M5 Junction 10 Improvements Scheme

Environmental Statement

Appendix 11.3 Geophysical Survey Report

TR010063 - APP 6.15

Regulation 5 (2) (a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Gloucestershire COUNTY COUNCIL

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M5 Junction 10 Improvements Scheme

Development Consent Order 202[x]

6.15 Environmental Statement:

Appendix 11.3 Geophysical Survey Report

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/6.15
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	December 2023	DCO Application

Geophysical Survey Report of

M5 J10,

Tewkesbury, Gloucestershire

For

Atkins

Magnitude Surveys Ref: MSSO739

OASIS ID: magnitud1-411598

January 2021

magnitude surveys

Issue Date:

04 January 2021

Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c.36.51ha area of land at the M5 J10, Tewkesbury, Gloucestershire. A fluxgate gradiometer survey was successfully completed across the area, although c. 5.55ha was not surveyed due to unsuitable ground conditions. Anomalies of probable and possible archaeological origin have been identified across the northern part of the survey area, interpreted as a potential enclosed multiphase settlement complex of possible Romano-British date, with potential Late Prehistoric origins. It also appears that the ability of the geophysical survey to determine the full extent of the potential complex may have been affected by fluvial processes. Anomalies interpreted as zones of possible extraction, and related activities, of unknown date have been identified along the bank of the River Chelt. Historical and modern agricultural activity is evident across the survey area, with multiple ridge and furrow regimes identified, along with modern ploughing and drains. The impact of modern activity on the site is limited to magnetic interference around field perimeters and that caused by buried and overhead services.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by Atkins to undertake a geophysical survey on a c.36.51ha area of land near to M5 J10, Tewkesbury, Gloucestershire (SO 908 245).

1.2. The geophysical survey comprised hand-pulled, cart-mounted and hand-carried, GNSS-positioned fluxgate gradiometer survey. Magnetic survey is the standard primary geophysical method for archaeological applications in the UK for its ability to detect a range of different features. The technique is particularly suited for detecting fired or magnetically enhanced features, such as ditches, pits, kilns, sunken earth houses, and industrial activity (David *et al*., 2008).

1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David et al., 2008), the Chartered Institute for Archaeologists (CIfA, 2014) and the European Archaeological Council (Schmidt et al., 2015).

1.4. It was conducted in line with a WSI produced by MS (Beck, 2020).

1.5. The survey commenced on 28/09/2020 and took 5 days to complete.

2. Quality Assurance

2.1. Magnitude Surveys is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, and a corporate member of ISAP (International Society of Archaeological Prospection).

2.2. The directors of MS are involved in the cutting edge of research and the development of guidance/policy. Specifically, Dr. Chrys Harris has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and is the Vice-Chair of the International Society for Archaeological Prospection (ISAP); Finnegan Pope-Carter has an MSc in archaeological geophysics and is a Fellow of the London Geological Society, as well as a member of GeoSIG (CIfA Geophysics Special Interest Group); Dr. Kayt Armstrong has a PhD in archaeological geophysics from Bournemouth University, is a Member of CIfA, the Editor of ISAP News, and is the UK Management Committee representative for the COST Action SAGA; Dr. Paul Johnson has a PhD in archaeology from the University of Southampton, has been a member of the ISAP Management Committee since 2015, and is currently the nominated representative for the EAA Archaeological Prospection Community to the board of the European Archaeological Association.

2.3. All MS managers have relevant degree qualifications to archaeology or geophysics. All MS field and office staff have relevant archaeology or geophysics degrees and/or field experience.

3. Objectives

3.1. The objective of this geophysical survey was to assess the subsurface archaeological potential of the survey area.

4. Geographic Background

4.1. The eastern extent of the survey area was located c.590m west of Uckington (Figure 1). Gradiometer survey was undertaken across 7 fields under pasture and 2 fields under arable use. The survey area was bounded by further fields to the north, east, south and southwest, and Withybridge Lane to the northwest (Figure 2). The A4019 separated Areas 1 and 3, and the B4634 separated Areas 7 and 8. An area of c. 3.28ha was not surveyed due to unsuitable ploughed ground conditions, and c. 2.27ha due to the presence of tall meadow grass.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	The area consisted of a flat field under pasture.	The area was bounded on all sides by hedgerows, with the addition of wire fencing to the north, south and west.
2	The area consisted of an arable field of wheat stubble. The south-eastern corner sloped downwards to the north. The field was otherwise flat.	The area was bounded to the east, south and west by hedgerows, with the River Chelt forming the northern boundary.
3	The area consisted of a flat field under pasture.	The area was bounded to the north and west by hedgerows and wire fencing, to the east by a farm track, and to the south by hedgerows. A series of telegraph poles were located along the southern boundary, with associated overhead cables.
4	The area consisted of a flat field under pasture. At the eastern end the area sloped downwards to the west.	The area was bounded on all sides by hedgerows, with wire fencing also located along the western, northern and eastern boundaries. A series of telegraph poles were located along the northern and western boundaries, with associated overhead cables.
5	The area consisted of a flat field under pasture. The area was largely unsurveyable due to the presence of tall meadow grass.	The area was bounded on all sides by hedgerows.
6	The area consisted of an arable field of wheat stubble.	The area was bounded to the north, east and south by hedgerows, with no physical boundary to the west.
7	The area consisted of two fields under pasture. The fields sloped gently downwards towards the south-western end of the area. A small area of overgrown vegetation was not surveyable in the north-eastern corner of the southern field.	The area was bounded to the north, south and east by hedgerows, with no physical boundary to the west. Wire fencing was also located along the eastern and southern boundary. A wire fence separated the area into two fields, a slightly larger one to the north and the other to the south. Overhead powerlines crossed the southern end of the area, running east-west.
8	The area consisted of a flat field under pasture.	The area was bounded to the north and west by hedgerows and wire fencing, with no physical boundary to the east and south.

4.3. The underlying geology comprises mudstone of the Charmouth Mudstone Formation. Superficial deposits recorded in the northern half of the survey area (Areas 1, 3, and the northern end of Area 4) comprise Cheltenham Sand and Gravel. To the south of this, a band of alluvial clay, silt sand and gravel is recorded (Area 5, the southern end of Area 4, and the northern end of Area 2). No superficial deposits are recorded in the southern half of the survey area (British Geological Survey, 2021).

4.4. In the northern part of the survey area the soils consist of freely draining, lime-rich, loamy soils (Areas 1, 3, and the northern end of Area 4). A band of loamy and clayey floodplain soils with naturally high groundwater is recorded crossing the centre of the area (Areas 2 and 6). The soils of the remaining survey area consist of lime-rich, loamy and clayey soils with impeded drainage (Soilscapes, 2021).

5. Archaeological Background

5.1. Within the survey area a series of cropmarks, indicative of the presence of a Later Prehistoric or Romano-British enclosed settlement, are recorded in Areas 3 and 4 (HER 8617).

5.2. Beyond the extent of the survey area, a Roman coin findspot has been recorded c.300m west of Area 4 (HER 17965). Undated cropmarks relating to possible enclosures and trackways have been identified in aerial photographs c. 150m northeast of Area 1 (HER 48029), and c.600m northwest of Areas 3 and 4 (HER 48027).

5.3. A possible moat or pond is recorded at Manor Farm c.200m southeast of Area 3 (HER 7469), and the probable site of the Medieval Uckington Mill is recorded along the River Chelt c.600m west of Area 5 (HER 6474).

6. Methodology

6.1. Magnetometer surveys are generally the most cost effective and suitable geophysical technique for the detection of archaeology in England. Therefore, a magnetometer survey should be the preferred geophysical technique unless its use is precluded by any specific survey objectives or the site environment. For this site, no factors precluded the recommendation of a standard magnetometer survey. Geophysical survey therefore comprised the magnetic method as described in the following section.

6.2. Data Collection

6.2.1. Geophysical prospection comprised the magnetic method as described in the following table.

6.2.2. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments Grad-13 Digital Three-Axis Gradiometer	1m	200Hz reprojected to 0.125m

6.2.3. The magnetic data were collected using a mixture of MS' bespoke hand-pulled cart system and hand-carried, GNSS-positioned system.

6.2.3.1. MS' cart and hand-carried system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a multi-channel, multi-constellation GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GPS is accurate to 0.008m + 1ppm in the horizontal and 0.015m + 1ppm in the vertical.

6.2.3.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger was continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allowed for data collection, processing and visualisation to be monitored in real-time as fieldwork was ongoing.

6.2.3.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data were collected by traversing the survey area along the longest possible lines, ensuring efficient collection and processing.

6.3. Data Processing

6.3.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps conform to Historic England's standards for "raw or minimally processed data" (see sect 4.2 in David et al., 2008: 11).

Sensor Calibration – The sensors were calibrated using a bespoke in-house algorithm, which conforms to Olsen et al. (2003).

Zero Median Traverse – The median of each sensor traverse is calculated within a specified range and subtracted from the collected data. This removes striping effects caused by small variations in sensor electronics.

Projection to a Regular Grid – Data collected using RTK GPS positioning requires a uniform grid projection to visualise data. Data are rotated to best fit an orthogonal grid projection and are resampled onto the grid using an inverse distance-weighting algorithm.

Interpolation to Square Pixels – Data are interpolated using a bicubic algorithm to increase the pixel density between sensor traverses. This produces images with square pixels for ease of visualisation.

6.4.Data Visualisation and Interpretation

6.4.1. This report presents the gradient of the sensors' total field data as greyscale images, as well as the total field data from the or lower sensors. The gradient of the sensors minimises external interferences and reduces the blown-out responses from ferrous and other high contrast material. However, the contrast of weak or ephemeral anomalies can be reduced through the process of calculating the gradient. Consequently, some features can be clearer in the respective gradient or total field datasets. Multiple greyscale images of the gradient and total field at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plot (Figures 8, 11, 14, 17). XY trace plots visualise the magnitude and form of the geophysical response, aiding in anomaly interpretation.

6.4.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historic maps, LiDAR data, and soil and geology maps. Google Earth (2021) was consulted as well, to compare the results with recent land usages.

6.4.3. Geodetic position of results - All vector and raster data have been projected into OSGB36 (ESPG27700) and can be provided upon request in ESRI Shapefile (.SHP) and Geotiff (.TIF) respectively. Figures are provided with raster and vector data projected against OS Open Data.

7. Results

7.1.Qualification

7.1.1. Geophysical results are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports as well as reports of further work in order to constantly improve our knowledge and service.

7.2.Discussion

7.2.1. The geophysical results are presented in consideration with satellite imagery and historical mapping (Figure 5).

7.2.2. The fluxgate gradiometer survey has responded well to the environment of the survey area. Modern interference is generally limited to magnetic haloes caused by four underground services and a set of overhead power cables crossing the survey area, and wire fences at field edges. These may potentially have obscured anomalies in the immediate vicinity of the disturbance if they were present within the survey area. The survey has revealed a relatively quiet magnetic background in the southern areas, with a slightly stronger mottled effect in the northern areas. This likely reflects variations in soils and superficial geology between the two halves (see Section 4.3).

7.2.3. A probable multiphase enclosed settlement has been identified in the northern part of the survey area, in Areas 3 and 4 (Figure 4). The potentially double-ditched enclosed site in Area 3 is situated along the northern edge of what appears to be the floodplain of the River Chelt, consisting of deposits of Cheltenham Sand and Gravel (see Section 4.3). It is possible that the enclosures extended continuously to the south-western edge of Area 4 (Figure 10), as they appear attenuated. This has been interpretated as the result of a natural process, either deposits of sediment potentially masking undetected anomalies or the washing out of features via a former watercourse. It is possible that the anomalies along the south-western boundary relate to deposited archaeological material, which has been carried westwards (which is consistent with the direction of waterflow, Figure 4). The complex of enclosures has been interpreted as a probable Romano-British settlement, with the presence of curvilinear anomalies, and palimpsest of varying orientations suggesting that the site may also have earlier, Late Prehistoric origins. Although it is not possible to date these enclosures based on magnetic data alone, the complex has clearly experienced several rearrangements during its use.

7.2.4. A slightly isolated, possibly double-ditched enclosure is located to the northeast of the main potential settlement in Area 3 (Figure 10). Double-ditched enclosures of a similar

size located on the edge of Romano-British settlements have previously been identified as temporary marching camps, though the past use of the enclosure identified in Area 3 cannot be interpreted as such based on only the morphology and location informed by this survey. Some anomalies classified as undetermined have also been identified in the area to the southwest of the enclosure complex, though they differ in orientation and do not have a clear layout indicative of an archaeological feature. It is possible that these anomalies relate to agricultural or modern activity, but their proximity to the nearby enclosures means that an archaeological origin cannot be ruled out.

7.2.5. The historical agricultural landscape of the survey area is evident in the extensive ridge and furrow regimes identified in all but the northernmost area (Figure 4). The regimes largely respect one another and field boundaries (mapped and unmapped). The similarity in orientation of the historical ploughing in the northern part of the survey area to the enclosure complex has caused some difficulty in clearly distinguishing between the two.

7.2.6. In the centre of the survey area, along the southern bank of the River Chelt, several zones of possible extraction related activity have been identified. The source of these anomalies is not clear though they appear to be enclosed by a field boundary depicted on 2nd edition historic mapping (Figure 5).

7.3.Interpretation

7.3.1. General Statements

7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.

7.3.1.2. **Data Artefact** – Data artefacts usually occur in conjunction with anomalies with strong magnetic signals due to how the sensors respond to very strong point sources. These are usually visible as minor 'streaking' following the line of data collection. While these artefacts can be reduced in post-processing through data filtering, this would risk removing real features. Therefore, these artefacts are indicated as necessary to preserve the data as 'minimally processed'.

7.3.1.3. **Ferrous (Spike)** – Discrete ferrous-like, dipolar anomalies are likely to be the result of isolated modern metallic debris on or near the ground surface.

7.3.1.4. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentrated deposition of discrete, dipolar ferrous anomalies and other highly magnetic material.

7.3.1.5. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures along the edges of the field have been classified as 'Magnetic Disturbance'. These magnetic 'haloes' will obscure the response of any weaker underlying features, should they be present, often over a greater footprint than the structure they are being caused by.

7.3.1.6. **Undetermined** – Anomalies are classified as Undetermined when the anomaly origin is ambiguous through the geophysical results and there is no supporting or correlative evidence to warrant a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes, although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally not ferrous in nature.

7.3.2. Magnetic Results - Specific Anomalies

7.3.2.1. **Probable Archaeology** – A complex of strong linear and curvilinear anomalies has been detected across an area of c. 4ha in the south-eastern parts of Areas 3 and 4 (Figure 10). The anomalies appear to form a series of overlapping mainly rectangular and sub-circular enclosures [**4a**], with a slight variation in alignments. The orientation is north-northeast to south-southwest and east-northeast to west-southwest, which in places aligns with the ridge and furrow regime in Area 4. The complex of enclosures appears to be bounded to the east, south and west by a pair of strong, parallel linear anomalies which indicate a probable double-ditched feature [**4b**]. Though this is difficult to distinguish in places where it follows the alignment of the plough furrows as the magnetic material may have been disturbed by the plough and not relate directly to an archaeological feature. Several discrete subcircular anomalies which can be indicative of pit features have also been detected within the complex. The linear and curvilinear anomalies across Areas 3 and 4 are indicative of an enclosed multiphase settlement site, with enhanced anomalies characteristic of the "habitation effect". This is caused when concentrated activity over a period of time leads to a higher concentration of magnetically enhanced material building up within centre of the area, and a lower concentration, therefore weaker, further from the focus of activity.

7.3.2.2. **Probable Archaeology** – Located immediately to the northeast of the complex in Areas 3 and 4 (see Section 7.3.2.1), a series of parallel linear anomalies appear to form a rectangular double-ditched enclosure [**3a**] in Area 3, measuring c. 33m x c.42m (Figure 10). The enclosure is on a similar alignment to the complex to the southwest (north-northeast to south-southwest and east-northeast to west-southwest) but appears separated from that complex. The enclosure is distinct from the ridge and furrow regime when compared with the similar parallel ditches [**4b**] in Area 3. The anomalies are weaker than those within the complex, which could indicate less intense activity or that this enclosure was in use for a shorter period of time.

7.3.2.3. **Possible Archaeology** – Along the south-western edge of Area 4, several broad, curvilinear anomalies have been detected [**4c**] (Figure 10). The strong and clearly-defined anomalies at the eastern end appear to be continuations of the enclosures identified immediately to the northeast, slightly separated by a zone of weak, amorphous anomalies interpreted as remnants of a watercourse or flooding event (see Section 7.3.2.8). The broader, weaker anomalies appear comparatively enhanced where they are located closer to the probable

archaeological activity. It is possible that the anomalies [**4c**] relate to naturally deposited archaeological material transported by water movement rather than further ditch features in these locations. This possibility along with the differing alignment and morphology to the anomalies interpreted as Probable Archaeology has contributed to the classification of these anomalies as Possible Archaeology.

7.3.2.4. **Possible Extraction Related (Strong/Zone)** – Alongside the small stream in the north-eastern part of Area 2, six zones of weak dipolar anomalies have been detected, the majority of which contain strong amorphous or linear anomalies (Figure 13). It is possible that these anomalies relate to small-scale extraction or industrial activity of uncertain date. The anomalies are also contained within a former field boundary depicted on 2nd edition OS mapping (Figure 5), aside from a single small outlier along the south-eastern boundary. This could indicate that the features may have been enclosed by a contemporaneous field boundary.

7.3.2.5. **Agricultural (Strong/Weak)** – A pair of weak, parallel linear anomalies detected in Area 1 follow a similar alignment to the field boundary (Figures 5 and 7). It is likely that these, along with a third adjacent connecting linear anomaly, relate to agricultural activity due to their alignment. Further weak, parallel anomalies have been identified in the north-western corner of Area 2 (Figure 13). These anomalies could indicate ploughing activity or a build-up of material at the field edge.

7.3.2.6. **Ridge and Furrow (Trend)** – Series of parallel linear and curvilinear anomalies have been identified across a six of the survey areas (Areas 2, 3, 4, 5, 6 & 7; Figure 5). The anomalies vary in strength and spacing, both between and within identifiable former fields, this variation is clearly shown in the anomalies detected in Area 7 (Figures 15 & 16). The regimes appear to respect some former field boundaries and cross extant ones, as can be seen across Areas 6 and 7 (Figure 5), showing some of the different configurations of historical land divisions that have previously been employed across this agricultural landscape.

7.3.2.7. **Agricultural & Drainage Feature (Trend)** – Across Areas 1, 3 and 7, a series of weak, closely-spaced linear anomalies have been detected. These anomalies are characteristic of modern ploughing. Isolated weak linear anomalies identified in Areas 1, 3 and 6 have been interpreted as land drains.

7.3.2.8. **Natural (Zone)** – A zone of weak amorphous anomalies along the south-western edge of Area 4 (Figure 10). These anomalies align with the edge of a band of recorded alluvium (see Section 4.3), which follows the route of the River Chelt (located c. 170m south of Area 4). These anomalies likely relate to either a former watercourse or deposits from a past flooding event. It is possible that river sediment has been deposited on top of further archaeological features and masked anomalies, or that magnetically enhanced archaeological material has

been washed out by water movement. It is not possible to discern whether either of these has occurred from magnetic data.

7.3.2.9. **Undetermined** – Three weak linear anomalies and two strong subcircular anomalies identified in Area 5 could not be confidently interpreted with a specific origin due to the lack of a clear layout (Figure 13). The anomalies are located c.150m south of the enclosure complex in Areas 3 and 4, and differ in orientation (east-west and north-south). It is possible that these anomalies relate to agricultural or modern activity but the potential for an archaeological interpretation cannot be entirely ruled out considering the extensive archaeological activity to the north.

8. Conclusions

8.1. A fluxgate gradiometer survey was successfully undertaken across the majority of the survey area, with c.5.55ha not surveyed due to unsuitable ground conditions. The survey technique responded well to the environment of the survey area, detecting a range anomalies of probable archaeological, agricultural and natural origins. High amplitude magnetic disturbance caused by modern activity has been detected but is largely restricted to services and field edges. Variations in the magnetic background between the northern and southern halves have been identified as likely relating to differing soils and superficial geology.

8.2. A probable complex of enclosures potentially relating to an enclosed multiphase settlement interpreted as Late Prehistoric/Romano-British has been identified in the northern part of the survey area, within the known boundaries of the Cheltenham Sands. It also appears possible that natural processes have affected the south-western extent of the potential settlement, either by possibly transporting material or depositing layers of sediment atop other features. A relatively isolated smaller and potentially double-ditched enclosure was also identified to the north of the possible settlement.

8.3. Several zones of anomalies interpreted as possible extraction related activity were identified in the centre of the survey area. They appear to be enclosed by an historical field boundary close to the bank of the River Chelt but it is not possible to discern the origin and date of these anomalies from magnetic data alone.

8.4. Agricultural activity has been detected across the survey area, with a number of ridge and furrow regimes, modern ploughing and some land drains identified. Additional linear and discrete anomalies have been identified that cannot be conclusively classified but may also be archaeological in origin.

9. Archiving

9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report.

9.2. MS contributes reports to the ADS Grey Literature Library upon permission from the client, subject to the any dictated time embargoes.

10. Copyright

10.1. Copyright and the intellectual property pertaining to all reports, figures, and datasets produced by Magnitude Services Ltd. is retained by MS. The client is given full licence to use such material for their own purposes. Permission must be sought by any third party wishing to use or reproduce any IP owned by MS.

11. References

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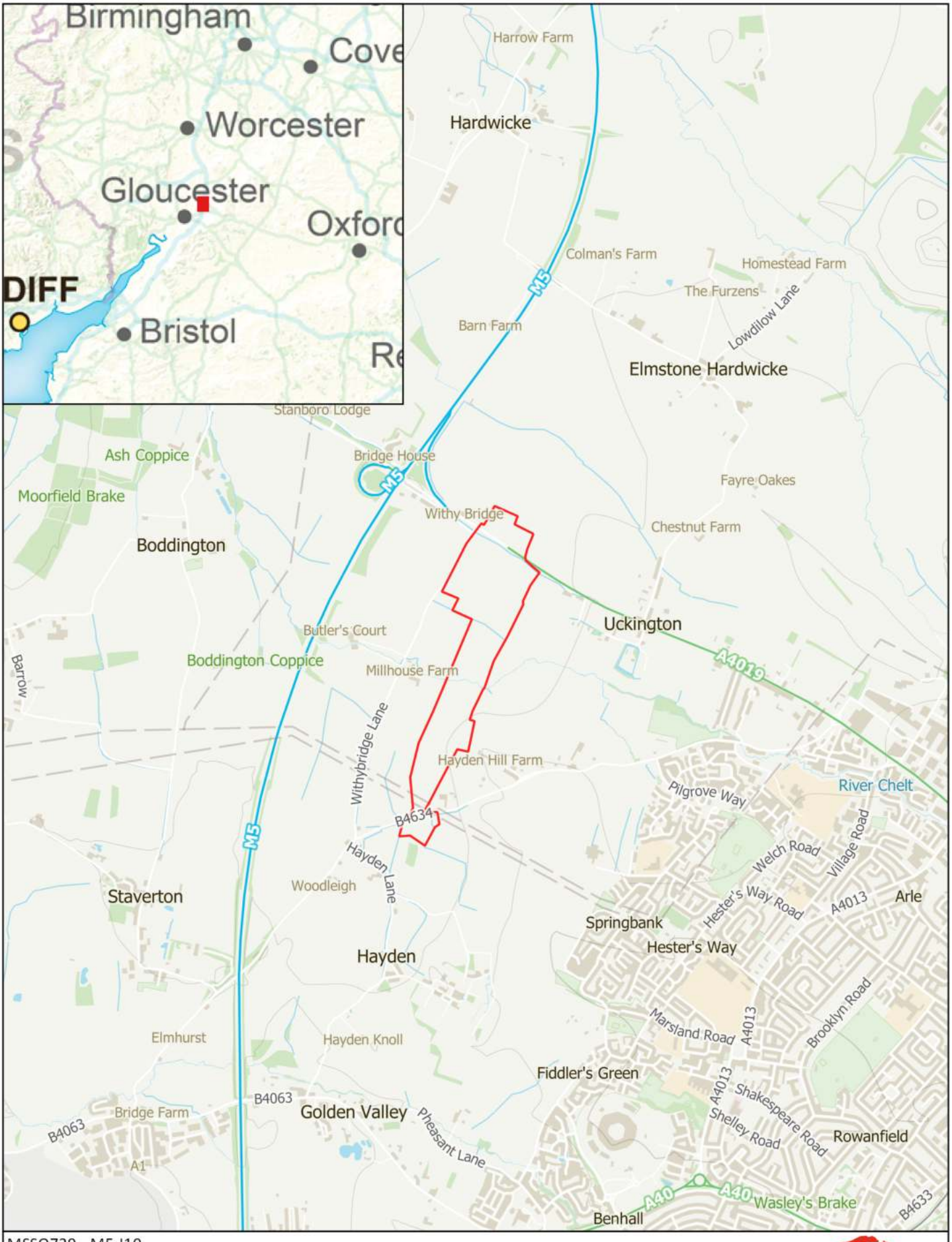
12. Project Metadata

MS Job Code	MSSO739
Project Name	M5 J10, Tewkesbury, Gloucestershire
Client	Atkins
Grid Reference	SO 908 245
Survey Techniques	Magnetometry
Survey Size (ha)	38.13ha (Magnetometry)
Survey Dates	2020-09-28 to 2020-10-02
Project Lead	Dr. Chrys Harris MCIfA
Project Officer	Lauren Beck BA
HER Event No	TBC
OASIS No	magnitud1-411598
S42 Licence No	N/A
Report Version	1.0

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	LB & JC	KD	24 November 2020
0.2	Draft for Director Approval	LB	PSJ	25 November 2020
0.3	Corrections from Director. Draft for Client	LB	PSJ	25 November 2020
0.4	Client corrections	LB	KA	07 December 2020
1.0	Issued as Final	LB	KA	04 January 2021



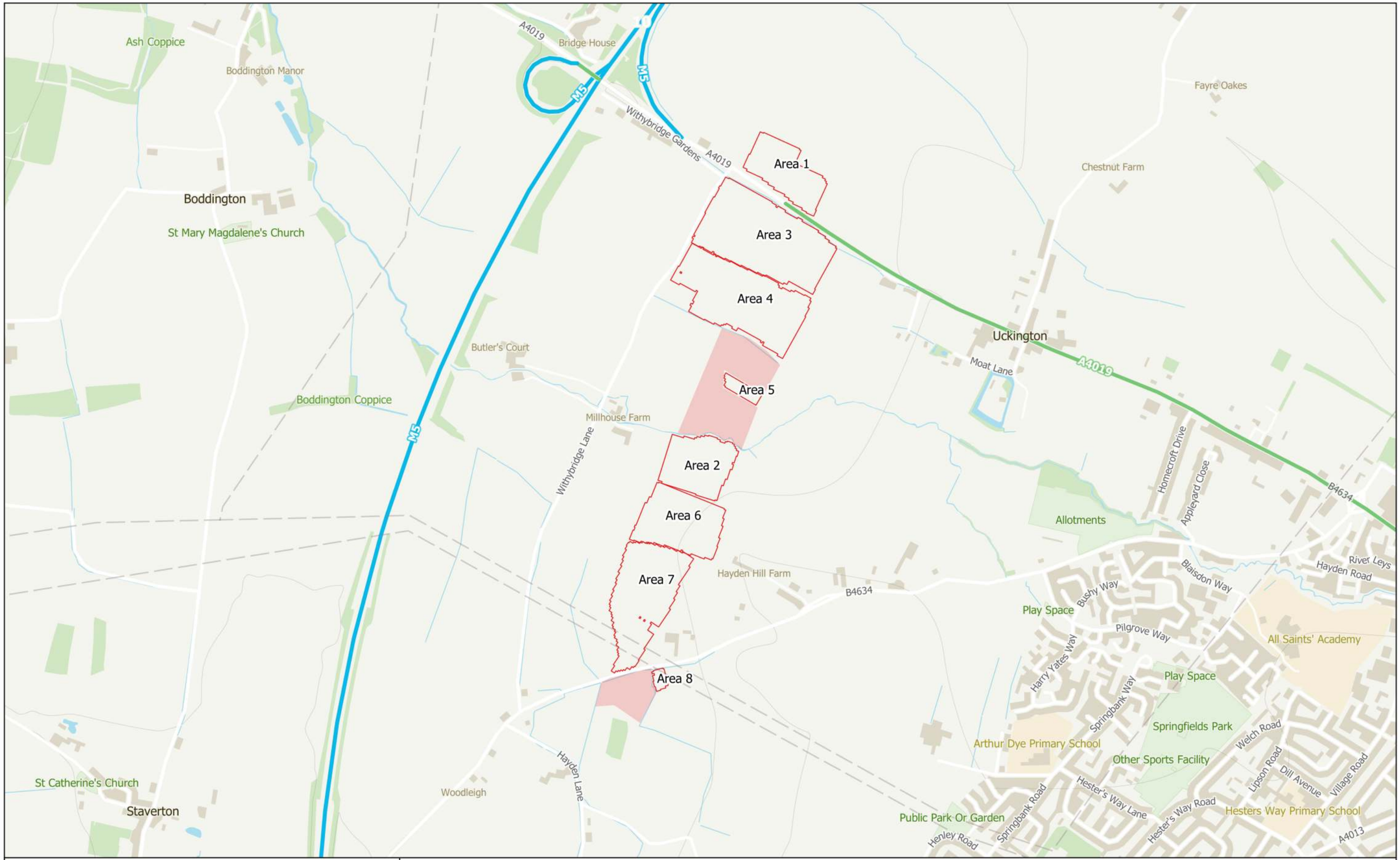
MSSO739 - M5 J10
Figure 1 - Site Location
1:25,000 @ A4

Site Boundary

N

0 0.5 1 km

magnitude surveys



MSSO739 - M5 J10
Figure 2 - Location of Survey Areas
1:4,000 @ A3

Survey Extent
Unsurveyable

N

0 200 400 600 m

magnitude surveys

Withybridge Lane

Millhouse Farm

A4019

Area 1

Area 3

Area 4

Area 5

Area 2

Area 6

Area 7

Area 8

Hayden Hill Farm

B4634

A4019

Moat Lane

MSSO739 - M5 J10
Figure 3 - Magnetic Gradient (Overview)
1:4,000 @ A3

-1 nT 2

N

0 50 100 150 m

magnitude surveys

MSSO739 - M5 J10
Figure 4 - Magnetic Total Field (Overview)
1:4,000 @ A3

48,997 nT 49,005

N

0 50 100 150 m

magnitude surveys

MSSO739 - M5 J10
Figure 5 - Magnetic Interpretation Over Historical Mapping and Satellite Imagery (Overview)
1:4,000 @ A3

Contains historic maps: Ordnance Survey, 6" 2nd edition c. 1882-1913 © National Library of Scotland
Contains satellite imagery © 2020 Bing Satellite

- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Agricultural (Weak)
- Possible Extraction Related (Strong)
- Possible Extraction Related (Zone)
- Natural (Weak)
- Natural (Zone)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Undetermined (Strong)
- Undetermined (Weak)
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Data Artefact
- Ferrous (Spike)

0 50 100 150 m

magnitude surveys

Area 1

A4019

Withybridge Gardens

A4019

Withybridge Lane

Area 3

MSSO739 - M5 J10
Figure 6 - Magnetic Gradient (North)
1:1,500 @ A3

-1 nT 2

N

0 20 40 60 m

magnitude surveys

Area 1

A4019

A4019

Withybridge Gardens

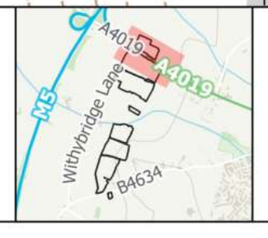
Withybridge Lane

Area 3

3a

MSSO739 - M5 J10
Figure 7 - Magnetic Interpretation (North)
1:1,500 @ A3

- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Agricultural (Weak)
- Natural (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Undetermined (Strong)
- Undetermined (Weak)
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Data Artefact
- Ferrous (Spike)



N

0 20 40 60 m

magnitude surveys

Area 1

A4019

Withybridge Gardens

Withybridge Lane

A4019

Area 3

MSSO739 - M5 J10
Figure 8 - XY Trace Plot (North)
30nT/cm at 1:1,500 @ A3

N

0 20 40 60 m

magnitude surveys

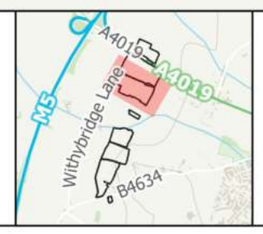
Area 3

Withybridge Lane

Area 4

MSSO739 - M5 J10
Figure 9 - Magnetic Gradient (Centre - North)
1:1,500 @ A3

-1 nT 2



N

0 20 40 60 m

magnitude surveys

Area 3

3a

4b

4a

4a

4a

4b

4c

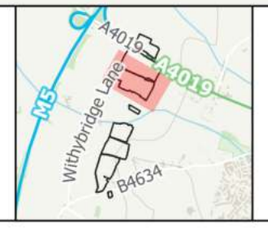
4c

Withybridge Lane

Area 4

MSSO739 - M5 J10
Figure 10 - Magnetic Interpretation (Centre - North)
1:1,500 @ A3

- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Natural (Weak)
- Natural (Zone)
- Magnetic Disturbance
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Drainage Feature
- Ferrous (Spike)



N

0 20 40 60 m

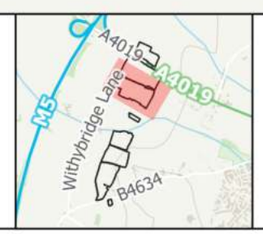
magnitude surveys

Area 3

Withybridge Lane

Area 4

MSSO739 - M5 J10
Figure 11 - XY Trace Plot (Centre - North)
30nT/cm at 1:1,500 @ A3



N

0 20 40 60 m

magnitude surveys

Area 5

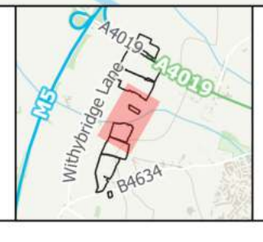
Area 4

Area 2

Area 6

MSSO739 - M5 J10
Figure 12 - Magnetic Gradient (Centre - South)
1:1,500 @ A3

-1 nT 2



N

0 20 40 60 m

magnitude surveys

Area 6

Area 2

Area 5

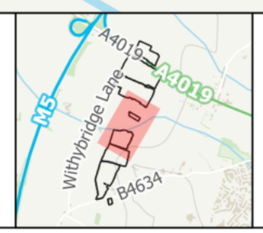
4c

4b

Area 4

MSSO739 - M5 J10
Figure 13 - Magnetic Interpretation (Centre - South)
1:1,500 @ A3

- Archaeology Probable (Strong)
- Archaeology Probable (Weak)
- Archaeology Possible (Strong)
- Archaeology Possible (Weak)
- Agricultural (Weak)
- Possible Extraction Related (Strong)
- Possible Extraction Related (Zone)
- Natural (Zone)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Undetermined (Strong)
- Undetermined (Weak)
- Agricultural (Trend)
- Service
- Ridge and Furrow (Trend)
- Ferrous (Spike)



N

0 20 40 60 m

magnitude surveys

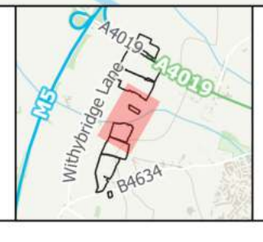
Area 5

Area 4

Area 2

Area 6

MSSO739 - M5 J10
Figure 14 - XY Trace Plot (Centre - South)
30nT/cm at 1:1,500 @ A3



N

0 20 40 60 m

magnitude surveys

Area 7

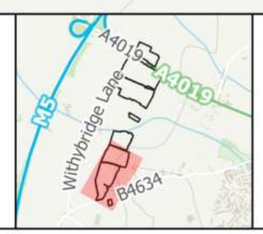
Area 6

Area 8

B4634

MSSO739 - M5 J10
Figure 15 - Magnetic Gradient (South)
1:1,500 @ A3

-1 nT 2



N

0 20 40 60 m

magnitude surveys

Area 7

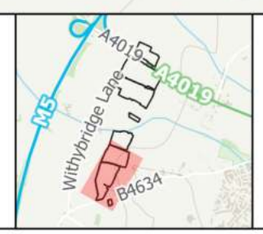
Area 6

Area 8

B4634

MSSO739 - M5 J10
Figure 16 - Magnetic Interpretation (South)
1:1,500 @ A3

Magnetic Disturbance
Ferrous/Debris (Spread)
Undetermined (Strong)
Undetermined (Weak)
Agricultural (Trend)
Service
Ridge and Furrow (Trend)
Drainage Feature
Data Artefact
Ferrous (Spike)



N

0 20 40 60 m

magnitude surveys

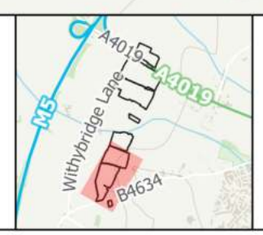
Area 6

Area 7

Area 8

B4634

MSSO739 - M5 J10
Figure 17 - XY Trace Plot (South)
30nT/cm at 1:1,500 @ A3



N

0 20 40 60 m

magnitude surveys

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