GEOPHYSICAL SURVEY REPORT

STRATASCAN™

SUMO Survey Services

SUMO Group Member

Project name:

Wixams, Bedford

Client:

CgMs Consulting Ltd

May 2015

Job ref:

J8335

Report author:

Thomas Richardson MSc ACIfA

GEOPHYSICAL SURVEY REPORT

Project name:
Wixams, Bedford
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J8335

Field team:
Robert Knight BA (Hons), **Richard Collins** BA (Hons), **Andrew Bateman** BSc (Hons), **Jack Larner**

Techniques:
Detailed magnetic survey – Gradiometry

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Survey date:
20th April - 1st May

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Site centred at:
TL 040 450

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 53 hectares of arable land. The survey at Wixams has identified an area of settlement, likely to be Iron Age or Roman in origin, along with a possibly related road or drove way. A small number of possible archaeological anomalies have been identified across the site, however these could equally be agricultural or natural in origin. The majority of the rest of the site is covered by anomalies relating to modern agricultural activity including former field boundaries, ploughing, land drains and the remains of Elstow Hardwick Farm buildings. The remaining anomalies are natural or modern in origin, relating to underground services, made ground, ferrous objects and fencing.

2 INTRODUCTION

2.1 *Background synopsis*

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by CgMs Consulting Ltd.

2.2 *Site location*

The site is located to the west of Watson Road, Wixams, Bedfordshire at OS ref. TL 040 450.

2.3 *Description of site*

The survey area is approximately 55.5 hectares, however areas of woodland and overgrown vegetation at field boundaries reduced the surveyable area to approximately 53 hectares split over three fields of arable land. The site lies on a gentle east facing slope, with no obstructions.

2.4 *Geology and soils*

The underlying geology is Peterborough Member – Mudstone (British Geological Survey website). The drift geology is Head – Clay, Silt, Sand and Gravel across the majority of the site, with areas on the south-east that have no recorded drift geology (British Geological Survey website).

The overlying soils are known as Evesham 3 which are typical calcareous pelosols. These consist of calcareous clayey soil, and fine loamy over clayey soils (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.5 *Site history and archaeological potential*

Extract from 'Environmental Impact Assessment Wixams Northern Expansion Area, Bedford' (Alliance Planning 2015):

No designated heritage assets would be physically impacted upon by the proposals. However, a Scheduled Monument is recorded within 1km of the Site. The setting of a heritage asset may be a material consideration if it would cause an impact to the overall significance of a heritage asset.

In respect of buried archaeological remains, known potential remains are limited to possible below ground remains of Elstow Hardwick Farm and the sewage disposal buildings of the Elstow Royal Ordnance Factory. Other buried remains cannot be ruled out, in-particular remains dated to the Iron Age/Roman periods, although if present these are likely to be related to agricultural activity rather than settlement activity.

A previous geophysical survey was conducted to the east and south-east of the current site by Stratascan in 1999. A plot of the minimally processed data and the original interpretations of the data in close proximity to the current site (Area 12) are shown on Figures 11 and 12. The results text from the 1999 report is as follows:

Most of Area 12 is covered by ridge and furrow running in a north westerly direction and which terminates in a headland crossing the middle of the site.

In the eastern corner of the site is an area of intense magnetic activity with clearly defined edges. This is likely to be a dump of modern debris.

What may be of interest is a scatter of weaker magnetic anomalies towards the south of the site. Within the area are two, possibly three, anomalies which may be kiln sites. It is recommended that this area is investigated further to clarify whether these are archaeological features or more modern debris.

2.6 *Survey objectives*

The objective of the survey was to locate any features of possible archaeological origin in order that they may be assessed prior to development.

2.7 *Survey methods*

This report and all fieldwork have been conducted in accordance with both the English Heritage guidelines outlined in the document: *Geophysical Survey in Archaeological Field Evaluation, 2008* and with the Chartered Institute for Archaeologists document *Standard and Guidance for Archaeological Geophysical Survey.*

Given the potential for Iron Age and Roman activity, as well as the effective previous survey in close proximity, detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in Appendix A.

2.8 Processing, presentation and interpretation of results

2.8.1 Processing

Processing is performed using specialist software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all manually collected minimally processed gradiometer data used in this report:

1. *Destripe* (Removes striping effects caused by zero-point discrepancies between different sensors and walking directions)
2. *Destagger* (Removes zigzag effects caused by inconsistent walking speeds on sloping, uneven or overgrown terrain)

Data collected by cart has the following processes applied:

1. *Zero Median Traverse* (This process sets the background median of each traverse to zero. Limits are applied to reduce the effect of extreme readings which can skew the statistics. The operation minimises the differences between adjacent sensors)
2. *Projection* (Greyscale images require data to be sampled at regular intervals on each traverse. Due to the high precision of the RTK GNSS on the CartEasy^{N} magnetometer cart small velocity & traverse separation variations result in an irregular sampling interval. Projection involves converting WGS84 coordinates to OSGB36 and re-sampling the collected data at regular intervals during the post processing stage.)

2.8.2 Presentation of results and interpretation

The presentation of the data for each site involves a print-out of the minimally processed data both as a greyscale plot and a colour plot showing extreme magnetic values. Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site.

3 RESULTS

The detailed magnetic gradiometer survey conducted at Wixams has identified a number of anomalies that have been characterised as being either of a *probable* or *possible* archaeological origin.

The difference between *probable* and *possible* archaeological origin is a confidence rating. Features identified within the dataset that form recognisable archaeological patterns or seem to be related to a deliberate historical act have been interpreted as being of a probable archaeological origin.

Features of possible archaeological origin tend to be more amorphous anomalies which may have similar magnetic attributes in terms of strength or polarity but are difficult to classify as being archaeological or natural.

The following list of numbered anomalies refers to numerical labels on the interpretation plots.

3.1 Probable Archaeology

1 Linear and curvilinear positive anomalies in the north-west of the site. These are indicative of former cut features related to archaeological settlement activity.

2 Small discrete positive anomalies in the north-west of the site. These are indicative of small former cut features, such as backfilled pits, and are likely to be related to the settlement activity seen in Anomaly 1.

3 Two parallel linear anomalies, approximately 14m, apart that deviate at their western end. These are indicative of former cut features and may relate to a former road or drove way. It is not clear whether this is related to the settlement activity seen in Anomalies 1 and 2.

3.2 Possible Archaeology

4 A small number of positive linear anomalies across the site. These are indicative of former cut features, and may be of archaeological or agricultural origin.

5 A number of small discrete positive anomalies across the site. These are indicative of small former cut features, such as backfilled pits, and may be of archaeological or natural origin.

3.3 *Medieval/Post-Medieval Agriculture*

6-8 Linear anomalies in the north and centre of the site related to former field boundaries present on available mapping. Anomaly 6 is present 1883-1975, Anomaly 7 is present 1883-1990, whilst Anomaly 8 is present 1901-1960.

9 Closely spaced parallel linear anomalies across the majority of the site. This is indicative of modern agricultural activity, such as ploughing.

3.4 *Other Anomalies*

10 High amplitude bipolar linear anomalies in the north and west of the site. These are indicative of modern underground services.

11 Weak bipolar linear anomalies across much of the site. These are indicative of land drains.

12-13 An area of magnetic disturbance (Anomaly 12) and strong magnetic debris possibly relating to made ground (Anomaly 13). These are related to the former Elstow Hardwick Farm buildings present on available mapping 1883-1972.

14 Areas of high amplitude dipolar responses in the centre of the site. These are indicative of modern made ground.

15 Large areas of magnetic variation across the site. These anomalies are likely to be geological or pedological in origin.

16 A positive anomaly in the south of the site. This is an artefact created by processing of the data.

17 Areas of magnetic disturbance are the result of substantial nearby ferrous metal objects such as fences and underground services. These effects can mask weaker archaeological anomalies, but on this site have not affected a significant proportion of the area.

18 A number of magnetic ‘spikes’ (strong focussed values with associated antipolar response) indicate ferrous metal objects. These are likely to be modern rubbish.

4 DATA APPRAISAL & CONFIDENCE ASSESSMENT

The previous survey in the area (Stratascan 1999) shows that the geology across the site is suitable for magnetic survey. This is evidenced by the detection of a number of archaeological features and agricultural activity across the site. It can therefore be stated that the survey has been effective in identifying any archaeological anomalies on the site.

5 CONCLUSION

The survey at Wixams has identified a number of anomalies of probable and possible archaeological origin. An area of settlement has been detected in the north-west of the area, along with a possibly related road or drove way. Given the information provided by the environmental impact assessment, the settlement is likely to be Iron Age or Roman in origin. The archaeological activity appears to be confined to the north-west of the site, with the exception of the possible road or drove way. A small number of possible archaeological anomalies have been identified across the site, however these could equally be agricultural or natural in origin.

The majority of the rest of the site is covered by anomalies relating to modern agricultural activity including former field boundaries, ploughing, land drains and the remains of Elstow Hardwick Farm buildings. The remaining anomalies are natural or modern in origin, relating to underground services, made ground, ferrous objects and fencing.

6 REFERENCES

Alliance Planning, 2015. *Environmental Impact Assessment Wixams Northern Expansion Area, Bedford*

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British Geological Survey, 2001. *Geological Survey Ten Mile Map, South Sheet, Fourth Edition (Solid)*. British Geological Society.

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Stratascan, 1999. *J1348 Geophysical Survey Carried out at Elstow Storage Depot*

APPENDIX A – METHODOLOGY & SURVEY EQUIPMENT

Grid locations

For the manually collected data the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site or a Leica Smart Rover RTK GPS.

For the cart collected data all survey data points had their position recorded using Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS equipment. The geophysical survey area is georeferenced relative to the Ordnance Survey National Grid.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. A SmartNet RTK GPS uses Ordnance Survey's network of over 100 fixed base stations to give an accuracy of around 0.01m.

Survey equipment and gradiometer configuration

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTeslas (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The manually collected magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

The cart collected survey was carried out using a CartEasyN magnetometer cart system utilizing Bartington 1000L Gradiometer sensors. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.

Sampling interval

For the manually collected data readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

For the cart collected data readings were taken at intervals of 0.125m along traverses 0.75m apart.

Depth of scan and resolution

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m, though strongly magnetic objects may be visible at greater depths. The collection of data at 0.25m centres provides an optimum methodology for the task balancing cost and time with resolution.

Data capture

The readings are logged consecutively into the data logger which in turn is daily down- loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

APPENDIX B – BASIC PRINCIPLES OF MAGNETIC SURVEY

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

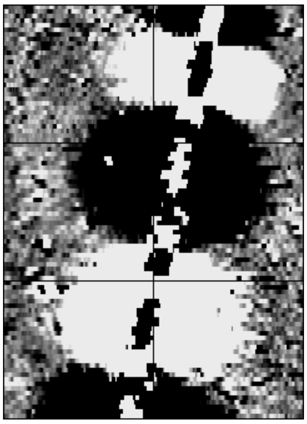
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

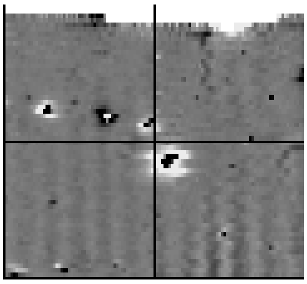
APPENDIX C – GLOSSARY OF MAGNETIC ANOMALIES

Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

Dipolar

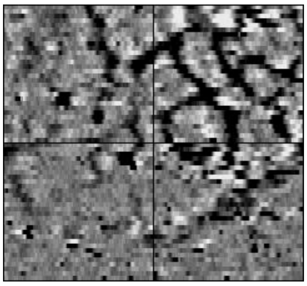


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

Positive anomaly with associated negative response

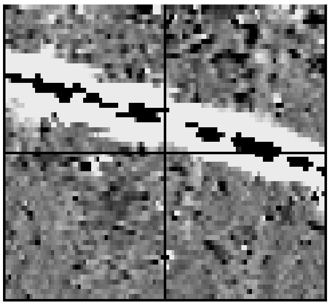
See bipolar and dipolar.

Positive linear



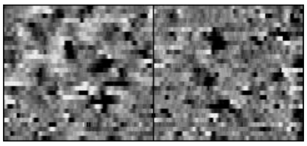
A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

Positive linear anomaly with associated negative response



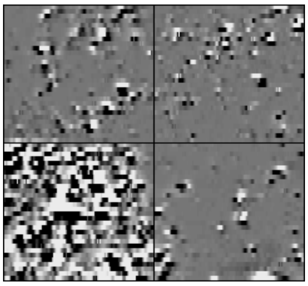
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

Positive point/area



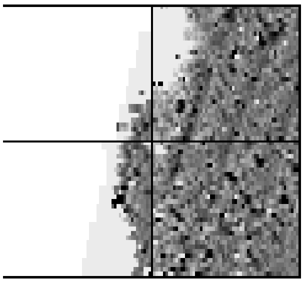
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

Magnetic debris



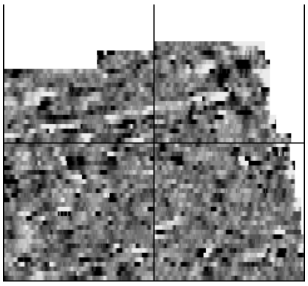
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low (+/-3nT) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly (+/-250nT) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremanent material such as bricks or ash.

Magnetic disturbance



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

Negative linear

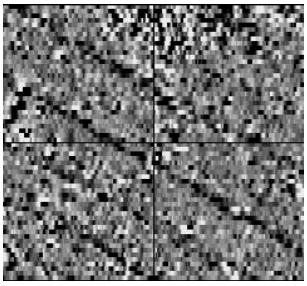


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative to the background top soil is built up. See also ploughing activity.

Negative point/area

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

Ploughing activity



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing. Clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

Polarity

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

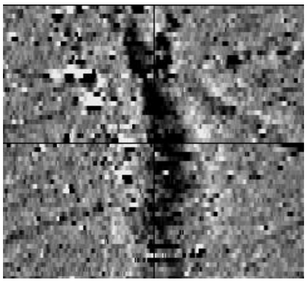
Strength of response

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a 10m^2 area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Colour plots are used to show the amplitude of response.

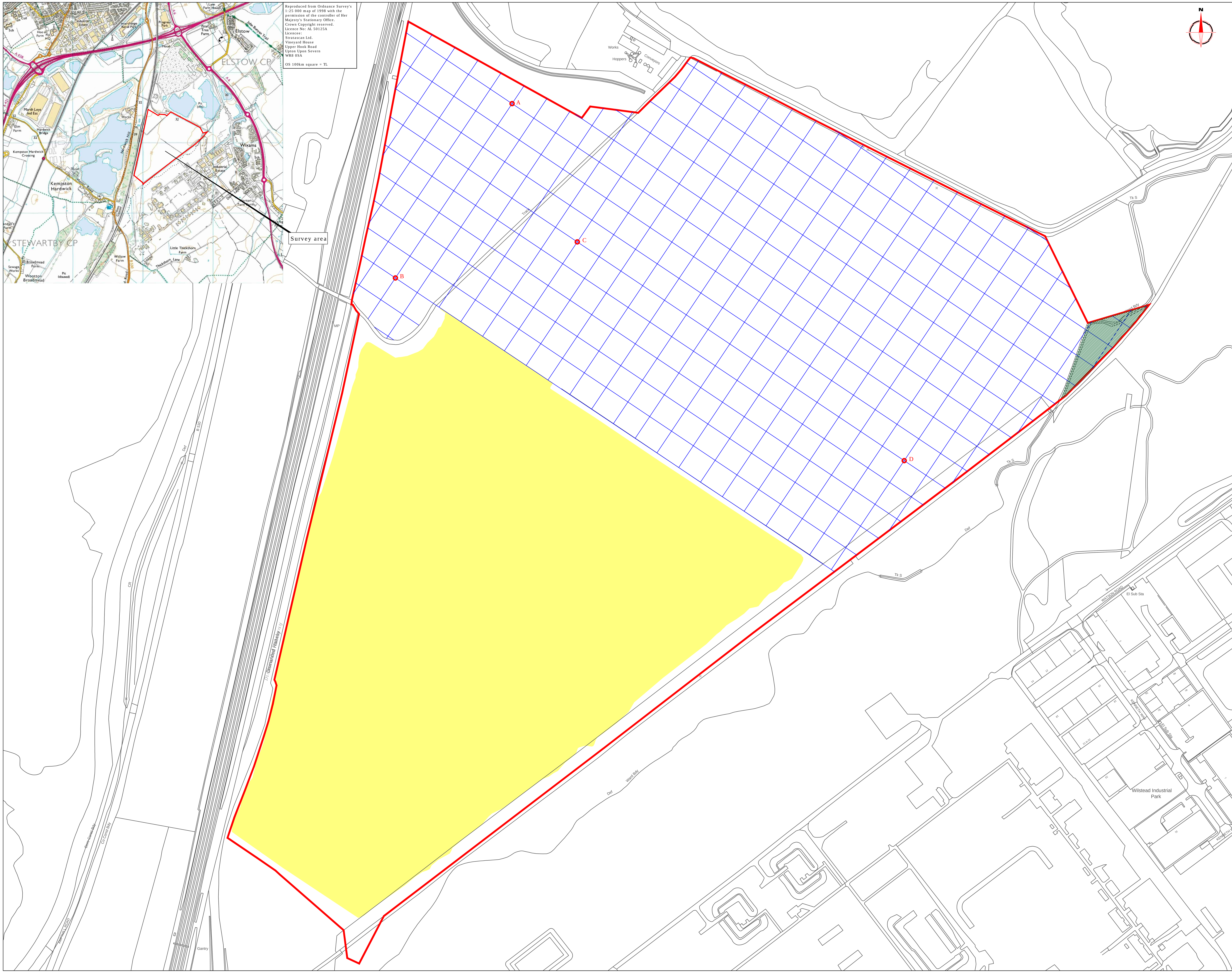
Thermoremanent response

A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately +/-100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred in situ (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

Weak background variations



Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Survey area

Site centred on NGR TL 040 450

KEY

- Grids collected manually
- Area collected by cart
- Area unsurveyable - woodland

OS REFERENCING INFORMATION

A	504194.72, 245379.45
B	504061.24, 245179.99
C	504269.33, 245221.23
D	504643.32, 244970.96

Job No.	Survey Date
J8335	APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

SITE LOCATION, SURVEY AREA & REFERENCING

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
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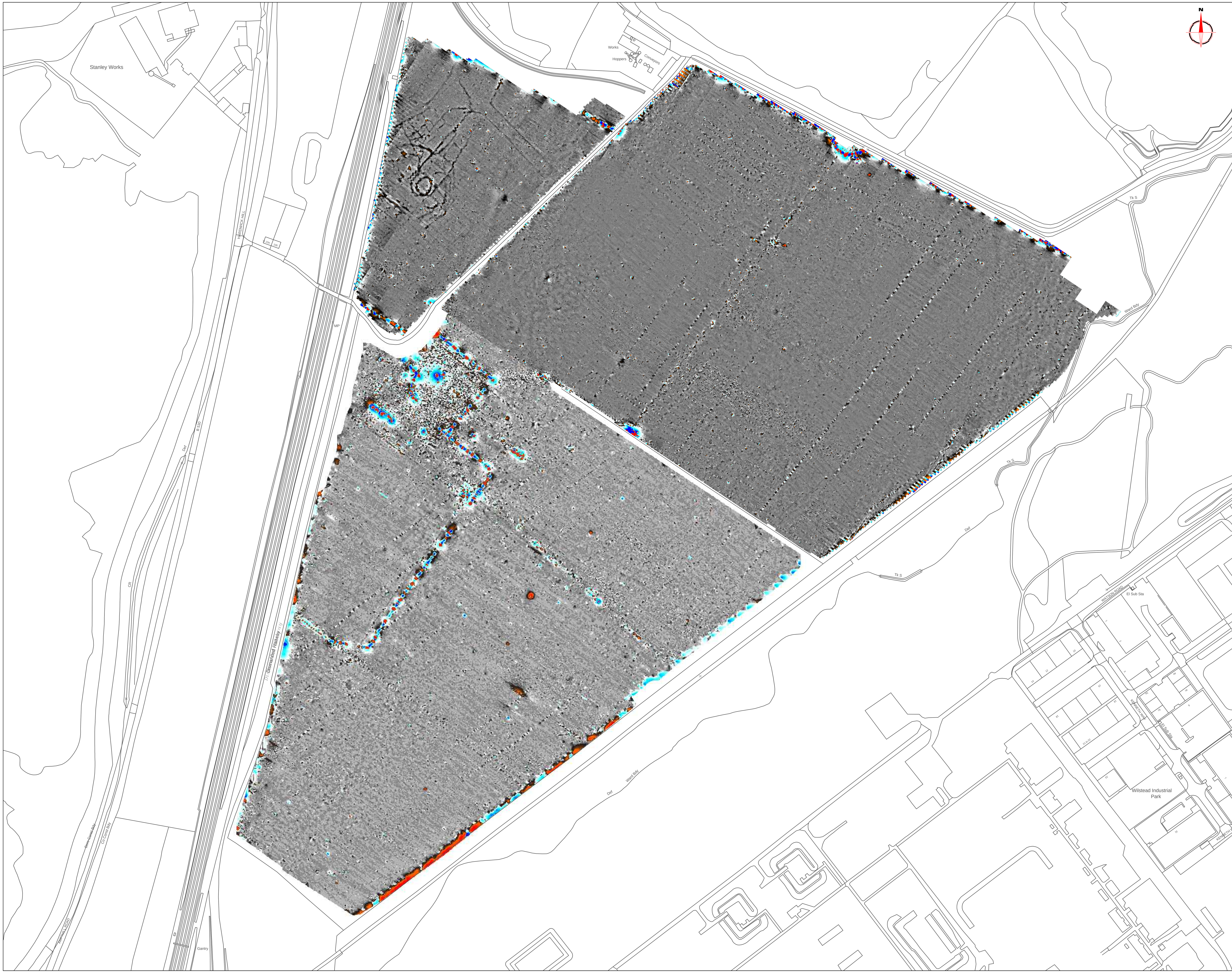
www.stratascan.co.uk

Scale 1:2000 (0m 20 40 60 80 100 120m)

Plot	Checked by	Issue No.
A1	PPB	01

Date	Drawn by	Figure No.
MAY 15	TR	01



Issue No.	Date	Description
-	-	-
-	-	-

Amendments

Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No. J8335

Survey Date APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - OVERVIEW

STRATASCAN™
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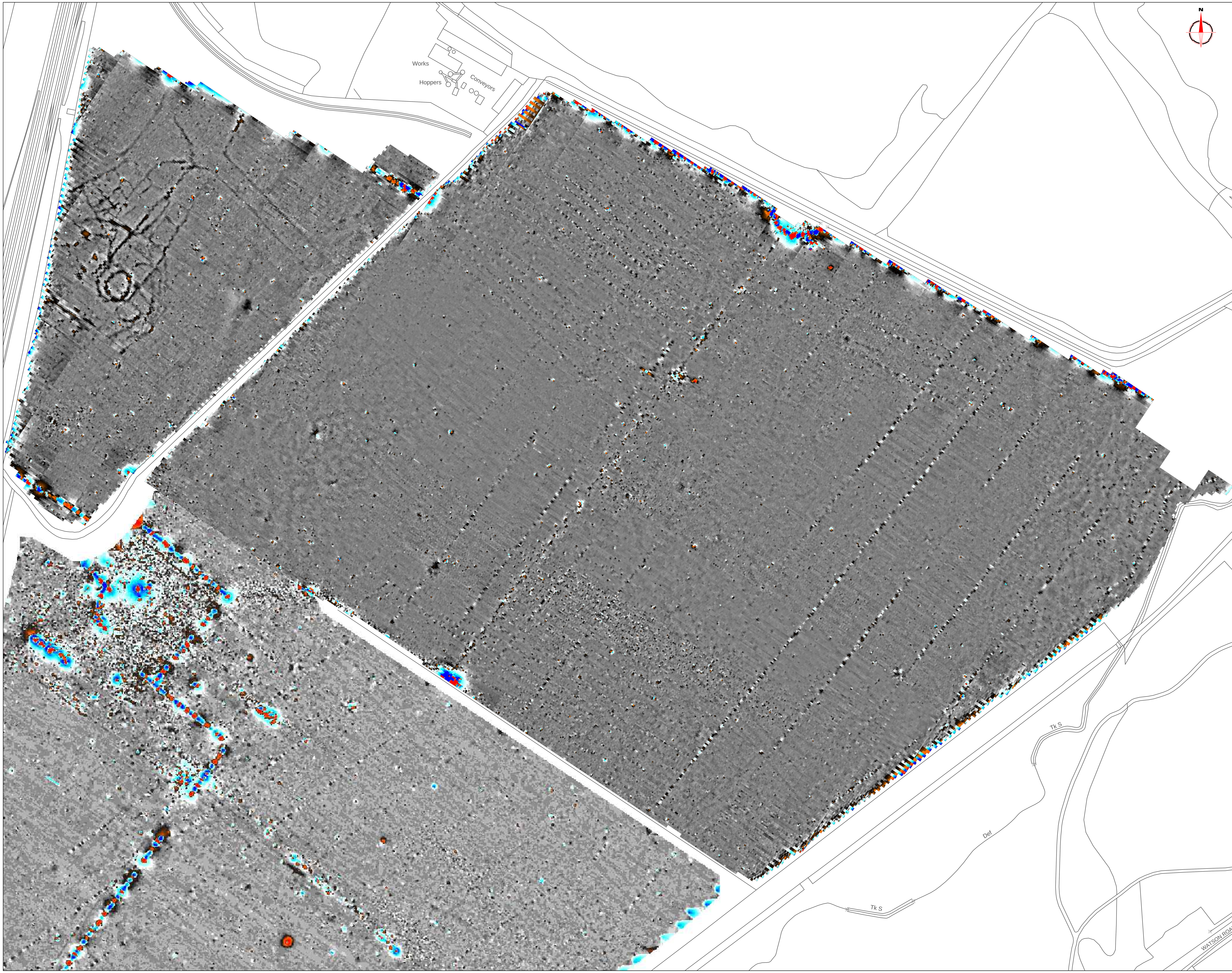
SUMO GROUP MEMBER

Scale 1:2000

0m 20 40 60 80 100 120m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	02



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8335	APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - NORTH

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING

VINEYARD HOUSE
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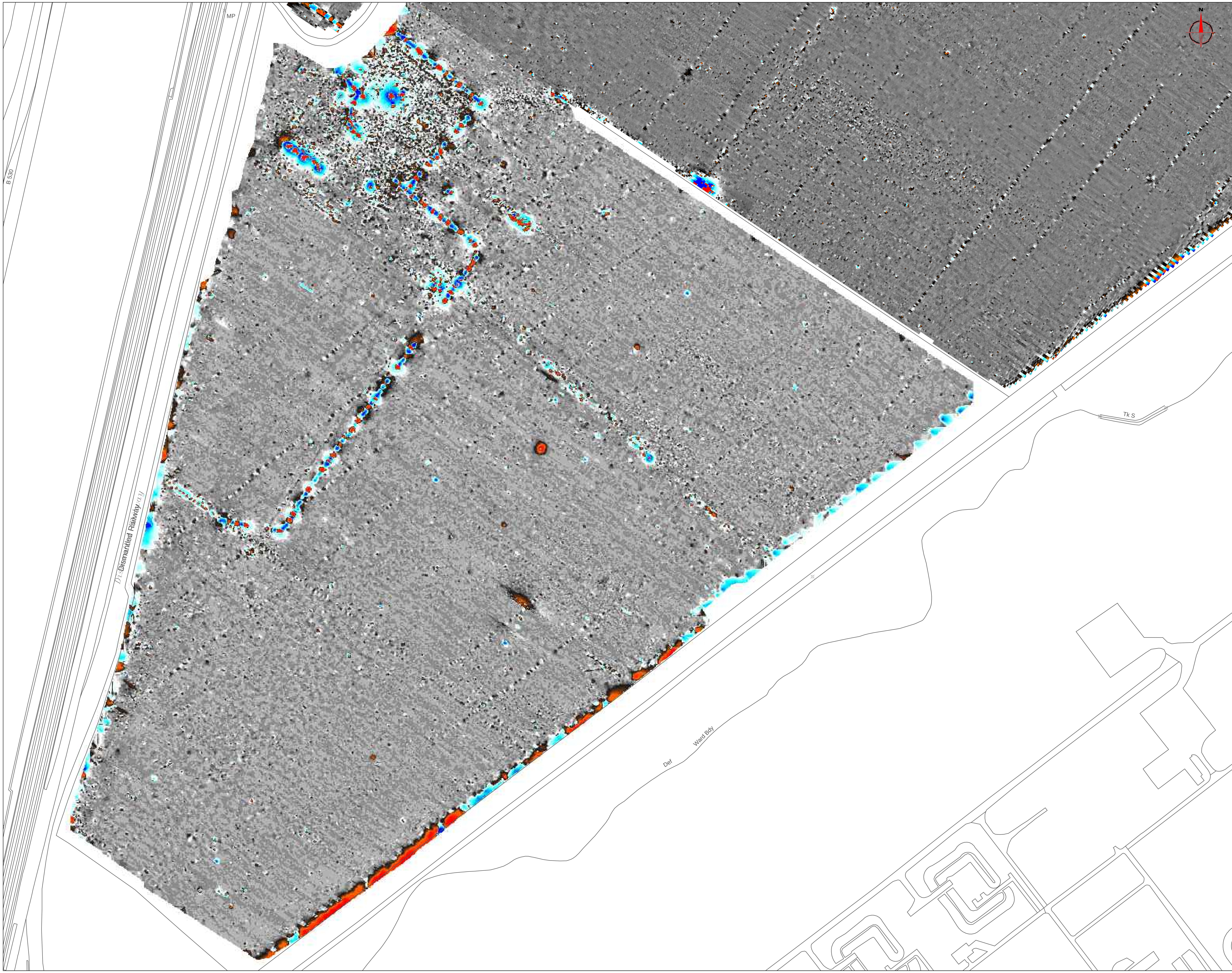
Scale 1:1250 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	03



Amendments		
Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8335	APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - SOUTH

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Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	04

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)

Zero Mean

-2nT +2nT

+2nT
-2nT

Job No.	Survey Date
J8335	APRIL 15

Client
CgMs CONSULTING LTD

Project Title
WIXAMS, BEDFORD

Subject
PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - OVERVIEW

STRATASCAN™
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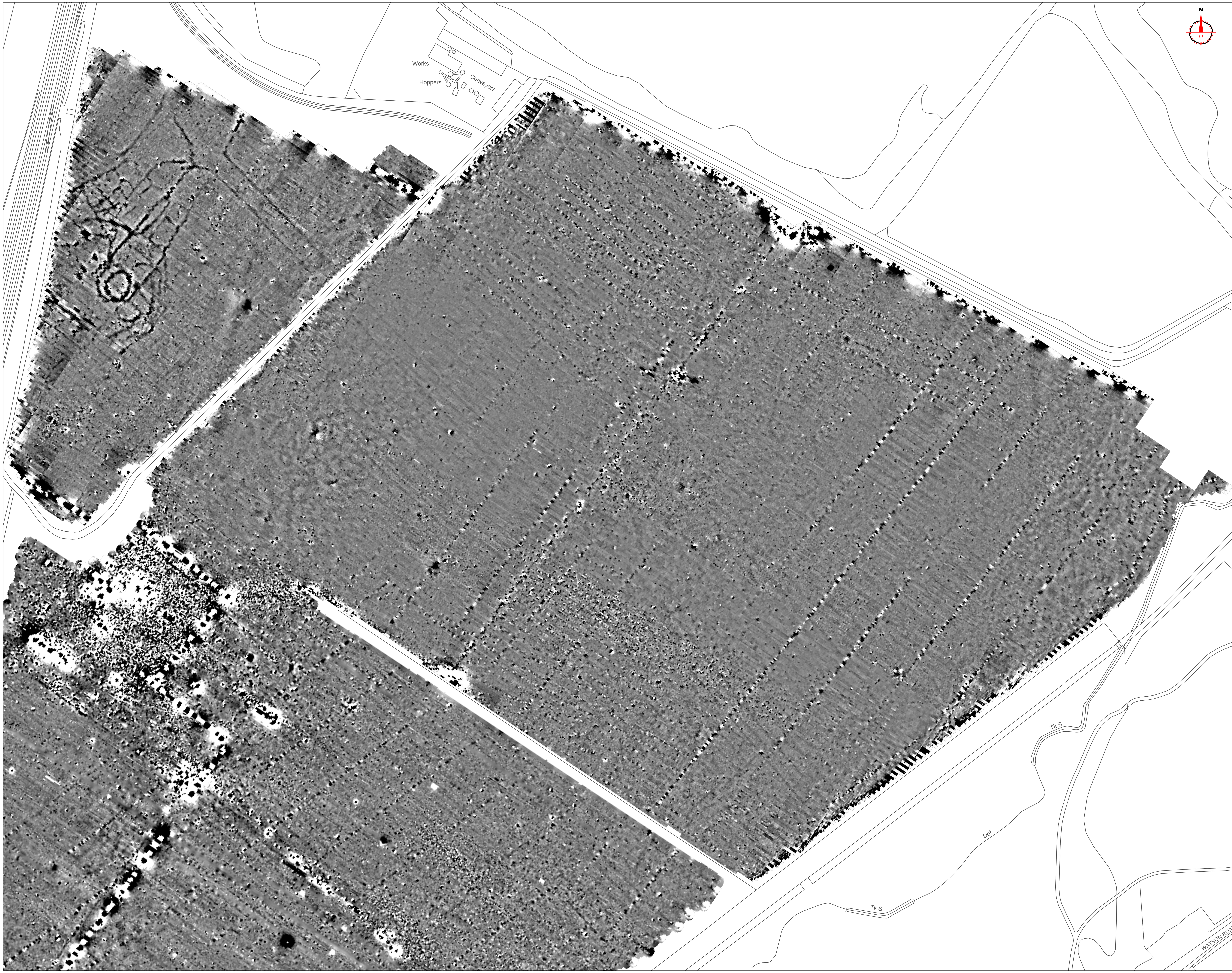
Scale 1:2000 — 0m 20 40 60 80 100 120m

Plot	Checked by	Issue No.
A1	PPB	01

Date	Drawn by	Figure No.
MAY 15	TR	05

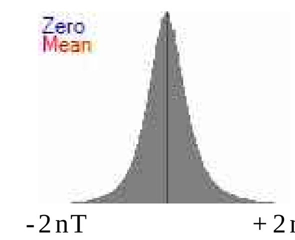


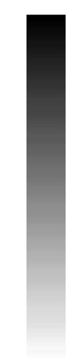
Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)





Job No.	Survey Date
J8335	APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - NORTH

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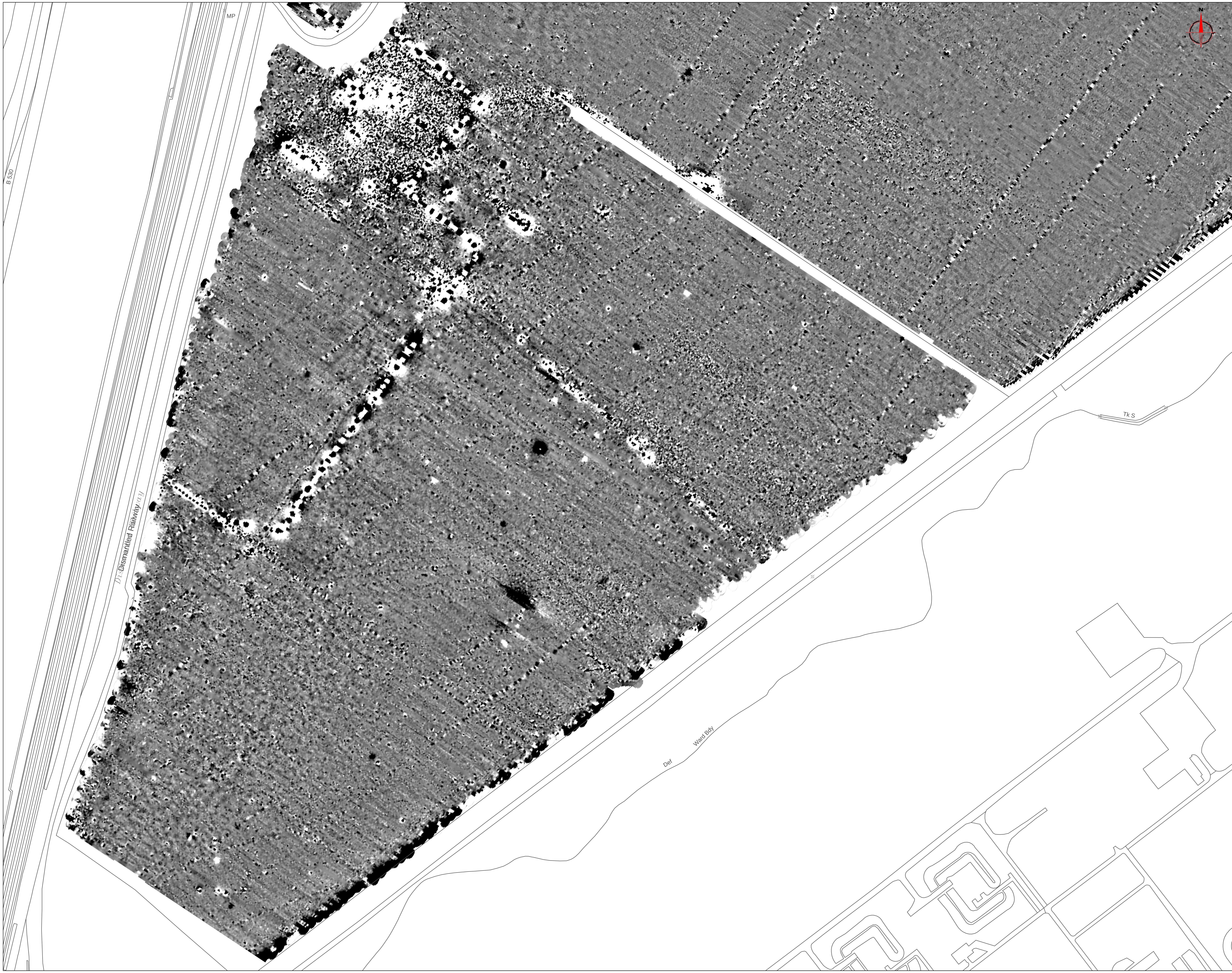
SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	06

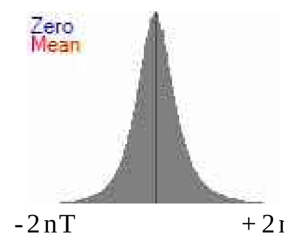


Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



+2nT
-2nT

Job No. J8335

Survey Date APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - SOUTH

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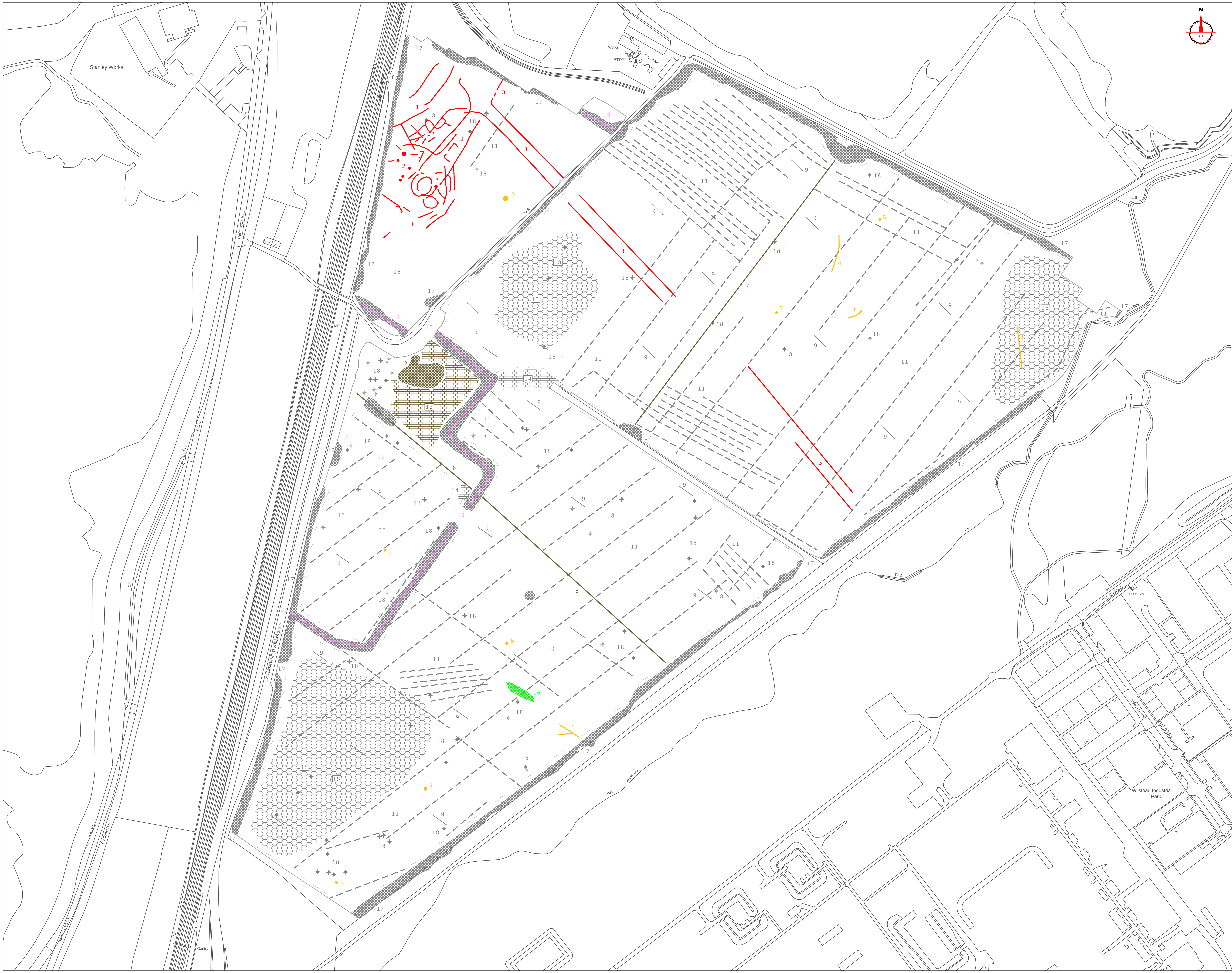
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	07



Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with former farm buildings present on available mapping
- Strong magnetic debris - possible made ground related to former farm buildings present on available mapping
- Processing artefact
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No. J8335
Survey Date APRIL 15

Client
CgMs CONSULTING LTD

Project Title
WIXAMS, BEDFORD

Subject
ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - OVERVIEW

STRATASCAN™
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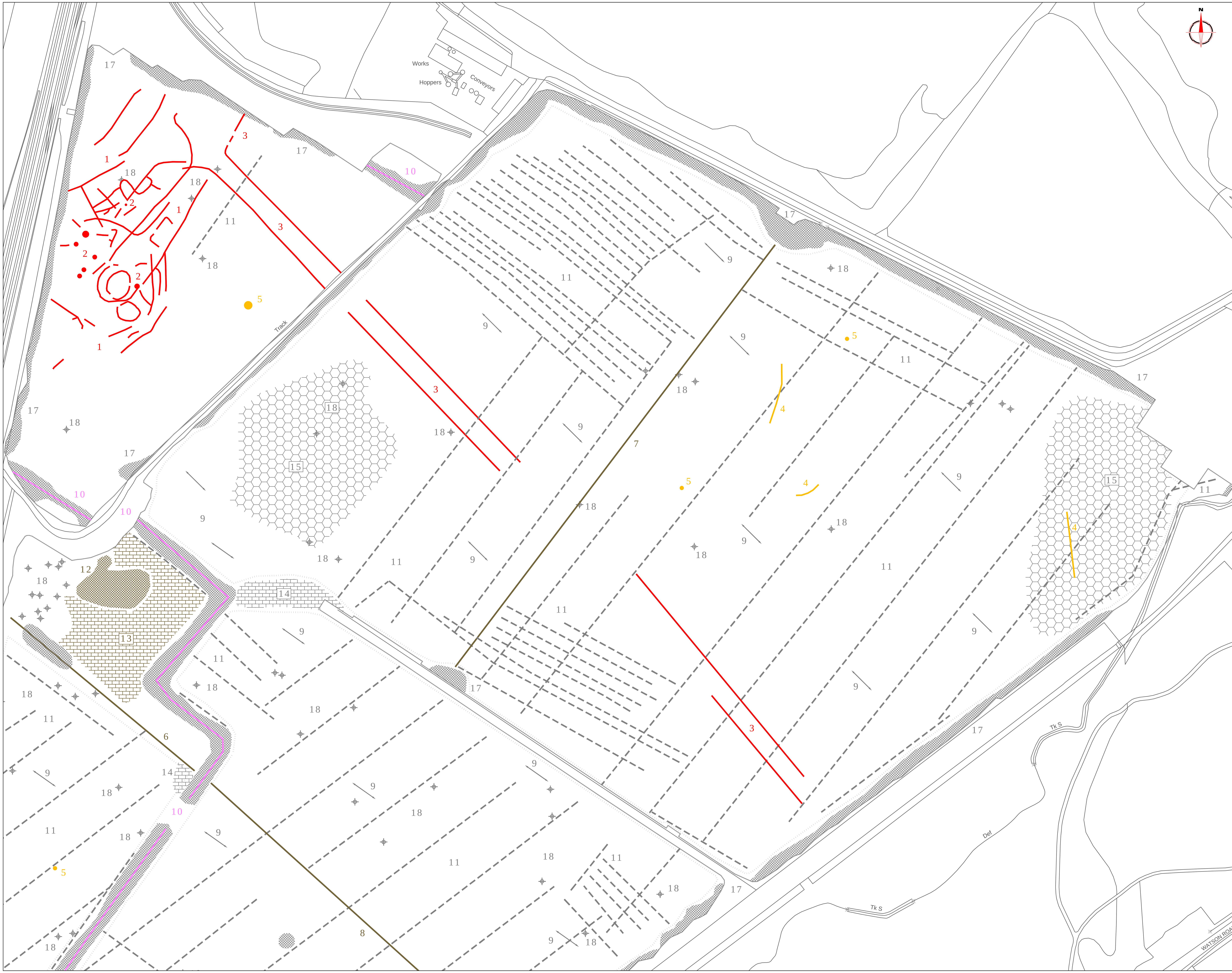
Scale 1:2000 — 0m 20 40 60 80 100 120m

Plot	Checked by	Issue No.
A1	PPB	01

Date	Drawn by	Figure No.
MAY 15	TR	08



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
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OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
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- Processing artefact
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8335	APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - NORTH

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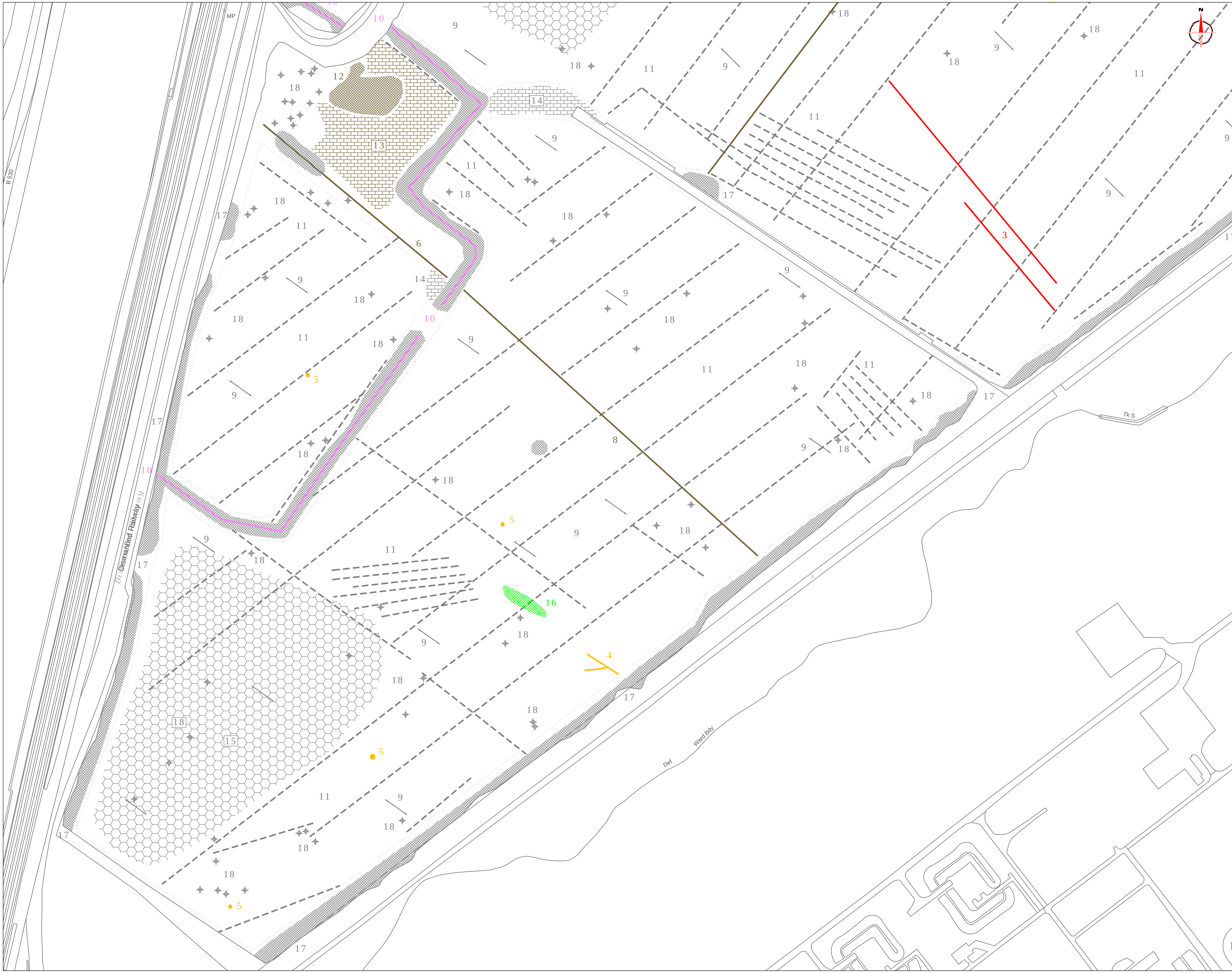
SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	09



Issue No.	Date	Description
-	-	-
-	-	-

Amendments

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with former farm buildings present on available mapping
- Strong magnetic debris - possible made ground related to former farm buildings present on available mapping
- Processing artefact
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8335	APRIL 15

Client
CgMs CONSULTING LTD

Project Title
WIXAMS, BEDFORD

Subject
ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - SOUTH

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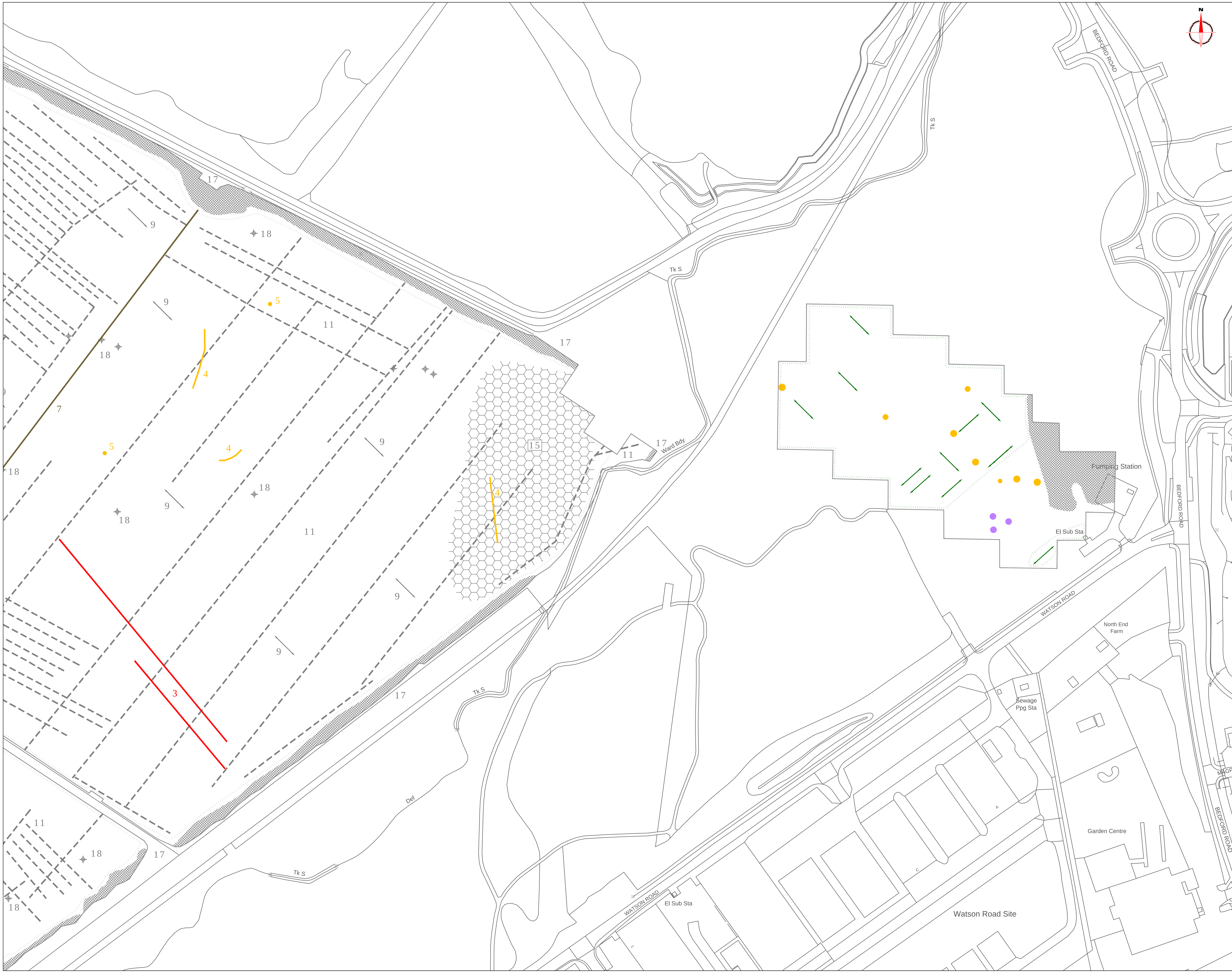
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	10



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin
- Possible thermoremnant feature such as a kiln

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with former farm buildings present on available mapping
- Strong magnetic debris - possible made ground related to former farm buildings present on available mapping
- Processing artefact
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No. J8335 | Survey Date APRIL 15

Client: CgMs CONSULTING LTD

Project Title: WIXAMS, BEDFORD

Subject: ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES FROM 1999 SURVEY

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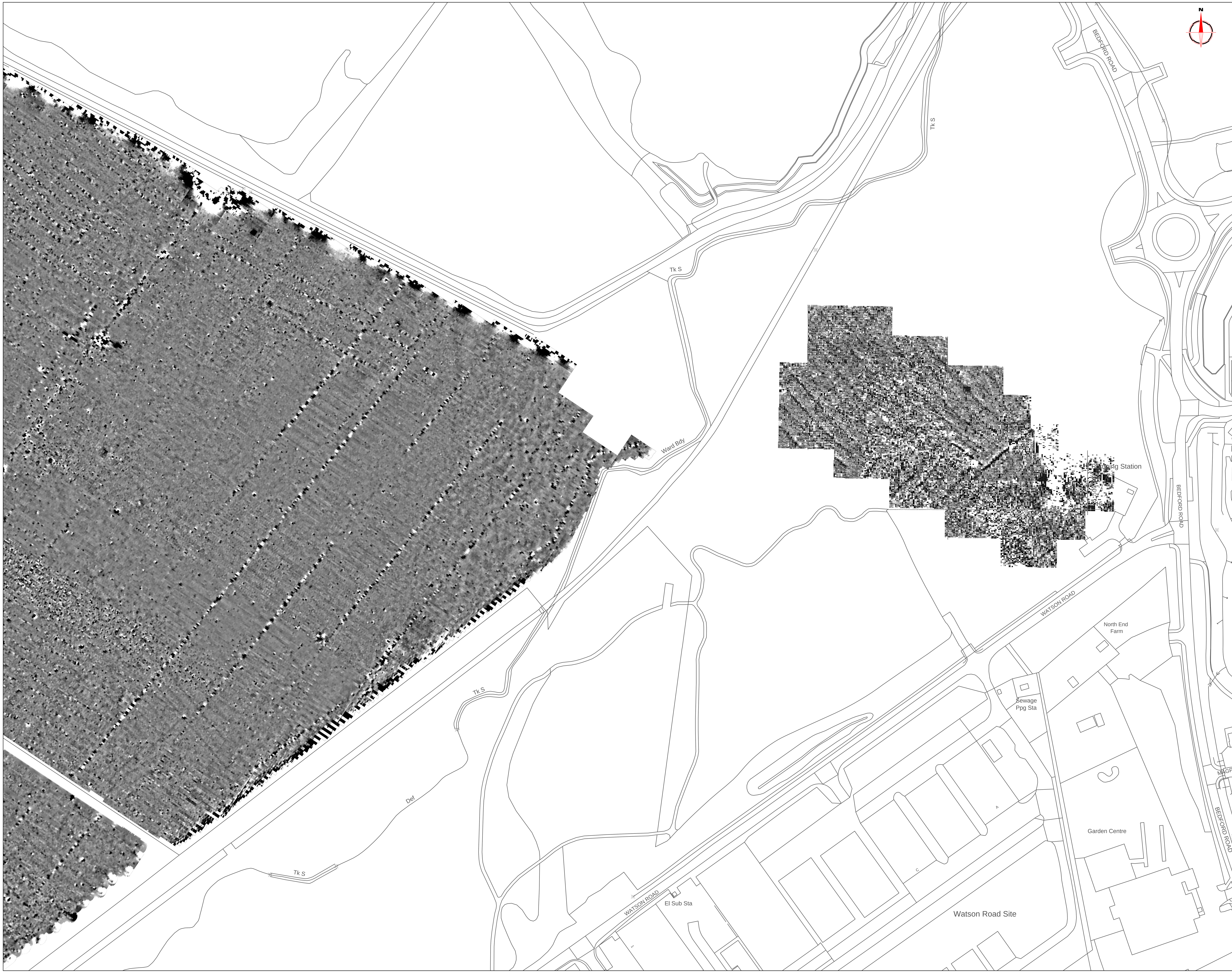
SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01

Date	Drawn by	Figure No.
MAY 15	TR	12



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)

Zero Mean

-2nT +2nT

+2nT
-2nT

Job No.	Survey Date
J8335	APRIL 15

Client

CgMs CONSULTING LTD

Project Title

WIXAMS, BEDFORD

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA FROM 1999 SURVEY

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Scale
1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
MAY 15	TR	11

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