Phase I Geo-Environmental Risk Assessment

Land to the East of Main Avenue, Cowlersley, Huddersfield

May 2022

Thirteen Group

Reference: 220322.R.001

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Client: Thirteen Group

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EXECUTIVE SUMMARY

SCOPE	
Purpose of the Report	This report has been prepared for the purpose of assisting in the evaluation of potential risk associated with contamination issues at the site and evaluates potential geological hazards that may have the potential to influence the proposed development.
Future Site End-use	Development of 49No. new residential dwellings with associated private gardens, soft landscaping and new roadways. Based on current plans the northern area of the site is to remain as is, with existing garages/outbuildings left *in situ*.
SITE INFORMATION	
Grid Reference	411030, 415140
Current Site Status	The subject site is an irregularly shaped parcel of land mainly comprising undeveloped land (scrubland). The site slopes from southwest to northeast, dropping 10-12m in elevation across the site. A public footpath runs across the centre north of the site from west to east. To the north of the footpath the land is generally flat with some localised variations. This area is surfaced with overgrown vegetation including bracken and trees. To the south of the footpath, the land slopes steeply towards the south/southwest. Site surfacing comprises rough pasture, marshy areas and trees. Several outbuildings/garages are present in the northern area of the site, likely associated with the residential dwellings immediately to the north of the site. A square area of gravel is present on the west of the site. Evidence of fly tipping was noted on the north and west of the site, adjacent to access points and evidence of small fires were also noted, containing burnt wood. No issues of significant environmental concern were noted for the current use of the site.
History	The site has been recorded as largely undeveloped land from pre-1854 until present, with buildings denoted on the northwest of the site. Surrounding land uses generally comprise residential dwellings with a school present immediately to the northwest of the south.
Geology	Records indicate an absence of significant recorded Made Ground materials on or immediately adjacent to the site. Given the site history, localised Made Ground should be anticipated. According to the BGS mapping the site is located in an area recorded as free from superficial deposits, however weathered bedrock is anticipated to be present. The site is recorded to be underlain by the Rossendale Formation (mudstone and siltstone) to the south and Huddersfield White Rock (sandstone) to the north. A BGS borehole SE11NW371 located 65m south of the site recorded subsoil to 1.83m bgl over solid deposits, comprising flag rock, boulders, gravel and rock to 57.00m bgl. The site lies out with a Coal Mining Reporting Area and therefore the risk associated with coal mine workings is considered to be low. Mineral (sandstone) extraction sites have been identified in the vicinity of the site, including Crossland Hill Quarry 170m southeast of the site.
Hydrogeology	The solid geological deposits are classified as a Secondary (A) Aquifer. The site is not situated within a groundwater Source Protection Zone. Six groundwater abstraction licences are recorded within 1km of the subject site, the closest of which is located 533m north (revoked), with the closest potable groundwater abstraction recorded 869m southwest.
Hydrology	The nearest surface watercourse is an unnamed stream 138m northeast. A tributary of the River Colne (River Quality B) is present, 482m to the northwest. There are five active surface water abstraction licences recorded within 1km of the subject site, the closest of which is 555m west, and the closest potable abstraction 962m northeast. The Environment Agency's data, places the subject site within a Flood Zone 1. This is an area determined as not being at significant risk of flooding from rivers and sea. A low to medium (1 in 100 year) risk of surface water flooding is identified in a narrow band which crosses the site from the southwest to northeast.
Environmental Sensitivity	Based on information discussed above, the site location is considered to be of Low to Moderate environmental sensitivity.

Previous Reports		No previous reports pertaining to the subject site have been made available for review.
Regulatory Consultation		Kirklees Council's Planning Portal identifies one previous planning application relating to the subject site. However, no environmentally pertinent information was included for review. Based on available information, we understand the site is not currently listed as Contaminated Land under the EPA 1990 and it is unlikely that the site would be investigated under the Contaminated Land Regime.
RISK ASSESSMENT (POTENTIALLY SIGNIFICANT POLLUTANT LINKAGES)		
Hazard Identification	*Source*	No potentially significant source of contamination has been identified. Localised areas of residual contamination may be present associated with the agricultural use and fly tipping. No significant sources of ground gas have been identified on site; however, three features, located 170m south (potentially infilled land), 242m east (landfill) and 484m east (landfill) respectively are considered to pose a risk to the site.
	Pathway	Direct contact or inhalation/ingestion pathways could exist where landscaped areas and/or permeable surfacing is present at the site. Mobile contaminants (where present) have the potential to migrate vertically and laterally via permeable strata. Ground gas/vapours (where present) have the potential to migrate vertically and laterally via permeable strata.
	Receptor	*Human Health* - Current site users, Adjacent site users and residents, Future groundworkers, Future residents and site users. *Built Environment* - Current structures and services, Adjacent residential properties and services, Future properties including foundations and services *Flora and Fauna* - Current vegetation and Future planting within landscaped areas and gardens. *Controlled Waters* - Groundwaters and surface waters.
CONCLUSIONS		
Risk Estimation		The current and historical assessment has identified that the previous site uses are unlikely to have resulted in significant contamination of underlying strata. However, residual localised contamination may be present within soils and groundwaters, associated with historic/current farming activities and fly tipping. Three potential sources of low-level gas generation are noted within 500m of the site, however no significant sources have been identified within a 500m radius of the site. The environmental risk arising from the ground condition at the subject site when taking into account the site's current status and usage is Low. For the redevelopment of the site to a residential usage, the potential environmental risk to arising from the ground conditions is Low to Medium. In conjunction with the recommendations outlined in Section Recommendations12, it is the opinion of REL, that no issues have been identified which are considered to preclude the future redevelopment of the site.
Recommendations		For the redevelopment of the site, we recommend the following action: A) Prior to redevelopment, environmental samples should be taken from soils in areas of future gardens and soft landscaping to confirm the absence of a significant risk to human health or sensitive receptors. B) Where new builds are proposed, an intrusive ground investigation would be required to allow for the collection of geotechnical data, to be used to inform future foundation design. C) Where sensitive land uses (i.e. buildings) are proposed, gas monitoring would be required to quantify the risk posed by potential ground gas sources present within a plausible migration distance of the site. D) Construction and maintenance work should be subject to risk assessment. Workers should use appropriate procedures and to manage residual risk from exposure to materials on site. E) During redevelopment, a watching brief should be maintained to identify any areas of unanticipated contamination. If identified, appropriate advice should be sought. F) A Flood and Drainage Risk Assessment would likely be required as part of any planning application due to the risk of Surface Water Flood Risk on the site.

1. Scope & Objectives

The Services	Phase I Geo-Environmental Risk Assessment	
The Client	Thirteen Group	
Appointment Details	The Services have been carried out in accordance with the Proposal dated 15 February 2022 and REL's Terms and Conditions of Engagement, (together "the Agreement") as accepted by the Client on 29 March 2022.	
Site Name	Land to the East of Main Avenue	
Site Address	Cowlersley, Huddersfield HD4 5US ("the Property")	
Proposed Use	Development of 49No. new residential dwellings with associated private gardens, soft landscaping and new roadways. Based on current plans the northern area of the site is to remain as is, with existing garages/outbuildings left *in situ*.	
Planning Application	None currently available.	
Information Sources (Where appropriate documents are contained in Appendix II with data extracts provided and summarised within pertinent sections of this report. List not exhaustive)	Online Source	Environment Agency Database and Mapping
		Magic Map Web Mapping Service
		Coal Authority Interactive Map Viewer
		British Geological Survey, Database and Mapping
		BGS Geoindex web mapping service
		British Geological Survey. (BGS) 1: 50,000 scale Provisional Series, Geological Map, England and Wales, Sheet 77 (Huddersfield), available on the BGS map portal.
	Documentation Source	Envirocheck Report (293555057_1_1) purchased from Landmark
	Previous Reports	None available for review at the time of compilation.
	Site Inspection	Undertaken 6 April 2022 by Rebecca Jordan of REL. Garages were not accessible during the site walkover.

2. Site Details

National Grid Ref.	411030, 415140
Ground Level Topography	150m – 160m AOD. A slight rise in site levels is noted from northeast to centre south, with the land to the south rising steeply towards the south.
Site Area	2.28 hectares
Occupancy	Vacant with the northern portion used by the residents to the north of the site for car parking with private garages.
Location	The subject site is located at Cowlersley, to the south of Main Avenue. The A62 is located 390m to the north. The site lies approximately 3.45km southwest of Huddersfield Town Centre.

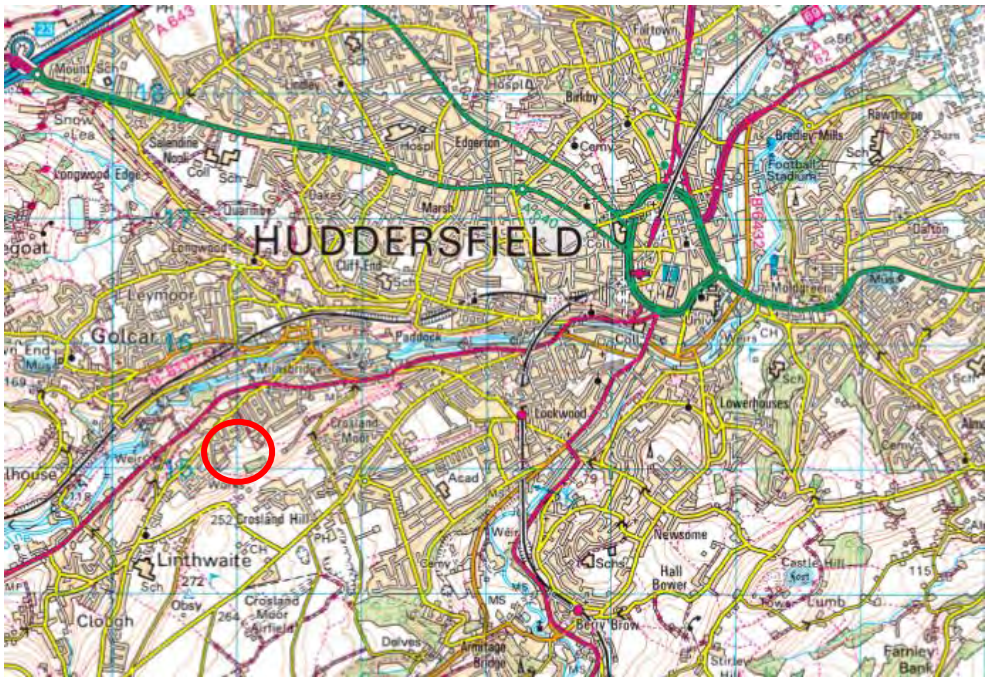


Figure 1: Approximate Site Location Highlighted in Red

Figure 2: Site Boundaries are Defined in Red with Photograph Locations also Labelled. Blue outline denotes the area proposed to be developed.

Current Site Description and Activities	The subject site is an irregularly shaped parcel of land mainly comprising undeveloped land (scrubland). The site slopes from southwest to northeast, dropping 10-12m in elevation across the site. A public footpath runs across the centre north of the site from west to east. To the north of the footpath the land is generally flat with some localised variations. This area is surfaced with overgrown vegetation including bracken and trees. To the south of the footpath, the land slopes steeply towards the south/southwest. Site surfacing comprises rough pasture, marshy areas and trees. Furthermore, several outbuildings/garages are present on the north of the site which are associated with the residential dwellings immediately to the north and northeast of the site (Jubilee Lane). A square area of gravel is present on the west of the site thought to have previously been used for parking, although access for vehicles is now restricted by concrete blocks. Evidence of fly tipping was noted on the north and west of the site, adjacent to access points on Jubilee Lane, Warneford Road and Main Avenue and evidence of small fires were also noted, containing burnt wood. No issues of environmental significance were noted associated with the current use of the site.
Surrounding land uses	The site is located within an area that largely comprises residential dwellings. A school bounds the site to the northwest, with residential dwellings on the north-eastern, east and western boundary. Undeveloped land is present to the south of the site. A disused quarry is located c.170m south of the site.
Site Photographs	
Photograph 1 – View of the northeast of the site.	
Photograph 2 – View of the site from northern boundary to south.	

Photograph 3 – View of the site from northwest to south.	
Photograph 4 – Evidence of a fire on the centre of the site	
Photograph 5 – Pooled water on the centre north of the site. The southeast of the site can be seen in the background. The surface water corresponds with the mapped areas at risk from surface water flooding as discussed further in Section 7.	

Photograph 6 – View of the garages present on the north of the site, looking towards the east.	
Photograph 7 – View of the garages present on the north of the site, looking towards the south.	
Photograph 8 – View of the garages present on the north of the site, looking towards the west.	

3. Site Information & Previous Reports

Item	Details						Contamination Sources and Potential	
	Evidence Source	Type	Location	Treatment Details	Condition	Further Information	Potential Contamination Sources	Contamination Potential (Low/Medium/High)
Deleterious Materials	REL Site Walkover	Potential Asbestos Containing Materials (ACMs)	Roofs of garages/outbuildings on the north of the site	N/A	Good (unbroken)	Potential ACMs on the roofs of a number of the buildings in the north of the site.	Potential ACM Roofing	Low
Above/Underground Ground Tanks (AST/UST)	Evidence Source	Type	Location	Size	Construction/Age	Contents	Integrity Tested	Observations	Potential Contamination Sources	Contamination Potential (Low/Medium/High)
	REL Site Walkover	AST	None noted within accessible areas						None	Low
		UST	None noted within accessible areas						None	Low
Site Services	Evidence Source	Type	Location	Condition	Further Information				Potential Contamination Sources	Contamination Potential (Low/Medium/High)
	REL Site Walkover	Drainage (including French drains)	On-site, crossing beneath the public path, east to west.	Good	Identified by a utilities survey being undertaken by Castle Keep site utilities surveying company for the Client. The survey was undertaken at the same time as the REL Site Walkover.				None	Low
	Service Plans	Drainage	On-site, crossing beneath the public path, east to west.	N/A	See plan included within Appendix II.				None	Low
Chemical Storage	Evidence Source	Type	Location	Size	Contents	Observations			Potential Contamination Sources	Contamination Potential (Low/Medium/High)
	REL Site Walkover	None noted within accessible areas							None	Low
Waste Management Practices	Evidence Source	Waste Type	Storage Location	Container Type	Waste Disposal Contractor	Observations			Potential Contamination Sources	Contamination Potential (Low/Medium/High)
	REL Site Walkover	Fly tipping	North, northeast and northwest entrances to site	None	N/A	Small amounts of rubbish and fly tipping were noted on the northern portions of the site, along the public footpath and adjacent to Main Avenue, Warneford Road and Jubilee Lane			Metals, Hydrocarbons, Asbestos	Low to Medium
Invasive Plants	REL have not been appointed to undertake an ecological survey. However, during the site walkover, none of these plants were noted to be present on site.									Low
Additional Information from Site Inspection	An area of pooled water was noted on the centre north of the site. Evidence of small fires were noted on the centre of the site.									Low
Additional Information from Previous Reports	None available for review at the time of report compilation.									Low

Overall Current Contamination Potential for the site is identified to be Low to Medium.

4. Historical Development

A review of historical maps has been undertaken. A summary of relevant information, within 250m (i.e. in the planning consultation zone), is shown in chronological order in the table below with relevant maps in Appendix I. All distances described below are approximate.

Source	Site	Surroundings	Potential Contamination Sources	Contamination Potential (Low/Medium/High)
Pre 1854 – pre 1892	The site mainly comprised undeveloped land, likely of *agricultural* use. A building was present on the north-eastern portion of the site.	Surrounding land uses largely comprised undeveloped *agricultural land*.	Onsite – Agricultural Use Offsite – Agricultural Use	Onsite - Low Offsite - Low
Pre 1892 – pre 1930	As of 1892, no change had occurred. The building was denoted as 'Jubilee', likely residential.	As of 1892, Longwood (woodland) was present 60m south and a *Quarry* was denoted 180m south. The surrounding land use remained largely unchanged.	Offsite – Quarry	Onsite – Low Offsite – Low to Medium
Pre 1930 – pre 1960	By 1930, no changes had occurred. As of 1938 a well was denoted onsite associated with the building.	As of 1930, residential houses were denoted 2m north and west, and *allotments* were present immediately northwest. By 1938 a club was denoted 70m northwest of the site. Further surrounding land use remained largely unchanged.	Off-site – Allotments	Onsite – Low Offsite – Low
Pre 1960 – pre 1993	As of 1961 'Jubilee' was no longer denoted and four outbuildings were present on the east of the site.	As of 1960, the Quarry was denoted as disused. By 1961 a school was denoted immediately northwest of the site, replacing the allotments.	Onsite – None Offsite – None	Onsite – Low Offsite - Low
Pre 1993 – present	As of 1993 onwards the site remained unchanged.	As of 1993 and onwards, residential dwellings were present to the north, east and west of the site. The school was still present to the northwest. Surrounding land use comprised its current layout.	Onsite – None Offsite – None	Onsite – Low Offsite - Low

* Potentially contaminative land uses in *bold italic*

Overall Historic Contamination Potential for the site is identified to be Low to Medium.

5. Geological and Hydrogeological Setting

	Recorded Geology	Hydrogeological Characteristics of Underlying Strata
Made Ground	Records indicate an absence of significant recorded Made Ground materials on or immediately adjacent to the site. Given the site history, localised Made Ground should be anticipated.	Unclassified Aquifer Classification.
Drift Geology	The site is recorded within an area free from drift deposits. Weathered bedrock may be present.	Not Applicable.
Solid Geology	The site is recorded to be underlain by the Rossendale Formation (mudstone and siltstone) to the south and Huddersfield White Rock (sandstone) to the north.	Secondary (A) Aquifer - Comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.
Economic Geology	The site is not situated in an area which may be affected by coal mining. No cavities were recorded within a 250m radius of the site. One BGS mineral site known as Crossland Hill Quarry (ceased opencast sandstone), located 170m southeast of the site is present within a 250m radius of the site	Not Applicable.
Groundwater Designation		
The site is located outwith a Source Protection Zone.		
Groundwater Abstraction Licences		
There are five active groundwater abstraction licences recorded within a 1km radius of the site: 747m southeast – used for quarry top up water; 764m south and 887m south – used for golf course spray irrigation; and 869m southwest and 889m southwest – used for general farming and domestic uses. In addition, one revoked license is recorded 533m north.		
Ground Stability Hazards		
The site is located in an area with no to a low ground stability hazard potential.		

BGS Borehole Logs			
Reference:	SE11NW371	Distance and Direction from Site:	65m to the South
0 - 1.83m		Subsoil	
1.83 – 13.41m		Clay and Flag Rock	
13.41 – 14.63m		Boulder	
14.63 – 16.15m		Gravel	
16.15 – 17.98m		Rock	
17.98 – 23.16m		Shale	
23.16 – 51.21m		Grey Rock	
51.21 – 57.00m		Rock and Shale	
Rest Water Level		8.23m	

6. Ground Gas and Vapours

The geological setting of the site and surrounding land is identified to include relatively permeable strata comprising sandstone. Sandstone strata are known to facilitate long distance migration of ground gases (where present), therefore potential sources located within a 500m radius of the site have been included below.

Potential Sources	
Made Ground	Significant deposits of Made ground are not anticipated on site.
Natural Geological Sources (i.e. peat, etc.)	The site is recorded to be free from superficial deposits, underlain by sandstone, mudstone, and siltstone. No gas generating natural strata is recorded within the borehole log 65m south of the site.
Economic Geology (including stythe gas)	The site is outwith an area at risk from coal mining, therefore the risk posed by stythe gas is considered to be low.
Landfills	Two historical landfills (one recorded as licensed and one BGS recorded) are mapped within a 250m radius of the site: *A)* 220m west – The Folly (deposited waste included inert, commercial, household, and liquid sludge), last input date 1979. *B)* 242m east – Quarry Road (no infill details available). Two additional landfills are recorded within a 500m radius: *C)* 371m north – Land west of Lock 12 and to the south of Huddersfield Narrow Canal (deposited waste included inert, commercial, household, and liquid sludge), last input date 1993. *D)* 484m east – Town Quarry (no infill details available).
Potentially Infilled Land	Eight areas of potentially infilled land are recorded within 500m. The largest is recorded 170m south (dated 1984), associated with the Quarry recorded on historical mapping 180m south of the site. Although dated as potentially infilled by 1984, anecdotal information identifies that the area of the former quarry is still being infilled to this day by the current owners, although this has not been confirmed. Anecdotal information also suggests the exact infill materials are unknown but are likely to include building rubble and inert/household waste. An additional seven areas of potentially infilled land are present 286m north (1987), 306m northwest (1987), 355m south (1984), 409m southeast (1984), 413m east (1984), 472m southeast (1984), and 489m east (1987).
Radon Gas	The site is recorded to be in a Lower Probability Radon Area (less than 1% of homes are estimated to be at or above the Action Level).
Vapours	No evidence of significant vapour sources was noted during the site walkover.
Comments	
Potential sources of ground gas have been identified within 500m of the site (sandstone strata are known to facilitate long distance migration). Based on the document prepared by CIRIA titled 'CIRIA C665 -Assessing risks posed by hazardous gases to buildings'. Section 7.2.5 (Figure 7.1), it is understood landfill gas generation rate significantly reduces with the age of the waste. By 30 years, the rate of gas generation is insignificant, and by 50 years, the rate is minimal. Therefore, the majority of the potential sources within a 500m radius are considered to pose a low to no risk due to time since infill. Three features located 170m south (potentially infilled land), 242m east (landfill) and 484m east (landfill) are considered to pose a risk to the site.	

Overall, the onsite ground gas generation potential is identified to be Low.

Overall, the offsite ground gas generation potential is identified to be Low to Medium.

7. Hydrology

A summary of pertinent information relating to the site's hydrological context is presented below.

Hydrological Context	
Surface Watercourses	No watercourses are recorded onsite. During the walkover a small area of ponded water was noted located in an area mapped at risk of surface water flooding (as discussed below). The closest watercourse is located 138m to the northeast of the site. An unnamed river which flows into the River Colne (River Quality B) is present 482m northwest of the site.
Culverted Watercourses	Based on the available information and following the completion of the site walkover no evidence of a culverted watercourse has been noted. Should further clarification on this point be required, it would be necessary to undertake an intrusive drainage survey to trace the course of drainage infrastructure.
Surface Water Abstractions Licences	Five active surface water abstractions are recorded within 1km radius of the site: • 555m west – used for process water and boiler feed; • 561m northwest – used for canal water; • 713m west – used for process water; • 962m northeast – used for general use (moderate loss); and • 967m northeast – used for general use (moderate loss). In addition, two revoked licenses are located 433m north and 753m northeast of the site.
River and Sea Flood Risk (Environment Agency database)	Flood Zone 1 - Land outside the area at significant risk of flooding from rivers and sea. Land within Flood Zone 1 can typically be considered to have a low low risk with regard river and sea flooding.
Surface Water Flood Risk	According to the Envirocheck report, areas of the site may be at a low to medium risk from surface water flooding (1 in 100 year risk). The area at risk is mapped to loosely follow the route of the public footpath on the centre north of the site. French drains are noted to be present on site, these should be subject to regular maintenance.
Groundwater Flood Risk	The Envirocheck report identifies the northern boundary of the site to be at a limited risk from groundwater flooding. The remainder of the site is recorded outside an area susceptible to groundwater flooding.
Area Benefitting from Flood Defences	None recorded within 1km of the site.
Evidence of Previous Flood Events at Site	Based on available information, none have been identified.
Overall Flood Risk	Based on available information, it is considered the site has an overall Low flood risk. However, when considering the size of the site and development proposals, a Flood and Drainage Risk Assessment would likely be required as part of any planning application.

8. Regulatory Databases & Enquiries

From a review of Envirocheck Report, presented in Appendix II, the following information has been obtained in relation to the regulatory database entries within 250m of the site.

Record	On site	Within 250m Radius	Details
Discharge Consents (Active)	0	0	Not Applicable (N/A).
Environmental Permits (Active)	0	0	N/A.
Radioactive Substances (Active)	0	0	N/A.
NIHHS	0	0	N/A.
Pollution Incidents	0	0	N/A.
Fuel Sites	0	o	N/A.
Designated or Sensitive Sites	0	1	The land immediately to the south of the site is designated as an Adopted and Unadopted Green Belt.
UXO Assessment (Zetica Unexploded Bomb Risk Map)	The site is located in an area with a Low risk and no further works are considered necessary when considering the proposed usage of the site. Please refer to Appendix II for a copy of the Zetica Map.		
Kirklees Council – Historic Planning Applications relating to the site			
86/60K/00955/C1	Outline application for residential development (March 1986). REL Comment: The above relates to the Subject Site and additional land to the east (Ayres Drive and Warneford Road). Following conditional application approval, the eastern area was developed (now mapped as residential dwellings on Ayres Drive and Warneford Road). No plans or drawings were available for review.		
Comments	No environmentally pertinent information was available for review within the planning applications available for the subject site and immediately adjacent developments. It is the opinion of REL that there is an absence of significant source-pathway-receptor pollutant linkages associated with the current and historical use of the site. We understand the site is not currently listed as Contaminated Land under the EPA 1990 and it is unlikely that the site would be investigated under the Contaminated Land Regime		

9. Preliminary Conceptual Site Model

The information obtained and collated for this preliminary assessment has been used to develop a conceptual site model in accordance with current prescribed regulatory guidance.

Physical & Environmental Site Summary	
Inferred ground conditions	Significant deposits of Made ground are unlikely on site. Localised areas of Made Ground may be present within the site boundaries, associated with historical land use. The site is recorded as free from superficial deposits, although weathered bedrock may be present. Bedrock is reported to comprise sandstone on the north of the site and siltstone and mudstone on the south of the site.
Geo-hazards & mining	The site is not at risk from shallow coal mining. No quarrying is anticipated at or below the site. The site is located in an area with No Hazard to a Low Hazard ground stability hazard potential.
Environmental Sensitivity	The site is free from superficial deposits and the solid geological deposits underlying the site are classified as a Secondary (A) Aquifer. The site is not situated within a groundwater Source Protection Zone however there are two active groundwater abstraction licenses and two active surface water abstraction licences recorded within 1km of the subject site used for potable or general uses. No surface water features are present on site, with the nearest recorded 138m northeast of the site. The site is situated within Flood Zone 1 associated with rivers and seas, a low to medium risk from surface water flooding risk is present across the centre of the site, loosely following the route of the public footpath. As such, the site location is considered to be of Low to Moderate environmental sensitivity.

Sources of Potential Contamination	
Historic on-site	Limited sources identified. Potential residual and localised sources associated with farming, i.e., pesticides and herbicides, and fly tipping, i.e. metals, hydrocarbons and asbestos may be present.
Historic off-site	Limited sources have been identified. The surrounding area has largely comprised undeveloped, likely agricultural land and residential estates. Potential residual sources associated with farming (i.e. pesticides and herbicides) and the quarry located c.170m south.
Current and Operational	Fly tipping in isolated areas of the site and items stored within garages (Generic).
Onsite ground gas	There are no notable sources of ground gas present onsite.
Offsite ground gas	No significant sources of ground gas have been identified onsite or within a 500m radius of the site. Potential sources of residual ground gas within a plausible migration distance (500m) of the site include; 170m south – Quarry (Potentially Infilled Land) 242m east – Quarry Road (Landfill) 484m east – Town Quarry (Landfill)

Potential Pathways	Current	During Construction	Future
Dermal Contact with Contaminated Soil and Groundwater.	✓	✓	✓
Ingestion of Contaminated Soils and Groundwaters.	✓	✓	✓
Inhalation of Translocated Contaminated Soils, Dusts and Fibres.	✓	✓	✓
Root Contact with Contaminated Soil and Groundwater.	✓	✓	✓
Ingestion of Contaminated Produce/Crops.			✓
Direct Contact of Contaminated Soils and Groundwaters with Foundations and Services.	✓	✓	✓
Lateral and Vertical Migration of Mobile Contaminants to Groundwaters or Surface Waters.	✓	✓	✓
Lateral Migration to Adjacent Properties.	✓	✓	✓
Upward and Lateral Migration of Ground Gas/Vapours Via Permeable Ground and Service Runs Into Above Ground Structures.	✓	✓	✓
Lateral Migration of Ground Gas/Stythe Gas/Vapours Via Permeable Ground and Service Runs into Buildings in Adjacent Areas.	✓	✓	✓
Upward and Lateral Migration of Ground Gas/Vapours Via Permeable Ground and Service Runs into Below Ground Structures and Excavations.	✓	✓	✓
Note: Construction and Groundworks have the potential to cause the mobilisation of adsorbed, absorbed and confined contaminants and confined ground gas within soils and groundwaters beneath the site, thereby creating lateral and vertical migration pathways which would not have otherwise existed in the absence of such ground disturbance.			
Potential Receptors	**Current**	**During Construction**	**Future**
Site users, visitors, and trespassers (Human Health).	✓	✓	✓
Agricultural workers and offsite residents (Human Health)	✓	✓	✓
Onsite residents (Human Health).			✓
Property including outbuildings, foundations and services (Built Environment).	✓	✓	✓
Adjacent site users (Human Health).	✓	✓	✓
Construction/groundworkers (Human Health) (Adjacent residential properties) (Built Environment).	✓	✓	✓
Planting within landscaped areas and gardens (Built Environment).			✓
Surface waters (Controlled Waters).			
Groundwater (Controlled Waters).	✓	✓	✓
Groundwater and Surface Water Abstraction Points.			

10. Environmental Risk Assessment

The risk of significant harm to human health or of pollution of controlled waters given the current and proposed future site uses has been assessed qualitatively as low, medium or high, see Appendix III. A risk estimation matrix for all pollutant linkages identified is shown below;

Very Low	Low	Low to Medium	Medium	Medium to High	High

Current Site Status					
Potential related sources	Pathways	Receptors	Stage	Risk	Discussion
Soil (including Made Ground)	Direct contact, ingestion, inhalation of dusts and/or fibres	Human Health – Current site users, Future ground workers and Future residents	Current Site	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. The current site is open access with a public footpath running east to west. However, natural attenuation is expected to have occurred and to continue occurring. Furthermore, the site is used in limited duration.
			During construction/groundworks	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. Potential for contact during construction/groundworks however PPE will be utilised by workers.
			Future Proposed Site	Low to Medium	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. The future proposed site will include private gardens and landscaped areas.
	Lateral and horizontal migration of mobile contaminants via groundwater	Controlled Waters – Surface Waters and Bedrock Aquifer (groundwater)	Current Site	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. The site is underlain by a Secondary A Bedrock Aquifer. Soft landscaping is present across the site, with lateral and horizontal migration of mobile contaminates through the permeable strata possible. Natural attenuation and dilution is expected to have occurred and to continue occurring.
			During construction/groundworks	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. The site is underlain by a Secondary A Bedrock Aquifer. Soft landscaping is present across the site, with lateral and horizontal migration of mobile contaminates through the permeable strata possible. Groundworks may also encourage ponding of water on site. Natural attenuation and dilution is expected to have occurred and to continue occurring.
			Future Proposed Site	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. The site is underlain by a Secondary A Bedrock Aquifer. Soft landscaping/private gardens are proposed across the site, with lateral and horizontal migration of mobile contaminates through the permeable strata possible. Natural attenuation and dilution is expected to have occurred and to continue occurring.
	Direct contact	Flora and Fauna – Current and future plants and animals present on or utilising the site	Current Site and during construction/groundworks	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. Grass coverage is present across the majority of the site. No evidence of vegetation die back was noted during the site walkover.
			Future Proposed Site	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the soils on site. Private gardens are proposed for the site. There is potential for contaminants which may cause problems for flora and fauna.
Ground gas generation - infilled land / Made Ground	Migration of harmful and/or explosive gas/vapours	Human Health – Current site users, Future ground workers and Future residents	Current Site	Low	Sources of ground gas have been identified within a plausible migration distance from the site. The current site is surfaced by soft landscaping, allowing diffusion of gas build-up under natural atmospheric conditions.
			During construction/groundworks	Low	Sources of ground gas have been identified within a plausible migration distance from the site. The current site is surfaced by soft landscaping, allowing diffusion of gas build-up under natural atmospheric conditions. During construction/groundworks groundworkers should be provided with PPE to protect from gas accumulation within below ground excavations.
			Future Proposed Site	Low to Medium	Sources of ground gas have been identified within a plausible migration distance from the site. The proposal includes 49 residential dwellings (closed structures) which would be at risk from ground gas migration and accumulation (if present).
		Property - residential Properties and services	Current Site and during construction/groundworks	Very Low	No properties are present on site.
			Future Proposed Site	Low to Medium	Sources of ground gas have been identified within a plausible migration distance from the site. Residential properties are proposed on site. Ground gases may pose a risk of explosion, if present, and if accumulation occurs.
Groundwater	Lateral migration of mobile contaminants via groundwater	Property - residential Properties and services	Current Site and during construction/groundworks	Low	No properties are present on site, but residential and school buildings are present immediately adjacent to the site. Groundwater is not expected to be at a depth which would impact foundations or services (8.23m bgl in BGS borehole 65m south). Groundwater is not expected to be at a depth which would be impacted by excavations during construction/groundworks.
			Future Proposed Site	Low	Groundwater is not expected to be at a depth which would impact foundations or services (8.23m bgl in BGS borehole 65m south). Groundwater is not expected to be at a depth which would impact proposed foundations or services.
		Controlled Waters – Surface Waters and Bedrock Aquifer (groundwater)	Current Site and during construction/groundworks	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the underlying groundwaters. The current site is soft landscaping with some ponding of surface water. The nearest recorded surface water is present 138m northeast. Natural attenuation is expected to have occurred and to continue occurring.
			Future Proposed Site	Low	Agricultural practices and fly tipping may have resulted in potential contamination of the underlying groundwaters. The proposed development does not include surface water features. The nearest recorded surface water is present 138m northeast. Natural attenuation is expected to have occurred and to continue occurring.

11. Conclusions

Current site description	The subject site is an irregularly shaped parcel of land mainly comprising undeveloped land (scrubland), and a public footpath runs across the centre north of the site from west to east. The site slopes from southwest to northeast, reducing by 10-12m in elevation across the site. To the north of the footpath the land is generally flat with overgrown vegetation including bracken and trees. To the south of the footpath, the land slopes steeply towards the south/southwest, surfaced with rough pasture, marshy areas and trees. Several outbuildings/garages are present in the northern area of the site, likely associated with the residential dwellings immediately to the north of the site. A square area of gravel is present on the west of the site. Evidence of fly tipping was noted on the north and west of the site, adjacent to access points and evidence of small fires were also noted, containing wood.
Geological	Localised areas of Made Ground associated with current and former buildings are expected. According to the BGS mapping the site is located in an area recorded as free from superficial deposits, however weathered bedrock is expected. The site is recorded to be underlain by the Rossendale Formation (mudstone and siltstone) to the south and Huddersfield White Rock (sandstone) to the north. A BGS borehole SE11NW371 located 65m south of the site recorded subsoil to 1.83m bgl over solid deposits, comprising flag rock, boulders, gravel and rock to 57.00m bgl. The site lies outwith a Coal Mining Reporting Area and therefore the risk associated with coal mine workings is considered to be low. Mineral (sandstone) extraction sites have been identified in the vicinity of the site, including Crossland Hill Quarry 170m southeast of the site.
Hydrogeological and hydrological	The site is free from superficial deposits and the solid geological deposits underlying the site are classified as a Secondary (A) Aquifer. The site is not situated within a groundwater Source Protection Zone however there are five active groundwater abstraction licenses and five active surface water abstraction licences recorded within 1km of the subject site. The site is situated within Flood Zone 1 associated with rivers and seas; however, it is recorded to have a 1 in 100 year risk of surface water flooding. Furthermore, a surface watercourse is present 138m northeast of the site.
Historical	The site has been recorded as largely undeveloped land from pre-1854 until present, with buildings denoted to the northwest of the site. Surrounding land uses generally comprise residential dwellings with a school present immediately to the northwest of the south. The current and historical assessment has identified that the previous site uses are unlikely to have resulted in significant contamination of underlying strata. However, residual localised contamination may be present within soils and groundwaters, associated with historic / current farming activities and fly tipping. Potential ground gas sources are present within a plausible migration distance of the site.
Environmental Risk Assessment	The environmental risk arising from the ground condition at the subject site when taking into account the sites current status and usage is Low.
Redevelopment Risk Assessment	For a residential with homegrown produce usage, the potential environmental risk to arising from the ground conditions is Low to Medium. In conjunction with the recommendations outlined in Section 12, it is the opinion of REL, that any issues identified should not preclude the future redevelopment of the site.
Geotechnical Comments	Bedrock is expected to be shallow with the nearby BGS Borehole (65m south) identifying rock at 1.83m bgl.

12. Recommendations

As part of the proposed redevelopment, we recommend that the client undertakes the following action:

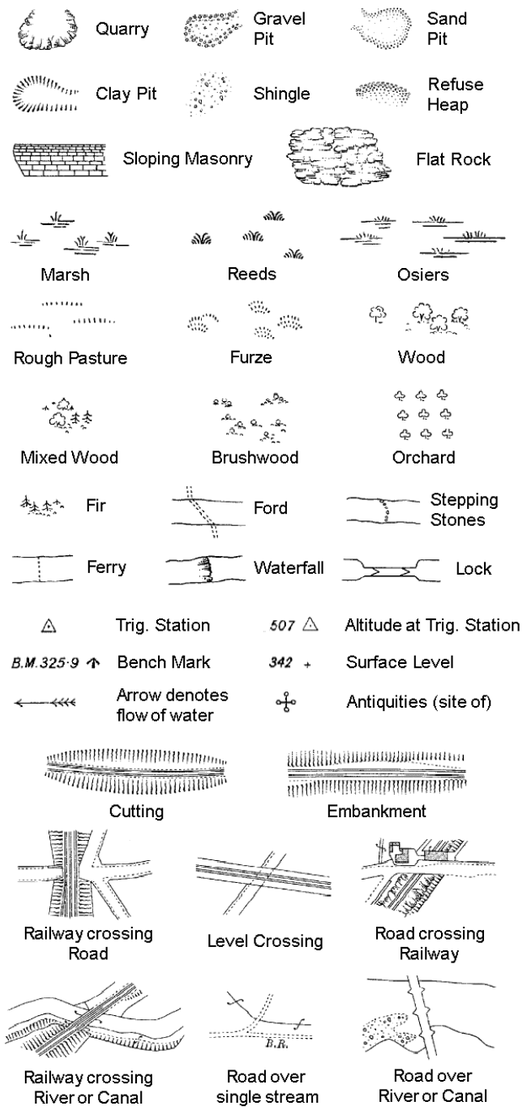
Environmental	Prior to redevelopment, targeted environmental sampling from areas of future gardens and soft landscaping, including soil, leachate and/or water samples should be collected and tested to confirm the absence of a significant risk to human health and/or sensitive receptors.
Geotechnical	Where development is proposed, an intrusive ground investigation would be required to allow for the collection of geotechnical data, to be used to inform future foundation design.
Ground Gas	Where sensitive land uses (i.e. buildings) are proposed, gas monitoring would be required to quantify the risk posed by potential ground gas sources present within a plausible migration distance of the site.
Flooding and Drainage	When considering the size of the site and development proposals, a Flood and Drainage Risk Assessment would likely be required as part of any planning application.
Construction Considerations	Construction and maintenance work should be subject to risk assessment. Workers should use appropriate procedures and to manage residual risk from exposure to materials on site.
Watching Brief	During redevelopment, a watching brief should be maintained to identify any areas of unanticipated contamination. If identified, appropriate advice should be sought.

Definitions and Reservations used in this report are presented in Appendix III.

APPENDIX I HISTORICAL MAPPING

Historical Mapping Legends

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



County Boundary (Geographical)

County & Civil Parish Boundary

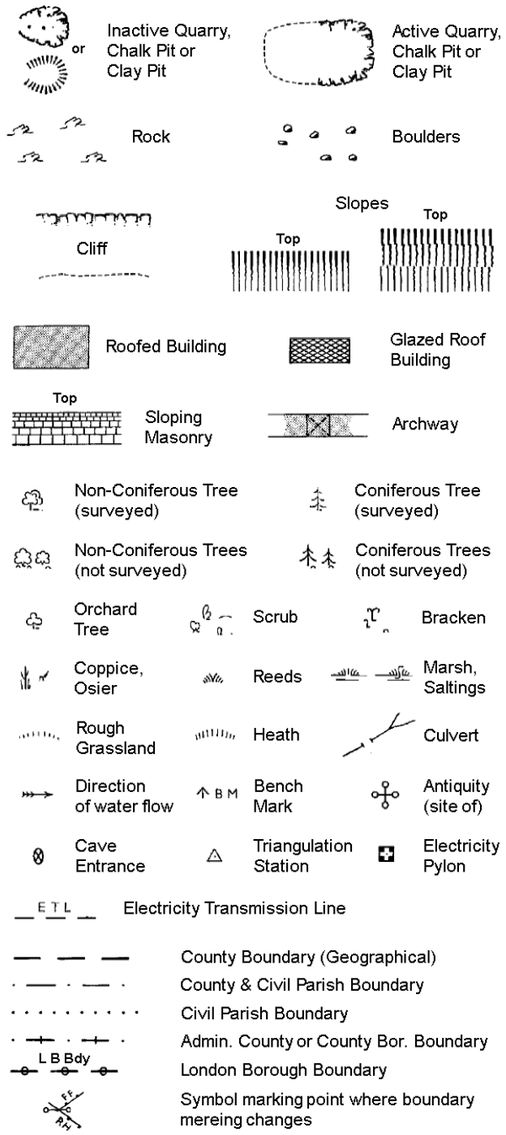
Administrative County & Civil Parish Boundary

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

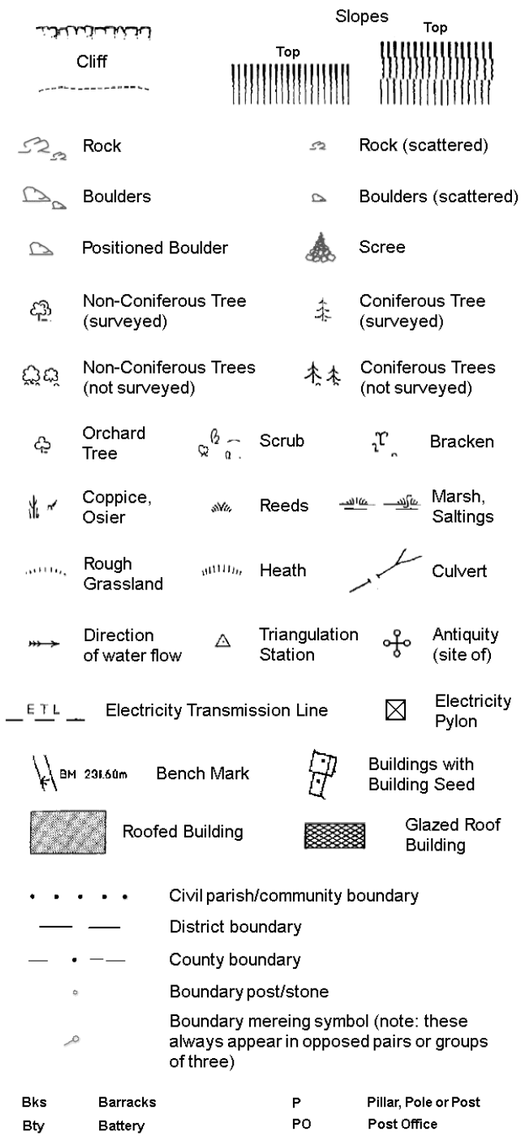
Admin. County or County Bor. Boundary

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)

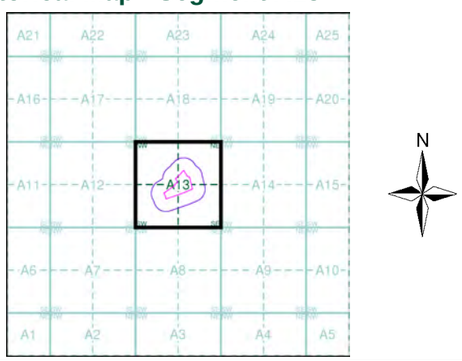
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity 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

ROBERTS ENVIRONMENTAL LTD

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:2,500	1892	2
Yorkshire	1:2,500	1906	3
Yorkshire	1:2,500	1916	4
Yorkshire	1:2,500	1938	5
Ordnance Survey Plan	1:1,250	1961	6
Ordnance Survey Plan	1:2,500	1962 - 1963	7
Supply of Unpublished Survey Information	1:1,250	1975	8
Supply of Unpublished Survey Information	1:1,250	1975	9
Supply of Unpublished Survey Information	1:2,500	1976	10
Ordnance Survey Plan	1:2,500	1977 - 1984	11
Additional SIMs	1:2,500	1978 - 1982	12
Additional SIMs	1:1,250	1978	13
Ordnance Survey Plan	1:2,500	1984	14
Additional SIMs	1:2,500	1984	15
Additional SIMs	1:1,250	1990	16
Additional SIMs	1:2,500	1992	17
Large-Scale National Grid Data	1:1,250	1993	18
Large-Scale National Grid Data	1:2,500	1993	19
Large-Scale National Grid Data	1:1,250	1993 - 1995	20
Large-Scale National Grid Data	1:1,250	1993	21
Large-Scale National Grid Data	1:2,500	1995	22
Large-Scale National Grid Data	1:2,500	1996	23
Large-Scale National Grid Data	1:2,500	1996	24
Historical Aerial Photography	1:2,500	2000	25

Historical Map - Segment A13



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Customer Ref:	220322
National Grid Reference:	411030, 415140
Slice:	A
Site Area (Ha):	2.28
Search Buffer (m):	100

Site Details

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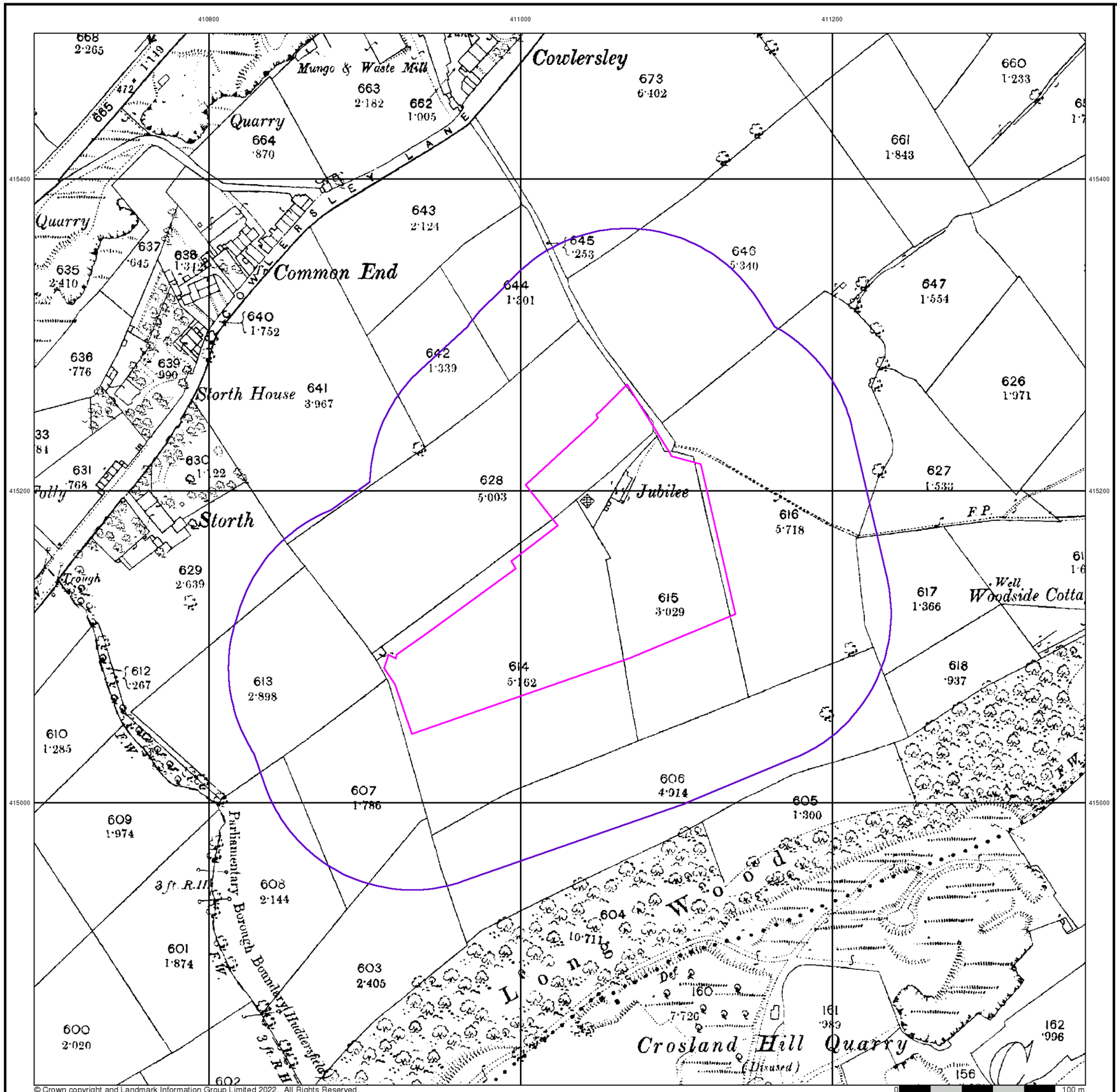

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Yorkshire

Published 1892

Source map scale - 1:2,500

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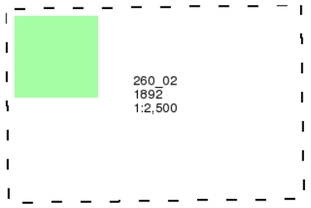
Map Name(s) and Date(s)



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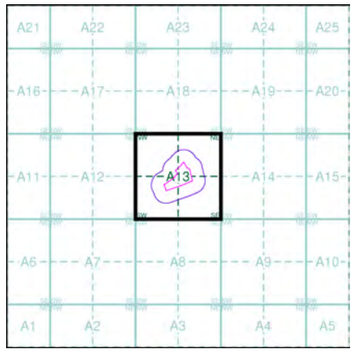

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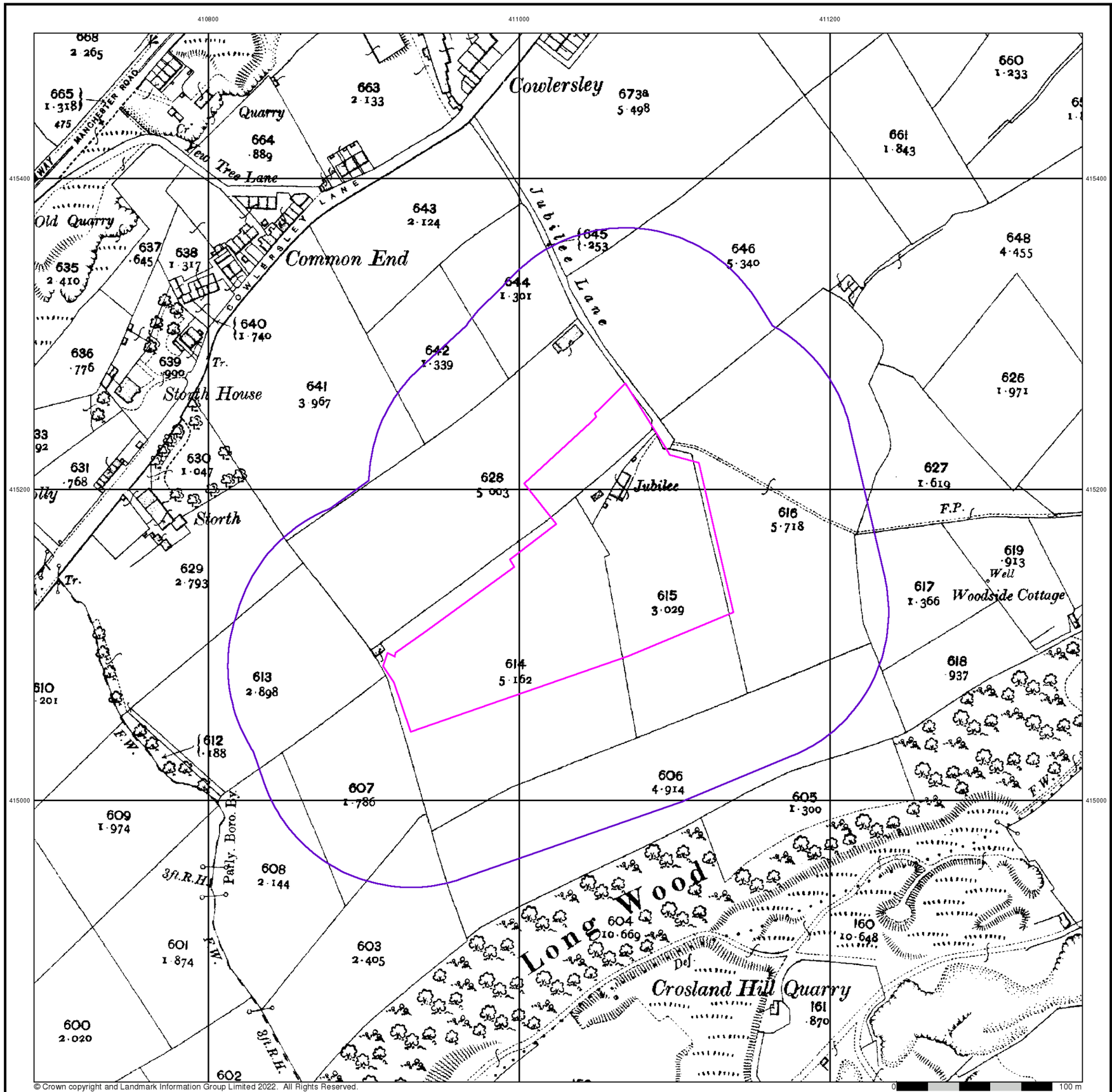

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Yorkshire

Published 1906

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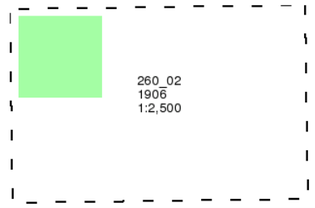

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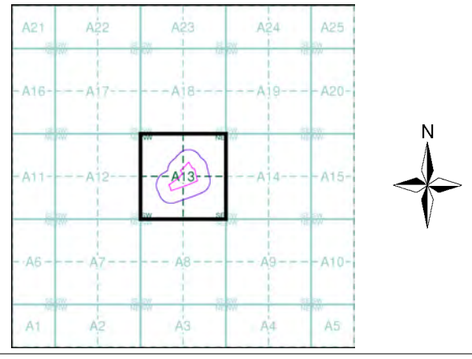

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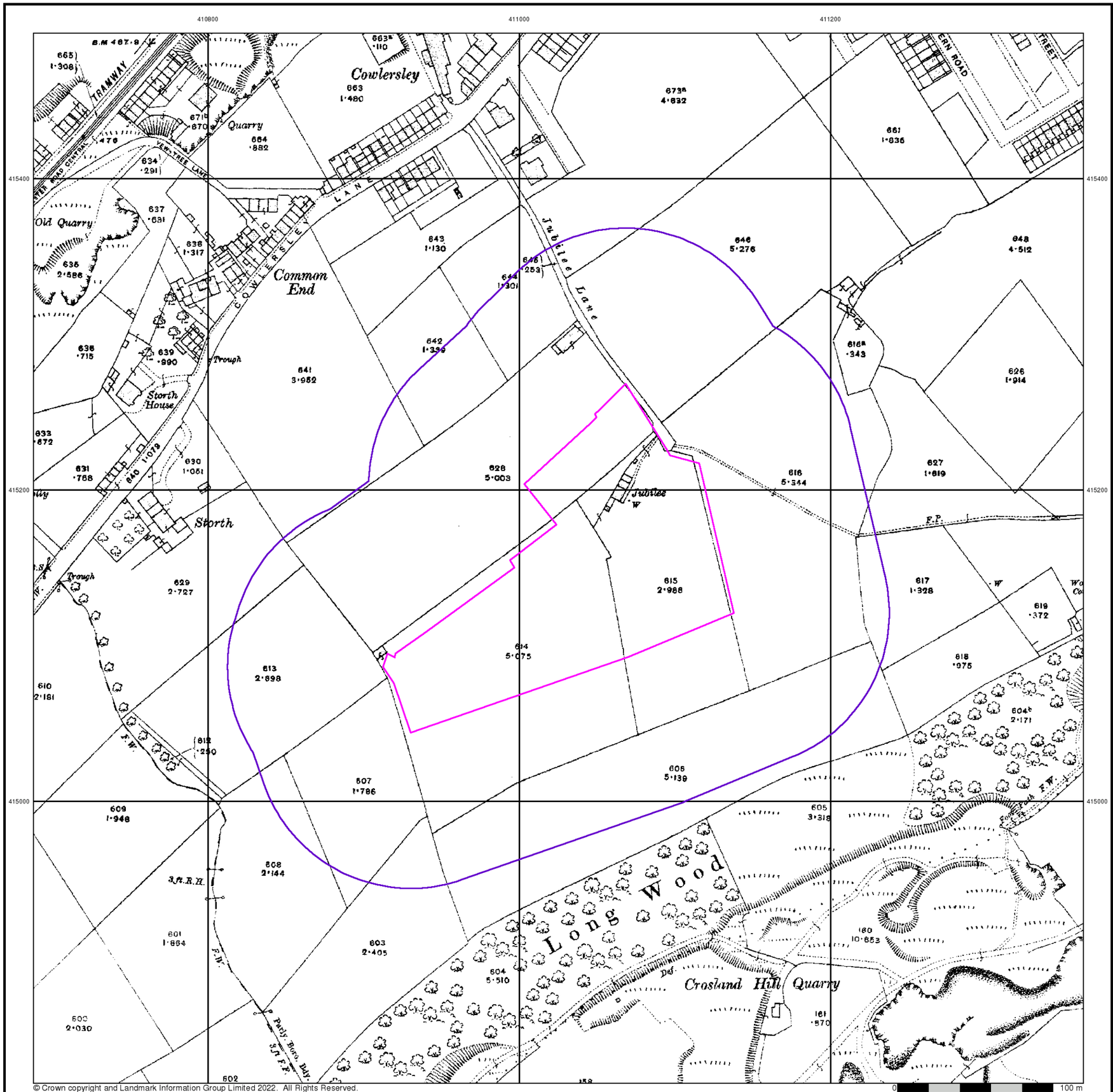

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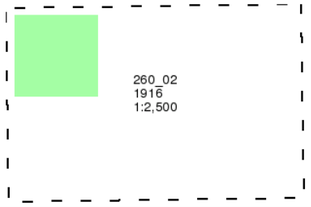

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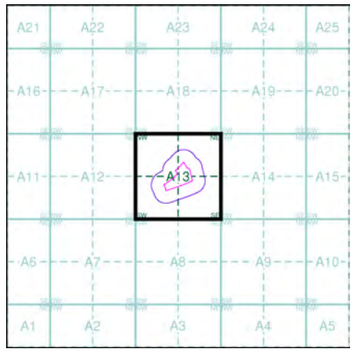

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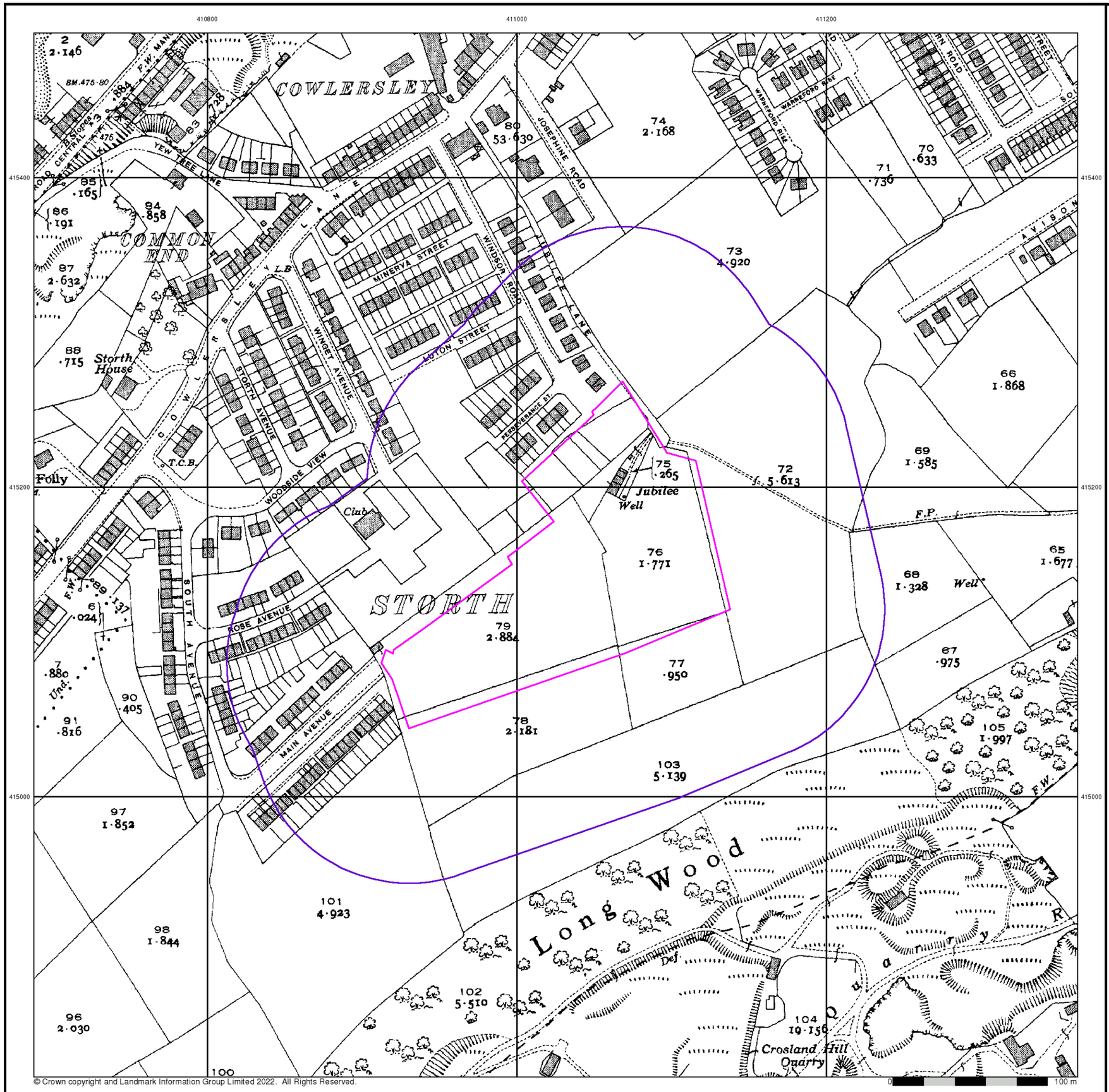

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Yorkshire

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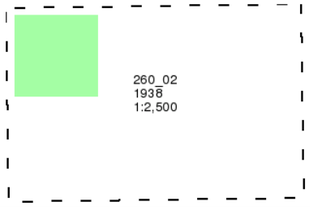

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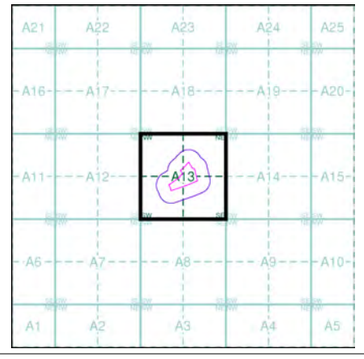

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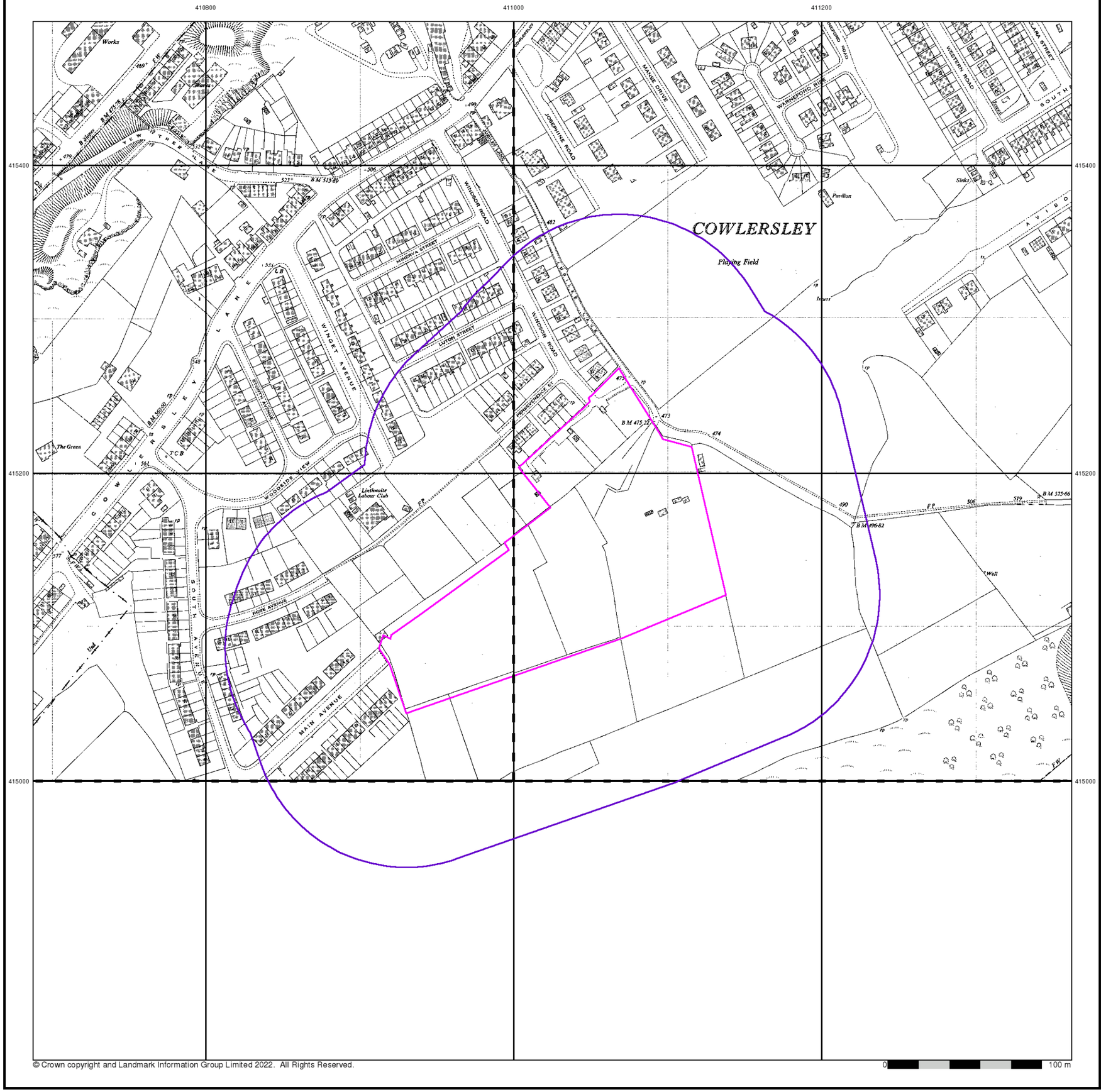

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Ordnance Survey Plan

Published 1961

Source map scale - 1:1,250

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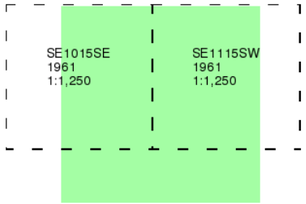

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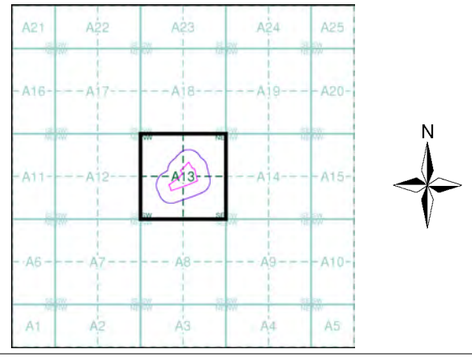

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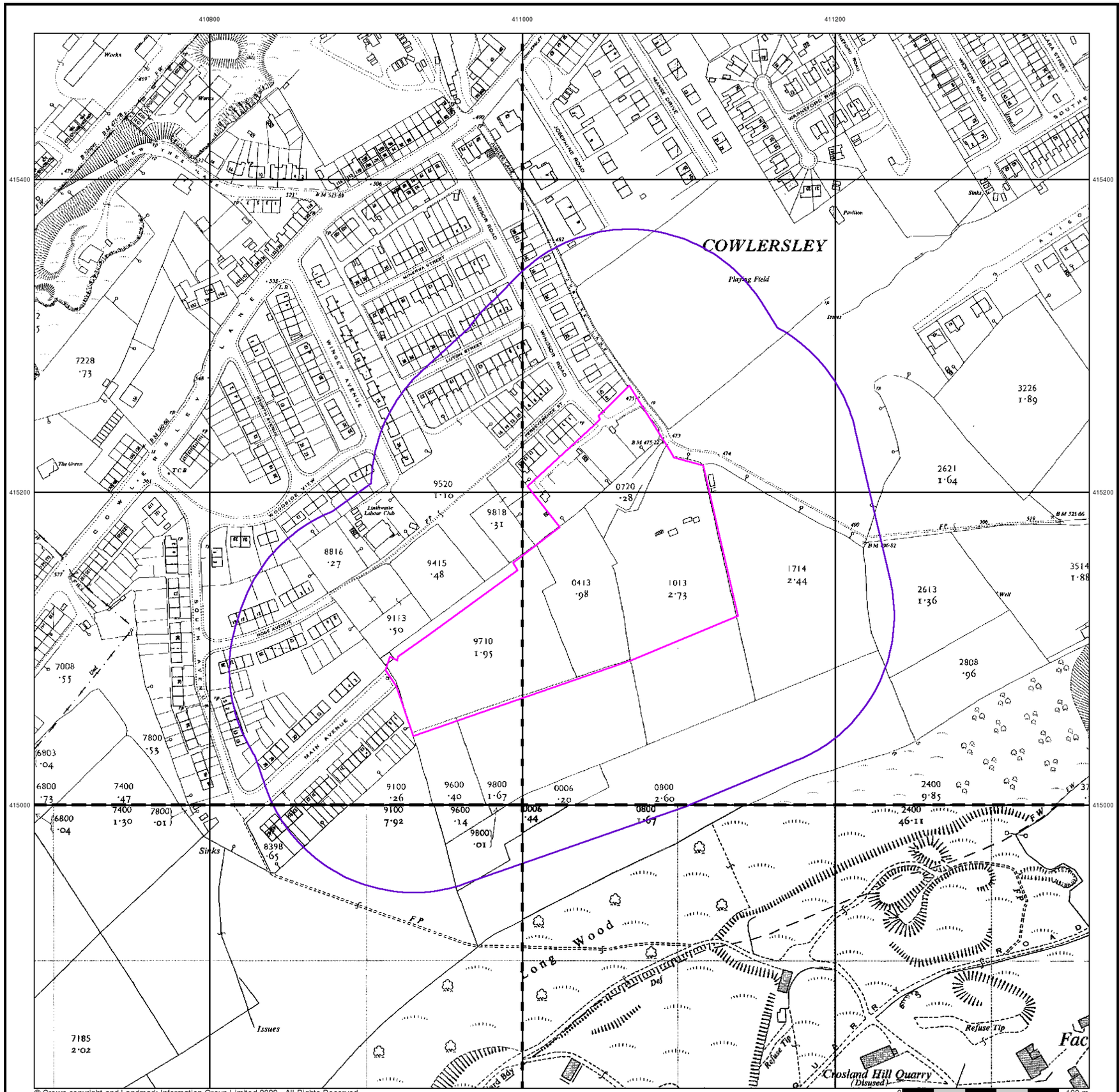

ROBERTS ENVIRONMENTAL LTD

Ordnance Survey Plan

Published 1962 - 1963

Source map scale - 1:2,500

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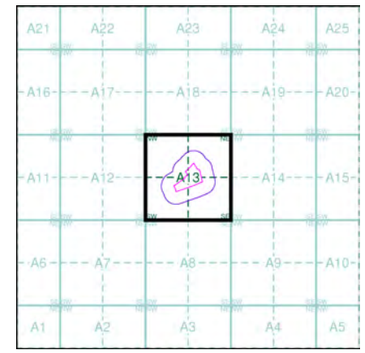
Map Name(s) and Date(s)

SE1015 1962 1:2,500	SE1115 1962 1:2,500
SE1014 1963 1:2,500	SE1114 1963 1:2,500

Historical Map - Segment A13



Order Details

Order Number:	293555057_1_1
Customer Ref:	220322
National Grid Reference:	411030, 415140
Slice:	A
Site Area (Ha):	2.28
Search Buffer (m):	100

Site Details

Main Avenue, HUDDERSFIELD, HD4 5US

Landmark INFORMATION GROUP

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Web: www.envirocheck.co.uk

410800 411000 411200

415400 415200 415000

Works Works Works

Cowersley Cowcliffe Hill Junior & Infants School

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0 100 m

ROBERTS ENVIRONMENTAL LTD

Supply of Unpublished Survey Information

Published 1975

Source map scale - 1:1,250

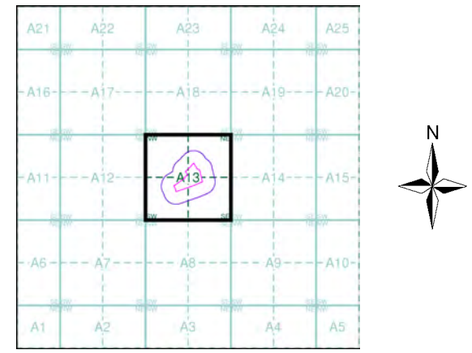
SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment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

Map Name(s) and Date(s)

SE1015SE 1975 1:1,250

SE1115SW 1975 1:1,250

Historical Map - Segment A13



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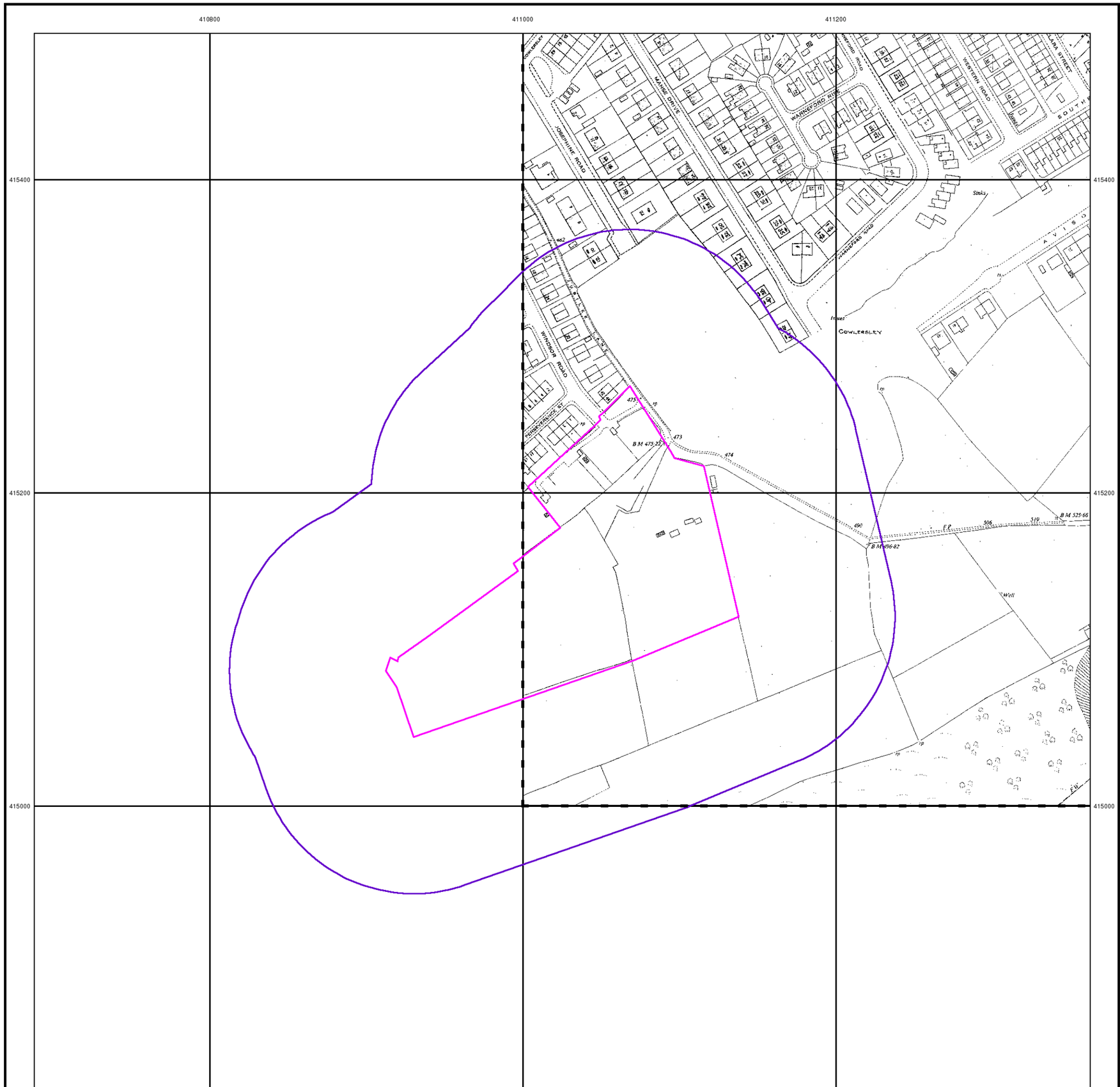

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Published 1975

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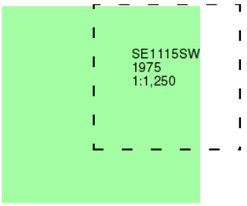
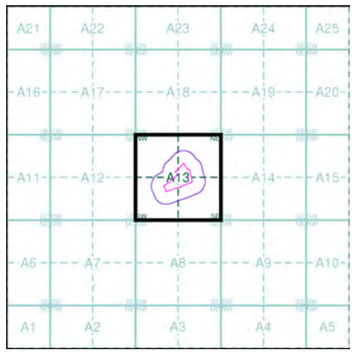
Map Name(s) and Date(s)



Historical Map - Segment A13



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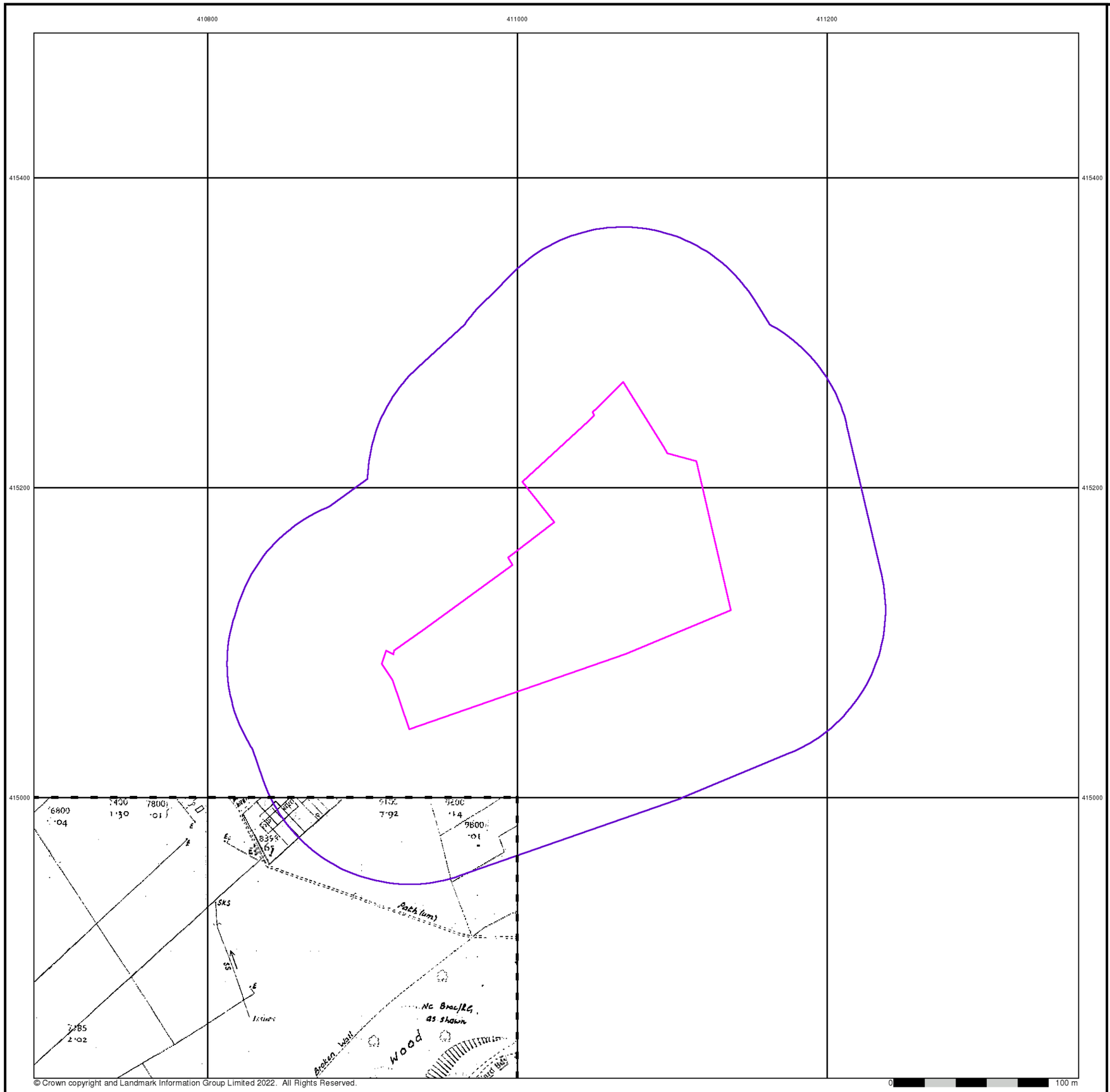


ROBERTS ENVIRONMENTAL LTD

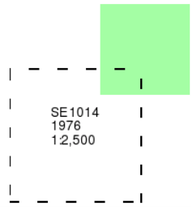
Supply of Unpublished Survey Information

Published 1976

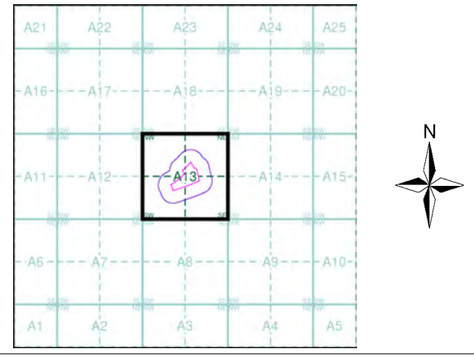
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



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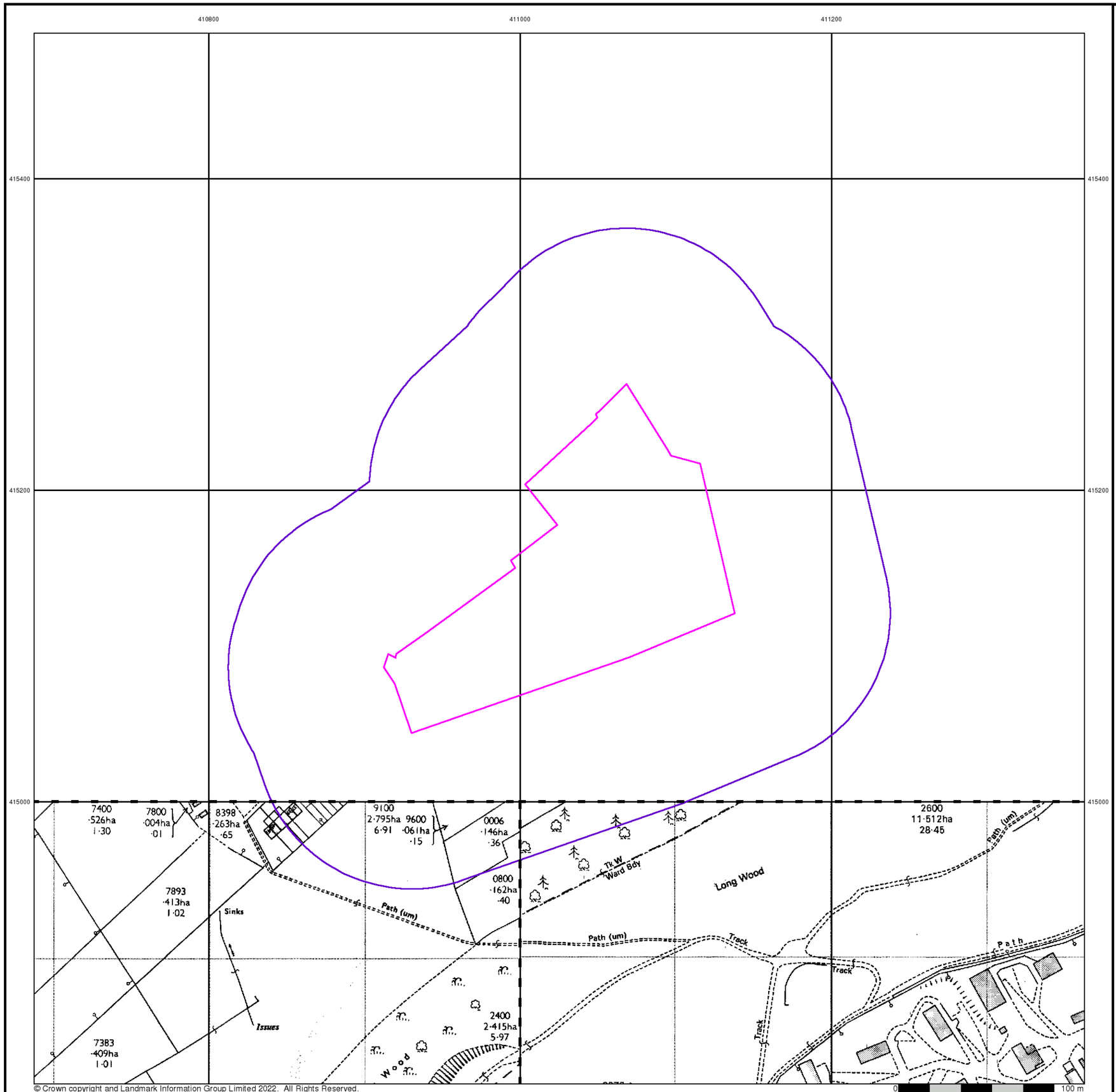


ROBERTS ENVIRONMENTAL LTD

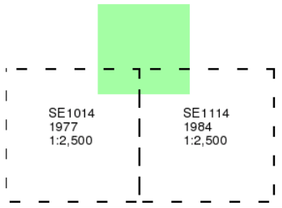
Ordnance Survey Plan

Published 1977 - 1984

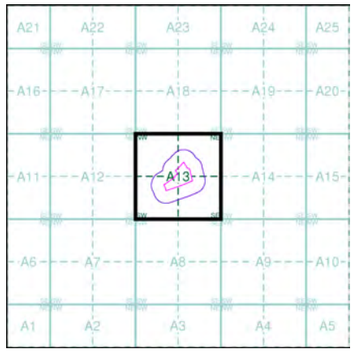
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



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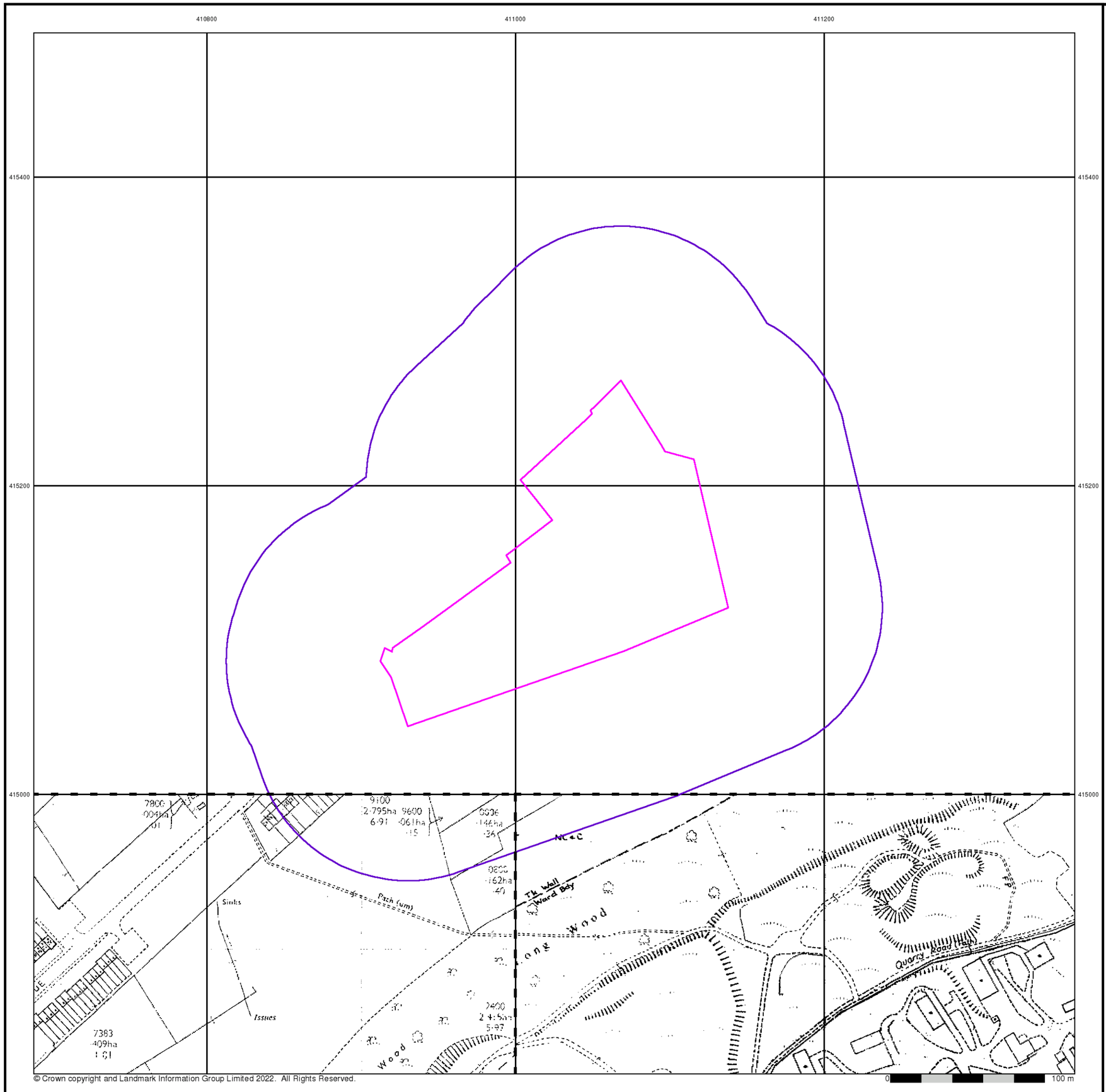


ROBERTS ENVIRONMENTAL LTD

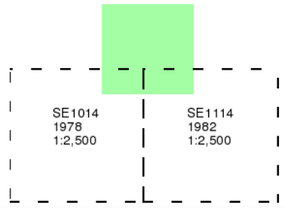
Additional SIMs

Published 1978 - 1982

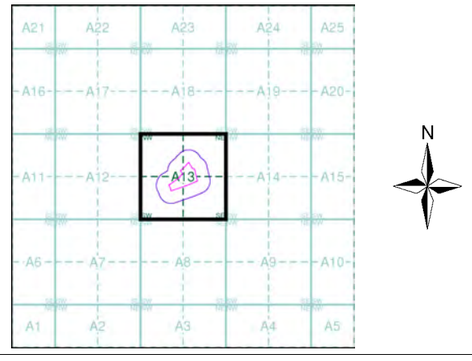
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



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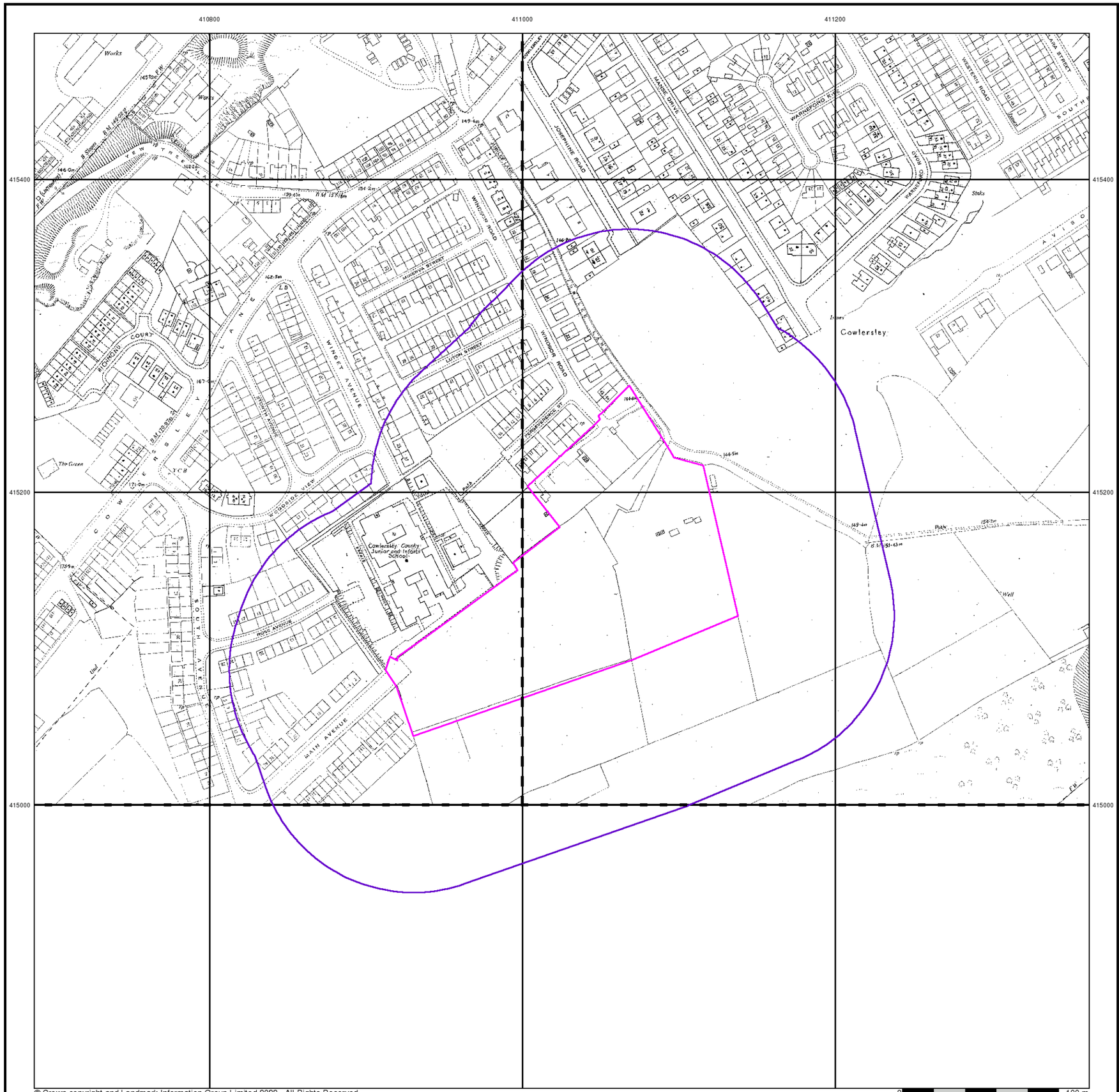

0 100 m

ROBERTS ENVIRONMENTAL LTD

Additional SIMs

Published 1978

Source map scale - 1:1,250

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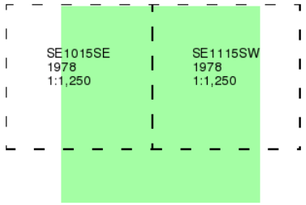
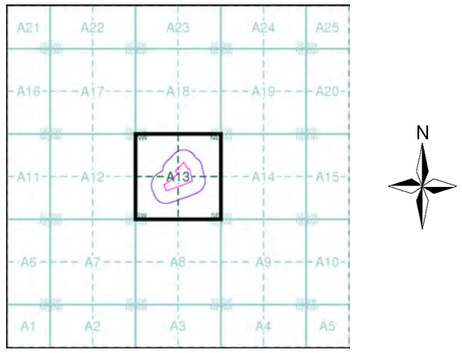
Map Name(s) and Date(s)



Historical Map - Segment A13



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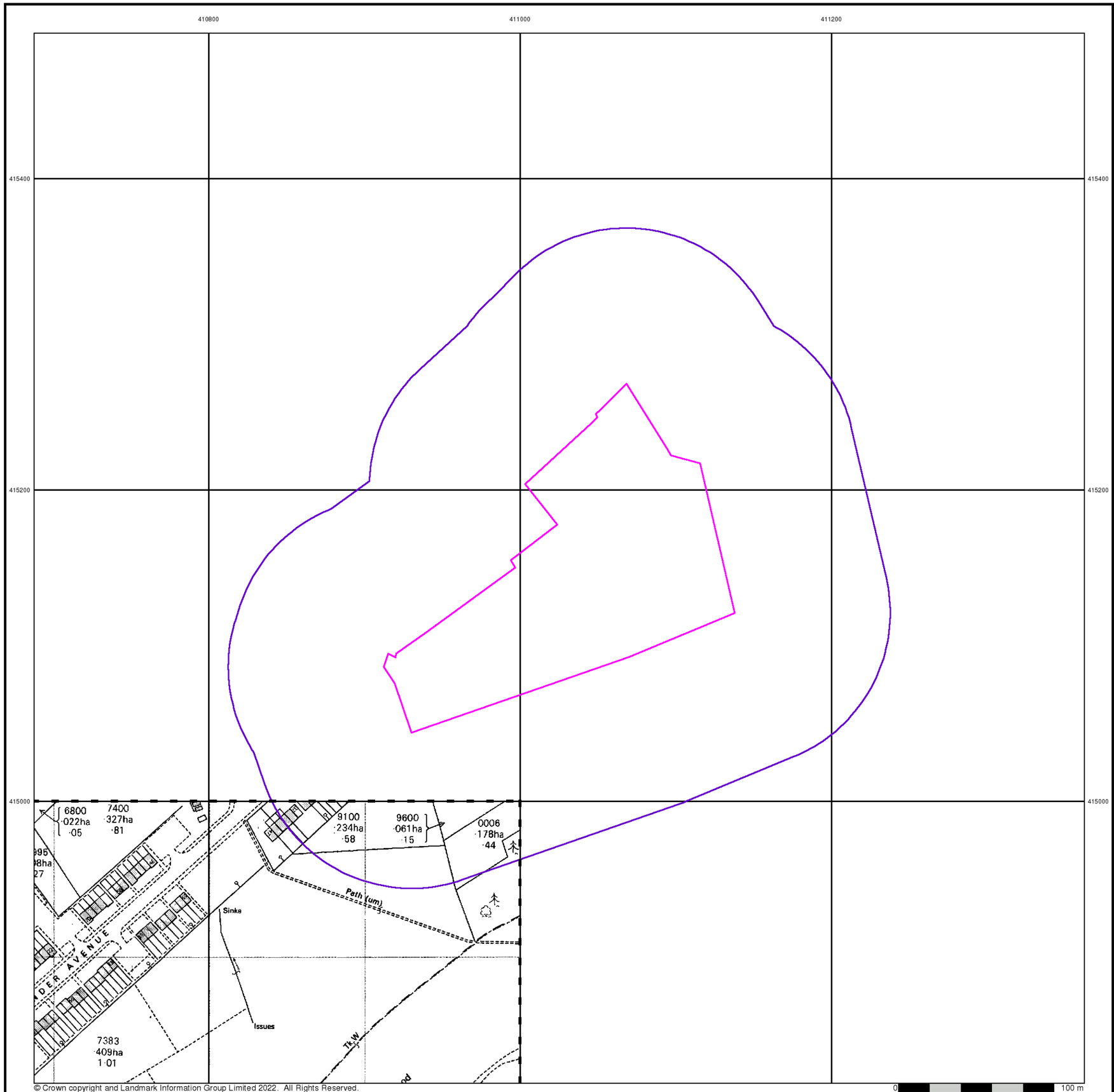


ROBERTS ENVIRONMENTAL LTD

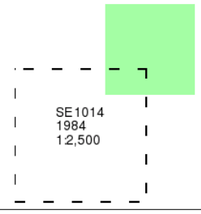
Ordnance Survey Plan

Published 1984

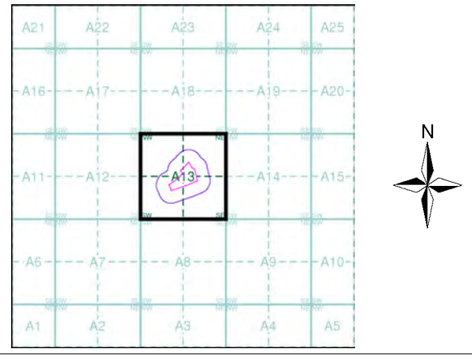
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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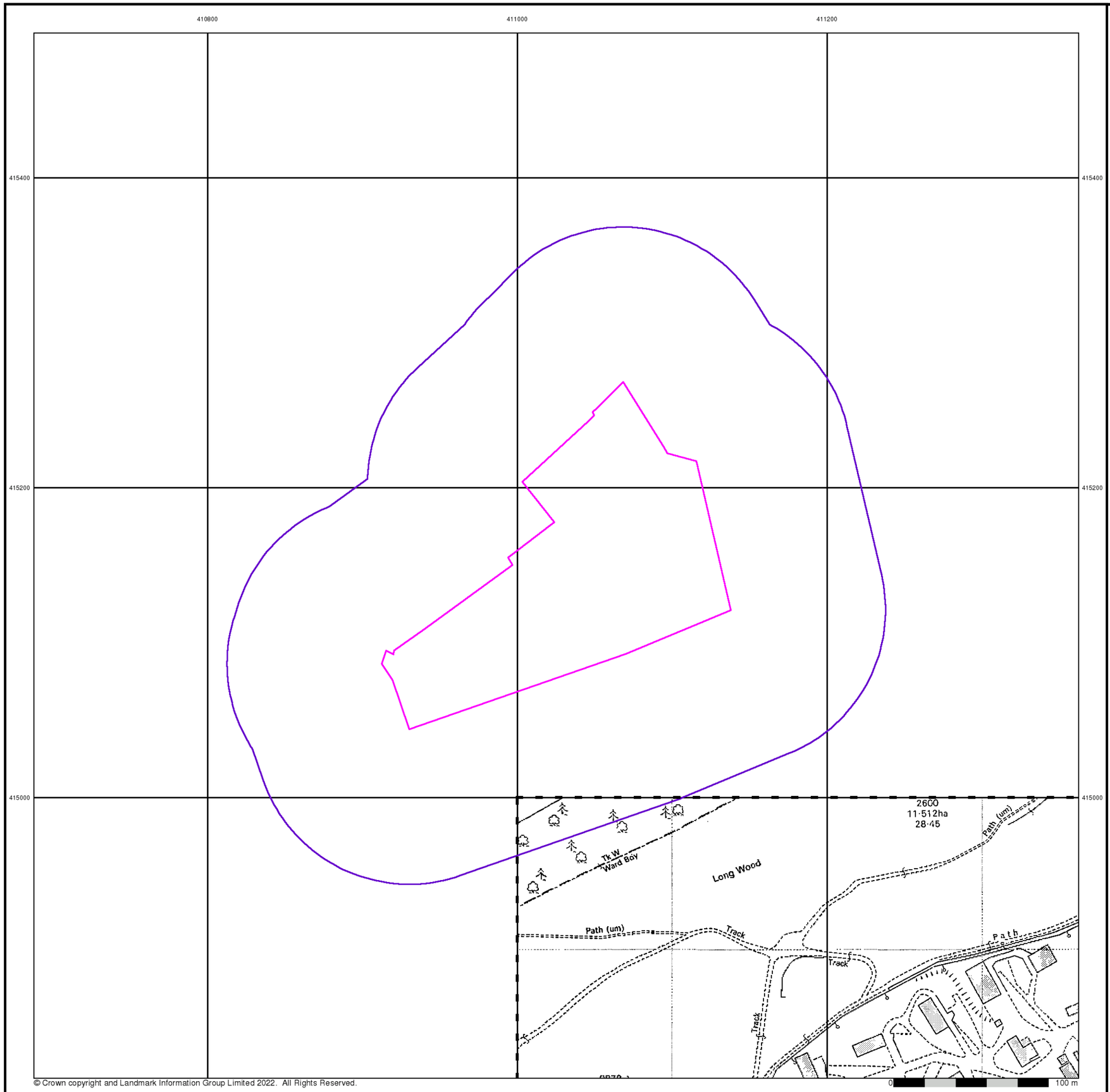


ROBERTS ENVIRONMENTAL LTD

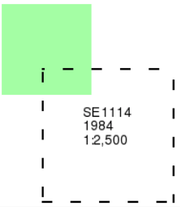
Additional SIMs

Published 1984

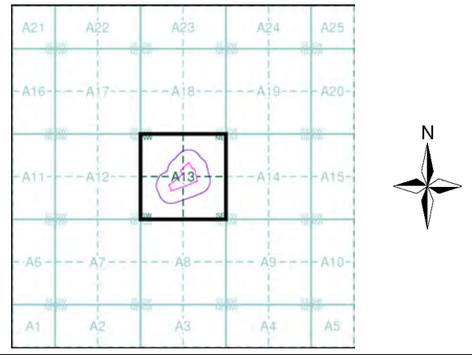
Source map scale - 1:2,500

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

Map Name(s) and Date(s)



Historical Map - Segment A13



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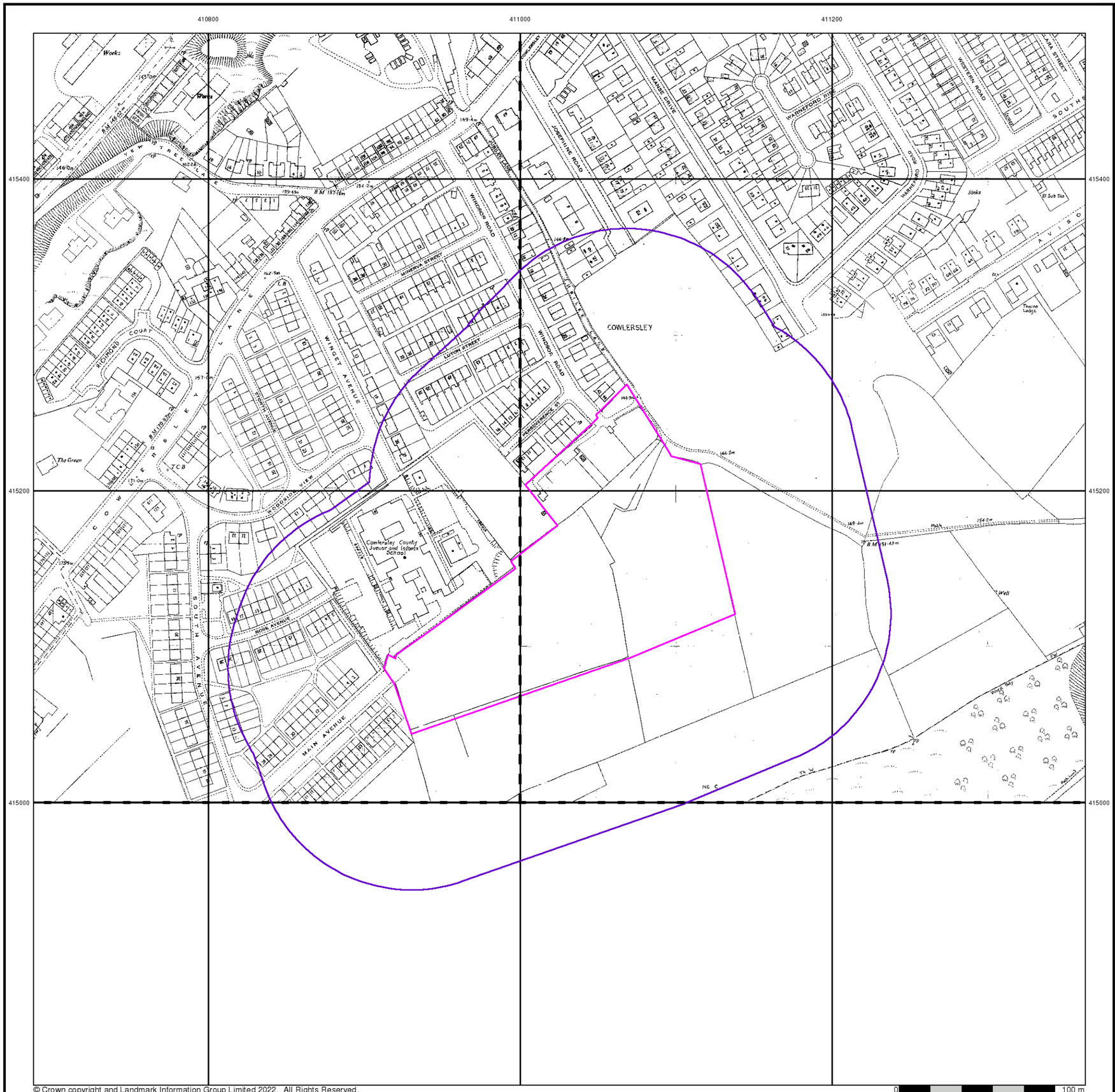

ROBERTS ENVIRONMENTAL LTD

Additional SIMs

Published 1990

Source map scale - 1:1,250

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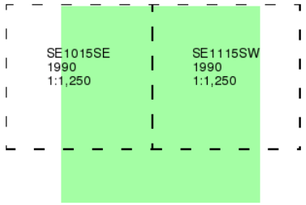
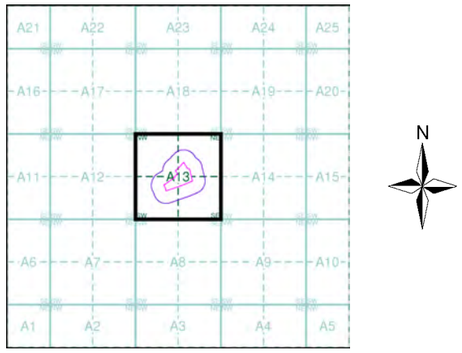
Map Name(s) and Date(s)



Historical Map - Segment A13



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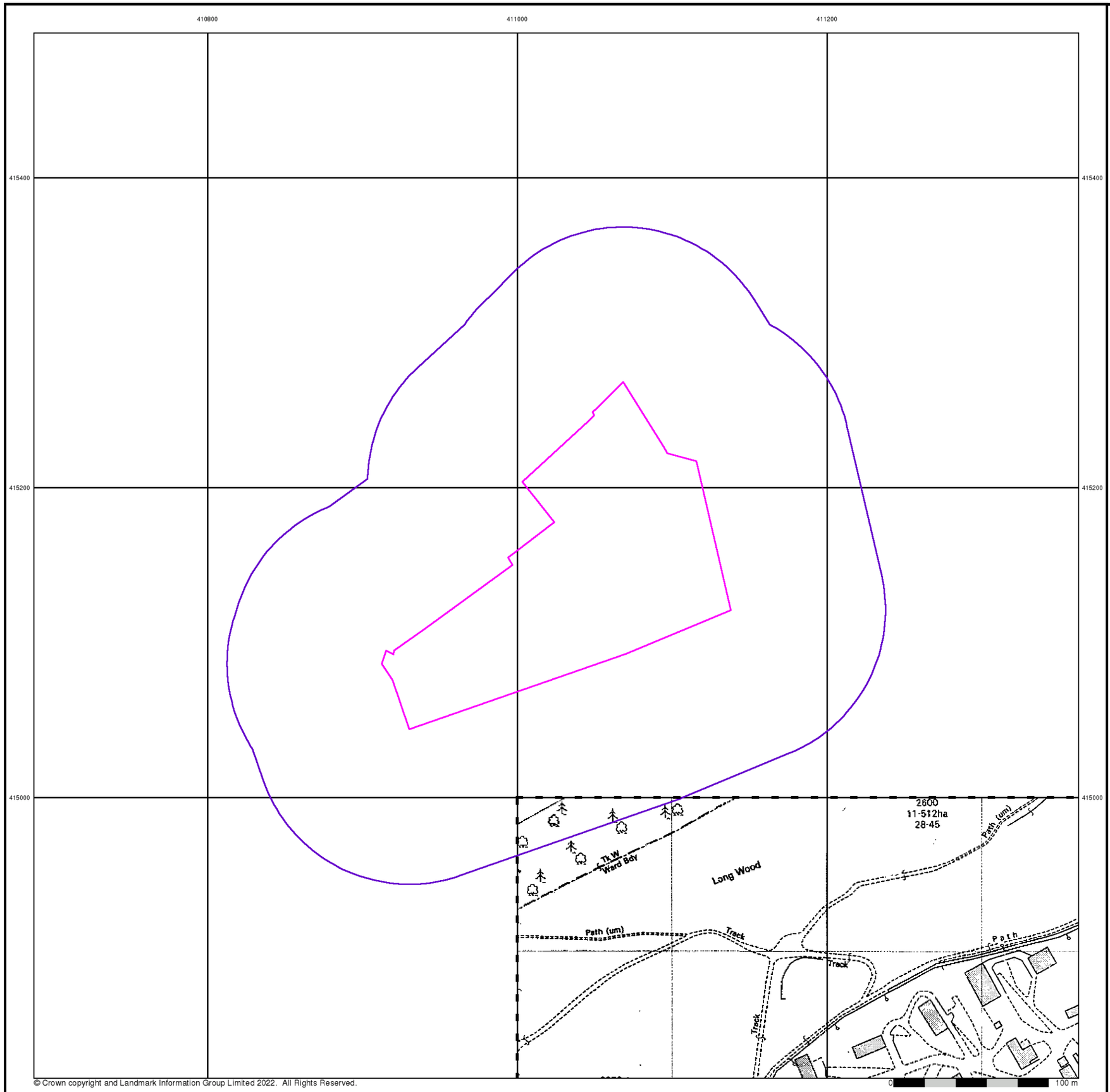

ROBERTS ENVIRONMENTAL LTD

Additional SIMs

Published 1992

Source map scale - 1:2,500

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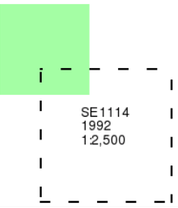
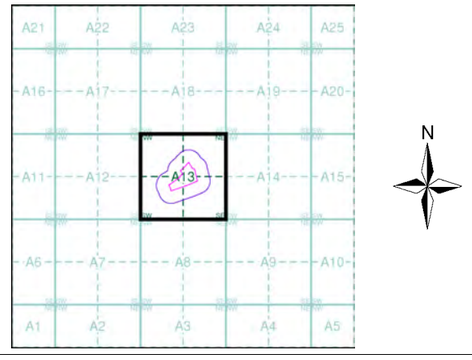


Historical Map - Segment A13



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