



**Phase I Desk Study**

at

**Padnell Grange, Padnell Road, Cowplain, Hampshire PO8 8ED**

for

**Bellway Homes (Wessex)**

**Reference: I6362/DS**

**August 2017**

## Control Document

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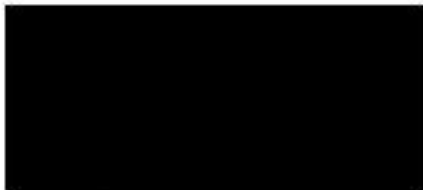
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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

### **Commission**

Soils Limited was commissioned by Bellway Homes (Wessex) to undertake a Phase I Desk Study on Padnell Grange, Padnell Road, Cowplain, Hampshire PO8 8ED. The scope of the investigation was outlined in the Soils Limited quotation reference Q18869 dated 21<sup>st</sup> June 2017.

### **Caveat**

Whilst reasonable skill and care has been taken to determine the site history and the environmental setting within the time constraints applied by the project, it should be appreciated that uncertainties may occur owing to the natural variability of soil material within a defined area or as a result of unknowns that are associated with contaminated land assessment in general. The site conditions may be different from that indicated by this desk study, particularly on a site with a history of past development. No responsibility can be accepted should such conditions alter the recommendations made in this report.

This Desk Study does not include a detailed UXO risk assessment. In preparing a Phase I Desk Study reference is made to web based sources to assess the risk of the site potentially having been impacted by bombing during the World Wars. The data readily available is not necessarily definitive. Certain areas were bombed heavily, such as the areas of docklands or railways junctions. The assessment is based on the likely area risk, bomb patterns (i.e. lines of recorded bomb impacts with gaps where an impact would be anticipated) and the age of structures on and in close proximity to the site.

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## **Section I      Introduction**

### **1.1      Objective**

The Phase I Desk Study was undertaken to advise the client on the risk pertaining to the site, with special reference to former and present-day potential contaminative uses. This also included their impact on sensitive receptors, such as, human health, controlled waters, ecological features, building structures and services.

### **1.2      Location**

The site was located at Padnell Grange, Padnell Road, Cowplain, Hampshire PO8 8ED and had an O.S Land Ranger Grid Reference of SU 699 110. The site location map is presented in Figure 1 and the full Site Walkover discussed in Section 3.1 of this report.

### **1.3      Proposed Development**

At the time of reporting, July 2017, the proposed development comprised eighty-four detached, semi-detached and terraced dwellings comprised of one to five bed houses and flats. The development included hard landscaping such as access roads, driveways and pavements, and soft landscaping such as public open spaces and private gardens.

In compiling this report reliance was placed on drawing number BELL170217/SKL-01, dated 16<sup>th</sup> March 2017 and was prepared by Thrive Architects. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

The proposed development plan has been provided in Figure 2.

### **1.4      Legislation and Liability**

The primary legislative mechanism for contaminated land management in the UK is Part 2A of the Environmental Protection Act, 1990 (EPA). Part 2A was introduced into the EPA under Section 57 of the Environment Act 1995 to help deal with the substantial legacy of land contamination. The legislation provides powers in relation to the identification, remediation and apportionment of liability for contaminated land. Part 2A applies where there is unacceptable risk, assessed on the basis of the current use and the relevant circumstances of the land. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission.

Under Part IIA of the Environment Act 1995, Local Authorities are required to identify contaminated land and serve on every person who is an appropriate person a remediation notice setting out what is to be done by way of remediation and the period within which it must be done.

If the person who caused, or knowingly permitted, the contaminating substance cannot be found, the owner and/or, occupier for the time being, of the property can be the

appropriate person.

Under the legislation, Contaminated Land is defined as: -

*“Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused.”*

Where the Act defines harm as:

*‘harm to the health of living organisms or other interference with the ecological systems of which they form a part and, in the case of man, includes harm to his property.’*

and pollution of controlled waters is defined as: -

*“the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter.”*

In addition, The Radioactive Contaminated Land (Modification of Enactments) (England) Regulations 2006 introduced the supplementary definition of harm to include: lasting exposure to any person resulting from the after-effects of a radiological emergency, past practice or past work activity.

With regard to contaminated waters, the Environment Act 1995 amends the Water Resources Act 1991 and provides the Environment Agency with the power to force clean-up of historical contamination by issuing a Works Notice, with remediation paid for by the responsible parties.

The Groundwater Regulations (1998) stated that entry of List 1 substances into groundwater must be prevented, and List II substances must be controlled.

### **1.5 Limitations and Disclaimers**

This Phase I Desk Study Report relates to the site located at Padnell Grange, Padnell Road, Cowplain, Hampshire PO8 8ED and was prepared for the sole benefit of Bellway Homes (Wessex) (The “Client”) for the brief described in the Commission of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no

responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

There may be other sources of information not included in those listed that hold data relevant to the Phase I Desk Study undertaken at the site that could materially affect the conclusions made in this report.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995.

Where a contaminative use is identified in the Phase I Desk Study this does not determine whether contamination has actually occurred, or if it has the degree to which it may have taken place. An intrusive investigation(s) and analysis is required to establish the nature and degree of any contamination present.

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## Section 2      Site Conditions

### 2.1      Site Walkover

A site walkover was undertaken in July 2017, the notes are presented in Table 2.1 and Table 2.2.

**Table 2.1 Site Walkover Record (On-site)**

|                |                                        |                                                                                                                                                                                                                           |
|----------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On-site</b> | <b>Use of site</b>                     | The site is currently used by The Borrow Foundation, occupying offices and residential housing within converted mill buildings.                                                                                           |
|                | <b>Structures</b>                      | Numerous buildings onsite, noticeably the large building in the centre of the site was Padnell Grange to the south of the site were converted barns.                                                                      |
|                | <b>Site topography</b>                 | The site was undulating and sloped downwards towards the south/south-east.                                                                                                                                                |
|                | <b>Site covering</b>                   | Predominately covered by areas of mowed grass. Hard landscaping comprising tarmacadam and concrete surround Grange House and is associated with Padnell Road.                                                             |
|                | <b>Vegetation</b>                      | Mature trees scattered around the site. High concentration of mature trees in the north and north-west of the site and on the northern site boundary. Hedge rows running parallel to Padnell Road and at site boundaries. |
|                | <b>Potential Contamination Sources</b> | None noted                                                                                                                                                                                                                |
|                | <b>Odour</b>                           | None noted                                                                                                                                                                                                                |
|                | <b>Drainage</b>                        | None noted                                                                                                                                                                                                                |

**Table 2.2 Site Walkover Record (Off-Site)**

|                 |                                        |                                                                                                                                                                                                                             |
|-----------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Off-Site</b> | <b>Use of Land</b>                     | The site is surrounded by residential properties to the south and west. The north of the site is bounded by a forested area into residential buildings whilst the east of the site is bounded by Waterlooville Golf Course. |
|                 | <b>Area topography</b>                 | Undulating with a general slope down towards the south.                                                                                                                                                                     |
|                 | <b>Vegetation</b>                      | Large mature trees to the north. Grass covering and mature trees to the east associated with the golf course. Residential gardens to the west and south.                                                                    |
|                 | <b>Potential Contamination Sources</b> | None noted                                                                                                                                                                                                                  |

### 2.2      Site Drainage

Surface drains noted around Padnell Grange and hard landscaping. No drainage was noted on grass or earth covered areas, which were considered to be self-draining.

### 2.3      Site Photographs

The site photographs have been included within Appendix D.

## Section 3      Geology, Hydrogeology, Hydrology and Radon

### 3.1      Anticipated Geology

The 1:50,000 BGS Geology map showed the site to be situated on the boundary of the bedrock formations of the Lambeth Group in the north of the site, and the London Clay Formation in the south of the site, with no recorded superficial deposits overlying.

#### 3.1.1      Lambeth Group

The Lambeth Group (formerly known as the Woolwich and Reading Beds) are a sedimentary complex comprising a basal bed (the Bottom Bed) composed of glauconitic sand, sandy clay and gravel, with laterally variable sand and clay above. In the eastern part of the area the basal bed is mostly overlain by a shelly grey sandy clay or silty sand. Lignite, or brown coal, a carbonaceous rock composed of plant remains which has not been subject to the same intensity of heat and pressure as has ordinary coal, is occasionally found within the Lambeth Group, as are individual logs and groups of logs indicating the position of a former log jam, which was covered by sand and clay at the time of deposition.

#### 3.1.2      London Clay Formation

The London Clay Formation in the Hampshire region comprises silty and sandy clay, clayey and sandy silt, silty sand; sporadic claystones and thin beds of flint pebbles. The formation includes the Whitecliff Sand, Durley Sand, Portsmouth Sand and Nursling Sand Members. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

The lowest part of the London Clay Formation rests on the Lambeth Group.

### 3.2      Hydrogeology

To assess the vulnerability of groundwater to contamination, consideration must be given to the leaching characteristics of the overlying soils and the characteristics of the strata in the unsaturated zone. Information on the geological strata, such as lithological type and permeability characteristics has been combined with the physical properties of the soil to produce varying degrees of vulnerability.

Table 3.1 presents the hydrological data that is relevant to the site.

**Table 3.1 Hydrogeological Assessment**

| Hydrogeological Data      |             | Comment                                                              | Risk |
|---------------------------|-------------|----------------------------------------------------------------------|------|
| On-site<br>Aquifers       | Superficial | No superficial deposits present                                      |      |
|                           | Bedrock     | Secondary A Aquifer <sup>1</sup> - Lambeth Group - Northwest         | ✓    |
|                           |             | Unproductive Strata <sup>2</sup> - London Clay Formation - Remainder |      |
| Groundwater Vulnerability |             | Soils of high leaching potential (U) <sup>3</sup> - Lambeth Group    | ✓    |
|                           |             | Non-Aquifer - London Clay Formation                                  |      |

| Hydrogeological Data                  |                    | Comment                                                                                           | Risk |
|---------------------------------------|--------------------|---------------------------------------------------------------------------------------------------|------|
| <b>Source Protection Zones (SPZ)</b>  |                    | GSPZ II <sup>4</sup> / GSPZ Ic <sup>5</sup> - Associated with underlying Newhaven Chalk Formation |      |
| <b>Abstraction</b>                    | <b>Potable</b>     | None within 1,000m.                                                                               |      |
|                                       | <b>Non-potable</b> | General Agriculture: Spray Irrigation - 945m/E                                                    |      |
| <b>Sensitive land uses</b>            |                    | Nitrate vulnerable zone - Onsite                                                                  |      |
| <b>Surface Water Features</b>         |                    | Pond – 74m/E                                                                                      |      |
| <b>Flood Risk from Rivers or Seas</b> |                    | None                                                                                              |      |
| <b>Flood Risk from Surface Water</b>  |                    | None                                                                                              |      |
| <b>Flood Risk from Groundwater</b>    |                    | Limited potential for groundwater flooding to occur – Northwest only                              |      |

**Note:** ✓ = Likely.

<sup>1</sup>Secondary A - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

<sup>2</sup>Unproductive Strata - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

<sup>3</sup>Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst-case vulnerability classification (H) assumed, until proved otherwise.

<sup>4</sup>Zone II (Outer Protection Zone): Either 25% of the source area or a 400-day travel time whichever is greater.

<sup>5</sup>Zone Ic (Inner Protection Zone): Travel time of 50 days or less to the groundwater source - subsurface activity only.

Any works or development, which may have an impact on surface water, aquifer or groundwater quality, must be approved by the Environment Agency prior to implementation.

### 3.3 Hydrology

The approximate elevation of the site was between 58.00m Above Ordnance Datum (AOD) in the south-east and 63.00m AOD in the north-west. The anticipated groundwater flow direction is given in Table 3.2.

**Table 3.2 Hydrogeological Assessment**

| Type                                                   | Direction | Notes                                                                                                 |
|--------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------|
| Surface water                                          | Southeast | In line with the wider topography.                                                                    |
| Shallow groundwater – Lambeth Group                    | Southeast | In line with the wider topography.                                                                    |
| Shallow groundwater – London Clay                      | Southeast | In line with the wider topography. At low velocity within the low permeability London Clay Formation. |
| Deep Groundwater – Underlying Newhaven Chalk Formation | North     | Towards the nearest source protection borehole associated with the SPZ.                               |

### 3.4 Radon Gas

The site **was not situated** within an area where protection or risk assessment against the ingress of radon was required. Radon protection measures **will not be required** within the proposed new development. It is not possible in the course of a survey or inspection to determine whether radon gas is present as the gas is colourless and

odourless. Tests can be undertaken to assess the concentration of radon in existing structures.

## Section 4      Site History

### 4.1 Historic Map Study

The object of this study was to report on the evidence of site history and redevelopment of the site and its environs from available County Series and Ordnance Survey Maps dating from the mid to late 19<sup>th</sup> Century to the present day as downloaded from Landmark Environmental.

Maps only represent a “snap shot” of the site and its environs at the date of the survey. Changes that had occurred either to the site and/or the environs may well not have been recorded on the maps and could represent a hazard to the site. Any distances quoted for features remote from the site have been scaled from the maps and are only approximate. Where dates have been noted in brackets, these are the actual dates applicable to the map editions.

The information reported might not represent all pertinent information that could be obtained. The interpretation of the maps and/or other data commented on in this report is subjective.

In the following sections dealing with individual maps, only features considered to have a potential contaminative impact on the site and usually within a notional 250m radius are discussed. The north point and approximate extent of the site are indicated on each figure. The historic maps referred to are appended to this report (Appendix A). The potential onsite and offsite sources have been presented in Table 4.1 and Table 4.2.

**Table 4.1 Potential Sources of Pollution Indicated from Historic Maps**

| Source                       | Direction | Distance<br>(m) | Date Range             |           |
|------------------------------|-----------|-----------------|------------------------|-----------|
|                              |           |                 | From                   | To        |
| Clay pit (unknown backfill)  | N         | 24              | 1868-1881 <sup>1</sup> | 1966-1970 |
| Clay pit (unknown backfill)  | NE        | 34              | 1868-1881 <sup>1</sup> | 1966-1970 |
| Chalk pit (unknown backfill) | W         | 113             | 1868-1881 <sup>1</sup> | 1962-1963 |
| Brick kiln                   | E         | 97              | 1868-1881 <sup>1</sup> | 1932      |
| Padnell Brick and Tile Works | E         | 44              | 1868-1881 <sup>1</sup> | 1973-1988 |
| Orchard                      | SE        | 160             | 1870                   | 1932      |
| Clay pit (unknown backfill)  | NW        | 165             | 1870                   | 1962-1963 |
| Kiln                         | NW        | 48              | 1909                   | 1966-1970 |
| Pond                         | W         | 101             | 1966-1970              | 1973-1988 |
| Electric sub-station         | NW        | 86              | 1966-1970              | Present   |
| Surgery                      | NW        | 66              | 1966-1970              | Present   |
| Pond                         | SE        | 89              | 1973-1988              | Present   |
| Electric sub-station         | NW        | 192             | 1973-1988              | Present   |
| Electric sub-station         | NE        | 238             | 1973-1988              | Present   |
| Pumping station              | NE        | 226             | 1973-1988              | Present   |
| Electric sub-station         | S         | 236             | 1973-1988              | Present   |

**Table 4.2 Historic Development of the Site**

| Site Development                                                                                                                                                                                                                                                                                                                                                                                                                                        | Date Range |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | From       | To        |
| Site is situated across multiple fields. The north of the site is bounded by Padenll Lane. On site features include a large clay pit in the north-west of the site, a well located in the east of the site, several buildings located in the centre of the site and a clay mill located on the eastern border of the site. The northern half of the site is covered by trees. The eastern half of the site is criss-crossed with paths and fence lines. | 1868       | 1897      |
| Kiln now located in the north of the site. Expansion of the buildings in the centre of the site. The wooded area in the north has reduced in size.                                                                                                                                                                                                                                                                                                      | 1897       | 1909      |
| Kiln is no longer located onsite.                                                                                                                                                                                                                                                                                                                                                                                                                       | 1909       | 1932      |
| Trees in the north of the site have been replaced by a building with a raised embankment. Buildings in the centre of the site have continued to be extended.                                                                                                                                                                                                                                                                                            | 1932       | 1962-1963 |
| A pond has been constructed in the east of the site.                                                                                                                                                                                                                                                                                                                                                                                                    | 1962-1963  | 1966-1970 |
| The clay pit in the north-west of the site has been infilled. The Pond has been removed and potentially infilled. Extension of buildings in the centre of the site towards the southern boundary, now known as Padnell Grange.                                                                                                                                                                                                                          | 1966-1970  | 1973-1988 |
| Clay mill removed from the eastern border of the site.                                                                                                                                                                                                                                                                                                                                                                                                  | 1973-1988  | current   |

**Notes:** <sup>1</sup>Earliest available map

## Section 5 Environmental Records and Consultation

### 5.1 Dataset Information

The Landmark Envirocheck Report was obtained by Soils Limited and includes site specific information. A copy of the report is appended to this report, Appendix B, and a summary is given in Table 5.1, Table 5.2 and Table 5.3.

**Table 5.1 Environmental Significance of Data**

| Source                                                                | Direction | Distance (m) | Maximum Radius (m) |
|-----------------------------------------------------------------------|-----------|--------------|--------------------|
| Contaminated Land Register Entries and Notices                        | None      | None         | 250                |
| Discharge Consents                                                    | NE        | 169          | 250                |
| Integrated Pollution Prevention and Control                           | None      | None         | 250                |
| Local Authority Pollution Prevention and Controls                     | "         | "            | 250                |
| Local Authority Pollution Prevention and Control Enforcements         | "         | "            | 250                |
| Nearest Surface Water Feature                                         | E         | 74           | 250                |
| Pollution Incidents to Controlled Waters (Significant Incidents only) | None      | None         | 250                |
| Prosecutions Relating to Authorized Processes                         | "         | "            | 250                |
| Registered Radioactive Substances                                     | "         | "            | 250                |
| Substantiated Pollution Incident Register                             | "         | "            | 250                |
| Nearest Potable Abstraction Point                                     | "         | "            | 250                |
| Nearest Non-Potable Abstraction Point                                 | "         | "            | 250                |
| Water Industry Act Referrals                                          | "         | "            | 250                |
| Source Protection Zones (At depth in chalk)                           | Onsite    | Onsite       | 250                |
| Extreme Flooding from Rivers or Sea Without Defences                  | None      | None         | 250                |
| Flooding from Rivers or Sea Without Defences                          | "         | "            | 250                |
| Areas Benefiting from Flood Defences                                  | "         | "            | 250                |
| Flood Water Storage Areas                                             | "         | "            | 250                |
| Flood Defences                                                        | "         | "            | 250                |
| BGS Recorded Landfill Sites                                           | "         | "            | 250                |
| Historical Landfill Sites                                             | "         | "            | 250                |
| Licensed Waste Management Facilities                                  | "         | "            | 250                |
| Local Authority Recorded Landfill Sites                               | "         | "            | 250                |
| Registered Landfill Sites                                             | "         | "            | 250                |
| Registered Waste Transfer Sites                                       | "         | "            | 250                |
| Registered Waste Treatment or Disposal Sites                          | "         | "            | 250                |
| Control of Major Accident Hazards Sites (COMAH)                       | "         | "            | 250                |
| Notification of Installations Handling Hazardous Substances           | "         | "            | 250                |
| Planning Hazardous Substance Consents                                 | "         | "            | 250                |

**Table 5.2 Contemporary Trade Directory**

| <b>Contemporary Trade Directory within 250m<sup>1</sup></b> | <b>Direction</b> | <b>Distance (m)</b> | <b>Status</b> |
|-------------------------------------------------------------|------------------|---------------------|---------------|
| Oliver Richard Motor Vehicle Engineer                       | SW               | 86                  | Active        |
| Albany Engineering Services Ltd                             | N                | 93                  | Inactive      |
| Widen Electronic Solutions                                  | W                | 114                 | Inactive      |
| Down To Earth Drainage & Guttering                          | NW               | 230                 | Inactive      |

**Note:** <sup>1</sup> Those likely to impact the underlying soil and/or groundwater, date not supplied.

**Table 5.3 Geological Hazards**

| <b>Source</b>                                                | <b>Nearest Distance from Site/Type</b>                        |
|--------------------------------------------------------------|---------------------------------------------------------------|
| Coal Mining Affected Areas                                   | None within 1000m                                             |
| Mining Instability                                           | None within 1000m                                             |
| Natural and Mining Cavities                                  | 33m NE / Historical Brick and Tile Works                      |
| Potential for Collapsible Ground Stability Hazards           | Onsite (Very low)                                             |
| Potential for Compressible Ground Stability Hazards          | Onsite (Very low)                                             |
| Potential for Ground Dissolution Stability Hazards           | Onsite (No hazard)                                            |
| Potential for Landslide Ground Stability Hazards             | Onsite (Very low)                                             |
| Potential for Running Sand Ground Stability Hazards          | Onsite (Low)                                                  |
| Potential for Shrinking or Swelling Ground Stability Hazards | Onsite (Moderate – Associated with the London Clay Formation) |
| Shallow Mining Hazards                                       | Unknown                                                       |

## 5.2 Site Sensitivity Maps

No other significant potential sources of contamination were shown on the Landmark Envirocheck Site Sensitivity Maps, which have not been listed in Table 5.1, Table 5.2 and Table 5.3, and copies of which are appended to this report (Appendix C).

## 5.3 Regulatory Enquires

As part of the Phase I Desk Study the Havant Borough Council had been contacted and asked to provide any information on potential risks pertaining the site. At the time of reporting, no response had been received.

## 5.4 Soil Geochemistry

Potential levels of metals including lead, arsenic, cadmium, chromium and nickel as contoured on the Landmark Environmental check report (Appendix B) were assessed against the appropriate environmental quality standards (e.g. SGV) for the sites purposed end use of a residential development. The results are indicated in Table 5.4.

**Table 5.4 Soil Geochemistry**

| <b>Determinand</b> | <b>Proposed Land Use</b> | <b>Indicated Soil Geochemistry (mg kg<sup>-1</sup>)</b> | <b>Guideline for Residential (mg kg<sup>-1</sup>)</b> | <b>Potential Hazard</b> |
|--------------------|--------------------------|---------------------------------------------------------|-------------------------------------------------------|-------------------------|
| Arsenic            | Residential              | <15                                                     | 37                                                    |                         |
| Cadmium            |                          | <1.8                                                    | 11                                                    |                         |
| Chromium           |                          | 60 – 90                                                 | 910                                                   |                         |
| Lead               |                          | 100 – 200                                               | 200                                                   |                         |
| Nickel             |                          | 15 - 30                                                 | 130                                                   |                         |

**Note:** ✓ = Likely. <sup>1</sup> Soil guideline value for 1% and 6% SOM respectively. Other soils guidelines presented in the table are based on soils with 6% SOM.

The results show no significant risk to identified receptors for contaminants presented. If the proposed land use change, then the recommendations given in the report would be likely to change.

Please note that there are only a limited number of land uses for which data on determinands have been published or can be readily determined.

## Section 6 Discussion and Conclusions

### 6.1 General

The findings of the Phase I Desk Study are summarised below:

1. The 1:50,000 BGS map showed the site to be underlain by the Lambeth Group in the northwest corner and the London Clay Formation within the remainder of the site. No overlying superficial deposits were noted.
2. The Environment Agency Hydrogeological Maps showed that the bedrock Lambeth Group, located in the northeast had a Secondary A Aquifer designation and the bedrock London Clay Formation, in remainder of the site, had a Unproductive Strata designation, no superficial deposits were noted onsite. The overall groundwater vulnerability was soils of high leaching potential (U), which is likely to reflect the granular soils of the Lambeth Group.
3. Surface water was anticipated flow downwards to the south/south-east in line with the wider topography within the Lambeth Group. Groundwater flow within the London Clay Formation was expected to flow downwards to the south/south-east in line with the wider topography but at a lower velocity. Deep groundwater within the Newhaven Chalk Formation was anticipated to flow north to the source protection borehole associated with the SPZ.
4. Radon protection measures **will not be required** within the proposed new development.
5. Environment Agency records showed that the northeast of the site had limited potential for groundwater flooding to occur
6. As part of the Phase I Desk Study the Havant Borough Council has been contacted and asked to provide any information on potential risks pertaining the site. At the time of reporting, no response had been received.
7. Any suspicious ground conditions encountered during groundworks must be reported to a competent person for further inspection.
8. Summary of potential on-site contamination sources identified during the study of the historic maps, the Dataset Information and Landmark Envirocheck Report and the Site Walkover are outlined in Table 6.1.

**Table 6.1 Summary of Potential Contamination Sources**

| Sources/Environmental Impact | Direction <sup>1</sup> | Distance<br>(m) | Date Range |           | Source |
|------------------------------|------------------------|-----------------|------------|-----------|--------|
|                              |                        |                 | From       | To        |        |
| On Site                      |                        |                 |            |           |        |
| Clay Pit (unknown backfill)  | Onsite                 | Onsite          | 1868-1881  | 1966-1970 | HM     |

| Sources/Environmental Impact          | Direction <sup>1</sup> | Distance (m) | Date Range |           | Source |
|---------------------------------------|------------------------|--------------|------------|-----------|--------|
|                                       |                        |              | From       | To        |        |
| Clay Mill                             | Onsite                 | Onsite       | 1868-1881  | 1973-1988 | HM     |
| Kiln and brickworks                   | Onsite                 | Onsite       | 1897       | 1909      | HM     |
| Pond                                  | Onsite                 | Onsite       | 1962-1963  | 1966-1970 | HM     |
| Made Ground from site redevelopment   | Onsite                 | Onsite       | 1962-1963  | 1966-1970 | HM     |
| <b>Off-Site</b>                       |                        |              |            |           |        |
| Clay pit (unknown backfill)           | N                      | 24           | 1868-1881  | 1966-1970 | HM     |
| Clay pit (unknown backfill)           | NE                     | 34           | 1868-1881  | 1966-1970 | HM     |
| Chalk pit (unknown backfill)          | W                      | 113          | 1868-1881  | 1962-1963 | HM     |
| Brick kiln                            | E                      | 97           | 1868-1881  | 1932      | HM     |
| Padnell Brick and Tile works          | E                      | 44           | 1868-1881  | 1973-1988 | HM     |
| Clay pit (unknown backfill)           | NW                     | 165          | 1870       | 1962-1963 | HM     |
| Kiln                                  | NW                     | 48           | 1909       | 1966-1970 | HM     |
| Pond                                  | W                      | 101          | 166-1970   | 1973-1988 | HM     |
| Electric sub-station                  | NW                     | 86           | 1966-1970  | Present   | HM     |
| Oliver Richard Motor Vehicle Engineer | SW                     | 86           | Active     |           | DS     |
| Albany Engineering Services Ltd       | N                      | 93           | Inactive   |           | DS     |
| Widen Electronic Solutions            | W                      | 114          | Inactive   |           | DS     |
| Down To Earth Drainage & Guttering    | NW                     | 230          | Inactive   |           | DS     |

**Notes:** SW – Site walkover, HM – Historic Maps, DS – Datasheet, GC – Geochemistry, LA – Local Authority

## Section 7 Preliminary Conceptual Site Model

### 7.1 General

Environment Agency guidance provided in CLR11 indicates the Conceptual Site Model should identify those contaminants, pathways and receptors which are 'likely' to represent an 'unacceptable' risk either to human health or the surrounding environment. The following sections present potential contaminants, pathways and receptors based on the information collected during the desktop study. Pathways have been established on scientific knowledge of the behaviour of the contaminants in the ground.

### 7.2 Sources of Contamination

The Landmark Site Specific Envirocheck Report and Site Walkover has been used to identify potential contaminative sources, the sources have been presented in Table 6.1. An initial assessment of the likelihood of each contaminative source that was considered a risk has been presented in Sections 7.2.1 – 7.2.3.

#### 7.2.1 Onsite Potential Contamination Sources

A study of Landmark Envirocheck Report and Site Walkover has shown a number of potentially onsite contaminative sources. The sources have been given in Table 7.1.

**Table 7.1 Onsite Potential Contamination Sources**

| Sources                      | Likely <sup>1</sup> |
|------------------------------|---------------------|
| Clay Pit                     | ✓                   |
| Kiln and brick and tileworks | ✓                   |
| Clay Mill                    | ✓                   |
| Pond (unknown backfill)      | ✓                   |
| Made Ground                  | ✓                   |

**Notes:** ✓ = Likely. <sup>1</sup> Sources that are not ticked were considered negligible. These considerations are based on type of contamination, age of source and anticipated significance.

#### 7.2.2 Offsite Potential Contamination Sources

A study of Landmark Envirocheck Report and Site Walkover has shown a number of potentially offsite contaminative sources. The sources have been given in given in Table 7.2.

**Table 7.2 Offsite Potential Contamination Sources**

| Sources                      | Direction | Distance (m) | Likely <sup>1</sup> |
|------------------------------|-----------|--------------|---------------------|
| Clay pit (unknown backfill)  | N         | 24           | ✓                   |
| Clay pit (unknown backfill)  | NE        | 34           | ✓                   |
| Chalk pit (unknown backfill) | W         | 113          | ✓                   |
| Brick kiln                   | E         | 97           |                     |

| Sources                               | Direction | Distance<br>(m) | Likely <sup>1</sup> |
|---------------------------------------|-----------|-----------------|---------------------|
| Padnell Brick and Tile works          | E         | 44              |                     |
| Clay pit                              | NW        | 165             |                     |
| Kiln                                  | NW        | 48              |                     |
| Pond                                  | W         | 101             |                     |
| Electric sub-station                  | NW        | 86              |                     |
| Oliver Richard Motor Vehicle Engineer | SW        | 86              |                     |
| Albany Engineering Services Ltd       | N         | 93              |                     |
| Widen Electronic Solutions            | W         | 114             |                     |
| Down To Earth Drainage & Guttering    | NW        | 230             |                     |

**Note:** ✓ = Likely. <sup>1</sup> Sources that are not ticked were considered negligible. These considerations are based on type of contamination, age of source, anticipated significance and taking account of the source distance from the site.

<sup>2</sup>surface water only

### 7.3 Potential Pathways

A pathway is a route by which a receptor is exposed to a contamination source. Pathways can also determine the likelihood of the contamination source reaching a receptor.

Anthropogenic (or artificial) pathways of contaminant migration can be present in the form of land drains etc. Leaking sewage supply pipes, site drainage, granular backfill to service trenches can also provide pathways for potential contaminant migration.

The potential geological pathways are given in Table 7.3.

**Table 7.3 Potential Soil Migration Pathways**

| Strata               | Pathway      |
|----------------------|--------------|
| Superficial Deposits | None Present |
| Bedrock              | LMBE ✓       |
|                      | LCF N/A      |

**Note:** ✓ = Likely

In Table 7.4 the site-specific sources and pathways are given.

Table 7.4 Site Specific Sources and Pathways

| Type of Attack | Standard Exposure Pathways                                | Source                                                                     | Site Assessment |                                                                                                                                                                                                  |
|----------------|-----------------------------------------------------------|----------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                                                           |                                                                            | Likely          | Comment                                                                                                                                                                                          |
| Oral           | Direct soil and dust ingestion                            | Contaminants in soft landscaping areas                                     | ✓               | Potential asbestos, metals and semi-metals from Made Ground. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag.                                              |
|                | Consumption of home-grown produce                         | Contaminants in gardens areas                                              |                 |                                                                                                                                                                                                  |
| Dermal         | Dermal contact                                            | Contaminants in soft landscaping areas                                     | ✓               | Potential metals and semi-metals from Made Ground. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag                                                         |
| Inhalation     | Inhalation of dust (indoor and outdoor)                   | Contaminants in soft landscaping areas                                     | ✓               | Potential asbestos, metals and semi-metals from Made Ground. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag.                                              |
|                | Inhalation of vapours (indoor and outdoor)                | Volatile compounds & Soft landscaping areas                                | ✓               | Potentially putrescible material used for backfilling of clay pit on and offsite within 250m of the site. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag  |
|                | Inhalation of soil gases                                  | Soil gases (e.g. CH <sub>4</sub> and CO <sub>2</sub> VOC) within 0-250m    |                 |                                                                                                                                                                                                  |
| Physical       | Fire and explosion <sup>1</sup>                           | UXO (e.g. Bombs or projectile sites) (0-250m) <sup>2</sup>                 |                 | No sources identified                                                                                                                                                                            |
|                |                                                           | Combustible material in soil                                               | ✓               | Potentially putrescible material used for backfilling of clay pit on and offsite within 250m of the site. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag  |
|                |                                                           | Soil gases (VOC) within 0-250m                                             |                 |                                                                                                                                                                                                  |
|                | Via anthropogenic pathways (services trenches)            | Contaminants & Trenches or drainage onsite                                 | ✓               | Existing trenches and drainage onsite                                                                                                                                                            |
|                | Others physical pathways <sup>3</sup>                     | Degradation of fills, blast... etc...                                      | ✓               | Due to the potential of slag onsite                                                                                                                                                              |
| Chemical       | Location of service supply pipes in contaminated soils    | Hydrocarbons & Pipes                                                       | ✓               | Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag                                                                                                            |
|                | Direct contact of concrete with concrete aggressive soils | Sulphate, Acids & Concrete                                                 |                 |                                                                                                                                                                                                  |
| Others         | Irradiation <sup>4</sup>                                  | Radon                                                                      |                 | No sources identified                                                                                                                                                                            |
|                |                                                           | Radioactive materials                                                      |                 | No sources identified                                                                                                                                                                            |
|                |                                                           | UXO within 0-250m                                                          |                 | No sources identified                                                                                                                                                                            |
|                | Via surface water runoff                                  | Contaminants & Gradient (South - offsite)                                  | ✓               | Low permeability bedrock (London Clay Formation) with no overlying superficial deposits.                                                                                                         |
|                | Migration downwards via granular soils                    | Contaminants & Drift: Secondary A Aquifer                                  | ✓               | Permeable bedrock (Lambeth Group) in the north with no overlying superficial deposits.                                                                                                           |
|                | Migration downwards via permeable soils and bedrock       | Contaminants & Bedrock: Secondary A Aquifer                                | ✓               | Permeable bedrock (Lambeth Group) in the north                                                                                                                                                   |
|                |                                                           | Contaminants & Groundwater vulnerability: Soils of high leaching potential | ✓               | Permeable bedrock (Lambeth Group) in the north                                                                                                                                                   |
|                | Plant uptake and phytotoxicity <sup>5</sup>               | Metallic contaminants                                                      | ✓               | Potential metals and semi-metals from Made Ground.                                                                                                                                               |
|                |                                                           | Soil gases within 0-250m                                                   | ✓               | Potentially putrescible material used for backfilling of clay pit on and offsite within 250m of the site. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag. |
|                | Plant uptake and ecotoxicological effects <sup>6</sup>    | Contaminants                                                               | ✓               | Potential metals and semi-metals from Made Ground. Source of PAH, VOC from Brick and Tile works, brick kiln and kiln and associated slag                                                         |

Notes: ✓ = Likely

<sup>1</sup> Both underground fires and biodegradable may produce toxic or flammable gases;

<sup>2</sup> UXO= Unexploded Ordnance: Although risk is generally low in the UK, a risk assessment (i.e. using Find map for example) may be needed if an UXO is found onsite.;

<sup>3</sup> Blast-furnace and steel-making slag may expand. Degradation of fills may cause settlement and voids in buried tanks and drums may collapse as corrosion occurs or under loading;

<sup>4</sup> Radioactive materials emitting gamma rays that can be inhaled and absorbed through the skin and also cause a radiation response;

<sup>5</sup> Prevention or inhibition of plant growth;

<sup>6</sup> Contaminants in soil may affect microbial, animal and plant populations. Ecosystems or individual species on the site, in surface waters or areas affected by migration from the site may be indirectly affected.

**Table 7.5 Off-site Potential Pathways**

| Receptors                                         | Off-Site Potential Pathways                       | Risk |
|---------------------------------------------------|---------------------------------------------------|------|
| Human Health<br>Building Materials                | Migration via surface water runoff (Surface flow) | ✓    |
| Human Health<br>Building Materials                | Migration via air                                 | ✓    |
| Groundwater<br>Human Health<br>Building Materials | Migration via groundwater flows                   | ✓    |
| Human Health<br>Buildings                         | Migration of soil gas via permeable soils         | ✓    |

Notes: ✓ = Likely

#### 7.4 Potential Receptors

The presence of potential receptors has been evaluated from our understanding of the current and planned land use of the site, an assessment of surrounding land uses and currently available information pertaining to the site. The assessment for potential receptors has been included in Table 7.6.

**Table 7.6 Potential Receptors**

| Potential Receptor            | Risk                                         |
|-------------------------------|----------------------------------------------|
| Human Health                  | Future users of the site ✓                   |
|                               | Visitors to the site ✓                       |
|                               | Construction workers on site ✓               |
|                               | Service and maintenance workers ✓            |
|                               | Site neighbours and wider public ✓           |
| Groundwater/Controlled Waters | Deep Groundwater/Future Potable Water Supply |
|                               | Shallow Groundwater within Lambeth Group ✓   |
|                               | Surface Water ✓                              |
| Buildings & Materials         | Construction materials ✓                     |
|                               | Buildings and confined spaces ✓              |
| Ecosystems                    | Flora and fauna in surface water ✓           |

Notes: ✓ = Likely

#### 7.5 Preliminary Risk Assessment

A preliminary risk assessment has been undertaken relating to the proposed development based on a qualitative assessment of the likely presence of a pollutant linkage. A pollutant linkage is the relationship between a contaminant source, a pathway and a receptor. Unless all three elements of a pollutant linkage are present, a risk is not considered to exist. Each of the three elements was considered in Sections 7.2, 7.3 and 7.4. The approach adopted was to screen the site based on assigning a risk category. The preliminary risk assessment is presented in Table 7.7 with the classification tables presented in Appendix E, which have been modified from, 'Contaminated land risk assessment: A guide to good practice, 2001, CIRIA C552'.

**Table 7.7 Risk Assessment**

| Source              | Direction | Distance (m) <sup>1</sup> | Pathway | Receptor | Risk            | Reasoning                                                                                                                                                                    |
|---------------------|-----------|---------------------------|---------|----------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clay Pit            | Onsite    | Onsite                    | ✓       | ✓        | Low - Moderate  | Potential for putrescible material to be used during back fill, therefore a soil gas risk is present onsite                                                                  |
| Made Ground         | Onsite    | Onsite                    | ✓       | ✓        | Low             | Made ground from historic redevelopment of the site potential source of asbestos, metals and semi-metals                                                                     |
| Kiln and brickworks | Onsite    | Onsite                    | ✓       | ✓        | Low - Moderate  | Onsite source of potential slag, PAH's and TPH's.                                                                                                                            |
| Pond                | Onsite    | Onsite                    | ✓       | ✓        | Low             | Putrescible material may have been used in the backfilling of this pond, posing a soil gas risk.                                                                             |
| Clay pit            | N         | 24                        | ✓       | ✓        | Low to moderate | Potential for putrescible material to be used during backfill, therefore a soil gas risk is present onsite. Proximal to the site and lateral flow through the Lambeth Group. |
| Clay pit            | NE        | 34                        | ✓       | ✓        | Low to moderate |                                                                                                                                                                              |
| Chalk pit           | W         | 113                       | ✓       | ✓        | Very low        |                                                                                                                                                                              |
| Clay pit            | NW        | 165                       | ✓       | ✓        | Very low        |                                                                                                                                                                              |

**Notes:** ✓ = Likely. <sup>1</sup> Approximately from boundary of the site. There can only be a risk if there is both a pathway and a receptor present

## 7.6 Potential Contamination

From the Risk Assessment presented in Table 7.7, the main groups of associated contaminants are presented in

Table 7.8. The associated contaminants have been based on DOE industry profiles or on knowledge of the processes involved in the activity carried out onsite.

**Table 7.8 Potential Contaminants or Properties**

| <b>Contaminants/Chemical Properties</b> |                        | <b>Potential Contaminative Sources</b>            |
|-----------------------------------------|------------------------|---------------------------------------------------|
| P1                                      | Asbestos               | Made Ground                                       |
| P2                                      | Organic compounds      | Padnell Brick and Tile works, brick kiln and kiln |
| P3                                      | Organic solvents       | Padnell Brick and Tile works, brick kiln and kiln |
| P4                                      | Metals and Semi-metals | Made Ground, kiln                                 |
| P5                                      | Soil Gas               | Backfilled clay pits on and off-site.             |
| <b>Note:</b> P=Properties               |                        |                                                   |

## 7.7 Preliminary Conceptual Site Model

The preliminary conceptual site model, including linkages that require further action, are presented in Table 7.9.

**Table 7.9 Preliminary Conceptual Site Model and Risk Assessment Methodology**

| Potential Contaminants (Table 7.8) | Pathway (See Tables 7.3, 7.4 & 7.5)                                          | Receptor (See Table 7.6)                   | Risk Assessment Methodology (plus anticipated quantitative risk assessment methods)                                                                                                                                         | Site specific settings                                                                                      | Risk Classification: Based on Desk Study | Pollutant Linkage & Action Required                                               |
|------------------------------------|------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------|
| P2, P3, P4                         | Uptake (root and stomata), ingestion, inhalation and dermal                  | Ecological features (i.e. Flora and Fauna) | Presence of SSSI, Nature reserves and others within 0- 250m to the site.                                                                                                                                                    | Wood noted to the north, development comprised private gardens                                              | Low                                      | <b>Further investigation required.</b><br>Phase II Ground investigation required. |
| P2, P3, P4                         | Chemical attack                                                              | Building structures/services               | BRE SDI 2005 for risk assessment. Water UK (2014) for pipes. Use Anglian Water trigger for services risk assessment                                                                                                         | Residential development                                                                                     | Low                                      | <b>Further investigation required.</b><br>Phase II Ground investigation required. |
| P1, P2, P3, P4                     | Inhalation, ingestion and dermal contact                                     | Human health<br>Site residents             | Use CLEA for human risk assessment                                                                                                                                                                                          | Residential development                                                                                     | Low to moderate                          | <b>Further investigation required.</b><br>Phase II Ground investigation required. |
|                                    |                                                                              | Human Health<br>Workers                    | Assessment not within the scope of this Desk study (responsibility of building contractor). Ground workers should follow regulations on health and safety during development (HSE, 1991)                                    | Workers and the general public should follow regulation on health and safety during development (HSE, 1991) | Low                                      | Follow HSE Procedures                                                             |
| P2, P3, P4                         | Leaching (direct precipitation, overland flow and through flow)              | Surface Water / Shallow groundwater        | Assess distance from watercourse and direction of flow – Consider use of R&D 20 publication and EA remediation target for risk assessment                                                                                   | Secondary A Aquifer in the bedrock of the Lambeth Group. Unproductive Strata in the London Clay Formation   | Low                                      | <b>Further investigation required.</b><br>Phase II Ground investigation required. |
| P2, P3, P4                         | Leaching (direct precipitation, overland flow, through and groundwater flow) | Deep groundwater                           | Undertake groundwater or leachate testing depending on site specific ground conditions. Consider use of R&D 20 publication and EA remediation target for risk assessment if contamination is identified.                    | Within the Newhaven Chalk Formation                                                                         | None                                     | <b>No Further Action Required</b>                                                 |
| P5                                 | Through fissures, shafts, high permeability strata and inhalation            | Human and Building Structures              | Current or former Landfill sites within 0-250m to the site. Assess nature/age/size of site for Risk Assessment. Use CIRIA 149 & 665 to assess need for gas protection measures where necessary following ground gas testing | Multiple potentially backfilled clay pits, chalk pit and ponds                                              | Medium                                   | <b>Further investigation required.</b><br>Phase II Ground investigation required. |

**Note:** P1: Asbestos P2: Organic compounds (e.g. PAHs and TPHs) P3: Organic Solvents, P4: Metals and Semi-metals, P5: Soil gas: HSE = Health and Safety Executive

## Section 8      Recommendations

### 8.1      General

Based on the information obtained during the compilation of this Phase I Desk Study and the preliminary conceptual site model, an intrusive investigation is required to quantify the risks. The intrusive investigation may reveal on site sources of contamination that were not identified in the Phase I Desk Study and Site Walkover that could modify the Conceptual Site Model.

### 8.2      Impact of Construction Activities on Controlled Water and Site Neighbours

A construction risk assessment must be undertaken and appropriate measures taken to mitigate against mobilisation and to monitor impact to groundwater and surface waters.

### 8.3      Proposed Further Site Works

An intrusive investigation was required to quantify the risks that have been identified within the preliminary CSM. The preliminary CSM identifies the test parameters relevant to the sources that have a pathway to a receptor. Dependant on the findings of an intrusive investigation the test parameters may be modified. The intrusive investigation will investigate and assess pollutant linkages identified in the preliminary Conceptual Site Model.

The required further environmental investigation has been presented in Table 8.1.

**Table 8.1 Required Further Environmental Investigation**

| Potential Further works    | General Purpose                                                                                | Required |
|----------------------------|------------------------------------------------------------------------------------------------|----------|
| Investigatory Holes        | Collect sufficient samples for a robust assessment                                             | ✓        |
| Laboratory Testing         | Quantify the risks identified in the Conceptual Site Model                                     | ✓        |
| Risk Assessment            | Assess pollutant linkages based on current contaminated land guidance and screening criteria's | ✓        |
| Borehole well installation | To allow for continued groundwater and/or gas monitoring                                       | ✓        |
| Remediation                | If the site-specific risk assessment reveals that the site was contaminated                    | ✓        |
| Validation & Verification  | To validate and verify the remedial objectives based on the site-specific risk assessment      |          |

### 8.4      Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

Care should be taken during excavation works especially to investigate any soils, which appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual

discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea, burning of nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded and the Local Authority, a competent and appropriate third-party Engineer/Environmental consultant notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation action.

The discovery strategy must remain on site at all times and must demonstrate a clear allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

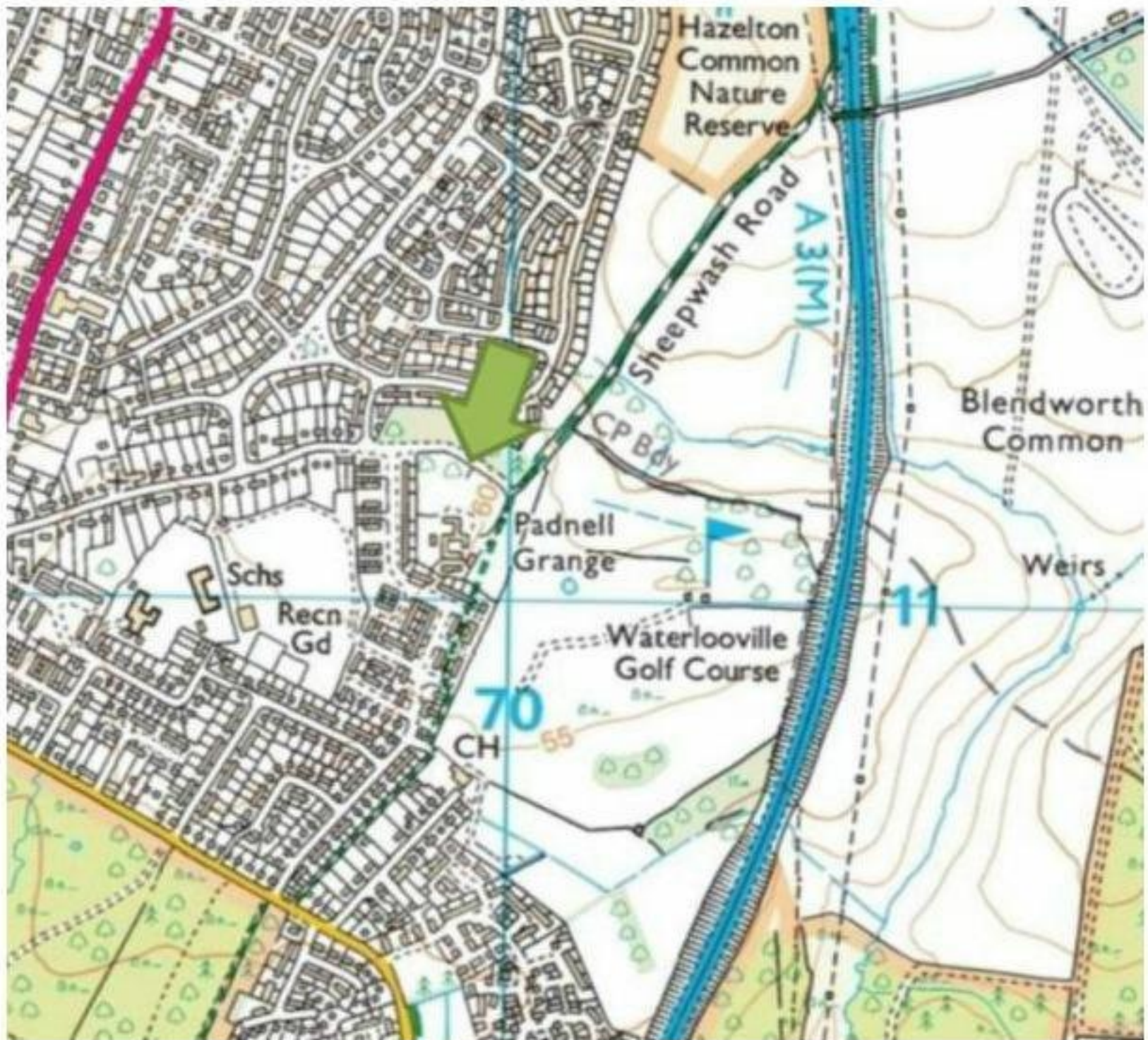


**Figure I - Site Location Plan**

**Project**

Padnell Grange, Padnell Road, Cowplain, Hampshire  
PO8 8ED

**Date**

August 2017

**Client**

Bellway Homes (Wessex)

**Reference**

16362



## **Appendix A Country Series and Ordnance Survey Maps**

# Historical Mapping Legends

## Ordnance Survey County Series 1:10,560

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

## Ordnance Survey Plan 1:10,000

|  |                                                                         |  |                                                         |
|--|-------------------------------------------------------------------------|--|---------------------------------------------------------|
|  | Chalk Pit, Clay Pit or Quarry                                           |  | Gravel Pit                                              |
|  | Sand Pit                                                                |  | Disused Pit or Quarry                                   |
|  | Refuse or Slag Heap                                                     |  | Lake, Loch or Pond                                      |
|  | Dunes                                                                   |  | Boulders                                                |
|  | Coniferous Trees                                                        |  | Non-Coniferous Trees                                    |
|  | Orchard                                                                 |  | Scrub                                                   |
|  | Bracken                                                                 |  | Heath                                                   |
|  | Marsh                                                                   |  | Reeds                                                   |
|  | Building                                                                |  | Glasshouse                                              |
|  | Sloping Masonry                                                         |  | Pylon                                                   |
|  | Cutting                                                                 |  | Embankment                                              |
|  | Road Under                                                              |  | Road Over                                               |
|  | Level Crossing                                                          |  | Foot Bridge                                             |
|  | Standard Gauge Multiple Track                                           |  | Standard Gauge Single Track                             |
|  | Siding, Tramway or Mineral Line                                         |  | Narrow Gauge                                            |
|  | Geographical County                                                     |  | Administrative County, County Borough or County of City |
|  | Municipal Borough, Urban or Rural District, Borough or District Council |  | Borough, Borough or County Constituency                 |
|  | Civil Parish                                                            |  |                                                         |
|  | BP, BS Boundary Post or Stone                                           |  | PO Post Office                                          |
|  | Ch Church                                                               |  | PC Public Convenience                                   |
|  | CH Club House                                                           |  | PH Public House                                         |
|  | F E Sta Fire Engine Station                                             |  | SB Signal Box                                           |
|  | FB Foot Bridge                                                          |  | Spr Spring                                              |
|  | Fn Fountain                                                             |  | TCB Telephone Call Box                                  |
|  | GP Guide Post                                                           |  | TCP Telephone Call Post                                 |
|  | MP Mile Post                                                            |  | W Well                                                  |
|  | MS Mile Stone                                                           |  |                                                         |

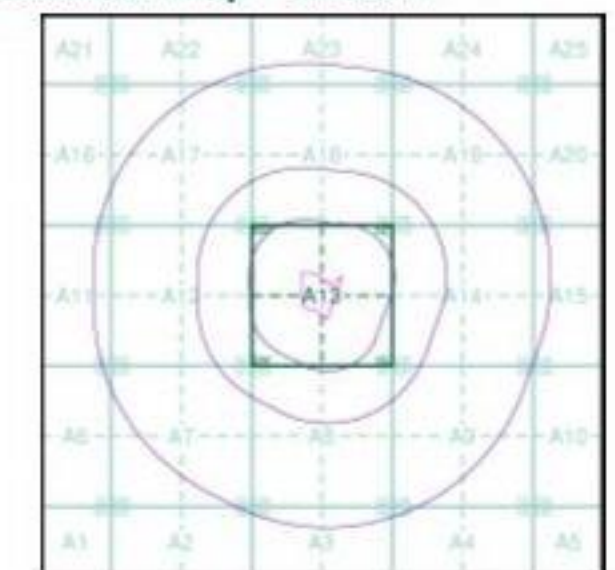
## 1:10,000 Raster Mapping

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

## Historical Mapping & Photography included:

| Mapping Type                  | Scale    | Date        | Pg |
|-------------------------------|----------|-------------|----|
| Hampshire & Isle Of Wight     | 1:10,560 | 1870        | 3  |
| Sussex                        | 1:10,560 | 1880        | 4  |
| Hampshire & Isle Of Wight     | 1:10,560 | 1897 - 1898 | 5  |
| Sussex                        | 1:10,560 | 1899        | 6  |
| Hampshire & Isle Of Wight     | 1:10,560 | 1909 - 1910 | 7  |
| Sussex                        | 1:10,560 | 1914        | 8  |
| Sussex                        | 1:10,560 | 1914        | 9  |
| Sussex                        | 1:10,560 | 1914        | 10 |
| Hampshire & Isle Of Wight     | 1:10,560 | 1931 - 1933 | 11 |
| Hampshire & Isle Of Wight     | 1:10,560 | 1931        | 12 |
| Hampshire & Isle Of Wight     | 1:10,560 | 1942        | 13 |
| Historical Aerial Photography | 1:10,560 | 1947 - 1949 | 14 |
| Ordnance Survey Plan          | 1:10,000 | 1962 - 1963 | 15 |
| Ordnance Survey Plan          | 1:10,000 | 1966        | 16 |
| Ordnance Survey Plan          | 1:10,000 | 1975        | 17 |
| Ordnance Survey Plan          | 1:10,000 | 1980 - 1982 | 18 |
| Havant                        | 1:25,000 | 1983        | 19 |
| Portsmouth                    | 1:10,000 | 1988        | 20 |
| Ordnance Survey Plan          | 1:10,000 | 1991 - 1992 | 21 |
| 10K Raster Mapping            | 1:10,000 | 2000        | 22 |
| 10K Raster Mapping            | 1:10,000 | 2006        | 23 |
| VectorMap Local               | 1:10,000 | 2017        | 24 |

## Historical Map - Slice A



## Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

## Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED

# Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale



243.8 Values for prominent elevations

186.0 Numbers for spot elevations, depth soundings, contour lines, etc.

0.2 Velocity of the current, width of river bed, depth of river

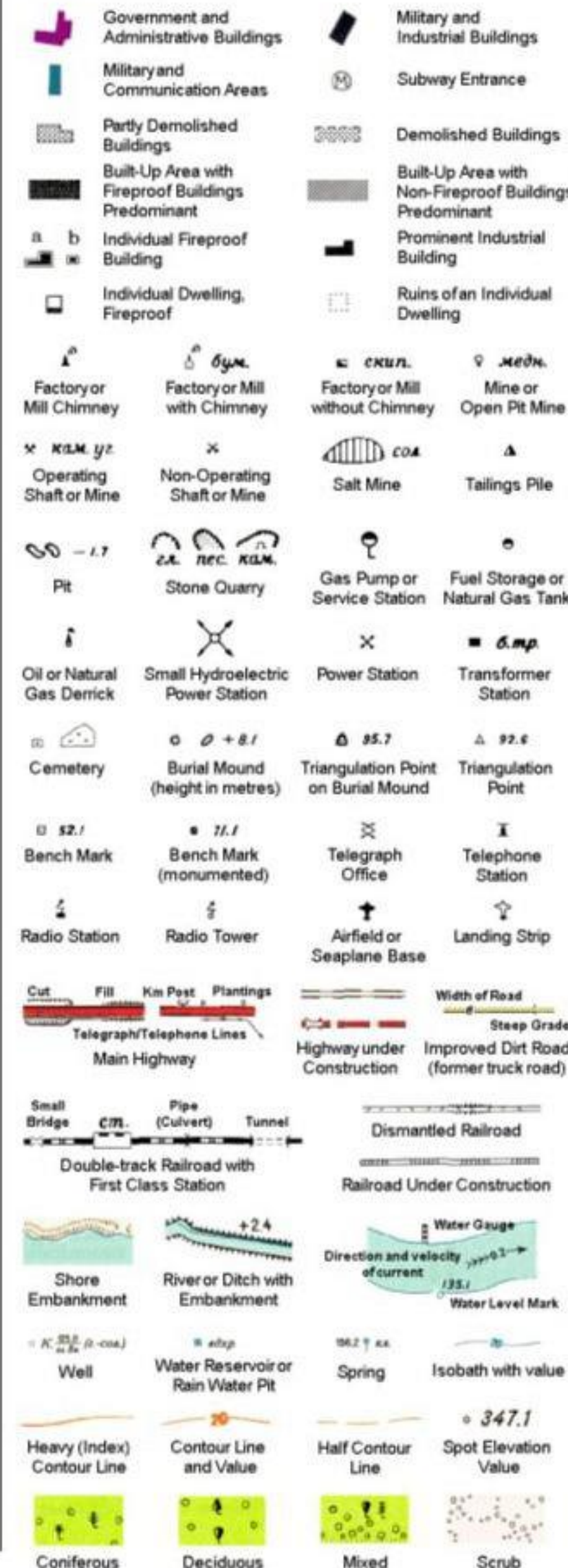
182.12 Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A) Б б (B) В в (V) Г г (G) Д д (D) Е е (E) Ё ё (YO) Ж ж (ZH) З з (Z) И и (I) Й й (Y) К к (K) Л л (L) М м (M) Н н (N) О о (O) П п (P) Р р (R) С с (S) Т т (T) У у (U) Ф ф (F) Х х (KH) Ц ц (TS) Ч ч (CH) Ш ш (SH) Щ щ (SHCH) Ъ ъ (-) Ы ы (Y) Ь ь (' ) Э э (E) Ю ю (YU or IU) Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale



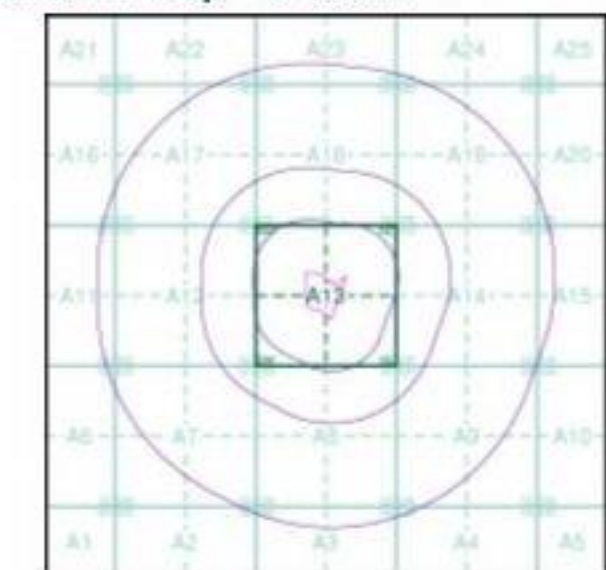
Key to Numbers on Mapping

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Historical Mapping & Photography included:

| Mapping Type                  | Scale    | Date        | Pg |
|-------------------------------|----------|-------------|----|
| Hampshire & Isle Of Wight     | 1:10,560 | 1870        | 3  |
| Sussex                        | 1:10,560 | 1880        | 4  |
| Hampshire & Isle Of Wight     | 1:10,560 | 1897 - 1898 | 5  |
| Sussex                        | 1:10,560 | 1899        | 6  |
| Hampshire & Isle Of Wight     | 1:10,560 | 1909 - 1910 | 7  |
| Sussex                        | 1:10,560 | 1914        | 8  |
| Sussex                        | 1:10,560 | 1914        | 9  |
| Sussex                        | 1:10,560 | 1914        | 10 |
| Hampshire & Isle Of Wight     | 1:10,560 | 1931 - 1933 | 11 |
| Hampshire & Isle Of Wight     | 1:10,560 | 1931        | 12 |
| Hampshire & Isle Of Wight     | 1:10,560 | 1942        | 13 |
| Historical Aerial Photography | 1:10,560 | 1947 - 1949 | 14 |
| Ordnance Survey Plan          | 1:10,000 | 1962 - 1963 | 15 |
| Ordnance Survey Plan          | 1:10,000 | 1966        | 16 |
| Ordnance Survey Plan          | 1:10,000 | 1975        | 17 |
| Ordnance Survey Plan          | 1:10,000 | 1980 - 1982 | 18 |
| Havant                        | 1:25,000 | 1983        | 19 |
| Portsmouth                    | 1:10,000 | 1988        | 20 |
| Ordnance Survey Plan          | 1:10,000 | 1991 - 1992 | 21 |
| 10K Raster Mapping            | 1:10,000 | 2000        | 22 |
| 10K Raster Mapping            | 1:10,000 | 2006        | 23 |
| VectorMap Local               | 1:10,000 | 2017        | 24 |

Russian Map - Slice A



Order Details

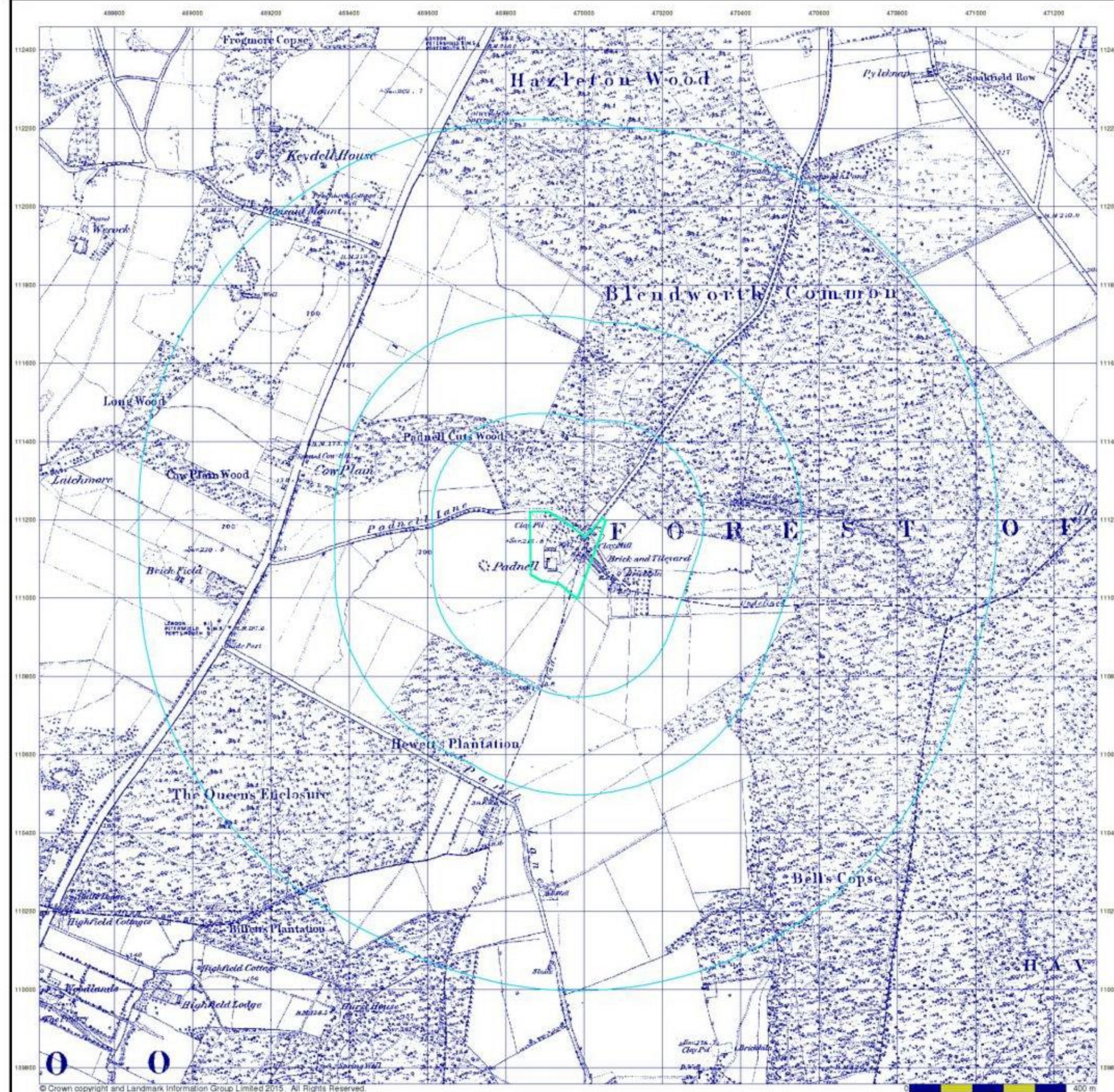
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National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

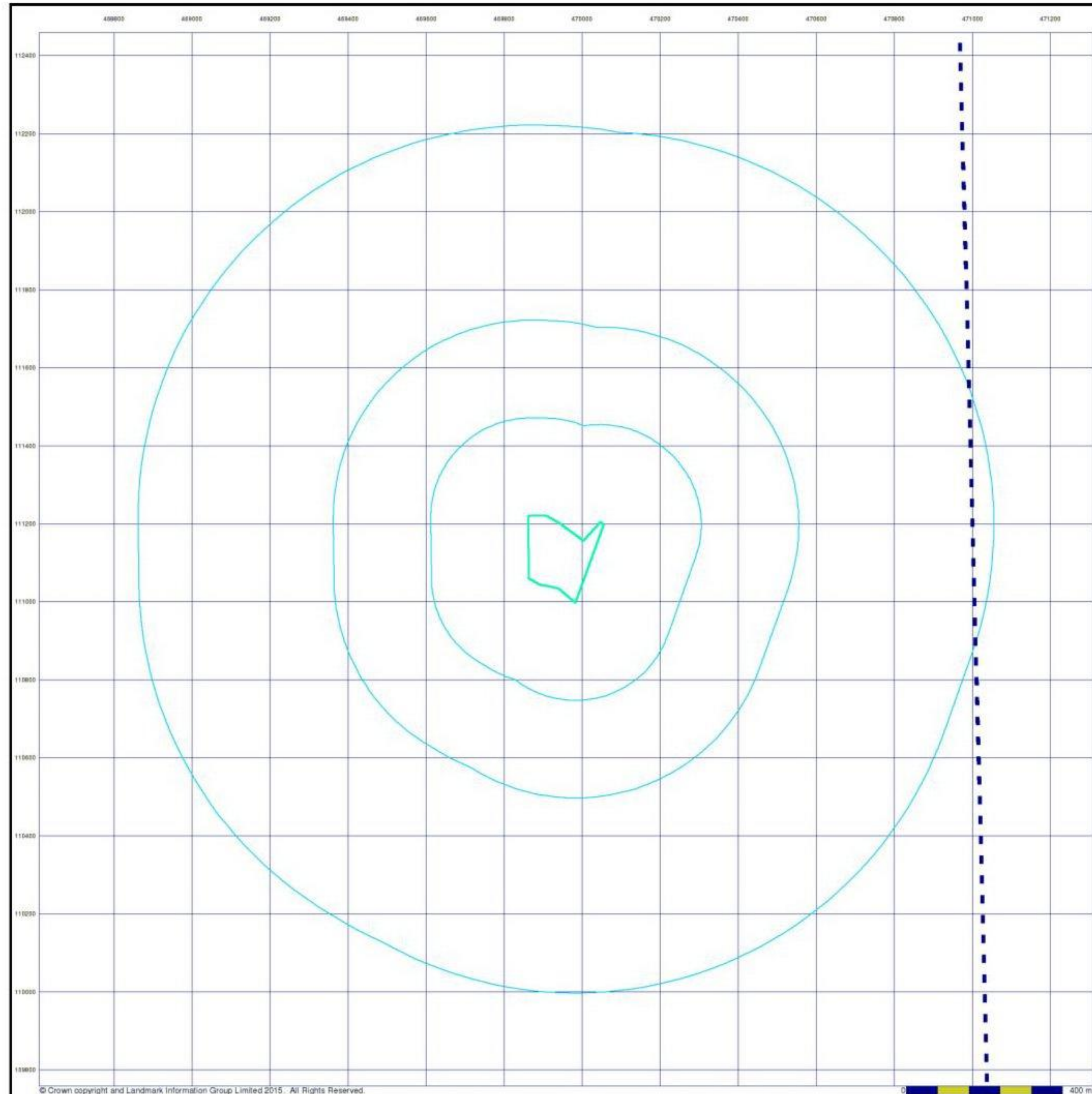
Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED

**Landmark**  
INFORMATION GROUP

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





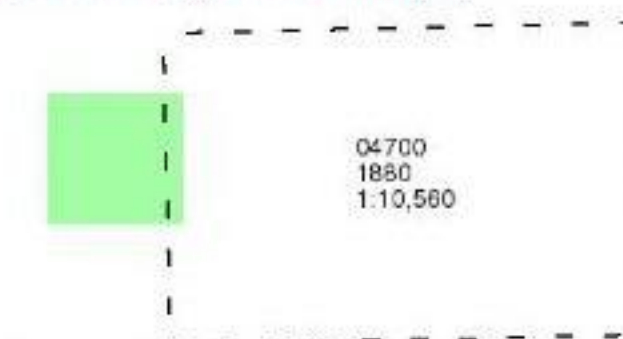
## Sussex

Published 1880

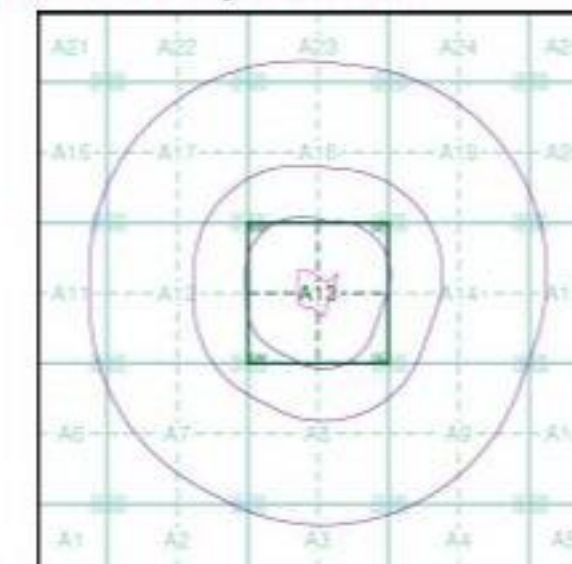
Source map scale - 1:10,560

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

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



### Historical Map - Slice A



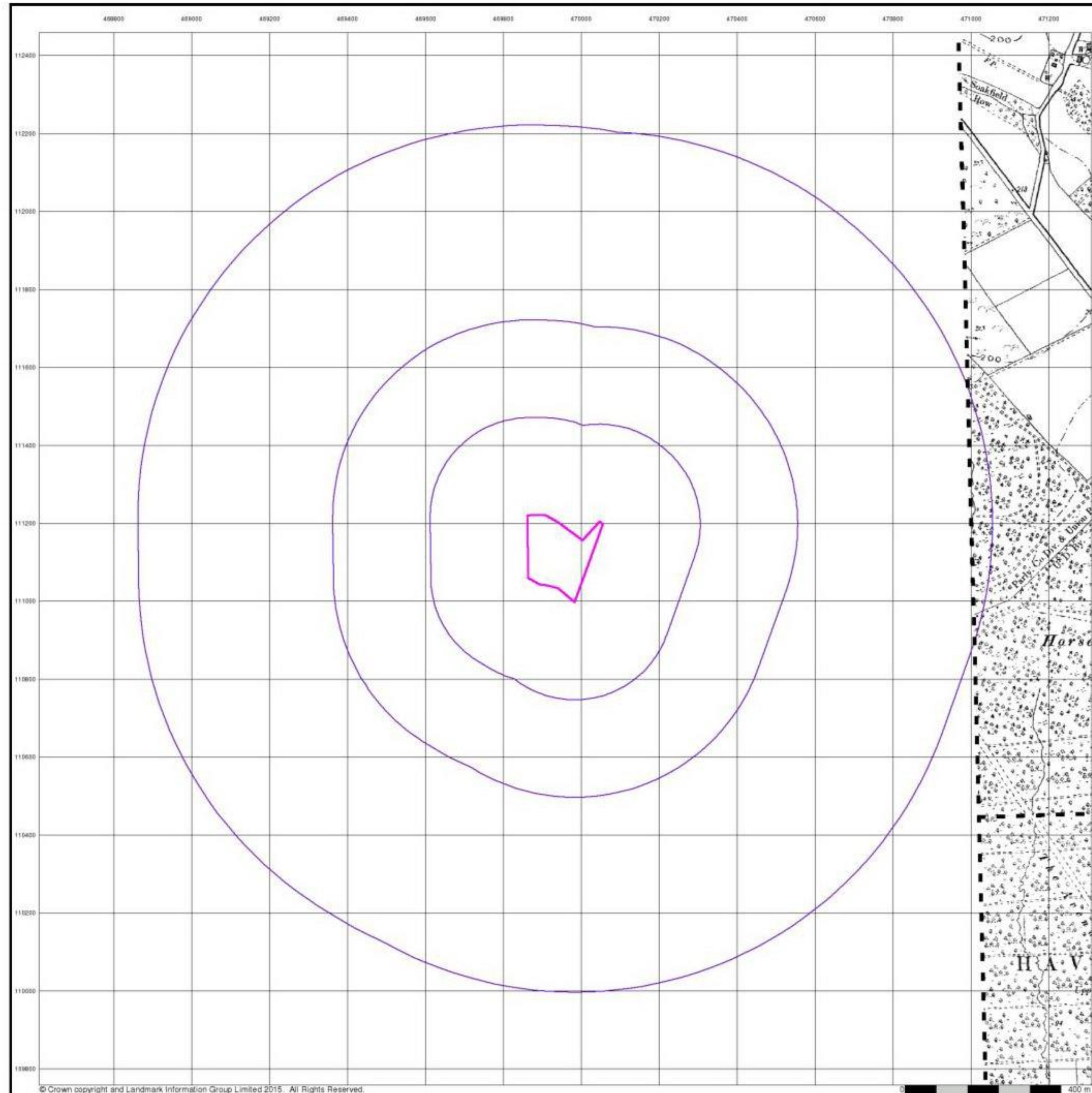
### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED





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0 400 m

## Sussex

Published 1899

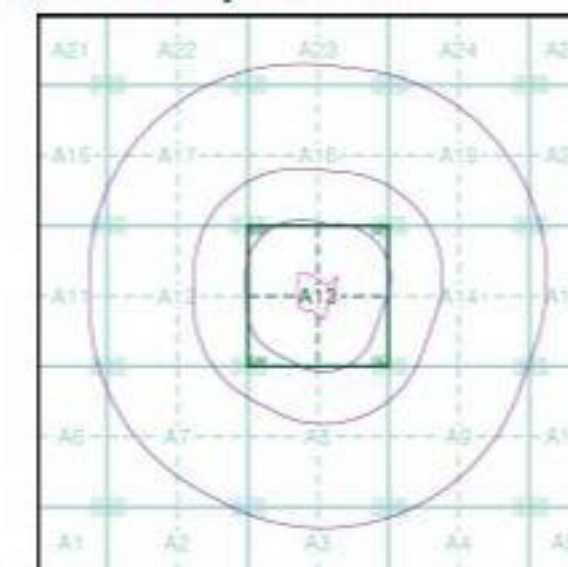
Source map scale - 1:10,560

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)

|          |
|----------|
| 047NW    |
| 1899     |
| 1:10,560 |
| 047SW    |
| 1899     |
| 1:10,560 |

### Historical Map - Slice A



### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED

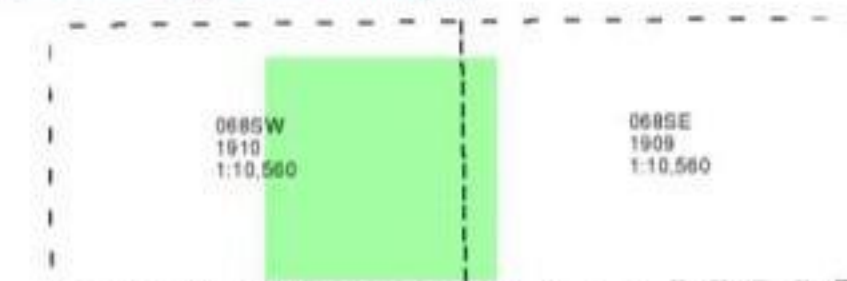
## Hampshire & Isle Of Wight

Published 1909 - 1910

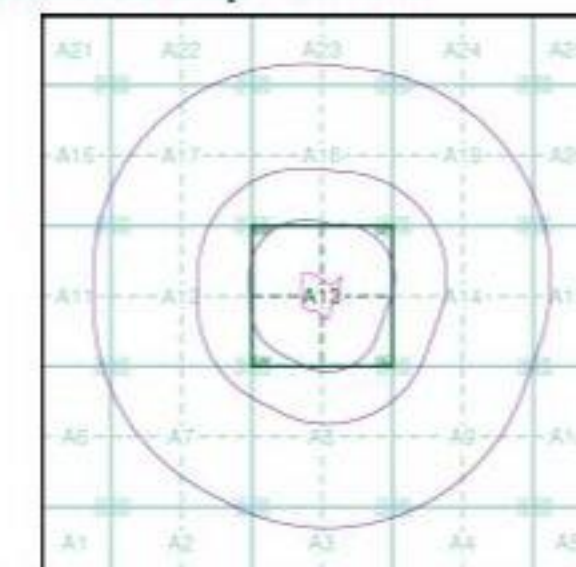
Source map scale - 1:10,560

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)



### Historical Map - Slice A

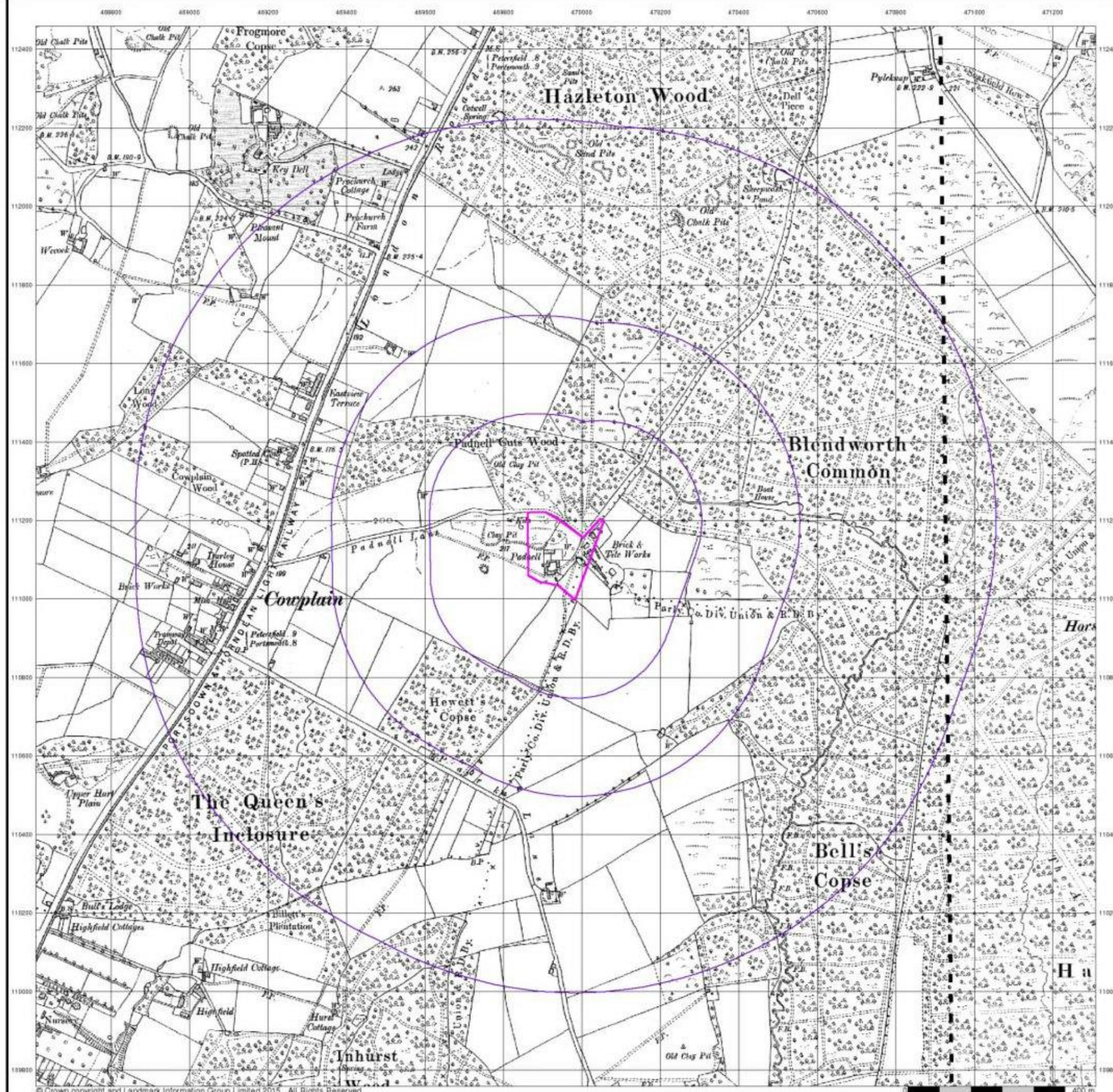


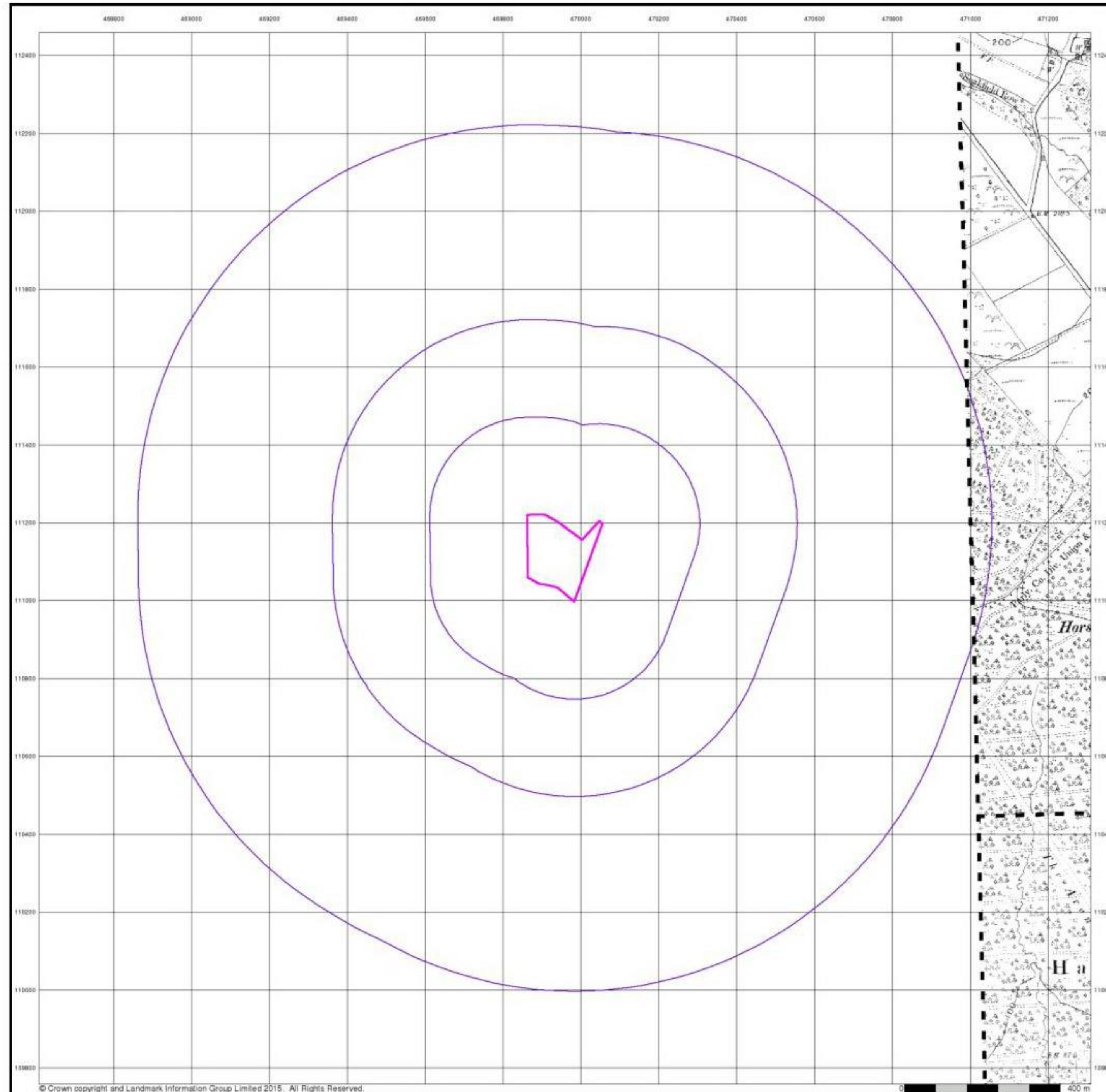
### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
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Site Area (Ha): 2.66  
Search Buffer (m): 1000

### Site Details

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## Sussex

Published 1914

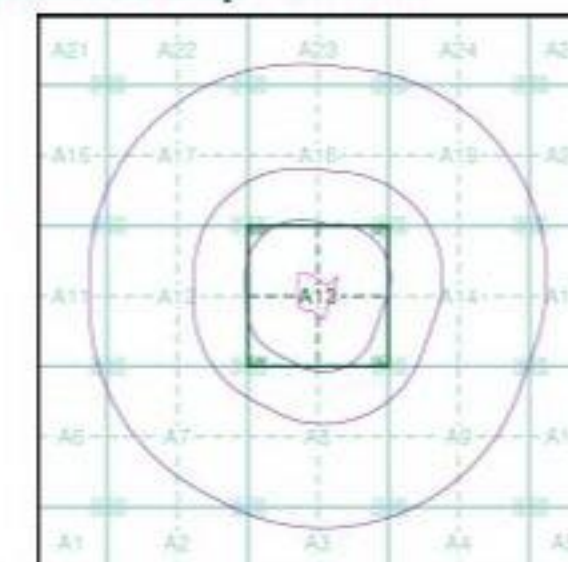
Source map scale - 1:10,560

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)

|          |
|----------|
| 047NW    |
| 1914     |
| 1:10,560 |
| 047SW    |
| 1914     |
| 1:10,560 |

### Historical Map - Slice A

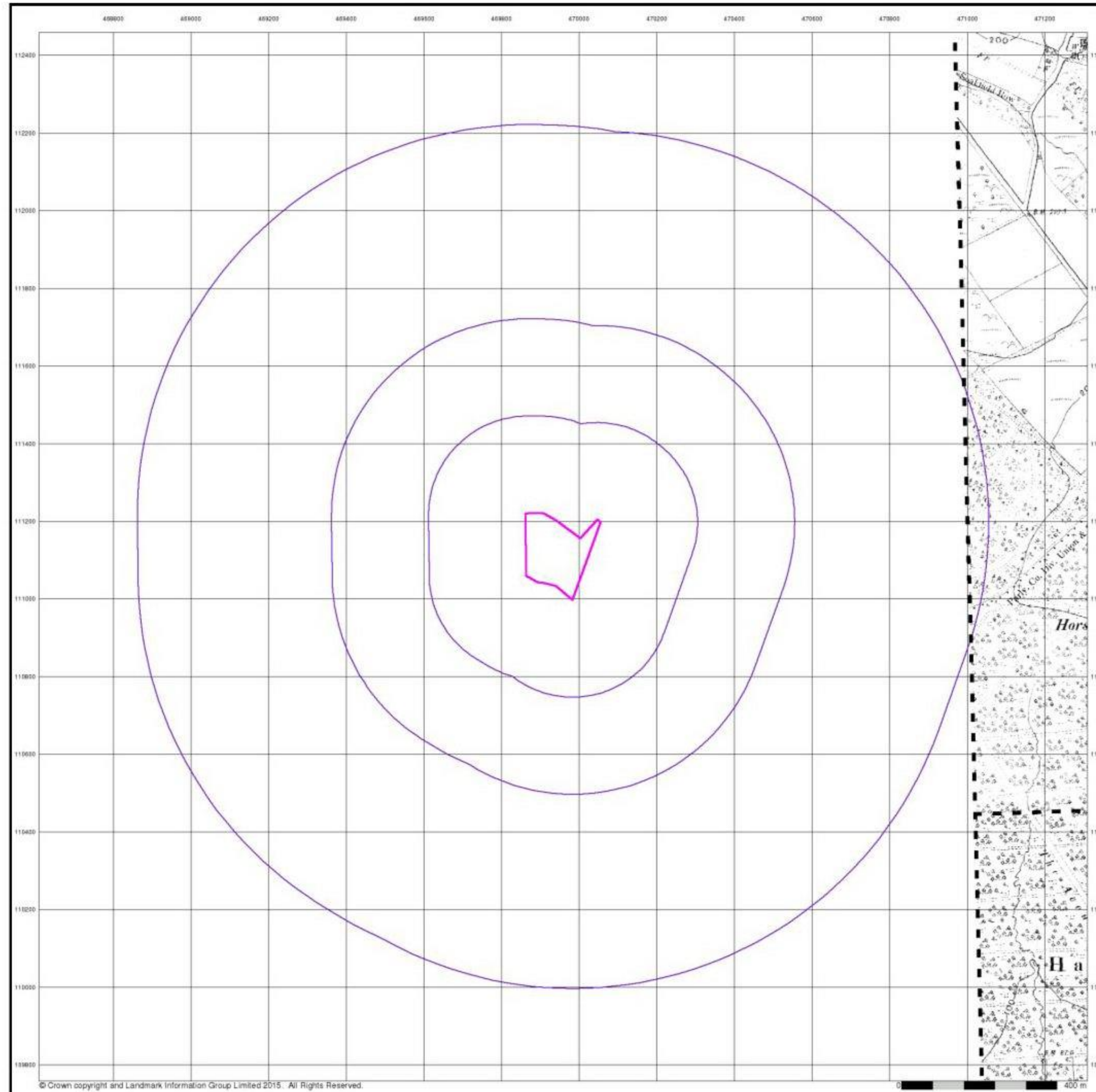


### Order Details

Order Number: 130737768\_1\_1  
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National Grid Reference: 469950, 111130  
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Search Buffer (m): 1000

### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED



## Sussex

Published 1914

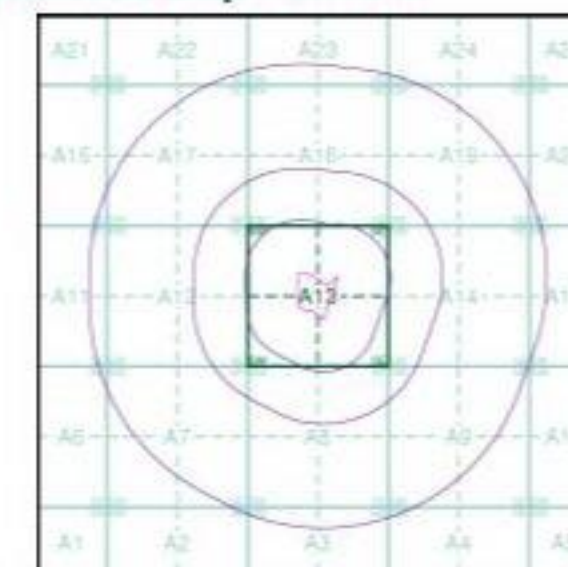
Source map scale - 1:10,560

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

|          |
|----------|
| 047NW    |
| 1914     |
| 1:10,560 |
| 047SW    |
| 1914     |
| 1:10,560 |

### Historical Map - Slice A

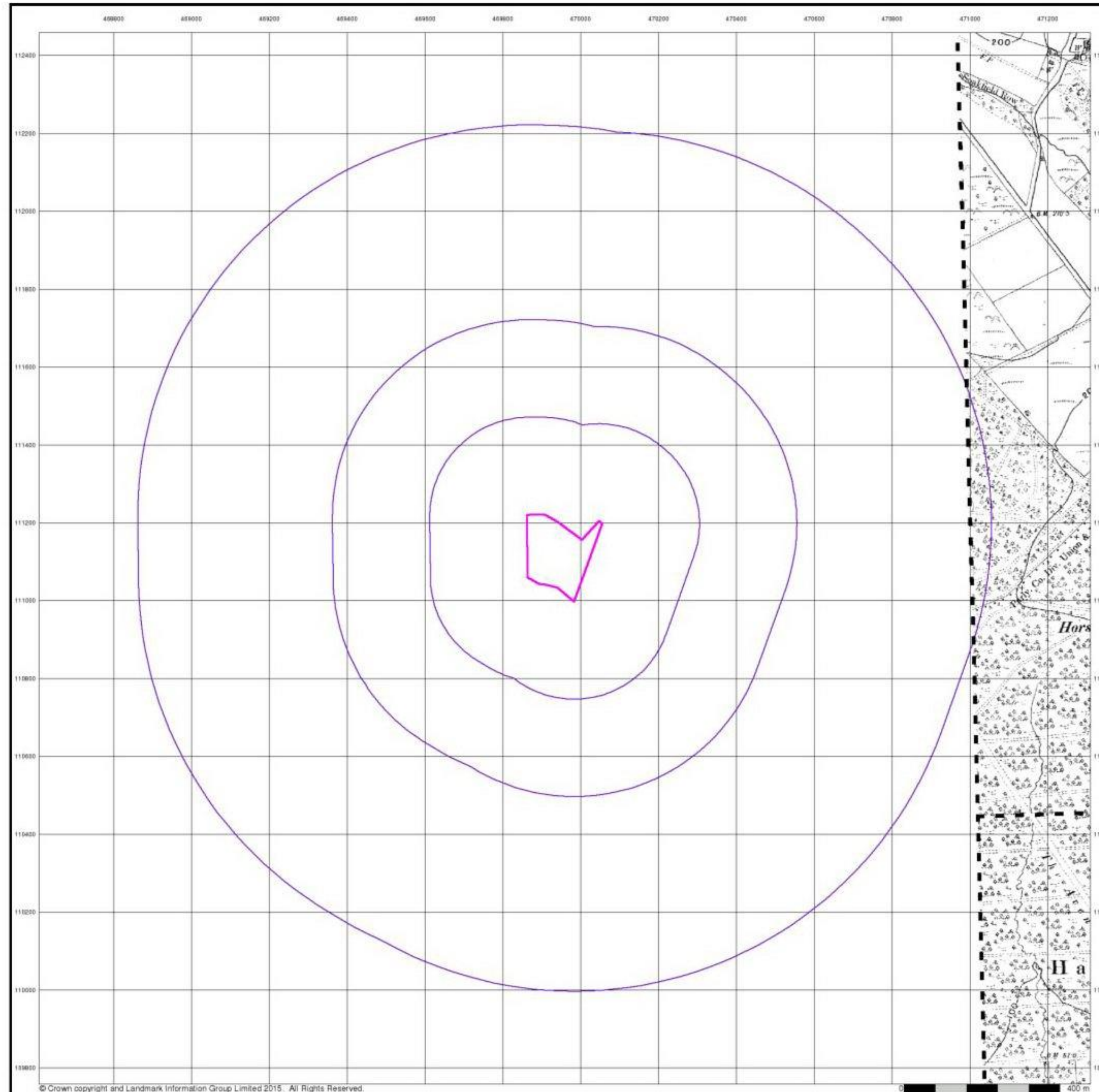


### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED



## Sussex

Published 1914

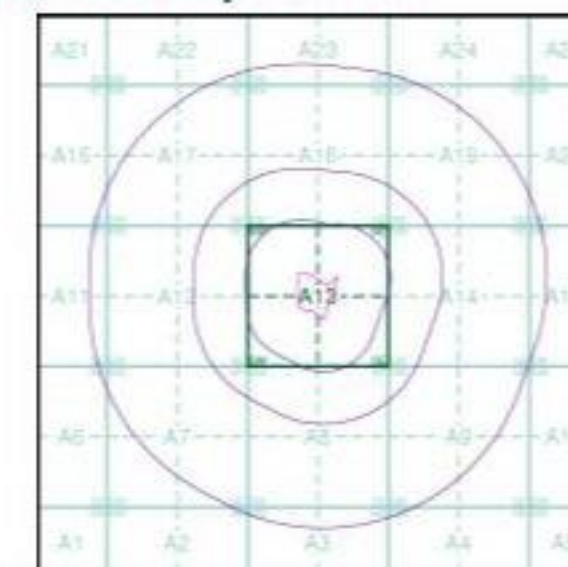
Source map scale - 1:10,560

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.

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|          |
|----------|
| 047NW    |
| 1914     |
| 1:10,560 |
| 047SW    |
| 1914     |
| 1:10,560 |

### Historical Map - Slice A

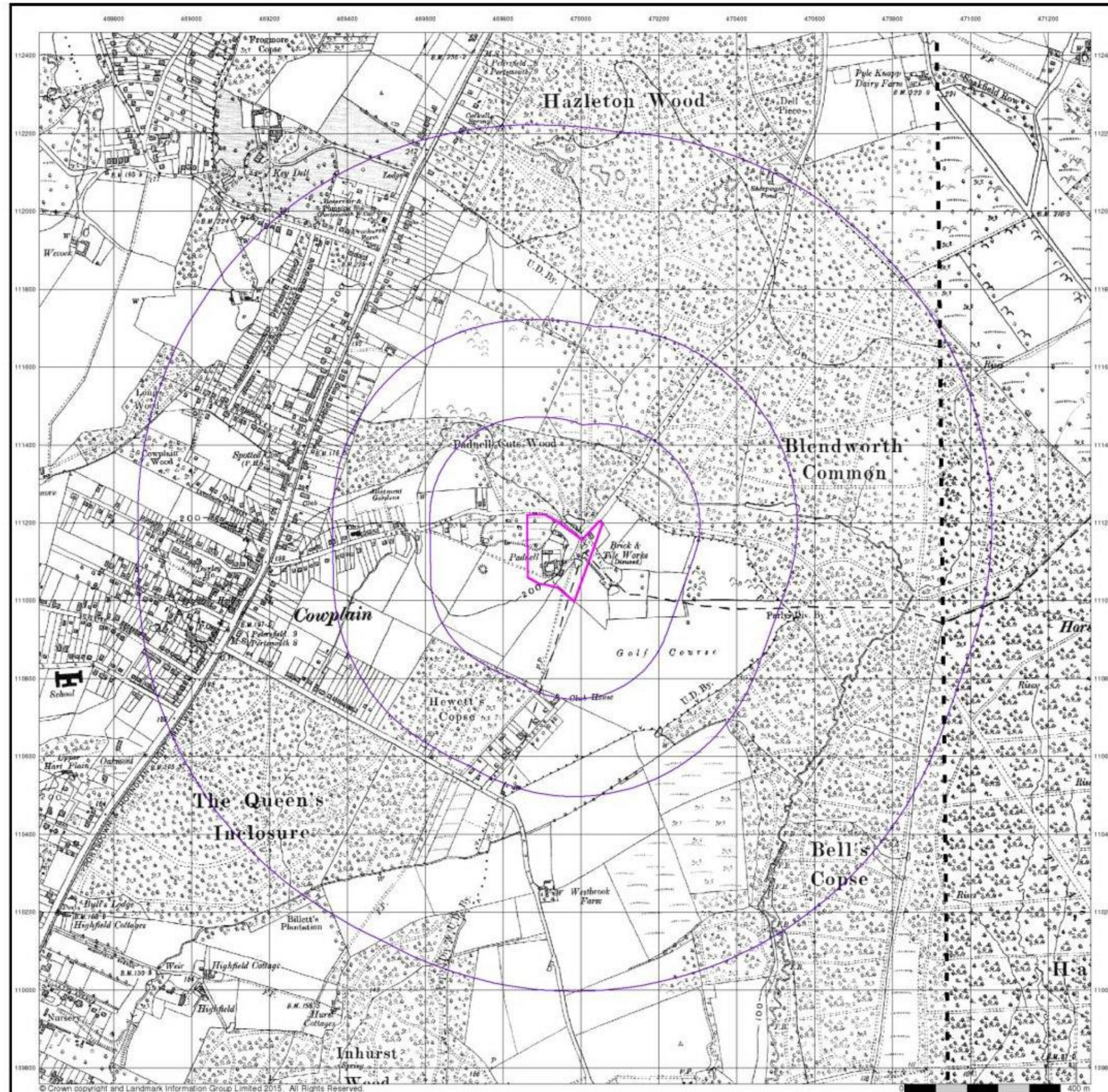


### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
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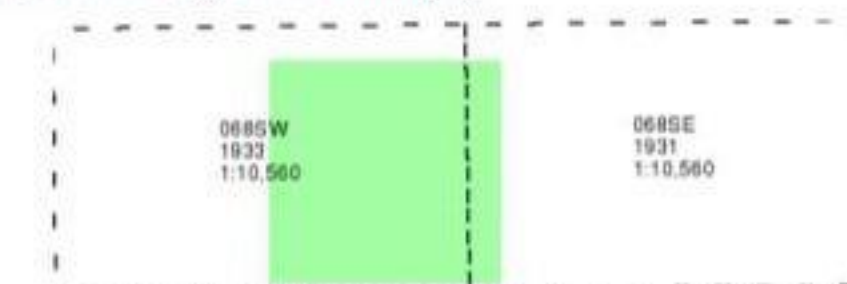
### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED

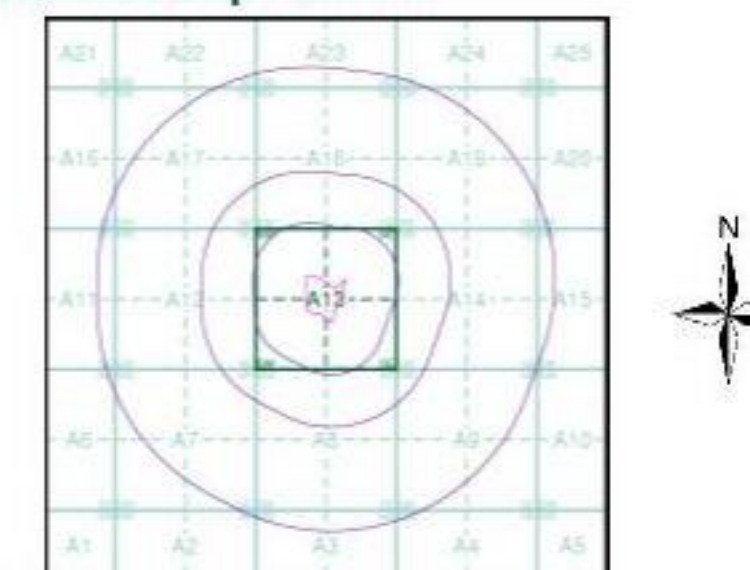


The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some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

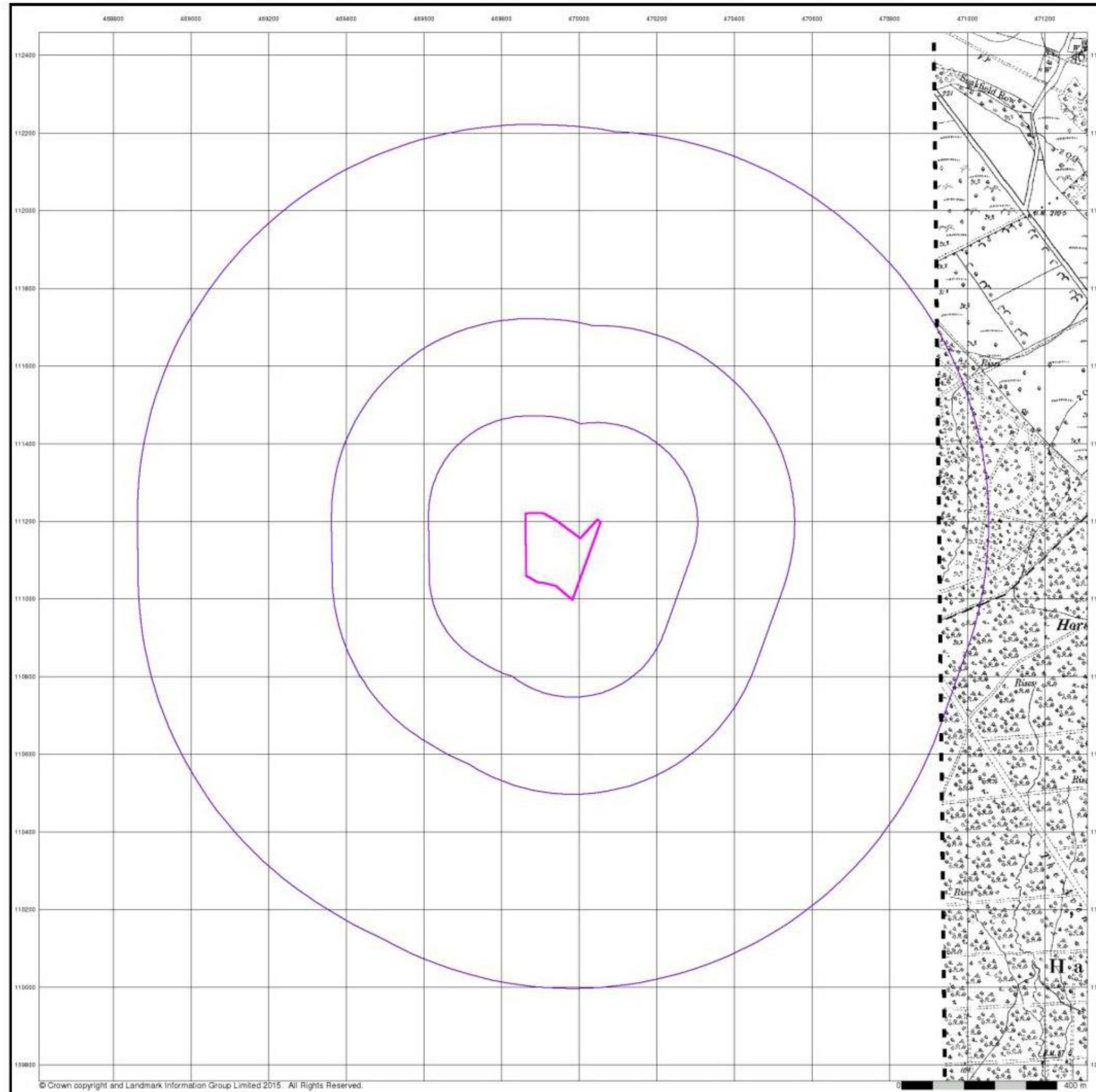


**Order Details**

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

**Site Details**

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED



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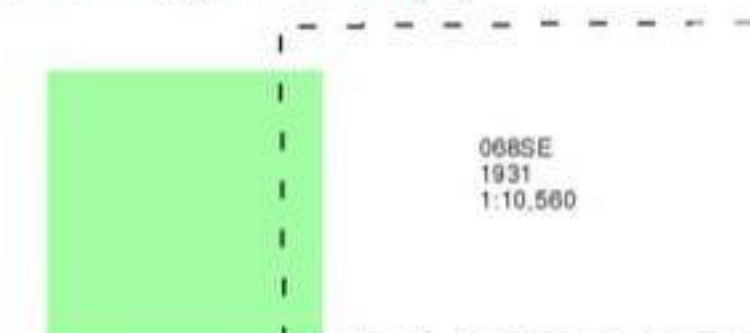
## Hampshire & Isle Of Wight

Published 1931

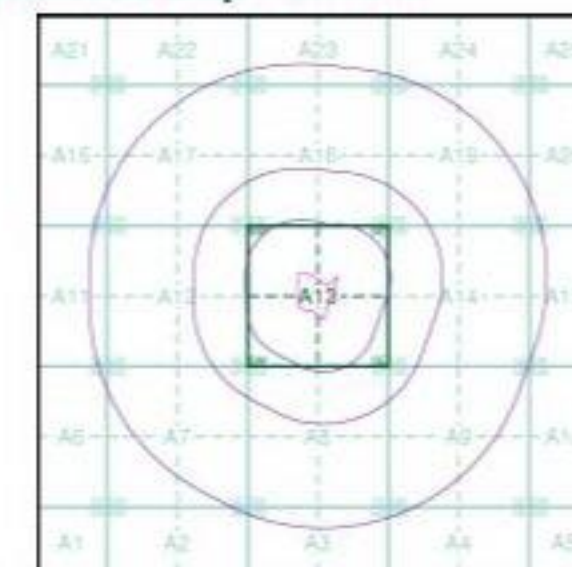
Source map scale - 1:10,560

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

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



### Historical Map - Slice A

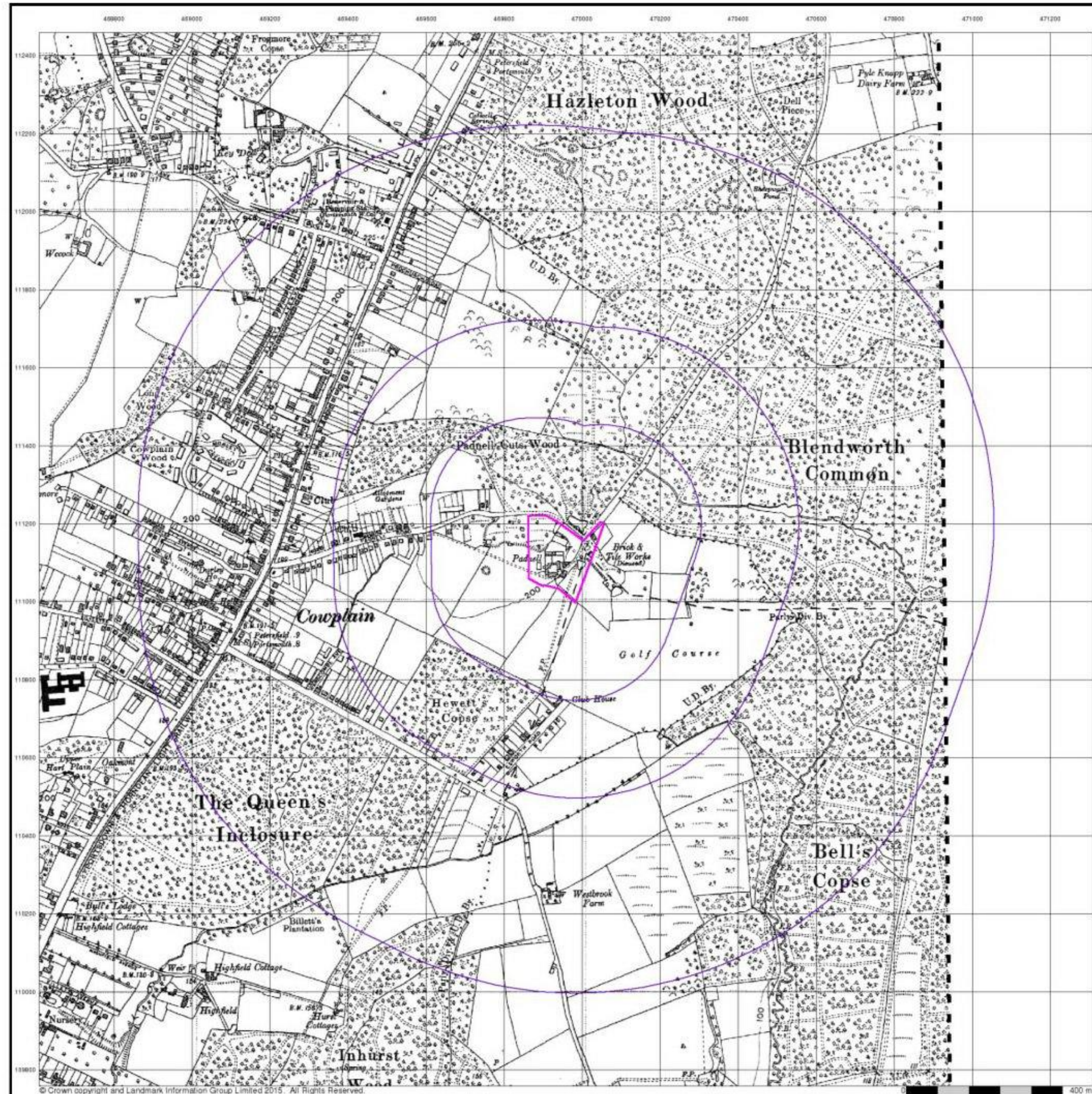


### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
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Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED



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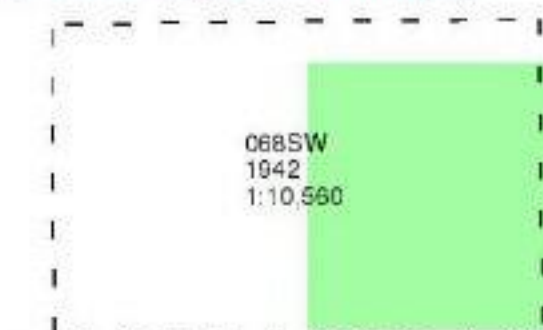
## Hampshire & Isle Of Wight

Published 1942

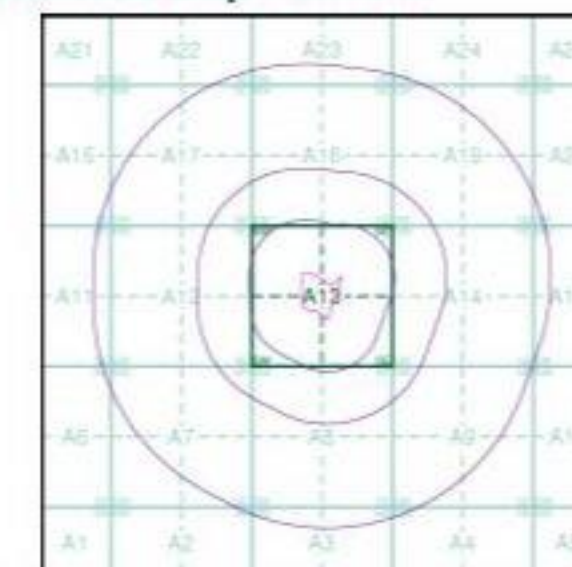
Source map scale - 1:10,560

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

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



### Historical Map - Slice A



### Order Details

Order Number: 130737768\_1\_1  
Customer Ref: 16362  
National Grid Reference: 469950, 111130  
Slice: A  
Site Area (Ha): 2.66  
Search Buffer (m): 1000

### Site Details

Padnell Grange, Padnell Road, WATERLOOVILLE, PO8 8ED

**Landmark**  
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