magnitude surveys

Fiddington Anaerobic Digestion Plant

Geophysical Survey Report MSSO07

For

tpa PLANNING AND ENVIRONMENT LTD

On Behalf Of

ecotricity

Magnitude Surveys Ref: MSSO07

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Unit 17, Commerce Court

Challenge Way

Bradford

BD4 8NW

+44 (0)1274 926020

info@magnitudesurveys.co.uk

Report Written by:

Graeme Attwood MSc

Figures Produced by:

Finnegan Pope-Carter BSc MSc FGS

Report Checked by:

Chrys Harris BA MSc

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Abstract

Magnitude Surveys was commissioned to assess the archaeological potential of land northeast of Fiddington, near Tewkesbury, Gloucestershire using geophysical survey. An area of approximately 5.5ha, comprising the proposed development area, an access track and the gas pipe connection route was successfully surveyed using the magnetic method. An anomaly of probable archaeological origin has been detected and takes the form of a segmented circular ditch-like feature, possibly pre-historic in origin. Further anomalies of a possible archaeological origin have also been identified, both around the circular feature and to the south of the feature.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by TPA Planning and Environment (TPA) on behalf of Ecotricity to undertake a geophysical survey on land north of Fiddington (SO 918 313), approximately 2.5km southeast of Tewkesbury, Gloucestershire.

1.2. The geophysical survey comprised:

1.2.1. Hand pulled, cart-mounted fluxgate gradiometer survey.

1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England and the Charted Institute of Field Archaeologists (CIfA 2014, David et al. 2008).

1.4. This survey was undertaken between the 7 November and the 9 December 2015.

2. Quality Assurance

2.1. Project management, survey work, data processing and report production have been carried out by qualified and professional geophysicists to standards exceeding the current best practice (CIfA 2014, David *et al*. 2008).

2.2. Magnitude Surveys is a corporate member of ISAP (International Society of Archaeological Prospection).

2.3. Finnegan Pope-Carter is a Fellow of the London Geological Society, the Chartered UK body for geophysicists and geologists.

3. Objectives

3.1. The geophysical survey aimed to assess the potential archaeological landscape of the survey area.

3.2. The survey forms part of the archaeological mitigation required by the planning archaeologist and shall be used to inform the location of any trenches, should they be required.

4. Geographic Background

4.1. The underlying geology comprises Charmouth mudstone formation (mudstone) with superficial deposits of Cheltenham sand and gravel in the southern half; no superficial deposits are recorded in the northern half (BGS 2015). Historic England guidelines state mudstone geology can produce average magnetic responses (David et al. 2008).

4.2. The soils are lime-rich loamy and clayey soils with impeded drainage (Soilscape 2015).

4.3. The survey area consisted of a flat field of short grass. The field was bound to the west and south by wire stock fences and hedgerows. A number of temporary structures and caravans were located immediately next to the field's southern end.

5. Archaeological Background

5.1. It is understood that the survey area has not been the subject of any previous archaeological geophysical surveys or other archaeological work. The following is a brief summary of nearby archaeological investigations detailed on Heritage Gateway (Heritage Gateway, 2015).

5.2. There have been a number of archaeological investigations in the surrounding landscape to the survey area. Approximately 1.5km north of the proposed development area, a number of 1st and 2nd century AD Roman deposits have been identified during previous archaeological work, including ditches, pottery and inhumations (HER 13980, 139801). Recovered evidence suggests this small agricultural complex began in the late Iron-Age. During the same investigation, a number of potentially prehistoric features, including a gully and pits, were also identified (HER 13982). However, as no dateable evidence has been found, the exact nature of these features is not fully understood.

5.3. Fiddington is a medieval village (HER 8789), which contains a number of listed buildings. A manor farm in the village's centre is the site of a medieval moated manor (HER 36104). To the east of the village are a number of earthworks and platforms indicative of a medieval or post medieval settlement (HER 41716).

5.4. Approximately 1km to the north east of the survey area lie the remains of a World War II anti-aircraft battery (HER 27051)

6. Methodology

6.1. Data Collection

6.1.1. Geophysical prospection comprised magnetic methods as described in the following table.

6.1.2. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments 1000L fluxgate gradiometer	1m	10Hz reprojected to 0.125m

6.1.3. Magnetic data were collected using a bespoke hand-pulled cart system.

6.1.4. The cart system supports the magnetic and GPS instruments with a bespoke datalogger. The magnetic instruments comprise two Bartington Instruments 1000L fluxgate gradiometers operating in NMEA mode. Positional referencing is through a Hemisphere S320 RTK GPS outputting in NMEA mode. Corrections were made through Topcon TopNet. Data from both instruments were logged in a bespoke datalogger. Data were transferred to a laptop computer for processing.

6.1.5. A series of temporary sight markers were established in each survey area to guide the surveyor and ensure full coverage with the cart. Data were collected by traversing the survey area along the longest possible lines, to ensure that the data was efficiently collected and processed.

6.2. Data Processing

6.2.1. Data were processed in bespoke in-house software produced by MS.

6.2.2. Magnetic processing steps were limited to:

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. Care is taken to ensure this filter does not remove linear trends running parallel to the survey direction.

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.

6.3. Data Visualisation

6.3.1. Greyscales should be viewed alongside the accompanying XY trace plots; these plots visualise the magnitude and form of the geophysical response, aiding in anomaly interpretation.

7. Survey Considerations

Survey Area	No. Survey Blocks	Surveyed Y/N	Ground Conditions	Further notes:
1	2	Y	Short Grass	Wire fences along the western and southern boundaries, with a five bar gate in the southeastern corner. Temporary structures were erected in the area immediately south of the immediate south of the survey area. Gas main markers were noted the field's northern end.

Refer to Figure 2 for survey area location.

8. Results

8.1. Qualification

8.1.1. *Geophysical techniques 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.*

8.2. Discussion

8.2.1. The geophysical results, both greyscale images and XY traces, were interpreted in consideration with historic mapping (*c.*1882 1st edition Gloucestershire OS 6" and *c.* 1903 2nd edition Gloucestershire OS 6") and satellite imagery (*c.* 2007 InfoTerra Ltd. and BlueSky from Google Earth).

8.2.2. Magnetic survey has responded well to the survey area's geological and pedological environment, detecting modern soil disturbance and anomalies associated with archaeological and agricultural processes. A number of anomalies have been detected and classified as Undetermined; these anomalies exhibit characteristics of anomalies with possible archaeological origin, but could potentially be of agricultural, geological or pedological in origin. A number of buried utilities cross the survey area; the strong responses from these utilities may mask weaker features. An anomaly of probable archaeological origin has been detected, further discussed in section 8.3.2.1.

8.3. Interpretation

8.3.1. General Statements

8.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually. Specific anomalies discussed within the text have been assigned numbers, which are emboldened within square parenthesis e.g. [**1**].

8.3.1.2. The survey area has been interpreted as one contiguous areas, but for purposes of display, the survey area has been split between two figures. The specific anomalies discussed within all occur in the northern area. Refer to Figure 3 for the greyscale and Figure 4 for the interpretation.

8.3.1.3. **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 agricultural, geological or pedological processes,

although an archaeological origin can usually not be ruled out; they are generally not ferrous in nature.

8.3.1.4. **Ferrous** – A number of discrete ferrous-like anomalies have been mapped across the entire survey area. These responses are likely to be the result of modern metallic disturbance on or near the ground surface. Broad ferrous responses from modern metallic features, such as fences, gates, feeders and pipes may mask any weaker underlying archaeological anomalies.

8.3.2. Specific Anomalies and Features

8.3.2.1. **Probable Archaeology** - A pair of opposing semi-circular ditch-like anomalies [**1**] have been detected in the northern third of the survey area. These anomalies are categorised as Probable Archaeology and likely represent a feature of prehistoric origin. These anomalies appear to form a segmented circular feature 15m in diameter with gaps at the eastern and western edges. It is unclear whether these gaps reflect the feature's original form or are a result of truncation by ridge and furrow ploughing (see para.8.3.2.5.).

8.3.2.2. **Possible Archaeology** – A number of amorphous positive magnetic ditch-like anomalies [**2**] have been detected around [**1**]. These anomalies [**2**] may indicate further ditches and gullies associated with [**1**]. However, [**2**] do not exhibit the magnitude or form within the XY Trace to be confidently classified as Probable Archaeology; hence the more cautious categorisation of Possible Archaeology. Although, [**2**]'s weaker magnetic response could indicate these features have been truncated by later ploughing or simply contain a less magnetically enhanced soil.

8.3.2.3. A pair of parallel linear anomalies [**3**] aligned in a northwest-southeast orientation have been detected at the centre of the survey area. These are likely to be land divisions; however, comparison against available historic mapping shows there has been no change in the field layout since the first edition OS (NLS, 2015). Furthermore, the ridge and furrow anomalies evident within the data do not respect [**3**], meaning they are unlikely to be contemporaneous.

8.3.2.4. A final narrow and magnetically weak ditch-like anomaly [**4**] has been detected to the south of [**3**]. [**4**] is also likely to be a land division in origin; although its antiquity cannot be ascertained from geophysical survey by itself.

8.3.2.5. **Agricultural** – Ridge and furrow anomalies have been identified within the survey area. These anomalies are broad and slightly curving in form. The ridge and furrow ploughing shares an alignment with the present westernmost field boundary, suggesting the current form of the field boundary had been established at the time the cultivation took place. As previously stated, the ridge and furrow does not conform to the potential land divisions [**3** and **4**] identified by the geophysical data. It is therefore unlikely these land divisions were still extant during the period of the ploughing.

9. Conclusions:

9.1. A positive magnetic, segmented circular anomaly of probable archaeological origin has been detected. This feature is likely prehistoric. Due to the later incursion of ridge and furrow ploughing, it is not possible to determine if the gaps in this anomaly actually represent the structure of the anomaly.

9.2. Amorphous linear anomalies surrounding the segmented circular feature have the potential to be archaeological in origin; however, given their lack of identifiable shape and relative magnetic weakness, a more confident classification is not given.

9.3. Ridge and furrow agricultural ploughing regimes has been identified throughout the survey area.

10. Archiving

10.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein 2013.

10.2. MS contributes all reports to the ADS Grey Literature Library subject to any time embargo dictated by the client.

10.3. Whenever possible, MS has a policy of making data available to view in easy to use forms on its website. This can benefit the client by making all of their reports available in a single repository, while also being a useful resource for research. Should a client wish to impose a time embargo on the availability of data this can be achieved in discussion with MS.

11. Copyright

12. References

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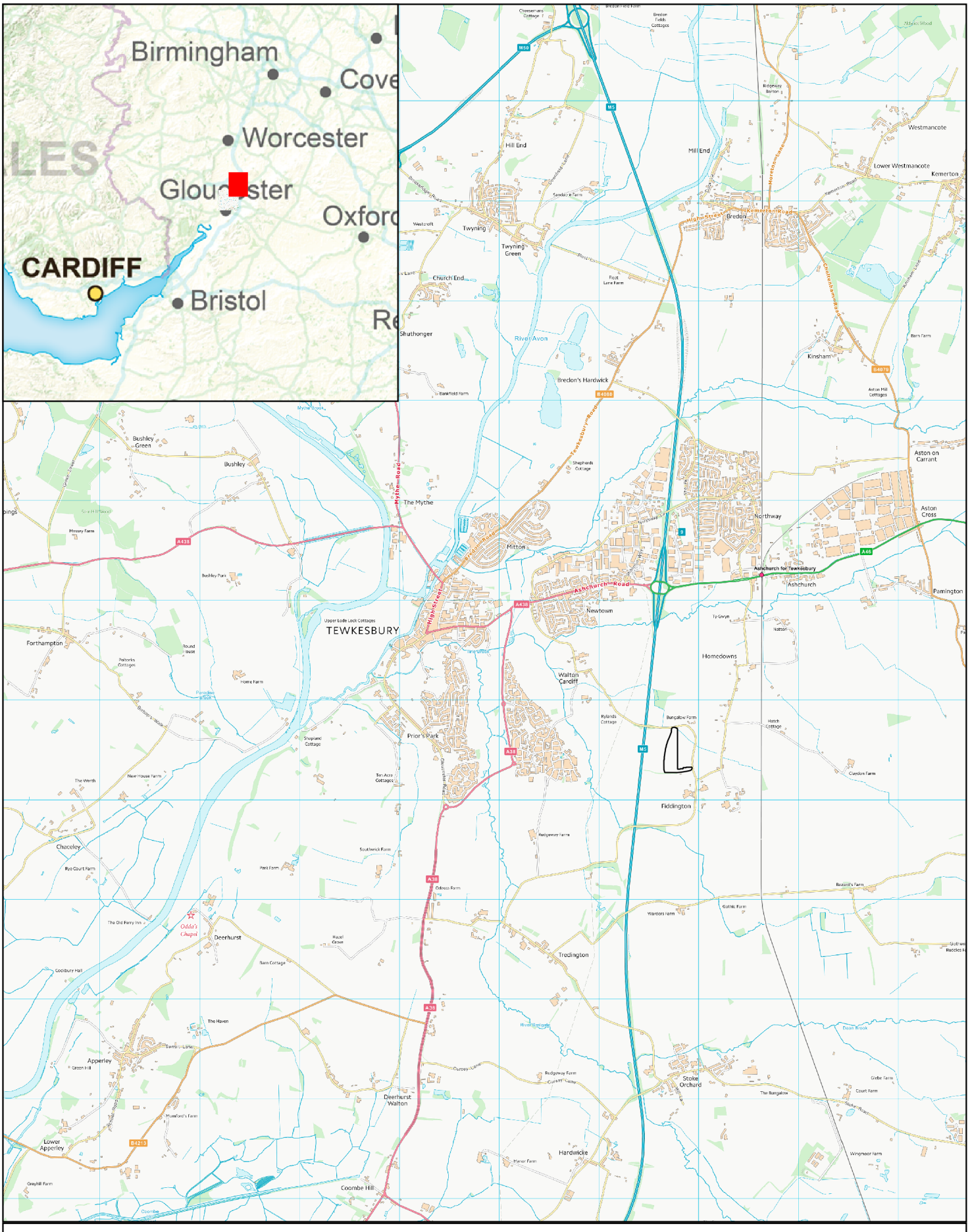

MSS007 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 1 - Site Location
1 : 50,000 @ A4 (Inset 1:2,500,000 @ A4)

0 500 1000 1500 m

N
W E
S

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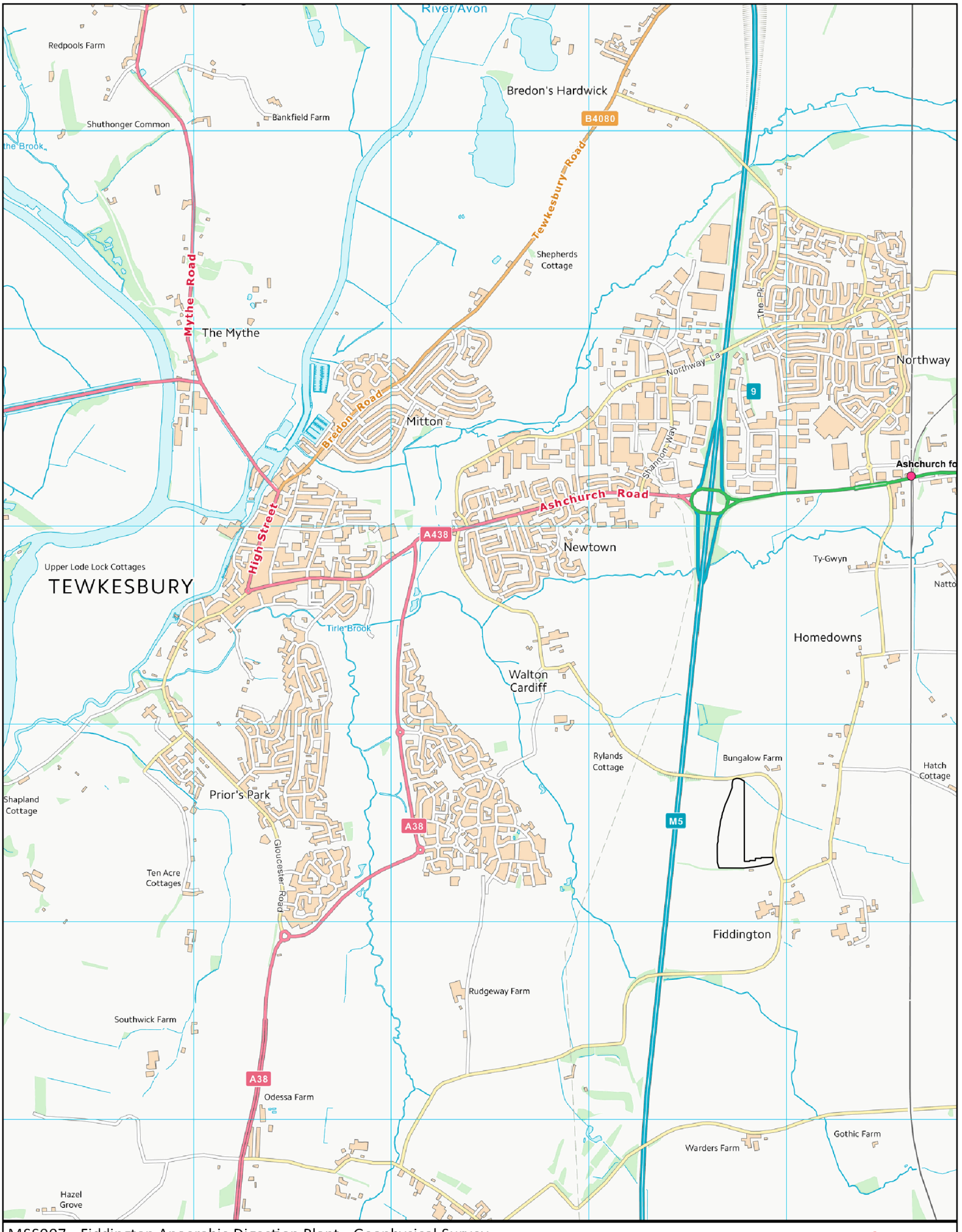

MSS007 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 2 - Location of Survey Area
1 : 25,000 @ A4

0 500 1000 1500 m

N
W E
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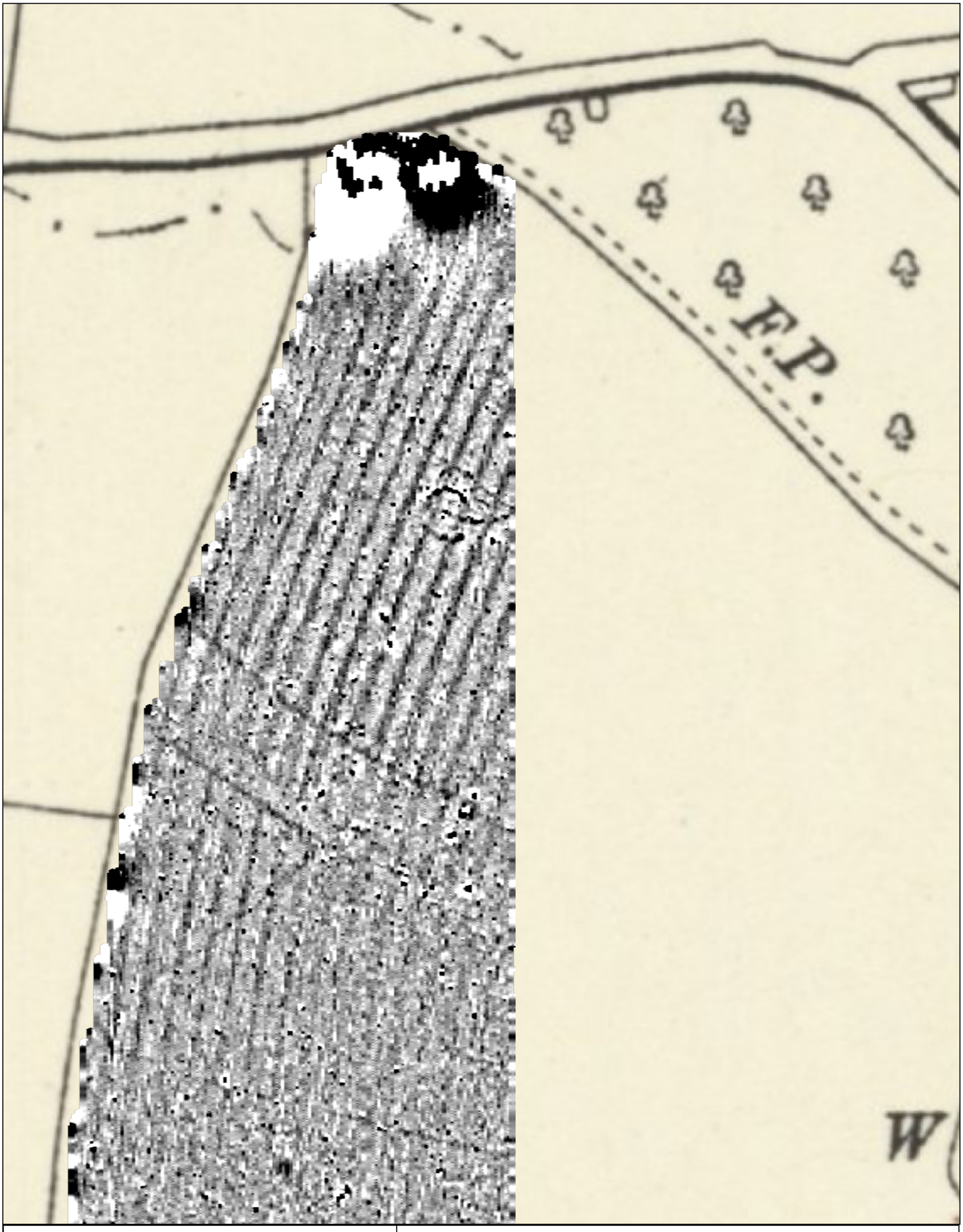
magnitude surveys



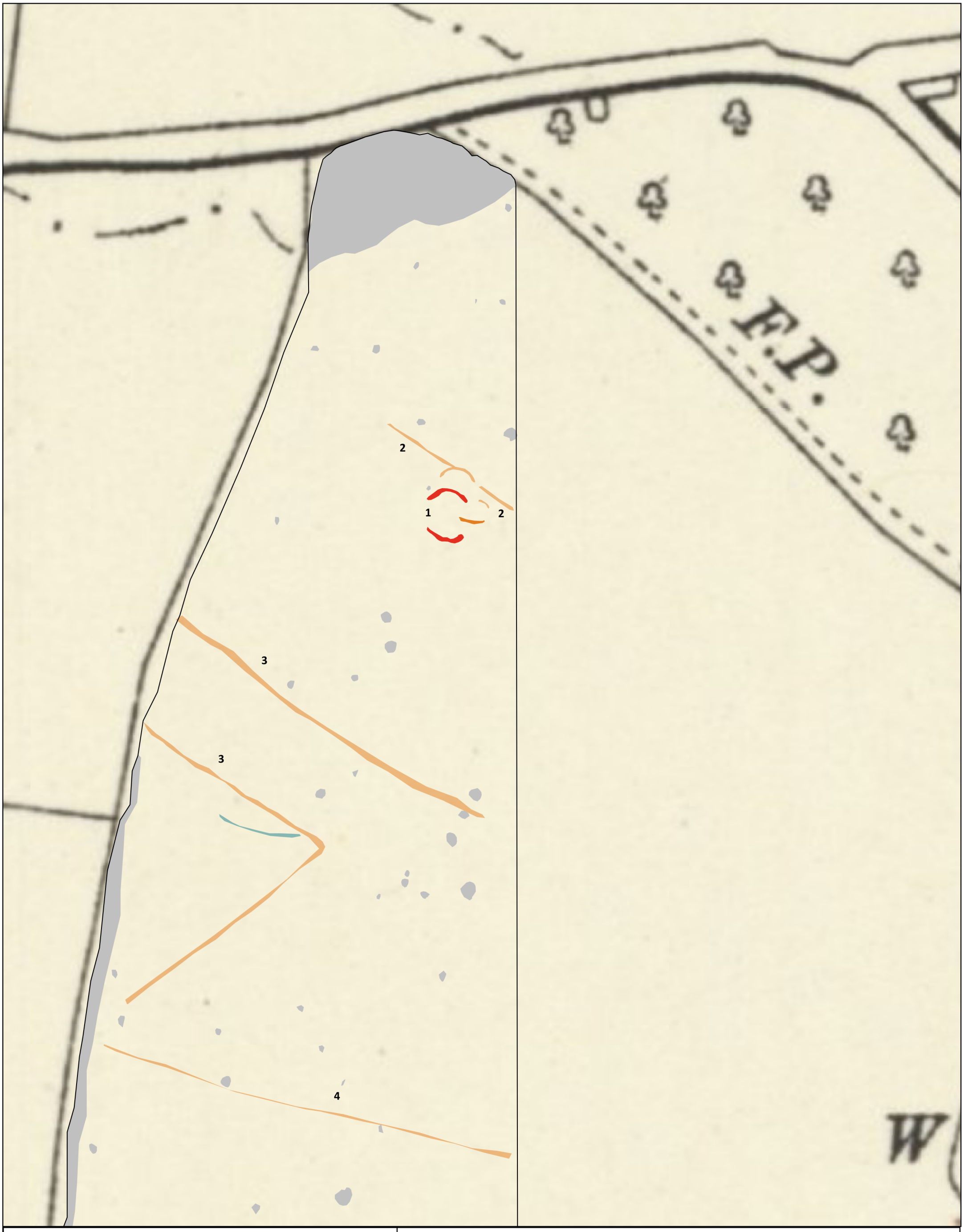
MSSO07 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 3 - Magnetometer Greyscale - North
1 : 1000 @ A3

-1 nT 2

0 50 100 m

N W E S

magnitude surveys



MSSO07 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 4 - Magnetometer Interpretation - North
1 : 1000 @ A3

Legend

- Archaeology Probable
- Archaeology Possible
- Archaeology Possible Weak
- Agricultural Plough
- Undetermined Weak
- Ferrous
- Survey Border

0 50 100 m

N W E S

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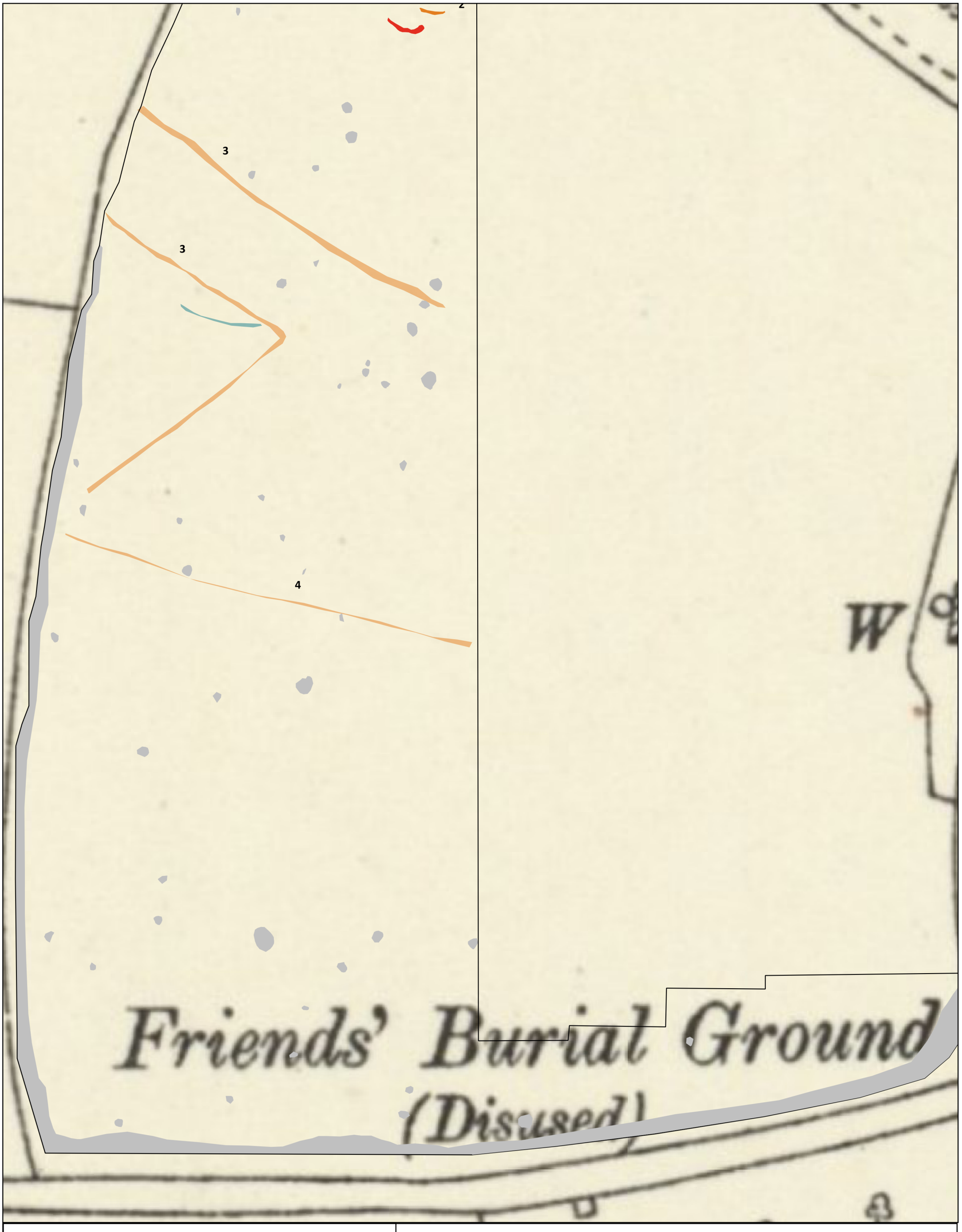
MSSO07 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 5 - Magnetometer Greyscale - South
1 : 1000 @ A3

-1 nT 2

0 50 100 m

N W E S

magnitude surveys



MSSO07 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 6 - Magnetometer Interpretation - South
1 : 1000 @ A3

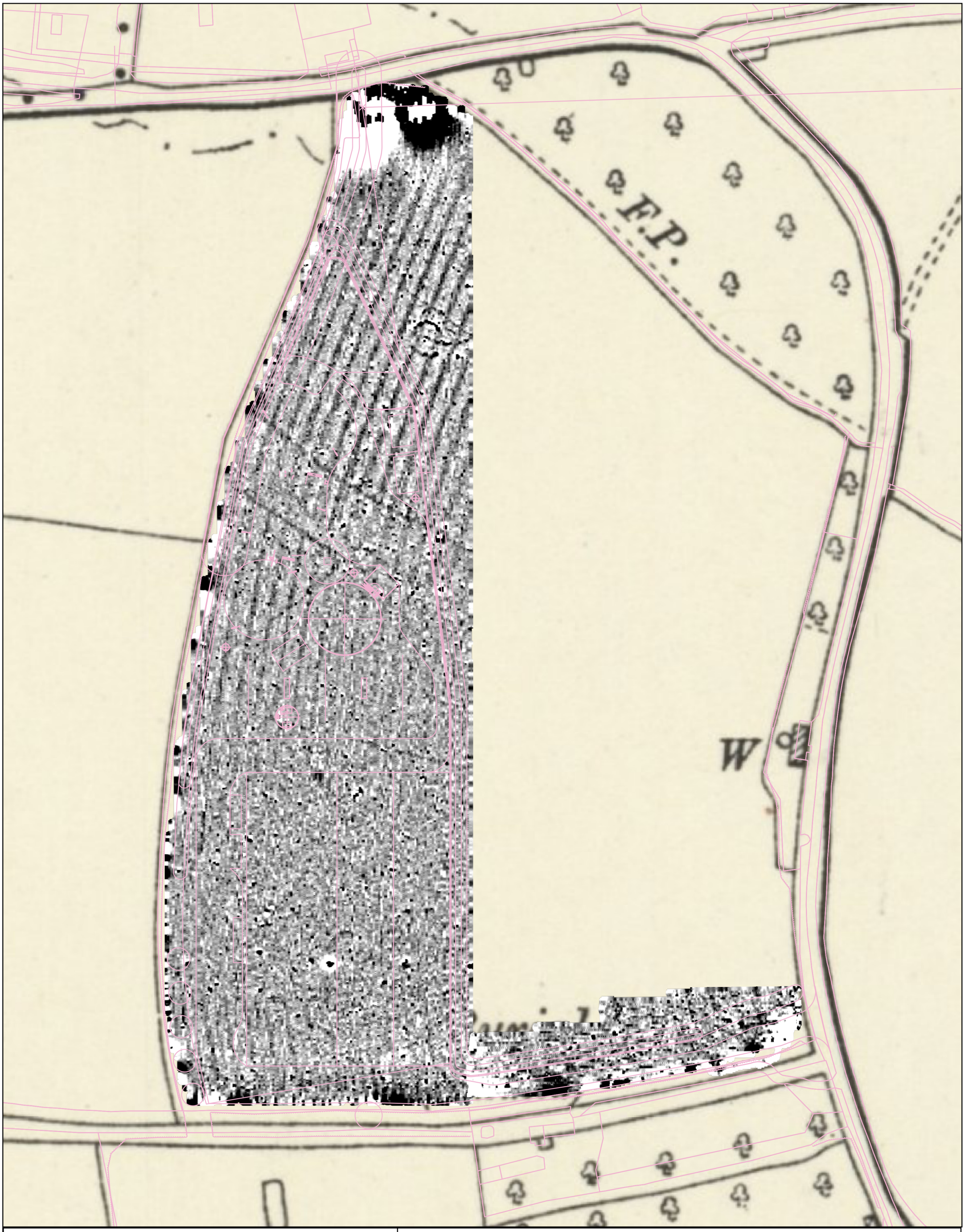
Legend

- Archaeology Probable
- Archaeology Possible
- Archaeology Possible Weak
- Agricultural Plough
- Undetermined Weak
- Ferrous
- Survey Border

0 50 100 m

N W E S

magnitude surveys



MSSO07 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 7 - Magnetometer Greyscale - With Proposed Development Overlay
1 : 1500 @ A3

-1 nT 2

0 50 100 m

N
W E
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Background Mapping Courtesy of maps.nls.uk

MSSO07 - Fiddington Anaerobic Digestion Plant - Geophysical Survey
Figure 8 - Magnetometer Interpretation - With Proposed Development Overlay
1 : 1500 @ A3

Legend

- Archaeology Probable
- Archaeology Possible
- Archaeology Possible Weak
- Agricultural Plough
- Undetermined Weak
- Ferrous
- Survey Border
- Ecotricity Proposed Development

0 50 100 m

N W E S

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