

COMBINED STAGE 1/STAGE 2

GEO-ENVIRONMENTAL REPORT

AT

WEST HOUSE, OXFORD ROAD

GOMERSAL

ON BEHALF OF

EMPIRE REAL ESTATE

DEVELOPMENT LIMITED

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1.0 EXECUTIVE SUMMARY

The pertinent conclusions of the report are tabulated below. However, the information below is not exhaustive, and it is recommended the report is read in its entirety.

Proposed Development	Residential dwellings with private gardens.
Existing Site Description	Occupied by a large house, West House, in the northwest of the site surrounded by extensive gardens. Clusters of trees in the west and around boundaries. Site is generally flat lying, sloping gently towards the northeast.
Site History	The site has been occupied by West House since circa 1854 with access via a track east west across the site.
Geology	Published mapping shows no superficial deposits to be present. Bedrock comprises the Lepton Edge Rock – Sandstone.
Coal Mining	Site can be considered stable.
Hydrogeology	Site underlain by "Secondary A" Aquifer. No active abstractions within 1km.
Hydrology	Nearest watercourse is Spen Beck, at approximately 150m to the east. No active abstractions within 1km. Not at risk of river flooding.
Radon	Site is located in an area where 3-5% of houses require radon protection. Basic radon protection measures are required.
Landfill Gas	There are no landfills within 250m of the site. Therefore, negligible risk of landfill gas on site.
Ground Conditions	Up to 1.3m of made ground localised to the northeast of the site, overlying stiff to very stiff superficial clay. The remainder being natural topsoil overlying stiff to very stiff superficial clay or sand/sandstone.
Contamination	Elevated arsenic in made ground and elevated arsenic and PAHs in topsoil.
Remediation Strategy	Removal of hotspots and a 600mm cover system in areas of made ground or retention below hard areas.

Foundations	Strips footings within the underlying superficial clays or sandstone bedrock in the southeast of the site. Tree survey recommended where founded in clays.
Excavations	Excavations should be readily achieved using conventional hydraulic plant. However, excavations into intact sandstone bedrock likely to require a hydraulic breaker. Natural strata will remain stable in the short term, requiring minimal trench support, but instability may be anticipated within the made ground.
Concrete	GEN 1 designation for unreinforced foundations. For any reinforced concrete, other design-specific mixes will apply.
Soakaways	Infiltration rates show the use of soakaways is not considered to be viable on the site.
Road Pavement	A design CBR value of 3-5% is considered applicable on the natural clay.

2.0 TERMS OF REFERENCE

2.1 Empire Real Estate Development Limited is considering developing the grounds of West House, Oxford Road, Gomersal with nine detached residential properties. It was considered appropriate to implement a desk study and ground investigation to provide information to aid the planning process, viability assessment, and design of any subsequent development.

2.2 ARP Geotechnical Ltd was appointed by Empire Real Estate Development Limited to carry out the investigation, which involved a desk study assessment of the geological and coal mining aspects, Ordnance Survey archive maps, radon gas, indicative flood risk, hydrogeology, landfill, and other environmental issues, primarily by assessment of a Landmark Envirocheck Report. This was supplemented by an intrusive investigation to assess the ground conditions.

2.3 The investigation was implemented generally in accordance with BS 5930:2015 +A1:2020 "Code of practice for site investigations", NHBC Standard Chapter 4.1 "Land quality - managing ground conditions", Environment Agency LCRM "Land Contamination Risk Management" and BS10175 : 2011 + A2 : 2017 "Investigation of potentially contaminated sites - Code of practice". This report is limited to the data obtained as part of this investigation. It should be noted that there is a possibility of variation in ground conditions between test locations and interpretation of strata is given for guidance only. No liability is accepted for changes to site conditions, including groundwater levels, after the preparation of this report.

2.4 The general observation and assessment of the ground surface, and the identification/classification of vegetation is made in general terms only. It would be prudent for a specialist to undertake a more detailed survey, including for any invasive/harmful weeds.

2.5 The assessment of any topsoil is carried out in terms of potential chemical effects on human health only, and no account is taken of aesthetic or horticultural properties. Such considerations should be referred to a horticulturist or landscape architect.

2.6 The report has been prepared for the use and reliance of the Client only. The report shall not be relied upon or transferred to any other parties without the written agreement of ARP Geotechnical Ltd. For the avoidance of any doubt, where ARP Geotechnical Ltd enters into a letter of reliance for the benefit of a third party, that third party will be permitted to rely on the report. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party without ARP Geotechnical Ltd.'s consent.

2.7 Attention is drawn to the requirements of the Construction Design and Management Regulations 2015, and in particular the duties and obligation of the Client.

2.8 The report refers to, and includes, a copy of an indicative proposed layout. This is only for the purposes of generating a conceptual site model for the contamination risk assessment. Unless the proposed layout changes significantly, such that the conceptual model and risk assessment is affected, there is no requirement to re-issue this report when the layout is revised.

3.0 SITE DESCRIPTION

Site Location

3.1 The site, which is centred on Ordnance Survey Grid Reference 420478, 426893, is located off Oxford Road in Gomersall, Bradford.

3.2 A site location plan and aerial photograph are presented in Appendix A.

3.3 A walkover survey was conducted on 27th March 2024. Details obtained from the walkover are discussed below.

3.4 The site has overall dimensions of approximately 230m (north - south) by 180m (east - west).

3.5 Plans and publicly available aerial and street view photographs have been assessed. These show the site is currently occupied by a large house in the northwest of the site surrounded by extensive gardens. Clusters of trees in the west and around boundaries.

On-Site Features

3.6 The site is a roughly square parcel of Land. The site surfaced with grassed open space, part of the large garden that belongs to West House. The site is bound on all sides by residential areas, Oxford Road runs along the eastern boundary with Latham Lane along the western boundary. To the north and south of the site are residential properties with associated gardens. The site slopes gently towards the northeast, with levels ranging between approximately 150m A.O.D to 145m A.O.D. A general view of the site, looking southwest, is presented below.



Site Boundaries and Surrounding Land Use

3.7 The site is tree lined around its perimeter and bounded by Oxford Road to the east, Latham Lane to the west and residential properties to the north and south.

Site History

3.8 Ordnance Survey archive maps were obtained for the site. Copies of the maps are included in Appendix B, and a summary of the findings is given below.

Map Date	On-Site	Off-Site
1854	The site was occupied by West House in the northwest corner access from Oxford Road via a track east west across the site. Comprises of the main house and several small outbuildings. Clusters of trees in the west and scattered trees across the centre and east of the site. The south of the site appears open with a tree lined boundary.	The site was surrounded by Oxford Road to the east and Latham Lane to the west. Several residential houses set in grounds were shown to be present surrounding site along with agricultural field parcels. Manor Field Colliery was shown to be present 30m to the southeast. A coal pit was located approximately 80m to the north of the site. Several coal pits were located between 250m and 500m of the site to the northeast and west.

1893-1894	No significant changes. A lodge was shown to be present in the east of the site.	Gomersall Main Colliery was shown approximately 80m to the north of the site. Manor Field Colliery was shown to be present 30m to the southeast. Springfield House and grounds was shown adjacent to the north of the site with expansion of residential development 100m to the southeast. Gomersall Mill was shown to be located approximately 650m to the south.
1907-1908	No significant change.	Gomersall Main Colliery to the north no longer shown to the be present, now occupied by soil heaps. Gomersal tunnel with air shaft shown to be located approximately 110m to the south running east to west. An unidentified mound is located across the tunnel line.
1922	No significant change.	Old shaft is located at the former Gomersall Main Colliery to the north. Ventnor Iron Works was shown to be present approximately 150m to the east.
1938	No significant change.	Ventnor Iron Works now shown to be an engineering works.
1956-1957	No significant change.	Ventnor engineering works expansion to the west adjacent to Knowles Lane.
2000-2024	No significant change.	Ventnor engineering works no longer shown to be present (2000). Gomersal Mill 650m to the south no longer shown to be present with residential properties across its former location.

3.9 In summary, there is no indication of any potentially contaminating use of the site. However, there is the possibility that contamination may be present in any fill material used on the development which has remained larger as the preset day since earliest mapping dating back to 1893.

4.0 ENVIRONMENTAL SETTING

Geology

4.1 Extracts from the British Geological Survey 1:50,000 Series Geology Maps are included within the Envirocheck Geology Report in Appendix C. The maps show the site to be underlain by the Lepton Edge Rock Sandstone. No superficial deposits are shown to be present.

4.2 The maps do not indicate any potential for the site to be adversely affected by any faults.

Coal Mining

4.3 A CON29M Coal Mining Report was obtained from Terrafirma. A copy of the report is included in Appendix D, and a summary is given below.

4.4 The site is in the likely zone of influence of workings in two seams of coal at 85m to 148m depth, and last worked in 1969. The site is not within the zone of influence of any recorded shallow (less than 30m depth) underground coal workings. There are no coal seams known to be present at shallow depth beneath the site that could have been worked (i.e. the site is not within the zone of influence of any potential unrecorded underground coal workings).

4.5 The site is not affected by any past, present, or future proposed underground coal mining. The report refers to reserves in the locality that could be worked at some time in the future. However, given the effective abandonment of the coalfields in this area, any future workings are considered highly unlikely.

4.6 There are no recorded mine entries on or within 20m of the site.

4.7 The site is unaffected by any past, present, or future proposed, opencast coal mining.

4.8 In view of the above, the site is considered stable with regard to coal mining.

Coal Recovery

4.9 There are no seams beneath the site at depths which could be worked by open excavation. There will be no significant arisings of coal during proposed development works, and it will not be possible to win any coal from the site before development.

Hydrogeology

4.10 The Landmark Envirocheck Report, included in Appendix E, indicates the Bedrock Aquifer Designation to be "Secondary A" Aquifer. These Aquifers comprise "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".

4.11 There are two groundwater abstractions within 1km of the site. Both are for Gomersal Mills located 650m to the south of the site. The permit end date is not supplied but current mapping shows the mill to no longer be present with residential properties now in its place. It is therefore assumed this abstraction is no longer active.

4.12 The site is not within a groundwater Source Protection Zone.

Hydrology

4.13 The general area slopes to the east. A pond is present on site. The nearest downslope surface water is a Spen Beck, at approximately 150m to the east of the site.

4.14 The site is not in an area at risk from river flooding. The risks of flooding from other causes such as adverse topography or insufficient surface water drainage, are not considered here. If such risk needs to be quantified, a separate specialist Flood Risk and Drainage Report should be commissioned, if not already available. BGS data indicates the general area has "limited for groundwater flooding to occur" with the far northeast of the site of property has "potential for groundwater flooding to occur" situated below ground level (i.e. basements or similar).

4.15 There are no surface water abstractions within 1km down gradient of the site.

Other Environmental Data

4.16 The Landmark Envirocheck Report, included in Appendix E, contains information on numerous environmental aspects. A summary of the pertinent findings, not already covered, with additional comments, is given below.

4.16.1 There are no Pollution Control Authorisations within 500m of the site.

4.16.2 There is one discharge consent relating to Yorkshire Water Services Limited sewerage network, located 19m to the north of the site, discharging into a tributary Nutter Beck.

4.16.3 There are no closed or currently licenced landfills within 500m of the site. There is one historical landfill site located 384m to the southwest of the site associated with the dismantled Cleckheaton railway. Associated waste included Inert and Commercial Waste with first input on 1st January 1976 and a last input date of 31st December 1990.

4.16.4 The property is an Intermediate probability radon area (3 to 5% of homes are estimated to be at or above the Action Level). Basic radon protective measures are necessary for new dwellings or extensions on the site.

4.16.5 There are no contemporary trade directory entries relating to any activities which could have significant impact on the site.

4.16 .6 There are no fuel station entries within 250m of the site.

5.0 PRELIMINARY RISK ASSESSMENT AND CONCEPTUAL MODEL

5.1 Part II A of the Environmental Protection Act (EPA) 1990 became effective from 1st April 2000. The Regime was introduced by the Contaminated Land (England) Regulations 2000 (SI 2000, No. 227) along with the associated DEFRA Circular February 2000.

5.2 Section 78A (2) of the Act defines "Contaminated land is any land ……. in such a condition, by reason of substances in, on or under that 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 caused, or there is a significant possibility of such pollution being caused".

From S78A (4) "Harm" : means harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property.

Controlled waters are defined as "..the waters in any relevant lake or pond, or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata". From the 1st October 2004, the definition of groundwater in relation to Part IIA was amended, by the Second Water Act Commencement Order SI 2004 No 2528. This makes clear that "ground waters" does not include waters above the saturation zone, i.e. does not include any soil water and pore water present in the unsaturated zone.

5.3 The objectives of the regime are to ensure that risks associated with contaminated land are reduced to an acceptable level, having regard to the costs of doing so. The costs should be proportionate, manageable and economically sustainable.

5.4 In assessing risk, it is necessary to consider the probability, or frequency, of occurrence of the hazard and the magnitude/seriousness of the consequences. Consequently, for land to be classified as contaminated, it must have, or be very likely to have, a detrimental effect on humans or the environment before it can be classified as contaminated land.

5.5 In establishing risk, the concept of the pollutant source/pathway/receptor linkage model, based on current and proposed site use, is to be considered. Therefore for a site to be deemed contaminated under the Regime, all three linkages must be in place i.e. the site must not only contain harmful substances, but the substances must have a pathway by which to leak out and cause significant harm to a receptor.

5.6 The Environment Agency has published guidance on contaminated land, in the form of online documents referred to as LCRM "Land Contamination Risk Management". The documents are intended to provide the technical framework for structured decision making about land contamination, and to assist all those involved in "managing" the land, in particular landowners, developers, financial service providers, planners and regulators. As the documents currently provide the framework for best practice, the general principles are, therefore, followed in conducting the assessment below.

5.7 The categorisations of risk adopted in this report are adapted from CIRIA Report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice, 2001). This approach assesses the potential severity of any pollution event and the probability of the event occurring, to arrive at a risk category, for the various potential source - pathway - receptor linkages. The relevant tables used, with the definitions, are presented in Appendix F.

Conceptual Site Model

5.8 It is known that the site is proposed for further residential development. An indicative proposed site layout is included in Appendix G. The site is shown to be underlain by the Lepton Edge Rock Sandstone. The solid strata beneath the site are designated a Secondary A Aquifer, superficial deposits are absent. There are no groundwater abstractions within 500m of the site.

The nearest surface water is approximately 150m to the north. There are no surface water abstractions within 1km downstream of the site.

5.9 The site has been occupied by West House since earliest mapping dated 1954. The most likely contamination sources are considered to be:

5.9.1 Possible made ground: – metals inorganics, total petroleum hydrocarbons (TPH), polyaromatic hydrocarbons (PAH), phenol, asbestos.

5.9.2 Possible asbestos within existing buildings.

5.10 The conceptual model needs to consider sources of contamination, pathways along which contaminants could migrate and the receptors, which may become exposed. Guidance published by the Environment Agency has been consulted with regard to pathways and receptors. The potential sources, pathways, and receptors, applicable to the proposed development are identified on the table below. Any pathways in italics are deemed not to be viable, and the reason given.

Potential Source - Pathway - Receptor Matrix (Finished Development)

Contamination Sources	Pathways	Receptors	Severity of Consequence	Probability of Event	Risk
Possible localised made ground: - metals, inorganics, TPH, PAH, phenol, asbestos.	• Inhalation, ingestion and dermal contact with soil and dust	**Humans:-** • Future occupants • Maintenance workers • Adjacent residents and general public	**Medium**	**Low Likelihood**	**Moderate/ Low**
	• Fruit and vegetable intake, with soil	**Humans (as above)**	**Medium**	**Low Likelihood**	**Moderate/ Low**
	• Vapour inhalation outdoor	**Humans (as above)**	**Medium**	**Low Likelihood**	**Moderate/ Low**
	• Vapour inhalation indoor	**Humans (as above)**	**Medium**	**Low Likelihood**	**Moderate/ Low**
	• Migration in surface water	• Surface water (nearest downslope is Spen Beck, at approximately 150m to the east of the site. There are no abstractions within 1km)	**Mild**	**Low Likelihood**	**Low**
	• Migration in groundwater	• Groundwater (Secondary A Aquifer, no abstractions within 1km)	**Mild**	**Unlikely**	**Very Low**
	• Root uptake	**Vegetation:-** • Landscape areas • Private gardens	**Medium**	**Low Likelihood**	**Moderate/ Low**
	• Migration	**Services/Utilities:-** • Potable water supply	**Medium**	**Low Likelihood**	**Moderate/ Low**
Possible asbestos within made ground	• Inhalation	• Future occupants • Maintenance workers • Adjacent residents and general public	**Severe**	**Low Likelihood**	**Moderate**

5.11 The above matrix indicates there are several potential source – pathway – receptor linkages applicable to the proposed development, ranging from moderate/Low to Low risk.

5.12 The assessment was used to inform the design of the subsequent ground investigation. To fully characterise the site, in accordance with BS10175 : 2011 + A2 : 2017 "Investigation of potentially contaminated sites - Code of practice", and to address the above concerns, it was decided that, in addition to geotechnical information required, the site investigation should include:

5.12.1 Trial pit excavations on a grid basis, preferably 25m spacing, or where targeting specific site areas where preferable.

5.12.2 Samples of the made ground issued for testing for a broad suite of determinands, including metals, inorganics, asbestos, phenols, speciated PAH, and TPH.

5.12.3 Upon receipt of contamination test results, any elevated TPH would be speciated to allow further risk assessment, and leachability testing undertaken on all elevated determinands, to give indication of mobility.

6.0 SITE INVESTIGATION

6.1 A site investigation was undertaken by ARP Geotechnical Ltd on 27th March 2024. The purpose of the investigation was to produce an assessment of the site in accordance with BS10175 : 2011 + A2 : 2017 "Investigation of potentially contaminated sites - Code of practice", and to provide geotechnical information to aid design of the development.

6.2 Trial pits targeted proposed garden areas, and three were requested by the drainage engineer to have soakaway tests undertaken. Eight trial pits (TP01 to TP08) and one hand pit (HP01) were excavated, to depths of between 0.4m and 1.9m. The trial pits were organised, supervised and logged by an Engineer from ARP Geotechnical Ltd.

LOCATION	REASON
HP01, TP1 – TP7	Targeting proposed garden areas.
TP1, 7,8	Soak Away Location.

6.3 The trial pit logs are included in Appendix H, along with the location plan. It should be noted that the co-ordinates on the logs have not been surveyed in, but determined by the grid referencing software (which incorporates mapping) following positioning of each location by the Engineer. However, each position has been located using smartphone GPS, with an indicated accuracy of 2m to 3m at the time of the investigation.

6.4 Chemical analysis of 8No. soil samples for metals, inorganics, speciated PAH, TPH, phenols, and asbestos was undertaken by the UKAS accredited Eurofins Chemtest Laboratory in Cambridge. The test certificates are included in Appendix I.

6.5 Analysis for Atterberg Limits and moisture content was undertaken by the UKAS accredited Professional Soils Laboratory (PSL) in Doncaster. Geochemical testing comprising pH and water-soluble sulphate was undertaken by UKAS accredited Eurofins Chemtest Laboratory in Cambridge. The test certificates are included in Appendix I.

6.6 Percolation tests were carried out in TP1, TP7 and TP8. The test readings, curves and calculations are included in Appendix J.

7.0 SUMMARY OF GROUND CONDITIONS

Strata and Groundwater

7.1 The ground investigation encountered topsoil across the site, from surface, to depths of 0.3m. This topsoil had been reworked in TP01 and TP03 as it was situated above made ground. In the northern end of the site localised made ground was identified in TP01 and TP03 to depths of 1.30m and 0.70m respectively. The made ground encountered consisted of two distinct materials. The material in the upper horizon comprised firm yellowish brown, grey mottled slightly sandy clay at 0.15m to 0.3m thick. With the lower horizon comprising dark brown and grey sandy platy gravel and cobbles of shale and shaley mudstone with rare subangular clinker, between 0.7m and 0.25 m thick in TP1 and TP3 respectively.

7.2 In the northern end of the site the made ground or topsoil was underlain, to the base of the trial pit, by cohesive residual soils. The cohesive deposits were recorded as stiff becoming very stiff yellowish brown / grey mottled slightly sandy to sandy clay. Shear strength readings of between 95KN/m^2 and 110KN/m^2 were recorded within the clay indicating high strength soils.

7.3 Towards the southwestern end of the site granular residual soils consisting of gravelly clayey sand was identified to at least 0.4m in HP01 and to 0.6m in TP07. Intact bedrock was encountered in TP06 and TP07 proven to the base of each excavation. This was recovered as angular to subangular, fine to coarse gravel and cobbles of sandstone.

7.4 Groundwater was only encountered in TP05, described as slow localised ingress, at a depth of 1.3m bgl. All trial pits were backfilled and compacted with arisings upon completion.

Percolation Testing

7.5 Percolation testing was implemented in TP01, TP07 and TP08 using a 1,500 gallon tractor towed water bowser to discharge water quickly into each pit. The intention was to monitor the water levels for a period until either the level had fallen to below 25% of the maximum filled

level, or the end of the working day had been reached. If time permitted, a further two tests were to be carried out in each pit. In all three pits, single tests were carried out, but there was insufficient time to undertake additional tests due to the slow infiltration rates observed.

7.6 In TP01, TP07, and TP08, one full test was carried out. A table showing the results is provided below with calculation sheets presented in Appendix J.

Location	Water Level Drop (m)/Time (mins)	Infiltration Rate (m/s)
TP01, Test 1	0.04m in 240 minutes	N/A*
TP07, Test 1	0.27m in 300 minutes	$5.86x10^{-6}$
TP08, Test 1	0.31m in 270 minutes	N/A*

*Infiltration rates too slow to be calculated

7.7 In the light of the results, disposal of surface water using soakaway pits is not considered to be viable on the site.

8.0 CONTAMINATION ASSESSMENT

Screening Values - Soils

8.1 There is presently conflicting opinion with regard to the appropriate generic assessment criteria, or screening values, for soils which should be used in contamination assessment for proposed development. In March 2014, DEFRA published Category 4 Screening Levels (C4SLs) for six contaminants: arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead. The values are based on the toxicological benchmark of a "low level of toxicological concern" (LLTC) rather than the previous regulatory approach of "minimal or tolerable level of risk". As the C4SLs are less protective of health than the previous approach, the Chartered Institute of Environmental Health (CIEH) has advocated an alternative approach based on minimal risk, but with some adjustment of exposure parameters to more realistic scenarios than those previously used. To this end, the CIEH has collaborated with Land Quality Management to publish "Suitable 4 Use Levels" (S4ULs) "The LQM/CIEH S4ULs for Human Health Risk Assessment", November 2014 (LQM/CIEH). However, DEFRA has reiterated its intention that the C4SLs should be used in generic risk assessment for proposed development, and there is indication that other parties will collaborate, in the near future, to extend the range of C4SL determinands beyond the six published so far.

8.2 In the absence of a final resolution to the issue, soil contamination test results in this report have been compared first against the more conservative S4UL, and where a C4SL exists for the same determinand, consideration given to the use of the C4SL for any exceedances of the S4UL, within the site specific context (including the use of benzo(a)pyrene as a surrogate marker for genotoxic PAH compounds, where appropriate). Where no S4UL exists for a determinand, for example lead, the C4SL has been used. The LQM/CIEH screening values have been calculated for soil organic matter contents of 1% and 2.5%, as well as 6%, and the appropriate screening value is used for the organic matter content of the soil. All the C4SL values published are for a soil organic matter content of 6%.

8.3 A table showing the screening values utilised is included in Appendix I.

Soils Analysis

8.4 Eight soil samples were issued to the UKAS accredited Eurofins Chemtest Laboratory in Cambridge for a suite of testing (As, Cd, Cr (VI), Cr(III), Cu, Hg, Ni, Pb, Se, Zn, Total Sulphate, Water Soluble Sulphate, pH, Phenol-monohydric, Speciated PAH, Total TPH, Asbestos, and Organic Matter). The testing comprised:

- Five samples of Topsoil from TP01, TP04, TP07 TP08 and HP01
- One sample of underlying clay strata from TP04
- Two samples of Made Ground from TP01 and TP03

8.5 For topsoil, any determinands with exceedances of screening values were subjected to statistical analysis to determine the 95% Upper Confidence Level (UCL). For made ground and natural strata statistical analysis of the results was not possible given the small number of samples obtained, although appropriate for the site circumstances.

Made Ground

8.6 A results summary table for determinands within the made ground found to be above screening values is given below:

Sample Reference	Depth (m)	Arsenic
TP1	0.70	52
Screening Value at 2.5% SOM*		37

All units in mg/kg unless indicated otherwise

Exceedance

Acceptable*

8.7 It can be seen from the table above that arsenic exceeds the screening values for Residential with Home Grown Produce. No asbestos was detected in any samples of the made ground tested.

Topsoil

8.8 A results summary table for determinands within the topsoil found to be above screening values is given below:

Sample Reference	Depth (m)	As	Pb	BbF	BaP	DahA
TP1	0.20	20	110	0.95	0.87	< 0.10
TP4	0.20	39	130	< 0.10	<0.10	< 0.10
TP7	0.10	88	21	0.76	0.65	< 0.10
TP8	0.20	24	88	0.47	0.34	< 0.10
HP1	0.20	29	220	9.8	6.8	1.3
Screening Value at 6% SOM*		37	200	3.7	5.0	0.3
95% UCL		66.5	182.6	6.4	4.5	0.9

* Residential With Home-Grown Produce Screening Values
+ Screening Value exceeds that of 6% SOM recorded in sample
As = Arsenic, Pb = Lead, BbF = benzo(b)flouranthene, BaP = Benzo(a)pyrene, DahA = dibenzo(a,h)anthracene.
All units in mg/kg unless indicated otherwise

Exceedance

Acceptable*

8.9 It can be seen from the table that the 95% UCL concentrations of lead and benzo (a) pyrene are below the screening value, with arsenic 88mg/kg in TP7, and dibenzo(a,h)anthracene 1.3mg/kg in HP1 calculated as being outliers. Concentrations of arsenic, benzo(b)fluoranthene and dibenzo(a,h)anthracene with 95% UCLs of 66.5mg/kg, 6.4mg/kg and 0.9mg/kg respectively, will need to be considered further in the risk assessment, as the 95% UCL concentrations are above the screening value.

8.10 The dataset supports the use of benzo(a)pyrene (BaP) as a surrogate marker. Therefore, the other genotoxic PAH compounds are not considered further individually, in accordance with C4SL guidance. All BaP concentrations were below the respective screening value (residential with home grown produce) with the exception of HP1 at 0.2m. Therefore, remedial measures with respect to PAH compounds in the topsoil will be required in and around the area of HP1. No asbestos fibres were detected.

8.11 The elevated arsenic concentration in TP7 has been calculated to be an outlier, and represents a 'hotspot' area not representative of the rest of the site. Excluding this result from the dataset provides a 95% UCLs value of 37.7mg/kg, slightly exceeding the Screening Value of 37mg/kg. Given the margin of exceedance, no remedial measures with respect to the site outside the hotspot area are considered necessary with regard to arsenic contamination. Further testing around the hotspot found in TP7 or separate stockpiling and testing of topsoil stripped from this area of the site is recommended to better define arsenic concentrations in and around TP7.

Natural Strata

8.12 A results summary table for determinands within the natural underlying clays found to be above screening values is given below:

Sample Reference	Depth (m)	BbF	DahA	B(a)P
TP4	1.0	4.3	0.49	3.5
Screening Value at 6% SOM*		3.7	0.30	3.0

* Residential With Home-Grown Produce Screening Values
+ Screening Value exceeds that of 6% SOM recorded in sample

BbF = benzo(b)flouranthene, DahA = dibenzo(a,h)anthracene.
All units in mg/kg unless indicated otherwise

Exceedance
Acceptable*

8.13 It can be seen from the table above that benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene marginally exceed the S4UL screening values for Residential with Home Grown Produce. The dataset however supports the use of benzo(a)pyrene (BaP) as a surrogate marker (C4SL 5mg/kg). Therefore, the other genotoxic PAH compounds are not considered further individually, in accordance with C4SL guidance. All determinands, including BaP, were below their respective screening values (residential with home grown produce), therefore, no remedial measures will be required with regard to contamination. No asbestos was detected in any samples of the natural soils tested.

Updated Risk Assessment and Conceptual Model

8.14 The updated source – pathway – receptor matrix is presented below, taking into account the findings of the investigation. Any pathways in italics are deemed not to be viable, and the reason given.

Viable Source - Pathway - Receptor Matrix (Finished Development)

Contamination Sources	Pathways	Receptors	Severity of Consequence	Probability of Event	Risk
Topsoil – arsenic (TP7), PAHs (HP1)	• Inhalation, ingestion and dermal contact with soil and dust	**Humans:-** • Future occupants • Maintenance workers • Adjacent residents and general public	**Medium**	**Unlikely**	**Low**
	• Fruit and vegetable intake, with soil	**Humans (as above)**	**Medium**	**Unlikely**	**Low**
	• Vapour inhalation outdoor	**Humans (as above)**	**Medium**	**Unlikely**	**Low**
	• Vapour inhalation indoor	**Humans (as above)**	**Medium**	**Unlikely**	**Low**
	• Migration in surface water	• Surface water (nearest downslope is Spen Beck, at approximately 150m to the east of the site. There are no abstractions within 1km)	**Mild**	**Unlikely**	**Very Low**
	• Migration in groundwater	• Groundwater (Secondary A Aquifer, no abstractions within 1km)	**Mild**	**Unlikely**	**Very Low**
	• Root uptake	**Vegetation:-** • Landscape areas • Private gardens	**Medium**	**Unlikely**	**Low**
	• Migration	**Services/Utilities:-** • Potable water supply	**Medium**	**Unlikely**	**Low**

8.15 It can be seen from the above matrix that several pathways to receptors are operative, with low risk applicable and this may affect users of the finished development. Some form of remedial action is, therefore, considered necessary to allow residential development without excess risk.

Risk Based Assessment of Remedial Options

Topsoil - Ingestion, Dust Inhalation, Dermal Contact, Root Uptake, and Fruit and Vegetable Intake With Soil

8.16 The topsoil is suitable for reuse on the site with the exception of the topsoil in and around TP7 which recorded elevated arsenic concentrations. Further testing around the hotspot found in TP7 or separate stockpiling and testing of topsoil stripped from this area of the site is recommended to better define arsenic concentrations in and around TP7.

8.17 The topsoil in HP1 also recorded elevated lead and benzo (a) pyrene, benzo(b)fluoranthene and dibenzo(a,h)anthracene concentrations. Further testing around HP1 or separate stockpiling and testing of topsoil stripped from this area of the site is recommended to better define PAH concentrations in this area of the site.

Made Ground - Ingestion, Dust Inhalation, Dermal Contact, Root Uptake, and Fruit and Vegetable Intake With Soil

8.18 This pathway is automatically blocked where buildings or hardstanding are present above the material. However, in garden areas, provision of a cover system of a minimum 0.6m thickness will be required, to reduce the risk to future users of the site to acceptable levels from these pathways. This assumes a worst-case double dig scenario (i.e. 2 x spade depths).

8.19 Made ground was recorded in TP1 and TP3 to a maximum depth of 1.3m with rare clinker recorded in the trial pit records.

Migration to Utilities

8.20 Any migration to utilities is unlikely to be significant. However, the local water company are likely to require details of the contaminants present on the site, to make a judgment on any requirement for protection of buried water supply pipes from chemical attack/ingress.

Risks During Construction Period

8.21 It is also necessary to consider the effects of the contamination present on the site in relation to the risks to adjacent residents, construction workers and the general public during construction. This is assessed in the following matrix.

Source	Pathway	Potential risk	Risk after employing suitable Health and Safety plan.
Existing made ground	Inhalation	Low	Damping down of the site during dry periods and timely placement of the existing made ground below barriers should block this pathway and reduce the risk to negligible.
Existing made ground	Ingestion	Low	Site fencing will exclude access to members of the public. Existing made ground will be contained within the site boundary, and placed below barriers as soon as possible. Washing facilities and a clean mess room from which work boots and overalls are excluded should be provided. These measures should block this pathway and reduce the risk to negligible.
Existing made ground	Contact	Low	Education of workers to use adequate hygiene and PPE should block this pathway and reduce the risk to negligible.
Existing made ground	Surface water	Very Low	Preventing surface water run off by minimising open exposure times of the existing made ground, and using bunds or cut off trenches as necessary should block this pathway and reduce the risk to negligible.

8.22 Provision of all the above measures will ensure that all the identified pathways for the contamination will be blocked.

<u>Summary of Contamination Assessment and Remedial Options</u>

8.23 The site is underlain locally by up to 1.3m of made ground in the northeast of the site, overlying stiff to very stiff superficial clay. The remainder being natural topsoil overlying stiff to very stiff residual clay or sand/sandstone. Elevated arsenic was recorded in made ground and elevated arsenic and PAHs recorded in topsoil.

8.24 The contamination risk assessment, and assessment of remedial options, has indicated that, provided that the following remedial measures are adopted then the risks to the identified receptors are deemed acceptable for the proposed development of residential properties with private gardens.

8.25 Topsoil in and around TP7 and HP1 should be stripped and subject to further testing to determine its suitability of reuse. Independent validation inspection will be required, to verify any removal of affected topsoil. If soils are to be disposed of off-site, further waste classification and waste acceptance criteria (WAC) testing may be required. The disposal/transfer documents should be retained for inclusion in the Validation Report.

8.26 Where any garden or landscape areas overlie the existing made ground, a minimum 600mm thickness of uncontaminated soils (topsoil and subsoil) should be provided. In areas of hardstanding or building footprints, the cover system is not required.

8.27 Any imported soils used within the cover system will need to be verified as suitable by inspection and testing, in accordance with guidance supplied in the document produced by the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG): "Guidance on the Verification Requirements for Cover Systems".

8.28 The local water company are likely to require details of the contaminants present on the site, to make a judgment on any requirement for protection of buried water supply pipes from chemical attack/ingress.

9.0 GEOTECHNICAL TESTING

9.1 Selected samples of the natural strata were delivered to PSL in Doncaster for testing with regard to plasticity indices and moisture content. Test certificates are presented in Appendix I and a summary of the results, including Modified Plasticity Indices, is given below.

Location	Depth (m)	MC	LL	PL	PI	<425µm	I'p
TP1	**1.5**	**28**	**61**	**29**	**32**	**98**	**31.4**
TP2	**0.9**	**15**	**45**	**21**	**24**	**98**	**23.5**
TP5	**1**	**17**	**36**	**19**	**17**	**94**	**16.0**
TP8	**0.7**	**25**	**39**	**21**	**18**	**97**	**17.5**
Number of results		4	4	4	4	4	4
Min.		15	36	19	17	94	16
Max.		28	61	29	32	98	31.4

I'p	VCP
>40%	High
20% - <40%	Medium
10% - <20%	Low

MC= Moisture Content (%) LL= Liquid Limit (%) PL= Plastic Limit (%)
PI= Plasticity Index (%) I'p= Modified PI (%) VCP= NHBC Standard Chapter 4.2 Volume Change Potential

9.2 The plasticity test data show clays of intermediate to high plasticity, in accordance with BS 5930:2015 +A1:2020 "Code of Practice for Site Investigations". When the percentage retained on the 425 micron BS sieve is considered, the Modified Plasticity Index, in accordance with NHBC Standard Chapter 4.2 "Building Near Trees" is a maximum of 31.4. In accordance with the Standard, this equates to Medium Volume Change Potential.

9.3 Geochemical testing (water soluble sulphate and pH) was undertaken on selected samples by Eurofins Chemtest Ltd, comprising one sample of natural strata and two samples of made ground. In accordance with the BRE Special Digest 1 "Concrete in aggressive ground", the characteristic values for the two materials are given below:

Characteristic Values

Material	pH	SO_4
Made Ground	8.0	28
Natural Strata	7.0	10

SO_4 = Sulphate content in mg/l on a 2:1 water : soil extract pH = Acidity

9.4 The geochemical analyses show the natural strata to have low water soluble sulphate content and near neutral pH. The Aggressive Chemical Environment for Concrete (ACEC) class is AC-1. Testing on the made ground indicates class AC-1. Therefore, the use of GEN 1 designated concrete will be satisfactory for unreinforced buried concrete, in accordance with BS 8500-1:2015+A2:2019,. For any reinforced buried concrete, other design-specific mixes will apply.

10.0 GEOTECHNICAL ASSESSMENT

Coal Mining and Coal Recovery

10.1 The Coal Mining Report indicates the site is stable with regard to coal mining.

10.2 There will be no significant arisings of coal during proposed development works, and it will not be possible to win any coal from the site before development.

Foundations

10.3 The localised made ground identified in the northwestern end of the site is not considered suitable for support of foundation loads. The underlying natural strata are considered suitable, for the use of strip/trench fill foundations. In the northern end of the site the founding strata is likely to be clay. For foundations on clay an allowable bearing pressure of 90kN/m^2 is considered applicable. Towards the southwestern end of the site the founding stratum is likely to be granular residual soils. For foundations on sand an allowable bearing pressure of 150kN/m^2 is considered applicable. A higher bearing capacity is possible if found on intact bedrock.

10.4 The clays, in the northern end of the site, were shown to be of medium volume change potential. Therefore, in accordance with NHBC Standard Chapter 4.2 "Building Near trees", in the absence of trees, a minimum foundation depth of 0.9m below existing or proposed ground level is applicable, whichever is the lower. However, in the presence of any proposed, existing or removed trees, the foundation may need to be deepened, depending on the type of tree and its distance from the face of the foundation. If not already available, a tree survey may be required to enable a foundation schedule to be prepared. The tree survey will also need to consider trees on third party properties.

10.5 In the southwestern end of the site the founding strata are non-plastic, and, therefore, the minimum foundation depths given in NHBC Standard Chapter 4.2 "Building Near Trees" do not apply. However, to protect against fines washing subsidence in the event of a burst water supply pipe, it is recommended that a foundation depth of 0.9m is adopted in proximity to any such pipes.

10.6 The foundation should be taken below the depth of any existing foundations or obstructions, onto natural ground. The whole plan area of the foundation should be placed on similar natural material. Foundations should be reinforced where it is necessary to transition from suitable granular to suitable cohesive strata within a proposed building footprint.

10.7 If bedrock is encountered on part of a foundation excavation, the rest of the plot should be deepened to ensure founding on similar material. However, if rock is not encountered by 2.5m depth on the remainder of the plot, then the Engineer should be contacted for further advice.

Excavations

10.8 It is likely that excavations into the natural strata will remain stable in the short term, requiring minimal trench support, in accordance with the prevailing statutory guidance. However, instability may be anticipated within the made ground.

10.9 Slight groundwater seepages were recorded in TP5 at 1.3m. Any such encounters should be controllable by pumping from an artificial sump.

10.10 Excavations should be readily achieved using conventional hydraulic plant. However, excavations into intact sandstone bedrock or any buried foundations and structures are likely to require a hydraulic breaker.

Chemical Precautions

10.11 The Aggressive Chemical Environment for Concrete (ACEC) class is AC-1 for both the natural strata and made ground. Therefore, the use of GEN 1 designated concrete will be satisfactory for unreinforced buried concrete, in accordance with BS 8500-1:2015+A2:2019. For any reinforced buried concrete, other design-specific mixes will apply.

Road Pavement Construction

10.12 For any areas of road pavement, including parking areas, the formation will be the underlying cohesive residual soils across the majority of the site with granular residual soils to the southwest. Based on the observed characteristics of the material, and the results of the plasticity testing a design California Bearing Ratio (CBR) value of 3% is considered applicable for the clay, below any obvious soft spots, and at equilibrium moisture content. A higher CBR value would be considered to be applicable for the granular residual soils. If considered necessary, this should be confirmed by testing at proposed subgrade level before construction. Formation of roads on the existing made ground will not be acceptable.

Flooding and Soakaways

10.13 The site is not at risk from river flooding. The risks of flooding from other causes such as adverse topography or insufficient surface water drainage, are not considered here. If such risk needs to be quantified, a separate specialist Flood Risk and Drainage Report should be commissioned, if not already available.

10.14 BGS data indicates the general area has the potential for "limited for groundwater flooding to occur" with the far northeast of the site of property has "potential for groundwater flooding to occur" situated below ground level (i.e. basements or similar).

10.15 In the light of percolation testing carried out on the site, and the calculated infiltration rates, the disposal of surface water using soakaways is not considered to be practical on the site.

Gas Protection

10.16 Basic radon protection measures are required for the site. This is usually achieved by incorporating an appropriate barrier within a solid floor system, and extending the barrier through the cavity wall. Detailed design of protection measures should be undertaken where basements are proposed.

10.17 There are no landfills within 250m of the site. Therefore, there should be no requirement for gas protection within the proposed properties.

APPENDIX A

SITE LOCATION PLAN AND AERIAL PHOTOGRAPH



0m 1500m

Approximate Scale

ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS
Northwest House 5-6 Northwest Business Park Servia Hill · Leeds LS6 2QH
Telephone : 0113 245 8498 Fax : 0113 244 3864 E-Mail : leeds@arpassociates.co.uk

Project
WEST HOUSE, OXFORD ROAD, GOMERSAL

Client
EMPIRE REAL ESTATE DEVELOPMENT LTD

Title
SITE LOCATION PLAN

Date
MARCH 2024

Drawn	Scale
JR	AS SHOWN

Job No.
ERE/01



0m 50m

Approximate Scale

ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS
Northwest House 5-6 Northwest Business Park Servia Hill · Leeds LS6 2QH
Telephone : 0113 245 8498 Fax : 0113 244 3864 E-Mail : leeds@arpassociates.co.uk

Project
WEST HOUSE, OXFORD ROAD, GOMERSAL

Client
EMPIRE REAL ESTATE DEVELOPMENT LTD

Title
AERIAL PHOTOGRAPH

Date
MARCH 2023

Drawn	Scale
JR	AS SHOWN

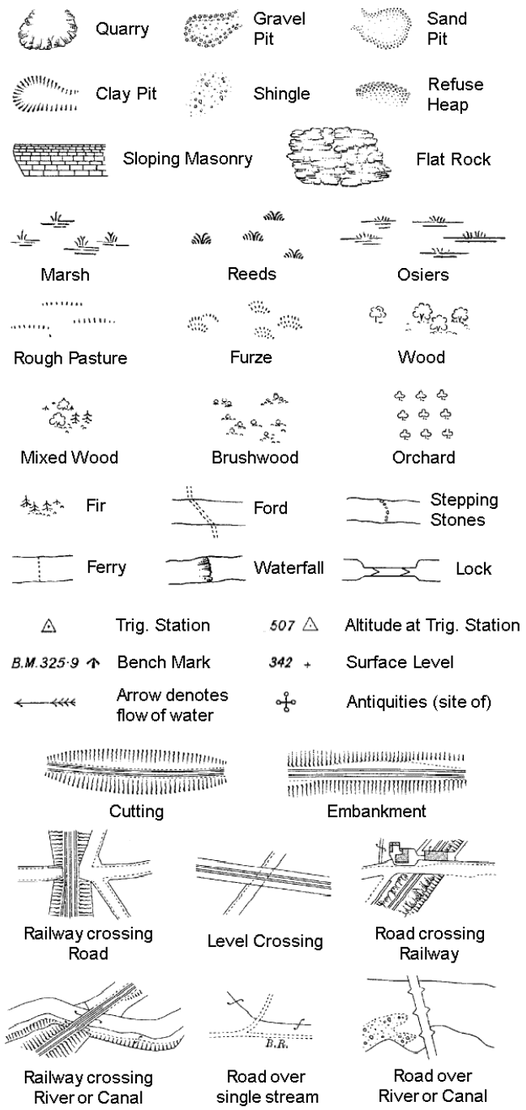
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APPENDIX B

ORDNANCE SURVEY ARCHIVE MAPS

Historical Mapping Legends

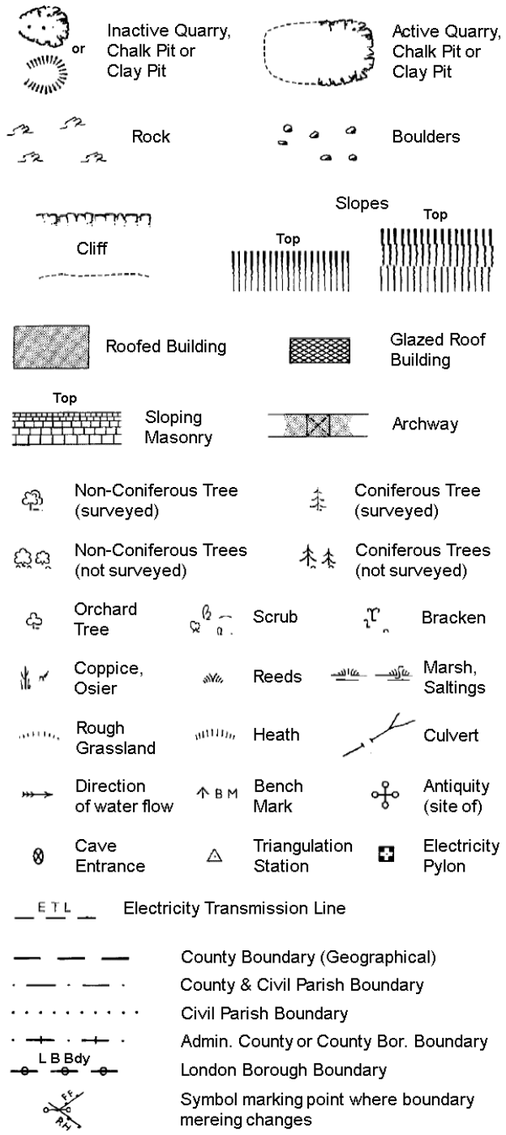
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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

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

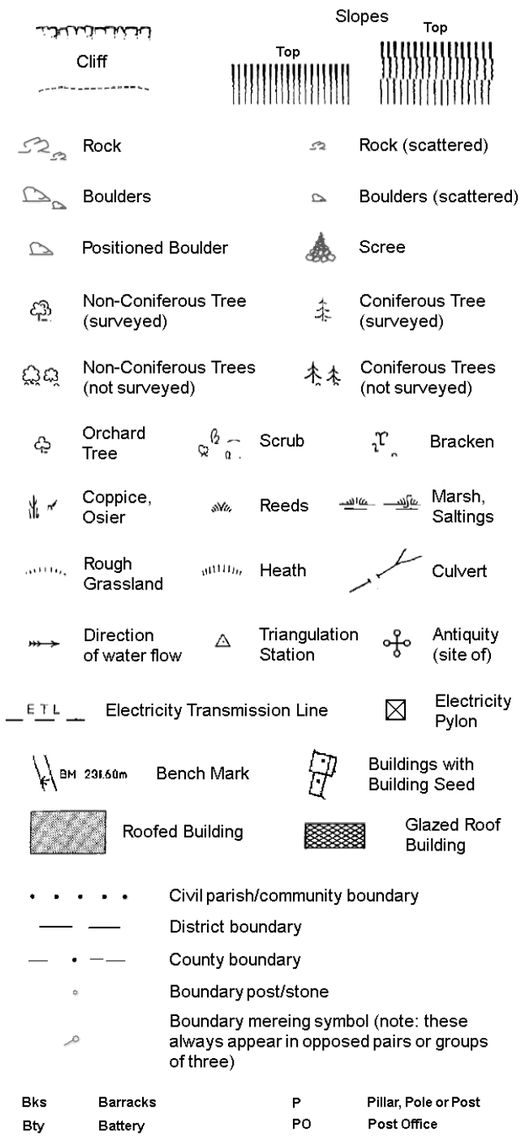
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



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

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

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



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

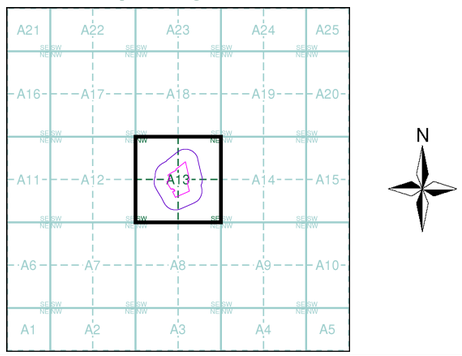
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity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

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:2,500	1893 - 1894	2
Yorkshire	1:2,500	1907 - 1908	3
Yorkshire	1:2,500	1922	4
Yorkshire	1:2,500	1938	5
Ordnance Survey Plan	1:1,250	1956	6
Ordnance Survey Plan	1:2,500	1957	7
Ordnance Survey Plan	1:1,250	1967 - 1972	8
Ordnance Survey Plan	1:2,500	1968 - 1970	9
Ordnance Survey Plan	1:1,250	1973 - 1975	10
Ordnance Survey Plan	1:1,250	1986	11
Additional SIMs	1:1,250	1986 - 1990	12
Additional SIMs	1:1,250	1988	13
Large-Scale National Grid Data	1:1,250	1993	14
Large-Scale National Grid Data	1:1,250	1996	15

Historical Map - Segment A13



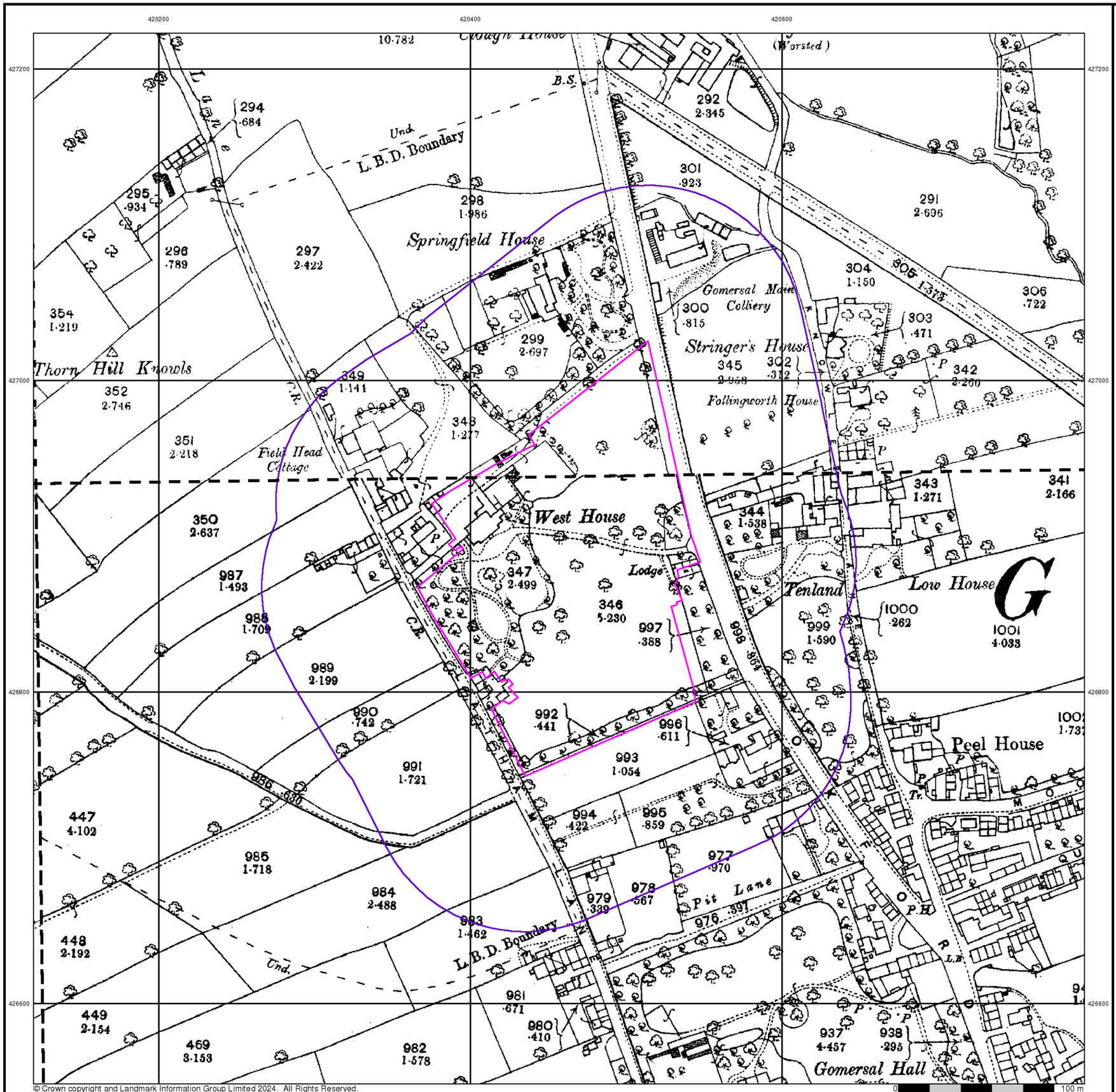
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National Grid Reference: 420470, 426880
Slice: A
Site Area (Ha): 3.03
Search Buffer (m): 100

Site Details

Site at, Gomersal, Kirklees

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



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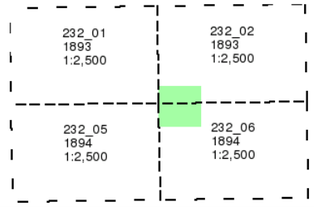
Yorkshire

Published 1893 - 1894

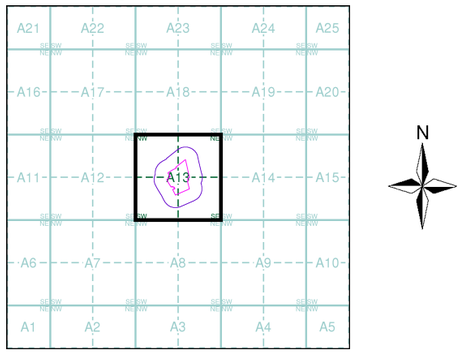
Source map scale - 1:2,500

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



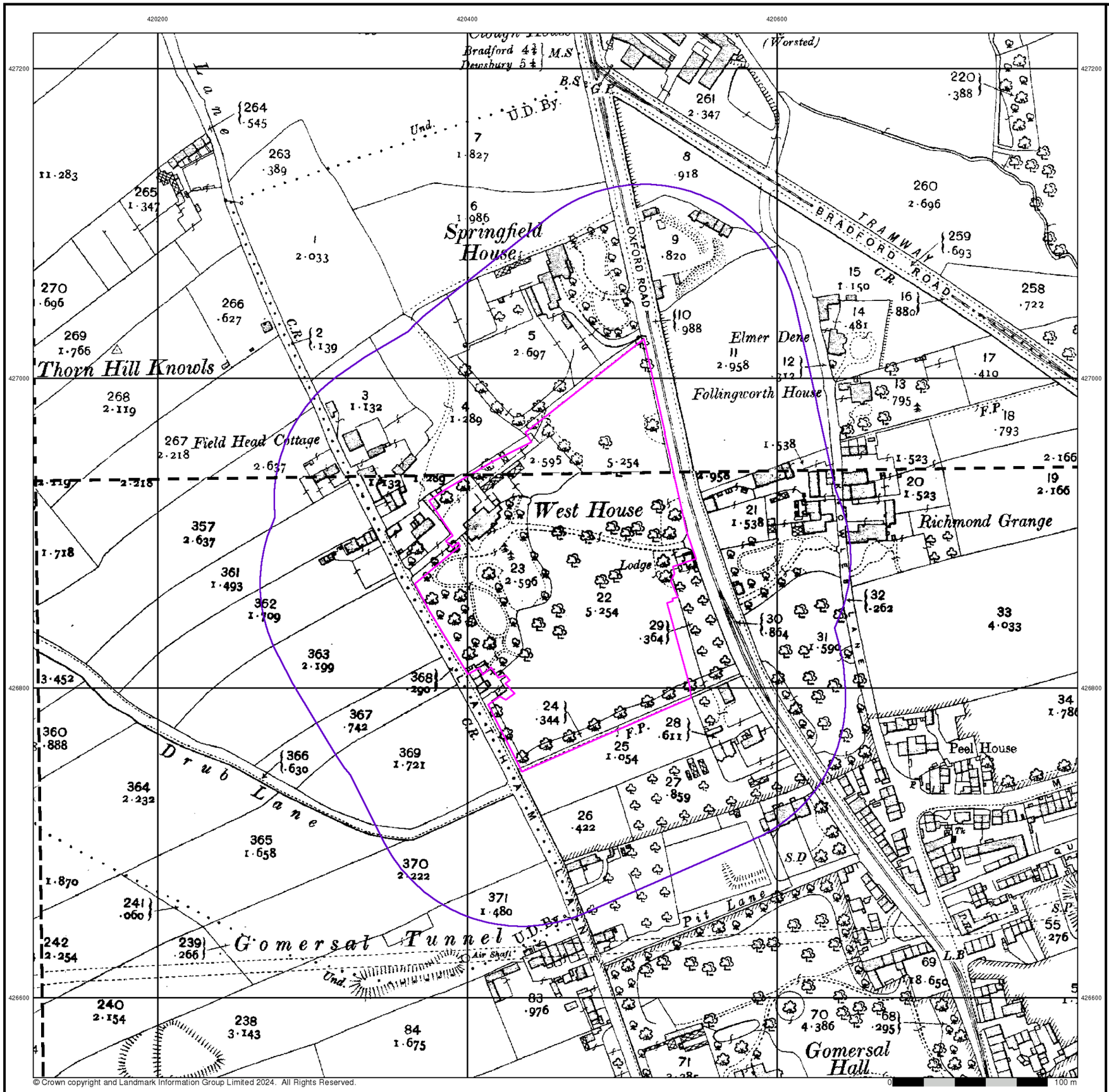
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National Grid Reference:	420470, 426880
Slice:	A
Site Area (Ha):	3.03
Search Buffer (m):	100

Site Details

Site at, Gomersal, Kirklees

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Web: www.envirocheck.co.uk



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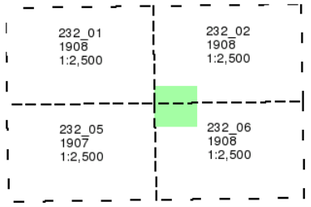
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Published 1907 - 1908

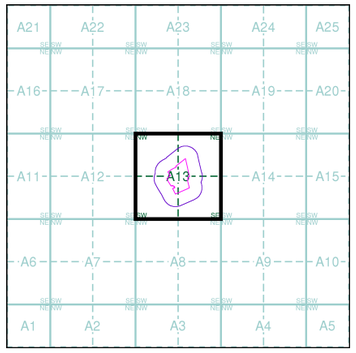
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A13



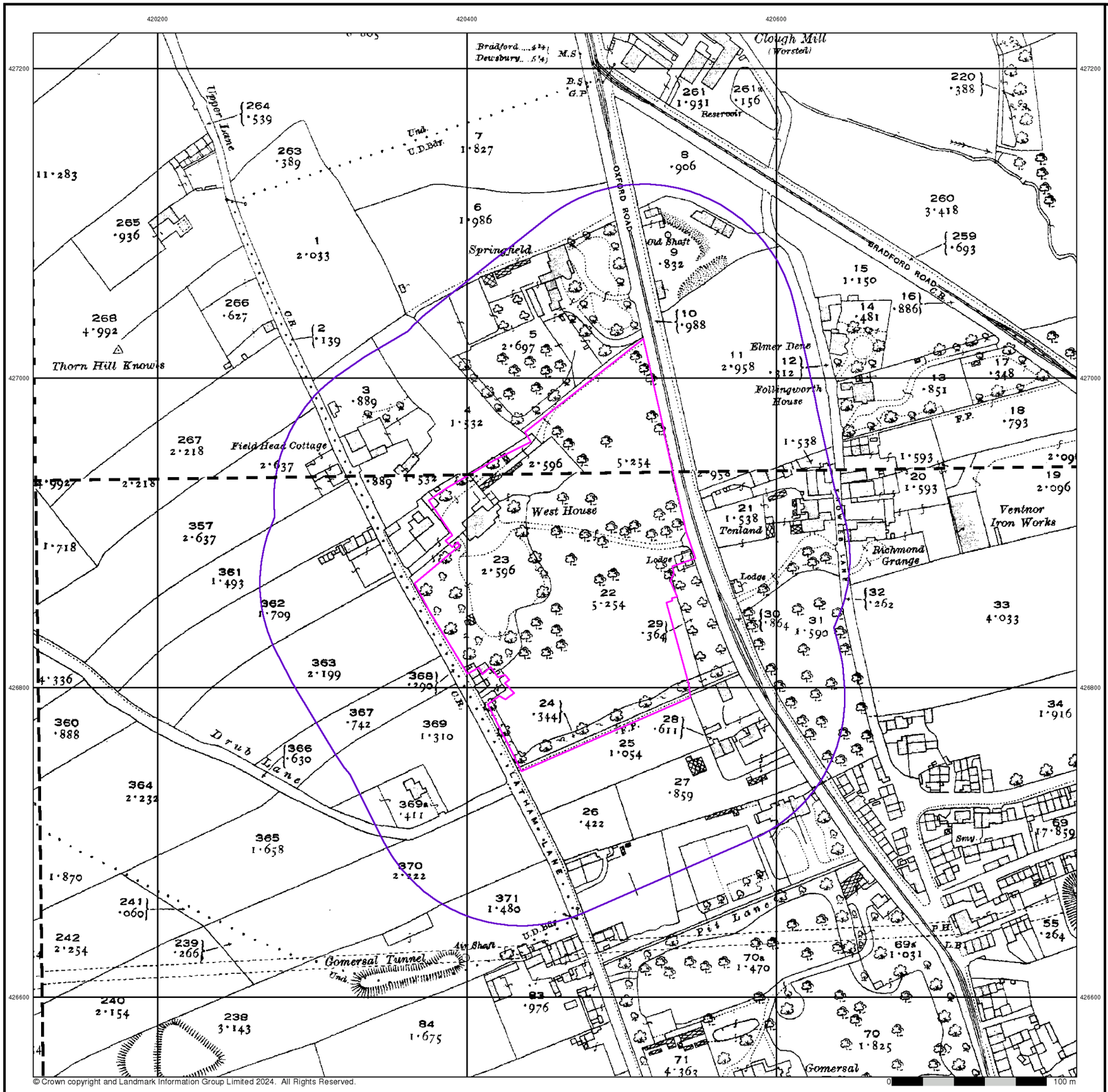
Order Details

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Site Area (Ha):	3.03
Search Buffer (m):	100

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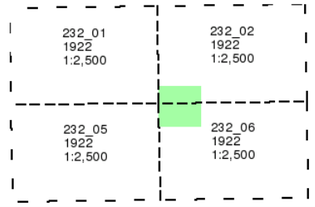
Yorkshire

Published 1922

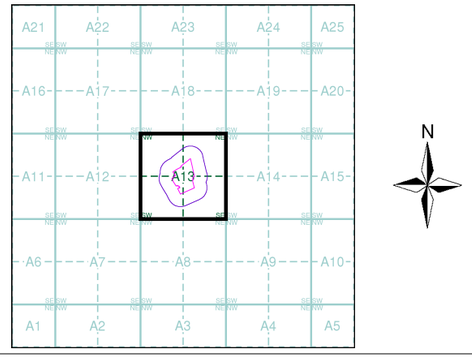
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

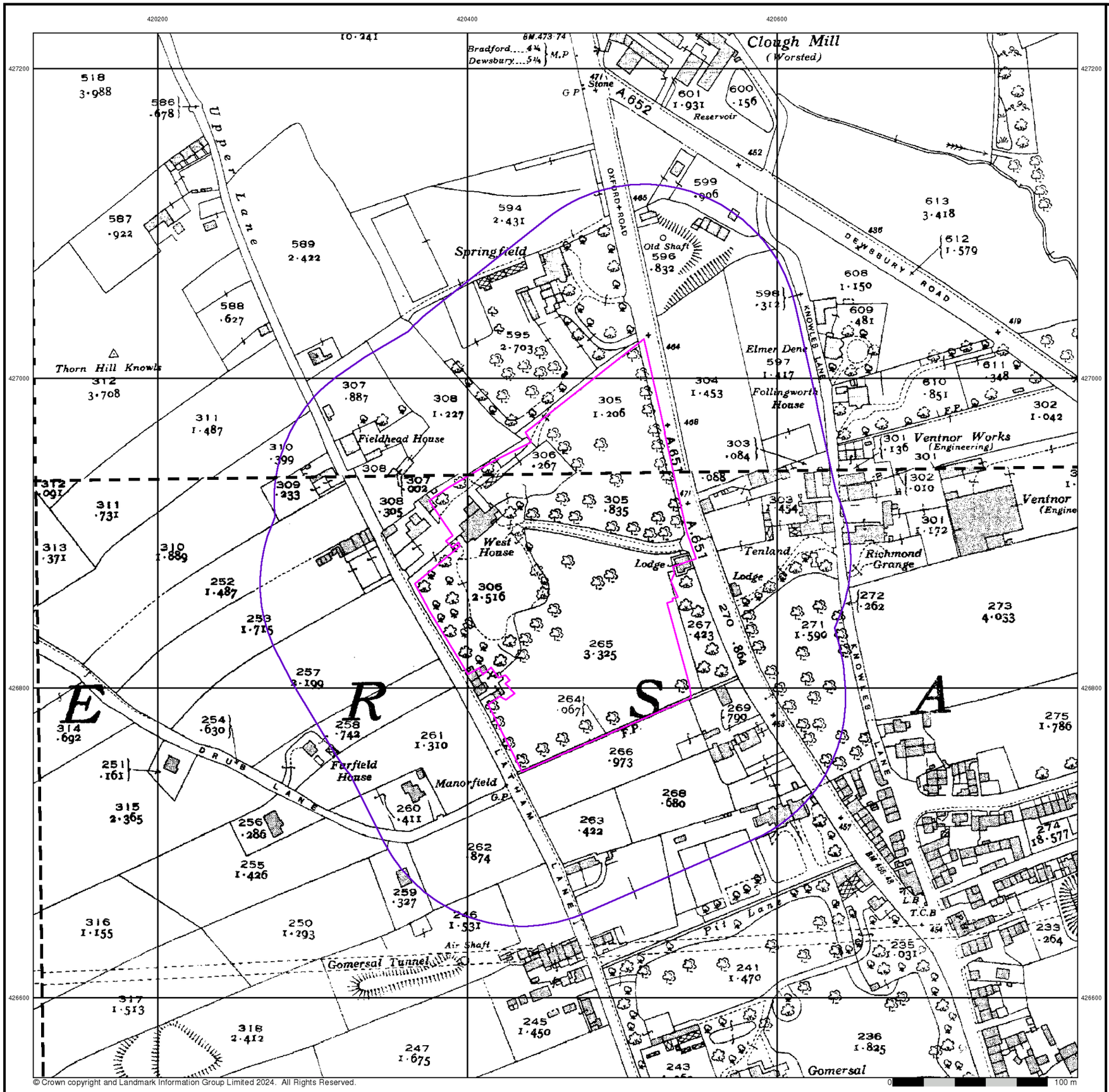
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Customer Ref:	ERE/01 West House, Oxford Road, Gomersal
National Grid Reference:	420470, 426880
Slice:	A
Site Area (Ha):	3.03
Search Buffer (m):	100

Site Details

Site at, Gomersal, Kirklees

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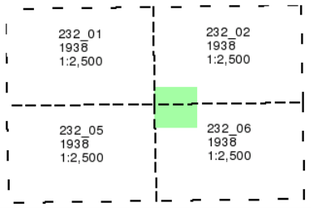
Yorkshire

Published 1938

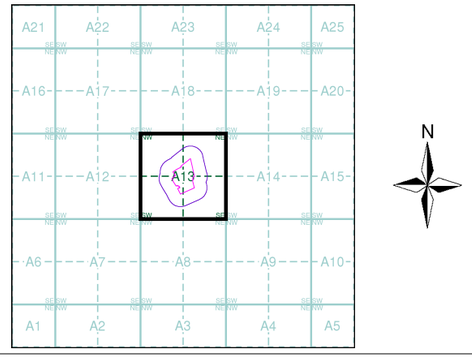
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

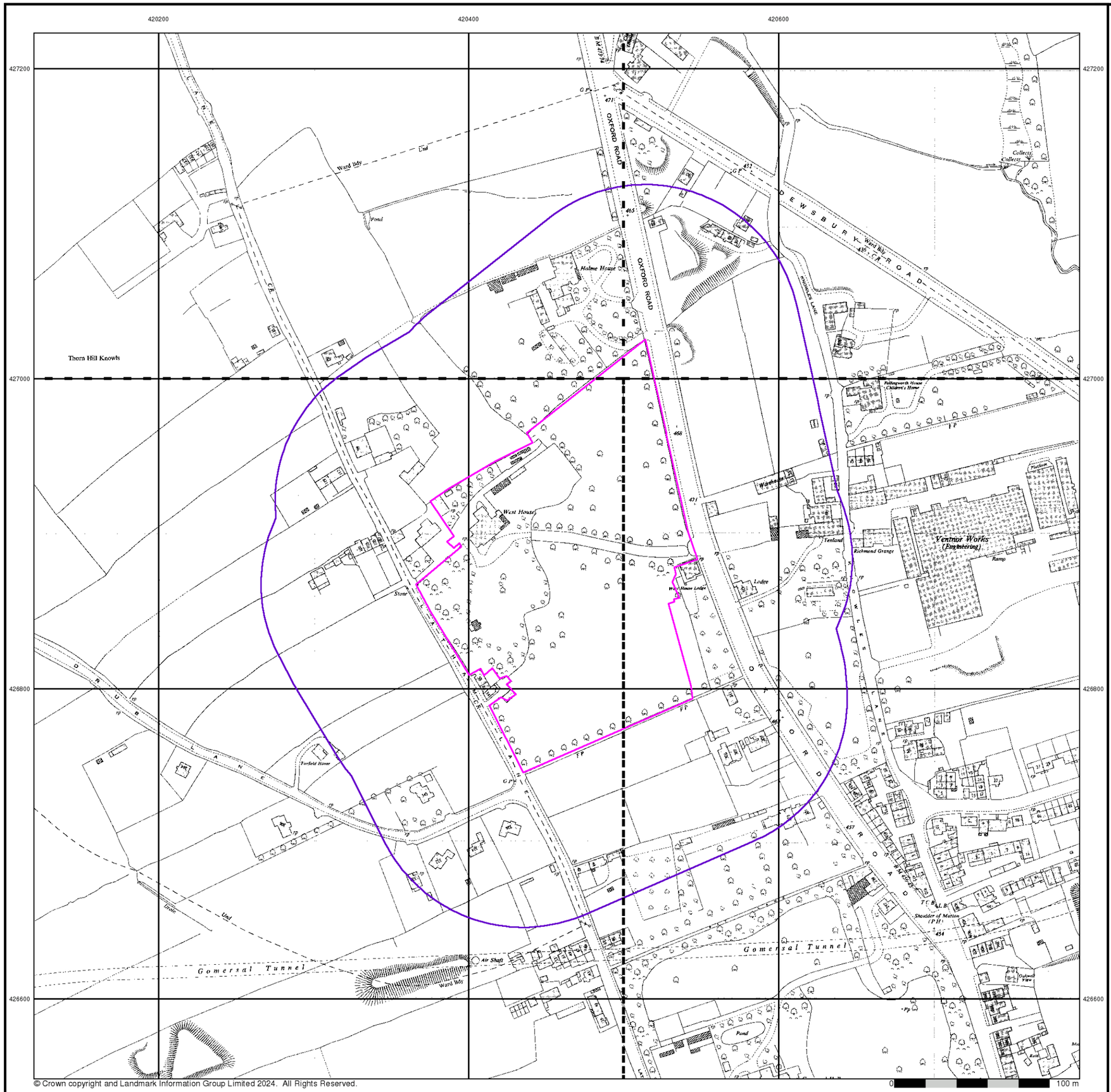
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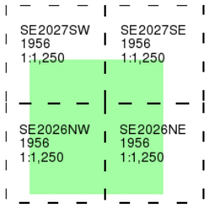
Ordnance Survey Plan

Published 1956

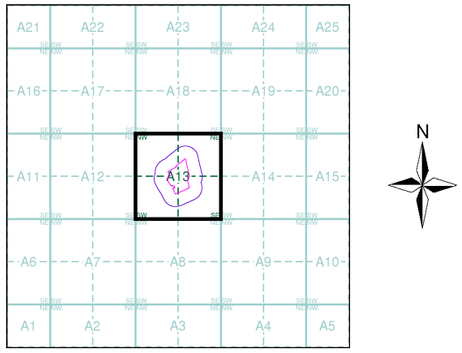
Source map scale - 1:1,250

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



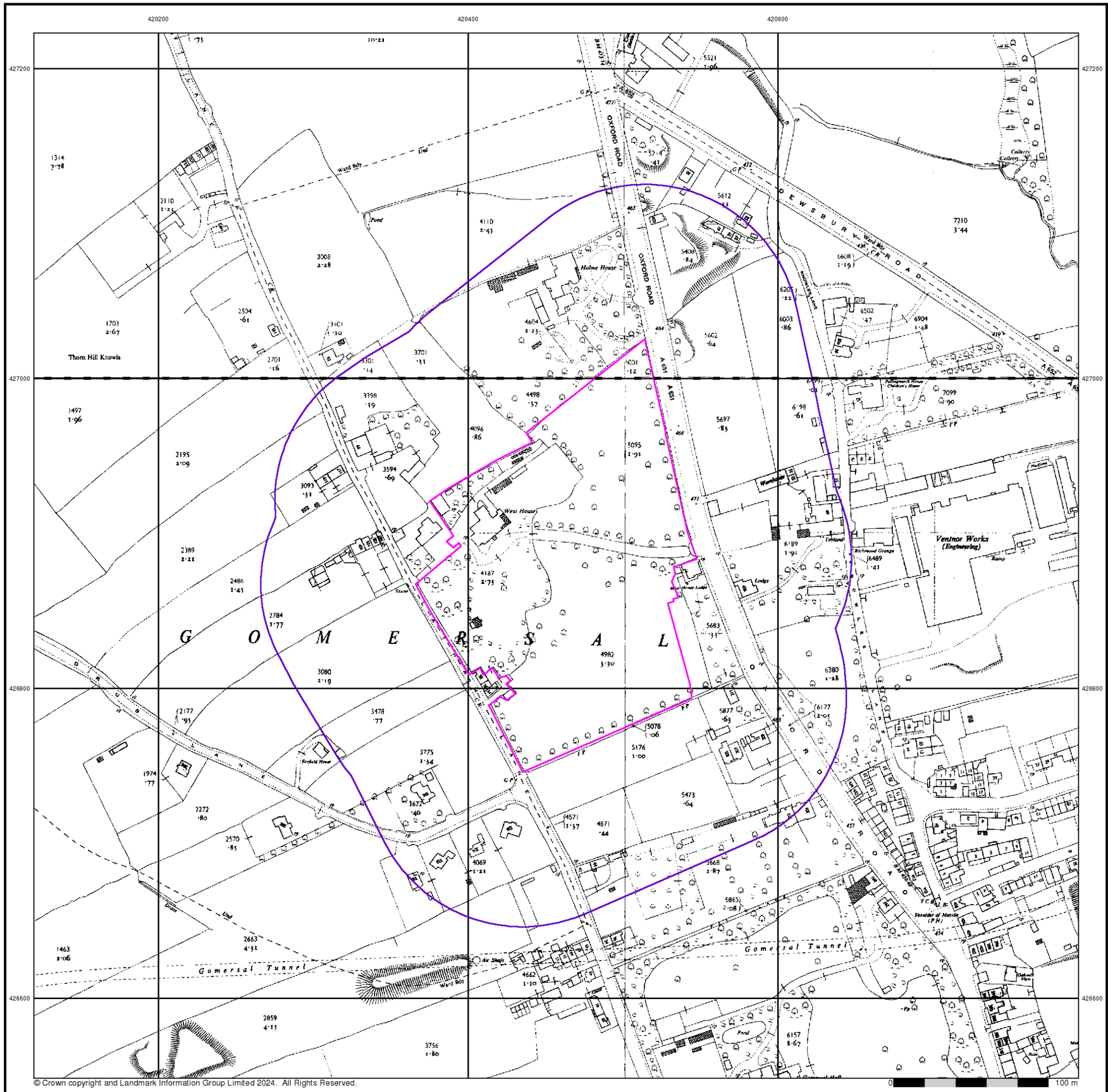
Order Details

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Ordnance Survey Plan

Published 1957

Source map scale - 1:2,500

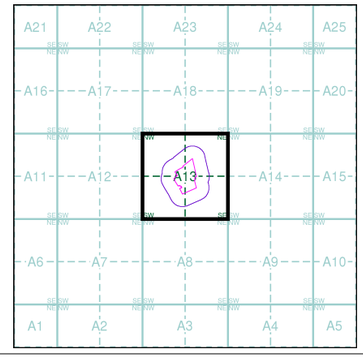
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Map Name(s) and Date(s)

SE2027
1957
1:2,500

SE2026
1957
1:2,500

Historical Map - Segment A13



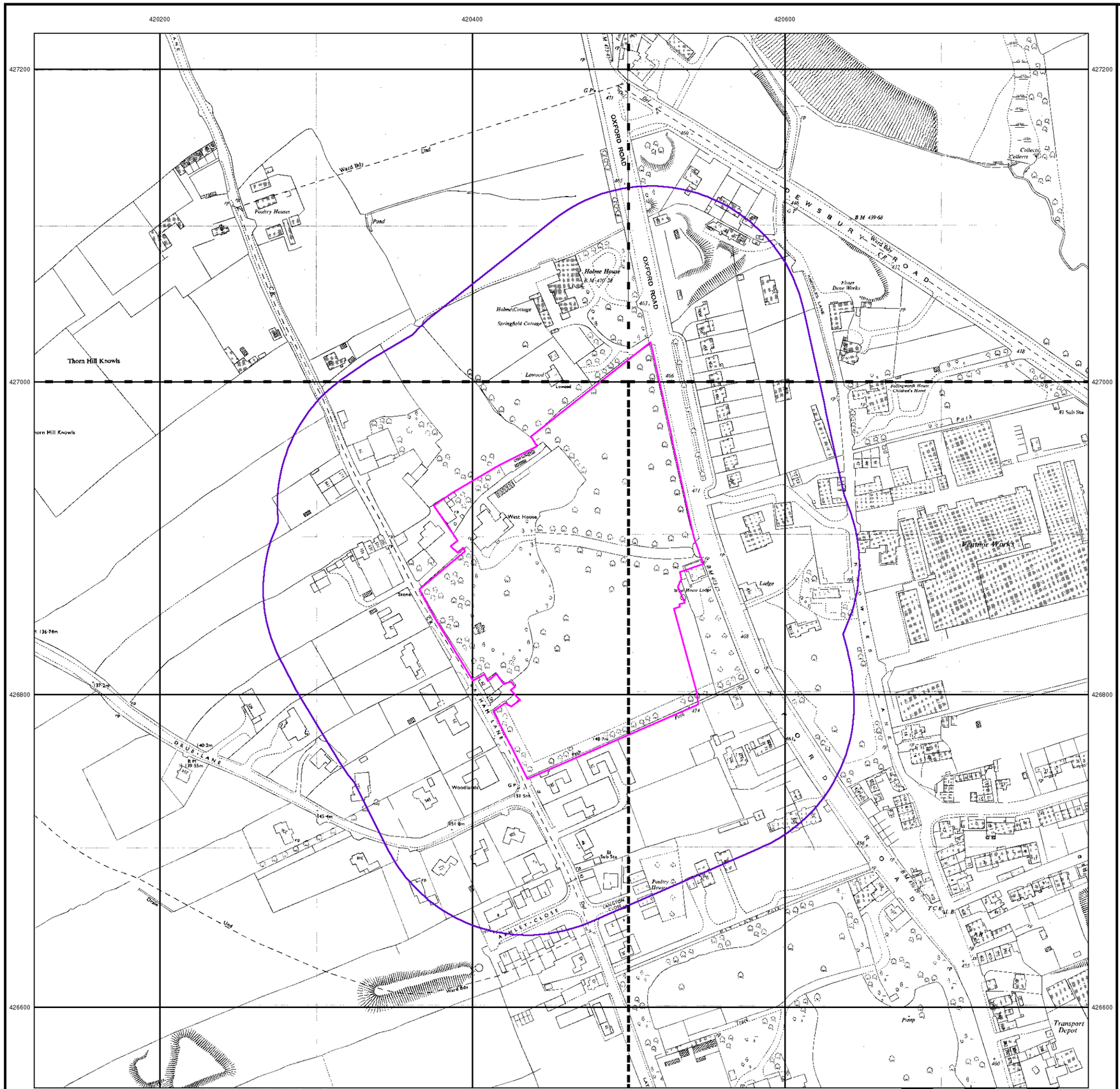
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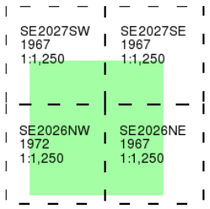
Ordnance Survey Plan

Published 1967 - 1972

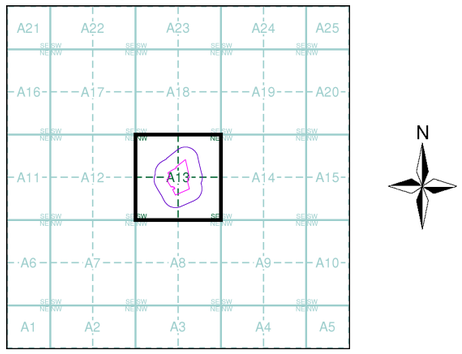
Source map scale - 1:1,250

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



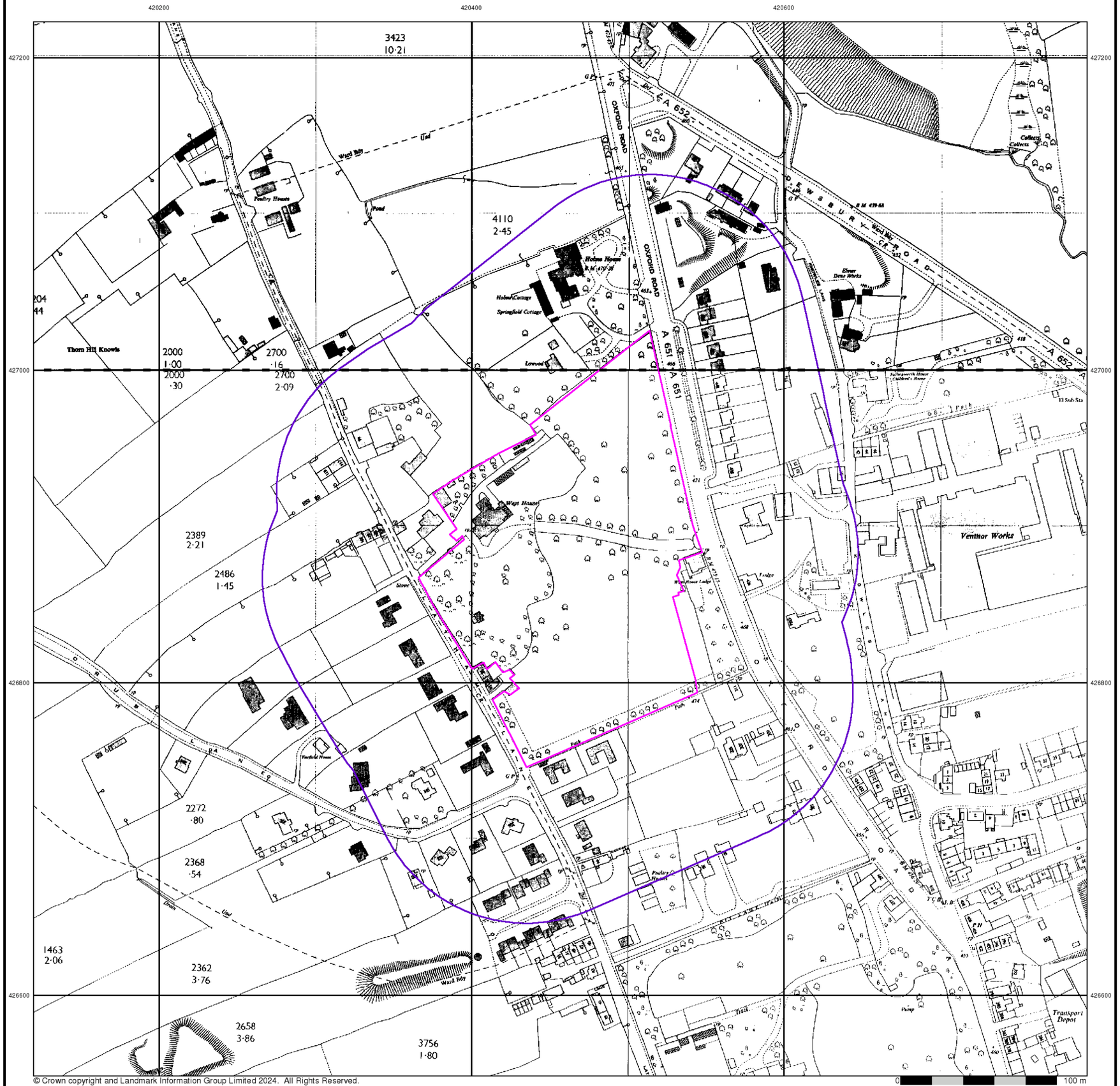
Order Details

Order Number:	340588198_1_1
Customer Ref:	ERE/01 West House, Oxford Road, Gomersal
National Grid Reference:	420470, 426880
Slice:	A
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Search Buffer (m):	100

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Ordnance Survey Plan

Published 1968 - 1970

Source map scale - 1:2,500

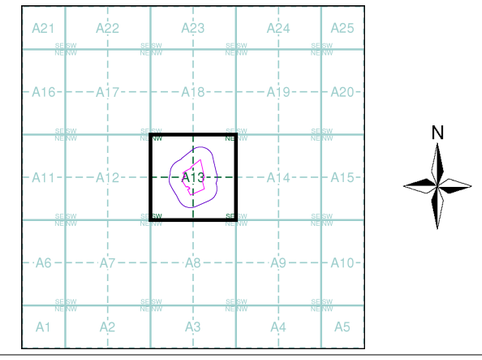
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain.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

Map Name(s) and Date(s)

SE2027
1970
1:2,500

SE2026
1968
1:2,500

Historical Map - Segment A13



Order Details

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National Grid Reference:	420470, 426880
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Site Area (Ha):	3.03
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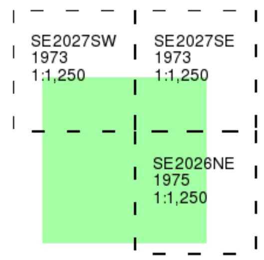
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0 100 m

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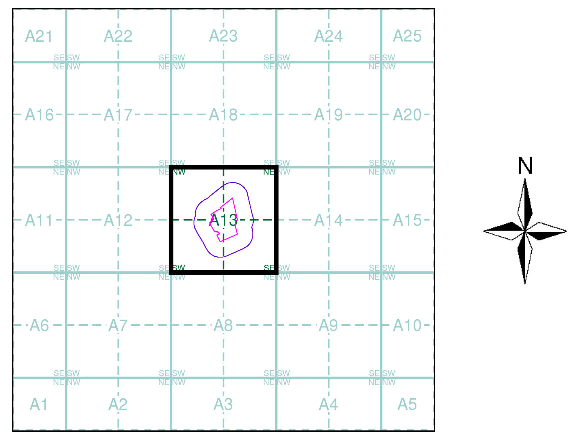
Ordnance Survey Plan
Published 1973 - 1975
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

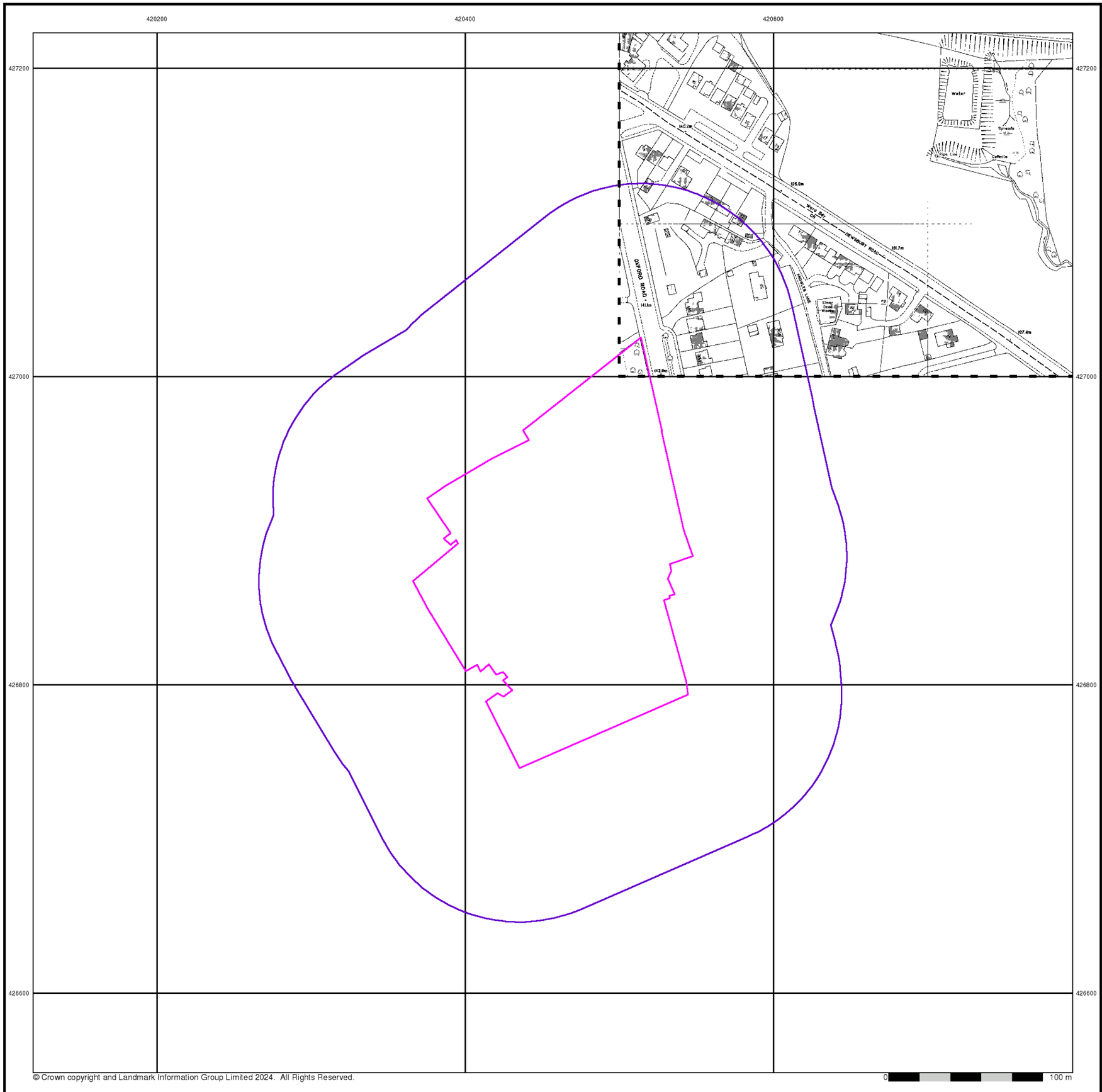
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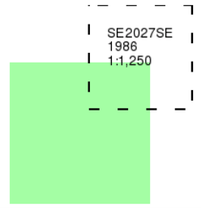
Ordnance Survey Plan

Published 1986

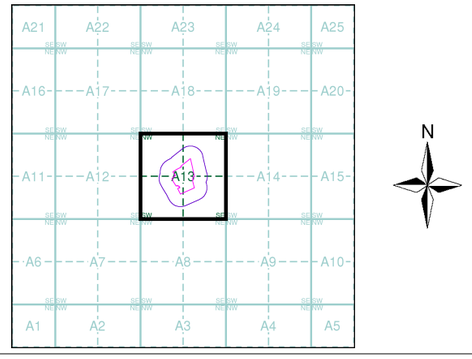
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A13



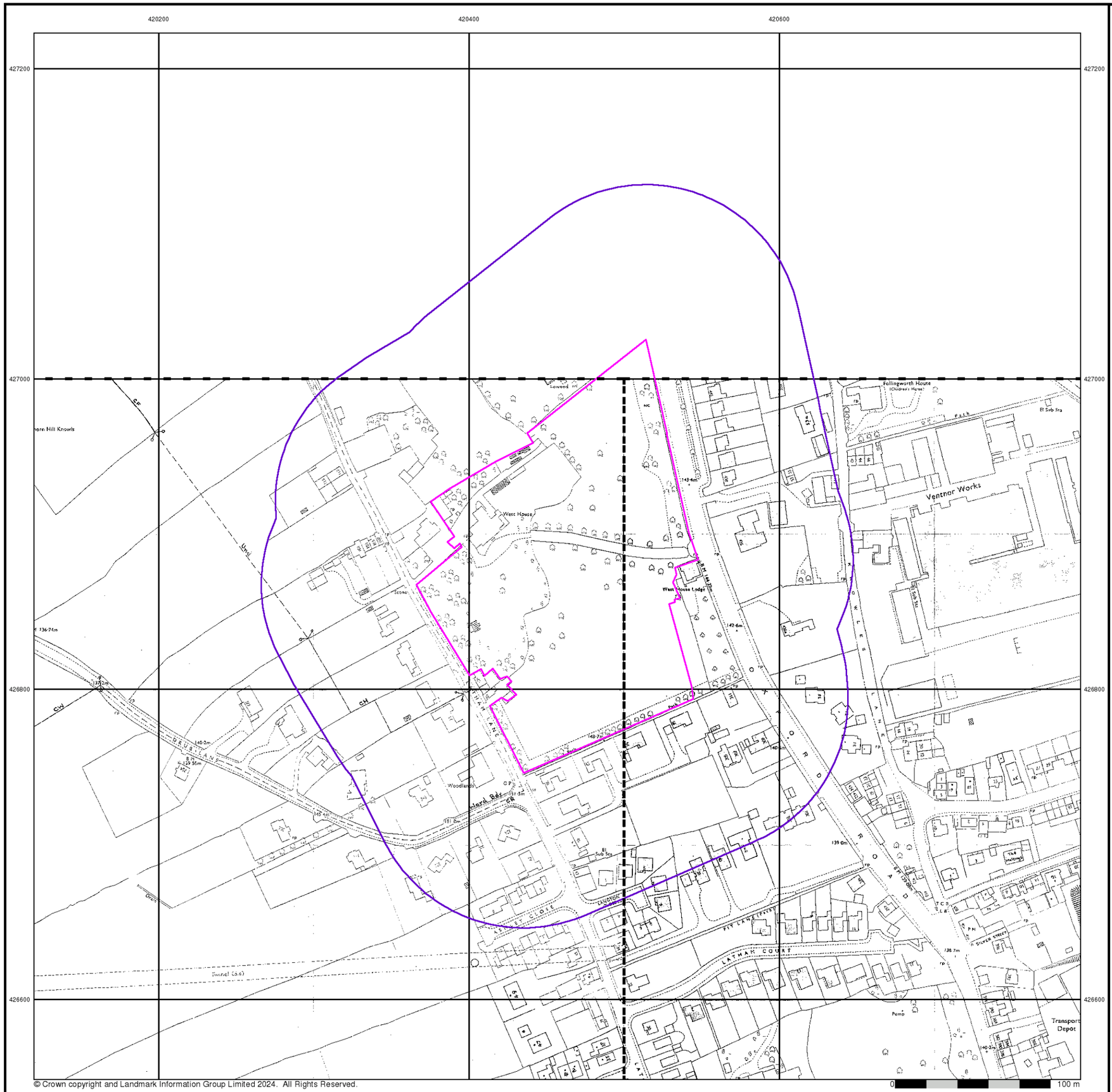
Order Details

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Customer Ref:	ERE/01 West House, Oxford Road, Gomersal
National Grid Reference:	420470, 426880
Slice:	A
Site Area (Ha):	3.03
Search Buffer (m):	100

Site Details

Site at, Gomersal, Kirklees

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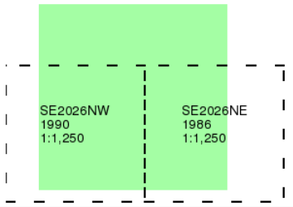
Additional SIMs

Published 1986 - 1990

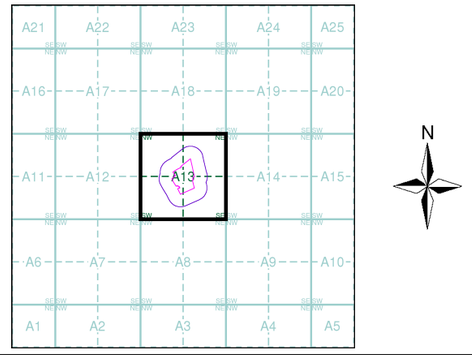
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A13



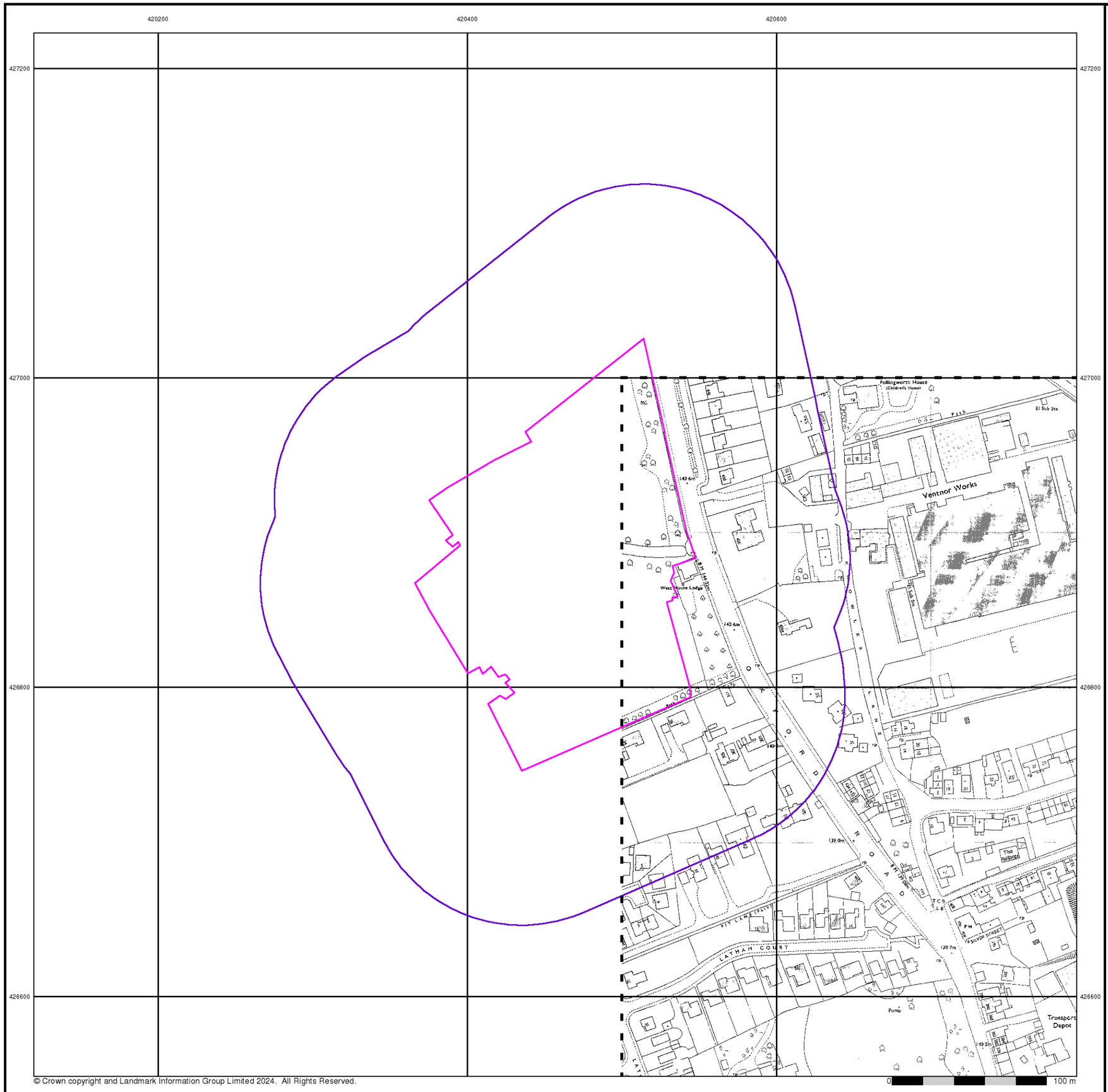
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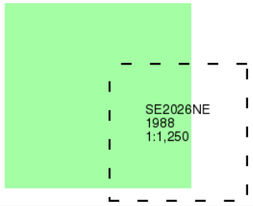
Additional SIMs

Published 1988

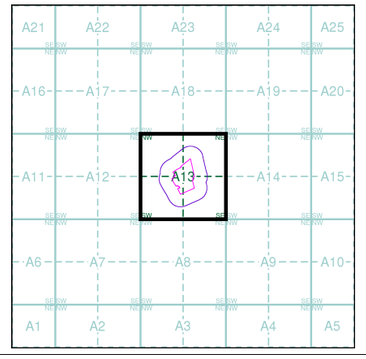
Source map scale - 1:1,250

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Map Name(s) and Date(s)



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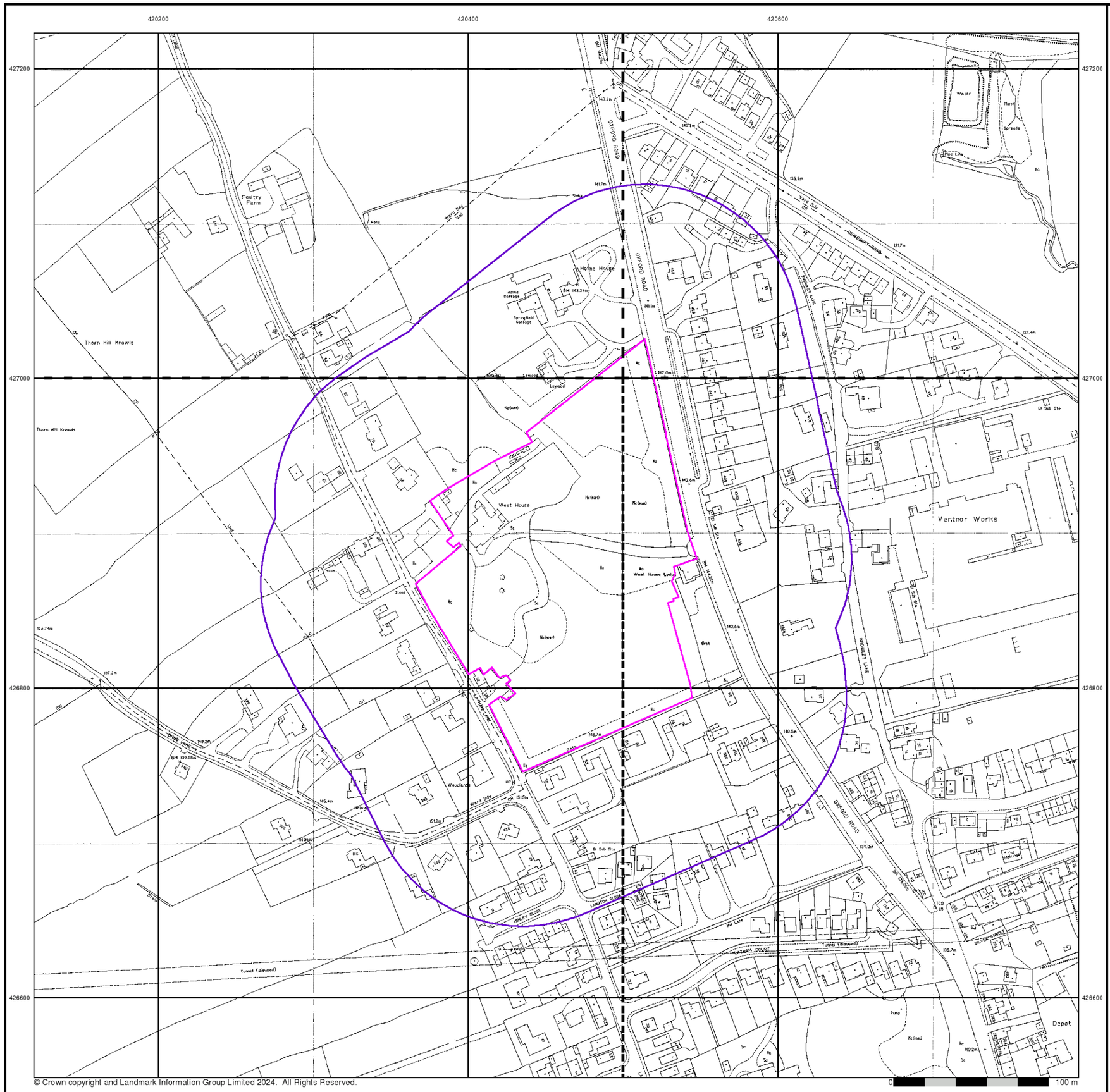
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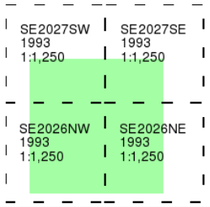
Large-Scale National Grid Data

Published 1993

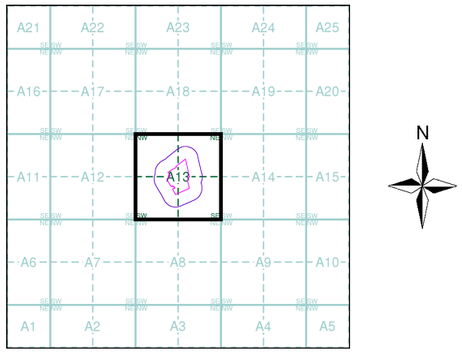
Source map scale - 1:1,250

'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)



Historical Map - Segment A13



Order Details

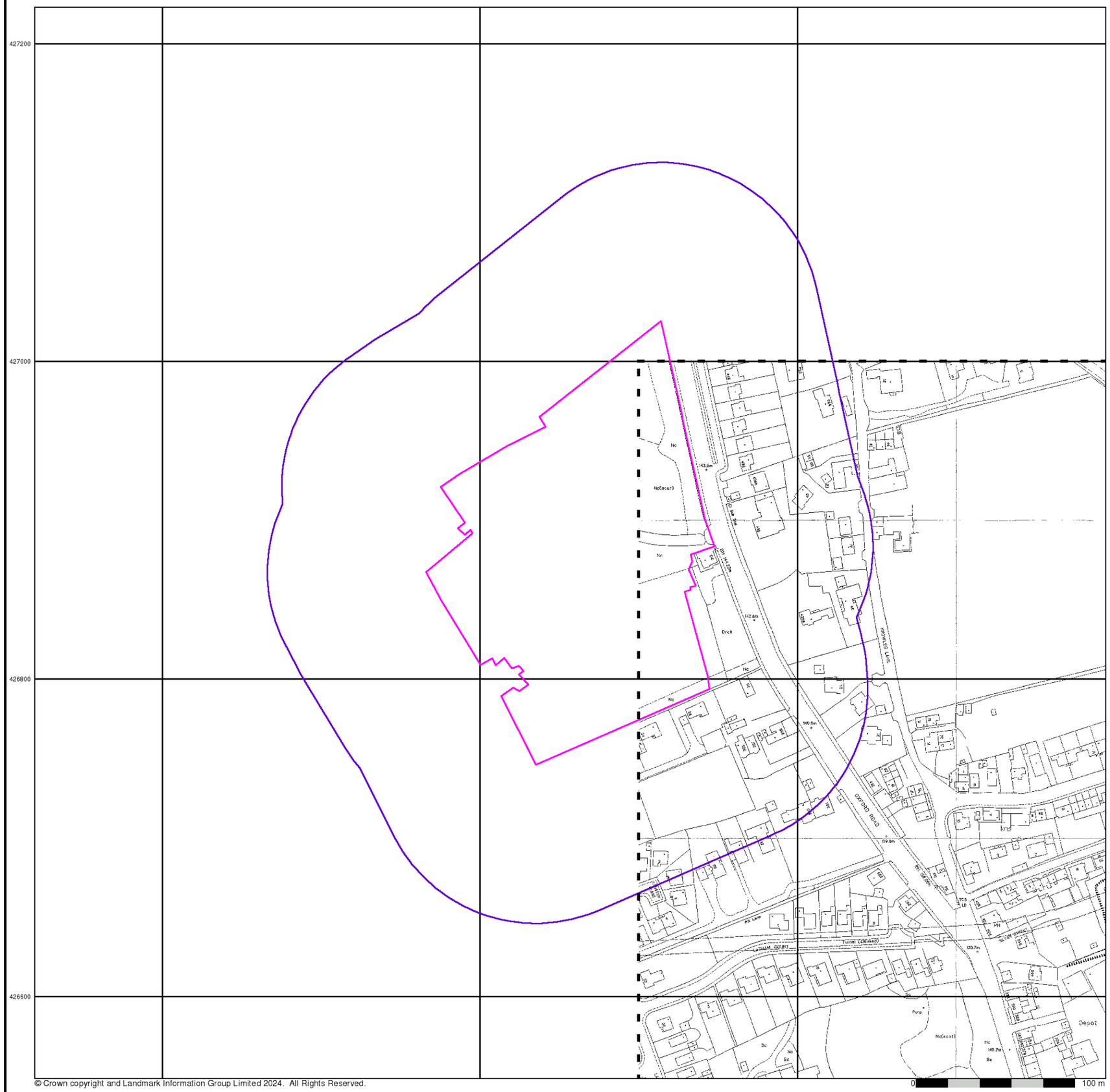
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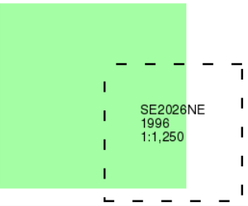
Large-Scale National Grid Data

Published 1996

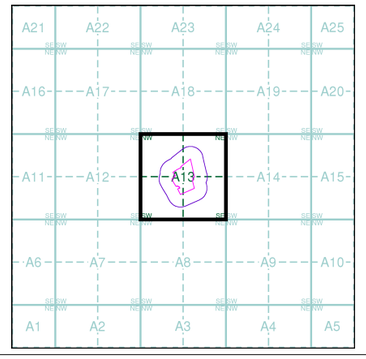
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A13



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Site Area (Ha):	3.03
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Site Details

Site at, Gomersal, Kirklees

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

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

Ordnance Survey Plan 1:10,000

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

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

1:10,000 Raster Mapping

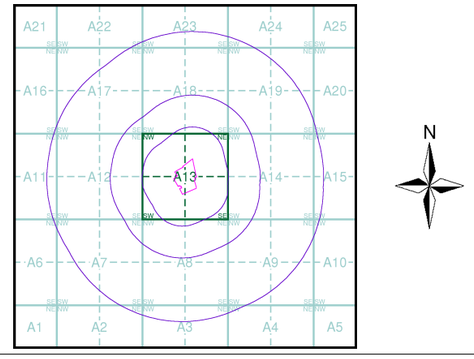
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community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

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:10,560	1854	2
Yorkshire	1:10,560	1894	3
Yorkshire	1:10,560	1908	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	8
Ordnance Survey Plan	1:10,000	1966 - 1967	9
Ordnance Survey Plan	1:10,000	1976	10
Ordnance Survey Plan	1:10,000	1984 - 1986	11
Ordnance Survey Plan	1:10,000	1991 - 1995	12
10K Raster Mapping	1:10,000	2000	13
Street View	Variable		14

Historical Map - Slice A



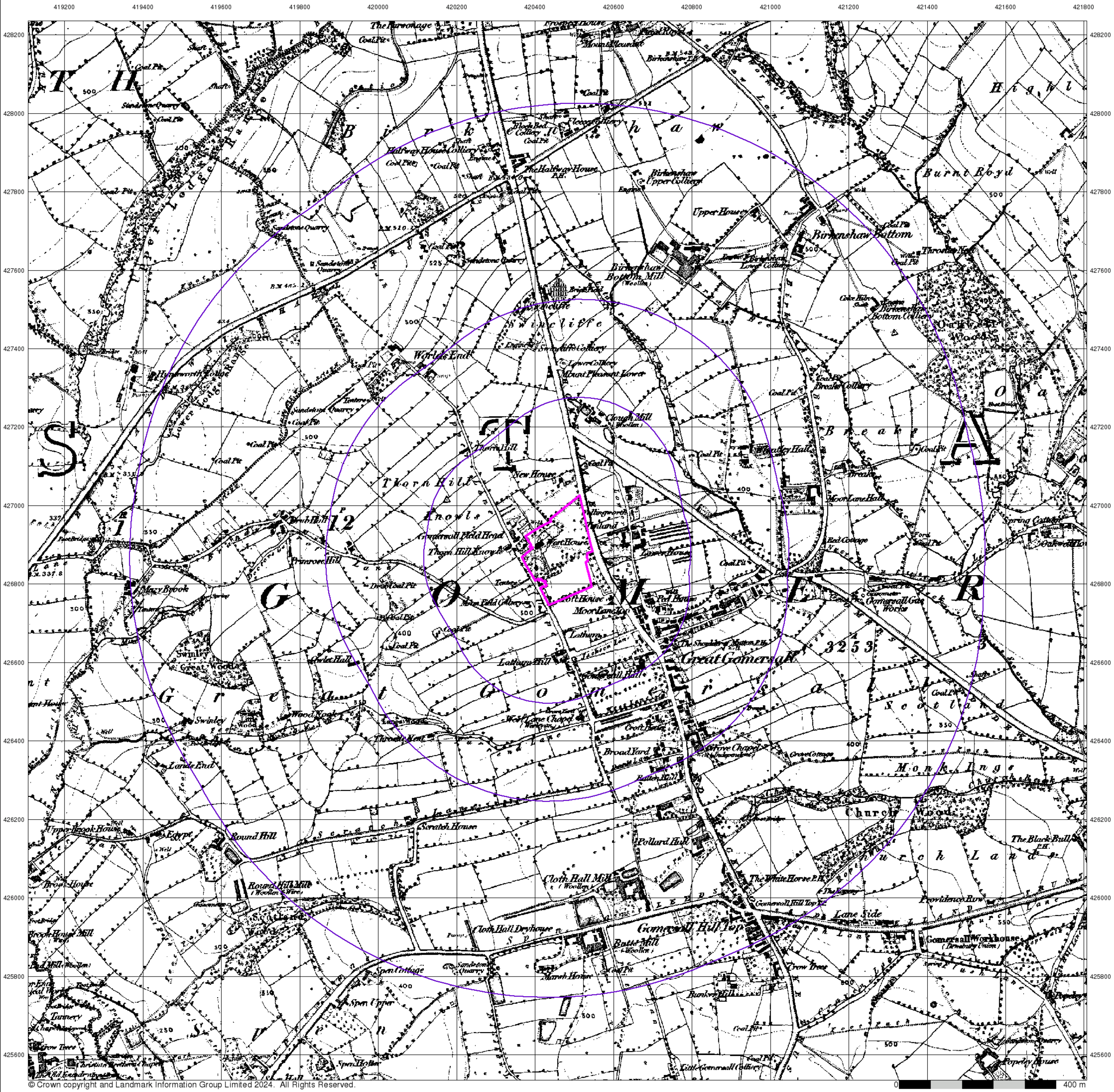
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Customer Ref: ERE/01 West House, Oxford Road, Gomersal
National Grid Reference: 420470, 426880
Slice: A
Site Area (Ha): 3.03
Search Buffer (m): 1000

Site Details

Site at, Gomersal, Kirklees

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



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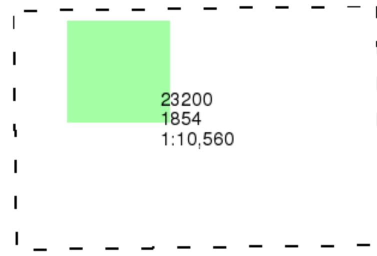
Yorkshire

Published 1854

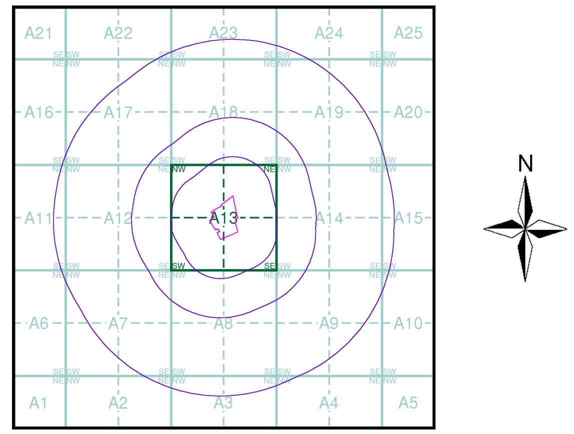
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps.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

Map Name(s) and Date(s)



Historical Map - Slice A



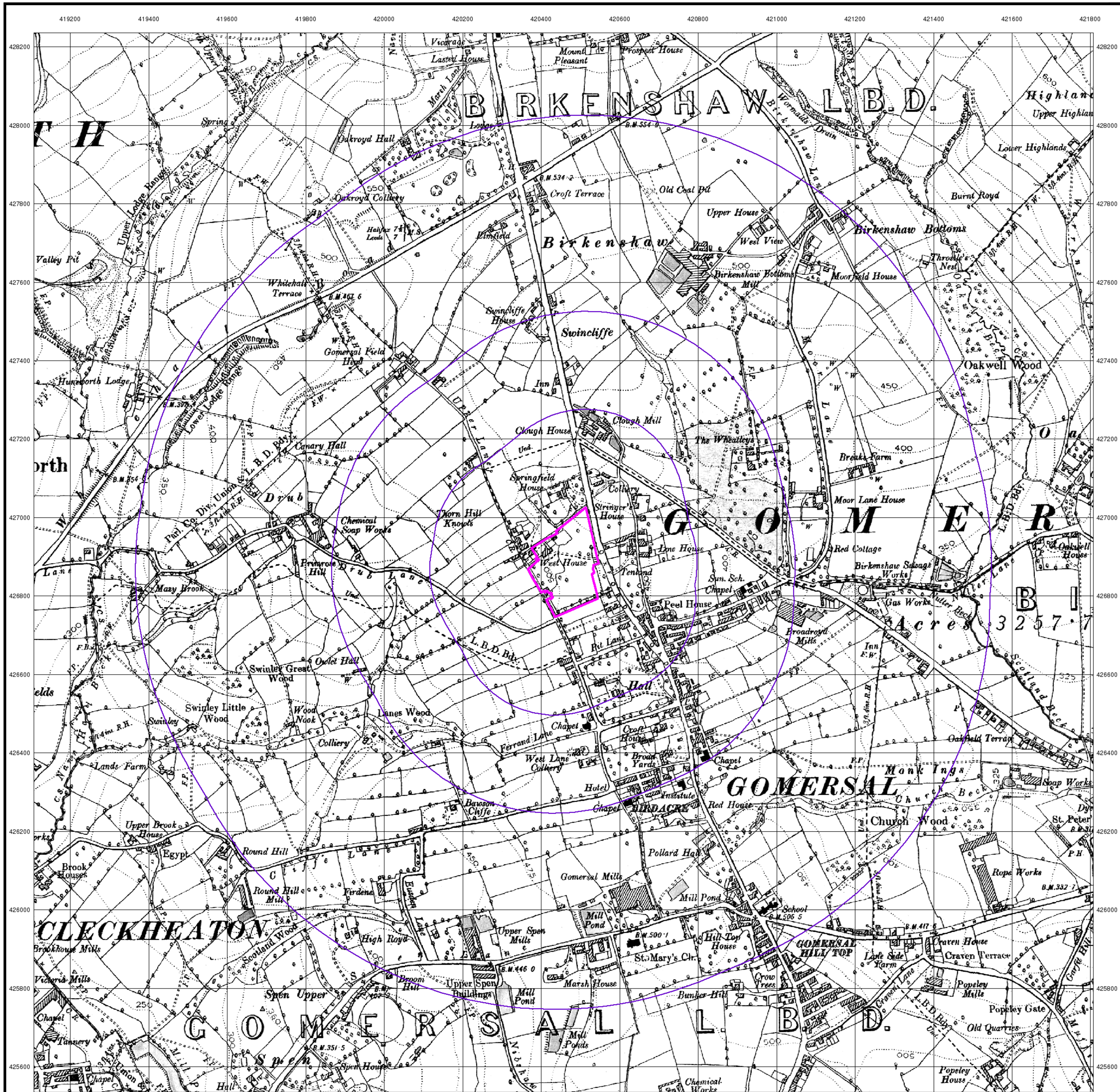
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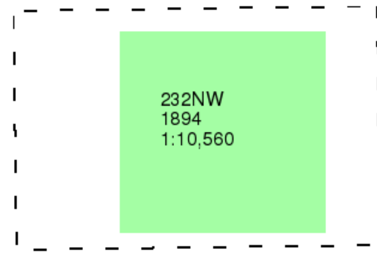
Yorkshire

Published 1894

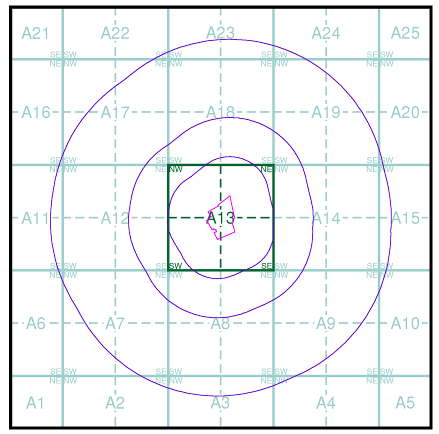
Source map scale - 1:10,560

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Map Name(s) and Date(s)



Historical Map - Slice A



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Order Details

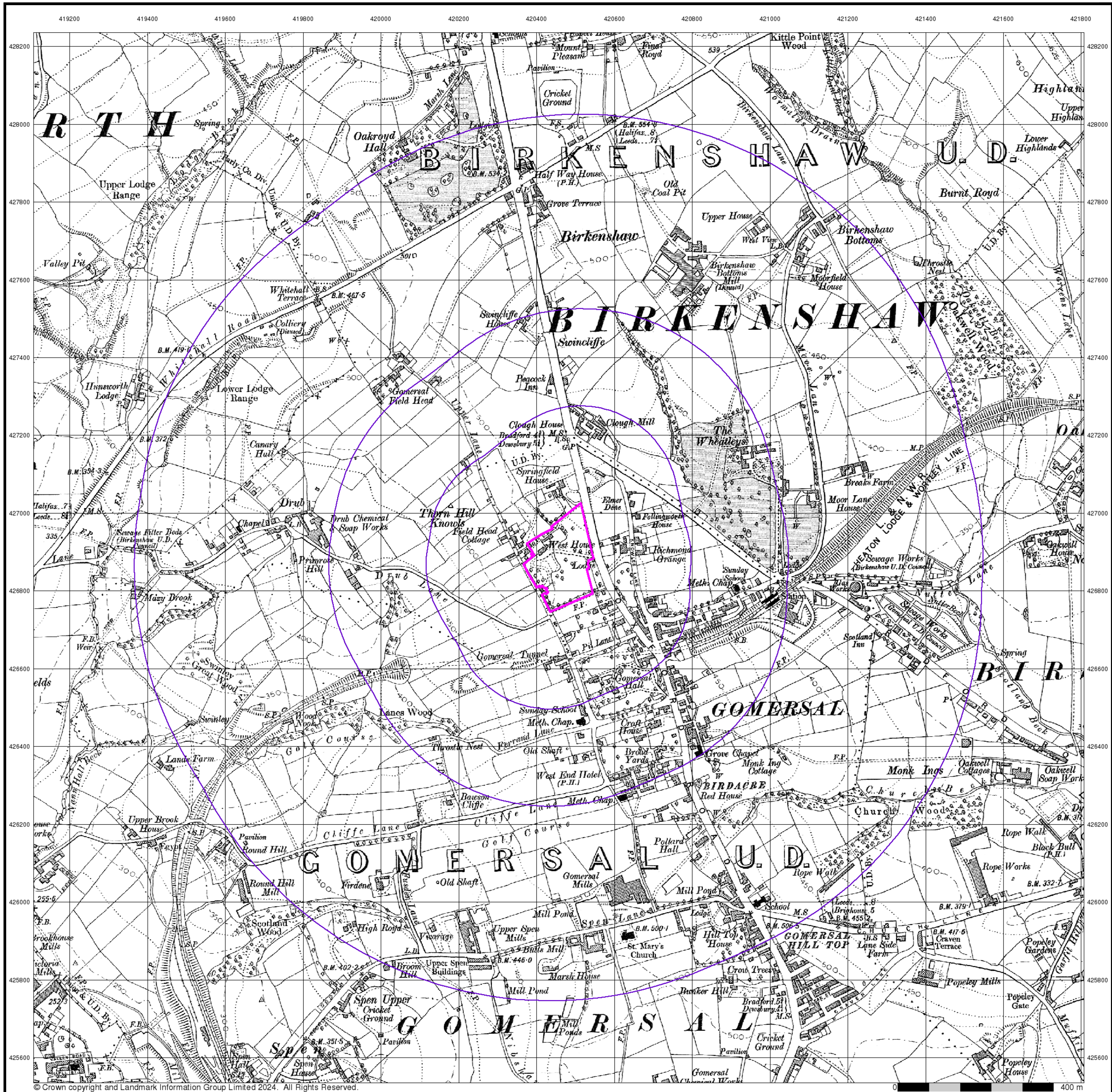
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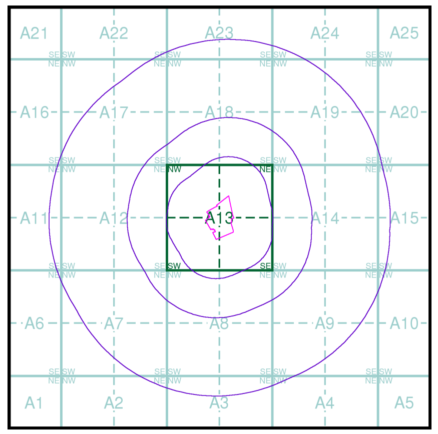
Yorkshire
Published 1908
Source map scale - 1:10,560

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Map Name(s) and Date(s)

232NW
1908
1:10,560

Historical Map - Slice A



N

Order Details

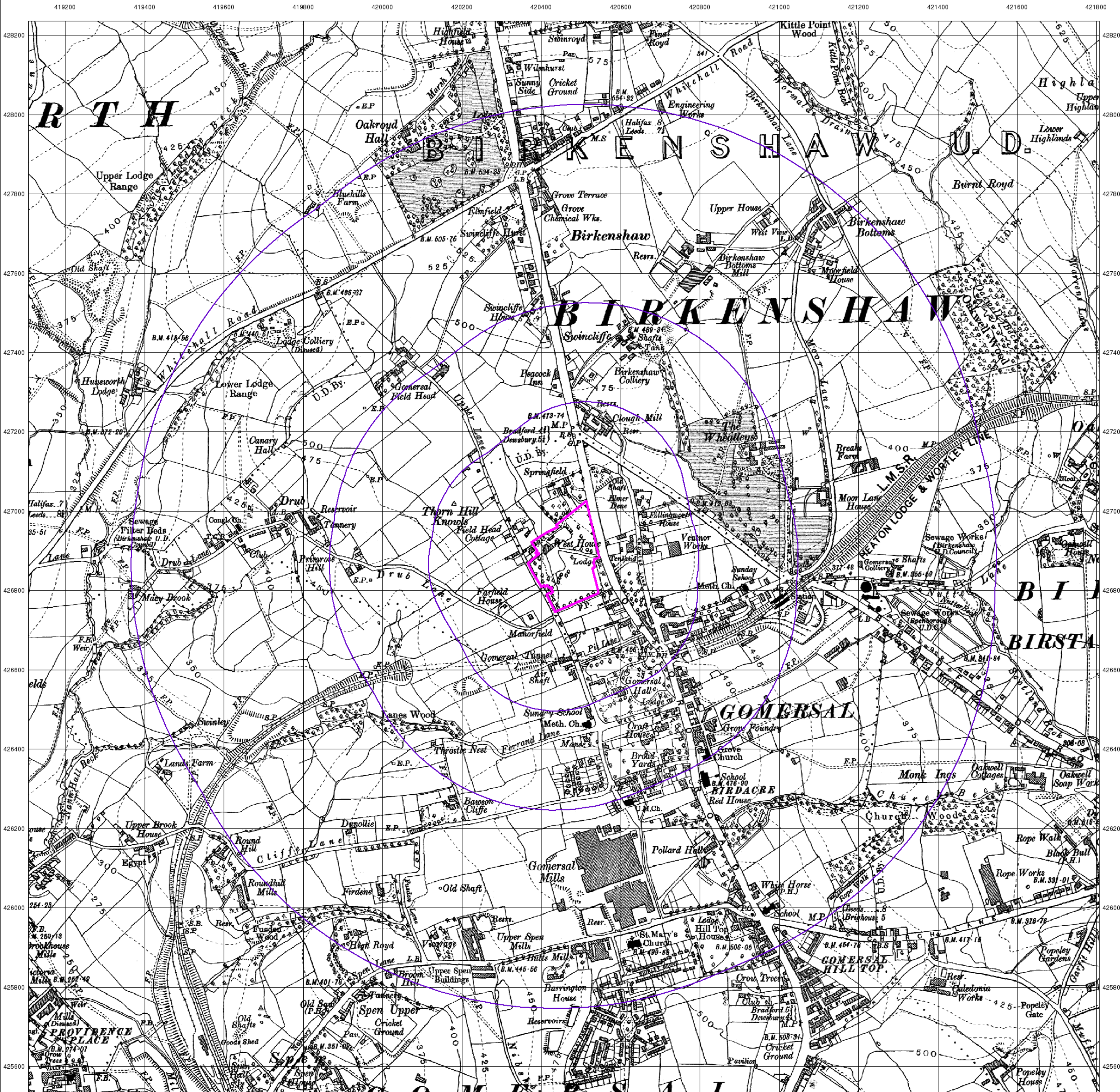
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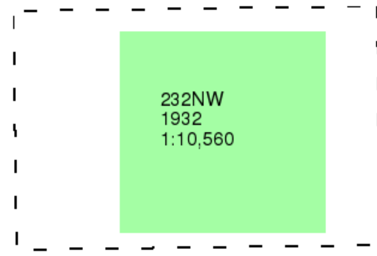
Yorkshire

Published 1932

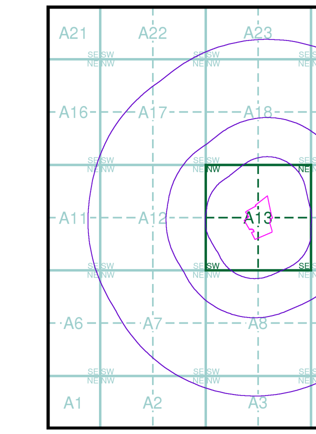
Source map scale - 1:10,560

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Historical Map - Slice A



N

Order Details

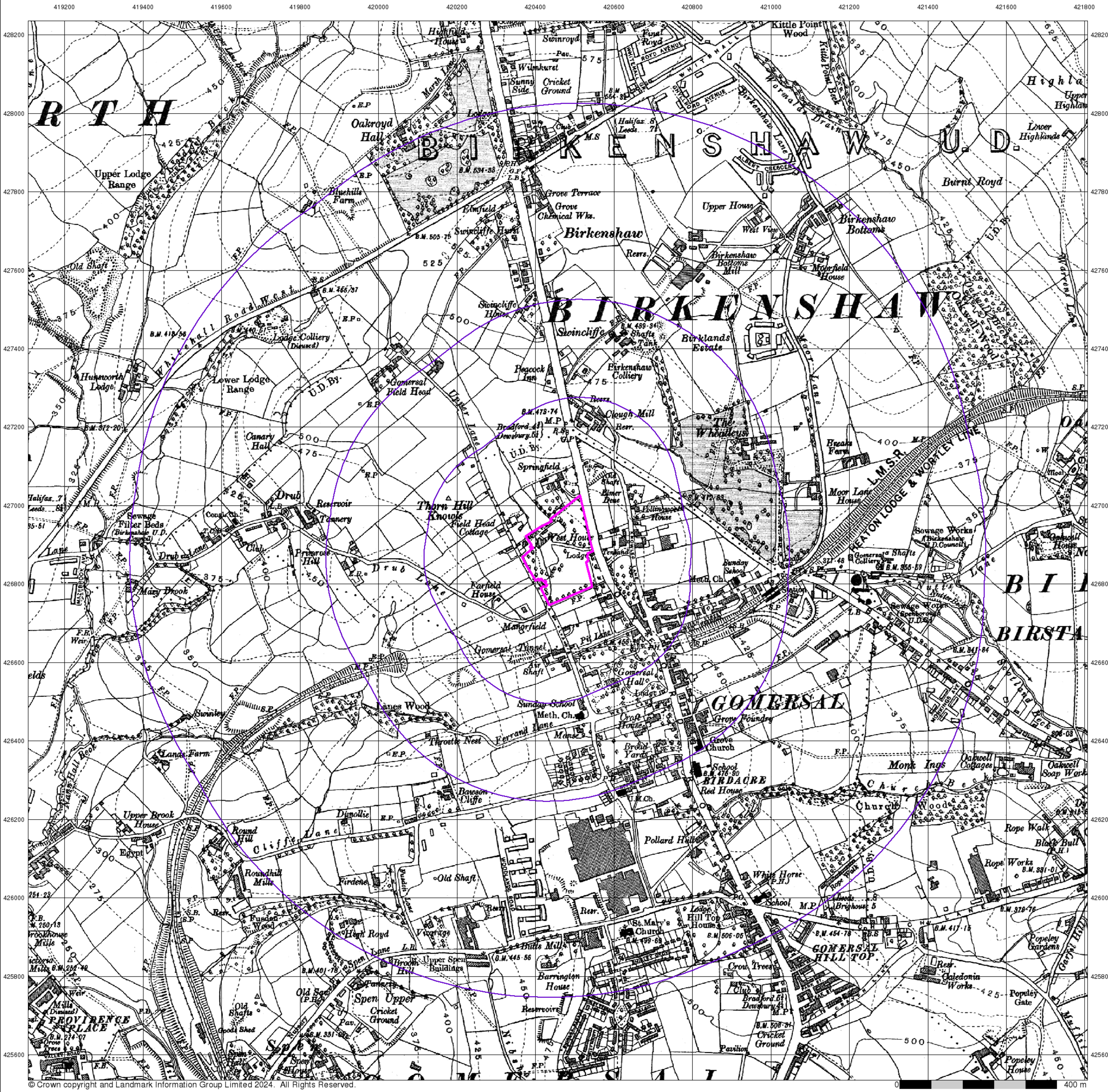
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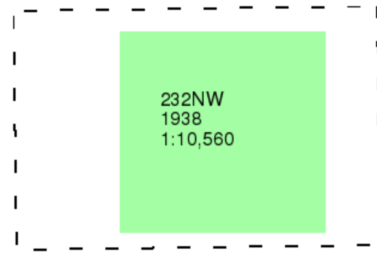
Yorkshire

Published 1938

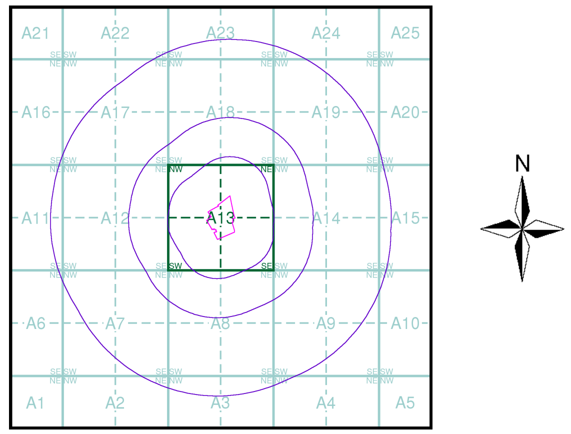
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