

Appendix E: Historic Environment

Appendix E.2: Geophysical Survey



WYAS
**Archaeological
Services**

Hollingworth Road
Littleborough
Greater Manchester

Geophysical Survey

Report no. 3949
April 2023

Client: Stantec UK Limited

On behalf of: Bloor Homes



Hollingworth Road, Littleborough, Greater Manchester

Geophysical Survey

Summary

A geophysical (magnetometer) survey was undertaken on approximately 18 hectares of land located in Littleborough, Greater Manchester. Anomalies associated with former quarrying have been recorded in the northern section of the Site. Medieval or post-medieval ridge and furrow cultivation have also been detected along with field boundaries and likely modern agricultural responses. Geological anomalies associated with a natural channel have also been recorded. Uncertain anomalies are likely to be associated with drainage and former boundaries although a rectilinear response may be of some archaeological interest. Magnetic disturbance along the limits of the dataset is due to metal fencing within the boundaries and interference from the adjacent roads and buildings. Based on the geophysical survey, the archaeological potential of this Site is deemed to be low.



Report Information

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Report Type:	Geophysical Survey
Location:	Littleborough
County:	Greater Manchester
Grid Reference:	SD 93414 15478
Period(s) of activity:	Post-medieval/modern
Report Number:	3949
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1 Introduction

Archaeological Services ASWYAS has been commissioned by Stantec on behalf of Bloor Homes to undertake a geophysical survey of land in Littleborough, Greater Manchester. This was undertaken in line with current best practice (CifA 2020; Schmidt *et al.* 2016). The survey was carried out between the 1st and 2nd of March 2023 to provide additional information on the archaeological resource of the Site.

Site location, topography and land-use

The Site is located at SD 93414 15478 (approximate centre), comprising c. 18ha over several pasture fields (Fields 1-9) separated by drystone wall (see Fig. 1). Parts of the Site were unsuitable for survey due to either steep terrain, marshy ground, farm buildings and a car park (see Fig. 2). Plates 1-16 show both the survey areas and areas which were unsuitable for survey.

The Site is bound to the east by Hollingworth Road, to the south by Lank Bank and Hollingworth Lake, to the north by the Rochdale Canal and by a residential development to the south. The above Ordnance Datum (aOD) varies significantly across the Site; the western part of the Site known as Brown Brow Hill lies at 181m aOD, the land in the north falls steeply towards the Rochdale Canal to 150m aOD and lies at approximately 167m aOD in the east.

Soils and Geology

The underlying bedrock of the site comprises mudstone, siltstone and sandstone of the Pennine Middle Coal Measures formation. The western section of the Site comprises sandstone of the Milnrow Sandstone formation. Both are sedimentary bedrocks that formed approximately 319 to 318 million years ago in the Carboniferous Period. The overlying superficial deposits consist of Till (Devensian) which formed between 116 and 11 thousand years ago in the Quaternary Period. A band of Head (diamicton) runs through the eastern section of the site on a south to north orientation (BGS 2023).

Soils of the area are described as slowly permeable seasonally wet acid loamy and clayey soils (Soilscape 17) (CSAI 2023).

2 Archaeological Background

The following archaeological background has been taken from a Historic Environment Desk Based Assessment prepared by Stantec and focuses on a 1km study area from the Site (Legge 2022).

Prehistoric Period

The earliest evidence of activity within the 1km study area comprises Mesolithic flints (HER: 290.1.0) recovered from the area of Hollingworth Lake, approximately 370m south of the Site.

Evidence of Neolithic activity recorded within the study area is also confined to residual finds, comprising flint implements (HER: 719.1.0) recovered from the area of Hollingworth Lake, approximately 460m south of the Site, and a late Neolithic polished stone axe-head (HER: 718.1.0) found in Hollingworth Fold, c. 660m southeast of the Site.

There are no Bronze Age or Iron Age remains recorded within the study area.

Romano-British Period

Evidence of Romano-British activity within the study area is represented by finds. An urn containing a number of Roman coins and a cup (HER: 733.1.0) was recovered during the excavation of foundations for Stubley Hall, c. 450m north of the Site, whilst a hoard of 65 silver coins (HER: 8679.1.0) and a bronze bracelet (HER: 8863.1.0) were identified by metal detecting around Hollingworth Brook, c. 700m and 500m east of the Site respectively. The possible route of a Roman road, as indicated by the distribution of coin hoards, is also suggested as likely to extend through the Study Area, following the high ground to the north of the River Roch to the west of Littleborough.

Medieval Period

The site is located within the ancient township of Butterworth within Rochdale parish. The etymology of Butterworth is indicative of Saxon origin, derived from the Old English butere meaning butter and worð meaning an enclosure. The place name of Littleborough, is also derived from the Old English lytel and burh meaning 'little fort or stronghold' (Mills 2011, 300).

The medieval manor of Cleggswood (HER: 2398.1.0), which formed part of the Butterworth township, was located c. 165m east of the Site. The manor became the seat of the Belfields of Belfield at the beginning of the 16th-century and at which time it is presumed that the house was established. Given its proximity to the manor, it is considered likely that the Site formed part of Cleggswood estate.

During the later medieval period Littleborough, which was located within the neighbouring township of Hundersfield, comprised a hamlet focused upon the junction of two ancient routes over the Pennines that converged to cross the River Roch. In 1471 the Abbot of Whalley granted a licence to the inhabitants of Butterworth and Hundersfield to erect a new chapel (HER: 2364.2.0) at Littleborough, which was located c 815m northeast of the Site in the vicinity of the existing church (HER: 2364.1.0). An inn is also recorded within Littleborough in 1472 and a water mill (HER: 2470.1.0), which is first mentioned in 1556,

was located on the river, c 175m north of the Site. The Grade II* listed Stubley Hall (NHLE:1162360) which stands to the east of Littleborough, is also of 15th-century origin.

Post-medieval Period

Buildings within the vicinity of Lower Cleggswood Farm are first illustrated by maps of Lancashire from 1818 and 1829, although may have been present earlier. The 1829 map clearly shows Heald Lane (formerly Lower Cleggs Wood Lane) crossing through the centre of the Site as well as the route of a 'proposed road' crossing through the eastern part of the Site on a northeast, southwest alignment. The Site is not shown on Butterworth Tithe map (1846).

The 1851 OS map shows that land within the Site was enclosed by at least this time comprising a series of regular fields with straight boundaries defined by drystone walls, the majority of which survive in varying states of condition. Several trackways are also shown crossing the Site. Hollingworth Road had also been constructed by this time, albeit along the eastern side of the Site rather than across it as indicated by the proposed alignment shown on the 1829 map.

A sandstone quarry, one of a number within the area, is shown within the north-western part of the Site on the 1851 Ordnance Survey map and by the time of the 1891 OS map is referred to as an 'old quarry'. An 'old coal pit' is also shown a short distance north of the Site on the 1851 OS map and another disused mine shaft is shown on the 1909 OS map directly adjacent to the north-western corner of the Site.

In 1794 an Act of Parliament sanctioned the construction of the Rochdale Canal. The canal extends for 51km across the Pennine between Manchester and Sowerbridge, passing directly north of the Site. The canal was opened in sections however, it formally opened in 1804. Hollingworth Lake, directly south of the Site, was created as feeder source for the canal and was completed in 1800. A 'drain or conduit' connecting the canal and the lake, is shown to have extended through the eastern part of the Site by the 1851 OS map.

3 Aims, Methodology and Presentation

The aims and objectives of the programme of geophysical survey were to gather sufficient information to establish the presence/absence, character and extent, of any archaeological remains within the specific area and to inform an assessment of the archaeological potential of the site. To achieve this aim, a magnetometer survey covering all amenable parts of the Site was undertaken (see Fig. 2).

The general aims of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;

- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Magnetometer survey

The cart-based survey was undertaken using an eight channel SenSYS MX V3 system containing eight FGM650 sensors. Readings are taken every 20MHz (between 0.05 and 0.1m). Data were recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. DLMGPS and MAGNETO software, alongside bespoke in-house software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 shows the location of the survey areas at a scale of 1:2500. Figure 3 displays processed magnetometer data at a scale of 1:2500 whilst Figure 4 shows an overview of the interpretation at the same scale. Processed and minimally processed data, together with interpretation of the survey results are presented in Figures 5 to 10 inclusive at a scale of 1:1250.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1. Technical information on locating the survey area is provided in Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the completed OASIS form is included in Appendix 4.

The survey methodology, report and any recommendations comply with guidelines outlined by the European Archaeological Council (Schmidt *et al.* 2015) and by the Chartered Institute for Archaeologists (CIfA 2020). All figures reproduced from Ordnance Survey mapping are with the permission of the controller of His Majesty's Stationery Office (© Crown copyright).

The figures in this report have been produced following analysis of the data in processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

4 Results and Discussion (see Figures 5 to 10)

Ferrous anomalies and magnetic disturbance

Ferrous anomalies, as individual ‘spikes’, or as large discrete areas are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution in this survey to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

A large area of magnetic disturbance recorded in the northwest of Field 1 corresponds to the location of an old sandstone quarry marked on historic mapping dating from 1851 (NLS 2023).

Another large area of disturbance in the northeast of Field 5 may also be associated with past quarrying although there is no map evidence to support this. It is also possible that it has a connection with the former chemical works to the immediate north which can be seen on Google imagery from 2000, it had been demolished by the 2016 image (Google Earth 2023).

Magnetic disturbance along the limits of the survey areas is due to metal fencing within the field boundaries and interference from the adjacent roads. There is an especially high concentration of these responses along the eastern edge of the Site due to the modern housing estate which borders it.

A linear dipolar trend has been recorded within the east of the Site (Fields 6 and 9), aligned east to west between Hollingworth Road and the cluster of farm buildings. This is likely to represent a buried service.

Geological anomalies

The survey has detected a number of anomalies that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the deposits of superficial material in which they derive. These are particularly evident within the north of the Site.

In a slightly raised field directly north of the Site there is a spring labelled on OS mapping from 1949-1972 (NLS 2023) which corresponds to a large, waterlogged area of ground. This area appears to drain through the Site from the northern boundary, causing several noticeable geological channels and depressions. The largest of these drainage channels can be seen as fragmentary band of geological responses on a southeast alignment through Fields 5 and 6. Within Field 6 the magnetic responses change and appear to become faintly dipolar and more firmly magnetic within this same alignment. It is likely that a length of pipe has been

installed within the natural drainage channel to control the direction of this drainage away from the farm buildings within the centre of the Site and as such a primarily geological explanation has been favoured here.

Agricultural anomalies

Linear responses associated with field boundaries have been recorded in Fields 1 and 2. These reflect the current boundaries but where the drystone walling has been removed and therefore data were able to be collected.

Parallel linear trends have been recorded within Fields 1 - 3 and may be associated with medieval or post-medieval ridge and furrow cultivation and can also be seen within LiDAR data (Legge 2022).

Other linear trends within the dataset have been interpreted as agricultural. These may also be associated with ridge and furrow cultivation, but a more modern origin is also possible. The weak linear trend in Field 9, on a northwest to southeast alignment corresponds with a drain or culvert marked on the 1951 historic map (NLS 2023) and also the LiDAR data (Legge 2022).

Uncertain anomalies

A handful of anomalies within the dataset have proved difficult to ascertain a definite interpretation and have been categorised as *Uncertain*. A linear response (**U1**) in Field 1 runs on a northwest to southeast alignment and is likely to be associated with a former boundary which pre dates available historic mapping. This response corresponds with a faint feature in the LiDAR data and may also reflect a change in topography (NLS 2023).

A group of linear trends (**U2**) in the northwest of Field 5 have produced a strong magnetic, but fragmented response and are most likely to be associated with field drains. They are located within an area of waterlogged ground (Google Earth 2023) which adds confidence to this interpretation.

Linear trends (**U3**) in the south of Field 6 have a similar response to (**U2**). These responses have been mentioned above in the Geological section as are likely to be associated in some way with the natural channels. These trends are on the same orientation as the current farmyard, along with possibly drainage they may reflect further small fields associated with the farm.

A small rectilinear response (**U4**) in Field 9 has been detected. It measures at least 7m by 6m and may be of some archaeological interest. It has quite a strong magnetic response and therefore a modern origin is also possible.

A magnetically weak linear trend (U5) in Field 9 lies on a northwest to southeast alignment and may be associated with a former boundary pre-dating historic mapping. This response is visible as a cropmark on Google imagery from 2005 (Google Earth 2023).

5 Conclusions

The geophysical survey has detected a number of magnetic anomalies associated with former quarrying in the northern section of the Site. These are large responses and will have masked any anomalies of interest if present.

Medieval or post-medieval ridge and furrow cultivation has been recorded along with field boundaries and modern agricultural regimes. Geological anomalies associated with a natural channel have also been recorded.

Uncertain anomalies, overall, are most likely to be associated with former boundaries, field drainage and later land use. Although a small rectilinear response may be of some archaeological interest.

Magnetic disturbance along the limits of the survey areas is due to metal fencing within the field boundaries and interference from the adjacent roads, farm buildings and the housing estate in the west.

Based on the geophysical survey, the archaeological potential of this Site is deemed to be low.

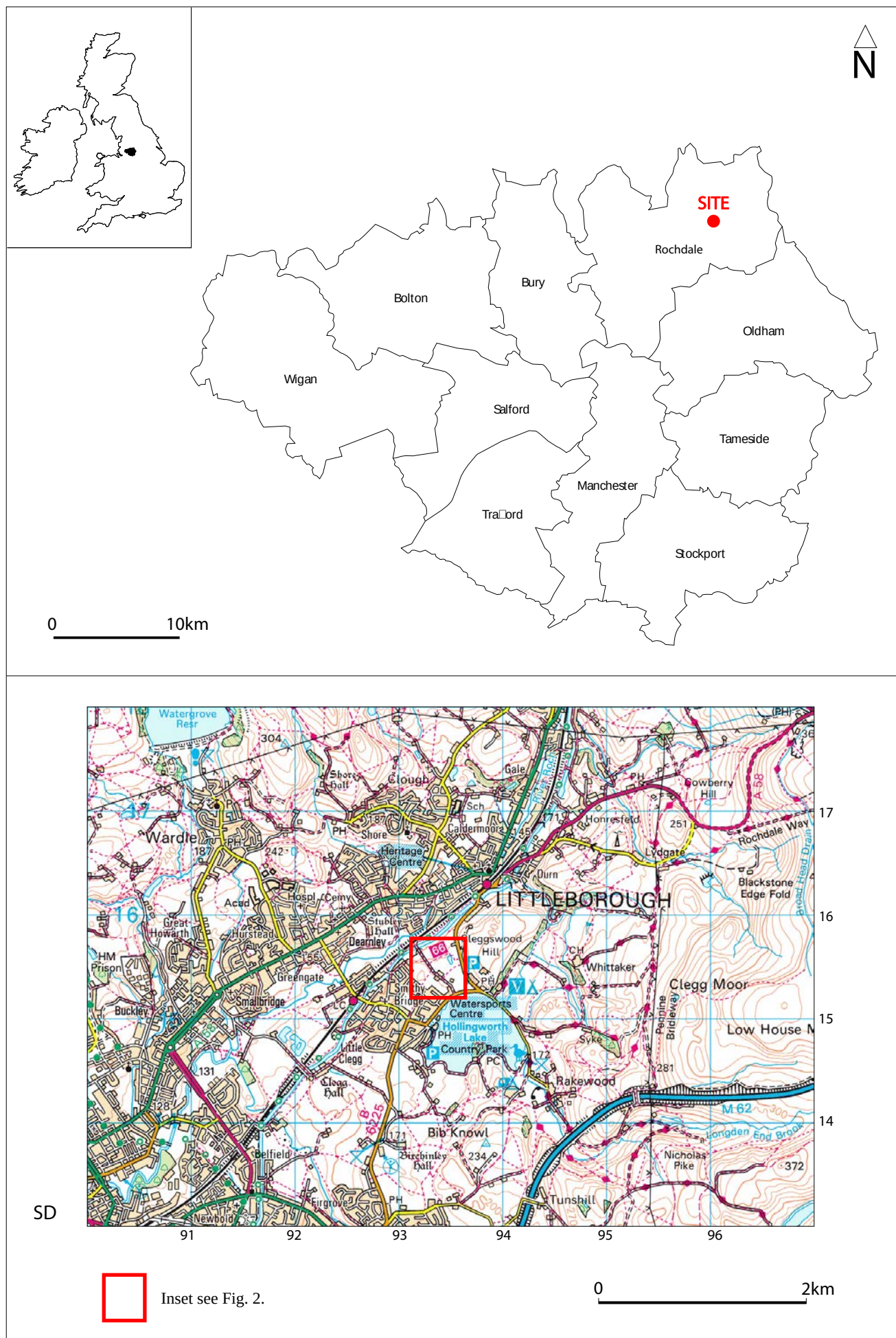


Fig. 1. Site location

N



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Project ID: X193_HRL23

Location of survey areas

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Fig. 2

Title

	SURVEY AREA		UNSUITABLE FOR SURVEY
	SECTOR BOUNDARY		PHOTO LOCATIONS
1	FIELD NUMBERS		

0 100m

1:2500 @ A3

N



Project ID: XI93_HRL23
Survey location showing processed greyscale magnetometer data

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Title

nT 

0 100m

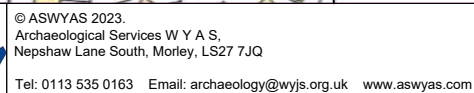
1:2500 @ A3



SECTOR 1
SEE FIGS 4-6

SECTOR 2
SEE FIGS 7-9

Smithy Bridge



Project ID: XI93_HRL23

Overall interpretation of magnetometer data

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Fig. 4

Title



Interpretation



FERROUS

SERVICE PIPE

MAGNETIC DISTURBANCE

RIDGE & FURROW

AGRICULTURAL

FORMER FIELD BOUNDARY



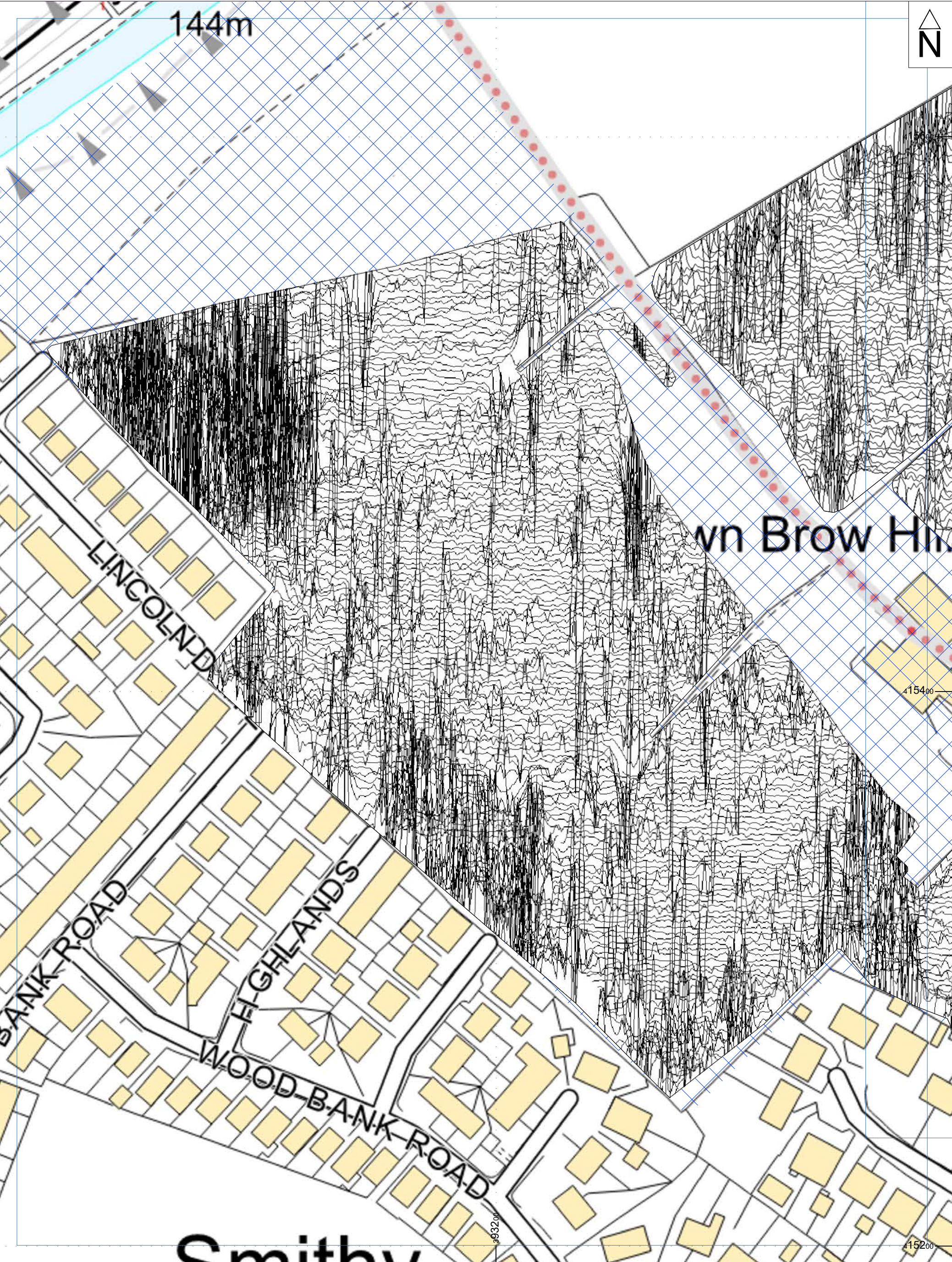
GEOLOGY

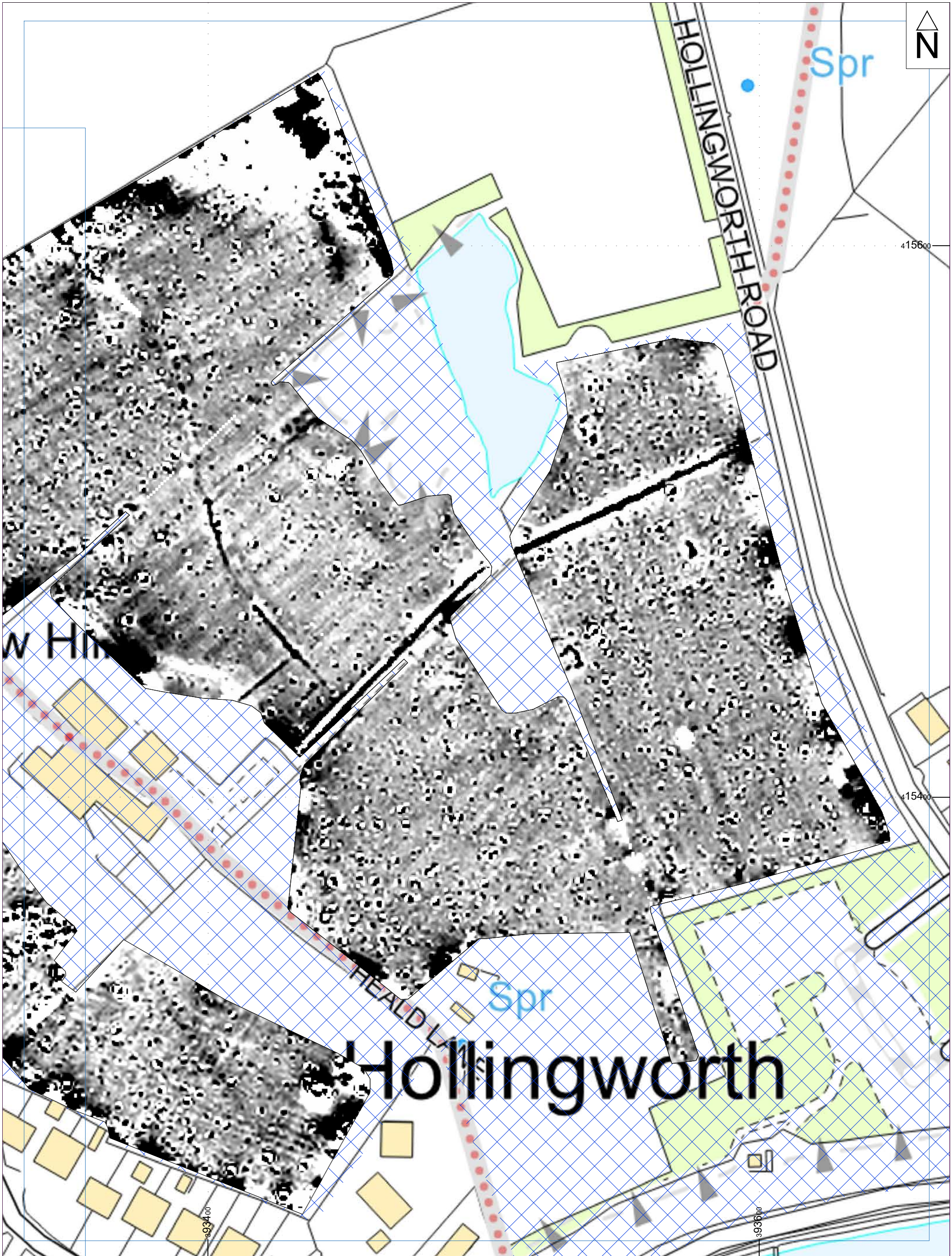
UNCERTAIN

0 100m

1:2500 @ A3





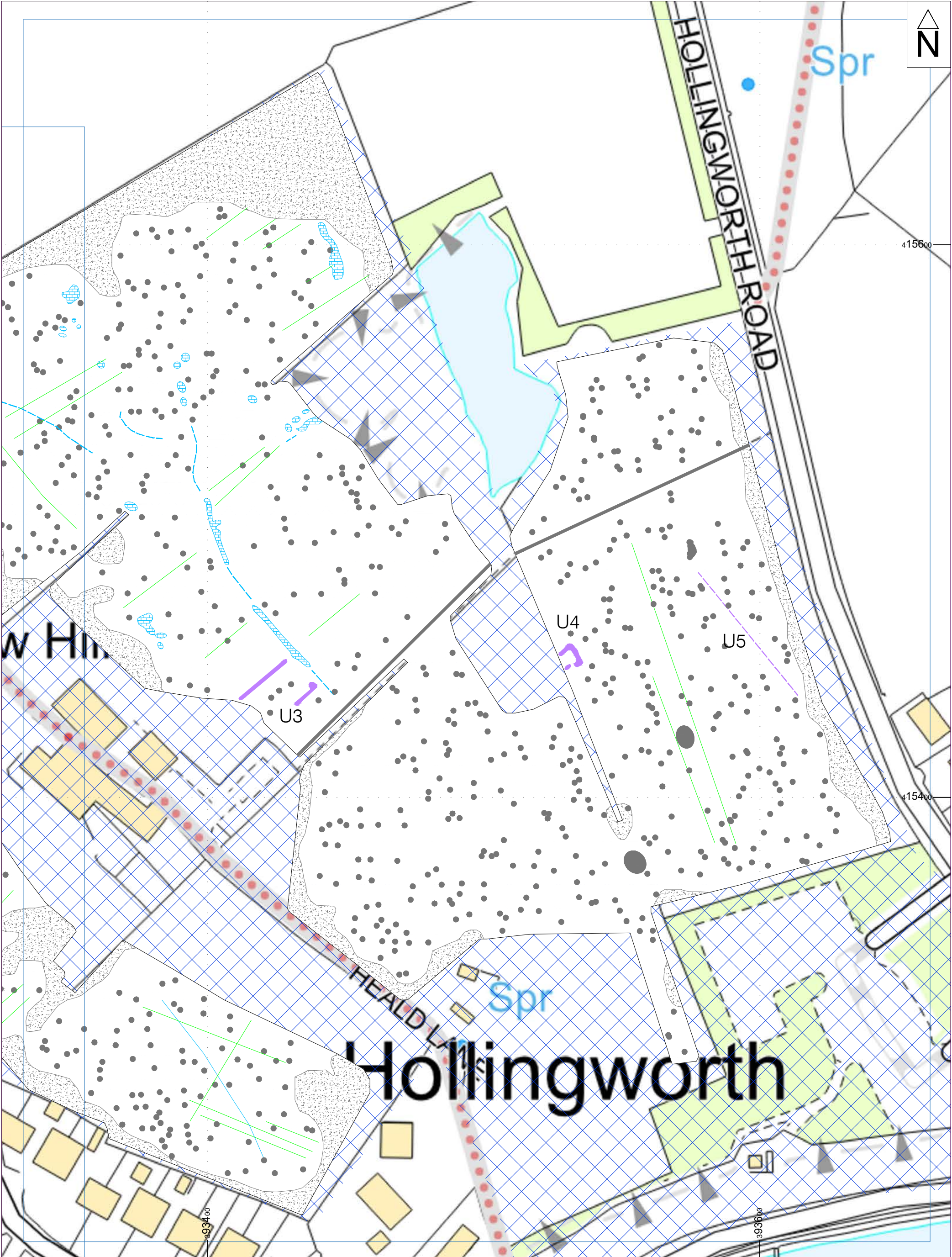


Title	
	SECTOR BOUNDARY
	UNSUITABLE FOR SURVEY



1:1250 @ A3

Fig. 8





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Project ID: XI93_HRL23

Interpretation of magnetometer data; Sector 2

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Fig. 10

Title

	SECTOR BOUNDARY
	UNSUITABLE FOR SURVEY

Interpretation

	FERROUS
	SERVICE PIPE
	MAGNETIC DISTURBANCE

	AGRICULTURAL
	GEOLOGY
	UNCERTAIN

0 50m

1:1250 @ A3



Plate 1. General view of Field 1, looking west



Plate 2. General view of Field 1, looking east



Plate 3. General view of Field 2, looking southeast



Plate 4. General view of Field 3, looking northeast



Plate 5. General view of Field 3, looking northwest



Plate 6. General view of Field 4, looking southwest



Plate 7. General view of Field 5, looking northeast



Plate 8. General view of Field 5, looking northwest



Plate 9. General view of Field 6, looking northeast



Plate 10. General view of Field 6, looking southeast



Plate 11. General view of Field 7, looking northeast



Plate 12. General view of Field 7, looking southeast



Plate 13. General view of Field 8, looking northeast



Plate 14. General view of Field 8, looking south



Plate 15. General view of Field 9, looking north



Plate 16. General view of Field 9, looking south

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic ‘spiky’ trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an ‘iron spike’ anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Methodology: Gradiometer Survey

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as **detailed survey** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey an eight channel Sensys MX V3 system containing eight FGM650 sensors was also used which was towed across the area using an ATV. Readings were taken every 20MHz (between 0.05 and 0.1m). Data was be recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation.

The gradiometer data have been presented in this report in processed greyscale format. The data in the greyscale images have been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better than 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Geophysical archive and metadata

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2003), and graphics files (Adobe Illustrator CS6 and AutoCAD 2017) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Greater Manchester Historic Environment Record).

Appendix 4: Oasis form

Summary for archaeol11-514532

OASIS ID (UID)	archaeol11-514532
Project Name	Geophysical Survey at Hollingworth Road, Littleborough
Sitename	Hollingworth Road, Littleborough
Activity type	Geophysical Survey, MAGNETOMETRY SURVEY
Project Identifier(s)	
Planning Id	
Reason For Investigation	Planning: Pre application
Organisation Responsible for work	Archaeological Services WYAS
Project Dates	01-Mar-2023 - 02-Mar-2023
Location	Hollingworth Road, Littleborough NGR : SD 93317 15456 LL : 53.63558084568806, -2.102544220120981 12 Fig : 393317,415456
Administrative Areas	Country : England County : Greater Manchester District : Rochdale Parish : Rochdale, unparished area
Project Methodology	The cart-based survey was undertaken using an eight channel SenSYS MX V3 system containing eight FGM650 sensors. Readings are taken every 20MHz (between 0.05 and 0.1m). Data were recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. DLMGPS and MAGNETO software, alongside bespoke in-house software was used to process and present the data.
Project Results	A geophysical (magnetometer) survey was undertaken on approximately 18 hectares of land located in Littleborough, Greater Manchester. Anomalies associated with former quarrying have been recorded in the northern section of the Site. Medieval or post-medieval ridge and furrow cultivation have also been detected along with field boundaries and likely modern agricultural responses. Geological anomalies associated with a natural channel have also been recorded. Uncertain anomalies are likely to be associated with drainage and former boundaries although a rectilinear response may be of some archaeological interest. Magnetic disturbance along the limits of the dataset is due to metal fencing within the boundaries and interference from the adjacent roads and buildings. Based on the geophysical survey, the archaeological potential of this Site is deemed to be low.
Keywords	
Funder	
HER	Greater Manchester HER - noRev - LITE
Person Responsible for work	Emma, Brunning, Jake, Freeman
HER Identifiers	
Archives	

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