

Telereal Trillium

Heywood Stores

Geo-environmental Site Investigation

322834-R1 (01)

RSK GEOSCIENCES

November 2021

RSK GENERAL NOTES

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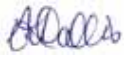
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Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

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1 INTRODUCTION

1.1 Commissioning

RSK Environment Limited (RSK) was commissioned by Telereal Trillium to carry out a Geo-Environmental site investigation of the land at Heywood Stores, Heywood, OL10 2PZ. The project was carried out to an agreed brief as set out in RSK's proposal (Ref. 322834TL01, dated 5 May 2021).

RSK's service constraints are shown in Appendix A.

RSK have not been provided with any plans confirming the proposed end use for the site.

1.2 Objectives

The objective of the work is:

- to identify any land contamination and/or geotechnical constraints to the proposed development and to support discharge of relevant planning conditions and relevant building control requirements
- to identify the need for any additional investigation or remediation works to demonstrate that the site is suitable for its proposed use.

1.3 Scope of works

The scope of this assessment has been developed in accordance with relevant British Standards and authoritative technical guidance as referenced through the report. The assessment of the contamination status of the site is in line with the technical approach presented in Land Contamination Risk Management (LCRM) (Environment Agency, 2021) – which supersedes CLR11 Model Procedures for Land Contamination – and in general accordance with BS 10175: 2011 + A2 2017 (BSI, 2017). It is also compliant with relevant planning policy and guidance.

The scope of the intrusive investigation has been designed in line with the recommendations of BS5930:2015+A1:2020 Code of practice for ground investigations (BSI, 2020), which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. It has also been developed in general accordance with BS 10175: 2011 + A2 2017. Ground gas assessment has been undertaken in general accordance with BS8576: 2013 and BS 8485:2015+A1:2019.

A brief summary of relevant legislation and policy relating to land contamination is given in Appendix B.

The scope of works for the assessment has included the following:

Desk Study:

- review of the history of development on the site and surroundings
- assessment of local geology, hydrogeology and hydrology
- assessment of the potential risks from past, present and future coal mining activities

- completion of a site reconnaissance survey to assess the visual condition of the site
- development of an initial conceptual site model (CSM)
- preliminary consideration of geotechnical constraints and hazards
- identification of the need for further action, e.g. intrusive investigations, if any.

Detailed UXO Risk Assessment

The UXO Risk Assessment will review a number of sources to provide an assessment of the probability of encountering explosive ordnance during proposed intrusive works at the site. Various sources will be consulted including, but not limited to:

- national and local archives
- the National Monuments Record Office (high resolution WWII-era aerial photography),
- historical mapping
- military records, books and internet resources.

Intrusive Investigation

- design and implementation of an intrusive investigation, in situ testing, soil sampling, laboratory geo-environmental and geotechnical testing, groundwater and ground gas monitoring of installed boreholes*
- interpretation of data to develop a refined conceptual site model (CSM)
- generic quantitative risk assessment (GQRA) of relevant contaminant linkages
- interpretation of ground conditions and geotechnical data to provide preliminary recommendations with respect to foundations and infrastructure design
- preliminary assessment of the potential waste classification
- preparation of this factual and interpretative report.

1.4 Existing reports

No existing reports relevant to the site assessment have been provided to RSK.

1.5 Limitations

This report is subject to the RSK service constraints given in Appendix A and limitations that may be described through this document.

2 SITE DETAILS

2.1 Site location

Site location details are presented in Table 1 and a site location plan is provided on Figure 1.

Table 1 Site location details

Site name	Heywood Stores
Full site address and postcode	Heywood Stores, Manchester Road, Heywood OL10 2QR
National Grid reference (centre of site)	Grid Ref: 385560 409190

2.2 Site description

The Site boundary and current site layout are shown on Figure 2. The site covers an area of c. 11.19 hectares. It is currently occupied by ten industrial units within the setting of a former RAF base, with gatehouse.

2.3 Surrounding land uses

The site is located in approximately 1.2km to the south of Heywood Town Centre, within a mixed residential setting. Immediate surrounding land uses are described in Table 2.

Table 2 Surrounding land uses

North	School playing fields are present immediately to the north of the site which are part of Newhouse Academy.
East	Residential properties are present to the east of the northern part of the site. Manchester Road forms the eastern site boundary with open fields further to the east.
South	Open fields are present to the south of the site with the M62 motorway noted 430m to the south east.
West	Commercial units are present to the immediate west of the site with agricultural land noted further to the west.

2.4 Development plans

RSK have not been provided with any plans to develop the site.

3 DESK-BASED ASSESSMENT

The desktop study was designed generally to meet the objectives of a preliminary (phase 1) investigation, as defined by BS 10175:2011 + A2 2017 (BSI, 2017) and this assessment relates to LCRM Stage 1, Tier 1 preliminary risk assessment. The "vicinity" of the site for the purposes of this report is defined as locations situated within an approximate 250 m radius of the site, although certain sources and/ or sensitive targets further than 250 m may also have been considered.

The study aims principally to identify and assess the potential risks and liabilities associated with contamination of the ground, on and in the vicinity of the site. While this includes consideration of current operations and housekeeping on the site, the report does not constitute a comprehensive environmental audit of the site, as covered under ISO 14001.

3.1 Site history

3.1.1 Historical development record

The development history of the site and surrounding area based upon assessment of historical plans and records is detailed in Table 3. The historical maps reviewed are shown within the environmental database report in Appendix C.

Table 3 Summary of historical development

Date from	Historical Land Use (on-site)
1848 - 1851	The site is occupied by six fields of varying size which are used for agricultural purposes.
1894	No significant changes.
1910	No significant changes.
1923 - 1932	No significant changes
1955 - 1956	Field boundaries within the site appear to have changed now.
1969	Ten units are shown on the site which is now labelled as a depot. Infrastructure is also shown on site which includes roadways.
1983 - 1988	A sewage works is present in the south western corner of the site. An additional building has been constructed in the south eastern part of the site.
1999	No significant changes.
2021	The site is shown in its current condition with the sewage works no longer present. Maps provided by Google indicates that the sewage works were decommissioned by 2000.

Date from	Historical Land Use (off-site)
1848 - 1851	The site is surrounded by agricultural land.
1894	Farm buildings are noted on the eastern site boundary. A gravel pit is present 315m north east of the site.
1910	An old shaft is shown 225m east of the site.
1923 - 1932	No significant changes.
1955 - 1956	No significant changes.
1965 - 1968	Residential properties are present north east of the site. The shaft to the east of the site is no longer shown.
1983 - 1988	A sewage works is present in the south western corner of the site which extends off site to the south west whilst additional residential properties are noted north east of the site. A school is present on land to the immediate north.
1999	The school buildings to the north of the site have expanded and are now labelled as a college.
2021	The sewage works are no longer present and are likely to have been decommissioned around the year 2000.

The historical maps show that the site remained undeveloped until the first buildings are shown on site in 1969. However, information available from http://www.lancashireatwar.co.uk/barrage-balloons/4586812401 indicates that the site was a large RAF site which was mainly civilian, used for maintenance, storage and repair, which was closed in 1967. The site was then used for the storage of documents in the warehouses.

3.1.2 Unexploded ordnance

A review of publicly available unexploded ordnance (UXO) risk maps indicates that the site is located in an area with medium potential for wartime bombs to be present (Zetica, 2021). However, a Detailed Unexploded Ordnance Assessment completed by First Line Defence indicated the site to be in a low-risk area in term of UXO. A copy of this report is included in Appendix D

3.2 Information from environmental database report

Relevant environmental permits and incidents detailed within the environmental database report (see Appendix C) are summarised below in Table 4.

Table 4 Summary of environmental permits, landfills and incidents

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Enforcement and prohibition notices	0	0	0	N/A
Pollution incidents to controlled waters, Prosecutions relating to controlled waters, Substantiated pollution incident register, Water Industry Act referrals	1	0	8	A pollution incident occurred on site and involved the spillage of an unknown pollutant . The incident was classified as category 3 (Minor)
Discharge consents	0	4	12	The nearest discharge consent is held by United Utilities and involves sewage discharges into Whittle Brook, 104m south of the site.
Registered radioactive substances	0	0	0	N/A
Landfill and waste				
Active landfills	0	0	1	The nearest landfill is 1km from site and is therefore unlikely to affect the site.
Historic / closed landfills	0	0	0	N/A
Other waste management licences	0	0	0	N/A
Potentially in-filled land (pit, quarry, pond, marsh, river, stream, dock etc)	0	0	0	N/A
Hazardous substances/ industrial land uses				
Control of Major Accident Hazards (COMAH) sites	0	0	0	N/A

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Explosives sites, Notification of Installations Handling Hazardous Substances (NIHHS), Planning hazardous substance consents/ enforcements	0	0	0	N/A
Contaminated land Part 2A register entries and notices	0	0	0	N/A
Contemporary trade directory entries	0	4	92	There are 96 contemporary trade directories within 1km of the site but none of these are likely to affect the site.
Fuel station entries	0	0	1	The nearest fuel station is located 600m east of the site.
Note: Entries have only been included within the table where they are located within a 250m radius of the site or, where they fall outside of this radius but are considered to comprise a significant entry.				

3.2.1 Site services

Buried utility services and their backfill can provide preferential pathways for gas, vapour or groundwater to migrate along to another part of the site or to a receptor. They can also represent significant constraints to development.

Service plans obtained from utility companies by RSK and the client are contained in Appendix E; these are dated August 2021. Buried services present on-site or located adjacent to site boundaries could represent a pathway for migration of groundwater and gases.

3.3 Site geology

3.3.1 Anticipated geological sequence

Published records (British Geological Survey, 13 July 2021 for the area and available historical borehole logs indicate the geology of the site to be characterised by the succession recorded in Table 5. There are no publicly available BGS historical boreholes located on or within 250 m of the site, a selection of which are presented in Appendix D.

Table 5 Site geology

Strata	Description	Estimated thickness	Permeability
Superficial Soils	Devensian Till	Unknown	Unknown
Bedrock	Pennine Lower Coal Measures	Unknown	Unknown
Relevant information sources: BGS Geoindex ☒ BGS borehole logs ☐ Previous SI reports ☐			

3.3.2 Radon

The environmental database report indicates that the site is not located within an 'Affected Area'. An 'Affected Area' is one with 1% or more homes above the radon Action Level of 200 Bq m^{-3}, and therefore the risk of significant ingress of radon into structures on-site is considered low and protection measures are not necessary in the construction of non-domestic buildings.

3.4 Mining and quarrying

3.4.1 Coal mining area

The site is located over Coal Measures bedrock and may therefore have been affected by coal mining activities. In these areas the assessment of mining legacy issues should be carried out in accordance with the guidance provided by the Coal Authority, who adopt a risk-based approach for the advice that they offer on proposed development sites. The Coal Authority are a statutory consultee to Local Planning Authorities in respect of building development within the defined coal mining areas of England, Wales and Scotland where a planning application is required.

An initial site appraisal has been carried out based on the information provided on the Coal Authority Interactive Viewer of the UK Coalfield areas.

This indicates the site lies within the Coal Authority Consultation Area but does not include Development High Risk areas. In these areas there is no requirement under the current planning regime to complete a CMRA, however in accordance with best practice we have obtained a Coal Authority Consultants Coal Mining report (Appendix D). The key findings from review of the datasets from the Coal Authority Interactive Viewer and the Coal Mining report are summarised in Table 6.

Table 6 Summary of key coal mining information

Item	Applicable to site?	Comment
Development High Risk Area on-site	No	N/A
Coal mine entries	No	A mine entry is noted 295m to the east of the site but is unlikely to affect the site.
Past shallow workings (recorded)	No	An area of shallow working is noted 300m east of the site.

Item	Applicable to site?	Comment
Probable shallow workings	Yes	Probable shallow workings are noted to the north east of the site.
Coal seam outcrops	No	N/A
Surface mining (opencast)	No	N/A

3.5 Hydrogeology

A summary of the hydrogeological setting of the site, with respect to the anticipated geological sequence set out in Section 3.3 is presented below in Table 7.

Table 7 Summary of hydrogeological setting

Condition	Description
Aquifer characteristics	The site is underlain by a secondary B aquifer in relation to the bedrock whilst superficial soils are classified as secondary undifferentiated strata. The presence of low permeability clay at relatively shallow depths beneath the site, while restricting downwards migration, may increase the potential for lateral migration of shallow groundwater (and therefore mobile contamination, if present).
Depth to groundwater and flow	The depth to groundwater is currently unknown as no previous site investigation data has been made available to review.
Rising groundwater levels	Not applicable.
Groundwater recharge/ attenuation	The site is covered in a mixture of hardstanding, landscaping and warehouses buildings and therefore this will limit infiltration to ground and groundwater recharge.
Licensed groundwater abstractions	The environmental database report indicates that there is one current licensed groundwater abstraction within a 1km radius of the site. Water is abstracted for general farming and domestic use 749m south of the site.
Source protection zones	Information available in the Envirocheck report indicates that the site does not lie within a currently designated groundwater Source Protection Zone (SPZ).

3.6 Hydrology

A summary of the hydrology within the site area is summarised in Table 8.

Table 8 Summary of hydrology in site area

Condition	Description
Surface watercourses/features	The Envirocheck report indicates that the nearest surface water feature is located on site. However, during the site walkover, this pond was noted to be dry.
Surface water abstractions	The environmental database report indicates that there are no current licensed surface water abstractions within a 1 km radius of the site.
Site drainage	The status of the site drainage has not been confirmed but it is possibly that storm water could drain into Whittle Brook 195m east of the site via a drainage network.
Preliminary flood risk assessment	The indicative floodplain map for the area indicates that the site is not in an area at risk from flooding from surface water.

3.7 Sensitive land uses

Table 9 provides a summary of any environmentally sensitive areas identified within 250 m of the site based on the environmental database report.

Table 9 Environmentally sensitive areas

Feature	Present within 250m of site?	Details	Likely pathways from site?
International designations – Ramsar wetland, Special Area of Conservation (SAC), Special Protection Area (SPA)	No	N/A	N/A
National designations – Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), ancient woodland	No	N/A	N/A
Local designations – Local Nature Reserve, Site of Importance for Nature Conservation (SINC)	No	N/A	N/A
Nearest high sensitivity development, e.g. residential	Yes	Residential properties are located on the northern site boundary.	A pathway may exist due to the close proximity of the residential.

4 SITE RECONNAISSANCE FINDINGS

A site reconnaissance survey was completed on 16 July 2021 by RSK. The characteristics of the site observed during the walkover and from current Ordnance Survey maps are summarised in Table 10.

A site plan is provided in Figure 2 with photographic records included in Appendix F detailing the main features identified below. Note: photos should include general site views, any potential sources of contamination, any geotechnical hazards, surface waters, any other features of note.

Whilst the walkover summary includes consideration of current operations and housekeeping on the site as potential sources of contamination, it does not constitute a comprehensive environmental audit of the site, as covered under ISO 14001.

Table 10 Site reconnaissance findings

Feature	Description
Physical characteristics	
Access constraints	Permission to access site is required from the security cabin at the site entrance.
Site topography	The site is generally flat with localised raised areas of landscaping, possibly as a result of reprofiling the site for the construction of the existing warehouses.
Surface cover	The majority of the site is covered with hardstanding, including warehouse structures, roadways, and car parks. Grassed areas are present around the buildings and along the site boundaries.
Site drainage	Details of the site drainage was not confirmed during the walkover, but stormwater is likely to drain off site via the drainage network, potentially into Whittle Brook 190m east of the site.
Surface water	No surface water features were identified during the walkover. However, it should be noted that the walkover was completed during a period of warm dry weather so surface water features may have been dry.
Trees and hedges	Trees were noted sporadically across site within the landscaped areas surrounding the buildings. An area of dense, unmanaged vegetation was noted to the west of building 117 in the western part of the site.
Invasive species	Based upon the walkover survey obvious evidence of Japanese Knotweed or other invasive species has been identified on-site. However, it should be noted that a detailed survey of the possible presence or absence of invasive species is outside of the scope of investigation and consideration should be given to commissioning a specialist survey, as necessary.
Existing buildings on-site	The site is occupied by nine large buildings as well as smaller structures including offices, three substations, as well as a tank for storing water used for the fire sprinkler system.

Feature	Description
Retaining walls and adjacent buildings on or close to site boundary	There are no such structures on or close to the site boundary. Residential properties are noted along the northern site boundary.
Basements on-site	No evidence of existing or infilled basements was observed.
Made ground, earthworks and quarrying	Made ground is likely to be present on-site following ground works to create a level platform for the warehouses. Small, raised areas were noted in the landscaping surrounding the buildings.
Potentially unstable slopes on or close to site	None observed.
Buried and overhead services present	There are several manhole covers noted on-site and street lighting was present on the site perimeter road.
Environmental characteristics	
Underground/ above ground storage tanks and pipework	An above ground storage tank was noted for storing water used for the sprinkler system.
Potentially hazardous materials storage and use	None observed.
Asbestos-containing materials	No obvious asbestos construction materials were observed but a detailed survey of the buildings would be required to confirm the presence or otherwise of asbestos-containing materials.
Waste storage	A waste storage area was noted on land to the east of the site, close to building 118.
Fly-tipping	None observed.
Electricity sub-stations/ transformers	Three electricity substations were noted on site and were spread out across the site.
Evidence of possible land contamination on-site	No obvious evidence of contamination was noted during the site visit. Contamination may be present from the substations or from unknown fill material. Historical maps indicated the presence of a sewage works on the south western part of the site but no evidence of this was noted.
Potential off-site sources of ground contamination	Remnant contamination may be off site from the former sewage works.

No potentially significant land contamination or geotechnical issues were identified during the site reconnaissance survey.

5 PRELIMINARY GEOTECHNICAL CONSTRAINTS

5.1 Design class

BS EN 1997-1 defines three different Geotechnical Categories that structures may fall into, which are summarised as follows:

- Category 1: Small and relatively simple structures for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations; with negligible risk
- Category 2: Conventional types of structure and foundation with no exceptional risk or difficult ground or loading conditions
- Category 3: Structures or part of structures, which fall outside limits of Geotechnical Categories 1 and 2. Examples include very large or unusual structures; structures involving abnormal risks, or unusual or exceptionally difficult ground or loading conditions; structures in highly seismic areas; structures in areas of probable site instability or persistent ground movements that require separate investigation or special measures.

Based on the information provided above on the proposed development and in view of the anticipated ground conditions, a Geotechnical Category of 1*Choose category.* has been assumed for the purposes of designing the geotechnical investigation. This should be reviewed at all stages of the investigation and revised where necessary.

5.2 Preliminary geotechnical hazards assessment

A summary of commonly occurring geotechnical hazards associated with the anticipated geology outlined in Section 3.3 above is given in Table 11 together with an assessment of whether the site may be affected by each of the stated hazards.

Table 11 Summary of preliminary geotechnical risks that may affect site

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	☐	☒	Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	☒	☐	Design to NHBC Standards Chapter 4 or similar

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Highly compressible and low bearing capacity soils, (including peat and soft clay)	☒	☒	Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	☐	☒	Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	☒	☐	Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)	☐	☒	May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence	☐	☒	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	☐	☒	Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	☐	☒	Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	☐	☒	Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	☐	☒	May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area	☐	☒	May affect deep foundations, basements and tunnels
Geological faults, fissures and break lines	☐	☒	May affect ground engineering and foundation design and construction
Underground mining including shafts and adits (e.g. coal, mineral)	☒	☐	Likely to require further assessment including potentially special stabilisation measures
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	☐	☒	Likely to affect ground engineering and foundation design and construction

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	☐	☐	Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	☒	☐	Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	☐	☒	May affect ground engineering and foundation design and construction
Site topography	☐	☒	May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

6 INITIAL CONCEPTUAL SITE MODEL

In the UK land contamination is assessed using a risk-based approach taking account of the magnitude (severity of the hazard) and likelihood (probability) of occurrence. A 'receptor' is something that could be adversely affected by contamination (e.g. people, an ecological system, property or a water body). A 'pathway' is a route or means by which a receptor is or could be exposed to or affected by a contaminant. A 'contaminant source' is a hazard but it can only pose a risk to a receptor where a pathway is present. The relationship between sources, pathways and receptors are referred to as a conceptual site model. A risk can only be released where a contaminant source, pathway and receptor are all in place, referred to as a 'pollutant linkage'.

In line with LCRM (Environment Agency, 2021) and BS 10175: 2011 + A2 2017 (BSI, 2017), RSK has used information in the preceding sections to identify hazards (sources of contaminants), receptors that may be impacted and plausible linking pathways. Where all three are present this is termed a potentially complete contaminant linkage and a qualitative risk estimation is made.

6.1 Potential soil, soil vapour and groundwater linkages

6.1.1 Potential sources of contamination

Potential sources of soil and groundwater contamination identified from current activities and the history of the site and surrounding area are presented in Table 12. Ground gas sources are addressed in the next section.

Table 12 Potential sources of soil and groundwater contamination

Potential sources	Contaminants of concern
On-site	
S1 Made ground (i.e. fill material)	Unknown fill material but potentially including brick, ash and clinker and containing toxic and phytotoxic metals, inorganics, polycyclic aromatic hydrocarbons (PAHs), asbestos.
S2 Electricity substations present on site	PCBs and lube oils.
S3 Historic Sewage works on south-western site boundary	Metals, asbestos, acids and alkalis, micro-organisms (pathogens).
S4 Buildings on site	Potential for asbestos containing materials.
Off-site	
S3 Sewage works on south-western site boundary	Metals, asbestos, acids and alkalis, micro-organisms (pathogens).

6.1.2 Sensitive receptors and linking exposure/ migration pathways

Sensitive receptors identified at or in the vicinity of the site that could be affected by the potential sources identified above comprise:

- R1 current/ future site users – [P1 oral, dermal and inhalation exposure with impacted soil, soil vapour and dust/fibres, ingestion of home-grown produce, inhalation of vapours from groundwater
- R2 current adjacent site users – residential, and school users [P2 migration of contamination via dust/fibre deposition, vapour or groundwater migration combined with inhalation]
- R3 current/ future buildings and services [P3 direct contact with contaminated soils or groundwater and chemical attack]
- R4 existing/ future vegetation [P4 direct contact with contaminated soils or groundwater and root uptake leading to phytotoxicity]
- R5 groundwater in secondary undifferentiated aquifer within the Devensian Till [P5 leaching from soils/ percolation to aquifer/ lateral migration of dissolved phase]
- R6 groundwater in secondary A aquifer within the Pennine Lower Coal Measures [P6 percolation through permeable strata to aquifer/ lateral migration of dissolved phase].

Potential linking pathways are show in brackets for each item above.

Please note that construction workers and future maintenance workers have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures according to the CDM Regulations.

Ecological receptors are only considered within the conceptual model in the context of statutory protected sites.

6.2 Potential ground gas linkages

6.2.1 Ground gas generation potential

Potential ground gas sources identified for the site and surrounding are shown in Table 13.

Table 13 Potential ground gas sources

Potential sources	Indicative ground gas generation potential (CIEH, 2008)	Additional information
On-site		
Made ground with low degradable organic content (e.g. up to 5% organic material and no easily degradable waste).	Very low	
Natural soil with a high degradable organic content.	Low	Unlikely to be present on site.

Potential sources	Indicative ground gas generation potential (CIEH, 2008)	Additional information
Sewage sludge.	Moderate	An historic sewage works is shown in the south western corner of the site.
Off-site		
Mine Workings more than 50 years since last worked.	Moderate	The Coal Authority Consultants report indicates no mine gases to be present within 500m of the site boundary.

Given the anticipated ground conditions set out above, significant potential sources of ground gas generation have been identified associated with:

- historic sewage works in the south western corner of the site
- made ground expected to be present on site
- shallow mine workings surrounding the site.

6.2.2 Preferential pathways for ground gas migration

Credible preferential pathways potentially connecting the source and receptor through vertical and lateral migration are:

- geology of the Devensian Till which may contain sand lenses which could act as pathways for gases
- faults/ fissures/ fractures in the underlying geology
- construction joints and cracks within building structure
- utility routes and service penetrations into buildings
- mine shaft adjacent to site.

6.2.3 Sensitive receptors and linking pathways

Sensitive receptors identified at or in the vicinity of the site that could be affected by the potential ground gas sources identified above comprise:

- current/ future site users – residential users, commercial site users [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation]
- current/ adjacent site users – residential users, commercial/ industrial workers [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation]
- current/ future* buildings and services [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion].

The assessment has identified receptors to include building structures and current/ proposed end-users.

Construction workers have not been identified as receptors for the purposes of this assessment. Risks may still be present to construction workers especially where works include the entry into excavations within the ground. Construction workers should undertake appropriate risk assessments and risks should be managed through health and safety procedures and the use of PPE.

6.3 Preliminary risk assessment

The preliminary risk assessment findings and potentially complete contaminant linkages are shown in Table 14 overleaf. The risk classification based on the combination of hazard consequence and probability using a risk matrix from CIRIA C552 (Rudland et al., 2001), a summary of which is included in Appendix G. This relates to Tier 1 preliminary risk assessment in LCRM (Environment Agency, 2021).

The initial conceptual site model is shown schematically in Figure 3.

Table 14 Risk estimation for potentially complete contaminant linkages

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Potential risk	Justification
S1 Contamination within made ground, likely to include asbestos, metals, TPH and PAHs	Future site users	Direct contact	Likely	Medium	Moderate	Historical maps show limited development has taken place on site. Any contamination is likely to be small scale but linkage is viable.
	Adjacent residential properties		Low likelihood	Medium	Moderate / Low	Historical maps show limited development has taken place on site. Any contamination is likely to be small scale.
	Proposed buildings and infrastructure	Direct contact – chemical attack	Low likelihood	Medium	Moderate / low	The nature of fill material is unknown and may pose a risk to foundations and services of properties constructed on site.
	Potable water supply	Permeation of water supply pipes	Likely	Medium	Moderate	The nature of the fill material is unknown and water supply pipes would be placed directly within the fill material.
	Secondary A Aquifer in bedrock and Secondary undifferentiated aquifer in superficials	Leaching of contamination	Low likelihood	Medium	Moderate / low	The nature of fill material is unknown. However, the majority of the site is covered by either hardstanding or buildings which would minimise the risk to the aquifers.
	Surface watercourse on-site (ditches)	Leaching of contamination	Likely	Medium	Moderate	Impact could migrate through made ground deposits into drains.
S2 Contamination from Electricity Substation	Future site occupants	Direct contact (soil, dust and vegetable ingestion, dermal contact, dust and fibre inhalation)	Likely	Medium	Moderate	Moderate of residents being affected as contamination may be present from the electrical substation.
	Vegetation	Root uptake (direct contact with contaminated soils or	Low likelihood	Minor	Very Low	Very low risk of vegetation being affected as contamination is expected on site.

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Potential risk	Justification
		groundwater and root uptake leading to phytotoxicity)				Vegetation is considered a less sensitive receptor.
	Potable water supply pipes	Chemical attack on infrastructure (including water supply pipes and buildings)	Likely	Medium	Moderate	Moderate risk of infrastructure being affected as contamination is expected on site and may be present in the vicinity electrical substation. However, the routes of services have not been determined.
S3 Contamination from historic Sewage Works	Current / future site users	Direct contact	Unlikely	Medium	Low	Low risk of current/future site users being affected as contamination from the former sewage works is likely to be highly localised.
	Adjacent residential properties	Direct contact	Unlikely	Medium	Low	Low risk of adjacent site users being affected as contamination from the former sewage works is likely to be highly localised. Residential properties are currently on the northern side of the site, furthest from the former sewage works.
	Proposed buildings and infrastructure	Direct contact – chemical attack	Unlikely	Medium	Low	Low risk of proposed buildings being affected as contamination from the former sewage works is likely to be highly localised.
	Potable water supply	Permeation of water supply pipes	Unlikely	Medium	Low	Low risk of water supply pipes being affected as contamination from the former sewage works is likely to be highly localised.
	Secondary A Aquifer in bedrock	Leaching of contamination	Unlikely	Medium	Low	Low risk of contamination affecting the site as ground conditions underlying site are likely to comprise impermeable clay.
	Surface watercourse on-site (ditches)	Leaching of contamination	Unlikely	Medium	Low	Low risk of current/future site users being affected as contamination from the former

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Potential risk	Justification
						sewage works is likely to be highly localised.
S4 Ground gases and mine gas from made ground and mine workings.	Future residents	Vertical and lateral migration and build-up of methane in confined spaces, leading to explosion, or inhalation of carbon dioxide in confined spaces, resulting in suffocation	Low likelihood	Severe	Moderate	Ground gases generated from infill material could be present. The Coal Authority report indicates that no mine gases issues have been reported within 500m of the site boundary. However, the consequences of gas build up in residential properties would be severe.

Risk matrix		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very low	Very low

Potentially complete contaminant linkages with a potential risk of moderate to low or higher identified in Table 14 comprise:

- risk to future site users, adjacent site users, proposed structures, potable water supply, underlying aquifers and surface waters from on site contamination
- risk to future site users and potable water supplies from contamination from substations on site
- risk to future occupants/structures from ground gases associated with made ground and mine gases.

These potentially complete contaminant linkages need to be assessed further through appropriate site investigation to target the identified sources of potential contamination and assess the feasibility of identified pathways.

6.4 Data gaps and uncertainties

Key data gaps and uncertainties identified in the CSM at desk study stage include:

- inaccuracies in available historical OS maps where military buildings are not shown until 1960s which conflicts with anecdotal information for the site
- access not available to far western part of the site which was heavily vegetated
- access not available to the area of the former sewage works
- no access into site buildings was possible
- there are no previous investigations available for the site, therefore no information on actual concentrations of contaminants in soil and groundwater or ground gas* at this stage
- groundwater depth and flow direction are conceptual at this stage.

7 SITE INVESTIGATION STRATEGY & METHODOLOGY

7.1 Introduction

RSK carried out intrusive investigation works and six monitoring rounds of boreholes between 12 August 2021 and 27 October 2021.

7.2 Objectives

The specific objectives of the investigation were as follows:

- to establish the ground conditions underlying the site
- to investigate specific potential sources of contamination identified in the initial CSM
- to determine groundwater depth
- to determine the ground gas regime underlying the site
- to assess geotechnical properties of soils.

7.3 Selection of investigation methods

The techniques adopted for the investigation were chosen with consideration of the objectives and site constraints, which are described below.

Cable percussion drilling was chosen based on the targeted drill depth, requirement for in-situ geotechnical data, the opportunity to collect samples. This was supplemented by window sampling to provide greater coverage across site and allow for the installation of combined gas and groundwater monitoring wells.

Prior to conducting intrusive works, utility service plans were obtained and buried service clearance undertaken in line with RSK's health and safety procedures. Copies of statutory service records obtained by RSK as part of the agreed scope of works are contained in Appendix E.

7.4 Investigation strategy

The ground investigation was carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930:2015+A1:2020, which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. Whilst every attempt was made to record full details of the strata encountered in the boreholes, techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

The investigation strategy involved both targeted and non-targeted exploratory holes.

The constraints to the investigation were as follows:

- the presence of buildings on site which were inaccessible has led to data gaps in the investigation works

- the presence of services on site restricted areas of the site where investigations works could take place
- parts of the site were heavily vegetated and inaccessible for site equipment
- part of the site was fenced-off preventing access.

Details of the investigation locations, installations and rationale are presented in Table 15. Three cable percussive boreholes were drilled to a maximum depth of 10.45m below ground level (bgl) and fifteen window samples were drilled to a maximum depth of 5.45m bgl, with selected wells installed with combined gas and groundwater monitoring wells. An exploratory hole location plan is shown on Figure 4.

Table 15 Exploratory hole and monitoring well location rationale

Investigation type	Number	Designation	Monitoring well installation	Rationale examples below
Boreholes by cable percussive methods	3	CP01 to CP03	N/A	To prove the geological succession beneath the site and obtain geotechnical data.
Boreholes by dynamic/ windowless sampling methods	15	WS1 to WS15	Gas/ groundwater	To determine the contamination status of the ground beneath the site and to install additional dual purpose groundwater and gas monitoring wells. WS05 and WS13 targeted substations whilst WS12 targeted the former sewage works known to be present on site.

7.4.1 Implementation of investigation works

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS5930:2015+A1:2020 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1).

The monitoring well construction and associated response zones are detailed on the exploratory hole records in Appendix H. The response zones were installed to target identified gas generation sources or migration pathways detailed in the initial preliminary CSM.

The soil sampling and analysis strategy was designed to characterise each encountered soil strata, permit an assessment of the potential contaminant linkages identified and investigate the geotechnical characteristics. In addition, samples were taken to allow for geo-environmental and geotechnical testing to be undertaken.

Soils collected for laboratory analysis were placed in a variety of containers appropriate to the anticipated testing suite required. They were dispatched to the laboratory in cool boxes under chain of custody documentation. Samples were stored in accordance with the RSK quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination.

7.5 Monitoring programme

7.5.1 Ground gas monitoring

In line with the initial CSM, response zones were installed to target the sources or pathways as detailed in Table 15.

Six monitoring rounds have been undertaken to provide data to support refining of the CSM. The number of monitoring rounds undertaken is in general accordance with the decision matrix presented as Figure 6 of BS8576 for a low source generation potential and an allowance for a high sensitivity development.

A calibrated infrared gas meter was used to measure gas flow, concentrations of carbon dioxide (CO_2), methane (CH_4) and oxygen (O_2) in percentage by volume, while hydrogen sulphide (H_2S) and carbon monoxide (CO) were recorded in parts per million.

Initial and steady state concentrations were recorded. In addition, during the first monitoring round, all wells were screened with a PID to establish if there are any interferences and cross-sensitivity of other hydrocarbons with the infrared gas meter [delete if not undertaken but we should routinely do this].

The atmospheric pressure before and during monitoring, together with the weather conditions, were recorded. The monitoring included periods of falling atmospheric pressures and after/during rainfall.

All ground gas monitoring results together with the temporal conditions are contained within Appendix I. Equipment calibration certificates are available on request.

7.6 Laboratory testing

Laboratory testing was undertaken at a UKAS accredited laboratory with ISO17025 and MCERTS accredited test methods were specified where applicable for contamination testing and as shown in the laboratory test certificates appended.

7.6.1 Chemical analysis of soil samples

The soil sampling strategy was designed to characterise made ground and/or natural strata typically within the upper 1.0m of the ground profile whilst also characterising deeper strata and the potential for contaminant migration from relevant sources of identified within the preliminary CSM.

The programme of chemical tests undertaken on soil samples obtained from the intrusive investigation is presented in Table 16 with the laboratory testing results contained in Appendix J.

Table 16 Summary of chemical testing of soil samples

Tests undertaken	No. of tests
Asbestos screening and ID	6
Polycyclic Biphenols	2
Total Petroleum Hydrocarbons (TPH)	4

Tests undertaken	No. of tests
BRE Brownfield Suite	3
Speciated PAH	2
Metals 9 Suite	9

7.6.2 Geotechnical analysis of soils

Where appropriate disturbed, bulk and undisturbed soil samples were taken for geotechnical classification testing with the depth and nature of samples detailed within the exploratory hole records.

Where appropriate, testing was undertaken in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes or, where superseded, by the relevant part of BS EN ISO 17892:2014 Geotechnical investigation and testing - Laboratory Testing of Soil. Tests carried out in order to classify the concrete class required on-site have been undertaken following the procedures within BRE SD1:2005.

The programme of geotechnical tests undertaken on samples obtained from the intrusive investigation is presented in Table 17. The results and UKAS accreditation of tests methods are shown in Appendix L.

Table 17 Summary of geotechnical testing undertaken

Strata	Tests undertaken	No. of tests
Natural clay	Moisture content %	6
Natural clay	Liquid/ plastic limits	6

8 SITE INVESTIGATION FACTUAL FINDINGS

The results of the intrusive investigation and subsequent geo-environmental and geotechnical laboratory analysis undertaken are detailed below.

8.1 Ground conditions encountered

The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination, list of samples taken, field observations of soil and groundwater, in-situ testing and details of monitoring well installations are included on the exploratory hole records presented in Appendix H.

The exploratory holes revealed that the site is underlain by a variable thickness of made ground over Devensian Till, bedrock of the Pennine Lower Coal Measures encountered at depth between 5.9m and 9.5m. This appears to confirm the stratigraphical succession described within the preliminary CSM.

For the purpose of discussion, the ground conditions encountered during the fieldworks are summarised in Table 18 with the strata discussed in subsequent subsections.

Table 18 General succession of strata encountered

Stratum	Exploratory holes encountered	Depth to top of stratum m bgl	Proven thickness (m)
Topsoil	WS01 – WS15 CP01 – CP03	0	0.15 – 0.4
Made ground	WS01 – WS15 CP01 – CP03	0.15 – 0.4	0.2 (WS06) – 4.0 (CP01) and >2.5m (WS15)
Devensian Till	WS01 – WS14 CP01 – CP03	0.40 (WS06) – > 3 (WS15)	3.6 (CP02) – 8.0 (CP03)
Pennine Lower Coal Measures	CP01 – CP03	5.9 – 9.5	Unconfirmed

8.1.1 Topsoil

Topsoil was encountered at all exploratory hole locations across the site and comprised grass onto slightly clayey, gravelly fine dark brown sand with occasional rootlets.

8.1.2 Made ground

The made ground generally comprised a granular soil with a slight cohesive content and ranged in proven thickness from 0.2m to 4.0m, although the base of this stratum was greater than 2.5m at one location (WS15). The made ground was described as dark brown, slightly clayey, gravelly, medium sand with brick, concrete and sandstone, and occasional slag, ash and ceramics.

8.1.3 Devensian Till

This stratum was encountered from surface/beneath the made ground and comprised a layer of soft to firm, slightly sandy, slightly gravelly clay with thin lenses of sand and coal fragments. Based on the in-situ and laboratory test data this layer has moderate moisture content and as such is likely to have a medium volume change potential.

A summary of the in-situ and laboratory test results recorded in the stratum are presented in Table 19.

Table 19 Summary of in-situ and laboratory test results for cohesive unit

Soil parameters	Min. Value	Max. Value	Reference
Moisture content (%)	15.8	31.4	Appendix K
Liquid limit (%)	29	57	Appendix K
Plasticity limit (%)	14	27	Appendix K
Plasticity index (%)	14	30	Appendix K
Modified plasticity index (%)	13.72	30	Appendix K
Plasticity term	Low	Intermediate	Appendix K
Volume change potential	Low	Medium	Appendix K
SPT 'N' values	4	>50	Appendix H
Undrained shear strength inferred from SPT 'N' values (kN/m^2)*	20	>250	Appendix H
Undrained shear strength measured by shear vane testing (kN/m^2)	NR	NR	N/A
Consistency term from field description	Soft	Stiff	Appendix H

8.1.4 Pennine Lower Coal Measures

This stratum was encountered at a depth of between 5.9m and 9.5m bgl and was described as a dark grey mudstone.

A summary of the in-situ and laboratory test results recorded in the stratum are presented in Table 20.

Table 20 Summary of in-situ and laboratory test results for Pennine Coal Measures

Soil parameters	Min. Value	Max. Value	Reference
SPT 'N' values	>50	>50	Appendix H

8.1.5 Visual/olfactory evidence of soil contamination

During the site investigation works, no obvious signs of contamination were reported.

8.2 Groundwater and surface water

8.2.1 Groundwater encountered during intrusive works

Groundwater was encountered during the intrusive investigation works as detailed on the logs in Appendix H.

8.2.2 Groundwater encountered during monitoring

Rest groundwater levels recorded during the monitoring programme are summarised in Table 21 based on the data provided in Appendix I. Field data measurements are also shown in Appendix I.

Table 21 Summary of groundwater monitoring results

Monitoring well	Response zone stratum	TOC elevation (m AOD)	Depth to water (mb TOC)	Product thickness (m)	Groundwater elevation (m AOD) – max.	Groundwater elevation (m AOD) – min.
WS01	MG	126.992	2.01 – 2.22	-	124.982	124.772
WS03	DT	130.159	2.16 – 2.59	-	127.999	127.569
WS05	DT	130.855	0.83 - 1.68	-	130.025	129.175
WS07	DT	131.757	2.01 – 2.35	-	129.747	129.407
WS09	MG	127.295	ND - 1.01	-	-	126.285
WS12	MG	124.914	ND - 1.22	-	-	123.694

The findings reflect the groundwater table in the Devensian Till, which is at an elevation of 123.694 and 130.025 m AOD.

It should be noted that groundwater levels might fluctuate for a number of reasons including seasonal variations. On-going monitoring would be required to establish both the full range of conditions and any trends in groundwater levels. The data indicate groundwater flow in a south westerly direction.

8.3 Chemical laboratory results

The soil testing results are presented in Appendix J.

The laboratory data was compared to the RSK Residential Generic Assessment Criteria (GAC) as this is the most sensitive criteria. The results identified no exceedances of the GAC. No asbestos containing materials were reported in six samples screened for asbestos.

8.4 Geotechnical laboratory results

The results of the geotechnical testing are discussed in Section 10 and presented in Appendix K.

8.5 Ground gas monitoring

The results of the ground gas monitoring and testing carried out are given in Appendix I and discussed in section 9.

9 GEO-ENVIRONMENTAL ASSESSMENT

9.1 Refinement of initial CSM

The ground investigation has confirmed the ground conditions expected in the desk based assessment. No sources of contamination were identified during the works, though made ground was confirmed in excess of 2.5m in WS15 and was of greater thickness than anticipated.

9.1.1 Linkages eliminated after refinement of the initial CSM

Based on the discussion above, the following potential contaminant linkages have been eliminated after refinement of the initial CSM (CSM):

- risk to future site users, adjacent site users, proposed structures, potable water supply, underlying aquifers and surface waters from on site contamination
- risk to future site users and potable water supplies from contamination from substations on site.

9.2 Linkages for assessment

As described in LCRM (Environment Agency, 2021), there are two stages of quantitative risk assessment (QRA), Tier 2 generic (GQRA) and Tier 3 detailed (DQRA). The GQRA comprises the comparison of soil, groundwater, soil gas and ground gas results with generic assessment criteria (GAC) that are appropriate to the linkage being assessed. This comparison can be undertaken directly against the laboratory results or following statistical analysis depending upon the sampling procedure that was adopted. This assessment relates to LCRM Stage 1, Tier 2 generic quantitative risk assessment

Following the refinement of the CSM, the potentially complete contaminant linkages that require further assessment and the methodology of assessment are presented in Table 22. A revised schematic CSM is shown on Figure 5.

Table 22 Linkages for GQRA

Potentially relevant contaminant linkage	Assessment method
Soil data	
1. Oral, dermal and inhalation exposure with impacted soil, soil vapour and dust by future residents.	Human health GAC in Appendix L for a proposed residential end use with home-grown produce as this is the most sensitive proposed end use.
2. Inhalation exposure of future residents to asbestos fibres.	Qualitative assessment based on the asbestos minerals present, their form, concentration, location and the nature of the proposed development.
3. Uptake of contaminants by vegetation potentially impacting plant growth (phytotoxicity).	Comparison of soil data to GAC in Appendix M for phytotoxicity.

Potentially relevant contaminant linkage	Assessment method
4. Contaminants permeating potable water supply pipes.	Comparison of soil data to GAC in Appendix N for plastic water supply pipes using UKWIR (2010) guidance.
5. Leaching of soil contaminants and dissolved phase migration.	Since no leachate data is available the potential for leaching has been considered qualitatively using soil results.
Ground Gas	
6. Concentrations of methane and carbon dioxide in ground gas entering and accumulating in enclosed spaces or small rooms in new buildings, which could affect future site users. For methane this could create a potentially explosive atmosphere, while death by asphyxiation could result from carbon dioxide.	Borehole hazardous gas flow rates (Qhg) have been calculated using maximum (peak) methane and carbon dioxide concentrations and steady state flow rates in accordance with BS8485. This is subject to interpretation and use of professional judgement to designate the site or zones of the site characteristic situation by comparison to a Gas Screening Value (GSV) as appropriate and in line with the CSM. For applicable low-rise residential developments reference to NHBC guidance has also been considered.

9.3 Methodology and assessment of soil results

The analysis of laboratory results relating to soil samples submitted for testing is included in the following sections.

9.3.1 Oral, dermal and inhalation exposure with impacted soil by future occupants/site users

The proposed end use has not been confirmed yet so all soils results have been compared to the RSK GAC for a residential end use, as this is the most sensitive.

9.3.2 Inhalation exposure of future occupants/site users to asbestos fibres

The visual inspection at the laboratory identified no materials suspected of potentially containing asbestos and the scheduled laboratory screening for asbestos found no detectable asbestos fibres within the samples of made ground.

9.3.3 Uptake of contaminants by vegetation potentially inhibiting plant growth (phytotoxicity)

The results have been compared with the GAC presented in Appendix M for this linkage. The soil screening output spreadsheet for this linkage is presented in Appendix M.

The results indicate that a relevant contaminant linkage is unlikely to exist associated with phytotoxic effects.

9.3.4 Impact of organic contaminants on potable water supply pipes

For initial assessment purposes, the results of the investigation have been compared with the GAC presented in Appendix N for this linkage, which are reproduced from *UKWIR*

Report 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (UKWIR, 2010).

The results indicate that a relevant linkage is unlikely to exist associated with organic contaminants and therefore pollutant polyethylene (PE) and/or polyvinyl chloride (PVC) water supply pipes are expected to be suitable for use on the development.

It should be noted that at the time of this investigation the future routes of water supply pipes had not been established, hence the investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling/analytical strategy may be required at a later date once the route(s) of the supply pipe(s) is/are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

9.4 Ground gas risk assessment – bulk gases

9.4.1 Appropriate guidance

The risks to development from ground gases have been assessed in accordance with BS8485:2015+A1:2019 (BS8485), which provides guidance on ground gas (methane and carbon dioxide) characterisation and hazard assessment, as well as providing a framework for the prescription of protection measures within new buildings.

The process involves characterising the gas hazard from combining the qualitative assessment of risk (using the CSM) with ground investigation data so that a 'characteristic situation' (CS) can be derived for the site or zones within the site. Characteristic situations range from CS1 to CS6, the higher the CS, the higher the hazard potential. Gas protection measures within new buildings can be prescribed using a point scoring system, taking into consideration the CS and the proposed building type.

BS8485 indicates that the gas hazard can be characterised using the following methods:

- an empirical semi-quantitative approach using gas monitoring data to determine the 'characteristic situation' of the site (or zones of the site) and subsequent protective measures (Wilson and Card approach)
- an empirical semi-quantitative approach using TOC data to determine the 'characteristic situation' of the site (or zones of the site) and subsequent protective measures (CL:AIRE RB17 approach), or
- detailed quantitative assessment methodologies.

For the purpose of this assessment, the empirical semi-quantitative approach above has been used to characterise the gas hazard and provide advice on the protective measures likely to be required within new buildings at the site.

9.4.2 Summary of the refined CSM for ground gas

In the assessment of risks and selection of appropriate mitigation measures, BS8485 highlights the importance of the conceptual model. In summary, potential sources of ground gas within influencing distance of the site identified in section 6.2 comprise:

- made ground associated with development of the site
- made ground within the former sewage works in the south western part of the site
- ground gases from coal measures and historic mining activities
- made ground from an off site, infilled gravel pit 315m north east of the site.

This assessment has been undertaken to assess risks to building structures and proposed end users. The assessment has not taken into consideration the health and safety of construction workers. Risks may still be present to construction workers especially where works include the entry into excavations within the ground. Construction workers should undertake appropriate risk assessments and risks should be managed through health and safety procedures and safe systems of work.

The risk assessment has been undertaken based on the current understanding of the CSM.

9.4.3 Empirical semi-quantitative approach using borehole monitoring data (Wilson and Card approach, BS8485)

9.4.3.1 Background

The empirical semi quantitative approach using gas monitoring data requires the designation of a gas screening value (GSV) for the entire site or zones within the site, which informs the hazard potential and associated prescribed ground gas protection measures within new buildings (where necessary). BS8485 defines the GSV as the *'flow rate (l/hr) of a specific hazardous gas* ***representative of a site or zone****, derived from assessment of borehole concentration and flow rate measurements and taking account of all other influencing factors, in accordance with a conceptual site model'.*

BS8485 Section 6.3.1 outlines the process for developing a GSV for the site or a zone as follows:

- borehole hazardous gas flow rate (Q_{hg}) is calculated for each borehole standpipe for each monitoring event. The borehole hazardous gas flow rate is defined in BS8485 as the '*flow rate of a specific hazardous gas, either methane or carbon dioxide, from a borehole standpipe'*. The Q_{hg} is calculated from individual borehole measurements of total gas flow and the concentration of the specific hazardous gas. BS8485 states in Section 6.3.4 that the **maximum** gas concentration recorded during the monitoring event should be used, together with **steady-state** values of gas flows
- the reliability of the measured gas flow rates and concentrations are assessed taking into account borehole construction
- decisions are made about how to deal with any temporal or spatial shortages in the data
- judgements are made about what GSV to designate for use for design purposes taking all relevant information and the conceptual site model into account.

Once the Q_{hg} has been calculated for methane and carbon dioxide, individual borehole measurements are compared to the thresholds presented in Table 2 of BS8485 which inform the CS that directly relates to each individual measurement. Taking into account

the site data (i.e. borehole gas concentration and flow rate to calculate the Q_{hg}) and all other influencing factors in accordance with the CSM, a decision can then be made regarding the GSV that is considered to be representative of the site or a zone within it.

Typical threshold concentrations of methane (1% v/v) and carbon dioxide (5% v/v), and flow rates (>70 l/h), are also considered when designating the GSV for the site or zone, which in turn dictates the hazard potential and CS. It is important to note that the site or zone characteristic GSV and maximum concentration or flow thresholds are guideline values and not absolute. The thresholds may be exceeded in certain circumstances, if the CSM indicates it is safe to do so.

9.4.3.2 Designation of a GSV for the site or zone

The results of the ground gas monitoring and testing undertaken, alongside site conditions at the time of monitoring, are given in Appendix I.

For the purposes of the current ground gas risk assessment, data from entirely flooded response zones has not been included in the risk assessment.

A summary of the maximum recorded concentrations per borehole (or minimum for oxygen) is presented in Table 23 overleaf. This table also presents details of the response zone, maximum recorded initial and steady state flow rates.

The range of atmospheric pressure over the six monitoring rounds completed to date was 992 - 1020 mbar.

Table 23 Summary of ground gas monitoring results – excluding entirely flooded response zones

Exploratory position ID	Response zone top (mbgl)	Response zone base (mbgl)	Response zone geological unit	No. of monitoring rounds	Peak CH_4 max. (%/vol)	Steady-state CH_4 max. (%/vol)	Steady-state CO_2 max. (%/vol)	Oxygen min. (%/vol)	Peak gas flow max. (l/hr)	Steady-state gas flow max. (l/hr)	Depth to water min. (m)	Depth to water max. (m)	Atm. pressure min. (mb)	Atm pressure max. (mb)
WS01	1	3	DT	6	<0.1	<0.1	4.0	17.6	<0.1	<0.1	2.01	2.14	993	1020
WS03	1	2.9	DT	6	<0.1	<0.1	4.5	16.6	0.1	<0.1	2.16	2.38	992	1020
WS05	1	3	DT	6	<0.1	<0.1	3.2	18.0	0.1	<0.1	1.68	0.83	993	1020
WS07	1.5	4	DT	6	<0.1	<0.1	6.8	14.7	0.1	<0.1	2.01	2.21	992	1020
WS09	0.5	1	MG	6	<0.1	<0.1	7.0	14.4	0.1	<0.1	1.01	ND	993	1020
WS12	0.6	1.2	MG	6	<0.1	<0.1	6.1	12.5	0.1	<0.1	1.22	ND	993	1020

9.4.3.3 *Designation of site gas screening value (GSV)*

Considering the calculated Q_{hg}, the CSM, monitoring conditions and response zone construction, Table 24 presents the GSVs designated for the site (or zone if applicable).

Table 24 Summary of ground gas monitoring results

Hazardous gas	GSV (l/h)	Justification for the GSV
Methane	0.00	Maximum concentration <0.1% methane combined with a maximum flow of 0.1 litres per hour.
Carbon dioxide	0.01	Maximum concentration 7% carbon dioxide combined with a maximum flow of 0.1 litres per hour.

Based on the Q_{hg}, the maximum concentrations and flows recorded, the CSM and the method for determining the CS presented within Table 2 of BS8485, the site has been characterised as CS1.

9.4.3.4 *Data limitations*

It should be noted that there are inherent limitations in ground gas monitoring including spatial adequacy of monitoring locations, changes in groundwater levels, variation in temporal or atmospheric conditions and whether these have been adequately characterised by the scope of monitoring undertaken.

9.4.4 BS8485 recommended ground gas protection measures

Case 1: CS1 classification

Based on the current understanding of the conceptual site model and the assessment undertaken, the site has been classified as CS1. Considering the foregoing and in accordance with BS8485, ground gas protective measures are not considered necessary within proposed buildings.

9.5 Uncertainties and implications in refined CSM and GQRA

In accordance with good practice, data gaps and uncertainties in the refined CSM have been identified at this stage. These are summarised in

Table 25 along with the likely implications.

Table 25 Data gaps and uncertainties

Data gap/ uncertainty	Details	Implications
Unable to complete site works within existing buildings.	Site works could only be completed in external areas.	Data gaps may exist and ground conditions/contamination status of soils underlying buildings is unknown.

Data gap/ uncertainty	Details	Implications
The area where the historic sewage works was located was inaccessible during the site investigation works.	Nearest borehole was drilled adjacent to the former sewage works.	There is a gap in coverage for this area. The depth of, and nature of fill within the former sewage works is unknown.
Asbestos not found in made ground samples tested.	Although not encountered to date, asbestos containing material (ACM) could still be present in discrete locations.	Vigilance should be maintained for any potential ACM or fibrous material during below ground works.

10 GEOTECHNICAL ASSESSMENT

10.1 Proposed development

RSK understand that no proposed development for the site has been confirmed, therefore at this stage, no specific information relating to building loads has been provided and therefore a wall loading of 100 kN/m has been considered. It has been assumed the ground-bearing floor slabs will not be required and that beam and block flooring will be utilised.

10.2 Key geotechnical hazards / development constraints

The key risks identified from the available ground investigation data are discussed below:

- areas of localised deep made ground (4m in CP01 >2.5m in WS15)
- localised shallow groundwater
- clay with medium volume change potential.

10.3 Foundations

10.3.1 Foundation options

Given the presence of competent natural soils at a relatively shallow depth it is considered that traditional spread footings will be suitable for the proposed development.

However, where a significant depth of made ground is encountered (WS15 and CP01) it is considered that spread footings are unlikely to be suitable for the development unless some form of ground improvement such as vibro-replacement or vibro-compaction is first adopted. If such ground improvement is not considered appropriate/cost-effective then pile foundations taken into the underlying competent strata are recommended.

Bedrock was encountered at depths of 6.10m bgl (CP02) and 6.45m bgl in CP01, therefore consideration could be given to a piled solution if a heavier load structure is to be built on site.

10.3.2 Spread foundations

The recommendations for the design and construction of spread foundations in relation to the ground conditions are set out in Table 26.

Table 26 Design and construction of spread foundations

Design/construction considerations	Design/construction recommendations
Founding stratum	Devensian Till.
Depth	Foundations should be taken to a minimum depth of 1m below the final or existing ground level, whichever is lower, and at least 0.2m into the founding stratum below any overlying made ground or to any

Design/construction considerations	Design/construction recommendations
	greater depth required in respect of the special design considerations given below.
Special design considerations	
Shrinkable soils	Owing to the presence of shrinkable clay soils, foundations should be designed taking into account all the normal precautions, including minimum founding depths, to minimise the risk of future foundation movements in accordance with NHBC standards or similar.
Variable founding soils	Owing to the significant lateral and vertical variability of the founding strata, consideration should be given to incorporating appropriate reinforcement into the strip foundations to minimise the risk of future differential foundation movements.
Construction considerations	All foundation excavations should be inspected, and any made ground and soft, organic or otherwise unsuitable materials removed and replaced with mass concrete.

10.4 Excavations for foundations and services

Man entry into any excavations should not be undertaken without provision of suitable shoring and support and dewatering or suitable regrading and battering of side slopes to safe angles. Confined spaces protocols for the Health and Safety of personnel should always be used where man entry into excavations is to be undertaken as low oxygen conditions may be present.

Groundwater was encountered in some of the exploratory holes, therefore dewatering may therefore be required to facilitate foundation excavation.

10.5 Chemical attack on buried concrete

This assessment of the potential for chemical attack on buried concrete at the site is based on BRE Special Digest 1: Concrete in aggressive ground, which represents the most up-to-date guidance on this topic currently available in the UK.

The desk study and site reconnaissance indicate that, for the purposes of assessing the aggressive chemical environment of the site, the site should be considered as comprising brownfield ground unlikely to contain pyrite.

Based on the characteristic water-soluble sulphate concentration in soil of 69 mg/l ($SO_{4)}$ testing, and a pH value of 5.52, the Design Sulphate (DS) class is DS-1, AC2-z, as determined from Table C2 of BRE Special Digest.

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 Geo-environmental assessment

The results of the site investigation and GQRA indicate that the identified potential contaminant linkages are absent based on the data available. Laboratory data was compared to the residential GAC as this is the most sensitive assessment criteria and no exceedances were reported. No asbestos containing materials were identified during the site works, or the screening of six samples. However, although not encountered to date, localised sources of contamination could still be present, although they are unlikely to be widespread. Data gaps are present as no investigation works could be completed within the existing buildings and further assessment may be required during redevelopment

The gas monitoring rounds have identified a maximum steady state methane concentration of <0.1% and a maximum carbon dioxide concentration of 7.0%, combined with a maximum flow rate of 0.1 litres per hours. Based on ground gas monitoring data, the site would be classified as CS1.

11.2 Geotechnical assessment

The key findings of the initial geotechnical assessment are as follows:

- clays underlying the site have low to medium volume change potential
- areas of localised deep made ground (WS15)
- shallow groundwater.

11.3 Recommendations

The ground gas monitoring is complete and has classified the site as CS1 based on the results of the six monitoring rounds. However, no proposed development plan is available for the site and due to the current status of the site, no exploratory holes could be drilled inside the existing buildings. RSK would recommend additional boreholes and monitoring works to address data gaps in the central part of the site once the current buildings have been demolished.

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FIGURES

FIGURE 1 SITE LOCATION PLAN

385000

386000

410000

409000



Legend:

Site Boundary

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	24/09/2021	First Draft	DR	RN	RN

Heywood Stores

RSK GEOSCIENCES

TITLE:
322834 R1 Figure 1:
Site Location Plan

0 50 100
Metres

SCALE: 1:7,000 @ A3

N
W E
S

REV 00

Document Path: \\HE-NAS3\Projects\Geoscience\322800 - 322899\322834 Heywood Stores\01 - GIS\R01 - Figure 1 - Site Location Plan.mxd

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FIGURE 2 SITE LAYOUT PLAN

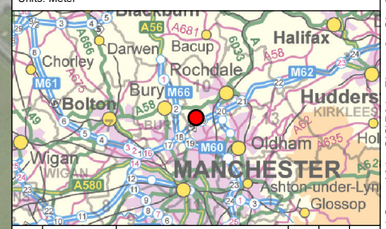
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409500 409400 409300 409200 409100 409000 408900

Legend:

Site Boundary

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	24/09/2021	First Draft	DR	RN	RN

Heywood Stores

RSK GEOSCIENCES

TITLE:
322834 R1 Figure 2:
Site Layout Plan

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Metres

SCALE: 1:2,250 @ A3

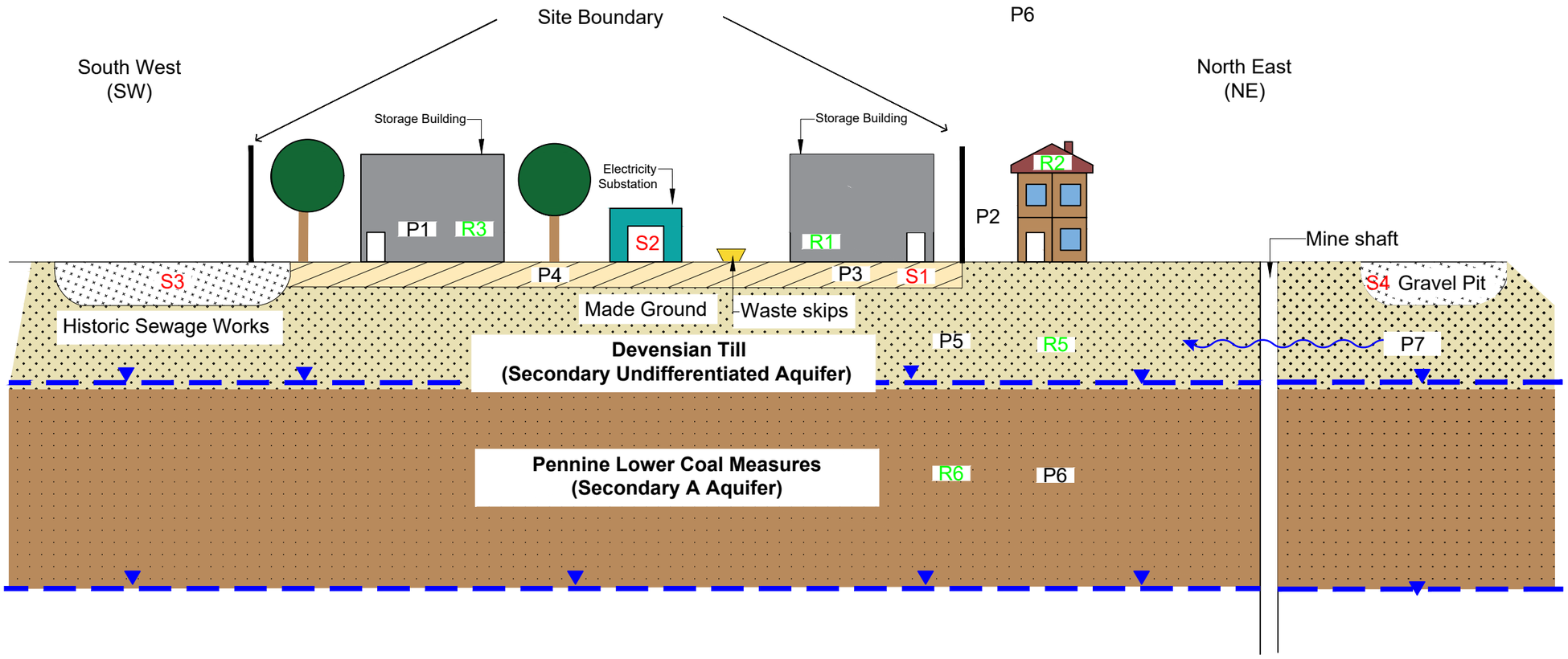
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REV 00

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FIGURE 3 INITIAL SCHEMATIC CONCEPTUAL SITE MODEL



Source

S1 - Made ground (i.e fill material)
S2 - Electricity substations present on site
S3 - Historic Sewage works on south western site boundary
S4 - Ground gases from Gravel Pit 315m North East

Pathways

P1 - Oral, dermal and inhalation exposure
P2 - Migration of contamination via dust/fibre inhalation]
P3 - Direct contact with contaminated soils]
P4 - Direct contact with contaminated soils or groundwater and root uptake]
P5 - Leaching from soils/ percolation to aquifer]
P6 - Percolation through permeable strata to aquifer
P7 - Migration of gases through permeable strata

Receptors

R1 - Current/ future site users
R2 - Current adjacent site users – residential, and school users
R3 - Current/ future buildings and services
R4 - Existing/ future vegetation
R5 - Groundwater in secondary undifferentiated aquifer within the Devensian Till
R6 - Groundwater in secondary A aquifer within the Pennine Lower Coal Measures]

REV	DATE	DESCRIPTION	BY	CHD.	APR.
A	25/08/21	First Issue	SDW	RN	RN

Dimensions	Projection	Scale	Orig Size
m		NTS	A3

RSK
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CLIENT: Telereal Trillium Limited

PROJECT: Heywood Stores

TITLE: Initial Concept Site Model

JOB No.:	DRAWING FILE:
322834	

BY:	DATE:	CONTRACT NO.		REV:
SDW	25/08/21		Figure 3	A

FIGURE 4 EXPLORATORY HOLE LOCATION PLAN

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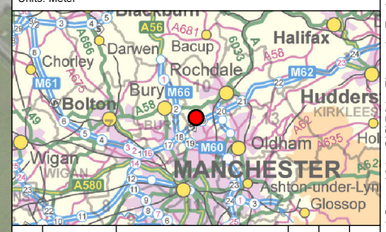
409500 409400 409300 409200 409100 409000 408900

Gloucester Avenue
Newhouse Road
Banks Croft
Jackman Avenue
Mercers Road
Oldbury Close
Oldbury Close
White House Close
Wings Grove
Manchester Road
Hareshill Road

WS08
(WS07)
WS10
(WS09)
CP03
CP02
WS06
WS11
(WS12)
WS13
Substation
Historic Sewage Works
(WS05)
WS14
WS04
(WS03)
Substation
WS02
CP01
Mine Shaft
WS15
(WS01)

Legend:
- Site Boundary
- Inaccessible Areas
- CP Hole (10m)
- Mine Shaft
- WS Location (Installation)

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	24/09/2021	First Draft	DR	RN	RN

Heywood Stores

RSK GEOSCIENCES

TITLE:
322834 R1 Figure 4:
Exploratory Hole Location Plan

0 20 40
Metres
SCALE: 1:2,250 @ A3

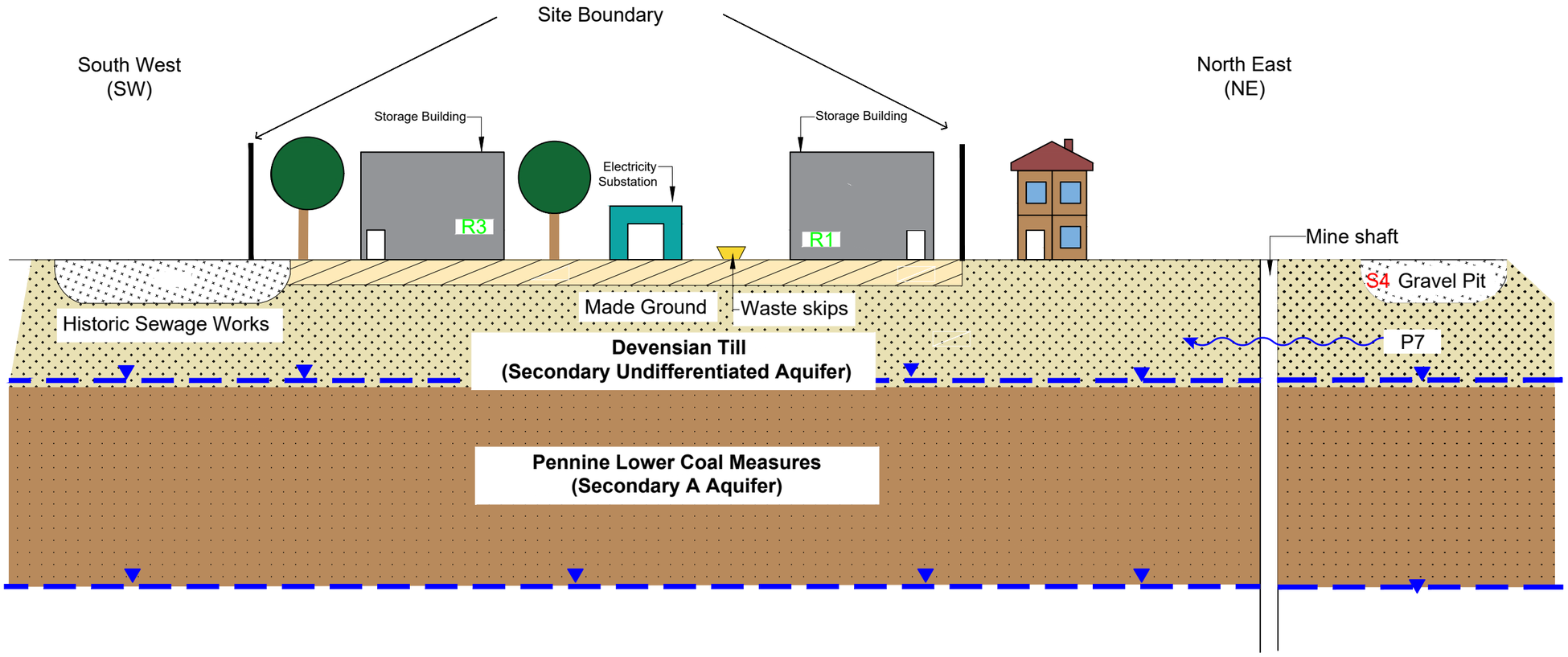
N W E S

REV 00

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FIGURE 5 REFINED CONCEPTUAL SITE MODEL



Source

S4 - Ground gases from Gravel Pit
315m North East

Pathways

P7 - Migration of gases through permeable strata

Receptors

R1 - Current/ future site users

R3 - Current/ future buildings and services

REV	DATE	DESCRIPTION	BY	CHD.	APR.
A	25/08/21	First Issue	SDW	RN	RN

Dimensions	Projection	Scale	Orig Size
m		NTS	A3

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CLIENT
Telereal Trillium Limited

PROJECT
Heywood Stores

TITLE
Initial Concept Site Model

JOB No.:	DRAWING FILE:
322834	

BY:	DATE:	CONTRACT NO.		REV:
SDW	25/08/21		Figure 5	A

APPENDICES

APPENDIX A SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Telereal Trillium (the "Client") in accordance with the terms of a contract RSK Environment Standard Terms and Conditions] between RSK and the Client, dated 5 May 2021. The Services were performed by RSK with the reasonable skill and care ordinarily exercised by an environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the Client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas, persistent, bioaccumulative or toxic chemicals (including PFAS/ PFOS) or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
    a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.
    b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.

c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.

11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.

12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.

APPENDIX B SUMMARY OF LEGISLATION AND POLICY RELATING TO LAND CONTAMINATION

Part IIA of the Environmental Protection Act 1990

Part IIA of the Environmental Protection Act 1990 (Part IIA) and its associated Contaminated Land Regulations 2000 (SI 2000/227), which came into force in England on 1 April 2000, formed the basis for the current regulatory framework and the statutory regime for the identification and remediation of contaminated land. Part IIA of the EPA 1990 defines contaminated land as 'any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused'. Controlled waters are considered to include all groundwater, inland waters and estuaries.

In August 2006, the Contaminated Land (England) Regulations 2006 (SI 2006/1380) were implemented, which extended the statutory regime to include Part IIA of the EPA as originally introduced on 1 April 2000, together with changes intended chiefly to address land that is contaminated by virtue of radioactivity. These have been replaced subsequently by the Contaminated Land (England) (Amendment) Regulations 2012, which now exclude land that is contaminated by virtue of radioactivity.

The intention of Part IIA is to deal with contaminated land issues that are considered to cause significant harm on land that is not undergoing development (see Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, April 2012). This document replaces Annex III of Defra Circular 01/2006, published in September 2006 (the remainder of this document is now obsolete).

Planning Policy

Land contamination is often addressed via the planning process during redevelopment of sites. This approach was documented in Planning Policy Statement: Planning and Pollution Control PPS23, which states that it remains the responsibility of the landowner and developer to identify land affected by contamination and carry out sufficient remediation to render the land suitable for use. PPS23 was withdrawn early in 2012 and has been replaced by much reduced guidance within the National Planning Policy Framework (NPPF), reference ISBN: 978-1-5286-1033-9, July 2021. For sites in Wales, reference should be made to Planning Policy Wales (Welsh Government. Edition 11, February 2021).

The new framework has limited guidance on contaminated land, as follows:

Chapter 11. Making effective use of land

117 Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.

118. Planning policies and decisions should:

c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.

Chapter 15. Conserving and enhancing the natural environment

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Ground conditions and pollution

178. Planning policies and decisions should ensure that:

a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

179. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

Water Resources Act (WRA)

The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 updated the Water Resources Act 1991, which introduced the offence of causing or knowingly permitting pollution of controlled waters. The Act provides the Environment Agency with powers to implement remediation necessary to protect controlled waters and recover all reasonable costs of doing so.

Water Framework Directive (WFD)

The Water Framework Directive 2000/60/EC is designed to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands that depend on the aquatic ecosystems
- promote the sustainable use of water
- reduce pollution of water, especially by ‘priority’ and ‘priority hazardous’ substances
- ensure progressive reduction of groundwater pollution.

The WFD requires a management plan for each river basin be developed every six years.

Groundwater Directive (GWD)

The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. The 1980 Directive is due to be repealed in December 2013. The European legislation has been transposed into national legislation by regulations and directions to the Environment Agency.

Priority Substances Directive (PSD)

The Priority Substances Directive 2008/105/EC is a 'Daughter' Directive of the WFD, which sets out a priority list of substances posing a threat to or via the aquatic environment. The PSD establishes environmental quality standards for priority substances, which have been set at concentrations that are safe for the aquatic environment and for human health. In addition, there is a further aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by pollutants on the list. The WFD requires that countries establish a list of dangerous substances that are being discharged and EQS for them. In England and Wales, this list is provided in the River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. In order to achieve the objectives of the WFD, classification schemes are used to describe where the water environment is of good quality and where it may require improvement.

Environmental Permitting Regulations (EPR)

The Environmental Permitting (England and Wales) Regulations 2016 (as amended) provide a single regulatory framework that streamlines and integrates waste management licensing, pollution prevention and control, water discharge consenting, groundwater authorisations, and radioactive substances regulation. Schedule 22, paragraph 6 of EPR 2016 states: 'the regulator must, in exercising its relevant functions, take all necessary measures - (a) to prevent the input of any hazardous substance to groundwater; and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.'

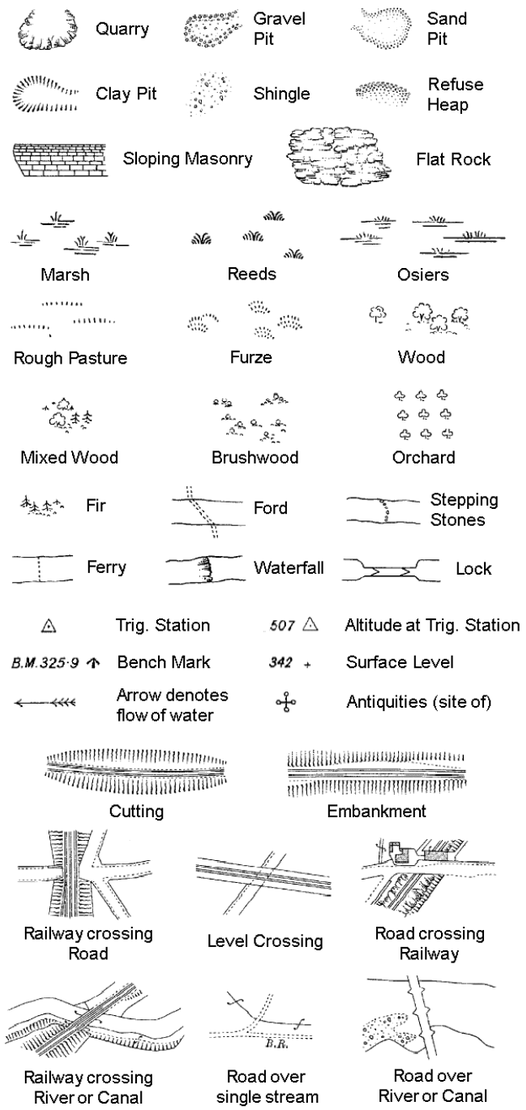
Notes:

1. *The above information is provided for background but does not constitute site-specific advice*
2. *The above summary applies to England only. Variations exist within other countries of the United Kingdom*

APPENDIX C ENVIRONMENTAL DATABASE REPORT

Historical Mapping Legends

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



County Boundary (Geographical)

County & Civil Parish Boundary

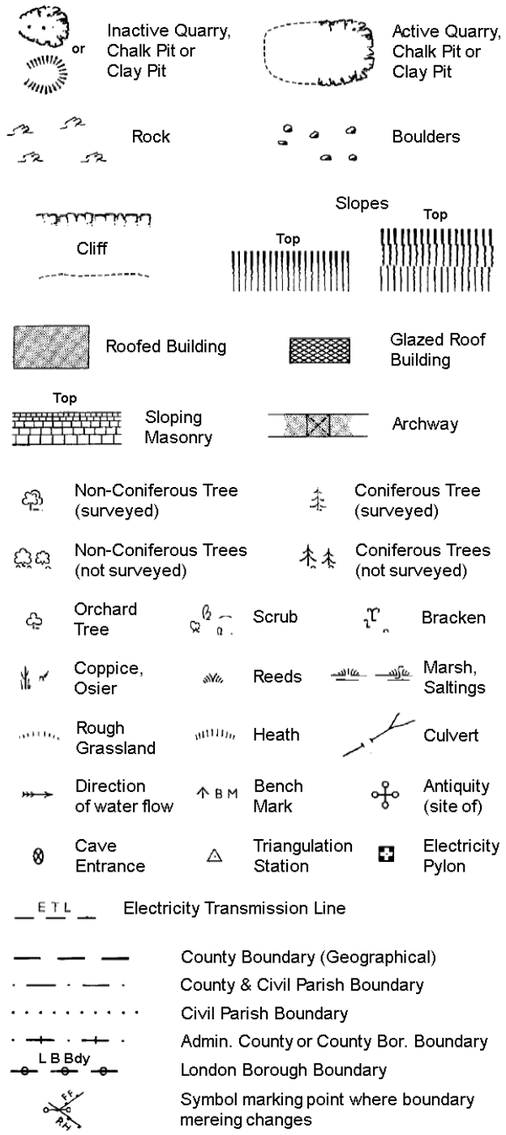
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

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

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



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

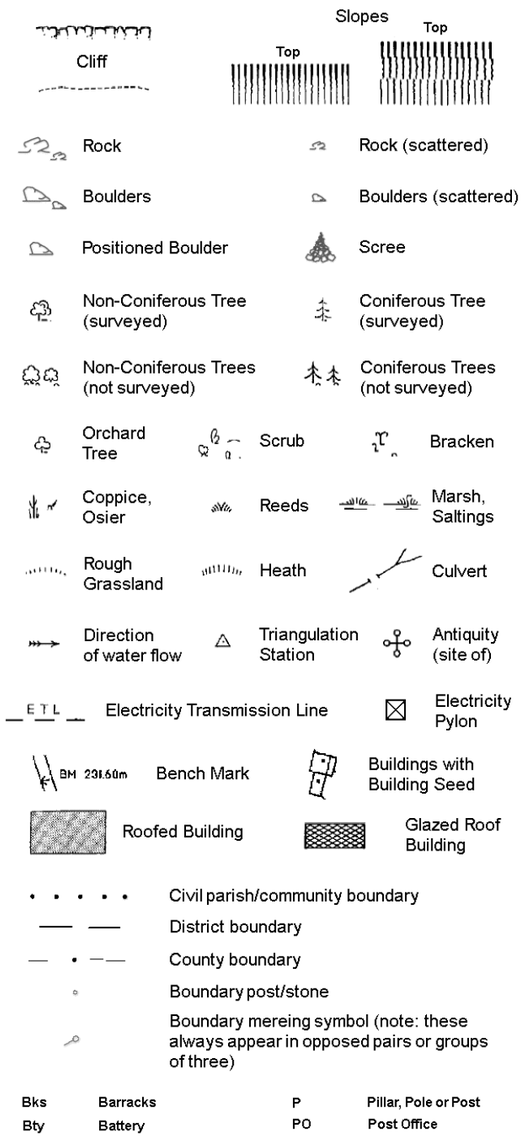
Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

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

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



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

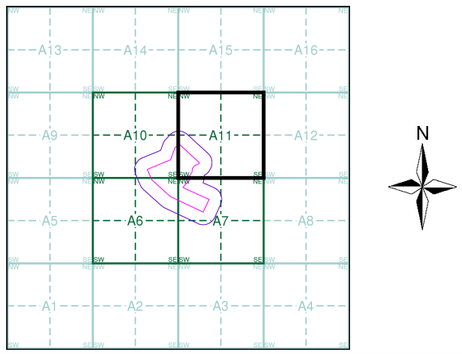
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity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

RSK

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1910	3
Lancashire And Furness	1:2,500	1929	4
Lancashire And Furness	1:2,500	1937	5
Ordnance Survey Plan	1:1,250	1956	6
Ordnance Survey Plan	1:2,500	1957	7
Ordnance Survey Plan	1:1,250	1965 - 1978	8
Ordnance Survey Plan	1:2,500	1969	9
Ordnance Survey Plan	1:1,250	1970 - 1986	10
Additional SIMs	1:1,250	1972 - 1990	11
Additional SIMs	1:1,250	1977 - 1986	12
Additional SIMs	1:1,250	1984	13
Large-Scale National Grid Data	1:1,250	1992	14
Large-Scale National Grid Data	1:1,250	1993 - 1994	15
Large-Scale National Grid Data	1:1,250	1996	16

Historical Map - Segment A11



Order Details

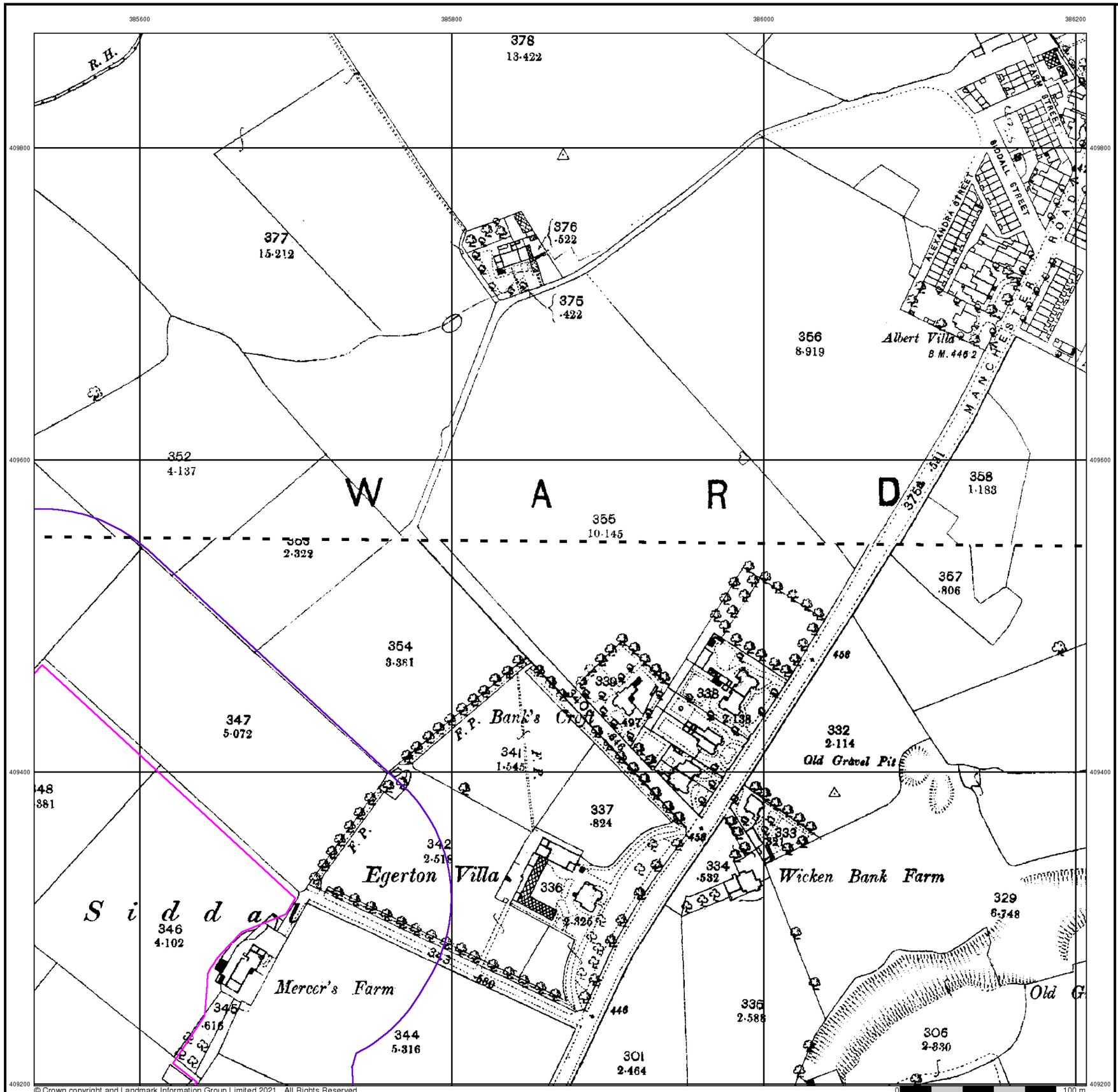
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National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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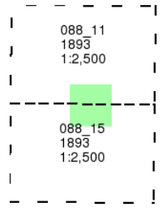
Lancashire And Furness

Published 1893

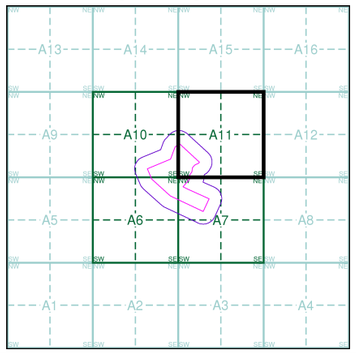
Source map scale - 1:2,500

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 A11



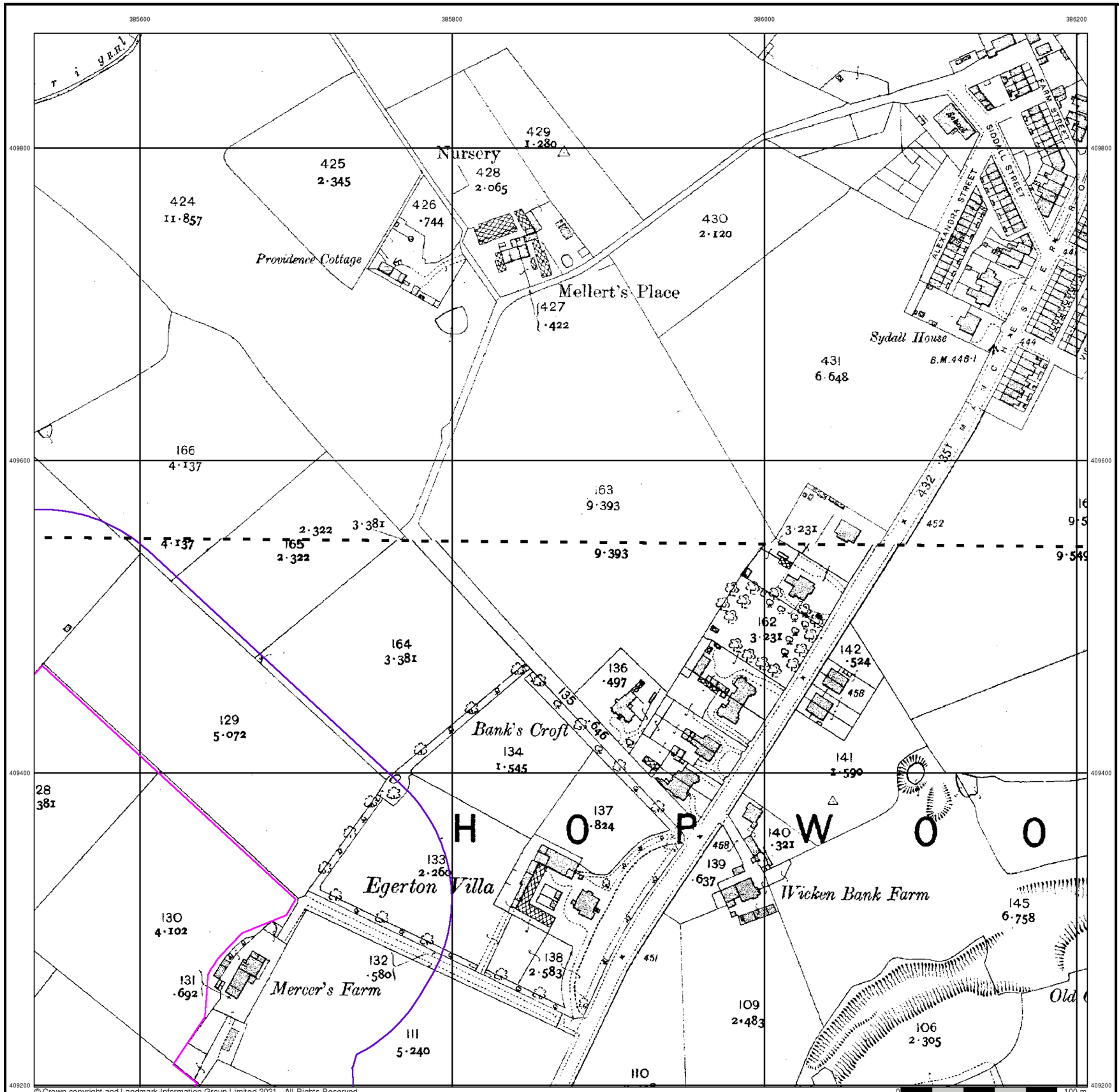
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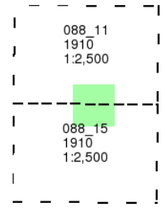
Lancashire And Furness

Published 1910

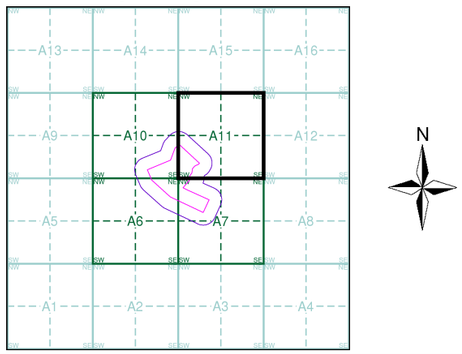
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Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

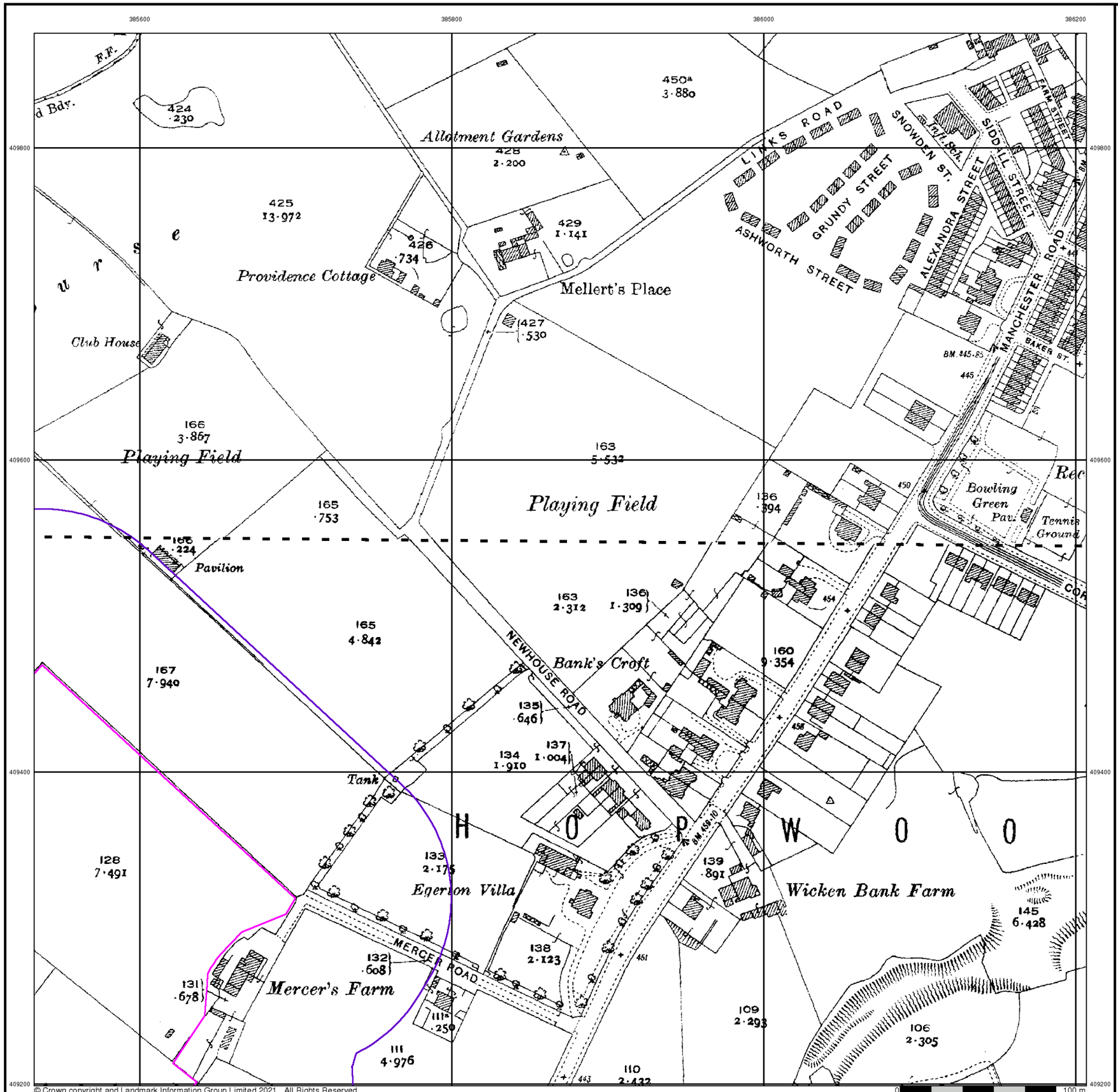
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National Grid Reference:	385560, 409190
Slice:	A
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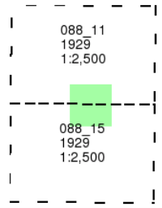
Lancashire And Furness

Published 1929

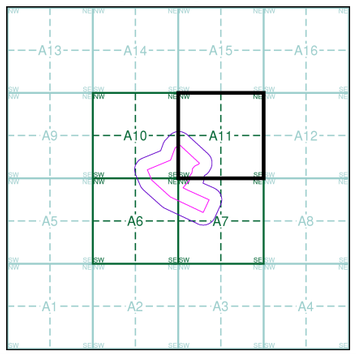
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



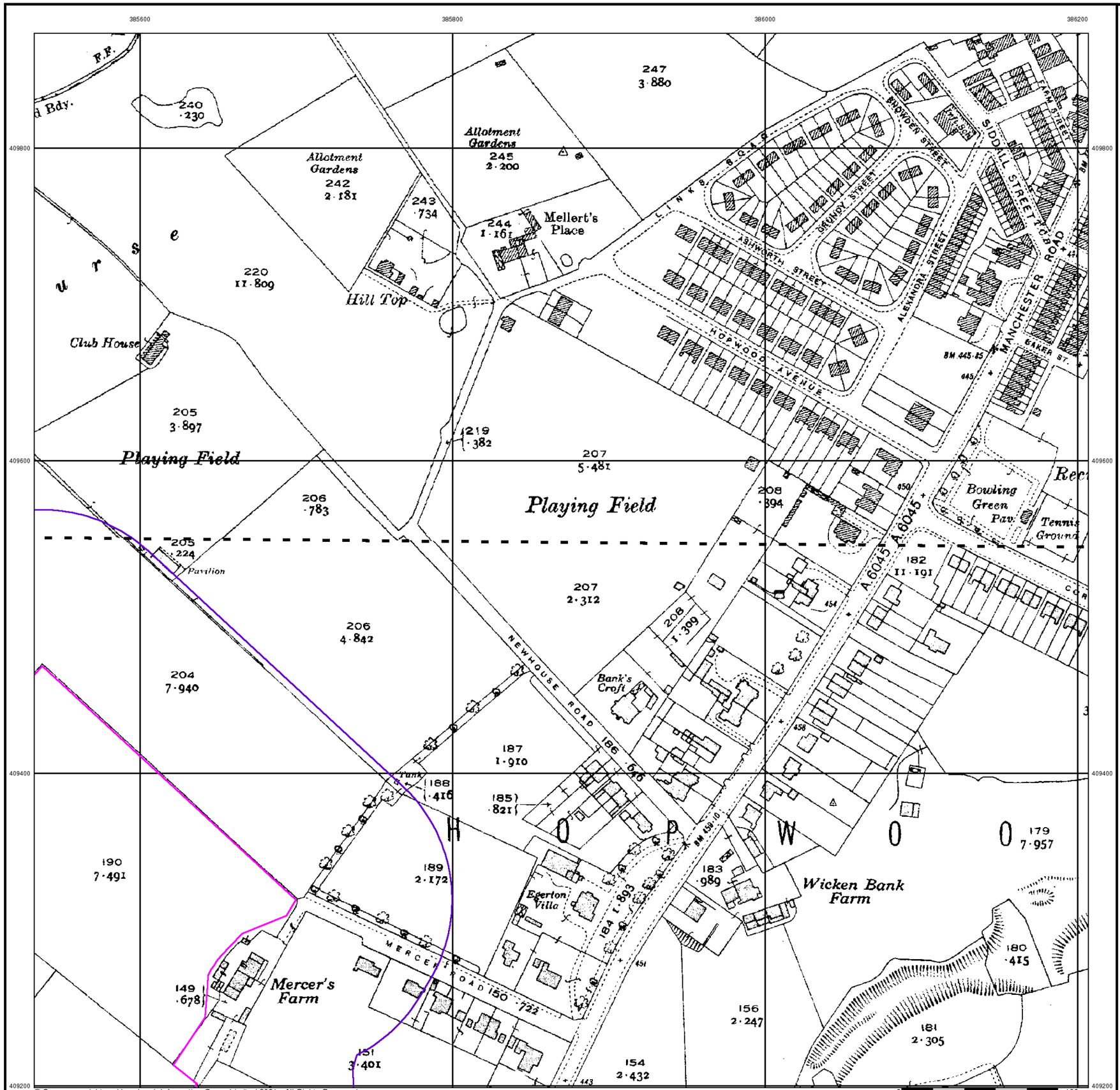
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Site Area (Ha):	11.19
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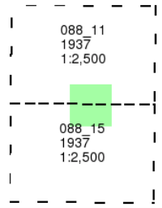
Lancashire And Furness

Published 1937

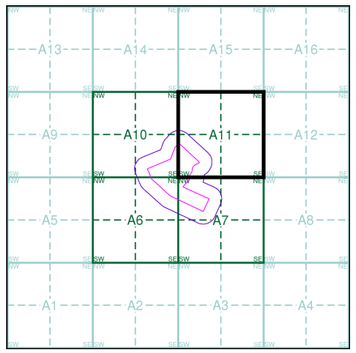
Source map scale - 1:2,500

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 A11



Order Details

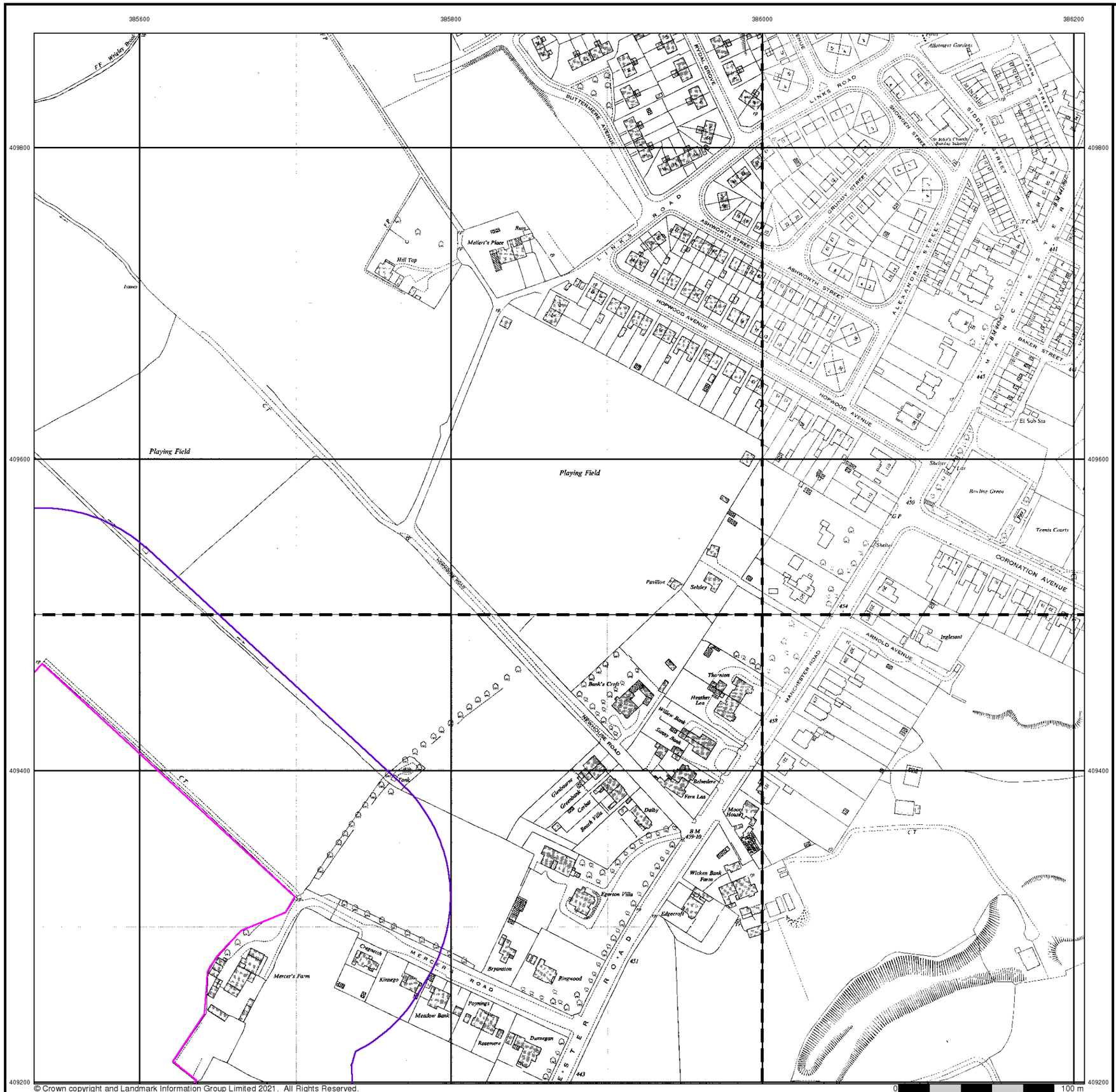
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Search Buffer (m):	100

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0 100 m

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Ordnance Survey Plan

Published 1956

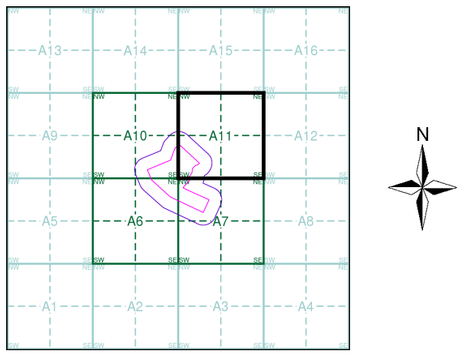
Source map scale - 1:1,250

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Map Name(s) and Date(s)

SD8509NE 1956 1:1,250	SD8609NW 1956 1:1,250
SD8509SE 1956 1:1,250	SD8609SW 1956 1:1,250

Historical Map - Segment A11



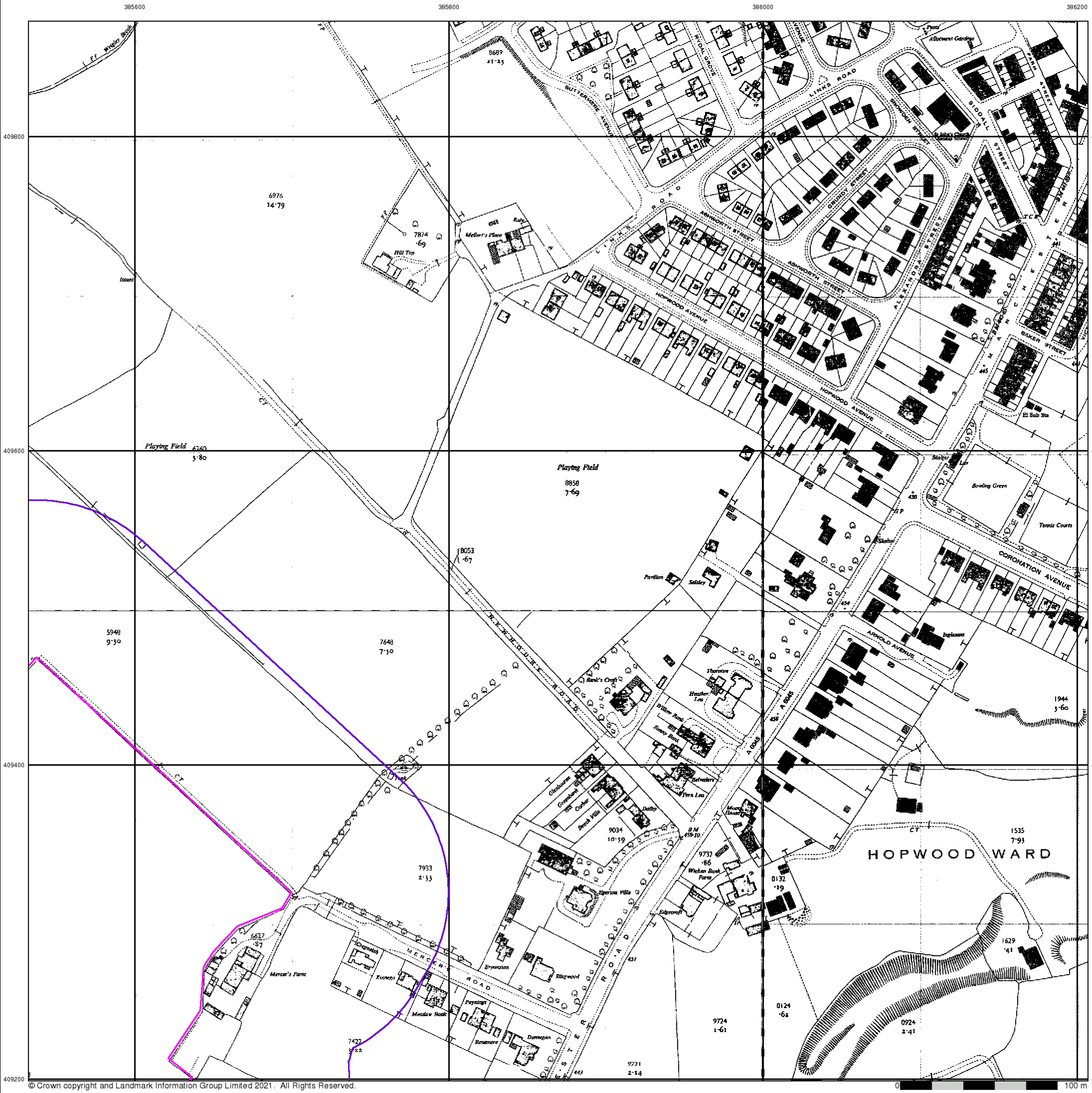
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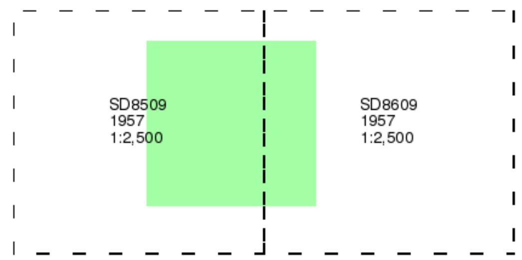
Ordnance Survey Plan

Published 1957

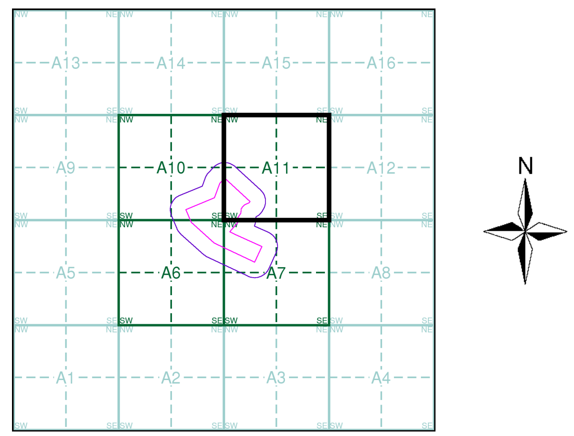
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



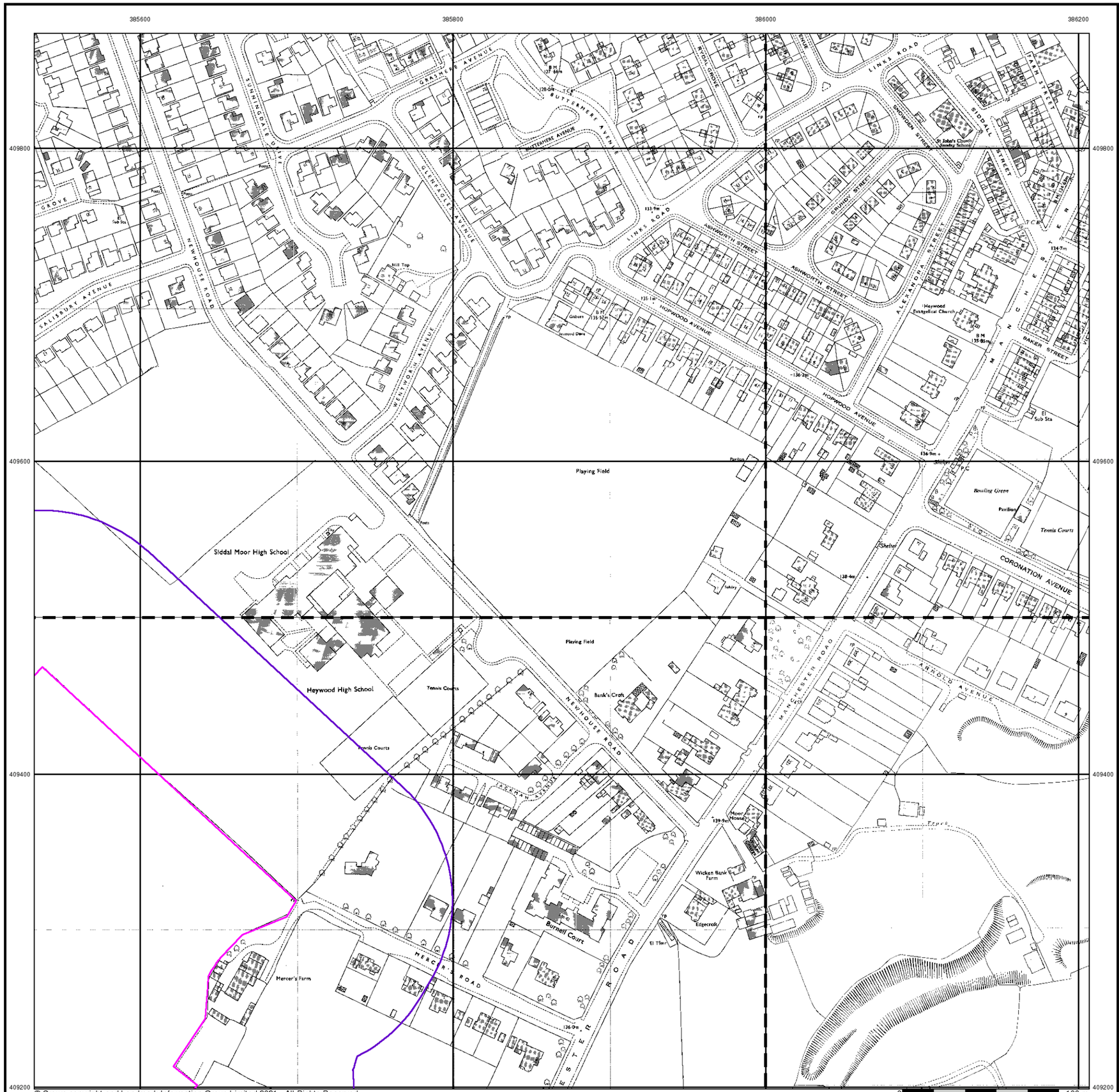
Order Details

Order Number: 281815927_1_1
Customer Ref: 322834
National Grid Reference: 385560, 409190
Slice: A
Site Area (Ha): 11.19
Search Buffer (m): 100

Site Details

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Ordnance Survey Plan

Published 1965 - 1978

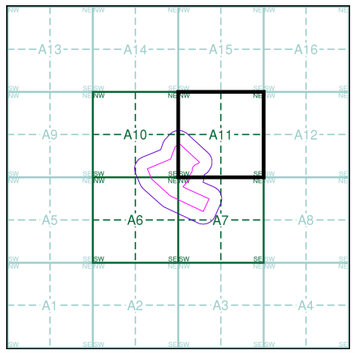
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Map Name(s) and Date(s)

SD8509NE 1978 1:1,250	SD8609NW 1970 1:1,250
SD8509SE 1972 1:1,250	SD8609SW 1965 1:1,250

Historical Map - Segment A11



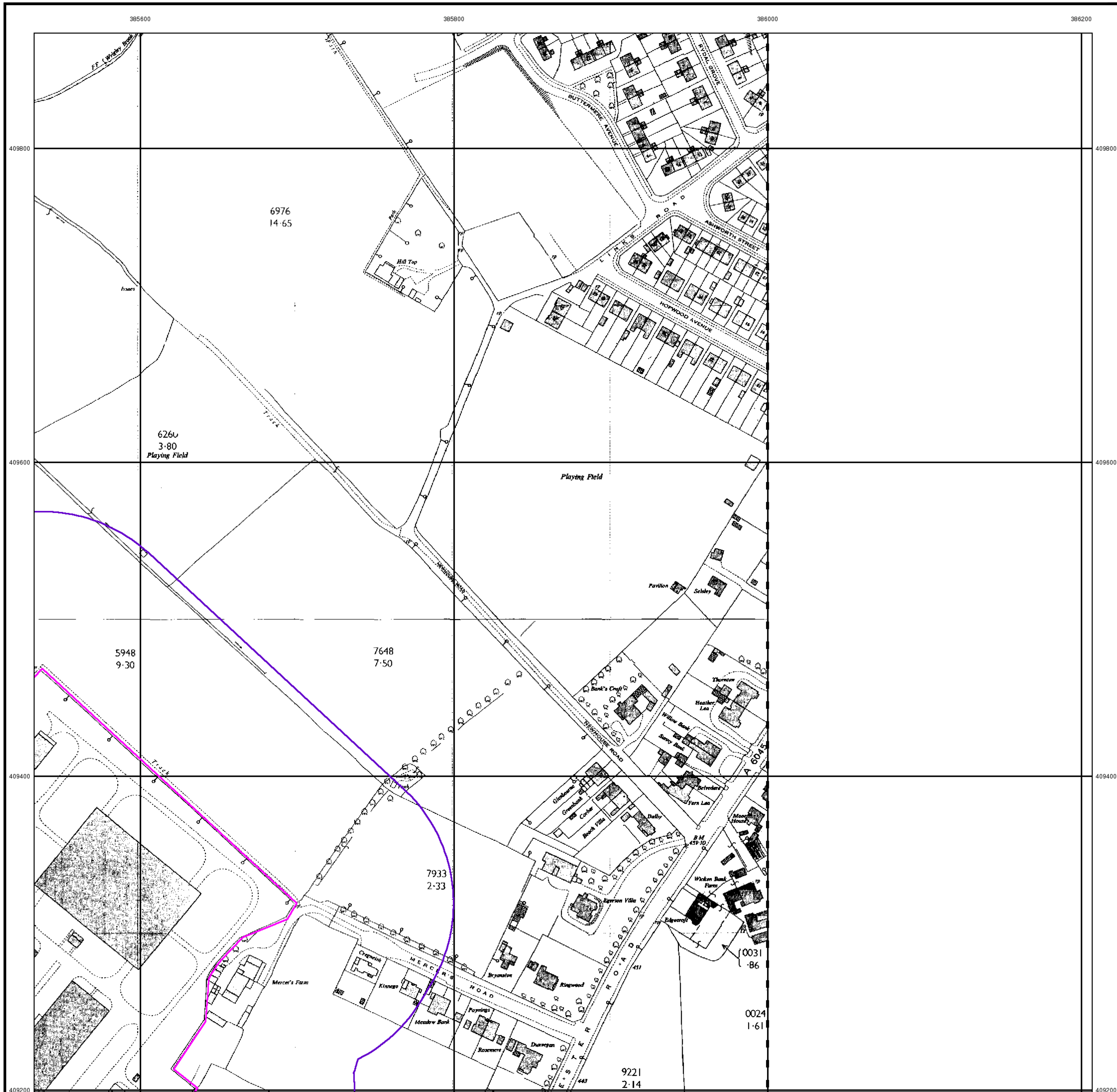
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Site Details

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0 100 m

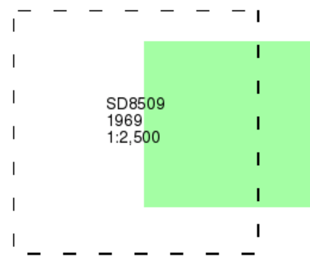
Ordnance Survey Plan

Published 1969

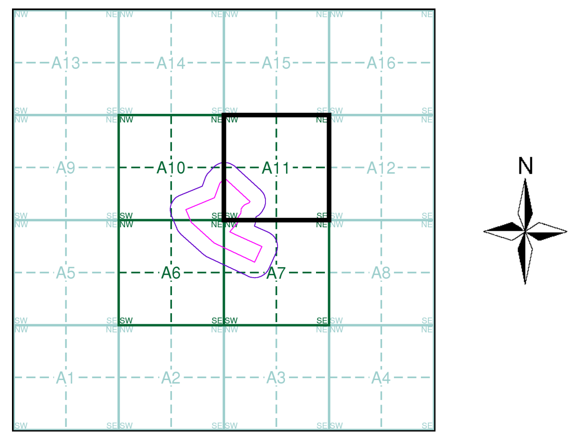
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Map Name(s) and Date(s)



Historical Map - Segment A11

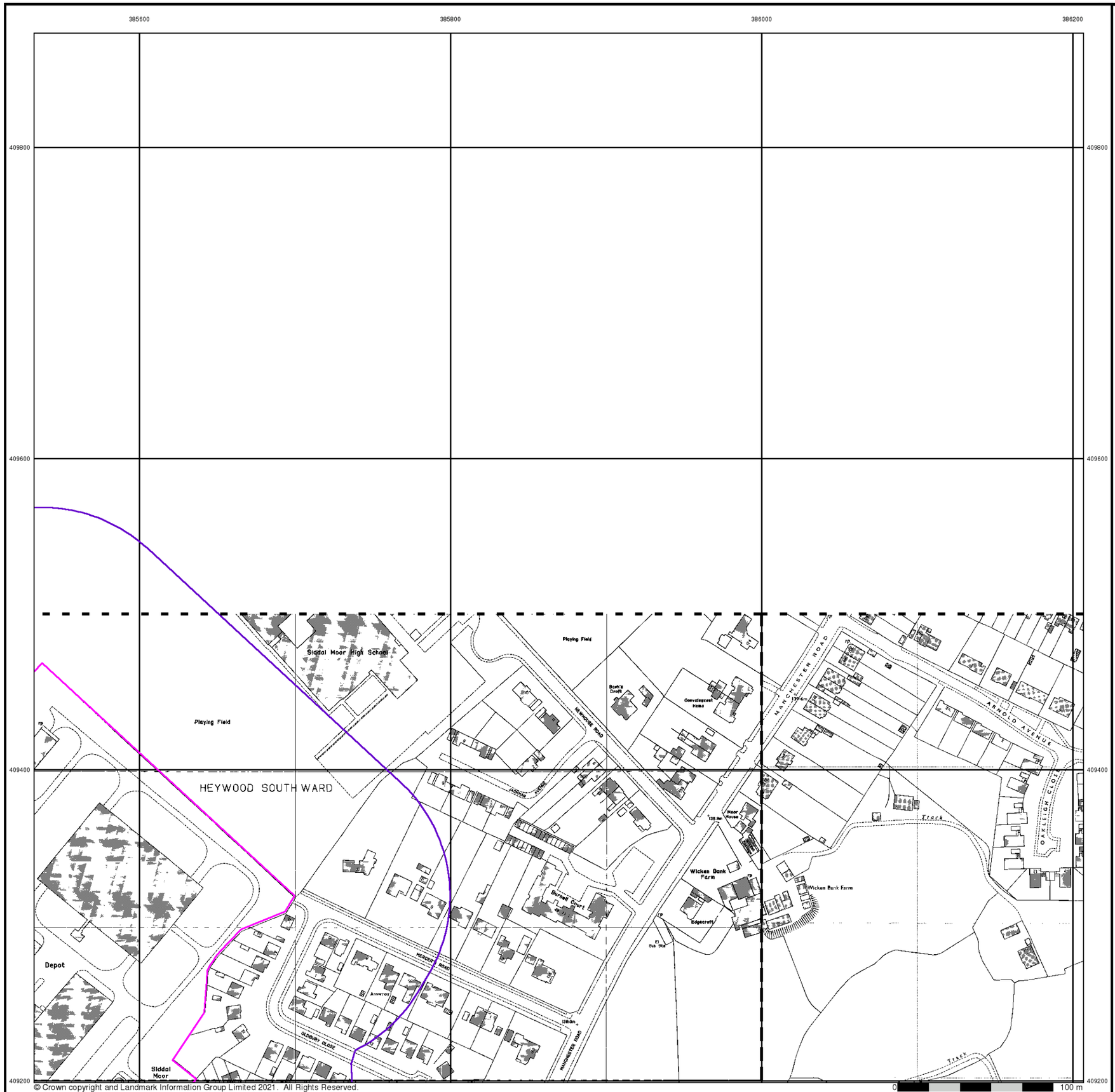


Order Details

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Slice: A
Site Area (Ha): 11.19
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Site Details

1, Wings Grove, HEYWOOD, OL10 2QR



RSK

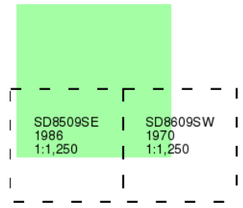
Ordnance Survey Plan

Published 1970 - 1986

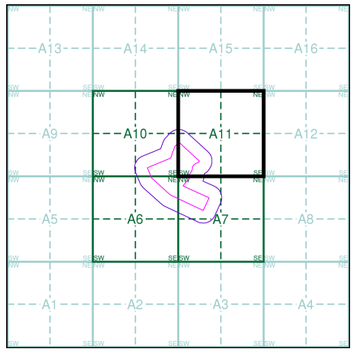
Source map scale - 1:1,250

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 A11



Order Details

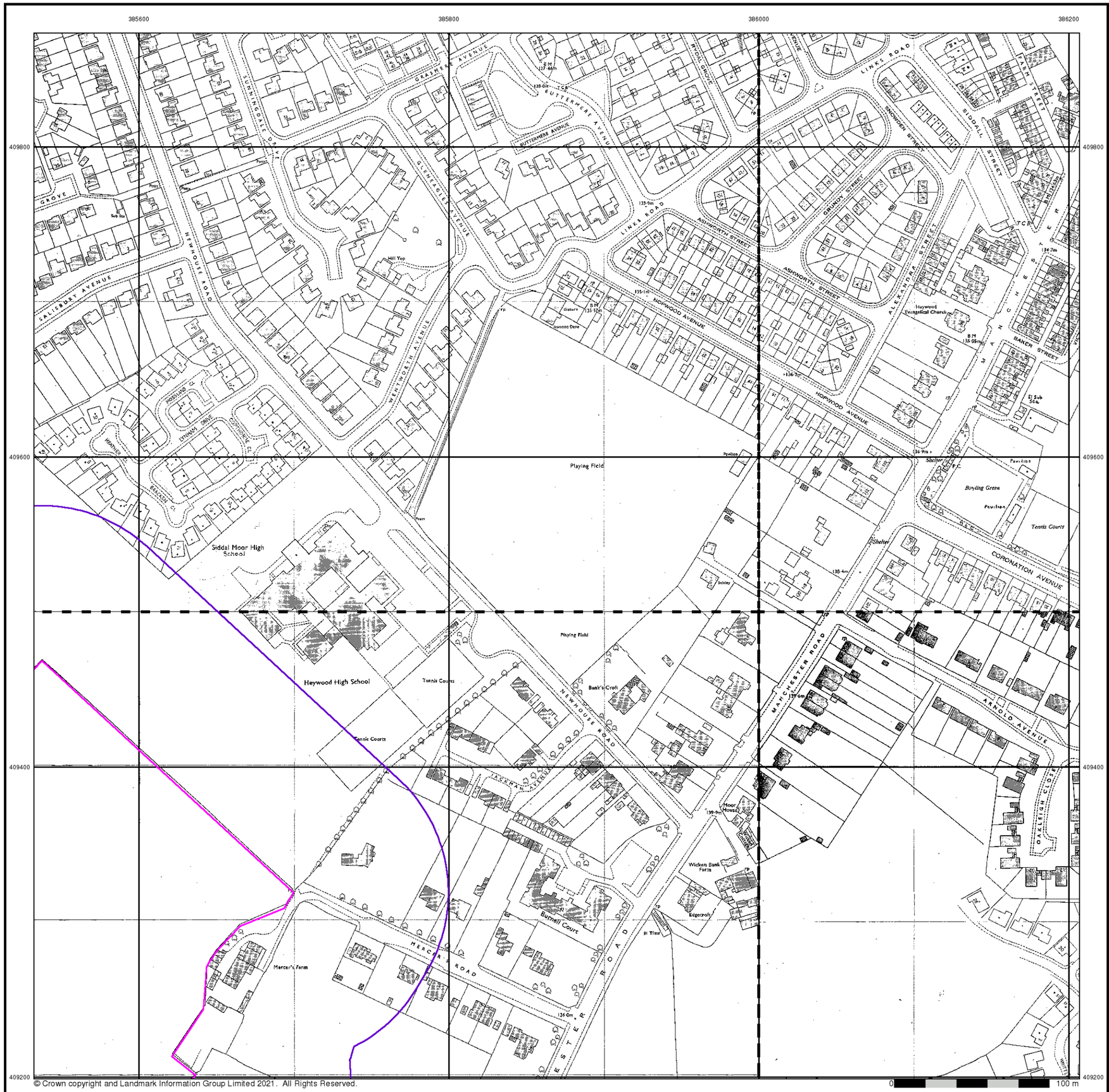
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

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Additional SIMs

Published 1972 - 1990

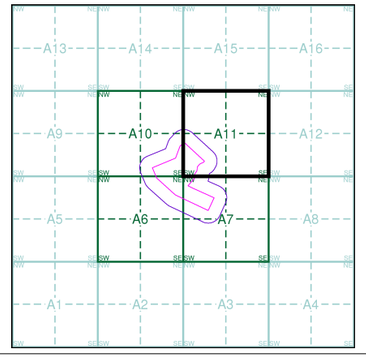
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SD8509NE 1990 1:1,250	SD8609NW 1983 1:1,250
SD8509SE 1972 1:1,250	SD8609SW 1990 1:1,250

Historical Map - Segment A11



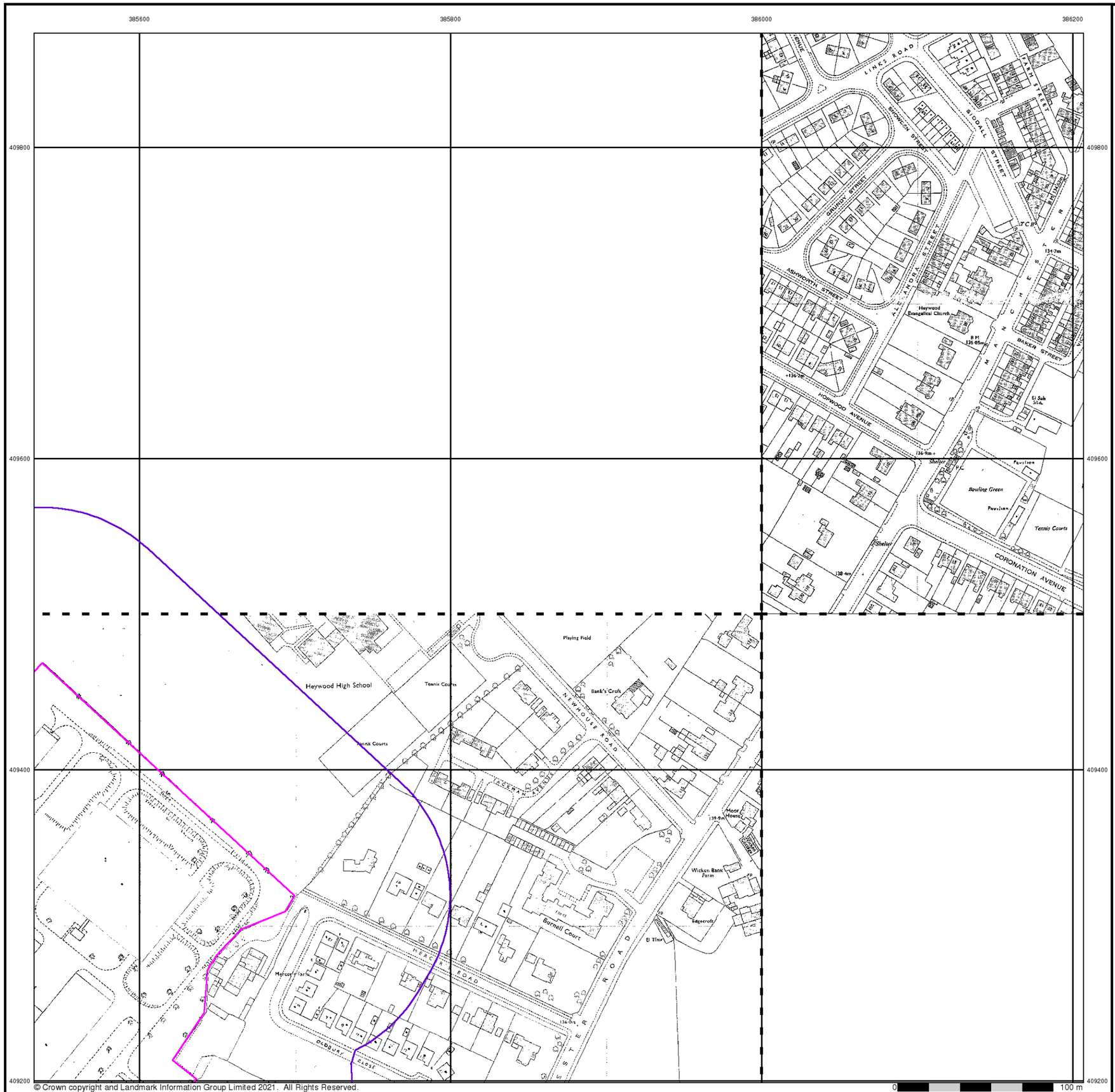
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Slice:	A
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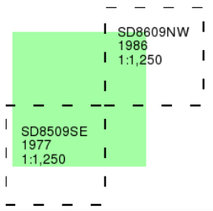
Additional SIMs

Published 1977 - 1986

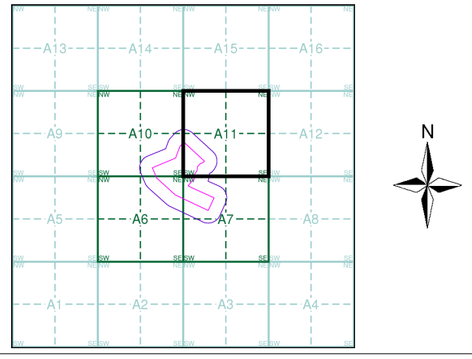
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A11

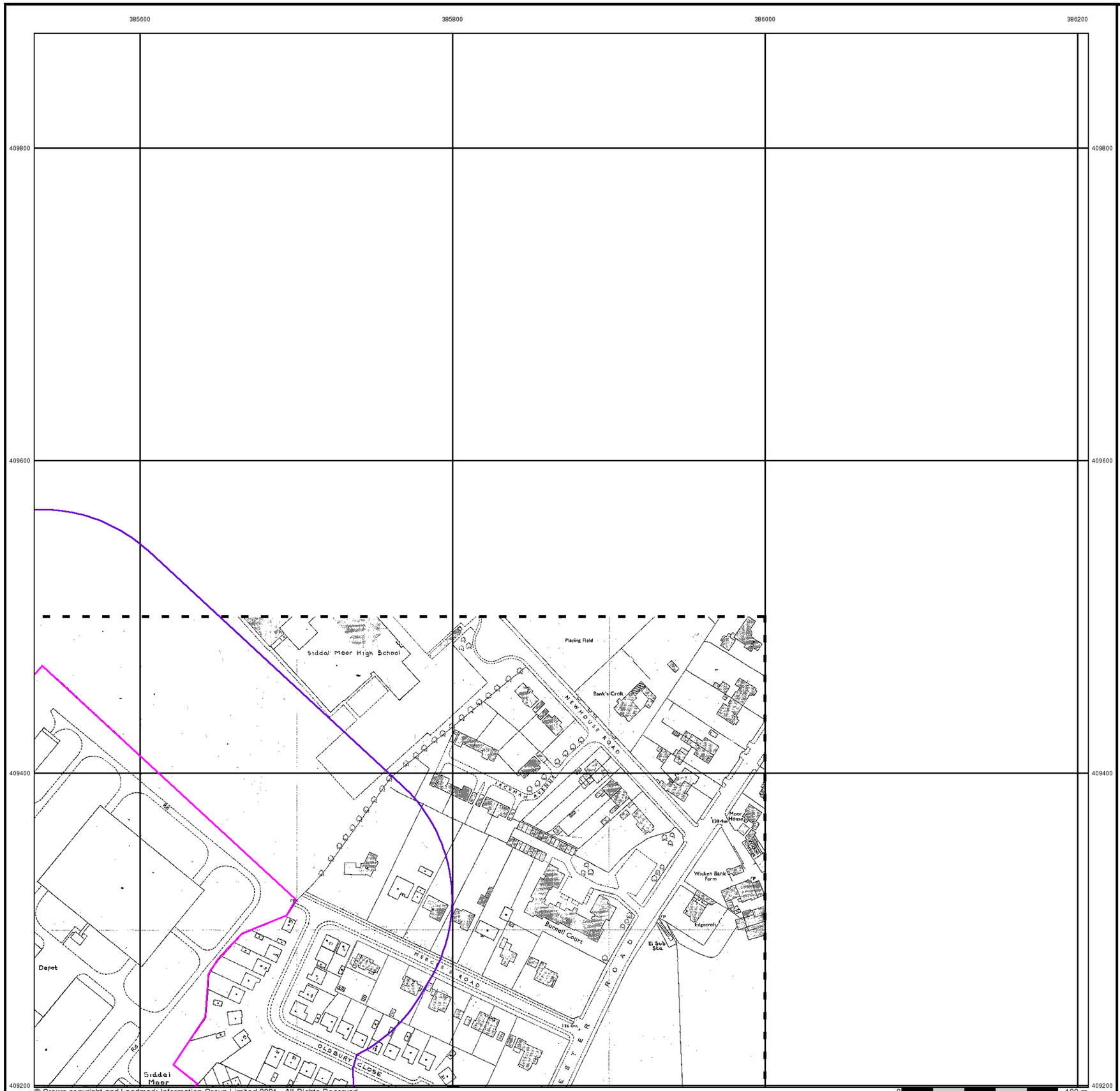


Order Details

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Site Details

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RSK

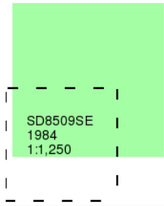
Additional SIMs

Published 1984

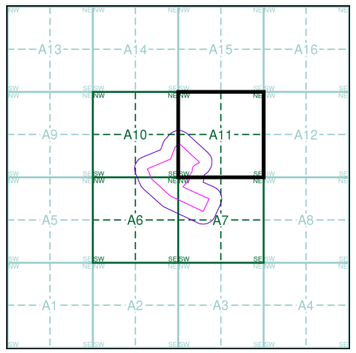
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A11



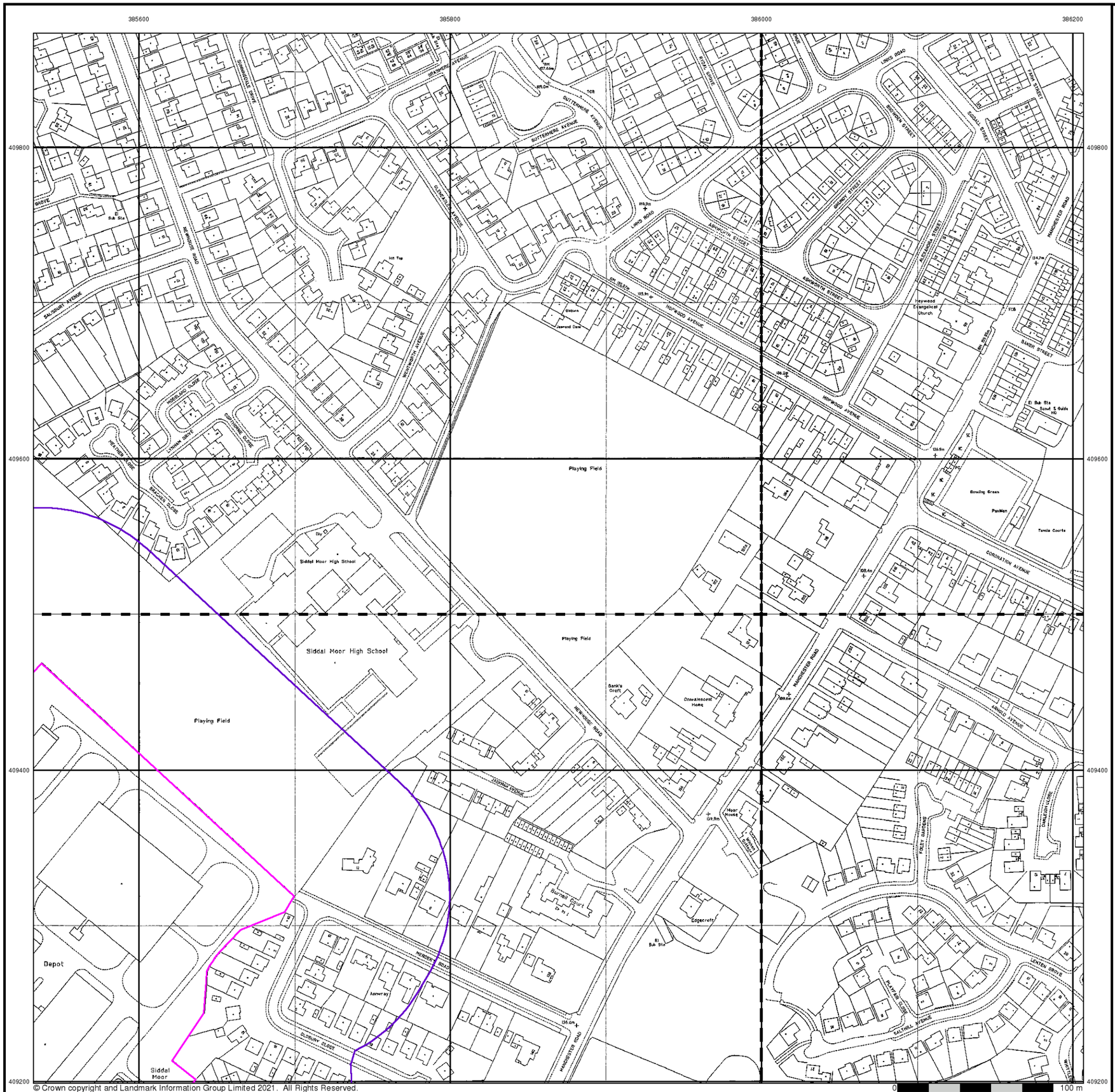
Order Details

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Large-Scale National Grid Data

Published 1992

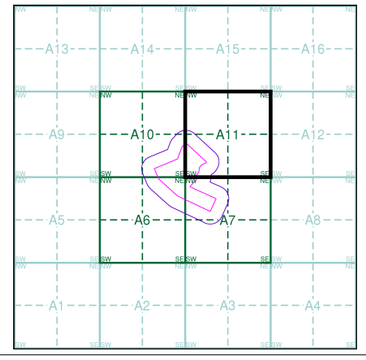
Source map scale - 1:1,250

'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)

SD8509NE 1992 1:1,250	SD8609NW 1992 1:1,250
SD8509SE 1992 1:1,250	SD8609SW 1992 1:1,250

Historical Map - Segment A11



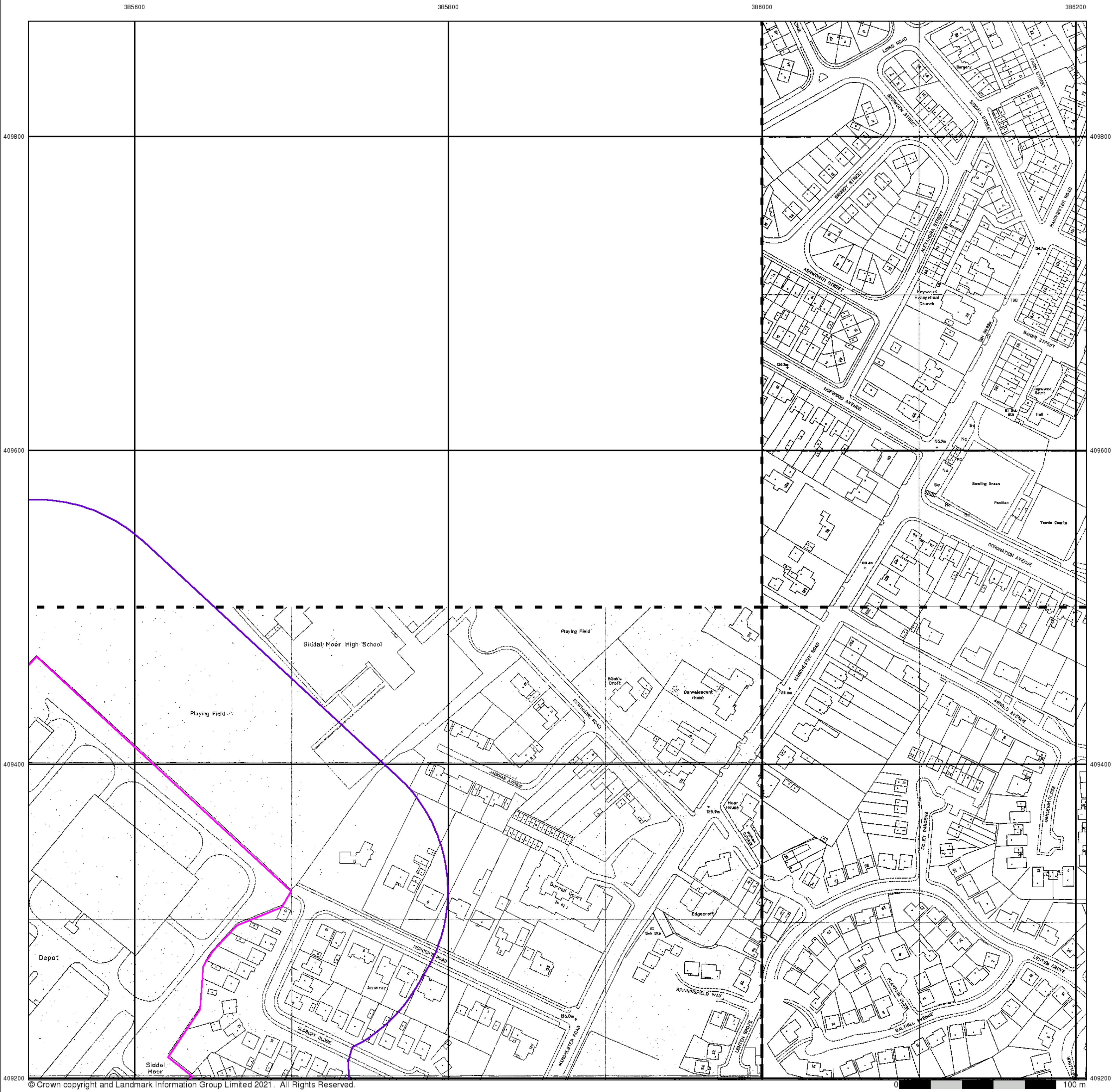
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
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Site Area (Ha):	11.19
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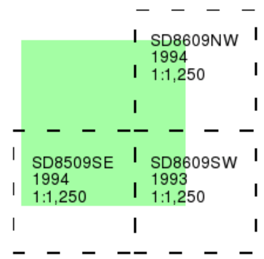
Large-Scale National Grid Data

Published 1993 - 1994

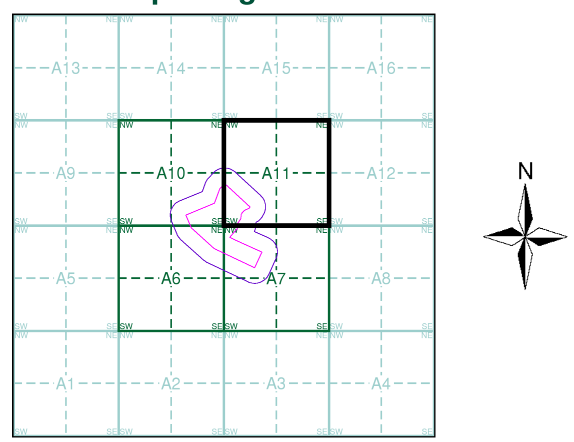
Source map scale - 1:1,250

'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)



Historical Map - Segment A11



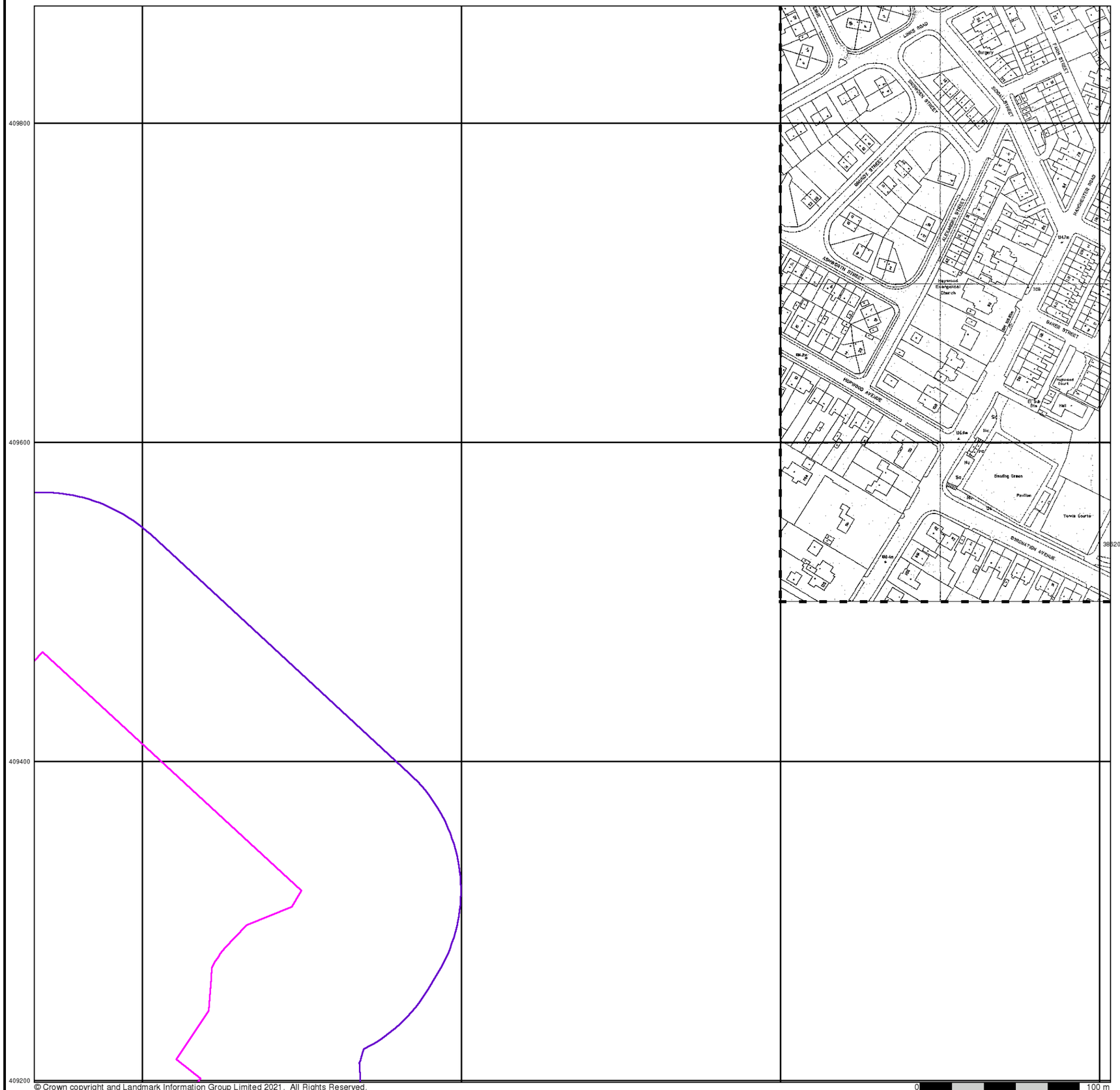
Order Details

Order Number: 281815927_1_1
Customer Ref: 322834
National Grid Reference: 385560, 409190
Slice: A
Site Area (Ha): 11.19
Search Buffer (m): 100

Site Details

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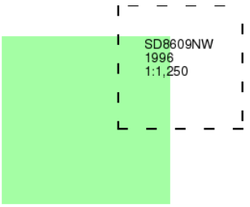
Large-Scale National Grid Data

Published 1996

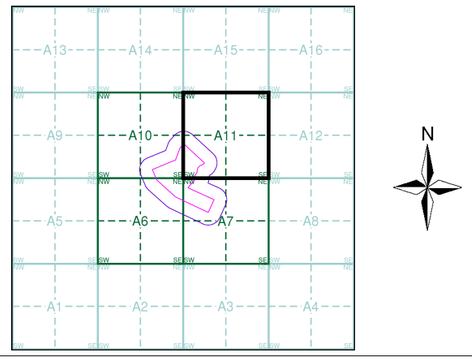
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	281815927_1_1
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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

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

Ordnance Survey Plan 1:10,000

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

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

1:10,000 Raster Mapping

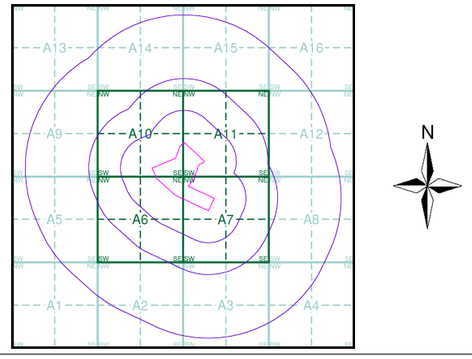
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community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

RSK

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:10,560	1848 - 1851	2
Lancashire And Furness	1:10,560	1894	3
Lancashire And Furness	1:10,560	1910	4
Lancashire And Furness	1:10,560	1923 - 1932	5
Lancashire And Furness	1:10,560	1932	6
Lancashire And Furness	1:10,560	1938	7
Ordnance Survey Plan	1:10,000	1955 - 1956	8
Ordnance Survey Plan	1:10,000	1965 - 1968	9
Ordnance Survey Plan	1:10,000	1974 - 1977	10
Ordnance Survey Plan	1:10,000	1983 - 1988	11
Ordnance Survey Plan	1:10,000	1993	12
10K Raster Mapping	1:10,000	1999	13
Street View	Variable		14

Historical Map - Slice A



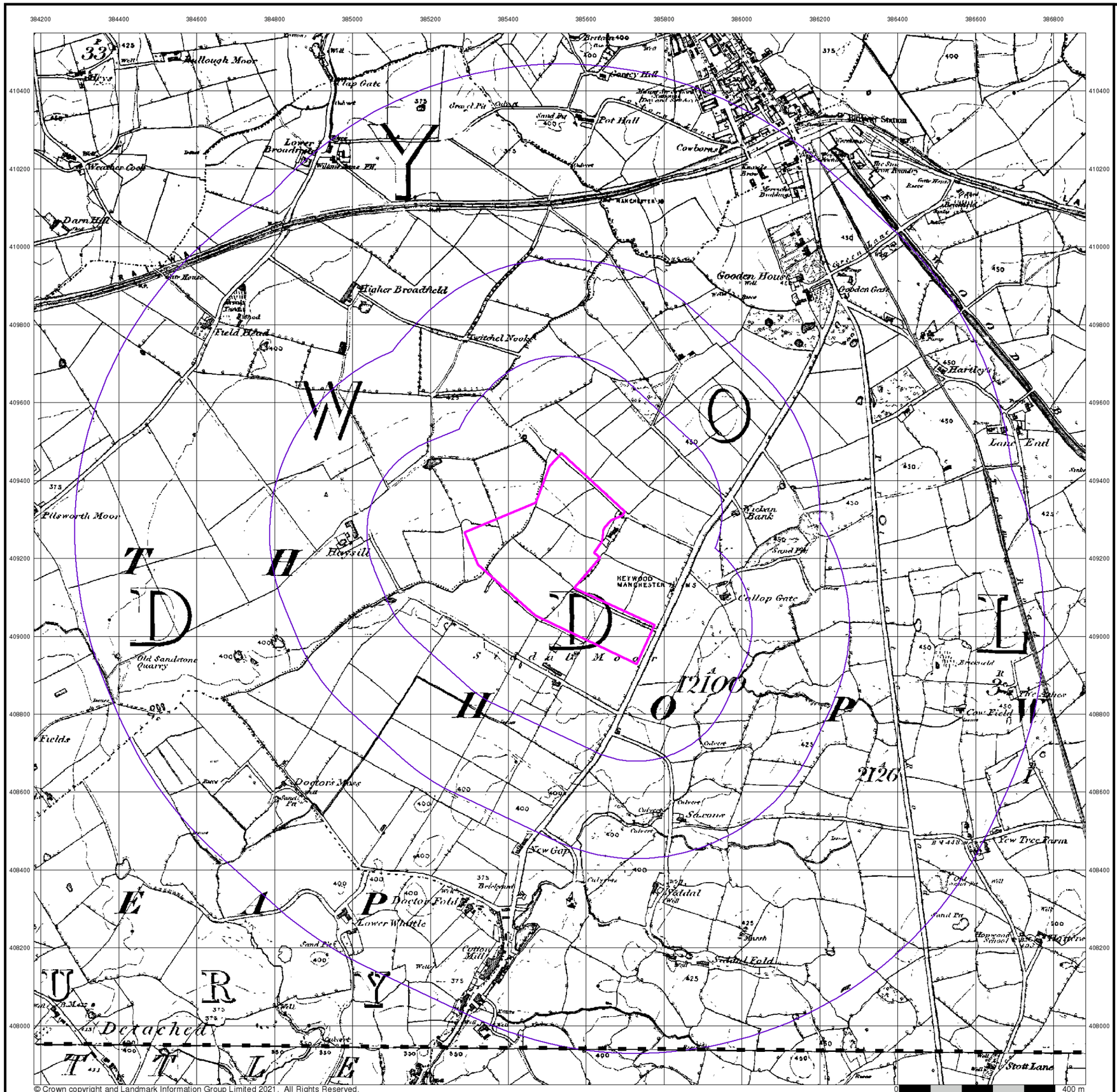
Order Details

Order Number: 281815927_1_1
Customer Ref: 322834
National Grid Reference: 385560, 409190
Slice: A
Site Area (Ha): 11.19
Search Buffer (m): 1000

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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RSK

Lancashire And Furness

Published 1848 - 1851

Source map scale - 1:10,560

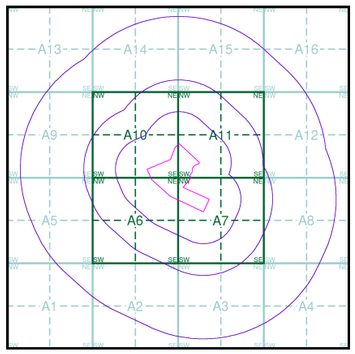
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some 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

09600
1848
1:10,560

Historical Map - Slice A



Order Details

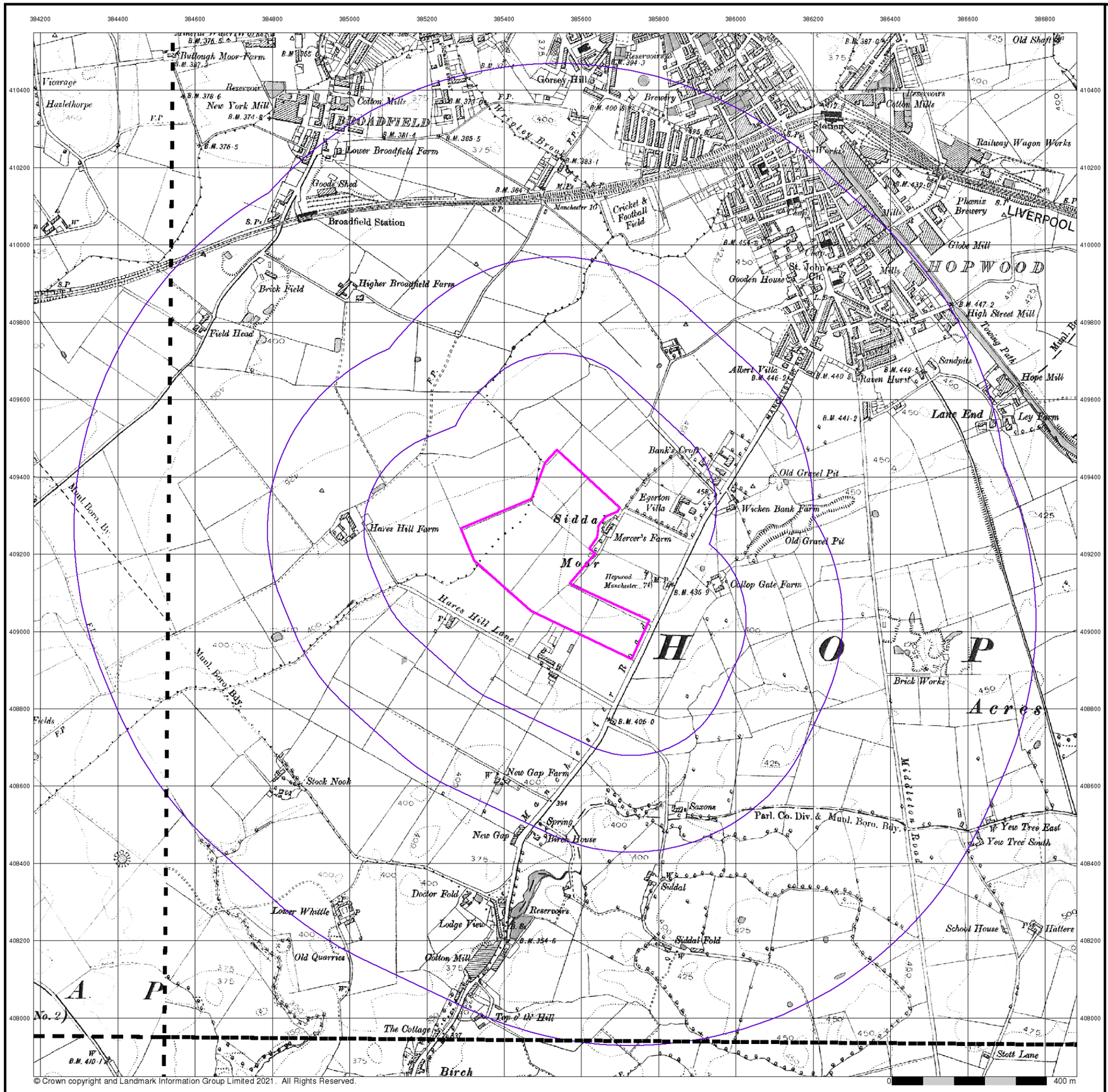
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Site Area (Ha):	11.19
Search Buffer (m):	1000

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RSK

Lancashire And Furness

Published 1894

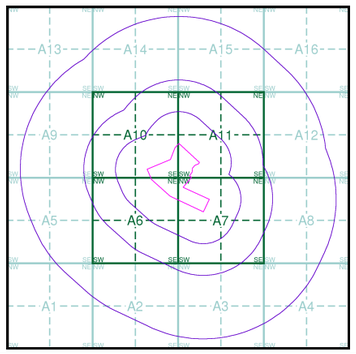
Source map scale - 1:10,560

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)

088SW 1894 1:10,560	088SE 1894 1:10,560
096NW 1894 1:10,560	096NE 1894 1:10,560

Historical Map - Slice A



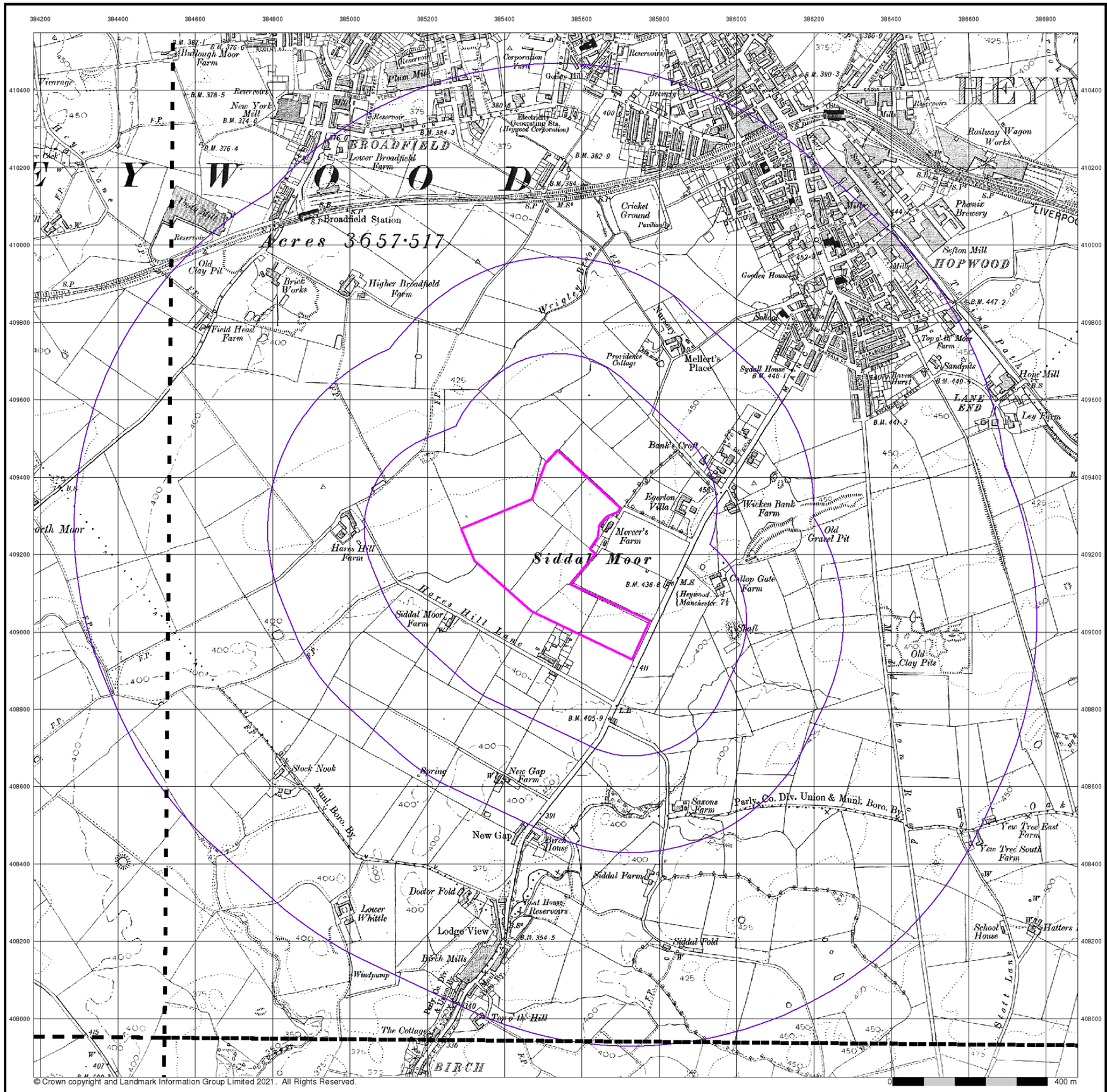
Order Details

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RSK

Lancashire And Furness

Published 1910

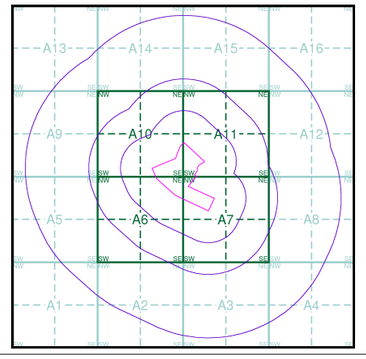
Source map scale - 1:10,560

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)

088SW 1910 1:10,560	088SE 1910 1:10,560
096NW 1910 1:10,560	096NE 1910 1:10,560

Historical Map - Slice A



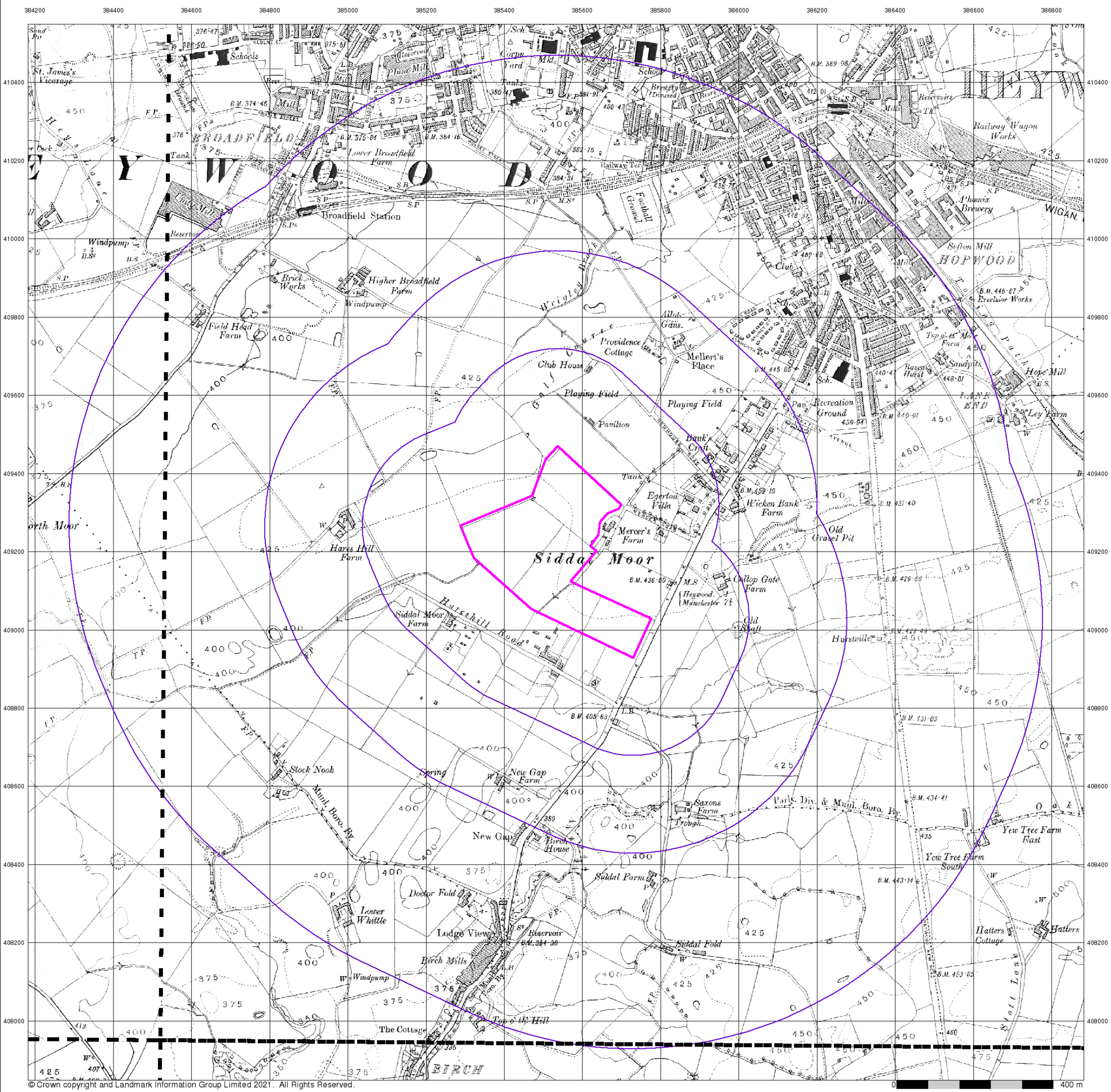
Order Details

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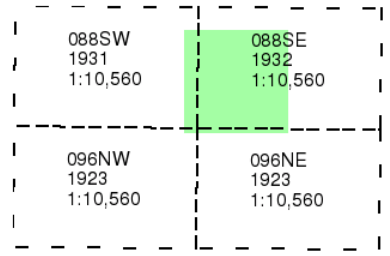
Lancashire And Furness

Published 1923 - 1932

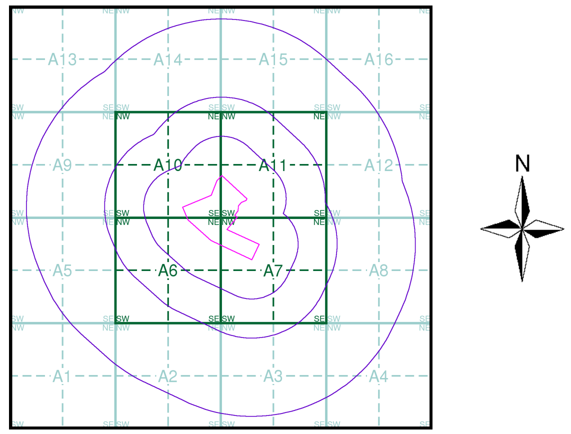
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

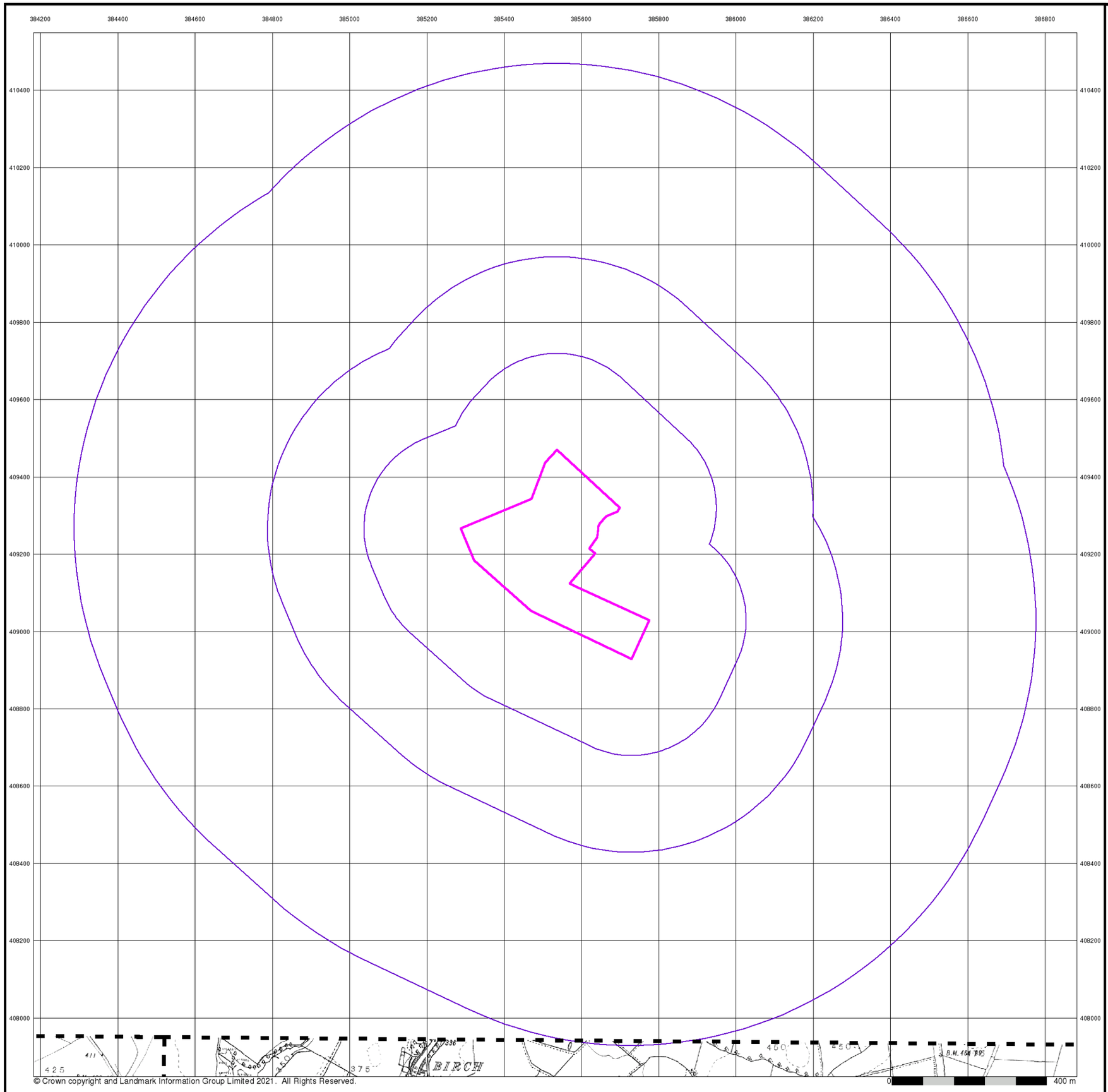
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Customer Ref: 322834
National Grid Reference: 385560, 409190
Slice: A
Site Area (Ha): 11.19
Search Buffer (m): 1000

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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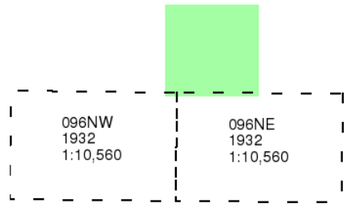
Lancashire And Furness

Published 1932

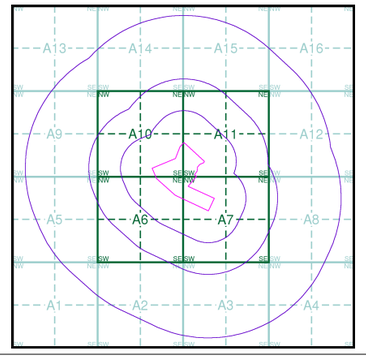
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



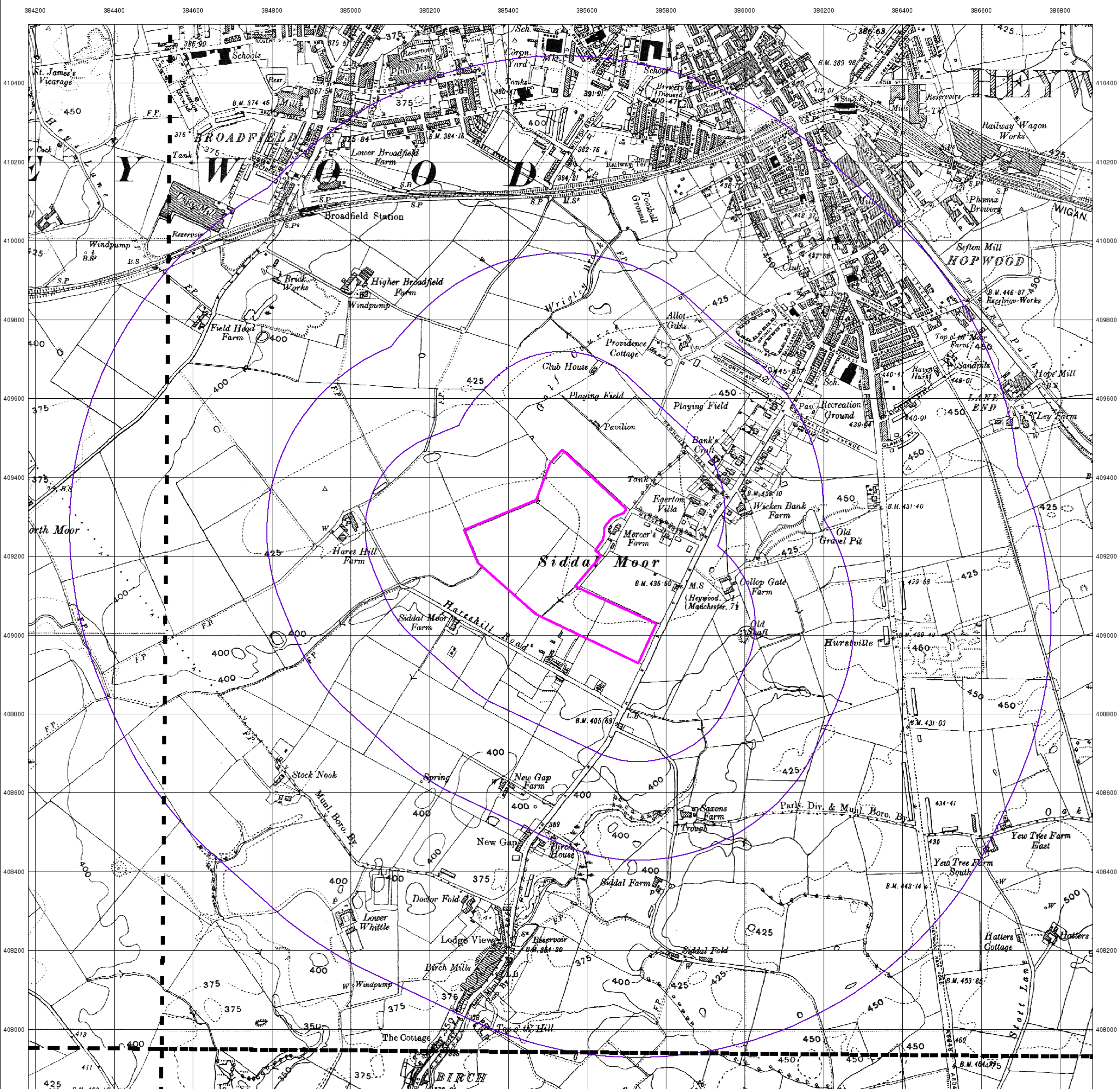
Order Details

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Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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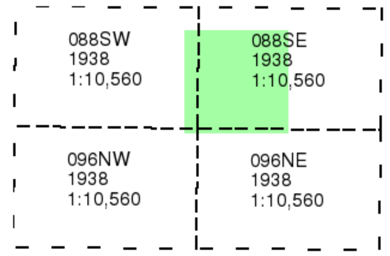
Lancashire And Furness

Published 1938

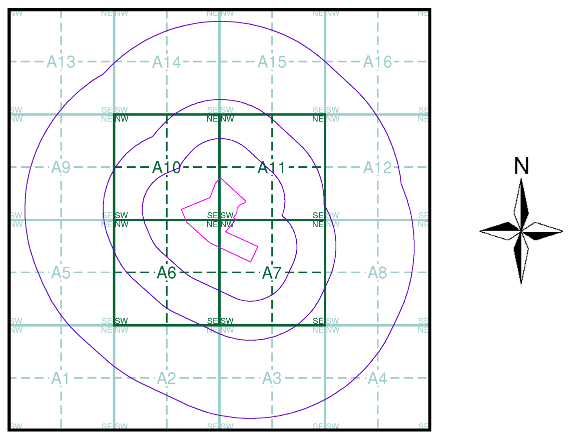
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



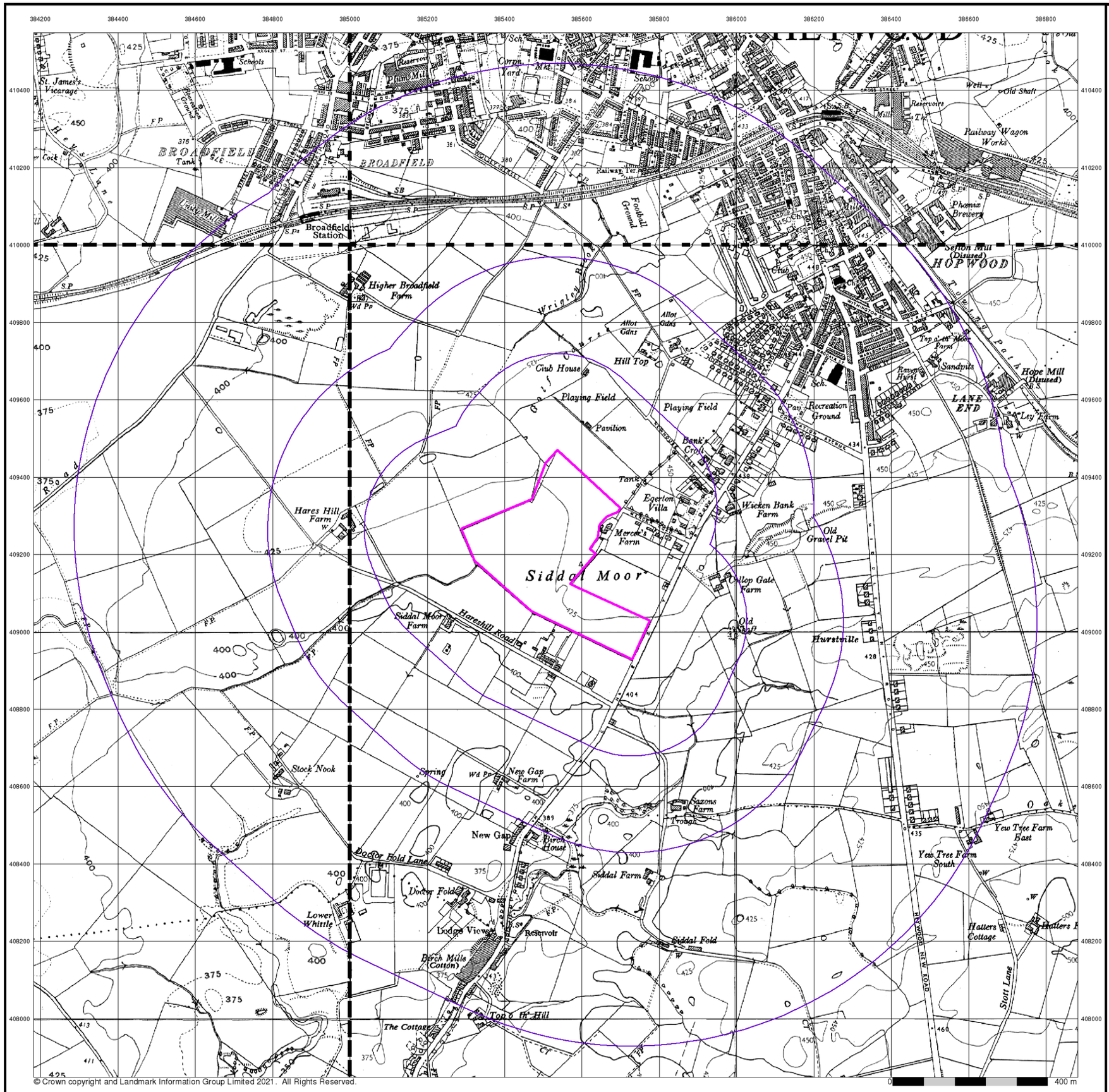
Order Details

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National Grid Reference: 385560, 409190
Slice: A
Site Area (Ha): 11.19
Search Buffer (m): 1000

Site Details

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Ordnance Survey Plan

Published 1955 - 1956

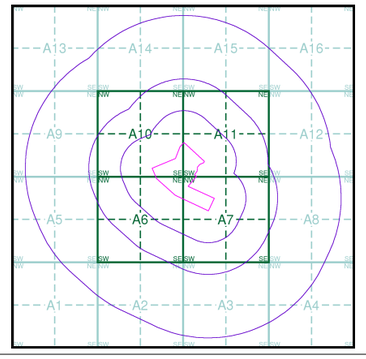
Source map scale - 1:10,000

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)

SD81SW 1956 1:10,560	SD81SE 1956 1:10,560
SD80NW 1955 1:10,560	SD80NE 1956 1:10,560

Historical Map - Slice A



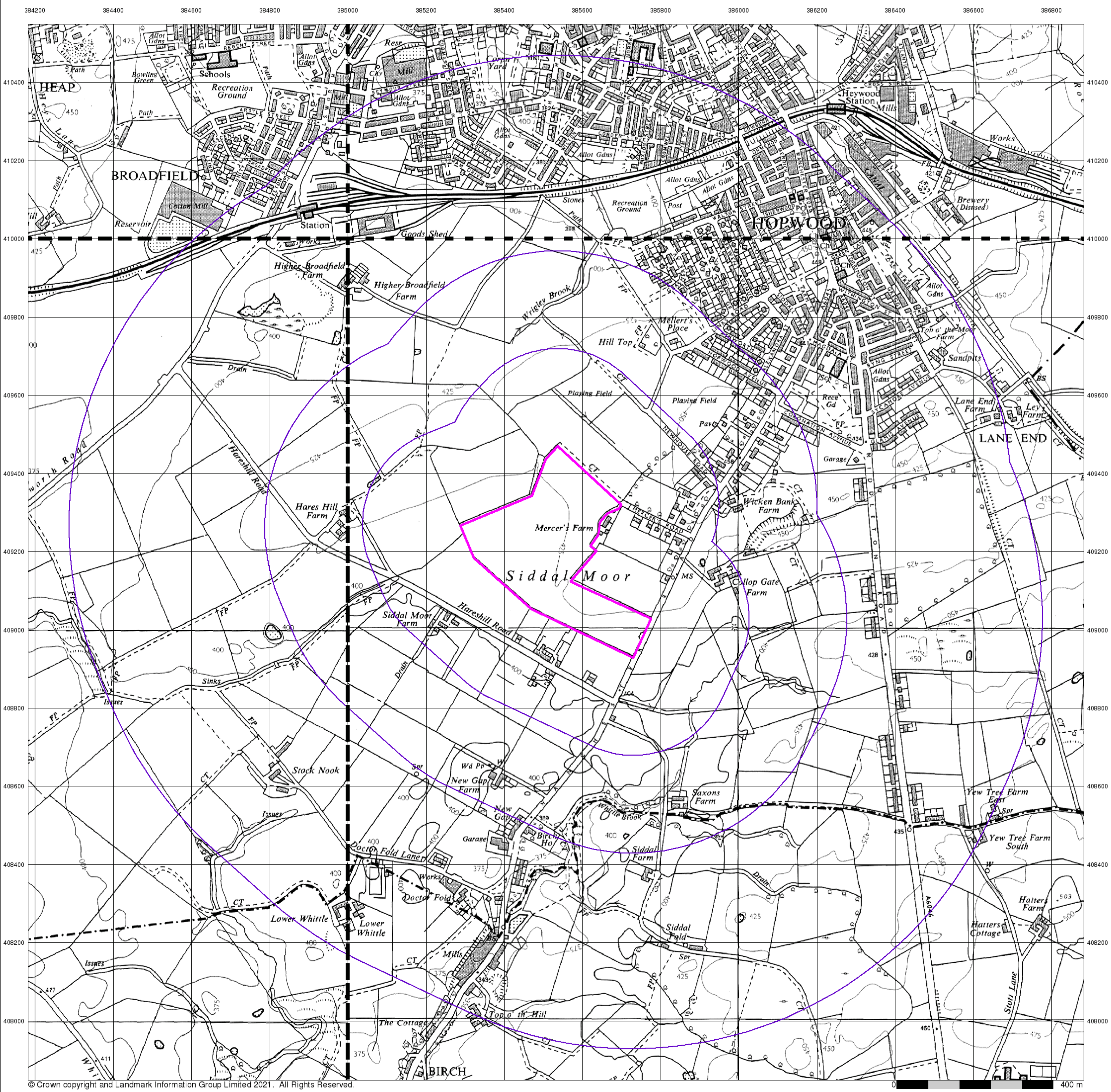
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

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Ordnance Survey Plan

Published 1965 - 1968

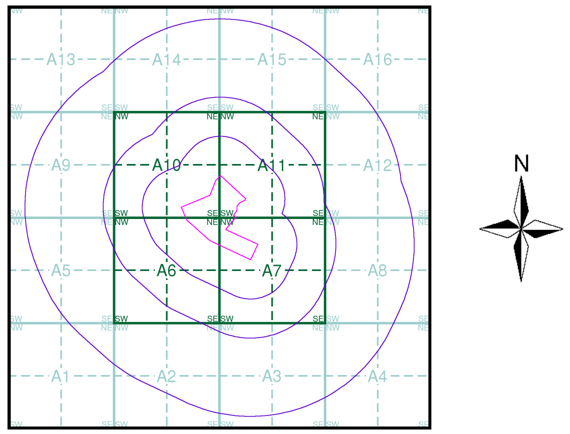
Source map scale - 1:10,000

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)

SD81SW 1967 1:10,560	SD81SE 1968 1:10,560
SD80NW 1965 1:10,560	SD80NE 1965 1:10,560

Historical Map - Slice A



Order Details

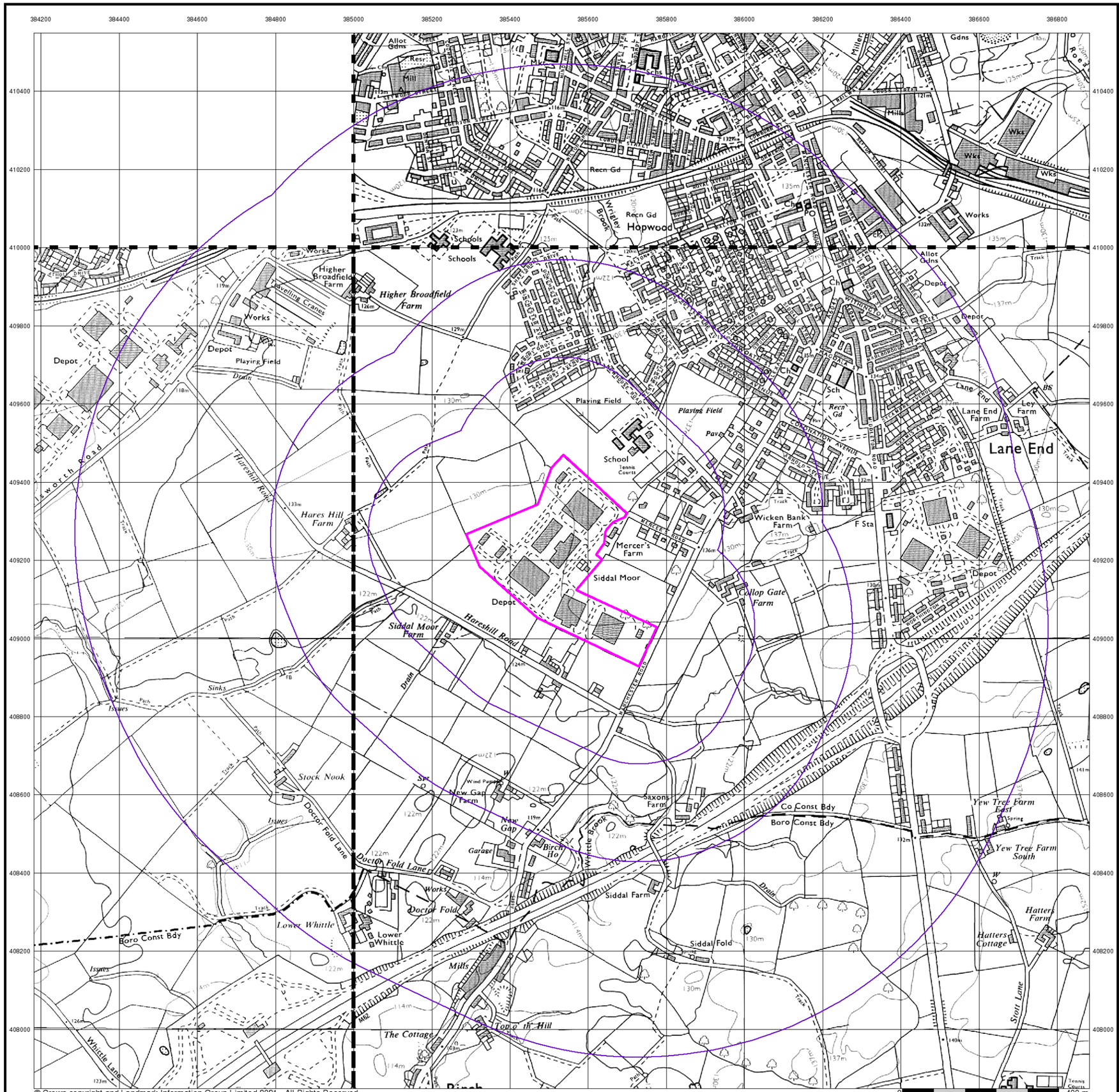
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Slice: A
Site Area (Ha): 11.19
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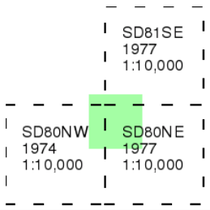
Ordnance Survey Plan

Published 1974 - 1977

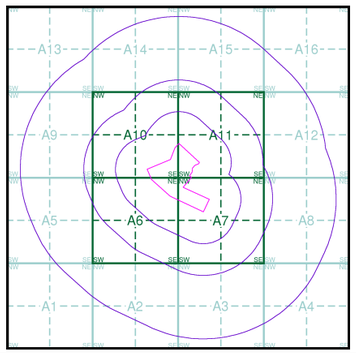
Source map scale - 1:10,000

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

Map Name(s) and Date(s)



Historical Map - Slice A



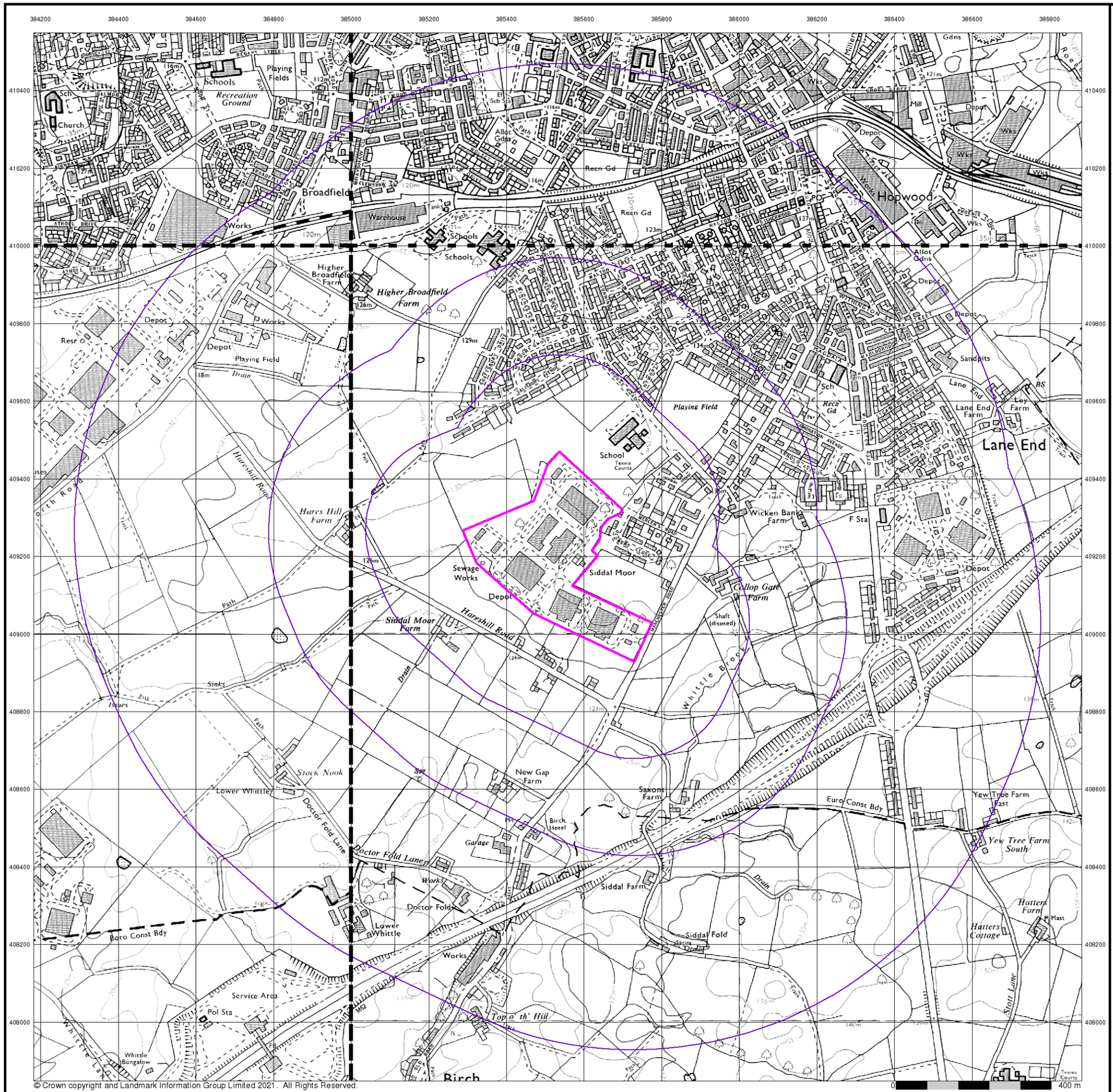
Order Details

Order Number:	281815927_1_1
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National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

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Ordnance Survey Plan

Published 1983 - 1988

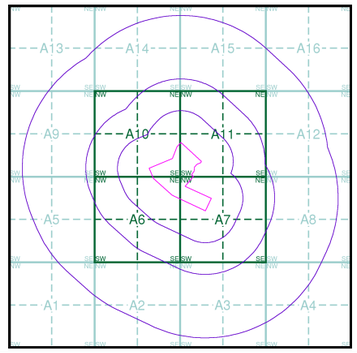
Source map scale - 1:10,000

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)

SD81SW 1984 1:10,000	SD81SE 1988 1:10,000
SD80NW 1983 1:10,000	SD80NE 1984 1:10,000

Historical Map - Slice A



Order Details

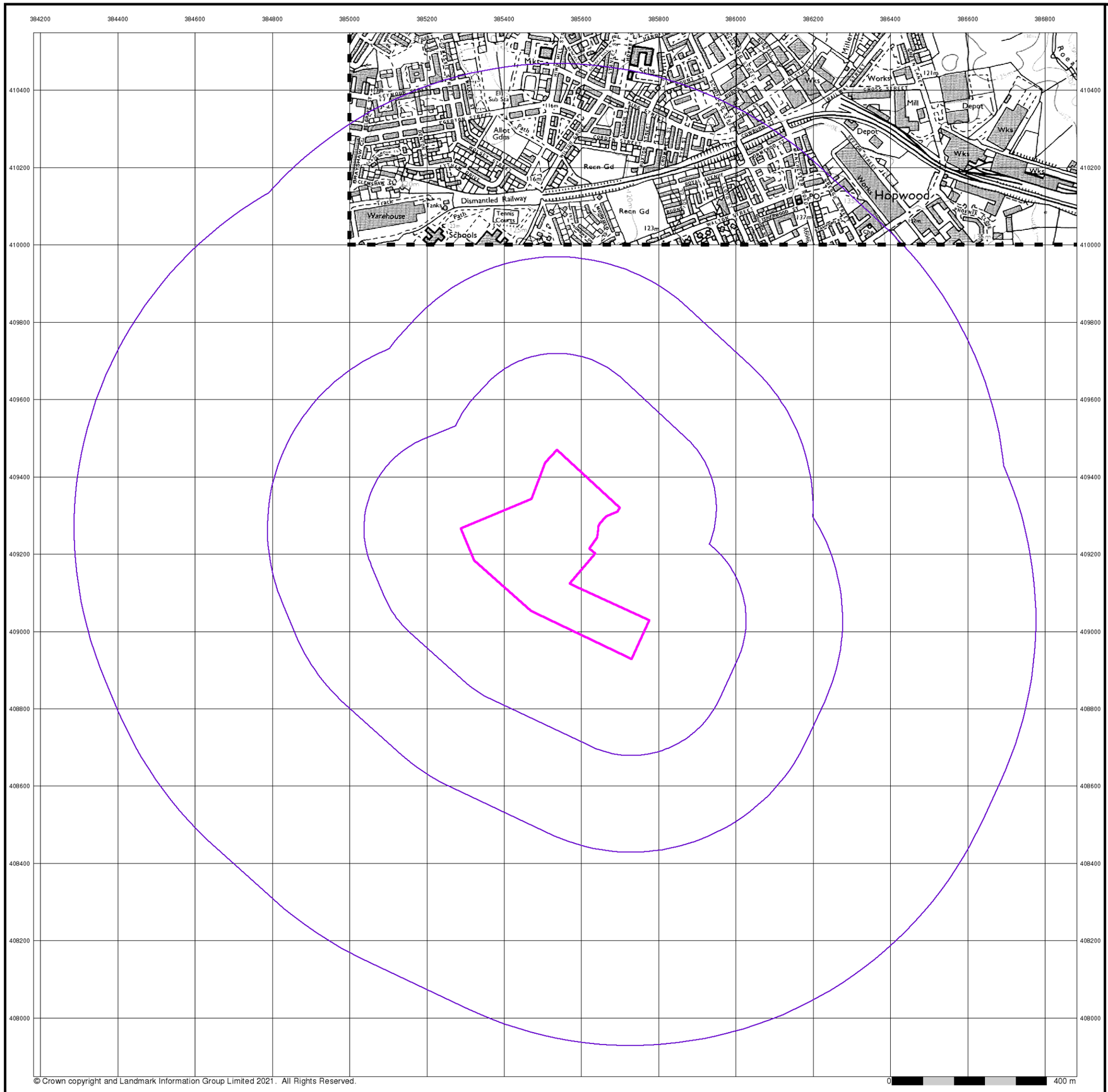
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Search Buffer (m):	1000

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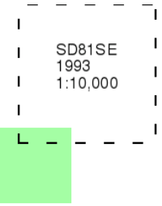
Ordnance Survey Plan

Published 1993

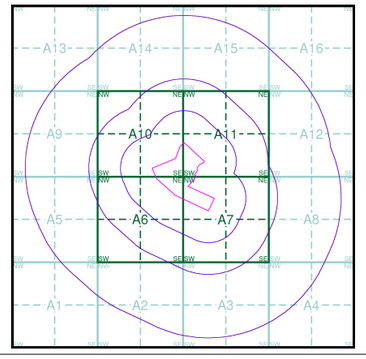
Source map scale - 1:10,000

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Map Name(s) and Date(s)



Historical Map - Slice A



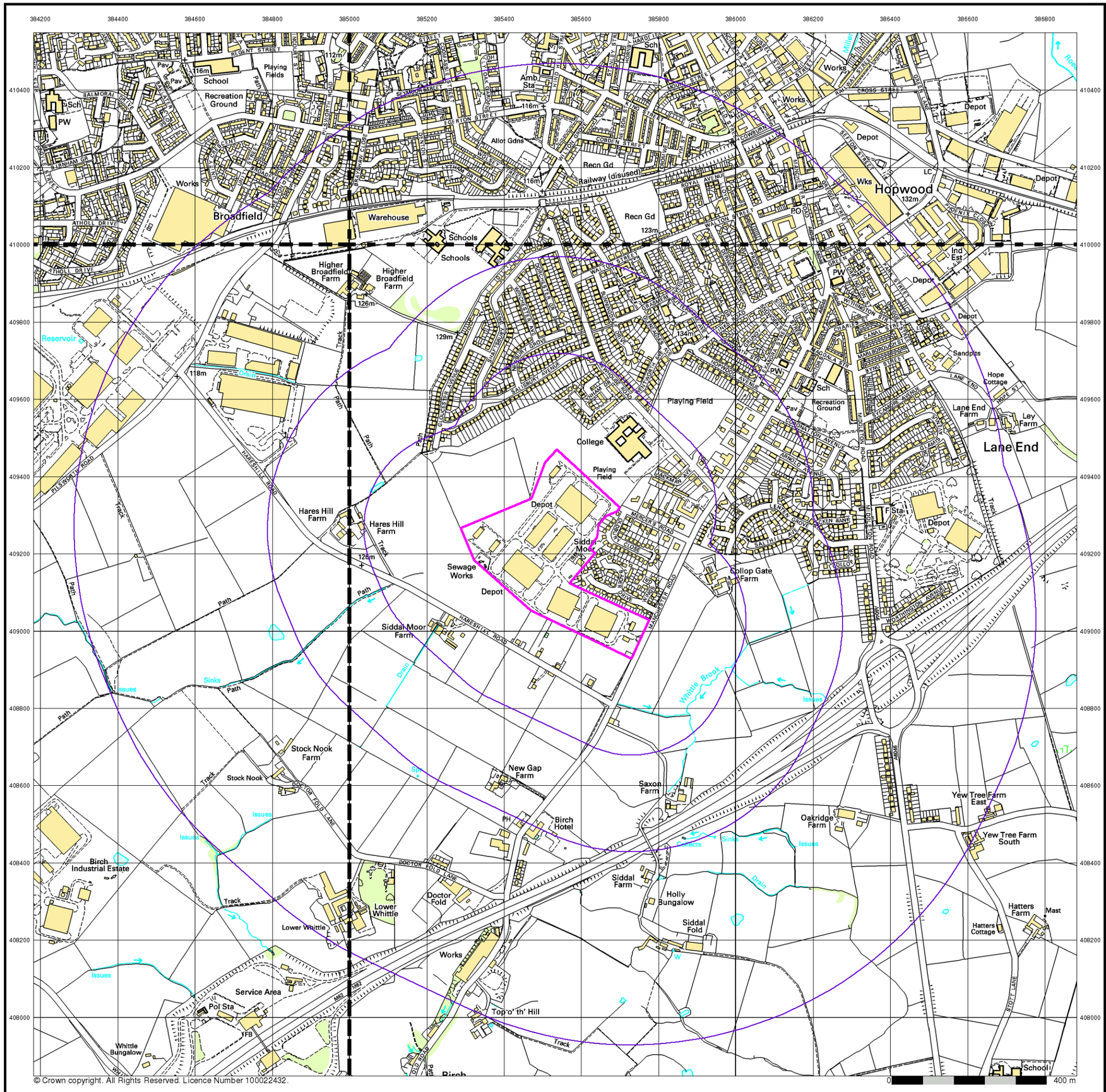
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10k Raster Mapping

Published 1999

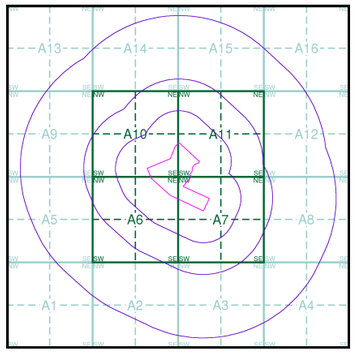
Source map scale - 1:10,000

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

Map Name(s) and Date(s)

SD81SW 1999 1:10,000	SD81SE 1999 1:10,000
SD80NW 1999 1:10,000	SD80NE 1999 1:10,000

Historical Map - Slice A



Order Details

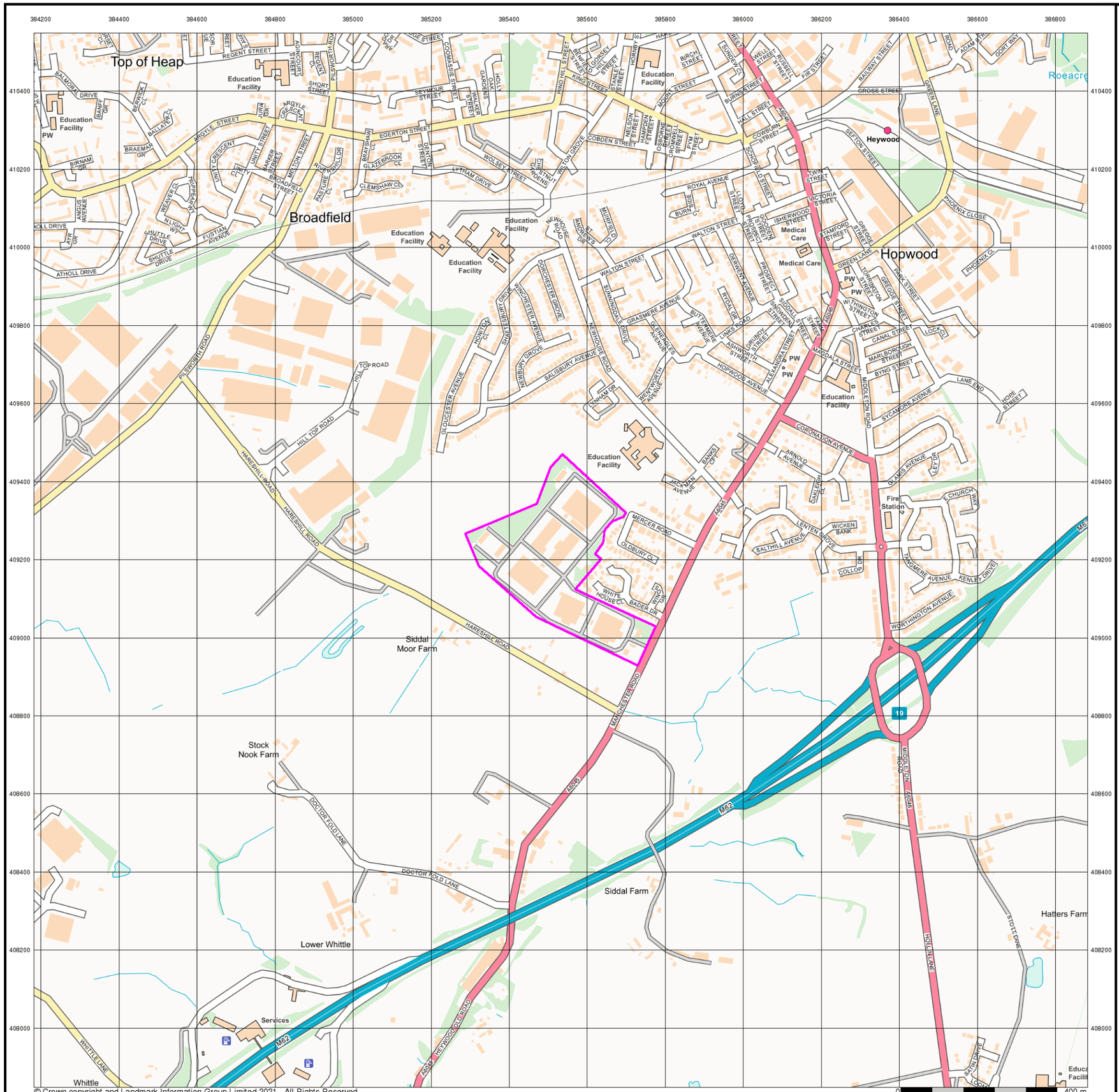
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Search Buffer (m):	1000

Site Details

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Street View

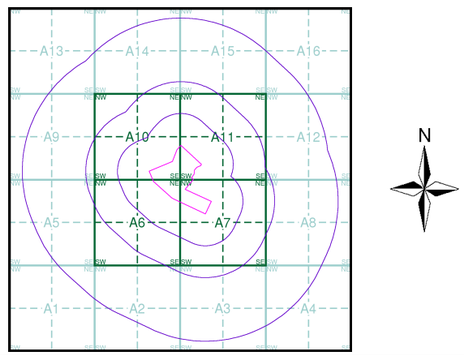
Published 2021

Source map scale - 1:10,000

Street View is a street-level map for the whole of Great Britain produced by the Ordnance Survey. These maps are provided at a nominal scale of 1:10,000

Map Name(s) and Date(s)

Street View Map - Slice A



Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

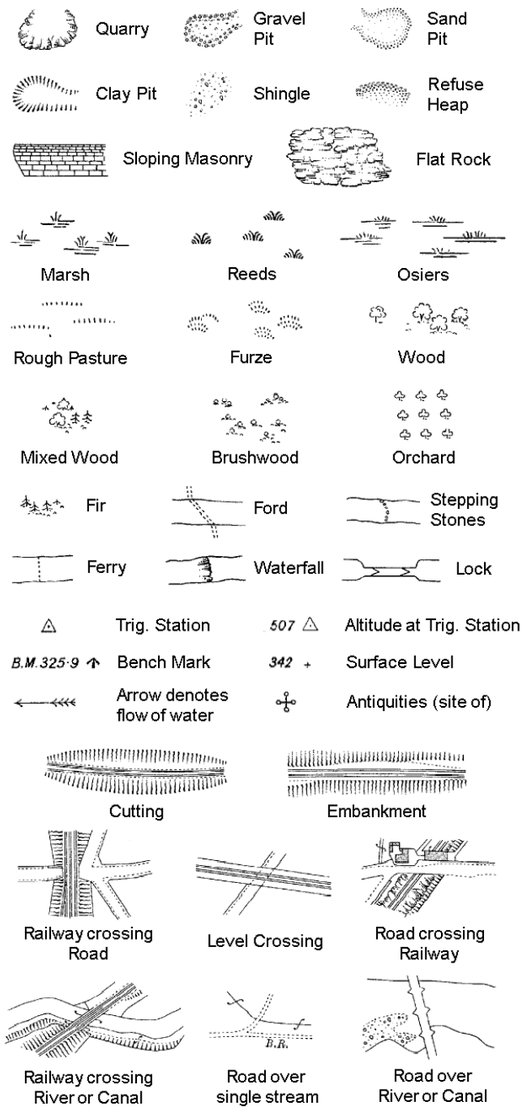
Site Details

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Historical Mapping Legends

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



County Boundary (Geographical)

County & Civil Parish Boundary

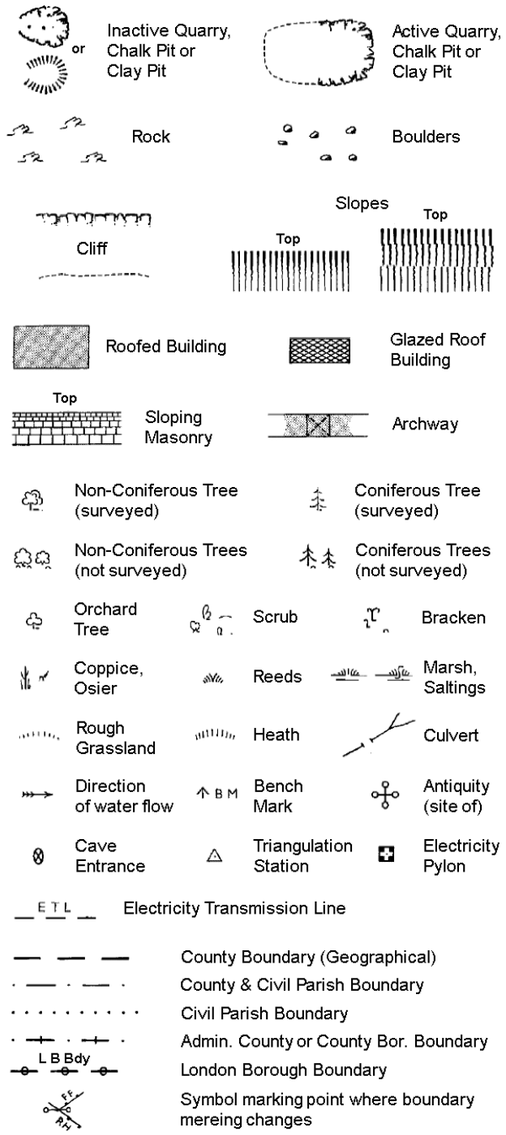
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

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

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



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

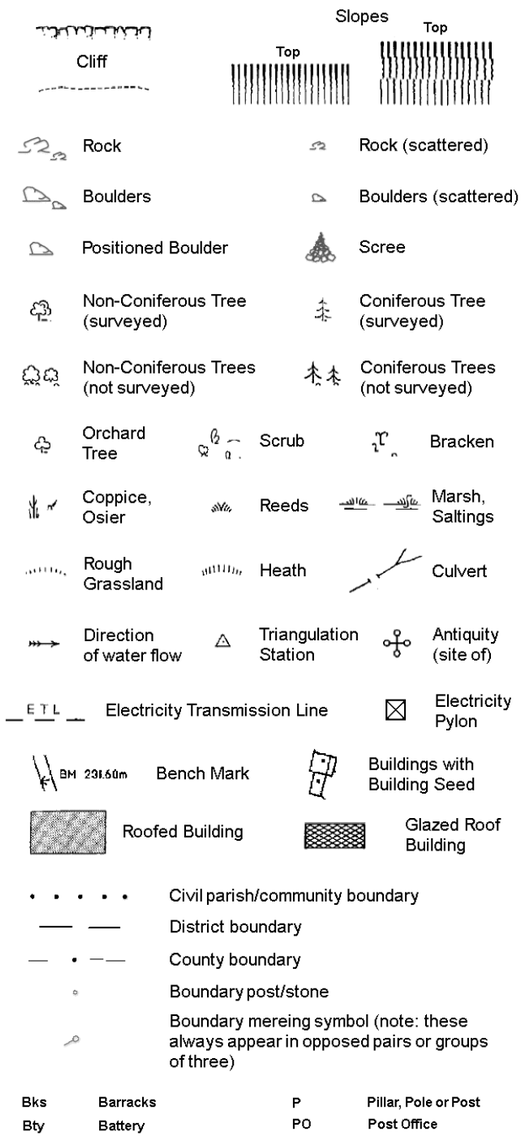
Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

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

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



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

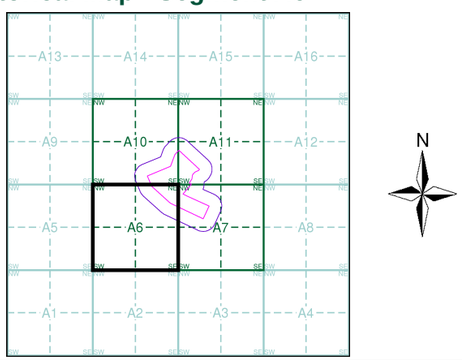
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity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

RSK

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1910	3
Lancashire And Furness	1:2,500	1929	4
Lancashire And Furness	1:2,500	1937	5
Ordnance Survey Plan	1:2,500	1956 - 1957	6
Ordnance Survey Plan	1:1,250	1956	7
Ordnance Survey Plan	1:2,500	1969 - 1981	8
Ordnance Survey Plan	1:1,250	1972	9
Additional SIMs	1:1,250	1972 - 1983	10
Additional SIMs	1:1,250	1977	11
Additional SIMs	1:1,250	1984	12
Ordnance Survey Plan	1:1,250	1986	13
Large-Scale National Grid Data	1:1,250	1992	14
Large-Scale National Grid Data	1:2,500	1992	15
Large-Scale National Grid Data	1:1,250	1994	16

Historical Map - Segment A6



Order Details

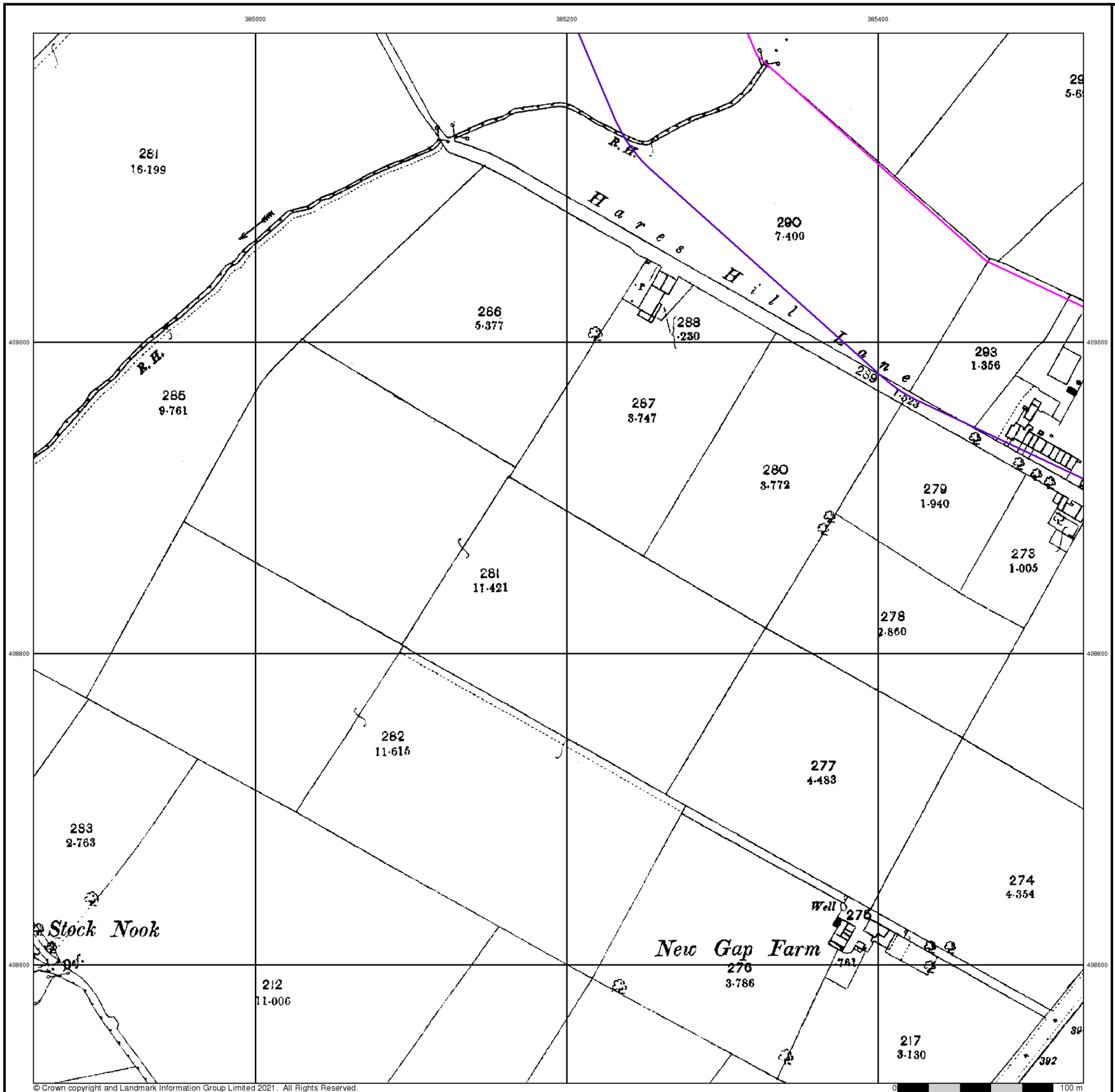
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Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

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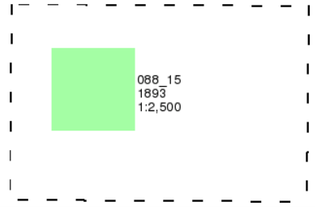
Lancashire And Furness

Published 1893

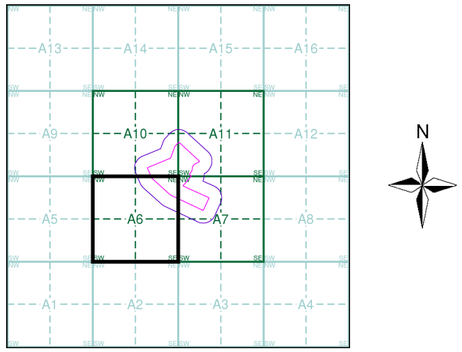
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A6



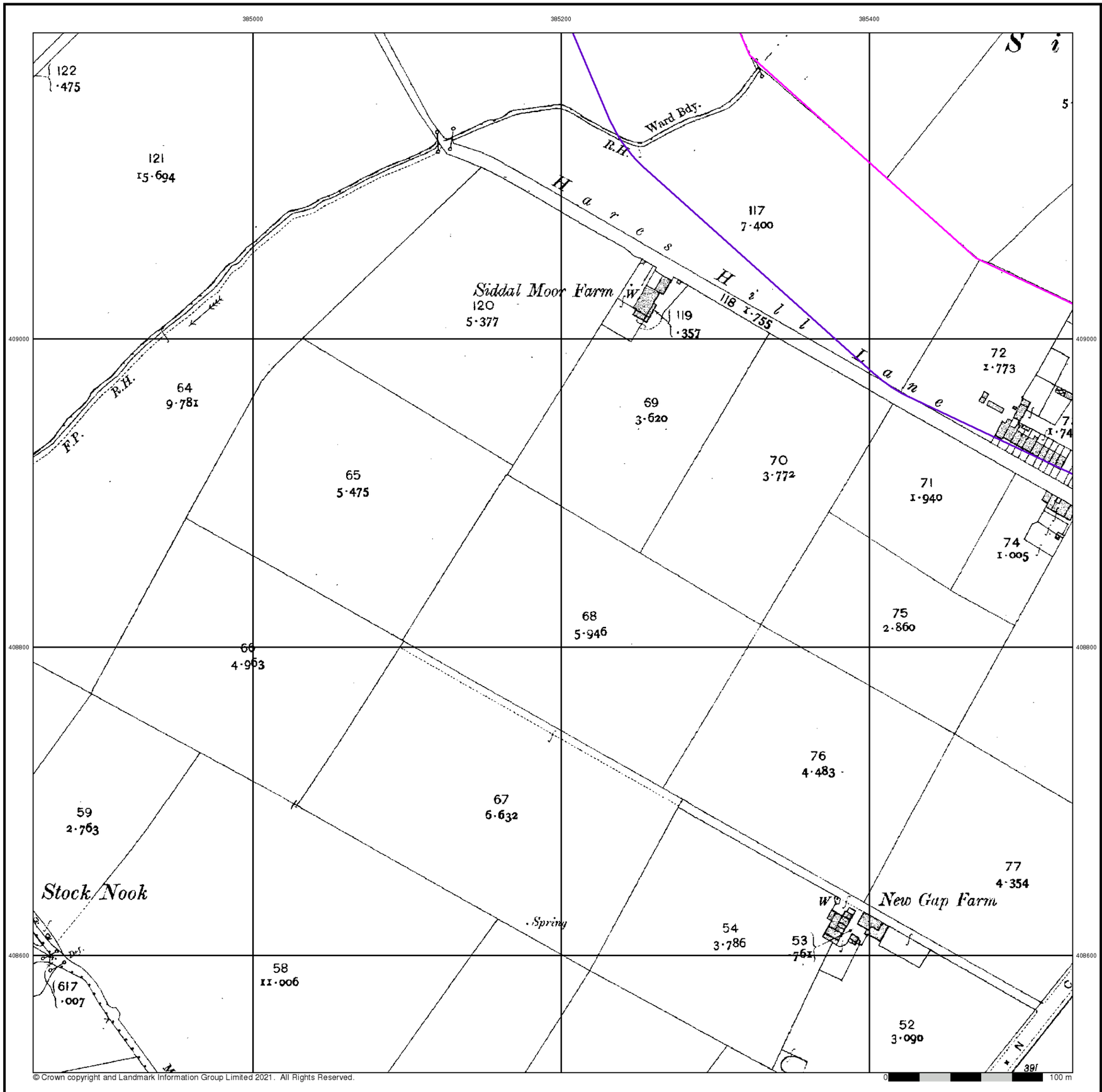
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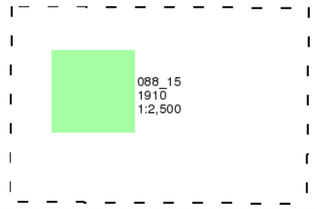
Lancashire And Furness

Published 1910

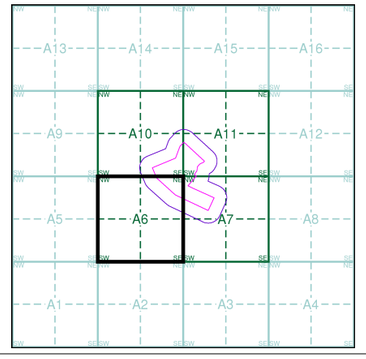
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A6



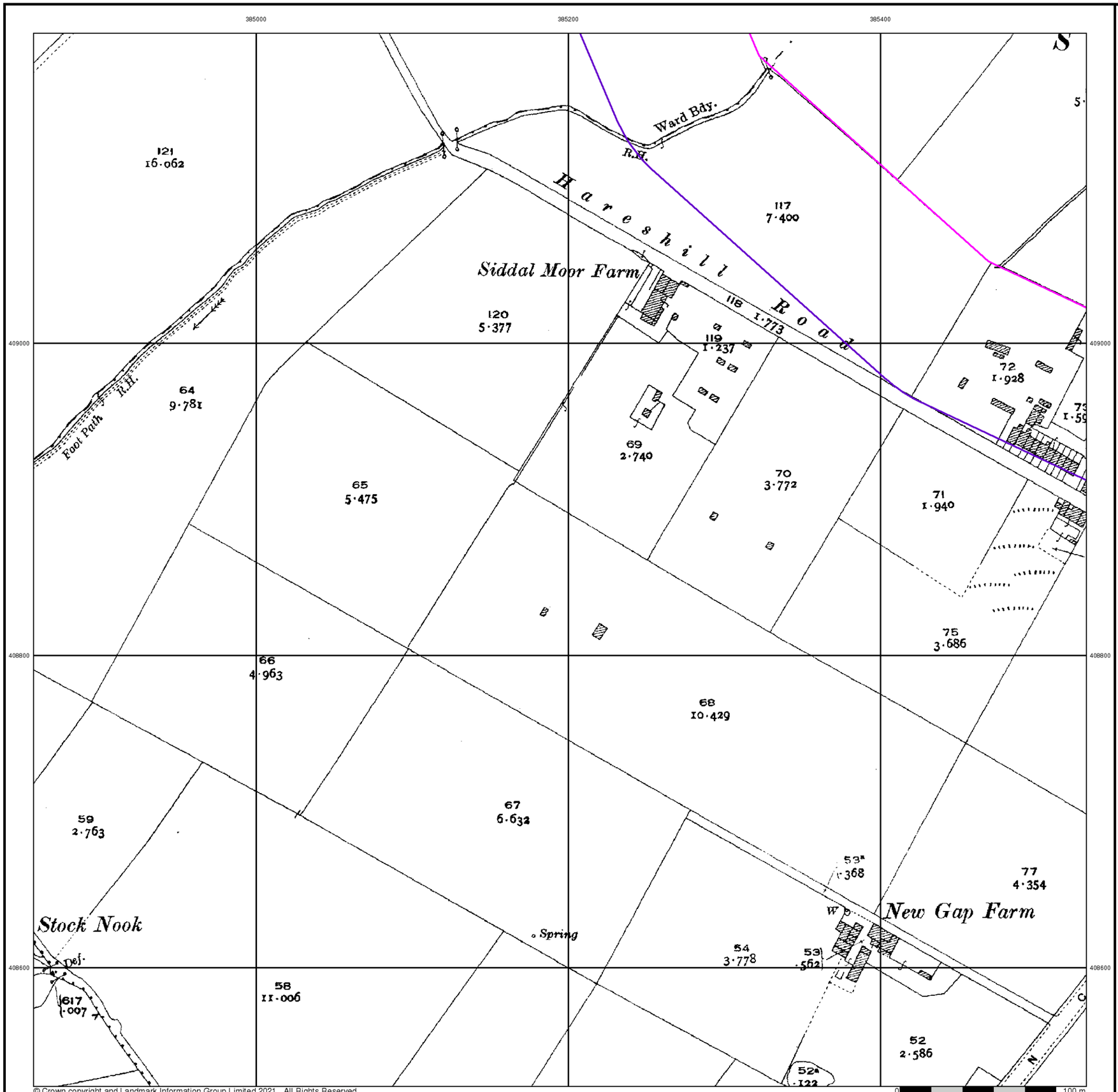
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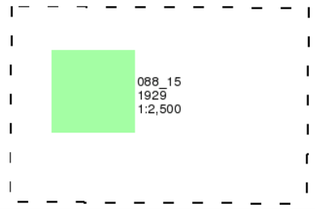
Lancashire And Furness

Published 1929

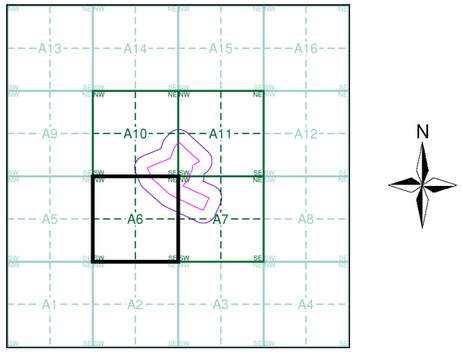
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A6



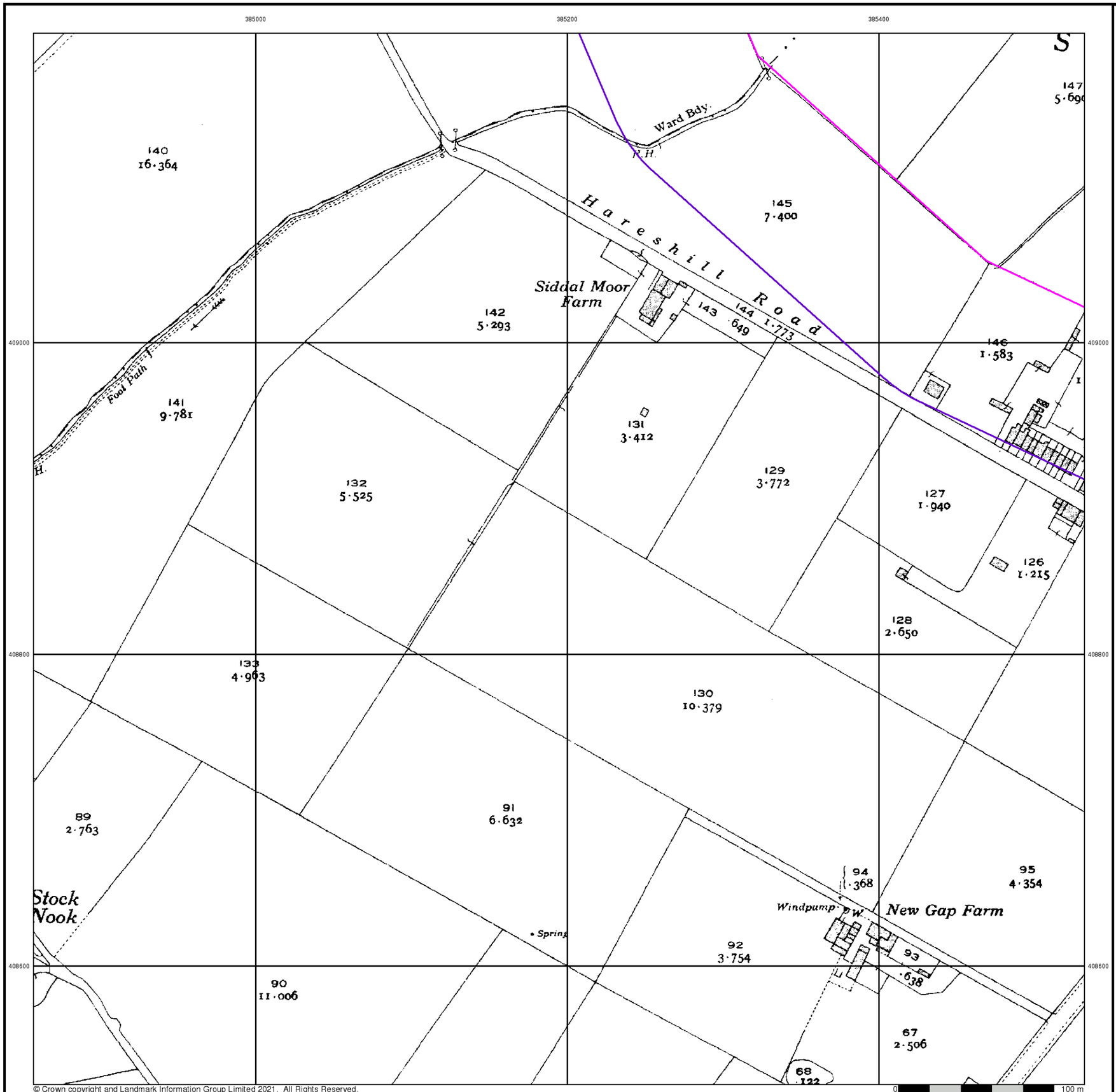
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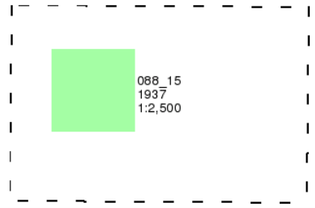
Lancashire And Furness

Published 1937

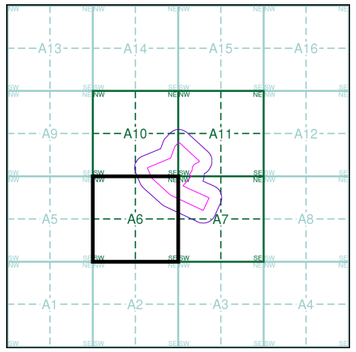
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A6



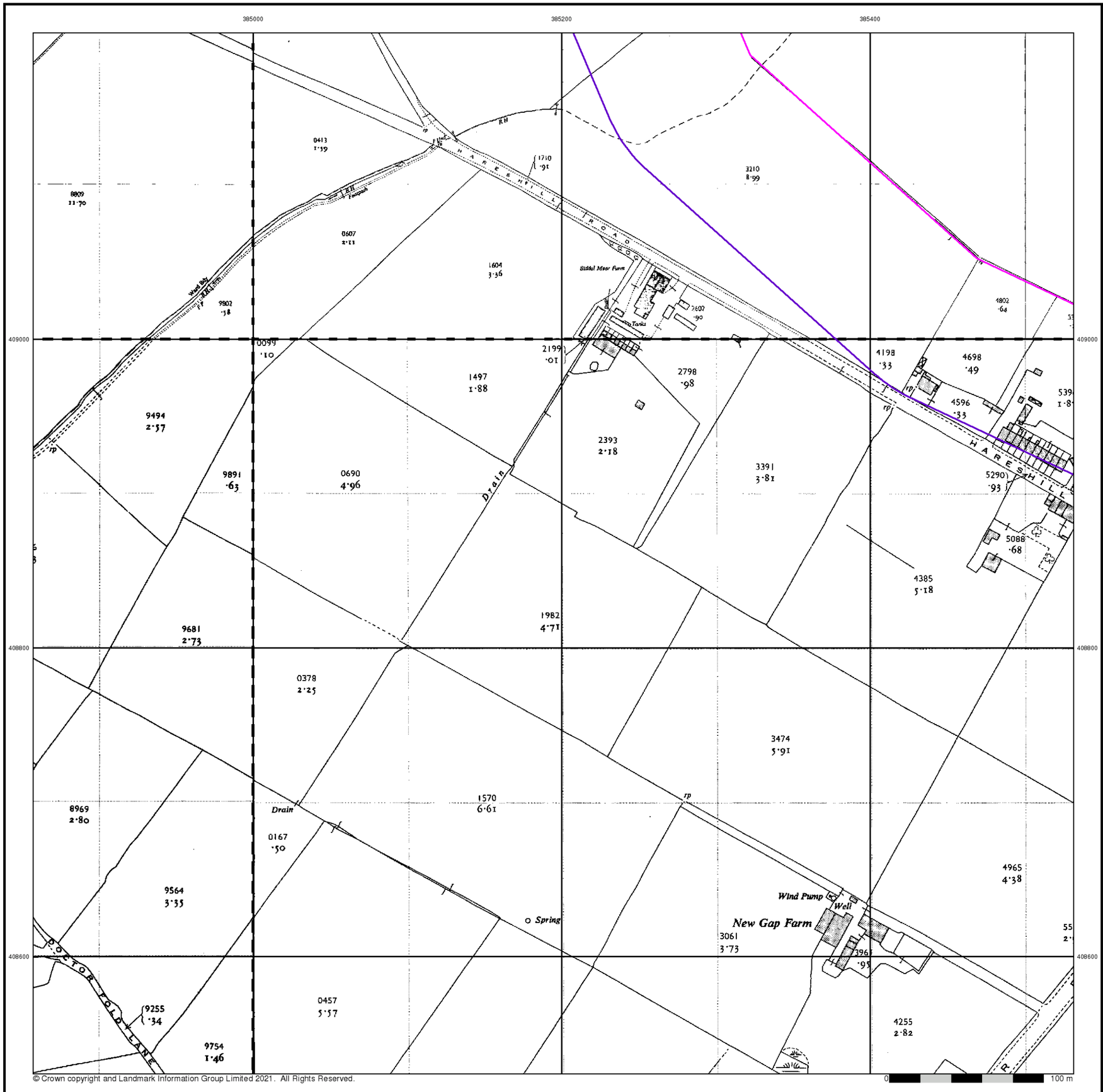
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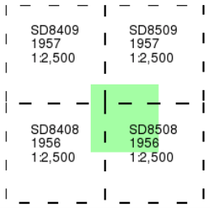
Ordnance Survey Plan

Published 1956 - 1957

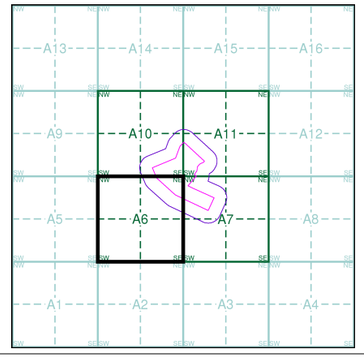
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A6



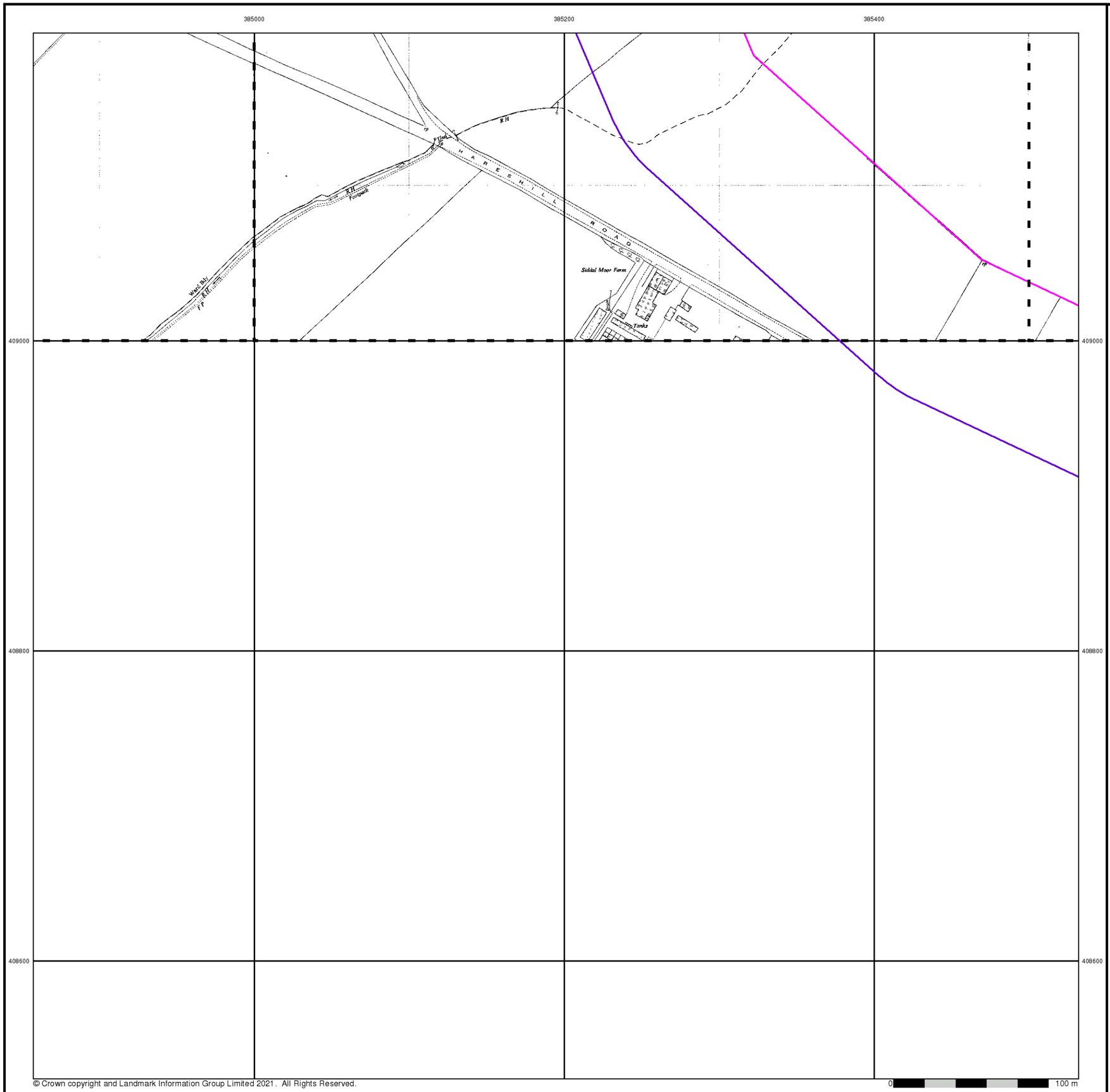
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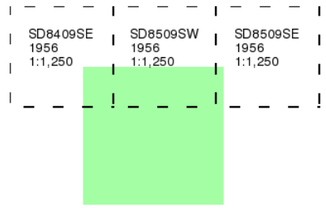
Ordnance Survey Plan

Published 1956

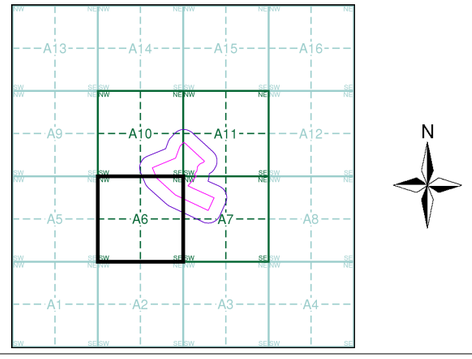
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A6



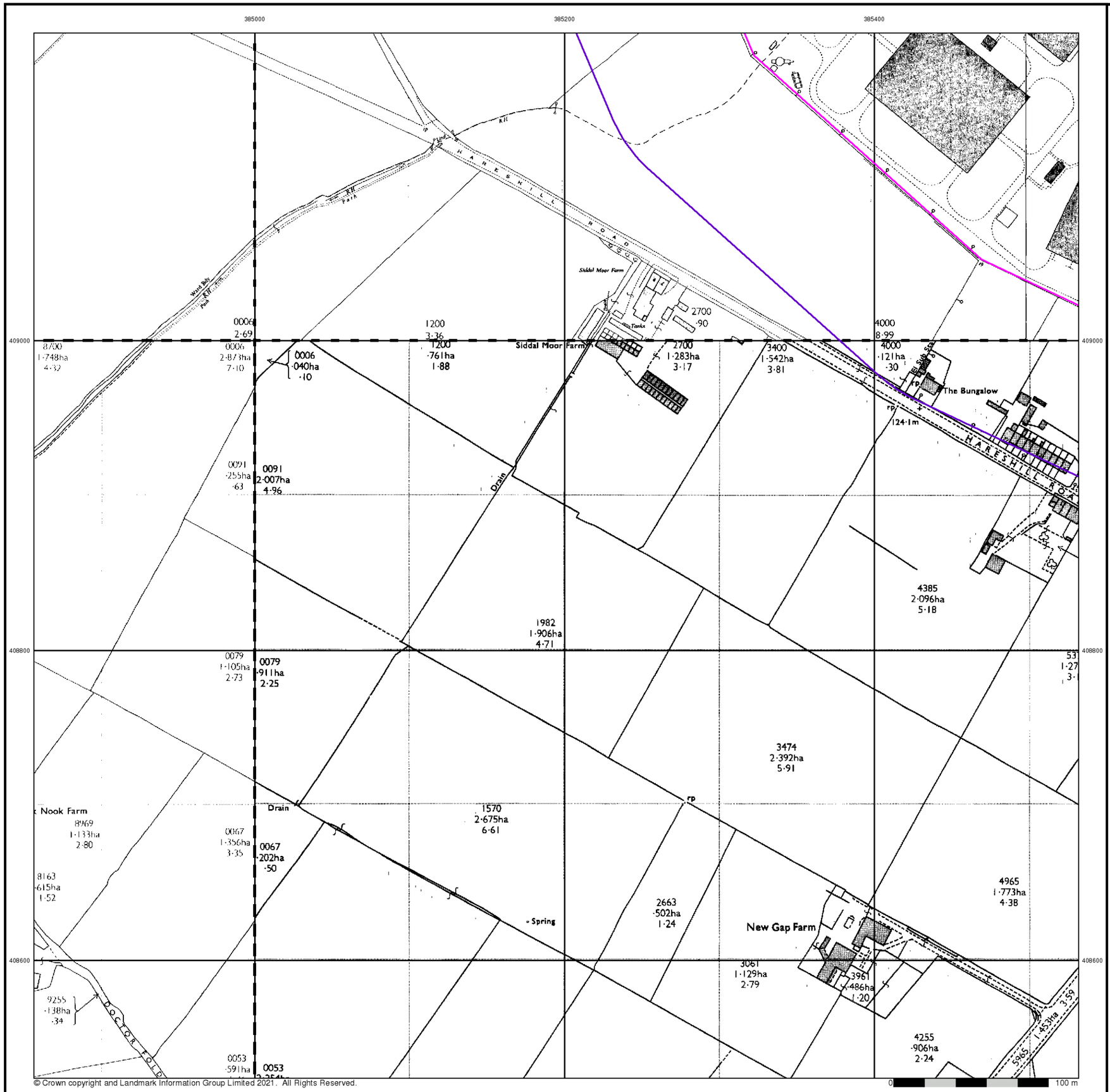
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National Grid Reference:	385560, 409190
Slice:	A
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Site Details

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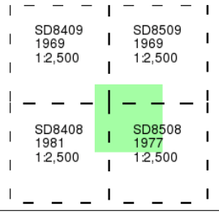
Ordnance Survey Plan

Published 1969 - 1981

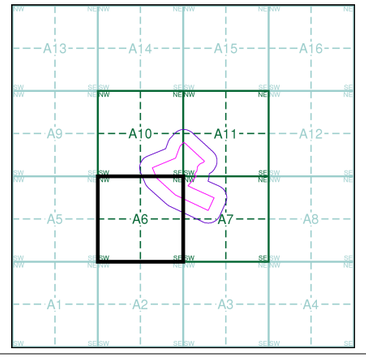
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered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

Map Name(s) and Date(s)



Historical Map - Segment A6



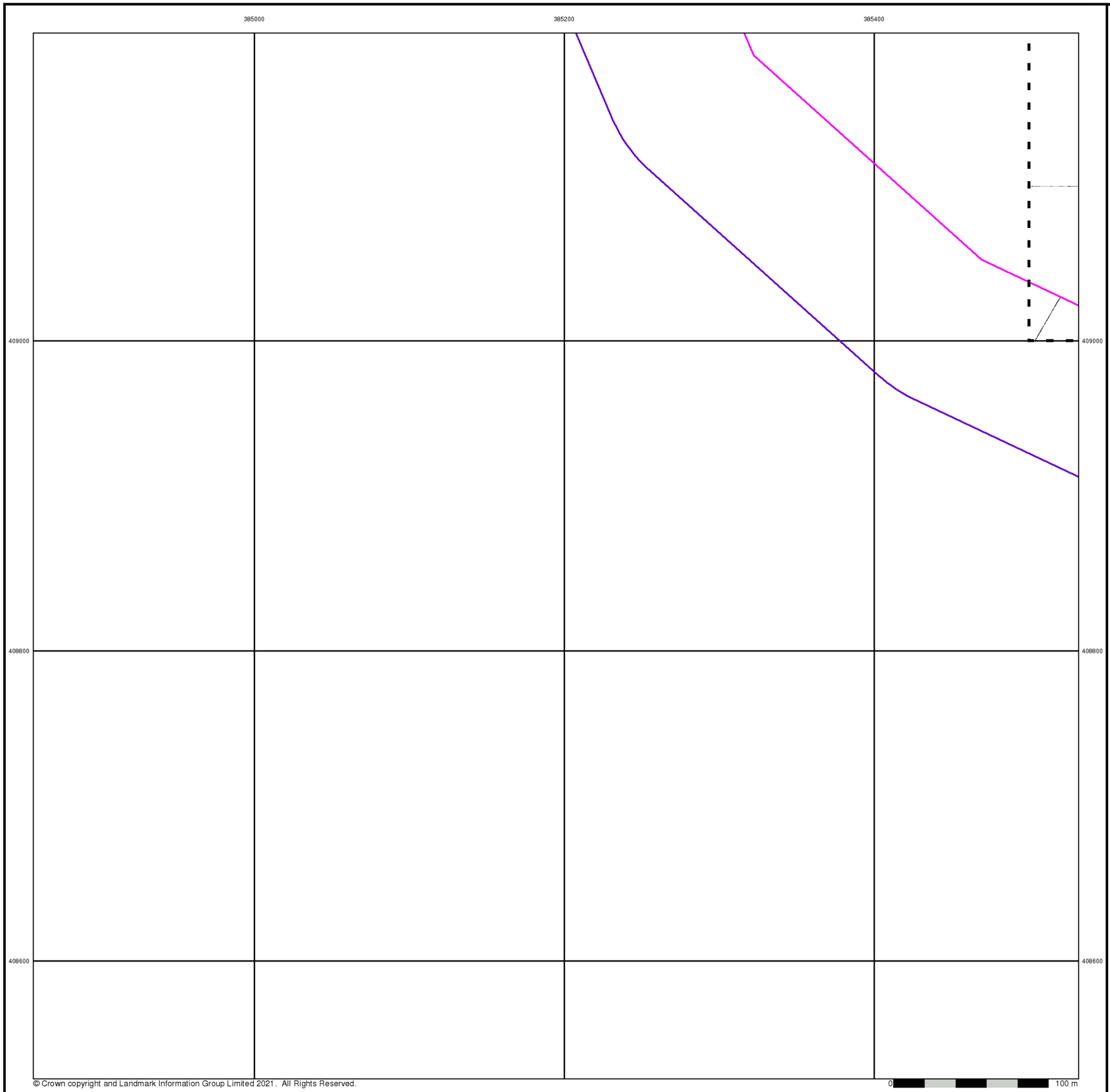
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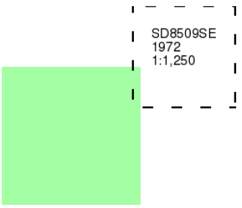
Ordnance Survey Plan

Published 1972

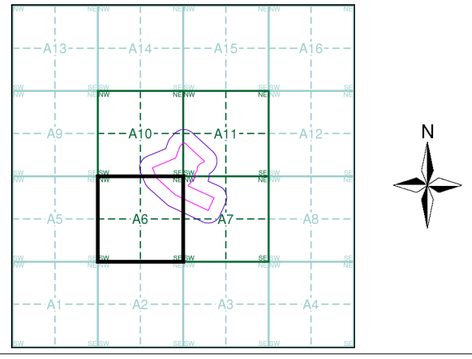
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A6



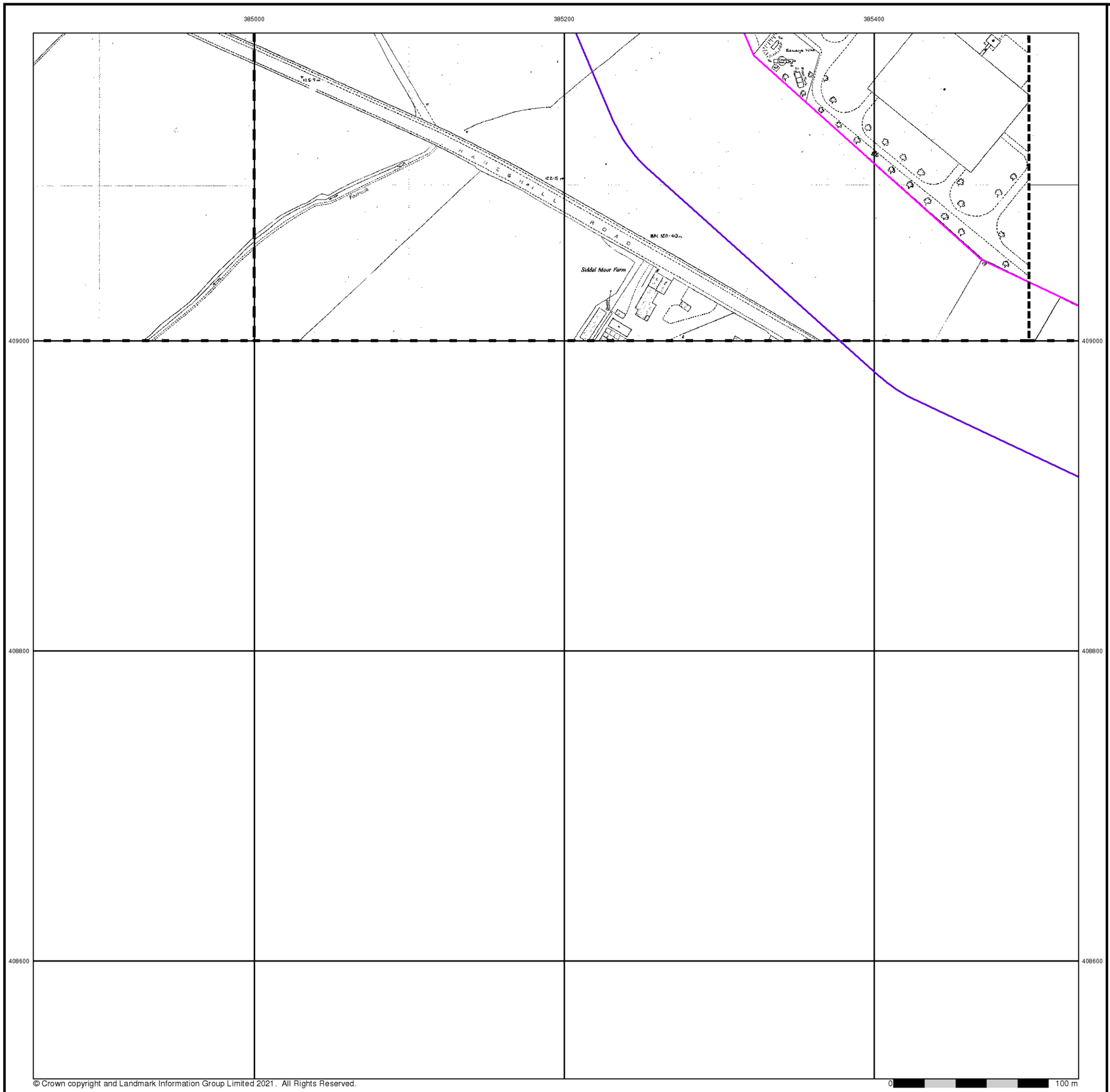
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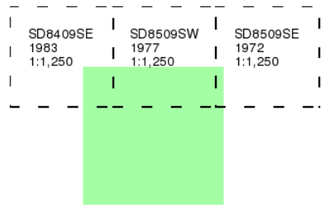
Additional SIMs

Published 1972 - 1983

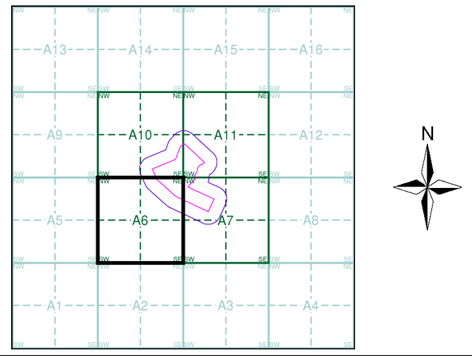
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A6



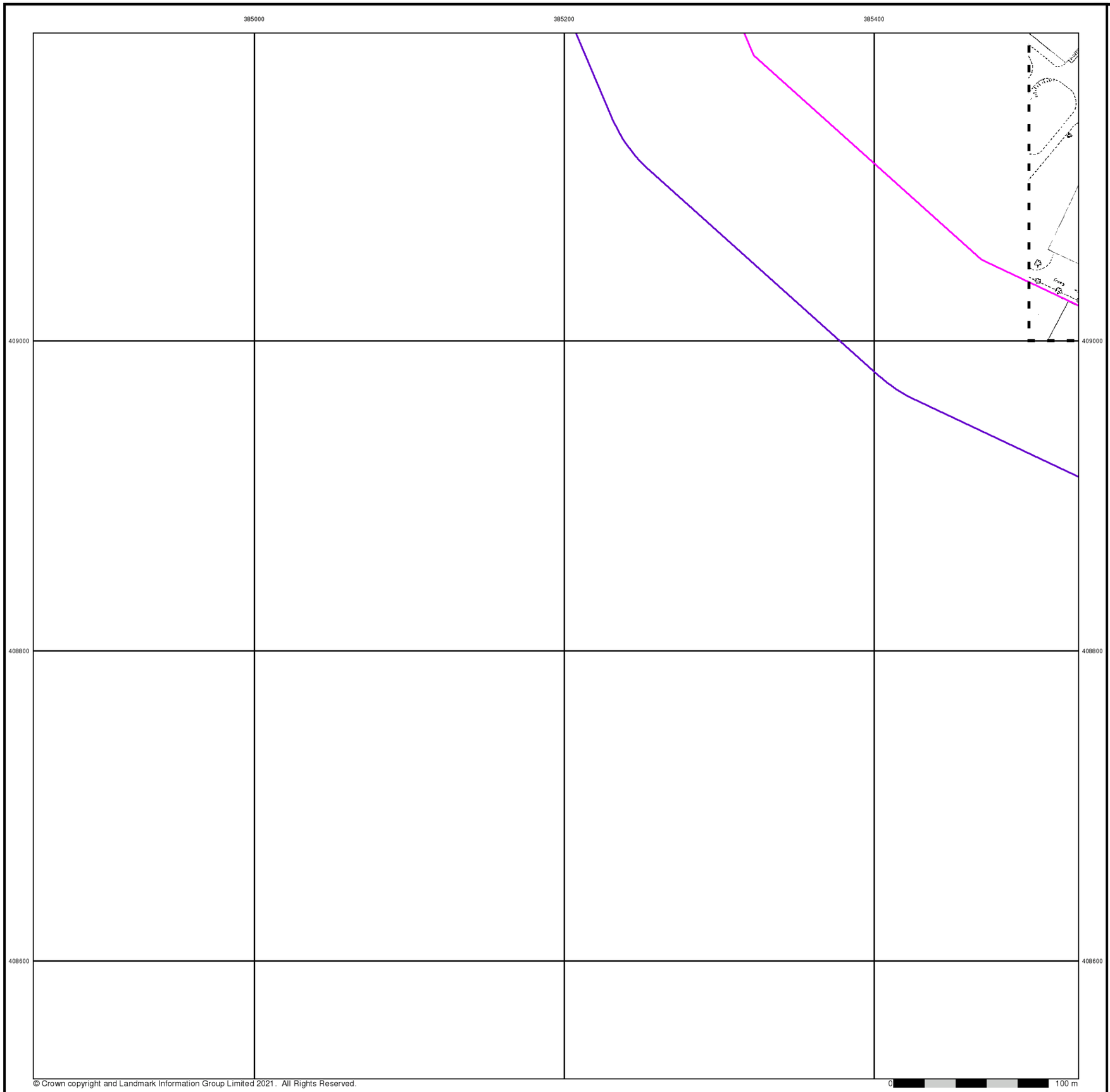
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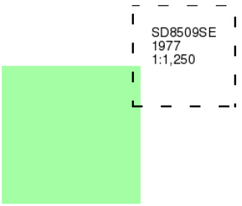
Additional SIMs

Published 1977

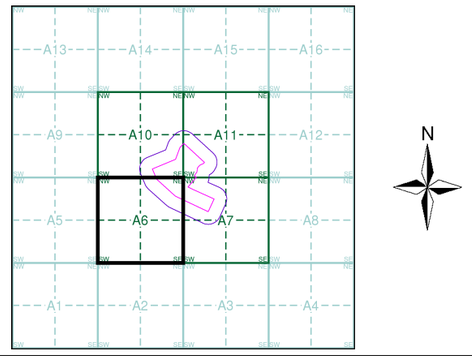
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A6



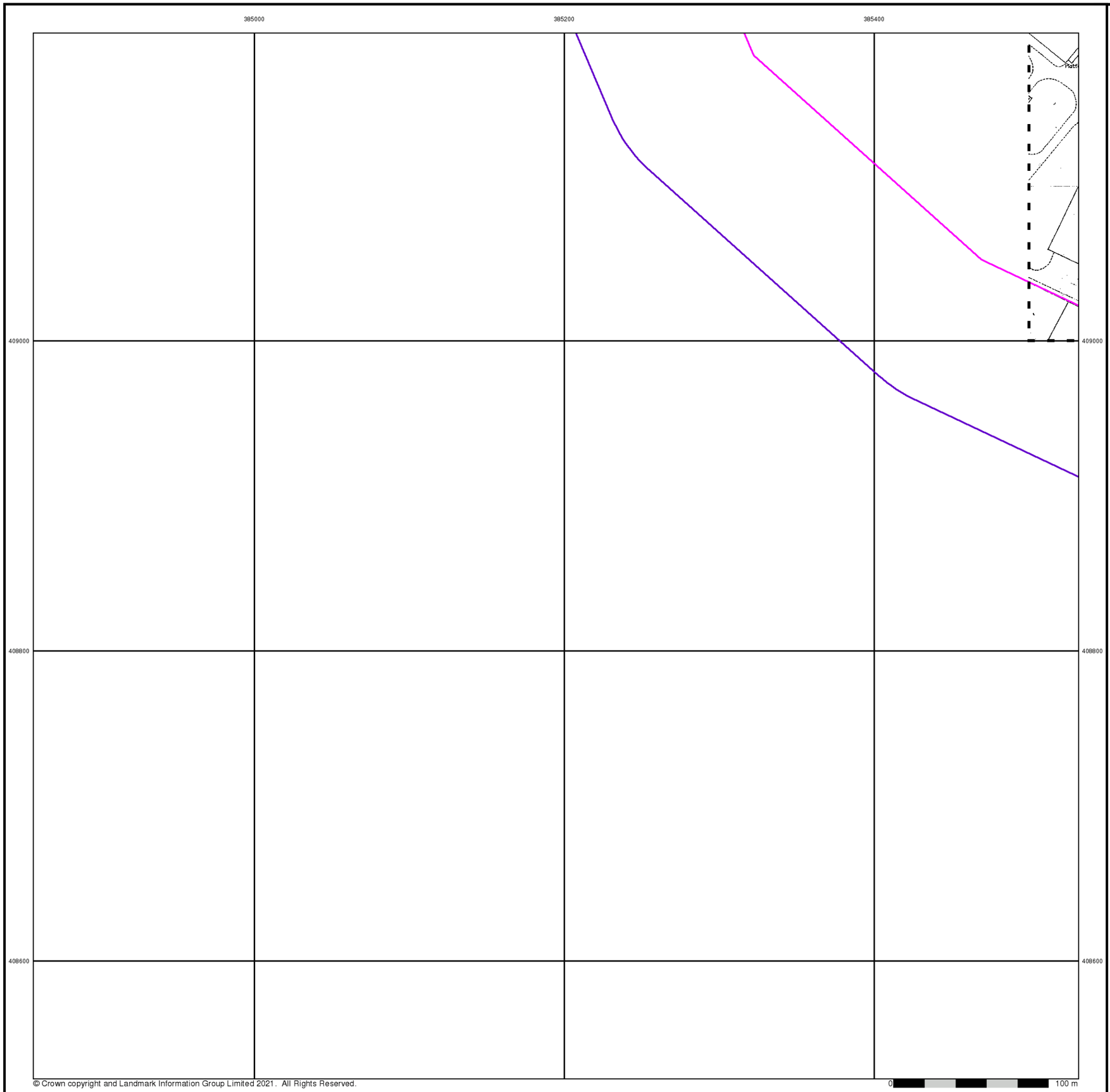
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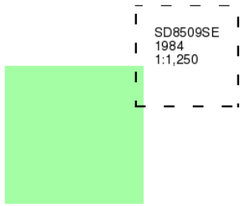
Additional SIMs

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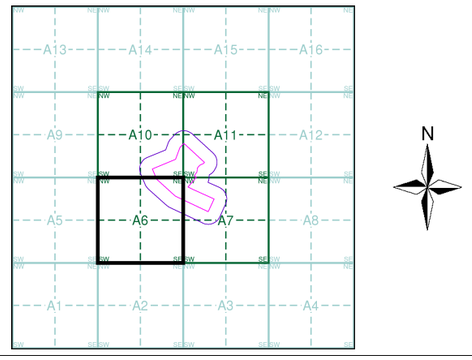
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A6



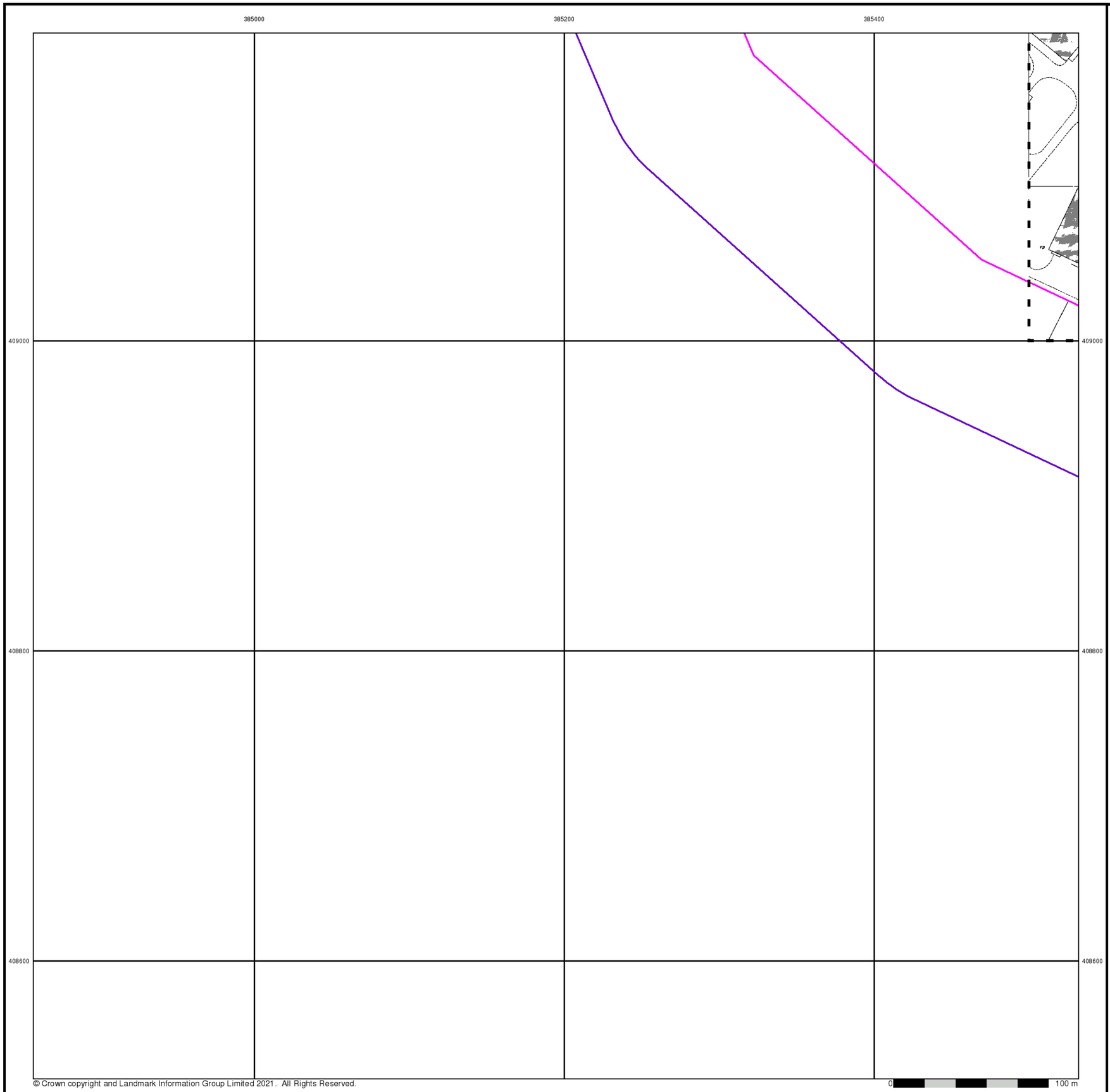
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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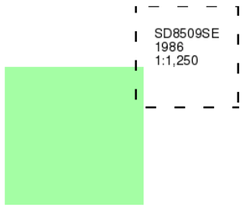
Ordnance Survey Plan

Published 1986

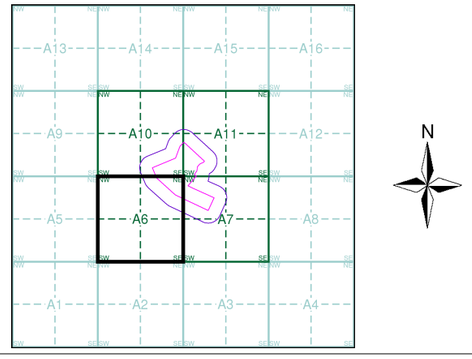
Source map scale - 1:1,250

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 A6



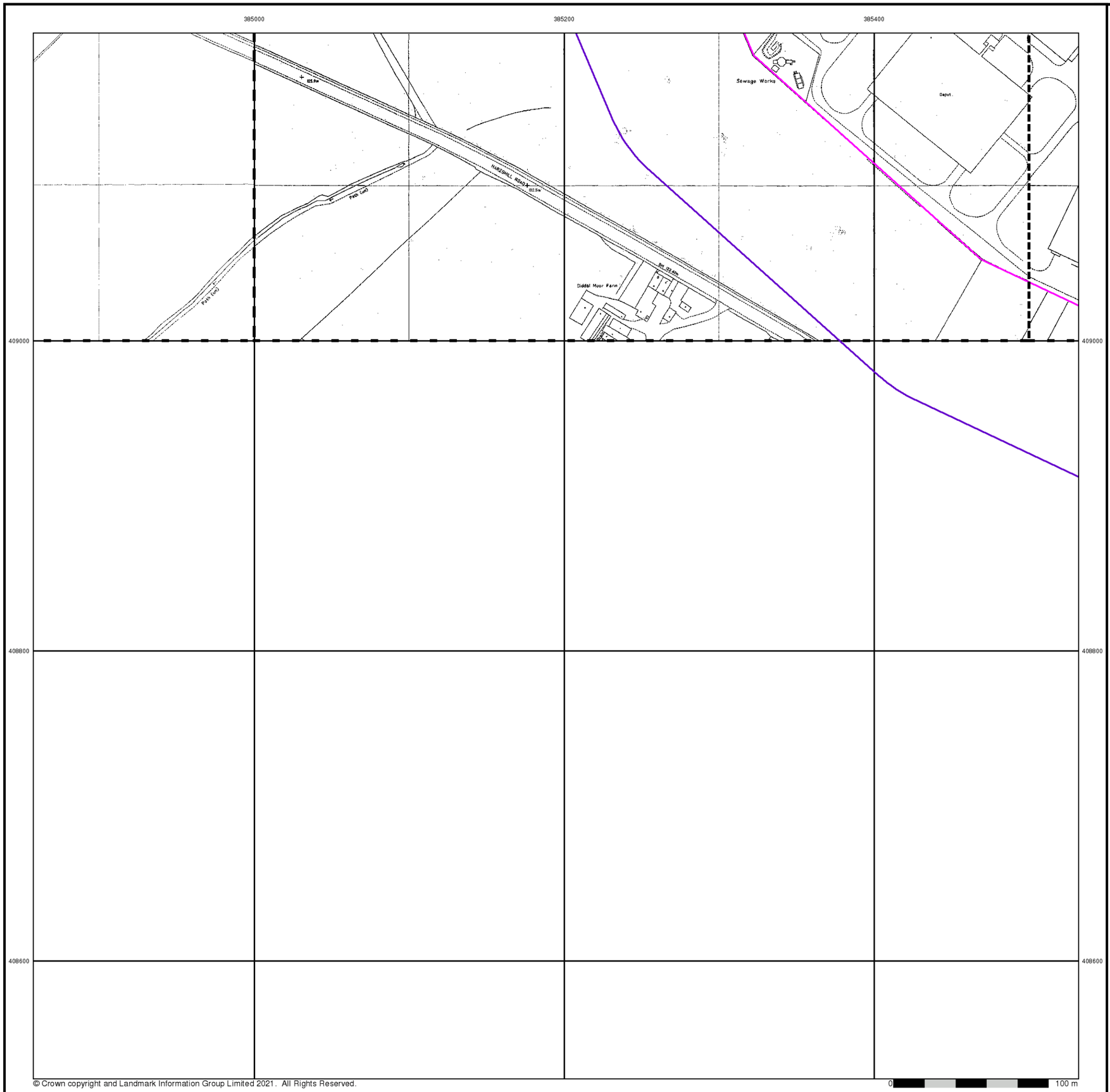
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RSK

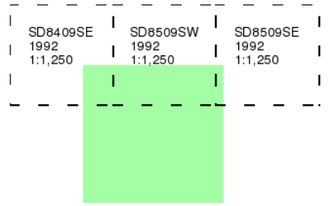
Large-Scale National Grid Data

Published 1992

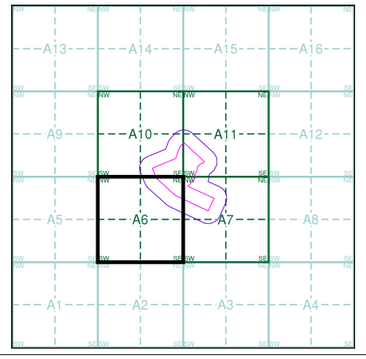
Source map scale - 1:1,250

'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)



Historical Map - Segment A6



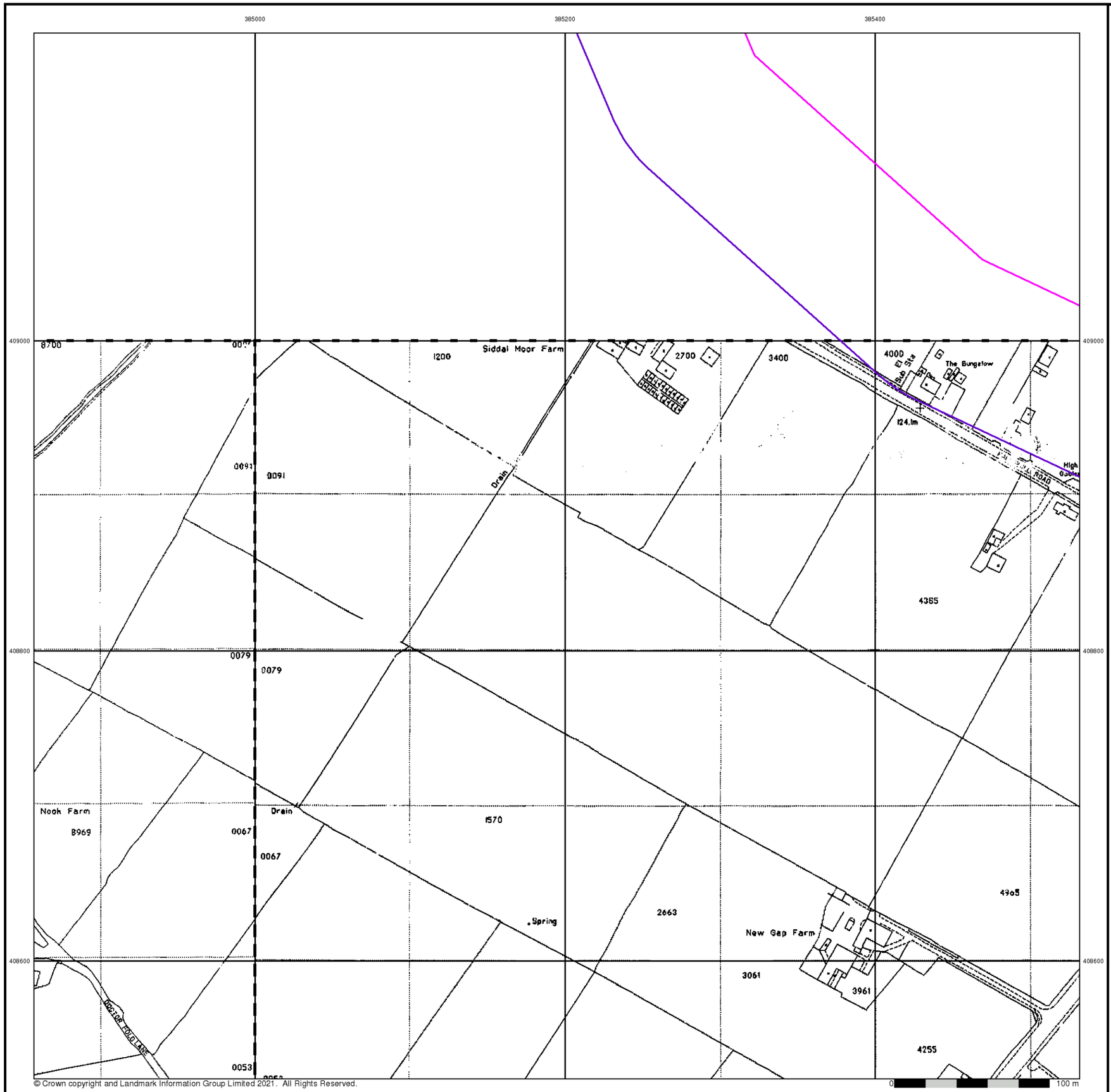
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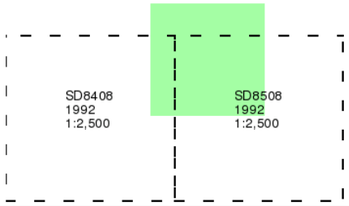
Large-Scale National Grid Data

Published 1992

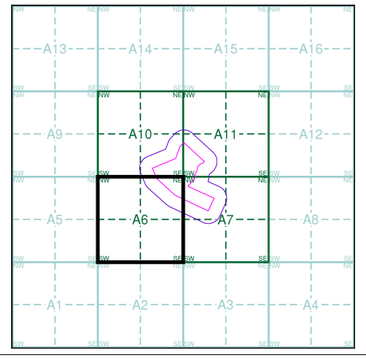
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A6



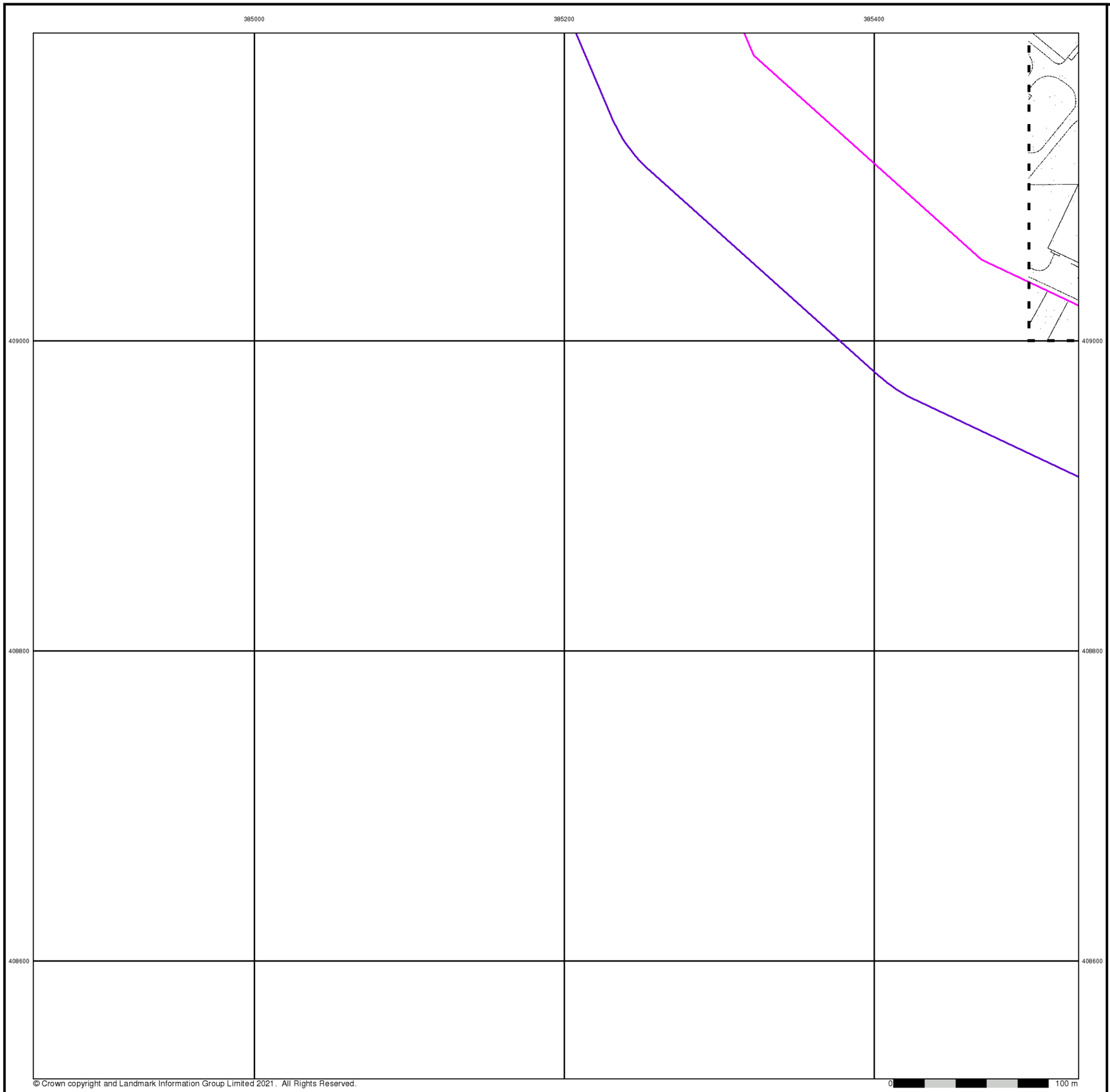
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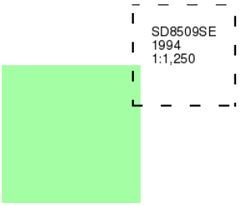
Large-Scale National Grid Data

Published 1994

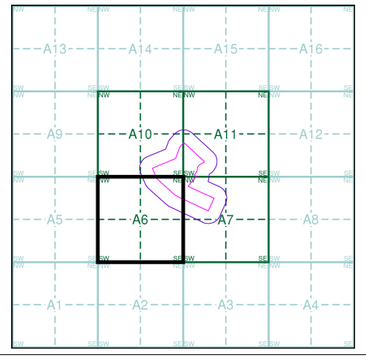
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A6



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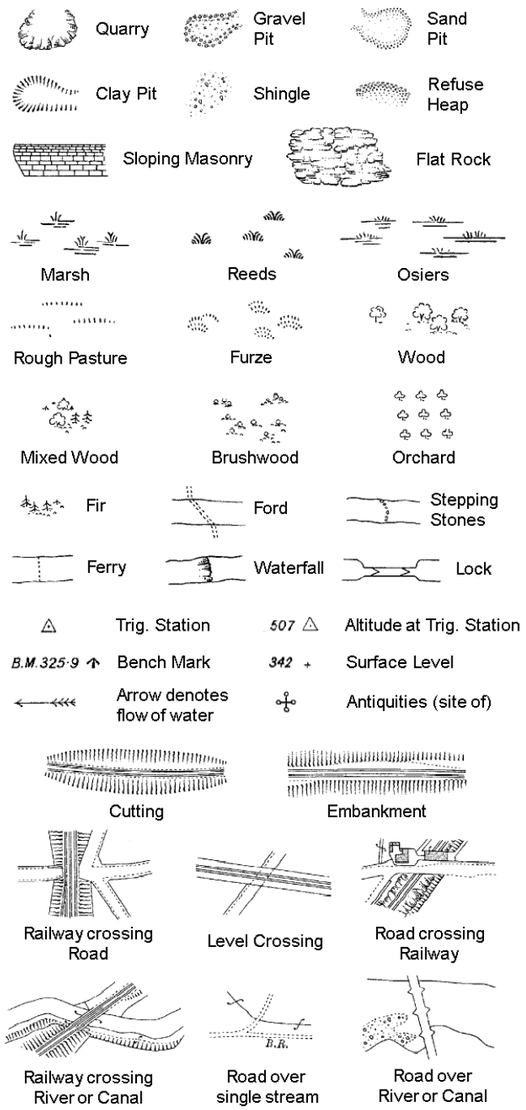
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Historical Mapping Legends

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



County Boundary (Geographical)

County & Civil Parish Boundary

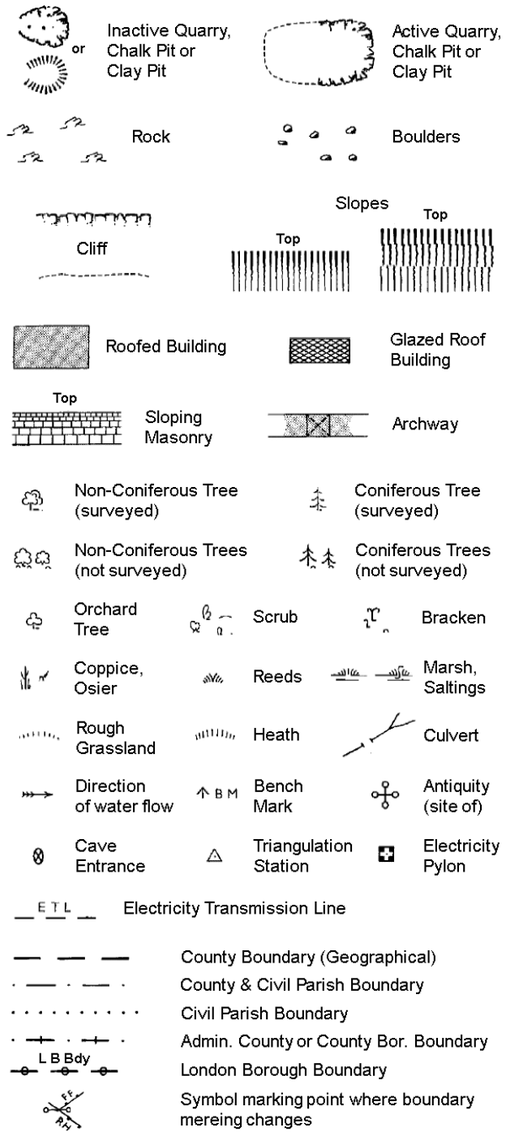
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

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

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



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

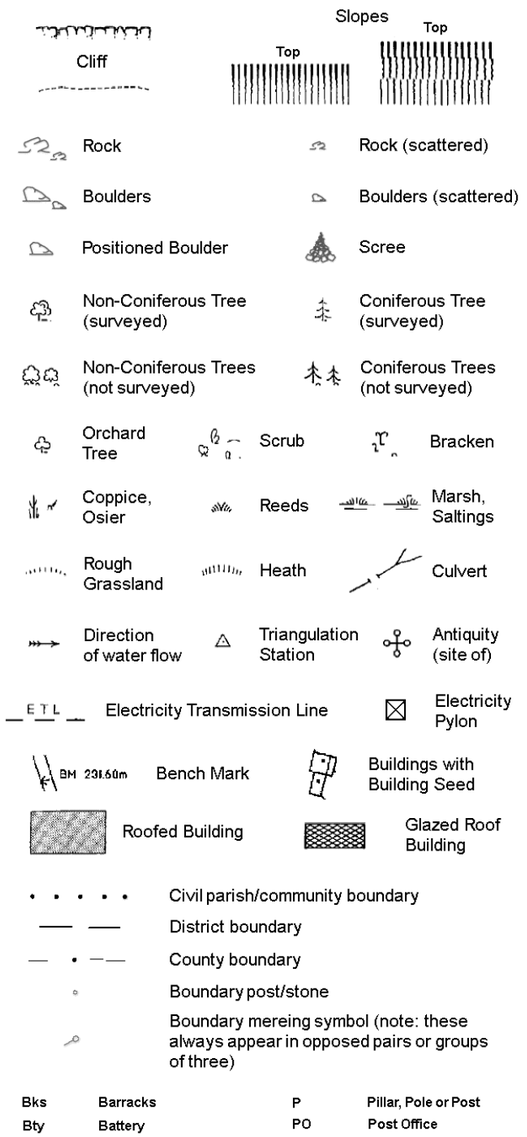
Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

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

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



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

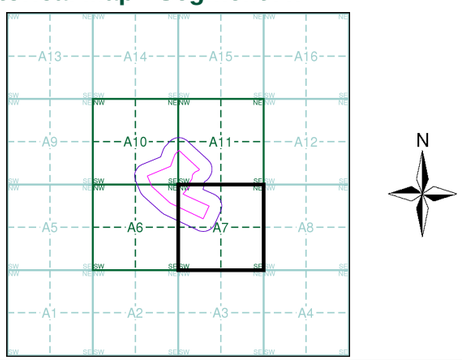
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity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

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1910	3
Lancashire And Furness	1:2,500	1929	4
Lancashire And Furness	1:2,500	1937	5
Ordnance Survey Plan	1:1,250	1956	6
Ordnance Survey Plan	1:2,500	1956 - 1957	7
Ordnance Survey Plan	1:1,250	1965 - 1972	8
Ordnance Survey Plan	1:2,500	1969 - 1977	9
Ordnance Survey Plan	1:1,250	1970 - 1986	10
Additional SIMs	1:1,250	1972 - 1990	11
Additional SIMs	1:1,250	1977	12
Additional SIMs	1:1,250	1984	13
Large-Scale National Grid Data	1:1,250	1992	14
Large-Scale National Grid Data	1:2,500	1992	15
Large-Scale National Grid Data	1:1,250	1993 - 1994	16

Historical Map - Segment A7



Order Details

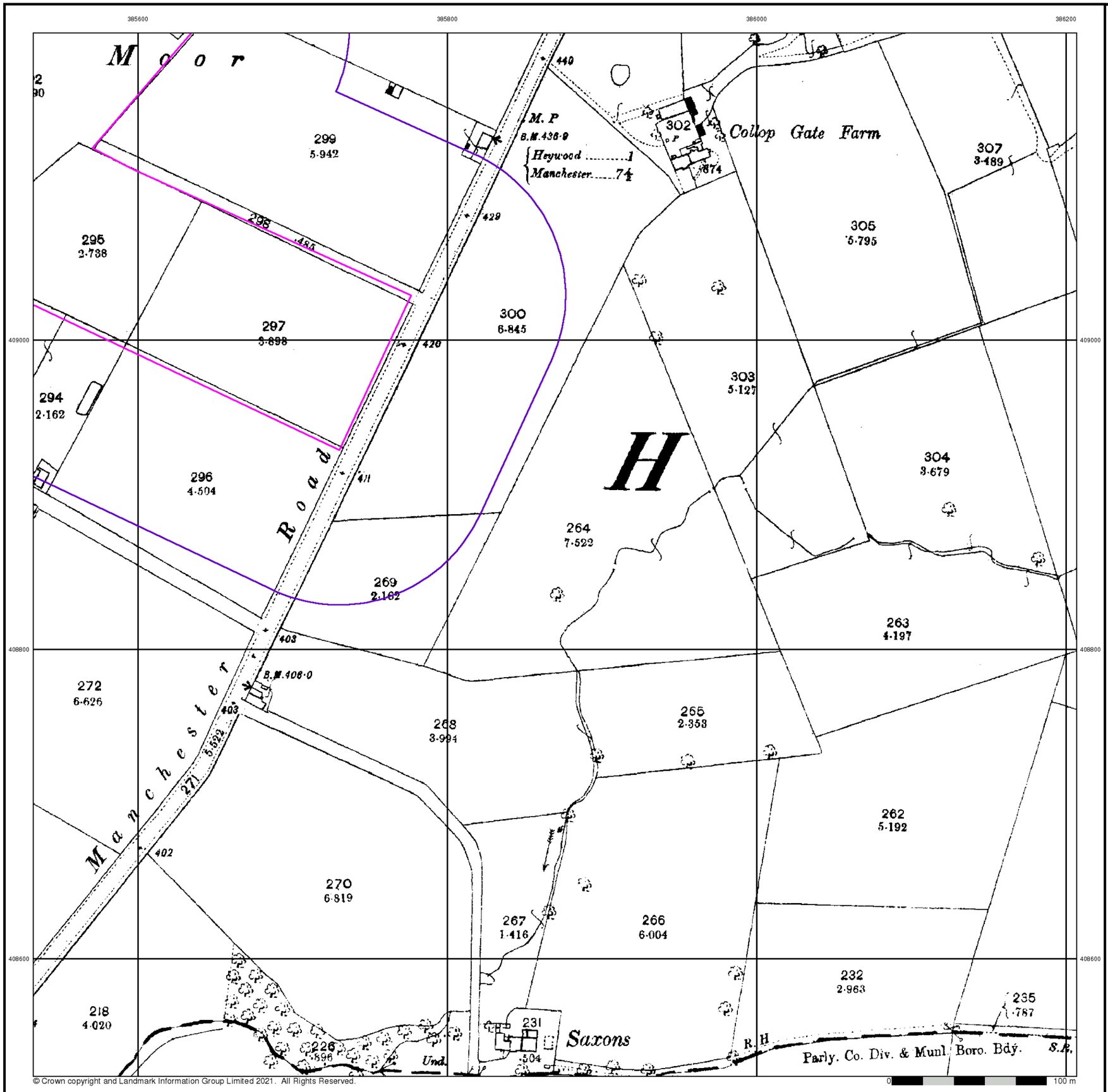
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Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

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Lancashire And Furness

Published 1893

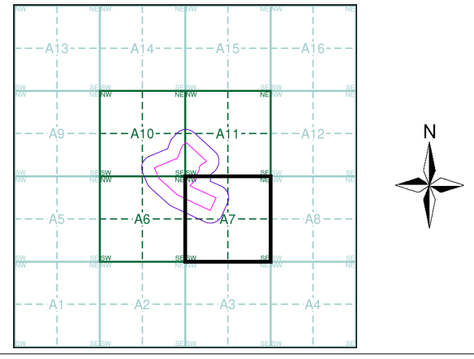
Source map scale - 1:2,500

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)

088_15
1893
1:2,500

Historical Map - Segment A7



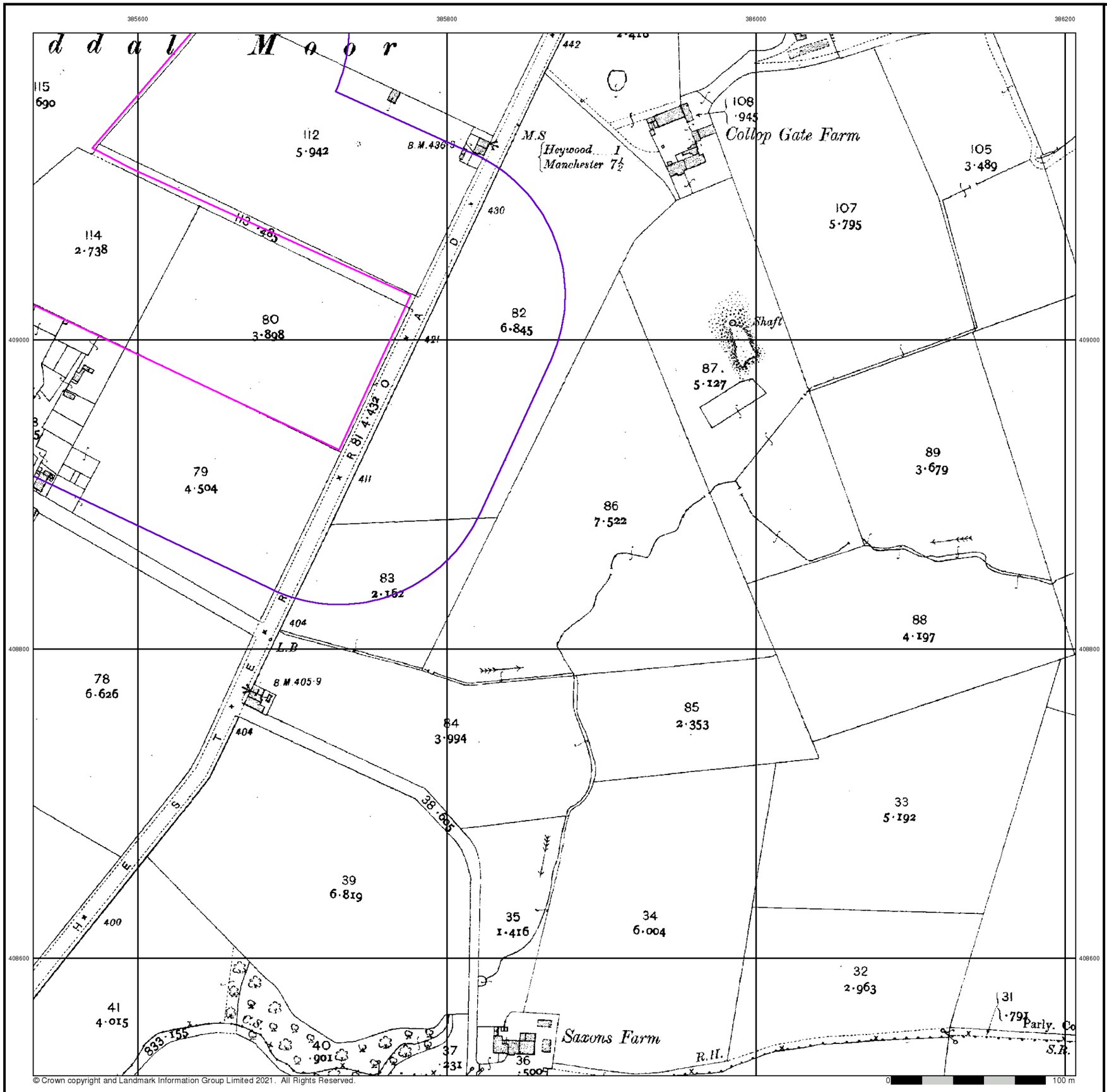
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Lancashire And Furness

Published 1910

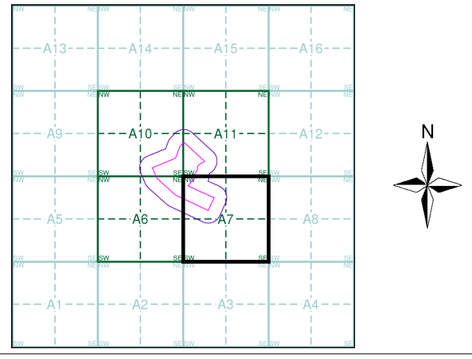
Source map scale - 1:2,500

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_15
1910
1:2,500

Historical Map - Segment A7



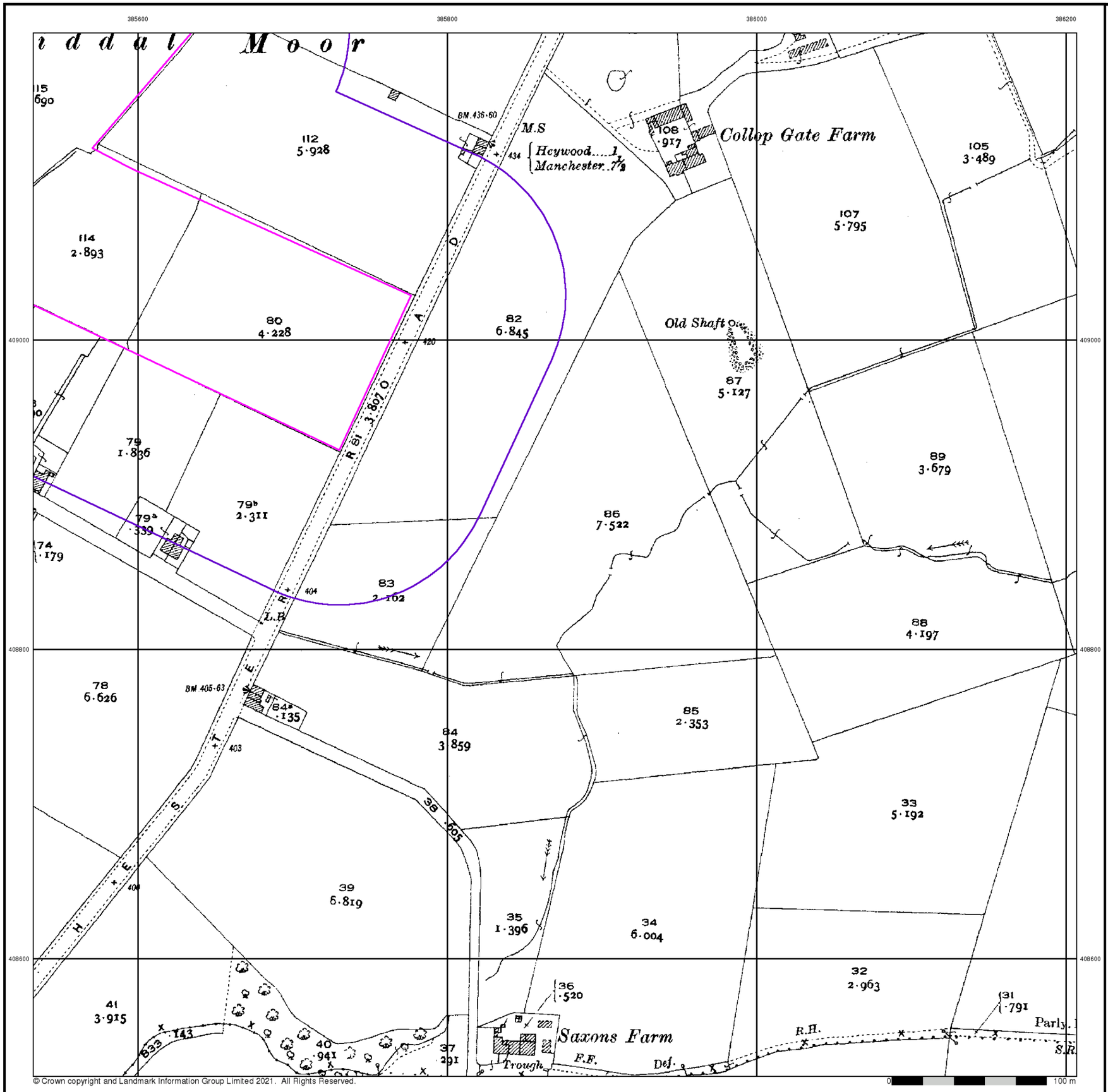
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Lancashire And Furness

Published 1929

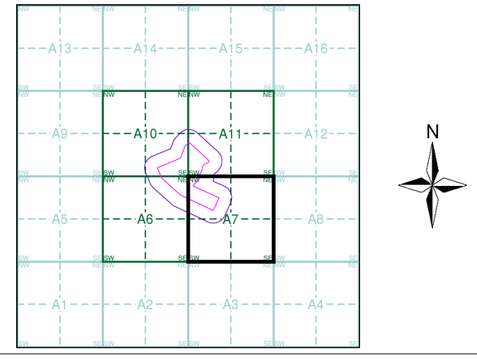
Source map scale - 1:2,500

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_15
1929
1:2,500

Historical Map - Segment A7



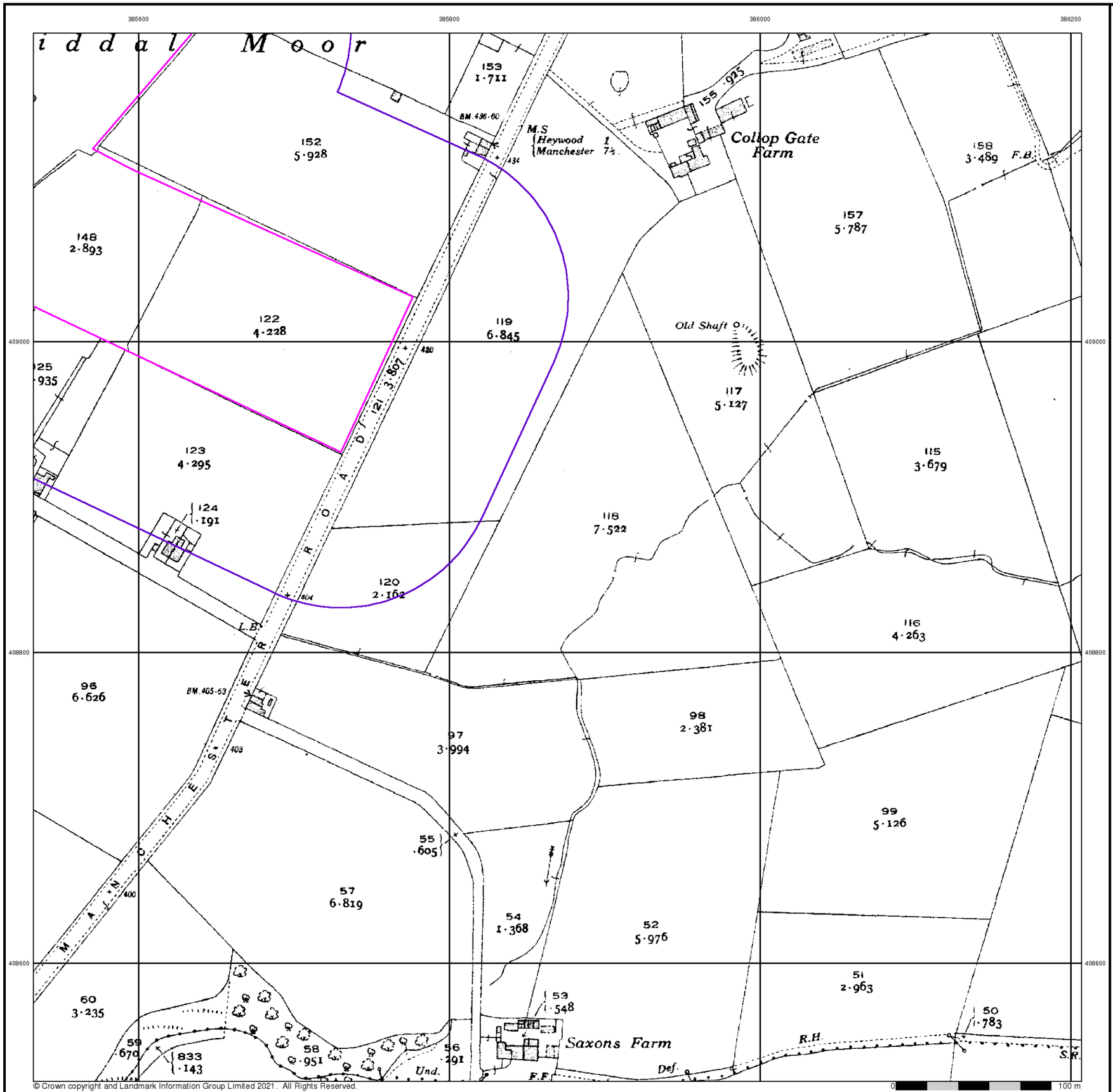
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Lancashire And Furness

Published 1937

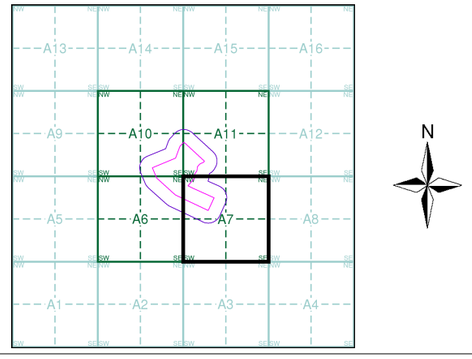
Source map scale - 1:2,500

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Map Name(s) and Date(s)

088_15
1937
1:2,500

Historical Map - Segment A7



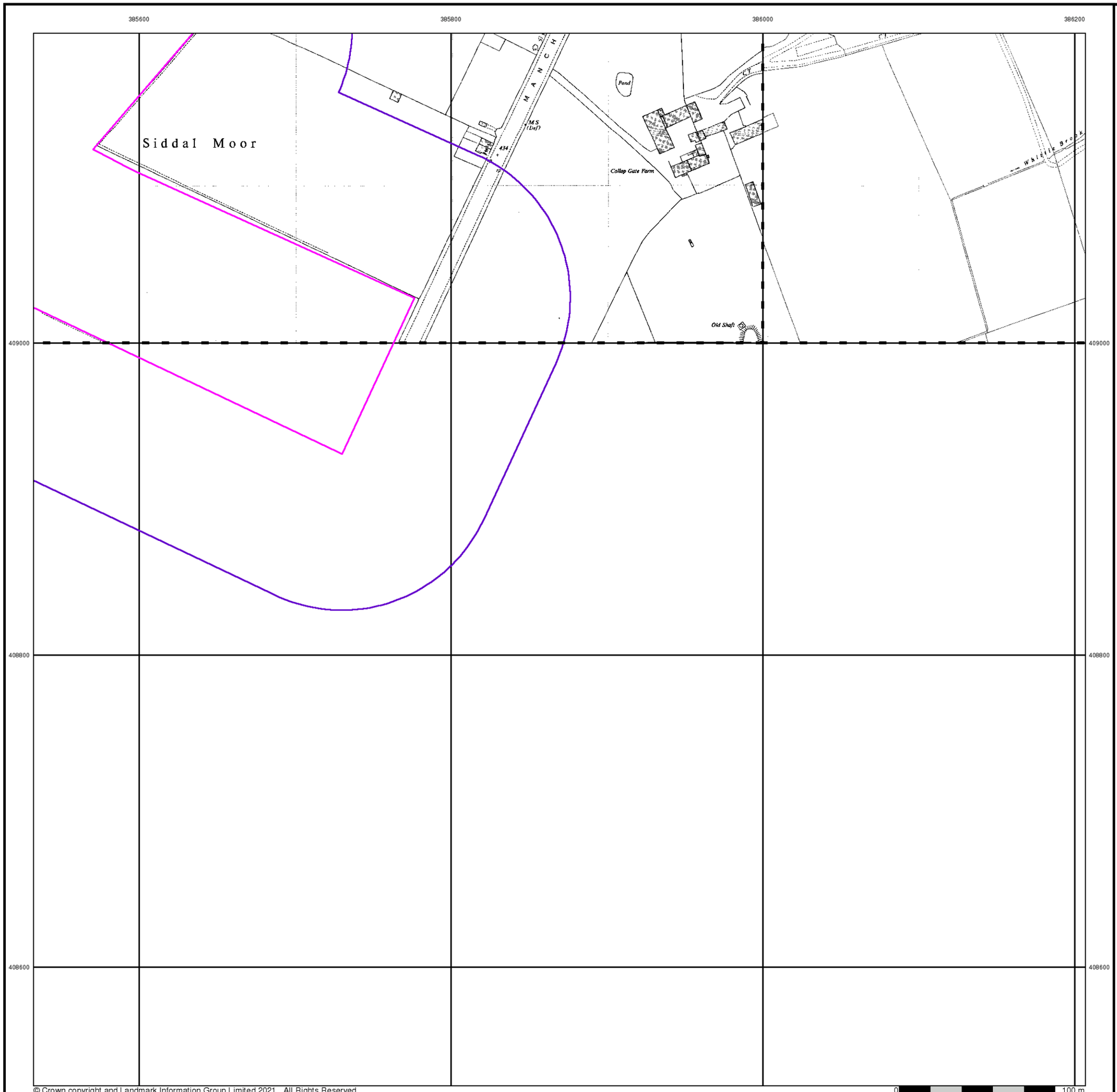
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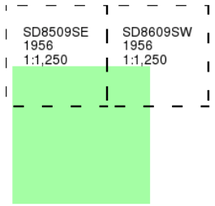
Ordnance Survey Plan

Published 1956

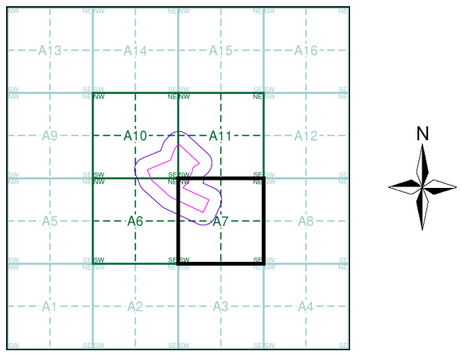
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Map Name(s) and Date(s)



Historical Map - Segment A7



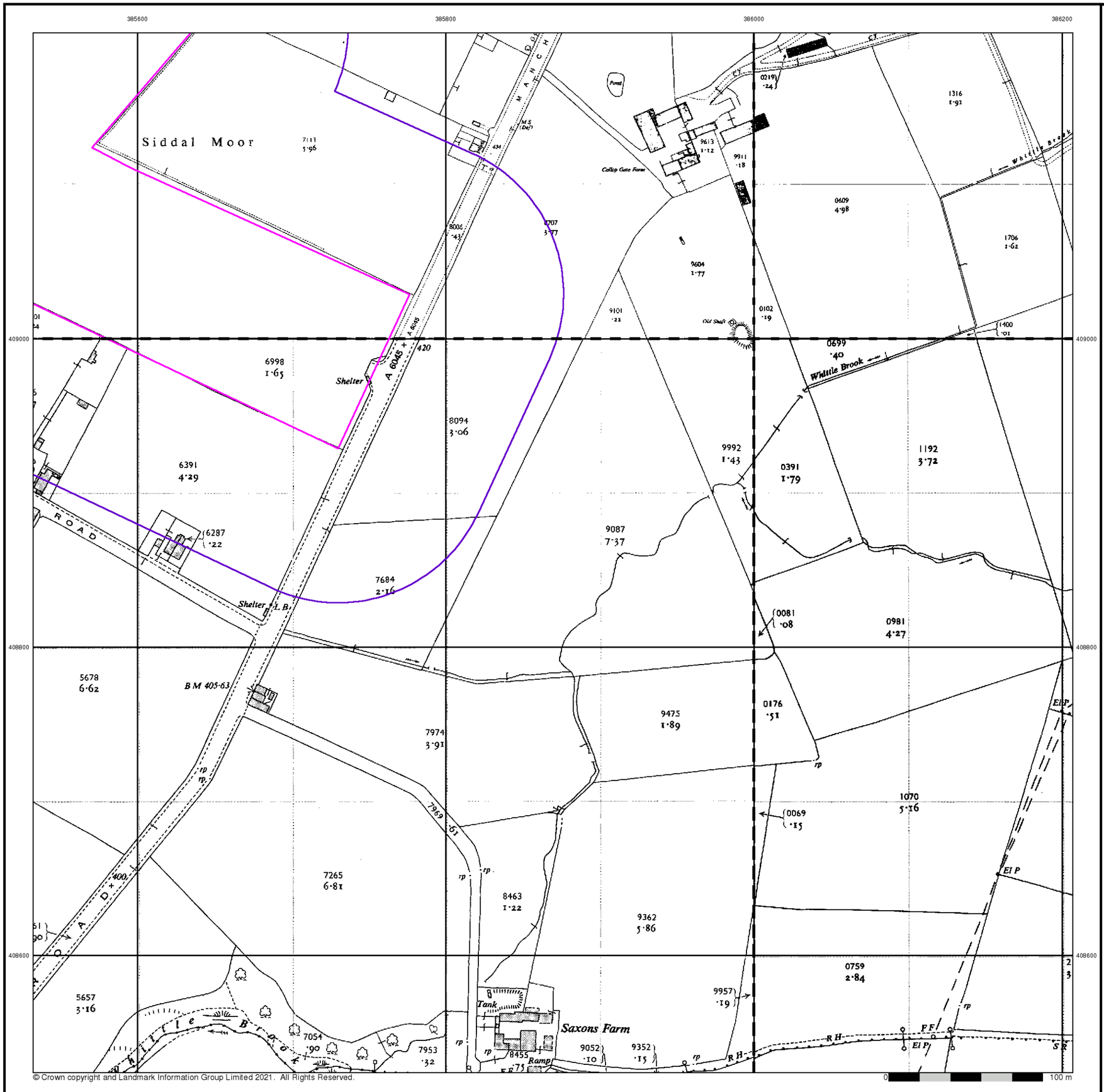
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Ordnance Survey Plan

Published 1956 - 1957

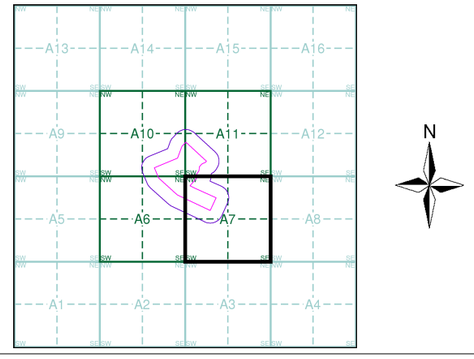
Source map scale - 1:2,500

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)

SD8509 1957 1:2,500	SD8609 1957 1:2,500
SD8508 1956 1:2,500	SD8608 1956 1:2,500

Historical Map - Segment A7



Order Details

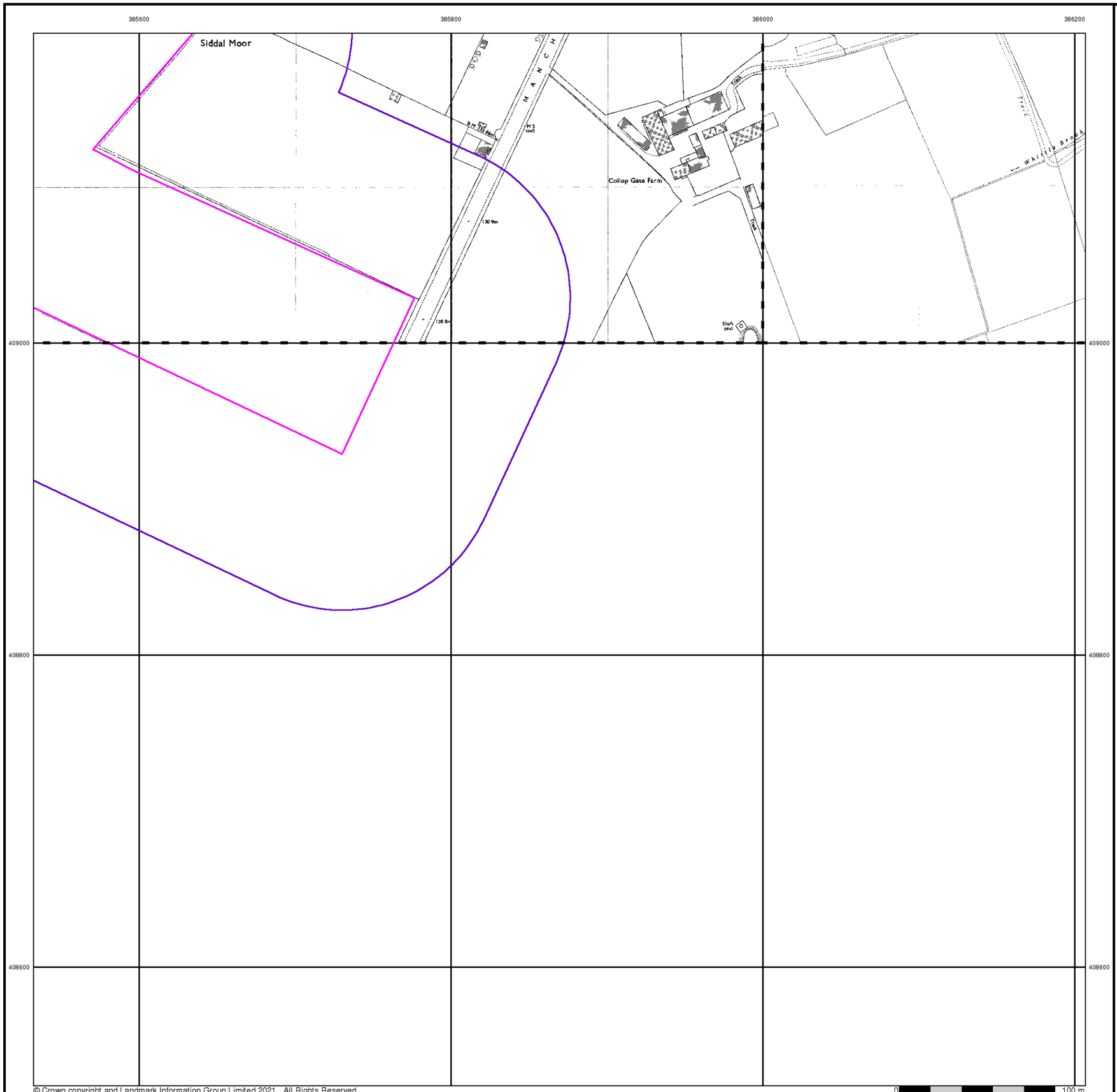
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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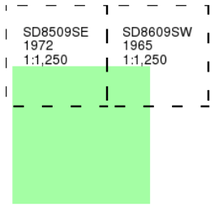
Ordnance Survey Plan

Published 1965 - 1972

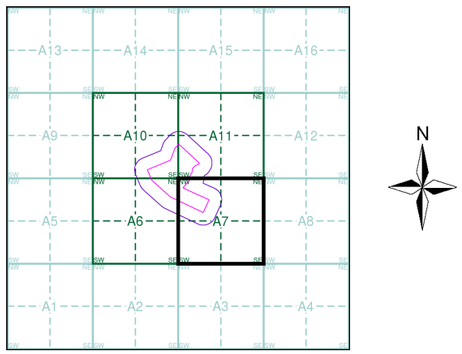
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A7



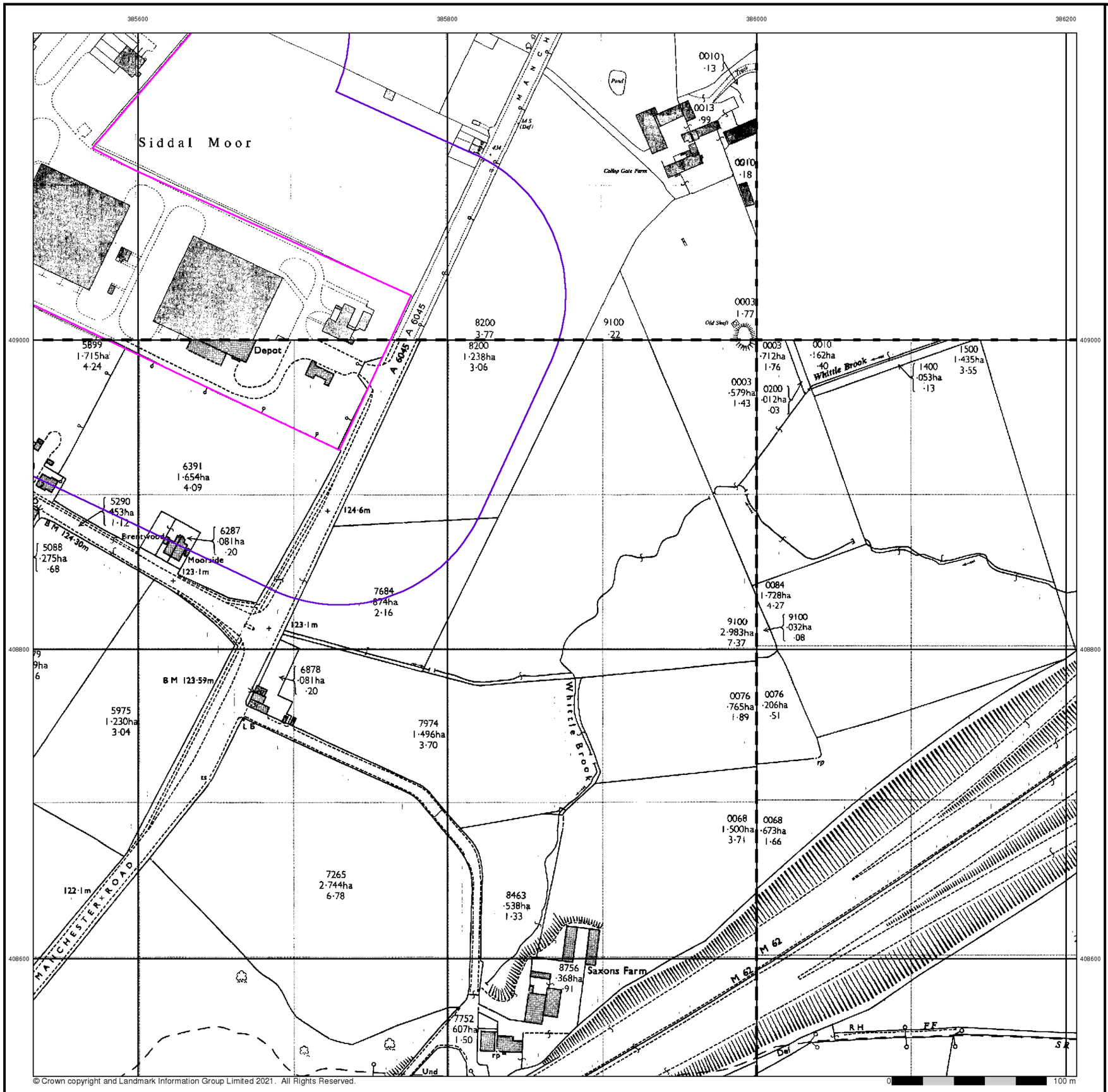
Order Details

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Customer Ref:	322834
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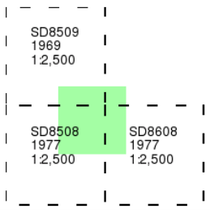
Ordnance Survey Plan

Published 1969 - 1977

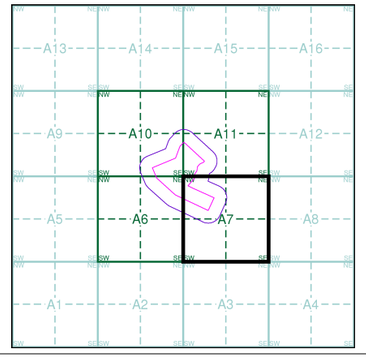
Source map scale - 1:2,500

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 A7



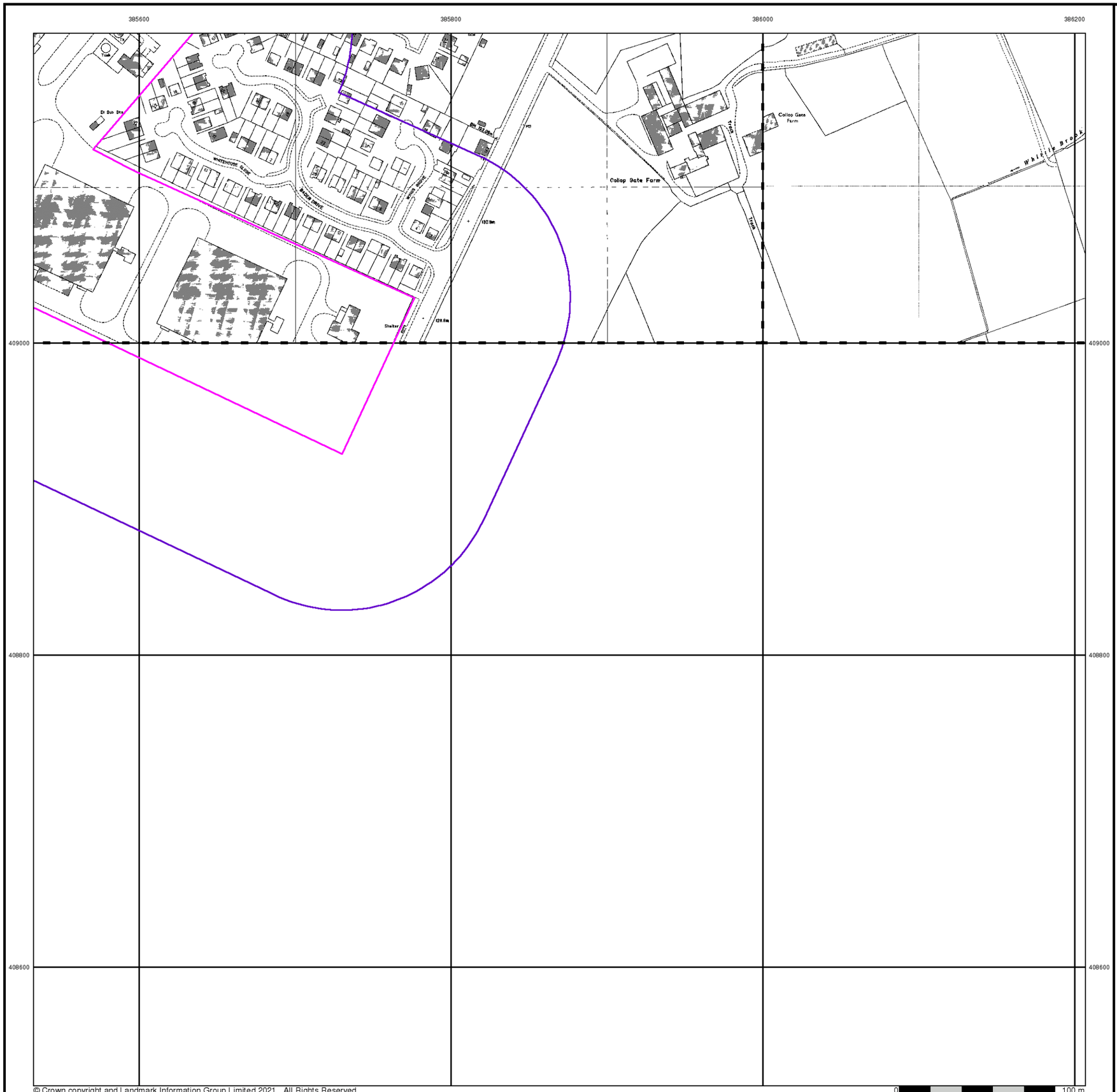
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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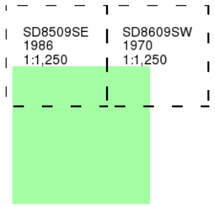
Ordnance Survey Plan

Published 1970 - 1986

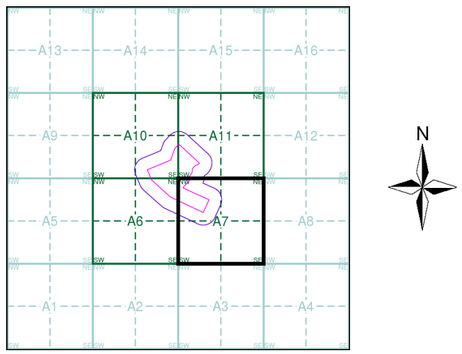
Source map scale - 1:1,250

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 A7



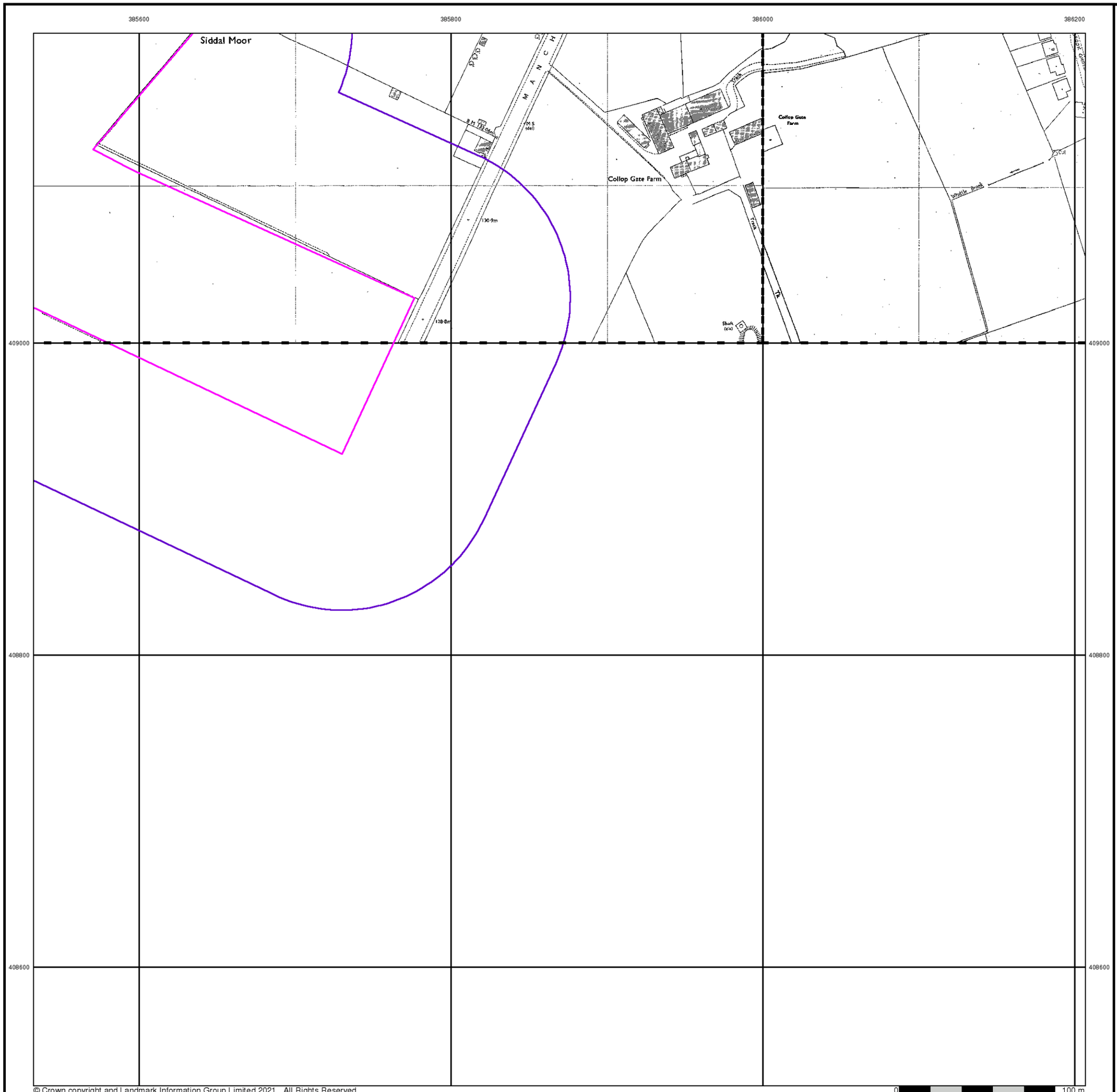
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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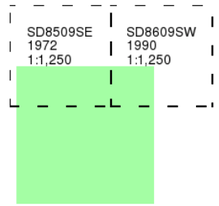
Additional SIMs

Published 1972 - 1990

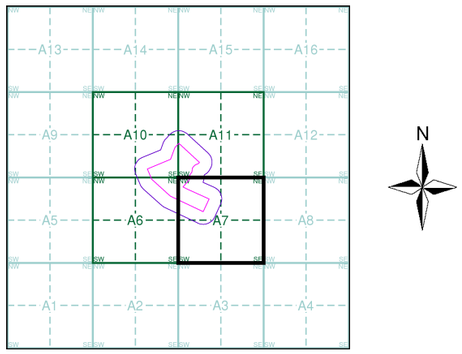
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A7

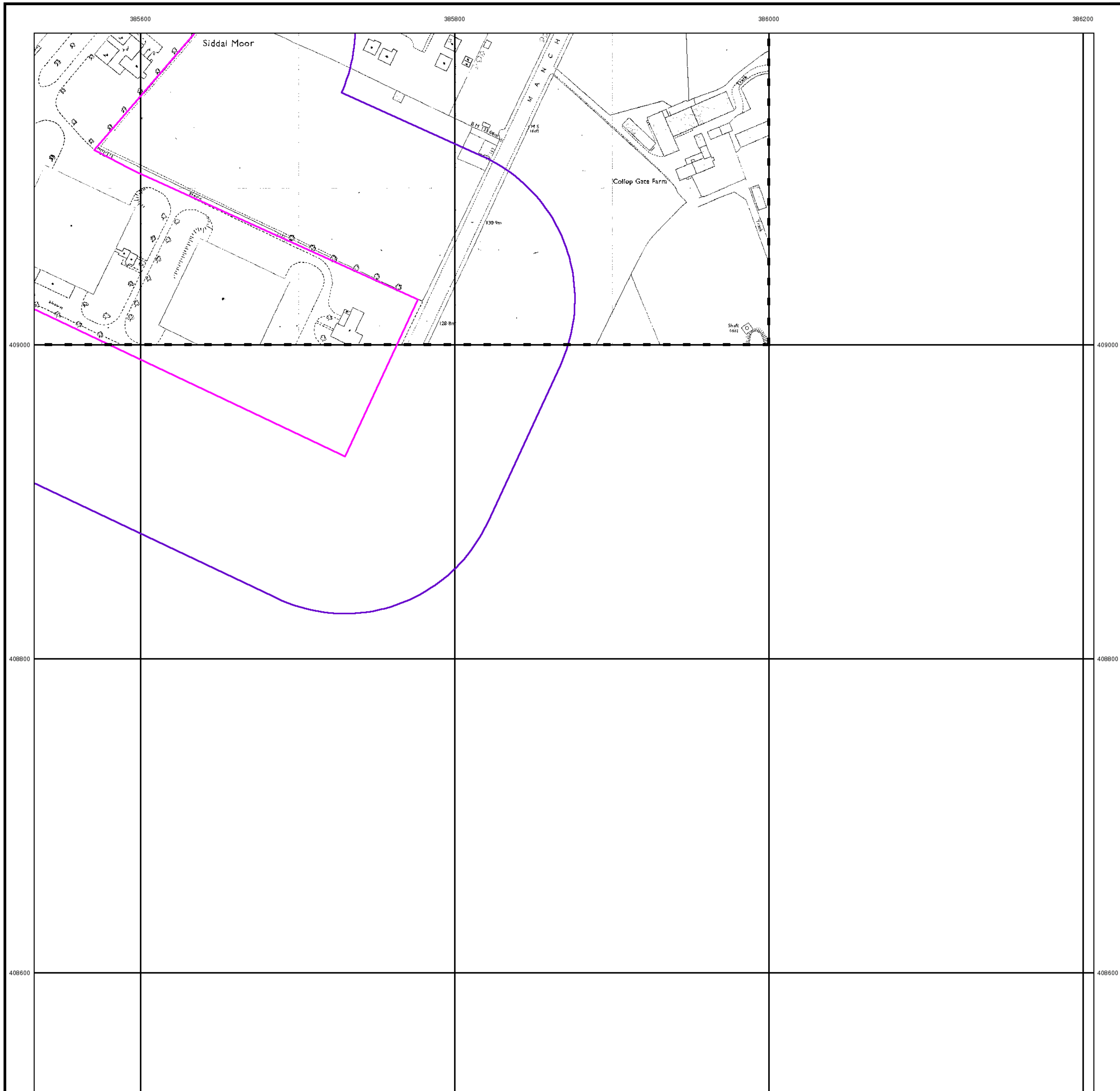


Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

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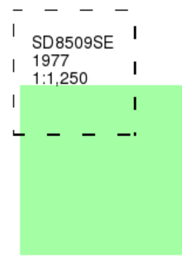
Additional SIMs

Published 1977

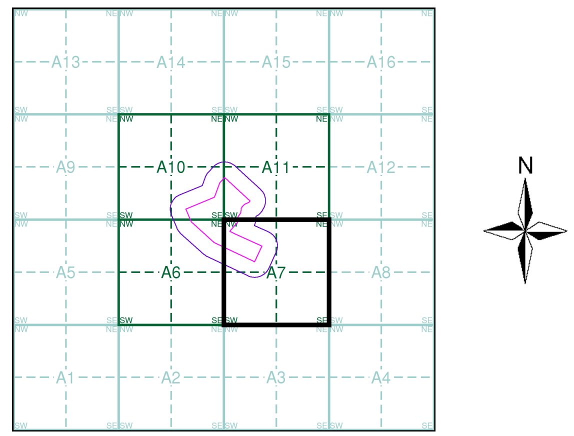
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A7



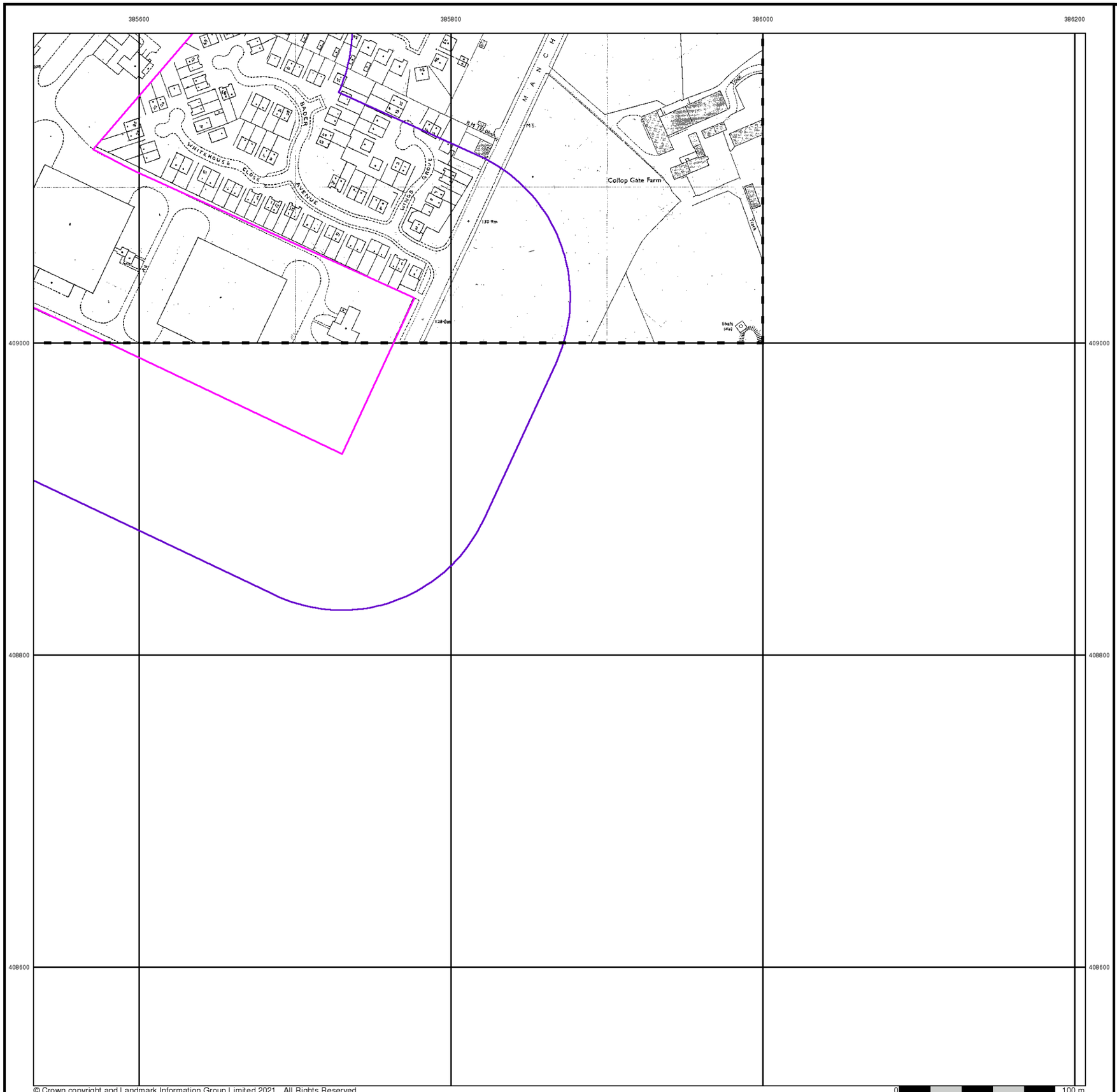
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National Grid Reference: 385560, 409190
Slice: A
Site Area (Ha): 11.19
Search Buffer (m): 100

Site Details

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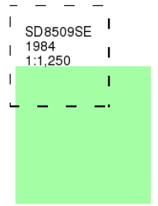
Additional SIMs

Published 1984

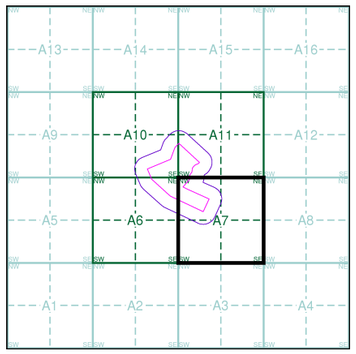
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A7



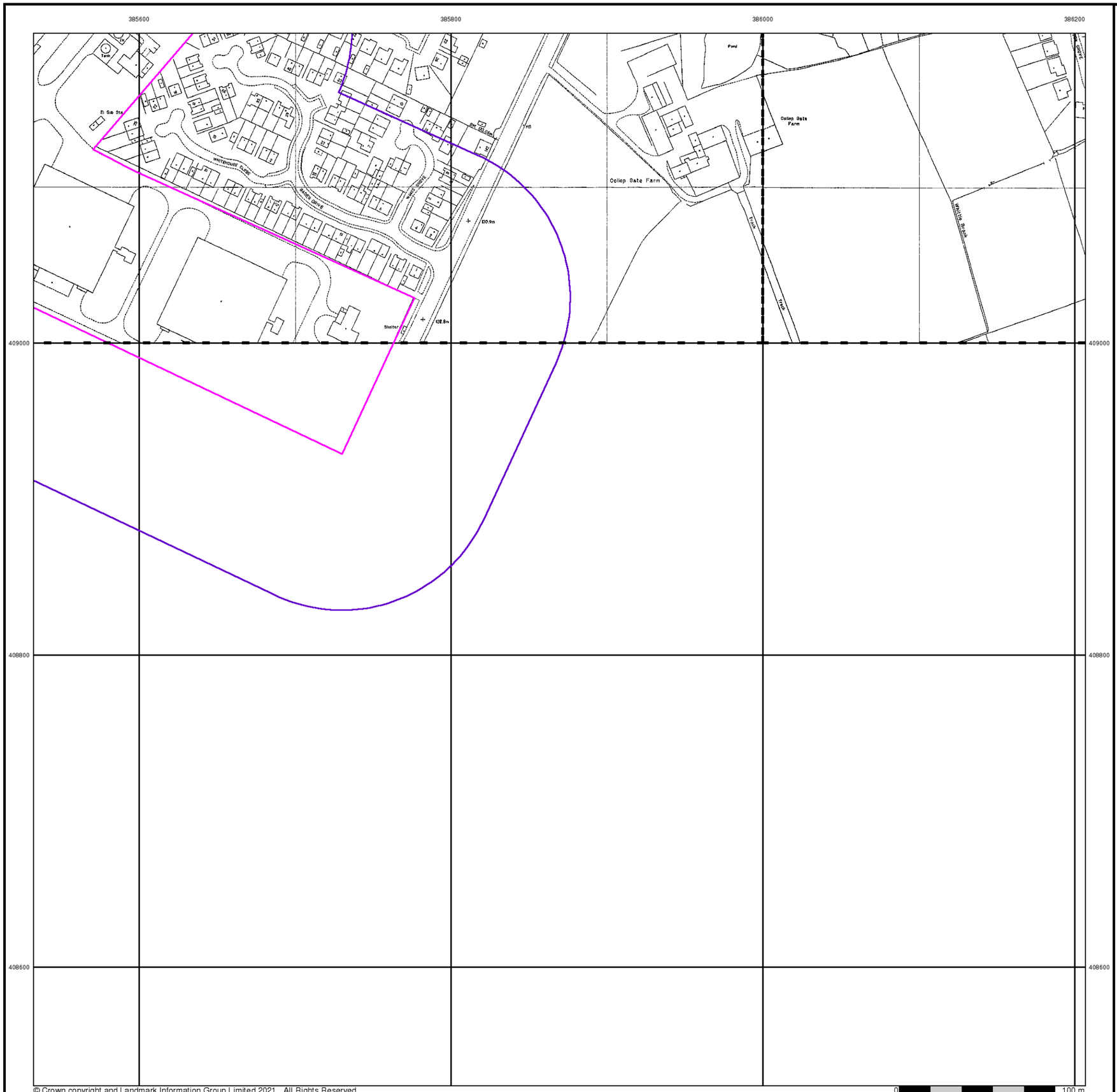
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Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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Site Details

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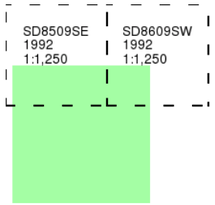
Large-Scale National Grid Data

Published 1992

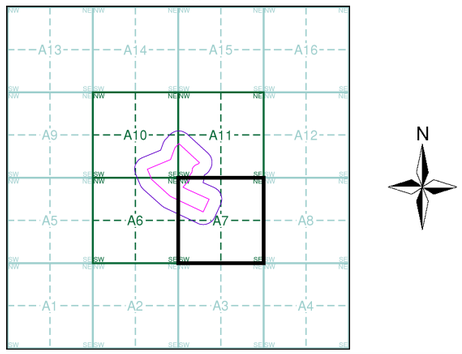
Source map scale - 1:1,250

'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)



Historical Map - Segment A7



Order Details

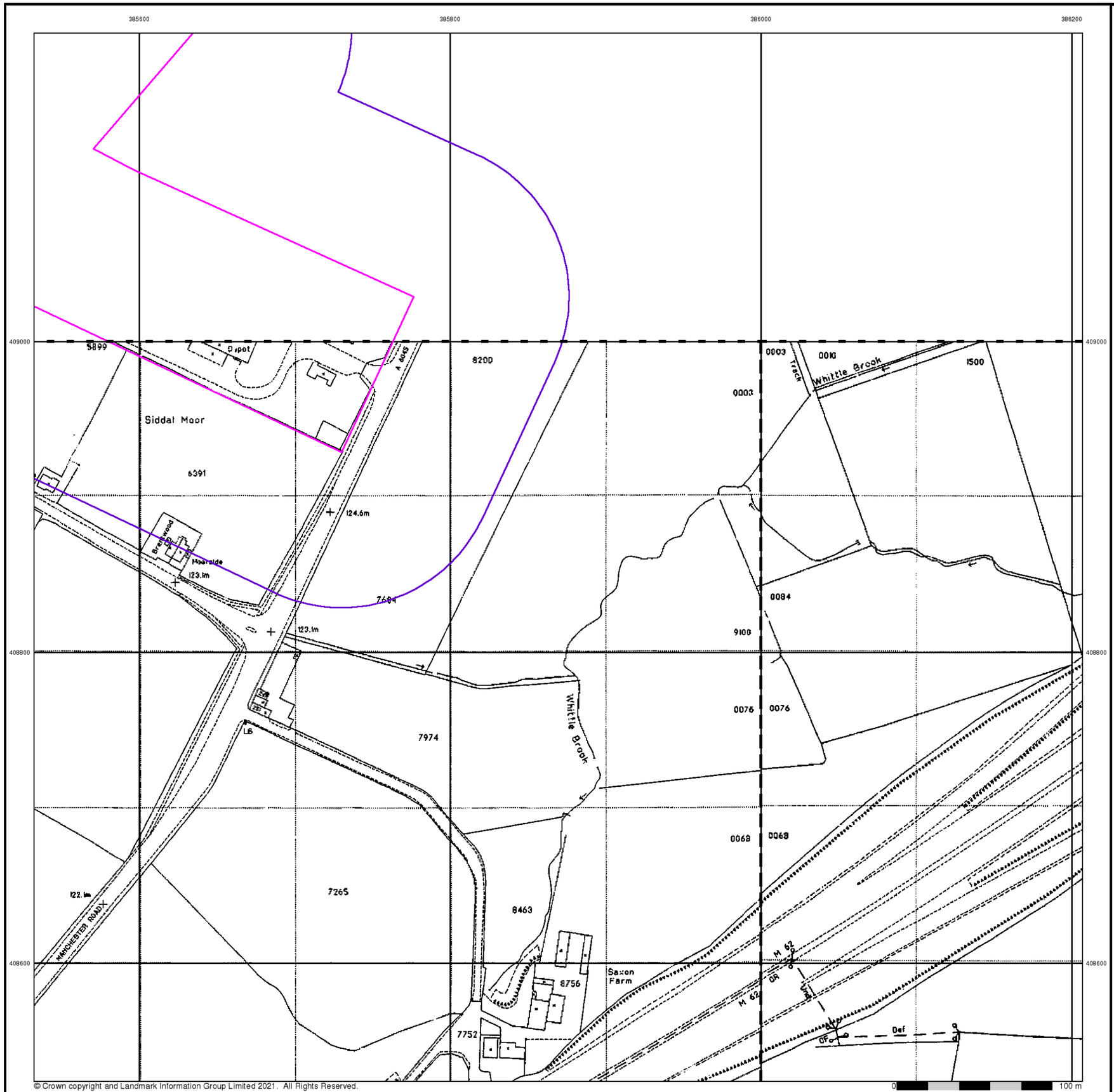
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Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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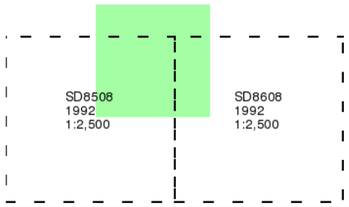
Large-Scale National Grid Data

Published 1992

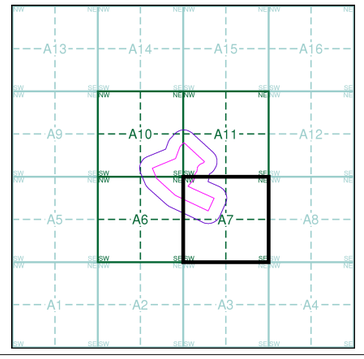
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A7



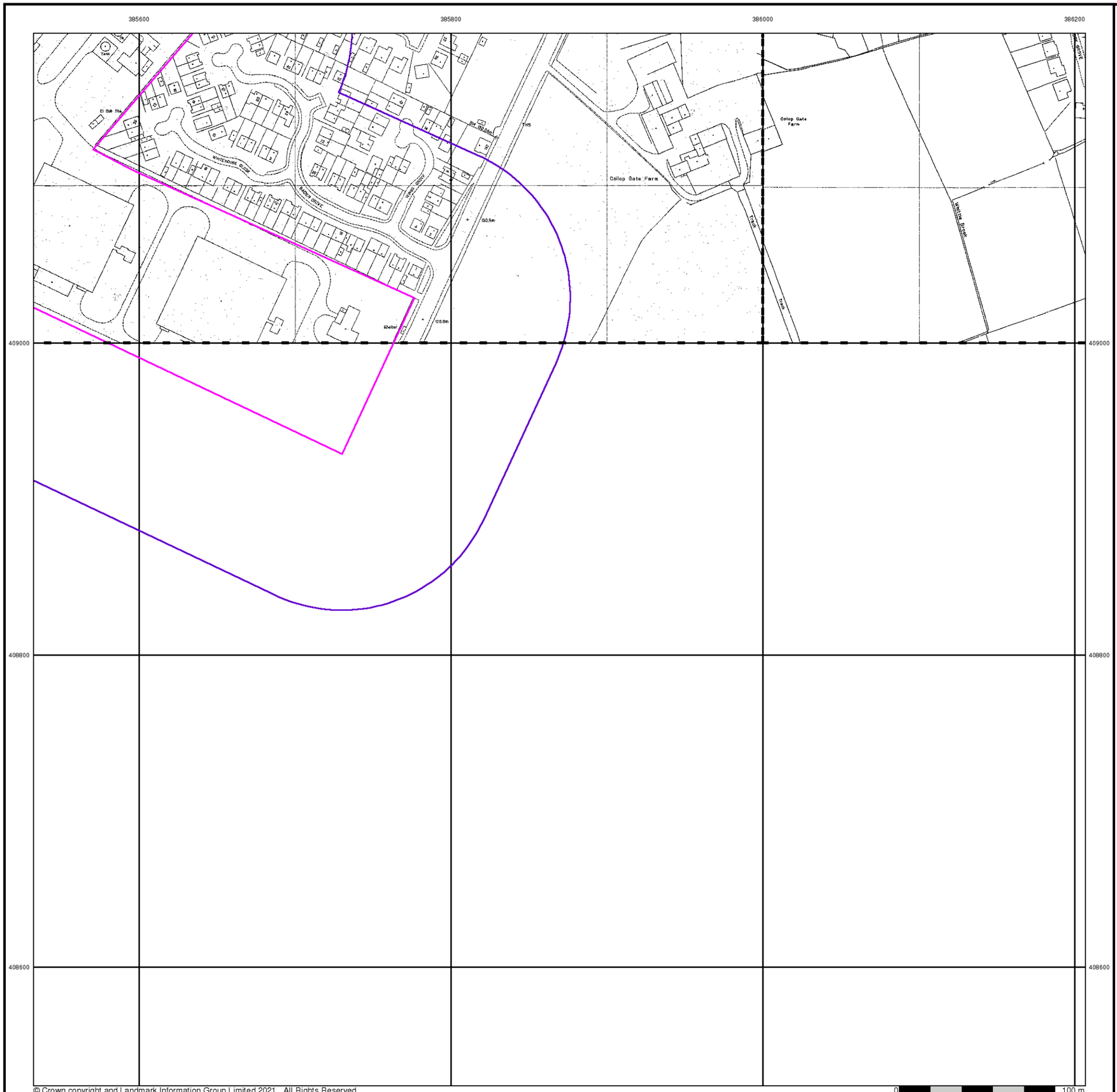
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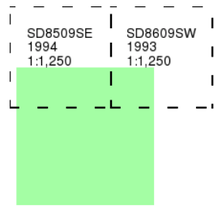
Large-Scale National Grid Data

Published 1993 - 1994

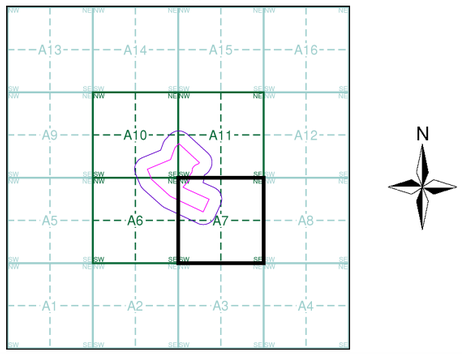
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A7



Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

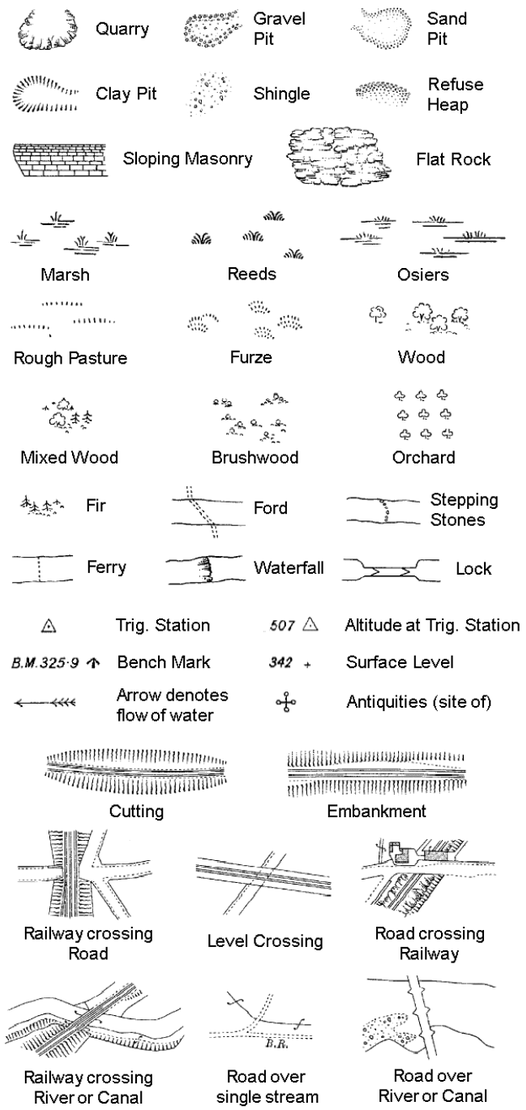
1, Wings Grove, HEYWOOD, OL10 2QR

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Historical Mapping Legends

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



County Boundary (Geographical)

County & Civil Parish Boundary

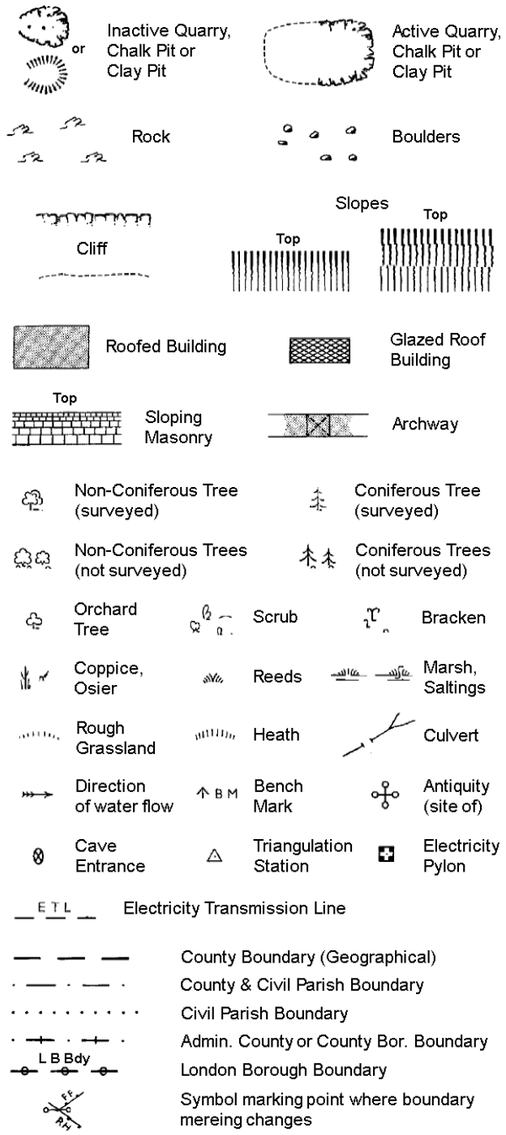
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

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

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



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

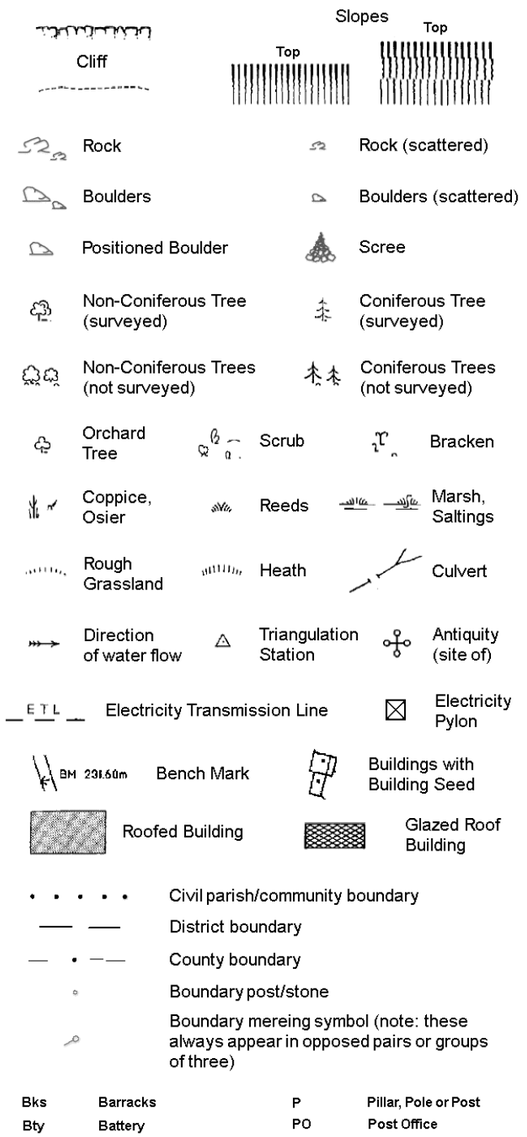
Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

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

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



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

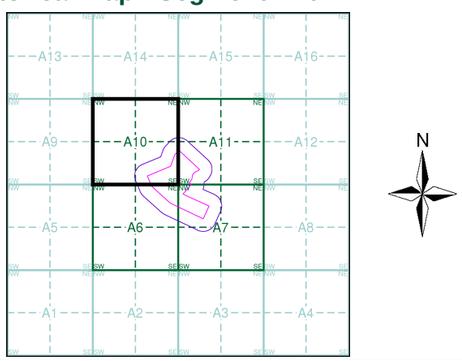
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity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

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lancashire And Furness	1:2,500	1893	2
Lancashire And Furness	1:2,500	1910	3
Lancashire And Furness	1:2,500	1929	4
Lancashire And Furness	1:2,500	1937	5
Ordnance Survey Plan	1:1,250	1956	6
Ordnance Survey Plan	1:2,500	1957	7
Ordnance Survey Plan	1:1,250	1968 - 1978	8
Ordnance Survey Plan	1:2,500	1969	9
Additional SIMs	1:1,250	1972 - 1990	10
Additional SIMs	1:1,250	1977 - 1992	11
Additional SIMs	1:1,250	1984	12
Ordnance Survey Plan	1:1,250	1986	13
Large-Scale National Grid Data	1:1,250	1992	14
Large-Scale National Grid Data	1:1,250	1994	15
Large-Scale National Grid Data	1:1,250	1996	16

Historical Map - Segment A10



Order Details

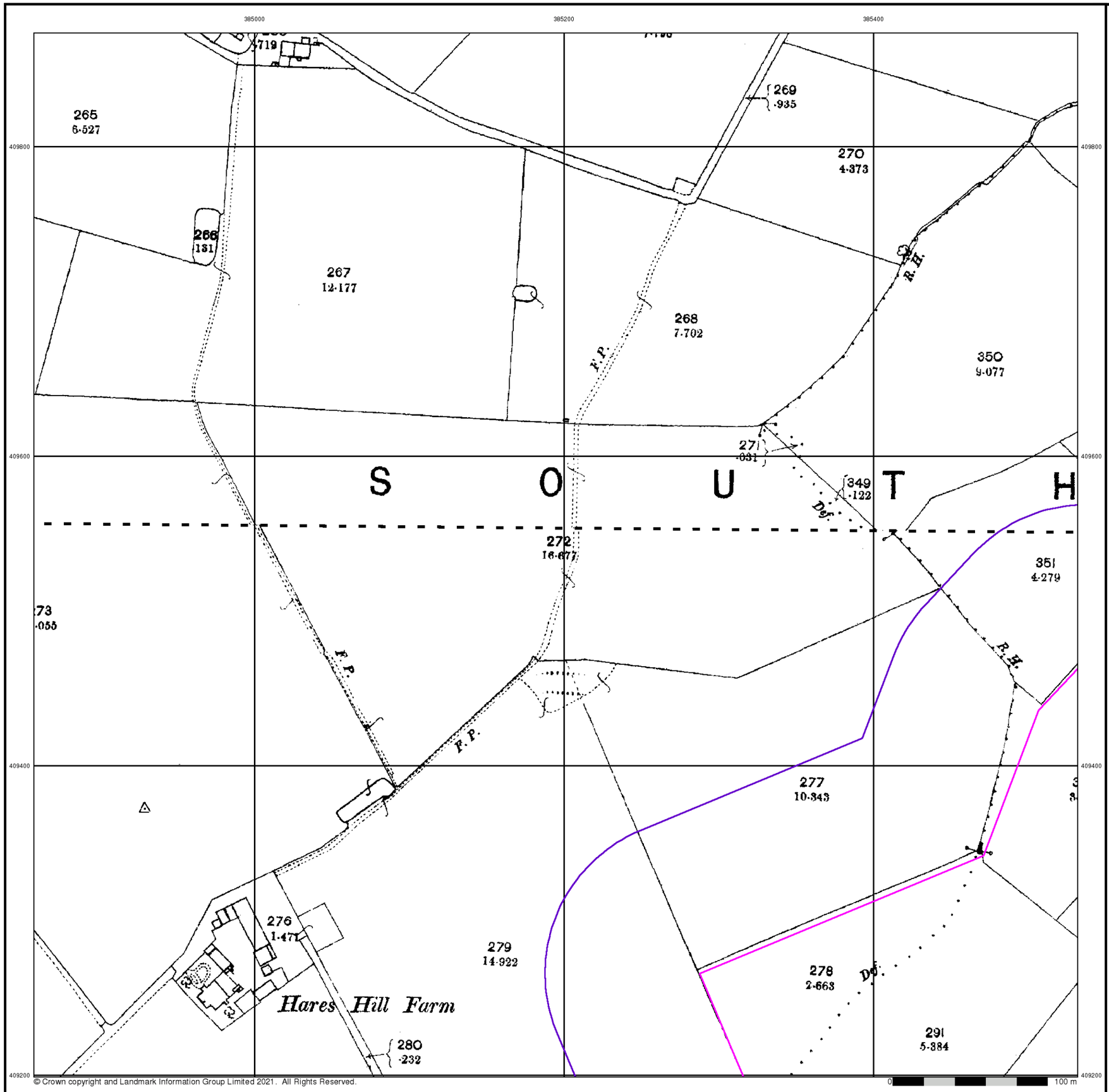
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Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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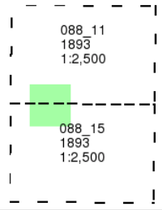
Lancashire And Furness

Published 1893

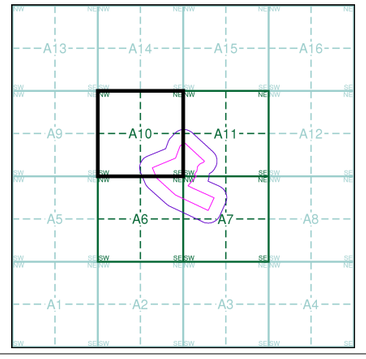
Source map scale - 1:2,500

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 A10



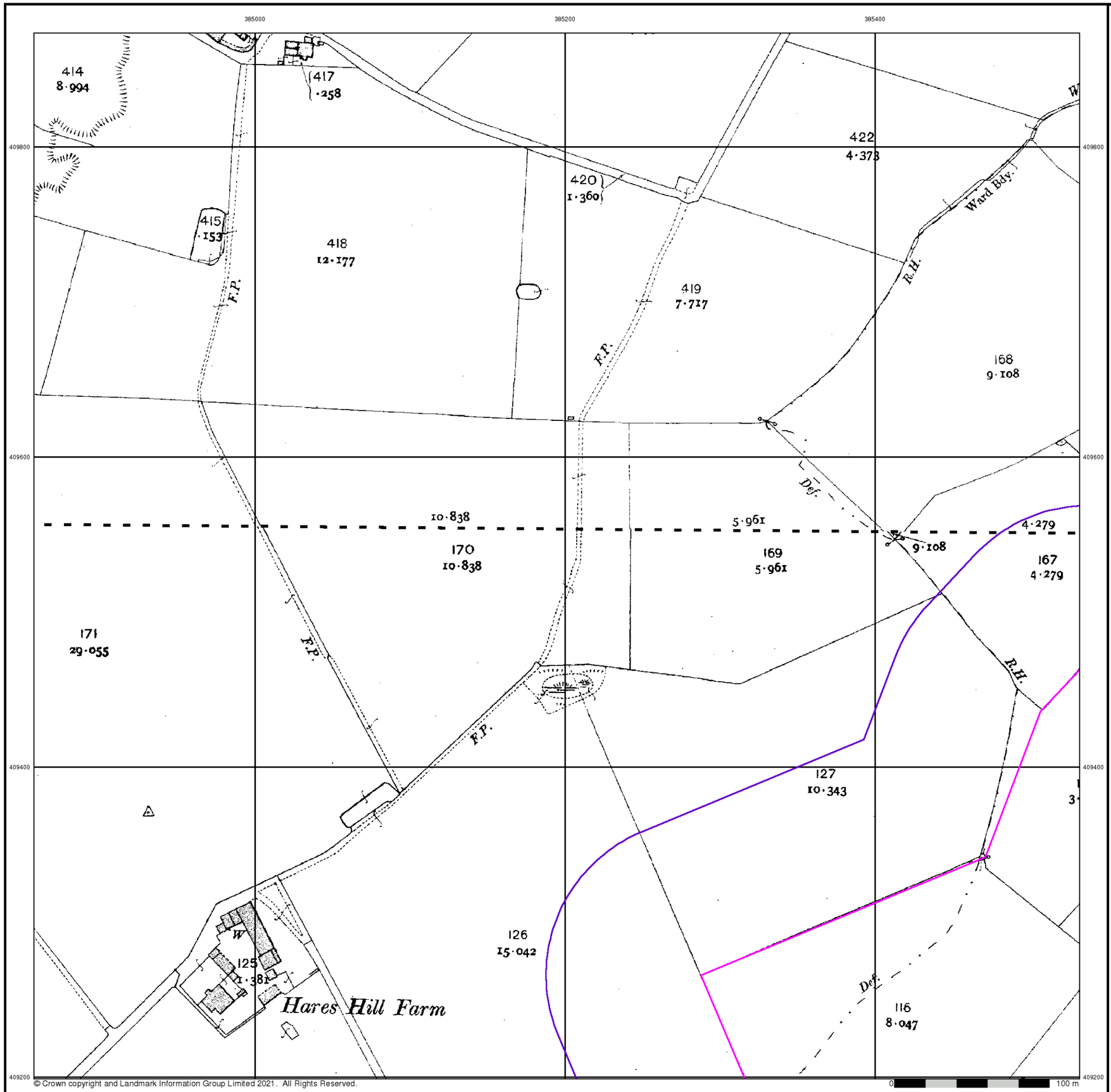
Order Details

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Customer Ref:	322834
National Grid Reference:	385560, 409190
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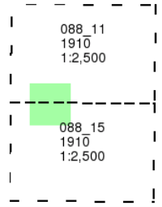
Lancashire And Furness

Published 1910

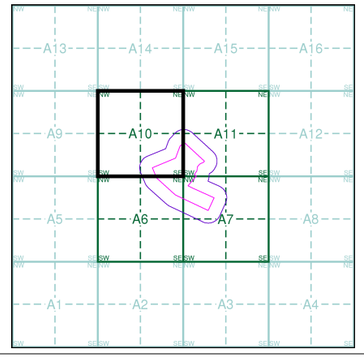
Source map scale - 1:2,500

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)



Historical Map - Segment A10



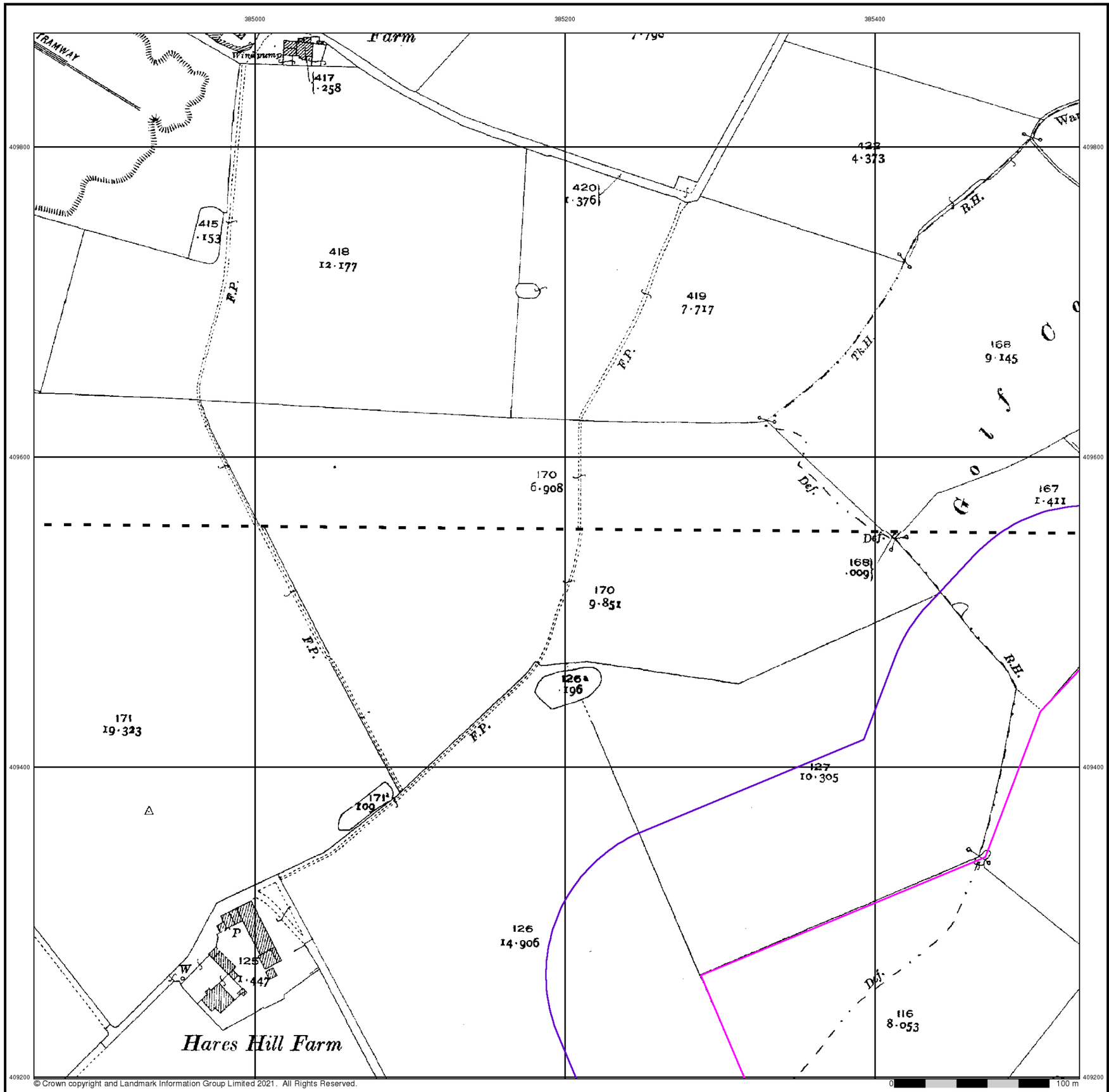
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

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Lancashire And Furness

Published 1929

Source map scale - 1:2,500

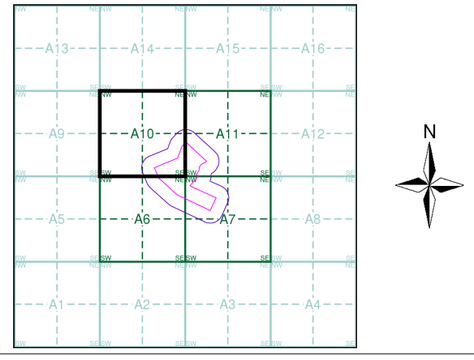
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. 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_11
1929
1:2,500

088_15
1929
1:2,500

Historical Map - Segment A10



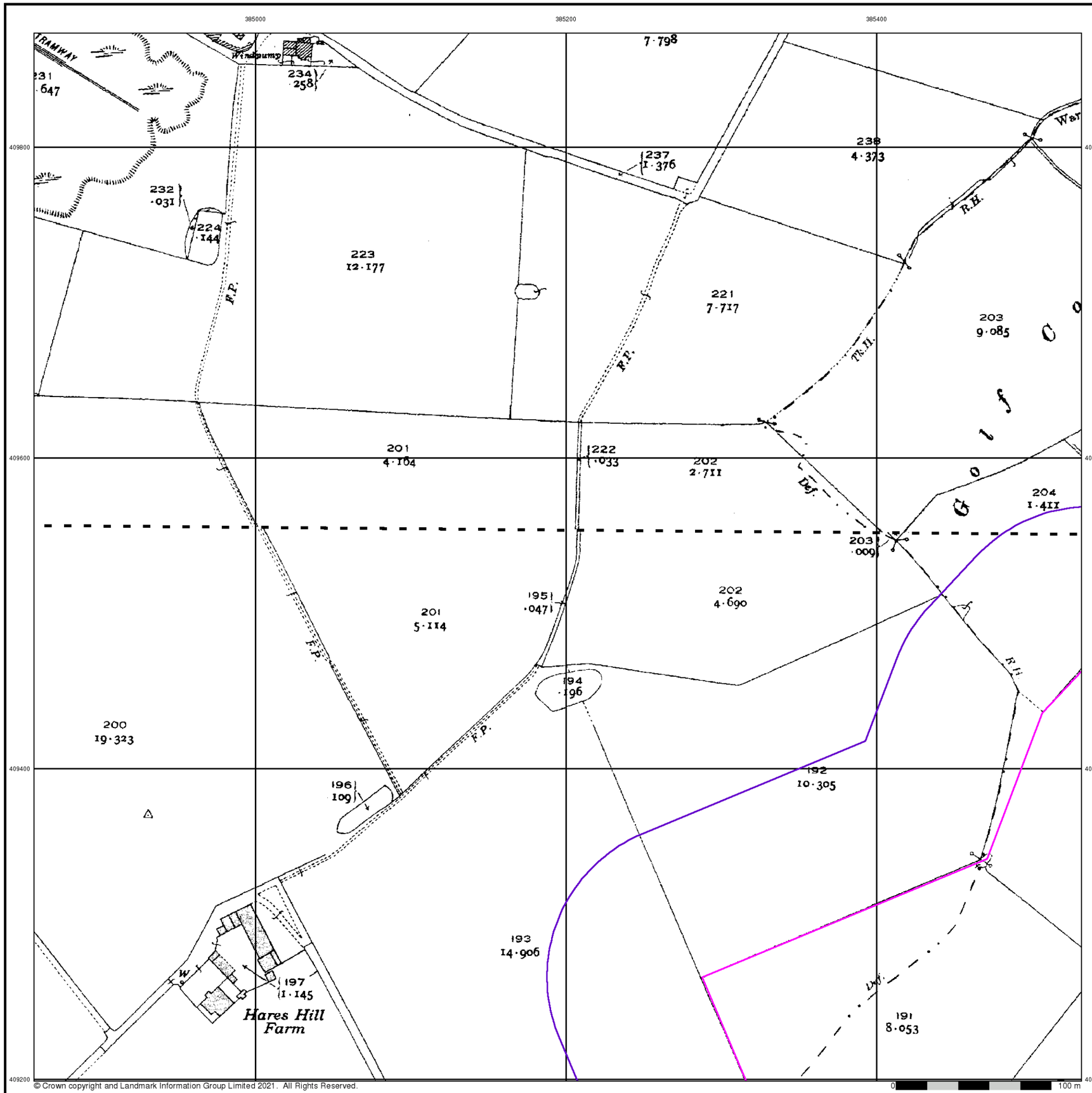
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National Grid Reference:	385560, 409190
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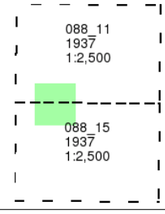
Lancashire And Furness

Published 1937

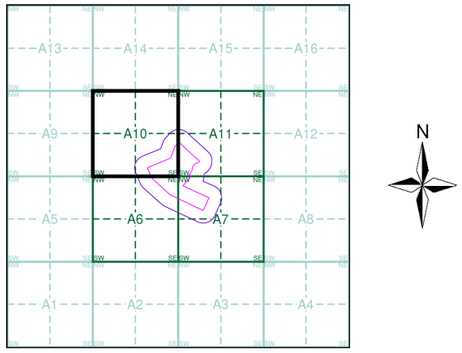
Source map scale - 1:2,500

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 A10



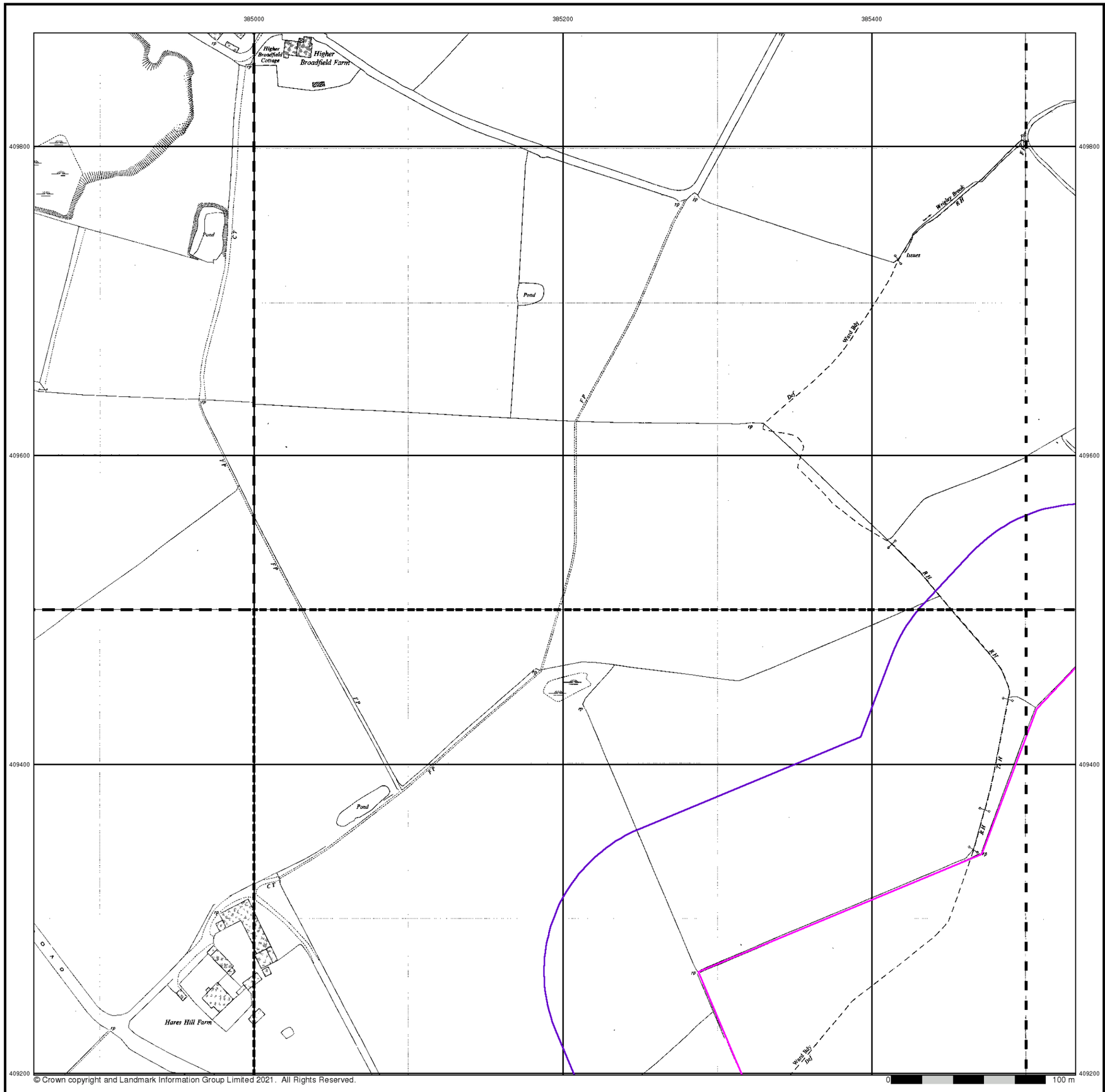
Order Details

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Customer Ref:	322834
National Grid Reference:	385560, 409190
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Site Area (Ha):	11.19
Search Buffer (m):	100

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Ordnance Survey Plan

Published 1956

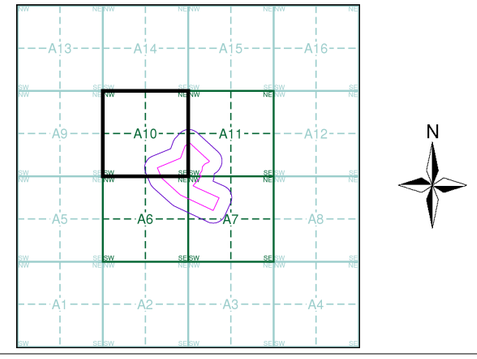
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SD8409NE 1956 1:1,250	SD8509NW 1956 1:1,250	SD8509NE 1956 1:1,250
SD8409SE 1956 1:1,250	SD8509SW 1956 1:1,250	SD8509SE 1956 1:1,250

Historical Map - Segment A10



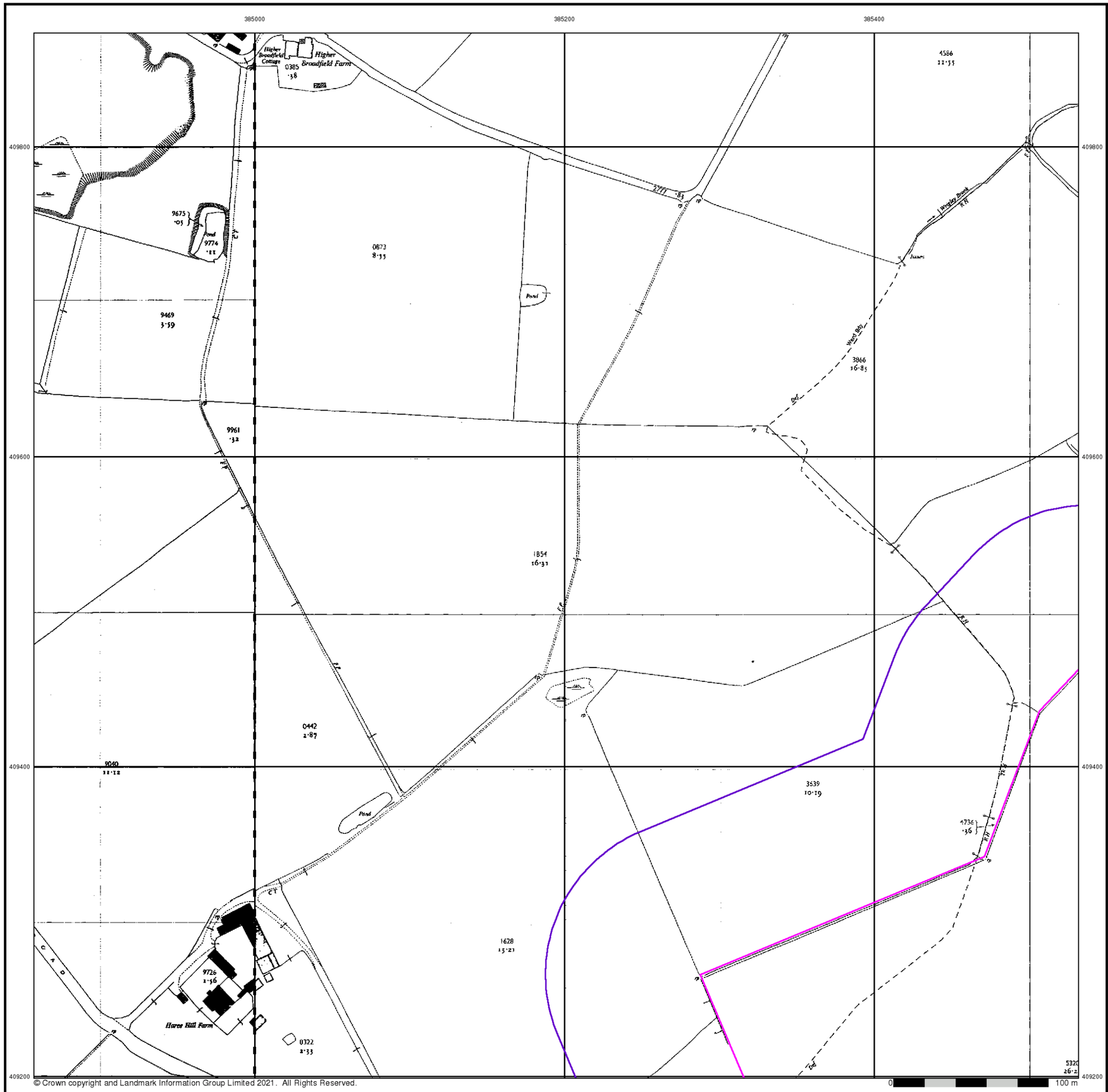
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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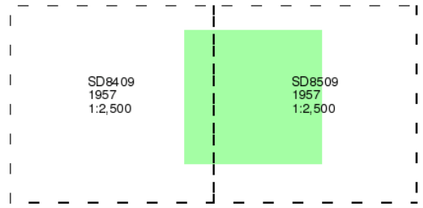
Ordnance Survey Plan

Published 1957

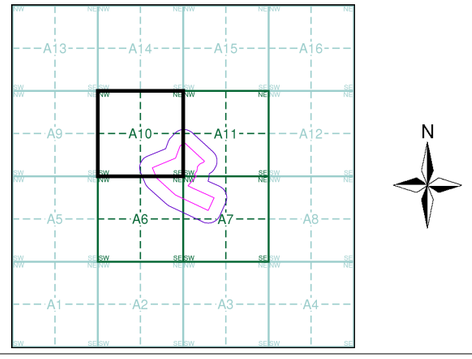
Source map scale - 1:2,500

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 A10



Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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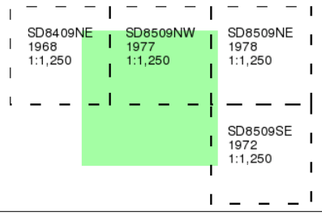
Ordnance Survey Plan

Published 1968 - 1978

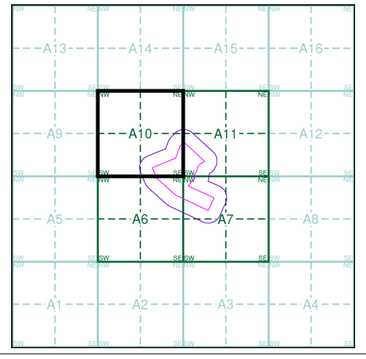
Source map scale - 1:1,250

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 A10



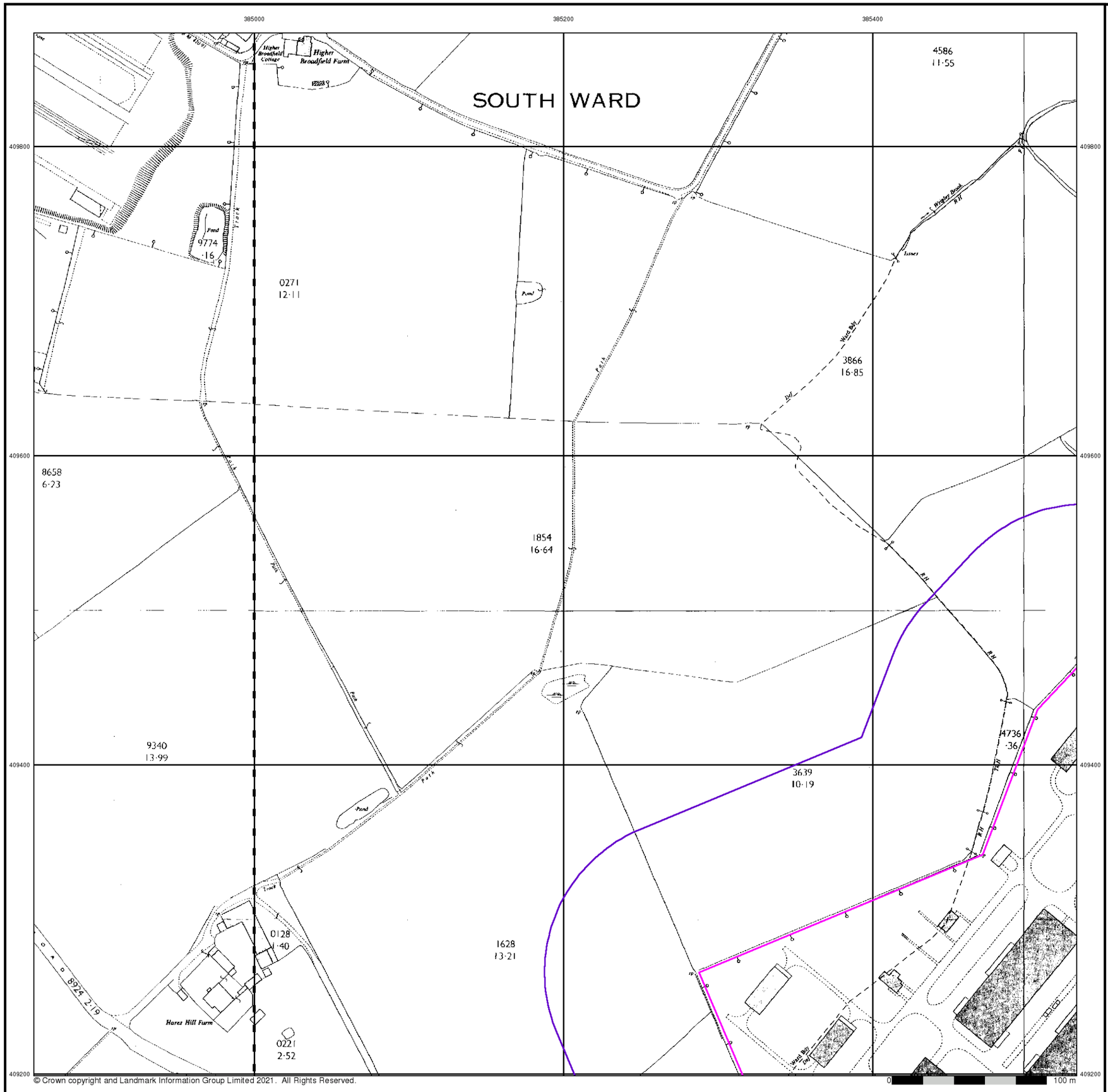
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Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

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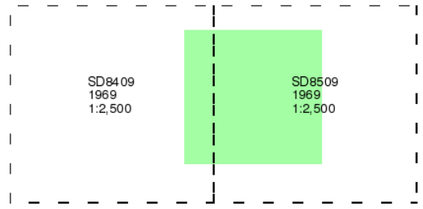
Ordnance Survey Plan

Published 1969

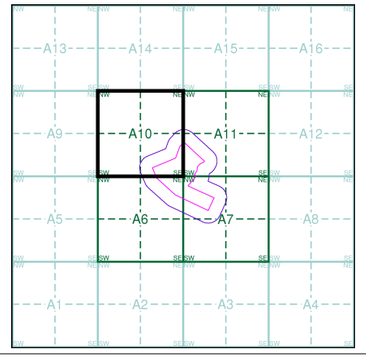
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

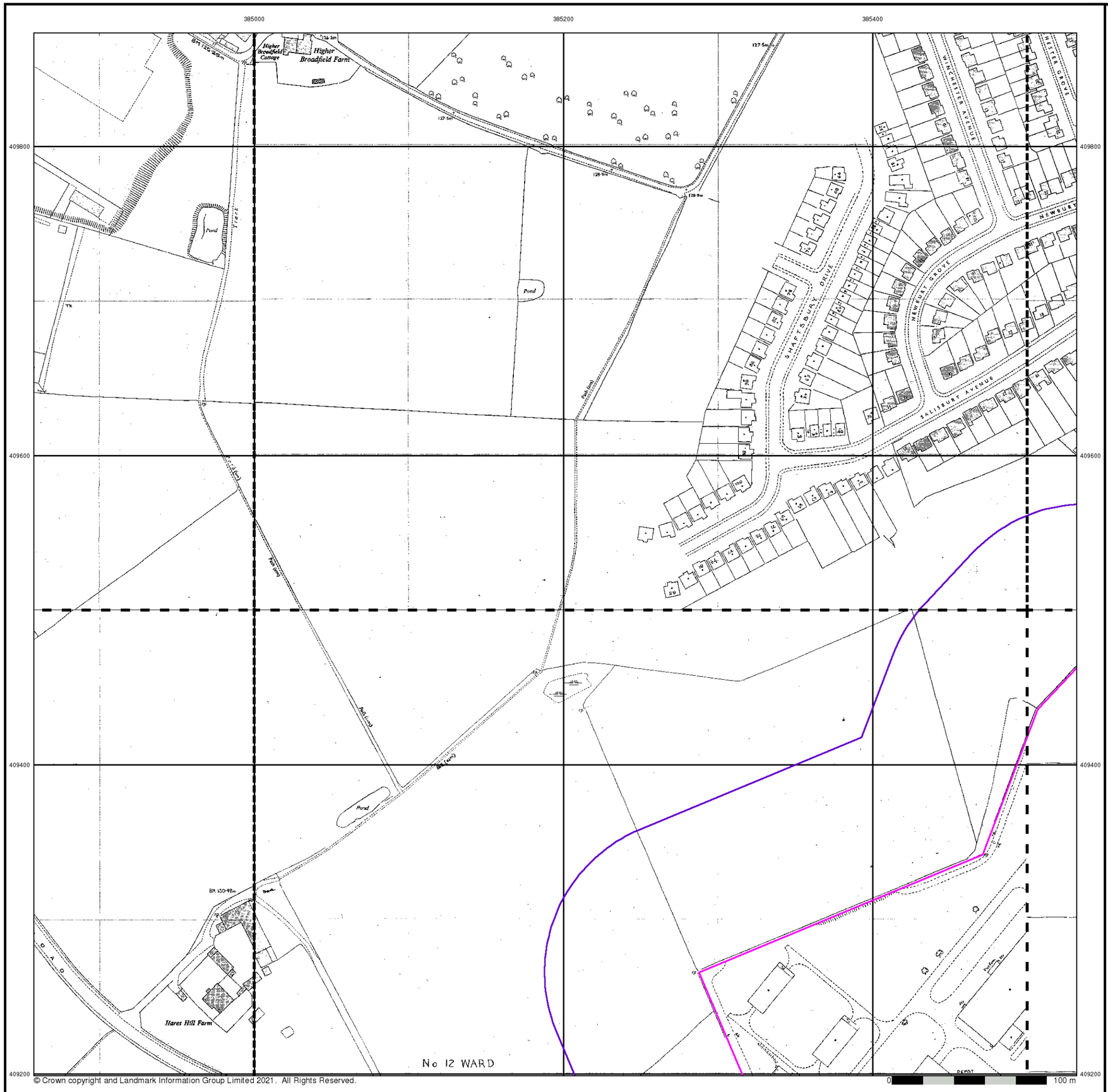
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Additional SIMs

Published 1972 - 1990

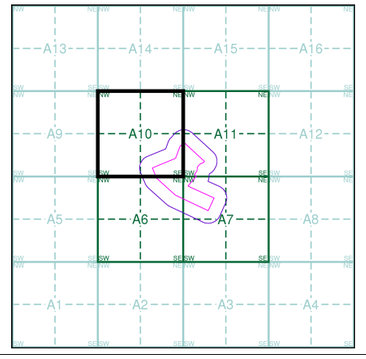
Source map scale - 1:1,250

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

Map Name(s) and Date(s)

SD8409NE 1984 1:1,250	SD8509NW 1982 1:1,250	SD8509NE 1990 1:1,250
SD8409SE 1983 1:1,250	SD8509SW 1977 1:1,250	SD8509SE 1972 1:1,250

Historical Map - Segment A10



Order Details

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385000 385200 385400

409800 409600 409400 409200

Higher Broadfield Cottage
Higher Broadfield Farm
Pond
Pond
HONITON CLOSE
SWARTS BURY DRIVE
WINCHESTER AVENUE
NEWBURY GROVE
SALISBURY AVENUE
GLOUCESTER AVENUE
DEPOT

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0 100 m

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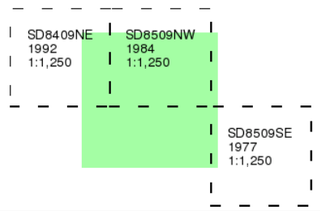
Additional SIMs

Published 1977 - 1992

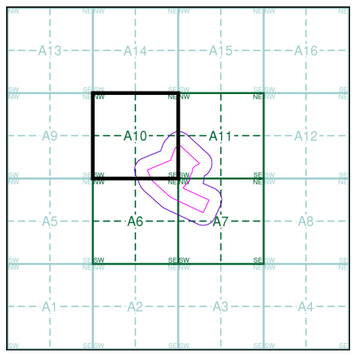
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A10



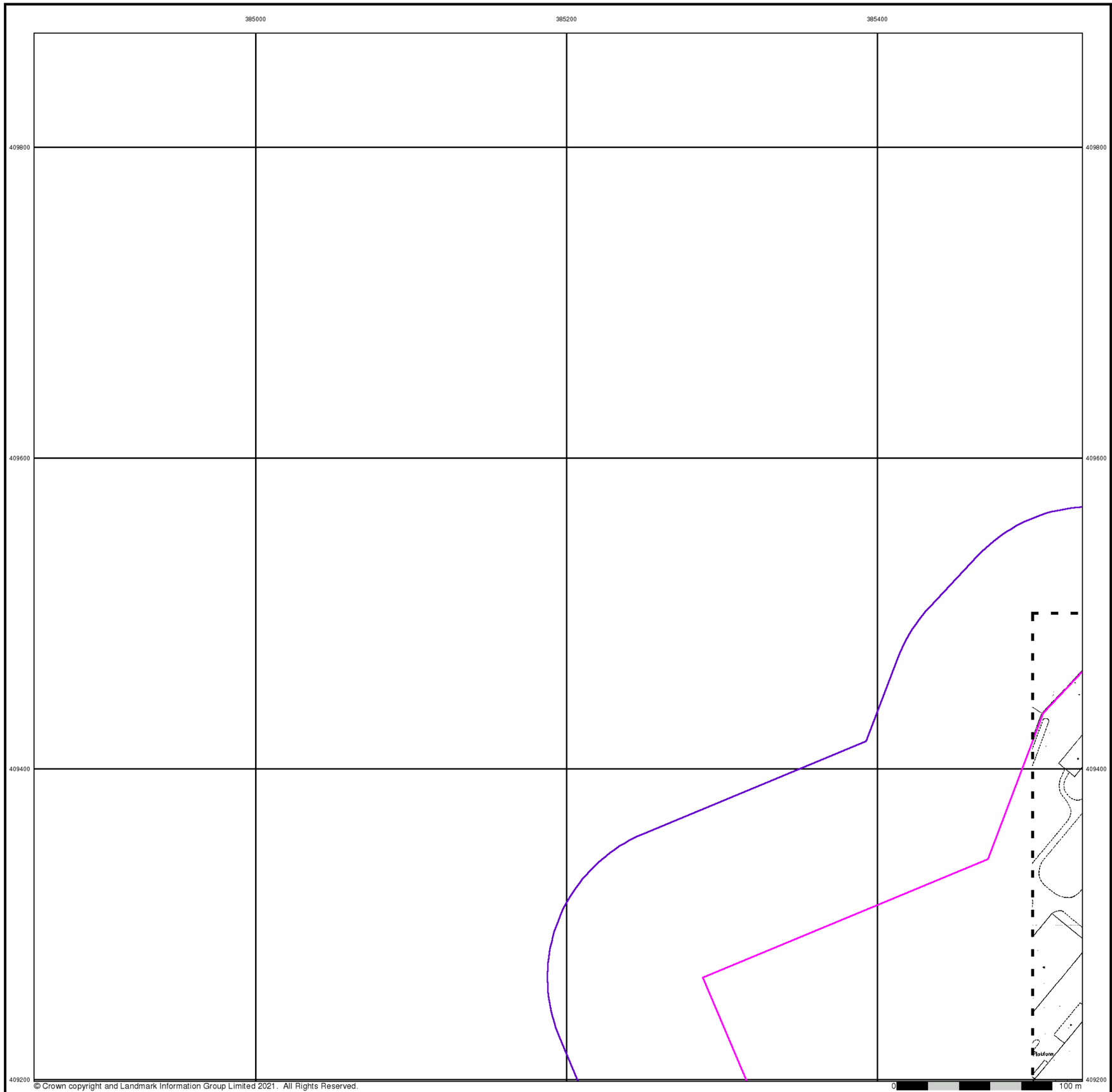
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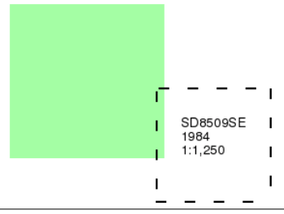
Additional SIMs

Published 1984

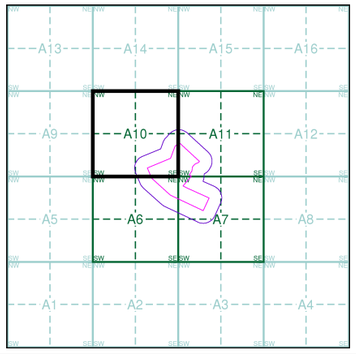
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

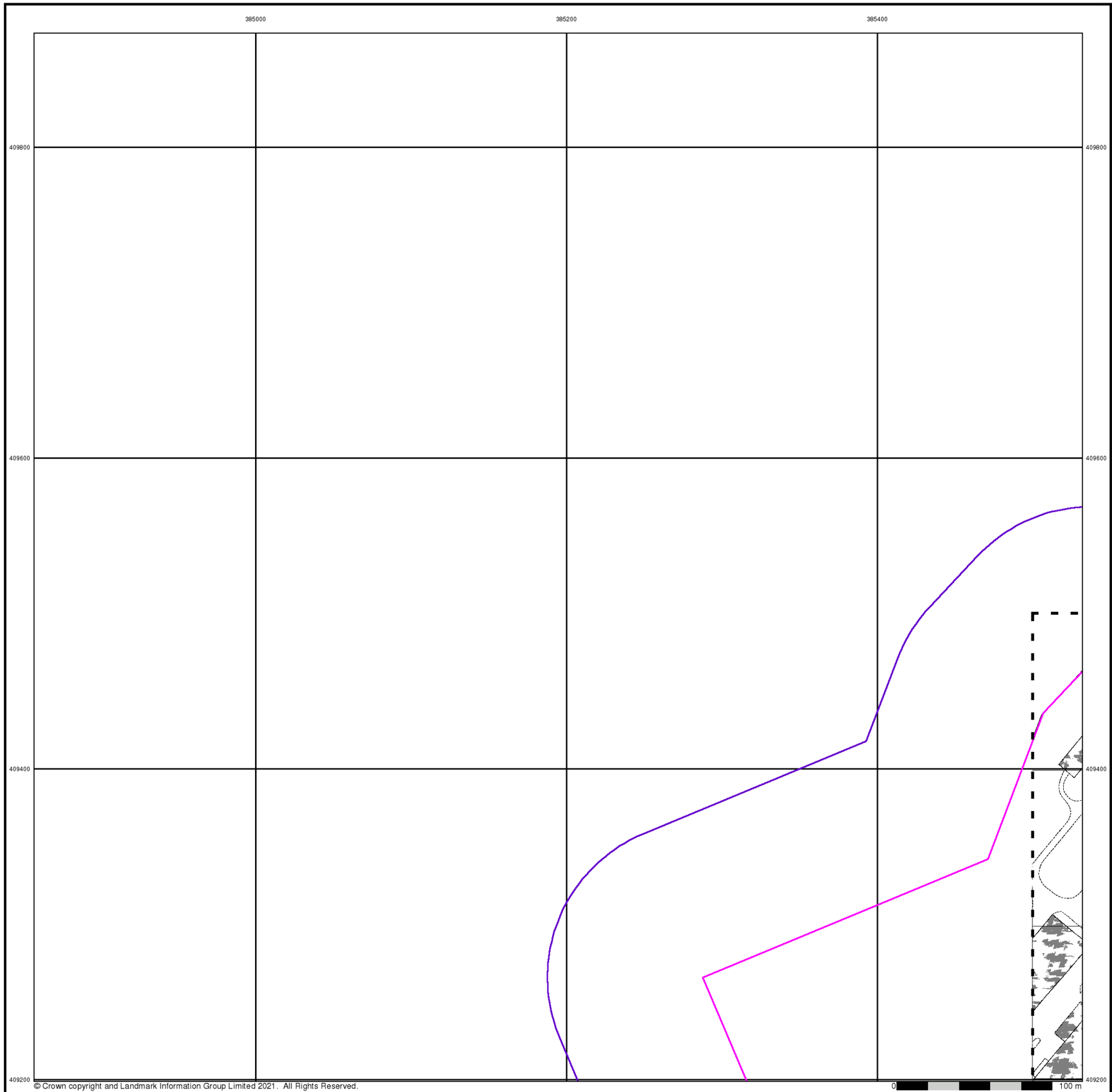
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Customer Ref:	322834
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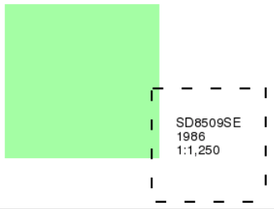
Ordnance Survey Plan

Published 1986

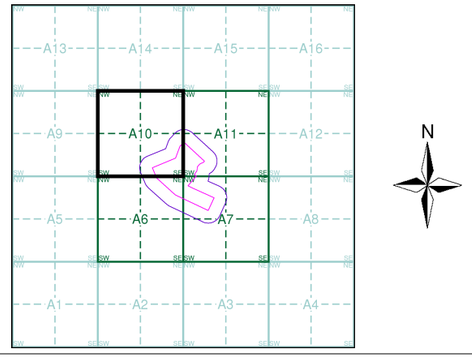
Source map scale - 1:1,250

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 A10



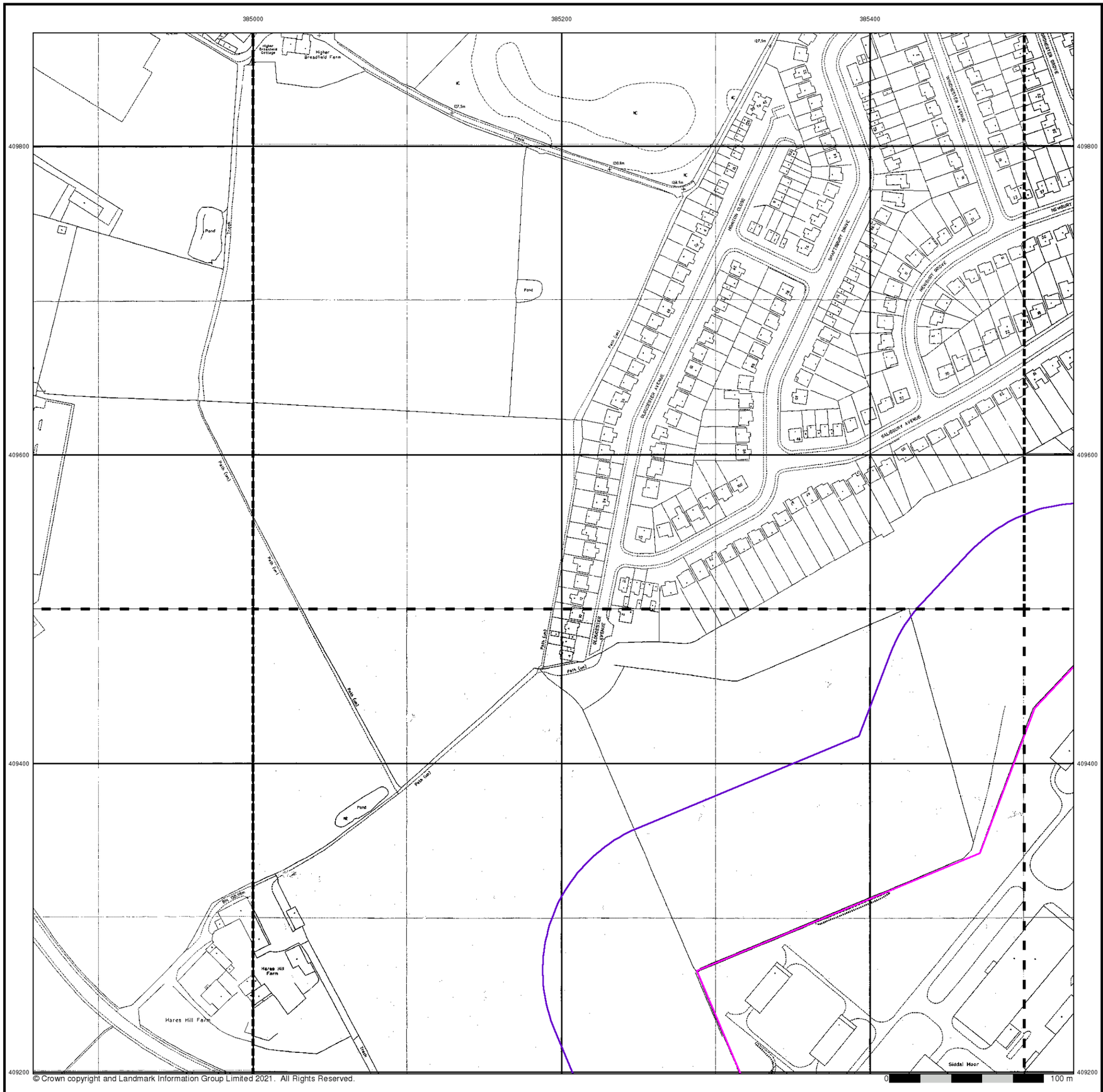
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

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Large-Scale National Grid Data

Published 1992

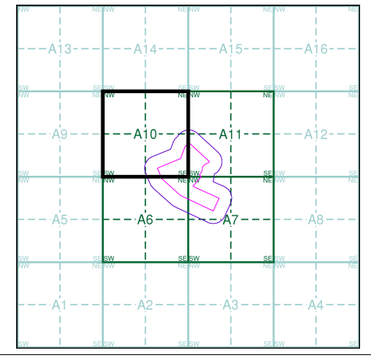
Source map scale - 1:1,250

'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)

SD8409NE 1992 1:1,250	SD8509NW 1992 1:1,250	SD8509NE 1992 1:1,250
SD8409SE 1992 1:1,250	SD8509SW 1992 1:1,250	SD8509SE 1992 1:1,250

Historical Map - Segment A10



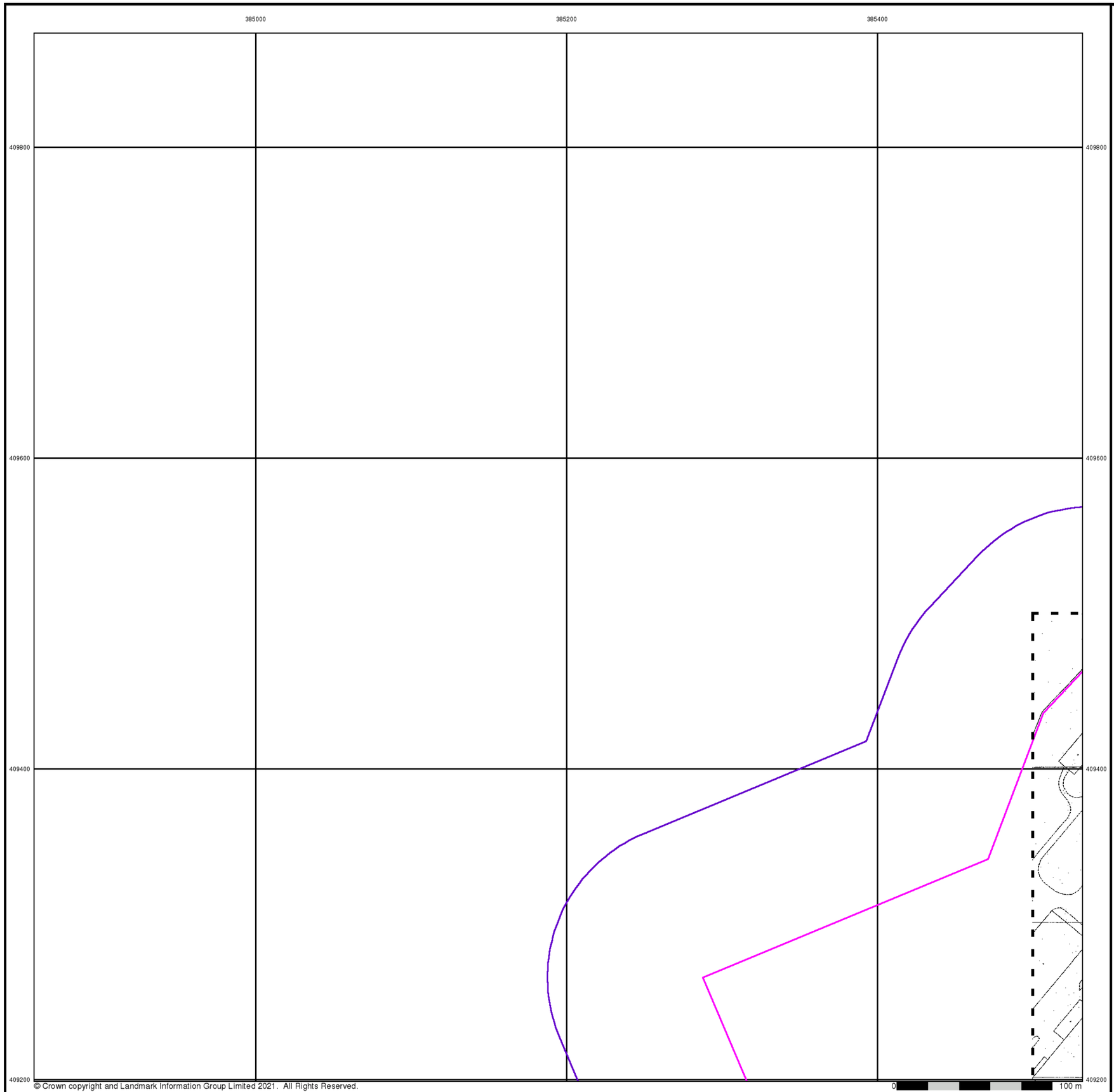
Order Details

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Customer Ref:	322834
National Grid Reference:	385560, 409190
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Site Area (Ha):	11.19
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Site Details

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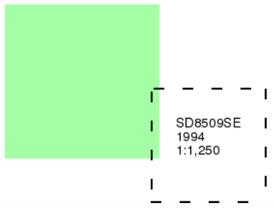
Large-Scale National Grid Data

Published 1994

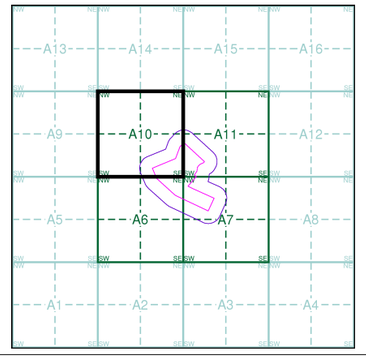
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

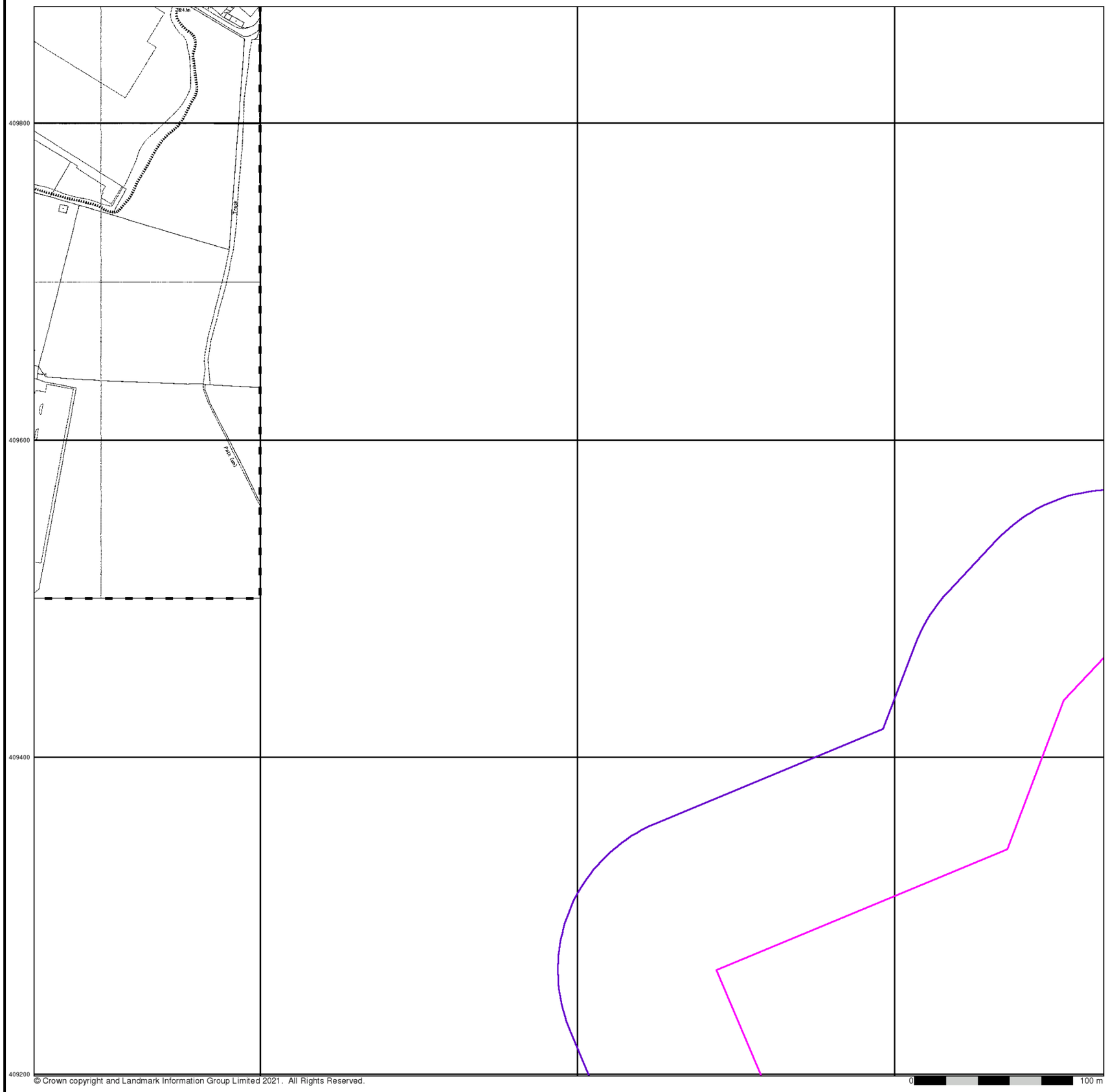
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

Site Details

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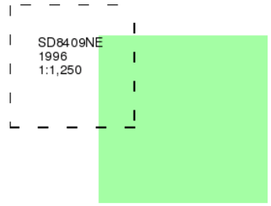
Large-Scale National Grid Data

Published 1996

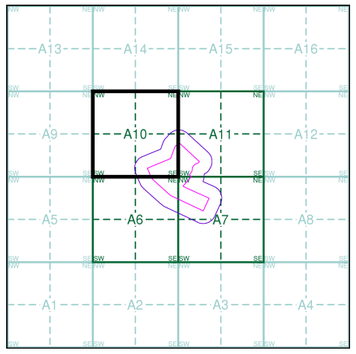
Source map scale - 1:1,250

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

Map Name(s) and Date(s)



Historical Map - Segment A10



Order Details

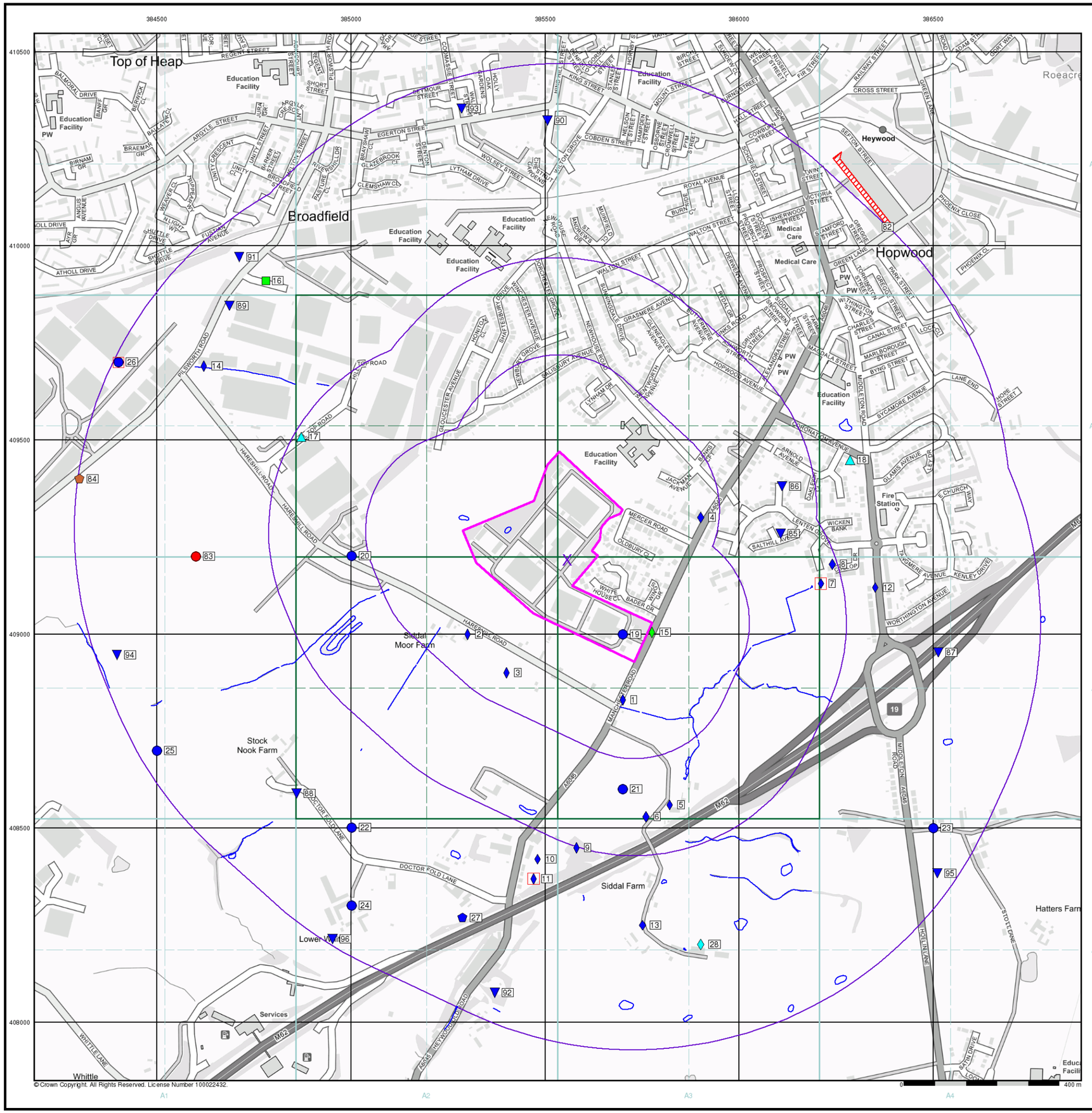
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	100

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General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Map ID

Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

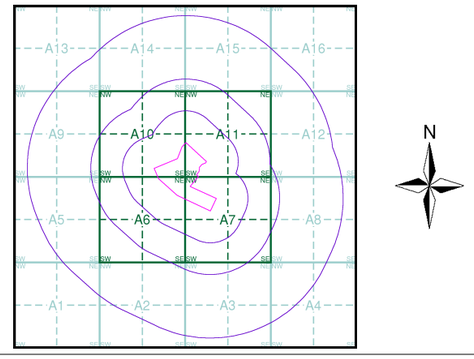
Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Slice A



Order Details

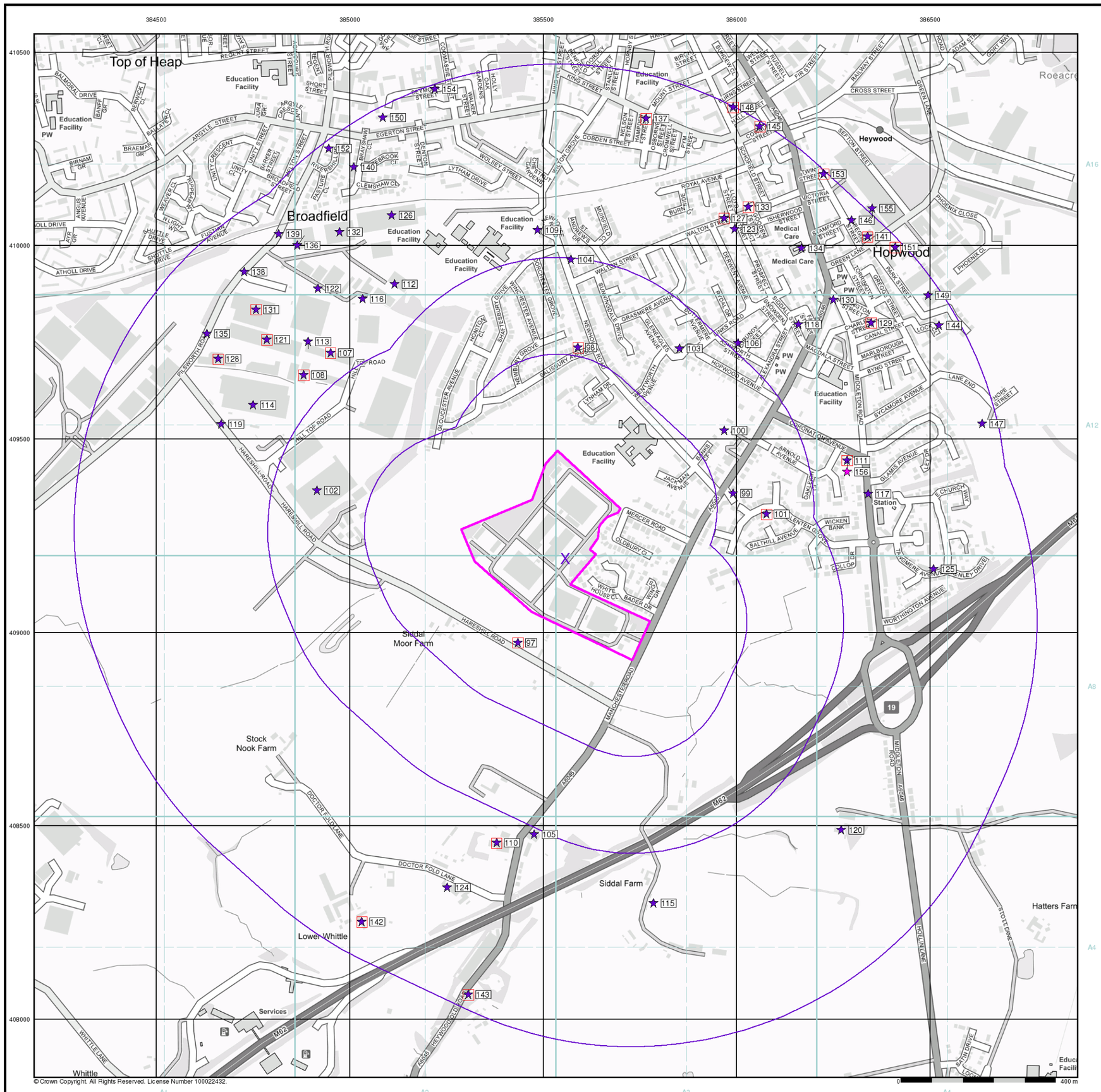
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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Industrial Land Use Map

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Slice | Map ID

Industrial Land Use

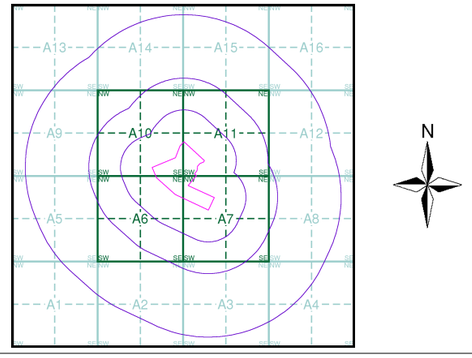
Contemporary Trade Directory Entry

Fuel Station Entry

Gas Pipeline

Underground Electrical Cables

Industrial Land Use Map - Slice A



Order Details

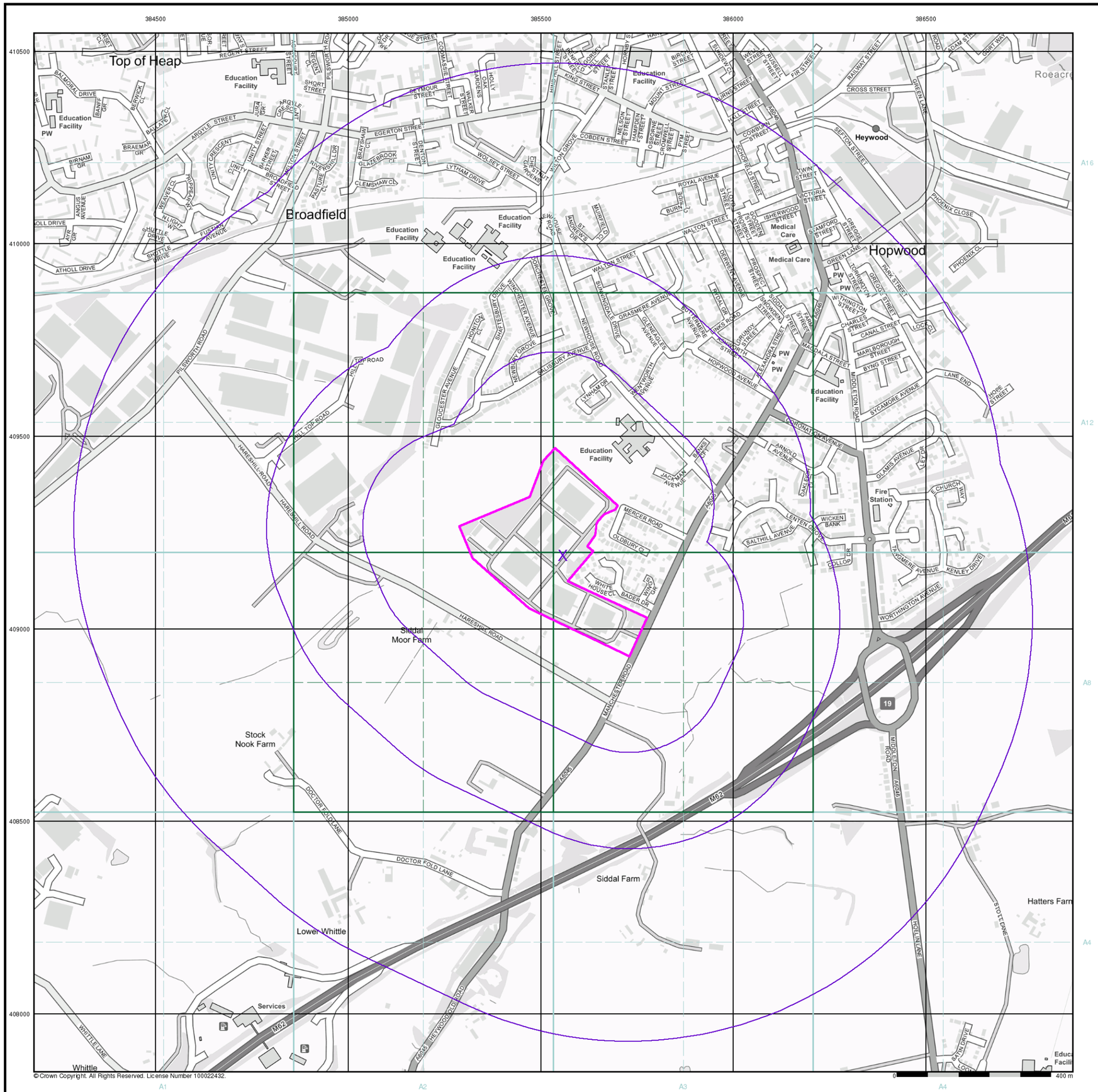
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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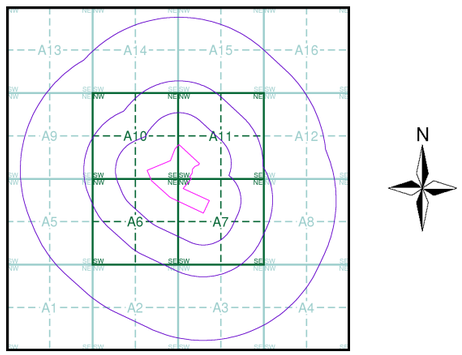
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



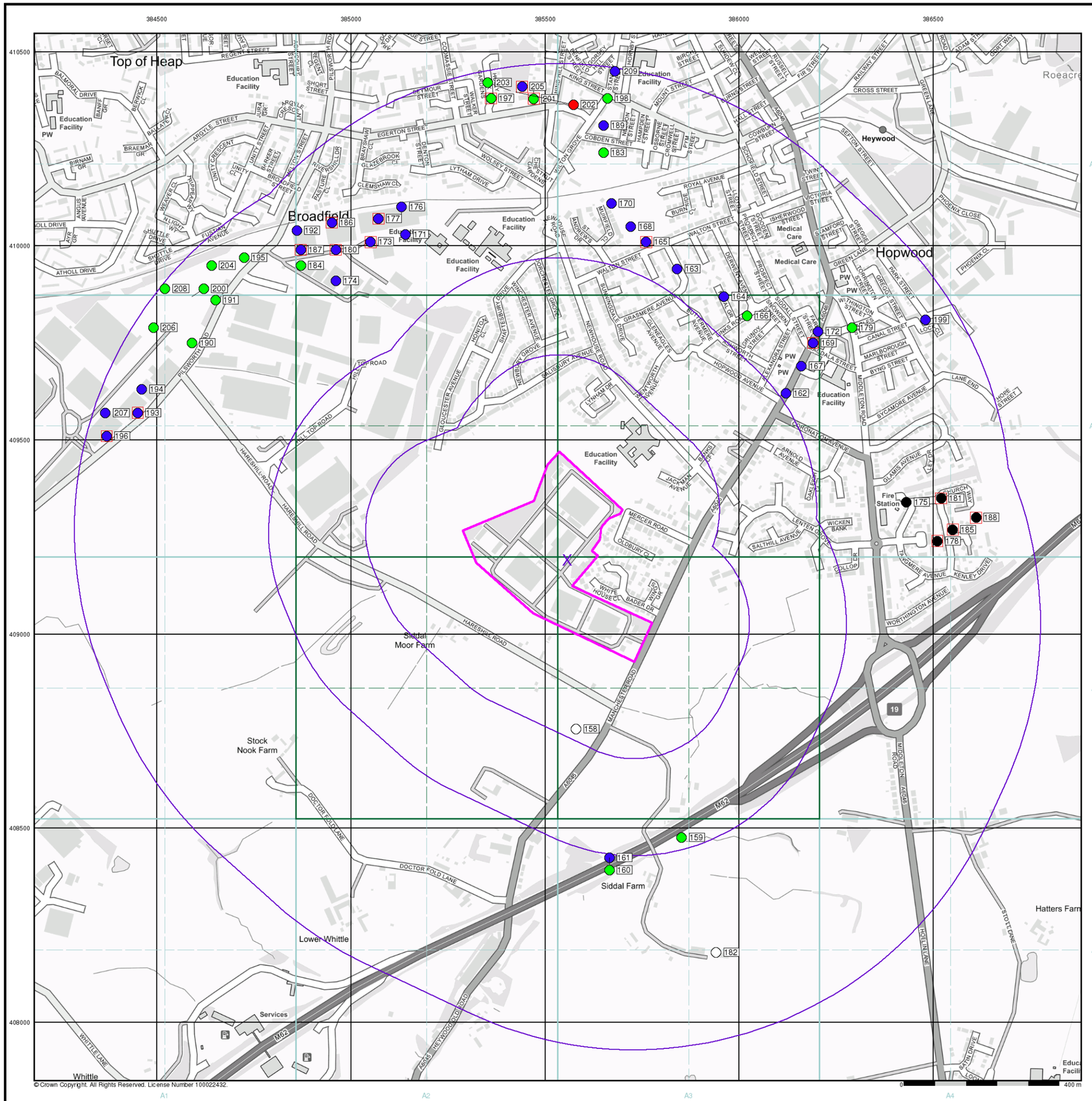
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

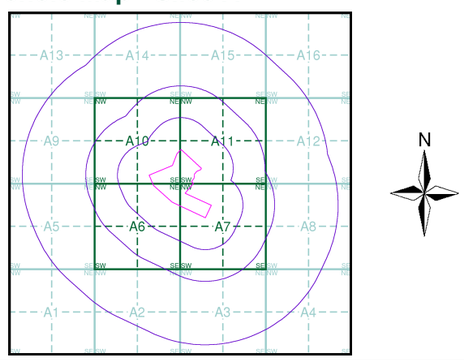
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A

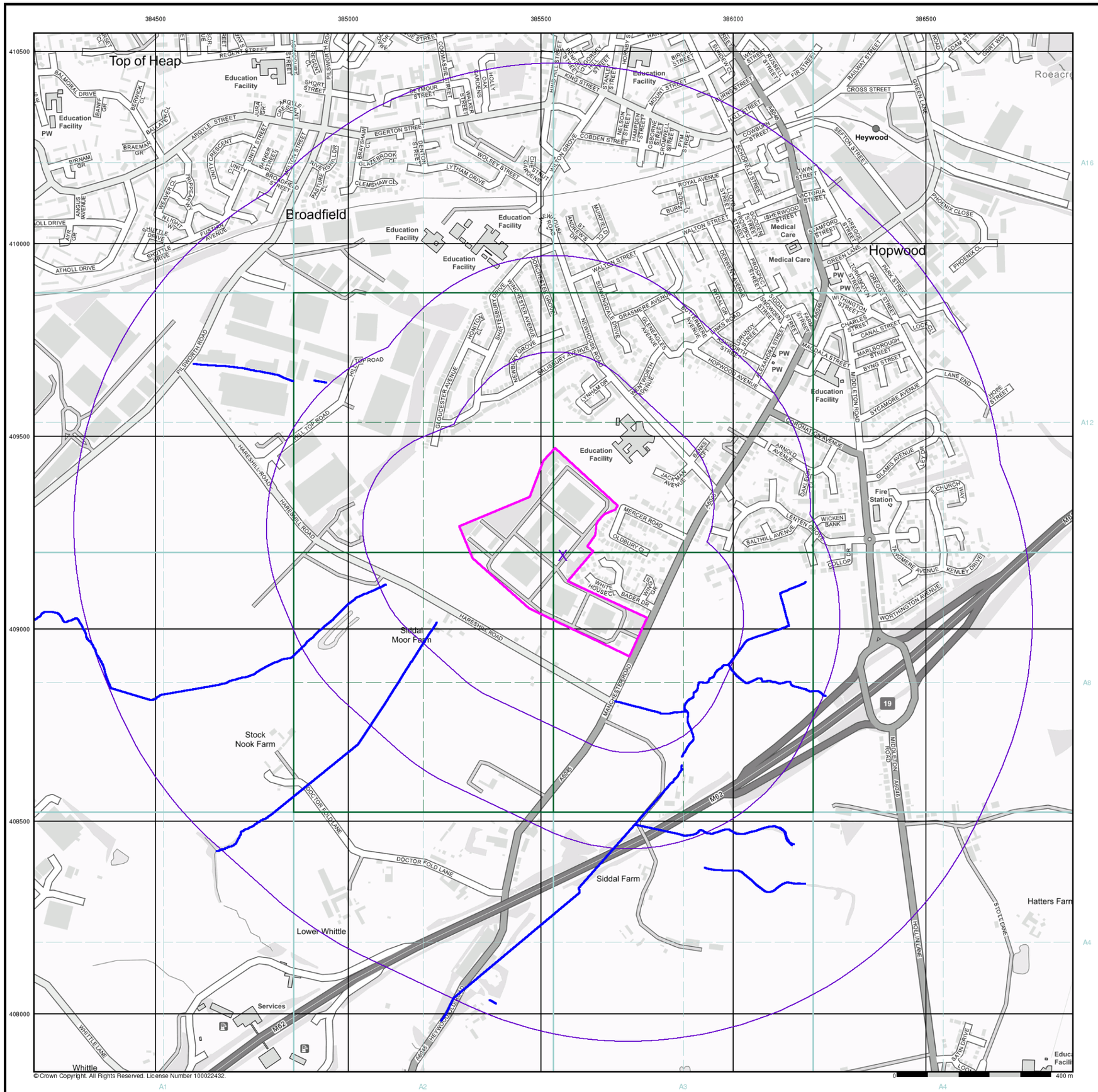


Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR



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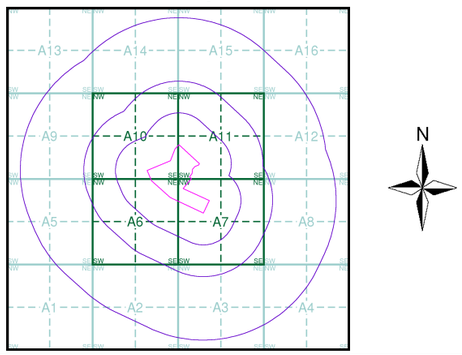
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea

OS Water Network Map - Slice A



Order Details

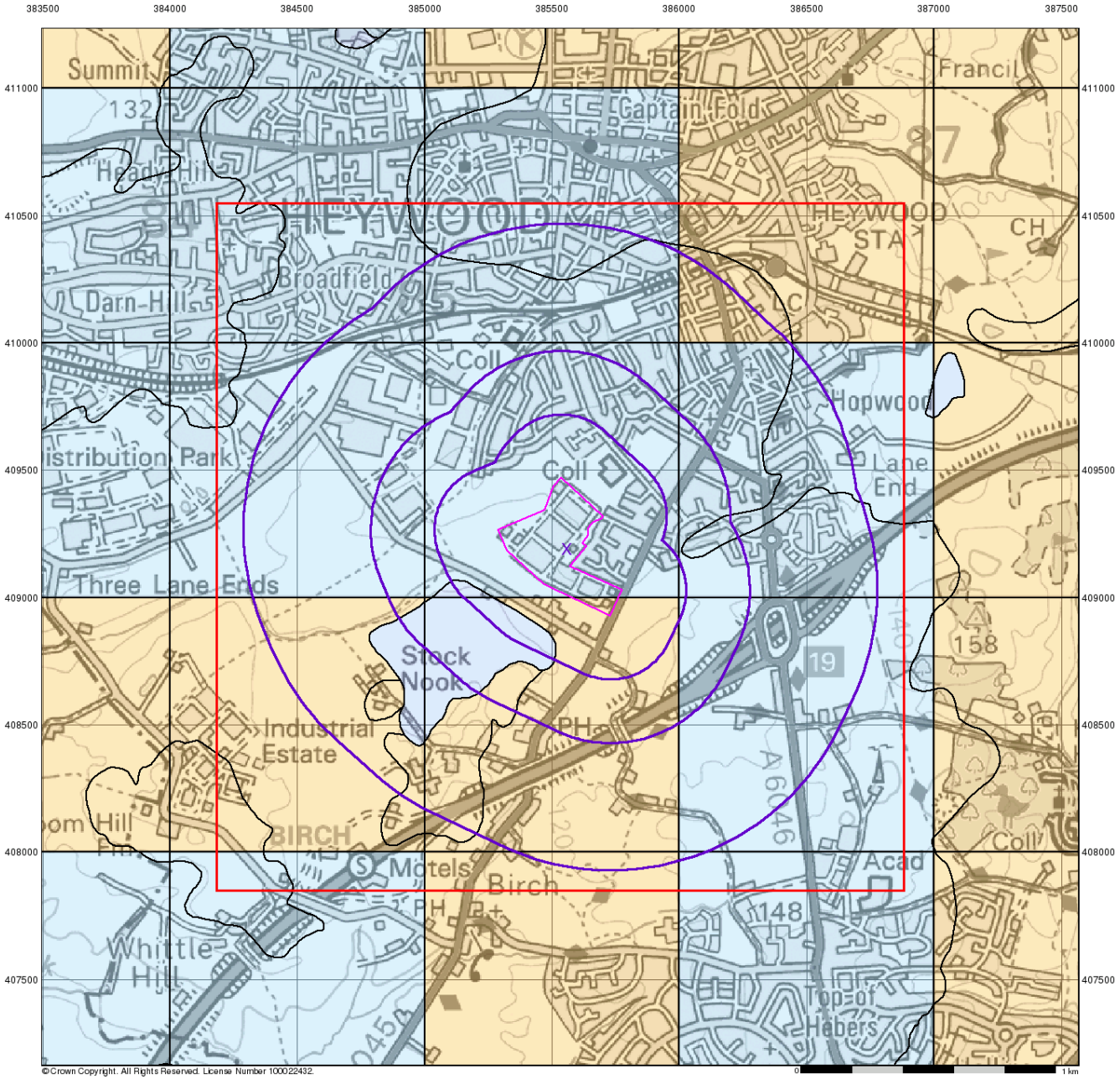
Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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Groundwater Vulnerability

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

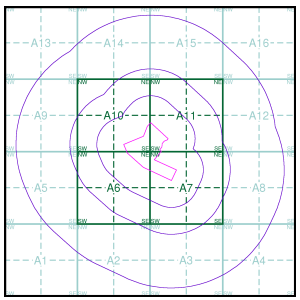
Agency and Hydrological

Bedrock Aquifers	Superficial Aquifers
High Vulnerability, Principal Aquifer	High Vulnerability, Principal Aquifer
High Vulnerability, Secondary Aquifer	High Vulnerability, Secondary Aquifer
Medium Vulnerability, Principal Aquifer	Medium Vulnerability, Principal Aquifer
Medium Vulnerability, Secondary Aquifer	Medium Vulnerability, Secondary Aquifer
Low Vulnerability, Principal Aquifer	Low Vulnerability, Principal Aquifer
Low Vulnerability, Secondary Aquifer	Low Vulnerability, Secondary Aquifer

Unproductive Aquifer

Soluble Rock

Site Sensitivity Context Map - Slice A



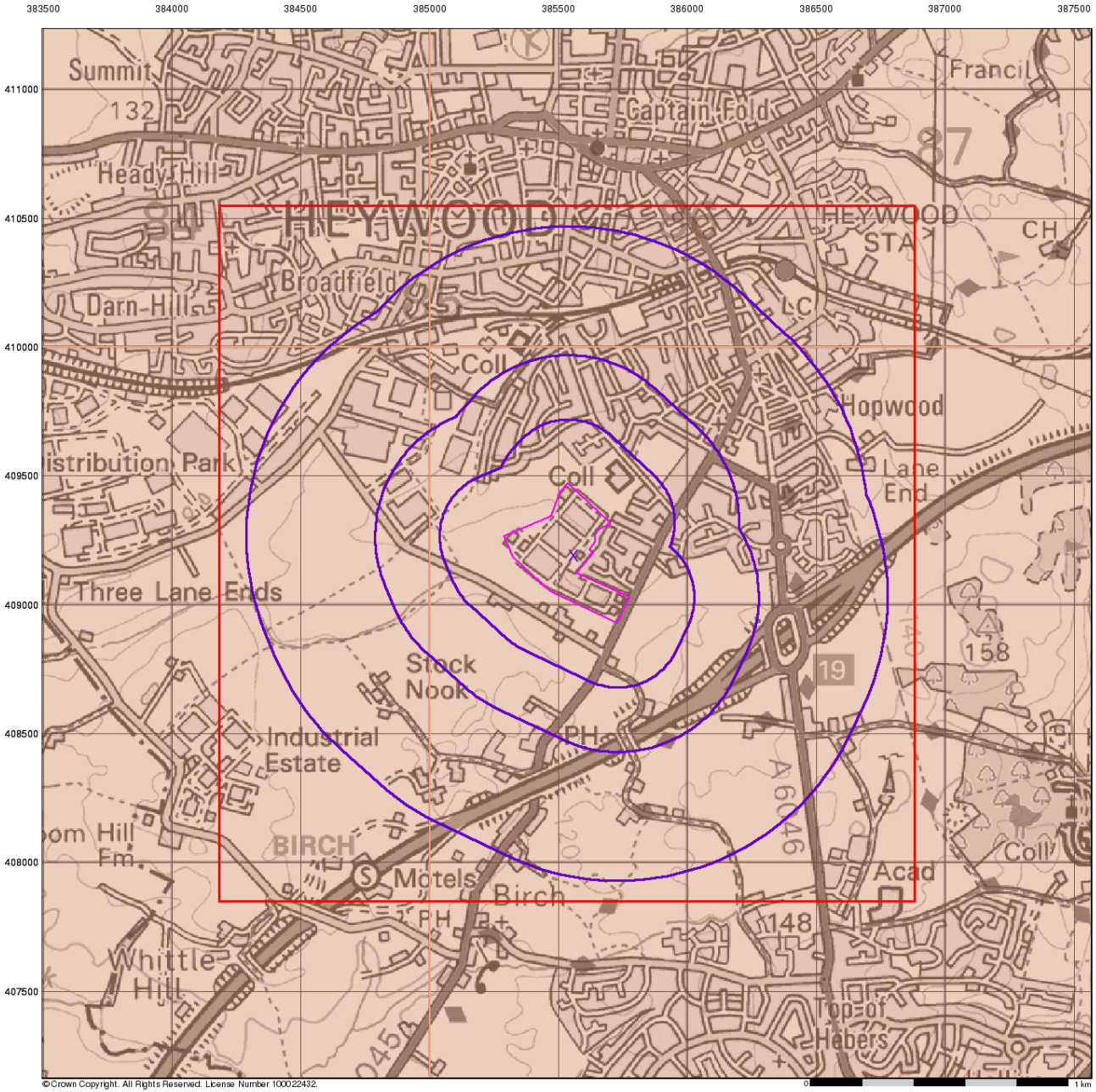
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
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Slice:	A
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Site Details

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Bedrock Aquifer Designation

General

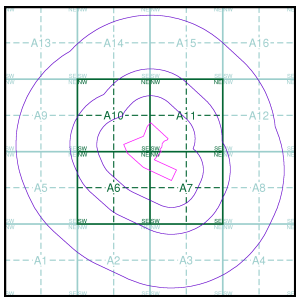
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



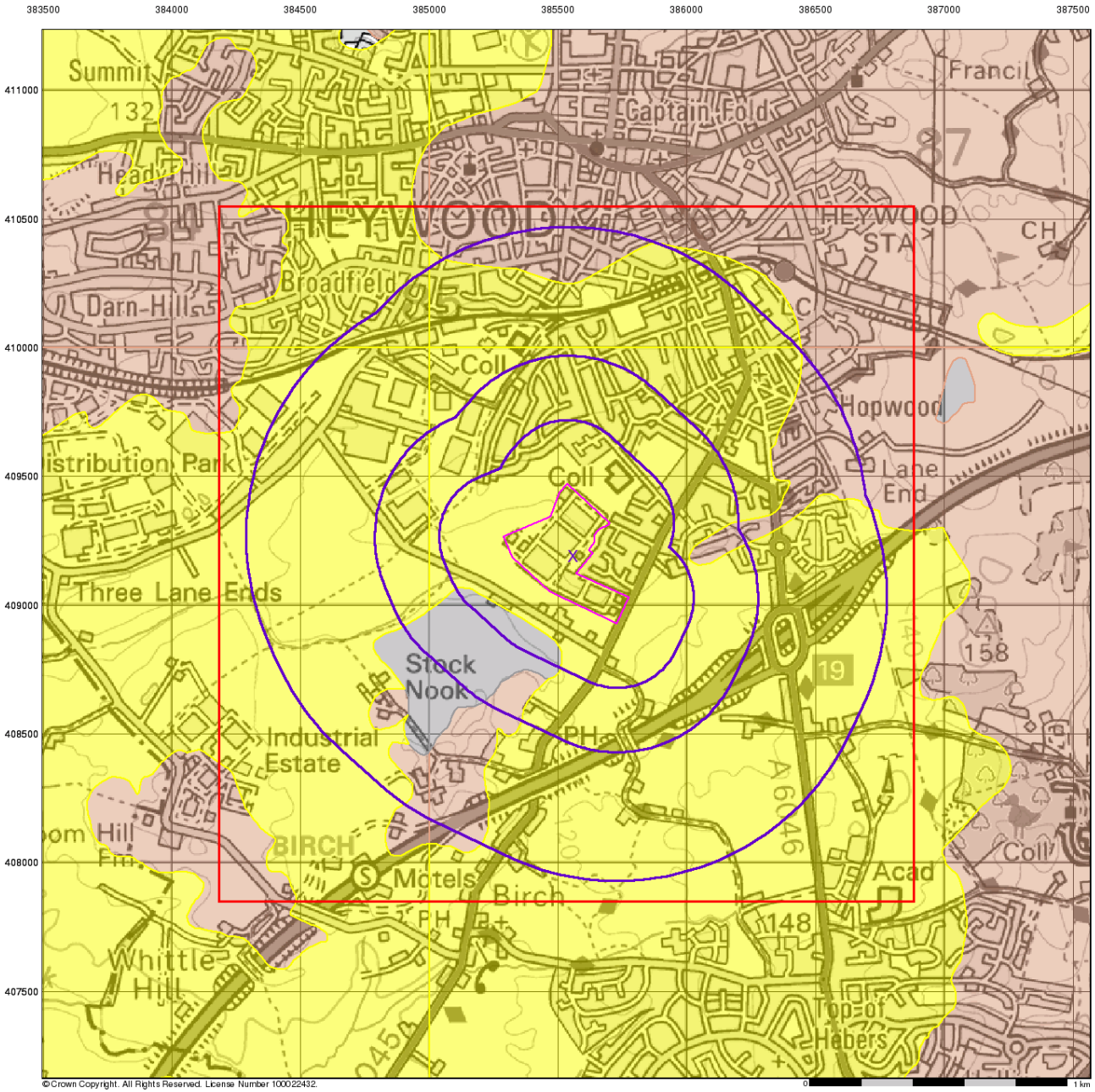
Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
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Superficial Aquifer Designation

General

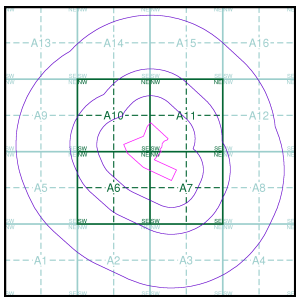
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

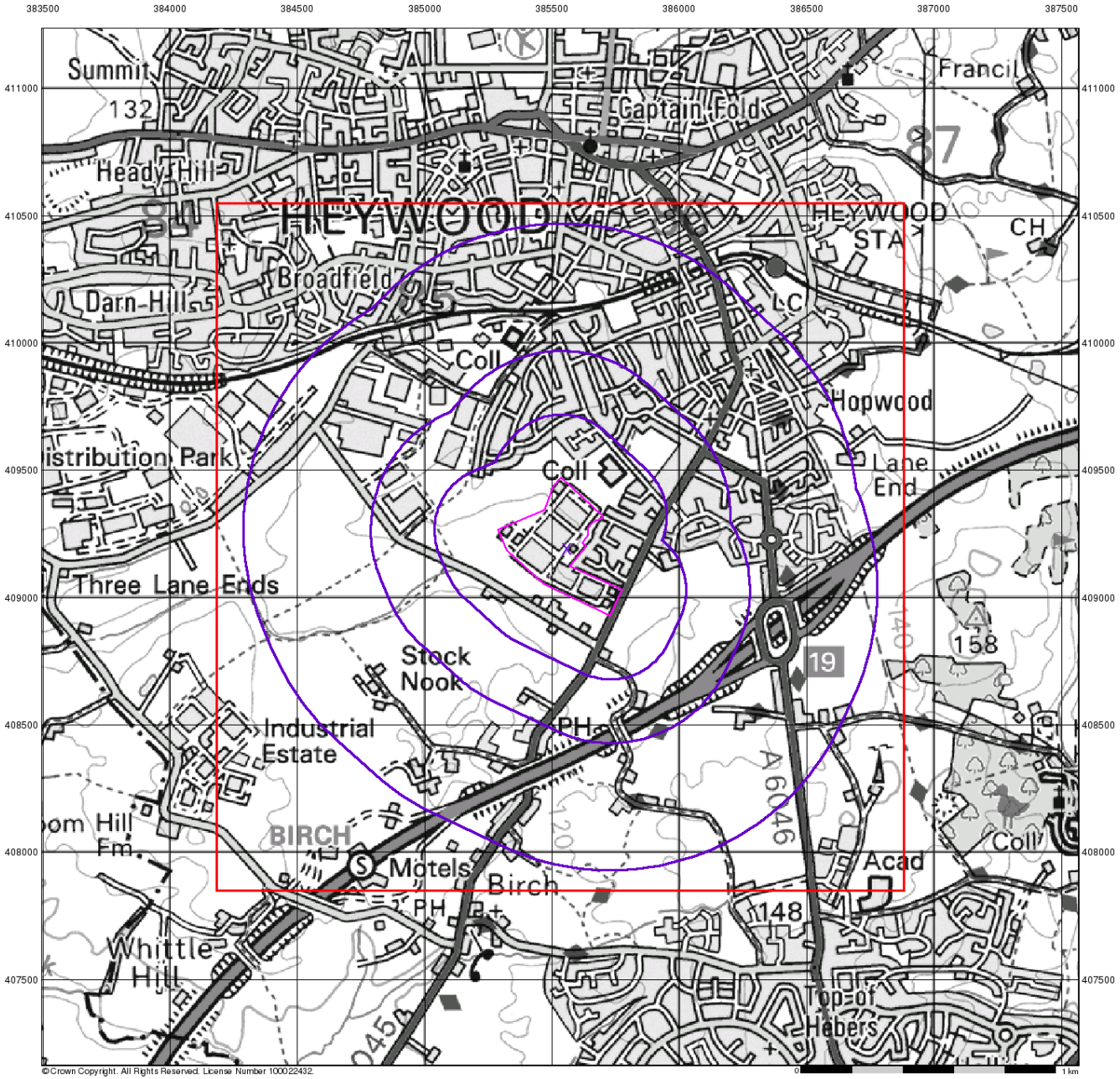


Order Details

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Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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Source Protection Zones

General

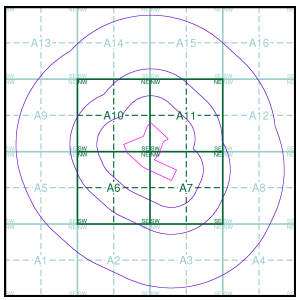
Specified Site | Specified Buffer(s) | Bearing Reference Point

Slice | Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A

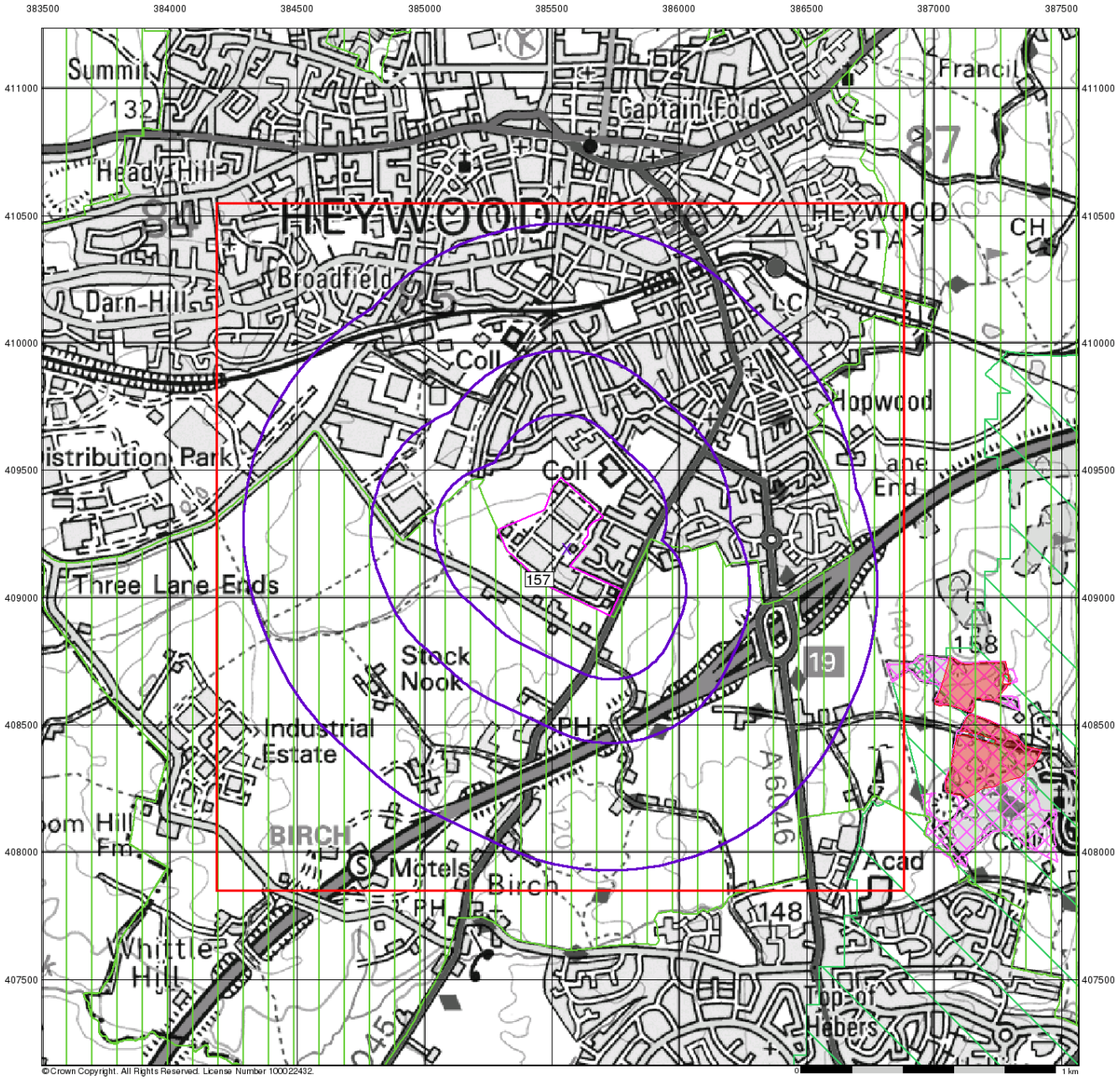


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Slice:	A
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Site Details

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Sensitive Land Uses

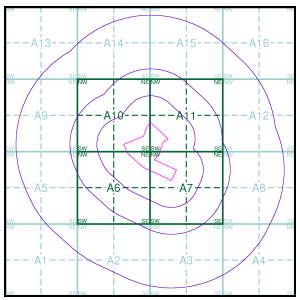
General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A

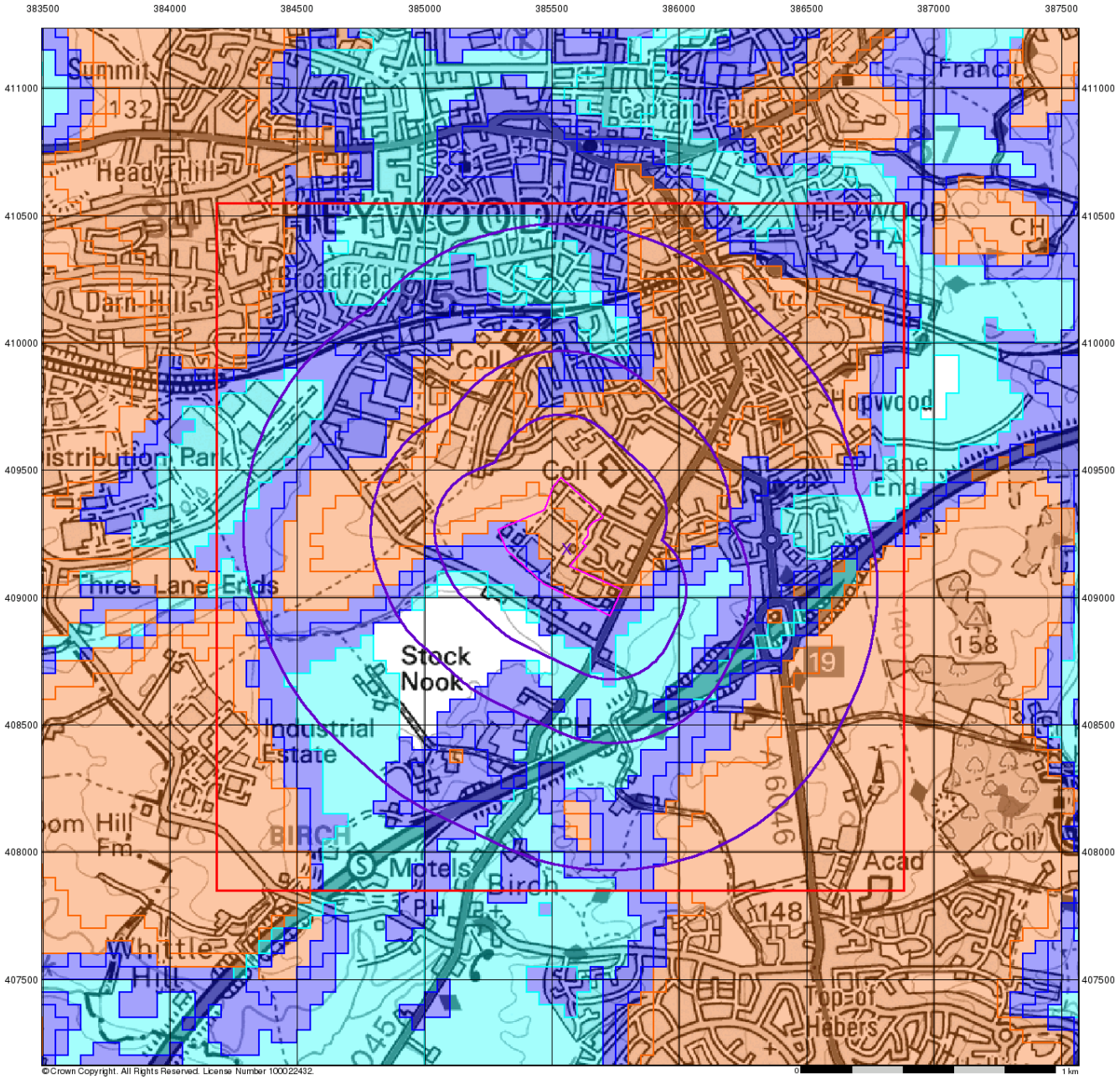


Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

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RSK

BGS Flood GFS Data

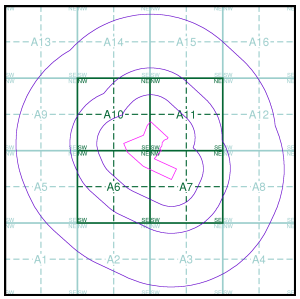
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	281815927_1_1
Customer Ref:	322834
National Grid Reference:	385560, 409190
Slice:	A
Site Area (Ha):	11.19
Search Buffer (m):	1000

Site Details

1, Wings Grove, HEYWOOD, OL10 2QR

APPENDIX D SUPPORTING DESK STUDY INFORMATION



Detailed Unexploded Ordnance (UXO) Risk Assessment

Project Name	Heywood Stores
Client	RSK Group Limited
Site Address	Heywood Stores, Manchester Road, Heywood, OL10 2PZ
Report Reference	DA13368-00
Date	04/08/2021
Originator	AS

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Executive Summary

Site Location and Description

The site is located in Heywood, Greater Manchester. It is bound by open land to the north, south-west and west; by residential property and associated gardens to the east; and by the roadway A6045/Manchester Road to the south/south-east.

According to recent aerial imagery dated 2021, the site comprises a number of large warehouse units which occupy the majority of the site area. A roadway, accessed from the A6045/Manchester Road, traverses the site, appearing to provide access to each of the industrial structures and a number of small carparks. The remainder of the site comprises well-maintained grassland.

The site is approximately centred on the OS grid reference: **SD 85555 09074**.

Proposed Works

It is understood the scope of works includes 12 window samples to an approximate depth of 5m, and 3 cable percussive boreholes to an approximate depth of 10m.

Geology and Bomb Penetration Depth

The British Geological Society (BGS) shows the site to be underlain by Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone.

Site-specific geotechnical information was not available to 1st Line Defence at the time of the production of this report. An assessment of maximum bomb penetration depth can be made once such data becomes available, or by a UXO specialist during on-site support.

It should be noted that the maximum depth that a bomb could reach may vary across a site and will be largely dependent on the specific underlying geological strata and its density.

UXO Risk Assessment

1st Line Defence has assessed that there is a **Low Risk** from items of German aerial delivered UXO and **Low Risk** from Allied UXO across the site. This assessment is based on the following factors:

Risk from German Aerial Delivered Ordnance:

- During WWII the site was located within the Municipal Borough of Heywood which, according to official Home Office bombing statistics, sustained an overall 'very low' density of bombing. This comprised a total of only four bombing incidents across the 8,508 acre district.
- Civil Defence Region 10 bomb census reports were checked for references to the town of Heywood, and RAF Heywood. This record set did not indicate any bombing incidents on or within the vicinity of the site.
- An anecdotal report found on an online resource suggests one bombing incident occurred at *Gooden Farm* in December 1940 – identifying the exact location of this incident has not been possible, however according to OS mapping *Gooden Farm* is not located within the vicinity of the site.
- It is anticipated that groundcover across the whole site should have been relatively conducive to the detection of evidence of air-delivered UXO. According to Air Ministry site plans, the site area comprised a number of buildings, and it is expected an unexploded bomb would have been noticed had it fallen on a building. Similarly, land not occupied by buildings would likely have been well maintained and post-raid checks would have been carried out. Furthermore, access across the site area is expected to have been regular.
- In summary, the risk from German unexploded ordnance on site is not anticipated to be above the 'background level' for this part of the country. Only four bombs were recorded across the entire borough. As the site was occupied by structures associated with RAF Heywood, it is thought likely that any damage would have been obvious, therefore spotted, reported and dealt with.

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UXO Risk Assessment

Risk from Allied Ordnance:

- During WWII the site formed part of RAF Heywood, making up *Site No.2* on Air Ministry site plans and operated by No.35 Maintenance Unit. It is understood RAF Heywood was largely manned by civilians, and primarily involved in storage and repair of aircraft. As a maintenance unit for storage and repair of RAF equipment and materiel, it should be noted that RAF Heywood had no provision for flying and no runways.
- According to Air Ministry site plans, the site comprised 23 buildings, including a number of different stores (accessory, packing case, fabric, tools), offices, and sanitary huts. It appears the explosive ordnance stores were located within different RAF Heywood sites, as no evidence has been found to suggest any munitions or ordnance were stored on *Site No.2*.
- A *Guard Hut* was listed on site, in the south of the site boundary. It is likely personal weapons would have been stored here, however this is not believed to significantly elevate the risk of allied ordnance contamination on site.
- In summary, due to the anticipated historic use of the site, contamination from items of Allied UXO is not considered likely to have occurred.

Recommended Risk Mitigation Measures

The following risk mitigation measures are recommended to support the proposed works at Heywood Stores:

All Works

- UXO Risk Management Plan
- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

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Glossary

Abbreviation	Definition
AA	Anti-Aircraft
AFS	Auxiliary Fire Service
AP	Anti-Personnel
ARP	Air Raid Precautions
DA	Delay-action
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
FP	Fire Pot
GM	G Mine (Parachute mine)
HAA	Heavy Anti-Aircraft
HE	High Explosive
IB	Incendiary Bomb
JSEODOC	Joint Services Explosive Ordnance Disposal Operation Centre
LAA	Light Anti-Aircraft
LCC	London County Council
LRRB	Long Range Rocket Bomb (V-2)
LSA	Land Service Ammunition
NFF	National Filling Factory
OB	Oil Bomb
PAC	Pilotless Aircraft (V-1)
PB	Phosphorous Bomb
PM	Parachute Mine
POW	Prisoner Of War
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RFC	Royal Flying Corps
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SA	Small Arms
SAA	Small Arms Ammunition
SD2	Anti-personnel “Butterfly Bomb”
SIP	Self-Igniting Phosphorous
U/C	Unclassified bomb
UP	Unrotated Projectile (rocket)
USAAF	United States Army Air Force
UX	Unexploded
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	Flying Bomb (Doodlebug)
V-2	Long Range Rocket
WAAF	Women’s Auxiliary Air Force
X	Exploded

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Detailed Unexploded Ordnance (UXO) Risk Assessment

Site: Heywood Stores
Client: RSK Group Limited

1. Introduction

1.1. Background

1st Line Defence has been commissioned by RSK Group Limited to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for the works proposed at Heywood Stores.

Buried UXO can present a significant risk to construction works and development projects. The discovery of a suspect device during works can cause considerable disruption to operations as well as cause unwanted delays and expense.

UXO in the UK can originate from three principal sources:

1. Munitions resulting from wartime activities including German bombing in WWI and WWII, long range shelling, and defensive activities.
2. Munitions deposited as a result of military training and exercises.
3. Munitions lost, burnt, buried or otherwise discarded either deliberately, accidentally, or ineffectively.

This report will assess the potential factors that may contribute to the risk of UXO contamination. If an elevated risk is identified at the site, this report will recommend appropriate mitigation measures, in order to reduce the risk to as low as is reasonably practicable. Detailed analysis and evidence will be provided to ensure an understanding of the basis for the assessed risk level and any recommendations.

This report complies with the guidelines outlined in *CIRIA C681*, 'Unexploded Ordnance (UXO) A Guide for the Construction Industry.'

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2. Method Statement

2.1. Report Objectives

The aim of this report is to conduct a comprehensive assessment of the potential risk from UXO at Heywood Stores. The report will also recommend appropriate site and work-specific risk mitigation measures to reduce the risk from explosive ordnance during the envisaged works to a level that is as low as reasonably practicable.

2.2. Risk Assessment Process

1st Line Defence has undertaken a five-step process for assessing the risk of UXO contamination:

1. The likelihood that the site was contaminated with UXO.
2. The likelihood that UXO remains on the site.
3. The likelihood that UXO may be encountered during the proposed works.
4. The likelihood that UXO may be initiated.
5. The consequences of initiating or encountering UXO.

In order to address the above, 1st Line Defence has taken into consideration the following factors:

- Evidence of WWI and WWII German aerial delivered bombing as well as the legacy of Allied occupation.
- The nature and conditions of the site during WWII.
- The extent of post-war development and UXO clearance operations on site.
- The scope and nature of the proposed works and the maximum assessed bomb penetration depth.
- The nature of ordnance that may have contaminated the proposed site area.

2.3. Sources of Information

Every reasonable effort has been made to ensure that relevant evidence has been consulted and presented in order to produce a thorough and comprehensible report for the client. To achieve this the following, which includes military records and archive material held in the public domain, have been accessed:

- The National Archives and the Lancashire Archives.
- Historical mapping datasets.
- Historic England National Monuments Record.
- Relevant information supplied by RSK Group Limited.
- Available material from 33 Engineer Regiment (EOD) Archive (now 28 Regt).
- 1st Line Defence's extensive historical archives, library and UXO geo-datasets.
- Open sources such as published books and internet resources.

Research involved a visit to The National Archives and the Lancashire Archives.

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3. Background to Bombing Records

3.1. General Considerations of Historical Research

This desktop assessment is based largely upon analysis of historical evidence. Every reasonable effort has been made to locate and present significant and pertinent information. 1st Line Defence cannot be held accountable for any changes to the assessed risk level or risk mitigation measures, based on documentation or other data that may come to light at a later date, or which was not available to 1st Line Defence during the production of this report.

It is often problematic and sometimes impossible to verify the completeness and accuracy of WWII-era records. As a consequence, conclusions as to the exact location and nature of a UXO risk can rarely be quantified and are, to a degree, subjective. To counter this, a range of sources have been consulted, presented and analysed. The same methodology is applied to each report during the risk assessment process. 1st Line Defence cannot be held responsible for any inaccuracies or the incompleteness in available historical information.

3.2. German Bombing Records

During WWII, bombing records were generally gathered locally by the police, Air Raid Precaution (ARP) wardens and military personnel. These records typically contained information such as the date, the location, the amount of damage caused and the types of bombs that had fallen during an air raid. This information was made either through direct observation or post-raid surveys. The Ministry of Home Security Bomb Census Organisation would then receive this information, which was plotted onto maps, charts, and tracing sheets by regional technical officers. The collective record set (regional bomb census mapping and locally gathered incidents records) would then be processed and summarised into reports by the Ministry of Home Security Research and Experiments Branch. The latter were tasked with providing the government 'a complete picture of air raid patterns, types of weapons used and damage caused- in particular to strategic services and installations such as railways, shipyards, factories and public utilities.'[1]

The quality, detail and nature of record keeping could vary considerably between provincial towns, boroughs and cities. No two areas identically collated or recorded data. While some local authorities maintained records with a methodical approach, sources in certain areas can be considerably more vague, dispersed, and narrower in scope. In addition, the immediate priority was mostly focused on assisting casualties and minimising damage at the time. As a result, some records can be incomplete and contradictory. Furthermore, many records were even damaged or destroyed in subsequent air raids. Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are therefore not always reliable. Whereas records of attacks on military or strategic targets were often maintained separately and have not always survived.

3.3. Allied Records

During WWII, considerable areas of land were requisitioned by the War Office for the purpose of defence, training, munitions production and the construction of airfields. Records relating to military features vary and some may remain censored. Within urban environments datasets will be consulted detailing the location of munition production as well as wartime air and land defences. In rural locations it may be possible to obtain plans of military establishments, such as airfields, as well as training logs, record books, plans and personal memoirs. As with bombing records, every reasonable effort will be made to access records of, and ascertain any evidence of, military land use. However, there are occasions where such evidence is not available, as records may not be accessible, have been lost/destroyed, or simply were not kept in the first place.

[1] http://www.nationalarchives.gov.uk/help-with-your-research/research-guides/bomb-census-survey-records-1940-1945/.

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4. UK Regulatory Environment and Guidelines

4.1. General

There is no formal obligation requiring a UXO risk assessment to be undertaken for construction projects in the UK, nor is there any specific legislation stipulating the management or mitigation of UXO risk. However, it is implicit in the legislation outlined below that those responsible for intrusive works (archaeology, site investigation, drilling, piling, excavation etc.) should undertake a comprehensive and robust assessment of the potential risks to employees and that mitigation measures are implemented to address any identified hazards.

4.2. CDM Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) define the responsibilities of parties involved in the construction of temporary or permanent structures.

The CDM 2015 establishes a duty of care extending from clients, principle co-ordinators, designers, and contractors to those working on, or affected by, a project. Those responsible for construction projects may therefore be accountable for the personal or proprietary loss of third parties, if correct health and safety procedure has not been applied.

Although the CDM does not specifically reference UXO, the risk presented by such items is both within the scope and purpose of the legislation. It is therefore implied that there is an obligation for parties to:

- Provide an appropriate assessment of potential UXO risks at the site (or ensure such an assessment is completed by others).
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks presented by the project.
- Ensure the preparation of a suitably robust emergency response plan.

4.3. The 1974 Health and Safety at Work etc. Act

All employers have a responsibility under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, to ensure the health and safety of their employees and third parties, so far as is reasonably practicable and conduct suitable and sufficient risk assessments.

4.4. CIRIA C681

In 2009, the Construction Industry Research and Information Association (CIRIA) produced a guide to the risk posed by UXO to the UK construction industry (CIRIA C681). CIRIA is a neutral, independent and not-for-profit body, linking organisations with common interests and facilitating a range of collaborative activities that help improve the industry.

The publication provides the UK construction industry with a defined process for the management of risks associated with UXO from WWI and WWII aerial bombardment. It is also broadly applicable to the risks from other forms of UXO that might be encountered. It focuses on construction professionals' needs, particularly if there is a suspected item of UXO on site, and covers issues such as what to expect from a UXO specialist. The guidance also helps clients to fulfil their legal duty under CDM 2015 to provide designers and contractors with project specific health and safety information needed to identify hazards and risks associated with the design and construction work. This report conforms to this CIRIA guidance and to the various recommendations for good practice referenced therein. It is

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recommended that this document is acquired and studied where possible to allow a better understanding of the background to both the risk assessment process and the UXO issue in the UK in general.

4.5. Additional Legislation

In the event of a casualty resulting from the failure of an employer/client to address the risks relating to UXO, the organisation may be criminally liable under the Corporate Manslaughter and Corporate Homicide Act 2007.

5. The Role of Commercial UXO Contractors and The Authorities

5.1. Commercial UXO Specialists

The role of a UXO Specialist (often referred to as UXO Consultant or UXO Contractor) such as 1st Line Defence, is defined in CIRIA C681 as the provision of expert knowledge and guidance to the client on the most appropriate and cost-effective approach to UXO risk management at a site.

The principal role of UXO Specialists is to provide the client with an appropriate assessment of the risk posed by UXO for a specific project, and identify and carry out suitable methodology for the mitigation of any identified risks to reduce them to an acceptable level.

The requirement for a UXO Specialist should ideally be identified in the initial stages of a project, and it is recommended that this occur prior to the start of any detailed design. This will enable the client to budget for expenditure that may be required to address the risks from UXO, and may enable the project team to identify appropriate techniques to eliminate or reduce potential risks through considered design, without the need for UXO specific mitigation measures. The UXO Specialist should have suitable qualifications, levels of competency and insurances.

Please note 1st Line Defence has the capability to provide a complete range of required UXO risk mitigation services, in order to reduce a risk to as low as reasonably practicable. This can involve the provision of both ground investigation, and where appropriate, UXO clearance services.

5.2. The Authorities

The police have a responsibility to co-ordinate the emergency services in the event of an ordnance-related incident at a construction site. Upon inspection they may impose a safety cordon, order an evacuation, and call the military authorities Joint Services Explosive Ordnance Disposal Operation Centre (JSEODOC) to arrange for investigation and/or disposal. Within the Metropolitan Police Operational Area, SO15 EOD will be tasked to any discovery of suspected UXO. The request for Explosive Officer (Expo) support is well understood and practiced by all Metropolitan Boroughs. The requirement for any additional assets will then be coordinated by the Expo if required.

In the absence of a UXO specialist, police officers will usually employ such precautionary safety measures, thereby causing works to cease, and possibly requiring the evacuation of neighbouring businesses and properties.

The priority given to the police request will depend on the EOD teams' judgement of the nature of the UXO risk, the location, people and assets at risk, as well as the availability of resources. The speed of response varies; authorities may respond immediately or in some cases it may take several days for the item of ordnance to be dealt with. Depending on the on-site risk assessment the item of ordnance may be removed from the site and/or destroyed by a controlled explosion.

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Following the removal of an item of UXO, the military authorities will only undertake further investigations or clearances in high-risk situations. If there are regular UXO finds on a site the JSEODOC may not treat each occurrence as an emergency and will recommend the construction company puts in place alternative procedures, such as the appointment of a commercial contractor to manage the situation.

6. The Site

6.1. Site Location

The site is located in Heywood, Greater Manchester. It is bound by open land to the north, south-west and west; by residential property and associated gardens to the east; and by the roadway A6045/Manchester Road to the south/south-east.

The site is approximately centred on the OS grid reference: **SD 85555 09074**.

Site location maps are presented in **Annex A**.

6.2. Site Description

According to recent aerial imagery dated 2021, the site comprises a number of large warehouse units which occupy the majority of the site area. A roadway, accessed from the A6045/Manchester Road, traverses the site, appearing to provide access to each of the industrial structures and a number of small carparks. The remainder of the site comprises well-maintained grassland.

A recent aerial photograph and site plan are presented in **Annex B** and **Annex C** respectively.

7. Scope of the Proposed Works

7.1. General

It is understood the scope of works includes 12 window samples to an approximate depth of 5m, and 3 cable percussive boreholes to an approximate depth of 10m.

8. Ground Conditions

8.1. General Geology

The British Geological Survey (BGS) map shows the site to be underlain by Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone, formed in the Carboniferous Period. Superficial deposits include Till, Devensian – Diamicton, formed in the Quaternary Period.

8.2. Site Specific Geology

Site-specific geotechnical data was not provided by the client during the production of this report.

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9. Site History

9.1. Introduction

The purpose of this section is to identify the composition of the site pre and post-WWII. It is important to establish the historical use of the site, as this may indicate the site's relation to potential sources of UXO as well as help with determining factors such as the land use, groundcover, likely frequency of access and signs of bomb damage.

9.2. Ordnance Survey Historical Maps

Relevant historical maps were obtained for this report and are presented in **Annex D.** See below for a summary of the site history shown on acquired mapping.

Pre-WWII		
Date	**Scale**	**Description**
1937	1:2,500	This map shows the site to be occupied by open, undeveloped land. *Sidal Moor* is labelled across the site area. The site is bound by open land to the north, north-east and west. *Mercer's Farm* borders to the site to east.

Post-WWII		
Date	**Scale**	**Description**
1956-1957	1:2,500	This map shows the site to be unchanged from pre-war years. *WWII era airfield plans will generally be censored, appearing as blank fields or as whited out areas. Censorship often extents into the post-war era if the airfield remained in RAF or US control.*
1974 – 1977	1:10;000	This map shows the site has undergone significant development, with a number of large, warehouse style buildings constructed across the whole site area. When comparing this to Air Ministry site plans it is clear this development occurred as a result of the site being used by the military (See **Annex E** and Section 11.2). Development is also visible to the north-east and east of the site, notably the establishment of a *School* and some additional housing

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10. Introduction to Allied Ordnance

10.1. General

Many areas across the UK may be at risk from Allied UXO because of both wartime and peacetime military use. Typical military activities and uses that may have led to a legacy of military UXO at a site include former minefields, home guard positions, anti-aircraft emplacements, training and firing ranges, military camps, as well as weapons manufacture and storage areas.

Although land formerly used by the military was usually subject to clearance before returned to civilian use, items of UXO are sometimes discovered and can present a potential risk to construction projects.

This section of the report discusses the generic types of Allied ordnance typically encountered on areas associated with former military activity.

10.2. Land Service Ammunition

Land service ammunition is believed to be the least common type of ordnance used by the RAF during WWII, typically only being employed for station defence of defence exercises at major RAF airfields, which RAF Heywood was not.

The term LSA covers items of ordnance that are propelled, placed, or thrown during land warfare. These items may be filled or charged with explosives, smoke, incendiary, or pyrotechnics and can be divided into five main groups:

Land Service Ammunition	
Item	**Description**
Mortar Rounds	A mortar round is normally nosed-fused and fitted with its own propelling charge. Its flight is stabilised by the use of a fin. They are usually tear-drop shaped (though older variants are parallel sided), with a finned 'spigot tube' screwed or welded to the rear end of the body which houses the propellant charge. Mortars are either High Explosive or Carrier (i.e. smoke, incendiary, or pyrotechnic).
Grenades	A grenade is a short range weapon designed to kill or injure people. It can be hand thrown or fired from a rifle or a grenade launcher. Grenades either contain high explosive or smoke producing pyrotechnic compounds. The common variants have a classic 'pineapple' shape.
Projectiles	A projectile (or shell) is propelled by force, normally from a gun, and continues in motion using its kinetic energy. The gun a projectile is fired from usually determines its size. A projectile contains a fuzing mechanism and a filling. Projectiles can be high explosive, carrier or Shot (a solid projectile).
Rockets	Rockets were commonly designed to destroy heavily armoured military vehicles (anti-tank weapon). The device contains an explosive head (warhead) that can be accelerated using internal propellants to an intended target. Anti-aircraft rocket batteries were also utilised as part of air defence measures.
Landmines	A landmine is designed to be laid on or just below the ground to be exploded by the proximity or contact of a person or vehicle. Landmines were often placed in defensive areas of the UK to obstruct potential invading adversaries.

In the UK unexploded or partially exploded mortars and grenades are the most common items of LSA encountered, as they could be transported and utilised anywhere. They are mostly encountered in areas used for military training and are often found discarded on or near historical military bases. Images of the most commonly found items of LSA are presented in **Appendices iv - vi.**

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10.3. Small Arms Ammunition

The most common type of ordnance encountered on land used by the military are items of Small Arms Ammunition (SAA). SAA refers to the complete round or cartridge designed to be discharged from varying sized hand-held weapons such as rifles, machine guns and pistols. SAA can include bullets, cartridge cases and primers/caps. Example images of the most SAA are presented in **Appendix vii.**

10.4. Defending the UK From Aerial Attack

During WWII the War Office employed a number of defence tactics against the Luftwaffe from bombing major towns, cities, manufacturing areas, ports and airfields. These can be divided into passive and active defences (examples are provided in the table below).

Active Defences	Passive Defences
• Anti-aircraft gun emplacements to engage enemy aircraft. • Fighter aircraft to act as interceptors. • Rockets and missiles were used later during WWII.	• Blackouts and camouflaging to hinder the identification of Luftwaffe targets. • Decoy sites were located away from targets and used dummy buildings and lighting to replicate urban, military, or industrial areas. • Barrage balloons forced enemy aircraft to greater altitudes. • Searchlights were often used to track and divert adversary bomber crews during night raids.

Active defences such as anti-aircraft artillery present a greater risk of UXO contamination than passive defences. Unexploded ordnance resulting from dogfights and fighter interceptors is rarely encountered and difficult to accurately qualify.

10.4.1. Anti-Aircraft Artillery (AAA)

During WWII three main types of gun sites existed: heavy anti-aircraft (HAA), light anti-aircraft (LAA) and 'Z' batteries (ZAA). If the projectiles and rockets fired from these guns failed to explode or strike an aircraft they would descend back to land. The table below provides further information on the operation and ordnance associated with these type of weapons.

Anti-Aircraft Artillery				
Item	**Description**			
HAA	These large calibre guns such as the 3.7" QF (Quick Firing) were used to engage high flying enemy bombers. They often fired large HE projectiles, which were usually initiated by integral fuzes, triggered by impact, area, time delay or a combination of aforementioned mechanisms.			
LAA	These mobile guns were intended to engage fast, low flying aircraft. They were typically rotated between locations on the perimeters of towns and strategically important industrial works. As they could be moved to new positions with relative ease when required, records of their locations are limited. The most numerous of these were the 40mm Bofors gun which could fire up to 120 x 40mm HE projectiles per minute to over 1,800m.			
Variations in HAA and LSA Ammunition	**Gun type**	**Calibre**	**Shell Weight**	**Shell Dimensions**
	3.0 Inch	76mm	7.3kg	76mm x 356mm
	3.7 Inch	94mm	12.7kg	94mm x 438mm
	4.5 Inch	114mm	24.7kg	114mm x 578mm

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	40mm	40mm	0.9kg	40mm x 311mm
Z-AA	The three inch unrotated rocket/projectile known as the UP-3 had initially been developed for the Royal Navy. The UP-3 was also used in ground-based single and 128-round launchers known as ''Z'' batteries. The rocket, containing a high explosive warhead was often propelled by cordite.			

The conditions in which anti-aircraft projectiles may have fallen unnoticed within a site area are analogous to those regarding aerial delivered ordnance. Unexploded anti-aircraft projectiles could essentially have fallen indiscriminately anywhere within range of the guns. The chance of such items being observed, reported and removed during the war depends on factors such as land use, ground cover, damage and frequency of access – the same factors that govern whether evidence of a UXB is likely to have been noted. More information about these factors with regards to this particular site can be found in the German Aerial Delivered Ordnance section of this report.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at **Appendix viii**.

11. The Likelihood of Contamination from Allied Ordnance

11.1. Introduction

When undertaking construction work within or immediately adjacent to a site with previous and/or current military use, it is often considered likely to contain an elevated risk of contamination from Allied UXO. This assumption of risk is based on the following reasoning:

- The clearance of ordnance from military camps, depots, storage facilities, ranges and training areas were not always effectively managed, or undertaken to equivalent degrees of certainty. In addition, search and detection equipment used over seventy years ago following WWII has proved ineffective both for certain types of UXO and at depths beyond capability.
- In the vast majority of cases, explosive ordnance would have been stored and available for use at military installations. Ordnance ranged from small arms and land service ammunition to weapons components and larger, aerial delivered items. During periods of heightened activity, ordnance was also frequently lost in transit, particularly between stores and assigned training locations.
- The military generally did not anticipate that their land would be later sold for civilian development, and consequently appropriate ordnance disposal procedure was not always adhered to. It was not uncommon for excess or unwanted ordnance to be buried or burnt within the perimeters of a military establishment as a means of disposal. Records of such practice were rarely kept.

There are several factors that may serve to either affirm, increase, or decrease the level of risk within a site with a history of military usage. Such factors are typically dependent upon the proximity of the proposed area of works to training activities, munition productions and storage, as well as its function across the years.

This section will examine the history of the proposed site and assess to what degree, if any, the site could have become contaminated as a result of the military use of the surrounding area.

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11.2. Operation of No.35 Maintenance Unit RAF Heywood

During WWII RAF Heywood was operated by No.35 Maintenance Unit, reported to be largely civilian and involved primarily in storage and repair.[2] In the book *Bury and the Second World War* (1995), by Ken Inman and Michael H. Helm, the following is stated with regards to No.35 Maintenance unit:

> *"A major part of the total war effort was played by the R.A.F. Maintenance Unit at Pilsworth. One of its main purposes was to provide replacement parts for aircraft, not only for use on R.A.F. aerodromes throughout Britain, but also for units based abroad.*
>
> *This involved a massive transport operation, both to home stations and to London, Liverpool and Bristol docks for transfer to all parts of the world. Regular convoys of lorries travelled overnight to minimise as far as possible detection by the enemy. The drivers, many of them women, generally returned to base the following day.*
>
> *Driving through the night during the 'black-out', along unfamiliar roads, and often alone, must have been very difficult, but as one woman driver later said, "I enjoyed it - it was all part of the war effort". 35 M.U. was situated fairly centrally in Britain, on the safer, western side of the Pennines, and it played a vital role in keeping the R.A.F. an efficient fighting force throughout the world."*[3]

RAF Heywood was closed in 1967 and is now the Department for Work and Pensions Distribution Park.

11.3. Air Ministry Site Plans

1948 Air Ministry Site Plans for RAF Heywood were obtained from the RAF Museum, Hendon. This is presented in **Annex E**, and displays the general layout of the site at this date, as well as it's relation to additional sites in the area which were part of RAF Heywood.

The entire site area was historically occupied by *Site No.2*, which according to the Air Ministry site plan comprised 23 buildings including a number of different stores (accessory, packing case, fabric, tools), offices, and sanitary huts. None of these buildings are listed as being in relation to the storage of explosive ordnance.

A *Guard Hut* was listed on site, in the south of the site boundary – it is likely personal weapons would have been stored here, however this is not believed to significantly elevate the risk of Allied ordnance contamination on site.

11.4. Evaluation of Contamination Risk from Allied UXO

1st Line Defence has considered the following potential sources of Allied ordnance contamination:

Sources of Allied UXO Contamination	Conclusion
Military Camps *Military camps present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training.*	1st Line Defence could find no evidence of a military camp within the site.

[2] http://www.lancashireatwar.co.uk/airfileds-page/4590234918
[3] http://www.lancashireatwar.co.uk/barrage-balloons/4586812401

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Anti-Aircraft Defences *Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.*	1st Line Defence could find no evidence of Anti-Aircraft defences such as a HAA or LAA gun emplacement occupying or bordering the site. The closest HAA was located approximately 4km south of the site, in the vicinity of Middleton. Despite this distance the maximum effective range of an AA projectile can be up to 15km. The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are analogous to those regarding German aerial delivered ordnance.
Home Guard Activity *The Home Guard regularly undertook training and ordnance practice in open areas, as well as burying ordnance as part of anti-invasion defences.*	Evidence of Home Guard activity is often difficult to locate, owing to the ad-hoc nature of Home Guard activity within each local area. Such training was often conducted on a small scale at the discretion of individual commanders and as such was seldom recorded officially. As such, no positive evidence could be found to confirm the presence of HG units within proximity to the site.
Defensive Positions *Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.*	There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.
Training or firing ranges *Areas of ordnance training saw historical ordnance usage in large numbers, often with inadequate disposal of expended and live items. The presence of these ranges significantly impact on the risk of encountering items of ordnance in their vicinity.*	No evidence of training or firing ranges could be found within the site or surrounding area.
Defensive Minefields *Minefields were placed in strategic areas to defend the country in the event of a German invasion. Minefields were not always cleared with an appropriate level of vigilance.*	There is no evidence of defensive minefields affecting the site.
Ordnance Manufacture *Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.*	No information of ordnance being stored, produced, or disposed of within the proposed site could be found.
Military Related Airfields *Military airfields present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training or bombing practice.*	During WWII the site was situated within the grounds of No.2 Site, RAF Heywood, under the operation of No.35 Maintenance Unit. Heywood was utilised as a storage and repair centre during WWII, and continued in use until 1967. However, this was a non-flying station. As a maintenance unit for storage and repair of RAF equipment and materiel, it should be noted that RAF Heywood had no provision for flying and no runways.

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12. Introduction to German Aerial Delivered Ordnance

12.1. General

During WWI and WWII, the UK was subjected to bombing which often resulted in extensive damage to city centres, docks, rail infrastructure and industrial areas. The poor accuracy of WWII targeting technology and the nature of bombing techniques often resulted in neighbouring areas to targets sustaining collateral damage.

In addition to raids which concentrated on specific targets, indiscriminate bombing of large areas also took place. This occurred most prominently in the London 'Blitz', though affected many other towns and cities. As discussed in the following sections, a proportion of the bombs dropped on the UK did not detonate as designed. Although extensive efforts were made to locate and deal with these UXBs at the time, many still remain buried and can present a potential risk to construction projects.

The main focus of research for this section of the report will concern German aerial delivered ordnance dropped during WWII, although WWI bombing will also be considered.

12.2. Generic Types of WWII German Aerial Delivered Ordnance

To provide an informed assessment of the hazards posed by any items of unexploded ordnance that may remain in situ on site, the table below provides information on the types of German aerial delivered ordnance most commonly used by the Luftwaffe during WWII. Images and brief summaries of the characteristics of these items of ordnance are listed in **Appendices i-iii**.

Generic Types of WWII German Aerial Delivered Ordnance		
Type	**Frequency**	**Likelihood of detection**
High Explosive (HE) bombs	In terms of weight of ordnance dropped, HE bombs were the most frequently deployed by the Luftwaffe during WWII.	Although efforts were made to identify the presence of unexploded ordnance following an air raid, often the damage and destruction caused by detonated bombs made observation of UXB entry holes impossible. The entry hole of an unexploded bomb can be as little as 20cm in diameter and was easily overlooked in certain ground conditions (see **Annex F**). Furthermore, ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded smaller bomb. UXBs therefore present the greatest risk to present–day intrusive works.
1kg Incendiary bombs (IB)	In terms of the number of weapons dropped, small IBs were the most numerous. Millions of these were dropped throughout WWII.	IBs had very limited penetration capability and in urban areas would often have been located in post-raid surveys. If they failed to initiate and fell in water, on soft vegetated ground, or bombed rubble, they could easily go unnoticed.
Large Incendiary bombs (IB)	These were not as common as the 1kg IBs, although they were more frequently deployed than PMs and AP bomblets.	If large IBs did penetrate the ground, complete combustion did not always occur and in such cases they could remain a risk to intrusive works.
Aerial or Parachute mines (PM)	These were deployed less frequently than HE and IBs due to size, cost and the difficulty of deployment.	If functioning correctly, PMs would generally have had a slow rate of descent and were very unlikely to have penetrated the ground. Where the parachute failed, mines would have simply shattered on impact if the main charge failed to explode. There have been extreme cases when these items have been found unexploded. However, in these scenarios, the ground was either extremely soft or the munition fell into water.
Anti-personnel (AP) bomblets	These were not commonly used and are generally considered to pose a low risk to most works in the UK.	SD2 bomblets were packed into containers holding between 6 and 108 submunitions. They had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.

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12.3. Failure Rate of German Aerial Delivered Ordnance

It has been estimated that 10% of WWII German aerial delivered HE bombs failed to explode as designed. Reasons for why such weapons might have failed to function as designed include:

- Malfunction of the fuze or gain mechanism (manufacturing fault, sabotage by forced labour or faulty installation).
- Many were fitted with a clockwork mechanism that could become immobilised on impact.
- Failure of the bomber aircraft to arm the bombs due to human error or an equipment defect.
- Jettisoning the bomb before it was armed or from a very low altitude. This most likely occurred if the bomber aircraft was under attack or crashing.

From 1940 to 1945, bomb disposal teams reportedly dealt with a total of 50,000 explosive items of 50kg, over 7,000 anti-aircraft projectiles and 300,000 beach mines. Unexploded ordnance is still regularly encountered across the UK, see press articles in **Annex G**.

12.4. UXB Ground Penetration

An important consideration when assessing the risk from a UXB is the likely maximum depth of burial. There are several factors which determine the depth that an unexploded bomb will penetrate:

- Mass and shape of bomb.
- Height of release.
- Velocity and angle of bomb.
- Nature of the ground cover.
- Underlying geology.

Geology is perhaps the most important variable. If the ground is soft, there is a greater potential of deeper penetration. For example, peat and alluvium are easier to penetrate than gravel and sand, whereas layers of hard strata will significantly retard and may stop the trajectory of a UXB.

12.4.1. The J-Curve Effect Principle

J-curve is the term used to describe the characteristic curve commonly followed by an aerial delivered bomb dropped from height after it penetrates the ground. Typically, as the bomb is slowed by its passage through underlying soils, its trajectory curves towards the surface. Many UXBs are found with their nose cone pointing upwards as a result of this effect. More importantly, however, is the resulting horizontal offset from the point of entry. This is typically a distance of about one third of the bomb's penetration depth, but can be higher in certain conditions (see **Annex F**).

12.4.2. WWII UXB Ground Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by bomb disposal (BD) teams. Conclusions were drawn predicting the likely average and maximum depths of penetration of different sized bombs in different geological strata.

For example, the largest common German bomb (500kg) had a likely concluded penetration depth of 6m in sand or gravel but 11m in clay. The maximum observed depth for a 500kg bomb was 11.4m and for a 1,000kg bomb 12.8m. Theoretical calculations suggested that significantly greater penetration depths were probable.

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12.4.3. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site of proposed works the following parameters have been used:

- WWII geology – the British Geological Society (BGS) shows the site to be underlain by Pennine Lower Coal Measures Formation - Mudstone, Siltstone and Sandstone.
- Impact angle and velocity – 10-15° from vertical and 270 metres per second.
- Bomb mass and configuration – The 500kg SC HE bomb, without retarder units or armour piercing nose (this was the largest of the common bombs used against Britain).

It has not been possible to determine maximum bomb penetration capabilities at this stage due to the limitations of site-specific geotechnical information provided for the purpose of this report. An assessment can be made once further information becomes available or by an UXO Specialist on-site.

12.5. V-Weapons

Hitler's 'V-weapon' campaign began from mid-1944. It used newly developed unmanned cruise missiles and rockets. The V-1, known as the *flying bomb* or *pilotless aircraft*, and the V-2, a long range rocket, were launched from bases in Germany and occupied Europe. A total of 9,251 V-1s and 1,115 V-2s were recorded in the United Kingdom.

Although these weapons caused considerable damage, their range was limited by their position of deployment across Europe and as a result the vast majority of V-weapon strikes were directed against targets in the south-east of England, predominantly in the London Boroughs and Home Counties. This limitation of capability meant targets in Heywood were generally too far to be considered for V-weapon strikes by the Luftwaffe.

The risk from V-weapons is therefore considered negligible and will not be further addressed in this report.

13. The Likelihood of Contamination from German Aerial Delivered UXBs

13.1. World War I

During WWI Britain was targeted and bombed by Zeppelin Airships as well as Gotha and Giant fixed-wing aircraft. The objective of these raids was to unnerve the British public, to destroy strategic targets and to ultimately attempt to coerce Britain's capitulation from the war. A WWI map of air raids and naval bombardments across the UK was consulted, see **Annex H**. This source does not record any WWI bombing incidents to have affected Heywood.

WWI bombs were generally smaller and dropped from a lower altitude than those used in WWII. This resulted in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons there is a limited risk that UXBs passed undiscovered in the urban environment. When combined with the relative infrequency of attacks and an overall low bombing density, the risk from WWI UXBs is considered low and will not be further addressed in this report.

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13.2. World War II Bombing of Municipal Borough of Heywood

The Luftwaffe's main objective for the attacks on Britain was to inhibit the country's economic and military capability. To achieve this they targeted airfields, depots, docks, warehouses, wharves, railway lines, factories, and power stations. As the war progressed the Luftwaffe bombing campaign expanded to include the indiscriminate bombing of civilian areas in an attempt to subvert public morale.

During WWII the site was located within the Municipal Borough of Heywood, which sustained an overall very low density of bombing, as represented by bomb density data figures and maps, see table below. The majority of bombing raids in this area were targeted at larger towns and cities, such as Manchester, located approximately 11km south of the site. While RAF sites were typically targeted by the Luftwaffe, no Luftwaffe target photography has been found which lists Heywood as a designated target.

Records of bombing incidents in the civilian areas of the Municipal Borough of Heywood were typically collected by Air Raid Precautions wardens and collated by Civil Defence personnel. Some other organisations, such as port and railway authorities, maintained separate records. Records would be in the form of typed or hand written incident notes, maps and statistics. Bombing data was carefully analysed, not only due to the requirement to identify those parts of the country most needing assistance, but also in an attempt to find patterns in the Germans' bombing strategy in order to predict where future raids might take place.

Records of bombing incidents are presented in the following sections.

13.3. WWII Home Office Bombing Statistics

The following table summarises the quantity of German aerial delivered bombs (excluding 1kg incendiaries and anti-personnel bombs) dropped on the Municipal Borough of Heywood between 1940 and 1945.

Record of German Ordnance Dropped on the Municipal Borough of Heywood		
Area Acreage		**8,508**
Weapons	High Explosive bombs (all types)	4
	Parachute mines	0
	Oil bombs	0
	Phosphorus bombs	0
	Fire pots	0
	Pilotless aircraft (V-1)	0
	Long range rocket bombs (V-2)	0
Total		**4**
Number of Items per 1,000 acres		**0.5**

Source: Home Office Statistics
This table does not include UXO found during or after WWII.

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the risk relating to IBs is lesser than that relating to larger HE bombs, they were similarly designed to inflict damage and injury. Anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. Although Home Office statistics did not record these types of ordnance, both should not be overlooked when assessing the general risk to personnel and equipment.

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13.4. Region 10 Bomb Census Reports

Bomb census reports compiled by the Research and Experiments Branch of the Ministry of Home Security during WWII were consulted at The National Archives. These reports recorded information such as the date, time, type and damage caused by bomb incidents for a selected time period in the region and are therefore not often comprehensive.

This record set was checked, and no references to the site were found within it.

13.5. Anecdotal Reports

An online resource has been found which references a bombing incident in the grounds of Gooden Farm, Heywood, whereby an unknown bomb struck a field within the farm and left a large crater. Locating the exact location of Gooden Farm has not been possible - according to historic OS mapping there is no Gooden Farm within the vicinity of the site. The incident description is provided below.

Title of Article	Date of Incident	Description
'Bomb on the Farm'	December 1940	I was living in Wilton's Extent near Pot Hall bridge Heywood, Lancashire. I think it was the Sunday before Christmas 1940 and we were visiting my mother, Mrs Walch at Gooden farm, Heywood when the air raids were on. My mother told us to stay there because she thought we would be safer. That night a bomb dropped in a field on the farm and the force blew me and my husband out of bed. We were on the floor but not hurt.[4]

13.6. WWII-Era Aerial Photography

Attempts to obtain high-resolution WWII-era aerial photography for the site area are carried by 1st Line Defence as standard for every Detailed UXO Assessment. However, on this occasion it has not been possible to obtain WWII-era imagery of the site within the timeframe of this report. This is due to the on-going Covid-19 pandemic and the resulting closure of both commercial and public record offices, including the National Monuments Record Office (Historic England).

13.7. Abandoned Bombs

A post air-raid survey of buildings, facilities, and installations would have included a search for evidence of bomb entry holes. If evidence of an entry hole was encountered, Bomb Disposal Officer Teams would normally have been requested to attempt to locate, render safe, and dispose of the bomb. Occasionally, evidence of UXBs was discovered but due to a relatively benign position, access problems, or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an 'abandoned bomb'.

Given the inaccuracy of WWII records, and the fact that these bombs were 'abandoned', their locations cannot be considered definitive or the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

1st Line Defence holds no records of officially registered abandoned bombs at or near the site of the proposed works.

[4] *https://www.bbc.co.uk/history/ww2peopleswar/stories/61/a4479861.shtml*

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13.8. Bomb Disposal Tasks

The information service from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD) (now 29 Regt) is currently facing considerable delay. It has therefore not been possible to include any updated official information regarding bomb disposal/clearance tasks with regards to this site. A database of known disposal/clearance tasks has been referred to which does not make reference to such instances occurring within the site of proposed works. If any relevant information is received at a later date, RSK Group Limited will be advised.

13.9. Evaluation of German Aerial Delivered UXO Records

Factors	Conclusion
Density of Bombing *It is important to consider the bombing density when assessing the possibility that UXBs remain in an area. High bombing density could allow for error in record keeping due to extreme damage caused to the area.*	During WWII the site was located within the Municipal Borough of Heywood, which according to official Home Office bombing statistics sustained an overall 'very low' density of bombing. This comprised a total of four bombing incidents, all of which were H.E bombs. One of these incidents has been accounted for, occurring at Gooden Farm in December 1940.[5] Due to a lack of bomb plot mapping and written records, it has not been possible to ascertain the locations of the other three bomb strikes within the Municipal Borough of Heywood.
Damage *If buildings or structures on a site sustained bomb or fire damage, any resulting rubble and debris could have obscured the entry holes of unexploded bombs dropped during the same or later raids. Similarly, a high explosive bomb strike in an area of open agricultural land will have caused soil disturbance, increasing the risk that a UXB entry hole would be overlooked.*	Given the site area is shown to be occupied by open land in historic OS mapping, there are no structures which damage could be attributed to. However, the site area was occupied by No.35 Maintenance Unit RAF Heywood, but it was censored in OS mapping. It has therefore not been possible to identify whether the site was subject to damage, however if the site was damaged it is likely repair would have been swift given the usage of the land.
Ground Cover *The nature of the ground cover present during WWII would have a substantial influence on any visual indication that may indicate UXO being present.*	It is anticipated groundcover across the whole site would have been conducive to the detection of evidence of UXO. According to Air Ministry site plans, the site area comprised a number of buildings, it is expected an unexploded bomb would have been noticed had it fallen on a building. Similarly, land not occupied by buildings would likely have been well maintained and post-raid checks would have been carried out.
Access Frequency *UXO in locations where access was irregular would have a greater chance of passing unnoticed than at those that were regularly occupied. The importance of a site to the war effort is also an important consideration as such sites are likely to have been both frequently visited and subject to post- raid checks for evidence of UXO.*	As the site area was used by the RAF, it is expected access would have been frequent throughout the war, and likewise the site would have been subject to regular monitor. Frequent access increases the likelihood that items of UXO would be spotted, reported, and appropriately dealt with.
Bomb Failure Rate	There is no evidence to suggest that the bomb failure rate in the locality of the site would have been dissimilar to the 10% normally used.

[5] https://www.bbc.co.uk/history/ww2peopleswar/stories/61/a4479861.shtml

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Abandoned Bombs	1st Line Defence holds no records of abandoned bombs at or within the site vicinity.
Bombing Decoy sites	1st Line Defence could find no evidence of bombing decoy sites within the site vicinity.
Bomb Disposal Tasks	1st Line Defence could find no evidence of bomb disposal tasks within the site boundary and immediate area.

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14. The Likelihood of UXO Contamination Summary

The following table assesses the likelihood that the site was contaminated by items of German aerial delivered and Allied ordnance. Factors such as the risk of UXO initiation, remaining, and encountering will be discussed later in the report.

UXO Contamination Summary	
Quality of the Historical Record	The research has evaluated pre- and post-WWII Ordnance Survey maps, Air Ministry site plans, in-house records, and online/anecdotal resources. The record set is of generally poor quality – bomb plot mapping for the district does not exist, so although the bombing density is very low and comprises only four H.E bombs, their locations cannot be confirmed. Likewise, written records for the district could not be obtained. However, the acquisition of Air Ministry site plans has proved helpful in ascertaining the allied risk on site.
German Aerial Delivered Ordnance	• During WWII the site was located within the Municipal Borough of Heywood which, according to official Home Office bombing statistics, sustained an overall 'very low' density of bombing. This comprised a total of only four bombing incidents across the 8,508 acre district. • Civil Defence Region 10 bomb census reports were checked for references to the town of Heywood, and RAF Heywood. This record set did not indicate any bombing incidents on or within the vicinity of the site. • An anecdotal report found on an online resource suggests one bombing incident occurred at *Gooden Farm* in December 1940 – identifying the exact location of this incident has not been possible, however according to OS mapping *Gooden Farm* is not located within the vicinity of the site. • It is anticipated that groundcover across the whole site should have been relatively conducive to the detection of evidence of air-delivered UXO. According to Air Ministry site plans, the site area comprised a number of buildings, it is expected an unexploded bomb would have been noticed had it fallen on a building. Similarly, land not occupied by buildings would likely have been well maintained and post-raid checks would have been carried out. Furthermore, access across the site area is expected to have been regular. • In summary, the risk from German unexploded ordnance on site is not anticipated to be above the 'background level' for this part of the country. Only four bombs were recorded across the entire borough. As the site was occupied by structures associated with RAF Heywood, it is thought likely that any damage would have been obvious, therefore spotted, reported and dealt with.
Allied Ordnance	• During WWII the site formed part of RAF Heywood, making up *Site No.2* on Air Ministry site plans and operated by No.35 Maintenance Unit. It is understood RAF Heywood was largely manned by civilians, and primarily involved in storage and repair of aircraft. As a maintenance unit for storage and repair of RAF equipment and materiel, it should be noted that RAF Heywood had no provision for flying and no runways • According to Air Ministry site plans, the site comprised 23 buildings, including a number of different stores (accessory, packing case, fabric, tools), offices, and sanitary huts. It appears the explosive ordnance stores were located within different RAF Heywood sites, as no evidence has been found to suggest any munitions or ordnance were stored on *Site No.2*. • A *Guard Hut* was listed on site, in the south of the site boundary. It is likely personal weapons would have been stored here, however this is not believed to significantly elevate the risk of allied ordnance contamination on site.

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	• In summary, due to the anticipated historic use of the site, contamination from items of Allied UXO is not considered likely to have occurred.

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15. The Likelihood that UXO Remains

15.1. Introduction

It is important to consider the extent to which any explosive ordnance clearance (EOC) activities or extensive ground works have occurred on site. This may indicate previous ordnance contamination or reduce the risk that ordnance remains undiscovered.

15.2. UXO Clearance

Former military sites (or at least certain areas within their footprint) are often subject to clearance before they are returned to civilian use by the MoD. If a site is retained by the military, it is possible that no clearance operations have ever been undertaken. However, UXO is sometimes still discovered even on sites where clearance operations are known to have been undertaken. The detail and level of survey and targeted investigation undertaken by the military will depend on the former use of the site and purpose of the clearance (i.e. disposal, redevelopment, return to agriculture, etc.).[6] The level of clearance will also depend on the available technology, resources and practices of the day.

It therefore cannot be assumed that the risk of UXO remaining has been completely mitigated, even though EOC tasks have been undertaken at a former military site.

15.3. Post-War Redevelopment

It is understood RAF Heywood was closed in 1967; when comparing Air Ministry site plans, post-WWII OS mapping from the 1970s, and recent aerial photography, it does not appear the site has undergone any significant development. The composition of the site and order of the structures within the site boundary do not seem to have changed.

The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.

[6] *CIRIA C681*

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16. The Likelihood of UXO Encounter

16.1. Introduction

For UXO to pose a risk at a site, there should be a means by which any potential UXO might be encountered on that site.

The likelihood of encountering UXO on the site of proposed works would depend on various factors, such as the type of UXO that might be present and the intrusive works planned on site. In most cases, UXO is more likely to be present below surface (buried) than on surface.

In general, the greater the extent and depth of intrusive works, the greater the risk of encountering. The most likely scenarios under which items of UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations.

Generally speaking, the risk of encountering any type of UXO will be minimal for any works planned within the footprint and down to the depth of post-war foundations and excavations.

16.2. Encountering Aerial Delivered Ordnance

Since an aerial delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth, there is a chance that such an item (if present) could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level as well as at depth.

16.3. Land Service/Small Arms Ammunition Encounter

Items of LSA and SAA are mostly encountered in areas previously used for military training. Such items could have been lost, burnt, buried or discarded during being in use by the military. Due to this, LSA are most likely to be encountered at relatively shallow depths – generally in the top 1m below ground level. Therefore, such items are most likely to be encountered during open excavation works. In some cases, there is the potential that LSA or SAA may be present on the surface of the ground – especially in areas with active military use or were recently in use by the MoD.

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17. The Likelihood of UXO Initiation

17.1. Introduction

UXO does not spontaneously explode. Older UXO devices will require an external event/energy to create the conditions for detonation to occur. The likelihood that a device will function can depend on a number of factors including the type of weaponry, its age and the amount of energy it is struck with.

17.2. Initiating Aerial Delivered Ordnance

Unexploded bombs do not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur.

In recent decades, there have been a number of incidents in Europe where Allied UXBs have detonated, and incidents where fatalities have resulted. There have been several hypotheses as to the reason why the issue is more prevalent in mainland Europe – reasons could include the significantly greater number of bombs dropped by the Allied forces on occupied Europe, the preferred use by the Allies of mechanical rather than electrical fuzes, and perhaps just good fortune. The risk from UXO in the UK is also being treated very seriously in many sectors of the construction industry, and proactive risk mitigation efforts will also have affected the lack of detonations in the UK.

There are certain construction activities which make initiation more likely, and several potential initiation mechanisms must be considered:

UXB Initiation	
Direct Impact	Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
Re- starting the Clock	A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.
Friction Impact	The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge.

17.3. Land Service /Small Arms Ammunition Initiation

Items of LSA generally do not become inert or lose their effectiveness with age. Time can cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays, or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

If left alone, an item of LSA will pose little/no risk of initiation. Therefore, if it is not planned to undertake construction/intrusive works at the site, the risk of initiation of any LSA that may be present would be negligible. Similarly, those accessing a contaminated area would be at minimal risk if they do not interfere with any UXO present on the ground. Clearly for many end uses, however, the presence of UXO anywhere on a site would not be acceptable as it could not be guaranteed that the items will not be handled, struck or otherwise affected, increasing the likelihood of initiation.

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Items of SAA are much less likely to detonate than LSA or UXBs, but can be accidentally initiated by striking the casing, coming into contact with fire, or being tampered with/dismantled. It is likely that the detonation of an item of SAA would result in a small explosion, as the pressure would not be contained within a barrel. Detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

18. Consequences of Initiation/Encounter

18.1. Introduction

The repercussions of the inadvertent detonation of UXO during intrusive ground works, or if an item or ordnance is interfered with or disturbed, are potentially profound, both in terms of human and financial cost. A serious risk to life and limb, damage to plant and total site shutdown during follow-up investigations are potential outcomes. However, if appropriate risk mitigation measures are put in place, the chances of initiating an item of UXO during ground works is comparatively low.

The consequences of encountering UXO can be particularly notable in the case of high-profile sites (such as airports and train stations) where it is necessary to evacuate the public from the surrounding area. A site may be closed for anything from a few hours to a week with potentially significant cost in lost time. It should be noted that even the discovery of suspected or possible item of UXO during intrusive works (if handled solely through the authorities), may also involve significant loss of production

18.2. Consequences of Detonation

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

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19. 1st Line Defence Risk Assessment

19.1. Risk Assessment Stages

Taking into account the quality of the historical evidence, the assessment of the overall risk from unexploded ordnance is based on the following five considerations:

1. That the site was contaminated with unexploded ordnance.
2. That unexploded ordnance remains on site.
3. That such items will be encountered during the proposed works.
4. That ordnance may be initiated by the works operations.
5. The consequences of encountering or initiating ordnance.

19.2. Assessed Risk Level

1st Line Defence has assessed that there is an overall **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. There is also an assessed **Low Risk** from Allied unexploded ordnance.

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs		✓		
German 1kg Incendiary Bombs		✓		
Anti-Aircraft Artillery Projectiles		✓		
Allied Land Service and Small Arms Ammunition		✓		

Please note – although the risk from unexploded ordnance on this site has been assessed as 'Low', this does not mean there is 'no' risk of encountering UXO. This report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified throughout this report. Our reports take a common-sense and practical approach to the assessment of risk, and we strive to be reasonable and pragmatic in our conclusions.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk where necessary. The mitigation measures outlined in the next section are recommended as a minimum precaution to alert ground personnel to the history of the site, what to look out for, and what measures to take in the event that a suspect item is encountered. It should also be noted that the conclusions of this report are based on the scope of works outlined in the 'Proposed Works' section of this report. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.

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20. Proposed Risk Mitigation Methodology

20.1. General

The following risk mitigation measures are recommended to support the proposed works at Heywood Stores:

Type of Work	Recommended Mitigation Measure
All Works	• **UXO Risk Management Plan** It is recommended that a site-specific plan for the management of UXO risk be written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc. Contact 1st Line Defence for help/more information. • **Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.** As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.

In making this assessment and recommending these risk mitigation measures, if known, the works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified or additional intrusive engineering works be considered, 1st Line Defence should be consulted to see if a re-assessment of the risk or mitigation recommendations is necessary.

1st Line Defence Limited **04/08/2021**

This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

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Site Location Maps

Annex: **A**





1ST LINE DEFENCE

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Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **RSK Group Limited**

Approximate site boundary

N

Project: **Heywood Stores**

Ref: **DA13368-00**

Source: Google Maps

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Recent Aerial Photography

Annex: **B**



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Approximate site boundary

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Project: **Heywood Stores**

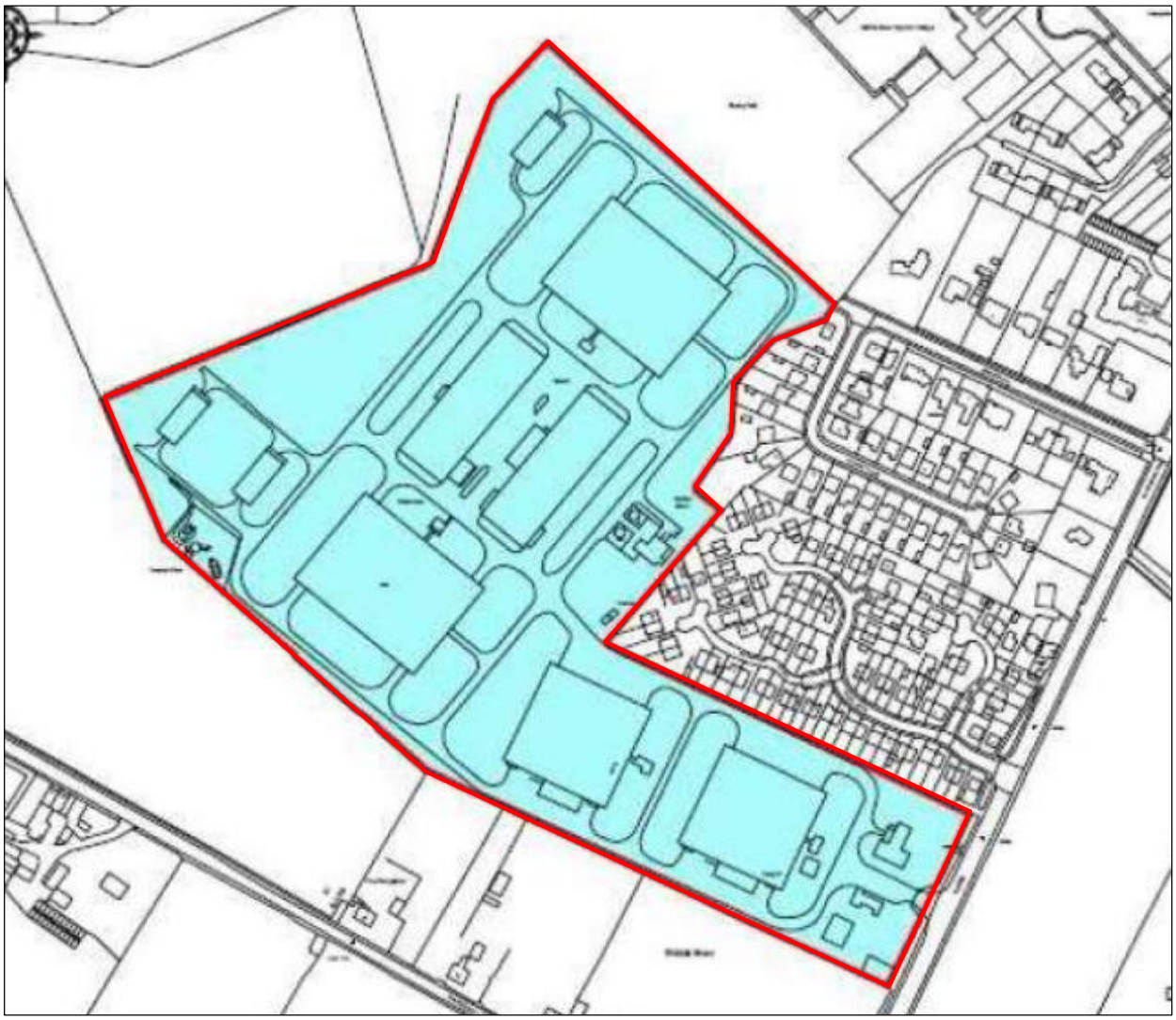
Ref: **DA13368-00**

Source: Google Earth ™ Mapping Services

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Client Provided Site Plan

Annex: **C**



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Project: **Heywood Stores**

Ref: **DA13368-00**

Source: RSK Group Limited

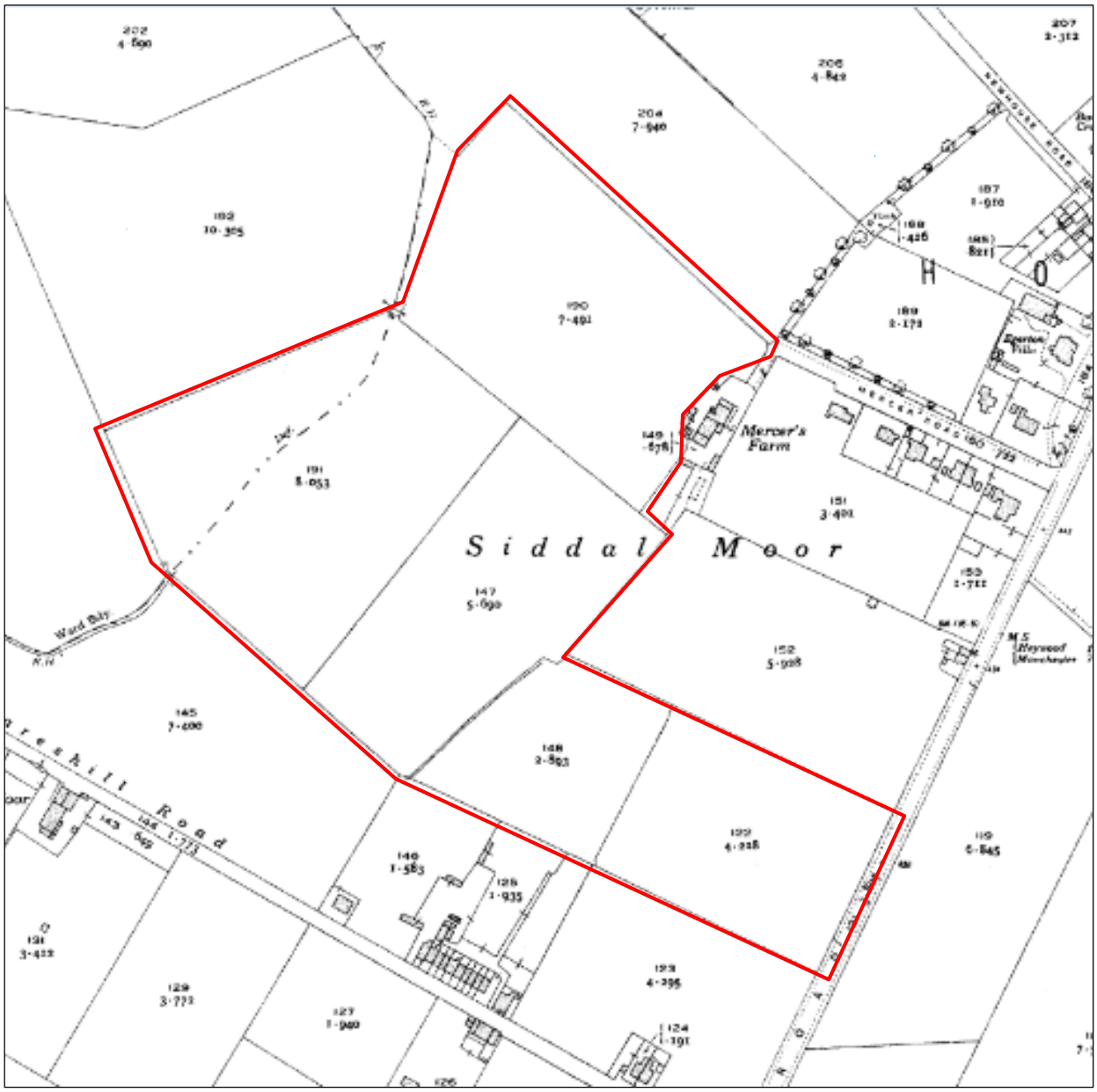
Approximate site boundary

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Pre-WWII Historical Map 1937 (1:2,500)

Annex: **D1**



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Source: Landmark Maps

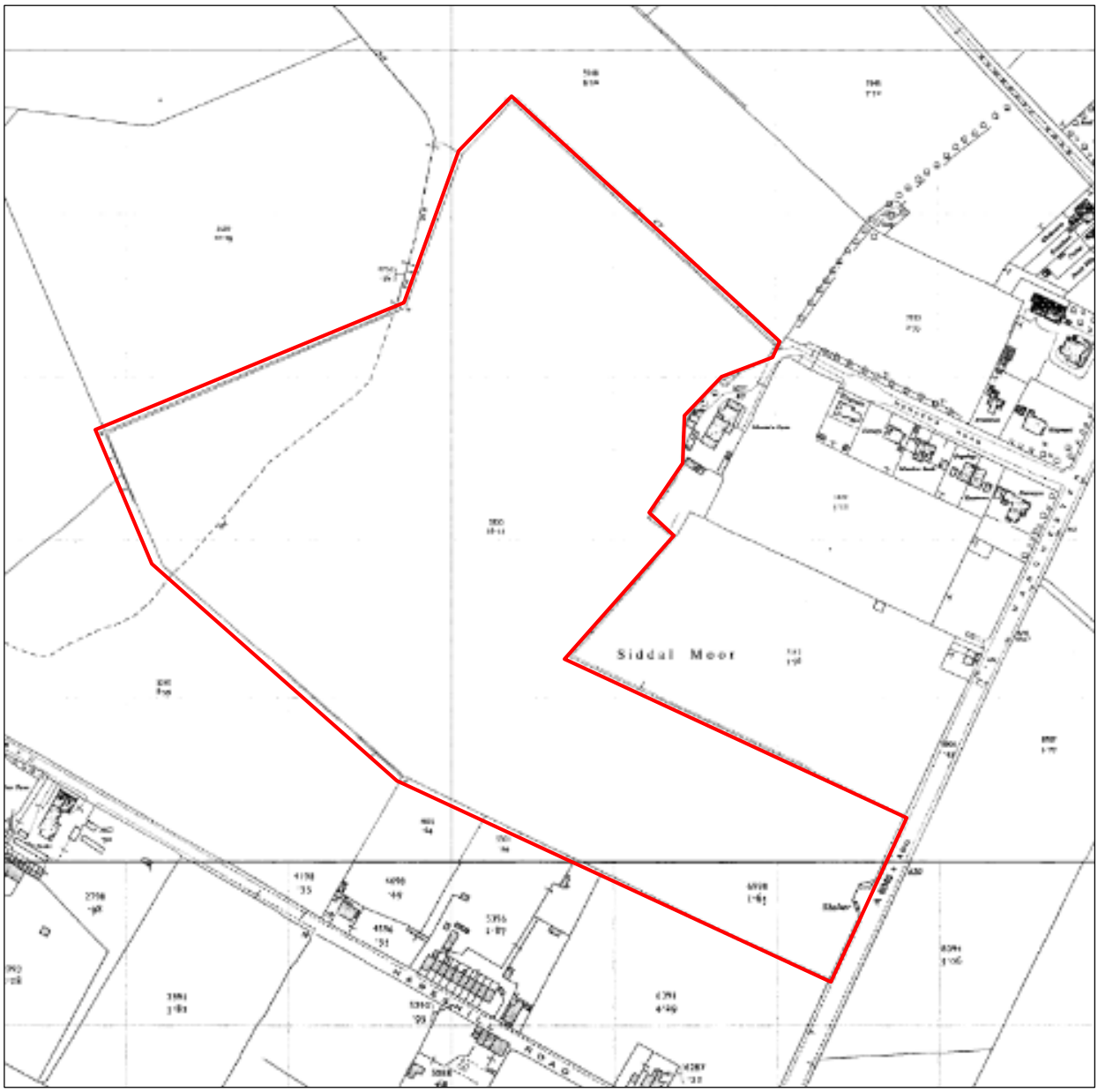
Approximate site boundary

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Post-WWII Historical Map 1956-1957 (1:2,500)

Annex: D2



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Approximate site boundary

Project: **Heywood Stores**

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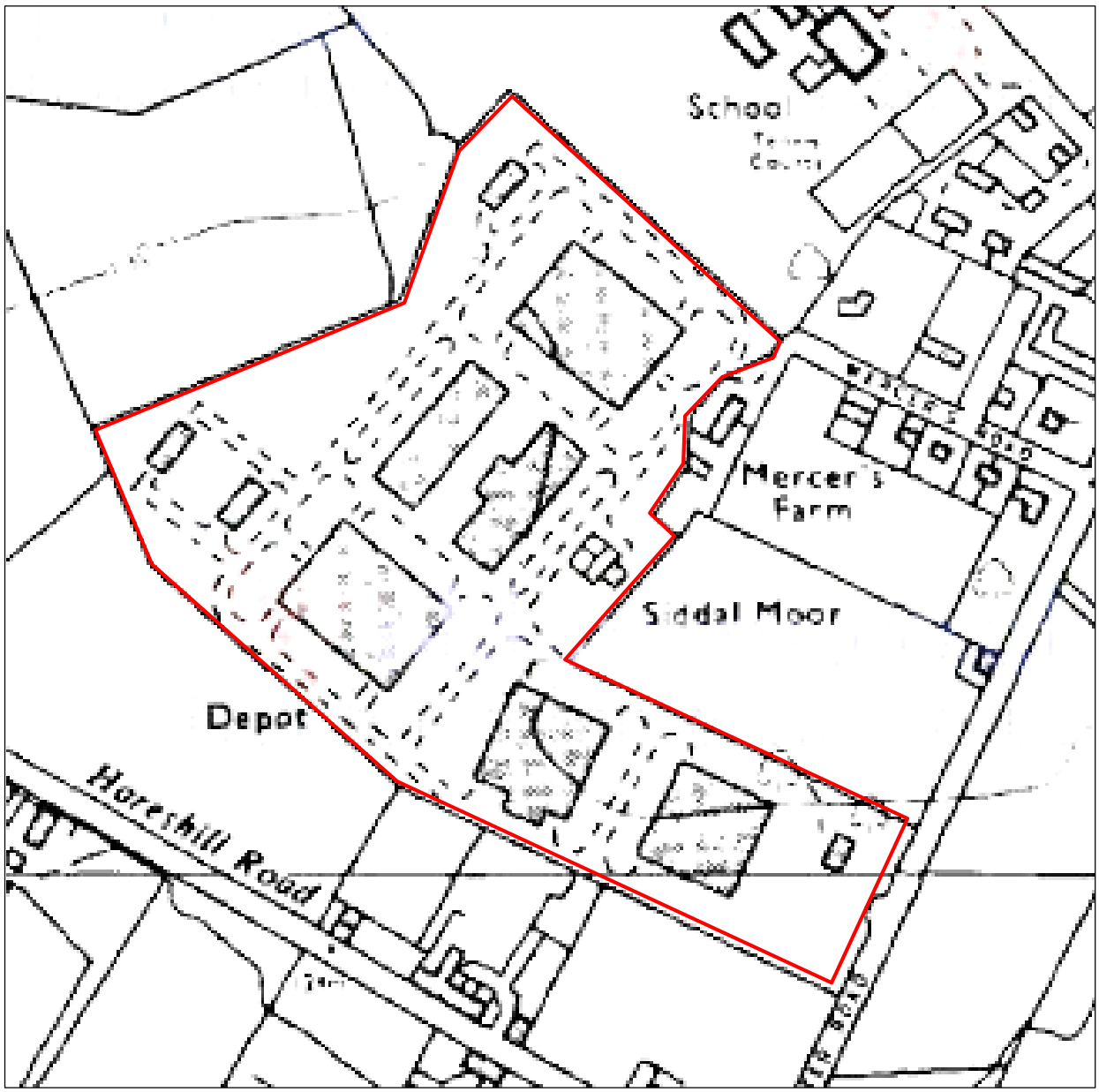
Ref: **DA13368-00**

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Post-WWII Historical Map 1974-1977 (1:10,000)

Annex: D3



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Approximate site boundary

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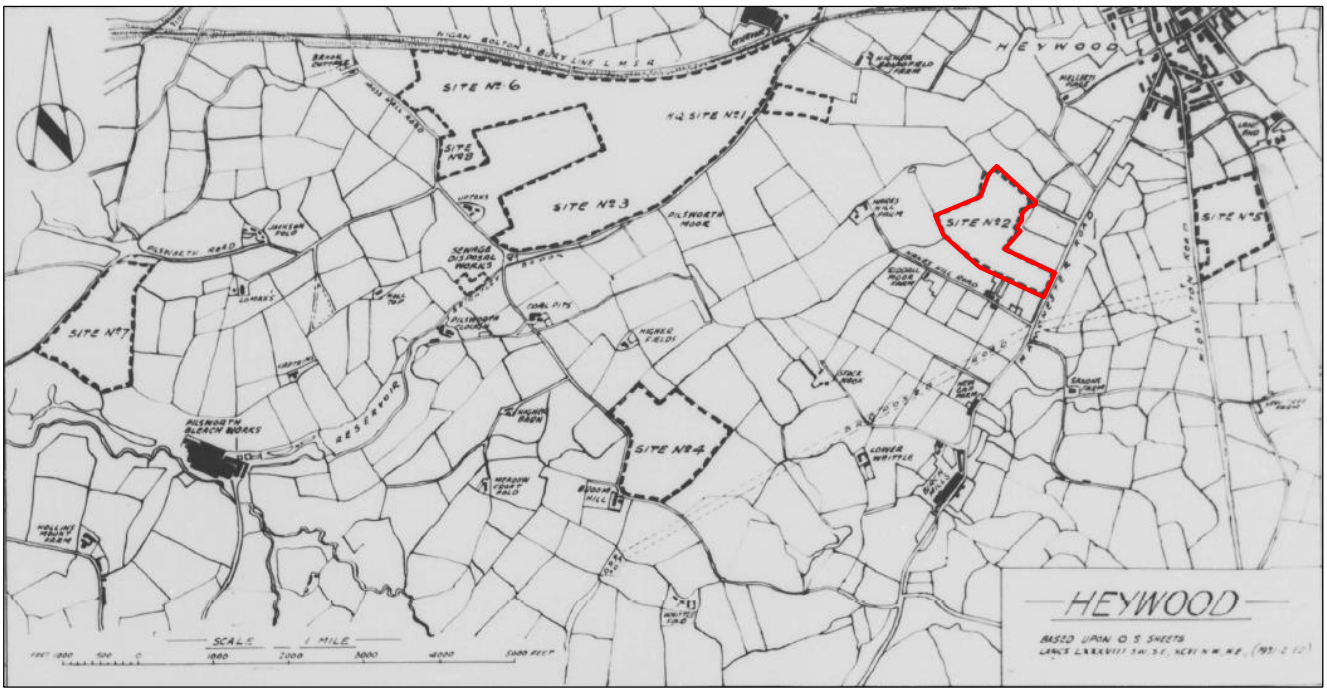
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Air Ministry Site Plan 1948

Annex: **E1**



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Ref: **DA13368-00**

Source: RAF Museum, Hendon

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Air Ministry Site Plan 1948

Annex: **E2**



SITE Nº 2

73	ACCESSORY STORES
74	PACKING CASE STORE
75	FABRIC STORE
76	GAS DEFENCE CENTRE
77	SANITARY BLOCK
78	DECONTAMINATION CENTRE
79	STORAGE SHED 300' × 100'
80	ACCESSORY STORES
81	
82	STORAGE SHED 300' × 100'
83	OFFICES TO STORAGE
84	DESTRUCTOR HOUSE
85	SANITARY BLOCK
86	SEWAGE DISPOSAL PLANT
87	TOOL SHED
88	FABRIC STORE
89	CENTRAL HEATING STATION
90	TRANSFORMER KIOSK
91	OFFICES TO STORAGE SHEDS
92	STORE BLOCK
93	GUARD HUT (LOCAL CONSTRUCTION)
94	SANITARY BLOCK
95	" (FEMALES)
96	STORE BLOCK
97	CANTEEN
98	WARDENS OFFICE

P.B
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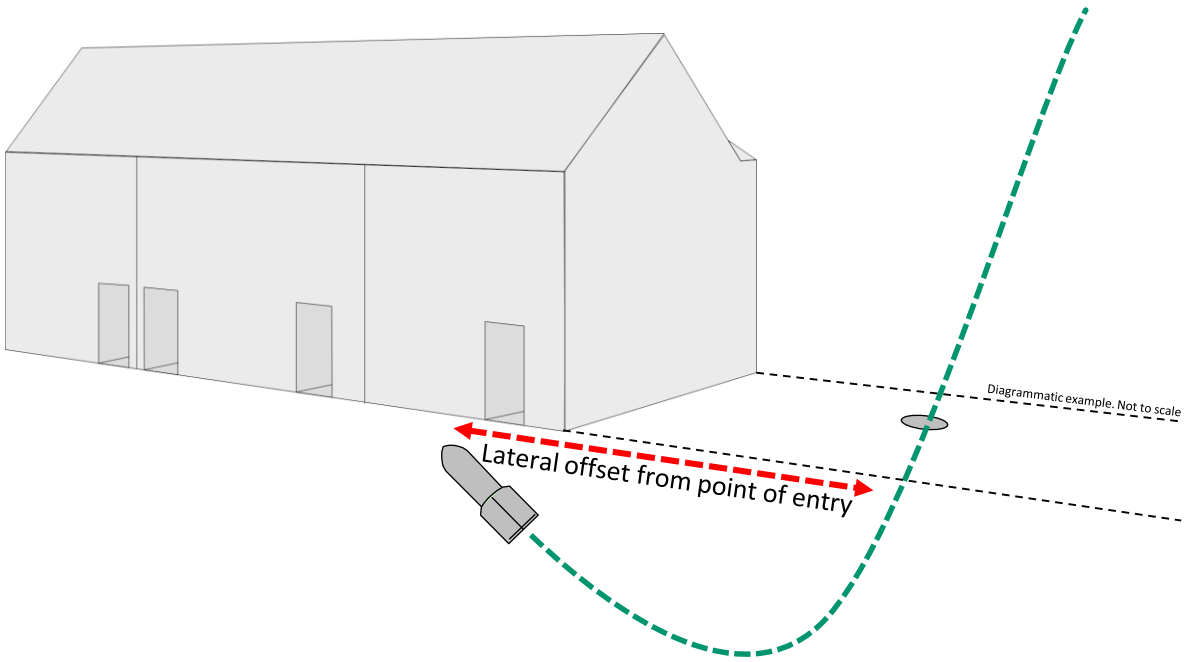
Project: **Heywood Stores**

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Example of UXO Entry Hole / The 'J-curve' Effect Principle









Top: J-curve Effect - Due to angle of entry, unexploded bombs would often end their trajectory at a lateral offset from point of entry, often ending up beneath adjacent extant structures/sites. The photograph above shows 250kg bomb found in Bermondsey pointing upwards, demonstrating 'J-curve'

One of the most common scenarios for UXO going unnoticed was when a UXB fell into a 'bomb site' (such as the area shown **Top Left**), the entry hole of the bomb obscured by any debris and rubble present. Note that the entry hole of a 50kg UXB could be as little as 20cm in diameter (**Left**).

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Project: **Heywood Stores**

Ref: **DA13368-00** Source: Various sources

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BBC NEWS

Bermondsey bomb: World War Two device safely removed



An unexploded World War Two bomb found in south London has been driven away safely under police and Army escort.

The 500lb (250kg) device was found on a building site in Grange Walk, Bermondsey on Monday.

March 2015

BBC NEWS

Bethnal Green WW2 bomb: Experts remove unexploded device



An unexploded World War Two bomb that prompted the evacuation of 700 people in east London has been made safe and removed by the military.

Families spent the night in a school hall after the 500lb bomb was found in the basement of a building site on Temple Street, in Bethnal Green, on Monday afternoon.

A 200m (650ft) exclusion zone was set up around the device.

August 2016

BBC NEWS

Bath WW2 bomb scare: Device defused, police say



A 500lb World War Two bomb found on the site of a former school in Bath has been defused and made safe.

The discovery of the bomb on Thursday **led to the evacuation of hundreds of homes** and many road closures in the Lansdown area of the city.

A cordon around the site was lifted on Friday evening, more than 24 hours after residents were asked to leave their homes.

May 2016

BBC NEWS

London City Airport reopens after WW2 bomb moved



London City Airport has reopened after an unexploded 500kg World War Two bomb was safely moved from the area.

The device was discovered at the King George V Dock on Sunday during planned work at the east London airport.

All flights were cancelled on Monday after an exclusion zone was put in place, **with the closure affecting up to 16,000 passengers and nearby residents being evacuated from their homes.**

May 2015

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Examples of Unexpected Detonation of WWII Bombs

Annex: G2

BASF has confirmed that an explosive device, most likely a World War II-era bomb, caused the blast that left one person injured Tuesday at a plant construction site in Germany.

The explosion was reported at BASF's Ludwigshafen toluene diisocyanate (TDI) plant, which recently broke ground for a 300,000 metric tons per year TDI production plant and other construction to expand its facilities.



BASF Provides Some Details

Responding to a request from *PaintSquare News* for more information on Wednesday (Feb. 27), BASF's manager of media relations and corporate communications Europe, Ursula von Stetten, wrote in an email, "So here [are] the facts: The detonation took place at 10:00 a.m. One person was injured; the injury is not serious. He will be kept in the hospital for some days.

"Cause of the detonation was an explosive device, presumably a bomb deriving from the Second World War. The device detonated when grounding work was done. No details on [a] delay [are] available. At the moment, the exact circumstances of the incident are [being] evaluated."

1st March 2013

SPIEGEL ONLINE

Blast Kills One

World War II Bomb Explodes on German Motorway

A highway construction worker in Germany accidentally struck an unexploded World War II bomb, causing an explosion which killed him and wrecked several passing cars.



A World War II bomb has exploded during construction work on a German highway, killing one worker and injuring several motorists who were driving past, police said.

The worker had been cutting through the road surface near the south-western town of Aschaffenburg when his machine struck the bomb and triggered it. Police said they weren't sure yet what type of bomb it was. "The explosion seems to have been too small for it to have been an aircraft bomb," a police spokesman said.

23rd October 2006

WWII bomb injures 17 at Hattingen construction site



Seventeen people were injured on Friday when a construction crew unwittingly detonated a buried World War II-era bomb in Hattingen.

An excavator apparently drove over a 250-kilogramme (550 pound) American bomb, damaging surrounding buildings. Most of the injured suffered auditory trauma from the blast, and the excavator operator suffered injuries to his hands, police in the German state of North Rhine-Westphalia said.

"The hole was astoundingly small for such a large bomb full of so many explosives," Armin Gebhard, head of the Arnsberg department for military ordnance removal, told The Local. "But of course it damaged all the surrounding buildings too. We are really happy it wasn't worse."

19th September 2013

BBC NEWS

World War II bomb kills three in Germany



A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

The blast happened an hour before the defusing operation was due to start.

Officials said the three men who died were experienced sappers, or combat engineers, who over 20 years had defused up to 700 bombs.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

2nd June 2010



June 2006

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Project: **Heywood Stores**

Ref: **DA13368-00**

Source: Various news sources

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Examples of Land Service Ammunition finds in the UK

Unexploded Second World War bomb discovered under Somerset footpath

By Western Daily Press | Posted: January 21, 2014



The unexploded bomb was found in Somerset

Comments (0)

An unexploded bomb dropped in Britain during the Second World War has finally been discovered – underneath a popular footpath in Somerset.

Unexploded WW2 bomb found at Kenfig Pool, Bridgend

23 August 2014 Last updated at 15:01



Dean Smith believes the shell was made in Germany

Bomb experts have been called to a south Wales nature reserve after an unexploded World War Two shell was discovered by a walker in Bridgend.

Dean Smith, 38, of Pyle, was walking near Kenfig Pool on Saturday when he saw a fin sticking out of the sand.

He reached down to pick it up, but ending up falling and landed with the 2ft-long (0.6m) bomb on top of him.

The site has been cordoned off by police and the Royal Logistics Corps will carry out a controlled explosion.

Related Stories

'Panic' as dog nearly thrown grenade

WW2 bomb found at wind farm exploded

WWII bomb found in kitchen cupboard

Mortar thought to be from WWII found on Oshawa's Camp-X grounds

August 24, 2016 | 5:42 am



What is believed to be a World War II mortar has been discovered in south Oshawa. A man out in Intrepid Park, the site of the Camp-X Second World War training grounds, discovered the round with his metal detector on Tuesday evening. Durham police are held the scene overnight awaiting military officials from Trenton to come and properly detonate the mortar.

Unexploded bomb found in farmer's field

17 May 2010



A live Second World War mortar shell was blown up by Army experts after a farmer found it in his field.

The discovery was made in the field alongside the A20 between Folkestone and Dover.

The mortar shell, which was around a foot long and 3in in diameter, was around 50ft from the main road.

The farmer alerted police and PC Trevor Moody and PCSO Michelle Brady went to the field.

PC Moody contacted the Army who sent in a bomb disposal unit.

An Army officer confirmed the live shell was from the Second World War and was packed with high explosives.

They moved it a safe distance away from the A20 and carried out a controlled explosion.

PC Moody said: "Given that we live in an area that saw much action during the Second World War, it is not uncommon for us to be alerted about unexploded bombs."

The incident was on Thursday.

Click here for more news from Kent.

Royal Navy bomb disposal experts remove a World War Two shell discovered in a nature reserve

- A World War Two bomb was discovered in a Plymouth nature reserve
- Amateur metal detector found the shell and partially dug it up
- Royal Navy experts carried the explosive away before disposing of it

By VALERIE EDWARDS FOR MAILONLINE
PUBLISHED: 01:29, 13 January 2016 | **UPDATED:** 09:51, 13 January 2016

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A World War Two bomb was reportedly found at Efford Nature Reserve in Plymouth after a member of the public was metal detecting and partially dug it up.

The Royal Navy Bomb Disposal team was called in to remove the bomb and police have closed off Military Lane, with the possibility of Military Road also being closed.

Police were called at around 1.30pm yesterday after what appeared to be a shell was discovered and partially dug up near Military Lane, Efford.



Holiday beach cordoned off after landslip sends more than a THOUSAND Second World War bombs and rockets tumbling onto the sands

- Bad weather led to ground movement which exposed the huge arsenal at Mappleton, East Riding
- A dog walker stumbled across the deadly find on Saturday and 15 controlled explosions were carried out
- Rockets, mortar bombs and 25-pounder bombs were recovered after they were fired into the cliffs by RAF aircraft during the war
- Most of the devices were dummy rounds used for bombing practice but contain enough explosives to cause terrible injuries



© Jonathan Pow

Bomb Beach Alley: Rockets were found after a landslide on Mappleton beach in 2012

Army bomb disposal team called to Blacksole Bridge in Herne Bay

by Aidan Barlow abarlow@thekmgroup.co.uk 08 July 2015

It was like a scene from Dad's Army when Army bomb disposal experts found wartime explosives made by the Home Guard in makeshift bottles.

A team was called to the Blacksole Bridge in Herne Bay after the wartime bombs were found.

The team from the Royal Logistics Corps set up a 30 metre exclusion zone for pedestrians around the railway embankment after the suspected homemade phosphorous bombs were found.



The scene at Blacksole Bridge after wartime explosives were found in the railway cutting



Tweet

Published by Huw Oxburgh

Posted: 03/06/14

Updated: 03/06/14

Unexploded bomb found in Axminster

Update: The bomb disposal unit has made the device safe and the road has re-opened.

Six homes have been evacuated today after the discovery of an unexploded device in Axminster.

A Royal Navy bomb disposal team have been called to the scene after a 'historic German device' was discovered in a garden.

Police have set up a 20m cordon around the garden in Alexandra Road and evacuated homes in the surrounding area as a precaution.

Storms and floods unearth unexploded wartime bombs

By Claire Marshall
BBC environment correspondent

There has been a dramatic increase in the number of wartime bombs unearthed because of the winter storms and flooding.

Bomb disposal teams in the South West have dealt with double the number of unexploded ordnance than in the same period last year.

Since mid December, the Royal Navy's Southern Dive Unit has recovered or disposed of 244 items of ordnance.

During the same period last year, they dealt with just 108 items.



The storms have uncovered a lethal past

Almost 70 years after the end of WWII, one legacy of that conflict continues to turn up on beaches and harbours around Britain.

Unexploded shells, bombs and mines continue to be discovered every year, and the Royal Navy's Southern Dive Unit is tasked with making these devices safe.

Its area of responsibility stretches for some 2,250km (1,400 miles). It begins from the highwater mark in Hull and proceeds seaward to the territorial limit, and then runs clockwise around the British Isles - including the Isle of Wight, Channel Islands, and Isles of Scilly - to finish in Liverpool.

Related Stories

Ancient trees revealed by storms

Land Service Ammunition (LSA) resulting from historic military activity is commonly encountered across the UK by the public and construction industry alike. Such finds are much more common in rural areas than in urban environments, and can often be anticipated in areas such as former RAF stations or ranges. However, many such items are encountered entirely by surprise where the landowner or developer has no knowledge of any previous military use of the land.

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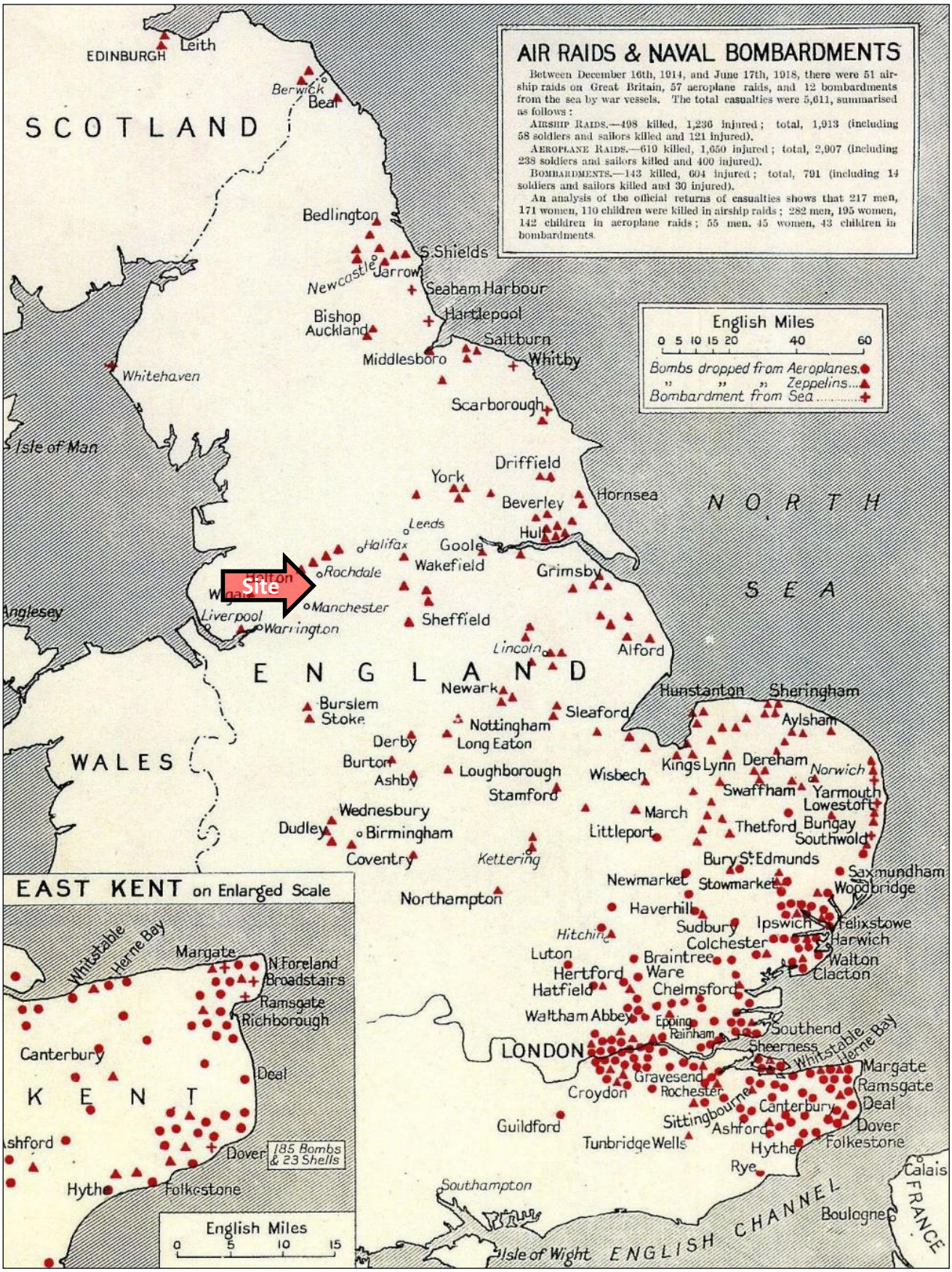
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Source: Various news sources

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WWI Map of Air Raids and Naval Bombardments

Annex: H



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Source: J. Morris, *German Air Raids on Britain*

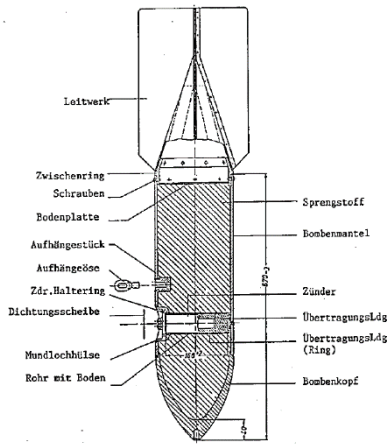
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Examples of German Bombs - HE

SC 50kg

Bomb Weight	40-54kg (110-119lb)
Explosive Weight	c25kg (55lb)
Fuze Type	Impact fuze/electro-mechanical time delay fuze
Bomb Dimensions	1,090 x 280mm (42.9 x 11.0in)
Body Diameter	200mm (7.87in)
Use	Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

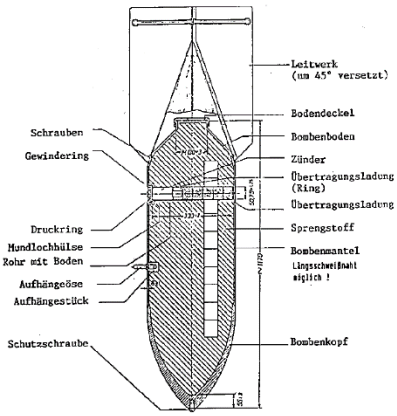






SC 250kg

Bomb Weight	245-256kg (540-564lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.
Remarks	It could be carried by almost all German bomber aircraft, and was used to notable effect by the Junkers Ju-87 Stuka (Sturzkampfflugzeug or dive-bomber).

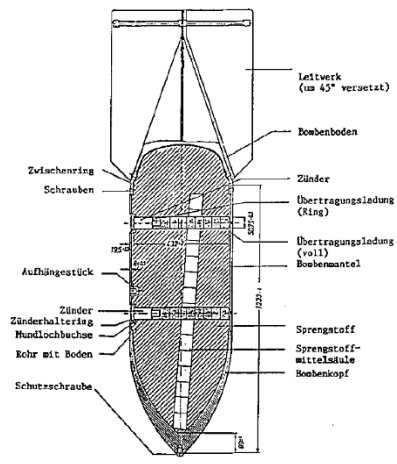




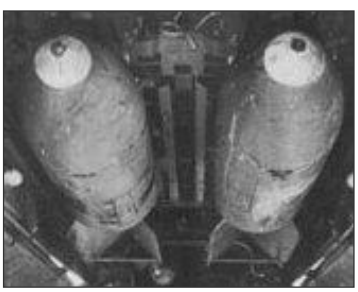


SC 500kg

Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, trialene. Bombs recovered with Trialen filling have cylindrical paper wrapped pellets 1-15/16 in. in length and diameter forming







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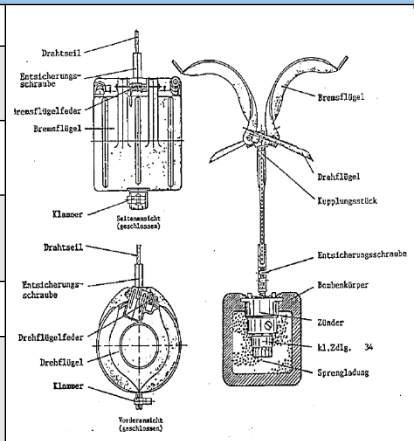
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Examples of German Bombs - HE, AP and Parachute Mines

SD2 Butterfly Bomb

Bomb Weight	2kg (4.41lb)
Explosive Weight	7.5oz (212.6 grams) of TNT surrounded by a layer of bituminous composition.
Fuze Type	41 fuze (time) , 67 fuze (clockwork time delay) or 70 fuze (anti-handling device)
Bomb Dimensions	Length 240 mm Width 140 mm Height 310 mm
Body Diameter	3in (7.62 cm) diameter, 3.1in (7.874) long
Use	It was designed as an anti-personnel/fragmentation weapon. They were delivered by air, being dropped in containers that opened at a predetermined height, thus scattering the bombs.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.





Parachute Mine (Luftmine B / LMB)

Bomb Weight	987.017kg (2176lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Impact/ Time delay / hydrostatic pressure fuze
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against civilian, military and industrial targets. Designed to detonate above ground level to maximise damage to a wider area.
Remarks	Parachute Mines were normally carried by HE 115 (Naval operations), HE 111 and JU 88 aircraft types. Deployed a parachute when dropped in order to control its descent.

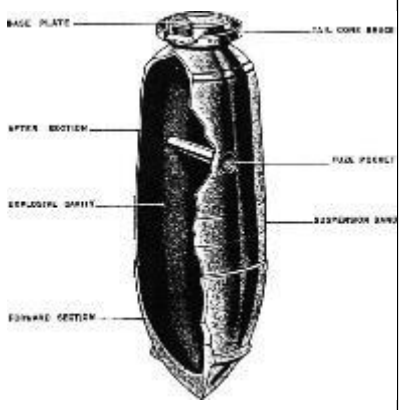


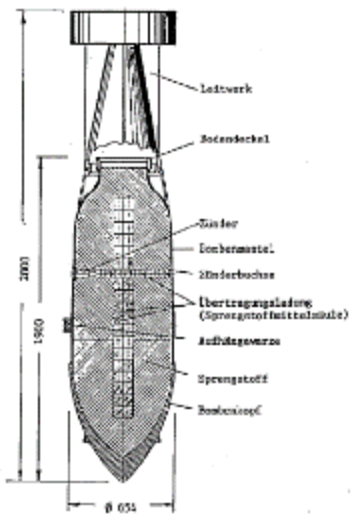




SC 1000kg

Bomb Weight	996-1061kg (1,058-1,146lb)
Explosive Weight	530-620kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Filling	Mixture of 40% amatol and 60% TNT, but when used as an anti-shipping bomb it was filled with Trialen 105, a mixture of 15% RDX, 70% TNT and 15% aluminium powder.
Bomb Dimensions	2800 x 654mm (77 x 25.2in)
Body Diameter	654mm (18.5in)
Use	SC type bombs are General Purpose Bombs used primarily for general demolition work. Constructed of parallel walls with comparatively heavy noses. They are usually of three piece welded construction





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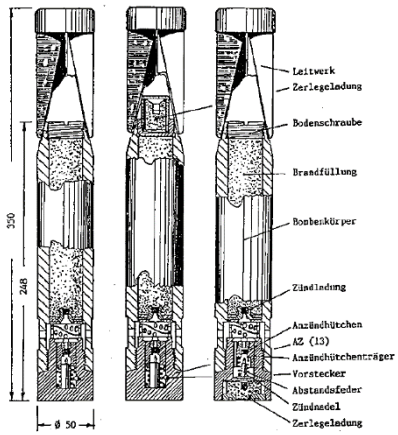
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Examples of German Bombs - Incendiary

1kg Incendiary Bomb

Bomb Weight	1.0 and 1.3kg (2.2 and 2.87lb)
Explosive Weight	680gm (1.3lb) Thermite
Fuze Type	Impact fuze
Bomb Dimensions	350 x 50mm (13.8 x 1.97in)
Body Diameter	50mm (1.97in)
Use	As incendiary – dropped in clusters against towns and industrial complexes
Remarks	Magnesium alloy case. Sometimes fitted with high explosive charge. The body is a cylindrical alloy casting threaded internally at the nose to receive the fuze holder and fuze.

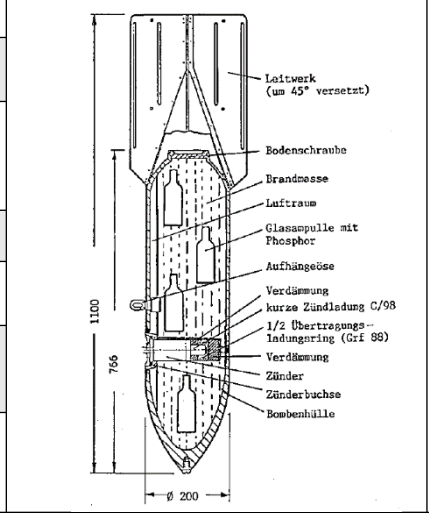


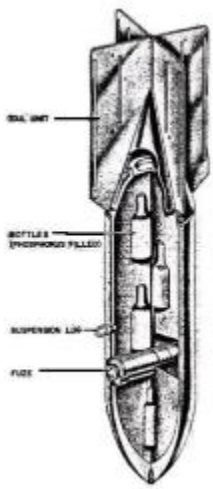




C50 A Incendiary Bomb

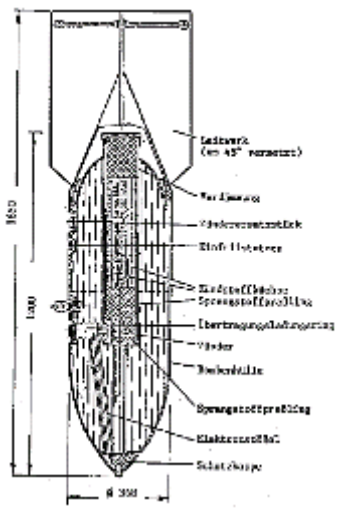
Bomb Weight	c41kg (90.4lb)
Explosive Weight	0.03kg (0.066lb)
Incendiary Filling	12kg (25.5lb) liquid filling with phosphor igniters in glass phials. Benzine 85%; Phosphorus 4%; Pure Rubber 10%
Fuze Type	Electrical impact fuze
Bomb Dimensions	1,100 x 280mm (43.2 x 8in)
Use	Against all targets where an incendiary effect is to be expected
Remarks	Early fill was a phosphorous/carbon disulphide incendiary mixture





Flam C-250 Oil Bomb

Bomb Weight	125kg (276lb)
Explosive Weight	1kg (2.2lb)
Fuze Type	Super-fast electrical impact fuze
Filling	Mixture of 30% petrol and 70% crude oil
Bomb Dimensions	1,650 x 512.2mm (65 x 20.2in)
Body Diameter	368mm (14.5in)
Use	Often used for surprise attacks on living targets, against troop barracks and industrial installations. Thin casing – not designed for ground penetration





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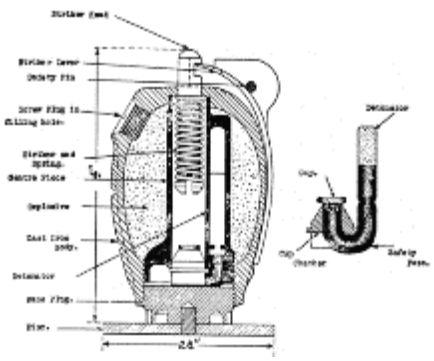
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Examples of LSA - Grenades

No. 36 'Mills' Grenade

Weight	760g filled (1ib 6oz)
Explosive Weight	71g (2.5 oz) Baratol filling.
Fuze Type	4 second delay hand-throwing fuze
Dimensions	95 x 61mm (3.7 x 2.4in)
Use	Fragmentation explosive at approx. 30m range 100m range of damage.
Remarks	First introduced in 1915 its classic grooved 'pineapple' design was designed to provide uniform fragmentation. Approx. over 70million were produced.

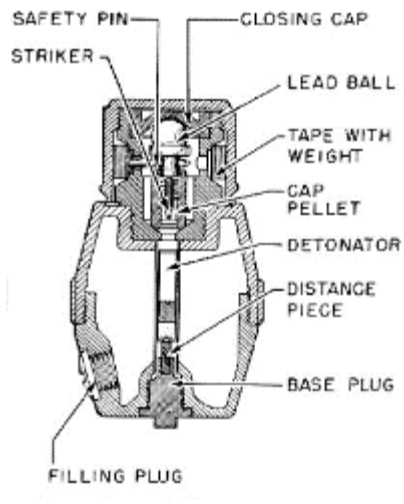




No. 69 Grenade

Weight	383g (0.81b)
Explosive Weight	93g (3.25 oz) of either Amatol, Baratol or Lyddite
Fuze Type	'All-ways' Fuze. Compromised of a safety cap, a weighted streamer attached to a steel ball bearing and a safety bolt designed to detonate from any point of impact.
Dimensions	114 x 60mm (4.5 x 2 .4 in)
Use	A blast grenade for use as an offensive weapon.
Remarks	Introduced December 1940 and made from the plastic Bakelite as opposed to conventional metals. Detection is difficult due to this low metal content.





L2 Grenade

Weight	454g (16 oz)
Explosive Weight	164g. (16 oz)
Fuze Type	Time Friction Fuze
Dimensions	Approx. 99 x 57 mm (3.9 x 2.2 in)
Use	A widely used anti-personnel grenade, a version of the American M26. Variants still see use in the present day.
Remarks	The L2 series also came as a Practice (L3) grenade and a Drill (L4) Grenade. The Drill variant, with a non-functional fuze and no filing, is visible on the far right.





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Examples of LSA - Mortars

Typical 2 Inch High Explosive Mortar

Weight	1.02kg (2.25lb)
Maximum Range	460m (500yards)
Filling	200g RDX/TNT
Dimensions	51 x 290mm (2in x 11.4 in)
Fuze Type	An impact fuze which detonates the fuze booster charge and in turn the high explosive charge.
Use	A small, portable mortar introduced into the British army in 1938. It had greater range and firepower over hand and rifle grenades, and was used to attack targets behind cover with high explosive rounds.
Remarks	Detonation causes the mortars bomb body to shatter producing optimum fragmentation and blast effect at the target.





Typical 3 inch Smoke Mortar

Weight	4.5kg (9lb 14oz)
Maximum Range	2515m (2,750 yards)
Filling	White phosphorus & smoke fill (also came in Explosive & Illuminating models)
Bomb Dimensions	490 x 76mm (19.3in x 3in)
Fuze Type	An impact fuze which initiates a bursting charge. This ruptures the mortar bomb 's body and disperses the phosphorus filler
Use	As a screening devices for unit movement or to impair enemy field of vision.
Remarks	This mortars long cylindrical body and tail sometimes causes it to be misrecognised as a German incendiary bomb.









ML 4.2 inch Mortar

Weight	9kg (19lb 13oz)
Maximum Range	3,750m (4,100 yards)
Filling	High explosive, smoke (white phosphorous or Titanium Tetrachloride) or chemical
Bomb Dimensions	500 x 105 mm (19 in x 4 in)
Fuze Type	Sensitive fuze with HE bursting charge.
Use	A widely used heavy motor which first saw use in 1942 and saw usage throughout the post-war period.
Remarks	Different markings denoted different filings. See image to the right.





L to R: HE, Smoke, Chemical, Smoke BE.

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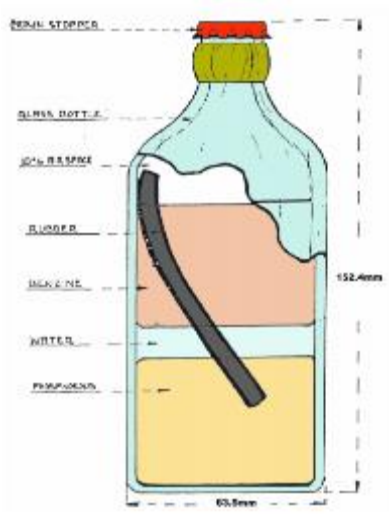
Examples of LSA - Home Guard Ordnance

Self Igniting Phosphorous (SIP) Grenades

Weight	Various
Filling	White Phosphorous and Benzene
Design	The filling was contained in a pint sized glass bottle with water and a strip of rubber. Over time the rubber dissolved to create a sticky which would self ignite when the bottle broke.
Use	Originally intended as an anti-tank incendiary weapon deployed by hand. Designed to be produced cheaply without consuming materials needed to produce armaments on the front line.
Remarks	The Home Guard hid caches of these grenades during the war for use in the event of an invasion. Not all locations were officially recorded and some caches were lost. Occasionally discovered today. In all cases, the grenades are still found to be dangerous.







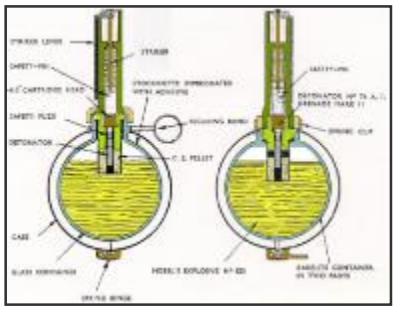
No. 74 Grenade (Sticky Bomb)

Weight	Approx. 1.1kg (2ib 4oz)
Filling	Approx. 600g Nobel's No.283 (Nitro-glycerine)
Design	A glass ball on the end of a Bakelite (plastic) handle. The inside of the ball would contain the explosive filling and the outside a very sticky adhesive coating.
Use	An anti-tank grenade primarily issued to the home guard. It required the user to come in very close proximity with the target and smash the glass explosive container against it.
Remarks	One of a number of weapons developed for use as an *ad hoc* solution to the lack of sufficient anti-tank guns in the aftermath of the Dunkirk evacuation amid fear of German invasion.







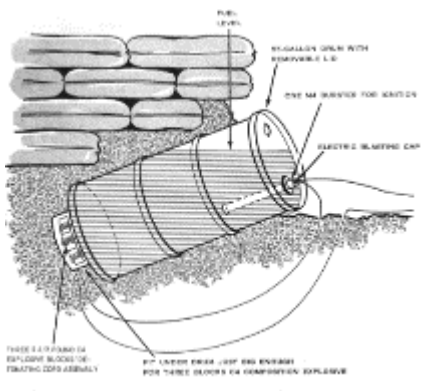


Flame Fougasse Bomb

Weight	Various
Filling	Initially a mixture of 40% petrol and 60% gas. Ammonal provided the propellant charge.
Design	Usually constructed from a 40-galleon drum dug into a roadside and camouflaged.
Use	As an improvised anti-tank bomb. When triggered the Fougasse could project a beam of burning sticky fuel in a fixed direction from up to 3m (10ft) wide and 27m (30yards) long.
Remarks	A highly unorthodox weapon designed by the Petroleum warfare department to address a critical lack of weapons in 1940. 50,000 are estimated to have been distributed around the UK.







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Examples of Small Arms Ammunition

Cannon Ammunition





Rifle Ammunition





Buried and Decayed Ammunition





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Examples of Anti-Aircraft Projectiles

QF 3.7 Inch WWII Anti-Aircraft Projectile

Projectile Weight	28lb (12.6 kg)
Explosive Weight	2.52lbs
Fuze Type	Mechanical Time Fuze
Dimensions	3.7in x 14.7in (94mm x 360mm)
Rate of Fire	10 to 20 rounds per minute
Use	High Explosive Anti-Aircraft projectile. 4.5in projectiles were also used in this role.
Ceiling	30,000ft to 59,000ft









40mm Bofors Projectile

Projectile Weight	1.96lb (0.86kg)
Explosive Weight	300g (0.6lb)
Fuze Type	Proximity and Mechanical Time Fuze
Rate of Fire	120 rounds per minute
Projectile Dimensions	40mm x 310mm (1.6in x 12.2in)
Ceiling	23,000ft (7000m)





Unrotated Projectile (UP) – Z Battery

Projectile Weight	84lb (24.5kg)
Warhead Weight	4.28lb (1.94kg)
Warhead	Aerial Mine with a No. 700 / 720 fuze
Filling	High Explosive
Dimensions	1930mm x 82.6mm (76 x 3.25in)
Use	As a short range rocket-firing anti-aircraft weapon developed for the Royal Navy. It was used extensively by British ships during the early days of World War II. The UP was also used in ground-based single and 128-round launchers known as Z Batteries.





1ST LINE DEFENCE

Unit 3, Maple Park
Essex Road, Hoddesdon,
Hertfordshire. EN11 0EX
Email: info@1stlinedefence.co.uk
Tel: +44 (0)1992 245 020

Client: **RSK Group Limited**

Project: **Heywood Stores**

Ref: **DA13368-00**

Source: Various sources

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Hertfordshire
EN11 0EX
Tel: 01992 245020

www.1stlinedefence.co.uk

1ST LINE DEFENCE

British Geological Survey

Version 2.0.6.3

BGS ID: 27174 : BGS Reference: SD80NE219
British National Grid (27700) : 386120,409620

Report an issue with this borehole

SD80NE 219

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Manchester Road Sewer, Heywood

Client: Rochdale MBC Project Ref.:

Borehole No. BH3

Sheet 1 of 1.

Job No.: 8458

Equipment and methods Light Cable Percussion

Casing Diameter (mm) 150

Casing Depth (m) 4.20

8612 C962

Drilled by L.B

Ground level 136.11 m AOD

Co-ordinates E N

Date 26-10-95

British Geological Survey

CASING DEPTH (m)	WATER DEPTH (m)	Field Records		SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value Cu	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
								MADE GROUND (50mm of tarmac over setts)	(0.15) 0.15	135.960	
								MADE GROUND (Concrete)	(0.25) 0.40	135.710	
								MADE GROUND (Ash & clay)	(0.80)		
1.20	NIL	-(26-10)-	35	1.20	1.65	U 1	59	Firm mottled brown/grey slightly sandy CLAY with a little fine to coarse mudstone gravel	1.20	134.910	
				1.90	1.90	D 1					
1.60	NIL		80	2.20	2.65	U 2					
				2.90	2.90	D 2			(2.80)		
3.00	NIL		125	3.20	3.65	U 3					

British Geological Survey British Geological Survey British Geological Survey

4.00	NIL		4.20 4.20	4.65 4.65	B 1 S 1	65	Grey highly weathered MUDSTONE	4.00	132.110
4.20	NIL		5.20 5.20	5.65 5.65	B 2 S 2	60		(2.70)	
4.20	NIL	-(31-10)-	6.20	6.65	S 3	95	Borehole Complete	6.70	129.410

British Geological Survey

Remarks
1) Service pit dug 1.00m x 1.00m x 1.20m.
2) No groundwater encountered during drilling.
3) Piezometer installed with tip at 6.70m and seal from 0.50m to 1.50m.

Logged by	Date
GL	24-11
Checked by	
Approved by	

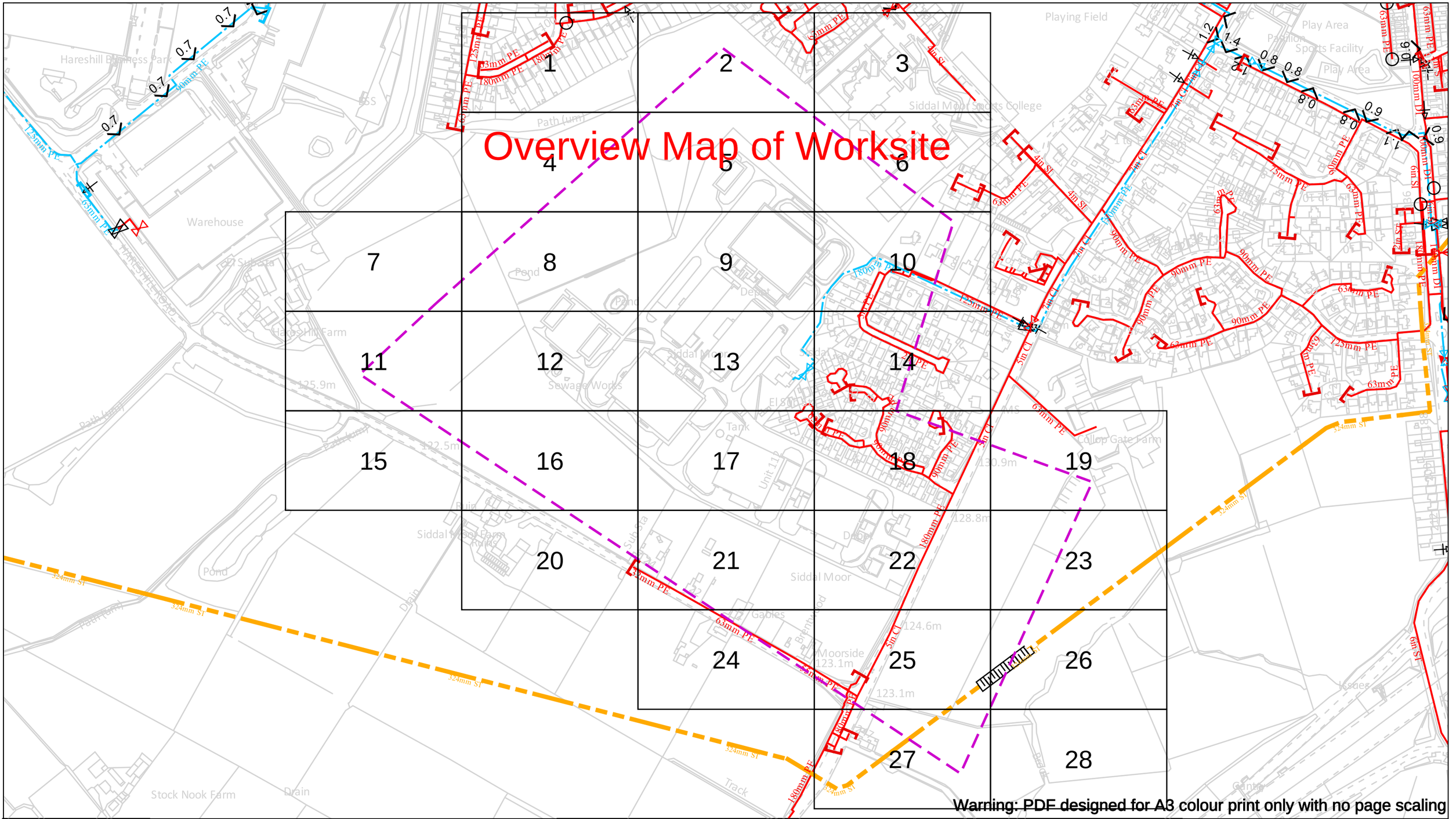
SSL—MMW—9

Scale 1:50 Field Records Column RHS Blows to drive U100s

FIG No.

APPENDIX E UTILITY SERVICE PLANS

Overview Map of Worksite



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Date Requested: 10/08/2021
Job Reference: 22938031
Site Location: 385534 409103
Requested by:
Miss Monique Elsom
Your Scheme/Reference:
322834

Scale: 1:4100 (When plotted at A3)

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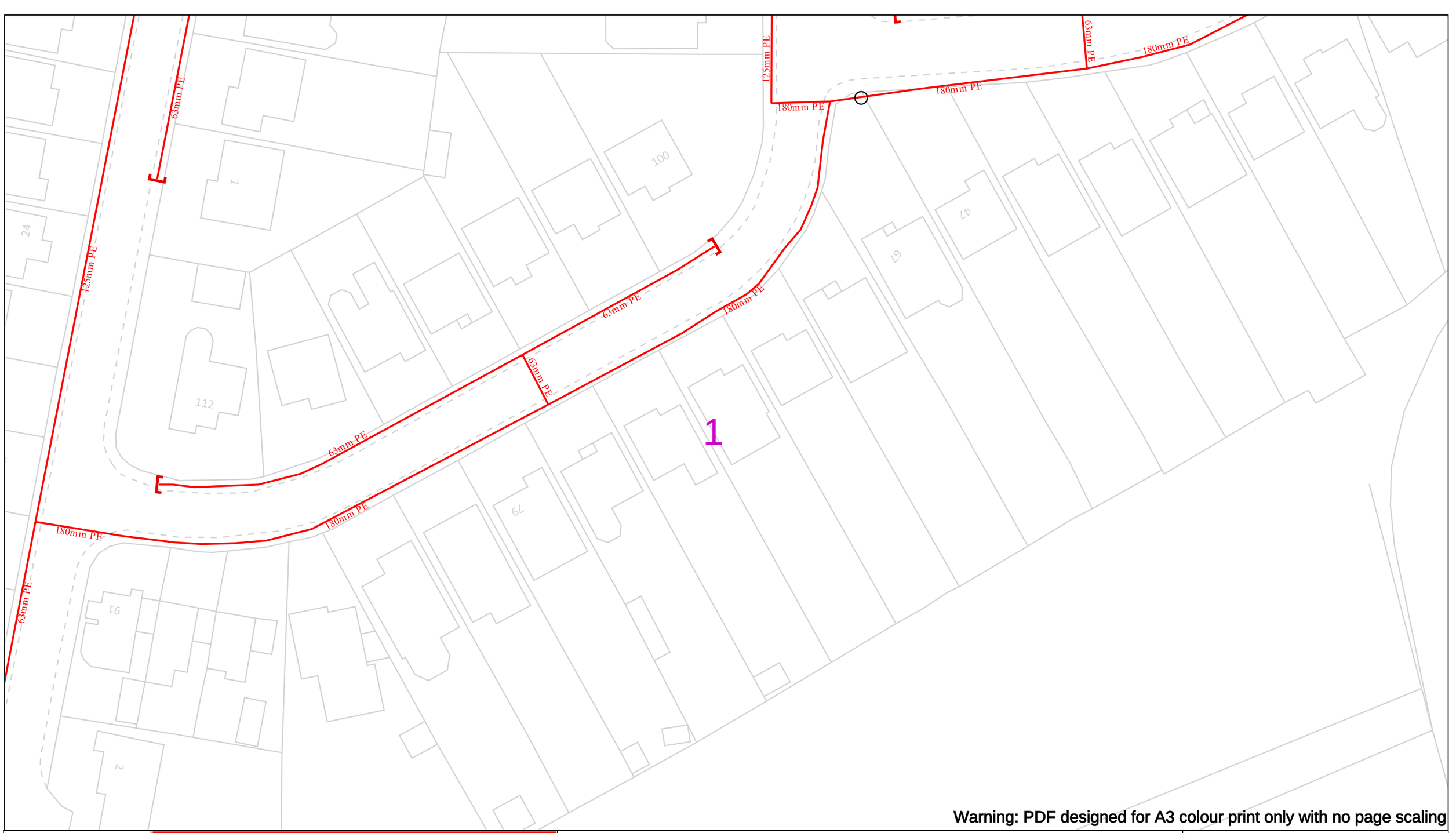
Area:

Line:

- LP Mains
- MP Mains
- IP Mains
- LHP Mains
- Valve
- Depth of cover
- Syphon
- Diameter Change
- Material Change
- Out of Standard Service

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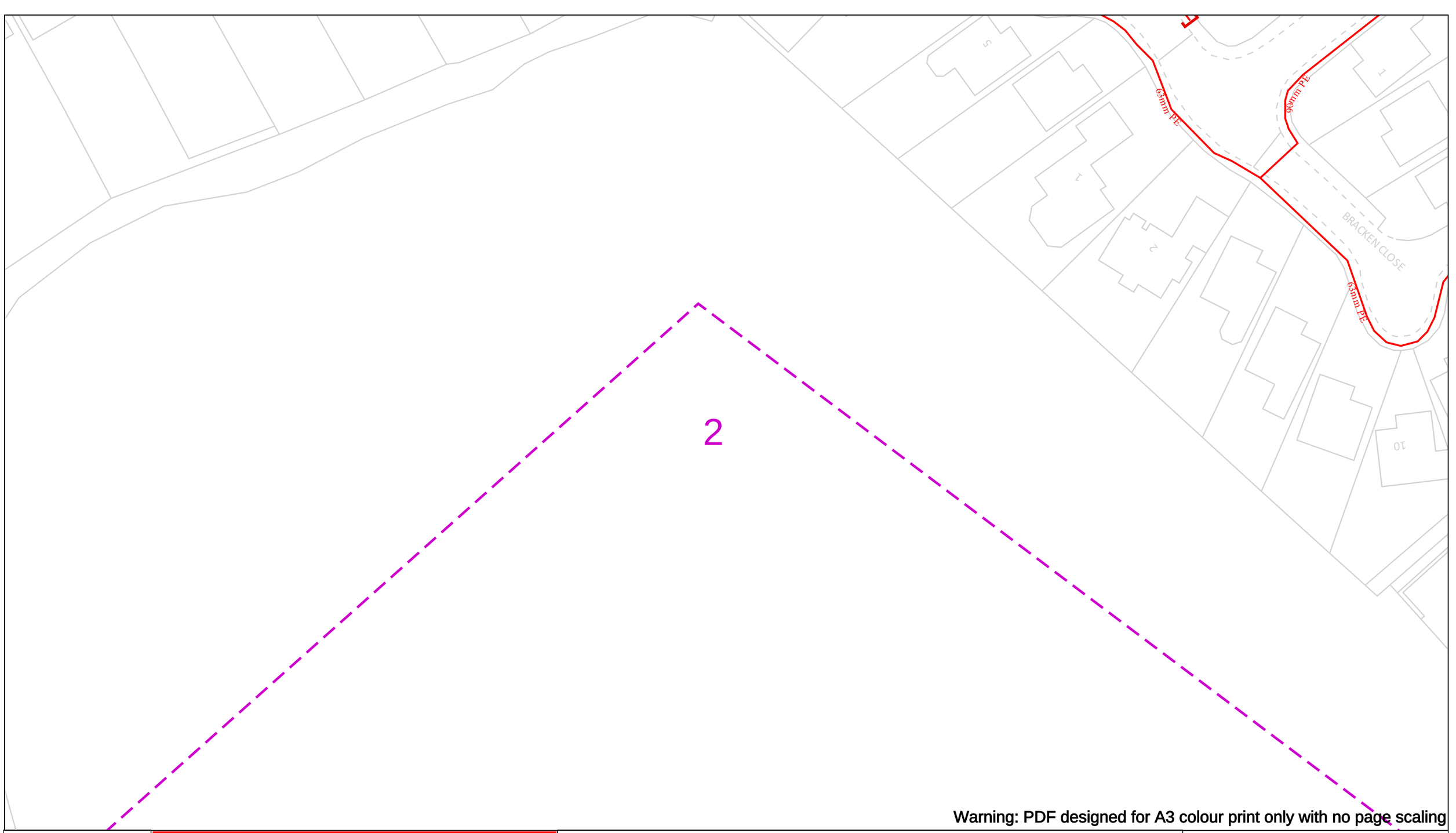
Dig Sites

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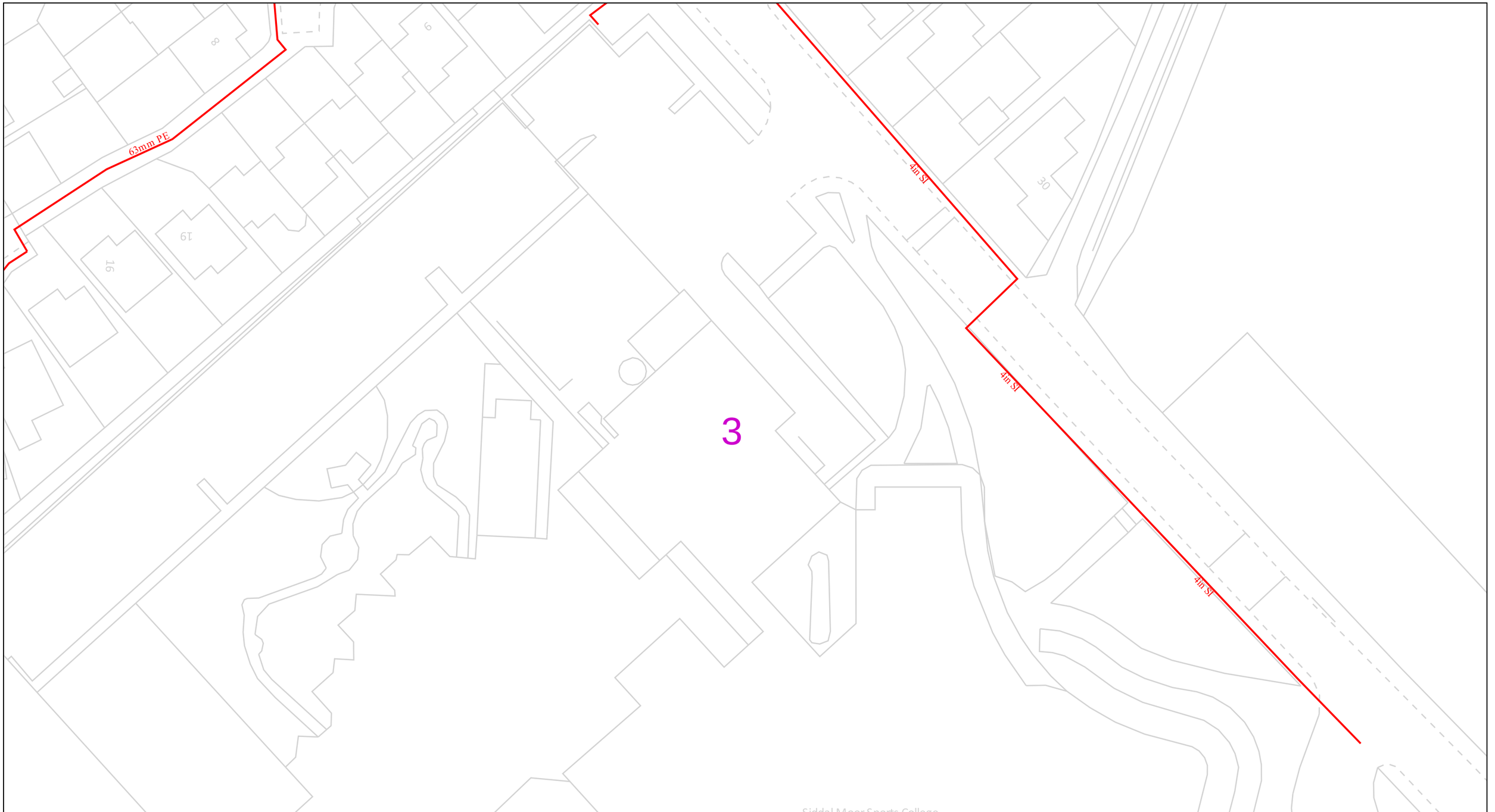
LP Mains
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Valve
Depth of cover
Syphon

Diameter Change
Material Change
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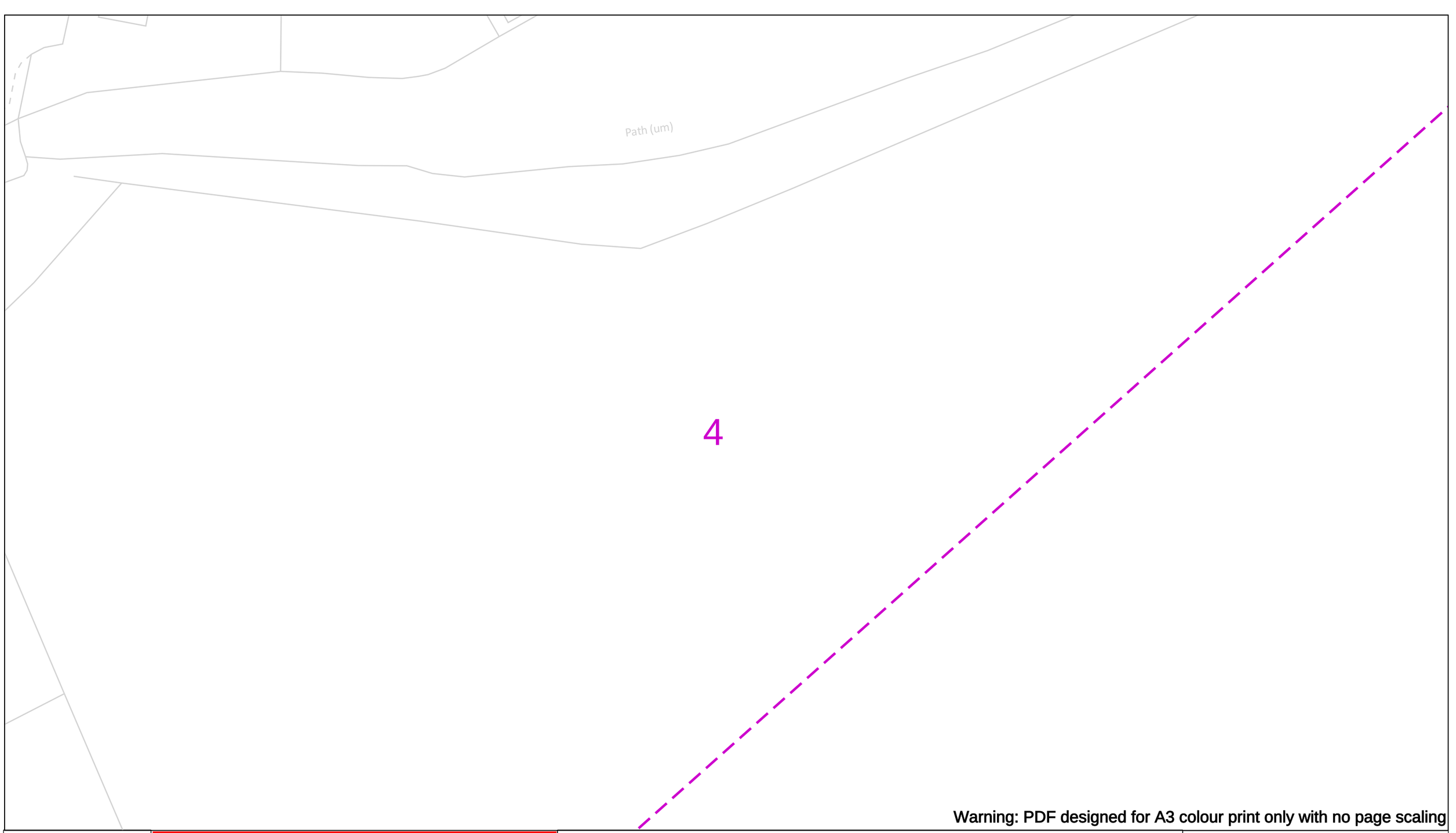
Area: Line:

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Valve
Depth of cover
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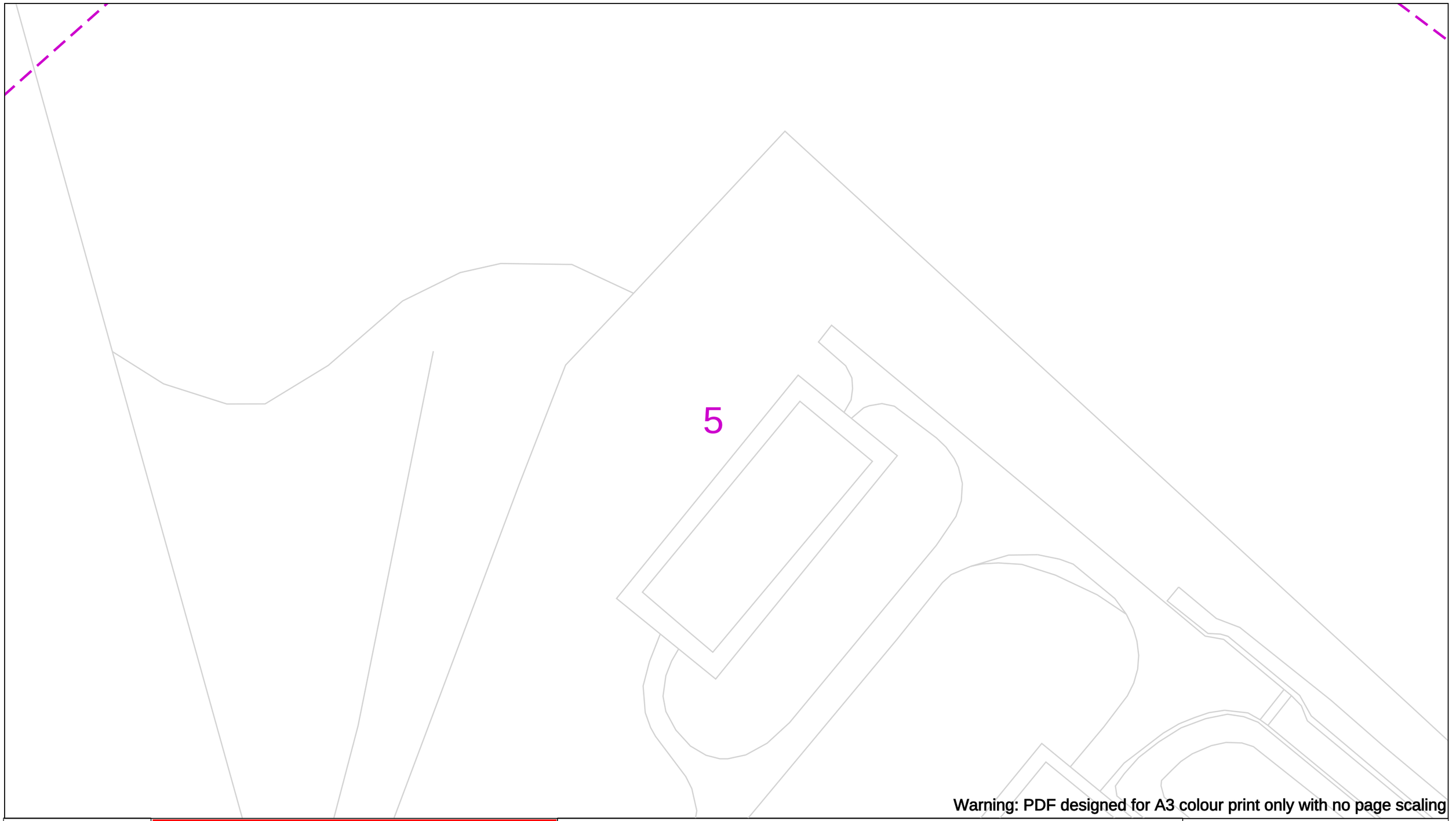
Dig Sites

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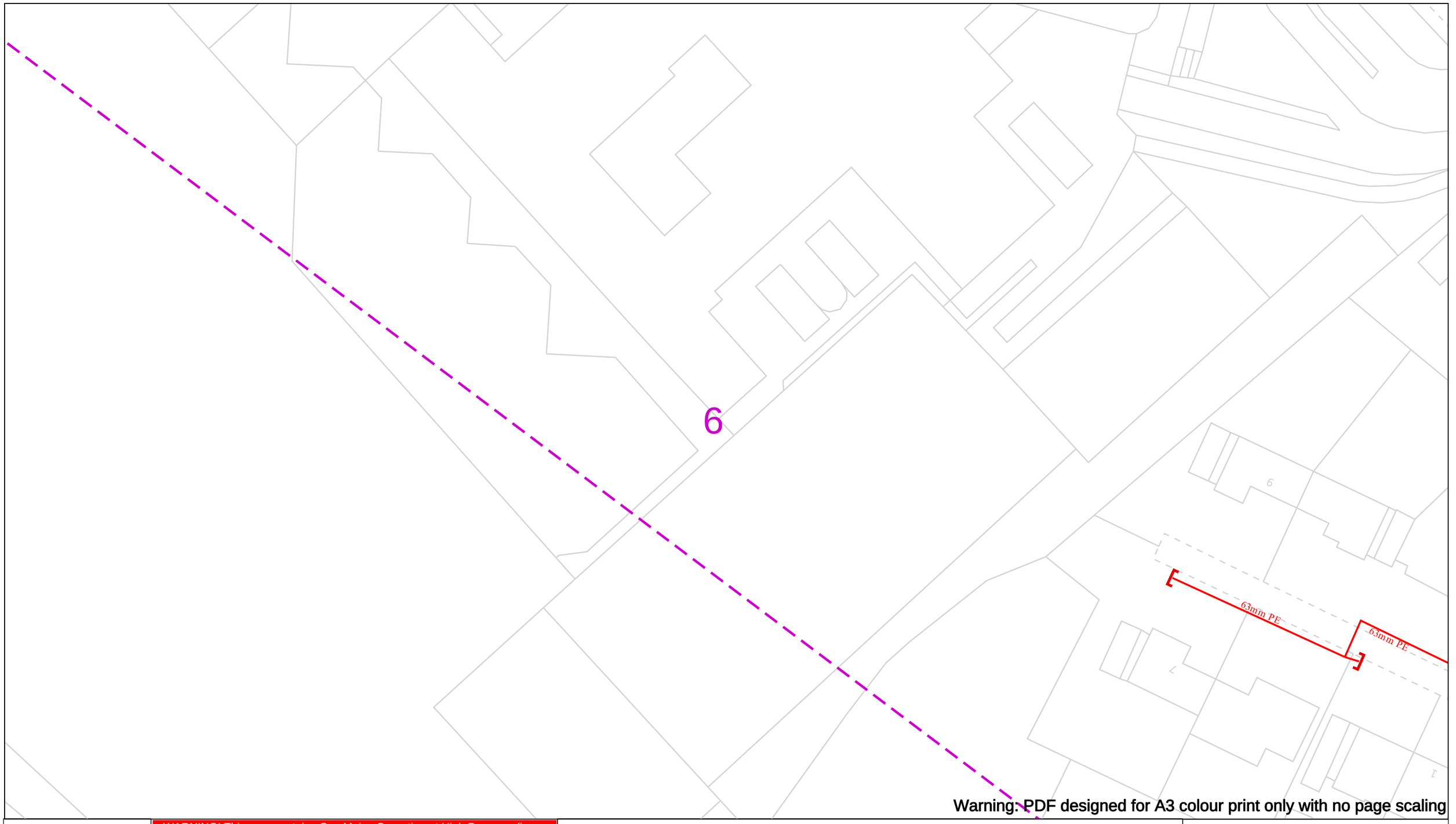
LP Mains
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LHP Mains

Valve
Depth of cover
Syphon

Diameter Change
Material Change
Out of Standard Service

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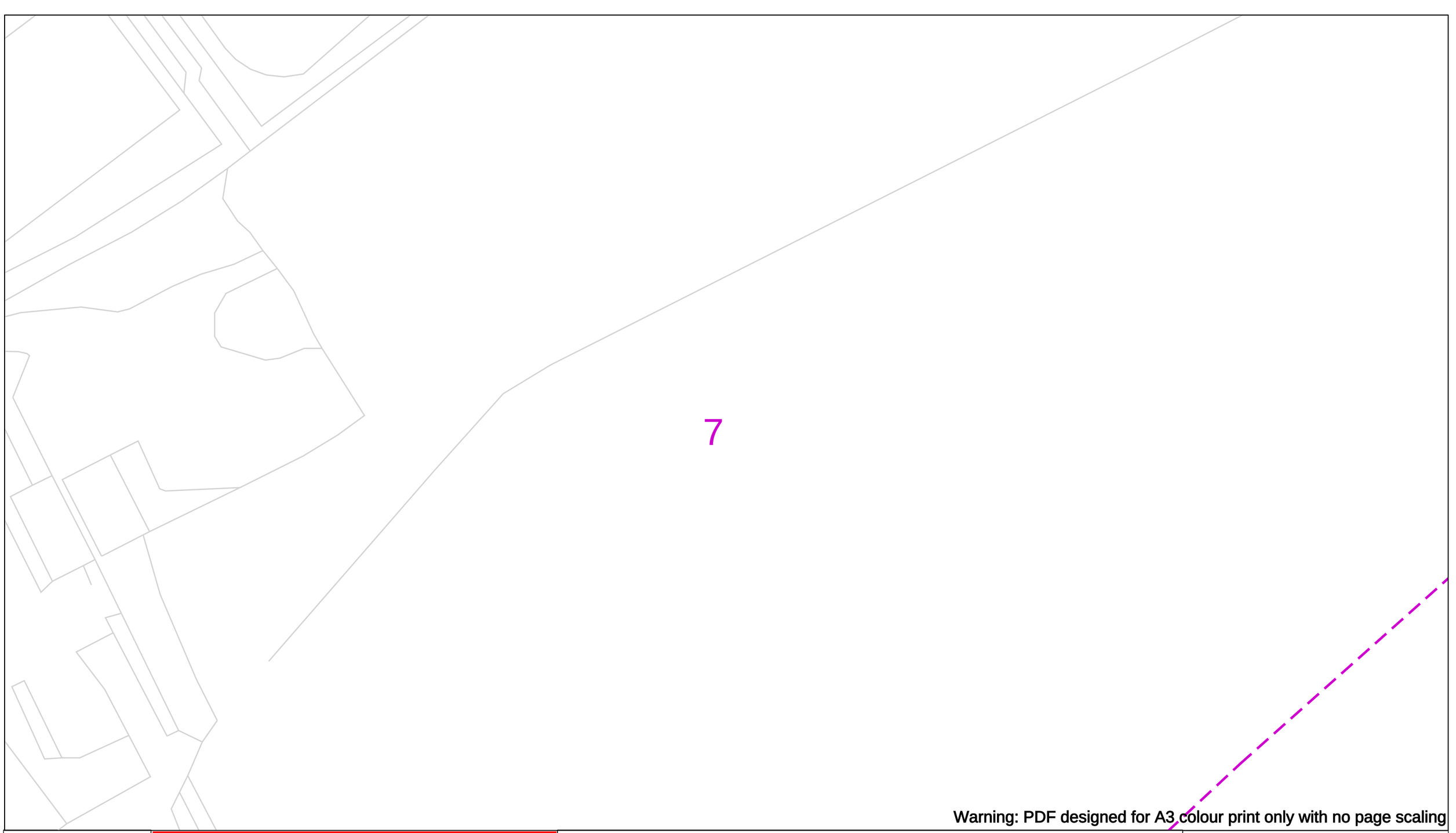
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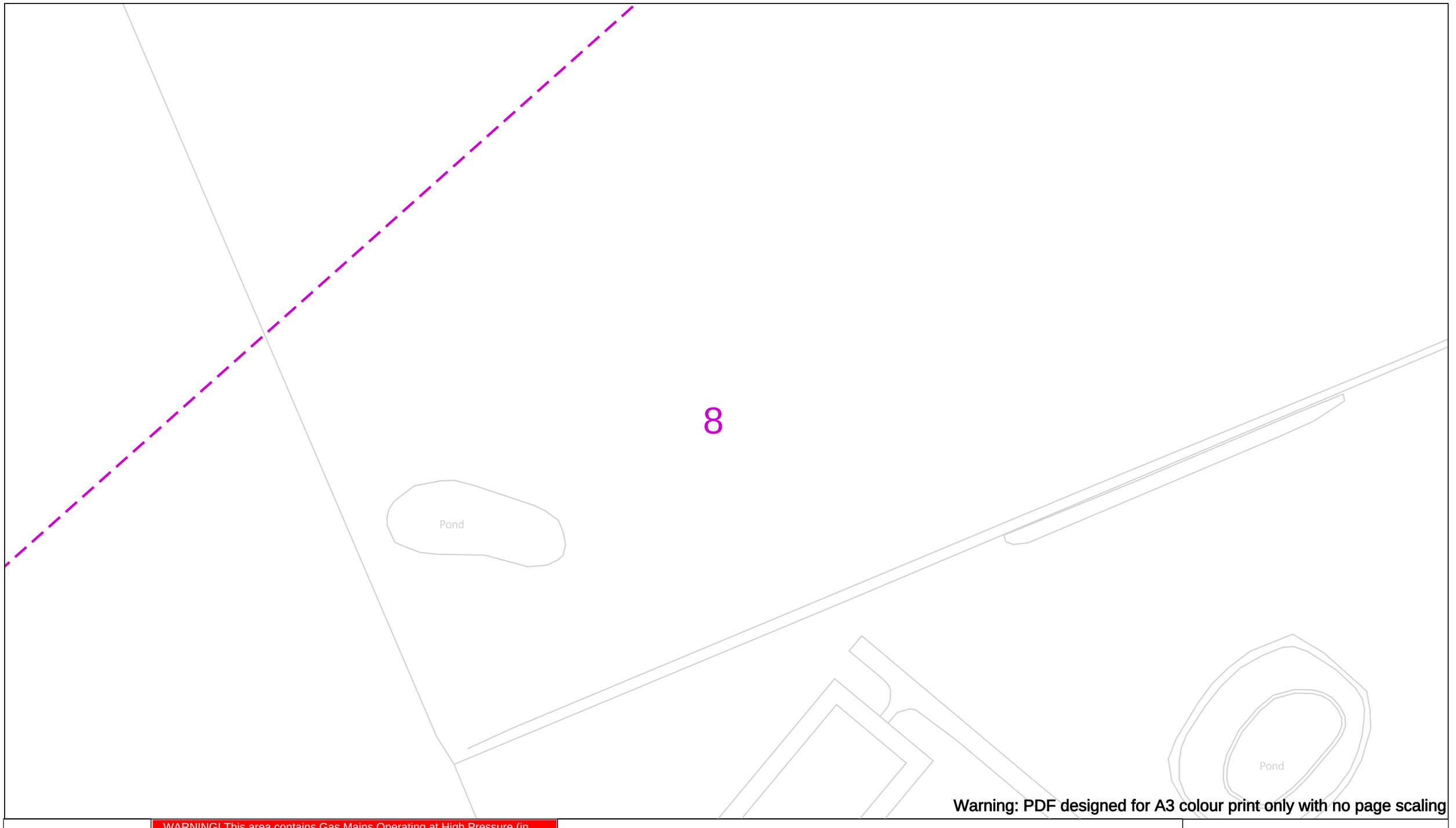
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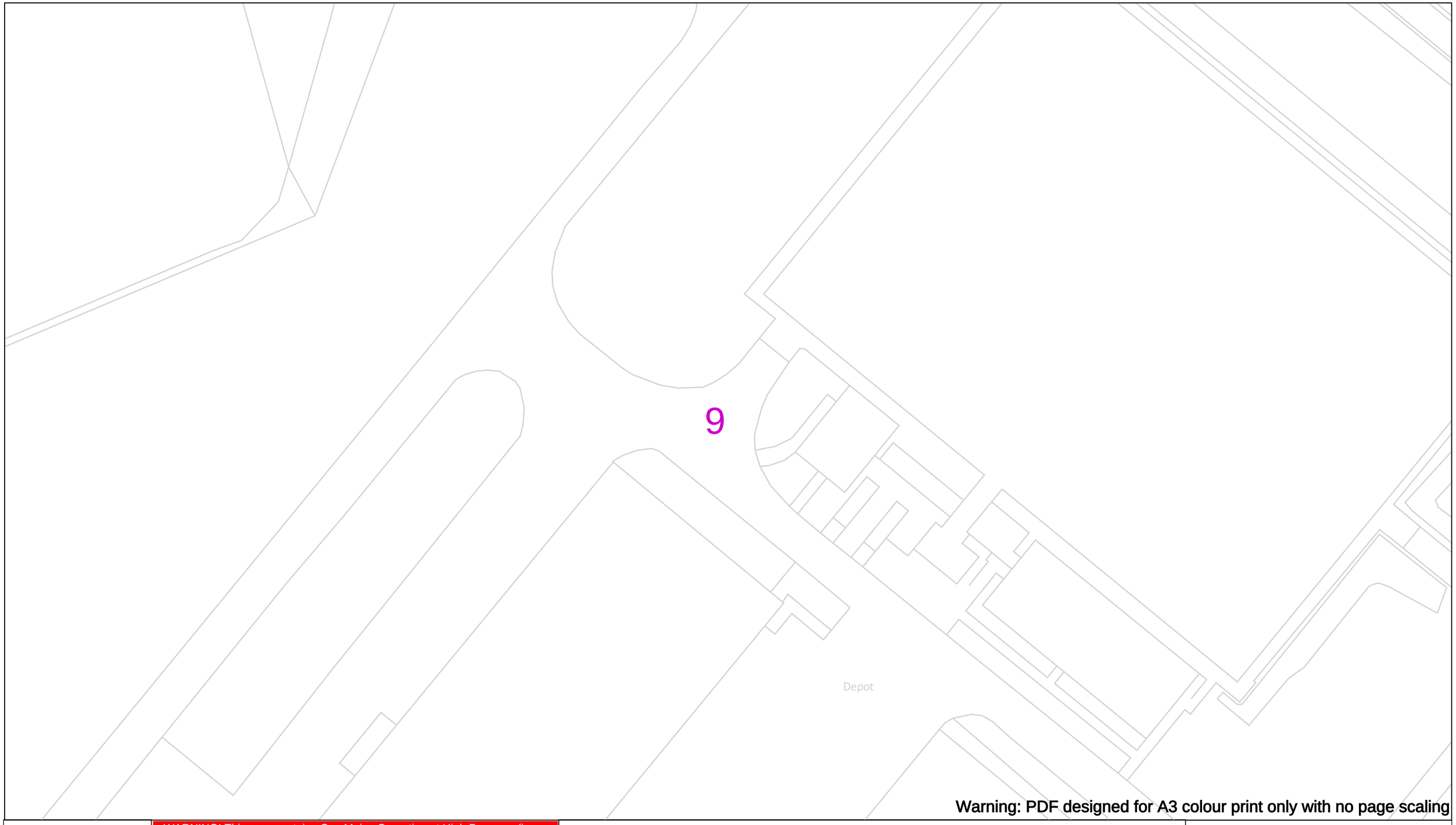
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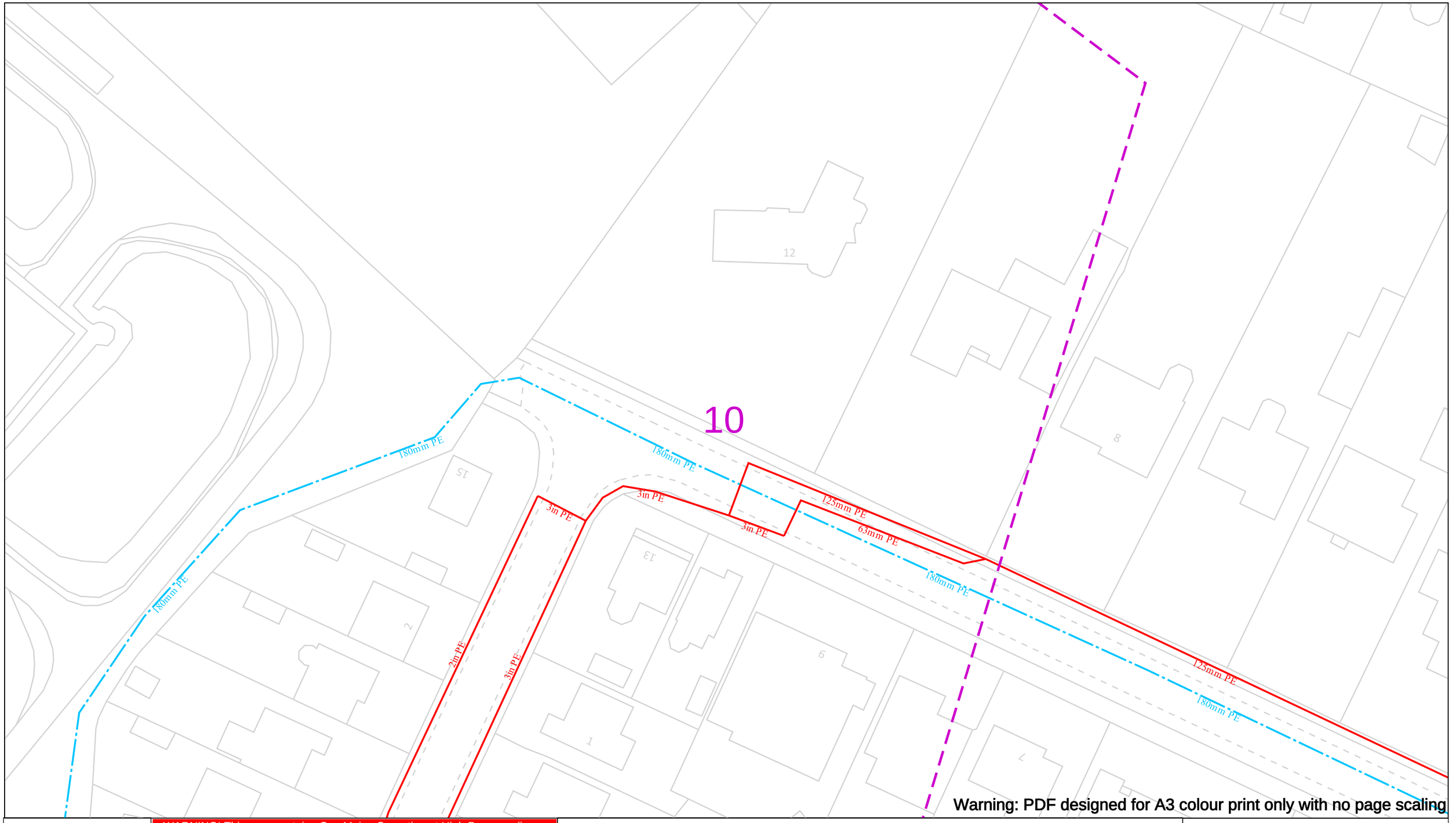
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Valve
Depth of cover
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Diameter Change
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Dig Sites

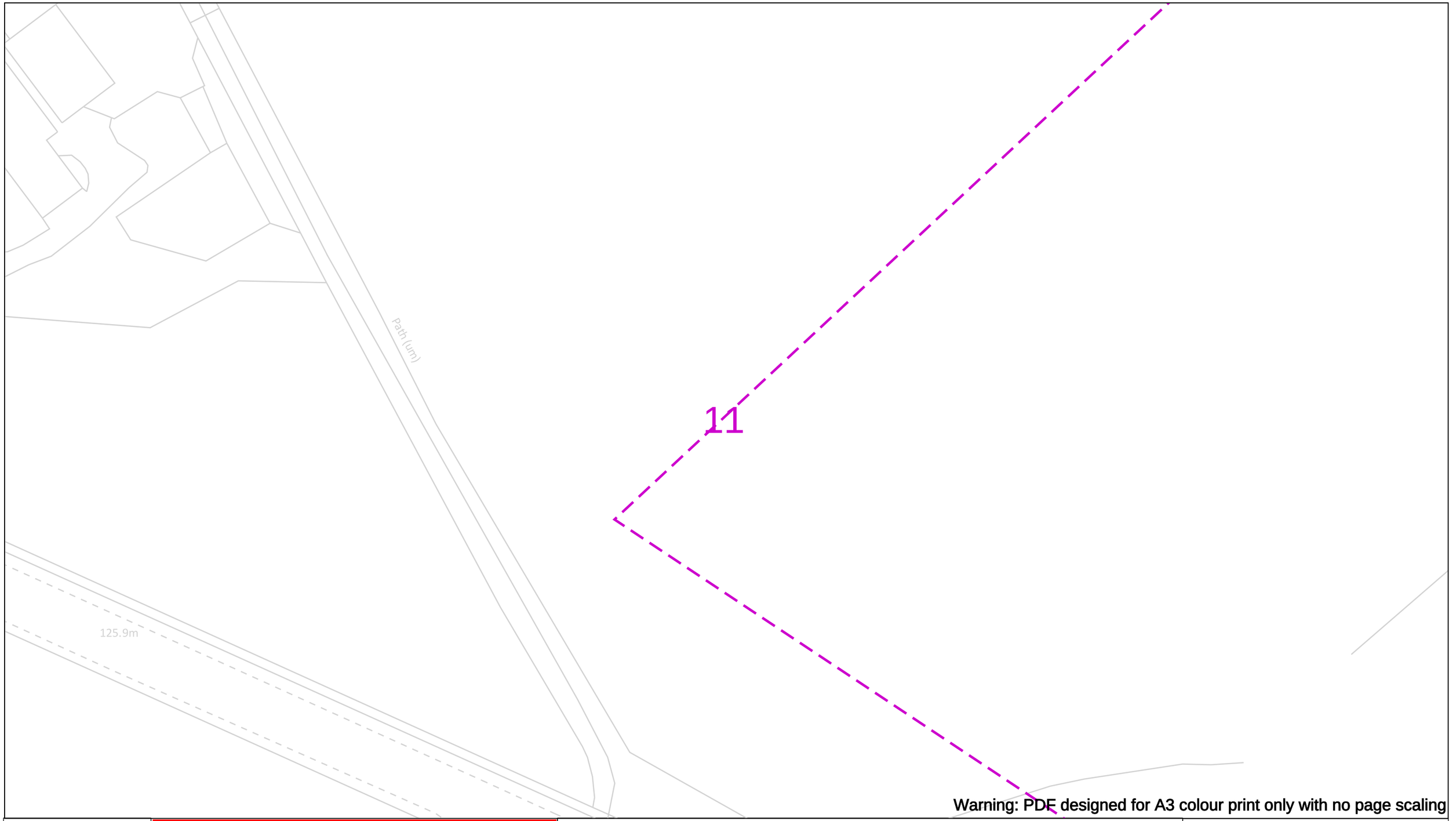
Area:

Line:

- LP Mains
- MP Mains
- IP Mains
- LHP Mains
- Valve
- Depth of cover
- Syphon
- Diameter Change
- Material Change
- Out of Standard Service

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Date Requested: 10/08/2021
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Site Location: 385534 409103
Requested by:
Miss Monique Elsom
Your Scheme/Reference: 322834

Scale: 1:500 (When plotted at A3)

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50m

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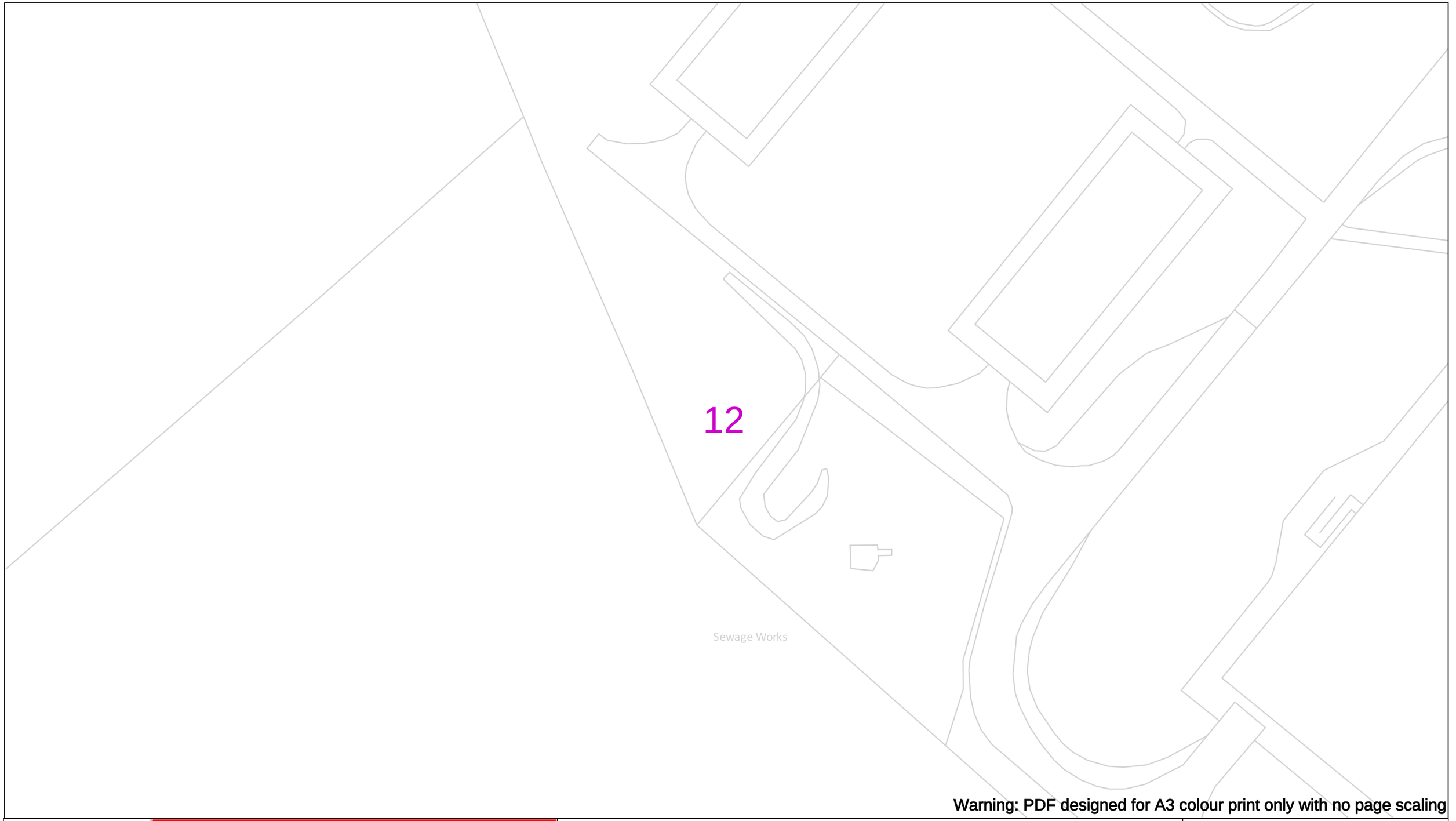
Area:

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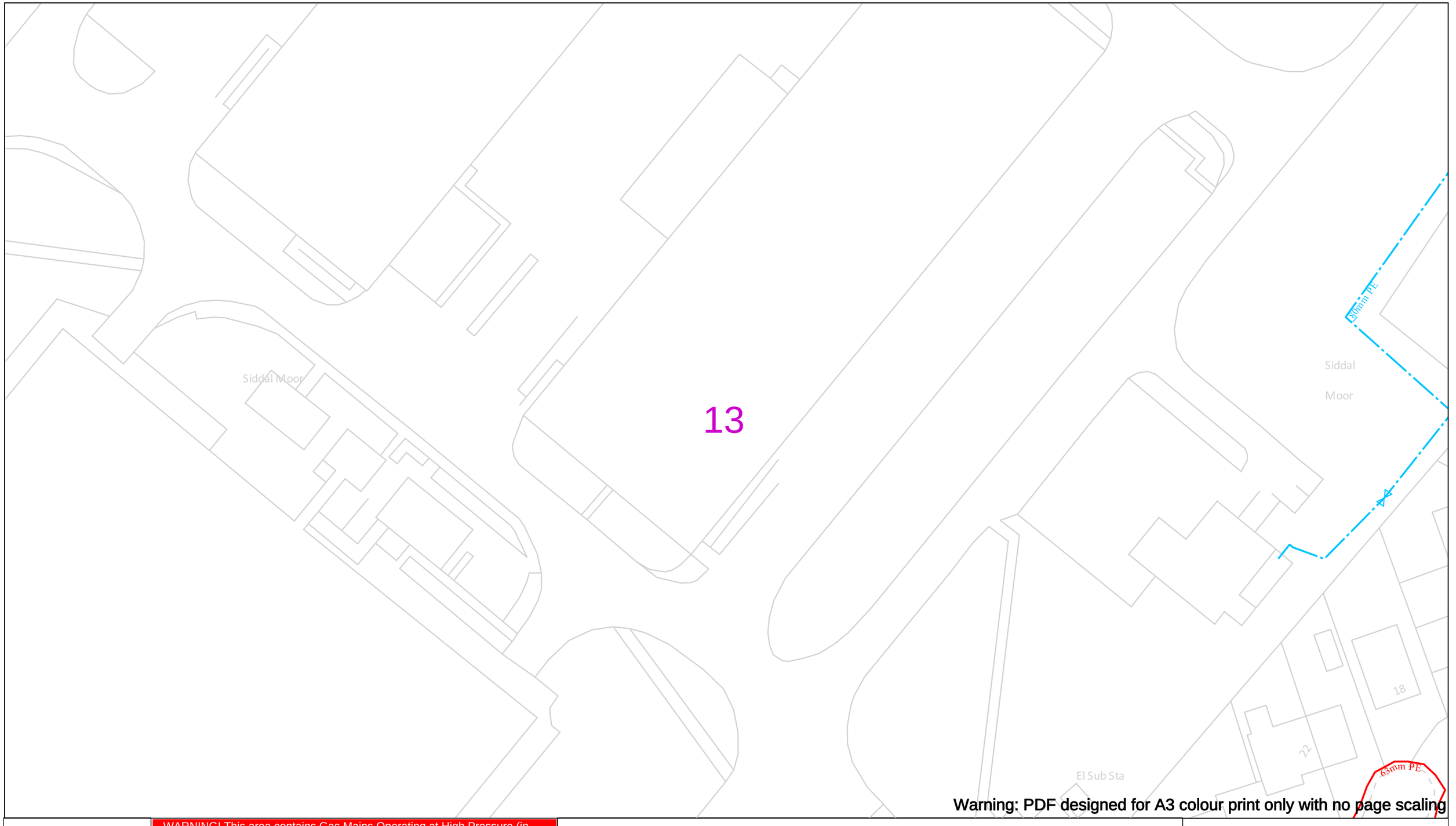
LP Mains
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IP Mains
LHP Mains

Valve
Depth of cover
Syphon

Diameter Change
Material Change
Out of Standard Service

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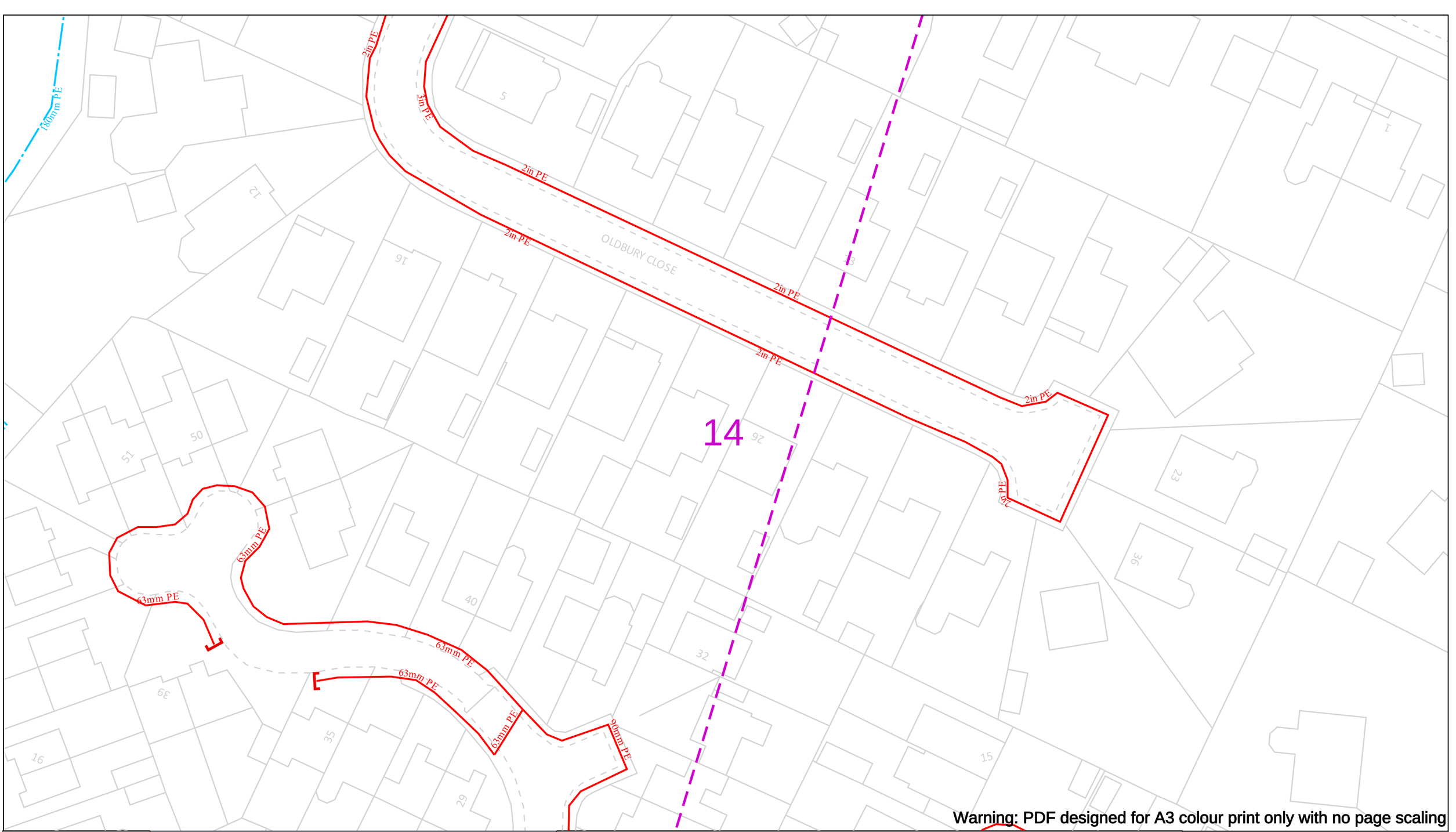
Dig Sites

Area: Line:

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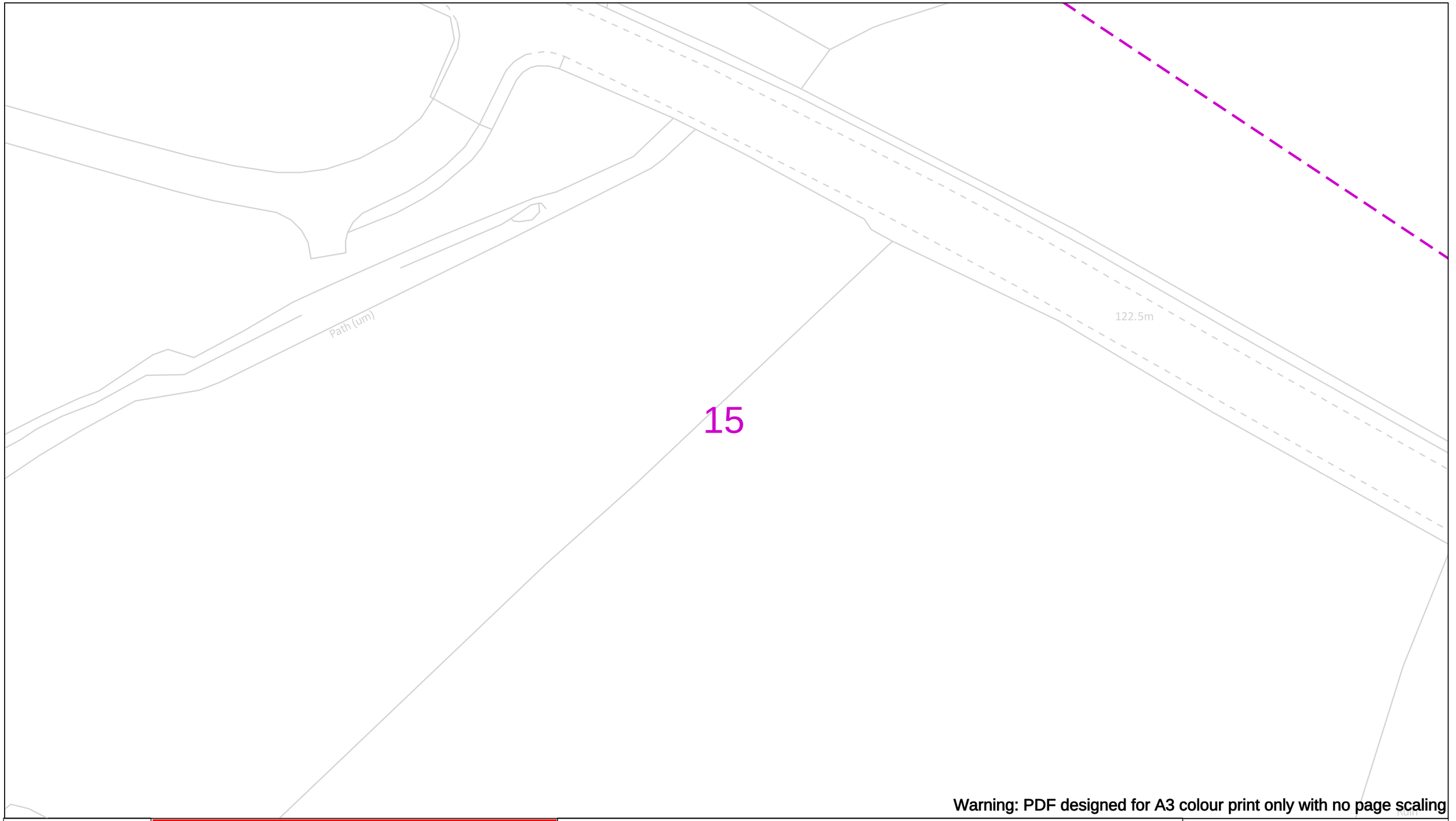
Area:

Line:

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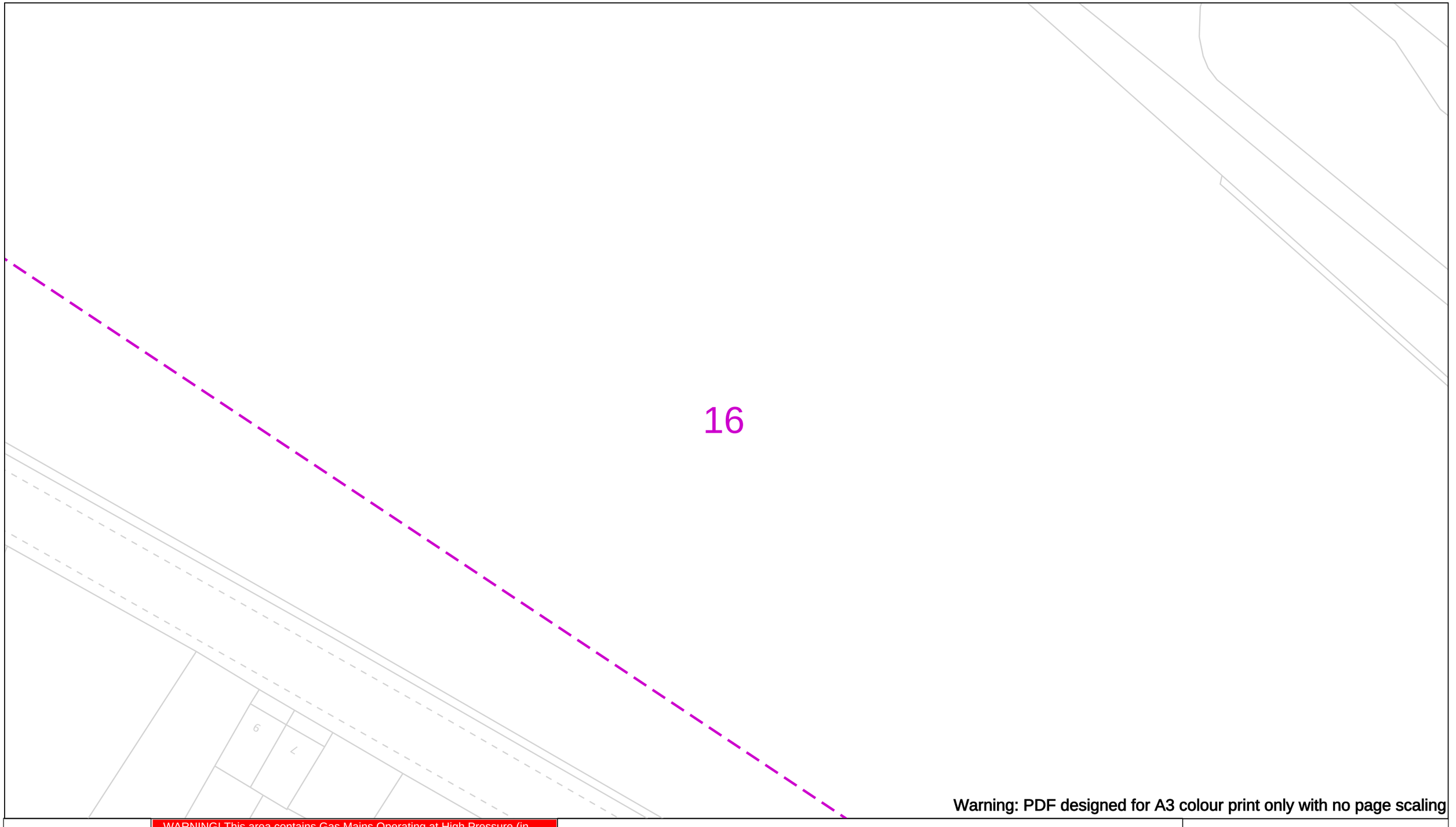
LP Mains
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LHP Mains

Valve
Depth of cover
Syphon

Diameter Change
Material Change
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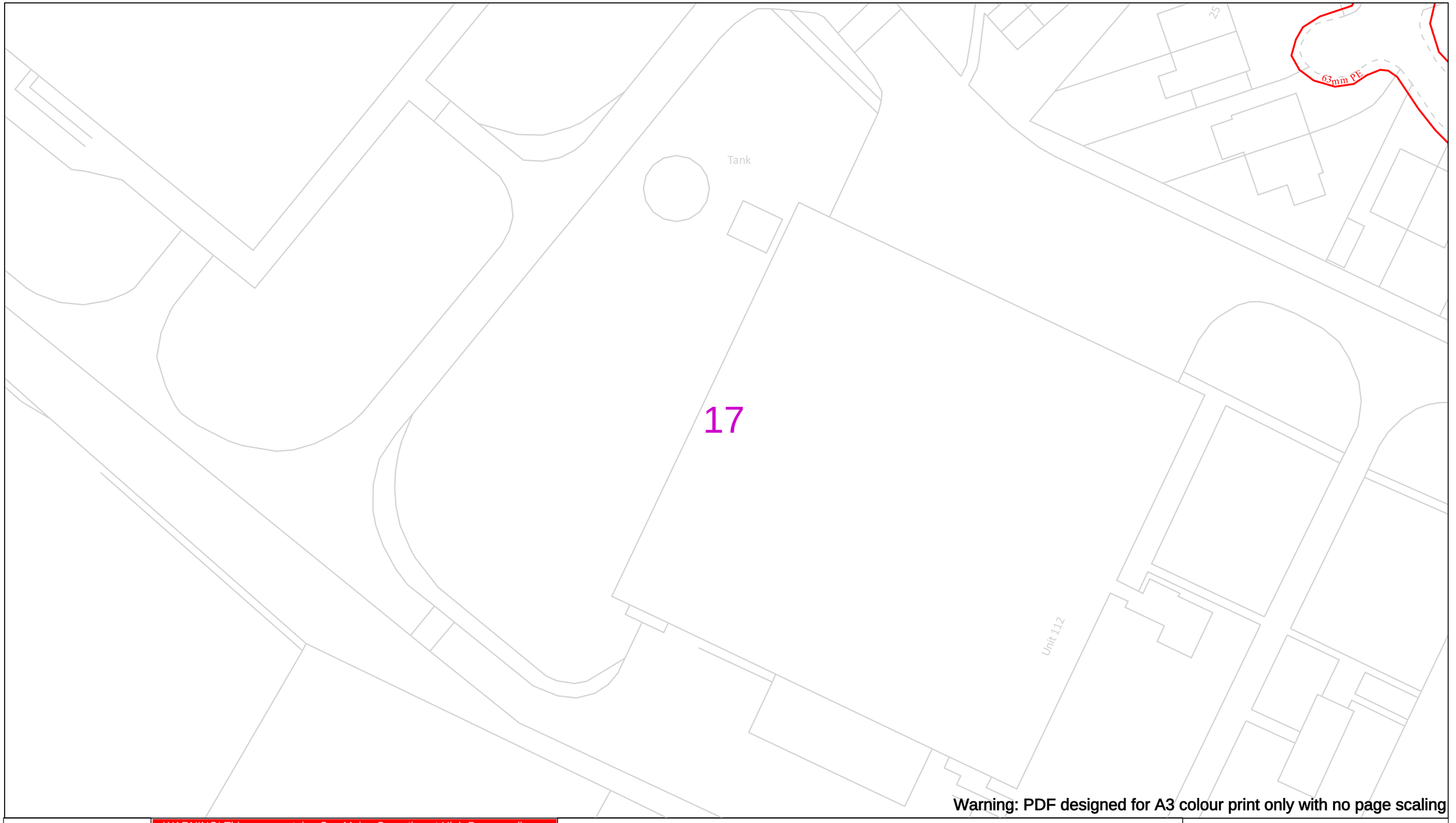
Area:

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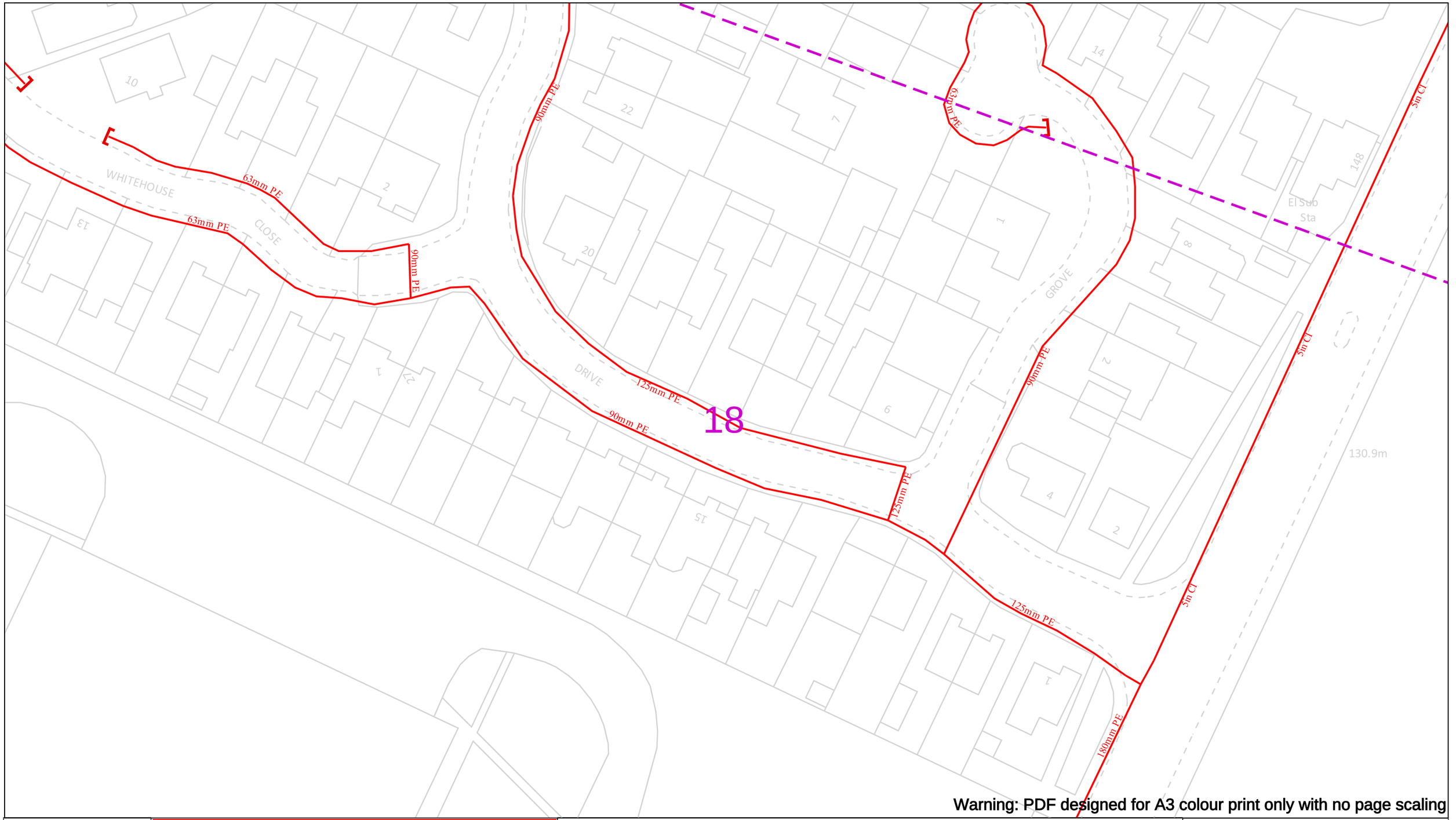
LP Mains
MP Mains
IP Mains
LHP Mains

Valve
Depth of cover
Syphon

Diameter Change
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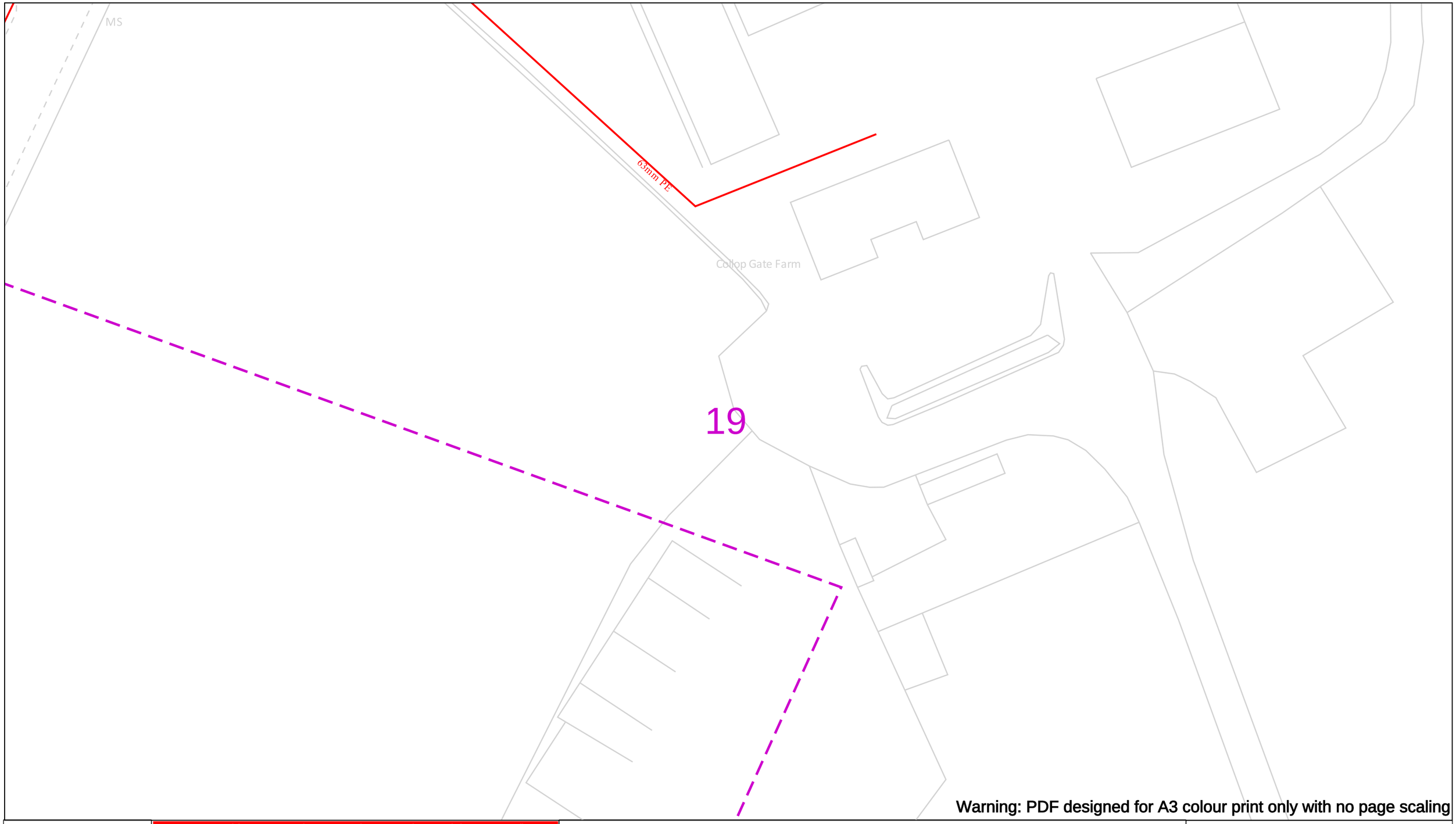
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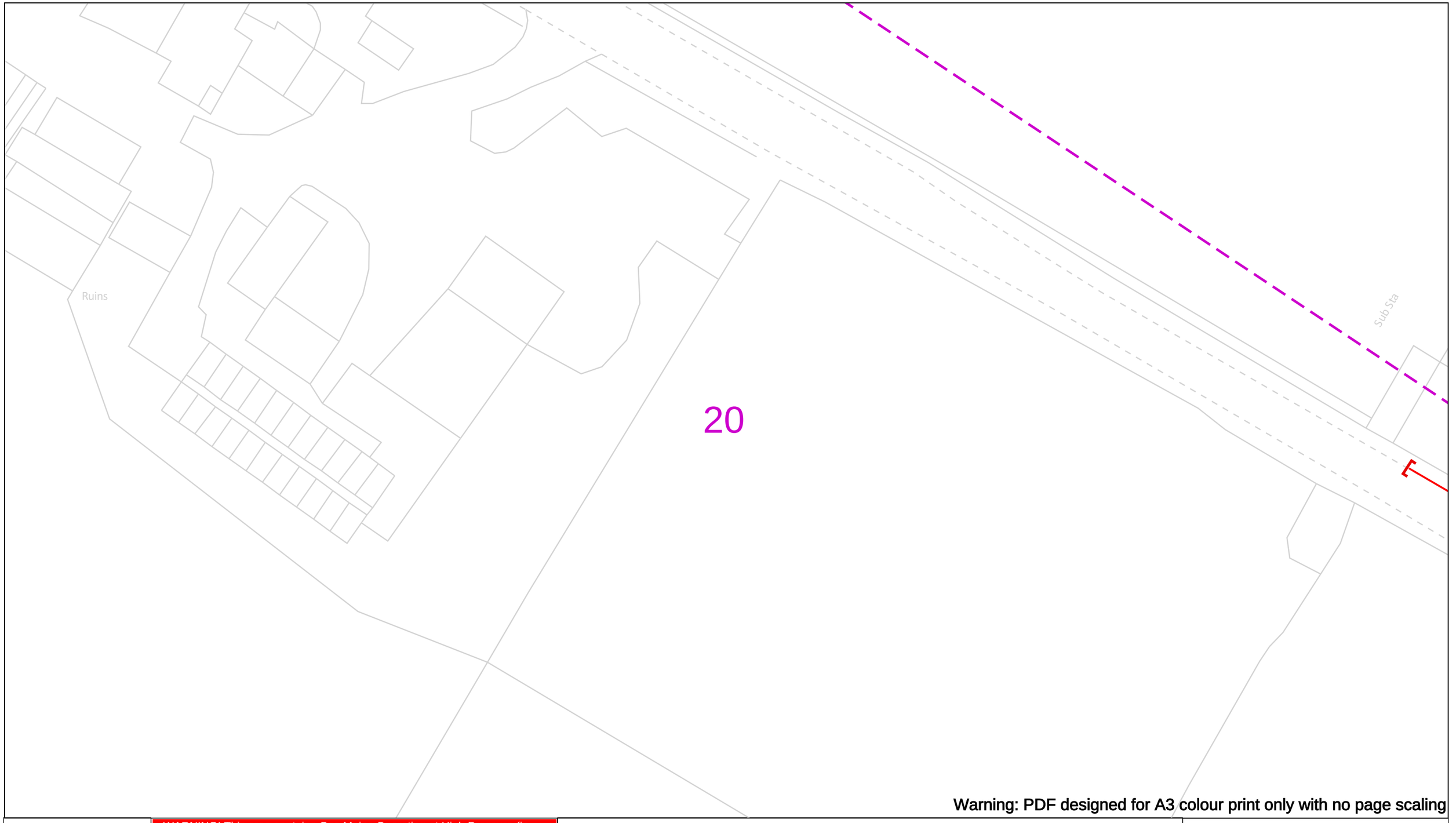
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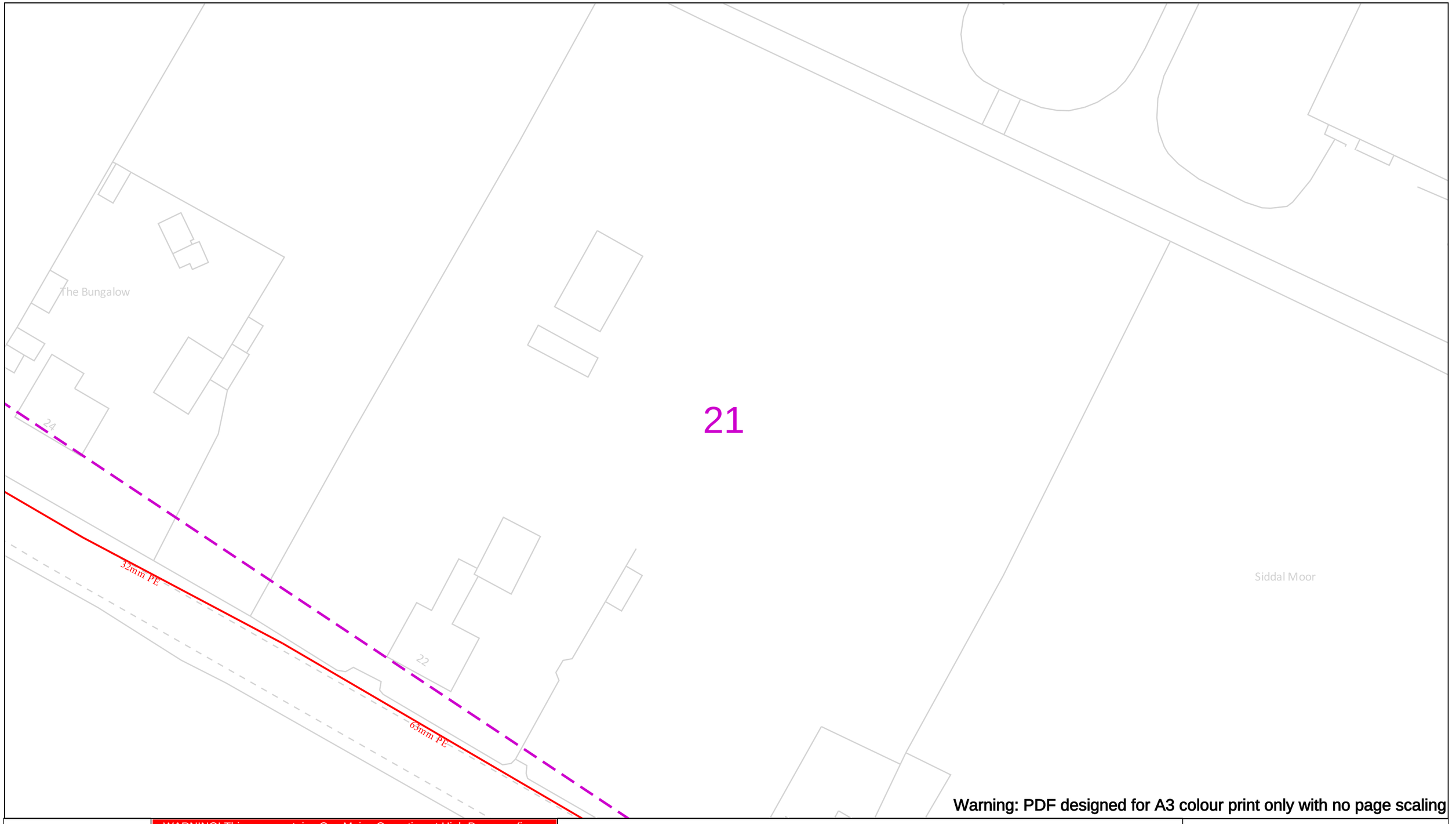
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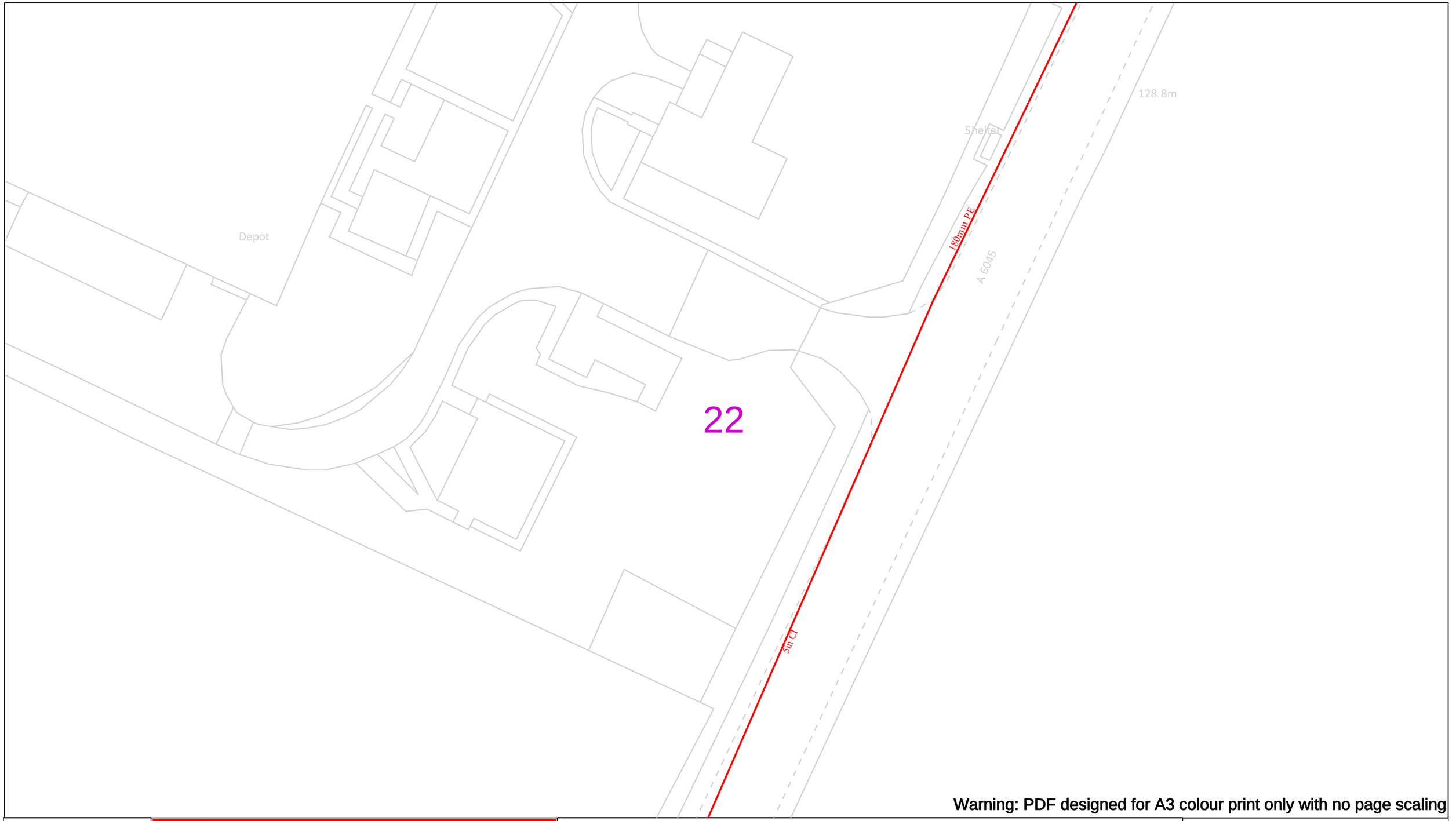
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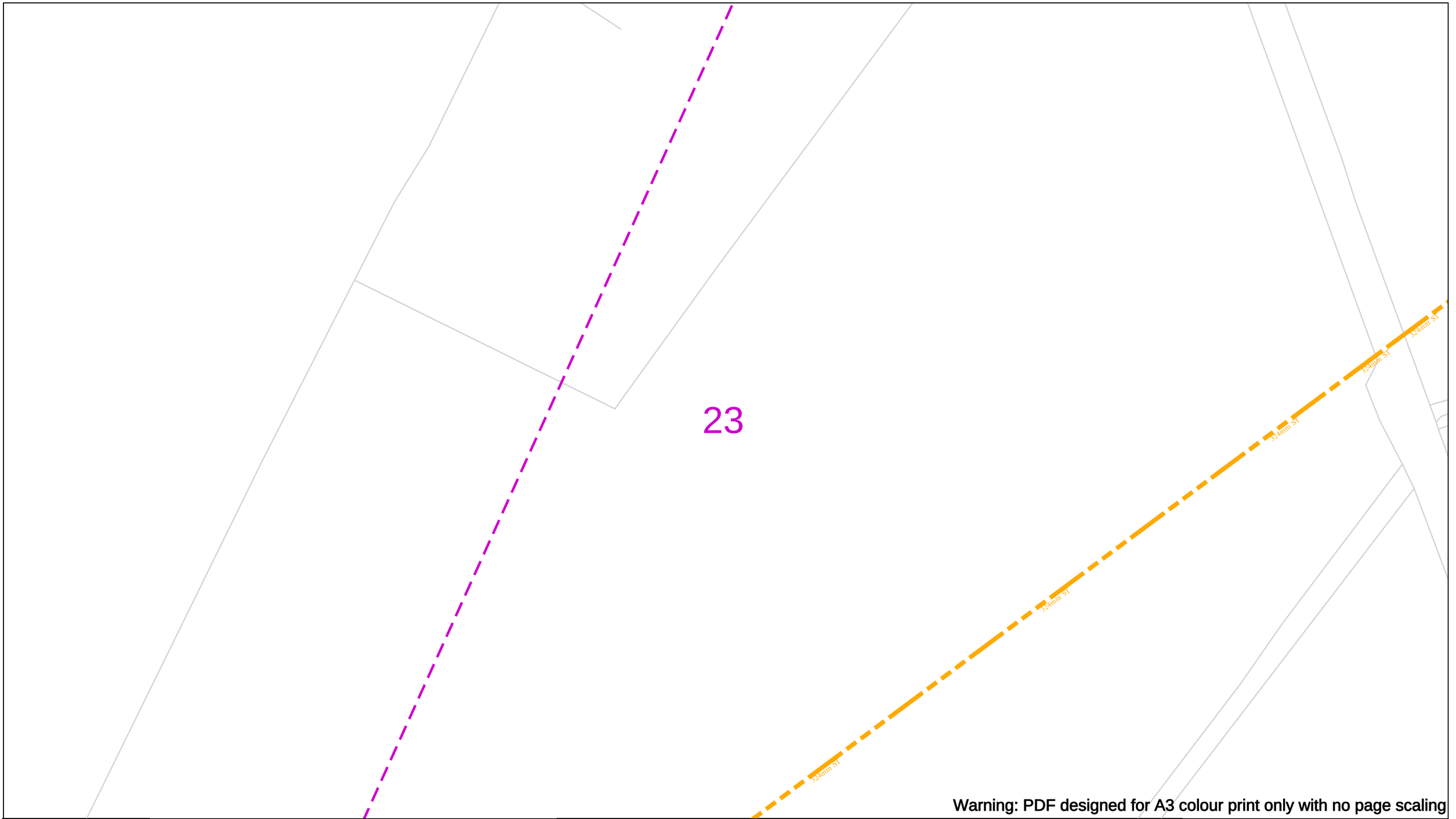
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Valve
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In case of an emergency call 0800 111 999

50m

Dig Sites

Area:

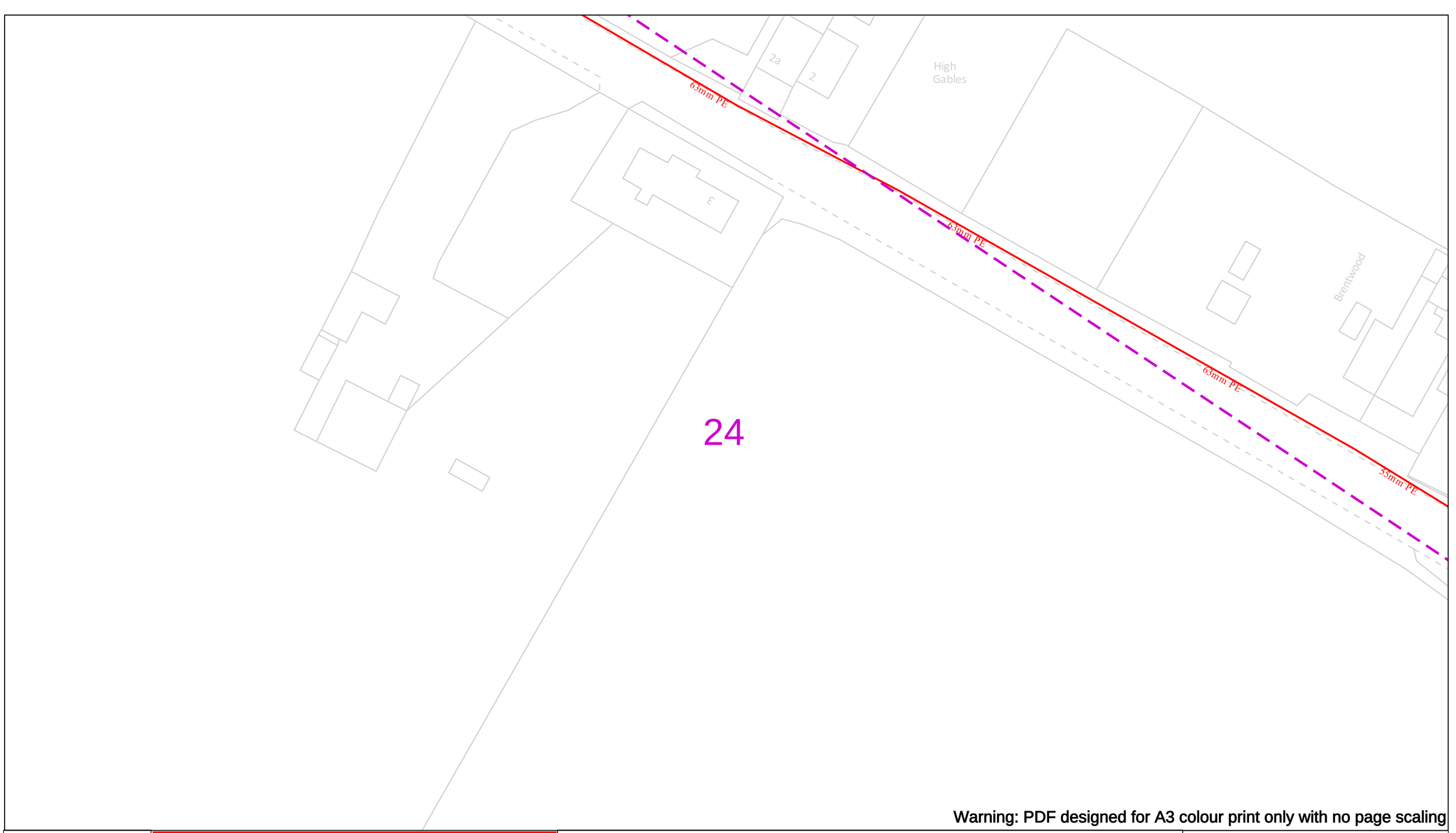
Line:

LP Mains
MP Mains
IP Mains
LHP Mains

Valve
Depth of cover
Syphon
Diameter Change
Material Change
Out of Standard Service

Cadent
Your Gas Network

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Date Requested: 10/08/2021
Job Reference: 22938031
Site Location: 385534 409103
Requested by:
Miss Monique Elsom
Your Scheme/Reference: 322834

Scale: 1:500 (When plotted at A3)

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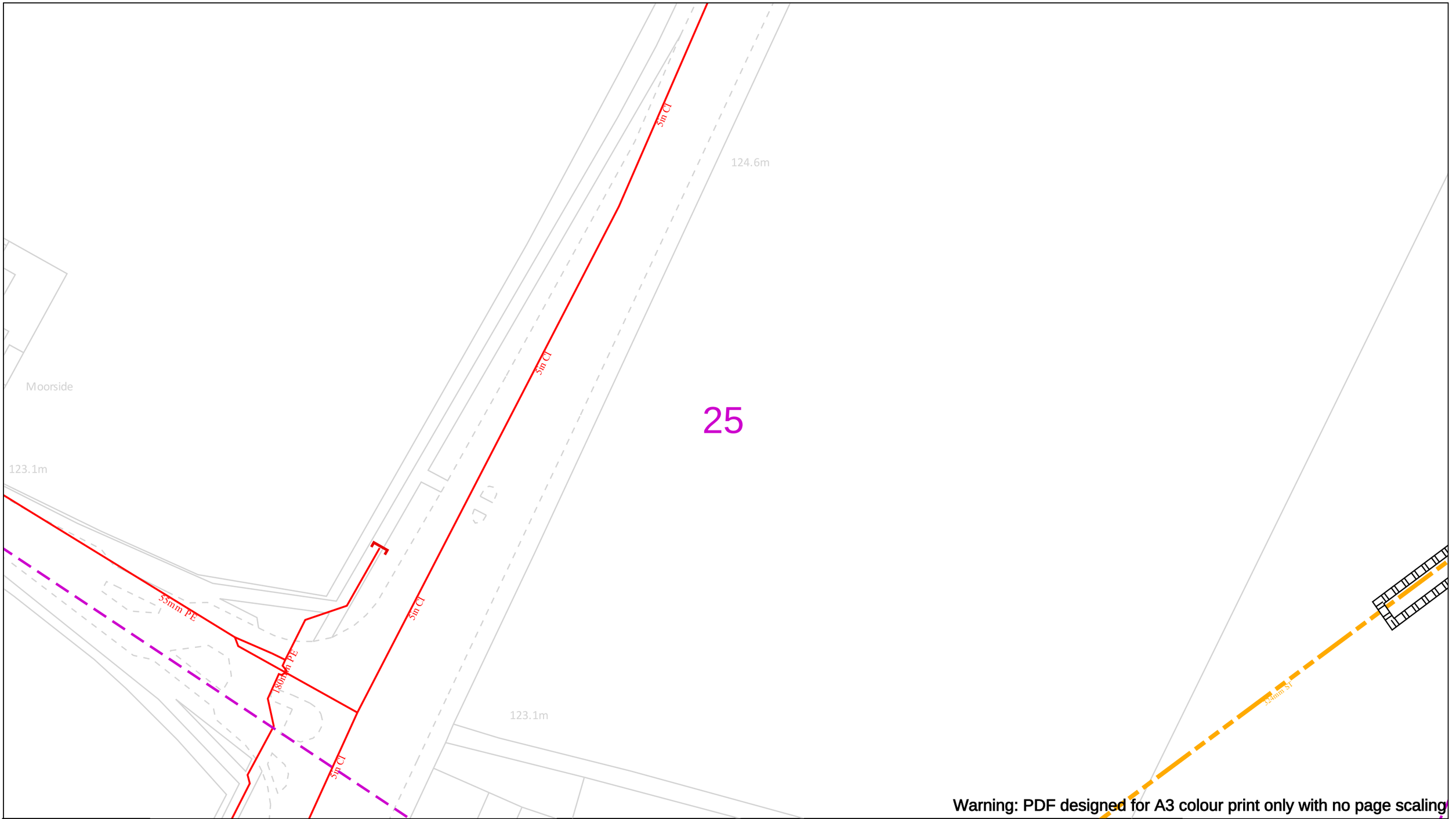
Area: Line:

LP Mains
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IP Mains
LHP Mains

Valve
Depth of cover
Syphon
Diameter Change
Material Change
Out of Standard Service

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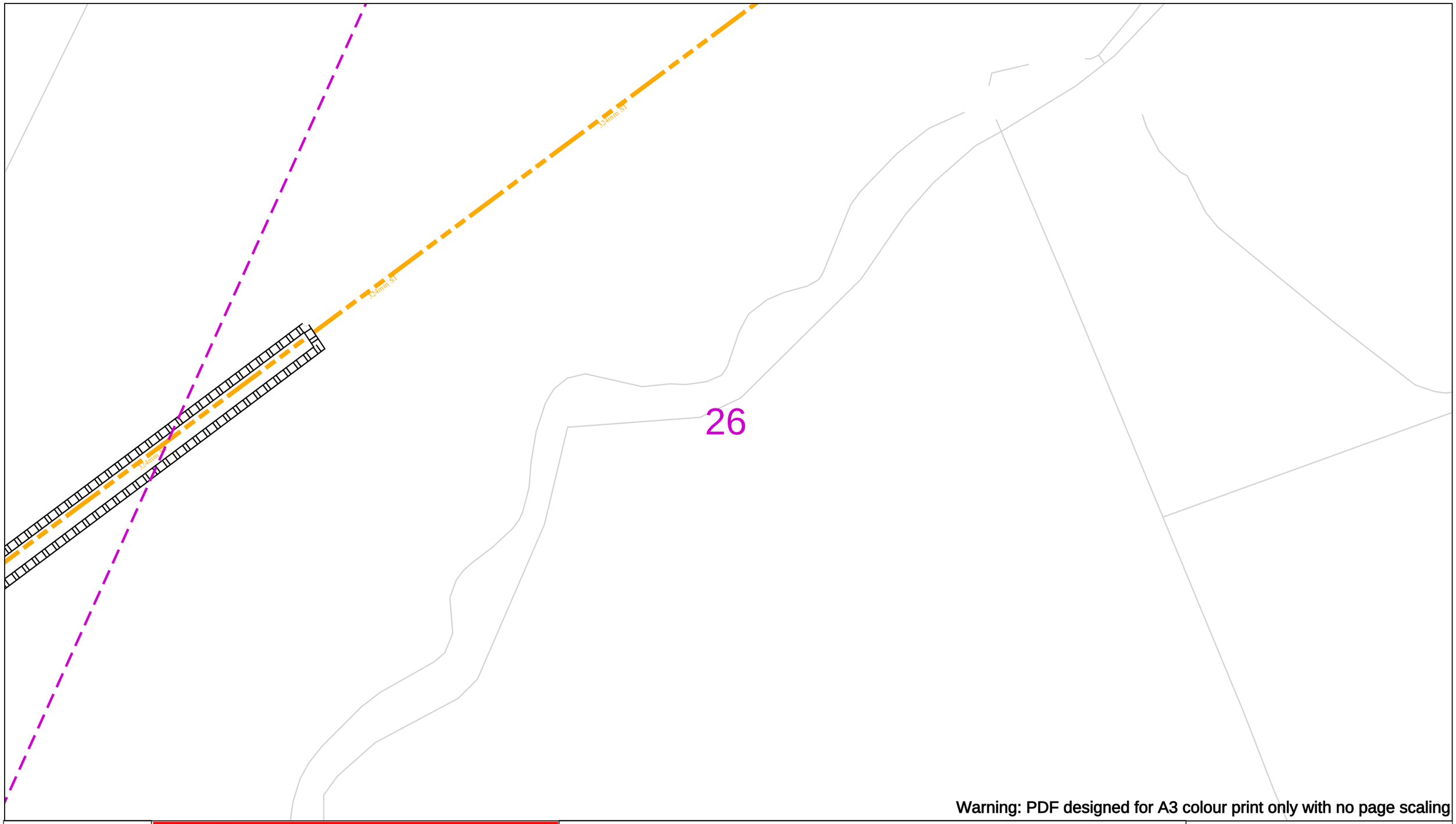
Area:

Line:

- LP Mains
- MP Mains
- IP Mains
- LHP Mains
- Valve
- Depth of cover
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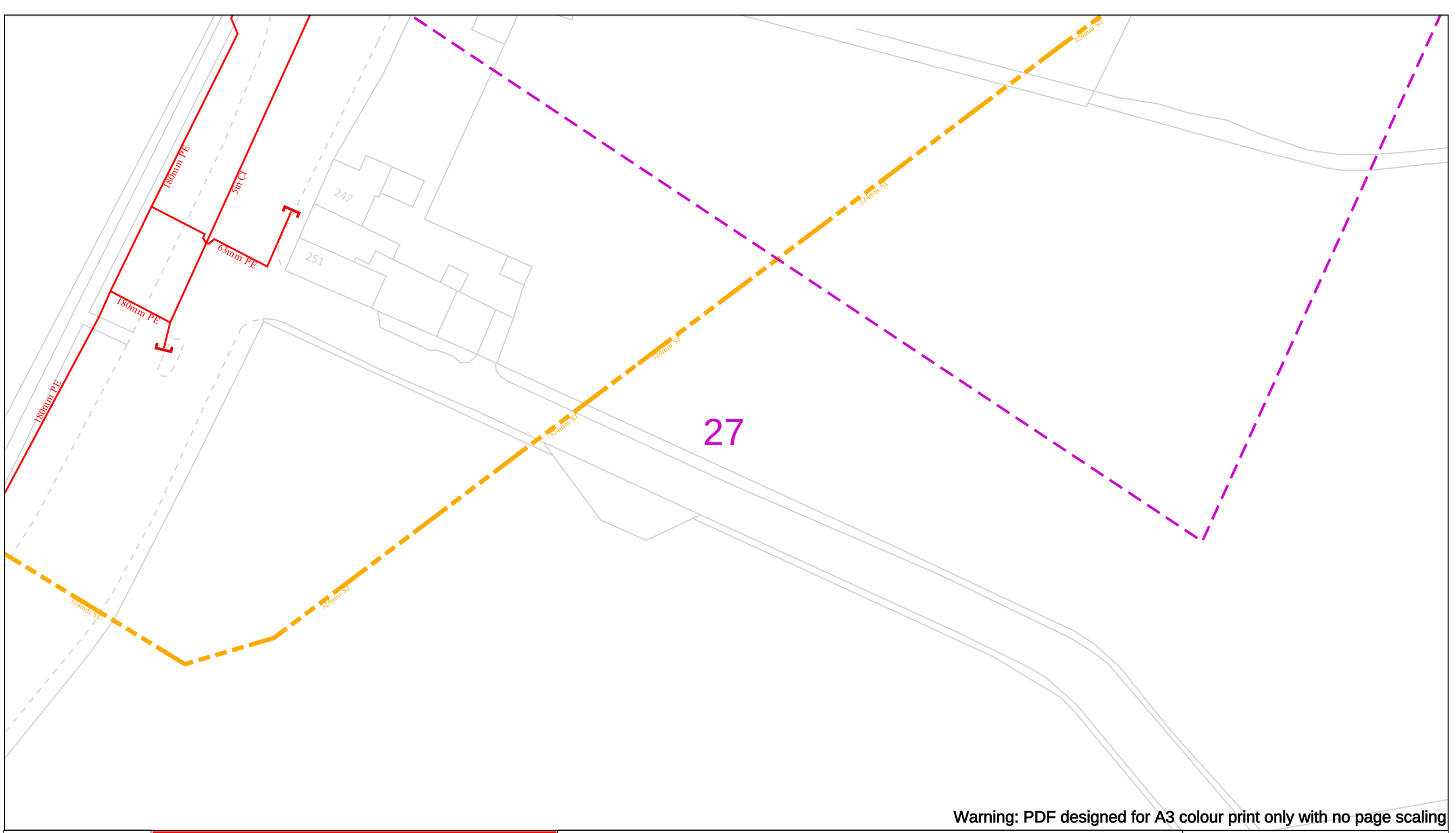
Line:

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MP Mains
IP Mains
LHP Mains

Valve
Depth of cover
Syphon
Diameter Change
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Out of Standard Service

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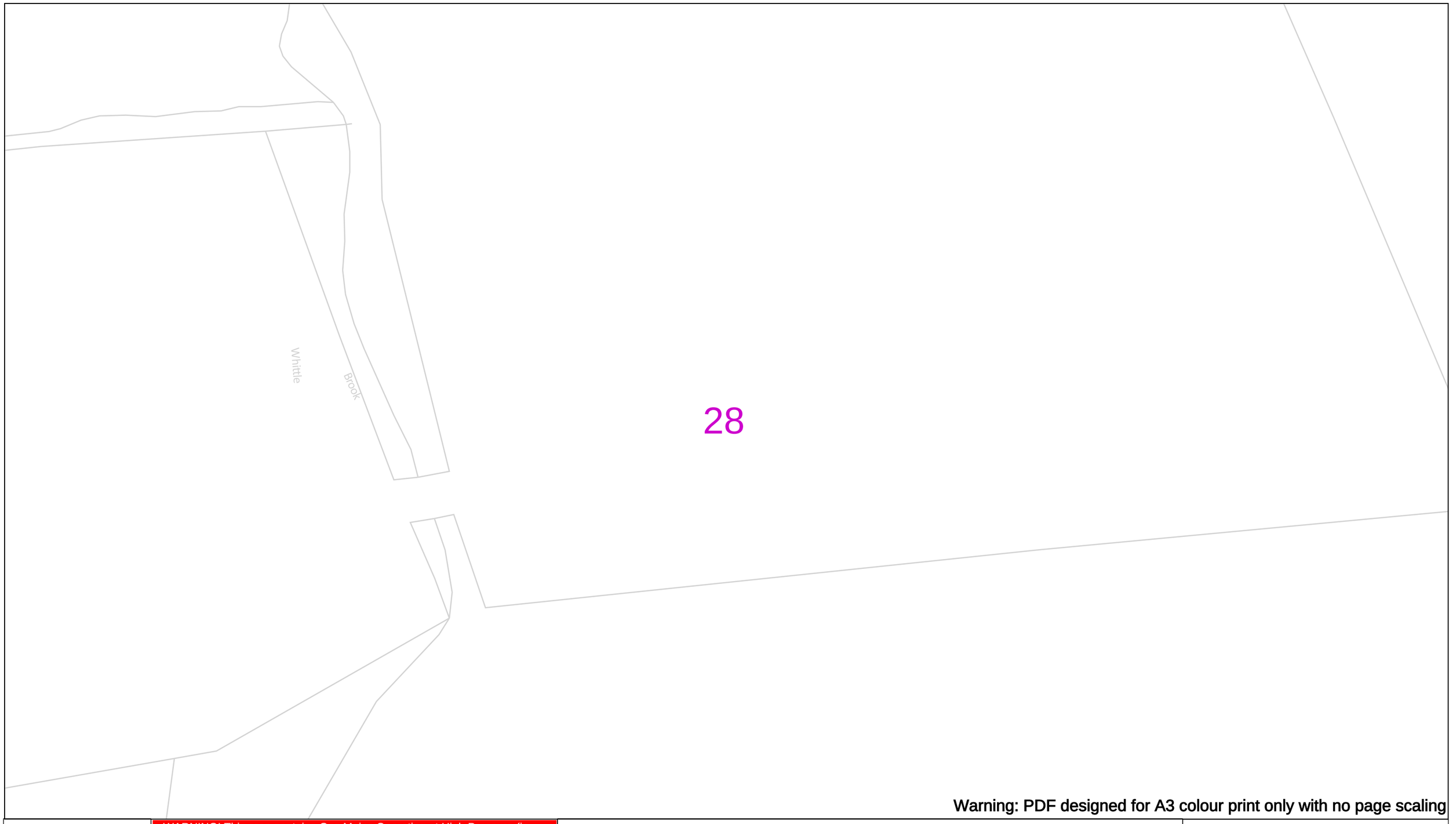
50m

Dig Sites Area: Line:

- LP Mains
- MP Mains
- IP Mains
- LHP Mains
- Valve
- Depth of cover
- Syphon
- Diameter Change
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Dig Sites

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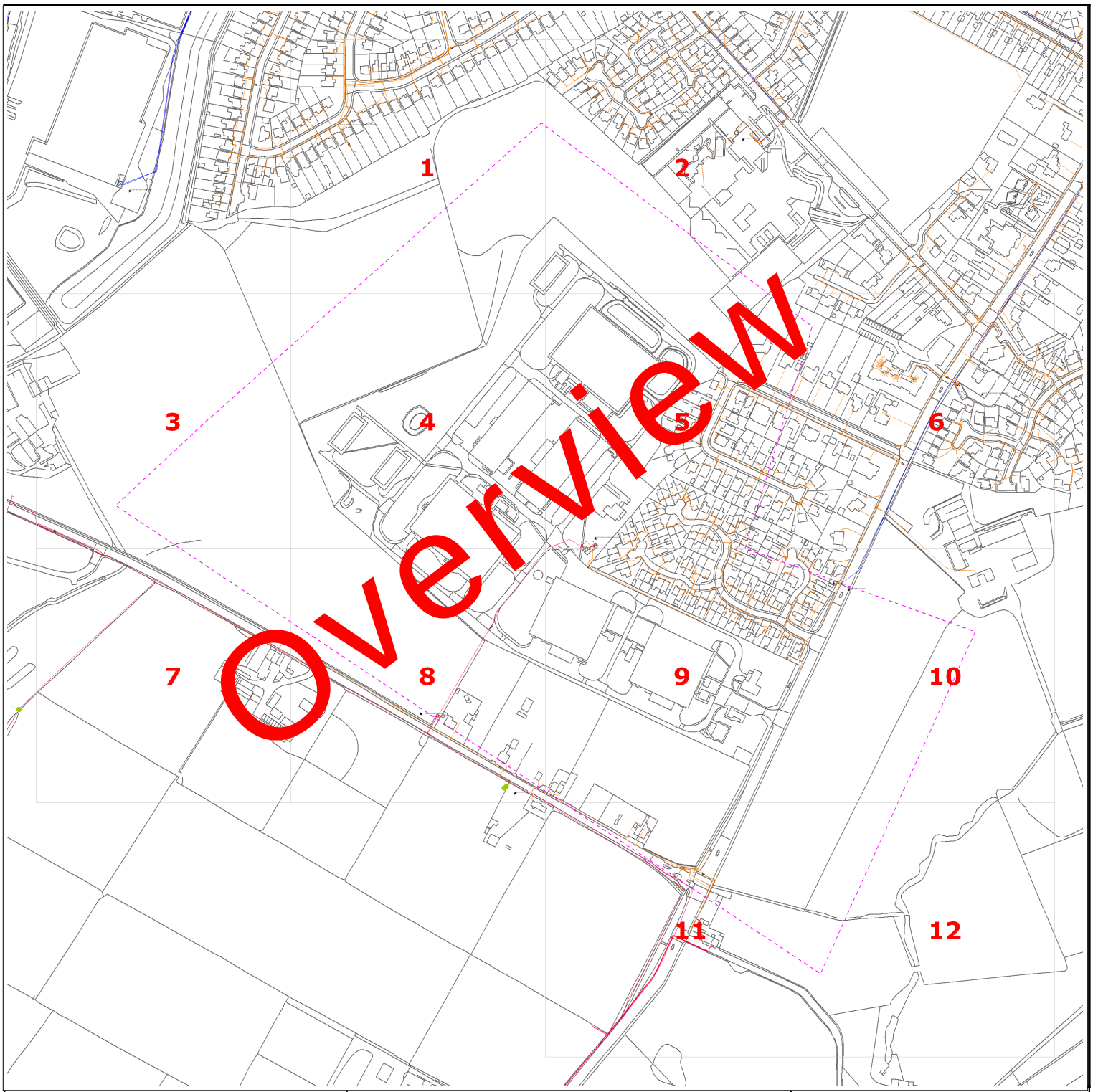
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Valve
Depth of cover
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Diameter Change
Material Change
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Requested by: Monique Elsom
Company: RSK
Date Requested: 10/08/2021
Job Reference: 22938031
Your Scheme/Reference: 322834

Dig Sites:

Area Line

Operating Voltage	Colour Code	Line Colour
132kV	Black	
33kV	Green	
22kV-25kV	Yellow	
11kV	Red	
6kV-6.6kV	Blue	
1kV-6kV	Violet	
LV	Orange	
Unknown Voltage	Brown	

electricity north west

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Manchester, M1 4LF
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Email: planrequest@enwl.co.uk

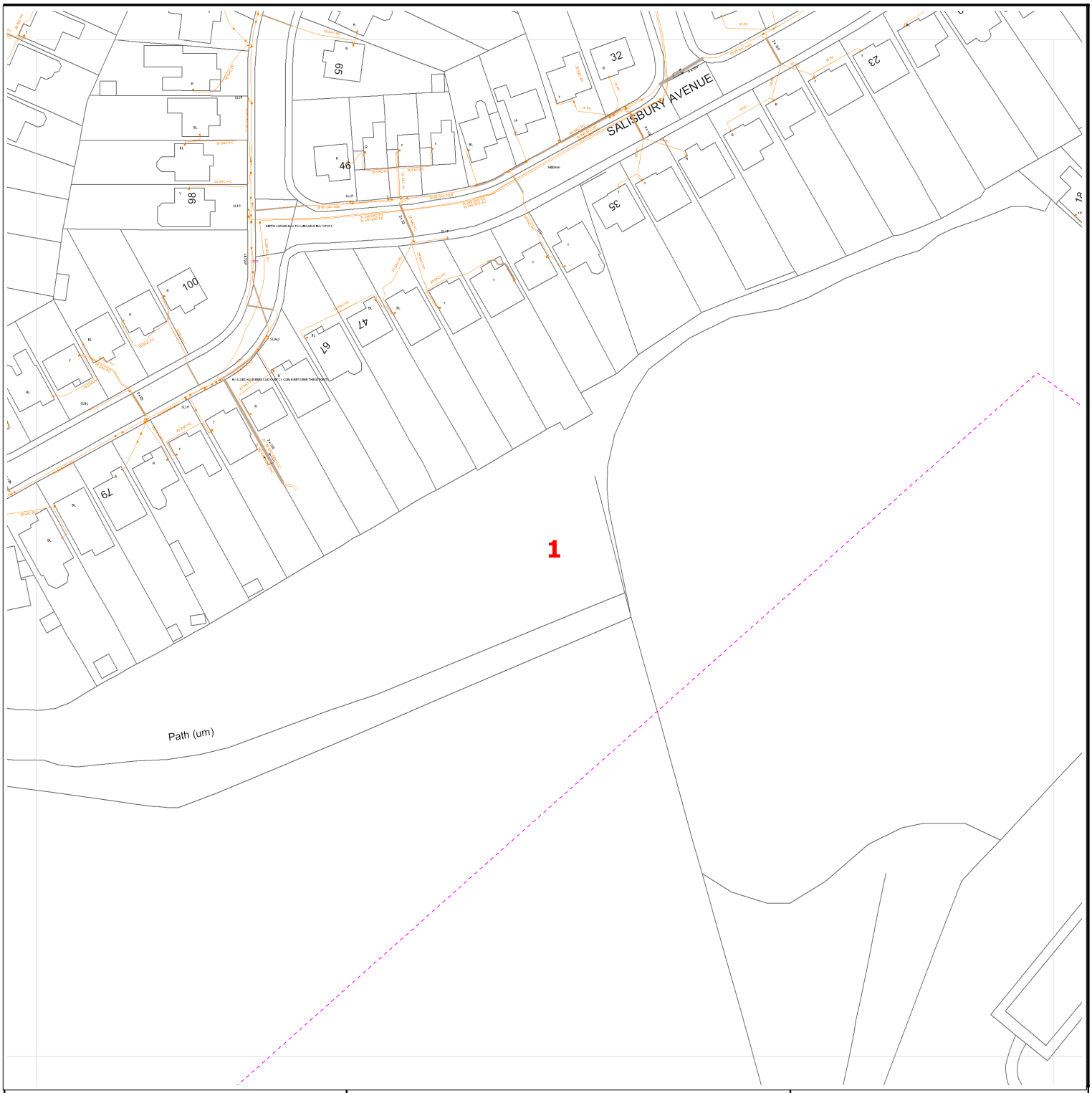
Scales on A4 paper:
1:1250 Area dig site
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Dig Sites:

Area Line

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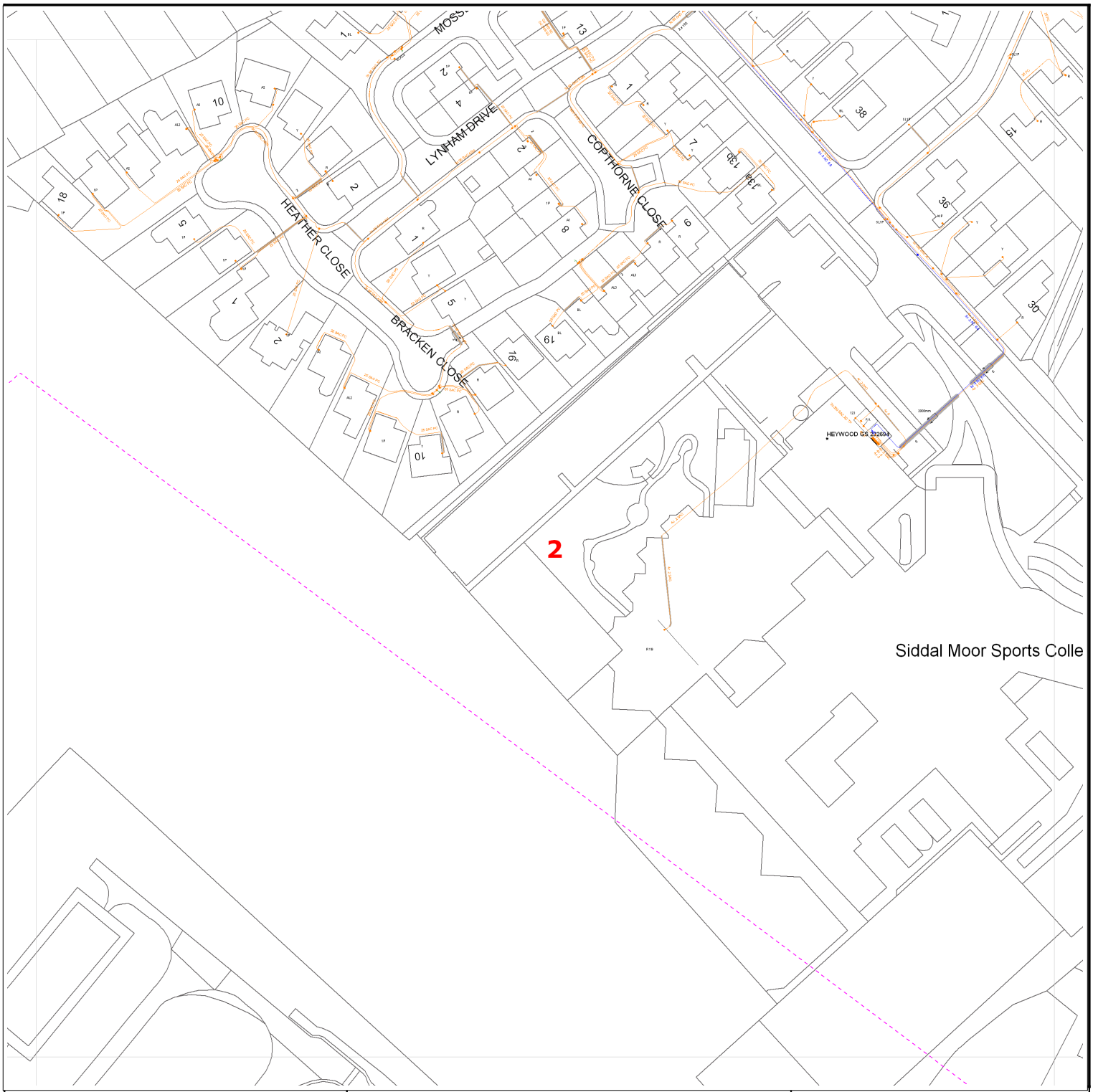
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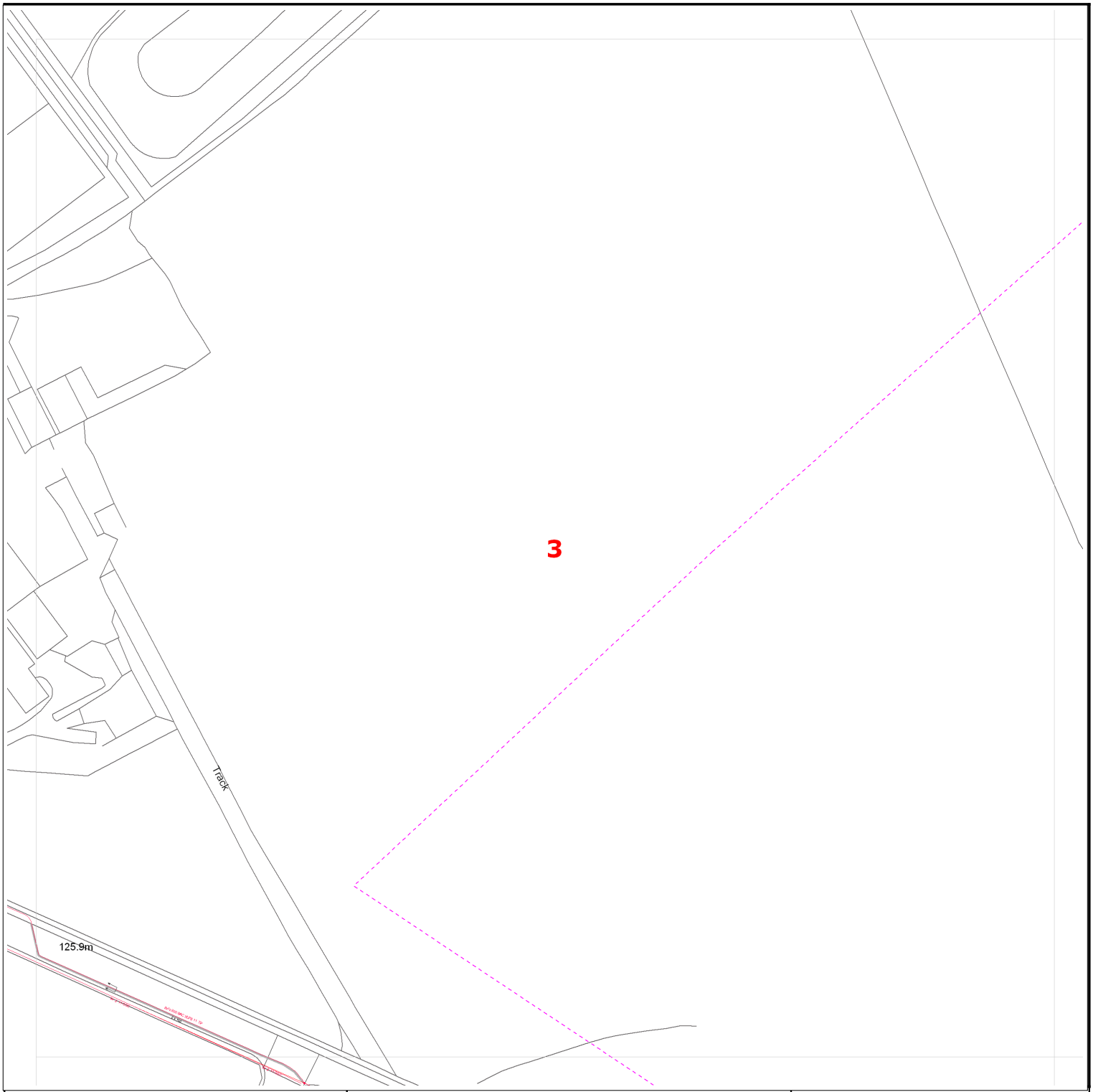
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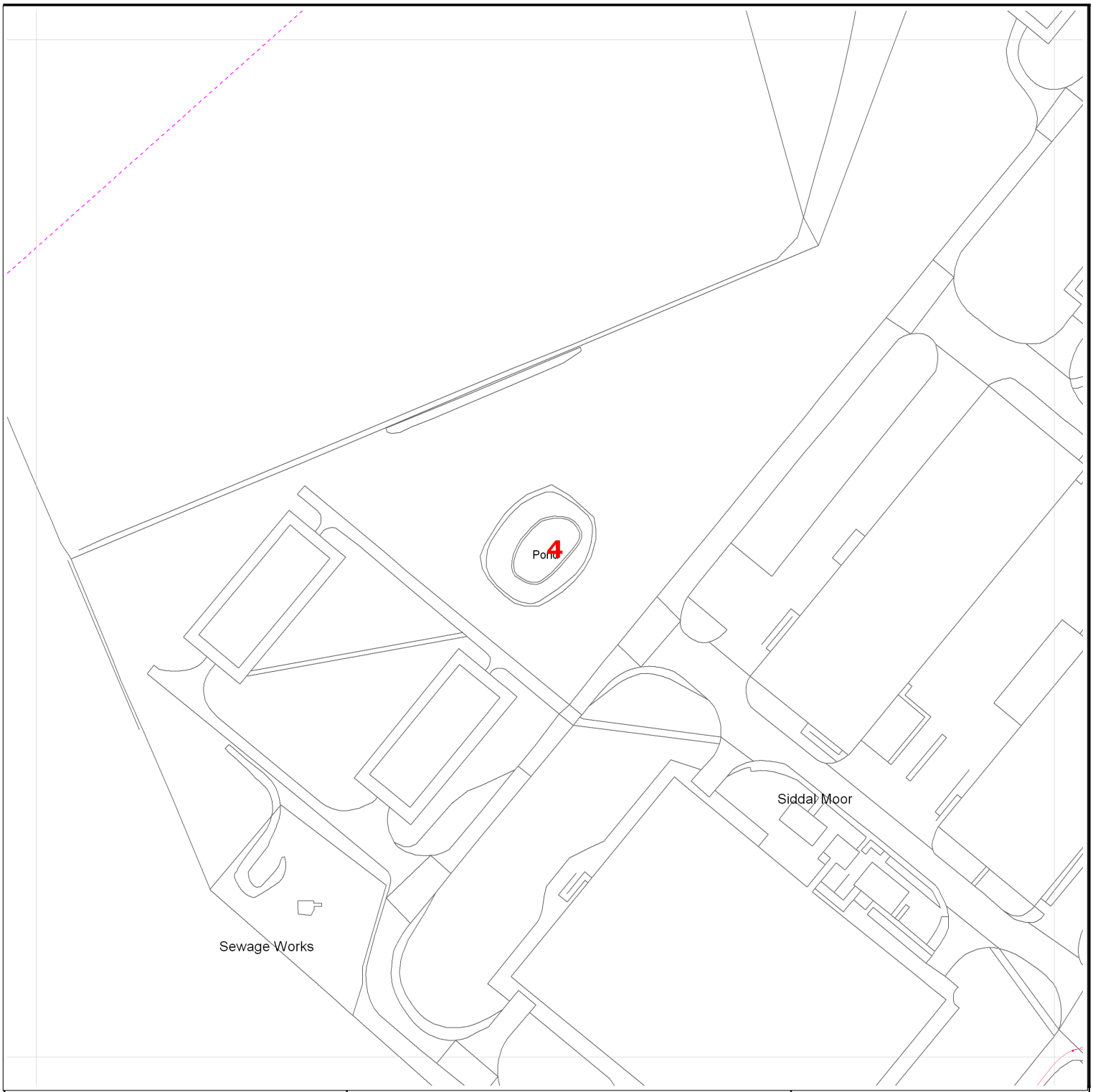
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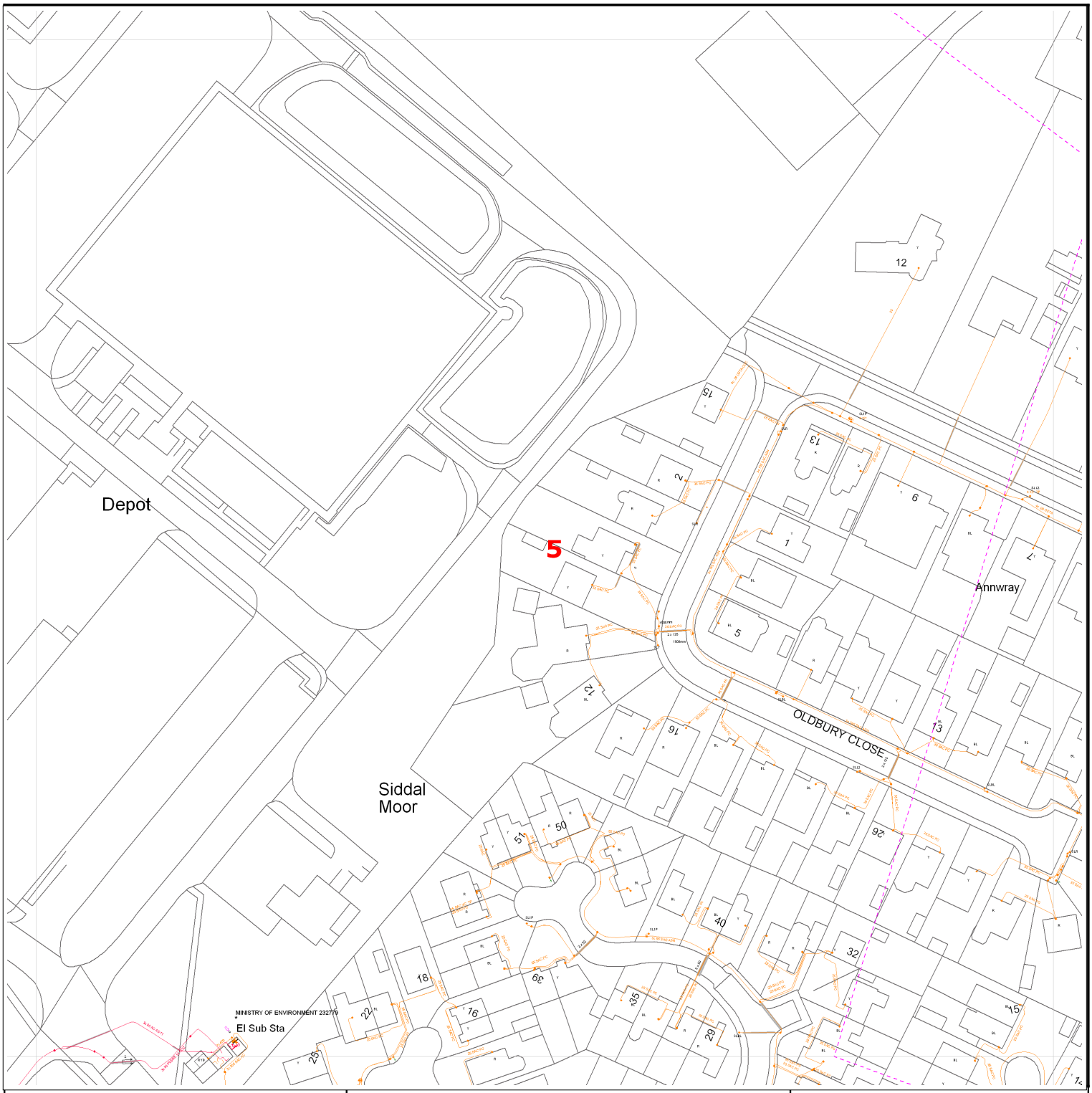
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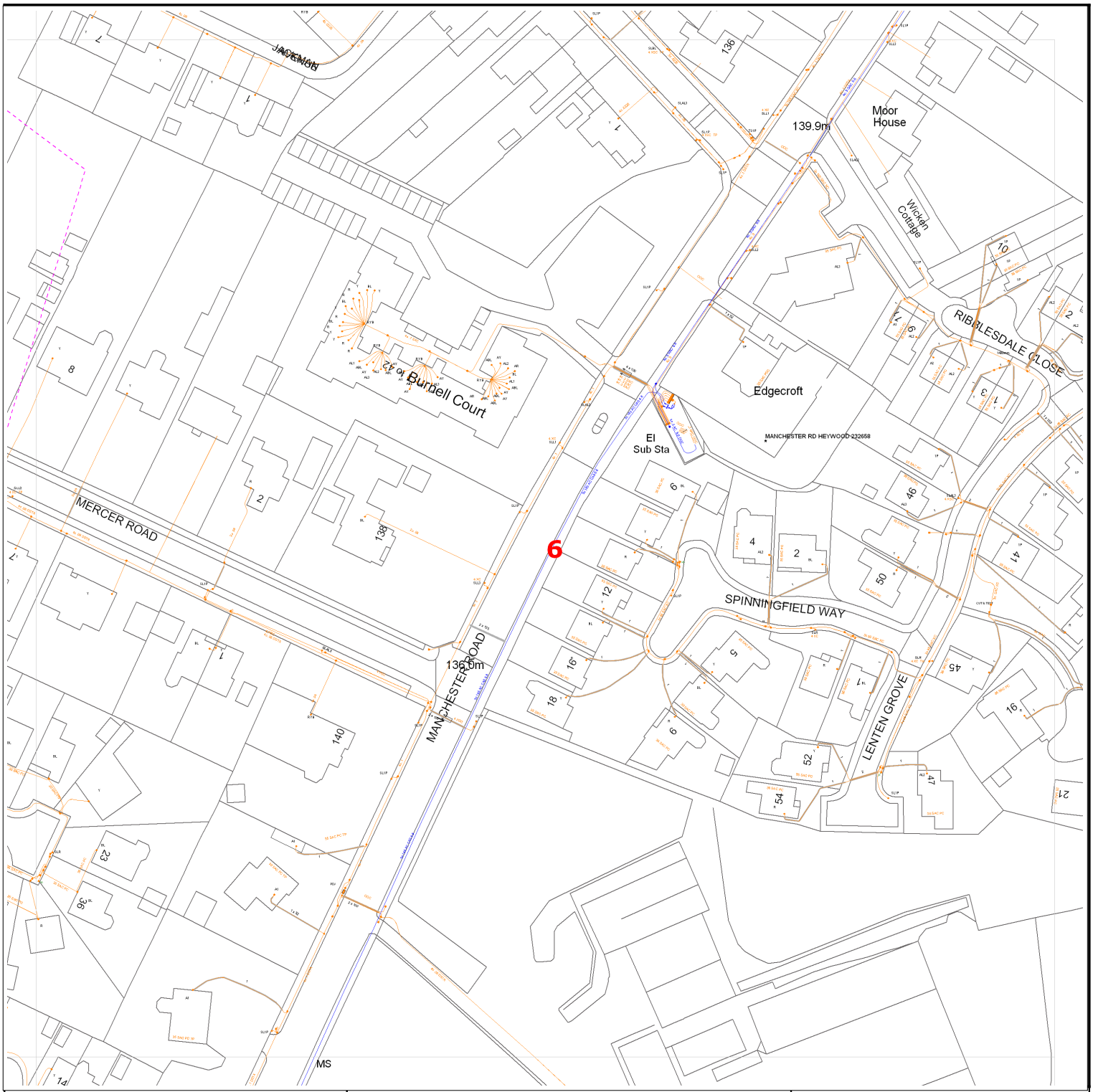
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Requested by: Monique Elsom
Company: RSK
Date Requested: 10/08/2021
Job Reference: 22938031
Your Scheme/Reference: 322834

Dig Sites:

Area Line

Operating Voltage	Colour Code	Line Colour
132kV	Black	
33kV	Green	
22kV-25kV	Yellow	
11kV	Red	
6kV-6.6kV	Blue	
1kV-6kV	Violet	
LV	Orange	
Unknown Voltage	Brown	

Data Management
Electricity North West
Linley House
Dickinson Street
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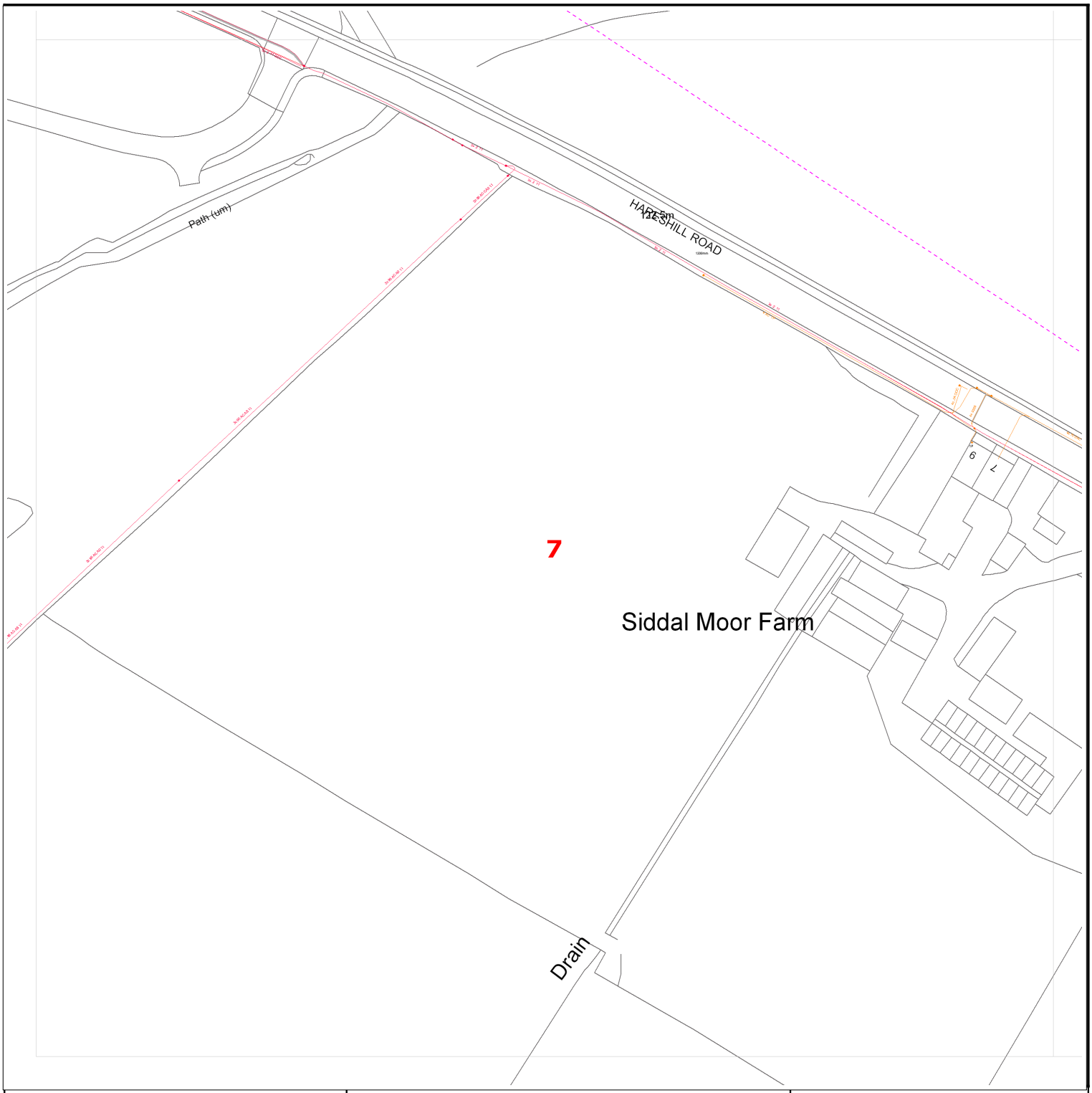
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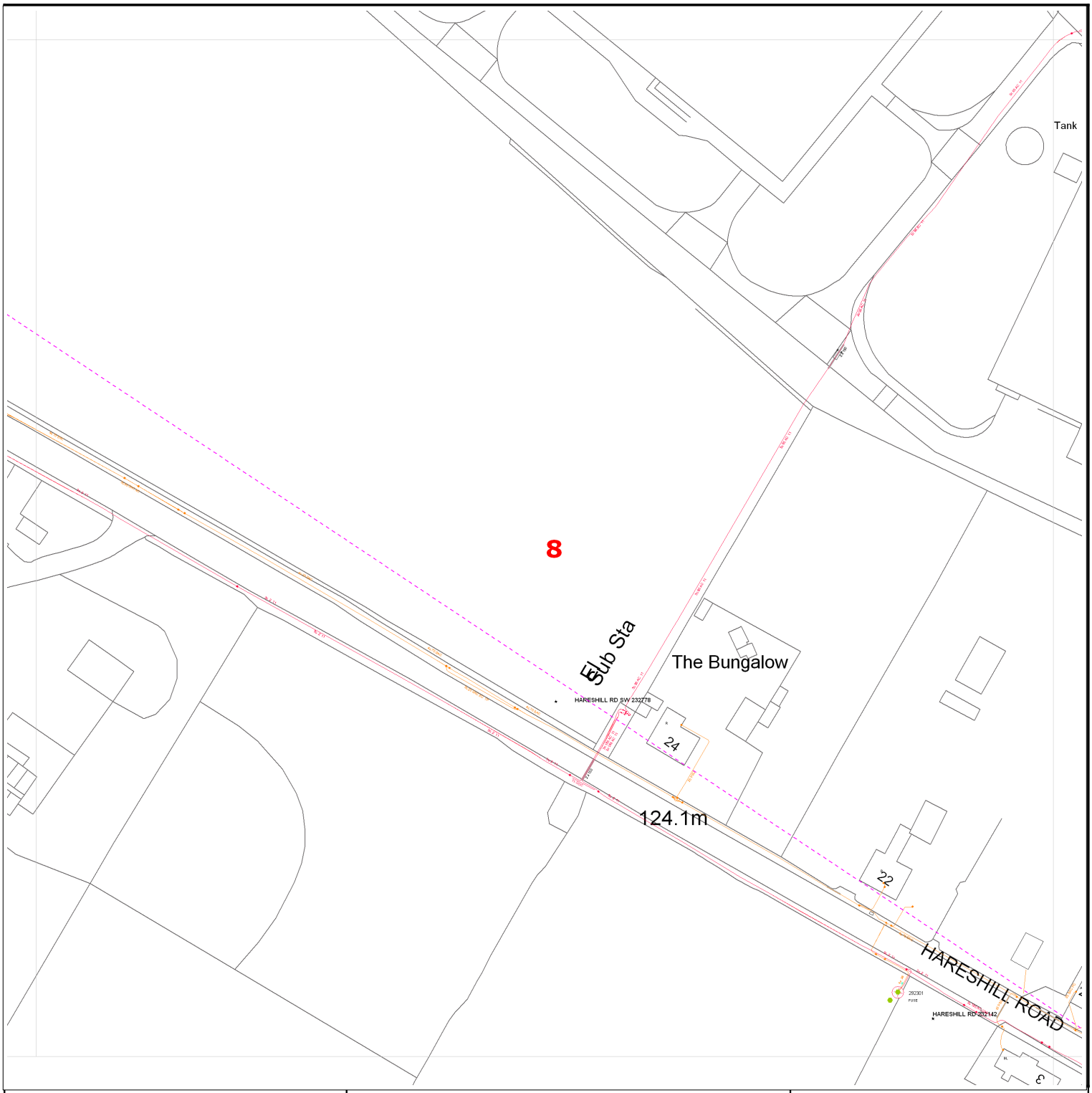
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electricity north west

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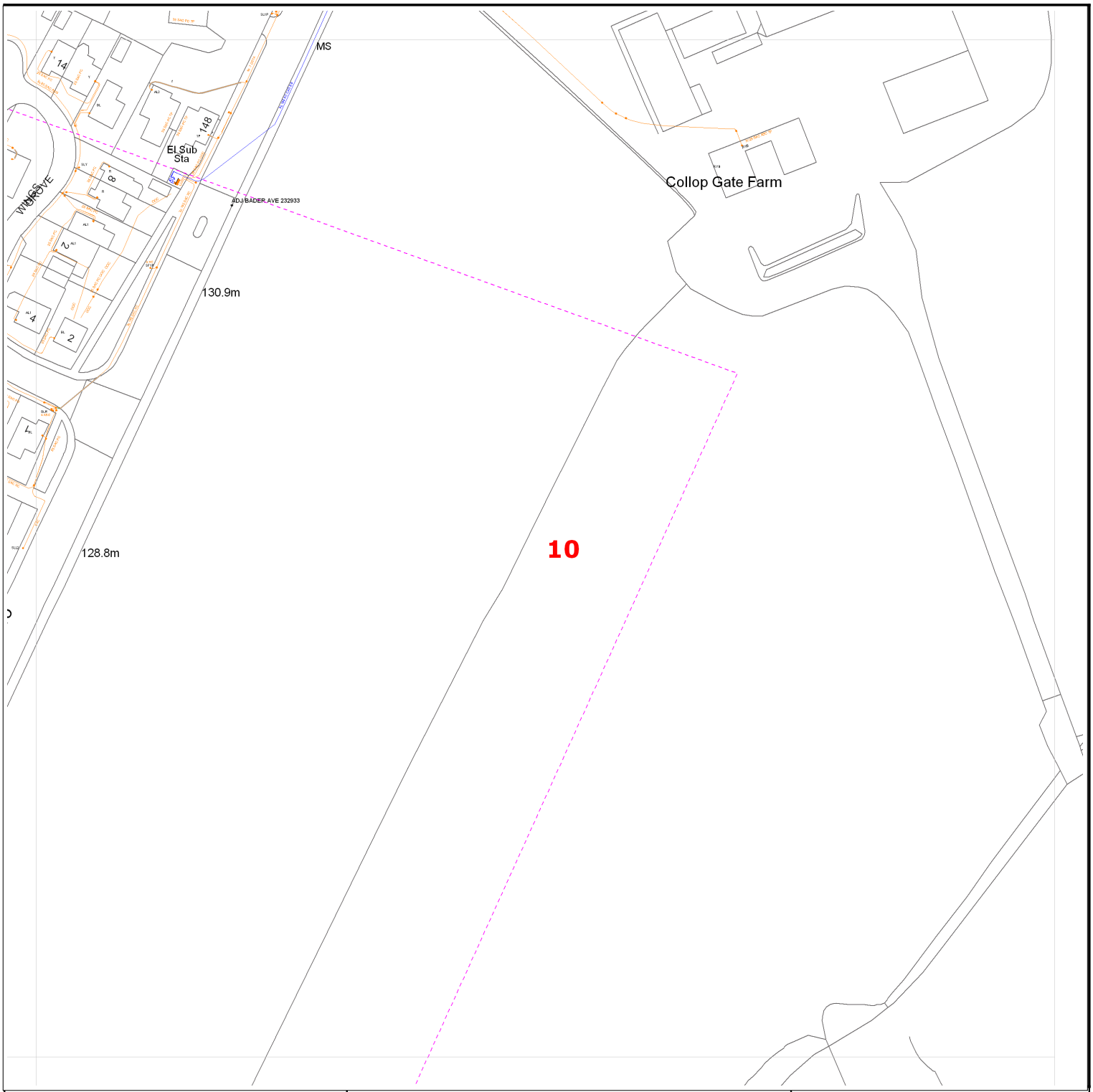
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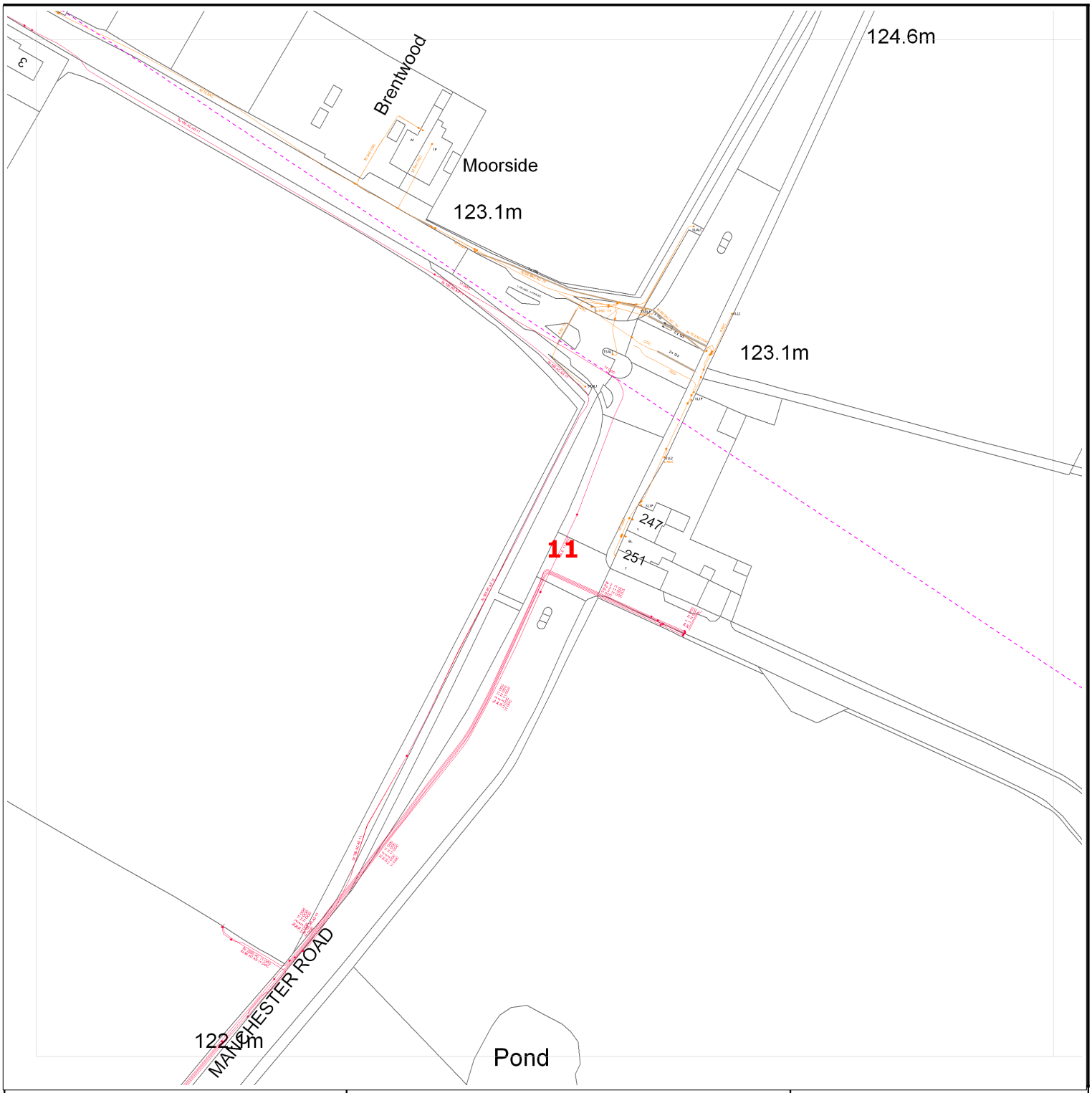
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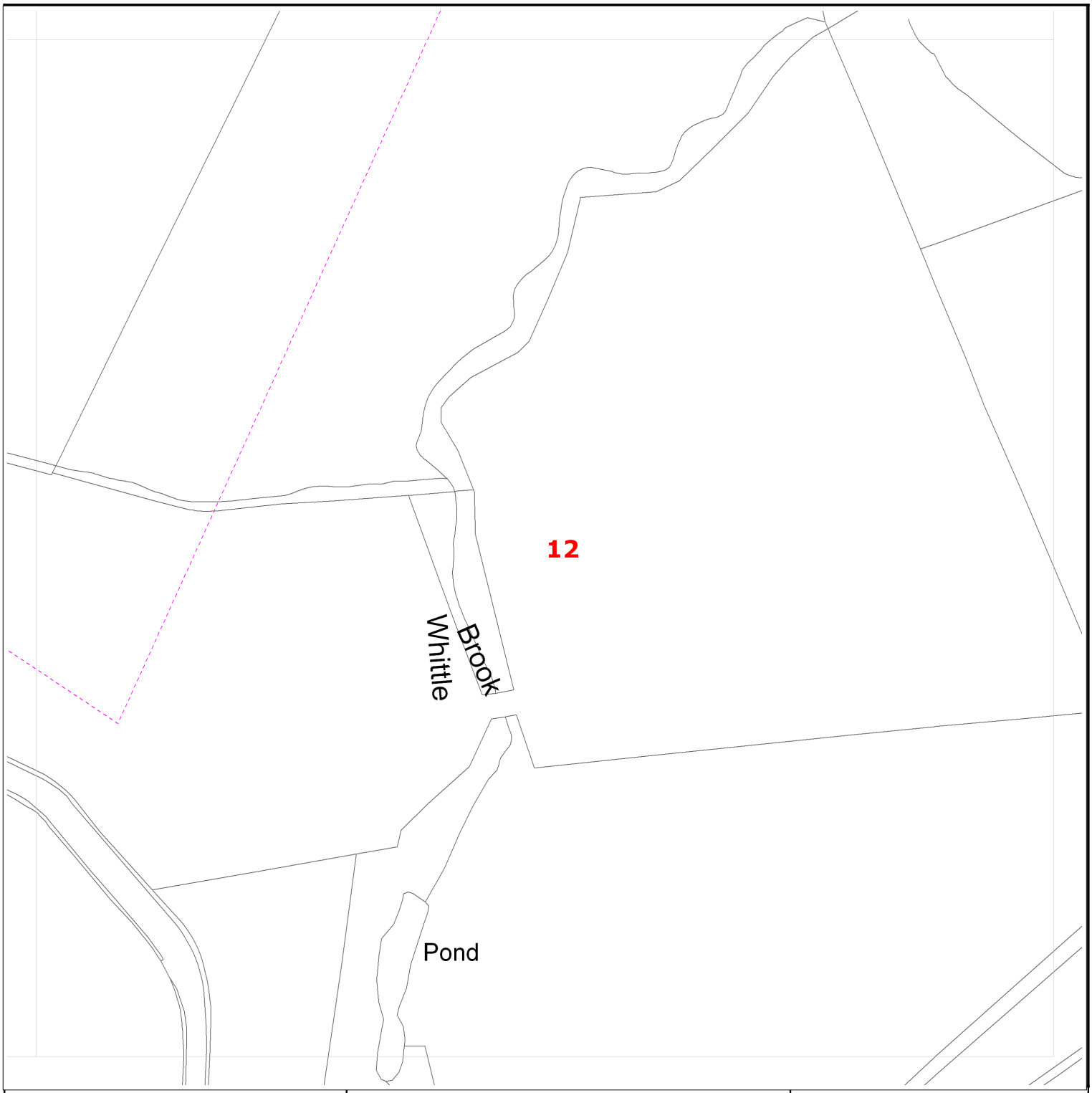
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LSBUD Reference: NW_3WWX_22938031
Your Reference: 322834

Date
12th August 2021

Cadent Gas Limited
Plant Protection (Block C), Mersey Road North, Failsworth, Greater Manchester M35 9FF
cadentgas.com

Miss Monique Elsom
01442416626
07449891968
MElsom@rsk.co.uk

Cadent
Your Gas Network

Dear Miss Monique Elsom,

URGENT: We still need to assess your planned works enquiry

We are still awaiting further information so we can assess the risk associated with your planned works. Please provide the following information as soon as possible:

- A plan showing the exact location and extent of your works (please include any access/egress routes from site)
- A full description of the works you are planning to undertake, including methods and excavation depths, if known
- Site contact details
- The date that your works are set to commence

Based on the information we have so far:

You must not start any work until we confirm it is safe to do.

There are Cadent gas pipes in the area you're planning to work. These pipes may have an impact on your proposed work or possibly prevent your work for safety or legal reasons.

We would also remind you of the criminal penalties which apply under the Pipeline Safety Regulations 1996 which state:

Regulation 15: "*No person shall cause such damage to a pipeline as may give rise to a danger to persons*";

The same criminal penalties apply under the Health and Safety at Work Act 1974, which makes it illegal to fail to prevent safety risks to any employees and others including Cadent operatives and members of the public.

If your works are being carried out in an easement, please note that the auto-response from our enquiry system does not constitute written consent and formal, signed written consent which will only be provided following consultation with our plant protection team. If necessary Cadent will take action to legally enforce the terms of the easement.

If you need any further information or have any questions about the above, please contact us at [**box.eaplantprotectionops@cadentgas.com / emplantprotectionops@cadentgas.com / nlplantprotection@cadentgas.com / plantprotection.nw@cadentgas.com / plantprotection.wm@cadentgas.com**] quoting your reference at the top of this letter.

Kind Regards
[East Anglia/East Midlands/North London/North West/West Midlands] Plant Protection Team

Cadent
Plant Protection (Block C), Mersey Road North, Failsworth, Greater Manchester M35 9FF

[box.eaplantprotectionops@cadentgas.com / emplantprotectionops@cadentgas.com / nlplantprotection@cadentgas.com / plantprotection.nw@cadentgas.com / plantprotection.wm@cadentgas.com]
cadentgas.com

Monique Elsom

From: plantprotection.NW@cadentgas.com
Sent: 10 August 2021 14:36
To: Monique Elsom
Subject: LSBUD Ref: 22938031 Your Ref: 322834 DBYD HP-IP-MP-LP affected High Risk
Attachments: 22938031_CadentGas.pdf; CADSPSSW22 - Specification for safe working in the vicinity of Cadent assets - August 2021 v2.pdf

Date: 10/08/2021
LinesearchbeforeUdig ref: 22938031
Your ref: 322834

Dear Sir/Madam,

We need to assess your planned works enquiry

We have received a notification from the LinesearchbeforeUdig (LSBUD) platform regarding plans to carry out works. Based on the information you provided:

You must not start any work until we confirm it is safe to do.

There are Cadent gas pipes in the area you're planning to work. These pipes may impact and possibly prevent your work for safety or legal reasons.

If your works are being carried out in an easement, please note that the auto-response from our enquiry system does not constitute written consent and formal, signed written consent which will only be provided following consultation with our plant protection team. If necessary Cadent will take action to legally enforce the terms of the easement.

We would also remind you of the criminal penalties which apply under the Pipeline Safety Regulations 1996 which state:

Regulation 15: "No person shall cause such damage to a pipeline as may give rise to a danger to persons";

The same criminal penalties apply under the Health and Safety at Work Act 1974, which makes it illegal to fail to prevent safety risks to any employees and others including Cadent operatives and members of the public.

Further assessment is required by our engineering team to review the impact on our apparatus and the necessary safe working requirements.

What you need to do

To assist us in assessing the risk associated with your planned works, please provide the following information as soon as possible:

- A plan showing the exact location and extent of your works (please include any access/egress routes from site)
- A full description of the works you are planning to undertake, including methods and excavation depths, if known
- Site contact details
- The date that your works are set to commence

In the meantime, please review our attached plans, which detail the Cadent gas assets in the area along with our key guidance documents.

BEFORE carrying out any work you must:

- Carefully read the attached guidance documents and maps showing the location of our gas apparatus.
- Contact the landowner and ensure any proposed works in private land do not infringe on Cadent's legal rights (i.e. easements or other rights). If the works are in the road or footpath, the relevant local authority should be contacted
- Ensure that all persons, including direct labour and contractors, working for you on or near Cadent apparatus follow the requirements of the HSE Guidance Notes HSG47 'Avoiding danger from underground services'. This guidance can be downloaded free of charge at www.hse.gov.uk
- In line with the attached guidance, verify and establish the actual position of gas mains, pipes, services and other apparatus on site before any activities are undertaken.

DURING any work you must:

- Comply with all guidance enclosed and any further guidance from our specialist team following assessment.
- Ensure that access to Cadent apparatus is maintained at all times.
- Prevent the placing of heavy construction plant, equipment, materials or the passage of heavy vehicles over Cadent apparatus unless specifically agreed with us in advance.
- Exercise extreme caution if slab (mass) concrete is encountered during excavation works as this may be protecting or supporting Cadent apparatus.
- Maintain appropriate clearances between gas apparatus and the position of other buried plant.

This outcome is valid for 28 days from the date of this letter. If your work, or the location, date or nature of the work you're doing changes, you must submit another enquiry.

If you need any further information or have any questions about this letter, please contact us at plantprotection.NW@cadentgas.com

Your Responsibilities and Obligations

It is your responsibility to ensure that the information you have given us is accurate. You must also share all relevant documents, including the attached guidance notes, with anyone who carries out work on your behalf.

This assessment solely relates to Cadent gas pipes. It doesn't however include:

- Cadent's legal interest (easements or other rights) in the land which restricts activity near Cadent's pipes in private land. You must get details of any such restrictions from the landowner in the first instance and if in doubt contact us plantprotection.NW@cadentgas.com
- Gas service pipes and related apparatus.
- Recently installed apparatus.
- Apparatus owned by other organisations such as other gas distribution networks, local electricity companies and other utilities.

It is your responsibility to consider whether the points above are relevant to you and whether they could be affected by your proposed work.

This letter does not constitute any formal agreement or consent for any proposed development work either generally or related to Cadent's easements or other rights, or any planning or building regulations applications.

Cadent Gas Ltd or their agents, servants or contractors do not accept any liability for any losses arising under or in connection with this information. This limit on liability applies to all and any claims in contract, tort (including negligence), misrepresentation (excluding fraudulent misrepresentation), breach of statutory duty or otherwise. This limit on liability does not exclude or restrict liability where prohibited by the law nor does it supersede the express terms of any related agreements.

Kind Regards,
North West Plant Protection Team
T: 0800 688 588
plantprotection.NW@cadentgas.com
cadentgas.com



[WARNING: This email originated outside of RSK. DO NOT CLICK links, attachments or respond unless you recognise the sender and are certain that the content is safe]

Cadent
Your Gas Network

Specification for
Safe Working in the Vicinity of Cadent Assets

CAD/SP/SSW/22
August 2021



Cadent
Your Gas Network

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Cadent
Your Gas Network

Cadent contact details



Central admin team
Address: Cadent, Brick Kiln Street, Hinckley, Leicestershire, LE10 0NA
Phone: 0800 688 588
Email: plantprotection@cadentgas.com

East of England Operations Plant Protection
Address: Cadent Gas Limited, Vicarage Farm Road, Peterborough, PE1 5TP
Email: eaplantprotectionops@cadentgas.com

East Midlands Operations Plant Protection
Address: Cadent Gas Limited, Effingham Street, Sheffield, S4 7YP
Email: emplantprotectionops@cadentgas.com

North London Operations Plant Protection
Address: Cadent Gas Limited, Uxbridge Road, Slough, SL2 5NA
Email: nlplantprotection@cadentgas.com

North West Operations Plant Protection
Address: Cadent Gas Limited, Plant Protection (Block C), Mersey Road North, Failsworth, Greater Manchester, M35 9FF
Email: plantprotection.nw@cadentgas.com

West Midlands Operations Plant Protection
Address: Cadent Gas Limited, Windsor Street, Birmingham, B7 4DN
Email: plantprotection.wm@cadentgas.com

Step by Step Process

Register with LinesearchbeforeUdig (LSBUD)

LSBUD provide a free online enquiry service giving results within minutes from a grid reference, postcode or street name. This allows you to submit enquiries about activities and work that you are planning which may have an impact on the gas network.

www.linesearchbeforeudig.co.uk

Submit an enquiry

Within LSBUD there are 3 enquiry types, initial enquiry, planned works and emergency works. Initial enquires are for information only purposes and will not be escalated for operational site-specific advice, should you wish to carry out works you must submit a planned works enquiry. If your works are of a genuine emergency nature (e.g. burst water main etc.) then you should submit an emergency enquiry.

Review the response, asset location and enclosed guidance

LSBUD will auto-generate a response based on your enquiry details and our assets in the area. The assessment will be based on the selected Work Category and Work Type, if your planned works propose activities to be undertaken within the distances specified within this booklet you must obtain site specific advice from our specialist operational plant protection team.

If your response says that we need to assess your enquiry further, you must not start any work until we confirm it is safe to do so.

If you are advised to proceed with caution, then you must ensure that you utilise the provided asset plans and follow the guidance in this document.

Observe restrictions

In addition to the guidance contained in this booklet, you must ensure that you observe any site-specific advice provided by our specialist operational plant protection teams.

If in doubt contact Cadent using the details in this booklet

Keeping you, your workers and the public safe when working near our pipelines



Disclaimer

This document is provided for use by third parties for safe working in the vicinity of Cadent assets. Where this document is used by any other party it is the responsibility of that party to ensure that this document is correctly applied.

Users should ensure that they are in possession of the latest edition of this document by referring to the Digging Safely webpage on the Cadent website.
www.cadentgas.com/help-advice/digging-safely

Mandatory and non-mandatory requirements

In this document:

- Shall: indicates a mandatory requirement
- Should: indicates best practice and is the preferred option

If an alternative method is used then a suitable and sufficient risk assessment shall be completed to show that the alternative method delivers the same, or better, level of protection.

Introduction
Safe Working in the Vicinity of Cadent Assets: Requirements for Third Parties

This specification is for issue to third parties carrying out work in the vicinity of Cadent gas assets and associated installations. It is provided to ensure that individuals planning and undertaking work take appropriate measures to prevent damage.

Any damage to a gas asset, or its coating, can affect its integrity and can result in failure leading to potentially serious hazardous consequences for individuals located in the vicinity.

It is therefore essential that the safety advice outlined in this document, along with any site-specific advice given by our operatives, is complied with when working near to our assets. If Cadent consider any work to be in breach of the requirements stipulated in this document, then the Cadent Plant Protection Officer will request that work is suspended until the non-compliances have been rectified.

Every reasonable precaution shall be undertaken to avoid personal injury or damage to our apparatus. If we incur any direct or indirect costs as a consequence of your works and we are required to repair or divert any gas apparatus, you'll be recharged in full.

Any damage to our apparatus will be subject to legislative reporting responsibilities to the HSE under Reporting of Injuries, Diseases & Dangerous Occurrences Regulations 2013, Gas Safety Management Regulations 1996 and the Pipelines Safety Regulations 1996.

The requirements in this document are in line with the Institution of Gas Engineers and Managers (IGEM) recommendations IGEM/SR/18 Edition 3 - Safe Working Practices to Ensure the Integrity of Gas Assets and Associated Installations and the HSE's guidance document HS(G)47 Avoiding Danger from Underground Services.

It is the responsibility of the third party to ensure that any work carried out also conforms with the requirements of the Construction and Design Management (CDM) Regulations 2015 and all other relevant health and safety legislation. Reference shall be made to our apparatus within your site Health and Safety file.

1. Scope

This specification sets out the safety precautions and other conditions associated with working in the vicinity of Cadent assets, located in negotiated easements (see Section 13) and public highways.

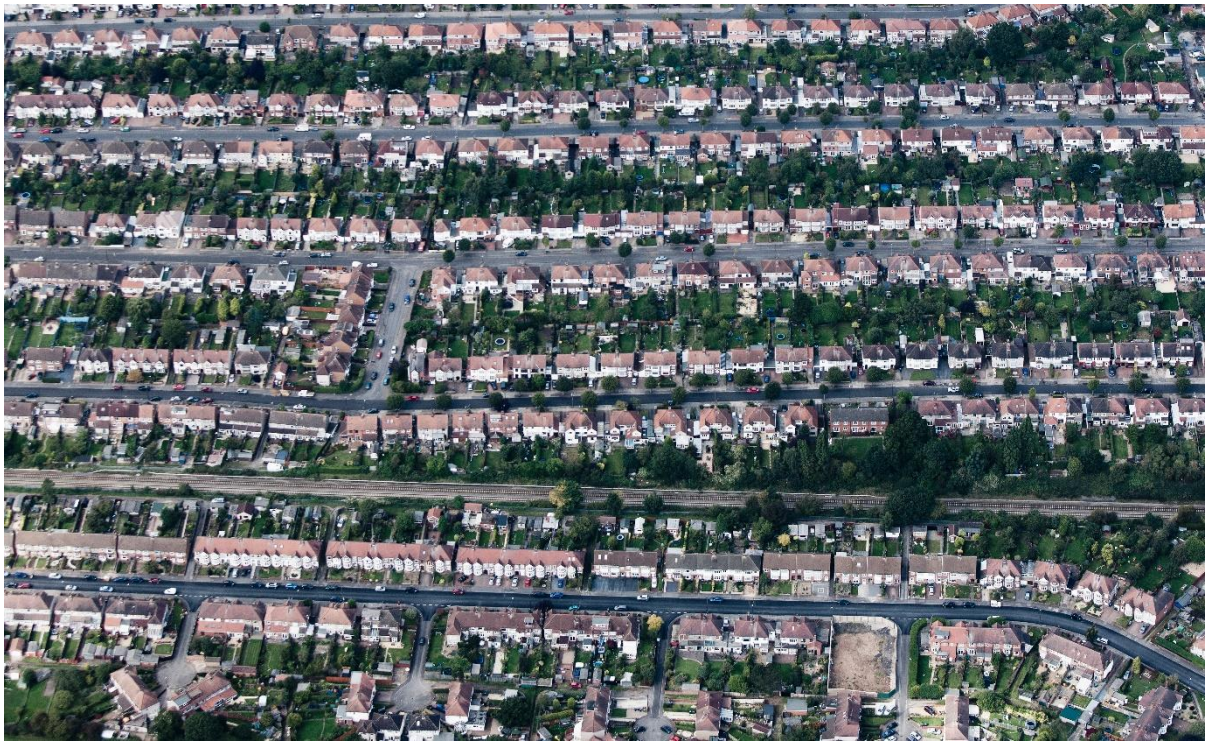


Where the guidance in this document cannot be adhered to, then the diversions process shall be followed.

Before contacting our diversions team, you'll need to have your site information and any design proposals available.

Once you have this information, please contact our diversions team diversions@cadentgas.com or on 0330 678 1034.

Visit www.cadentgas.com/diversions for more information.



2. Formal Consent

Cadent's assets are either located in an easement agreed with the landowner at the time of installation, or within the highway. As the required arrangements for working in an easement and working in the highway differ, this section describes the specific requirements for these two areas.

Any documents handed to contractors or other individuals undertaking work (e.g. farmers, local authorities etc.), on site by Cadent, shall be signed for and adhered to by the site. All personnel working on site shall be made aware of the potential hazards of working near gas assets and the actions they should follow in case of an emergency.

2.1 Within an easement

The promoter of any works (see Section 13) within an easement shall provide Cadent with details of the proposed works, including a risk assessment and method statement of how the work is intended to be carried out. Work shall not commence in an easement strip until formal written consent has been provided by Cadent. This will include details of Cadent's protection requirements, contact telephone numbers and the emergency telephone number. On acceptance of Cadent's requirements, the promoter of the works shall give Cadent at least 14 days' notice before commencing work on site.

Where clearance to proceed has been granted directly from the system, for example, if your works only affect low pressure assets (operating at less than 75 mbar), but the asset concerned is within an easement, the promoter of the works shall contact the network Plant Protection Office for formal written consent.

In addition to formal written consent, an easement crossing agreement (deed of indemnity) may be required. This shall be discussed with the Cadent Plant Protection Officer prior to the commencement of the works.

The width of an easement is dependent on a number of factors and is mainly dependent on the operating pressure, pipeline material and diameter as these factors influence safe working requirements and building proximity distances. Easement details should be registered at Land Registry however if you are unsure please liaise with your network Plant Protection Officer.

Below is a list of our standard easement widths, however, some easements may vary:

Pressure tier/ Material	Diameter	Easement Width (total)
HP Steel	900mm, 1060mm, 1200mm (36", 42", 48")	24.4m (80')
HP Steel	750mm and 600mm (30" & 24")	18.3m (60')
HP Steel	Up to and including 450mm (18")	12.2m (40')
HP RTP	Determined on a case by case basis	
IP Steel	All sizes	6m plus pipe diameter
IP PE > 5.5 bar	Above 500mm (19") 356mm to 500mm 126mm to 365mm Up to and including 125mm	30m plus pipe diameter 16m plus pipe diameter 12m plus pipe diameter 12m plus pipe diameter
IP PE <5.5 bar	Above 500mm (19") 356mm to 500mm 126mm to 365mm Up to and including 125mm	26m plus pipe diameter 8m plus pipe diameter 8m plus pipe diameter 8m plus pipe diameter
AGI's	All sites	3m restrictive width around the installation
MP PE	Above 500mm (19") 356mm to 500mm 126mm to 355mm Up to and including 125mm	12m plus pipe diameter 6m plus pipe diameter 5m plus pipe diameter 4.5m plus pipe diameter
MP Steel	All sizes	6m plus pipe diameter
MP Iron*	All sizes	6m plus pipe diameter
LP	Above 125mm Up to and including 125mm	3m plus pipe diameter 1m plus pipe diameter

2.2 Within a highway

Work shall be notified to Cadent in accordance with the requirements of the New Roads and Street Works Act (NRSWA) and HS(G)47. The promoter of any works within the highway should provide Cadent with details of the proposed works, including a risk assessment and method statement of how the work is intended to be carried out. This shall be submitted at least 14 days before the planned work is to be carried out. If similar works are being carried out at several locations in close proximity, a single risk assessment and method statement should be adequate depending on the nature of the works. Work should not go ahead until formal written consent has been given by Cadent. This will include details of Cadent's protection requirements, contact telephone numbers and the emergency telephone number.



3. Location of Gas Assets

A copy of our plans with your marked-out site is provided in our LSBUD response. Cadent asset records shall be consulted to establish the indicative location of the gas assets in relation to the promoter's work area.

If the marked-out area is incorrect you MUST resubmit your enquiry with the correct area marked out.



Prior to work commencing on site, the gas assets should be located to verify the indicative location from plans.

This should initially be carried out through non-intrusive methods utilising pipe locators where possible. The indicative location should be verified through trial holes. Once located, the gas assets should be marked out at regular intervals using asset location markers with triangular flags (see Appendix A) or other suitable methods.

For assets exceeding 2 bar, the excavation of all trial holes shall be monitored by Cadent. For assets not exceeding 2 bar, monitoring will be at the discretion of the Cadent Plant Protection Officer.

Safe digging practices, in accordance with HSE publication HS(G)47, shall be followed. Direct and consequential damage to gas plant can be dangerous both to employees and to the general public.

We utilise marker posts and surface boxes to denote the location of our apparatus providing access to key parts of our network. Free access shall be maintained to such apparatus during and after your works and these shall not be moved, covered or damaged during the works.



Low Pressure

Medium Pressure

Intermediate Pressure

High Pressure

4. Temporary and Permanent Protective Measures

No temporary or permanent protective measures, including the installation of concrete slab protection, shall be installed over or near to a Cadent asset without the prior written consent of Cadent. Cadent will need to approve the material, dimensions and method of installation for the proposed protective measure.

The method of installation shall be confirmed through the submission of a formal written method statement from the contractor to Cadent. Where permanent protection is to be installed over an asset, Cadent will normally carry out a coating survey of metallic assets to check that there is no existing damage to the coating, prior to the slab protection being installed. Cadent shall, therefore, be given at least 14 days' notice prior to the laying of any slab protection to arrange for this survey to be carried out.

Generally, due to the need for future access to below 2 bar gas assets, permanent protection is not permitted, however, can be approved at Cadent's discretion.

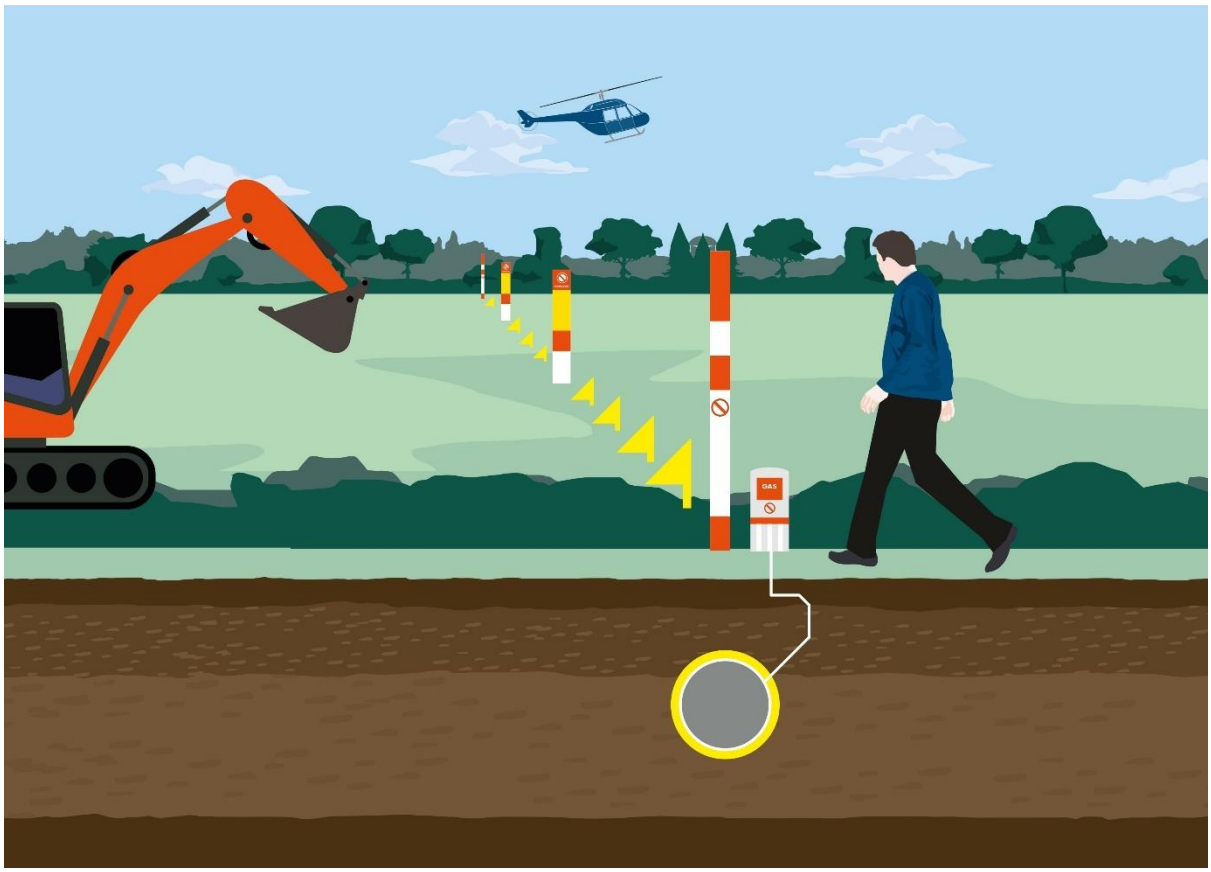
The safety precautions detailed in Sections 5, 6, 7 or 8 of this document should also be observed during the installation of the asset protection.



5. Working in the Vicinity of a High or Intermediate Pressure Gas Asset (Operating at Pressures Greater than 2 bar)

The below information shall only be used as guidance, for all works in the vicinity of High and Intermediate Pressure Pipelines the auto-response from the system will advise not to carry out any works until we have undertaken a technical review of the planned works and provided site specific safe working advice.

Initial enquires are for information only purposes and will not be escalated for operational site-specific advice, should you wish to carry out works you must submit a planned works enquiry for assessment.



5.1 Excavation

Mechanical excavators should not be sited or moved above an asset.

Mechanical excavators, and any other powered mechanical plant, shall not dig on one side of the asset with the cab of the excavator positioned on the other side.

All traffic should be positioned far enough away from the trench to prevent trench wall collapse.

5.1.1 In proximity to an asset in an easement

Following location and marking of assets in agreement with the Cadent Plant Protection Officer, powered mechanical excavation may be used no closer than 3m (see Figure 1). The use of toothed excavator buckets vastly increases the potential for damage to assets, therefore only toothless buckets shall be used.

Any fitting, attachment or connecting pipework on an asset shall be exposed by hand.

If third parties are using any form of trench support system, they shall ensure that none of the components are in contact with the Cadent asset.

Consideration may be given to a relaxation of these limits or lower risk excavation methods by agreement with the Cadent Plant Protection Officer on site.

Where sufficient depth of cover exists and the absence of attachments and projections has been confirmed (e.g. valve spindles, pressure points etc.) and following evidence from hand dug trial holes, light tracked vehicles may be permitted to strip topsoil to a depth of 250mm, using a toothless bucket.

No topsoil or other materials shall be stored within the easement without the written permission of Cadent. No fires are allowed in the easement strip or close to above ground gas installations.

After the completion of the work, the level of cover over an asset should be the same as that prior to work commencing, unless otherwise agreed by Cadent.

No new service shall be laid parallel to an asset within the easement. In special circumstances, and only with formal written agreement from Cadent, this may be relaxed for short excursions where the service shall be laid no closer than 600mm.

Where work is being carried out parallel to an asset, within or just alongside the easement, suitable barriers shall be erected for protection between the works and the asset to prevent encroachment.

5.1.2 In proximity to an asset in the highway

Following locating and marking of assets in agreement with the Cadent Plant Protection Officer, powered mechanical excavation may be used no closer than 3 meters (see Figure 1).

The use of toothed excavator buckets vastly increases the potential for damage to assets, therefore only toothless buckets shall be used.

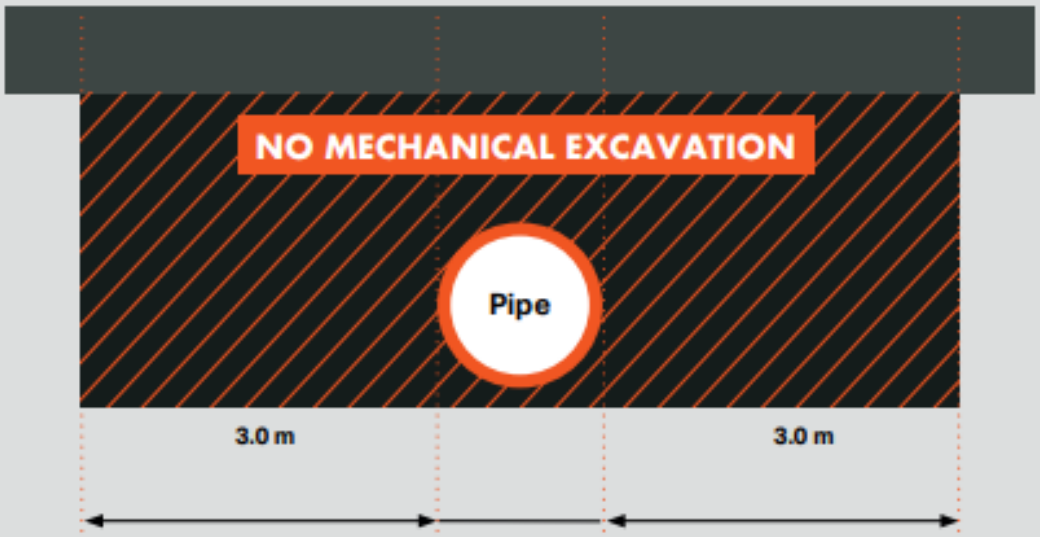
Any fitting, attachment or connecting pipework shall be exposed by hand.

If third parties are using any form of trench support system, they shall ensure that none of the components are in contact with the Cadent asset.

Removal of the bituminous or concrete highway surface layer by mechanical means is permitted to a depth of 300mm, unless any attachments or projections are present on an asset (e.g. valve spindles, pressure points etc.). The use of chain trenchers is not permitted within 3m of an asset. The Cadent Plant Protection Officer may need to be present to monitor this work. Where the bituminous or concrete highway surface layer extends below 300mm deep, it shall only be removed by handheld power assisted tools under the observation of Cadent.

In special circumstances, consideration may be given to a relaxation of these rules by agreement with the Cadent Plant Protection Officer and only whilst they remain on site.

Figure 1. Excavation restrictions



5.1.3 Crossing over an asset (Open cut)

Where a new service is to cross over an asset, a clearance distance of 600mm between the crown of the asset and underside of the service should be maintained. If this cannot be achieved, the service shall cross below the asset (see Section 5.1.4).

In special circumstances, this distance may be reduced at the discretion of the Cadent Plant Protection Officer on site.

5.1.4 Crossing below an asset (Open cut)

Where a service is to cross below an asset, a clearance distance of 600mm between the crown of the new service and underside of the asset shall be maintained. Where lengths of pipe greater than one metre are to be exposed, the Cadent Plant Protection Officer shall be consulted. Exposed assets should be suitably supported and protected by matting and timber cladding. Any supports shall be removed prior to backfilling.

In special circumstances, this clearance distance may be reduced at the discretion of the Cadent Plant Protection Officer on site.

5.1.5 Cathodic protection

Cathodic protection (CP) is applied to Cadent's buried steel pipe and is a method of protecting assets from corrosion by maintaining an electrical potential between the pipe and anodes placed at strategic points along the asset.

Where a new service is to be laid and similarly protected, the party installing the CP system shall undertake tests to determine whether the new service is interfering with the cathodic protection of Cadent assets.

Should any cathodic protection posts or associated apparatus need to be moved to facilitate third party works, at least 14 days' notice shall be given to Cadent. Cadent will undertake this work and any associated costs will be borne by the third party.

5.1.6 Installation of electrical equipment

Where electrical equipment is being installed close to Cadent's buried steel assets, the effects of a rise of earth potential under fault conditions shall be considered by the third party and a risk assessment and method statement shall be submitted to Cadent for approval, prior to the works commencing.

The installation of electrical cables parallel to Cadent assets may induce currents into the asset. This may interfere with the effective operation of the cathodic protection system. In these instances, Cadent will require the promoter of the works to conduct pre and post energisation potential surveys of Cadent's assets. The costs for any stray current mitigation systems required will be borne by the promoter of the works.

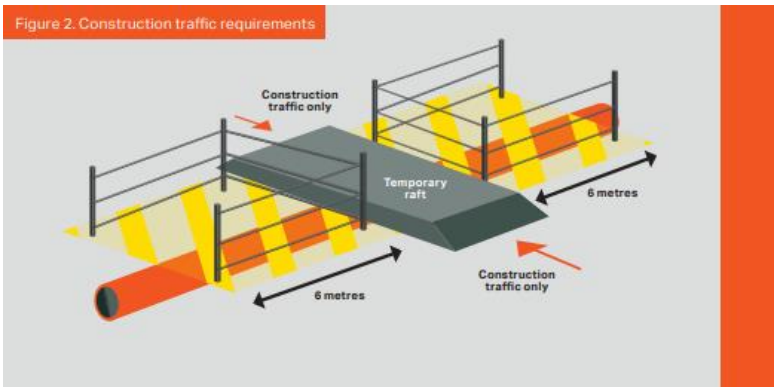
5.2 Construction traffic

Where existing roads cannot be used, construction traffic shall only cross an asset at locations agreed with the Cadent Plant Protection Officer. Notices shall be placed directing traffic to the crossing points. Post and wire fencing shall be erected at all crossing points, and the fence should cover the width of the easement and extend a further 6 metres along the length of the easement on both sides (see Figure 2).

Assets shall be protected at all crossing points by a suitable method agreed with the Cadent Plant Protection Officer prior to installation. The promoter of the works shall review ground conditions, vehicle types and crossing frequencies to determine the type and construction of the protection required.

For larger scale projects or permanent solutions, a protection slab may be required.

Figure 2. Construction traffic requirements



5.3 Specific activities

This section details the precautions that need to be taken when carrying out certain prescribed activities in the vicinity of an asset. The promoter of works is required to consult Cadent when intending to undertake one of the listed activities and/or further advice is required on whether the work has the potential to affect the asset. The table below shows, for some specific activities, the prescribed distances where the advice of Cadent shall be sought.

Activity	Distance within which Cadent advice shall be sought
Piling	15m
Surface mineral extraction	100m
Landfilling	100m
Demolition	150m or 400m for structure mass > 10,000 tonnes
Blasting	500m if the MIC is > 200kg 250m if the MIC is > 10kg but ⩽ 200kg 100m if the MIC is ⩽ 10kg
Deep mining	1000m
Wind turbine	1.5 times mast height

5.3.1 Trenchless techniques

Where trenchless techniques are being considered, a formal risk assessment and method statement shall be produced. This risk assessment and method statement shall be formally agreed with Cadent prior to the commencement of the work. Please provide Cadent with at least 14 days' notice as the Cadent Plant Protection Officer may wish to be present to monitor this work.

5.3.2 Changes to depth of cover

The depth of cover over Cadent's asset shall not be altered. Cadent shall be consulted for any activity proposed that will lead to a change in cover over the asset. Expert advice may need to be sought, which will be determined by the Cadent Plant Protection Officer.

5.3.3 Piling

No piling shall be allowed within 15m of an asset without an assessment of the vibration levels at the asset. The peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec. The promoter of the works should provide Cadent the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought, which can be arranged through Cadent.

5.3.4 Demolition

No demolition should be allowed within 150m of an asset, or 400m for a structure mass greater than 10,000t without an assessment of the vibration levels at the asset. The peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

The promoter of the works should provide Cadent the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought, which can be arranged through Cadent.

5.3.5 Blasting

The Maximum Instantaneous Charge (MIC) dictates the distance at which an assessment of the vibration levels (at the located asset) is required. The measured distances are as follows:

- 500m if the MIC is greater than 200kg
- 250m if the MIC is greater than 10kg but less than 200kg
- 100m if the MIC is 10kg or less

The peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

The promoter of the works should provide Cadent the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance.

The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought, which can be arranged through Cadent.

5.3.6 Surface mineral extraction

An assessment shall be carried out on the effect of surface mineral extraction activity within 100 metres of an asset. Consideration should also be given to extraction around other plant and equipment associated with assets (e.g. cathodic protection ground beds).

Where the mineral extraction extends up to the asset easement, a stable slope angle and stand-off distance between the asset and slope crest shall be determined by Cadent. The easement strip should be clearly marked by a suitable permanent boundary, such as a post and wire fence. Additionally, where appropriate, slope indicator markers shall be erected to facilitate the verification of the recommended slope angle as the slope is formed, by the third party. The asset easement and slope need to be inspected periodically to identify any signs of developing instability. This may include any change of slope profile including:

- Bulging
- The development of tension cracks on the slope or easement
- Any changes in drainage around the slope

The results of each inspection should be recorded

Where surface mineral extraction activities are planned within 100m of the asset but do not extend up to the asset easement boundary, Cadent shall assess whether this could promote instability in the vicinity of the asset. This may occur where the asset is routed across a natural slope or the excavation is deep. A significant cause of this problem is where the groundwater profile is affected by changes in drainage or the development of lagoons.

Where the extraction technique involves explosives, the provisions of Section 5.3.5 apply.

5.3.7 Deep mining

Assets within 1km of active deep mining may be affected by subsidence resulting from mineral extraction. The determination of protective or remedial measures will normally require expert assistance, which can be arranged through Cadent.

5.3.8 Landfilling

The creation of slopes outside of the asset easements may promote instability within the vicinity of an asset. Cadent should carry out an assessment to determine the effect of any landfilling activity within 100m of an asset. The assessment is particularly important if landfilling operations are taking place on a slope in which an asset is routed.

5.3.9 Pressure testing

Hydrostatic testing of a third-party asset should not be permitted within 8 metres either side of a Cadent asset, to provide protection against the effects of a burst. Where this cannot be achieved, typically where the third-party asset needs to cross a Cadent asset, one of the following precautions would need to be adopted:

- limiting of the design factor of the third-party pipeline to 0.3 at the asset's nominated maximum operating pressure (MOP), and the use of pre-tested pipe
- the use of sleeving
- Cadent conduct risk analysis of pipe failure

In either case, the third party shall submit their site-specific risk assessment and safe system of works for consideration by Cadent.

5.3.10 Seismic surveys

The promoter of works shall advise Cadent of any seismic surveying work in the vicinity of an asset that will result in peak particle velocities in excess of 75mm/sec at the asset.

The promoter of the works should provide Cadent the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

5.3.11 Hot work

Where a Cadent metallic gas asset has been exposed, welding (or other hot works that may involve naked flames) should not be carried out in proximity of the gas asset. This may be reduced if suitable protection and precautions has been agreed with Cadent.

If the gas asset is PE (or a PE asset is contained within a metallic sleeve) welding, or other hot works that may involve naked flames, should not take place within 500mm of the gas asset. This may be reduced if suitable protection and precautions have been agreed with the Cadent Plant Protection Officer to prevent against the effects of sparks, radiant heat transfer etc.

The Cadent Plant Protection Officer shall be present to monitor all welding, burning or other 'hot work' that takes place.

5.3.12 Wind turbines

Wind turbines shall not be sited any closer than 1.5 times the proposed height of the turbine mast away from the nearest edge of a gas asset.

Further guidance can be found from UKOPA's Good Practice Guide 13 (UKOPA/GP/013) - Requirements for the Siting and Installation of Wind Turbines Installations in the Vicinity of Buried Pipelines.

5.3.13 Solar farms

Solar Farms can be built adjacent to gas assets but never within an easement. Advice shall be sought from Cadent at the early stages of design to ensure that electrical interference, security, future access and construction methods can be mutually agreed.

Further guidance can be found from UKOPA's Good Practice Guide 14 (UKOPA/GP/014) - Requirements for the Siting and Installation of Solar Photovoltaic (PV) Installations in the Vicinity of Buried Pipelines.

5.4 Backfilling

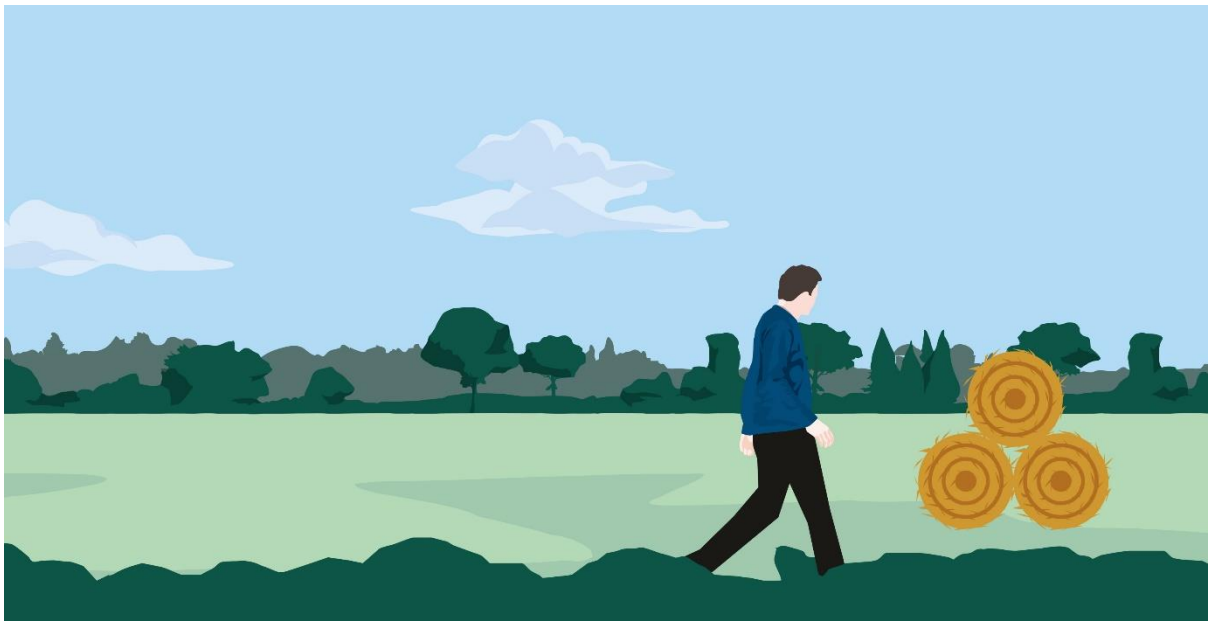
No backfilling should be undertaken without Cadent's agreement to proceed and the Cadent Plant Protection Officer will stipulate the necessary requirements. Some equipment may not be suitable for use over or around an asset due to the adverse effects of excessive compaction and vibration levels. The Cadent Plant Protection Officer will be able to advise on suitable equipment. Third parties undertaking work shall provide Cadent with 48 hours' notice, or shorter only if agreed with Cadent, of the intent to backfill over, under or alongside the asset.

This requirement should also apply to any backfilling operations that:

- are within 3 metres of an asset
- could influence the ground stability

Any damage to an asset or its coating shall be reported to Cadent in order that damage can be assessed, and repairs carried out.

Minor damage to pipe coating and cathodic protection test leads will be repaired by Cadent free of charge. If an asset has been backfilled without the knowledge of the Cadent Plant Protection Officer, the third party shall re-excavate to enable the condition of the asset coating to be assessed.



6. Working in the Vicinity of a Medium Pressure Gas Asset (Operating at Pressures Greater than 75 mbar but not Exceeding 2 bar)

The below information shall only be used as guidance, and where appropriate, will be supplemented by site specific safe working advice from the network Plant Protection Officer.

Initial enquires are for information only purposes and will not be escalated for operational site-specific advice, should you wish to carry out works you must submit a planned works enquiry for assessment.

6.1 Temporary and permanent structures

No temporary or permanent structures are permitted to be installed above, or in close proximity to a gas asset or easement due to the restriction of access this imposes. This includes, but is not limited to, permanent street furniture such as planters and bollards and temporary buildings such as welfare units and other enclosed spaces. The building proximity distances for medium pressure assets is as follows:

Material	Minimum proximity to premises
Cast/Spun Iron	3m
Ductile Iron	30m
Steel	1m
PE (inserted)	1m
PE (non-inserted)	2m for diameters ⩽ 500mm 5m for diameters > 500mm

Please note that the easement distance may be greater than the building proximity distance. For any proposed structures in the easement, please consult with the Cadent network Plant Protection Officer.

6.2 Excavation

6.2.1 General

Mechanical excavators should not be sited or moved above an asset.

Mechanical excavators and any other powered mechanical plant shall not dig on one side of the asset with the cab of the excavator positioned on the other side. All traffic should be positioned far enough away from the trench to prevent trench wall collapse.

Excavation with a powered mechanical excavator should not be carried out until the asset has been located through vacuum excavation or by hand. No mechanical excavation is permitted within 500mm of a gas asset. Any mechanical excavation should utilise a banksman. Toothless buckets shall be used due to the potential of damage to assets using toothed excavator buckets.

Consideration shall be given to apparatus installed on gas assets including valves, spindles, pressure points etc. Any fitting, attachment or connecting pipework on an asset shall be exposed by hand.

Where concrete is exposed around gas apparatus, it shall not be removed without first consulting with a Cadent Plant Protection Officer as it could be providing protection or anchorage to live apparatus.

Where a third party is using any trench support system, they shall ensure that none of its components are in contact with an asset.

The use of chain trenchers is not permitted within 3m of the confirmed location of an asset.

6.2.2 Working in vicinity of iron pipework

When deep excavation greater than 1.5m in depth is carried out in the vicinity of iron pipework, steps shall be taken to ensure the risk associated with immediate and latent asset failure are considered and, where necessary, excavations are cut back to reduce the shear factor created by ground disturbance likely to result in settlement. This also includes instances where excavations are part of construction works, including basement conversions, underground carparks, shaft construction, etc.

Care should be taken to ensure that any exposed iron pipework is suitably supported at 1m intervals and protected from damage to avoid creating tensions that could lead to joint disturbance or pipe barrel fracture.

Where fittings or existing repairs are uncovered, care shall be taken to ensure that these are not disturbed.

When working near ductile iron pipework, any corrosion identified on the pipeline shall be reported to 0800 111 999 for a first call operative to attend to undertake a hazard assessment.

6.2.3 In proximity to an asset in an easement

Where sufficient depth of cover exists and the absence of attachments and projections has been confirmed (e.g. valve spindles, pressure points etc.), following evidence from hand dug trial holes, light tracked vehicles may be permitted to strip topsoil to a depth of 250mm using a toothless bucket.

No topsoil or other materials shall be stored within the easement without the written permission of Cadent. No fires are allowed in the easement strip or other gas assets.

After the completion of the work, the level of cover over the asset should be the same as that prior to work commencing.

No new service shall be laid parallel to the asset within the easement.

Where work is being carried out parallel to the asset, within or alongside the easement, suitable barriers shall be erected between the works and the asset to prevent encroachment or damage.

6.2.4 In proximity to an asset in the highway

Where sufficient depth of cover exists, and the absence of attachments and projections has been confirmed (e.g. valve spindles, pressure points etc.), following evidence from hand dug trial holes, removal of the bituminous or concrete highway surface layer by mechanical means is permitted to a depth of 300mm. Where the bituminous or concrete highway surface layer extends below 300mm deep, it shall only be removed by handheld power assisted tools.

6.2.5 Crossing over an asset (Open cut)

Where a new service is to cross over a gas asset, a minimum clearance distance of 1.5 times the diameter of the gas asset or 300mm, whichever is greater, shall be maintained. If this cannot be achieved, the service shall cross below the asset, see Section 6.2.6.

6.2.6 Crossing below an asset (Open cut)

Where a service is to cross below a gas asset, a minimum clearance distance of 1.5 times the diameter of the gas asset or 300mm, whichever is greater, between the crown of the new service and underside of the asset shall be maintained. The exposed asset shall be suitably supported and protected by matting and timber cladding. Any supports shall be removed prior to backfilling.



6.2.7 Cathodic protection

Cathodic protection (CP) is applied to some buried steel pipes and is a method of protecting assets from corrosion by maintaining an electrical potential between the asset and anodes placed at strategic points along the asset. Where a new service is to be laid and similarly protected, the party installing the CP system shall liaise with the Cadent Plant Protection Officer and undertake tests to determine whether the new service is interfering with the cathodic protection of the Cadent asset.

Should any cathodic protection posts or associated apparatus need moving to facilitate third party works, at least 14 days' notice shall be given to Cadent. Cadent will undertake this work and any associated costs will be borne by the third party.

6.2.8 Installation of electrical equipment

Where electrical equipment is being installed close to Cadent's buried steel assets, the effects of a rise of earth potential under fault conditions shall be considered by the third party, a risk assessment carried out and this shall be provided to the Cadent Plant Protection Officer for inspection. Equipment shall not be installed if the integrity of Cadent's assets is compromised. In this case, diversion of the affected assets is required.

The installation of electrical cables parallel to Cadent assets may induce currents into the asset. This may interfere with the effective operation of cathodic protection systems. In these instances, Cadent will require the promoter of the works to work with the Cadent Plant Protection Officer to ensure that pre and post energisation potential surveys of Cadent's assets are undertaken. The costs for any stray current mitigation systems required will be borne by the third-party promoter.

6.3 Construction traffic

The promoter of the works shall review the ground conditions, vehicle types and crossing frequency to determine the type and construction of crossing that will be required. Additionally, no undue loads such as spoil heaps, lighting columns, permanent traffic lights or road signs should be allowed over gas assets.

Iron pipes, or pipes that are not already within an existing road (such as those within footways or verges), shall not be crossed by construction vehicles without suitable protection and the consent of the Cadent Plant Protection Officer.

Where existing roads cannot be used, construction traffic should only cross Cadent assets at specific locations, with notices directing traffic to the crossing points erected. All crossing points shall:

- Be at right angles to the asset
- Be fenced denoting the existence of the asset to ensure all traffic uses the crossing point. The fencing shall cover the width of any easements and extend a further 6m along the length of any easements on both sides (see Figure 2).
- Have signs attached to the fence denoting the asset that the crossing point is located over

- Be regularly inspected and maintained in good condition

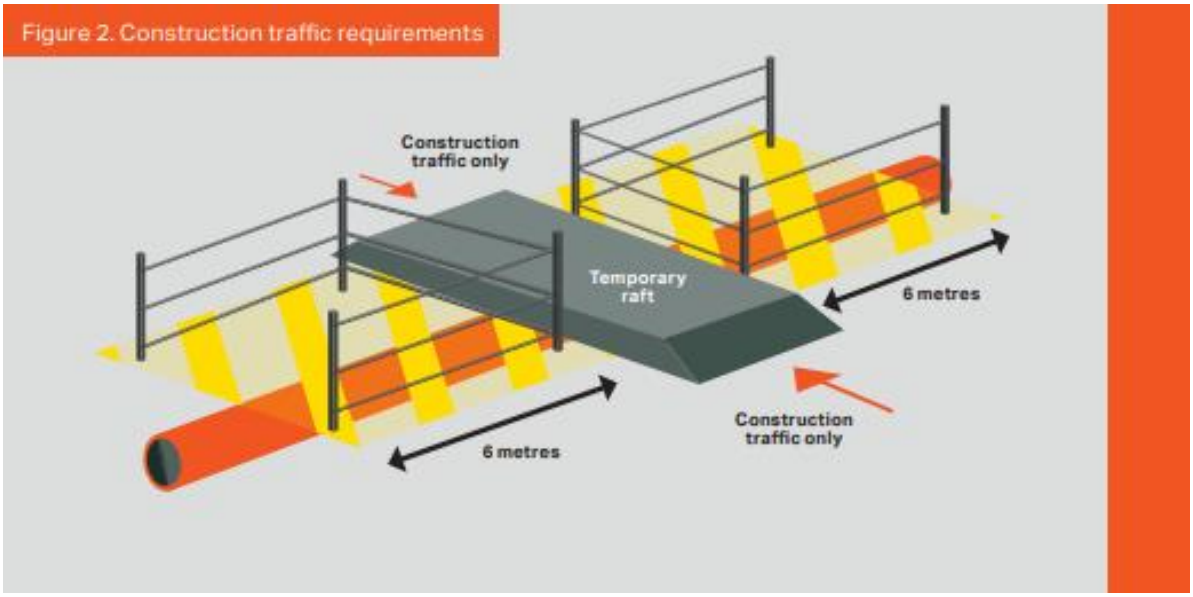
Note: A 5mph speed restriction should be enforced at all crossing points.

Suitable protection methods may include:

- Temporary protection slab
- Free-standing bridges (prefabricated modular steel or pre-cast concrete bridges)
- Proprietary access roadways
- Haul roads (including hardcore, sleepers, steel plates or a combination)

For larger scale projects or permanent crossings, diversion of the asset may be required.

Figure 2. Construction traffic requirements



6.4 Specific activities

This section details the precautions that need to be taken when carrying out certain prescribed activities in the vicinity of a Cadent asset. The promoter of works is required to consult Cadent when intending to undertake one of the activities listed below to obtain further site-specific advice on whether the work has the potential to affect the asset. The table below shows, for some specific activities, the prescribed distances where the advice of Cadent shall be sought.

Activity	Distance within which Cadent advice shall be sought
Piling	15m
Surface mineral extraction	100m
Landfilling	100m
Demolition	150m or 400m for structure mass > 10,000 tonnes
Blasting	500m if the MIC is > 200kg 250m if the MIC is > 10kg but ⩽ 200kg 100m if the MIC is ⩽ 10kg
Deep mining	1000m
Wind turbine	1.5 times mast height

6.4.1 Carriageway construction (including widening & bell mouth construction)

Where it is proposed to carry out carriageway construction over an asset previously located in a footway or verge, you must contact the diversions team to determine if diversion or replacement of the asset is required before commencement of your works.

6.4.2 Trenchless techniques

Where trenchless techniques are being considered, a formal risk assessment and method statement shall be produced and submitted to the Cadent Plant Protection Officer for review prior to commencing work. Please provide Cadent with at least 14 days' notice as we may wish to be present to monitor the work.

6.4.2.1 Tunnelling

Ground movement may occur when tunnelling in soft ground conditions. Ground movement contours from the tunnelling operation shall be calculated and all gas assets within the affected zone should be identified and assessed.

PE assets can tolerate some differential ground movement.

For cast and ductile iron assets, acceptable limits on stress increase and joint disturbances are defined in the performance acceptance criteria for iron mains.

For steel assets, an integrity assessment should be carried out according to the industry standard **IGEM/TD/12 – Pipework stress analysis for gas industry plant**. An expert on Soil/Pipe Interaction Analysis should be consulted when required for the evaluation of ground movement effects on the assets.

For any proposed tunnelling works, you must contact the diversions team to determine if diversion or replacement of the asset is required before commencement of your works, due to the likely impact on our assets.

6.4.3 Changes to depth of cover

The depth of cover over Cadent's asset shall not be altered. Where a change in cover is required, contact your network Plant Protection Officer.

6.4.4 Piling

No piling shall be allowed within 15m of an asset without an assessment of the vibration levels at the asset.

For steel or PE assets, the peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

For iron assets, the peak particle velocity at the asset shall be limited to a maximum level of 25mm/sec.

The promoter of the works should provide the Cadent Plant Protection Officer with the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure the allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made, which may require expert advice.



6.4.5 Demolition

No demolition should be allowed within 150m of an asset for 400m for a structure mass greater than 10,000 tonnes without an assessment of the vibration levels at the asset.

For steel or PE assets, the peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

For iron assets, the peak particle velocity at the asset shall be limited to a maximum level of 25mm/sec.

The promoter of the works should provide the Cadent Plant Protection Officer with the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure the allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought, which can be arranged through Cadent.

6.4.6 Blasting

The Maximum Instantaneous Charge (MIC) dictates the distance at which an assessment of the vibration levels (at the located asset) is required. The measured distances are as follows:

- 500m if the MIC is greater than 200kg
- 250m if the MIC is greater than 10kg but less than 200kg
- 100m if the MIC is 10kg or less

For steel or PE assets, the peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

For iron assets, the peak particle velocity at the asset shall be limited to a maximum level of 25mm/sec.

The promoter of the works should provide the Cadent Plant Protection Officer with the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought, which can be arranged through Cadent.

6.4.7 Surface mineral extraction

An assessment shall be carried out on the effect of surface mineral extraction activity within 100m of a gas asset. Consideration should also be given to extraction around plant and equipment associated with assets (e.g. cathodic protection ground beds).

Where the mineral extraction extends up to the asset easement, a stable slope angle and stand-off distance between the asset and slope crest shall be determined. Where an easement exists, the easement strip shall be clearly marked by a suitable permanent boundary, such as a post and wire fence. Additionally, where appropriate, slope indicator markers shall be erected to facilitate the verification of the recommended slope angle as the slope is formed, by the third party. The asset easement and slope need to be inspected periodically to identify any signs of developing instability. This may include any change of slope profile including:

- Bulging
- The development of tension cracks on the slope or easement
- Any changes in drainage around the slope

The results of each inspection should be recorded.

Where surface mineral extraction activities are planned within 100m of the asset but do not extend up to the asset easement boundary, an assessment should be made as to whether this could promote instability in the vicinity of the asset. This may occur where the asset is routed across a natural slope or the excavation is deep. A significant cause of this problem is where the groundwater profile is affected by changes in drainage or the development of lagoons.

Where the extraction technique involves explosives, the provisions of Section 6.4.6 apply.

6.4.8 Deep mining

Gas assets within 1km of active deep mining may be affected by subsidence resulting from mineral extraction. The determination of protective or remedial measures will normally require expert assistance, which can be arranged through Cadent.

6.4.9 Landfilling

The creation of slopes outside of the asset easements may promote instability within the vicinity of the asset. Cadent should carry out an assessment to determine the effect of any landfilling activity within 100m of an asset. The assessment is particularly important if landfilling operations are taking place on a slope in which the asset is routed.

6.4.10 Pressure testing

Pressure testing should not be permitted within 8m of an asset unless suitable precautions have been taken against the effects of a pipe failure.

6.4.11 Seismic surveys

The promoter of works shall advise Cadent of any seismic surveying work in the vicinity of PE or steel assets that will result in peak particle velocities in excess of 75mm/sec at the asset or for iron assets that will result in peak particle velocities in excess of 25mm/sec at the asset.

The promoter of the works should provide Cadent the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

6.4.12 Hot work

Where the Cadent's metallic gas assets have been exposed, welding (or other hot works that may involve naked flames) should not be carried out in proximity of the gas asset. This may be reduced if suitable protection and precautions have been agreed with Cadent.

If the gas asset is PE (or a PE asset is contained within a metallic sleeve) welding, or other hot works that may involve naked flames, shall not take place within 500mm of the gas asset. For further advice contact your network Plant Protection Officer.

Protection measures shall be agreed with the Cadent Plant Protection Officer prior to installation to prevent the effects of sparks, radiant heat transfer etc.

Any hot works in proximity to a Cadent gas asset require leakage surveys prior to, during and after the works. If gas is detected, all works shall stop, and the leak immediately reported to the National Gas Emergency Service on 0800 111 999.

The Cadent Plant Protection Officer will determine the need to remain on site to monitor all welding, burning or other 'hot work' that takes place.

6.4.13 Wind turbines

Wind turbines shall not be sited any closer than 1.5 times the proposed height of the turbine mast away from the nearest edge of the asset.

Further guidance can be found from UKOPA's Good Practice Guide 13 (UKOPA/GP/013) - Requirements for the Siting and Installation of Wind Turbines Installations in the Vicinity of Buried Pipelines.

6.4.14 Solar farms

Solar Farms can be built adjacent to gas assets, but never within an easement. Advice shall be sought from Cadent at the early stages of design to ensure that electrical interference, security, future access and construction methods can be mutually agreed.

Interference checks shall be completed by the third party to ensure that the solar installations and associated infrastructure have no negative effect on cathodic protection systems.

Further guidance can be found from UKOPA's Good Practice Guide 14 (UKOPA/GP/014) - Requirements for the Siting and Installation of Solar Photovoltaic (PV) Installations in the Vicinity of Buried Pipelines.

6.4.15 Lifting operations

Where lifting operations are planned to be carried out in the vicinity of medium pressure apparatus a site-specific risk assessment and lift plan is required to be reviewed by the Cadent Plant Protection Officer.

Protection shall be afforded to live apparatus when carrying out the works to prevent impact damage in the event of an uncontrolled failure or drop. Any loads shall be secured using suitable and sufficient lifting accessories to reduce the likelihood of the load being dropped.

Consideration shall be given to the location of lifting equipment and the loads induced into the ground to avoid the potential overloading of buried apparatus. Where the site cannot be laid out to avoid loading gas apparatus, the asset shall be suitably protected with the consent of the Cadent Plant Protection Officer. Alternatively, the asset will require replacement/diversion.

6.5 Backfilling and reinstatement

Reinstatement around Cadent apparatus still poses a risk to the integrity of the asset. A gas asset must not be located within the footway or carriageway construction as this has the potential to cause damage to the apparatus during and post completion of the reinstatement.

No backfilling should be undertaken without Cadent's agreement to proceed. Some equipment may not be suitable for use over or around assets due to the adverse effects of excessive compaction and vibration levels.

A gas asset shall not be encased in concrete or have concrete positioned within 300mm of the asset, or anywhere above an iron gas asset due to the need for future access.

The fine fill material should be firmly packed around the pipe in 100mm layers to achieve a compacted thickness of 75mm and shall be laid to a minimum depth of 150mm above the crown of the asset.

Mechanical compaction equipment shall not be used until a 250mm hand rammed layer has been compacted above the crown of the pipe.

For backfilling and reinstatement in the vicinity of iron apparatus, in addition to the above, the maximum weight of compaction equipment used above the crown of the asset shall not exceed 1.5t/m^2 and vibratory compaction shall not be used.

Material used in the backfill shall conform to the following requirements:

- Sand shall be well-graded in accordance with BS EN 13242:2002+A1:2007
- It shall not contain any sharp objects, large stones or bricks

- Foamed concrete shall not be used

We will require marker tape to be installed at least 250mm above the crown of the main.

Prior to backfilling, if the asset is coated, Cadent require the opportunity to inspect its condition in order assess and to carry out any repairs as necessary. Please contact your network Plant Protection office to arrange this. Any damage to the asset or coating shall be reported to the Cadent Plant Protection Officer so that damage can be assessed, and repairs carried out.

Minor (and existing) damage to pipe coating and cathodic protection test leads will be repaired by Cadent free of charge. If the asset has been backfilled without the knowledge of the Cadent Plant Protection Officer, the third party will need to re-excavate to enable the condition of the asset coating to be assessed.

All temporary supports shall be removed prior to backfill but only when the asset is sufficiently supported by bedding material around the pipe.



7. Working in the Vicinity of a Low Pressure Gas Asset (Operating at Pressures up to 75 mbar)

For planned and emergency works in the vicinity of Low Pressure gas assets, the promoter will be advised proceed with caution. The guidance contained within this section must be followed. If it cannot, contact shall be made with the network Plant Protection office for advice.

7.1 Temporary and permanent structures

No temporary or permanent structures are permitted to be installed above, or in close proximity to a gas asset or easement due to the restriction of access this imposes. This includes, but is not limited to, permanent street furniture such as planters and bollards and temporary buildings such as welfare units and other enclosed spaces. The building proximity distances for low pressure assets is as follows:

Material	Minimum proximity to premises
All materials	1m

Please note that the easement distance may be greater than the building proximity distance, for any proposed structures in the easement please consult with the Cadent network Plant Protection Officer.

7.2 Excavation

7.2.1 General

Mechanical excavators should not be sited or moved above an asset.

Mechanical excavators and any other powered mechanical plant shall not dig on one side of an asset with the cab of the excavator positioned on the other side. All traffic should be positioned far enough away from the trench to prevent trench wall collapse.

Excavation with a powered mechanical excavator should not be carried out until gas assets have been located through vacuum excavation or by hand. No mechanical excavation is permitted within 500mm of gas assets. Any mechanical excavation should utilise a banksman. Toothless buckets shall be used due to the potential of damage to assets using toothed excavator buckets.

Consideration shall be given to apparatus installed on gas assets including valves, spindles, pressure points etc. Any fitting, attachment or connecting pipework on the asset shall be exposed by hand.

Where concrete is exposed around gas apparatus this shall not be removed as it could be providing protection or anchorage to the live apparatus.

Where a third party is using any trench support system, they shall ensure that none of its components are in contact with the asset.

The use of chain trenchers to do this is not permitted within 3m of the confirmed location of the asset.

7.2.2 Working in vicinity of iron pipework

When deep excavation greater than 1.5m in depth is carried out in the vicinity of iron pipework, steps shall be taken to ensure the risk associated with immediate and latent asset failure are considered, and where necessary, excavations are cut back to reduce the shear factor created by ground disturbance likely to result in settlement. This also includes instances where excavations are part of construction works including basement conversions, underground carparks, shaft construction, etc.

Care should be taken to ensure that any exposed iron pipework is suitably supported at 1m intervals and is protected from damage to avoid creating tensions that could lead to joint disturbance or pipe barrel fracture.

Where fittings or existing repairs are uncovered care shall be taken to ensure that these are not disturbed.

When working near ductile iron pipework should any corrosion be identified on the pipeline this shall be reported to 0800 111 999 for a first call operative to attend to undertake a hazard assessment.

7.2.3 In proximity to an asset in an easement

Where sufficient depth of cover exists and the absence of attachments and projections has been confirmed (e.g. valve spindles, pressure points etc.), following evidence from hand dug trial holes, light tracked vehicles may be permitted to strip topsoil to a depth of 250mm using a toothless bucket.

No topsoil or other materials shall be stored within the easement without the written permission of Cadent. No fires are allowed in the easement strip or other gas assets.

After the completion of the work, the level of cover over an asset should be the same as that prior to work commencing.

No new service shall be laid parallel to an asset within an easement.

Where work is being carried out parallel to an asset, within or alongside an easement, suitable barriers shall be erected between the works and the asset to prevent encroachment or damage.

7.2.4 In proximity to an asset in the highway

Where sufficient depth of cover exists, and the absence of attachments and projections has been confirmed (e.g. valve spindles, pressure points etc.), following evidence from hand dug trial holes, removal of the bituminous or concrete highway surface layer by

mechanical means is permitted to a depth of 300mm. Where the bituminous or concrete highway surface layer extends below 300mm deep, it shall only be removed by handheld power assisted tools.

7.2.5 Crossing over an asset (Open cut)

Where a new service is to cross over an asset, a minimum clearance distance of 1.5 times the diameter of the gas asset or 300mm, whichever is greater shall be maintained. If this cannot be achieved, the service shall cross below the asset, see Section 7.2.6.

7.2.6 Crossing below an asset (Open cut)

Where a service is to cross below an asset, a minimum clearance distance of 1.5 times the diameter of the gas asset or 300mm, whichever is greater, between the crown of the new service and underside of the asset shall be maintained. The exposed asset shall be suitably supported and protected by matting and timber cladding. Any supports shall be removed prior to backfilling.

7.2.7 Cathodic protection

Cathodic protection (CP) is applied to some buried steel pipes and is a method of protecting assets from corrosion by maintaining an electrical potential between the asset and anodes placed at strategic points along the asset. Where a new service is to be laid and similarly protected, the party installing the CP system shall undertake tests to determine whether the new service is interfering with the cathodic protection of the Cadent asset.

Should any cathodic protection posts or associated apparatus need moving to facilitate third party works, appropriate notice, shall be given to Cadent. Cadent will undertake this work and any associated costs will be borne by the third party.

7.2.8 Installation of electrical equipment

Where electrical equipment is being installed close to Cadent's buried steel assets, the effects of a rise of earth potential under fault conditions shall be considered by the third party and a risk assessment carried out. Equipment shall not be installed if the integrity of Cadent's assets is compromised. In this case, diversion of the affected assets will be required.

The installation of electrical cables parallel to Cadent assets may induce currents into the asset. This may interfere with the effective operation of cathodic protection systems. In these instances, Cadent will require the promoter of the works to conduct pre and post energisation potential surveys of Cadent's assets. The costs for any stray current mitigation systems required will be borne by the third-party promoter.

7.3 Construction traffic

The promoter of the works should review the ground conditions, vehicle types and crossing frequency to determine the type and construction of crossing that will be required. Additionally, no undue loads such as spoil heaps, lighting columns, permanent traffic lights or road signs shall be allowed over gas assets.

Iron pipes, or pipes that are not already within an existing road such as those within footways or verges shall not be crossed by construction vehicles without suitable protection being designed and installed. Consideration shall be given to the requirement for access to low pressure apparatus therefore for large scale, long duration projects, or permanent crossings, the diversions process shall be followed to determine whether the asset requires diversion/replacement in advance of the works taking place.

Where existing roads cannot be used, construction traffic should only cross Cadent assets with a minimum depth of cover of 750mm (post crossing construction) at specific locations, with notices directing traffic to the crossing points erected. All crossing points shall:

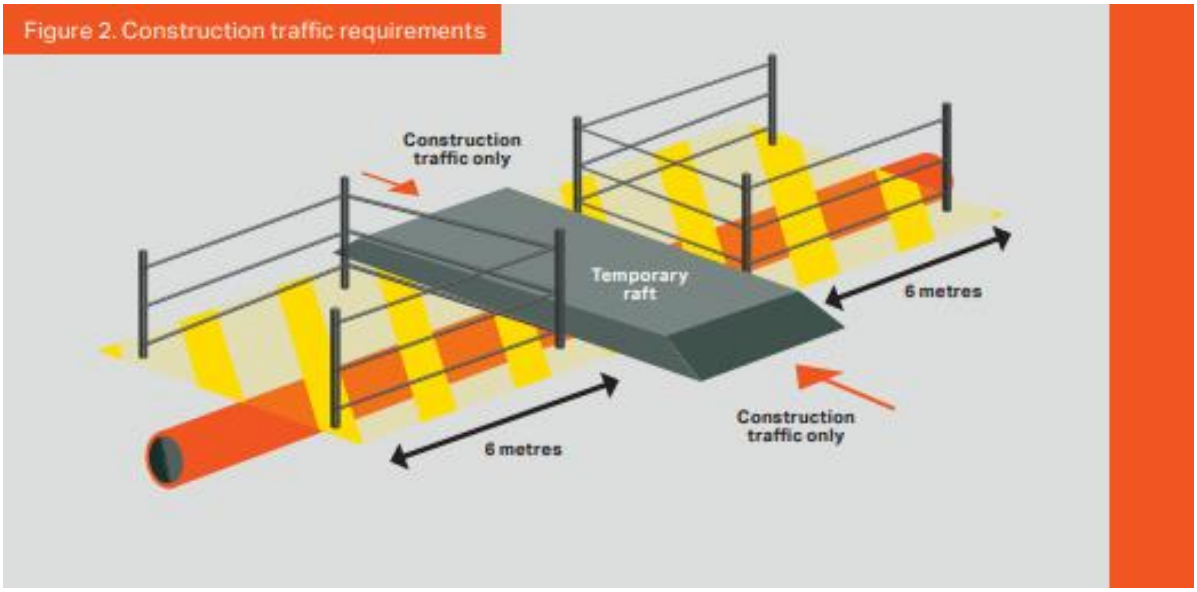
- Be at right angles to the asset
- Be fenced denoting the existence of the asset to ensure all traffic uses the crossing point. The fencing shall cover the width of any easements and extend a further 6m along the length of any easements on both sides (see Figure 2).
- Have signs attached to the fence denoting the asset that the crossing point is located over
- Be regularly inspected and maintained in good condition

Note: A 5mph speed restriction should be enforced at all crossing points.

Suitable protection methods may include:

- Temporary protection slab
- Free-standing bridges (prefabricated modular steel or pre-cast concrete bridges)
- Proprietary access roadways
- Haul roads (including hardcore, sleepers, steel plates or a combination)

Figure 2. Construction traffic requirements



7.4 Specific activities

This section details the precautions that need to be taken when carrying out certain prescribed activities in the vicinity of a Cadent asset. The promoter of works is required to consult Cadent when intending to undertake one of the activities listed below and further advice is required on whether the work has the potential to affect the asset.

7.4.1 Carriageway construction (including widening & bell mouth construction)

Where it is proposed to carry out carriageway construction over an asset previously located in a footway or verge you must contact the diversions team to determine if diversion or replacement of the asset is required before commencement of your works.

7.4.2 Trenchless techniques

Where trenchless techniques are being considered, a formal risk assessment and method statement shall be produced prior to commencing work.

Trial holes shall be undertaken to ensure that sufficient clearance exists between gas assets and the proposed third-party asset (or the pipe to be split if a pipe splitting technique is being used) prior to the works.

If an asset is to be replaced using pipe splitting techniques in the vicinity of iron mains, in addition to the below clauses, an integrity assessment shall be undertaken.

When running parallel to gas assets, the minimum clearance shall be:

- 1m

When crossing gas assets, the minimum clearance shall be:

- 500mm or 1.5 times the diameter of the asset, whichever is greater.

Clearances may need to be increased due to the following factors:

- Ground conditions
- Largest reamer diameter
- Type of reamer used, e.g. hollow, finned, etc.
- Accuracy of equipment being used
- Construction of adjacent services and structures
- Configuration of other underground services crossing or running parallel to the drill path
- Consequences of damage
- Pipe stress increase from potential ground movement

The exposed asset should be suitably supported and be protected by matting and suitable timber cladding to reduce the risk of damage from any broken pipe fragments (if pipe

splitting is used). Supports shall be removed prior to backfill but only when the asset is sufficiently supported by bedding material around the pipe.

All lateral crossings shall be exposed around their full circumference with an additional 250mm clearance below. The width of the excavation shall be three times the diameter of the largest reamer or 500mm either side of the largest reamer, whichever is the greatest. These clearances shall be measured from the drill path centre. Each crossing should be manned during the drilling/splitting operation to watch the reamer/splitter pass.

For pipe splitting running parallel to a buried gas asset, trial holes should be undertaken at suitable and frequent locations along the proposed route to confirm sufficient clearance distances exist, and the pipe route is confirmed.

The line of the pipe to be installed/split should be monitored along its length to ensure no variance from its path.

Consideration should be given for a leakage survey to be undertaken before work starts, during the works if safe to do so and following completion. If there is any likelihood of damage to the asset, the operation shall be stopped immediately.

7.4.2.1 Tunnelling

Ground movement may occur when tunnelling in soft ground conditions. Ground movement contours from the tunnelling operation shall be calculated and all gas assets within the affected zone should be identified and assessed.

PE assets can tolerate some differential ground movement.

For cast and ductile iron assets, acceptable limits on stress increase and joint disturbances are defined in the performance acceptance criteria for iron mains.

For steel assets an integrity assessment should be carried out according to the industry standard **IGEM/TD/12 – Pipework stress analysis for gas industry plant**. An expert on Soil/Pipe Interaction Analysis should be sought when required for the evaluation of ground movement effects on the assets.

For any proposed tunnelling works, due to the likely impact on our assets you must contact the diversions team to determine if diversion or replacement of the asset is required before commencement of your works.

7.4.3 Changes to depth of cover

The depth of cover over or around Cadent's iron assets shall not be altered. If a change in the depth of cover is required, you must contact the diversions team to arrange for diversion or replacement of the asset before commencement of your works.

For PE and steel pipes, reductions in depth of cover are only permitted if the below minimum depths of cover can be maintained (following investigation across the affected length):

- In fields and agricultural land 1.1m
- In roads and verges 750mm
- In footpaths 600mm
- In private property 600mm

Substantial increases in depth of cover shall not be permitted.

Where a change in the depth of cover affects attachments and projections such as services and valves, liaison with our diversions team is required to ensure these are appropriately protected or altered.

7.4.4 Piling

No piling shall be allowed within 15m of an asset without an assessment of the vibration levels at the asset.

For steel or PE assets, the peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

For iron assets, the peak particle velocity shall be limited to a maximum level of 25mm/sec.

The promoter of the works should determine the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure the allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made, which may require expert advice.

7.4.5 Demolition

No demolition should be allowed within 150m of an asset for 400m for a structure mass greater than 10,000 tonnes without an assessment of the vibration levels at the asset.

For steel or PE assets, the peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

For iron assets, the peak particle velocity at the asset shall be limited to a maximum level of 25mm/sec.

The promoter of the works should determine the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure the allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought.

Where demolition is proposed you must ensure that the gas supply to the premises has been isolated in a suitable, identified location.

7.4.6 Blasting

The Maximum Instantaneous Charge (MIC) dictates the distance at which an assessment of the vibration levels (at the located asset) is required. The measured distances are as follows:

- 500m if the MIC is greater than 200kg
- 250m if the MIC is greater than 10kg but less than 200kg
- 100m if the MIC is 10kg or less

For steel or PE assets, the peak particle velocity at the asset shall be limited to a maximum level of 75mm/sec.

For iron assets, the peak particle velocity at the asset shall be limited to a maximum level of 25mm/sec.

The promoter of the works should determine the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

Where ground conditions include silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the asset shall be made. Expert advice may need to be sought.

7.4.7 Surface mineral extraction

An assessment shall be carried out on the effect of surface mineral extraction activity within 100m of an asset. Consideration should also be given to extraction around plant and equipment associated with assets (e.g. cathodic protection ground beds).

Where the mineral extraction extends up to the asset easement, a stable slope angle and stand-off distance between the asset and slope crest shall be determined. Where an easement exists, the easement strip shall be clearly marked by a suitable permanent boundary, such as a post and wire fence. Additionally, where appropriate, slope indicator markers shall be erected to facilitate the verification of the recommended slope angle as the slope is formed, by the third party. The asset easement and slope need to be inspected periodically to identify any signs of developing instability.

This may include any change of slope profile including:

- Bulging
- The development of tension cracks on the slope or easement
- Any changes in drainage around the slope

The results of each inspection should be recorded.

Where surface mineral extraction activities are planned within 100m of the asset but do not extend up to the asset easement boundary, an assessment should be made as to whether this could promote instability in the vicinity of the asset. This may occur where the asset is routed across a natural slope or the excavation is deep. A significant cause of this problem is where the groundwater profile is affected by changes in drainage or the development of lagoons.

Where the extraction technique involves explosives, the provisions of Section 7.4.6 apply.

7.4.8 Deep mining

Assets routed within 1km of active deep mining may be affected by subsidence resulting from mineral extraction. The determination of protective or remedial measures will normally require expert assistance.

7.4.9 Landfilling

The creation of slopes outside of the asset easements may promote instability within the vicinity of the asset. An assessment shall be carried out by the promoter of the works to determine the effect of any landfilling activity within 100m of an asset. The assessment is particularly important if landfilling operations are taking place on a slope in which the asset is routed.

7.4.10 Pressure testing

Pressure testing should not be permitted within 8m of an asset unless suitable precautions have been taken against the effects of a pipe failure.

7.4.11 Seismic surveys

The promoter of works shall advise Cadent of any seismic surveying work in the vicinity of PE or steel assets that will result in peak particle velocities in excess of 75mm/sec at the asset or for iron assets that will result in peak particle velocities in excess of 25mm/sec at the asset.

The promoter of the works should determine the anticipated vibration levels prior to the work commencing. The ground vibration should be monitored by the promoter to verify the anticipated levels and to ensure allowable peak particle velocity is not exceeded. Alarms should be set at suitable increments to provide a forewarning of limit exceedance. The promoter shall retain records of ground vibration levels for provision of the Cadent Plant Protection Officer on request.

7.4.12 Hot work

Where the Cadent's metallic gas asset has been exposed, welding (or other hot works that may involve naked flames) should not be carried out in proximity of the gas asset.

If the gas asset is PE (or a PE asset is contained within a metallic sleeve) welding, or other hot works that may involve naked flames, shall not take place within 500mm of the gas asset.

Protection measures shall be installed to prevent the effects of sparks, radiant heat transfer etc.

Any hot works in proximity to a Cadent gas asset shall require leakage surveys prior to, during and after the works. If gas is detected, all works shall stop, and the leak immediately reported to the National Gas Emergency Service on 0800 111 999.

7.4.13 Wind turbines

Wind turbines shall not be sited any closer than 1.5 times the proposed height of the turbine mast away from the nearest edge of the asset.

Further guidance can be found from UKOPA's Good Practice Guide 13 (UKOPA/GP/013) - Requirements for the Siting and Installation of Wind Turbines Installations in the Vicinity of Buried Pipelines.

7.4.14 Solar farms

Solar Farms can be built adjacent to assets but never within an easement.

Interference checks shall be completed by the third party to ensure that the solar installations and associated infrastructure have no negative effect on cathodic protection systems.

Further guidance can be found from UKOPA's Good Practice Guide 14 (UKOPA/GP/014) - Requirements for the Siting and Installation of Solar Photovoltaic (PV) Installations in the Vicinity of Buried Pipelines.

7.4.15 Lifting operations

Where lifting operations are planned to be carried out in the vicinity of low pressure apparatus a site-specific risk assessment and lift plan is required.

Protection shall be afforded to live apparatus when carrying out the works to prevent impact damage in the event of an uncontrolled failure or drop. Any loads shall be secured using suitable and sufficient lifting accessories to reduce the likelihood of the load being dropped.

Consideration shall be given to the location of lifting equipment and the loads induced into the ground to avoid the potential overloading of buried apparatus. Where the site cannot be laid out to avoid loading gas apparatus, the asset shall be suitably protected with the consent of the Cadent Plant Protection Officer. Alternatively, the asset will require replacement/diversion.

7.5 Backfilling and reinstatement

Reinstatement around Cadent apparatus still poses a risk to the integrity of the asset. A gas asset must not be located within the footway or carriageway construction as this has the potential to cause damage to the apparatus during and post completion of the reinstatement.

No backfilling should be undertaken without Cadent's agreement to proceed. Some equipment may not be suitable for use over or around assets due to the adverse effects of excessive compaction and vibration levels.

A gas asset shall not be encased in concrete or have concrete positioned within 300mm of the asset or anywhere above an iron gas asset due to the need for future access.

The fine fill material should be firmly packed around the pipe in 100mm layers to achieve a compacted thickness of 75mm and shall be laid to a minimum depth of 150mm above the crown of the asset

Mechanical compaction equipment shall not be used until a 250mm hand rammed layer has been compacted above the crown of the pipe

For backfilling and reinstatement in the vicinity of iron apparatus, in addition to the above, the maximum weight of compaction equipment used above the crown of the pipe shall not exceed 1.5t/m^2 and vibratory compaction shall not be used.

Material used in the backfill shall conform to the following requirements:

- Sand shall be well-graded in accordance with BS EN 13242:2002+A1:2007
- It shall not contain any sharp objects, large stones or bricks
- Foamed concrete shall not be used

We will require marker tape to be installed at least 250mm above the crown of the pipe. Any damage to the asset or coating shall be reported to the Cadent Plant Protection Office so that damage can be assessed, and repairs carried out.

Minor (and existing) damage to pipe coating and cathodic protection test leads will be repaired by Cadent free of charge. If the asset has been backfilled without the knowledge of the Cadent Plant Protection Officer, the third party will need to re-excavate to enable the condition of the asset coating to be assessed.

All temporary supports shall be removed prior to backfill but only when the asset is sufficiently supported by bedding material around the pipe.

8. Working in the Vicinity of a Pressure Reduction Installation (PRI)

Pressure reduction installations come in a variety of forms:

- Above Ground Installation (AGI) – Sites with exposed pipes surrounded by fencing
- Above Ground Installation (AGI) – District governors often found in large above ground kiosks with vent stacks attached
- Below Ground Installation – District governors with large surface governors for valves and pressure reduction equipment with an above ground control cabinet and vent stack
- Service governor Installations – Small service governors providing gas to a small number of customers in an area often identified by a small green or brick kiosk

Where excavations are to be made within 10 metres of the perimeter of a pressure reduction installation (above or below ground), with the exception of service governor installations, appropriate protection methods should be determined and recorded by the Cadent Plant Protection Officer.

These installations may have magnetic slam shut devices which could operate in the event of high vibration levels being caused by the works. Advice on whether these are present shall be sought from the Cadent Plant Protection Officer and we may need to have an operative, with the competence to reset the plant, on site whilst your works are being undertaken.

Hazardous areas may be present around these installations and no ignition sources are permitted within these zones. Information on the zonings shall be sought from the Cadent Plant Protection Officer prior to commencement of any works on site.

There may be telemetry and pressure recording lines in the vicinity of these installations therefore extreme caution must be exercised when planning and undertaking works it the vicinity of these assets.

In addition to this, the safety advice detailed in either or a combination of Sections 5, 6 or 7 shall be observed when working in the proximity of an AGI.

Access to gas assets shall be maintained at all times.

9. Tree Planting

Before any tree planting is carried out in the vicinity of a Cadent asset or its easement, written consent should be obtained. This approval should be subject to Cadent retaining the right to remove any trees which might become a danger or restrict access to the asset at any time in the future.

The only hardwood plants which can be planted directly across an asset are shallow rooting hedge plants such as Quickthorn, Blackthorn, etc., and these shall only be planted where a hedge is necessary for screening or to indicate a field boundary.

Raspberries, Gooseberries and Blackcurrants shall not be planted within 2m of the outside edge of the pipe.

Dwarf Apple Stocks shall not be planted within 3m of an asset.

Christmas trees (Picea Abies) shall not be planted within 3 metres of an asset. However, permission may be given on the strict understanding that Christmas trees are clear-felled at intervals not exceeding seven years.

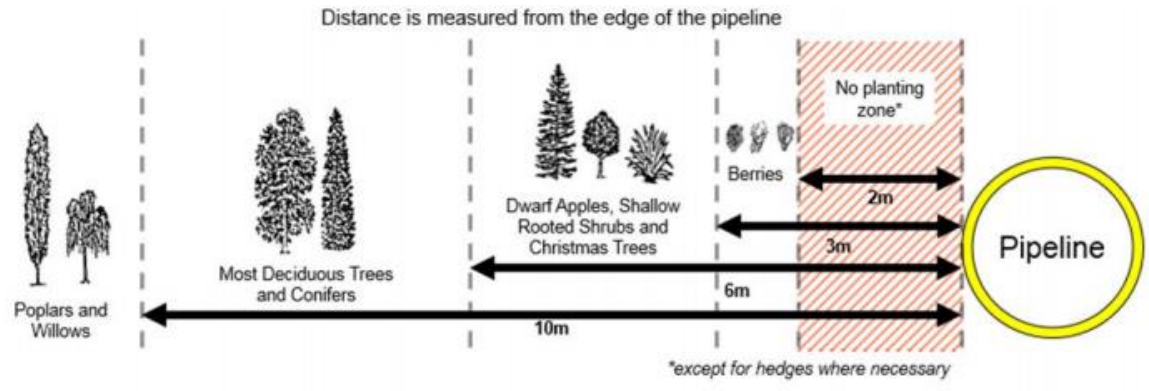
The following trees, and those of similar size which may be deciduous or evergreen, shall not be planted within 6 metres of an asset:

- Ash, Beech, Birch, most Conifers, Elm, Maple, Horse Chestnut, Oak, Sycamore, Apple, Lime and Pear trees.

Dense mass planting shall not be carried out within 10m of the outside edge of the pipe.

Poplar and Willow trees shall not be planted within 10m of the outside edge of the pipe.

For further guidance please refer to NJUG Volume 4.



10. Unidentified Exposed Pipes

An unidentified pipe is one that is not shown on any current or historical records.

Iron and steel water pipes and gas pipelines may appear very similar. If any such pipe is uncovered, it shall be treated as if it were a gas pipe.

If upon checking with all other utilities you believe an unidentified pipe to be a gas pipe, the promoter of the works shall contact plantprotection@cadentgas.com with the following information:

- LSBUD enquiry reference
- Site address (please include postcode and grid references)
- Site contact details
- Size of pipe
- Pipe material
- Confirmation that the unidentified pipe is exposed (if not, it will need to be exposed prior to our attendance)
- Confirmation that Cadent and all other asset owners plans, are available for review and inspection
- Photos of the pipe

Please be aware that it can take up to 28 days for us to confirm whether the unidentified exposed pipe is a gas asset or not.

11. Action in case of Damage to an Asset

If you hit a gas asset, whether the damage is visible or not, or in the event of an emergency, call the National Gas Emergency Service immediately on 0800 111 999*.

If the Cadent asset is damaged, even slightly, and even if no gas leak has occurred, then the following precautions shall be taken immediately:

- Shut down all plant and machinery and extinguish any potential sources of ignition.
- Evacuate all personnel from the vicinity of the asset
- Notify Cadent using the free 24-hour emergency telephone number 0800 111999
- Notify the Cadent responsible person immediately using the contact telephone number provided.
- Ensure no one approaches the asset.
- Do not try to stop any leaking gas.
- Provide assistance as requested by Cadent, or emergency services to safeguard persons and property



12. References

Document reference	Title
HASAWA	The Health and Safety at Work etc Act 1974
CDM	The Construction (Design and Management) Regulations 2015
LOLER	Lifting Operations and Lifting Equipment Regulations 1998
RIDDOR	Reporting of Injuries, Diseases & Dangerous Occurrences Regulations 2013,
GS(M)R	Gas Safety (Management) Regulations 1996
PSR	Pipelines Safety Regulations 1996
NRSWA	New Roads and Street Works Act 1991
HS(G)47	Avoiding Danger from Underground Services
IGEM/SR/18	Safe Working Practices to Ensure the Integrity of Gas Pipelines and Associated Installations
IGEM/TD/12	Pipework stress analysis for gas industry plant
NJUG Volume 4	Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees
UKOPA/11/0027	Requirements for the Siting of Wind Turbines Close to HP Pipelines
UKOPA/GP/013	Requirements for the Siting and Installation of Wind Turbines Installations in the Vicinity of Buried Pipelines
UKOPA/GP/014	Requirements for the Siting and Installation of Solar Photovoltaic (PV) Installations in the Vicinity of Buried Pipelines

13. Glossary of Terms

Term	Definition
Easement	Easements are negotiated legal entitlements between Cadent and landowners and allow Cadent to lay, operate and maintain assets within the easement strip. Easement strips may vary in width, typically between 6 and 25 metres depending on the diameter and pressure of the pipeline. Consult Cadent for details of the extent of the easement strip where work is intended.
Liquefaction	Liquefaction is a phenomenon in which the strength and stiffness of the soil is reduced by earthquake shaking or other rapid loading. Liquefaction occurs in saturated soils, that is, soils in which the space between individual particles is completely filled with water. When liquefaction occurs, the strength of the soil decreases and the ability of the soil to support assets are reduced.
Promoter of works	The person or persons, firm, company or authority for whom new services, structures or other works in the vicinity of existing Cadent assets and associated installations operating above 7 bar gauge are being undertaken.
Cadent Plant Protection Officer	The person or persons appointed by Cadent with the competencies required to act as the Cadent representative for the purpose of monitoring a particular activity.
Banksman	Another person who assists the machine operator from a position where they can safely see into the excavation and warn the driver of any services or other obstacles. This person should remain outside of the operating radius of the excavator arm and bucket.

Appendix A – Asset Location Markers



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bitmap_layout select_raster

LEGEND

EXISTING PLANT

EXISTING PLANT

bitmap_layout select_raster

Head Office
CityFibre Holdings Ltd
15 Bedford Street,
London,
WC2E 9HE

Tel: 0845 293 0774
Web: www.cityfibre.com

Asset Office
CityFibre Holdings Ltd,
Rutherford House,
Birchwood,
Warrington,
WA3 6ZH

Email: asset.team@cityfibre.com

Disclaimer:

Information shown on this plan is for general guidance only. No warranty is made as to its accuracy.
This plan must not be solely relied upon in the event of excavation or other works being carried out in the vicinity of Cityfibre plant.
No liability of any kind is accepted by Cityfibre, its agents or servants for any error, omission, discrepancy or deviation. This information is valid for the date printed.

Project

Plant Enquiry

Drawing

Existing Plant

Drawn by:

smallworld

Date: 11/08/2021

Drawing No.

CFH_EP_000001

Revision

001

Scale: 1:2500

A4

0m 20m 40m 60m 80m 100m

N



bitmap_layout select_raster

LEGEND

EXISTING PLANT

EXISTING PLANT

bitmap_layout select_raster

Head Office
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15 Bedford Street,
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Plant Enquiry

Drawing

Existing Plant

Drawn by:

smallworld

Date: 11/08/2021

Drawing No.

CFH_EP_000001

Revision

001

Scale: 1:2500

A4

0m 20m 40m 60m 80m 100m

N

Conditions and information regarding electricity mains

These general conditions and precautions apply to the electricity distribution system of Electricity North West Limited.

Please ensure that a copy of these conditions is passed to your representative and contractor on site.

1. There may be other Electricity North West Limited apparatus in the vicinity, which is not indicated on the cable records. Other apparatus may also be present which a third party owns other than Electricity North West Limited

2. Before any machines are used all of Electricity North West's underground apparatus should be located by manual excavation taking the appropriate safety precautions in accordance with the **Health and Safety Executive Guidance note HS(G)47 "Avoiding danger from underground services"**. This contains advice to site personnel when working near underground services.

   Underground services, particularly electricity and gas, can be dangerous. Damage to electricity cables can cause a dangerous flash, leading to severe burns or even death. Gas leaks can cause fire or explosion.

   Damage can result from excavation or penetration of the ground, e.g. by a road pin.

   Underground services may be found in roads, footpaths and on sites. Always assume that they are present. Treat any services found anywhere as live.

   Accidents have happened because people have mistaken one service for another, e.g. black plastic covered electricity cables look like black plastic water pipes and cast iron gas and water mains look alike. Check before you act.

3. Before starting work you must:

   - Make sure you have plans of the underground services in the area. This may not always be possible for emergency or unforeseen works. **Remember that service connection cables and pipes from the main to building or streetlight may not be shown**.
   - Use a cable and pipe locator to trace electricity cables and metal pipes.
   - Look for signs of service connection cables or pipes, e.g. a gas meter or service connection entry into a house or a streetlight.
   - Hand dig trial holes (as many as necessary) to confirm the position of services in close proximity to the area of work.

4. When you start work:

   - Hand dig near buried services whenever possible. Spades and shovels are safer than picks, pins or forks.
   - Remember that cables may be embedded in concrete. Electricity cables embedded in concrete **must** either be made dead before the concrete is broken out or another safe way of working agreed with the cable owner.
   - Watch out for signs of services as work continues.
   - Report damage to a cable, pipe or pipe coating however slight.
   - Do not use hand held power tools within 0.5m of he marked position of an electricity cable, unless this is impracticable and the line of the cable has been identified by plans and positively confirmed by a locator.
   - Do not use hand held power tools directly over the marked line of cable unless:

     a) You have already found the cable at that position by careful hand digging beneath the surface and it is at a safe depth (at least 300mm) below the bottom of the surface to be broken, or

     b) Physical means have been used to prevent the tool striking it.

   - If an excavator is used near an electricity cable keep everyone clear of the bucket while it is digging. Buckets should not be used near cable – hand dig.
   - Do not use exposed services as a convenient step or handhold.
   - Do not handle or attempt to alter the position of an exposed service.
   - Do not install plant close to an existing service.
   - Do not build existing services into a manhole or other structure or encase them in concrete.

Would you also ensure that all site operators have this information and if any electrical apparatus is damaged, they/you should contact Electricity North West Limited fault desk on **0800 195 4141 (option 1)**

5. Overhead lines are not necessarily shown on the Electricity North West Limited cable records but may be present. In the event of work being carried out adjacent to overhead lines (including access, storage etc.) please always ensure strict adherence to the requirements of the **Health and Safety Executive's Document GS6 "Avoidance of Danger from Overhead Electric Lines"**.

   Extreme personal danger can result from contact, or near contact, with live conductors or overhead lines.

   Treat all overhead lines and other electrical apparatus as live. If in doubt, get advice.

6. Electricity North West Limited must be consulted if work is to take place within 15 metres of overhead lines on steel towers or 9 metres of overhead lines on wood, concrete or steel pylons. (All distances should be measure at ground level from a position estimated by eye to be vertically under the outermost conductor at a tower or pole position) Any person involved in work in the vicinity of overhead lines should:

   - Understand and follow the instructions given on safe working areas and methods of work.
   - Make sure that warning notices are in the cabs of machines working in the vicinity of an overhead line.
   - Make sure that barriers and warning notices are erected as required.
   - Not tip soil or stack material underneath overhead lines as this may reduce the clearance to an unsafe distance.
   - Make sure when handling or using platforms, scaffold, poles, piping, ladders, hand tools etc., that they are kept at a safe distance from overhead lines.
   - Not steady a suspended load, skip, hoist wire, slings etc., unless satisfied that there isn't any danger from overhead lines.
   - Remember that when mobile plant, such as a crane or excavator, is operating near overhead lines , the raising or slewing of the jib may introduce danger.
   - Always keep overhead lines in view when manoeuvring mobile plant.
   - Never operate a machine unless carefully guided by an experienced banksman.
   - Not approach or touch any broken or fallen conductors or any plant in contact with an overhead line before Electricity North West Limited confirms that conditions are safe. Warn others to keep well clear.

   Machine operators should note that: if a machine comes into contact with an overhead line and cannot be disentangled by backing off, remain seated in the cab and warn others to keep clear of the machine until Electricity North West Limited confirms that conditions are safe. If it is essential to leave the machine while it is in contact with the overhead line, for example if it catches fire, jump well clear – and **do not** attempt to climb down in the normal way nor touch any part of the machine when on the ground.

7. Electricity North West Limited provides approximate locations of its electricity mains or apparatus according to its records but these records are not necessarily accurate or complete and do not always show the position of private cables from mains to properties. No person or company shall be relieved from liability for any damage caused by reason of the actual positions and/or depths being different from those indicated.

8. Care should be taken when excavating near cables. Known road crossings are highlighted on the enclosed plans. Should any cable, or Electricity North West Limited apparatus indicated on the attached plans, be affected by your proposals please contact us as follows:

   Data Management
   Linley House
   Dickinson St
   Manchester
   M1 4LF

   Telephone: **0800 195 4141 (option 2)**

   Details of diversion costs, if any, will be provided on request once your firm proposals have been submitted.

9. Please note that service cables may be affected by some of the works being carried out on site.

   If any services do require temporary disconnection please phone **0800 195 4141 (option 2)** for domestic and commercial disconnection, so that arrangement can be made to disconnect before work commences on site.

10. For information regarding supplies please contact us on **0800 195 4141 (option 2)**.

11. Please note that cable records supplied may not be up to date, or may be incomplete, if the area concerned is a new site.

12. For information regarding wayleave or easement agreements contact:

Manchester	**08433 115157**
Preston	**08433 113969**
Kendal	**08433 115155**

13. The latest cable records are always available for inspection during normal working hours and you should satisfy yourself that the information you have is up to date at the time you commence work. This service is consistent with the requirement of Regulation 36 of the Electricity Supply Regulations and paragraph 79 of the New Road and Street Works Act.

    Please contact Data Management on **0800 195 4141 (option 2)** to arrange an appointment to view the records.

304 Bridgewater Place
Birchwood Park
Warrington
WA3 6XG

www.enwl.co.uk

Registered in England and Wales
Registered Number 2366949

Electricity North West
Data Management,
Electricity North West
Linley House
Dickinson Street
Manchester, M1 4LF
Phone: 0800 195 4141
Email: planrequest@enwl.co.uk
Web: www.enwl.co.uk

Miss Monique Elsom
RSK
18 Frogmore Road
Hemel Hempstead Hertfordshire
HP3 9RT

Our Reference: 22938031

Your Reference: 322834

Dear Miss Monique Elsom

Electricity Network Plans

I acknowledge with thanks your request dated 10/08/2021 12:02:55 PM for information on the location of our services.

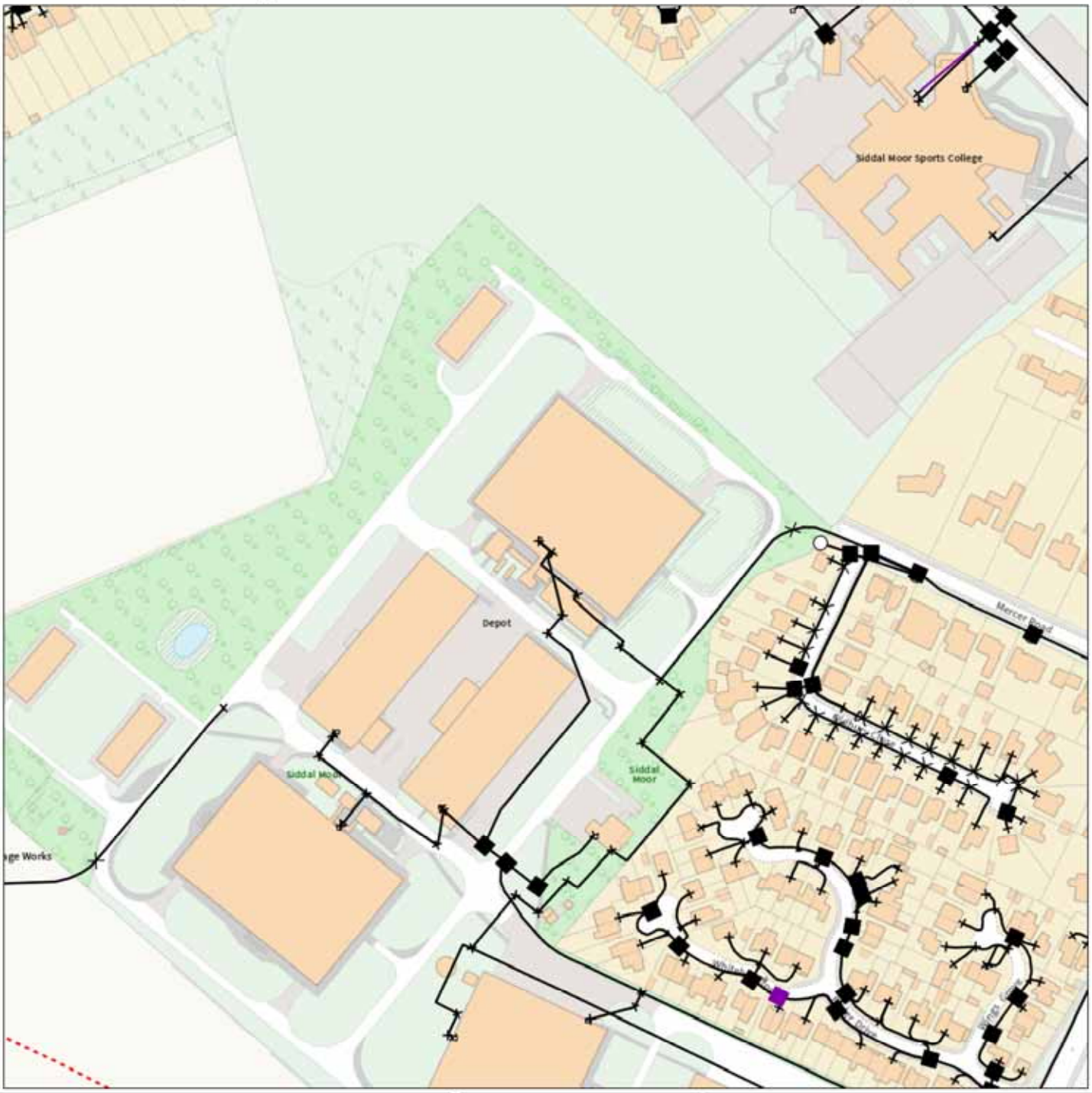
Please find enclosed plan(s) showing the approximate position of our apparatus known to be in the vicinity of this site.

I attach Conditions and information regarding electricity mains, which details contact numbers for additional services (i.e. new supplies, connections, diversion). In addition you should ensure they are made available to anyone carrying out any works which may affect our apparatus.

Yours sincerely,

Data Management

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

Reproduced from the Ordnance Survey map by BT by permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office
(C) Crown Copyright British Telecommunications plc 100028040

KEY TO BT SYMBOLS

	Planned	Live
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling		Built	
Duct Tee		Planned	
Building		Inferred	
Kiosk	K	Duct	

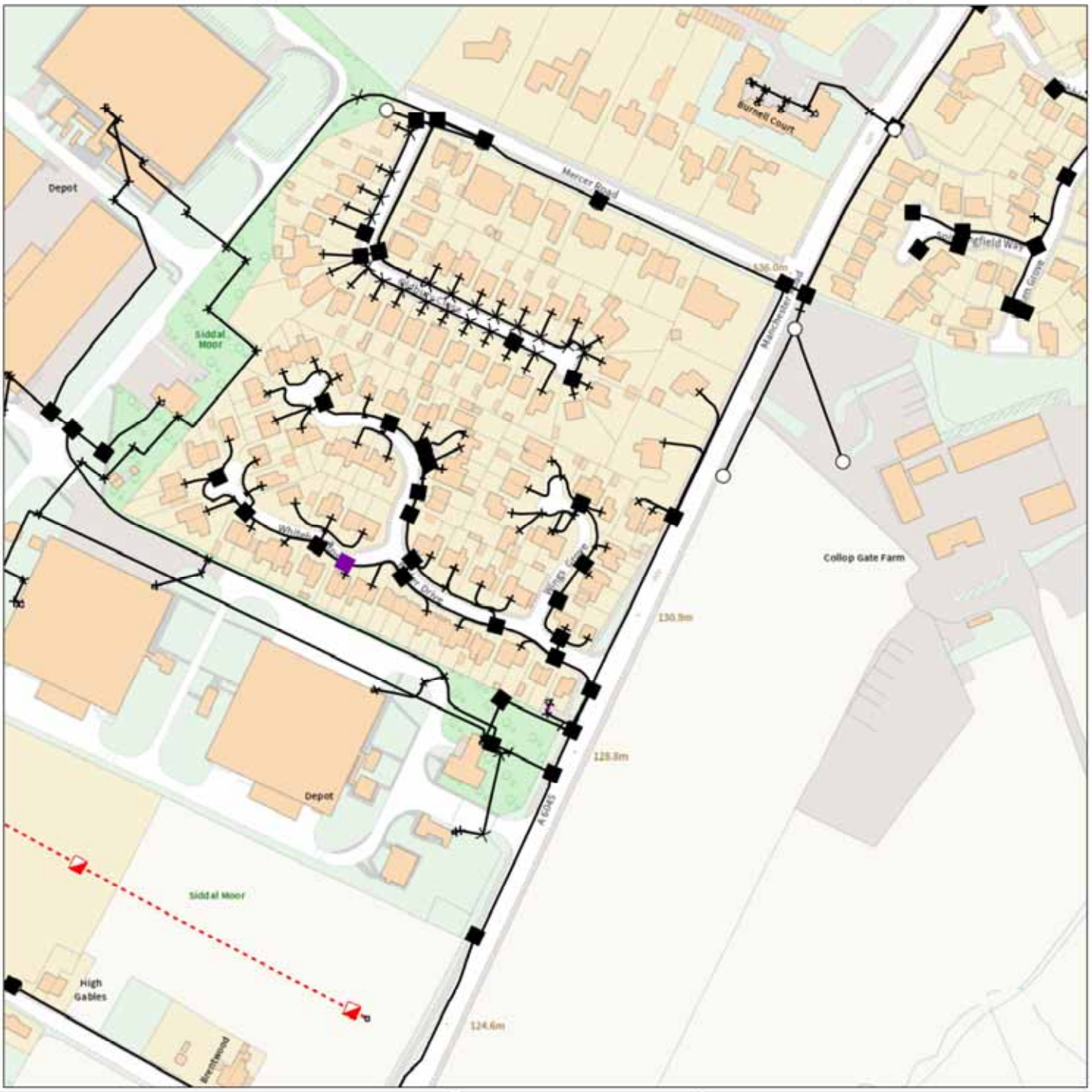
Other proposed plant is shown using dashed lines. BT Symbols not listed above may be disregarded. Existing BT Plant may not be recorded. Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : JNA01147W
Map Reference : (centre) SD8556709310
Easting/Northing : (centre) 385567,409310
Issued : 10/08/2021 13:15:05

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

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KEY TO BT SYMBOLS

	Planned	Live
PCP		
Pole		
Box		
Manhole		
Cabinet		

Change Of State	+	Hatchings	
Split Coupling		Built	
Duct Tee		Planned	
Building		Inferred	
Kiosk	K	Duct	

Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : TEB01023V
Map Reference : (centre) SD8576709110
Easting/Northing : (centre) 385767,409110
Issued : 10/08/2021 13:02:36

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

United Utilities
Water for the North West

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

RSK Environment Ltd

18
Frogmore Road,
Hemel Hempstead,
HP3 9RT

FAO:

Your Ref: 322834
Our Ref: UUPS-ORD-316181
Date: 16/08/2021

Dear Sirs

Location: 1 WINGS GROVE, HEYWOOD, OL10 2QR

I acknowledge with thanks your request dated 10/08/2021 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

United Utilities

Water for the North West

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

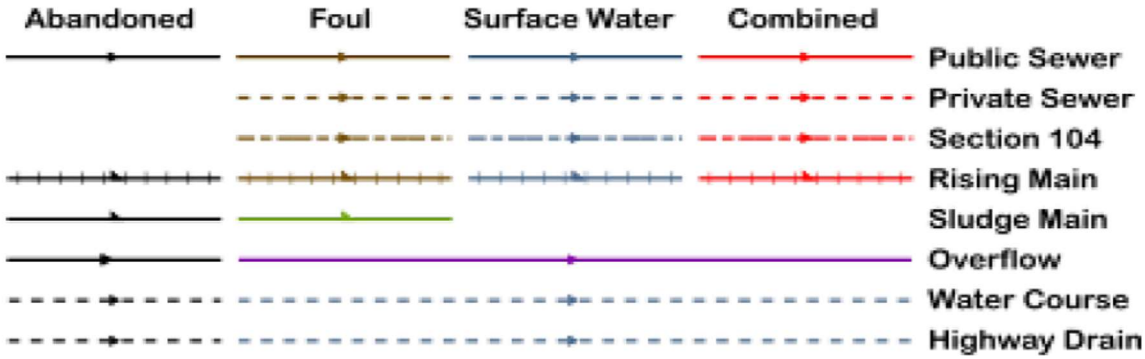
TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

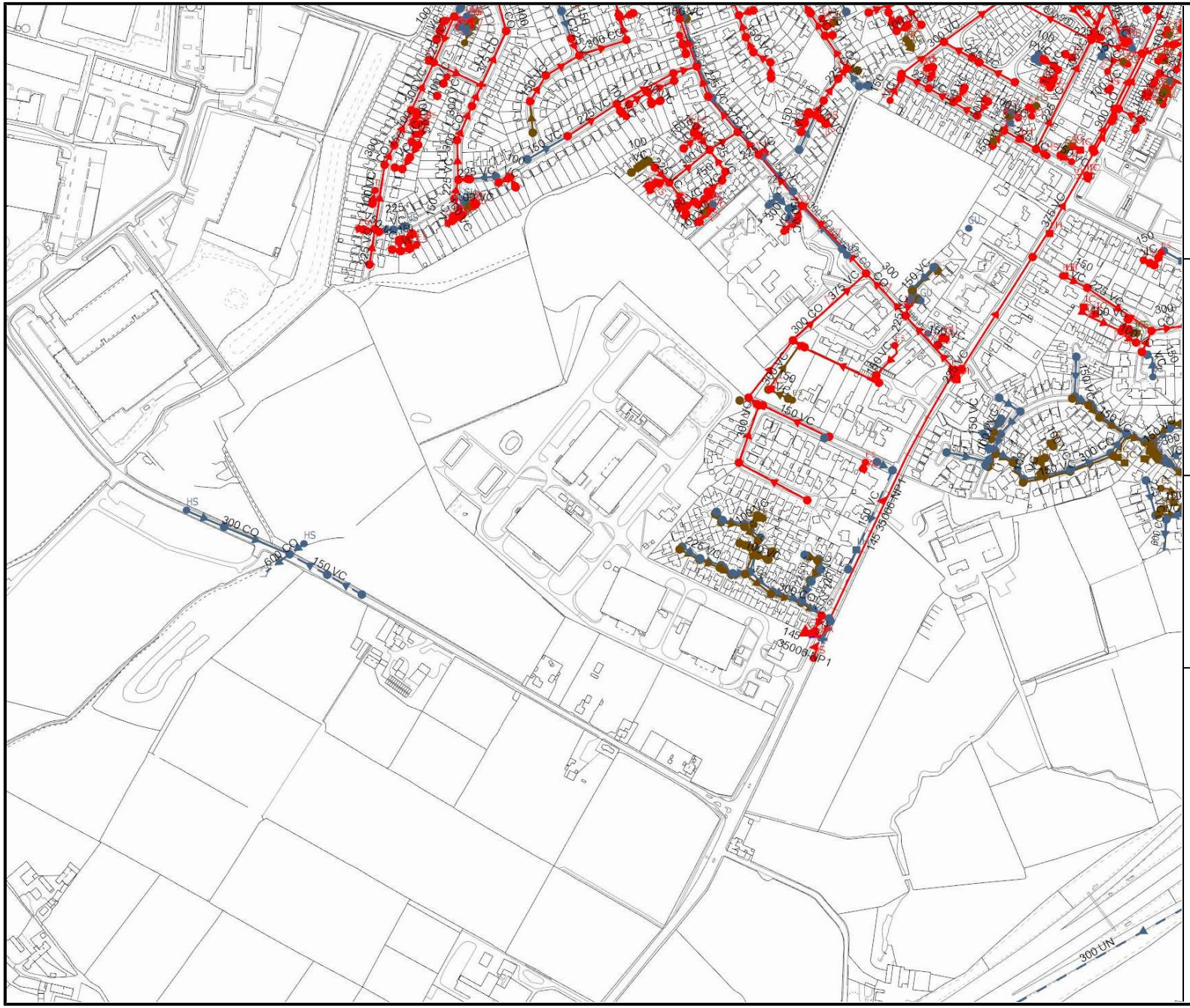
United Utilities
Water for the North West

Wastewater Symbology



All point assets follow the standard colour convention: red – combined, brown - foul, blue – surface water, purple - overflow

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- CA Catchpit
- VC Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- CK Control Kiosk
- Change of Characteristic



United Utilities

Water for the North West

SEWER RECORDS

Address or Site Reference

1 WINGS GROVE,
HEYWOOD,
OL10 2QR

Scale: 1:5000

Date: 16/08/2021

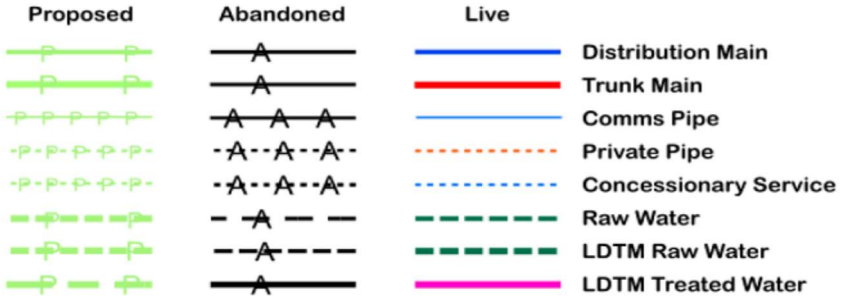
Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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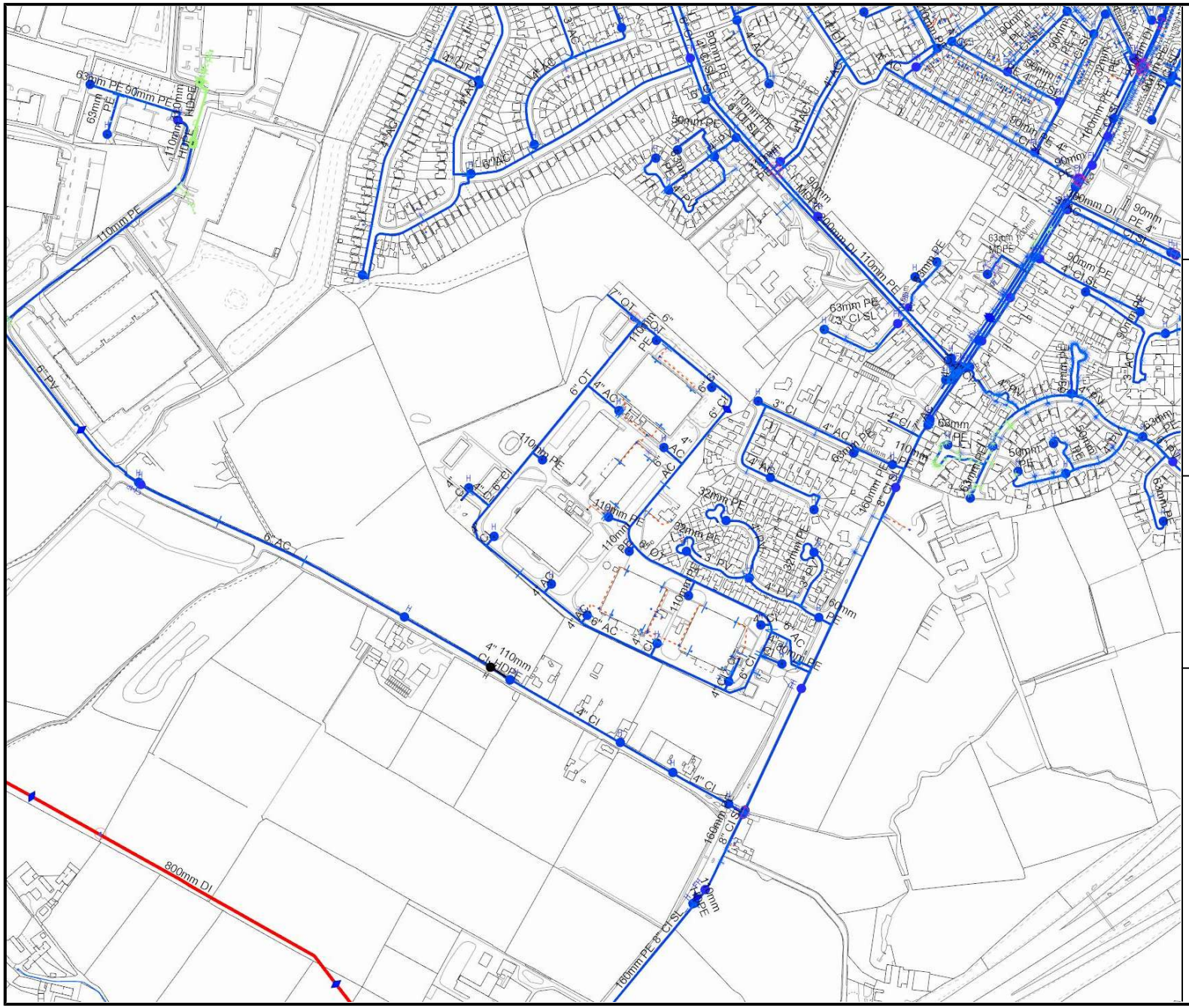
United Utilities
Water for the North West

Clean Water Symbology





Symbology for proposed assets is the same as above, but shown in green
Symbology for abandoned assets is the same as above, but shown in black



United Utilities

Water for the North West

WATER MAIN RECORDS

Address or Site Reference

1 WINGS GROVE,
HEYWOOD,
OL10 2QR

Scale: 1:5000
Date: 16/08/2021

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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(c) Crown copyright and database rights 2021 Ordnance Survey 100019209 | Date: 10/08/21 | Scale: 1:1250 | Map Centre: 385545,409217 | Data updated: 01/08/21 | Our Ref: 619787 - 1 | Telecoms Plan A1

Important Information - please read The purpose of this plan is to identify Virgin Media apparatus. We have tried to make it as accurate as possible but we cannot warrant its accuracy. In addition, we caution that within Virgin Media apparatus there may be instances where mains voltage power cables have been placed inside green, rather than black ducting. Further details can be found using the "Affected Postcodes.pdf", which can be downloaded from this website. Therefore, you must not rely solely on this plan if you are carrying out any excavation or other works in the vicinity of Virgin Media apparatus. The actual position of any underground service must be verified by cable detection equipment, etc. and established on site before any mechanical plant is used. Accordingly, unless it is due to the negligence of Virgin Media, its employees or agents, Virgin Media will not have any liability for any omissions or inaccuracies in the plan or for any loss or damage caused or arising from the use of and/or any reliance on this plan. This plan is produced by Virgin Media Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100019209.

Duct, Trench | Chamber | Cabinet

melsom@rsk.co.uk

322834

APPENDIX F SITE PHOTOGRAPHS

PHOTOGRAPHIC LOG		
Photo no. **1**	**Date:** 16.7.2021	
Description: Site entrance off Manchester Road.		

Photo No. **2**	**Date:** 16.7.2021	
Description: Landscaped area surrounding buildings.		

Photo No.	Date:
3	16.7.2021



Description:

Residential properties to the north of the site.

Photo No.	Date:
4	16.7.2021



Description:

General site use showing building 113 and parking area.

Photo No.	Date:
5	16/07/2021



Description:

Waste storage area to the east of building 118.

Photo No.	Date:
6	16.7.2021



Description:

Water storage tank for sprinkler system to the west of building 112.

APPENDIX G TECHNICAL BACKGROUND

H1 Desk Study

Aquifer designation and Source protection zones

Principal aquifer: layers of rock or drift deposit that have high intergranular and/or fracture permeability (usually providing a high level of water storage). They may support water supply and/or river base flow on a strategic scale.

Secondary A aquifer: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Secondary B aquifer: predominantly lower permeability layers that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Secondary undifferentiated aquifer: it has not been possible to attribute either a category A or B to a rock type. In most cases this means that it was previously designated as both a minor and non-aquifer in different locations owing to the variable characteristics.

Unproductive' strata: low permeability with negligible significance for water supply or river base flow.

The EA generally adopts a three-fold classification of source protection zones (SPZ) surround abstractions for public water supply. The Site is situated in an area defined as follows:

- Zone 1 or the 'inner protection zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time from any point below the water table to the source. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source
- Zone 2 or the 'outer protection zone' is defined by a 400-day travel time from a point below the water table to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants
- Zone 3 or the 'total catchment' is the area around the source within which all groundwater recharge is presumed to be discharged at the source.

Preliminary risk assessment methodology

LCRM outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) contaminant linkages (contaminant–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the

likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- highly likely: the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution
- likely: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term
- low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term
- unlikely: circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- severe: short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000)
- medium: chronic damage to human health ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem
- mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment
- minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the probability of an event occurring and its consequences have been classified, a risk category can be assigned according to the table below.

		Consequences			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**Highly likely**	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very low	Very low

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

- very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability; urgent investigation and remediation are likely to be required
- high: harm is likely to occur. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required. Remedial works may be necessary in the short term and are likely over the long term
- moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term
- low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild
- very low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe.

H2 Site Investigation Methodology

Ground gas monitoring

An infrared gas meter was used to measure gas flow, concentrations of carbon dioxide (CO_2), methane (CH_4) and oxygen (O_2) in percentage by volume, while hydrogen sulphide (H_2S) and carbon monoxide (CO) were recorded in parts per million. Initial and steady state concentrations were recorded. In addition, during the first monitoring round, all wells were screened with a PID to establish if there are any interferences and cross-sensitivity of other hydrocarbons with the infrared gas meter.

Low flow groundwater sampling

Groundwater samples were retrieved using a United States Environment Protection Agency (USEPA) approved low-flow purging and sampling methodology.

The low-flow method relies on moving groundwater through the well screen at approximately the same rate as it flows through the geological formation. This results in a significant reduction in the volume of water extracted before sampling and significantly reduces the amount of disturbance of the water in the monitoring well during purging and sampling. Drawdown levels in the monitoring well and water quality indicator parameters (pH, temperature, electrical conductivity, redox potential and dissolved oxygen) are monitored during low-flow purging and sampling, with stabilisation indicating that purging is complete and sampling can begin. As the flow rate used for purging, in most cases, is the same or only slightly higher than the flow rate used for sampling, and because purging and sampling are conducted as one continuous operation in the field, the process is referred to as low-flow purging and sampling.

Reuse of suitable materials

The Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011) (CoP) was developed in consultation with the Environment Agency and development industry to enable the

re-use of materials under certain scenarios and subject to demonstrating that specific criteria are met. The current reuse scenarios covered by the CoP comprise

- reuse on the site of origin (with or without treatment)
- direct transfer of clean and natural soils between sites
- use in the development of land other than the site of origin following treatment at an authorised Hub site (including a fixed soil treatment facility).

The importation of made ground soils (irrespective of contamination status) or crushed demolition materials is not permitted currently under the CoP and requires either a standard rules environmental permit or a U1 waste exemption (see below).

In the context of excavated materials used on-sites undergoing development, four factors are considered to be of particular relevance in determining if the material is a waste or when it ceases to be waste:

- the aim of the Waste Framework Directive is not undermined, i.e. if the use of the material will create an unacceptable risk of pollution of the environment or harm to human health it is likely to be waste
- the material is certain to be used
- the material is suitable for use both chemically and geotechnically
- only the required quantity of material will be used.

The CoP requires the preparation of a materials management plan (MMP) that confirms the above factors will be met. This plan needs to be reviewed by a 'Qualified Person' (QP) who will then issue a declaration form to the EA. As the project progresses, data must be collated and on completion a verification report produced that shows the MMP was followed and describes any changes.

The MMP establishes whether specific materials are classified as waste and how excavated materials will be treated and/or reused in line with the CoP. The MMP is likely to form part of the site waste management plan.

APPENDIX H EXPLORATORY HOLE RECORDS

BOREHOLE LOG

Contract:	Client:	Borehole:
Heywood Stores	**Telereal Trillium Ltd**	**CP01**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**129.88**	**E:385745.5 N:409036.8**	**1** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.05-0.10	1	ES	1xT+1xJ+1xV			Grass onto dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular fine of mixed lithologies, including quartzite and brick with many rootlets. (TOPSOIL)	0.15	
0.90-1.00	2	ES	1xT+1xJ+1xV			MADE GROUND: Soft dark blackish brown slightly sandy slightly gravelly CLAY with low cobble content of brick and concrete with occasional rootlets. Sand is medium. Gravel is subangular fine to medium of mixed lithologies, including brick and concrete.	(1.15) 1.30	
1.20	3	B						
1.20-1.65	4	SPT	N=6			MADE GROUND: Soft light greyish brown mottled and orange sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subangular fine of mixed lithologies, including brick. Clay is damp.		
1.20-1.65	5	B						
1.20-1.65	8	ES	1xT+1xJ+1xV					
2.00-2.45	6	SPT	N=5					
2.00-2.45	7	B					(2.70)	
3.00-3.45	9	SPT	N=15			. . . 3.00m to 3.45m, thin band of blueish grey mudstone.	4.00	
4.00-4.45	10	SPT	N=25			Light blueish grey slightly weathered MUDSTONE.		
4.00-4.45	11	B						
5.00-5.35	12	SPT	5,4/7,20,23 for 50mm				(1.90)	
5.00-5.45	13	B					5.90	
6.00-6.12	14	SPT	22/50 for 60mm			Light yellowish grey medium to coarse SANDSTONE.	(0.55) 6.45	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. No groundwater encountered.
4. Borehole terminated at 6.45m on refusal.
5. Backfilled with bentonite from 6.45m to 6.00m and arisings from 6.00m to 0.00m.
6. Had to move rig backwards 10.00m due to concrete structure(?) preventing drilling.
7. Refusal at 5.00m, 1hr slow drilling/chiselling, refusal

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2500**	**Vincent Cameron**	**RHomer**	

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Log CABLE PERCUSSION LOG - A4P | 322834-HEYWOOD-STORES.GPJ - v10_01.
RSK Environment Ltd, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR. Tel: 01928 726006, Fax: 01928 725633, Web: www.rsk.co.uk. | 24/09/21 - 12:12 | AW1 |

BOREHOLE LOG

Contract:	Client:	Borehole:
Heywood Stores	**Telereal Trillium Ltd**	**CP01**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**129.88**	**E:385745.5 N:409036.8**	**2** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

again at 6.00m.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2500**	**Vincent Cameron**	**RHomer**	

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Log CABLE PERCUSSION LOG - A4P | 322834-HEYWOOD-STORES.GPJ - v10_01.
RSK Environment Ltd, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR. Tel: 01928 726006, Fax: 01928 725633, Web: www.rsk.co.uk. | 24/09/21 - 12:12 | AW1 |

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Heywood Stores	**Telereal Trillium Ltd**	**CP02**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**17.08.21** End: **17.08.21**	**126.14**	**E:385356.9 N:409231.0**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-1.00	11	B				Grass onto dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is angular to rounded fine to medium of mixed lithologies, including quartzite and brick with frequent rootlets. (TOPSOIL)	0.30	
0.10-0.20	1	ES	1xT+1xJ+1xV				(0.50)	
0.30-0.50	2	ES	1xT+1xJ+1xV				0.80	
						MADE GROUND: Soft dark orangish brown mottled grey sandy slightly gravelly CLAY with low cobble content of brick and concrete. Sand is medium. Gravel is fine to medium of mixed lithologies, including brick and concrete with occasional rootlets.	(0.50)	
1.20	4	ES	1xT+1xJ+1xV	▼1			1.30	
1.20-1.65	6	SPT	N=7			MADE GROUND: Soft light bluish grey slightly sandy gravelly CLAY. Gravel is angular fine to medium of mixed lithologies, including sandstone and brick.		
1.20-1.65	12	B					(1.20)	
						Firm light brownish grey mottled orange sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is angular to subangular fine and of mixed lithologies, including sandstone.		
2.00-2.45	7	SPT	N=6				2.50	
2.00-2.45	13	B						
						Soft bluish grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mixed lithologies, including sandstone.		
3.00-3.45	8	SPT	N=3					
3.00-3.45	14	B					(2.40)	
4.00-4.20	5	ES	1xT+1xJ+1xV					
4.00-4.45	15	B					4.90	
						Light brownish yellow coarse SAND.	5.10	
5.00-5.45	9	SPT	N=13			Soft greyish brown slightly gravelly CLAY. Gravel is subrounded fine to medium of sandstone.		
5.00-5.45	16	B					(0.90)	
							6.00	
						Light brownish yellow SANDSTONE.	6.10	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
			-		1.30

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Groundwater encountered at 1.30m.
4. Terminated at 6.10m after refusal and chiselling.
5. Backfilled with bentonite from 6.10m to 5.90m and arisings from 5.90m to 0.00m.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2500**	**Vincent Cameron**	**RHomer**	AGS

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Log CABLE PERCUSSION LOG - A4P | 322834-HEYWOOD-STORES.GPJ - v10_01.
RSK Environment Ltd, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR. Tel: 01928 726006, Fax: 01928 725633, Web: www.rsk.co.uk. | 24/09/21 - 12:12 | AW1 |

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Heywood Stores	**Telereal Trillium Ltd**	**CP03**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**17.08.21** End: **17.08.21**	**131.66**	**E:385613.9 N:409272.0**	**1** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-1.00	5	B				MADE GROUND: Grass onto dark greyish brown slightly clayey slightly gravelly medium SAND. Gravel is subangular fine to medium of mixed lithologies, including sandstone, brick and concrete with many rootlets.	0.15	
0.05-0.10	1	ES	1xT+1xJ+1xV			Soft bluish grey slightly sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to subrounded fine to medium of mixed lithologies, including mudstone.	(1.35)	
1.20-1.65	6	SPT	N=4					
1.20-1.65	7	B					1.50	
						Soft light greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular fine to medium of mixed lithologies, including mudstone and sandstone.		
2.00-2.20	2	ES						
2.00-2.45	8	SPT	N=4					
2.00-2.45	9	B						
3.00-3.45	10	SPT	N=13					
3.00-3.45	11	B					(4.30)	
4.00-4.45	12	SPT	N=10			. . . 4.00m, becoming firm.		
4.00-4.45	13	B						
4.50-4.60	3	ES	1xT+1xJ+1xV					
5.00-5.45	14	SPT	N=17					
5.00-5.45	15	B					5.80	
						Dark reddish brown coarse SAND.	6.00	
6.00-6.45	16	SPT	N=22			Firm light greyish brown slightly sandy slightly gravelly CLAY. Sand is medium. Gravel is subangular fine to medium of mixed lithologies, including sandstone and mudstone.	(1.00)	
6.00-6.45	17	B				. . . 6.00m, becoming medium to coarse gravel.		
							7.00	
7.20-7.30	4	ES				Firm light brown gravelly CLAY. Gravel is subangular to subrounded medium to coarse,of mixed lithologies including sandstone. Very wet clay.		
7.50-7.95	19	B				. . . 7.50m, boulder.		
8.00-8.45	20	SPT	N=35				(2.50)	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. No groundwater encountered.
4. Refusal at 7.5m on SPT, 1 hour of chiselling - boulder.
5. Borehole terminated on 10.00m SPT on refusal.
6. Borehole backfilled with bentonite from 10.45m to 10.00m and arisings from 10.0m to 0.00m.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2500**	**Vincent Cameron**	**RHomer**	AGS

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BOREHOLE LOG

Contract:	Client:	Borehole:
Heywood Stores	**Telereal Trillium Ltd**	**CP03**

Contract Ref:	Start: **17.08.21**	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	End: **17.08.21**	**131.66**	**E:385613.9 N:409272.0**	**2** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
							9.50	
						Dark grey MUDSTONE.	(0.95)	
							10.45	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress		
From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2500**	**Vincent Cameron**	**RHomer**	

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Log CABLE PERCUSSION LOG - A4P | 322834-HEYWOOD-STORES.GPJ - v10_01.
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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS01**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**126.99**	**E:385732.2 N:408946.2**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.00-0.15 0.00	4	ES PID	1xT+1xJ+1xV 0.0ppm			Grass onto dark brown slightly gravelly fine to medium SAND. Gravel is subangular fine to medium of mixed lithologies, including mudstone and sandstone. Occasional rootlets. (TOPSOIL)	0.15	
	0.30-0.50 0.30	5	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular fine to medium of mixed lithologies, including brick fragments.	(0.70) 0.85	
	0.90-1.10 0.90	6	ES PID	1xT+1xJ+1xV 0.0ppm			Light yellowish grey clayey fine to medium SAND. Occasional pockets of firm dark greyish brown mottled orange slightly sandy clay. Sand is fine.	(0.35) 1.20	
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT	N=10			Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine to medium of sandstone and coal fragments.	(0.50) 1.70	
							Dark orangish brown fine to medium SAND.	1.75	
							Firm dark greyish brown sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of sandstone, mudstone and coal fragments.	1.85 (0.35)	
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT	N=2	≈		Dark orangish brown fine to medium SAND.	2.20	
							Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine of sandstone and mudstone.	(0.80) 3.00	
3.00 - 4.00 (75mm dia) 0% rec	3.00-3.45	3	SPT	N=8			No recovery.	(1.00) 4.00	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)
			-		2.30

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Groundwater encountered at 2.30m.
4. Installed to 3.00m: 1.00m plain and 2.00m slotted.
5. Terminated at 4.00m due to no recovery from 3.00m to 4.00m.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS02**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**12.08.21** End: **12.08.21**	**129.53**	**E:385605.4 N:409028.7**	**1** of **1**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20 0.10	2	ES PID	1xT+1xJ+1xV 0.0ppm			Grass onto dark brown slightly clayey slightly gravelly organic fine to coarse SAND. Gravel subangular fine to medium of concrete and slag. Occasional rootlets. (TOPSOIL)	0.25	
	0.40-0.60 0.40	3	ES PID	1xT+1xJ+1xV 0.0ppm			Dark reddish brown slightly gravelly fine to coarse SAND. Gravel subangular to subrounded fine to medium of sandstone. Occasional pockets of dark grey and orange mottled soft to firm clay. . . . 0.3m to 0.35m, wood.	(1.35)	
1.20 - 2.00 (85mm dia) 30% rec	1.20-1.20	1	SPT	NP	1			1.60	
							Soft dark grey slightly sandy CLAY. Sand fine to coarse.	1.80	
							Dark reddish brown slightly clayey fine to coarse SAND.	2.00	
2.00 - 3.00 (75mm dia) 0% rec							No recovery.	(1.00)	
								3.00	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Groundwater encountered at 1.20m, rising to 1.00m.
4. Terminated at 3.00m due to no recovery between 2.00m and 3.00m.
5. Backfilled with arisings.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS03**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**12.08.21** End: **12.08.21**	**130.16**	**E:385613.9 N:409064.6**	**1** of **2**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							MADE GROUND. Grass onto dark brown slightly clayey slightly gravelly fine to coarse SAND with low cobble content of brick. Gravel is subangular fine to medium of concrete, sandstone and brick fragments. Occasional rootlets.	(0.30) 0.30	
	0.30-0.50 0.30	2	ES PID	1xT+1xJ+1xV 0.1ppm			MADE GROUND: Light yellow slightly gravelly fine to coarse SAND. Gravel subangular fine to medium of brick fragments. Occasional pockets of light yellow soft sandy clay. Sand fine to medium.	(0.40) 0.70	
	0.70-0.90 0.70	3	ES PID	1xT+1xJ+1xV 0.4ppm			Firm dark reddish brown mottled orange slightly sandy slightly gravelly CLAY. Sand fine to medium. Gravel is subangular fine of sandstone, mudstone and coal fragments.	(0.50) 1.20	
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65 1.20-1.40 1.20	1 7	SPT ES PID	N=5 1xT+1xJ+1xV 0.0ppm			Firm dark orangish brown mottled grey sandy CLAY. Sand fine to medium.	(0.30) 1.50	
	2.00-2.45	4	SPT	N=15			Firm dark greyish brown sandy slightly gravelly CLAY. Sand fine to coarse. Gravel is subangular fine of mudstone, coal and sandstone. . . . Becoming less sandy from 1.7. Gravel is fine to medium	(2.50)	
	3.00-3.45	5	SPT	N=13	1.1			4.00	
	4.00-4.45	6	SPT	N=17			Dark reddish brown slightly gravelly fine to coarse SAND. Gravel is fine to medium of sandstone. Occasional pockets of firm clay.	(1.00)	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Groundwater encountered at 3.00m.
4. Installed to 3.90m: 1.00m plain and 2.90m slotted.
5. Drilled to 5.00m collapsed in to 3.90m.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	AGS

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS03**

Contract Ref:	Start: **12.08.21**	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	End: **12.08.21**	**130.16**	**E:385613.9 N:409064.6**	**2** of **2**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Dark reddish brown slightly gravelly fine to coarse SAND. Gravel is fine to medium of sandstone. Occasional pockets of firm clay. *(stratum copied from 4.00m from previous sheet)*	5.00	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS04**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**12.08.21** End: **12.08.21**	**129.17**	**E:385512.6 N:409099.5**	**1** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Grass onto dark brown organic fine to coarse SAND. Occasional rootlets. (TOPSOIL)	0.20	
	0.40-0.60 0.40	1	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown slightly clayey gravelly fine to coarse SAND with low cobble content of sandstone and brick. Gravel angular to subangular fine to coarse of brick, clinker, concrete and sandstone.	(0.70)	
	0.90-1.00 0.90	2	ES PID	1xT+1xJ+1xV 0.0ppm				0.90	
1.20 - 2.00 (85mm dia) 90% rec	1.20-1.65	3	SPT	N=6			Soft to firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium of sandstone. . . . 1.20m, becoming firm. . . . 1.60m to 1.65m, sand band.	(0.80)	
							Firm dark reddish brown mottled grey slightly sandy slightly gravelly CLAY. Sand fine to medium. Gravel is subangular fine to medium of sandstone.	1.70 (0.30)	
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	4	SPT	N=12			Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular fine to medium of sandstone and coal. Occasional bands of fine to medium sand.	2.00 (1.00)	
3.00 - 4.00 (75mm dia) 100% rec	3.00-3.45	5	SPT	N=32			Stiff dark greyish brown slightly gravelly CLAY. Gravel is fine to medium of sandstone and mudstone.	3.00	
4.00 - 5.00 (75mm dia) 90% rec	4.00-4.45	6	SPT	N=38				(2.45)	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Back filled with arisings.
4. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS04**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**12.08.21** End: **12.08.21**	**129.17**	**E:385512.6 N:409099.5**	**2** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
4.00 - 5.00 (75mm dia) 90% rec	5.00-5.45	7	SPT	N=43			Stiff dark greyish brown slightly gravelly CLAY. Gravel is fine to medium of sandstone and mudstone. *(stratum copied from 3.00m from previous sheet)*	5.45	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	AGS

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS05**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**130.86**	**E:385582.5 N:409154.6**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Grass onto dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular fine of sandstone. (TOPSOIL)	0.15	
	0.20-0.40 0.20	4	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown slightly clayey slightly gravelly fine to medium SAND with low cobble content of brick.. Gravel is subangular to subrounded fine to medium of brick fragments, sandstone and mudstone.	(0.75)	
	0.90-1.00 0.90	5	ES PID	1xT+1xJ+1xV 0.0ppm			Firm light greyish brown mottled orange slightly sandy CLAY. Sand is fine.	0.90 (0.30)	
1.20 - 2.00 (85mm dia) 50% rec	1.20-1.65	1	SPT	N=8			Firm light greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of sandstone and mudstone.	1.20 (1.30)	
2.00 - 3.00 (75mm dia) 90% rec	2.00-2.45	2	SPT	N=17			. . . 2.00m, gravel becoming fine to coarse.	2.50	
							Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone and sandstone.	(0.70)	
3.00 - 4.00 (75mm dia) 20% rec	3.00-3.45	3	SPT	N=17			No recovery.	3.20 (0.80)	
								4.00	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. No groundwater encountered.
4. Installed to 3.00m: 1.00m plain and 2.00m slotted.
5. Terminated at 4.00m due to no recovery from 3.20m to 4.00m.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS06**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**13.08.21** End: **13.08.21**	**131.54**	**E:385618.8 N:409221.7**	**1** of **1**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.20-0.40	4	ES	1xT+1xJ+1xV			Grass onto dark brown slightly clayey slightly gravelly fine SAND. Gravel is fine of mixed lithologies, including sandstone and mudstone. Occasional rootlets. (TOPSOIL)	0.20	
	0.50-0.70	5	ES	1xT+1xJ+1xV			MADE GROUND: Dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is angular to subangular fine to medium of brick, concrete and sandstone.	0.40	
							Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine of mudstone and sandstone.	(0.80)	
1.20 - 2.00 (85mm dia) 80% rec	1.20-1.65	1	SPT	N=7				1.20	
							Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine to medium of sandstone and mudstone.	(0.80)	
2.00 - 3.00 (75mm dia) 90% rec	2.00-2.45	2	SPT	N=11				2.00	
							Firm dark greyish brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone and sandstone. Occasional fibrous material.	(0.50)	
								2.50	
							Firm to stiff dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subrounded fine to medium of mudstone and sandstone.	(0.95)	
	3.00-3.45	3	SPT	N=15				3.45	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. No groundwater encountered.
4. Barrel getting stuck in ground at 3.0m, borehole terminated at 3.45m.
5. Backfill with arisings.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS07**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**13.08.21** End: **13.08.21**	**131.76**	**E:385625.4 N:409349.8**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instru-mentation	Description of Strata	Depth (Thick ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.20-0.40 0.20	5	ES PID	1xT+1xJ+1xV 0.0ppm			Grass onto dark brown slightly gravelly fine to medium SAND. Gravel is subangular fine of sandstone. (TOPSOIL)	0.20	
	0.60-0.80 0.60	6	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown clayey slightly gravelly fine to medium SAND. Gravel is angular to subangular fine to coarse of brick fragments and sandstone.	(0.40) 0.60	
	1.20-1.65	1	SPT	N=3			Light yellowish grey slightly gravelly fine to medium SAND. Gravel is subangular to rounded fine to medium of mixed lithologies including, sandstone.	(0.65) 1.25	
1.20 - 2.00 (85mm dia) 90% rec	1.40-1.70 1.40	7	ES PID	1xT+1xJ+1xV 0.0ppm			Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine of sandstone and mudstone. Occasional sand lenses and fibrous material.	(0.75) 2.00	
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT	N=9			Dark reddish grey clayey fine to medium SAND.	2.05	
							Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subrounded fine of mudstone and sandstone. Occasional sand lenses.	(0.75) 2.80	
							Firm dark brown slightly sandy CLAY. Sand is fine. Occasional sand lenses.	3.00	
3.00 - 4.00 (65mm dia) 80% rec	3.00-3.45	3	SPT	N=13	1.1		Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of sandstone and mudstone.	(1.45)	
	4.00-4.45	4	SPT	N=21				4.45	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit at 1.20m.
2. CAT and Genny scanned prior to start.
3. Installed to 4.00m: 1.50m plain and 2.50m slotted.
4. Groundwater encountered at 3.70m.
5. Terminated at 4.45m as borehole collapsed in.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS08**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**13.08.21** End: **13.08.21**	**130.87**	**E:385544.2 N:409436.5**	**1** of **1**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.00-0.30 0.00	4	ES PID	1xT+1xJ+1xV 0.1ppm			Grass onto dark brown slightly gravelly fine to medium SAND. Gravel is subangular fine of concrete and brick fragments. Occasional rootlets. (TOPSOIL)	(0.30) 0.30	
							MADE GROUND: CONCRETE block.	0.40	
	0.50-0.70 0.50	5	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown clayey gravelly fine to medium SAND. Gravel is angular to subangular fine to coarse of brick, concrete, slag and ceramics. Occasional piece of plastic and wood. Occasional pockets of clay.	(0.80) 1.20	
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65 1.20-1.40 1.20	1 6	SPT ES PID	N=7 1xT+1xJ+1xV 0.1ppm			Firm dark brown sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine of mudstone. Occasional bands of fine to medium sand.	(0.30) 1.50	
							Firm dark greyish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine of mudstone. Occasional fibrous material.	(0.50) 2.00	
2.00 - 3.00 (75mm dia) 30% rec	2.00-2.45	2	SPT	N=7			Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone.	(1.00) 3.00	
3.00 - 4.00 (75mm dia) 0% rec							No recovery.	(1.00) 4.00	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Backfilled with arisings.
4. No groundwater encountered.
5. Collapsed in at 3.00m, no recovery on last sampler tube and SPT at 3.00m not taken due to pit collapse.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	AGS

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS09**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**13.08.21** End: **13.08.21**	**127.30**	**E:385461.5 N:409280.5**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Grass onto dark brown slightly gravelly fine to medium SAND. Gravel is subangular fine of mixed lithologies, including sandstone and mudstone. (TOPSOIL)	0.25	
	0.40-0.60 0.40	5	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown clayey slightly gravelly fine to medium SAND. Gravel is subangular fine to medium of brick fragments, concrete and sandstone. Occasional pockets of firm clay.	(0.65)	
	0.90-1.10 0.90	6	ES PID	1xT+1xJ+1xV 0.0ppm			Dark yellowish brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of sandstone.	0.90 (0.35)	
1.20 - 2.00 (85mm dia) 100% rec	1.20-1.65	1	SPT	N=8			Firm dark orangish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine of mudstone, sandstone and coal fragments.	1.25 1.50	
							Firm dark greyish brown slightly sandy CLAY. Sand is fine. Occasional fibrous material.	(0.50)	
	2.00-2.45	2	SPT	N=21			Firm dark greyish brown slightly sandy CLAY. Sand is fine.	2.00 (0.50)	
2.00 - 3.00 (85mm dia) 100% rec	2.20-2.40 2.20	7	ES PID	1xT+1xJ+1xV 0.0ppm				2.50	
							Firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine to medium of coal fragments.	2.60	
							Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone. Occasional bands of fine sand.	(1.85)	
3.00 - 4.00 (75mm dia) 100% rec	3.00-3.45	3	SPT	N=43			. . . 3.80m, gravel becoming fine to medium.		
	4.00-4.45	4	SPT	N=50				4.45	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. No groundwater encountered.
4. Installed to 1.00m: 0.50m plain and 0.50m slotted.
5. Terminated on refusal on 4.00m SPT.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS11**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**13.08.21** End: **13.08.21**	**126.94**	**E:385428.7 N:409217.8**	**1** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.40-0.60 0.40	5	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Grass onto dark brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to medium of brick fragments, concrete and sandstone. Occasional rootlets and piece of plastic.	(0.40) 0.40	
	0.80-0.00 0.80	6	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown clayey slightly gravelly fine to medium SAND. Gravel is subangular to angular fine to coarse of brick fragments. Occasional pockets of firm dark brown sandy clay.	0.60	
1.20 - 2.00 (85mm dia) 80% rec	1.20-1.65	1	SPT	N=9			Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone and sandstone. . . . 1.20m, gravel becoming fine to coarse.	(1.70)	
2.00 - 3.00 (75mm dia) 100% rec	2.00-2.45	2	SPT	N=14				2.30	
							Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine to medium of sandstone and coal fragments.	(0.70)	
3.00 - 4.00 (65mm dia) 90% rec	3.00-3.45	3	SPT	N=12				3.00	
							Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone and sandstone.	(0.30)	
								3.30	
							Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium of sandstone and coal fragments	3.50	
							Firm dark greyish brown slightly sandy CLAY. Sand is fine.	(0.50)	
4.00 - 5.00 (65mm dia) 0% rec	4.00-4.45	4	SPT	N=16				4.00	
							No recovery.	(1.00)	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. No groundwater encountered.
3. Backfilled with arisings.
4. CAT and Genny scanned prior to start.
5. Terminated at 5.00m with no recovery in sampler from 4.00m to 5.00m.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS11**

Contract Ref:	Start: **13.08.21**	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	End: **13.08.21**	**126.94**	**E:385428.7 N:409217.8**	**2** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
4.00 - 5.00 (65mm dia) 0% rec							No recovery. *(stratum copied from 4.00m from previous sheet)*	5.00	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS12**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**13.08.21** End: **13.08.21**	**124.91**	**E:385353.6 N:409208.6**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.20-0.30 0.20	3	ES PID	1xT+1xJ+1xV 0.0ppm			Grass onto dark brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subangular fine to medium of brick fragments mudstone and sandstone. Occasional rootlets. (TOPSOIL)	0.20 0.30	
	0.60-0.70 0.60	4	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of brick fragments, sandstone and mudstone. MADE GROUND: Dark brown very clayey slightly gravelly fine to medium SAND. Gravel is fine to medium of brick fragments and sandstone.	(0.90) 1.20	
1.20 - 2.00 (85mm dia)	1.20-1.65 1.30-1.50 1.30	1 6	SPT ES PID	N=4 1xT+1xJ+1xV 0.0ppm	1		Firm dark greyish brown mottled grey and orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular fine and of sandstone.	(0.80) 2.00	
2.00 - 3.00 (85mm dia)	2.00-2.45	2	SPT	N=4			Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mixed lithologies, including sandstone.	(1.40) 3.40	
3.00 - 4.00 (75mm dia) 50% rec	3.00-3.45	5	SPT	N=10	1		No recovery.	(1.05) 4.45	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Groundwater encountered at 3.20m rising to 2.00m.
4. Installed to 1.20m: 0.60m plain and 0.60m slotted.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS13**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**127.70**	**E:385461.5 N:409206.4**	**1** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.00		PID	0.0ppm			Grass onto dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular fine to medium of sandstone. Occasional rootlets. (TOPSOIL)	0.20	
	0.20		PID	0.0ppm			MADE GROUND: Dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is angular to subangular fine to coarse of brick fragments and sandstone.	0.40	
	0.40		PID	0.0ppm			Light yellowish grey fine to medium SAND. Occasional pockets of firm very sandy clay, sand is fine.	(0.80)	
	1.20-1.65	1	SPT	N=5			Firm dark greyish brown mottled orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone and sandstone.	1.20 (0.80)	
	2.00-2.45	2	SPT	N=20			Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone and sandstone.	2.00 (2.00)	
	3.00-3.45	3	SPT	N=12					
	4.00-4.45	4	SPT	N=13			No recovery.	4.00 (1.00)	

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. No groundwater encountered.
4. Backfilled with arisings.
5. No recovery from 4.00m to 5.00m. Borehole terminated.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS13**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**127.70**	**E:385461.5 N:409206.4**	**2** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							No recovery. *(stratum copied from 4.00m from previous sheet)*	5.00	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS14**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**12.08.21** End: **12.08.21**	**126.80**	**E:385431.3 N:409104.2**	**1** of **1**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Grass onto dark brown slightly clayey fine to medium SAND. Occasional rootlets. (TOPSOIL)	(0.30) 0.30	
	0.40-0.60 0.40	1	ES PID	1xT+1xJ+1xV 0.0ppm	1		MADE GROUND: Dark brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subangular fine of sandstone and brick fragments.	(0.60) 0.90	
	0.90-1.10 0.90	4	ES PID	1xT+1xJ+1xV 0.0ppm	1		Firm light greyish brown mottled orange sandy slightly gravelly CLAY with low cobble content of sandstone.. Sand is fine to medium. Gravel is subangular fine of sandstone and coal.	(0.80) 1.70	
1.20 - 1.60 (85mm dia) 0% rec	1.20-	2	SPT						
	1.70-	3	SPT						

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. CAT and Genny scanned prior to start.
3. Water seepage rising from 1.20m to 0.80m.
4. SPT at 1.20m very soft, sampler recovery fell out in borehole and couldn't progress further than 1.70m. Removed sampler and did an SPT at 1.70m, which was a refusal.
5. Borehole terminated on a refusal and back filled with arisings.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

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WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Heywood Stores	**Telereal Trillium Ltd**	**WS15**

Contract Ref:	Start:	Ground Level:	National Grid Co-ordinate:	Sheet:
322834	**16.08.21** End: **16.08.21**	**127.62**	**E:385674.2 N:408971.5**	**1** of **1**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.20-0.40 0.20	3	ES PID	1xT+1xJ+1xV 0.0ppm			Grass onto dark brown slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine of sandstone. Occasional rootlets. (TOPSOIL)	0.20	
	0.80-1.00 0.80	4	ES PID	1xT+1xJ+1xV 0.0ppm			MADE GROUND: Dark brown slightly gravelly fine SAND. Gravel is subangular to subrounded fine to medium of brick fragments and sandstone. Occasional pieces of wood.	(0.40) 0.60	
	1.20-1.65 1.20-1.60 1.20	1 5	SPT ES PID	N=0 1xT+1xJ+1xV 0.0ppm	1 1		MADE GROUND: Light pinkish brown gravelly fine to coarse SAND. Gravel is angular to subangular fine to medium of brick fragments and clinker.	(0.60) 1.20	
1.20 - 2.00 (85mm dia) 30% rec							MADE GROUND: Soft to firm dark greyish brown mottled yellow slightly sandy CLAY. Sand is fine.	(0.40) 1.60	
							MADE GROUND: dark pinkish grey sandy angular to subangular fine to medium GRAVEL of clinker and mudstone. Sand is fine to coarse.	(0.40) 2.00	
	2.00-2.45	2	SPT	N=6			MADE GROUND: Firm dark greyish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine of mudstone and sandstone.	2.20	
2.00 - 3.00 (85mm dia) 10% rec							MADE GROUND: dark pinkish grey sandy fine to medium and angular to subangular GRAVEL of clinker and mudstone. Sand is fine to coarse.	(0.30) 2.50	
							No recovery.	(0.50) 3.00	

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Hand dug pit to 1.20m.
2. Groundwater seepage encountered at 1.40m.
3. CAT and Genny scanned prior to start.
4. Backfilled with arisings.
5. Terminated at 3.00m with no recovery with 2.50m to 3.00m.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier 110**	**Vincent Cameron**	**RChanter**	

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Log WINDOW SAMPLE LOG - A4P | 322834-HEYWOOD-STORES.GPJ - v10_01.
RSK Environment Ltd, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR. Tel: 01928 726006, Fax: 01928 725633, Web: www.rsk.co.uk. | 24/09/21 - 12:23 | AW1 |

APPENDIX I GROUND GAS MONITORING DATA

Job Number:
Client:
Site:

Revised Wilson and Card Classification Ground Gas Risk Assessment

Job No.:	322834
Client:	Telereal Trillium
Site:	Heywood Stores

For low-rise residential developments without a clear ventilated sub-floor void, flats and commercial / industrial sites

Characteristic Situation	Risk	GSV
1	Very Low	0.07
2	Low	0.7
3	Moderate	3.5
4	Moderate to High	15
5	High	70
6	Very High	>70

From CIRIA Report 659 (2006) "Assessing Risks Posed By Hazardous Ground Gases To Buildings", Wilson **et al.**

KEY:
GSV Gas Screening Value

GSV cannot be calculated on a site-specific basis

GSV indicates very low risk
GSV indicates low to moderate risk
GSV indicates moderate or greater risk; Concentrations of CH4 ≥20%V/V; CO2 ≥30%V/V
Oxygen concentration ≤10%v/v
Total ground gas concentrations >100%v/v

		DTW	CH4 I	CH4 SS	CO2 I	CO2 SS	O2 I	O2 SS	Flow	Baro	BH Press	I SUM	SS SUM	GSV		
BH NO.	**DATE**	**m/bc**	**%v/v**	**%v/v**	**%v/v**	**%v/v**	**%v/v**	**%v/v**	**l/hr**	**mbar**	**mbar**	**%v/v**	**%v/v**	**CH4**	**CO2**	**CS No.**
WS01	20/08/2021	2.01	<0.1	<0.1	0.2	3.1	20.2	17.8	**0**	999		20.4	20.9	**0.00**	**0.00**	**CS1**
	01/09/2021	2.14	<0.1	<0.1	0.2	4.0	18.3	17.6	**0**	1020		18.5	21.6	**0.00**	**0.00**	**CS1**
	15/09/2021	2.22	<0.1	<0.1	3.5	3.4	19.9	17.8	**0**	1000		23.4	21.2	**0.00**	**0.00**	**CS1**
	29/09/2021	2.20	<0.1	<0.1	1.7	1.7	20.3	19.2	**0**	1003		22.0	20.9	**0.00**	**0.00**	**CS1**
	13/10/2021	2.20	<0.1	<0.1	2.2	2.2	18.7	18.8	**0**	1013		20.9	21.0	**0.00**	**0.00**	**CS1**
	27/10/2021	2.18	<0.1	<0.1	1.7	1.7	19.7	19.7	**0**	993		21.4	21.4	**0.00**	**0.00**	**CS1**
WS03	20/08/2021	2.16	<0.1	<0.1	0.2	2.8	19.7	17.5	**0**	1000		19.9	20.3	**0.00**	**0.00**	**CS1**
	01/09/2021	2.38	<0.1	<0.1	3.5	3.6	17.9	17.3	**0**	1020		21.4	20.9	**0.00**	**0.00**	**CS1**
	15/09/2021	2.59	<0.1	<0.1	4.4	4.5	19.6	16.6	**0.1**	1000		24.0	21.1	**0.00**	**0.00**	**CS1**
	29/09/2021	2.11	<0.1	<0.1	4.5	4.4	19.3	17.7	**0**	1003		23.8	22.1	**0.00**	**0.00**	**CS1**
	13/10/2021	2.10	<0.1	<0.1	3.1	3.2	18.7	18.0	**0.1**	1013		21.8	21.2	**0.00**	**0.00**	**CS1**
	27/10/2021	1.13	<0.1	<0.1	4.7	3.8	17.4	17.9	**0**	992		22.1	21.7	**0.00**	**0.00**	**CS1**
WS05	20/08/2021	1.68	<0.1	<0.1	0.2	2.0	19.7	18.4	**0**	1000		19.9	20.4	**0.00**	**0.00**	**CS1**
	01/09/2021	0.83	<0.1	<0.1	0.5	0.3	19.7	18.6	**0.1**	1020		20.2	18.9	**0.00**	**0.00**	**CS1**
	15/09/2021	1.03	<0.1	<0.1	0.3	0.3	19.7	19.7	**0.1**	1000		20.0	20.0	**0.00**	**0.00**	**CS1**
	29/09/2021	1.12	<0.1	<0.1	1.2	1.2	20.2	19.8	**0.1**	1004		21.4	21.0	**0.00**	**0.00**	**CS1**
	13/10/2021	0.59	<0.1	<0.1	3.2	3.2	18.7	18.0	**0.1**	1013		21.9	21.2	**0.00**	**0.00**	**CS1**
	27/10/2021	0.45	<0.1	<0.1	0.5	0.4	20.4	20.6	**0**	993		20.9	21.0	**0.00**	**0.00**	**CS1**
WS07	20/08/2021	2.01	<0.1	<0.1	0.2	2.0	19.3	17.3	**0**	1000		19.5	19.3	**0.00**	**0.00**	**CS1**
	01/09/2021	2.21	<0.1	<0.1	1.8	3.0	19.7	18.6	**0**	1020		21.5	21.6	**0.00**	**0.00**	**CS1**
	15/09/2021	2.35	<0.1	<0.1	5.2	5.3	19.8	16.1	**0**	1000		25.0	21.4	**0.00**	**0.00**	**CS1**
	29/09/2021	2.33	<0.1	<0.1	6.6	6.8	18.1	14.7	**0.1**	1004		24.7	21.5	**0.00**	**0.01**	**CS1**
	13/10/2021	2.02	<0.1	<0.1	0.3	0.1	21.2	21.2	**0**	1013		21.5	21.3	**0.00**	**0.00**	**CS1**
	27/10/2021	1.62	<0.1	<0.1	7.4	6.8	18.1	18.1	**0**	992		25.5	24.9	**0.00**	**0.00**	**CS1**
WS09	20/08/2021	1.01	<0.1	<0.1	0.3	4.0	19.9	15.9	**0**	1000		20.2	19.9	**0.00**	**0.00**	**CS1**
	01/09/2021	Dry	<0.1	<0.1	5.3	5.3	16.6	16.6	**0.1**	1020		21.9	21.9	**0.00**	**0.01**	**CS1**
	15/09/2021	Dry	<0.1	<0.1	4.5	5.0	19.6	17.2	**0**	1001		24.1	22.2	**0.00**	**0.00**	**CS1**
	29/09/2021	Dry	<0.1	<0.1	4.2	4.2	18.2	17.2	**0**	Dry		22.4	21.4	**0.00**	**0.00**	**CS1**
	13/10/2021	0.99	<0.1	<0.1	3.3	3.4	19.6	18.9	**0**	1013		22.9	22.3	**0.00**	**0.00**	**CS1**
	27/10/2021	0.99	<0.1	<0.1	6.8	7.0	16.0	14.4	**0**	993		22.8	21.4	**0.00**	**0.00**	**CS1**
WS12	20/08/2021	1.22	<0.1	<0.1	0.3	3.3	19.7	17.2	**0**	1000		20.0	20.5	**0.00**	**0.00**	**CS1**
	01/09/2021	Dry	<0.1	<0.1	3.4	3.4	20.1	18.0	**0**	1020		23.5	21.4	**0.00**	**0.00**	**CS1**
	15/09/2021	Dry	<0.1	<0.1	3.0	3.2	19.6	17.7	**0.1**	1000		22.6	20.9	**0.00**	**0.00**	**CS1**
	29/09/2021	1.19	<0.1	<0.1	3.2	3.3	19.3	16.3	**0**	1003		22.5	19.6	**0.00**	**0.00**	**CS1**
	13/10/2021	1.10	<0.1	<0.1	6.0	6.1	12.5	12.5	**0.1**	1013		18.5	18.6	**0.00**	**0.01**	**CS1**
	27/10/2021	0.92	<0.1	<0.1	5.8	0.9	17.1	20.2	**0**	993		22.9	21.1	**0.00**	**0.00**	**CS1**

WORST-CASE VALUES PER BOREHOLE

			Maximum CH4		Maximum CO2		Minimum O2		Max Flow	Not Applicable		Maximum Total		Maximum GSVs		CS No
WS01			<0.1	<0.1	3.5	4.0	18.3	17.6	<0.1			21.8	21.6	**0.00**	**0.00**	**CS1**
WS03			<0.1	<0.1	4.7	4.5	17.4	16.6	0.1			22.1	21.1	**0.00**	**0.00**	**CS1**
WS05			<0.1	<0.1	3.2	3.2	18.7	18.0	0.1			21.9	21.2	**0.00**	**0.00**	**CS1**
WS07			<0.1	<0.1	7.4	6.8	18.1	14.7	0.1			25.5	21.5	**0.00**	**0.01**	**CS1**
WS09			<0.1	<0.1	6.8	7.0	16.0	14.4	0.1			22.8	21.4	**0.00**	**0.01**	**CS1**
WS12			<0.1	<0.1	6.0	6.1	12.5	12.5	0.1			18.5	18.6	**0.00**	**0.01**	**CS1**

APPENDIX J LABORATORY CERTIFICATES FOR SOIL ANALYSIS

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 21/08959
Issue Number: 1 **Date:** 16 September, 2021

Client:
RSK Environment Helsby
Spring Lodge
172 Chester Road
Helsby
Cheshire
UK
WA6 0AR

Project Manager: Jon Clayton/Rebecca Chanter/Rebecca Homer/Richard
Project Name: Heywood Stores
Project Ref: 322834
Order No: N/A
Date Samples Received: 16/08/21
Date Instructions Received: 18/08/21
Date Analysis Completed: 16/09/21

Prepared by:



Sophie France
Client Service Manager

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07			
Depth to Top	0.90	0.10	0.40	0.40	0.90	0.20	0.60			
Depth To Bottom	1.10	0.20	0.60	0.60	1.00	0.40	0.80			
Date Sampled	16-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	16-Aug-21	13-Aug-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	5A	6AE	5A	6AE	5A			
% Stones >10mm$_A$	<0.1	23.1	<0.1	20.7	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	-	7.04	-	7.17	-	5.52	5.87	pH	0.01	A-T-031s
pH BRE$_D$$^{M\#}$	5.19	-	-	-	5.94	-	-	pH	0.01	A-T-031s
Chloride BRE, SO4 equiv. (water sol 2:1)$_D$	19	-	-	-	-	-	-	mg/l	7	A-T-026s
Nitrate BRE, SO4 equiv. (water sol 2:1)$_D$	<0.4	-	-	-	-	-	-	mg/l	0.4	A-T-026s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	25	-	-	-	69	-	-	mg/l	10	A-T-026s
Arsenic$_D$$^{M\#}$	-	7	-	4	-	17	<1	mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	-	0.7	-	0.8	-	1.1	<0.5	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	-	22	-	35	-	50	7	mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	-	15	-	17	-	23	15	mg/kg	1	A-T-024s
Lead$_D$$^{M\#}$	-	47	-	39	-	96	9	mg/kg	1	A-T-024s
Mercury$_D$	-	<0.17	-	<0.17	-	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	-	12	-	17	-	20	13	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	-	<1	-	<1	-	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	-	50	-	64	-	70	22	mg/kg	5	A-T-024s

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07			
Depth to Top	0.90	0.10	0.40	0.40	0.90	0.20	0.60			
Depth To Bottom	1.10	0.20	0.60	0.60	1.00	0.40	0.80			
Date Sampled	16-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	16-Aug-21	13-Aug-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	5A	6AE	5A	6AE	5A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	-	-	NAD	-	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	-	-	N/A	-	N/A	N/A			A-T-045

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07			
Depth to Top	0.90	0.10	0.40	0.40	0.90	0.20	0.60			
Depth To Bottom	1.10	0.20	0.60	0.60	1.00	0.40	0.80			
Date Sampled	16-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	16-Aug-21	13-Aug-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	5A	6AE	5A	6AE	5A			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	-	-	0.17	-	-	-	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	-	-	<0.01	-	-	-	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	-	-	0.28	-	-	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	-	-	0.63	-	-	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	-	-	0.54	-	-	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	-	-	0.55	-	-	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	-	-	0.23	-	-	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	-	-	0.21	-	-	-	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	-	-	0.64	-	-	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	-	-	0.06	-	-	-	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	-	-	1.47	-	-	-	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	-	0.12	-	-	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	-	-	0.31	-	-	-	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	-	-	<0.03	-	-	-	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	-	-	1.30	-	-	-	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	-	-	1.20	-	-	-	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	-	-	7.71	-	-	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07			
Depth to Top	0.90	0.10	0.40	0.40	0.90	0.20	0.60			
Depth To Bottom	1.10	0.20	0.60	0.60	1.00	0.40	0.80			
Date Sampled	16-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	16-Aug-21	13-Aug-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	5A	6AE	5A	6AE	5A			
Speciated PCB-EC7 & WHO12										
PCB BZ $28_A^{M\#}$	-	-	-	-	-	<0.002	-	mg/kg	0.002	A-T-004s
PCB BZ $52_A^{M\#}$	-	-	-	-	-	<0.002	-	mg/kg	0.002	A-T-004s
PCB BZ 81_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ $101_A^{M\#}$	-	-	-	-	-	<0.004	-	mg/kg	0.004	A-T-004s
PCB BZ 105_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 114_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ $118_A^{M\#}$	-	-	-	-	-	<0.007	-	mg/kg	0.007	A-T-004s
PCB BZ 123_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 126_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ $138_A^{M\#}$	-	-	-	-	-	<0.006	-	mg/kg	0.006	A-T-004s
PCB BZ $153_A^{M\#}$	-	-	-	-	-	<0.004	-	mg/kg	0.004	A-T-004s
PCB BZ 156_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 157_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 167_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 169_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ $180_A^{M\#}$	-	-	-	-	-	<0.004	-	mg/kg	0.004	A-T-004s
PCB BZ 189_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 77_A	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
Total Speciated PCB-EC7 & $WHO12_A$	-	-	-	-	-	<0.007	-	mg/kg	0.002	A-T-004s

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07			
Depth to Top	0.90	0.10	0.40	0.40	0.90	0.20	0.60			
Depth To Bottom	1.10	0.20	0.60	0.60	1.00	0.40	0.80			
Date Sampled	16-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	12-Aug-21	16-Aug-21	13-Aug-21			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6AE	5A	6AE	5A	6AE	5A			
TPH CWG										
Ali >C5-C6$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	-	-	<1	-	-	-	-	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	-	-	<1	-	-	-	-	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	-	-	<1	-	-	-	-	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	-	-	<1	-	-	-	-	mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	-	-	2	-	-	-	-	mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	-	2	-	-	-	-	mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	-	-	<1	-	-	-	-	mg/kg	1	A-T-055s
Aro >C10-C12$_A$	-	-	<1	-	-	-	-	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	-	-	1	-	-	-	-	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	-	-	2	-	-	-	-	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	-	-	7	-	-	-	-	mg/kg	1	A-T-055s
Total Aromatics$_A$	-	-	11	-	-	-	-	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	-	-	13	-	-	-	-	mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	-	-	<0.01	-	-	-	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/18	21/08959/19	21/08959/22	21/08959/27	21/08959/28	21/08959/31		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS08	WS09	WS12	WS12	WS13				
Depth to Top	0.00	0.50	0.90	0.60	1.30	0.40				
Depth To Bottom	0.30	0.70	1.10	0.70	1.50	0.60				
Date Sampled	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	16-Aug-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	6AE	6ABE	5AE	6AE	5A	4A				
% Stones >10mm$_A$	25.8	28.9	2.2	11.5	<0.1	2.8		% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.82	8.27	-	6.57	7.04	7.16		pH	0.01	A-T-031s
pH BRE$_D$$^{M\#}$	-	-	6.27	-	-	-		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	-	-	22	-	-	-		mg/l	10	A-T-026s
Arsenic$_D$$^{M\#}$	9	3	-	5	2	<1		mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	1.5	0.8	-	1.2	0.6	<0.5		mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	31	23	-	27	19	8		mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	19	15	-	31	18	11		mg/kg	1	A-T-024s
Lead$_D$$^{M\#}$	54	43	-	70	33	16		mg/kg	1	A-T-024s
Mercury$_D$	0.47	1.14	-	<0.17	<0.17	<0.17		mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	16	14	-	21	14	8		mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	-	<1	<1	<1		mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	126	68	-	87	38	17		mg/kg	5	A-T-024s

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/18	21/08959/19	21/08959/22	21/08959/27	21/08959/28	21/08959/31		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS08	WS09	WS12	WS12	WS13				
Depth to Top	0.00	0.50	0.90	0.60	1.30	0.40				
Depth To Bottom	0.30	0.70	1.10	0.70	1.50	0.60				
Date Sampled	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	16-Aug-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	6AE	6ABE	5AE	6AE	5A	4A				
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	-	-	-	NAD	-	NAD				A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	-	-	-	N/A	-	N/A				A-T-045

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/18	21/08959/19	21/08959/22	21/08959/27	21/08959/28	21/08959/31		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS08	WS09	WS12	WS12	WS13				
Depth to Top	0.00	0.50	0.90	0.60	1.30	0.40				
Depth To Bottom	0.30	0.70	1.10	0.70	1.50	0.60				
Date Sampled	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	16-Aug-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	6AE	6ABE	5AE	6AE	5A	4A				
Speciated PCB-EC7 & WHO12										
PCB BZ $28_A^{M\#}$	-	-	-	-	-	<0.002		mg/kg	0.002	A-T-004s
PCB BZ $52_A^{M\#}$	-	-	-	-	-	<0.002		mg/kg	0.002	A-T-004s
PCB BZ 81_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ $101_A^{M\#}$	-	-	-	-	-	<0.004		mg/kg	0.004	A-T-004s
PCB BZ 105_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ 114_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ $118_A^{M\#}$	-	-	-	-	-	<0.007		mg/kg	0.007	A-T-004s
PCB BZ 123_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ 126_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ $138_A^{M\#}$	-	-	-	-	-	<0.006		mg/kg	0.006	A-T-004s
PCB BZ $153_A^{M\#}$	-	-	-	-	-	<0.004		mg/kg	0.004	A-T-004s
PCB BZ 156_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ 157_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ 167_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ 169_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ $180_A^{M\#}$	-	-	-	-	-	<0.004		mg/kg	0.004	A-T-004s
PCB BZ 189_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
PCB BZ 77_A	-	-	-	-	-	<0.005		mg/kg	0.005	A-T-004s
Total Speciated PCB-EC7 & $WHO12_A$	-	-	-	-	-	<0.007		mg/kg	0.002	A-T-004s

Envirolab Job Number: 21/08959

Client Project Name: Heywood Stores

Client Project Ref: 322834

Lab Sample ID	21/08959/18	21/08959/19	21/08959/22	21/08959/27	21/08959/28	21/08959/31		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS08	WS09	WS12	WS12	WS13				
Depth to Top	0.00	0.50	0.90	0.60	1.30	0.40				
Depth To Bottom	0.30	0.70	1.10	0.70	1.50	0.60				
Date Sampled	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	13-Aug-21	16-Aug-21				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
Sample Matrix Code	6AE	6ABE	5AE	6AE	5A	4A				
TPH CWG										
Ali >C5-C6$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	-	<1	-	<1	<1	-		mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	-	<1	-	<1	1	-		mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	-	2	-	<1	4	-		mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	-	4	-	2	<1	-		mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	-	56	-	16	8	-		mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	61	-	19	13	-		mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	-	2	-	1	<1	-		mg/kg	1	A-T-055s
Aro >C10-C12$_A$	-	<1	-	<1	4	-		mg/kg	1	A-T-055s
Aro >C12-C16$_A$	-	6	-	3	9	-		mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	-	44	-	7	4	-		mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	-	167	-	34	8	-		mg/kg	1	A-T-055s
Total Aromatics$_A$	-	220	-	45	24	-		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	-	281	-	64	37	-		mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	-	<0.01	-	<0.01	<0.01	-		mg/kg	0.01	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

v1

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: RSK Environment Helsby, Spring Lodge, 172 Chester Road, Helsby, Cheshire, UK, WA6 0AR

Project: Heywood Stores

Clients Project No: 322834

Project No: 21/08959

Date Received: 18/08/2021 (am)

Cool Box Temperatures (°C): 15.7 - 17.1

Lab Sample ID	21/08959/3
Client Sample No	
Client Sample ID/Depth	WS01 0.90-1.10m
Date Sampled	16/08/21
Deviation Code	
F	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	21/08959/3
Client Sample No	
Client Sample ID/Depth	WS01 0.90-1.10m
Date Sampled	16/08/21
Chloride BRE, SO4 equiv. (water sol 2:1)	✓
Nitrate BRE, SO4 equiv. (water sol 2:1)	✓

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples 5 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	21/08959/18	21/08959/19	21/08959/22	21/08959/27	21/08959/28
Client Sample No												
Client Sample ID/Depth	WS01 0.90-1.10m	WS02 0.10-0.20m	WS02 0.40-0.60m	WS04 0.40-0.60m	WS04 0.90-1.00m	WS05 0.20-0.40m	WS07 0.60-0.80m	WS08 0.00-0.30m	WS08 0.50-0.70m	WS09 0.90-1.10m	WS12 0.60-0.70m	WS12 1.30-1.50m
Date Sampled	16/08/21	12/08/21	12/08/21	12/08/21	12/08/21	16/08/21	13/08/21	13/08/21	13/08/21	13/08/21	13/08/21	13/08/21
A-T-004s						24/08/2021						
A-T-019s	23/08/2021			23/08/2021								
A-T-022s			27/08/2021						23/08/2021		23/08/2021	23/08/2021
A-T-024s		02/09/2021		02/09/2021		02/09/2021	02/09/2021	02/09/2021	02/09/2021		02/09/2021	02/09/2021
A-T-026s	16/09/2021				02/09/2021					02/09/2021		
A-T-031s	01/09/2021	01/09/2021		01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021
A-T-044	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021	01/09/2021
A-T-045	20/08/2021			20/08/2021		20/08/2021	20/08/2021				20/08/2021	
A-T-055s			27/08/2021						23/08/2021		23/08/2021	23/08/2021

Lab Sample ID	21/08959/31
Client Sample No	
Client Sample ID/Depth	WS13 0.40-0.60m
Date Sampled	16/08/21
A-T-004s	24/08/2021
A-T-019s	
A-T-022s	
A-T-024s	02/09/2021
A-T-026s	
A-T-031s	01/09/2021
A-T-044	01/09/2021
A-T-045	20/08/2021
A-T-055s	

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

APPENDIX K LABORATORY CERTIFICATES FOR GEOTECHNICAL ANALYSIS

IAN FARMER ASSOCIATES

Unit 4, Faraday Close, Pattinson North Industrial Estate, Washington, NE38 8QJ. Tel: 0191 482 8500 Fax: 0191 482 8520
washington@ianfarmer.co.uk www.ianfarmer.co.uk

F.A.O.

Final Test Report - 2280708 / 1

Site:	Heywood Stores
Job Number:	2280708
Originating Client:	RSK Helsby
Originating Reference:	322834
Date Sampled:	19/08/2021
Date Scheduled:	24/08/2021
Date Testing Started:	09/09/2021
Date Testing Finished:	17/09/2021

Previous Reports		Amendments	Date Issued

Amendments:

Authorised By:

Tim Robinson
Quality Supervisor

Report Issue Date: 17/09/2021

Constructionline
Part of Capita plc

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AGS

IAN FARMER ASSOCIATES

Laboratory Test Report 2280708 / 1

Site: Heywood Stores **Job Number:** 2280708

Client: RSK Helsby **Page:** 2

Determination of Water Content, Liquid Limit and Plastic Limit and Derivation of Plasticity and Liquidity Index

Borehole / Trial Pit	Depth (m)	Sample	Natural Water Content %	Sample Preparation Natural = Hand picked Sieved = Washed on 425µm			Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	One-point PI Only		Description / Remarks
				Natural / Sieved	Passing %	Calc. WC %						Cone Penetration (mm)	Correction Factor	
CP01	2.00	B+D	17.6	Natural	98	18	29	15	14	0.21	CL	20 20.2	0.9984	Brown slightly silty, slightly gravelly CLAY
CP01	3.00	D	15.8	Natural	91	17	34	15	19	0.12	CL	20.2 20.1	0.998	Brown slightly silty, slightly gravelly CLAY
CP02	2.00	B	31.4	Natural	100	31	57	27	30	0.15	CH	19.9 19.8	1.0027	Brown silty CLAY
CP02	4.00	B	19	Natural	98	19	29	14	15	0.36	CL	20.2 20.2	0.9972	Brown slightly gravelly, silty CLAY
CP03	2.00	B	18.8	Natural	98	19	29	14	15	0.35	CL	19.6 19.5	1.0071	Brown slightly gravelly, silty CLAY
CP03	4.00	B	17.1	Natural	100	17	30	16	14	0.08	CL	19.8 19.7	1.0038	Brown silty CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.2 Specimen preparation for liquid and plastic limits

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.3 Determination of liquid limit by the fall cone method. 80g / 30° Cone
BS EN ISO 17892 : Part 12 : 2018 : Clause 5.5 Determination of plastic limit

UKAS TESTING 1464

General Remarks: All samples tested with increasing water content, unless otherwise stated.
All samples tested to four-point method, unless the extra 'One-point PI Only' data is reported.

Results reported relate only to the samples tested.

Final Test Report - 2280708 / 1

Site:	Heywood Stores
Job Number:	2280708
Originating Client:	RSK Helsby

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

This test report shall not be reproduced, except in full and only with the written permission of Ian Farmer Associates Ltd.

Samples will be retained for 28 days from date of issue of the final test report before being disposed of, unless we receive written instruction to the contrary.

Report Issue Date: 17/09/2021

APPENDIX L GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH

Table 5
Human Health Generic Assessment Criteria for Residential with home-grown produce

Compound	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals			
Arsenic	37	37	37
Barium	1,300	1,300	1,300
Beryllium	1.7	1.7	1.7
Boron	300	300	300
Cadmium	22	22	22
Chromium (III) - trivalent	910	910	910
Chromium (VI) - hexavalent	21	21	21
Copper	2,500	2,500	2,500
Lead	200	200	200
Elemental Mercury (Hg^0)	0.2	0.6	1.2
Inorganic Mercury (Hg^{2+})	39	39	39
Methyl Mercury (Hg^{4+})	10	10	10
Nickel	130	130	130
Selenium	258	258	258
Vanadium	410	410	410
Zinc	3,900	3,900	3,900
Cyanide (free)	1.4	1.4	1.4
Volatile Organic Compounds			
Benzene	0.20	0.41	0.87
Toluene	130	300	680
Ethylbenzene	50	110	260
Xylene - m	59	140	327
Xylene - o	61	143	332
Xylene - p	57	133	310
Total xylene	57	133	310
Methyl tertiary-Butyl ether (MTBE)	60	110	210
1,1,1,2 Tetrachloroethane	1.20	2.78	6.46
1,1,2,2-Tetrachloroethane	1.6	3.5	7.7
1,1,1-Trichloroethane	9	18	39
1,1,2 Trichloroethane	0.8	1.6	3.5
1,1-Dichloroethene	0.32	0.57	1.16
1,2-Dichloroethane	0.007	0.011	0.019
1,2,4-Trimethylbenzene	1.8	4.3	9.7
1,3,5-Trimethylbenzene	NR	NR	NR
1,2-Dichloropropane	0.034	0.060	0.120
Carbon Tetrachloride (tetrachloromethane)	0.026	0.056	0.127
Chloroethane	11.7	15.9	25.7
Chloromethane	0.012	0.014	0.019
Cis 1,2 Dichloroethene	0.16	0.27	0.52
Dichloromethane	0.62	1.08	1.92
Tetrachloroethene (PCE)	0.31	0.70	1.60
Trans 1,2 Dichloroethene	0.28	0.50	1.02
Trichloroethene (TCE)	0.009	0.020	0.043
Vinyl Chloride (chloroethene)	0.006	0.010	0.017
Semi-Volatile Organic Compounds			
2-Chloronaphthalene	5	13	31
Acenaphthene	230	540	1,170
Acenaphthylene	180	440	970
Anthracene	2,400	5,500	10,900
Benzo(a)anthracene	7	11	13
Benzo(a)pyrene	5	5	5
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(g,h,i)perylene	310	340	350
Benzo(k)fluoranthene	77	92	100
Chrysene	15	22	27
Dibenzo(a,h)anthracene	0.24	0.28	0.30
Fluoranthene	290	560	900
Fluorene	170	410	880
Hexachloroethane	0.27	0.66	1.55
Indeno(1,2,3-cd)pyrene	13	30	71
Naphthalene	13	30	71
Phenanthrene	100	220	440
Pyrene	620	1,240	2,040
Phenol	120	210	390
Total Petroleum Hydrocarbons			
Aliphatic hydrocarbons EC_5-EC_6	42	78	160
Aliphatic hydrocarbons >EC_6-EC_8	100	230	530
Aliphatic hydrocarbons >EC_8-EC_{10}	27	65	154
Aliphatic hydrocarbons >EC_{10}-EC_{12}	130 (48)	330 (118)	760 (283)
Aliphatic hydrocarbons >EC_{12}-EC_{16}	1,100 (24)	2,400 (59)	4,300 (142)
Aliphatic hydrocarbons >EC_{16}-EC_{35}	65,000 (8)	92,000 (21)	110,000
Aliphatic hydrocarbons >EC_{35}-EC_{44}	65,000 (8)	92,000 (21)	110,000
Aromatic hydrocarbons >EC_8-EC_{10}	30	80	190
Aromatic hydrocarbons >EC_{10}-EC_{12}	80	180	390
Aromatic hydrocarbons >EC_{12}-EC_{16}	140	330	670
Aromatic hydrocarbons >EC_{16}-EC_{21}	260	540	930
Aromatic hydrocarbons >EC_{21}-EC_{35}	1,100	1,500	1,700
Aromatic hydrocarbons >EC_{35}-EC_{44}	1,100	1,500	1,700
Minerals			
Asbestos	Stage 1 test – No asbestos detected with ID; Stage 2 test - <0.001% dry weight (exceedance of either equates to an exceedance of the GAC)[1]		

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.

NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used

EC - equivalent carbon. SAC - soil assessment criteria.

[1] LOD for weight of asbestos per unit weight of soil calculated on a dry weight basis using PLM, handpicking and gravimetry.

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58.
1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, PAHs napthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

(VALUE IN BRACKETS)
RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.

APPENDIX M GENERIC ASSESSMENT CRITERIA FOR PHYTOTOXIC EFFECTS

Several compounds can inhibit plant growth; hence it is important to have generic assessment criteria (GAC) to promote healthy plant growth. In the absence of other published GAC, the GAC have been obtained from legislation (UK and European) and guidance related to the use of sewage sludge on agricultural fields.

The Council of European Communities Sewage Sludge Directive (86/278/EEC) dated 1986, has been transposed into UK law by Statutory Instrument No. 1263, The Sludge (use in Agriculture) Regulations 1989 (Public Health England, Wales and Scotland), as amended in 1990 and The Sludge (use in Agriculture) Regulations (Northern Ireland) SR No, 245, 1990. In addition, the Department of Environment (DoE) produced a Code of Practice (CoP) (Updated 2nd Edition) in 2006 which provided guidance on the application of sewage sludge on agricultural land (however the status of this document is unclear as it is on the archive section of the Defra website).

The directive seeks to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to "***prevent harmful effects on soil, vegetation, animals and man".*** To this end, it prohibits the use of untreated sludge on agricultural land unless it is injected or incorporated into the soil. Treated sludge is defined as having undergone "biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use". To provide protection against potential health risks from residual pathogens, sludge must not be applied to soil in which fruit and vegetable crops are growing, or less than ten months before fruit and vegetable crops are to be harvested. Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge.

The specified limits of concentrations of selected elements in soil are presented in Table 4 of the updated 2nd Edition of the DoE Code of Practice and are designed to protect plant growth. It is noted that these values are more stringent than the values set in current UK regulations. However, since they were amended following recommendations from the Independent Scientific Committee in 1993. (MAFF/DOE 1993). The GAC are presented in Table 1.

Table 1: Generic assessment criteria

Determinant	Generic assessment criteria (mg/kg)			
	pH 5.0 < 5.5	pH 5.5 < 6.0	pH 6.0 < 7.0	pH >7.0
Zinc	200	200	200	300
Copper	80	100	135	200
Nickel	50	60	75	110
Lead	300	300	300	300
Cadmium	3	3	3	3
Mercury	1	1	1	1
Note: Only compounds with assessment criteria documented within the Directive 86/278/EEC have been included, although criteria for 5 additional compounds have been presented within the 2006 CoP.				

APPENDIX N GENERIC ASSESSMENT CRITERIA FOR POTABLE WATER SUPPLY PIPES

A range of pipe materials is available and careful selection, design and installation is required to ensure that water supply pipes are satisfactorily installed and meet the requirements of the Water Supply (Water Fittings) Regulations 1999 in England and Wales, the Byelaws 2000 in Scotland and the Northern Ireland Water Regulations. The regulations include a requirement to use only suitable materials when laying water pipes and laying water pipes without protection is not permitted at contaminated sites. The water supply company has a statutory duty to enforce the regulations.

Contaminants in the ground can pose a risk to human health by permeating potable water supply pipes. To fulfil their statutory obligation, UK water supply companies require robust evidence from developers to demonstrate either that the ground in which new plastic supply pipes will be laid is free from specific contaminants, or that the proposed remedial strategy will mitigate any existing risk. If these requirements cannot be demonstrated to the satisfaction of the relevant water company, it becomes necessary to specify an alternative pipe material on the whole development or in specific zones.

In 2010, UK Water Industry Research (UKWIR) published *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (Report Ref. No. 10/WM/03/21). This report reviewed previously published industry guidelines and threshold concentrations adopted by individual water supply companies.

The focus of the UKWIR research project was to develop clear and concise procedures, which provide consistency in the pipe selection decision process. It was intended to provide guidance that can be used to ensure compliance with current regulations and to prevent water supply pipe failing prematurely due to the presence of contamination.

The report concluded that in most circumstances only organic contaminants pose a potential risk to plastic pipe materials and Table 3.1 of the report provides threshold concentrations for polyethylene (PE) and polyvinyl chloride (PVC) pipes for the organic contaminants of concern. The report also makes recommendations for the procedures to be adopted in the design of site investigations and sampling strategies, and the assessment of data, to ensure that the ground through which water supply pipes will be laid is adequately characterised.

Risks to water supply pipes have therefore been assessed against the threshold concentrations for PE and PVC pipe specified in Table 3.1 of Report 10/WM/03/21, which have been adopted as the GAC for this linkage and are reproduced in Table A3 below.

Since water supply pipes are typically laid at a minimum depth of 0.75 m below finished ground levels, sample results from depths between 0.5 m and 1.5 m below finished level are generally considered suitable for assessing risks to water supply. Samples outside these depths can be used, providing the stratum is the same as that in which water supply pipes are likely to be located. The report specifies that sampling should characterise the ground conditions to a minimum of 0.5 m below the proposed depth of the pipe.

It should be noted that the assessment provided in this report is a guide and the method of assessment and recommendations should be checked with the relevant water supply company.

Table Q1: Generic assessment criteria for water supply pipes

		Pipe material	
		GAC (mg/kg)	
	Parameter group	**PE**	**PVC**
1	Extended VOC suite by purge and trap or head space and GC-MS with TIC (Not including compounds within group 1a)	0.5	0.125
1a	• BTEX + MTBE	0.1	0.03
2	SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C_5–C_{10}) (Not including compounds within group 2e and 2f)	2	1.4
2e	• Phenols	2	0.4
2f	• Cresols and chlorinated phenols	2	0.04
3	Mineral oil C_{11}–C_{20}	10	Suitable
4	Mineral oil C_{21}–C_{40}	500	Suitable
5	Corrosive (conductivity, redox and pH)	Suitable	Suitable
Specific suite identified as relevant following site investigation			
2a	Ethers	0.5	1
2b	Nitrobenzene	0.5	0.4
2c	Ketones	0.5	0.02
2d	Aldehydes	0.5	0.02
6	Amines	Not suitable	Suitable
Notes: where indicated as ‘suitable’, the material is considered resistant to permeation or degradation and no threshold concentration has been specified by UKWIR.			

APPENDIX O GQRA DATA SCREENING TABLES – SOILS

Project name	Heywood Stores
Project code	322834
Client name	telereal Trillium
Address	
NGR	
Land use	Residential with home-grown produce
SOM	1%
GAC version	2021_00

Notes

Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects	Lab sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	21/08959/18	21/08959/19	21/08959/22
									Client sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07	WS08	WS08	WS09
									Depth to top	0.9	0.1	0.4	0.4	0.9	0.2	0.6	0	0.5	0.9
									Depth to bottom	1.1	0.2	0.6	0.6	1	0.4	0.8	0.3	0.7	1.1
									Date sampled	16/08/21	12/08/21	12/08/21	12/08/21	12/08/21	16/08/21	13/08/21	13/08/21	13/08/21	13/08/21
Metals and Inorganics																			
Arsenic	mg/kg	37		17	<1	9	7	2		7		4		17	<1		9	3	
Cadmium	mg/kg	22		1.5	<0.5	9	7	2		0.7		0.8		1.1	<0.5		1.5	0.8	
Chromium	mg/kg	910	21	31	11	9	9	0		15		17		23	15		19	15	
Copper	mg/kg	2500		50	7	9	9	0		22		35		50	7		31	23	
Lead	mg/kg	200		96	9	9	9	0		47		39		96	9		54	43	
Mercury	mg/kg	39	0.2	1.14	<0.17	9	2	7		<0.17		<0.17		<0.17	<0.17		0.47	1.14	
Nickel	mg/kg	130		21	8	9	9	0		12		17		20	13		16	14	
Selenium	mg/kg	258			<1	9	0	9		<1		<1		<1	<1		<1	<1	
Zinc	mg/kg	3900		126	17	9	9	0		50		64		70	22		126	68	
Asbestos																			
Asbestos in soil						6	0	6		NAD			NAD		NAD		NAD		
Petroleum Hydrocarbons																			
Ali >C5-C6	mg/kg	42			<0.01	4	0	4			<0.01							<0.01	
Ali >C6-C8	mg/kg	100			<0.01	4	0	4			<0.01							<0.01	
Ali >C8-C10	mg/kg	27			<1	4	0	4			<1							<1	
Ali >C10-C12	mg/kg	130	48	1	<1	4	1	3			<1							<1	
Ali >C12-C16	mg/kg	1100	24	4	<1	4	2	2			<1							2	
Ali >C16-C21	mg/kg			4	<1	4	2	2			<1							4	
Ali >C21-C35	mg/kg			56	2	4	4	0			2							56	
Ali >C16-C35 calculated	mg/kg	65000	8	60	2	4	4	0			2							60	
Total Aliphatics	mg/kg			61	2	4	4	0			2							61	
Aro >C5-C7	mg/kg				<0.01	4	0	4			<0.01							<0.01	
Aro >C7-C8	mg/kg				<0.01	4	0	4			<0.01							<0.01	
Aro >C8-C10	mg/kg	30		2	<1	4	2	2			<1							2	
Aro >C10-C12	mg/kg	80		4	<1	4	1	3			<1							<1	
Aro >C12-C16	mg/kg	140		9	1	4	4	0			1							6	
Aro >C16-C21	mg/kg	260		44	2	4	4	0			2							44	
Aro >C21-C35	mg/kg	1100		167	7	4	4	0			7							167	
Total Aromatics	mg/kg			220	11	4	4	0			11							220	
TPH (Ali & Aro)	mg/kg			281	13	4	4	0			13							281	
BTEX - Benzene	mg/kg	0.2			<0.01	4	0	4			<0.01							<0.01	
BTEX - Toluene	mg/kg	130			<0.01	4	0	4			<0.01							<0.01	
BTEX - Ethyl Benzene	mg/kg	50			<0.01	4	0	4			<0.01							<0.01	
BTEX - o Xylene	mg/kg	61			<0.01	4	0	4			<0.01							<0.01	
BTEX - m & p Xylene	mg/kg	57			<0.01	4	0	4			<0.01							<0.01	
Fuel oxygenates																			
MTBE	mg/kg	60			<0.01	4	0	4			<0.01							<0.01	
Polycyclic aromatic hydrocarbons																			
Acenaphthene	mg/kg	230		0.17	<0.01	2	1	1	<0.01			0.17							
Acenaphthylene	mg/kg	180			<0.01	2	0	2	<0.01			<0.01							
Anthracene	mg/kg	2400		0.28	<0.02	2	1	1	<0.02			0.28							

Project name	Heywood Stores
Project code	322834
Client name	telereal Trillium
Address	
NGR	
Land use	Residential with home-grown produce
SOM	1%
GAC version	2021_00

Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-dete	Lab sample ID: 21/08959/27	21/08959/28	21/08959/31
									Client sample ID: WS12	WS12	WS13
									Depth to top: 0.6	1.3	0.4
									Depth to bottom: 0.7	1.5	0.6
									Date sampled: 13/08/21	13/08/21	16/08/21
Metals and Inorganics											
Arsenic	mg/kg	37		17	<1	9	7	2	5	2	<1
Cadmium	mg/kg	22		1.5	<0.5	9	7	2	1.2	0.6	<0.5
Chromium	mg/kg	910	21	31	11	9	9	0	31	18	11
Copper	mg/kg	2500		50	7	9	9	0	27	19	8
Lead	mg/kg	200		96	9	9	9	0	70	33	16
Mercury	mg/kg	39	0.2	1.14	<0.17	9	2	7	<0.17	<0.17	<0.17
Nickel	mg/kg	130		21	8	9	9	0	21	14	8
Selenium	mg/kg	258			<1	9	0	9	<1	<1	<1
Zinc	mg/kg	3900		126	17	9	9	0	87	38	17
Asbestos											
Asbestos in soil						6	0	6	NAD		NAD
Petroleum Hydrocarbons											
Ali >C5-C6	mg/kg	42			<0.01	4	0	4	<0.01	<0.01	
Ali >C6-C8	mg/kg	100			<0.01	4	0	4	<0.01	<0.01	
Ali >C8-C10	mg/kg	27			<1	4	0	4	<1	<1	
Ali >C10-C12	mg/kg	130	48	1	<1	4	1	3	<1	1	
Ali >C12-C16	mg/kg	1100	24	4	<1	4	2	2	<1	4	
Ali >C16-C21	mg/kg			4	<1	4	2	2	2	<1	
Ali >C21-C35	mg/kg			56	2	4	4	0	16	8	
Ali >C16-C35 calculated	mg/kg	65000	8	60	2	4	4	0	18	8	
Total Aliphatics	mg/kg			61	2	4	4	0	19	13	
Aro >C5-C7	mg/kg				<0.01	4	0	4	<0.01	<0.01	
Aro >C7-C8	mg/kg				<0.01	4	0	4	<0.01	<0.01	
Aro >C8-C10	mg/kg	30		2	<1	4	2	2	1	<1	
Aro >C10-C12	mg/kg	80		4	<1	4	1	3	<1	4	
Aro >C12-C16	mg/kg	140		9	1	4	4	0	3	9	
Aro >C16-C21	mg/kg	260		44	2	4	4	0	7	4	
Aro >C21-C35	mg/kg	1100		167	7	4	4	0	34	8	
Total Aromatics	mg/kg			220	11	4	4	0	45	24	
TPH (Ali & Aro)	mg/kg			281	13	4	4	0	64	37	
BTEX - Benzene	mg/kg	0.2			<0.01	4	0	4	<0.01	<0.01	
BTEX - Toluene	mg/kg	130			<0.01	4	0	4	<0.01	<0.01	
BTEX - Ethyl Benzene	mg/kg	50			<0.01	4	0	4	<0.01	<0.01	
BTEX - o Xylene	mg/kg	61			<0.01	4	0	4	<0.01	<0.01	
BTEX - m & p Xylene	mg/kg	57			<0.01	4	0	4	<0.01	<0.01	
Fuel oxygenates											
MTBE	mg/kg	60			<0.01	4	0	4	<0.01	<0.01	
Polycyclic aromatic hydrocarbons											
Acenaphthene	mg/kg	230		0.17	<0.01	2	1	1			
Acenaphthylene	mg/kg	180			<0.01	2	0	2			
Anthracene	mg/kg	2400		0.28	<0.02	2	1	1			

								Lab sample ID	21/08959/3	21/08959/4	21/08959/5	21/08959/9	21/08959/10	21/08959/11	21/08959/16	21/08959/18	21/08959/19	21/08959/22
								Client sample ID	WS01	WS02	WS02	WS04	WS04	WS05	WS07	WS08	WS08	WS09
								Depth to top	0.9	0.1	0.4	0.4	0.9	0.2	0.6	0	0.5	0.9
								Depth to bottom	1.1	0.2	0.6	0.6	1	0.4	0.8	0.3	0.7	1.1
								Date sampled	16/08/21	12/08/21	12/08/21	12/08/21	12/08/21	16/08/21	13/08/21	13/08/21	13/08/21	13/08/21
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-detects										
Benzo(a)anthracene	mg/kg	7		0.63	<0.04	2	1	1	<0.04			0.63						
Benzo(a)pyrene	mg/kg	5		0.54	<0.04	2	1	1	<0.04			0.54						
Benzo(b)fluoranthene	mg/kg	2.6		0.55	<0.05	2	1	1	<0.05			0.55						
Benzo(ghi)perylene	mg/kg	310		0.23	<0.05	2	1	1	<0.05			0.23						
Benzo(k)fluoranthene	mg/kg	77		0.21	<0.07	2	1	1	<0.07			0.21						
Chrysene	mg/kg	15		0.64	<0.06	2	1	1	<0.06			0.64						
Dibenzo(ah)anthracene	mg/kg	0.24		0.06	<0.04	2	1	1	<0.04			0.06						
Fluoranthene	mg/kg	290		1.47	<0.08	2	1	1	<0.08			1.47						
Fluorene	mg/kg	170		0.12	<0.01	2	1	1	<0.01			0.12						
Indeno(123-cd)pyrene	mg/kg	27		0.31	<0.03	2	1	1	<0.03			0.31						
Naphthalene	mg/kg	13			<0.03	2	0	2	<0.03			<0.03						
Phenanthrene	mg/kg	100		1.3	<0.03	2	1	1	<0.03			1.3						
Pyrene	mg/kg	620		1.2	<0.07	2	1	1	<0.07			1.2						
Total PAH-16MS	mg/kg			7.71	<0.08	2	1	1	<0.08			7.71						
PCBs																		
PCB BZ 101	mg/kg				<0.004	2	0	2						<0.004				
PCB BZ 105	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 114	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 118	mg/kg				<0.007	2	0	2						<0.007				
PCB BZ 123	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 126	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 138	mg/kg				<0.006	2	0	2						<0.006				
PCB BZ 153	mg/kg				<0.004	2	0	2						<0.004				
PCB BZ 156	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 157	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 167	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 169	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 180	mg/kg				<0.004	2	0	2						<0.004				
PCB BZ 189	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 28	mg/kg				<0.002	2	0	2						<0.002				
PCB BZ 52	mg/kg				<0.002	2	0	2						<0.002				
PCB BZ 77	mg/kg				<0.005	2	0	2						<0.005				
PCB BZ 81	mg/kg				<0.005	2	0	2						<0.005				
Other analytes																		
% Stones >10mm	% w/w			28.9	<0.1	13	7	6	<0.1	23.1	<0.1	20.7	<0.1	<0.1	<0.1	25.8	28.9	2.2
pH	pH			8.27	5.52	9	9	0		7.04		7.17		5.52	5.87	7.82	8.27	
pH BRE	pH			6.27	5.19	3	3	0	5.19				5.94					6.27
Total Speciated PCB-EC7 & WHO12	mg/kg				<0.007	2	0	2						<0.007				

								Lab sample ID	21/08959/27	21/08959/28	21/08959/31
								Client sample ID	WS12	WS12	WS13
								Depth to top	0.6	1.3	0.4
								Depth to bottom	0.7	1.5	0.6
								Date sampled	13/08/21	13/08/21	16/08/21
Analyte	Unit	GAC	T1	Max	Min	Count	# Detects	# Non-dete			
Benzo(a)anthracene	mg/kg	7		0.63	<0.04	2	1	1			
Benzo(a)pyrene	mg/kg	5		0.54	<0.04	2	1	1			
Benzo(b)fluoranthene	mg/kg	2.6		0.55	<0.05	2	1	1			
Benzo(ghi)perylene	mg/kg	310		0.23	<0.05	2	1	1			
Benzo(k)fluoranthene	mg/kg	77		0.21	<0.07	2	1	1			
Chrysene	mg/kg	15		0.64	<0.06	2	1	1			
Dibenzo(ah)anthracene	mg/kg	0.24		0.06	<0.04	2	1	1			
Fluoranthene	mg/kg	290		1.47	<0.08	2	1	1			
Fluorene	mg/kg	170		0.12	<0.01	2	1	1			
Indeno(123-cd)pyrene	mg/kg	27		0.31	<0.03	2	1	1			
Naphthalene	mg/kg	13			<0.03	2	0	2			
Phenanthrene	mg/kg	100		1.3	<0.03	2	1	1			
Pyrene	mg/kg	620		1.2	<0.07	2	1	1			
Total PAH-16MS	mg/kg			7.71	<0.08	2	1	1			
PCBs											
PCB BZ 101	mg/kg				<0.004	2	0	2			<0.004
PCB BZ 105	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 114	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 118	mg/kg				<0.007	2	0	2			<0.007
PCB BZ 123	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 126	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 138	mg/kg				<0.006	2	0	2			<0.006
PCB BZ 153	mg/kg				<0.004	2	0	2			<0.004
PCB BZ 156	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 157	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 167	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 169	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 180	mg/kg				<0.004	2	0	2			<0.004
PCB BZ 189	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 28	mg/kg				<0.002	2	0	2			<0.002
PCB BZ 52	mg/kg				<0.002	2	0	2			<0.002
PCB BZ 77	mg/kg				<0.005	2	0	2			<0.005
PCB BZ 81	mg/kg				<0.005	2	0	2			<0.005
Other analytes											
% Stones >10mm	% w/w			28.9	<0.1	13	7	6	11.5	<0.1	2.8
pH	pH			8.27	5.52	9	9	0	6.57	7.04	7.16
pH BRE	pH			6.27	5.19	3	3	0			
Total Speciated PCB-EC7 & WHO12	mg/kg				<0.007	2	0	2			<0.007