THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

# Phase 4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire

**Geophysical Survey (Magnetic)**

**by Kyle Beaverstock**

**Site Code: ORB15/150**

**(SP 4742 3965)**

# Phase 4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire

**Geophysical Survey (Magnetic) Report**

**For DB Symmetry**

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code ORB 15/150

**August 2019**

## Summary

**Site name:** Phase 4: Central M40, Land at Overthorpe Road, Banbury

**Grid reference:** SP 4742 3965

**Site activity:** Magnetometer survey

**Date and duration of project:** 31st of July and 2nd of August 2019

**Project coordinator:** Tim Dawson

**Site supervisor:** Kyle Beaverstock

**Site code:** ORB 15/150

**Area of site:** c. 2ha + 2.8ha

**Summary of results:** The geophysical survey showed that the occupational deposits comprising of linear and curvilinear ditches such as those seen in phases 1 to 3 do continue into the eastern field but do not appear to continue into the western field.

**Location of archive:** The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.




| | |
|---|---|
| Report edited/checked by: | Steve Ford✓ 16.08.19 |
| | Tim Dawson✓ 16.08.19 |




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# Phase 4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire
# A Geophysical Survey (Magnetic)

by Kyle Beaverstock

**Report 15/150f**

## Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Overthorpe Road, Banbury, Northamptonshire (SP 4742 3965) (Fig. 1). The work was commissioned by Stephen Bradford of Savills, Finsbury Circus House, 15 Finsbury Circus, London, EC2M 7EB, on behalf of DB Symmetry, Grange Park, roman Way, Northampton, NN4 5EA. Planning permission (S/2014/0302/MAO) has been gained from South Northamptonshire District Council for the site which straddles the Oxfordshire and Northamptonshire border to erect new industrial units on the site along with a balancing pond, this subject is subject to a condition (7) relating to archaeology. Initial field evaluation of the central part of the comprised of a geophysical survey (Constable 2015) and evaluation trenching (Taylor 2015) determined the presence of a large number of linear and curvilinear features likely representing an area of intensive Iron Age occupation. Subsequently, a geophysical survey for the adjacent areas to the west (Oxfordshire) and east (Northamptonshire) preceding an evaluation was conducted to determine the extents of these occupational deposits as well as targeting the evaluation trenches.

This is in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF 2012), and the District's policies on archaeology. The field investigation was carried out to a specification approved by Liz Mordue, Assistant Archaeological advisor to Northampton County Council. The fieldwork was undertaken by Kyle Beaverstock and Ashley Kruger on the 31st of July and 2nd of July 2019 and the site code is ORB 15/150.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

## Location, topography and geology

The site is located to the southeast of Banbury, on the western side of the M40 to the south of junction 11 (Fig. 2). Whilst the majority of the site lies in Northamptonshire a 2ha portion on the western side resides in Oxfordshire. The overall site consists of four main areas with phases 1 – 3 covering the central area, whilst phase 4 covers the fields to the west and east of these. The western field on the Oxfordshire side of the border is a

relatively flat, rectangular parcel of former farmland that is currently not being utilised and sits at a height of 91m aOD (above Ordinance Datum). The eastern field on the Northamptonshire side of the border is a irregularly shaped parcel of land, sitting at a height of 90m OD and not currently being utilised. The underlying geology is stated as Lower Lias clay (BGS 1982).

## Site history and archaeological background

In this part of Oxfordshire/Northamptonshire, away from the chalk and limestone outcrops on which numerous prehistoric sites have been identified, although this may in part be due to their conduciveness to being identified by aerial photography, only a limited number of sites were previously known. The archaeological potential was initially highlighted in a desk-based assessment (Ford 2004). The site is beyond the historic Medieval core of Banbury within the area where a medieval hospital once stood. To the east, across the county boundary lies the remains of a 1st world war munitions factory. (Cocroft 1999 fig. 6.21). The bulk of the factory is on the eastern side of the M40 but some components lay to the west. Subsequently, the initial phases of development to the north were subject to a large (112 trench) evaluation (Ford 2008) in Oxfordshire with smaller evaluations and recording action taking place in Northamptonshire (McNicoll-Norbury 2014; Bray 2015). These revealed very little of archaeological interest. A few undated or post-medieval field boundaries were revealed along with a few sherds of medieval pottery and a single sherd of Roman pottery. A few traces of the munitions factory were noted and the below ground remains of those were recorded (Bray 2015).

The archaeological potential of phase 2 to the south was further determined by the results of a field evaluation comprising of a geophysical survey and evaluation trenching (Constable, 2015; Taylor 2015). The geophysical survey revealed a large number of linear and curvilinear features forming what was likely a settlement of Iron Age date with trenching confirming that the geophysical anomalies represented Iron Age occupational deposits. An excavation on the western part of these Iron Age deposits was then carried out for the excavation of an attenuation pond (Sanchez 2017) as well as further recording of the munitions factory remains to the north (Davey 2017).

## Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly

spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating northeast to southwest zig-zag orientation across the western (Oxfordshire) survey area and northwest to southeast in the eastern (Northamptonshire) area. Other than some slight overgrowth on the eastern border of the western field and the western side of the eastern field and a newt fence dividing the western and eastern parts of the western field and the northern and southern halves of the eastern field, no significant obstructions were encountered.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to $10^{-9}$ Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base

line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

| **Process** | **Effect** |
|---|---|
| Clip from -4.20 to 4.62 nT<br>-6.60 to 6.63 nT | Enhance the contrast of the image to improve the appearance of possible archaeological anomalies. |
| De-stripe: median, all sensors | Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies. |
| De-spike: threshold 1, window size 3×3 | Compresses outlying magnetic points caused by interference of metal objects within the survey area. |
| De-stagger: all grids, both by -1 intervals | Cancels out effects of site's topography on irregularities in the traverse speed. |

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.18.15 and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

## Results

In general the geophysical survey revealed a continuation of the Iron Age occupational deposits seen in the previous phases in the eastern field. As suggested by the excavation, these deposits do not appear to continue into the western field;

### *Eastern (Northamptonshire) Field*

In the northern half of this field the majority of the area is dominated by an extensive area of magnetic debris. This is represented by sporadic dipolar responses over a large area, the relatively high amplitude of these responses suggests that this is an area of made ground containing fragments of ferrous material. In the northwestern corner are two sets of sub-rounded positive anomalies with the more northerly forming a rudimentary semi-circle and the more southerly clustering along the southwestern boundary. These may represent pit clusters or possibly a segmented ditch that relates to the north-south ditch detected in the geophysical survey for the previous phase. To the east of these, along the northern boundary and to the west of the magnetic debris is a large circular positive anomaly, this most likely represents a large pit. These anomalies may represent archaeological features, or they may be related to the area of magnetic debris.

In the immediate south of the magnetic debris, bisected by the newt fencing is a small enclosure. This is comprised of a weak linear anomaly aligned southwest to northeast and running for c. 30m to the north of the newt fence and a comparatively stronger linear anomaly forming two sides of the enclosure. These run northwest to southeast for 20m before turning to the northeast and runs for 18.5m. Within the enclosure two parallel curvilinear ditches as well as a short linear running across both of these may represent internal structures.

Along the western edge in the southern half of the field are two distinct enclosures with associated linears, these appear to correspond to the linears detected in the previous phase to form a larger complex. The most northerly has two sides of the enclosure running from the western boundary to the east for 38m before turning and bending round to the northwest for 47m and back into the western edge. Within this enclosure is a curvilinear ditch orientated north to south and corresponds to a curvilinear ditch in the previous phase forming a circular feature such as a roundhouse. To the south of this is a possible entrance ditch, This runs north to south for 11m however it is mostly obscured by the boundary. There is also a sub-rounded positive feature which may represent a pit or cluster of pits due to its size, c. 5m in diameter, and lack of distinct form.

The second enclosure consists of a complex of ditches, one running from the western boundary to the east for 13m with a short ‘turn’ at the eastern end towards the northeast. Two parallel ditches running southwest to

northeast for 13m, a short gap of 3m and two corresponding parallel ditches running southeast to northwest into the boundary. Running from the south of the eastern double ditch, running for 14m to the east before turning south for 36m and then to the west and into the magnetic disturbance. Within this enclosure was a short segment of ditch c. 8m long, running north to south, its orientation suggests it is most likely related to the enclosure complex. Along the southwestern edge of the survey area was a significant area of magnetic disturbance this is likely due to both the railway fence and the high pressure gas main that runs along it which is likely masking any further archaeological features in this area.

Finally, a weak positive 'u' shaped anomaly was detected orientated southeast to northwest and measuring 16m in diameter. As seen from the results of the previous phases the signal strength appears to weaken in the eastern part of the site. During the evaluation it was noted that the trenches became deeper in these areas which may explain the weakening signal but may also mask more subtle features.

### *Western (Oxfordshire) Field*

Other than the continued magnetic disturbance from the gas main along the southwestern edge of the site and some magnetic spikes, a line of which may indicate a fence line in the north of this area. The only possible feature detected was a weak positive anomaly running north east to southwest for 28m in the northwest corner of the field which may represent a ditch of indeterminate date.

## Conclusion

The geophysical survey has successfully shown that in the western field, other than a single potential ditch along the northern boundary, it does not contain any obvious geophysical anomalies of archaeological origin and the previously recorded deposits to the east do not extend westwards. However, for the southern end of the eastern field, the deposits already identified by the previous survey and interpreted as a settlement complex, clearly continue into the proposal site. Further, another rectilinear enclosure complex appears to be partly present on the eastern side of the site an extending further east below the M40. Survey of the northern end of the eastern field was only partially successful as much of this area contained interference from magnetic debris which most likely represents an area of made ground. However, the previously recorded deposits do not appear to continue north eastwards into the proposal area.

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# Appendix 1. **Survey and data information**

**Programme:**
Name: TerraSurveyor
Version: 3.0.25.0

**Raw data**
*Filename: Overthorpe Road 3 sensors.xcp*
*Instrument Type: MLgrad Import*
*Units:*
*UTM Zone: 30*
*Survey corner coordinates (X/Y):*
*Northwest corner: 447230.023387732, 239820.975710889 m*
*Southeast corner: 447356.773387732, 239628.835710889 m*
*Direction of 1st Traverse: 90 deg*
*Collection Method: Parallel*
*Sensors: 2 @ 1 m spacing.*
*Dummy Value: 32702*

*Dimensions*
*Survey Size (meters): 127 m x 192 m*
*X&Y Interval: 0.13 m*
*Source GPS Points: Active: 18278, Recorded: 18278*

*Stats*
*Max: 107.34*
*Min: -109.75*
*Std Dev: 14.49*
*Mean: -0.47*
*Median: 0.47*
*Composite Area: 2.4354 ha*
*Surveyed Area: 0.823 ha*

Filename: Overthorpe Road C.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 447498.891370765, 239787.463277902 m
Southeast corner: 447630.321370765, 239424.763277902 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 131 m x 363 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 65447, Recorded: 65447

Stats
Max: 107.65
Min: -109.76
Std Dev: 24.73
Mean: -1.15
Median: 0.84
Composite Area: 4.767 ha
Surveyed Area: 2.364 ha

Filename: Overthorpe Road E.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 447207.367812003, 239826.341572397 m
Southeast corner: 447393.527812003, 239612.491572397 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 186 m x 214 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 34303, Recorded: 34303

Stats
Max: 107.65
Min: -109.76
Std Dev: 18.28
Mean: -0.14
Median: 0.98
Composite Area: 3.981 ha
Surveyed Area: 1.2785 ha

**Processed data**

Filename: Overthorpe Road 3 sensors.xcp
Stats
Max: 4.62
Min: -4.20
Std Dev: 1.28
Mean: -0.07
Median: 0.03
Composite Area: 2.4354 ha
Surveyed Area: 0.823 ha

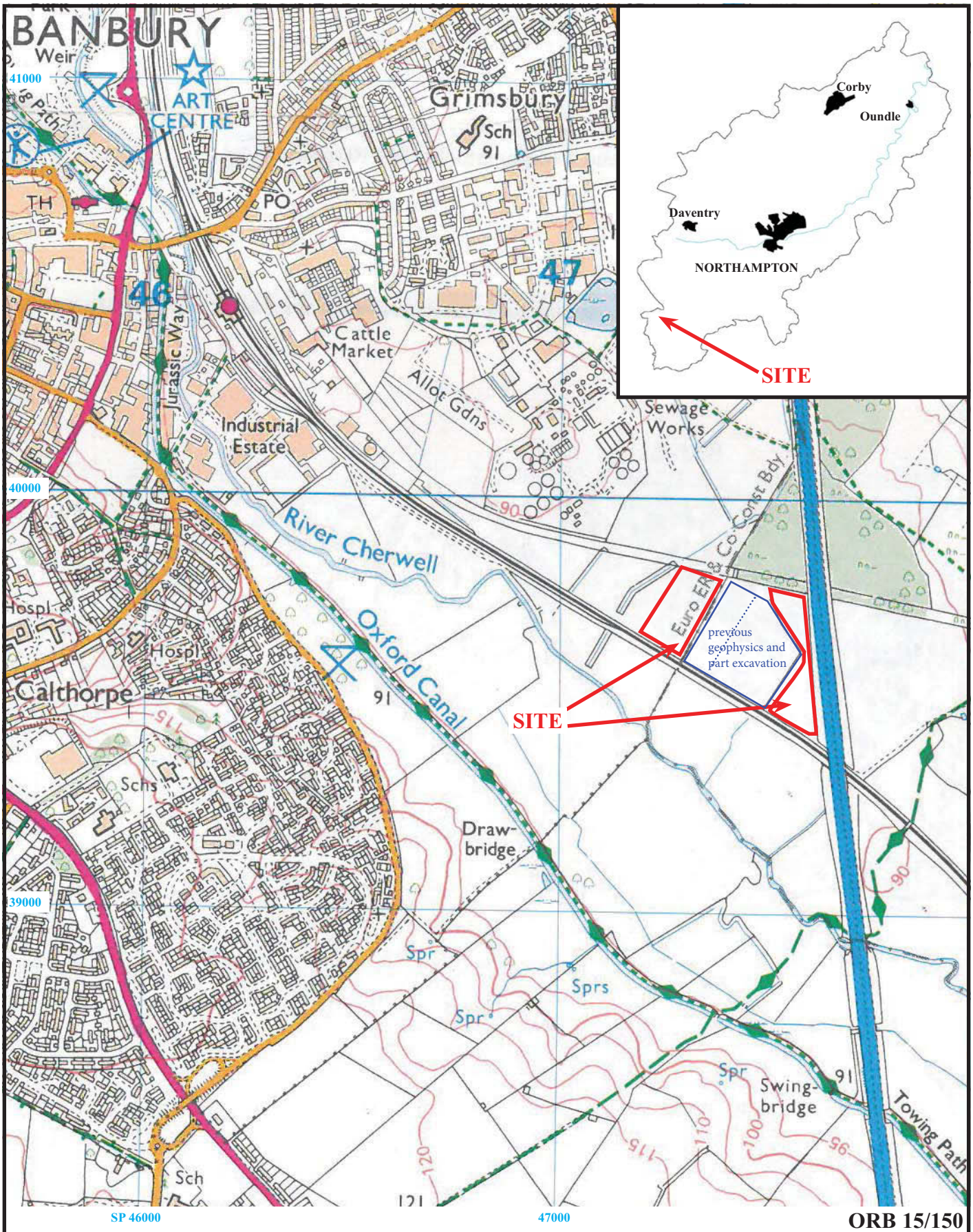
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 Clip from -3.80 to 4.20

Filename: Overthorpe Road C.xcp
Stats
Max: 6.63
Min: -6.60
Std Dev: 2.93
Mean: 0.24
Median: 0.00
Composite Area: 4.767 ha
Surveyed Area: 2.364 ha

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Despike Threshold: 1 Window dia: 3
5 Clip from -6.00 to 6.00

Filename: Overthorpe Road E.xcp
Stats
Max: 6.63
Min: -6.60
Std Dev: 1.94
Mean: 0.09
Median: 0.01
Composite Area: 3.981 ha
Surveyed Area: 1.2785 ha

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Despike Threshold: 1 Window dia: 3
5 Clip from -6.00 to 6.00

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**Central M40, Land at Overthorpe Road, Banbury, Phase 4**
**Northamptonshire, 2019**
**Geophysical Survey (Magnetic)**

Figure 1. Location of site within Banbury and Northamptonshire



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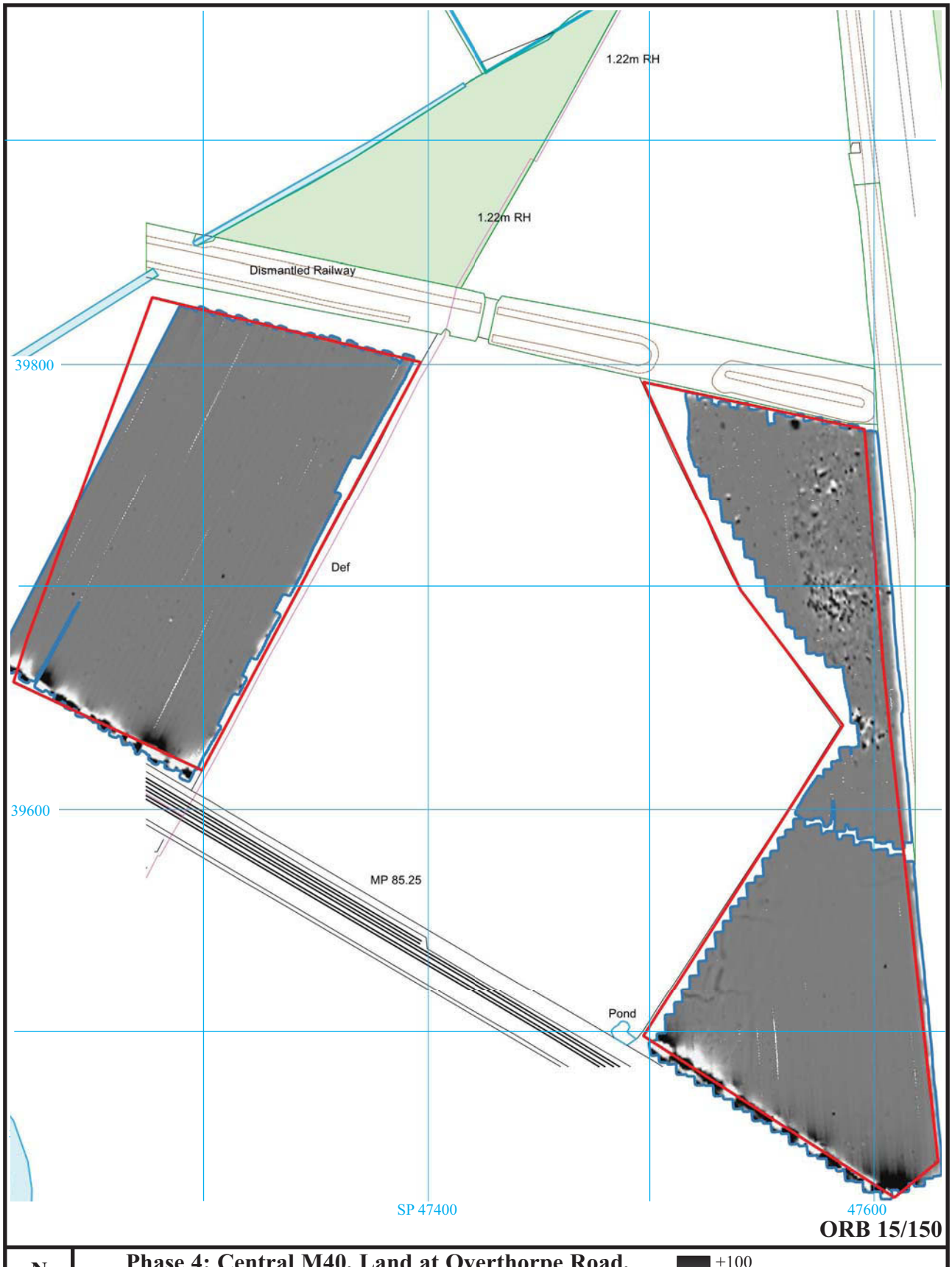
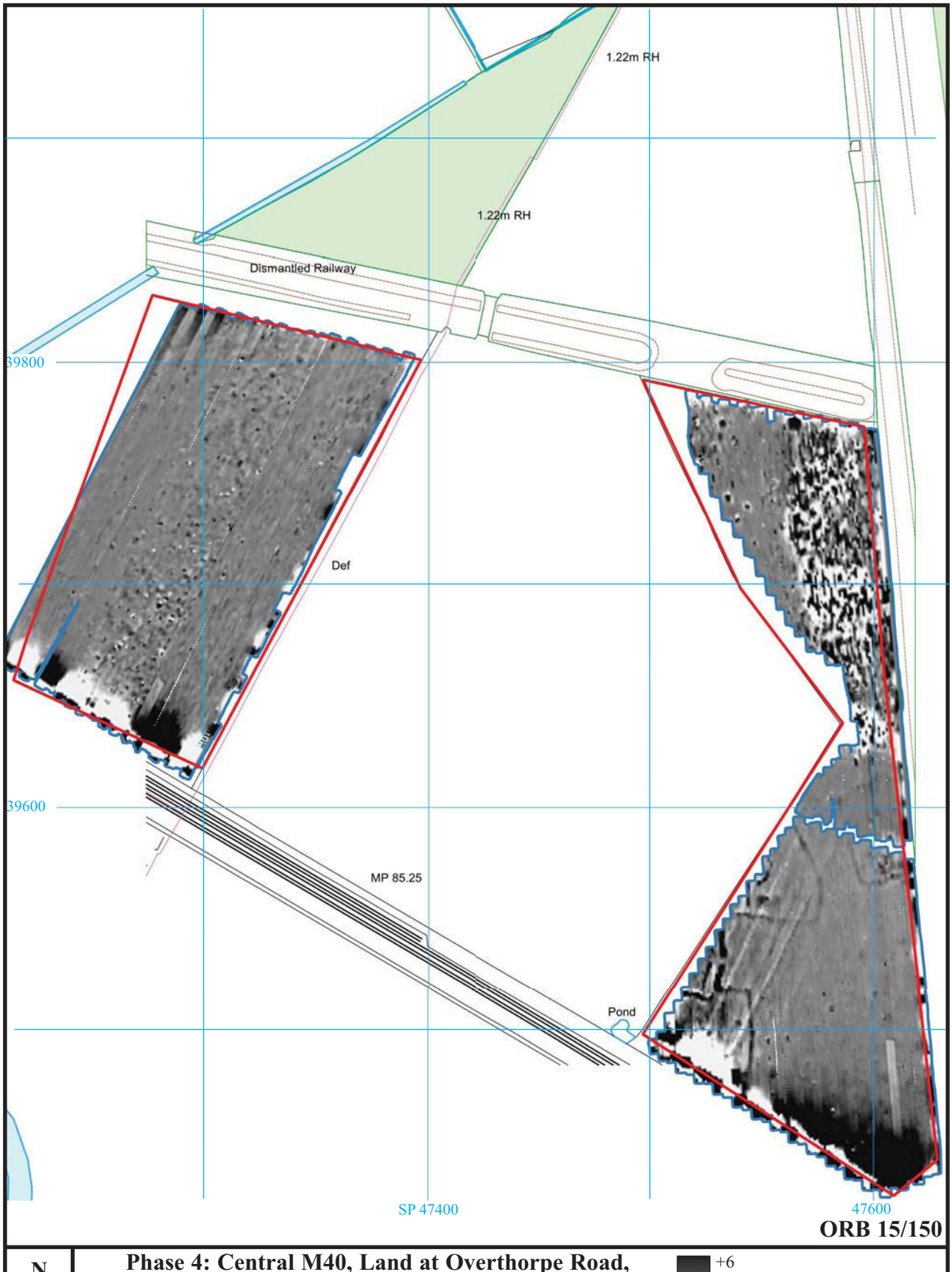
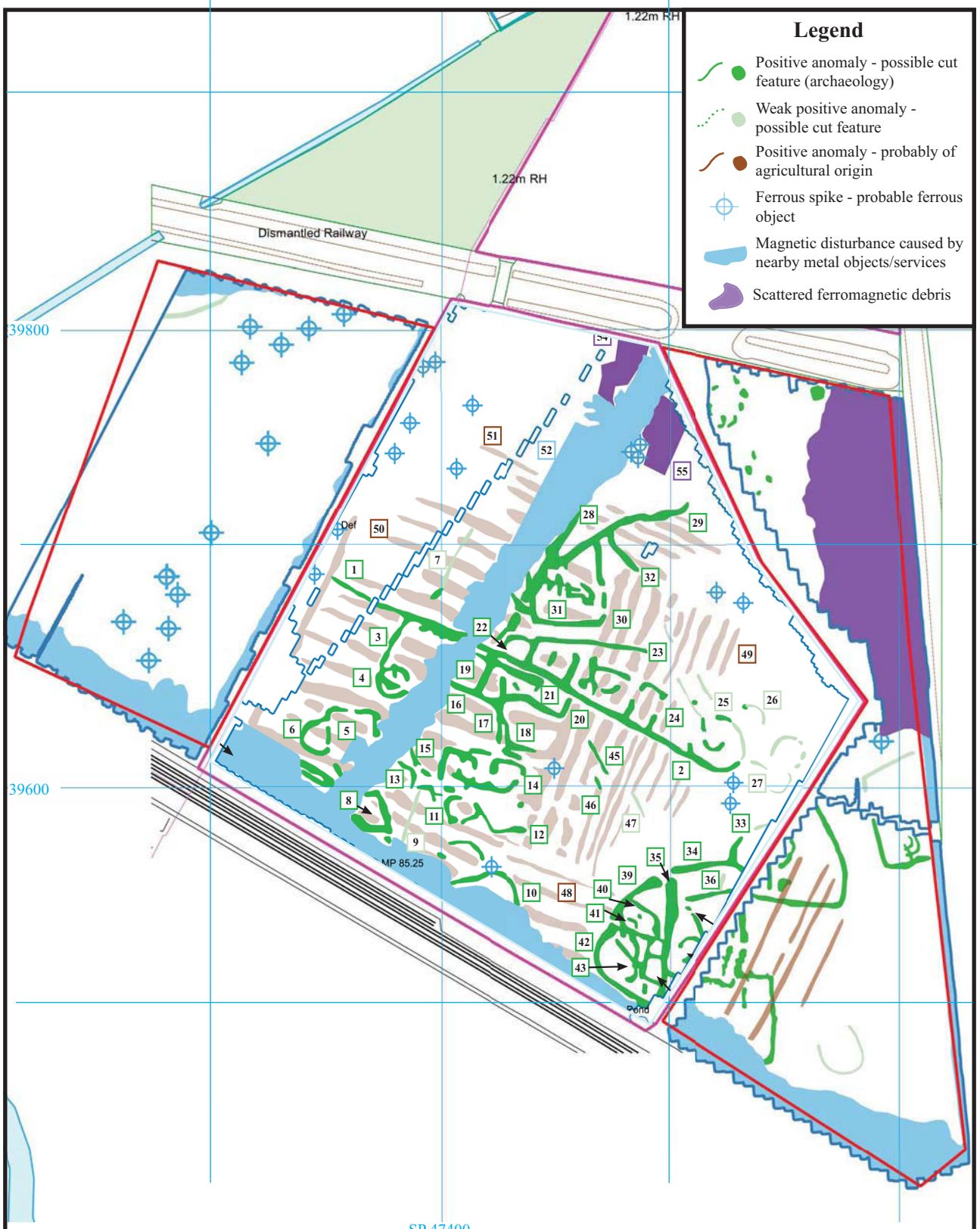



**Phase 4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire, 2019**
**Geophysical Survey (Magnetic)**
Figure 2. Plot of raw gradiometer data.




**Phase 4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire, 2019**
**Geophysical Survey (Magnetic)**
Figure 3. Plot of processed gradiometer data.




**Phase 4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire, 2019**
**Geophysical Survey (Magnetic)**
Figure 4. Interpretation plot relative to previous geophysical survey results.

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Plate 1. Eastern Area of Survey, looking South.

Plate 2. Western Area of Survey, looking North.

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**Phase4: Central M40, Land at Overthorpe Road, Banbury, Northamptonshire, 2019**
**Geophysical Survey (Magnetic)**
Plates 1 and 2.

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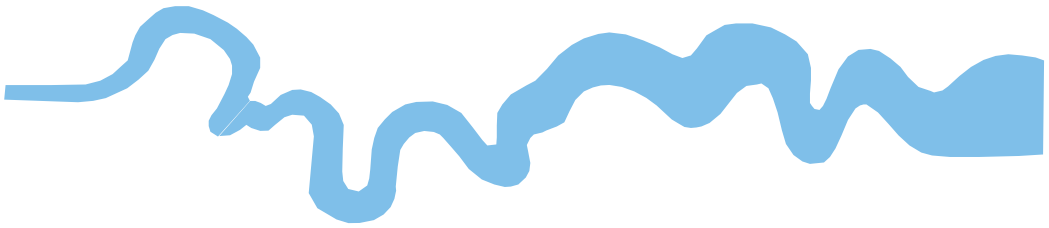
# TIME CHART

| | Calendar Years |
|---|---|
| Modern | AD 1901 |
| Victorian | AD 1837 |
| Post Medieval | AD 1500 |
| Medieval | AD 1066 |
| Saxon | AD 410 |
| Roman | AD 43 |
| | AD 0 BC |
| Iron Age | 750 BC |
| Bronze Age: Late | 1300 BC |
| Bronze Age: Middle | 1700 BC |
| Bronze Age: Early | 2100 BC |
| Neolithic: Late | 3300 BC |
| Neolithic: Early | 4300 BC |
| Mesolithic: Late | 6000 BC |
| Mesolithic: Early | 10000 BC |
| Palaeolithic: Upper | 30000 BC |
| Palaeolithic: Middle | 70000 BC |
| Palaeolithic: Lower | 2,000,000 BC |



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