

LAND AT FERNGROVE BURY

PHASE 1: PRELIMINARY RISK ASSESSMENT

Job Number: LKC 20 2015
Date: March 2021
Client: Lords Roofing (NW) Ltd



INCREASING LAND VALUE

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LK Consult Document Verification			
Site Address	Land between Ferngrove and Woodgate Hill Road, Bury, BL9 7LS		
Report Title	Phase 1: Preliminary Risk Assessment		
Job Number	LKC 20 2015	Document Ref.	CL-602-LKC 20 2015-01
Date Issued	March 2021	Report Version	R0
Prepared By	Michelle Thorniley	Signature	
Reviewed By	Colin Crompton	Signature	

Revision Record			
Revision No.	Date	Nature of Revision	Approved By

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1 Introduction

LK Consult Ltd (LKC) has been retained to carry out a Phase 1 Preliminary Risk Assessment (PRA) for land at Ferngrove, Bury.

In accordance with current guidance (including LMRM¹ and the National Planning Policy Framework (NPPF)²), the PRA will include a site reconnaissance, site history, geology, hydrogeology, hydrology, mineral search and a landfill search. Information gathered from the desk study and site reconnaissance will be used to develop a contamination conceptual model for the site.

In addition, the information gathered will be used to identify potential geotechnical constraints associated with the redevelopment of the site.

Based on the findings of this report, an appropriate site investigation can be derived, if required.

Site details are provided in Table 1-1. Figure 1 shows the site location and boundary. Figure 2 shows the proposed development plan.

Site Location	Land between Ferngrove and Woodgate Hill Road off Rochdale Old Road, Bury. Centred at approximate National Grid Reference 382180E 411430N.
Approximate Area	1,500m ² .
Topography	108 metres Above Ordnance Datum (AOD) in the northeast to 105mAOD in the south.
Current Site Use	Unmaintained grassland with a stream and trees.
Purpose of Report	Pre-planning.
Proposed Development	Residential housing with gardens / soft landscaping. 5no. residential houses (semi-detached and terraced) with rear gardens. Associated infrastructure including access road and parking.

Table 1-1: Summary of site details

¹ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

² "National Planning Policy Framework." The Ministry of Housing, Communities and Local Government. February 2019.

2 Historical Review

In compiling the site history, LKC consulted Envirocheck historical mapping (Appendix A).

Table 2-1 summarises features on site.

Table 2-2 summarises potentially contaminative land uses within approximately 50m and potentially infilled features within approximate 250m.

Site Features	Location on Site	Dates Present		Comments
		From	To	
Fern Grove	Whole Site	1851	1992	Site forms part of grounds of Fern Grove (assumed residential dwelling).
Watercourse	N & W	1851	2020	Watercourse indicated through site flowing S.
Outbuilding	N	1891	1992	Associated with cottages adjacent north. No longer present by 1999 mapping.
Small structure	W	1893	1910	No longer present by 1930 mapping.
Pond	N	1893	1893	Small pond formed adjacent to watercourse on this map edition.
Glass house	N	1930	1964	No longer present by 1980 mapping.

Table 2-1: Summary of site features. Dates based on available historical map editions.

Surrounding Area Features	Distance (m)	Direction	Dates Present		Comments
			From	To	
Woollen Mill	10	N	1851	1992	Annotated as 'Fern Grove Mill (weaving)' mill by 1891 with associated reservoir (40m N) and chimney. Well 30m N by 1910 mapping. Annotated as 'cotton' mill by 1910 mapping and 'cotton weaving' by 1930 mapping. Mill demolished by 1999 mapping. Reservoir structure remains along with well. Reservoir structure no longer present by 2020 mapping. Well remains.
Reservoir	180	WSW	1851	1967	No longer present by 1984 mapping.
Tramway	Adjacent	S	1910	1937	No longer present by 1939 mapping.
Cutting	80	W	1910	1911	No longer present by 1930 mapping.
Allotment gardens	45	NW	1959	1967	No longer present by 1980 mapping.
Domestic garage cluster	50	W	1959	1964	No longer present by 1967 mapping.
Domestic garage cluster	40	S	1959	1967	No longer present by 1980 mapping

Table 2-2: Summary of potentially contaminative features within 50m and potentially infilled features with 250m. Dates are based on available historical map editions.

An extract of the 1960 historical mapping showing the site and surrounding area (including watercourse and former mill to the north) is shown on Plate 2-1.

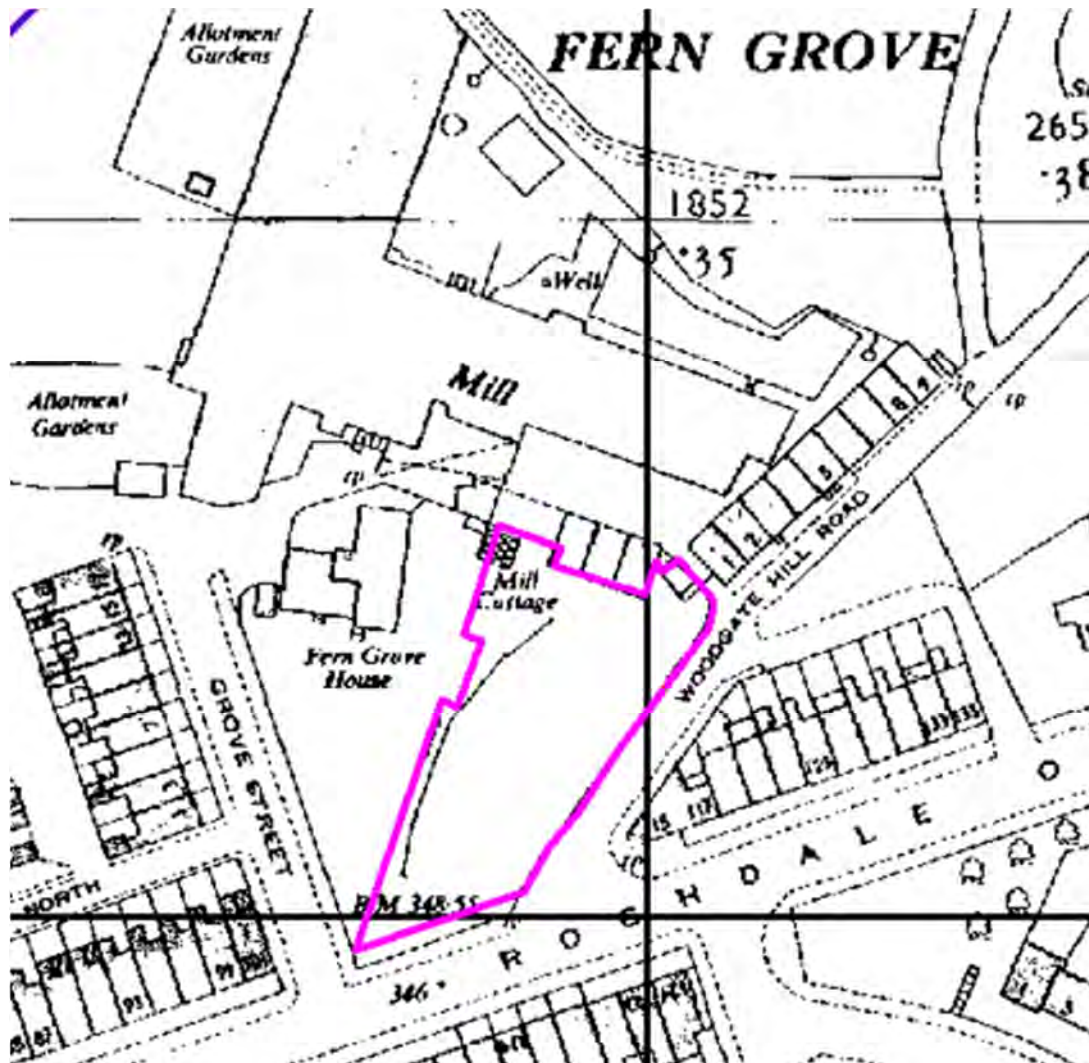


Plate 2-1: Extract from 1960 mapping (not to scale).

3 Environmental Setting

A summary of environmental settings is presented in Table 3-1, based on a review of available environmental data.

Categories (data sources)		Details
Geology ¹	Artificial	- No BGS recorded artificial.
	Superficial	- Till (diamicton).
	Bedrock	- Pennine Lower Coal Measures (mudstone, siltstone and sandstone) in northern part of the site. - Pennine Lower Coal Measures (sandstone) across remainder of the site.
	BGS Logs (<50m)	- BH Ref: SD81SW340, 44m E: topsoil to 0.3, made ground to 1.3m, soft to firm sandy clay to 2.5m, loose silty sand to 4.4m, stiff sandy clay to >5.2m. - BH Ref: SD81SW249, 47m NE: topsoil to 0.5m, firm very sandy clay to 1.0m, soft to firm very silty sandy clay to 1.8m, gravel with much clay to >2m.
Hydro-geology ¹	Aquifer Designation	- Superficial - Bedrock
	Source Protection Zone (SPZ)	- Secondary Undifferentiated Aquifer. - Secondary A Aquifer.
	Groundwater Abstractions (100m)	- Site not within an SPZ.
	Groundwater Abstractions (100m)	- None.
Hydrology ¹	Surface Water Courses (100m)	- Un-named stream onsite, flowing S.
	Flooding risk	- Flood Zone 1.
	Surface Water Abstractions (100m)	- None.
	Discharge Consents	- None.
	Pollution Incidents	- None.
Minerals & Mining ^{1,3,4}	Coal Mining	- Within a Coal Reporting Area. - Not within a Development High Risk Area. - Not within a surface area that could be affected by past recorded underground coal mining. - No recorded mine entries within 20m.
	Surface Mineral Extractions (250m)	- None.
	Cheshire Brine Compensation District	- Not within Compensation District. - Not within Consultation Area.
	Non-Coal Mining Area	- Not within an area of conclusive metalliferous mining.
Ground Stability ¹	Collapsible Ground	- Very low hazard.
	Compressible Ground	- No hazard.
	Ground Dissolution	- No hazard.
	Landslide	- Very low hazard.
	Running Sand	- Very low hazard.
	Shrinking / Swelling Clay	- Very low hazard.

Table 3-1: Summary of the environmental setting.

Notes: Distance in brackets is the distance from site that features are included. Where no distance given, features relate to on site only.

Data Sources:

1 Envirocheck Report (Appendix A & B).

2 BGS Geology of Britain Viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (Appendix C).

3 The Coal Authority Web Mapping Services (WMS) /

Interactive Map Viewer <http://coal.decc.gov.uk/en/coal/cms/publications/data/map/map.aspx>.

4 Coal Authority Report (Appendix D).

Categories (data sources)		Details
Landfill Sites (250m) ¹	Known / Registered	- None.
	Potentially Infilled Land (non-water and water), based on Envirocheck Report	- 1no. feature: 214m W.
	Potentially infilled sites, based on LKC historical review	- 4no. features: See Table 2-1.
Radon Potential ¹		- <1% of homes above Action Level. No protective measures are necessary in the construction of new dwellings or extensions.
Designated Sites (50m) ¹		- None.
Contemporary Trade Directory (50m) ¹		- None.
Fuel Station Entries (50m) ¹		- None.
Unexploded Ordnance Risk (UXO)	Zetica Risk Map ⁵	- Low.

Table 3-1 (continued): Summary of the environmental setting.

Notes: Distance in brackets is the distance from site that features are included. Where no distance given, features relate to on site only.

Data Sources:

1 Envirocheck Report (Appendix A & B).

5 Zetica UXO Unexploded Bomb Risk Map (Appendix E).

4 Site Reconnaissance

A site reconnaissance was undertaken on 5th February 2021 and photographs are provided in Appendix B.

Relevant features identified on site are summarised below:

- The site is currently unmaintained grassland.
- Site levels fall to the southwest.
- The site is bordered by dry stone walls and occasional mature trees.
- There is a watercourse at the west of the site, which flows in a southerly direction. The watercourse is open in the area adjacent to the central part of the site but is culverted at the north and south.
- Hand-dug samples taken within the northern, central and southern parts of the site indicate Made Ground to 0.5-0.7m – consisting of silty Clay with frequent brick and occasional ash.

The surrounding area comprises:

- Ferngrove and a residential dwelling to the west.
- Open grass land to the north.
- Woodgate Hill Road to the east
- Rochdale Old Road to the south.

Relevant photographs are provided in Plate 4-1.



Plate 4-1: Site photographs.



Photograph 3 (facing NW):
South-eastern site boundary.

Photograph 4 (facing N):
Watercourse at western boundary.



Photograph 5 (facing N):
Upstream culvert at northwest of site.

Photograph 6 (facing E):
Site entrance at southwestern boundary.

Plate 4-1 (continued): Site photographs.

5 Preliminary Conceptual Model

5.1 Introduction

The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and whether further site investigation work is required.

The Sections below are therefore divided into potential contaminant, potential pathway and potential receptor as described in LCRM³, on the premise that, if there is no pollutant linkage, then there will be no risk to the receptor. The final Section provides an assessment of the potential pollutant linkages that may still be present on the site if redevelopment were to occur.

5.2 Potential Contaminants

Potential viable contamination sources are detailed in Table 5-1. These are split into onsite sources, offsite sources and underlying geology.

Potential Source	Contaminants
On Site	
Shallow Made Ground below some or all of site (e.g. site levelling)	- Assuming predominantly reworked natural soils with possible demolition rubble, ash and clinker: Asbestos, heavy metals, sulphates, PAHs⁴. - Not expected to be a significant source of gas given anticipated depth and nature of Made Ground.
Demolished buildings	- Asbestos Containing Material (ACM).
Surrounding Area	
Textile Mill (woollen, weaving, cotton weaving)	- Metals, other inorganic compounds (e.g. cyanides, sodium compounds, sulphide compounds, chloride compounds, mineral acids, alkalis), chlorinated organic solvents, sizing agents, other organic compounds (e.g. formaldehydes, polyvinyl chloride), water repellents (organo silicon, oxazoline), fire / flame retardants (e.g. borax, ammonium phosphate, brominated organic compounds with metals oxides), soaps and detergents. - Other ancillary activities could include coal fired boilers producing large quantities of boiler ash (heavy metals, sulphates and PAHs), if powered by gas or oil there may historically have been fuel storage tanks. Asbestos may have been used within the building as insulation and lagging or as roofing and cladding⁵.
Surrounding land uses (tramway, domestic garage clusters, allotments)	- Not expected to be a significant source due to distance and position to the site.
Offsite potentially infilled features within 250m	- Given size, distance and age of features, there is not considered to be a significant source of hazardous gas.
Underlying Geology	
Underlying Pennine Lower Coal Measures	- Ground Gas (principally carbon dioxide and methane). - There is not considered to be a significant source as no worked coal seams are anticipated beneath the site.

Table 5-1: Potential contamination sources.

³ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

⁴ Defra (2002). "Potential Contaminants for the Assessment of Land". R&D Publication CLR 8.

⁵ Department of the Environment. Industry Profile. Textile Works and Dye Works. 1995.

5.3 Potential Receptors

Potential receptors are detailed in Table 5-2.

Receptors	
Human Health	- Future site users (including residents, visitors and site workers). - Offsite land users.
Controlled Waters	- Stream onsite. - Secondary A Aquifer.
Buildings and structures.	
Potable water pipes.	
Flora within future gardens and landscaping.	

Table 5-2: Potential receptors.

5.4 Potential Pathways

Potential pathways are detailed in Table 5-3.

Pathways		
Soil	Human Health ⁶ (residential land use: houses with private gardens)	- Ingestion of soil. - Ingestion of soil-derived indoor dust. - Ingestion of contaminated vegetables. - Ingestion of soil attached to vegetables. - Dermal contact with soil. - Dermal contact with soil-derived indoor dust. - Inhalation of soil-derived outdoor dust. - Inhalation of soil-derived indoor dust. - Inhalation of vapours outside. - Inhalation of vapours inside.
		- Windblown dust and fibres to adjacent receptors.
		- Direct contact with receptors (building foundations, services).
		- Root uptake.
		- Surface run-off over impermeable surface.
Water		- Infiltration into the ground, through potentially contaminated material (contamination possibly going into solution).
Water and Gas		- Migration through potentially permeable strata and preferential pathways. - Superficial (Till) likely to be low permeability. - Bedrock (mudstone, siltstone, sandstone) likely to be variably permeable. - Bedrock (sandstone) likely to be relatively permeable. - Preferential pathways: watercourse, services.
Gas		- Migration into buildings (e.g. via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).

Table 5-3: Potential pathways.

5.5 Preliminary Contamination Conceptual Model

The Preliminary Contamination Conceptual Model is illustrated in Table 5-4 and has identified seven generic potential pollutant linkages.

Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552⁷.

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the

⁶ EA (2008). "Updated Technical Background to the CLEA Model". Science Report – SC050021/SR3.

⁷ CIRIA (2001). "Contaminated Land Risk Assessment: A Guide to Good Practice". C552.

magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix F.

Where LKC identified a low to very low risk, targeted or low-density intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

Where LKC identifies a moderate or higher risk, intrusive investigation work or precautionary remedial measures will be recommended.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance⁸) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

⁸ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land". London HMSO.

PL	Pathway	Receptor	Contaminants of Concern (CoC)	Probability	Consequence	Risk	Recommendations
1	- Dermal contact. - Inhalation of soil, fibres and dust. - Ingestion of soils, dust, vegetables, soil attached to vegetables. - Windblown dust.	- Future site users. - Offsite receptors.	- ACM. - Heavy metals. - PAHs.	Likely (given site history, site conditions and proposed end use)	Medium	Moderate	Intrusive investigation required. Soil analysis of CoC.
			- Petroleum hydrocarbons. - Other inorganic and organic contaminants.	Low Likelihood (given site conditions and source location)	Medium	Moderate / Low (low assumed as significant migration of contaminants to site not anticipated)	Watching brief during groundworks. Soil analysis of CoC, subject to ground conditions encountered.
2	- Inhalation of vapours. - Migration via permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	- Volatile contaminants (TPHCWG, SVOC, VOCs).	Unlikely (given site history, site conditions and proposed end use)	Medium	Low	Watching brief during groundworks. Soil analysis of CoC, subject to ground conditions encountered and PID testing.
3	- Inhalation of gas. - Migration via permeable strata and preferential pathways. - Explosion in confined spaces.	- Future site users. - Buildings. - Offsite land users.	- Ground / hazardous gas (carbon dioxide, methane).	Unlikely (given no viable gas source)	Severe	Moderate / Low (low assumed as no significant source)	No further assessment required.
4	- Surface run-off. - Migration via permeable strata and preferential pathways. - Perched waters migration.	- Groundwater (Secondary A Aquifer). - Surface water (Stream onsite).	- Mobile contaminants such as metals, PAHs, hydrocarbons.	Unlikely (no significant mobile contamination anticipated)	Medium	Low	Watching brief during groundworks. Groundwater and surface water sampling, subject to ground conditions encountered. Analysis of CoC.
5	- Sulphate attack on concrete.	- Building structure.	- Sulphate.	Likely (given site history, site conditions and direct contact / pathway)	Mild	Moderate / Low (moderate assumed until ground conditions confirmed)	Low density intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered.
6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	- Organic contaminants such as petroleum hydrocarbons, naphthalene.	Low Likelihood (given site history, site conditions and made ground not expected at pipeline depth)	Medium	Moderate / Low (low risk assumed given anticipated limited made ground and contamination)	Watching brief during groundworks. Soil analysis of CoC, subject to ground conditions encountered.
7	- Direct contact (plant uptake).	- Flora.	- Phytotoxic contaminants such as heavy metals.	Likely (given site history, site conditions and proposed end use)	Minor	Low	Low density intrusive investigation required. Soil analysis of CoC.

Table 5-4: Preliminary Contamination Conceptual Model.

Notes: PL = Pollutant Linkage. Contaminant of Concern (CoC) - See Table 5-1 for contamination sources. Site conditions based on observations during site reconnaissance.

6 Preliminary Geotechnical Risk Assessment

Table 6-1 summarises the possible geotechnical constraints of the site, based on the site history, environmental settings and site reconnaissance. Investigation work will be required to confirm the risks and provide a detailed geotechnical assessment and foundation design.

Coal Mining	Site is not within a Development High Risk Area. No further assessment required.
Slope Stability	Site slopes to the south west. Depending on proposed levels stability assessment and / or retaining structures may be required.
Envirocheck Ground Stability Hazards	No to very low hazard identified. No further action required.
Made Ground	Unknown depth and constituent of made ground across the site. Initial information indicates relatively shallow made ground anticipated. Possible in-ground structures from previous structures. Unlikely to be a suitable founding stratum.
Superficial	Unknown strength of soils for foundation design.
Bedrock	Unknown depth to bedrock.
Groundwater	Shallow / fluctuating groundwater can affect the strength of the soil, particularly in granular ground. Shallow groundwater can also affect construction works.
Plasticity	Plasticity of clay deposits should be confirmed, particularly where trees are present or proposed, to identify the shrink / swell risk.
Sulphate	Unknown sulphate content of the made ground and natural. Ash noted in the made ground which may give rise to elevated sulphate.
Road / Pavement Design	Unknown CBR values for footpath and road design.
Watercourse	Onsite watercourse and possible historic seasonal pond will need to be considered.

Table 6-1: Summary of geotechnical constraints.

7 Summary Conclusions and Recommendations

7.1 Summary Conclusions

Table 7-1 summarises the site details, historical review, environmental settings and site reconnaissance.

Current Site Use	Unmaintained grassland with a stream and trees.
Proposed Development	5no. residential houses (semi-detached and terraced) with rear gardens. Associated infrastructure including access road and parking.
Main Historical Features	Onsite: watercourse, outbuilding, glass house, former pond. Surrounding Area: mill, tramway, reservoirs, cutting, allotment gardens, domestic garage clusters.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Till. Secondary Undifferentiated Aquifer. Bedrock: Pennine Lower Coal Measures. Secondary A Aquifer.
Landfills / Infilled ground	No recorded landfills. Potentially infilled ground identified.
Coal Mining	No recorded mine workings beneath the site.
Site walkover	The site levels fall to the southwest. The site is bordered by dry stone walls and occasional mature trees. There is a watercourse at the west of the site, which flows in a southerly direction. The watercourse is open in the area adjacent to the central part of the site but is culverted at the north and south. Hand-dug samples taken within the northern, central and southern parts of the site indicate Made Ground to 0.5-0.7m – consisting of silty Clay with frequent brick and occasional ash.

Table 7-1: Summary of site details, historical review, environmental settings and site reconnaissance.

A preliminary contamination conceptual model has been produced by LKC, which is summarised in Table 7-2.

Pollutant Linkage		Risk	Recommendations
PL1: Contaminants posing a risk to future site users via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	ACM, heavy metals, PAHs	Moderate	Intrusive investigation required. Soil analysis of CoC.
	Petroleum hydrocarbons, other contaminants.	Moderate / Low	Watching brief during groundworks. Soil analysis of CoC, subject to ground conditions encountered.
PL2: Volatile contaminants posing a risk to future site users via the inhalation of vapours.		Low	Watching brief during groundworks. Soil analysis of CoC, subject to ground conditions encountered and PID testing.
PL3: Gas posing a risk to buildings and future site users via the migration of gas into building causing explosion and asphyxiation.	Carbon dioxide & methane	Moderate / Low	No further assessment required.
PL4: Mobile contamination posing a risk to controlled waters via the migration through permeable strata.		Low	Watching brief during groundworks. Groundwater sampling, subject to ground conditions encountered. Analysis of CoC.
PL5: Sulphate posing a risk to building via direct contact (sulphate attack).		Moderate / Low	Low density intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered.

Table 7-2: Summary risk table.

Where moderate / low risk had been identified, the assumed risk is shown in bold.

Pollutant Linkage	Risk	Recommendations
PL6: Organic contaminants posing a risk to water pipes.	Moderate / Low	Watching brief during groundworks. Soil analysis of CoC, subject to ground conditions encountered.
PL7: Phytotoxic metals posing a risk to flora via root uptake.	Low	Low density intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered.

Table 7-2 (continued): Summary risk table.

Where moderate / low risk had been identified, the assumed risk is shown in bold.

A preliminary geotechnical assessment has been carried out by LKC. Table 7-3 summarises the geotechnical constraints.

Coal Mining	Site is not within a Development High Risk Area. No further assessment required.
Slope Stability	Site slopes to the south west. Depending on proposed levels stability assessment and / or retaining structures may be required.
Made Ground	Unknown depth and constituent of made ground across the site.
Superficial	Unknown strength of soils for foundation design.
Bedrock	Unknown depth to bedrock.
Groundwater	Shallow groundwater anticipated.
Plasticity	Plasticity of clay deposits should be confirmed.
Sulphate	Unknown sulphate content of the made ground and natural.
Road / Pavement Design	Unknown CBR values for footpath and road design should be calculated.
Watercourse	Watercourse and former seasonal pond onsite.

Table 7-3: Summary of geotechnical constraints.

7.2 Recommendations

Recommendations are provided in Table 7-4.

Contamination status	There is sufficient information on the potential contaminative status of the site to allow conditional approval of a planning application, based on the proposed end use detailed in the PRA.
Further assessment recommendations	Phase 2 intrusive investigation required. Phase 2 investigation to be carried out in line with current guidance, including BS10175 ⁹ , BS5930 ¹⁰ CIRIA C665 ¹¹ , RB17 ¹² and BS8485 ¹³ . 'Detailed investigation': 1 sample per 10-25m square centres. Plus targeted investigation locations in areas of concern (contamination and geotechnical). To be agreed with the Local Authority.
Type of investigation work	Boreholes and / or trial pits.
PL 1, 2, 5, 6, 7	Intrusive investigation work recommended to confirm ground conditions across the site. Testing of contaminants of concern based on preliminary conceptual model and field observations (PID tests and visual / olfactory evidence).

Table 7-4: Recommendations.

⁹ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice". BS10175:2017.

¹⁰ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹¹ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings". CIRIA C665.

¹² CL:AIRE Research Bulletin RB17 (November 2012) "A Pragmatic Approach to Ground Gas Risk Assessment".

¹³ BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings". BS8485:2015.

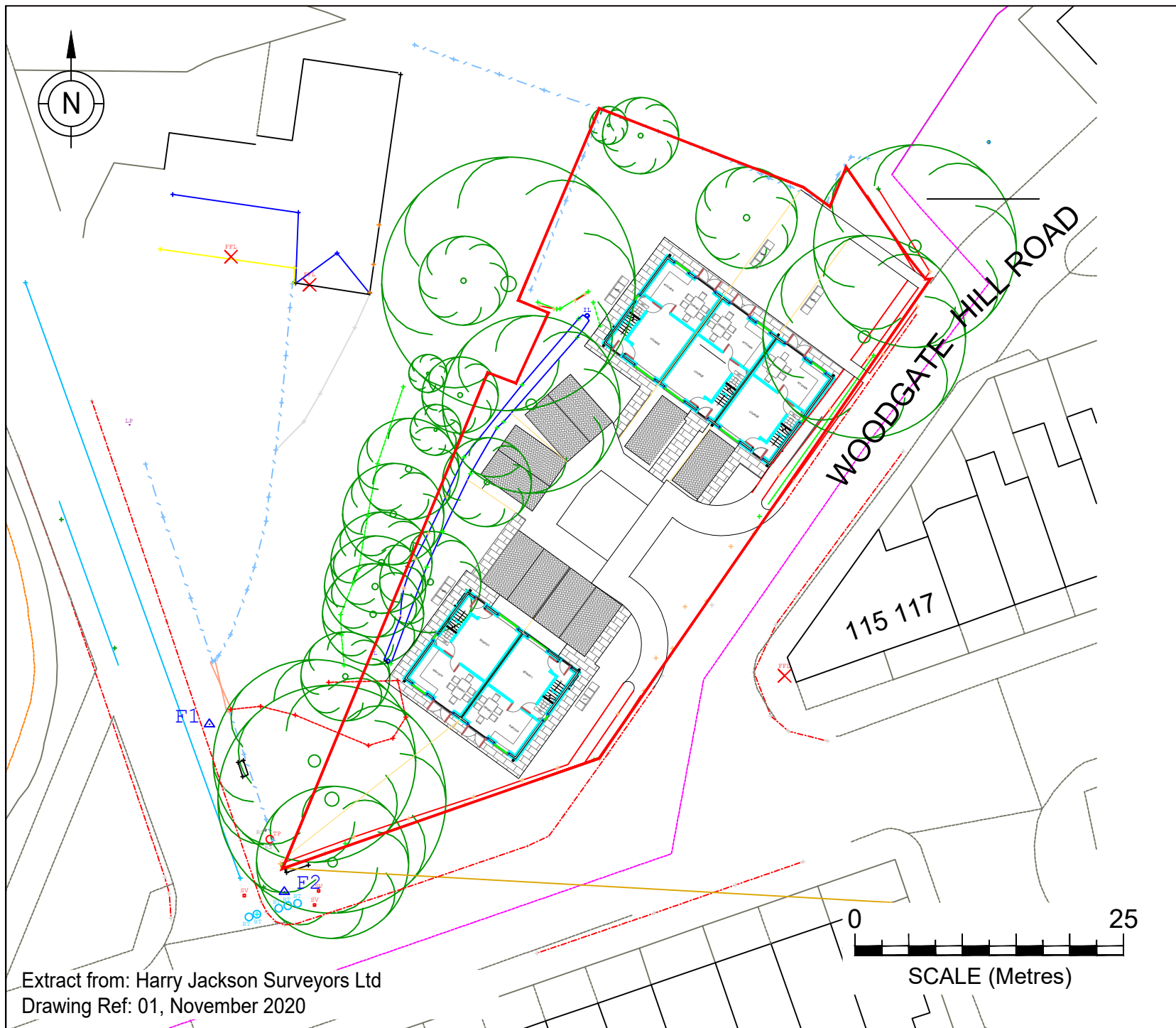
PL 3	No further assessment required.
PL 4	Groundwater and surface water sampling, subject to ground conditions encountered.
Reporting	Information from the above can be used to carry out a contamination and geotechnical assessment and provide a remediation strategy for the site.

Table 7-4 (continued): Recommendations.

Figures



Client: Lord Roofing (NW) Ltd				Title: Site Location & Boundary Plan			
Site: Land at Ferngrove, Bury				Scale (see scale bar): 1:25,000 & 1:2,000 @ A4			
Job No.: LKC 20 2015	Drawn By: CC	Checked By: MT	Drawn: March 2021	Figure: 1	Revision:		



Extract from: Harry Jackson Surveyors Ltd
Drawing Ref: 01, November 2020

KEY



Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:			
Lords Roofing (NW) Ltd			
Site:			
Land at Ferngrove, Bury			
Title:			
Proposed Development Plan			
Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 20 2015	See Scale Bar	2	
Drawn By:	Checked By:		
CC	MT	March 2021	

Appendix A

Historical Maps

Published 1893 - 1894

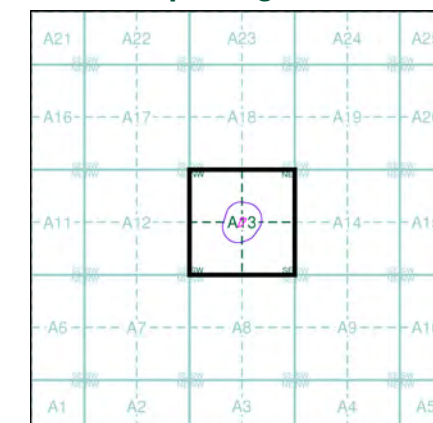
Source map scale - 1:2,500

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)

088_05 1893 1:2,500	088_06 1894 1:2,500
088_09 1893 1:2,500	088_10 1893 1:2,500

Historical Map - Segment A13

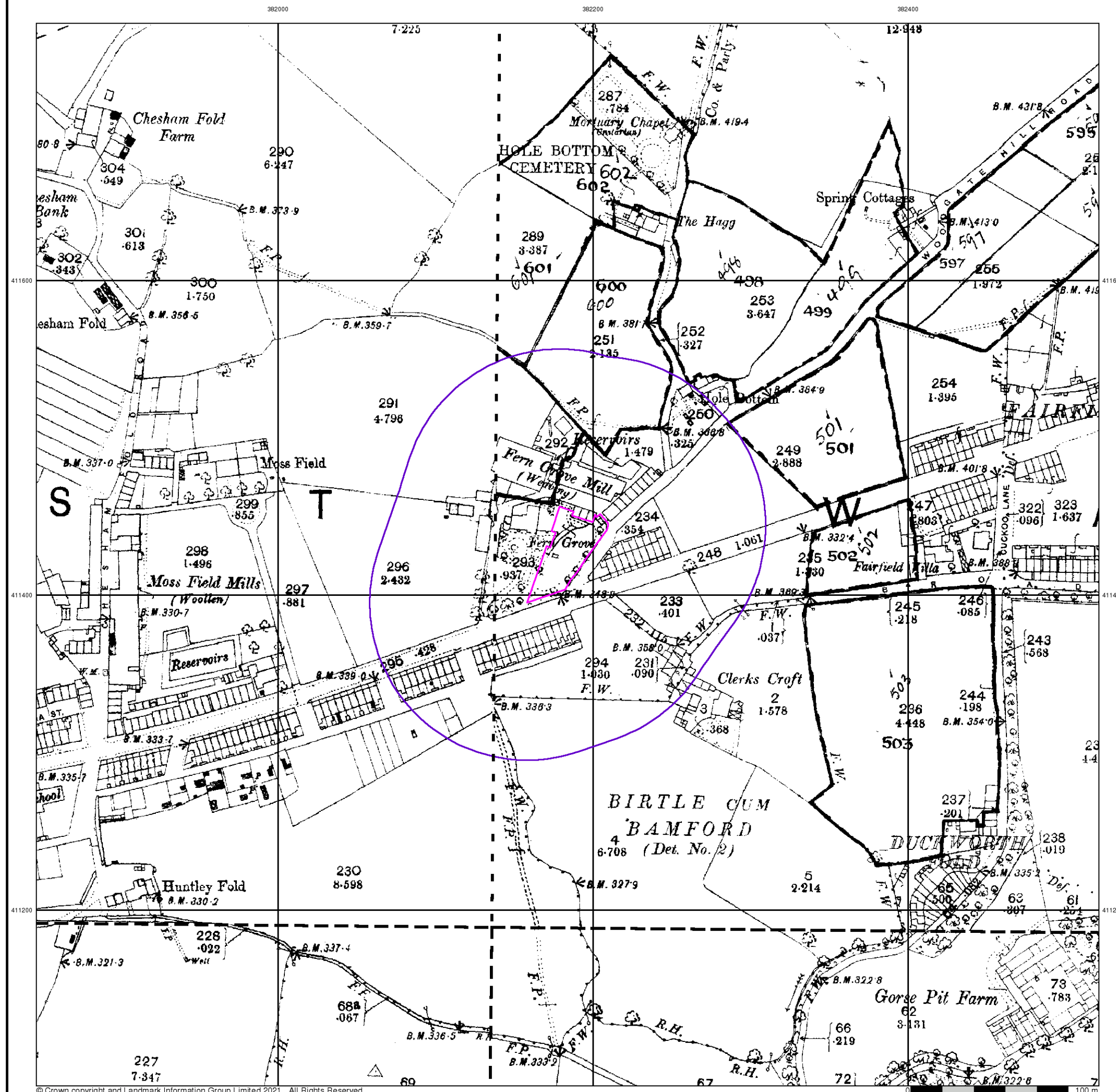


Order Details

Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

Land between Ferngrove and Woodgate Hill Road, Rochdale
Old Road, Bury, BL9 7LS



Published 1910

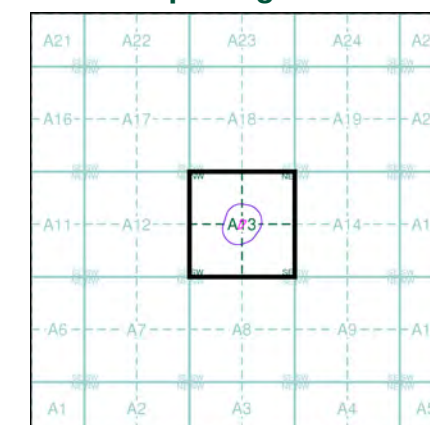
Source map scale - 1:2,500

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)

088_05 1910 1:2,500	088_06 1910 1:2,500
088_09 1910 1:2,500	088_10 1910 1:2,500

Historical Map - Segment A13

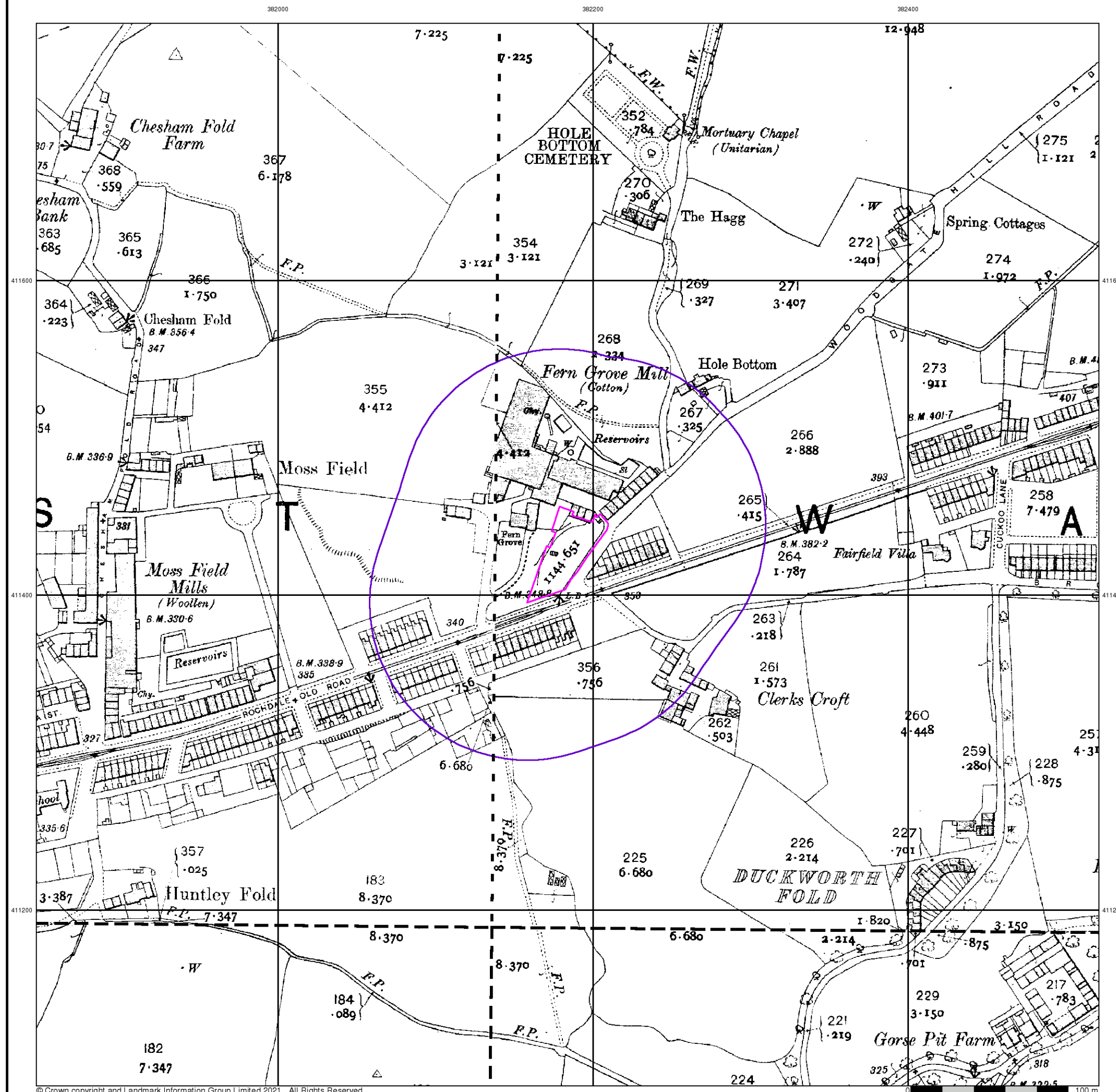


Order Details

Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

Land between Ferngrove and Woodgate Hill Road, Rochdale
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Published 1930

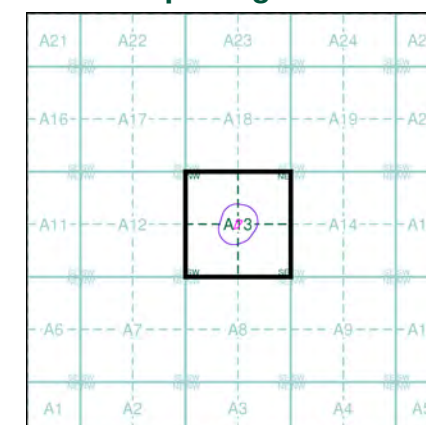
Source map scale - 1:2,500

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)

088_05 1930 1:2,500	088_06 1930 1:2,500
088_09 1930 1:2,500	088_10 1930 1:2,500

Historical Map - Segment A13



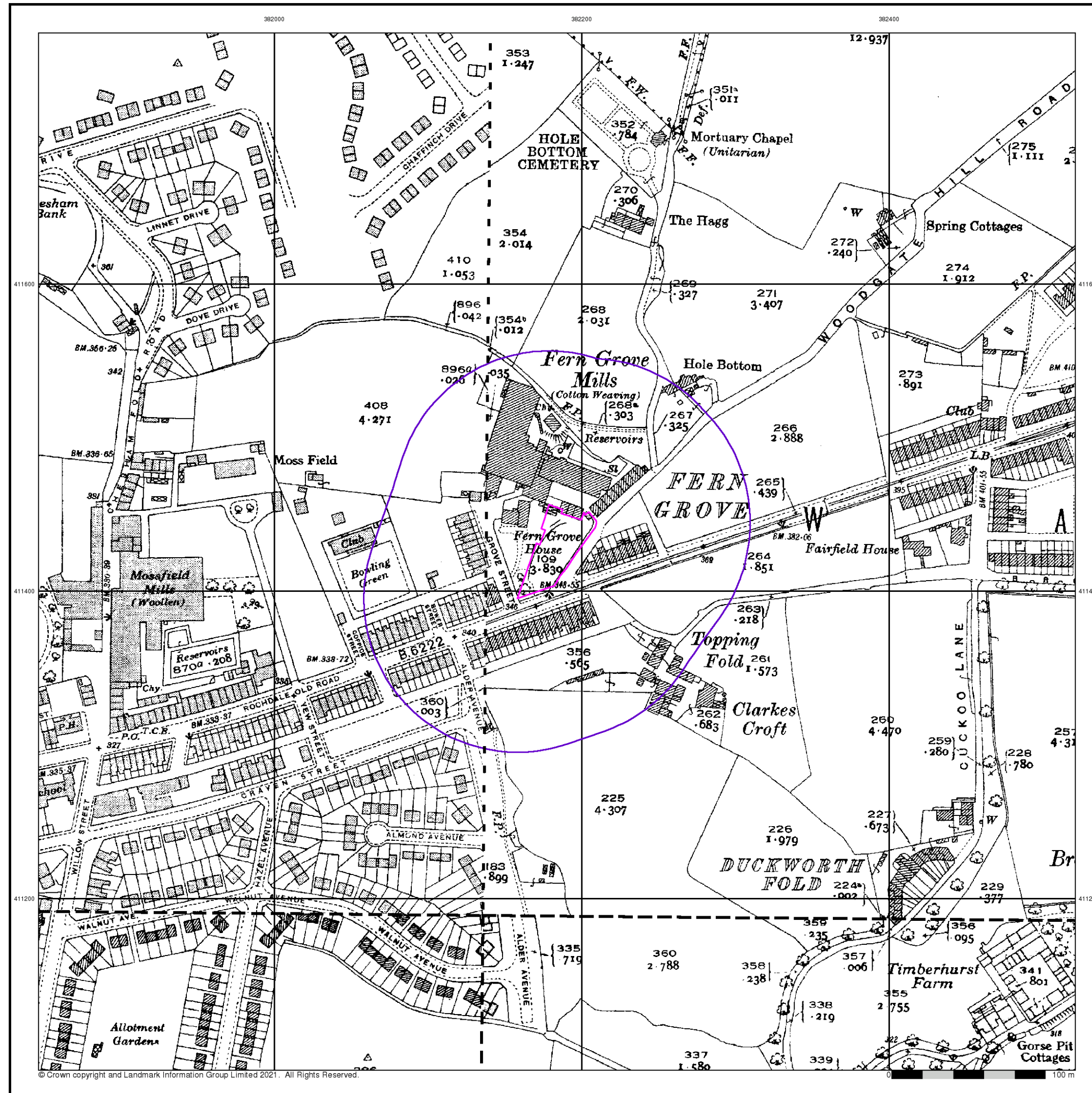
Order Details

Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

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Lancashire And Furness

Published 1937 - 1939

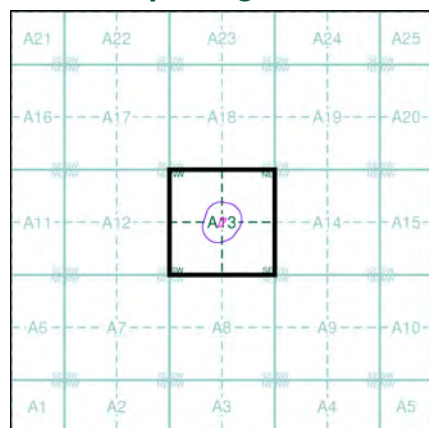
Source map scale - 1:2,500

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)

088_05 1939 1:2,500	088_06 1937 1:2,500
088_09 1937 1:2,500	088_10 1937 1:2,500

Historical Map - Segment A13



Order Details

Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

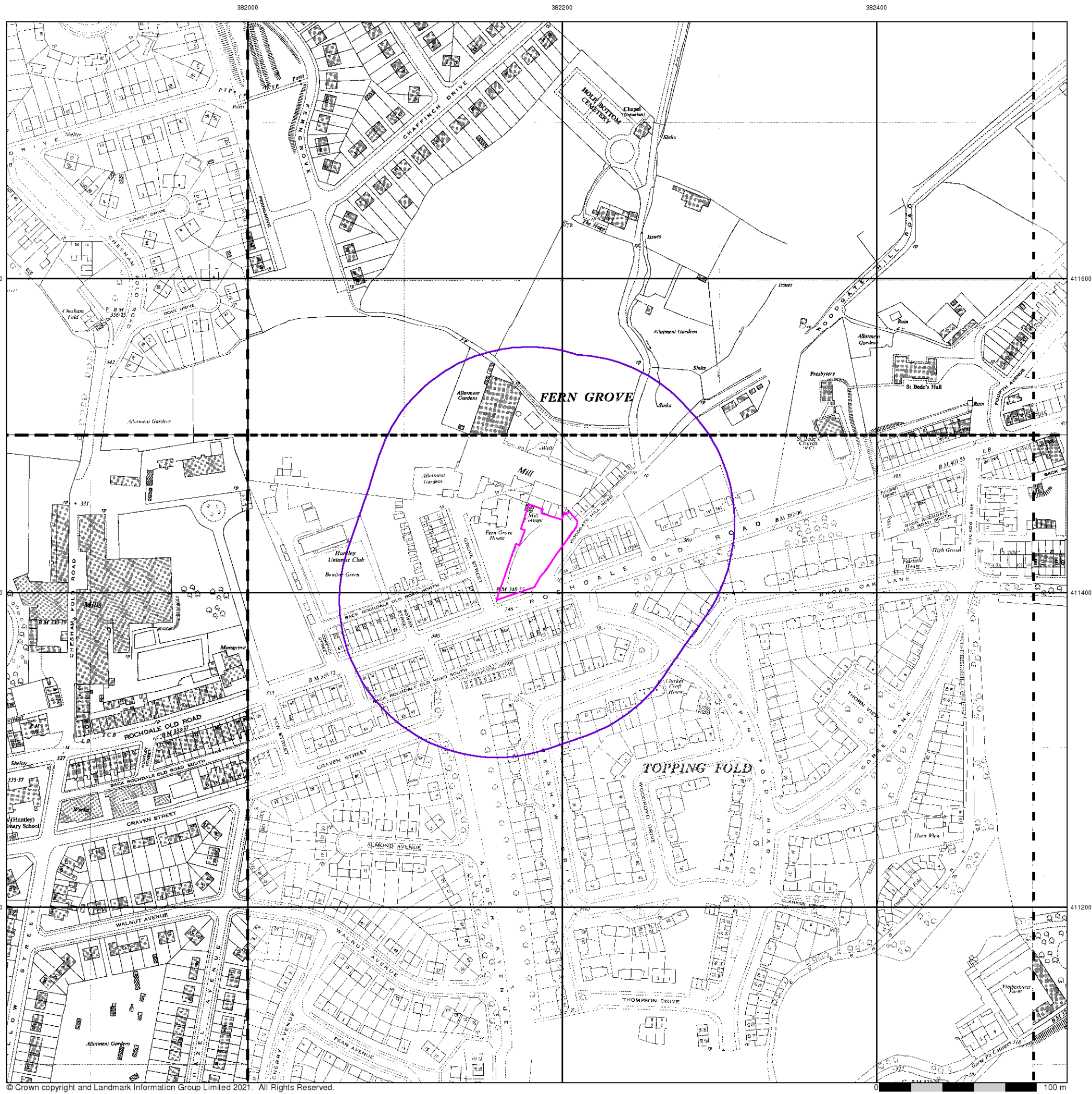
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LK GROUP

Ordnance Survey Plan

Published 1959

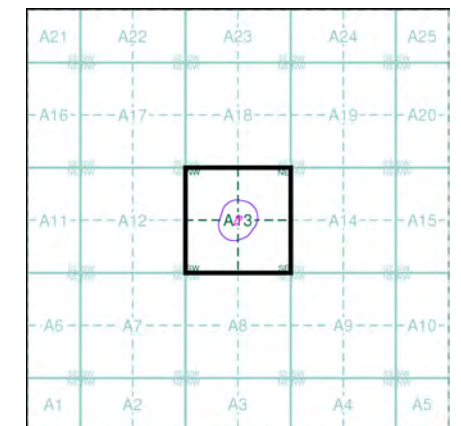
Source map scale - 1:1,250

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)

SD8111NE 1959 1:1,250	SD8211NW 1959 1:1,250	SD8211NE 1959 1:1,250
SD8111SE 1959 1:1,250	SD8211SW 1959 1:1,250	SD8211SE 1959 1:1,250

Historical Map - Segment A13



Order Details

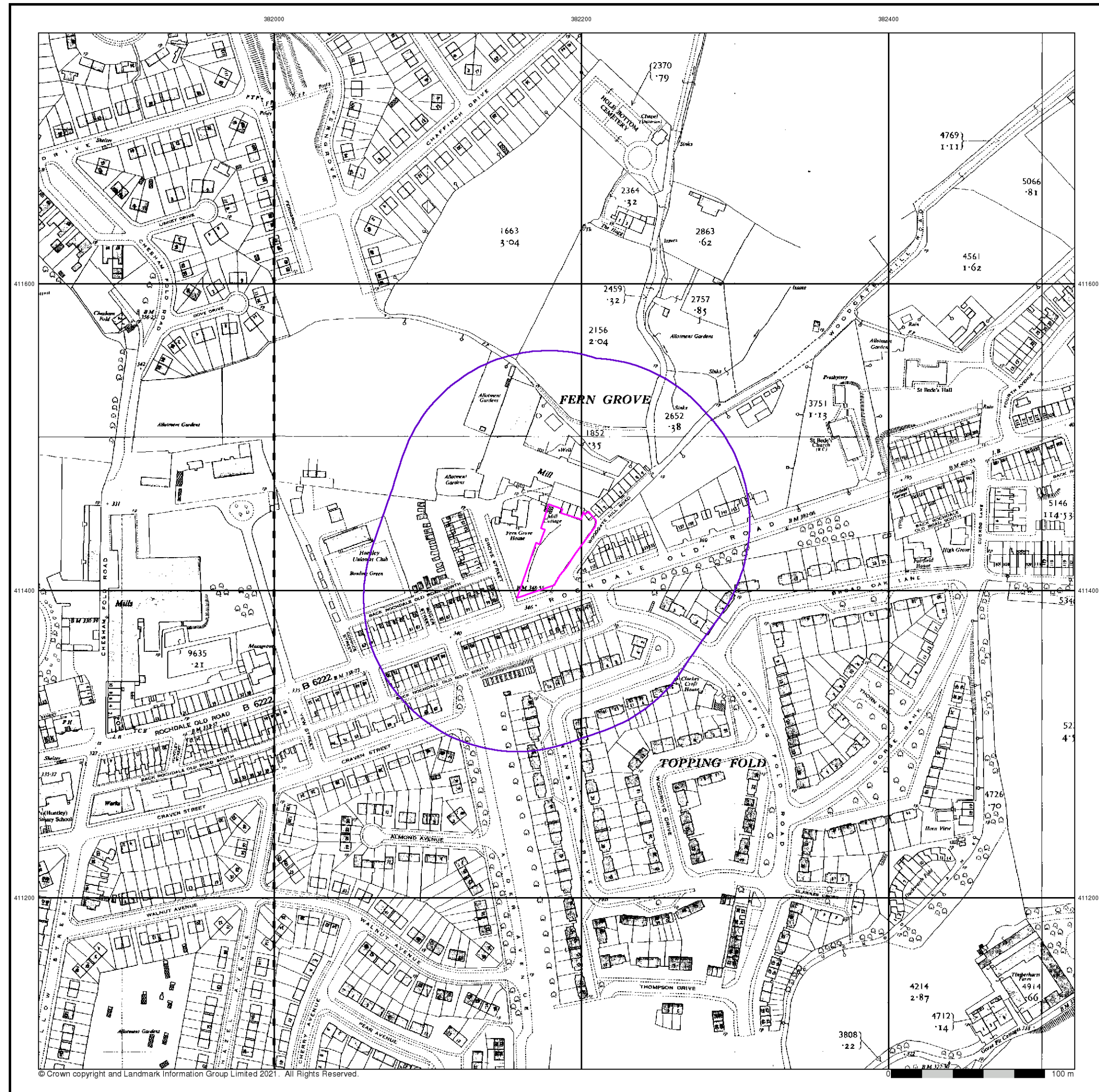
Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

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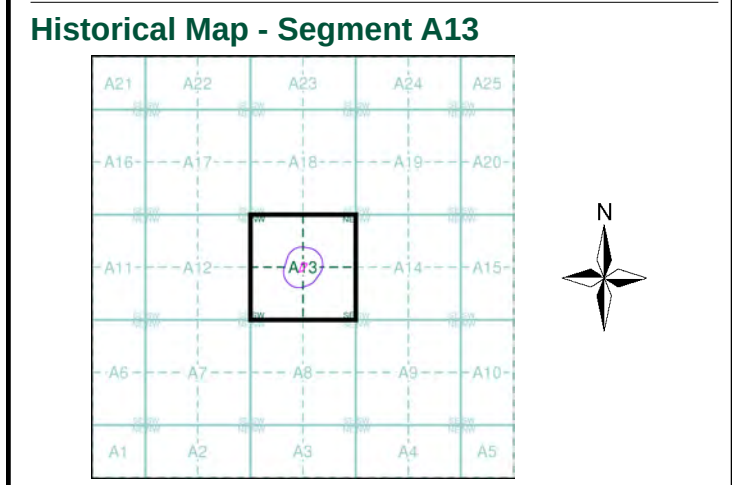
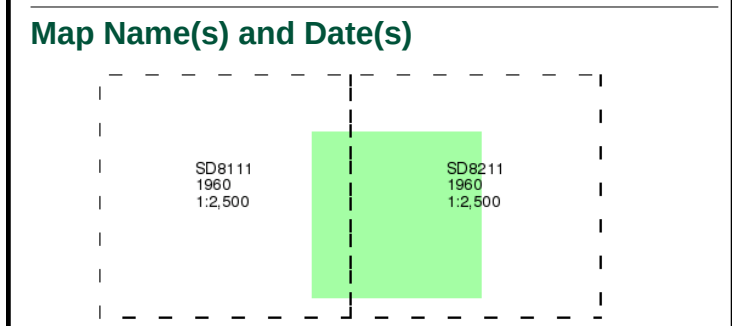
GROUP

Ordnance Survey Plan

Published 1960

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.



Order Details

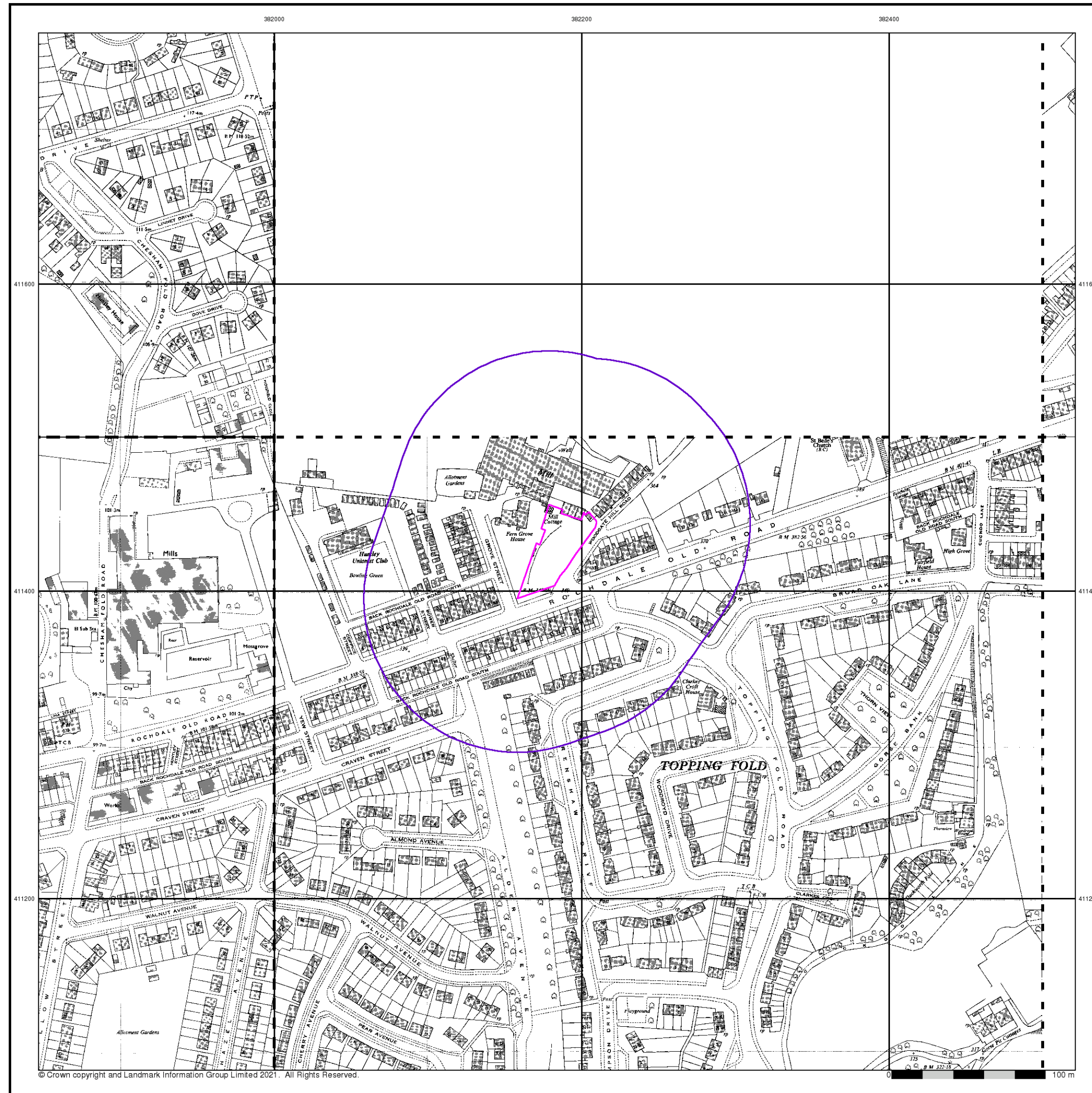
Order Number:	273312241_1_1
Customer Ref:	LKC 20 2015
National Grid Reference:	382180, 411430
Slice:	A
Site Area (Ha):	0.15
Search Buffer (m):	100

Site Details

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Ordinance Survey Plan

Published 1964 - 1976

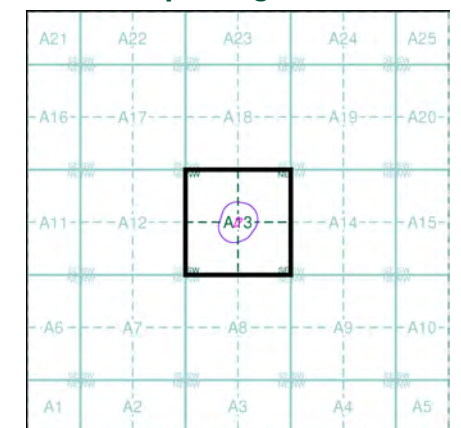
Source map scale - 1:1,250

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)

SD8111NE 1970 1:1,250	SD8211NE 1964 1:1,250
SD8111SE 1976 1:1,250	SD8211SW 1964 1:1,250

Historical Map - Segment A13



Order Details

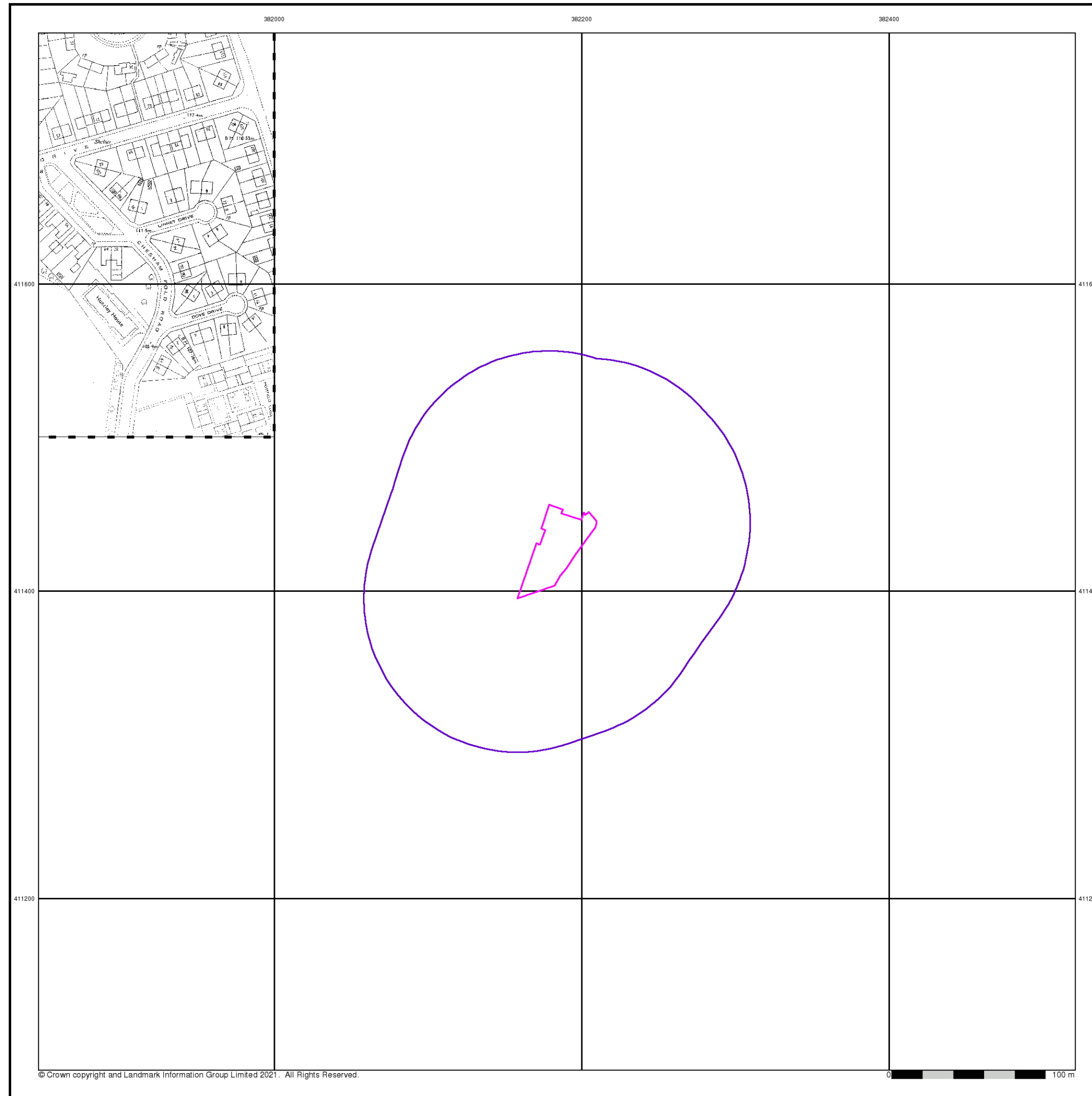
Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

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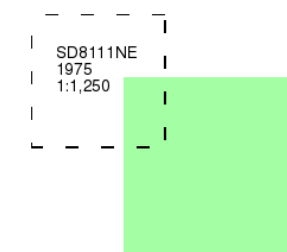
Supply of Unpublished Survey Information

Published 1975

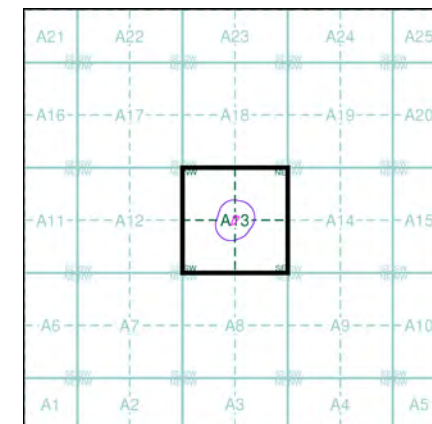
Source map scale - 1:1,250

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)



Historical Map - Segment A13



Order Details

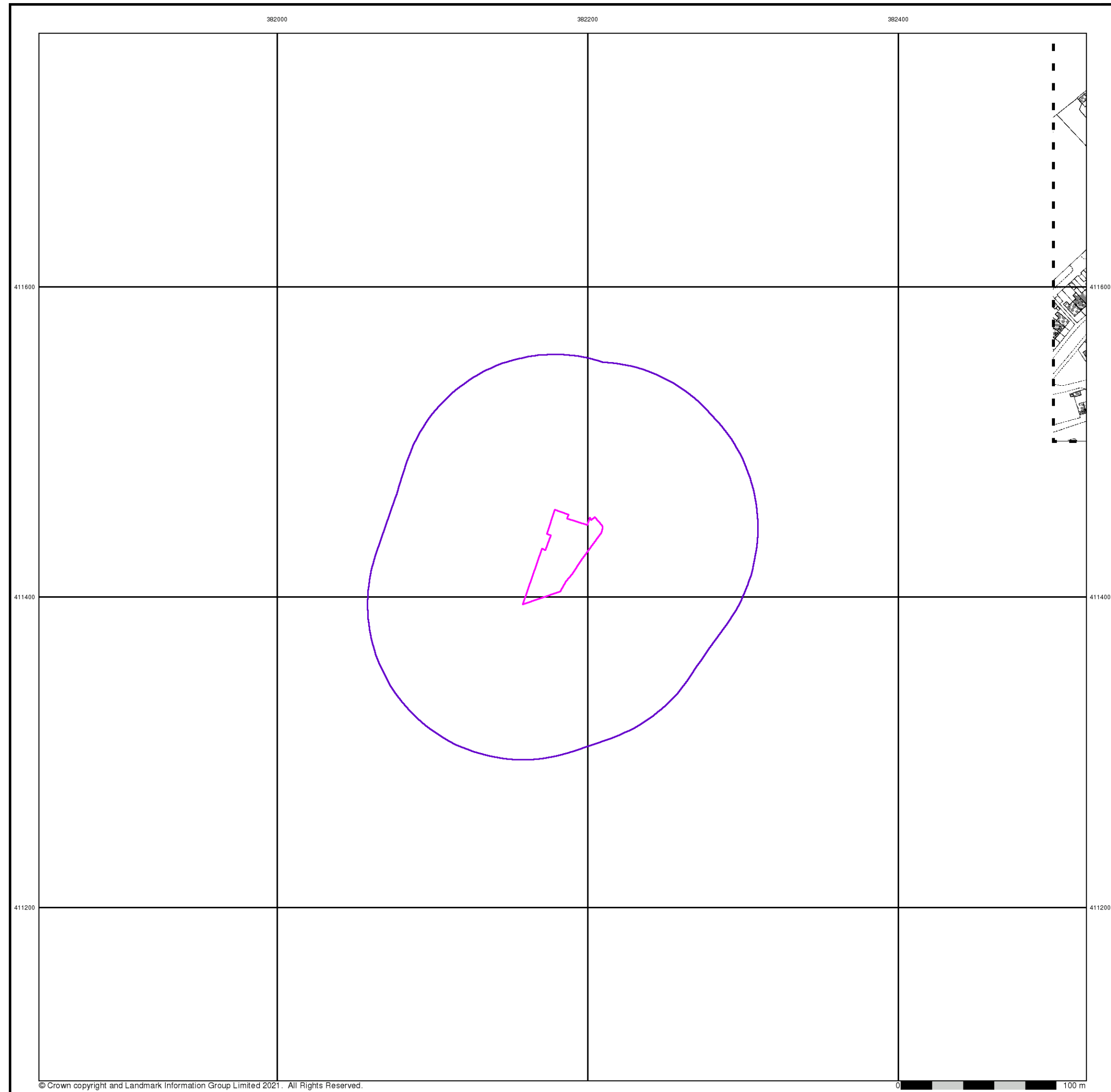
Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

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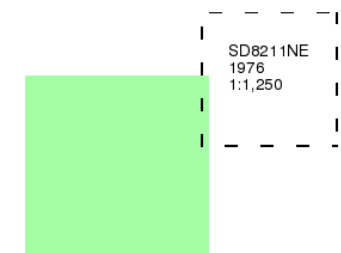
Ordinance Survey Plan

Published 1976

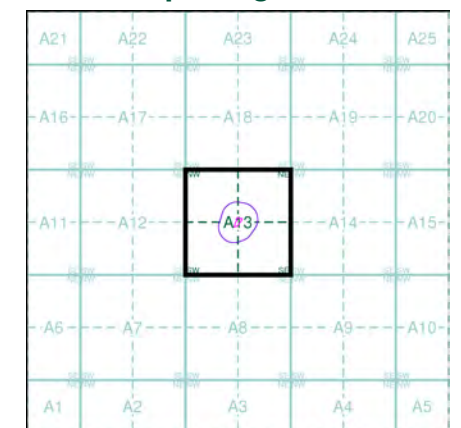
Source map scale - 1:1,250

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

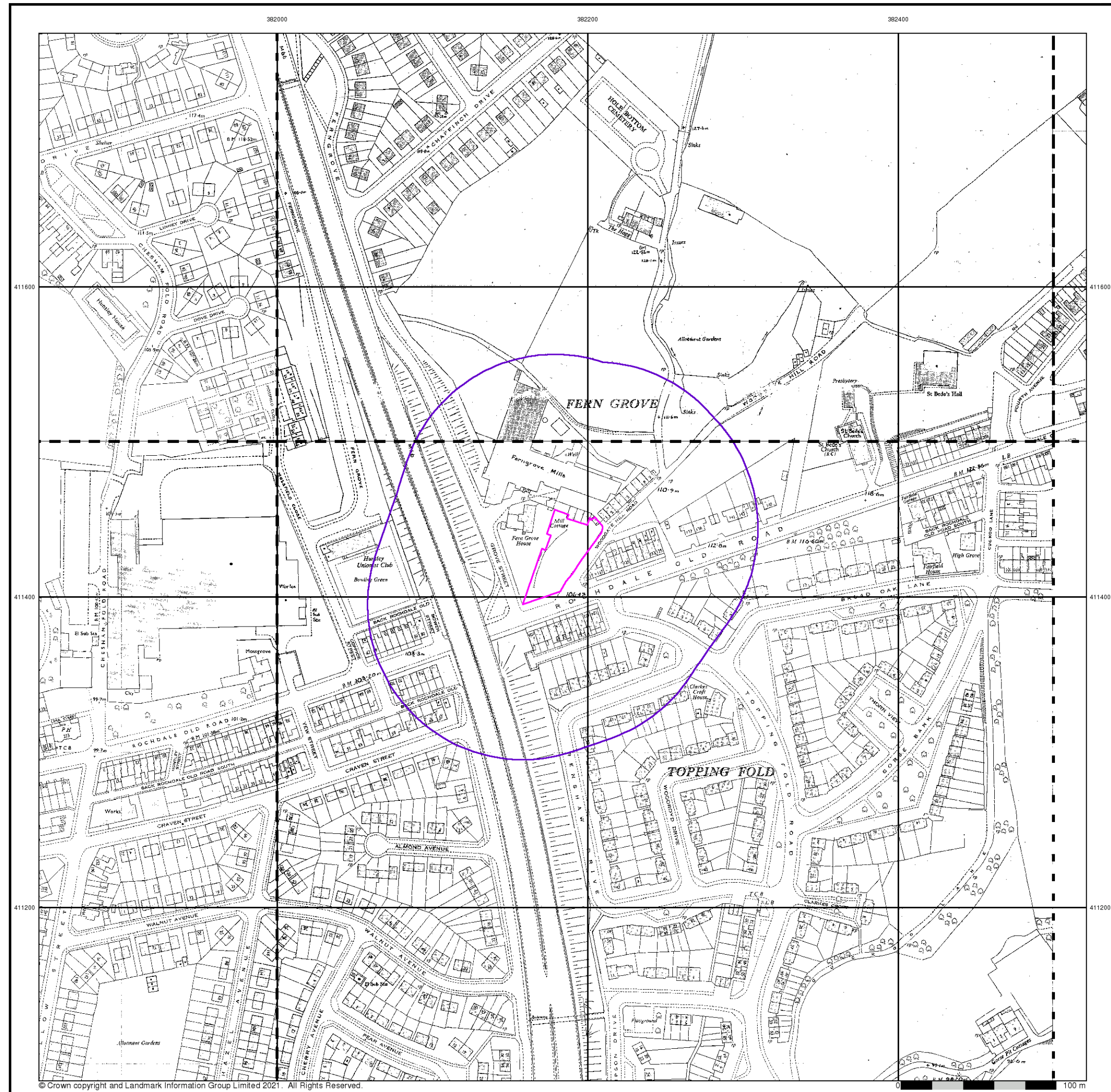
Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

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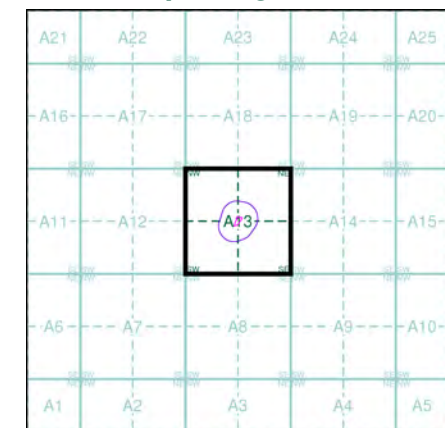
Published 1977 - 1985
Source map scale - 1:1,250

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)

SD8111NE	SD8211NW	SD8211NE
1977	1980	1978
1:1,250	1:1,250	1:1,250
SD8111SE	SD8211SW	
1985	1980	
1:1,250	1:1,250	

Historical Map - Segment A13



Order Details

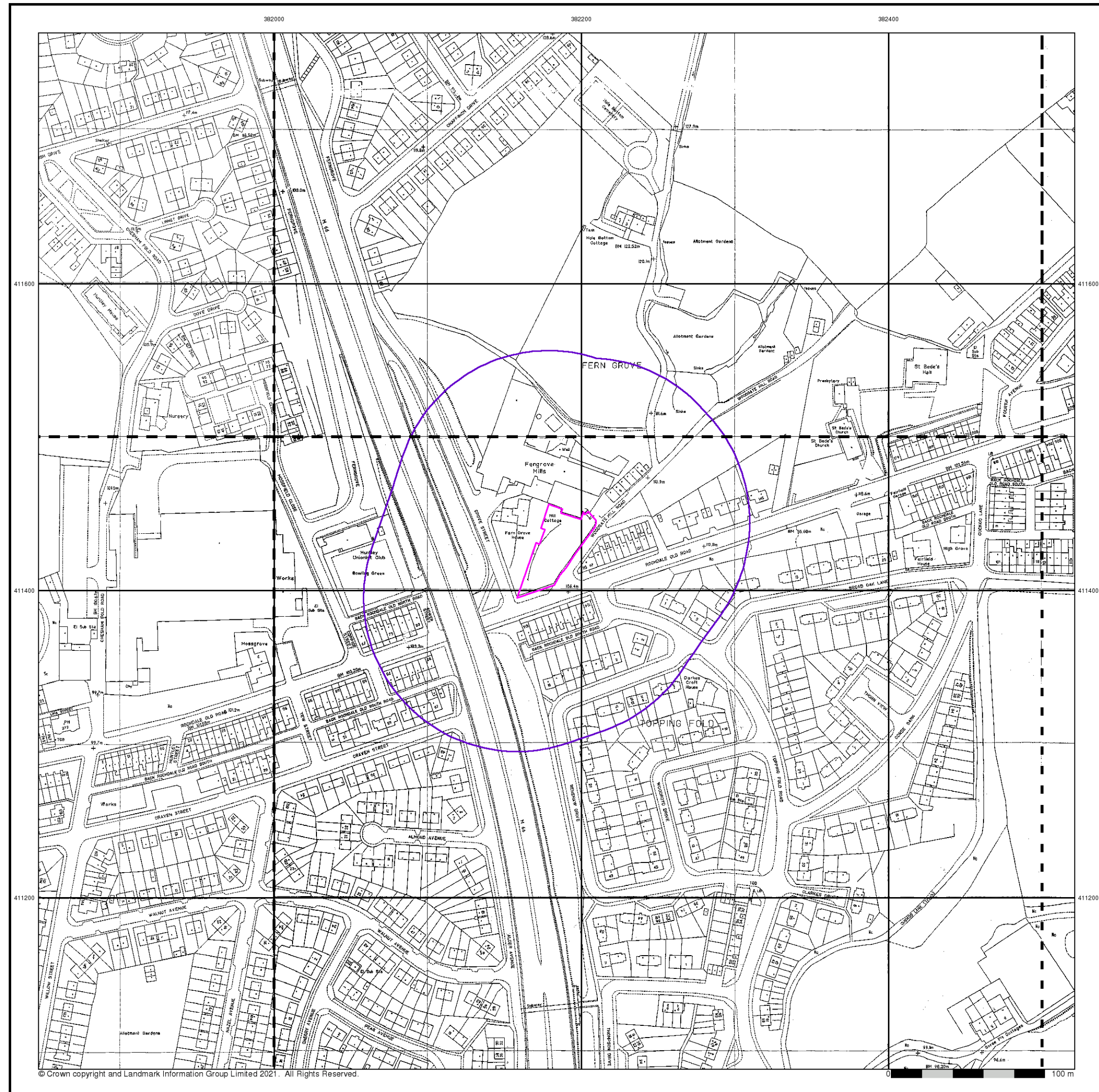
Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

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LK

GROUP

Large-Scale National Grid Data

Published 1992

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)

SD8111NE	SD8211NW	SD8211NE
1992	1992	1992
1:1,250	1:1,250	1:1,250
SD8111SE	SD8211SW	SD8211SE
1992	1992	1992
1:1,250	1:1,250	1:1,250

Historical Map - Segment A13

A21A22A23A24A25

A16A17A18A19A20

A11A12A13A14A15

A6A7A8A9A10

A1A2A3A4A5

N

Order Details

Order Number: 273312241_1_1

Customer Ref: LKC 20 2015

National Grid Reference: 382180, 411430

Slice: A

Site Area (Ha): 0.15

Search Buffer (m): 100

Site Details

Land between Ferngrove and Woodgate Hill Road, Rochdale Old Road, Bury, BL9 7LS

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LK GROUP
Large-Scale National Grid Data
Published 1994
Source map scale - 1:1,250

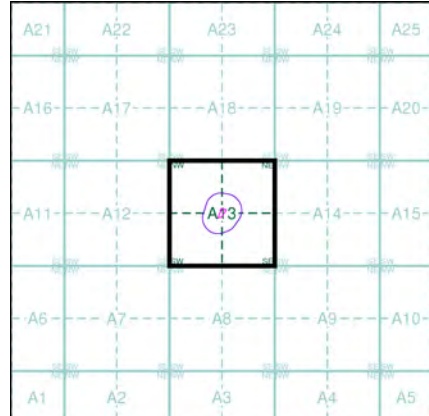
'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic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

Map Name(s) and Date(s)



SD8111SE
1994
1:1,250

Historical Map - Segment A13

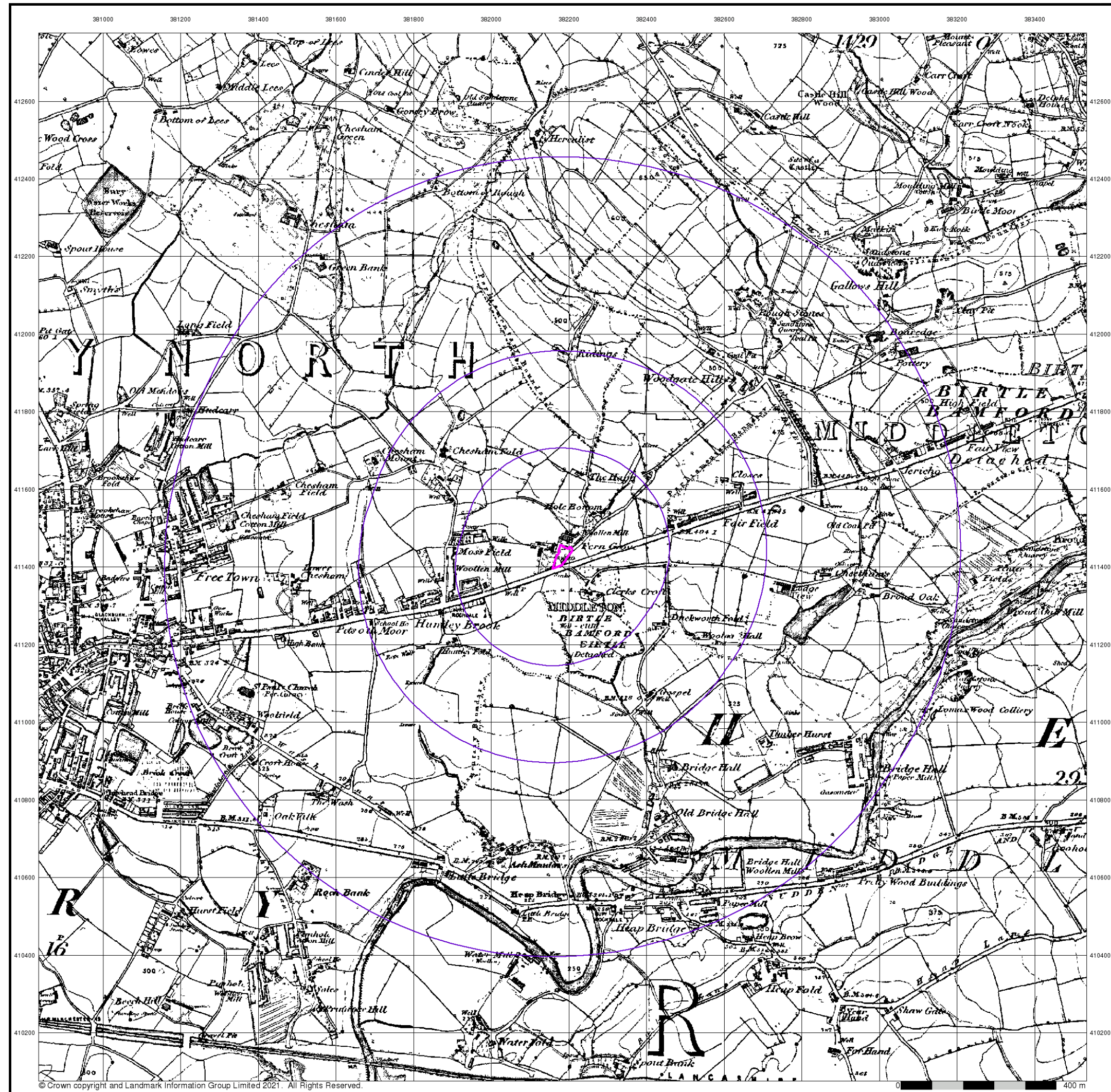


Order Details

Order Number: 273312241_1_1
Customer Ref: LKC 20 2015
National Grid Reference: 382180, 411430
Slice: A
Site Area (Ha): 0.15
Search Buffer (m): 100

Site Details

Land between Ferngrove and Woodgate Hill Road, Rochdale
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Lancashire And Furness

Published 1851

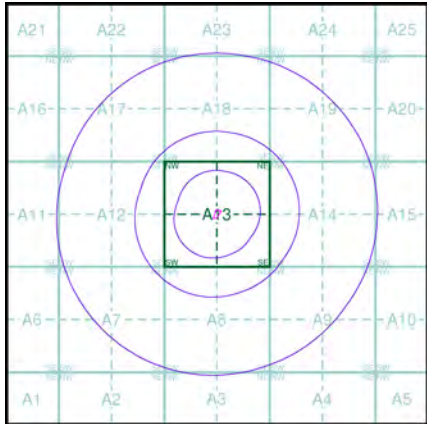
Source map scale - 1:10,560

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)

08800
1851
1:10,560

Historical Map - Slice A



Order Details

Order Number:	273312241_1_1
Customer Ref:	LKC 20 2015
National Grid Reference:	382180, 411430
Slice:	A
Site Area (Ha):	0.15
Search Buffer (m):	1000

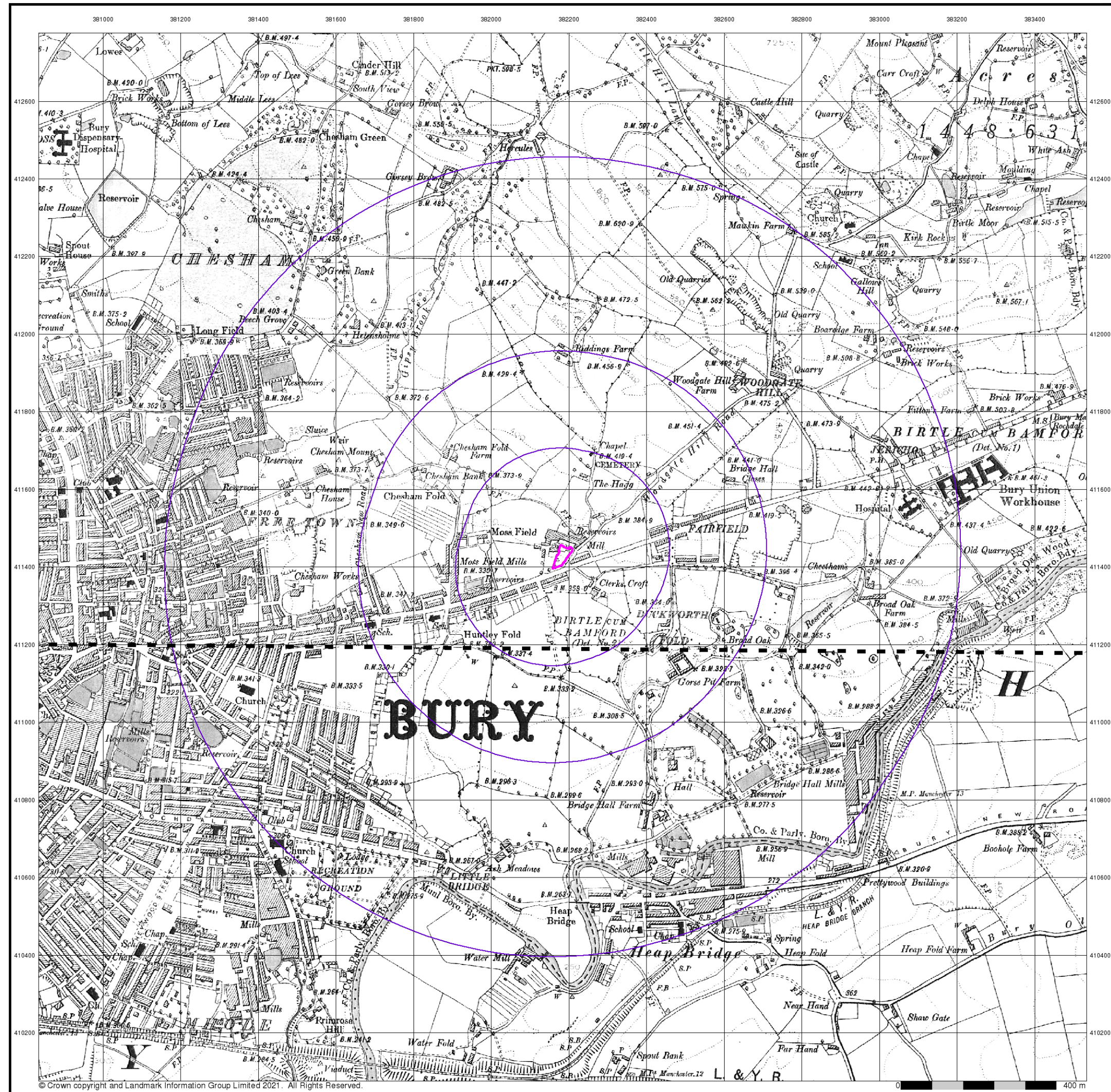
Site Details

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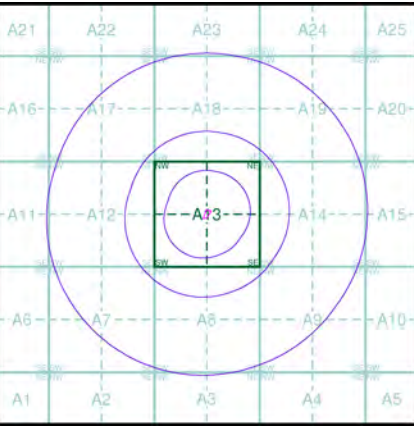
Lancashire And Furness
Published 1894
Source map scale - 1:10,560

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)

088NW	1894
1:10,560	
088SW	1894
1:10,560	

Historical Map - Slice A



Order Details

Order Number:	273312241_1_1
Customer Ref:	LKC 20 2015
National Grid Reference:	382180, 411430
Slice:	A
Site Area (Ha):	0.15
Search Buffer (m):	1000

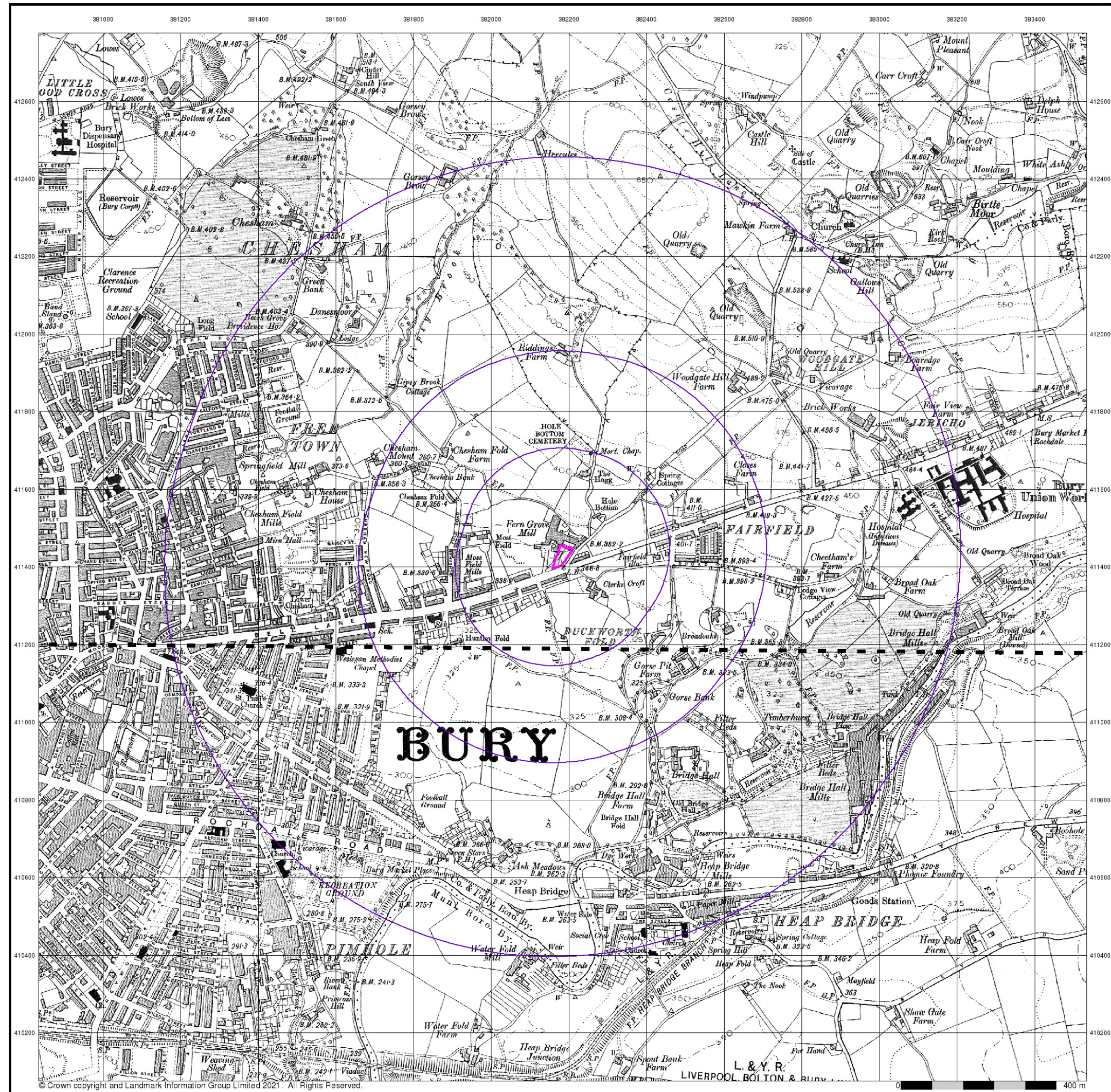
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LK GROUP

Lancashire And Furness

Published 1910 - 1911

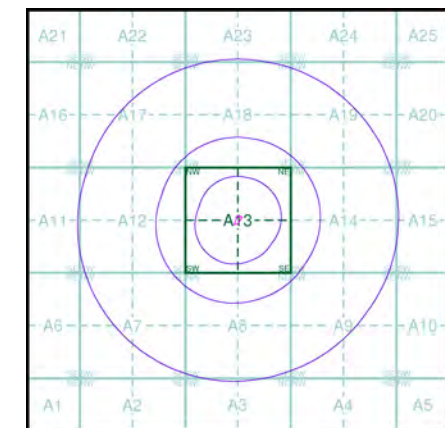
Source map scale - 1:10,560

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)

088NW
1911
1:10,560
088SW
1910
1:10,560

Historical Map - Slice A



Order Details

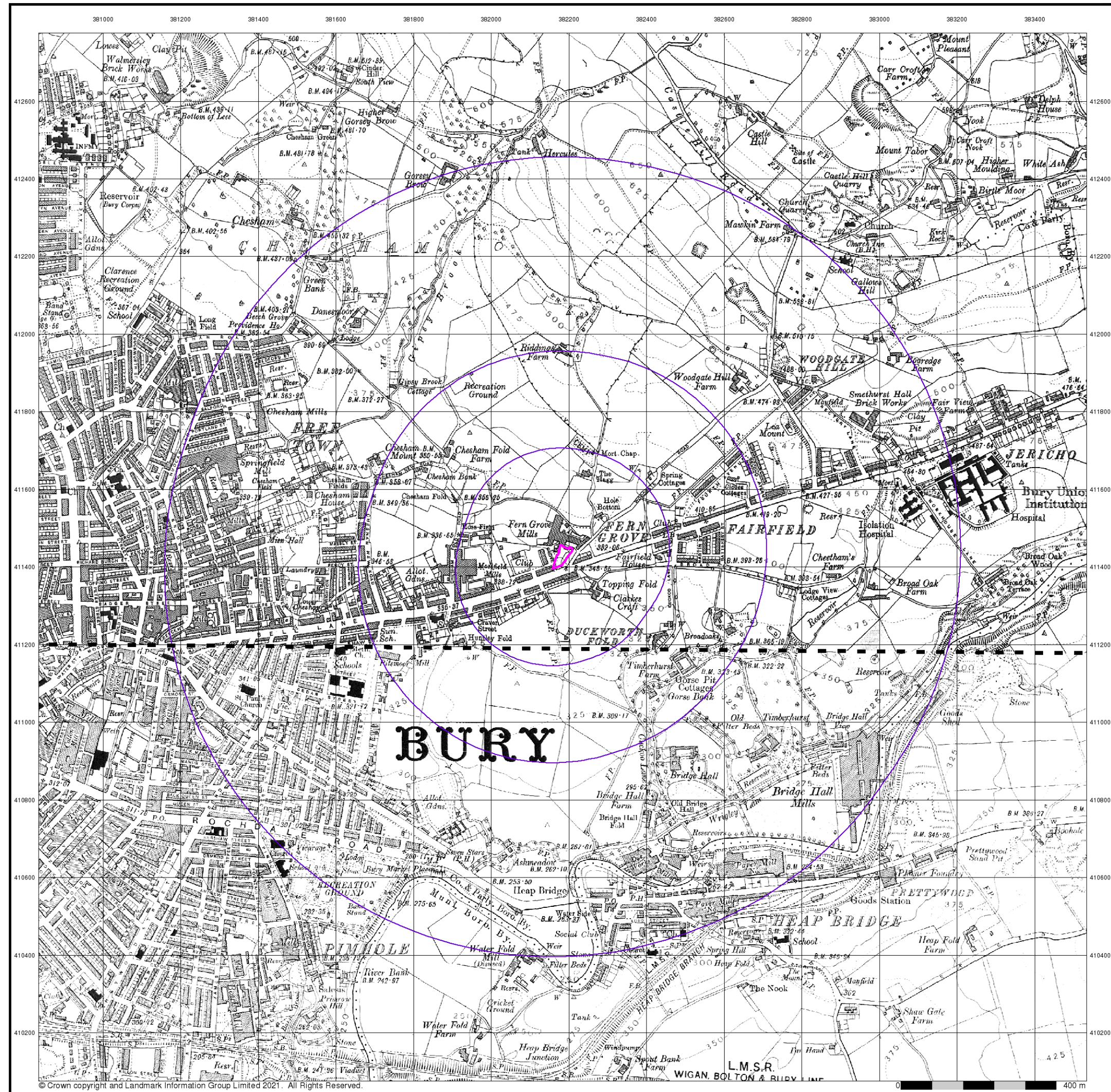
Order Number:	273312241_1_1
Customer Ref:	LKC 20 2015
National Grid Reference:	382180, 411430
Slice:	A
Site Area (Ha):	0.15
Search Buffer (m):	1000

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LK GROUP

Lancashire And Furness

Published 1931

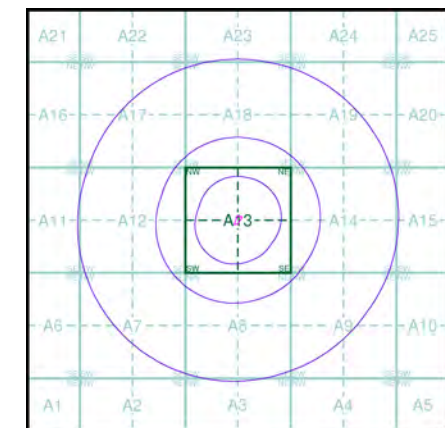
Source map scale - 1:10,560

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

Map Name(s) and Date(s)

088NW	1931
1:10,560	
088SW	1931
1:10,560	

Historical Map - Slice A



Order Details

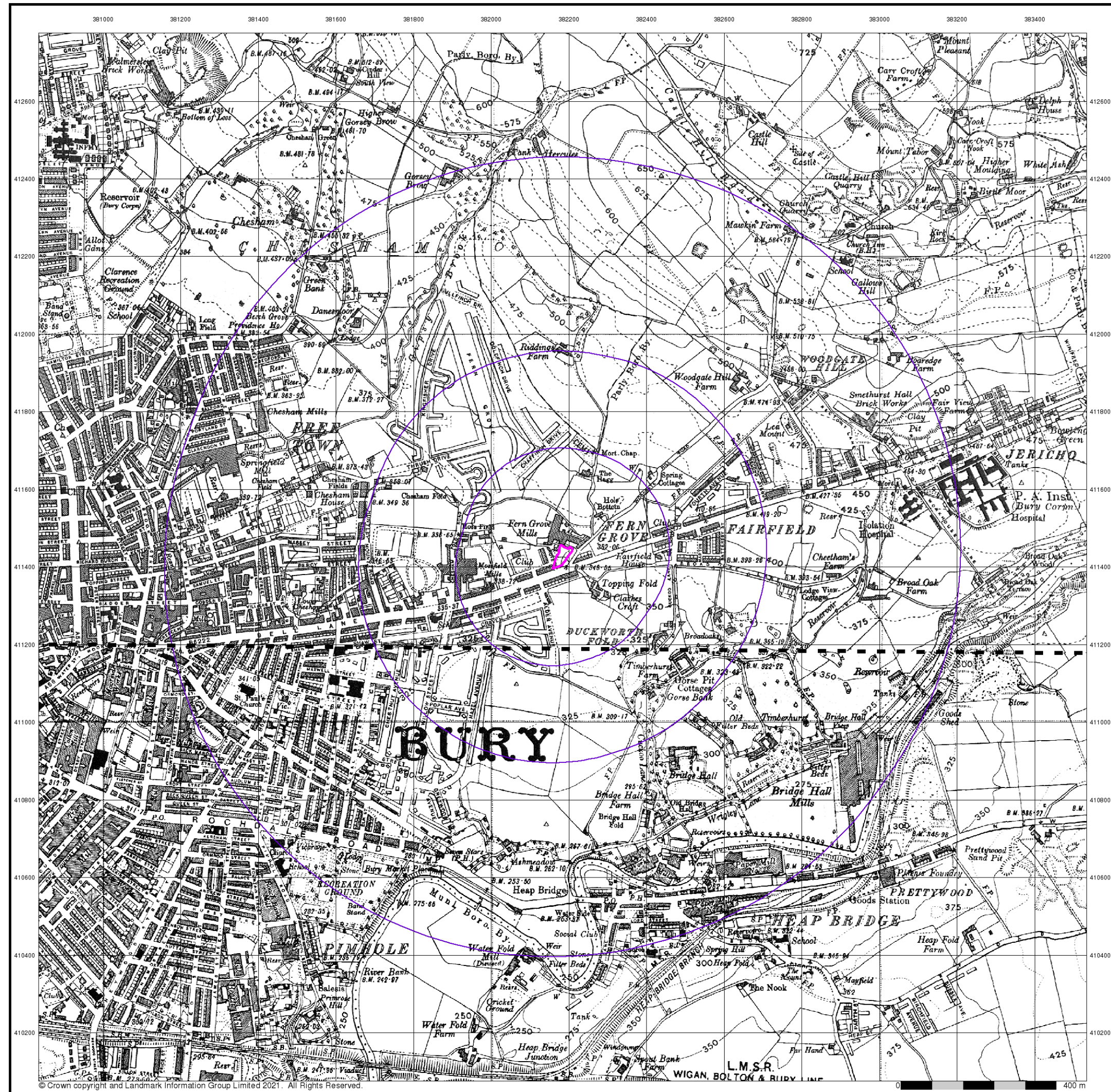
Order Number:	273312241_1_1
Customer Ref:	LKC 20 2015
National Grid Reference:	382180, 411430
Slice:	A
Site Area (Ha):	0.15
Search Buffer (m):	1000

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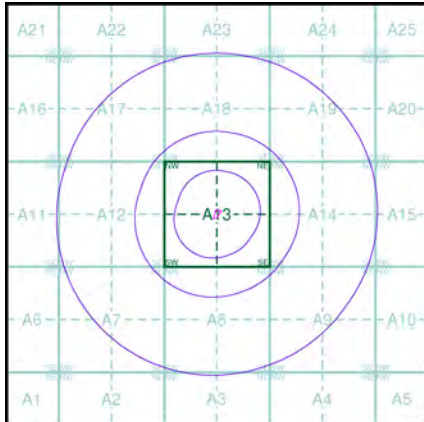
Lancashire And Furness
Published 1938 - 1939
Source map scale - 1:10,560

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)

088NW	1939
1:10,560	
088SW	1938
1:10,560	

Historical Map - Slice A



Order Details

Order Number:	273312241_1_1
Customer Ref:	LKC 20 2015
National Grid Reference:	382180, 411430
Slice:	A
Site Area (Ha):	0.15
Search Buffer (m):	1000

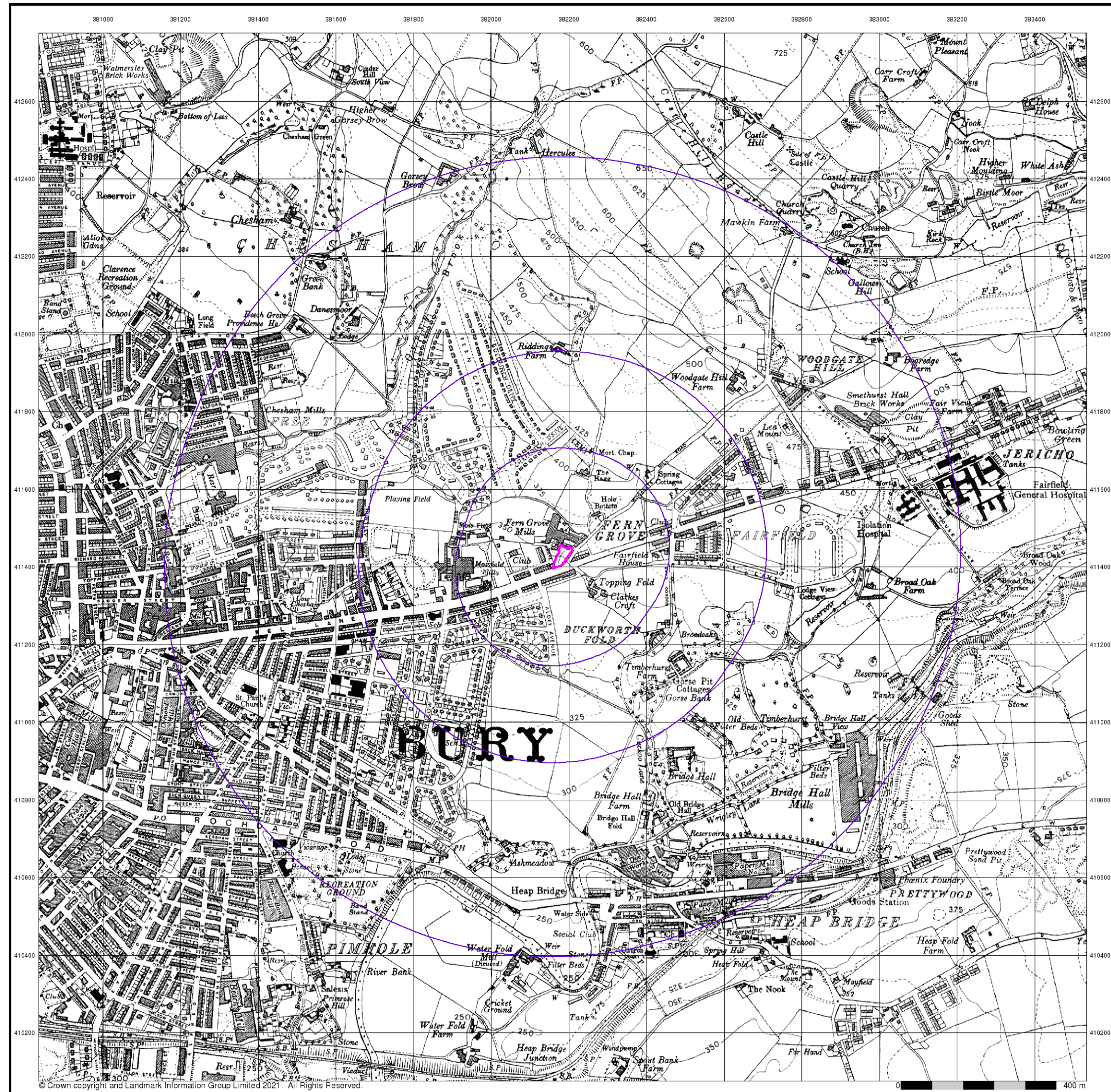
Site Details

Land between Ferngrove and Woodgate Hill Road, Rochdale
Old Road, Bury, BL9 7LS



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

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GROUP

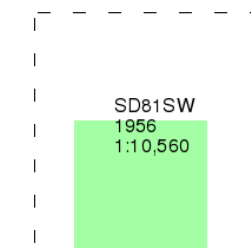
Ordnance Survey Plan

Published 1956

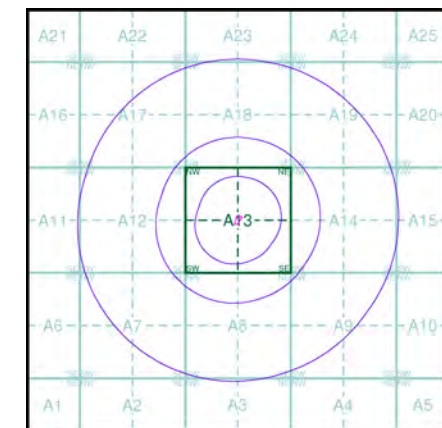
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



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Order Number: 273312241_1_1
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