# Meerdyke, Wisbech
# Norfolk

## Archaeological Geophysical Survey Report

National Grid Reference: TF 50685 10295 (centred)

AOC Project No: 40333

Date: August 2022

AOC Archaeology Group

ARCHAEOLOGY | HERITAGE | CONSERVATION

# Meerdyke, Wisbech

# Norfolk

# Archaeological Geophysical Survey Report

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|---|---|
| **On Behalf of:** | **Ramboll Ltd<br>240 Blackfriars Road<br>London<br>SE1 8NW** |
| **National Grid Reference (NGR):** | **TF 50685 10295 (centred)** |
| **AOC Project No:** | **40333** |
| **Oasis ID:** | **aocarcha1-507196** |
| **HER Event Number:** | **ENF152477** |
| **Prepared by:** | **Sacha O'Connor and Chris Sykes** |
| **Illustrations by:** | **Chris Sykes, Kayt Armstrong and Sacha O'Connor** |
| **Date of survey:** | **23/05/2022 - 16/06/2022** |
| **Surveyors:** | **Sacha O'Connor, Alistair Galt, Marguerite Hall, Kris Hall, Rhys Martin** |

**This document has been prepared in accordance with AOC standard operating procedures.**

**Author: Sacha O'Connor, Chris Sykes & Kayt Armstrong** **Date: 29th August 2022**

**Quality Checked by: James Lawton & Susan Ovenden** **Date: 31 1st August 2022**

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## Abbreviations used in this report

| | |
|---|---|
| aOD | above Ordnance Datum |
| EAC | European Archaeological Council |
| HER | Historic Environment Record |
| WSI | Written Scheme of Investigation |

## Non-Technical Summary

*AOC Archaeology Group was commissioned by Ramboll Ltd to undertake an archaeological geophysical gradiometer survey initially between 5th May and 16th June 2022 to investigate the potential for buried archaeological remains ahead of a proposed development at Meerdyke, Wisbech, Norfolk (centred at TF 50685 10295).*

*A total of 75 hectares were surveyed with an area of 13ha in the northwestern of the scheme unavailable for survey due to crop concerns, which will be collected and reported on at a later date.*

*The gradiometer survey has not identified any anomalies or features of a definitive archaeological nature; however, three clusters of linear and discrete anomalies have been identified as being of possible archaeological interest in the northern part of the survey area, and a group of less clearly understood anomalies exists within the southern part of the survey area, again forming a mixture of linear and discrete groupings of positive anomalies. The survey results are dominated by strong positive curvilinear anomalies with a dendritic pattern indicative of former watercourses, in this case interpreted as a former creek and tidal flat landscape. In the southern part of the survey area, this is disrupted by broad swaths of subdued magnetic background which have been tentatively interpreted as a different phase of the paleoenvironment this time dominated by freshwater channels, which have deposited paleochannel material in these swaths.*

*Historical features such as the debris associated with a former railway line and buildings have been identified within the results and corroborated by historic maps, alongside a network of former field boundaries (likely to have been in the form of open field drains); some of the 'uncertain' anomalies identified in the results are likely to be parts of the same evolving system of drains, but are not depicted on available historic maps and therefore cannot be corroborated.*

*Overall, the magnetic gradiometer survey has allowed the aims of the survey to be met, with a range of anomalies identified within the resulting plots, many of which are corroborated by historic map evidence. Though the fluvial/geological responses dominate the results, weaker and more ephemeral anomalies can be identified and interpreted against this background, resulting in a good level of confidence in the findings.*

# 1 Introduction

1.1 AOC Archaeology Group was commissioned by Ramboll Ltd to undertake an archaeological geophysical gradiometer survey of a site at Meerdyke, Walsoken,near Wisbech in Norfolk. The survey was conducted between 5th May and 16th June 2022 as part of a wider scheme of archaeological assessment in advance of the proposed development of the site.

1.2 Archaeological geophysical survey uses non-intrusive and non-destructive techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits, as far as is reasonably possible (CIfA, 2014).

1.3 The survey was carried out to provide information on the extent and significance of potential buried archaeological remains within the proposed development site.

# 2 Site Location and Description

2.1 The Site is located to either side of Harp's Hall Road, Walsoken, (NGR TF 50685 10295). The Site is situated across arable agricultural land.

2.2 The Site totals approximately 87 ha and consists of seven fields. Two of these fields were unsurveyable at the time due to a crop of potatoes. Survey will be completed for this area post-harvest and a supplemental report produced to cover this area and any changes to the overall interpretation that may result from the new information provided.

2.3 The ground level within the site is undulating, situated at between 6m – 16m above Ordnance Datum (aOD) across the site.

2.4 The site is located on Mudstone of the Ampthill Clay Formation. These are overlain by superficial tidal deposits of clay and silt (BGS, 2022). The soils within the Site are loamy and clayey soils of coastal flats with naturally high groundwater (Soilscapes, 2022).

2.5 Gradiometer survey is suggested to provide a variable response over sedimentary rocks; for example the results can be good over certain sandstones and average over mudstones and the drift / alluvium deposits may also have an effect (David *et al.* 2008, 15).

# 3 Archaeological Background

3.1 The archaeological background below is drawn from the WSI for the site, in preparation by AOC Archaeology (AOC Archaeology 2022). A 1km study zone was examined, with HER reference numbers provided where appropriate.

## Prehistoric

3.2 There are no recorded remains of prehistoric date within the proposed development area itself.

3.3 A mound, possibly a barrow and a pond used to exist approximately 500m to the northeast of the eastern fields of the survey area. They were destroyed in the 20th century, all that remains are shallow circular depressions. This feature has been recorded as 'Tom Hickathrift's Washbowl' and 'Giant's Grave', who according to marshland folklore, was born in the reign of William the Conqueror and because of his size and strength, cleared ogres and undesirables before being knighted. The mound was allegedly the grave of a defeated ogre.

3.4 A series of metal finds (4471, 4472) have been identified at Marshland St James, at the turn of the 20th century, although their details of their exact location and discovery is unknown.

### Roman

3.5 A probable Roman settlement has been identified to the northeast of the site (19034). This is based upon the amount of pottery and briquetage in the vicinity, and on the aerial photograph TF510A-B.

3.6 In addition Roman pottery (19033) has been identified to the southeast of the survey area, close to Long Lots Drove, a historic feature which may have an early origin, explaining the location of this findspot.

### Medieval

3.7 There are no Medieval remains located within the Site boundary, although a small concentration of medieval pottery sherds are known immediately to the south of the Site.

3.8 The proposed development was within the Hundred of Freebridge in 1086. The nearest manorial estate recorded within the Domesday Book (Open Domesday, 2022) would likely have been Walsoken which comprised a relatively large settlement with 24 households recorded. The land belonged to the Abbey of Ramsey (St Benedict) (recorded as both Lord and tenant-in-chief) and contained ploughlands, livestock, 12 acres of meadow and a fishery; it is likely that the proposed development was located within the surrounding agricultural land or meadow.

3.9 The former St James' Chapel (17028) has been recorded approximately 250m to the southeast of the eastern fields, however the chapel was washed away in floods. Conflicted interpretations place the former chapel in various alternative positions.

3.10 A series of enclosure and Medieval drove roads bisect the site and run close to the boundaries of the survey area.

## 4 Aims

4.1 The aim of the geophysical survey was to identify any potential archaeological anomalies that would enhance the current understanding of the archaeological resource within the proposed survey area.

4.2 Specifically, the aims of the gradiometer survey were;

- To locate, record and characterise any surviving sub-surface archaeological remains within the survey area,
- To help determine the next stage of works as per the client's instruction,
- To provide an assessment of the potential significance of any identified archaeological remains in a local, regional and (if relevant) national context,
- To produce a comprehensive site archive (Appendix 2) and report.

## 5 Methodology

5.1 The geophysical survey was undertaken between 5th May and 16th June 2022.

5.2 All geophysical survey work was carried out in accordance with recommended good practice specified in the EAC guideline documents published by Historic England (Schmidt et al. 2016) and the Chartered Institute for Archaeologists Standard and Guidance for archaeological geophysical survey (2014).

5.3 Parameters and survey methods were selected that were suitable for the prospective aims of the survey and in accordance with recommended professional good practice (Schmidt et al. 2016).

5.4 Digital photographs of every survey parcel were taken before, during and after geophysical survey to show any changes to field conditions following the programme of works. The photos were downloaded and stored off site.

5.5 The gradiometer survey was carried out using a Bartington Non-Magnetic Cart. The cart system utilises six Grad-01 fluxgate gradiometer sensors mounted upon a carbon fibre frame 1m apart, along with data logging equipment and batteries (see Appendix 3). Before each session of use, the cart system was balanced around a single set up point within the Site specifically chosen for being magnetically quiet. In balancing the machine around this point, it produces a more uniform dataset throughout and allows all data to be plotted with ease.

5.6 Data was collected using zig-zag traverses alongside a constant stream of GPS data collected through a Trimble R10 GPS, enabling the collected data to be spatially georeferenced without the need for a pre-determined grid system. The data was collected through a laptop mounted to the cart using Geomar MLGrad601 software.

5.7 A total of 75ha were surveyed using the Bartington cart.

5.8 Care was taken to attempt to avoid metal obstacles present within the survey area, such as metal fencing around hedge boundaries as gradiometer survey is affected by 'above-ground noise' and avoiding these improves the overall data quality and results obtained.

5.9 The data was downloaded from MLGrad601 and converted into a .xyz file in Geomar MultiGrad601 before being processed along with the GPS data in TerraSurveyor v3.0.34.10. The details of these processed can be found in Appendices 3 and 4.

5.10 Interpretations of the data were created in ArcGIS Pro and the technical terminology used to describe the identified features can be found in Appendix 5.

# 6 Results and Interpretation

6.1 The gradiometer survey results have been visualised as greyscale plots, with processed data plotted at -1nT to 2nT in Figures 3.1 - 3.14. An interpretation of the data can be seen in Figures 4.1 - 4.14. Minimally processed data is supplied in figures 5.1 – 5.10 in the form of XY trace plots, drawn at 30nT/cm.

6.2 For the most part, only trends of a possible archaeological or historical origin have been assigned an anomaly number on the interpretation figures. However, trends that are otherwise integral to the discussion have also been assigned anomaly numbers.

### Archaeology

6.3 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset, however, as discussed below, a handful of anomalies have the potential to relate to archaeological features and there are further ambiguous linear anomalies identified in the results.

### Possible Archaeology

6.4 Anomalies indicating the presence of possible archaeological remains were identified within the dense network of anomalies related to fluvial processes within the survey area (figures 4.1, 4.5, 4.7). These were picked out largely on the basis of their morphology, which is typically straighter than the surrounding fluvial anomalies or cross-cutting them in some way. These anomalies [**3A, 3B, 3C**] occur in clusters in Area 3, in an area with fewer natural anomalies and a rather different magnetic background – this is in the northern and western part of the survey area, and relatively speaking, is higher (and therefore drier) ground, where it might make sense to locate settlement or industry. All three clusters are composed of narrow linear anomalies, characteristic of ditches, and groups 3A and 3B also contain discrete positive or dipolar anomalies, suggestive of pits and burning or heating respectively.

6.5 In the northern part of area 5 there are several strongly positive linear anomalies which are intense enough to have a negative dipolar component **[5A, 5B]**. These are difficult to interpret but suggest either high temperature processes or dumps of strongly enhanced material and so they have been classified as possibly being of archaeological interest (figures 4.2, 4.10). A smaller more isolated example of this usual anomaly occurs in the southern part of area 5 **[5C]** (figures 4.4, 4.11).

### Unclear Origins

6.6 A number of trends are visible across the dataset which have unclear origins. The weaker and more ephemeral of these run at right-angles to the identified historical field boundaries (see below) and likely relate to components of the same network of ditches and drains that simply were not captured on historic maps during their period of use.

6.7 A group of strongly positive anomalies intrudes into an east-west running swath of altered magnetic character (which in itself is discussed below) (figures 4.3, 4.4 and 4.11-14). These do not fit with the character of the fluvial channels and the local broader channels they interrupt. Rather, they are cross cutting the general alignments and, in some cases, have seeming right-angled returns. These have been split into sub-groups **[6A, 6B, 6C, 7A]** based anomalies on their apparent clustering within areas 6, and 7. These anomalies are difficult to confidently classify as they may yet be of natural origins, or relate to more recent drainage or agricultural processes, and could also possibly relate to archaeological features, though this is less certain than for the anomalies discussed in area 3.

6.8 As well as the more robust linear anomalies discussed above, there are several groups of discrete positive anomalies suggestive of cut features with magnetically enhanced fills, such as pits scattered within area 7 and in the southern part of area 5 **[5G, 5H, 5J, 7B, 7C]**. Again, it is difficult to suggest a period for their creation and they could relate to prehistoric or pre-modern industrial activity or storage, or to more recent agricultural practices or quarrying. They may also be natural hollows or the remnants of truncated fluvial systems.

6.9 Finally, in the northern parts of areas 5 and 6 (figures 4.2, 4.9) there are patches of noisy magnetic response typical of spreads of magnetic material within the topsoil, such as modern or historical ferrous rubbish, or ceramic material **[5E, 5F].** Given their proximity to extant housing, their origin is unlikely to be of archaeological interest, but their provenance is uncertain, and they have been classified as such.

### Agricultural/Historical

6.10 An area of magnetic disturbance **[3D]** extending into the area from the northern boundary in Field 5 corresponds to the former boundaries of Poplar Farm, as depicted on historical maps of the area. The disturbance is likely to result from magnetised ceramic building remains and ferrous demolition debris within the topsoil in this location (figures 4.1, 4.5).

6.11 Throughout the survey area there are linear anomalies or trends, sometimes with associated patches of magnetic disturbance **[5D, 6D]** related to debris within the topsoil that correspond with former field boundaries depicted on historical maps. These are drawn as ‘historical features’ in the interpretation plots, with only the spreads of debris being assigned anomaly numbers. Many of the uncertain linear trends follow this same alignment (which persists into the current landscape organisation) but have no corroborating historical maps (see 6.6 above).

6.12 An area of magnetic disturbance in the southern most extent of the survey in Area 7, **7D** may relate to a boundary depicted here but may also relate to the line of the former Lynn & Wisbech branch of the Great Eastern Railway, which has since been replaced with a field drain (figures 4.4, 4.14).

### Geological/Natural

6.13 Across the entire site there are multiple strongly positive banded and braided dendritic anomalies characteristic of former fluvial systems, that extend out from the boundaries of the survey area and clearly form part of a continuous landscape previously dominated by fluvial or tidal processes, or both.

6.14 Broad swaths of altered magnetic background disrupt the finer system of creeks, particularly in the southern part of the survey area cutting across the survey area in a broadly east-west direction, and with weaker or softer magnetic characteristics. These broader features may represent a different, more fluvially influenced period with the creek systems suggesting a more tidal environment – a salt-water environment may explain the strength of the magnetic anomalies related to these features, but this is speculation as it is difficult to phase and interpret these anomalies beyond a broad outline.

### Non - Archaeology

6.15 Magnetic disturbance is visible in areas 3 and 4 along the southeast and part of the southern boundary in area 3, this likely due to the metal fencing that runs along these boundaries.

6.16 In area 4 there is disturbance along the northern and north-west boundary of the field: this in line with an extant trackway

6.17 Approximately 200m along the southwestern boundary of area 5 there is an area of magnetic disturbance potentially associated with a nearby upstanding building.

6.18 In area 6 there is substantial magnetic disturbance in the southern corner, this is potentially due the proximity with an electrical pylon in an adjacent field.

## 7 Conclusion

7.1 The gradiometer survey has not identified any anomalies or features of a definitive archaeological nature; however three clusters of linear and discrete anomalies have been identified as being of possible archaeological interest in the northern part of the survey area, and a group of less clearly understood anomalies exists within the southern part of the survey area, again forming a mixture of linear and discrete groupings of positive anomalies. The survey results are dominated by strong positive curvilinear anomalies with a dendritic pattern indicative of former watercourses, in this case interpreted as a former creek and tidal flat landscape. In the southern part of the survey area, this is disrupted by broad swaths of subdued magnetic background which have been tentatively interpreted as a different phase of the paleoenvironment, this time dominated by freshwater channels, which have deposited paleochannel material in these swaths.

7.2 Historical features such as the debris associated with a former railway line and buildings have been identified within the results and corroborated by historic maps, alongside a network of former field boundaries (likely to have been in the form of open field drains); some of the ‘uncertain’ anomalies identified in the results are likely to be parts of the same evolving system of drains, but are not depicted on available historic maps and therefore cannot be corroborated.

7.3 There is little modern disturbance evident in the results, and what is present is limited to the survey margins and has clear sources along boundaries or in the form of adjacent infrastructure.

7.4 In assessing the results of the geophysical survey against the specific aims set out in Section 4;

- The survey has succeeded in locating, recording and characterising surviving sub-surface remains within the Site, though more remains may be present that are not suitable for detection through magnetometry;

- The survey will help in determining the next stage of works as it has provided evidence that remains of an uncertain origin are most likely present on site, and has provided a number of targets for further investigation;
- It is not possible to provide an assessment of the potential significance of the identified remains in a local, regional or national context as it has not been possible to definitively characterise the nature of the anomalies identified through survey alone;
- The survey has resulted in a comprehensive report and archive.

7.5 The geophysical survey has produced good quality gradiometer results which have successfully helped to clarify whether archaeological or uncertain remains are present across the Site. There is a high confidence level that the methodology and survey strategy chosen were appropriate to assess the archaeological potential across the Site.

## 8 Statement of Indemnity

8.1 Although the results and interpretation detailed in this report have been produced as accurately as possible, it should be noted that the conclusions offered are a subjective assessment of collected data sets.

8.2 The success of a geophysical survey in identifying archaeological remains can be heavily influenced by several factors, including geology, seasonality, field conditions and the properties of the features being detected. Therefore, the geophysical interpretation may only reveal certain archaeological features and not produce a complete plan of all the archaeological remains within a survey area.

## 9 Archive Deposition

9.1 In accordance professional standard practice an 'Online Access to the Index of archaeological investigations' ('OASIS') record will be completed for submission to the HER and Archaeological Data Service (ADS) (Appendix 2).

9.2 One digital and hard copy of the report and data will be submitted to the relevant HER at the Client's discretion.

9.3 A digital copy of the report and data will also be submitted to the ADS at the Client's discretion.

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# 11 Plates

Plate 1. Fields 1 and 2 potato crop southeast facing northwest

Plate 2. Field 3 northeast facing south

Plate 3. Field 4 northeast facing southwest

Plate 4. Field 5 west facing east towards the pylons

Plate 5. Field 5 south facing northwest

Plate 6. Field 6 northeast facing southwest

Plate 7. Field 7 north facing south

# 12 Figures

## Appendix 1: Survey Metadata

**Oasis ID: aocarcha1-507196**

| Field | Description |
|---|---|
| Surveying Company | AOC Archaeology |
| Data collection staff | Sacha O'Connor, Alistair Galt, Rhys Martin, Marguerite Hall, Kris Hall |
| Client | Ramboll Ltd |
| Site name | Meerdyke, Walsoken |
| County | Norfolk |
| NGR | TF 50685 10295 |
| Land use/ field condition | Tilled/ploughed |
| Duration | 06/05/2022-15/06/2022 |
| Weather | Overcast/rain/sunny |
| Survey type | Gradiometer Survey |
| Instrumentation | Bartington cart survey: Bartington Non-Magnetic Cart, three Bartington Grad 601-2, Trimble R10 GNSS System |
| Area covered | Approx 75ha |
| Download software | MLGrad601 |
| Processing software | Geomar, MultiGrad601 and TerraSurveyor |
| Visualisation software | ArcGIS Pro |
| Geology | Bedrock: Mudstone of Ampthill clay formation<br>Superficial: Tidal deposits of silt and clay (BGS 2022) |
| Soils | Loamy and clayey soils of coastal flats with naturally high groundwater (Soilscapes 2022) |
| Scheduled Ancient Monument | No |
| Known archaeology on site | None |
| Historical documentation/ mapping on site | None |
| Report title | Meerdyke, Walsoken, Norfolk: Archaeological Geophysical Survey |
| Project number | 40333 |
| Report Author | Sacha O'Connor and Chris Sykes |
| Quality Checked by | Susan Ovenden |

# Appendix 2: Archaeological Prospection Techniques, Instrumentation and Software Utilised

## Bartington Non-Magnetic Cart Instrumentation and Software

AOC Archaeology's cart-based surveys are carried out using a Bartington Non-Magnetic Cart. The cart enables multiple traverses of data to be collected at the same time, increasing the speed at which surveys may be carried out and offers the benefits of reduced random measurement noise and rapid area coverage (Schmidt et al 2015, 60-62, David et al. 2008, 21).

The cart uses a configuration of six Grad-01-1000L sensors mounted upon a carbon fibre frame along with three DL601 dataloggers and one BC601 battery cassette. The sensors are normally positioned at 1m intervals on a horizontal bar, with the datalogger taking readings every 12.5cm along each traverse, though this can be altered to increase / reduce resolution if required. The data is georeferenced via a Trimble R10 Real Time Kinematic (RTK) VRS Now GNSS GPS which streams data throughout survey and allows the data to be recorded relative to a WGS1984 UTM coordinate system.

The gradiometer data is collected through Geomar MLGrad601 software on a laptop in real-time during the survey. The data is downloaded and converted into a .xyz file in Geomar MultiGrad601 before being processed along with the GPS data in TerraSurveyor v3.0.34.10 (see Appendix 4 for a summary of the processes used in Geoplot to create final data plots).

# Appendix 3: Summary of Data Processing

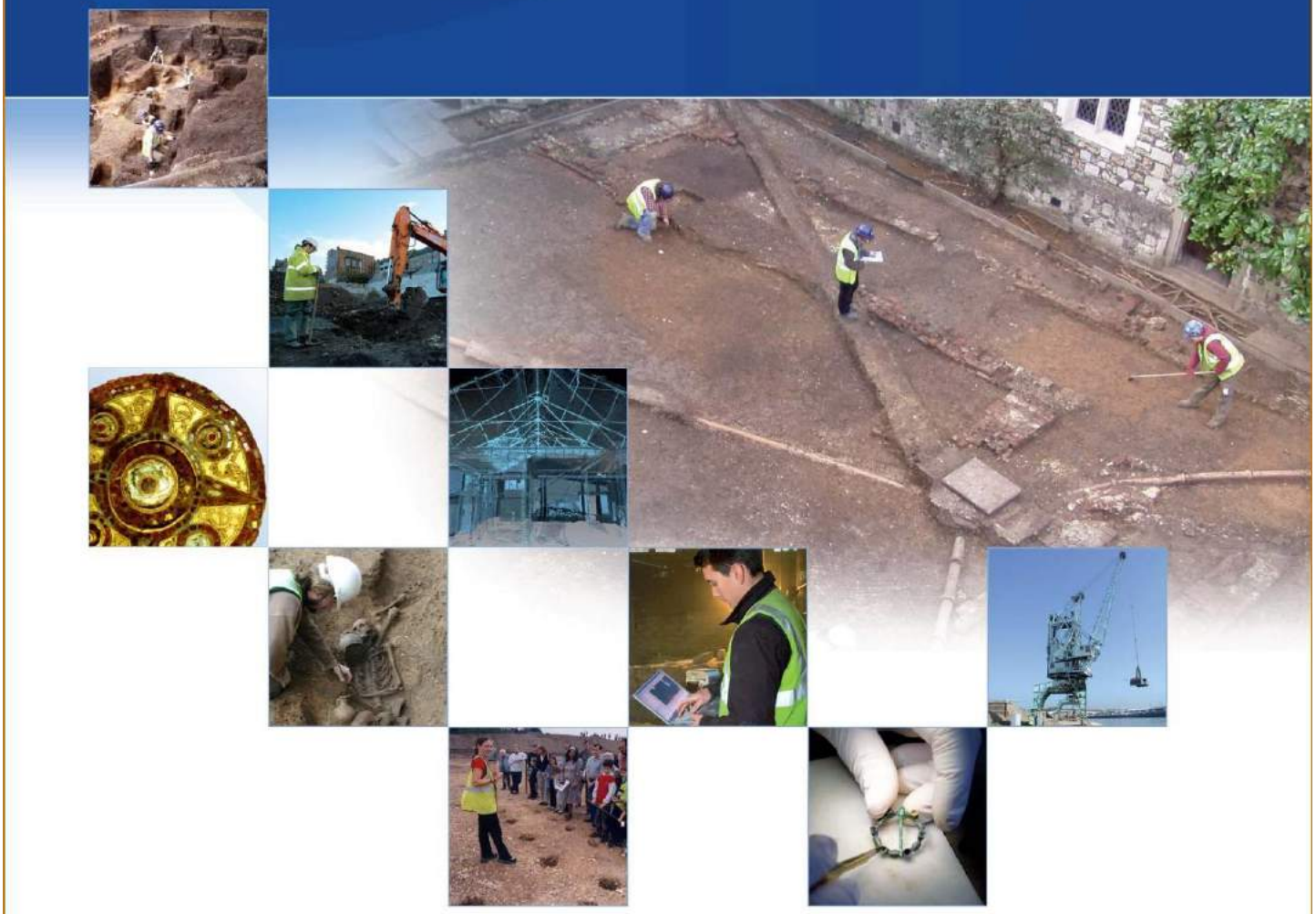
| Process | Effect |
|---|---|
| Clip | Limits data values to within a specified range |
| De-spike | Removes exceptionally high readings in the data that can obscure the visibility of archaeological features. In resistivity survey, these can be caused by poor contact of the mobile probes with the ground. In gradiometer survey, these can be caused by highly magnetic items such as buried ferrous objects. |
| De-stagger | Corrects a misalignment of data when the survey is conducted in a zig-zag traverse pattern. |
| Discard Overlap (TerraSurveyor) | Removes datapoints which occur too closely together and can cause digital artefacts in the data which are caused by the overlapping of parallel traverses. |
| Edge Match | Counteracts edge effects in grid composites by subtracting the difference between mean values in the two lines either side of the grid edge. |
| Filter (MAGNETO) | Much like a zero mean traverse, it resets the median value of each point to zero, in order to address the effect of striping in the data and counteract edge effects. In MAGNETO the individual values take into account the value of all uncorrected points within a certain distance to create its own median. |
| GPS Filter (MAGNETO) | Used to either remove or reduce the appearance of constant and reoccurring features that are not consistent with the GPS signal in use by the cart system. |
| High pass filter | Removes low-frequency, large scale detail in order to remove background trends in the data, such as variations in geology. |
| Interpolate | Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect. |
| Low Pass filter | Uses a Gaussian filter to remove high-frequency, small scale detail, typically for smoothing the data. |
| Periodic Filter | Used to either remove or reduce the appearance of constant and reoccurring features that distort other anomalies, such as plough lines. |
| Remove Turns (TerraSurveyor) | Uses analysis of the direction of travel derived from the GNSS data to break continuous streams of data into individual traverses. |
| Zero Mean Grid | Resets the mean value of each grid to zero, in order to counteract grid edge discontinuities in composite assemblies. |
| Zero Mean Traverse | Resets the mean value of each traverse to zero, in order to address the effect of striping in the data and counteract edge effects. |

## Processing Steps

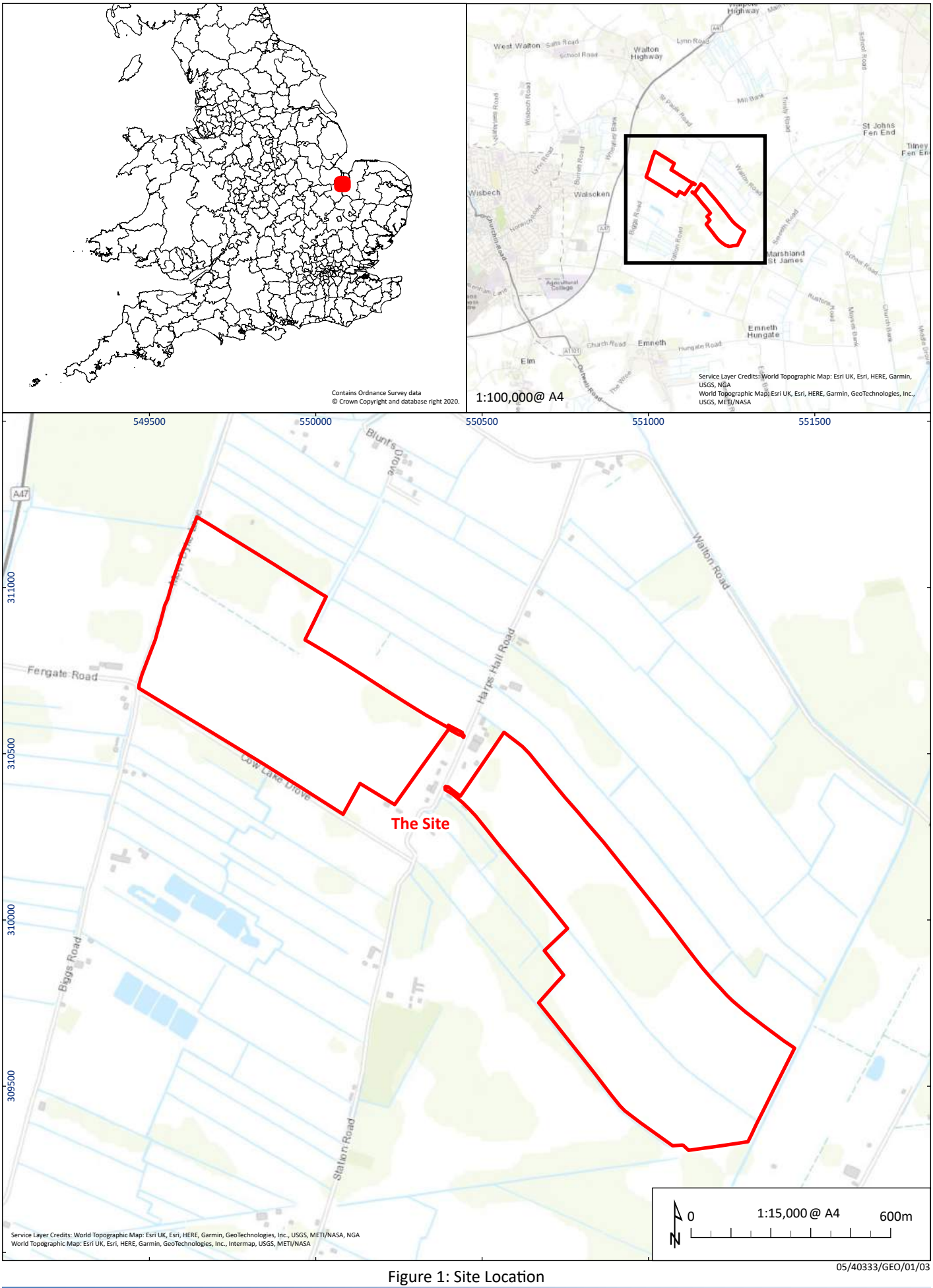
| **Bartington Cart survey** | |
|---|---|
| **Process** | **Extent** |
| Base Settings | Interval 0.121m, Track Radius 1.06m |
| Discard Overlap | Threshold Distance 0.4m, Minimum Track 5, Newest |
| Despike | Mean Diameter 7 Threshold 3 |
| Destripe | Mean Traverse absolute –10 to 10 |
| Clip | -30/30 |

# Appendix 4: Technical Terminology

| Type of Anomaly | Description |
|---|---|
| ***Archaeology*** | *Interpretation is supported by the presence of known archaeological remains or by other forms of evidence such as HER records, LiDAR data or cropmarks identified through aerial photography.* |
| Trend | Linear / curvilinear / rectilinear anomalies either characterised by an increase or decrease in values compared to the magnetic background. |
| Area of enhanced magnetism | A zone of enhanced magnetic responses over a localised area. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly and likely have a relationship with nearby archaeological trends. |
| Pit | An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is pit-like in appearance. |
| ***Possible Archaeology*** | *Trends are likely to have an archaeological origin, however without supporting evidence from known archaeological remains, HER records, LiDAR or aerial photography, they can only be classed as having a possible archaeological origin.* |
| Trend | Linear / curvilinear / rectilinear anomalies either characterised by an increase or decrease in values compared to the magnetic background. |
| Area of enhanced magnetism | A zone of enhanced magnetic responses over a localised area. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly but lacks definitive records to be classed as being archaeological. |
| Pit-like anomaly | An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is pit-like in appearance. |
| Burnt area | An anomaly with a patterning on the XY trace plot that is suggestive of industrial activity such as a kiln or hearth. |
| ***Unclear Origin*** | *Trends are magnetically weak, fractured or isolated and their context is difficult to ascertain. Whilst an archaeological origin is possible, an agricultural, geological or modern origin is also likely.* |
| Trend | Linear / curvilinear / rectilinear anomalies which are composed of a weak or different change in magnetic values. The trends do not appear to form a patterning that is suggestive of archaeological remains, such as enclosures or trackways. |
| Area of enhanced magnetism | A zone of enhanced magnetic responses which lack context for a conclusive interpretation. They do not appear to have a relationship with nearby trends of an archaeological origin. Can often be caused by areas of former woodland, geological variations or agricultural activity. |
| ***Agricultural*** | *Trends associated with agricultural activity, either historical or modern.* |
| Old Field Boundary | These isolated long linear anomalies, most often represented as a negative or fractured magnetic trend, relate to former field boundaries when their positioning is cross referenced with historical mapping. |
| Historical Features | Features observed on historical mapping that correspond with anomalies or trends in the data. Areas of enhanced magnetism could relate to former buildings, trackways, quarries or ponds. |
| Ridge and Furrow / Rig and Furrow | A series of regular linear or curvilinear anomalies either composed of an increased or decreased magnetic response compared to background values. The wide regular spacing between the anomalies is consistent with that of a ridge and furrow / rig and furrow ploughing regime. The anomalies often present as a positive 'ridge' trend adjacent to a negative 'furrow' trend. |
| Ploughing Trends | A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. Anomalies seen parallel to field edges are representative of headlands caused by ploughing. |
| Field Drainage | A series of magnetic linear anomalies of an indeterminate date, usually with a regular or herringbone patterning. |
| ***Non - Archaeology*** | *Trends which are likely to have derived from non-archaeological processes or activities.* |
| Geology / Natural | An area of enhanced magnetism that is composed of irregular weak increases or decreases in magnetic values compared with background readings. It is likely to indicate natural variations in soil composition or reflect variations in the bedrock or superficial geology. |
| Possible Modern Service | Anomalies of a linear form often composed of contrasting high positive and negative dipolar values. Such anomalies usually signify a feature with a high level of magnetisation and are likely to belong to modern activity such as pipes or modern services. |
| Magnetic Disturbance | A zone of highly magnetic disturbance that has been caused by or is a reflection of modern activity, such as metallic boundary fencing, gateways, roads, boreholes, adjacent buildings, rubbish at field edges or a spread of green waste material. |
| Isolated Dipolar Anomalies / Ferrous (iron spikes) and Ferrous Zones | A response caused by ferrous materials on the ground surface or within the subsoil, which causes a 'spike' in the data representing a rapid variation in the magnetic response. These generally represent modern material often re-deposited during manuring. |

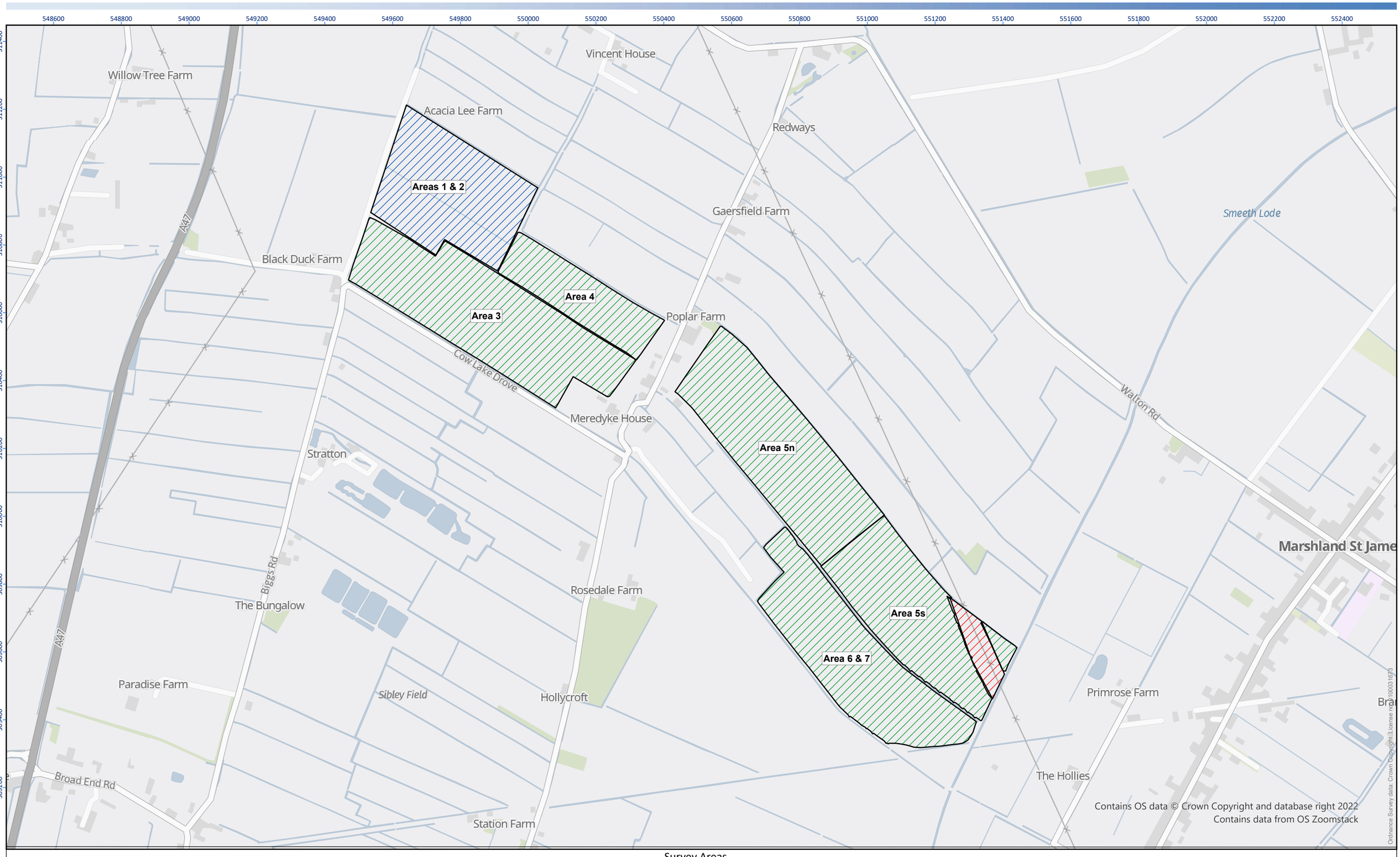


**AOC Archaeology Group** The Lodge, Unit 8, Mortec Park, Leeds, LS15 4TA
tel: **01138 232 853** email: **leeds@aocarchaeology.com**




05/40333/GEO/01/03

Figure 1: Site Location




Survey Areas

Figure 02

- Outstanding
- Surveyed
- Unsuitable

N

0 300m

Scale: 1:10,000 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/02/03 | |
| Created by: KA | Date: 21/09/2022 |
| Checked by: JL | Date: 21/09/2022 |
| Approved by: JL | Date: 21/09/2022 |

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549500 549600 549700 549800 549900 550000 550100 550200 550300 550400

310900 310800 310700 310600 310500 310400

MEER DYKE LANE
COW LAKE DROVE
BIGGS ROAD
HARRIS HALL ROAD

Esri UK, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS

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Processed Magnetic Gradiometer Survey Results - Overview

Figure 3.1

2nT
-1nT

Outstanding
Unsuitable

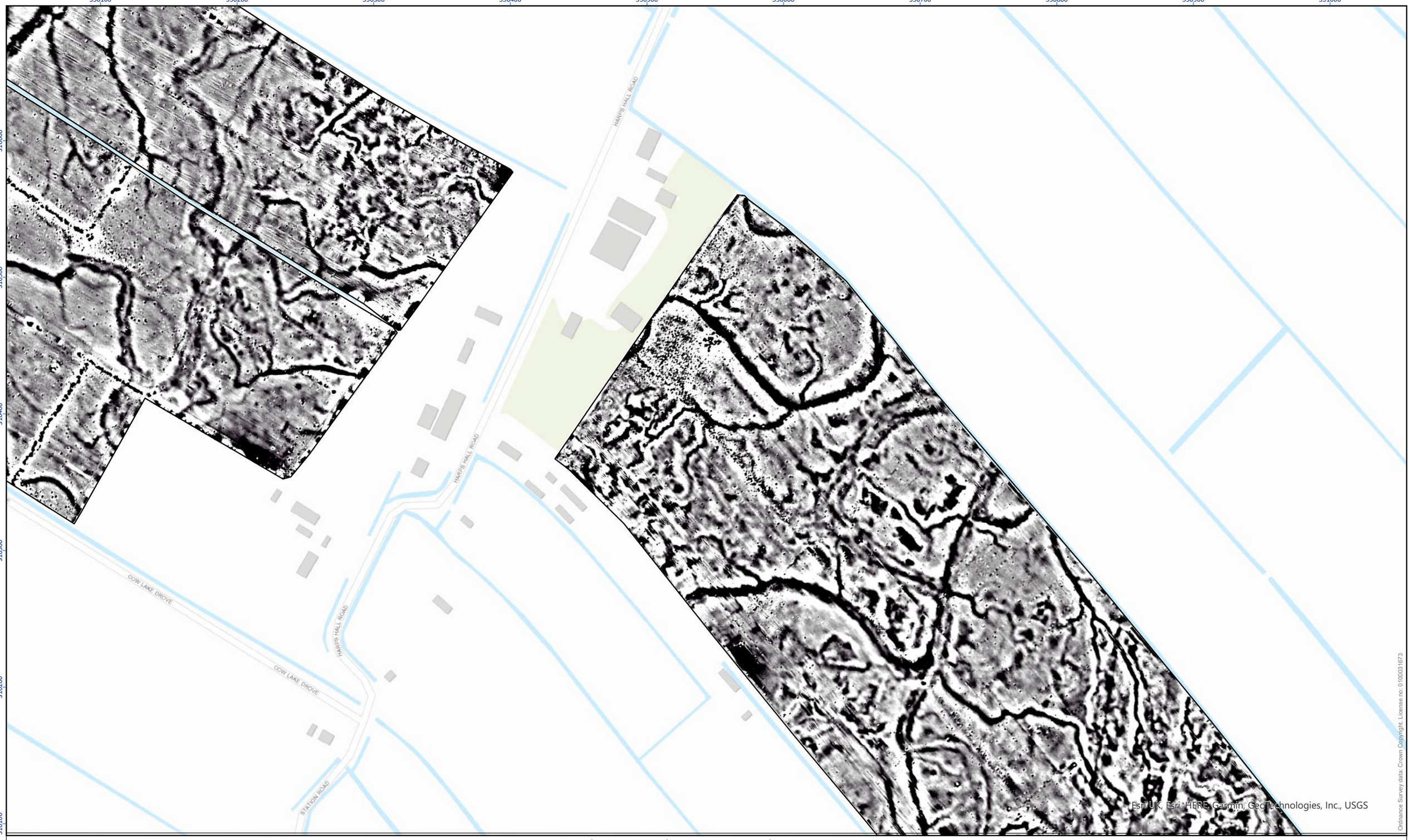
N

0 90m

Scale: 1:2,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.1/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group




Processed Magnetic Gradiometer Survey Results - Overview

Figure 3.2

2nT
-1nT

Outstanding
Unsuitable

N
0
90m
Scale: 1:2,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.2/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

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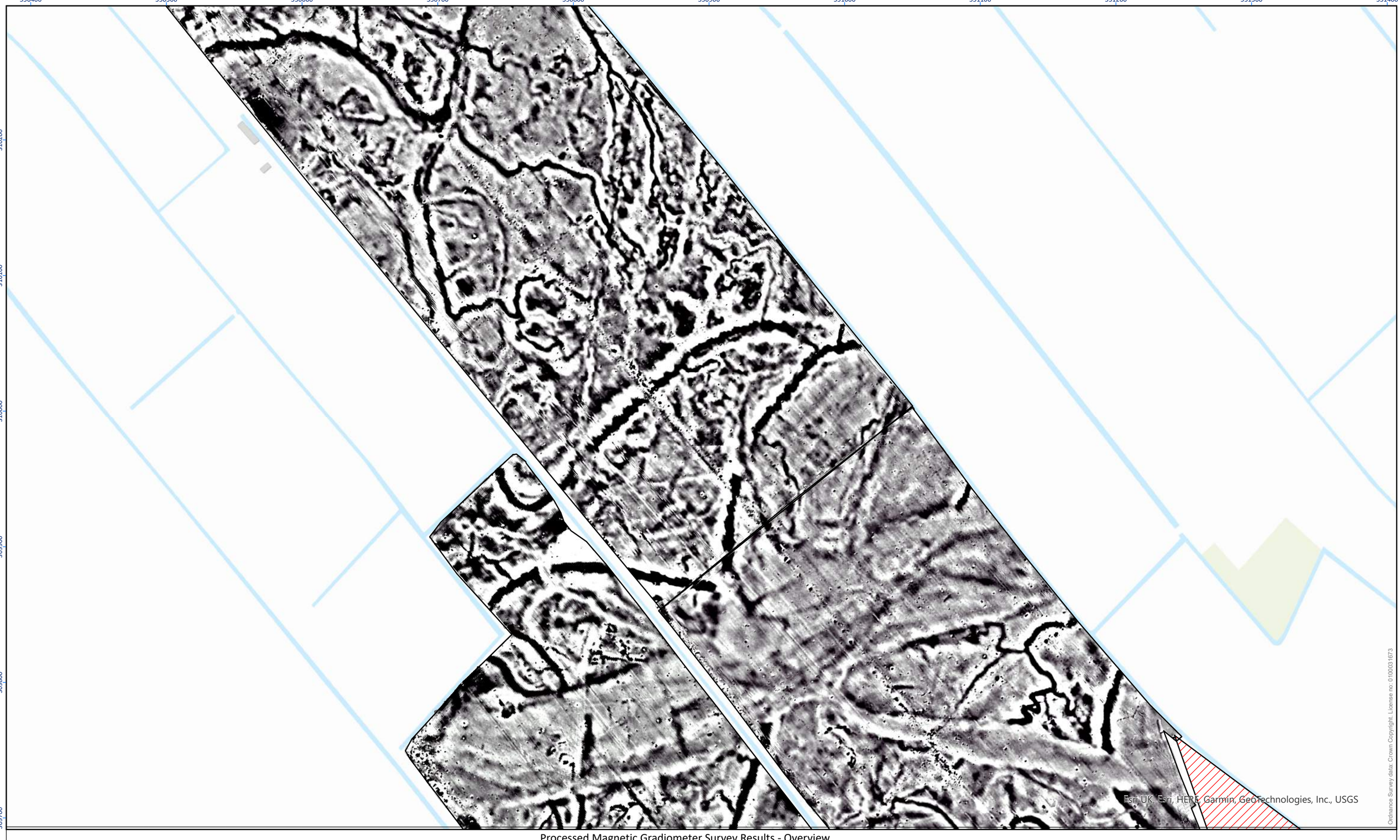


Processed Magnetic Gradiometer Survey Results - Overview

Figure 3.3

2nT
-1nT

Outstanding
Unsuitable

N

0 90m

Scale: 1:2,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.3/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

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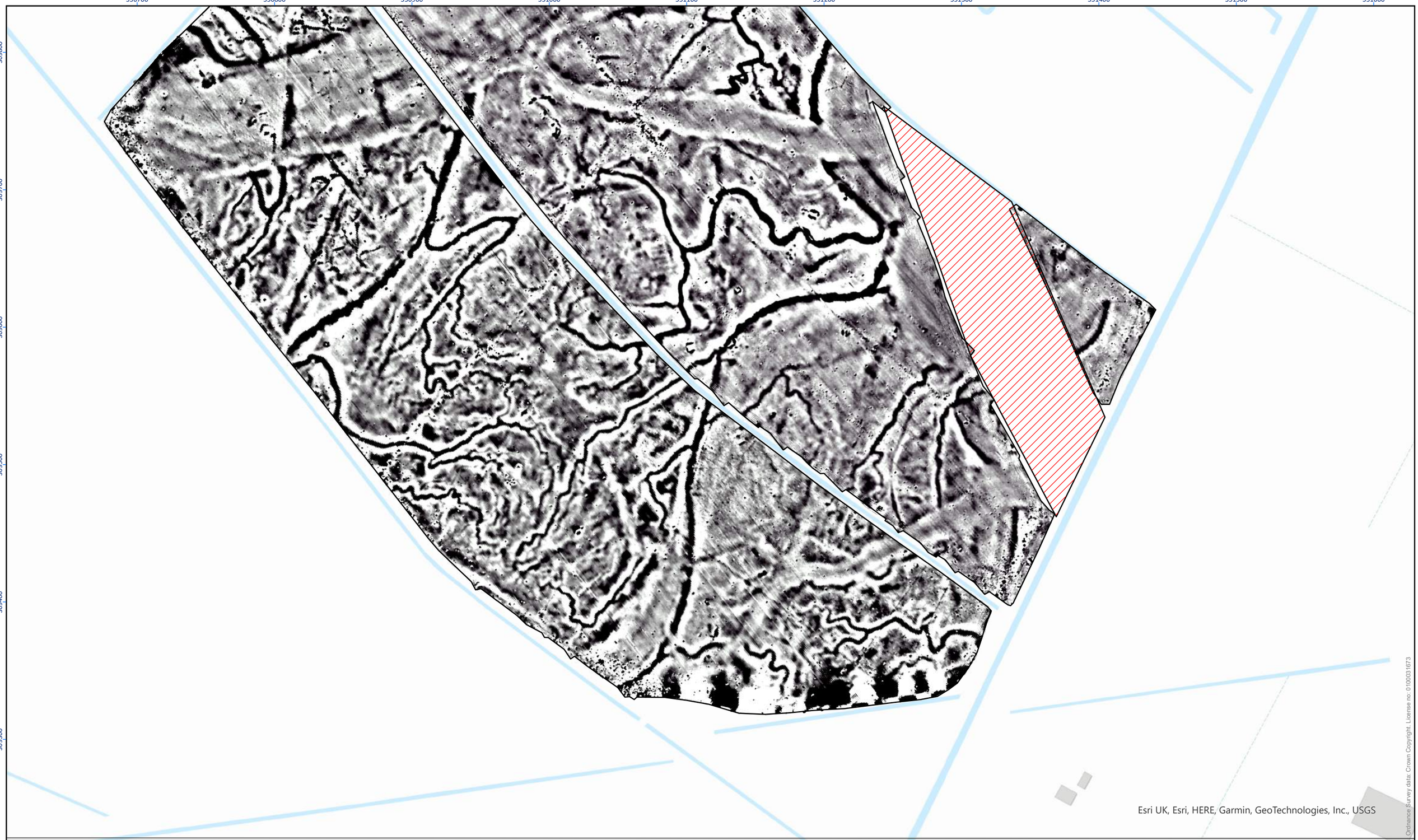


Processed Magnetic Gradiometer Survey Results - Overview

Figure 3.4

2nT
-1nT

Outstanding
Unsuitable

N
0
90m
Scale: 1:2,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.4/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group

549400 549450 549500 549550 549600 549650 549700 549750 549800 549850 549900 549950

310900 310850 310800 310750 310700 310650 310600

MEER DYKE LANE
FENGATE ROAD
COW LAKE DROVE
BIGGS ROAD

Esri UK, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS

Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.5

2nT
-1nT

Outstanding
Unsuitable

N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.5/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group

# MEERDYKE: ARCHAEOLOGICAL GEOPHYSICAL SURVEY

549900 549950 550000 550050 550100 550150 550200 550250 550300 550350 550400 550450

310900 310850 310800 310750 310700 310650 310600 310550





Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.6

2nT

-1nT

Outstanding

Unsuitable

N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.6/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

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549600 549650 549700 549750 549800 549850 549900 549950 550000 550050 550100 550150

310650 310600 310550 310500 310450 310400 310350 310300

COW LAKE DROVE



Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.7

2nT
-1nT

Outstanding
Unsuitable

N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.7/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group

549900 549950 550000 550050 550100 550150 550200 550250 550300 550350 550400 550450

310600 310550 310500 310450 310400 310350 310300

COW LAKE DROVE

HARPS HALL ROAD

Esri UK, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS



Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.8

2nT

-1nT

Outstanding

Unsuitable

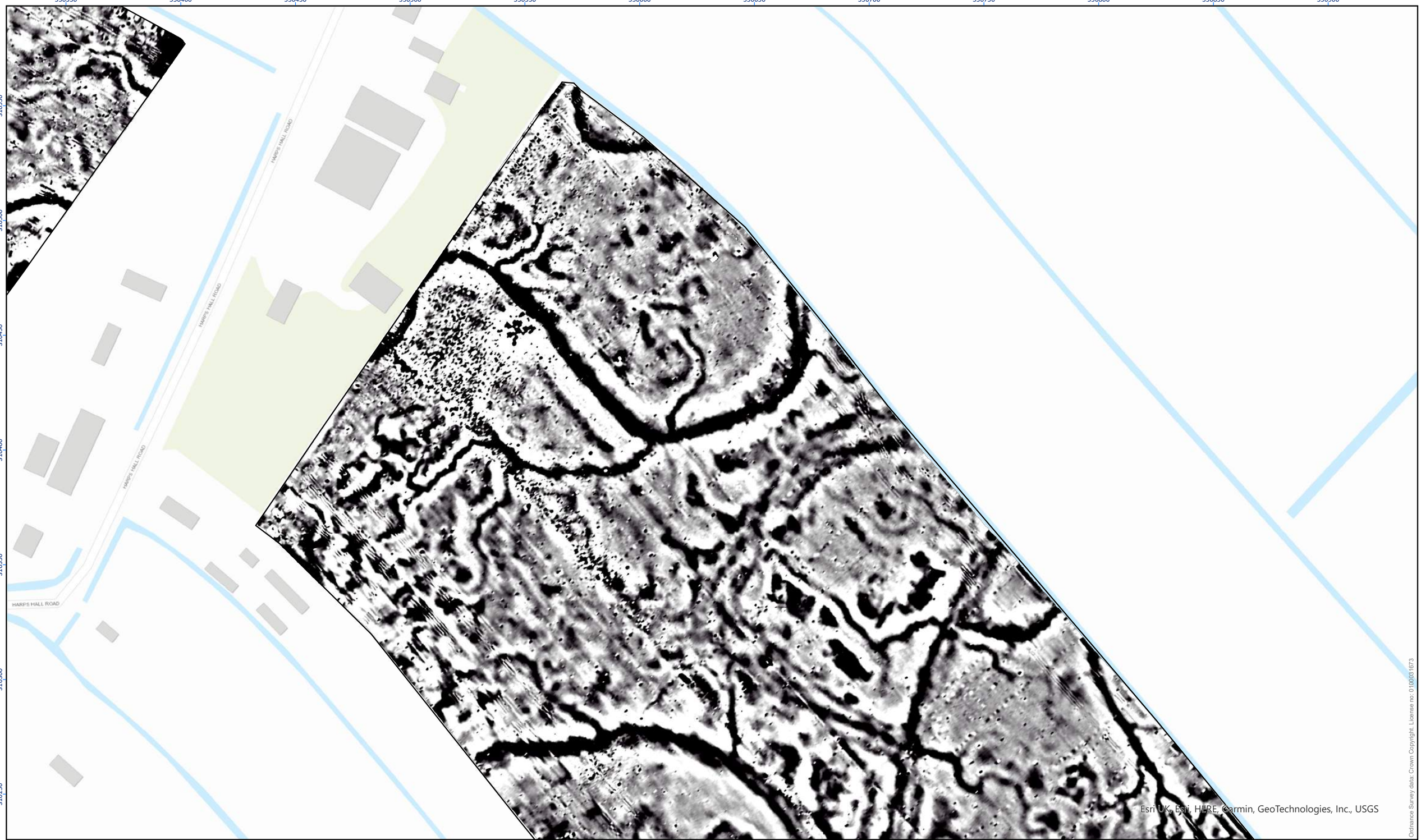
N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.8/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group




Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.9

2nT
-1nT

Outstanding
Unsuitable

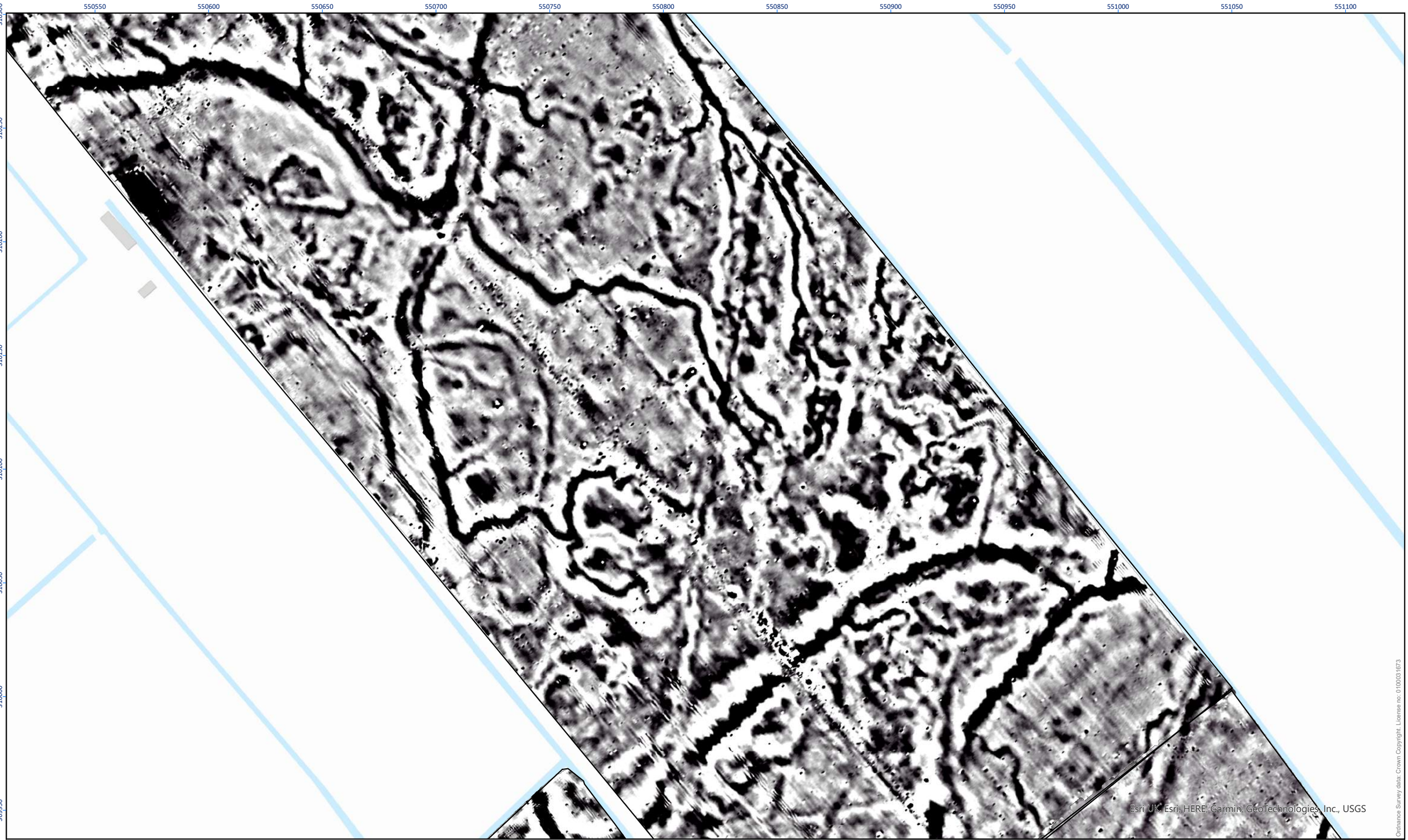
N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.9/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group






Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.10

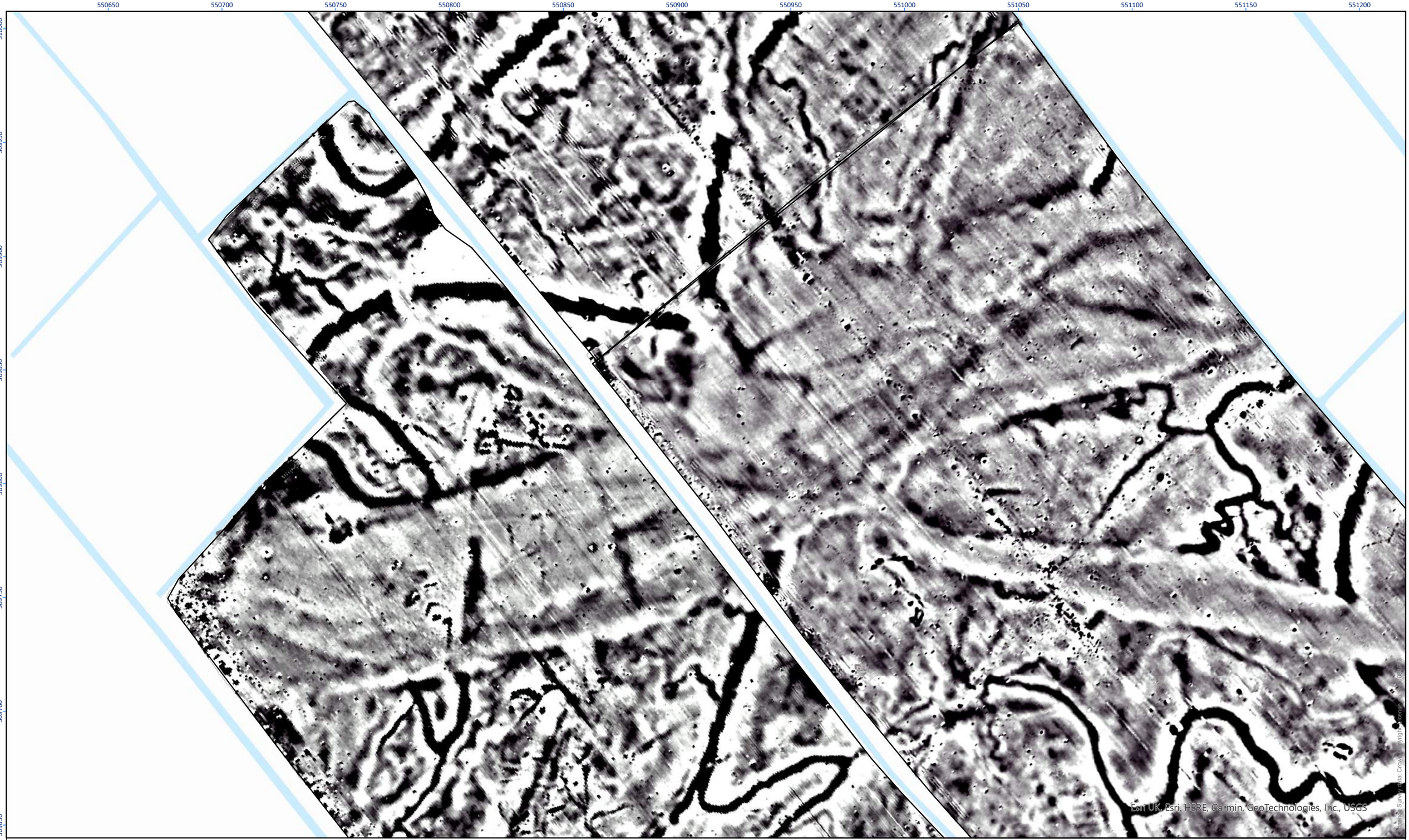
2nT
-1nT

Outstanding
Unsuitable

N
0 30m
Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.10/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group




Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.11

2nT
-1nT

Outstanding
Unsuitable

N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.11/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group

551050 551100 551150 551200 551250 551300 551350 551400 551450 551500 551550 551600

309850 309800 309750 309700 309650 309600 309550

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Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.12

2nT
-1nT

Outstanding
Unsuitable

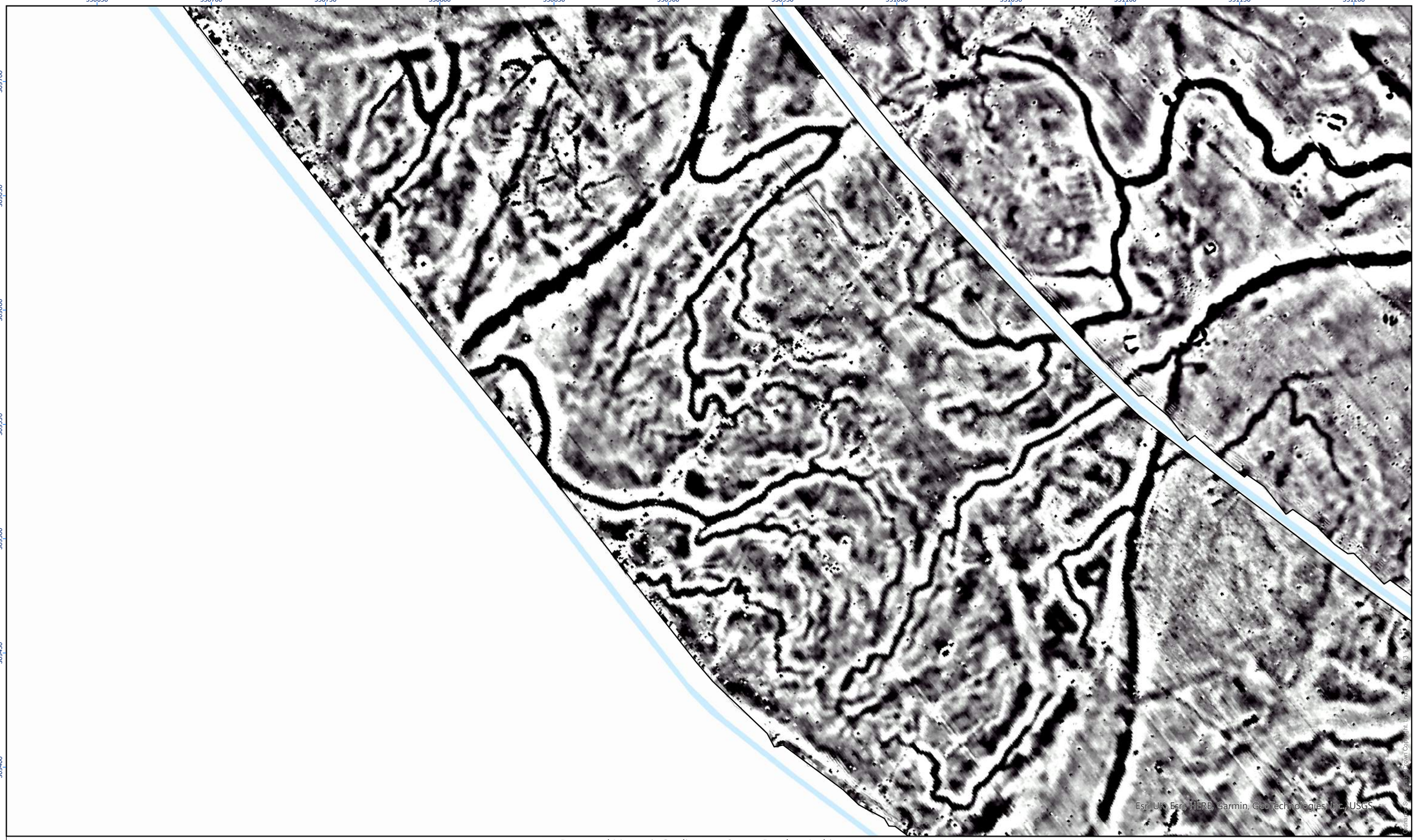
N

0 30m

Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.12/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group




Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.13

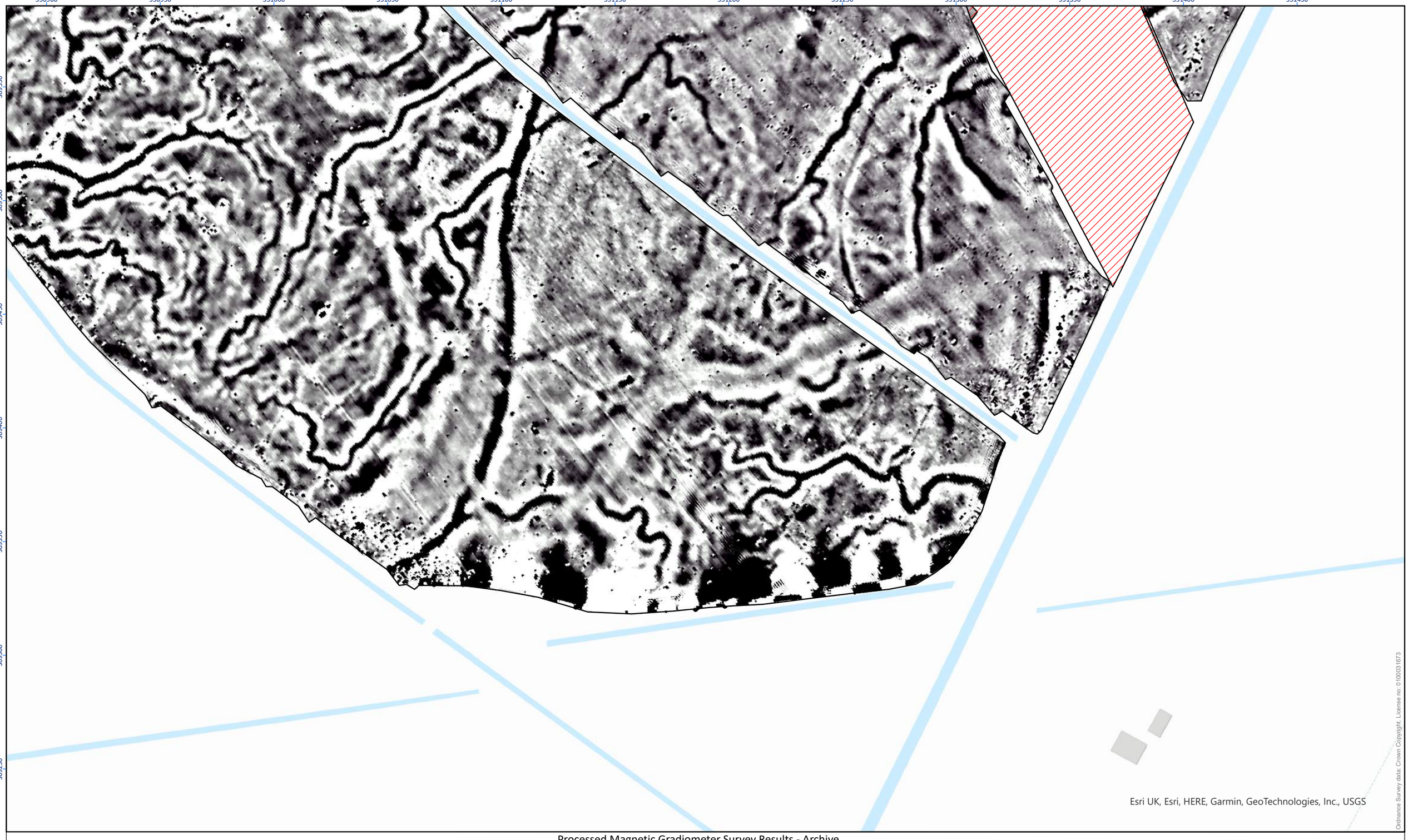
2nT
-1nT

Outstanding
Unsuitable

N
0 30m
Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.13/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group




Processed Magnetic Gradiometer Survey Results - Archive

Figure 3.14

2nT
-1nT

Outstanding
Unsuitable

N
0 30m
Scale: 1:1,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/3.14/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group

549600 549800 550000 550200 550400

310800 310600 310400

3A 3B 3C 3D

Biggs Rd

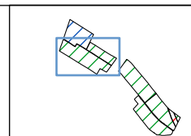
Cow Lake Drove

Cow Lake Drove



Interpretation - Overview

Figure 4.1



- Geology/Natural
- Enhanced Magnetism (Historic Feature)
- Possible Archaeology
- Trend (Historic Feature)
- Trend (Possible Archaeology)
- Trend (Unclear Origin)
- Ferrous/Iron Spike
- Survey Outline

N

0 90m

Scale: 1:2,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/4.1/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group

550200 550400 550600 550800 551000

310600 310400 310200

Poplar Farm

Meredyke House

Cow Lake Drove

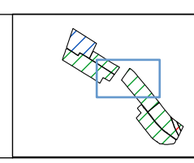
3B

5E 5E 5C 5D 5B 5A 5D 5D



Interpretation - Overview

Figure 4.2



- Geology/Natural
- Enhanced Magnetism (Historic Feature)
- Possible Archaeology
- Enhanced Magnetism (Possible Archaeology)
- Enhanced Magnetism (Unclear Origin)
- Trend (Historic Feature)
- Trend (Unclear Origin)
- Ferrous/Iron Spike
- Survey Outline

N

0 90m

Scale: 1:2,500 @ A3

| | |
|---|---|
| Drawing Number: 05/40333/GEO/4.2/03 | |
| Created by: CS & KA | Date: 16/09/2022 |
| Checked by: SO | Date: 16/09/2022 |
| Approved by: JL | Date: 16/09/2022 |

AOC Archaeology Group