



e3p

Phase I Geoenvironmental Site Assessment
East Hub, Knowsley

Reference: 15-354-R1-1
Date: July 2022



PHASE I GEOENVIRONMENTAL SITE ASSESSMENT

East Hub
Knowsley Business Resource Centre
Admin Road
Liverpool
L33 7TX

Prepared for:
Redsun Projects Ltd



Report Ref: 15-354-R1-1
Date Issued: July 2022

East Hub, Knowsley

Phase I Geoenvironmental Site Assessment

July 2022

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EXECUTIVE SUMMARY

Site Address	Land north of Admin Road, Liverpool, L33 7TX
Grid Reference	E 343310, N 397760
Site Area	1.07 Ha
Proposed Development	Redsun Projects Ltd intends to construct a commercial development comprising a 50,000 sqft commercial unit with associated loading areas and car parking. Drawing 15-354-002 (Appendix III) identifies the proposed development layout.
Current Site Use	The subject site is a rectangular shaped parcel of land located to the south of Knowsley Industrial Park and was formerly occupied by the 'Admin Building' associated with the former Royal Ordnance Factory (ROF) Kirkby, an ordnance filling factory. The buildings were demolished by 2019 and the existing site is predominantly covered by overgrown grasses with areas of short scrub vegetation and bushes. A series of sporadic semi-mature and mature trees are present along the eastern boundary of the site. A small rectangular area of hardstanding is present in the northwest corner of the site, adjacent to the gated entrance to the site. Wooden boarded fencing supported by oil drums filled with sand, runs along the western and southern boundaries. Metal palisade fencing borders the north and east of the site. Areas of waste plywood boards, planks of wood and empty drums are located in the central area and along the southern boundary of the site. The south of the site is a hardstanding area with several car parking spaces and a small, landscaped area with a single semi-mature tree.
Site History	A review of the pertinent Ordnance Survey mapping suggests that the site comprised agricultural land until circa 1956. Circa 1956 the 'Admin Building' associated with ROF Kirkby was constructed on-site. The main building was a single-storey structure, with a complicated structure of rectangular elements, interlinking corridors, and open spaces between. Additional structures on site included a telephone exchange to the northwest, a post office and two lavatory buildings to the west, five structures marked as banks to the southwest and seven identical structures with earth mounds between the structures to the northeast. Circa 1970, the telephone exchange was no longer recorded/had been demolished. Circa 1977 the structures in the north-eastern sector were no longer recorded/had been demolished. Circa 2001, the north of the site was utilised as a car park. All buildings on site were demolished by 2019 and the existing site is predominantly covered by overgrown grasses with the south of the site being utilised as a car park.



Environmental Setting	Drift Geology	Shirdley Hill Sand Formation- SAND.
	Bedrock Geology	Chester Formation- SANDSTONE.
	Faults	None within influencing distance of site boundary.
	Hydrogeology	Secondary A superficial aquifer overlying principal bedrock aquifer. Two groundwater abstraction points are recorded within 1 km of the site; located 886 m north of the site for process water, boiler feed, drinking, cooking, sanitary and washing and 887 m southeast for potable water supply.
	Hydrology	The nearest off-site surface water feature is drainage associated with the Acorn Field Plantation located 183 m east of the site.
	Flood Risk	Unaffected by flooding from rivers.
Utility Locations	 Distribution clean water mains are present in the south of the site and also within the northern sector of the site. An additional main, partly abandoned, is present on the eastern boundary of the site. Foul sewers are present along the western boundary and across the south of the site.  Medium pressure gas mains are present along the boundaries of the site.  A CCTV box is present in the northwest corner of the site and it is proposed to be diverted near the widened main entrance.  Electricity infrastructure is present along the western boundary. A LV cable is present within the north of the site. LV, HV (22kV/11kV) and EHV (33kV) cables are present in the southwest corner of the site. Out of use LV cables are present in the northern central sector of the site. LV and HV power cables are present in the south of the site adjacent to Admin Road, with an LV feed entering the south of the site.  Virgin media infrastructure is present along the western boundary and across the south of the site with chambers and cabinets also present in the south.  BT infrastructure is present along the western boundary and across the south of the site. Ducting and BT boxes are present in the north of the site.	
Landfill Sites and Ground Gases	No landfill sites (current or historic) are located within 250 m of the site. The site has undergone some historic development, the Made Ground associated with the historic development and localised infilling may produce hazardous ground gases such as methane and carbon dioxide. Historical mapping suggests the potential for munition storage on site. This was likely kept in controlled conditions with careful handling to ensure no spillages or damage.	
Radon	Less than 1% of houses above the 'Action Level' – no special precautions required.	



Coal Mining/Land Stability	The site is not located within a coal mining reporting area or development high risk area; therefore, no further assessment is required.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed development have been identified within influencing distance of the subject site.
Initial Conceptual Site Model	Contaminant Sources Made Ground associated with localised construction and demolition activities and the on-site infilled field boundary is a potential source of heavy metals PAHs, hydrocarbon compounds and ACM. There is the potential for localised small fuel leaks or spillages from the fuel station to the north and the on-site car park, which are a potential source of PAHs and hydrocarbon compounds. Pathways The main pathways based on the identified potential contaminants are direct contact and ingestion, volatilisation and indoor explosion, vapour inhalation, dust inhalation and vertical migration. Receptors The presence of potentially impacted Made Ground on site poses a risk to both construction workers and future site users. Mobile contaminants may be present associated with Made Ground, infilled features, leaks from the fuel station to the north and the on-site car park. The underlying drift is recorded as a Secondary A aquifer and the bedrock is recorded as a Principal aquifer. Two groundwater abstraction points are recorded within 1 km of the site; located 886 m north of site for process water, boiler feed, drinking, cooking, sanitary and washing and 887 m southeast for potable water supply. The sensitivity of the aquifers is reduced given there are no groundwater abstractions within 500 m.
Recommendations	A detailed Phase II intrusive Geoenvironmental Site Assessment should be undertaken to confirm the findings of the initial conceptual site model and value engineer a development solution.



Table of Contents

EXECUTIVE SUMMARY	1
1. INTRODUCTION	6
1.1. Background	6
1.2. Proposed Development	6
1.3. Objectives	7
1.4. Sources of Information	7
1.5. Limitations	7
1.6. Confidentiality	7
1.7. Risk Classification	8
2. SITE SETTING	9
2.1. Site Details	9
2.2. Current Site Use	9
2.3. Surrounding Area	10
3. SITE HISTORY	11
3.1. On-Site Historical Development	11
3.2. Off-Site Historical Development	14
3.3. Planning History	15
3.4. Anecdotal Information	16
3.5. Previous Reports	16
4. ENVIRONMENTAL SETTING	18
4.1. Geology and Hydrogeology	18
4.2. Natural Landform and Geomorphology	19
4.3. Geotechnical Data	19
4.4. Coal Mining	20
4.5. Brine Workings	20
4.6. Radon Risk Potential	20
4.7. Preliminary Geotechnical Assessment	20
4.8. Hydrology	21
4.9. Industrial Land Uses	21
4.10. Sensitive Land Uses	22
4.11. Site Sensitivity Assessment	22
5. REGULATORY DATA	23
5.1. Landfill Sites and Waste Treatment Sites	23
5.2. Regulatory Database	23
5.1. Unexploded Ordnance	24
6. INITIAL CONCEPTUAL SITE MODEL	26
6.1. Conceptual Site Model	28
7. CONCLUSIONS AND RECOMMENDATIONS	32
7.1. Site Summary	32
7.2. Contaminated Land Assessment	33
7.3. Geotechnical Assessment	34



APPENDIX I LIMITATIONS.....	35
APPENDIX II GLOSSARY	37
APPENDIX III DRAWINGS	40
APPENDIX IV PHOTOGRAPHS	42
APPENDIX V HISTORICAL MAPS	47

DRAWING LIST

15-354-001 - Site Location Plan
15-354-002 - Proposed Development Plan
15-354-003 - Historical Features Plan
15-354-004 - Site Features Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P Ltd has been commissioned by Redsun Projects Ltd to undertake a Phase I Geoenvironmental Site Assessment at land to the north of Admin Road, Knowsley, L33 7TX.

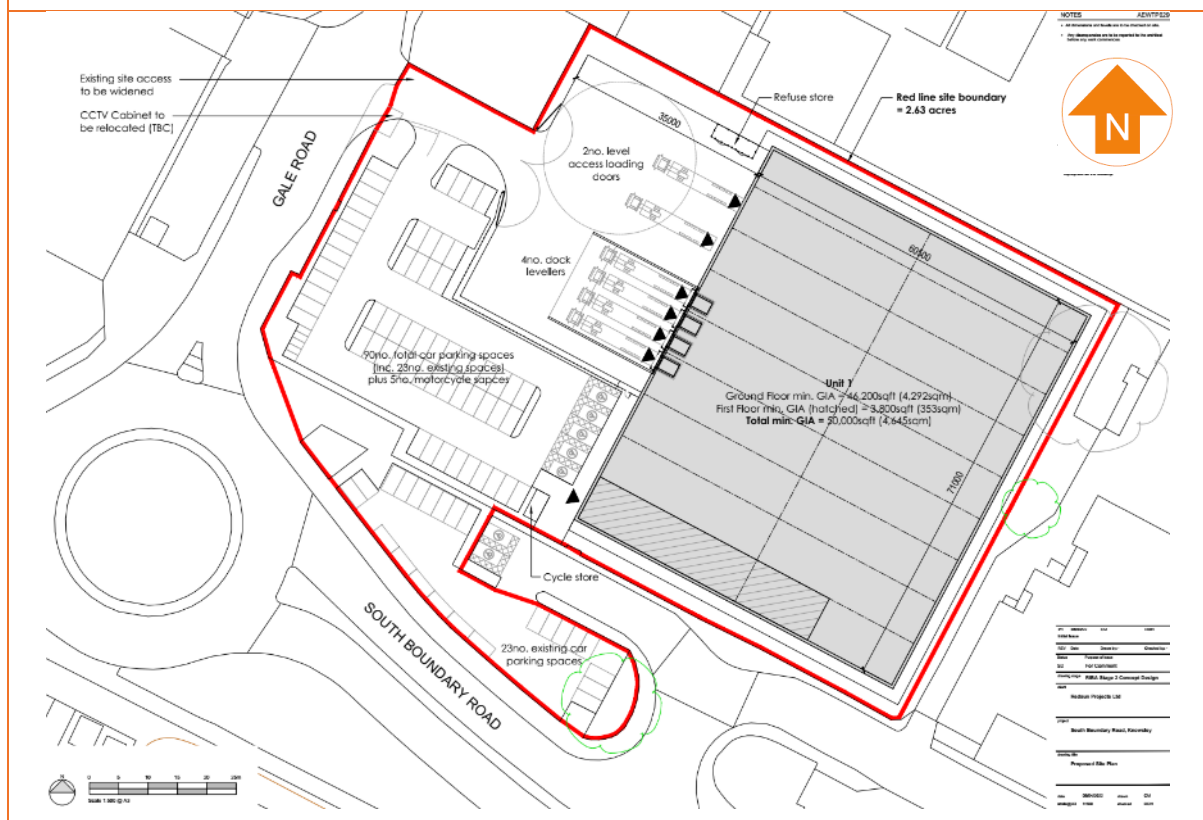
This report is required to determine potential contaminated land liabilities and geotechnical constraints as part of a proposed site redevelopment.

1.2. PROPOSED DEVELOPMENT

Redsun Projects Ltd intends to construct a commercial development comprising a 50,000 sqft commercial unit with associated loading areas and car parking. Drawing 15-354-002 (Appendix III) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the geoenvironmental investigation are as follows:

- ✳ Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document Land Contamination: Risk Management (LC:RM) (2019)
- ✳ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ✳ Assess the desk-study information and, where possible, provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- ✳ Provide recommendations regarding future works required and undertake a preliminary pre-construction cost appraisal.

1.4. SOURCES OF INFORMATION

Background information was sought from the following sources:

- ✳ Envirocheck Search;
- ✳ Historical mapping dated 1850 to 2021. A selection of historical maps are reproduced in Appendix V;
- ✳ On-line planning records held by Knowsley Council;
- ✳ Magic Map Groundwater Vulnerability Map;
- ✳ Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2007);
- ✳ British Geological Survey Map;
- ✳ Groundsure IO database;
- ✳ <https://zeticauxo.com/downloads-and-resources/risk-maps/>; and,
- ✳ <https://flood-map-for-planning.service.gov.uk>.

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



1.7. RISK CLASSIFICATION

E3P has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the site development. The risk classification definitions are summarised in Table 1.1.

TABLE 1.1 RISK CLASSIFICATION

RISK	DEFINITION
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the site.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation.
Moderate High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.



2. SITE SETTING

2.1. SITE DETAILS

Site Address	Land north of Admin Road, Knowsley, Liverpool, L33 7TX
National Grid Reference	E 343310, N 397760
Site Area	1.07 Ha.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 15-354-001.

2.2. CURRENT SITE USE

E3P has undertaken a site walkover of the entire site and a description of the key findings is summarised in Table 2.1.

TABLE 2.1 SITE DESCRIPTION

Occupancy/Use	The subject site is a rectangular shaped parcel of land located to the south of Knowsley Industrial Park and was formerly occupied by the 'Admin Building' associated with the former Royal Ordnance Factory (ROF) Kirkby, an Ordnance Filling Factory. The buildings were demolished by 2019 and the existing site is predominantly covered by overgrown grasses with areas of short rough scrub vegetation and bushes. A series of sporadic semi-mature and mature trees are present along the eastern boundary of the site. A small rectangular area of hardstanding is present in the northwest corner of the site, adjacent to the gated entrance to the site. Wooden boarded fencing supported by oil drums filled with sand, runs along the western and southern boundaries. Metal palisade fencing borders the north and east of the site. Areas of waste plywood boards, planks of wood and empty drums are located in the central area and along the southern boundary of the site. The south of the site is a hardstanding area with several car parking spaces and a small, landscaped area with a single semi-mature tree.	
Surface Cover (%)	Buildings	0 %
	Hardstand	5 %
	Soft Cover	95 %
Structures	No existing structures are present within the site boundary.	
Access	Access can be gained via a locked gate from Gale Road to the northwest. Pedestrian access can also be gained through a gap in the wooden boarded fencing in the southeast corner of the site from Admin Road.	
Slope	There is little topographic variance.	



Retaining Structures	None identified.
Vegetation/Ecology	Overgrown grasses are present across the majority of the site with areas of short rough scrub vegetation and bushes. A series of sporadic semi-mature and mature trees are present along the eastern boundary of the site. A habitat survey may be required to support the planning application.
Hazardous Material Storage	No above-ground storage tanks (ASTs) or underground storage tanks (USTs) were observed at the site during the preliminary site walkover.
Asbestos-Containing Material (ACM)	ACM may have been used in the former structures on-site and may not have been correctly managed during demolition/re-development. ACM (fibres and fragments) may therefore be present within the underlying Made Ground soils. No evidence of ACM was identified during the site walkover.
Polychlorinated Biphenyls (PCBs)	There is no equipment identified that may contain PCBs within the site boundary; however, there is an electricity box in the northwest corner.
Waste Storage	Potentially hazardous waste streams are unlikely to be generated at the site and none were observed during the preliminary site inspection.
Drainage	A formal drainage survey has not been completed; however, a review of online records held by United Utilities indicates foul sewers are present along the western boundary and across the south of the site.

2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

DIRECTION	LAND USE
North	Container Supplier, Spar convenience store, Texaco fuel station
East	Commercial units, residential units and Spinney Woods.
South	Car Park and South Boundary Road (A5208)
West	Commercial units.

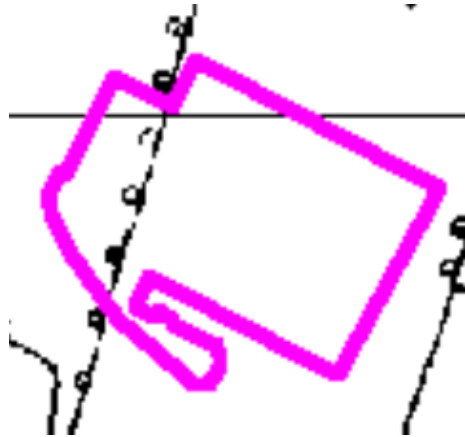
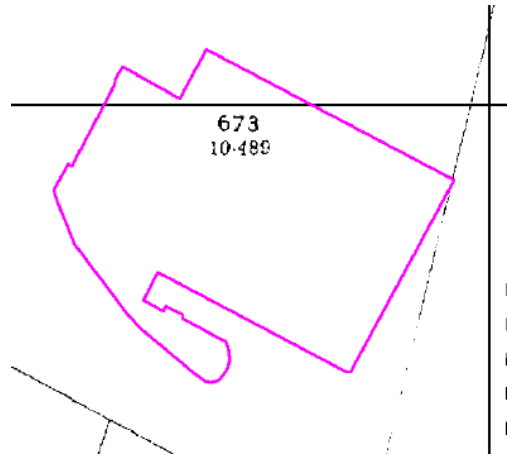


3. SITE HISTORY

3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented in Drawing No 15-354-R1-003 in Appendix III.

TABLE 3.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1850 1:10,560	The site is undeveloped agricultural land with a field boundary in the western sector.	
1893 – 1939 1:2,500	The field boundary in the west is no longer shown.	

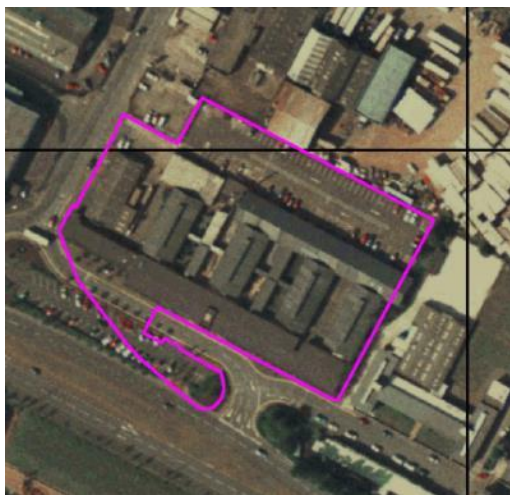
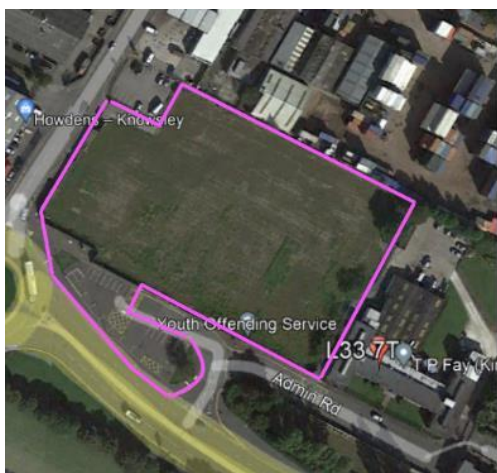


MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1959-1962 1:2,500	A telephone exchange building is recorded to the northwest of the site. An earth mound is recorded to the north of the site. In the north-eastern sector of the site seven small identical structures are recorded parallel to each other, with earth mounds recorded between the structures. It is believed that these were blast mounds used to protect buildings from accidental explosions. A Post Office is recorded to the west of the site with two lavatory buildings recorded on the western boundary. Five buildings marked as banks are recorded to the southwest of the site. Across the remainder of the site, a large building with rectangular elements and interlinking corridors and open spaces is recorded. Admin Road bisects the south of the site and a small area of mature trees is recorded at the very south of the site.	
1965 – 1976 1:1,250	Two small additional structures are recorded in the southeast corner of the site.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1970 – 1971 1:1,250	The telephone exchange building located to the northwest of the site is no longer recorded/has been demolished.	
1977 1:1,250	The structures in the north-eastern sector are no longer recorded/have been demolished. The area of mature trees at the very south of the site is no longer recorded.	
1993 1:1,250	An additional structure is recorded to the west of the site.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
2001 – 2018 Historical Aerial Photography	The northern and southern sectors of the site appear to be utilised as car parks.	
2019 – 2022 Google Earth Aerial Photography	All structures have been demolished on site. The site is now predominantly grass covered, with areas of hardstanding to the south and northwest corner.	

3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 250 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Paint Research Laboratory Then: marked as Factory Then: no longer marked	5 m	Pre 1965–Pre 1977 Pre 1977–Pre 1993 Pre 1993–Present	East
Transport Repair Depot Then: no longer marked	30 m	Pre 1965–Pre 1993 Pre 1993–Present	Northwest
Dismantled Tramway Then: marked as disused	35 m	Pre 1959–Pre 1965 Pre 1965–Present	South
Garage Then: no longer marked	40 m	Pre 1959–Pre 1993 Pre 1993–Present	North



SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Tank Then: no longer recorded	50 m	Pre 1977–Pre 2001 Pre 2001–Present	North
Transport Depot Then: no longer marked	55 m	Pre 1965–Pre 1993 Pre 1993–Present	North
Domestic Appliance Factory Then: no longer marked	80 m	Pre 1965–Pre 1993 Pre 1993–Present	South
Works Then: marked as curtain factory Then: marked as factory Then: no longer marked	80 m	Pre 1959–Pre 1965 Pre 1965–Pre 1977 Pre 1977–Pre 1993 Pre 1993–Present	West
Tank Then: no longer recorded	90 m	Pre 1965–Pre 2001 Pre 2001–Present	North
Works Then: no longer marked	140 m	Pre 1977–Pre 1993 Pre 1993–Present	Northwest
Tanks Then: no longer recorded	150 m	Pre 1965–Pre 2001 Pre 2001–Present	Northwest
Works Then: no longer marked	150 m	Pre 1977–Pre 1993 Pre 1993–Present	Northwest
Works Then: no longer marked	180 m	Pre 1977–Pre 1993 Pre 1993–Present	Northwest
Factory Then: marked as warehouse Then: no longer marked	200 m	Pre 1959–Pre 1965 Pre 1965–Pre 1977 Pre 1977–Present	Northwest
Tank Then: no longer recorded	210 m	Pre 1977–Pre 2001 Pre 2001–Present	West
Factory Then: marked as clothing factory Then: marked as factory Then: no longer marked	250 m	Pre 1959–Pre 1965 Pre 1965–Pre 1977 Pre 1977–Pre 1993 Pre 1993–Present	Northeast

3.3. PLANNING HISTORY

E3P has undertaken a review of online planning records held by Knowsley Metropolitan Borough Council and the following applications have previously been submitted for the site:

-  18/00520/KMBC1 | DEMOLITION OF BUILDINGS, LANDSCAPING WORKS AND ERECTION OF HOARDING | MHF Cafe/CB Fitness Zone Gale Road And 2-26 Admin Road Knowsley Industrial Park Kirkby Knowsley L33 7YB
-  20/00379/FUL | DEMOLITION OF EXISTING BUILDING AND THE ERECTION OF 2 NO. INDUSTRIAL BUILDINGS (USE CLASSES B1/B2 AND B8 WITH ANCILLARY TRADE COUNTER) TOGETHER WITH VEHICULAR ACCESS, CAR PARKING AND SERVICE AREA. | The Web Complex Admin Road Knowsley Industrial Park Kirkby Knowsley L33 7SF



3.4. ANECDOTAL INFORMATION

A web-based search of the subject site has recovered the following photograph, courtesy of Britain From Above:

**PLATE 01 – BRITAIN
FROM ABOVE 1947**



3.5. PREVIOUS REPORTS

The following previous site investigation reports have been provided to E3P for review or were obtained from online planning records held by Knowsley Council:

- ✿ **E3P** – *Phase I and Phase II Geoenvironmental Site Assessment* Knowsley Hub, July 2019, Reference: 13-305-R1-RevA. Prepared for Redsun Projects
- ✿ **Wardell Armstrong** – *Archeological Building Recording*. Reference GM10252-002-V0.1 October 2018. Prepared for Knowsley Metropolitan

The key findings of the previous site investigation reports are summarised below and where necessary data used to support the E3P geoenvironmental site assessment.

E3P 2019 (site investigation for 'West Hub' for an adjacent parcel of land to the west of site)

- ✿ Site investigation works were completed between 9th May 2019 and the 10th May 2019 and comprised of the following:
 - 18 No. mechanically excavated trial pits
 - 12 No. window sample boreholes
- ✿ Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.30 m and 1.90 m bgl, although in general Made Ground was encountered to a depth of less than 1.00 m bgl. Made Ground deposits comprise a reworked topsoil of black brown,



gravelly, sandy clay with mudstone, brick, plastic and concrete in the majority of locations. Within all locations, the Made Ground underlying the reworked topsoil comprises a greyish brown, dark reddish-brown or black, slightly sandy gravel with gravel comprising of mudstone, ash, brick, asphalt and occasional boulders of concrete and shale. Within TP118 Made Ground was identified to 1.90 m bgl. where the exploratory hole location was terminated at this depth due to the presence of weathered sandstone bedrock.

-  Drift deposits: Drift deposits were encountered within all exploratory hole locations apart from TP118. The drift deposits are fairly consistent across the site, generally comprising a brown clayey SAND, a reddish-brown SAND or a orangey brown gravelly SAND with gravel comprising of sandstone.
-  Solid Geology: The weathered solid bedrock geology was encountered at 5No. locations (TP101 – TP105) at depths of between 1.40 m and 2.40 m bgl. The solid geology comprises a red weathered SANDSTONE. All remaining exploratory hole locations either refused within the bedrock or were terminated due to difficulty excavating due to the presence of the underlying bedrock geology.
-  Loose chrysotile fibres were identified within the Made Ground deposits in WS110, TP107 and TP111.
-  The controlled waters risk assessment did not identify any elevated levels of contaminants of concern above the Drinking Water Standards.
-  The presence of varied depths of Made Ground within some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement. Furthermore, the site is predominantly underlain by circa 1.00-2.00 m of likely high permeability SAND. Therefore, the use of soak-away drainage may be possible. Falling head permeability tests have been completed which have shown the underlying SAND to have a moderate soakage potential.
-  Concrete classification is varied across the site and ranges from Class DS-1 AC-1s, DS-2, AC-1s and DS-3. AC-2s.

Wardell Armstrong 2018 (Prior to demolition)

-  *The archaeological work was undertaken prior to the proposed demolition of buildings formerly associated with ROF Kirkby (Planning Ref: 18/00207/KMBC1 and 18/00520/KMBC1).*
-  *The archaeological building recording has been concerned with a complex of buildings which formed part of ROF Kirkby, an Ordnance Filling Factory which was constructed in 1939-40, and operated until 1946. The complex has been identified from a plan and schedule dating to c.1945 as the 'Admin Building'. The Admin Building was only one of over 1000 structures which existed at ROF Kirkby during its height of production.*
-  *The archaeological building recording project has identified the former Admin Building as a single-storey structure, quite complicated in its plan form, with linear ranges, rectangular elements, interlinking corridors and open spaces between.*



4. ENVIRONMENTAL SETTING

4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map (Sheet 96) for the site, (1:50,000, Solid and Drift editions) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	Shirdley Hill Sand Formation	SAND	Secondary A Aquifer
Solid	Chester Formation- Sandstone.	SANDSTONE	Principal Aquifer

TABLE 4.2 SUMMARY OF BGS BOREHOLE RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
10 m N SJ49NW1073	1.50 m	Asphalt underlain by moist crushed concrete, sand, gravel and silt. 0.50 m	SAND 0.50–1.00 m	Not encountered (Borehole refused)
15m NW SJ49NW1067	1.40 m	Asphalt underlain by concrete 0.20m	SAND 0.20-0.60 m	Weathered SANDSTONE 0.60–1.40m
20m NW SJ49NW1074	1.69 m	Asphalt underlain by crushed concrete 0.50 m	SAND 0.50–1.69 m	Not encountered (Borehole refused)
20m NW SJ49NW1071	0.80 m	Asphalt underlain by sand with crushed concrete 0.40 m	SAND 0.40–0.80 m	Not encountered (Borehole refused)
45m NW SJ49NW1068	1.90 m	Asphalt underlain by sand and angular gravel 0.40 m	SAND 0.40–1.90 m	Not encountered (Borehole refused)
50m NW SJ49NW1069	1.60 m	Asphalt 0.20 m	SAND 0.20–1.60 m	Not encountered (Borehole refused)
32m NW SJ49NW1070	1.29 m	Asphalt underlain by sand, gravel and brick fragments 0.40 m	SAND 0.40–1.29 m	Not encountered (Borehole refused)
33m NW SJ49NW1072	1.50 m	Asphalt underlain by moist crushed concrete, sand and gravel 0.30 m	SAND 0.30–1.50 m	Not encountered (Borehole refused)



A summary of exploratory hole logs from the E3P site investigation on the adjacent parcel of land to the west of the site (known as West Hub), is summarised within Table 4.3.

TABLE 4.3 SUMMARY OF E3P EXPLORATORY HOLE LOGS (REPORT REF: 13-305-R1-REVA)

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
WS101	1.20 m	0.50 m	SAND 0.50–1.20 m	Refused on red weathered sandstone bedrock.
WS102	1.20 m	0.50 m	SAND 0.50–1.20 m	
WS103	2.20 m	1.50 m	SAND 1.50–2.20 m	
WS104	1.20 m	0.40 m	SAND 0.40–1.20 m	
WS105	2.18 m	0.80 m	SAND 0.80–2.18 m	
WS106	1.20 m	0.60 m	SAND 0.60–1.20 m	
WS107	1.20 m	0.70 m	SAND 0.70–1.20 m	
WS108	2.20 m	1.30 m	SAND 1.30–2.20 m	
WS109	1.18 m	0.70 m	SAND 0.70–1.18 m	
WS110	1.80 m	0.60 m	SAND 0.60–1.80 m	
WS111	1.84 m	1.20 m	SAND 1.20–1.84 m	
WS112	1.65 m	0.80 m	SAND 0.80–1.65 m	

No faults have been identified within influencing distance of the site boundary.

The Envirocheck report indicates that the site is not located within a groundwater source protection zone.

There are two groundwater/potable abstractions within 1 km of the site.

4.2. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological assessment of the landform and its possible mechanism for formation.

A review of relevant records indicates that the site has not been subject to significant anthropogenic changes with the current site topography broadly representing natural landform.

4.3. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 4.4.



TABLE 4.4 SUMMARY OF GEOTECHNICAL DATA

HAZARD	DESIGNATION
Shrink-Swell Clay	No hazard
Landslides	Very low risk
Ground Dissolution	No hazard
Compressible Ground	Very low risk
Collapseable Deposits	Very low risk
Running Sand	Low risk

4.4. COAL MINING

E3P has reviewed the Coal Authority Interactive Map which confirms the following:

-  The site is not located within a Coal Mining Reporting Area;
-  The site is not within a Development High Risk Area;
-  There are no mine entries, surface mining (past or current), past shallow coal mine workings or coal outcrops within influencing distance of the site; and,
-  The site is not located in proximity to any mine entry potential zone of influence.

4.5. BRINE WORKINGS

The site is not situated within the Cheshire Salt Field and is not within an area deemed to be at risk from historic brine workings or rock salt extraction.

4.6. RADON RISK POTENTIAL

The Envirocheck report indicates the site is situated in an area where less than 1% of homes are above the "Action Level" and that the BGS reports that full radon protective measures are not necessary in the construction of new dwellings or extensions.

4.7. PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the desk-study information, the following geotechnical assessment has been made:

-  It is likely there will be significant Made Ground deposits and obstructions in the locations of the former building footprints. All relict foundations will require grubbing out, prior to the construction of the proposed development.
-  Shallow bedrock is anticipated beneath the site and has been proven within proximity to the site at depths of between 1.20 m bgl to 2.18 m bgl, therefore, foundations and buried infrastructure will likely require specialist design.



4.8. HYDROLOGY

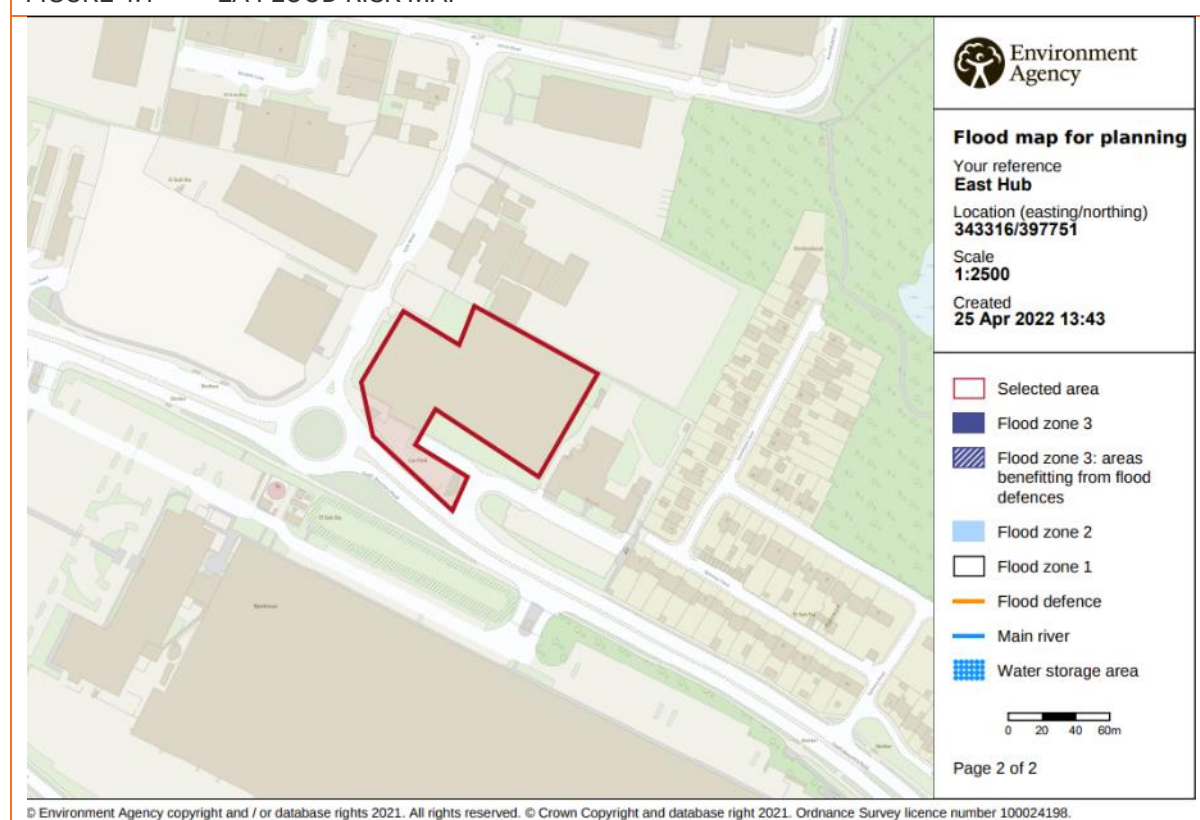
Surface water features within 250 m of the subject site are summarised in Table 4.5.

TABLE 4.5 SURFACE WATER FEATURES

SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Drain within Acorn Field Plantation	Unknown	183 m	East

The site is located within a currently defined “Flood Risk Zone 1”; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (< 0.1%), and as such is considered to be unaffected by river flooding. In addition, the Envirocheck report states there is a limited potential for groundwater flooding to occur at the site. The Environment Agency (EA) Flood Risk Map for the site is presented in Figure 4.1.

FIGURE 4.1 EA FLOOD RISK MAP



Source - <https://flood-map-for-planning.service.gov.uk/>

4.9. INDUSTRIAL LAND USES

The Trade Directory records eight active industrial land uses within 250 m. The closest entry is the Texaco Filling Station located 30 m north.



4.10. SENSITIVE LAND USES

Acornfield Planation is located 86 m to the east of the site. The closest residential properties are located on Acornfield Close, 80 m east of the site. No other environmentally sensitive land uses have been identified within close proximity to the site.

4.11. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a "Moderate" sensitivity setting as discussed within Table 4.6.

TABLE 4.6 SITE SENSITIVITY ASSESSMENT

SENSITIVITY PROFILE	DISCUSSION	RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located within a Groundwater Source Protection Zone or Drinking Water Safeguard Zone.	Low
Distance to the Closest Groundwater Abstraction Point	Two groundwater abstraction points are located within 1km of the site: - A borehole at Kirkby Industrial Estate has two associated permits for Baker Hughes Limited and Petrolite Ltd, dated 18th March 2011 and 1st January 1989, respectively. Abstractions are for process water, boiler feed, drinking, cooking, sanitary and washing. The borehole is located 886m north of site. - A borehole associated with United Utilities Water Ltd for potable water supply is located 887m southeast of site. Two permits are associated with this borehole, dated from 26th November 2018 and 16th March 1966.	Moderate
Aquifer Classification in Superficial Drift Deposits	Secondary A Aquifer.	High
Aquifer Classification in Bedrock	Principal Aquifer.	High
Is the Site Underlain by Low-Permeability Drift to Depths in Excess of 10 m?	The underlying superficial deposits are likely to comprise high permeability sands which may facilitate the potential for mobile phase contaminants to migrate towards the superficial and bedrock aquifers.	High
Is the Site Located Within 50 m of a Surface Watercourse?	The risk of surface water is negligible given the absence of a viable receptor within the influencing distance of the site. The closest surface water receptor identified within 250 m of the site is drainage associated with the Acornfield Plantation, 183 m east of the site.	Low
Sensitive Land Uses	Acornfield Planation is located 86m to the east of site.	Moderate
OVERALL SITE ENVIRONMENTAL SENSITIVITY		Moderate



5. REGULATORY DATA

5.1. LANDFILL SITES AND WASTE TREATMENT SITES

A historical landfill site is located 788 m northeast of the site at Perimeter Road. The landfill received inert, industrial, commercial and household waste and liquid sludge between 1965 and 1975.

The closest BGS Recorded Landfill is located 983 m northeast, known as Perimeter Road Tip.

Two registered waste treatment/ disposal sites are recorded within 500 m of the site; D A Webster (drum collection service) is located 328 m north of the site and is authorised to receive used or contaminated drums and containers. Fourway Management Ltd is located 317 m northeast of the site and is authorised to receive degradable commercial waste, degradable industrial waste, inert materials, metal waste/scrap metal and special waste. Fourway Management is also recorded as a waste transfer site and authorised waste is aqueous tank washings and petrol tank washings.

Six potentially infilled land locations associated with water are recorded within 250 m of the site. A marsh was recorded on historical mapping from circa 1959, located 210 m east of the site.

5.2. REGULATORY DATABASE

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and is not otherwise detailed in the report.

TABLE 5.1 SUMMARY OF ENVIRONMENTAL DATA

RECORD	ENTRIES WITHIN 250 m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified
Authorised Industrial Processes (IPC/IPPC/LAPPC)	5	Five LAPPCs: - Littlewoods Garage for respraying of road vehicles- authorised (32m north of site) - Tom England & Sons Ltd for respraying of road vehicles- authorisation revoked (44m north of site) - Rockfield Engineering x2 for waste oil burners and respraying of road vehicles- authorisation revoked for respraying of road vehicles (62m north of site) - Texaco for petrol filling station- permitted (33m north of site)
Fuel Stations Entries	1	Texaco located 29 m north of site.
Licensed Radioactive Substances	0	None Identified



RECORD	ENTRIES WITHIN 250 m	DETAILS
Enforcements, Prohibitions or Prosecutions	0	None Identified
Discharge Consents	0	None identified within 250m
Pollution Incidents	3	The following two incidents identified within 250m of site were classified as Category 2 significant incidents and the receiving water was Knowsley Brook: ▪ Deliberate disposal of pollutant (vehicle washings and de waxing) 209m south of the site on 17th January 1997 from a garage premises. ▪ Release of oil on 16th January 1997, also from the garage premises.
Consents Issued Under the Planning (Hazardous Substances) Act 1990	0	None Identified
Control of Major Accident Hazard (COMAH) Sites	0	None identified within 250 m

5.1. UNEXPLODED ORDNANCE

The regional unexploded bomb risk map from Zetica (2014) indicates that the site is in an area at low risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetica UXO Risk Map is presented as Figure 5.1.

However, historic mapping confirms that the site was formerly occupied by the 'Admin Building' associated with the former Royal Ordnance Factory (ROF) Kirkby, an Ordnance Filling Factory. Therefore, it is possible that explosives were stored on site.



FIGURE 5.1 ZETICA UXO RISK MAP



Source - <https://zeticauxo.com/downloads-and-resources/risk-maps/>



6. INITIAL CONCEPTUAL SITE MODEL

In accordance with EA LCRM (2019) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P has developed an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

ON-SITE SOURCES OF CONTAMINATION

The following potential on-site sources of contamination have been identified:

- ✚ Made Ground (footprint of former structures)
 - Asbestos
 - Heavy metals, PAHs
 - Hazardous ground gases – Carbon Dioxide, Methane
- ✚ Infilled Field Boundary
 - Asbestos
 - Heavy metals, PAHs
 - Hazardous ground gases – Carbon Dioxide, Methane

OFF-SITE SOURCES OF CONTAMINATION

The following potential off-site source of contamination have been identified within a 50 m radius:

- ✚ Texaco Fuel Station
 - Petroleum spirit – Alcohols, ethers, benzene, olefins, naphthalene, PAHs
 - Petrol additives – Lead, MTBE
 - Diesel additives
- ✚ Transport Repair Depot and Garage
 - Metals – Copper, Zinc, Lead, Chromium
 - Waste Oils – PAHs, Heavy metals
 - Anti-freeze and brake fluids – Polymerised glycols and ethers
 - Solvents (Chlorinated and non-chlorinated) – xylene, esters, glycols, dichloroethane, etc.
 - Paints containing metals, esters, etc. and paint thinners
 - Inorganic compounds – Asbestos, sulphur, battery acids



- Detergents



Dismantled Tramway

- Organic contaminants – Hydrocarbons (TPHs), diesel, lubricating oils, paraffin, PCBs, PAHs, creosote, herbicides
- Metals – Ferrous residues and metal fines
- Asbestos
- Ash and clinker fill (metals, phenols, sulphates, and PAHs)



Former Paint Laboratory

- Paints containing metals, esters, etc. and paint thinners
- Pigments, dyes, extenders and binders
- Organic solvents – Aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons, alcohols and glycol ethers, ketones and esters
- Additives – plasticisers, lubricants, driers, catalysts etc
- Asbestos
- Fuels – coke, coal, fuel oil

The main contaminants of concern identified from the off-site sources indicated above are deemed to present a low risk as the sources are likely associated with minor leaks, spills, and localised isolated events occurring away from the site itself.



6.1. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 6.1 has been prepared for the site.

TABLE 6.1 CONCEPTUAL MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Heavy Metals, non-volatile PAH (Made Ground, Infilled Field Boundary)	Dermal contact Dermal contact and ingestion	Future site users Off-site receptors	Likely	Moderate	To be determined
Assessment: Made Ground derived from demolition activities and localised infilling is likely to be present across the site. Made Ground is a potential source of heavy metals and non-volatile PAHs, albeit likely low-level. If present, heavy metals and non-volatile PAHs may pose a short-term risk to construction workers who may come into contact with impacted soils during earthworks. There is also a risk to future residential end users through dermal contact and ingestion in areas of soft cover. Recommendation: Intrusive investigation required. If unacceptable concentrations of the above-mentioned non-volatile contaminants is encountered, the risks can be mitigated through the presence of hardstanding (no direct contact with end user) and installation of a suitable cover system in landscaped areas, if proposed. Construction works will need to be completed with PPE and provision of welfare.						
PL3	Asbestos-Containing Materials (ACM) in Made Ground.	Inhalation of dust	Future site users Buildings. Off-site land users	Likely	Moderate	To be determined
Assessment: ACM may have been used in the former structures on-site and may not have been correctly managed during demolition/re-development. ACM (fibres and fragments) may therefore be present within the underlying Made Ground soils. ACM poses a risk through fibre and dust inhalation and if present may pose a risk to future site users as well as construction workers during any future earthworks / demolition and to adjacent third-party property should dust be generated during those works. Recommendation: Site investigation and laboratory analysis are required to determine the presence and quantification of any asbestos in the soils.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
These risks can be mitigated through the development of a detailed enabling works strategy following guidance and protocol specified within the Control of Asbestos Regulations (2012) and industry best practice as detailed in CIRIA733 (Asbestos in Soil and Made Ground: A guide to understanding risk). Construction works completed with PPE and provision of suitable welfare.						
PL4	Volatile contaminants such as hydrocarbons (Made Ground, localised fuel spillages)	Inhalation of vapours Migration through permeable strata and preferential pathways	Future site users Off-site receptors	Low Likelihood	Low	To be determined
Assessment: Made Ground across the site and any fuel spillages from the Texaco Fuel Station located circa 30 m north and the on-site car park may be potential sources of hydrocarbon compounds and volatile PAHs, such as naphthalene. Future site users may be exposed to volatile contaminants via inhalation and accumulation of vapours in indoor space, representing a long-term risk. Volatile contamination may pose a short-term risk to construction workers, particularly in confined spaces. Recommendation: Investigation is required to confirm if the Made Ground soils are impacted by volatile contaminants. Should potentially volatile contamination be identified during the intrusive phase of works, appropriate mitigation measures will be required.						
PL4	Methane, carbon dioxide (Made Ground and infilled features within 250 m of the site)	Inhalation of gas Migration through permeable strata and preferential pathways Explosion in confined spaces	Future site users Buildings Off-site land users	Likely	Moderate	To be determined
Assessment: Made Ground and infilled features within 250 m of the site are potential sources of hazardous ground gases such as carbon dioxide and methane, which have associated with asphyxiation and explosive risks. Recommendation: A phase of ground gas monitoring should be completed to determine the level of risk.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL5	Mobile contaminants (Made Ground, fuel spillages)	Surface runoff Migration through permeable strata and preferential pathways Perched waters migration	Groundwater (Principal, bedrock aquifer and Secondary A drift aquifer)	Low Likelihood	Moderate	To be determined
Assessment: No significant sources of mobile contamination have been identified. Localised impacted Made Ground and potential localised fuel spillages from the on-site car park and off-site Texaco Fuel Station represent a potential source of mobile contamination. Contaminants have the potential to leach into the soil and migrate downwards to the underlying Secondary A superficial aquifer and Principal aquifer. The underlying superficial deposits are likely to comprise high permeability sands which may facilitate the potential for mobile phase contaminants to migrate towards the superficial and bedrock aquifers. Additionally, there are two groundwater abstraction points within 1km of the site. Recommendation: Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.						
PL6	Sulphate (potential high sulphate and acidic Made Ground)	Sulphate attack on concrete	Building structure	Likely	Low	To be determined
Assessment: High sulphate concentrations may be present within Made Ground deposits (associated with the former structures), which may result in corrosion of buried concrete within the proposed development. Recommendation: Assessment must be undertaken to confirm the levels of pH and sulphate within the underlying strata and in particular any Made Ground deposits so that a concrete classification can be determined.						
PL7	Organic Contaminants such as Hydrocarbons associated with Made Ground	Ingestion of tainted water supply	Future site users Water pipes	Low Likelihood	Low	To be determined
Assessment: Low likelihood as no significant contamination is anticipated at pipeline depth across the site (0.75–1.35 m). Recommendation: An intrusive investigation is required to confirm requirements for the proposed water supply.						



POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL8	Phytotoxic contaminants (Made Ground)	Direct contact (plant uptake)	Flora.	Low Likelihood	Low	To be determined
Assessment: Contaminations may be present within shallow Made Ground which may be taken up by flora in soft landscaping, however the majority of the proposed surface cover is hardstanding. Assessment: Intrusive investigation to determine risk on a site wide basis. If identified, a cover system may be required within any future proposed landscaped areas.						

Main exposure pathways:

PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete PL7=Tainting of water supply; PL8 = Uptake by plants;



7. CONCLUSIONS AND RECOMMENDATIONS

7.1. SITE SUMMARY

Current Site Use	The subject site is a rectangular shaped parcel of land located to the south of Knowsley Industrial Park and was formerly occupied by the 'Admin Building' associated with the former Royal Ordnance Factory (ROF) Kirkby, an Ordnance Filling Factory. The buildings were demolished by 2019 and the existing site is predominantly covered by overgrown grasses with areas of short rough scrub vegetation and bushes. A series of sporadic semi-mature and mature trees are present along the eastern boundary of the site. A small rectangular area of hardstanding is present in the northwest corner of the site, adjacent to the gated entrance to the site. Wooden boarded fencing supported by oil drums filled with sand, runs along the western and southern boundaries. Metal palisade fencing borders the north and east of the site. Areas of waste plywood boards, planks of wood and empty drums are located in the central area and along the southern boundary of the site. The south of the site is a hardstanding area with several car parking spaces and a small, landscaped area with a single semi-mature tree.
Historical Site Use	A review of the pertinent Ordnance Survey mapping suggests that the site comprised agricultural land until circa 1956. Circa 1956 the 'Admin Building' associated with ROF Kirkby was constructed on site. The main building was a single-storey structure, with a complicated structure of rectangular elements, interlinking corridors, and open spaces between. Additional structures on site included a telephone exchange to the northwest, a post office and two lavatory buildings to the west, five structures marked as banks to the southwest and seven identical structures with earth mounds between the structures to the northeast. Circa 1970, the telephone exchange was no longer recorded/had been demolished. Circa 1977 the structures in the north-eastern sector were no longer recorded/had been demolished. Circa 2001, the north of the site was utilised as a car park. All buildings on site were demolished by 2019 and the existing site is predominantly covered by overgrown grasses with the south of the site being utilised as a car park.



7.2. CONTAMINATED LAND ASSESSMENT

Human Health	Made Ground associated with localised construction and demolition activities and the on-site infilled field boundary is a potential source of heavy metals PAHs, hydrocarbon compounds and ACM. There is the potential for localised small fuel leaks or spillages from the fuel station to the northwest and the on-site car park, which are a potential source of PAHs and hydrocarbon compounds.
Controlled Waters	No significant sources of mobile contamination have been identified. Localised impacted Made Ground and potential localised fuel spillages from the on-site car park and the off-site Texaco Fuel Station represent a potential source of mobile contamination. Contaminants have the potential to leach into the soil and migrate downwards to the underlying Secondary A superficial aquifer and Principal aquifer. The underlying superficial deposits are likely to comprise high permeability sands which may facilitate the potential for mobile phase contaminants to migrate towards the superficial and bedrock aquifers. Additionally, there are two groundwater abstraction points within 1km of the site, which increases the sensitivity of the aquifers. Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.
Ground Gas	Localised Made Ground, and potential off-site infilled features and marsh are potential sources of hazardous ground gas. Carbon dioxide and methane have associated asphyxiation and explosive risks, respectively. If present, the risks can be appropriately mitigated through the careful design of building structures. Historical mapping suggests the potential for munition storage on site. This was likely kept in controlled conditions with careful handling to ensure no spillages or damage.
Potable Water	No significant sources of contamination have been identified that would pose a significant risk to the proposed potable water supply, however, this will need to be confirmed following intrusive investigation.



7.3. GEOTECHNICAL ASSESSMENT

Geological	Records show the drift is made up of Shirdley Hill Sand Formation and the bedrock is the Chester Formation (Sandstone). BGS borehole records in close proximity to the northwest of site show Made Ground deposits in all locations, to a maximum proven depth of 0.50 m bgl. All holes refused at shallow depths in SAND or on weathered SANDSTONE bedrock. Exploratory boreholes completed by E3P at the adjacent parcel of land to the west show Made Ground deposits in all locations with a range of depths, to a maximum proven depth of 1.50 m bgl. All holes refused at shallow depths on the red weathered SANDSTONE bedrock.
Civil and Structural	It is likely there will be significant Made Ground deposits and obstructions in the location of the former structures on the site. All relict foundations will require grubbing out, prior to the construction of the proposed development. Shallow bedrock is anticipated beneath the site and has been proven within proximity to the site at depths of between 1.20 m bgl to 2.18 m bgl, therefore, foundations and buried infrastructure will likely require specialist design.
Abnormal Foundations	Foundation solutions will be largely dependent on the proposed development levels and the requirement to cut and fill to achieve the development platform levels. An abnormal engineering solution may be required where there is significant thickness of Made Ground, tree influence, loose granular soils or soft cohesive deposits.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



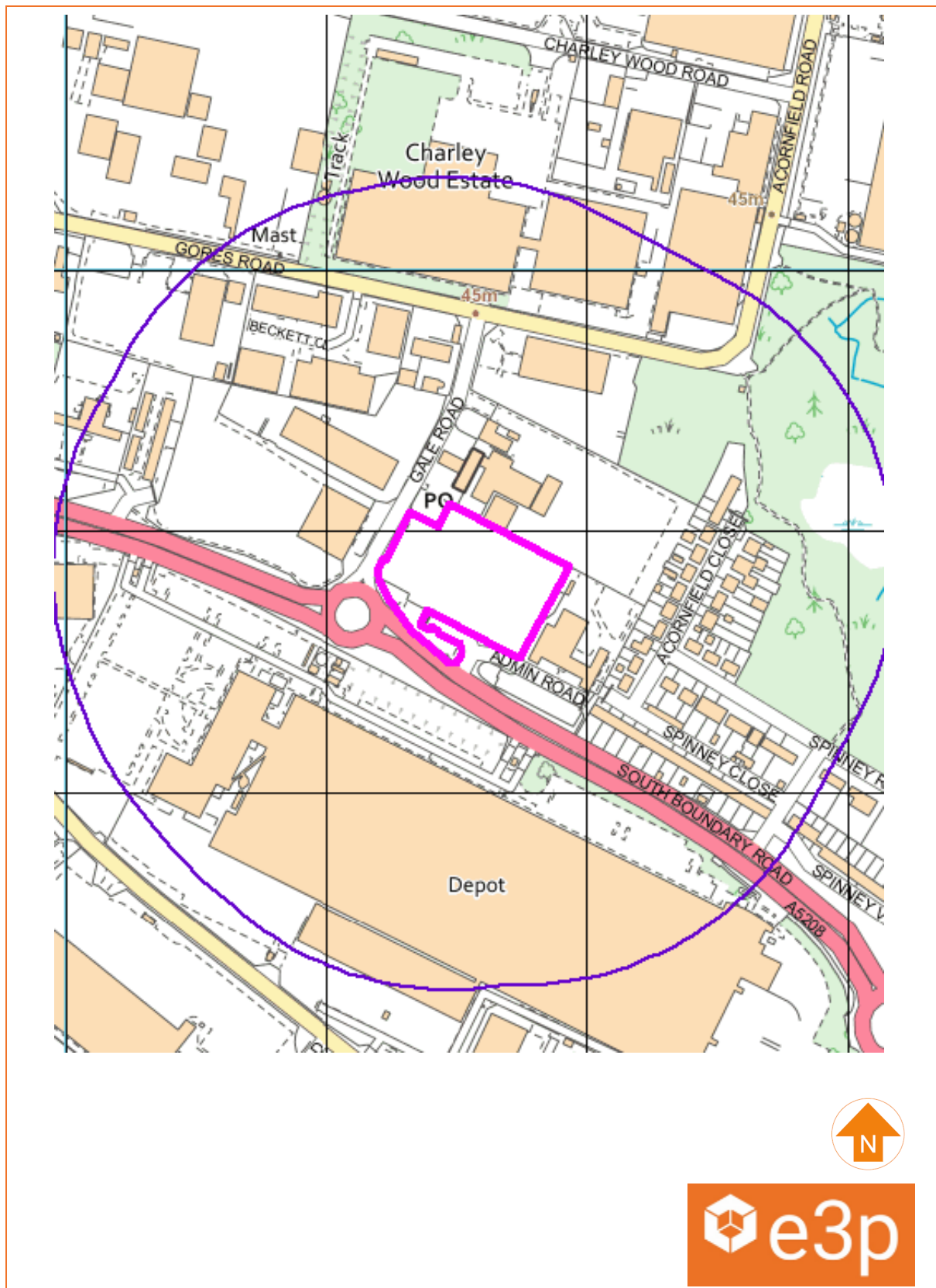
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection

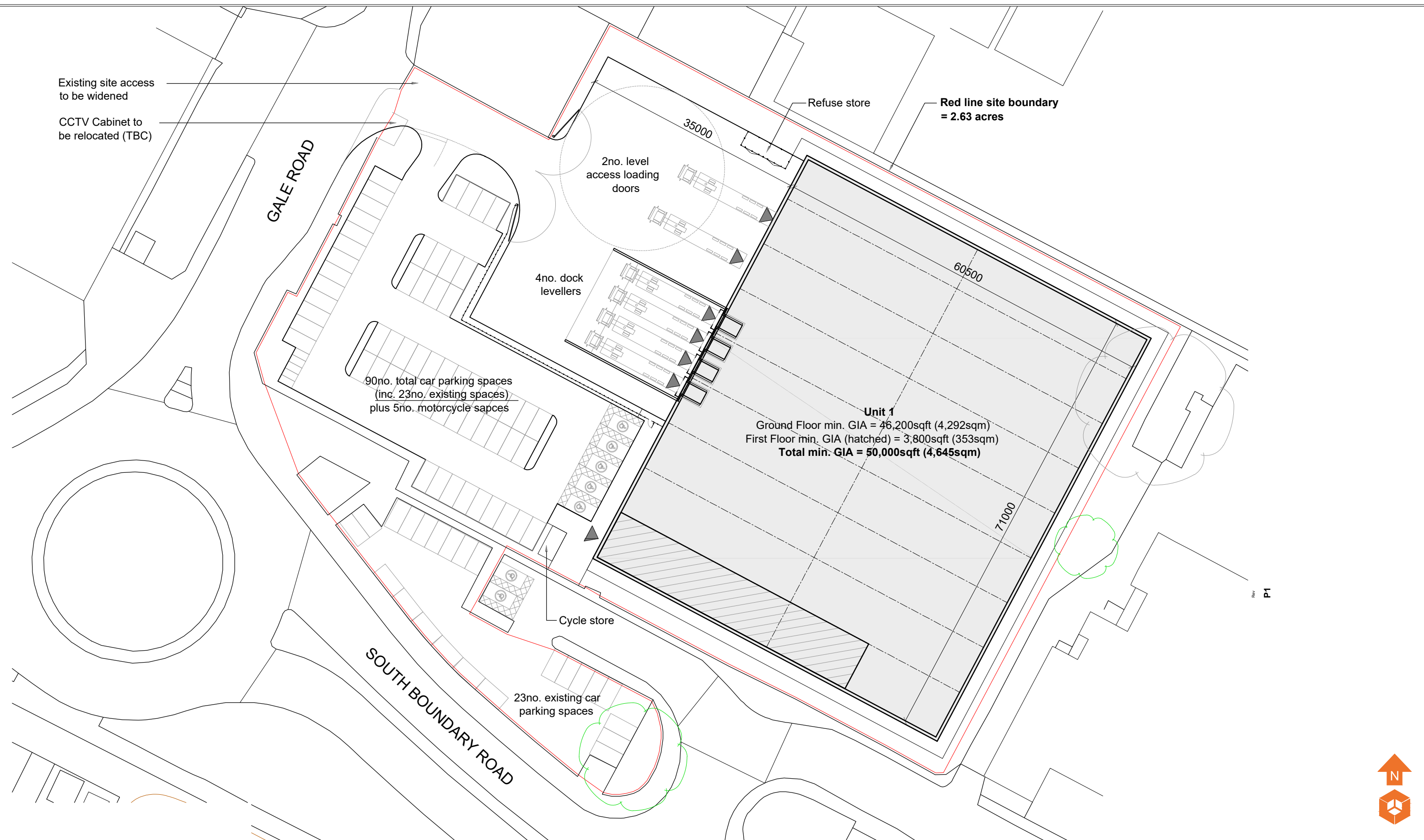


APPENDIX III

DRAWINGS

DRAWING 15-354-001 – SITE LOCATION PLAN





Notes:				
P1	REVA	01.06.2022	EB	NS
Phase	Issue	Date	Drawn	Checked

Client:	
Redsun	
Job Title:	
East Hub, Knowsley	

Job No:
15-354
Drawing No:
002

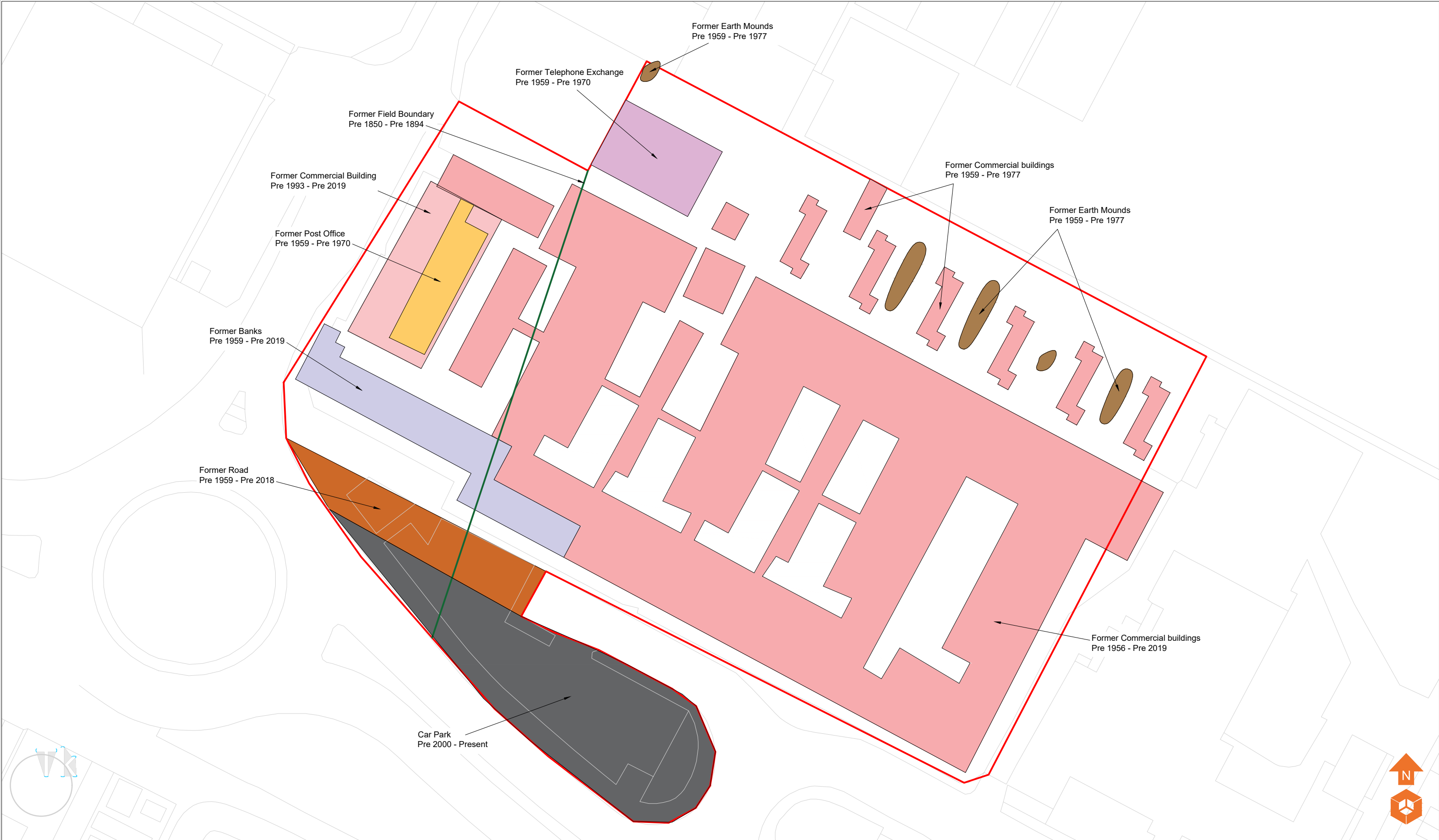
Date:
01.06.2022
Scale:
NTS@ A3

Drawing Title:
Proposed Development Plan



Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Historical Features Former Telephone Exchange Former Commercial Buildings Former Post Office Former Banks Former Road Car Park Former Earth Mounds Former Field Boundary

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Site Features Soft Standing Active Car Park Hardstanding Electricity Box Camera Rubbish Access Fuel Station
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APPENDIX IV

PHOTOGRAPHS

PLATE 1 SITE ENTRANCE



PLATE 2 HARDSTANDING IN NORTHWEST CORNER OF SITE FACING EAST



PLATE 3 SCRAP WOOD AND PLYWOOD IN THE CENTRAL AREA OF THE SITE



PLATE 4 ELECTRICITY BOX IN NORTH WEST CORNER OF SITE



PLATE 5 VIEW OF SITE FACING NORTHWEST



PLATE 6 VIEW OF NORTHERN BOUNDARY OF SITE FACING NORTHEAST



PLATE 7 VIEW OF SOUTHERN BOUNDARY OF THE SITE FACING WEST

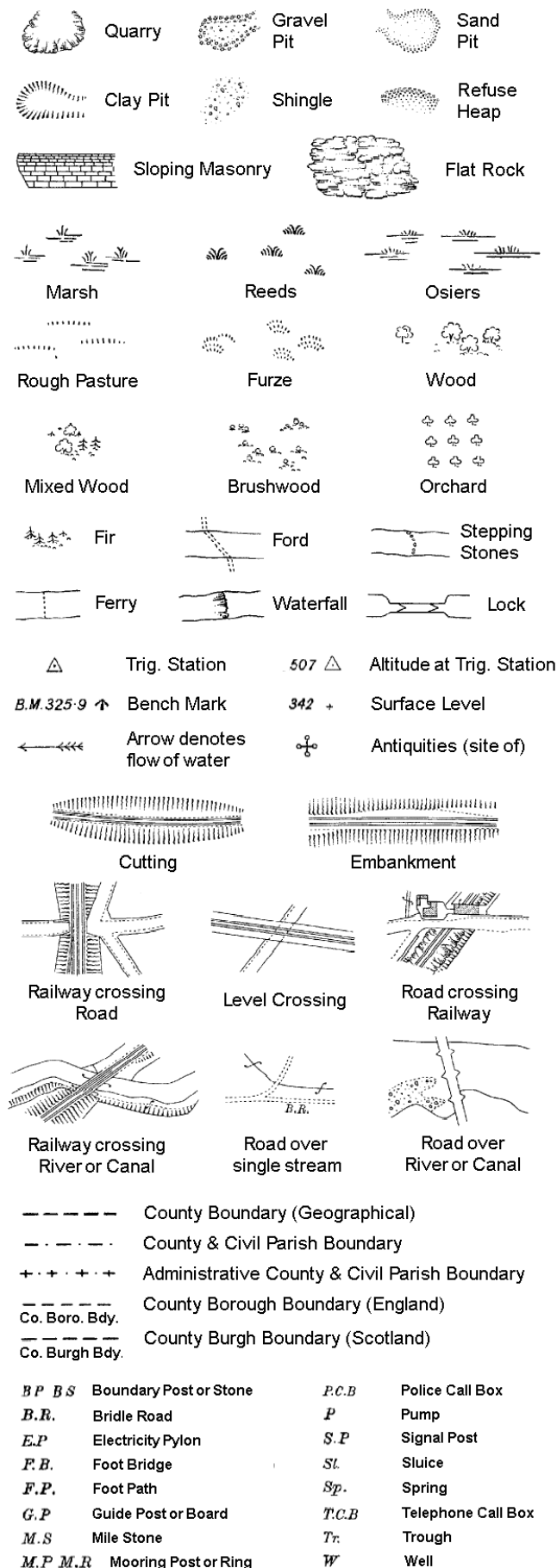


APPENDIX V

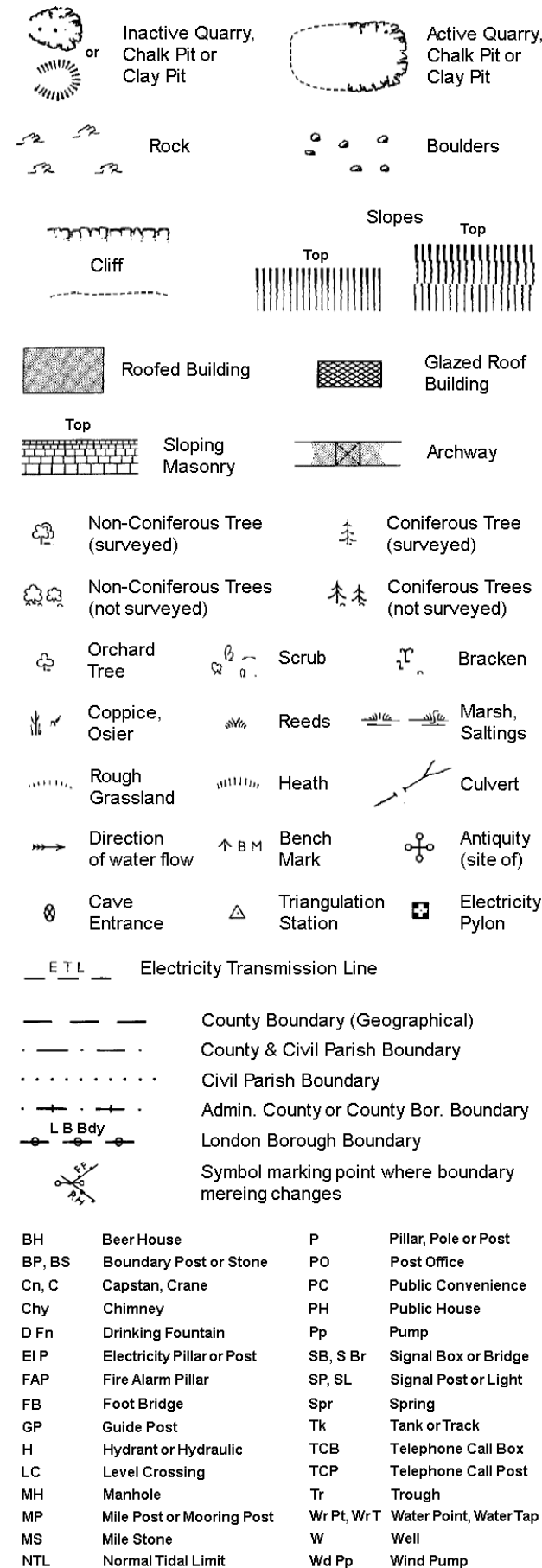
HISTORICAL MAPS

Historical Mapping Legends

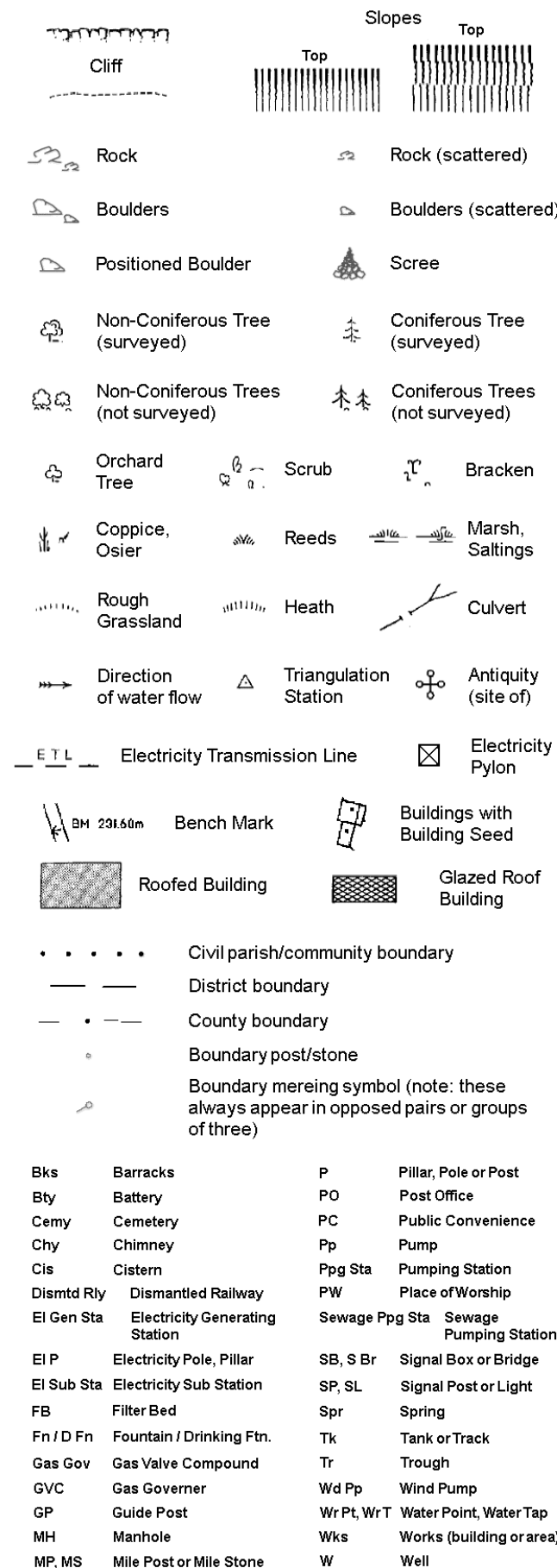
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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



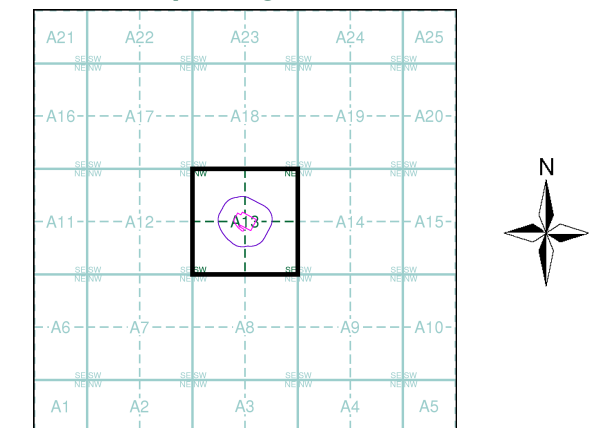
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1908	3
Lancashire And Furness	1:2,500	1927	4
Lancashire And Furness	1:2,500	1939	5
Ordnance Survey Plan	1:1,250	1959 - 1961	6
Ordnance Survey Plan	1:2,500	1960 - 1962	7
Ordnance Survey Plan	1:1,250	1965 - 1976	8
Ordnance Survey Plan	1:2,500	1970 - 1971	9
Ordnance Survey Plan	1:1,250	1977	10
Additional SIMs	1:1,250	1978 - 1985	11
Additional SIMs	1:1,250	1987	12
Large-Scale National Grid Data	1:1,250	1993	13
Large-Scale National Grid Data	1:1,250	1994	14
Large-Scale National Grid Data	1:1,250	1996	15
Historical Aerial Photography	1:2,500	2001	16

Historical Map - Segment A13



Order Details

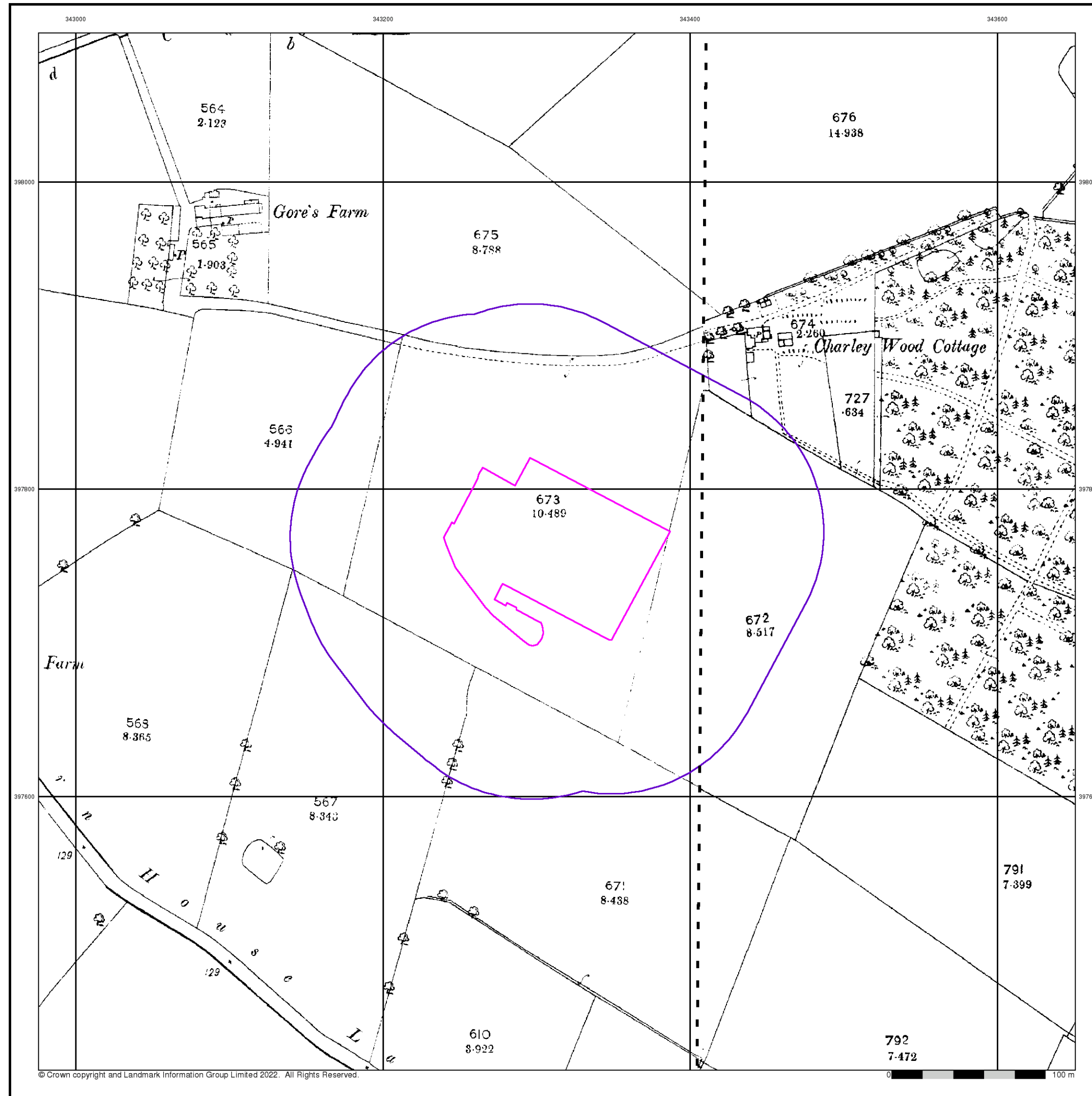
Order Number: 293915306_1_1
Customer Ref: 15-354
National Grid Reference: 343310, 397760
Slice: A
Site Area (Ha): 1.07
Search Buffer (m): 100

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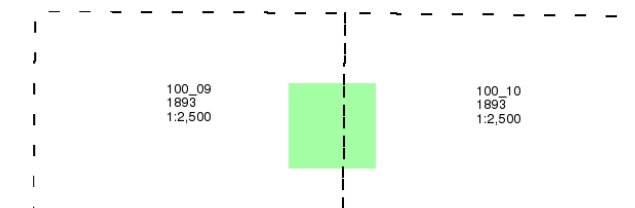
Lancashire And Furness

Published 1893

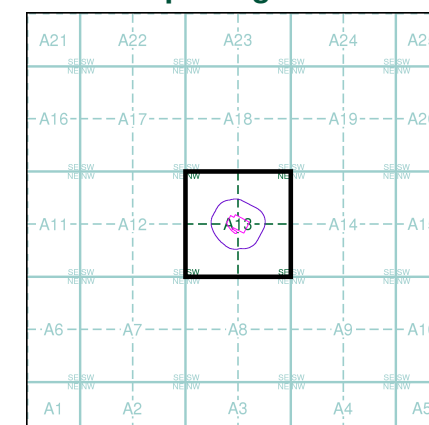
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

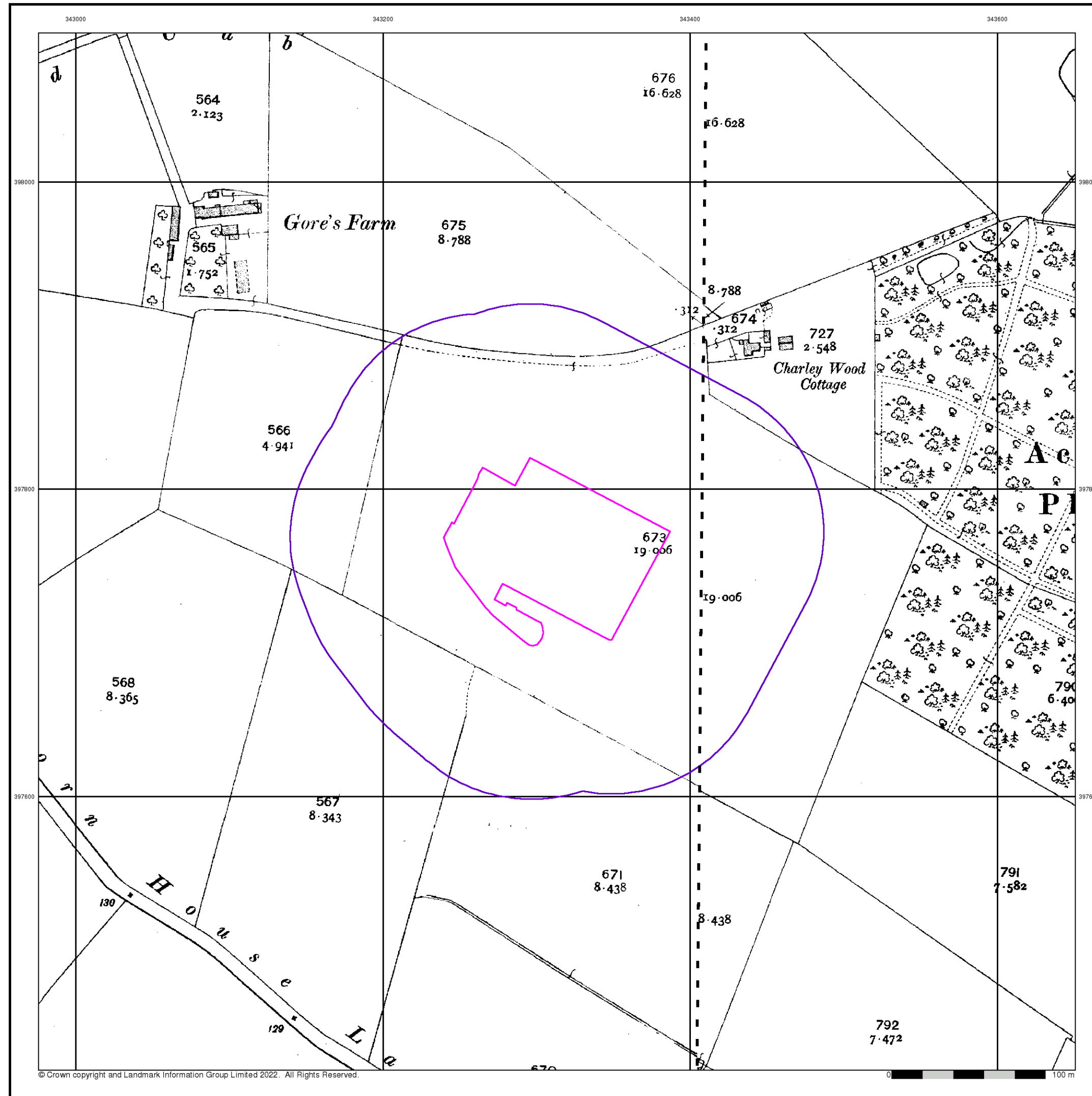
Order Number: 293915306_1_1
Customer Ref: 15-354
National Grid Reference: 343310, 397760
Slice: A
Site Area (Ha): 1.07
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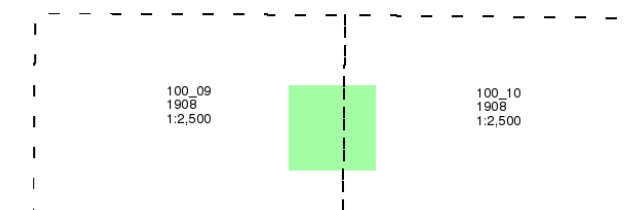
Lancashire And Furness

Published 1908

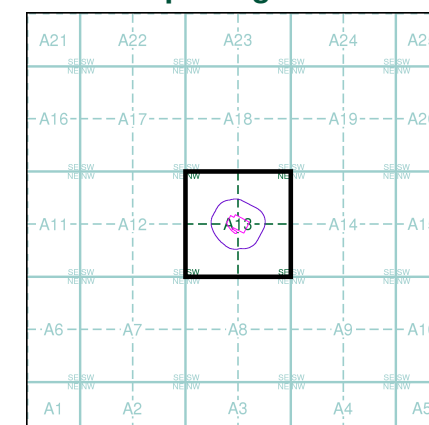
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

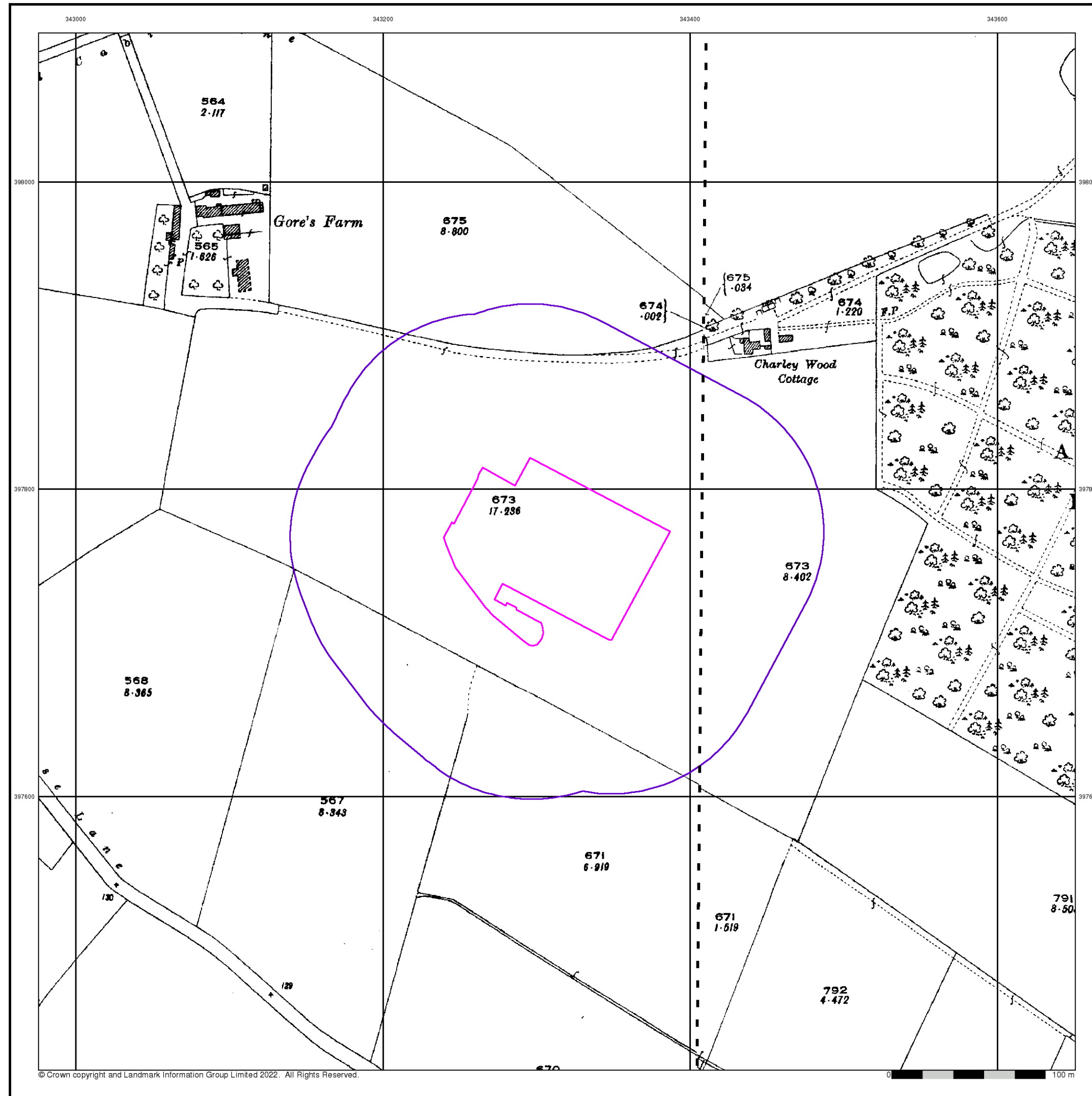
Order Number: 293915306_1_1
Customer Ref: 15-354
National Grid Reference: 343310, 397760
Slice: A
Site Area (Ha): 1.07
Search Buffer (m): 100

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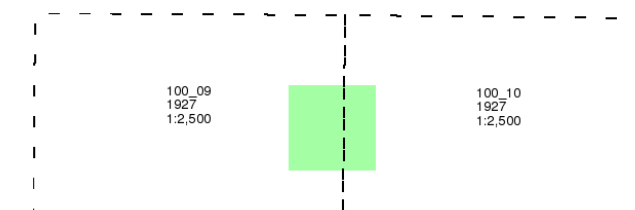
Lancashire And Furness

Published 1927

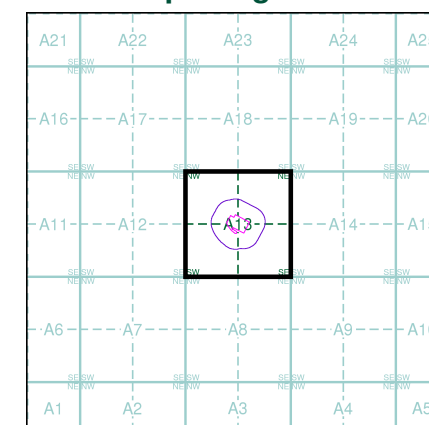
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

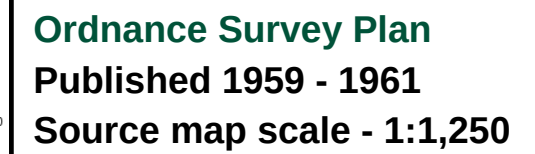
Order Number: 293915306_1_1
Customer Ref: 15-354
National Grid Reference: 343310, 397760
Slice: A
Site Area (Ha): 1.07
Search Buffer (m): 100

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Map Name(s) and Date(s)

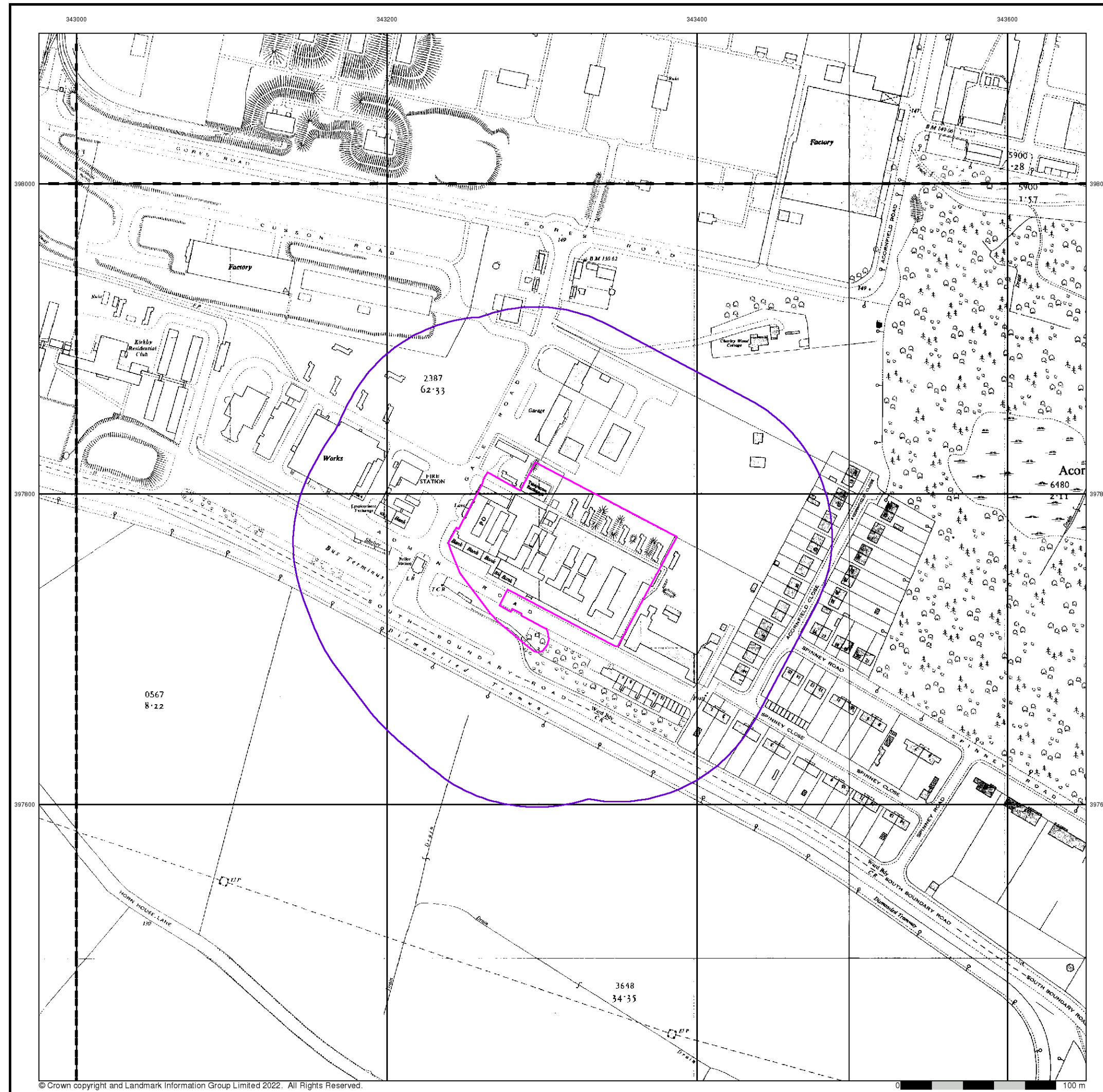
SJ4298SE	SJ4398SW	SJ4398SE
1961	1960	1960
1:1,250	1:1,250	1:1,250
SJ4297NE	SJ4397NW	SJ4397NE
1960	1959	1959
1:1,250	1:1,250	1:1,250
SJ4297SE	SJ4397SW	SJ4397SE
1960	1959	1959
1:1,250	1:1,250	1:1,250



Order Number:	293915306_1_1
Customer Ref:	15-354
National Grid Reference:	343310, 397760
Slice:	A
Site Area (Ha):	1.07
Search Buffer (m):	100

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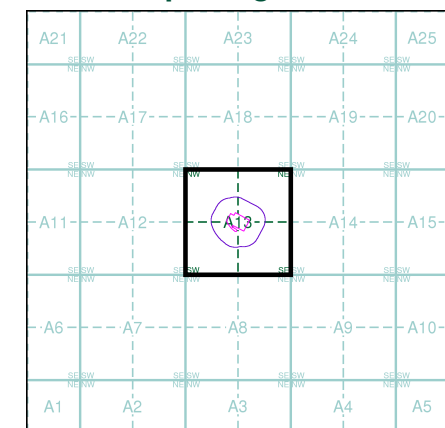
Ordnance Survey Plan
Published 1960 - 1962
Source map scale - 1:2,500

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

Map Name(s) and Date(s)

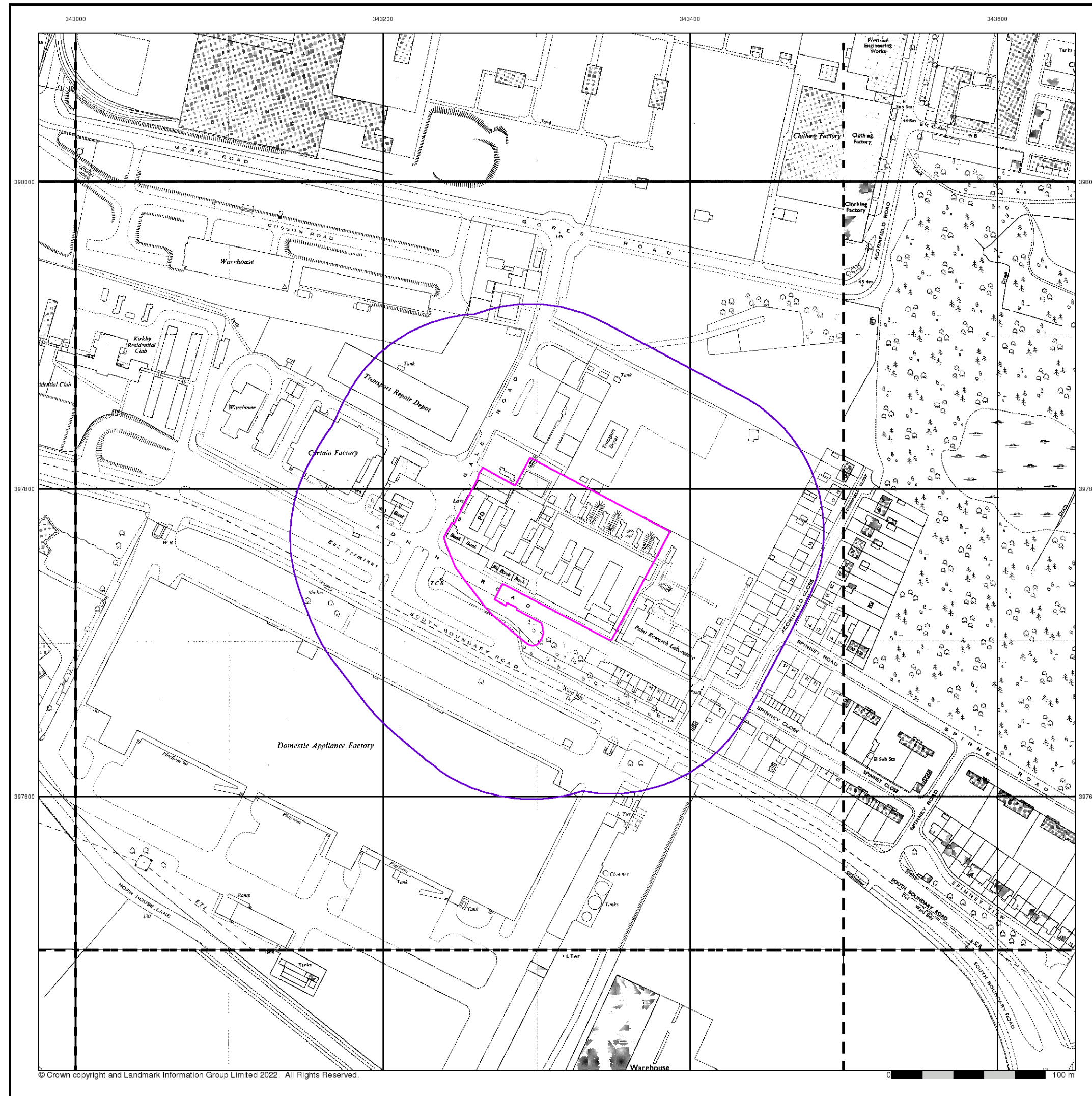
SJ4298 1962 12,500	SJ4398 1962 12,500
SJ4297 1960 12,500	SJ4397 1960 12,500

Historical Map - Segment A13



Order Details
Order Number: 293915306_1_1
Customer Ref: 15-354
National Grid Reference: 343310, 397760
Slice: A
Site Area (Ha): 1.07
Search Buffer (m): 100

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Ordnance Survey Plan

Published 1965 - 1976

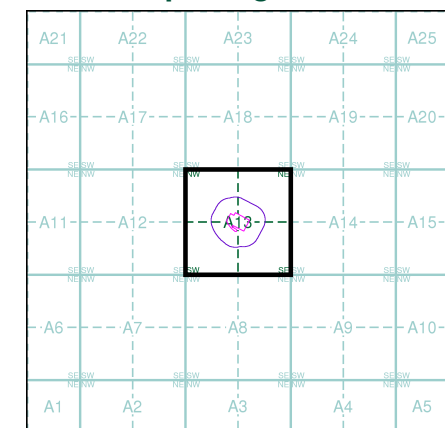
Source map scale - 1:1,250

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)

SJ4298SE	SJ4398SW	SJ4398SE
1968	1967	1972
1:1,250	1:1,250	1:1,250
SJ4297NE	SJ4397NW	SJ4397NE
1968	1965	1975
1:1,250	1:1,250	1:1,250
SJ4297SE	SJ4397SW	SJ4397SE
1976	1975	1968
1:1,250	1:1,250	1:1,250

Historical Map - Segment A13



Order Details

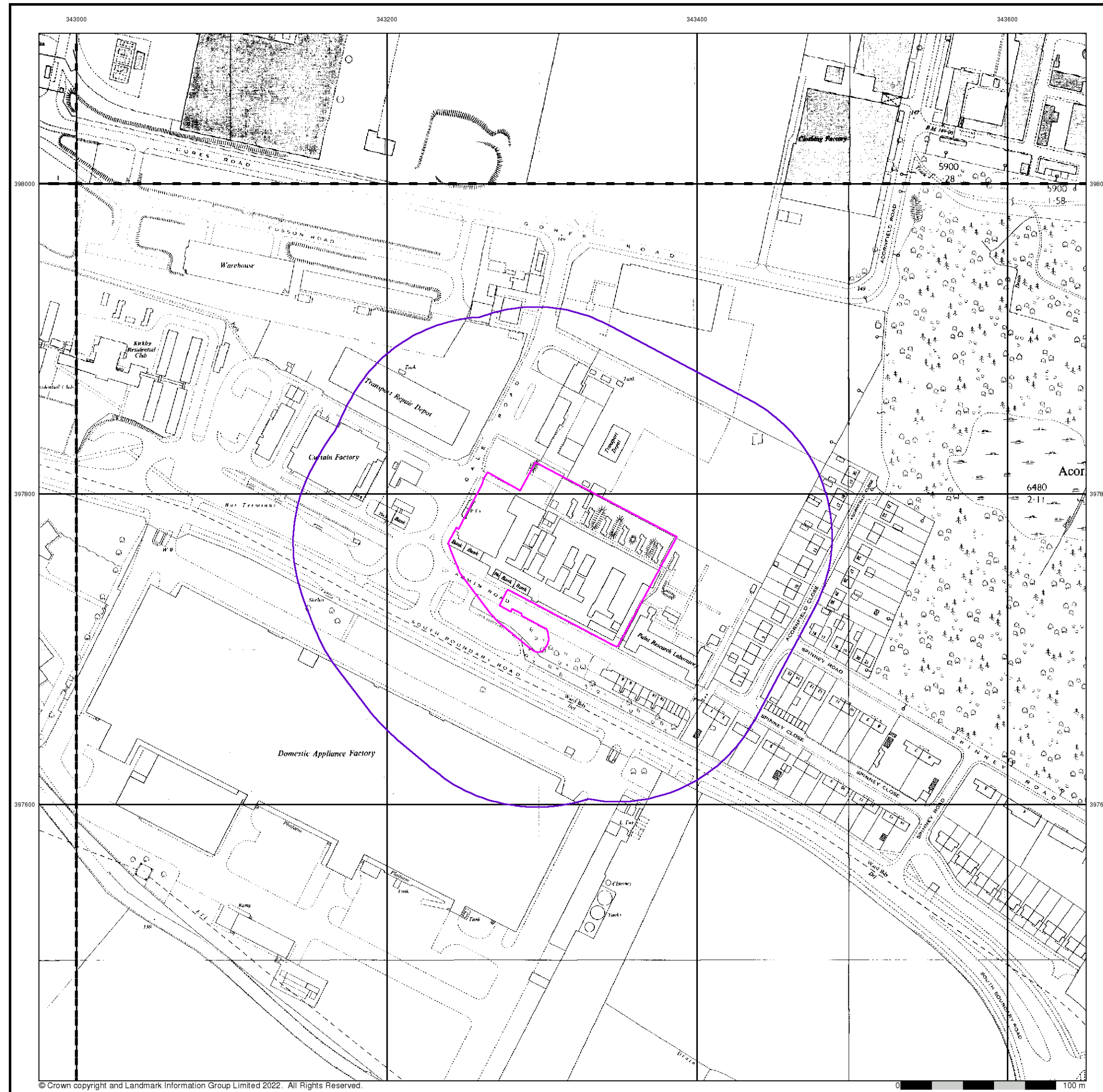
Order Number: 293915306_1_1
 Customer Ref: 15-354
 National Grid Reference: 343310, 397760
 Slice: A
 Site Area (Ha): 1.07
 Search Buffer (m): 100

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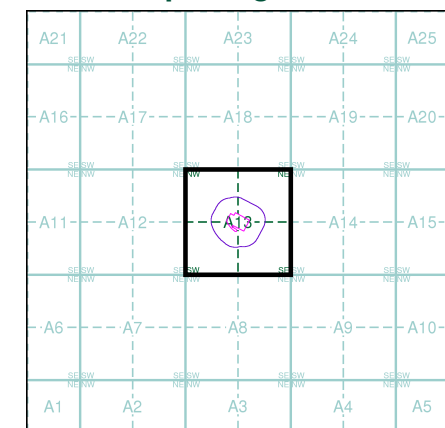
Ordnance Survey Plan
Published 1970 - 1971
Source map scale - 1:2,500

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)

SJ4298 1971 12,500	SJ4398 1971 12,500
SJ4297 1970 12,500	SJ4397 1970 12,500

Historical Map - Segment A13



Order Details

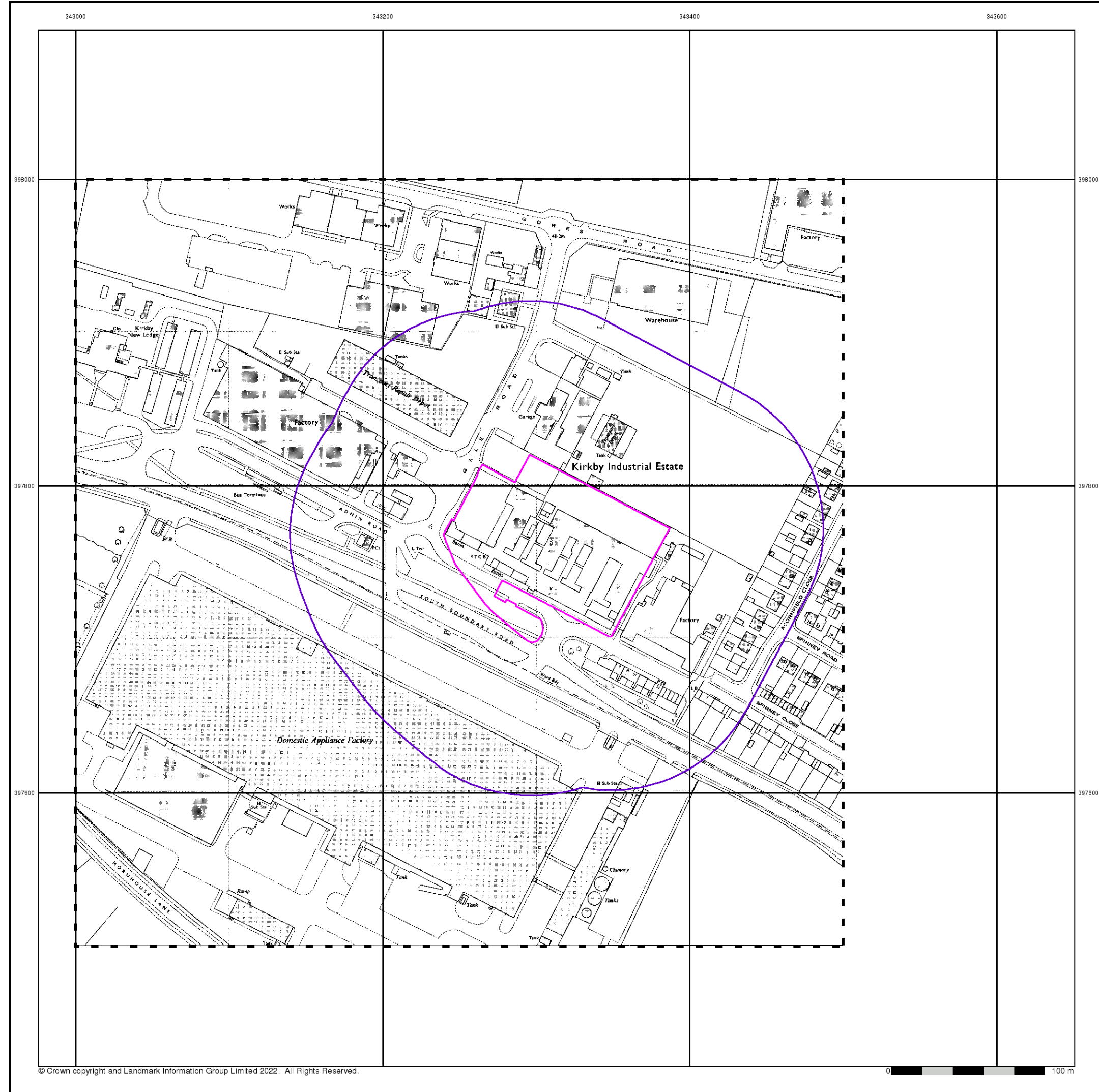
Order Number: 293915306_1_1
Customer Ref: 15-354
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Slice: A
Site Area (Ha): 1.07
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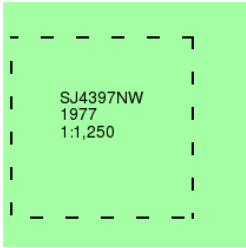
Ordnance Survey Plan

Published 1977

Source map scale - 1:1,250

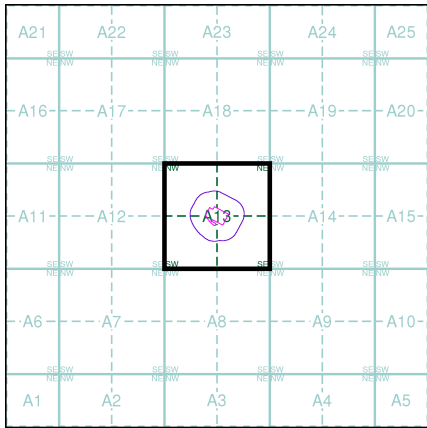
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. 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)



SJ4397NW
1977
1:1,250

Historical Map - Segment A13



Order Details

Order Number:	293915306_1_1
Customer Ref:	15-354
National Grid Reference:	343310, 397760
Slice:	A
Site Area (Ha):	1.07
Search Buffer (m):	100

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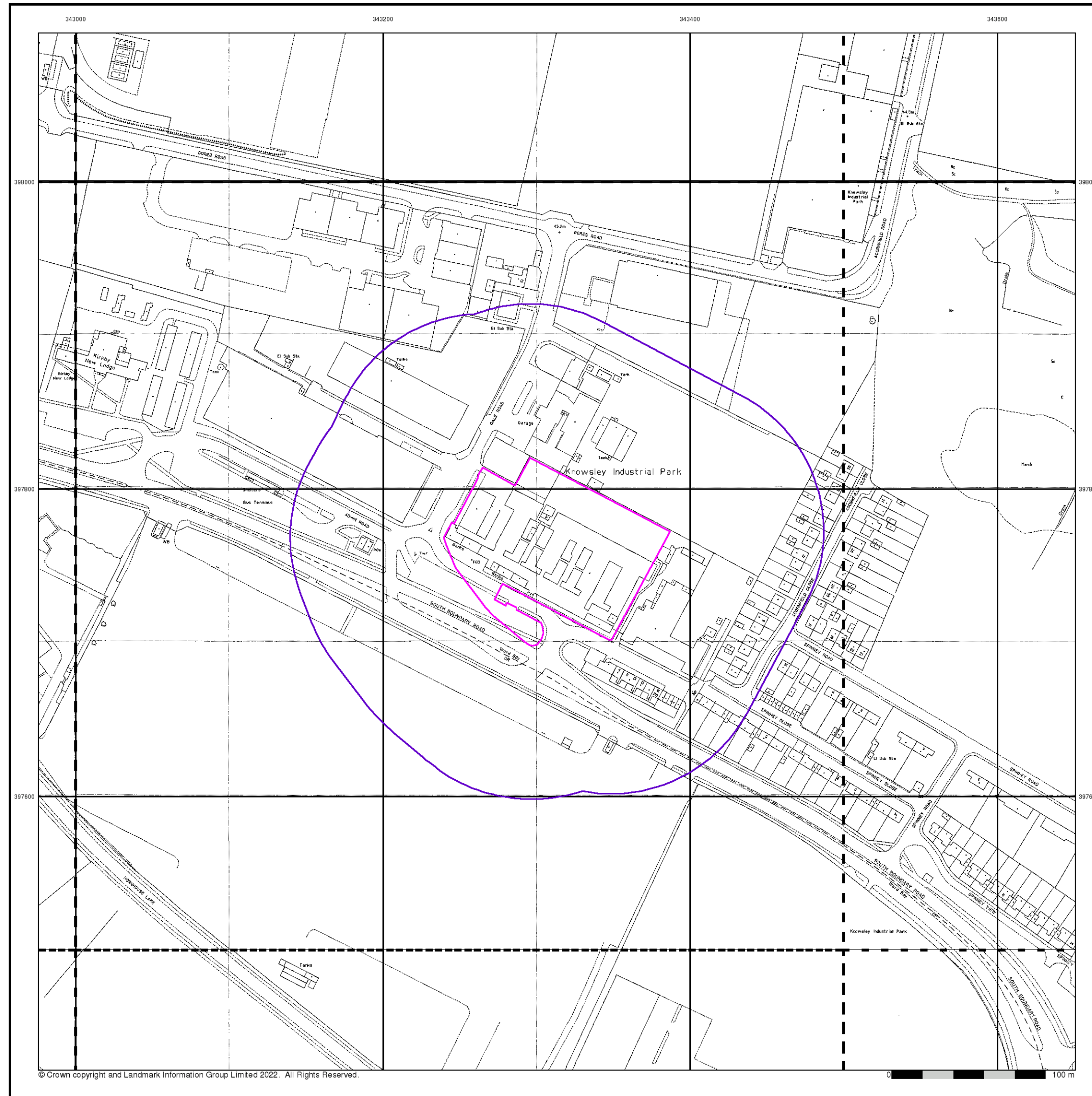


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A Landmark Information Group Service v50.0 11-Apr-2022 Page 10 of 16



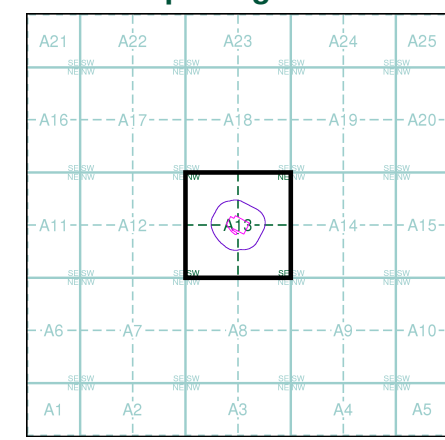
Large-Scale National Grid Data
Published 1993
Source map scale - 1:1,250

'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)

SJ4298SE	SJ4398SW	SJ4398SE
1993	1993	1993
1:1,250	1:1,250	1:1,250
SJ4297NE	SJ4397NW	SJ4397NE
1993	1993	1993
1:1,250	1:1,250	1:1,250
SJ4297SE	SJ4397SW	SJ4397SE
1993	1993	1993
1:1,250	1:1,250	1:1,250

Historical Map - Segment A13



Order Details

Order Number: 293915306_1_1
Customer Ref: 15-354
National Grid Reference: 343310, 397760
Slice: A
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343000

343200

343400

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398000

398000

397800

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397600

397600



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0 100 m

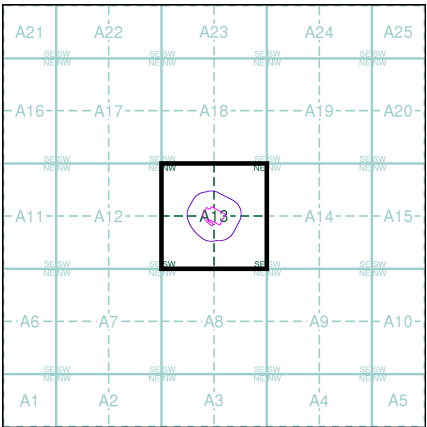


Historical Aerial Photography

Published 2001

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

Order Number: 293915306_1_1
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