessment desk study is undertaken to confirm the risk rating for the site, and recommendations given with regard to any special mitigation measures necessary prior to any intrusive ground works or investigation.

#### 4.7 Foundation Conditions

The ground stability assessment has identified that there is a high hazard of solution features and high hazard for man-made mining activity to be present within the site. It is considered that a risk based approach be adopted in relation to building foundations. If such features are confirmed to be present, it is unlikely that conventional shallow spread strip and pad foundations will be suitable for the proposed development. In this situation, reinforced strip or trench fill or grillage foundations with minimum widths and cantilever spans are likely to be required, the specific details and design of which would be determined following ground investigation and testing, and with reference to the proposed masterplan.

The type and capacity of foundations adopted for this site will be dependent on the soil structure interaction i.e. load, size and spacing of the footings, the stiffness of the soil and tolerances of the structure to settlement, particularly differential settlement. The differential settlement criteria relative to each structure will be dependent on the structure type. Steel frames tend to be more tolerant to differential settlements than concrete frames. Brickwork is tolerant to differential settlements as long as consideration has been given to the mortar design, to promote overall flexibility or rigidity of the finished brickwork unit/item. The sensitivity of a building to differential settlement will also depend on the proposed use of the finished building.

#### 4.8 Soakaway Strategy in Chalk

- 4.8.1 The CIRIA Guide C574 'Engineering in chalk' (CIRIA, 2002) gives the following guidance in regards to the construction of soakaways in chalk:

"Where the chalk is of medium density (or higher) the closest part of the soakaway should be at least 5 m away from any foundations. Where the chalk is of low density, or its density is not known, soakaways should be sited at least 10 m away from any foundations". In areas where dissolution features are known to be prevalent....soakaways should be sited at least 20 m away from any foundation."

Given the potential for dissolution features any soakaways should be carefully located away from housing, roads and primary infrastructure and located in lower risk soft landscaping areas. If such soakaways are located in areas of intensively used public open space, then the position of such soakaways should be investigated. It would be recommended that rather than the adoption of shallow soakaways discharging into areas where overlying Thanet Sand is present, consideration should be given to the use of deep bored soakaways discharging into competent chalk strata, to reduce the risk of ground collapse due to fines migration into widened fissures or open voids within the underlying chalk.

#### **4.9 Confidence and Uncertainty**

The ground condition data used in this section is limited in nature and in some cases is not site specific; therefore, as such there is a degree of uncertainty as to the actual ground stability conditions to be found on site.

It is therefore recommended that in due course a ground investigation is carried across the site to better understand the actual conditions as part of the detailed design development of the site.

## 5 Tier 1 Preliminary Risk Assessment

### 5.1 Introduction

The methodology developed and adopted by PBA for contamination risk assessment is presented in **Appendix A**.

The model procedures (also known as 'Contaminated Land Report 11' or 'CLR 11') have been developed to provide the technical framework for applying a risk management process when dealing with land affected by potential contamination (EA, 2004). In accordance with guidance presented in CLR 11, PBA adopt a staged approach to risk assessment and this report presents a Tier 1 preliminary (qualitative) assessment.

### 5.2 Conceptual Site Model

The underlying principle to ground condition assessment is the identification of pollutant linkages in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. For a pollutant linkage to be identified a connection between all three elements (source-pathway-receptor) is required.

The Tier 1 Preliminary Risk Assessment includes the development of a conceptual site model (CSM). The CSM describes the types and locations of potential contamination sources, the identification of potential receptors and the identification of potential transport/migration pathways.

Description of the Risk categories and likely action required (ranging from Very Low to Very High) are outlined in **Appendix A, Table 7**.

### 5.3 Geoenvironmental Hazard Identification

#### On Site

The site mainly comprises farm land. The geoenvironmental hazards associated with the current and historical land use are mainly agrochemicals and fuels. Based on the known history of the site and the walkover undertaken the most likely hazard is very localised areas of potential contamination linked to the chemical and farm storage areas. The main farm building on Pump Farm potentially has an asbestos roof, although this appears to be in good condition.

Most storage containers are located on concrete plinths, reducing the chance for contaminants to infiltrate into the ground. Additionally, storage containers and tanks have no clear signs of leakages. However, some containers do not appear to be underlain by concrete and the forecourt in front of Pump Farm is unsurfaced, resulting in an increased risk of potential for localized contamination associated with any spills or leaks from farm machinery or agrochemicals.

Open storage areas appear to contain wood (such as various locations of piled pallets/ fence posts) and agricultural plant and equipment, not representing a substantial contamination hazard.

The area of recent redevelopment to the north-west of the Bloors Farm site represents an additional localised potential contamination hazard as material from the old buildings appear to have been used to construct an access track through the site. Importantly this material may include asbestos fragments. This potential hazard is further highlighted upon inspecting historical Google Earth images from March 2011 to July 2013 which reveals collapsed roofing material on site, associated with the former derelict outbuildings which may contain asbestos.



An area of construction waste and general building materials is still located in the south-west corner of this development.

It is further recognised that a number of the agricultural access roads through the site, have been provided with hardcore surfacing in part to assist in providing vehicular access and to minimise potential rutting of the surface as a result of increased trafficking. The hard-surfacing area where seen appeared to comprise largely inert gravel, construction rubble and occasional road scalplings. Given their use and presence of localised areas of made ground these may present very localised small areas of potential hydrocarbon contamination from localised spills or leaks. Given that some of the material appears to have been derived from demolition of former buildings there is a risk that there may be the potential for asbestos containing material (ACM) fragments to be present in localised areas

Based on the known history of the site and the walkover undertaken during the preparation of this report, the potential for widespread significant contamination associated with the current and historical land use to be present is considered to be **Very Low** and very localised **Low** potential in areas used for the storage of chemicals and fuels, and in areas of localised made ground.

### Off Site

The surrounding land use is predominantly agricultural and residential in use, and whilst this generally presents a **Very Low** risk of widespread contamination it is recognised that agricultural storage areas may represent very localised contamination hazards. For example, a leaking oil drum, with observed staining to the ground, is located off the large concrete slab storage area immediately south-east of Pump Farm. However, the risk of widespread contamination should be minimal.

The historical Lower Twydall Chalk Pit landfill site borders the study site to the northwest and represents a potential geoenvironmental hazard. The available factual data indicate that the landfill was filled with Inert Waste arising from the local construction industry (GES, 2014a). Given the potential presence of timber or other gas generating materials, the landfill was considered as a potential off-site source of ground gases. Gas concentrations at the landfill were monitored between 2010 and 2015 as part of the landfill closure procedure; the monitoring wells located around the perimeter of the landfill recorded very low concentration of ground gases, with methane recorded below 0.3% and carbon dioxide below 3.5% (GES, 2015). Furthermore, groundwater monitoring undertaken at the site has not revealed any significant groundwater contamination occurring. Additionally, this landfill is located down-gradient of the site. Therefore, it is unlikely any contaminants will be mobilised from the landfill and transported onto the site. This suggests that fugitive emissions from the landfill site onto the study site are likely to be negligible and the landfill does not constitute a significant source of potential contamination. The risk associated with the landfill is considered to be **Low**.

The Chatham Main Railway Line running alongside the southern site boundary is located up-gradient in respect to the site. This railway is at grade with the southern edge of the site. There are no historical records suggesting the presence of sidings or maintenance/loading areas. Therefore, it is unlikely this railway poses a substantial contamination risk.

A substation is located along Pump Lane, near Pump Farm, poses a potential contamination hazard in relation to polychlorinated biphenyls (PCBs) and hydrocarbons. The potential risk of contamination from the railway line is considered to be **Very Low**.

The potential sources of contamination (PSC) and contaminants of concern are outlined in **Table 5.1** below:

Table 5.1 Potential sources of contamination (PSC) and contaminants of concern (COC)

Location	PSC Description	COC
On Site	Farmland and associated storage areas	Agrochemicals, hydrocarbons, metals
On Site	Old Demolished Development	Hydrocarbons, metals, asbestos
On Site	Made Ground Access Tracks	Localised Asbestos, hydrocarbons
Off Site	Agricultural and residential development	Agrochemicals, hydrocarbons, metals
Off Site	Historical Inert landfill	Whilst described as being “inert” there is a residual risk that waste materials could contain fractions of materials which could lead to hazardous ground gases including methane and carbon dioxide. Metals, heavy metals, hydrocarbons (TPH and PAH) including vapours and asbestos.  Based on monitoring records to date anticipated low potential for migration of gas from the historical landfill site.
Off Site	South Eastern (Chatham to Sittingbourne) Railway line	Hydrocarbons, metals Very Low potential for significant contamination
Off Site	Substation	Hydrocarbons, PCBs

## 5.4 Risk Assessment

In order to determine whether the identified hazards pose a risk, it is necessary to identify the presence of potential receptors and pathways by which they can be exposed to the hazard. The development masterplan is composed of residential properties with gardens, green open space, a school, and retirement village.

### Potential Receptors

Details of the potential receptors considered and whether or not the receptor is plausible are presented in **Table 5.2** below.

Table 5.2 Potential Receptors and Receptor Sensitivity

Receptor Type	Comment	Potential Receptor (Y/N)	Sensitivity Value
Human Health – On-site current users	Farm workers working in the fields across the site. General Public using footpaths etc.	Y	4
Human Health – On-site future users	Future residents of houses. Children attending proposed school.	Y	5
Human Health - neighbours	Owners of houses in Twydall and Lower Rainham. People visiting the adjacent Bloors Lane Community Woodland and Allotment Gardens.	Y	5
Human Health – construction / maintenance workers	Workers constructing the proposed development.	Y	4
Groundwater – Shallow	Head Superficial Deposits - Secondary Undifferentiated Aquifer.	Y	2
Groundwater - Deep	Seaford Chalk Formation – Principal Aquifer	Y	4
Surface Waters	None	N	N/A
Property - Buildings	Proposed buildings and services	Y	1
Ecological systems	RAMSAR and SSSI	Y	5
Property - Animal or Crop	Proposed Community Orchard	Y	2

## Identification of Potential Pathways

Table 3 in the PBA methodology (**Appendix A**) describes possible pathways for each receptor type. Each of these possible pathways is then considered when assessing the possible pollutant linkage (see below).

## Potential Pollutant Linkages

Potential environmental hazards need a pathway connecting the source (if present) to potential receptors in order to be able to impact upon the receptors. These pathways are capable of conveying the contaminants. Pathways may be anthropogenic (artificial) or natural.

Anthropogenic pathways are artificial routes capable of conveying contaminants and include such routes as surface water drains, high permeability backfill materials, poorly consolidated Made Ground, foundations, and persons disturbing contamination sources in such a way as to liberate contaminants.

In the case of persons working with contaminated ground (e.g. to lay foundations or install services) direct contact with the source becomes possible, and pathways such as dermal contact, inhalation or ingestion require consideration.

The site is expected to be underlain by Head Deposits over Thanet Beds and Seaford Chalk Formation. Potential downward and lateral migration of contaminants is expected to be significant given the likely high hydraulic conductivity of the geological materials underlying the site.

Potential pollutant linkages have been identified using the information on potential sources (contaminant types), receptors and exposure pathways. **Appendix I** identifies which pollutant linkages are considered to potentially exist.

## 5.5 Risk Estimation

When there is a pollutant linkage (and therefore some measure of risk), it is necessary to determine whether the risk matters and therefore whether further action is required. Risk estimation involves predicting the likely consequences (what degree of harm might result) and the probability that the consequences will arise (how likely the outcome is).

For this assessment, the consequences and probability for each potential pollutant linkage has been identified, these are presented in **Appendix I**. Based on the information available, and assuming a worst-case scenario and no mitigation measures, the estimated risks have been designated as follows. It is noted that the below table is informed by the proposed development masterplan in order to identify the end-user of the development (**Appendix H**).

Table 5.3 Contamination Risk Estimation

Receptor	Worst-Case Outcome of Contamination Risk Estimation
Human Health: On Site, Current Users	Low
Human Health: On Site, Future User	Low <sup>(1)</sup>
Human Health: Neighbours	Very Low
Human Health: Construction/Maintenance	Low <sup>(1)</sup>
Groundwater (Shallow)	Very Low
Groundwater (Deep)	Very Low
Surface Water	Eliminated
Property: Buildings	Very Low
Ecological Systems	Very Low
Property: Animal/Crop	Very Low

Notes: (1) See additional commentary below

The outcomes presented in the above summary table are the worst-case across all pollutant linkages for an identified receptor without mitigation. Some pathways may have a lower consequence or probability/likelihood and therefore a lower estimated risk. For a full breakdown of the risks assigned to each pathway, for each receptor, refer to the two tables of estimated risk in **Appendix I**.

## Additional Commentary

Under the existing conditions and in the absence of any redevelopment, the worst-case risk to Human Health from potential contamination originating at the Site is assessed as **Low**.

When considering a future redevelopment to a residential with private gardens (allowing the growing and consumption of home-grown produce) the worst-case risk to Human Health from potential contamination originating at the majority of Site is assessed as **Low**. The report has identified that there may be the potential for localised areas of contamination, which would increase the risk to Moderate, however following appropriate ground investigation and adoption of appropriate mitigation should any areas of contamination be encountered to ensure that clean soils are provided then this risk can be reduced to **Low**.

The risk to Human Health (Construction Workers) has been assessed as **Low** on the basis of construction workers encountering potentially contaminated soils and groundwater during construction activities (i.e. the construction of the proposed residential development) and an associated risk of ingestion/inhalation/dermal contact with these soils. It is envisaged that with the adoption of appropriate hygiene, working methods and PPE, that the risk to Human Health (Construction Workers) can be reduced to **Very Low**.

In light of the above, in absence of any mitigation, the worst-case risk identified to any receptor is **Low**. This is a function of:

- The sensitivity of future users (assessed as Very High (5))
- The increased probability of dermal contact or ingestion/inhalation of potential sources of contamination within any newly exposed areas of future soft-landscaping, in absence of any mitigation.

A **Low** risk is described in **Appendix A, Table 7** as:

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

## 5.6 Confidence and Uncertainty

The ground condition data used in this report is qualitative in nature and as such there is a degree of uncertainty as to the actual ground conditions present and the associated soil and groundwater chemistry and well as the ground gas regime at the site.

The need to establish the precise nature of the ground conditions, the extent of contamination (if present) and identify potential remediation and/or mitigation measures associated with impacted soil and groundwater will need to be assessed through intrusive ground investigation, monitoring and Tier 2 risk assessments. It is therefore recommended that a ground investigation is carried out on-site to confirm the conceptual site model prior to development.

It is considered however given the low risks identified through this study it is considered that a ground investigation and Tier 2 risk assessment is not required to support the planning application for redevelopment of the Site. Any requirement to carry out a geoenvironmental intrusive investigation can be dealt with by incorporation as a condition in any granted Planning Consent.

Possible pollutant linkages are determined using professional judgement. If a linkage is considered possible, it is considered that this represents a potentially 'unacceptable risk' and therefore requires further consideration. This may be through remediation or mitigation or through further tiers of assessment.

Given redevelopment is being considered, the current identified risk of encountering contamination that requires further assessment as part of the redevelopment should be considered low. This assessment is based on a future residential with private gardens usage. If a proposed use other than this is adopted in any future redevelopment, then the risks would require re-assessment.

On the basis of the current identified low risk of contamination, it is considered unlikely that the local planning authority will designate the Site as Contaminated Land under Part 2a of the Environmental Protection Act 1990.

## 6 Conclusions & Recommendations

### 6.1 Conclusions

Ground Conditions The available geological data indicates that the Site is underlain by the Head deposits in part with a thinning sequence of Thanet Formation overlying the Seaford Chalk Formation below. Groundwater is anticipated to be at a depth of between around 4m and 2mAOD (GES, 2015).

A landfill, Lower Twydall Chalk Pit, has been determined as being present to the west of the site. The site is currently in closure and environmental monitoring data indicate that ground gases concentrations on the perimeter are relatively low, with methane concentrations recorded being below 0.4% and carbon dioxide generally between about 2% and 3.5%. Similarly, groundwater monitoring has shown that the site poses a low risk of contamination.

#### Preliminary Geoenvironmental Assessment

Based on the proposed end use of the site, being residential with private gardens, the findings of a qualitative risk assessment carried out to assess hazards and constraints posed by the existing site conditions to the proposed development and this generally found to be low.

It is considered very unlikely that the local planning authority will designate the site as Contaminated Land under Part 2A of the Environmental Protection Act 1990.

#### Preliminary Ground Stability Risk Assessment

A review of potential geological hazards has identified the risk of land instability or potentially adverse foundation conditions to be present, in general, to be High. This is due to the High risk of solution features associated with the dissolution of the Seaford Chalk Formation underlying the site.

If such features are confirmed to be present, it is unlikely that conventional shallow spread strip and pad foundations will be suitable for the proposed development. In this situation, reinforced strip or trench fill or grillage foundations with minimum widths and cantilever spans are likely to be required, the specific details and design of which would be determined following ground investigation and testing, and with reference to the proposed masterplan.

If soakaways are proposed for the site, and in areas where dissolution features are known to be prevalent they should be located a minimum of 20m away from foundations or primary infrastructure due to risk of triggering the potential for solution feature or mine shaft collapse and precautionary measures should be adopted if located in areas of intensively used public open space.

### 6.2 Recommendations

The ground condition data used in our desk-based report is qualitative in nature and as such there is a degree of uncertainty as to the actual ground conditions present and the associated soil and groundwater chemistry as well as the ground gas regime at the site.

Therefore, there will ultimately be a need for intrusive geotechnical ground investigations. The aim of these would be to confirm the desk study findings, particularly those related to contamination, to identify the design parameters for the foundation and other ground based works required for the development.

Whilst the ground conditions may enable infiltration systems to be incorporated in the design, consideration must be given to the risk of solution features and man-made cavities in the appropriate design and siting of any infiltration system. Identification of such below ground features and the associate risk will be a further requirement of the intrusive ground investigation.



## 7 Essential Guidance for Report Readers

This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints they are described in the report text.

The opinions and recommendations expressed in this report are based on statute, guidance, and best practice current at the time of its publication. Peter Brett Associates LLP (PBA) does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and the report should be returned to us and reassessed if required for re-use after one year from date of publication. Following delivery of the report PBA has no obligation to advise the Client or any other party of such changes or their repercussions.

Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third party data used. Historical maps and aerial photographs provide a “snap shot” in time about conditions or activities at the site and cannot be relied upon as indicators of any events or activities that may have taken place at other times.

The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

This report has been written for the sole use of the Client stated at the front of the report in relation to a specific development or scheme. The conclusions and recommendations presented herein are only relevant to the scheme or the phase of project under consideration. This report shall not be relied upon or transferred to any other party without the express written authorisation of PBA. Any such party relies upon the report at its own risk.

The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc, unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.

Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as the Environment Agency, Natural England or Local Authority) have taken place only as part of this work where specifically stated.

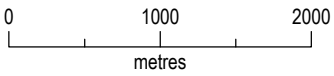
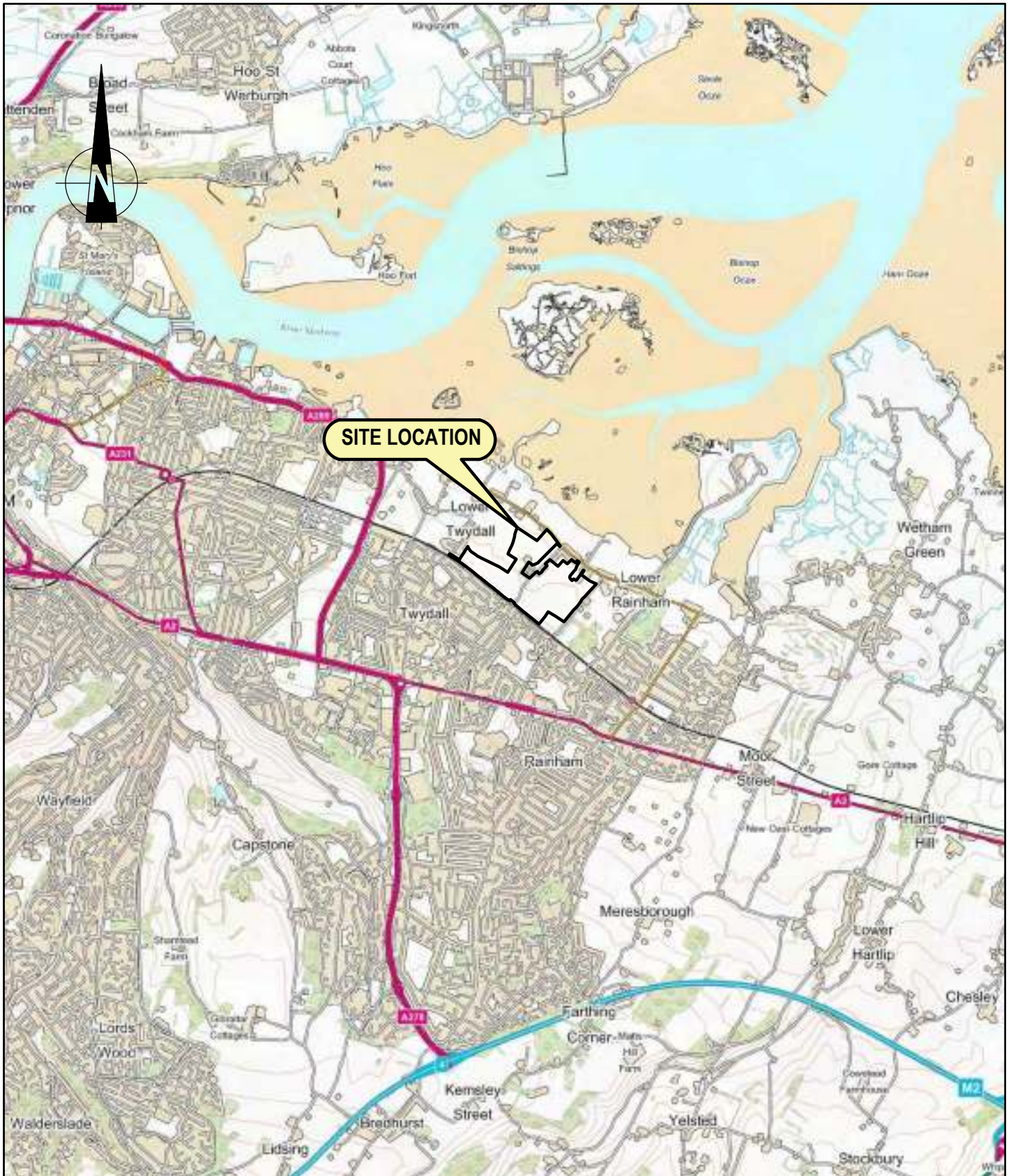
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## Figures

Figure 1: Site Location

Figure 2: Site Layout



Site Grid Ref: TQ 809 675

**PUMP AND BLOORS FARMS, RAINHAM**  
**SITE LOCATION PLAN**

Client  
**AC GOATHAM AND SON**

Date of 1st Issue  
 13.09.2018

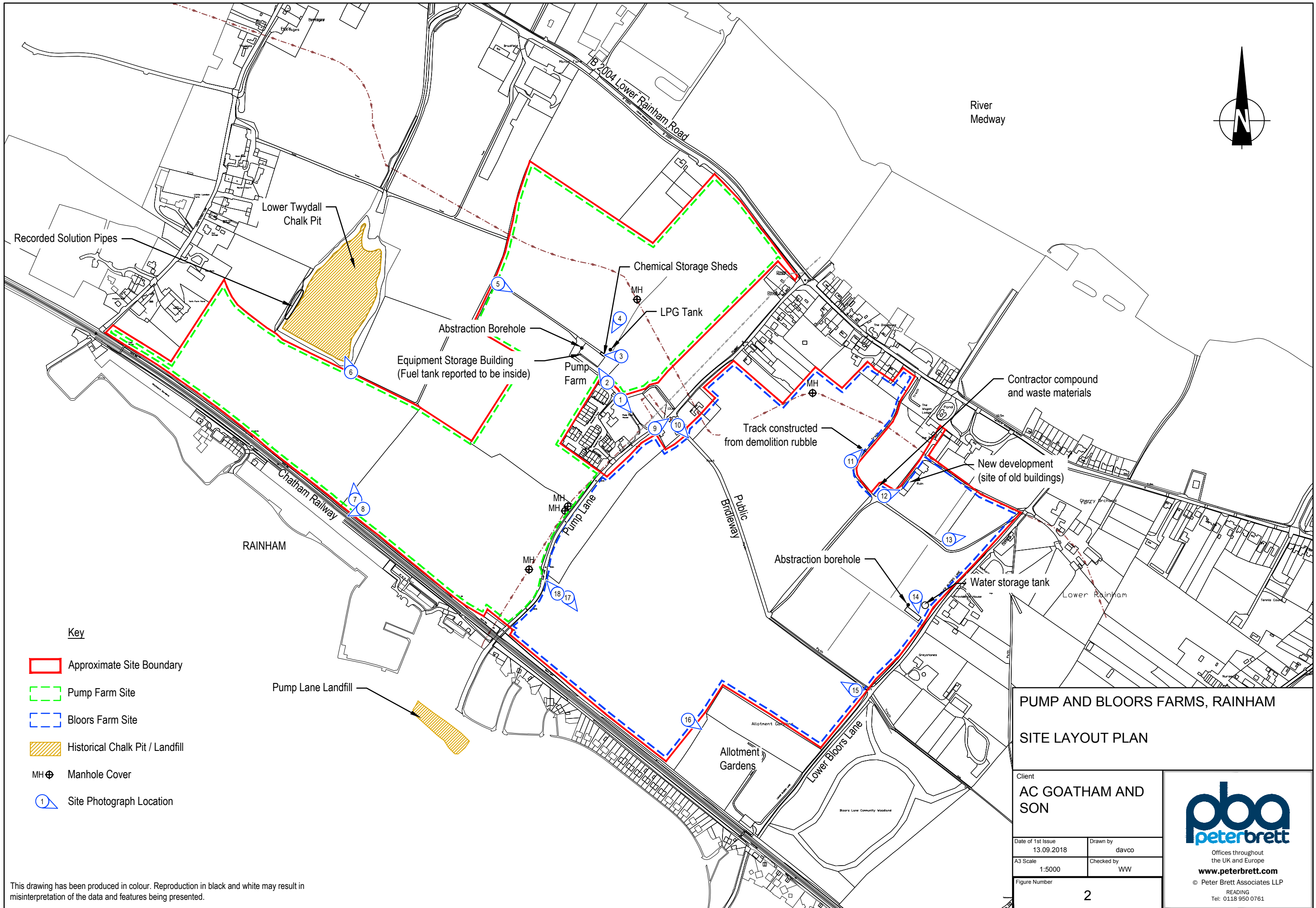
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**Key**

- Approximate Site Boundary
- Pump Farm Site
- Bloors Farm Site
- Historical Chalk Pit / Landfill
- MH ⊕ Manhole Cover
- ① Site Photograph Location

**PUMP AND BLOORS FARMS, RAINHAM**  
**SITE LAYOUT PLAN**

Client  
**AC GOATHAM AND SON**

Date of 1st Issue 13.09.2018	Drawn by davco
A3 Scale 1:5000	Checked by WW

Figure Number  
2



This drawing has been produced in colour. Reproduction in black and white may result in misinterpretation of the data and features being presented.

## **Appendix A: PBA Methodology for Assessing Land Contamination in England.**

# PBA Methodology for Assessing Land Contamination in England

## 1 Introduction

This document defines the approach adopted by PBA in relation to the assessment of land contamination in England. The aim is for the approach to (i) be systematic and objective, (ii) provide for the assessment of uncertainty and (iii) provide a rational, consistent, transparent framework.

When preparing our methodology, we have made reference to various technical guidance documents and legislation referenced in Section 7 of which the principal documents are (i) Contaminated Land Statutory Guidance (Defra 2012), (ii) the Model Procedures for the Management of Contamination (CLR 11) (EA 2004), (iii) Contaminated land risk assessment: A guide to good practice (C552) (CIRIA 2001) (iv) National Planning Policy Framework (NPPF, 2012 and 2018) and (v) BS 10175 Investigation of potentially contaminated sites - Code of Practice (BSI 2017).

## 2 Dealing with Land Contamination

Government policy on land contamination aims to prevent new contaminated land from being created and promotes a risk based approach to addressing historical contamination. With regard to historical contamination, regulatory intervention is held in reserve for land that meets the legal definition and cannot be dealt with through any other means, including through planning. Land is only considered to be “contaminated land” in the legal sense if it poses an unacceptable risk.

UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the 1990 Act by section 57 of the Environment Act 1995). Part 2A was introduced in England on 1 April 2000 and provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment. In 2004 the Model Procedures for the Management of Contamination (CLR 11) were published providing guidance on how the statutory requirements were to be delivered. The approach, concepts and principles for land contamination management promoted by CLR 11 are applied to the determination of planning applications.

Other legislative regimes may also provide a means of dealing with land contamination issues, such as the regimes for waste, water, environmental permitting, and environmental damage. Further, the law of statutory nuisance may result in contaminants being unacceptable to third parties whilst not attracting action under Part 2A or other environmental legislation.

### 2.1 Part 2A

The Regulations and Statutory Guidance that accompanied the Act, including the Contaminated Land (England) Regulations 2006, has been revised with the issue of The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and the Contaminated Land Statutory Guidance for England 2012.

Part 2A defines contaminated land as “*land which appears to the Local Authority in whose area it is situated to be in such a condition that, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant*

*possibility that such significant harm (SPOSH) could be caused, or significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution (SPOSP) being caused*”.

Harm is defined as “*harm to the health of living organisms or other interference with the ecological systems of which they form part, and in the case of man, includes harm to his property*”.

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment, and under the guidance enforcing authorities should seek to find and deal with such land. It states that “*under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Guidance, should be considered as meeting the Part 2A definition of contaminated land*”. Further, the guidance makes it clear that “*regulatory decisions should be based on what is reasonably likely, not what is hypothetically possible*”.

The overarching objectives of the Government’s policy on contaminated land and the Part 2A regime are:

- “(a) *To identify and remove unacceptable risks to human health and the environment.*
- (a) *To seek to ensure that contaminated land is made suitable for its current use.*
- (b) *To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development*”.

The enforcing authority may need to decide whether and how to act in situations where decisions are not straight forward, and where there is uncertainty. “*In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight, and burdens on affected people*”. The authority is required to “*take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case*”. The aim is “*that the regime produces net benefits, taking account of local circumstances*”.

The guidance recognises that “*normal levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise*”.

Normal levels are quoted as:

- “(a) *natural presence of contaminants’ such as from underlying geology that have not been shown to pose an unacceptable risk to health and the environment*
- b) *...low level diffuse pollution, and common human activity...*”

## PBA Methodology for Assessment of Potentially Contaminated Land

Similarly the guidance states that significant pollution or significant possibility of significant pollution of controlled waters is required for land to be considered contaminated and the “*fact that substances are merely entering water*” or “*where discharge from land is not discernible at a location immediately downstream*” does not constitute contaminated land.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised Statutory Guidance presented a new four category system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high.

For land that cannot be readily placed into Categories 1 or 4 further assessment is required. If there is a sufficiently strong case that the risks are of sufficient concern to cause significant harm or have the significant possibility of significant harm the land is to be placed into Category 2. If the concern is not met land is considered Category 3.

The technical guidance clearly states that the currently published SGV and GAC's represent “*cautious estimates of level of contaminants in soils*” which should be considered “*no risk to health or, at most, a minimal risk*”. These values do not represent the boundary between categories 3 and 4 and “*should be considered to be comfortably within Category 4*”.

At the end of 2013 technical guidance in support of Defra's revised Statutory Guidance (SG) was published and then revised in 2014 (CL:AIRE 2014) which provided:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

With regards controlled waters the revised Statutory Guidance states that the following types of pollution should be considered to constitute significant pollution of controlled waters:

*“(a) Pollution equivalent to “environmental damage” to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009, but which cannot be dealt with under those Regulations.*

*(b) Inputs resulting in deterioration of the quality of water abstracted, or intended to be used in the future, for human consumption such that additional treatment would be required to enable that use.*

*(c) A breach of a statutory surface water Environment Quality Standard, either directly or via a groundwater pathway.*

*(d) Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants (as defined in Article 2(3) of the Groundwater Daughter Directive (2006/118/EC)).*

The guidance also states that, in some circumstances, significant concentrations at a compliance point (in

groundwater or surface water) may constitute pollution of controlled waters.

As with SPOSH for human health the revised Statutory Guidance presents a four category system for SPOSP for controlled waters. Category 1 covers land where there is a strong and compelling case for SPOSH, for example where significant pollution would almost certainly occur if no action was taken to avoid it. Category 4 covers land where there is no risk or the risk is low, for example, where the land contamination is having no discernible impact on groundwater or surface water quality. Category 2 is for land where the risks posed to controlled waters are not high enough to consider the land as Category 1 but nonetheless are of sufficient concern to constitute SPOSP, Category 3 is for land where the risks posed to controlled waters are higher than low but not of sufficient concern to constitute SPOSP.

### 2.2 Planning

The Local Planning Authority (LPA) is responsible for the control of development, and in doing so it has a duty to take account of all material considerations, including contamination.

The principal planning objective is to ensure that any unacceptable risks to human health, buildings and other property and the natural and historical environment from the contaminated condition of the land are identified so that appropriate action can be considered and taken to address those risks.

The National Planning Policy Framework (NPPF, 2012) has been revised in July 2018 (NPPF, 2018).

Paragraph 118 states that planning policies and decisions should “*(c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.*”

Paragraph 179 states “*Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.*”

Paragraph 170 states “*planning policies and decisions should contribute to and enhance the natural and local environment by:*

*e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*

*f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”*

Paragraph 178 describes the policy considerations the Government expects LPA's to have in regard to land



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affected by contamination when preparing policies for development plans and in taking decisions on applications. have been replaced by paragraphs 178 and 180 respectively.

Paragraph 178 states “*planning policies and decisions should ensure that:*

*a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);*

*b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*

*c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.”*

Paragraph 183 states “*The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”*

The Glossary in Annex 2 provides the following:

**Brownfield land registers:** *Registers of previously developed land that local planning authorities consider to be appropriate for residential development, having regard to criteria in the Town and Country Planning (Brownfield Land Registers) Regulations 2017. Local planning authorities will be able to trigger a grant of permission in principle for residential development on suitable sites in their registers where they follow the required procedures.*

**Competent person (to prepare site investigation information):** *A person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation.*

**Previously developed land:** *Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or was last occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill, where provision for restoration has been made through development management procedures; land in built-up areas such as residential gardens, parks, recreation grounds and allotments; and land that was previously developed but where the*

*remains of the permanent structure or fixed surface structure have blended into the landscape.*

**Site investigation information:** *Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 Investigation of Potentially Contaminated Sites – Code of Practice). This in turn links to procedures in CLR11 which PBA adopt.*

PBA adopt the principle that a Phase 1 desk study is the minimum assessment requirement for planning applications.

The level at which contamination is deemed to be unacceptable, or, gives rise to adverse effects under a planning context has not been identified but is envisaged to be more precautionary than the level required to determine land as contaminated under Part 2A.

### 2.3 Building Control

The building control department of the local authority or private sector approved inspectors are responsible for the operation and enforcement of the Building Regulations (DCLG 2010) to protect the health, safety and welfare of people in and around buildings. Approved Document C requires the protection of buildings and associated land from the effects of contamination, to be applied (non-exclusively) in all changes of use from commercial or industrial premises, to residential property.

### 3 Approach

CLR 11 recommends a phased or tiered approach to risk assessment with the three tiers being:-

- Tier 1 - preliminary – a qualitative assessment forming part of a Phase 1 report,
- Tier 2 - generic - a quantitative assessment using published criteria to screen site specific ground condition data forming part of a Phase 2 report
- Tier 3 - detailed – a quantitative assessment involving the generation of site specific assessment criteria

Each tier of risk assessment comprises the following four stages:-

1. Hazard Identification – identifying potential contaminant sources on and off site;
2. Hazard Assessment – assessing the potential for unacceptable risks by identifying what pathways and receptors could be present, and what pollutant linkages could result (forming the Conceptual Site Model (CSM));
3. Risk Estimation – estimating the magnitude and probability of the possible consequences (what degree of harm might result to a defined receptor and how likely); and
4. Risk Evaluation – evaluating whether the risk needs to be, and can be, managed.

A PBA Phase 1 report normally comprises a desk study, walkover and Tier 1 risk assessment (the project specific proposal defines the actual scope of work). At Tier 1 the PBA approach to risk estimation involves identifying the magnitude of the potential consequence

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(taking into account both the potential severity of the hazard and the sensitivity of the receptor) and the magnitude of the likelihood i.e. the probability (taking into account the presence of the hazard and the receptor and the integrity of the pathway). This approach is promoted in current guidance such as R&D 66 (NHBC 2008).

The PBA approach is that if a pollution linkage is identified then it represents a potential risk which requires further consideration and either (1) remediation / direct risk management or (2) further tiers of assessment.

A PBA preliminary Phase 2 report comprises an intrusive investigation to collect site specific information, a Tier 2 quantitative generic risk assessment and a refinement of the CSM using the site specific data. Depending on the findings further investigation and/or progression to Tier 3 risk assessment and the generation of site specific assessment criteria may be required.

### 4 Identification of Pollutant Linkages and Conceptual Site Model (CSM)

For all Tiers of Risk Assessment the underlying principle to ground condition assessment is the identification of *pollutant linkages* in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements:-

- A source/hazard – a substance or situation which has the potential to cause harm or pollution;
- A pathway – a means by which the hazard moves along / generates exposure; and
- A receptor/target – an entity which is vulnerable to the potential adverse effects of the hazard.

The *Conceptual Site Model* identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). The CSM is refined as the assessment progresses through the Tiers.

#### 4.1 Hazard Identification

A hazard is a substance or situation that has the potential to cause harm. Hazards may be chemical, biological or physical.

At Tier 1 the potential for hazards to be present is determined from consideration of the previous or ongoing activities on or near to the site in accordance with the criteria presented in the **Table 1**.

Based on the land use information Contaminants of Potential Concern (COPC) are identified. The COPC direct the scope of the collection of site specific data and the analytical testing selected for subsequent Tiers.

At Tier 2 the site specific data is screened using appropriate published assessment criteria (refer to PBA document entitled Rationale for the Selection of Tier 2 Assessment Criteria). In general, published criteria have been developed using highly conservative

assumptions and therefore if the screening criterion is not exceeded (and assuming that sufficient samples from appropriate locations have been analysed) then the COPC is eliminated as a potential Hazard. It should be noted that exceedance does not necessarily indicate that a site is contaminated and/or unsuitable for use only that the COPC is retained as a potential Hazard. Published criteria are generated using models based on numerous and complex assumptions. Whether or not these assumptions are appropriate in a site-specific context requires confirmation on a project by project basis and would normally form part of a Tier 3 assessment.

When reviewing or assessing site specific data PBA utilise published guidance on comparing contamination data with a critical concentration (CL:AIRE/CIEH 2008) which presents a structured process for employing statistical techniques for data assessment purposes. The benefit of the statistical tool is uncertainty in estimating the representative exposure/source concentration) is quantified and decisions are made knowing the strength of the evidence. Correct decision probability is a function of sample size, difference in the mean and the critical concentration, variation in measured values and the significance level.

#### 4.2 Receptor and Pathway Identification

For all Tiers the potential receptors (for both on site and adjoining land) that will be considered are:

- Human Health – including current and future occupiers, construction and future maintenance workers, and neighbouring properties/third parties;
- Ecological Systems; \*<sup>1</sup>
- Controlled Waters \*<sup>2</sup> – including surface water and groundwater;
- Property - Animal or Crop (including timber; produce grown domestically, or on allotments, for consumption; livestock; other owned or domesticated animals; wild animals which are the subject of shooting or fishing rights); and
- Property - Buildings (including archaeological sites and ancient monuments).

\*<sup>1</sup> International or nationally designated sites (as defined in the statutory guidance (Defra Circular 04/12)) “in the local area” will be identified as potential ecological receptors. A search radius of 1, 2 or 5km will be utilised depending on the site specific circumstances (see also pathway identification). The Environment Agency has published an ecological risk assessment framework (EA 2008) which promotes (as opposed to statutorily enforces) consideration of additional receptors to include locally protected sites and protected or notable species. These additional potential receptors will only be considered if a Phase 1 habitat survey, undertaken in accordance with guidance (JNCC 1993), is commissioned and the data provided to PBA. It should be noted that without such a survey the Tier 1 risk assessment may conclude that the identification of potential ecological receptors is inconclusive (refer to PBA Specification for Phase 1).

\*<sup>2</sup> the definition of “pollution of controlled water” was amended by the introduction of Section 86 of the Water Act 2003. For the purposes of Part 2A groundwater does not include waters above the saturated zone and our assessment does not therefore address perched water other than where development causes a pathway to develop.

If a receptor is taken forward for further assessment it will be classified in terms of its sensitivity, the criteria for which are presented in **Table 2**. Table 2 has been generated using descriptions of environmental receptor

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importance/value given in various guidance documents including R&D 66 (NHBC 2008) and Transport Analysis Guidance (based on DETR 2000). Human health and buildings classifications have been generated by PBA using the attribute description for each class.

The exposure pathway and modes of transport that will be considered are presented in **Table 3**.

### 4.3 Note regarding Ecological Systems

The Environment Agency (EA) has developed an ecological risk assessment framework which aims to provide a structured approach for assessing the risks to ecology from chemical contaminants in soils (EA 2008). In circumstances where contaminants in water represent a potential risk to aquatic ecosystems then risk assessors will need to consider this separately.

The framework consists of a three tiered process:-

- Tier 1 is a screening step where the site soils chemical data is compared to a soil screening value (SSV)
- Tier 2 uses various tools (including surveys and biological testing) to gather evidence for any harm to the ecological receptors
- Tier 3 seeks to attribute the harm to the chemical contamination

Tier 1 is preceded by a desk study to collate information about the site and the nature of the contamination to assess whether pollutant linkages are feasible. The framework presents ten steps for ecological desk studies and development of a conceptual site model as follows.

- 1 Establish Regulatory Context
- 2 Collate and Assess Documentary Information
- 3 Summarise Documentary Information
- 4 Identify Contaminants of Potential Concern
- 5 Identify Likely Fate Transport of Contaminants
- 6 Identify Potential Receptors of Concern
- 7 Identify Potential Pathways of Concern
- 8 Create a Conceptual Site Model
- 9 Identify Assessment and Measurement Endpoints
- 10 Identify Gaps and Uncertainties

The information in a standard PBA Phase 1 report covers Steps 1 to 4 inclusive. Step 5 considers fate and transport of contaminants and it should be noted that our standard report adopts a simplified approach considering only transport mechanisms. A simplified approach has also been adopted in respect of Steps 6 and 7 receptors (a detailed review of the ecological attributes has not been undertaken) and pathways (a food chain assessment has not been undertaken). Step 9 is outside the scope of our standard Phase 1 report.

It should be noted that the Tier 1 assessment for ecological systems (i.e. where designated sites are identified) as part of a Phase 1 report will assess the viability of the mode of transport given the site specific circumstances and not specific pathways.

The Tier 1 risk assessment may conclude that the risk to potential ecological receptors is inconclusive (see PBA Specification for Phase 1).

### 4.4 Note regarding Controlled Waters

Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwaters, but not perched waters.

The EU Water Framework Directive (WFD) 2000/60/EC provides for the protection of sub-surface, surface, coastal and territorial waters through a framework of river basin management. The EU Updated Water Framework Standards Directive 2014/101/EU amended the EU WFD to update the international standards therein; it entered into force on 20 November 2014 with the requirements for its provisions to be transposed in Member State law by 20 May 2016. Other EU Directives in the European water management framework include:

- the EU Priority Substances Directive 2013/39/EU;
- EU Groundwater Pollutants Threshold Values Directive 2014/80/EU amending the EU Groundwater Directive 2006/118/EC; and
- EU Biological Monitoring Directive 2014/101/EU.

The Ground Water Daughter Directive (GWDD) was enacted by the Groundwater Regulations (2009), which were subsumed by the Environmental Permitting Regulations (2010) which provide essential clarification including on the four objectives specifically for groundwater quality in the WFD: -

- Achieve 'Good' groundwater chemical status by 2015, commonly referred to as 'status objective';
- Achieve Drinking Water Protected Area Objectives;
- Implement measures to reverse any significant and sustained upward trend in groundwater quality, referred to as 'trend objective'; and
- Prevent or limit the inputs of pollutants into groundwater, commonly referred to as 'prevent or limit' objectives

The Water Act 2003 (Commencement No.11) Order 2012 amends the test for 'contaminated land' which relates to water pollution so that pollution of controlled waters must now be "significant" to meet the definition of contaminated land.

River Basin Management Plans (RBMP) have been developed for the 11 River Basin Districts in England and Wales. These were released by Defra in 2009 (Defra 2009) and these were updated in 2015.

These RBMP's establish the current status of waters within the catchments of the respective Districts and the current status of adjoining waters identified. As part of a Tier 2 risk assessment water quality data is screened against the WFD assessment criteria. Comparison with the RBMP's current status of waters for the catchment under consideration would form part of a Tier 3 assessment.

## 5 Risk Estimation

Risk estimation classifies what degree of harm might result to a receptor (defined as consequence) and how likely it is that such harm might arise (probability).

At Tier 1 the consequence classification is generated by multiplying the hazard classification score and the receptor sensitivity score. This approach follows that presented in the republished R&D 66 (NHBC 2008).

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The criteria for classifying probability are set out in **Table 4** and have been taken directly from Table 6.4 CIRIA C552 (CIRIA 2001). Probability considers the integrity of the exposure pathway.

The consequence classifications detailed in **Table 5** have been adapted from Table 6.3 presented in C552 and R&D 66 (Annex 4 Table A4.3).

The Tier 1 risk classification is estimated for each pollutant linkage using the matrix given in **Table 6** which is taken directly from C552 (Table 6.5).

Subsequent Tiers refine the CSM through retention or elimination of potential hazards and pollutant linkages.

### 6 Risk Evaluation

Risk evaluation is used to determine whether the risk is acceptable or not. It includes consideration of the risk estimation and associated uncertainties.

The PBA Tier 1 methodology provides an estimate of the level of risk, but does not identify a risk level at which the risk is considered “significant” and/or “unacceptable” as this is dependent on the view of the individual / stakeholder. For example; to a risk adverse stakeholder even a risk level of “very low” may be considered unacceptable and as such this stakeholder may require risk management options to be implemented.

In order to put the Tier 1 risk classification into context the likely actions are described in **Table 7** which is taken directly from C552 (Table 6.6). Subsequent Tiers identify potential risk management options through remediation and/or mitigation measures.

### 7 References

BSI 2007 BS 8485 Code of Practice for characterisation and remediation from ground gas in affected developments.  
BSI 2017 BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of Practice  
CIRIA 2001: Contaminated land risk assessment – a guide to good practice C552.  
CIRIA 2008: Assessing risks posed by hazardous ground gases to buildings C655  
CL:AIRE/EIH 2008 Guidance on Company Soil Contamination Data with a Critical Concentration. Published by Contaminated Land: Applications in Real Environments (CL:AIRE)  
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Defra '2009 Water for Life and Livelihoods. River Basin Management Plan. (11 Districts: Anglia, Dee, Humber, Northumbria, Northwest, Severn, Solway and Tweed, Southeast, Thames, Western Wales) December 2009

EA 2004: The Model Procedures for the Management of Land Contamination CRL 11 published by the Environment Agency (EA).

EA 2008 Ecological Risk Assessment Science Report Series SC070009 published by the Environment Agency (EA).

JNCC 1993 Handbook for Phase 1 Habitat Survey – A Technical for Environmental Audit prepared by the Joint Nature Conservancy Council (JNCC)

NHBC/EA/CIEH 2008: R&D Publication 66 Guidance for the safe development of housing on land affected by contamination.

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**Table 1: Criteria for Classifying Hazards / Potential for Generating Contamination**

Classification/Score	Potential for generating contamination/gas based on land use
Very Low 1	Land Use: Greenfield Contamination: None. Gas generation potential : Inert Made Ground
Low 2	Land Use: Residential, retail or office use, recent small scale industrial. Contamination: None or locally slightly elevated concentrations. Gas generation potential : Shallow thickness of alluvium
Moderate 3	Land Use: Railway yards, collieries, scrap yards, light industry, engineering works. Contamination: Locally elevated concentrations. Gas generation potential : Dock silt and substantial thickness of organic alluvium/peat
High 4	Land Use: Gas works, chemical works, heavy industry, non-hazardous landfills. Contamination: Possible widespread elevated concentrations. Gas generation potential : Shallow mine workings Pre 1960's landfill
Very High 5	Land Use: Hazardous waste landfills. Contamination: Likely widespread elevated concentrations. Gas generation potential: Domestic landfill post 1960

*"Greenfield" is land which has not been developed.. This can include land only used for agriculture but it should be recognised there is a potential for localised contamination of buried animal pits and diffuse pollution and this possibility should be considered in the risk assessment.*

**Table 2: Criteria for Classifying Receptor Sensitivity/Value**

Classification/Score	Definition
Very Low 1	Receptor of limited importance Groundwater: Non aquifer Surface water: Water body within 25m or eliminate Ecology: No local designation Buildings: Replaceable Human health: Unoccupied/limited access
Low 2	Receptor of local or county importance with potential for replacement Groundwater: Secondary B aquifer or Secondary Undifferentiated Surface water: Tertiary water body immediately adjacent Ecology: local habitat resources Buildings: Local value Human health: Minimum score 4 where human health identified as potential receptor
Moderate 3	Receptor of local or county importance with potential for replacement Groundwater: Secondary A aquifer Surface water: Secondary water body immediately adjacent Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character Human health: Minimum score 4 where human health identified as potential receptor
High 4	Receptor of county or regional importance with limited potential for replacement Groundwater: Principal aquifer Surface water: Primary water body immediately adjacent Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) Buildings: Conservation Area Human health: Minimum score 4 where human health identified as potential receptor
Very High 5	Receptor of national or international importance Groundwater: Source Protection Zone Surface water: Primary water body on site Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) Buildings: World Heritage site Human health: Residential, open spaces and uses where children are present

**Table 3: Exposure Pathway and Modes of Transport**

<b>Receptor</b>	<b>Pathway</b>	<b>Mode of transport</b>
<b>Human health</b>	Ingestion	Fruit or vegetable leaf or roots
		Contaminated water
		Soil/dust indoors
		Soil/dust outdoors
	Inhalation	Particles (dust / soil) – outdoor
		Particles (dust / soil) - indoor
		Vapours – outdoor - migration via natural or anthropogenic pathways
		Vapours - indoor - migration via natural or anthropogenic pathways
	Dermal absorption	Direct contact with soil
		Direct contact with waters (swimming / showering)
Irradiation		
<b>Groundwater</b>	Leaching	Gravity / permeation
	Migration	Natural – groundwater as pathway Anthropogenic (e.g. boreholes, culverts, pipelines etc.)
<b>Surface Water</b>	Direct	Runoff or discharges from pipes
	Indirect	Recharge from groundwater
	Indirect	Deposition of wind blown dust
<b>Buildings</b>	Direct contact	Sulphate attack on concrete, hydrocarbon corrosion of plastics
	Gas ingress	Migration via natural or anthropogenic paths
<b>Ecological systems</b>	See Notes	Runoff/discharge to surface water body
	See Notes	Windblown dust
	See Notes	Groundwater migration
	See Notes	At point of contaminant source
<b>Animal and crop</b>	Direct	Wind blown or flood deposited particles / dust / sediments
	Indirect	Plants via root up take or irrigation. Animals through watering
	Inhalation	By livestock / fish - gas / vapour / particulates / dust
	Ingestion	Consumption of vegetation / water / soil by animals

**Table 4: Classification of Probability**

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

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**Table 5: Classification of Consequence (score = magnitude of hazard Table 1 and sensitivity of receptor Table 2)**

Classification / Score	Examples
<b>Severe</b> <b>17-25</b> <b>(3 out of 25 outcomes)</b>	Human health effect - exposure likely to result in "significant harm" as defined in the Defra (2012) Part 2A Statutory Guidance <sup>1</sup> . Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
<b>Medium</b> <b>10-16</b> <b>(7 out of 25 outcomes)</b>	Human health effect - exposure could result in "significant harm" <sup>1</sup> . Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. Damage to crops, buildings or property
<b>Mild</b> <b>5-9</b> <b>(7 out of 25 outcomes)</b>	Human health effect - exposure may result in "significant harm" <sup>1</sup> . Controlled water effect - equivalent to EA Category 3 incident (short lived and/or minimal effects on water quality). Ecological effect - unlikely to result in a substantial adverse effect. Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
<b>Minor</b> <b>1-4</b> <b>(8 out of 25 outcomes)</b>	No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discolouration of concrete.

Note: 1. Significant harm includes death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. The local authority may also consider other health effects to constitute significant harm such as physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts. Whether or not these would constitute significant harm would depend on the seriousness of harm including impact on health, quality of life and scale of impact.

**Table 6: Classification of Risk (Combination of Consequence Table 5 and Probability Table 4)**

Probability	Consequence			
	Severe	Medium	Mild	Minor
<b>High likelihood</b>	Very high	High	Moderate	Low
<b>Likely</b>	High	Moderate	Moderate/	Low
<b>Low likelihood</b>	Moderate	Moderate	Low	Very low
<b>Unlikely</b>	Low	Low	Very low	Very low

**Table 7: Description of Risks and Likely Action Required**

Risk Classification	Description
<b>Very high risk</b>	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
<b>High risk</b>	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
<b>Moderate risk</b>	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
<b>Low risk</b>	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
<b>Very low risk</b>	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

## Appendix B1: Historical Maps South-West (Area 1)



# Historical Mapping Legends

## Ordnance Survey County Series 1:10,560

	Gravel Pit		Sand Pit		Other Pits
	Quarry		Shingle		Orchard
	Cobble		Roads		Marsh
	Mixed Wood		Deciduous		Broadwood
	Lime		Rough Pasture		
	Arrow dangles low of water		Ingeometrical Station		
	Site of Antiquity		Bench Mark		
	Pump, Quilt, Tree, Signal Post		Well, Spring, Boundary Post		
	Surface Level				
	Scale of Contour		Instrumental Contour		
	Main Road		Minor Roads		
	Banked Road		Railway Road		
	Road over Railway		Railway over River		
	Viaduct over Road		Level Crossing		
	Bridge over River or Canal		Road over Stream		
	Look over Stream				
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Borough Boundary (Scotland)				
	Urban 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		Lakes, Loch or Pond
	Dunee		Boulders
	Coniferous Trees		Non-Coniferous Trees
	Orchard		Dun, Scrub
	Low Coppice		Rough Grass and
	Hedges		Walls, Roads
	Sailings		
	Mauing		Direction of Flow of Water
	Glasshouse		Slings
	Sapping Masonry		Sand
	Fyln		Electricity Transmission Line
	Fyn		
	Cutting		Standard Gauge Multiple Track
	Road Jumps		Standard Gauge Single Track
	Level Crossings		Siding, Trenching or Mineral Line
	Foot Paths		Narrow Gauge
	Geographical County		
	Administrative County, County Borough or County of City		
	Civil Parish Boundary, Urban or Rural District, Borough or Town Council		
	Search Range, County Constituency, Electoral Ward or Parliamentary Constituency		
	Cell Path		
	Boundary, Pier or Stone		Pit Symbol
	Church		Post Office
	Club House		Public Garden, Park
	Fire Engine Station		Public House
	Foot Bridge		Signal Post
	Fountain		Spring
	Gull Nest		Telephone Call Box
	Mill Race		Telephone Call Point
	Mill Stone		Well
	General Building		Important Building

## 1:10,000 Raster Mapping

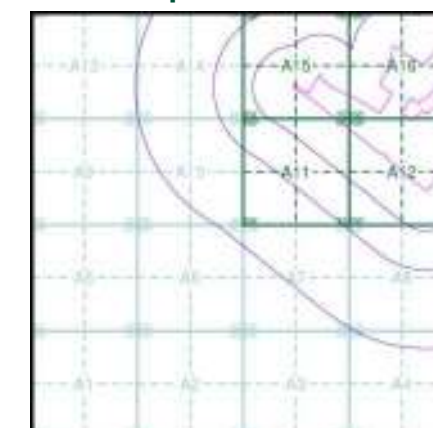
	Gravel Pit		Refuse pit or slag heap
	Rack		Track (cellarway)
	Boulders		Judders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slates		Top of cliff
	General canal		Underground culvert
	Overhead canal		Narrow gauge railway
	Multiple track railway		Single track railway
	County boundary (England)		Civil parish or community boundary
	District, Urban, Metropolitan, London Borough boundary		Constituency boundary
	Area of woodland (vegetation)		Non-coniferous trees
	Non-coniferous trees (scattered)		Coniferous trees
	Coniferous trees (scattered)		Pavilion tree
	Orchard		Copse or Colony
	Rough Grassland		Heath
	Scrub		Marsh, Salt Marsh or Seeps
	Water Feature		Fish weirs
	Mean high water (sea level)		Mean low water (spring)
	Telephone line (above ground)		Electricity transmission or line (wires)
	Benchmark (white stone)		Triangular station
	Point feature (e.g. Gull Nest or Mill Stone)		Pylon, Mast, stack or lighting tower
	Site of Antiquity		Glasshouse
	General Building		Important Building



## Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Kent	1:10,560	1869	2
Kent	1:10,560	1897 - 1898	3
Kent	1:10,560	1909 - 1910	4
Kent	1:10,560	1931 - 1933	5
Kent	1:10,560	1938	6
Kent	1:10,560	1938 - 1950	7
Ordnance Survey Plan	1:10,000	1961 - 1962	8
Ordnance Survey Plan	1:10,000	1967 - 1969	9
Ordnance Survey Plan	1:10,000	1974 - 1975	10
Ordnance Survey Plan	1:10,000	1981 - 1985	11
Ordnance Survey Plan	1:10,000	1991	12
10K Raster Mapping	1:10,000	1999	13
Street View	Variable		14

## Historical Map - Slice A



## Order Details

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

## Site Details

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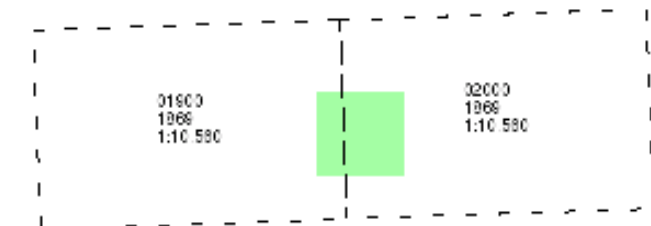
Kent

Published 1869

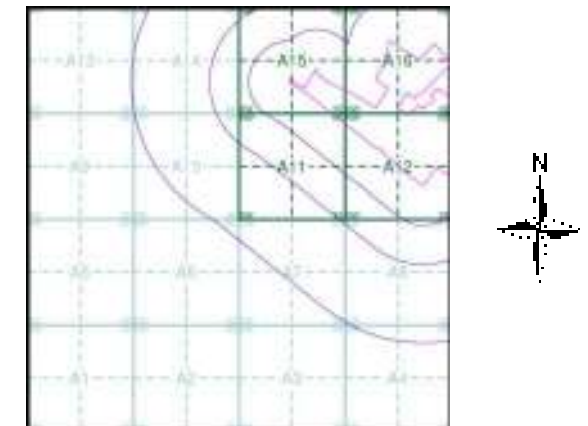
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. 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

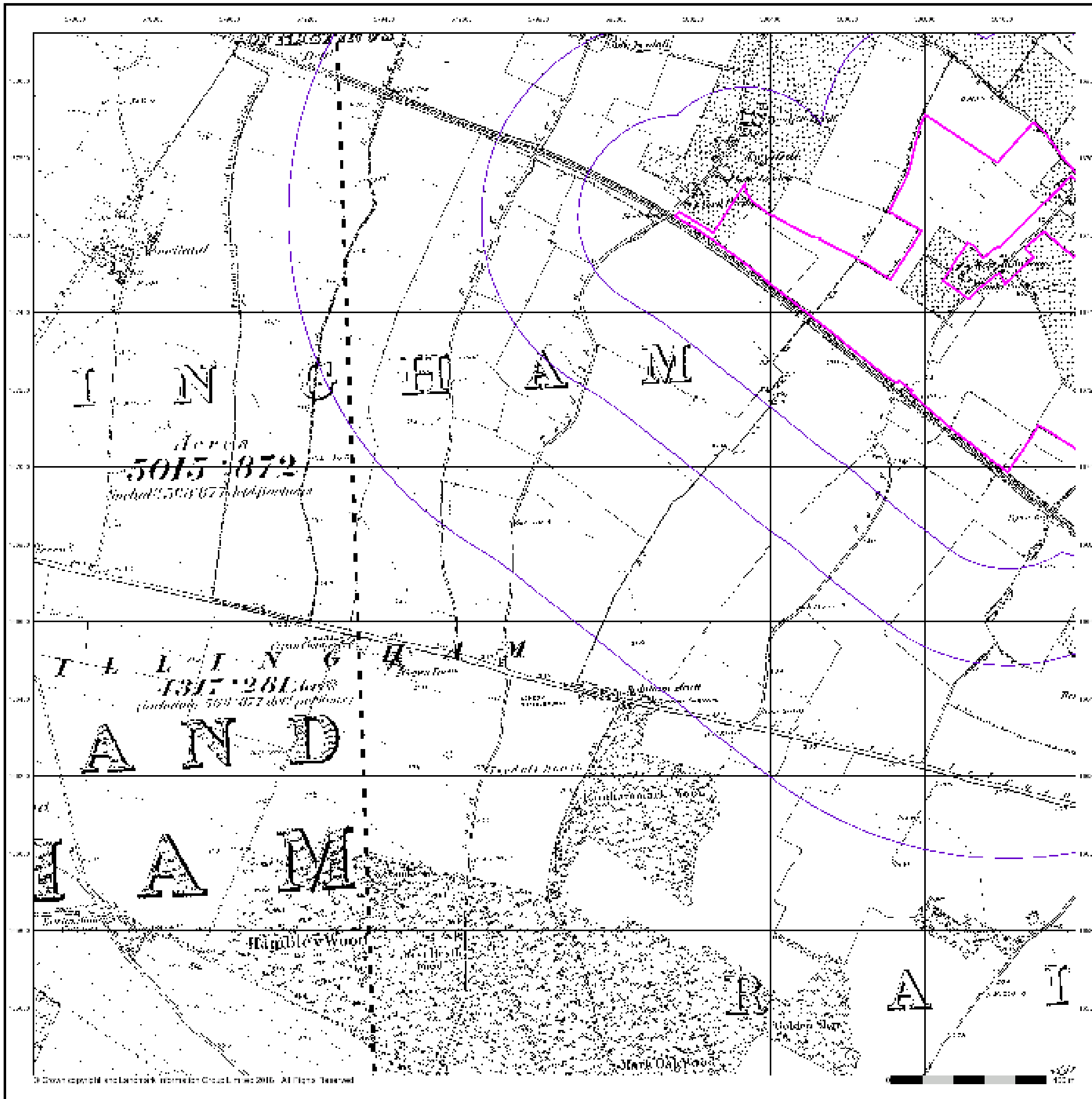
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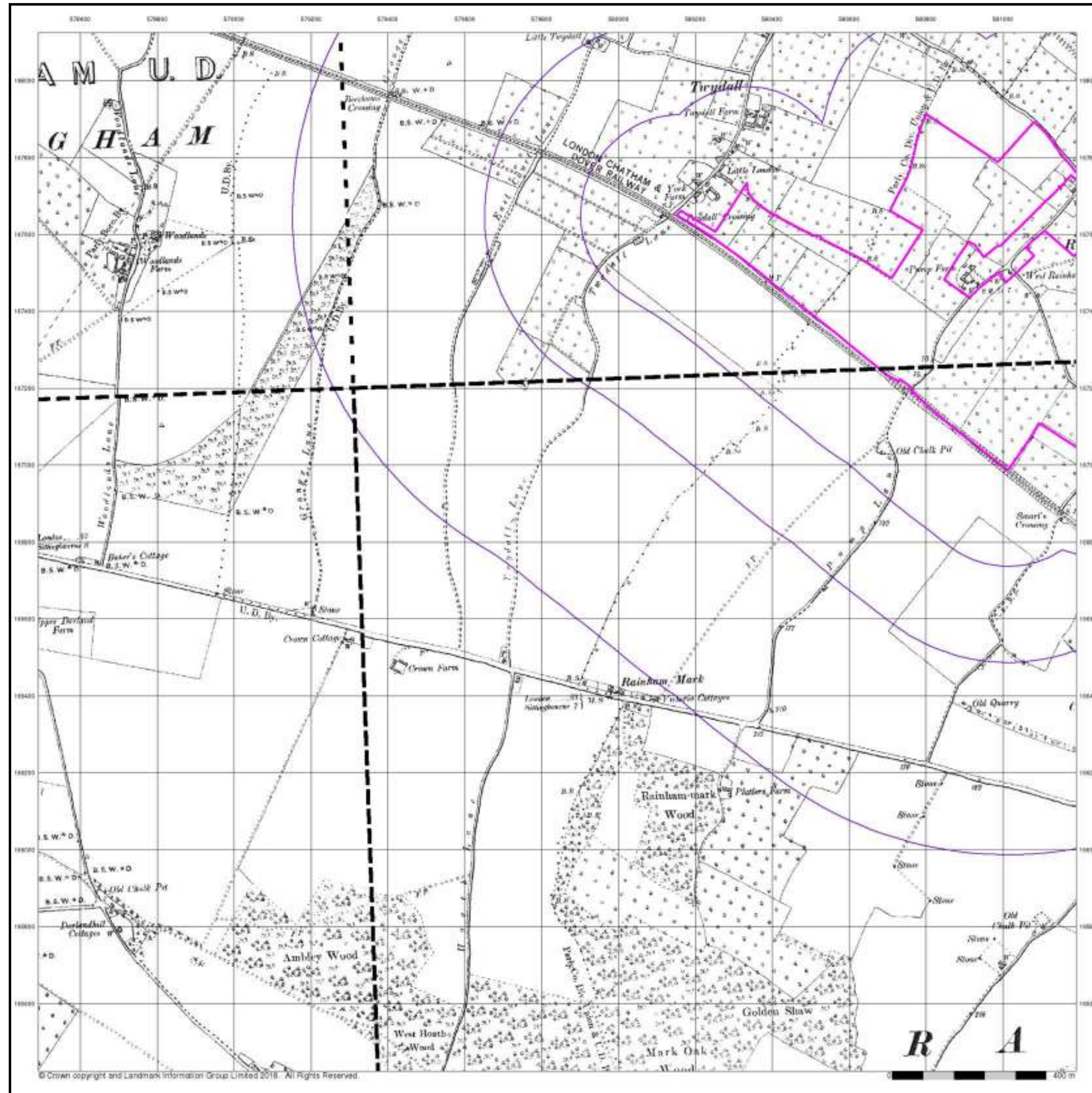
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**Kent**

**Published 1897 - 1898**

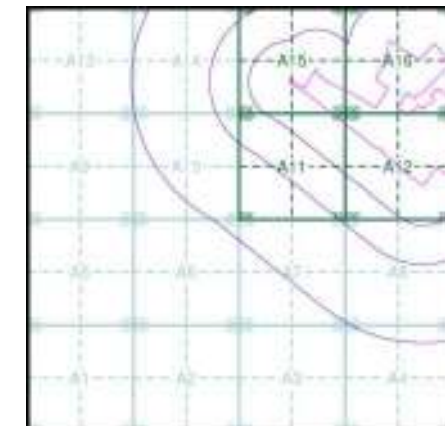
**Source map scale - 1:10,560**

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)**

019NE 1898 1:10,560	022NW 1898 1:10,560
019SE 1898 1:10,560	022SW 1897 1:10,560

**Historical Map - Slice A**



**Order Details**

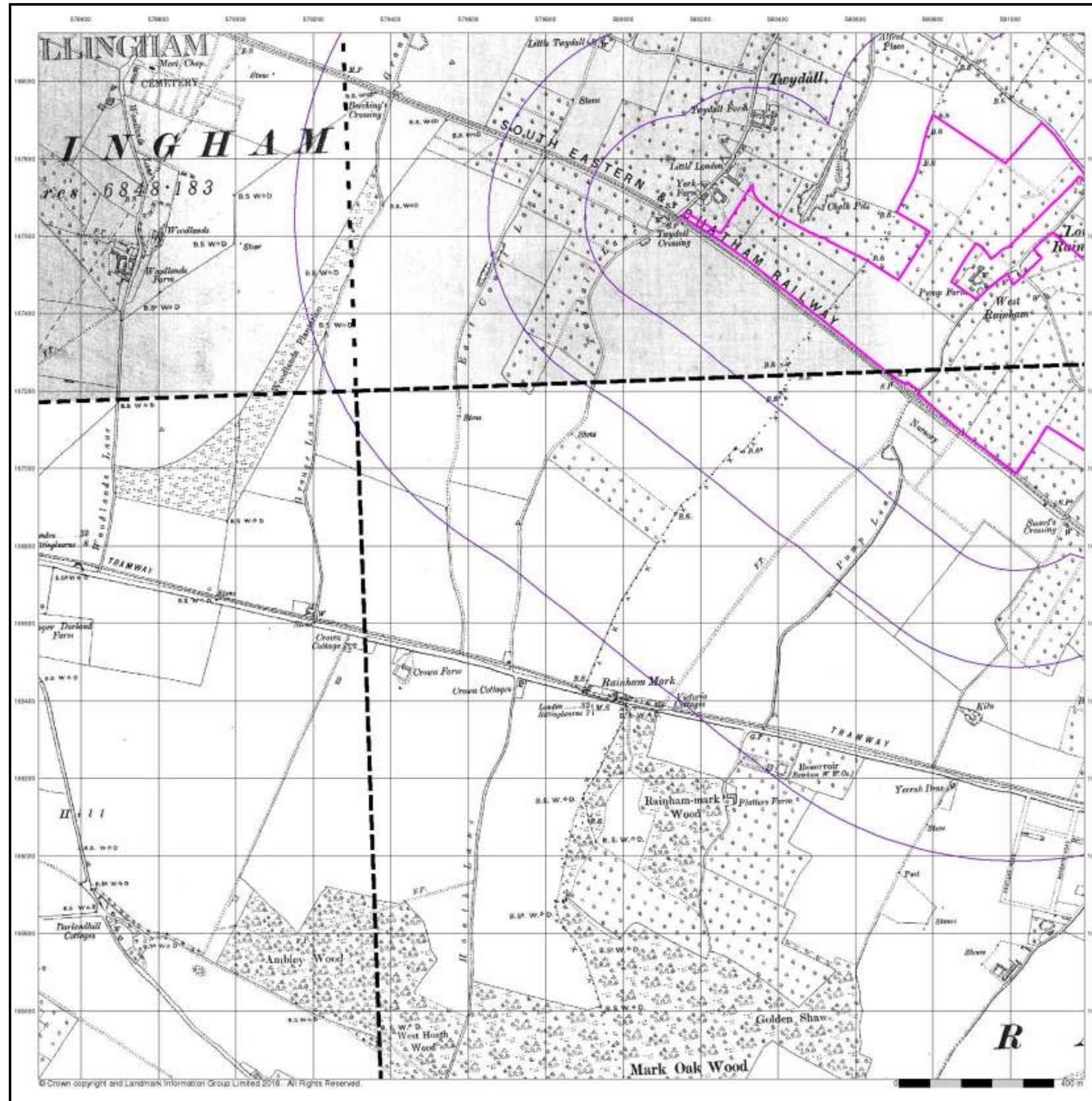
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 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
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 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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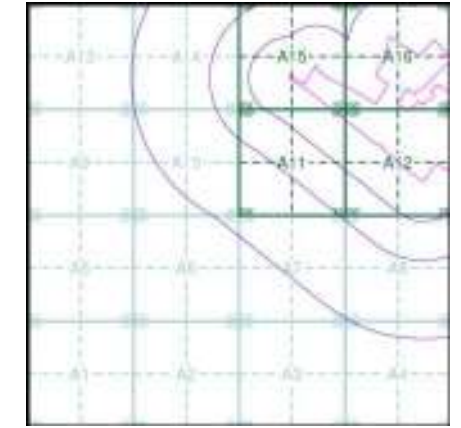
**Kent**  
**Published 1909 - 1910**  
**Source map scale - 1:10,560**

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)**

019NE 1909 1:10,560	022NW 1909 1:10,560
019SE 1910 1:10,560	022SW 1909 1:10,560

**Historical Map - Slice A**



**Order Details**

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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Kent

Published 1931 - 1933

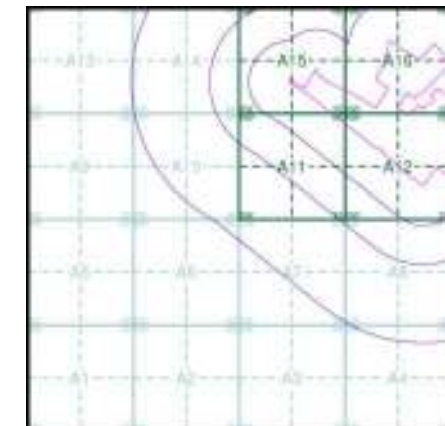
Source map scale - 1:10,560

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)

019NE 1933 1:10,560	022NW 1932 1:10,560
019SE 1932 1:10,560	022SW 1931 1:10,560

Historical Map - Slice A



Order Details

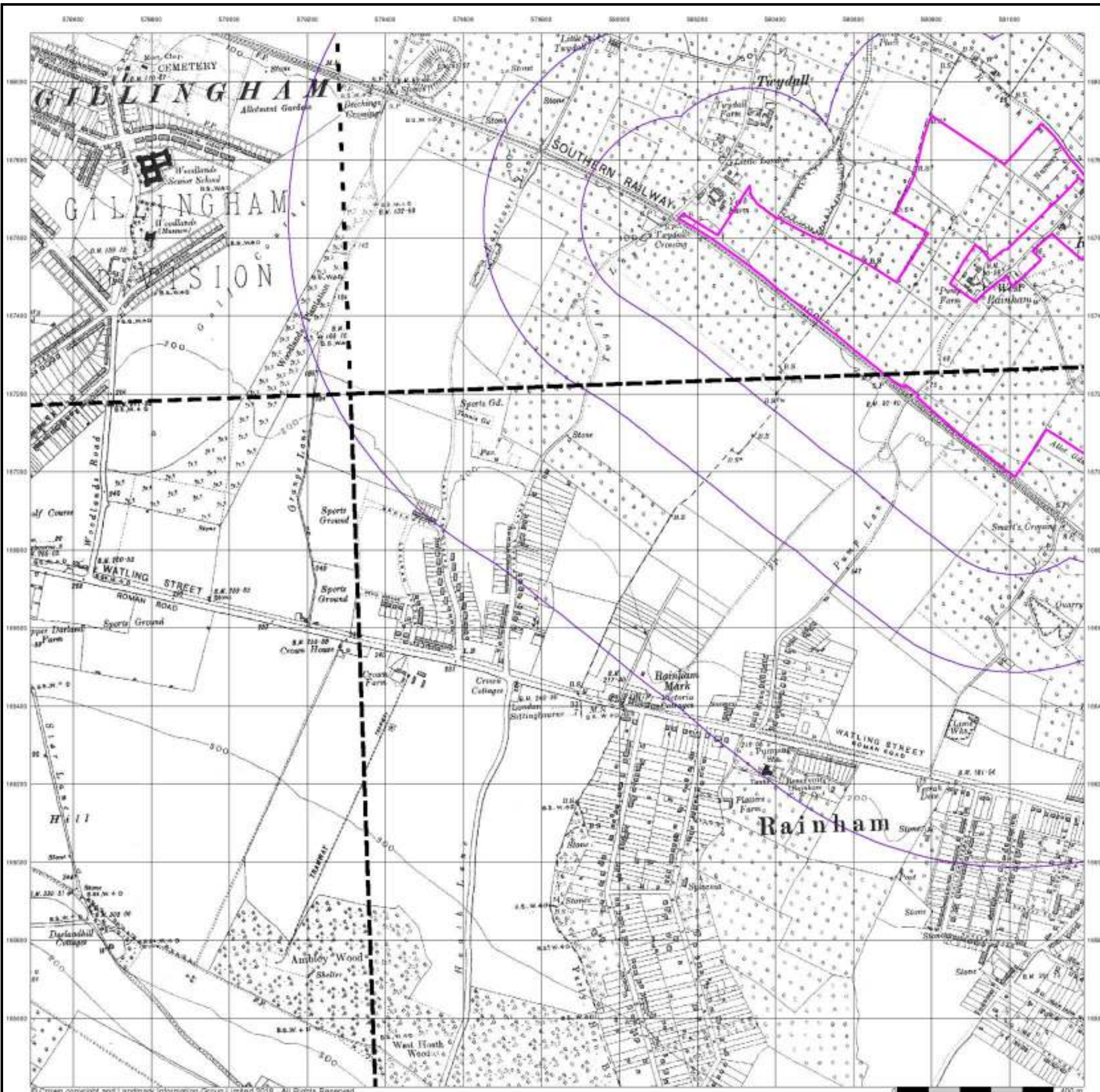
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 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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Kent

Published 1938

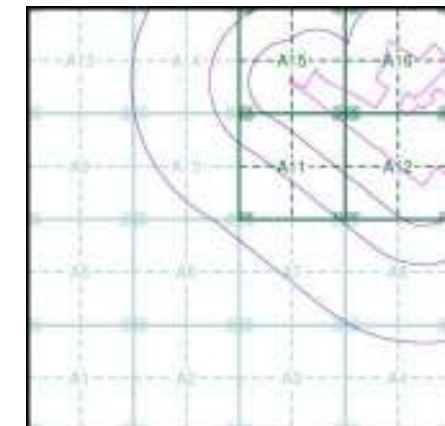
Source map scale - 1:10,560

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)

019NE 1938 1:10,560	021NW 1938 1:10,560
019SE 1938 1:10,560	021SW 1938 1:10,560

Historical Map - Slice A



Order Details

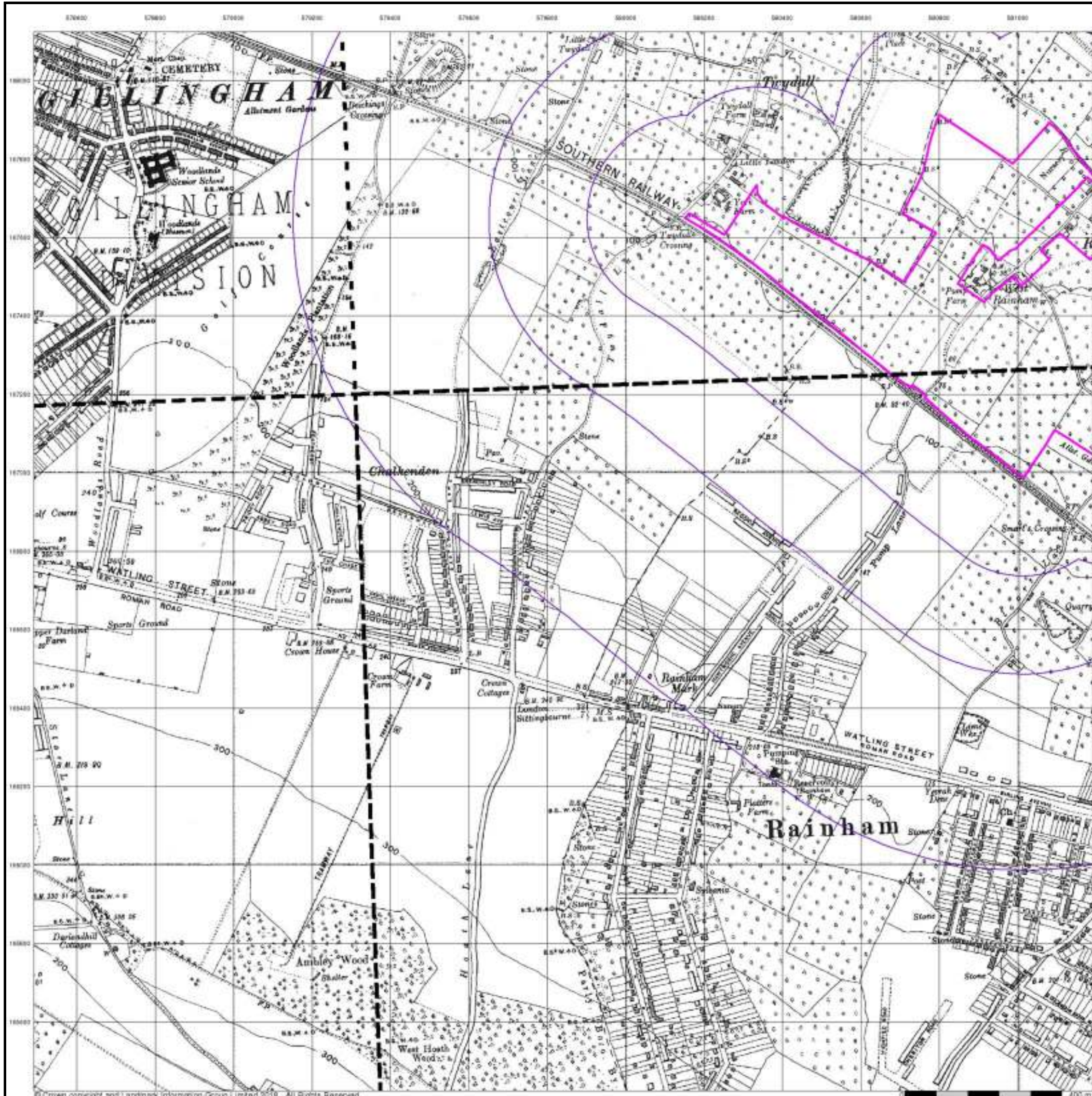
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 Search Buffer (m): 1000

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Kent

Published 1938 - 1950

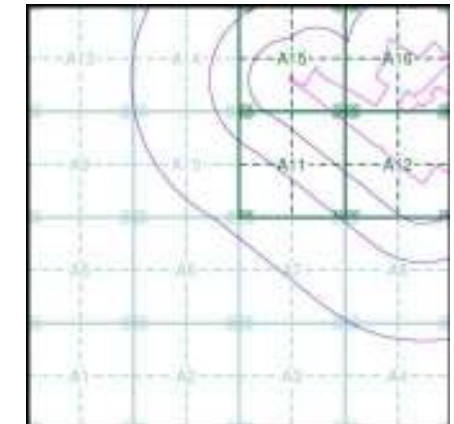
Source map scale - 1:10,560

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)

019NE	1938	1:10,560
019SE	1950	1:10,560

Historical Map - Slice A



Order Details

Order Number: 178768733\_1\_1  
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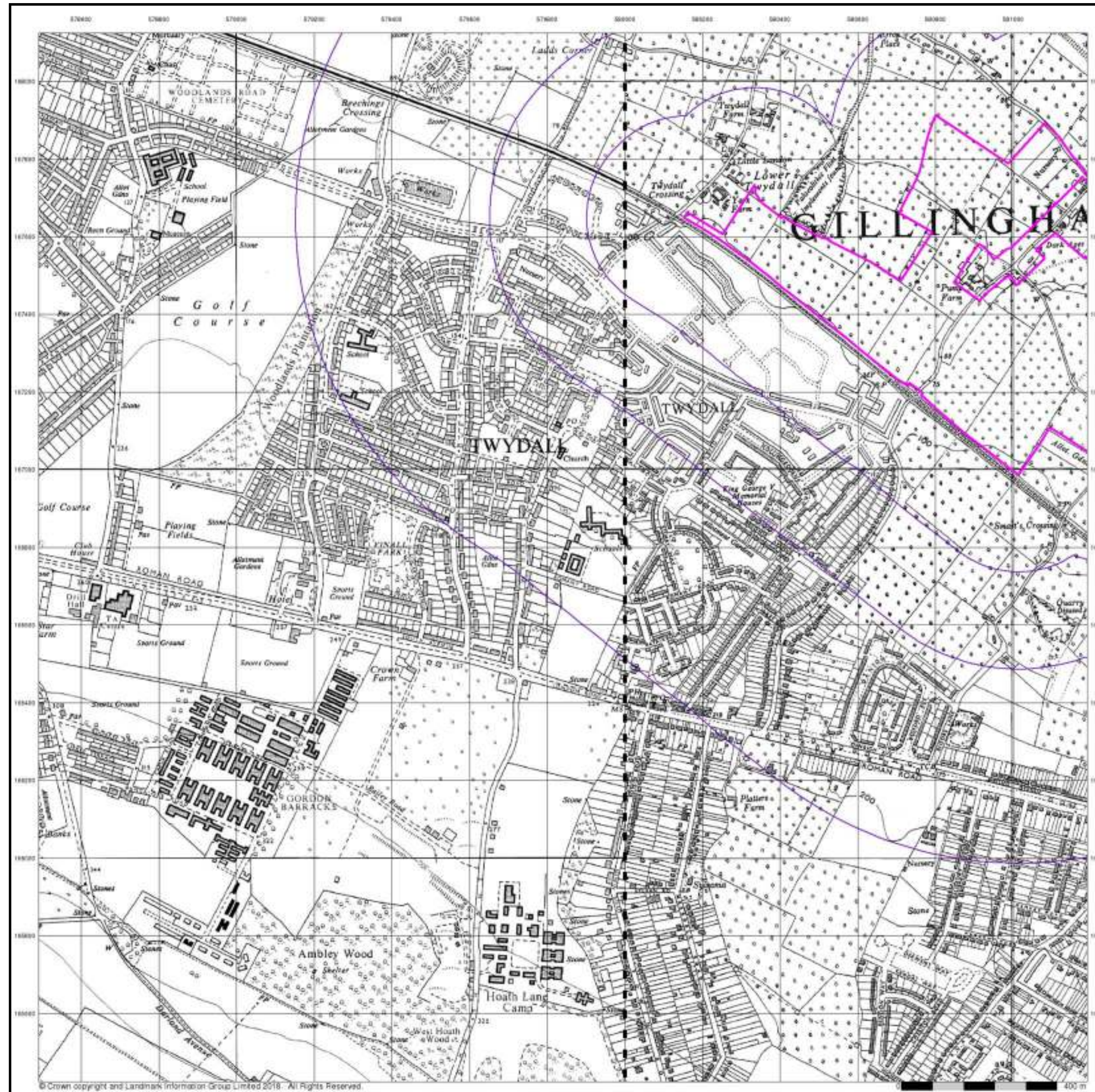
Site Details

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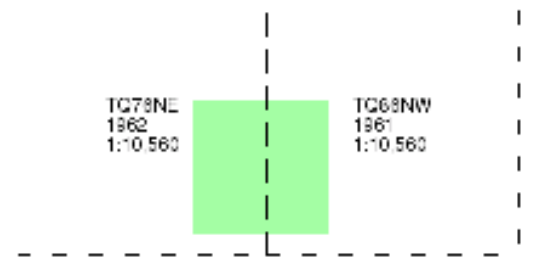




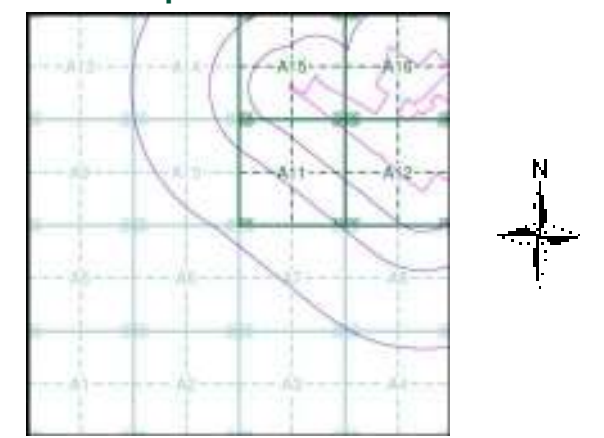
**Ordnance Survey Plan**  
**Published 1961 - 1962**  
**Source map scale - 1:10,000**

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: 178768733\_1\_1  
 Customer Ref: 44538-3501  
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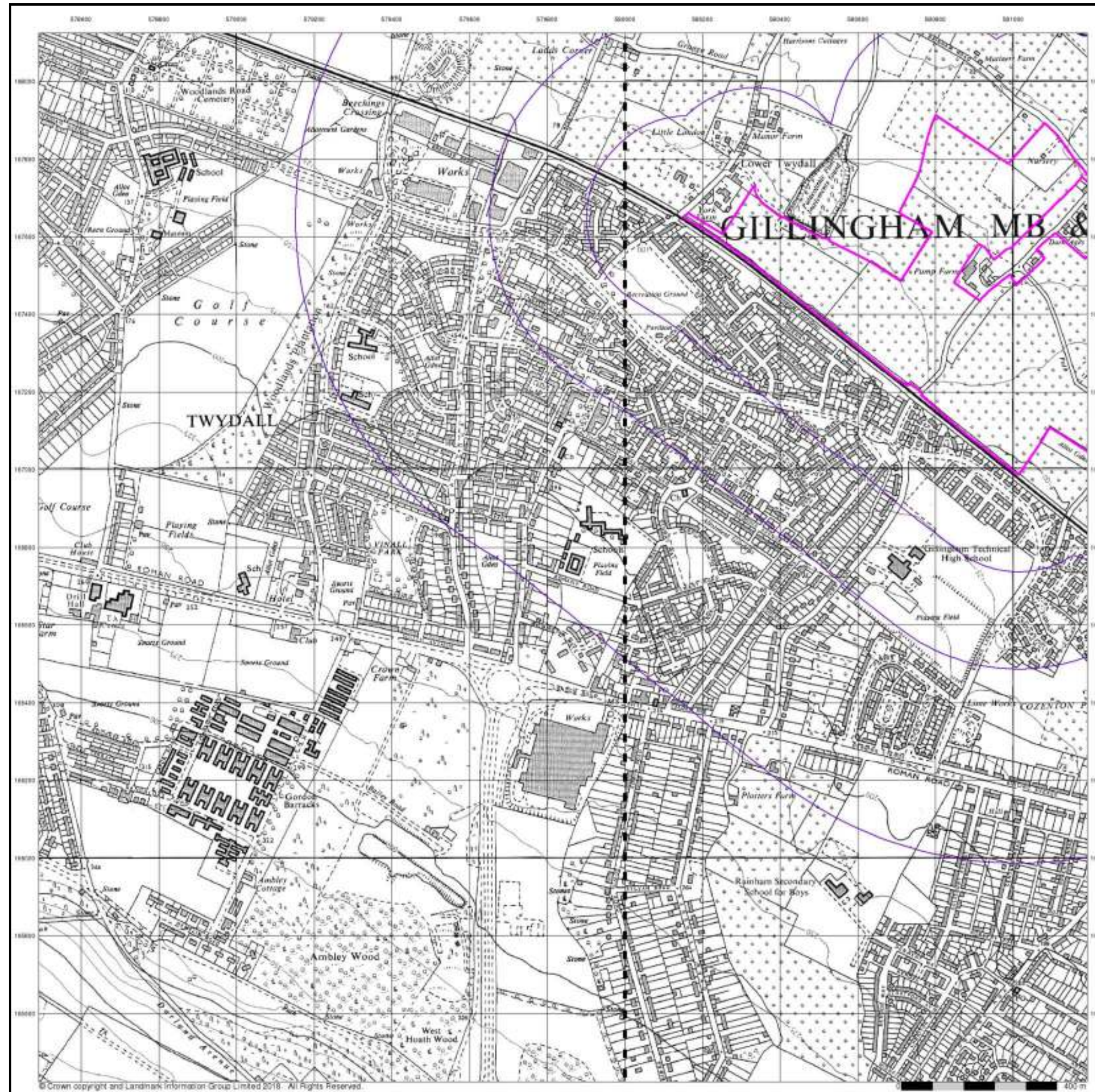
**Site Details**

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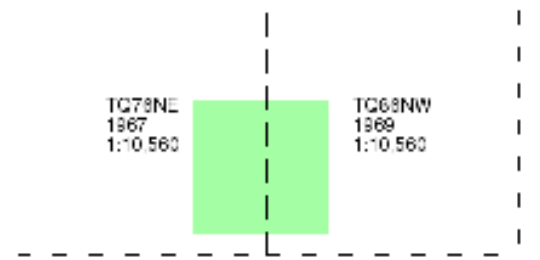




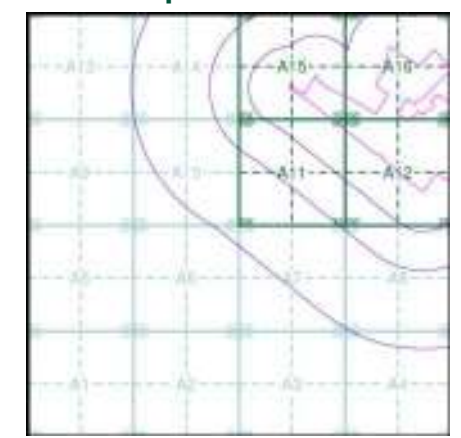
**Ordnance Survey Plan**  
**Published 1967 - 1969**  
**Source map scale - 1:10,000**

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**

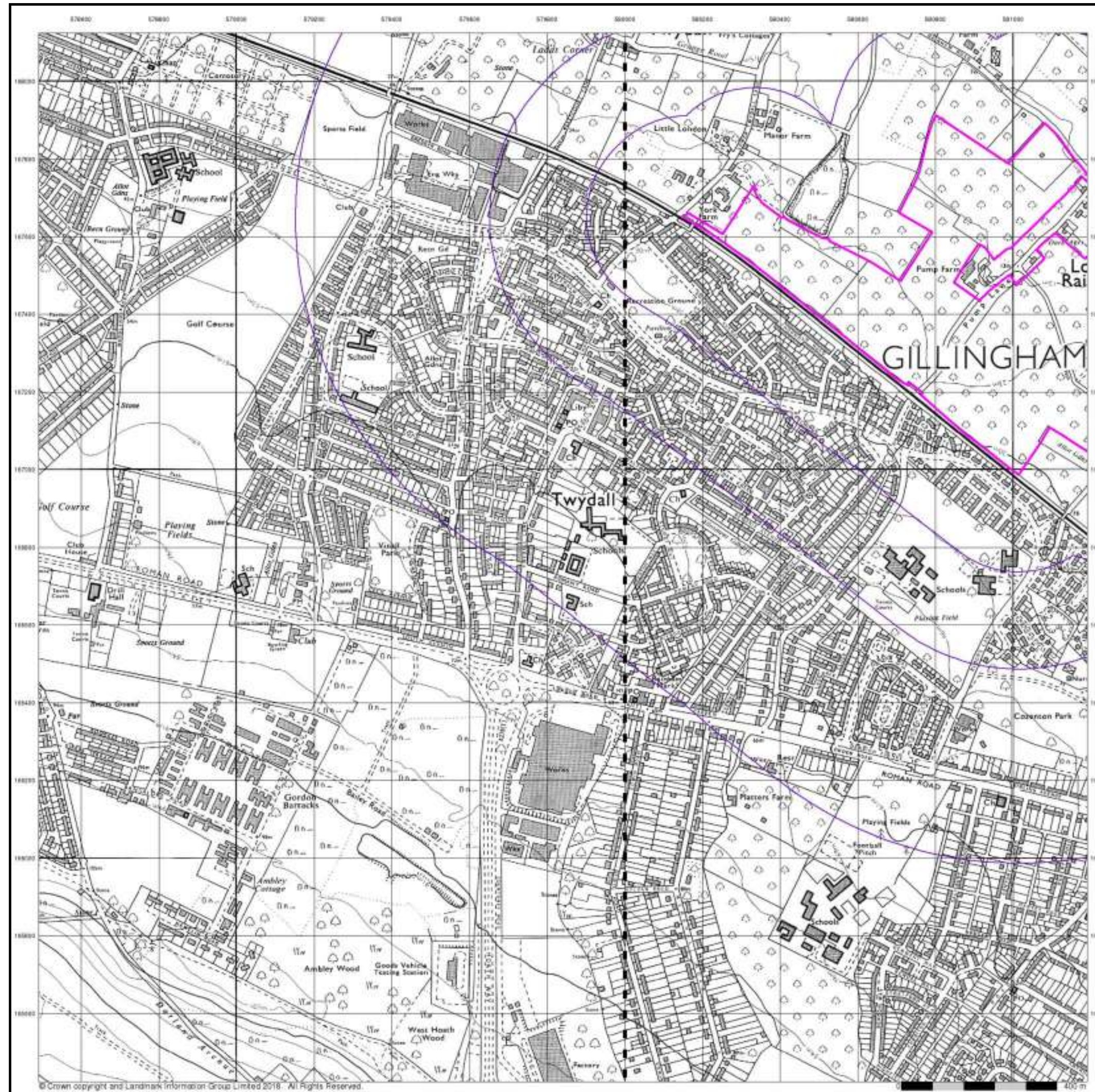
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 Search Buffer (m): 1000

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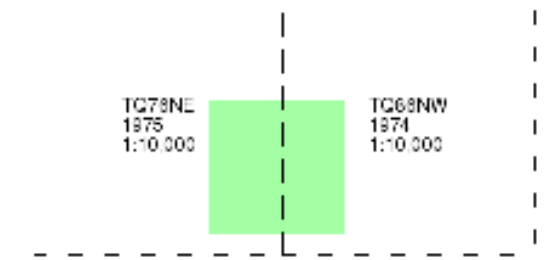
**Ordnance Survey Plan**

**Published 1974 - 1975**

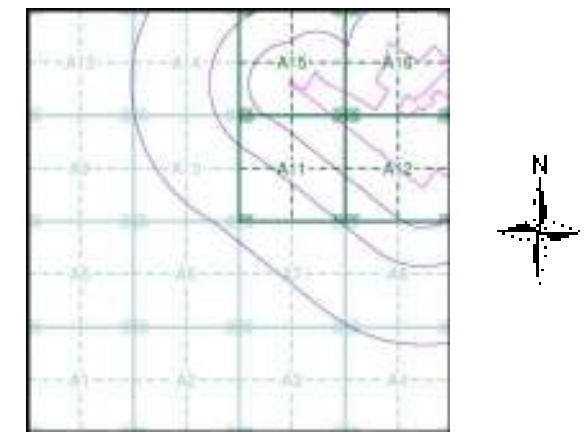
**Source map scale - 1:10,000**

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: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
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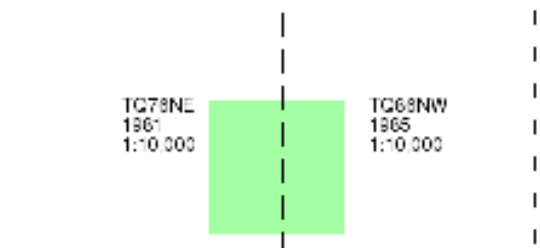
### Ordnance Survey Plan

Published 1981 - 1985

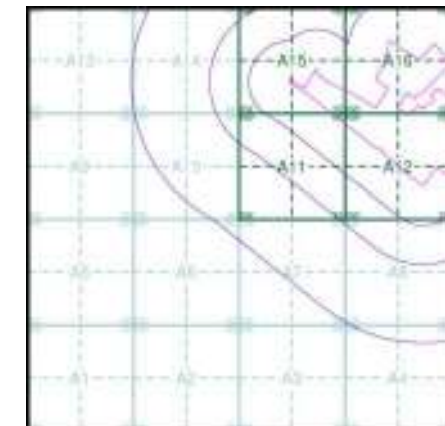
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. 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: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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### Ordnance Survey Plan

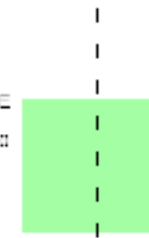
Published 1991

Source map scale - 1:10,000

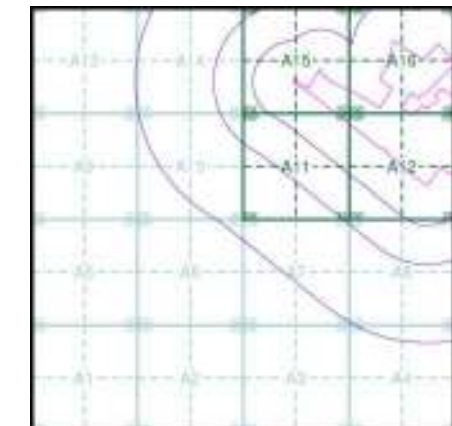
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some 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)

TQ78NE  
1991  
1:10,000



### Historical Map - Slice A



### Order Details

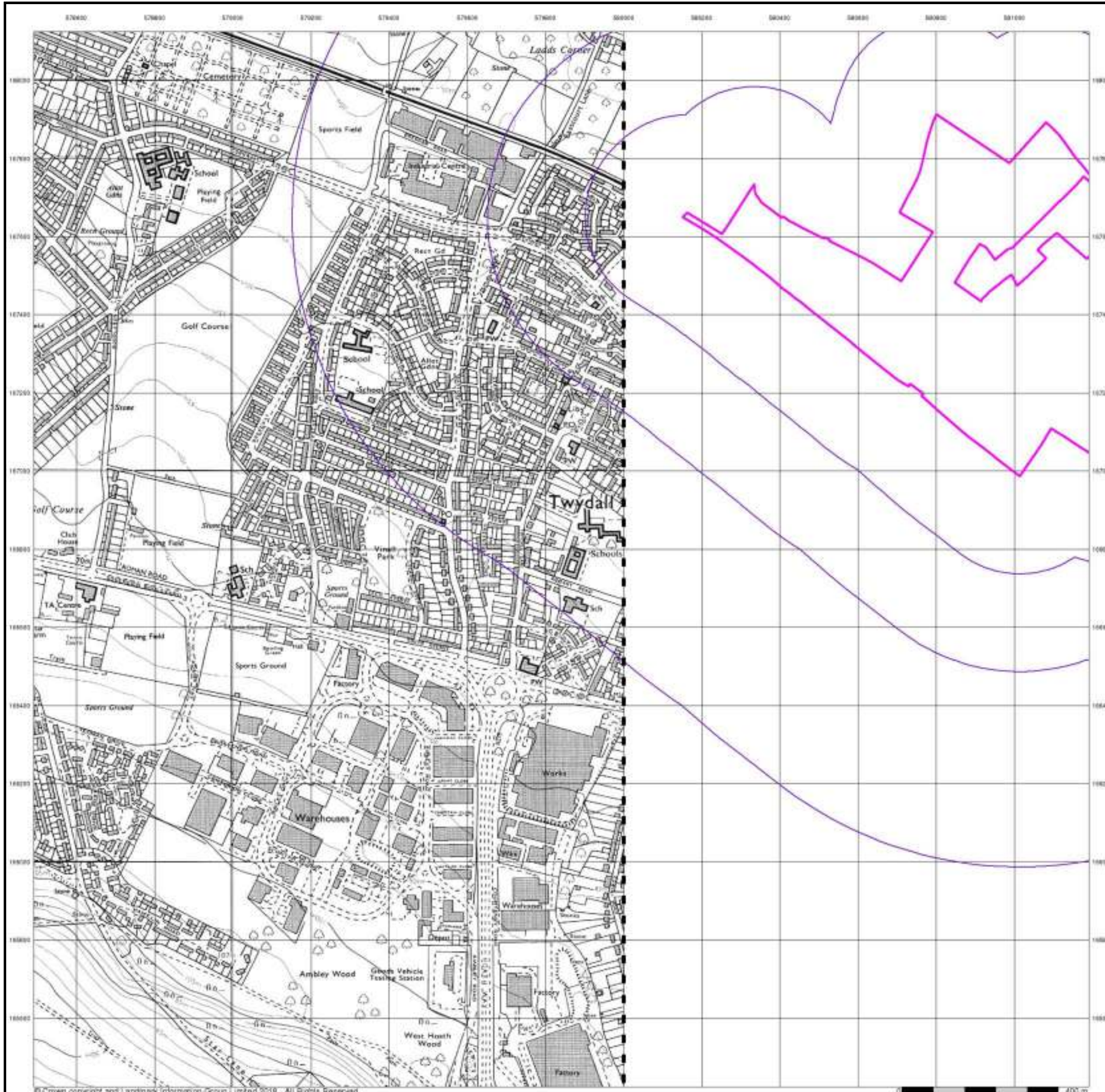
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 1000

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### 10k Raster Mapping

Published 1999

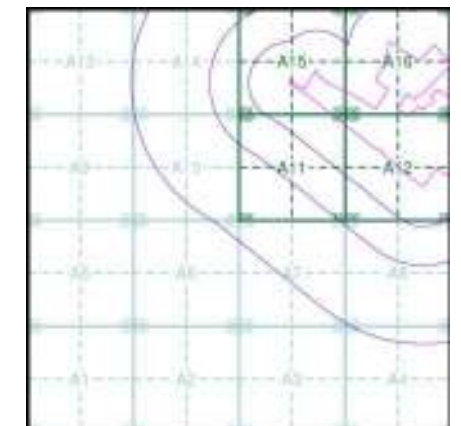
Source map scale - 1:10,000

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)

TC78NE 1999 1:10,000		TC68NW 1999 1:10,000
----------------------------	--	----------------------------

### Historical Map - Slice A



### Order Details

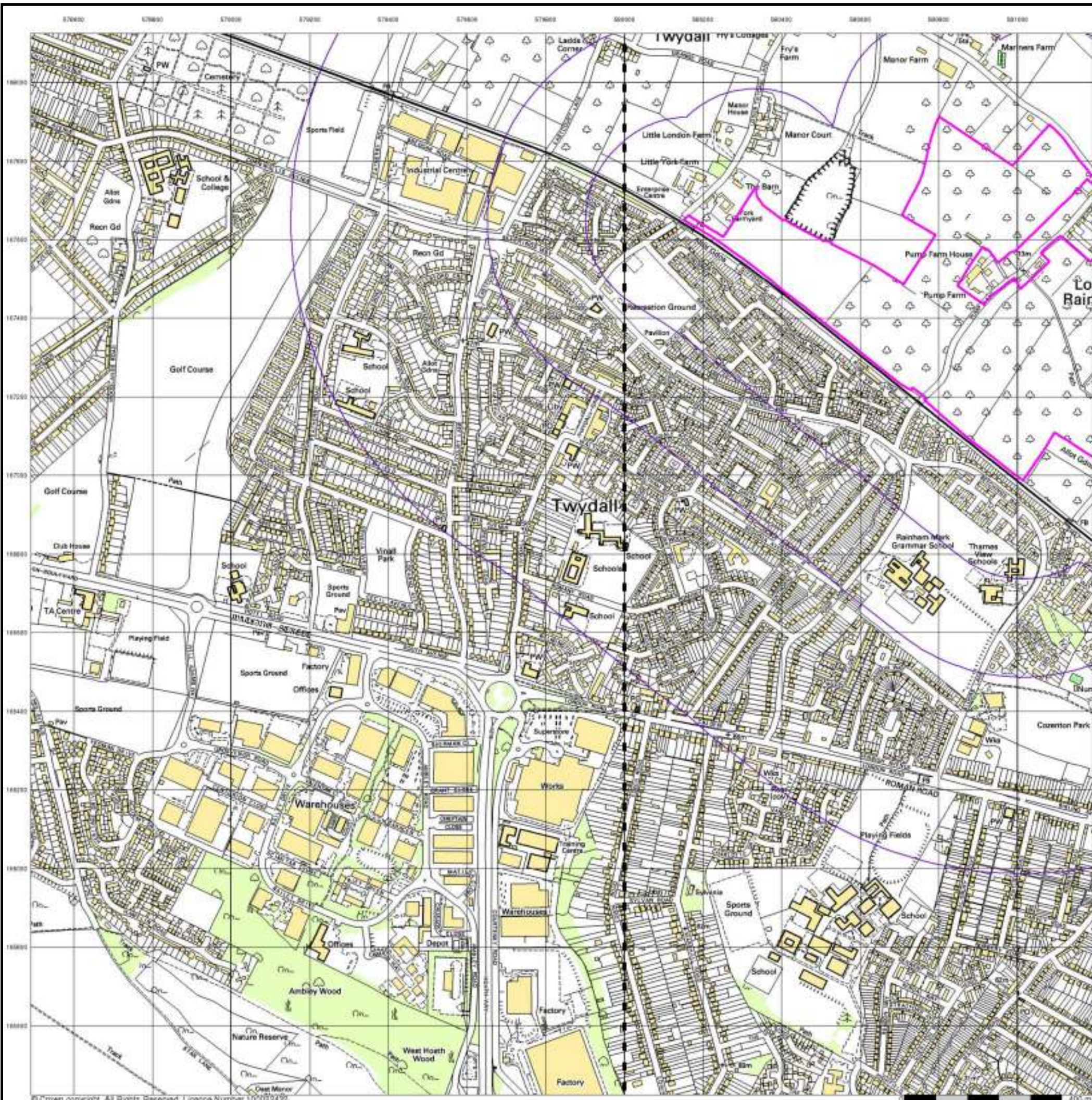
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

### Site Details

1, Russett Farm, Rainham, GILLINGHAM, ME8 7AT



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Street View

Published 2018

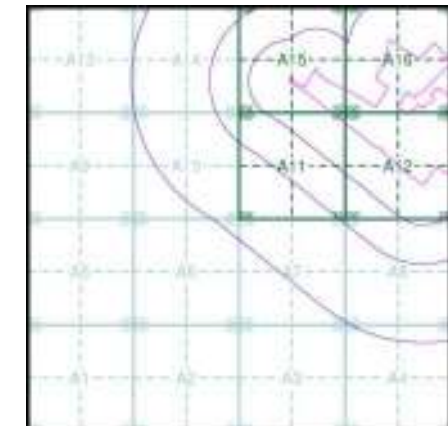
Source map scale - 1:10,000

Street View is a street-level map for the whole of Great Britain produced by the Ordnance Survey. These maps are provided at a nominal scale of 1:10,000

Map Name(s) and Date(s)



Street View Map - Slice A



**Order Details**

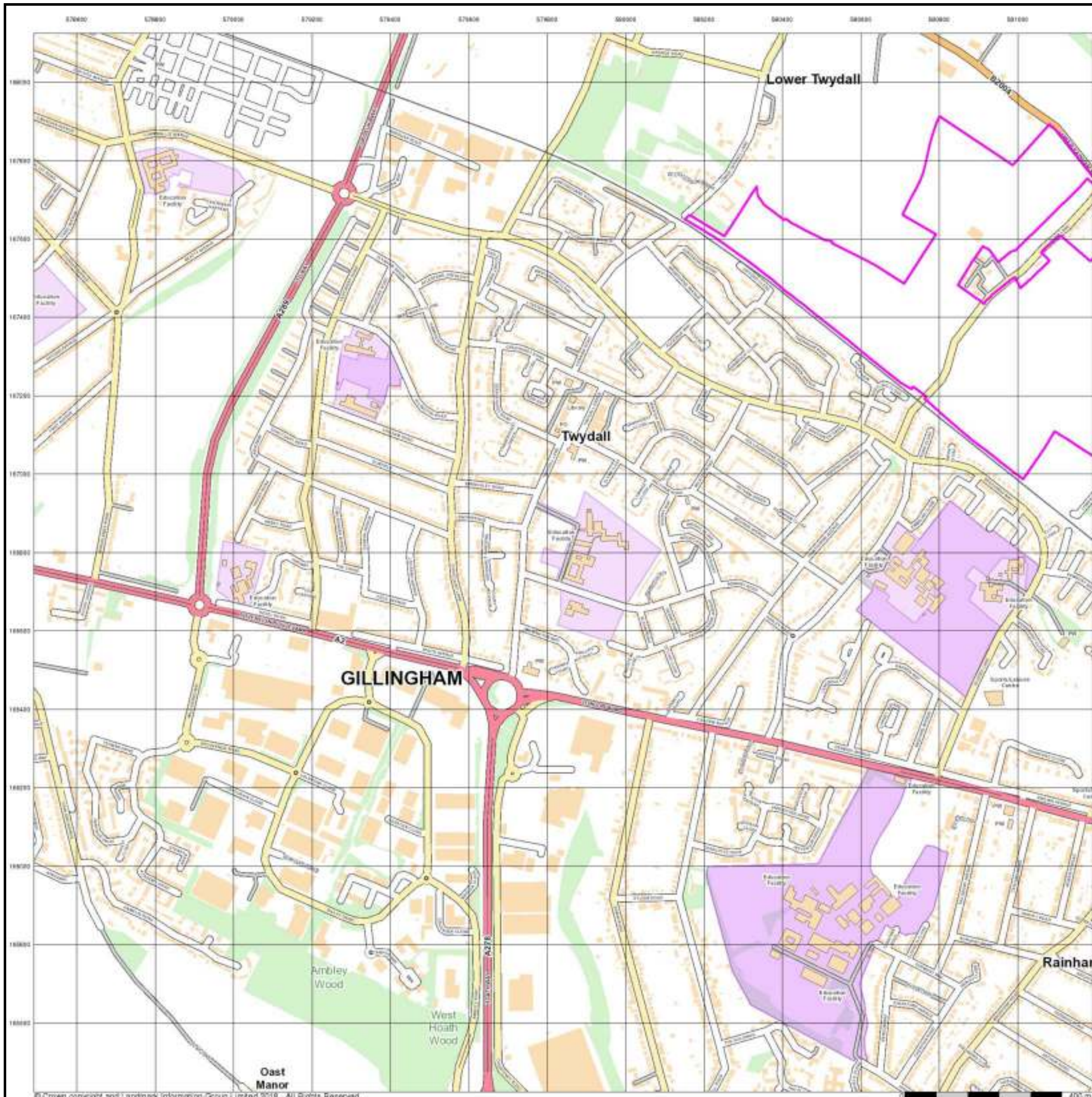
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 1000

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# Historical Mapping Legends

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

	County		Grave Pt		Grove Pt
	Chy Pt		Sludge		Ledge Leap
	Slating Masonry		Flint Work		
	Marsh		Heeds		Oolans
	Rough Pasture		Luzes		Wood
	Mixed Wood		Bushland		Orchard
	Ridge Pt		Roo		Sloping Slates
	Twy		Waterfall		Bank
	Twp Station		Elevation of Twp Station		
	Bench Mark		Surface Road		
	Arch Bridge over water		Antiquities (Site of)		
	Culling		Fulcrum		
	Subway crossing Road		Level Crossing		Road crossing Railway
	Subway crossing River or Canal		Rail over single main		Road over River or Canal
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Borough Boundary (Scotland)				

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

	Inactive Quarry		Active Quarry
	Rise		Furrows
	Cliff		Slopes Top
	Roofed Building		Glassed front Building
	Rooftop		Archway
	Non-Coniferous Tree (not surveyed)		Coniferous Tree (surveyed)
	Non-Coniferous Trees (not surveyed)		Coniferous Trees (not surveyed)
	Coniferous Tree		Scrub
	Coppice Oak		Rocks
	Rough Grassland		Heath
	Direction of water flow		Bench Mark
	Cave Entrance		Triangular Station
	Electricity Transmission Line		Electricity Pylon
	County Boundary (Geographical)		
	County & Civil Parish Boundary		
	Civil Parish Boundary		
	Administrative County & Civil Parish Boundary		
	London Borough Boundary		
	Symbol marking point where boundary meaning changes		

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

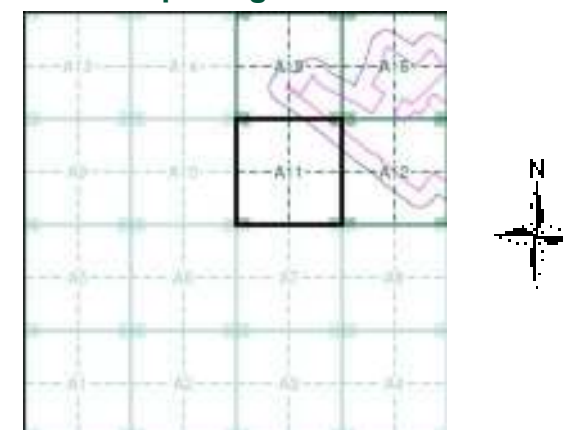
	Cliff		Slopes Top
	Bank		Rocks (surveyed)
	Boulders		Boulders (surveyed)
	Discoloured Boulder		Screen
	Non-Coniferous Tree (surveyed)		Coniferous Tree (surveyed)
	Non-Coniferous trees (not surveyed)		Coniferous trees (not surveyed)
	Orchard tree		Scrub
	Coppice Oak		Rocks
	Rough Grassland		Heath
	Direction of water flow		Triangular Station
	Electricity Transmission Line		Electricity Pylon
	Bench Mark		Buildings with Building Seed
	Roofed Building		Glassed front Building
	Civil parish/community boundary		
	District boundary		
	County boundary		
	Boundary poststone		
	Boundary meaning symbol (not shown - always appear in opposite pairs of grids of lines)		



## Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Kent	1:2,500	1894 - 1895	2
Kent	1:2,500	1895	3
Kent	1:2,500	1896	4
Kent	1:2,500	1909	5
Kent	1:2,500	1932 - 1938	6
Ordnance Survey Plan	1:2,500	1955 - 1967	7
Ordnance Survey Plan	1:1,250	1955	8
Additional SIMs	1:2,500	1955	9
Ordnance Survey Plan	1:1,250	1960 - 1969	10
Ordnance Survey Plan	1:1,250	1966 - 1975	11
Ordnance Survey Plan	1:2,500	1970	12
Additional SIMs	1:1,250	1981 - 1990	13
Large-Scale National Grid Data	1:1,250	1994	14

## Historical Map - Segment A11



## Order Details

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

## Site Details

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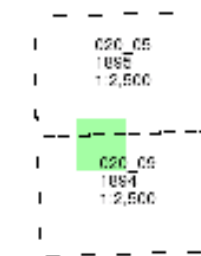
### Kent

Published 1894 - 1895

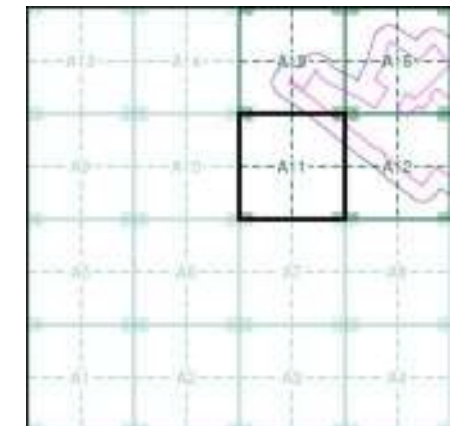
Source map scale - 1:2,500

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



### Order Details

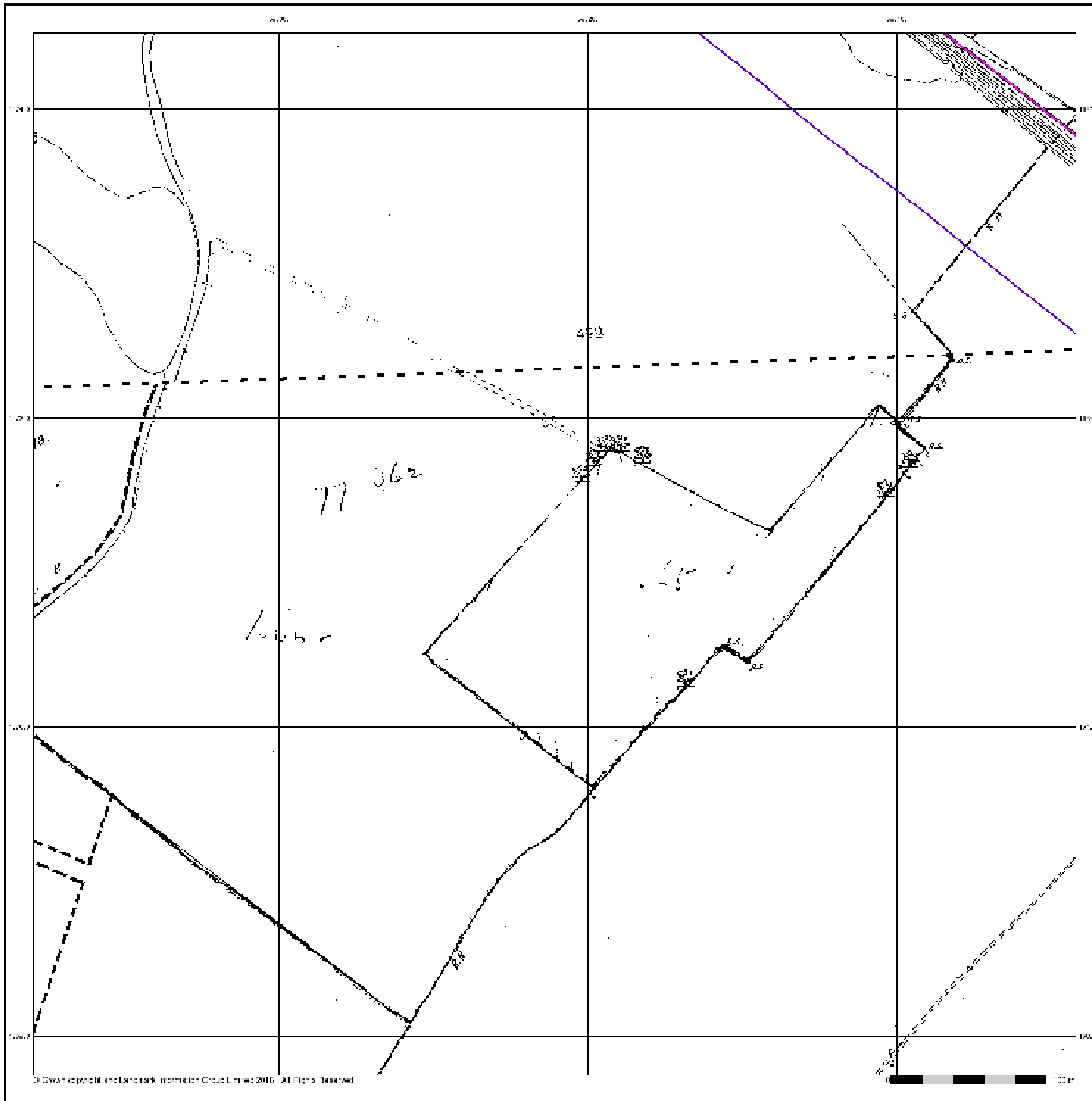
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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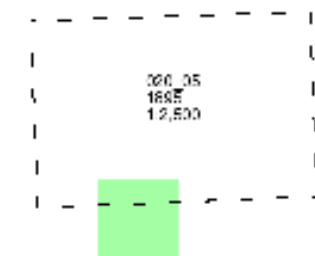
### Kent

Published 1895

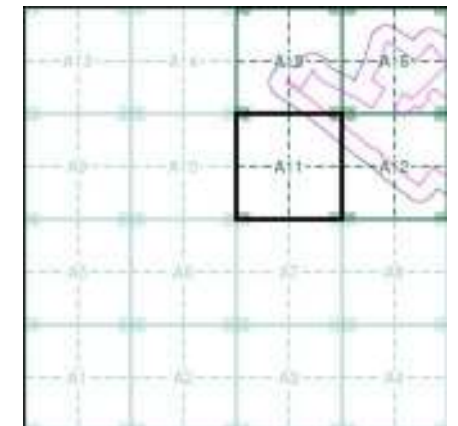
Source map scale - 1:2,500

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



### Order Details

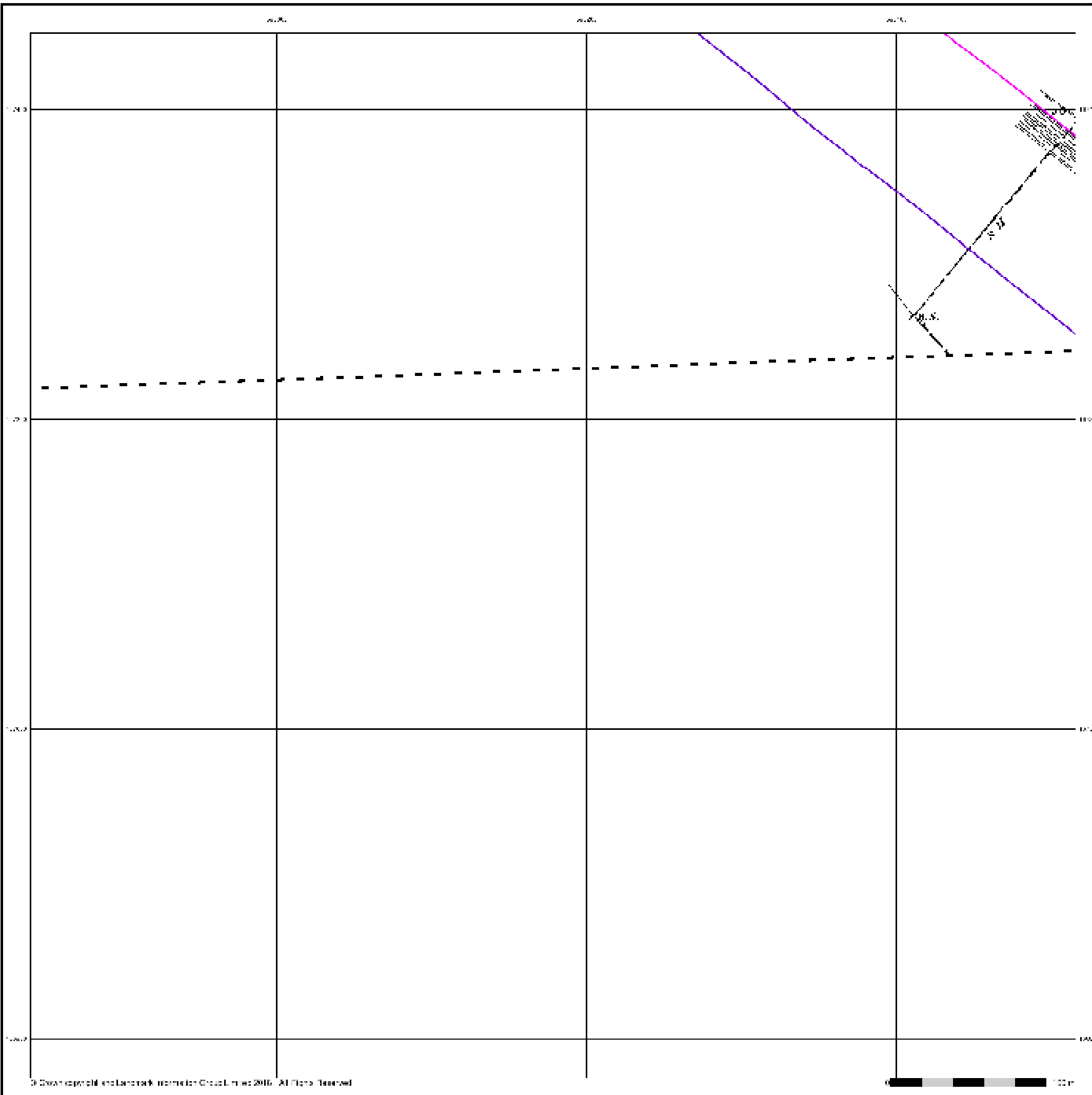
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
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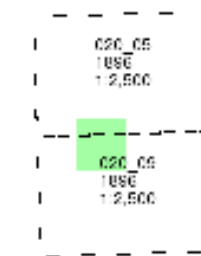
Kent

Published 1896

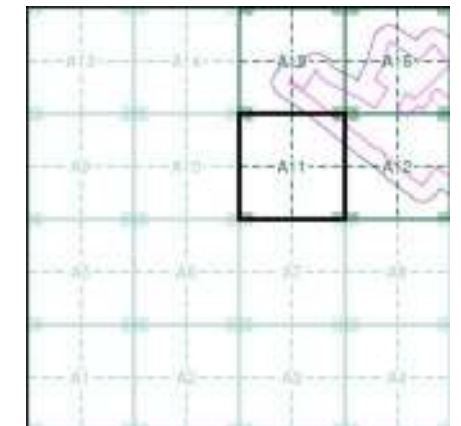
Source map scale - 1:2,500

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



Order Details

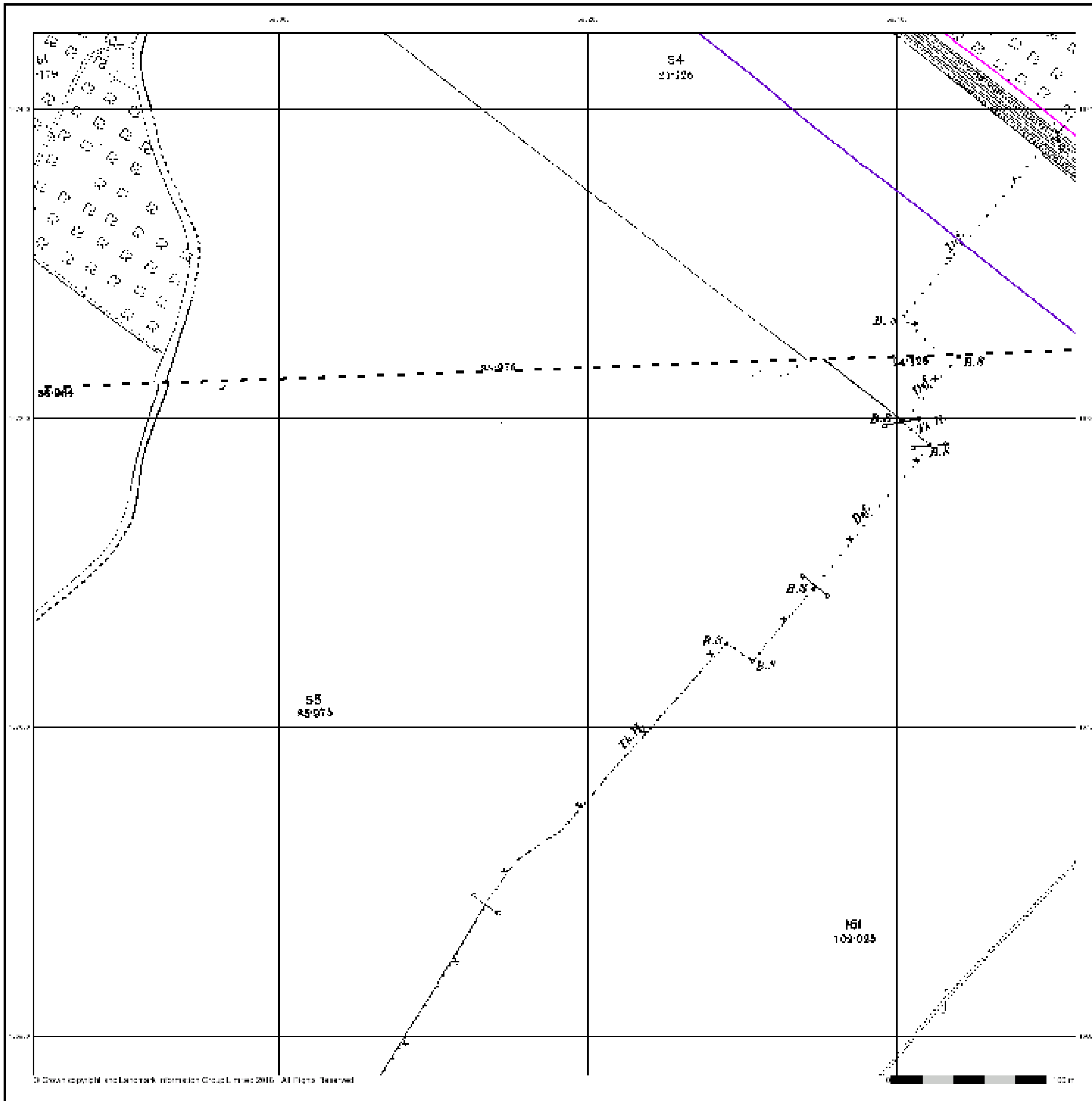
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National Grid Reference: 580320, 167230  
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Site Area (Ha): 51.8  
Search Buffer (m): 100

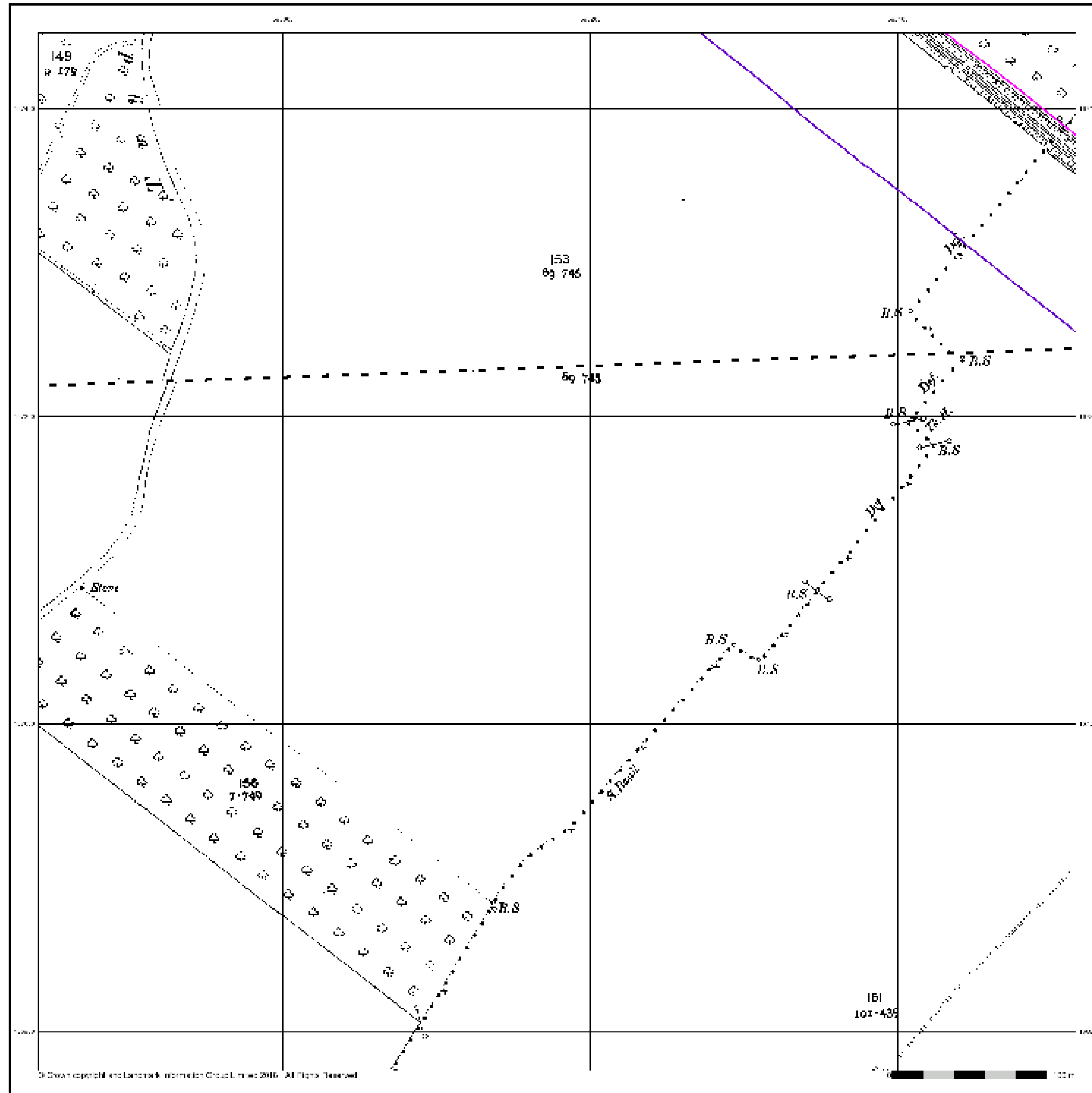
Site Details

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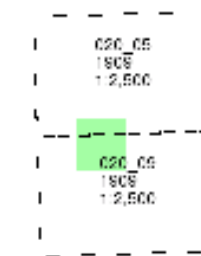
**Kent**

**Published 1909**

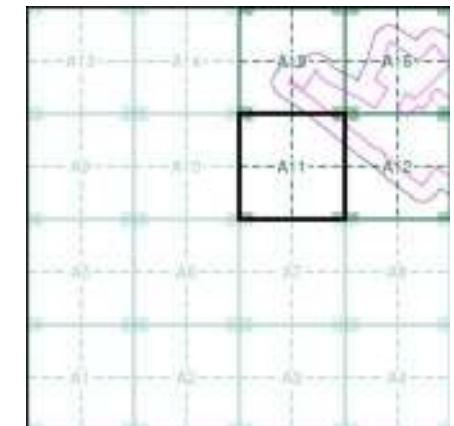
**Source map scale - 1:2,500**

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**



**Order Details**

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
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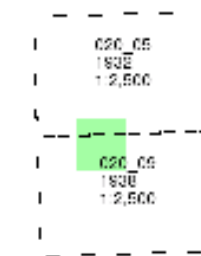
Kent

Published 1932 - 1938

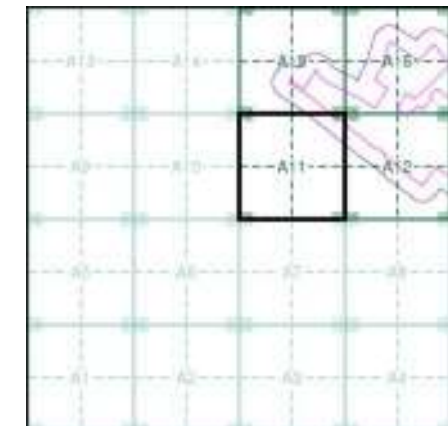
Source map scale - 1:2,500

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



Order Details

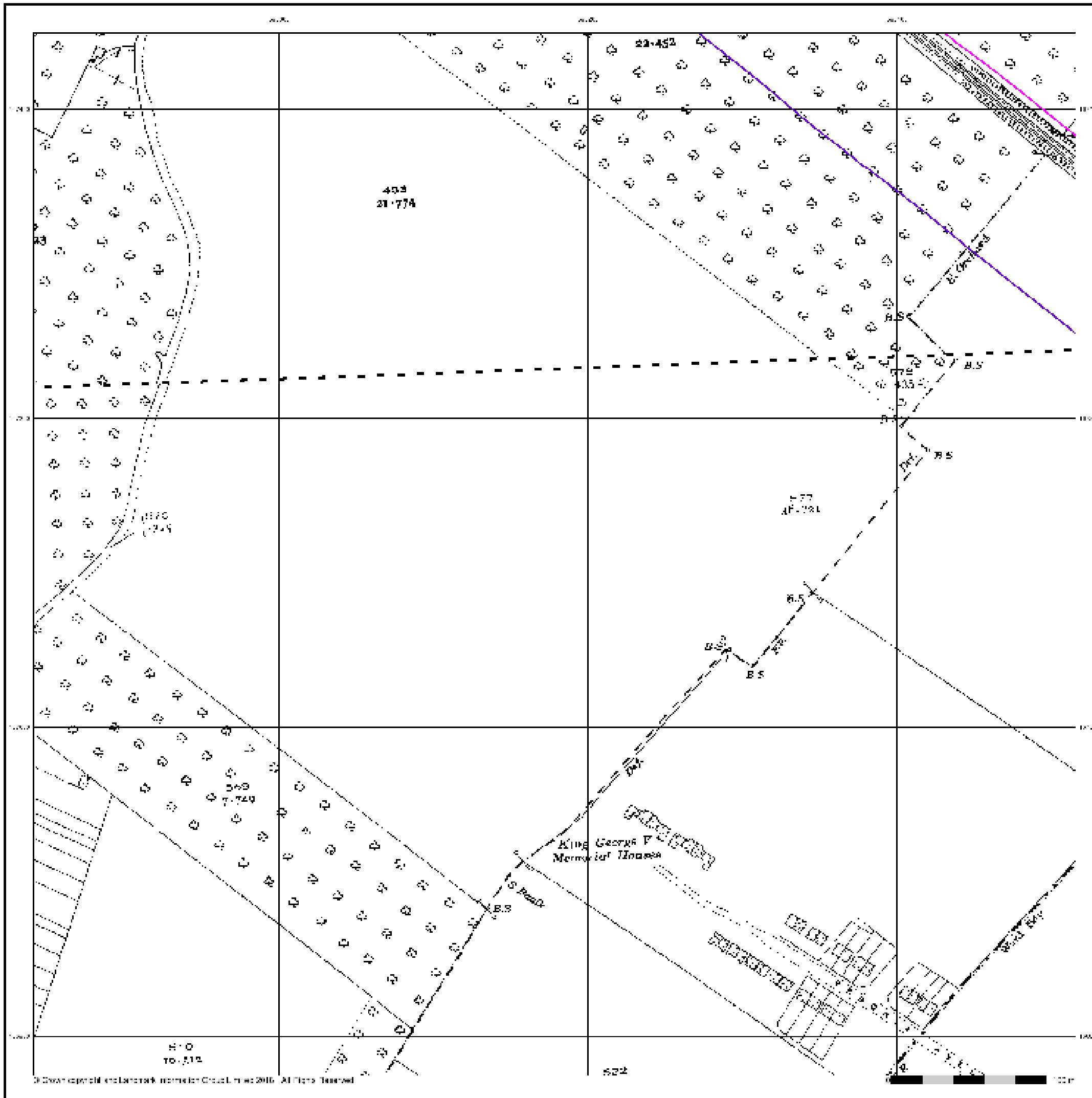
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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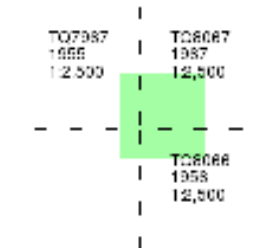
### Ordnance Survey Plan

Published 1955 - 1967

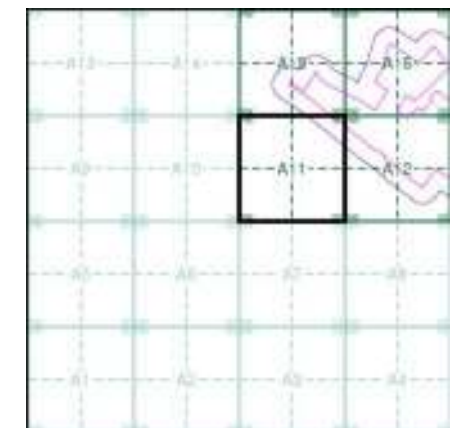
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### Map Name(s) and Date(s)



### Historical Map - Segment A11



### Order Details

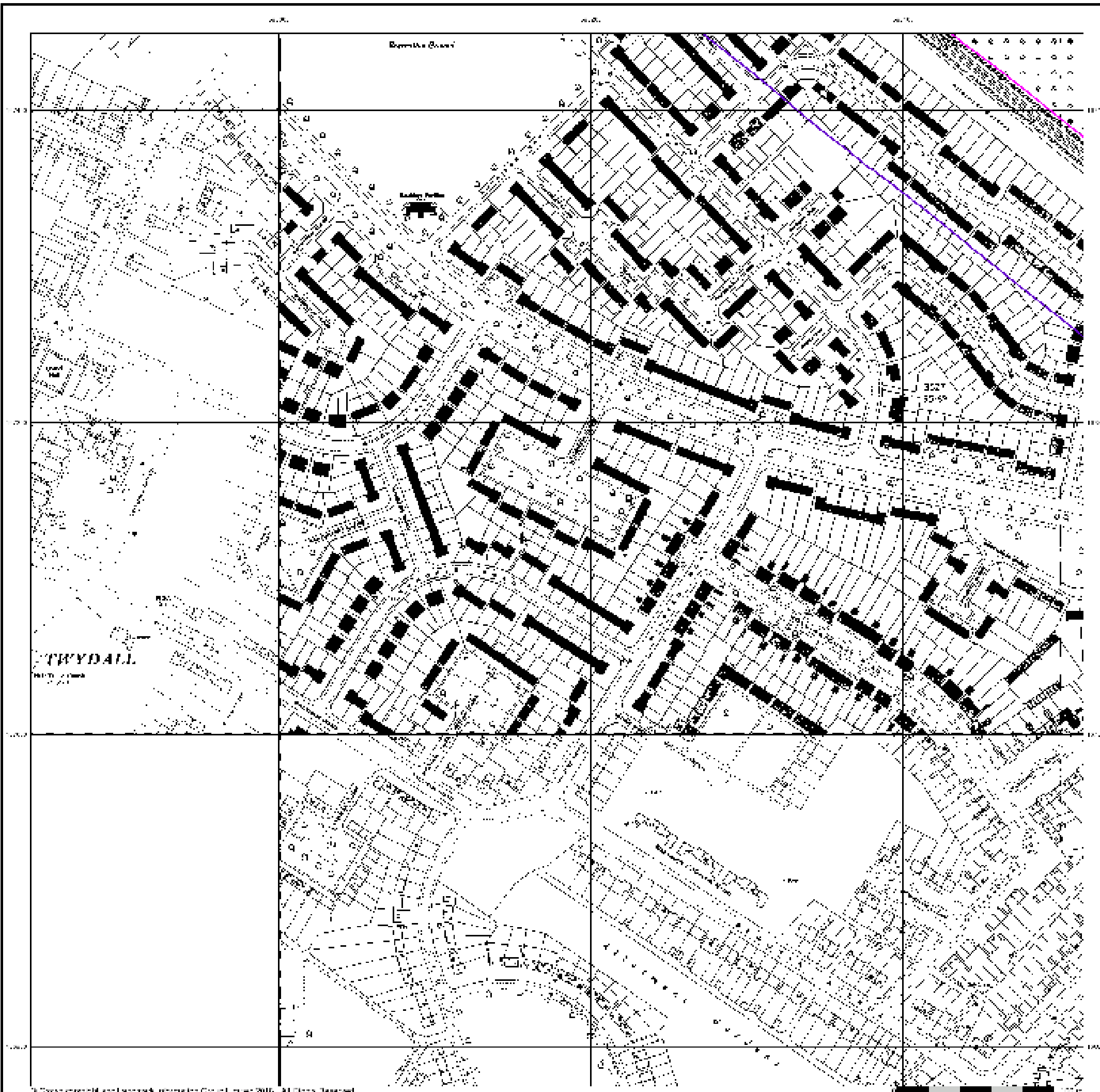
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

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### Ordnance Survey Plan

Published 1955

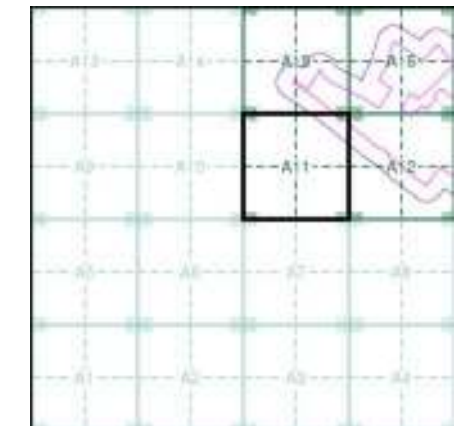
Source map scale - 1:1,250

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)

TQ79879F	1955	1:1,250
TQ7988NF	1955	1:1,250

### Historical Map - Segment A11



### Order Details

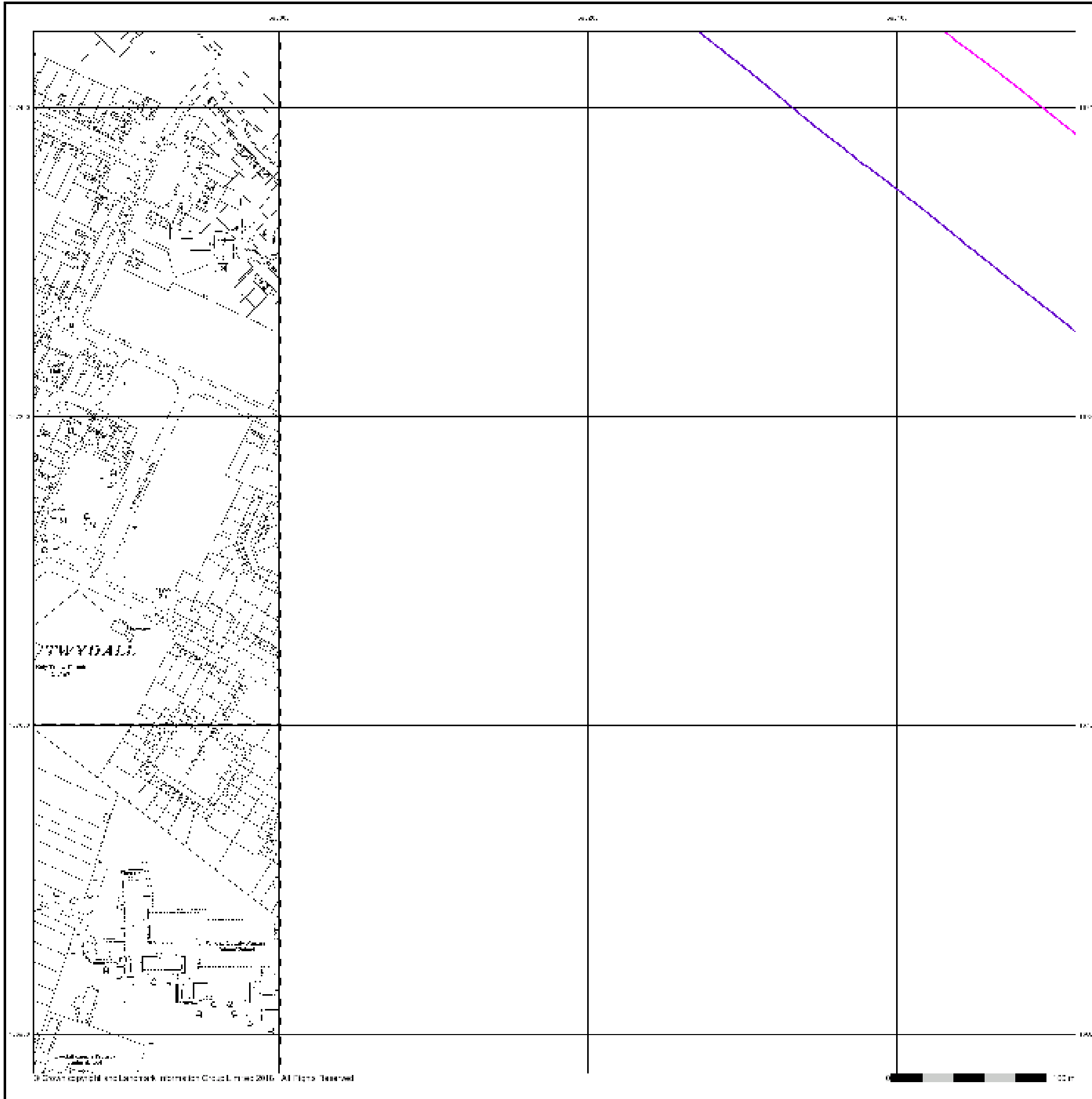
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 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

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### Additional SIMs

Published 1955

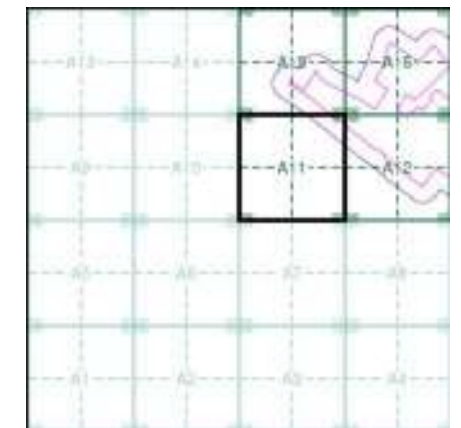
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

### Map Name(s) and Date(s)



### Historical Map - Segment A11



### Order Details

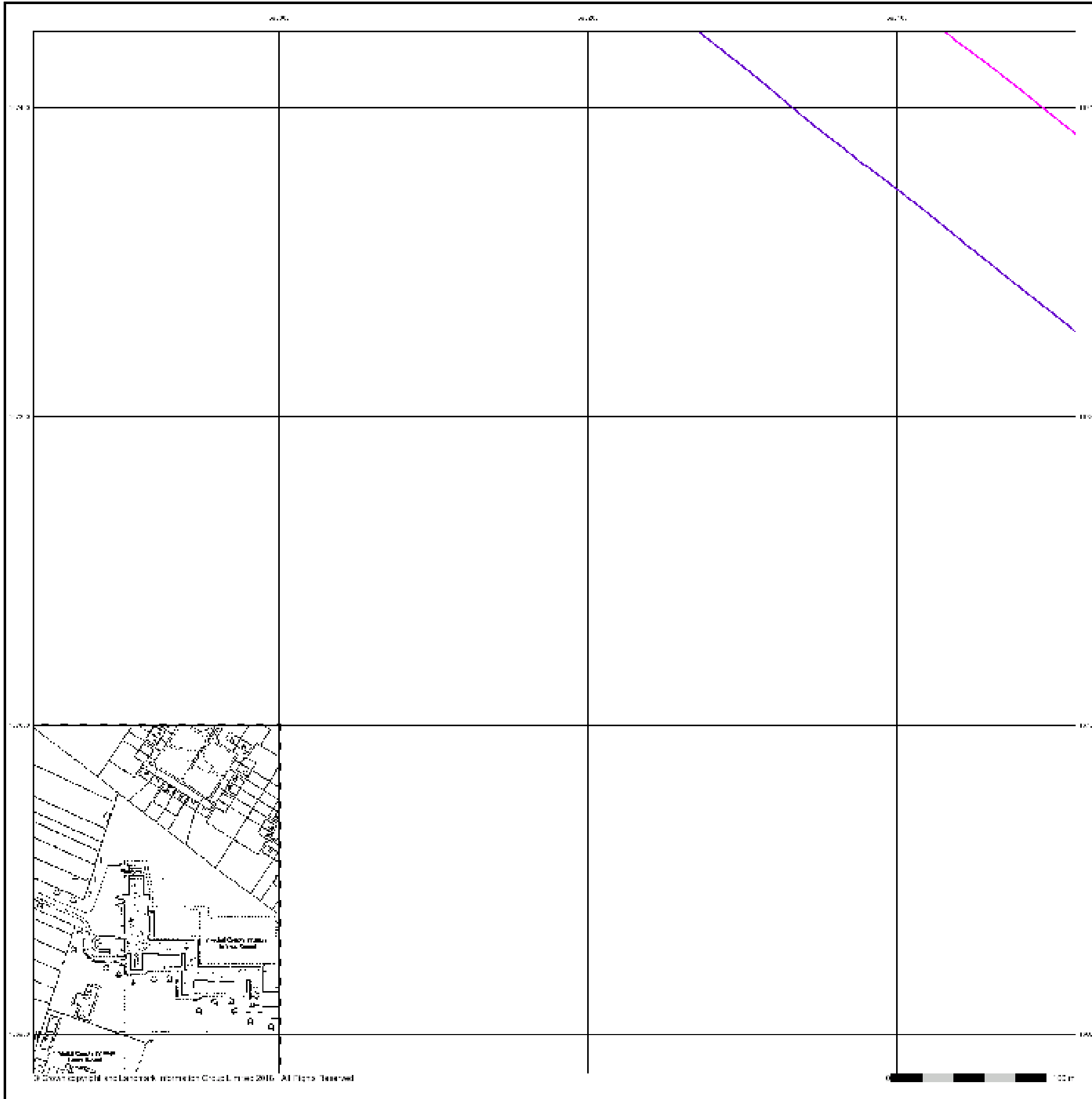
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Customer Ref:	44538-3501
National Grid Reference:	580320, 167230
Slice:	A
Site Area (Ha):	51.8
Search Buffer (m):	100

### Site Details

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### Ordnance Survey Plan

Published 1960 - 1969

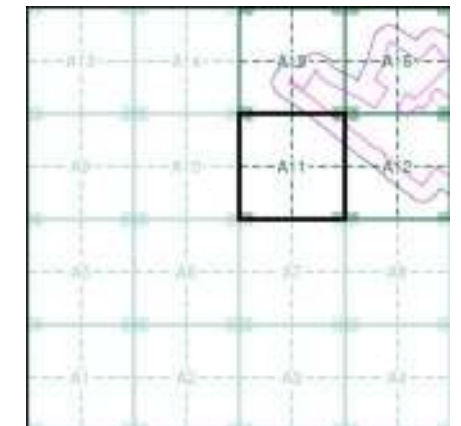
Source map scale - 1:1,250

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)

TO76679L 1953 1:1,250	TO66679W 1953 1:1,250	
TO66679E 1959 1:1,250	TO66679W 1960 1:1,250	TO66679F 1959 1:1,250

### Historical Map - Segment A11



### Order Details

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
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### Site Details

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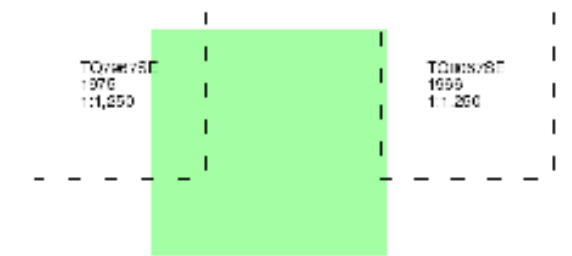
### Ordnance Survey Plan

Published 1966 - 1975

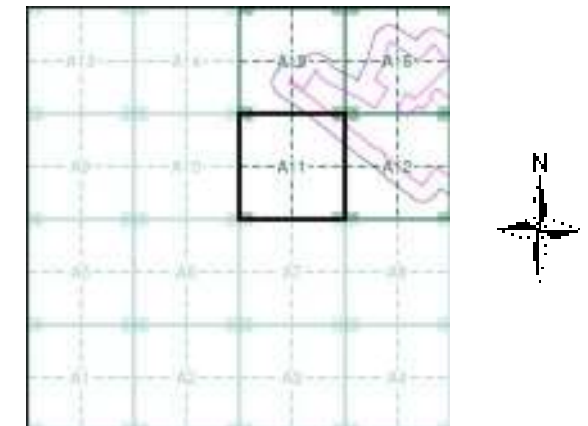
Source map scale - 1:1,250

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



### Order Details

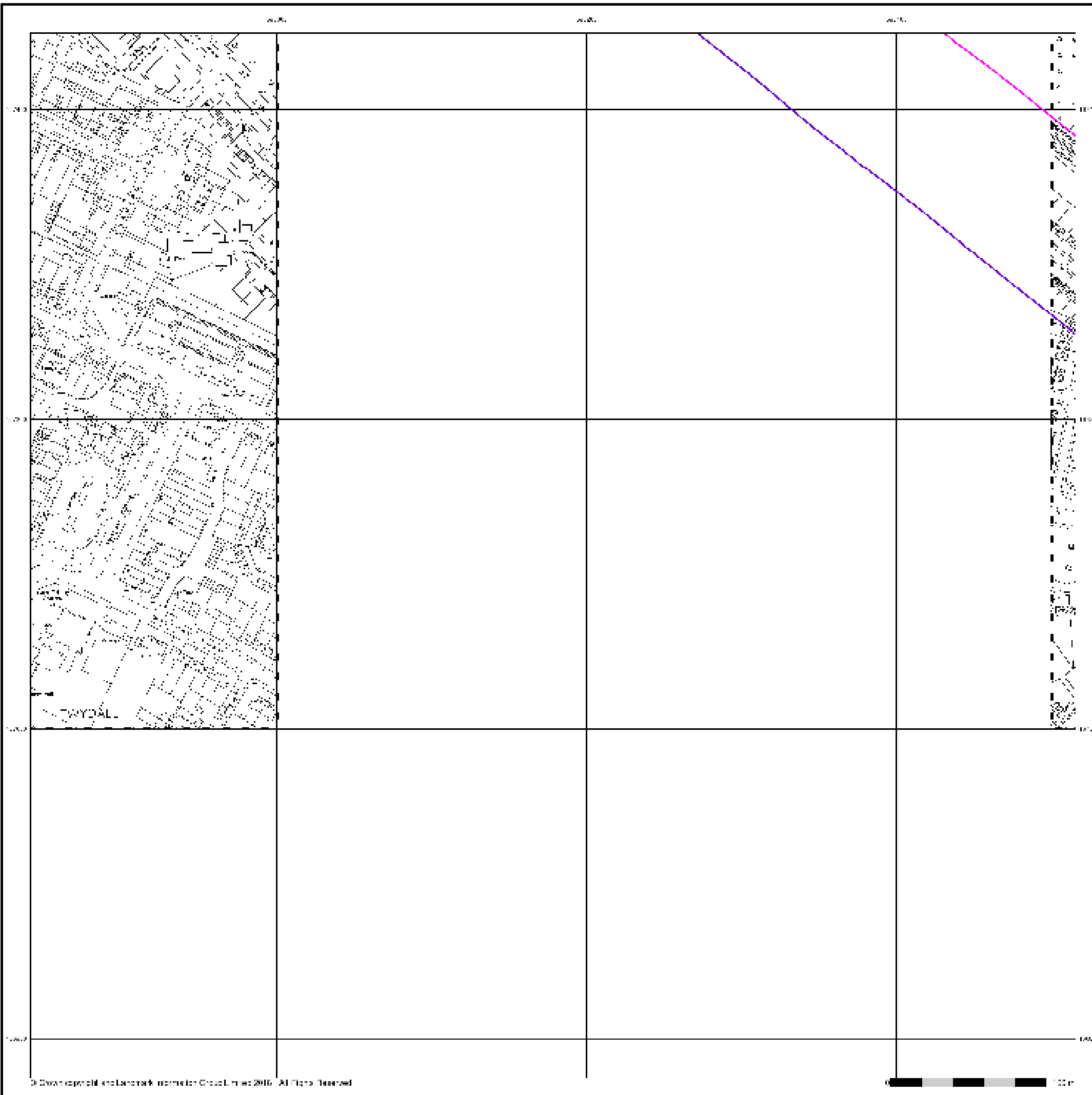
Order Number:	178768733_1_1
Customer Ref:	44538-3501
National Grid Reference:	580320, 167230
Slice:	A
Site Area (Ha):	51.8
Search Buffer (m):	100

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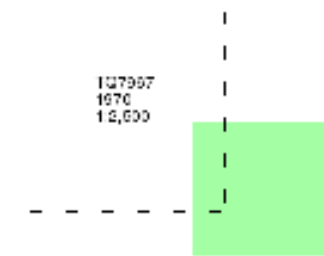
### Ordnance Survey Plan

Published 1970

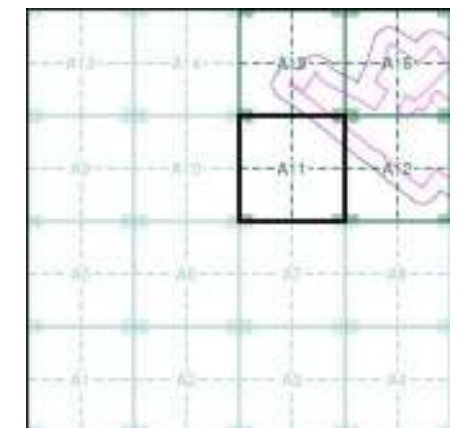
Source map scale - 1:2,500

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



### Order Details

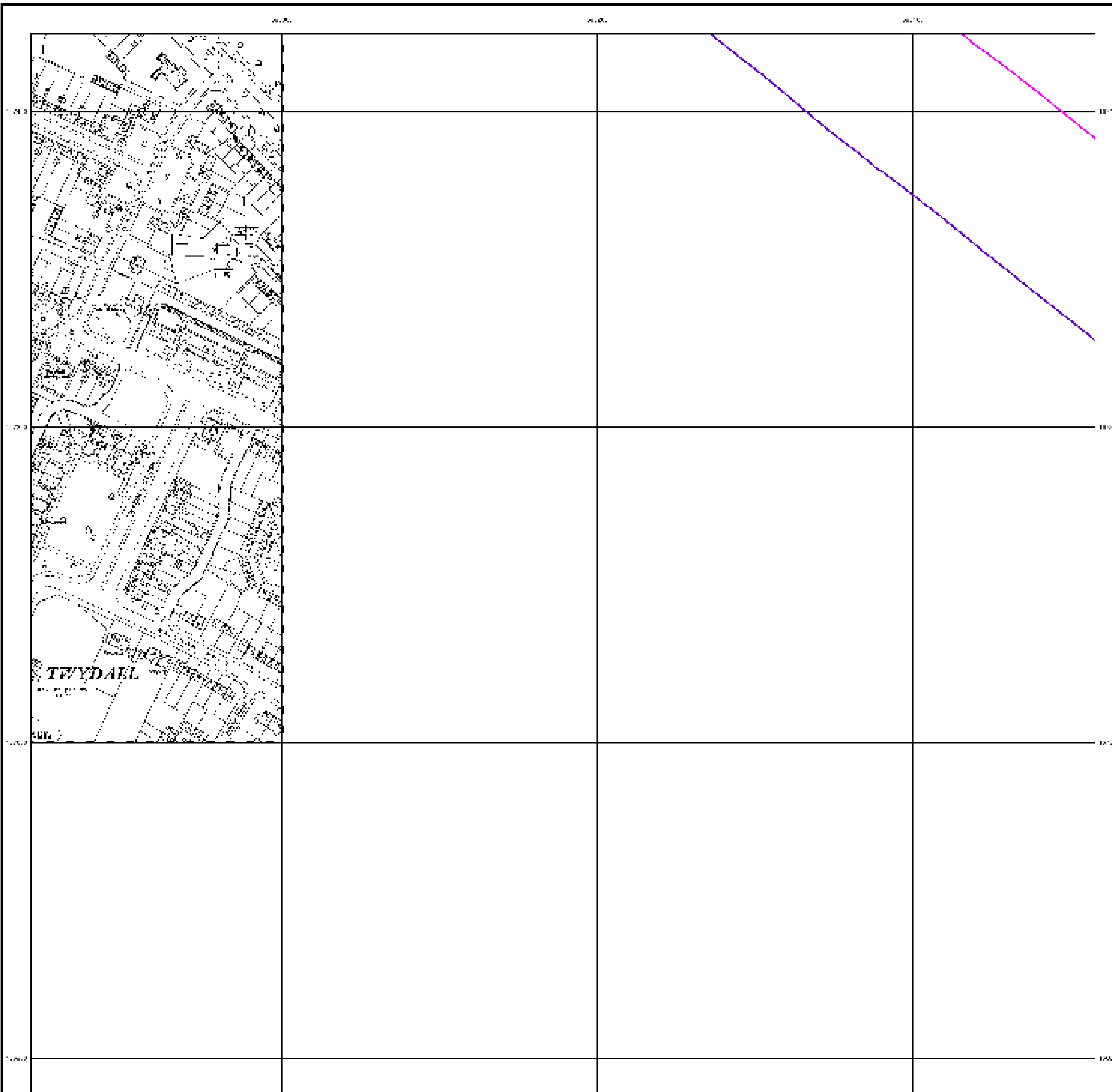
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National Grid Reference:	580320, 167230
Slice:	A
Site Area (Ha):	51.8
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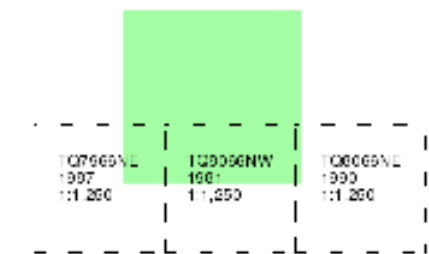
### Additional SIMs

Published 1981 - 1990

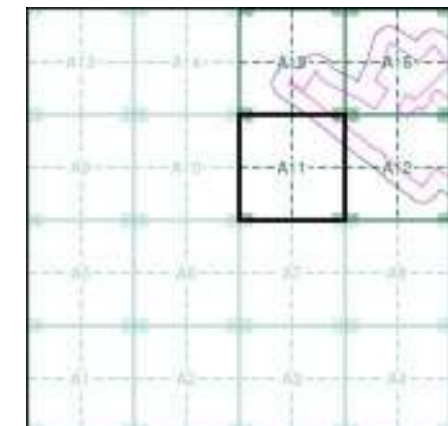
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

### Map Name(s) and Date(s)



### Historical Map - Segment A11



### Order Details

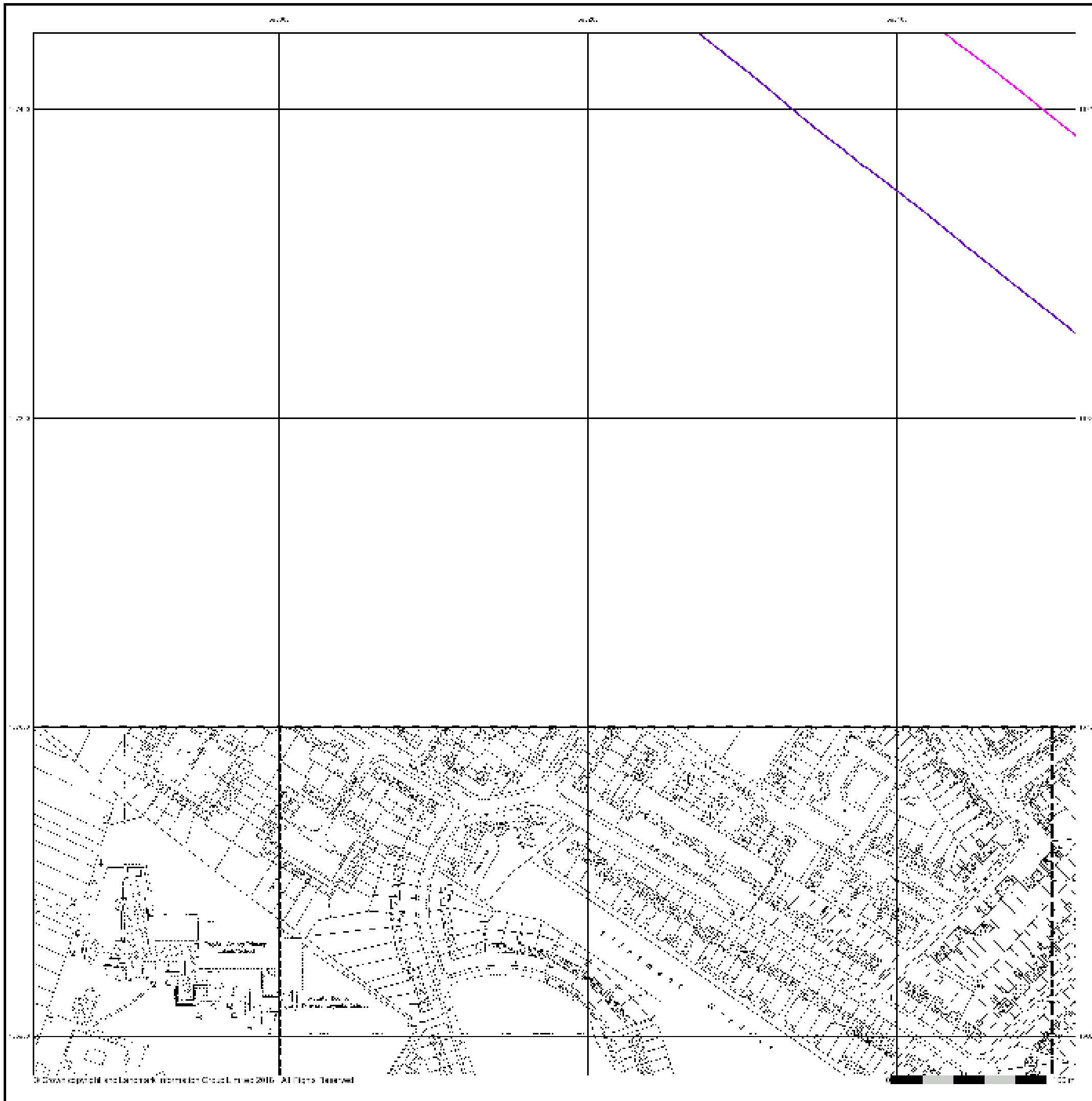
Order Number: 178768733\_1\_1  
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 National Grid Reference: 580320, 167230  
 Slice: A  
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## Large-Scale National Grid Data

Published 1994

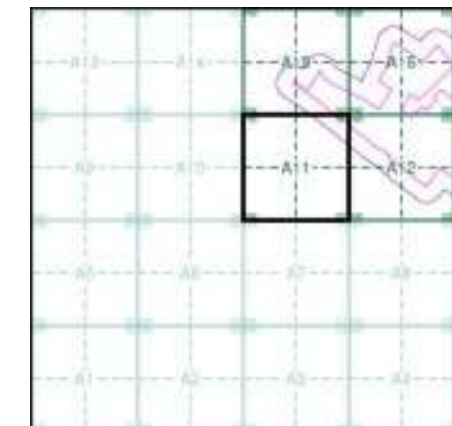
Source map scale - 1:1,250

'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)

TQ7667BL 1994 1:1 250	TQ6667SW 1994 1:1 250	TQ6667BL 1994 1:1 250
TQ6667NE 1994 1:1 250	TQ6667NW 1994 1:1 250	TQ6667SE 1994 1:1 250

### Historical Map - Segment A11



### Order Details

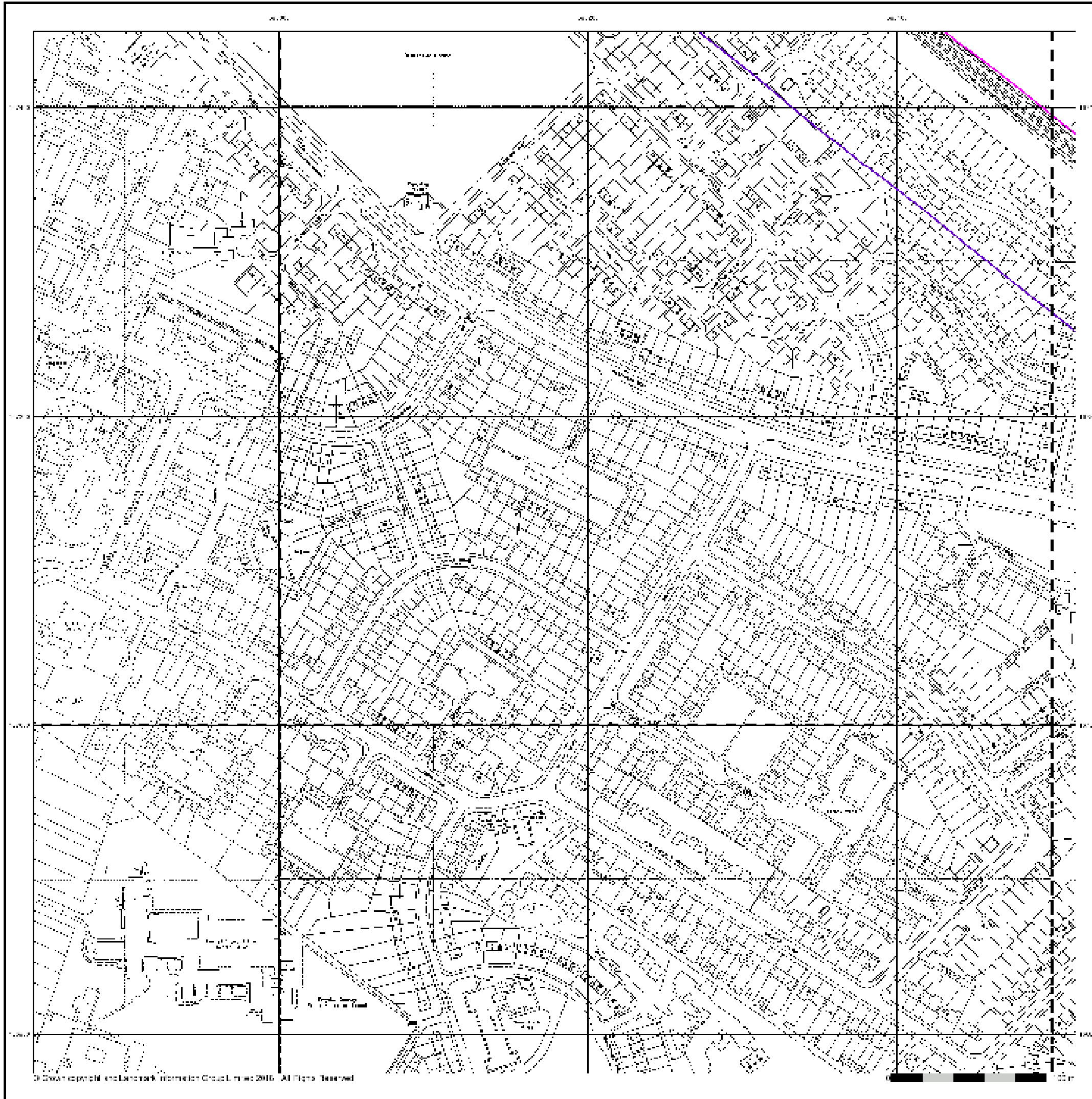
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

### Site Details

1, Russett Farm, Rainham, GILLINGHAM, ME8 7AT



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# Historical Mapping Legends

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

This legend defines symbols for various geographical and man-made features. It includes symbols for County, Grave, Lane Pt, Clay Pt, Sludge, Sense Leap, Slating Masonry, Flat Rock, Marsh, Heels, Oolite, Rough Pasture, Linn, Wood, Mixed Wood, Freshwater, Orchard, Hedge, Fm, Fm, Sloping Slates, Army, Waterfall, and Brook. It also includes symbols for Top Station, Elevation at Top Station, Bench Mark, Surface Road, Area between two of water, Antiquities (Site of), Gullies, Embankment, Railway crossing Road, Level Crossing, Road crossing feature, Railway crossing over Canal, Road over single stream, and Road over River or Canal. A table at the bottom lists symbols for County Boundary (Geographical), County & Civil Parish Boundary, Administrative County & Civil Parish Boundary, County Borough Boundary (England), County Borough Boundary (Scotland), Boundary between civil parishes, Boundary between civil parishes (where there is always a space between the names of the parishes), and Boundary between civil parishes (where there is always a space between the names of the parishes).

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

This legend defines symbols for features not covered in the standard OS Plan. It includes symbols for Inactive Quarry, Active Quarry, Rock, Feature, Cliff, Slopes, Ice, Roofed Building, Glazed roof Building, Siding, Highway, Archway, Non-Coniferous Tree (surveyed), Coniferous Tree (surveyed), Non-Coniferous Trees (not surveyed), Coniferous Trees (not surveyed), Coppice Tree, Coppice, Coppice, Coppice, Rough Grassland, Heath, Orchard, Direction of water flow, Direction of water flow, Cave Entrance, Tidal gauge Station, Electricity Transmission Line, Electricity pylons, County Boundary (Geographical), County & Civil Parish Boundary, Civil Parish Boundary, Administrative County Boundary, London Borough Boundary, Symbol marking point where boundary meaning changes, and symbols for various types of buildings and structures like Bell Tower, Barn, Chapel, Church, Cottage, Farm, House, Mill, Public House, Shop, Tower, and Well.

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

This legend defines symbols for National Grid Data. It includes symbols for Cliff, Slopes, Ice, Bank, Boulder, Discoloured Boulder, Non-Coniferous Tree (surveyed), Coniferous Tree (surveyed), Non-Coniferous trees (not surveyed), Coniferous trees (not surveyed), Orchard tree, Scrub, Bracken, Coppice, Oak, Heath, Cuckoo, Direction of water flow, Tidal gauge Station, Antiquity (Site of), Electricity Transmission Line, Electricity pylons, Buildings with Building Seed, Roofed Building, Glazed roof Building, Civil parish/community boundary, District boundary, County boundary, Boundary poststone, Boundary between civil parishes (where there is always a space between the names of the parishes), and Boundary between civil parishes (where there is always a space between the names of the parishes).



## Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Kent	1:2,500	1894 - 1895	2
Kent	1:2,500	1895	3
Kent	1:2,500	1896	4
Kent	1:2,500	1909	5
Kent	1:2,500	1932 - 1938	6
Ordnance Survey Plan	1:2,500	1956 - 1967	7
Ordnance Survey Plan	1:1,250	1958	8
Additional SIMs	1:2,500	1959 - 1989	9
Ordnance Survey Plan	1:1,250	1966 - 1969	10
Ordnance Survey Plan	1:1,250	1966	11
Additional SIMs	1:1,250	1990	12
Large-Scale National Grid Data	1:1,250	1994	13
Large-Scale National Grid Data	1:2,500	1994	14

## Historical Map - Segment A12



## Order Details

Order Number: 178768733\_1\_1  
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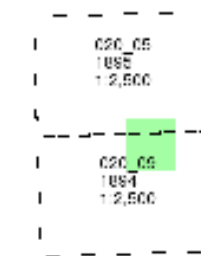
### Kent

Published 1894 - 1895

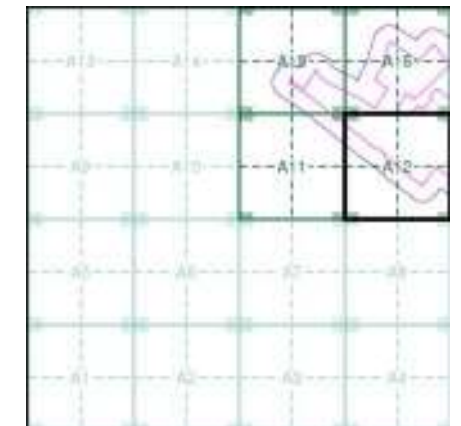
Source map scale - 1:2,500

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

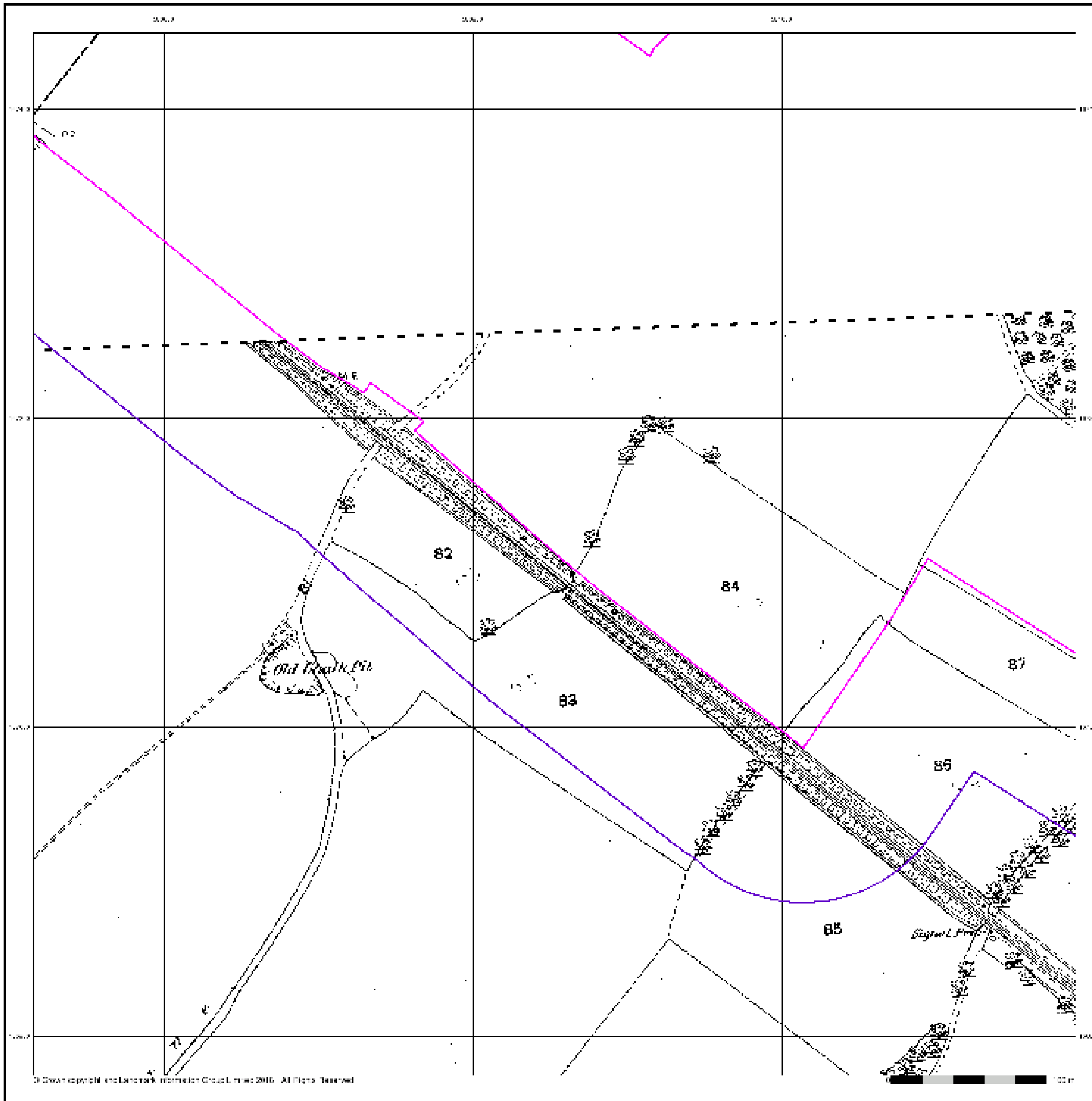
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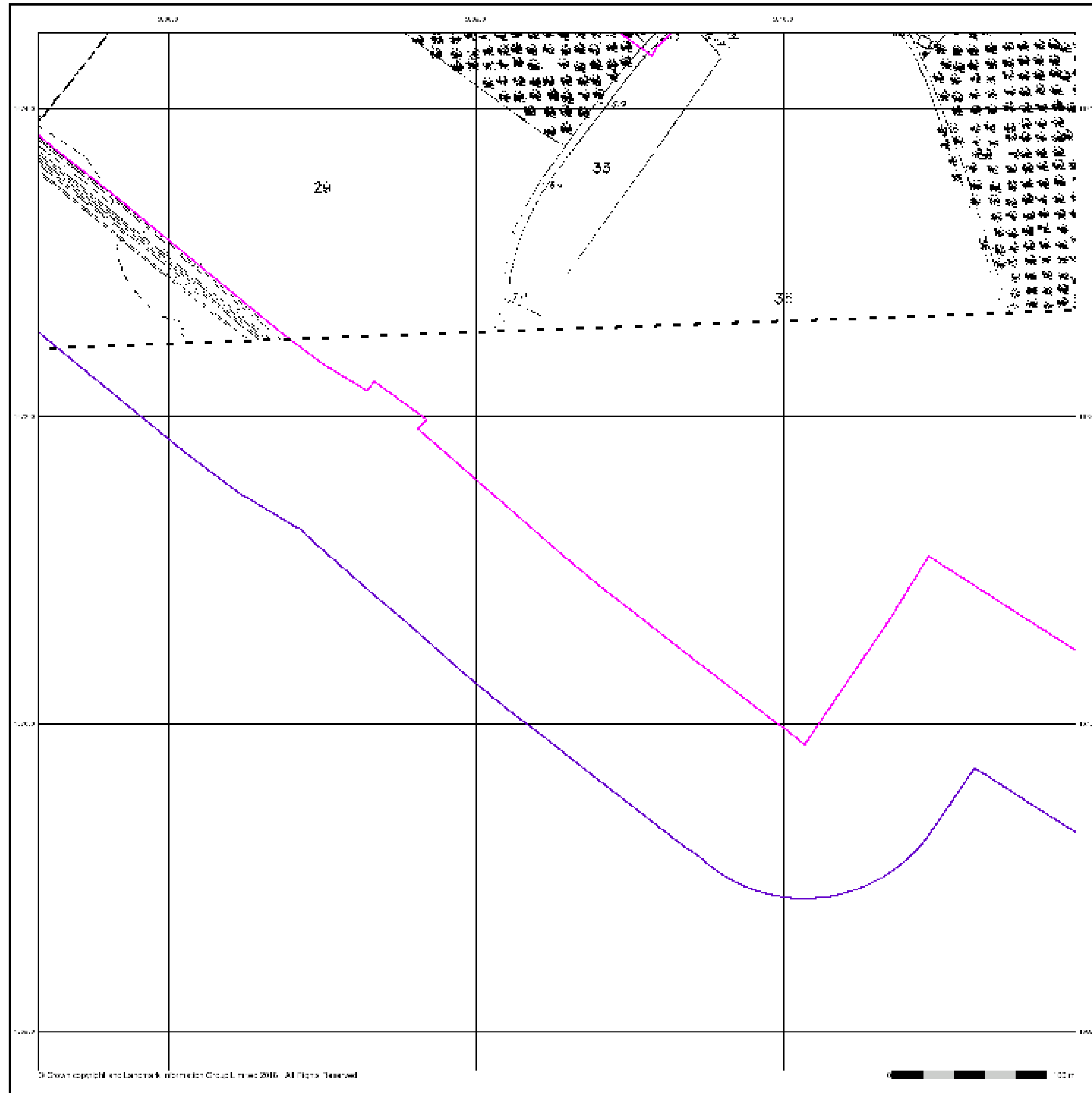
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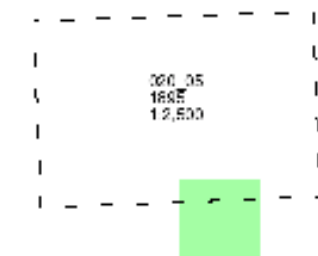
**Kent**

**Published 1895**

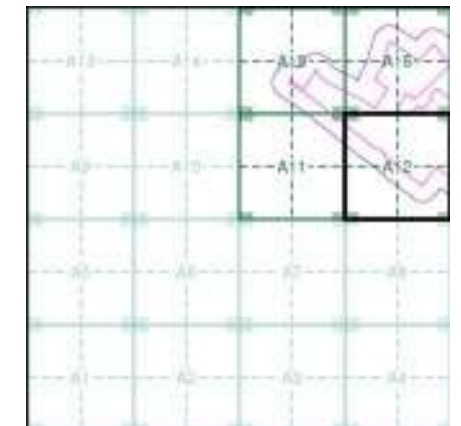
**Source map scale - 1:2,500**

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**

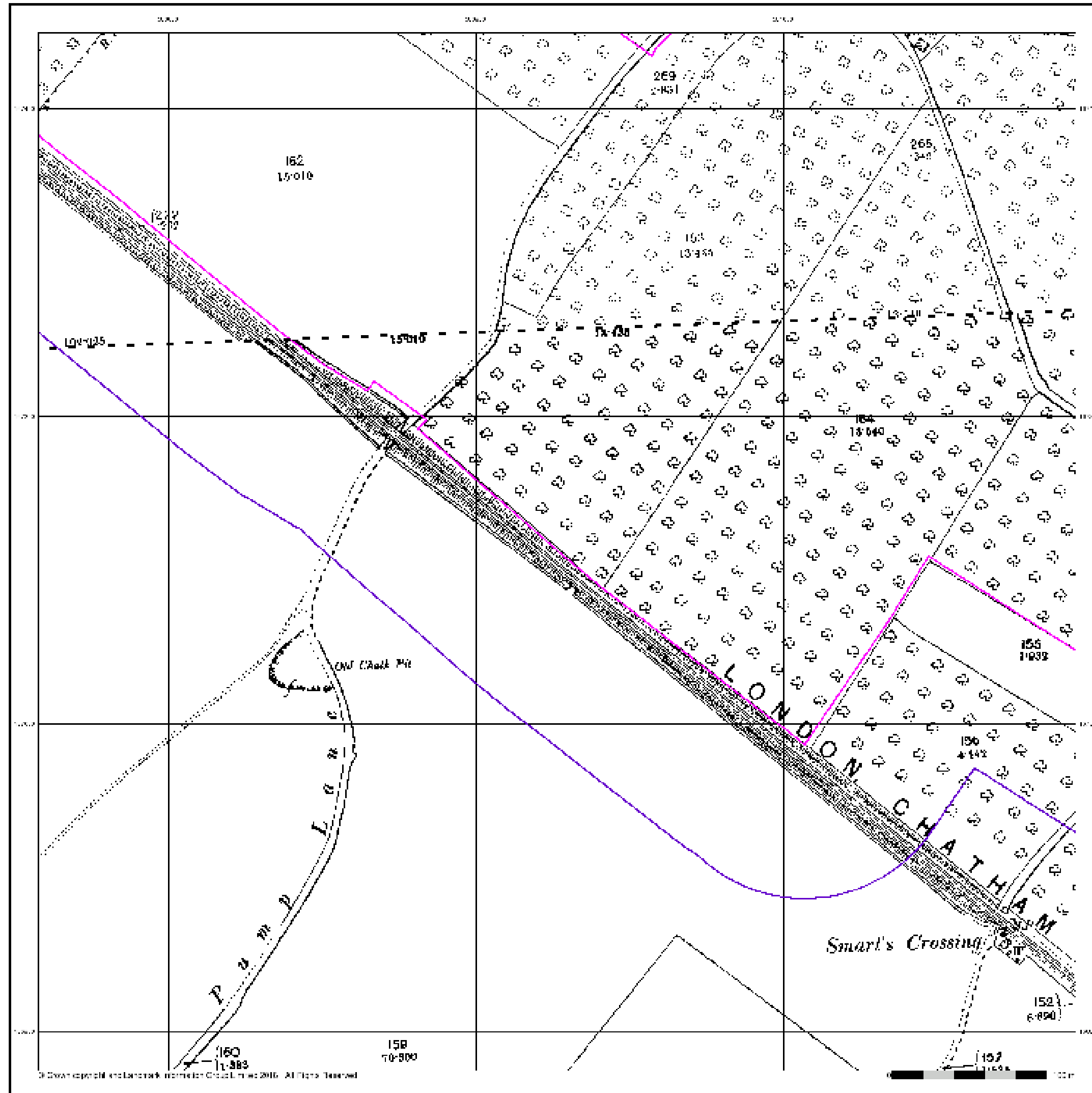
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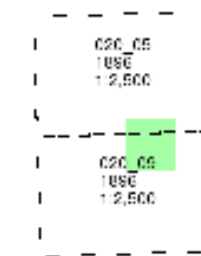
**Kent**

**Published 1896**

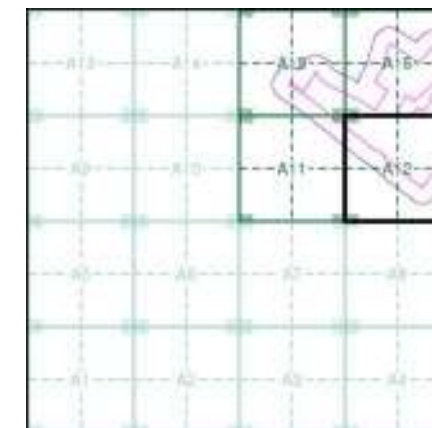
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered 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**



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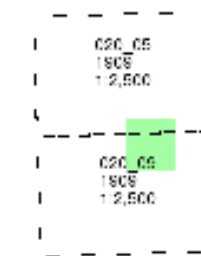
Kent

Published 1909

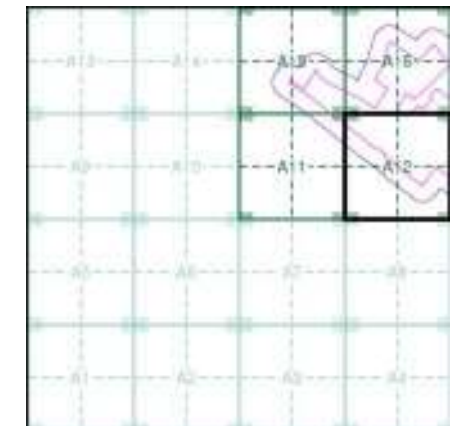
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered 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

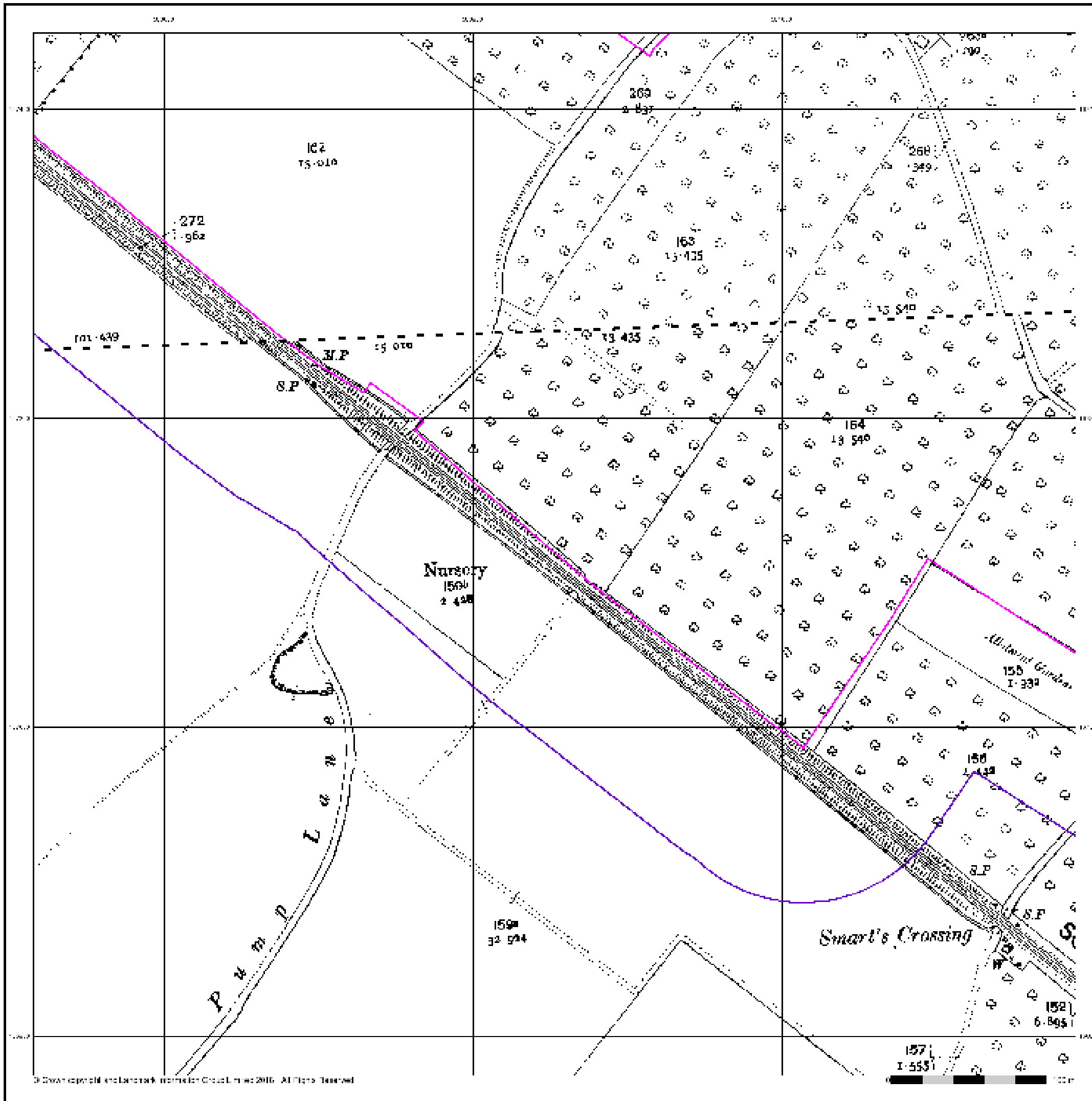
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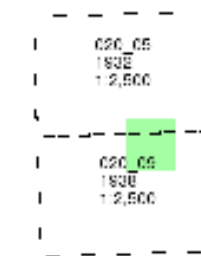
Kent

Published 1932 - 1938

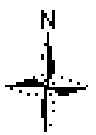
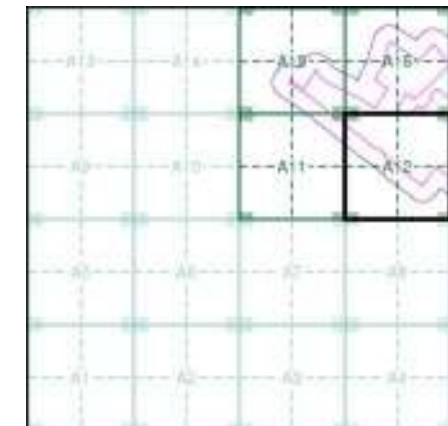
Source map scale - 1:2,500

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

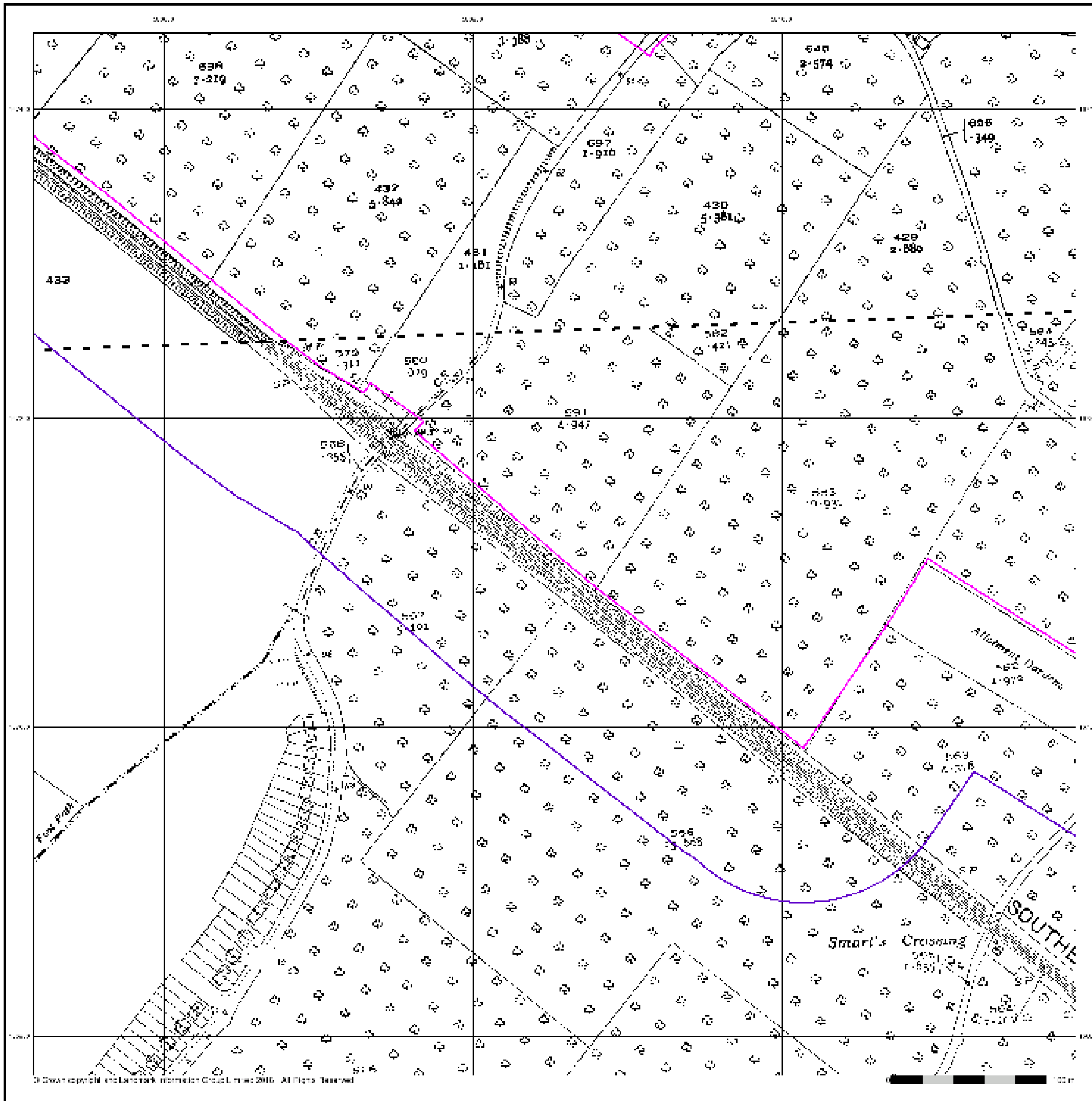
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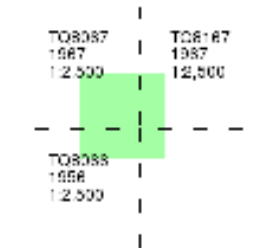
### Ordnance Survey Plan

Published 1956 - 1967

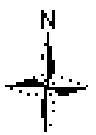
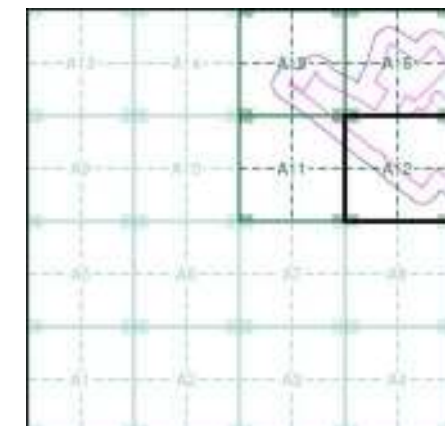
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered 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: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
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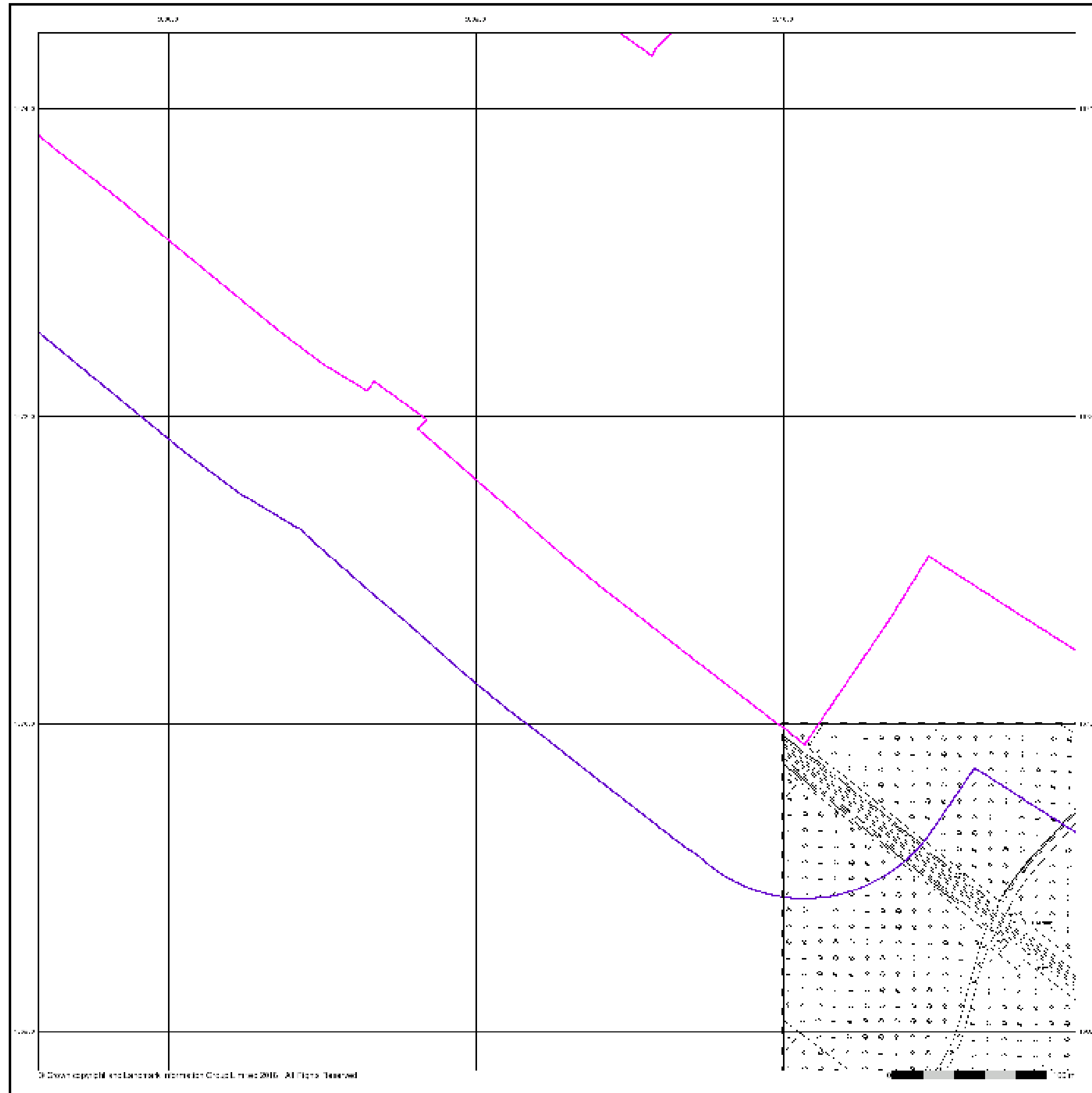
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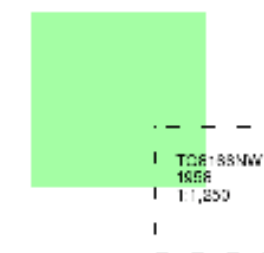
## Ordnance Survey Plan

Published 1958

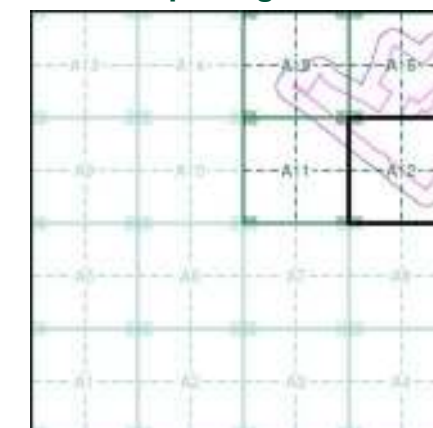
Source map scale - 1:1,250

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

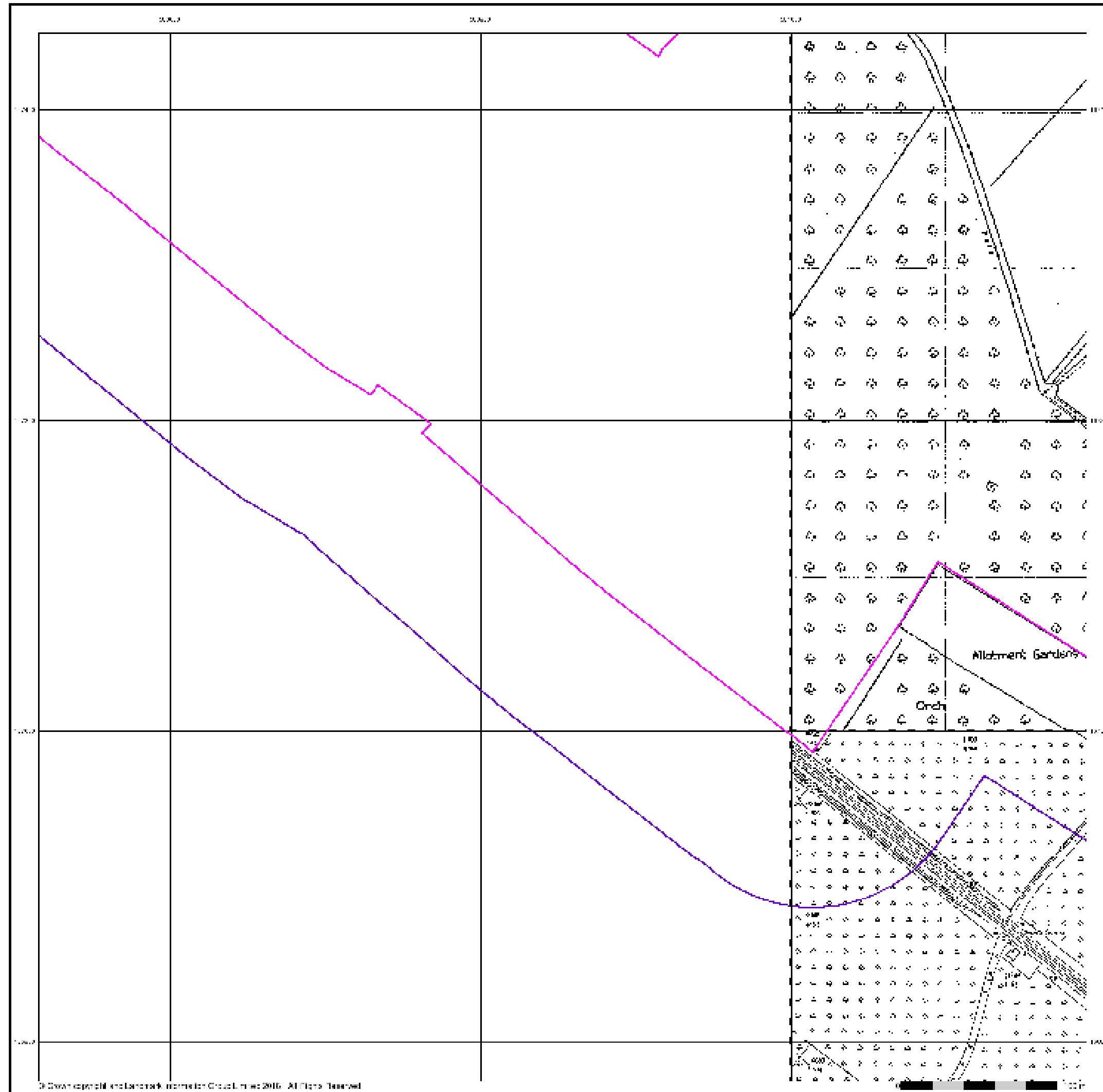
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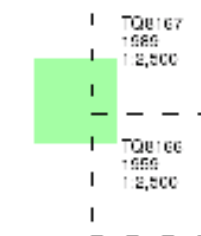
**Additional SIMs**

**Published 1959 - 1989**

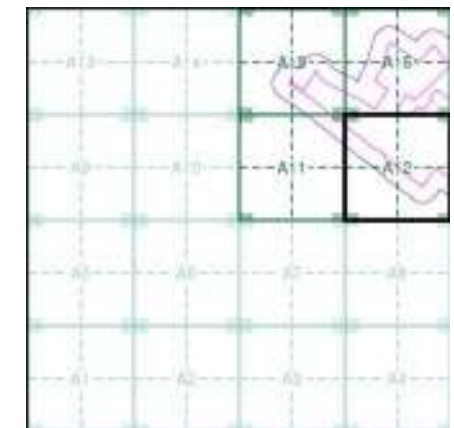
**Source map scale - 1:2,500**

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. 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**

Order Number: 178768733\_1\_1  
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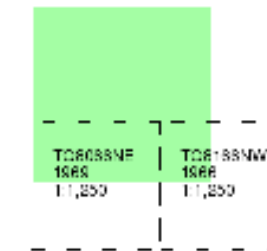
### Ordnance Survey Plan

Published 1966 - 1969

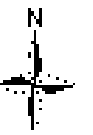
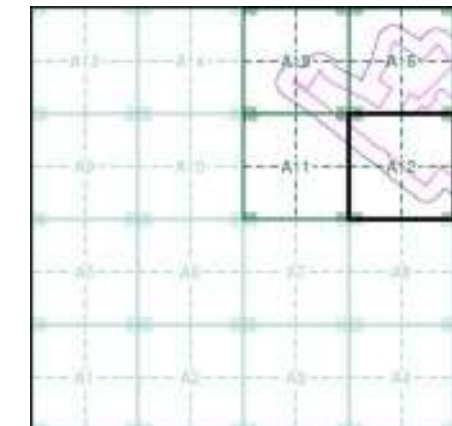
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered 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

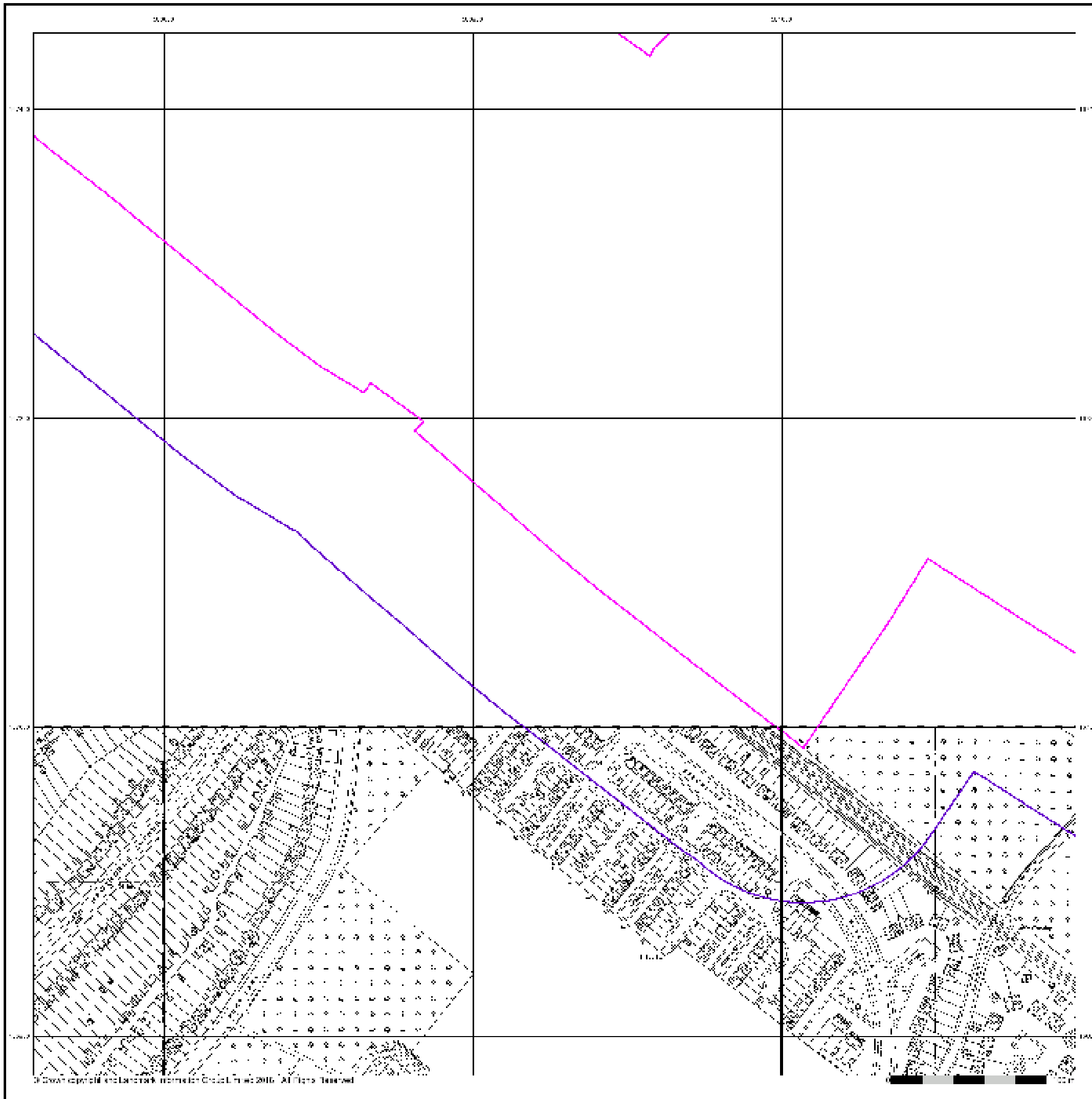
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
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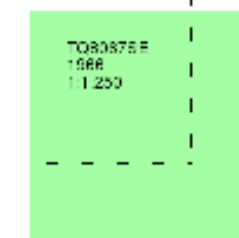
### Ordnance Survey Plan

Published 1966

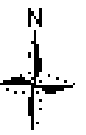
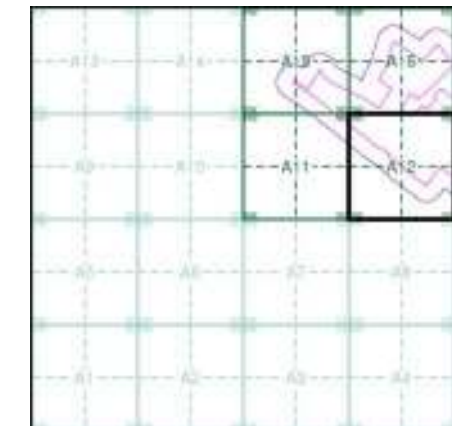
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### Historical Map - Segment A12



### Order Details

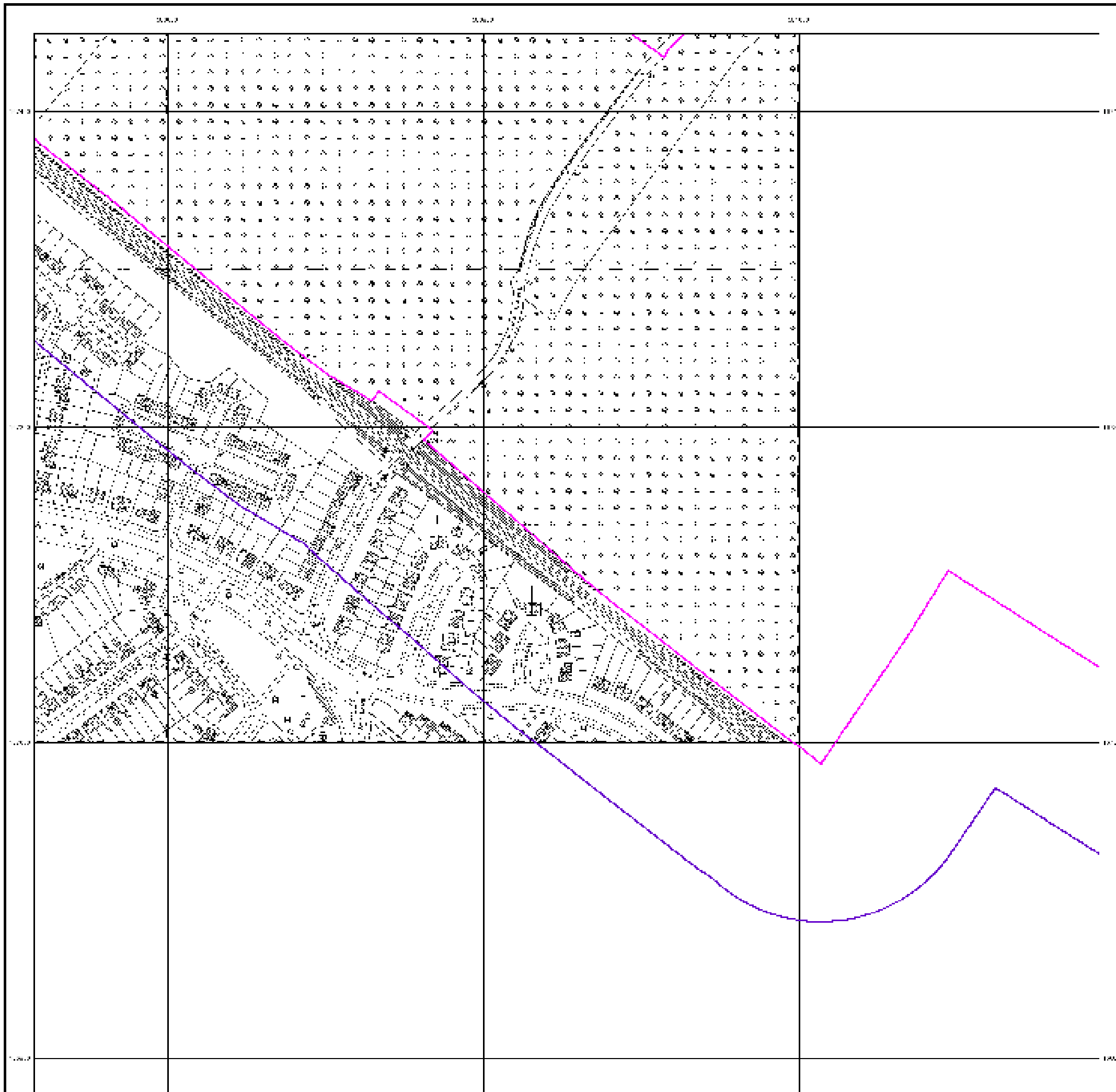
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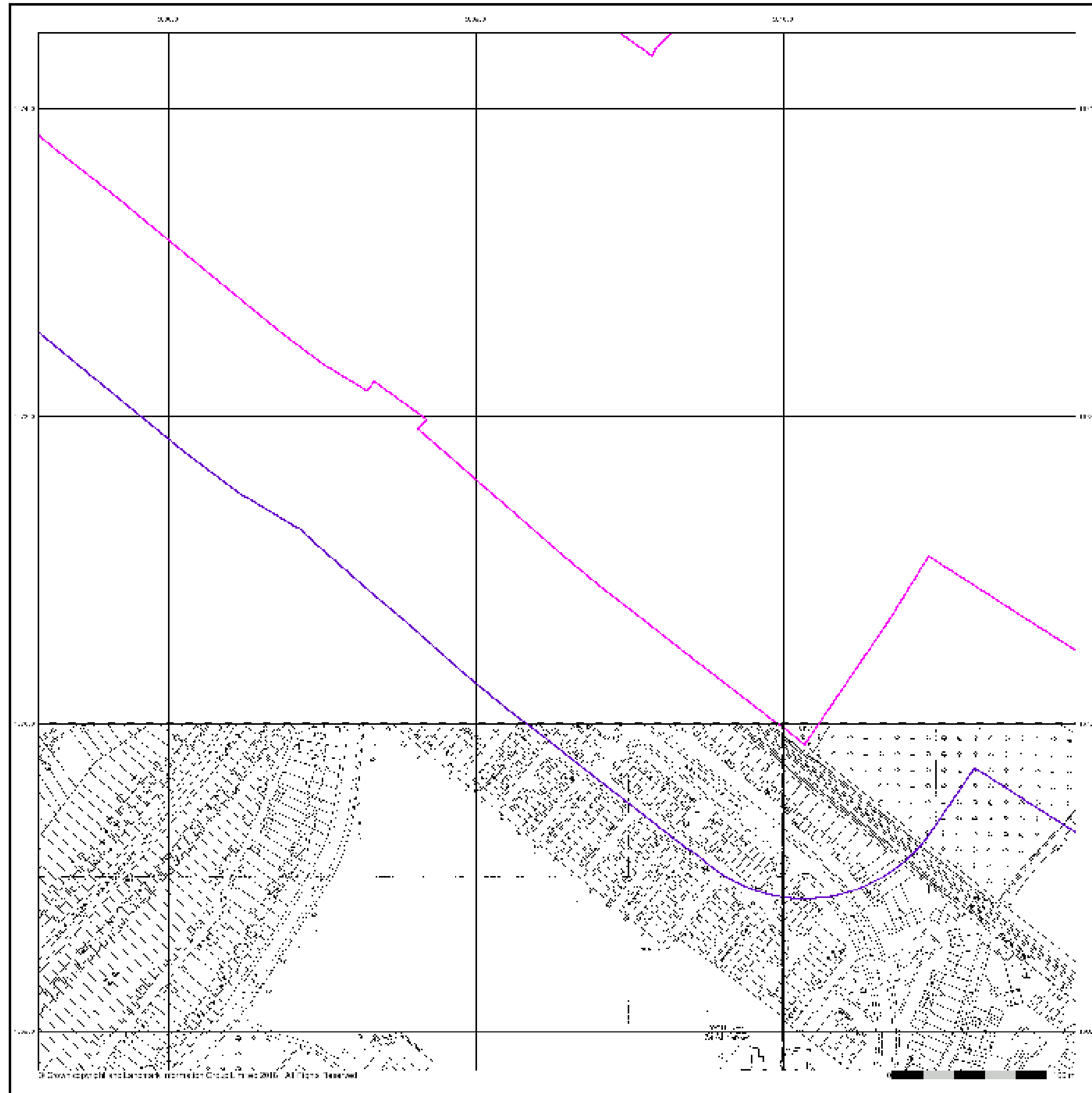
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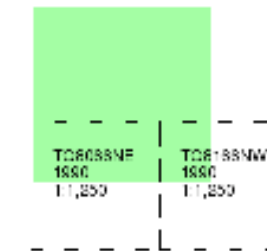
**Additional SIMs**

**Published 1990**

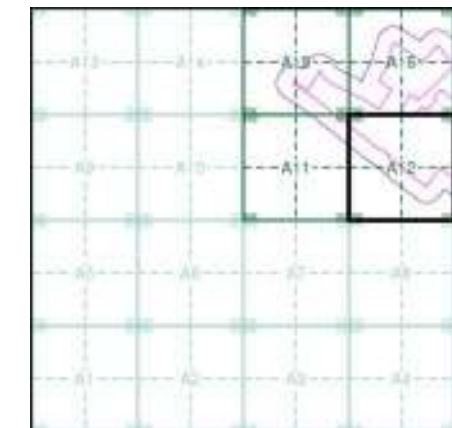
**Source map scale - 1:1,250**

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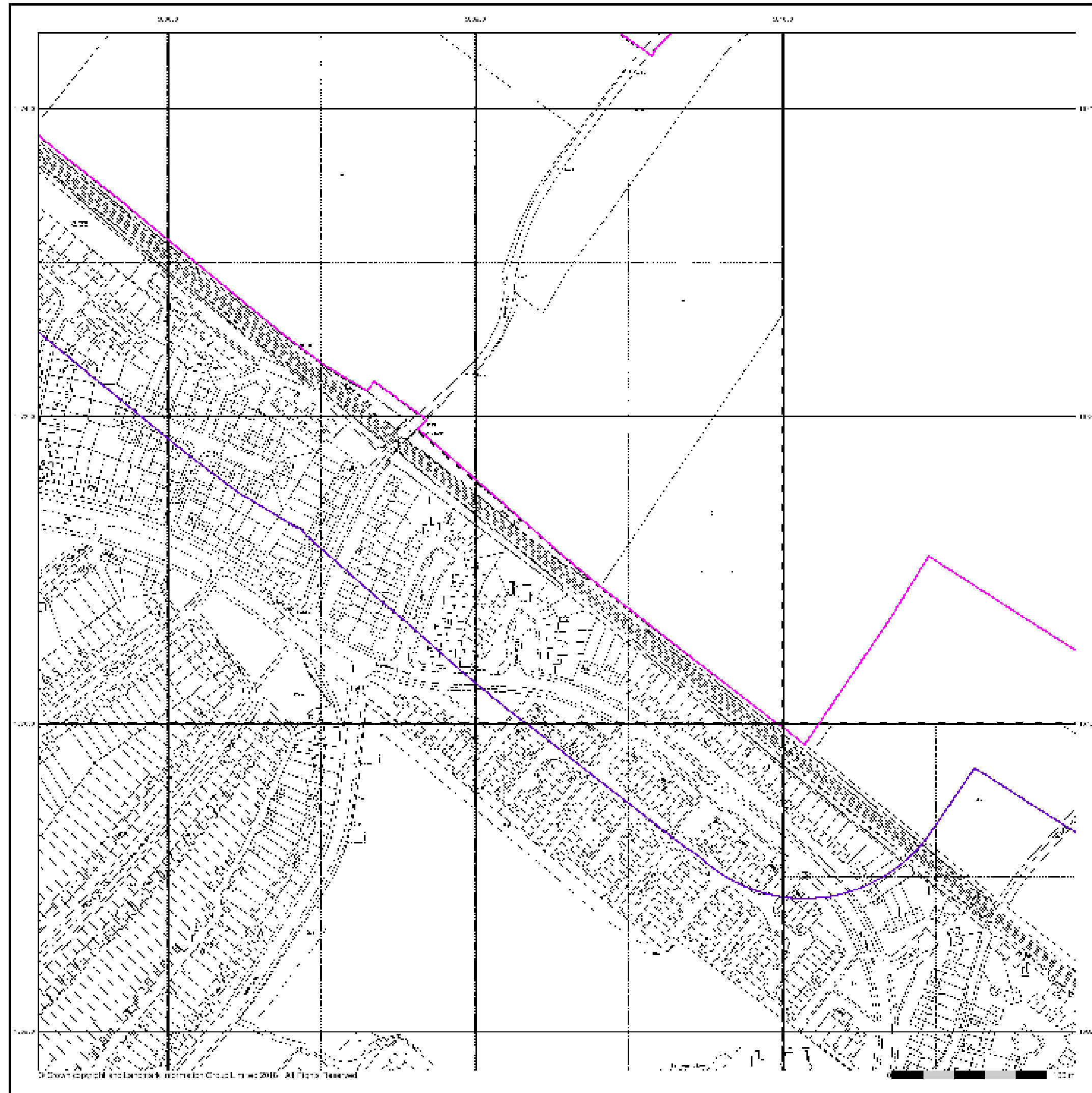
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## Large-Scale National Grid Data

Published 1994

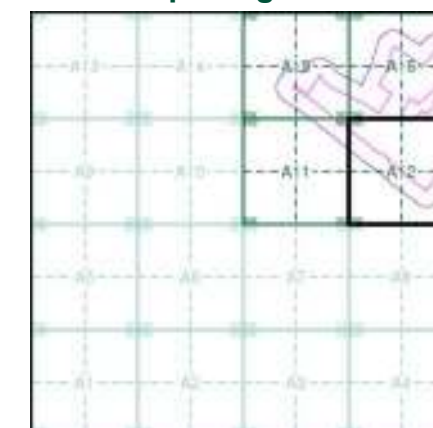
Source map scale - 1:1,250

'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)

TC80678F	1994	1:250
TC80686F	1994	1:250
TC8188NW	1994	1:1250

### Historical Map - Segment A12



### Order Details

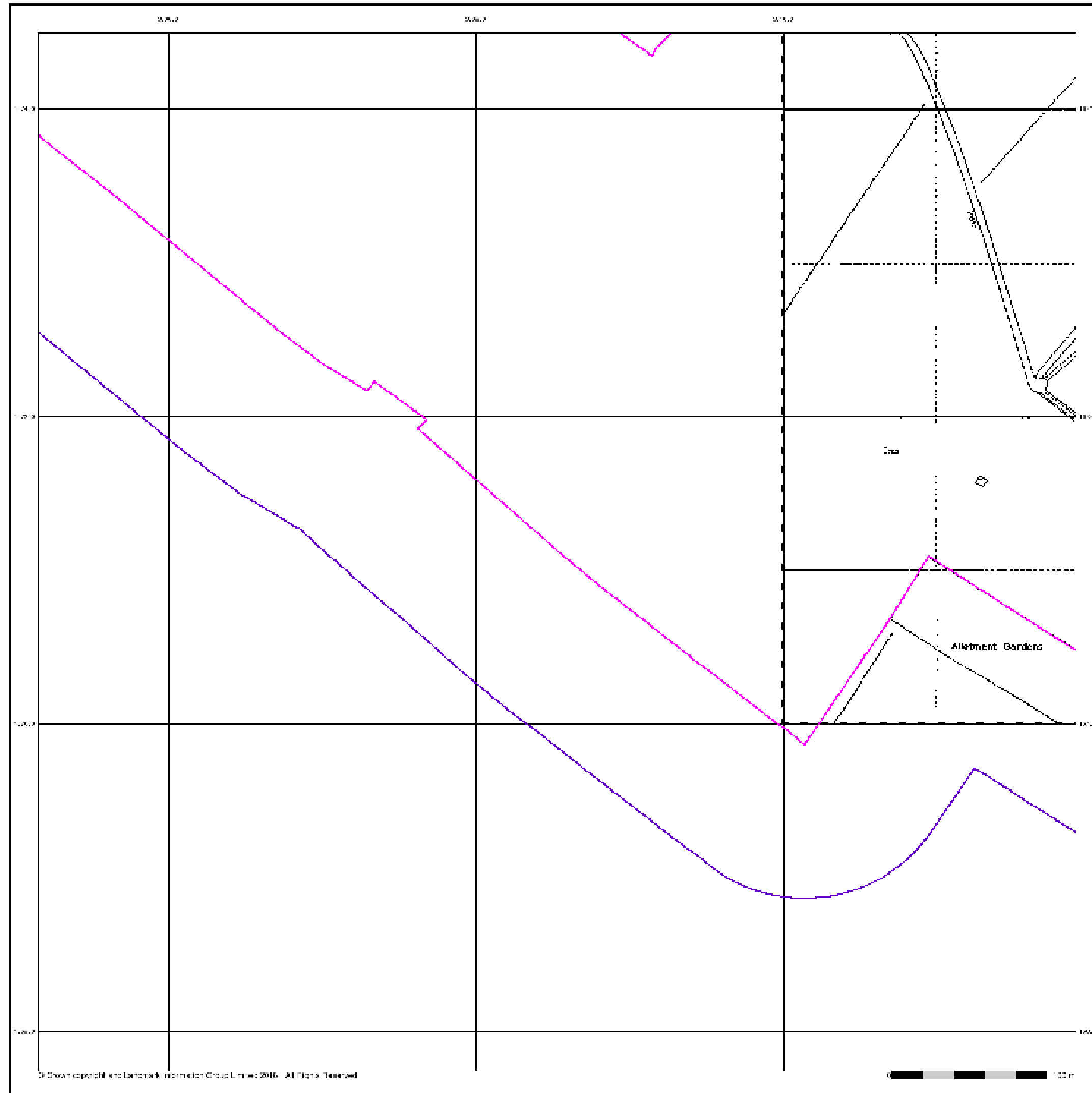
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

### Site Details

1, Russett Farm, Rainham, GILLINGHAM, ME8 7AT



Tel: 0844 844 9952  
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 Web: www.envirocheck.co.uk



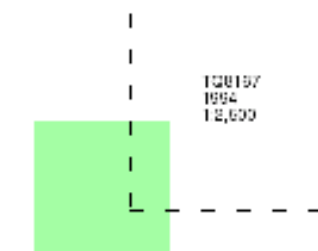
## Large-Scale National Grid Data

Published 1994

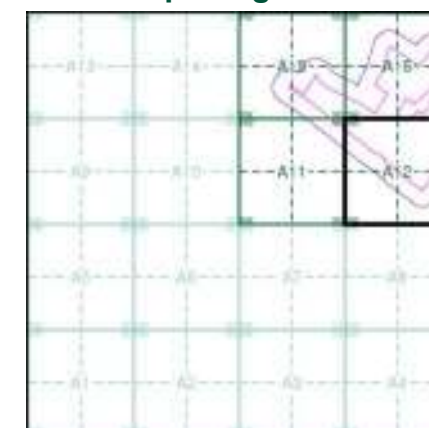
Source map scale - 1:2,500

'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

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

### Site Details

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# Historical Mapping Legends

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

**County Series**

- Quarry
- Grave
- Gate Pt
- Clay Pt
- Slough
- Water Leap
- Slating Masonry
- Flat Rock

**Other Features**

- Marsh
- Heath
- Oak
- Rough Pasture
- Luz
- Wood
- Mixed Wood
- Field Wood
- Orchard
- Highway
- Foot
- Sloping Slope
- Waterfall
- Bank

**Infrastructure**

- Top Station
- Abutment of Bridge
- Surface Road
- Antiquities (Site of)
- Subsiding
- Embankment
- Railway crossing Road
- Level Crossing
- Road crossing Railway
- Road over single main
- Road over River or Canal

**Boundaries**

- County Boundary (Geographical)
- County & Civil Parish Boundary
- Administrative County & Civil Parish Boundary
- County Borough Boundary (England)
- County Borough Boundary (Scotland)

**Other Symbols**

- Boundary between
- Rail Road
- Electricity Pole
- Four Paths
- Four Paths
- Gate to Watercourse
- Gate to
- Winding Post on Road
- Water Gull
- Post
- Signal Post
- Slack
- Spring
- Telephone Call Box
- Trench
- Well

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

**Additional Features**

- Inactive Quarry
- Active Quarry
- Road
- Footpath
- Slopes
- Roofed Building
- Glazed Roof Building
- Roofing
- Archway
- Non-Coniferous Tree (not surveyed)
- Coniferous Tree (surveyed)
- Non-Coniferous Trees (not surveyed)
- Coniferous Trees (not surveyed)
- Cave Entrance
- Triangular Station
- Electricity Pylon
- Electricity Transmission Line
- Course Boundary (Geographical)
- County & Civil Parish Boundary
- Civil Parish Boundary
- Administrative County & Civil Parish Boundary
- London Borough Boundary
- Symbol marking point where boundary meaning changes

**Other Symbols**

- Gravel Pit
- Gravel
- Gate
- Clay
- Slough
- Water Leap
- Slating Masonry
- Flat Rock
- Marsh
- Heath
- Oak
- Rough Pasture
- Luz
- Wood
- Mixed Wood
- Field Wood
- Orchard
- Highway
- Foot
- Sloping Slope
- Waterfall
- Bank
- Top Station
- Abutment of Bridge
- Surface Road
- Antiquities (Site of)
- Subsiding
- Embankment
- Railway crossing Road
- Level Crossing
- Road crossing Railway
- Road over single main
- Road over River or Canal
- County Boundary (Geographical)
- County & Civil Parish Boundary
- Administrative County & Civil Parish Boundary
- County Borough Boundary (England)
- County Borough Boundary (Scotland)
- Boundary between
- Rail Road
- Electricity Pole
- Four Paths
- Four Paths
- Gate to Watercourse
- Gate to
- Winding Post on Road
- Water Gull
- Post
- Signal Post
- Slack
- Spring
- Telephone Call Box
- Trench
- Well

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

**Other Symbols**

- Electricity Transmission Line
- Boundary between
- County Boundary
- Boundary poststone
- Boundary meaning changes (not always shown in opposite pairs or in sequence)
- Electricity Pylon
- Buildings with Building Seed
- Roofed Building
- Glazed Roof Building
- Electricity Transmission Line
- County Boundary
- County Boundary
- Boundary poststone
- Boundary meaning changes (not always shown in opposite pairs or in sequence)

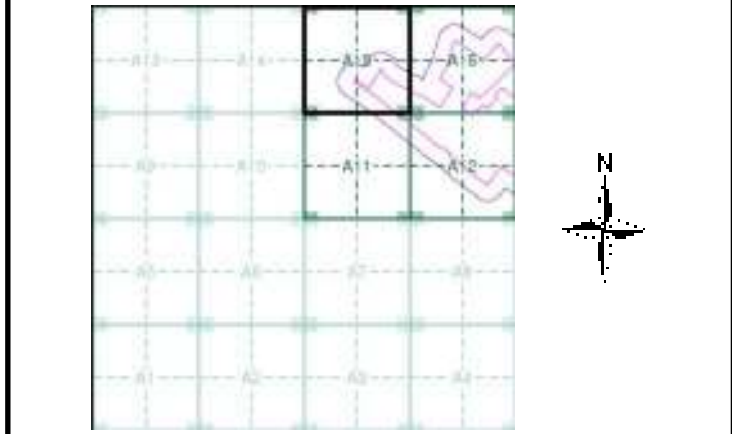
**Other Symbols**

- Electricity Transmission Line
- County Boundary
- County Boundary
- Boundary poststone
- Boundary meaning changes (not always shown in opposite pairs or in sequence)
- Electricity Pylon
- Buildings with Building Seed
- Roofed Building
- Glazed Roof Building
- Electricity Transmission Line
- County Boundary
- County Boundary
- Boundary poststone
- Boundary meaning changes (not always shown in opposite pairs or in sequence)

**Historical Mapping & Photography included:**

Mapping Type	Scale	Date	Pg
Kent	1:2,500	1895	2
Kent	1:2,500	1895	3
Kent	1:2,500	1896	4
Kent	1:2,500	1909	5
Kent	1:2,500	1932	6
Ordnance Survey Plan	1:2,500	1955 - 1967	7
Ordnance Survey Plan	1:1,250	1955	8
Ordnance Survey Plan	1:1,250	1960 - 1985	9
Additional SIMs	1:1,250	1960	10
Ordnance Survey Plan	1:1,250	1965 - 1975	11
Ordnance Survey Plan	1:2,500	1970	12
Ordnance Survey Plan	1:1,250	1975	13
Additional SIMs	1:2,500	1989	14
Additional SIMs	1:1,250	1990	15
Large-Scale National Grid Data	1:1,250	1994	16
Large-Scale National Grid Data	1:2,500	1994	17

## Historical Map - Segment A15



**Order Details**

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

**Site Details**

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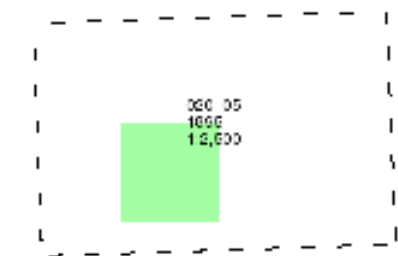
Kent

Published 1895

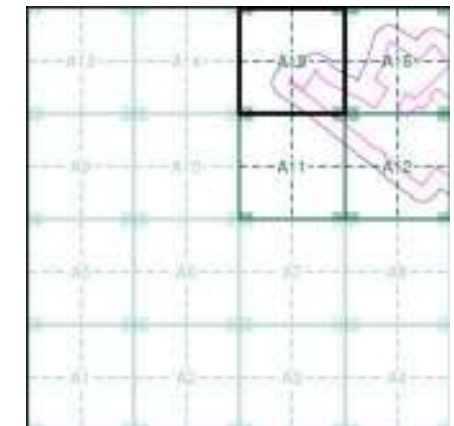
Source map scale - 1:2,500

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 A15



Order Details

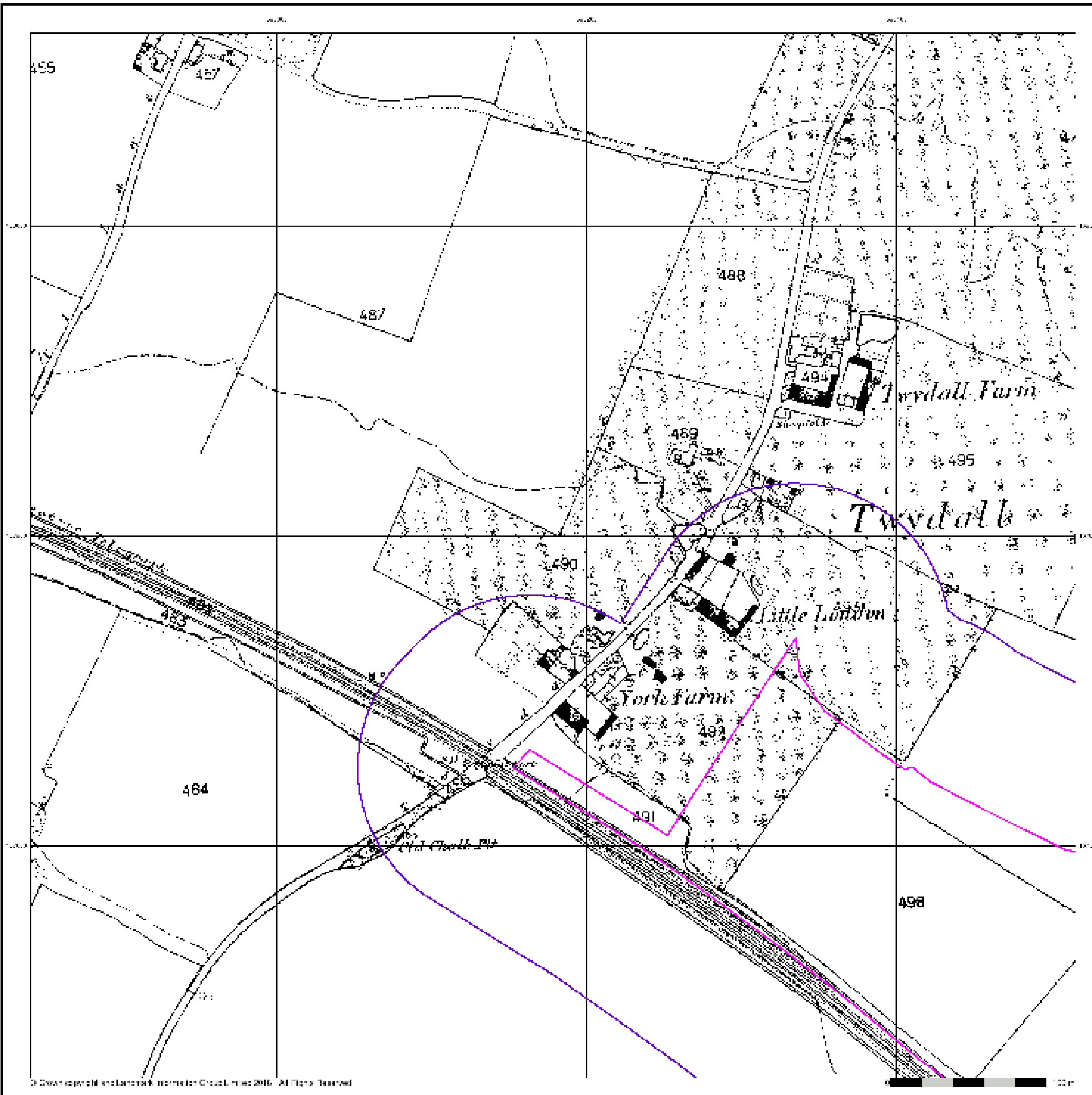
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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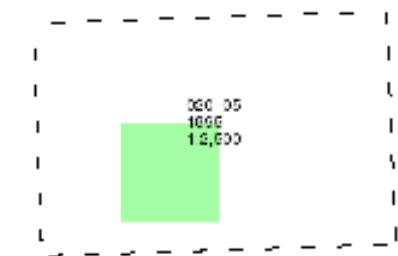
### Kent

Published 1895

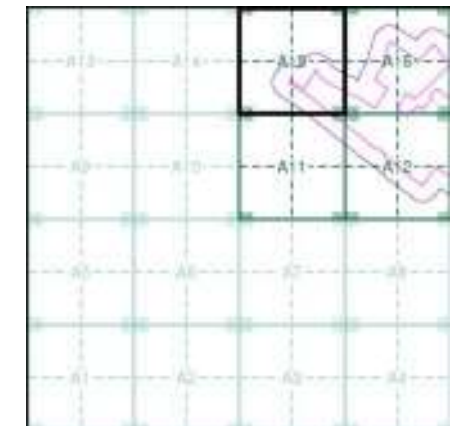
Source map scale - 1:2,500

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 A15



### Order Details

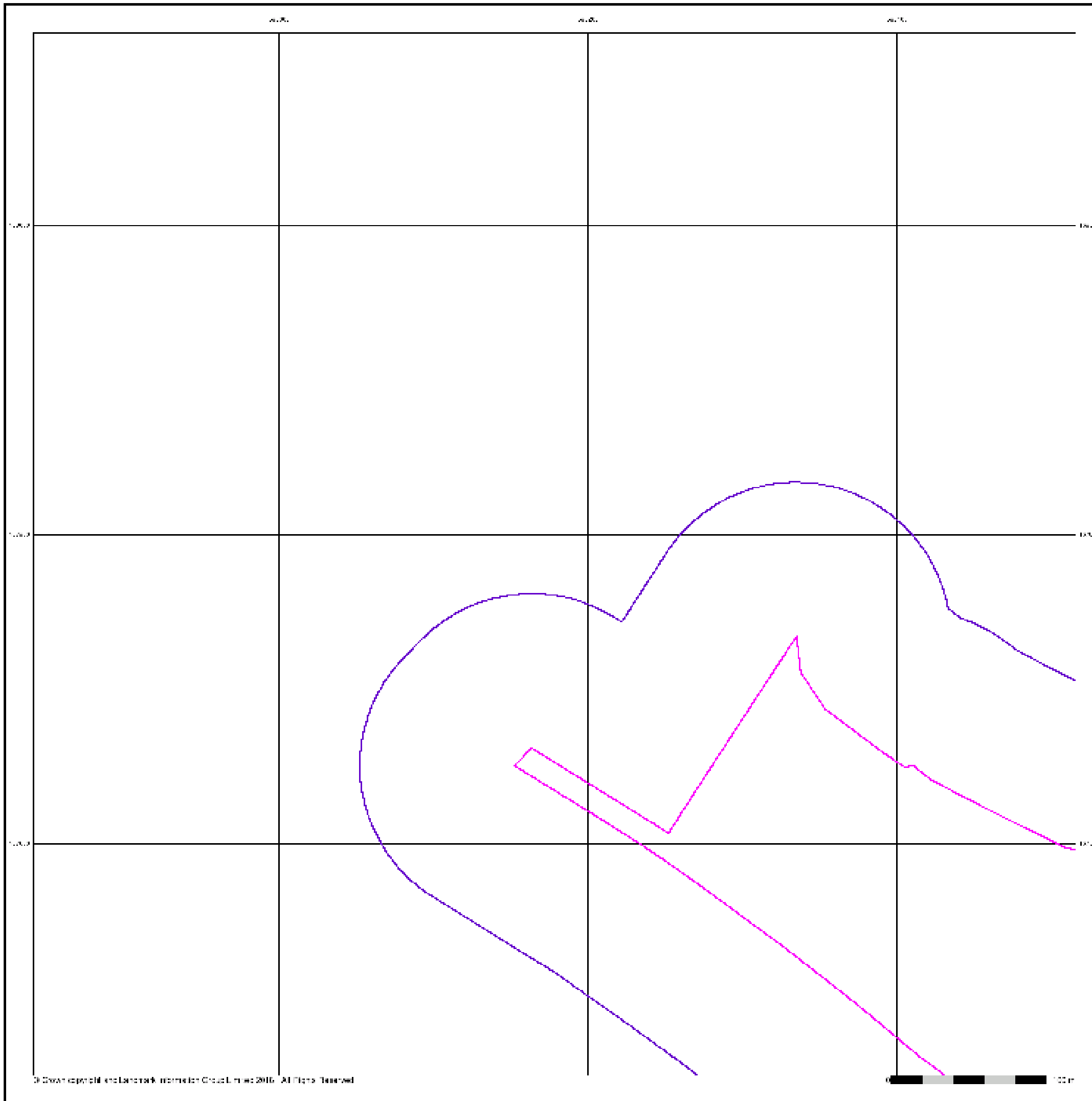
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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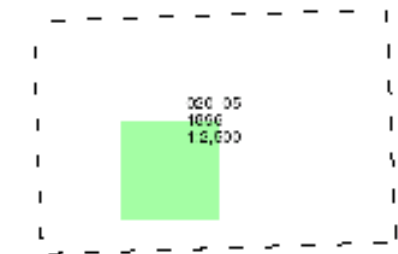
Kent

Published 1896

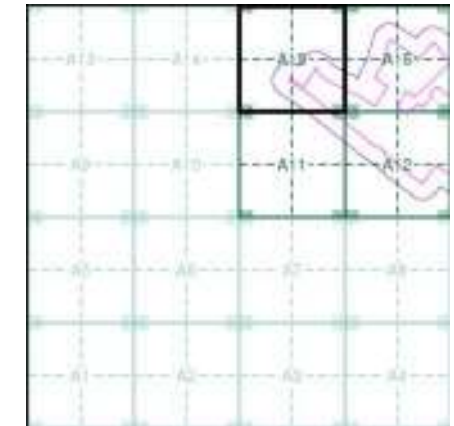
Source map scale - 1:2,500

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 A15



Order Details

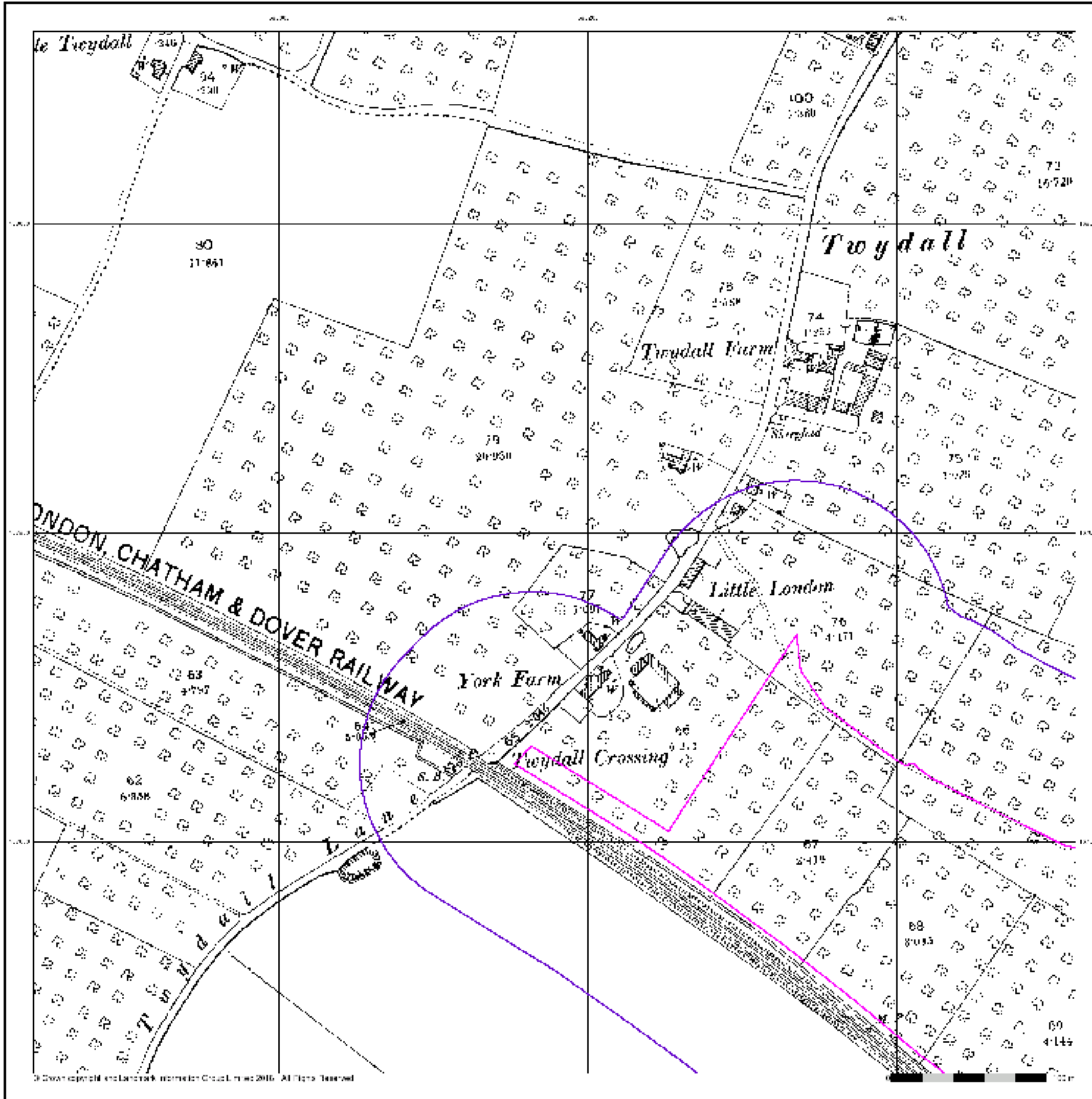
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

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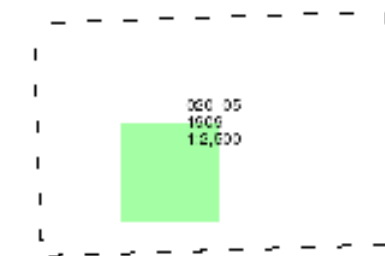
Kent

Published 1909

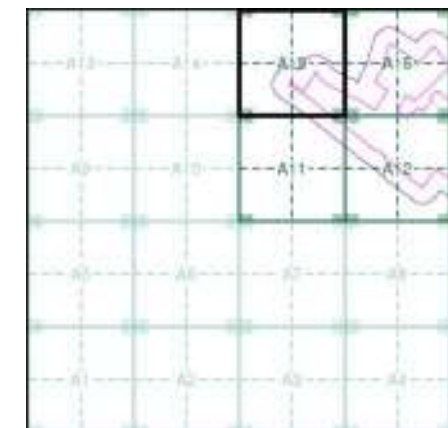
Source map scale - 1:2,500

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 A15



Order Details

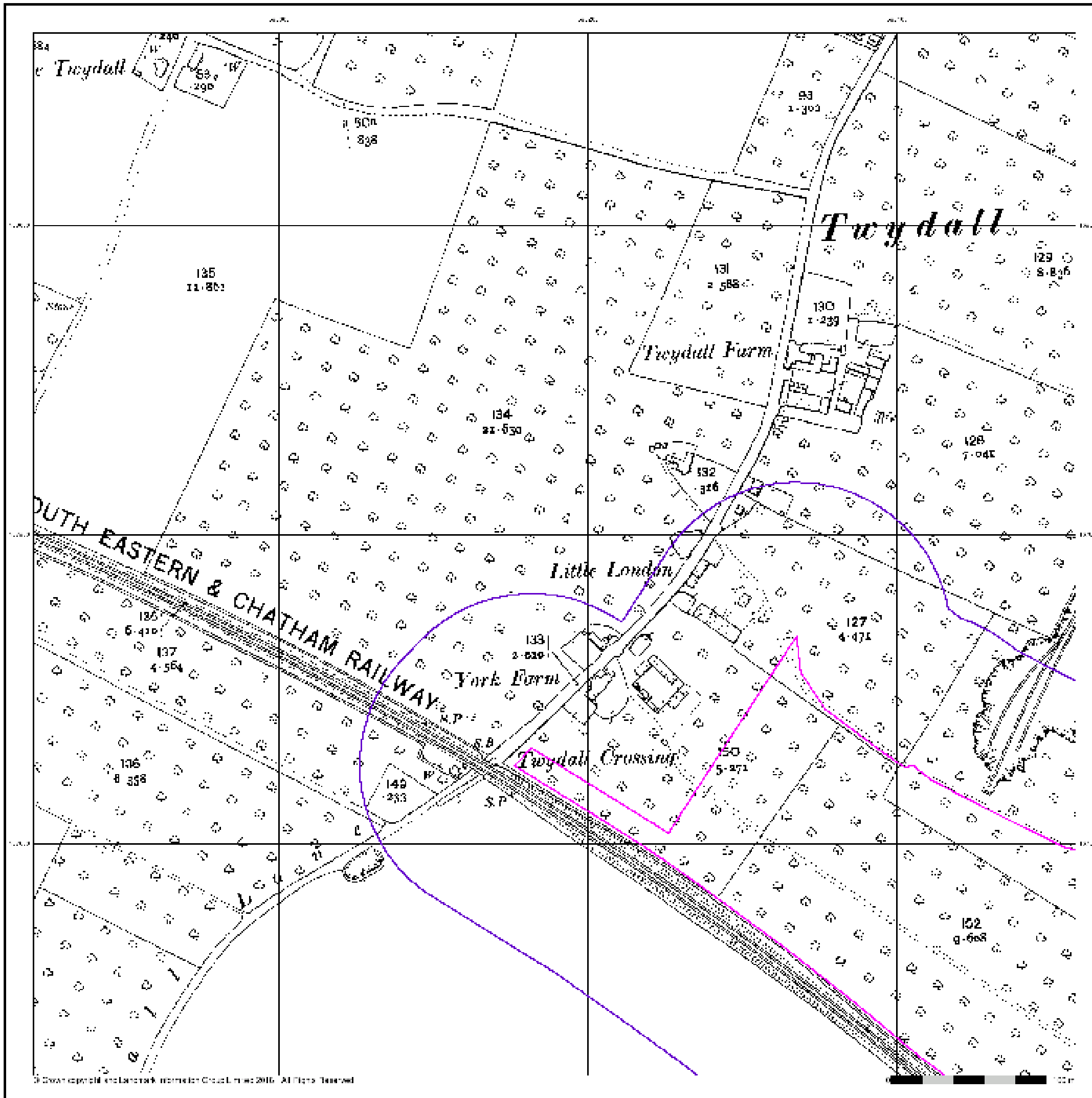
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

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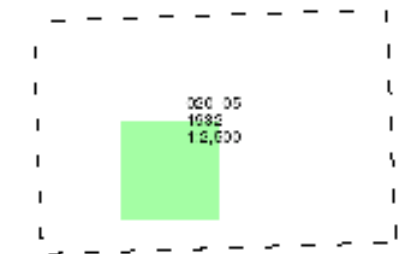
Kent

Published 1932

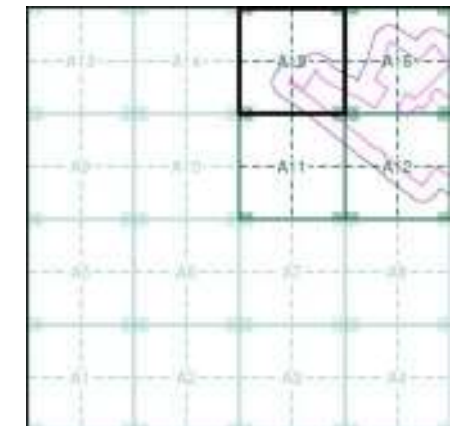
Source map scale - 1:2,500

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 A15



Order Details

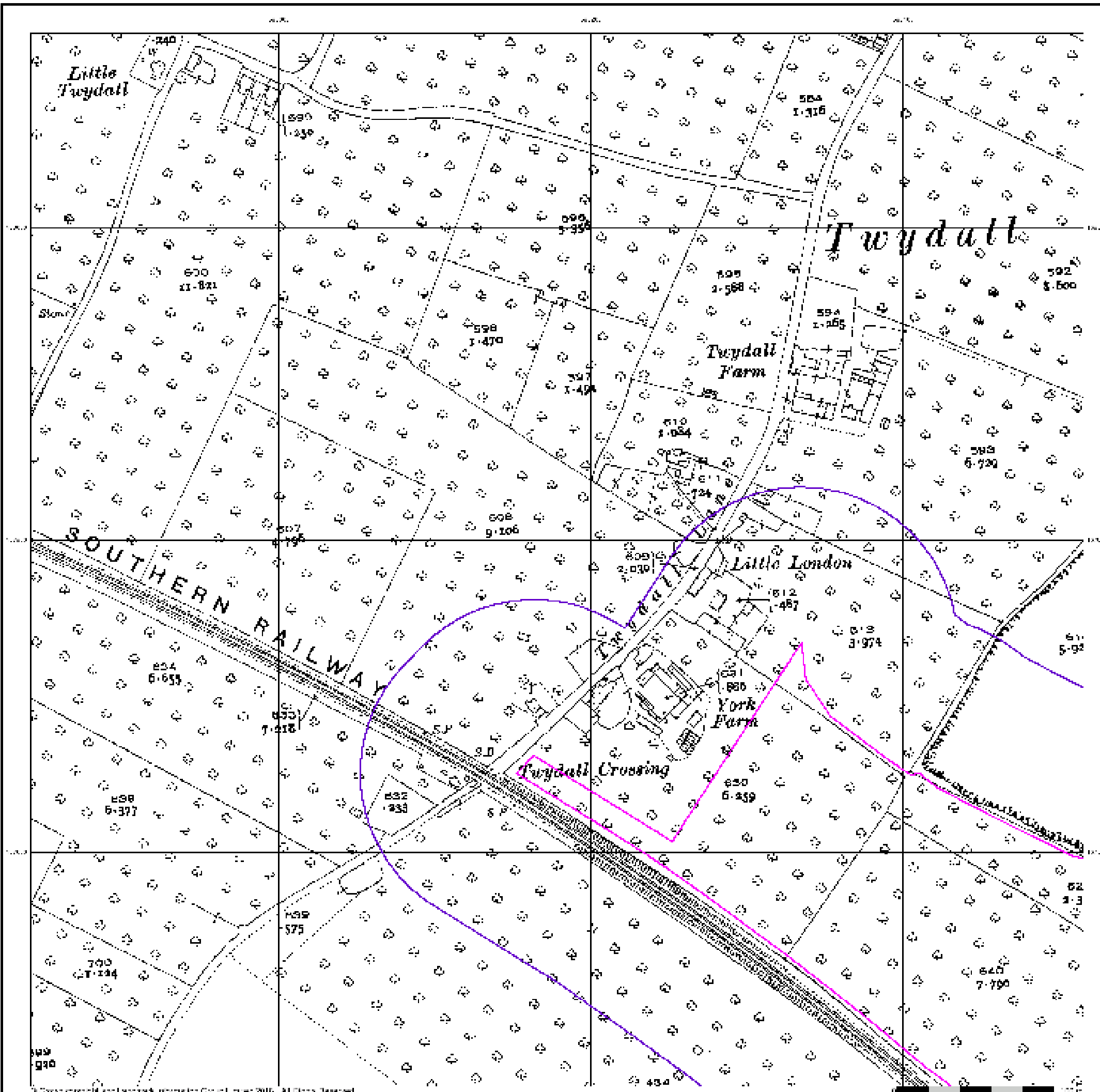
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

Site Details

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### Ordnance Survey Plan

Published 1955 - 1967

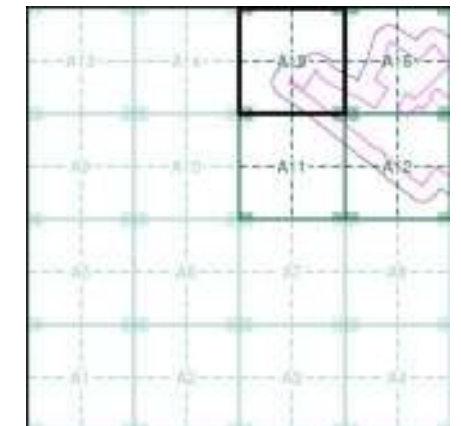
Source map scale - 1:2,500

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)

T07988 1958 1:2,500	T08088 1958 1:2,500
T07987 1958 1:2,500	T08087 1957 1:2,500

### Historical Map - Segment A15



### Order Details

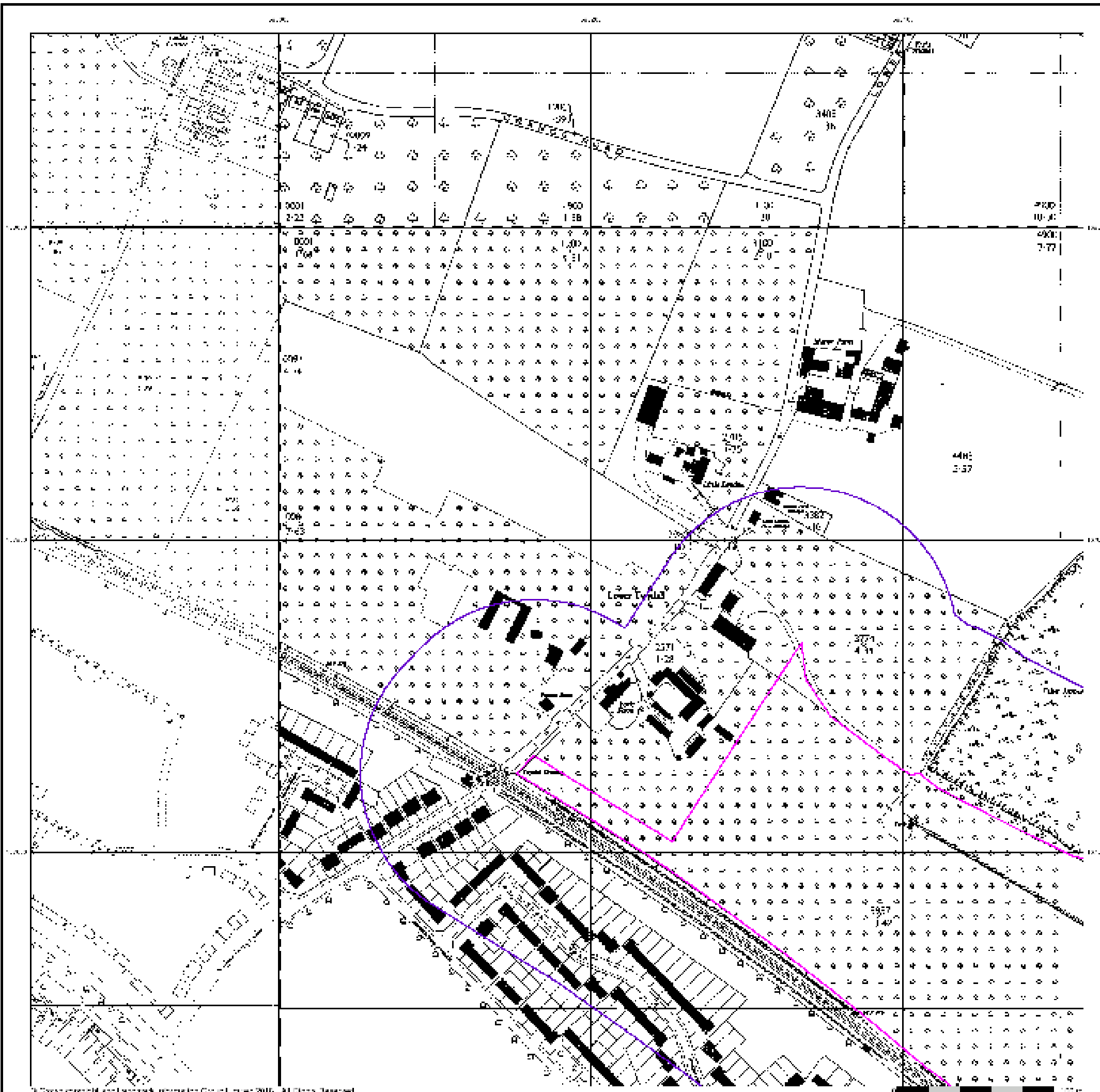
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 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

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### Ordnance Survey Plan

Published 1955

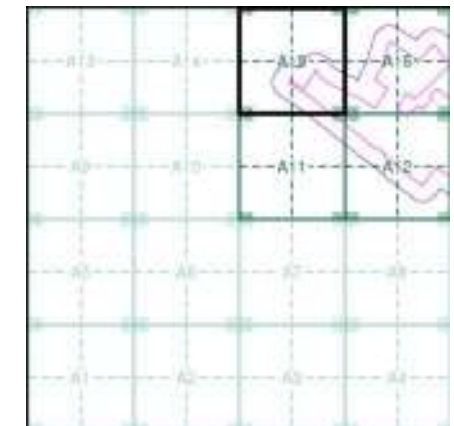
Source map scale - 1:1,250

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)

10756884	1888	1:1,250
10756742	1955	1:1,250
10756782	1888	1:1,250

### Historical Map - Segment A15



### Order Details

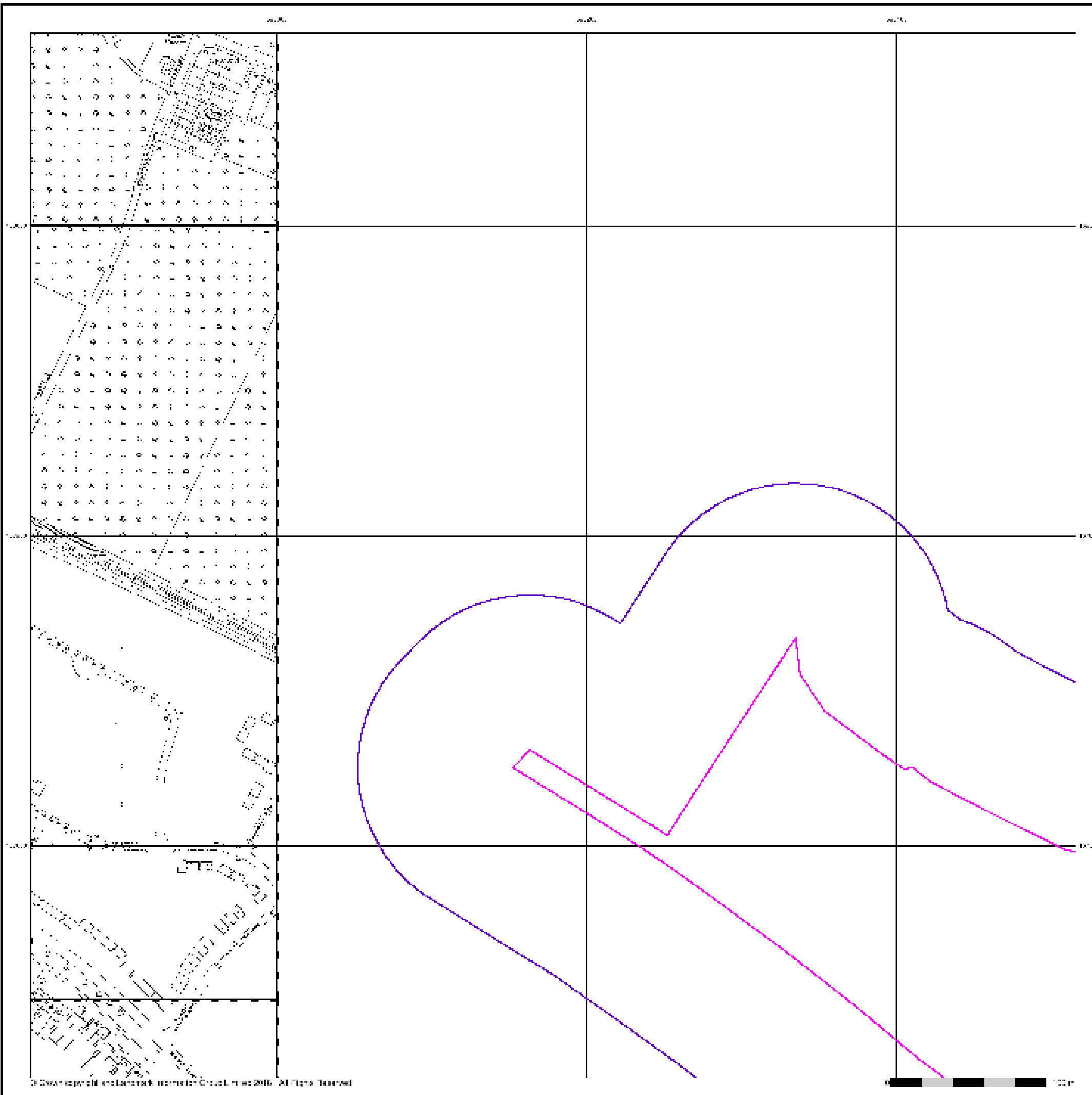
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

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### Ordnance Survey Plan

Published 1960 - 1985

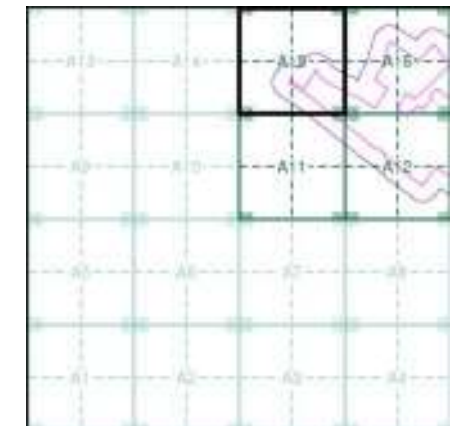
Source map scale - 1:1,250

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)

TQ756884	
1885	
1:1,250	
TQ756740	TQ756740
1950	1950
1:1,250	1:1,250
TQ756784	TQ756784
1863	1863
1:1,250	1:1,250

### Historical Map - Segment A15



### Order Details

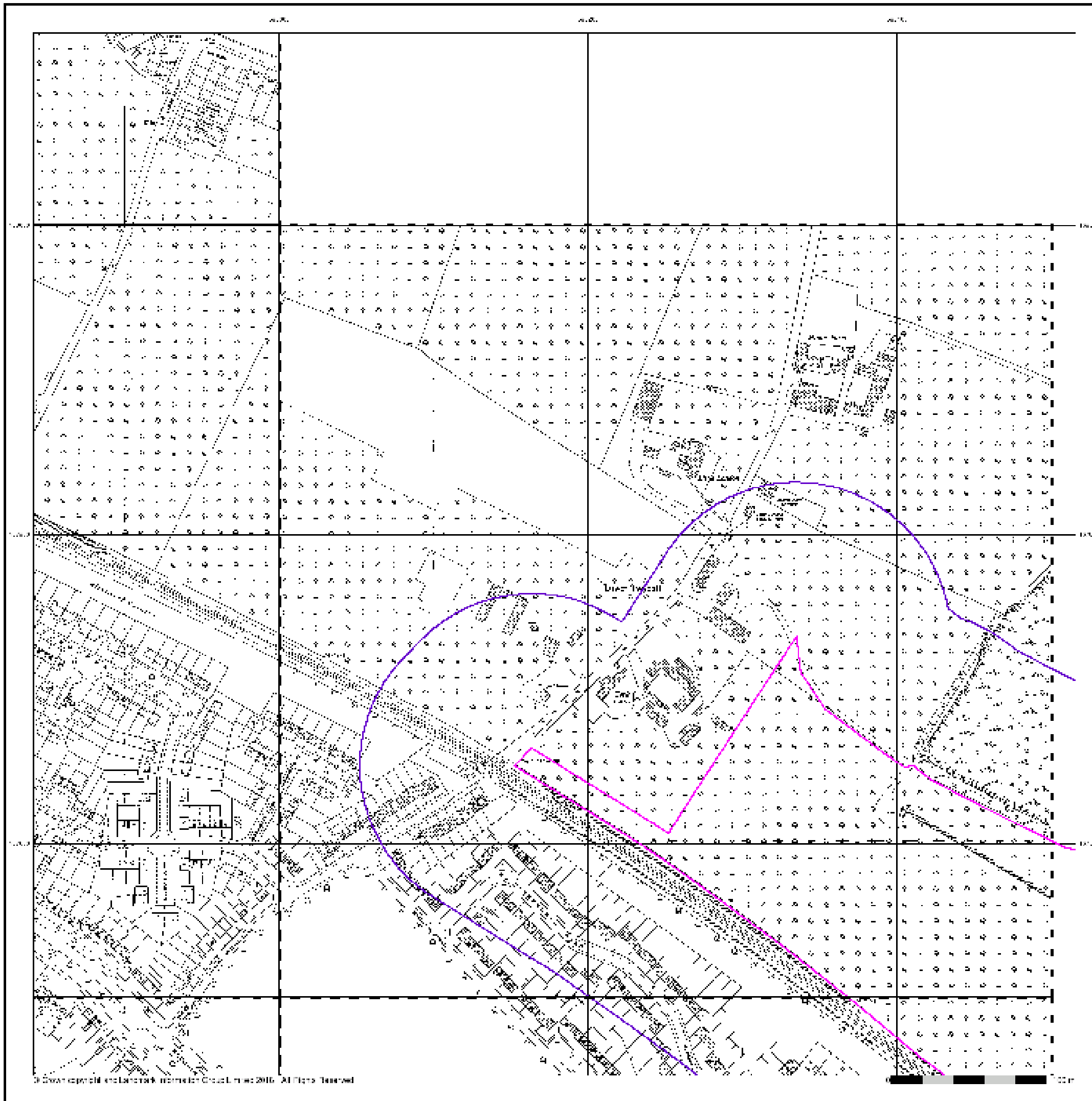
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

### Site Details

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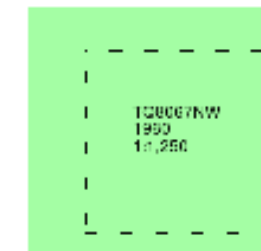
### Additional SIMs

Published 1960

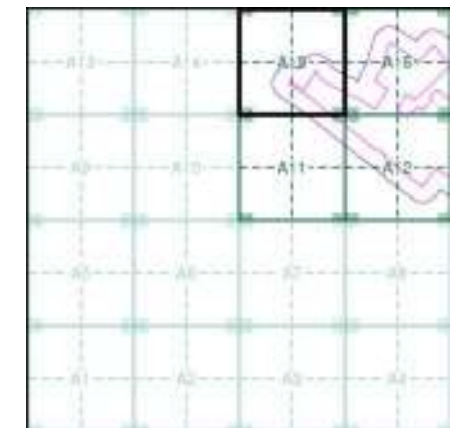
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

### Map Name(s) and Date(s)



### Historical Map - Segment A15



### Order Details

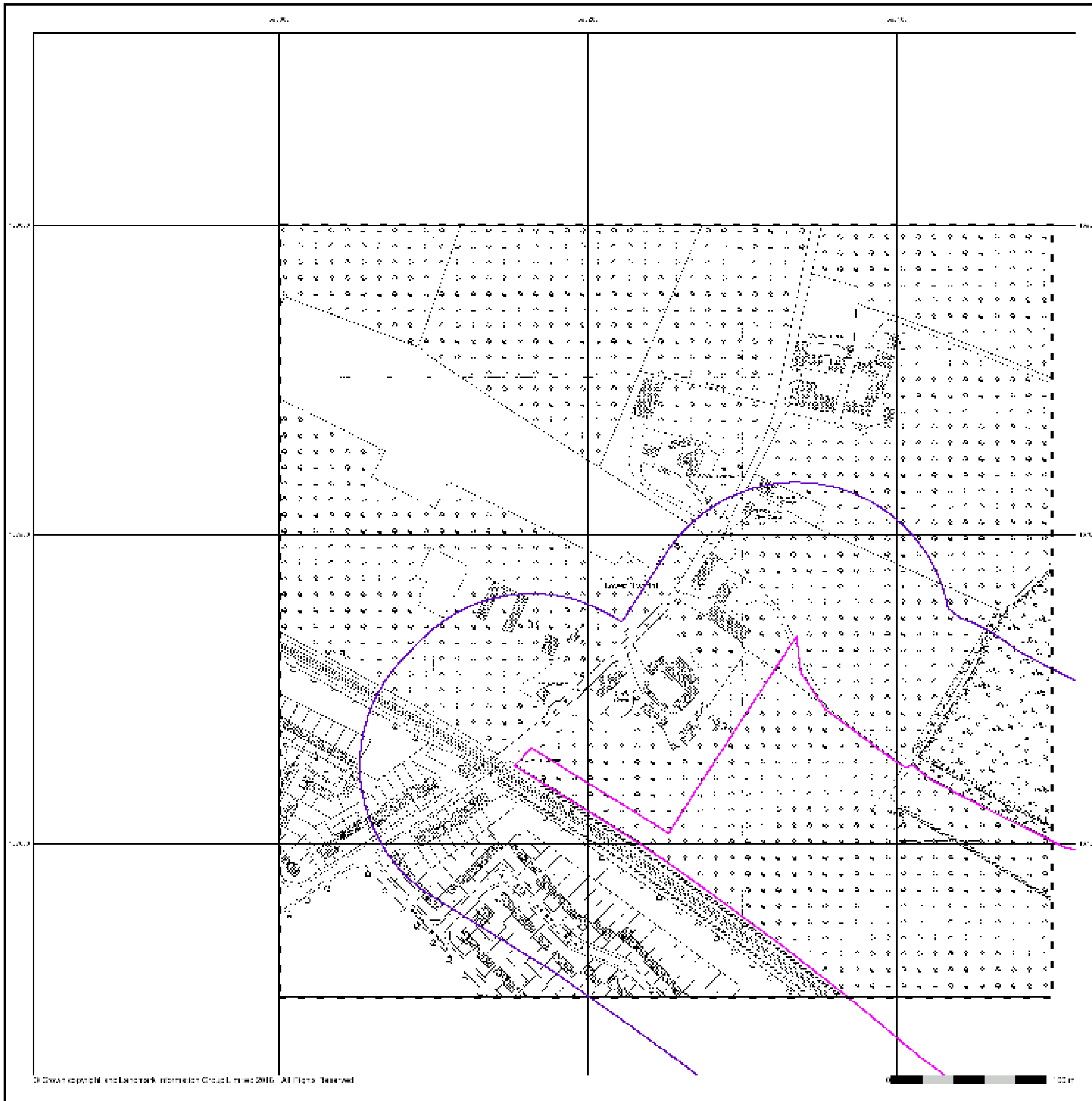
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

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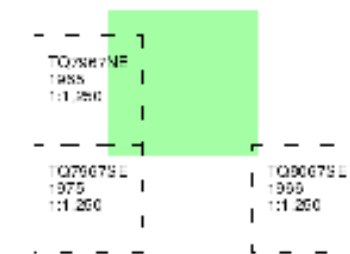
### Ordnance Survey Plan

Published 1965 - 1975

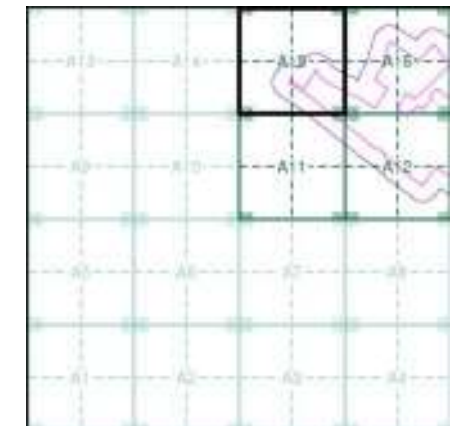
Source map scale - 1:1,250

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 A15



### Order Details

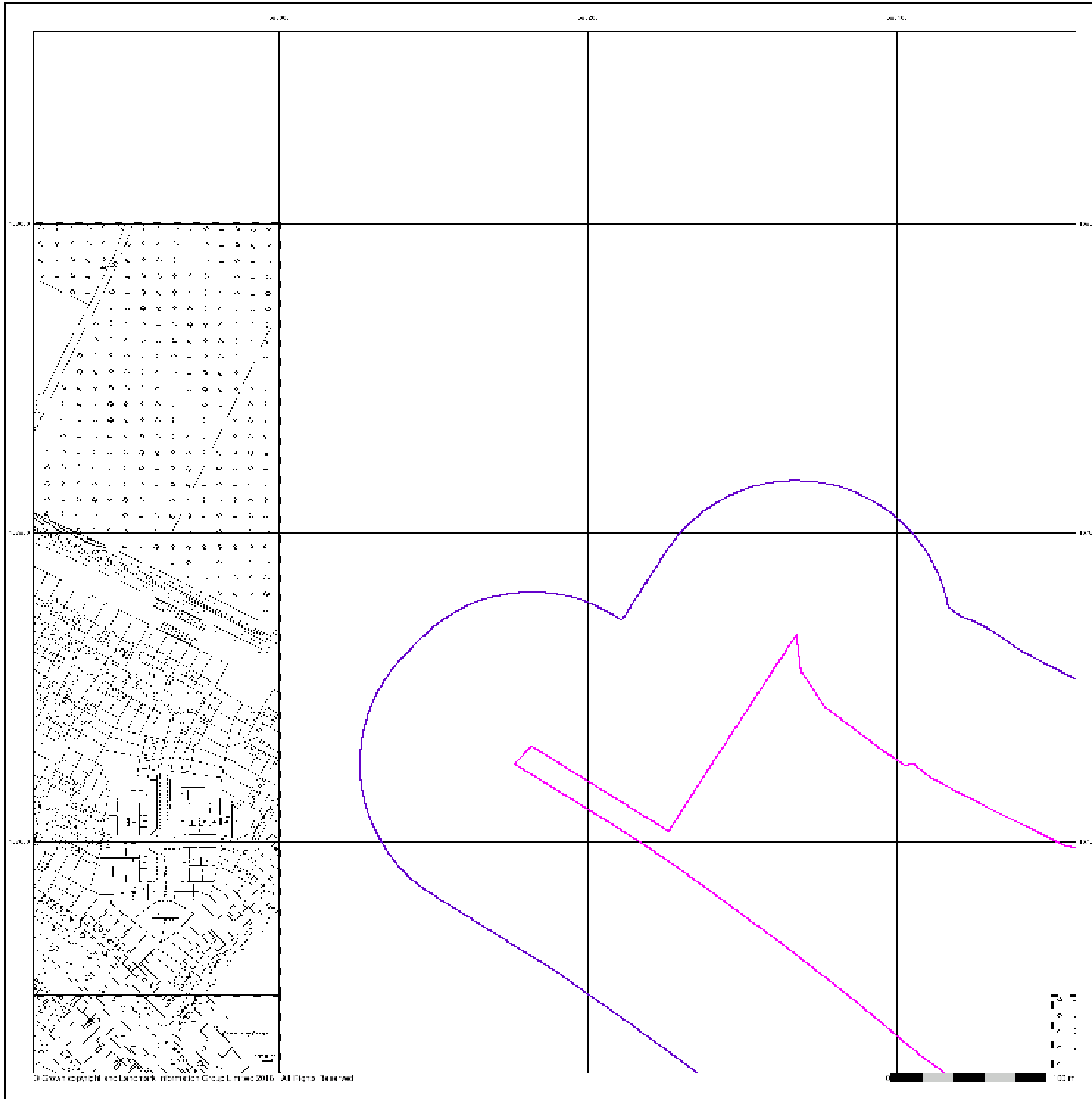
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Slice: A  
Site Area (Ha): 51.8  
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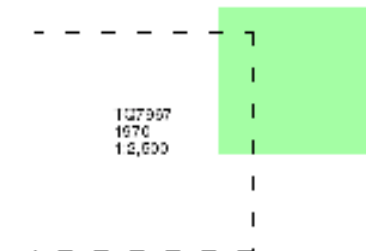
### Ordnance Survey Plan

Published 1970

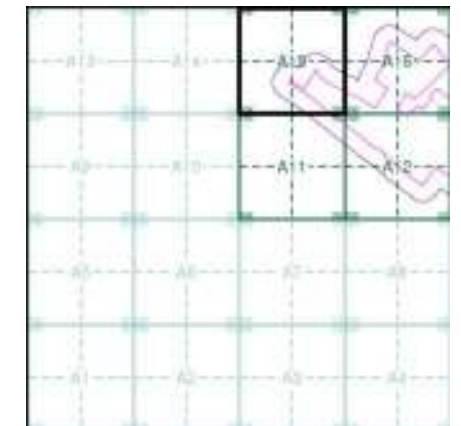
Source map scale - 1:2,500

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 A15



### Order Details

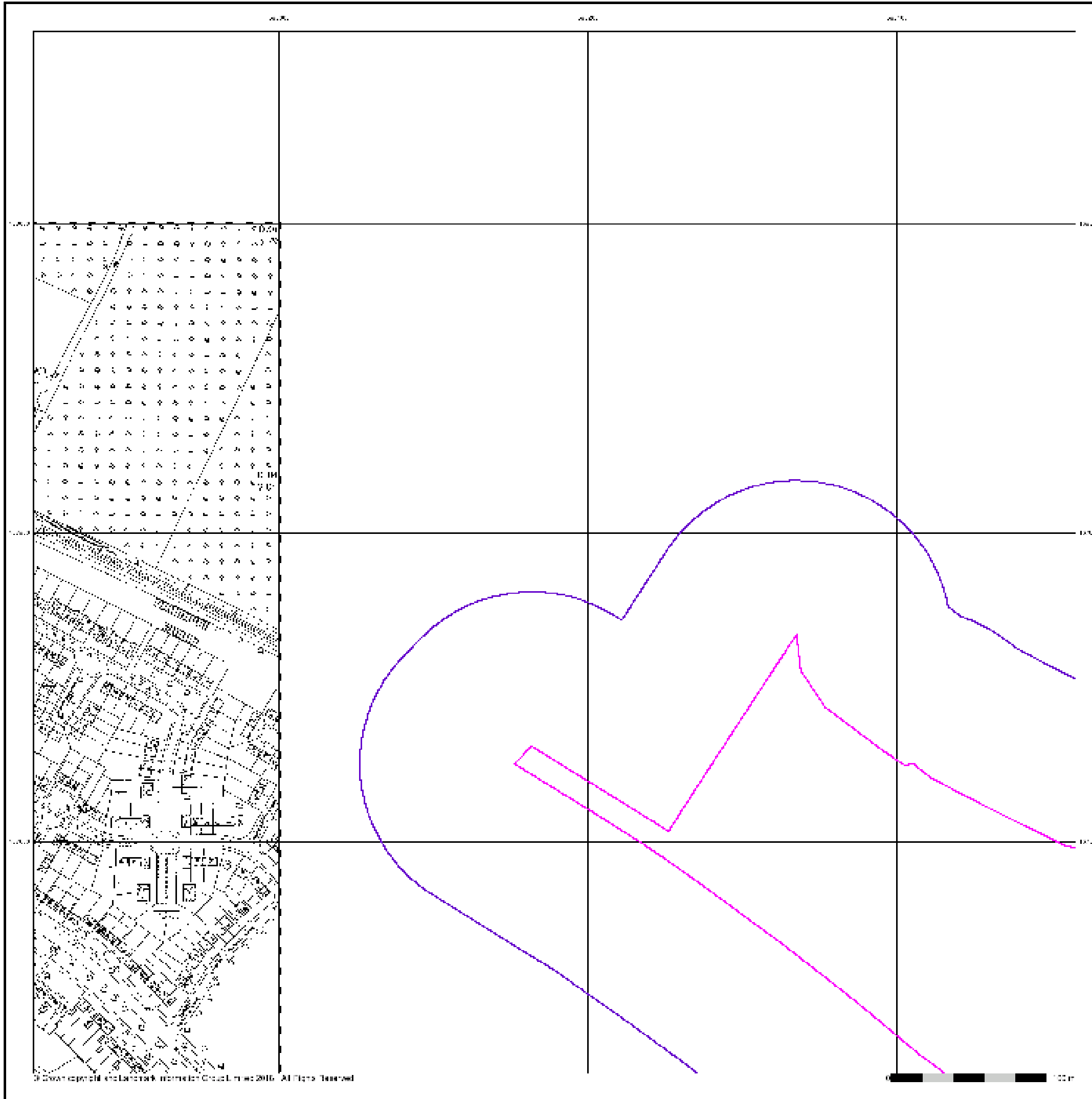
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Customer Ref:	44538-3501
National Grid Reference:	580320, 167230
Slice:	A
Site Area (Ha):	51.8
Search Buffer (m):	100

### Site Details

1, Russett Farm, Rainham, GILLINGHAM, ME8 7AT



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





### Ordnance Survey Plan

Published 1975

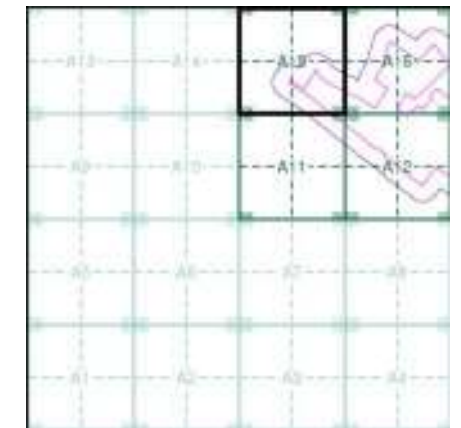
Source map scale - 1:1,250

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 A15



### Order Details

Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

### Site Details

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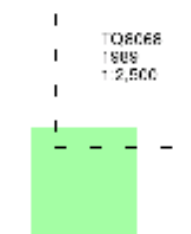
### Additional SIMs

Published 1989

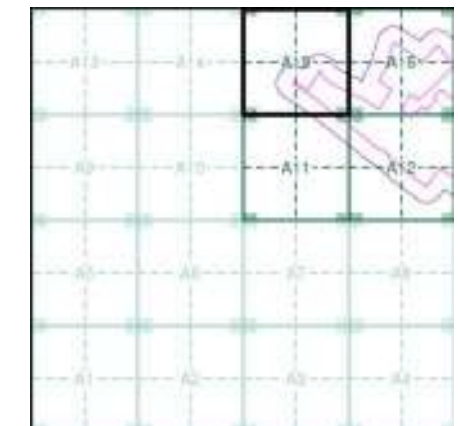
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

### Map Name(s) and Date(s)



### Historical Map - Segment A15



### Order Details

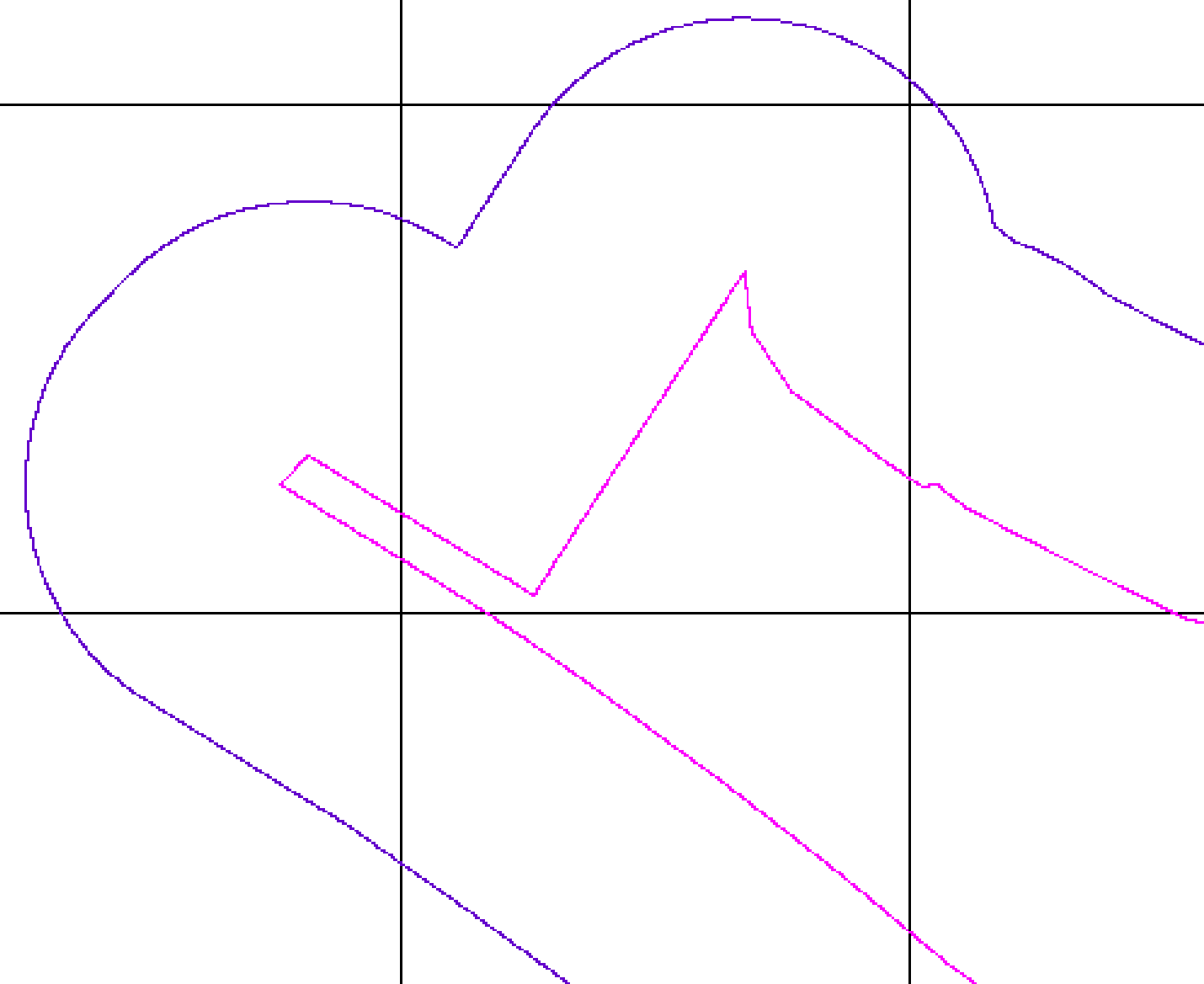
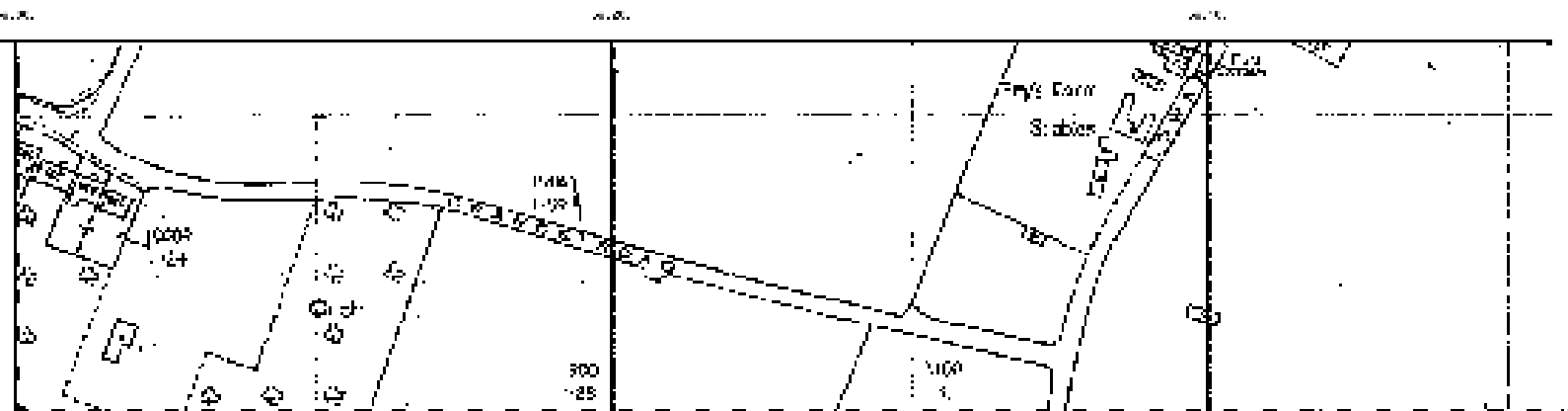
Order Number:	178768733_1_1
Customer Ref:	44538-3501
National Grid Reference:	580320, 167230
Slice:	A
Site Area (Ha):	51.8
Search Buffer (m):	100

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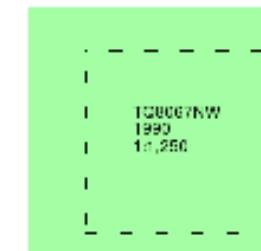
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Published 1990

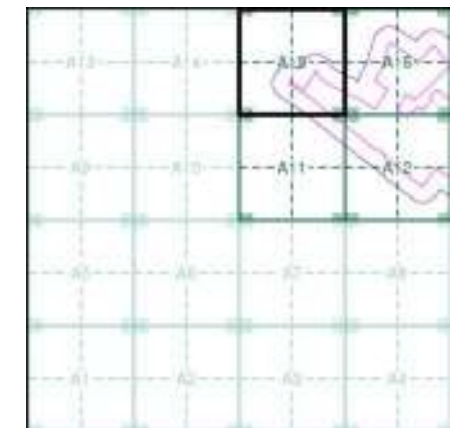
Source map scale - 1:1,250

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### Map Name(s) and Date(s)



### Historical Map - Segment A15



### Order Details

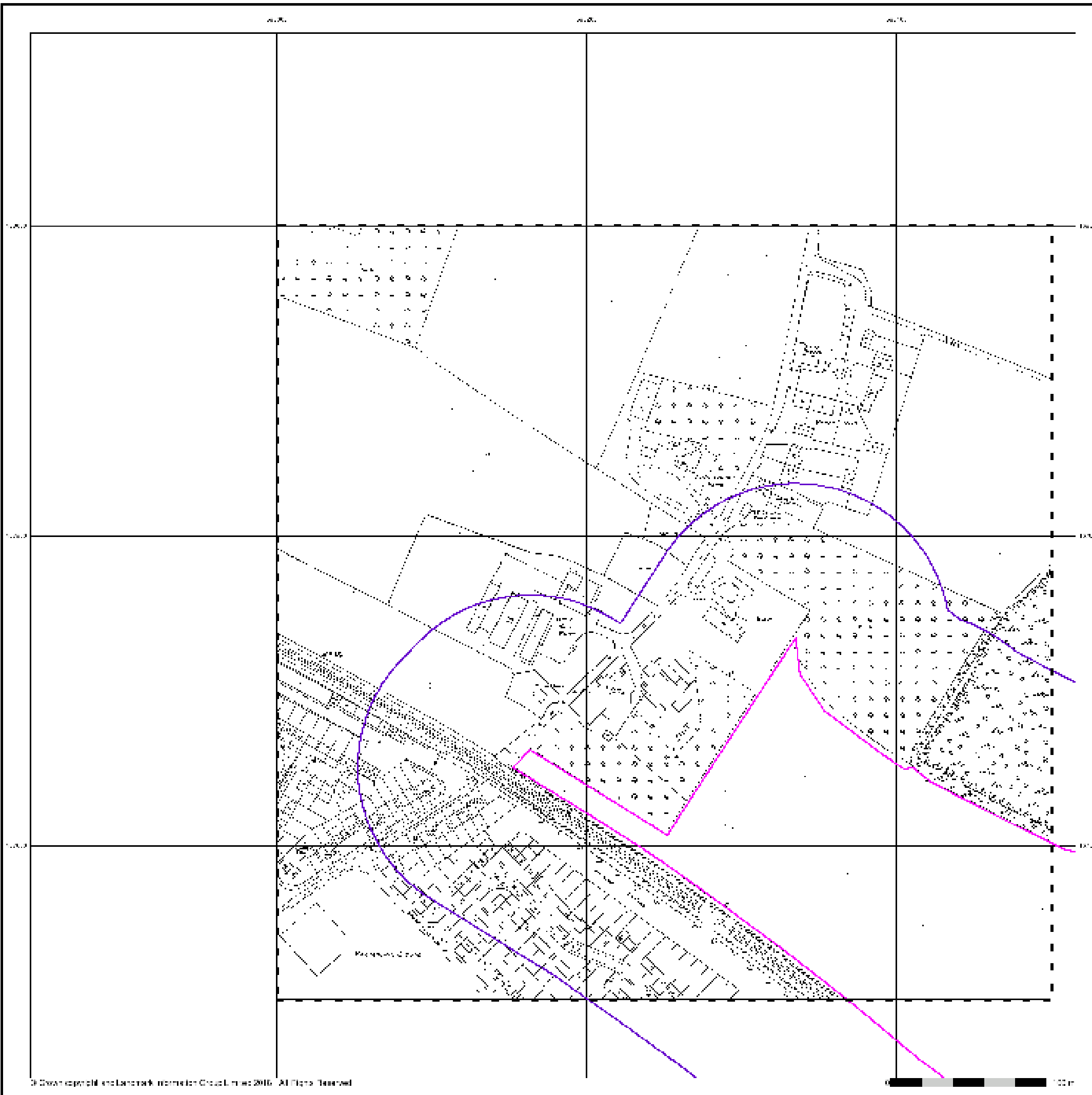
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

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## Large-Scale National Grid Data

Published 1994

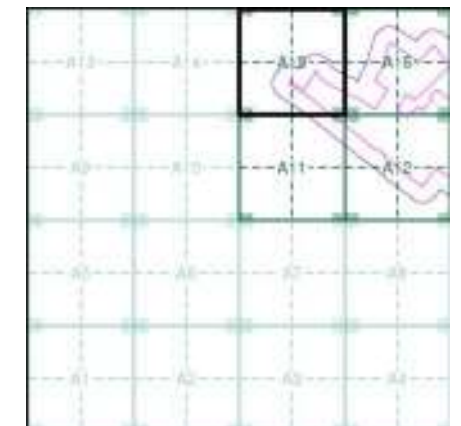
Source map scale - 1:1,250

'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)

107908SL		
1994		
1:250		
107907NP	Q9357NW	Q9357NE
1994	1994	1994
1:250	1:250	1:250
107907SL	Q9357SW	Q9357SE
1994	1994	1994
1:250	1:250	1:250

### Historical Map - Segment A15



### Order Details

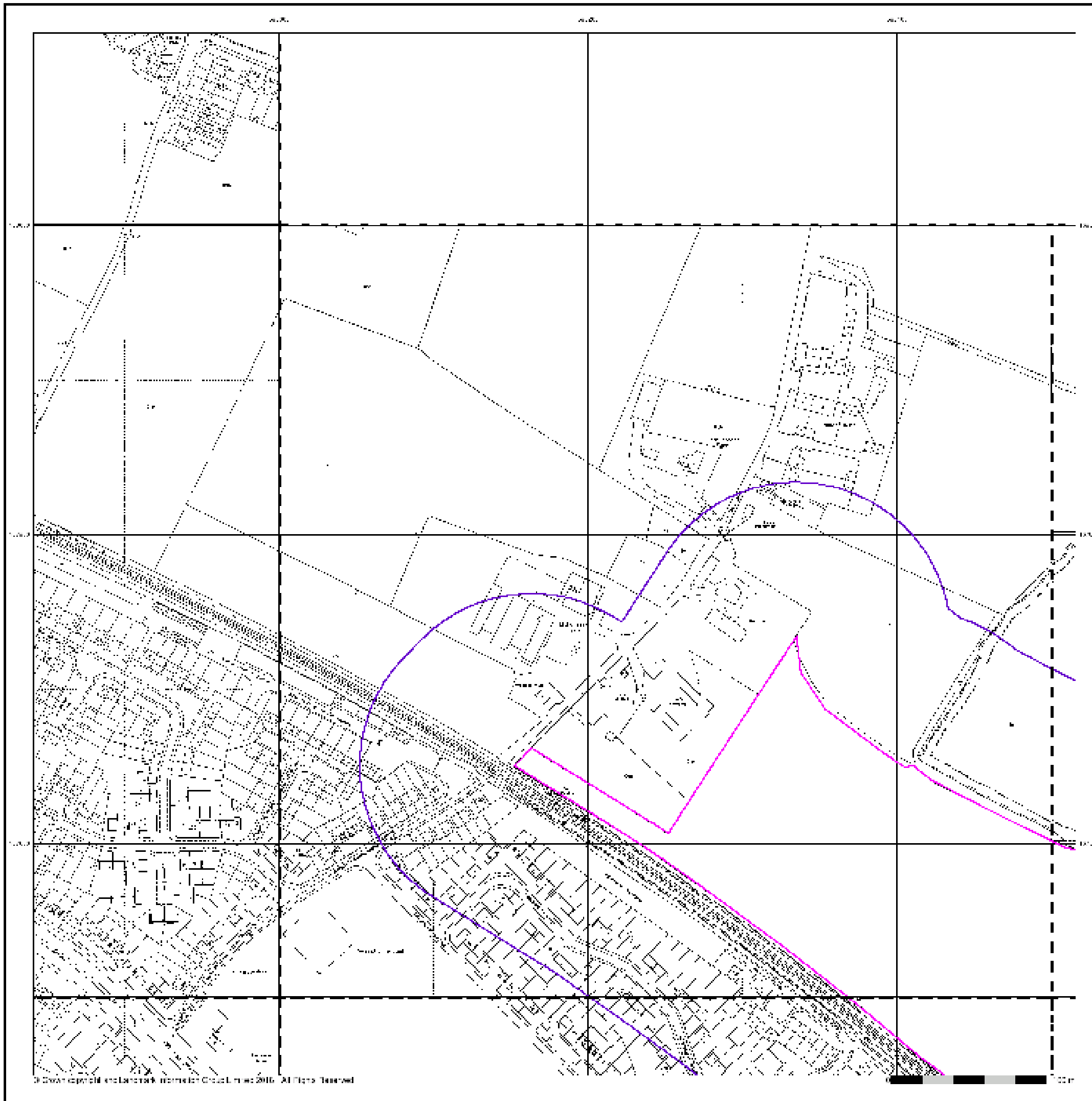
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

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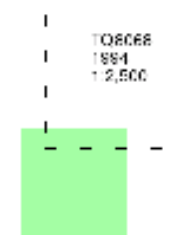
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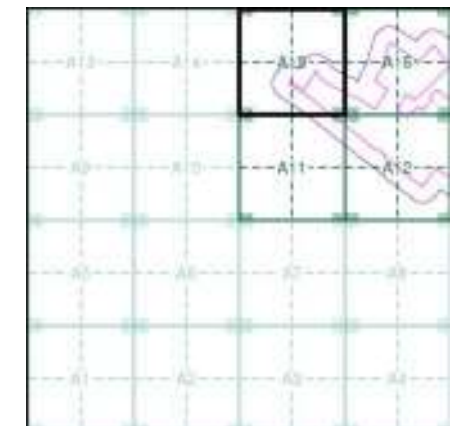
Source map scale - 1:2,500

'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 A15



### Order Details

Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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# Historical Mapping Legends

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

	Quarry		Grave Pt		Wash Pt
	Clay Pt		Slough		Sewer Leap
	Slatting Masonry		Flint Work		
	Marsh		Heath		Oaks
	Rough Pasture		Luzes		Wood
	Mixed Wood		Fruitwood		Orchard
	Ridge Ft		Fence		Sloping Slabs
	Tany		Waterfall		Duck
	Twp Station		Ehude at Twp Station		
	Ranch Mark		Surface Wood		
	Arched Slender Twp of water		Antiquities (Site of)		
	Culling		Enbankment		
	Railway crossing Road		Level Crossing		Road crossing feature
	Railway crossing River or Canal		Road over single stream		Road over River or Canal
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Borough Boundary (Scotland)				

	Boundary between Sluic		Water Cutt Ww
	Rills Road		Pit
	Electricity Pole		Signal Post
	Four Fences		Sluic
	Four Fins		Spring
	Gate or Water Course		Telephone Call Box
	Mile Stone		Trench
	Mixing Post or Pier		Well

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

	Inactive Quarry		Active Quarry
	Rise		Fence
	Curt		Slopes
	Roofed Building		Glazed Roof Building
	Sloping Highway		Archway
	Non-Coniferous Tree (not surveyed)		Coniferous Tree (not surveyed)
	Coniferous Tree		Rocks
	Coppice Oak		Roads
	Rough Grassland		Heath
	Direction of water flow		Ranch Mark
	Cave Entrance		Tidegauge Station
	Electricity Transmission Line		Electricity Pylon
	Course Boundary (Geographical)		
	County & Civil Parish Boundary		
	Civil Parish Boundary		
	Administrative County & Civil Parish Boundary		
	London Borough Boundary		
	Symbol marking point where boundary meaning changes		

	Belt		Filling Post or Post
	Barricade		Furnace
	Cannon		Public Convenience
	Cannon Crans		Public House
	Cannon		Pump
	Cannon		Pump Station
	Cannon		Pillar Wash
	Cannon		Sewage Pump Station
	Cannon		Signal Tower
	Cannon		Signal Tower Light
	Cannon		Spring
	Cannon		Tank or Tank
	Cannon		Telephone Call Box
	Cannon		Telephone Call Post
	Cannon		Well
	Cannon		Well

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

	Cliff		Slopes
	Balk		Boulders (scattered)
	Boulders		Boulders (scattered)
	Discontinual Boulder		Screen
	Non-Coniferous Tree (not surveyed)		Coniferous Tree (not surveyed)
	Non-Coniferous trees (not surveyed)		Coniferous trees (not surveyed)
	Orchard tree		Scrub
	Coppice Oak		Ranch
	Rough Grassland		Heath
	Direction of water flow		Tidegauge Station
	Electricity Transmission Line		Electricity Pylon
	Building with Building Seed		Roofed Building
	Roofed Building		Glazed Roof Building
	Civil parish/community boundary		
	District boundary		
	County boundary		
	Boundary post/stone		
	Boundary meaning changes (not always apparent)		

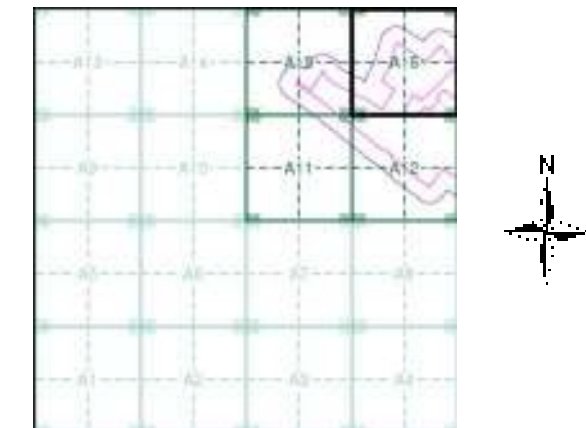
	Public House		Pillar Wash
	Public Convenience		Pump
	Pump Station		Pillar Wash
	Sewage Pump Station		Signal Tower
	Signal Tower		Signal Tower Light
	Spring		Tank or Tank
	Telephone Call Box		Telephone Call Post
	Well		Well



## Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Kent	1:2,500	1895	2
Kent	1:2,500	1895	3
Kent	1:2,500	1896	4
Kent	1:2,500	1909	5
Kent	1:2,500	1932	6
Ordnance Survey Plan	1:2,500	1966 - 1967	7
Ordnance Survey Plan	1:1,250	1966	8
Additional SIMs	1:2,500	1989	9
Large-Scale National Grid Data	1:1,250	1994	10
Large-Scale National Grid Data	1:2,500	1994	11

## Historical Map - Segment A16



## Order Details

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

## Site Details

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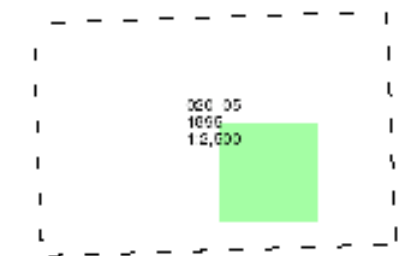
**Kent**

**Published 1895**

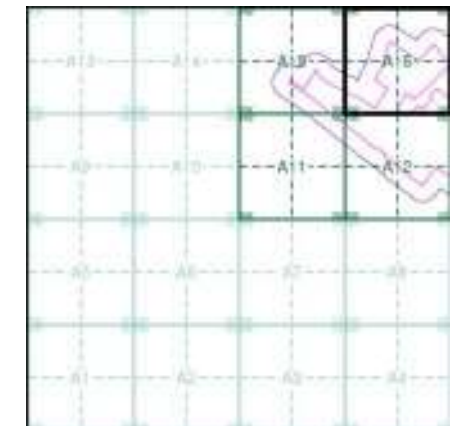
**Source map scale - 1:2,500**

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 A16**



**Order Details**

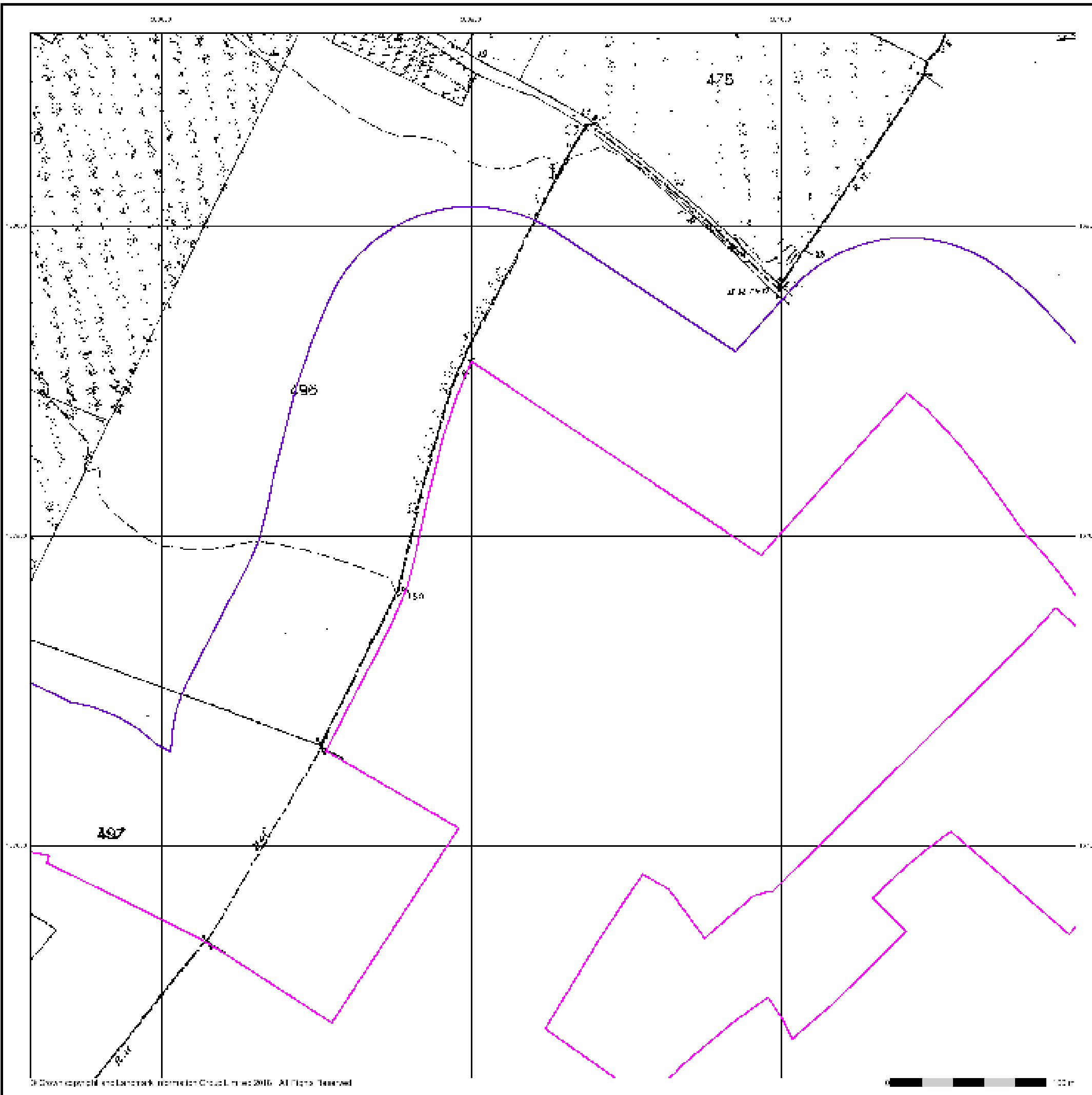
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
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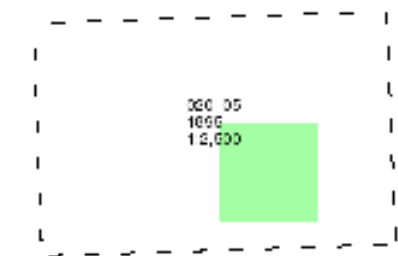
Kent

Published 1895

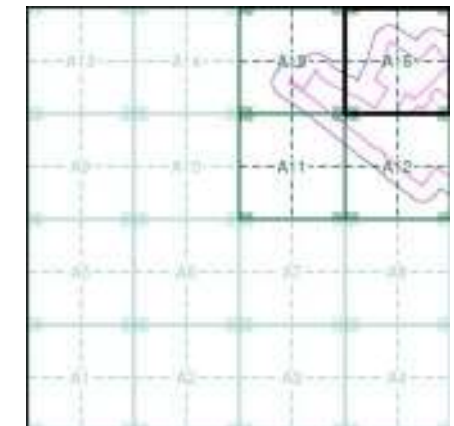
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Map Name(s) and Date(s)



Historical Map - Segment A16



Order Details

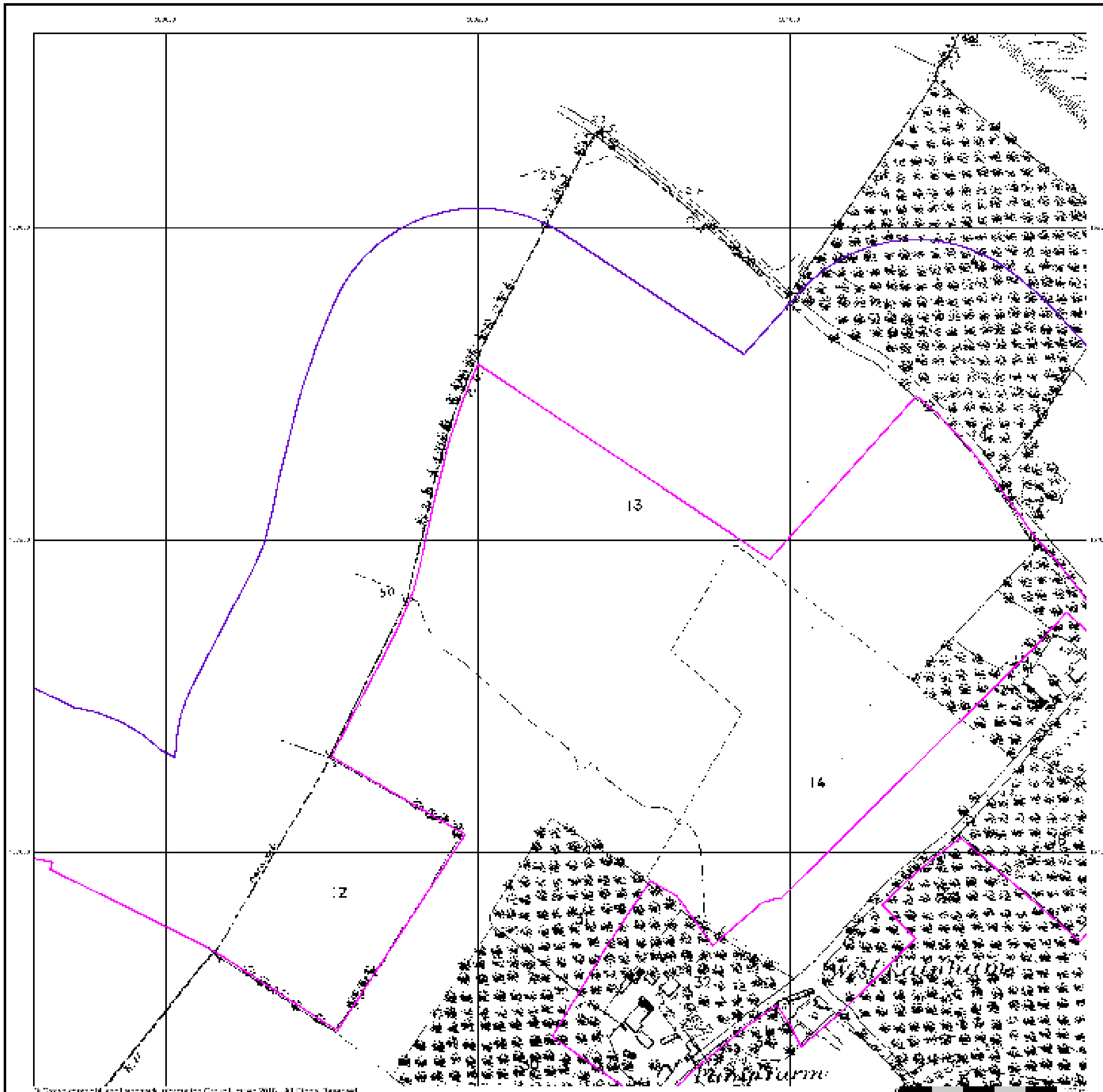
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
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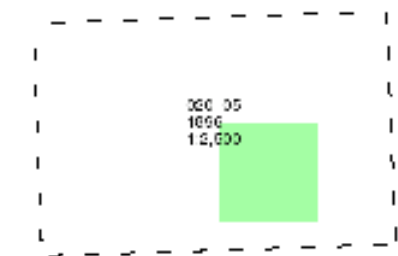
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Published 1896

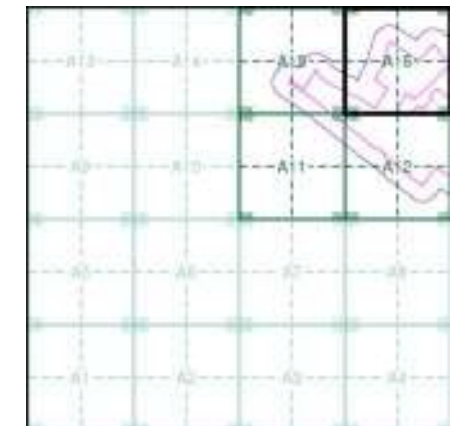
Source map scale - 1:2,500

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 A16



Order Details

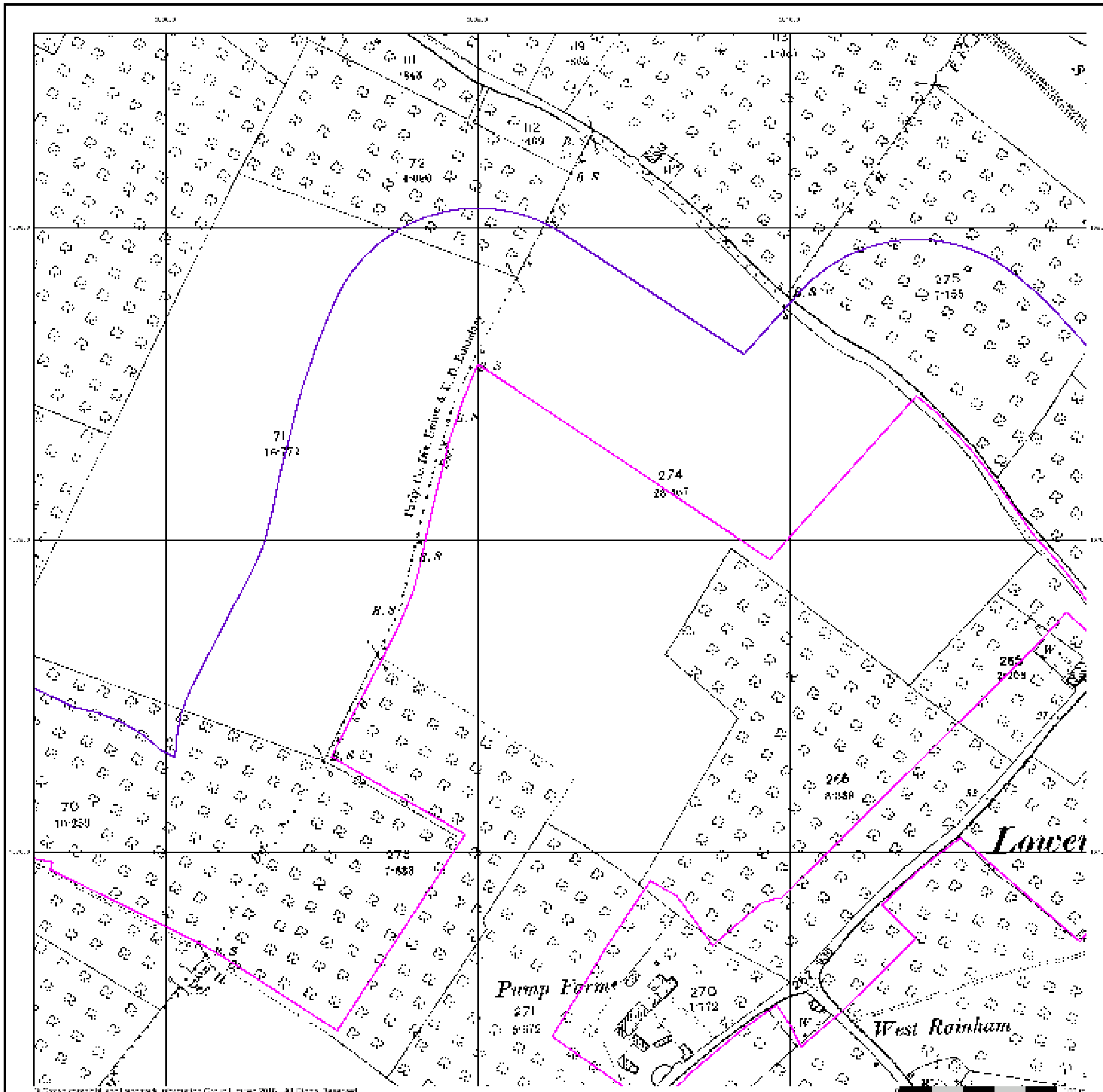
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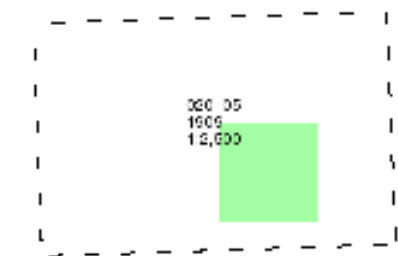
Kent

Published 1909

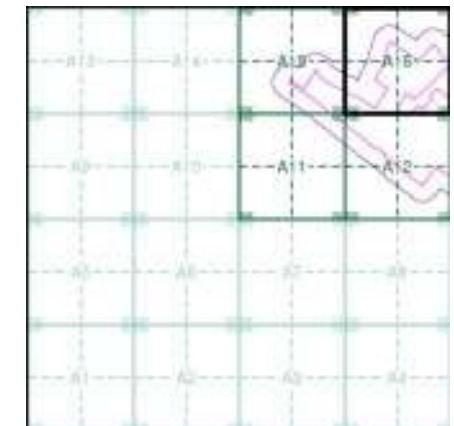
Source map scale - 1:2,500

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 A16



Order Details

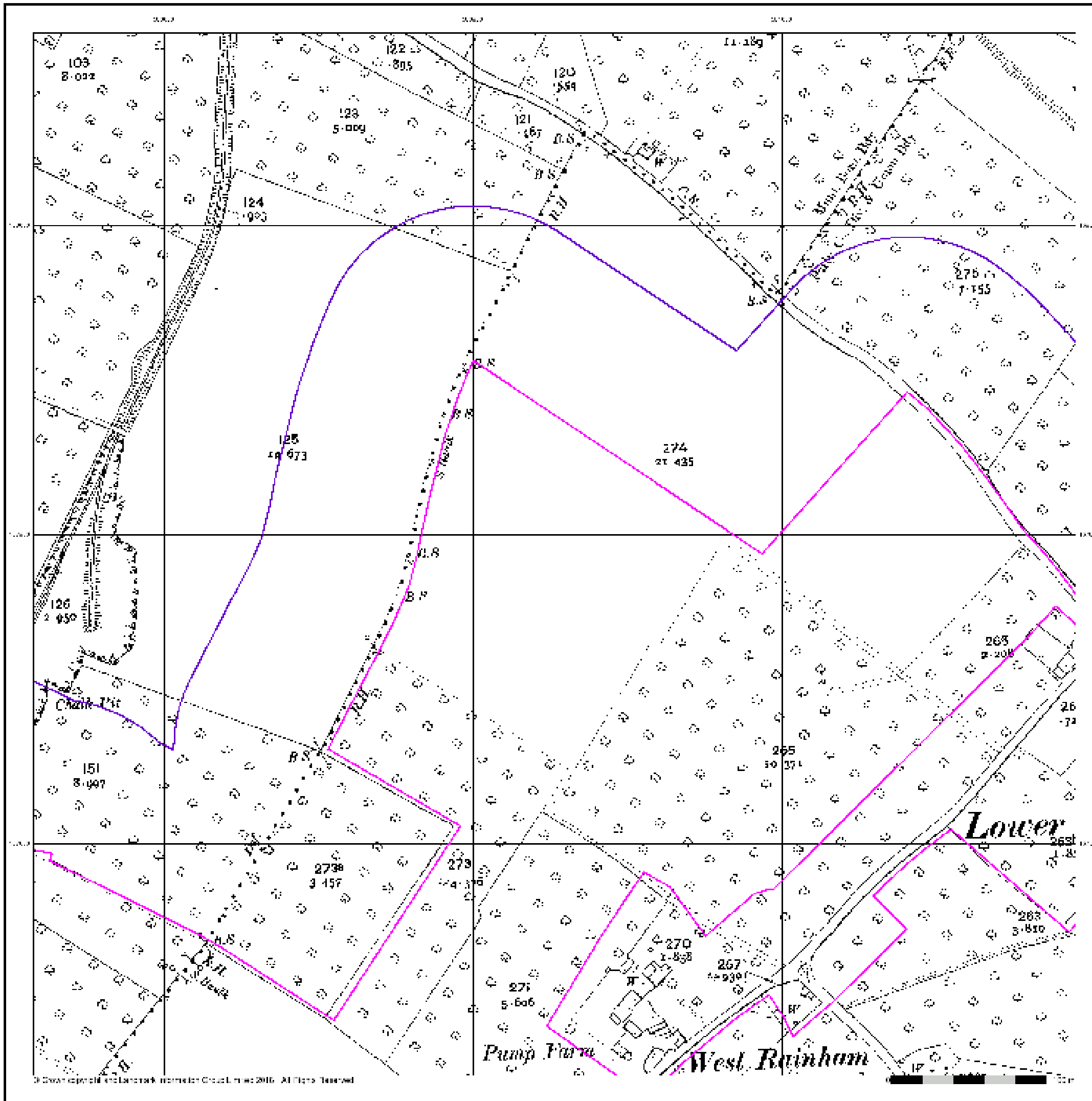
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
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Kent

Published 1932

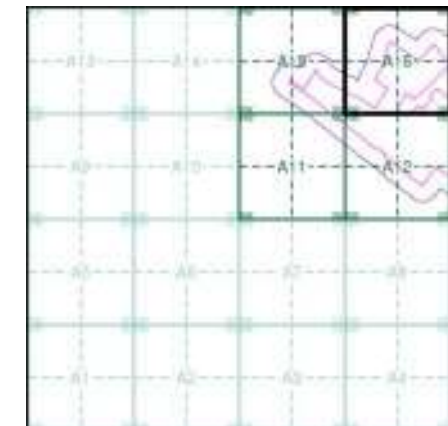
Source map scale - 1:2,500

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 A16



Order Details

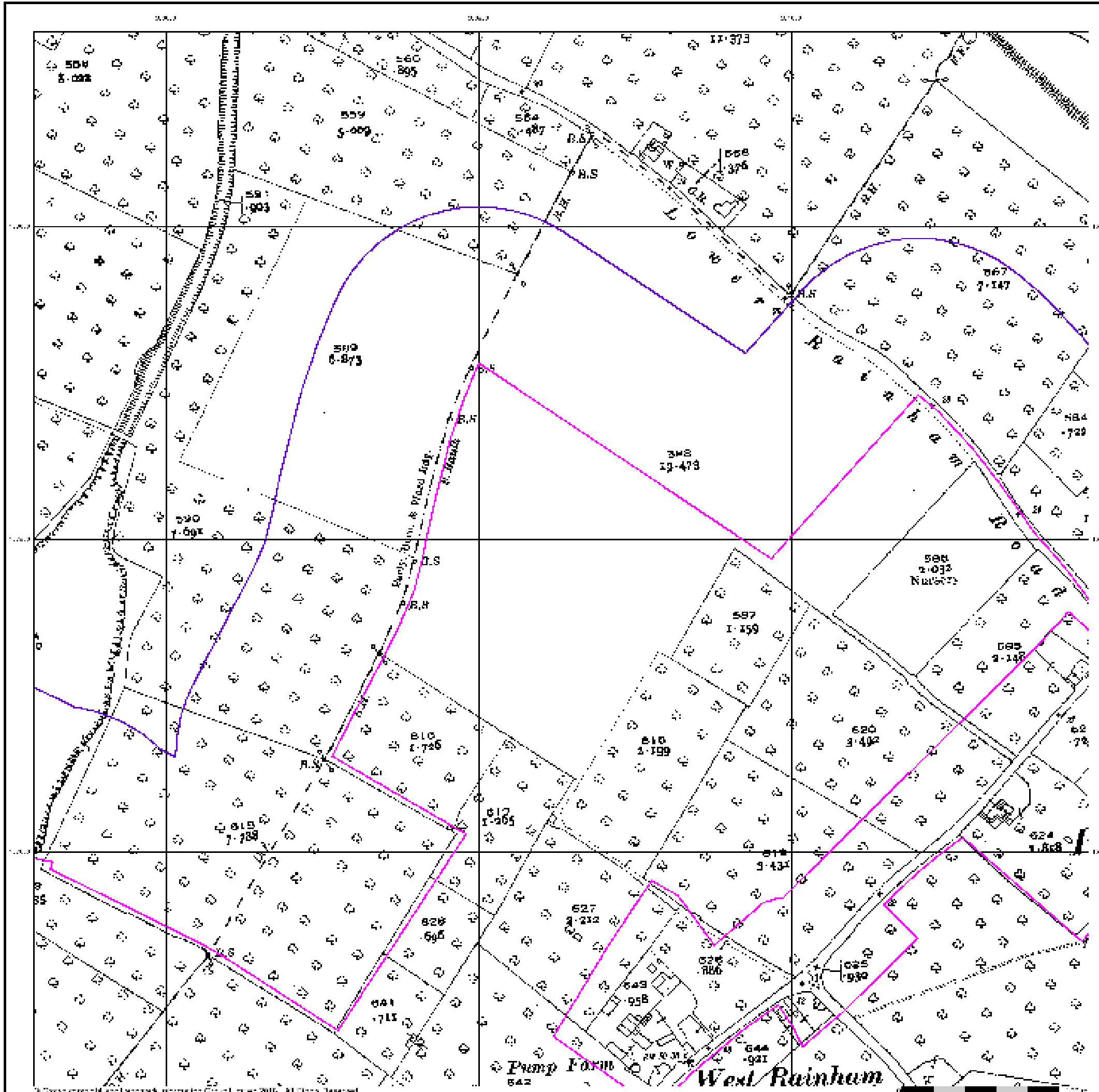
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Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
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### Ordnance Survey Plan

Published 1966 - 1967

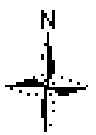
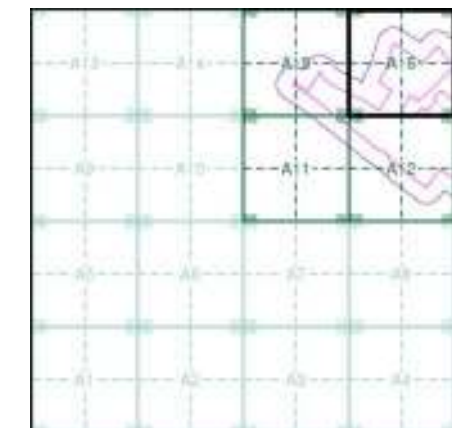
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### Map Name(s) and Date(s)

T08088 1966 1:2,500	T08166 1966 1:2,500
T08087 1967 1:2,500	T08167 1967 1:2,500

### Historical Map - Segment A16



### Order Details

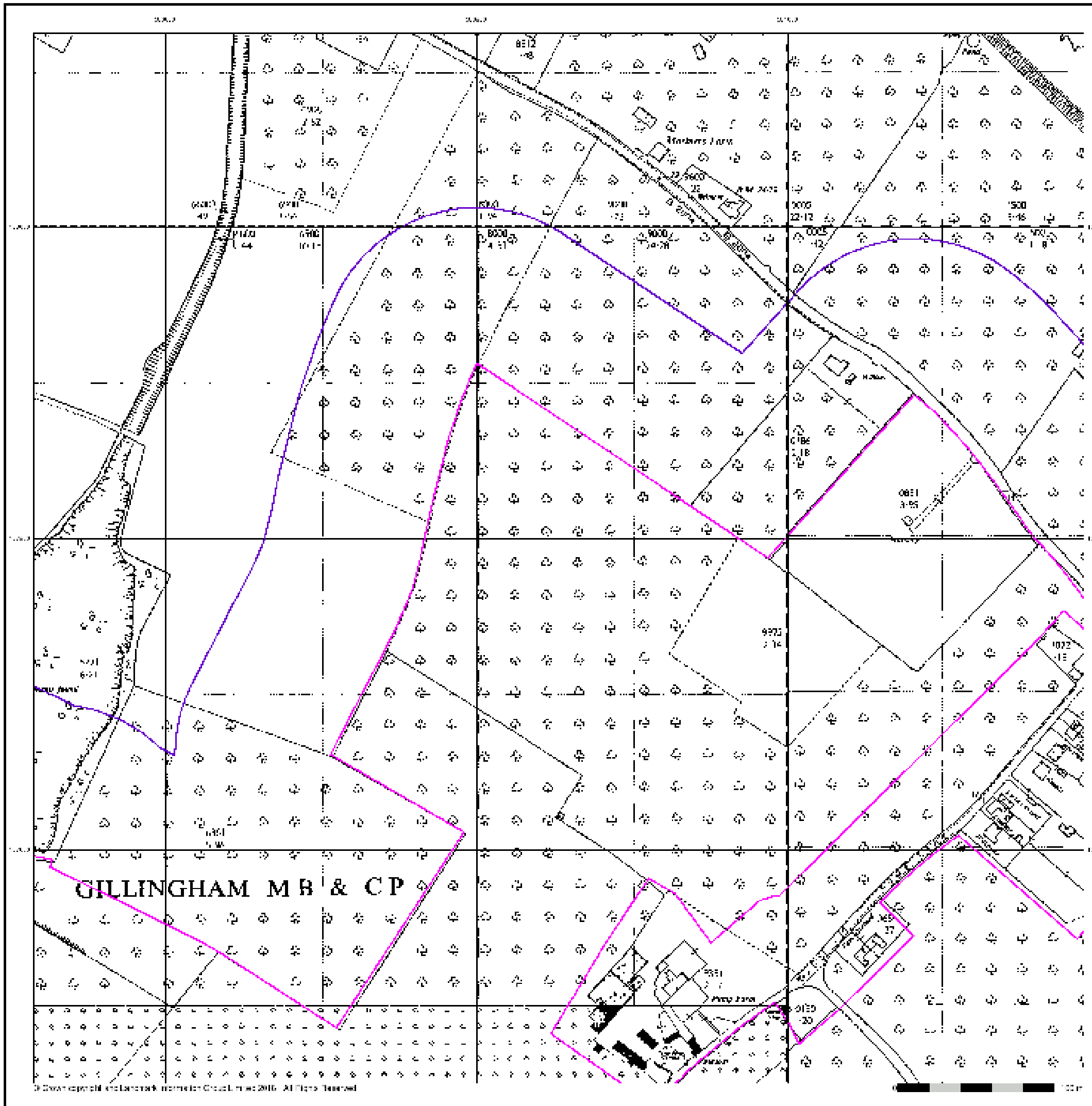
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### Ordnance Survey Plan

Published 1966

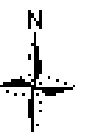
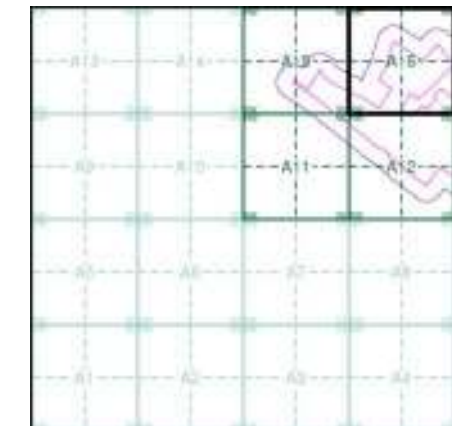
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered 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 A16



### Order Details

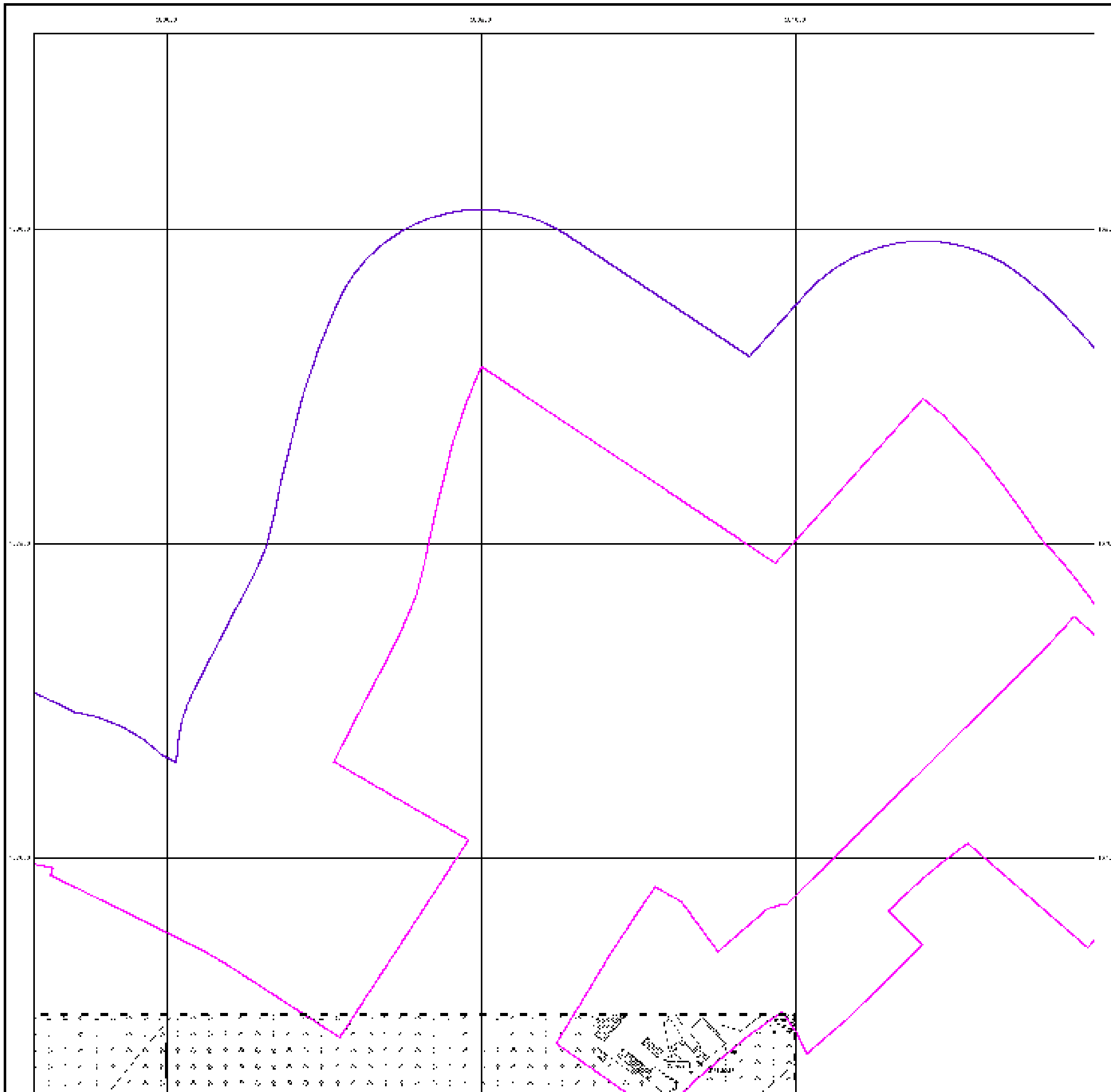
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### Additional SIMs

Published 1989

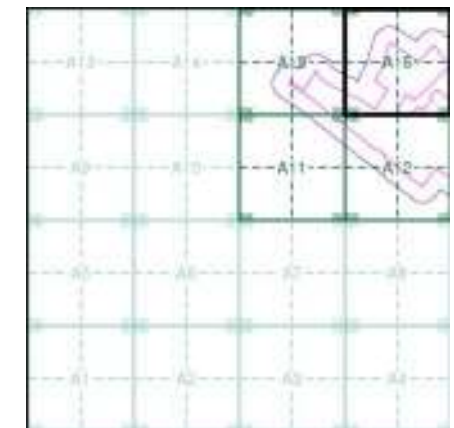
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

### Map Name(s) and Date(s)



### Historical Map - Segment A16



### Order Details

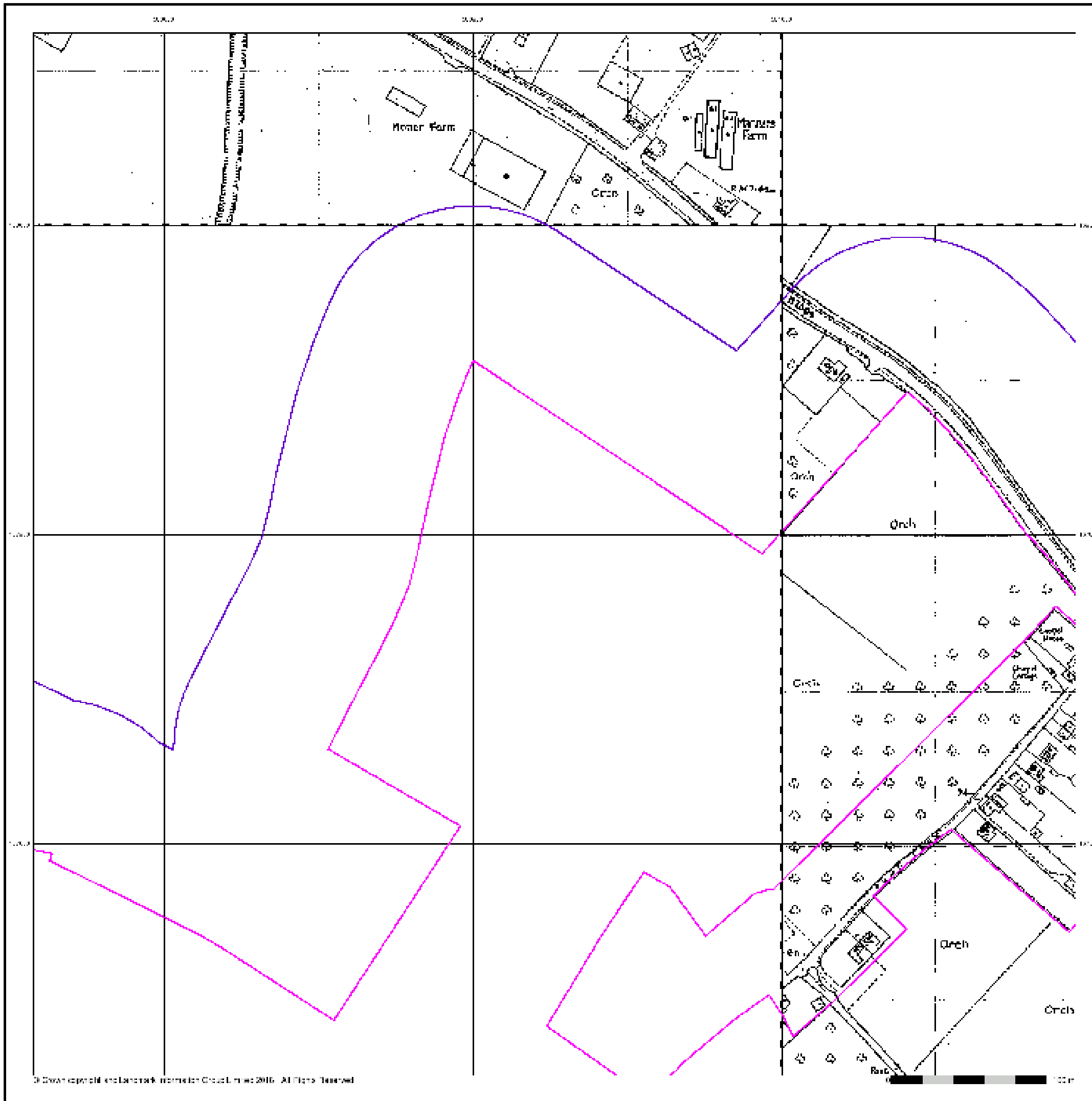
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 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

### Site Details

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## Large-Scale National Grid Data

Published 1994

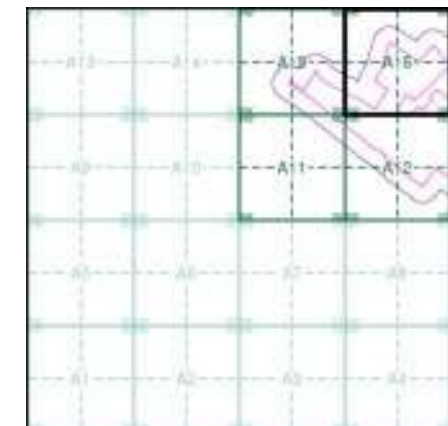
Source map scale - 1:1,250

'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 A16



### Order Details

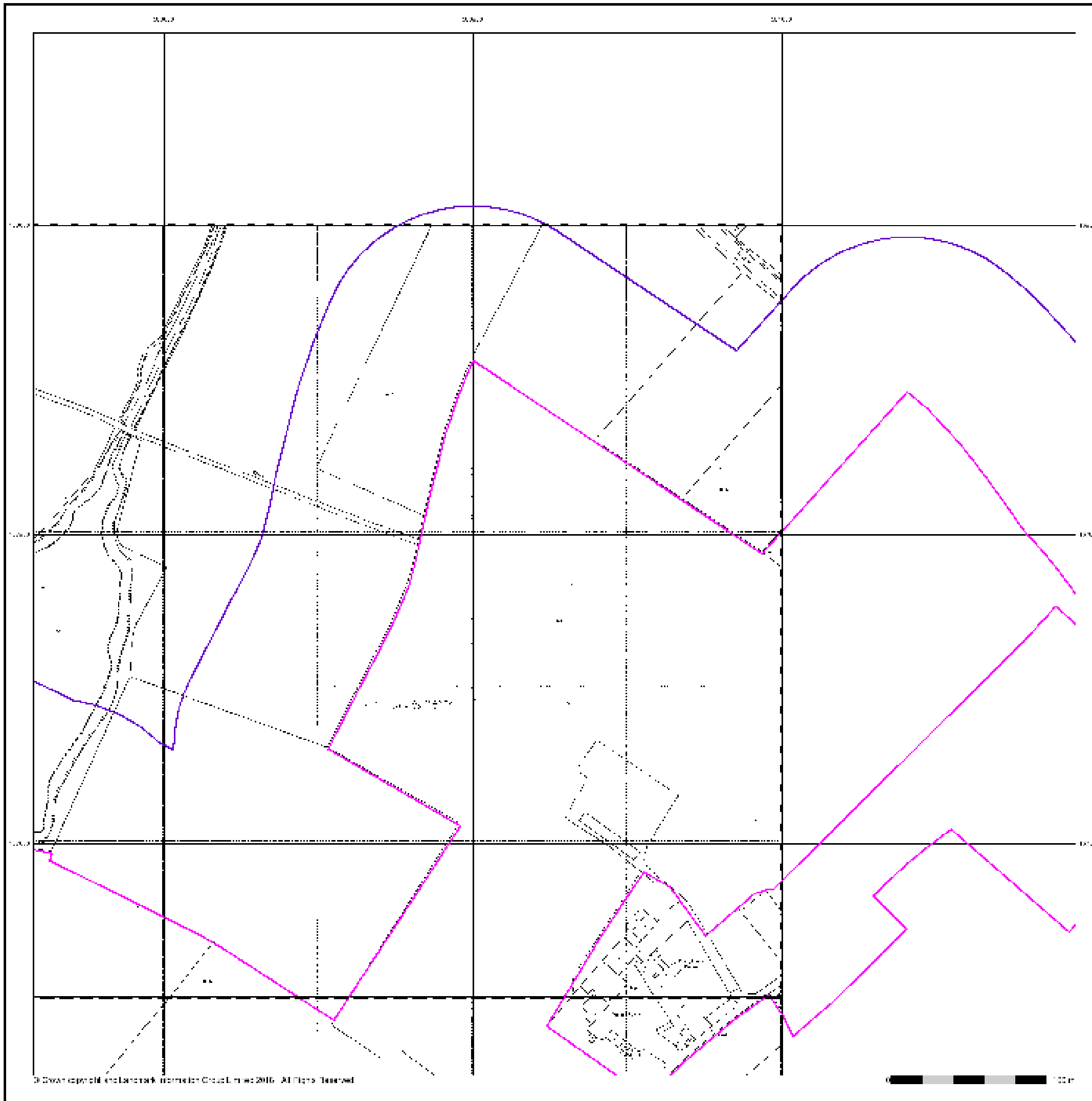
Order Number: 178768733\_1\_1  
Customer Ref: 44538-3501  
National Grid Reference: 580320, 167230  
Slice: A  
Site Area (Ha): 51.8  
Search Buffer (m): 100

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### Large-Scale National Grid Data

Published 1994

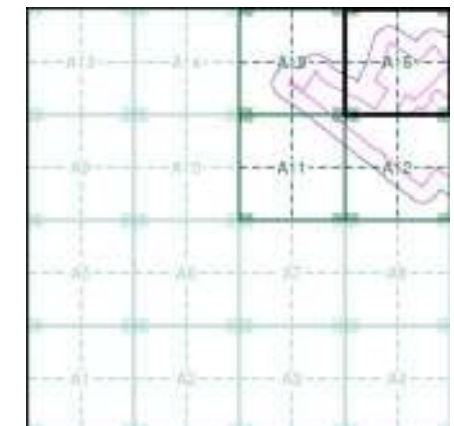
Source map scale - 1:2,500

'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)

T08088 1994 1:2,500	T08166 1994 1:2,500
	T08167 1994 1:2,500

### Historical Map - Segment A16



### Order Details

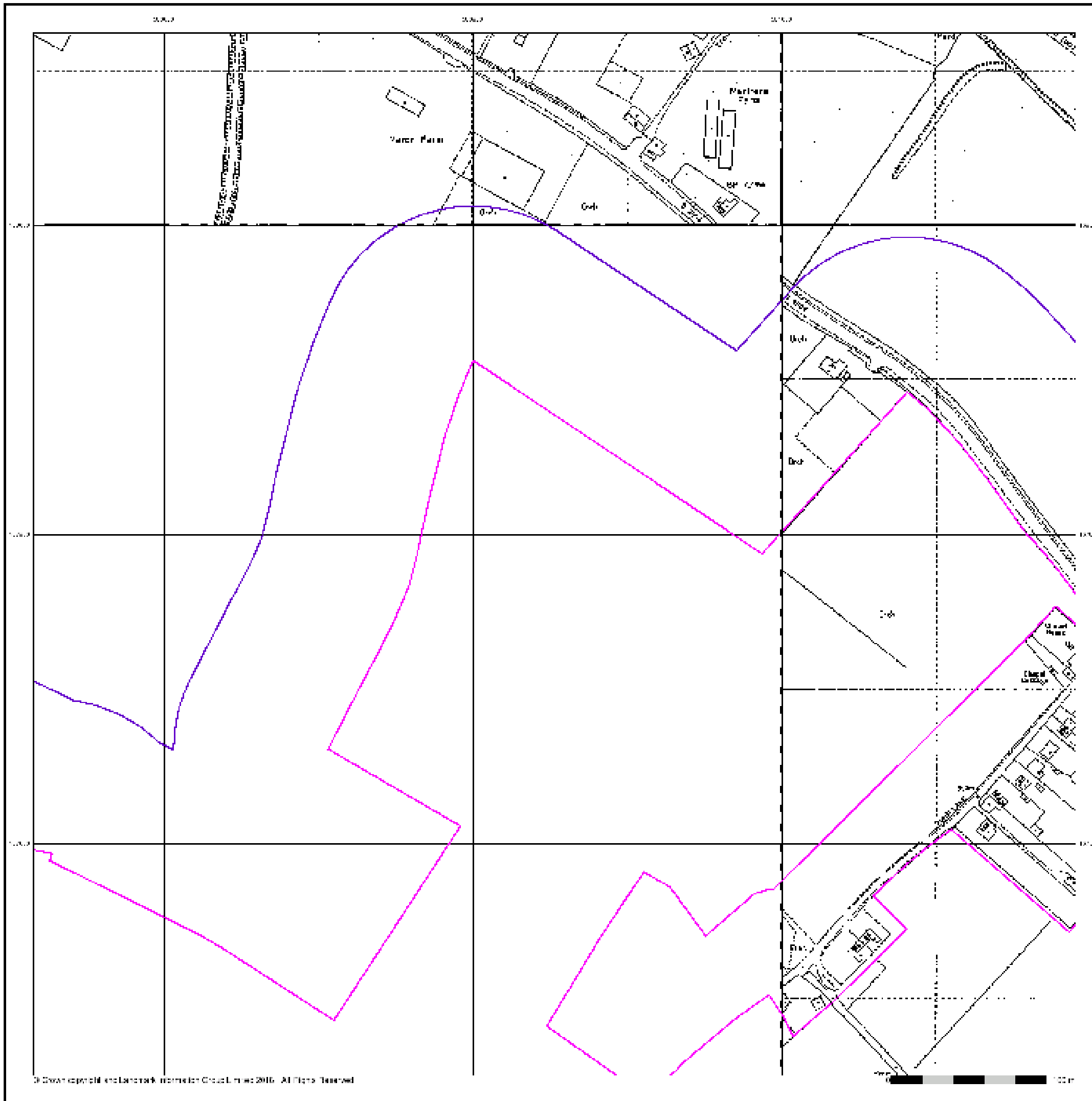
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 580320, 167230  
 Slice: A  
 Site Area (Ha): 51.8  
 Search Buffer (m): 100

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## Appendix B2: Historical Maps South-East (Area 2)

# Historical Mapping Legends

## Ordnance Survey County Series 1:10,560

## Ordnance Survey Plan 1:10,000

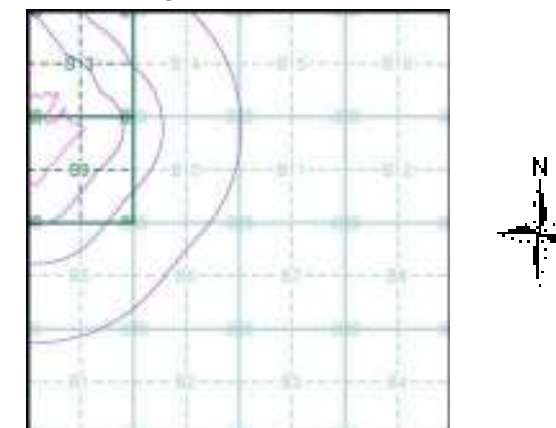
## 1:10,000 Raster Mapping



### Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Kent	1:10,560	1869	2
Kent	1:10,560	1897 - 1898	3
Kent	1:10,560	1909	4
Kent	1:10,560	1931 - 1932	5
Kent	1:10,560	1938	6
Kent	1:10,560	1950	7
Ordnance Survey Plan	1:10,000	1961	8
Ordnance Survey Plan	1:10,000	1969	9
Ordnance Survey Plan	1:10,000	1974	10
Ordnance Survey Plan	1:10,000	1985	11
10K Raster Mapping	1:10,000	1999	12
Street View	Variable		13

### Historical Map - Slice B



### Order Details

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 581780, 167180  
 Slice: B  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

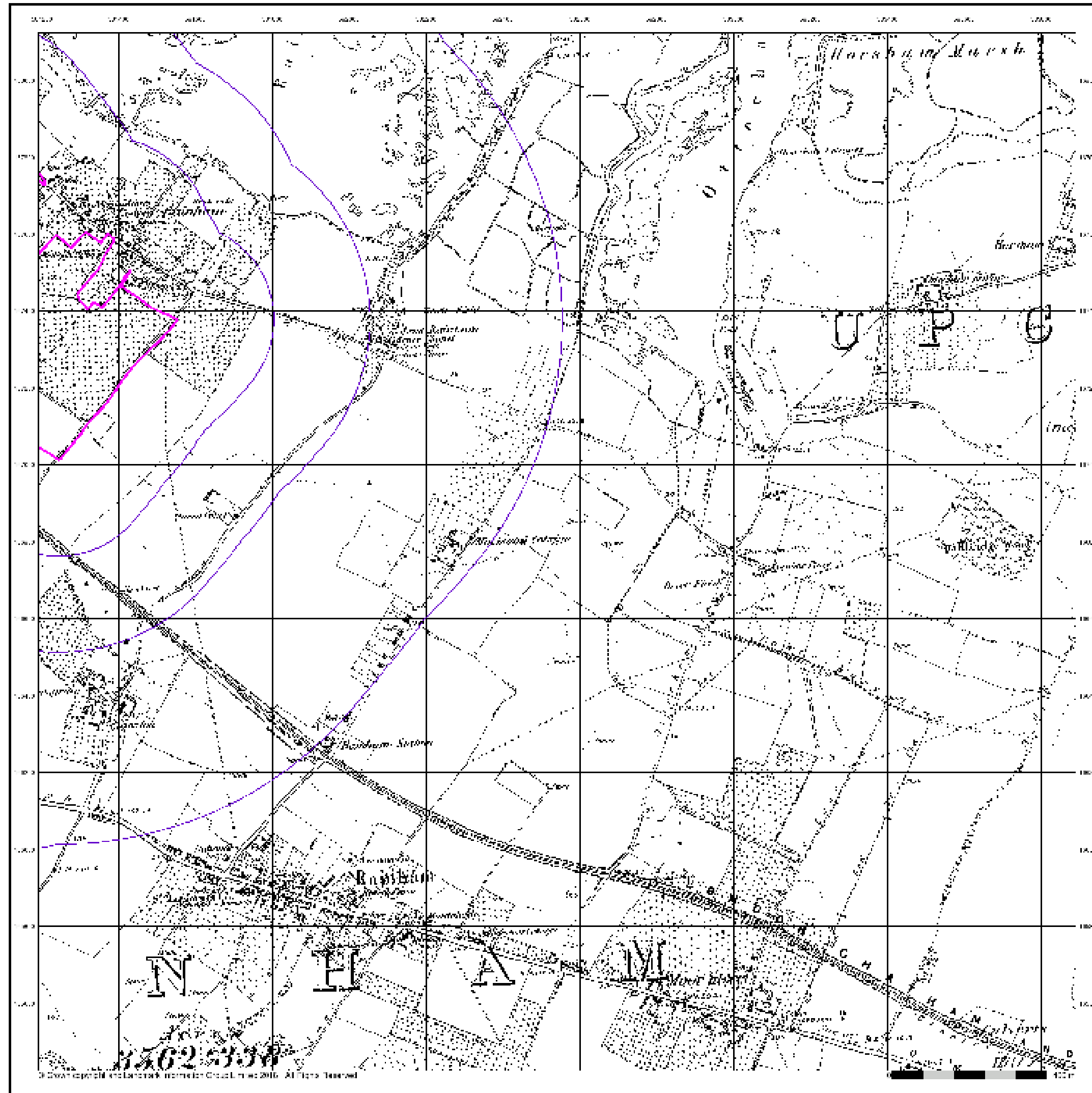
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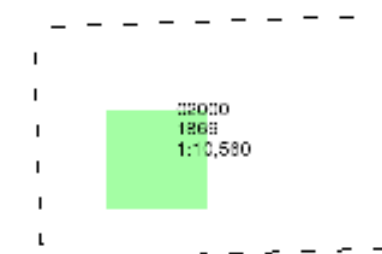
**Kent**

**Published 1869**

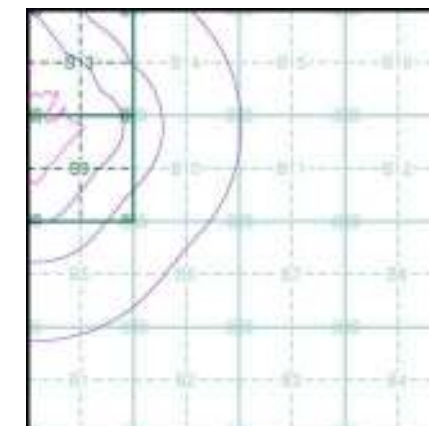
**Source map scale - 1:10,560**

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 B**



**Order Details**

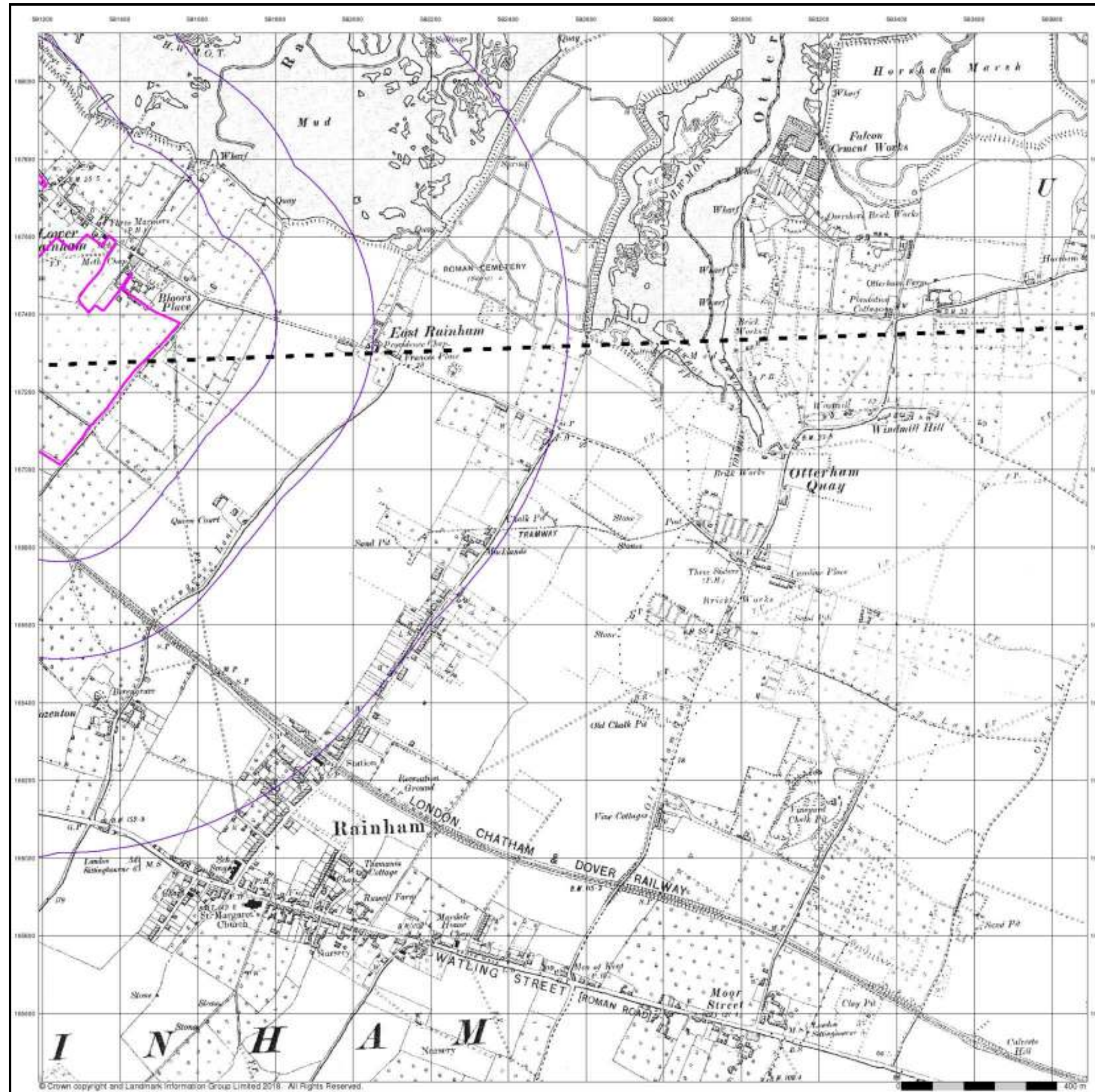
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 581780, 167180  
 Slice: B  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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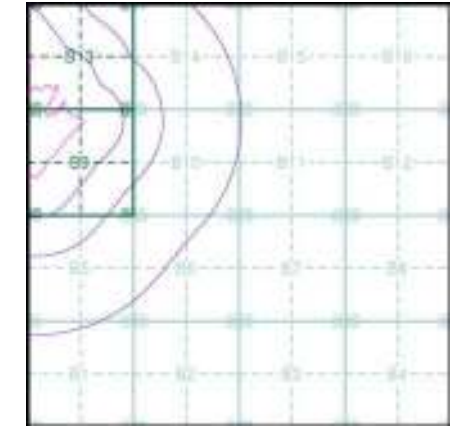
**Kent**  
**Published 1897 - 1898**  
**Source map scale - 1:10,560**

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)**

020NW	1898	1:10,560
020SW	1897	1:10,560

**Historical Map - Slice B**

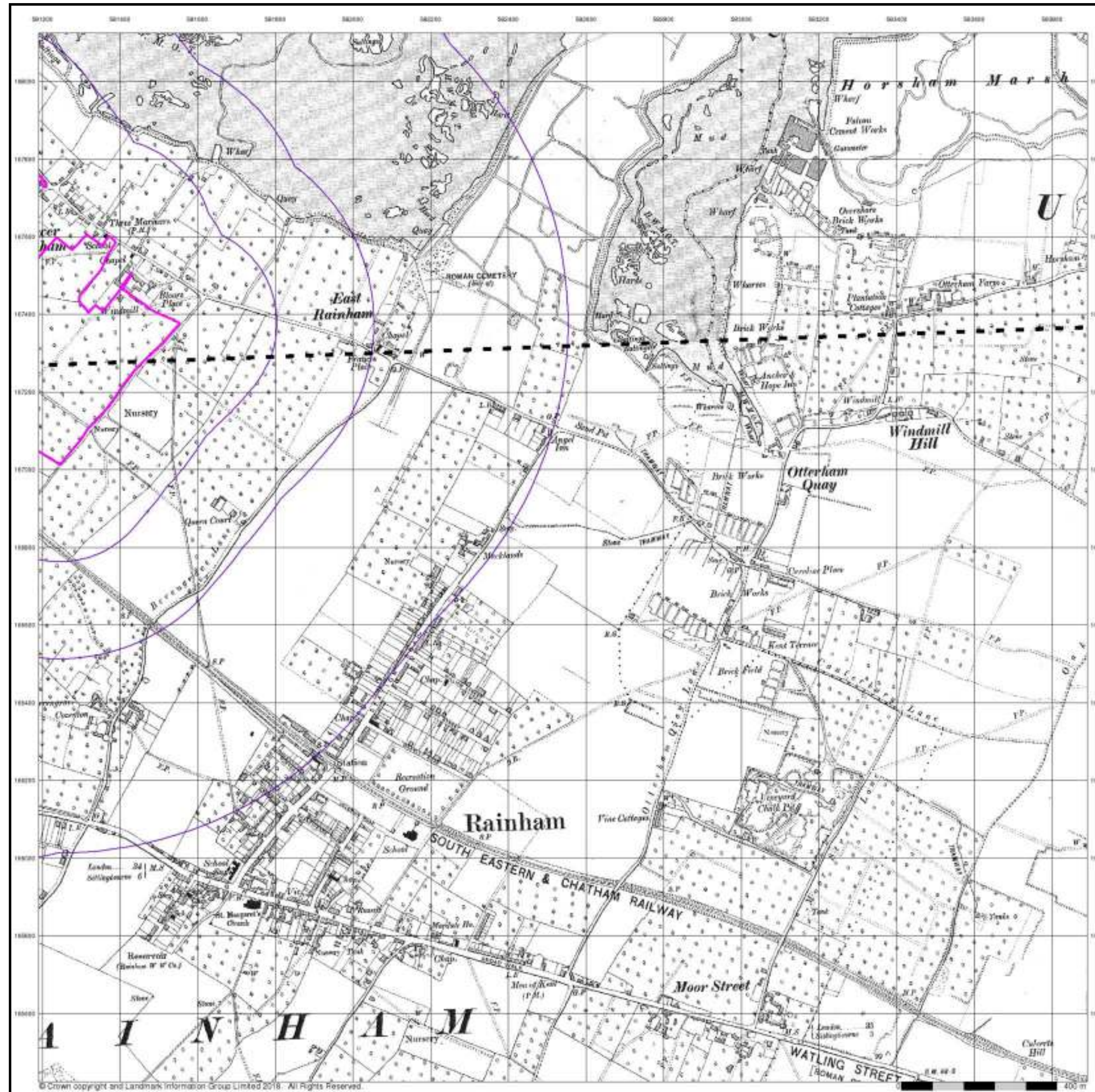


**Order Details**  
 Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 581780, 167180  
 Slice: B  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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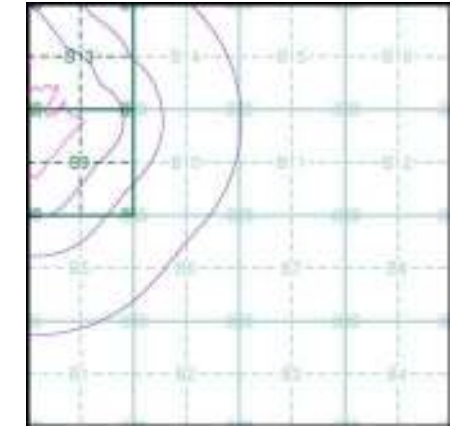
**Kent**  
**Published 1909**  
**Source map scale - 1:10,560**

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)**

020NW	1909	1:10,560
020SW	1909	1:10,560

**Historical Map - Slice B**



**Order Details**

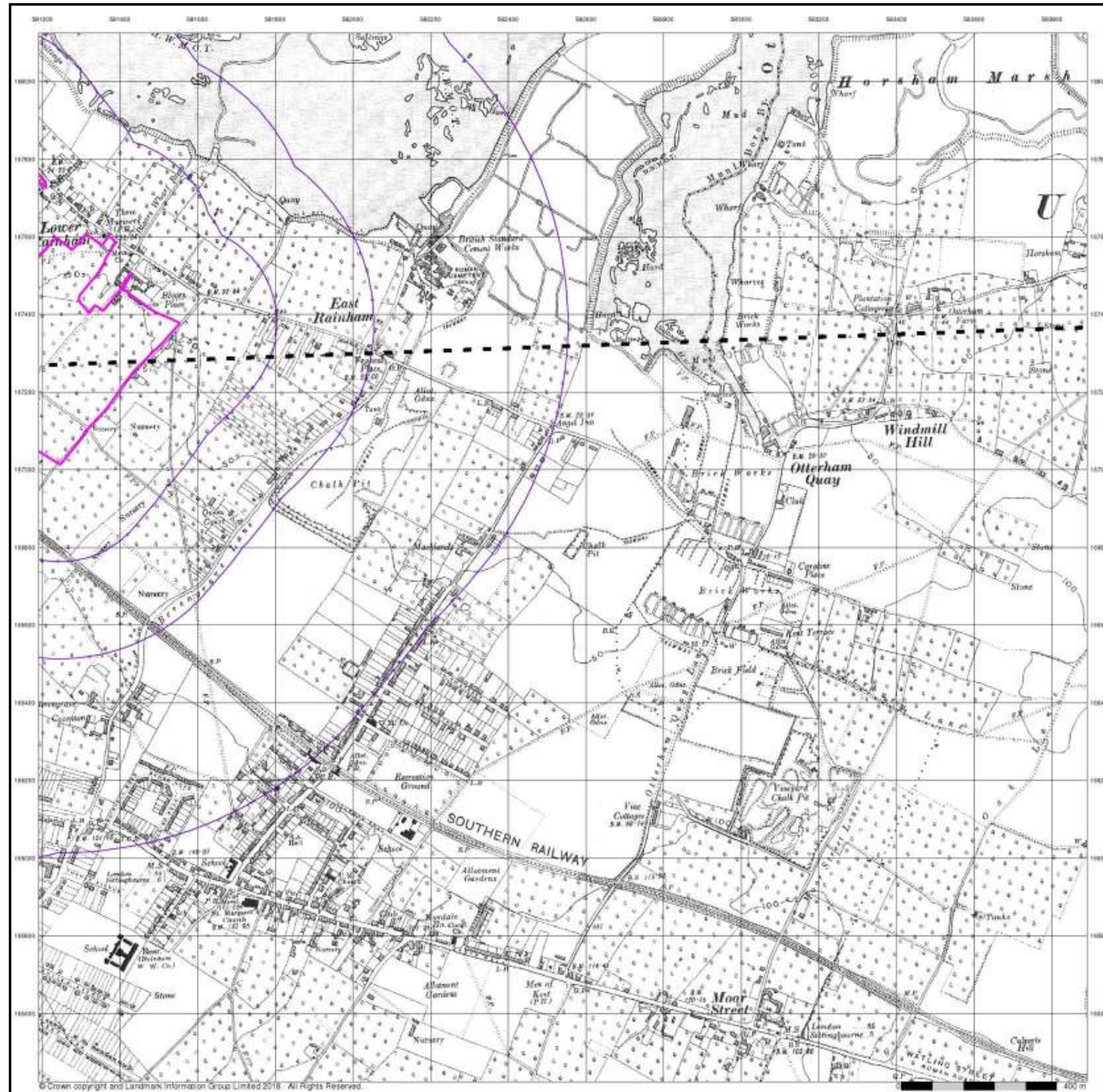
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 581780, 167180  
 Slice: B  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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**Kent**

**Published 1931 - 1932**

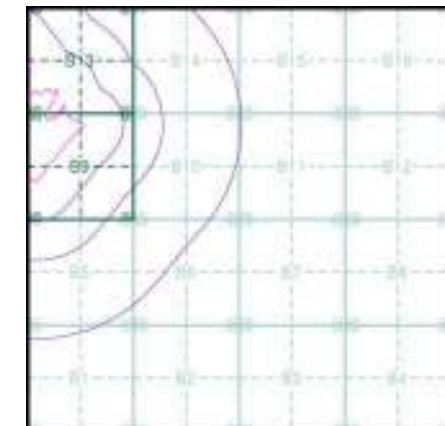
**Source map scale - 1:10,560**

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)**

220NW	1932	1:10,560
220SW	1931	1:10,560

**Historical Map - Slice B**



**Order Details**

Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 581780, 167180  
 Slice: B  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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Kent

Published 1938

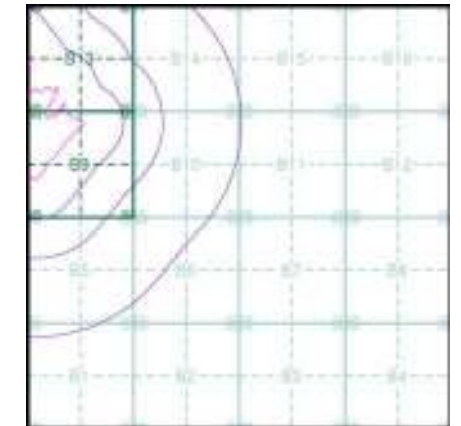
Source map scale - 1:10,560

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)

020NW	1938	1:10,560
020SW	1938	1:10,560

Historical Map - Slice B



Order Details

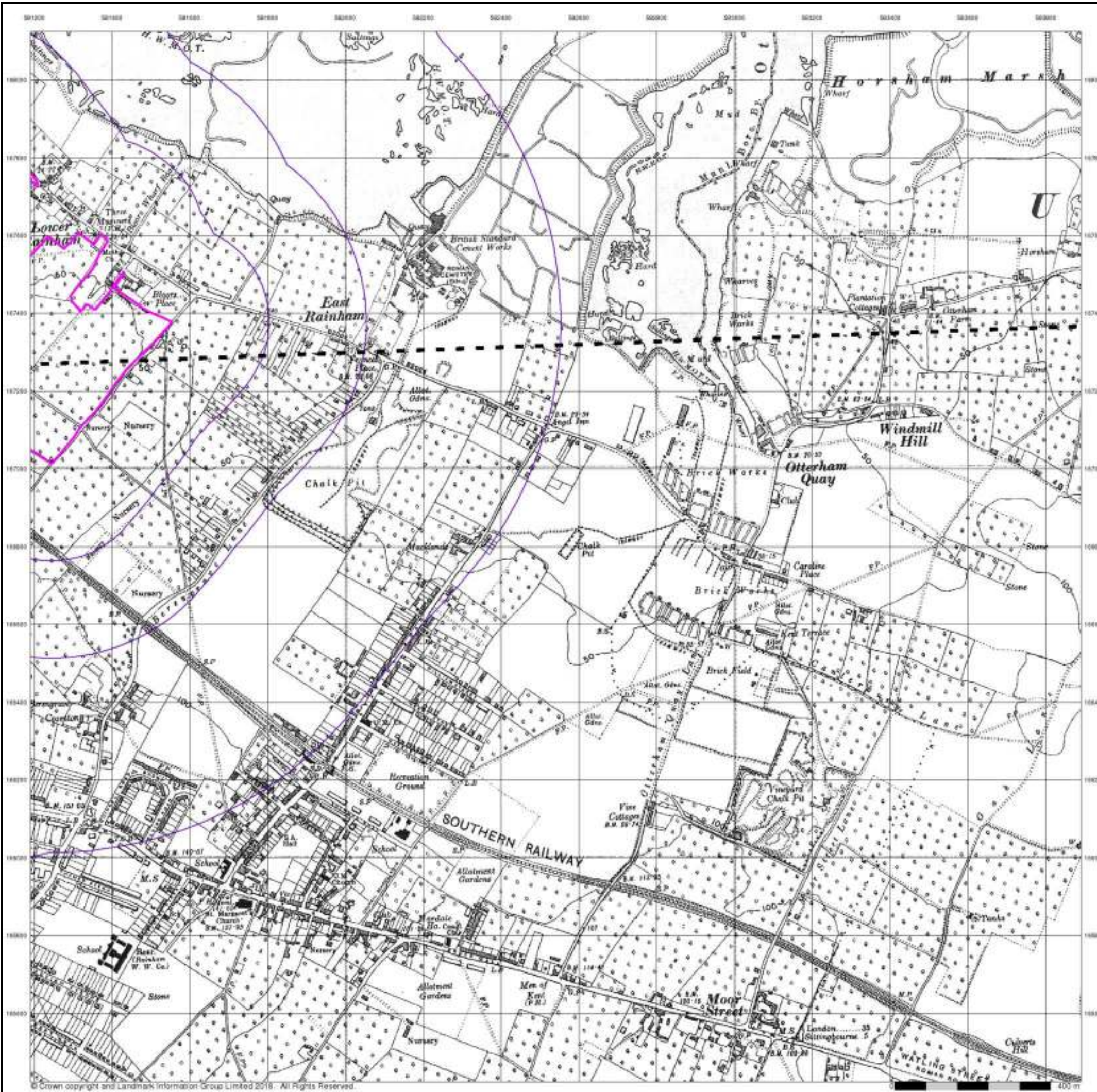
Order Number: 178768733\_1\_1  
 Customer Ref: 44538-3501  
 National Grid Reference: 581780, 167180  
 Slice: B  
 Site Area (Ha): 51.8  
 Search Buffer (m): 1000

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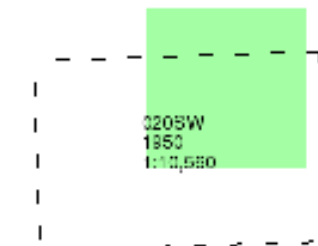
### Kent

Published 1950

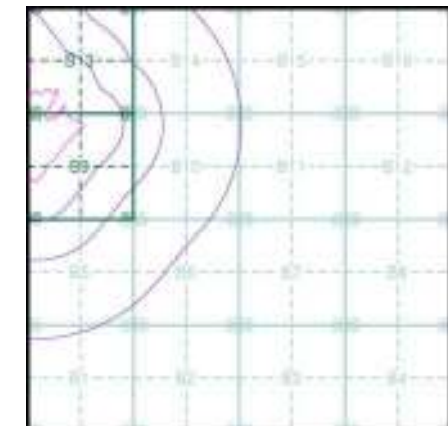
Source map scale - 1:10,560

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 B



### Order Details

Order Number:	178768733_1_1
Customer Ref:	44538-3501
National Grid Reference:	581780, 167180
Slice:	B
Site Area (Ha):	51.8
Search Buffer (m):	1000

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