

5.0 OUTLINE CONCEPTUAL MODEL

The site is being considered for low-rise housing of conventional construction with private gardens and associated areas of soft landscaping and hardstanding. It is understood the current buildings onsite, including Clough House, will be demolished prior to development.

5.1 Potential Sources of Contamination

Topsoil is expected below grass cover across the majority of the southern half of the site. Made ground is expected to be present below the surface covering in the north of the site as a result of previous development and the infilling of a railway cutting (historic landfill). Any made ground may contain some elevated concentrations of heavy metals / metalloids such as arsenic, lead, nickel, copper or zinc, as well as elevated concentrations of polycyclic aromatic hydrocarbons (PAHs), particularly if ashy materials are present, and sulphates. Asbestos may also be present in the made ground.

The historical map review highlighted the presence of tanks in the north of the site. The purpose of these tanks is unknown, but if they did contain hydrocarbon-based products, elevated levels of petroleum hydrocarbons may be locally present.

5.2 Ground Gas

No radon protective measures are required.

Deep made ground is expected onsite within the backfilled railway cutting, which is also recorded as a historical landfill, and may also be present below former buildings and the existing Clough House which contains a cellar. Historically, a well and pump have been onsite which could have been backfilled and are therefore potentially a more localised source of ground gas.

Due to historical land uses localised contamination onsite may include volatiles which could require protective measures in overlying plots. This is not expected to affect a significant proportion of the site.

There are three recorded infilled areas of ground and five recorded areas of potentially infilled land relating to water within 250 m of the boundary.

If shallow coal workings exist beneath the site they are a possible source of mine gas which could migrate to surface.

A ground gas monitoring programme will be required to establish the level of gas precautions necessary. At this stage, we recommend that you assume Amber 1 precautions are required for

around 80% of the site, with the remaining 20%, i.e. in plots directly over the historical landfill and any hotspots of volatile contamination, requiring Amber 2 precautions.

5.3 Potential Pollutant Linkages

The table below details the possible sources and associated contaminants of concern, pathways and receptors:

Source	Potential Contaminants	Potential Pathways	Potential Receptors
Made ground/current and former use of the site	Heavy metals/metalloids PAHs Asbestos Sulphates	Ingestion, inhalation, direct contact	Future residents and visitors to the site Site construction workers Plants
		Direct contact	Below ground concrete
		Migration through ground	Secondary A Aquifer
Old tanks	Petroleum hydrocarbons	Direct contact	Water supply pipes
Onsite landfill / infilled cutting Backfilled well and pump onsite Possible shallow mine workings Infilled ground offsite	Ground gas	Migration through ground, inhalation	Future residents and visitors to the site Site construction workers Buildings

5.4 Remedial Measures

The following remedial measures should be allowed for:

- A minimum 600 mm thick clean capping, including 100 mm of topsoil, for all gardens and landscaped areas in the northern half of the site. This may need to be increased to 1000 mm if coal seams outcrop beneath garden and landscaped areas to mitigate combustion risks*;
- Remediation or removal of localised hotspots of hydrocarbon impacted soils (e.g. associated with former tanks) although this is considered unlikely;
- If significant asbestos containing material is present, it may need to be removed by a specialist contractor;
- A minimum DS-2 AC-2 level of sulphate precautions, applying to below ground concrete structures within contact of made ground;
- Suitably resistive water supply pipes in made ground; and
- A gas monitoring programme to establish the gas regime of the site. At this stage, we recommend assuming that Amber 1 gas precautions are required for around 80% of the site, and Amber 2 precautions for the remaining 20% of the site.

*Potential heat sources, such as electricity cables should also not be laid in contact with coal.

6.0 GEOTECHNICAL APPRAISAL

6.1 General

Made ground is expected across the northern half of the site as a result of previous development. Deep made ground may be present below existing buildings and is expected within the extent of the backfilled railway cutting.

Below made ground, or below the surface covering in the southern half of the site, clay over mudstone or shale is expected with a band of sand over sandstone in the centre of the site. Shallow bedrock is expected.

Shallow groundwater is not expected at shallow depth beneath the site.

Shallow coal workings may be present below the site. A drilling investigation is required to confirm this. Drilling and grouting could be required but is considered unlikely.

The site slopes down to Leeds Road on the southern boundary at an approximate gradient of around 1 in 24. The ground level of site was noted to be around 0.5 m lower than Moat Hill Farm Drive located directly west of the boundary and where an access road is expected to be built. Site levels may therefore require re-grading.

The Party Wall Act may need to be considered for structures associated with neighbouring properties along the site boundaries.

6.2 Foundations

If mine workings are identified as part of the ground investigation, drilling and grouting of the mine workings is expected to be required. Unrecorded mine entries may be located on the site, an allowance should be made to treat such a feature if found.

It is expected that unreinforced strip or trench-fill footings can be used across the majority of the site, taken through any made ground and into undisturbed non-desiccated natural ground. The minimum footing depth is expected to be 900 mm in the natural clay or mudstone, taken from the lowest of existing or finished ground level, and 600 mm to 750 mm in sand over sandstone. The final depth of the footings within the clay or mudstone/shale will be dependent on the volume change potential of the soil which will need to be determined as part of an intrusive investigation.

Where within influencing distance of trees, the footing depth will need to be increased in accordance with the NHBC Standards Chapter 4.2. Precautions against soil heave due to the influence of past or existing trees are likely to be required wherever the footing depth is increased to a depth greater than 1500 mm.

Anecdotal evidence suggests around a third of Clough House is underlain by a cellar. Once this feature has been located and removed, allowance for deepening foundations in this area to found on suitable natural material below should be made. Other cellars associated with former buildings elsewhere on site cannot be discounted.

If foundations span two different ground types, i.e. clay and sand or clay and bedrock, the footings should be thickened and reinforced.

The current Feasibility Sketch Layout, referenced 0208_SK2 dated November 2016, provided by the client, does not show any plots within the footprint of the former railway cutting. The depth of made ground in this area is unknown and therefore should any plots be proposed in this vicinity piles should be allowed for, taken down through the made ground into the underlying bedrock.

6.3 Ground Slabs

Given that gas precautions are expected to be required, precast concrete floors with an underlying minimum 150 mm ventilated void and fully lapped and sealed gas membrane system should be allowed for. The void height will need to be increased if heave precautions are required.

6.4 Superstructure Precautions

Additional superstructure precautions could be necessary if drilling and grouting is found to be required.

6.5 Excavation Problems

Obstructions in the made ground, such as concrete, may be found onsite as a result of previous structures.

Hardstanding is present across a large portion of the western half of the site which will need broken out as part of any investigation. A walled / fenced garden directly east of Clough House is currently inaccessible for large machinery, only pedestrian access is possible.

Manhole covers were observed at surface across the site during the walkover indicating private services to Clough House and the outbuildings exist. Overhead BT cables were observed in the south west of the site.

An electric gate, with passcode entry, provides access to the site off Leeds Road. Any access to the site will need to be arranged and a code obtained.

The stability of trenches may be poor in any made ground and if shallow perched groundwater is encountered. Temporary support will be required in accordance with current Health & Safety

Regulations wherever access is required to trenches deeper than 1.2 m or less where there is risk of collapse.

6.6 Obstructions

A remnant rectangular concrete base was observed to the north of Clough House during the site walkover, its purpose is unknown and further similar features or slabs cannot be discounted.

A well (east) and a pump (west) were mapped in 1894 and between 1894 to 1908 respectively. If either of these features is encountered during the investigation or future works they will need to be confirmed to have been appropriately backfilled and possibly capped.

6.7 Roads

A CBR value of at least 2% is expected to be appropriate for road design. It is recommended that CBR tests are undertaken along any proposed roads prior to construction so that accurate CBR values can be obtained. The ground should be assumed to be frost susceptible and a minimum construction thickness of 450 mm will therefore apply.

6.8 Surface Water Drainage

Soakaways may be viable within the expected sandstone band across the centre of the site. However, clay soils are expected to the north and south and may be present at shallow depth overlying the sandstone bedrock. Soakaways are therefore not expected to be viable across the majority of the site.

7.0 RECOMMENDATIONS FOR FURTHER WORK

Before more definite information regarding the properties of the ground and any contamination present can be given, an intrusive ground investigation will be required. Investigation by mechanically dug trial pits would be the preferred method of investigating the soils on site, as this allows a larger volume of soil to be viewed. Some of these will need to target the footprints of the former structures, tanks and the infilled railway cutting.

Investigation of the coal seams and any workings beneath the site is proposed by rotary boreholes.

If deep made ground is found, cable percussion boreholes will be required to investigate the depth of made ground and collect strength data for pile design.

A gas monitoring programme will be required to determine the current gassing regime of the site.

In areas with granular soils, and where deep made ground is not encountered, infiltration testing could be undertaken to establish the viability of soakaway drainage.

The potential pollutant linkages presented in Section 5.3 will need to be investigated by means of soil analysis. The chemical testing suite should be chosen to cover the range of potential contaminants indicated. If any clay soils are encountered geotechnical testing should be carried out to determine their volume change potential.

APPENDIX

Site Photographs

Envirocheck

Consultants Coal Mining Report



Looking north west up to Clough House from the site entrance

Looking towards the south eastern corner of the site from the front of Clough House

Prepared	NG	Checked	CAT	Date	09.12.19	Photograph No	1 & 2
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St Andrew's House
 23 Kingfield Road
 Sheffield S11 9AS
 Tel: (0114) 2554554 Fax: (0114) 2554330

CLOUGH HOUSE, LEEDS ROAD, BIRSTALL

ROSIE CARR

SITE PHOTOGRAPHS



View of the south eastern corner of the site looking north



Pedestrian access to the enclosed garden located to the east of Clough House

Prepared	NG	Checked	CAT	Date	09.12.19	Photograph No	3 & 4
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CLOUGH HOUSE, LEEDS ROAD, BIRSTALL

ROSIE CARR

SITE PHOTOGRAPHS



Within the walled garden looking west towards Clough House



Looking north east towards the outbuildings directly north of Clough House

Prepared	NG	Checked	CAT	Date	09.12.19	Photograph No	5 & 6
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SITE PHOTOGRAPHS



View looking west between outbuildings towards the entrance to Moat Hill Farm Drive beyond the site boundary

View looking east across the grassy area from the outbuildings

Prepared	NG	Checked	CAT	Date	09.12.19	Photograph No	7 & 8
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SITE PHOTOGRAPHS



Looking south east from the northern site boundary



Remnant rectangular concrete base located between the outbuildings

Prepared	NG	Checked	CAT	Date	09.12.19	Photograph No	9 & 10
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CLOUGH HOUSE, LEEDS ROAD, BIRSTALL

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SITE PHOTOGRAPHS

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		Minor Roads		
	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				
	County Borough Boundary (England)				
	County Burgh Boundary (Scotland)				
	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		Glasshouse
	Sloping Masonry		Pylon
	Electricity Transmission Line		Pole
	Cutting		Embankment
	Standard Gauge Multiple Track		
	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)
	Bench mark (where shown)		Triangulation station
	Point feature (e.g. Guide Post or Mile Stone)		Pylon, flare stack or lighting tower
	Site of (antiquity)		Glasshouse
	General Building		Important Building

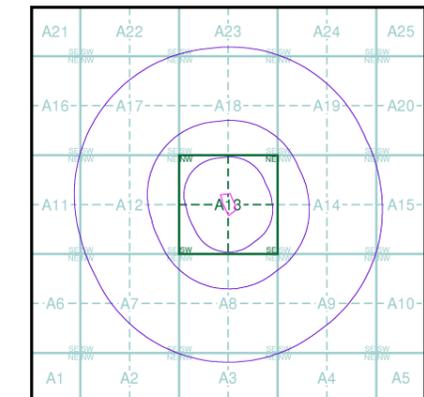
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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:10,560	1854	3
Yorkshire	1:10,560	1894 - 1895	4
Yorkshire	1:10,560	1908	5
Yorkshire	1:10,560	1931 - 1932	6
Yorkshire	1:10,560	1938	7
Yorkshire	1:10,560	1938 - 1948	8
Yorkshire	1:10,560	1948	9
Ordnance Survey Plan	1:10,000	1955	10
Ordnance Survey Plan	1:10,000	1966	11
Leeds	1:10,000	1972	12
Ordnance Survey Plan	1:10,000	1976	13
Batley	1:10,000	1983	14
Ordnance Survey Plan	1:10,000	1986	15
Bradford	1:10,000	1990	16
Ordnance Survey Plan	1:10,000	1995	17
10K Raster Mapping	1:10,000	2000	18
10K Raster Mapping	1:10,000	2006	19
VectorMap Local	1:10,000	2019	20

Historical Map - Slice A



Order Details

Order Number: 226382729_1_1
 Customer Ref: 44688
 National Grid Reference: 423390, 426680
 Slice: A
 Site Area (Ha): 0.93
 Search Buffer (m): 1000

Site Details

Site at 423390, 426690

Landmark
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Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale

	Government and Administrative Buildings		Military and Industrial Buildings
	Military and Communication Areas		Subway Entrance
	Fireproof Building		Prominent Fireproof Building
	Non-fireproof Building		Non-fireproof Building (non-dwelling)
	Factory, mill, and flour mill, with chimneys		Factory, mill, and flour mill, without chimneys
	Power Station, drawn to scale		Hydroelectric Power Station
	Radio Station, drawn to scale		Telephone Station, drawn to scale
	Abandoned Open-pit Mine or Quarry		Open-pit Salt Mine
	Pit		Oil Deposit or Well
	Oil Seepage		Natural Gas Tank
	Tailings Pile		Fuel Storage Tanks
	Bench Mark		Drill Hole
	Burial Mound		Triangulation Point on Burial Mound
	Single-track Railroad		Double-track Railroad
	Small Bridge		Tunnel
	Pipe (Culvert)		Railroad and Station Building
	Coniferous Forest		Deciduous Forest
	Mixed Forest		Lawns
	Citrus Orchard		Wet Ground
	Scattered Vegetation		

243,8 Values for prominent elevations
186.0 Numbers for spot elevations, depth soundings, contour lines, etc.
0,2 Velocity of the current, width of river bed, depth of river
180/12 Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	Ъ (-)
Д д (D)	Л л (L)	У у (U)	Ы (Y)
Е е (E)	М м (M)	Ф ф (F)	Ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale

	Government and Administrative Buildings		Military and Industrial Buildings
	Military and Communication Areas		Subway Entrance
	Partly Demolished Buildings		Demolished Buildings
	Built-Up Area with Fireproof Buildings Predominant		Built-Up Area with Non-Fireproof Buildings Predominant
	Individual Fireproof Building		Prominent Industrial Building
	Individual Dwelling, Fireproof		Ruins of an Individual Dwelling
	Factory or Mill Chimney		Factory or Mill with Chimney
	Factory or Mill without Chimney		Mine or Open Pit Mine
	Operating Shaft or Mine		Non-Operating Shaft or Mine
	Salt Mine		Tailings Pile
	Pit		Stone Quarry
	Gas Pump or Service Station		Fuel Storage or Natural Gas Tank
	Oil or Natural Gas Derrick		Small Hydroelectric Power Station
	Power Station		Transformer Station
	Cemetery		Burial Mound (height in metres)
	Triangulation Point on Burial Mound		Triangulation Point
	Bench Mark		Bench Mark (monumented)
	Telegraph Office		Telephone Station
	Radio Station		Radio Tower
	Airfield or Seaplane Base		Landing Strip
	Cut		Fill
	Km Post		Plantings
	Telegraph/Telephone Lines		Main Highway
	Highway under Construction		Improved Dirt Road (former truck road)
	Small Bridge		Pipe (Culvert)
	Tunnel		Dismantled Railroad
	Double-track Railroad with First Class Station		Railroad Under Construction
	Shore Embankment		River or Ditch with Embankment
	Water Reservoir or Rain Water Pit		Spring
	Well		Isobath with value
	Heavy (Index) Contour Line		Half Contour Line
	Contour Line and Value		Spot Elevation Value
	Coniferous		Deciduous
	Mixed		Scrub

Key to Numbers on Mapping

SE22NW_Leeds

No.	Description
38	Factory (Machinery)

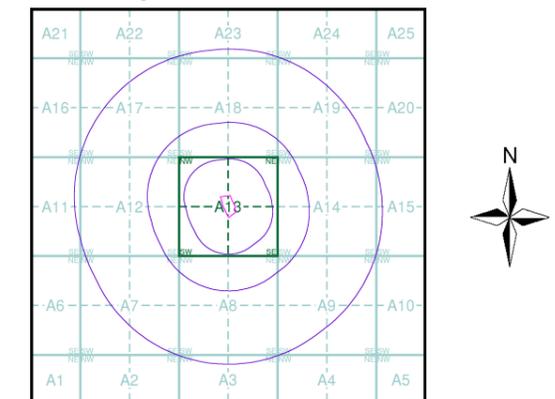
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Historical Mapping & Photography included:

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Russian Map - Slice A



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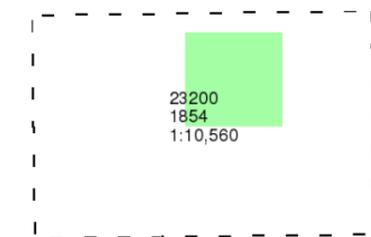
Site at 423390, 426690

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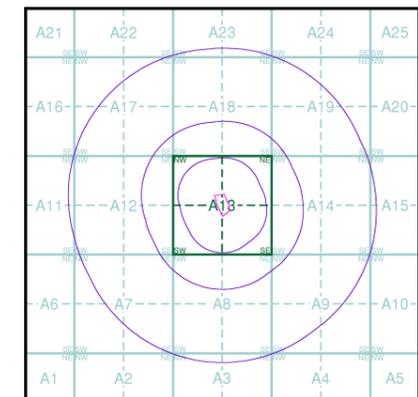
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps.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

Map Name(s) and Date(s)



Historical Map - Slice A

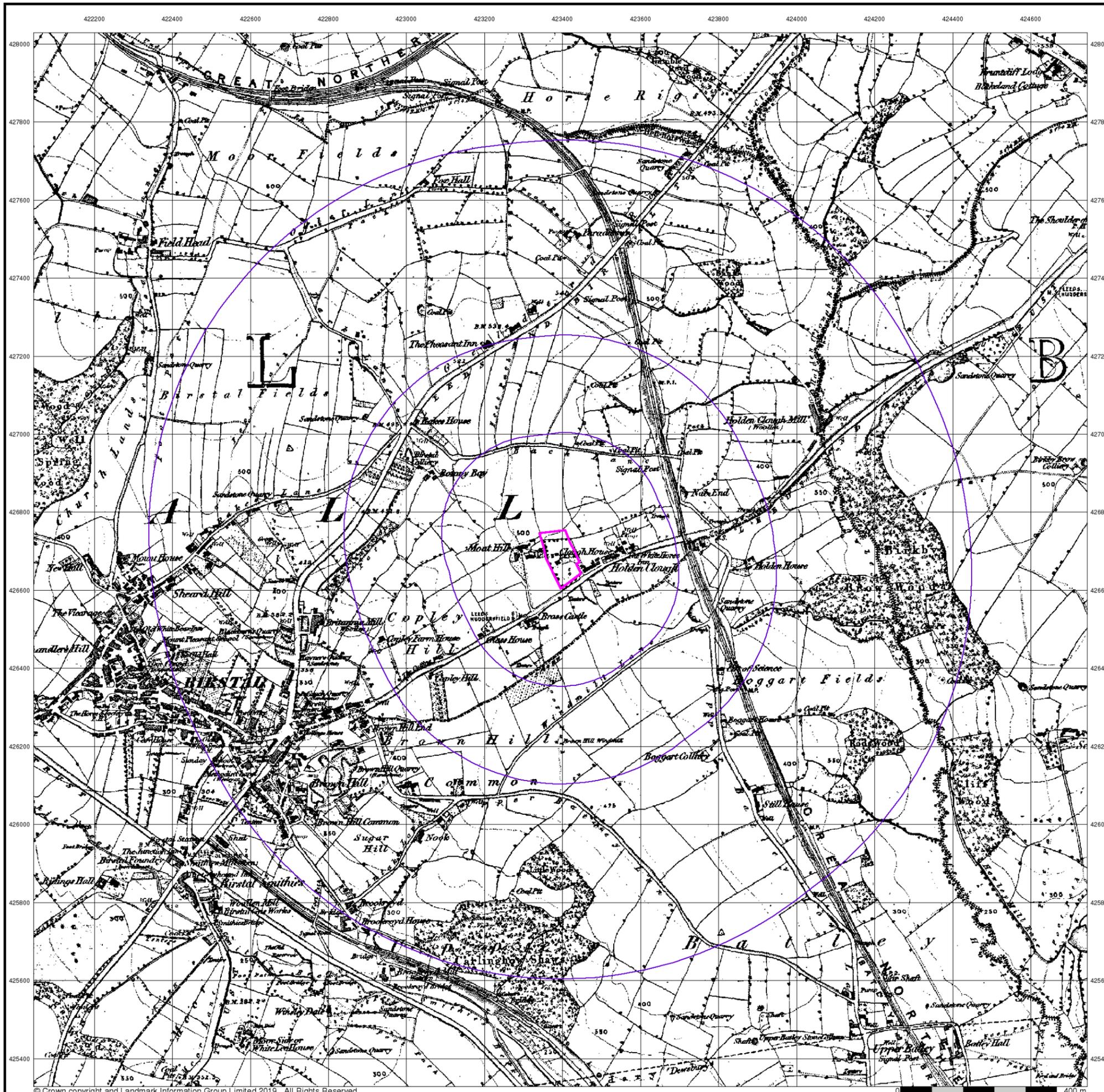


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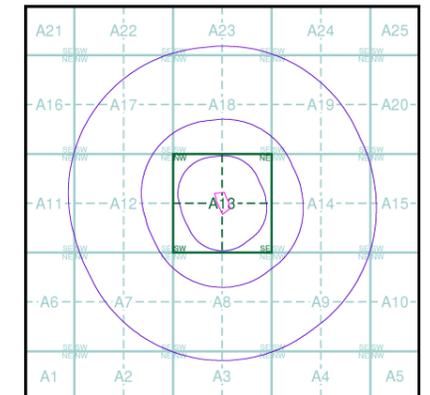


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232NW 1894 1:10,560	232NE 1894 1:10,560
232SW 1894 1:10,560	232SE 1895 1:10,560

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