

GEOPHYSICAL SURVEY REPORT

STRATASCAN™



Project name:
Weston-Super-Mare, Somerset

Client:
CH2M

February 2016

Job ref:
J9113

Report author:
Thomas Richardson MSc ACIfA

GEOPHYSICAL SURVEY REPORT

Project name:

Weston-Super-Mare, Somerset

Client:

CH2M



Job ref:

J9113

Techniques:

**Detailed magnetic survey –
Gradiometry**

Survey date:

**26th-29th January & 19th February
2016**

Site centred at:

ST 366 614

Post code:

BS24 7NA

Field team:

Stephen Weston BA (Hons), **Lukasz Krawec** BSc,
Christian Adams BA (Hons), **Tom Hynd** BSc (Hons),
Rosie Everett BA (Hons), **Jay Griffiths** BA (Hons),
Alexis Thouki MA, **Sophie Nicholson** BSc (Hons)

Project manager:

Simon Haddrell BEng(Hons) AMBCS PCIfA

Report written By:

Thomas Richardson MSc ACIfA

CAD illustrations by:

Thomas Richardson MSc ACIfA

Checked by:

David Elks MSc ACIfA

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 37.5 hectares of mixed arable and grassland. The survey has not identified any anomalies of probable archaeological origin. Several linear anomalies possibly relating to field boundaries or enclosures have been detected, however these could equally be natural or modern in origin. The remaining anomalies relate to the extensive natural variation across the site or are modern including underground services, land drains, a track way, stadium features, 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 CH2M.

2.2 *Site location*

The site is located to the east of Weston-Super-Mare, Somerset, between the A370, A371, and M5 at OS ref. ST 366 614.

2.3 *Description of site*

The survey area is approximately 44 hectares, however areas of concrete and overgrown vegetation in the south of the site reduced the surveyable area to approximately 37.5 hectares. The majority of the site is covered by arable land with grassland covering the northern extension, small fields in the north-west, and southern stadium area. The site is generally flat with small obstructions caused by waterlogging and areas of overgrown vegetation.

2.4 *Geology and soils*

The underlying geology is Mercia Mudstone Group – mudstone and halite-stone across the majority of the site with a small area of Anchor Formation – mudstone in the south (British Geological Survey website). The drift geology is Tidal Flood Deposits – clay, silt, and sand across the majority of the site, with none recorded in the south (British Geological Survey website).

The overlying soils for the majority of the site are known as Newchurch 2, which are typical pelo-calcareous alluvial gley soils. These consist of deep, stoneless, calcareous, clayey soils. A small area in the south of the site is covered by Worcester, which are typical argillic pelosols. These consist of non-calcareous and calcareous reddish clayey soils over mudstone (Soil Survey of England and Wales, Sheet 5 South West England).

2.5 **Site history and archaeological potential**

A cultural heritage assessment of the area has identified a potential for later prehistoric/Roman remains. Evidence of Iron Age and Roman settlement activity has been identified by excavation at the former RAF Locking site (Receptor ID ref 206, 208). Possible barrow area also recorded to the west of the site (Receptor ID ref 207). Evidence of medieval activity in the surrounding area is seen in the form of a scheduled Motte and Bailey castle to the west of the site (Receptor ID ref 204) (CH2M 2016).

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 prehistoric, Roman, and medieval activity, 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 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)

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 Weston-Super-Mare has identified a number of anomalies that have been characterised as being of a *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

No probable archaeology has been identified within the survey area.

3.2 Possible Archaeology

- 1 Positive linear anomalies in the centre of the site. These are indicative of former cut features, such as ditches, and may relate to former field boundaries or enclosures. However, these could equally relate to the large amount of natural variation seen across the site.
- 2 Short linear anomalies in the southern stadium area of the site. These are indicative of small former cut features and may relate to archaeological activity or modern activity associated with the stadium.
- 3 A negative linear anomaly in the centre of the site. This is indicative of a bank or earthwork feature, which appears to be associated with Anomaly 1a. This may relate to a former field boundary or be natural in origin.

- 4 A small discrete positive anomaly in the south of the site. This is indicative of a small former cut feature, such as a backfilled pit. This may archaeological in origin or a modern feature associated with the stadium.

3.3 *Medieval/Post-Medieval Agriculture*

No medieval or post-medieval agriculture has been identified within the survey area.

3.4 *Other Anomalies*

- 5 Magnetically strong bipolar linear anomalies across the centre and north of the site. These are indicative of underground services, such as pipes or cables.
- 6 Curved and linear areas of magnetic variation across the centre of the site. These anomalies are likely geological or pedological in origin, possibly relating to palaeochannels and creeks. Anomalies 6a-c appear to be straighter than the other anomalies suggesting that they may relate to human activity, however their shared orientation with other natural responses and generally weak response suggests they are more likely to be modern.
- 7 Large areas of magnetic variation in the north of the site. These anomalies are likely to be natural in origin, possibly relating to tree boles.
- 8 Magnetically weak bipolar linear anomalies across the site. These are indicative of land drains.
- 9 A linear anomaly in the north-west of the site. This is related to a modern track way visible on aerial photography of the area.
- 10 Magnetically strong linear anomalies in the south of the site. These are related to the stadium.
- 11 Linear anomalies in the north-west of the site. These are related to electric fences.
- 12 An area of magnetically strong responses in the south of the site. This is indicative of made ground, likely related to the stadium.
- 13 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.

- 14** 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

Mudstone geologies, such as those seen across the Weston-Super-Mare site, can give variable responses to magnetic survey, whilst the tidal deposits and alluvial gley soils seen across the centre and north of the site have the potential to mask archaeological features. The large amount of magnetic variation seen across the north and centre of the site suggests that any weak archaeological responses in the area are likely to be masked. This means that only large and strong archaeological features are likely to be seen in this area. The area in the south of the site not covered by tidal deposits shows a greater contrast between anomalies suggesting that the underlying mudstone geology is suitable for magnetic survey and that the survey has been effective in this area.

5 CONCLUSION

The survey at Weston-Super-Mare has not identified any anomalies of probable archaeological origin, however the survey does appear to have been affected by overlying tidal deposits. There is no firm evidence for prehistoric, Roman, or medieval activity in the area, which the heritage assessment found evidence of in the surrounding area. Several linear anomalies possibly relating to field boundaries or enclosures have been detected, however these could equally be natural or modern in origin. The remaining anomalies are modern or relate to the extensive natural variation across the site. The modern anomalies relate to underground services, land drains, a track way, stadium features, ferrous objects, and fencing.

6 REFERENCES

British Geological Survey South Sheet, 1977. *Geological Survey Ten Mile Map, South Sheet First Edition (Quaternary)*. Institute of Geological Sciences.

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<http://www.archaeologists.net/sites/default/files/nodefiles/Geophysics2010.pdf>

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Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 5 South West England*.

APPENDIX A – METHODOLOGY & SURVEY EQUIPMENT

Grid locations

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.

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 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.

Sampling interval

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

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.

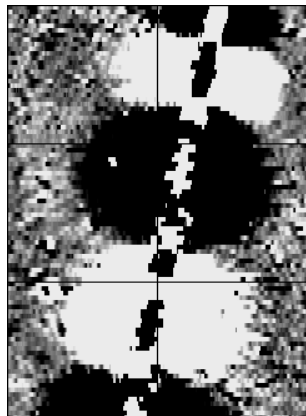
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement 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.

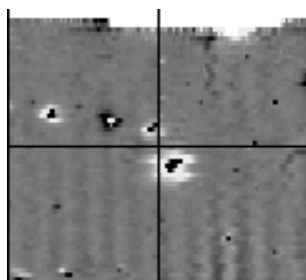
APPENDIX C – GLOSSARY OF MAGNETIC ANOMALIES

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

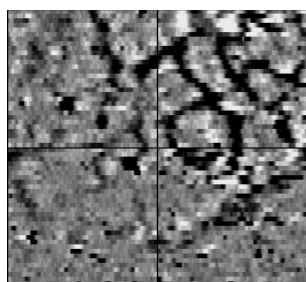


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very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

Positive anomaly with associated negative response

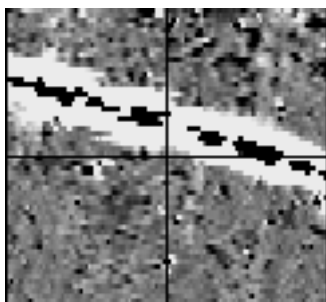
See bipolar and dipolar.

Positive linear



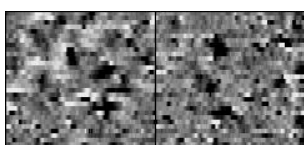
A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity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

Positive linear anomaly with associated negative response



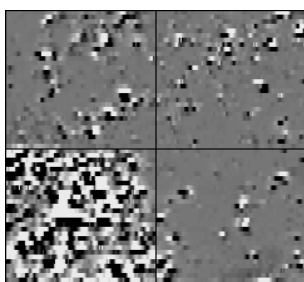
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field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

Positive point/area



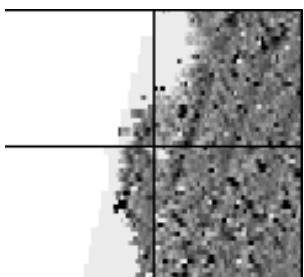
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally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

Magnetic debris



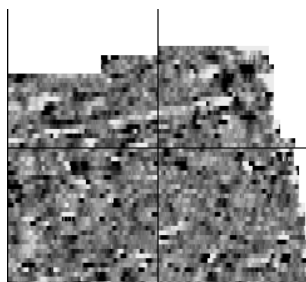
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low ($\pm 3nT$) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly ($\pm 250nT$) 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

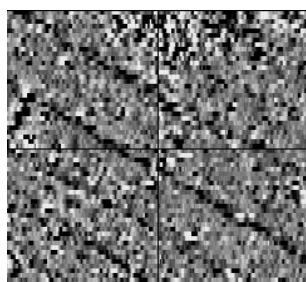


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative to the background top soil is built up. See also ploughing activity.

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).

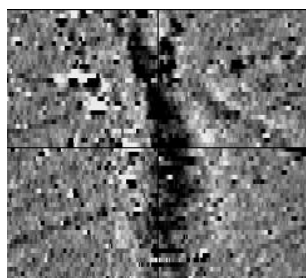
Strength of response

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 10m² 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.

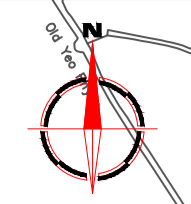
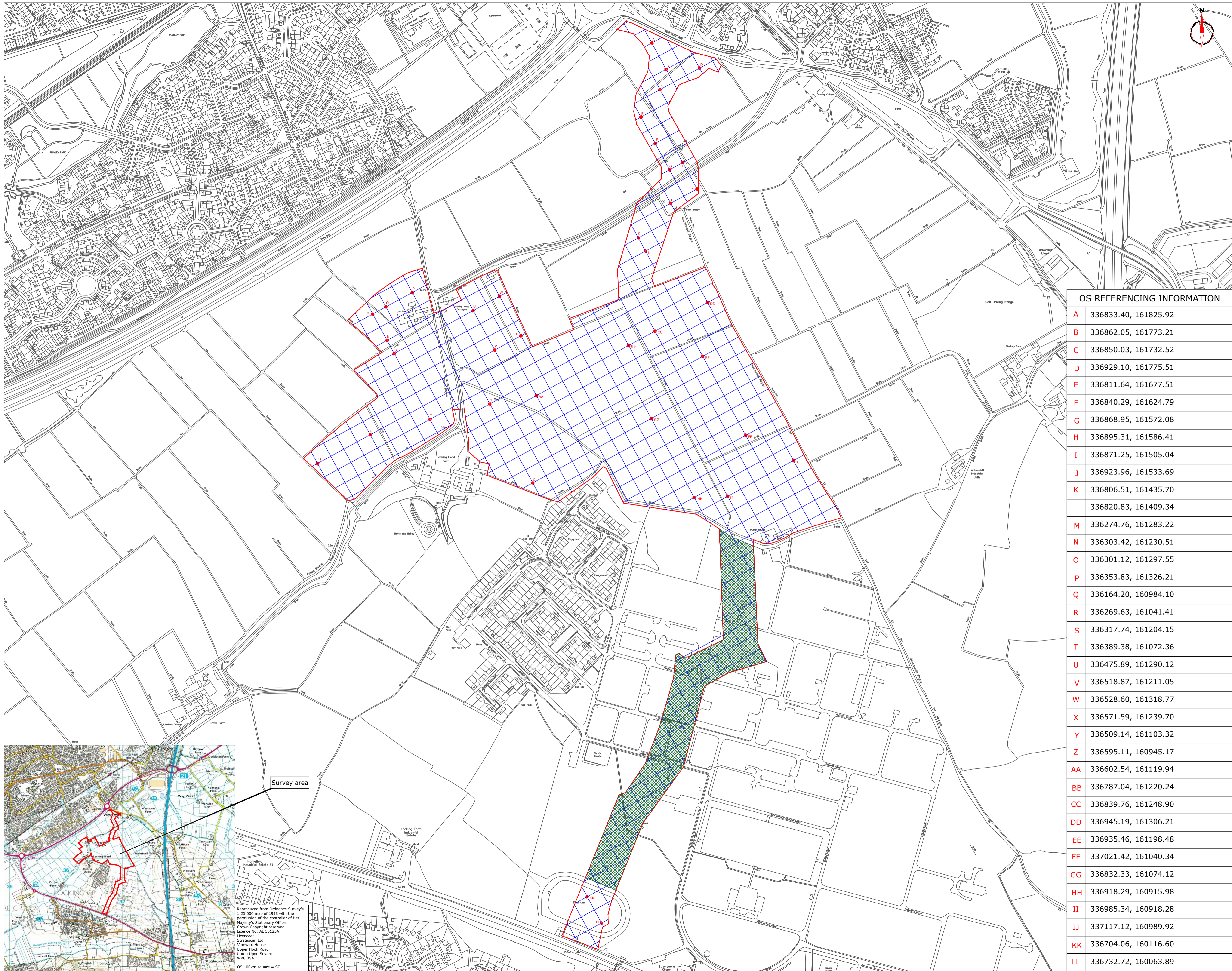
Thermoremanent response

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 |
|-----------|------|-------------|
| - | - | - |
| - | - | - |

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Survey area

Site centred on NGR ST 366 614

OS REFERENCING INFORMATION

| | |
|----|----------------------|
| A | 336833.40, 161825.92 |
| B | 336862.05, 161773.21 |
| C | 336850.03, 161732.52 |
| D | 336929.10, 161775.51 |
| E | 336811.64, 161677.51 |
| F | 336840.29, 161624.79 |
| G | 336868.95, 161572.08 |
| H | 336895.31, 161586.41 |
| I | 336871.25, 161505.04 |
| J | 336923.96, 161533.69 |
| K | 336806.51, 161435.70 |
| L | 336820.83, 161409.34 |
| M | 336274.76, 161283.22 |
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| R | 336269.63, 161041.41 |
| S | 336317.74, 161204.15 |
| T | 336389.38, 161072.36 |
| U | 336475.89, 161290.12 |
| V | 336518.87, 161211.05 |
| W | 336528.60, 161318.77 |
| X | 336571.59, 161239.70 |
| Y | 336509.14, 161103.32 |
| Z | 336595.11, 160945.17 |
| AA | 336602.54, 161119.94 |
| BB | 336787.04, 161220.24 |
| CC | 336839.76, 161248.90 |
| DD | 336945.19, 161306.21 |
| EE | 336935.46, 161198.48 |
| FF | 337021.42, 161040.34 |
| GG | 336832.33, 161074.12 |
| HH | 336918.29, 160915.98 |
| II | 336985.34, 160918.28 |
| JJ | 337117.12, 160989.92 |
| KK | 336704.06, 160116.60 |
| LL | 336732.72, 160063.89 |

KEY

Area unsurveyable - concrete and overgrown vegetation

Job No. **J9113** Survey Date **JAN-FEB'16**

Client

CH2M

Project Title

WESTON-SUPER-MARE, SOMERSET

Subject

SITE LOCATION, SURVEY AREA & REFERENCING

STRATASCAN™
 GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
 VINEYARD HOUSE UPTON UPON SEVERN WR8 0SA
 T: 01684 592266 E: info@stratascan.co.uk www.stratascan.co.uk

GPR ASSOCIATION
SUMO GROUP MEMBER

Scale **1:3500**
 0m 30 60 90 120 150 180m

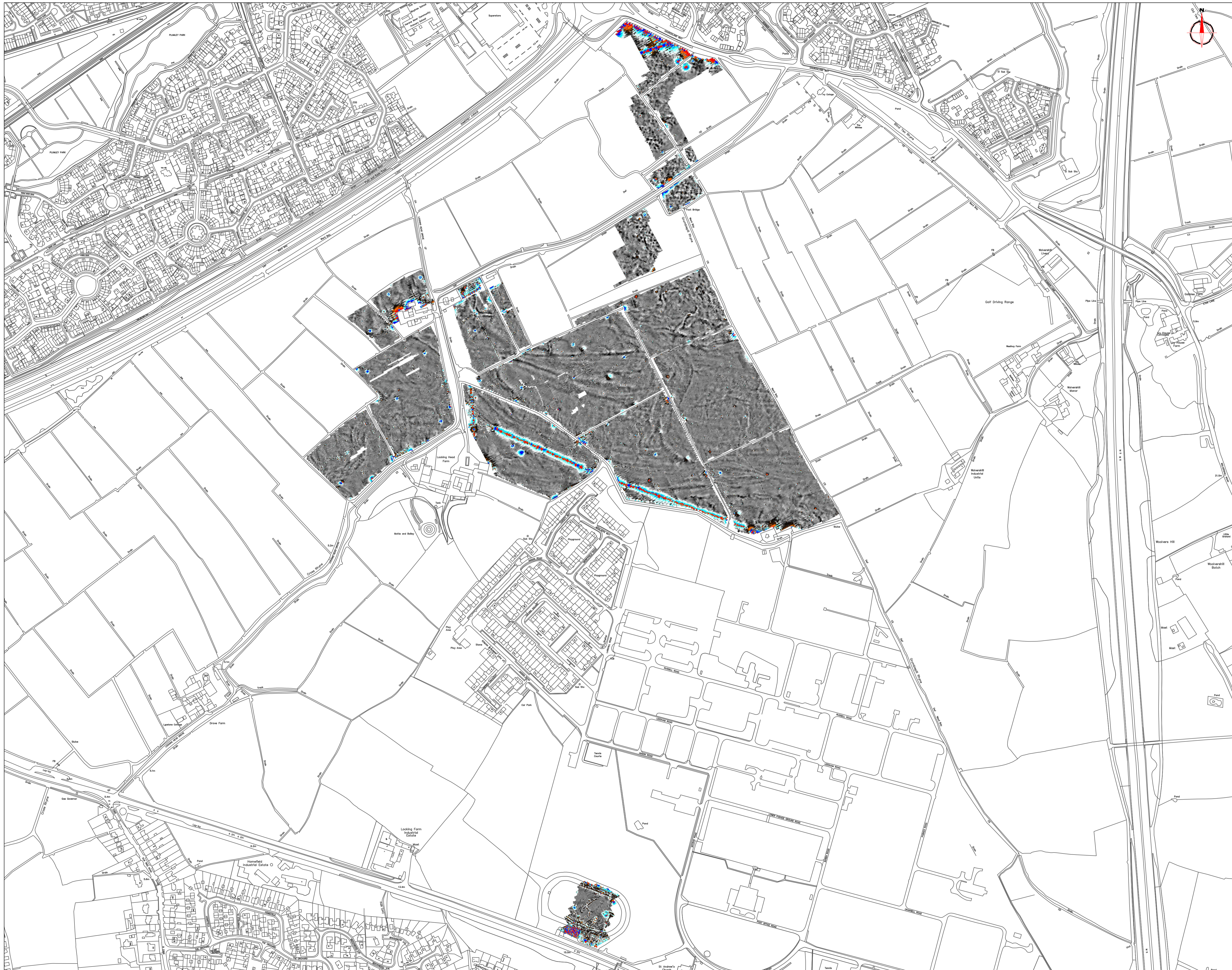
Plot **A1** Checked by **DGE** Issue No. **01**
 Date **FEB 16** Drawn by **TR** Figure No. **01**

Survey area

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Licence:
 Stratascan Ltd,
 Vineyard House
 Upton Upon Severn
 WR8 0SA

OS 100mm square = ST



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
| - | - | - |
| © Stratascan Ltd - 2016 | | |

| | |
|-----------------------|--------|
| Plotting parameters | +100nT |
| Maximum +100nT (red) | +25nT |
| Minimum -100nT (blue) | +3nT |
| | -3nT |
| | -25nT |
| | -100nT |

| | | | |
|---------------|-------------------------------------------------------------------|-------------|------------|
| Job No. | J9113 | Survey Date | JAN-FEB'16 |
| Client | CH2M | | |
| Project Title | WESTON-SUPER-MARE, SOMERSET | | |
| Subject | COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - OVERVIEW | | |

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GPR ASSOCIATION
SUMO GROUP MEMBER

Scale 1:3500
 0m 30 60 90 120 150 180m

| | | | | | |
|------|--------|------------|-----|------------|----|
| Plot | A1 | Checked by | DGE | Issue No. | 01 |
| Date | FEB 16 | Drawn by | TR | Figure No. | 02 |



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
| - | - | - |
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| | |
|-----------------------|--------|
| Plotting parameters | |
| Maximum +100nT (red) | +100nT |
| Minimum -100nT (blue) | -100nT |

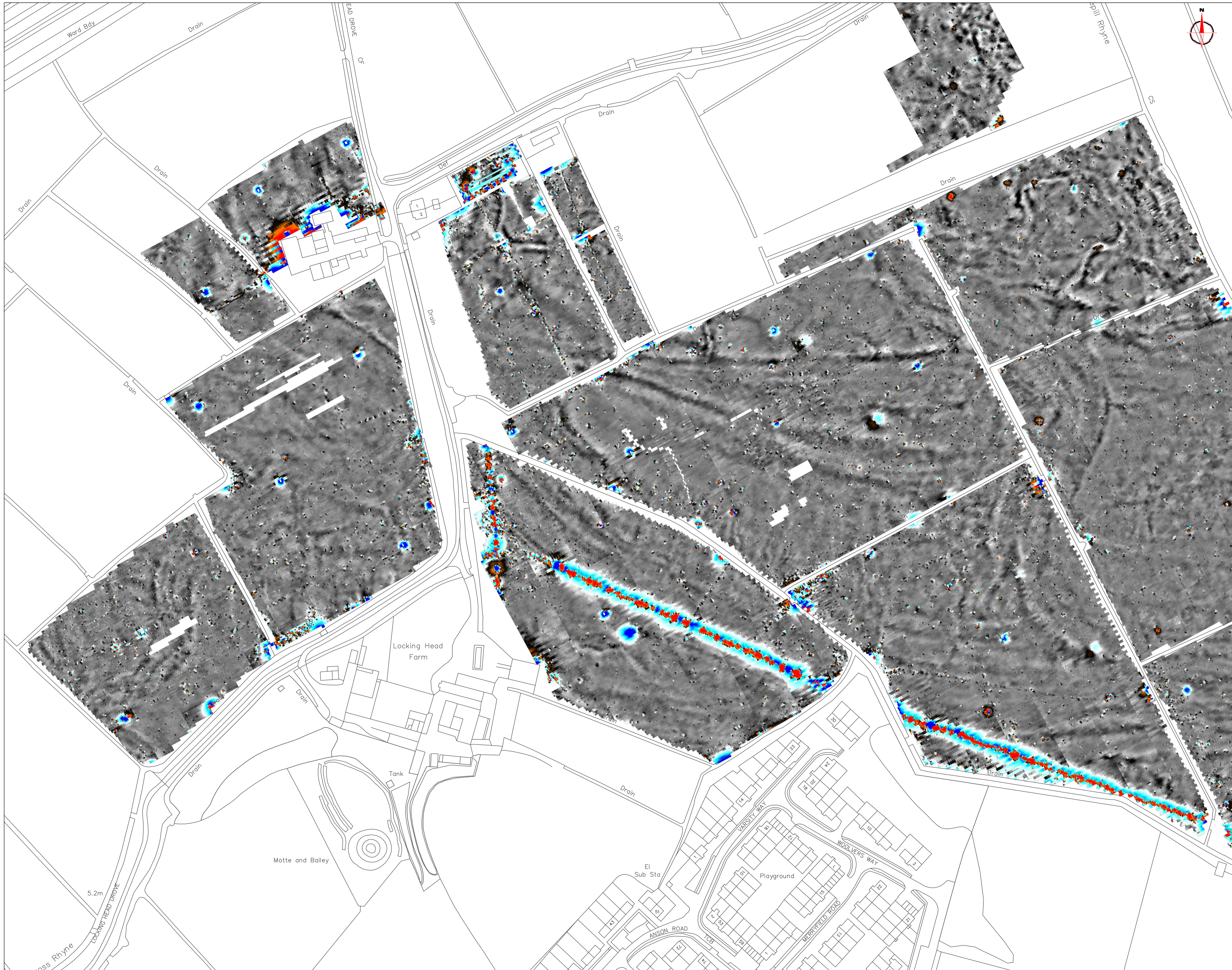
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|---------------|-------------------------------------------------------------------|-------------|------------|
| Job No. | J9113 | Survey Date | JAN-FEB'16 |
| Client | CH2M | | |
| Project Title | WESTON-SUPER-MARE, SOMERSET | | |
| Subject | COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - OVERVIEW | | |

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GPR ASSOCIATION
SUMO GROUP MEMBER
 ISO 9001 certified
 ISO 14001 certified

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

| | | | | | |
|------|--------|------------|-----|------------|----|
| Plot | A1 | Checked by | DGE | Issue No. | 01 |
| Date | FEB 16 | Drawn by | TR | Figure No. | 03 |



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
| - | - | - |
| - | - | - |
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Plotting parameters

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

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

| | | | |
|---------------|------------------------------------------------------------------------|-------------|------------|
| Job No. | J9113 | Survey Date | JAN-FEB'16 |
| Client | CH2M | | |
| Project Title | WESTON-SUPER-MARE, SOMERSET | | |
| Subject | COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES - WEST | | |

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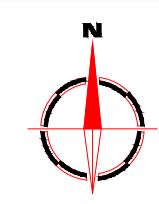
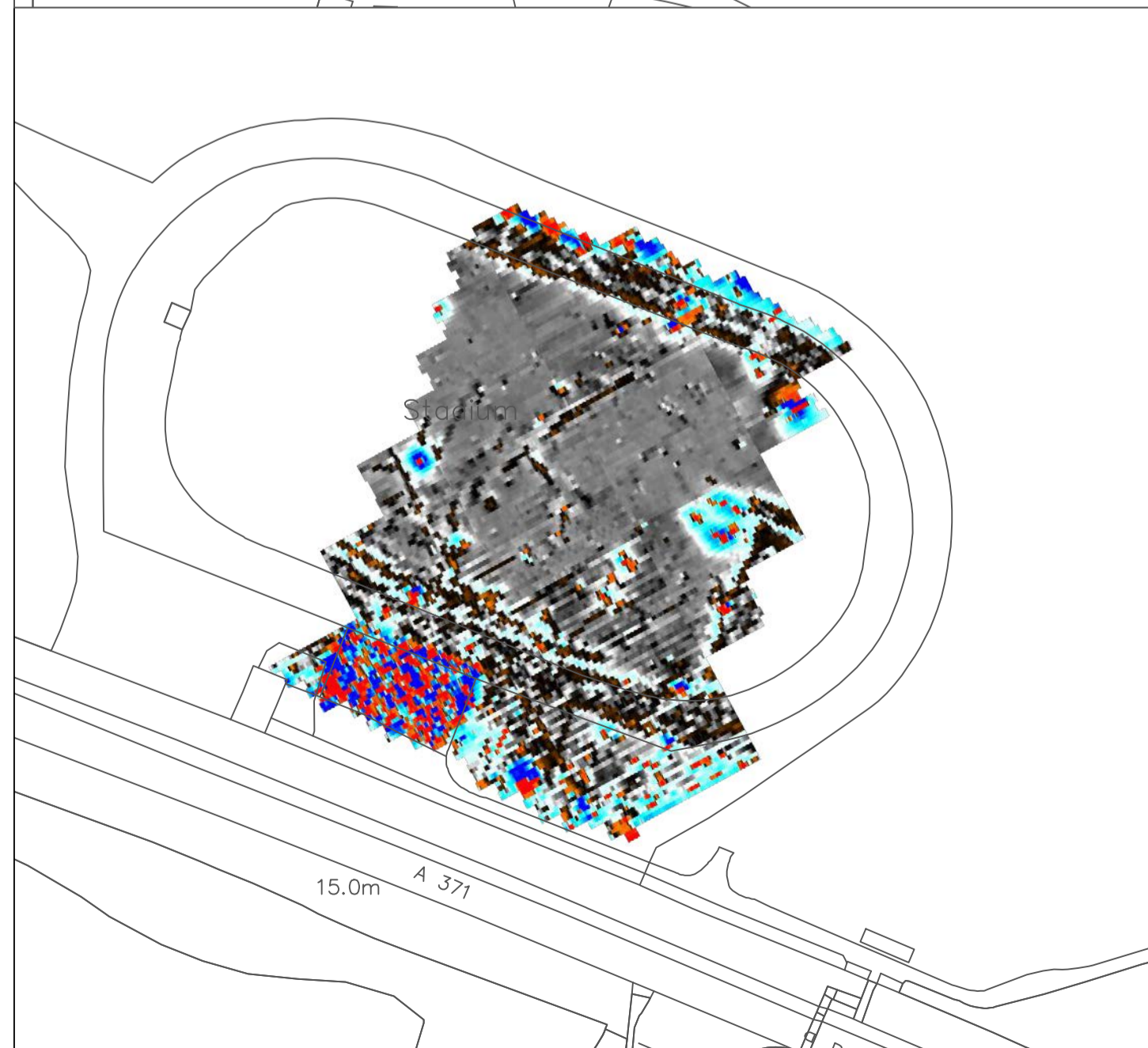
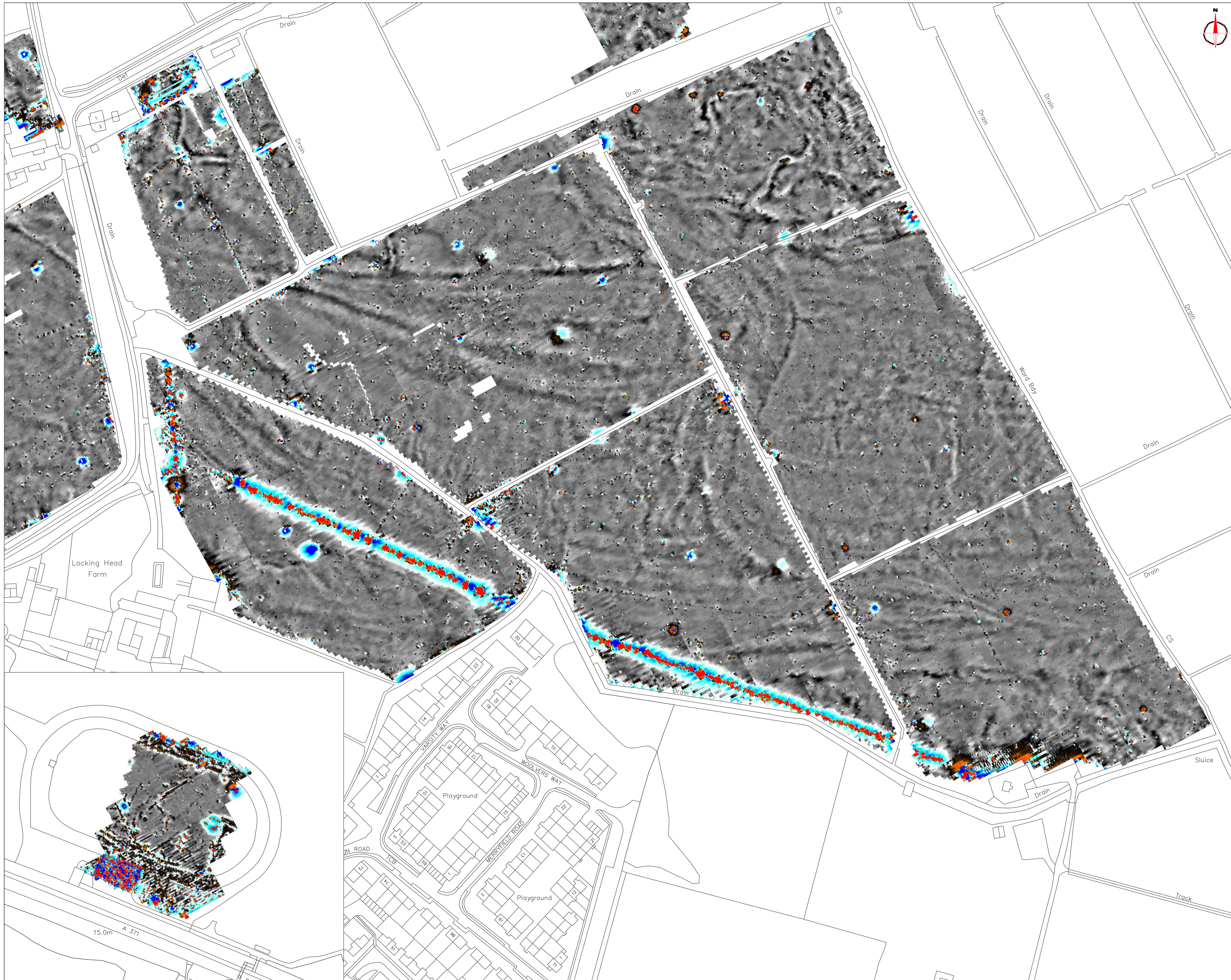
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SUMO GROUP MEMBER

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 ISO 14001 certified

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

| | | | | | |
|------|--------|------------|-----|------------|----|
| Plot | A1 | Checked by | DGE | Issue No. | 01 |
| Date | FEB 16 | Drawn by | TR | Figure No. | 04 |



Amendments

| Issue No. | Date | Description |
|-----------|------|-------------|
| - | - | - |
| - | - | - |

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Plotting parameters

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

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

| | | | |
|---------|-------|-------------|------------|
| Job No. | J9113 | Survey Date | JAN-FEB'16 |
|---------|-------|-------------|------------|

Client
CH2M

Project Title
**WESTON-SUPER-MARE,
SOMERSET**

Subject
**COLOUR PLOT OF
GRADIOMETER DATA
SHOWING EXTREME VALUES -
EAST & SOUTH**

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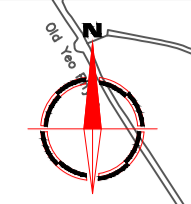
GPR ASSOCIATION

SUMO GROUP MEMBER

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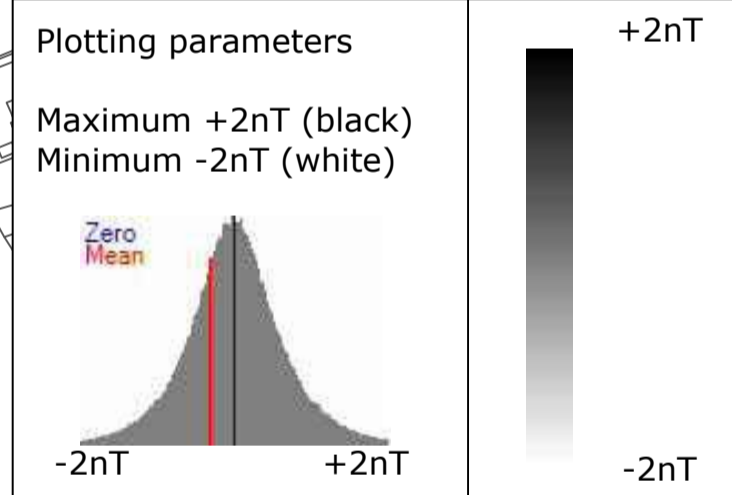
Scale 1:1250
0m 10 20 30 40 50 60 70 80m

| | | | | | |
|------|--------|------------|-----|------------|----|
| Plot | A1 | Checked by | DGE | Issue No. | 01 |
| Date | FEB 16 | Drawn by | TR | Figure No. | 05 |



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

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Client

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Project Title

**WESTON-SUPER-MARE,
SOMERSET**

Subject

**PLOT OF MINIMALLY
PROCESSED GRADIOMETER
DATA - OVERVIEW**

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Scale

1:3500

| | | |
|--------|------------|------------|
| Plot | Checked by | Issue No. |
| A1 | DGE | 01 |
| Date | Drawn by | Figure No. |
| FEB 16 | TR | 06 |



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
| - | - | - |
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Plotting parameters

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

-2nT +2nT

Zero Mean

+2nT

-2nT

| | | | |
|---------------|------------------------------------------------------------|-------------|------------|
| Job No. | J9113 | Survey Date | JAN-FEB'16 |
| Client | CH2M | | |
| Project Title | WESTON-SUPER-MARE, SOMERSET | | |
| Subject | PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - NORTH | | |

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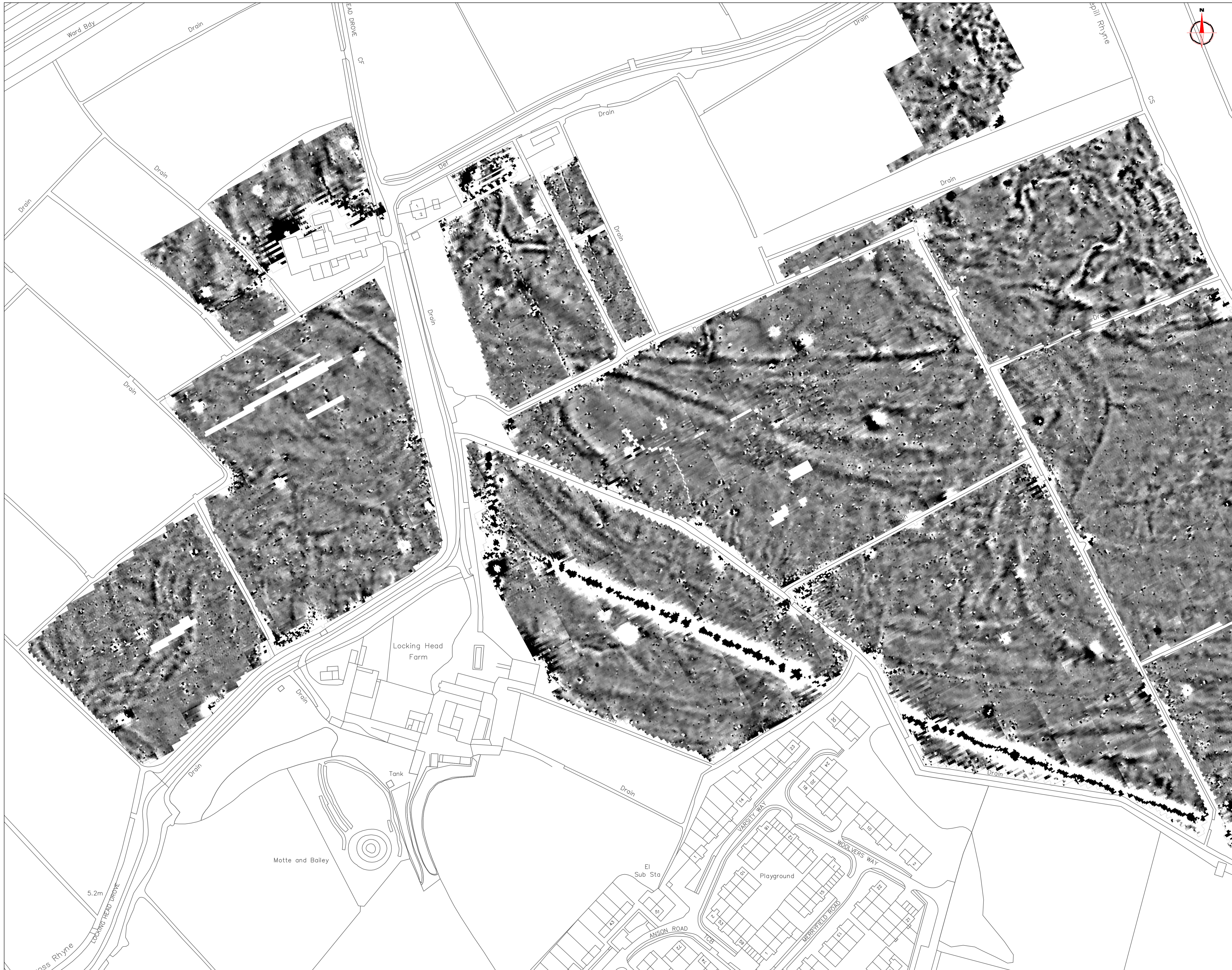
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SUMO GROUP MEMBER

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

| | | | | | |
|------|--------|------------|-----|------------|----|
| Plot | A1 | Checked by | DGE | Issue No. | 01 |
| Date | FEB 16 | Drawn by | TR | Figure No. | 07 |



| Amendments | | |
|-------------------------|------|-------------|
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| - | - | - |
| - | - | - |
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Plotting parameters

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

-2nT +2nT

Job No. **J9113** Survey Date **JAN-FEB'16**

Client **CH2M**

Project Title **WESTON-SUPER-MARE, SOMERSET**

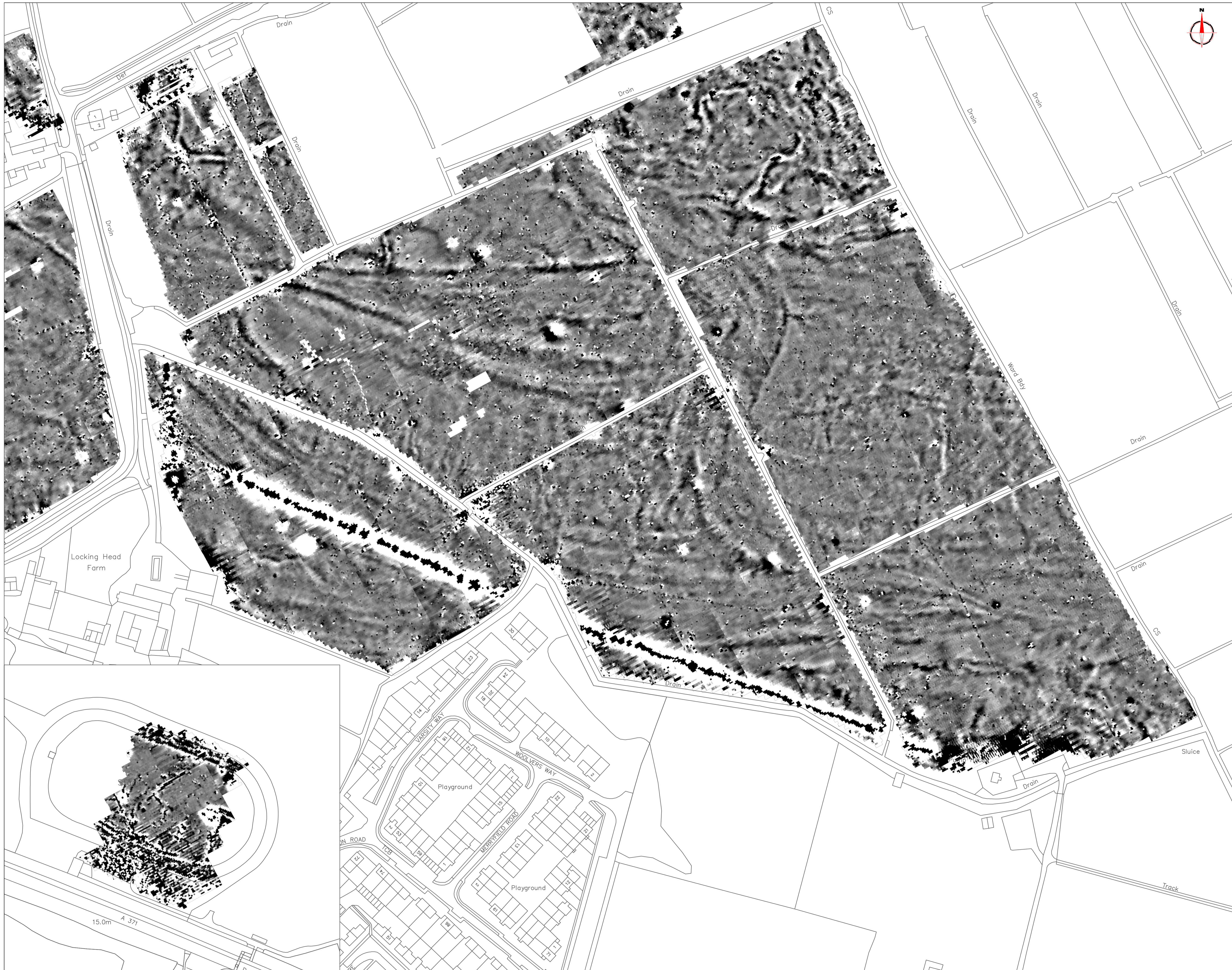
Subject **PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - WEST**

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GPR ASSOCIATION **SUMO GROUP MEMBER**

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

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|--------------------|-----------------------|----------------------|
| Plot A1 | Checked by DGE | Issue No. 01 |
| Date FEB 16 | Drawn by TR | Figure No. 08 |



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
| - | - | - |
| - | - | - |
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Plotting parameters

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

-2nT +2nT

+2nT
-2nT

Job No. J9113 Survey Date JAN-FEB'16

Client CH2M

Project Title WESTON-SUPER-MARE, SOMERSET

Subject PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA - EAST & SOUTH

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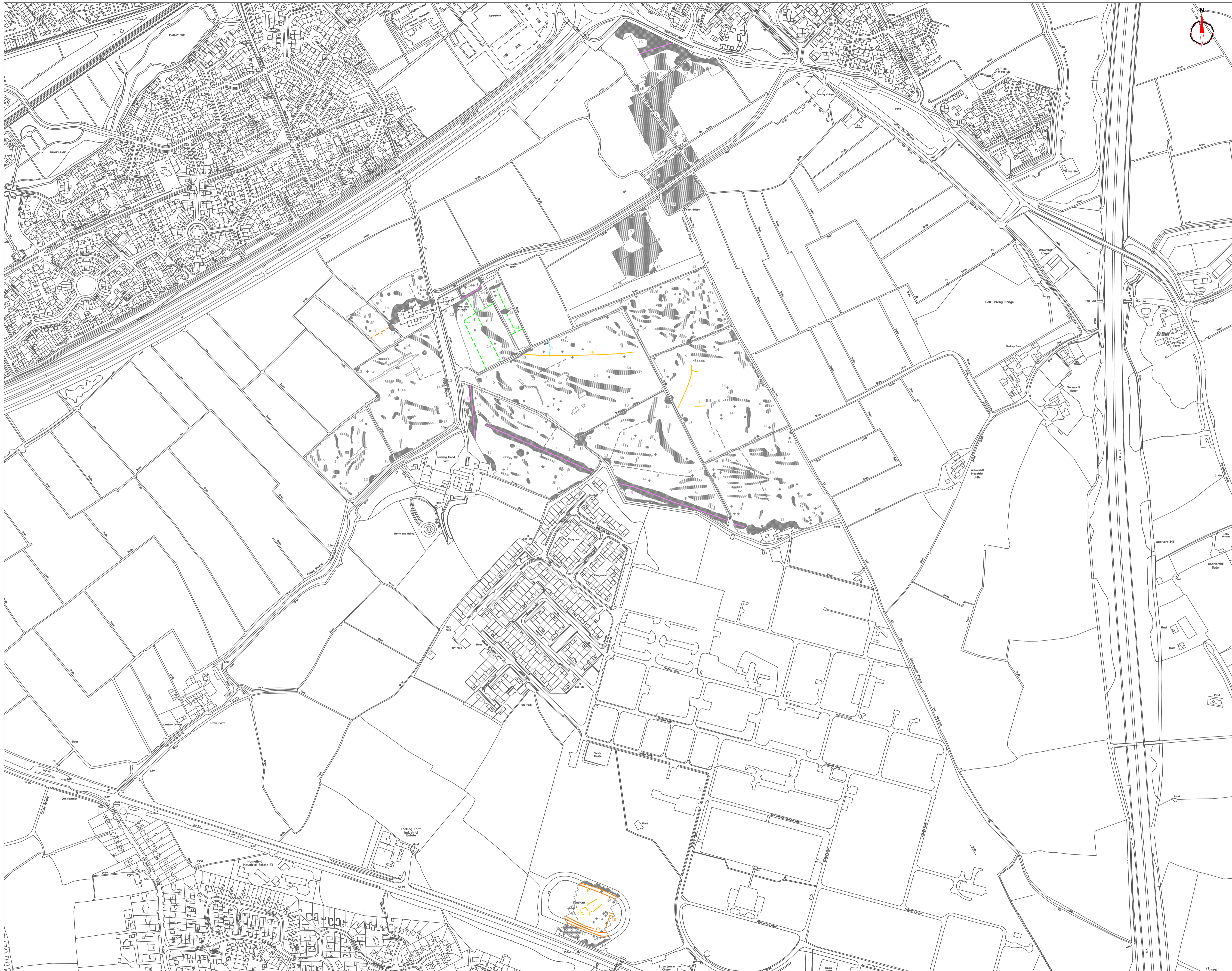
GPR ASSOCIATION

SUMO GROUP MEMBER

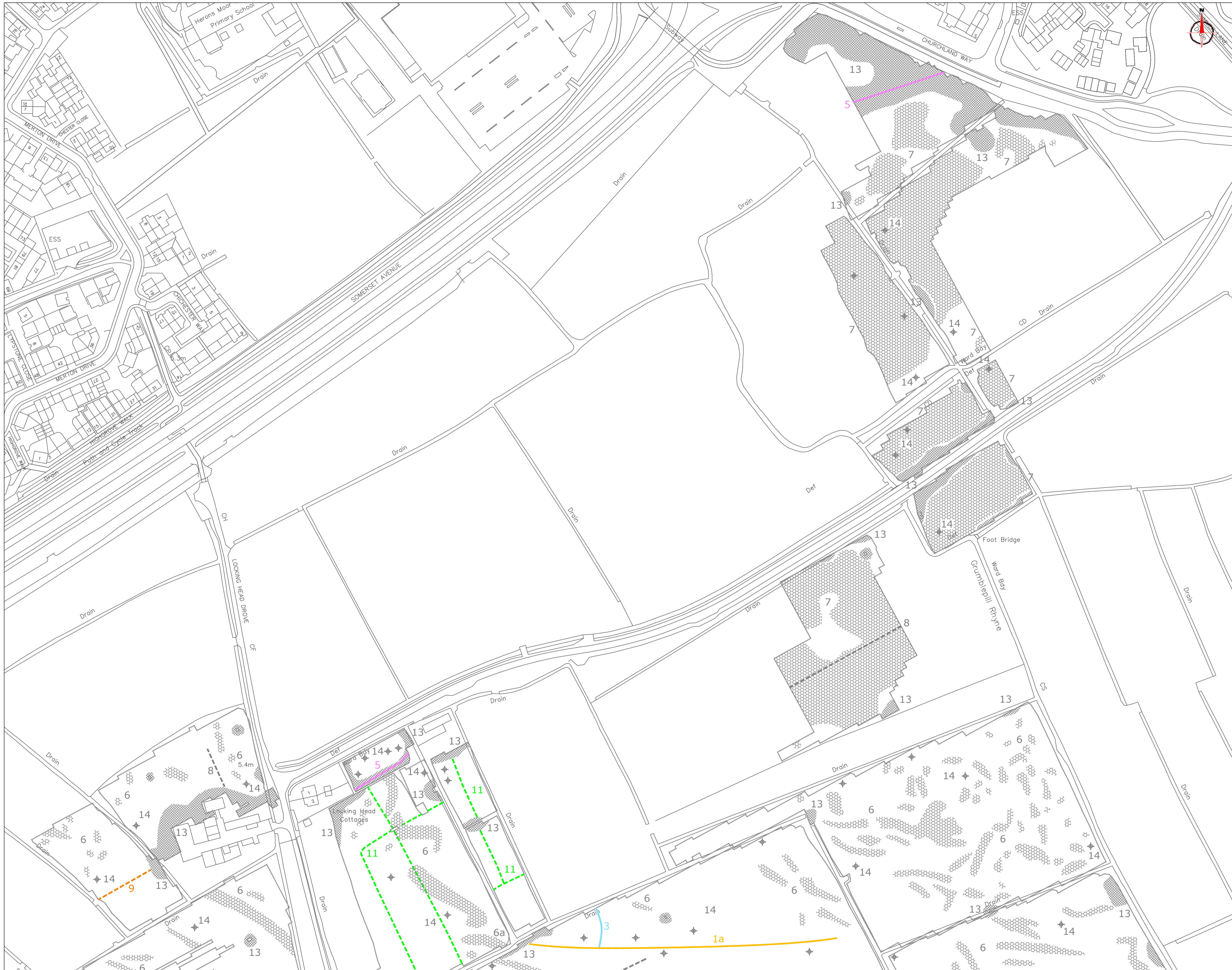
ISO 9001 certified ISO 14001 certified

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

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|-------------|----------------|---------------|
| Plot A1 | Checked by DGE | Issue No. 01 |
| Date FEB 16 | Drawn by TR | Figure No. 09 |



| Amendments | | |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Issue No. | Date | Description |
| - | - | - |
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| 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 | |
| | Linear anomaly - modern track way | |
| | Linear anomaly - modern stadium feature | |
| | Linear anomaly - electric fence | |
| | 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 | |
| J9113 | JAN-FEB'16 | |
| Client | CH2M | |
| Project Title | WESTON-SUPER-MARE, SOMERSET | |
| Subject | ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - OVERVIEW | |
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| | | |
| Scale | 0m 30 60 90 120 150 180m | |
| 1:3500 | | |
| Plot | Checked by | Issue No. |
| A1 | DGE | 01 |
| Date | Drawn by | Figure No. |
| FEB 16 | TR | 10 |



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
| - | - | - |
| - | - | - |
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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
- Linear anomaly - modern track way
- Linear anomaly - modern stadium feature
- Linear anomaly - electric fence
- 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. **J9113** Survey Date **JAN-FEB'16**

Client **CH2M**

Project Title **WESTON-SUPER-MARE, SOMERSET**

Subject **ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - NORTH**

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

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| Plot A1 | Checked by DGE | Issue No. 01 |
| Date FEB 16 | Drawn by TR | Figure No. 11 |



| Amendments | | |
|-------------------------|------|-------------|
| Issue No. | Date | Description |
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| - | - | - |
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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
- Linear anomaly - modern track way
- Linear anomaly - modern stadium feature
- Linear anomaly - electric fence
- 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. **J9113** Survey Date **JAN-FEB'16**

Client **CH2M**

Project Title **WESTON-SUPER-MARE, SOMERSET**

Subject **ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - WEST**

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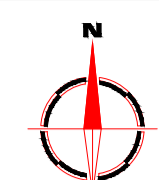
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GPR ASSOCIATION

SUMO GROUP MEMBER

Scale 1:1250

| | | |
|--------|------------|------------|
| Plot | Checked by | Issue No. |
| A1 | DGE | 01 |
| Date | Drawn by | Figure No. |
| FEB 16 | TR | 12 |



| Amendments | | |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------|
| Issue No. | Date | Description |
| - | - | - |
| - | - | - |
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| 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 | |
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| | Linear anomaly - probably related to pipe, cable or other modern service | |
| | Linear anomaly - possibly related to land drain | |
| | Linear anomaly - modern track way | |
| | Linear anomaly - modern stadium feature | |
| | Linear anomaly - electric fence | |
| | 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 | |
| J9113 | JAN-FEB'16 | |
| Client | CH2M | |
| Project Title | WESTON-SUPER-MARE, SOMERSET | |
| Subject | ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES - EAST & SOUTH | |
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| Scale | | |
| 1:1250 | | |
| Plot | Checked by | Issue No. |
| A1 | DGE | 01 |
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| FEB 16 | TR | 13 |

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STRATASCAN LTD

Vineyard House Upper Hook Road Upton upon Severn
Worcestershire WR8 0SA United Kingdom

T:01684 592266 F: 01684 594142
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