

**PHASE 1 & PHASE 2 GEOTECHNICAL &
GEO-ENVIRONMENTAL SITE INVESTIGATION**

**LAND AT HONEYWELL LANE,
BARNSELY**

FOR

MILLER HOMES LIMITED

ISSUE 2



38903-002

14 DECEMBER 2015

**PHASE 1 & PHASE 2 GEOTECHNICAL &
GEO-ENVIRONMENTAL SITE INVESTIGATION**

**LAND AT HONEYWELL LANE,
BARNSELY**

FOR

MILLER HOMES LIMITED

ISSUE 2

Job No. : 38903
Report Status : Final
Document Date : 14 December 2015
Approved : 

P Richardson

Also at:- Principle House, 121-123 Fleet Road, Fleet, Hampshire, GU51 3PD Tel: 01252 360580 Fax: 01252 360581

Directors: **P Richardson** BSc, CEng, MICE, MStructE **S D Preston** BEng, CEng, FICE, FStructE **N J Baines** BSc, CEng, MICE, MCIWEM
S R Ellis BEng, CEng, MStructE, AMICE **K R Pursall** BEng, CEng, MStructE
C A Topliss BSc, CEng, CSci, CGeol, SiLC, AMICE, FGS **S J English** BEng, CEng, MStructE **A R Priest** BEng
Senior Associates: **K Newsome** BSc, CEng, MICE, MStructE **S J Mitchell** BSc, MSc, CEng, MEI, MCIBSE, MASHRAE **A Allison** BEng
M Young MA, CEng, MICE, MStructE **C A Wood** BSc, CEng, MStructE, AMICE
Associates: **K Edwards** MSc, FGS **A J Kerslake** BEng **A G Marshall** BEng, CEng, MStructE **C Hodge** EngTech, TMICE **P A Harrison** BEng, CEng, MStructE
M P Chappell BEng, IEng, AMIStructE **P H Halberstadt** MEng, ACGI, CEng, MICE **M Dyson** BSc(Hons.) CEng, MStructE
Consultants: **J M Wood** BSc, CEng, MICE, FStructE **M J Yates** BSc(Eng), ACGI, CEng, MICE, FStructE

CONTENTS

1.0	EXECUTIVE SUMMARY	6
2.0	INTRODUCTION.....	8
2.1	Terms of Reference	8
2.2	Context	8
2.3	Aims and Objectives	8
2.4	Scope of Investigation.....	8
2.5	Limitations of Investigation	9
3.0	THE SITE.....	11
3.1	Description.....	11
3.2	History.....	11
3.3	Geology	12
3.4	Hydrogeology.....	13
3.5	Hydrology.....	13
3.6	Coal Mining.....	13
3.7	Ground Gas	15
3.8	Pollution Incidents.....	15
3.9	Discharge Consents.....	15
3.10	Flooding	15
4.0	OUTLINE CONCEPTUAL MODEL	16
4.1	Potential Pollutant Linkages.....	16
5.0	GROUND INVESTIGATION.....	18
5.1	Site Works	18
5.2	Laboratory Testing	18
6.0	GROUND CONDITIONS.....	19
6.1	Surface Covering	19
6.2	Made Ground.....	19
6.3	Natural Ground	19
6.4	Coal	20
6.5	Obstructions.....	20
6.6	Groundwater	20

6.7	Evidence of Contamination	21
7.0	GEOTECHNICAL APPRAISAL	22
7.1	General	22
7.2	Shallow Mining.....	22
7.3	Foundations	22
7.4	Ground Floors.....	23
7.5	Superstructure Precautions.....	23
7.6	Slope Stability	23
7.7	Excavation Problems	24
7.8	Obstructions.....	24
7.9	Surface Water Drainage.....	24
8.0	REFINEMENT OF OUTLINE CONCEPTUAL MODEL	26
8.1	Source Characterisation.....	26
8.2	Unexpected Contamination	26
8.3	Ground Gas	26
8.4	Chemical Testing	27
8.5	Assessment Criteria.....	27
8.6	Chemical Test Results	27
8.7	Significant Pollutant Linkages	30
9.0	RISK ASSESSMENT	31
9.1	Human Health – Future Residents and Visitors.....	31
9.2	Human Health – Construction Workers	31
9.3	Construction Materials	32
9.4	Plants.....	32
9.5	Controlled Waters	32
9.6	Ground Gas	32
10.0	CONTAMINATION - RECOMMENDATIONS AND APPROVALS	34

APPENDICES

- Appendix 1** Exploratory Hole Location Plan, 38903/001/B
- Appendix 2** Envirocheck Report
Coal Authority Report
- Appendix 3** Trial Pit Logs, TP1 to TP15
Borehole Logs, BH1 to BH5
Soakaway Calculations, SA1 to SA3
- Appendix 4** Chemical Test Results, Chemtest Reports No's. 15-20762 and 15-27797
Table of Assessment Values – Residential with Home-grown Produce
Geometric and Modified Mean Calculations

1.0 EXECUTIVE SUMMARY

1. The site is located off Honeywell Lane and Carrington Avenue in Barnsley. It has an area of approximately 2.6 hectares and is centred around grid reference 434290, 407480.
2. The site is currently grass covered sports pitches in use by Barnsley College and others. Carrington Avenue and residential dwellings border the site to the north and west, Honeywell Lane and houses are located to the south of the site, and a railway borders the site to the east.
3. The site lies at around 3 m lower than Carrington Avenue, and around 3.5 m higher than Honeywell Lane. A steeply sloped bank is present just inside the western boundary of the site, sloping at around 1 in 1.6 to the east. Another bank with mature trees is present just inside the south of the site, which slopes to the south at around 1 in 6.5. The majority of the site appears flat but is sloping gently to the east at around 1 in 43.
4. Historically, the site was fields until 1960, when it was first used as a playing field, and the present day layout was achieved. The surrounding land is mainly residential, with Barnsley College campus to the south.
5. The site overlies Kent's Rock, a sandstone of the Middle Coal Measures, which is expected to dip to the east at around 4 to 5°. Two faults cut across the north eastern corner of the site.
6. The rotary boreholes recorded one intact coal of seam, between 0.3 and 0.6 m thick beneath the site at 10.6 to 14.2 m bgl to the base. This is considered to be the Kent's Thin Coal seam. The seam is considered to be deep enough that precautions against the effects of shallow mining are not considered necessary.
7. The ground conditions on the site generally comprise around 150 to 650 mm of topsoil over made ground to around 1 m bgl, over natural sandstone cobbles in a clay matrix to around 2 m bgl, with strong, solid sandstone beneath. The made ground deepens from the west to east, from around 0.5 m, to around 2 m bgl in the centre of the site, up to at least 4.15 m bgl close to the eastern boundary.
8. Traditional unreinforced strip or trench fill foundations are considered to be appropriate across the most of the site, taken through any made or soft ground and into the natural cobbly clay or sandstone at a minimum depth of 750 mm. Reinforcement of the footings is considered prudent in the north around the positions of the two faults.
9. Made ground is deeper across the west of the site, and piled foundations would have to be considered for this part of the site.

10. Since more than 600 mm of made ground is expected to be present below the majority of the ground floor slabs, either reinforced suspended in-situ or precast concrete floors with a minimum 200 mm ventilated void will be required.
11. Soakaway tests have been undertaken and the results were found to be very variable. Results in the sandstone bedrock were relatively low, whilst the more weathered material above offered greater infiltration rates. Further testing may be required to determine the suitability of soakaways, and discussions may need to be undertaken with Network Rail to confirm that they are accepting of having soakaways close to their land. Due to the varying results, at this stage soakaways are not considered to be suitable at this site and piped drainage should be allowed for.
12. Slightly elevated concentrations of contaminants were recorded in the topsoil, but modified mean calculations have been undertaken, and the topsoil as a whole should not pose a risk to human health. We consider that it will be suitable for reuse, subject to the agreement of the regulators. 150 mm of topsoil should be applied across all gardens and areas of soft landscaping as a growing medium.
13. Amber 1 gas precautions are recommended in the eastern part of the site where the made ground exceeds 2.5 m bgl. No radon precautions are required.
14. DS2 AC4z sulphate precautions are required for all sub-surface concrete in contact with the relic topsoil. DS1 AC3z sulphate precautions are required elsewhere on site.
15. The conclusions made in this report in relation to contamination are subject to agreement by the approving bodies such as the Local Authority and the NHBC (if applicable).

2.0 INTRODUCTION

2.1 Terms of Reference

This report presents the findings of a geotechnical and geo-environmental site investigation carried out by Eastwood & Partners (Consulting Engineers) Ltd for, and on the instructions of, Miller Homes Ltd. Any other parties using the information in this report do so at their own risk and any duty of care is excluded.

2.2 Context

No previous geotechnical or geo-environmental investigations are known to have been undertaken on the site in the past. It is proposed to redevelop the site for residential use.

2.3 Aims and Objectives

The aims and objectives of this investigation were as follows:

- Assimilate Phase 1 data to derive an outline conceptual model identifying potential contaminants, pathways and receptors, as well as possible linkages between these;
- Obtain information enabling refinement and subsequent testing of the conceptual model;
- Carry out tiered risk assessment to establish the likely risks to future receptors, involving the use of generic assessment criteria and where unacceptable risks are identified, site specific assessment criteria within a detailed quantitative risk assessment;
- Identify feasible remediation options if unacceptable risks are highlighted;
- Develop an appropriate remediation strategy where remediation is required; and
- Detail the ground conditions and their geotechnical properties enabling outline foundation proposals to be made.

2.4 Scope of Investigation

This document is split into two sections. These constitute the findings of the Phase 1 and Phase 2 investigations, consecutively.

2.4.1 Phase 1

The Phase 1 investigation involved a review of information extracted from published documentation. Information regarding the current and former land uses both on and surrounding the site, as well as

the environmental sensitivity of the site location as determined by factors including geology, hydrogeology and hydrology has been examined.

Information analysed in this section of the report has been obtained from a variety of sources and include historical maps, the Environment Agency website, an Envirocheck Report, the Coal Authority, geological maps and memoirs, as well as a site walkover.

2.4.2 Phase 2

This part of the investigation consisted of intrusive works and laboratory analysis. The findings were used to test the conceptual model and produce a final risk assessment.

The intrusive works comprised trial pits which were completed to enable:

- Examination of the upper few metres of ground;
- In situ description of soils, enabling any localised lateral and vertical changes in soil conditions to be logged;
- Completion of infiltration tests to enable an assessment of the grounds suitability to receive surface water discharge via soakaways;
- Assessment of any contamination identified using visual and olfactory methods;
- Collection of soil samples for chemical and laboratory testing.

A borehole investigation was also undertaken to determine whether any seams of coal or historical mine working are present at shallow depth beneath the site.

2.5 Limitations of Investigation

This report is based on the assumption that new low rise residential properties of conventional construction will be built on the site, with associated hardstanding and landscaping. It is expected that existing ground levels will not alter significantly. If this is not the case, further advice may be needed.

Where assessments of site areas affected in particular ways are given, these are approximate. All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, on the results of laboratory testing carried out as part of the investigation and information gained from a geological and historical desk study. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata and water conditions between or below investigation points. It should be noted that

groundwater and gas levels vary due to seasonal or other effects, and may at times differ from those measured during the investigation.

This report considers the ground and groundwater and does not cover any buildings or their fabric. Generally, testing has only been carried out for contaminants identified as potentially present with no assessment made of biological contamination. Risks to ecological receptors, such as bats, have not been considered.

3.0 THE SITE

3.1 Description

The site is located to the north of Honeywell Lane, and to the east of Carrington Avenue, in Barnsley, South Yorkshire. It has an area of approximately 2.4 hectares and is centred around Ordnance Survey national grid reference 434290, 407480. The site is roughly rectangular on plan, with the long axis being orientated north to south.

The site is currently being used as football and sports pitches for Barnsley College and Sport Village. Grass is present across the vast majority of the site, with a number of sports pitches marked out. The site is generally level, with a gentle fall to the south east. Raised banks are present on the western and north western boundaries of the site, which are around 3 m higher than the rest of the site with Carrington Avenue running along the top. A sloped bank is present on the southern boundary of the site, which falls to approximately 3.5 to 4 m below the general level of the site down to Honeywell Lane. It is expected that some cut and fill earth works have been undertaken on the site in the past to provide a level surface.

Semi-mature and mature trees and bushes, including hawthorn and sycamore, were noted to the north, east and south of the site.

Carrington Avenue and private houses border the north and western boundaries of the site. Private houses off Honeywell Lane form the southernmost boundary of the site, and a railway line borders the eastern boundary.

A stand of Japanese Knotweed was noted within the hawthorn hedge, in the southern section of the eastern boundary of the site. We understand that a spraying programme has begun to eradicate this knotweed.

The 'Exploratory Hole Location Plan', drawing reference 38903/001 Revision B, included in Appendix 1, shows the site's main features.

3.2 History

Historical Ordnance Survey maps within the Envirocheck Report have been studied to assess the previous use of the site and surrounding area. Copies of the maps are presented in Appendix 2.

3.2.1 The Site

The earliest map reviewed, dated 1855 (1:10,560), shows the site to comprise parts of three different fields.

By 1960, the field boundaries were removed, and the site was labelled as a playing field. The present-day embankments in the west of the site, and slopes in the south of the site, are shown at this point.

The site then remains the same to the present day.

3.2.2 The Surrounding Area

The earliest historical map from 1855 shows the Barnsley Branch railway line running approximately north to south, adjacent to the eastern boundary of the site. Barnsley canal lies approximately 350 m to the east of the site, running north west to south east., and the River Dearne runs almost parallel to the canal, around 100 m to the east of the canal. Four collieries are shown within 1 km of the site. These are Honey Well Colliery, Gawber New Colliery, Barnsley Colliery and Gawber Colliery. They lie at the approximate distances of 100 m to the south east, 300 m to the north east, 500 m to the south and 900 m to the north west of the site respectively. An old mill is shown around 700 m to the east of the site.

The 1894 historical map no longer shows these four collieries. However, two new collieries are shown at approximately 800 to 900 m to the north east. The Barnsley Coal Railway Extension is shown to run between the two collieries, in a north west to south east direction. Unnamed buildings, most likely residential, are shown in the field to the east of the Barnsley Branch railway.

The 1907 map shows little change, with the addition of a spring roughly 50 m to the south west of the site.

By 1932 all collieries are no longer labelled. Residential development of the area continues, with new buildings now shown in the surrounding area. These include a school around 350 m to the west of the site, and houses in the adjacent fields to the west. By 1938, more housing in the western fields, and another school have been built around 150 m to the south.

By 1966 the site is bounded by residential buildings on three sides, with the railway line still on its eastern side.

Little changes up until the present day, apart from the construction of residential buildings in the fields directly north of the site, and continued development of residential areas.

3.3 Geology

The geological map SE 30 NW (1:10,000 scale) shows the site to overlie Kent's Rock, a sandstone of the Middle Coal Measures. The sandstone may be soft and weathered in the upper 1 to 2 m. No superficial deposits or made ground are shown on site. However, there may be some made ground

due to the change in land use from agricultural fields to a playing field around 1960 and the apparent earthworks associated with this.

The older geological map, 274 NE (1:10,560 scale) also shows the site to overlie sandstone, which is described as 'massive, 25 ft.' (around 7.6 m thick) further to the south of the site.

The strata are shown on the geological map to be dipping to the east at around 4 to 5°.

Two faults cut across the north eastern corner of the site. One fault is orientated north west to south east and is downthrown to the north east, and the other is orientated north east to south west with a throw to the south east. The geology on the northern side of these faults is also shown as Kent's rock.

3.4 Hydrogeology

The Envirocheck Report records the strata beneath the site to comprise a Secondary A aquifer. These are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The Envirocheck report indicates that there are no groundwater abstraction licenses within 250 m of the site.

The site does not lie within a Groundwater Source Protection Zone.

3.5 Hydrology

The Envirocheck Report indicates the nearest surface water feature is the River Dearne, at 280 m south east of the site.

3.6 Coal Mining

The shallowest coal seam beneath site is expected to be the Kent's Thin Coal seam. This is recorded by the geological memoirs to lie a few feet below the base of the Kent's Rock sandstone. The geological maps conjecture the seam to outcrop around 550 m south west of the site, although the seam is exposed within the sides of a railway cutting to within 350 m of the site. The memoirs record the seam to typically be between 0.5 m to 0.6 m thick. The seam has occasionally been worked in the local area.

The strata are shown to be dipping at 4 to 5° towards the east. Therefore, the Kent's Thin Coal is expected at a depth of about 10 to 18 m below ground level along the eastern side of the site. It is generally expected that there will be a sufficient thickness of competent rock cover between any

potential workings within the Kent's Thick seam and the underside of foundations of the proposed plots. However, it may be prudent to undertake a borehole investigation to confirm this.

The next seam of coal expected below the site is the Kent's Thick Coal, which is typically found around 18 to 30 m below the Kent's Thin coal seam. The two seams are divided by shales and rare, thin unnamed coals and sandstones. The Kent's Thick Coal is recorded to be between 0.9 and 1.2 m thick in the local area, and outcrops approximately 800 m south west of the site. The seam is therefore expected at a depth of around 26 to 40 m bgl. Again, there is expected to be a sufficient thickness of competent cover above any workings, which are expected in this seam as there are numerous sold shafts in the local area which are shown to have encountered the seam.

A Coal Authority Mining Report has been obtained for the site. This states that the site is within the zone of likely influence from workings in nine seams at 90 m to 450 m depth, last worked in 1987. The report states that all ground movements associated with these workings should have ceased by now.

There are no known mine entries on the site or within 20 m of the boundary, although Coal Authority records may be incomplete.

The site is not within the likely zone of influence from any present or currently proposed future underground coal workings. However, reserves of coal exist in the local area which could be worked at some time in the future subject to feasibility, licences and planning consents. Future workings of the coal reserves below the site are considered unlikely due to the demise of the UK coal mining industry and the sites location within an urban area.

There is one claim of ground subsidence due to coal mining within 50 m of the property. This is for a single residential dwelling to the west of the site. The status of the claim is not indicated by the report, but it is possible that the claim relates to the historical workings at depth.

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Based on all of the above information, it is generally considered that the site is unlikely to be affected by shallow coal mining activities. However it is considered prudent to undertake a borehole investigation in order to confirm the depth and thickness of the Kent's Thin Coal to confirm that there is adequate competent ground above the seam. The borehole investigation has been undertaken as part of the Phase 2 intrusive works.

3.7 Ground Gas

There is one historical landfill site 250 m south of the site. This landfill, named 'Land off Old Mill Lane', accepted inert and commercial waste between 1984 and 1989, and was operated by White and Peace. At this distance it is considered unlikely that any significant concentration of gas will migrate onto the development site.

The geological maps indicate the presence of known made ground to the south of the site. If made ground is present on the site deeper than 2.5 m, this may represent a gas risk to the site.

According to the Envirocheck Report, the site lies in an area where no radon precautions are required.

3.8 Pollution Incidents

The Envirocheck Report records no pollution incidents to controlled waters within 250 m of the site.

3.9 Discharge Consents

The Envirocheck Report indicates there are no active discharge consents within 250 m of the site.

3.10 Flooding

According to the Envirocheck report, the site does not lie within a flood plain.

4.0 OUTLINE CONCEPTUAL MODEL

Historically, the site was used as agricultural fields for over 100 years until around 1960, when it was converted into a playing field. The surrounding land has been used as a mixture of schools, residential developments as well as a railway line to the east.

Made ground may be present as a result of earth works undertaken to level the site during conversion of the land use from agricultural to recreational. Any made ground which is present may contain some elevated concentrations of heavy metals such as arsenic, nickel, copper or zinc, as well as elevated levels of PAHs, particularly if ashy materials are present, although such materials are generally not expected

Any natural ground may not be particularly contaminated, although some naturally elevated concentrations of metals/metalloids and sulphates may be recorded within the Coal Measures strata.

Ground gases and landfill gases are considered to present a low risk to the site. Some made ground may be present on site, but this is not expected to comprise biodegradable materials, and is more likely to comprise re-worked natural soils. This will need to be confirmed by intrusive investigation. No radon precautions are required for any proposed development on the site.

4.1 Potential Pollutant Linkages

The following table details the possible sources and associated contaminants of concern, pathways and receptors, highlighted by the Phase 1 investigation as potentially present:

Potential Contaminants	Pathway	Receptor
Made ground with possible elevated concentrations of heavy metals, PAHs and sulphates.	- Ingestion, inhalation, direct contact. - Migration through soils.	- Future residents and visitors to the site. - Site construction workers. - Secondary A aquifer
	Direct contact.	- Sub-surface concrete. - Water supply pipes.
Naturally elevated concentrations of heavy metals, PAHs and sulphates within natural ground.	- Ingestion, inhalation, direct contact. - Migration through soils.	- Future residents and visitors to the site. - Site construction workers. - Secondary A aquifer.
	Direct contact.	Water supply pipes.
Asbestos in any made ground present.	Inhalation of fibres	- Future residents and visitors to the site. - Site construction workers.
Ground gas from potential deep made ground on the site.	Migration onto site, inhalation	Future buildings, residents and visitors to the site.

5.0 GROUND INVESTIGATION

5.1 Site Works

Eastwood & Partners visited the site on 2 September 2015 and undertook ten trial pits in order to determine the underlying ground conditions. The trial pits, referenced TP1 to TP10, reached depths of between 0.55 m and 4.10 m below ground level (bgl). The trial pit positions were chosen to give good site coverage and target any potential sources of contamination, and to avoid the sports pitches which were still in use.

Three of the ten trial pits were used for soakaway tests, referenced SA1 to SA3.

Five air flush rotary boreholes, referenced BH1 to BH5, were also undertaken in order to assess the depth and thickness of coal seams beneath the site, and whether they had been worked. These boreholes were drilled to depths between 17 and 30 m bgl.

Five additional trial pits, referenced TP11 to TP15, were undertaken on 23 November 2015. These were again positioned to avoid the sports pitches which were still in use, but also to assess the change in depth to sandstone bedrock across the site from the east to the west.

A number of shallow trenches were also excavated into the embankments running along the western and southern edges of the site to assess the materials used to form these features.

Samples of the soils encountered were collected from all of the trial pits. Disturbed samples were obtained from each of the trial pits and were generally taken at each significant change of strata.

Copies of the exploratory hole logs are presented in Appendix 3, and their locations are shown on the Exploratory Hole Location Plan, Drawing number 38903/001/B in Appendix 1.

5.2 Laboratory Testing

Ten samples of the topsoil, eight samples of made ground and two samples of the natural ground were originally submitted for chemical testing at Chemtest Limited in Newmarket.

During the second investigation, eight further samples of the topsoil and three samples of made ground were submitted for chemical testing at Chemtest Limited in Newmarket.

The chemical testing is discussed in Section 8.0.

6.0 GROUND CONDITIONS

6.1 Surface Covering

The site is covered by grass over topsoil. The topsoil was brown sandy clay or clayey sand, and was between 150 and 650 mm in thickness.

6.2 Made Ground

Beneath the topsoil, a reworked made ground layer was encountered in eleven of the fifteen trial pits. These were all located in the central and eastern areas of the site. The made ground consisted of reworked sandstone cobbles, often in a matrix of friable dry clay, and occasionally containing fragments of ceramics and coal. This layer varied between 0.45 and 2.7 m bgl to the base. In TP1, this was a clayey sand with ceramic fragments.

Beneath this cobbly made ground layer, trial pits TP3, TP5, TP6, TP10, and TP13 found a made ground of sandy clay with rootlets and an occasional organic odour. This is considered to be relic topsoil, probably representing the original ground level, and was found between 0.95 and 1.75 m bgl to the base, and varied between 50 and 350 mm thick.

Reworked clay made ground was found to 1.8 m bgl below the clayey sand with ceramic fragments in TP1.

The depth of made ground became progressively deeper from west towards the east, with pits on the western side of the site encountering little to no made ground with shallow bedrock, to pits on the eastern side of the site recording more than 4 m of made ground.

6.3 Natural Ground

The natural ground on site was found in all but one of the trial pits, and was found to be a firm to stiff orange to grey mottled sandy gravelly clay. This was found from around 0.25 to 3.5 m bgl to the top of the strata.

Beneath this was strong yellow flaggy sandstone, at depths of between 0.8 and 2.55 m bgl. No progress could be made through this sandstone.

In TP7 and TP8, the topsoil lies directly on top of the sandstone at depths of 0.15 m and 0.35 m bgl respectively.

In TP2, mudstone was found in between two layers of clay, between 1.05 and 1.70 m bgl.

Two pits excavated into the bank on the western boundary of the site, TP7A and TP14A, encountered a negligible layer of topsoil over weathered sandstone cobbles to 0.8 m below the top of the bank, below which was solid sandstone.

TP13 in the north east of the site was the only pit to not encounter natural ground. Here, made ground was encountered to at least 4.15 m bgl.

Within the boreholes, the sandstone was found to continue to depths of between 9.7 m and 15.7 m bgl. Below this, bands of mudstone, coal and sandstone were encountered. The sandstone was described as being weak in BH1 in the north of the site between 9.8m and 15.7m. This possibly represents a fracture zone of one of the faults conjectured to run across this area of the site.

6.4 Coal

Coal was encountered in four out of the five boreholes. The coal was encountered as a single seam of between 300 mm and 600 mm thick, at depths of between 10.6 m and 14.2 m bgl to the base of the seam. The seam appears to dip generally towards the north east, as expected from the geological maps, and is considered to represent the Kent's Thin Coal.

No coal was recorded in BH1 in the north of the site. Weak sandstone was present in the sandstone strata in the horizon at which the coal would be expected to be. This area of the site is affected by faulting, and it is considered likely that this weakening of the strata is due to this faulting, rather than being indicative of mine workings. It is possible that the coal was not returned in the drill flush, and was therefore not noted, or that this borehole was on the northern, downthrown side of the fault and is therefore at a greater depth.

6.5 Obstructions

No significant obstructions were encountered within the trial pits.

6.6 Groundwater

The clay at the base (3.4 m bgl) of TP1 was wet, and clay from 1.75 to 2.5 m bgl in TP5 was damp to wet. These are unlikely to be the natural ground water level, and are most likely to have been perched water.

The sandstone cobbles in TP13 were also wet between 1.6 and 2.4 m bgl.

No other groundwater ingresses were encountered.

6.7 Evidence of Contamination

Made ground within the upper 2 m occasionally contained coal fragments.

An organic odour was noted in the possible relic topsoil in TP3 between 1.5 and 1.7 m bgl, a slight one in the same material in TP5 between 1.65 and 1.75 m bgl, and in the same material in TP13 between 2.4 and 2.7 m bgl.

No other visual or olfactory evidence of possible significant contamination was identified any of the other exploratory holes.

7.0 GEOTECHNICAL APPRAISAL

7.1 General

Made ground is present across the site below the topsoil in the form of reworked clay, reworked sandstone cobbles in clay and relic topsoil, generally to depths of between 0.85 and about 3 m, but locally to in excess of 4.15 m bgl. Below, natural ground of firm to stiff sandy gravelly clay was present. Competent sandstone is present from around 0.8 to 2.55 m bgl to the top of the rock.

The natural ground is unlikely to be significantly shrinkable due to the high sand and gravel content. A classification of low shrinkability is considered appropriate for the clayey, weathered sandstone deposits. The sandstone bedrock should be regarded as being non-shrinkable.

An allowable bearing capacity of at least 100 kN/m² is considered appropriate for the upper layers of the natural strata. This will rise rapidly into the sandstone bedrock, which will be able to provide a bearing capacity of at least 250 kN/m².

7.2 Shallow Mining

One seam of coal, considered to be the Kent's Thin Coal, was found in four out of the five boreholes drilled, which was between 300 mm and 600 mm thick. BH1, in the north east of the site, did not find any coal within 17 m of surface, although as discussed in Section 6.4, this is considered likely to be due to a geological fault which runs across this part of the site.

This coal seam was found at its shallowest at 10.6 m bgl to the base in the south of the site, deepening to 14.2 m bgl to the base in the north of the site. The boreholes recorded solid coal with no evidence of workings.

In order for there to be considered no risk of mining voids migrating to surface, it is generally accepted that there should be ten times the seam thickness of competent ground between the base of the coal seam and the underside of foundations. In this instance, there would need to be 7 to 11 m of competent cover, assuming the seam to be 600 mm thick and that foundations are typically between 1 and 5 m deep. This level of cover will be provided across the site, and therefore precautions against the effects of shallow coal mining are therefore not considered necessary, even if localised workings have been undertaken.

7.3 Foundations

The proposed development is to comprise low rise residential dwellings of conventional construction.

If the ground levels are remaining the same as existing, traditional unreinforced strip or trench fill foundations are considered to be appropriate across the majority of the site, taken through any made or soft ground and into the natural cobbly clay or sandstone, at a minimum depth of 0.75 m below current, or existing ground level, whichever is the lower. Due to the depth of made ground, footings up to 2.5 m deep may be necessary.

For plots in the north of the site, which overlie the areas affected by geological faults, it is considered prudent to include reinforcement within the footings. This would comprise a single layer of B785 mesh in the top of the footings.

A localised area in the east of the site recorded deeper made ground. TP10 and TP13 recorded made ground to 3.05 and to at least 4.15 m bgl respectively. Piled foundations may be more economical in this part of the site. These would most probably be top driven steel or precast concrete piles of between 4 and 5 m length, although this would need to be confirmed by a specialist piling contractor. Consideration will need to be given to the level of vibration caused by the installation of piles to ensure no adverse effects are presented to the adjacent railway.

7.4 Ground Floors

Due to the general thickness of made ground across the site, ground bearing slabs will not be appropriate for the majority of plots. Reinforced suspended in-situ or precast concrete floors with a minimum 200 mm ventilated void will be required.

7.5 Superstructure Precautions

Additional superstructure precautions should not be required based on the ground conditions encountered on the site.

7.6 Slope Stability

Trenches were excavated into the embankment along the western edge of the site along Carrington Avenue to confirm the nature of the materials used to form the slope. A nominal thickness of topsoil was encountered, with weathered sandstone directly below, becoming hard sandstone by around 800 mm below the top of the embankment. The slope is up to around 3 m in height and has a face angle of around 30° from the horizontal. It is not anticipated that any stability issues will be presented by the existing embankment, if it is to remain in situ.

Similar trenches were also excavated into the slope at the southern end of the site, where the ground falls by around 3.5 to 4 m to Honeywell Lane. Around 1.4 m of made ground was encountered at the top of the slope, with competent sandy, gravelly clay below, becoming sandstone bedrock at around 2.5 m below the top of the slope. The face of the slope has an angle

of around 15° from the horizontal. This slope is considered to be stable and should not present any significant stability issues during development.

7.7 Excavation Problems

Wet ground was occasionally encountered at the base of the trial pit, at 3.4 m bgl in TP1, between 1.75 and 2.5 m bgl in TP5, and at around 2.35 m bgl in TP13. The sides of any excavation may therefore be expected to locally be unstable due to the ingress of water, or where made ground is present.

Support will be required in accordance with current Health & Safety Regulations wherever access is required to trenches deeper than 1.2 m, or less where there is risk of collapse.

7.8 Obstructions

Shallow, solid sandstone was found in nine trial pits, between 0.50 and 2.55 m bgl. We consider that the bedrock will not pose an obstruction to appropriate plant.

No other significant obstructions were encountered during the intrusive investigation.

7.9 Surface Water Drainage

Infiltration tests were carried out within the natural ground in order to confirm whether the ground may be considered suitable for soakaway drainage. One test each was completed in TP2 (SA2) and TP6 (SA3). Two tests were undertaken in TP5 (SA1). The locations of the pits are indicated on the Exploratory Hole Location Plan in Appendix 1. The soakaway calculations are attached, in Appendix 3.

The test results are summarised below:

Test Location	Volume of water used (m ³)	Material	Time taken to drain (Mins)	BRE 365 Infiltration Rate (x10 ⁻⁶ m/sec)	Average Infiltration Rate (x10 ⁻⁶ m/sec)
SA1 Test 1	0.5	Sandy cobbly clay (weathered bedrock)	2	750	1100
SA1 Test 2	0.5	Sandy cobbly clay (weathered bedrock)	2	2500	1300
SA2	0.5	Sandy gravelly clay	252*	N/A	4.2
SA3	0.5	Sandstone	245	14	14

* water level only dropped 420 mm in this time.

The results of the testing carried out are variable. In the south east of the site, the infiltration rates are indicated to be very high. This area of the site has an embankment to the south of it, and a railway bridge abutment to the south east. It is possible that the water was simply draining down the slope or into backfill materials surrounding the bridge structure. Elsewhere on the site, the weathered bedrock materials appear to give moderate results, whilst the more competent bedrock in the west of the site provides only very low infiltration rates.

Based on the results recorded, it would appear that soakaway drainage may be viable in some parts of the eastern half of the site. However, these would need to be taken through any made ground, to avoid any potentially unacceptable levels of settlement due to inundation. This may mean, therefore, that hard sandstone is present at the invert level, which may give less favourable infiltration rates. In addition, it would need to be confirmed that Network Rail would accept soakaways being positioned close to the railway line.

Due to the variability of the results in other part of the site, it is likely that further testing will be required. The rates recorded in SA 2 and SA3 were quite low, and therefore they may not be able to provide a sufficient discharge rate to sustain a full surface water drainage system.

Public combined and surface water sewers are present in the surrounding roads, and therefore it may be possible to use piped drainage, connecting into the existing local network. At this stage it is recommended that a piped system is allowed for, give the relatively poor infiltration rates recorded in the tests carried out. However, this will be for the regulators to agree and as stated above, further soakaway testing may be required. If a piped system is used, it is likely that on site attenuation will be required, and that a restricted outfall rate is used.

8.0 REFINEMENT OF OUTLINE CONCEPTUAL MODEL

8.1 Source Characterisation

An outline conceptual model, detailing the possible sources and associated contaminants of concern, potential pathways and receptors identified in the Phase 1 study was detailed in Section 4.0.

This section of the report documents the works undertaken to obtain information to test and refine this model enabling a risk assessment to be produced and, where significant risks are expected, remediation recommendations.

8.2 Unexpected Contamination

Made ground within the upper 2 m occasionally contained coal fragments.

An organic odour was noted in the relic topsoil in TP3 between 1.5 and 1.7 m bgl, a slight one in the same material in TP5 between 1.65 and 1.75 m bgl, and in the same material in TP13 between 2.4 and 2.7 m bgl.

No other visual or olfactory evidence of unexpected contamination was identified during the site investigation.

8.3 Ground Gas

Radon precautions are not required on this site.

Made ground between 3.05 and 4.15 m deep was encountered in TP10 and TP13 during the ground investigation. These pits are both located along the eastern boundary of the site. The majority of the made ground did not contain a significant proportion of organic material. However, reworked clay with rootlets and an organic odour, considered to be relic topsoil, was present in three trial pits between 1.5 and 2.7 m bgl. Therefore, these organic soils, and deep made ground beneath the site, may present a low risk of ground gas to the site.

A 25 to 30 year old landfill is present around 250 m to the south of the site. Migration from this landfill to the site would appear unlikely.

The coal seams beneath the site were found to be intact. Therefore there should not be a risk of mine gas to the site.

Instead of carrying out a programme of gas monitoring, we would recommend installing Amber 1 gas precautions on plots on the eastern part of this site, where made ground is found to be deeper than 2.5 m bgl. This would need to be agreed with the regulators.

8.4 Chemical Testing

Fifteen samples of topsoil, ten samples of made ground and two samples of the natural ground were sent for chemical testing. Each of the samples was analysed for the suite of contaminants listed below:

Contaminant Type	Actual Contaminants
Metals/Metalloids	Arsenic, cadmium, chromium, lead, mercury, nickel, selenium copper and zinc
PAHs	Speciated PAH
Asbestos*	Presence
Sulphates**	pH, water soluble sulphate, acid soluble sulphate and sulphur

*Near surface samples only.

**All samples except topsoil samples.

Testing was undertaken by Chemtest Limited, using MCERTs accredited methodologies, where available. A copy of the test results is included in Appendix 4.

8.5 Assessment Criteria

The proposed development of the site is to be residential with associated hardstanding and limited landscaping. Therefore the assessment criteria relating to a residential end use have been used with home grown produce included as a potential pathway. Tables detailing the relevant assessment concentrations used are included in Appendix 4.

8.6 Chemical Test Results

8.6.1 Topsoil

Metals/Metalloids

One sample of the topsoil, from TP3 at 0.1 m bgl, recorded a marginally elevated concentration of lead, at 220 mg/kg compared to the residential assessment value of 200 mg/kg. A modified geometric mean calculation has been undertaken,. The lead in the topsoil as a whole was calculated to have a geometric mean of 118. 6 mg/kg, which is below the residential assessment value.

Two samples of topsoil, from TP6 at 0.1 m bgl, and TP14 at 0.2 m bgl, recorded slightly elevated concentrations of arsenic at 42 and 49 mg/kg respectively, compared to the residential assessment value of 37 mg/kg. A modified mean of 28.2 mg/kg has been calculated. We would therefore consider that as a whole, the arsenic concentrations in the topsoil do not pose a risk to human health.

Two samples of topsoil, from TP6 at 0.1 m bgl, and TP12 at 0.1 m bgl, recorded elevated concentrations of mercury at 1.3 and 2.4 mg/kg respectively, compared to the residential assessment value of 1.2 mg/kg. The mercury in the topsoil was calculated to have a modified mean of 0.97 mg/kg, which is below the residential assessment value, and therefore this is not considered to present a significant risk.

A slightly elevated concentration of copper was recorded in one sample (TP3, 0.1m). A concentration of 93 mg/kg was recorded compared with the pH dependent assessment value of 80 mg/kg.

No other metals/metalloids were recorded at concentrations exceeding their respective assessment values in any of the other samples of the topsoil.

PAHs

Two samples of topsoil, from TP9 at 0.3 m bgl and TP10 at 0.1 m bgl, recorded elevated concentrations of benzo(a)pyrene and dibenz(a,h)anthracene. These ranged between 4 and 5 mg/kg for benzo(a)pyrene, compared to the residential assessment value of 2.2 mg/kg; and between 0.58 and 0.88 mg/kg for dibenz(a,h)anthracene, compared to the residential assessment value of 0.24 mg/kg.

The benzo(a)pyrene in the topsoil was calculated to have a modified mean of 1.53 mg/kg, which is below the residential assessment value of 2.2 mg/kg.

The dibenz(a,h)anthracene in the topsoil as a whole was calculated to have a modified mean of 0.29 mg/kg, which is marginally elevated above the residential assessment value of 0.24 mg/kg.

No other PAHs were recorded at concentrations exceeding their respective assessment values in any of the other samples of the topsoil.

8.6.2 Made Ground

One of the samples of relic topsoil, from TP5 at 1.7 m bgl, recorded a slightly elevated lead concentration of 240 mg/kg, as compared to the residential assessment value of 200 mg/kg. An arithmetical mean value of 148 mg/kg is calculated for this contaminant.

An elevated concentration of zinc was also recorded in this sample, at 430 mg/kg compared with an assessment value of 200 mg/kg.

None of the other samples of made ground recorded any contaminants exceeding their respective assessment values.

8.6.3 Natural Ground

None of the two samples of natural ground recorded any contaminants exceeding their respective assessment values.

8.6.4 Asbestos

No asbestos fibres were identified within any of the samples which were submitted for an asbestos screen.

8.6.5 Sulphates

The site has been taken as a brownfield location in relation to the Aggressive Chemical Environment for Concrete classifications. Groundwater is expected to be mobile through the made ground and near surface soils.

Made Ground

Reworked Clay/Sandstone Made Ground

Seven samples of the reworked clay and sandstone made ground were tested. The results are shown in the table below:

Total Sulphur %	0.022, 0.016, 0.026, 0.05, <0.01, 0.04, 0.02
Total Potential Sulphate %	0.06, 0.048, 0.078, 0.15, <0.03, 0.12, 0.06
Water Soluble Sulphate mg/l	<10, <10, <10, <10, <10, <10, <10
Acid Soluble Sulphate %	<0.01, <0.01, <0.01, 0.037, <0.01, 0.018, 0.017
pH	6.0, 6.1, 6.0, 5.8, 6.9, 6.0, 5.5

Characteristic values of 0.135% have been calculated for total potential sulphate and <10 mg/l for water soluble sulphate, and 5.5 for pH.

Relic Topsoil Made Ground

Three samples of the relic topsoil were tested:

Total Sulphur %	0.12, 0.12, 0.03
Total Potential Sulphate %	0.36, 0.36, 0.09
Water Soluble Sulphate mg/l	12, 83, <10
Acid Soluble Sulphate %	0.053, 0.093, 0.032
pH	6.0, 5.8, 4.6

A Characteristic value of 0.36% has been taken for total potential sulphate and 83 mg/l for water soluble sulphate. A characteristic value of 4.6 is taken for pH.

Natural Ground

Two samples of natural ground were tested for sulphates:

Total Sulphur %	<0.01, <0.01
Total Potential Sulphate %	<0.03, <0.03
Water Soluble Sulphate mg/l	<10, <10
Acid Soluble Sulphate %	<0.01, 0.016
pH	5.7, 4.5

A characteristic value of 0.03% is taken for total potential sulphate and <10 mg/l for water soluble sulphate, and 4.5 for the pH.

8.7 Significant Pollutant Linkages

Contaminants	Pathway	Receptor
Marginally elevated concentrations of dibenz(a,h)anthracene within the existing topsoil.	Direct contact.	- Future residents or visitors. - Construction workers.
	Migration through ground.	Secondary A aquifer.
- Elevated zinc within the relic topsoil. - Marginally elevated concentrations of copper and mercury within the topsoil.	Root uptake	Plants.
- Sulphates in the relic topsoil and made ground. - Low pH values in made ground, relic topsoil and natural ground.	Direct contact.	Below ground concrete.

9.0 RISK ASSESSMENT

9.1 Human Health – Future Residents and Visitors

The results of the testing carried out on the samples collected during the intrusive investigations do not indicate any significantly elevated concentrations of contaminants within any of the materials encountered.

Locally elevated concentrations of arsenic, lead, mercury and benzo(a)pyrene were recorded within the topsoil and a marginally elevated concentration of lead was recorded in one sample of relic topsoil, although modified mean calculations undertaken on these results do not indicate elevated results when considering the materials as a whole. A significant risk is therefore not considered to be presented by these contaminants.

A modified mean was calculated for the dibenz(a,h)anthracene levels recorded in the topsoil of 0.29 mg/kg, which is still slightly elevated above the residential assessment value of 0.24 mg/kg. However, as the exceedance is only marginal, we would not consider this to present a significant risk. It would be expected that with the testing of additional samples of the topsoil, it could be shown that elevated levels are rare, and using the additional results, the modified mean value would fall to a level below the assessment value. However it is not proposed to undertake any additional sampling at this stage.

It is therefore our conclusion that the existing topsoil will not pose a significant risk to human health, and we consider that the existing topsoil will be suitable for re-use on a residential development, subject to the agreement of the regulators. No significant risks are anticipated from the made ground or relic topsoil.

9.2 Human Health – Construction Workers

Ground workers employed during the construction phase of the development are most at risk of harm due to them having direct contact with the affected soils. However, the contact is generally of short duration, and all competent ground workers will be aware of the potential risks associated with soils of this nature. Therefore the overall risk to the health of construction workers is considered to be low.

All ground workers employed on the site should be made aware that slightly elevated concentrations of metals and PAHs are present within the soils, and normal site procedures such as the wearing of gloves when handling soils, and the washing of hands prior to eating should be implemented.

Any unusual, brightly coloured, ashy or odorous material encountered during construction should be brought to the attention of the site staff and investigated.

9.3 Construction Materials

The results of sulphate testing indicate that the relic topsoil made ground has a total potential sulphate concentration in excess of the upper limit for classification as DS-1. However, the pH levels in the relic topsoil, the reworked ground and the natural ground are also quite low.

Therefore, the reworked natural ground and the natural ground should be considered to require DS1 AC-3z sulphate precautions. Where the relic topsoil layer is encountered, the classification should be upped to DS-2 AC-4z.

All chemical test results should be forwarded to the water supplier to determine the level of protection, if any, required for water supply pipes.

9.4 Plants

Concentrations of mercury and copper slightly above the phytotoxic assessment values were recorded within the topsoil. However, these results were only very marginally above the assessment values, and as a whole, the topsoil is considered unlikely to present a significant risk to plant growth. Currently the site is grassed, and does not shown any detrimental effects.

The topsoil should be suitable for reuse, and should be placed in a minimum thickness of 150 mm in all gardens and soft landscaped areas as a growing medium for proposed plants and lawns.

The relic topsoil also locally contains slightly elevated concentrations of zinc. However, future planting is unlikely to encounter this material due to the depth at which it lies (greater than 1m bgl), and therefore no significant risk should be presented.

9.5 Controlled Waters

The site overlies a Secondary A aquifer, and the nearest surface water feature is the River Dearne, at 280 m south east of the site. The site does not lie within a Groundwater Source Protection Zone.

The slightly elevated contaminants recorded are not particularly mobile, as indicated by the lack of elevated concentrations in the underlying natural ground. Materials on site are therefore not considered to pose a significant risk to controlled waters.

9.6 Ground Gas

As indicated in Section 8.3, we recommend that Amber 1 gas precautions should be installed in plots which overlie made ground that is deeper than 2.5 m bgl, which was found to be present locally in the eastern part of the site.

This would require the installation of a 2000 gauge polythene membrane within the floor structure, which is continuous to the external leaf of brickwork across the plot. All joints and service penetrations would need to be sealed in accordance with the manufacturers details. This would need to be agreed with the regulators.

10.0 CONTAMINATION - RECOMMENDATIONS AND APPROVALS

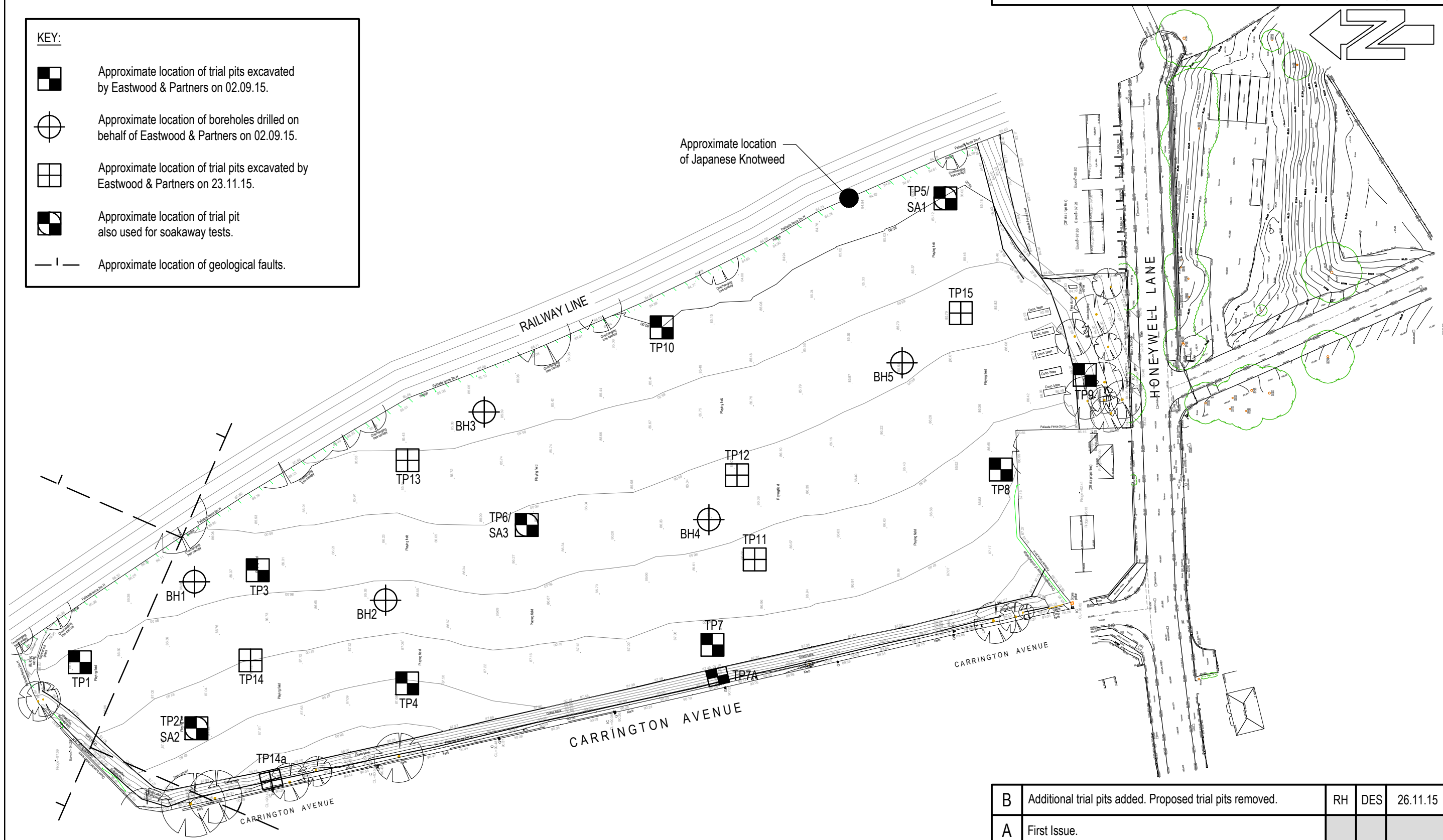
1. Significant contamination has not been identified on the site, and therefore remedial works are not considered necessary for the majority of the site.
2. Subject to the agreement of the regulators, the topsoil on site should be suitable for reuse. The topsoil should be placed in a minimum 150 mm layer in all gardens and areas of soft landscaping to provide a growing medium for plants.
3. Amber 1 gas precautions are recommended in plots overlying deep made ground, which was encountered locally in the eastern part of the site.
4. DS2 AC4z sulphate precautions are required for all sub-surface concrete in contact with the relic topsoil made ground. DS1 AC3z sulphate precautions are required elsewhere on site for all sub-surface concrete.
5. The conclusions made in this report in relation to contamination are subject to agreement by the approving bodies such as the Local Authority and the NHBC (if applicable).

Appendix 1

Exploratory Hole Location Plan, 38903/001/B

INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

- KEY:
-  Approximate location of trial pits excavated by Eastwood & Partners on 02.09.15.
 -  Approximate location of boreholes drilled on behalf of Eastwood & Partners on 02.09.15.
 -  Approximate location of trial pits excavated by Eastwood & Partners on 23.11.15.
 -  Approximate location of trial pit also used for soakaway tests.
 -  Approximate location of geological faults.



Eastwood & Partners
CONSULTING ENGINEERS
St. Andrew's House
23 Kingfield Road
Sheffield
S11 9AS
Tel 0114 255 4554
Fax 0114 255 4330
mail@eastwoodandpartners.com
www.eastwoodandpartners.com



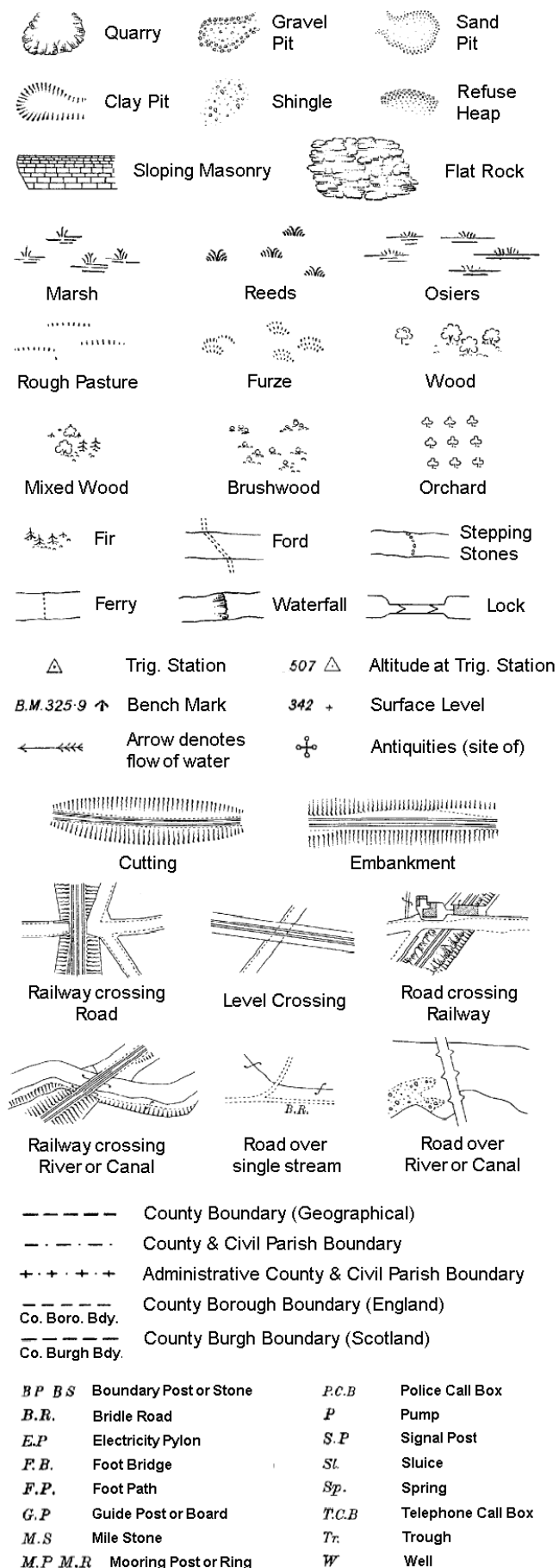
MILLER HOMES LTD
HONEYWELL LANE, BARNSELY
EXPLORATORY HOLE LOCATION PLAN

B	Additional trial pits added. Proposed trial pits removed.	RH	DES	26.11.15
A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE
SCALE WHEN PLOTTED AT A3 1:1000		DRAWING STATUS INFORMATION		
DRAWN RH	CHECKED DES	DATE 07.09.15	DRAWING NUMBER 38903/001	REV B

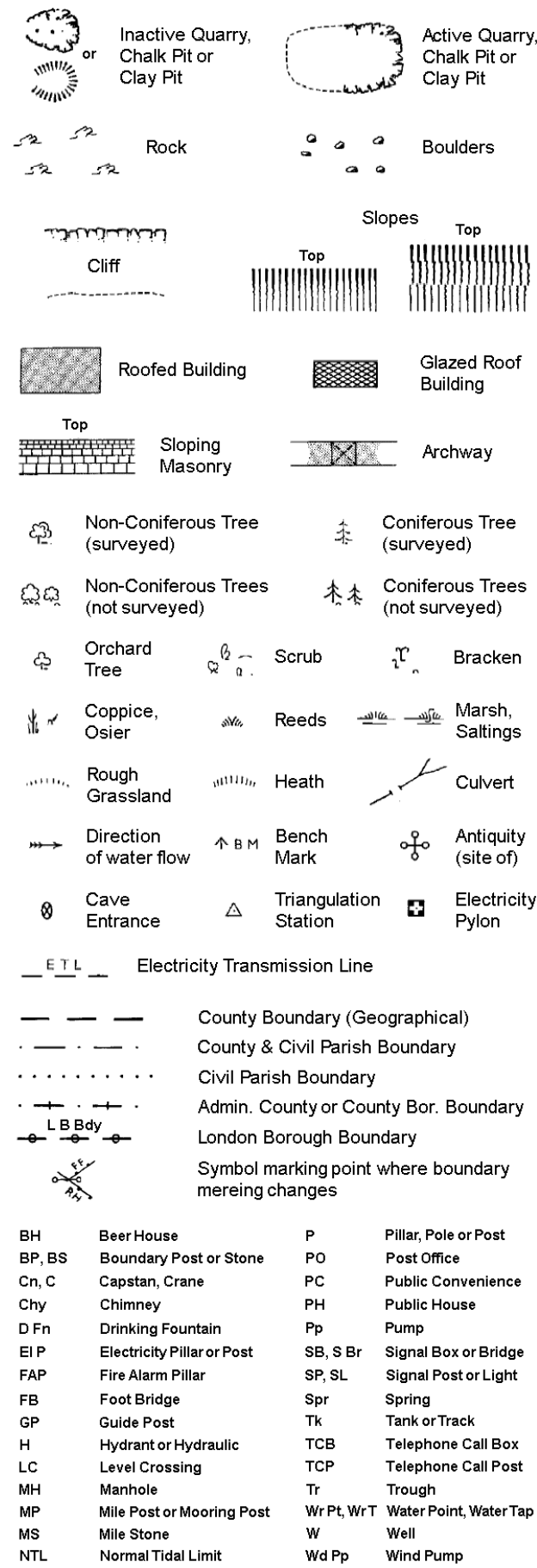
Appendix 2
Envirocheck Report
Coal Authority Report

Historical Mapping Legends

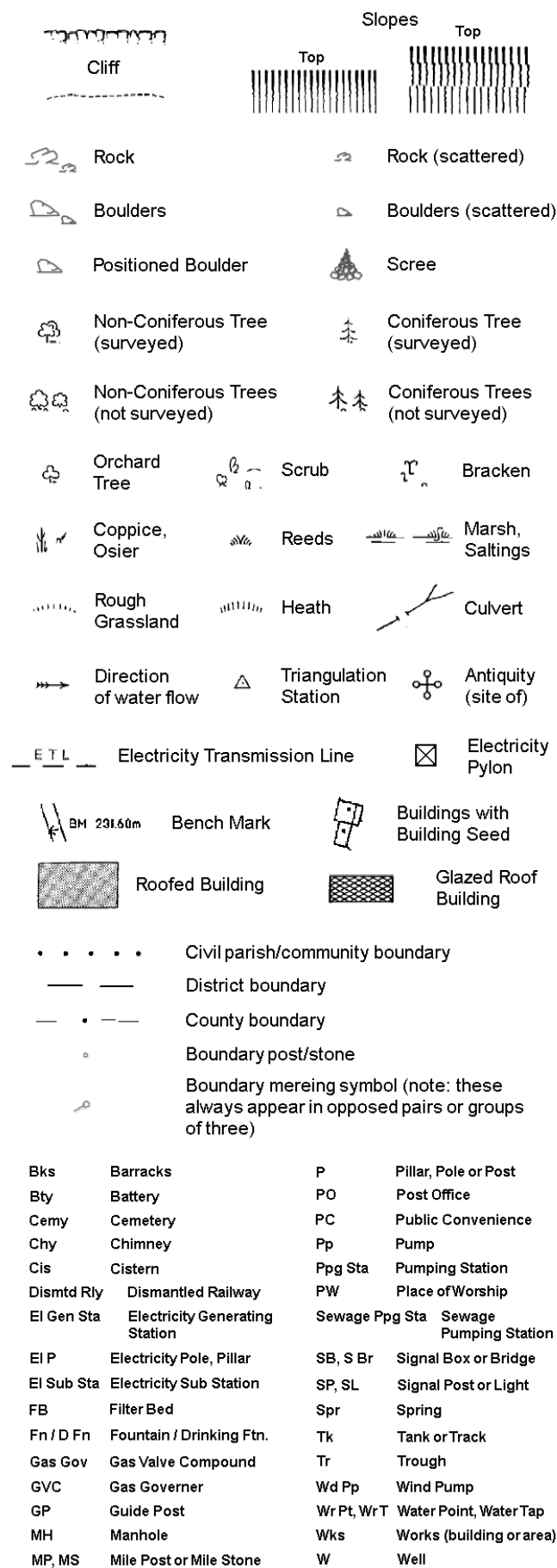
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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



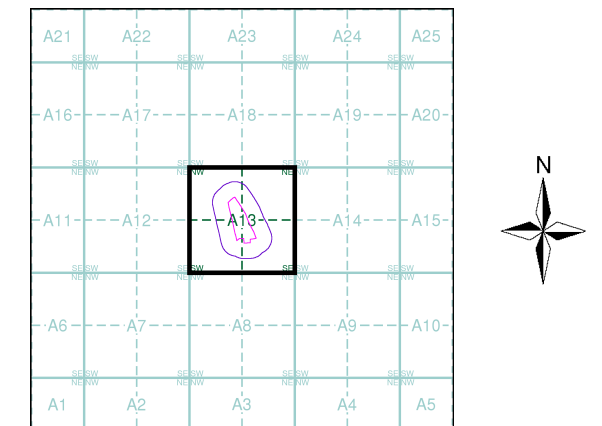
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:2,500	1892 - 1893	2
Yorkshire	1:2,500	1906	3
Yorkshire	1:2,500	1931	4
Ordnance Survey Plan	1:1,250	1959 - 1960	5
Ordnance Survey Plan	1:2,500	1960 - 1962	6
Ordnance Survey Plan	1:1,250	1965 - 1975	7
Ordnance Survey Plan	1:2,500	1969	8
Supply of Unpublished Survey Information	1:1,250	1973	9
Ordnance Survey Plan	1:1,250	1974	10
Additional SIMs	1:1,250	1979 - 1991	11
Additional SIMs	1:1,250	1982 - 1991	12
Additional SIMs	1:1,250	1989	13
Additional SIMs	1:1,250	1991	14
Large-Scale National Grid Data	1:1,250	1993	15

Historical Map - Segment A13



Order Details

Order Number: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW

Yorkshire

Published 1892 - 1893

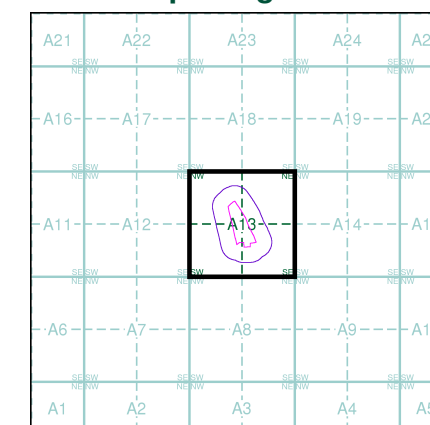
Source map scale - 1:2,500

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)

274_03	1892	1:2,500
274_07	1893	1:2,500

Historical Map - Segment A13

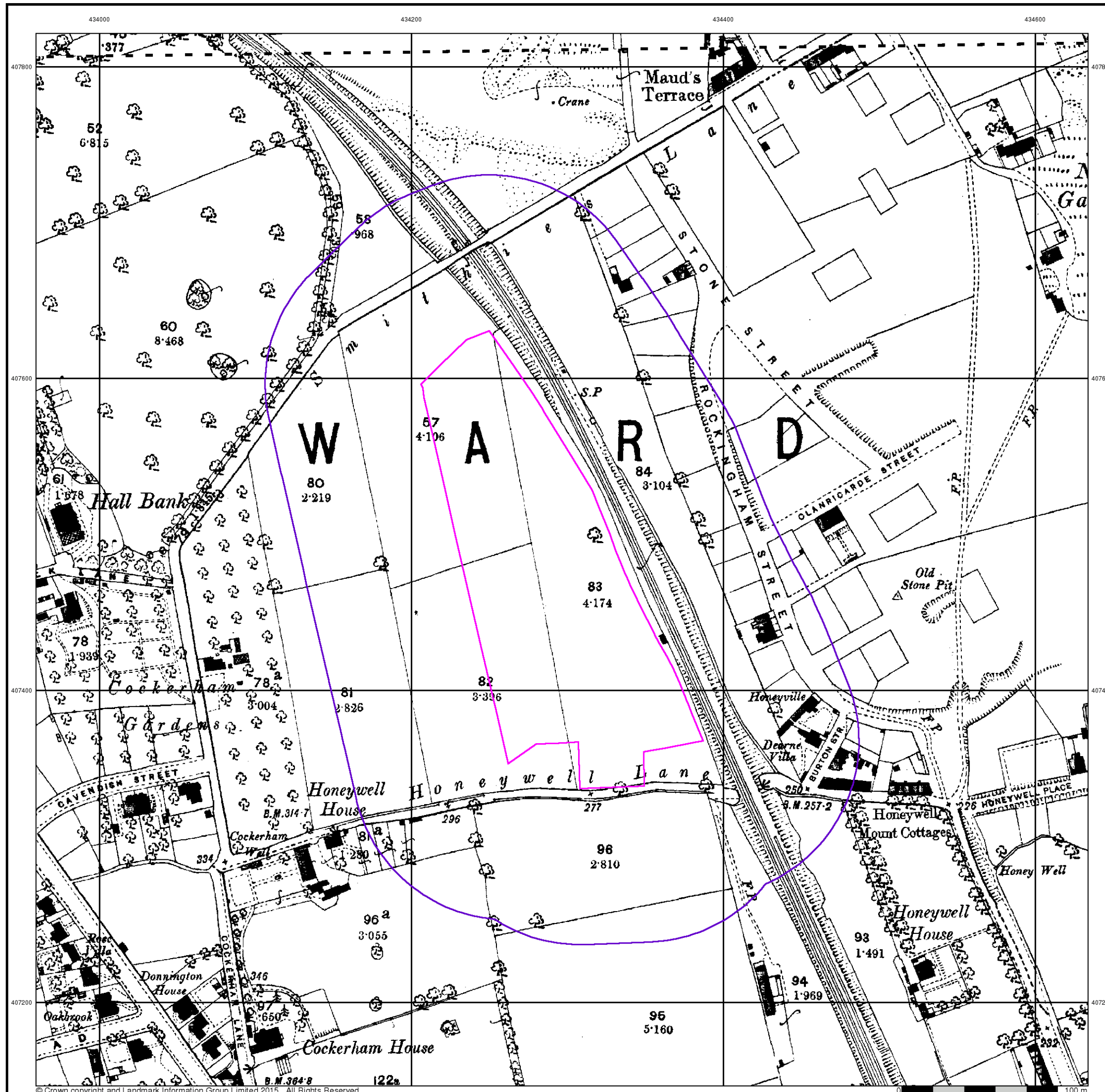


Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



Yorkshire

Published 1906

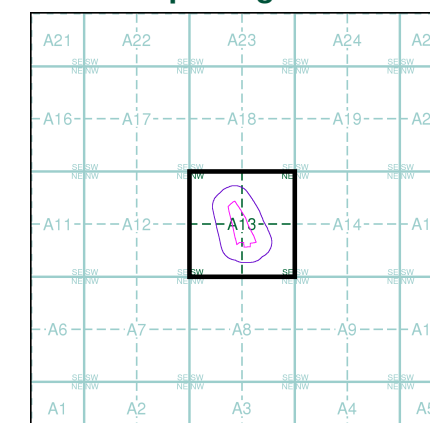
Source map scale - 1:2,500

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)

274_03	1906	1:2,500
274_07	1906	1:2,500

Historical Map - Segment A13

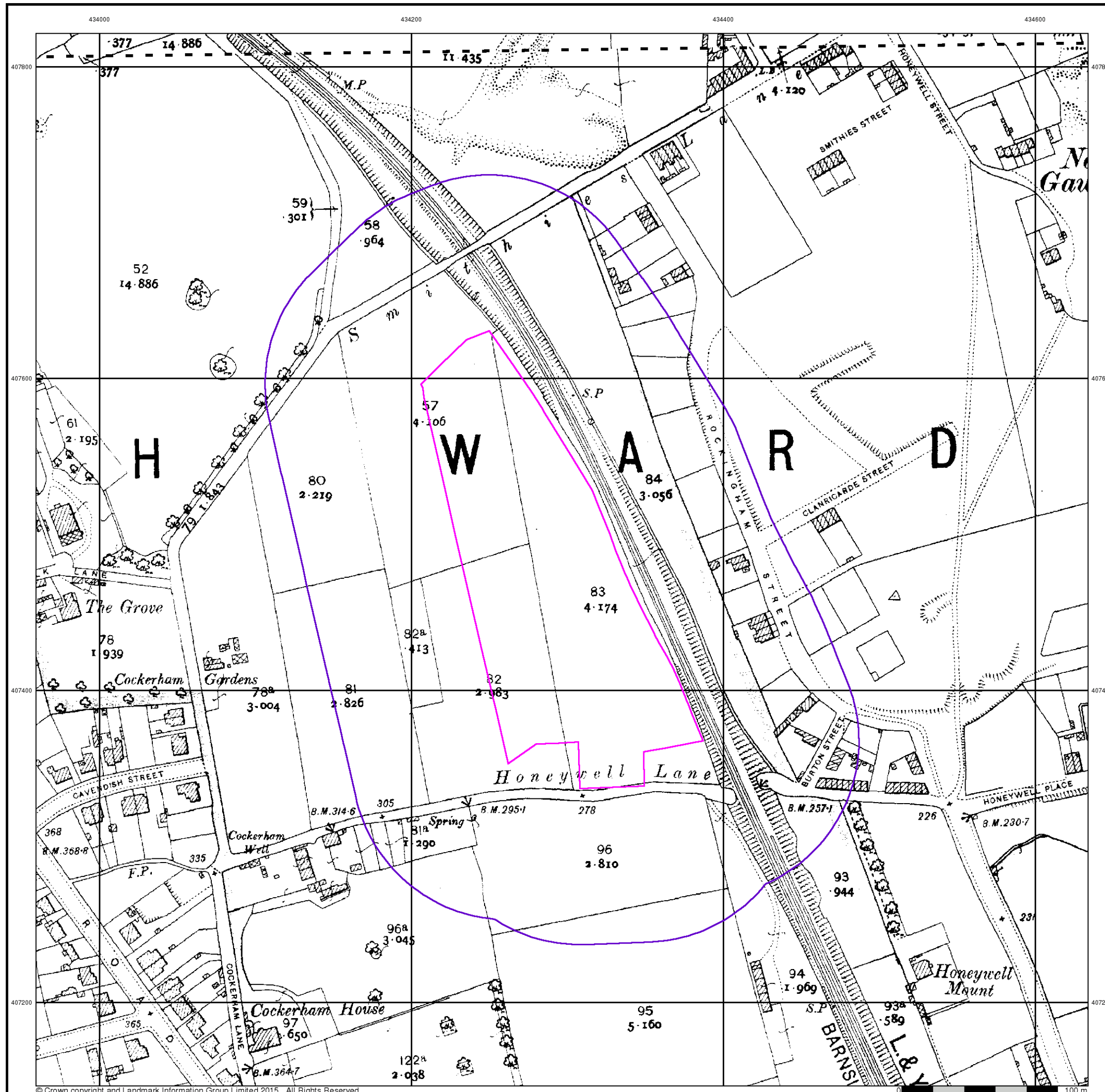


Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSEY, South Yorkshire, S75 1BW



Yorkshire

Published 1931

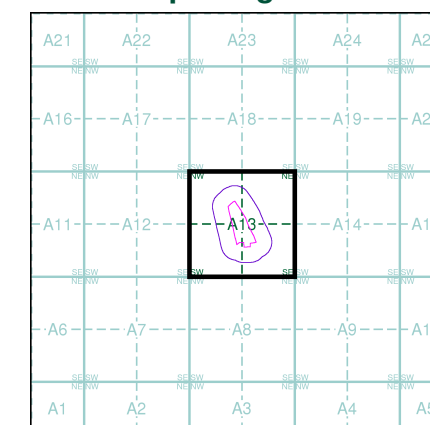
Source map scale - 1:2,500

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)

274_03	1931	1:2,500
274_07	1931	1:2,500

Historical Map - Segment A13

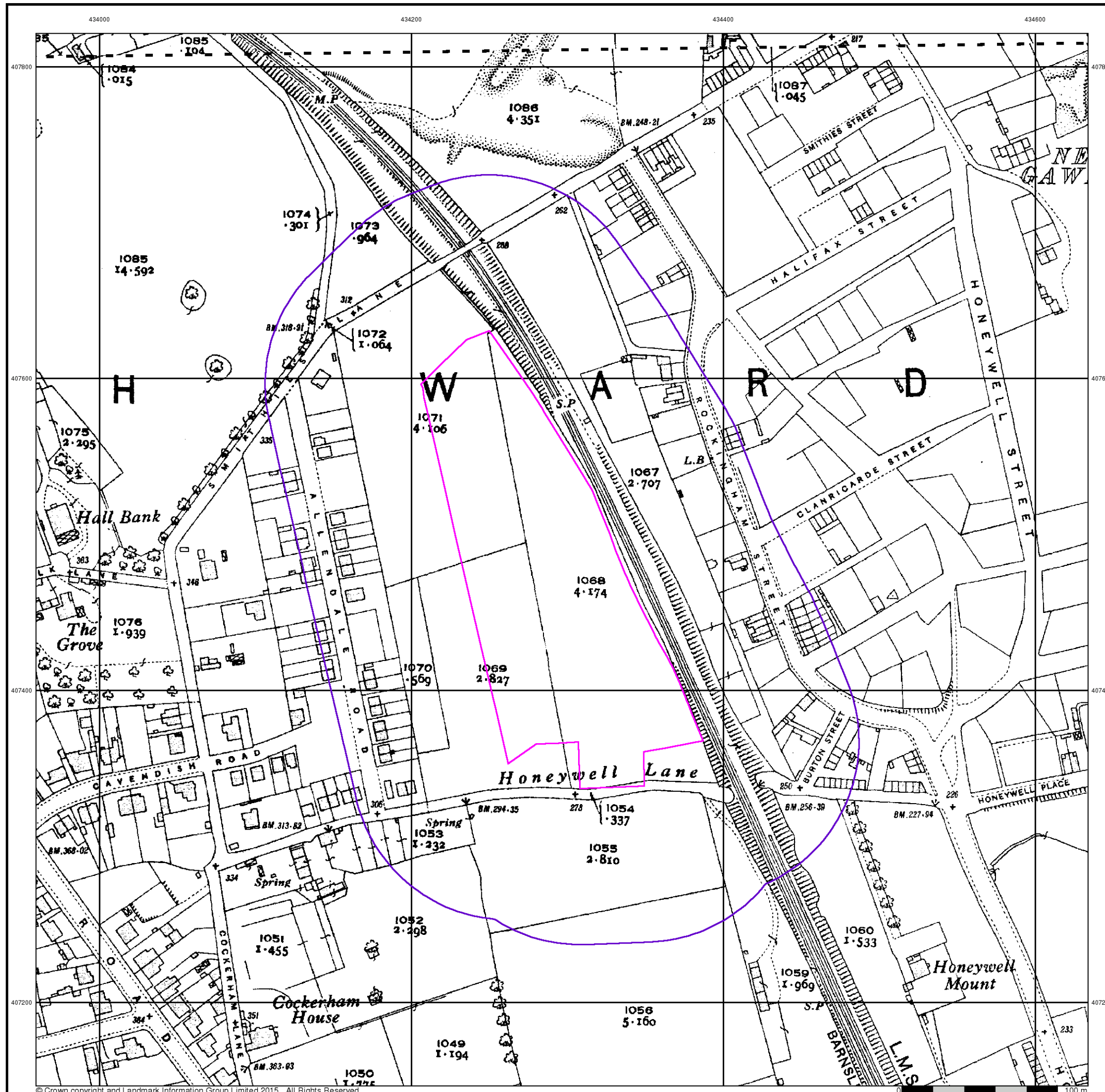


Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



Ordnance Survey Plan

Published 1959 - 1960

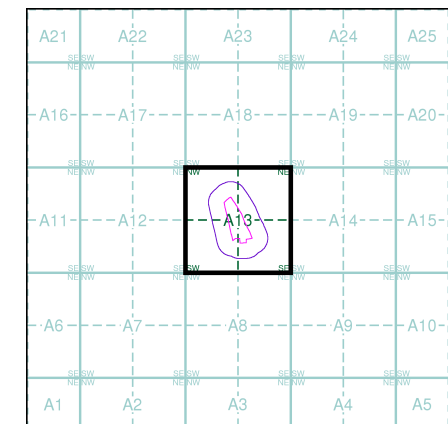
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SE3307NE 1959 1:1,250	SE3407NW 1960 1:1,250	SE3407NE 1960 1:1,250
SE3307SE 1959 1:1,250	SE3407SW 1960 1:1,250	SE3407SE 1960 1:1,250

Historical Map - Segment A13

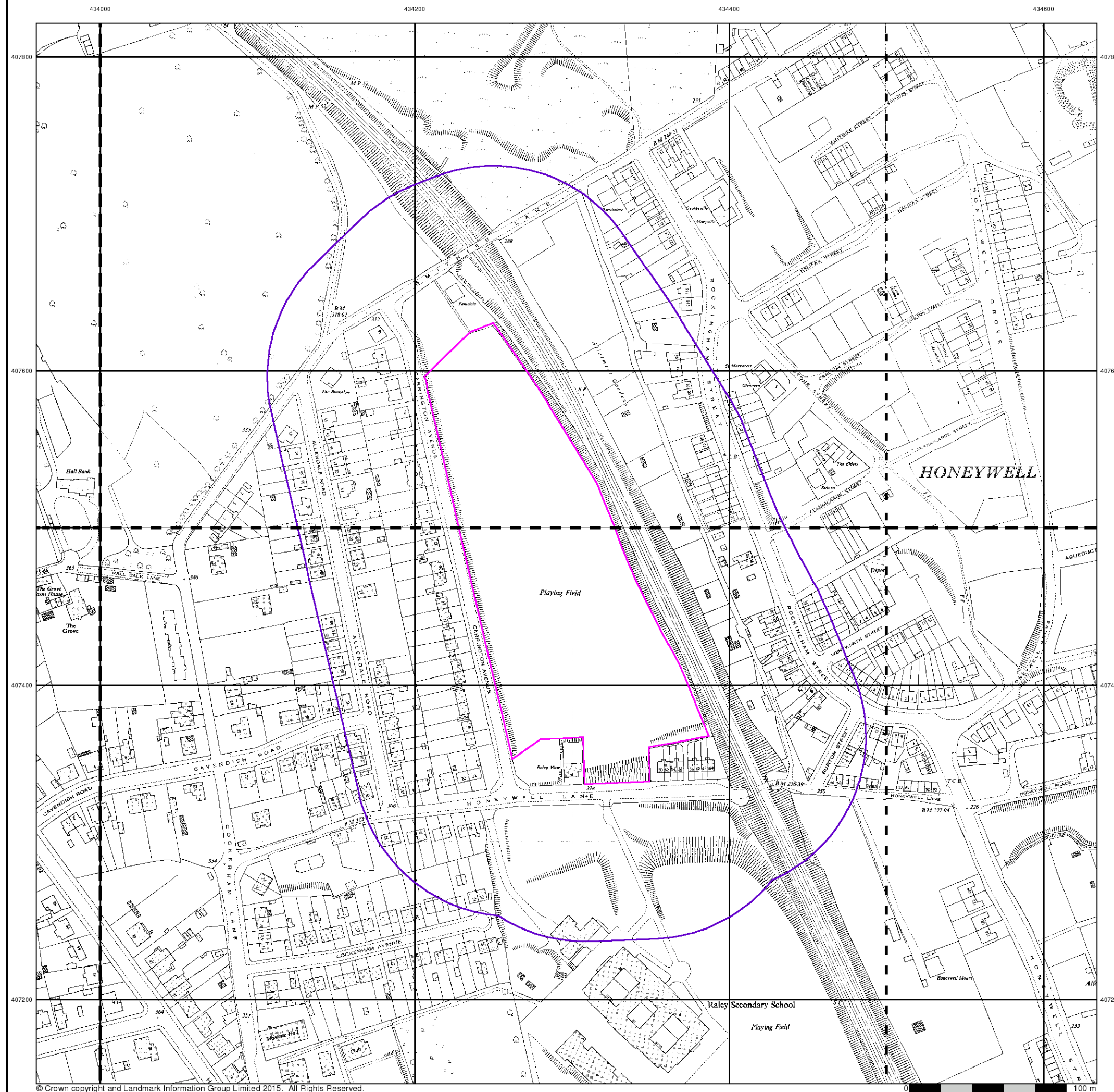


Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSEY, South Yorkshire, S75 1BW



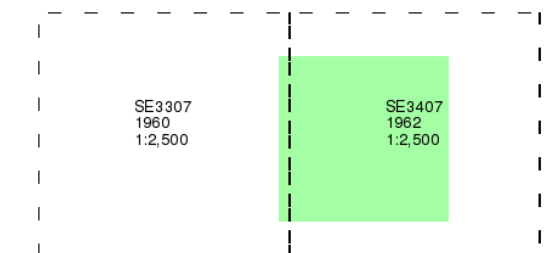
Ordnance Survey Plan

Published 1960 - 1962

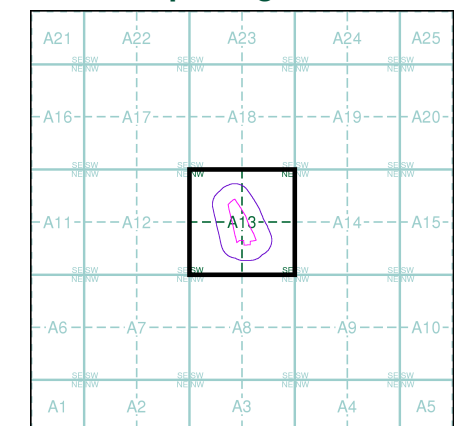
Source map scale - 1:2,500

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

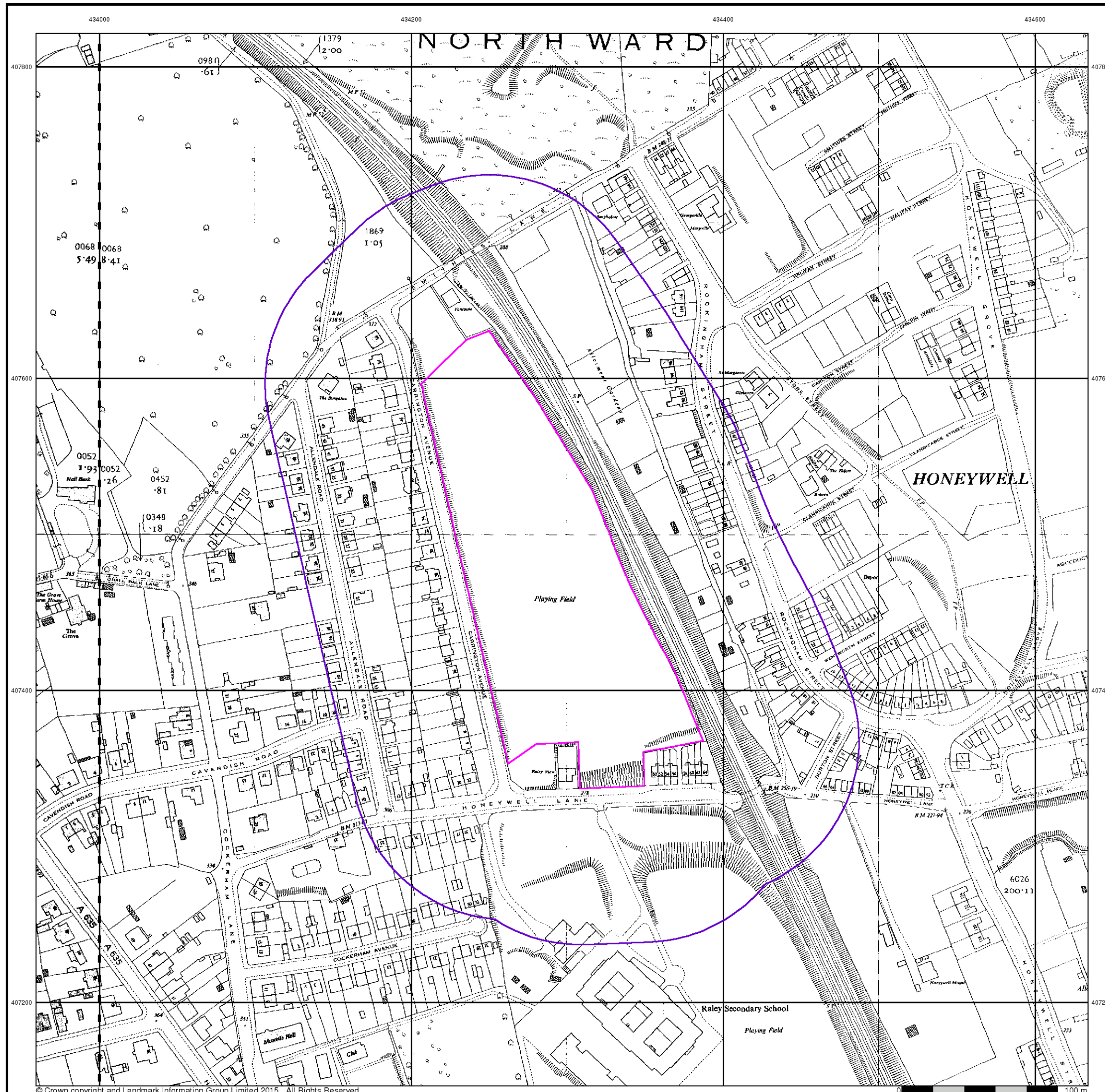


Order Details

Order Number: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSEY, South Yorkshire, S75 1BW



Ordnance Survey Plan

Published 1965 - 1975

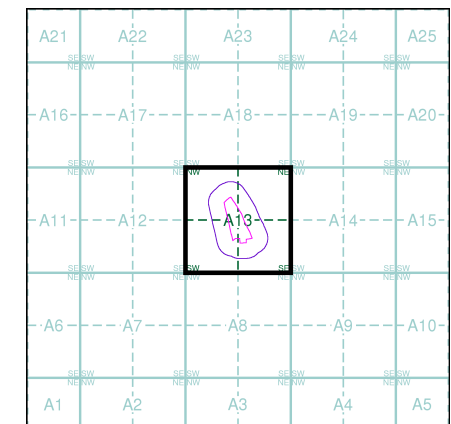
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SE3307NE 1965 1:1,250	SE3407NW 1969 1:1,250	SE3407NE 1970 1:1,250
SE3307SE 1974 1:1,250	SE3407SW 1975 1:1,250	SE3407SE 1970 1:1,250

Historical Map - Segment A13



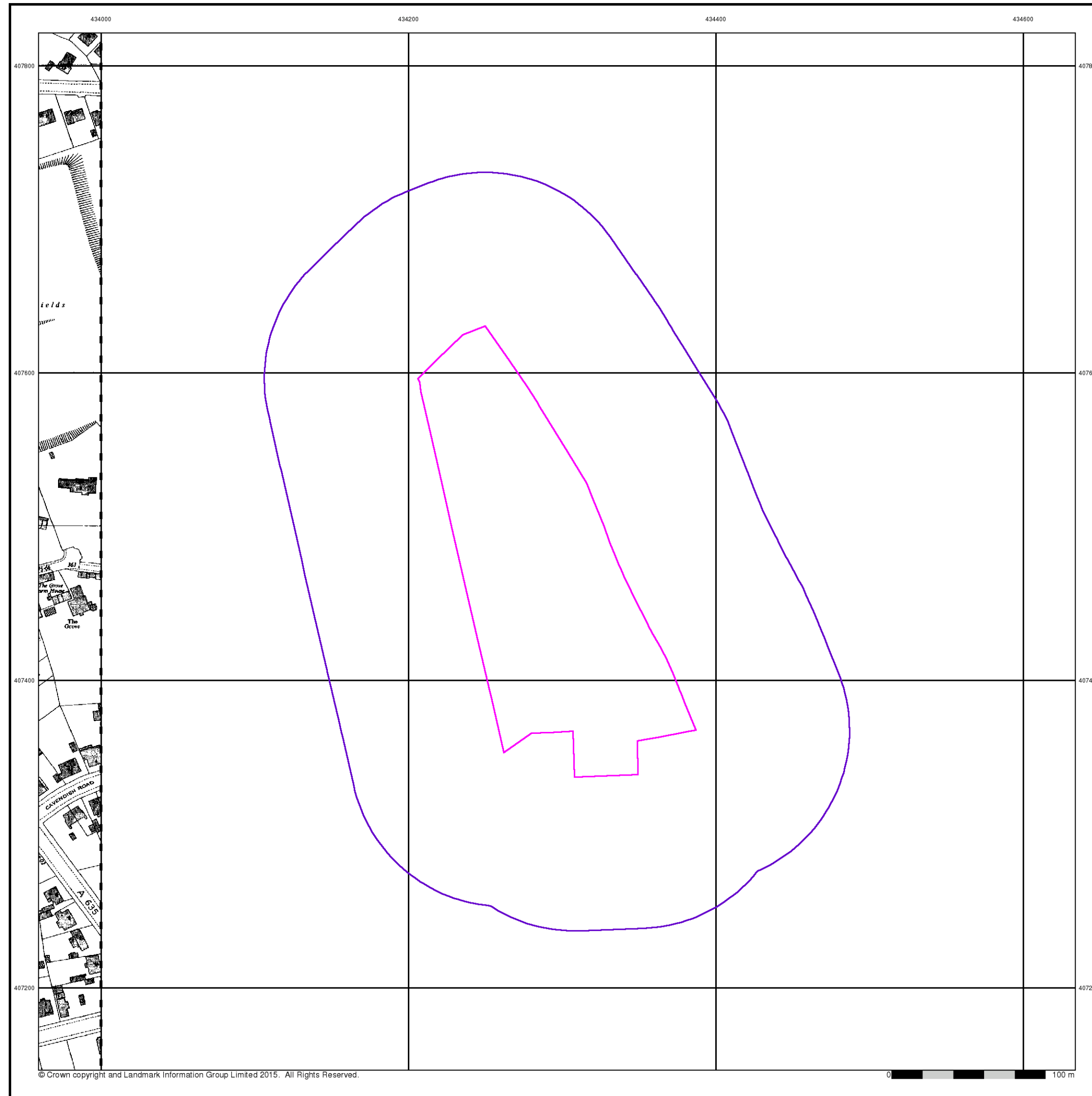
Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW





© Crown copyright and Landmark Information Group Limited 2015. All Rights Reserved.



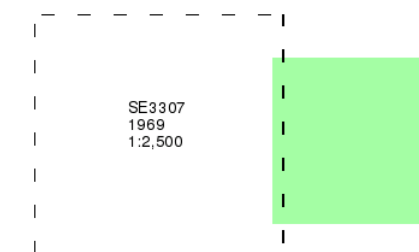
Ordnance Survey Plan

Published 1969

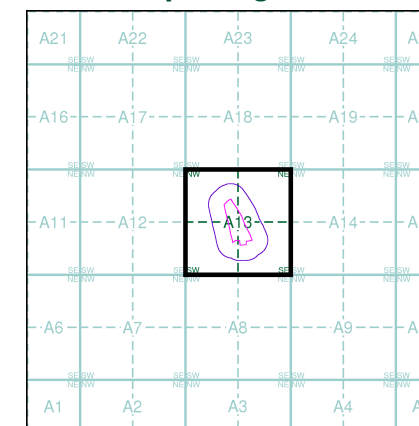
Source map scale - 1:2,500

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: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



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



© Crown copyright and Landmark Information Group Limited 2015. All Rights Reserved.



Supply of Unpublished Survey Information

Published 1973

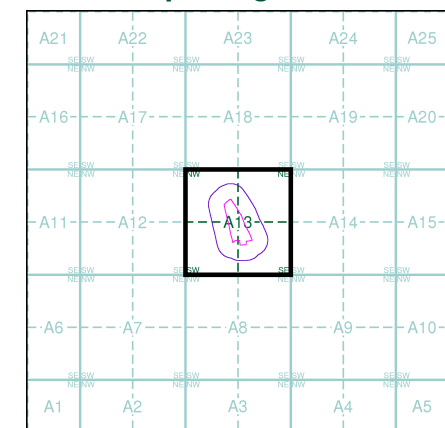
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SE3407NW	SE3407NE
1973	1973
1:1,250	1:1,250

Historical Map - Segment A13



Order Details

Order Number: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



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

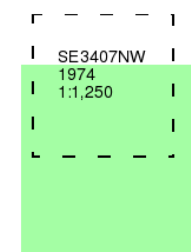
Ordnance Survey Plan

Published 1974

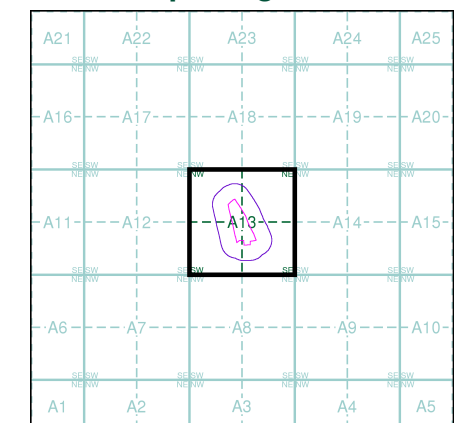
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A13

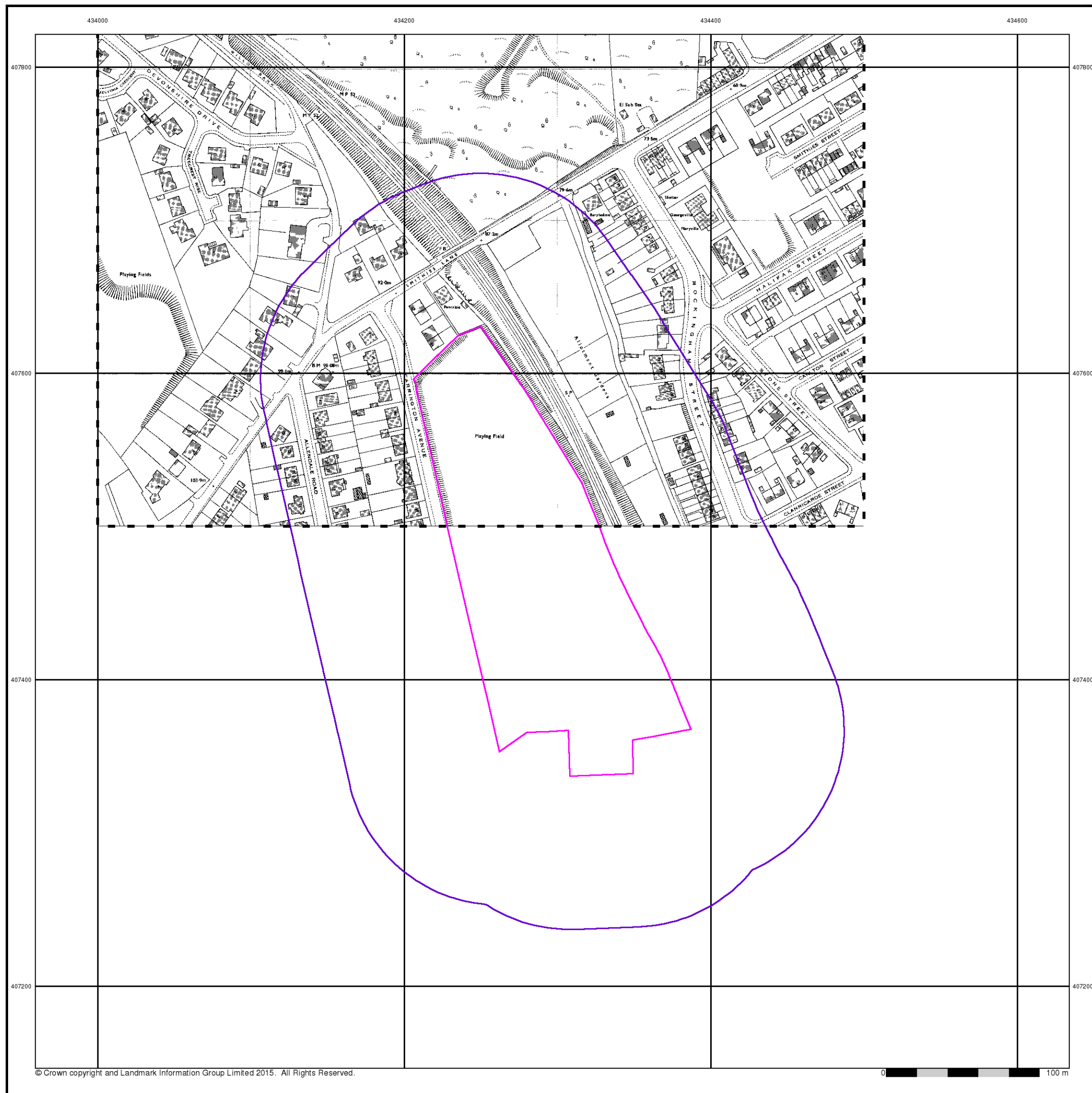


Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



Additional SIMs

Published 1979 - 1991

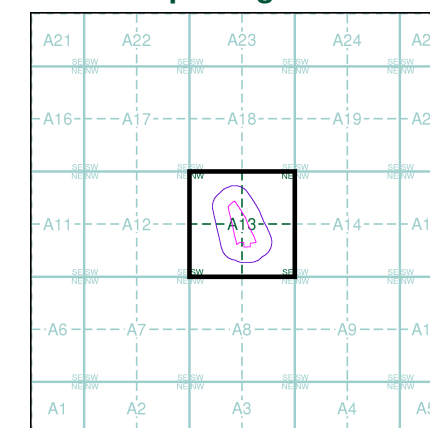
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SE3307NE 1991 1:1,250	SE3407NW 1991 1:1,250	SE3407NE 1990 1:1,250
SE3307SE 1991 1:1,250	SE3407SW 1991 1:1,250	SE3407SE 1979 1:1,250

Historical Map - Segment A13



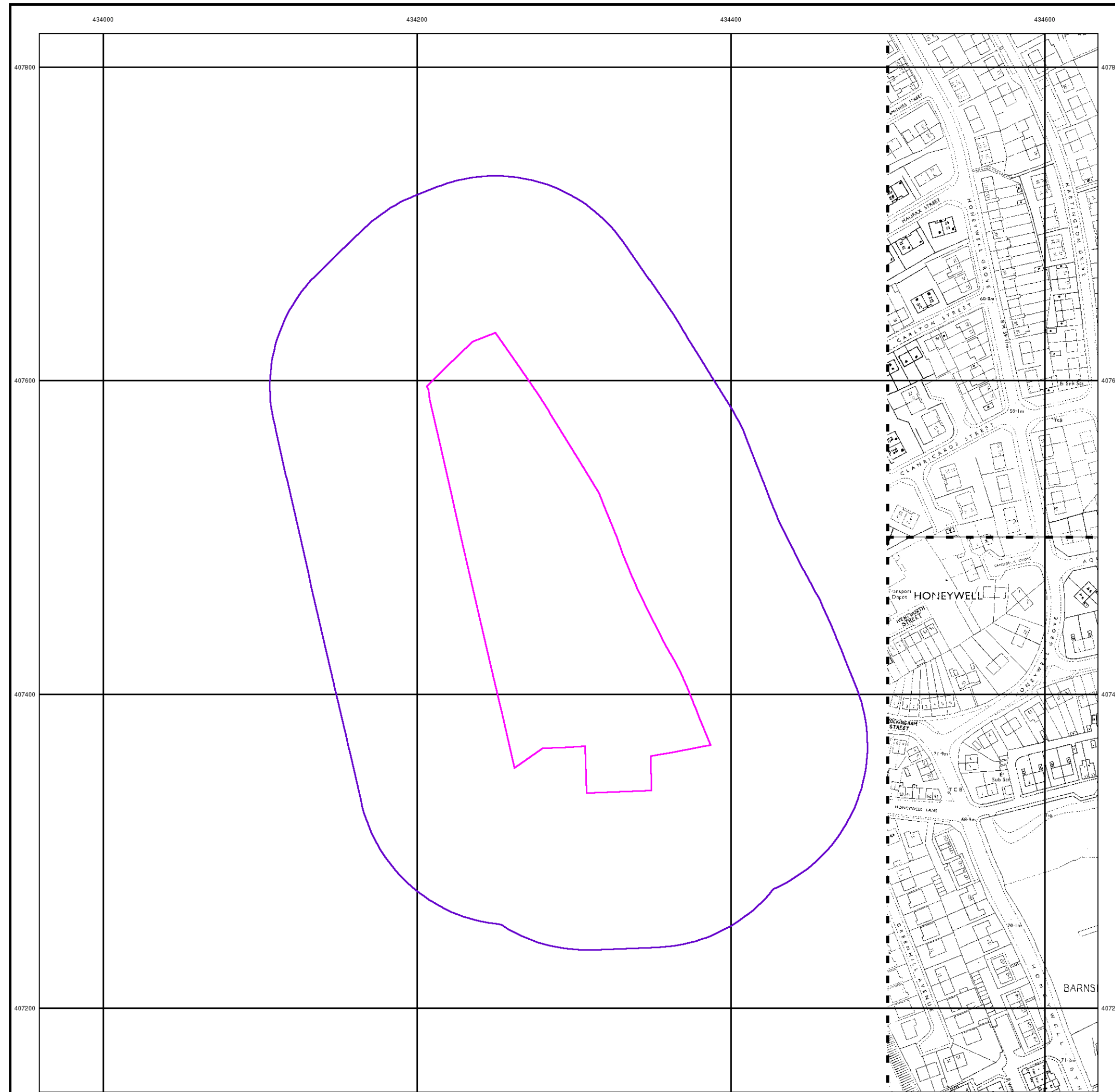
Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW





© Crown copyright and Landmark Information Group Limited 2015. All Rights Reserved.

0 100 m



Additional SIMs

Published 1982 - 1991

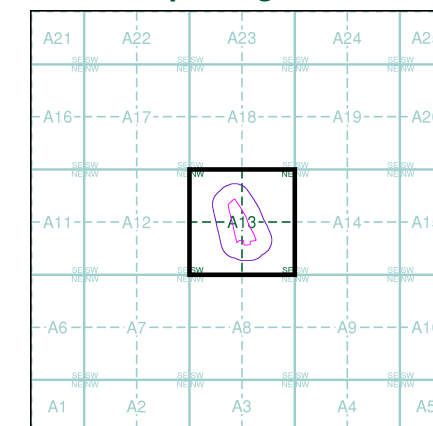
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SE3407NE
1991
1:1,250
SE3407SE
1982
1:1,250

Historical Map - Segment A13



Order Details

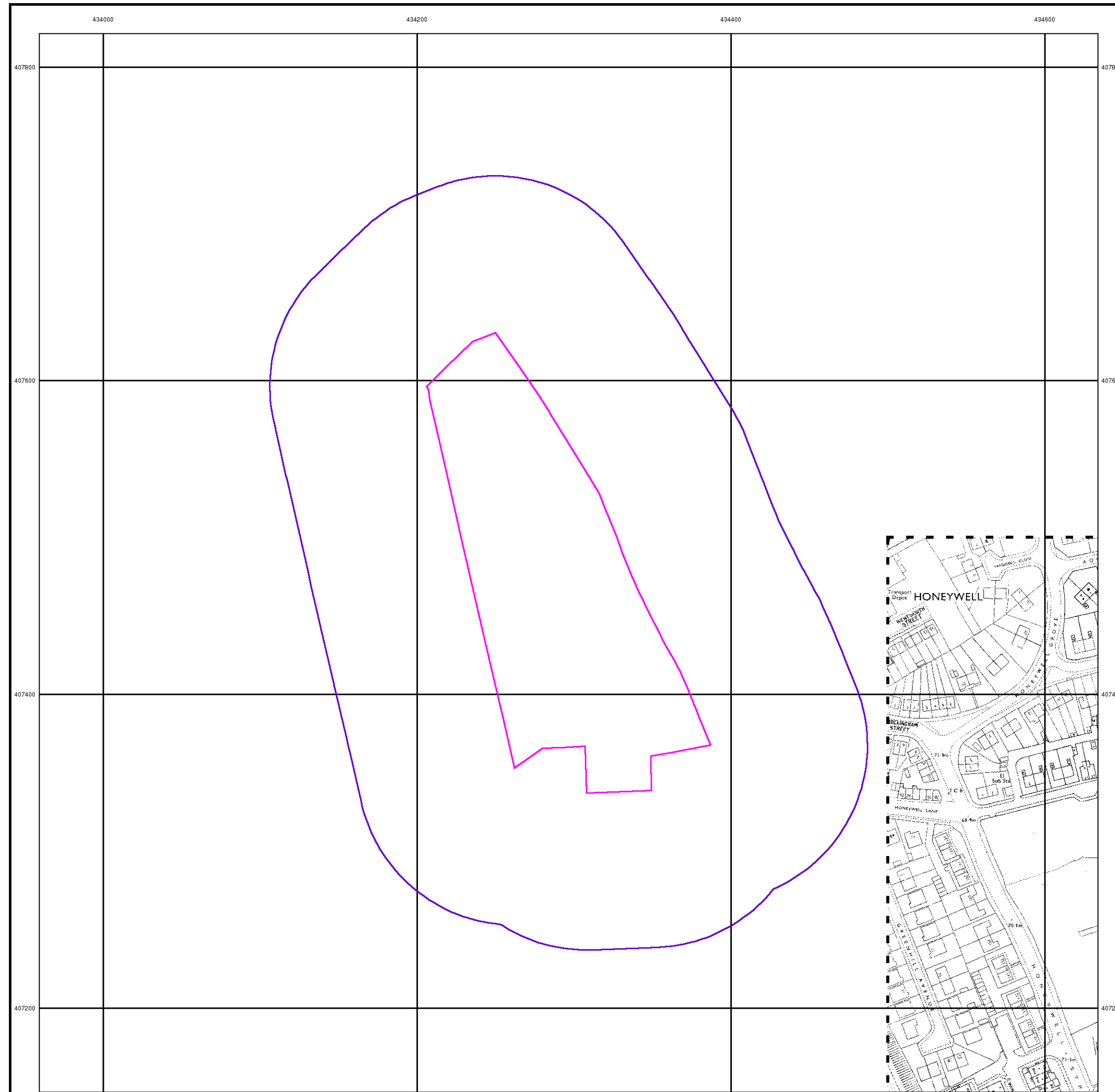
Order Number: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSEY, South Yorkshire, S75 1BW



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



© Crown copyright and Landmark Information Group Limited 2015. All Rights Reserved.



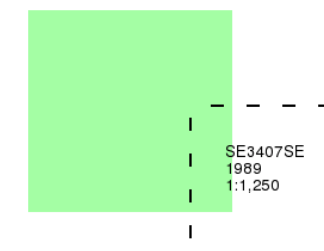
Additional SIMs

Published 1989

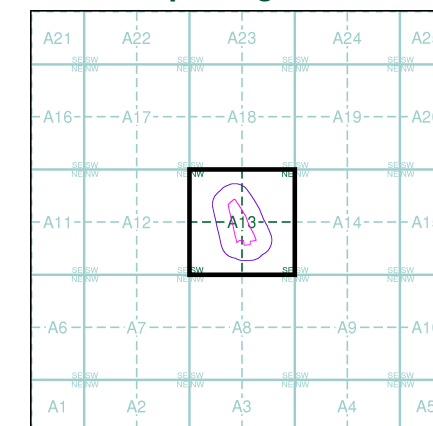
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



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

Large-Scale National Grid Data

Published 1993

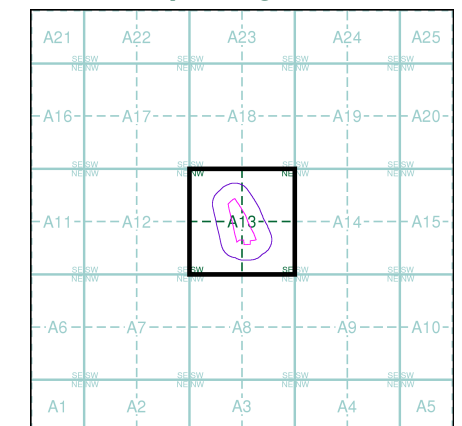
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SE3307NE 1993 1:1,250	SE3407NW 1993 1:1,250	SE3407NE 1993 1:1,250
SE3307SE 1993 1:1,250	SE3407SW 1993 1:1,250	SE3407SE 1993 1:1,250

Historical Map - Segment A13

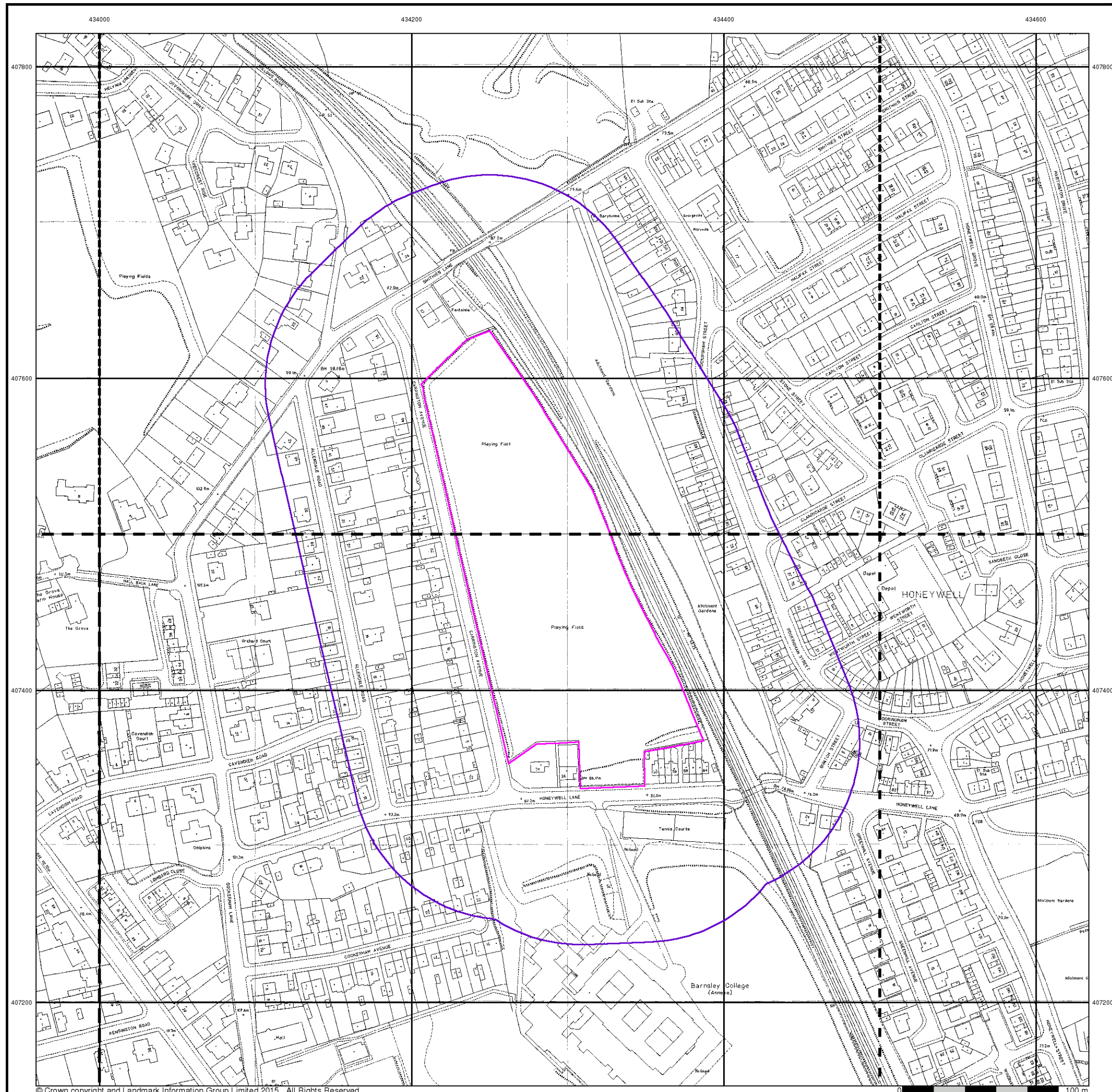


Order Details

Order Number: 71383443_1_1
 Customer Ref: 38903/PR
 National Grid Reference: 434290, 407480
 Slice: A
 Site Area (Ha): 2.62
 Search Buffer (m): 100

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



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
	Bracken		Heath
	Marsh		Reeds
	Building		Glasshouse
	Sloping Masonry		Pylon
	Cutting		Embankment
	Road Under		Road Over
	Level Crossing		Foot Bridge
	Standard Gauge Multiple Track		Standard Gauge Single Track
	Siding, Tramway or Mineral Line		Narrow Gauge
	Geographical County		Administrative County, County Borough or County of City
	Municipal Borough, Urban or Rural District, Burgh or District Council		Borough, Burgh or County Constituency
	Civil Parish		
	BP, BS Boundary Post or Stone		Police Station
	Church		Post Office
	Club House		Public Convenience
	Fire Engine Station		Public House
	Foot Bridge		Signal Box
	Fountain		Spring
	Guide Post		Telephone Call Box
	Mile Post		Telephone Call Post
	Mile Stone		Well

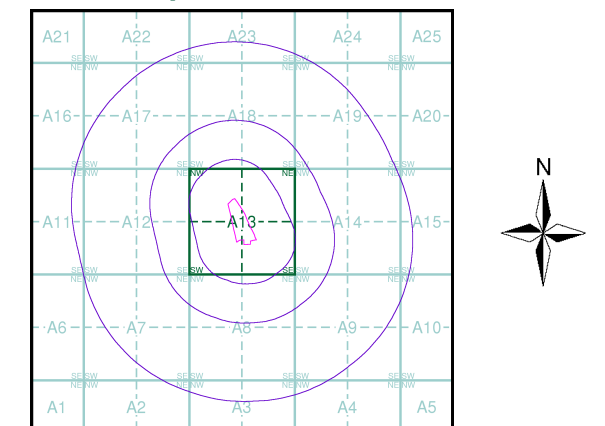
1:10,000 Raster Mapping

	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
	Mean high water (springs)		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
Yorkshire	1:10,560	1855	2
Yorkshire	1:10,560	1894	3
Yorkshire	1:10,560	1907	4
Yorkshire	1:10,560	1932	5
Yorkshire	1:10,560	1938	6
Yorkshire	1:10,560	1948	7
Ordnance Survey Plan	1:10,000	1955 - 1956	8
Ordnance Survey Plan	1:10,000	1966	9
Ordnance Survey Plan	1:10,000	1973 - 1974	10
Ordnance Survey Plan	1:10,000	1983 - 1984	11
Ordnance Survey Plan	1:10,000	1993	12
10K Raster Mapping	1:10,000	2006	13
VectorMap Local	1:10,000	2015	14

Historical Map - Slice A

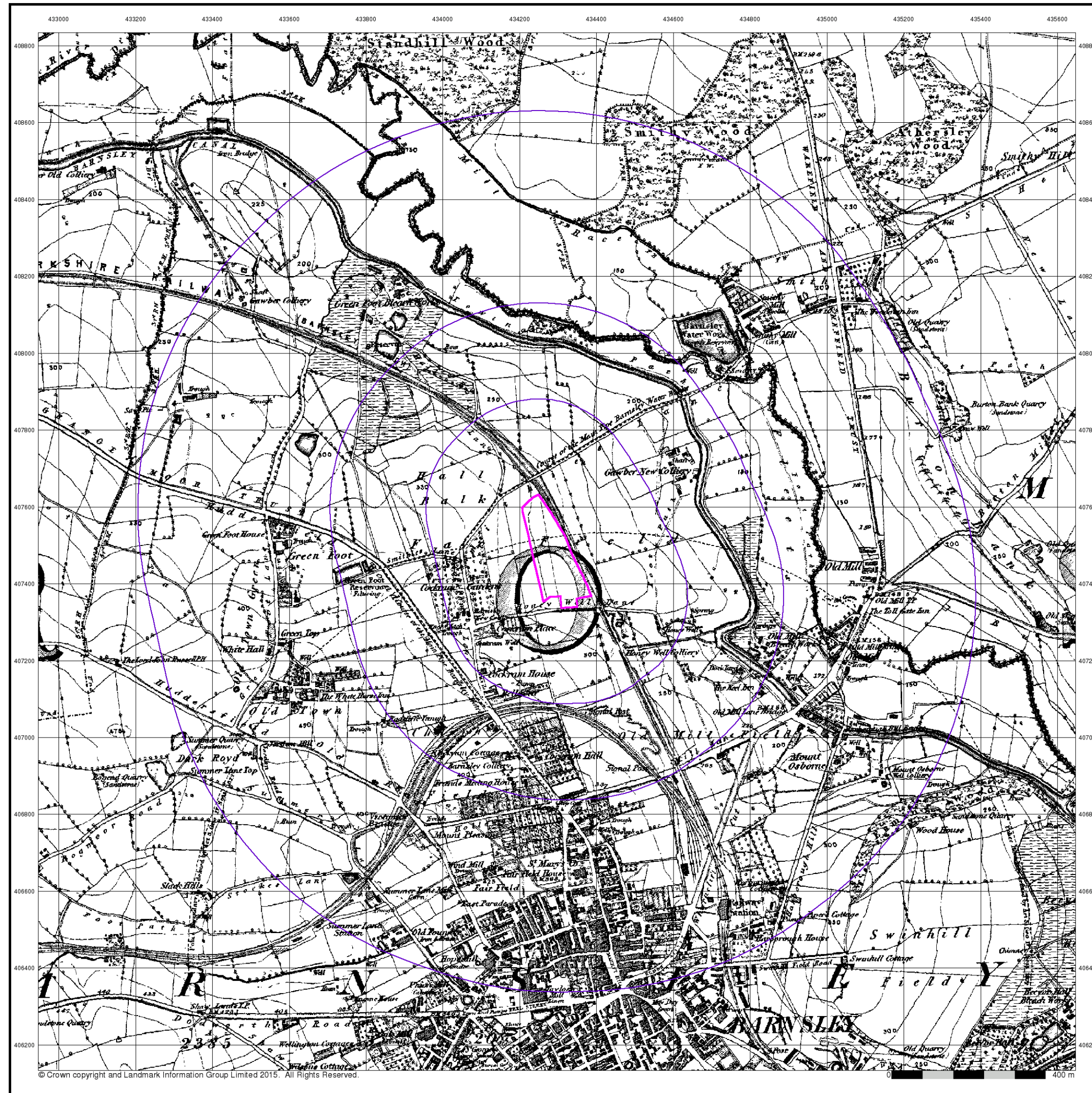


Order Details

Order Number: 71383443_1_1
Customer Ref: 38903/PR
National Grid Reference: 434290, 407480
Slice: A
Site Area (Ha): 2.62
Search Buffer (m): 1000

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW



© Crown copyright and Landmark Information Group Limited 2015. All Rights Reserved.



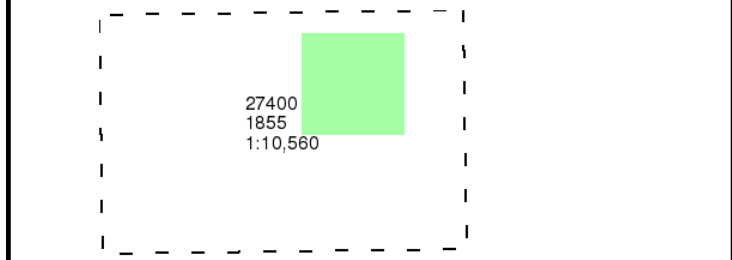
Yorkshire

Published 1855

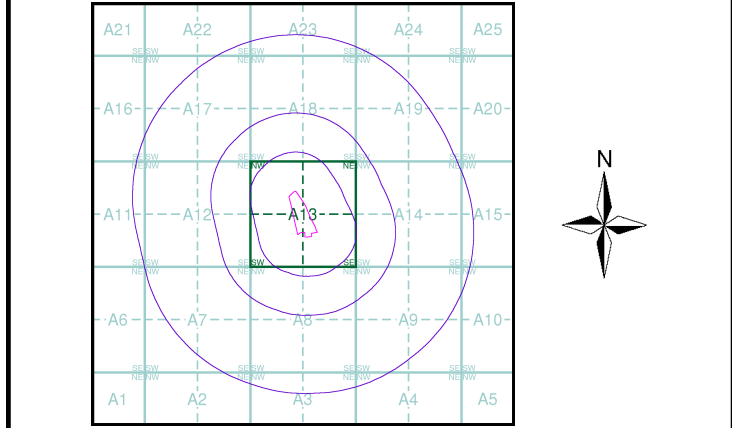
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details	
Order Number:	71383443_1_1
Customer Ref:	38903/PR
National Grid Reference:	434290, 407480
Slice:	A
Site Area (Ha):	2.62
Search Buffer (m):	1000

Site Details

Land off Honeywell Lane, BARNSELY, South Yorkshire, S75 1BW

