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**GEO-TECHNICAL &
GEO-ENVIRONMENTAL REPORT
PROPOSED RESIDENTIAL RHOOSE
POINT, VALE OF GLAMORGAN**

Prepared for:

Taylor Wimpey UK Limited

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Report No. 11621

REPORT TITLE : **Geo-Technical & Geo-Environmental
Report – Proposed Residential
Development, Rhoose Point, Vale of
Glamorgan**

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Executive Summary

The site was unused grassland until the progressive expansion of the nearby cement works meant the western portion of the site was occupied by machinery and loading areas including a conveyor. The cement works was disused and removed by 1993. The Rhoose Point development was undertaken in the early 2000's and near completion in 2006. The site was unused and laid to scrub vegetation in 2011.

The site is underlain by Jurassic Limestones and Mudstones bedrock

In order to confirm the ground conditions a site investigation comprising nineteen trial pits, two soakaway tests and MEXE probing was carried out.

Soakaway drainage is not recommended at the site given the impermeable nature of the soils/rock encountered.

Ten samples were tested for selected elements/compounds. No contamination was noted at the site.

The Standard Radon (RPM) Site Report, prepared by the British Geological Society indicates that full radon protection measures are required in the development.

A traditional strip/trench foundation solution with ground bearing floor slabs solution would be appropriate giving an allowable bearing pressure of 200k/Nm².

TABLE OF CONTENTS

Section 1	Introduction and Proposed Development
1.1	Limitations and Exceptions of Investigation
Section 2	Review of Existing Data
2.1	Physical Setting, Current Use and Site Conditions
2.2	Site History
2.3	Geology
2.4	Radon
2.5	Hydrology
2.6	Environment Agency Information
Section 3	Preliminary Risk Assessment
3.1	General
3.2	Classification of Consequence
3.3	Classification of Probability
3.4	Risk Assessment Matrix
3.5	Potential Sources of Contamination
3.6	Potential Receptors
3.7	Potential Pollution Linkages
3.8	Qualitative Preliminary Risk Assessment
3.9	Preliminary Site Conceptual Model
Section 4	Field Investigation
4.1	Site Works
4.2	Quality Assurance
4.3	Ground Conditions
4.4	Sampling Regime
4.5	Laboratory Chemical Testing
4.5.1	Soils
4.6	In-Situ Permeability Testing
4.7	MEXE Probe Testing
Section 5	Risk Assessments and Evaluation of Analytical Results
5.1	Risk Assessment
5.1.1	Introduction
5.1.2	Methodology
5.1.3	Sources
5.1.4	Pathways
5.1.5	Potential Receptors
5.2	Evaluation of Analytical Results
5.2.1	Soils
5.3	Contaminants of Concern in Soils

TABLE OF CONTENTS (Continued)**Section 6 Quantitative Risk Assessment/Mitigation Measures**

- 6.1 Site Summary
- 6.2 Risks to Human Health
- 6.3 Risks to the Aquatic Environment
- 6.4 Risks to Buildings and Other Structures
- 6.5 Refined Site Conceptual Model

Section 7 Engineering Recommendations

- 7.1 Preparation of Site
- 7.2 Foundations and Floor Slab Solution
- 7.3 Excavations and Formations
- 7.4 Access Road and Car Parking Areas
- 7.5 Protection of Buried Concrete
- 7.6 Soakaway Drainage

Tables

Table 2.1	Historic Landfill Records
Table 3.1	Classification of Consequence
Table 3.2	Classification of Probability
Table 3.3	Risk Assessment Matrix
Table 3.4	Preliminary Risk Assessment
Table 4.1	Summary of Ground Conditions
Table 4.2	Sample Descriptions
Table 4.3	In-Situ Permeability Test Results
Table 4.4	MEXE Probe Test Results
Table 5.1	Summary of Chemical Test Results - Soils
Table 5.2	Summary of Asbestos Test Results
Table 6.1	Human Health Risk Assessment

Annexes

Annex A	Envirocheck History Report
Annex B	Radon (RPM) Report
Annex C	Trial Pit Logs
Annex D	Laboratory Chemical Test Results - Soils

Drawings

Drawing 01	Site Location
Drawing 02	Site Layout

SECTION 1 Introduction and Proposed Development

Taylor Wimpey UK Limited are proposing a new residential development at Rhoose Point, Vale of Glamorgan.

Terra Firma (Wales) Limited have been commissioned to carry out a geo-environmental assessment and geo-technical site investigation of the above site.

The main objectives of the geo-environmental assessment programme were to:

- Identify the potential environmental liabilities at the site associated with any soil and groundwater contamination from past site uses.
- Provide a summary of the environmental conditions at the site, together with any necessary remediation works to render the site fit for its intended use.
- Provide recommendations with regard to any other geo-environmental aspects pertaining to the development such as methane and radon gas emissions.

The main objectives of the geo-technical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial and underlying solid geology.
- Provide recommendations for a suitable and economic foundation/floor slab solution for the development.
- Provide recommendations with regard to any other geo-technical aspects pertaining to the development.

In order to achieve the above objectives, Terra Firma (Wales) Limited carried out an assessment programme including a review of existing data, followed by a field investigation to confirm the prevailing ground conditions and also to collect and analyse soil samples from selected locations around the site.

The layout of the site is presented in **Drawing 02**.

1.1 Limitations and Exceptions of Investigation

Taylor Wimpey UK Limited has requested that a Geo-environmental Site Assessment (GSA) and Geo-technical Investigation (GI) be performed in order to determine if contamination is present beneath the site, the affect if any of radon gas and to determine an appropriate foundation solution for the proposed development.

The GSA and GI were conducted and this report has been prepared for the sole internal reliance of Vivard Limited and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-environmental and geo-technical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The site investigation was specifically limited by the following site constraints:

- The presence of underground services.

SECTION 2 Review of Existing Data

2.1 Physical Setting, Current Use and Site Conditions

The site is located at Rhoose Point on Trem Echni (Road) south of the village of Rhoose, Vale of Glamorgan, CF62 3LJ at a National Grid Reference 306900 166100, see **Drawing 01**.

The site is rectangular in shape and covers an area of 2.7 hectares. The boundaries of the site are defined by chain link fences on the northern and southern boundaries. The eastern and western boundaries comprise brick walls adjoining residential properties, see **Drawing 02**.

A railway line is present atop an embankment running along the northern boundary. The site is grassed with scrub vegetation and is generally flat.

2.2 Site History

An Envirocheck history report was obtained for the site. The full report is presented in **Annex A**. The most relevant editions are summarised below.

1878, 1879 and 1885

These editions show the site to form part of two fields approximately 400m to the north of the sea cliffs. The coastline forms an open “V” shape with Rhoose Point the southernmost part, immediately south of the site. The village of Rhoose is present 400m to the northwest. Lower Porthkerry is present 1km to the northeast. “The Bulwarks” (prehistoric fort complex) are present 1km to the east on the sea cliffs. An old castle is present 100m south of the village of Rhoose. Limekilns are present approximately 600m west south west and 600m north east. A disused quarry is located 60m south of the south eastern corner of the site.

1900

This map show a railway line to have been constructed along the northern boundary of the site. The railway line runs east to west with Rhoose Station present 500m to the west. The limekilns are now disused. A siding travelling northwest spurs off the main railway line, approx 1km to the east.

1919 & 1921

These maps show no change to the site area. A quarry and limeworks is present 400m to the east. A cement works with associated reservoir, sidings, reservoir and quarry is located 100m to the west. Rhoose has grown with the addition of further residential properties and a school.

1943, 1947 and 1965

The site was unchanged until 1943. By 1947, Rhoose airport was constructed approximately 800m to the northwest of the site. An Asbestos Cement Works has been constructed 400m to the west (with associated tanks, conveyors and ancillary equipment) of the site and further quarrying has occurred to the southwest of the site associated with the cement works.

1973, 1975, 1978, 1982 and 1988

The site was unchanged until 1973. By 1975 the quarry is disused to the southwest and the area directly south is being quarried as far south as Rhoose Point. By 1975, the edge of this quarry is approximately 90m to the south of the site, moving north to 25m from the southern margin by 1988. The cement works immediately west has expanded onto the western extremity of the site with the construction of a conveyor by 1973. A new runway has been added to the Airport which is now noted as “Cardiff Wales Airport” truncating Rhoose Road and upgrading Porthkerry Road as a replacement. New Terminal Buildings have also been constructed at the airport and further residential buildings have been constructed in Rhoose.

2.2 Site History (Continued)

1993, 1995 and 1999

This map shows no change to the site area. The terminal buildings of the airport have been moved to the north. The Cement works and quarries have become disused. The asbestos cement works is now noted as Cardiff Airport Industrial Estate. By 1999 all of the industrial buildings have been cleared from the area and further residential developments have occurred in the Village of Rhoose.

2006 and 2011

The 2006 map shows the Rhoose Point development to be under construction (near completion) with residential properties immediately to the west, east and south of the site. The site itself is undeveloped with the exception of a small electric sub-station and gas station in the south west and south east corners, respectively.

2.3 Geology

The 1:50 000 scale geological map of the area (Bridgend, Sheet 261 and 262) shows the site to be underlain by the rocks of the Lower Lias formation of Jurassic Age. This unit comprises interbedded Limestones and Mudstones with marine fossils.

No superficial deposits are shown to overlie the superficial deposits however a thin veneer of residual soils and made ground may be present.

2.4 Radon

A Radon (RPM) Site Report from the British Geological Survey (BGS) confirms that **full** radon protection measures are required in the development. A copy of this report is presented in **Annex B**.

2.5 Hydrology

No watercourses are present within influencing distance of the site, but the sea locates 550m to the south.

2.6 Environment Agency Information

The 'What's in your back yard' feature on the Environment Agency website was consulted for information on the following:

Hydrogeology

According to the Environment Agencies Groundwater Protection Policy (April 2010), the geology of the area is classed as a Secondary A Aquifer. From the geological map, no superficial deposits are present. Any residual soils are also likely to be unproductive.

Pollution

There are no recorded incidents within 1km of the site.

Landfill Records

Three historic landfills are present within 1km of the site (see table 2.1 below). No Active landfills are present within this distance.

2.6 Environment Agency Information (Continued)

Site Name	Location in Relation to Site	First Waste Received	Last Waste Received	Waste Type	Control Measures
Rhose Quarry	300m S	1981	1991		Gas
Rhose Point Encapsulation	400m SW	-	-	Industrial Special	Gas Leachate
The Quarry	400m SW	1947	1979	Industrial Commercial Household Special	-

The Quarry Landfill was incorporated within the Rhose Point Encapsulation landfill and as a result the remediation measures apply for both.

Flooding

The site is not at risk of flooding.

Groundwater Source Protection Zones

The site does not locate within a groundwater source protection zone.

Geotechnical Issues

The site lies within an area where shrinkable clays may be a problem. Solution cavities are also possible, but were not encountered throughout the Rhose Point development and are unlikely to be present on the site.

SECTION 3 Preliminary Risk Assessment

The following sub-sections detail a preliminary risk assessment that is based on the desk study information.

3.1 General

The contaminated land regime is set out in Part IIA of the Environmental Protection Act (EPA) 1990 and was introduced on the 1st April 2000 in England and 1st July 2001 in Wales.

Part IIA was introduced to achieve two aims:

- (1) The identification of contaminated land
- (2) The remediation of contaminated land that poses an unacceptable risk to human health and/or the environment

Under Part IIA the statutory definition of ‘contaminated land’ is:

“any land which appears to the local authority in whose area it is situated, to be in such a condition, by reason of substances in, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) Pollution of controlled waters is being, or is likely to be, caused.”

For land to be classified as ‘Contaminated Land’ there must be a ‘**pollutant linkage**’. A pollutant linkage requires three essential elements:

- (1) A **CONTAMINANT** (hazard) - a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of **controlled waters**
- (2) A **RECEPTOR** (target) - something which could be adversely affected by a contaminant
- (3) A **PATHWAY** – a route or means which either allows the contaminant to cause significant harm to that receptor, or that there is a significant possibility of such harm being caused to the receptor, or that pollution of controlled waters is being or likely to be caused.

The term ‘Risk’ is widely used in different contexts and situations, but a prescriptive definition is given by the Guidelines for Environmental Risk Assessment and Management (DEFRA *et al*, 2000):

‘Risk is a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence’.

A ‘Hazard’ is defined as *‘a property or situation that in particular circumstances could lead to harm’.*

The classification of consequences and probability and determining the risk category are defined in the following sections.

3.2 Classification of Consequence

Table 3.1 Classification of Consequence	
Classification	Definition
Severe	<ul style="list-style-type: none"> • Short term (acute) risk to human health likely to result in significant harm • Short term risk to controlled waters • Catastrophic damage to buildings/structures • Short term risk to an ecosystem or organism within the particular ecosystem
Medium	<ul style="list-style-type: none"> • Chronic damage to human health (long term risk) • Pollution of a sensitive water resource • A significant change in an ecosystem or organism within the ecosystem
Mild	<ul style="list-style-type: none"> • Pollution of non-sensitive water resources • Significant damage to buildings/structures
Negligible	<ul style="list-style-type: none"> • Harm (not necessarily significant) which may result in financial loss • Non permanent health effects to humans (easily prevented by PPE for example) • Easily repairable effects of structural (building) damage

3.3 Classification of Probability

Table 3.2 Classification of Probability	
Classification	Definition
High	<ul style="list-style-type: none"> • There is a complete pollution linkage and an event appears very likely to occur in the short term and is inevitable in the long term. • Evidence of harm to the receptor
Medium	<ul style="list-style-type: none"> • There is a complete pollution linkage which means that it is probable that an event will occur • The event is not inevitable but possible in short term and likely in the long term
Low	<ul style="list-style-type: none"> • There is a complete pollution linkage and circumstances are possible under which an event could occur • It is not certain that an event will occur in the long term, and it is less likely to occur in the short term
Negligible	<ul style="list-style-type: none"> • There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term

3.4 Risk Assessment Matrix

By comparing the consequences of a risk and the probability of the risk of a pollution linkage, the likely risk category can be determined as shown in Table 3.3 below.

Table 3.3 Risk Assessment Matrix					
Increasing acceptability ↘		Consequence			
		Severe	Medium	Mild	Negligible
Probability	High	High	High	Medium / Low	Near zero
	Medium	High	Medium	Low	Near zero
	Low	High / medium	Medium / Low	Low	Near zero
	Negligible	High / medium / Low	Medium / Low	Low	Near zero

High Risk

There is a high probability that severe harm could risk a receptor, or there is evidence that a receptor is being harmed. The risk if realised is likely to result in liability, and urgent investigation or remediation will be required.

Medium Risk

It is probable that harm will arise to a receptor. However it is relatively unlikely that such harm would be severe, or if harm does occur the harm is likely to be relatively mild. Investigation will be required to determine the liability, and some remedial works may be required in the long term.

Low Risk

It is possible that harm may arise to a receptor, but it is likely that the harm would be mild.

Near Zero Risk

There is a very low risk of harm to the receptor. In the event of harm being realised the harm is not likely to be severe.

The following sub-sections detail a preliminary risk assessment, based upon the desk study information.

3.5 Potential Sources of Contamination

The potential contamination beneath the site, whether in the matrix of soil or any groundwater will be related to the sites past use.

The site has remained mainly unused throughout the years researched, however a cement works (asbestos and conventional) was located on the margin and nearby and it is possible that Made ground is present containing contamination.

3.6 Potential Receptors

The potential receptors of any contamination are taken to be:

During Construction

- Construction workers
- Neighbouring site users
- Passers-by
- The Aquatic Environment - Surface waters, perched groundwater, rivers

Following Construction

- Site End Users - residents, visitors, maintenance contractors
- The Aquatic Environment - Surface waters, perched groundwater, watercourses.
- Building Materials - these are potentially at risk from aggressive ground conditions involving sulphates, sulphides, magnesium ions, ammonium ions, carbon dioxide, chloride ions and phenols.
- Vegetation upon the site is potentially at risk from phytotoxic contaminants.

3.7 Potential Pollution Linkages

The potential pollution linkages relating to human health and the protection of the aquatic environment on the site are as follow:

- Ingestion of soil and soil dust
- Ingestion of home grown vegetables
- Inhalation of soil dust, both indoors and outdoors
- Dermal contact with soil and soil dust
- Inhalation of radon gas
- Indoor migration of landfill gas/ground gas leading to potential risk of explosion
- Surface water runoff
- Leaching into the groundwater
- Groundwater transport
- Permeation of water pipes - Organic contaminants have the potential to be adsorbed into plastic water pipes which may be used for drinking water supply. Toxic and corrosive contaminants may also enter the potable water source.

3.8 Qualitative Preliminary Risk Assessment

A Qualitative Preliminary Risk Assessment (QPRA) aims to make initial assumptions about potential risks posed towards the human health and to the aquatic environment during all stages of the development. Where it is assumed that a potential pollution pathway exists, there is a potential source, a potential receptor and a likely pathway, which links the two. The QPRA can be refined into a qualitative and quantitative risk assessment once the site investigation and laboratory soil chemical testing/environmental assessment has been undertaken. The risk assessment is presented in Table 3.4 on the following page.

3.8 Qualitative Preliminary Risk Assessment (Continued)

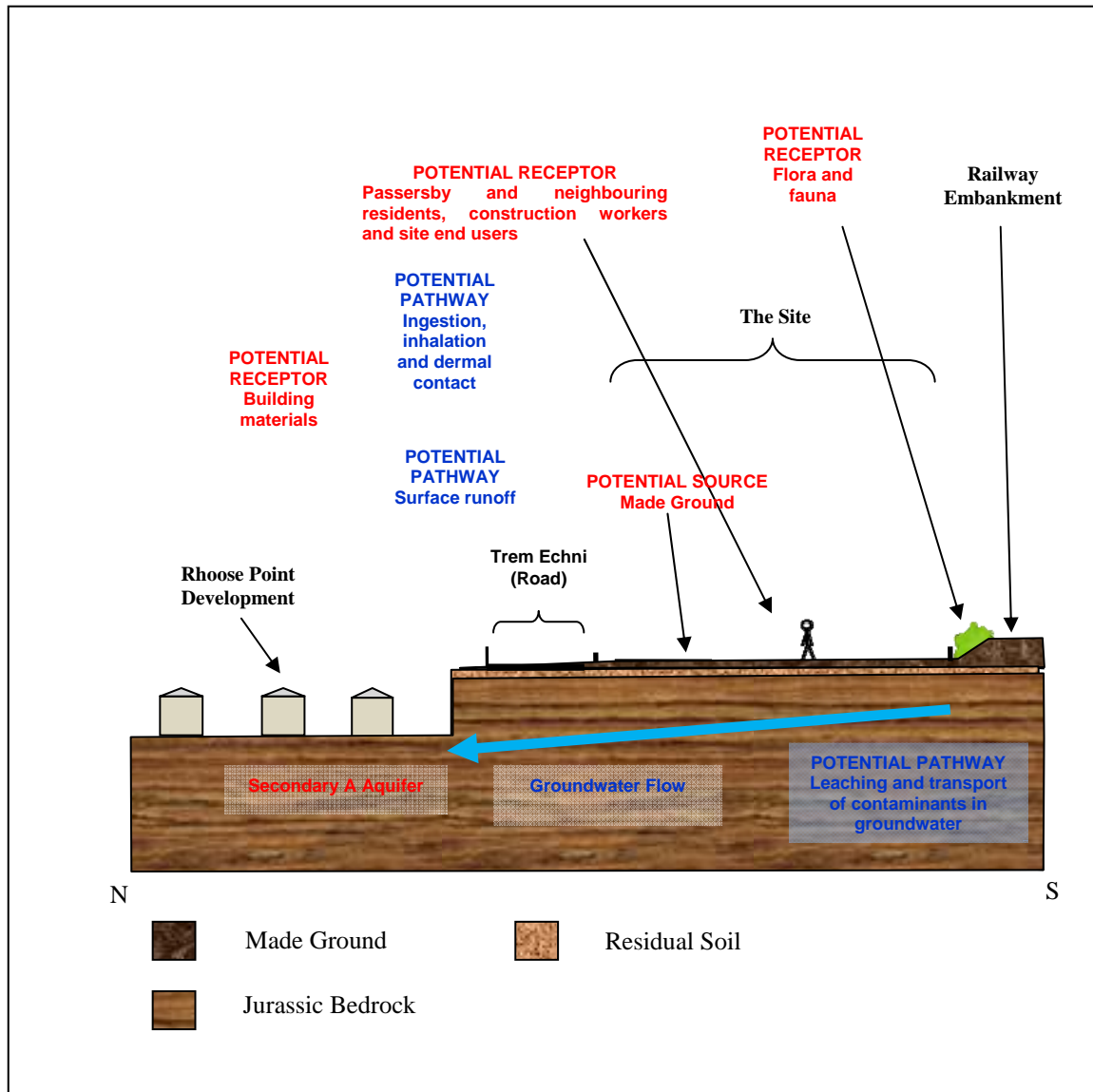
Table 3.4 Preliminary Risk Assessment			
Potential Source	Potential Pathway	Potential Target	Preliminary Risk Assessment
Made Ground and contaminated soils	Ingestion Dermal contact Inhalation of soil/dust	Construction workers Site end Users	Thin layers of made Ground possible at the site. Possible Asbestos contamination from cement works near by. Medium Risk
Made ground and contaminated soils	Surface runoff Leaching Groundwater transport	Groundwater	Secondary A Aquifer The site does not lie within a SPZ Medium Risk
Made ground and contaminated soils	Surface runoff Leaching Groundwater transport	Building Materials	High levels of sulphate can damage building materials. Low Risk
Ground Gas (Methane and carbon dioxide gas)	Inhalation	Site end users Construction workers Neighbouring site users/passersby	Given the unlikely presence of significant thicknesses of made ground, ground gas sourced at the site is unlikely. Low Risk
Hydrocarbon vapours	Inhalation	Site end users	Thin layers of made Ground possible at the site. Medium Risk
Radon	Inhalation	Site end users	The Radon Report indicates that full radon protection is required. High Risk
Landfill Gas	Inhalation	Site end users Construction workers Neighbouring site users/passersby	Landfills within influencing distance have been remediated Low Risk

3.9 Preliminary Site Conceptual Model

The ground conditions at the site are likely to comprise a thin layer of Made Ground overlying residual soils, further underlain by Jurassic Limestones and Mudstones.

The dominant direction of groundwater flow is likely to be towards the watercourse on the southern boundary of the site.

A preliminary site conceptual model is presented below. It should be noted that the SCM is generalised and not to scale.



SECTION 4 Field Investigation

4.1 Site Works

A geo-technical and geo-environmental site investigation was undertaken in accordance with BS5930:1990, during December 2011. The investigation comprised the excavation of nineteen trial pits and two in situ permeability tests.

The fieldworks were supervised by Terra Firma (Wales) Limited, who also logged the samples to the requirements of BS5930: 1999.

Samples were also taken for chemical testing.

The detailed trial pit logs are presented in **Annex C**. The trial pit locations are presented in **Drawing 02**.

4.2 Quality Assurance

Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

- The use of nitrile gloves at each sampling point.
- Stainless steel shovels were used to collect soil samples. The tool was cleaned with distilled water between each sample point.
- Soil samples were stored at a temperature below 4 degrees.
- No head space was left in sample containers.

4.3 Ground Conditions

The shallow ground conditions encountered by the exploratory holes can in general be summarised as shown in Table 4.1. See logs in **Annex C** for details.

Depth (m)	Thickness (m)	Stratum
GL - 0.10/0.25	0.10/0.25	TOPSOIL: Soft brown silt with humus and rootlets.
0.10/0.20 - 0.50/1.40	0.50/1.40	Firm to stiff brown CLAY and gravels/ COBBLES of Limestone.
GL - 1.40	-	OR Weathered Limestone.

No groundwater was encountered within any of the trial pits. Topsoil and superficial deposits were absent TP16 present from ground level. Granular Made ground was encountered in TP15, TP17 TP18 and TP19 to a maximum thickness of 0.40m.

4.4 Sampling Regime

During the intrusive investigation small disturbed soil samples were collected. The sample locations and depths are illustrated in the Table 4.2.

Table 4.2 Sample Descriptions		
Sample No.	Depth (m)	MCERTS Description
TP01	0.40	brown gravelly sandy CLAY
TP02	0.35	brown grey gravelly sandy CLAY
TP05	0.45	brown gravelly sandy CLAY odd rootlets possible made ground contains brick
TP08	0.40	brown gravelly clayey SAND
TP11	0.40	light brown gravelly clayey SAND odd rootlets
TP12	0.55	brown gravelly sandy CLAY
TP14	0.30	brown gravelly sandy CLAY
TP17	0.10	dark brown gravelly clayey SAND made ground contains brick
TP18	0.20	brown red gravelly sandy CLAY made ground contains brick
TP19	0.20	brown red gravelly silty sandy CLAY made ground contains brick

4.5 Laboratory Chemical Testing

During the current site works a number of soil samples were taken and despatched to the laboratories of Derwentside Environmental Testing Services for laboratory chemical testing.

The following chemical tests were undertaken:

4.5.1 Soils

Metals	Semi Metals/Non-Metals	Inorganic Chemicals	Others
Cadmium	Arsenic	Cyanide	pH (acidity)
Chromium	Selenium	Sulphate	Asbestos
Lead			
Mercury			
Nickel			
Zinc			
Copper			

Organic Chemicals

Phenol
Polyaromatic Hydrocarbons (PAH)

The results of the above chemical tests for soil are presented in **Annex D**.

4.6 In-Situ Permeability Testing

Two in situ permeability tests were carried out. The results are tabulated below:

Table 4.3: In-Situ Permeability Testing Results				
Trial Pit No.	LxWxD (m)	Depth to water at start (m)	Depth to water at end (m)	Infiltration Rate (m/s)
TP01	2.8x0.6x1.4	0.50	0.50	Impermeable
TP07	2.9x0.6x1.2	0.51	0.51	Impermeable

Notes: Each test was carried out over a six hour period and measured regularly, not change in water level was noted throughout.

4.7 MEXE Probe Testing

In-situ MEXE probe tests were carried out with a hand held probe. The results are presented below.

Table 4.4: MEXE Probe Test Results		
Location	Depth (m)	Result (%)
TP01	0.50	4
TP05	0.50	5
TP10	0.20	+10
TP15	0.60	+10
TP19	0.50	+10

SECTION 5 Risk Assessment and Evaluation of Analytical Results

5.1 Risk Assessment

5.1.1 Introduction

The results obtained from the investigation, which are discussed in detail in Section 5.2, were used to conduct an environmental risk assessment for the site. The risk assessment aimed to:

- Identify sensitive receptors
- Determine pathways for contaminant migration to the receptors
- Estimate contaminant impact on receptors
- Establish whether remedial action is required
- Calculate remediation target levels if required

The future use of the site i.e. whether it is to be used for residential or commercial purposes has an impact on any risk assessment.

In this case residential guidelines (with plant uptake) are appropriate.

5.1.2 Methodology

Environmental risk assessment evaluates the risk to receptors via an analysis of the 'source-pathway-target' linkage. In order for a risk to be present, there must be a contaminant source capable of causing a health risk, a vulnerable receptor, and a pathway linking the two.

This sort of risk assessment is usually conducted using a tiered approach. Tier 1 consists of a comparison of the analytical results obtained from the site investigation with Soil Guideline Values (SGV's) specific to the type of development obtained from The Environment Agency Contaminated Land Exposure Assessment (CLEA) Guidelines.

Where SGV values are not available reference has been made to or Generic Assessment Criteria (GAC) provided by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH).

Should Tier 1 levels be exceeded, a choice is made either to remediate the site to conservative Tier 1 levels, or proceed to Tier 2. Tier 2 makes use of site-specific data to evaluate acceptable concentrations of chemicals for the particular conditions present at the site.

At each tier, the amount and detail of investigation work increases as more site-specific data are needed to refine the characterisation of the site. Conversely, as site conditions are better understood, a more site-specific remediation strategy can be determined.

For Tier 1, the site itself is considered to be the receptor. Therefore, attenuation of contaminants between the source and receptor is not considered.

A summary of the chemical test results which include the regulatory SGVs or GACs used in the Tier 1 assessment is given in the tables on the following pages.

5.1.3 Sources

The sources of contamination considered in the risk assessment are taken to be concentrations of chemicals beneath the site.

The made ground at the site is considered the source of potential contamination, but the risk assessment does not take into account the origins of the chemicals.

5.1.4 Pathways

The various pathways considered in the risk assessment are given below:

- Direct contact/inhalation/ingestion of affected superficial soils, up to 1.0m in depth
- Wind born dust from affected superficial soils
- Leaching from soils to groundwater
- Groundwater transport

5.1.5 Potential Receptors

Potential receptors include site workers, future on site users and visitors, businesses and residents in the area surrounding the site, persons who may come into contact with water in the vicinity of the site, and aquatic life within these waters.

5.2 Evaluation of Analytical Results

5.2.1 Soils

For Tier 1, the site itself is considered to be the receptor. Therefore, attenuation of contaminants between the source and receptor is not considered.

A summary of the chemical test results which include the regulatory Soil Guideline Values (SGV's) /Generic Assessment Criteria (GAC) used in the Tier 1 assessment are given in Tables 5.1 and 5.2 on the following page:

5.2.1 Soils (Continued)

Table 5.1 Summary of Chemical Test Results - Soils						
Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		US95	Number of exceedences
			Minimum	Maximum		
Arsenic	32	CLEA	2.2	13	4.74	0
Cadmium	10	CLEA	0.1	0.7	0.24	0
Chromium	130	CLEA	6.1	23	9.81	0
Copper	2330	LQM/CIEH	3.6	23	9.92	0
Lead	450	CLEA	8.0	18	7.58	0
Mercury	170	CLEA	0.05	0.05	0.05	0
Nickel	130	CLEA	6.8	24	9.43	0
Selenium	350	CLEA	0.5	0.5	0.5	0
Zinc	3750	LQM/CIEH	17	69	25.49	0
Cyanide, Total	8	CLEA	0.1	0.2	0.12	0
Organic Matter	-	CLEA	0.5	3.2	-	0
Monohydric Phenols,	420	CLEA	0.3	0.3	0.3	0
Total as SO4	-	BRE	300	1600	-	0
pH	-	-	7.8	11.5	-	-
PAH, Total	8.3	LQM/CIEH	1.6	1.6	-	-

Notes :

- CLEA-Generic Soil Guideline Values for a commercial development CIEH – Chartered Institute of Environmental Health Generic Assessment Criteria for a residential development with plant uptake
- BRE - British Research Establishment - Considered in concrete aggressive environment assessment
- A total of 10 samples were tested.
- PAH-Polyaromatic Hydrocarbons

It should be noted that for contamination concentrations, which are measured to be lower than the detection limits, then the detection limit has been included in the statistical assessment.

Table 5.2: Summary of Asbestos Test Results		
Trial Pit No.	Depth (m)	Asbestos Type
TP01	0.40	None detected
TP02	0.35	None detected
TP05	0.45	None detected
TP08	0.40	None detected
TP11	0.40	None detected
TP12	0.55	None detected
TP14	0.30	None detected
TP17	0.10	None detected

5.3 Contaminants of Concern in Soils

Contaminants of concern are those whose measured concentrations or 95% Upper Confidence Limit exceeds the relevant Tier 1 CLEA Soil Guideline Value, CIEH Generic Assessment Criteria or laboratory detection limits.

All of the substances tested for were found to be below the Tier 1 threshold values.

SECTION 6 Quantitative Risk Assessment/Mitigation Measures

The following risk assessment and mitigation measures are based upon information compiled in the desk study, site investigation and the chemical test results.

6.1 Site Summary

The site is located at Rhoose Point, in the Village of Rhoose, Vale of Glamorgan at a National Grid Reference 306900 166100, see **Drawing 01**.

The site is rectangular in shape and covers an area of 2.7 hectares. The site is mainly covered with grass and scrub vegetation.

6.2 Risks to Human Health

The site has been assessed using Human Health Guidelines for residential use with plant uptake.

Chemical testing of soil samples revealed no exceedences in any contaminant tested for.

A site risk assessment is presented below and considers the following receptors/targets:

- Future Site Occupiers
- Site Visitors/Passers-by and neighbours during construction phase
- Construction workers

The potential routes of exposure (pathway) considered are:

- Ingestion of soil
- Ingestion of soil dust
- Dermal contact with soil/dust
- Inhalation of fugitive soil
- Ingestion of vegetables

6.2 Risks to Human Health (Continued)

A Qualitative and Quantitative Risk Assessment is presented in the following table.

Table 6.1 - Human Health Risk Assessment				
Source	Pathway	Target	Risk Assessment	Mitigation Measures
In-Situ Soils	Dermal contact with soil/dust Inhalation of soil/dust/vapours Ingestion of soil/dust	Construction workers	Low risk to construction workers involved in excavation phase of development	COSHH assessment and good level of PPE/hygiene by site workers/staff; dust suppression measures if required.
	Inhalation of fugitive soil dust/vapours Ingestion of soil dust Dermal contact with soil dust	Passersby, neighbouring site occupants	Low risk during construction phase	The site should be managed well including screening and dust suppression measures if required
	Dermal contact with soil dust Inhalation of soil/dust/vapours Ingestion of soil/dust	Site end users – residents and visitors	Low risk to future site users from contamination.	None Required.
	Adsorption into potable water plastic pipes	Site end users – residents and visitors	Low risk	Suitable materials should be selected and used for the water supply in accordance with WRAS guidance.
Radon Gas	Inhalation of gas	Site end users	High Risk	Full radon protection measures are required

6.2 Risks to Human Health (Continued)

During construction phases, potential human health risks should be mitigated by:

- COSHH Assessment and good standards of site hygiene, PPE etc;
- Appropriate H&S instructions being in place to cover the above;

It should be noted that the appointed contractor should provide Method Statements and Risk Assessments to deal with these matters.

If during the development materials are encountered that are significantly different to those encountered in the investigation, the occurrence should be reported to the Engineer and appropriate action taken prior to continuing with the works.

Any materials to be removed from site should be subject to Waste Acceptance Criteria (WAC) testing and taken to an appropriately licensed landfill facility, based on the results of the WAC Testing.

Prior to the placement of water supply pipes an assessment should be made, by the water provider, of soils along the route of the pipe.

6.3 Risks to the Aquatic Environment

No contamination was encountered at the site so the risk to the aquatic environment will be low.

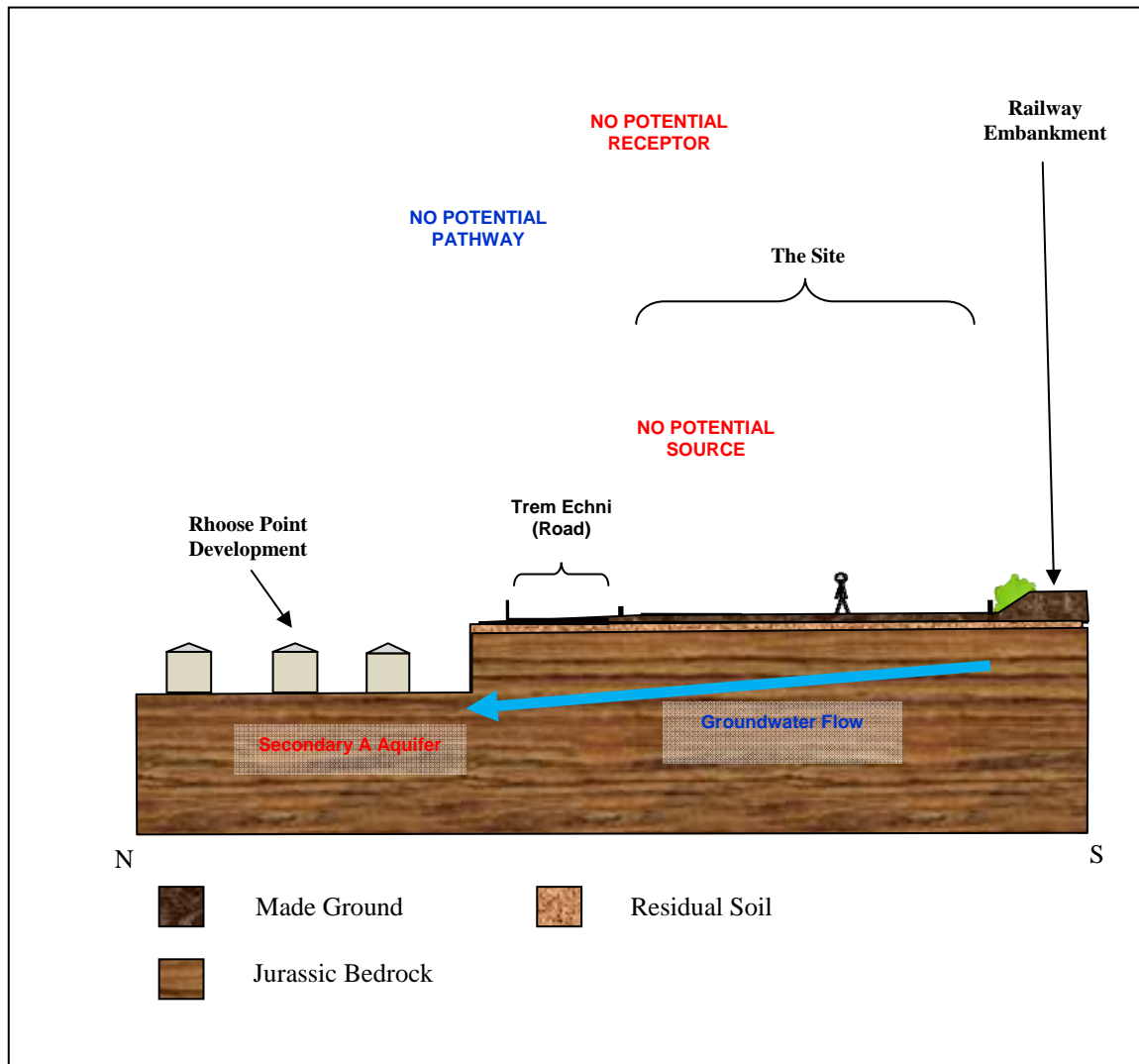
6.4 Risks to Buildings and Other Structures

Within BRE Special Digest 1 the chemical agents that aggressively attack concrete are sulphates, sulphides, magnesium ions, ammonium ions, carbon dioxide, chloride ions and phenols.

Based upon the site investigation data collected, there are no such contaminants of concern upon the site.

6.5 Refined Site Conceptual Model

The site conceptual model (SCM) is presented overleaf. It should be noted that the SCM is generalised and not to scale.



SECTION 7 Engineering Recommendations

7.1 Preparation of Site

Prior to the site works commencing, all grass and scrub vegetation including all roots, beneath the proposed buildings, access roads and car parking areas, should be grubbed up and removed from site and taken to a suitable landfill facility.

The reduced levels should be brought up to the required levels with well, compacted imported granular materials. Department of Transport (DoT) Type 2 sub-base or similar may be used and should be compacted in layers, in accordance with the Specification for Highway Works. Alternatively, appropriate selected inert imported fill could be used.

Allowances should be made for removing any soft spots/areas and their replacement with well-compacted imported granular materials as previously described.

Allowances should be made for any protection and/or diversionary works to the culvert on site and any other services on site made necessary as a result of the proposed development.

7.2 Foundation and Floor Slab Solution

Traditional mass concrete strip foundations founded within the Limestone bedrock. Depth to the founding strata will vary from GL to 1.40m

This solution would be capable of delivering an allowable bearing pressure of 200kN/m² for a maximum total settlement of 30mm and angular distortion of no greater than 1:750.

In order to protect the formations from the effect of frost heave and/or thermal shrinkage the foundations should be at a minimum depth below ground level of 0.75m and a minimum penetration of 200mm into founding strata.

Allowances should be made for the removal of any soft spots/areas and their replacement with well compacted imported granular materials as previously described.

Provided all soft spots/areas are removed and replaced with well compacted imported granular materials the floor slabs may be designed and constructed as ground bearing. In addition, if the made ground, beneath the proposed floor slabs exceeds 600mm in order to satisfy the requirements of the National House Building Council (NHBC) the floor slabs should be designed as suspended.

7.3 Excavations and Formation

Most of the shallow excavations should be possible with normal soil excavating machinery. However, significant allowances should be made for the use of hydraulic breaker attachments when excavating Limestone bedrock.

The shallow excavations should not encounter significant groundwater inflows. Any inflows that are encountered should be slight, and dealt with by using conventional pumping techniques. In addition, it should be noted that during times of high rainfall a higher groundwater table might be encountered.

The sides of any excavations deeper than 1.0m should be supported by planking and strutting or other proprietary means.

7.3 Excavations and Formation (Continued)

Any soft spots encountered which were not revealed by the initial site investigation should be excavated and replaced with imported granular material.

The excavation formations will be susceptible to softening and deterioration by wet weather and site traffic. Therefore, they should be protected by blinding concrete or a 200mm thick layer of hardcore immediately after exposure.

7.4 Access Road and Car Parking Areas

For the access roads and car parking area formations within the Limestone bedrock, for design purposes a California Bearing Ratio (CBR) Value of +10% may be used. Within the gravelly Clay, a CBR value of 4-5% may be used.

Allowances should be made for the removal of any 'soft spots/areas' and their replacement with well-compacted granular materials as previously described.

7.5 Protection of Buried Concrete

The laboratory soil chemical analysis reported concentrations of total sulphate of between less than 200 and 1600 mg/kg and pH of between 7.8 and 11.5 pH units.

As a result, DS-1 concrete class AC1s would be appropriate for the development.

7.6 Soakaway Drainage

Given the failure of permeability tests undertaken as part of the site investigation, soakaway drainage is not recommended for this site.

ANNEX A
Envirocheck History Report

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 Burgh 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
	Coppice		Bracken
	Heath		Rough Grassland
	Marsh		Reeds
	Saltings		
	Building		Glasshouse
	Sloping Masonry		Pylon
	Electricity Transmission Line		Pole
	Cutting		Embankment
	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, Burgh or District Council		
	Borough, Burgh or County Constituency Shown only when not coincident with other boundaries		
	Civil Parish Shown alternately when coincidence of boundaries occurs		
	BP, BS Boundary Post or Stone		Pol Sta Police Station
	Ch Church		PO Post Office
	CH Club House		PC Public Convenience
	F E Sta Fire Engine Station		PH Public House
	FB Foot Bridge		SB Signal Box
	Fn Fountain		Spr Spring
	GP Guide Post		TCB Telephone Call Box
	MP Mile Post		TCP Telephone Call Post
	MS Mile Stone		W Well

1:10,000 Raster Mapping

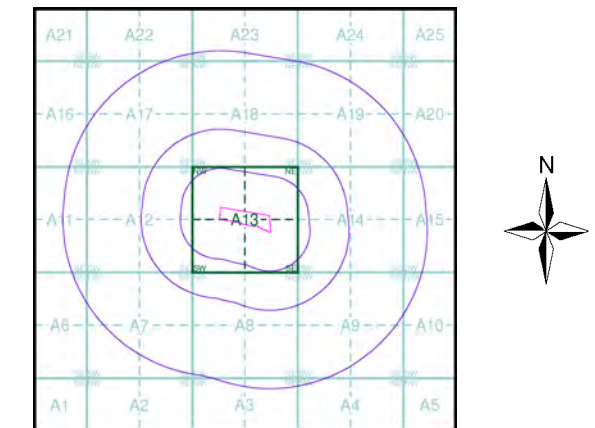
	Gravel Pit		Refuse tip or slag heap
	Rock		Rock (scattered)
	Boulders		Boulders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slopes		Top of cliff
	General detail		Underground detail
	Overhead detail		Narrow gauge railway
	Multi-track railway		Single track railway
	County boundary (England only)		Civil, parish or community boundary
	District, Unitary, Metropolitan, London Borough boundary		Constituency boundary
	Area of wooded vegetation		Non-coniferous trees
	Non-coniferous trees (scattered)		Coniferous trees
	Coniferous trees (scattered)		Positioned tree
	Orchard		Coppice or Osiers
	Rough Grassland		Heath
	Scrub		Marsh, Salt Marsh or Reeds
	Water feature		Flow arrows
	MHW(S) Mean high water (springs)		MLW(S) Mean low water (springs)
	Telephone line (where shown)		Electricity transmission line (with poles)
	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
Glamorganshire	1:10,560	1885	2
Glamorganshire	1:10,560	1900 - 1901	3
Glamorganshire	1:10,560	1921	4
Glamorganshire	1:10,560	1936	5
Glamorganshire	1:10,560	1938 - 1947	6
Historical Aerial Photography	1:10,560	1947	7
Historical Aerial Photography	1:10,560	1947	8
Ordnance Survey Plan	1:10,000	1965	9
Ordnance Survey Plan	1:10,000	1975	10
Ordnance Survey Plan	1:10,000	1982	11
Ordnance Survey Plan	1:10,000	1995	12
10K Raster Mapping	1:10,000	1999	13
10K Raster Mapping	1:10,000	2006	14
10K Raster Mapping	1:10,000	2011	15

Historical Map - Slice A



Order Details

Order Number: 36931701_1_1
 Customer Ref: 11621-Rhooose
 National Grid Reference: 306900, 166100
 Slice: A
 Site Area (Ha): 2.7
 Search Buffer (m): 1000

Site Details

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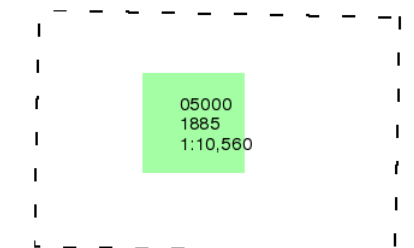
Glamorganshire

Published 1885

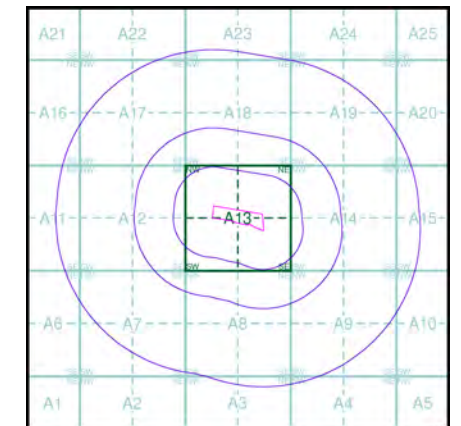
Source map scale - 1:10,560

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

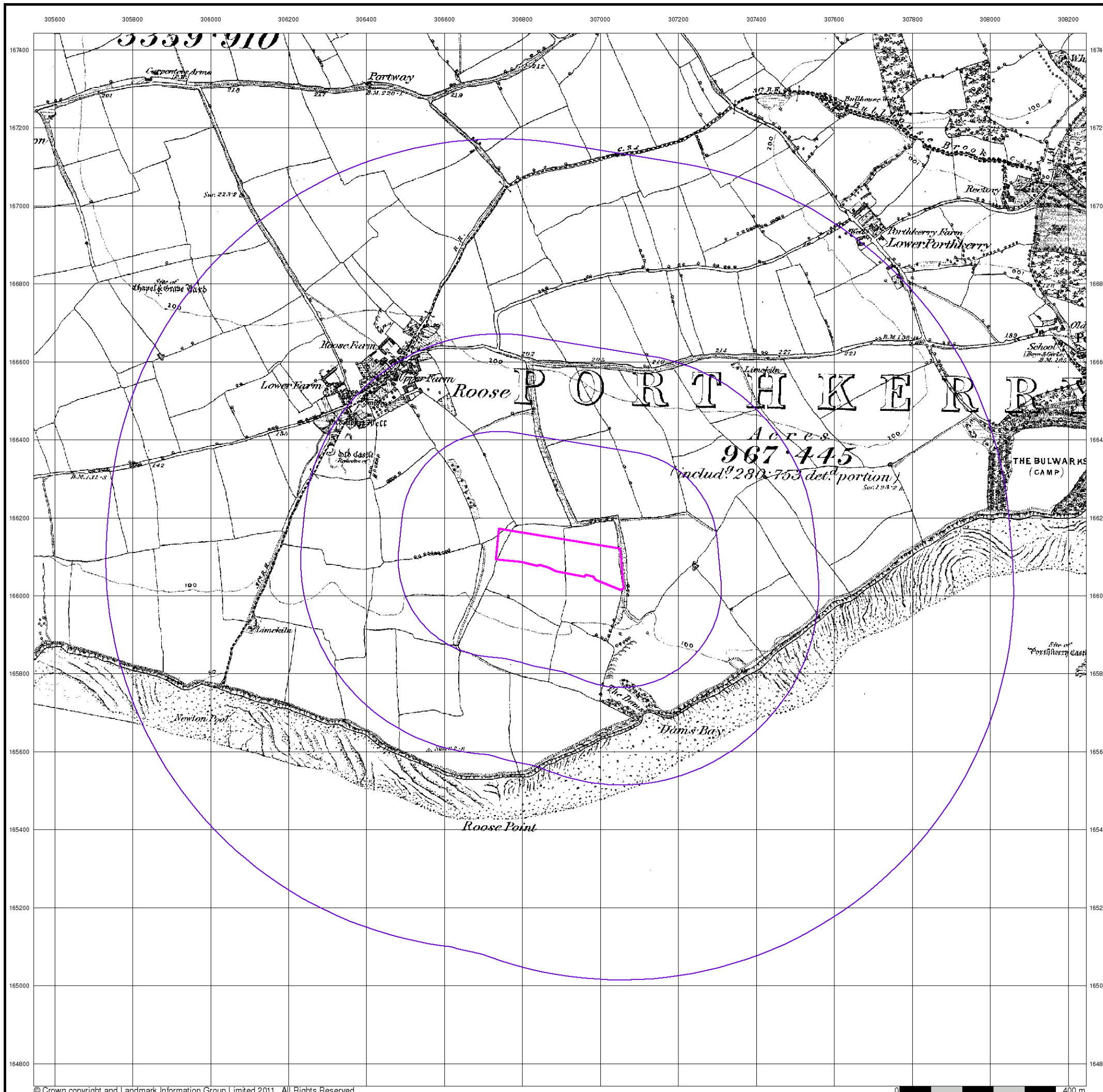
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National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 1000

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Glamorganshire

Published 1900 - 1901

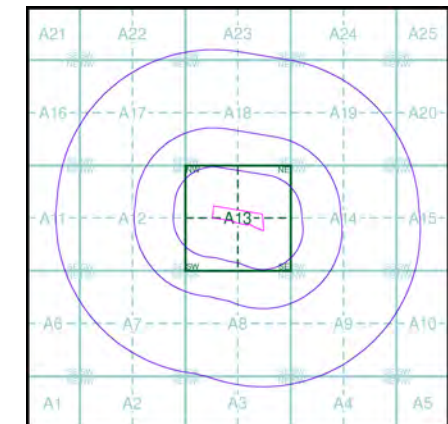
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Map Name(s) and Date(s)

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050SW 1900 1:10,560	050SE 1901 1:10,560

Historical Map - Slice A



Order Details

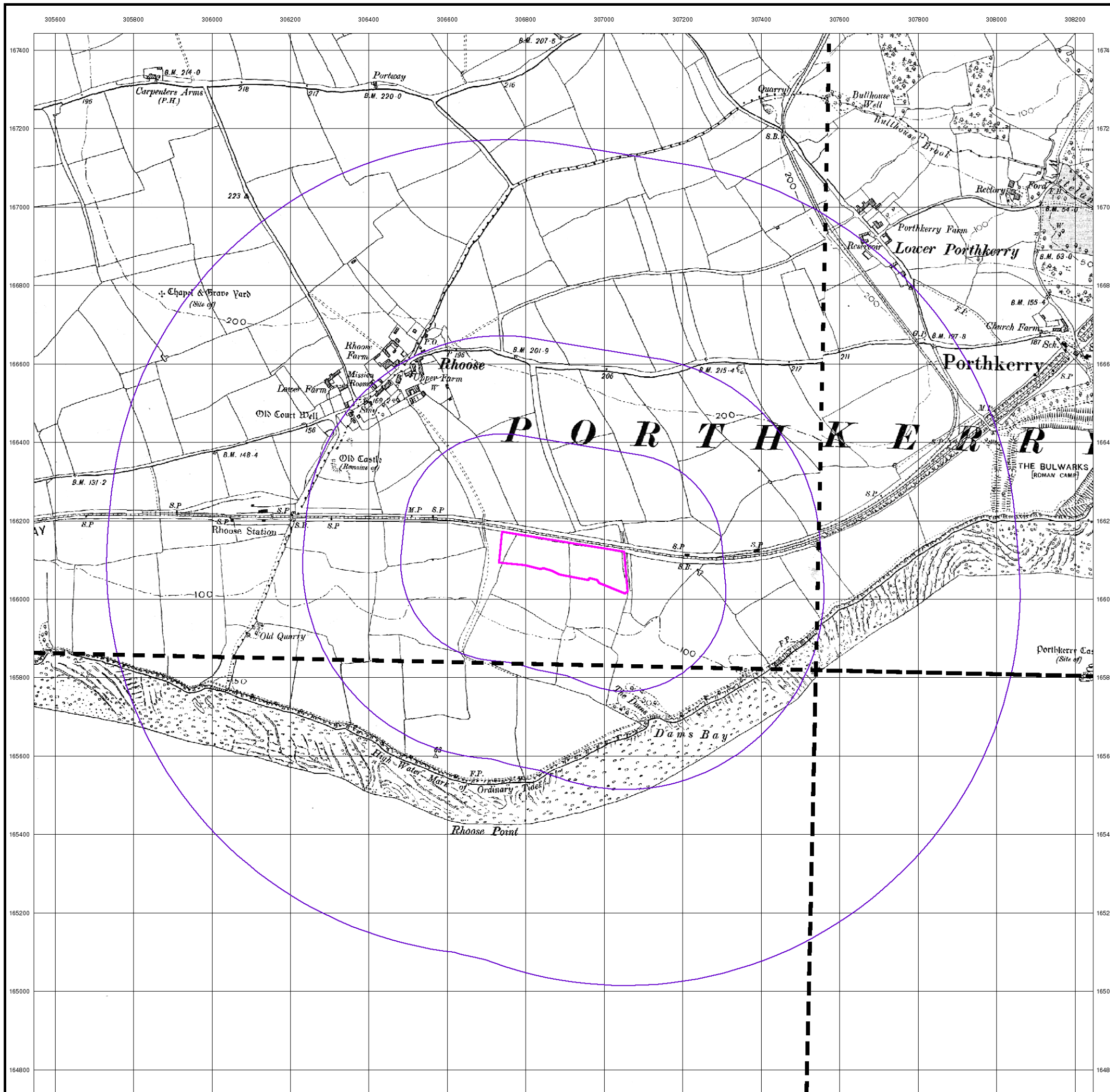
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Glamorganshire

Published 1921

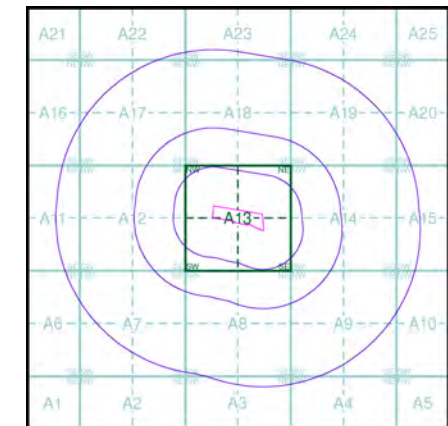
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Map Name(s) and Date(s)

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050SW 1921 1:10,560	050SE 1921 1:10,560

Historical Map - Slice A



Order Details

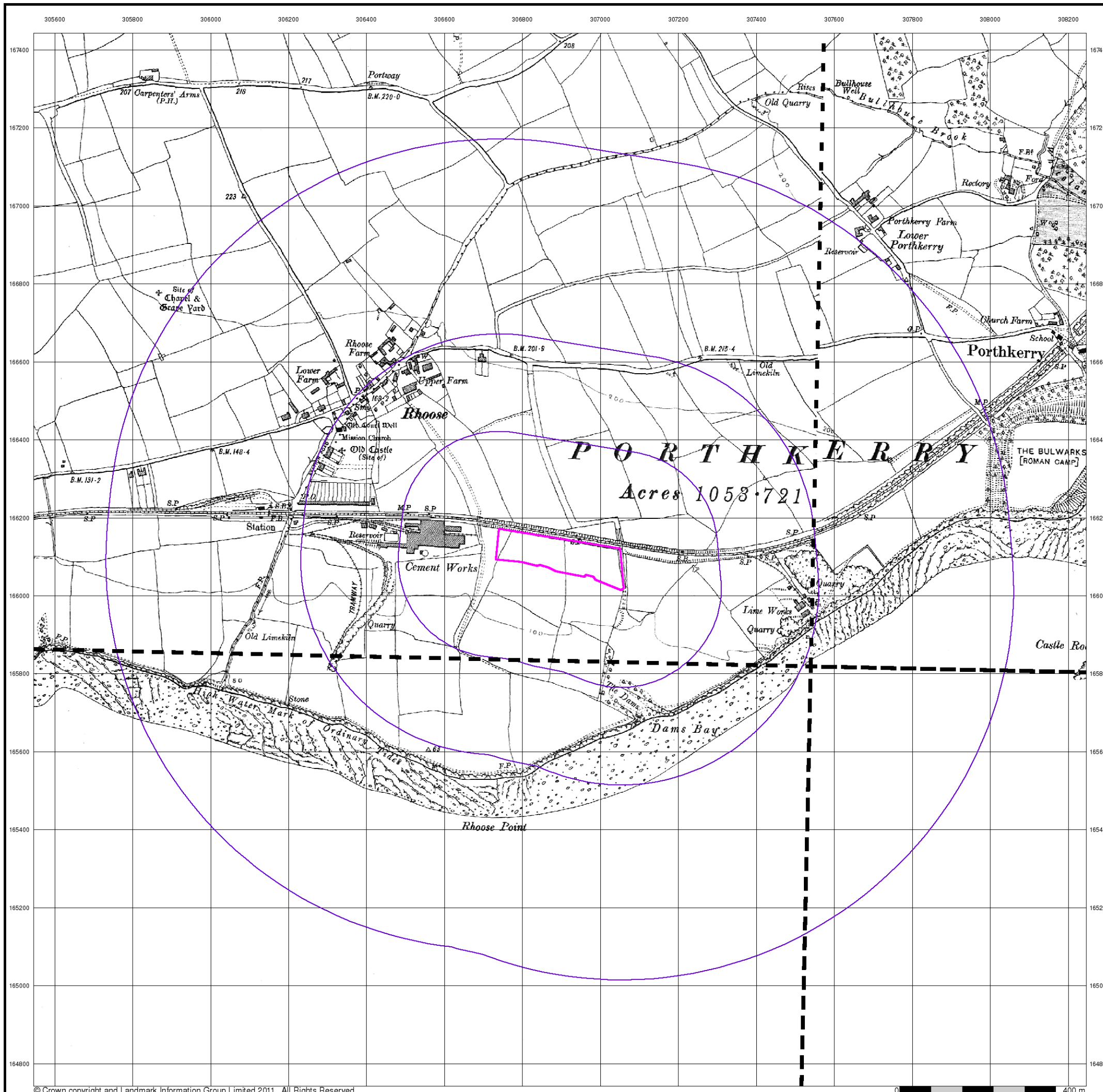
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Glamorganshire

Published 1936

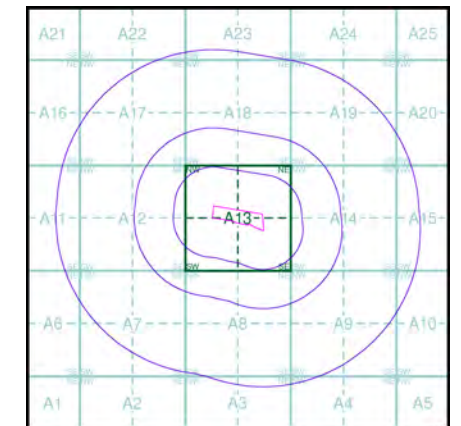
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Map Name(s) and Date(s)

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050SE	1936	1:10,560

Historical Map - Slice A



Order Details

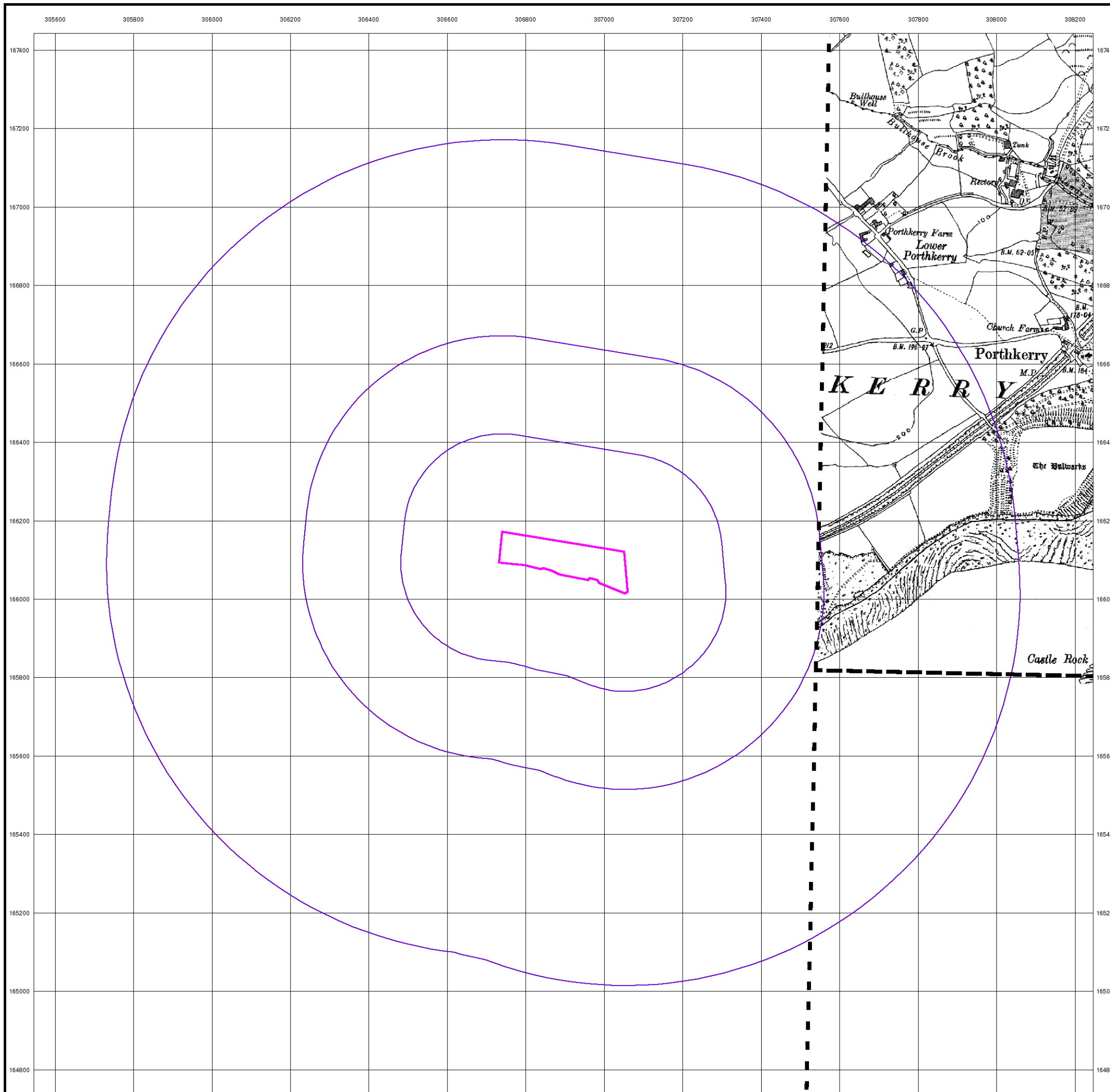
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 National Grid Reference: 306900, 166100
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 Site Area (Ha): 2.7
 Search Buffer (m): 1000

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Glamorganshire

Published 1938 - 1947

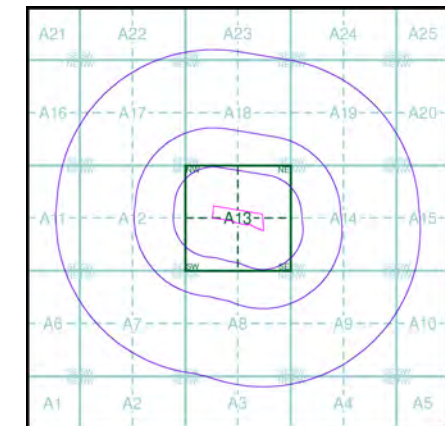
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps.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

Map Name(s) and Date(s)

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Historical Map - Slice A



Order Details

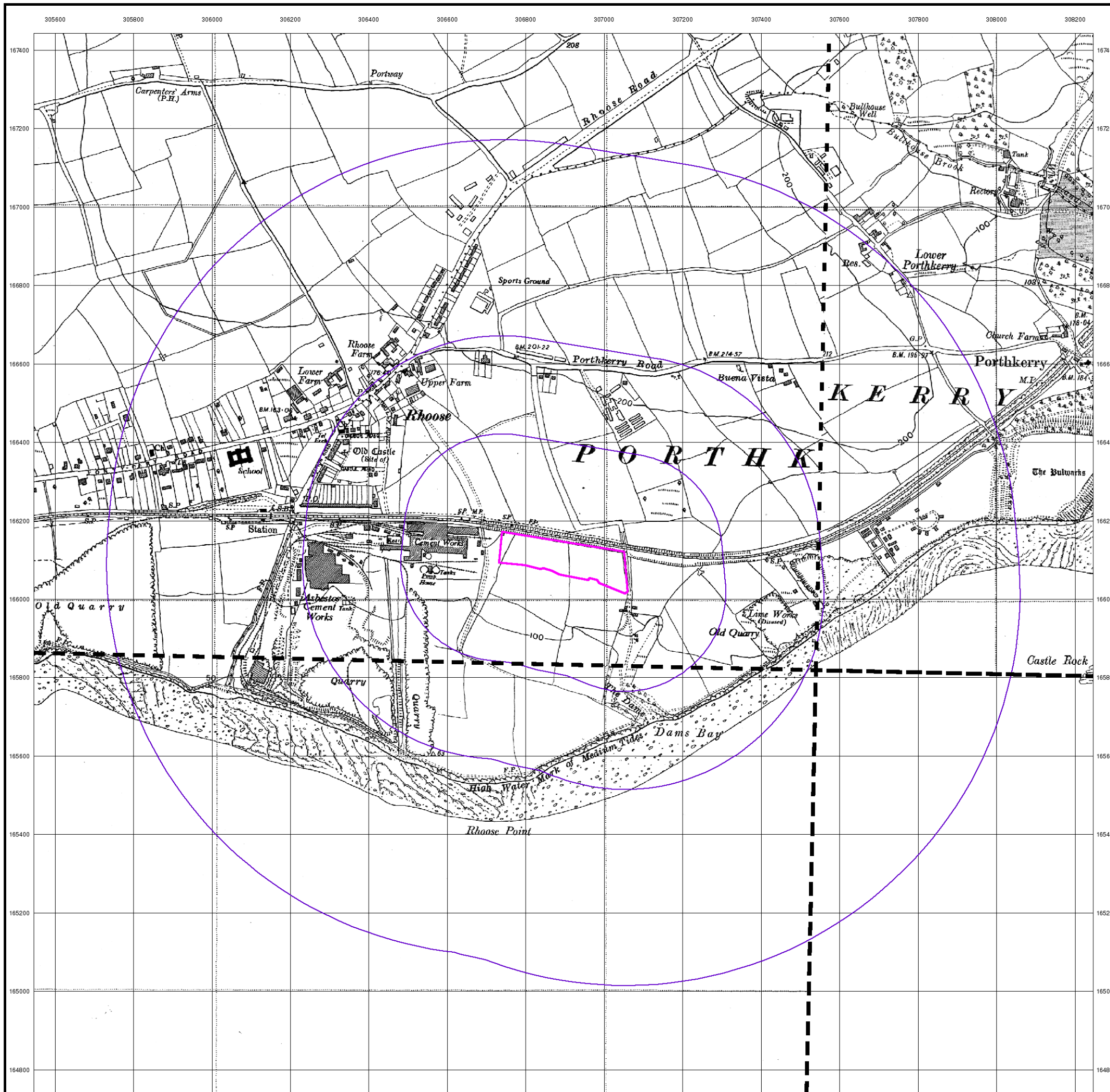
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 Slice: A
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Historical Aerial Photography

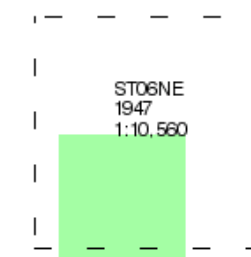
Published 1947

Source map scale - 1:10,560

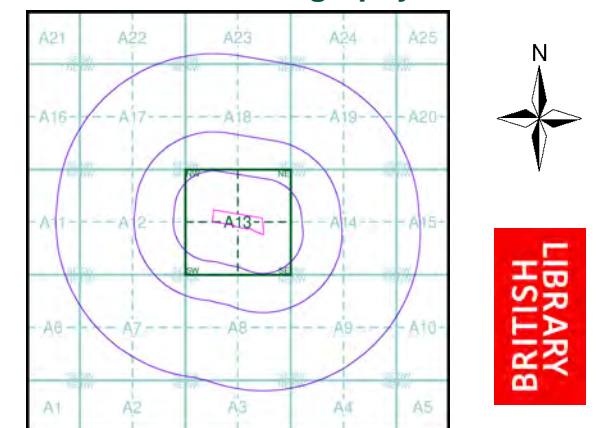
The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the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

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Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



Order Details

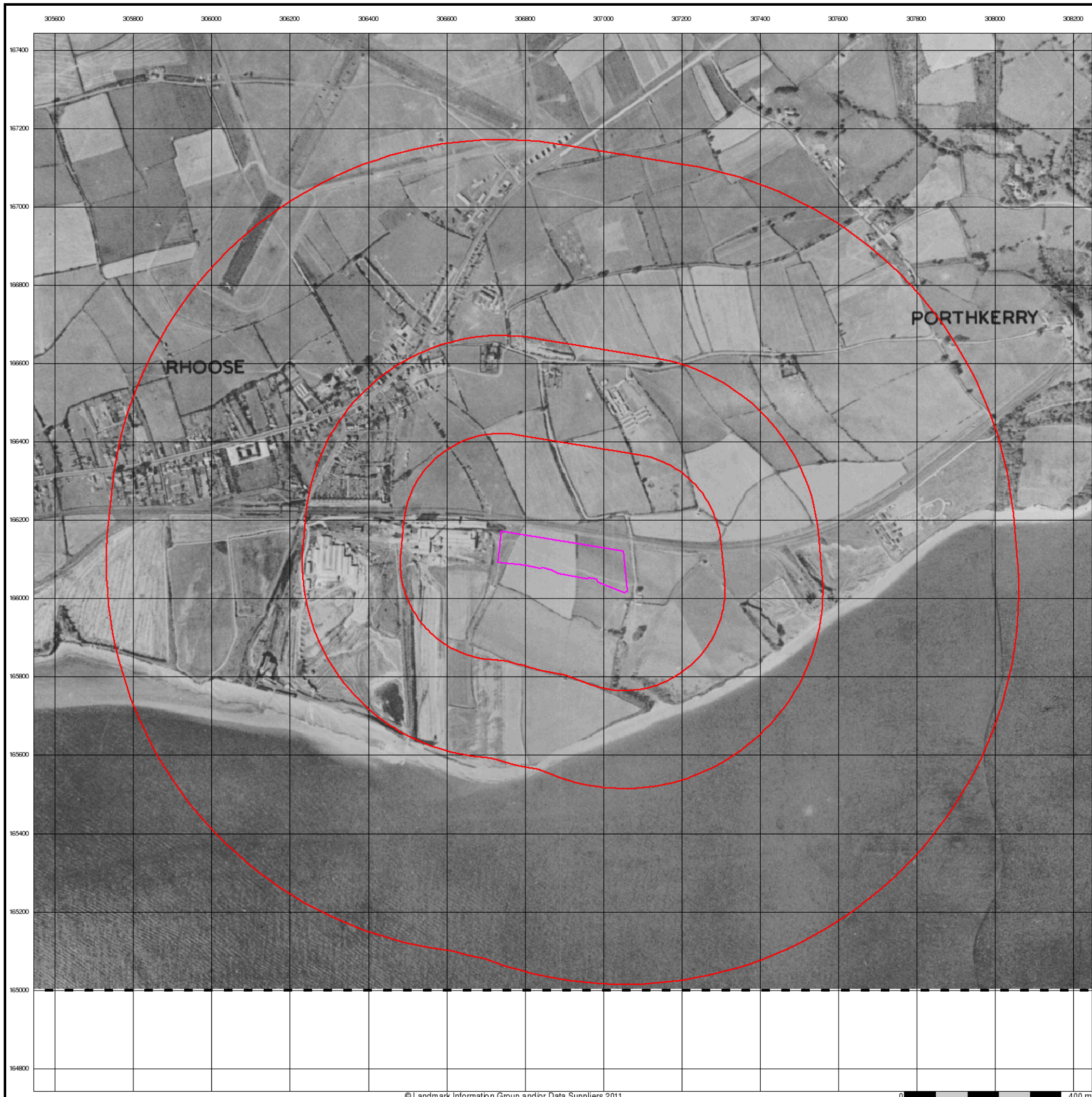
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Customer Ref: 11621-Rhoose
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Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 1000

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Historical Aerial Photography

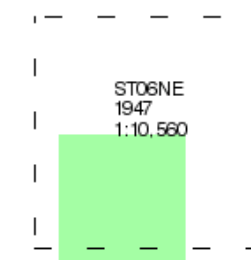
Published 1947

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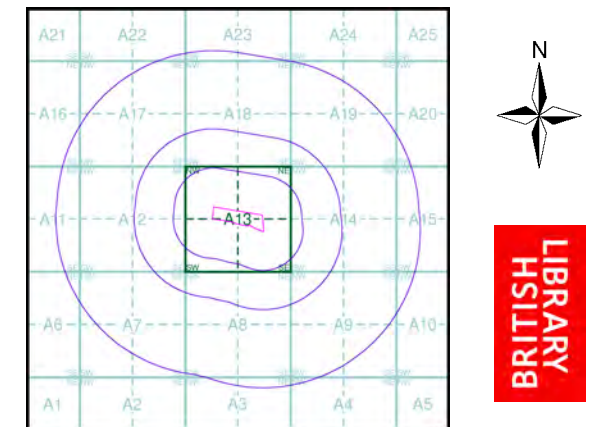
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Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



Order Details

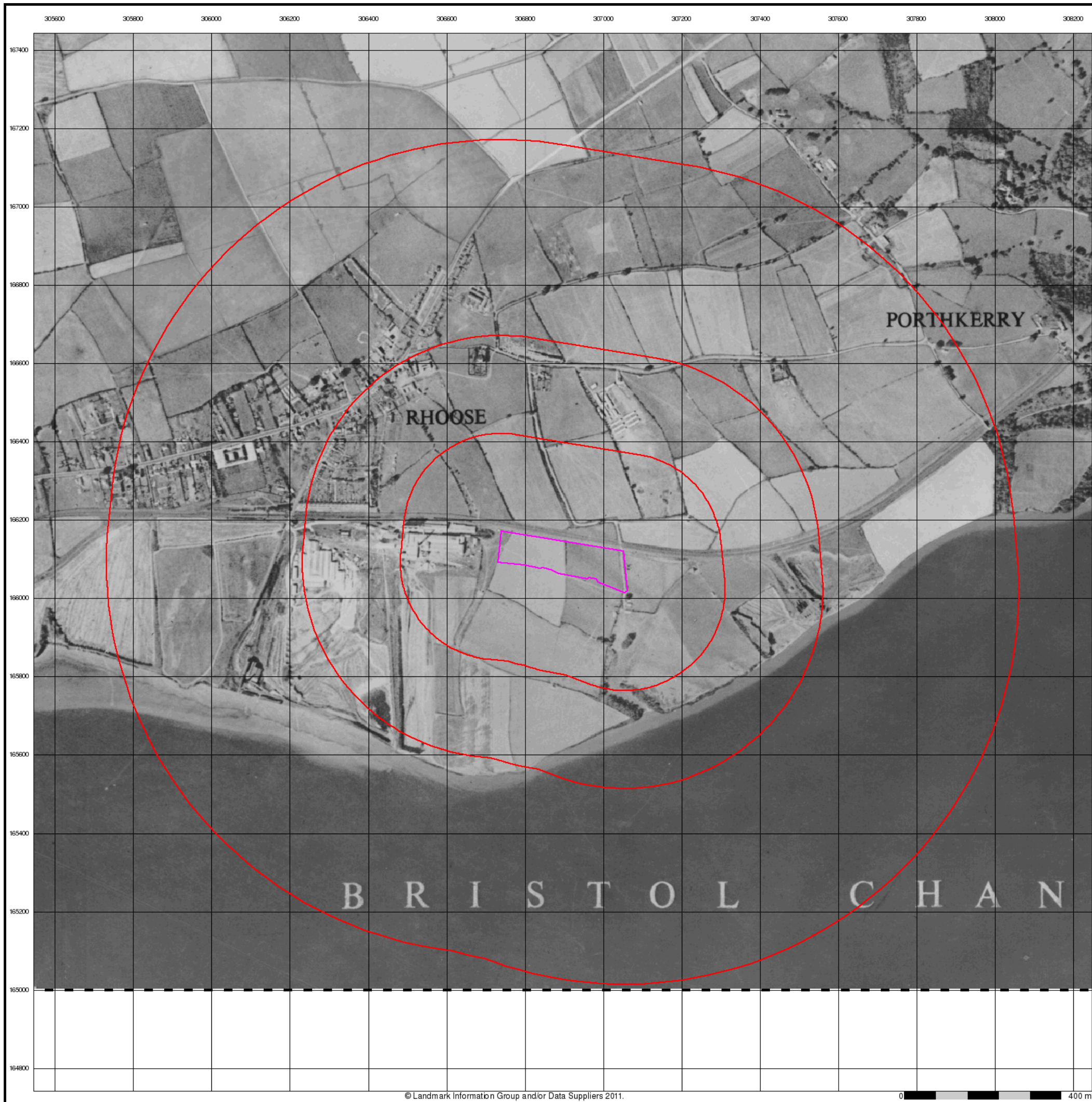
Order Number: 36931701_1_1
Customer Ref: 11621-Rhooose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 1000

Site Details

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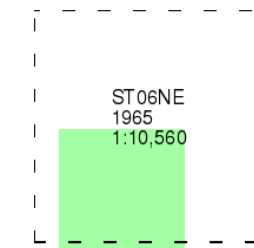
Ordnance Survey Plan

Published 1965

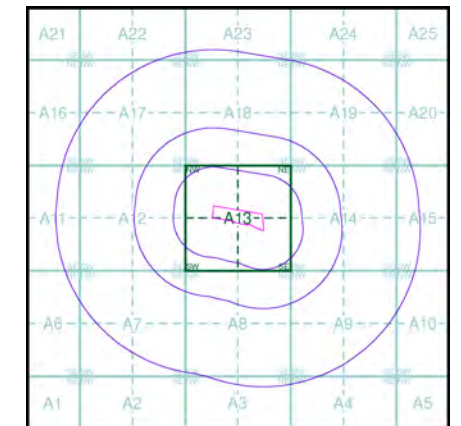
Source map scale - 1:10,000

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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 36931701_1_1
Customer Ref: 11621-Rhoose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 1000

Site Details

The Employment Site, Rhoose, Barry, Vale of Glamorgan, CF62 3LJ



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





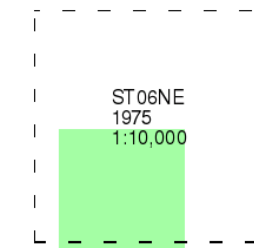
Ordnance Survey Plan

Published 1975

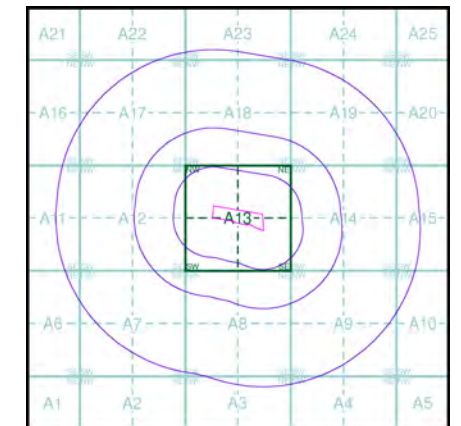
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

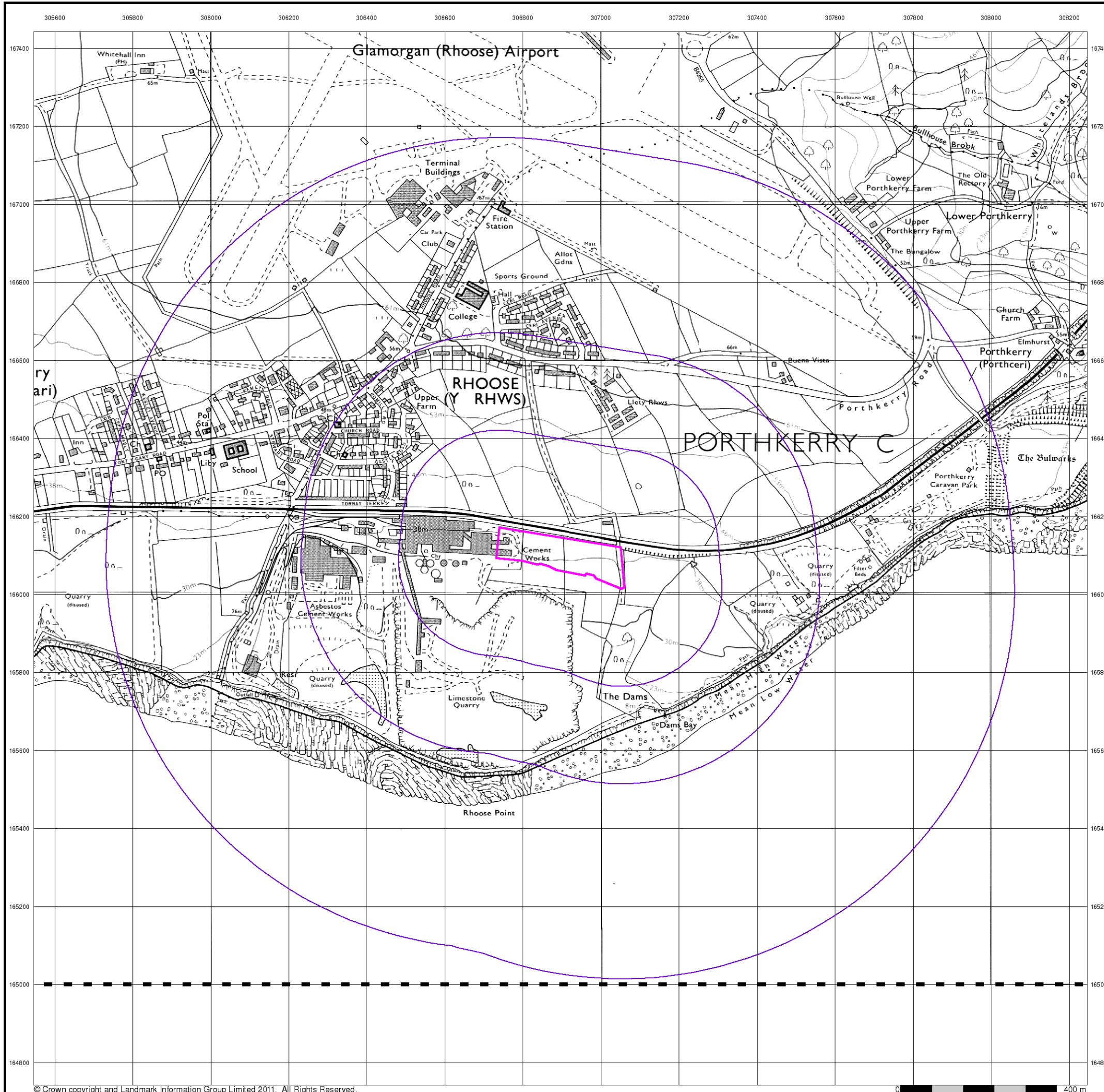
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Customer Ref: 11621-Rhoose
National Grid Reference: 306900, 166100
Slice: A
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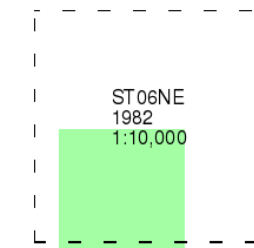
Ordnance Survey Plan

Published 1982

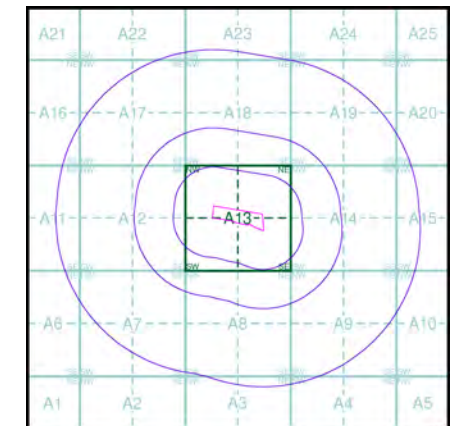
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

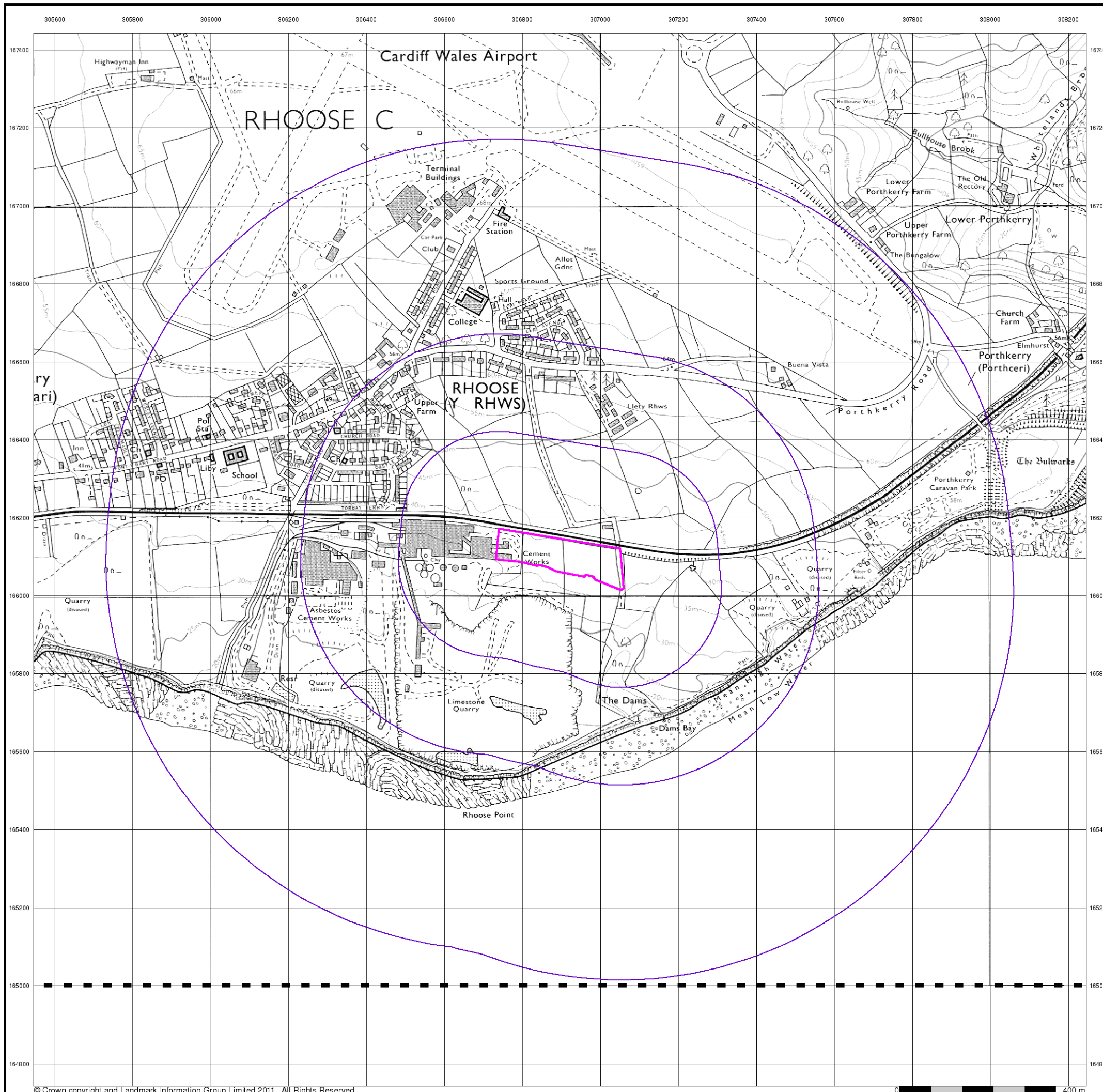
Order Number: 36931701_1_1
Customer Ref: 11621-Rhoose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
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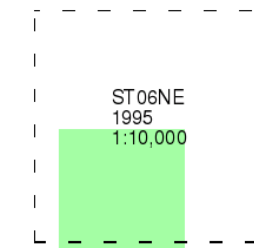
Ordnance Survey Plan

Published 1995

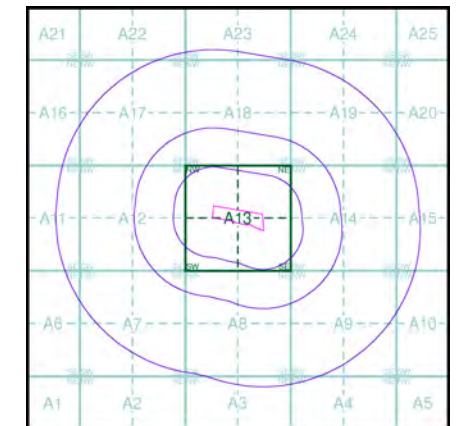
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

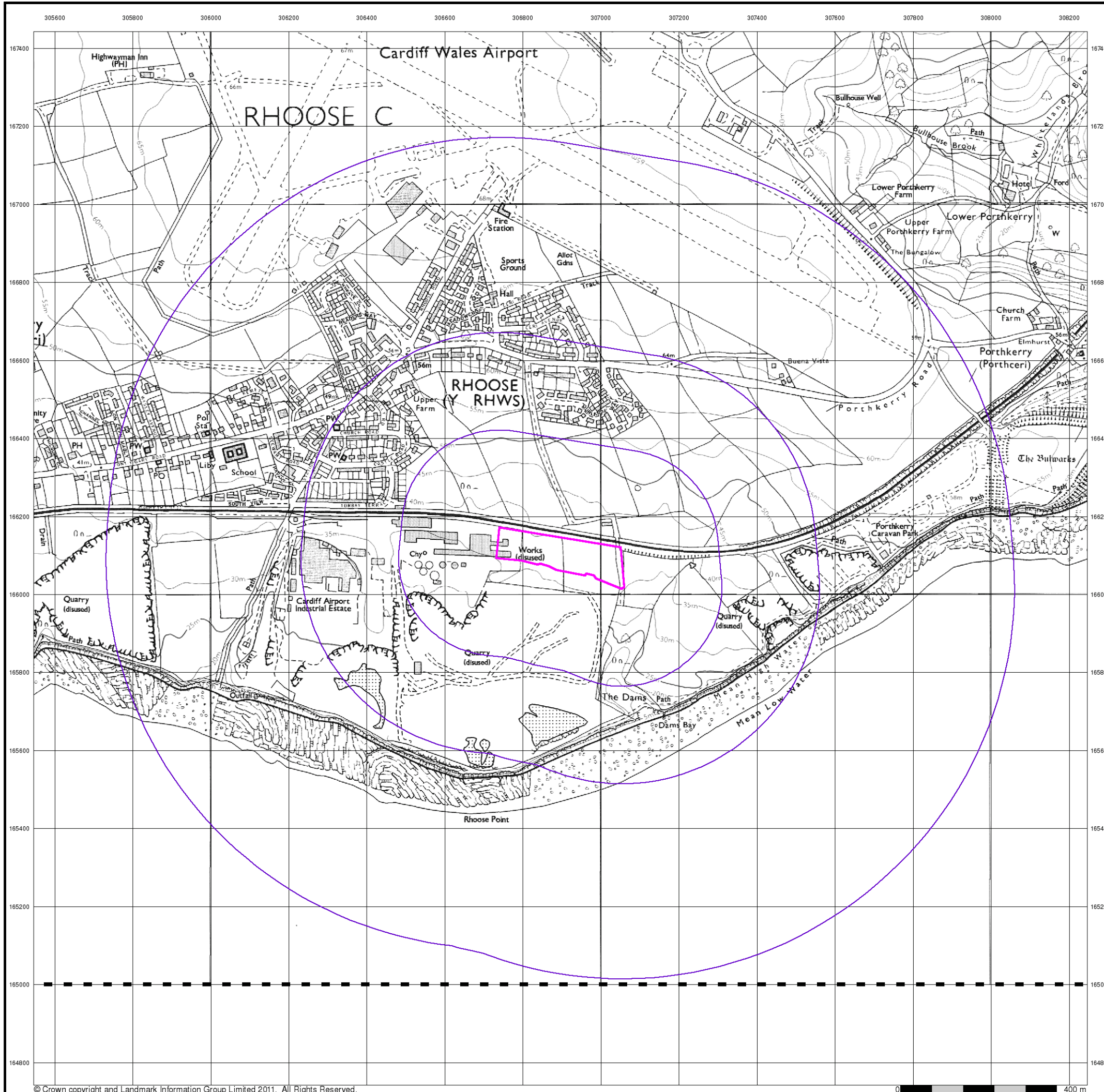
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Customer Ref: 11621-Rhoose
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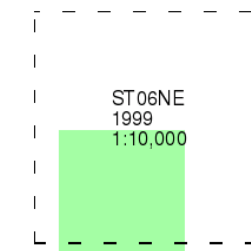
10k Raster Mapping

Published 1999

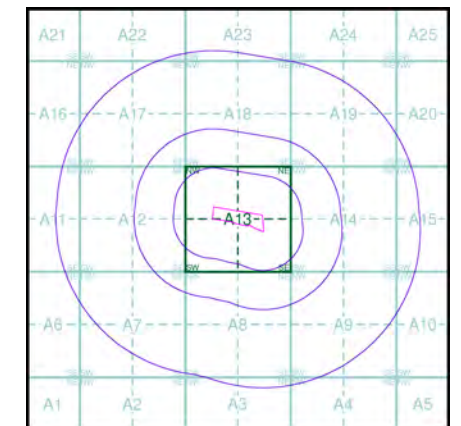
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 36931701_1_1
 Customer Ref: 11621-Rhoose
 National Grid Reference: 306900, 166100
 Slice: A
 Site Area (Ha): 2.7
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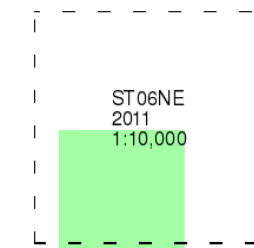
10k Raster Mapping

Published 2011

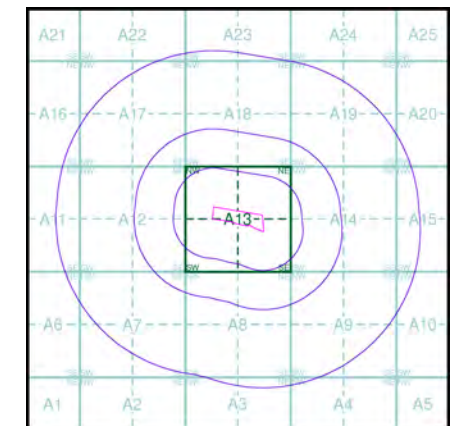
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 36931701_1_1
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 Slice: A
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Historical Mapping Legends

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

Quarry **Gravel Pit** **Sand Pit**
Clay Pit **Shingle** **Refuse Heap**
Sloping Masonry **Flat Rock**
Marsh **Reeds** **Osiers**
Rough Pasture **Furze** **Wood**
Mixed Wood **Brushwood** **Orchard**
Fir **Ford** **Stepping Stones**
Ferry **Waterfall** **Lock**
Trig. Station **Altitude at Trig. Station**
B.M. 325.9 **Bench Mark** **Surface Level**
Arrow denotes flow of water **Antiquities (site of)**
Cutting **Embankment**
Railway crossing Road **Level Crossing** **Road crossing Railway**
Railway crossing River or Canal **Road over single stream** **Road over River or Canal**
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
County Borough Boundary (England)
Co. Boro. Bdy.
County Burgh Boundary (Scotland)
Boundary Post or Stone **Police Call Box**
B.R. **Bridle Road** **P** **Pump**
E.P. **Electricity Pylon** **S.P.** **Signal Post**
F.B. **Foot Bridge** **Sl.** **Sluice**
F.P. **Foot Path** **Sp.** **Spring**
G.P. **Guide Post or Board** **T.C.B.** **Telephone Call Box**
M.S. **Mile Stone** **Tr.** **Trough**
M.P. M.R. **Mooring Post or Ring** **W** **Well**

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

Inactive Quarry, Chalk Pit or Clay Pit **Active Quarry, Chalk Pit or Clay Pit**
Rock **Boulders**
Cliff **Slopes** **Top**
Roofed Building **Glazed Roof Building**
Sloping Masonry **Archway**
Non-Coniferous Tree (surveyed) **Coniferous Tree (surveyed)**
Non-Coniferous Trees (not surveyed) **Coniferous Trees (not surveyed)**
Orchard Tree **Scrub** **Bracken**
Coppice, Osier **Reeds** **Marsh, Saltings**
Rough Grassland **Heath** **Culvert**
Direction of water flow **Bench Mark** **Antiquity (site of)**
Cave Entrance **Triangulation Station** **Electricity Pylon**
Electricity Transmission Line
County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
London Borough Boundary
Symbol marking point where boundary mereing changes
BH **Beer House** **P** **Pillar, Pole or Post**
BP, BS **Boundary Post or Stone** **PO** **Post Office**
Cn, C **Capstan, Crane** **PC** **Public Convenience**
Chy **Chimney** **PH** **Public House**
D Fn **Drinking Fountain** **Pp** **Pump**
EI P **Electricity Pillar or Post** **SB, S Br** **Signal Box or Bridge**
FAP **Fire Alarm Pillar** **SP, SL** **Signal Post or Light**
FB **Foot Bridge** **Spr** **Spring**
GP **Guide Post** **Tk** **Tank or Track**
H **Hydrant or Hydraulic** **TCB** **Telephone Call Box**
LC **Level Crossing** **TCP** **Telephone Call Post**
MH **Manhole** **Tr** **Trough**
MP **Mile Post or Mooring Post** **Wr Pt, Wr T** **Water Point, Water Tap**
MS **Mile Stone** **W** **Well**
NTL **Normal Tidal Limit** **Wd Pp** **Wind Pump**

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

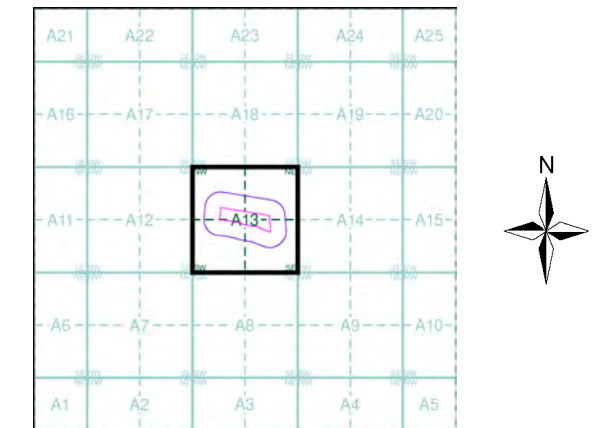
Cliff **Slopes** **Top**
Rock **Rock (scattered)**
Boulders **Boulders (scattered)**
Positioned Boulder **Scree**
Non-Coniferous Tree (surveyed) **Coniferous Tree (surveyed)**
Non-Coniferous Trees (not surveyed) **Coniferous Trees (not surveyed)**
Orchard Tree **Scrub** **Bracken**
Coppice, Osier **Reeds** **Marsh, Saltings**
Rough Grassland **Heath** **Culvert**
Direction of water flow **Triangulation Station** **Antiquity (site of)**
Electricity Transmission Line **Electricity Pylon**
B.M. 231.60m **Bench Mark** **Buildings with Building Seed**
Roofed Building **Glazed Roof Building**
Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)
Bks **Barracks** **P** **Pillar, Pole or Post**
Bty **Battery** **PO** **Post Office**
Cemy **Cemetery** **PC** **Public Convenience**
Chy **Chimney** **Pp** **Pump**
Cis **Cistern** **Ppg Sta** **Pumping Station**
Dismtd Rly **Dismantled Railway** **PW** **Place of Worship**
EI Gen Sta **Electricity Generating Station** **Sewage Ppg Sta** **Sewage Pumping Station**
EI P **Electricity Pole, Pillar** **SB, S Br** **Signal Box or Bridge**
EI Sub Sta **Electricity Sub Station** **SP, SL** **Signal Post or Light**
FB **Filter Bed** **Spr** **Spring**
Fn / D Fn **Fountain / Drinking Ftn.** **Tk** **Tank or Track**
Gas Gov **Gas Valve Compound** **Tr** **Trough**
GVC **Gas Governor** **Wd Pp** **Wind Pump**
GP **Guide Post** **Wr Pt, Wr T** **Water Point, Water Tap**
MH **Manhole** **Wks** **Works (building or area)**
MP, MS **Mile Post or Mile Stone** **W** **Well**



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Glamorganshire	1:2,500	1879	2
Glamorganshire	1:2,500	1900	3
Glamorganshire	1:2,500	1919	4
Glamorganshire	1:2,500	1943	5
Ordnance Survey Plan	1:2,500	1973	6
Additional SIMs	1:2,500	1978 - 1988	7
Additional SIMs	1:2,500	1988	8
Ordnance Survey Plan	1:2,500	1990	9
Large-Scale National Grid Data	1:2,500	1993	10
Large-Scale National Grid Data	1:2,500	1993	11
Large-Scale National Grid Data	1:2,500	1993	12
Large-Scale National Grid Data	1:2,500	1994	13
Large-Scale National Grid Data	1:2,500	1995	14
Large-Scale National Grid Data	1:2,500	1996	15
Large-Scale National Grid Data	1:2,500	1997	16

Historical Map - Segment A13



Order Details

Order Number: 36931701_1_1
 Customer Ref: 11621-Rhoose
 National Grid Reference: 306900, 166100
 Slice: A
 Site Area (Ha): 2.7
 Search Buffer (m): 100

Site Details

The Employment Site, Rhoose, Barry, Vale of Glamorgan, CF62 3LJ



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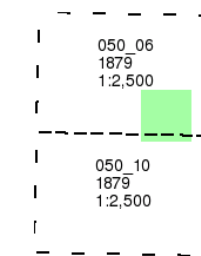
Glamorganshire

Published 1879

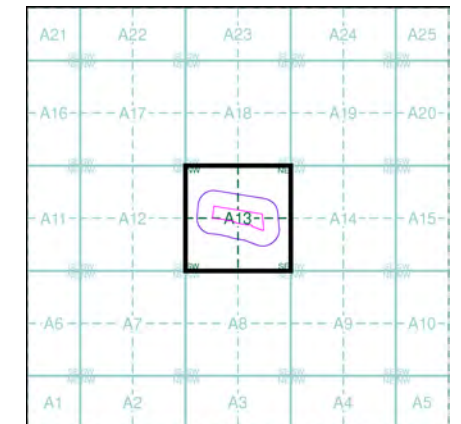
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

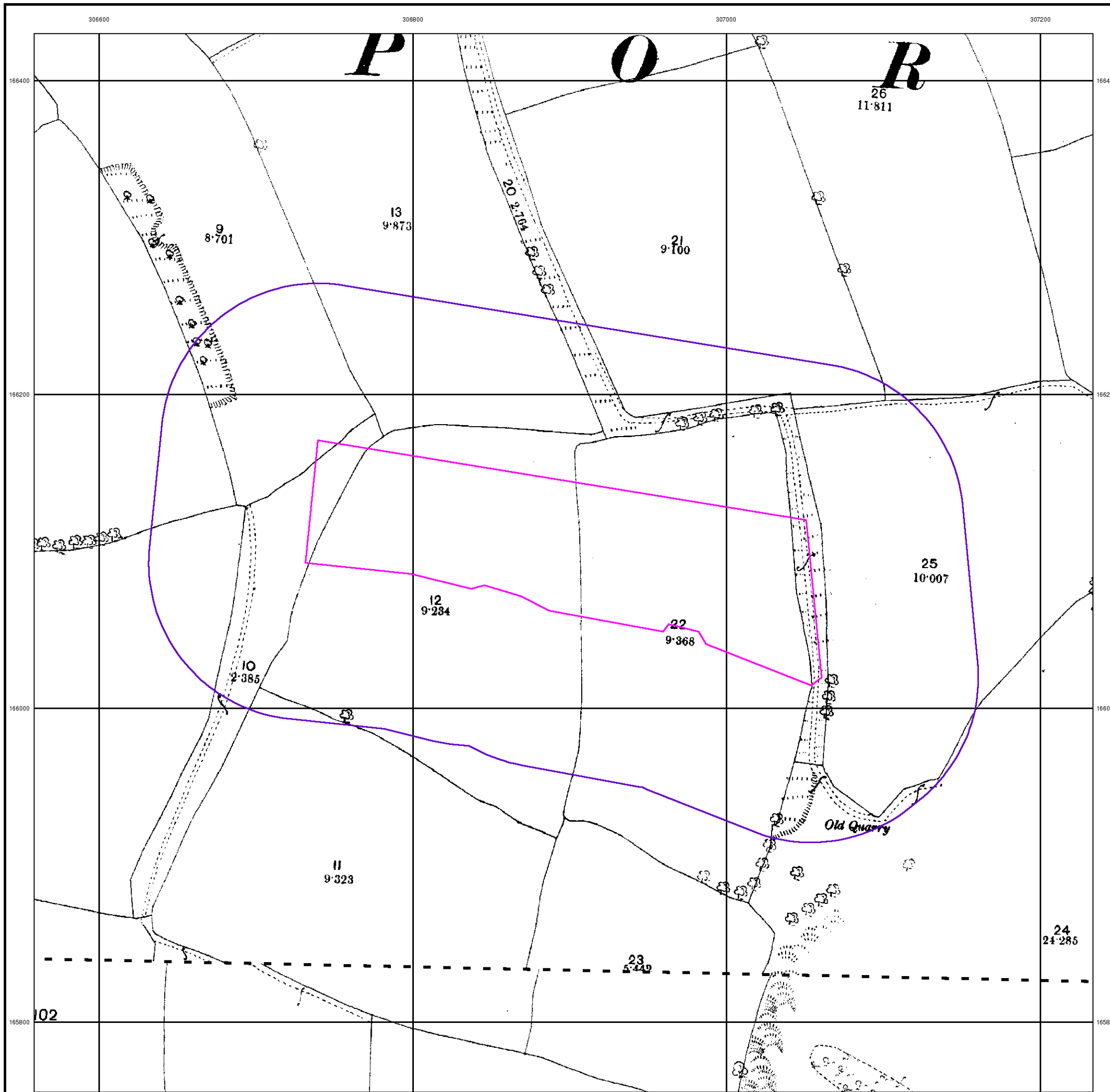
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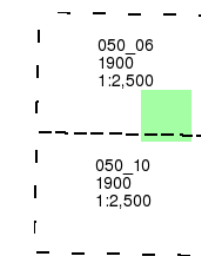
Glamorganshire

Published 1900

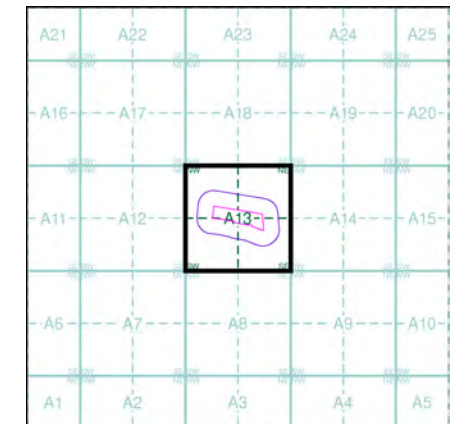
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Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

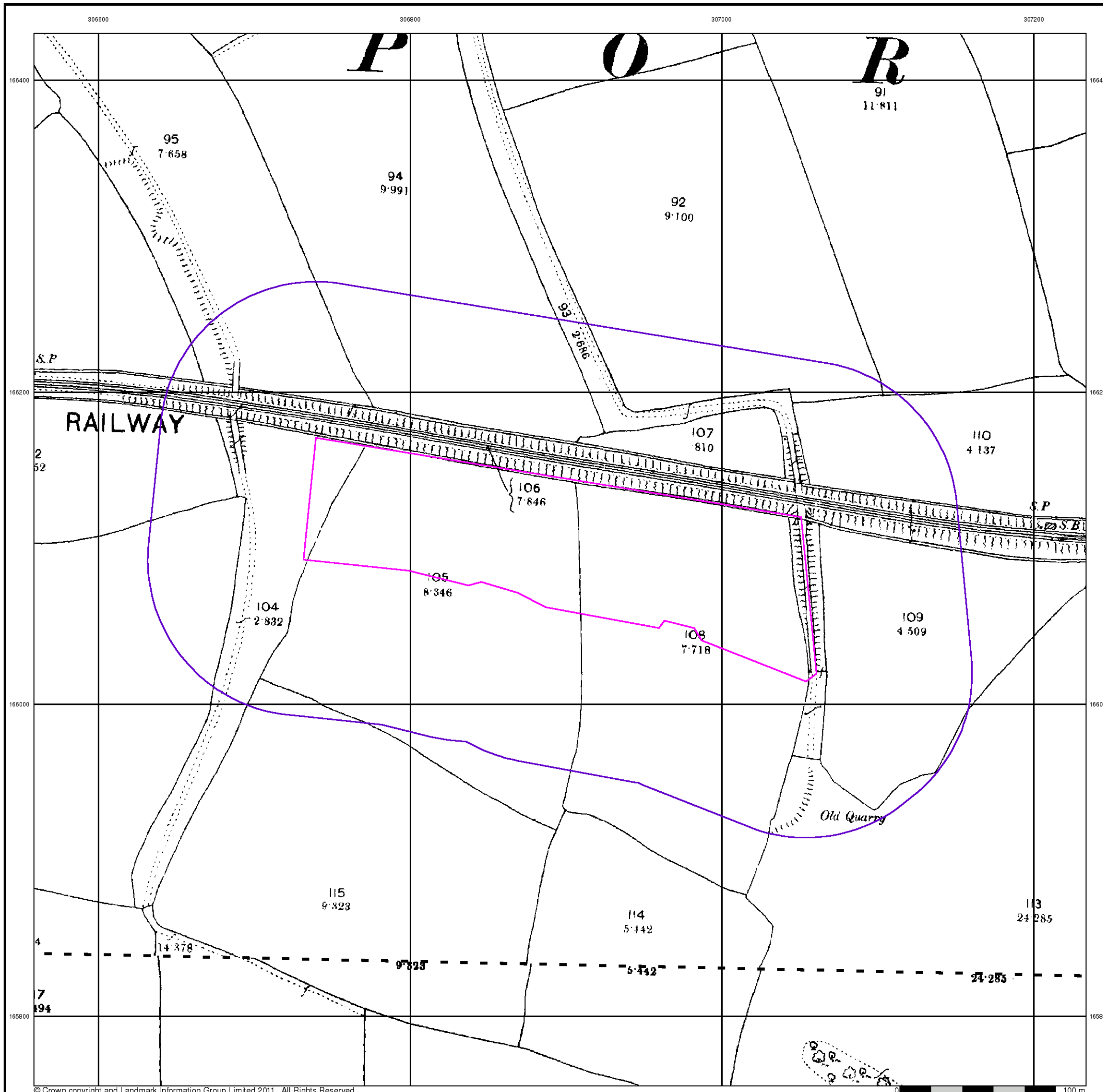
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Customer Ref: 11621-Rhose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
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Glamorganshire

Published 1943

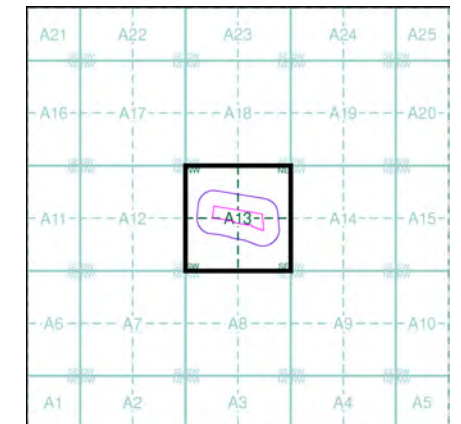
Source map scale - 1:2,500

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

Map Name(s) and Date(s)

050_06	1943	1:2,500
050_10	1943	1:2,500

Historical Map - Segment A13



Order Details

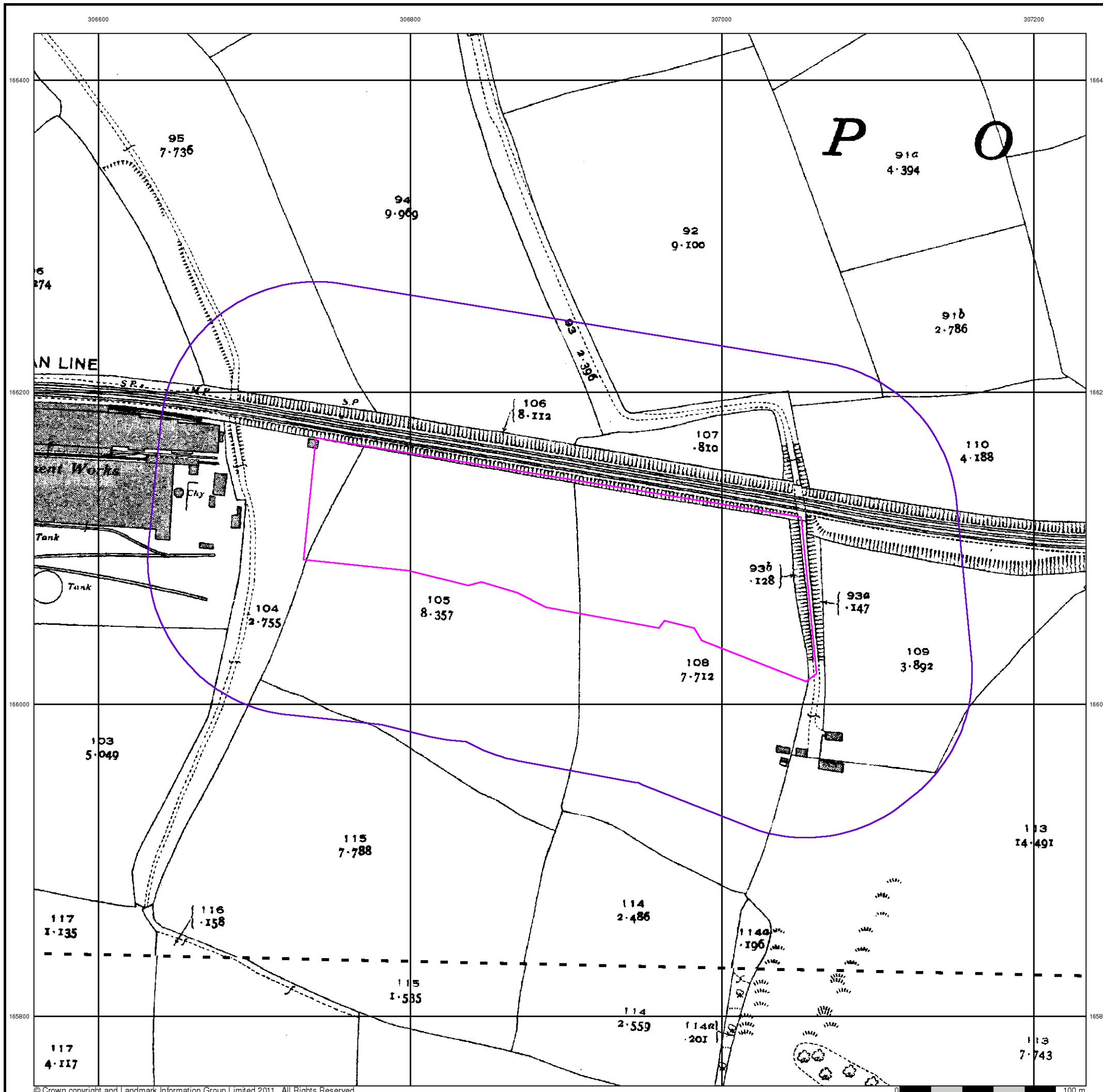
Order Number: 36931701_1_1
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Ordnance Survey Plan

Published 1973

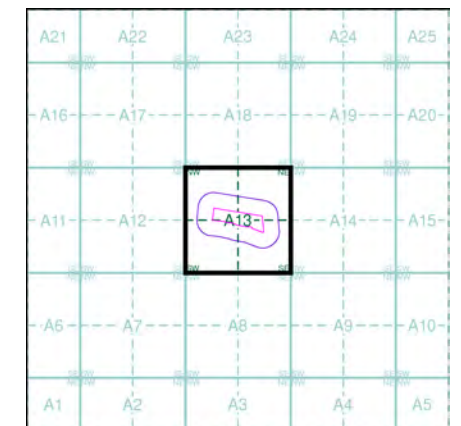
Source map scale - 1:2,500

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

Map Name(s) and Date(s)

ST0666 1973 12,500	ST0766 1973 12,500
ST0665 1973 12,500	ST0765 1973 12,500

Historical Map - Segment A13



Order Details

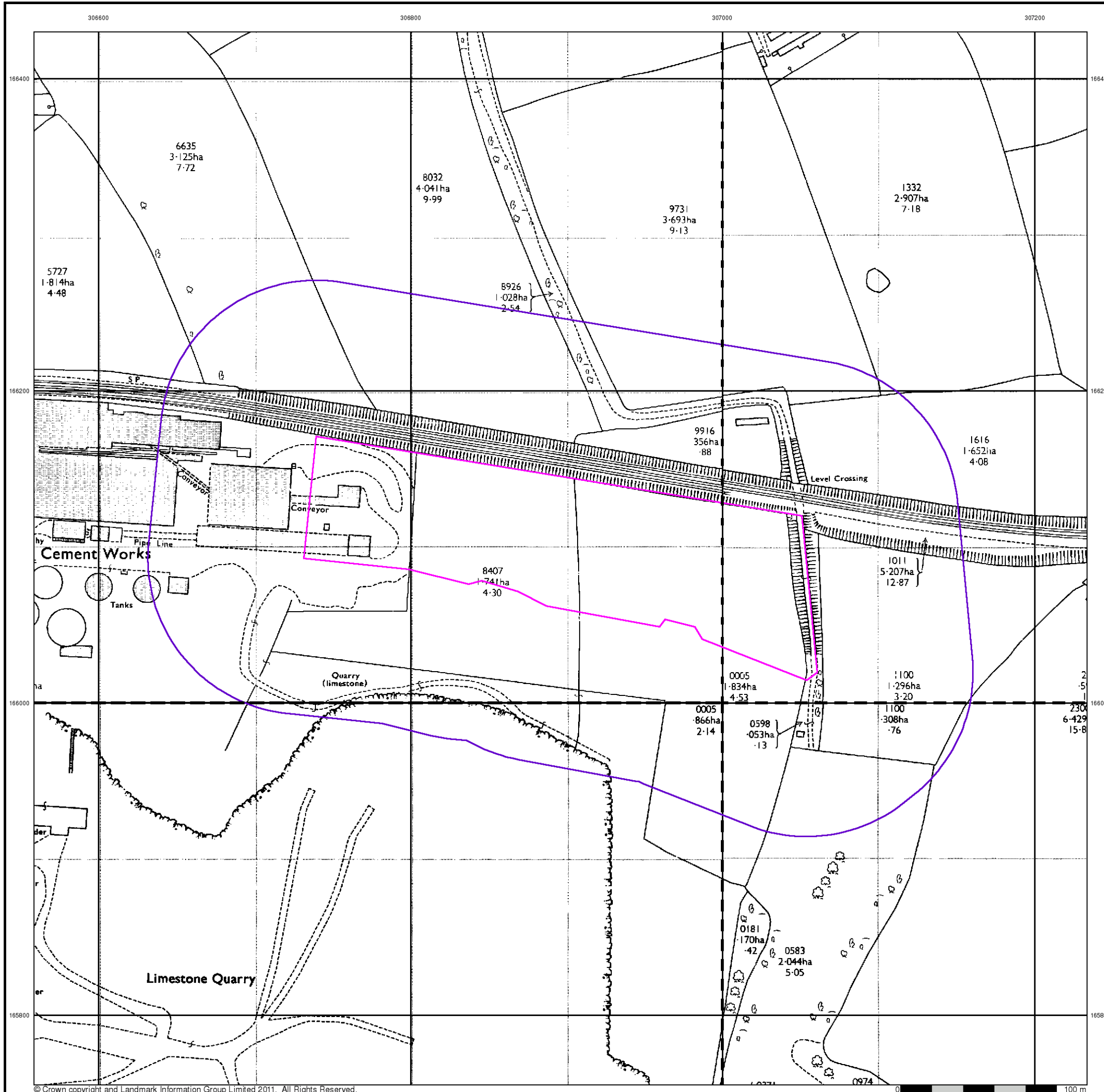
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Additional SIMs

Published 1978 - 1988

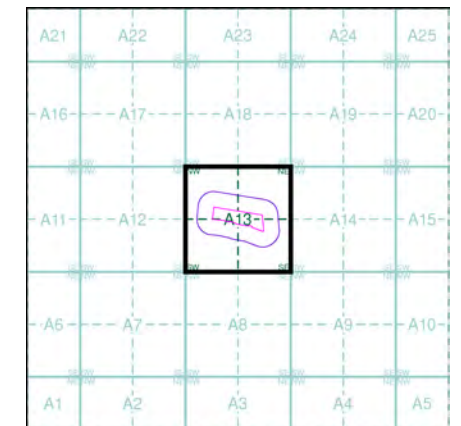
Source map scale - 1:2,500

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

Map Name(s) and Date(s)

ST0666 1978 1:2,500	ST0766 1984 1:2,500
ST0665 1988 1:2,500	

Historical Map - Segment A13



Order Details

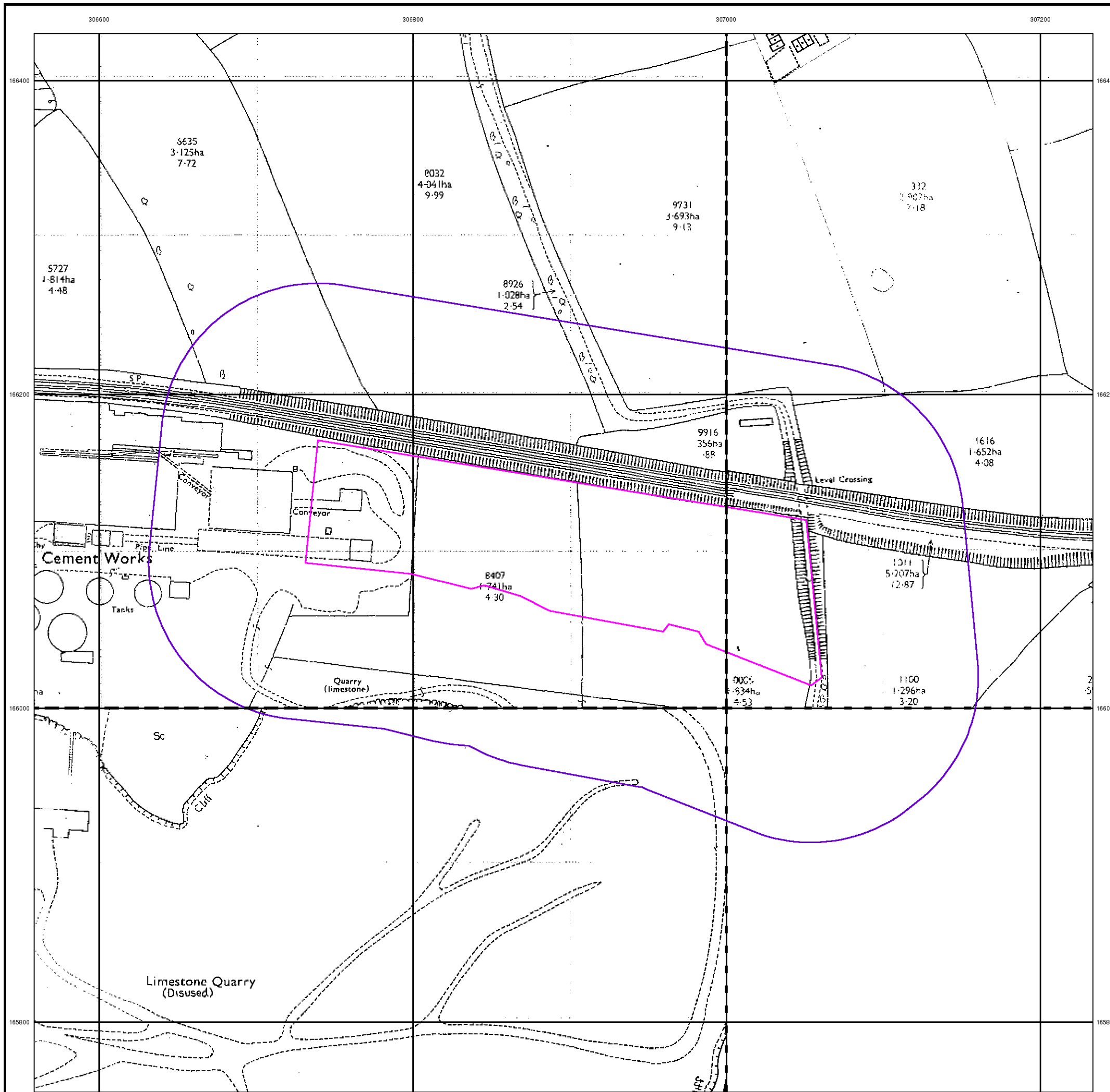
Order Number: 36931701_1_1
 Customer Ref: 11621-Rhooose
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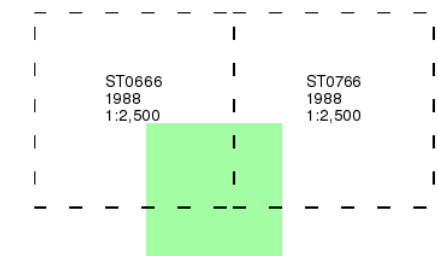
Additional SIMs

Published 1988

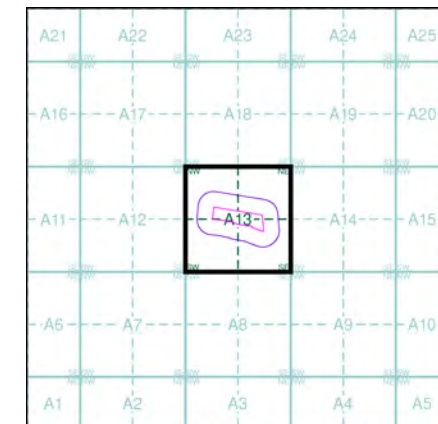
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

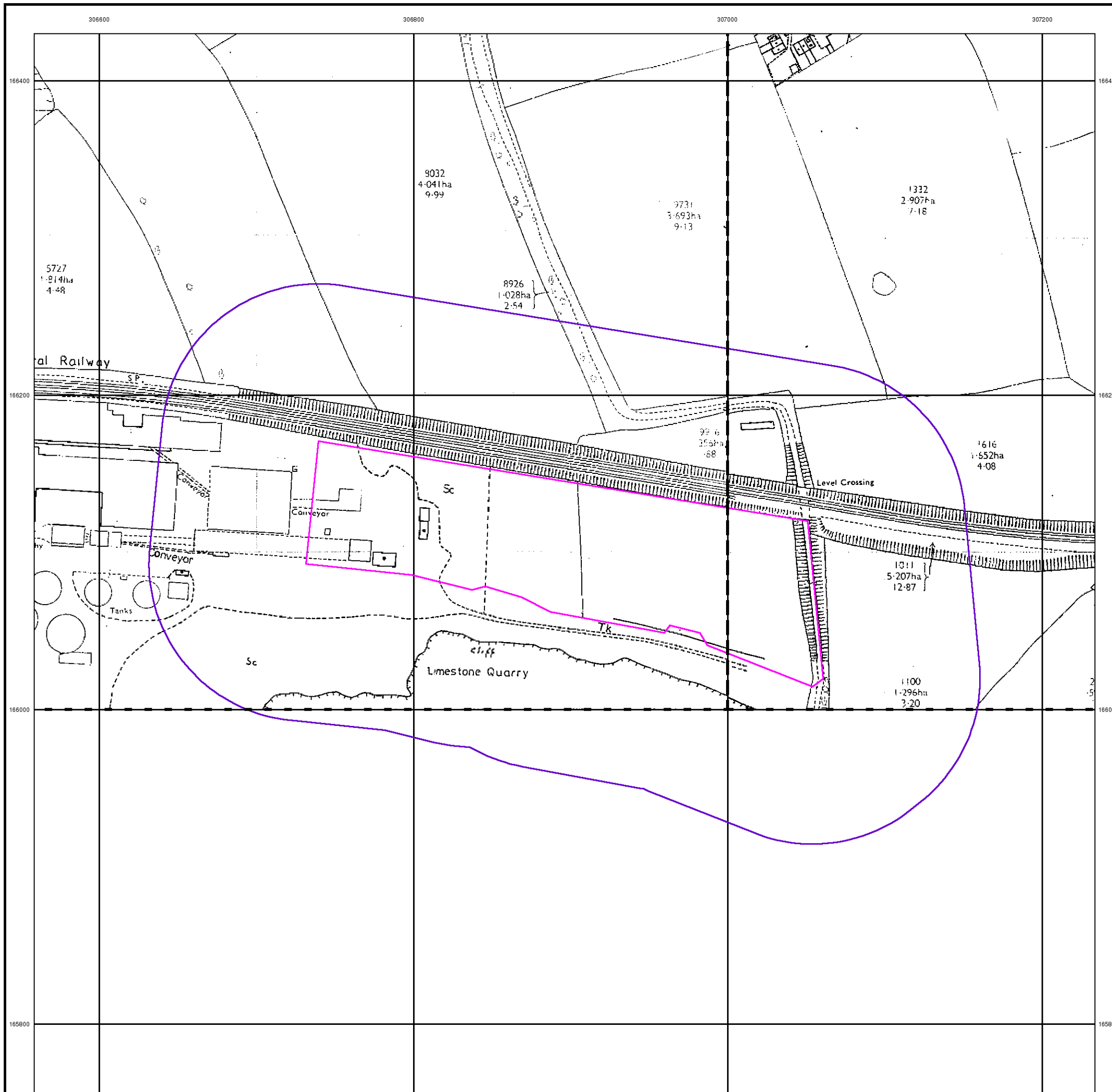
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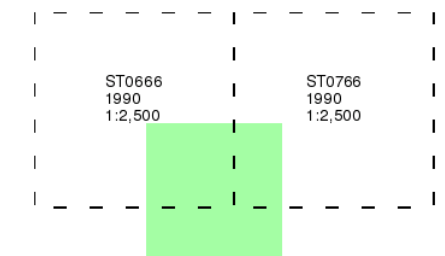
Ordnance Survey Plan

Published 1990

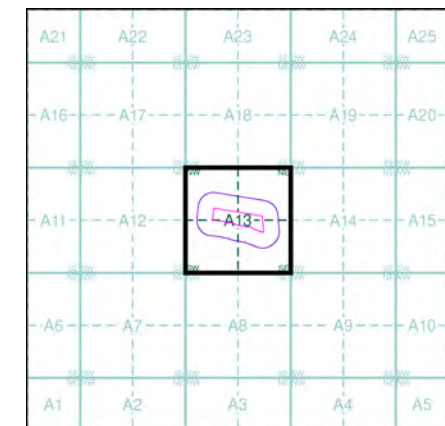
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

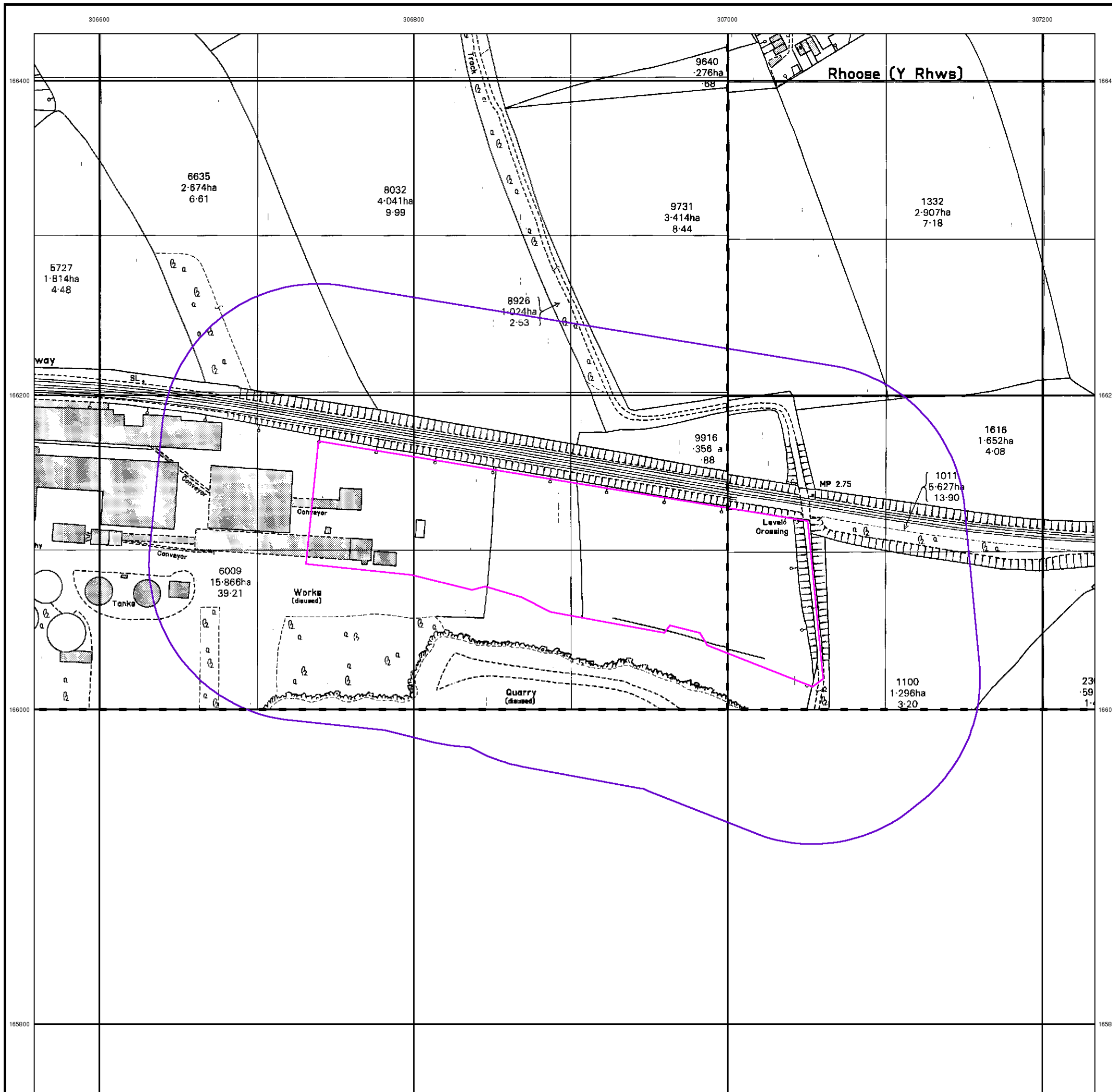
Order Number: 36931701_1_1
Customer Ref: 11621-Rhooe
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

Site Details

The Employment Site, Rhooe, Barry, Vale of Glamorgan, CF62 3LJ



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





Large-Scale National Grid Data

Published 1993

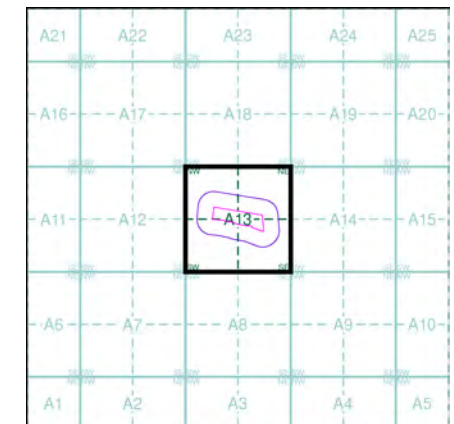
Source map scale - 1:2,500

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

Map Name(s) and Date(s)

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12,500	12,500
ST0665	ST0765
1993	1993
12,500	12,500

Historical Map - Segment A13



Order Details

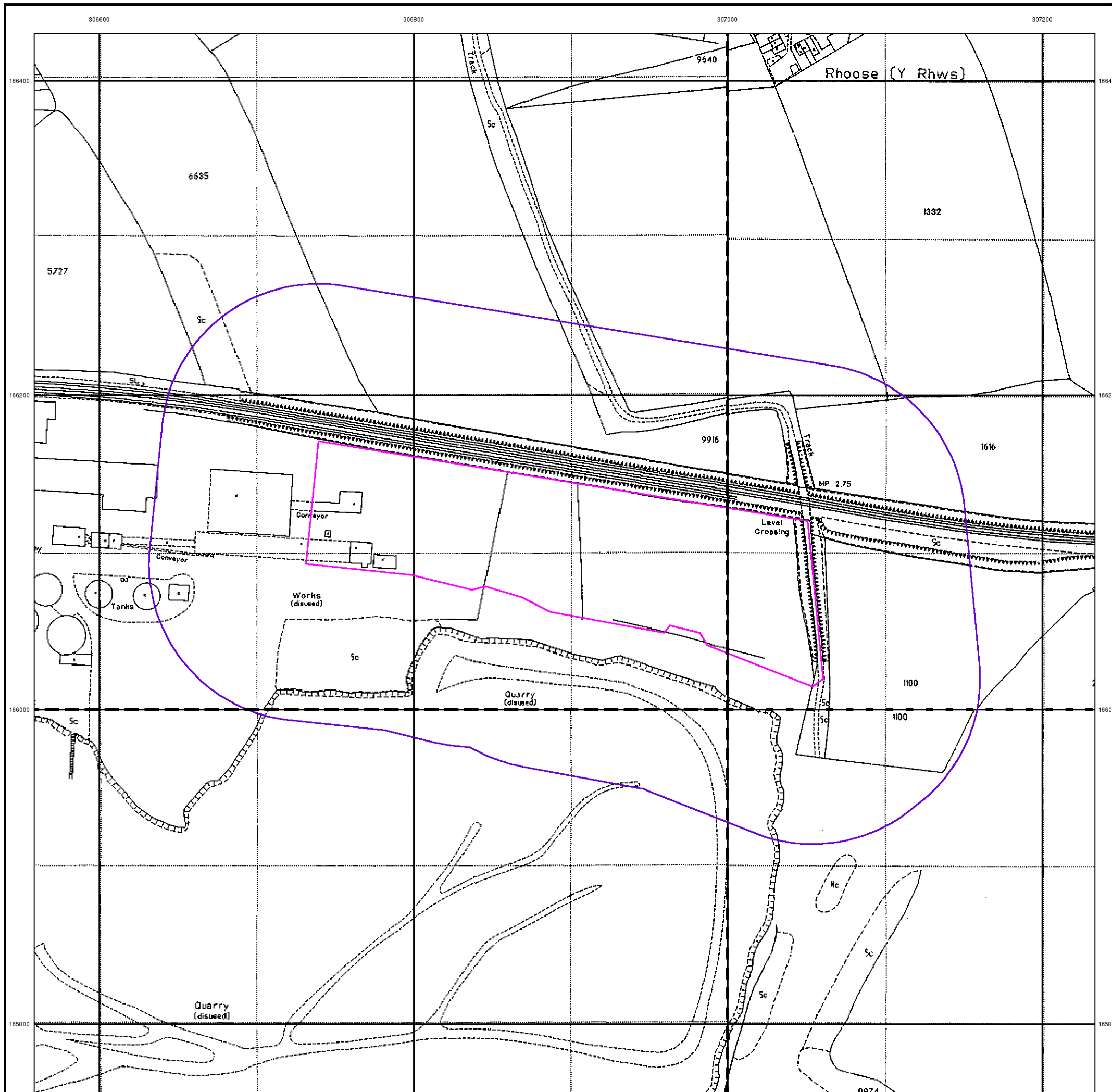
Order Number: 36931701_1_1
 Customer Ref: 11621-Rhooe
 National Grid Reference: 306900, 166100
 Slice: A
 Site Area (Ha): 2.7
 Search Buffer (m): 100

Site Details

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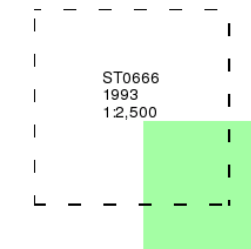
Large-Scale National Grid Data

Published 1993

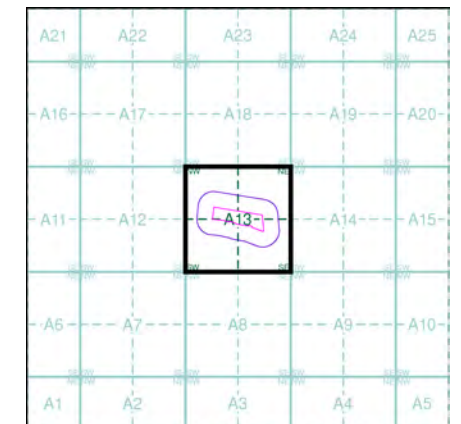
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'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

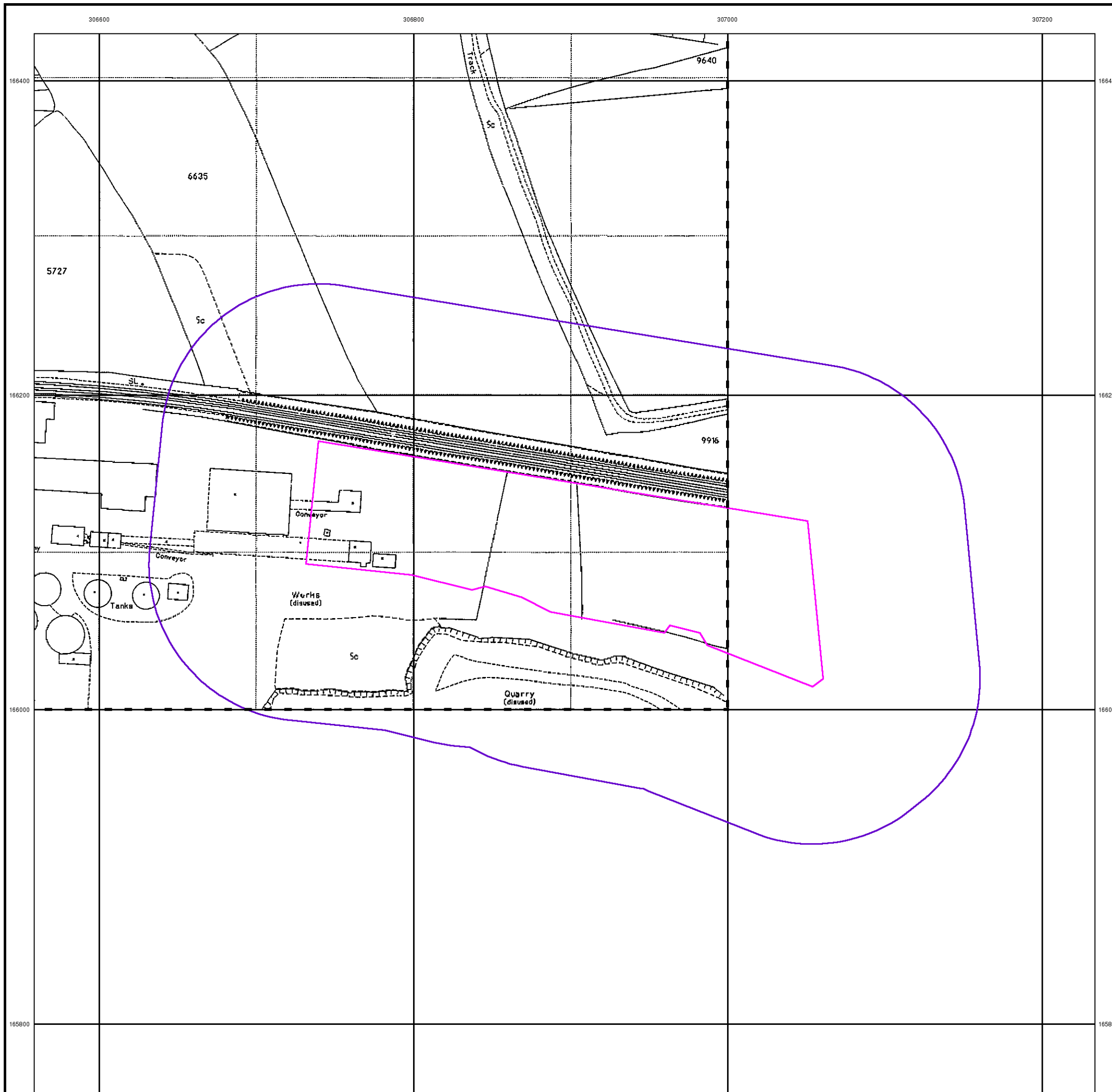
Order Number: 36931701_1_1
Customer Ref: 11621-Rhooose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

Site Details

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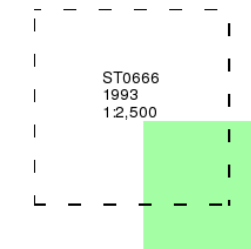
Large-Scale National Grid Data

Published 1993

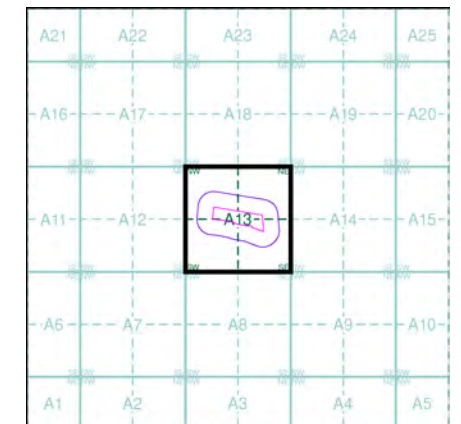
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'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

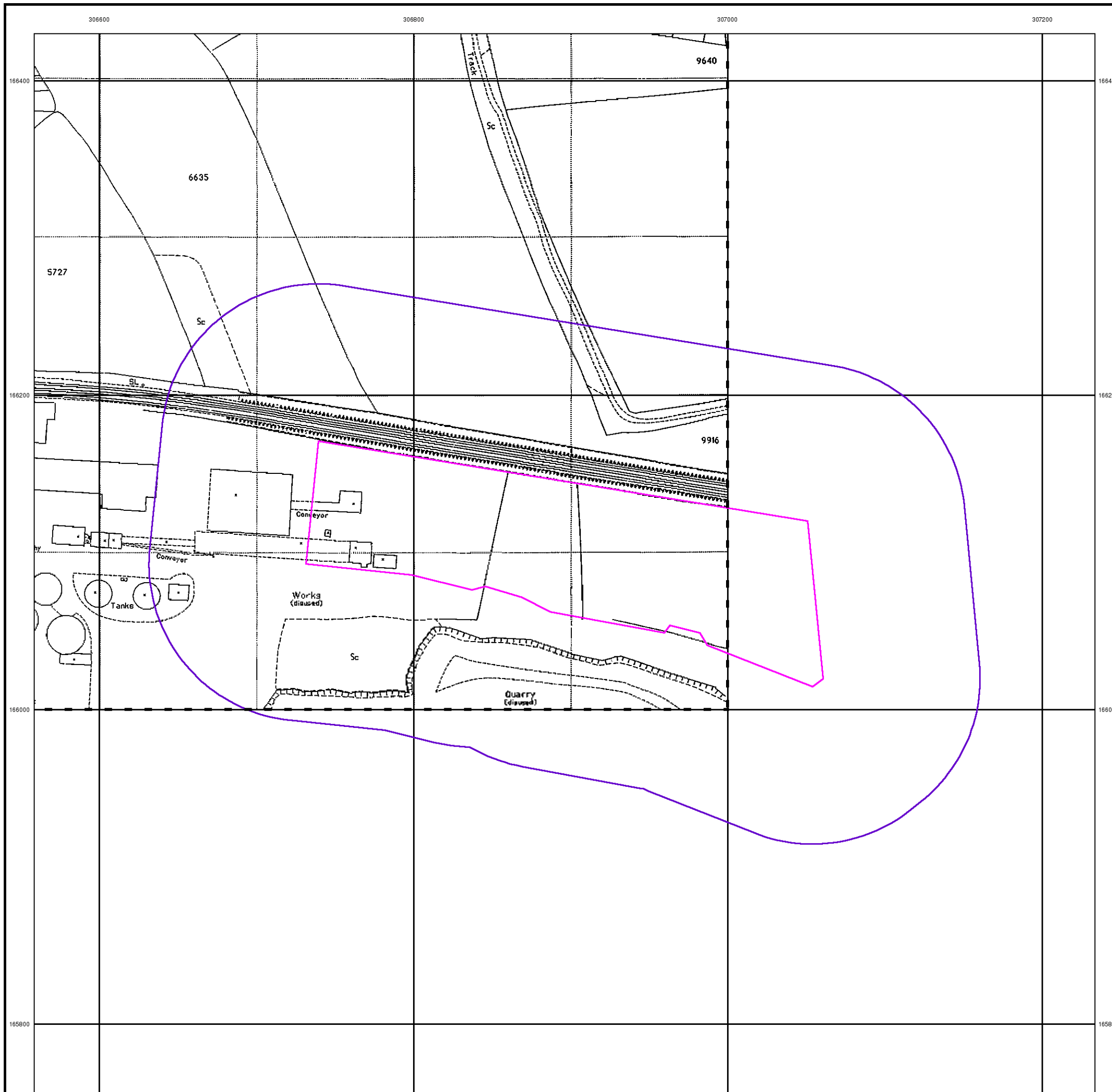
Order Number: 36931701_1_1
Customer Ref: 11621-Rhooose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

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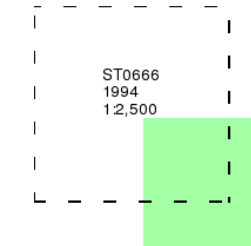
Large-Scale National Grid Data

Published 1994

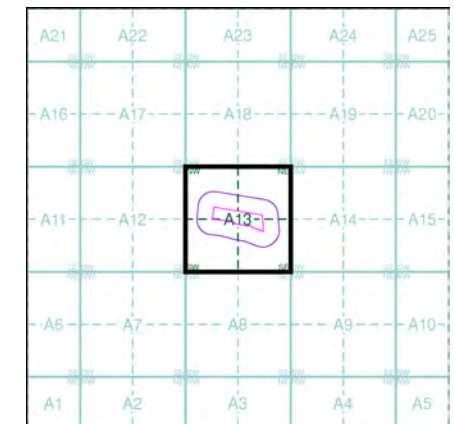
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 36931701_1_1
Customer Ref: 11621-Rhooose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

Site Details

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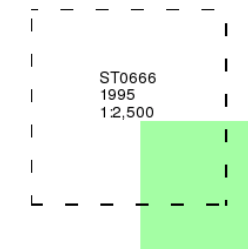
Large-Scale National Grid Data

Published 1995

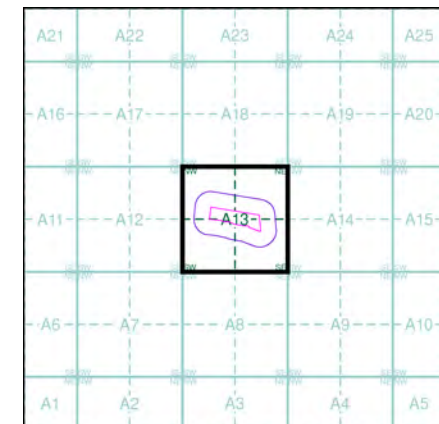
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

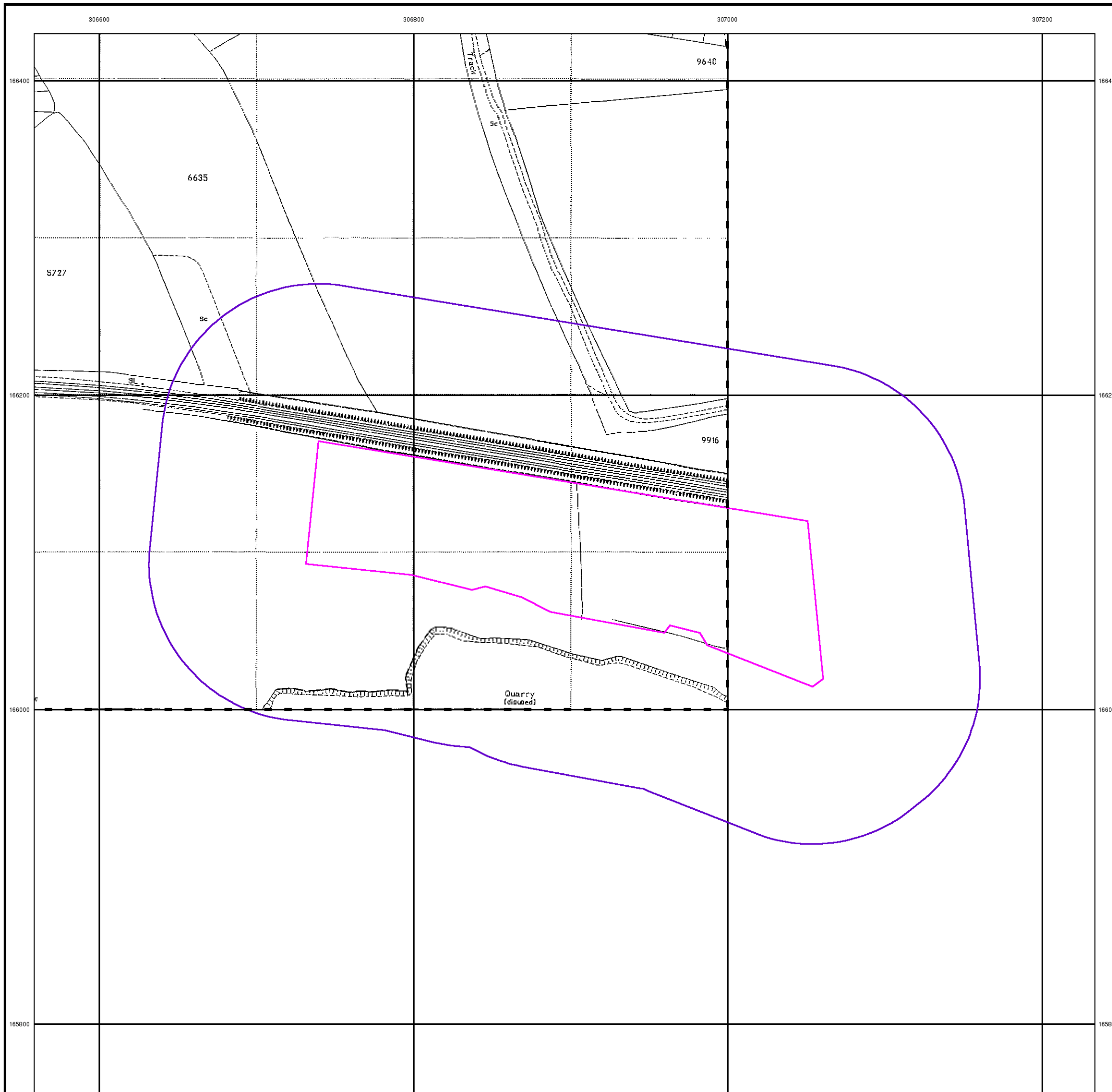
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National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

Site Details

The Employment Site, Rhose, Barry, Vale of Glamorgan, CF62 3LJ



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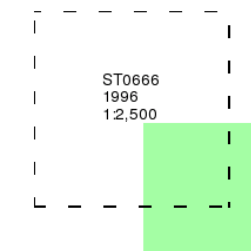
Large-Scale National Grid Data

Published 1996

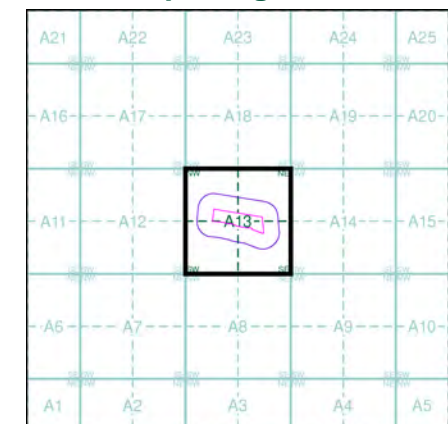
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

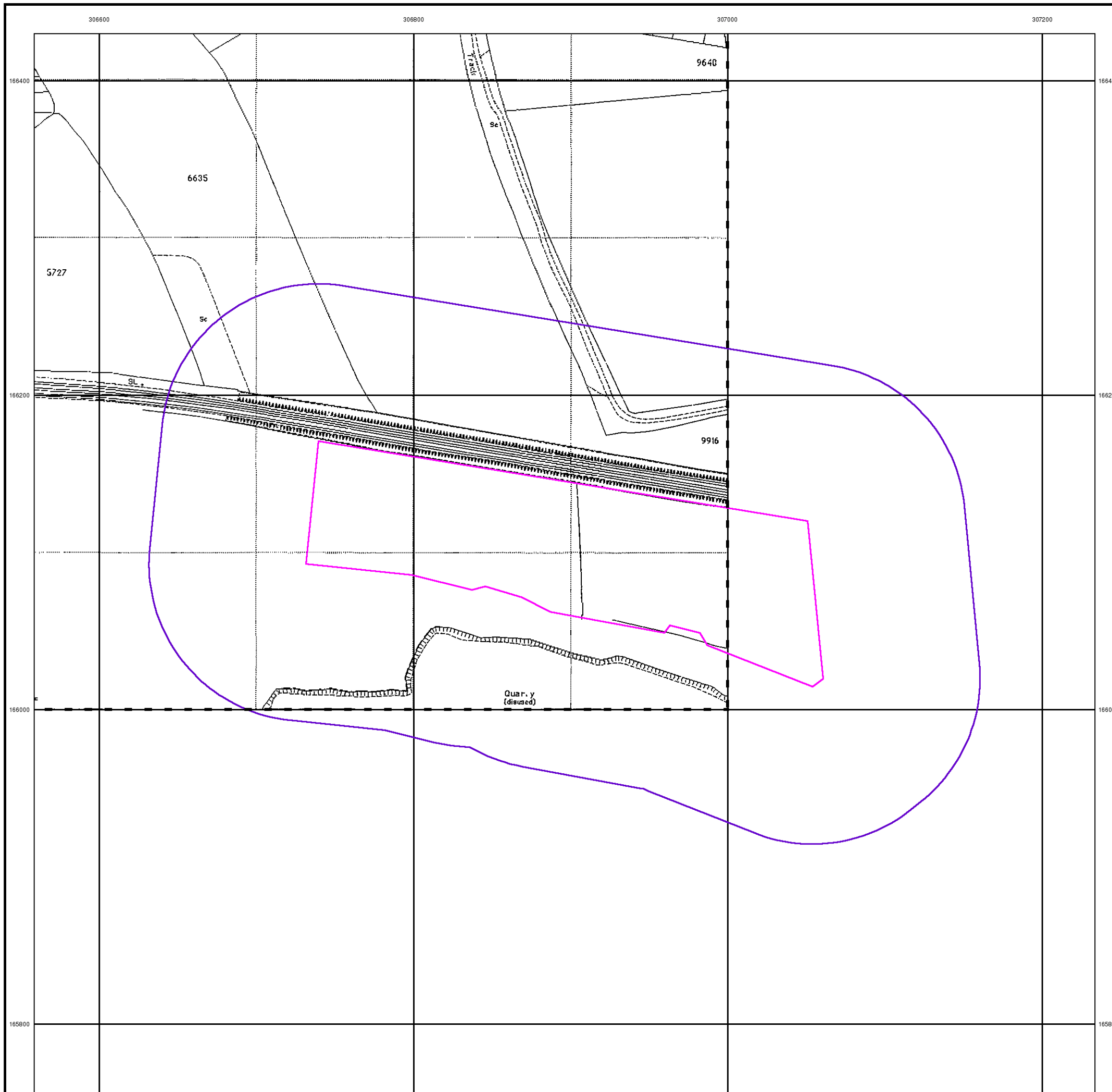
Order Number: 36931701_1_1
Customer Ref: 11621-Rhooose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

Site Details

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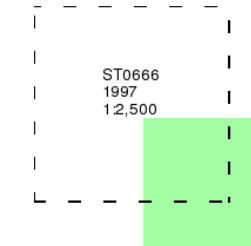
Large-Scale National Grid Data

Published 1997

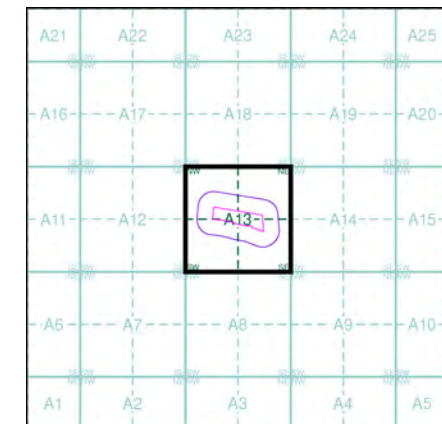
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

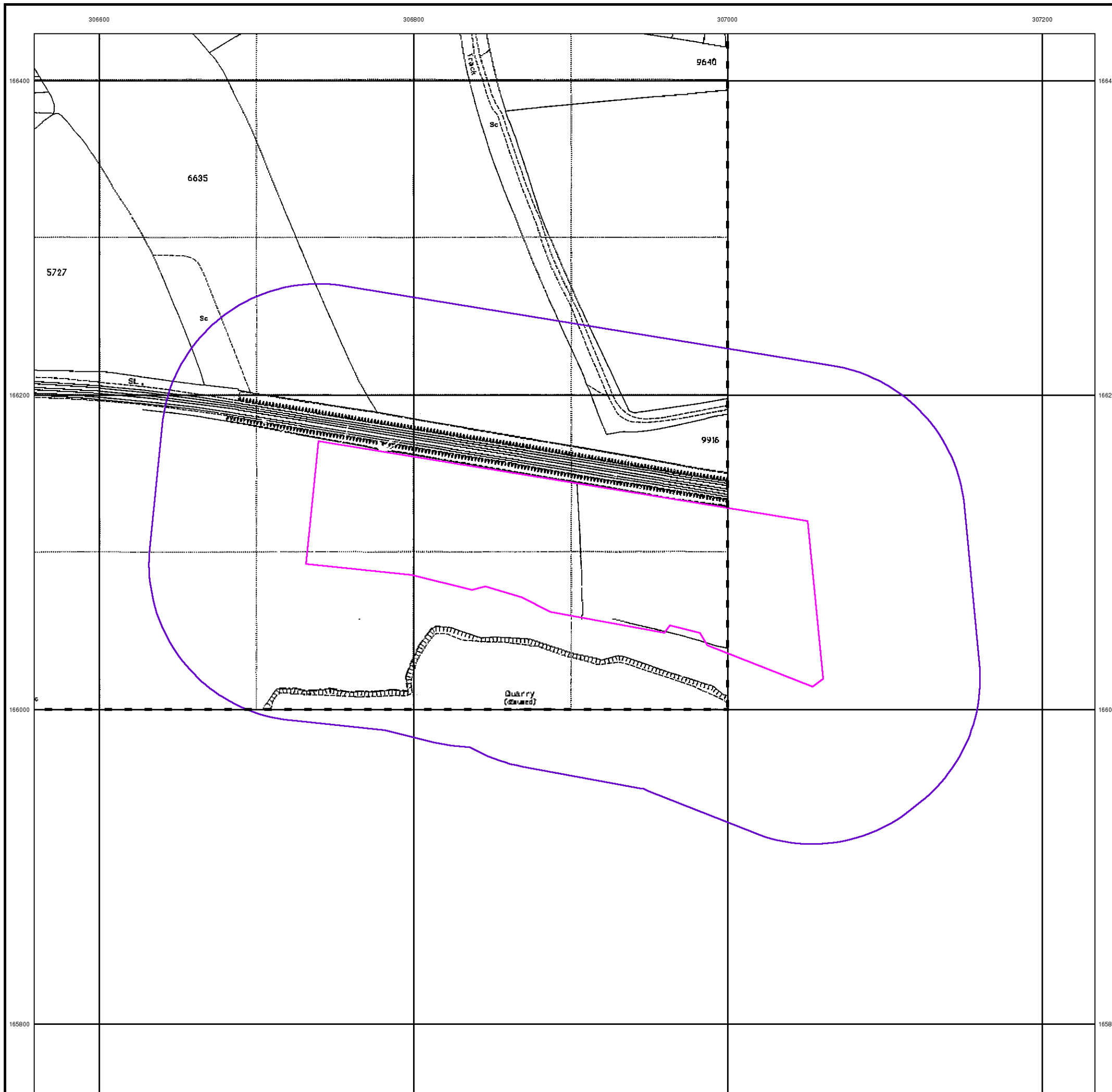
Order Number: 36931701_1_1
Customer Ref: 11621-Rhooose
National Grid Reference: 306900, 166100
Slice: A
Site Area (Ha): 2.7
Search Buffer (m): 100

Site Details

The Employment Site, Rhooose, Barry, Vale of Glamorgan, CF62 3LJ



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ANNEX B
Radon (RPM) Site Report



**British
Geological Survey**
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoReports

**Nick Paulakis
Terra Firma Wales Ltd
5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF237HB**

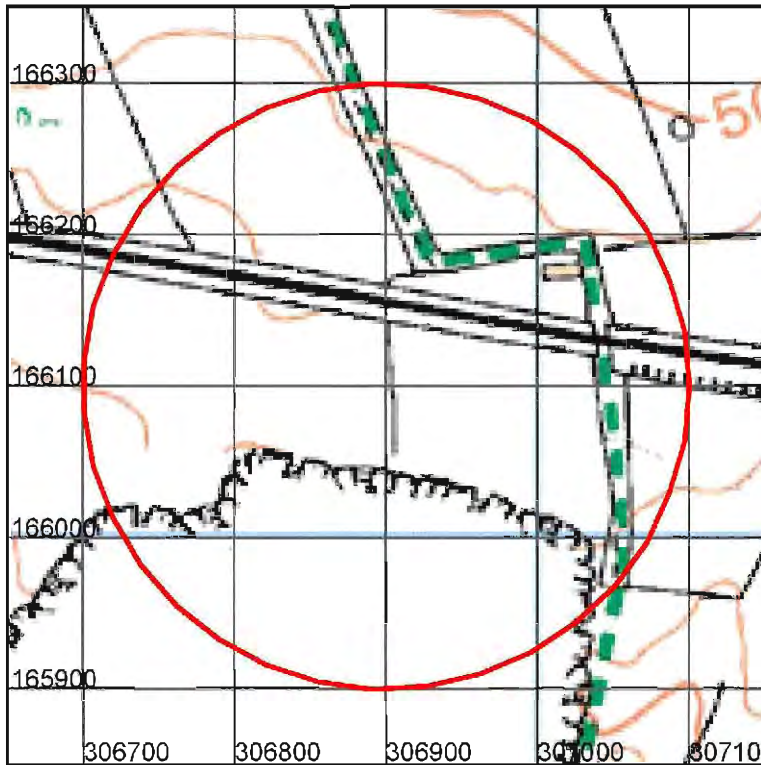
Radon Report: England and Wales

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: GR_203659/1

Client reference: 11621

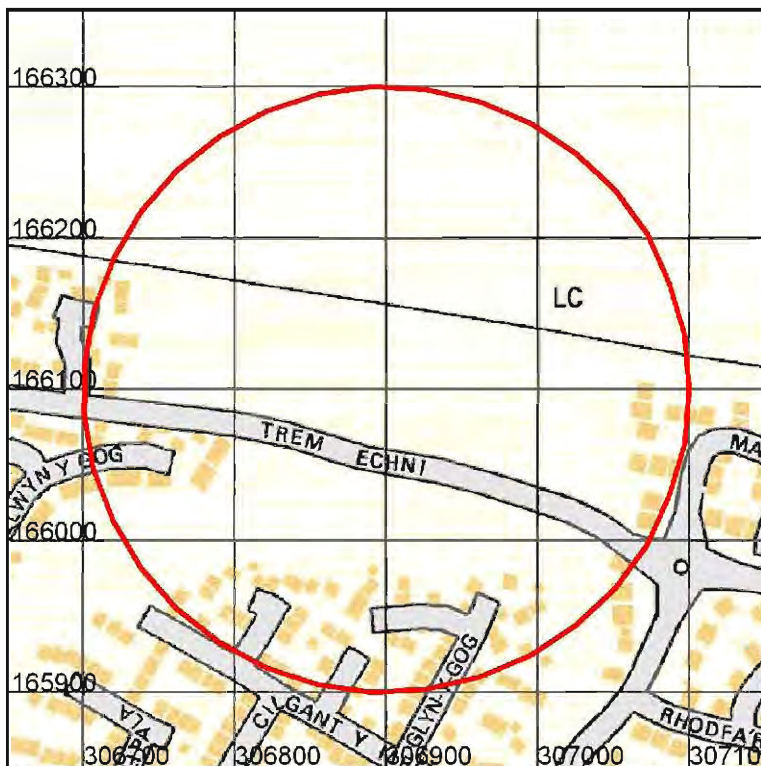
Location and extent of site



This report describes a site located at National Grid Reference 306900, 166100. Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.

Search area indicated in red

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Scale: 1:5 000 (1cm = 50 m)



Contains Ordnance Survey data © Crown Copyright and database right 2011
OS Street View: Scale: 1:5 000 (1cm = 50 m)



Radon Report: England and Wales

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2007 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

BASIC RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

The BGS is not able to provide advice on the technical specifications of 'basic' and 'full' radon protective measures. This information is detailed in **BRE Report BR211 Radon: guidance on protective measures for new buildings** which may be purchased from [brebookshop.com](http://www.brebookshop.com). This report offers guidance on the technical solutions that are required to satisfy Building Regulations requirements.

Technical solutions to radon protection in new build and existing dwellings in radon affected areas are available on the BRE web site at:

<http://www.bre.co.uk/page.jsp?id=1626> and <http://www.bre.co.uk/radon/> and in a range of technical reports available from [brebookshop.com](http://www.brebookshop.com); Tel: 01923 664262, email: bookshop@bre.co.uk.

Summary guidance is available on the web at:

<http://www.bre.co.uk/radon/protect.html>.

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.



Radon in existing buildings

Is this property in a radon affected area – **YES**

The answer to the standard enquiry on house purchase known as **CON29 Standard Enquiry of Local Authority 3.13 Radon Gas: Location of the Property in a radon Affected Area** is **YES** this property is in a Radon Affected Area as defined by the Health Protection Agency (HPA).

The estimated probability of the property being above the Action Level for radon is: **5-10% (INTERMEDIATE PROBABILITY)**.

The result informs you of the estimated probability that this particular property is above the Action Level for radon. This does not necessarily mean there is a radon problem in the property. The only way to determine whether it is above or below the Action Level is to carry out a radon measurement within the existing property.

Radon Affected Areas are designated by the HPA. They advise that radon gas should be measured in all properties within Radon Affected Areas.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a Radon Affected Area you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were above the Radon Action Level and if so whether remedial measures were installed, radon levels were retested, and that the results of re-testing confirmed the effectiveness of the measures.

In radon affected homes, the problem of radon can usually be tackled with simple, effective and relatively inexpensive measures. These measures are comparable in cost to work such as damp-proofing and timber treatment. You can get practical advice about construction work to reduce radon levels from the Building Control Officer at your local council.

For further information, advice about radon, its health risks and details of how to order the radon test, please contact the HPA Radon Helpline on 01235 822622 or go online at www.ukradon.org or write to Radon Survey, Health Protection Agency, Centre for Radiation, Chemical and Environmental Hazards, Chilton, Didcot, Oxon, OX11 0RQ, email: radon@hpa.org.uk. You can obtain an information pack from the HPA free Radon answerphone on 0800 614529



What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level exceeds the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations, 1999, require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com



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Tel: 01491 838800
Fax: 01491 692345
Email: hydroenq@bgs.ac.uk

Murchison House (MH) Office

British Geological Survey
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Edinburgh
EH9 3LA
Tel: 0131 650 0282
Fax: 0131 650 0252
Email: enquiry@bgs.ac.uk



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- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated measuring techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.
- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
- Data may be compiled from the disparate sources of information at BGS's disposal, including material donated to BGS by third parties, and may not originally have been subject to any verification or other quality control process.
- Data, information and related records, which have been donated to BGS, have been produced for a specific purpose, and that may affect the type and completeness of the data recorded and any interpretation. The nature and purpose of data collection, and the age of the resultant material may render it unsuitable for certain applications/uses. You must verify the suitability of the material for your intended usage.
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- The topography shown on any map extracts is based on the latest OS mapping and is not necessarily the same as that used in the original compilation of the BGS geological map, and to which the geological linework available at that time was fitted.
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**Report issued by
BGS Enquiry Service**

ANNEX C
Trial Pit Logs


Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 1.40m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP


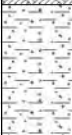
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20						TOPSOIL. Soft brown silt with humus and rootlets. (TOPSOIL)
						Firm brown slightly sandy CLAY with occasional limestone gravels.
0.80						Stiff brown slightly sandy gravelly CLAY with many cobbles of Limestone. Gravels are fine to coarse sub angular.
1.40						Trialpit Complete at 1.40 m

Remarks: Trial pit refused on weathered bedrock at 1.40m.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.65m	Scale 1:25
Client: Taylor Wimpey Limited		0.60m 	Logged By NPP



Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Soft brown silt with humus and rootlets.
			0.65			Firm to stiff brown slightly sandy CLAY with many fine to coarse angular gravels of Limestone.
----- Trialpit Complete at 0.65 m						
1 2 3 4						

Remarks: Trial pit refused on weathered bedrock at 0.65m.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.50m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP


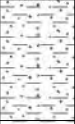
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Depth (m)	Type	Results				
			0.20			Soft brown silt with humus and rootlets.
			0.50			Firm to stiff brown slightly sandy CLAY with many fine to coarse angular gravels of Limestone.
						----- Trialpit Complete at 0.50 m
1 2 3 4						

Remarks: Trial pit refused on weathered bedrock at 0.50m.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP




Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Soft brown silt with humus and rootlets.
			0.60			Firm to stiff brown slightly sandy CLAY with many fine to coarse angular gravels of Limestone.
Trialpit Complete at 0.60 m						
1 2 3 4						

Remarks: Trial pit refused at 0.60m on weathered bedrock.

Groundwater: None.




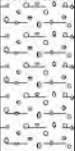
Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.70m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.25			TOPSOIL. Soft brown silt with humus and rootlets.
			0.45			Firm to stiff brown slightly sandy CLAY with many fine to coarse angular gravels of Limestone.
			0.70			Firm to stiff brown slightly sandy CLAY with many fine to coarse angular gravels and cobbles of Limestone.
Trialpit Complete at 0.70 m						

Remarks: Trial pit refused at 0.70m on weathered bedrock.
Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.66m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.15			TOPSOIL. Soft brown silt with humus and rootlets.
						Dense brown clayey COBBLES of Limestone.
			0.66			----- Trialpit Complete at 0.66 m







Remarks: Trial pit refused at 0.66m on weathered bedrock.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 1.20m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
			0.25			TOPSOIL. Soft brown silt with humus and rootlets.	
			0.60			Soft to firm brown CLAY.	
			0.90			Dense brown clayey cobbles of Limestone.	
			1.20			Firm to stiff brown clay with many angular fine to coarse gravels of Limestone.	1
----- Trialpit Complete at 1.20 m							
							2
							3
							4



Remarks: Trial pit refused at 1.20m on weathered bedrock.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
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Location: Barry	Dimensions: 1.80m Depth 0.50m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited		Logged By NPP


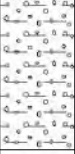
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.15			TOPSOIL. Soft brown silt with humus and rootlets.
			0.50			Stiff brown CLAY with many cobbles of Limestone.
----- Trialpit Complete at 0.50 m						
1 2 3 4						

Remarks: Trial pit refused at 0.50m on weathered bedrock.

Groundwater: None.





Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.70m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Soft brown silt with humus and roots.
			0.70			Dense brown slightly clayey COBBLES of Limestone.
Trialpit Complete at 0.70 m						

Remarks: Trial pit refused on weathered Limestone at 0.70m.
Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.80m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP



Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Soft brown silt with humus and rootlets.
			0.80			Dense brown clayey COBBLES of Limestone.
						----- Trialpit Complete at 0.80 m
1 2 3 4						

Remarks: Trial pit refused at 0.80m on weathered Limestone.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.50m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Soft brown silt with humus and rootlets.
			0.50			Dense brown clayey COBBLES of Limestone.
----- Trialpit Complete at 0.50 m						
1 2 3 4						



Remarks: Trial pit refused at 0.50m in weathered Limestone.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
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Location: Barry	Dimensions: 1.80m Depth 0.60m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited		Logged By NPP





Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.08						TOPSOIL. Soft brown silt with humus.
0.60						Dense brown COBBLES of Limestone.
Trialpit Complete at 0.60 m						

Remarks: Trial pit refused at 0.60m on weathered Limestone.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
Location: Barry		Dimensions: 1.80m Depth 0.80m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited			Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Soft brown silt with humus and occasional rootlets.
						MADE GROUND. Loose brown sandy cobbles and gravel.
			0.60			Dense brown clayey sub angular COBBLES. Probable weathered bedrock.
			0.80			Trialpit Complete at 0.80 m




Remarks: Trial pit refused at 0.80m on weathered Limestone.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
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Location: Barry	Dimensions: 0.80m Depth 0.40m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited		Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						Refusal at 0.40m.
			0.25			Dense brown slightly clayey sub angular COBBLES of Limestone. Probable weathered bedrock. ----- Trialpit Complete at 0.40 m
			0.40			



Remarks: Trial pit refused at 0.40m on weathered Limestone.

Groundwater: None.



Project Name Rhoose Point	Project No. 11621	Co-ords: - Level: -	Date 09/12/2011
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Location: Barry	Dimensions: 1.80m Depth 0.50m 0.60m	Scale 1:25
Client: Taylor Wimpey Limited		Logged By NPP

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.10			Refusal at 0.50m on probable weathered bedrock.
			0.50			MADE GROUND. clayey gravels, cobbles, bricks and concrete fragments.
----- Trialpit Complete at 0.50 m						
						1
						2
						3
						4

Remarks: Trial pit refused at 0.50m on weathered Limestone.

Groundwater: None.



ANNEX D
Laboratory Chemical Test Results - Soils



2139

Certificate of Analysis



Date: 19/12/2011

Certificate Number: 11-57308

Client: Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference: 11-57308

Client Reference: 11621

Contract Title: Rhoose Point

Description: 10 soil samples


Date Received: 13 December 2011

Date Started: 13 December 2011

Date Completed: 19 December 2011

Test Procedures: Identified by prefix DETSn, details available upon request.

Notes: Observations and interpretations are outside the scope of UKAS accreditation

Approved By: 
Mark Hughes, Contracts Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample.

Key

- * Denotes test not included in laboratory scope of accreditation
- # Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
- \$ Denotes tests completed by an approved subcontractor
- I/S Denotes insufficient sample to carry out test
- U/S Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month

Liquids - 2 weeks

Asbestos (test portion) - 6 months

Summary of Chemical Analysis

Matrix Descriptions

Our Ref: 11-57308

Client Ref: 11621

Contract Title: Rhoose Point

Sample ID	Depth	Sample No	Completed	Matrix Description
TP01	0.40	377122	19/12/2011	brown gravelly sandy CLAY
TP02	0.35	377123	19/12/2011	brown grey gravelly sandy CLAY
TP05	0.45	377124	19/12/2011	brown gravelly sandy CLAY odd rootlets possible made ground contains brick
TP08	0.40	377125	19/12/2011	brown gravelly clayey SAND
TP11	0.40	377126	19/12/2011	light brown brown gravelly clayey SAND odd rootlets
TP12	0.55	377127	19/12/2011	brown gravelly sandy CLAY
TP14	0.30	377128	19/12/2011	brown gravelly sandy CLAY
TP17	0.10	377129	19/12/2011	dark brown gravelly clayey SAND made ground contains brick
TP18	0.20	377130	19/12/2011	brown red gravelly sandy CLAY made ground contains brick
TP19	0.20	377131	19/12/2011	brown red gravelly silty sandy CLAY made ground contains brick

Summary of Chemical Analysis

Soil Samples

Our Ref: 11-57308

Client Ref: 11621

Contract Title: Rhoose Point

				Lab No.	377122	377123	377124	377125	377126
				Sample ID	TP01	TP02	TP05	TP08	TP11
				Depth	0.40	0.35	0.45	0.40	0.40
				Sample Ref					
				Sample Type	J	J	J	J	J
				Sampling Date	//	//	//	//	//
				Sampling Time					
Test	Units	DETSxx	LOD						
Arsenic	mg/kg	DETS 042#	0.2	8.3	5.3	7.2	11	8.8	
Cadmium	mg/kg	DETS 042#	0.1	0.6	0.3	0.3	0.7	0.5	
Chromium III	mg/kg	*	0.15	22	16	15	23	22	
Chromium	mg/kg	DETS 042#	0.15	22	16	15	23	22	
Hexavalent Chromium	mg/kg	DETS C2204*	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Copper	mg/kg	DETS 042#	0.2	18	16	11	22	22	
Lead	mg/kg	DETS 042#	0.3	16	10	16	18	15	
Mercury	mg/kg	DETS 081#	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Nickel	mg/kg	DETS 042#	1	20	19	9.4	24	20	
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
Zinc	mg/kg	DETS 042#	1	49	24	35	55	46	
Cyanide total	mg/kg	DETS 067#	0.1	0.2	< 0.1	0.2	0.1	0.1	
Organic matter	%	DETS 002#	0.1	1.6	1.1	1.3	3.2	2.6	
Total Sulphate as SO4	%	DETS 075#	0.01	0.04	0.03	0.07	0.05	0.05	
pH		DETS 008#		7.8	8.1	9.2	8.1	8.2	
PAH	mg/kg	DETS 050	1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	
Phenol - Monohydric	mg/kg	DETS 067#	0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	

Summary of Chemical Analysis

Soil Samples

Our Ref: 11-57308

Client Ref: 11621

Contract Title: Rhoose Point

				Lab No.	377127	377128	377129	377130	377131
				Sample ID	TP12	TP14	TP17	TP18	TP19
				Depth	0.55	0.30	0.10	0.20	0.20
				Sample Ref					
				Sample Type	J	J	J	J	J
				Sampling Date	//	//	//	//	//
				Sampling Time					
Test	Units	DETSxx	LOD						
Arsenic	mg/kg	DETS 042#	0.2		5.6	5.9	2.2	3.9	13
Cadmium	mg/kg	DETS 042#	0.1		0.3	0.3	0.1	0.2	0.2
Chromium III	mg/kg	*	0.15		13	13	6.1	9.1	12
Chromium	mg/kg	DETS 042#	0.15		13	13	6.1	9.1	12
Hexavalent Chromium	mg/kg	DETS02204*	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2		11	16	3.6	7.0	23
Lead	mg/kg	DETS 042#	0.3		6.1	8.4	8.0	9.4	11
Mercury	mg/kg	DETS 081#	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	mg/kg	DETS 042#	1		14	16	3.6	6.9	6.8
Selenium	mg/kg	DETS 042#	0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	1		33	32	17	30	69
Cyanide total	mg/kg	DETS 067#	0.1		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Organic matter	%	DETS 002#	0.1		0.7	0.5	0.7	0.6	0.6
Total Sulphate as SO4	%	DETS 075#	0.01		0.02	0.03	0.16	0.06	0.09
pH		DETS 008#			7.9	8.2	11.5	10.5	10.0
PAH	mg/kg	DETS 050	1.6		< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenol - Monohydric	mg/kg	DETS 067#	0.3		< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Asbestos Analysis

Soil Samples

Our Ref: 11-57308

Client Ref: 11621

Contract Title: Rhoose Point

Lab No	Sample Ref	Depth	Material	Result
377122	TP01	0.40	SOIL	NAD
377123	TP02	0.35	SOIL	NAD
377124	TP05	0.45	SOIL	NAD
377125	TP08	0.40	SOIL	NAD
377126	TP11	0.40	SOIL	NAD
377127	TP12	0.55	SOIL	NAD
377128	TP14	0.30	SOIL	NAD
377129	TP17	0.10	SOIL	NAD
377130	TP18	0.20	SOIL	NAD
377131	TP19	0.20	SOIL	NAD

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos

NAD = No Asbestos Detected. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos

Samples are analysed by DETS 082 using polarised light microscopy in accordance with HSG248 and documented in-house methods. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'

Sample Comments

(The laboratory cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".)

Lab No.	Sample ID	Date Sampled	Sample exceeded holding time for test	Sample not received in appropriate containers for test
377122	TP01 0.40	-	Cannot evaluate without date sampled.	
377122	TP01 0.40	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377122	TP01 0.40	-	Cannot evaluate without date sampled.	PAH SPEC solid
377122	TP01 0.40	-	Cannot evaluate without date sampled.	PAH FID solid
377123	TP02 0.35	-	Cannot evaluate without date sampled.	
377123	TP02 0.35	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377123	TP02 0.35	-	Cannot evaluate without date sampled.	PAH SPEC solid
377123	TP02 0.35	-	Cannot evaluate without date sampled.	PAH FID solid
377124	TP05 0.45	-	Cannot evaluate without date sampled.	
377124	TP05 0.45	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377124	TP05 0.45	-	Cannot evaluate without date sampled.	PAH SPEC solid
377124	TP05 0.45	-	Cannot evaluate without date sampled.	PAH FID solid
377125	TP08 0.40	-	Cannot evaluate without date sampled.	
377125	TP08 0.40	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377125	TP08 0.40	-	Cannot evaluate without date sampled.	PAH SPEC solid
377125	TP08 0.40	-	Cannot evaluate without date sampled.	PAH FID solid
377126	TP11 0.40	-	Cannot evaluate without date sampled.	
377126	TP11 0.40	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377126	TP11 0.40	-	Cannot evaluate without date sampled.	PAH SPEC solid
377126	TP11 0.40	-	Cannot evaluate without date sampled.	PAH FID solid
377127	TP12 0.55	-	Cannot evaluate without date sampled.	
377127	TP12 0.55	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377127	TP12 0.55	-	Cannot evaluate without date sampled.	PAH SPEC solid
377127	TP12 0.55	-	Cannot evaluate without date sampled.	PAH FID solid
377128	TP14 0.30	-	Cannot evaluate without date sampled.	
377128	TP14 0.30	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377128	TP14 0.30	-	Cannot evaluate without date sampled.	PAH SPEC solid
377128	TP14 0.30	-	Cannot evaluate without date sampled.	PAH FID solid
377129	TP17 0.10	-	Cannot evaluate without date sampled.	
377129	TP17 0.10	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377129	TP17 0.10	-	Cannot evaluate without date sampled.	PAH SPEC solid
377129	TP17 0.10	-	Cannot evaluate without date sampled.	PAH FID solid
377130	TP18 0.20	-	Cannot evaluate without date sampled.	
377130	TP18 0.20	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377130	TP18 0.20	-	Cannot evaluate without date sampled.	PAH SPEC solid
377130	TP18 0.20	-	Cannot evaluate without date sampled.	PAH FID solid

377131	TP19 0.20	-	Cannot evaluate without date sampled.	
377131	TP19 0.20	-	Cannot evaluate without date sampled.	Hexavalent Chromium
377131	TP19 0.20	-	Cannot evaluate without date sampled.	PAH SPEC solid
377131	TP19 0.20	-	Cannot evaluate without date sampled.	PAH FID solid

Appendix A - Details of Analysis

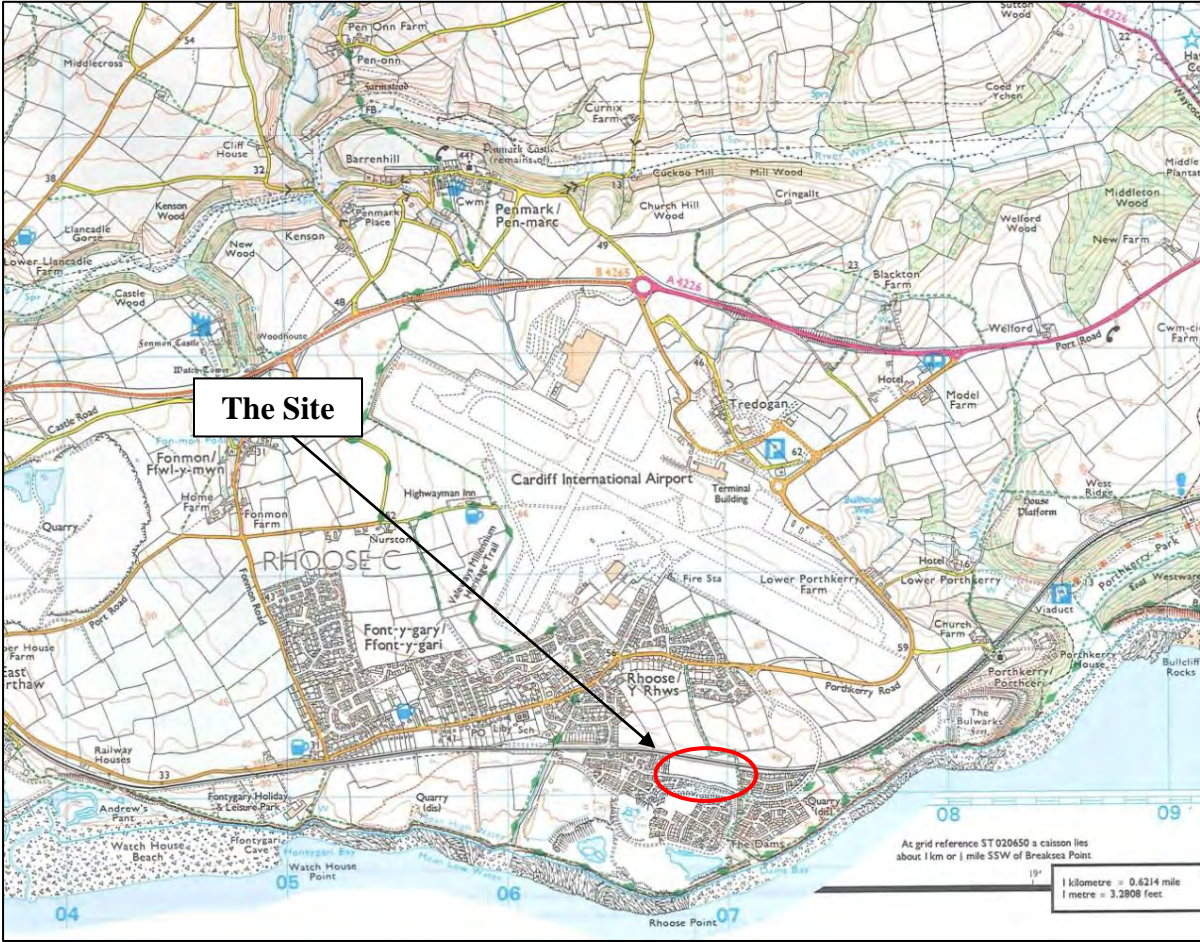

Method details are shown only for those determinants listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.

No Recovery Factors are used in the determination of results. Results reported assume 100% recovery.

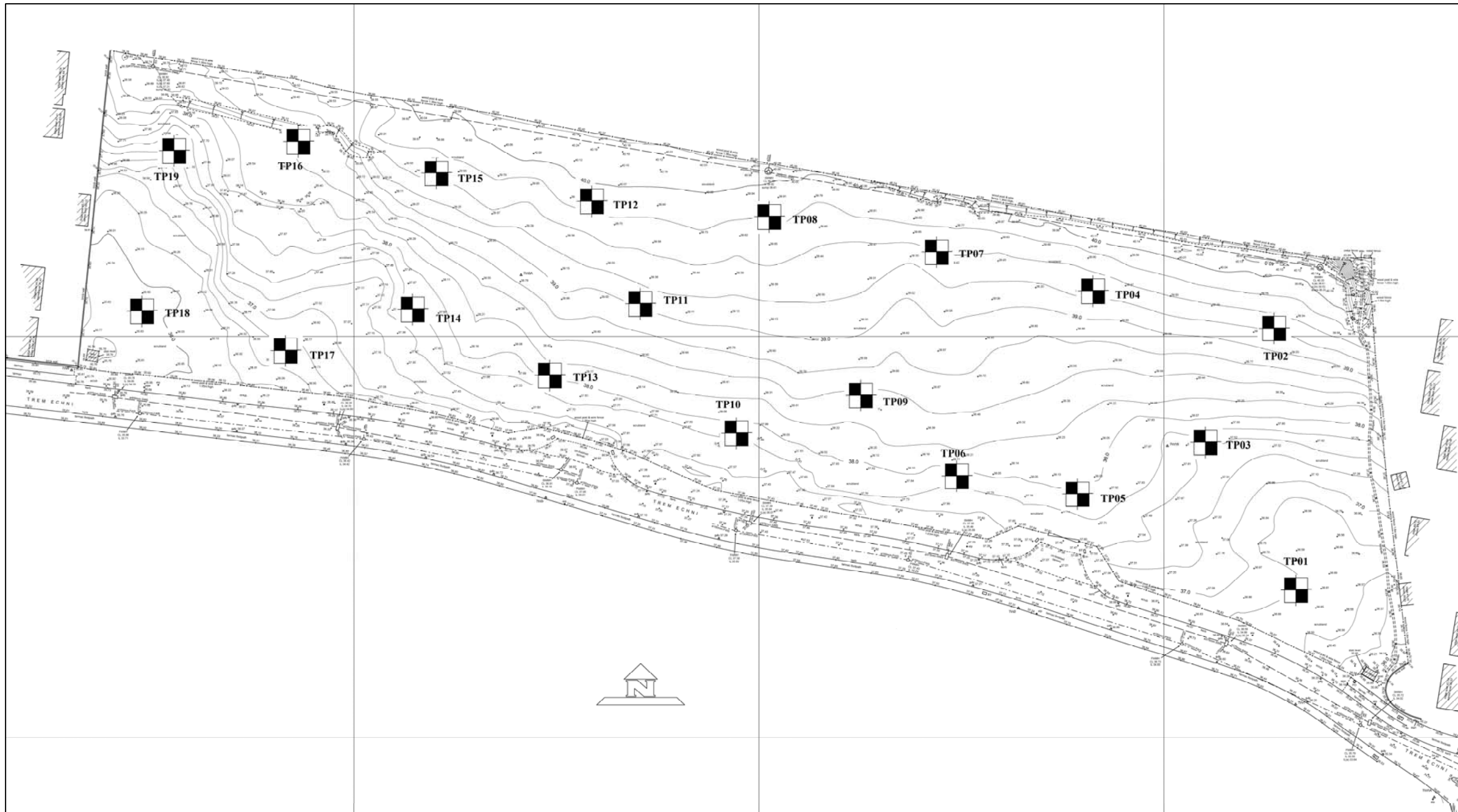
Full method statements are available on request.


<u>Method</u>	<u>Name of Parameter</u>	<u>Units</u>	<u>Limit of Detection</u>	<u>Sample Preparation</u>	<u>Sub-Contracted</u>	<u>UKAS</u>	<u>MCERTS</u>
DETS 002	Organic Matter	%	0.01	Air Dried	No	Yes	Yes
DETS 003	Loss on Ignition	%	0.01	Air Dried	No	Yes	Yes
DETS 004	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETS 075	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETS 004	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETS 076	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETS 006	Chloride	mg/kg	0.01	Air Dried	No	Yes	Yes
DETS 008	pH	pH Units	0.10	Air Dried	No	Yes	Yes
DETS 042	Selenium	mg/kg	0.50	Air Dried	No	Yes	Yes
DETS 019	Ammonia	mg/kg	0.02	Air Dried	No	Yes	Yes
DETS 020	Boron (Water Soluble)	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 024	Sulphide	mg/kg	10.00	Air Dried	No	Yes	Yes
DETS 042	Antimony	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Arsenic	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Barium	mg/kg	1.50	Air Dried	No	Yes	Yes
DET S 042	Beryllium	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Cadmium	mg/kg	0.10	Air Dried	No	Yes	Yes
DETS 042	Cobalt	mg/kg	0.70	Air Dried	No	Yes	Yes
DETS 042	Copper	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes


DETS 042	Iron	mg/kg	1.00	Air Dried	No	Yes	No
DETS 042	Lead	mg/kg	0.30	Air Dried	No	Yes	Yes
DETS 042	Manganese	mg/kg	20.00	Air Dried	No	Yes	Yes
DETS 081	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 042	Molybdenum	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 042	Nickel	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Thallium	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Vanadium	mg/kg	0.80	Air Dried	No	Yes	Yes
DETS 042	Zinc	mg/kg	1.00	Air Dried	No	Yes	Yes
DETS 049	Sulphur (Free)	mg/kg	0.50	As Received	No	Yes	Yes
DETS 050	PAH	mg/kg	0.10	As Received	No	Yes	No
DETS 051	TPH (C10 - C40)	mg/kg	20.00	As Received	No	Yes	Yes
DETS 052	PCB	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzne	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 067	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETS 067	Easily Liberatable Cyanide	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 067	Complex Cyanide	mg/kg	0.30	Air Dried	No	Yes	No
DETS 067	Total Cyanide	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 067	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETS 068	VOC	mg/kg	0.01	As Received	No	No	No

Project : Rhoose Point
Number: 11621
Drawing No. 01 - Site Location
Scale NTS



 Trial Pit Location



Project : Rhoose Pint
Number: 111621
Drawing No. 02 - Site Layout
Scale: NTS